REGULAR MEETING & WORK SESSION OF THE CITY COUNCIL

February 25, 2020

ADDISON TOWN HALL

5300 BELT LINE RD., DALLAS, TX 75254
5:45 PM WORK SESSION
7:30 PM REGULAR MEETING

1. Call Meeting to Order

WORK SESSION

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2. Present and Discuss **the Format for the Town Meeting on April 6, 2020.**

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3. Present and Discuss **the Potential Adoption of the Town's Building Codes Including the International Code Council 2018 Codes and the 2017 National Electrical Code**.

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4. Present and Discuss **Fees for Environmental Health Related Permits, Licenses, and Inspections**.

REGULAR MEETING

Pledge of Allegiance

Announcements and Acknowledgements regarding Town and Council Events and Activities

Discussion of Events/Meetings

Public Comment.
The City Council invites citizens to address the City Council on any matter, including items on the agenda, except public hearings that are included on the agenda. Comments related to public hearings will be heard when the specific hearing starts. Citizen comments are limited to three (3) minutes, unless otherwise required by law. To address the Council, please fill out a City Council Appearance Card and submit it to a staff member prior to the Public Comment item on the agenda. The Council is not permitted to take any action or discuss any item not listed on the agenda. The Council may choose to place the item on a future agenda.

Consent Agenda:
All items listed under the Consent Agenda are considered routine by the City Council and will be enacted by one motion with no individual consideration. If individual consideration of an item is requested, it will be pulled from the Consent Agenda and discussed separately.

5. Consider Action to Approve **the Minutes of February 13, 2020 City Council Meeting.**

6. Consider Action on a **Resolution Authorizing the Adoption of the Election Systems and Software ExpressVote Universal voting System (Ballot Marking Devices), EVS 6.0.2.0, Firmware 2.4.0.0; the ES&S DS200 Digital Precinct Scanner, EVS 6.0.2.0, Firmware 2.17.0.0; and ES&S Model DS850 High-Speed Scanner/Tabulator, Version 1, EVS 6.0.2.0, along with the required ancillary parts and services required for this voting tabulation system equipment for use in all forms of voting in the Town of Addison.**

7. Consider Action to Approve a **Resolution Authorizing the Use of Eminent Domain for the Acquisition of Permanent Right-of-Way, Utility Easements, and Temporary Construction Easements for the Reconstruction of Midway Road from Spring Valley Road to Keller Springs Road.**

8. Consider Action to **Approve the First Quarter Update from the Finance Committee to the City Council for the Period from October 2019 to December 2019**.

Regular Items

9. Present, Discuss, and Consider Action on a **Resolution to Approve a Contract Agreement with Flow-Line Construction Inc. for the Construction of Sanitary Sewer Outfall Re-route and Water Line Improvements and Authorize the City Manager to Execute the Agreement** in an Amount Not to Exceed $1,442,933.

10. Present, Discuss and Consider Action on a **Resolution to Approve the Agreement for the Construction of Belt Line 1.5 Enhancements Between Marsh Lane and Midway Road Between the Town of Addison and J.B. & CO. LLC and Authorize the City Manager to Execute the Agreement** in an Amount not to Exceed $1,798,287.95 and set a total project budget of $2,378,000.

11. Present and Discuss the **Addison Police Department's 2019 Annual Report.**

12. Present, Discuss and Consider Action **to Accept the Addison Police Department's 2019 Racial Profiling Report And Motor Vehicle Contact Search Analysis Report.**

13. Present, Discuss, and Consider Action on an **Ordinance Declaring Unopposed Candidates in the May 2, 2020 City General Election, Elected to Office; Canceling the Election; Providing a Severability Clause; and Providing an Effective Date.**

14. Present and Discuss the **Finance Department Quarterly Financial Report of the Town of Addison for the Fiscal Year 2020 First Quarter Ended December 31, 2019**.

Adjourn Meeting

NOTE: The City Council reserves the right to meet in Executive Session closed to the public at any time in the course of this meeting to discuss matters listed on the agenda, as authorized by the Texas Open Meetings Act, Texas Government Code, Chapter 551, including §551.071 (private consultation with the attorney for the City); §551.072 (purchase, exchange, lease or value of real property); §551.074 (personnel or to hear complaints against personnel); §551.076 (deployment, or specific occasions for implementation of security personnel or devices); and §551.087 (economic development negotiations). Any decision held on such matters will be taken or conducted in Open Session following the conclusion of the Executive Session.

Posted: _____
Irma G. Parker, City Secretary
Date: Thursday, February 20, 2020
Time: 6:34 pm

THE TOWN OF ADDISON IS ACCESSIBLE TO PERSONS WITH DISABILITIES. PLEASE CALL (972) 450-7090 AT LEAST 48 HOURS IN ADVANCE IF YOU NEED ASSISTANCE.

Work Session and Regular Meeting **2.**

Meeting Date: 02/25/2020

Department: Communications & Marketing

AGENDA CAPTION:

Present and Discuss **the Format for the Town Meeting on April 6, 2020.**

BACKGROUND:

Town Meetings are held twice a year in the spring and fall. This year, the spring meeting will be held on April 6, 2020 at 7:00 pm at the Addison Conference Centre. The purpose of this item is to discuss the format and topics for the presentation.

RECOMMENDATION:

Staff requests direction from Council.

Work Session and Regular Meeting **3.**

Meeting Date: 02/25/2020

Department: Development Services

AGENDA CAPTION:

Present and Discuss **the Potential Adoption of the Town's Building Codes Including the International Code Council 2018 Codes and the 2017 National Electrical Code**.

BACKGROUND:

The Town regulates the construction, alteration, occupancy and maintenance of buildings through the adoption and enforcement of a series of codes. The Town currently operates under the 2012 International Code Council (ICC) Codes and the 2014 National Electrical Code. These codes regulate commercial and residential structures including elements pertaining to the fire protection, plumbing, mechanical and electrical elements of buildings. New versions of these codes are released every three years to account for issues that arise between code cycles, new construction methods, and to clarify existing regulations. Staff is proposing that the Town adopt the 2018 ICC Codes and the 2017 National Electrical Code.

In anticipation of bringing forward new codes for adoption in March, Staff will present the attached presentation to provide an overview of building codes and the adoption process.

It should be noted that updating the building codes is separate from the Unified Development Code (UDC) process that is also occurring. The UDC covers uses of property and development standards related to the type, location, bulk and appearance of structures on a property. Building codes regulate the technical aspects of construction to ensure they are built soundly and can be occupied safely.

RECOMMENDATION:

Information only, no action required.

Attachments

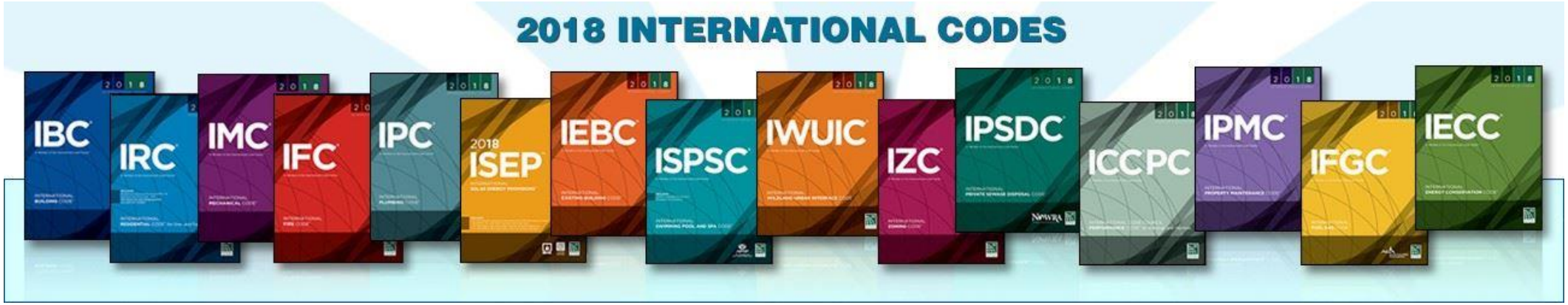
Presentation - Building Code Update

Building Code Updates

February 25, 2020

What are the Building Codes?

- Family of Codes developed by the International Code Council (ICC)
- Help ensure safe, sustainable, and resilient structures
- ICC Codes are the most widely accepted, comprehensive set of model codes used in the United States
- Used in all 50 states
- Commonly used in conjunction with the National Electrical Code



Codes for Adoption

- 2018 International Building Code
- 2018 International Residential Code
- 2018 International Existing Building code
- 2018 International Fuel Gas Code
- 2018 International Energy Conservation Code
- 2018 International Solar Energy Provisions
- 2018 International Plumbing Code
- 2018 International Mechanical Code
- 2018 International Swimming Pool and Spa Code
- 2018 International Property Maintenance Code
- 2018 International Fire Code
- 2017 National Electrical Code

Adoption Cycle

- ICC releases new codes every three years
- Addison adopted the 2012 ICC Codes and the 2014 National Electrical Code
- Staff did not bring forward 2015 ICC Codes for adoption
- 2018 ICC Codes and 2017 National Electrical Code released for adoption
- Best practice to adopt the most current codes and not to be more than one code cycle behind
  - Can effect ISO ratings for cities if they get behind
  - Can increase insurance rates

Council Strategic Pillars and Milestones

- Pillar One
  - Entrepreneurship and Business Hub
- Milestone
  - Review Town Ordinances and regulations to modernize them and facilitate redevelopment

- Updated building codes are separate from the Unified Development Code process
  - UDC covers uses of property and type, location, bulk and appearance of structures on a property
  - Building codes regulate the technical aspects of construction to ensure they are built soundly and can be occupied safely

Comparator Cities Survey

City	ICC Code Edition	National Electrical Code Edition
Addison (Current/Proposed)	2012/2018	2014/2017
Allen	2018	2017
Carrollton	2018	2017
Coppell	2015	2014
Dallas	2015	2017
Grapevine	2006	2005
Farmers Branch	2018	2017
Flower Mound	2018	2014
Frisco	2015	2014
Irving	2015	2014
Lewisville	2015 *	2014
McKinney	2015	2017
Plano	2018	2017
Richardson	2015 *	2014

* Currently discussing adopting 2018 ICC Codes

Local Amendments

- North Central Texas Council of Governments leads efforts to review new codes
- Suggests technical local amendments that municipalities should consider when adopting new codes
- Staff currently reviewing which, if any, local amendments are appropriate for Addison

Next Steps

- Staff will bring back ordinances adopting these codes at March 24, 2020 Council Meeting
- At the same time, Staff will bring forward minor changes to reorganize the Town's Code of Ordinances related to building regulations
- New codes would become effective June 1, 2020

Work Session and Regular Meeting **4.**
Meeting Date: 02/25/2020
Department: Development Services

AGENDA CAPTION:
Present and Discuss **Fees for Environmental Health Related Permits, Licenses, and Inspections**.

BACKGROUND:
The Town charges a variety of fees for Environmental Health related functions. These fees cover the costs of various activities such as food services licensing and inspections, including mobile food vendors, liquid waste hauler licensing and inspections, and public and semi-public pool inspections. These fees were last reviewed and increased in 2010. During the Fiscal Year (FY) 2020 budget process, Staff discussed establishing new fee amounts and using the associated revenue increases to fund a new Senior Environmental Health Specialist to assist with the Town's Environmental Health related functions. These fee amounts were assumed in the adopted FY 2020 budget and the Senior Environmental Health Specialist has been hired.

Staff conducted a review of the fees charged by our comparator cities and found that the fees currently charged by the Town are much lower. To establish new fee amounts, the Town looked to the average of our comparator cities and established new fee amounts that are higher than what is being charged currently, but in most cases are slightly below the average of the other cities. When the fees were brought forward for adoption, the Council requested to hold additional discussion. Staff presented the proposed fees to the Council on January 28, 2020, the Council requested that Staff reconsider the fee structure and amounts to maintain some consideration for the size of the establishment as well as its categorization.

In response, Staff has developed a revised fee structure and fee amounts. The changes are detailed in the attached presentation, which Staff will present this to the Council for additional discussion.

RECOMMENDATION:
Staff requests direction from Council.

Attachments

Presentation - Revised Environmental Health Fees

Environmental Health Fee Discussion

February 25, 2020

Prior Discussion

- Staff presented proposed Environmental Health related fee increases on January 28th
  - Council discussed a desire for:
    - Hybrid option that considered both restaurant type and number of employees
    - Stay as close to 90% of the average fees charged by our comparator cities as possible
    - Similar cost recovery percentage

Revised Food Service Fees

Category	Current Fee	Average Fee	ORIGINAL Proposed Fee	REVISED Proposed Fee
Grocery Store	$450 31+ employees $190 11-30 employees $115 1-10 employees $90 Prepackaged only	$528	$475	$500
Full Service (Restaurant, Hotel, Schools, Hospitals)		$417	$375	$450 31+ employees
				$375 11-30 employees
				$300 1-10 employees
Limited Service (Fast Food, Deli, Day Care)		$341	$300	$300 11+ employees
				$250 1-10 employees
Convenience and Retail		$236	$200	$200

Revised Fees and Council Direction

- Hybrid option that considered both restaurant type and number of employees
  - Revised fee schedule and amounts achieves Council's direction

- Stay as close to 90% of the average fees charged by the Town's comparator cities as possible
  - Except for a full service establishment with 31 or more employees, the fees are below the average of the Town's comparator cities for all categories
  - A full service establishment with 31 or more employees would continue to be charged the same fee amount they are currently charged

- Similar cost recovery percentage
  - Cost recovery percentage decreases by 1.35%

Proposed Fees with No Changes from Original

Category	Current Fee	Average Fee	Proposed Fee
Mobile Food Unit (Full)	$75	$306	$275
Mobile Food Unit (Pre-packaged)	$75	$247	$175
Temporary Food Events	$75	$64.38	$100
Special Temporary Events	$75	N/A	$100
Food Manager Registration	$10	N/A	$25

Category	Current Fee	Average Fee	Proposed Fee
Pool Permit - First	$120	$192	$175
Fee Per Additional Pool	$60	$175	$150
Liquid Waste Hauler - First	$80	$150	$135
Fee Per Additional Truck	$40	$100	$90

Proposed Fee Totals

Program Totals	Current	ORIGINAL Proposed	REVISED Proposed
Food Service	$56,100	$96,225	$91,425
Mobiles	$2,625	$11,700	$11,700
CFM Registration	$2,670	$6,675	$6,675
Pool Permit – First	$8,400	$12,250	$12,250
Additional Pool/Spa	$960	$2,400	$2,400
Liquid Waste Hauler – First	$1,840	$2,970	$2,970
Additional Truck	$1,680	$3,780	$3,780
GRAND TOTAL	**$74,275**	**$136,000**	**$131,200**
Add. Revenue	-	$61,725	$56,925
Cost Recovery	20.78%	38.06%	36.71%

- Note: Does not include Temporary and Special Event Fees

Next Steps

- Address any Council comments
- Bring fees for adoption at March 10, 2020 Council Meeting
- Communicate with current license/permit holders
- Effective Date of May 1, 2020

Questions?

Work Session and Regular Meeting **5.**

Meeting Date: 02/25/2020

Department: City Secretary

AGENDA CAPTION:

Consider Action to Approve **the Minutes of February 13, 2020 City Council Meeting.**

BACKGROUND:

The Minutes for the February 13, 2020 City Council Work Session and Regular Meeting have been prepared for consideration.

RECOMMENDATION:

Administration recommends approval.

Attachments

Minutes - February 13, 2020 City Council Meeting

D R A F T

OFFICIAL ACTIONS OF THE ADDISON CITY COUNCIL WORK SESSION & REGULAR SESSION

February 13, 2020

Addison Town Hall, 5300 Belt Line Rd., Dallas, TX 75254
5:00 p.m. Executive Session & Work Session
7:30 p.m. Regular Meeting

Present: Mayor Joe Chow; Mayor Pro Tempore Tom Braun; Deputy Mayor Pro Tempore Lori Ward; Council Member Ivan Hughes; Council Member Guillermo Quintanilla; Council Member Paul Walden; Council Member Marlin Willesen.

1. **Call Meeting to Order:** Mayor Chow called the meeting to order.

2. **Closed (Executive) Session** of the Addison City Council pursuant to Section 551.071, Texas Government Code, to conduct a private consultation with its attorney pertaining to: Bigelow Arizona TX-344, Limited Partnership DBA Suite of America and/or Budget Suites of America v. Town of Addison, Cause No. DC-19-09630, 191st Judicial District, Dallas County District Court.

Executive Session convened at 5:08 p.m.

3. **Reconvene into Regular Session:** In accordance with Texas Government Code, Chapter 551, the City Council will reconvene into Regular Session to consider action, if any, on matters discussed in Executive Session. No action was taken as a result of the Executive Session.

Open Session reconvened at 5:23 p.m.

WORK SESSION

4. **Present and Discuss All Aspects of the Non-Profit Organization Grant Funding Process.**

Deputy City Manager John Crawford presented this item. He reviewed the background of the non-profit funding process and the changes that have occurred since its inception. Mr. Crawford specifically stated the program purpose is to provide a grant of public funds to various

organizations that promote public purposes and benefit the public within the Town. He also reviewed the roles and responsibilities, timeline for submission and review, and types of agreements. He noted that the current timeline will change when Senate Bill 2 is effective.

Mr. Crawford explained that the Community Partners Bureau (CPB) is made up of resident members that evaluate, review and make funding recommendations for certain organizations that do not have Council Liaisons and report those evaluations to the CPB Council Liaisons. He reviewed the responsibilities of the Council Member Liaisons. The two types of agreements, Grant Funding and Services Agreements, were reviewed as to structure and what the non-profit organizations are to accomplish or provide if awarded a grant. A list of current organizations was provided. All but one are categorized as having received a Grant Funding Agreement. The World Affairs Council has a Services Agreement.

Council direction was requested on the following:

- Does Council want to formalize changes to the roles and responsibilities, i.e. the Community Partners Bureau Council Liaisons or Council Member Liaisons making funding recommendations?
- Funding Process-
    - Does Council want to change the funding process to reflect the changes in roles and responsibilities?
    - Does Council want all non-profits to present to the Community Partners Bureau and to the entire council?
- Types of Agreement- Does Council want to make changes to the current agreement classifications?

COUNCIL COMMENTS: Mayor Chow began by asking for staff to find out how the other cities contract with Metrocrest Chamber of Commerce. He also asked City Manager Wes Pierson to research why they changed from a service agreement to a grant funding agreement in 2012. Discussion followed that Metrocrest Chamber of Commerce agreement appears to be more of a service type agreement. Council discussed the level of specificity that service agreements should have referring to the World Affairs Council and Metrocrest Chamber of Commerce agreements as examples. It was pointed out that a services agreement receives funding based on a quarterly report. Council Member Quintanilla stated that the amount of funding awarded under a service agreement should determine the amount of oversight by required by staff.

There was discussion specifically regarding the Cavanagh Flight Museum agreement and what they provide. It was noted that they currently have not signed their agreement. Council Member Willesen expects to have a meeting with them and the Mayor advised he will attend.

Deputy Mayor Pro Tempore Ward expressed that, as a Liaison to the CPB, she believes the process for grant applications to be redundant. Discussion followed as to whether non-profit organizations should be required to make their presentations to the CPB Council Liaisons and again to the Council in full. After discussion, Council expressed their desire to dissolve the Council Liaisons for the CPB, but to maintain CPB Resident Liaisons for a few organizations, and some others would have no liaisons.

Council Members expressed that Council Liaisons for non-profit entities would make funding recommendations for the respective non-profit organization and that thefunding recommendations would be heard by the entire Council. If there are resident liaisons for a non-profit group, Council would not receive funding recommendations from them. City Manager Pierson reminded the Council that the non-profit funding amounts are determined during the budget process and that he can provide input during the considerations based on the budget.

City Manager Pierson provided an overview of the discussion as follows:

1) Move Metrocrest Chamber of Commerce from a Grant Funding Agreement to a Services Agreement.
2) Clean up unclear language in Grant Funding Agreement (that is too specific.)
3) There will no longer be Council Liaisons to the CPB Liaisons.
4) Continue to have CPB resident liaisons and look to grow those opportunities for non-profits that currently do not have a resident liaison or a Council liaison.
5) Funding recommendations will be heard from Council liaisons.

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5. Present and Discuss the Town's Short-Term Rental Regulations.

Development Services Director Charles Goff presented this item. He reviewed that in March 2019 the City Council adopted regulations for short-term rental (defined as less than 30 days) properties in Addison. These regulations require that the properties be registered with the Town and that the owner and occupants agree to abide by certain requirements to minimize their impact on the adjacent neighbors.

The ordinance includes a sunset provision after one year requiring the City Council to review and adjust or extend the requirements by April 30, 2020. If the ordinance is not extended, short-term rentals would be allowed, but without the registration process or regulations the Town has established.

Mr. Goff advised that since the adoption of the ordinance, six properties have registered with the Town. Staff estimates that there are many more properties being used as short-term rentals, but it has proven more difficult than expected to contact these property owners.

Mr. Goff reviewed the ordinance requirements as follows:
- Town has the right to inspect the property
- No external signage
- Occupancy limit: No more than two adults per bedroom, plus two adults; 10 people maximum
- Vehicle limit: Maximum that can be accommodated in garage and driveway
- Must be the registrant's primary address (homestead)
- Must pay applicable hotel occupancy taxes
- Cannot rent for the primary purpose of having a party venue
- Must share neighborhood information for parking, noise, trash
- Annual registration fee of $25.00

Mr. Goff reviewed the ordinance enforcement efforts that include an informational website and attempts by staff to contact property owners that advertise on various websites. The rental companies contacted declined to share client contact information. Seven violations have been recorded to date. Mr. Goff explained that warnings are issued for no registration and violators are given two weeks to comply prior to citations being issued. Staff's main issue in enforcing the ordinance has been contacting short-term rental property owners. He advised that there are companies that specialize in helping cities to enforce regulations and staff has drafted a tentative agreement with Host Compliance. Host Compliance is estimating approximately 80 active properties within the Town of Addison. Host Compliance would provide staff with an updated monthly report with detailed location data of active short-term rental properties within Town boundaries for one year. Staff is requesting direction from Council prior to executing the agreement.

It was noted that of the Town's comparison cities three have regulations and one other is considering the matter. Mr. Goff provided information on legal cases pending for Grapevine and Austin. Town Attorney Brenda McDonald advised that Home Owner Associations may prohibit this usage. Mr. Goff also voiced that if the ordinance is extended, he would like to remove utility bills as an option for proof of owner residency.

Council feedback was requested on whether they would like to extend the Short-Term Rental Regulation Ordinance; continue to require that a short-term rental property be owner-occupied; continue with the current requirements in the ordinance prohibiting properties from being used as party venues; and, continue occupancy limits.

COUNCIL COMMENTS: Council Member Walden questioned whether the fees should be increased to cover costs and inquired about what happens when an apartment owner does not sign the application form allowing the short-term rental use. It was explained that if the Town wanted to recover the cost associated with the Host Compliance service, then the annual short-term rental registration fee would need to be increased from $25 to $115. City Manager Pierson advised that the Town will not get involved regarding whether an apartment owner signs off on an application. Council Member Walden and Deputy Mayor Pro Tempore Ward expressed concerns that this type of commercial endeavor is being allowed in residential areas citing safety and possibly noise issues for the neighborhoods. Council Member Hughes advised he is not in favor of extending due to zoning. Councilmember Quintanilla advised he is okay with extending the ordinance for one year. Mayor Chow addressed the cost of engaging a consultant to assist with ordinance enforcement versus the number of registered properties there are. City Manager Pierson responded that the consultant would provide information to the Town that will help with enforcement.

REGULAR MEETING

Pledge of Allegiance

Announcements and Acknowledgements regarding Town and Council Events and Activities

Discussion of Events/Meetings

Public Comment: *The City Council invites citizens to address the City Council on any matter, including items on the agenda, except public hearings that are included on the agenda. Comments related to public hearings will be heard when the specific hearing starts. Citizen comments are limited to* ***three (3) minutes****, unless otherwise required by law. To address the Council, please fill out a* ***City Council Appearance Card*** *and submit it to a staff member prior to the Public Comment item on the agenda. The Council is not permitted to take any action or discuss any item not listed on the agenda. The Council may choose to place the item on a future agenda.*

No residents or audience members requested to speak.

Consent Agenda: *All items listed under the Consent Agenda are considered routine by the City Council and will be enacted by one motion with no individual consideration. If individual consideration of an item is requested, it will be pulled from the Consent Agenda and discussed separately.*

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6. **Consider Action on the Minutes of the January 28, 2020 and the January 30, 2020 City Council Meetings.**

(This item was pulled from the Consent Agenda for separate discussion.)

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7. **Consider Action on a Resolution to Approve the Creation of a One-Year Lease that will Automatically Renew for 19 consecutive, 12-month Terms, But Not Beyond June 30, 2040 with U.S. Customs and Border Protection Located at 4545 Jimmy Doolittle Drive, Suite 100, and Authorize the City Manager to Execute the Lease.**

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8. **Consider Action on a Resolution to Approve Acceptance of an Airport Improvement Program (AIP) Grant Offer from the Texas Department of Transportation (TxDOT) in the Amount of $600,000 for Construction of an Aircraft Parking Ramp and Associated Airside Improvements to Serve the U.S. Customs and Border Protection Facility Currently Under Construction at Addison Airport; Designating TxDOT as the Town of Addison's Agent for Receiving and Disbursing Funds; Acknowledging that Addison will be Responsible for an Estimated Contribution and Authorize the City Manager to Execute All Necessary Documents to Accept the Grant.**

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9. **Consider Action on a Resolution to Approve an Easement for Overhead and/or Underground Electric Supply and Communications Facilities Associated with the Galaxy Fixed-Based Operator (FBO) Located at 15601 Addison Road Development Project Between the Town of Addison and Oncor Electric Delivery Company LLC and Authorize the City Manager to Execute the Agreement.**

10. **Consider Action on a Resolution to Approve the Purchase of Network Infrastructure from Centre Technologies and an End User License Agreement with Datrium, Inc. for the Installation of Hardware, Software, and Technical Support Services and Authorize the City Manager to Execute the Agreement in an Amount Not to Exceed $311,637.63.**

11. **Consider Action on a Resolution to Approve the Purchase of a Firewall System from Centre Technologies and a Service Level Agreement with Check Point Software Technologies, LTD., for Software Technical Support and Hardware Replacement Services and Authorize the City Manager to Execute the Agreement in an Amount Not to Exceed $165,485.37.**

12. **Consider Action on a Resolution to Approve an Interlocal Agreement with Dallas Area Rapid Transit (DART) for Implementing Procurement and Financial Matters of the Approved Street Repair - Local Assistance Program (LAP) and Authorize the City Manager to Execute the Agreement.**

13. **Consider Action on a Resolution to Approve a Performance Contract between the Town of Addison and Strong Arm Touring, Inc. for the Personal Services of Musicians and Authorize the City Manager to Execute the Contract in an Amount not to Exceed $102,500.**

14. **Consider Action on a Resolution to Approve a Performance Contract between the Town of Addison and 3EB Touring, Inc. for the Personal Services of Musicians and Authorize the City Manager to Execute the Contract in an Amount Not to Exceed $125,000.**

Mayor Chow asked if there were any requests to remove an item from the Consent Agenda for separate discussion. Council Member Hughes requested to remove Item Number 6 for separate discussion. Mayor Chow called for a motion to approve Consent Agenda Items 7 through 14 as submitted.

MOTION: Mayor Pro Tempore Braun moved to approve Consent Items 7 through 14. Council Member Willesen seconded the motion. Motion carried unanimously.

Regarding Consent Agenda Item Number 6: Council Member Hughes requested a correction to the January 28th minutes, Item Number 3. He advised that the Council consensus did not include to target the cost recovery at 38 percent and asked that it be removed. The item should read as follows: *"Following discussion, City Manager Wes Pierson summarized that the Council*

consensus is to target 90 percent of the comparison cities' average. Revisions to the fee schedule to reflect a potential hybrid version will be prepared for additional council conversation."

MOTION: Council Member Hughes moved to approve Item 6 as corrected (above). Deputy Mayor Pro Tempore Ward seconded the motion. Motion carried unanimously.

Resolution No. R20-011: U.S. Customs and Border Protection Lease
Resolution No. R20-012: TxDOT Grant for Airport Improvement Program
Resolution No. R20-013: Oncor Electric Delivery Easement Agreement15601 Addison Rd.
Resolution No. R20-014: Purchase Network Infrastructure Centre Technologies; Datrium, Inc. License Agreement
Resolution No. R20-015: Purchase Firewall System Centre Technologies; Technical Support Agreement Check Point Software Technologies, LTD.
Resolution No. R20-016: DART Interlocal Agreement Approved Street Repair- Local Assistance Program
Resolution No. R20-017: Strong Arm Touring, Inc. Performance Agreement
Resolution No. R20-018: 3EB Touring, Inc. Performance Agreement

Regular Items

15. Hold a Public Hearing, Present, Discuss and Consider Action to Approve an Ordinance Changing the Zoning on Property Located at 4580 Belt Line Road, Which Property is Currently Zoned Local Retail (LR), by Approving a Special Use Permit for a Restaurant With the Sale of Alcoholic Beverages for On-Premises Consumption Only, in Order to Allow Relocation and Expansion of the Bar Area Within an Existing Restaurant Space. Case 1808-SUP/Remington's.

Development Services Director Charles Goff presented this item. He advised Remington's is a restaurant located at the southwest corner of Belt Line Road and East Beltwood Parkway and has occupied that space since 1979. The applicant is proposing interior renovations and kitchen improvements that include upgrading the grease trap. The renovation also includes relocating and expanding the bar area. Mr. Goff advised that there are 116 total parking spaces for this restaurant and adjacent businesses. While this is short of the required 146 spaces, Mr. Goff noted that since the square footage of the restaurant is not changing the existing parking should not be a hindrance. He added that the landscaping will also be supplemented with shrubbery and five (5) shade trees will be planted.

The Planning and Zoning Commission recommends approval with the grease trap being upgraded to meet the Town's requirements. Also, the applicant shall not use any terms or graphic depictions that relate to alcoholic beverages in any exterior signage.

Mayor Chow inquired if the restaurant would remain open during renovations. The applicant and co-owner, Eddie Ledesma-Porter, advised they plan to close for approximately one week. He also described the planned renovations.

Mayor Chow opened and closed the public hearing with no one wishing to speak.

MOTION: Council Member Hughes moved to approve Item 15 as presented. Deputy Mayor Pro Tempore Ward seconded the motion. Motion carried unanimously.

Ordinance No. O20-02 Zoning Case 1808-SUP/Remington's

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16. Hold a Public Hearing, Present, Discuss, and Consider Action to Approve an Ordinance Changing the Zoning on Property Located at 5100 Belt Line Road Suite 410, Which Property is Currently Zoned PD, Planned Development, Through Ordinance 012-001, by Approving a Special Use Permit for a New Restaurant With the Sale of Alcoholic Beverages for On-Premises Consumption Only. Case 1810-SUP/Vidorra.

Development Services Director Charles Goff presented this item. Mr. Goff advised that this request is for a new Mexican restaurant in an existing vacant restaurant space. The plans are to renovate the interior and exterior of the site and expand the patio. Expansion of the patio will cause the loss of four (4) parking spaces and an existing tree. Mr. Goff explained that the applicant is proposing to replace most of the existing stucco with brick and provide wood and metal accents. Vinyl roll down patio covers are proposed to allow patio dining in inclement weather. Mr. Goff added that staff is recommending the vinyl roll down patio covers be motorized with a head box, side tracks, hem bar, and stiffening bars to keep the siding taut, as well as include extruded vinyl that is high in quality and clarity to mimic window panels. Mayor Pro Tempore Braun inquired whether fire sprinklers will be required on the patio. Mr. Goff responded that he is not aware of the requirements of the Fire Department however it was noted that if so, the matter will be addressed during the plan review and separate of this zoning case.

Mr. Goff described in detail how some changes to the entire parking area in this development should improve traffic flow and add additional parking spaces. Specifically, the spaces in the main east-west drive aisle near the center of the property will be restriped from angled parking to 90-degree spaces and the three (3) existing round-a-bouts will be eliminated to add parking and landscaping. With these changes the parking requirements for the restaurant will be met.

The Planning and Zoning Commission recommended approval with the regular condition of having no terms or graphics that relate to alcoholic beverages on exterior signage and also that prior to issuance of a Certificate of Occupancy, the restriping of the existing main drive aisle parking spaces is to be completed.

Mr. Maxwell Fisher representing the applicant addressed the Council. He introduced the company and reviewed existing restaurants. He provided a visual rendering of the building, site plan, parking and landscaping as proposed. He noted that the owner has implemented a parking management plan and described how the process works. Mayor Chow commented that people are beginning to use ride share services such as Uber and that parking requirements may be revised with the upcoming ordinance review.

Mayor Chow opened and closed the public hearing with no one wishing to speak.

Council Member Willesen expressed that he likes the center round-a-bout as it exists currently and suggested that the parking lot striping should not be a factor in this zoning case. Council Member Willesen went on to suggest that the valet parking plan be reevaluated because the valet operators block of spaces directly in front of businesses and suggested that the use of ride share apps should considered when discussing parking requirements.

Mayor Pro Tempore Braun stated that he believes removing the round-a-bouts will make it safer for pedestrians. He also stated he disagrees with the Town dictating parking requirements beyond providing an overall number of parking spaces on the site in accordance with Town standards. Council Member Hughes expressed that he likes the angled parking except that it differs from the remainder of the parking on the property. Deputy Mayor Pro Tempore Ward agreed that the suggested plan will help the flow of traffic. Council Member Quintanilla stated that he is in favor of including the improvements to the parking area proposed as part of this case.

Council Member Walden inquired about the valet plan for the property and the logic behind valet spaces being reserved directly in front of the businesses. Mr. Goff responded that the valet plan was proposed by the property owner and reserving spaces in front of businesses was often done at the request of that business and to minimize the time it takes to retrieve customers' vehicles. City Manager Wes Pierson added that the Town does not typically regulate valet parking on private property and that additional regulations on the valet operator would require a fundamental change in policy by the Town. Council Member Willesen asked if the Town regulates valet operations in the public right-of-way in Addison Circle. Mr. Pierson confirmed that the Town does regulate valet operations in the right-of-way because they are operating in a public street, not on private property.

MOTION: Council Member Hughes moved to approve Item 16 with the recommended conditions as presented. Deputy Mayor Pro Tempore Ward seconded the motion. Motion carried with Council Member Willesen voting against.

Ordinance No. O20-03 Zoning Case 1810-SUP/Vidorra

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17. Present, Discuss, and Consider Action on a Resolution to Approve the Agreement for Professional Planning Services with Moore Iacofano Goltsman, Inc. (MIG) to Create the City-Wide Trails Master Plan and Authorize the City Manager to Execute the Agreement in an Amount Not to Exceed $122,284.00

Parks and Recreation Director Janna Tidwell presented this item. She advised that a city-wide Trails Master Plan was a recommendation of the Parks, Recreation & Open Space Plan (PROS). Since completion of the PROS plan, staff has had experiences where a completed trails master plan would have been helpful in guiding decisions as redevelopment opportunities are explored.

Because of this, parks staff requested $117,700 to hire a consultant to prepare this plan and the requested funds were approved by Council in the Fiscal Year (FY) 2020 budget.

Request for Qualifications (RFQ) Bid Number 20-09 was issued on Bid Sync October 14, 2019 and the Town received eight responses. Staff shortlisted four consultant teams: Halff Associates, MIG, Toole Design and Alta Planning & Design. Each shortlisted team made presentations to the Town regarding their experience with Trails Master Plans and discussed items unique to Addison. Following the interviews, staff identified MIG as the most qualified consultant to complete the master plan. MIG provided staff with a proposal and staff requested that additional public engagement opportunities be included in the process. Once revised, the professional services fee changed to $122,284 which exceeds the $117,700 approved in the budget. Staff has identified savings from a purchase of equipment for the Imagination Playground also approved in the FY2020 budget and will reallocate those savings to offset the $4,584 difference.

The Trails Master Plan is scheduled to be brought to Council for adoption in March 2021. There are four phases to the project, each of those phases are listed below with the schedule.

Phase	**Duration**
Phase I - Project Initiation	March 2020 - May 2020
Phase 2 - Vision, Goals and Strategies	June 2020 - August 2020
Phase 3 - Trail recommendations	September 2020 - November 2020
Phase 4 - Action Plan	December 2020 - February 2021

This project will include extensive public input gathering during Phase 2, like what was implemented for the PROS plan. A component of gathering input is involving an advisory committee in the process. Following Council's approval of this agreement, staff will solicit applicants for the committee and provide a list of applicants to Council in March to consider for forming the advisory committee. Methods for soliciting public input include a cell phone app that is designed to accept input, crowd source pop-up events, and a citywide walk or bike ride is planned.

MOTION: Council Member Walden moved to approve Item 17 as presented. Council Member Willesen seconded the motion. Motion carried unanimously.

Resolution No. R20-019: Professional Planning Services Agreement Moore Iacofano Goltsman for Trails Master Plan

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18. Hold a Public Hearing, Present, Discuss, and Consider Action on an Ordinance Calling and Ordering a Special Election on May 2, 2020, to Submit to the Voters, Amendments to the Addison Home Rule Charter as Recommended by the Charter Review Commission.

Deputy City Manager Ashley Mitchell presented this item. She advised that this item is to consider approving an ordinance calling an election to consider 26 propositions for amending the Town's Charter. If approved, the election will be held on Saturday, May 2, 2020.

Ms. Mitchell reminded Council that on September 10, 2019, the City Council appointed 14 residents to a Charter Review Commission in accordance with Section 11.29 of the Town's Charter. The Commission was tasked to work with Town staff to advise the Mayor and City Council as to whether the Town's Charter should be amended. The Commission met six times over a three-month period to review all sections of the Charter. As a result of their review, the Commission recommended 26 propositions be put forth to the voters for their consideration. Vice-Chair of the Commission Sue Halpern was present to answer questions.

Council Member Hughes asked Ms. Halpern to review why the Commission recommended Proposition 16 requiring a petition for someone to apply to be on a City Council election ballot. Ms. Halpern advised that in previous years there have been some candidates who did not seem to be serious about the election process, and some did not file the proper campaign finance reports. She said the Commission agreed that a petition requirement that has a modest minimum number of signatures (25) would show a candidate is sincerely interested in the process. She added that the maximum number of signatures (50) is appropriate since a resident can sign only one petition (additional signatures on other petitions would become invalid.) Ms. Halpern stated the decision to make the minimum number 25 was based on petition scenarios in state law that also requires a minimum of 25 signatures. All persons signing a petition would be required to include a date of birth or voter registration number according to state law, and the City Secretary will verify that the signatory is a registered voter. Council Member Hughes asked about how other cities in Addison's group of comparison cities handle candidate filing. Ms. Halpern presented a chart showing that about one-half of the cities require a filing fee and/or a petition, and the others require nothing. Deputy Mayor Pro Tempore Ward and Council Member Walden spoke in favor of the petition requirement.

Council Member Willesen spoke regarding Proposition 8 which would delete Section 11.15 of the Charter that addresses the ability to obtain Town records and assess fees. Ms. Halpern stated that having it in the Charter is no longer relevant since the matter of obtaining public records is now in state law. Town Attorney Brenda McDonald added that the text in Section 11.15 references an ordinance that includes fee amounts however she believes that ordinance was repealed since state law dictates the fees.

Ms. Halpern pointed out a few punctuation marks in the proposition language that need to be corrected. Council Member Quintanilla stated that even though he was absent at the last meeting he watched the presentation of the proposed propositions on-line and voiced his appreciation to all involved.

Mayor Chow opened and closed the public hearing with no one wishing to speak.

Deputy Mayor Pro Tempore Ward asked whether all Council was okay with calling a special election even if the City Council election is cancelled due to no candidate being opposed. Council Member Hughes asked about the cost of a special election. City Manager Pierson advised that during a general election costs are shared with other entities. For a special election, the Town incurs all the costs. It is unknown if there is a cost savings to having both on the same ballot.

Council Member Willesen again addressed Proposition 8 by saying he would like to omit it from the list of propositions. Council Member Hughes responded that he is okay with taking cost references out of the Code of Ordinances.

MOTION: Council Member Hughes moved to approve Item 18 with the punctuation corrections as discussed. Deputy Mayor Pro Tempore Ward seconded the motion. Motion carried unanimously.

Ordinance No. O20-04: Order Special Charter Amendment Election

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19. Present and Discuss an Update on Taste Addison 2020.

Special Events Director Jasmine Lee provided an update on the 2020 Taste of Addison event that is scheduled for May 29-31, 2020. The hours for this year's event are 6:00 – 11:00 p.m. on Friday, Noon to 11:00 p.m. on Saturday, and noon to 6:00 p.m. on Sunday. Cost of general admission remains the same as last year at $15 for ages 13 and over, $5 for children ages 6-12, and children under 6 are free. Foodie Passes are available for $30, and a Legends Pass is available for $65. The Legends Pass includes admission to the Main Stage viewing deck. Ms. Lee advised this area can hold up to 200 people.

Featured areas this year include the following:

- Culinary Experience: Chef demonstrations, interactive sessions & specialty food vendors
- Creation Station: Free craft activities for all ages
- Family Fun Lawn: Inflatable rides and attractions (wrist bands available for all day admission)
- Marketplace: Vendor sales for arts and unique items
- Alcohol Sampling: Complimentary for guests 21+
- Merch Tent: Featuring event apparel and convenience items (sunscreen, hand towels)

Currently 13 of the 30 restaurant spaces are filled. On January 20th restaurants received an electronic invitation and over the next two weeks staff will meet other restaurants. Ms. Lee advised that there is a new fee structure for restaurants this year that depends on booth size. Event attendees may use the point of sale system to accept cards, cash and Tasty Bucks at the restaurant booths.

There will be three stages for music entertainment that include the Main Stage, Legends Stage, and Garden Stage. The entertainer line-up for each stage was provided. Ms. Lee advised that while the Main Stage headliners are performing, event attendees will be able to view the show on a large screen at the Legends Stage.

Marketing of the Taste of Addison event includes media partnerships with Spectrum, IHeart Radio, Dallas Morning News and CBS 11. On April 7th there will be a Taste the Competition media event. There will also be television and radio opportunities for participating restaurants.

Adjourn Meeting

There being no further business to come before the Council, Mayor Chow adjourned the meeting.

TOWN OF ADDISON, TEXAS

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Joe Chow, Mayor

ATTEST:

_____

Irma G. Parker, City Secretary

Work Session and Regular Meeting **6.**

Meeting Date: 02/25/2020

Department: City Secretary

AGENDA CAPTION:

Consider Action on a **Resolution Authorizing the Adoption of the Election Systems and Software ExpressVote Universal voting System (Ballot Marking Devices), EVS 6.0.2.0, Firmware 2.4.0.0; the ES&S DS200 Digital Precinct Scanner, EVS 6.0.2.0, Firmware 2.17.0.0; and ES&S Model DS850 High-Speed Scanner/Tabulator, Version 1, EVS 6.0.2.0, along with the required ancillary parts and services required for this voting tabulation system equipment for use in all forms of voting in the Town of Addison.**

BACKGROUND:

In 2018, the Dallas County Commissioners Court authorized the Dallas County Elections Department to enter into an agreement for the purchase of a new election system and software with Election Systems & Software, LLC (ES&S). The Office of the Secretary of State has reviewed the proposed equipment and has approved its use by Dallas County Elections Department.

The Order and Notice of the May 2, 2020 Election adopted at the January 14 meeting authorized Staff to execute a Joint Election Contract. That contract does contain the name of the election system and software; however, pursuant to Section 123.001 of the Texas Election Code, in order for the Town of Addison to continue to contract with Dallas County Elections Department to hold a joint election, the City Council must formally adopt this equipment for use in its election.

RECOMMENDATION:

Administration recommends approval.

Attachments

Resolution - Adoption of Voting System

Approval Letter - Secretary of State

RESOLUTION NO. R20-__

A RESOLUTION OF THE CITY COUNCIL OF THE TOWN OF ADDISON, TEXAS, AUTHORIZING THE ADOPTION OF THE ELECTION SYSTEMS & SOFTWARE EXPRESSVOTE UNIVERSAL VOTING SYSTEM (BALLOT MARKING DEVICE), EVS 6.0.2.0, FIRMWARE 2.4.0.0; THE ES&S DS200 DIGITAL PRECINCT SCANNER, EVS 6.0.2.0, FIRMWARE 2.17.0.0.; AND ES&S' MODEL DS850 HIGH-SPEED SCANNER AND TABULATOR, VERSION 1, EVS 6.0.2.0., AS THE VOTING SYSTEM TO BE USED IN ALL FORMS OF VOTING IN THE TOWN OF ADDISON, TEXAS; AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, Dallas County issued a Request for Proposals for ("RFP") Election Voting Tabulation System and Services, RFP No. 2018-052-6745 on Monday, November 12, 2018; and on August 21, 2018 with Court Order 2018-0996, the Dallas County Commissioners Court ("the Court") authorized Dallas County Elections Department, Purchasing Department and the District Attorney's Office - Civil Division to enter into contract negotiations with Election Systems & Software, LLC ("ES&S) for the aforementioned solicitation.; and

WHEREAS, pursuant to Section 123.035 of the Texas Election Code, the Court has received a letter from the Office of the Secretary of State affirming that the elected voting system satisfies the applicable requirements; and

WHEREAS, in order to continue to contract with Dallas County to hold joint elections, and pursuant to Section 123.001 of the Texas Election Code, the City Council of Addison, Texas must adopt this equipment for use in its elections.

NOW, THEREFORE, BE IT HEREBY RESOLVED BY THE CITY COUNCIL OF THE CITY OF ADDISON, TEXAS:

SECTION 1. Findings Incorporated. The findings recited above are incorporated as if fully set forth in the body of this Resolution.

SECTION 2. Adoption of Voting System. That the City Council of Addison, Texas hereby adopts the ES&S ExpressVote Universal Voting System (Ballot Marking Devices), EVS 6.0.2.0, Firmware 2.4.0.0; the ES&S DS200 Digital Precinct Scanner, EVS 6.0.2.0, Firmware 2.17.0.0.; and ES&S' Model DS850 High-Speed Scanner/Tabulator, Version 1, EVS 6.0.2.0., along with the required ancillary parts and services required for this voting tabulation system equipment for use in Absentee Voting By Mail, Early Voting By Personal Appearance, Regular Voting on Election Day and Provisional Voting.

SECTION 3. Savings/Repealing Clause. All resolutions, or parts thereof, that are in conflict or inconsistent with any provision of this Resolution or the Town's Public Investment Policy, as amended, and adopted in accordance with Chapter 2256, Texas Government Code, the Public Funds Investment Act, are hereby repealed to the extent of such conflict, and the provisions of this Resolution and the Town's Public Investment Policy, as amended, shall be and remain controlling as to the matters regulated herein.

SECTION 4. Severability Clause. Should any of the clauses, sentences, paragraphs, sections or parts of this Resolution be deemed invalid, unconstitutional, or unenforceable by a court of law or administrative agency with jurisdiction over the matter, such action shall not be construed to affect any other valid portion of this Resolution.

SECTION 5. Effective Date. This Resolution shall become effective immediately upon its passage and approval.

DULY RESOLVED AND ADOPTED by the City Council of the Town of Addison, Texas, on this the ***25th*** day of ***FEBRURY 2020.***

TOWN OF ADDISON, TEXAS

Joe Chow, Mayor

ATTEST:

Irma Parker, City Secretary

APPROVED AS TO FORM:

Brenda N. McDonald, City Attorney

The State of Texas

Elections Division
P.O. Box 12060
Austin, Texas 78711-2060
www.sos.state.tx.us

Phone: 512-463-5650
Fax: 512-475-2811
Dial 7-1-1 For Relay Services
(800) 252-VOTE (8683)

Ruth R. Hughs
Secretary of State

September 3, 2019

The Honorable Clay Jenkins
Dallas County Judge
Dallas County Administration Building
411 Elm Street, 2nd Floor
Dallas, Texas 75202

Dear Judge Jenkins:

The Secretary of State accepts Dallas County's application to participate in the countywide precinct polling place program for the November 5, 2019 constitutional amendment election date. Pursuant to Section 43.007 of the Texas Election Code, following the November 2019 constitutional amendment election under the program, Dallas County may apply for "successful" status with the Secretary of State to continue using the countywide polling place program in subsequent elections. Below please find additional information regarding the county's participation in this program for the upcoming election date.

Dallas County has confirmed to our office that it purchased 4,000 Tenex touch pad e-poll book devices in 2019 and that these devices were first used during the May 2019 uniform election and the June 8, 2019 election. The documentation provided by Dallas County reflects that the county deploys MiFi devices from two service carriers; one device from each carrier to deploy with each e-pollbook. In the event service fails from the primary device, the secondary device from another service carrier can be connected immediately. Dallas County also indicated that it recently purchased and began taking delivery of ES&S DS200 Precinct Counters and ExpressVote Ballot Marking Devices. The county confirmed to our office that it presently has sufficient equipment to conduct the November 5, 2019 constitutional amendment election.

In regards to voter accessibility, Dallas County provided that it has a database of approximately 500 bilingual poll workers and that it has also contracted with four temporary employment services companies to help provide bilingual workers for elections. The county confirmed that it will have adequate staffing in place and will use call centers so that in the event all locations are not properly staffed, all voters at all locations can still receive assistance using a call-in number to assist bilingual voters. It is of utmost importance that Dallas County continue to prioritize staffing language interpreters in the areas where they most efficiently meet the needs of your community.

The policy of our office is to permit non-disruptive exit polling within the 100-foot boundaries surrounding each early voting and election day polling place. We note that the early voting clerk or presiding judge at each polling place, as appropriate, must determine that such exit polling does not constitute either (1) "loitering" in violation of Section 61.003(a) of the Texas Election Code or (2) a disruption of order or a contribution to a breach of the peace at the early voting or election day polling place in violation of Section 32.075(a) of the Code, as applicable to early voting under Section 81.002 of the Code.

Please note, counties may not distribute written surveys to voters regarding the county's use of the countywide polling place program inside the polling place or within the 100-foot boundary surrounding each early voting and election day polling place. Further, election workers should not verbally solicit feedback from voters while at the polling place or within the 100-foot boundary regarding the county's use of the program.

Although changes to voting practices or procedures are no longer required to be submitted to the Department of Justice for preclearance under the federal Voting Rights Act, the county election authority is advised to consult with the County Attorney before changing polling place locations. Pursuant to Section 61.012 of the Texas Election Code, polling places are still required to be in compliance with the Americans with Disabilities Act. County officials must remain diligent to ensure that any changes to county voting practices or procedures are consistent with federal and state law.

The deadline for the elections administrator to submit a report to our office on the November 5, 2019 uniform election is Thursday, December 5, 2019. We ask that your report contain statements and opinions of interested parties, including persons who voted in the election, representatives of minority groups, and organizations concerned with persons with disabilities. Based on past elections, we would suggest that you stay in touch with these groups throughout the election process. While the county has the final word on polling place placement and the administration of the election, it is important that your local groups remain committed and involved in the countywide precinct election. If these groups have been involved in the project through the election period, it should be easier to gather their comments, complaints, and suggestions for your post-election report.

In addition to these statements, we would also request that your post-election report contain comparisons of voting patterns and turnout for the county between the November 5, 2019 uniform election and their two previous years of elections held on the November constitutional amendment election date. An example of a voting pattern would be persons voting at the polling place near their place of employment versus voting at the precinct nearest the voter's residence. Another example would be comparing early voting to election day turnout to review whether the countywide precincts had any effect on the ratio between the two voting periods.

Again, thank you very much for your participation, and we look forward to working with you to make this program a success.

Sincerely,

Keith Ingram
Director of Elections

KI:HM

CC: Ms. Toni Pippins-Poole
Dallas County Elections Administrator
2377 North Stemmons Frwy, Suite 820
Dallas, Texas 75207

Work Session and Regular Meeting **7.**

Meeting Date: 02/25/2020

Department: Infrastructure- Development Services

Pillars: Excellence in Transportation Systems

Milestones: Implementation and continuous development of Long Term Financial Plan

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AGENDA CAPTION:

Consider Action to Approve a **Resolution Authorizing the Use of Eminent Domain for the Acquisition of Permanent Right-of-Way, Utility Easements, and Temporary Construction Easements for the Reconstruction of Midway Road from Spring Valley Road to Keller Springs Road.**

BACKGROUND:

This item would authorize the use of eminent domain proceedings as necessary for the acquisition of additional right-of-way needed in those cases where agreement cannot be reached on the purchase of property for the reconstruction of Midway Road from Spring Valley Road to Keller Springs Road.

On March 26, 2019 Council authorized the City Manager to sign the purchase documents for additional right-of-way and easements that will be needed for the reconstruction of Midway Road from Spring Valley Road to Keller Springs Road. At that meeting, the Staff indicated that if a purchase amount cannot be agreed to, Council would be asked to authorize the use of eminent domain proceeding to acquire those properties.

Negotiations with the twenty-five affected property owners have been on-going and several property owners have agreed to the purchase of the right-of-way for the appraised value or a reasonable counteroffer. Staff anticipates, however, that some property owners will not be willing to accept the appraisal amount for the property. In order for the project to stay on schedule, it is necessary to obtain authorization to use eminent domain proceedings to acquire these properties, if needed.

The attached resolution declares the public purpose of the reconstruction project and authorizes the use of eminent domain in those cases where agreement cannot be reached with the property owner.

RECOMMENDATION:

Administration recommends approval.

Attachments

Resolution - Midway Road Reconstruction Eminent Domain

TOWN OF ADDISON, TEXAS

RESOLUTION NO. _____

A RESOLUTION OF THE CITY COUNCIL OF THE TOWN OF ADDISON, TEXAS, AUTHORIZING THE USE OF EMINENT DOMAIN FOR THE ACQUISITION OF PERMANENT RIGHT-OF-WAY, UTILITY EASEMENTS, AND TEMPORARY CONSTRUCTION EASEMENTS FOR THE RECONSTRUCTION OF MIDWAY ROAD FROM VALLEY ROAD TO KELLER SPRINGS ROAD.

WHEREAS, due to the growth of the population of the Town of Addison and the increased traffic loads in the Town of Addison on and along Midway Road, it is necessary to widen and improve Midway Road to provide for the public health, safety and welfare; and

WHEREAS, due to the Town of Addison's goals of providing a safe and efficient road and street system as a part of its master thoroughfare plan, it is necessary to widen and improve Midway Road; and

WHEREAS, in order to accomplish the above public purposes, it is necessary to acquire permanent easements, fee simple title, and temporary construction easements on, over and across those certain properties on Midway Road from Spring Valley to Keller Springs Road as shown on Exhibit "A" to provide for the construction, re-construction, widening, improvement and operation and maintenance of Midway Road, public utilities, public sidewalks, and landscaping.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE TOWN OF ADDISON, TEXAS:

Section 1. There is a public need for and the public welfare, safety and convenience will be served by the acquisition of fee simple title, permanent easements and temporary construction easements for the properties described in Exhibit "A" attached hereto; and

Section 2. It is in the best interest of the Town of Addison, and is necessary to acquire fee simple title, permanent easements and temporary construction easements through eminent domain on, over, and across the twenty five (25) properties described in Exhibit "A" for the construction, re-construction, widening, improvement, operations and maintenance of Midway Road, sidewalks, landscaping and public utilities.

Section 3. The use of eminent domain is hereby authorized to acquire fee simple title, permanent easements for Right-of-Way and Utilities and temporary construction easements on, over and across theproperties described in Exhibit "A".

Section 4. Funding for the acquisition of the easements is available from current funds and use of these funds for acquisition of the above property interests is hereby authorized.

Section 5. That if any portion of this Resolution shall, for any reason, be declared invalid by any court of competent jurisdiction, such invalidity shall not affect the remaining provisions hereof and the City Council hereby determines that it would have adopted this Resolution without the invalid provision.

Section 6. This Resolution shall take effect from and after its passage and it is accordingly resolved.

PASSED AND APPROVED on this_____day of February 2020.

APPROVED:

_____
Joe Chow, Mayor

ATTEST:

_____
Irma Parker, City

Exhibit "A"

Midway Road Reconstruction Acquisition Properties

Owner Name	Property Location
Greenhill School	4141 Spring Valley Rd (Greenhill School)
CP Greenhill, LLC, a Texas limited liability company	14131 Midway Rd (Greenhill Towers)
Saskaway Six LP, a Texas limited partnership	14275 Midway Rd (Midway Atriums)
14315 Midway Road Addison LLC, a Delaware limited liability company	14315 Midway Rd (Crowne Plaza)
Emerald Seas, LLC, a Texas limited liability company	14655 Midway Rd (James Antony Home)
Midway Office Park, LLC, a Texas limited liability company	14665 Midway Rd (Midway Office Park)
14671-14683 Midway Road LP, a Texas limited partnership	14673 Midway Rd (Office in the Park)
Habib Elahinejad	14775 Midway Rd (Addison Event Center)
VVI, Inc., a Texas corporation	14831 Midway Rd (Jaxx Steakhouse)
Carroll Family Investments, Ltd., a Texas limited partnership	14941 Midway Rd
Piedmont Midway Partners, L.P., a Texas limited partnership	14951 Midway Rd (Nate's)
Piedmont Midway Partners, L.P., a Texas limited partnership	15099 Midway Rd (Starbucks)
J.S. Miller Family Limited Partnership I, a Texas limited partnership	14920 Midway Rd (Blue Goose)
K & B Lewis Texas, Ltd.; Gartner Management Trust; W.W. Willinghan, III;	14930 Midway Rd (The Londoner)
FCPT SW Properties, LLC, a Delaware limited liability company	4240 Belt Line Rd (Olive Garden)
MidBelt Center, Ltd., a Texas limited partnership	4201 Belt Line Rd (Ghengis Grill)
The Merrifield No. 1 Limited Partnership, a Texas limited partnership	4151 Belt Line Rd (Beltway Center)
Midway Centurion, Ltd., a Texas limited partnership	15101 Midway Rd (Charter Furniture)
McLane Foodservice Inc., a Texas corporation	2085 Midway Rd
14400 Midway, LLC, a Texas limited liability company	15100 Midway Rd (Premier Autos)
Hard Six Holdings, LLC, a Texas limited liability company	next to 15100 Midway Rd
SBLFT/OF I, LTD., a Texas limited partnership	15200 Midway Rd (Multitenant Industrial Building)
Forest-Way Corporation, a Texas corporation	15402 Midway Rd (Multitenant Industrial Building)
Midway-Addison Group Ltd., a Texas limited partnership	15500 Midway Rd (Enterprise Car Rental)
Concentra Mgmt Care Center, Inc. DBA Concentra Medical Center	15800 Midway Rd (Concentra Urgent Care)

Work Session and Regular Meeting **8.**

Meeting Date: 02/25/2020

Department: City Manager

Pillars: Gold Standard for Financial Health

AGENDA CAPTION:

Consider Action to **Approve the First Quarter Update from the Finance Committee to the City Council for the Period from October 2019 to December 2019**.

BACKGROUND:

The Finance Committee (Committee) serves in an advisory capacity to the City Council. The Committee includes: Mayor Pro Tempore Tom Braun, Council Member Ivan Hughes, and Council Member Marlin Willesen. The Committee reviews and makes recommendations to the City Council regarding the following matters:

- Quarterly Financial Reports;
- Comprehensive Annual Financial Report (CAFR);
- Long-term debt capacity of the Town;
- Engagement of independent accounting firms to audit the financial statements; and
- Review the adequacy and implementation of an internal audit function.

The Committee meets monthly and is required to provide quarterly reports to the Council. The attached report cover topics discussed at the Committee Meetings for the first quarter of Fiscal Year 2020 from October to December 2019.

RECOMMENDATION:

Administration recommends approval.

Attachments

Report - Finance Committee Report First Quarter Fiscal Year 2020

Finance Committee Report

January 13, 2020

The Finance Committee shall serve solely in an advisory capacity to the City Council. Among other matters that may be requested from time to time by the Council, the Finance Committee may review and make recommendations to the City Council regarding the following matters:

- quarterly financial reports,
- comprehensive financial annual report (CAFR),
- long term debt capacity of the Town,
- engagement of independent accounting firms to audit the financial statements,
- review the adequacy and implementation of any internal audit function.

Finance Committee members as of June 2019:

- Tom Braun, Deputy Mayor Pro-Tempore
- Ivan Hughes, Council Member
- Marlin Willesen, Council Member

This document covers the topics discussed by the Committee from October to December 2019.

October 7, 2019

Topic	Discussion
Finance Committee Annual Review	Reviewed and discussed the Town's Investment Policy as required by the Code of Ordinances. This item was placed on the consent agenda at the October 8, 2019 Council meeting.
Finance Committee Report	A draft of the 4th Quarter Finance Committee Report 2019 was discussed.

Attendees: Tom Braun, Ivan Hughes, Marlin Willesen, Wes Pierson, John Crawford, Olivia Riley and Amanda Turner.

November 19, 2019

Topic	Discussion
Government Finance Officers Association (GFOA) Certificate	Staff informed the Committee of receipt of the GFOA's Certificate of Achievement for Excellence in Financial Reporting: 2018 Comprehensive Annual Financial Report (CAFR).
4th Quarter Finance Committee Report	The 4th Quarter Finance Committee Report was discussed. The report was presented at the November 21, 2019 Council meeting.
4th Quarter Financial Report	The FY2019 4th Quarter Financial Report was discussed. This report was presented at the November 21, 2019 Council meeting.

Finance Committee Report

4th Quarter Investment Report	The FY2019 4th Quarter Investment Report was discussed. This report was presented at the November 21, 2019 Council meeting.

Attendees: Tom Braun, Ivan Hughes, Marlin Willesen, Wes Pierson, John Crawford, Bill Hawley, Amanda Turner, and Kristen Solares.

December 2019

Topic	Discussion
No Meeting Held	No meeting was scheduled because the November meeting was held late in the month and no new data of significance was available to discuss.

Work Session and Regular Meeting **9.**

Meeting Date: 02/25/2020

Department: Infrastructure- Development Services

AGENDA CAPTION:

Present, Discuss, and Consider Action on a **Resolution to Approve a Contract Agreement with Flow-Line Construction Inc. for the Construction of Sanitary Sewer Outfall Re-route and Water Line Improvements and Authorize the City Manager to Execute the Agreement** in an Amount Not to Exceed $1,442,933.

BACKGROUND:

The purpose of this item is to award a construction contract to Flow-Line Construction, Inc., as the low bidder for sanitary sewer outfall re-route and water line improvements for Sanitary Sewer Basin I. The design for the improvements was completed in December 2019 and the project was posted on BidSync on January 7, 2020 and closed on January 30, 2020. Contractors were asked to bid on the sanitary sewer and water line improvements as well as an Additive Alternate for the extra cost of High-Early Strength Concrete. Four bids were received. A breakdown of the bids is provided below:

Bidder	Base Bid	Alternate 1 Bid	Grand Total Bid
Flow-Line Construction, Inc.	$1,397,777.00	$45,156.00	$1,442,933.00
Joe Funk Construction	$1,493,465.70	$24,459.50	$1,517,916.20
Excel Trenching	$1,706,572.00	$165,572.00	$18,72,144.00
Atkins Brother Equipment	$5,996,415.00	$3,010,400.00	$9,006,815.00

Flow-Line Construction has been determined to be the low bidder. The design engineer, Dannenbaum Engineering Company, has checked their references and recommends the award of contract to Flow-Line Construction, Inc. in the amount of $1,442,933.00.

Starting in the mid-1990s, the sanitary sewer flows in Basin I have flowed into a sanitary sewer line that is owned by Farmers Branch. Per the terms of an agreement that expired in November 1995, the sanitary sewer flow from Addison to the Farmers Branch system was unmetered and Addison paid Farmers Branch for the service based on a percentage of the water usage in that basin. In October 2017, Farmers Branch informed Addison that it the sanitary sewer flows into their system must be metered or a new agreement would need to be executed. At the April 24, 2018 Council meeting, Council agreed with Staff's recommendation to construct a new sanitary sewer line that will reroute the sanitary sewer flows from the Farmers Branch system into Addison's sanitary sewer line on Midway Road.

In the development of the scope of the design, Staff directed the design engineer to design a replacement of the water line that is in the same easement as the sanitary sewer line. The installation of this new line will improve water distribution pressure and will replace an older line that is in poor condition. The project consists of constructing approximately 2,630 linear feet of gravity sewer pipeline and 14 manholes that will begin on Beltway Drive near Midway, extending east through private property parking lots, and ending at the manhole that receives all the sanitary sewer flow in Basin I. The new water line will be constructed from Beltwood to Beltway and through private parking areas.

As a part of this project, the new sanitary sewer line will be stubbed out and capped just east of Midway Road. The rest of the line will be constructed and put into service when Midway Road is reconstructed. he new water line, however, will go into service immediately upon completion, testing, and acceptance.

The project is budgeted in the Fiscal Year 2020 Utility Capital Improvement Fund. The table below reflects the budget and project cost to date. Staff is in the process of obtaining a proposal for materials testing for the project that will also be paid from these funds. The contract for materials testing will be brought to Council at a later date, if necessary.

Basin I Project Cost

Project Phase	**Budgeted**	**Contract Amount**	**Remaining Funds**
Design Contract	$371,000	$309,961	$61,039
Construction Contract	$1,650,000	$1,442,933	$207,067
Property Acquisition	$280,000	$282,530	-$2,530
Totals	**$2,301,000**	**$2,035,424**	**$265,576**

RECOMMENDATION:
Administration recommends approval.

Attachments

Resolution - Contract Agreement with Flow-Line Construction, Inc
Bid Packet - Flow-Line Construction
Technical Specifications - Flow-Line Construction, Inc
Construction Plans - Bid 20-54 Basin I Reroute
Map - Basin I Reroute

RESOLUTION NO. _____

A RESOLUTION OF THE CITY COUNCIL OF THE TOWN OF ADDISON, TEXAS APPROVING A CONTRACT AGREEMENT BETWEEN THE TOWN OF ADDISON AND FLOW-LINE CONSTRUCTION, INC., IN AN AMOUNT NOT TO EXCEED $1,442,922, FOR CONSTRUCTION OF THE BASIN I SANITARY SEWER OUTFALL REROUTE AND WATER LINE IMPROVEMENTS PROJECT, AUTHORIZING THE CITY MANAGER TO EXECUTE THE AGREEMENT, AND PROVIDING AN EFFECTIVE DATE.

BE IT RESOLVED BY THE CITY COUNCIL OF THE TOWN OF ADDISON, TEXAS:

SECTION 1. The Contract Agreement between the Town of Addison and Flow-Line Construction Inc., for infrastructure construction operations and services on the Basin I Sanitary Sewer Reroute and Water Line Improvements Project in an amount not to exceed $1,442,933, a copy of which is attached to this Resolution as **Exhibit A** and which incorporates the Town of Addison's General and Specific Conditions for construction contracts, and the Advertisement for Bids, Instruction to Bidders, General Provisions, Special Provisions, Plans and other bid documents**,** is hereby approved. The City Manager is hereby authorized to execute the agreement.

SECTION 2. This Resolution shall take effect from and after its date of adoption.

DULY RESOLVED AND ADOPTED by the City Council of the Town of Addison, Texas, on this the ***25th*** day of ***February 2020*****.**

TOWN OF ADDISON, TEXAS

_____
Joe Chow, Mayor

ATTEST:

_____
Irma Parker, City Secretary

APPROVED AS TO FORM:

_____
Brenda N. McDonald, City Attorney

CONTRACT AGREEMENT

STATE OF TEXAS

COUNTY OF DALLAS

THIS AGREEMENT is made and entered into this _____ day of _____, 2020, by and between the Town of Addison, of the County of Dallas and State of Texas, acting through its City Manager, thereunto duly authorized so to do, Party of the First Part, hereinafter termed the OWNER, and Flow-Line Construction, Inc., of the City of Dallas, County of Dallas, State of Texas, Party of the Second Part, hereinafter termed CONTRACTOR.

WITNESSETH: That for and in consideration of the payment and agreement hereinafter mentioned, to be made and performed by the OWNER, the said CONTRACTOR hereby agrees with the said OWNER to commence and complete construction of certain improvements as follows:

WASTEWATER BASIN I SEWER OUTFALL RE-ROUTE AND WATER IMPROVEMENTS
BID NUMBER 20-54

and all extra work in connection therewith, under the terms as stated in the General and Specific Conditions of the AGREEMENT; and at his own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance and other accessories and services necessary to complete the said construction, in accordance with the conditions and prices stated in the Proposal attached hereto and in accordance with the Advertisement for Bids, Instructions to Bidders, General Provisions, Special Provisions, Plans, and other drawings and printed or written explanatory matter thereof, and the Technical Specifications and Addenda thereto, as prepared by the OWNER, each of which has been identified by the endorsement of the CONTRACTOR and the OWNER thereon, together with the CONTRACTOR's written Proposal and the General Provisions, all of which are made a part hereof and collectively evidence and constitute the entire AGREEMENT.

The CONTRACTOR hereby agrees to commence work within ten (10) calendar days after the date of written notice to do so shall have been given to him, to complete the work within **two hundred and seventy (270) calendar days**, after he commences work, subject to such extensions of time as are provided by the General Provisions.

The OWNER agrees to pay the CONTRACTOR One Million Four Hundred Forty Two Thousand Nine Hundred Ninety Three 00/100 Dollars ($ 1,442,933.00) in current funds for the performance of the Contract in accordance with the Proposal submitted thereof, subject to additions and deductions, as provided in the General Provisions, and to make payments of account thereof as provided therein.

IN WITNESS WHEREOF, the parties of these presents have executed this AGREEMENT in the year and day first above written.

TOWN OF ADDISON, TEXAS (OWNER)

By: _____
City Manager

ATTEST:

By: _____

(CONTRACTOR)

By: _____

ATTEST:

By: _____

The following to be executed if the CONTRACTOR is a corporation:

I, Eduardo M. Hernandez certify that I am the secretary of the corporation named as CONTRACTOR herein; that Eduardo M. Hernandez, who signed this Contract on behalf of the CONTRACTOR is the President (official title) of said corporation; that said Contract was duly signed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

Signed: _____

Corporate Seal

ADDISON PUBLIC WORKS & ENGINEERING SERVICES

SPECIFICATIONS AND CONTRACT DOCUMENTS

FOR THE CONSTRUCTION OF

WASTEWATER BASIN I SEWER OUTFALL RE-ROUTE AND WATER IMPROVEMENTS BID #20-54

TOWN OF ADDISON, TEXAS

JANUARY 2020

DANNENBAUM

3030 LBJ Freeway, Suite 910
Dallas, Texas 75034
(972) 763-3400



12/16/2019

SECTION PF-1

PROPOSAL FORM

PROPOSAL FORM

1/30/2019 , 2020

TO: The Honorable Mayor and Town Council
Town of Addison, Texas

Gentlemen:

The undersigned bidder, having examined the plans, specifications and contract documents, and the location of the proposed work, and being fully advised as to the extent and character of the work, proposes to furnish all equipment and to perform labor and work necessary for completion of the work described by and in accordance with the Plans, Specifications and Contract for the following prices, to wit:

Signed by: _____

ACKNOWLEDGMENT OF ADDENDA:

The Bidder acknowledges receipt of the following addenda:

Addendum No. 1 1/8/2020 EHH

Addendum No. 2 1/16/2020 EHH

Addendum No. 3 1/21/2020 EHH

The following pages contain all bid items for:

BID SCHEDULE – **WASTEWATER BASIN I SEWER OUTFALL RE-ROUTE AND WATER IMPROVEMENTS - BID NUMBER 20-54**

Town of Addison BID# 20-54 Bid Schedule

Wastewater Basin I Sewer Outfall Reroute and Water Improvements

Furnish and install, all appurtenant work, complete in place, the following items

Item #	Estimated Bid Quantity	Unit	Description	Unit Price	Bid Amount
Base Bid					
1	1	LS	Mobilization & Demobilization/ Cleanup One Hundred thousand dollars & Zero cents	100,000.00	$ 100,000.00
2	1	LS	Traffic Control Plan Two thousand dollars & Zero cents	2,000.00	$2,000.00
3	2	EA	Project Signs One thousand dollars & Zero cents	1,000.00	$2,000.00
4	1	LS	Barricade, Signs, Traffic Control and Pavement Markings. Twenty thousand dollars & Zero cents	20,000.00	$20,000.00
5	1	LS	Site Protection and Site Preparation Eight thousand dollars & Zero cents	8,000.00	$8,000.00
6	1	LS	Construction Staking Seven thousand dollars & Zero cents	7,000.00	$ 7,000.00
7	2	EA	Stabilized Construction Entrance Five Hundred dollars & Zero cents	500.00	$ 1,000.00
8	1	LS	Temporary Erosion, Sedimentation Control Seven teen thousand dollars & Zero cents	17,000.00	$17,000.00
9	9	EA	Inlet Protection One Hundred Sixty four dollars & Zero cents	164.00	$ 1,476.00
10	2,630	LF	Trench Safety Plan for Wastewater Pipelines Three dollars & Zero cents	3.00	$ 7,890.00

11	82	LF	8"PVC SS Pipe (SDR 35) by Open Cut -**Daytime Const.** One Hundred forty dollars & Zero cents	140.00	$11,480.00
12	1,704	LF	15"PVC SS Pipe (SDR 26) by Open Cut - **Daytime Const.** One Hundred Fifty dollars & Zero cents	150.00	$255,600.00
13	844	LF	15"PVC SS Pipe (SDR 26) by Open Cut - **Nighttime Const.** One Hundred Eighty dollars & Zero cents	180.00	$151,920.00
14	1	LS	Jumper Pipe on Beltway Eight thousand Two Hundred dollars & Zero cents	8200.00	$8200.00
15	14	EA	New Standard SSMH 5' Dia. Eight thousand four Hundred dollars & Zero cents	8400.00	$117,600.00
16	1	EA	Rehabilitate Existing SSMH Six thousand Nine Hundred dollars & Zero cents	6900.00	$6,900.00
17	128	VF	Extra Depth for SSMH Five Hundred Eighty dollars & Zero cents	580.00	$74,240.00
18	1	LS	Temporary Wastewater Bypass Pumping/ Piping Two thousand Seven Hundred dollars & Zero cents	2,700.00	$2,700.00
19	898	LF	Trench Safety Plan Water Pipeline three dollars & Zero cents	3.00	$2,694.00
20	331	LF	Remove and Replace existing WL Pipeline with 8" PVC (DR 18) by Open Cut - **Daytime Const.** Eighty Six dollars & Zero cents	86.00	$28,466.00
21	567	LF	8"PVC WL Pipe (DR 18) by Open Cut - **Nighttime Const.** One Hundred Six dollars & Zero	106.00	$60,102.00
22	43	LF	12" Steel Encasement Pipe by Open Cut One Hundred Eighty Nine dollars & Zero cents	189.00	$8,127.00

23	5	EA	8" Resilient Seat Gate Valve Assembly One thousand Eight hundred dollars & Zero cents	1,800.00	$ 9,000.00 -
24	1	LS	Cut and Plug Water Line Two thousand Eight hundred dollars & Zero cents	2,800.00	$ 2,800.00 -
25	1	Ton	Various Water fittings, tees and bends Seven thousand dollars & Zero cents	7,000.00	$ 7,000.00 -
26	1	EA	New Water Service Line Assembly Two thousand Nine hundred dollars & Zero cents	2,900.00	$ 2,900.00 -
27	6	CY	Cement Stabilized Backfill Embedment One hundred Forty dollars & Zero cents	140.00	$ 840.00 -
28	3763	SY	Permanent Concrete Repair of Pavement at 8" thickness One hundred Ten dollars & Zero cents	110.00	$ 413,930.00
29	100	CY	Temporary Asphalt Paving and Flexible Base three hundred dollars & Zero cents	300.00	$ 30,000.00
30	70	LF	Curb and Gutter Replacement or Repair, as directed thirty dollars & Zero cents	30.00	$ 2,100.00
31	15	LF	Sidewalk Replacement or Repair, as directed Seventy dollars & Zero cents	70.00	$ 1,050.00
32	10	CY	High Early Strength (HES) Concrete misc., as directed Two hundred dollars & Zero cents	200.00	$ 2,000.00 -
33	13	SY	Sod Replacement, as directed Ten dollars & Zero cents	10.00	$ 130.00 -
34	1544	LF	Permanent Pavement Markings, as directed three dollars & Zero cents	3.00	$ 4,632.00
35	20	LF	Remove and Replace Fence One hundred dollars & Zero cents	100.00	$ 2,000.00 -
36	1	LS	Miscellaneous Repairs/ Contingency Twenty Five thousand dollars & Zero cents	25,000.00	$ 25,000.00

TOTAL BASE BID				1,397,777.00	
Additive Alternate Bid					
Alt. 1	3763	SY	Extra Cost for using High Early Strength Concrete HES for all Permananet Concrete Repair of Pavement as per Bid Item 28	12.00	45,156.00
GRAND TOTAL BID				1,442,933.00	

NOTES:

1. All items, labor, materials, equipment, facilities, incidentals and work required for construction of the project are to be provided and installed by the Contractor as part of the project and payment for the cost of such shall be included in the price bid for the construction of the project.

2. Prices must be shown in words and figures for each item listed in the Proposal. In the event of discrepancy, the words shall control.

3. Materials, which are "tax exempt", are those items which are physically incorporated into the facilities constructed for the Town of Addison, as set forth in the Special Provisions. Materials include, but are not limited to purchased items such as water pipe, sanitary sewer pipe, storm drain pipe, etc.

   Services, which are "not tax exempt", are those items which are used by the Contractor but are not physically incorporated into the Town of Addison's facility and/or items which are consumed by construction, as set forth in the Special Provisions. Services include, but are not limited to, items such as supplies, tools, skill and labor, the purchase, rental or lease of equipment, etc.

Eduardo M. Hernandez
Name of Person Signing Bid

Signature of Person Signing Bid

P.O. Box 600881 Dallas, TX 75360
Address

214-390-2848
Telephone No. Fax No.

46-0730116
T.I.N. (Tax Identification or Employer's Number)

If BIDDER is:

AN INDIVIDUAL

By _____ (Seal)
(Individual's Name)

doing business as _____

Business address: _____

_____

_____

Phone No. _____

A PARTNERSHIP

By _____ (Seal)
(Firm Name)

_____
(General Partner)

doing business as _____

Business address: _____

_____

_____

Phone No. _____

A CORPORATION

By Flow-Line Construction, Inc.
(Corporation Name)

Ohio
(State of Incorporation)

By Eduardo M Hernandez
(Name of Person Authorized to Sign)

President
(Title)

(Corporate Seal)

Attest
(Secretary)

Business address: P.O. Box 600881, Dallas, TX 75360

Phone No. 214-390-2848

A JOINT VENTURE

By
(Name)

(Address)

By
(Name)

(Address)

(Each joint venture must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above.)

SECTION BB

BID BOND

BID BOND

Bidder shall submit a bid bond equal to five percent (5%) of the base bid price, for Section 1. Failure to submit a bid bond when required may deem the bid non-responsive. Bid Bonds may be submitted electronically with the executed original provided immediately upon request.

GREAT AMERICAN INSURANCE GROUP

BID BOND - PRIVATE WORK

For Use With The American Institute of Architects Contract Proposals

KNOW ALL MEN BY THESE PRESENTS, That we, Flow-Line Construction, Inc. * as Principal, hereinafter called the Principal, and the GREAT AMERICAN INSURANCE COMPANY, of Cincinnati, Ohio, a corporation duly organized under the laws of the State of Ohio, as Surety, hereinafter called the Surety, are held and firmly bound unto * Town of Addison as Obligee, hereinafter called the Obligee, in the sum of Five Percent of the Greatest Amount Bid Dollars ($ 5% of GAB), for the payment of which sum well and truly to be made, and said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for Project Number: Bid Number 20-54 Wastewater Basin I Sewer Outfall Re-Route & Water Improvements

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

PROVIDED, HOWEVER, neither Principal nor Surety shall be bound hereunder unless Obligee prior to execution of the final contract shall furnish evidence satisfactory to Principal and Surety that financing has been firmly committed to cover the entire cost of the project.

Signed and sealed this 28th day of January , 2020

Flow-Line Construction, Inc. (Seal)
Principal

Francisco Brunet Comptroller , Witness

Eduardo M. Hernandez, President Title

GREAT AMERICAN INSURANCE COMPANY

By: Jeremy Swartzwelder , Attorney-in-Fact

S1152A (04/11)

GREAT AMERICAN INSURANCE COMPANY®

Administrative Office: 301 E 4TH STREET • CINCINNATI, OHIO 45202 • 513-369-5000 • FAX 513-723-2740

The number of persons authorized by
this power of attorney is not more than FIVE

No. 0 21290

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the GREAT AMERICAN INSURANCE COMPANY, a corporation organized and existing under and by virtue of the laws of the State of Ohio, does hereby nominate, constitute and appoint the person or persons named below, each individually if more than one is named, its true and lawful attorney-in-fact, for it and in its name, place and stead to execute on behalf of the said Company, as surety, any and all bonds, undertakings and contracts of suretyship, or other written obligations in the nature thereof; provided that the liability of the said Company on any such bond, undertaking or contract of suretyship executed under this authority shall not exceed the limit stated below.

Name	Address	Limit of Power
MICHAEL B. MURPHY GEORGE TILLOTSON MALAYE M. KINDER JEREMY SWARTZWELDER CHARLES D. FOUNTAIN	ALL OF RICHARDSON, TEXAS	ALL UNLIMITED

This Power of Attorney revokes all previous powers issued on behalf of the attorney(s)-in-fact named above.

IN WITNESS WHEREOF the GREAT AMERICAN INSURANCE COMPANY has caused these presents to be signed and attested by its appropriate officers and its corporate seal hereunto affixed this 14TH day of JANUARY , 2020 .

Attest GREAT AMERICAN INSURANCE COMPANY

Assistant Secretary

Divisional Senior Vice President

MARK VICARIO (877-377-2405)

STATE OF OHIO, COUNTY OF HAMILTON - ss:

On this 14TH day of JANUARY , 2020 , before me personally appeared MARK VICARIO, to me known, being duly sworn, deposes and says that he resides in Cincinnati, Ohio, that he is a Divisional Senior Vice President of the Bond Division of Great American Insurance Company, the Company described in and which executed the above instrument; that he knows the seal of the said Company; that the seal affixed to the said instrument is such corporate seal; that it was so affixed by authority of his office under the By-Laws of said Company, and that he signed his name thereto by like authority.

Susan A. Kohorst
Notary Public, State of Ohio
My Commission Expires 05-18-2020

This Power of Attorney is granted by authority of the following resolutions adopted by the Board of Directors of Great American Insurance Company by unanimous written consent dated June 9, 2008.

RESOLVED: That the Divisional President, the several Divisional Senior Vice Presidents, Divisional Vice Presidents and Divisonal Assistant Vice Presidents, or any one of them, be and hereby is authorized, from time to time, to appoint one or more Attorneys-in-Fact to execute on behalf of the Company, as surety, any and all bonds, undertakings and contracts of suretyship, or other written obligations in the nature thereof; to prescribe their respective duties and the respective limits of their authority; and to revoke any such appointment at any time.

RESOLVED FURTHER: That the Company seal and the signature of any of the aforesaid officers and any Secretary or Assistant Secretary of the Company may be affixed by facsimile to any power of attorney or certificate of either given for the execution of any bond, undertaking, contract of suretyship, or other written obligation in the nature thereof, such signature and seal when so used being hereby adopted by the Company as the original signature of such officer and the original seal of the Company, to be valid and binding upon the Company with the same force and effect as though manually affixed.

CERTIFICATION

I, STEPHEN C. BERAHA, Assistant Secretary of Great American Insurance Company, do hereby certify that the foregoing Power of Attorney and the Resolutions of the Board of Directors of June 9, 2008 have not been revoked and are now in full force and effect.

Signed and sealed this 14 day of January 2020 .

Assistant Secretary

SECTION BQS

BIDDER QUALIFICATION STATEMENT

SECTION BQS

ALL BIDDERS ARE NOTIFIED THAT THE FOLLOWING QUALIFICATION STATEMENT MUST BE COMPLETED AND SUBMITTED WITH THE BID PROPOSAL

CONTRACTOR'S QUALIFICATIONS

The Contractor shall show that he has experience with similar projects that require working on water, sanitary sewer, and storm sewer pipeline construction and/or relocation projects working in confined areas in close proximity to many physical features (such as: fences, carports, utility poles, guy lines, gas lines and meters, water lines, sewer manholes and cleanouts, etc.) which will require the Contractor to plan his work efforts and equipment needs with these limitations in mind.

The Contractor shall also provide their experience in trenching in limestone rock and constructing water and sewer lines in roadways with heavy traffic. Experience must show developing and following traffic control plans that provide continuous traffic safety.

The Contractor shall submit a complete list of previous project experience with Municipal and Non-Municipal clients. Bidders should list all previous experience with the Town of Addison. Out of State of Texas experience is acceptable, but preference is given to north Texas regional experience.

The list shall include current and completed projects for the past three (3) years for review and/ or any similar type project as this subject project Bid# 20-54. See attached forms.

BIDDERS QUALIFICATION STATEMENT

BID NUMBER 20-54

WASTEWATER BASIN I SEWER OUTFALL RE-ROUTE AND WATER LINE

Contractor: Flow-line Construction, Inc.

Indicate One: _____Sole Proprietor _____Partnership _____Other

__X__Corporation _____ Joint Venture

Name: Eduardo M Hernandez Partner: _____

Title: President Title: _____

Address: P.O. Box 600881 Address: _____

City: Dallas City: _____

State & Zip: Texas, 75360 State & Zip: _____

Phone: 214-390-2848 ___Phone: _____

State and Date of Incorporation, Partnership, Ownership, Etc. Ohio 2012

Location of Principal Office: 4310 Gaston Ave #200 Dallas, Texas 75360

Contact and Phone at Principal Office: Eduardo M. Hernandez 214-390-2848

Liability Insurance Provider and Limits of Coverage: Hitco Insurance 1,000,000 / 2,000,000

Workers Compensation Insurance Provider: Texas Mutual

Surety (Performance and Payment): Great America Insurance Group

Address: 13760 Noel Rd Dallas, TX 75240

Contact and Phone: Mark Hiff 972-715-8735

Superintendent and Backup Superintendent: (Work Resume - attach additional sheets.) (Safety Record – attached additional sheets; if needed show all verified safety violations.) The superintendent shall be able to communicate in English and not operate any equipment and have not had any verified job safety violations in the past five years. Any variations shall be reviewed by the OWNER for approval or denial. A job site shall be shut down if proper supervision is not provided.

Superintendent Name: Anthony Gideon

Backup Superintendent Name: Greg Gideon

Safety Record – List ALL Verified Violations for Superintendent and Backup Superintendent with explanation, date and action taken to correct future safety violations:

Superintendent

N/A

Backup Superintendent

N/A

Total Number of Employees to be Associated with this Job: _____

Managerial 1 Administrative 1 Professional 1

Skilled 8 Semi-Skilled 8 Other _____

Percentage of work to be done by Bidder's Employees (Based on Dollars Bid): ~~100%~~ 90%

Type(s) of work to be done by Bidder's Employees (examples: concrete paving, structural concrete, waterlines, sanitary sewer lines, storm pipe, storm inlets, excavation, lime, bridge fencing, etc.)

Sewer Main, Watermain, Paving, Demolition, Traffic Control
Saw Cutting, Trucking & Hauling

Access to Tools and Equipment: Percent Owned 100% Percent Rented____

Number of Years in Business as a Contractor on Above Types of Works: 8

Type(s) of Work to be done by Sub-Contractors
Include Name, Address, and Phone Number of Sub-Contractor.
Use additional sheets if needed.

Type of Work	Sub-Contractor
Materials Testing	Alliance Geotechnical
Pavement Stripping	American Stripping
Epoxy Mtl Lining	BLAC
Survey & Layout	Martinez Surveying
Joint Sealing	Supreme Sawing

List Equipment to be used on this project (Make/Model/Age of Major Equipment) Any Equipment not listed shall be reviewed by the OWNER for approval or rejection prior to use of Equipment on this project. (Use additional sheets if necessary)

Type of Equipment	Make	Model	Age (years)
Excavator	Cat	345	
Excavator	Cat	320	
Wheel Loader	Cat	950	
Wheel Loader	Cat	936	
Soil Reclaimer/Pulverizer	Cat	RM300	
Compactor	Cat	84"	

List of ALL Municipal and Similar Non-Municipal current and completed projects for the past three (3) years. (Use additional sheets if necessary.)

1. Project: Please See Attached List

Current Status: _____

Any Litigation Issues: Yes or No (Circle One) If Yes, explain: _____

_____

_____

_____

Any Verified Safety Violations: Yes or No (Circle One) If Yes, explain: _____

_____

_____

_____

Project Description: _____

Owner/Agency: _____

Year Built: _____ Contract Price: _____

Contact Person: _____ Phone: _____

2. Project: _____

Current Status: _____

Any Litigation Issues: Yes or No (Circle One) If Yes, explain: _____

_____

_____

_____

Any Verified Safety Violations: Yes or No (Circle One) If Yes, explain: _____

_____

_____

Project Description:_____

Owner/Agency:_____

Year Built:_____ Contract Price:_____

Contact Person:_____ Phone:_____

3. Project:_____

Current Status:_____

Any Litigation Issues: Yes or No (Circle One) If Yes, explain:_____

Any Verified Safety Violations: Yes or No (Circle One) If Yes, explain:_____

Project Description:_____

Owner/Agency:_____

Year Built:_____ Contract Price:_____

Contact Person:_____ Phone:_____

4. Project:_____

Current Status:_____

Any Litigation Issues: Yes or No (Circle One) If Yes, explain:_____

Any Verified Safety Violations: Yes or No (Circle One) If Yes, explain:_____

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_____

Project Description:_____

Owner/Agency:_____

Year Built:_____ Contract Price:_____

Contact Person:_____ Phone:_____

5. Project:_____

Current Status:_____

Any Litigation Issues: Yes or No (Circle One) If Yes, explain:_____

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Any Verified Safety Violations: Yes or No (Circle One) If Yes, explain:_____

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Project Description:_____

Owner/Agency:_____

Year Built:_____ Contract Price:_____

Contact Person:_____ Phone:_____

6. Project:_____

Current Status:_____

Any Litigation Issues: Yes or No (Circle One) If Yes, explain:_____

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Any Verified Safety Violations: Yes or No (Circle One) If Yes, explain:_____

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Project Description:_____

Owner/Agency:_____

Year Built:_____ Contract Price:_____

Contact Person:_____ Phone:_____

7. Project:_____

Current Status:_____

Any Litigation Issues: Yes or No (Circle One) If Yes, explain:_____

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Any Verified Safety Violations: Yes or No (Circle One) If Yes, explain:_____

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Project Description:_____

Owner/Agency:_____

Year Built:_____ Contract Price:_____

Contact Person:_____ Phone:_____

8. Project:_____

Current Status:_____

Any Litigation Issues: Yes or No (Circle One) If Yes, explain:_____

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Any Verified Safety Violations: Yes or No (Circle One) If Yes, explain:_____

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Project Description:_____

Owner/Agency:_____

Year Built:_____ Contract Price:_____

Contact Person:_____ Phone:_____

9. Project:_____

Current Status:_____

Any Litigation Issues: Yes or No (Circle One) If Yes, explain:_____

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Any Verified Safety Violations: Yes or No (Circle One) If Yes, explain:_____

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Project Description:_____

Completed Projects

Year	Project Information			Reference Information				
	Owner	Project Name	Total Contract Cost	Company Name	Role	Point of Contact	Phone	Email
2019	NTMWD	McKinny and Upper Cottonwood Creek Lift Stations Metering Improvements	$408,350.00	North Texas Municipal Water District	Manager Construction Managem	Ashley Burt	972-442-5405	aburt@ntmwd.com
2019	NTMWD	Water Pipeline Relocations at State Highway 66 & FM 3549	$872,621.00	North Texas Municipal Water District	Project Manager	Jay London	469-626-4717	jlondon@ntmwd.com
2019	City of Frisco	Lebanon Road Improvements and Forcemain	$6,782,404.00	City of Frisco	City Engineer	Arthur Hartle	972-292-5435	ahartle@friscotexas.gov
2019	City of Irving	Singleton Blvd WL WWTR	$920,498.00	City of Irving	City Engineer	Matthew Estridge	972-721-2749	mestridge@cityofirving.com
2019	Town of Addison	Vitruvian Park Public Infrastructure Block 500	$2,349,453.00	UDR, Inc.	Construction Manager	Brian Richardson	303-475-5396	brrichardson@udr.com
2019	Trinity River Authority	Norther Region Pipeline Repair and Maintenance 2018 - 2019	$1,282,860.00	Trinity River Authority	Chief Maintenance Mechanic	Danny Sutton	214-876-1518	suttond@trinityra.org
2018	Trinity River Authority	Ventilation System Lancaster Meter Station	$84,220.00	Trinity River Authority	Construction Inspector Super	Mike Querry	972-263-0076	querrym@trinityra.org
2018	City of Frisco	Lebanon Road Lift Station	$904,861.00	City of Frisco	City Engineer	Arthur Hartle	469-556-3809	ahartle@friscotexas.gov
2018	Town of Addison	Vitruvian Park Public Infrastructure - Block 200	$3,823,000.00	UDR, Inc.	Construction Manager	Brian Richardson	303-475-5396	brrichardson@udr.com
2018	City of Fort Worth	Water & Sanitary Sewer Rehabilitation Contract 71: North Hampton Street	$1,950,988.00	City of Fort Worth	City Engineer	Robert Sauceda	972-721-4670	robert.sauceda@fortworthtexas.gov
2018	Trinity River Authority	Norther Region Pipeline Repair and Maintenance 2017 - 2018	$1,297,460.00	Trinity River Authority	Chief Maintenance Mechanic	Danny Sutton	214-876-1518	suttond@trinityra.org
2018	Trinity River Authority	DCURD Raw Waterline Relocation	$267,042.00	Trinity River Authority	Construction Inspector Super	Mike Querry	972-263-0076	querrym@trinityra.org
2017	City of Irving	East Pioneer Drive Wastewater Improvements	$962,030.00	City of Irving	City Engineer	Matthew Estridge	972-721-2749	mestridge@cityofirving.com
2017	City of Irving	Royal Ridge North Supply Waterline	$2,672,000.00	City of Irving	City Engineer	Wayne Lee	972-721-4677	wlee@cityofirving.com
2017	City of University Park	Water, Sanintary Sewer and Paving Improvements at Various Locations	$1,815,099.00	City of University Park	Public Works Director	Jacob Speer	214-987-5400	jspeer@uptexas.org
2017	City of Grand of Prairie	E Main St at the UPRR Bridge Drainage Improvements (7' x 5' Box Culvert)	$1,567,874.00	City of Grand Prairie	City Engineer	Chris Agnew	972-237-8137	cagnew@gptx.org
2017	Trinity River Authority	Norther Region Pipeline Repair and Maintenance 2016-2017	$472,999.00	Trinity River Authority	Chief Maintenance Mechanic	Danny Sutton	214-876-1517	suttond@trinityra.org
2016	City of Irving	Sleepy Hollow Drive, Ichabod Court Waste Water Improvements	$562,000.00	City of Irving	City Engineer	Walter Thomas	972-721-4677	wthomas@cityofirving.com
2016	City of Rockwall	Southside Elevated Storage Tank Valves	$181,000.00	Birkhoff, Hendricks & Carter, L.L.P.	Design Engineer	Mathew Hickey	214-361-7900	mhickey@bhclip
2016	Dallas Water Utilities	36" WL Relocation on FM423 at Office Creek	$537,150.00	Omega Contracting, Inc.	Project Manager	Daniel Garcia	214-689-3815	dgarcia@azteca-omega.com
2015	City of Corpus Christi	Cefe Valenzuela Landfil (6' x 3' Box Culvert)	$1,000,000.00	C. Green Scaping, L.P.	Vice President	Curtis Green	817-577-9299	cgreen@greenscaping.com
2015	TXDOT Aviation	Meacham International Airport Terminal Taxilane	$260,000.00	C. Green Scaping, L.P.	Vice President	Curtis Green	817-577-9299	cgreen@greenscaping.com
2013	Dallas Water Utilities	Dart Orange Line - Water Line 3.3 Relocation (30" PCCP)	$250,000.00	Omega Contracting Inc.	Project Manager	Daniel Garcia	214-689-3815	dgarcia@azteca-omega.com
2014	Dallas Water Utilities	48" PCCP Watermain at Westmoreland Road & Remond Drive	$146,780.00	Omega Contracting Inc.	Project Manager	Daniel Garcia	214-689-3815	dgarcia@azteca-omega.com
2014	Dallas Water Utilities	48" PCCP Watermain at Westmoreland Road & Remond Drive	$146,780.00	Dallas Water Utilities	City Project Coordinator	Gary Lewis	214-670-8050	gary.lewis@dallascityhall.com
2015	Dallas Water Utilities	Upper Chain of Wetland Remediation - 54" (Hobas) Warren Avenue Interceptor	$1,340,000.00	C. Green Scaping, L.P.	Project Manager	Curtis Green	817-577-9299	cgreen@greenscaping.com
2014	Parkland Hostpital	Parkland Hospital Sky Bridges Utility Relocation	$73,000.00	Azteca-Russell Joint Venture	Project Manager	Steve White	404-734-8397	swhite@hrussell.com
2014	City of University Park	Caruth Park Drainage Improvements	$320,000.00	City of University Park	Publics Works Director	Jacob Speer	214-987-5400	jspeer@uptexas.org
2015	Town of Addison	Addison Airport Sky B&B Terminal Hangar Utility Relocations	$473,000.00	Garver	Project Engineer	Mitchell McAnally	214-619-9023	mrmcanally@garverusa.com
2015	City of Richland Hills	BFC-5 Drainage Improvements: Kingsbury Bypass (8' x 7' Box Culverts)	$2,022,000.00	City of Richland Hills	City Manager	Eric Strong	817-616-3807	estrong@richlandhills.com
2015	DFW International Airport	SA-03: Elevated Water Tower Storage	$2,400,000.00	C. Green Scaping, L.P.	Vice President	Curtis Green	817-577-9299	cgreen@greenscaping.com
2014	City of Rowlett	24" Forcemain Replacement and TV Inspections	$538,000.00	City of Rowlett	City Engineer	Sherrelle Diggs	972-412-6178	sdiggs@rowlett.com
2014	Town of Flower Mound	Wellington Interceptor Section II	$352,000.00	Town of Flower Mound	Engineering Manager	Tiffany Bruce	972-874-6306	tiffany.bruce@flowermound.com
2013	TXDOT Aviation	Rockwall Municipal Airport Drainage Improvements	$307,347.00	KSA Engineers, Inc.	Project Engineer	Elliot Neph	918-521-7534	eneph@ksaeng.com
2012	Dallas Area Rapid Transit	DART Orange Line - I-1/I-2 and I-3		Kiewit Infrastructure	Project Sponsor	Steve Medina	847-561-2292	steve.medina@kiewit.com

Ongoing Projects

% Comp	Project Information			Reference Information				
	Owner	Project Name	Total Contract Cost	Company Name	Role	Point of Contact	Phone	Email
0%	Dallas Trinity Watershed	Simpkins Remediation Raw Water Line	$2,458,715.00	City of Dallas	City Engineer	David Garcia	214-948-4334	david.garcia@dallascityhall.com
80%	City of Arlington	Johnson Creek (Center to Collins) Sanitary Sewer Improvements	$2,162,655.50	City of Arlintgon	City Engineer	Michael Mosier	817-459-6289	michael.mosier@arlingtontx.gov
95%	City of Irving	Hidalgo Alley & Las Colinas Country Club Sewer Improvements	$2,315,044.00	City of Irving	City Engineer	Matthew Estridge	972-721-2749	mestridge@cityofirving.com
70%	Trinity River Authority	CRWS Clarifiers 5-8 Rehabilitation	$1,186,506.00	Kiewit	Project Engineer	Kyle Adkins	720-347-7415	kylew.adkins@kiewit.com
25%	Trinity River Authority	Norther Region Pipeline Repair and Maintenance 2019 - 2021	$2,574,760.00	Trinity River Authority	Chief Maintenance Mechanic	Danny Sutton	214-876-1518	suttond@trinityra.org
75%	Trinity River Authority	CRWS Fire Water System Improvements	$1,638,300.00	Trinity River Authority	Manager Construction Managem	Richard Postma	817-493-5147	postmar@trinityra.org
95%	NTMWD	Leonard Building 20 84" and 66" Underground Pipe	$262,183.00	Kiewit	Project Manager	Nick Black	720-557-3198	Nick.Black@Kiewit.com
20%	Trinity River Authority	Emergency Repair Biennial Contract	$2,920,500.00	Trinity River Authority	Deputy Executive Manager PDC	Tom Davies	682-217-5627	DaviesT@Trinityra.org
30%	City of Arlington	Green Oaks Sanitary Sewer	$4,871,970.00	City of Arlington	City Engineer	Preeti KC	817-459-6605	Preeti.kc@arlingtontx.gov
0%	City of Fort Worth	Churchill Road Water and Sewer Improvements	$8,136,955.00	City of Fort Worth	City Engineer	Lawrence Hamilton	817-392-2626	lawrence.hamilton@fortworthtexas.gov

Owner/Agency:_____

Year Built:_____ Contract Price:_____

Contact Person:_____ Phone:_____

10. Project:_____

Current Status:_____

Any Litigation Issues: Yes or No (Circle One) If Yes, explain:_____

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_____

_____

Any Verified Safety Violations: Yes or No (Circle One) If Yes, explain:_____

_____

_____

_____

Project Description:_____

Owner/Agency:_____

Year Built:_____ Contract Price:_____

Contact Person:_____ Phone:_____

Trade references (List Company, Address, Contact Person, and Phone):

Trinity River Authority
Tom Davies - 682-217-5627
Deputy Executive Manager

Bank References (List Institution, Address, Contact Person, and Phone)

Inwood National Bank
7621 Inwood Road, Dallas, Texas 75209
Charlie Smith 214-351-7352

Claims and Suits (if the answer to any of the following questions is yes, please attached details):

1. Has your organization ever failed to complete any work awarded to it? No

2. Are there any judgments, claims, arbitration proceedings, or suits pending or outstanding against your organization or officers? No

3. Has your organization filed any lawsuits or requested arbitration with regard to construction contracts within the last five years? No

4. Within the last five (5) years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? No

I, Eduardo M Hernandez, being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Date this 30th day of January, 2020.

Name of Organization: Flow-Line Construction, Inc

By: _____

Title: President

STATE OF TEXAS

COUNTY OF DALLAS

BEFORE ME the undersigned authority, on this day personally appeared _____ Eduardo M Hernandez, known to me to be the person whose name subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and considerations therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 30th day of January 2020.

_____

Notary Public in and for Dallas County, Texas

FRANCISCO JOSE BRUNET
Notary Public, State of Texas
Comm. Expires 03-21-2022
Notary ID 131498404

NTCOG Technical Specification
Division 200 – 800

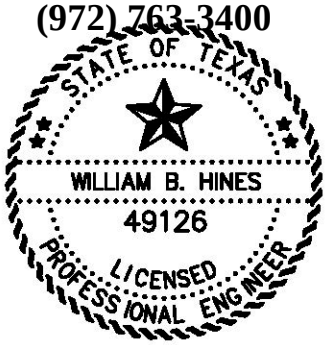
WASTEWATER BASIN I SEWER OUTFALL RE-ROUTE AND WATER IMPROVEMENTS
BID #20-54

TOWN OF ADDISON, TEXAS

JANUARY 2020

DANNENBAUM

3030 LBJ Freeway, Suite 910
Dallas, Texas 75034
(972) 763-3400



DIVISION 200 SITE PROTECTION & PREPARATION

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ITEM 201. SITE PROTECTION

201.1. REMOVAL, PROTECTION, AND REPLACEMENT OF TREES, SHRUBBERY, PLANTS, SOD, AND OTHER VEGETATION

No trees shall be removed unless so noted on the plans or upon the specific approval of the OWNER. Where trees, plants, shrubbery, etc., are adjacent to the line of the work and are not to be removed or are designated on the plans to be removed and replanted, the CONTRACTOR shall protect such trees, plants, shrubbery, and etc.in accordance to the contract documents. If, in the opinion of the OWNER, such trees, plants, shrubbery, etc., would be damaged by machinery, etc., hand excavation may be required. Shrubbery, plants, etc. to be relocated or reused shall be removed with a ball of dirt about their roots and shall be carefully stored and given proper attention.

Sod shall be removed in squares cut out with a sharp spade and of such sizes that they may be handled conveniently without breaking. They shall be carefully stored and given proper attention. During hot, dry weather, the stored sod shall be protected by covering with canvas or burlap.

Tree roots shall be protected by installing temporary construction fencing outside the tree's drip line. Other tree protection may be required by OWNER. No operating, parking, or storing of equipment and/or materials is allowed within the tree protection zone. The CONTRACTOR shall be responsible for all damage to trees, plants, shrubbery, etc., and any such damage shall be remedied to the satisfaction of the OWNER at the expense of the CONTRACTOR. All damaged limbs over 1-inch in diameter shall be sawed clean adjacent to the damaged area or at the trunk and dressed with acceptable tree wound treatment material, unless dressing is waived by the OWNER.

The cost of removal shall be paid for as a separate contract pay item if a separate pay item is provided; otherwise, the costs thereof shall be included in such pay items as are provided in the proposal and contract. The cost of protection shall not be paid for as a separate contract pay item; the costs thereof shall be included in such pay items as are provided for in the proposal and contract.

Where sod, shrubbery, plants, etc., are designated for removal and replacement, such areas shall have sod, shrubbery, plants, etc., of the same kind and in good condition, placed in OWNER approved locations. Trees that are to be removed and subsequently replaced shall be designated on the plans. When backfilling is completed, the sod, shrubbery, plants, etc. shall be carefully placed in OWNER approved locations and the area thoroughly wet down.

The cost of such replacement shall be paid for as a separate contract pay item if a separate pay item is provided; otherwise, the costs thereof shall be included in such pay items as are provided in the proposal and contract.

201.2. DETERMINING LOCATION AND PROTECTION OF EXISTING STRUCTURES AND UTILITIES

Determining location and protection of existing structures and utilities shall comply with this Item 201.2. and with the provisions of Item 107.24. Existing Structures, Facilities and Appurtenances and Item 103.1. Contractor's Warranties and Understanding.

201.2.1. Determining Location. Determining the location of existing structures, utilities and appurtenances shall proceed according to the specifications herein and the provisions of Item 107.24. Existing Structures, Facilities and Appurtenances.

BIDDERS must satisfy themselves as to the actual existing subsurface conditions, including but not limited to the depth, location and sizes of pipe or conduits of various kinds in place. Where the exact depth of any utility or obstruction is not shown on a plan, excavation shall be made prior to reaching the obstruction in order to determine adjustments in grade if needed to prevent interference. Redesign to eliminate conflicts may be necessary. Extra compensation shall not be paid for such delays.

201.2.1.1. Subsurface Utility Engineering. If provided by CONTRACTOR, subsurface utility engineering shall be in conformance with CI/ASCE 38-02, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, or as currently revised.

201.2.2. Protection. All existing structures, improvement and utilities designated to remain shall be adequately protected, at the expense of the CONTRACTOR, from damage that might otherwise occur due to construction operations. Where construction comes in close proximity to existing structures, utilities or

appurtenances, or if it becomes necessary to move services, poles, guy wires, pipe lines or other obstructions, the CONTRACTOR shall notify and cooperate with the owner of the utility, structure, or appurtenance. The utility lines and other existing structures shown on the plans are for information only and are not guaranteed by the OWNER to be complete or accurate as to location and/or depth. The CONTRACTOR shall be liable for damage to any utilities resulting from the CONTRACTOR'S operations. During construction, all fire hydrants, valve boxes, water meters/vaults, manholes, emergency call boxes and/or other existing utility controls shall be left intact, unobstructed and accessible unless noted on the plan.

All water mains, wastewater collection mains, wastewater collection laterals, storm drains, power conduits, gas mains, gas service laterals, irrigation systems, and other lines or appurtenances encountered during construction shall be supported or replaced as detailed on the plans. Water service lines shall not be removed during excavation, and the CONTRACTOR shall provide adequate support for the services across the open ditch.

201.2.2.1. Temporary Utility Supports. CONTRACTOR shall provide temporary utility support to protect existing utility lines exposed during construction. Method and type of temporary utility supports, if required, shall be approved by the utility owner.

201.2.3. Relocating or Replacing Structures, Utilities or Appurtenances. Utility locations shall be obtained prior to the commencement of work according to Item 107.24. Existing Structures, Facilities and Appurtenances. Unless noted on plans that utilities are to be moved by others, any cost of temporarily or permanently relocating utilities shall be borne by the CONTRACTOR. The cost of these replacements shall be included in the CONTRACTOR'S bid price for the various items of work, and no separate payment shall be made. The OWNER shall approve all shut downs and may assist in the shut down operations.

If it is necessary to adjust another utility, a representative of that utility shall be notified to decide method and work to be done. The CONTRACTOR shall make satisfactory arrangements with the OWNER or other utilities for the required adjustments at the CONTRACTOR'S own expense, other than for items that may be provided in the contract for such work. No extra compensation shall be paid due to delays caused by removal of public utility structures.

201.2.3.1. Interrupted Utility Services. In case damage to an existing utility occurs, the CONTRACTOR shall notify the OWNER and utility owner immediately. The CONTRACTOR shall be responsible for the cost to restore the structure or utility to its original condition and position without extra compensation. Restoration of utility services shall be made as soon as practicable as directed and approved by the utility owner.

The CONTRACTOR shall notify the OWNER of any spill of wastewater. Remediation of the spill is the responsibility of the CONTRACTOR and shall be at no additional cost to the OWNER. Spill and remediation will be reported by the OWNER to the TCEQ, USEPA, or other appropriate regulatory agencies. The CONTRACTOR shall be responsible for notifying customers of temporary interruption of service.

201.2.3.2. Street Sign Posts and Signs. The CONTRACTOR shall be responsible for all damage to street sign posts and signs within the limits of the CONTRACTOR'S operations that remain in place or are removed and replaced. In the event that street sign posts and signs are damaged or destroyed by the CONTRACTOR'S operations, they shall be replaced at the CONTRACTOR'S expense.

201.2.3.3. Methods of Removal and Disposal. Materials or parts of structures which are to be broken up, dismantled or removed, and which are to be salvaged, shall be removed, loaded, cleaned and unloaded at sites designated by the OWNER. Materials that are not salvageable shall become the property of the CONTRACTOR. Disposal of such materials, in accordance with applicable local, state, and federal regulations, shall be at the CONTRACTOR'S expense.

201.2.4. Measurement and Payment. No measurement shall be made for the removal and replacement of utility pipe even if the utility pipe is replaced with a different pipe. No payment shall be made except as provided for under certain conditions in Item 107.24. Existing Structures, Facilities and Appurtenances and Item 201.2.4.1. Measurement and Payment for Utility Supports, unless otherwise provided in the Contract.

201.2.4.1. Measurement and Payment for Temporary Utility Supports. No separate measurement or payment shall be made for temporary utility supports unless a separate bid item is established in the Contract. If a separate bid item for temporary utility supports is established in the Contract, it shall include all necessary labor, tools, materials, equipment and incidentals necessary to complete the work, including removal and cleanup.

201.3. MAINTENANCE OF STREETS AND RIGHTS OF WAY DURING CONSTRUCTION

The CONTRACTOR shall at all times maintain vehicular and pedestrian traffic through and adjacent to work zones in accordance with Item 107. Legal Relations and Contractor Responsibilities. The maintenance required shall include but not be limited to the filling of potholes; blading or otherwise smoothing of the paved surfaces (particularly in a trench area); cleaning and removal of surplus excavation material, rubbish, etc.; and the maintenance of safe and efficient vehicular and pedestrian access. Dust control shall be in accordance with 203.6 Dust Control.

ITEM 202. TEMPORARY EROSION, SEDIMENTATION, AND WATER POLLUTION PREVENTION AND CONTROL

202.1. DESCRIPTION

This Item shall govern the use of temporary control measures necessary to prevent and control soil erosion, sedimentation, and water pollution that may degrade the MS4, adjacent properties, and/or receiving waters including rivers, streams, lakes, reservoirs, groundwater, and wetlands. The temporary control measures contained herein shall be installed and maintained throughout the construction contract and coordinated with any permanent or temporary pollution control features specified elsewhere on the plans and in the specifications to assure effective and continuous water pollution control throughout the construction and post construction periods. These control measures shall not be used as a substitute for the permanent pollution control measures unless otherwise directed by the OWNER in writing. The controls may include any of the devices listed in this item. Additional information regarding these and other controls can be found in NCTCOG's *integrated* Storm Water Management iSWM Program Manuals. In the event of conflict between these specifications and applicable Federal, State and Local laws, rules and regulations, the more restrictive requirement shall apply.

Measurement and payment for all measures called for within Item 202. shall be per Item 202.19 Measurement and Payment.

202.2. ITEMS OF WORK AND MATERIALS

The items, estimated quantities, and locations of the control measures will be shown on the plans; however, the OWNER may revise these items as needs arise. The materials will be shown on the plans and in the specifications. The OWNER may allow, in writing, the use of other materials and work methods as the need arises.

202.3. PRECONSTRUCTION SUBMITTALS

Prior to the start of construction, the CONTRACTOR shall submit to the OWNER a copy of the Storm Water Pollution Prevention Plan (SWPPP) and any documentation required by the Construction General Permit. Work on the project shall not begin until the submittals have been accepted by the OWNER. The CONTRACTOR shall provide the OWNER, for information purposes, proposed methods of storm water pollution control for CONTRACTOR operations in areas which are outside the limits of the erosion control plan or the SWPPP (such as construction and haul roads, field offices, equipment and supply storage areas, portable process plants, and source material storage), as well as a plan for disposal of waste materials.

202.4. CONSTRUCTION REQUIREMENTS

202.4.1. General. The CONTRACTOR shall provide control measures to prevent or minimize the impact of the CONTRACTOR'S operations to receiving waters as required by the plans or Storm Water Pollution Prevention Plan (SWPPP) and/or as directed by the OWNER in writing.

In any disturbed area where construction activities have ceased, permanently or temporarily, the CONTRACTOR shall initiate stabilization of the area by the use of seeding, mulching, soil retention blankets or other appropriate measures within 14-days, except in areas where construction activities are scheduled to resume within 21-days.The CONTRACTOR shall effectively prevent and control erosion and sedimentation on the site at the earliest practicable time as outlined in the approved schedule. Control measures, where applicable, will be implemented prior to the commencement of each construction operation. The CONTRACTOR shall limit the amount of disturbed earth to the area(s) shown on the plans or as directed by the OWNER. The OWNER has the authority to limit the disturbed surface area exposed by construction operations. If, in the opinion of the OWNER, the CONTRACTOR is not able to effectively control soil erosion and sedimentation resulting from construction operations, the OWNER will limit the amount of disturbed area to that which the CONTRACTOR is able to control.

Should the control measures fail to function effectively, the CONTRACTOR shall act immediately to bring the erosion and sedimentation under control by maintaining existing controls or by providing additional controls as directed by the OWNER. When, in the opinion of the OWNER, the site is adequately stabilized, the control measures, except mulches and soil retention blankets, will be removed and properly disposed of by the CONTRACTOR. Soil retention blankets shall be removed only when, in the opinion of the OWNER, final

permanent perennial seeding would be adversely affected by the presence of an existing soil retention blanket.

All erosion, sediment, and water pollution controls will be maintained in good working order. The CONTRACTOR and OWNER will inspect the entire project to determine the condition of the control measures using one of the following inspection schedules:

(1) A rain gauge provided by the CONTRACTOR will be located at the project site. Inspection will occur every fourteen (14) calendar days, and also within 24-hours of a rainfall event of 0.5-in. or more as measured by the project rain gauge.

(2) Inspection will occur at least once every seven (7) calendar days on a specifically defined day, regardless of whether or not there has been a rainfall event since the previous inspection.

Sediment will be removed and devices repaired as soon as practicable but no later than seven (7) calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from equipment operations needed for repairs.

In the event of continuous rainfall over a 24-hour period, or other circumstances that preclude equipment operation in the area, the CONTRACTOR will install additional backup devices, as determined by the OWNER, by other appropriate methods. The CONTRACTOR will remove silt accumulations and deposit the spoils in an area approved by the OWNER as soon as practical. Any corrective action needed for the control measures will be accomplished in the sequence directed by the OWNER; however, areas adjacent to receiving waters shall generally have priority, followed by devices protecting storm sewer inlets.

In the event of conflict between these requirements and storm water pollution control laws, rules or regulations of other Federal, State, or Local agencies, the more restrictive laws, rules or regulations shall apply.

202.4.2. Other Practices and Controls. The CONTRACTOR shall also conform to the following practices and controls.

202.4.2.1. Location and Construction of CONTRACTOR'S Auxiliary Areas. Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the amount of sediment that may enter receiving waters. Disposal areas shall not be located in any floodplain or receiving waters. Construction roads may not be located in or cross any receiving waters without prior approval of the OWNER and shall be done in compliance with applicable rules and regulations. Staging areas and vehicle maintenance areas shall be constructed by the CONTRACTOR in a manner to minimize the runoff of pollutants and at a location approved by the OWNER. The CONTRACTOR shall prevent pollution of receiving waters with petroleum products or other hazardous or regulated substances.

202.4.2.2. Activity In or Near Waters. Construction operations in receiving waters shall be restricted to those areas where it is necessary to perform the work shown on the plans. Wherever streams are crossed, temporary bridges, timber mats, or other structures shall be used and approved by the OWNER. When work areas or material sources are located adjacent to a receiving water, control measures such as diversion dikes or rock berms shall be used to keep sediment and other contaminants from entering the adjacent receiving water. Care shall be taken during the construction and removal of such barriers to minimize down-gradient sedimentation.

All receiving waters shall be cleared as soon as practicable of temporary embankment, temporary bridges, matting, falsework, piling, debris, or other obstructions placed during construction operations that are not a part of the finished work.

202.4.2.3. Materials Storage. Protected storage for paints, chemicals, solvents, fertilizers, and other potentially toxic materials will be provided by the CONTRACTOR at a location approved by the OWNER.

202.4.2.4. Vegetation. Disturbance of vegetation shall be minimized and limited to only what is shown on the construction plans or as directed by the OWNER in writing. Operations shall be in accordance with Item 204. Landscaping.

202.4.2.5. Keeping Roadways Clean. The CONTRACTOR shall clean paved surfaces, as necessary, to remove sediment that has accumulated on the roadway.

202.4.3. Cleaning and Stabilizing Project Area. The project will not be accepted until the CONTRACTOR has cleaned up as described in Item 107.25. Project Clean-up to the satisfaction of the OWNER. The project will

also not be accepted until the CONTRACTOR provides a uniform perennial vegetative cover with a density of 70-percent of the native background vegetative cover or, if in the opinion of the OWNER, permanent measures (such as riprap, gabions, geotextiles, or other stabilization methods approved by the OWNER), supplemented by temporary measures (such as mulching with seed, silt fences, earth dams, etc.) have been employed that will control erosion, sedimentation, and water pollution until sufficient vegetative cover can be established.

202.5. SILT FENCE

202.5.1. Description. Silt Fence is a barrier consisting of geotextile fabric, steel wire fence fabric and supported by steel posts to prevent soil and sediment loss from a site. This includes all labor and materials associated with installation, maintenance, and ultimate removal of the silt fence as shown in the construction drawings or similar document.

The purpose of a silt fence is to intercept and detain water-borne sediment from unprotected areas to a limited extent. Silt fence is used during the period of construction near the perimeter of a disturbed area to intercept sediment while allowing water to percolate through. This fence shall remain in place until the disturbed area is permanently stabilized. Silt fences are to be constructed along a line of constant elevation (along contour line) where possible. Silt fence shall not be used where there is a concentration of water in a channel or drainage way or where soil conditions prevent a minimum toe-in depth of 6-inches or installation of support post to depth of 12-inches. If concentrated flow occurs after installation, corrective action shall be taken such as placing a stone overflow in the areas of concentrated flow or replacing the silt fence with a more appropriate control measure.

202.5.2. Materials.

202.5.2.1. Geotextile. Silt Fence fabric must meet the following minimum criteria:

(1) Tensile Strength, ASTM D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles, 90-lbs.
(2) Puncture Rating, ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products, 60-lbs.
(3) Mullen Burst Rating, ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, 280-psi.
(4) Apparent Opening Size, ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile, U.S. Sieve No. 40 (max) to 80 (min).
(5) Ultraviolet Resistance, ASTM D4355 standard Test Method for Deterioration of Geotextiles by Exposure to light, Moisture, and Heat in a Xenon Arc Type Apparatus, Minimum 70 percent.

202.5.2.2. Posts. Fence posts shall be steel and may be T-section or L-section, 1.3 pounds per linear foot minimum, and 4 feet in length minimum. Plastic caps to be installed in areas exposed to pedestrian traffic. Wood posts may be used if anticipated length of service is less than 90 days and provided they are 4 feet in length minimum and have a nominal cross section of 2 inches by 4 inches for pine or 2 inches by 2 inches for hardwoods. If allowed, wood posts shall be replaced if deterioration renders post ineffective.

202.5.2.3. Wire Support. Silt fence shall be supported by steel wire fence fabric as follows:

(1) 4" x 4" mesh size, W1.4 /1.4, minimum 14-gauge wire fence fabric;
(2) Hog wire, 12 gauge wire, small openings installed at bottom of silt fence;
(3) Standard 2" x 2" chain link fence fabric; or
(4) Other welded or woven steel fabrics consisting of equal or smaller spacing as that listed herein and appropriate gauge wire to provide support.

202.5.2.4. Stone. When a stone overflow is specified, the stone shall be 1½-inches washed stone containing no fines meeting the requirement for coarse crushed stone in Section 504.2.2.1. (a) Coarse Crushed Stone Embedment.

202.5.3. Construction. Silt Fence shall consist of synthetic fabric supported by wire mesh and steel posts set a minimum of 1-foot depth and spaced not more than 6-feet on center. A 6-inch wide trench is to be cut 6-inches deep at the toe of the fence to allow the fabric and wire mesh to be laid below the surface and backfilled with compacted earth or gravel. This entrenchment prevents any bypass of runoff under the fence. Fabric shall overlap at abutting ends a minimum of 3-feet and shall be joined such that no leakage or bypass

occurs. Sufficient room for the operation of sediment removal equipment shall be provided between the silt fence and other obstructions in order to properly maintain the fence. The last 10 feet (or more) at the ends of a line of silt fence shall be turned upslope to prevent bypass of stormwater. Additional upslope runs of silt fence may be needed every 200 to 400 linear feet, depending on the traverse slope along the line of silt fence. A stone overflow structure constructed in accordance with Standard Drawing 1020A shall be installed at all low points or spaced approximately every 300 feet if there is no apparent low point.

202.6. INTERCEPTOR SWALE

202.6.1. Description. A temporary interceptor swale may have a V-shape, parabolic, or be trapezoidal with a flat bottom. Interceptor swales are used to shorten the length of exposed slope by intercepting runoff and can also serve as perimeter swales preventing off-site runoff from entering the disturbed area or prevent sediment-laden runoff from leaving the construction site or disturbed area. The outlet (discharge point) of the swale shall be designed to have non-erosive velocities or designed with velocity dissipation devices. Diverted runoff from a disturbed area or other construction activity shall be conveyed to a sediment control. The swales shall remain in place until the disturbed area is permanently stabilized.

202.6.2. Applications and Design Criteria. It is the responsibility of the OWNER to provide specific details and specifications of all interceptor swales.

202.7. DIVERSION DIKE

202.7.1. Description. A temporary diversion dike is a barrier created by the placement of an earthen embankment to reroute the flow of runoff to an erosion control device or away from an open, easily erodible area. A diversion dike intercepts runoff from small upland areas and diverts it away from exposed slopes to a stabilized outlet or sediment trapping device. Dikes are generally used for the duration of construction to intercept and reroute runoff from disturbed areas to prevent excessive erosion until permanent drainage features are installed and/or slopes are stabilized. The outlet (discharge point) of the diversion dike shall be designed to have non-erosive velocities or designed with velocity dissipation devices. Diverted runoff from a disturbed area or other construction activity shall be conveyed to a sediment control.

202.7.2. Materials. For grades less than 2 percent and velocities less than 6 feet per second, the minimum required channel stabilization shall be grass, erosion control blankets, or anchored mulch. For grades in excess of 2 percent or velocities exceeding 6 feet per second, stabilization is required in the form of turf reinforcement mats (or rip-rap with appropriate size, gradation, and thickness depending on flow conditions). Velocities greater than 8 feet per second will require approval by the OWNER. Dike material shall consist of in situ soils with a plasticity index greater than 25.

202.7.3. Construction and Maintenance. Diversion dikes shall be installed prior to and maintained for the duration of construction and should intercept no more than 5-acres of runoff. Maximum depth of flow at the dike shall be 1 foot based on a 2-year return period design storm peak flow. Dikes shall have a minimum top width of 2.0-ft. and a minimum height of compacted fill of 18" measured from the top of the existing round at the upslope toe to top of the dike and having side slopes of 3:1 or flatter. The soil for the dike shall be placed in lifts of 8" or less and be compacted to 95-percent standard proctor density using ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort. The channel formed by the dike must have positive drainage for its entire length to a controlled outlet.

CONTRACTOR shall inspect dikes on a regular basis, at least as frequently as required by the SWPPP. Deficiencies shall be repaired as required by the SWPPP or as directed by the OWNER. Remove temporary diversion dike at direction of OWNER or upon establishment of permanent ground cover; and establish permanent ground cover in the area disturbed by the removal.

202.8. TRIANGULAR SEDIMENT FILTER DIKE

202.8.1. Description. The work shall consist of installing a temporary triangular sediment filter dike as shown on the plans during the construction period to control sedimentation.

The purpose of a triangular sediment filter dike is to intercept and detain water-borne sediment from unprotected areas of limited extent. Triangular filter dikes are used in place of silt fence, treating sediment flow at the perimeter of construction areas and at the perimeter of the site. Also, the dikes can serve as

stream protection devices by preventing sediment from entering the streams. This measure can be effective on paved areas where installation of silt fence is not possible.

202.8.2. Materials.

202.8.2.1. Geotextile. The fabric must meet the following minimum criteria:

(1) Tensile Strength, ASTM D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles, 90-lbs.
(2) Puncture Rating, ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products, 60-lbs.
(3) Mullen Burst Rating, ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, 280-psi.
(4) Apparent Opening Size, ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile, U.S. Sieve No. 30 (max) to 100 (min).
(5) Ultraviolet Resistance, ASTM D4345 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus, Minimum 70 percent.

202.8.2.2. Wire Mesh Support. The internal support for the dike structure shall be 6-gauge 6" x 6" wire mesh or 4" x 4" welded wire fabric folded into triangular form being 18"on each side.

202.8.2.3. Filter Stone for Rock Bags. Material shall consist of 1inch Crushed Stone conforming to Item 504.2.2.1. Crushed Stone Embedment.

202.8.2.4. Bag Material for Rock Bags. Bag material shall be polypropylene, polyethylene, polyamide or cotton burlap woven fabric, minimum unit weight 4-ounces-per-square-yard, mullen burst strength exceeding 300-psi as determined by ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, and ultraviolet stability exceeding 70-percent. Bag material shall be free of all defects.

202.8.3. Construction. Triangular sediment filter dikes shall be installed across exposed slopes during construction with ends of the dike tied into existing grades to prevent failure. Filter material shall lap over ends 6-inches to cover dike-to-dike junction; each junction shall be secured by shoat rings. Where the dike is placed on pavement, two rock bags shall be used to anchor the overlap to the pavement. Additional bags shall be used as needed to ensure continuous contact with the placement (no gaps). The ends of the dike shall be turned upgrade to prevent bypass of stormwater.

202.9. CHECK DAM (ROCK)

202.9.1. Description. The work shall consist of constructing temporary rock check dams as shown on the plans during the construction period to control erosion and sedimentation.

202.9.2. Materials.

202.9.2.1. Stone. Stone shall be well graded with size range from 1½-inches to 3½-inches in diameter depending on expected flows. Where the channel design flow velocity will be greater than 5 feet per second the upper size limit of the stone will need to be increased by the designer and specified on the construction drawings.

202.9.2.2. Geotextile Fabric. Use geotextile filter fabric under check dams exceeding 18 inches in height. If required, the check dam shall be placed on geotextile fabric meeting the following minimum criteria:

(1) Tensile Strength, ASTM D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles, 250-lbs
(2) Puncture Rating, ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products, 135-lbs.
(3) Mullen Burst Rating, ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, 420-psi.

Apparent Opening Size, ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile, U.S. Sieve No. 20 (max).

202.9.3. Construction and Maintenance. Check dams should be placed at a distance and height to allow small pools to form between each one. Typically, dam height should be between 12" and 36". Dams should be spaced such that the top of the downstream dam should be at the same elevation as the toe of the

upstream dam. Rock check dams should be triangular in cross section with slopes of 1:1 or flatter on the upstream side and 2:1 or flatter on the downstream side. The middle overflow section of the check dam shall be half the total depth of the channel.

The check dam shall be inspected regularly in accordance with the SWPPP. The check dams shall be reshaped or replaced as needed during inspection. When the silt reaches 1/3 the height of the berm or 1-foot, whichever is less, the accumulated silt shall be removed and disposed of at an approved site in a manner that will not contribute to additional siltation. The check dam shall be left in place until all upstream areas are stabilized and accumulated silt removed; removal shall be done by hand.

202.10. CHECK DAM (FILTER TUBE)

202.10.1. Description. The work shall consist of constructing temporary filter tube check dams as shown on the plans during the construction period to control channel velocity and erosion.

202.10.2. Materials.

202.10.2.1. Filter Tube. Filter tubes shall meet the material requirements of Item 202.18 Filter Tubes.

202.10.2.2. Stakes (Metal and Wood). Galvanized or painted steel stakes in studded "T" shape or punched "U" shape, minimum filter tube diameter of 18" and a weight of 1.25 pounds per linear foot minimum. Hardwood stakes or pressure treated wood stakes nominal 2"x2"x36" minimum dimensions.

202.10.2.3. Geotextile Fabric. Section held for future use.

202.10.3. Construction and Maintenance. Filter tube check dams should be placed at a distance and diameter (i.e. height) to allow small pools to form between each one. Typically, minimum tube diameter shall be 6". The tubes should be spaced such that the top of the downstream tube should be at the same elevation as the toe of the upstream tube. The filter tube shall be placed in a bedding trench to ensure firm contact between the tube and ground.

The check dam shall be inspected regularly in accordance with the SWPPP. The check dams shall be reshaped or replaced as needed during inspection. When the silt reaches 1/3 the height of the berm or 1-foot, whichever is less, the accumulated silt shall be removed and disposed of at an approved site in a manner that will not contribute to additional siltation. The check dam shall be left in place until all upstream areas are stabilized and accumulated silt removed; removal shall be done by hand.

202.11. STABILIZED CONSTRUCTION EXIT

202.11.1. Description. The work shall consist of constructing a temporary stabilized construction in accordance with contract documents. The exit will consist of a pad of crushed stone placed on a geotextile filter cloth and remain in place for the duration of the construction period to facilitate the removal of sediment and other debris from construction equipment prior to exiting the construction site. This includes all labor and materials associated with installation, maintenance, and ultimate removal of the stabilized construction exit as shown in the construction drawings or similar document.

202.11.2. Materials.

202.11.2.1. Stone. Stone material shall consist of 3-inch to 5-inch minimum coarse aggregate and shall be placed in a layer of at least 6-inches thickness. No crushed concrete shall be allowed.

202.11.2.2. Geotextile. The geotextile fabric must meet the following minimum criteria:

(1) Tensile Strength, ASTM D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles, 300-lbs.
(2) Puncture Strength, ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products, 120-lbs.
(3) Mullen Burst Rating, ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, 600-psi.
(4) Apparent Opening Size, ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile, U.S. Sieve No. 40 (max).

202.11.3. Construction and Use. A temporary stabilized construction exit shall be installed at any point where traffic will be leaving a construction site to or from a paved surface such as a street, alley, sidewalk or parking area. The purpose of a stabilized construction exit is to reduce or eliminate the tracking or flowing of sediment onto paved surfaces. The exit shall be properly graded, sloping away from offsite paved surfaces

or incorporate a drainage swale to prevent runoff from leaving the construction site. Avoid placing construction access at the lowest point on the construction site or on top of proposed utility lines. The minimum length shall be 50 feet. The minimum width shall be 20 feet for sites less than 5 acres and 30 feet for sites 5 acres and larger.

The stabilized construction exit shall be maintained in a condition that prevents tracking or flow of sediment onto paved surfaces. Periodic re-grading and top dressing with additional stone must be done to keep the efficiency of the exit from diminishing. The rock shall be re-graded when ruts appear. Additional rock shall be added when soil is showing through the rock surface.

Additional controls will be required if inspections reveal a properly installed and maintained exit, but tracking of soil outside the construction area is still evident. All sediment spilled, dropped, washed or tracked onto public rights of way shall be removed immediately by the CONTRACTOR. The use of water to wash sediment from streets is prohibited.

When necessary, vehicles must be cleaned to remove sediment prior to entrance onto paved roads, streets, or parking lots. When vehicular washing is required, it shall be done on a constructed wheel wash facility that drains into an approved sediment trap or sediment basin or other sedimentation/filtration device.

202.12. STONE OUTLET SEDIMENT TRAP

202.12.1. Description. A stone outlet sediment trap is an impoundment created by the placement of a stone embankment and filter stone to prevent soil and sediment loss from a site. The stone embankment may be confined within a gabion basket or chain link fence fabric or unconfined. This item includes all labor and materials associated with installation, maintenance and ultimate removal of the stone outlet sediment trap as shown in the construction drawings or similar document.

202.12.2. Materials.

202.12.2.1. Embankment Stone. The embankment stone shall be comprised of Type A Dry Riprap stone conforming to Item 803.3. Riprap and with a size range of 6 to 12 inches in diameter.

202.12.2.2. Filter Stone. The filter stone covering the upstream face of the 6 to 12 inch Riprap shall be 1inches washed stone containing no fines meeting the requirement for coarse crushed stone in Section 504.2.2.1., Crushed Stone Embedment.

202.12.2.3. Geotextile. The embankment stone shall be place on geotextile fabric meeting the following minimum criteria:

(1) Tensile Strength, ASTM D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles, 250-lbs.
(2) Puncture Rating, ASTM D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products, 135-lbs.
(3) Mullen Burst Rating, ASTM D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, 420-psi.
(4) Apparent Opening Size, ASTM D4751 Test Method for Determining Apparent Opening Size of a Geotextile, U.S. Sieve No. 20 (max).

202.12.2.4. Confinement. When a confined stone outlet sediment trap is used the confinement of the embankment stone shall be by one of the following:

(1) Gabion Basket – Gabion baskets shall meet the requirements of Item 803.2.2.1. Baskets, Metallic Coated. Tie wire shall be supplied by the gabion manufacturer for use with the product selected.
(2) Chain Link Fence Fabric – Fabric shall meet the requirements of Item 801.4.2.1. Chain Link Fence Fabric, Zinc or Aluminum coated. Tie wire or metal bands for closure and anchoring shall be as recommended by the fabric supplier for use with the fence material used.

202.12.2.5. Anchor Pipe. Standard weight, 2" nominal diameter galvanized steel pipe.

202.12.3. Construction and Maintenance. The required temporary storage volume behind the stone outlet structure as shown on the construction plans shall be provided with the existing topography or can be provided by additional excavation as needed. Embankment slopes of excavated area should not be steeper than 2H: 1V to prevent slope failures into the storage area.

202.12.3.1. Stone Embankment. The maximum stone embankment height shall be 6 feet as measured from the toe of the slope on the downstream side. The minimum width of the stone

embankment at the top shall be 2 feet. Embankment slope shall be 1.5H: 1V or flatter. The embankment shall have a depressed area to serve as the overflow with a minimum width of 4 feet. The overflow width shall be designed to have a minimum freeboard of 6" at design flow.

For a confined stone outlet sediment trap the embankment stone may be enclosed in a gabion basket or chain link fence fabric and anchored to the channel bottom to prevent washing away. This type of device shall be required where the placement will be in a perennial stream channel.

202.12.3.2. Filter Stone Embankment Face. Filter stone shall be placed on the upstream face of the stone embankment to a minimum depth of 6 inches.

202.12.3.3. Maintenance. The filter stone on the upstream face shall be removed and replaced when it becomes clogged with any material that prevents the storage basin from dewatering. Also, accumulated silt shall be removed from the storage area when the depth of sediment is equal to one-third of the height of the embankment as measured from the original toe of slope to the crest of the outlet, or has reached a depth of one foot, whichever is less.

202.13. PIPE SLOPE DRAIN

202.13.1. Description. A temporary pipe slope drain is an erosion control device that combines an earthen diversion dike and a rigid or flexible pipe to carry runoff over an exposed slope to a stabilized outlet apron. This includes all labor and materials associated with installation and maintenance of the pipe slope drain as shown in the construction drawings or similar document. Maximum drainage areas for individual pipe slope drains shall be 5 acres. For areas larger than 5 acres, additional drains shall be added. Both the entrance and outfall of the pipe slope drain should be properly stabilized. Grass can normally be used at the entrance, but armor type stabilization such as stone or concrete riprap is normally required to address the high velocities of the outfall.

202.13.2. Materials.

202.13.2.1. Pipe. The drain pipe shall be made of any material, rigid or flexible capable of conveying runoff. Regardless of material, the drain pipe shall be completely water-tight so that no water leaks onto the slope to be protected.

202.13.2.2. Stabilized Outlet. The most common stabilized outlet consists of well graded stone or recycled concrete riprap. Alternate materials for stabilized outlets may be approved by the OWNER.

202.13.2.3. Stabilized Entrance. Material shall be in accordance with Item 202.15 Erosion Control Blankets.

202.13.2.4. Diversion Dike. Material shall be in accordance with Item 202.7 Diversion Dike.

202.13.3. Construction and Maintenance.

202.13.3.1. Pipe Slope Drain. A diversion dike shall be constructed at the top of the slope which shall be protected. Attached to the inlet end of the pipe, using water-tight fittings, shall be a standard tee fitting with a stabilized entrance apron extending a minimum of 3 feet long by 3 feet wide from the open ends of the tee staked in place per the manufacturer's recommendations. Attached to the branch end of the tee fitting shall be rigid or flexible pipe to be used for containment of the runoff from the top of the slope to the bottom. The pipe shall be secured with hold down anchors spaced 10 feet on center.

202.13.3.2. Stabilized Outlet. A stabilized outlet shall be excavated to accept the runoff from the pipe and dissipate the energy of the flow.

202.13.3.3. Maintenance. Pipe slope drains should be inspected regularly (at least as often as required by the SWPPP Construction General Permit) to locate and repair any damage to joints or clogging of the pipe. In cases where the diversion dike has deteriorated around the entrance of the pipe, it may be necessary to reinforce the dike with sandbags or to install a concrete collar to prevent failure. Signs of erosion around the pipe drain should be addressed by stabilizing the area with erosion control blanket, turf reinforcement mats, riprap, concrete, or other acceptable methods. All repairs shall be completed in a timely manner or as directed by the OWNER.

202.14. INLET PROTECTION

202.14.1. Description. Inlet protection devices vary depending on the type of inlet and whether the inlet is located at grade (i.e. on a slope) or in a sag (i.e. at a low point). The devices are normally located at the inlet, providing either detention or filtration to reduce sediment and floatable materials in storm water. Clogging can greatly reduce or completely stop the flow into the inlet.

Ensure that inlet protection is properly designed, installed and maintained to avoid flooding of the roadway or adjacent properties and structures. Inlet protection devices shall provide overflow capability to allow stormwater overflow during extreme storm events or when the filter media on the protection device has clogged. Inlet protection **shall not** be installed on inlets located on publicly traveled streets unless approved by the OWNER in writing.

The five types of inlets commonly used in public works construction are listed below with their recommended inlet protection devices. Grate inlets are installed in either paved or unpaved locations and they are therefore listed twice in the list below. These measures include all labor and materials associated with installation, maintenance and ultimate removal of the inlet protection as shown in the details or the approved construction drawings.

202.14.1.1. Curb Inlets.

A. Filter Tube – The use of a prefabricated or site fabricated filter tube and support system at the inlet to slow the sediment laden stormwater to allow sedimentation to occur. The diameter or height of the filter tube shall be two inches shorter than the curb opening height to allow for overflow capability.

B. Filter Fabric – The use of a geosynthetic filter fabric material and support system at the inlet to slow the sediment laden stormwater to allow sedimentation to occur. A 2-inch high gap shall be cut in the filter fabric just below the top of the curb opening to allow for overflow capability. The filter fabric and support system are held in place with filter stone anchor bags strategically placed to hold the filter fabric in contact with the pavement surface and the curb face.

202.14.1.2. Grate Inlets in Paved Areas.

A. Filter Tube – The use of a prefabricated or site fabricated filter tube at the inlet to slow the sediment laden stormwater to allow sedimentation to occur. The diameter or height of the filter tube shall be designated on the approved construction plans and shall be small enough to prevent flood damage to on site facilities or adjacent properties. Traffic control warning devices shall be provided to prevent damage from and to vehicles.

B. Block & Gravel – The use of filter stone with a concrete block and hardware fabric support system to slow the sediment laden stormwater to allow sedimentation to occur.

202.14.1.3. Grate Inlets or Area Inlets in Unpaved Areas.

(1) Filter Tube – The use of a prefabricated or site fabricated filter tube surrounding the inlet to slow the sediment laden stormwater to allow sedimentation to occur. The diameter or height of the filter tube shall be designated on the approved construction plans and shall be small enough to prevent flood damage to on site facilities or adjacent properties. The filter tube shall be located in a prepared bedding trench to ensure good contact with the underside of the filter tube and shall be staked in place to prevent movement by flowing stormwater.

(2) Block & Gravel – The use of filter stone with a concrete block and hardware fabric support system to slow the sediment laden stormwater to allow sedimentation to occur.

(3) Excavated Impoundment – The use of an excavated impoundment at the inlet to slow the sediment laden stormwater to allow sedimentation to occur. Dewatering weep holes shall be provided in the structure walls at the bottom of the excavation to allow the impoundment to dewater after rain events.

(4) Filter Fabric – The use of filter fabric with wire backing supported by wooden stakes at each corner of the grate and reinforced with a 2"x4" wood frame around the top perimeter of the wood posts.

202.14.1.4. Combination Inlets.

(1) Filter Tube – The use of a prefabricated or site fabricated filter tube at the inlet to slow the sediment laden stormwater to allow sedimentation to occur. The diameter or height of the filter tube shall be

designated on the approved construction plans and shall be small enough to prevent flood damage to on site facilities or adjacent properties. Traffic control warning devices shall be provided to prevent damage from and to vehicles.

202.14.1.5. Pipe Inlets.

(1) Filter Tube – The use of a prefabricated or site fabricated filter tube and support system at the inlet end of an open pipe system to slow the sediment laden stormwater to allow sedimentation to occur. The diameter or height of the filter tube shall be one half the diameter of the pipe opening to allow for overflow capability.

(2) Filter Stone – The use of a confined or unconfined stone dam with a six inch thick layer of filter stone on the upstream face of the stone dam to slow the sediment laden stormwater to allow sedimentation to occur. The height of the stone dam shall be one half the diameter of the pipe opening to allow for overflow capability.

202.14.2. Materials.

202.14.2.1. Filter Tubes. Filter tubes shall meet the material requirements of Item 202.18 Filter Tubes.

202.14.2.2. Concrete Blocks. Concrete blocks shall be standard 8" x 8" x 16" hollow core concrete masonry units and may be either load bearing or non-load bearing concrete masonry units.

202.14.2.3. Geotextile Filter Fabric. The fabric shall meet the material requirements of Item 202.5 Silt Fence.

202.14.2.4. Filter Stone. Filter stone shall consist of 1-1/2 inch Coarse Crushed Stone conforming to Item 504.2.2.1. Crushed Stone Embedment. Angular shaped stone is preferable to rounded shapes.

202.14.2.5. Stakes (Metal and Wood). Galvanized or painted steel stakes in studded "T" shape or punched "U" shape, minimum 36" long and a weight of 1.25 pounds per linear foot minimum. Hardwood stakes or pressure treated wood stakes nominal 2"x2"x36" minimum dimensions.

202.14.2.6. Wire Mesh. Wire mesh shall be standard hardware cloth or comparable wire mesh with an opening size not to exceed ½-inch.

202.14.2.7. Stone Riprap. The stone riprap shall be comprised of Type A Dry Riprap stone conforming to Item 803.3. Riprap with a size range of 6 inches to 12 inches in diameter.

202.14.3. Construction and Maintenance. Inlet protection filter media shall be placed to intercept the flow of sediment laden water into the inlet with no gaps and shall be adequately anchored to prevent movement. When properly installed the inlet filter media will pond water during a rain event and for up to two days after the end of the rain event. If the filter media becomes clogged and will not drain, remove the standing water through another sediment control BMP before it is allowed into the storm drain or off site. **Do not remove the filter media to allow the water to drain.** Replace the filter media with new material prior to the next rain event.

Check inlet protection devices for proper construction immediately after installation, at the end of each work day, immediately prior to rain events and as required by the SWPPP. Remove trapped sediment, floatable debris and yard waste as needed to keep the filter media clear.

202.14.3.1. Curb Inlets. The filter media shall make firm contact with the pavement surface at all times, shall extend beyond the curb opening at least 24 inches along the curb and be pressed tight against the curb face on both sides of the inlet opening. The overflow gap shall be provided to prevent complete blockage of the inlet opening.

202.14.3.2. Grate Inlets in Paved Areas. The filter media shall completely surround the grate inlet with no gaps and shall make firm contact with the pavement surface at all times. The height of the filter media surrounding the grate inlet shall be shown on the approved plans and must be checked on site to ensure that when water attains the top height of the filter media it will not cause localized flooding or property damage. Grate inlets are commonly located in the middle of paved areas subject to local and construction traffic. Installations shall have adequate traffic control devices to prevent damage to vehicles and to prevent damage to the BMP.

202.14.3.3. Grate Inlets & Area Inlets in Unpaved Areas. The filter media shall completely surround the inlet with no gaps and shall make firm contact with the ground surface at all times. A bedding trench

shall be provided under filter tubes when they are used. The height of the filter media surrounding the inlet shall be shown on the approved plans and must be checked on site to ensure that when water attains the top height of the filter media it will not cause localized flooding or property damage.

202.14.3.4. Combination Inlets. The filter media shall surround the three non-curb sides of the grate, extend beyond the curb opening at least 24 inches along the curb and be pressed tight against the curb face on both sides of the inlet opening.

202.14.3.5. Pipe Inlets. The filter media shall surround the pipe opening inlet as shown on the approved plans for project. A bedding trench shall be provided under filter tubes when they are used.

202.15. EROSION CONTROL BLANKETS

202.15.1. Description. An erosion control blanket (ECB) is a temporary erosion prevention product placed over disturbed areas to limit the effects of erosion due to rainfall impact and runoff across barren soil. Erosion control blankets are manufactured by a wide variety of vendors addressing a wide variety of conditions such as slope and functional longevity. Blankets are typically constructed of natural materials such as coir (coconut husk) fibers, excelsior (wood) or straw between two layers of synthetic netting.

202.15.2. Materials.

202.15.2.1. Blanket. Erosion control blanket shall be of a type and class appropriate to site-specific requirements as determined by the OWNER. Installed materials shall meet the applicable "Minimum Performance Standards for TxDOT" as published by TxDOT in its "Erosion Control Report". Approved products may be found in the official listing on the most current annual "Approved Products List for TxDOT" applicable to TxDOT Item 169 Soil Retention Blanket and its Special Provisions.

202.15.2.2. Staples. Staples shall conform to the recommendations shown within the manufacturer's published literature for the approved soil retention blanket. In the absence of manufacturer's recommendation for staples, a minimum 11-gauge wire staples 6-inches in length and 1-inch in width shall be used.

202.15.3. Construction and Maintenance.

202.15.3.1. Erosion Control Blanket. Prior to the installation of any erosion control blankets, all rocks, dirt clods, stumps, roots, trash and any other obstructions that would prevent the mat from lying in direct contact with the soil shall be removed. Anchor trenching shall be located along the entire perimeter of the installation area, except for small areas with less than 2% slope. These trenches shall be 6-inches deep and 6-inches wide and the blanket shall be laid into the trench then backfilled with compacted soil or gravel. At a minimum, the end of each roll of ECB shall overlap the next roll by 3 feet and the sides of rolls shall overlap 4 inches. Blankets shall be fastened to the ground according to the manufacturer's instruction. Staples shall be placed parallel to the flow, at all critical channel points, and at all overlaps. If requested by the OWNER, the CONTRACTOR shall submit staple pattern to the OWNER for approval. Installations shall be in accordance with manufacturer's recommended guidelines with the exception of the minimum criteria stated herein.

202.15.3.2. Maintenance. Blankets shall be inspected for deficiencies every seven days and after each half-inch or greater rainfall event. Noted deficiencies shall be repaired or replaced prior to the next rainfall event, but no later than seven days.

202.16. SECTION HELD FOR FUTURE USE

202.17. SECTION HELD FOR FUTURE USE

202.18. FILTER TUBES

202.18.1. Description. The work shall consist of constructing temporary filter tubes consisting of a filter media confined within a roll or tube of mesh material. The filter tube is then anchored or secured to the ground or pavement surface to prevent movement during storm events. The filter tube slows the flow of

sediment laden stormwater to allow the sediment to settle out or to be filtered out as the stormwater seeps through the filter media. Installations are either for perimeter protection or slope protection.

202.18.2. Materials.

202.18.2.1. Tubes. Tubes shall be constructed out of geosynthetic material, plastic mesh, jute mesh, coir mesh or metal hardware fabric. Material used shall be of adequate strength and durability to withstand anticipated environmental conditions (Heat, cold, ultraviolet light, etc.) and construction hazards during the full term of the device installation. The mesh openings shall be large enough to allow the flow of water through the filter media, but will be small enough to contain the filter media.

202.18.2.2. Filter Media. Filter media may consist of any of the following or an approved combination of the following materials:

(1) Compost. Erosion Control Compost (ECC) per TxDOT Specification Item 161, Compost.
(2) Coir or Straw. Commercially produced product interwoven into the tube mesh. Loose material inserted into the tube will not be allowed.
(3) Filter Stone. Stone shall consist of 1-1/2 inch Coarse Crushed Stone conforming to Item 504.2.2.1. Crushed Stone Embedment.

202.18.2.3. Stakes. Stakes may be metal or wood. Metal stakes when used will be T-section or L-section and 1.3 pounds per linear foot minimum. Wood stakes when used shall have a nominal cross section of 2-inches by 2-inches. Stakes shall be at least six inches longer than the outside diameter of the tube being anchored.

202.18.3. Construction and Maintenance. Installations shall be of the size and material specified on the approved plans or as approved by the OWNER. Overlaps between ends of bound or sealed tubes shall be a minimum of three feet and shall be securely tied together to prevent gaps from forming between the tubes and movement of the tubes. Filter Tubes are to be placed along a line of constant elevation (along a contour line) where possible. The ends of the tube installation at the edge of the disturbed ground area shall be turned uphill to prevent the bypass of stormwater.

202.18.3.1. Perimeter Protection. For installations on soil, construct a one-inch to two-inch deep shaped bedding trench along the full length of the filter tube to ensure positive contact of the filter tube with the soil. Install the properly sized filter tube at the downstream edge of the disturbed land area and anchor in place with stakes placed on maximum eight-foot centers. For installations on pavement which typically occur along utility trenches or when there is a temporary stockpile of erodible material, the mesh with the filter media in place shall provide at least a 6-inch wide contact with the pavement to ensure that the stormwater flows through the filter media. The filter tube shall be anchored with temporary traffic control devices (i.e. vertical panel, barrels, etc.) or standard concrete masonry units to prevent movement of the filter tube during storm events.

202.18.3.2. Slope Protection. Slope protection installations are generally only installed when slopes are steeper than 5H: 1V, slopes that are longer than 30' from top to bottom, or the slope has a large amount of stormwater runoff that will flow downslope. Filter tubes shall be placed at the spacing shown on the approved plans, but generally every 25' apart along lines of constant elevation.

202.19. MEASUREMENT AND PAYMENT

If included in the Contract as a unit price item, measurement for payment will be made complete, in place and ready for use inclusive of all components necessary for a complete and working installation. This includes all labor and materials associated with installation, maintenance, and ultimate removal as shown in the construction drawings or similar document, and establishing permanent ground cover at removal.

ITEM 203. SITE PREPARATION

203.1. GENERAL SITE PREPARATION

203.1.1. Description. This Item shall consist of preparing the right-of-way and designated easements for construction operations by the removal and disposal of all obstructions from the right-of-way and from designated easements, where removal of such obstructions is not otherwise provided for in the plans and specifications. Such obstructions shall be considered to include remains of houses not completely removed by others, foundations, floor slabs, concrete, brick, lumber, plaster, septic tanks, basements, abandoned utility pipes or conduits, equipment or other foundations, fences, retaining walls, outhouses, shacks and other debris.

This item shall also include the removal and disposal of curb and gutters, driveways, paved parking areas, miscellaneous stone, brick, concrete sidewalks, drainage structures, manholes, inlets, abandoned railroad tracks, scrap iron, all rubbish and debris, whether above or below ground except live utility facilities. This Item shall also include the removal and disposal of designated trees, stumps, bushes, vegetation, roots, shrubs, brush, and logs. It is the intent of this specification to provide for the removal and disposal of all obstructions and objectionable materials not specifically provided for elsewhere in the plans and specifications. This Item does not include the removal and disposal of hazardous material.

203.1.2. Construction Methods.

The entire right-of-way, permanent and temporary easements for this project and such additional areas, including public or corporate areas and public or corporate lands, as made available for construction of this project, shall be cleared of all structures and obstructions, as defined above, except that trees or shrubs shall be protected unless specifically designated by the OWNER for removal. Unless designated for removal without replacement, trees and shrubs shall be treated according to Item 201.1. Removal, Protection, and Replacement of Trees, Shrubbery, Plants, Sod, and Other Vegetation. Unless otherwise indicated on the plans, trees and stumps to be removed shall be cut off or otherwise removed as close to the natural ground as practicable on areas which are to be covered by at least 3-ft. of embankment. On areas required for borrow sites and material sources, stumps, roots, etc., shall be removed to the complete extent necessary to prevent such objectionable matter becoming mixed with the material to be used in construction. At all times during site preparation, the area shall be maintained in a manner as to prevent standing water.

Unless otherwise indicated on plans, all foundations and underground obstructions shall be removed to the following depths:

(1) In areas to receive embankment, 2-ft. below natural ground or to bottom of structure.
(2) In areas to be excavated, 2-ft. below the lower elevations of the excavation, or to the bottom of structure.
(3) In all other areas, 1-ft. below natural ground or to bottom of structure.

All basement walls and floors, septic tanks and storage tanks within the limits of the right-of-way shall be removed and the resulting holes backfilled as directed by the OWNER. Holes remaining after removal of all obstructions, objectionable material, trees, stumps, etc., shall be backfilled. The CONTRACTOR shall complete the operation of preparing right-of-way so that the prepared right-of-way shall be free of holes, ditches and other abrupt changes in elevations and irregularities to contour.

The remaining ends of all abandoned-in-place storm sewers, culverts, sanitary sewers, conduits and water or gas pipes shall be plugged with an adequate quantity of concrete to form a tight closure. All materials and debris removed shall become the property of the CONTRACTOR unless otherwise provided for on the plans or in the specifications and shall be removed from the right-of-way. Unless otherwise provided, all merchantable timber removed as previously specified shall become the property of the CONTRACTOR. Gravel, brick, stone or broken concrete, when permitted by special conditions, may be used in the roadway embankment.

203.1.3. Measurement and Payment. General site preparation shall be measured on a lump sum basis, unless indicated otherwise. Measurement for payment shall be made only on areas indicated and classified on the plans as "General Site Preparation," and disposed of properly as indicated in Item 107.26. Disposal of Materials. All work performed and measured as prescribed by this Item shall be paid for at the lump sum

price bid for "General Site Preparation" unless indicated otherwise, which price shall be full compensation for furnishing all labor, equipment, tools, supplies and incidentals necessary to complete the work.

203.2. UNCLASSIFIED EXCAVATION

203.2.1. Description. Unclassified excavation shall consist of required excavation for general site grading, and street and channel excavation within the limits of the OWNER'S right-of-way or designated easements and areas adjacent thereto (except excavation specifically described and provided for elsewhere in the specifications). This will include the proper removal, utilization, and/or disposal of all uncontaminated excavated materials to the required lines, grades and typical cross sections in accordance with the plans and specifications.

203.2.2. Classification. All authorized excavation shall be "unclassified" and involves removal of all materials necessary to permit carrying on the completion of the work. Any reference to rock or other material on the plans and/or in this specification is solely for the OWNER'S and CONTRACTOR'S information and is not to be taken as an indication or guarantee of classification of excavation.

203.2.3. General. In general, all excavation shall be made in open cut from the surface of the ground and shall be no greater in width or depth than is necessary to permit the proper construction of the work in accordance with the plans and specifications. Where excavation to grades established in the field by the OWNER would terminate in unstable soil, the CONTRACTOR shall remove the unstable soil and backfill to the required grade. Work shall be executed in a neat workmanlike manner. All excavation shall be to the line and grade as provided on the approved plans. The CONTRACTOR shall abide by all applicable federal, state and/or local laws governing excavation work.

The CONTRACTOR shall provide for the uninterrupted flow of storm, water and wastewater lines and surface waters during progress of the construction. The CONTRACTOR shall coordinate interruptions to gas, electric, and other services no less than two (2) days prior to construction of the planned interruptions. Completed work shall conform to the established alignment, grades and cross sections.

203.2.4. Water for Construction. The CONTRACTOR shall provide water as needed for site preparation, compaction, and other incidental activities in accordance with local requirements.

203.2.5. Dewatering. During construction, channels, trenches, pits, and other low point excavations shall be kept drained, insofar as practicable. Dewatering work shall include the installation and operation of all pumping, bailing, well-pointing, sumps, and draining necessary to keep the excavation free from groundwater, seepage water, water from storm drains, wastewater collection systems, ditches, creeks, ponds, and other sources. Construction will not be permitted in standing water. All discharges from dewatering activities shall be in conformance with all federal, state, and local requirements in a manner approved by the OWNER. Outlet velocity of discharges from dewatering activities shall be controlled to prevent erosion. Unless provided for as a separate pay item, all dewatering work shall be considered incidental to unclassified excavation.

203.2.6. Excavated Material. Excavated materials shall be handled at all times in such manner as to cause a minimum of inconvenience to the public and to permit safe and convenient access to private and public property adjacent to the line of the work.

All suitable materials removed from the excavation shall be used, insofar as practicable, in the formation of embankments as required by Item 203.5. Embankment, or shall be otherwise utilized. Desirable topsoil, sod, etc. shall be carefully removed and piled separately adjacent to the work when required. Suitable excavated materials to be utilized for the project may be temporarily stockpiled adjacent to the work provided appropriate BMPs are installed.

Unclassified excavated material in excess of that needed for construction or deemed unsuitable shall be known as "waste" and, unless specified otherwise, shall become the property of the CONTRACTOR to be disposed of outside the limits of the project in accordance with federal, state, and local requirements.

203.2.7. Alternate Methods of Excavation. Prior to commencing any alternate method of excavation, the CONTRACTOR shall submit means and methods approach for approval by the OWNER. All alternate methods of excavation shall be in compliance with applicable federal, state, and local requirements. If approved by the OWNER, alternate methods of excavation shall be at no additional cost to the OWNER.

203.2.8. Measurement and Payment. All unclassified excavation shall be measured in its original position and the volume in cubic-yards determined by the average end area method. Work performed for finishing of parkways and medians shall not be measured directly, but shall be considered subsidiary to unclassified excavation.

All unclassified excavation work performed as prescribed by this Item shall be paid for at the contract bid price per cubic-yard for unclassified excavation, which price shall constitute payment in full for furnishing and operating all equipment, excavation, placement, compaction, loading, hauling, and unloading and for satisfactory disposal of unsuitable and excess materials; finishing slopes, ditches and parkways; for all maintenance blading or scarifying the ground surface; and for furnishing all labor, fuel, tools, materials, equipment, implements, and incidentals necessary to the satisfactory performance of the work.

203.3. SECTION HELD FOR FUTURE USE

203.4. BORROW & SPOIL

203.4.1. Description. Borrow shall consist of required excavation, removal, and proper utilization of materials obtained from designated or approved off-site sources. Spoil shall consist of the required excavation, removal, transportation, deposit, and storage of materials to an off-site location.

203.4.2. Classification. All authorized borrow shall be "unclassified" unless otherwise noted.

203.4.3. Construction Methods. All suitable materials removed from the excavation shall be used, insofar as practicable, in the formation of the embankment as required by the governing item for embankment; or shall otherwise be utilized as indicated on the plans or as directed. The completed work shall conform to the established alignment, grades and cross section. Site of the borrow and spoil operations shall be left so as to provide proper drainage where practicable. Where indicated on the plans, the sides and/or ends of borrow pits shall be sloped to the dimensions indicated on the plans.

203.4.4. Selection of Materials. Where shown on the plans, select material shall be utilized in the formation of embankment, embedment or backfill, or to improve the project, in which case the work shall be performed in such a manner and sequence that suitable material may be selected, removed separately and deposited in the project as shown on the approved plans. When required, acceptable borrow material, tested by standard laboratory methods, and shall meet the requirements indicated on the plans.

203.4.5. Measurement and Payment. Borrow shall be measured in a compacted condition in its final position and the volume computed in cubic-yards by the method of average end areas, or as specified otherwise. Spoil sites shall be considered part of the overall project site, and the spoil area shall contribute to the total project acreage.

All work performed as required herein and in the Item 203.5. Embankment, and measured as provided in this Item shall be paid for at the unit price bid. Payment shall not be allowed for excavation for any material which is used for purposes other than those designated. The unit price shall be full compensation for furnishing all labor, for materials, tools, equipment, compaction, hauling and incidentals necessary to compete the work, as well as for any and all fees associated with disposal.

203.5. EMBANKMENT

203.5.1. Description. Embankment shall consist of the placement and compaction of all suitable materials obtained from excavation, borrow or any other approved excavation.

203.5.2. Construction Methods. Prior to the placing of any embankment, all clearing and grubbing and site preparation shall have been completed. Stump holes or other small excavations within the limits of the embankment shall have been backfilled with material with same properties as to in-situ material or specified fill material before commencing the embankment construction. The surface of the ground, including plowed or loosened ground or small ditches or washes, shall be restored to approximately its original slope.

The surface of hillsides shall be loosened by the scarifying or plowing to a depth of not less than 4-in. or cut into steps before embankment materials are placed. The embankment shall then be placed in layers as hereinafter specified, beginning at the low side in part widths as the embankment is raised. The material

which has been loosened shall be recompacted simultaneously with the embankment material placed at the same elevation.

Where embankment is to be placed over or adjacent to the existing roadbeds, the slopes shall be plowed or scarified to a depth not less than 4-in. and the embankment built up in successive layers, as hereinafter specified, to the level of the old roadbed before its height is increased. Then the old roadbed shall be scarified and recompacted with the next layer of embankment. The total depth of the scarified and added materials shall not exceed the permissible depth of the layer. All embankments for roadbeds shall be constructed in layers approximately parallel to the finished grade of the street and shall be so constructed as nearly as possible to conform to the cross section of the subgrade section.

Embankments shall be constructed to the established grade and to the shape of the typical section shown on the plans, and each section shall conform to the detailed sections of slopes. After completion of the embankment, it shall be continuously maintained to its finished section and grade until the project is accepted.

Earth embankments shall be constructed in successive layers, for the full width of specified depth or cross sections; and in such lengths as are suitable for the sprinkling and compaction methods to be used. Each layer of earth embankment shall be uniform as to material, density, and moisture content before beginning compaction. Prior to compaction, the layers shall not exceed 6-in. in depth for pneumatic tire rolling or 8-in. in depth for rolling with other types of rollers unless otherwise specified on the plans.

Earth embankment for the construction of dams and placed adjacent to and over pipes, culverts, arches and bridges shall be of material as specified on the plans and shall be placed in successive layers approximately horizontal. Layers of embankment shall be brought up uniformly on each side of the structure, and special care shall be taken to prevent any wedging action against the structure. For such distances along embankments adjacent to structures where it is impracticable to obtain compaction by rolling, the embankment material shall be placed in layers not exceeding 6-in.in depth of loose material wetted uniformly to the moisture content directed; and shall then be compacted by methods approved by the OWNER, maintaining the required moisture content by additional sprinkling, if necessary, supplemented by such hand work as is necessary to secure a uniform and thoroughly compacted fill, until each layer has been uniformly compacted to the satisfaction of OWNER.

All earth cuts, full or part width in the side of a hill, which are not required to be excavated below subgrade elevation for base or backfill, shall be scarified to a uniform depth of not less than 6-in. below grade shown on the plans, and the materials shall be mixed and reshaped by blading and then sprinkled and rolled in accordance with the hereinabove outlined requirements for earth embankments.

Rock embankments shall be composed principally of rock and shall be constructed in successive layers for the full width of the specified depths or cross sections, and each layer shall be 18-in. or less in depth. Each layer shall be constructed by starting at one end, dumping the rock on top of the layer being constructed and then pushing the dumped material ahead in such a manner that the larger rock shall be placed on the ground or preceding rock embankment layer; and the interstices between the larger stones shall be filled with smaller stones and spalls both by this operation and from the placing of succeeding loads of rock materials. Each rock layer shall be rolled or compacted as specified in the plans. The upper or final layer of rock embankment shall contain no stones larger than 4-in. in their maximum dimension, and insofar as such is available by selection of the excavation, this layer shall be composed of materials so graded that the maximum density and uniformity of the surface layer may be secured. Each rock embankment layer shall be rolled as directed by the OWNER.

In addition to the foregoing selection of materials and utilization of the materials in the embankment, the embankment shall be constructed in the proper sequence to receive select materials as specified or as shown on the plans, with any modifications as may be directed by the OWNER. The layer of embankment immediately preceding the upper layer of select material shall be constructed to the required cross section and the proper elevation within a tolerance of not more than 0.1-ft. from the established cross section or elevation after proper compaction and shall be finished as necessary to receive the select material.

203.5.3. Density. For each layer of earth embankment and select material, the relative compaction of the embankment shall be as shown on the plans. Earth embedment and select material shall be compacted to between 95 percent and 100 percent of Standard Proctor Density as determined by ASTM D-698 at, or up to

five (5) percentage points above, optimum moisture content, using mechanical compaction methods, unless otherwise specified in the plans or specifications. After each section of earth embankment or select material is completed, such tests as are necessary shall be made as specified by the OWNER, unless otherwise specified in the special provisions or in the plans.

203.5.4. Measurement and Payment. Embankment shall not be measured or paid for as a separate contract pay item, but the cost of construction of the embankment complete in place shall be included in such contract pay items as described in standard specifications Item 203.2. Unclassified Excavation or Item 203.4. Borrow & Spoil. The contract pay items provided shall be full compensation for the furnishing of all labor, material, tools, equipment and incidentals necessary to complete the embankment, including cost of water, sprinkling or wetting, rolling, compaction, etc., in accordance with the plans and specifications.

203.6. DUST CONTROL

203.6.1. Description. Sprinkling for dust control shall consist of the authorized application of water or other material approved by the OWNER on those portions of the projects as shown on the plans or as directed and as herein specified. It shall be the responsibility of the CONTRACTOR to take preventive measures to eliminate, reduce, or alleviate any dust nuisance in the work area. The OWNER will approve the method used. Should the CONTRACTOR fail to control dust as outlined above, the OWNER may suspend the work until corrective measures are taken.

203.6.2. Materials. Water or other material approved by the OWNER shall be furnished by the CONTRACTOR and shall be clean, free from industrial waste and other objectionable matter. Emulsions shall meet the requirements of Item 302.3.4.5. Emulsions for Priming, Curing and Erosion Control.

203.6.3. Construction Methods. The CONTRACTOR shall use sprinkling or other methods acceptable to the OWNER to control dust in accordance with TCEQ airborne contamination requirements. When sprinkling, the CONTRACTOR shall furnish and operate a sprinkler equipped with positive and rapidly working cutoff valves and approved spray bars, which shall insure the distribution of material in a uniform and controllable rate of application.

The CONTRACTOR shall maintain all excavations, embankment, stockpiles, haul roads, and access roads within or outside the project boundaries free from dust, which would cause a hazard or nuisance to adjacent property owners. The CONTRACTOR shall effectively prevent and control erosion and sedimentation from any runoff resulting from dust control activities. It shall be the CONTRACTOR'S continuous responsibility to be on call at all times including nights, holidays, weekends, etc. and respond in a timely manner, until acceptance of the project by the OWNER, to maintain the project free of dust in a manner which shall cause the least inconvenience to the public.

203.6.4. Measurement and Payment. Sprinkling performed as provided above shall be measured by the 1,000-gallons as delivered on the project. Sprinkling provided in the proposal and the contract as a separate pay item shall be paid for in accordance with the contract unit price. Noncompliant dust control activities shall not be approved for payment by the OWNER. When sprinkling is not classified separately for payment, then such sprinkling shall be considered as incidental work and shall not be paid for as a separate item; the cost thereof shall be included in such contract pay items as are provided. In either case, such pay items shall be the total compensation for all labor, materials, tools, machinery, equipment and incidentals necessary to complete the work in accordance with the plans and this specification.

ITEM 204. LANDSCAPING

204.1. VEGETATION REMOVAL AND REUSE, CLEARING AND GRUBBING

204.1.1. Trees. No trees shall be removed unless so noted on the plans or upon the specific approval of the OWNER. Where trees are adjacent to the line of the work and are not to be removed or are designated on the plans to be removed and replaced, the CONTRACTOR shall protect such trees by substantial wooden boxes and guards and shall not permit machinery or employees to scrape, tear the limbs from, damage or attach guy cables to them. If, in the opinion of the OWNER, such trees, etc., would be damaged by machinery, etc., hand excavation may be required. The CONTRACTOR shall be responsible for all damage to adjacent trees, etc., and any such damage shall be remedied to the satisfaction of the OWNER. All damaged limbs over 1-inch in diameter shall be sawed clean adjacent to the damaged area or at the trunk and dressed with acceptable tree wound treatment material, unless dressing is waived by the OWNER. Trees that are to be removed and subsequently replaced shall be designated on the plans. The cost of protection shall not be paid for as a separate contract pay item; the costs thereof shall be included in such pay items as are provided for in the proposal and contract.

204.1.2. Shrubbery, Plants, Sod and Other Vegetation. Shrubbery, plants, sod and any vegetation noted on the plans to be removed shall be removed and disposed of. Reuse of these items, unless specifically called for by the plans, shall not be permitted. The cost of removal shall be paid for as a separate contract pay item if a separate pay item is provided; otherwise, the costs thereof shall be included in such pay items as are provided in the proposal and contract. Where shrubbery, plants, sod and any vegetation are removed in making the excavation, such areas shall have the same shrubbery, plants, sod, vegetation , etc., of the same kind, and in new condition, replaced in their prior positions or as close as possible. When backfilling is completed, the shrubbery, plants, sod, vegetation, etc. shall be carefully replaced in their original location and the area thoroughly wet down. The cost of such replacement shall be paid for as a separate contract pay item if a separate pay item is provided; otherwise, the costs thereof shall be included in such pay items as are provided in the proposal and contract.

204.2. TOPSOIL

204.2.1. Description. This Item shall consist of furnishing and placing topsoil, free from rock and foreign material, as indicated on the plans, to the lines and grades as established by the construction plans.

204.2.2. Materials and Storage. All excavated material which is suitable for topsoil shall be used before any topsoil is obtained from a borrow source. Topsoil shall be secured from borrow sources as required to supplement suitable material secured from project excavation. Topsoil material secured from excavations shall be stockpiled at locations approved by OWNER.

204.2.3. Construction Methods. Approved topsoil shall be a minimum thickness of 6-inches unless otherwise specified on the plans, and shall be placed on areas formed to the line and grade specified in the plans.

204.2.4. Measurement and Payment. Topsoil secured from borrow sources shall be measured by the square yard in place on the project site. Measurement for payment shall be made only on topsoil secured from borrow sources. All work performed as ordered and measured as provided under this Item shall be paid for at the unit price bid for topsoil. The price shall be full compensation for excavating (except as noted below), loading, hauling, placing and furnishing all labor, equipment, tools, supplies and incidentals necessary to complete the work.

All labor, equipment, tools and incidentals necessary to place salvage topsoil as specified shall be included in the price bid for Item 203.2. Unclassified Excavation. All excavation required by this Item in cut section shall be measured in accordance with provisions for the various excavation items involved with the provision that excavation shall be measured and paid for once only, regardless of the manipulations involved.

204.3. SOIL AMENDMENTS

204.3.1. General. Where indicated on the plans and defined in the specifications, soil amendments shall be added as defined or as noted in these specifications.

204.3.2. Sand. All sand shall be thoroughly washed, coarse grade construction or brick sand, free of clay balls, weeds or grass. So-called cushion sand, blow sand, creek silt or water treatment solid byproducts shall not be acceptable. A quart sample of the sand proposed to be used shall be submitted for the OWNER'S approval.

204.3.3. Compost. This Item shall govern for the furnishing and placing of approved compost material to the depths and area shown on the plans or as directed by the OWNER.

204.3.3.1. Materials. Compost material shall be an organic substance produced by the aerobic (biological) decomposition of organic matter. All compost is to be clean and free of visible refuse, live plants, seed, excessive cotton lint and any chemical elements harmful to plant growth. Composted matter may include, but is not limited to, brush, manure and/or other agricultural residuals, forest residues and bark, and unrecyclable paper. Mixed municipal solid waste compost, and Class B Biosolids (as defined in 40 CFR part 503) shall not be allowed. Raw organics in the finished compost shall not be allowed.

Compost materials furnished shall meet all applicable Federal (40 CFR Part 503 Standards for Class A Biosolids) and TCEQ health and safety regulations (TAC Chapter 332). All compost material supplied shall be processed to meet the time and temperature standards in TAC Chapter 332 Subchapter B Part 23 to control noxious weeds, pathogen and vector attraction; and the physical requirements shown in Table 204.3.4.1.(a) Compost Physical Requirements.

Table 204.3.3.1.(a) Compost Physical Requirements

Compost for Manufactured Topsoil	Erosion Control Compost	General Use Compost
Organic Matter Content as determined by loss on ignition (ASTM D5268 Standard Specification for Topsoil Used for Landscaping Purposes @ 824°F)		
30% (dry mass)	40-60% (dry mass)	40-60% (dry mass)
Particle Size as determined by TEX-110-E Particle Size Analysis of Soils		
100% passing 1"	100% passing 3" <70% passing 2"	100% passing 3/4" <70% passing No. 20
Soluble Salts as determined by TEX-129-E Measuring the Resistivity of Soil Materials		
5.0 max. mmhos/cm)	5.0 max. mmhos/cm	5.0 max. mmhos/cm
(1) Maturity		
Finished	Finished	Finished
pH as determined by TEX-128-E Determining Soil pH		
5.5 - 8.5	5.5 - 8.5	5.5 - 8.5

204.3.3.2. Construction Methods. After the designated areas have been completed to the lines, grades, and cross sections shown on the plans and as provided for in other items to the contract, compost of the type specified shall be placed in accordance with the requirements hereinafter described and as directed by the OWNER. Any stockpile areas shall be well drained, and shall be left in a neat and presentable condition upon completion of the removal of the materials. Where rolling is specified, the roller shall be a light corrugated drum roller of the type approved by the OWNER. Compost shall be loose and friable and not dusty at the time of application. Compost may be required to be brought to an acceptable moisture content, as directed by the OWNER. No compost materials shall be placed within 30-yards of any source of surface water or drinking water supply.

204.3.3.2.1. Compost Manufactured Topsoil. Compost manufactured topsoil shall consist of soil constituents amended with 5- to 30-percent compost, measured by volume, as shown on the plans. Any trash, stumps, roots, weeds, or other objectionable materials in the soil shall be removed and disposed of, as approved by the OWNER, prior to beginning the mixing process.

Blended On-Site. Compost shall be spread in a uniform layer over the previously prepared subgrade area and thoroughly incorporated into the soil materials, to the depths shown on the plans, by rototilling, harrowing, or other suitable methods. After the topsoil has been produced and shaped, it shall be sprinkled and rolled as directed by the OWNER.

Pre-Blended. Topsoil manufactured from sources outside the right-of-way shall be produced in accordance with the requirements for Blended On-Site topsoil, and spread over the prepared subgrade so as to form a uniform layer of loose material of the thickness shown on the plans. After the topsoil has been placed, it shall be raked carefully to remove all objectionable materials and to yield a consistent grade, and then sprinkled and rolled as directed by the OWNER.

204.3.3.2.2. Erosion Control Compost. Compost shall be spread evenly over the previously prepared subgrade or slopes so as to form a uniform layer of loose material of the thickness shown on the plans. Erosion Control Compost shall not be placed on any slope having a slope ratio steeper than 2:1. After the compost has been placed, it shall be sprinkled and rolled as directed by the OWNER.

204.3.3.2.3. General Use Compost. General use compost shall be applied as a top dressing by placing the material evenly upon established areas of turf, grass, or other ground cover growth to the depth specified on the plans or as directed by the OWNER. Compost applications shall not bury or kill existing vegetation. All stems, roots, or other debris larger than 2-inches diameter shall be removed from the ground surface.

204.3.4. Measurement and Payment. "Compost Manufactured Topsoil (Blended On-Site)", "Compost Manufactured Topsoil (Pre-Blended)", "Erosion Control Compost" and "General Use Compost" will be measured by the cubic-yard in vehicles at the point of delivery.

The work performed and materials furnished in accordance with this Item and measured as provided for shall be paid for at the unit price bid for "Compost Manufactured Topsoil (Blended On-Site)", "Compost Manufactured Topsoil (Pre-Blended)", "Erosion Control Compost" or "General Use Compost" for the depth specified. This price shall be full compensation for securing any necessary source(s) and any royalty involved; for furnishing all materials, for all excavation, loading, hauling, stockpiling, placing, rototilling, harrowing, raking, rolling and sprinkling; and for furnishing all labor, tools, equipment and incidentals necessary to complete the work.

204.4. FERTILIZER

204.4.1. General. Fertilizer shall be a commercial product, uniform in composition, free flowing, with uniform particle size, minimal dust, and suitable for application with approved equipment. Fertilizer may be a natural organic, synthetic organic or inorganic fertilizer. If requested by the OWNER, a sample label or specification of proposed fertilizer(s) to be used shall be submitted to the OWNER for approval.

All fertilizer used shall be delivered in original bags or containers clearly labeled to show analysis of the contents. Fertilizer shall be in good physical condition. Fertilizer which has been exposed to high humidity and moisture or has become caked or otherwise damaged, making it unsuitable for use, shall be rejected.

The fertilizer is subject to testing by the OWNER in accordance with the Texas Fertilizer Law. A fertilizer shall be used with an analysis as indicated below. The figures in the analysis represent the percent of nitrogen, phosphoric acid and potash nutrients, respectively, as determined by the methods of the Association of Official Agricultural Chemists. In the event it is necessary to substitute a fertilizer of a different analysis with a lower concentration, the total amount of nutrients furnished and applied per unit area shall equal or exceed that specified for each nutrient.

204.4.2. Preplanting Application. Fertilizer analysis shall be based on soil test results and the nitrogen requirements for the turfgrass specified. If the OWNER waives soil testing, fertilizer analysis shall be, by weight, in a 1-1-1 or 1-2-1 (N-P-K) ratio (such as 13-13-13 or 10-20-10,) and 10- to 15-percent sulphate and traces of iron and zinc as required and approved by the OWNER.

Preplanting application rate shall be 10-lbs.-fertilizer-per-1,000-sq.ft.

204.4.3. Post Planting Application. Fertilizer analysis shall be based on soil test results and the nitrogen requirements for the turfgrass specified. If the OWNER waives soil testing, fertilizer analysis shall be as

specified below except that for autumn applications a complete fertilizer with a 4-1-2 to 3-1-2 (N-P-K) ratio shall be applied.

Fertilizer shall contain 30- to 50-percent slow release nitrogen, unless specified otherwise by the OWNER.

204.4.3.1. Seeds or Sprigs. As soon as new growth starts after seeding or sprigging, grass shall be fertilized every 10- to 14-days with 0.75- to 1.0-lb.-nitrogen-per-1,000-sq.ft. Applications shall alternate between nitrogen only fertilizer whose analysis is, by weight, 21-0-0 or 45-0-0 (N-P-K) and a complete fertilizer with a 3-1-2 or 4-1-2 (N-P-K) ratio (such as 21-7-14.)

204.4.3.2. Sod. Fertilizer analysis shall be based on soil test results. Fertilizer shall be applied every 4- to 6-weeks at 1.0-lb.-(actual)nitrogen-per-1,000-sq.ft.

204.4.4. Measurement and Payment. Fertilizing may be paid for as a separate pay item or considered subsidiary to other pay items as specified by the OWNER.

204.5. SODDING

204.5.1. Description. Sodding shall consist of furnishing and planting grass as designated on the plans and in accordance with the requirements of this specification and special conditions.

204.5.2. Materials. Sod shall be "Stenotaphrum secundatum" (St. Augustine grass), "Cynodon dactylon" (Common Bermudagrass), "Buchloe dactyloides" (Buffalograss), an approved hybrid of Common Bermudagrass, or an approved hybrid of Zoysiagrass, or other as approved by the OWNER. Sod shall consist of stolons, leaf blades, rhizomes, and roots with a healthy, virile system of dense, thickly matted roots throughout the soil of the sod for a thickness not less than 0.75-in. Sod shall be alive, healthy, vigorous, free of insects, disease, stones, and undesirable foreign materials, weeds and grasses deleterious to its growth or which might affect its subsistence or hardiness when transplanted. The grass shall have been mowed prior to sod cutting so that the height of the grass shall not exceed 2-inches. St. Augustine grass sod shall have been produced on growing beds of clay or clay loam topsoil. Bermudagrasses and zoysiagrasses shall have been grown on sand or sandy loam soils. Sod shall not be harvested or planted when its moisture condition is so excessively wet or dry that its survival shall be affected. Sod shall be protected from exposure to wind, sun and freezing. If sod is stacked, it shall be kept moist and shall be stacked roots to roots and grass to grass.

Sod to be placed between curb and walk and on terraces shall be the same type grass as adjacent grass or existing lawn.

Sod to be placed during the dormant stage of these grasses shall be inspected by the OWNER to verify that the grass is acceptable.

204.5.2.1. Dimensions. All sod shall have been machine cut to uniform soil thickness of ½-in. ± ⅛-in. All sod shall be of the same thickness. Rectangular sections of sod may vary in length, but all shall be of equal width and of a size that permits the sod to be lifted, handled and rolled without breaking. Broken pads and torn, uneven ends shall be rejected.

204.5.3. Construction Methods. After the designated areas have been completed to the lines, grades and cross sections shown on the plans and as provided for in other items of the contract, sodding of the type specified shall be performed in accordance with the requirements hereinafter described. Sodding shall be either plugging or solid.

Care shall be taken at all times to retain native soil on the roots of the sod during the process of excavating, hauling and planting. Sod material shall be kept moist from the time it is dug until planted. When so directed by the OWNER, the sod existing at the source shall be watered to the extent required prior to excavating. Sod material shall be planted within 3-days after it is excavated unless preserved by techniques such as shrink wrapping and transporting in refrigerated trucks, in which case the OWNER shall approve the time interval between excavation and planting.

When necessary, the sodded areas shall be smoothed after planting has been completed and shaped to conform to the cross section previously provided and existing at the time sodding operations were begun. Any excess dirt from planting operations shall be spread uniformly over the adjacent areas or disposed of as directed by the OWNER, so that the completed surface shall present a sightly appearance.

204.5.3.1. Plugging. Furrows parallel to the curb line or sidewalk lines, 12-in. on centers or to the dimensions shown on the plans, shall be opened on areas to be sodded. In all furrows, sod approximately 3-in.-square shall be placed on 12-in. centers at proper depth so that the top of the sod shall not be more than ½-in. below finished grade. Holes of equivalent depth and spacing may be used instead of furrows. Soil shall be firm around each block; then the entire sodded area shall be carefully rolled with a heavy, hand roller developing 15- to 25-lb.-per-square-inch compression. Hand tamping may be required on terraces.

204.5.3.2. Solid Sodding. At locations on the plans, or where directed, sod blocks shall be carefully placed on the prepared areas. Sod shall be so placed that the entire designated areas shall be covered. Any voids left in the solid sodding shall be filled with additional sod and tamped. The entire sodded area shall be rolled and tamped to form a thoroughly compact solid mass. Surfaces of solid sod which, in the opinion of the OWNER, may slide due to the height or slope of the surface or nature of the soil, shall, upon direction of the OWNER, be pegged with wooden pegs driven through the sod block to the firm earth, sufficiently close to hold the sod firmly in place.

204.5.3.3. Fertilizing Sod. Fertilizing shall consist of providing and distributing fertilizer over such areas as are designated on the plans and in accordance with these specifications. The fertilizer shall be applied uniformly over the area specified to be fertilized and in the manner directed. Fertilizer for sod shall comply with applicable provisions of Item 204.4. Fertilizer.

204.5.3.4. Watering and Finishing Sod. Sodded areas shall be thoroughly watered immediately after they are planted. Large areas shall be planted by irrigation zones, so areas can be watered as soon as they are planted. Sod shall be subsequently watered and mowed at such time and in a manner and quantity directed by the OWNER until completion and final acceptance of the project by the OWNER.

Sod shall not be considered finally accepted until the sod has started to peg down (roots growing into the soil), and is free from dead blocks or rolls of sod.

204.5.4. Measurement and Payment. Plugging and solid sodding shall be measured for payment in square yards of sodded area completed in accordance with the plans and specifications. Plugging or solid sodding, as the case may be, shall be paid for at the contract unit price per square yard, complete in place, as provided in the proposal and contract. The contract unit price shall be the total compensation for furnishing and placing all sod, for all rolling and tamping, for all water, for disposal of all surplus material, and for all material, labor, equipment, tools and incidentals necessary to complete the work, all in accordance with the plans and these specifications.

204.6. SEEDING TURFGRASS

204.6.1. General. Seeding shall consist of preparing the ground, providing and planting seed or a mixture of seed of the kind specified along and across such areas as may be designated on the plans and in accordance with these specifications.

204.6.2. Materials. All material for turfgrass provided shall be in accordance with these specifications and as noted in the plans and contract documents. Prior to planting, CONTRACTOR shall provide the OWNER with the State of Texas Certificate stating analysis of purity and germination of seed.

Seed shall be labeled in accordance with U.S. Department of Agriculture rules and regulations.

204.6.2.1. Bermuda Grass Seed. Turfgrass seed shall be "Cynodon Dactylon" (Common Bermuda Grass). The seed shall be harvested within 1-year prior to planting, free of Johnsongrass, field bind weed, dodder seed, and free of other weed seed to the limits allowable under the Federal Seed Act and applicable seed laws. The seed shall not be a mixture. The seed shall be hulled, extra fancy grade, and have a germination and purity that shall produce, after allowance for Federal Seed Act tolerances, a pure live seed content of not less than 85-percent. Pure Live Seed (PLS) Percent shall be determined using the formula: Percent Pure Live Seed = %Purity x [(%Germination + %Firm or Hard Seed) ÷ 100]

204.6.2.2. Ryegrass Seed. Turfgrass seed shall be "Lolium multiflorum" (Italian or Annual Ryegrass). The seed shall be harvested within 1-year prior to planting and shall be free of perennial ryegrass seed, other grass seed and weed seed to the limits allowable under the Federal Seed Act and applicable seed

laws. Seed shall be at least 95-percent pure, treated with fungicide, and shall have a 90-percent minimum germination rate.

204.6.2.3. Sprigs. Turfgrass sprigs and stolons shall be "Cynodon Dactylon" (Common Bermuda Grass) (Hybrid Bermuda Grass of the Tifway 419/ Tifton 10/Tifgreen Strain). Sprigs shall be acquired from a healthy stand of grass, free of weeds and other grasses. The source is to be inspected and approved by the OWNER. Sprigs and stolons are to be delivered and planted within 24-hours of harvest unless special precautions are taken to prevent drying of sprigs to assure optimum rooting.

204.6.3. Planting Season and Application Rates. All planting shall be done between the dates specified for each grass type except when specifically authorized in writing. The seeds planted per acre shall be of a type specified with the mixture, rate and planting dates as shown in Table 204.6.3.(a) Seeding Turfgrass, or as specified by the OWNER.

Table 204.6.3.(a) Seeding Turfgrass

Type	Planting Season	Seed and Rate
Type I	March through September	Bermuda Grass, hulled, 50-lb.-PLS[1]-per-acre
Type II	October through February	Rye Grass, 100-lb.- PLS[1]-per-acre combined with Bermuda Grass, unhulled, 20-lb.- PLS[1]-per-acre
Other	specified on the plans	specified on the plans

1. Pure Live Seed (PLS) is determined by multiplying the gross weight times purity times the germination. (For example, a 100-lb. bag with 85% purity and 80% germination: PLS = pounds in bag x purity x germination = 100-lb. x 0.85 x 0.80 = 60.8-lb. of pure live seed.)

204.6.4. Construction Methods.

204.6.4.1. General. After the designated areas have been completed to the lines, grades and cross sections shown on the plans and as provided for in other items of this contract, seeding of the type specified shall be performed in accordance with the requirements hereinafter described. All seeding operations shall be performed by either "drilling" or "cultipacker" process or approved equivalent. Seed shall be covered by + ¼" topsoil.

The OWNER may reject seeded area on the basis of weed populations.

204.6.4.2. Broadcast Seeding. Area to be treated shall be rough graded and raked. Seed or seed mixture in the quantity specified shall be uniformly distributed over the areas shown on the plans and where directed. If the sowing of seed is by hand, rather than by mechanical methods, the seed shall be sown in two directions at right angles to each other. Seed and fertilizer may be distributed at the same time, provided the specified uniform rate of application for both is obtained.

204.6.4.3. Disced Seeding. Soil over the area shown on the plans as directed to be seeded shall be loosened to a minimum depth of 3-in. All particles in the seedbed shall be reduced to less than 1-in. in diameter, or they shall be removed. The area shall then be finished to the line and grade as specified under Item 204.6.4.6. Watering, Maintaining, and Finishing Seeded Areas.

Seed or seed mixture specified shall then be planted at the rate required, and application shall be made uniformly. If the sowing of seed is by hand rather than by mechanical methods, seed shall be sown in two directions at right angles to each other. Seed and fertilizer may be distributed at the same time, provided the specified uniform rate of application for both is obtained. After planting, the seed shall be raked or harrowed into the soil to a depth of approximately 0.125-in.

204.6.4.4. Hydraulic Mulching. All mulch shall be cellulose fiber mulch and shall be refined specifically for lawn hydraulic mulch applications. Use "Conwed" or an approved equal. Adhesive (Tacking) agents for mulch may include guar gum, polyacrylamide, or other tacking agent, as approved by the OWNER. Tacking agent shall be evenly distributed in the hydraulic mulch before land application in the proportion recommended by the mulch manufacturer.

Seed or seed mixture, in the quantity specified, shall be uniformly distributed over the areas shown on the plans or where directed. Seed and fertilizer are to be distributed as a water slurry, and the mixture shall be applied to that area to be seeded within 30-minutes after all components are placed in the

equipment. Fertilizer shall conform to the applicable requirements of Item 204.4. Fertilizer. After placement is completed, the planted area shall be watered sufficiently to assure uniform moisture from the surface to a minimum 6-in. depth.

204.6.4.5. Fertilizing. Fertilizing shall consist of providing and distributing fertilizer over such areas as are designated on the plans and in accordance with applicable requirements of Item 204.4. Fertilizer. The fertilizer shall be applied uniformly over the area specified to be fertilized and in the manner directed.

204.6.4.6. Watering, Maintaining, and Finishing Seeded Areas. Seeded areas shall be thoroughly watered immediately after they are planted. Seeded areas shall be watered as directed by the OWNER at least twice daily for at least 14-days after seeding in such a manner as to prevent washing of the slopes or dislodgment of the seed. Water shall be applied to the cultivated areas until a minimum depth of 6-inches is thoroughly moistened. CONTRACTOR shall re-seed washed areas. The CONTRACTOR shall be responsible for proper watering until final acceptance.

Seeded areas shall be maintained, including watering and mowing, at such time and in a manner and quantity directed by the OWNER until completion and final acceptance of the project by the OWNER. At minimum, the CONTRACTOR shall maintain the seeded area until each of the following conditions is achieved: vegetation is evenly distributed, without large bare areas, and covers 70% of the seeded area.

Where applicable, the shoulders, slopes and ditches shall be smoothed after seeding has been completed and shaped to conform to the cross section previously provided and existing at the time planting operations were begun.

204.6.5. Measurement and Payment. Acceptable material for broadcast seeding, disced seeding, and hydraulic mulching shall be measured by the square-yard or by the acre complete in place. The work performed and materials furnished and measured as provided in this Item shall be paid for at the unit price for broadcast seeding, disced seeding, or hydraulic mulching of the type specified, as the case may be. The price shall be full compensation for furnishing all materials, including water for seed-fertilizer slurry and hydraulic mulching, fertilizer, and for performing all operations necessary to complete the work.

Water for sprinkling the cultivated area or seedbed when required shall meet the requirement of and shall be measured and paid for in accordance with the provisions governing Item 203.6. Dust Control.

204.7. MULCHING

204.7.1. Description. Mulching provides protection for bare soil by absorbing the energy of each raindrop prior to the point when this energy would dislodge individual soil particles and begin the erosion process. Mulching fosters plant growth by providing insulation from temperature extremes and retaining valuable moisture necessary for proper germination.

204.7.2. Materials.

204.7.2.1. Organic Mulches.

204.7.2.1.1. Straw. The best quality straw mulch comes from wheat, oats or barley and shall be free of weed and grass seed that may not be desired vegetation for the area to be protected. Straw mulch is light and therefore shall be properly anchored to the ground.

204.7.2.1.2. Wood Chips. Wood chips are suitable for areas that will not require mowing frequently and are heavy enough that they do not require anchoring. They do however deplete nitrogen from the soil, which is a necessary nutrient for all plants. To alleviate this condition wood chips must be treated with 12-pounds-ammonium-nitrate-per-ton of mulch used.

204.7.2.1.3. Bark Chips. Bark chips are popular for ornamental applications as they do not require anchoring, do not decompose very rapidly and serve as an excellent insulation material. When using bark chips, it is not necessary to treat for nitrogen deficiency or to fertilize.

204.7.2.1.4. Compost and Wood Mulch Mixture. Compost and wood mulch mixtures should be a blend of 50% untreated wood mulch with 50% compost measured by volume. Wood mulch should be less than or equal to 5 in. in length with 95% passing a 2-in. screen and less than 30% passing a

1-in. screen. The compost shall meet the Physical Requirements specified in Table 1 of TxDOT Special Specification 1058, Compost.

204.7.2.1.5. Other. Other types of organic mulches shall be approved by the OWNER.

204.7.3. Construction and Maintenance.

204.7.3.1. Oragnic Mulch. Prior to the placement of any mulch, the area to be protected shall be graded completely in accordance with plans. Fertilization and soil treatment shall then be done prior to placement of mulch with the exceptions of when seed is to be applied by means of hydraulic seeding or when seed is distributed following straw mulch spreading during winter months. Organic mulches may be distributed by hand or by mechanical means, so long as a complete covering is achieved. The application of straw mulch should be approximately 2 tons dry straw per acre spread uniformly across the area. Other forms of mulch, such as wood chips or chopped site vegetation, should be placed in thicknesses of two-inches or greater over the area. Straw mulch should be anchored by application of a fiber mulch binder, by the application of a synthetic liquid mulch binder, by using a tractor-drawn crimper to punch into the soil, or by placing a netting above the mulch stapled to the ground, as required.

204.7.3.2. Maintenance. All mulching materials shall be inspected on a weekly basis, and after each significant local rainfall event of ½ inch or more to locate areas of erosion. Where erosion has occurred, either additional mulch shall be applied or an alternative method shall be implemented, as required by the OWNER.

204.7.4. Measurement. If included in the Contract as a unit price item, measurement of organic mulches shall be made by the square yard of treated area, in place and ready for use as an erosion control surface treatment. Alternatively, it may be measured per pound of organic mulch.

204.8. REJECTION

Landscape materials may be rejected for failure to meet any of the requirements shown in the plans and specifications.

DIVISION 300 ROADWAY CONSTRUCTION

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ITEM 301. SUBGRADE, SUBBASE, AND BASE PREPARATION

301.1. GENERAL

Subgrade is that portion of the roadbed upon which the subbase, base or the pavement is to be placed. It includes minimum 12-in. beyond the back of the curb for streets, which are to be paved with concrete. Subbase is that layer of specified material of plan thickness between a base and a subgrade. Base is that layer of specified material of plan thickness placed immediately below the pavement course surfacing.

301.1.1. Subgrade Preparation.

301.1.1.1. Description. These specifications shall govern for the preparation of the subgrade except as otherwise provided or specified.

301.1.1.2. Equipment. All equipment necessary for the construction of this item shall be on the project and shall be approved by the OWNER as to condition before the CONTRACTOR shall be permitted to begin construction operations on which the equipment is to be used. Any equipment that achieves the desired results in the time frame allowed is acceptable.

301.1.1.3. Construction Methods. After the excavation of embankment has been substantially completed, the subgrade shall be shaped so that after rolling as specified in Item 301.1.2. Rolling of Embankment, Subgrade or Flexible Base and subsequent finishing operations, it shall conform to the correct alignment, cross section and elevation. Subgrade shall be proof rolled prior to subgrade stabilization and after final compaction after subgrade stabilization as specified in Item 301.1.1.3.1. Proof Rolling. Rolling and sprinkling, as needed, shall be performed when and to the extent directed and the roadbed shall be completed to or above the plane of the typical section shown on the plans and the lines and grades established by the OWNER.

After completion of the compaction and immediately before the application of subbase, base or pavement, the subgrade preparation equipment shall be operated using approved methods in a manner to finish the subgrade to the required section. The subgrade shall then be tested with the approved template, operated and maintained by the CONTRACTOR. All irregularities which develop in excess of ½-in. in a length of 16-ft. measured longitudinally shall be corrected by loosening, adding or removing material; reshaping; and recompacting by sprinkling and rolling. The completed subgrade shall have a uniform density of not less than 95-percent of the maximum density determined by ASTM D698 Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft3). Moisture content shall be within minus-2- to plus-4-of-optimum.

The subgrade shall be maintained in a smooth, compacted condition, in conformity with the required section and established grade, until the subbase, base or pavement is placed, and shall be kept wetted down sufficiently in advance of placing any subbase, base or pavement to insure its being in a firm and moist condition for at least 2-in. below surface of the prepared subgrade. Only such subgrade as is necessary for the satisfactory execution of the work shall be completed ahead of the placement of base or pavement. Hauling or operating of unnecessary equipment on the completed subgrade shall be kept to a minimum. If equipment is operated on recent work, the OWNER may inspect and require subgrade replacement for such defects as fractures, rutting, or any other failure. Complete drainage of the subgrade shall be provided at all times.

Finishing of the subgrade by other methods shall be permitted on pavement widening projects, on sections where the pavement width is not uniform, at intersections and elsewhere where the operation of certain equipment would not be practical. Subgrade finished by hand or other methods shall conform to the requirements above specified. not be practical. Subgrade finished by hand or other methods shall conform to the requirements above specified.

301.1.1.3.1. Proof Rolling. This Item shall govern for furnishing and operating heavy pneumatic tire compaction equipment for locating unstable areas of earthwork or base.

301.1.1.3.1.1. Proof Rolling Equipment. The proof rolling equipment shall consist of not less than four pneumatic tire wheels, running on axles carrying not more than four wheels, and mounted in a rigid frame and provided with loading platform or body suitable for ballast loading.

All wheels shall be arranged so that they will carry approximately equal loads when operating on uneven surfaces.

The proof roller under working conditions shall have a rolling width of from 8-ft. to 10-ft., and shall be so designed that, by ballast loading, the gross load may be varied uniformly from 15 tons to 25 tons. The tires shall be capable of operating under the various loads with up to 150 pounds per square inch air pressure. Tires shall be practically full of liquid. (Tires shall be considered as being practically full when liquid will flow from the valve stem of a fully inflated tire with the stem in the uppermost position.)

The operating load and tire pressure shall be within the range of the manufacturer's chart as directed by the OWNER. The CONTRACTOR shall furnish the OWNER charts or tabulations showing the contact areas and contact pressures for the full range of tire inflation pressures and for the full range of loadings for the particular tires furnished.

The proof roller shall be towed by a suitable crawler type tractor or rubber tire tractor of adequate tractive capacity, or may be of the self-propelled type. A proof roller unit shall consist of either a self-propelled roller or combination of roller and towing tractor.

There shall be a sufficient quantity of ballast available to load the equipment to a maximum gross weight of 25 tons.

Rubber tire tractive equipment shall be used on base courses and asphalt pavements. Other type tractive equipment may be used on embankment subgrade. The heavy pneumatic tire roller unit shall be capable of turning 180 degrees in the crown width or operating in forward and reverse modes.

In lieu of the rolling equipment specified, the CONTRACTOR may, upon written permission from the OWNER, operate other compacting equipment that will produce equivalent results in the same period of time as the specified equipment. The CONTRACTOR shall submit together with any proposed alternate compacting equipment, the weight (empty and with proposed loading), the wheel configuration and load distribution along with his proposed procedure to provide full width and length coverage of the subgrade area within the required period of time. If the substituted compaction equipment fails to produce the desired results within the same period of time as would be expected of the specified equipment, as determined by the OWNER, its use shall be discontinued.

301.1.1.3.1.2. Proof Rolling Construction Methods. This work shall be done when specified in the plans and specifications. The subgrade and base layer shall be proof rolled to locate unstable areas.

Within the ranges set forth in Item 301.1.1.3.1. Proof Rolling, the load and tire inflation pressures shall be adjusted as directed by the OWNER. It is proposed to use a contact pressure corresponding as nearly as practical to the maximum supporting value of the earthwork or base. A minimum of two coverages of the proof roller will be required. Each succeeding trip of the proof roller shall be offset by not greater than one tire width. Rollers shall be operated at speeds directed by the OWNER which shall be between 2 and 6 miles per hour.

Where the operation of the proof roller unit shows an area to be unstable or non-uniform, it shall be corrected in accordance with the applicable Item of Work.

301.1.1.4. Measurement and Payment. Preparation of subgrade shall not be measured for payment as a separate contract pay item. Preparation of the subgrade or fine grading shall not be paid for as a separate contract pay item; and cost thereof shall be included in such contract items as are provided, which pay items shall be the total compensation for the furnishing of all labor, tools, materials, equipment and incidentals necessary to complete the work, including disposal or surplus material, all in accordance with the plans and these specifications.

301.1.2. Rolling of Embankment, Subgrade or Flexible Base

301.1.2.1. Description. Rolling shall consist of the compaction of embankment, subgrade or flexible base by the operation of approved power rollers, as herein specified and as directed by the OWNER.

301.1.2.2. Roller Requirements. All equipment necessary for the construction of this item shall be on the project and shall be approved by the OWNER as to condition before the CONTRACTOR shall be permitted to begin construction operations on which the equipment is to be used. Any equipment that achieves the desired results in the time frame allowed is acceptable. If equipment fails to produce the desired result within the required time frame, its use shall be discontinued and the CONTRACTOR will be required to furnish equipment, as determined by the Engineer, at no additional cost to the OWNER.

Sufficient rollers shall be provided to compact the material in a manner satisfactory to the OWNER. When operations are so isolated from one another that one roller unit cannot perform the required compaction satisfactorily, the CONTRACTOR shall provide additional roller units.

301.1.2.3. Rolling Methods. The embankment, subgrade or base course shall be sprinkled as directed by the OWNER. Rolling patterns and speeds shall be established per project and indicated on the plans.

301.1.2.4. Measurement and Payment. Rolling provided in the proposal and contract, as a separate contract pay item, shall be measured for payment by the actual hours the roller is in operation, as ordered by the OWNER. Rolling provided in the proposal and the contract, as a separate pay item, shall be paid for in accordance with the contract unit price. When rolling is not classified separate for payment, then such rolling shall be considered as incidental work and shall not be paid for as a separate item. The cost thereof shall be included in such contract pay items as are provided. In either case, such pay items shall be the total compensation for all labor, materials, tools, machinery, equipment and incidentals necessary to complete the work in accordance with the plans and this specification.

301.2. LIME TREATMENT

This item shall consist of treating subgrade, subbase, and base courses by the pulverization, addition of lime, mixing and compacting the mixed material to the required density. This item applies to natural ground, embankment, or pulverized recycled asphalt pavement base or subbase courses placed under this contract, which shall be constructed as specified herein and in conformity with the typical section, lines and grades as shown on the plans.

301.2.1. Materials.

301.2.1.1. Hydrated Lime (Slurry).

301.2.1.1.1. General. Hydrated lime slurry shall be a pumpable suspension of solids in water. The solids portion of the mixture, when considered on the basis of "solids content," shall consist principally of hydrated lime of a quality and fineness sufficient to meet the following requirements as to chemical composition and residue.

301.2.1.1.2. Chemical Composition. The "solids content" of the lime slurry shall have a hydrate alkalinity $Ca(OH)_2$ of not less than 90-percent by weight.

301.2.1.1.3. Residue. The percent by weight of residue retained in the "solid content" of lime slurry shall conform to the requirements in Table 301.2.1.1.3.(a) Hydrated Lime.

Table 301.2.1.1.3.(a) Hydrated Lime

Sieve Size	Residue Retained, Percent by Weight
No. 6 (3360 micron)	None
No. 10 (2000 micron)	Max. 1.0%
No. 30 (590 micron)	Max. 2.5%

301.2.1.1.4. Slurry Grades. Type B, commercial lime slurry, shall conform to one of the following three grades:

(1) Grade 1: The "dry solids contents" shall be at least 31-percent by weight of the slurry.
(2) Grade 2: The "dry solids contents" shall be at least 35-percent by weight of the slurry.
(3) Grade 3: The "dry solids contents" shall be at least 46-percent by weight of the slurry.

When Type B, commercial lime slurry, is specified, the CONTRACTOR shall select, prior to construction, the grade to be used and shall notify the OWNER in writing before changing from one grade to another.

301.2.1.2. Quicklime.

CAUTION: Handling and use of quicklime can be dangerous. Quicklime should be prescribed by a registered professional engineer familiar with its use.

301.2.1.2.1. General. Quicklime is a dry material consisting essentially of calcium oxide. It shall be furnished either in "pebble" gradation suitable for dry placing and slurry placing, or as a dry powder suitable only for slurry placing. Powdered quicklime is restricted to slurry placing, as the possibility of appreciable amounts of finely divided powdered quicklime makes it unsuitable for dry placing.

301.2.1.2.2. Chemical Composition. Quicklime shall conform to the chemical requirements of ASTM C977 Quicklime and Hydrated Lime for Soil Stabilization.

301.2.1.3. Tests. If the minimum design strength or percent lime to be used for the treated subgrade, existing base, new subbase or new base is specified, it shall be determined by preliminary laboratory tests at the OWNER'S expense. Optimum lime addition percentage shall be determined by Tex-112-E Admixing Lime to Reduce Plasticity Index of Soils (Atterberg Limits Soil-Lime Series) and/or by ASTM D6276 Test Method for Using pH to Estimate the Soil-Lime Proportion Requirement for Soil Stabilization (pH Soil-Lime Series.) The actual minimum lime dosage to be applied shall be 1% above the minimum test results.

301.2.1.4. Lime Delivery and Storage. If hydrated lime is furnished in bags, each bag shall bear the manufacturer's certified weight. Bags varying more than 5-percent by weight may be rejected, and the average weight of the bags in any shipment, as shown by weighing 50 bags taken at random, shall not be less than the manufacturer's certified weight. If lime is furnished in trucks, each truck shall bear the weight of lime measured on certified scales, or the CONTRACTOR shall place a set of standard platform truck scales or hopper scales at a location approved by the OWNER.

Hydrated lime and quicklime shall be stored and handled in closed, weatherproof containers until immediately before distribution on the road. If storage bins are used, they shall be completely enclosed. Hydrated lime bags shall be stored in weatherproof buildings with adequate protection from ground dampness. Quicklime, when permitted, shall be shipped only in bulk; bagged material shall not be acceptable.

301.2.1.5. Water. Water shall conform to the requirements of Item 303.2.7. Water.

301.2.1.6. Soil. The soil shall consist of the in-situ soil or approved soil, free from vegetation, roots, or other objectionable matter. It may be either the material encountered in the existing section, material secured from approved sources shown on the plans or as designated by the OWNER, or a combination of existing and additional soil from approved sources, as shown on the plans, or as directed by the OWNER.

301.2.1.7. Recycled/Reclaimed Asphalt Pavement. Recycled/Reclaimed asphalt pavement is defined as a salvaged, milled, pulverized, broken or crushed asphaltic pavement uncontaminated by dirt or other objectionable materials.

301.2.1.8. Rejection. Any materials that do not conform to the requirements of this specification shall be rejected.

301.2.2. Equipment. Machinery, tools and equipment necessary for proper performance of the work shall be on the project and approved by the OWNER prior to the beginning of construction operations.

301.2.3. Lime Treatment Construction Methods.

301.2.3.1. General. It is a primary requirement of this specification to secure a completed course of treated material containing a uniform lime mixture, free from loose or segregated areas, or uniform density and moisture content, well bound for its full depth, and with a smooth surface and suitable for placing subsequent courses. It shall be the responsibility of the CONTRACTOR to regulate the sequence of work, to use the specified amount of lime, maintain the work and rework the courses as necessary to meet the above requirements.

Prior to beginning any lime treatment, the roadbed shall be constructed and shaped to conform to the typical sections, lines and grades as shown on the plans or as established by the OWNER.

In cases where groundwater is present, application of lime for stabilization shall be evaluated by the OWNER.

301.2.3.2. Section Held for Future Use.

301.2.3.3. General Construction.

301.2.3.3.1. Treatment for Materials in Place. Materials to be treated shall be excavated to the secondary grade (proposed bottom of lime treatment) and removed or windrowed to expose the secondary grade. Any wet or unstable material below the secondary grade shall be corrected by scarifying, adding lime and compacting until it is of uniform stability. The excavated material shall then be spread to the desired cross section.

If the CONTRACTOR elects to use a cutting or pulverizing machine that shall remove the subgrade material accurately to the secondary grade and to pulverize the material at the same time, CONTRACTOR shall not be required to expose the secondary grade or windrow the material. However, the CONTRACTOR shall be required to roll the subgrade before using the pulverizing machine and correct any soft areas that this rolling may reveal. This method shall be permitted only where a machine is provided which shall insure that the material is cut uniformly to the proper depth and which has cutters that shall place the secondary grade to a smooth surface over the entire width of the cut. The machine shall be of such design that a visible indication is given at all times that the machine is cutting to the proper depth.

301.2.3.3.2. Treatment for New Materials. The base and subbase materials, as provided in the governing specifications, shall be delivered, placed and spread in the required amount per station. The material shall be manipulated as specified and thoroughly mixed prior to the addition of the lime.

301.2.3.4. Lime Application. Lime shall be spread only on that area where the first mixing operation can be completed in the same working day, except that quicklime shall be mixed at the time of application. The application and mixing of lime with the materials shall be accomplished by the methods hereinafter described unless otherwise approved by the OWNER.

301.2.3.4.1. Dry Placing Quicklime. Quicklime may be placed dry if it is in pebble form. A spreader or motor grader shall be used to spread pebble Quicklime.

301.2.3.4.2. Slurry Placing.

Hydrated Lime or Commercial Lime Slurry. Lime shall be mixed with water and applied as a thin water suspension or slurry. Type B, commercial lime slurry, shall be applied with a lime percentage not less than that applicable for the grade used. The distribution of lime at the rate shown on the plans shall be attained by successive passes over a measured surface of roadway until the proper moisture and lime content have been achieved.

Quicklime. When Quicklime is applied as a slurry, the amount of dry quicklime shall be 80-percent of the amount shown on the plans. The residue from the Quicklime slurrying procedure shall be spread uniformly over the length of the roadway currently being processed unless otherwise approved by the OWNER. This residue is primarily inert material with little stabilizing value, but may contain a small amount of Quicklime particles that slake slowly. A concentration of these particles could cause the compacted stabilized material to swell during slaking.

301.2.3.5. Mixing. Mixing procedure shall be the same for "dry placing" or "slurry placing" as hereinafter described.

301.2.3.5.1. Treatment for Materials-In-Place. Material and lime shall be thoroughly mixed by approved road mixers or other approved equipment and the mixing continued until a homogeneous, friable mixture of material and lime is obtained, free from all clods or lumps. Materials containing plastic clay or other materials which shall not readily mix with lime shall be mixed as thoroughly as possible at the time of the lime application, brought to the proper moisture content, sealed with a pneumatic roller, and left to cure 1- to 4-days as directed by the OWNER. During the curing period,

the material shall be kept moist. After the required curing time, the material shall be uniformly mixed by approved methods. If the soil binder lime mixture contains clods, they shall be reduced in size by raking, blading, discing, harrowing, scarifying or the use of other approved pulverization methods so that when all nonslaking aggregates obtained on the No. 4 sieve are removed, the remainder of the material shall meet the requirements of Table 301.2.3.5.1.(a) Lime Treated Materials-In-Place when tested dry by laboratory sieves.

Table 301.2.3.5.1.(a) Lime Treated Materials-In-Place

Sieve Size	Minimum Passing
1¾-in. (45mm)	100%
No. 4 (4.75mm)	60%

1. Recycled asphalt pavement shall be pulverized so that 100-percent shall pass a 2-in. (50mm) sieve.

During the interval of time between application and mixing, hydrated lime that has been exposed to the open air for a period of 6-hours or more, or to excessive loss due to washing or blowing, shall not be accepted for payment.

In addition to the above, when pebble quicklime is used, the material and lime shall be mixed as thoroughly as possible at the time of application. Sufficient moisture shall be added during the mixing to hydrate the quicklime. After mixing, and prior to compaction, the mixture of material, quicklime and water shall be moist cured for 2- to 7-days, as approved by the OWNER. After curing, mixing shall continue until the pulverization requirements are met.

301.2.3.5.2. Treatment of New Material. The base or subbase material, lime and required water shall be thoroughly mixed and blended by approved road mixers or other approved equipment and the mixing continued until a homogeneous, friable mixture is obtained. When lime is placed as a slurry and mixed by the use of blades, the material shall be bladed as the lime water mixture is applied; after the total amount has been placed, the mixture shall be thoroughly blended to the satisfaction of the OWNER.

During the interval of time between application and mixing, hydrated lime that has been exposed to the open air for a period of 6-hours or more, or to excessive loss due to washing or blowing, shall not be accepted for payment.

301.2.3.6. Compaction. Compaction of the mixture shall begin immediately after final mixing and in no case later than 3-days after final mixing. The material shall be aerated or sprinkled as necessary to provide optimum moisture. Compaction shall begin at the bottom and shall continue until the entire depth of the mixture is uniformly compacted as shown on the plans or specified by the OWNER. The compacted mixture shall have a uniform density of not less than 95-percent of the maximum density as determined by ASTM D698 Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3). Moisture content shall be within minus 2-percent to plus 4-percent of optimum. After each section is completed, such tests as are necessary shall be made by the OWNER. If any portion fails to meet the density specified, it shall be reworked as necessary to obtain the specified density. After the mixture has been compacted, the surface shall be shaped to the required line, grades and cross sections and then rolled sufficiently to prevent hairline cracking.

301.2.3.7. Maintenance. The CONTRACTOR shall be required to maintain the completed soil lime base within the limits of its contract in good condition, satisfactory to the OWNER as to grade, crown and cross section until such time as the surface course is constructed. The surface of the compacted layer shall be kept moist until covered by other base or paving material or application of a curing seal of emulsified asphalt conforming to requirements of Item 302.3.5. Emulsions for Priming, Curing and Erosion Control (PCE). If a curing seal is used, it should be applied as soon as possible after completion of final rolling, at a rate of between 0.10- and 0.20-gallons-per-square-yard, the exact rate to be determined by the OWNER. No equipment or traffic shall be permitted on lime treated material for 72-hours after curing seal is applied, unless otherwise permitted by the OWNER. In cases where subgrade treatment or subbase sets up sufficiently to prevent objectionable damage from traffic, such layers may be opened to traffic 2-

days after compaction. The CONTRACTOR shall immediately repair all irregularities or other defects that may occur at the CONTRACTOR'S expense. Repairs are to be made as directed by the OWNER and in a manner to insure restoration of a uniform surface and durability of the portion repaired.

301.2.4. Measurement and Payment. Lime treatment shall be measured for payment in square-yards for the thickness shown in the plans for the surface area of completed and accepted work. The measurement for lime shall be by the ton of 2000-pounds dry weight. The measured tonnage of (dry) quicklime shall be multiplied by the conversion factor 1.25 to give the equivalent quantity of hydrated lime (dry) which shall be the basis of payment.

Lime treatment shall be paid for at the contract unit price per square-yard, as provided in the proposal and contract. The contract unit price shall be the total compensation for preparing the roadbed; for loosening, pulverizing, application of lime, water content in the slurry mixture and the mixing water; mixing, shaping, sprinkling, compacting, finishing, curing and maintaining; for manipulations required; and for all labor, equipment, fuels, tools and incidentals necessary to complete the work, all in accordance with the plans and specifications.

Lime material measured as provided in the this item shall be paid for at the unit price bid for "lime material" which price shall be full compensation for furnishing the material; for all freight involved; for all unloading, storing and handling; and for all labor, equipment, fuels, tools and incidentals necessary to complete the work.

301.3. PORTLAND CEMENT TREATMENT

This item shall consist of the treatment of the subgrade, subbase or base course which is to be composed of a compacted mixture of soil, and/or pulverized recycled asphalt pavement, Portland cement and water and shall be constructed as herein specified and in conformity to the cross sections, lines and grades as established by the OWNER. In the event new materials are placed, rather than using in-situ soils, the subbase or base shall be constructed as herein specified and in conformity with the items governing the base or subbase courses.

301.3.1. Materials.

301.3.1.1. Portland Cement. Cement shall be ASTM C150 Type I, II or IP and conform to the requirements of Item 303.2.2. Portland Cement.

301.3.1.2. Water. Water shall conform to the requirements of Item 303.2.7. Water.

301.3.1.3. Soil. The soil shall consist of the in-situ soil or approved soil, free from vegetation, roots, or other objectionable matter. It may be either the material encountered in the existing section, material secured from approved sources shown on the plans or as designated by the OWNER, or a combination of existing and additional soil from approved sources, as shown on the plans, or as directed by the OWNER.

301.3.1.4. Recycled/Reclaimed Asphalt Pavement. Recycled/Reclaimed asphalt pavement is defined as a salvaged, milled, pulverized, broken or crushed asphaltic pavement uncontaminated by dirt or other objectionable materials.

301.3.2. Equipment. All equipment necessary to properly prosecute, perform and complete the work within the contract time shall be on the project and shall be approved by the OWNER as to type and condition before the CONTRACTOR shall be permitted to begin construction operations on which the equipment is to be used.

The cement-modified soil layer may be constructed with any machine or combination of machines and auxiliary equipment that shall produce the results meeting the requirements for soil pulverization, cement application, water application, mixing, incorporation of materials, compaction, finishing and curing as specified herein. The CONTRACTOR shall at all times provide sufficient equipment to enable continuous performance of the work and its completion in the required number of working days.

301.3.3. Portland Cement Treatment Construction Methods.

301.3.3.1. General. The primary requirement of this specification is to secure a complete course of treated material containing a uniform Portland cement mixture, free from loose or segregated areas, of uniform density and moisture content, well bound and compacted for its full depth with a smooth surface suitable for placing additional subbase, base or surface courses. It shall be the responsibility of the CONTRACTOR to regulate the sequence of work, to process a sufficient quantity of material so as to

provide full depth as shown on plans, to use the proper amount of Portland cement, maintain the work and to rework the courses as necessary to meet the foregoing requirements.

Cement stabilized base shall not be mixed or placed when the air temperature is below 40°F and falling, but may be mixed or placed with the air temperature is above 35°F and rising, the temperature being taken in the shade and away from artificial heat, and with the further provisions that cement stabilized base shall be mixed or placed only when weather conditions, in the opinion of the OWNER, are suitable.

301.3.3.2. Treatment for Materials-In-Place. Before other construction operations are begun, the roadbed shall be graded and shaped as required to construct the Portland cement treatment for material in place in conformance with the lines, grades, thickness and typical cross sections shown on the plans. Unsuitable soil or material shall be removed and replaced with acceptable soil. The subgrade shall be firm and able to support without displacement the construction equipment and achieve the compaction herein specified. Soft or yielding subgrade shall be corrected and made stable before construction proceeds.

The soil and/or recycled asphalt pavement shall be so pulverized that at the completion of moist-mixing, it meets the gradation in Table 301.3.3.2.(a) Cement Treated Materials-In-Place.

Table 301.3.3.2.(a) Cement Treated Materials-In-Place

Sieve Size	Minimum Passing by Dry Weight[1,2]
1-in. (25mm)	100%
No. 4 (4.75mm)	80%

1. Exclusive of gravel or stone retained on these sieves.
2. Recycled asphalt pavement shall be pulverized so that 100-percent shall pass a 2-in. (50mm) sieve.

301.3.3.2.1. Application of Cement to Materials-In-Place. Portland cement shall be spread by an approved dry or slurry method uniformly on the soil at the rate specified on the plans or as determined by preliminary laboratory tests. If a bulk cement spreader is used, it shall be positioned by string lines or other approved method during spreading to insure a uniform distribution of cement. Cement shall be applied only to such an area that all the operations can be continuous and completed in daylight within 6-hours of such application.

The percentage of moisture in the soil at the time of cement application shall not exceed the quantity that shall permit uniform and intimate mixture of soil and cement during dry-mixing operations, and it shall not exceed the specified optimum moisture content for the soil and cement mixture. In the event of high soil-moisture contents, cement may be applied at one-half the specified rate when approved by the Engineer. The remainder of the application rate of cement shall be applied the following day(s), not to exceed 48-hours. The usual construction sequence shall then be resumed.

No equipment, except that used in the spreading and mixing, shall be allowed to pass over the freshly spread cement until it is mixed with the soil.

301.3.3.2.2. Mixing and Processing of Stabilized Materials-In-Place. Any method used to achieve the specified results is acceptable. Mixing shall continue until a homogeneous, friable mixture of the material and cement is obtained, free from all clods or lumps. The mixture shall be kept within moisture tolerances throughout the operation.

301.3.3.2.3. Compaction and Finishing of Stabilized Materials-In-Place. Compaction shall begin after mixing and after gradation and moisture requirements have been met. The material shall be compacted to at least 95-percent of the maximum density as determined by ASTM D698 Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3). At the start of compaction, the percentage of moisture in the mixture and in unpulverized soil lumps, based on oven-dry weights, shall be within 2-percentage-points of the specified optimum moisture content and shall be less than the quantity which shall cause the soil-cement mixture to become unstable during compaction and finishing. When the uncompacted soil-cement mixture is wetted by rain so that the

average moisture content exceeds the tolerance given at the time of final compaction, the entire section shall be reconstructed in accordance with this specification at the sole expense of the CONTRACTOR. The specified optimum moisture content and density shall be determined in the field on the representative samples of soil-cement mixture obtained from the area being processed. Final moisture content shall be within minus-2- to plus-4-of-optimum.

Prior to the beginning of compaction, the mixture shall be in a loose condition for its full depth. Compaction shall begin at the bottom and shall continue until the entire depth of the mixture is uniformly compacted. The loose mixture shall then be uniformly compacted to the specified density within 2-hours. After the soil and cement mixture, except the top mulch, is compacted, water shall be uniformly applied as needed and thoroughly mixed in. The surface shall then be reshaped to the required lines, grades and cross section and then lightly scarified to loosen any imprint left by the compacting or shaping equipment.

The resulting surface shall be thoroughly rolled with a pneumatic tire roller and "clipped," "skinned," and "tight-bladed" by a power grader to a depth of approximately ¼-in., moving all loosened soil and cement from the section. The surface shall then be thoroughly compacted with the pneumatic roller, adding small increments of moisture as needed during rolling. When directed by the OWNER, surface finishing methods may be varied from this procedure, provided a dense, uniform surface, free of surface material, is maintained at its specified optimum during all finishing operations. Surface compaction and finishing shall proceed in such a manner as to produce, in not more than 2-hours, a smooth, closely knit surface, free of cracks, ridges or loose material, conforming to the drawn grade and line shown on the plans.

OWNER shall conduct in-place density tests shall as outlined in ASTM D2922 Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth). In-place density tests shall be performed at the rate of one-per-300-linear-ft. of paving for two (2) lanes. The suitability of the modification shall be confirmed by Atterberg Limit testing at the rate of one-test-per-2,500-cubic-yards of processed material.

In addition to the requirements specified for density, the full depth of the material shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is completed, tests as necessary will be made by the OWNER. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements. Throughout this entire operation the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and in conformity with the typical section shown on the plans and to the established lines and grades. Should the material, due to any reason or cause, lose the stability, density and finish before the next course is placed or the work is accepted, it shall be recompacted and refinished at the sole expense of the CONTRACTOR.

301.3.3.3. Plant-Mixed Cement Treated Base.

301.3.3.3.1. Subgrade Preparation. Before other construction operations are begun, the area to be paved shall be graded and shaped as required to receive the cement treated base in conformance with the grades, lines, thicknesses and typical cross-section shown on the plans. Unsuitable subgrade soil or material shall be removed and replaced with acceptable soil. The subgrade shall be firm and able to support without displacement of the construction equipment and compaction. Soft or yielding subgrade shall be corrected and made stable before construction proceeds.

301.3.3.3.2. Mixing and Processing for Plant-Mixed Cement Treated Base. The aggregate, cement and water shall be mixed in a pug mill as approved by the Engineer. The plant shall be equipped with feeding and metering devices that add the aggregate, cement and water into the mixer in the specified quantities to produce a mixture that meets or exceeds the mix design criteria. Aggregate and cement shall be mixed sufficiently to prevent cement balls from forming when the mix water is added. Mixing time shall be sufficient to assure an intimate, uniform mixture of aggregate, cement and water. The percentage of moisture in the aggregate, at the time of cement application shall be the amount that assures a uniform and intimate mixture of aggregate and cement during

mixing operations. It shall not exceed the specified moisture content required for adequate compaction.

Free access to the plant shall be provided to the OWNER for construction quality control. The mixture shall be hauled to the paving area in trucks having beds cleaned of deleterious material.

The CONTRACTOR shall submit a mix design for the proposed Cement Treated Base (CTB) to the OWNER for approval in advance of the proposed work. Unconfined compression strength test results shall be submitted with the mix design by the supplier of the CTB material. Work shall not begin until the mix design is approved by the OWNER.

301.3.3.3.3. Placement of Plant-Mixed Cement Treated Base. The mixture shall be placed on a moistened subgrade in a uniform layer by any approved method of spreading that will deposit the required quantity per lineal foot, without segregation, to produce a uniformly compacted base conforming to the grade and cross-section. Not more than 30-minutes shall elapse between placement of cement treated base in adjacent lanes at any location except at longitudinal and transverse construction joints. Compaction shall start as soon as possible after spreading. Elapsed time between the addition of water to the cement treated base mixture and the start of compaction shall not exceed 60-minutes under normal conditions. The Engineer may alter this time if environmental conditions, such as temperature, humidity or wind conditions would justify such a change. Laboratory tests may be required to verify changes in compaction time limits.

301.3.3.3.4. Compaction and Finishing of Plant-Mixed Cement Treated Base. At the start of compaction, the percentage of moisture in the mixture shall not be more than one-percentage-point-below or two-percentage-points-above the specified optimum moisture content, and shall be less than that quantity which will cause the cement treated base mixture to become unstable during compaction and finishing. The specified optimum moisture content and density shall be determined in the field by a Moisture-Density Test AASHTO T134 or ASTM D558 Test Methods for Moisture-Density Relations of Soil-Cement Mixtures, on representative samples of cement treated base mixture obtained from the area prior to compaction. Prior to compaction, the mixture shall be in a loose condition for its full depth. The loose mixture shall then be compacted uniformly to the specified density. During compaction operations, initial shaping may be required to obtain uniform compaction and required grade and cross-section.

When initial compaction is completed, the surface of the cement treated base shall be shaped to the required lines, grades and cross-section. The moisture content of the surface material shall be maintained at not less than its specified optimum moisture content during finishing operations. If any reshaping of the surface is necessary, it shall be lightly scarified to remove any compaction planes, scales or smooth surfaces left by equipment. Final compaction shall then be continued until uniform and adequate density is obtained. Cement treated base shall be uniformly compacted to a minimum of 95-percent of maximum density. Compaction and finishing shall be done in such a manner as to produce, in not longer than two-hours, a smooth, dense surface free of compaction planes, cracks, ridges, or loose material.

301.3.3.4. Finishing and Preparation for Surfacing. After the final layer or course of the cement-modified soil has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The completed section shall then be finished by rolling as directed with a pneumatic tire or other suitable roller sufficiently light to prevent hair cracking. Preparation for final surfacing may begin immediately.

301.3.3.5. Protection and Cover. After the roadway has been finished as specified herein, it shall be immediately protected against rapid drying by applying a curing seal of emulsified asphalt at the rate of 0.2-gallon-per-square-yard. The curing seal shall consist of emulsified asphalt conforming to requirements of Item 302.3.5. Emulsions for Priming, Curing and Erosion Control (PCE). Immediately prior to application of the curing seal, the section shall be wetted by the use of pressure water distributors so that all voids in the soil-cement surface are filled with water, but without free water standing on the surface. The curing seal shall be applied while this moisture condition exists so that

undue asphalt penetration of the soil-cement surface shall be prevented; and at the same time aided in complete coverage by the curing seal.

Should it be necessary for construction equipment or other traffic vehicles to pass over the section before the curing seal has dried sufficiently to prevent pickup, if shall be the responsibility of the CONTRACTOR to dust or sand the surface before such use. The CONTRACTOR shall also maintain the curing cover for 7-days so that all of the soil-cement base course shall be covered effectively with curing seal during this period. The curing seal shall remain in place for the additional asphalt-wearing surface.

301.3.3.6. Opening to Traffic. The CONTRACTOR shall not be permitted to drive heavy equipment over completed portions. Pneumatic-tired equipment required for hauling cement and water may be permitted to drive over after the surface has hardened sufficiently to prevent the equipment from marring the surface, provided that protection and cover are not impaired. The soil-cement course may be opened to local traffic as soon as the curing seal has been applied and dusted or sanded as necessary to prevent it from being picked up by traffic. Completed portions may be opened to all traffic after 7-days or as directed by OWNER.

301.3.3.7. Maintenance. The CONTRACTOR shall be required within the limits of its contract to maintain the soil-cement treatment in good condition from the time it first starts work until all work shall have been completed. Maintenance shall include immediate repairs of any defect that may occur after the cement is applied. Such maintenance work shall be done by the CONTRACTOR at the CONTRACTOR'S expense and repeated as often as necessary to keep the area continuously intact. Repairs are to be made in such a manner as to insure restoration of a uniform surface for the full depth of treatment. Any low area of treated subgrade shall be remedied by scarifying the surface to a depth of at least 2-in., filling the area with treated material and compacting. Any low area of subbase or base shall be remedied by replacing the material for the full depth of subbase or base treatment rather than adding a thin layer of stabilized material to the completed work.

301.3.4. Measurement and Payment. Portland cement treatment shall be measured by the square-yard of completed and accepted cement treated course. Measurement for cement shall be by the ton of 2000-pounds of dry weight, as determined by certified weight tickets. No allowance shall be made for any materials used or work done outside the limits as established by the OWNER.

The work performed and material furnished as prescribed by this item and measured as provided in this item shall be paid for at the unit price bid for soil-cement treated subgrade, subbase, or base course, which price shall be full compensation for pulverizing or providing the soil material; handling, hauling and spreading dry or slurry cement, mixing the cement with the soil either in-place or in a mixing plant; furnishing, hauling and mixing water with the soil-cement mixture; spreading and shaping the mixture; compacting the mixture, including all rolling required for this compaction; surface finishing; curing; and for all manipulation, labor, equipment, appliances, tools and incidentals necessary to complete the work and carry out the maintenance provisions in this specification.Cement material measured as provided in this item shall be paid for at the unit price bid for cement material, which price shall be compensation for furnishing the material, for all freight involved, for all unloading and storing, and for all labor, equipment, fuels, tools and incidentals necessary to complete the work, all in accordance with the plans and these specifications.

301.4. ASPHALT EMULSION TREATMENT

This item shall consist of treating subgrade, subbase, and base courses by the pulverization, addition of asphalt base stabilization agent, mixing and compacting the mixed material to the required density. This item applies to natural ground, embankment, base or subbase courses placed under this contract, which shall be constructed as specified herein and in conformity with the typical section, lines and grades as shown on the plans.

Asphalt stabilization of recycled material such as crushed concrete or other non-hazardous recycled materials, processed recycled asphalt pavements, bottom ash, foundry slag, glass, recycled crumb rubber to create subgrade, subbase or base courses shall conform to TxDOT Special Specification 3157 Cold Processed - Recycled Paving Material (RPM) for Use as Aggregate Base Course. Asphalt emulsion for such recycling shall conform to Item 302.3.6. Specialty Emulsions or Item 302.3.7. Emulsion for In-Place Asphalt Recycling, as specified by the OWNER.

301.4.1. Materials.

301.4.1.1. Asphalt Soil (Base) Stabilization Agent. The product shall be composed of petroleum of resin oil base with selective hardening and drying agents to form a stable subgrade, subbase, or base. Independent laboratory tests shall certify compliance with requirements of Table 301.4.1.1.(a) Asphalt Soil Stabilization Agent Requirements, as specified on the plans.

If the minimum design strength or percent asphalt base stabilization agent to be used for the treated subgrade, existing base, new subbase or new base is specified, it shall be determined by preliminary laboratory tests at the OWNER'S expense.

Table 301.4.1.1.(a) Asphalt Soil Stabilization Agent Requirements

Property	Test Method, Test Parameters	Required Value	
		Minimum	Maximum
Appearance	Visual Inspection	Brown Liquid	
Viscosity S.F. at 77°F Sec	ASTM D244 Emulsified Asphalts	5	175
Residue, % min	ASTM D244, modified[1]	55	65
Penetration 77°F, Sec		5	40
Miscibility Test	ASTM D244, modified[2]	No coagulation	
Moisture, wt %		-	45
Volatile %		25	-
% Non-Volatile Soluble in Trichloroethylene	AASHTO T 45-56	-	8
Accelerated Weathering (2-year exposure)	Federal Spec TT C-555 B, 40 ml	No material deterioration after exposure	
Resistance To wind and Driven Rain (@ 98 mph)	Federal Spec TT C-555 B, As 4ml sealer after cure	Passes/no wt. gain	
Ash, % wt.		-	8
Polymer, % wt.		-	4
Particle Charge	ASTM D244	Positive	
Flash Point	TCC	275°F	
Shaker Test 2- to 4-hrs.	Mix Burrell Wrist Action Shaker Model 75 set on Level 7, diluted 1 part water to 4 parts soil stabilizer, Sieve #40	-	1%

1. ASTM D244 Modified Evaporation Test for percent of residue is made by heating 50-gram sample to 300°F until foaming ceases, then cool immediately and calculate results.

2. Test procedure identical with ASTM D244, except that 0.02 Normal Calcium Chloride solution shall be used in place of distilled water.

301.4.1.2. Base and Subbase Materials. Base and subbase materials shall meet the requirements shown on the plans or in the pertinent specifications.

301.4.1.3. Delivery and Storage. If asphalt base stabilization agent is furnished in trucks, each truck shall bear the weight of asphalt base stabilization agent measured on certified scales, or the CONTRACTOR shall place a set of standard platform truck scales or hopper scales at a location approved by the OWNER.

Asphalt base stabilization agent shall be stored and handled in tank, tanker or distributor truck until immediately before distribution on the road. Asphalt base stabilization agent shall be stored in freeze-proof containers.

301.4.2. Equipment. Machinery, tools and equipment necessary for proper performance of the work shall be on the project and approved by the OWNER prior to the beginning of construction operations. All machinery, tools and equipment used shall be maintained in a satisfactory and workmanlike manner.

301.4.3. Asphalt Emulsion Treatment Construction Methods.

301.4.3.1. General. It is a primary requirement of this specification to secure a completed course of treated material containing a uniform asphalt base stabilization agent mixture, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth, and with a smooth surface and suitable for placing subsequent courses. It shall be the responsibility of the CONTRACTOR to regulate the sequence of work, to use the proper amount of asphalt base stabilization agent, maintain the work and rework the courses as necessary to meet the above requirements.

Prior to beginning any asphalt base stabilization agent treatments, the roadbed shall be constructed and shaped to conform to the typical sections, lines and grades as shown on the plans or as established by the OWNER.

301.4.3.2. General Construction.

301.4.3.2.1. Treatment for Materials-In-Place. Materials to be treated shall be excavated to the secondary grade (proposed bottom of asphalt base stabilization agent) and removed or windrowed to expose the secondary grade. Any wet or unstable material below the secondary grade shall be corrected by scarifying, adding asphalt base stabilization agent and compacting until it is of uniform stability. The excavated material shall then be spread to the desired cross section.

If the CONTRACTOR elects to use a cutting or pulverizing machine that shall remove the subgrade material accurately to the secondary grade and to pulverize the material at the same time, CONTRACTOR shall not be required to expose the secondary grade or windrow the material. However, the CONTRACTOR shall be required to roll the subgrade before using the pulverizing machine and correct any soft areas that this rolling may reveal. This method shall be permitted only where a machine is provided which shall insure that the material is cut uniformly to the proper depth and which has cutters that shall place the secondary grade to a smooth surface over the entire width of the cut. The machine shall be of such design that a visible indication is given at all times that the machine is cutting to the proper depth.

301.4.3.2.2. Treatment for New Materials. The base and subbase material, as provided in the governing specifications, shall be delivered, placed and spread in the required amount per station. The material shall be manipulated as specified and thoroughly mixed prior to the addition of the asphalt base stabilization agent.

301.4.3.3. Asphalt Base Stabilization Agent Application. Asphalt base stabilization agent shall be spread only on that area where the mixing can be completed in the same working day. Asphalt base stabilization agent shall be mixed with water and applied as a thin water suspension. The distribution of asphalt stabilization agent at the rate shown on the plans shall be attained by successive passes over a measured surface of roadway until the proper moisture content and asphalt base stabilization agent content has been achieved.

The asphalt base stabilization agent shall be distributed at a uniform rate and in such a manner as to reduce heavy or light areas to a minimum. A motor grade can be used to cover the exposed asphalt base stabilization agent. If necessary, the material shall be sprinkled until a proper moisture content has been achieved.

301.4.3.4. Mixing. The application and mixing of asphalt base stabilization agent with the material shall be thorough. During the interval of time between application and mixing, asphalt base stabilization agent that has been exposed to the open air for a maximum time of 2-hours, or a shorter period when the breaking of the emulsion has occurred, shall not be accepted for payment. (*Breaking of the emulsion is when the emulsion is over exposed on the surface without mixing, thus turning it from a brown color to black. The color change is due to the evaporation of the water from the emulsion, thus rendering it ineffective in mixing in the soil, base or subbase material*). The CONTRACTOR is responsible for monitoring the application and the mix time of the asphalt stabilization agent with the soil, base or subbase material. The overexposed area shall be retreated with another application of asphalt base stabilization agent and mixed.

301.4.3.4.1. Treatment for Materials-In-Place. Material and asphalt base stabilization agent shall be thoroughly mixed by approved road mixers or other approved equipment and the mixing

continued until a homogeneous, friable mixture of material and asphalt base stabilization agent is obtained, free from all clods or lumps. Materials containing plastic clay or other materials which shall not readily mix with asphalt base stabilization agent shall be mixed as thoroughly as possible, and meet the requirements of Table 301.4.3.4.1.(a) Asphalt Emulsion Treated Materials-In-Place when tested dry by laboratory sieve at the time of the asphalt base stabilization agent application, brought to the proper moisture content, sealed with a pneumatic roller, and left to cure 1 to 2 days as directed by the OWNER. During the curing period, the material shall be kept moist.

Table 301.4.3.4.1.(a) Asphalt Emulsion Treated Materials-In-Place

Sieve Size	Minimum Passing by Dry Weight[1,2]
1¾-in. (45mm)	100%
No. 4 (4.75mm)	60%

301.4.3.4.2. Treatment of New Material. The base or subbase material, asphalt base stabilization agent and required water shall be thoroughly mixed and blended by approved road mixers or other approved equipment and the mixing continued until a homogeneous, friable mixture is obtained. When the asphalt base stabilization agent is placed and mixed by the use of blades, the material shall be bladed as the asphalt base stabilization agent water mixture is applied; after the total amount has been placed, the mixture shall be thoroughly blended to the satisfaction of the OWNER.

301.4.3.4.3. Central Mixing Plant. The soil, asphalt base stabilization agent and water shall be mixed in a pugmill either of the batch or continuous-flow type. The plant shall be equipped with feeding and metering devices which shall add the soil, asphalt base stabilization agent and water into the mixer in the specified quantities. Soil and asphalt base stabilization agent shall be mixed sufficiently to prevent asphalt base stabilization agent balls from forming when water is added. Mixing shall continue until a uniform and intimate mixture of soil, asphalt base stabilization agent and water is obtained. The mixture shall be placed on the moistened subgrade in a uniform layer by an approved spreader or spreaders.

After mixing asphalt stabilization agent with the base or subbase material the following conditions shall be met:

(1) Not more than 3-hours shall elapse between the placement of soil-asphalt emulsion mixture in adjacent lanes and placement at any location except at longitudinal construction joints.
(2) Not more than 3-hours shall elapse between the start of spreading the soil-asphalt emulsion mixture and start of compaction.
(3) Not more than 4-hours shall elapse between the start of mixing and the start of compaction.

The layer of soil-asphalt base stabilization agent shall be uniform in thickness and surface contour, and in such quantity that the completed base shall conform to the required grade and cross section. Dumping of the mixture in piles or windrows upon the subgrade shall be permitted.

301.4.3.5. Compaction. Compaction of the mixture shall begin immediately after final mixing and in no case later than 2-days after final mixing. The material shall be aerated or sprinkled as necessary to provide optimum moisture content. At the start of compaction, the moisture in the mixture and in unpulverized soil lumps, based on oven-dry weights, shall be within minus-2- to plus-2-percent-of-optimum. The specified optimum moisture content and density shall be determined in the field on the representative samples of soil-asphalt base stabilization agent mixture obtained from the area being processed. Prior to the beginning of compaction, the mixture shall be in a loose condition for its full depth. The loose mixture shall be uniformly compacted to the specified density within 4-hours. Compaction shall begin at the bottom and shall continue until the entire depth of the mixture is uniformly compacted as shown on the plans or specified by the OWNER.

The compacted mixture shall have a uniform density of not less than 95-percent of the maximum density as determined by ASTM D698 Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3). Final moisture content shall be within minus-2- to plus-4-percent-of-optimum. If the soil-asphalt base stabilization agent mixture is wetted by rain so that the average moisture content

exceeds the tolerance given at the time of final compaction, the entire section shall be reconstructed in accordance with this specification at the sole expense of the CONTRACTOR. After the soil and asphalt base stabilization agent mixture, except the top layer, is compacted, water shall be uniformly applied as needed and thoroughly mixed in with a spike tooth harrow or equal. The surface shall then be reshaped to the required lines, grades and cross sections and then lightly scarified to loosen any imprint left by the compacting or shaping equipment. After each section is completed, such tests as are necessary shall be made by the OWNER. If any portion fails to meet the density specified, it shall be reworked as necessary to obtain the specified density at the sole expense of the CONTRACTOR.

301.4.3.6. Finishing, Curing and Preparation for Surfacing. The resulting surface shall be thoroughly rolled with a pneumatic tire roller and "clipped", "skinned", and "tight-bladed" by a power grader to a depth of approximately ¼-in., moving all loosened soil and asphalt base stabilization agent from the section. The surface shall then be thoroughly compacted with the pneumatic roller, adding small increments of moisture as needed during rolling. When directed by the OWNER, surface finishing methods maybe varied from this procedure, provided a dense, uniform surface, free of surface material, is maintained at its specified optimum during all finishing operations. Surface compaction and finishing shall proceed in such a manner as to produce, in not more than 4-hours, a smooth, closely knit surface, free of cracks, ridges or loose material, conforming to the drawn grade and line shown on the plans.

The completed section shall then be moist-cured for a minimum of 2-days before further courses are added, unless otherwise directed by the OWNER. In cases where, in the opinion of the OWNER, subgrade treatment or subbase sets up sufficiently to prevent objectionable damage from traffic, such layers may be opened to traffic after compaction. The surface of the compacted layer shall be kept moist until covered by other base or paving material or application of a curing seal of emulsified asphalt. If a curing seal is used, it shall be applied as soon as possible after completion of final rolling, at a rate of between 0.10- and 0.20-gallons-per-square-yard, the exact rate to be determined by the OWNER. No equipment or traffic shall be permitted on asphalt base stabilization agent treated material for 12-hours after curing seal is applied, unless otherwise permitted by the OWNER.

301.4.3.7. Maintenance. The CONTRACTOR shall be required to maintain the completed asphalt stabilized base within the limits of its contract in good condition, satisfactory to the OWNER as to grade, crown and cross section until such time as the surface course is constructed. The CONTRACTOR shall immediately repair all irregularities or other defects that may occur at the CONTRACTOR'S expense. Repairs are to be made as directed by the OWNER and in a manner to insure restoration of a uniform surface and durability of the portion repaired.

301.4.4. Measurement and Payment. Asphalt base stabilization agent treatment shall be measured for payment in square-yards for the thickness shown in the plans for the surface area of completed and accepted work. The measurement for asphalt base stabilization agent shall be by the gallon.

Asphalt base stabilization agent treatment shall be paid for at the contract unit price per square yard, as provided in the proposal and contract. The contract unit price shall be the total compensation for preparing the roadbed; for loosening, pulverizing, application of asphalt base stabilization agent, water content in the asphalt base stabilization agent mixture and the mixing water; mixing, shaping, sprinkling, compacting, finishing, curing and maintaining; for manipulations required; and for all labor, equipment, fuels, tools and incidental necessary to complete the work, all in accordance with the plans and specifications. Asphalt base stabilization agent material measured as provided in this item shall be paid for a the unit price bid for "asphalt emulsion base stabilizer" which price shall be full compensation for furnishing the material; for all freight involved; for all unloading, storing and handling; and for all labor, equipment, fuels, tools and incidentals necessary to complete the work.

301.5. FLEXIBLE SUBBASE OR BASE (CRUSHED STONE/CONCRETE)

This item shall consist of a foundation course for a surface course or for other subbase or base courses; shall be constructed as herein specified in one or more courses in conformity with the typical section shown on the plans and to the lines and grades as established by the OWNER.

301.5.1. Material.

301.5.1.1. General. Should the CONTRACTOR elect to produce the material from local pits, the material shall be secured from sources approved by the OWNER. The pits as utilized shall be opened up in such a manner as to immediately expose the vertical faces of all the strata of acceptable material in the depth mined. Unless otherwise directed, the material shall be secured in successive vertical cuts extending through all of the exposed strata, in order that a uniform mixed material shall be secured. Should OWNER allow crushed concrete, materials shall meet the requirements in Table 301.5.1.2.(a) Flexible Base or Subbase Material Requirements, according to specified grade. Additionally, this material shall be free of thin, laminated, or elongated pieces, reinforcing steel, or an excess of shale, dirt, organic matter or other objectionable materials as determined by the OWNER that could be harmful to the production of a homogenous base coarse.

301.5.1.2. Tests and Physical Requirements. Tests shall be performed in accordance with ASTM D4318 Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils. The preparation of samples for testing according to ASTM D4318 shall be in accordance with the requirements of ASTM D2217 Practice for Wet Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants. The material shall also be tested under TxDOT Test Method Tex-116-E The Wet Ball for Determining the Disintegration of Flexible Base Materials. When a magnesium soundness value is shown on the plans the material shall be tested in accordance with Test Method Tex-411-A Soundness of Aggregate Using Sodium Sulfate or Magnesium Sulfate. Physical properties shall meet the requirements in Table 301.5.1.2.(a) Flexible Base or Subbase Material Requirements, according to specified grade.

Table 301.5.1.2.(a) Flexible Base or Subbase Material Requirements

Property	Grade 1		Grade 2	
Triaxial Class	1		1 to 2.3	
Minimum Compressive Strength at lateral pressure 0-psi at lateral pressure 15-psi	 45-psi 175-psi		 35-psi 175-psi	
Master Grading	Sieve	Percent Retained	Sieve	Percent Retained
	1¾" ⅞" ⅜" No. 4 No. 40	0 10-35 30-50 45-65 70-85	2½" 1¾" No. 4 No. 40	0 0-10 45-75 60-85
Maximum Liquid Limit	35		40	
Maximum Plasticity Index	10		12	
Maximum Wet Ball Mill[1]	40		45	
Maximum increase in passing No. 40	20%		20%	
Maximum foreign material allowed	1%		1%	

1. When lightweight aggregates are used, the wet ball mill requirements shall not apply; lightweight aggregate shall meet the Los Angeles Abrasion, Pressure Slaking and Freeze Thaw requirements of TxDOT Item 303 Aggregate for Surface Treatment (Lightweight).

301.5.1.3. Rejection. Aggregate that fails to meet the requirements of these specifications may be rejected by the OWNER. Such rejection shall incur no cost to the OWNER. Aggregate sources from which materials are delivered with properties not meeting these specifications may be rejected as further supply sources to the project by the OWNER.

301.5.2. Construction Methods.

301.5.2.1. Preparation of Subgrade. Preparation of the subgrade shall be in conformity with the requirements of Item 301.3.3.3.1. Subgrade Preparation.

301.5.2.2. Placing. Immediately before placing the subbase or base course material, the subgrade shall be checked as to conformity with grade and section.

The material shall be delivered in approved vehicles of a uniform capacity. It shall be the charge of the CONTRACTOR that the required amount of specified material shall be delivered to secure the proper thickness of the completed subbase or base course. Material deposited on the subgrade shall be spread and shaped the same day. All material shall be moved at least once from the original position in which it is deposited. In the event of inclement weather or other unforeseen circumstances which render impracticable the spreading of the material during the first 24-hour period, the material shall be scarified and spread as directed by the OWNER. The material shall be sprinkled, if directed, and shall then be bladed, dragged and shaped to conform to the typical section as shown on the plans.

All areas and "nests" of segregated coarse or fine material shall be corrected or removed and replaced with well-graded material as directed by the OWNER. If additional binder is considered desirable or necessary after the material is spread and shaped, it shall be furnished and fully incorporated with the material in place by scarifying, harrowing, brooming or by other approved methods. The course shall be sprinkled as required and compacted to the extent necessary to provide not less than the percent density as specified in Item 301.5.2.3. Density. In addition to the requirements specified for density, the full depth of flexible subbase or base shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each course is completed, tests as necessary shall be made by the OWNER unless otherwise specified in the special provisions or in the plans. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements.

Throughout the entire operation, the shape of the course shall be maintained by blading. The surface, upon completion, shall be smooth and in conformity with the typical sections shown on the plans to the established lines and grades. On the surface on which pavement is to be placed, any deviation in excess of ½-in. in cross section in a length of 16-ft. measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling. All fractures, settlement, or segregation that develops shall be corrected immediately by scarifying the areas affected, adding suitable material as required, reshaping and recompacting by sprinkling and rolling.

Should the subbase or base course, due to any reason or cause, lose the required stability, density and finish before the surfacing is complete, it shall be recompacted and refinished at the sole expense of the CONTRACTOR.

301.5.2.3. Density. The density required under this item shall not be less than 92-percent compaction as determined by ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3). Moisture content shall be within minus-2- to plus-4-of-optimum.

301.5.2.4. Courses. Non full depth asphalt pavements, paving types with flexible base under the curb and gutter, shall be placed and compacted at the same time and in the same operation as the flexible base under the pavement. Where the subbase or base course exceeds 6-in. in thickness, it shall be constructed in two or more courses of equal thickness as indicated on the typical section. A minimum course depth of 3-in. is recommended. The first course shall be placed and compacted under the curb and gutter and under the pavement. The curb and gutter shall then be built upon the first course. The final course of the flexible base shall be placed following the curing time as specified in Item 305.1. Concrete Curb and Gutter.

301.5.3. Measurement and Payment. Work and accepted materials as specified for this item shall be measured by the square-yard of the required depth from plans and specifications completed flexible base as follows:

(1) Where no curb and gutter is in place or is to be constructed in connection with the flexible base, measurement shall be made to the lines shown on the plans or established as the edge of the base to be constructed.

(2) Where curb and gutter is in place or is proposed to be constructed in connection with the placing of the flexible base, measurement shall be made to the lip of the gutter. Material placed under the curb and gutter or behind the curb shall not be measured as flexible base but shall be considered as foundation courses for the curb and gutter.

The work performed and material placed (including additional binder if required) as prescribed for this item, measured as provided in this item, shall be paid for at the unit price bid per square-yard for flexible base, which price shall be full compensation for preparation of subgrade, furnishing of material, hauling, blading, sprinkling, compacting and furnishing all of labor and equipment necessary to complete the work.

301.6. GEOTEXTILES USED IN PAVING APPLICATIONS

301.6.1. Materials.

301.6.1.1. Physical Properties. The fabric properties shall conform to those shown in Table 301.6.1.(a) Geotextiles for Paving, as determined by the Federal Highway Administration Task Force 25 Guidelines using ASTM Test Methods, except where noted.

301.6.1.2. Certification. The manufacturer, if required by the OWNER, shall provide documents stating the name and manufacturer, the chemical composition of the filaments or yarns and test values of the properties of the geotextile. The manufacturer must certify that the material meets or exceeds these specifications.

301.6.1.3. Rejection. Geotextile may be rejected for failure to meet any of the requirements of this specification.

Table 301.6.1.(a) Geotextiles for Paving

Designation (Test Method)	Characteristic	Average Roll Minimum Value
ASTM D4632 Grab Breaking Load and Elongation of Geotextiles	Grab Strength	80-lbs. @ 12-in.-per-minute
ASTM D4632	Elongation @ Break	50% @ 12-in.-per-minute
Tex-616-J, Construction Fabrics	Asphalt Retention	0.5-oz.-per-sq.-ft.
ASTM D276 Identification of Fibers in Textiles	Melting Point	300°F

301.6.2. Construction Methods. Construction methods for each type unit shall be provided by the manufacturer and approved by the OWNER based on the site-specific use.

301.6.3. Measurement and Payment. If provided as a separate contract item, geotextile shall be measured by the square-yard, complete in place.

Geotextile, when provided as a separate pay item, shall be paid for by the square-yard, complete in place, which price shall include materials, hauling, placing, anchoring, and all other work necessary to achieve a functional geotextile layer(s) in the subbase or base layer. If not provided as a separate contract item, geotextile shall be considered subsidiary to those items provided for subbase or base preparation.

ITEM 302. ASPHALT PAVEMENT

302.1. DESCRIPTION

This Item establishes the requirements for asphalt construction. This Item includes material requirements and construction methods for emulsified asphalts, hot-mix asphalt pavement, performance graded (PG) asphalts and other miscellaneous asphaltic materials and polymer additives. Alternately, the use of warm-mix asphalt may be permitted with the OWNER'S approval in accordance with the Texas Department of Transportation Pavement Design Guide - Section 5: Hot-Mix Asphalt Concrete Pavement Mixtures.

302.2. AGGREGATES FOR HOT-MIX ASPHALT PAVEMENT

302.2.1. General Requirements. Aggregates shall conform to the requirements contained in this Item 302.2. Aggregates for Hot-Mix Asphalt Pavement and shall be approved by the OWNER prior to use. The integrity of the aggregate shall be such as to produce a workable material within the limits contained in this specification.

302.2.1.1. Deleterious Substances. Aggregates shall be free from loam, clay balls or other injurious foreign matter occurring either free or as a coating on the aggregates.

302.2.1.2. Storage. Prior to stockpiling of aggregates, the area shall be cleaned of trash, weeds and grass and be relatively smooth. Aggregates shall be stockpiled in such a manner as to prevent mixing of one aggregate with another. Coarse aggregates shall be separated into stockpiles of different gradation, such as a large coarse aggregate and a small coarse aggregate stockpile and such that the grading requirements of the specified type shall be met when the piles are combined in the asphaltic mixture. No coarse aggregate stockpile shall contain more than 15-percent by weight of material that shall pass a No. 10 (2.0mm) sieve except as noted on the plans. Fine aggregate stockpiles may contain coarse aggregate in the amount of up to 20-percent by weight; however, the coarse aggregate shall meet the quality tests specified in Item 302.2.2. Coarse Aggregates. Suitable equipment of acceptable size shall be furnished by the CONTRACTOR to work the stockpiles and prevent segregation of the aggregates.

302.2.1.3. Quality and Testing Requirements. Test of aggregates, when required, shall be made in accordance with applicable Texas Department of Transportation tests or ASTM Test Methods, as shown in the tables below or as required by OWNER.

Requirements for hot-mix asphalt pavement aggregates are shown in Table 302.2.2.(a) Coarse Aggregate Quality Requirements.

302.2.1.4. Aggregate Rejection. Aggregates that fail to meet the requirements of these specifications may be rejected by the OWNER. Such rejection shall incur no cost to the OWNER. The OWNER may reject sources from which materials are delivered with properties not meeting these specifications. Such rejection shall incur no cost to the OWNER.

302.2.2. Coarse Aggregates. Coarse aggregates shall be that portion of the total aggregates retained on the No. 10 sieve (2.0mm). Coarse aggregates shall consist of clean, tough, durable fragments of crushed stone, crushed gravel, or steel slag as specified herein, of uniform quality throughout.

All coarse aggregates shall meet the requirements listed in Table 302.2.2.(a) Coarse Aggregate Quality Requirements.

Table 302.2.2.(a) Coarse Aggregate Quality Requirements[1]

Characteristic	Test Method	Value
Deleterious Material	Tex-217-F, Part I, Determining Deleterious Material in Coarse Aggregates (Bituminous Mixtures)	1.5% Max.
Decantation	Tex-217-F, Part II, Decantation Test for Coarse Aggregate (Bituminous Mixtures)	1.5% Max.
Los Angeles Abrasion	Tex-410-A, Abrasion of Coarse Aggregate Using the Los Angeles Machine (ASTM C131)	35% Max.
Magnesium Sulfate Soundness Loss, 5 Cycle	Tex-411-A, Soundness of Aggregate Using Sodium Sulfate or Magnesium Sulfate	30% Max. (lower value may be shown on plans)
Coarse Aggregate Angularity Two Crushed Faces	Tex-460-A, Part I, Determining Crushed Face Count	90% Min.
Flat Elongated Particles	ASTM D4791 Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate	20% Max. @ 3:1

1. Sampled during delivery to the plant or from the stockpile, unless otherwise shown on the plans.

302.2.3. Fine Aggregate. Fine aggregate may consist of crushed stone, crushed gravel, sand, and/or limestone or steel slag screenings.

Fine aggregate shall meet the requirements listed in Table 302.2.3.(a) Fine Aggregate Quality Requirements.

Table 302.2.3.(a) Fine Aggregate Quality Requirements[1]

Characteristic	Test Method	Value
Linear Shrinkage	Tex-107-E, Determining the Bar Linear Shrinkage of Soils	3% Max.
Sand Equivalent Value	Tex-203-F, Sand Equivalent Test	45% Min.

1. Sampled during delivery to the plant or from the stockpile, unless otherwise shown on the plans.

302.2.3.1. Sand. Sand material may constitute a part of the fine aggregates for hot-mix asphalt pavement. The fine aggregate portion of the sand passing the No. 40 (425-µm) sieve shall meet the Linear Shrinkage requirement listed in Table 302.2.3.(a) Fine Aggregate Quality Requirements.

302.2.3.1.1. Gradation. Fine aggregate sand shall be that portion of the sand in the total aggregate passing the No. 10 (2.0mm) sieve. It shall be well graded and composed of sound, durable sand particles.

302.2.3.2. Limestone or Steel Slag Screenings. Limestone or steel slag screenings may constitute part or all of the fine aggregates for hot-mix asphalt pavement. Screenings shall be of the same or similar material for coarse aggregates. Where limestone rock screenings are specified for use, they shall be screenings resulting from crushing operation.

The fine aggregate portion passing the No. 40 (425-µm) sieve shall meet the Linear Shrinkage requirement listed in Table 302.2.3.(a) Fine Aggregate Quality Requirements. Fine aggregates from each source shall meet Linear Shrinkage requirements.

302.2.3.2.1. Gradation. The limestone or steel slag screening shall meet the grading requirements in Table 302.2.3.2.1.(a) Limestone or Steel Slag Screenings Gradation unless otherwise shown on the plans.

When authorized by the OWNER, stone or steel slag screenings containing particles larger than ⅜-in. (9.5-mm) may be used but only that portion of the material passing the ⅜-in. (9.5-mm) sieve shall be considered as fulfilling the requirements for screenings when a minimum percent of screenings is specified for a particular mixture.

Table 302.2.3.2.1.(a) Limestone or Steel Slag Screenings Gradation

Sieve Size	Percent Passing by Weight
⅜-in. (9.5-mm)	100
Passing No. 200 (75-µm)	0 to 30

302.2.4. Mineral Filler. Mineral filler shall consist of a thoroughly dry stone dust Portland cement or other mineral dust approved by the OWNER. All mineral filler shall meet the requirements listed in Table 302.2.4.(a) Mineral Filler Quality Requirements.

Table 302.2.4.(a) Mineral Filler Quality Requirements[1]

Characteristic	Test Method	Value
Linear Shrinkage	Tex-107-E, Determining the Bar Linear Shrinkage of Soils	3% Max.

1. Sampled during delivery to the plant or from the stockpile, unless otherwise shown on the plans.

302.2.4.1. Gradation. When tested by the method outlined in TxDOT Test Method Tex-200-F Sieve Analysis of Fine and Coarse Aggregates (Part 1 Dry Sieve Analysis (Based on Weight) or Part 3 Volumetric Sieve Analysis, as applicable), it shall meet the requirements of Table 302.2.4.1.(a) Mineral Filler Gradation.

Table 302.2.4.1.(a) Mineral Filler Gradation

Sieve Size	Percent Passing by Weight
No. 30 sieve (600-µm)	95 to 100
No. 80 sieve (180-µm)	Not Less Than 75
No. 200 sieve (75 µm)	Not Less Than 55

302.3. BITMINOUS MATERIALS

302.3.1. General. This Item consists of bituminous material, including performance graded asphalts, modified performance graded asphalts, asphalt cement, emulsified asphalt, and other miscellaneous asphaltic materials. Asphalt for use in paving shall be a refined asphalt produced from crude petroleum. The base asphalt shall be homogeneous and free from water and residue from distillation of coal, coal tar or paraffin oil and shall not foam when heated to 347°F.

302.3.1.1. Tests and Certification of Bituminous Materials. When tested according to ASTM or AASHTO test methods, the various materials shall meet the applicable requirements of this specification. At the time of delivery of each shipment of asphalt, the vendor supplying the material shall deliver to the CONTRACTOR certified copies of the test report. Two copies of the test reports shall be furnished to the OWNER. Test reports shall indicate the name of the vendor, type and grade of bituminous material delivered, date and point of delivery, quantity delivered, delivery ticket number, purchase order number, and results of the specified tests. The test report, signed by an authorized representative of the vendor, shall certify that the product delivered conforms to the specifications for the type and grade indicated. The certified test reports and the testing required in connection with the reports shall be at no cost to the OWNER.

Until the certified test reports and samples of the material have been checked by the OWNER to determine their conformity with the prescribed requirements, the material to which such report relates and any work in which it may have been incorporated as an integral component, shall be only tentatively accepted by the OWNER. Final acceptance shall be dependent upon the determination by the OWNER that the material involved fulfills the prescribed requirements.

302.3.1.2. Rejection. Any material specified in this section may be rejected for failure to meet any of the provisions for this specification, or for any defect causing it to be unsuitable for its intended use.

302.3.2. Performance Graded (PG) Asphalt Binders. Performance graded asphalt binders shall be smooth and homogeneous, shall be free from water, shall not foam when heated to 347°F and shall meet the

requirements for performance graded asphalt binders shown in Table 302.3.2.(a) Performance Graded Asphalt Binders.

PG binders shall show no separation when tested according to Tex-540-C Measurement of Polymer Separation on Heating in Modified Asphalt Systems. Separation testing is not required if one of the following conditions is met:

(1) The modifier is introduced separately at the mix plant either by injection in the asphalt line or mixer; or
(2) The binder is blended on site in continuously agitated tanks; or
(3) Binder acceptance is based on field samples taken from an in-line sampling port at the hot-mix plant after the addition of modifiers.

302.3.2.1. Modified Performance Graded Asphalt Binders. In addition to meeting the requirements in Table 302.3.2.(a) Performance Graded Asphalt Binders, modified performance graded asphalt binders shall also meet the requirements listed herein according to grade.

302.3.2.1.1. SBR Latex Rubber Modified Performance Graded Binders. Available grades include PG 64-28L, PG 70-28L, PG 70-22L, PG 76-22L, and PG 82-22L. The manufacturer shall provide certification that SBR latex rubber was used in production of the binder. Ductility tested according to AASHTO T51: 39.2°F, 1-cm/min, cm, 70-cm minimum.

302.3.2.1.2. SBS Rubber Modified Performance Graded Binders. Available grades include PG 64-28S, PG 70-28S, PG 70-22S, PG 76-22S, and PG 82-22S. The manufacturer shall provide certification that SBS rubber was used in production of the binder. Elastic recovery tested according to Tex-539-C Measurement of Elastic Recovery of Tensile Deformation Using a Ductilometer: 50°F, 55% minimum.

302.3.2.1.3. Tire Rubber Modified Performance Graded Binders. Available grades include PG 64-28TR, PG 70-28TR, PG 70-22TR, PG 76-22TR, and PG 82-22TR. The manufacturer shall provide certification that tire rubber was used in production of the binder. Elastic recovery tested according to Tex-539-C Measurement of Elastic Recovery of Tensile Deformation Using a Ductilometer: 50°F, 40% minimum.

Table 302.3.2.(a) Performance Graded Asphalt Binders

Performance Grade	PG 58			PG 64				PG 70				PG 76				PG 82		
	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28
Average 7-day maximum Pavement Design Temperature, °C[1]	58			64				70				76				82		
Minimum Pavement Design Temperature, °C[1] (i.e. design temperature shall be greater than shown)	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28
Original Binder																		
Flash Point Temperature, AASHTO T48: Minimum °C	230																	
Viscosity, AASHTO TP48[2,3] Maximum, 3.0 Pa*s, Test Temp, °C	135																	
Dynamic Shear, AASHTO TP5:[4] G*/sinδ, Minimum, 1.00-kPa Test Temperature @ 10-rad/s, °C	58			64				70				76				82		
Rolling Thin Film Oven (Tex-541-C)																		
Maximum Loss, percent	1.0																	
Dynamic Shear, AASHTO TP5: G*/sinδ, Minimum, 2.20-kPa Test Temperature @ 10-rad/s, °C	58			64				70				76				82		
Pressure Aging Vessel Residue (AASHTO PP1)																		
PAV Aging Temperature, °C	100																	
Dynamic Shear, AASHTO TP5: G*/sinδ, Maximum, 5000-kPa Test Temperature @ 10-rad/s, °C	25	22	19	28	25	22	19	28	25	22	19	28	25	22	19	28	25	22
Creep Stiffness, AASHTO TP1:[5,6] *S*, Maximum, 300-Mpa *m*-value, Minimum, 0.300 Test Temp @60s, °C	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18
Direct Tension, AASHTO TP3:[6] Failure Strain, Minimum, 1.0% Test Temp @ 1.0-mm/min, °C	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18

1. Pavement temperatures are estimated from air temperatures using an algorithm contained in the PGEXCEL3.XLS software program, may be provided by the specifying agency, or by following the procedures as outlined in AASHTO MP2 and PP28.
2. This requirement may be waived at the discretion of the specifying agency if the supplier warrants that the asphalt binder can be adequately pumped, mixed and compacted at temperatures that meet all applicable safety, environmental and constructability requirements. At test temperatures where the binder is a Newtonian fluid, any suitable standard means of viscosity measurement may be used, including capillary (AASTHO T201 or T202) or rotational viscometry (AASHTO TP48).
3. Viscosity at 135°C is an indicator of mixing and compaction temperatures that can be expected in the lab and field. High values may indicate high mixing and compaction temperatures. Additionally, significant variation can occur from batch to batch. CONTRACTORS should be aware that variation could significantly impact mixing and compaction operations. CONTRACTORS are therefore responsible for addressing any constructability issues which may arise.
4. For quality control of unmodified asphalt cement production, measurement of the viscosity of the original asphalt cement may be substituted for dynamic shear measurements of G*/sin(δ) at test temperatures where the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary (AASHTO T201 or T202) or rotational viscometry (AASHTO TP48).
5. Silicone beam molds as described in AASHTO TP1-93 are acceptable for use.
6. If the creep stiffness is below 300-Mpa, the direct tension test is not required. If the creep stiffness is between 300- and 600-Mpa, the direct tension failure strain requirement can be used in lieu of the creep stiffness requirement. The m-value requirement must be satisfied in both cases.

302.3.2.2. Acceptance of Performance Graded (PG) Asphalt Binders.

302.3.2.2.1. Location of Manufacture. Performance graded binder acceptance procedures are dependent on where the binder is manufactured. The requirements are as follows.

Manufactured at the Source. PG binders manufactured at the source are normally approved at the source according to the applicable requirements of the OWNER. The OWNER may acquire field samples at any time, particularly if material quality is suspect.

Manufactured at the Job Site. If PG binders are manufactured at the job site, for example where SBR latex is injected at the hot mix plant, the following quality measures are required. Antistrip agents are not considered asphalt modifiers.

(1) Preconstruction. The CONTRACTOR shall provide the OWNER with a 1-quart sample of the proposed binder and a test report showing compliance with the required performance grade. The sample and test report will be forwarded to OWNER for verification testing. If the OWNER chooses to verify that the sample meets specifications, the OWNER will complete verification testing within ten (10) working days after receipt of the sample. If the OWNER chooses to verify the sample, then the sample shall be verified before mixture production is allowed to begin.

(2) Construction. A sampling port is required which meets the requirements of AASHTO T40 Practice for Sampling Bituminous Materials, Section 9, "Sampling From Pipelines During Loading or Unloading". This sampling port shall be located on the asphalt line before introduction of the asphalt into the mix plant and shall be downstream from the addition of any modifiers and any dispersing or mixing equipment associated with their introduction.

Sample containers shall be provided by the CONTRACTOR and shall be clean, double friction top round 1-quart cans. All samples shall be taken by the CONTRACTOR, and witnessed by the Engineer.

All samples shall be taken from the sampling port after a sufficient amount of asphalt is run out and wasted, in order to clear any residual asphalt that builds up in the sampling port. All samples shall be taken in a clean, 1-gallon can, immediately stirred and used to fill three (3) 1-quart sample cans. The cans shall be delivered to the OWNER. The OWNER will choose one sample can for testing and the other cans are retained until testing is complete, in case the original sample is lost or damaged.

302.3.2.2.2. Sampling Frequency. A sample of the PG binder may be taken from each mixture production day, at a time determined by the OWNER. The sample from the first day's production may be subjected to verification testing. Additionally, throughout the duration of the project, the OWNER may randomly select binder samples for verification testing.

302.3.2.2.3. Verification Testing. OWNER may perform verification testing on all construction samples. The OWNER will complete verification testing within 10 working days after receipt of the sample.

For verification testing which fails to confirm the required performance grade, the CONTRACTOR shall review the manufacturing process to locate the source of the problem. The OWNER may stop production until the CONTRACTOR can show that the next binder produced will meet the specifications. The OWNER may require materials not meeting the specification requirements to be removed and replaced at the CONTRACTOR's expense.

302.3.3. Asphalt Cement. Asphalt cement is bituminous liquid binder. The material for asphalt cement shall be homogeneous, shall be free from water, shall not foam when heated to 347°F and shall meet the requirements of Table 302.3.3.(a) Requirements for Asphalt Cement.

Table 302.3.3.(a) Requirements for Asphalt Cement

Property, Test Parameters	Value According to Grade							
	AC-3		AC-5		AC-10		AC-20	
	Min	Max	Min	Max	Min	Max	Min.	Max
Viscosity, 140°F , Stokes	250	350	400	600	800	1200	1600	2400
Viscosity, 275°F, Stokes	1.1	—	1.4	—	1.9	—	2.5	—
Penetration, 77°F, 100-g, 5-sec.	210	—	135	—	85	—	55	—
Flash point C.O.C., °F	425	—	425	—	450	—	450	—
Solubility in trichloroethylene (%)	99.0	—	99.0	—	99.0	—	99.0	—
Tests on residues from thin film oven test: Viscosity, 140°F, Stokes	—	900	—	1500	—	3000	—	6000
Ductility, 77°F 5-cms-per-min, cms.	100	—	100	—	70	—	50	—
Spot Test	Negative for all grades							

302.3.3.1. Polymer Modified Asphalt Cement. For surface treatment applications, a polymer additive consisting of an anionic emulsion of styrene-butadiene low-temperature copolymer shall be added to the AC-5 or AC-10 asphalt when specified on the plans or in the specifications in the contract. The polymer additive shall consist of two-percent (by weight) polymer additive (solids basis) which has good storage stability. Polymer additive shall possess the properties specified in Item 302.3.3.1.1. Polymer Additive Properties. The manufacturer shall furnish the actual styrene-butadiene rubber (SBR) content for each batch of polymer emulsion. This information shall accompany all shipments to facilitate proper addition rates.

The finished polymer modified asphalt cement blend shall be smooth, homogeneous, and comply with the requirements in Table 302.3.3.1.(a) Polymer Modified Asphalt Requirements.

Table 302.3.3.1.(a) Polymer Modified Asphalt Requirements

Property	Test Method, Test Parameters	Value According to Grade	
		AC-5 + 2% Polymer Solids	AC-10 + 2% Polymer Solids
Minimum SBR Content	Tex-533-C Determining Polymer Additive Percentages in Polymer Modified Asphalt Cements, IR Determination[1]	2.0% Solids By Wt.	2.0% Solids By Wt.
Penetration	AASHTO T49, 100-G, 5-Sec, 77°F	120 Min	80 Min
Minimum Viscosity	AASHTO T202, 140°F	700-Poise	1300-Poise
Maximum Viscosity	AASHTO T202, 275°F	7.0-Poise	8.0-Poise
Ductility	AASHTO T51, 39.2°F, 5-cm/Min	70-cm, Min	60-cm, Min
Separation of Polymer	Tex-540-C Measurement of Polymer Separation on Heating in Modified Asphalt Systems, After 48-Hrs. at 325°F	None	None

1. The asphalt supplier shall furnish the OWNER samples of the asphalt cement and polymer emulsion used in making the finished product.

302.3.3.1.1. Polymer Additive Properties.
The polymer additive shall be an emulsion of styrenebutadiene low-temperature copolymer in water. The emulsion shall have good storage stability and possess the properties in Table 302.3.3.1.1.(a) Polymer Additive Requirements.

Table 302.3.3.1.1.(a) Polymer Additive Requirements

Property	Value
Monomer Ratio of Polymer (butadiene to styrene)	$\frac{73 \pm 5}{27 \pm 5}$
Minimum Solids Content (percent by weight)	45
Viscosity of Emulsion at 77 ± 1°F, cps, max (No.3 spindle, 20-rpm, Brookfield RVT Viscometer)	2000

302.3.4. Emulsified Asphalt. Emulsified asphalt shall be composed of a paving asphalt base uniformly emulsified with water. It shall be homogeneous throughout and, when stored, shall show no separation within 30-days after delivery. Emulsified asphalt shall meet the requirements for the specified type and grade shown in Tables 302.3.4.(a) through (d).

302.3.4.1. Testing Requirements. Test reports and certification shall be made for emulsified asphalt in accordance with Item 302.3.1.1. Tests and Certification of Bituminous Materials.

302.3.4.2. Temperature. Emulsified asphalt may be reheated, but at no time after loading for transportation from refinery to the purchaser shall the temperature of the emulsion be raised above 160°F. During reheating, the emulsified asphalt shall be agitated to prevent localized overheating. Emulsified asphalt shall not be permitted to cool to a temperature of less than 40°F. Unless otherwise specified, emulsified asphalt shall be applied at a temperature within the limits specified in Table 302.5.(a) Requirements for Storage, Heating and Application Temperature. CONTRACTOR shall furnish and keep on the site an accurate thermometer suitable for determining the temperature of the emulsified asphalt.

Table 302.3.4.(a) Tests and Properties of Anionic Emulsions

Property	Rapid Setting				Medium Setting		Slow Setting			
	Type - Grade									
	RS-2		RS-2h		MS-2		SS-1		SS-1h	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol at 77°F, sec	-	-	-	-	-	-	20	100	20	100
at 122°F, sec	150	400	150	400	100	300	-	-	-	-
Sieve Test, %	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10
Miscibility (Standard Test)	-	-	-	-	-	-	Passing		Passing	
Cement Mixing, %	-	-	-	-	-	-	-	2.0	-	2.0
Demulsibility, 35-ml of 0.02 N $CaCl_2$, %	60	-	60	-	-	30	-	-	-	-
Storage Stability, 1-day, %	-	1	-	1	-	1	-	1	-	1
Freezing Test, 3 cycles[1]	-	-	-	-	Passing		Passing		Passing	
Distillation Test:										
Residue by Distillation, % by weight	65	-	65	-	65	-	60	-	60	-
Oil Distillate, % by volume of emulsion	-	½	-	½	-	½	-	½	-	½
Tests on Residue from Distillation:										
Penetration at 77°F, 100 g, 5 sec	120	160	80	110	120	160	120	160	70	100
Solubility in Trichloroethylene, %	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-
Ductility at 77°F, 5 cm/min, cm	100	-	80	-	100	--	100	-	80	-

1. Applies only when the Engineer designates material for winter use.

Table 302.3.4.(b) Tests and Properties of High Float Anionic Emulsions

Property	Rapid Setting		Medium Setting	
	Type - Grade			
	HFRS-2		AES-300	
	Min	Max	Min	Max
Viscosity, Saybolt Furol at 77°F, sec	-	-	75	400
at 122°F, sec	150	400	-	-
Sieve Test, %	-	0.10	-	0.10
Coating Ability and Water Resistance:				
Coating, dry aggregate	-	-	good	
Coating, after spraying	-	-	fair	
Coating, wet aggregate	-	-	fair	
Coating, after spraying	-	-	fair	
Demulsibility 35-ml of 0.02 N $CaCl_2$, %	50	-	-	-
Storage Stability Test, 1-day, %	-	1	-	1
Distillation Test:				
Residue by Distillation, % by weight	65	-	65	-
Oil Distillate, by volume of emulsion, %	-	1/2	-	5
Tests on Residue from Distillation:				
Penetration at 77°F, 100 g, 5 sec	100	140	300	-
Solubility in Trichloroethylene, %	97.5	-	97.5	-
Ductility at 77°F, 5 cm/min, cm	100	-	-	-
Float Test at 140°F, sec	1200	-	1200	-

Table 302.3.4.(c) Tests and Properties of Cationic Emulsions

Property	Rapid Setting				Medium Setting				Slow Setting			
	Type - Grade											
	CRS-2		CRS-2h		CMS-2		CMS-2s		CSS-1		CSS-1h	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, Saybolt Furol												
at 77°F, sec	-	-	-	-	-	-	-	-	20	100	20	100
at 122°F, sec	150	400	150	400	100	300	100	300	-	-	-	-
Sieve Test, %	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10
Cement Mixing, %	-	-	-	-	-	-	-	-	-	2.0	-	2.0
Demulsibility, 35 ml 0.8 percent												
sodium dioctyl sulfosuccinate, %	40	-	40	-	-	-	-	-	-	-	-	-
Storage Stability, 1 day, %	-	1	-	1	-	1	-	1	-	1	-	1
Coating Ability and Water												
Resistance:												
Coating, dry aggregate	-	-	-	-	good		good		-	-	-	-
Coating, after spraying	-	-	-	-	fair		fair		-	-	-	-
Coating, wet aggregate	-	-	-	-	fair		fair		-	-	-	-
Coating, after spraying	-	-	-	-	fair		fair		-	-	-	-
Particle Charge Test	positive		positive		positive		positive		positive		positive	
Distillation Test:												
Residue by Distillation, % by wt	65	-	65	-	65	-	65	-	60	-	60	-
Oil Distillate, % by volume of												
Emulsion	-	½	-	½	-	7	-	5	-	½	-	½
Tests on Residue from Distillation:												
Penetration at 77°F,100-g,5-sec	120	160	80	110	120	200	300	-	120	160	80	110
Solubility in Trichloroethylene, %	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-
Ductility at 77° F, 5 cm/min, cm	100	-	80	-	100	-	-	-	100	-	80	-

Table 302.3.4.(d) Tests and Properties of Polymer Modified Emulsions

Property	High Float Anionic Rapid Setting		Cationic Rapid Setting	
	Type - Grade			
	HFRS-2P		CRS-2P	
	Min	Max	Min	Max
Polymer Content, percent by weight of the distillation residue [1]	3.0	-	3.0	-
Viscosity, Saybolt Furol at 122°F, sec	150	400	150	400
Storage Stability Test, 1-day, %	-	1	-	1
Demulsibility, 35-ml of 0.02 N $CaCl_2$, %	40	-	-	-
Demulsibility, 35-ml 0.8-percent sodium dioctyl sulfosuccinate, %	-	-	40	-
Sieve Test, %	-	0.10	-	0.10
Particle Charge Test	-		Positive	
Distillation Test:[2]				
Oil distillate, by volume of emulsion, %	-	½	-	½
Residue, % by wt	65	-	65	-
Tests on Residue from Distillation:				
Float Value at 140°F, sec	1200	-	-	-
Penetration, 77°F, 100-g, 5-sec	100	140	110	150
Ductility, 39.2°F, 5-cm/min, cm	50	-	50	-
Viscosity at 140°F, poises	1500	-	1300	-
Solubility in Trichloroethylene, %	97	-	97	-

1. The CONTRACTOR shall provide the OWNER samples of the asphalt cement and polymer used in making the finished emulsion with a certified statement from the Emulsion Supplier stating that the provided asphalt cement and polymer used in the finished product are the same as provided.
2. The temperature on the lower thermometer shall be brought slowly to 350°F plus or minus 10°F and maintained at this temperature for 20-minutes. The total distillation shall be completed in 60-minutes plus or minus 5-minutes from the first application of heat.

302.3.5. Emulsions for Priming, Curing and Erosion Control (PCE).

302.3.5.1. General Use Emulsions. The emulsion shall be a slow curing anionic or cationic emulsion of a petroleum based material in water. The supplier must state whether the material supplied is cationic or anionic. Such emulsions may be used for priming of base materials, curing seal for stabilized base materials, and erosion control applications such as dust control, soil surface stabilization, or mulch binder.

Emulsion properties shall fall within the ranges as shown in Table 302.3.5.1.(a) Tests and Properties of PCE (General Use) Emulsions. The base emulsion material may be diluted with water to achieve the desired concentration of residual with maximum dilution rates as indicated in Table 302.3.5.1.(b) Maximum Dilution Rate.

Table 302.3.5.1.(a) Tests and Properties of PCE (General Use) Emulsions

Property	Test Methods, Test Parameters	Minimum	Maximum
Viscosity	Saybolt Furol, 25°C	10-seconds	100-seconds
Sieve Test	Sieve Test	-	0.1%
Miscibility	ASTM D244 Emulsified Asphalts, modified[1]	Passing	-
Residue by Evaporation	ASTM D244, modified[2]	60% by weight	-
Tests on Residue from Evaporation	Flash Point, C.O.C. Kinematic Viscosity, 60°C	200°C 100-cSt	- 350-cSt

1. Except the dilution shall use 350-ml of distilled or deionized water and a 100-ml beaker.
2. Except the sample shall remain in the oven until foaming ceases, then cooled and weighed.

Table 302.3.5.1.(b) Maximum Dilution Rate

Use	Maximum Dilution Rate
Priming of Base Materials	(1) part PCE to (3) parts water
Curing Seal	(1) part PCE to (3) parts water
Erosion Control	(1) part PCE to (7) parts water

302.3.5.2. Emulsions Specifically for Priming and Curing. Product shall be a water-based emulsion composed of petroleum of resin oil base with selective hardening and drying agents to form a road prime and sealer. Emulsions may be provided either concentrated or pre-diluted. Concentrated prime and/or road sealing emulsions specified in this Item 302.3.5.2. Emulsions Specifically for Priming and Curing shall meet the requirements of Table 302.3.5.2.(a) Requirements for MCS-600-C – Concentrated. Diluted prime and/or road sealing emulsions specified in this Item 302.3.5.2. Emulsions Specifically for Priming and Curing shall meet the requirements of Table 302.3.5.2.(b) Requirements for MCS-600-D – Dilute.

Table 302.3.5.2.(a) Requirements for MCS-600-C – Concentrated

Property	Test Methods, Test Parameters	Required Value	
		Minimum	Maximum
Appearance	Visual Inspection	Brown Liquid	
Viscosity S.F. at 77°F Sec	ASTM D244 Emulsified Asphalts	15	200
Residue, % min	ASTM D244, modified[1]	56	65
Miscibility Test	ASTM D244, modified[2]	No coagulation	
Moisture, wt %		-	48
Volatile %		35	-
% Non-Volatile Soluble in Trichloroethylene	AASHTO T 45-56	-	6
Accelerated Weathering (2-year exposure)	Federal Spec TT C-555 B, 40 ml	No material deterioration after exposure	
Resistance To wind and Driven Rain (@ 98 mph)	Federal Spec TT C-555 B, As 4ml sealer after cure	Passes/no wt. gain	
Ash, % wt.		-	8
Polymer, % wt.		-	4
Freeze Test (Concentrated Form)	3-cycle	Pass	
Particle Charge	ASTM D244	Positive	
Shaker Test 2- to 4-hrs.	Mix Burrell Wrist Action Shaker Model 75 set on Level 7, diluted 1 part water to 4 parts road prime, Sieve #40	-	1%

1. ASTM D244 Modified Evaporation Test for percent of residue is made by heating 50-gram sample to 300°F until foaming ceases, then cool immediately and calculate results.
2. Test procedure identical with ASTM D244, except that 0.02 Normal Calcium Chloride solution shall be used in place of distilled water.

Table 302.3.5.2.(b) Requirements for MCS-600-D – Dilute

Property	Test Methods, Test Parameters	Required Value	
		Minimum	Maximum
Appearance	Visual Inspection	Brown Liquid	
Viscosity S.F. at 77°F Sec	ASTM D244 Emulsified Asphalts	5	70
Residue, % min	ASTM D244, modified[1]	10	20
Miscibility Test	ASTM D244, modified[2]	No coagulation	
Moisture, wt %		-	90
Volatile %		90	-
% Non-Volatile Soluble in Trichloroethylene	AASHTO T 45-56	0	2
Accelerated Weathering (2-year exposure)	Federal Spec TT C-555 B, 40 ml	No material deterioration after exposure	
Resistance To wind and Driven Rain (@ 98 mph)	Federal Spec TT C-555 B, As 4ml sealer after cure	Passes/no wt. gain	
Ash, % wt.		-	2
Polymer, % wt.		-	1
Freeze Test (Concentrated Form)	3-cycle	Pass	
Particle Charge	ASTM D244	Positive	
Shaker Test 2- to 4-hrs. (non-diluted)	Mix Burrell Wrist Action Shaker Model 75 set on Level 7, Sieve #40	-	1%

1. ASTM D244 Modified Evaporation Test for percent of residue is made by heating 100-gram sample to 300°F until foaming ceases, then cool immediately and calculate results.
2. Test procedure identical with ASTM D244, except that 0.02 Normal Calcium Chloride solution shall be used in place of distilled water.

302.3.6. Specialty Emulsions. Specialty emulsions shall be slow setting emulsions of a petroleum-based material in water. Specialty emulsions may be used for purposes such as tack coat, fog seals, priming base materials, curing seal for stabilized base materials, recycled/reclaimed asphalt pavement (RAP) rejuvenator, repairing surface deficiencies, and erosion control applications. Specialty emulsions are classified as either Restorative Seal or Maltene Rejuvenator and shall meet the requirements for the specified type shown in Table 302.3.6.(a) Requirements for Restorative Seal or Table 302.3.6.(b) Requirement for Maltene Rejuvenator, respectively. Specialty emulsions shall be freeze stabilized and if freezing has occurred a homogeneous mixture shall be obtained when the material has thawed and been thoroughly mixed.

Table 302.3.6.(a) Requirements for Restorative Seal

Properties	Test Methods	Requirements
Test on Emulsion		
Viscosity @77°F, SES	ASTM D244 Emulsified Asphalts	25 - 150
Sieve Test, % by Wt.	ASTM D244, modified[1]	0.1 Max.
Particle Charge Test	ASTM D244	Positive
Cement Mixing Test, % by Wt.	ASTM D244	2.0 Max.
Pumping Stability	See Note 2.	Pass
5-day Settlement Test, % by Wt.	ASTM D244	5.0 Max.
Residue, % Wt.	ASTM D244, modified[3]	64 Min.
Test on Residue from Distillation		
Viscosity @ 140°F, cSt	ASTM D2170 Kinematic Viscosity of Asphalts (Bitumens)	1,000 – 4,000
Maltene Distribution Ratio[4]	ASTM D2006-70 Method of Test for Characteristic Groups in Rubber Extender and Processing Oils by the Precipitation Method (Discontinued 1975)	0.7 – 1.1
PC/S Ratio[4]	ASTM D2006-70	0.5 Min.
Asphaltenes, % Wt.	ASTM D2006-70	11.00 Max.

1. Test procedure identical with ASTM D244 except that distilled water shall be used in place of two-percent sodium oleate solution.
2. Pumping stability is determined by charging 15-ounces (450-ml) of emulsion into 30-ounce (one-liter) beaker and circulating the emulsion through a gear pump (Roper 29.B22621) having ¼" inlet and outlet. The emulsion passes if there is not significant oil separation after circulating ten-minutes.
3. ASTM D244 Evaporation Test for percent of residue is modified by heating 2-ounces (50-gram) sample to 300°F until foaming ceases, then cooling immediately and calculating results.
4. In the Maltene Distribution Ratio Test by ASTM Method D2006-70:

$(PC + A_1) \div (S + A_2)$

PC=Polar Compounds A_1=First Acidaffins

A_2= Second Acidaffins S= Saturated Hydrocarbons

Table 302.3.6.(b) Requirement for Maltene Rejuvenator

Properties	Test Methods		Requirements	
	ASTM	AASHTO	Min.	Max.
Test on Emulsion				
Viscosity @77°F, SES	D244 Emulsified Asphalts	T-59	15	40
Residue, % Wt.	D244 (Mod)[1]	T-59 (Mod)	60	65
Miscibility Test	D244 (Mod)[2]	T-59 (Mod)	No Coagulation	
Sieve Test, % by Wt.	D244 (Mod)[3]	T-59 (Mod)	-	0.1
Particle Charge Test	D244	T-59	Positive	
Percent Light Transmittance	See Note 4.		-	30
Test on Residue from Distillation				
Flash Point, COC, °F	D92 Flash and Fire Points by Cleveland Open Cup	T-48	385	-
Viscosity @ 140°F, cSt	D445 Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)	-	100	200
Asphaltenes, % Wt.	D2006-70 Method of Test for Characteristic Groups in Rubber Extender and Processing Oils by the Precipitation Method (Discontinued 1975)	-	-	1.0
Maltene Distribution Ratio[5]	D2006-70		0.3	0.6
PC/S Ratio[5]	D2006-70	-	0.5	-
Saturated Hydrocarbons, S[5]	D2006-70	-	21	28

1. ASTM D244 Modified Evaporation Test for percent of residue is made by heating 2-ounces sample to 300°F until foaming ceases, then cool immediately and calculate results.
2. Test procedure identical with ASTM D244 except that 0.02 Normal Calcium Chloride solution shall be used in place of distilled water.
3. Test procedure identical with ASTM D244 except that distilled water shall be used in place of two-percent sodium oleate solution.
4. Test according to Attachment "Standard Procedure for Determining Percent Light Transmittance of Maltene Rejuvenator, Restorative Seal, and PCE Material" in TxDOT Special Provision to Item 300 for Maltene Rejuvenator (Waco District).
5. Chemical composition by ASTM Method D2006-70:
   $(PC + A_1) \div (S + A_2)$
   PC=Polar Compounds A_1=First Acidaffins
   A_2= Second Acidaffins S= Saturated Hydrocarbons

302.3.7. Emulsion for In-Place Asphalt Recycling. Emulsion shall be designed to be a recycling agent to be mixed at ambient temperature with existing in-place asphalt, native or selective material and or Recycled Asphalt Pavement (RAP) material. Product shall be a water miscible emulsion. Asphaltene, Resins, Cyclics, Saturates content must be specifically formulated based on laboratory data of existing material in relation to rejuvenation demand and any added RAP material. Product shall meet minimums and fall within the ranges specified in Table 302.3.7.(a) Emulsion Requirements for In-Place Asphalt Recycling.

Table 302.3.7.(a) Emulsion Requirements for In-Place Asphalt Recycling

Properties	Test Methods, Test Parameters	Requirements	
		Min.	Max.
Test on Emulsion			
Viscosity	Saybolt Furol, 122°F	-	185
Sieve %		-	1.0
Particle Charge		Positive	
Specific Gravity @ 77°F		0.910	1.16
Cement Mixing Test	ASTM D244	Passing	
Distillation			
Residue; % from Distillation @ 325°F		60	68
Test on Residue from Distillation			
Penetration, 77°F Extrapolation function		1400	-
Asphaltene, %		3.1	10.1
Resins, % wt.		1.2	8.9
Cyclics		65.0	95.0
Saturates		2.8	18.3
Flash Point C.O.C.		400°F	-

302.4. SECTION HELD FOR FUTURE USE

302.5. STORAGE, HEATING AND APPLICATION TEMPERATURE OF BITUMINOUS MATERIALS

Asphalt materials should be applied at the temperature that provides proper and uniform distribution. Within practical limits, higher temperatures than necessary should be avoided. Satisfactory application should be obtained within the recommended ranges shown in Table 302.5.(a) Requirements for Storage, Heating and Application Temperature. No material shall be heated above the maximum temperature shown. Performance graded asphalt binders containing particulate or polymer modifiers may be susceptible to separation of the modifier. Appropriate circulation or agitation in storage shall be provided if separation of the modifier is expected or suspected, and in every case when the modified binder will be stored at elevated temperatures for more than one day before use.

WARNING TO CONTRACTOR: Attention is called to the fact that asphaltic materials are highly flammable. Heating of asphaltic materials constitutes a fire hazard to various degrees. The utmost care shall be taken to prevent open flames of any kind from coming in contact with the asphaltic material or the gases of same. Proper precautions should be used in all cases. The CONTRACTOR shall be responsible for any fires or accidents which may result from heating the asphaltic materials.

Binder or modifier supplier instructions regarding recommended application and storage temperatures shall supersede the guidelines below.

Table 302.5.(a) Requirements for Storage, Heating and Application Temperature

Material Type-Grade	Application and Mixing		Heating and Storage
	Recommended Range °F	Maximum Allowable °F	Maximum °F
All PG Binders	275-375	375	400
AC-3, 5, 10, 20	275-325	350	400
Emulsions			
SS-1, SS-1h, SS-1P, CSS-1h	50-130	140	140
RS-2, RS-2h, MS-2, CRS2h, CRS-2P, CMS-2, CMS-2s, HFRS-2, HFRS-2P, AES-300	110-160	170	170
PCE, Restorative Seal or Maltene Rejuvenator	Ambient = 72-130	140	140

302.6. EMULSIFIED ASPHALT TREATMENT

302.6.1. Description. Emulsified asphalt treatment shall consist of one or more applications of a mixture of emulsified asphalt of the proportion and type specified on the plans and water. The mixture shall be applied at the rate specified on the plans. It is to be used as a base treatment, earthwork seal, prime coat or dust preventative. This mixture may be applied to the base course, subgrade, shoulders or detours at the locations and to the extent shown on plans or as directed by the OWNER.

302.6.2. Materials. The amount of emulsified asphalt in the mixture, expressed as a percent by volume of the total mixture, shall be within the limits specified on the plans. When tested by approved laboratory methods, the emulsified asphalt used shall meet the requirements of Item 302.3.4. Emulsified Asphalt or Item 302.3.5. Emulsions for Priming, Curing, and Erosion Control (PCE) or Item 302.3.6. Specialty Emulsions.

The water used shall be clear, free from industrial wastes and other objectionable matter.

302.6.3. Construction Methods. Asphalt materials shall be handled in accordance with Item 302.5. Storage, Heating and Application Temperature of Bituminous Materials.

The emulsified asphalt and water mixture shall be applied by a self-propelled sprinkler meeting the requirements of Item 203.6. Dust Control so operated as to uniformly distribute the mixture in the quantity determined by the OWNER.

The emulsion and water may be mixed in the sprinkler tank. The CONTRACTOR shall make suitable provisions for agitating the two materials sufficiently to produce a uniform blend. The sprinkler tank shall have been recently calibrated, and the OWNER shall be furnished an accurate and satisfactory record of such calibration. After beginning the work, should the yield on the emulsion applied appear to be in error, the distributor shall be recalibrated in a manner satisfactory to the OWNER, before proceeding with the work.

302.6.4. Measurement and Payment. Emulsified asphalt shall be measured by the gallon prior to mixing with water. The work performed and the emulsified asphalt furnished as prescribed by this Item and measured as provided in this Item shall be paid for at the unit price bid of the type specified, which price shall be full compensation for furnishing all required materials including mixing water for application; all freight involved; all hauling, mixing, and distributing the mixture as specified; and all manipulation, labor, tools, equipment and incidentals necessary to complete the work.

302.7. PRIME COAT

302.7.1. Description. This Item shall consist of application of asphaltic materials on the completed base course and/or other approved area, which shall be applied in accordance with these specifications and as shown of the plans.

302.7.2. Materials. The asphaltic material used for the prime coat shall be of the type and grade as stated in the contract and when tested by approved laboratory methods shall meet the requirements of Item 302.3.4. Emulsified Asphalt or Item 302.3.5. Emulsions for Priming, Curing, and Erosion Control (PCE) or Item 302.3.6. Specialty Emulsions.

302.7.3. Equipment. All storage tanks, piping, retorts, booster tanks and distributors used in storing and handling asphaltic material shall be kept clean and in good condition at all times. Equipment shall be operated in such a manner that there shall be no contamination of the asphaltic material with foreign material. It shall be the responsibility of the CONTRACTOR to provide and maintain in good working order a recording thermometer at the storage heating unit at all times. The distributor shall have been recently calibrated and the OWNER shall be furnished an accurate and satisfactory record of such calibration. After beginning the work, should the yield on the asphaltic material applied appear to be in error, the distributor shall be recalibrated in a manner satisfactory to the OWNER before proceeding with the work.

302.7.4. Construction Methods. Asphalt materials shall be handled in accordance with Item 302.5. Storage, Heating and Application Temperature of Bituminous Materials.

Prime coat shall not be applied when the air temperature is below 50°F and falling, but it may be applied when the air temperature is above 40°F and rising, the air temperature being taken in the shade and away from artificial heat. Asphaltic material shall not be placed when general weather conditions, in the opinion of the OWNER, are not suitable.

When, in the opinion of the OWNER, the base is thoroughly dry and is satisfactory to receive the prime coat, the surface shall be cleaned by sweeping or other methods approved by the OWNER. The asphaltic material shall be applied to the cleaned base at the approximate rate of 0.15- to 0.25-gallons-per-square-yard of surface area. The application shall be made with an approved type of self-propelled pressure distributor so constructed and operated as to distribute the material evenly and smoothly in the quantity specified or directed. The CONTRACTOR shall provide all necessary facilities for determining the temperature of the asphaltic material in all of the heating equipment and in the distribution, for determining the rate at which it is applied, and for securing uniformity at the junction of two distributor loads.

The OWNER shall select the temperature of application within the limits recommended in Item 302.5. Storage, Heating and Application Temperature of Bituminous Materials based on the temperature-viscosity relationship that shall permit application of the asphalt. The CONTRACTOR shall apply the asphalt at a temperature within 15°F of the temperature selected.

No traffic, hauling or placing of subsequent courses shall be permitted over the freshly applied prime coat until authorized by the OWNER.

The CONTRACTOR shall be responsible for the maintenance of the surface until the work is accepted by the OWNER.

302.7.5. Measurement and Payment. The asphaltic material for prime coat will be measured at the point of delivery on the road in gallons at the applied temperature. The quantity to be measured for payment shall be the number of gallons used, as directed, of the specified prime coat.

The work performed and materials furnished in accordance with this Item and measured as provided will be paid for at the unit prices bid for "Asphaltic Material," of the type and grade specified. Price shall be full compensation for cleaning the area to be primed; for furnishing, preparing, hauling and placing all required materials; for all freight and heating involved; for spreading, dragging, brooming, finishing and maintaining under traffic until accepted; and for all manipulation, labor, tools, equipment and incidentals necessary to complete the work.

302.8. ASPHALT BASE COURSE

302.8.1. Description. Asphalt base course shall consist of a compact mixture of mineral aggregates and asphaltic material mixed hot in a mixing plant. It may be a base course, subbase course, or foundation course. It is made of larger aggregate than Hot-Mix Coarse Base (A) as shown in Table 302.9.3.(a) Dense Graded Hot Mix Master Grading.

302.8.2. Materials.

302.8.2.1. Asphaltic Cement. Asphalt for the mixture shall be of the types of asphalt cement as determined by the OWNER and shall meet the requirements of Item 302.3.2. Performance-Graded (PG) Asphalt Binders or Item 302.3.3. Asphalt Cement. The grade of asphalt to be used shall be determined by the OWNER after design tests have been made using the mineral aggregate approved for use in the construction. If more than one type of asphaltic cement mixture is specified for the project, only one grade of asphalt shall be required for all types of mixture unless otherwise shown on the plans. The

CONTRACTOR shall notify the OWNER of the source of asphaltic material prior to production of the asphaltic mixture, and this source shall not be changed during the course of the project, except by written permission of the OWNER.

302.8.2.2. Tack Coat. The liquid asphalt material used for tack coat should be MS-2 or SS-1 in Item 302.3.4. Emulsified Asphalt, Restorative Seal in Item 302.3.6. Specialty Emulsions or one of the other various grades of materials (selected by the OWNER) listed under Item 302.3.4. Emulsified Asphalt.

302.8.2.3. Mineral Aggregate. The material shall be crushed and screened as necessary to meet the requirements hereinafter specified and shall consist of durable coarse aggregate particles mixed with approved binding materials.

Unless otherwise specified, the grading of the mineral aggregate shall conform to the limitations as shown in Table 302.8.2.3.(a) Asphalt Base Course Aggregate Grades.

Table 302.8.2.3.(a) Asphalt Base Course Aggregate Grades

Sieve Size	Grade			
	1	2	3	4
1 3/4-inch		100.0	100.0	As Shown on Plans
1 1/2-inch	100.0	90.0-100.0		
1-inch	90.0-100.0			
3/8-in.	45.0-70.0			
No. 4	30.0-55.0	25.0-55.0		
No. 40	15.0-30.0	15.0-40.0	15.0-40.0	

Testing of the mineral aggregate shall be in accordance with the test methods in Table 302.8.2.3.(b) Aggregate Tests.

Table 302.8.2.3.(b) Aggregate Tests

Property	Test
Preparation of Soil Constants	Tex-101-E Preparing Soil and Flexible Base Materials for Testing
Liquid Limit	ASTM D4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils
Plastic Limit	ASTM D4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils
Plasticity Index	ASTM D4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils
Sieve Analysis	ASTM C136 Sieve Analysis of Fine and Coarse Aggregates
Wet Ball Mill	Tex-116-E Ball Mill Method for Determining the Disintegration of Flexible Base Material
Sand Equivalent	ASTM D2419 Sand Equivalent Value of Soils and Fine Aggregate

Unless otherwise specified on the plans, the mineral aggregate for Grades 1, 2 and 3 shall meet the limits of Table 302.8.2.3.(c) Aggregate Physical Requirements. Mineral aggregate for Grade 4 shall meet the physical requirements shown on the plans.

Table 302.8.2.3.(c) Aggregate Physical Requirements

Property	Limit
Wet Ball Mill	50 Max.
Plasticity Index	15 Max.
Liquid Limit	40 Max.
Sand equivalent	≥ 40

302.8.3. Construction Methods. Asphalt materials shall be handled in accordance with Item 302.5. Storage, Heating and Application Temperature of Bituminous Materials.

Mixing plants may be either the weight-batching type plant, the continuous mixing type plant, or the drum mixing type plant as described in Item 302.9.5. Mixing Plants except that requirements for Type "B" and "D" mixtures of fine graded surface course are deleted.

Equipment for storage, weighing and heating of materials shall be as described in Item 302.9.4. Equipment.

The OWNER shall designate the asphalt content to be used in the mixture after design tests have been made with the aggregates to be used in the project. When tests as determined by the OWNER are made, samples of the mixture shall not vary from the asphalt content designated by the OWNER by more than 0.5-percent dry weight (based on total mixture). The asphaltic material will form typically 4- to 9-percent of the mixture by weight.

The mixture shall consist of a uniform mixture of mineral aggregates and asphaltic material.

The asphaltic mixtures for the weight-batching type plant and from the continuous mixing type plant, when tested in accordance with the current methods outlined in TxDOT Test Method Tex-208-F Test for Stabilometer Value of Bituminous Mixtures (Part I or Part III as applicable), shall have laboratory density and stability as indicated in Table 302.8.3.(a) Stability of Asphalt Base Course. If the mixture produced does not have the specified qualities, the mixture shall be changed until it conforms to the specified qualities.

Table 302.8.3.(a) Stability of Asphalt Base Course

Property	Value
Density (%)	96 ±2
Stability (%) Hveem Stabilometer	Not less than 40 except when otherwise shown on the plans

302.8.4. Measurement and Payment. Asphalt base course shall be measured and paid for in accordance with Item 302.10. Measurement and Payment.

302.9. HOT-MIX ASPHALT PAVEMENT

302.9.1. Description. This Item shall govern pavement consisting of a binder course, a leveling up course, a surface course or any combination of these courses as shown on the plans. Each course shall be composed of a compacted mixture of mineral aggregate and asphaltic material mixed hot in a mixing plant; and shall be constructed on the previously completed and approved subgrade, subbase course, base course, existing pavement, or in the case of a bridge, on the prepared floor slab, all in accordance with these specifications and in conformity with the lines, grades, quantities and typical sections as stated in the contract, plans and/or established in the field by the OWNER.

302.9.2. Materials. The materials proposed to be used may be inspected and tested at any time during the preparation of the work.

302.9.2.1. Aggregates. Mineral aggregates shall consist of a fine aggregate, coarse aggregate and, when required, a mineral filler all in accordance with Item 302.2. Aggregates for Hot-Mix Asphalt Pavement and approved by the OWNER. Representative samples of the materials proposed to be used in the mixture shall be submitted for tests in the quantities required by the OWNER. No material that has in any way become unfit for use after approval shall be used in the work. Approval of both the materials and sources of supply must be obtained from the OWNER prior to delivery of the material.

302.9.2.2. Asphaltic Materials. Material shall conform to the applicable paragraphs of Item 302.3. Bituminous Materials. Only one grade of asphalt shall be required for all the types of mixtures unless otherwise shown on the plans or required by the OWNER.

302.9.2.2.1. Paving Mixture. Asphaltic materials for the paving mixture shall be the type and grade specified, shown on the plans, or as designated by the OWNER after design tests have been made, using the mineral aggregates proposed to be used in the mixture, and shall meet the requirements of Item 302.3.2. Performance Graded (PG) Asphalt Binders or Item 302.3.3. Asphalt Cement. If more than one type of asphaltic pavement mixture is specified for the project, only one grade of asphalt

shall be required for all types of mixtures, unless otherwise shown on the plans. The CONTRACTOR shall notify the OWNER of the source of asphaltic material prior to production of the asphaltic mixture and prior to the paving of this course of the project except on written permission of the OWNER.

302.9.2.2.2. Prime Coat. Prime coat shall conform to the provisions of Item 302.7. Prime Coat.

302.9.2.2.3. Track Coat. The liquid asphalt material used for tack coat should be MS-2 or SS-1 in Item 302.3.4. Emulsified Asphalt, restorative seal in Item 302.3.6. Specialty Emulsions or one of the other various grades of materials (selected by the OWNER) listed under Item 302.3.4. Emulsified Asphalt.

302.9.3. Paving Mixture. The paving mixture shall consist of a uniform mixture of coarse aggregate, fine aggregate, mineral filler, when required, and asphaltic material, accurately proportioned by weight. The grading of each constituent shall be such as to produce, when properly proportioned, a mixture conforming to the following limitations for grading the type specified. The exact proportions of each constituent producing the total aggregate within these limits shall be as directed by the OWNER, and when tested by standard laboratory methods, the mixture shall meet the requirements listed in Tables 302.9.3.(a) through (f). The OWNER shall specify or approve a mixture within the specified limits for all types of mixtures, which shall be suitable for the work in which the asphaltic pavement shall be used. The percentages of asphalt shall not vary more than 0.4-percent from the proportions established by the OWNER.

Table 302.9.3.(a) Dense Graded Hot Mix[1] Master Grading

Sieve Size	Type of Mixture						
	A Coarse Base	B Fine Base	C Coarse Surface	D Fine Surface	F Fine Mixture	CMHB – C Coarse Surface	CMHB – F Fine Surface
	Percent Passing by Weight						
1½"	100						
1¼"	95-100						
1"		100					
⅞"	70-90	95-100	100			98 –100	
⅝"		75-95	95-100			95 –100	
½"	50-70			100			98 –100
⅜"		60-80	70-85	85-100	100	50-70	85 - 100
¼"					95-100		
No. 4	30-50	40-60	43-63	50-70		30 - 45	40 - 60
No. 10	20-34	27-40	30-40	32-42	32-42	15 - 25	15 - 25
No. 40	5-20	10-25	10-25	11-26	9-24	6 – 20	6 – 20
No. 80	2-12	3-13	3-13	4-14	3-13	6 – 18	6 – 18
No. 200	2 - 8	2 - 8	2 - 8	2 - 8	2 - 8	5 - 8	5 - 8
VMA % minimum	11	12	13	14	15	14	15

1. These mixtures shall be designed using a Texas Gyratory Compactor (TGC) and in accordance with Test Method Tex-204-F Design of Bituminous Mixtures. Design must be researched and based on intended use.

Table 302.9.3.(b) Superpave Hot Mix[1] Master Grading

Sieve Size, inches (centimeters)	Nominal Maximum Aggregate Size, inches (centimeters)				
	1½ (3.81)	1 (2.54)	¾ (1.90)	½ (1.27)	⅜ (0.95)
	Coarse Base	Fine Base	Coarse Surface	Fine Surface	Fine Mixture
	Percent Passing By Weight				
2 (5.08)	100.0				
1½ (3.81)	90.0 – 100.0	100.0			
1 (2.54)		90.0 – 100.0	100.0		
¾ (1.90)			90.0 – 100.0	100.0	
½ (1.27)				90.0 – 100.0	100.0
⅜ (0.95)					90.0 – 100.0
No. 4					
No. 8	15.0 - 41.0	19.0 – 45.0	23.0 - 49.0	28.0 – 58.0	32.0 – 67.0
No. 16					
No. 30					
No. 50					
No. 100					
No. 200	0.0–6.0	1.0 – 7.0	2.8 - 8.0	2.0 - 10.0	2.0 – 10.0
VMA % minimum	11	12	13	14	15

1. These mixtures shall be designed using a Superpave Gyratory Compactor (SGC) and in accordance with the AASHTO Standard Practice for Designing Superpave Hot Mix Asphalt (PP28-99). Design must be researched and based on intended use.

Table 302.9.3.(c) Superpave – Plant Produced Mixture Requirements

VMA (MIN)	VFA	Dust/Asphalt Ratio
11.0%	64 – 77 %	0.6 – 1.8 %
12.0%	67 – 77 %	0.6 – 1.6 %
13.0%	69 – 80 %	0.6 – 1.6 %
14.0%	71 – 80 %	0.6 – 1.6 %
15.0%	73 – 80 %	0.6 – 1.6 %

Table 302.9.3.(d) Cellulose Modified Mixtures[1] Master Grading

Sieve Size	Stone Mastic Asphalt (SMA)		Permeable Friction Course (PFC)	
	¾"	½"	½"	½" Modified
	Coarse Surface	Fine Surface	Coarse Surface	Fine Surface
	Percent Passing By Weight			
¾"	100.0			
½"	99.0-100.0	100.0	90.0-100.0	85.0-100.0
⅜"	70.0-85.0	70.0-90.0	35.0-60.0	55.0-75.0
No. 4	30.0-42.0	30.0-50.0	10.0-25.0	15.0-25.0
No. 8	20.0-33.0	20.0-30.0	5.0-10.0	5.0-10.0
No. 16		21.0 max		
No. 30		18.0 max		
No. 50		15.0 max		
No. 100				
No. 200	8.0-11.0	8.0-12.0	1.0 - 4.0	2.0 - 4.0

1. These mixtures shall be designed using a Superpave Gyratory Compactor (SGC) and in accordance with the AASHTO Standard Practice for Designing Superpave Hot Mix Asphalt (PP28-99). Design must be researched and based on intended use.

Table 302.9.3.(e) Cellulose Modified Mixture Properties

Property	Requirements	
	Stone Mastic Asphalt (SMA)	Permeable Friction Course (PFC)
Air Voids, %	4.0 (Lab Molded)	20.0 Min. (Lab Molded)
Cellulose Fibers, %	0.4	0.4
VMA, Percent (Min.)	17.0 (Plant); 17.5 (Design)	
VCA[1] (Mix), Percent	Less Than VCA (DRC)	
TSR, Percent	80.0 Min. (Tex-531-C)	
Draindown @ Production Temp., %	0.30 Max. (T305)	0.30 Max. (T305)
Asphalt Content, Percent	6.0 Min.	6.0 Min.
N(Des)	100	20

1. See NCHRP Report 425 for definition and calculation of VCA (Voids in Coarse Aggregate).

302.9.3.1. Extraction Test. When required by the OWNER, samples of the asphaltic mixture may be taken from the plant, trucks or finished pavement for check tests. The minimum weight of the test specimen in grams shall be 3000 times the maximum size of aggregate in inches, and when tested in accordance with Recovery of Asphalt from Solution by Abson Method and Quantitative Extraction of Bitumen from Bituminous Paving Mixtures, ASTM Designations D1856 and D2172, respectively, it shall not vary from the grading proportions specified for the mixture being used by more than 5-percent.

302.9.3.2. Stability. The asphaltic mixture from the weight-batching plant and from the continuous mixing type plant, when tested in accordance with the current methods outlined in the TxDOT Test Method Tex-208-F Test for Stabilometer Value of Bituminous Mixtures, shall have the laboratory density and stability indicated in Table 302.9.3.(f) Asphalt Pavement Mixture Stability. If the mixture produced does not have the specified qualities, the mixture shall be changed until it conforms to the specified qualities.

Table 302.9.3.(f) Asphalt Pavement Mixture Stability

Property	Value
Density (%)	96 ±1
Stability (%) Hveem Stabilometer	Unless otherwise shown on the plans, Not less than 40 applied on arterials with truck traffic, and Not less than 35 for residential applications

302.9.4. Equipment. All equipment necessary for the construction of the hot-mix asphalt pavement shall be on the project and shall be approved by the OWNER as to condition before the CONTRACTOR shall be permitted to begin construction operations on which the equipment is to be used. All equipment shall be maintained in good repair and operating condition.

302.9.4.1. Bins. Bin storage shall be provided with tight cut-off gates to prevent leakage of aggregates or mineral filler into the weight box. The weight box for aggregates shall be of sufficient capacity to hold a complete batch of aggregates and mineral filler without wasting or leveling and shall be so designed that it shall quickly discharge the entire batch into the mixer. The weight box shall be provided with a close fitting and quick operating cut-off gate so that there shall be no leakage of the aggregates into the mixer and shall be satisfactorily attached to the batching scales.

302.9.4.2. Scales. Scales used for weighing different grades of mineral aggregates may be either the springless dial type or the multi-beam type. All scales must be a tare beam for balancing. The beam scales must also be equipped with a telltale indicator of the springless dial type indicating over-and-under loads of at least 50-pounds. Scales shall be accurate within 4-pounds-per-1000-pounds. If plant vibration interferes with accurate weighing, the scales shall be insulated against shock or vibration.

302.9.4.3. Material Bucket. The asphaltic material bucket shall be of sufficient size to hold the necessary asphaltic material for one batch. If the material is measured by weight, the bucket shall be properly attached to the scales herein specified. If the proportioning is by volume based on weight, the measuring bucket used shall be of the overflow type and shall meet the requirements of the OWNER.

302.9.4.4. Asphalt Storage. Asphalt storage shall be sufficient to meet the requirements of the plant. Asphalt in storage shall be heated by steam coils, absolutely tight to prevent leakage of moisture into the asphalt; the steam for heating shall not be at a temperature in excess of 400°F; direct fire heating of the asphalt shall not be permitted. Agitating asphalt with steam or air shall not be permitted.

302.9.4.5. Steam Heating Systems. The steam heating system shall insure the maintaining of the asphalt at a uniform draw-off temperature at the asphalt bucket of between 275°F and 375°F. The temperature shall be maintained with an efficient positive control of heat at all times as directed or approved by the OWNER. Asphalt heated beyond 375°F either before or during mixing with the mineral aggregate shall be rejected. The draw-off at the asphalt bucket shall be of a quick cut-off type which shall not leak. The asphalt supply line shall be of circulating type, and equipped with a recording thermometer indicating the temperature of the asphalt at the draw-off valve. This thermometer may be combined with the one used in recording the temperature of the aggregate.

302.9.4.6. Weight Bucket. The asphalt weight bucket shall be of an approved type. The scales of weighing the asphalt shall be either the springless dial type or the multi-beam type. The dial type shall be arranged for rapid adjustment at zero and shall be provided with a pointer to indicate the weight of the asphalt required in one batch. The beam type shall have a tare beam for balancing and shall be equipped with a telltale indicator of the springless dial type. If plant vibration interferes with accurate weighing, the scales shall be insulated against shock or vibration. The asphalt shall be sprayed into the mixer through an approved spray bar that shall distribute the asphalt uniformly throughout the length of the mixer.

302.9.4.7. Mixer. The mixer shall be of the pugmill type and shall have a capacity of not less than 1,000-pounds in a single batch. The number of blades and their positions shall give a uniform and complete circulation of the batch. A mixer that segregates mineral aggregate or fails to secure a thorough and uniform mixing with the asphalt and mineral filler shall not be permitted to be used. The

adequacy of the mixer to produce a successful mix shall be determined by mixing the standard batch for the required time, then dumping the batch, and taking samples from different parts of the batch; the samples shall be tested by the extraction test and shall show that the batch is uniform throughout.

All mixers shall be provided with an automatic time lock on the discharge gates of the mixer and the weigh box; and shall be locked for a period of 45-seconds after all the mineral aggregates have been introduced into the mixer. When discharged, the mixture shall have a temperature of 225°F to 350°F. The dump doors of the mixer shall be tight to the dry mineral aggregate or dust so that there shall be no spilling from the pugmill or drum. In introducing the batch into the mixer, all mineral aggregates shall first be introduced. Aggregates shall be thoroughly mixed for a period of 5- to 10-seconds before the asphalt is added; then the total mixture shall be mixed for the time required to produce a homogeneous mixture, in which all particles of the aggregates are uniformly coated.

302.9.4.8. Spreading and Finishing Machine. The spreading and finishing machine shall be of a type approved by the OWNER and capable of producing a surface that shall meet the requirements of the typical cross section and surface test.

302.9.4.9. Rollers. Rollers shall meet the governing specifications for Item 301.1.2. Rolling of Embankment, Subgrade or Flexible Base. The use of vibratory roller on overlay thickness less than 1.5 inches will not be permitted.

302.9.4.10. Straightedges. The CONTRACTOR shall provide acceptable 16-ft. straightedges for the surface testing. Satisfactory templates shall be provided as required by the OWNER.

302.9.4.11. Vehicles for Transporting Mixture. Asphaltic concrete shall be transported from the plant to the site of the work in tight vehicles with metal bottoms previously cleaned of all foregoing substances. The OWNER may require that the vehicles be suitably insulated, and each load shall be covered with canvas or other suitable material of sufficient size to protect the asphaltic concrete from the weather and to prevent loss of material.

302.9.5. Mixing Plants. Mixing plants may be either the weight-batching plant, the continuous mixing type plant or the drum mixing type plant as hereinafter described. All types of plants shall be equipped with satisfactory conveyors, power units, aggregates handling equipment, hot-aggregates screens and bins and dust collectors.

Temporary storing or holding of the asphaltic mixture by a surge-storage system is permitted during the normal day's operation. Overnight storage shall not be permitted.

302.9.5.1. Weight Batching Plant. The proportioning of the various materials entering into the asphaltic mixture shall be as approved or directed by the OWNER. The OWNER shall have access at all times to all parts of the paving plant. The plant shall be of the batch type provided with separate storage bins and chambers for heating and mixing the materials.

The various sizes of mineral aggregates as received shall be stored or stockpiled separately, and the feeding of all sizes of mineral aggregates to the dryer shall be done by mechanical means that shall give a uniform and continuous feed to each of the sizes incorporated in order to give a control of the temperature and grading of the mineral aggregates.

The drying of the mineral aggregates shall be done in such a manner that the finer particles shall not escape with the furnace gases. If forced draft is used, a dust collector system shall be installed. If natural draft is used, the OWNER may require a dust collector system to prevent loss of the finer particles. The aggregate shall be heated in a suitable apparatus that continuously agitates the aggregate during the heating and in which the temperature can be efficiently and positively controlled so that the aggregates shall not be damaged and the mixture produced shall have a temperature between 225°F and 350°F.

A recording thermometer shall be provided which shall record the temperature of the aggregates as they leave the dryer. The recording thermometer shall be provided with a 24-hour chart and may be so equipped that it shall record both the temperature of the aggregates and the temperature of the asphalt incorporated into the batch. The drying apparatus shall be of sufficient size to dry and heat the amount of aggregates required to maintain the plant in continuous operation.

The screening capacity and size of the bins shall be sufficient to screen and store the amount of aggregates required to properly operate the plant and keep the plant in continuous operation at full capacity. Provisions shall be made to enable inspection forces to have easy and safe access to the proper location on the mixing plant where representative samples may be taken from the hot bins for testing. The aggregates shall be separated into at least four bins when producing Type "B" mixtures and at least three bins when producing Type "D" mixtures. If mineral filler is needed, an additional bin shall be provided. These bins shall contain the sizes of aggregates as shown in Table 302.9.3.(a) Dense Graded Hot Mix Master Grading.

302.9.5.2. Continuous Mixing Plant. Cold-aggregates bin and proportioning devices, dryer, and screening and proportioning shall conform to the requirements hereinabove for the weight-batching type of plant. The hot-aggregates proportioning device shall be so designed that when properly operated, a uniform and continuous flow of aggregates into the mixer shall be maintained.

An accurate asphaltic material meter shall be installed in the asphalt line leading to the spray bar, so that the amount of asphalt being used can be accurately determined. The asphaltic material spray bar shall be so designed that the asphalt shall be uniformly and continuously sprayed into the mixture.

The mixer shall be of the pugmill continuous type and shall have a capacity of not less than 40-tons-per-hour of mixture. Any mixer that segregates the aggregates or fails to secure a through and uniform mixing of the aggregates or fails to secure a thorough and uniform mixing of the aggregates with the asphaltic material shall not be used. This shall be determined by taking samples from different parts of a truckload and testing by the extraction test. These tests must show that the load is uniform throughout.

The amount of aggregates and asphaltic material entering the mixer and the rate of travel through the mixer shall be so coordinated that a uniform mixture of the specified grading and asphalt content shall be produced. The mixture shall not vary from the specified mixture by more than the specified tolerances.

The asphaltic mixture shall be at a temperature of between 225°F and 350°F when dumped from the mixer. The OWNER shall determine the lowest temperature, within the above limitations, at which the material can be satisfactorily dried, mixed, transported, spread and compacted, and the mixture furnished by the CONTRACTOR shall be between this determined temperature and 30°F higher.

302.9.5.3. Drum Mixing Plant. The plant shall be adequately designed and constructed for the process of mixing aggregates and asphalt in the drum mixer. The plant shall be equipped with satisfactory conveyors, power units, aggregates-handling equipment, and feed controls and shall consist of the following essential pieces of equipment.

The number of compartments in the cold-aggregates bin shall be equal to or greater than the number of stockpiles of individual materials to be used. The bin shall be of sufficient size to store the amount of aggregates required to keep the plant in continuous operation and of proper design to prevent overflow of material from one compartment to another. The feed system shall provide a uniform and continuous flow of aggregates in the desired proportion to the drum mixer.

A surge-storage system shall be required. It shall be adequate to minimize the production interruptions during the normal day's operations and shall be constructed to minimize segregation. A device such as gob hopper or other similar device approved by the OWNER to prevent segregation in the surge-storage bin shall be required.

The system shall provide positive weight measurement of the combined cold-aggregates feed by use of belt scales or other approved devices. Provisions of a permanent nature shall be made for checking the accuracy of the measuring device as required by Item 302.9.4. Equipment. When a belt scale is used, mixture production shall be maintained so that the scale normally operates between 50-percent and 100-percent of its rated capacity. Belt scale operation below 50-percent of the rated capacity may be allowed by the OWNER if accuracy checks show the scale to meet the requirements of Item 302.9.4. Equipment at the selected rate, and it can be satisfactorily demonstrated to the OWNER that the mixture uniformity and quality have not been adversely affected.

An asphaltic material measuring device meeting the requirements of Item 302.9.4. Equipment shall be placed in the asphalt line leading to the drum mixer so that the cumulative amount of asphalt used can be accurately determined. Provisions of a permanent nature shall be made for checking the accuracy of measuring device output. The asphalt measuring device and line to the measuring device shall be protected with a jacket of hot oil or other approved means to maintain the temperature of the line and measuring device near the temperature specified for the asphaltic material. Unless otherwise shown on the plans, the temperature of the asphaltic material entering the measuring device shall be maintained at ±10°F of the temperature at which the asphalt measuring device was calibrated and set.

The asphaltic material feed-control shall be coupled with the total aggregate weight measuring device in such manner as to automatically vary the asphalt-feed rate as required to maintain the required proportion. A scalping screen shall be required, unless otherwise shown on the plans, and shall be located ahead of any weighing device.

The asphaltic mixture shall be at a temperature of between 225°F and 350°F when dumped from the mixer. The OWNER shall determine the lowest temperature, within the above limitations, at which the material can be satisfactorily dried, mixed, transported, spread and compacted, and the mixture furnished by the CONTRACTOR shall be between this lowest determined temperature and 30°F higher. The drum mix system shall be of the type that continually agitates the aggregates and asphalt mixture during heating and in which the temperature can be so controlled that aggregates and asphalt shall not be damaged in the necessary drying and heating operations required to obtain a mixture of the specified temperature. A continuously recording thermometer shall be provided which shall indicate the temperature of the mixture as it leaves the drum mixer.

Scales may be standard platform truck scales, belt scales or other equipment such as weigh hopper (suspended) scales approved by the OWNER. All scales shall conform to Item 302.9.4. Equipment. If truck scales are used, they shall be placed at a location approved by the OWNER. If other weighing equipment is used, the OWNER may require weight checks by truck scales for the basis of approval of the equipment.

302.9.5.4. Special Instructions for Cellulose Fiber. A separate dry storage area or silo shall be required for cellulose fiber. All equipment used in the storage and handling of cellulose fibers shall be kept a clean condition at all times and shall be operated in such a manner that there will be no contamination with foreign matter.

Cellulose fibers shall be added at 0.3% ±0.1% by mass of the mixture. Drainage shall be tested according to Tex-235-F Determination of Draindown Characteristics in Bituminous Materials. Draindown shall not exceed 0.3%-per-hour.

The cellulose fiber feed system shall supply the proper amount of cellulose fiber to the weigh box. Feeding of the cellulose fiber shall be performed in a manner such that the fibers are not damaged during the feeding and mixing processes and in a manner such that a uniform and constant flow of materials in the required proportions is maintained. The cellulose fiber storage capacity shall be ample to meet the requirements of the plant. Cellulose fiber shall not be allowed in the hot bins.

Mixing system shall control temperature so that the cellulose fiber will not be damaged in drying, heating and mixing operations.

302.9.5.4.1. Weight Batching Plant. Cellulose fiber shall be introduced into the pugmill during the dry mixing of the aggregates, prior to injection of the asphalt.

In introducing the batch into the mixer, all aggregates and then all cellulose fiber shall be introduced first and shall be mixed thoroughly for a minimum period of 5-seconds to uniformly distribute the various sizes of the aggregate and cellulose fiber throughout the batch before asphaltic material is added. The asphaltic material shall then be added and the mixing continued for a wet mixing period of not less than 15-seconds. The mixing period shall be increased if, in the opinion of the Engineer, the mixture is not uniform or the aggregates are not properly coated.

302.9.5.4.2. Continuous Mixing Plant. The mixing requirements shall be the same as is required for a standard Weigh-Batch Plant.

302.9.5.4.3. Drum-Mix Plant. Cellulose fiber shall be added to the mixture during the dry mixing process, unless otherwise approved by the Engineer. Cellulose fiber shall be uniformly dispersed in the mixture. Engineer may require that fiber be introduced into the drum dryer at the recycle port by use of a vane feeder.

The amount of aggregate, cellulose fiber and asphaltic material entering the mixer and the rate of travel through the mixing unit shall be so coordinated that a uniform mixture of the specified grading, cellulose fiber content and asphalt content is produced.

302.9.6. Construction Methods. Asphalt materials shall be handled in accordance with Item 302.5. Storage, Heating and Application Temperature of Bituminous Materials.

The prime coat, tack coat or the asphaltic mixture shall not be placed when the air temperature is below 50°F and is falling but may be placed when the air temperature is above 40°F and is rising, the temperature being taken in the shade and away from artificial heat; with the provision that the asphaltic mixture shall be placed only when the humidity, general weather conditions and temperature and moisture condition of the base, in the opinion of the OWNER, are suitable. Mat thickness of 2 inches and less shall not be placed when the temperature of the surface on which the mat is to be placed is below 50°F.

302.9.6.1. Prime Coat. If required, a prime coat shall be applied to the completed subgrade, subbase or base, in accordance with Item 302.7. Prime Coat. The type and grade of asphaltic material and the application rate shall be as shown on the plans or as directed by the OWNER.

302.9.6.2. Tack Coat. A tack coat shall be applied when the surface to be paved is Portland cement concrete, brick or asphaltic pavement. When a tack coat is required, it shall consist of an application of the asphaltic material indicated and shall be at the rate specified on the plans or as directed by the OWNER, but not to exceed 0.10 gallons-per-square-yard of surface area. The surfaces of curbs, gutters, vertical faces of existing pavements and all structures in actual contact with asphaltic mixes shall be painted with a thin, complete coating of asphaltic material to provide a closely bonded, watertight joint.

302.9.6.3. Compacted Thickness of Hot-Mix Asphalt Pavement Surface Courses and Base Courses.

302.9.6.3.1. Base Courses. The compacted thickness or depth of each base course shall be as shown on the plans. Where the plans require a depth or thickness of the course greater than 4-in., same shall be accomplished by constructing multiple lifts of approximately equal depth, each of which shall not exceed 4-in. compacted depth. If, in the opinion of the OWNER, an additional tack coat is considered necessary between any of the multiple lifts, it shall be applied as in Item 302.9.6.2. Tack Coat and at the rate as directed.

302.9.6.3.2. Surface Courses. The compacted thickness or depth of the asphalt pavement surface course shall be as shown on the plans. Where the plans require a depth or thickness of the surface course greater than 2-in. compacted depth, same shall be placed in multiple courses of equal depth, each of which shall not exceed 2-in. compacted depth. If, in the opinion of the OWNER, an additional tack coat is considered necessary between any of the multiple courses, it shall be applied as in Item 302.9.6.2. Tack Coat and at the rate as directed.

302.9.6.4. Transporting Hot-Mix Asphalt Pavement Material. The mixture shall be hauled to the job site in tight vehicles previously cleaned of all foreign material. The dispatching of vehicles shall be arranged so that all material delivered shall be placed and all rolling shall be completed during daylight hours. In cool weather, or for long hauls, canvas covers may be required. The inside of the truck body may be given a light coating of an approved release agent, if necessary, to prevent the mixture from adhering to the body.

302.9.6.5. Temperature. The hot-mix asphalt mixture shall be at a temperature between 275° and 350°F when dumped from the mixer. The OWNER shall determine the temperature, within the above limitations. The mixture when dumped from the mixer shall not vary from this selected temperature more than 30°F. Restrictions on maximum mixture temperatures placed by environmental regulatory agencies supersede the maximum temperature listed above.

302.9.6.6. Placing. The hot-mix asphalt mixture shall be placed on the approved base course with the specified spreading and finishing machine in such manner that, when properly compacted, the finished course shall comply with the maximum thickness requirements, be smooth and of uniform density, and meet the requirements of the typical cross sections and the surface test. During the placing and spreading of the hot-mix asphalt material, care shall be taken to prevent the spilling of the material onto adjacent pavement, gutters or structures.

302.9.6.7. Compaction. Rolling with a tandem or vibratory roller shall start longitudinally at the sides and proceed toward the center of the surface course, overlapping on successive trips by at least half the width of the rear wheels. Alternate trips of the roller shall be slightly different in length. Rolling with the pneumatic tire roller shall be done as directed by the OWNER. Rolling shall continue until no further compression can be obtained and all roller marks are eliminated. The motion of the rollers shall be slow enough at all times to avoid displacement of the asphaltic surface material. If displacement should occur, it shall be corrected at once by the use of rakes and fresh asphaltic mixtures where required. The roller shall not be allowed to stand on the surface course when it has not been fully compacted and allowed to cool. To prevent adhesion of the surface course to the roller, the wheels shall be kept thoroughly moistened with water, but an excess of water shall not be permitted. All rollers must be in good mechanical condition. All necessary precautions shall be taken to prevent the dripping of gasoline, oil, grease or other foreign matter on the surface course while the rollers are in motion or when standing. In areas where the surface course cannot be compacted with the rollers, hand tamps, lightly oiled, shall be used to secure the required compaction.

Each course, after final compaction, shall have a relative density of not less than 92-percent. The relative density will be determined using Tex-207-F Determining Density of Compacted Bituminous Mixtures and Tex-227-F Theoretical Maximum Specific Gravity of Bituminous Mixtures.

302.9.6.8. Surface Tests. The finished surface of the pavement after compression shall be smooth and true to the established line, grade and cross section. When tested with a 16-ft. straightedge placed parallel to the centerline of the roadway, the finished surface shall have no deviation in excess of $^{1}/_{16}$-in-per-foot from the nearest point of contact. The maximum ordinate measured from the face of the straightedge shall not exceed ¼-in. at any point. Any point in the pavement surface not meeting these requirements shall be immediately corrected.

302.9.6.9. Pavement Thickness Test. Upon completion of the work and before final acceptance and final payment shall be made, pavement thickness test shall be made by the OWNER or its authorized representative unless otherwise specified in the special provisions or in the plans. The number and location of tests shall be at the discretion of the OWNER. The cost for the initial pavement thickness test shall be at the expense of the OWNER. In the event a deficiency in thickness of pavement is revealed during normal testing operations, subsequent tests necessary to isolate the deficiency shall be at the CONTRACTOR'S expense. The cost for the additional coring test shall be at the same rate charged by commercial laboratories.

302.10. MEASUREMENT AND PAYMENT

Prime coat and tack coat shall not be measured for direct payment but shall be considered as subsidiary work pertaining to the placing of hot-mix asphalt mixtures of the type specified.

Hot-mix asphalt pavement material shall be measured complete in place by the ton (2,000-lb.) computed at 110-lb. per S.Y. surface area per inch thickness of course, or by the S.Y. of the type(s) and grade(s) used in the completed and accepted work. Weight shall be determined by a certified scale approved by the OWNER and recorded on serially numbered weight tickets, identifying the vehicle and presented to the OWNER'S representative on the job. Work performed and materials furnished as prescribed by this Item and measured as specified in this Item shall be paid for at the contract unit price bid for the type or types of courses and mixtures as shown in the proposal, which price shall be payment in full for quarrying, furnishing all materials, heating, mixing, hauling, cleaning existing base course or pavement, placing asphaltic mixtures, rolling and finishing, and all labor, tools, equipment and incidentals necessary to complete the work, including the work and materials involved in the application of prime coat and tack coat.

ITEM 303. PORTLAND CEMENT CONCRETE PAVEMENT

303.1. DESCRIPTION

This item shall consist of finished pavement constructed of Portland cement concrete on the prepared subgrade or other base course, in conformity with the plans, as herein specified and as supplemented and/or amended by special provisions and to the lines and grades as established by the OWNER. Concrete shall be considered of satisfactory quality, provided it is:

(1) Made of materials acceptable to the job and meeting the requirements of Item 303.2. Portland Cement Concrete Pavement Materials and special provisions and amendments thereto;
(2) In the proportions approved by the OWNER; and
(3) Mixed, placed, finished and cured in accordance with the requirements of these specifications and any special provisions.
(4) No concrete shall be placed where the temperature of the mix exceeds 95 degrees Fahrenheit or where the time from being batched to placed exceeds the times shown in Table 303.5.5.(a) Concrete Placement.
(5) All concrete utilized for street, alley, drive approach and sidewalk pavement shall be batch mixed unless another method is specifically approved by the OWNER.

303.2. PORTLAND CEMENT CONCRETE PAVEMENT MATERIALS

303.2.1. Aggregates for Portland Cement Concrete Pavement.

303.2.1.1. General Requirements. Aggregates for Portland cement concrete shall conform to the requirements contained in this Item and shall be approved by the OWNER prior to use. Aggregates shall be of such character that it shall be possible to produce workable concrete within the limits contained in this specification.

303.2.1.1.1. Storage. The manner of handling and storage of aggregates shall be such as to prevent intrusion of foreign materials and segregation of sizes. If materials are stored on the ground, the stockpile sites shall be grubbed, cleaned of all vegetation and leveled. In this case, the bottom six-in. layer of aggregate shall not be disturbed and shall not be used in the work.

Where two or more sizes or types of aggregates are delivered to the job, each size or type shall be stored separately.

Aggregates shall be stockpiled on the job or at a central batching plant for a minimum of 24-hours prior to use in the project. At the plant, the aggregate shall be wetted to a uniform moisture content of not less than three-percent below saturated surface dry condition before or while being loaded for shipment. Care shall be exercised to maintain this uniformity of moisture until the aggregates are used in the mix. Wetting of stockpiles to maintain the required percent moisture shall be performed at least 12-hours prior to use.

At the time of use, the aggregates shall be free from frozen material and foreign matter. All grass, wood, sticks, burlap, paper or other material which may have become mixed with the aggregates while stockpiled or in handling shall be removed.

303.2.1.1.2. Aggregate Measuring.

The fine and coarse aggregates shall be measured loose and separately.

By Weight. Aggregate weighing equipment shall conform to the requirements of ASTM C94 Standard Specification for Ready-Mixed Concrete and shall be approved by the OWNER prior to use.

By Volume. The volume measuring equipment shall consist of approved boxes, pans or mechanical devices, which, while in operation, shall give the required volumes of the different kinds of aggregates required for the several classes of concrete. Equipment shall also be so marked and designed that the OWNER can accurately and conveniently check the quantities of each aggregate being used.

Concrete made by continuous mixing shall conform to ASTM C685 Concrete Made by Volumetric Batching and Continuous Mixing.

303.2.1.1.3. Tests. Test of aggregates shall be made in accordance with the applicable current ASTM standards, listed in Table 303.2.1.1.3.(a) Aggregate Tests.

Table 303.2.1.1.3.(a) Aggregate Tests

ASTM Designation	Standard Specification or Standard Test Method (Title)
C29	Bulk Density ("Unit Weight") and Voids in Aggregate
C33	Concrete Aggregates
C40	Organic Impurities in Fine Aggregates for Concrete
C88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
C123	Lightweight Particles in Aggregate
C125	Terminology Relating to Concrete and Concrete Aggregates
C127	Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate
C128	Density, Relative Density (Specific Gravity) and Absorption of Fine Aggregate
C131	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
C136	Sieve Analysis of Fine and Coarse Aggregates
C142	Clay Lumps and Friable Particles in Aggregates
C330	Lightweight Aggregates for Structural Concrete
C535	Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
C641	Staining Materials in Lightweight Concrete Aggregates
D8	Terminology Relating to Materials for Roads and Pavements
D75	Sampling Aggregates
D422	Particle-Size Analysis of Soils
D4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
D2217	Wet Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants

303.2.1.2. Fine Aggregates. Fine aggregate shall consist of natural sand, manufactured sand or a combination of the two, with or without mineral filler. The sand, or mixture of sand, comprising a single fine aggregate, shall consist of clean, hard, durable, uncoated grains and shall be essentially free from clay lumps.

303.2.1.2.1. Foreign Material and Deleterious Substances. The maximum permissible percentage, by weight, of deleterious substances shall not exceed the amounts in Table 303.2.1.2.1.(a) Deleterious Substances in Fine Aggregates.

The fine aggregate shall be free from an excess amount of salt or alkali and at the time of use shall be free from frozen and/or all foreign material.

Table 303.2.1.2.1.(a) Deleterious Substances in Fine Aggregates

Substance	Maximum % by Weight
Material removed by decantation	3.0%[1]
Other deleterious substances such as coal, shale, coated grains and soft flaky particles	3.0%

1. An additional loss of two-percent by decantation may be allowed, provided this new additional loss is material of the same quality as specified for fine aggregate or mineral filler.

303.2.1.2.2. Gradation. The fine aggregate shall be well graded from fine to coarse and when tested by standard laboratory sieves shall meet the requirements of Table 303.2.1.2.2.(a) Grading Requirements for Fine Aggregates.

Table 303.2.1.2.2.(a) Grading Requirements for Fine Aggregates

Sieve	Percent Passing by Weight
⅜-in. sieve (9.5mm)	100%
No. 4 sieve (4.75mm)	95 to 100%
No. 8 sieve (2.36mm)	80 to 100%
No. 16 sieve (1.18mm)	50 to 85%
No. 30 sieve (600µm)	25 to 65%
No. 50 sieve (300µm)	10 to 30%
No. 100 sieve (150µm)	0 to 10%
No. 200 sieve (75µm)	0 to 3%

303.2.1.2.3. Mineral Filler. Stone dust or crushed sand may be added as a mineral filler, if so directed by the OWNER. Amounts of mineral filler shall not exceed 5-percent of the fine aggregate to improve the workability or quality specified for fine or coarse aggregates. When tested by standard laboratory sieves shall meet the requirements of Table 303.2.1.2.3.(a) Fine Aggregate Mineral Filler.

Table 303.2.1.2.3.(a) Fine Aggregate Mineral Filler

Sieve	Percent Passing
No. 30 sieve (600µm)	95 to 100%
No. 100 sieve (150 µm)	70 to 100%

303.2.1.2.4. Rejection. Fine aggregates which fail to meet the requirements of these specifications may be rejected by the OWNER. Such rejection shall incur no cost to the OWNER.

Fine aggregates sources, from which materials with properties not meeting these specifications are delivered, may be rejected as further supply sources to the project by the OWNER. Such rejection shall incur no cost to the OWNER.

303.2.1.3. Coarse Aggregates. Coarse aggregates shall consist of durable particles of crushed gravel, crushed stone, crushed blast furnace slag meeting the requirements of ASTM C989 (Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars) Grade 100 or 120, recycled crushed Portland cement concrete, or a combination of these.

303.2.1.3.1. Foreign Material and Deleterious Substances. The maximum permissible percentage, by weight, of deleterious substances shall not exceed the amounts in Table 303.2.1.3.1.(a) Deleterious Substances in Coarse Aggregates.

Aggregates shall be free from injurious amounts of salt, alkali, vegetable matter, or other objectionable material either free or as an adherent coating. At the time of their use, aggregates shall be free from frozen and/or all foreign material that may have become mixed with them in the stockpile.

Table 303.2.1.3.1.(a) Deleterious Substances in Coarse Aggregates

Substance	Maximum % by Weight
Material removed by decantation	1.0%
Shale, slate or other similar material	1.0%
Clay lumps	0.25%
Soft fragments	3.0%
Other deleterious substances, including friable, thin, elongated or laminated pieces	3.0%
The sum of all deleterious substances, exclusive of material removed by decantation	5.0%

303.2.1.3.2. Gradation. Coarse aggregates shall be well graded in size from coarse to fine. When tested by standard laboratory methods, coarse aggregates shall meet the requirements in Table 303.2.1.3.2.(a) Grading Requirements for Coarse Aggregates for percentage passing each sieve by weight.

Coarse aggregates of different characteristics, though tested and approved, shall not be mixed with other aggregates; but shall be stored, batched and weighed separately.

The difference in percent passing between two adjacent sieve sizes shall not exceed 20%.

Maximum Size Aggregate. The maximum size aggregate is defined as the clear space between the sides of the smallest square openings through which 95-percent of the weight of the aggregate can be passed. The maximum size of aggregates for paving concrete shall not exceed 1½-inches, and shall be reduced in size to meet the following conditions:

(1) one-fifth of the least dimension between forms of that part of the structure in which concrete is to be placed;
(2) three-fourths of the clear space between reinforcement; and
(3) one-third the depth of the slab.

Table 303.2.1.3.2.(a) Grading Requirements for Coarse Aggregates

Size No.	Nominal Size (Sieve with Square Openings)	Amounts Finer than Each Laboratory Sieve (Square-Opening), Mass Percent													
		100 mm (4 in)	90 mm (3½ in.)	75 mm (3 in.)	63 mm (2½ in.)	50 mm (2 in.)	37.5 mm (1½ in.)	25.0 mm (1 in.)	19.0 mm (¾ in.)	12.5 mm (½ in.)	9.5 mm (⅜ in)	4.75 mm (No. 4)	2.36 mm (No. 8)	1.18 mm (No. 16)	0.30 mm (No. 50)
1	90 to 37.5 mm (3½ to 1½ in.)	100	90 to 100	–	25 to 60	–	0 to 15	-	0 to 5	-	-	-	-	-	-
2	63 to 37.5 mm (2½ to 1½ in.)	-	-	100	90 to 100	35 to 70	0 to 15	-	0 to 5	-	-	-	-	-	-
3	50 to 25.0 mm (2 to 1 in.)	-	-	-	100	90 to 100	35 to 70	0 to 15	-	0 to 5	-	-	-	-	-
357	50 to 4.75 mm (2 in to No. 4)	-	-	-	100	95 to 100	-	35 to 70	-	10 to 30	–	0 to 5	-	-	-
4	37.5 to 19.00 mm (1½ to ¾ in.)	-	-	-	-	100	90 to 100	20 to 55	0 to 15	-	0 to 5	-	-	-	-
467	37.5 to 4.75 mm (1½ in to No. 4)	-	-	-	-	100	95 to 100	-	35 to 70	-	10 to 30	0 to 5	-	-	-
5	25.0 to 12.5 mm (1 to ½ mm)	-	-	-	-	-	100	90 to 100	20 to 55	0 to 10	0 to 5	-	-	-	-
56	25.0 to 9.5 mm (1 to ¾ in.)	-	-	-	-	-	100	90 to 100	40 to 85	10 to 40	0 to 15	0 to 5	-	-	-
57	25.0 to 4.75 (1 to No. 4)	-	-	-	-	-	100	95 to 100	-	25 to 60	-	0 to 10	0 to 5	-	-
6	19.0 to 9.5 mm (¾ to ¾ in.)		-	-	-	-	-	100	90 to 100	20 to 55	0 to 15	0 to 5	-	-	-
67	19.0 to 4.75 mm (¾ in to No. 4)	-	-	-	-	-	-	100	90 to 100	-	20 to 55	0 to 10	0 to 5	-	-
7	12.5 to 4.75mm (½ in to No. 4)	-	-	-	-	-	-	-	100	90 to 100	40 to 70	0 to 15	0 to 5	-	-
8	9.5 to 2.36 mm (⅜ in to No. 8)	-	-	-	-	-	-	-	-	100	85 to 100	10 to 30	0 to 10	0 to 5	–
89	9.5 to 1.18 mm (⅜ in to No. 16)	-	-	-	-	-	-	-	-	100	90 to 100	20 to 55	5 to 30	0 to 10	0 to 5
9[1]	4.75 to 1.18 mm (No. 4 to No. 16)	-	-	-	-	-	-	-	-	-	100	85 to 100	10 to 40	0 to 10	0 to 5

1. Although size 9 aggregate is defined in ASTM C125 Standard Terminology Relating to Concrete and Concrete Aggregates as a fine aggregate, it is included as a course aggregate when it is combined with a size 8 material to create a size 89, which is a course aggregate as defined by ASTM C125.

303.2.1.3.3. Tests. Results of tests performed according to the applicable standard test methods listed in Table 303.2.1.1.3.(a) Aggregate Tests shall meet the criteria specified by the OWNER. Coarse Aggregates shall have a percent wear of not more than 45 when tested by abrasion and impact in the Los Angeles machine, ASTM C131 and C535.

303.2.1.3.4. Rejection. Coarse aggregates which fail to meet the requirements of these specifications may be rejected by the OWNER. Such rejection shall incur no cost to the OWNER.

Coarse aggregate sources, from which materials with properties not meeting these specifications are delivered, may be rejected as further supply sources to the project by the OWNER. Such rejection shall incur no cost to the OWNER.

303.2.2. Portland Cement. Cement shall be of a standard brand of Portland cement which shall conform to the requirements of ASTM C150 Portland Cement, ASTM C595 Blended Hydraulic Cements, or other applicable test methods of the ASTM and shall be as approved by the OWNER.

303.2.2.1. Delivery. Cement delivered in bags shall be legibly marked on the bag with brand and name of the manufacturer, shall be in good condition at the time of delivery, and shall contain 94-pounds net. Bags of cement varying more than 5-percent from the specified weight may be rejected, and if the average net weight in any shipment, as determined by weighing 50 bags taken at random, is less than 94-pounds, the entire shipment may be rejected. Cement salvaged from discarded or used bags shall not be used.

Cement delivered in bulk may be used, provided the manner and method of handling is approved by the OWNER. When delivered in bulk, the brand name of the manufacturer contained in the shipping information accompanying the shipment shall be furnished to the OWNER prior to the use of the cement. Bulk cement shall be weighed on approved scales.

Cement from different manufacturers, although tested and approved, shall not be mixed, except as approved by the OWNER.

The CONTRACTOR, when required, shall furnish to the OWNER, with each shipment of cement, a statement as the specific surface of the cement expressed in square-centimeters-per-gram.

303.2.2.2. Cement Weighing Equipment. Bulk cement shall be batched by weight. The scales shall be either the beam or springless dial type, of substantial construction with a maximum allowable error of 0.5-percent of the net load and with minimum gradations of not greater than 5-pounds. Provisions shall be made for indicating to the operator that the required load in the weight box or container is being approached, which device shall indicate at least the last 50-pounds of the load. Dial type scales shall be provided with a pointer to the dial.

When a closed-type cement box is used, the cement-weighing scales shall be provided with a springless dial indicator or tare beam to indicate when the weigh box is empty. This indicator for the empty condition of the weigh box shall be in continuous operation. The weigh box shall be fitted with an approved vent and a tightly covered inspection opening of not less than 12-sq.in. The weigh box and scales shall be maintained in a satisfactory condition to meet the requirements for accuracy for weight.

303.2.2.3. Volume and Weight of Bag of Cement. A bag of cement as packed by the manufacturer and weighing 94-pounds shall be considered 1-cubic-foot.

303.2.2.4. Storage. Cement shall be stored in a suitable weathertight building which shall protect the cement from dampness, and placed in such manner that shall permit easy access for proper inspection and identification of each shipment.

303.2.2.5. Rejection. Cement may be rejected for failure to meet any of the requirements of this specification and shall be rejected under the following specific conditions:

(1) any bag of cement which has partially set or which contains any lumps or cakes;
(2) all cement salvaged from torn, discarded or used bags; or
(3) bulk cement which has partially set or which contains any lumps or cakes.

303.2.3. Chemical Admixtures. Unless otherwise provided in the plans or special provisions, approved types of chemical admixtures to minimize segregation, to improve workability or to reduce the amount of mixing water may be used in the rate of dosage specified by the OWNER and in accordance with the manufacturer's recommendations.

Admixtures shall be dispensed in a form by an accurate mechanical dispenser designed for convenient confirmation of the accuracy of measurement. Dispensers shall have sufficient capacity to measure at one time the full quantity required for each batch. Two or more admixtures of different types, such as a water-reducing and air-entraining admixture, may not be compatible when mixed together. Where different admixtures are used, they should be added to the batch separately unless it is known that they can be mixed together satisfactorily. Dosage of admixtures shall not vary from the dosage order by the OWNER by more than 5-percent. In addition:

(1) Chemical admixtures shall conform to ASTM C494 Chemical Admixtures for Concrete, Types "A", "D," "F" and "G" for concrete dosages in accordance with manufacturer's recommendations as specified by the OWNER.

Water-reducing admixtures conforming to ASTM C494, Types "A" and "F", shall be used to improve quality of concrete by obtaining specified strength at lower cement content and to increase slump without increasing water-cement ratio and may also be utilized in improving properties of concrete containing aggregates that are harsh or poorly graded.

Water-reducing, set retarding admixtures, conforming to ASTM C494, Type "D" and "G", may be used during hot weather concrete placement, so as to keep concrete workable during the entire placing period, in order that succeeding placements may be made without development of cold joints or discontinuities in the structural unit.

(2) OWNER'S option: High range water-reducing admixtures, super-plasticizers conforming to ASTM C494, Type "F" and "G", may be used to greatly reduce water content to obtain dense concrete with higher early strengths and maintain high slump or flowing concrete while maintaining low water-cement ratio for concrete that must be placed under difficult conditions such as pump or tremie methods, etc.

(3) Air-entraining admixtures shall conform to ASTM C260 Air-Entraining Admixtures for Concrete.

Dosage shall conform to recommendations of manufacturer, as specified by OWNER, and determined by field testing of concrete mixture by qualified testing personnel in accordance with ASTM C94 Ready-Mixed Concrete.

The CONTRACTOR shall secure the approval of the OWNER for the particular admixture which it proposes to incorporate into the concrete prior to actual use of the admixture. The CONTRACTOR shall furnish such information and evidence that the OWNER may require in its determination of the acceptability of the proposed admixture. When the CONTRACTOR proposes to use an air-entraining admixture which has been previously approved by the OWNER, it shall submit a certification stating that the admixture is the same as that previously approved.

Either prior to or at any time during construction, the OWNER may require that the air-entraining admixture selected by the CONTRACTOR be tested to determine its effect upon the strength of the concrete. When so tested, a 7-day compressive strength of concrete, made with cement and aggregates in proportions to be used in the work and containing the admixture in an amount sufficient to produce from 3- to 6-percent entrained air in the plastic concrete, shall be no less than 85-percent of the strength of concrete, made with the same materials and with the same cement content and consistency but without the admixture.

Any other admixtures for whatever purpose shall have the approval of the OWNER prior to incorporation into the concrete mix.

303.2.4. Mineral Admixtures. Fly ash shall conform to the requirements of ASTM C618 Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete, with the exception that the "Loss on Ignition" requirements shall be a maximum of 3-percent. Fly ash shall be sampled and tested at a frequency schedule in accordance with the requirements of ASTM C311 Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete. All sources of fly ash for use in Portland cement concrete shall conform to the requirements of Texas Department of Transportation (TxDOT) Material Specification DMS-8900 Fly Ash.

With the approval of the OWNER, fly ash may be used in all classes of concrete to replace a portion of the Portland cement in a mix design. Unless otherwise approved by the OWNER, the maximum cement reduction shall not exceed 25-percent by weight per cubic-yard of concrete. If historical data and general practice in locality of usage substantiates fly ash concrete using higher percentages, CONTRACTOR may submit written request to OWNER for review. Fly ash replacement shall be on a weight basis. The minimum replacement ratio shall be 1.0-pounds of fly ash per 1.0-pounds of cement replaced.

The water-cement ratio of the concrete mix shall be based on total cementitious (cement plus fly ash) materials. Proposed concrete mix designs with materials certification data and laboratory or field mix test results on the properties of the fresh or hardened concrete shall be submitted to the OWNER for approval.

303.2.5. Mineral Filler. Mineral filler shall consist of stone dust, crushed sand or other inert material approved by the OWNER. Mineral filler may be added in amounts not to exceed 10-percent of the weight of

the sand or mixture of sands to improve the workability or plasticity of the concrete mix. Such mineral filler shall be of the quality specified for fine or coarse aggregate, and when tested by laboratory methods shall meet the requirements of Table 303.2.5.(a) Mineral Filler.

Where mineral filler is used, it shall be measured by volume or weighed and batched separately.

Table 303.2.5.(a) Mineral Filler

Sieve	Percent Retained on Sieve
No. 30 sieve (600µm)	0%
No. 200 (75 µm)	0% to 35%

303.2.6. Fibrous Reinforcement. At the OWNER'S option, fibrous reinforcement in concrete may be used unless otherwise shown on the plans or in the contract documents. Fibrous reinforcement shall not be used as a replacement for any reinforcement required for structural purposes.

303.2.6.1. Material. Fibers for reinforcement of concrete shall be in accordance with materials specified in ASTM C1116 Fiber-Reinforced Concrete and Shotcrete.

303.2.6.2. Length and Size. The fibers shall be length and size as specified in ASTM C1116.

303.2.6.3. Testing. Test methods ASTM C995 Time of Flow of Fiber-Reinforced Concrete Through Inverted Slump Cone, and ASTM C1018 Flexural Toughness and First-Crack Strength of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading) in addition to applicable ASTM methods for the testing of concrete shall be used to test the fiber-reinforced concrete. Performance of fiber-reinforced concrete shall meet all requirements as specified in Section 21 of ASTM C1116.

303.2.6.4. Rejection. Fibrous reinforcement or fiber-reinforced concrete may be rejected for failure to meet any of the requirements of this specification or ASTM C1116.

303.2.7. Water. Water for use in concrete shall be reasonably clean and free of oil, acid, alkali, organic matter or other deleterious substances. Water which is suitable for drinking or ordinary household uses may be accepted for use without being tested.

303.2.7.1. Source. Water shall be obtained preferably from a domestic water supply. Where other source of supply is proposed, the approval of the OWNER must be obtained prior to using the water.

303.2.7.2. Measuring Devices. The device for measuring the quantity of water shall indicate the quantity in gallons or pounds and fractions thereof. The operating mechanism shall regulate the quantity required for any given batch within one-percent. The supply inlet shall be cut off automatically when the water is discharged into the mixer.

Upon approval of the OWNER, the water for any one batch in the mixer may be measured in approved cans, buckets or other containers, and no more than the required amount of water shall be introduced into the mixer. The measuring devices shall be checked at the beginning of each job.

303.2.7.3. Tests. If the water is of questionable quality, it shall be tested in accordance with the standard Method of Test of Quality of Water to be used in concrete, AASHTO T26.

303.2.7.4. Rejection. Water for use with cement may be rejected for failure to meet any of the requirements of this specification.

303.2.8. Dowel Bars. Dowel and tie bars shall be either straight or bent, smooth or deformed, as shown on the plans and shall conform to the requirements of Item 303.2.9. Steel Reinforcement. The dowel bars shall be coated with either hot asphalt or an alternate coating, as designated on the plans, to the extent shown on the plans.

303.2.8.1. Dowel Caps. Caps for slip dowel bars shall be of the length shown on the plans and shall have an internal diameter sufficient to permit the cap to freely slip over the bar. In no case shall the internal diameter exceed the bar diameter by more than ⅛-in., and one end of the cap shall be closed. The cap shall be installed to allow the bar to move not less than 1¼-in. in either direction.

303.2.9. Steel Reinforcement. Concrete reinforcement is the metal (rods or fabric) imbedded in concrete in such a manner that the reinforcement and concrete act together in resisting forces.

303.2.9.1. Material. Unless otherwise specified or designated on the plans, the metal for all bar reinforcement shall be one of the following:

303.2.9.1.1. New Billet Steel. New billet steel shall meet the requirements of ASTM A615/A615M Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

303.2.9.1.2. Axle Steel. Axle steel shall meet the requirements of ASTM A996/A996M Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.

303.2.9.1.3. Rail Steel. Axle steel shall meet the requirements of ASTM A996/A996M Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.

The use of rail steel or axle steel shall not be permitted where bending of the bar is required.

Unless otherwise designated on the plans, all reinforcement steel bars shall be deformed in accordance with the requirements of ASTM A615/A615M or A996/A996M, as appropriate. Twisted bars are not considered deformed and shall not be used. The deformed bars shall provide a net sectional area at all points equivalent to that of plain square or round bars of equal nominal size.

Bars for spiral reinforcement shall be plain bars rolled from billets directly reduced from ingots and shall conform to the requirements of ASTM A615/A615M.

303.2.9.2. Sizes and Weights. The size and weight of reinforcing bars shall conform to the requirements of ASTM A615/A615M.

303.2.9.3. Bending. Reinforcement bars shall be bent cold to the shapes indicated on the plans. All bending of hard grade new billet steel shall be done in the shop. Bends shall be true to the shapes indicated, and irregularities shall be cause for rejection. Unless otherwise shown on the plans, bends for stirrups and ties shall be made around a pin having a diameter not less than two times the minimum thickness of the bar. Other bends shall be made according to the latest code of Standard Practice of the Reinforcing Steel Institute.

303.2.9.4. Storage. Reinforcement shall be stored above the ground surface upon skids, platforms or other supports, and shall be protected from mechanical injury and surface deterioration caused by exposure to the conditions producing rust. When placed in the work, the reinforcement shall be free from dirt, loose rust, scale, painting, oil or other foreign material.

303.2.9.5. Rejection. Reinforcement may be rejected for failure to meet any of the requirements of this specification. Additionally, reinforcement may be rejected for the following:

(1) reinforcement exceeding the allowable variations,
(2) reinforcement not bent in accordance with the details,
(3) reinforcement with a coating of dirt, loose scale, paint, oil or other foreign substances which shall prevent bonding of the concrete and reinforcement,
(4) twisted bars, or
(5) reinforcement subjected to construction traffic.

303.2.10. Steel Wire Reinforcement. At the OWNER'S option the use of welded wire fabric may be used in lieu of deformed reinforcement bars unless otherwise shown on the plans or in the contract specifications.

Welded wire fabric shall be delivered to the job site in sheets. Rolls of wire fabric shall not be permitted.

The size of welded wire fabric shall be 12 x 12- W 4 x W 4 with a nominal diameter in inches of 0.225 and a nominal weight 0.136 lbs/linear foot.

303.2.10.1. Material. Wire for fabric reinforcement shall be cold-drawn from rods hot-rolled from billets and shall conform to the requirements of ASTM A82 Steel Wire, Plain, for Concrete Reinforcement. Welded wire fabric shall conform to the requirements of ASTM A185 Steel Welded Wire Reinforcement, Plain, for Concrete.

303.2.10.2. Sizes and Weights. The properties of wire fabric shall conform to the requirements of ASTM A82 or ASTM A185, as appropriate.

303.2.10.3. Storage. Reinforcement shall be stored above the ground surface upon skids, platforms or other supports, and shall be protected from mechanical injury and surface deterioration caused by exposure to the conditions producing rust. When placed in the work, the reinforcement shall be free from dirt, loose rust, scale, paint, oil or other foreign materials.

303.2.10.4. Rejection. Reinforcement may be rejected for failure to meet any of the requirements of this specification, and specifically for the following:

(1) reinforcement exceeding the allowable variations,
(2) reinforcement not bent in accordance with the details,
(3) reinforcement with a coating of dirt, loose scale, paint, oil or other foreign substances which shall prevent bonding of the concrete and reinforcement, or
(4) twisted bars.

303.2.11. Reinforcement Bar Chairs. Reinforcement bar chairs or supports shall be of adequate strength (if specified) to support the reinforcement bars and shall not bend or break under the weight of the reinforcement bars or CONTRACTOR'S personnel walking on the reinforcing bars.

Bar chairs may be made of metal (free of rust), precast mortar or concrete blocks or plastic. Pre-cast mortar or concrete blocks must be approved by the OWNER; and the CONTRACTOR shall supply test data showing the strength of the mortar or concrete blocks.

For approval of plastic chairs, representative samples of the plastic shall show no visible indications of deterioration after immersion in a 5-percent solution of sodium hydroxide for 120-hours.

303.2.11.1. Rejection. Bar chairs may be rejected for failure to meet any of the requirements of this specification.

303.2.12. Joint Filler. Joint filler is the material placed in concrete pavement and concrete structures to allow for the expansion and contraction of the concrete.

303.2.12.1. Material. Expansion joint materials shall consist of boards or a premolded asphalt board tested in accordance with ASTM D545 Test Methods for Preformed Expansion Joint Fillers for Concrete Construction (Nonextruding and Resilient Types).

Boards for expansion joint filler shall be of the required size, shape and type indicated on the plans or required in the specifications. Boards shall be of selected stock of redwood, cypress, gum, southern yellow pine, or Douglas fir timber. The boards shall be sound heartwood and shall be free from sapwood, knots, clustered birdseyes, checks and splits. Occasional sound or hollow birdseyes, when not in clusters, shall be permitted, provided the board is free from any other effects that shall impair its usefulness as a joint filler. With the exception of redwood and cypress, all boards shall be preservative treated according to American Wood-Preservers' Association (AWPA) Standards.

Asphalt boards for expansion joint filler shall be of the required size and uniform thickness and, when used in transverse joints, they shall conform approximately to the shape of the pavement crown shown on the plans and details. Asphalt boards shall consist of two liners of 0.016 asphalt impregnated kraft paper filled with a mastic mixture of asphalt and vegetable fiber and/or mineral filler. Boards shall be smooth, flat and straight throughout, and shall be sufficiently rigid to permit ease of installation. Boards shall be furnished in lengths equal to the width between longitudinal joints, and may be furnished in strips or scored sheet of the required shape.

Asphalt boards, when tested in accordance with the following described methods, shall not deflect from the horizontal more than ¾-inches in 3½-inches. A sample of the board, 2-in. wide and 6-in. long, flat, straight and cut with its length parallel to the lay of the fiber, shall be clamped between two blocks in the direction of its thickness in such manner that 3½-in. length of the sample shall extend unsupported and at right angles from the common plane of the block faces. The samples and clamp so assembled shall be maintained at a temperature of 180°F for 2-hours, with the length and width of the clamped portion of the sample horizontal after which the deflection from the horizontal of the unclamped portion shall be immediately measured.

303.2.12.2. Dimensions. The thickness of the expansion joint filler shall be shown on the plans; the width shall be not less than that shown on the plans, providing for the top seal space.

303.2.12.3. Rejection. Expansion joint filler may be rejected for failure to meet any of the requirements of this specification.

303.2.13. Curing Materials. This specification shall govern the materials to be used in the curing of concrete. The materials when applied as elsewhere specified shall retain the moisture, present in the concrete at the time of application of curing material, within specified limits for the curing period.

303.2.13.1. Material. Materials for the curing of concrete shall conform to the following requirements:

303.2.13.1.1. Membrane-Forming Compounds. The membrane curing compound shall conform to the requirements of ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete, Type 2, white pigmented compound, unless otherwise specified or indicated. It shall be of such nature that it shall not produce permanent discoloration of concrete surfaces nor react deleteriously with the concrete.

The compound shall produce a firm, continuous uniform moisture-impermeable film free from pinholes and shall adhere satisfactorily to the surfaces of damp concrete. It shall, when applied to the damp concrete surface at the specified rate of coverage, dry to touch in 1-hour and dry through in not more than 4-hours under normal conditions suitable for concrete operations. It shall adhere in a tenacious film without running off or appreciably sagging. It shall not disintegrate, check, peel or crack during the required curing period.

The compound shall not peel or pick up under traffic and shall disappear from the surface of the concrete by gradual disintegration.

The compound shall be delivered to the job site in the manufacturer's original containers only, which shall be clearly labeled with the manufacturer's name, the trade name of the material and a batch number or symbol with which test samples may be correlated.

When tested in accordance with ASTM C156 Water Retention by Concrete Curing Materials, the liquid membrane-forming compound shall restrict the loss of water present in the test specimen at the time of application of the curing compound to not more than 0.01-oz.-per-in^2 of surface.

303.2.13.1.2. Cotton Mats. The cotton mats used for curing shall meet the following requirements:

Each mat shall have a finished width of approximately 5-ft. 6-in.; and after shrinkage shall be at least 6-in. longer than the width of the concrete to be cured.

The mats shall be composed of a single layer of cotton filler, completely enclosed in a cover of cotton cloth. The cotton filler shall be of low-grade cotton, cotton linters of such shall contain not less than ¾-pound of cotton filler per square-yard of mat, uniformly distributed. The cotton cloth used for covering material shall be Osnaburg, weighing not less than $6^3/_{10}$-ounces-per-square-yard.

All mats shall be stitched longitudinally with continuous parallel rows of stitching at intervals of not more than 4-in. or shall be tufted both transversely and longitudinally at intervals of not more than 3-in. The sewing or tufting shall not be done so tightly that the mat shall not contact the surface of the concrete at all points when saturated with water.

To insure the complete covering of the concrete where the mats fit together, there shall be a flap extending all along one side of each mat. This flap shall be composed of two thicknesses of the cover material and shall be at least 6-in. in width.

303.2.13.1.3. Waterproof Paper. Waterproof paper shall consist of two sheets of plain kraft paper cemented together with a bituminous material in which are imbedded cords or strands of fiber running in both directions of the paper, not more than 1¼-in. apart. The paper shall be light in color; shall be free of visible defects; and shall have a uniform appearance. It shall be sufficiently strong and tough to permit its use under the conditions existing on streets and structural work without tearing or otherwise becoming unfit for the use for which it is intended. The paper shall conform to specifications for ASTM C171 Sheet Materials for Curing Concrete.

When tested in accordance with ASTM C156 Water Retention by Concrete Curing Materials, the paper shall restrict the loss of water present in the test specimen at the time of application of the waterproof paper to not more than 0.055-grams-per-square-centimeter of surface.

303.2.13.1.4. Polyethylene Film. Polyethylene film shall be opaque pigmented white in color; and shall be manufactured from virgin resin without additives or scrap. The film shall have a minimum thickness of 4-mils. The permissible moisture loss from the concrete, when tested in accordance with ASTM C156 Water Retention by Concrete Curing Materials, shall not exceed 0.055-grams-per-square-centimeter of surface. The film shall be sufficiently strong and tough to permit its use under the conditions existing on paving or structural projects without being torn or otherwise rendered unfit

for the use intended during the curing period. It shall be of uniform thickness throughout, free of pinholes and other blemishes.

303.2.13.2. Rejection. Concrete curing materials may be rejected for failure to meet any of the requirements of this specification.

303.2.14. Joint Sealant. Joint sealing compound shall consist of hot poured polymer or ready-mixed cold-applied sealant, silicone joint sealant or other material approved by the OWNER. It shall not crack or break when exposed to low temperatures. The cured sealant must not pick up or "track" at elevated road temperature.

303.2.14.1. Materials.

303.2.14.1.1. Hot Poured Polymer. The joint sealing compound shall melt to the proper consistency for pouring and shall solidify on cooling to atmospheric temperatures. At no time shall the material be heated to temperature exceeding 450°F; any material heated above 450°F shall be rejected.

Hot poured polymer shall be tested in accordance with TxDOT Test Method Tex-525-C Tests for Asphalt and Concrete Joint Sealers and shall meet the requirements in Table 303.2.14.1.1.(a) Hot Poured Polymer Sealant Requirements.

Table 303.2.14.1.1.(a) Hot Poured Polymer Sealant Requirements

Property	Test Parameters	Required Result
Penetration	32°F , 7-oz. , 60-sec.	Minimum 0.1-in.
	77°F , 5-oz., 5-sec.	0.45- to 0.3-in.
Flow	5-hours, 140°F, 75° incline	Maximum 0.2-in.
Bond extension	15°F, 5-cycles	No cracking of the joint sealing material or break in the bond between the joint sealer material and the mortar pieces.

303.2.14.1.2. Ready-Mixed Cold-Applied. This sealant shall be a single component and shall consist of a homogeneous blend of asphalt emulsion, polymer, and inert filler. The material shall be a resilient, adhesive compound capable of effectively sealing properly cleaned joints and cracks in concrete and asphalt pavements against infiltration of moisture throughout repeated cycles of contraction and expansion and which shall not be picked up by vehicle tires, particularly at summer temperatures.

This Item covers an emulsion composed principally of a semi-solid asphalt base, water and emulsifying agent suitable for sealing cracks at ambient temperatures of 40°F and higher. The emulsion shall be modified with a polymer and shall be smooth and homogeneous, with no evidence of polymer separation.

The cold-applied crack sealant shall meet the requirements in Table 303.2.14.1.2.(a) Cold-Applied Sealant Requirements. Material shall be free-flowing down to 40°F, such that routine pavement joints and cracks are filled to a depth of 1½-in. without the addition of heat.

The material shall be furnished in 55-gallon drums.

Table 303.2.14.1.2.(a) Cold-Applied Sealant Requirements

Property	Test Method	Required Result	
		Minimum	Maximum
Viscosity[1], Brookfield, 77°F	ASTM D2196 Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield type) Viscometer; Method A	6,000 Centipoise	25,000 Centipoise
Storage Stability Test, One-Day	AASHTO T59	-	1-Percent
Sieve Test	AASHTO T59	-	0.10-Percent
Evaporations[2] and Tests on Residue			
Residue	See Note 2.	65-Percent	-
Penetration test on Residue, 77°F, 100g, 5-seconds	AASHTO T49	35 (0.1-mm)	75 (0.1-mm)
Softening Point test on Residue, R.&B.	AASHTO T53	140°F	-
Ductility test on Residue, 39.2°F, 5 cm/Min	AASHTO T51	100-cm	-

1. OWNER may require Viscosity Profile in lieu of single-spindle viscosity test, in which case the apparent viscosity shall be 10,000.
2. Residue may be obtained by the following evaporation procedure: Mass 200g of sealant into a 1000-ml beaker or a 1-quart can and place in a heating mantle designed for a 1000-ml beaker. During the evaporation the sealant should be stirred frequently to prevent foam-over or local overheating. The temperature shall be maintained between 260°F and 300°F for 3- to 5-minutes after the material is water free. Pour required specimen.

303.2.14.1.3. Thermoplastic Cold-Applied. If approved by the OWNER, thermoplastic cold-applied jointing material may be used according to manufacturer's recommendations.

303.2.14.2. Rejection. Materials may be rejected for failure to meet any of the requirements of this specification.

303.2.15. Elastomeric Materials. This material shall conform to the requirements of the TxDOT Item 435 Elastomeric Materials. This item shall govern for the materials, testing and fabrication of elastomeric materials, except as otherwise covered in other specifications or on the plans.

303.2.15.1. Rejection. Elastomeric materials may be rejected for failure to meet any of the requirements of this specification.

303.3. MIX DESIGN AND MIXING CONCRETE FOR PAVEMENT

303.3.1. Description. This section shall govern for the concrete in pavements.

303.3.2. Equipment. All machinery and equipment necessary for the prosecution of the work specified herein shall be on the project and shall be approved by the OWNER as to condition before the CONTRACTOR shall be permitted to begin operations on which the machinery or equipment is to be used. All machinery and equipment shall be maintained in good condition to insure the completion of the work without excessive delays for repairs and replacements.

303.3.3. Concrete Mix Design and Control. At least 10-days prior to the start of concrete paving operations, the CONTRACTOR shall submit to the OWNER a design of the concrete mix it proposes to use together with samples, if requested, of all materials to be incorporated into the mix and a full description of the source of supply of each material component. The proposed batch designs must be submitted to the OWNER on the approved form.

The design of the concrete mix shall produce a quality concrete complying with these specifications and meet the requirements of ACI 318 (most recent edition) - PART 3 Construction Requirements, CHAPTER 5, Concrete Quality, except as amended by these provisions. The concrete mix design shall include the following information:

(1) Design Requirements and Design Summary
(2) Material source
(3) Dry weight of cement/cu. yd. and type
(4) Dry weight of fly ash/cu. yd. and type, if used
(5) Saturated surface dry weight of fine and coarse aggregates/cu. yd.
(6) Design water/cu. yd.
(7) Quantities, type, and name of admixtures with manufacturer's data sheets
(8) Current strength tests or strength tests in accordance with ACI 318
(9) Current Sieve Analysis and -200 Decantation of fine and coarse aggregates and date of tests
(10) Fineness modulus of fine aggregate
(11) Specific Gravity and Absorption Values of fine and coarse aggregates
(12) L.A. Abrasion of coarse aggregates

All material samples submitted to the OWNER shall be sufficiently large to permit laboratory batching for the construction of test specimens to check the adequacy of the design. When the OWNER has approved the design mix, there shall be no change or deviation from the proportions thereof or sources of supply except as hereinafter provided. No concrete may be placed on the job site until the mix design has been approved by the OWNER in writing to the CONTRACTOR.

303.3.4. Quality of Concrete.

303.3.4.1. Consistency. In general, the consistency of concrete mixtures shall be such that:

(1) the mortar shall cling to the coarse aggregate,
(2) the aggregate shall not segregate in concrete when it is transported to the place of deposit,
(3) the concrete, when dropped directly from the discharge chute of the mixer, shall flatten out at the center of the pile, but the edges of the pile shall stand and not flow,
(4) the concrete and mortar shall show no free water when removed from the mixer,
(5) the concrete shall slide and not flow into place when transported in metal chutes at an angle of 30° with the horizontal,
(6) the surface of the finished concrete shall be free from a surface film or laitance, and
(7) the concrete shall be uniform and workable.

The consistency of the concrete as placed should allow the completion of all finishing operations without the addition of water to the surface. When field conditions are such that additional moisture is needed for the final concrete surface finishing operation, the required water shall be applied to the surface by fog spray only; and shall be held to a minimum amount. The concrete shall be workable, cohesive, possess satisfactory finishing qualities and be of the stiffest consistency that can be placed and vibrated into a homogeneous mass. Excessive bleeding shall be avoided.

If the strength or consistency required for the class of concrete being produced is not secured with the minimum cement specified or without exceeding the maximum water/cement ratio, the CONTRACTOR may use, or the OWNER may require, an approved cement dispersing agent (water reducer); or the CONTRACTOR shall furnish additional aggregates, or aggregates with different characteristics, or the CONTRACTOR may use additional cement in order to produce the required results. The additional cement may be permitted as a temporary measure, until aggregates are changed and designs checked with the different aggregates or cement dispersing agent.

The CONTRACTOR is solely responsible for the quality of the concrete produced. The OWNER reserves the right to independently verify the quality of the concrete through inspection of the batch plant, testing of the various materials used in the concrete and by casting and testing concrete cylinders or beams on the concrete actually incorporated in the pavement.

303.3.4.2. Standard Classes. Unless otherwise shown on the plans or detailed specifications, the Standard Classes of Pavement Concrete shown in Table 303.3.4.2.(a) shall be used.

Streets, alleys, driveways, and inlets shall be constructed in accordance with these specifications using the classes of concrete, machine or hand finished, whichever is appropriate. Mass pour medians, noses, and islands shall use hand-finished concrete.

The testing does not in any way change the penalties imposed on the CONTRACTOR for deficient strength outlined elsewhere in these specifications.

Table 303.3.4.2.(a) Standard Classes of Pavement Concrete.

Class of Concrete[1]	Minimum Cementitious Lb./CY	28 Day Min. Compressive Strength[2] psi	28 Day Min. Beam Strength[2,3] psi	Maximum Water/ Cementitious Ratio	Coarse Aggregate Maximum Size[4]
A[5]	470	3000	500	0.58	1½"
C	564	3600	600	0.53	1½"
P1[6]	517	4000	N/A	0.49	1½"
P2[7]	564	4500	N/A	0.45	1½"
M	As directed by the OWNER or as shown on the plans				

1. All exposed horizontal concrete shall have entrained – air.
2. Minimum Strength Required by OWNER [Compressive or Flexural]
3. ASTM C78 (Third-Point); Reduce by 10% when Type II Cement is Used
4. Smaller nominal maximum size aggregate may be used if strength requirement is satisfied
5. Sidewalks, separate curb and gutter, and 4-inch thick median pavement
6. Machine Finished
7. Hand Finished

303.3.4.3. Performance Classes. Performance Classes of structural concrete shall meet the requirements in Table 303.3.4.3.(a) Performance Classes of Pavement Concrete.

Table 303.3.4.3.(a) Performance Classes of Pavement Concrete

Class of Concrete[1]	Minimum Cementitious Lb./CY	28-Day Compressive Strength psi	28-Day Flexural Strength[2,3] psi	Maximum Water/ Cementitious Ratio[4]	Coarse Aggregate Maximum Size[5]
PA	423	3000[6]	425	0.58	1½"
PC	517	3600[6]	510	0.53	1½"
PP1[7]	517	4000	N/A	0.48	1½"
PP2[8]	564	4500	N/A	0.44	1½"
PM	As directed by the OWNER or as shown on the plans				

1. All exposed horizontal concrete shall have entrained – air.
2. ASTM C78 (Third-Point); Reduce by 10% when Type II Cement is used
3. For early form removal
4. Consistent with ACI 211.1 Table 6.3.4(a) Relationship between water-cementitious materials ratio and compressive strength of concrete
5. Smaller nominal maximum size aggregate may be used if Strength requirement is satisfied
6. Calculated Average Required Compressive Strength Considering ACI 318 - Sec. 5.3.2.1 shall be strength shown times 1.15
7. Machine Finish
8. Hand Finish

303.3.4.4. Slump. Slump requirements for pavement and related concrete shall be as specified in Table 303.3.4.4.(a) Pavement Concrete Slump Requirements. No concrete shall be permitted with slump in excess of the maximums shown. Any concrete mix failing to meet the above consistency requirements, although meeting the slump requirements, shall be considered unsatisfactory, and the mix shall be changed to correct such unsatisfactory conditions.

Table 303.3.4.4.(a) Structural Concrete Slump Requirements.

Concrete Use	Avg. Slump (in.)	Max. Slump (in.)
Slip Form Paving	3	4
Hand formed paving	4	5
Sidewalk, Separate Curb and Gutter, and Other Miscellaneous Concrete	As specified by OWNER	

303.3.5. Mixing and Delivery. The concrete shall be produced in an approved method conforming to the requirements of this specification and ASTM C94/C94M Standard Specification for Ready-Mixed Concrete or National Ready-mixed Concrete Association (NRMCA). Ready-mix concrete shall be permitted in lieu of the paver-mixer. When ready-mix concrete is used, sampling provisions of ASTM C94 Alternate Procedure 2 shall govern. If fiber-reinforced concrete is used, mixing shall be in accordance with ASTM C1116 Fiber-Reinforced Concrete and Shotcrete. All materials for concrete placed in pavements shall conform to the requirements of the governing item of this specification.

303.3.5.1. Batch Mixing. The concrete shall be mixed in a batch mixer and only in such quantities as are required for immediate use. The mixing of each batch, after all materials are in the drum, shall continue until it produces a thoroughly mixed concrete of uniform mass as determined by established mixer performance ratings and inspection, or appropriate uniformity tests as described in ASTM C94. The entire contents of the drum shall be discharged before any materials are placed therein for the succeeding batch. Retempering or remixing shall not be permitted.

303.3.5.1.1. Mixer. The mixer shall produce concrete of uniform consistency and appearance.

303.3.5.1.2. Cleaning. The mixer shall be cleaned thoroughly each time when out of operation for more than 30 minutes.

303.3.5.2. Transit Mixing. When transit mixing is used, the transit mixer shall be of an approved revolving drum or revolving blade type so constructed as to produce a thoroughly mixed concrete with a uniform distribution of the materials throughout the mass and shall be equipped with a discharge mechanism which shall insure the discharging of the mixed concrete without segregation.

303.3.5.2.1. Prevention of Leaking. The mixer drum shall be watertight when closed and shall be equipped with a locking device that shall automatically prevent the discharging of the mixer prior to receiving the required number of revolutions.

303.3.5.2.2. Mixing. The entire quantity of mixing water shall be accurately measured by a visible calibrated mechanism. Leaking water valves shall be considered as ample reason for condemnation of the mixer unit and removal from the job by the OWNER. Each batch shall be mixed not less than 70 nor more than 100 revolutions at the rate of rotation specified by the manufacturer as mixing speed. Any additional mixing shall be done at a slower speed specified by the manufacturer for agitation and shall be continuous until the batch is discharged.

303.3.5.2.3. Counters. Truck mixers shall be equipped with actuated counters by which the numbers of revolutions of the drum may be readily verified. The counters shall be actuated at the time of starting mixing at mixing speeds.

303.3.5.2.4. Delivery. The rate of delivery of the mixed concrete shall be such that the interval between loads shall not exceed 10-minutes. The concrete shall be delivered to the site of the work and discharged from the mixer before the drum has been revolved 300 revolutions, after the introduction of the mixing water with the dry materials.

303.3.5.3. Central Mixing Plant. A central mixing plant shall be allowed, provided the method of mixing and handling has first been approved by the OWNER.

303.3.5.4. Commercial Concrete Plants. In the event the CONTRACTOR elects to use concrete produced by a commercial concrete plant, an agreement shall be drawn and executed by the responsible executive management of said plant granting the OWNER ingress and egress to all parts of the plant with full authority to make any and all required tests of aggregates and to regulate and control

all batching plant and/or central mixing plant operations. This regulatory control shall be applicable only to the concrete produced by the commercial plant for the payment herein specified.

303.3.5.5. Delivery Tickets. For transit mix operations, the manufacturer of the concrete shall, before unloading, furnish to the purchaser with each batch of concrete at the site a delivery ticket on which is printed, stamped, or written, the following information to determine that the concrete was proportioned in accordance with the approved mix design:

(1) Name of concrete supplier
(2) Serial number of ticket
(3) Date
(4) Truck number
(5) Name of purchaser
(6) Specific designation of job (name and location)
(7) Specific class, design identification and designation of the concrete in conformance with that employed in job specifications
(8) Amount of concrete in cubic yards (or cubic meters)
(9) Time loaded or of first mixing of cement and aggregates
(10) Water added by receiver of concrete and his/her initials
(11) Weight of cement
(12) Weight of fly ash
(13) Type and amount of admixtures
(14) Information necessary to calculate the total mixing water added by the producer (total mixing water includes free water on the aggregates, water and ice batched at the plant, and water added by the truck operator from the mixer tank);
(15) Maximum size of aggregate
(16) Weights of fine and coarse aggregate

For on-site concrete plant operations, the CONTRACTOR shall supply to the OWNER a batch ticket with the following information and for each continuous paving operation, provide receipts and invoices to substantiate the amounts of cement and fly ash used in the placement.

(1) At the beginning of each day's placement, a list of the actual batch weights to be used shall be given to the OWNER.
(2) When any changes are made, a new list of weights shall be given to the OWNER.

303.4. EQUIPMENT

303.4.1. General. All equipment necessary for the construction of this item shall be on the project and shall be approved by the OWNER as to condition before the CONTRACTOR shall be permitted to begin construction operations on which the equipment is to be used.

303.4.2. Field Laboratory. A field laboratory structure shall be required only when specifically required and provided for in the special provisions.

303.4.3. Slip Form Paver. Slip form paving equipment shall be provided with traveling side forms of sufficient dimensions, shape and strength so as to support the concrete laterally for a sufficient length of time during placement to produce pavement of the required cross section. The equipment shall spread, consolidate, screed and float-finish the freshly placed concrete in such a manner as to provide a dense and homogeneous pavement.

303.4.4. Forms. The side forms shall be metal, of approved cross section and bracing, of a height not less than the prescribed edge thickness of the concrete section, and a minimum of 10-ft. in length for each individual form. Forms shall be of ample strength and shall be provided with adequate devices for secure setting so that when in place they shall withstand the impact and vibration of equipment imposed thereupon without appreciable springing or settlement. In no case shall the base width be less than 8-in. for a form 8-in. or more in height. The forms shall be free from warps, bends or kinks and shall show no variation from the true plane for face or top. Each 10-ft. length of forms shall be provided with at least 3 pins for securely staking in position. Sufficient forms shall be provided for satisfactory prosecution of the work. 10-ft. metal

form sections shall be used in forming curves with a 250-ft., and larger radius. For curves with a radius of less than 250-ft., acceptable flexible metal forms or wood forms may be used upon approval by the OWNER.

303.4.5. Mechanical Vibratory Equipment. All concrete placed for pavement shall be consolidated by approved mechanical vibrators operated ahead of the transverse finishing machine and designed to vibrate the concrete internally and/or from the surface. Unless otherwise shown on the plans, vibrators of the surface-pan type shall be used for full-depth placement. Both types of vibrators shall be furnished and may be used concurrently at the discretion of the OWNER. Vibratory members shall extend across the pavement practically to, but shall not come in contact with, the side forms. Mechanically-operated vibrators shall be mounted in such a manner as not to interfere with the transverse or longitudinal joints.

The internal-type vibrators shall be spaced at not more than 24-in. and shall be equipped with synchronized vibratory units. Separate Vibratory units shall be spaced at sufficiently close intervals to provide uniform vibration and consolidation to the entire width of the pavement. The frequency in air of the internal spud-type Vibratory units shall be not less than 8,000-cycles-per-minute and not less than 5,000-cycles-per-minute for tube types. The method of operation shall be as directed by the OWNER. The CONTRACTOR shall have a satisfactory tachometer available for checking the vibratory elements.

The pavement vibrators shall not be used to level or spread the concrete but shall be used only for purposes of consolidation. The vibrators shall not be operated where the surface of the concrete, as spread, is below the elevation of the finished surface of the pavement, except for the first lift of concrete where the double strike-off method of placement is employed. The vibrators shall not be operated for more than 15-seconds while the machine upon which they are installed is still.

The pan-type vibrator units shall apply the vibrating impulses directly to the surface of the concrete. The operating frequency shall not be less than 3,500-cycles- nor more than 4,200-cycles-per-minute in air. The CONTRACTOR shall have a satisfactory tachometer available for checking the speed of the vibratory elements.

Approved hand manipulated mechanical vibrators shall be furnished in the number required for provision of proper consolidation of the concrete along the forms, at joints and in areas not covered by mechanically controlled vibrators. These vibrators shall be sufficiently rigid to insure control of the operating position of the vibrating head.

Complete and satisfactory consolidation of the concrete pavement is a most important requirement of this specification. Cores taken as required by Item 303.8. Pavement Testing and Evaluation shall be carefully examined for voids, honeycombing or other evidence of incomplete consolidation. If such evidence is present, changes in the consolidation procedures and/or equipment shall be made to insure satisfactory consolidation.

303.4.6. Vibrating Screed. The mechanically vibrated screed shall be provided with a template adjusted to the crown of the concrete section. The template shall be power vibrated, adjustable in height and mounted to ride on the forms. The mechanical vibration of one of the screeds on the transverse finishing machine specified in Item 303.4.7. Transverse Finishing Machine shall be acceptable.

303.4.7. Transverse Finishing Machine. The transverse finishing machine shall be provided with two screeds accurately adjusted to the crown of the pavement, shall be power driven and mounted in a substantial frame equipped to ride on the forms. The machine shall be so designed and operated as to strike off and consolidate the concrete.

Finishing machines shall be maintained in a tight and good operating condition, accurately adjusted to the required crown or profile and free from deflection, wobble or vibration tending to affect the surface finish. Machines failing to meet these requirements shall be rejected by the OWNER, and the CONTRACTOR shall provide approved equipment.

303.4.8. Miscellaneous Finishing Equipment. The CONTRACTOR shall furnish a broom of the push broom type not less than 18-in. in width with stiff bristles for the final surface finish of concrete base or as the OWNER directs.

The CONTRACTOR shall furnish a sufficient number of bridges equipped to ride on the forms and span the pavement for finishing operations and for the installation and finishing of joints. The CONTRACTOR shall furnish, operate and maintain at least two standard 10-ft. steel straightedges and all necessary finishing and edging tools as may be required to complete the pavement in accordance with the plans and specifications.

303.5. CONSTRUCTION METHODS

303.5.1. Subgrade. When manipulation or treatment of subgrade is required on the plans, the work shall be performed in proper sequence with the preparation of the subgrade for pavement.

The roadbed shall be excavated and shaped in conformity with the typical sections and to the lines and grades shown on the plans or established by the OWNER. Material excavated in the preparation of the roadbed in excess of that needed to properly construct the subgrade, shoulders, slopes or parkway shall be wasted. If additional material is required, it shall be secured from sources indicated on the plans or designated by the OWNER. All holes, ruts and depressions shall be filled with suitable material and, if required, the subgrade shall be thoroughly wetted and reshaped. Irregularities of more than ½-in., as shown by straightedge or template, shall be corrected. The subgrade shall be uniformly compacted to at least 95-percent of the maximum density as determined by ASTM D698 Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3). Moisture content shall be within minus-2%- to plus-4%-of-optimum. The prepared subgrade shall be wetted down sufficiently in advance of placing the pavement to insure its being in a firm and moist condition for at least 2-in. below the surface. Sufficient subgrade shall be prepared in advance to insure satisfactory prosecution of the work. No hauling or equipment shall be permitted on the finished subgrade.

The CONTRACTOR shall notify the OWNER at least three working days in advance of its intention to place concrete pavement.

Density tests must be taken no more than 72-hours prior to placement of concrete. After the specified moisture and density are achieved, the CONTRACTOR shall maintain the subgrade moisture and density in accordance with Item 301. Subgrade, Subbase, and Base Preparation until the pavement is placed. In the event that rain or other conditions may have adversely affected the condition of the subgrade or base, additional tests may be required as directed by the OWNER.

303.5.2. Placing and Removing Forms. Forms shall be set to line and grade at least 200-ft., where practicable, in advance of the paving operations. Forms shall be adequately staked with at least three pins per 10-ft. section and capable of resisting the pressure of concrete placed against them and the thrust and the vibration of the construction equipment operating upon them without appreciable springing or settlement. Forms shall be jointed neatly and tightly and set with exactness to the established grade and alignment. Forms must be in firm contact with the subgrade throughout their length and base width. If the subgrade becomes unstable, forms shall be reset, using heavy stakes, or other additional supports may be necessary to provide the required stability.

303.5.2.1. Settling. When forms settle over ⅛-in. under finishing operations, paving operations shall be stopped, the forms reset to line and grade and the pavement then brought to the required section and thickness.

303.5.2.2. Cleaning and Oiling. Forms shall be thoroughly cleaned after each use and well-oiled before reuse.

303.5.2.3. Removal. Forms shall remain in place a minimum of twelve hours or more as required by the OWNER. At the time the forms are removed, any honeycomb shall be rubbed with grout and sealed with a curing compound.

303.5.2.4. Curb. Superimposed or monolithic curb shall be formed from the flowline of the gutter to the top of the curb. All expansion joints in the curbs shall conform to the joint locations in the slab.

303.5.3. Placing Reinforcing Steel, Tie, and Dowel Bars. When reinforcing steel, welded wire mesh, tie bars, dowels, etc., are required, they shall be placed as shown on the plans. All reinforcing shall be clean, free from rust in the form of loose or objectionable scale, and of the type, size and dimensions shown on the plans. Reinforcing bars shall be securely wired together at the alternate intersections and all splices and shall be securely wired to each intersection dowel and load-transmission unit intersected. All bars shall be installed in their required position as shown on the plans.

The storing of reinforcing or structural steel on completed roadway slabs generally shall be avoided and, where permitted, such storage shall be limited to quantities and distribution that shall not induce excessive stresses.

303.5.3.1. Installation. All reinforcing bars and bar mats shall be installed in the slab at the required depth below the finished surface and supported by and securely attached to bar chairs installed on prescribed longitudinal and transverse centers as shown by sectional and detailed drawings on the plans. After the reinforcing steel is securely installed above the subgrade, as specifically required by plans and as herein prescribed, there shall be no loading imposed upon (or walking upon) the bar mats or individual bars before or during the placing or finishing of the concrete.

303.5.3.2. Welded Wire Mats. Where welded wire fabric reinforcement mats are required by the plans, or permitted as an alternate by the OWNER, the concrete shall be placed and struck off by means of a template to the depth below the finished surface as specified for the location of the mesh. Welded wire mats, conforming to the specified side lap and end splice requirements as detailed on the plans, shall be placed upon the struck surface. The remainder of the concrete shall be placed thereupon with finishing operations proceeding immediately. There shall be no loading imposed upon the mesh mats after installation in the slab concrete.

303.5.3.3. Assembly. Expansion joints or dummy joints which may require an assembly of parts supported by special devices shall be completely assembled and rigidly supported in the correct position well in advance of the placing of concrete.

303.5.4. Joints.

303.5.4.1. Joint Dimensions. The width of the joint shall be shown on the plans, creating the joint sealant reservoir. The depth of the joint shall be shown on the plans. Dimensions of the sealant reservoir shall be in accordance with manufacturer's recommendations. Normal width/depth ratios are 1 to 1, not to exceed 1 to 1½. After curing, the joint sealant shall be ⅛-in. to ¼-in. below the pavement surface at the center of the joint.

303.5.4.2. Expansion Joints. Expansion joints shall be installed perpendicularly to the surface and to the centerline of the pavement at the locations shown on the plans.

Refer to Item 702.5.4.1. Expansion Joints for more information.

303.5.4.2.1. Joint Filler. Joint filler shall be as specified in Item 303.2.12. Joint Filler, as approved by OWNER, of the size and shape shown on the plans.

Board joint material with less than 25-percent of moisture at the time of installation shall be thoroughly wetted on the job. Green lumber of much higher moisture content is desirable and acceptable.

The joint filler shall be appropriately drilled to admit the dowel bars when required. The bottom edge of the filler shall extend to or slightly below the bottom of the slab. The top edge shall be held approximately ½-in. below the finished surface of the pavement in order to allow the finishing operations to be continuous. Where the joint filler is of a premolded asphaltic type, the top edge shall be protected, while the concrete is being placed and finished, by a metal cap of at least 10 gauge material having flanges not less than 1½-in. in depth. The channel cap may remain in place during the joint finishing operations to serve as a guide for tooling the edges of the joint. After the removal of the side forms, the ends of the joints at the edges of the slab shall be carefully opened for the entire depth of the slab.

303.5.4.2.2. Curb. Where a superimposed curb or a separate curb and gutter may be used, the expansion joints therein shall coincide and be continuous with the pavement joint and of the same size and type.

303.5.4.2.3. Proximity to Existing Structures. When the pavement is adjacent to or around existing structures, expansion joints shall be constructed in accordance with the details shown on the plans.

303.5.4.2.4. Dowel Bars. Dowel bars, where required on the plans, shall be installed through the predrilled joint filler and rigidly supported in true horizontal and vertical positions by an assembly of bar chairs and dowel holders welded to transverse bars extending across the slab and placed on each side of the joint. The chair assembly shall be similar and equal to that shown on the plans and shall be approved by the OWNER prior to extensive fabrication.

303.5.4.3. Contraction Joints. Contraction or dummy joints shall be installed at the locations and at the intervals shown on the plans in accordance with this section and Item 402.3. Sawing. The joints shall be constructed by sawing to a ¼-in. width and to a depth of ¼ of the pavement thickness, or deeper if so indicated on the plans. Unless otherwise specified on the plans, joints shall be sawed into the completed pavement surface as soon after initial concrete set as possible so that some raveling of the green concrete is observed in order for the sawing process to prevent uncontrolled shrinkage cracking. If sharp edge joints are being obtained, the sawing process shall be sped up to the point where some raveling is observed. Damage by blade action to the slab surface and to the concrete immediately adjacent to the joint shall be minimized. Any portion of the curing membrane which has been disturbed by sawing operations shall be restored by spraying the areas with additional curing compound. The sawed groove shall immediately be thoroughly cleaned for the full depth and width of the joint and filled. The type of equipment and method for performing this work shall be approved by the OWNER.

303.5.4.4. Construction Joints. Construction joints formed at the close of each day's work or when the placing of concrete has been stopped for 30-minutes or longer shall be constructed by use of metal or wooden bulkheads cut true to the section of the finished pavement and cleaned and oiled. Wooden bulkheads shall have a thickness of not less than 1½-in. Longitudinal bars shall be held securely in place in a plane perpendicular to the surface and at right angles to the centerline of the pavement. Edges shall be rounded to ¼-in. radius. Any surplus concrete on the subgrade shall be removed upon the resumption of the work.

In no case shall an emergency construction joint be placed within 8-ft. following a regular installation of expansion or contraction joint. If the emergency construction joint should fall within this limitation, the concrete shall be removed back to the previously installed joint.

Refer to Item 702.5.4.2. Construction Joints for more information.

303.5.4.5. Longitudinal Parting Strips. Longitudinal parting strips or planes of weakness, when required, shall be accurately placed as shown on the plans.

303.5.4.6. Longitudinal Construction Joints. Longitudinal construction joints shall be of the type shown on the plans. Longitudinal joints shall be constructed accurately to required lines in order to coincide with traffic lane lines. No width between longitudinal construction joints shall exceed 24-ft., unless specifically authorized or directed by the OWNER in writing.

303.5.4.7. Joint Sealing. Routine pavement joints shall be filled to a depth of 1½-in. Materials shall generally be handled and applied according to the manufacturer's recommendations, with additional requirements as stated herein.

303.5.4.7.1. Hot Poured Polymer. The sealing filler shall be melted in an approved oil-batch kettle with continuous mechanical agitation. The kettle shall be equipped with temperature indicators. The OWNER shall determine the optimum temperature for proper pouring fluidity, and the CONTRACTOR shall maintain the material within close range of optimum temperature. At no time shall the temperature exceed 450°F. Joint sealing compound shall not be poured at atmospheric temperatures below 32°F.

303.5.4.7.2. Ready-Mixed Cold-Applied. Permeation of joints shall principally be achieved without the task of squeegeeing. However, squeegeeing is recommended to assist permeation and to allow sealant to become rapidly tack-free. Sealant shall "set" in a fixed position within 40-minutes after application, to where traffic may be restored to the pavement without the effects of "tracking." "Tracking" shall be averted without the use of topping materials such as sand.

303.5.5. Placing Concrete. Unless otherwise shown on the plans, the concrete shall be placed using either forms or slipform paver. The concrete shall be rapidly deposited on the subgrade in successive batches and shall be distributed to the required depth and for the entire width of the pavement by shoveling or other approved methods. Any concrete not placed as herein prescribed within the time limits specified in Table 303.5.5.(a) Concrete Placement will be rejected.

Table 303.5.5.(a) Concrete Placement Temperature –Time Requirements

Concrete Temp (at point of placement)	Max Time - minutes (no retarding agent)	Max Time – minutes (with retarding agent)[1]
Non-Agitated Concrete		
All temperatures	30	45
Agitated Concrete		
Above 90°F	45	75
Above 75 F thru 90°F	60	90
75°F and Below	90	120

1. Normal dosage of retarder.

Where bar mats or wire mesh reinforcing is specified, method of concrete placement shall be in accordance with Item 303.5.3. Placing Reinforcing Steel, Tie, and Dowel Bars. Rakes shall not be used in handling concrete. The placing operation shall be continuous. At the end of the day, or in case of unavoidable interruption or delay of more than 30-minutes, a transverse construction joint shall be placed in accordance with Item 303.5.4.4. Construction Joints.

303.5.5.1. Honeycombing. Special care shall be taken in placing and spading the concrete against the forms and at all joints and assemblies so as to prevent honeycombing. Excessive voids and honeycombing in the edge of the pavement, revealed by the removal of the side forms, may be cause for rejection of the section of slab in which the defect occurs.

303.5.5.2. Weather Conditions. Except by specific written authorization of the OWNER, no concrete shall be placed when the air temperature is less than 40°F and falling but may be placed when the air temperature is above 35°F and rising, the temperature being taken in the shade away from artificial heat. When and if such permission is granted, the CONTRACTOR shall furnish sufficient protective material and devices to enclose and protect the fresh concrete in such a way as to maintain the temperature of the air surrounding the fresh concrete at not less than 50°F for a period of at least 5-days.

Except by specific written authorization of the OWNER, no concrete shall be placed when the concrete temperature is higher than 95°F. CONTRACTOR shall take appropriate measures including chilling and reduction of time intervals between batching and placing.

It is to be distinctly understood that the CONTRACTOR is responsible for the quality and strength of the concrete placed under any weather conditions. No concrete shall be placed on a frozen subgrade.

303.5.5.3. Time. Concrete shall not be placed before the time of sunrise and the surface finishing shall be completed prior to sunset unless otherwise authorized by the OWNER.

303.5.6. Finishing.

303.5.6.1. Machine. When the concrete has been deposited, it shall be approximately leveled and then struck off to such elevation that, when mechanically screeded and tamped, the concrete shall be thoroughly compacted and finished to the required line, grade and section with all surface voids filled. Where bar mats or wire mesh reinforcing is specified, method shall be in accordance with Item 303.5.3. Placing Reinforcing Steel, Tie, and Dowel Bars.

303.5.6.1.1. Tolerance Limits. While the concrete is still workable, it shall be tested for irregularities with a 10-ft. straightedge placed parallel to the centerline of the pavement so as to bridge depressions and to touch all high spots. Ordinates measured from the face of the straightedge to the surface of the pavement shall at no place exceed $^1/_{16}$ inch-per-foot from the nearest point of contact. In no case shall the maximum ordinate to a 10-ft. straightedge be greater than ⅛-in. Any surface not within the tolerance limits shall be reworked and refinished.

303.5.6.1.2. Edging. The edges of slabs and all joints requiring edging shall be carefully tooled with an edger of the radius required by the plans at the time the concrete begins to take its "set" and becomes non-workable. All such work shall be left smooth and true to lines.

303.5.6.1.3. Stamp or Die. All concrete including curbs, curb with gutter, sidewalks, alleys, driveways and structures shall be marked by means of a substantial stamp or die so designed to make an impression in the finish of the concrete. The stamp or die shall designate the firm name or CONTRACTOR and the month and year in which the work was done. The design of the stamp or die shall be approved by the OWNER.

303.5.6.2. Hand. Hand finishing shall be permitted only in intersections and areas inaccessible to a finishing machine. The addition of one-sack of cement per cubic-yard shall be required for all hand finish concrete.

When the hand method of striking off and consolidating is permitted, the concrete, as soon as placed, shall be approximately leveled and then struck off and screeded to such elevation above grade that, when consolidated and finished, the surface of the pavement shall be at the grade elevation shown on the plans. The entire surface shall then be tamped and the concrete consolidated so as to insure maximum compaction and a minimum of voids. For the strike off and consolidation, both a strike template and tamping template shall be provided on the work. In operation the strike template shall be moved forward with a combined longitudinal and transverse motion and so manipulated that neither end of the template is raised from the forms during the striking-off process. A slight excess of material shall be kept in front of the cutting edge at all times.

The straightedge and joint finishing shall be as hereinabove prescribed.

303.5.7. Curing. The curing of concrete pavement shall be thorough and continuous throughout the entire curing period. Failure to provide proper curing as herein prescribed shall be considered as sufficient cause for immediate suspension of the paving operations. The curing method as herein specified does not preclude the use of any of the other commonly used methods of curing, and the OWNER may approve another method of curing if so requested by the CONTRACTOR. If any selected method of curing does not afford the desired results, the OWNER shall have the right to order that another method of curing be instituted. Immediately after the finishing of the surface, the pavement shall be covered with a continuous, uniform water-impermeable coating of the type specified in Item 303.2.13. Curing Materials. After removal of the side forms, the sides of the slab shall receive a like coating before earth is banked against them. The solution shall be applied, under pressure with a spray nozzle, in such a manner as to cover the entire surfaces thoroughly and completely with a uniform film.

The rate of application shall be such as to insure complete coverage and shall not exceed 200-square-feet-per-gallon of curing compound. When thoroughly dry, it shall provide a continuous and flexible membrane, free from cracks or pinholes, and shall not disintegrate, check, peel or crack during the curing period. If for any reason the seal is broken during the curing period, it shall be immediately repaired with additional sealing solution.

When tested in accordance with ASTM C156 Water Retention by Concrete Curing Materials, the curing compound shall provide a film which shall have retained within the test specimen a percentage of the moisture present in the specimen when the curing compound was applied according to Table 303.5.7.(a) Water Retention by Curing Materials.

Table 303.5.7.(a) Water Retention by Curing Materials

Time	Minimum Retained Moisture
After 24-hours	97%
After 3-days	95%
After 7-days	91%

303.5.8. Opening Pavement to Traffic. All traffic shall be excluded from the pavement for a period of not less than 14-days or until field cured test specimens indicate concrete meets at least 75% of design strength, or as otherwise approved by the OWNER. In all cases the pavement shall be cleaned and joints shall be filled and trimmed before being opened to traffic.

303.5.8.1. Traffic Access. When it is necessary to provide for traffic across the pavement, the CONTRACTOR shall, at its own expense, construct suitable and substantial crossings over the concrete which shall be adequate for the traffic using same.

303.5.8.2. Time. Opening pavement to traffic shall not relieve the CONTRACTOR of responsibility for the work and shall not in any way affect the time charge on the entire project. The number of days stated in the contract shall govern for the completion of the entire work covered by the contract.

303.5.9. Monolithic Curb. Concrete for monolithic curb shall be the same as for the pavement and, if carried back from the paving mixer, shall be placed within 20-minutes after being mixed. Concrete may be placed from the separate mixer if desired but in any case must be placed while the pavement concrete is still plastic. After the concrete has been struck off and sufficiently set, the exposed surfaces shall be thoroughly worked with a float. The exposed edges shall be rounded by the use of an edging tool to the radius indicated on the plans. When the concrete in the curb has been sufficiently set, the inside form shall be carefully removed and the surface may be plastered with a mortar consisting of one part of Portland cement and two parts fine aggregate. The mortar shall be applied with a template or "mule" made to conform to curb dimensions. All exposed surfaces of curb shall be brushed to a smooth and uniform surface.

303.5.10. Superimposed Curb. When sawed joints are used, curbs shall be doweled as shown on the plans and poured after sawing. Doweled curbs which are placed with an extrusion machine shall have a mixture that conforms to Item 303.3. Mix Design and Mixing Concrete for Pavement.

303.5.11. Slip Form Paving. At the option of the CONTRACTOR, and with the approval of the OWNER, concrete pavement may be constructed by the use of slip form paving equipment.

The concrete, for the full paving width, shall be effectively consolidated by internal vibration with transverse vibrating units or with a series of longitudinal vibrating units loaded with the specified thickness of pavement section and at a minimum distance ahead of the screed equal to the pavement thickness.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels offset to run a sufficient distance from the edge of the pavement to avoid breaking or cracking the pavement edge.

Final finishing for slip form pavement construction shall be to the tolerance as specified in Item 303.5.6. Finishing.

303.6. ALLEY PAVING

Alley paving shall be constructed in accordance with the specifications for street paving hereinbefore described, in accordance with the details shown on the plans, and with the following additional provisions:

Alley paving shall be constructed to one of the typical cross sections shown on the plans.

Transverse expansion joints of the type shown on the plans shall be constructed at the property line on each end of the alley with a maximum spacing of 600-ft. Transverse contraction and dummy joints shall be placed at the spacing shown on the plans. Contraction and dummy joints shall be formed in such a manner that the required joints shall be produced to the satisfaction of the OWNER. All joints shall be filled with top seal in accordance with the requirements of Item 303.5.4. Joints.

303.7. PAVEMENT LEAVEOUTS

Pavement leaveouts as necessary to maintain and provide for local traffic shall be provided at location indicated on the plans or as directed by the OWNER. The extent and location of each leaveout required and a suitable crossover connection to provide for traffic movements shall be determined in the field by the OWNER. Left or right-turn lanes and median openings shall not be considered as pavement leaveouts.

303.8. PAVEMENT TESTING AND EVALUATION

303.8.1. Testing of Materials. Samples of all materials for test shall be made at the expense of the OWNER, unless otherwise specified in the special provisions or in the plans. In the event the initial sampling and testing does not comply with the specifications, all subsequent testing of the material in order to determine if the material is acceptable shall be at the CONTRACTOR'S expense at the same rate charged by the

commercial laboratories. All testing shall be in accordance with applicable ASTM Standards and concrete testing technician must be ACI certified or equivalent.

303.8.2. Pavement Thickness Test. Upon completion of the work and before final acceptance and final payment shall be made, pavement thickness test shall be made by the OWNER. The number of tests and location shall be at the discretion of the OWNER, unless otherwise specified in the special provisions or on the plans. The cost for the initial pavement thickness test shall be the expense of the OWNER. In the event a deficiency in the thickness of pavement is revealed during normal testing operations, subsequent tests necessary to isolate the deficiency shall be at the CONTRACTOR'S expense. The cost for additional coring test shall be at the same rate charged by commercial laboratories.

Where the average thickness of pavement in the area found to be deficient in thickness by more than 0.20-in., but not more than 0.50-in., upon discretion of the OWNER payment shall be made at an adjusted price as specified in Table 303.8.2.(a) Concrete Pavement Deficiency.

Table 303.8.2.(a) Concrete Pavement Deficiency

Deficiency in Thickness Determined By Cores	Proportional Part of Contract Price
Inches	Allowed
0.00 — 0.20	100 percent
0.21 — 0.30	80 percent
0.31 — 0.40	70 percent
0.41 — 0.50	60 percent

Any area of pavement found deficient in thickness by more than 0.50-in. but not more than 0.75-in. or $^1/_{10}$ of the plan thickness, whichever is greater, shall be evaluated by the OWNER. If, in the judgment of the OWNER, the area of such deficiency should not be removed and replaced, there shall be no payment for the area retained. If, in the judgment of the OWNER, the area of such deficiency warrants removal, the area shall be removed and replaced, at the CONTRACTOR'S entire expense, with concrete of the thickness shown on the plans. Any area of pavement found deficient in thickness by more than 0.75-in. or more than $^1/_{10}$ of the plan thickness, whichever is greater, shall be removed and replaced, at the CONTRACTOR'S entire expense, with concrete of the thickness shown on the plans.

No additional payment over the contract unit price shall be made for any pavement of a thickness exceeding that required by the plans.

303.8.3. Pavement Strength Test.

303.8.3.1. For Standard Classes of Concrete. During the progress of the work, the CONTRACTOR shall cast test cylinders, in accordance with ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field, to maintain a check on the compressive strengths of the concrete being placed.

In accordance with ASTM C31 and ASTM C172 Standard Practice for Sampling Freshly Mixed Concrete, four test cylinders shall be taken from a representative portion of the concrete being placed for every 150-cubic yards of concrete pavement placed, but in no case shall less than 2 sets of cylinders be taken from any one day's placement. For smaller placements, the testing frequency may be adjusted at the OWNER'S discretion.

After the cylinders have been cast, they shall remain on the job site and then transported, moist cured, and tested by the OWNER in accordance with ASTM C31 and ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

In each set, one of the cylinders shall be tested at 7-days, two cylinders shall be tested at 28-days, and one cylinder shall be held or tested at 56-days, if necessary.

If the 28-day test results indicate deficient strength, the CONTRACTOR may, at its option and expense, core the pavement in question and have the cores tested by an approved laboratory, in accordance with ASTM C42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of

Concrete and ACI 318 protocol, except the average of all cores must meet 100% of the minimum specified strength, with no individual core resulting in less than 90% of design strength, to override the results of the cylinder tests.

The CONTRACTOR shall be responsible for the proper storage, maintenance, and any required curing of concrete test samples made by the OWNER. The CONTRACTOR shall provide and maintain curing facilities for the purpose of curing concrete test specimens on site in accordance with ASTM C31. The cost of all materials used in test specimens and the cost of storing, maintaining and of providing and maintaining curing facilities will not be paid for as a separate contract pay item, and the costs thereof shall be considered incidental to the contract pay items provided.

Cylinders and/or cores must meet minimum specified strength. Pavement not meeting the minimum specified strength shall be subject to the money penalties or removal and replacement at the CONTRACTOR'S expense as shown in Table 303.8.3.1.(a) Standard Class Concrete Deficiency Penalties.

Table 303.8.3.1.(a) Standard Class Concrete Deficiency Penalties.

Percent Deficient	Percent of Contract Price Allowed
Greater Than 0% — Not More Than 5%	95-percent
Greater Than 5% — Not More Than 10%	90-percent
Greater Than 10% — Not More Than 15%	80-percent
Greater Than 15%	60-percent or removed and replaced at the entire cost and expense of CONTRACTOR as directed by OWNER.

The amount of penalty shall be deducted from payment due to CONTRACTOR; such penalty deducted is to defray the cost of extra maintenance.

These requirements are in addition to the requirements of Item 303.9. Measurement and Payment.

The strength requirements for structures and other concrete work are not altered by this special provision.

No additional payment over the contract unit price shall be made for any pavement of strength exceeding that required by plans and/or specifications.

303.8.3.2. For Performance Classes of Concrete. During the progress of the work, the CONTRACTOR shall cast test cylinders, in accordance with ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field, to maintain a check on the compressive strengths of the concrete being placed.

In accordance with ASTM C31 and ASTM C172 Standard Practice for Sampling Freshly Mixed Concrete, four test cylinders shall be taken from a representative portion of the concrete being placed for every 150-cubic yards of concrete pavement placed, but in no case shall less than 2 sets of cylinders be taken from any one day's placement.

After the cylinders have been cast, they shall remain on the job site and then transported, moist cured, and tested by the OWNER in accordance with ASTM C31 and ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

In each set, one of the cylinders shall be tested at 7-days, two cylinders shall be tested at 28-days, and one cylinder shall be held or tested at 56-days, if necessary.

If the 28 day test results indicate deficient strength, the CONTRACTOR may, at its option and expense, core the pavement in question and have the cores tested by an approved laboratory, in accordance with ASTM C42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete and ACI 318 protocol, to override the results of the cylinder tests.

The CONTRACTOR shall be responsible for the proper storage, maintenance, and any required curing of concrete test samples made by the OWNER. The CONTRACTOR shall provide and maintain curing facilities for the purpose of curing concrete test specimens on site in accordance with ASTM C31. The cost of all materials used in test specimens and the cost of storing, maintaining and of providing and maintaining curing facilities will not be paid for as a separate contract pay item, and the costs thereof shall be considered incidental to the contract pay items provided.

Cylinders and/or cores must meet the specified strength in accordance with ACI 318 protocol. Pavement not meeting the specified strength shall be subject to the money penalties or removal and replacement at the CONTRACTOR'S expense as shown in Table 303.8.3.2.(a) Performance Class Concrete Deficiency Penalties.

Table 303.8.3.2.(a) Performance Class Concrete Deficiency Penalties.

Percent Deficient	Percent of Contract Price Allowed
Greater Than 0% — Not More Than 5%	95-percent
Greater Than 5% — Not More Than 10%	90-percent
Greater Than 10% — Not More Than 15%	80-percent
Greater Than 15%	60-percent or removed and replaced at the entire cost and expense of CONTRACTOR as directed by OWNER.

The amount of penalty shall be deducted from payment due to CONTRACTOR; such penalty deducted is to defray the cost of extra maintenance.

These requirements are in addition to the requirements of Item 303.9. Measurement and Payment.

The strength requirements for structures and other concrete work are not altered by this special provision.

No additional payment over the contract unit price shall be made for any pavement of strength exceeding that required by plans and/or specifications.

303.8.4. Random Drying Shrinkage Cracks and Stress Cracks. Random drying shrinkage cracks or stress cracks of widths greater than 0.025-inches in recently placed reinforced Portland cement concrete pavement placed on stabilized subbase or slabs on grade are subject to being removed and replaced at the discretion of the OWNER. Random drying shrinkage cracks or stress cracks of any nature in recently placed non-reinforced Portland cement concrete pavement placed on non-stabilized subbase or slabs on grade are subject to being removed and replaced at the discretion of the OWNER. Recently placed concrete pavement or slabs on grade are those for which the one-year maintenance bond has not expired. Routing, by any means, and sealing random cracks will not be permitted. When Portland cement concrete pavement or slabs on grade must be removed and replaced, the area of removal must extend from the nearest contraction or dummy joint or construction joint a minimum distance of 10-feet, measured parallel to the longitudinal axis of the pavement, and include that portion of the concrete pavement or slab on grade containing the random crack. A sawed dummy joint will be required to be sawed across the opposing, non-damaged, slab in line with the saw cut made for the removal of the damaged slab. The area of removal and replacement of slabs containing longitudinal random cracks will be determined by the OWNER. Randomly cracked Portland cement concrete sidewalks will require removal and replacement of only the five-feet long section or sections containing random cracks.

303.9. MEASUREMENT AND PAYMENT

Portland cement concrete pavement shall be measured by the square-yard of completed and accepted pavement. Measurement for reinforced concrete pavement shall be by the square-yard measured in its final position.

The work performed and material furnished as prescribed by this item and measured as provided in this item shall be paid for at the unit price bid per square-yard for concrete pavement or the adjusted unit price for pavement of deficient thickness as provided under Pavement Thickness Test and Pavement Strength Test, which price shall be full compensation for shaping and fine grading the roadbed, including furnishing and applying all water required; for furnishing, loading and unloading, storing, hauling and handling all concrete ingredients, including all freight and royalty involved; for mixing, placing, finishing and curing all concrete; for furnishing and installing all reinforcing steel; for furnishing all materials and placing longitudinal, warping, expansion, and contraction joints, including all steel dowels, dowel caps and load transmission units required, wire and devices for placing, holding and supporting the steel bar, load transmission units, and joint filler material in the proper position; for coating steel bars where required by the plans; for all manipulations, labor, equipment, appliances, tools, traffic provisions and incidentals necessary to complete the work.

ITEM 304. PAVING UNITS

304.1. SOLID CONCRETE INTERLOCKING PAVING UNITS

This item shall govern the construction of concrete pavements and medians utilizing interlocking paving units according to lines, grades, locations, and designs as indicated on the plans and specifications, or as established by the OWNER.

304.1.1. General. Concrete Interlocking Paving Units are to be used on a site-specific basis only. The OWNER shall specify the special material and construction requirements for each location. Each site-specific application requires proper engineering design for the anticipated traffic volumes and vehicle loads.

304.1.2. Materials.

304.1.2.1. Concrete Paving Units. Interlocking paving unit construction shall conform to ASTM C936 Solid Interlocking Concrete Paving Units.

Pigment in concrete paving units shall conform to ASTM C979 Pigments for Integrally Colored Concrete.

All units shall be sound and free of defects that would interfere with the proper placing of unit or impair the strength or permanence of the construction.

304.1.2.1.1. Sampling and Testing Units. Manufacturer shall provide access to lots ready for delivery to the OWNER for testing in accordance with ASTM C936 for sampling of material prior to commencement of paving unit placement.

Manufacturer shall provide data showing manufactured products meet or exceed ASTM C936 when tested in compliance with ASTM C140 Sampling and Testing Concrete Masonry Units.

304.1.2.2. Base. The OWNER shall specify the site-specific requirements for each use. Base for pavements may consist of a reinforced concrete base, asphalt, flexible base, or stabilized subgrade. Base for medians shall be site specific and according to design parameters of the OWNER.

304.1.2.3. Bedding and Joint Sand. Bedding and joint sand shall be clean, non-plastic, and free from deleterious or foreign matter. The sand shall be natural or manufactured from crushed rock. When concrete paving units are subject to vehicular traffic, the sands shall be as hard and angular as practically available. Limestone screenings or stone dust shall not be used. Unevenly graded sand with an excess amount of material passing the No. 200 sieve shall not be used.

Sand that is suitable for the manufacturing of concrete is typically suitable for bedding. Grading of sand samples for the bedding course and joints shall be done according to ASTM C136 Method for Sieve Analysis for Fine and Coarse Aggregate. Bedding sand shall conform to the grading requirements of ASTM C33 Concrete Aggregates as shown in Table 304.1.2.3.(a) Bedding Sand Gradation.

Table 304.1.2.3.(a) Bedding[1] Sand Gradation

Sieve Size	Percent Passing
⅜-in.	100
No. 4	95 to 100
No. 8	85 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

1. Bedding sand may be used for joint sand. However, extra effort in sweeping and compacting the paving units shall be required to fill the joints completely.

If joint sand other than bedding sand is used, it shall conform to the grading requirements of ASTM C144 Aggregate for Masonry Mortar as shown in Table 304.1.2.3.(b) Joint Sand Gradation(Natural Sand). Joint sand shall not be used for bedding sand. Mason sands are typically acceptable only for

joint sand provided they meet grading requirements as shown in Table 304.1.2.3.(b) Joint Sand Gradation (Natural Sand).

Table 304.1.2.3.(b) Joint Sand Gradation (Natural Sand)

Sieve Size	Percent Passing
No. 4	100
No. 8	95 to 100
No. 16	70 to 100
No. 30	40 to 75
No. 50	10 to 35
No. 100	2 to 15
No. 200	0

304.1.2.4. Curbs and Gutters. Edge restraint is a critical design component of interlocking unit pavement. Curbs and gutters for concrete pavement units shall meet the requirements of Item 305.1. Concrete Curb and Gutter with any deviations indicated on the plans or instructed by the OWNER.

304.1.3. Construction Methods. Construction methods for each type unit shall be provided by the manufacturer and approved by the OWNER based on the site-specific use. Delivery and paving schedule shall be coordinated to minimize interference with normal use of buildings adjacent to paving.

304.1.3.1. Delivery, Storage and Handling. Concrete paving units shall be delivered to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by fork lift or clamp lift. Paving units shall be unloaded at job site in such a manner that no damage occurs to the product.

Sand shall be covered with waterproof covering to prevent exposure to rainfall or removal by wind. The covering shall be secured in place.

304.1.3.2. Environmental Conditions. Paving units shall not be installed during heavy rain or snowfall over frozen base materials. Sand shall not be wet or frozen.

304.1.3.3. Construction Procedure.

304.1.3.3.1. Base. Construction methods shall follow the requirements of the selected base as contained in these specifications with any deviations indicated on the plans or instructed by the OWNER.

304.1.3.3.2. Bedding. Sand shall be spread evenly over the base course and screed to a nominal 1-in. thickness, not exceeding 1.5-in. thickness. The secreted sand shall not be disturbed. Sufficient sand shall be placed to stay ahead of the laid paving units. Bedding sand shall not be used to fill depressions in the base surface. The material shall be of uniform moisture content when spread.

304.1.3.3.3. Paving Units and Joints. Paving units shall be free of foreign materials before installation. Paving units shall be laid in the pattern(s) as shown on the drawings. Straight pattern lines shall be maintained.

Joints shall be made according to manufacturer recommendations. Typically, joints between the paving units will be between $^{1}/_{16}$-in. and $^{3}/_{16}$-in. wide except where paving unit shapes require a larger joint.

Gaps at the edges of the paved area shall be filled with cut paving units or edge units. Cuts shall be made with a mounted masonry saw. Units cut no smaller than one-third of a whole paving unit when feasible are recommended along edges subject to vehicular traffic. Areas not feasible shall be neatly grouted and pointed up.

A low amplitude, high frequency plate vibrator shall be used to vibrate the paving units into the sand. The size of compaction equipment shall be selected according to Table 304.1.3.3.3.(a) Compaction Equipment.

Table 304.1.3.3.3.(a) Compaction Equipment

Paving Unit Thickness	Minimum Centrifugal Compaction Force
2.4-in.	3000-lbs.
3.1-in.	5000-lbs.

Dry joint sand shall be swept into the joints and vibrated until joints are full. This will require at least two or three passes with the vibrator. All work to within 3-ft. of the laying face must be left fully compacted with sand-filled joints at the completion of each day. Excess sand shall be swept off and removed when the job is complete.

The final surface elevation of paving units after removal of excess sand shall conform to the plans, shall not deviate more than ⅜-in. under a 10-ft. long straightedge, and shall be ⅛-in. to ¼-in. above adjacent drainage inlets, curb and gutters, concrete collars or channels.

The CONTRACTOR shall resand paving unit joints as necessary for a period of 90-days after completion of work.

304.1.4. Measurement and Payment. Concrete paving units shall be measured by the square-yard of completed and accepted pavement. Payment shall include all labor, equipment, materials, tools, and incidentals necessary to complete the work.

ITEM 305. MISCELLANEOUS ROADWAY CONSTRUCTION

305.1. CONCRETE CURB AND GUTTER

305.1.1. Description. Curb and gutter shall be of the type specified and shall be constructed to the size, shape, lines and grade as shown on the plans or as directed by the OWNER. Variations in size and shape may be made to fit individual special conditions.

305.1.2. Materials. All materials used in concrete herein specified shall conform to the requirements of the applicable sections of Item 303. Portland Cement Concrete Pavement of these specifications and to additional requirements herein included.

305.1.3. Construction Methods.

305.1.3.1. Excavation. Excavation shall be as provided in Item 203.2. Unclassified Excavation, and as shown on the plans. Asphalt millings or extra depth concrete shall be used to correct grade deficiencies identified after subgrade has been checked.

305.1.3.2. Reinforcing Steel. All steel reinforcement shall be accurately placed as shown on the plans and held in place during progress of concreting by such effective means that it shall not be moved out of true position. All bars shall be wired at their intersections and at all laps or splices. All bars at splices shall be lapped a minimum of 20-diameters of the bar or 12-in., whichever is greater.

All reinforcement necessary for a section of concrete shall be placed and approved by the OWNER before any concrete is deposited in the section. All steel must be free from paint and oil and all loose scale, rust, dirt and other foreign substances shall be completely removed before using.

305.1.3.3. Forms. All forms shall be of wood or steel, straight, free of warp and framed, braced or staked in a substantial and approved manner so as to insure perfect alignment and grade. All forms shall be clean and shall be oiled immediately before concreting. Care shall be taken in removing forms to prevent marring or spalling of the concrete. Forms shall extend the full depth of concrete and be a minimum of $1^5/_8$-in. in thickness or equivalent when wooden forms are used, or be of a gauge that shall provide equivalent rigidity and strength when metal forms are used.

For curves with a radius of less than 250-ft., acceptable flexible metal or wood forms shall be used.

All forms showing a deviation of ⅛-in. in 10-ft. from a straight line shall be rejected.

305.1.3.4. Expansion Joints. Expansion joints shall be constructed using expansion joint material of an approved type. Expansion joints shall be placed in the curb and gutter at 200-ft. intervals and at intersection returns and other rigid structures, or as otherwise specified by the OWNER. Tooled joints shall also be placed at 15-ft. intervals or matching abutting sidewalk joints and pavement joints to a depth of ¼ the thickness of the curb. Expansion joints shall also be placed at all intersections with concrete driveways, curbs, buildings and other curbs and gutters. All expansion joints shall be not less than ½-in. in thickness, extending the full depth of the concrete and shall be perpendicular and at right angles to the face of the curb. Any expansion material extending above the finished work shall be neatly trimmed to the surface of the finished work. The expansion joints in concrete pavement shall coincide with the expansion joints in the curb and gutter and sidewalk. Longitudinal dowels, across the expansion joints in the curb and gutter, shall be required. There shall be three No. 4 round, smooth bars for dowels at each expansion joint, spaced in accordance with standard reinforcement steel specifications. The dowel shall be a minimum of 24-in. in length. One-half of the dowel shall be coated with asphalt and terminated with an expansion cap. The cap shall provide a minimum of 1-in. free expansion. Dowels shall be supported by an approved method to provide a true horizontal and longitudinal alignment.

In the event that concrete pavement is to be placed in the street, the contraction (dummy) joints in the curb, gutter and/or combined curb and gutter shall be in strict alignment with the contraction (dummy) joints in the pavement and may be marked with an approved tool to the depth designated by the OWNER. If the joints are not constructed by marking, they shall be sawed at the time of sawing joints in the concrete slab and to the same depth as those in the slab. Expansion joints of the size of those in the pavement shall be placed through the curb and gutter at the point of, and in strict alignment with, expansion joints in the pavement.

All joints through the gutters (not curb) shall be sealed with hot-poured polymer sealer unless otherwise specified.

All joints shall be constructed in a neat and workmanlike manner, with edges rounded, in conformity with the plans and specifications and at location as shown on the plans or as designated by the OWNER.

305.1.3.5. Concrete Placement. Concrete shall be placed in accordance with Item 303. Portland Cement Concrete Pavement.

Concrete shall be deposited so as to maintain a horizontal surface and shall be thoroughly and continuously worked into all spaces and around any reinforcement so as to form a dense voidless mass. The coarse aggregate shall be worked away from contact with the forms so as to form a smooth, hard exposed concrete surface.

The concrete for curb and gutter shall preferably be placed continuously between expansion joints. If construction joints are allowed at other locations by the OWNER, they shall be properly constructed with wooden bulkheads so as to completely separate adjacent concrete sections.

Integral curb, with or without gutter, when designated in the plans or specifications, shall be placed while the concrete in the base or pavement is still plastic and shall be spaded and consolidated with the concrete slab in order that a thorough bond shall be obtained.

Integral curb, with or without gutter, shall be placed in sections equal to the adjoining concrete slab length, with expansion joints provided as specified herein.

Where curb and gutter is not adjacent to new pavement, 2-in. of sand cushion shall be used. After the fine grading has been completed, a 2-in. layer of sand or suitable gravel cushion shall be evenly spread over the subgrade for curb and gutter, thoroughly wetted and tamped into place to the satisfaction of the OWNER. The forms shall be placed upon this sand or gravel base. A screed shall be used to shape the sand cushion to fit a plane parallel to the top of gutter. A curb and gutter machine may be used, if approved by the OWNER.

305.1.3.6. Finishing. After the concrete has been struck off and while it is still plastic, the exposed surfaces may be plastered with ¼-in. mortar topping. The mortar topping shall be applied with a steel "mule," or a finishing tool or method which produces results equivalent to that obtained with the mule. All exposed surfaces shall then be floated or troweled and lightly brushed as required by the OWNER to produce a smooth and uniform finish. Excess working of the surfaces shall be avoided. Excess water, laitance and inert materials shall be removed from the surfaces.

The top of all the work and the face of all curbs shall be checked for irregularities as soon as the surface is finished, using a 10-ft. straightedge, and the maximum distance from the straightedge to the concrete shall not exceed ¼-in. All variations greater than ¼-in. shall be immediately corrected. All honeycombed areas disclosed by removal of forms shall be immediately chipped out and patched with Portland cement mortar.

305.1.3.7. Curing. After finishing operations are completed, the concrete surface shall be sprayed with concrete curing compound. The surface of the concrete shall be kept thoroughly damp between the completion of the finishing operations and the application of the curing compound. The curing compound shall be applied under pressure, by means of a spray nozzle, at a rate not to exceed 200-sq.-ft.-per-gallon. A minimum of 72-hours curing time shall be required.

Forms shall remain in place at least 12 hours after completion of the concrete placement for the curb and gutter. Should the CONTRACTOR elect to remove the forms before the minimum curing time has elapsed, it shall apply curing compound to the newly exposed vertical faces. Forms for inside curb faces may be removed in approximately 3-hours, provided that the concrete has set sufficiently to permit form removal without curb damage.

305.1.3.8. Finishing Exposed Surfaces. Exposed surfaces of curb and gutter shall receive the type of finish as specified by the OWNER in accordance with Item 702.5.13. Finishing Exposed Surfaces.

305.1.4. Measurement and Payment. Curb and gutter shall be measured by the linear foot in place complete.

The work performed and materials furnished as prescribed in this item, measured as provided in this item, shall be paid for at the contract unit prices bid for curb and gutter, which shall be full compensation for

preparing the subgrade; furnishing and placing all materials, including foundation course, reinforcing steel and expansion joint material; and for all manipulation, labor, tools, equipment and incidentals necessary to complete the work.

305.2. CONCRETE SIDEWALKS, DRIVEWAY APPROACHES, AND BARRIER FREE RAMPS

305.2.1. Description. This item shall govern the construction of barrier free access ramps, concrete sidewalks, driveways and approaches conforming to the lines, grades, locations and designs as indicated on the plans and specifications or as established by the OWNER.

305.2.2. Materials.

305.2.2.1. Concrete. All materials and requirements for concrete shall conform to the requirements of Item 303. Portland Cement Concrete Pavement.

305.2.2.2. Reinforcement. Driveway approaches and walk reinforcing, when required, shall be No. 3 bars on 24-in. centers or No. 4 bars on 30-in. centers. No. 6 gauge, 6-in. x 6-in. wire fabric conforming to Item 303.2.10. Steel Wire Reinforcement may be used only as approved by the OWNER. Sidewalk reinforcing (except in driveway approach) may be No. 3 bars on 24-in. centers or No. 10 gauge, 6-in. x 6-in.

305.2.3. Construction Methods.

305.2.3.1. General. Concrete sidewalks shall have a minimum thickness of 4-in., except that sidewalks constructed in driveway approach sections shall have a minimum thickness equal to that of driveway approach or as called for by plans and specifications within the limits of the driveway approach. Standard slope for walks shall be ¼-in.-per-ft. in the direction of the curb or street with a tolerance of $^1/_8$-in.-per-ft. The construction of the driveway approach shall include the variable height radius curb in accordance with the plans and details. The drive approach shall have a minimum thickness equal to the thickness of the adjacent street or 6-in., whichever is greater.

Ramps shall comply with provisions of Texas Accessibility Standards including location, slope, width, shapes, texture and coloring.

At the locations shown on the plans or at locations designated by the OWNER, the separate curb, integral curb or curb and gutter shall be laid down to a uniform width of not less than the specified height of the curb from the back of the curb line for access to future driveways. The return radii and partial curb return shall be built from the face of the curb to the back of the curb lay-down.

Where a driveway approach or ramp is to be constructed at a location where there exists a separate curb and gutter, said curb and gutter shall be removed for the full width of the gutter to the nearest joint or to a sawed point at the point of radius. On concrete pavement with monolithic curb, the breakout line shall be 12-in. from the face of the curb line and shall be parallel to it and form a right angle with the concrete surface. The breakout line shall be a sawed groove in accordance with the requirements of Item 402.3. Sawing. Alternately, the OWNER may approve use of equipment designed to cut concrete curbs. All faces and edges exposed as a result of cutting shall be smoothed.

305.2.3.2. Excavation. Excavation required for the construction of sidewalks and driveways shall be to the lines and grades as established by the OWNER or as shown on the plans.

305.2.3.3. Fine Grading. The CONTRACTOR shall do all necessary filling, leveling and fine grading required to bring the subgrade to the exact grades specified and compacted to at least 90-percent of maximum density as determined by ASTM D698 Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3). Moisture content shall be within minus-2- to plus-4-of-optimum. Any over-excavation shall be repaired to the satisfaction of the OWNER.

305.2.3.4. Forms. Forms shall be of wood or metal, of a section satisfactory to the OWNER, straight, free from warp and of a depth equal to the thickness of the finished work. Forms shall be securely staked to line and grade and maintained in a true position during the depositing of concrete.

305.2.3.5. Reinforcement. Steel bar reinforcement, when required, shall be placed according to the methods in Item 303.2.9. Steel Reinforcement. If wire fabric is permitted, it shall be placed in accordance with Item 303.2.10. Steel Wire Reinforcement.

305.2.3.6. Concrete Placement. Concrete placement shall be in accordance with the relevant provisions of Item 303. Portland Cement Concrete Pavement.

305.2.3.7. Finishing. Concrete sidewalks and driveway approaches shall be finished to a true, even surface. They shall be troweled and then brushed transversely to obtain a smooth uniform brush finish. Joint and sides shall be edged with suitable tools.

305.2.3.8. Joints. Expansion joints for sidewalks and driveways shall be formed using expansion joint material of an approved type and shaped to the section. Expansion joints shall be placed in the sidewalk at 40-ft. intervals or as otherwise specified by the OWNER. Expansion joints shall also be placed at all intersections, sidewalks with concrete driveways, curbs, formations, other sidewalks and other adjacent old concrete work. Similar material shall be placed around all obstructions protruding into or through sidewalks or driveways. All expansion joints shall be ½-in. in thickness. Edges of all construction and expansion joints and outer edges of all sidewalks shall be finished to approximately a ½-in. radius with a suitable finishing tool. Sidewalks shall be marked at intervals equal to the width of the walk with a marking tool. When sidewalk is against the curb, expansion joints and tooled grooves shall match those in the curb.

305.2.3.9. Curing. Sidewalks and driveways shall be cured in accordance with the requirements of Item 303. Portland Cement Concrete Pavement.

305.2.4. Measurement and Payment. Measurement for sidewalks, driveway approaches and ramps complete and in place shall be by the square-yard. Measurement of driveway approaches shall start at the back of the laydown curb line and shall include the area of the curb radii. Curbs on driveways shall not be measured separately but shall be included as a part of the driveway concrete. Concrete sidewalks and driveways shall be paid for at the contract unit price bid, which price shall be full compensation for excavating and preparing the subgrade; furnishing and placing all materials, including gravel base and expansion joint materials; and for all manipulation, labor, tools, equipment and incidentals necessary to complete the work.

305.3. CONCRETE MEDIANS

305.3.1. Description. This item shall consist of concrete medians in accordance with these specifications and in conformance with the lines and grades established by the OWNER and details shown on the plans.

305.3.2. Materials. All material requirements for constructing concrete medians shall conform to the requirements of Item 303. Portland Cement Concrete Pavement. Where a monolithic concrete median is indicated, concrete and reinforcement shall match the adjacent pavement.

305.3.3. Construction Methods.

305.3.3.1. Excavation. Excavation and fine grading shall be done according to Item 203.2. Unclassified Excavation, and shall be subsidiary to the item.

305.3.3.2. Forms. Forms, where required, shall conform to the requirements of Item 303. Portland Cement Concrete Pavement and shall be of a depth equal to the depth of the required section. Forms shall be securely staked to line and grade and maintained in a true position during the depositing of concrete.

305.3.3.3. Concrete Placement. Concrete placement shall be in accordance with the relevant provisions of Item 305.1. Concrete Curb and Gutter.

305.3.3.4. Finishing. The surface shall be finished with a float and lightly brushed to obtain a uniform finish. Tooled joints shall be placed longitudinally and transversely at intervals not to exceed 6-ft. center to center, as shown on the plans, or as directed by the OWNER. Joints in the median shall coincide with joints in curb and gutter. Expansion joint material shall be placed between the median and the back of curb and around all obstructions protruding through the concrete median.

305.3.4. Measurement and Payment. Concrete median shall be measured by the square-yard complete in place.

The work performed and materials furnished as prescribed by this item, measured as provided for in this item, shall be paid for at the contract unit price bid for "concrete median," which price shall be full compensation for constructing concrete median and for preparing the subgrade; furnishing and placing all

materials, including sand cushion, reinforcement and expansion materials; and for all manipulation, labor, tools, equipment and incidentals necessary to complete the work.

305.4. REINFORCED CONCRETE HEADERS

This item shall govern the construction of reinforced concrete header to the size, shape and at the location shown on the plans.

Material requirements shall be the same as those for Item 303. Portland Cement Concrete Pavement.

Concrete header shall be constructed at the location(s) shown on the plans and shall be constructed as shown on the plans in accordance with Item 303. Portland Cement Concrete Pavement.

Concrete header shall be paid by the linear-foot complete in place.

The work performed and materials furnished as prescribed by this item, measured as provided for in this item, shall be paid for at the contract unit price bid for concrete header. This payment shall be full compensation for necessary excavation, reinforcing steel, furnishing and placing concrete, and for all labor, tools, equipment and incidentals necessary to complete the work.

DIVISION 400 ROADWAY MAINTENANCE & REHABILITATION

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ITEM 401. CRACK SEALING

401.1. GENERAL

Crack sealing compound shall consist of hot poured polymer or ready-mixed cold-applied sealant, or other material approved by the OWNER. It shall not crack or break when exposed to low temperatures. The cured sealant must not pick up or "track" at elevated road temperature.

401.2. MATERIALS

401.2.1. Hot Poured Polymer. The sealing compound shall meet the requirements of Item 303.2.14.1.1. Hot Poured Polymer.

401.2.2. Ready-Mixed Cold-Applied. This sealant shall meet the requirements of Item 303.2.14.1.2. Ready-Mixed Cold-Applied.

401.2.3. Thermoplastic Cold-Applied. If approved by the OWNER, thermoplastic cold-applied jointing material may be used according to manufacturer's recommendations.

401.2.4. Rejection. Materials may be rejected for failure to meet any of the requirements of this specification.

401.3. METHODS

Routine pavement cracks shall be filled to a depth of 1½-in. Materials shall generally be handled and applied according to the manufacturer's recommendations, with additional requirements as stated herein. CONTRACTOR shall clean all cracks prior to installation of crack sealant materials.

401.3.1. Hot Poured Polymer. The sealing compound shall be melted in an approved oil-batch kettle with continuous mechanical agitation. The kettle shall be equipped with temperature indicators. The OWNER shall determine the optimum temperature for proper pouring fluidity, and the CONTRACTOR shall maintain the material within close range of optimum temperature. At no time shall the temperature exceed 450°F. The sealing compound shall not be poured at atmospheric temperatures below 32°F.

401.3.2. Ready-Mixed Cold-Applied. Permeation of cracks shall principally be achieved without the task of squeegeeing. However, squeegeeing is recommended to assist permeation and to allow sealant to become rapidly tack-free. Sealant shall "set" in a fixed position within 40-minutes after application, to where traffic may be restored to the pavement without the effects of "tracking." "Tracking" shall be averted without the use of topping materials such as sand.

401.4. MEASUREMENT AND PAYMENT

Crack sealing shall be measured and paid for on a lump-sum basis for the amount specified in contract documents under "Crack Sealing."

ITEM 402. PAVEMENT CUT, EXCAVATION, AND REPAIR

402.1. GENERAL REQUIREMENTS

Also refer to Standard Drawings 3070A – 3070D for more information.

402.1.1. Marking All pavement cut repairs shall be marked with the CONTRACTOR'S name if required by the OWNER.

402.1.2. Throughfares. No interference with traffic flow on the thoroughfares shall be permitted during the hours of 6:30 a.m. to 9:30 a.m. and 3:30 p.m. to 6:30 p.m., Monday through Friday, unless directed otherwise by the OWNER. Emergency closures during these hours shall be with the approval of the OWNER. Notice of street closures should be provided to the appropriate emergency and/or other department personnel.

Streets shall be maintained in accordance with Item 201.3. Maintenance of Streets and Rights of Way During Construction. When work is stopped for the day, all lanes of arterial or collector streets shall be opened to traffic in accordance with the traffic control plan. A traffic lane shall be considered satisfactorily open if it is paved with hot-mix or cold-mix asphalt paving, or paved with another suitable material approved by the OWNER, or covered.

If the cut is to be covered, the CONTRACTOR shall use steel plates of sufficient strength and thickness to support all the traffic. A transition of hot-mix or cold-mix asphalt conforming to the requirements of Item 302. Asphalt Pavement shall be constructed from the top of the steel plate to the existing pavement to create a smooth riding surface.

Exceptions to these specifications must be approved by the OWNER.

402.2. MINIMUM SIZE OF REPAIR

The following dimensions are minimums and may be superseded by site-specific factors or OWNER requirements. Exact pavement removal locations must be approved by the OWNER prior to construction.

If multiple repairs are closer than 10-ft. apart from edge of one repair to the edge of a second repair, a continuous section shall be replaced.

402.2.1. Sidewalk, Driveway, and Curb and Gutter. Sidewalks shall be removed and replaced to the nearest existing joint.

No sidewalk or driveway section to be replaced shall be smaller than 30-in. in either length or width unless otherwise approved by the OWNER.

A gutter of at least 12-in. may remain, provided that the curb and gutter is not damaged by the construction activity. Damaged curbs shall be replaced at the expense of the CONTRACTOR.

402.2.2. Dimension Parallels the Centerline (Along the Street/Alley). In a concrete paved street or alley, no horizontal dimension of any cut along the street path shall be less than 3-ft. or no less than 1-ft. from the edge of the trench on each end, whichever is greater. In an asphalt paved street or alley, no horizontal dimension of any cut along the street path shall be less than 4-ft. or no less than 2-ft. from the edge of the trench on each end, whichever is greater. Where saw-cut locations coincide with or fall within 3-ft. of the present location of either dummy joints, cold joint, construction joints, expansion joints, or edge, removal shall be to the existing joint or edge. See Standard Drawings 3070C and 3070D.

402.2.3. Dimension Perpendicular to the Centerline (Across the Street) – Multiple Lanes. See Standard Drawing 3070D.

402.2.3.1. Concrete. If the trench edge or point repair is located greater than 1-ft. from a lane line on the side of the line closest to the curb, pavement shall be removed and replaced from the curb to the lane line. If the edge of a trench or point repair is located less than 1-ft. from a lane line on the side of the line closest to the curb, pavement shall be removed and replaced from the curb to the 2nd lane line beyond the trench edge or point repair.

402.2.3.2. Asphalt. If the edge of a trench or point repair is located less than or equal to ½-lane-width but greater than 2-ft. from a lane line, the lane-width of pavement shall be removed and replaced. If the edge of a trench or point repair is located less than 2-ft. from a lane line, the pavement shall be removed and replaced to ½-lane-width on each side. In the lane along the curb, if the trench edge or

point repair plus 2-ft. toward the lane line is less than ½-lane-width, pavement shall be removed and replaced from the curb to ½-lane-width.

402.2.4. Dimension Perpendicular to the Centerline (Across the Street/Alley) – Residential Street or Alley. See Standard Drawing 3070C.

402.2.4.1. Concrete. In any concrete residential street or alley, if the trench edge or point repair is less than 1-ft. from the street or alley centerline, pavement shall be removed and replaced on each side from the trench edge or point repair to a distance 10-ft. from curb, and a minimum of 1-ft. from the trench edge or point repair. If the 1-ft. minimum causes the repair to be closer than 10-ft. from a curb, replace to the curb.

In a concrete residential street or alley less than 30-ft. wide, if the trench edge or point repair is between 1-ft. and 5-ft. from the street or alley centerline, the pavement shall be removed and replaced from the curb to the centerline.

In a concrete residential street or alley 30-ft. wide or greater, if the trench edge or point repair is greater than 5-ft. from the centerline, the pavement shall be removed and replaced from the curb to a distance 10-ft. from the curb. If the trench edge or point repair is more than 1-ft. but less than 5-ft. from the centerline, pavement shall be removed and replaced from the centerline to a distance 10-ft. from the curb.

402.2.4.2. Asphalt. In any asphalt residential street or alley, if the trench edge or point repair is less than 2-ft. from the street or alley centerline, pavement shall be removed and replaced on each side from the trench edge or point repair to a distance 10-ft. from curb, and a minimum of 2-ft. from the trench edge or point repair. If the 2-ft. minimum causes the repair to be closer than 10-ft. from a curb, replace to the curb.

In an asphalt residential street or alley less than 30-ft. wide, if the trench edge or point repair is between 2-ft. and 5-ft. from the street or alley centerline, the pavement shall be removed and replaced from the curb to the centerline.

In a concrete residential street or alley 30-ft. wide or greater, if the trench edge or point repair is greater than 5-ft. from the centerline, the pavement shall be removed and replaced from the curb to a distance 10-ft. from the curb. If the trench edge or point repair is more than 2-ft. but less than 5-ft. from the centerline, pavement shall be removed and replaced from the centerline to a distance 10-ft. from the curb.

402.3. SAWING

402.3.1. Description. This item shall apply in the removal of bituminous or concrete pavement, curb, gutter, sidewalk or driveways. This item shall also govern for the sawing of weakened plane joints (contraction joints). Sawing shall be in accordance with the requirements of this item unless otherwise shown on the plans or in the special provisions.

The removal and replacement of portions of permanent pavement (Portland cement concrete or hot-mix asphalt), drives, slabs, sidewalks, etc. shall require a full-depth of pavement cut to be sawed by the use of an approved power-driven concrete saw in accordance with this specification or as directed by the OWNER.

402.3.2. Equipment. The saw shall be power driven, shall be manufactured especially for the purpose of sawing pavement, shall be suitable for the work to be performed including dust control and shall be maintained in good operating condition.

Saw blades shall make a clean, smooth cut, producing a groove ⅛-in. to ¼-in. wide and to the full depth required by these specifications or as shown on the plans.

The saw, with its control devices, shall be mounted on a sturdy frame supported on rubber-tired wheels.

402.3.3. Construction Methods. Dust and residues from sawing shall be prevented from entering the atmosphere or storm drain.

The edge of pavements, curb, gutter, sidewalk and/or driveways shall be neatly sawed. Saw cuts shall be made perpendicularly to the surface to full pavement depth or as directed by the OWNER. The edges of pavement and appurtenances damaged subsequent to sawing shall again be saw cut to neat straight lines for the purpose of removing the damaged areas. Such saw cuts shall be parallel to the original saw cut.

Concrete sidewalk or driveway to be removed shall be neatly sawed in straight lines either parallel to the curb or at right angles to the alignment of the sidewalk.

402.3.4. Measurement and Payment. Sawing shall be considered subsidiary to the items requiring sawing if no pay item exists in the Contract.

If a pay item exists in the contract for "Saw Cuts," it shall be measured and paid in linear feet of groove actually cut in accordance with the specifications and as directed by the OWNER.

402.4. REPLACING PAVED SURFACES

402.4.1. General. Repairs are to be made as rapidly as possible. Use of fast setting concrete and similar techniques are encouraged. Completion of the job, including replacement of pavement and cleanup, shall normally be accomplished within 10-working-days after the repair work involving the cut is made.

Removal of unsatisfactory work shall begin within 15-days and replacement shall be completed within 30-days of written notification by the OWNER.

The existing pavement shall be sawed in accordance with Item 402.3. Sawing.

The OWNER shall approve embedment specified in accordance with Item 504.5. Embedment, or the embedment standards of the utility owner. The OWNER shall approve embedment compaction. Final backfill shall meet the requirements of Item 504.2.3.4. Flowable or Stabilized Backfill or Item 504.2.3.3. Type "B" Backfill, as determined by the OWNER. Type "B" Backfill shall be compacted to 95% Standard Proctor density.

Parkways shall be treated in accordance with Item 204. Landscaping, including a minimum of 6-in. topsoil and protection and replacement of plants in areas disturbed by construction.

402.4.2. Temporary Pavement Repair. In the event it is necessary to place a temporary surface on any cut opening, it shall be composed of permanent type paving material, specifically excluding gravel or flexible base as the surface material, unless approved by the OWNER. Temporary surfaces shall be adequately compacted and sealed to prevent degradation of the repair during the temporary period. Any temporary surface that fails to provide a nondegraded riding surface shall be removed and replaced at the CONTRACTOR'S expense.

402.4.3. Replacing Curb, Gutter, Sidewalks, Driveways, Etc. Curb, curb with gutter, sidewalks, drives, etc. shall be replaced with Class A or Class PA concrete (Class determined by the OWNER), unless specified otherwise by the OWNER. Replacement shall meet current OWNER standards.

402.4.3.1. Measurement for Replacement of Curb, Gutter, Sidewalks, Driveways, Etc. Removed curb, curb with gutter, sidewalks, drives, etc. shall be measured for payment in square-yard or linear feet as specified in the bid item. The removal or replacement of curbs, curbs and gutters, sidewalks, driveways, etc. in excess of that specified or approved by the OWNER shall be at the expense of the CONTRACTOR.

402.4.4. Replacing Reinforced Concrete Pavement. Pavement shall be removed to a line 12-in. back of the firm banks of the trench or, if within 3-ft. of an existing joint, to the joint. The concrete replacement shall be reinforced with like-size bars as the existing pavement, #4 minimum, drilled 12-in. deep and epoxied in place, spaced on a minimum of 24-in. centers each way.

The concrete shall be Class P2 or Class PP2 (as determined by the OWNER), unless another class is specified by the OWNER. The replacement concrete shall match the thickness of the existing concrete pavement, minimum of 6-in. thick or the minimum thickness of current OWNER standard for the street type.

The new concrete pavement shall be protected from vehicular traffic for a minimum of 7 days or until a minimum flexural strength of 500-psi is obtained or until a compressive strength of 3000-psi is obtained.

402.4.4.1. Measurement of Reinforced Concrete Pavement. Replacement of the reinforced concrete pavement shall be measured at the specified trench width plus 2-ft., thickness in inches, and length in linear feet. Additional reinforced concrete pavement ordered by the OWNER to be placed will be measured as the thickness in inches, and length and width in linear feet.

402.4.5. Replacing Concrete Pavement and Asphalt Overlay. The existing pavement shall be removed to a neat line at least 12-in. back of the firm banks of the trench or, if within 3-ft. of an existing joint, to the joint.

The concrete replacement shall be reinforced with like-size bars as the existing pavement, #4 minimum, drilled 12-in. deep and epoxied in place, spaced on a minimum of 24-in. centers each way.

The asphalt surface course shall be hot-mix asphalt pavement of the type and class indicated on the plans meeting the requirements of Item 302. Asphalt Pavement. Thickness shall match existing pavement or meet the minimum thickness of current OWNER standard for the street type. The joint formed at the interface of the existing pavement and the repair shall be sealed with a material approved by the OWNER.

402.4.5.1. Measurement of Concrete Pavement and Asphalt Overlay. Replacement of the reinforced concrete pavement shall be measured at the specified trench width plus 2-ft., thickness in inches, and length in linear feet. Additional reinforced concrete pavement ordered by the OWNER to be placed will be measured as the thickness in inches, and length and width in linear feet.

Hot-mix asphalt pavement shall be measured at the specified trench width plus 2-ft., thickness in inches, and the length measured in linear feet. Additional asphalt pavement ordered by the OWNER to be placed will be measured as the thickness in inches, and length and width in linear feet.

If paid for, crack sealer shall be measured as indicated on the plans.

402.4.6. Replacing Full Depth Hot-Mix Asphalt Pavement. Unless otherwise specified by the OWNER, the existing hot-mix asphalt shall be cut back to produce a vertical edge for the full depth of the paving. The cut shall extend 24-in. back of the firm banks of the trench.

All courses of hot-mix asphalt pavement shall be of the types and classes as indicated on the plans. Thickness of each course shall match existing courses or meet the minimum thickness of each course of current OWNER standard for the street type. The joint formed at the interface of the existing pavement and the repair shall be sealed with a material approved by the OWNER.

402.4.6.1. Measurement for full depth Hot-Mix Asphalt Pavement. Hot-mix asphalt pavement shall be measured at the specified trench width plus 4-ft., thickness in inches, and the length measured in linear feet. Additional asphalt pavement ordered by the OWNER to be placed will be measured as the thickness in inches, and length and width in linear feet.

If paid for, crack sealer shall be measured as indicated on the plans.

402.4.7. Replacing Hot-Mix Asphalt Pavement on a Flexible Base. Unless otherwise specified by the OWNER, the existing hot-mix asphalt shall be sawed 24-in. back from the firm banks of the trench. The cut shall be replaced with a compacted flexible base, as specified in Item 301.5. Flexible Subbase or Base (Crushed Stone/Concrete), to match the existing thickness of the base, 6-in. minimum.

All courses of hot-mix asphalt pavement shall be of the types and classes as indicated on the plans.

402.4.7.1. Measurement for Hot-Mix Asphalt Pavement on a Flexible Base. Hot-mix asphalt pavement shall be 2-in. thick, specified ditch width plus 4-ft., and the length measured in linear feet. The flexible base shall be measured at the specified trench width only, 6-in. thick or the depth of the existing flexible base, and the length measured in linear feet.

402.4.8. Replacing One- or Two-Course Surface Treatment or Penetration Type Pavement. The pavement shall be replaced as specified by the OWNER in accordance with Item 404. Surface Treatments.

402.4.9. Replacing Gravel Pavement on a Dirt Base. The existing gravel pavement shall be replaced with compacted flexible base, as specified in Item 301.5. Flexible Subbase or Base (Crushed Stone/Concrete). The minimum thickness of flexible base shall be 8-in. unless otherwise specified by the OWNER.

402.4.9.1. Measurement. The flexible base shall be measured at specific trench width only, 8-in. thick, and the length measured in linear feet.

402.4.10. Payment for Pavement Replacement. If paid for by the OWNER, replacement curb, curb with gutter, sidewalks, drives, etc. shall be paid at the contract unit price per square-yard or linear feet as specified in the bid item, complete in place.

If paid for by the OWNER, replacement of pavement(s) and base(s) shall be paid at the contract unit price per square-yard of respective thickness, complete in place.

If paid for by the OWNER, replacement of one- or two-course surface treatment or penetration type pavement surface shall be paid in accordance with Item 404. Surface Treatments.

The contract unit price shall be total compensation for furnishing and placing all materials, including excavation, compaction, rolling and finishing, for disposal of all surplus material, and for all labor, tools, equipment and incidentals necessary to complete the work, all in accordance with the plans and specifications.

ITEM 403. ASPHALTIC PAVEMENT REPAIR

403.1. DESCRIPTION

Asphaltic Pavement Repair shall be used only for patching utility cuts, potholes and temporary pavement repairs.

403.2. MATERIALS AND MIXING

403.2.1. Performance Guaranty. The supplier of the material shall guarantee the performance of the patching mix to meet the following requirements:

(1) The material shall remain workable, in an uncovered stockpile, if applicable, for a period of not less than 12-months.

(2) Containerized material, if applicable, shall have a shelf life and remain workable for a period of not less than 12-months.

(3) Repaired potholes shall not show any significant signs of shoving, rutting, tracking, kick-up, or ravel-out within a period of 12-months from the time of repair.

403.2.2. Rejection. In the event a material furnished does not meet all of the specified requirements (regardless of weather, test's acceptability, methods of repair, or other conditions), the material shall be removed and replaced at no cost to the OWNER.

The OWNER shall determine the quantity of unacceptable material and the CONTRACTOR shall be required to deliver an equal quantity of acceptable material. The material shall be delivered to the location(s) designated by the OWNER within 14-days from the date of written notification from the OWNER.

In the event that the material CONTRACTOR cannot provide acceptable material, the OWNER shall determine the quantity of the unacceptable material and the CONTRACTOR shall reimburse the OWNER based on the unit bid price. The reimbursement shall be submitted to the OWNER in the form of a cashier's check or other form of payment as approved by the OWNER within 28-days from the date of written notification from OWNER.

403.2.3. Hot-Mix, Cold-Laid Asphaltic Concrete (Cold Mix). Hot-Mix, Cold-Laid Asphaltic Concrete shall consist of surface mix.

403.2.3.1. Asphaltic Mixture. The asphaltic material shall form from 4% to 7.5% of the mixture by weight. Asphalt for the mixture shall be a bituminous material in accordance with Item 302.3. Bituminous Materials as determined by the mix manufacturer and OWNER. The grade of asphalt to be used shall be determined by the OWNER after design tests have been made using the mineral aggregate approved for use in the construction. The CONTRACTOR shall notify the OWNER of asphaltic material source prior to production of the asphaltic mixture, and this source shall not be changed during the course of the project except by written permission of the OWNER.

403.2.3.2. Tack Coat. The liquid asphalt material used for tack coat should be MS-2 or SS-1 in Item 302.3.4. Emulsified Asphalt, Restorative Seal in Item 302.3.6. Specialty Emulsions or one of the other various grades of materials (selected by the OWNER) listed under Item 302.3.4. Emulsified Asphalt.

403.2.3.3. Primer. When approved by the OWNER, the use of an asphaltic primer will be permitted. When used, the primer shall be added as directed by the OWNER during the mixing.

403.2.3.4. Mineral Aggreagate. The material shall be crushed and screened as necessary to meet the requirements hereinafter specified and shall consist of durable coarse aggregate particles mixed with approved binding materials.

Unless otherwise specified, the grading of mineral aggregate shall conform to the limitations as shown in Table 403.2.3.4.(a) Aggregate Grading for Cold Mix Asphalt Repair.

Table 403.2.3.4.(a) Aggregate Grading for Cold Mix Asphalt Repair

Sieve	% Aggregate by Weight
Passing ⅜-in. sieve	100%
Passing ¼-n. sieve	80 to 100%
Passing ¼-in. sieve, retained on No. 10 sieve	27 to 58%
Total retained on No. 10 sieve	42 to 58%
Passing No. 10 sieve, retained on No. 40 sieve	6 to 32%
Passing No. 40 sieve, retained on No. 80 sieve	4 to 32%
Passing No. 80 sieve, retained on No. 200 sieve	3 to 32%
Passing No. 200 sieve	1 to 8%

403.2.3.5. Water. Water in an amount not to exceed 3% by weight of the mixture may be used in preparing the mixture. In the event water is used in the mixing operation, adequate measuring devices as approved by the OWNER shall be used, and the water shall be administered to the mix through an approved spray bar.

When used, the water shall be added as directed by the OWNER during the mixing.

403.2.3.6. Mixture Preparation. The materials may be mixed on the job or at a central mixing plant and shipped ready for use. Mixtures that do not remain workable a sufficient period of time to permit unloading by normal means, proper spreading, blading and rolling shall not be acceptable.

403.2.3.6.1. Mixing Plants. Mixing plants may be either the weight-batching type plant, the continuous mixing type plant, or the drum mixing type plant as described in Item 302.9.5. Mixing Plants.

403.2.3.6.2. Equipment. Equipment for storage, weighing and heating of materials shall be as described in Item 302.9.4. Equipment.

403.2.4. High Performance Cold Mix Asphaltic Concrete. This specification shall govern for asphaltic concrete mixture intended primarily as a cool to cold wet-weather, high-performance, pothole-patching mix for maintenance. It is primarily crushed stone, asphaltic concrete with asphalt additives.

When shown on the plans or requisition, the mixture shall be provided in airtight, resealable plastic buckets of 4- to 5-gal. capacities.

403.2.4.1. Mixture Performance Criteria. The patching mix shall not require the use of a tack coat or a primer for adherence to the patch area. The mix shall be capable of being placed in air temperatures from -15°F to 100°F and shall maintain adhesive qualities in areas that are damp or wet at the time of application. The repaired areas shall remain flexible and cohesive to an air temperature of -15°F and shall have the capability of immediately being opened to traffic with no kick-up or ravel-out.

403.2.4.2. Mixture Properties. The mixture shall comply with the following requirements.

403.2.4.2.1. Aggregate. Aggregate shall have a maximum particle size of ½-in.

403.2.4.2.2. Resistance to Water Damage. Tests shall be conducted according to TxDOT methods. The as-received mix shall be evaluated for resistance to water damage by soaking a 3.5-oz. representative sample of the total mixture in 7-fluid-ounces of distilled or deionized water at 140 ± 2°F for 24 ± 2 hours. The soaking test shall be accomplished in a glass beaker of approximately 14-fluid-ounces. Upon completion of the 24-hour period, the mixture shall be evaluated while submerged in the testing water. The material shall show no visible evidence of stripping.

403.3. METHODS

If OWNER requires base, subbase, and/or subgrade repair by a separate method than the asphaltic patch, the base, subbase, and/or subgrade shall be repaired as specified by the OWNER. Otherwise, repair of the base, subbase, and/or subgrade may be accomplished using the asphaltic patch material when it is specifically designed to do so.

CONTRACTOR shall use all repair material(s) as instructed by its respective manufacturers.

403.4. MEASUREMENT AND PAYMENT

Repair of base, subbase, and/or subgrade if by a separate method than the asphaltic patch shall be measured as specified by the OWNER. Asphaltic patches shall be measured per each, which repair shall include all materials, work, equipment and incidentals necessary to accomplish patching as instructed by the manufacturers.
Payment for Asphaltic Pavement Repair, measured as provided for, shall be paid for at the unit price bid.

ITEM 404. SURFACE TREATMENTS

404.1. DESCRIPTION

This Item provides specifications for the construction and quality control required for the proper application of pavement surface treatments.

404.2. GERNERAL

404.2.1. Environmental Conditions. Surface treatments shall not be applied when the air temperature is below 60°F and is falling but may be applied when the air temperature is above 50°F and is rising, the air temperature being taken in the shade and away from artificial heat. If the air temperature does not meet these criteria, the OWNER shall evaluate the asphaltic material for applicability. Surface treatments shall not be applied when the temperature of the surface to which the surface treatment is to be applied is below 60°F. When latex modified asphalt cement is specified, surface treatments shall not be applied when the air temperature is below 80°F and is falling, but may be applied when the air temperature is above 70°F and is rising and shall not be applied when the temperature of the surface on which the surface treatment is to be applied is below 70°F. Asphaltic material shall not be placed when, in the opinion of the OWNER, general weather conditions are not suitable.

Slurry seal or micro-surfacing shall only be applied between March 1st and December 1st. Neither treatment shall be applied under any of the following conditions:

(1) In the period following precipitation with water remaining on the surface to be coated
(2) In foggy conditions
(3) If there is a threat of rain before the treatment can fully cure
(4) If there is danger that the finished product will freeze within 24-hours of application
(5) If weather conditions could delay opening to traffic beyond the time specified by the OWNER.

404.2.2. Storage and Stockpiling. Precautions shall be taken to insure aggregate does not become contaminated with over-sized rock, clay, silt or excessive amounts of moisture during storage. The stockpile shall be kept in areas that have good drainage. Segregation of aggregates proposed for use and as supplied to the mixing plant shall be avoided.

The CONTRACTOR shall be required to provide a suitable storage facility for all equipment and materials needed to perform the work. This site should be located as close as possible to the area of work being done to reduce turnaround time and insure an acceptable rate of work. The OWNER shall subject any site selected to final approval.

Temporary stockpiling of aggregates on the roadways shall be permitted, provided the stockpiles are spaced not less than 1,000-ft. apart and are so placed that they neither obstruct traffic nor interfere with roadway drainage. The CONTRACTOR shall be responsible for the proper preparation of all stockpile material necessary for protection of the aggregate and to prevent any contamination thereof.

404.3. SLURRY SEALS AND MICRO- (RE) SURFACING

The surface treatment shall consist of a mixture of an approved emulsified asphalt, mineral aggregate, mineral filler, water, and specified additives, proportioned, mixed and uniformly spread over a properly prepared surface. The completed slurry seal shall leave a homogenous mat, adhere firmly to the prepared surface and have a skid resistant surface texture.

404.3.1. Laboratory Evaluation. Before work commences, the CONTRACTOR shall submit a signed original of a mix design containing the test results and proportioning of the specific materials to be used on the project. A qualified laboratory must have performed this design. Previous lab reports covering the exact materials to be used may be accepted provided they were made during the calendar year. This initial mix design shall be done at the CONTRACTOR'S expense. Upon receipt of the original mix design, an independent qualified laboratory selected by the OWNER shall perform tests using the same materials as used in the initial mix design for verification of the results. This testing shall be done at the OWNER'S expense. No work shall begin until all materials and/or mix design proportions have met the specifications as required. Once the materials are approved, no substitution shall be permitted unless first tested and approved by the methods stated above.

404.3.2. Materials.

404.3.2.1. Mineral Filler. Mineral filler shall be a recognized brand of non-air-entrained Type I or II Portland that meets the requirements of ASTM D242 Mineral Filler For Bituminous Paving Mixtures, if required by the mix design. 0.5% to 2% by dry weight of aggregate shall be the range of mineral filler in the mix design. The mineral filler shall be considered as part of the dry aggregate.

404.3.2.2. Water. All water shall be potable and compatible with the slurry mix. The CONTRACTOR must insure compatibility. The percent of water in the mix design shall be as required to produce proper mix consistency.

404.3.2.3. Additives. The mix design laboratory as part of the mix design shall approve any additive used to accelerate or retard the break-set of the surface treatment materials. The amount and type of additive (if needed) shall be shown on the mix design and approved by the OWNER.

404.3.2.4. Aggregate. The mineral aggregate shall consist of natural or manufactured crushed stone such as granite, slag, limestone or other high quality aggregates or a combination thereof that conforms to the quality requirement of ASTM D1073 Fine Aggregate for Bituminous Paving Mixtures, and shall be free of dirt, organic matter, clay balls, adherent films of clay, dust or other objectionable material. If the OWNER accepts aggregate that is not free of dirt, organic matter, clay balls, adherent films of clay, or dust, the OWNER shall have the option to evaluate and accept or reject chemical modifiers of the asphaltic material. The aggregate shall contain no free water. Smooth textured sands of less than 1.25-percent water absorption shall not exceed 50-percent (by weight) of the total aggregate blend. For heavy-duty surface requirements, 100% crushed material is required.

The aggregate shall meet the gradations as shown in the Table 404.3.2.4.(a) Slurry Seal Aggregate Requirements or Table 404.3.2.4.(b) Micro-Surface Aggregate Requirements, as appropriate, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves or vice versa. The gradation type to be used shall be as designated by the OWNER.

Table 404.3.2.4.(a) Slurry Seal Aggregate Requirements

Sieve Size	Percent Passing
3/8-in.	100
No. 4	70-90
No. 8	45-70
No. 16	28-50
No. 30	19-34
No. 50	12-25
No. 100	7-8
No. 200	5-15

Table 404.3.2.4.(b) Micro-Surface Aggregate Requirements

Sieve Size	Percent Passing
3/8-in.	99-100
No. 4	86-94
No. 8	45-65
No. 16	25-46
No. 30	15-35
No. 50	10-25
No. 100	7-18
No. 200	5-15

404.3.2.5. Emulsified Asphalt. The asphalt emulsion shall be homogeneous and show no separation after mixing.

404.3.2.5.1. Slurry Seal. As directed by the OWNER, one of the following two grades of emulsion shall be selected. Grade CQS-1h (Quick Set) shall be specified on streets where the amount of time the street can be closed is restricted.

Grade SS-1h: Conforming to the requirements specified in ASTM D977 for Emulsified Asphalt.

Grade CQS-1h: Conforming to the requirements specified in ASTM D2397 for Cationic Emulsions (Quick Set).

Any emulsion used for slurry will be with 4% polymer modifier content based on bitumen weight, certified by the emulsion supplier, which shall be milled into the emulsion or blended into the asphalt prior to the emulsification process. It shall pass all applicable storage and settlement tests. The cement-mixing test shall be waived.

404.3.2.5.2. Micro-Surface. Emulsified asphalt for micro-surfacing shall be a quick-set polymer modified cationic type CSS-1h emulsion and conform to the requirements specified in AASHTO M208 and ASTM D2397 Cationic Emulsified Asphalt. It shall pass all applicable storage and settlement tests. A minimum of 3% polymer modifier content based on bitumen weight content, certified by the emulsion supplier, along with special quick-setting emulsifier agents, shall be milled into the asphalt emulsion. The cement mixing test shall be waived. The emulsified asphalt shall be so formulated that when the paving moisture is applied with the relative humidity at no more than 50% and ambient air temperature of at least 75°F, it will cure sufficiently such that rolling traffic can be allowed in one-hour with no damage to the surface.

404.3.2.6. Mixture Tests. Mixtures shall meet the requirements in Table 404.3.2.6.(a) Slurry Seal Mixture Requirements or Table 404.3.2.6.(b) Micro-Surface Mixture Requirements, as appropriate when tested by the given methods.

Table 404.3.2.6.(a) Slurry Seal Mixture Requirements

Characteristic	Test Method	Value
Consistency test	ASTM D3910 Standard Practices for Design, Testing, and Construction of Slurry Seal	2- to 3-cm Flow
Set time	ASTM D3910 (same as above)	12-hours maximum
Cure time	ASTM D3910 (same as above)	24-hours maximum
Wet stripping test	ISSA TB114	80%-coating minimum
Wet track abrasion test	ASTM D3910 (same as above)	75-g/ft^2 maximum

Table 404.3.2.6.(b) Micro-Surface Mixture Requirements

Characteristic	Test Method	Value
Set time	ASTM D6372 Standard Practice for Design, Testing, and Construction of Micro-Surfacing	12-hours maximum
Cure time	ASTM D6372 (same as above)	24-hours maximum
Wet stripping test	ISSA TB114	80%-coating minimum
Wet track abrasion test	ASTM D6372 (same as above)	75-g/ft^2 maximum
Marshall stability Flow units	ASTM D5581 Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (6 inch-Diameter Specimen)	1800-lbs. minimum 6- to 16-units
Hveem stability, exceeding a height twice the maximum aggregate size	ASTM D1560 Resistance to Deformation and Cohesion of Bituminous Mixtures by Means of Hveem Apparatus	35 minimum
Set Time 30-minute Blotter test Displacement test Water resistance test @ 30-Minutes	ISSA TB102	 No Brown Stain No Displacement No Discoloration

404.3.3. Equipment. All methods and equipment employed in performing the work shall be subject to the approval of the OWNER before work is started and whenever found unsatisfactory they shall be changed and improved as required. All equipment must be maintained in a satisfactory condition.

The CONTRACTOR will provide suitable crack and pavement cleaning equipment, hand tools and any support equipment as necessary to perform the work.

404.3.3.1. Calibration. Each piece of equipment to be used shall be calibrated in the presence of the OWNER prior to construction. Previous calibration documentation covering the exact materials to be used may be accepted provided they were made during the calendar year. No machine will be allowed to work on the project until the calibration has been completed and/or accepted.

404.3.3.2. Verification. Test strips shall be laid (location to be determined by the OWNER) before construction begins. The OWNER will observe the test strip for verification or rejection according to the specifications. Upon failure of any test, additional test strips will be laid at no cost to the OWNER. The square-yards of the first test strip will be measured and paid for at the contract unit price.

A field test shall be made to check consistency of the surface treatment. If a line made through the surface treatment fills up, the mixture is too wet, which the CONTRACTOR shall correct. If the line stays, the slurry has a proper consistency.

404.3.3.3. Mixing Equipment.

404.3.3.3.1. Slurry Seal. The slurry seal mixing equipment shall be continuous flow mixing unit as to give a uniform and complete circulation of the batch in the mixer, so as not to segregate the aggregates, but will provide a thorough and uniform free flowing mix with the asphalt and water. The units shall be equipped with a water pressure system and nozzle type spray bar adequate for completely fogging the surface with 0.05- to 0.15-gallons-per-square-yard immediately ahead of the spreader box.

Application rate of aggregate, based on dry weight of aggregate, shall be 15- to 21-lbs-per-square-yard complete in place.

The residual asphalt content, based on % weight of dry aggregate, shall be 8% to 12%.

404.3.3.3.2. Micro-Surface Mixing Equipment. The material shall be mixed by a self-propelled micro-surfacing mixing machine which shall be a continuous flow mixing unit able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler and water to a revolving multi-blade mixer and discharge the mixed product on a continuous flow basis. The machine shall have sufficient storage capacity for aggregate, emulsified asphalt, mineral filler and water to maintain an adequate supply to the proportioning controls. The machine shall be equipped with self-loading devices which provide for the loading of all materials while continuing to lay micro-surfacing, thereby minimizing construction joints.

Individual volume or weight controls for proportioning each material to be added to the mix shall be provided. Each material control device shall be calibrated and properly marked.

The mixing machine shall be equipped with a water pressure system and nozzle type spray bar to provide a water spray immediately ahead of and outside the spreader box with 0.05- to 0.15-gallons-per-square-yard.

The aggregate feed to the mixer shall be equipped with a revolution counter or similar device so the amount of aggregate used may be determined at any time. The mixing machine shall be equipped with an approved fines feeder that shall provide a uniform accurately metered, predetermined amount of the specified mineral filler. Application rate of aggregate, based on dry weight of aggregate, shall be 22- to 28-lbs-per-square-yard complete in place.

The emulsion pump shall be a positive displacement type and shall be equipped with a revolution counter or similar device so that the amount of emulsion used may be determined at any time. The residual asphalt content, based on % weight of dry aggregate, shall be 6% to 11.5%.

404.3.3.4. Spreading Equipment.

404.3.3.4.1. Slurry Seal. The spreader box shall be equipped to prevent loss of slurry seal from all sides and with a flexible rear strike-off capable of being adjusted. It shall have suitable means for side tracking to compensate for deviations in pavement geometry. The box shall be kept free of built-up asphalt and aggregate. The strike-off drag shall be kept completely flexible at all times.

404.3.3.4.2. Micro-Surface. The surface mixture shall be spread uniformly by means of a mechanical type spreader box attached to the mixer, equipped with paddles to agitate and spread the materials throughout the box. A front seal shall be provided to insure no loss of the mixture at the road contact point. The rear seal shall act as final strike off and shall be adjustable. The mixture shall be spread to fill cracks and minor surface irregularities and leave a uniform skid resistant application of material on the pavement. The longitudinal joint where two passes join shall be neat appearing, uniform and lapped. All excess material shall be removed from the job site prior to opening the road. The spreader box shall have suitable means provided to side shift the box to compensate for variations in pavement geometry.

404.3.4. Preparation. Any breakdowns, base failures, or other defects shall be properly repaired by the OWNER before application of the surface treatment. No work shall commence on any location until approval by the OWNER.

Immediately prior to applying the surface treatment, CONTRACTOR shall thoroughly clean the pavement of all loose materials, vegetation, soil and objectionable material. The CONTRACTOR shall cover manholes, valve boxes, raised pavement markers and other designated objects to insure their integrity. All pavement cleaning and covering of appurtenances shall be subject to the final approval and acceptance of the OWNER.

If required, the CONTRACTOR shall apply a tack coat or a second coverage of treatment on brick, concrete, or other highly absorbent or polished pavements. If a tack coat is required, a 1-part emulsion, 3-part water tack coat of the same asphalt emulsion type and grade as specified for the surface treatment is required. Rate of application of tack coat material shall be 0.05- to 0.10-gallons-per-square-yard. All debris and unused material shall be removed.

404.3.5. Surface Treatment Application. Surface treatments shall be placed on the location and within the time limit as specified by the OWNER.

404.3.5.1. Fogging. If conditions require, the pavement shall be pre-wetted by fogging ahead of the slurry/spreader box. Water used in fogging the surface shall be applied so that the entire surface is damp with no flowing water in front of the box. Rate of spray shall be 0.05- to 0.15-gallons-per-square-yard or as directed by the OWNER. No streaks, lumps, balls or unmixed aggregated shall be permitted.

404.3.5.2. Mix Stability. The mix shall be sufficiently stable during the spreading period so that the emulsion does not break, there is no segregation of the fines from the coarser aggregate and the liquid of the mix does not float to the surface.

404.3.5.3. Lines and Joints. Straight lines along curb gutters and shoulder will be required. No runoff on these areas will be permitted. Lines at intersections must be kept straight to provide a good appearance. Surface treatment shall be placed at the lip of the gutter or at a distance from the face of the curb as directed by the OWNER.

No excessive buildup or unsightly appearance shall be permitted on longitudinal or transverse joint. An excessive overlap will not be permitted on longitudinal joints. The CONTRACTOR shall provide suitable width spreading equipment to produce a minimum number of longitudinal joints throughout the project. Longitudinal joints shall be placed on lane lines when possible. If half passes are used, they shall not be the last passes on any paved area.

404.3.5.4. Rolling. If required, specified areas shall be rolled by a self-propelled 10-ton pneumatic roller with tire pressure of 50-psi and equipped with a water spray system. The slurried pavement shall be subjected to a minimum of 5 full coverages by the roller. Rolling should not commence until the slurry has cured enough so that it will not pick up on the tires. In areas of high traffic volume and subject to slow turning, e.g. major intersections, rolling may be feasible.

404.3.5.5. Hand Work. In areas where the spreader box cannot be used, hand squeegees to provide complete and uniform coverage shall apply the surface treatment. Any joint cracks not filled by the mix shall be corrected by use of hand squeegees. Handwork shall be completed during the machine applying process. Due to the difficulty in hand working micro-surfacing material because of the quick-set nature of the emulsion, hand work for micro-surface treatment shall be kept to a minimum.

404.3.5.6. Curing and Finishing. All traffic shall be kept off the treated area until it has cured to a firm condition that will prevent damage to the surface treatment. Any uncured areas damaged will be repaired satisfactory to the OWNER at the CONTRACTOR'S expense.

After completion of surface treatment placement, the CONTRACTOR shall remove covered objects (manhole covers, valve covers, raised traffic markers, etc.) so the object protected will remain fully functional. All objects not to have been covered shall be restored to original integrity. Any objects damaged by the CONTRACTOR'S work activities shall be repaired or replaced at no cost to the OWNER.

Any work directed by the OWNER to correct any appearance defect shall be subject to the final approval of the OWNER.

The CONTRACTOR shall remove all unused material and debris from the site prior to final acceptance.

404.3.6. Measurement and Payment. The treated area on each street shall be field measured and calculated in square-yards. Payment shall be approved if the amount of emulsion and aggregate fall within the specified application range per square-yard. Payment per square-yard shall be full compensation for grass removal, cleaning the existing pavement, all material (including mineral filler, water, modifiers and additives) labor, tools, equipment, maintenance of traffic and notification of adjacent property owners and incidentals necessary to complete the work.

404.4. BITUMINOUS SURFACE TREATMENT (CHIP SEAL)

404.4.1. Description. This item shall consist of a wearing surface composed of one, two or three applications of asphaltic materials, each covered with aggregate, constructed on the prepared base course or surface in accordance with the requirements as shown on the plans and these specifications.

404.4.2. Materials.

404.4.2.1. Asphaltic Materials. The asphaltic materials used shall be of the type and grade as specified by the owner and shall meet the requirements of Item 302.3. Bituminous Materials.

WARNING TO CONTRACTOR: Attention is called to the fact that asphaltic materials are highly flammable. The utmost care shall be taken to prevent open flames from coming in contact with the asphaltic materials or the gases of same. The CONTRACTOR shall be responsible for any fires or accidents that may result from heating the asphaltic materials.

404.4.2.2. Aggregate. Aggregate shall be composed of dry, sound, durable particles of processed stone or steel slag having a percent of wear of not more than 35 when tested in accordance with ASTM C131 Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine. Crushed gravel shall not be allowed. The aggregate shall be free from organic matter, clay, loam, or coated pebbles and shall contain no more than five-percent of slate, shale, schist, or soft particles.

The aggregate used shall be of the type and grade or types and grades selected from those prescribed in Item 301.5. Flexible Subbase or Base (Crushed Stone/Concrete). The particular type and grade or types and grades shall be as provided on the plans or as required by the OWNER.

Aggregate when tested by standard laboratory methods shall meet the grading requirements in Table 404.4.2.2.(a) Chip Seal Aggregate Gradations. Prior to shipping aggregate to the project, the CONTRACTOR shall furnish the OWNER with samples of the proposed aggregate.

Table 404.4.2.2.(a) Chip Seal Aggregate Gradations

Sieve Size	% Retained, by weight	Sieve Size	% Retained, by weight
FIRST APPLICATION			
Small Aggregate "SB"		**Large Aggregate "LB"**	
5/8-in.	0%	1-in.	0%
1/2-in.	0 - 10%	3/4-in.	15 - 45%
1/4-in.	70 - 100%	1/2-in.	85 - 100%
No. 10	95 - 100%	1/4-in.	98 - 100%
SECOND APPLICATION			
Small Aggregate "ST"		**Large Aggregate "LT"**	
3/8-in.	0%	3/4-in.	0%
1/4-in.	2 - 20%	1/2-in.	0 - 10%
No. 10	70 - 100%	1/4-in.	65 - 85%
No. 20	95 - 100%	No. 10	90 - 100%
		No. 20	98 - 100%

404.4.2.2.1. Precoated Aggregate. The grade of aggregate specified shall meet all other requirements of Item 404.4.2.2. Aggregate prior to the application of precoat or fluxing material. Materials that are not uniformly and/or properly coated, in the opinion of the OWNER, shall not be accepted for use.

Precoated aggregate shall be aggregate of the type and grade specified, coated with 0.5- to 1.5-percent (by weight) of residual bitumen from a precoating material. When limestone rock asphalt is used, it shall be fluxed with 0.5- to 1.5-percent (by weight) of fluxing material. The materials may be mixed on the job or at a central mixing plant and shipped ready for use. Mixes that do not maintain flow qualities such that the precoated aggregate may be satisfactorily spread by approved mechanical spreading devices will not be acceptable.

Precoated aggregate will show no stripping when tested in accordance with TxDOT test method Tex-530-C Effect of Water on Bituminous Paving Mixtures. If antistripping additives are required to meet this requirement, they shall meet the requirements of TxDOT Item 301 Asphalt Antistripping Agents.

404.4.3. Construction Methods.

404.4.3.1. Equipment and Preparation. All storage tanks, piping, retorts, booster tanks, and distributors used in storing or handling asphalt shall be kept clean and in good operating condition at all times. They shall be operated in such a manner that there shall be no contamination of the asphalt with foreign material.

The area to be treated shall be cleaned of dirt, dust or other deleterious matter by sweeping or other approved methods. If it is found necessary by the OWNER, the surface shall be lightly sprinkled just prior to the application of the asphaltic material.

404.4.3.2. Application of Asphalt. The OWNER shall select the temperature of application based on the temperature-viscosity relationship that shall permit application of the asphalt with the limits recommended in Item 302.5. Storage, Heating and Application Temperature of Bituminous Materials. The CONTRACTOR shall apply the asphalt at a temperature within 15°F of the temperature selected. It shall be the responsibility of the CONTRACTOR to provide and maintain in good working order a recording thermometer at the storage heating unit at all times.

Asphaltic material may be placed by preheating aggregate to 280°F when the air temperature is 70°F and falling or when the air temperature is 50°F and rising.

Asphaltic material of the type and grade shown on the plans shall be applied on the clean surface by an approved type of self-propelled pressure distributor so operated as to distribute the material in the quantity specified, evenly and smoothly, under a pressure necessary for proper distribution. The CONTRACTOR shall provide all necessary facilities for determining the temperature of the asphaltic materials in all of the heating equipment and in the distributor, for determining the rate at which they are

applied, and for securing uniformity at the junction of two distributor loads. The distributor shall have been recently calibrated and the OWNER shall be furnished an accurate and satisfactory record of such calibration. After beginning the work, should the yield on the asphaltic materials appear to be in error, the distributor shall be recalibrated in a manner satisfactory to the OWNER before proceeding with the work.

Asphaltic materials for each course may be applied for the full width of the surface treatment in one application, unless the width exceeds 26-ft. No traffic or hauling shall be permitted over the freshly applied asphaltic materials. Asphaltic materials shall not be applied until immediate covering with aggregate is assured.

404.4.3.3. Application of Aggregate. Aggregate, of the type and grade shown on the plans for the first course, shall be immediately and uniformly applied and spread by approved calibrated mechanical spreaders, operated on the rear of the aggregate trucks or as a separate power-driving unit. These spreader units shall be approved by the OWNER prior to the start of the work. The aggregate shall be applied at the approximate rates indicated on the plans, within the limits shown in Table 404.4.3.4.(a) Chip Seal Rates of Application, and as directed by the OWNER. The entire surface shall then be broomed, bladed or raked as required by the OWNER and shall be thoroughly rolled with both pneumatic tire and steel wheel (3- to 6-tons) rollers to insure proper embedding into the bitumen. The rolling shall be continued until no more aggregate can be worked into the surface. Rolling shall meet the governing specifications for Item 301.1.2. Rolling of Embankment, Subgrade or Flexible Base.

404.4.3.4. Rates of Application. The asphalt and aggregates shall be applied at the approximate rates indicated on the plans within the following limits, as directed by the OWNER. The rates of application and the estimated quantities of aggregate are based on the usual or average gradation of known materials. Prior to shipping aggregate to the project, the CONTRACTOR shall furnish the OWNER with samples of the proposed aggregate so that the gradation may be determined and rate of application changed if necessary.

Table 404.4.3.4.(a) Chip Seal Rates of Application

Application	Asphalt gal/yd^2		Aggregate yd^3 per yd^2	
	Minimum	Maximum	Minimum	Maximum
SMALLER AGGREGATE				
First, Aggregate "SB"	0.20	0.30	1:100	1:75
Second, Aggregate "ST"	0.30	0.40	1:200	1:150
LARGER AGGREGATE				
First, Aggregate "LB"	0.25	0.35	1:75	1:50
Second, Aggregate "LT"	0.35	0.45	1:150	1:100

404.4.3.5. Multiple Courses. Where double or triple surface courses are specified on the plans, each succeeding course shall be constructed by the procedures as prescribed for the first course. The rates of asphaltic material and aggregate for multiple-course construction shall be as shown on the plans within the limits shown in Table 404.4.3.4.(a) Chip Seal Rates of Application or as directed by the OWNER.

404.4.3.6. Maintenance and Completion. The CONTRACTOR shall be responsible for the maintenance of the surface and distribution of the excess aggregate until final completion and acceptance of the entire project by the OWNER. All holes or failures in the surface shall be repaired per each course by use of additional asphalt and aggregate. All fat or bleeding surfaces shall be covered with approved cover material per each course in such a manner that the asphaltic material will not adhere to or be picked up by the wheels of vehicles.

404.4.4. Measruement and Payment. Bituminous surface treatments shall be measured by the square-yard of surface area of completed and accepted per bid item "One-, "Two-, or "Three-Course Surface Treatment."

Rolling shall not be measured for payment but shall be considered as subsidiary to the Items of "Asphalt" and/or "Aggregate." Work performed and materials furnished as prescribed by this item and measured as provided in this item shall be paid for at the unit price bid for "One-, "Two-, or "Three-Course Surface Treatment," which price shall be full compensation for cleaning and sprinkling the surface to be treated; for furnishing, preparing, hauling and placing all materials; for all blading, brooming, rolling; and for all manipulations, labor, tools, equipment and incidentals necessary to complete the work.

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ITEM 501. UNDERGROUND CONDUIT MATERIALS

501.1. GENERAL

All pipe and fittings shall be new.

The OWNER shall at all times have free access to the manufacturer's plant while production is in progress, and may at any time refuse to accept pipe made when the plant is failing to follow the stipulations of the specifications in regard to workmanship, or failing in provisions to insure a uniform product coming within the permissible variations of the specifications. The OWNER may reject pipe if adequate means and methods are not provided so as to insure the manufacture of a product of uniform high quality.

Pipe shall be color coded according to the American Public Works Association Uniform Color Code (i.e. blue for water, green for wastewater or storm drain lines, violet for reclaimed water, etc.) or labeled with labeling tape identifying its specific use. Where feasible, permanent identification of the piping service shall be provided by co-extruding color stripes into the pipe outside surface. The striping shall be of the same material except for the color. For co-extruded markings, IPS sized pipe shall have four equally spaced, longitudinal color stripes and DIPS sized pipe shall have three equally spaced pairs of longitudinal color stripes. The color or marking shall be visible on top of buried pipe when pipe is excavated.

Pipe shall be acceptable by the Underwriters' Laboratories, Inc. or Factory Mutual Research when specifically requested and shall be acceptable by the State Fire Insurance Commission for use in water distribution systems when used for fire protection without penalty. Potable water pipe shall also bear the seal of approval (or "NSF" mark) of the National Sanitation Foundation Testing Laboratory for potable water pipe.

Installation shall be performed in accordance with relevant portions of Division 500 Underground Conduit Construction and Appurtenances.

501.1.1. Rejection. Pipe, joints, fittings, or coatings may be rejected for failure to meet any of the requirements of this specification or for any manufacturing, transportation and/or handling defects that may cause pipe, joints, fittings or coatings to be unsuitable for intended use(s). When approved by the OWNER, materials may be re-tested to establish conformity. All rejected materials shall be plainly marked by the Engineer and shall be replaced by the CONTRACTOR with materials which meets the requirements of these specifications. Such rejected materials shall be removed immediately from the site of the work.

501.1.2. Damaged Pipe. Pipe that is damaged during installation will be repaired only by a method approved by the OWNER. If, in the opinion of the OWNER, a satisfactory repair cannot be made by the method(s) suggested by the CONTRACTOR or pipe manufacturer, the damaged pipe shall be removed and replaced with sound pipe that meets the specifications of the contract. Repairs or replacement will be at no cost to the OWNER including costs associated with removing and replacing non-damaged pipe for the purpose of removing damaged pipe.

501.2. CLAY WASTEWATER PIPE.

501.2.1. General. Clay wastewater pipe shall conform to ASTM C700 Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated, having compression joints and bell and spigot ends or compression couplings for plain-end pipe.

501.2.2. Class. Extra strength vitrified clay wastewater pipe shall be used unless otherwise designated.

501.2.3. Fittings. Fittings shall be of the same test strength as the pipe as ordered or shown on plans.

501.2.4. Joints. Factory-fabricated compression joints and joints for fittings shall meet the requirements of ASTM C425 Compression Joints for Vitrified Clay Pipe and Fittings.

501.2.5. Pipe Tests. Tests of the pipe shall be made in accordance with ASTM C301 Test Methods for Vitrified Clay Pipe.

501.3. VITRIFIED CLAY PIPE USED IN TRENCHLESS APPLICATIONS

501.3.1. General. Clay pipe used for microtunneling, sliplining, pipe bursting, and tunnels shall conform to ASTM C1208 (C1208M) Vitrified Clay Pipe and Joints for Use in Microtunneling, Sliplining, Pipe Bursting, and Tunnels. The pipe shall have a minimum compressive strength of 7000-psi.

501.3.2. Pipe Joints. The pipe joint collar shall be manufactured of Series 316 stainless steel or better and compression discs are required to distribute the jacking forces.

501.3.3. Pipe Tests. Tests of the pipe shall be made in accordance with ASTM C1208 (C1208M).

501.4. CONCRETE PRESSURE PIPE AND FITTINGS

501.4.1. General. These specifications cover the manufacture of concrete pressure pipe designed for internal pressures from a minimum of 20-psi to a maximum of 350-psi. Products shall conform to relevant standards as noted in Table 501.4.1.(a) Standards for Concrete Pressure Pipe and Fittings.

Table 501.4.1.(a) Standards for Concrete Pressure Pipe and Fittings

Item Reference No.	AWWA Standard	Description
501.4.5	C301	Prestressed Concrete Pressure Pipe, Steel-Cylinder Type
	C304	Design of Prestressed Concrete Cylinder Pipe
501.4.6	C303	Bar-Wrapped Concrete Cylinder Pipe

Items 501.4.2. through 501.4.4., inclusive, shall apply to each type of pipe in Item 501.4 Concrete Pressure Pipe and Fittings. Concrete Pressure Pipe and Fittings shall be provided in accordance with ANSI/AWWA C301. In accordance with C301, Section III.A – Purchaser Options and Alternatives, the purchasers are advised that, while the standard presents information on materials and procedures for manufacture of the pipe, it may not contain all of the engineering information needed to prepare a complete specification for a particular pipeline installation. A specific pipeline installation may require provisions more restrictive than those in the standard and will likely require additional design and installation details.

Reference to AWWA Manual M9 - Concrete Pressure Pipe, should be considered as a supplement to the use of the C301 standard, and information in the manual should not be regarded as superseding any portion of the C301 standard. Purchaser options and alternatives shall be provided by the specifier, including working pressure, surge pressure, field-test pressure, external loading conditions, method of bedding and backfilling, manner of storage and delivery (if required by the manufacturer), tabulated layout schedules, and detailed shop drawings and schedules submitted to the OWNER for review. Purchaser options and alternatives shall be specified in the supplemental conditions, plans, or technical specifications.

The type of pipe to be supplied shall be as shown on the plan and/or in the special provisions for each project.

The manufacturer shall submit a successful experience record in the design and construction of the type of concrete pressure pipe involved. Each type of pipe shall have the complete approval of the Underwriters' Laboratories, Inc., for the manufacture of the pipe specified and diameters required. Pipe shall have NSF61 standard approval for potable water applications.

Upon award of the Contract, the CONTRACTOR shall furnish OWNER with shop drawings showing the pipe and fittings to be furnished and shall include a tabulated layout schedule with reference to the stationing of the contract drawings with plan and profile drawings. Such drawings shall be subject to the approval of the OWNER and fabrication of pipe and fittings shall not be commenced until such drawings have been approved by the OWNER. Such approval by the OWNER shall not relieve the CONTRACTOR of any responsibility of providing pipe and/or fittings in accordance with the OWNER'S plans and specifications.

No cracks will be permitted in the mortar lining of the pipe, except for minor hairline cracks. Pipe with cracks through the mortar wall or damaged bells, spigots or joint grooves shall not be accepted without manufacturer-approved repair. Cracks in the vicinity of the spigot of the pipe and those cracks in the vicinity of the circumferential wrappers and outlets shall not be allowed. Cracks up to 0.010-in in the lining of the pipe are acceptable if they are not excessive in length (should be less than 2 ft.).

All cracks to the mortar coating shall be repaired according to the manufacturer's specification prior to installation.

501.4.2. Fittings and Specials. The manufacturer shall furnish all fittings and special pieces required for closures, bends, branches, manholes, air valves, blow offs and connections to mainline valves and other fittings shown on the contract drawings or as set out in the specifications conforming with AWWA C301,

AWWA C303, or AWWA C304 as applicable. All openings in the pipe for fittings, manholes, taps, blow offs, etc. shall have the interior and exterior surfaces of the steel lined and coated with mortar. The lining thickness shall be a minimum of 0.5-inches for sizes 16-in. and smaller, and 0.75-in. minimum lining thickness for sizes larger than 16-in. The minimum coating thickness shall be 1-in. The type of fittings and details covering the design of fittings and specials shall be furnished by the manufacturer and subject to the approval of the OWNER. The fittings and specials shall comply in all respects with the requirements of AWWA with modifications as herein set forth.

501.4.3. Flanged Outlets. Flanged outlets shall be insulated at all points where external valves, pipe, fittings, etc., are connected to the line. The CONTRACTOR shall furnish an insulating flange kit, flange gaskets, insulating sleeves, and two plastic washers for each bolt approved by the OWNER. Bolts, nuts, and washers for flanged outlet connections shall be carbon steel.

501.4.4. Tests. All pipe shall be tested in accordance with applicable specifications and AWWA Standards. In addition to certification of all applicable tests required by governing AWWA Standards, the following tests or certifications of tests may be required.

501.4.4.1. Steel Cylinder Pipe. The manufacturer shall submit for approval the specified details of materials and methods of welding it proposes to use before any welding is done.

The manufacturer shall furnish one specimen for tensile tests of welds from each 3,000-ft. of pipe. If tests indicate the welding is unsatisfactory, additional samples as required shall be furnished. Two test cylinders out of each day's pour of the concrete used, or as required by the OWNER, shall be furnished for testing by an independent laboratory. The cost of such a test shall be borne by the OWNER. Certified test reports made by the manufacturer shall be acceptable in lieu of the test cylinders, provided such test certificates show that they cover pours from which the purchased pipe is made.

Mill test reports on each heat from which steel cylinders and reinforcing are rolled shall be furnished by the OWNER, if required.

Test certificates showing the physical properties of the compound used in the gaskets shall be furnished by the OWNER, if required.

501.4.4.2. Three-Edge Bearing Test. The manufacturer of concrete cylinder pipe supplied in accordance with the provisions of Item 501.4. Concrete Pressure Pipe and Fittings shall have demonstrated, or shall demonstrate as may be required, that the pipe when tested in a three-edge bearing test as described in ASTM C497 (C497M) Concrete Pipe, Sections or Tile under a load equivalent to the design ditch load shall not deflect more than 0.1-percent. At the above specified load, there shall be no continuous cracks wider than 0.002-in. for a length of 12-in.

501.4.5. Prestressed Concrete Cylinder Pipe, AWWA C301.

501.4.5.1. General. The pipe shall comply in all respects with the requirements of AWWA C301 Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids. The pipe may be of two types of prestressed concrete steel cylinder pipe as specified on the plans and/or specifications or special conditions:

(1) the lined cylinder type with a core composed of a steel cylinder lined with concrete and subsequently wire-wrapped directly on the steel cylinder and coated with the mortar.
(2) the embedded cylinder type with a core composed of a steel cylinder encased in concrete and subsequently wire-wrapped on the exterior concrete surface and coated with concrete or mortar.

501.4.5.2. Design Pressures and Stresses. Design pressure shall be that shown on plans and/or specifications. The size of the high-tensile wire and the spacing and tension under which it is wound shall be such that the conditions required by AWWA C304 Design of Prestressed Concrete Cylinder Pipe are met.

501.4.6. Bar-Wrapped Concrete Cylinder Pipe, AWWA C303.

501.4.6.1. General. The pipe shall consist of a welded sheet-steel or plate-steel cylinder, manufactured by the spiral or straight seam method with joint rings attached, inside of which a cement mortar lining is centrifugally spun; a mild steel bar spirally wrapped under measured tension on the steel cylinder and protective cement mortar coating applied to the outside of the cylinder and spirally-wrapped rod.

The manufacturer shall furnish pipe in uniform lengths except lengths ordered as specials.

The pipe shall comply in all respects with the requirements of AWWA C303, with the following addition.

501.4.6.2. Design Pressures and Stresses. Design pressure shall be that shown on the plans and/or specifications. Steel cylinder and bar reinforcement shall be designed in accordance with AWWA Manual M9, Concrete Pressure Pipe.

501.5. REINFORCED CONCRETE WASTEWATER PIPE WITH RUBBER GASKET JOINTS

501.5.1. General. Except as applicable to Item 501.5.2. Alternate Concrete Pipe D-Load Design, reinforced concrete pipe manufactured under these specifications shall conform to ASTM C76 (C76M) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; or ASTM C655 (C655M) Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe, and by a plant certified by the American Concrete Pipe Association, Texas Department of Transportation, or other recognized authority, with the following additions:

(1) All pipe shall be machine made by a process which shall provide for uniform placement of zero slump concrete in the form and compaction by mechanical devices which shall assure a dense concrete in the finished product.
(2) Aggregates for the concrete shall comply with requirements ASTM C33 Concrete Aggregates, with the additional requirement that the aggregate shall have a minimum of 50-percent of calcium carbonate equivalent.
(3) Pipe furnished under this specification shall be steam cured in accordance with methods prescribed in ASTM C76 (C76M) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe except that the steam curing time shall be not less than eight-continuous-hours.
(4) The pipe and connecting joints shall be subject to the hydrostatic tests set forth in ASTM C443 (C443M) Joints for Concrete Pipe and Manholes, Using Rubber Gaskets, both for pipes in straight alignment and for pipes in maximum deflected position without leakage either in the pipe or in the joints.

501.5.2. Alternate Concrete Pipe D-Load Design. When bedding is specified in accordance with Item 504.5.2.16. Alternate Embedment for Concrete Pipe, reinforced concrete pipe shall conform to ASTM C1417 (C1417M) Manufacture of Reinforced Concrete Sewer, Storm Drain, and Culvert Pipe for Direct Design. This specification covers the manufacture and acceptance of precast concrete pipe designed to conform to the OWNER's design requirements and to ASCE 15-93, ASTM C655 (C655M) Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe, or an equivalent design specification. Conditions 501.5.1. (1) through (4) apply to pipe provided under this specification and appropriate corrosion protection shall be furnished for pipe used in wastewater applications.

501.5.3. Steel Reinforcement. All steel reinforcement shall be in accordance with ASTM C76 (C76M) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe and shall be circular in shape. No elliptical reinforcement shall be permitted. Where Class III pipe of sizes larger than 30-in. in diameter are specified, the manufacturer may, at its option, furnish pipe manufactured with either Wall "B" or Wall "C" minimum thicknesses, and the applicable minimum steel area as listed for circular cages in Table II of ASTM C76 may be substituted, at the manufacturer's option, for those listed in Table III of ASTM C76, provided test strength requirements for Class III pipe are satisfactorily met.

Where Class IV or V pipe is specified, the steel as called for in the wall as designated shall be furnished. Quadrant reinforcement shall be acceptable. As an alternate the pipe may be designed as detailed in ASTM C655 (C655M) Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe. Proof of design must be submitted.

501.5.4. Joints. Connecting joints shall be made using a flexible watertight rubber-type compression gasket. The rubber gasket shall be the sole element of the joint depended upon to provide water tightness.

501.5.4.1. Rubber Gaskets. All rubber-type gaskets shall be of the round profile design. The rubber gasket shall be required to meet and be tested in accordance with ASTM C443 (C443M) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

501.5.4.2. Deflection. The joint design shall provide for the deflection of a pipe unit by opening one side of the outside perimeter of the joint ½-inch wider than the full "home" position without reducing its

water tightness. Where greater deflections are required that provided by the joint design, beveled joints or elbows shall be provided.

501.5.4.3. Joint Approval. A detailed design of the joint or joints, including design and durometer hardness of the rubber gasket proposed to be furnished under this specification, shall be approved by the OWNER prior to installation. The design shall also include minimum and maximum interior joint opening in the assembled position in straight alignment and the maximum interior joint opening in the maximum deflected position. Joint dimensions (waste bell and spigot) should be addressed in shop drawings.

501.5.5. Fittings and Specials. Component parts for all specials such as bends, wyes, tees, etc. shall be manufactured on machines and in the same manner as straight joint concrete wastewater pipe under these specifications, except that joint lengths may be shorter than minimum listed.

501.5.6. Coatings and Linings. Coatings and liners called for in the specifications or as indicated on the plans shall meet the requirements of Item 502.9. Corrosion-Resistant Coatings and Liners for Wastewater Conduit and Appurtenances and shall be installed or applied by the pipe manufacturer.

501.5.7. Repairs. Repairs shall be permitted as set out in ASTM C76 and/or ASTM C655 except field repairs shall be permitted only with prior approval of the OWNER. Repairs to pipe and shall be done in strict conformity with all applicable specifications, instructions and recommendations of the manufacturer to ensure material warranty. If, in the opinion of the OWNER, repairs should not be made, the section of pipe shall be rejected and removed from the construction site and not repaired or returned to any of the OWNER'S projects. Rejected pipe shall be marked in a manner mutually agreed upon by the OWNER and the pipe manufacturer.

Field repairs on damage to the gasket bearing area shall not be allowed without prior approval of the OWNER.

501.5.8. Markings. Each length of pipe shall bear the initials or name of the person, company or corporation by whom it was manufactured; date of manufacture; and the class of pipe. The markings shall be indented or stenciled on the exterior or interior of the barrel near the bell and shall be plainly legible for purpose of identification.

501.5.9. Tests. The pipe shall be required to meet and be tested in accordance with ASTM C76 (C76M) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, or ASTM C655 (C655M) Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe, as applicable.

The connecting joints shall be subject to the hydrostatic tests set forth in ASTM C443 (C443M) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

The rubber gasket shall be required to meet and be tested in accordance with ASTM C443 (C443M).

501.5.10. Rejection. The pipe may be rejected for having defects or failure to meet the requirements as follows:

(1) variations in any dimension exceeding the permissible variations prescribed,
(2) a piece broken out of the bell or spigot or tongue or groove end of such size that the water tightness of the joint should be impaired,
(3) a shattering or flaking of concrete or other conditions indicating an improper concrete mix,
(4) lack of uniformity in placement of steel which might preclude all joints being typical of those tested,
(5) cracks sufficient to impair the strength, durability or serviceability of the pipe,
(6) failure to conform with any of the specifications herein set forth or referenced,
(7) the complete absence of distinct web-like markings, which may be indicative of a deficiency of water in the concrete mix, from the external surface of the pipe made by any process in which the forms are removed immediately after the concrete has been placed, unless specimens submitted for test that do not have such web-like markings shall have passed the physical tests required by these specifications,
(8) failure of pipe to go completely "home" due to binding of spigot against bell or tongue against groove,
(9) failure to pass any of the tests in Item 501.5.9. Tests,
(10) joint sections with spalls, cracks, fractures, or other imperfections that could adversely affect the performance of the joint,
(11) failure to meet the requirements for coatings and linings.

501.6. REINFORCED CONCRETE CULVERT, STORM DRAIN, PIPE AND BOX SECTION

This item shall govern reinforced concrete culvert, storm drain, pipe and precast reinforced concrete box sections. Pipe shall be cured in accordance with the applicable ASTM Designations for each type of pipe as referred to below.

501.6.1. Reinforced Concrete Culvert, Storm Drain, and Pipe.

501.6.1.1. General. Except as applicable to Item 501.6.1.1.1. Alternate Concrete Pipe D-Load Design, circular reinforced concrete pipe shall conform to ASTM C76 (C76M) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; arch pipe shall conform to ASTM C506 Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe; elliptical pipe shall conform to ASTM C507 Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe, of the class as designed on the plans subject to the following modifications:

(1) All pipe shall be machine-made by a process which shall provide for uniform placement of zero slump concrete in the form and compaction by mechanical devices which shall assure a dense concrete in the finished product.
(2) Sizes larger than 60-in. diameter shall be manufactured using two lines of circular reinforcement.
(3) Where Class III pipe of sizes larger than 60-in. diameter are specified, the manufacturer may at its option furnish pipe manufactured with either Wall "B" or Wall "C" minimum thicknesses and the applicable minimum steel area as listed for circular cages in Table II of ASTM C76 (C76M), provided tests strength requirements for Class III pipe are satisfactorily met.

501.6.1.1.1. Alternate Concrete Pipe D-Load Design. When bedding is specified in accordance with Item 504.5.2.16. Alternate Embedment for Concrete Pipe, reinforced concrete pipe shall conform to ASTM C1417 (C1417M) Manufacture of Reinforced Concrete Sewer, Storm Drain, and Culvert Pipe for Direct Design. This specification covers the manufacture and acceptance of precast concrete pipe designed to conform to the OWNER's design requirements and to ASCE 15-93, ASTM C655 (C655M) Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe, or an equivalent design specification. Conditions of 501.6.1.1. modifications (1) and (2) apply to pipe provided under this specification.

501.6.1.2. Sizes and Permissible Variations. Variations in diameter, size, shape, wall thickness, reinforcement, placement of reinforcement, laying length and the permissible underrun of length shall be in accordance with the applicable ASTM specification for each type of pipe as referred to previously.

Where rubber gasket pipe joints are to be used, the design of joints and permissible variations in dimensions shall be in accordance with ASTM C443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets, Sections 5 and 6.

501.6.1.3. Joints. Pipe to be placed along curves shall consist of whatever pipe joint lengths or beveled end joints of pipe or combination thereof that are required to place the pipe on the designated centerline curve with no more than one-half of the tongue length of the pipe exposed from its normal fully closed joint position.

501.6.1.3.1. Flexible Joint Sealant. Unless otherwise specified on the plans or in the special provisions, pipe joints shall be sealed with one of the following types of gaskets; Flexible Joint Sealant manufactured in accordance with ASTM C990, Expanded Cellular Rubber Gaskets in accordance with ASTM D1056 Flexible Cellular Materials – Sponge or Expanded Rubber, Class 2C1, or Elastomeric Seals. Each joint shall require one continuous gasket conforming to the joint shape. Gasket cross-sectional diameters shall be in accordance with the manufacturer's recommendations.

Cold-Applied Preformed Plastic Gaskets. Plastic gasket shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents, irritating fumes, or obnoxious odors.

Expanded Cellular Rubber Gaskets. Expanded Cellular Rubber Gaskets shall be produced from tubular cross sections of a blend of nitrile and vinyl polymers meeting the physical requirement of ASTM D1056, Flexible Cellular Materials – Sponge or Expanded Rubber, Class 2C1.

Elastomeric Seals for Joining Concrete Structures. Elastomeric seals shall be produced from natural or synthetic rubber meeting the requirements of ASTM C1619 Standard Specification for Elastomeric Seals for Joining Concrete Structures.

501.6.1.4. Workmanship and Finish. Pipe shall be substantially free from fractures, large or deep cracks and surface roughness. The ends of the pipe shall be normal to the walls and centerline of the pipe within the limits of variations allowed as stated previously.

501.6.1.5. Pipe Marking. Markings shall be indented on the pipe section or painted thereon with waterproof paint. The following information shall be clearly marked on each section of pipe:

(1) the class of pipe,
(2) the date of manufacture,
(3) the name or trademark of the manufacturer,
(4) where elliptical reinforcement is used, one end of each section or joint of pipe shall be clearly marked during the process of manufacture or immediately thereafter on the inside and the outside of opposite walls to show the location of the "top" or "bottom" of the pipe as it should be installed.

501.6.1.6. Tests. The acceptability of the pipe in all diameters, strengths and classes shall be determined by such material tests performed as required in ASTM C76 (C76M), C506 or C507; by the results of the three-edge bearing test for the load to produce a 0.01-in. crack and ultimate load and by absorption tests on selected samples from the wall of the pipe in accordance with ASTM C497 (C497M) Concrete Pipe, Manhole Sections, or Tile; and by inspection of the finished pipe to determine its conformance with the design prescribed in these specifications and its freedom from defects.

Testing rates shall be as follows, except that in no case fewer than two specimens shall be furnished:

(1) If subjected to three-edge-bearing tests for the 0.01-in. crack only, testing shall be performed on 0.8-percent of the number of pipe sections of each size included in the order. Pipes that have been tested only to the formation of a 0.01-in. crack and that meet the 0.01-in. test load requirements shall be accepted for use.
(2) If subjected to three-edge-bearing tests for both the 0.01-in. crack and the ultimate load, testing shall be performed on 0.2-percent of the number of pipe sections of each size included in the order.

As an alternate to the three-edge-bearing test, concrete pipe 60-in. in diameter and over may be accepted, at the option of the manufacturer, on the basis of material tests and inspection of the completed product. Acceptability of pipe on this basis shall be determined by the results of material tests as required in ASTM C76, C506 or C507; by crushing tests on cores taken from the barrel of the completed and cured pipe; by absorption tests on samples from the wall of the pipe; and by inspection of the finished pipe, including amount and placement of reinforcement, to determine its conformance with the design prescribed in these specifications and its freedom from defects.

The manufacturer shall furnish facilities and personnel for taking the cores from the pipe barrel and for determining the compressive strength of the samples. When the cores cut from a section of pipe successfully meet the strength requirement, the core-holes shall be plugged and sealed by the manufacturer in a manner such that the pipe section shall meet all of the test requirements of ASTM C76, C506 or C507. Pipe sections, so sealed, shall be accepted for use.

Tested pipe accepted for use shall be marked "TEST" or otherwise appropriately identified. Should any of the test specimens fail to meet the test requirements, two consecutive joints in the same mix series shall be tested and results shall be a basis of accepting or rejecting the pipe of the series.

501.6.1.7. Rejection of Pipe. All rejected pipe shall be plainly marked by the OWNER and shall be replaced by the CONTRACTOR with pipe that meets the requirements of these specifications. Such rejected pipe shall be removed immediately from the site of the work.

501.6.2. Precast Reinforcement Concrete Box.

501.6.2.1. General. Precast reinforced concrete box sections shall conform to ASTM C1433 (C1433M) Standard Specifications for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains and Sewers and ASTM C1577 Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers Designed According to AASHTO

LRFD. More information may be found in ASTM C877 Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections.

501.6.2.2. Concrete. Boxes shall be machine-made or cast by process which will provide for uniform placement of concrete in forms and compaction by mechanical devices to produce dense, structurally sound concrete. Use concrete mixed in central batch plant or other batching facility from which quality and uniformity of concrete can be assured. Transit-mixed concrete is not acceptable. Representatives of the Engineer will inspect manufacturer's plant and casting operations as deemed necessary.

501.6.2.3. Joints. Joints shall conform to ASTM C990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants, Expanded Cellular Rubber Gaskets meeting the physical requirement of ASTM D1056, Flexible Cellular Materials - Sponge or Expanded Rubber, Class 2C1, ASTM C1677 Standard Specification for Joints for Concrete Box, Using Rubber Gaskets. For joints conforming to C1677, the elastomeric (gasket) material shall conform to ASTM C1619 Standard Specification for Elastomeric Seals for Joining Concrete Structures, Class C requirements. Gaskets which require oil resistant properties (e.g. Nitrile) shall meet Class D requirements. Gasket material for sealing tongue & groove joints shall be performed flexible butyl rubber meeting the requirements of ASTM C990 Section 6.2 Butyl Rubber Sealant, or Expanded Cellular Rubber Gaskets. Gasket width shall be in accordance with the joint material manufacturer's recommendations, and large enough to properly seal the entire perimeter of the tongue and groove joint.

501.6.2.4. Lifting Holes. For precast boxes, no more than 4 lifting holes shall be in each section. Lifting holes may be cast, cut into fresh concrete after form removal, or drilled. Lifting holes of sufficient size shall be used for adequate lifting based on the size and weight of the box section. Lifting holes larger than 3 inches in diameter are not acceptable. More than 1 longitudinal wire or 2 circumferential wires per layer of reinforcing steel may not be cut when locating lifting holes. Spalled areas around lifting holes shall be repaired when discovered.

501.6.2.5. Quality. Fine cracks on the surface of the member that do not extend to the plane of the nearest reinforcement are acceptable unless the crack are numerous and extensive.

501.6.2.6. Repairs. Cracks that extend into the plane of the reinforcement steel shall be repaired in an approved manor. Excessive damage, honeycombing, or cracking will be subject to structural review. The OWNER MAY accept box repairs that are sound, properly finished and cured in conformance with pertinent specifications.

501.7. DUCTILE-IRON PRESSURE PIPE AND FITTINGS

501.7.1. General. Ductile-iron pressure pipe 4-in. through 64-in. shall conform to the American National Standard for Ductile-Iron Pipe Centrifugally Cast for Water or Other Liquids, AWWA C151. In accordance with C151, Section III.A, purchaser options and alternatives shall be provided by the specifier, including pipe size, joint type, special joints, thickness or class, and laying length. Purchaser options and alternatives shall be specified in the supplemental conditions, plans, or technical specifications. Polyethylene encasement for ductile iron pipe systems shall conform to Item 502.8. Polyethylene Wrap for Metal Pipe and Fittings. The CONTRACTOR shall protect the polyethylene wrap and prevent damage during embedment and backfill installation.

The ductile iron shall conform in all respects to the specifications set forth in ASTM Standard A377, Standard Index of Specifications for Ductile Iron Pressure Pipe. The specific grade of ductile iron used shall be Grade 60-42-10, with a Minimum Tensile Strength of 60,000 psi, a Minimum Yield Strength of 42,000 psi, and a Minimum Elongation in 2" of 10%.

501.7.2. Joints. All ductile-iron pressure pipe shall be furnished with one of the types of joints indicated in Table 501.7.2.(a) Ductile Iron Pressure Pipe Joint Types and as described in the proposal or bid request.

Bolts and nuts for mechanical joints or flanged ends (if used underground) shall be of a high-strength low-alloy corrosion-resistant steel and shall conform to ASTM F3125 (F3125M) High Strength Structural Bolts.

All threaded flanges shall be ductile iron.

Table 501.7.2.(a) Ductile Iron Pressure Pipe Joint Types

Type Joint	AWWA Standard
Push-on	AWWA C111 Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
Mechanical Joint	AWWA C111 (same as above)
Flanged Ends	AWWA C110 Ductile-Iron and Gray-Iron Fittings, 3 in.-48 in., for Water, or AWWA C115 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
Grooved Ends	AWWA C606 Grooved and Shouldered Joints

501.7.3. Coating and Lining. All ductile-iron pipe shall be bituminous coated outside and cement mortar lined inside. The cement mortar lining shall be seal coated in accordance with the latest revision of ANSI / AWWA C104 / A21.4 American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water. All ductile iron pipe shall require an exterior polywrap corrosion protection system as defined in the latest version of ANSI / AWWA C105 / A21.5 American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems. In the event of tears, pinches, breaches, or other damage to the initial external polywrap protection layer, the use of dual layer external polywrap protection meeting the above standards shall be required. If this specification conflicts with manufacturer's installation recommendations, follow manufacturer's recommendations for ductile iron pipe installation.

501.7.4. Fittings. Fittings shall be of ductile-iron and shall conform to AWWA C110 ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3-in. through 48-in. for Water, or conform to AWWA C153 ANSI Standard for Ductile-Iron Compact Fittings for Water Service, 3-in. through 64-in., unless otherwise specified in the proposal, special specification or in the plans.

Welded-on outlets may be used in lieu of the tees shown on the plans. Outlet pipe shall be special thickness class 53. All weldments must be 55% nickel iron and each outlet pipe shall be air tested to 15-psi to insure weld integrity. The outlet branches must be made from ductile iron pipe.

All fittings shall be rated for a minimum of 250-psi working pressure unless otherwise specified.

Special fittings using end condition combinations of bells, spigots, mechanical, integrally restrained or push-on joints, flanges, or special internally locked joints shall be dimensioned in accordance with AWWA C110 or C153.

Bolts and nuts for mechanical joints or flanged ends shall be of a high-strength, corrosion-resistant low-alloy steel and shall conform to ASTM A325 (Type 3) or shall be stainless steel in accordance with ASTM A304 Carbon and Alloy Steel Bars Subject to End-Quench Hardenability Requirements.

The OWNER shall determine whether fittings shall be bituminous coated outside and cement-mortar lined inside with seal coat in accordance with AWWA C104 Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water or whether the interior and exterior surfaces shall be protected consistent with AWWA C116 Standard for Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service.

501.7.5. Tests. All ductile-iron pipe and fittings shall be tested in accordance with the applicable provisions of the specifications relating thereto.

501.7.6. Markings. Class, weight, and casting period shall be shown on each pipe.

501.8. SECTION HELD FOR FUTURE USE

501.9. STEEL PIPE AND FITTINGS

501.9.1. General. Steel pipe, fittings and specials shall conform to the details as shown on the plans or included in the specifications and as specified below. Steel Pipe and Fittings shall be provided in accordance with AWWA C200. In accordance with C200, Section III.A, purchaser options and alternatives shall be provided by the specifier, including pipe size, joint type, special joints, thickness or class, and laying length. Purchaser options and alternatives shall be specified in the supplemental conditions, plans, or technical specifications.

501.9.2. Applicable Standard Specifications. Except as modified or supplemented herein, all steel pipe, fittings and specials shall conform to the applicable requirements of the standard specifications indicated in Table 501.9.2.(a) Standards for Steel Pipe and Fittings.

Table 501.9.2.(a) Standards for Steel Pipe and Fittings

Standard	Designation
AWWA C200	Steel Water Pipe—6 in. and Larger
AWWA C203	Coal Tar Protective Coatings and Linings for Steel Water Pipeline — Enamel and Tape — Hot Applied
AWWA C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe — 4 in. and Larger — Shop Applied
AWWA C206	Field Welding of Steel Water Pipe
AWWA C207	Steel Pipe Flanges for Waterworks Service—Sizes 4 In. Through 144 in.
AWWA C208	Dimensions for Fabricated Steel Water Pipe Fittings
AWWA C209	Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipe
AWWA C210	Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
AWWA C214	Tape Coating Systems for the Exterior of Steel Water Pipelines
AWWA C222	Polyurethane Coatings for the Interior and Exterior of Steel Water Pipelines and Fittings
AWWA C602	Cement-Mortar Lining of Water Pipelines in Place—4 in. and Larger
AWWA C606	Grooved and Shouldered Joints
ASTM A283	Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A139	Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
NSF/ANSI 61	Drinking Water System Components

CONTRACTOR shall submit a written certification that the pipe has been manufactured and tested in accordance with the applicable standards. The pipe shall be manufactured, fabricated, coated and lined by a single manufacturer being a certified member in good standing of the Steel Plate Fabricators Association (SPFA).

501.9.3. Pipe and Fittings Requirements. Fabricated pipe and fittings shall be made of steel plate conforming to ASTM A283, Grade D, or ASTM A139, Grade B, C, or D in accordance with AWWA C200. Mill-type pipe and fittings shall be Grade B conforming to AWWA C200.

Nominal pipe diameter shall be as specified in the plans. Nominal diameters for steel pipe sizes under 24-in. are outside diameters and for sizes 24-in. and over are inside diameters per AWWA M11 Steel Pipe—A Guide for Design and Installation.

The pipe wall thickness shall be as specified in the plans.

Pipe sections shall be furnished in not less than 20 ft. lengths except for specials and closures sections as may be required.

501.9.4. Joints. Steel pipe and fittings shall be joined with any of the end types as specified below, unless a particular end type is specified. Flange ends shall be used only where specifically noted on drawings.

Welded joints shall conform to and be tested in accordance with AWWA C206.

Rubber gasketed joints may be used up to 72-in. in diameter and shall conform to, and be tested in accordance with AWWA C200.

Grooved and shouldered joints shall conform to, and be tested in accordance with AWWA C606.

Mechanically coupled joints shall consist of Dresser Couplings Style 38 or equal or as specified on the drawings.

Flanged joints shall conform to the AWWA C207, Class D. The thickness of flanges shall be as specified in Table 1 or 2 of AWWA C207, or as specified on the drawings.

501.9.5. Lining and Coating. Steel pipe and fittings shall be lined in accordance with any of the standards indicated in Table 501.9.5.(a) Lining and Coating for Steel Pipe and Fittings, unless a particular specification is shown on the plans.

The exterior surface of steel pipe and fittings to be installed underground shall be coated in accordance with AWWA C214. If coated in accordance with AWWA C214, then the fittings will be coated in accordance with AWWA C209. The exterior surface of steel pipe and fittings to be installed above ground shall be cleaned, primed and coated, all in accordance with either AWWA C222 or C210.

Table 501.9.5.(a) Lining and Coating for Steel Pipe and Fittings

Standard	Topic
AWWA C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe — 4 In. and Larger — Shop Applied
AWWA C210	Liquid-Epoxy Coating Systems for Interior and Exterior of Steel Water Pipelines
AWWA C222	Polyurethane Coatings for the Interior and Exterior of Steel Water Pipelines and Fittings
AWWA C602	Cement-Mortar Lining of Water Pipeline — 4 In. and Larger — in Place

501.9.6. Testing. All steel pipe shall be hydrostatically tested to a pressure that will induce a stress of 75% of the minimum yield strength of the steel in accordance with AWWA C200. Fittings fabricated from hydrostatically tested pipe shall not require shop hydrostatic testing. Welds for fittings that were not previously hydrostatically tested shall require hydrostatic testing, air testing, or other ASTM nondestructive testing.

501.10. SEAMLESS COPPER TUBING

501.10.1. General. These specifications pertain only to Type K, annealed (soft) copper water tubing for use with solder, flared, or compression-type fittings. The copper tubing shall conform to ASTM B88 Seamless Copper Water Tube.

501.10.2. Quality. The vendor shall be responsible for submission of a laboratory analysis of the products supplied. The manufacturer's own laboratory analysis is acceptable. The certificate of analysis shall state size and type of analysis and results obtained. A statement shall be made and validated that tests confirm compliance with the requirements of this specification.

The OWNER reserves the right to conduct or cause to have conducted independent laboratory tests. Where the results of such tests prove the quality requirements have not been met: (1) the costs of tests shall be charged to the vendor's account, and (2) the entire shipment may be rejected on the basis of such tests.

501.11. CORRUGATED METAL PIPE OR PIPE ARCH SHAPES

501.11.1. General. This item shall govern the furnishing of corrugated metal pipe for culverts and storm water conduit for the locations and designations as shown on the plans and contract specifications as herein outlined.

Pipe having a design hydraulic head exceeding 5-ft. of water will have helical corrugations and the lock seam shall be either continuously welded or caulked with a neoprene or mastic seal during fabrication. Caulked helical pipe shall be fabricated by applying a uniform bead of neoprene or mastic compound to the lock seam in such a manner that the inner surfaces of the lock seam are free of voids.

Shell Data shall specify diameter, classification (Type), material, gage and corrugation. This information shall be designated on the plans and/or contract specifications.

501.11.2. Pipe Manufacture. Corrugated metal pipe or pipe arch shapes shall meet the requirements of ASTM A760 (A760M) Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains, ASTM B745 (B745M) Corrugated Aluminum Pipe for Sewers and Drains, or ASTM A742 (A742M) Steel Sheet, Metallic Coated and Polymer Precoated for Corrugated Steel Pipe. All pipe shall be manufactured with a minimum of two re-rolled ends

501.11.2.1. Steel Pipe. Galvanized or aluminized steel pipe shall be full circle or arch pipe conforming to AASHTO Designation M36, Type I, Type II or Type III as specified in the plans.

501.11.2.2. Aluminum Pipe. Aluminum pipe shall conform to the requirements of AASHTO Designation M196, Type I, Type II or Type III pipe arch as specified on the plans.

Aluminum pipe may be placed bare of any precoating, but any portions of aluminum pipe that are to be in contact with a metal other than aluminum or in contact with concrete containing chlorides, shall be insulated from this other metal or concrete by a coating of bituminous material or a plastic coating, such as asphalt mastic or polymeric coating. The coating applied to the aluminum pipe or pipe arch to provide an insulation between the aluminum and other metal shall extend a minimum distance of 1 ft. beyond the area of contact.

501.11.2.3. Precoated Galvanized or Aluminized Steel Pipe. Pipe shall be full circle or arch pipe conforming to AASHTO Designation M245, Type I, Type II or Type III as specified in the plans.

501.11.3. Classification (Type). Corrugated metal pipe shall be classified on the plans and/or specifications with the notations as set forth in ASTM A760 (A760M), ASTM B745 (B745M) and ASTM A742 (A742M) and indicated in Table 501.11.3.(a) Corrugated Metal Pipe Type.

Table 501.11.3.(a) Corrugated Metal Pipe Type

Type	Description
Type I	Pipe with a full circular cross section with a singular thickness of corrugated sheet, fabricated with annular or helical corrugations.
Type IA	Pipe with a full circular cross section, with an outer shell of corrugated sheet fabricated with helical corrugations and an inner liner of smooth (uncorrugated) sheet attached to the shell at helical lock seams. Unless otherwise shown on the plans or contract specifications, the inner liner of smooth (uncorrugated) sheets shall be 18-gage, polymer coated per ASTM A762 (A762M) Grade 10/10 or 20-gage, polymer coated per ASTM A762 (A762M) Grade 10/10.
Type IR	Pipe with a full circular cross section, with a single thickness of smooth sheet, fabricated with helical ribs projecting outward.
Type II	Type I pipe which has been reformed into a pipe-arch, having an approximately flat bottom.
Type IIA	Type IA pipe which has been reformed into a pipe-arch, having an approximately flat bottom.
Type IIR	Type IR pipe which has been reformed into a pipe-arch, having an approximately flat bottom.
Type III	Type I pipe which has been perforated to permit the inflow and outflow of water, intended for use as underdrains.
Type IIIA	Pipe shall consist of semi-circular cross section having a smooth bottom with a corrugated top shield which has been perforated, intended for use as deck drains.

501.11.4. Material. Corrugated metal pipe or pipe arch shapes shall be fabricated from corrugated sheets conforming to one of the styles indicated in Table 501.11.4.(a) Corrugated Sheets for Pipe or Pipe Arch Shapes.

Table 501.11.4.(a) Corrugated Sheets for Pipe or Pipe Arch Shapes

Metal		Standards
GALV	Galvanized Steel	ASTM A760 (A760M) Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
ALT2	Aluminized Type 2 Steel	ASTM A760 (A760M) (same as above)
POLY	Polymeric Steel	ASTM A762 (A762M) Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains (Grade 10/10)
ALUM	Aluminum Alloy	ASTM B744 (B744M) Aluminum Alloy Sheet for Corrugated Aluminum Pipe

501.11.5. Gage. Where reference is made to gage of metal, the reference is to U.S. Standard Gage for uncoated sheets in ASTM A929 (A929M) Steel Sheet, Metallic-Coated by the Hot-Dip Process for

Corrugated Steel Pipe. Unless otherwise shown on the plans or contract specifications, minimum gages shall be as required by TxDOT *Standard Specifications for Construction of Highways, Streets and Bridges*, Item 460.4. Selection of Gages.

501.11.6. Corrugation. Corrugated configurations shall be governed by dimensional tolerances set forth in ASTM A760 (A760M). The corrugations as shown in Table 501.11.6.(a) Corrugation Configurations shall only be valid with their respective classifications (type).

Table 501.11.6.(a) Corrugation Configurations

Type	Configuration
Type 1	2⅔-in. x ½-in.; 3-in. x 1-in.; 5-in. x 1-in.
Type IA	2⅔-in. x ½-in.; 3-in. x 1- in.
Type IR	¾-in. x ¾-in. x 7½-in.; ¾-in. x 1-in. x 11½-in.
Type II	2⅔-in. x ½-in.; 3-in. x 1-in.; 5-in. x 1-in.
Type IIA	2⅔-in. x ½-in.; 3-in. x 1-in.
Type IIR	¾-in. x ¾-in. x 7½-in.; ¾-in. x 1-in. x 11½-in.
Type III	2⅔-in. x ½-in.; 3-in. x 1-in.

501.11.7. Repairs. All damage incurred in fabrication will be repaired at the fabrication location. Damage incurred during handling and placement will be repaired, inspected and approved by the OWNER prior to backfilling the pipe.

501.11.7.1. Galvanized Steel Pipe. Damaged spelter coating shall be repaired by thoroughly wire brushing the damaged area and removing all loose, cracked or weld burned spelter coating. The cleaned area shall be painted with a zinc dust-zinc oxide paint conforming to Federal Specifications TT-P-641.

501.11.7.2. Aluminized Steel Pipe. Damaged areas of aluminized coating, including saw cut ends and welds, shall be cleaned and repaired by brush coating of aluminized paint to the damaged, cut or welded area to a minimum thickness of 0.005-in.

501.11.7.3. Precoated Pipe. Damaged or cut areas of polymeric coatings shall be repainted by the application of a polymeric coating similar and compatible with the polymeric coating on the pipe and to a minimum 10-mil thickness.

Damaged areas of bituminous coated galvanized steel shall be repaired by repair of any damaged areas of spelter coatings in accordance with Item 501.11.7.1. Galvanized Steel Pipe before repairing the bituminous coating by applying asphalt mastic to the same thickness as the original coating.

501.11.8. Pipe Marking. The following information shall be clearly marked on each section of pipe:

(1) Date of manufacture of the pipe.
(2) The name or trademark of the manufacturer of the pipe.
(3) Gage or thickness of metal.
(4) Alloy number (aluminum pipe only).

501.11.9. Couplings.

501.11.9.1. Coupling Bands. Except as may be otherwise required, coupling bands shall be of the same base material(s) as the pipe. Coupling bands shall lap evenly on each of the pipes being connected and shall fit securely into a least one full circumferential corrugation to form a tightly closed joint. Pipe end circumferential corrugations shall be the corrugation width and depth as shown on the plans or as specified by the Engineer.

All pipe shall be field jointed with corrugated locking bands. Coupling bands shall not be more than three nominal sheet thicknesses lighter than the pipe to be connected and in no case thinner than 0.052-in. The minimum width of the corrugated locking bands shall be as shown in Table 501.11.9.1.(a) Corrugated Locking Band Width for the corrugation which corresponds to the end circumferential corrugations on the pipe being joined.

Table 501.11.9.1.(a) Corrugated Locking Band Width

Corrugation	Minimum Band Width
2⅔-in. x ½-in.	10½-in.
3-in. x 1-in.	12-in.
6-in. x 1-in.	18-in.

When it is necessary to join a new pipe of helical corrugations to an existing pipe which was installed with no circumferential end corrugations, the two pipes shall be field jointed with helically corrugated bands. The width of helically corrugated bands shall conform to the minimum widths in Table 501.11.9.1.(b) Helically Corrugated Band Width.

Table 501.11.9.1.(b) Helically Corrugated Band Width

Helical End Corrugation	Minimum Band Width
½-in. deep	12-in.
1-in. deep	14-in.

All coupling bands 12-in. wide or less shall be drawn together by means of a minimum of two ½-in. diameter bolts through angles or bar and strap device suitably welded; coupling bands greater than 12-in. wide shall have a minimum of three ½-in. diameter bolts.

501.11.9.2. Bell-and-Spigot Coupling. Except as may otherwise be required, bell-and-spigot couplings shall be of the same base material as the pipe, and in no case thinner than 0.052-in.

Couplings shall be bell and spigot type. The bell shall have a corrugation to engage the rerolled annular corrugation in the pipe, with a flare to receive the spigot end of the next section of pipe. The bell shall have factory-welded lap(s) applied after snugging the bell corrugation into the pipe rerolled annular corrugation.

Gaskets, if required, shall be polyisoprene (or similar) with a durometer of 45 ±5. The gasket on the spigot end shall be fluted with two flutes to prevent rolling when assembled in the field and to resist pull out from the bell.

501.12. STRUCTURAL PLATE STRUCTURES

501.12.1. General. Structural plate conduit, pipe arch, box culverts and special shapes shall meet the requirements of TxDOT *Standard Specifications for Construction of Highways, Streets and Bridges* Item 461 Structural Plate Structures and be in accordance with ASTM A761 Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches for galvanized steel structures or ASTM B221 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes, for aluminum alloy structures.

501.12.2. Plates. Steel plates shall consist of structural units of corrugated galvanized metal. Single plates shall be furnished in standard sizes to permit structure length increments of 2-ft. Aluminum plate shall consist of structural units of corrugated aluminum alloy. For aluminum alloy structures, cut plates shall be furnished on structure ends to permit structure length increments of 1-ft.

Plates shall be formed to provide bolted lap joints. The bolt holes shall be so punched that all plates having like dimensions, curvature, and the same number of bolts per foot of seam shall be interchangeable. Each plate shall be curved to the proper radius so that the cross-sectional dimensions of the finished structure will be as indicated on the plans. Joints shall be staggered so that not more than 3 plates are joined at any one point. Unless otherwise specified, bolt holes along those edges of the plates that will form longitudinal seams in the finished structure shall be:

(1) staggered in rows 2-inches apart, with one row in the valley and one in the crest of the corrugations and not less than 4-bolts-per-foot for galvanized steel structures, or
(2) in rows 1¾-in. apart with 2 bolts in each valley and on each crest and not less than 16-bolts-per-3-feet for aluminum alloy structures.

Bolt holes along those edges of the plates that will form circumferential seams in the finished structure shall provide for a bolt spacing of not more than 12-in. The minimum distance from center of hole to edge of the plate shall be not less than 1¾-times the diameter of the bolt. The diameter of the bolt holes in the longitudinal seams shall not exceed the diameter of the bolt by more than ¼-in. Plates for forming skewed or sloped ends shall be cut so as to give the angle of skew or slope specified. Burned edges shall be free from oxide and burrs and shall present a workmanlike finish and legible identification numerals shall be placed on each plate to designate its proper position in the finished structure.

501.12.3. Corrugations. Permissible corrugations of metal plates to be furnished for each structure shall be shown on the plans. Corrugations for steel structures shall have a pitch of 6-in. with a tolerance of ¼-in. and a depth of 2-in. with a tolerance of ⅛-in. The radius on the inside of the corrugations shall be at least $1^{1}/_{16}$-in. for steel structures. Corrugations for aluminum alloy structures shall have a pitch of 9-in. with a tolerance of ⅜-in. and a depth of 2½-in. with a tolerance of ⅛-in. The radius of the inside of the corrugation shall be at least 2-in. for aluminum alloy structures.

501.12.4. Gauge Determination and Tolerances. The gage or minimum thickness of metal plates to be furnished for each structure shall be shown on the plans. The gauge and tolerances of aluminum plates shall conform to those in ASTM B221 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes. The thickness of galvanized steel plates shall conform to those in ASTM A929/A929M Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe.

501.12.5. Metal Headwalls. The material for metal headwalls shall comply with requirements shown on plans. When required, aluminum alloy inverts, toewalls footings and closure plates shall conform to the material requirements herein. Extruded aluminum transverse stiffeners shall conform to ASTM B221 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes, Alloy 6061-T6.

501.12.6. Fasteners. Fasteners for steel structural plate shapes shall be high strength bolts ¾-in. diameter, hot-dip galvanized, meeting ASTM A449 Quenched and Tempered Steel Bolts and Studs. Nuts shall conform to ASTM A563 Carbon and Alloy Steel Nuts, Grade C. Fasteners for aluminum structural plate shapes shall be ¾-in. diameter, hot-dip galvanized steel, meeting ASTM A307 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength with the zinc coating in accordance with ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware. Nuts shall conform to ASTM A563, Grade A.

Bolt lengths shall be such as to result in at least "full nuts" when tightened in place.

501.12.7. Anchor Bolts. Anchor bolts for anchoring the ends of structural plate conduits into concrete headwall, footings or toewalls, as shown on the plans, shall be ¾-in. diameter conforming to ASTM A307 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength with the zinc coating in accordance with ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware. The length, shape and placement of these anchor bolts shall be as shown on the plans or approved by the Engineer.

501.12.8. Identification. No plates shall be accepted unless the metal is identified by a stamp on each plate in accordance with AASHTO M167 for Steel Structural Plate or AASHTO M219 for Aluminum Alloy Structural Plates.

501.12.9. Inspections. If the Engineer so elects, it may have the material inspected and sampled in the rolling mill or in the shop where fabricated. Engineer may require from the mill the chemical analysis of any plate. The inspection, either in the mill or in the shop, shall be under the directions of the Engineer. The Engineer or its representative shall have free access to the mill or shop for inspection and every facility shall be extended to the Engineer or representative for this purpose. Any material that has been previously rejected at the mill or shop and included in a later lot will be cause for rejection unless it has been satisfactorily repaired.

The CONTRACTOR shall furnish an itemized statement of the number and size of plates in each shipment. From this list a visual inspection shall include an examination of the plates for deficiency in size, radius of curvature specified, and any evidence of poor workmanship as outlined herein. The inspection may include the taking of samples for chemical analysis and determination of weight of spelter coating on steel plates. The plates making up the shipment shall fully meet the requirements of these specifications. Any plates failing to do so will be rejected.

501.12.10. Rejection. In addition to the provisions of Item 501.1.1. Rejection, structures shall be rejected on which the spelter coating has been bruised or broken either in the shop or in shipping, or which shows defective workmanship. The requirement applies not only to the individual plates but also to the shipment on any contract as a whole. Among others, the following defects are specified as constituting poor workmanship, and the presence of any or all of them in any individual culvert plate or in general in any shipment shall constitute sufficient cause for rejection:

(1) elliptical shaping,
(2) variation from a straight centerline,
(3) ragged edges,
(4) unevenly lined or spaced bolt holes,
(5) illegible brands,
(6) bruised, scaled or broken spelter coating,
(7) dents or bends in the metal itself, or
(8) uneven laps.

501.13. TUNNEL LINER PLATES

501.13.1. General. This specification covers the material, galvanizing, coating, shapes and gauge requirements of tunnel liner plates for use in tunneling under railroads, highways and streets.

501.13.2. Plates. The plates shall be fabricated from steel sheets conforming to the requirements of ASTM A1011 Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability. In addition, the flat plates before cold forming shall have mechanical properties indicated in Table 501.13.2.1.(a) Tunnel Liner Plate Requirements.

501.13.2.1.(a) Tunnel Liner Plate Requirements

Property	Minimum Value
Tensile Strength	42,000-psi
Yield Strength	28,000-psi
Elongation, 2-in.	30-percent

501.13.3. Bolts and Nuts. Bolts used with lapped seam type (2 flange) liner plates shall be not less than $^{5}/_{8}$-in. diameter. Bolts shall conform to ASTM A449 Quenched and Tempered Steel Bolts and Studs for plate thickness equal to or greater than 0.209-in. and to ASTM A307 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength for plate thickness less than 0.209-in. Nuts shall conform to ASTM A307.

Bolts and nuts used with the four-flanged type shall be not less than $^{1}/_{2}$-in. for 7-gauge plates and lighter and not less than $^{5}/_{8}$-in. diameter for plats heavier than 7-gauge. The bolts and nuts shall be quick acting coarse thread and shall conform to ASTM A307, Grade A.

501.13.4. Fabrication. The plates shall be new and unused prior to fabrication. All plates shall be punched for bolting on both longitudinal and circumferential seams or joints and shall be so fabricated as to permit complete erection from the inside of the tunnel. All plates shall be of uniform fabrication and those intended for one size tunnel shall be interchangeable.

501.13.5. Grout Holes. One-half of the total number of the top plates shall be equipped with 2-in. diameter grout holes to facilitate grouting above and around the tunnel liner conduit. All grout holes shall be equipped with screw type galvanized plugs for final watertight closure of the grout holes.

501.13.6. Galvanizing. After the plates are formed to shape and after all holes are punched, the plates shall be galvanized on all surfaces by the hot-dip process. A coating of prime western spelter or equal shall be applied in accordance with ASTM A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products. Spelter coating shall be of first-class commercial quality free from injurious defects such as blisters, flux and uncoated spots. All nuts shall be galvanized to conform to ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

501.13.7. Bituminous Coating. The plates shall be given a bituminous coating meeting the current American Railway Engineering & Maintenance of Way Association specification or ASTM A849 Post-Applied

Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe. Bituminous protected corrugated metal pipe or plates may be spray-coated in the field with a minimum dry film thickness of 0.05-in. prior to installation.

501.13.8. Section Properties. Section properties shall conform to those specified in AASHTO Standard Design Specifications for Highway Bridges, Section 16, Steel Tunnel Liner Plates.

501.13.9. Rejection. Structures on which the spelter coating has been bruised or broken either in the shop or in shipping or which shows defective workmanship shall be rejected. The requirement applies not only to the individual plates but also to the shipment on any contract as a whole. Among others, the following defects are specified as constituting poor workmanship, and the presence of any or all of them in any individual liner plate or in general in any shipment shall constitute sufficient cause for rejection:

(1) uneven laps,
(2) elliptical shaping,
(3) variation from a straight centerline,
(4) ragged edges,
(5) unevenly lined or spaced bolt holes,
(6) illegible brands,
(7) bruised, scaled or broken spelter coating, or
(8) dents or bends in the metal itself.

501.14. POLYVINYL CHLORIDE (PVC) WATER PIPE

501.14.1. General. Unplasticized polyvinyl chloride (PVC) water pipe shall meet the requirements of AWWA C900, sizes 4-in. to 60-in. diameter. In accordance with C900, Section III.A, purchaser options and alternatives shall be provided by the specifier, including working, occasional, and recurring surge pressures, pressure class, or dimension ratio (DR). Purchaser options and alternatives shall be specified in the supplemental conditions, plans, or technical specifications. Laying lengths shall be 20-ft ±1-in.

501.14.2. Approvals. PVC water pipe shall be approved by the Underwriters' Laboratories and shall be accepted by the State Fire Insurance Commission for use in water distribution systems in cities and towns of Texas. PVC water pipe shall also bear the seal of approval (or "NSF" mark) of the National Sanitation Foundation Testing Laboratory for potable water pipe.

501.14.3. Dimension Ratio. PVC water pipe shall meet the dimension ratios (DR's) and physical dimensions as shown in AWWA C900. The pressure classification refers to the maximum hydrostatic pressure to which the pipe shall be subjected in normal operations.

501.14.4. Joints. PVC water pipe shall be furnished with gasketed joints. Lubricant used for pipe and fittings assembly shall be nontoxic and in conformance to NSF61. The lubricant shall have no detrimental effect to either gasket or pipe.

501.14.5. Fittings. Fittings for PVC water pipe shall conform to one of the standards Table 501.14.5.(a) PVC Water Pipe Fittings unless otherwise specified. Fittings joints shall be push-on, integrally restrained, or mechanical. Bolts and nuts for mechanical and integrally restrained fittings joints shall be of a high-strength, corrosion-resistant, low-alloy steel and shall conform to ASTM A325 High Strength Bolts for Standard Steel Joints (Type 3) or shall be stainless steel in accordance with ASTM A304.

Table 501.14.5.(a) PVC Water Pipe Fittings Standards

Standard	Topic
AWWA C110 (ANSI A21.10)	Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in. for Water
AWWA C153	ANSI Standard for Ductile-Iron Compact Fittings for Water Service
AWWA C907	Polyvinyl Chloride (PVC) Pressure Fittings for Water—4 in. Through 8 in.
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 in. Through 12 in. or Water Distribution

501.15. POLYVINYL CHLORIDE (PVC) PRESSURE-RATED PIPE (SDR SERIES)

501.15.1. General. PVC pressure-rated pipe shall conform to the current ASTM D2241, Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

501.15.2. Material. The pipe shall be made of PVC plastic having cell classifications of 12454 or 13343 in accordance with ASTM D1784.

501.15.3. Joints. Joint tightness shall be tested in accordance with ASTM D3139, Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

501.15.4. Testing. All pipe shall meet ASTM requirements for sustained pressure test, accelerated regression test, burst pressure, flattening and impact resistance.

501.16. MOLECULARLY ORIENTED POLYVINYL CHLORIDE (PVCO) WATER PIPE

501.16.1. General. Unplasticized (PVCO) Water pipe shall meet the requirements of AWWA Standard C909 Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. – 24 In., for Water Distribution. Laying length shall be 20ft ± 1 inch.

501.16.2. Material. PVCO water pipe starting stock shall be made from ASTM D1784 cell class 12454 material, having an Hydrostatic Design Basis (HDB) of 4000-psi. When orientation is achieved, PVCO pipe will have an HDB of 7100-psi. The pressure classifications refer to the maximum hydrostatic pressure to which the pipe shall be subject in normal operations.

501.16.3. Dimensions. Dimensions shall conform to the requirements in AWWA C909.

501.16.4. Joints. PVCO water pipe shall be furnished with gasketed joints, meeting ASTM D3139 Joints for Plastic Pressure Pipes using Elastomeric Seals. Lubricant used for pipe and fittings assembly shall be nontoxic and shall have no detrimental effect to either gasket or pipe. Solvent cement shall not be used with PVCO pipe.

501.16.5. Fittings. Fittings for PVCO water pipe shall conform to American National Standard for Gray-Iron and Ductile-Iron Fittings, 3 In. through 48 In., For Water and Other Liquids, AWWA Standard C110 (ANSI A21.10) or AWWA C907 for Polyvinyl Chloride (PVC) Pressure Fittings for Water, 4 In. through 12 In., or AWWA C153 ANSI Standard for Ductile-Iron Compact Fittings for Water Service unless otherwise specified. Fittings joints shall be push-on or mechanical joints. Bolts and nuts for mechanical joints shall be of a high-strength, corrosion-resistant, low-alloy steel and shall conform to High Strength Bolts for Standard Steel Joints, ASTM A325 (Type 3) or stainless steel in accordance with ASTM A304.

501.17. POLYVINYL CHLORIDE (PVC) WASTEWATER PIPE & FITTINGS WITH DIMENSION CONTROL

501.17.1. General. PVC Wastewater Pipe and Fittings shall conform to ASTM D3034 Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings for 4 in. through 15 in. diameter and ASTM F679 Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings for greater than 15 in. diameter.

501.17.2. Material. The pipe shall be made of PVC plastic having cell classification of 12454, or 12364, and fittings shall be made of PVC plastic having cell classifications of 12454, or 13343 as defined in ASTM D1784 Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds. Pipe type shall be determined by size as shown in Table 501.17.2.(a) PVC Wastewater Pipe Type.

501.17.2.(a) PVC Wastewater Pipe Type

Pipe Size (diameter)	Type	Standard
4-in. through 15-in., inclusive	Pipe stiffness of 46, 115 and 153	ASTM D3034
greater than 15-in.	Pipe stiffness of 46, 75 and 115	ASTM F679

501.17.3. Dimensions. Dimensions shall conform to requirements of ASTM D3034 or F679.

501.17.4. Testing. All pipe shall meet ASTM requirements for flattening, impact resistance, stiffness, joint tightness and extrusion quality as specified in ASTM D3034 or F679.

501.18. POLYVINYL CHLORIDE (PVC) PROFILE GRAVITY WASTEWATER PIPE AND FITTINGS – FOR DIRECT BURY AND SLIPLINING APPLICATIONS

501.18.1. General. This specification designates requirements for PVC plastic gravity wastewater pipe for the conveyance of domestic wastewater with various modified wall profiles and performance requirements.

501.18.2. Stiffness. Minimum pipe stiffness at five percent deflection shall be 46-psi for wastewater conduit as specified for all sizes when calculated in accordance with ASTM D2412 Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

501.18.3. Pipe Classification. Pipe as indicated on the plans shall conform to one of the standards in Table 501.18.3. PVC Profile Gravity Pipe Standards.

501.19. PVC COMPOSITE PIPE FOR WASTEWATER CONDUITS

501.19.1. General. PVC composite pipe shall conform to ASTM D2680 Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping for 8 in. through 15 in diameter. Acrylonitrile-Butadiene-Styrene (ABS) shall not be allowed.

501.19.2. Joints, Couplings and Fittings. Wyes or tees with saddle shall be provided as indicated on the plans. Adapters to other types of pipe shall be supplied as indicated on the plans.

501.19.2.1. Chemically Welded Joints. If the pipe is plane ended with couplings, the pipe shall be delivered prebelled. Sufficient primer and solvent cement shall be provided. The solvent cement shall conform to ASTM D2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

501.19.2.2. O-Ring Joints. If the pipe is prebelled with an enlarged coupling, an O-Ring shall be provided for each joint. The physical properties of the gasket shall be at least equal to the requirements of ASTM C443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

501.19.3. Tests. The pipe stiffness at five-percent vertical deflection shall be at best equal to or exceed 200-lb./in. of deflection for each diameter as determined by ASTM D2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading. The physical test may be the 3-Edge Bearing Method under applicable ASTM Designation if preferred.

501.20. SECTION HELD FOR FUTURE USE.

501.21. SOLID WALL POLYETHYLENE PLASTIC PIPE FOR WATER, WASTEWATER, AND PIPE REHABILITATION

501.21.1. General. Pipe and fittings shall conform to the material and physical properties as described in ASTM F714 Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter, unless otherwise specified herein or in the special specifications. Standard Lengths shall be 40-ft or 50-ft for straight pipe. Coiled pipe may be obtained in reels of 500-ft, 1000-ft or 1500-ft depending on outside diameter and Dimension Ratio (DR) requested.

Solid wall high density polyethylene pipe (HDPE) for pressure water pipe shall meet the requirements of AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing, ½ in. Through 3 In., for Water Service or AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 63 In., for Water Distribution.

501.21.2. Material. Pipe and fittings shall be made of high density, high molecular weight polyethylene pipe PE3408 material, polyethylene resin which conforms to Polyethylene Plastics Molding and Extrusion Materials, meeting the requirements of Type III, Grade P33, as defined in ASTM D3350 Polyethylene Plastics Pipe and Fittings Materials. The polyethylene plastic shall meet the Cell Classification requirements of 345464C or 345464E as defined in ASTM D3350. Pipe for non-pressure applications shall have a light colored interior for video inspection, unless otherwise specified in the plans, contract documents or purchase request.

501.21.3. Dimensions. The polyethylene (PE) pipe shall meet the dimension ratios and outside diameter, wall thickness and tolerances as provided in the reference specifications of manufacture as listed in Table 501.21.3.(a) Solid Wall PE Pipe Dimension Standards. Diameters and wall thickness other than those shown in the standards may be used if specifically called for in the plans, contract documents or purchase request, and if they are mutually agreed upon by the manufacturer and OWNER.

Table 501.21.3.(a) Solid Wall PE Pipe Dimension Standards.

Standard	Topic
AWWA C901	Polyethylene (PE) Pressure Pipe and Tubing, ½ in Through 3 in for Water Service
AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4in through 63in for Water Distribution and Transmission
ASTM D2239	Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
ASTM D2737	Polyethylene (PE) Plastic Tubing
ASTM D3035	Polyethylene (PE) Plastic Pipe Based on Controlled Outside Diameter
ASTM F714	Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

501.21.4. Joints. Dependent upon installation requirements, site location, weather conditions, and the presence of water, joining shall be performed within or outside the excavation.

Sections of polyethylene pipe and fittings shall be joined by the butt fusion process, unless an alternate method is approved by the OWNER. The butt (heat) fusion method shall be performed in accordance with the pipe manufacturer's recommendations. Electrofusion fittings shall be used. Extrusion welding or hot gas welding of PE shall not be used for pressure pipe application or fabrications where shear or structural strength is important.

501.21.5. Tests and Requirements. Tests for compliance with this specification shall be made as specified herein and according to the applicable ASTM or AWWA Standard(s). All polyethylene pipe shall be tested for brittleness, joint separation, quality, and ring stiffness as specified in the applicable ASTM or AWWA Standard(s). A certification of compliance with this specification shall be furnished by the manufacturer for all material furnished under this specification. In addition, the OWNER may, at its own expense, witness inspection and test of the materials.

501.21.5.1. Tensile Properties. The tensile strength, yield strength, elongation and elastic modulus of the material shall be determined in accordance with Tensile Properties for Plastics, ASTM D638 (D 638M).

501.21.5.2. Hydrostatic Properties. The long term hydrostatic strength rating shall be listed in the name of the pipe and fittings manufacturer in PPI (Plastic Pipe Institute) TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings compounds, with a standard grade HDB rating of 1600-psi at 73°F.

501.21.5.3. Melt Index. The melt index of the polyethylene plastic, as determined in accordance with ASTM D1238 Flow Rates of Thermoplastics by Extrusion Plastometer, shall meet the requirements as specified in ASTM D3350 Cell Classification of 4.

501.21.5.4. Density. The density of the polyethylene plastic, as determined in accordance with ASTM D1505 Density of Plastics by the Density - Gradient Technique shall have specific base resin densities meeting the requirements as specified in ASTM D3350 Cell Classification 3.

501.21.5.5. Environmental Stress Cracking Resistance. The environmental stress cracking resistance (ESCR) of the material shall meet the requirements as specified in ASTM D3350 Cell Classification of 6 using ASTM F1473 (PENT) or meet a Cell Classification of 4 according to ASTM D1693.

501.21.5.6. Wastewater Pipe Stiffness. Minimum pipe stiffness at five-percent deflection shall be 46-psi for all sizes of gravity and pressure wastewater conduits as specified in Section XI "Deflection Control In Unpressurized Polyethylene Piping Systems," Table X1.1 "Pipe Stiffness Ranges for Specified Materials" and DR's of ASTM F714.

501.22. POLYETHYLENE (PE) LARGE DIAMETER WASTEWATER PIPE WITH MODIFIED WALL PROFILES AND PERFORMANCE STANDARDS

501.22.1. General. High Density Polyethylene gravity wastewater pipe and fittings in nominal sizes 18-in. through 120-in. with integral bell joints shall conform to current ASTM F894 Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.

501.22.2. Materials. The pipe and fittings shall be made of high density, high molecular weight polyethylene pipe material meeting the requirements of Type III, Class C, Category 5, Grade P34, as defined in ASTM D3350 Polyethylene Plastics Pipe and Fittings Materials with a minimum cell classification of 345444C.

501.22.3. Stiffness. Minimum pipe stiffness at five-percent deflection shall be 10-psi for wastewater as specified for all sizes when calculated according to Appendix XI, "Relation of RSC To Pipe Properties and Pipe Stiffness" of ASTM F894.

501.22.4. Joints. Joint tightness shall be tested in accordance with ASTM D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

501.22.5. Testing. Pipe shall be tested for flattening, quality and ring stiffness as specified in the applicable ASTM Designations.

501.23. THERMOPLASTIC CORRUGATED DRAINAGE TUBING AND CORRUGATED SMOOTH LINED STORM WATER PIPE AND FITTINGS

501.23.1. General. High Density Corrugated and Corrugated Smooth Lined Thermoplastic storm water tube/pipe and fittings shall conform to Table 501.23.1.(a) Thermoplastic Storm Water Pipe and Fittings.

Table 501.23.1.(a) Thermoplastic Storm Water Pipe and Fittings.

Pipe Material	Topic	Standard
Polyvinyl Chloride (PVC)	PVC Corrugated Storm Water Pipe With A Smooth Interior	ASTM F949 (4"-36")
Polyethylene (PE)	PE Corrugated Pipe With A Smooth Interior	AASHTO M294 (12"-60") AASHTO M252 (3"-10")
Polypropylene (PP)	PP Corrugated Pipe With A Smooth Interior	ASTM F2736 (6"-30")

501.23.2. Materials.

501.23.2.1. PVC. The storm water conduit/drainpipe shall be of PVC compound having a minimum cell classification of 12454 in accordance with ASTM D1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds. The fittings shall be made of PVC compound having a cell classification of 12454 or 13343 as defined in ASTM D1784.

501.23.2.2. PE. The tube/pipe and fittings shall be made of virgin polyethylene which conforms with the requirements of cell class 335400C as defined and described in ASTM D3350 Polyethylene Plastics Pipe and Fittings Materials.

501.23.2.3. PP. Polypropylene compound for pipe and fitting production shall be impact modified copolymer meeting the material requirements of ASTM F2736, Section 4 for the respective diameters. Minimum pipe stiffnesses at 5% deflection shall meet or exceed ASTM F2736, Section 6.2.6 Pipe Stiffness.

501.23.3. Stiffness.

501.23.3.1. PVC. Constant minimum pipe stiffness at five-percent deflection shall be 46-psi for storm conduit as specified for all sizes when calculated in accordance with ASTM D2412 Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

501.23.3.2. PE. Minimum tube/pipe stiffness at 5-percent deflection shall be 50-psi for 3-in. through 10-in. diameters and as outlined in Section 7.4 of AASHTO M-294 for other diameters.

501.23.3.3. PP. Minimum pipe stiffnesses at 5% deflection shall meet or exceed ASTM F2736, Section 6.2.6 Pipe Stiffness.

501.23.4. Joints.

501.23.4.1. PVC. Joints shall be an integral bell-gasketed joint. When the joint is assembled, it shall prevent misalignment of adjacent pipes and form either a soil tight joint (2-psi hydrostatic test per AASHTO Standard Specification for Highway Bridges, Section 26.4.2.4) or a watertight joint (10.8-psi

test per ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals) as required.

501.23.4.2. PE. Joint integrity shall be tested in accordance with ASTM F667 Large Diameter Corrugated Polyethylene Pipe and Fittings, Section 9.6 for PE corrugated pipe up to 24" or AASHTO M-294 and M-252 for smooth-lined corrugated pipe. Profile wall HDPE pipe joints shall be made and tested in accordance with ASTM D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

501.23.4.3. PP. Pipe shall be joined with a gasketed integral bell & spigot joint meeting the requirements of ASTM F2736 for the respected diameters (12"-30"), and shall be watertight according to the requirements of ASTM D3212. Gasket shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. 12"-30" diameters shall have a reinforced bell with a polymer composite band installed by the manufacturer.

501.23.5. Testing.

501.23.5.1. PVC. Pipe shall be tested for flattening, impact resistance and extrusion quality as specified in the applicable ASTM Designations.

501.23.5.2. PE. All polyethylene tubing/piping shall be tested for elongation, brittleness, joint separation, quality and ring stiffness as specified in the applicable AASHTO M-294, AASHTO M-252 or ASTM F2648, as applicable.

501.23.5.3. PP. All polypropylene piping shall be tested as per ASTM F2736, Section 8 as applicable.

501.24. FIBERGLASS (GLASS-FIBER-REINFORCED THERMOSETTING-RESIN) WASTEWATER PIPE

501.24.1. General. This specification designates requirements for fiberglass glass-fiber reinforced thermosetting-resin pipe (RTRP) sizes from 8-in. to 144-in. for the conveyance of wastewater. Pipe for gravity application shall conform to ASTM D3262 for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe. Pipe for force main applications shall conform to or ASTM D3754 for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe. If ASTM D3754 pipe is selected, its actual outside diameter shall be in accordance with AWWA C950 Fiberglass Pressure Pipe.

501.24.2. Stiffness. Minimum pipe stiffness at 5-percent deflection shall be 46-psi for gravity and pressure wastewater conduit and 36-psi for gravity sliplining applications as specified for all sizes when calculated in accordance with ASTM D2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

501.24.3. Joints. Joint tightness shall be tested in accordance with ASTM D4161 for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.

501.24.4. Fittings. Fittings shall conform to ASTM D5685 Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe Fittings or D3840 Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications.

501.24.5. Testing. Pipe shall be tested for inside and outside diameter, wall thickness, squareness of pipe ends, chemical requirements, stiffness, beam strength as specified in the respective ASTM D3681 Test Method for Chemical Resistance of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe in a Deflected Condition, ASTM D2412 Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading, and ASTM D3262 Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.

501.25. FIBERGLASS (GLASS-FIBER-REINFORCED THERMOSETTING-RESIN) FOR WATER PIPE

501.25.1. General. This specification designates requirements for glass-fiber reinforced thermosetting resin pipe in sizes 8-in. to 156-in. intended for water conveyance in pressurized systems of less than 450 psi. Pipe manufactured for these applications shall conform to ASTM D3517 Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe.

501.25.2. Joints. Joints shall either be bell & spigot with elastomeric gasket, flanged, lay-up lamination or mechanical coupling. Gaskets shall comply with ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe. Lay-up laminations shall be of manufacturer approved materials and

applied by, or under, the supervision of a pipe manufacturer's representative. Mechanical coupling shall be of a type approved for use on the pipe by the manufacturer.

501.25.3. Fittings. Fittings shall conform to ASTM D5685 Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe Fittings. Only fittings approved for use by the pipe manufacturer shall be permitted.

501.25.4. Markings. All pipe shall have be clearly marked by the manufacturer designating nominal size, pressure class, stiffness, manufacturer's name or trademark, and ASTM D3517 Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe.

501.25.5. Testing. All pipe and fittings, once in place complete with compacted backfilled shall be hydrostatically tested at 120-percent of design pressure in accordance with Section 506.5. Hydrostatic Test.

ITEM 502. APPURTENANCES

502.1. MANHOLES

502.1.1. Manhole Materials. Manholes shall be fabricated in different configurations to meet the specific needs required in the water or wastewater or storm water system.

502.1.1.1. Precast Reinforced Concrete Manhole Sections. These specifications cover precast reinforced concrete manhole sections, which shall conform to ASTM C478 Precast Reinforced Concrete Manhole Sections, with the following additions:

(1) Aggregates for the concrete shall comply with requirements of ASTM C33 Concrete Aggregates.
(2) Resilient connectors between reinforced concrete manhole structures and pipes shall meet the requirements of ASTM C923 Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals

502.1.1.1.1. Joints. Joints shall conform to the joint specification ASTM C443 Joints for Concrete Pipe & Manholes, Using Rubber Gaskets. All joints shall have rubber gaskets. Rubber gaskets shall meet the requirements of Item 501.5.4.1. Rubber Gaskets.

502.1.1.1.2. Coatings and Linings. Coatings and linings called for in the specifications or shown on the plans shall meet the requirements as specified by the OWNER and shall be installed or applied by the manufacturer. Add mixtures may be required as per OWNER specification.

502.1.1.1.3. Lifting Devices. Manhole sections and cones may be furnished with lift lugs or lift holes. If lift lugs are provided, they shall be 180° apart. Cast-in-place nuts must have clean threads capable of inserting lug bolts. OWNER shall approve the lift lug design. If lift holes are provided, they shall be plugged with a nonmetallic nonshrink grout approved by the OWNER. Field repairs shall not be allowed without OWNER approval.

502.1.1.1.4. Rejection. Manhole sections shall be subject to rejection on account of failure to conform to any of the requirements specified herein or having defects as follows:

(1) Variations in any dimensions exceeding the permissible variation prescribed.
(2) A piece broken out of the bell, spigot, tongue or groove in such size that the watertightness of the joint could be impaired.
(3) Any shattering or flaking of concrete or other conditions indicating an improper concrete mix.
(4) Lack of uniformity in placement steel which might preclude all joints being typical of those tested.
(5) Cracks sufficient to impair the strength, durability, or serviceability of the pipe.
(6) Joint sections with spalls, cracks, fractures, or other imperfections that could adversely affect the performance of the joint.

502.1.1.2. Fiberglass Manholes. Fiberglass manholes shall conform to all ASTM standards governing plastic laminations and ASTM D3753, Glass-Fiber-Reinforced Polyester Manholes and Wetwells, with supplementary details or additions as set forth in these specifications. See Standard Drawing 5040.

502.1.1.2.1. Manufacturing. The barrel and cone shall each be produced in a continuous manufacturing process that insures continuous reinforcement and uniform strength and composition. The cone section, if produced separately, shall be affixed to the barrel section at the factory with a reinforced glass resin joint resulting in a one-piece unit. Field made joints shall not be acceptable.

502.1.1.2.2. Manhole Configuration. The manhole shall be a circular cylinder with a minimum internal diameter of 4-ft. The cone of the manhole shall have a bearing surface wide enough to facilitate the placement of adjustment rings. The ring and cover shall not be placed directly on the manhole. The manway reducer shall be concentric with respect to the manhole cylinder. Eccentric manway reducers shall not be permitted. Manhole gaskets shall be used to ensure a watertight assembly.

502.1.1.2.3. Testing. All tests included in Glass Fiber-Reinforced Polyester Manholes, ASTM D3753, shall be required. Manufacturer shall provide OWNER a product certification if requested. This certification shall confirm the fiberglass manhole provided is in compliance with the testing requirements outlined in the ASTM standard.

502.1.1.2.4. Rejection. Any fiberglass manhole shall be subject to rejection for failure to conform to any of the requirements of these specifications. Any manhole found to be defective or damaged resulting from improper handling or installation shall be removed and replaced at no additional expense to the OWNER. Patching shall not be acceptable.

502.1.2. Grade Adjustment Risers. Casting shall be raised to final grade adjustment of access covers and frame assemblies made using adjustment risers. Risers may be concrete, polyethylene, metal, or rubber meeting requirements below or other materials as approved by the OWNER. OWNER shall specify material. Adjustment risers shall be tested to assure compliance with impact and loading requirements of the AASHTO Standard Specification for Highway Bridges. To determine the suitability of a specific ring or frame and to insure a proper fit, the dimensions of the existing frames, grates and covers must be verified by the CONTRACTOR and provided to the supplier prior to fabrication of the adjustment rings and frames.

Installed grade adjustment risers and riser assemblies shall fit within the existing casting without interference, cause no binding to the manhole lid, be immobile and watertight. Manhole lids shall have bearing on all of the surface of inner ring(s).

502.1.2.1. Precast Concrete Adjustment Riser. Concrete adjustment risers shall be precast, reinforced concrete meeting requirements of ASTM C478 Precast Reinforced Concrete Manhole Sections. Preformed flexible gaskets shall be used below each riser.

502.1.2.2. HDPE Adjustment Riser. The HDPE adjustment risers shall be manufactured from high density polyethylene plastic as identified in ASTM D1248 Polyethylene Plastic Molding and Extrusion Materials. They may be molded from 100% recycled HDPE material or have other recycled HDPE material content. Material properties shall be tested and qualified for usage according to the test methods in ASTM D1248. HDPE risers shall be manufactured using the injection molding process as defined by the Society of Plastic Engineers.

502.1.2.3. Metal Adjustment Riser.

502.1.2.3.1. Steel. Inner riser rings shall consist of ¾" thick domestic steel meeting the requirements of ASTM A36 Carbon Structural Steel. Intermediate and outer rings shall be one of the combinations indicated in Table 502.1.2.3.1.(a) Steel Adjustment Risers, as specified by the OWNER.

Table 502.1.2.3.1.(a) Steel Adjustment Risers

Intermediate ring	Outer ring	Type
none	ASTM A36 steel ½" thick	solid
ASTM A36 12-gauge steel	½" x ½" surrounding intermediate ring at finished elevation	solid
none	ASTM A36 steel ½" thick	Adjustable[1]
ASTM A36 steel ⅛" thick	½" x ½" surrounding intermediate ring at finished elevation	Adjustable[1]

1. Adjustment devices for adjustable steel risers shall be fabricated from stainless steel, have a positive lock, and be in line with the lower bearing bar. It shall be capable of adjustment ±⅜" from nominal.

Rings shall be fabricated to ±1/16" concentricity. The outer riser ring shall have an inside diameter no greater than 3/16" larger than the outside diameter of the manhole lid. All materials shall be coated as specified by OWNER.

Certified welders shall securely weld rings in accordance with American Welding Society D1.5 Bridge Code to prevent differential movement between rings under traffic loads.

502.1.2.3.2. Iron. Gray iron adjustment risers shall be manufactured from iron conforming to ASTM A48 Gray Iron Castings, Class 35B, in accordance with AASHTO M306. Ductile iron adjustment risers shall be manufactured from iron conforming to ASTM A536 Ductile Iron Castings, Grade 70-50-05.

502.1.2.4. Rubber Adjustment Riser. The adjustment risers shall be manufactured from a mixture of rubber and appropriate additives to create a flexible product that will not rot, chip or break, and is resistant to moisture, oil and other common automotive chemicals. Product shall be stable under a wide range of temperatures and resistant to temperature fluctuations. Rubber adjustment risers may be

produced with recycled rubber content. Results of the tests listed in Table 502.1.2.4.(a) Rubber Adjustment Riser Tests shall be provided to the OWNER.

Table 502.1.2.4.(a) Rubber Adjustment Riser Tests

Property	ASTM Test Method	Topic
Density	C642	Test Method for Density, Absorption, and Voids in Hardened Concrete
Durometer hardness, molded and interior surfaces	D2240	Rubber Property-Durometer Hardness
Tensile strength	D412	Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
Compression deformation, initial and final	D575	Rubber Properties in Compression
Compression set	D395	Rubber Property-Compression Set
Freeze and thaw when exposed to deicing chemicals	C672	Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals
Coefficient of thermal expansion	C531	Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes
Weathering (70 hours at 70 C)	D573	Rubber-Deterioration in an Air Oven

502.1.3. Frame and Cover. Frame (Ring) and cover shall meet the requirements of Item 806.4.1.2. Iron Castings.

502.1.4. Manhole Construction. TCEQ regulations shall take precedence in the case of conflict between these specifications and TCEQ regulations.

Manholes shall be of sufficient inside diameters to allow personnel to work within them and to allow proper joining of the pipes in the manhole wall. Unless otherwise specified, manholes shall have an inside diameter of at least 48-inches.

Manholes constructed in advance of paving projects shall be constructed with the top of the concrete portion of the manhole 23-inches below the final finished grade. The ring and cover shall be placed on a built-up section of approved grade rings and approved sealers between rings and between rings and other materials. Manholes shall be watertight. The type and size, if greater than 4-feet inside diameter, shall be shown on the plans for each location. The CONTRACTOR shall furnish all appropriate equipment and access required for inspection.

Backfilling of manholes shall comply with Section 504.4.

502.1.4.1. Manhole Types and Requirements. Manholes in water lines shall be Cast-In-Place or Precast as described below and as shown in Division 5000 Standard Drawings. Manholes in wastewater service lines may be any of those described below, also shown in Division 5000 Standard Drawings. Manholes in storm sewers shall be Cast-In-Place, Precast, or constructed according to Standard Drawing 6010A-B. Storm sewer junction boxes shall be constructed according to Standard Drawing 6010A-B or constructed according to engineered plans. Manholes may be standard or shallow, as specified by the OWNER.

502.1.4.1.1. Cast-In-Place. The base, wall and cone shall be Class F or Class PF concrete as specified by the OWNER, in conformance with Item 702. Concrete Structures, poured and vibrated to assure a monolithic structure free from infiltration. Typical requirements are shown in Standard Drawing 5030. Manufacturer shall submit shop drawings for OWNER approval. Construction joints with waterstops must be approved by the OWNER.

502.1.4.1.2. Precast. Precast manholes shall conform to the requirements of Item 502.1.1.1. Precast Reinforced Concrete Manhole Sections. Typical requirements are shown in Standard Drawing 5020. The base shall be Class F or Class PF concrete as specified by the OWNER, in

conformance with Item 702. Concrete Structures. The precast sections shall be of the bell-and-spigot design incorporating trapped O-ring gaskets in conjunction with premolded joint sealing compound, or tongue-and-groove with a premolded joint sealing compound (water or storm water). Wastewater precast sections shall be sealed using trapped O-rings gaskets in conjunction with premolded joint sealing compound. Premolded joint sealing compound may be used for water line manholes only when approved by the OWNER. Prior to placing each section of manhole riser or cone, the bells and spigots to be joined shall be thoroughly cleaned, the gasket properly placed, lubricated and the joint pushed home. Combination of joints shall be selected to minimize the number of individual segments. Long joints shall be used in the bottom and shorter segments utilized for top adjustments. Lift holes may be used but must be filled with a nonshrink grout after the section is in place. Precast manholes used in floodplains shall require sealed anchor design.

502.1.4.1.3. Fiberglass. Fiberglass manholes shall conform to the requirements of Item 502.1.1.2. Fiberglass Manholes. The fiberglass portion of the manhole shall be delivered in one piece. Field jointing shall not be permitted. Fiberglass manholes shall be installed in accordance with the manufacturer's recommendation and with supplementary details, additions or exceptions as directed by the OWNER and/or as shown on the plans. Typical requirements are shown in Standard Drawing 5040. The base shall be Class F or Class PF reinforced concrete as required per Item 702. Concrete Structures as specified by the OWNER. A minimum of 8 holes ⅝-in. in diameter shall be drilled equidistantly around the periphery of the manholes at a distance 4-in. from the bottom for use in inserting #4 reinforcing bars to be keyed into the concrete base to prevent the manhole from floating. All holes shall be sealed around the reinforcing steel to prevent leakage.

502.1.4.1.4. Drop. Drop manholes shall be constructed in accordance with details on the plans. Typical requirements are shown in Standard Drawings 5070 and 5080. The basic construction for drop manholes shall be identical to that described for standard manholes preceding with special provisions incorporated to provide drop piping and appurtenances as detailed.

502.1.4.1.5. Pressure Type. Pressure type manholes (sealed manholes) shall be constructed in accordance with Standard Drawing 5050 unless otherwise shown on the plans.

502.1.4.1.6. Standard Manhole. Standard manholes shall be constructed to the proper elevation as required and to a depth of at least 6-ft. above the invert of the main(s) or lateral(s) in the system.

502.1.4.1.7. Shallow Manhole. Shallow manholes shall be constructed for specific locations in a storm sewer system for depth less than 6-ft. when specifically designated on the project plans, or when so directed by the OWNER.

502.1.4.2. Vents. When specified, vents shall be constructed as shown in Standard Drawing 5060 unless the OWNER provides details for vent construction.

502.1.4.3. Invert. The invert of manholes shall be formed in a typical pattern regardless of the wall construction.

502.1.4.3.1. Flow Channel. When specified in the special provisions or in the plans, the pipe shall be laid through the manhole stations where possible, prior to concreting, so that the full depth of the pipe is embedded in concrete to form the flow channel.

502.1.4.3.2. Flow Channel Alternate. Where pipe cannot be used through the manhole due to intersecting flow channels, flow channels equivalent to the top of pipe shall be formed with concrete, then troweled to a smooth, even finish with a steel trowel.

502.1.4.3.3. Manhole Bench. The manhole bench from wall line to flow channels shall be sloped and troweled smooth on a grade of 1-in.-per-foot with a liberal radius applied at flow channel intercepts.

502.1.4.4. First Full Joint. The first full joint of pipe extending from the manhole shall be cradled in concrete to the pipe joint in the same pour as that for the manhole base slab as shown on the plans.

502.1.4.5. Grade Adjustment Risers. Installation of risers shall be shown on the plans. Grade risers and sealers shall be approved by the OWNER. Risers may be of concrete, polyethylene, metal, rubber or other materials meeting the requirements of Item 502.1.2. Grade Adjustment Risers. The minimum

number of risers required of the type approved shall be used. The manhole and grade adjustment shall form a watertight assembly. Tapered adjustment risers shall be used to match road grade. The annular space between risers and cone basin, between risers and cover frame, and between multiple risers shall be sealed using an approved sealant. Butyl sealant shall be used for HDPE.

502.1.4.6. Covers. Manhole covers shall be detailed on the plans. Manhole covers of nominal 30-inch or larger diameter are required for all manholes where personnel entry is anticipated. Manholes located within the floodplain shall have gasketed, pressure-type lids and bolted covers, or have another means of preventing inflow.

Installation of covers shall be shown on the plans. For all manhole installations, the manhole covers shall be provided with pick slots or bars in lieu of pick holes. (Pickholes are allowed for stormdrain manholes.) If the rim elevation above surrounding ground is prohibited by land use or other reasons, a cover with a pick slot or bar as described for use in street locations shall be used.

502.1.4.7. Concrete Pad. A 5-ft. by 5-ft. square concrete pad shall be constructed as shown on the plans for manhole installation outside of paved areas.

502.1.4.8. Wastewater Manhole Frame Seals. All newly constructed Wastewater Manholes shall include an Internal Frame Seal as approved by OWNER. All costs for furnishing and installing the seal and extensions shall be included in the applicable Unit Price bid for Wastewater Manholes.

502.1.5. Manhole Testing. Manholes shall be tested by hydrostatic exfiltration or vacuum testing, or other method as approved by TCEQ and determined by the OWNER. Manholes shall be tested after installation with all connections (existing and/or proposed) in place. Drop-connections and gas sealing connections shall be installed prior to testing.

502.1.5.1. Exfiltration Testing Manholes. The rate of exfiltration for manhole testing shall not exceed 0.025-gallons per foot diameter per foot of manhole depth per hour. Alternative test methods shall ensure compliance with the above allowable leakage. Hydrostatic exfiltration testing shall be performed as follows: All wastewater lines coming into the manhole shall be sealed with an internal pipe plug, then the manhole shall be filled with water, and maintained full for at least 1-hour. For concrete manholes a wetting period of 24-hours may be used prior to testing in order to allow saturation of the concrete. If the manhole fails the hydrostatic test, the manhole shall be repaired and retested until it passes the test.

502.1.5.2. Vacuum Testing Manholes. Vacuum testing of manholes shall be performed by the CONTRACTOR in compliance with these specifications. All lift holes and exterior joints shall be plugged with a non-shrink grout. No grout shall be placed in horizontal joints prior to testing. All pipes entering the manhole shall be plugged. Stubouts, manhole boots, and pipe plugs shall be secured to prevent movement while the vacuum is drawn. A minimum 60-in./lb. torque wrench shall be used to tighten the external clamps that secure the test cover to the top of the manhole. The test head shall be placed at the inside of the top of the cone section, and the seal inflated in accordance with the manufacturer's recommendations. A vacuum of 10-inches-of-mercury (34-kPa) shall be drawn, and the vacuum pump shut off. With all valves closed, the time for the vacuum to drop to 9-inches-of-mercury (30-kPa) shall not be less than the time indicated in Table 502.1.5.2.(a) Vacuum Drop Minimum Time.

Table 502.1.5.2.(a) Vacuum Drop Minimum Time

Depth of MH (feet)	Manhole Diameter		
	48"	60"	72"
	Minimum Time Required for a Vacuum Drop of 1" Hg (min:sec)		
0 – 20	0:40	0:50	1:00
22	0:44	0:55	1:06
24	0:48	1:00	1:12
26	0:52	1:05	1:18
28	0:56	1:10	1:24
30	1:00	1:15	1:30
See note 1.	0:04	0:05	0:06

1. Additional 2-ft. depths, add indicated time for each 2-ft.

Manholes shall be accepted with relation to vacuum test requirements if they meet the criteria above. Any manhole that fails the initial test must be repaired with a non-shrink grout or other suitable material based on the material from which the manhole is constructed. The manhole shall be retested as described above until a successful test is made. After a successful test, the temporary plugs shall be removed.

502.1.6. Measurement and Payment of Manholes. Measurement and payment for manholes shall be on a per each basis and shall cover all costs for the structure complete in place as designed. Included shall be all excavation, castings, reinforcing steel, concrete, backfill, and other materials, and all appurtenances for a complete and functional unit.

Payment for grade adjustment for existing manholes shall be measured and paid per each manhole.

The payment for extra depth in excess of the basic manhole depth shall be made under a separate item of bid as defined herein. If a separate bid item is not established in the contract, there shall not be any payment for extra depth, and the manhole shall be paid for as per each regardless of the depth. Unless specified otherwise, only one bid item shall provide payment for extra depth of manhole structures in excess of the basic depth for all types of manholes under consideration. Such extra depth shall be allocated on the total depth of all manholes, excluding shallow manholes, specified for the project. Payment for extra depth of the various types of manholes shall be at a unit price bid per linear foot of additional depth, measured to the nearest $^1/_{10}$ ft. over the basic depth stipulated for the type manholes under bid. A standard manhole is 6-ft. deep measured from the top of the manhole cover to the flow line of the invert. A shallow manhole is less than 6-ft. deep as measured above.

The contract price shall be the total compensation for the furnishing of all labor, materials, tools, equipment and incidentals necessary to complete the work, including earth excavation, disposal of surplus materials and backfill, all in accordance with the plans and these specifications.

502.2. WASTEWATER MAIN CLEANOUTS AND ACCESS CHAMBERS

Cleanouts shall be constructed in accordance with the plans and these specifications for materials and construction.

502.2.1. Typical Cleanout. Typical cleanout requirements are shown in Standard Drawing 5110.

502.2.2. Access (Sampling) Chambers. An access chamber may be specified in a wastewater or storm drainage situation that requires access for maintenance and inspection equipment without human entry. Chamber may be used in lieu of cleanouts, dead-end manholes or sampling ports.

The chamber body shall be a one-piece, rotational molded polyethylene unit that is corrosion resistant, lightweight, and designed for use in traffic and non-traffic locations where sewer pipe is 6", 8", 10" or 12" in diameter. The chamber shall be adaptable to clay, cast iron, ductile iron, PVC, and/or concrete pipe through use of an eccentric coupling. Such coupling shall be provided with the chamber or recommended by the chamber manufacturer and readily obtainable.

502.2.2.1. Composition and Characteristics. The wastewater access chamber shall be rotational molded of 100% virgin, hexane-based, Linear Low Density Polyethylene meeting the minimum standards in Table 502.2.2.1.(a) Access Chamber Requirements.

Table 502.2.2.1.(a) Access Chamber Requirements

Characteristic	Test Method	Value
Density	ASTM D1505	0.936-grams/cm^3
Tensile Strength @ Yield	ASTM D638	2490-psi
Flexural Modulus	ASTM D790	87,000-psi
Heat Distortion @ 66psi Load	ASTM D648	151°F
Low Temp. Impact @ 125 mils Thick	ARM Std. (B)	45-ft.-lbs.
Environmental Stress Corrosion Cracking (ESCR), 100% Igepal	ASTM D1693	> 1000-Hours
Wall thickness	-	minimum 0.375"

Additionally, at minimum, size and dimensions shall be sufficient to accommodate insertion of 36" long, standard tractor type closed-circuit TV cameras and manufactured within a 0.50-inch tolerance of required dimensions. Chamber shall be manufactured with no seams or welds. Chamber interior shall be white or cream color for visibility. Bottom of chamber shall form a channel (invert) with minimal flow disruption. Top of chamber shall have capability of accepting 18" sewer pipe and gasket. Outlets and inlets shall be male (spigot) type extensions connecting to existing or new piping systems with eccentric reducing couplings. Spigot sizes of chamber shall be in accordance with ASTM D3034 Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings, SDR 35 Sewer Pipe sizing.

502.2.2.2. Access Chamber Installation. Installation shall conform to manufacturer recommendations, with supplemental requirements contained herein. Chamber assembly including lid shall be watertight. Appropriate flexible couplings shall be used between chamber coupling and pipe. Couplings shall be attached and sized prior to lowering chamber into trench. All gaskets including those included with lid shall be properly seated, and CONTRACTOR shall insure that gaskets are not rolled or twisted. Embedment (bedding and backfill) material as provided for surrounding pipe shall be provided for chamber compacted to a minimum 80% Proctor Density, unless the OWNER specifies otherwise. Embedment material shall be prevented from entering chamber.

Two 3" minimum thickness grade rings shall be included in the access chamber assembly. If standard manhole ring and cover is to be used, it shall be set on grade rings according to normal specified standards to meet local codes. If chamber is to be installed in backyard or easement location where it may be undesirable to have a manhole cover visible, the polyethylene, sealed lid of the chamber may be fitted with a non-ferrous metal disk. Once the disk is epoxy bonded to lid and covered with earth or other ground cover, the metal will allow the chamber to be located with a typical metal locator if access is required.

502.2.2.2.1. Installation on Existing Pipe. The OWNER may specify special conditions in addition to those listed above.

502.2.2.2.2. Installation in New Construction. In addition, installation in new construction shall also meet these provisions. Excavation shall be performed in accordance with Item 201. Site Protection or Item 701.2. Structural Removal, Excavation, and Backfill, as determined by the OWNER. The excavation shall provide a minimum of 6 in. outside the widest dimension of the chamber allowing enough space for installation workers to function. Normally, the trench width for the chamber will be no wider than the trench excavated for the pipe being laid. The chamber shall be lowered into trench and connected to pipe as the pipe is laid. Enough crushed stone shall be placed around the lower portion of the chamber to support it and prevent it from leaning.

502.2.3. Measurement and Payment of Cleanouts. Measurement and payment for cleanout structures shall be on a per each basis and shall cover all costs for the structure complete in place as designed.

Included shall be all excavation, castings, reinforcing steel, concrete, backfill, and other materials, and all appurtenances for a complete and functional unit.

Cleanouts shall not be measured and paid for according to depth.

The contract price shall be the total compensation for the furnishing of all labor, materials, tools, equipment and incidentals necessary to complete the work, including earth excavation, disposal of surplus materials and backfill, all in accordance with the plans and these specifications.

502.3. FIRE HYDRANTS

502.3.1. Materials. Fire hydrants which are to be installed as shown on the plans or to be furnished for general installation shall be dry-barrel traffic model that conform to AWWA C502 Standard for Dry-Barrel Fire Hydrants, except for changes and/or additions specified as follows or as shown on the plans or in the contract specifications. All hydrant components covered by NSF-61 must comply with NSF-61 requirements.

502.3.1.1. Supplementary Details Specified. The type of shut-off may be either of the following:

(1) Compression type with the flow.

(2) Compression type against the flow.

The valve action shall provide positive shut-off at minimum closing torque. Wedge action closing gates shall not be permitted, and the scissors type main valves shall not be permitted unless approved by the OWNER.

Inlet connection shall be mechanical joint unless otherwise specified and shall be for a 6-in. cast iron pipe with minimum net valve opening of 5¼-in. unless otherwise specified.

Delivery classification: number and size of pumper and hose nozzles shall be as shown on the plans and contract specifications.

Bury length: ground to bottom of connecting pipe shall be 4-feet or as specified by the OWNER.

Diameter outlet connections: hose and pumper nozzle threads shall be of the size and type shown on the plans.

Gaskets shall be furnished on all nozzle caps and shall be long life, black rubber meeting ASTM D2000, Classification System for Rubber Products in Automotive Applications, or equal.

Unless otherwise specified in the special provisions or in the plans, the operating and nozzle cap nuts shall be tapered pentagon nuts with faces not less than 1-in. high.

Drain valve and outlet: hydrants shall be equipped with a minimum of two drainholes and provided with an automatic and positively operating noncorrodible drain or dip valve so as to drain the hydrant completely when the main valve is shut.

Direction to open is to be specified in the contract specifications. Number of turns to open shall be in accordance with AWWA Standard C502.

The outside of the hydrant shall be thoroughly cleaned and thereafter painted in the shop with one coat of primer. After shop priming, a finish coat of colored paint as specified by OWNER shall be applied to the exterior above ground surfaces.

502.3.1.2. Breakable Type Hydrants. Breakable or Sleeve Type Couplings. The barrel of the hydrant between the base and the nozzle section must be made in two parts connected by a swivel flange or breakable flange which shall permit facing of the nozzles in any desired direction in increments of 45° or less. The complete hydrant shall be of such design that when the hydrant barrel is broken through traffic collision or otherwise, it may be replaced without disturbing the base of the hydrant.

The materials used for gaskets between the upper and lower barrels and the base and nozzle section shall be compounded to conform to ASTM D2000 or an equal material that shall have OWNER approval prior to substitution unless otherwise specified in the plans.

Provision shall be made in the design of the stem to disconnect the stem from the hydrant parts above the standpipe break point in the event of traffic accidents. Design of the coupling shall be such that when the coupling is broken, no parts shall come loose and fall into the hydrant barrel, and the break shall not occur through the pins or bolts holding the coupling to the stem.

502.3.1.3. Main Valve Seats. Main valve seats shall be of such design that incorrect positioning is impossible.

502.3.1.4. Nozzle Cap Chains. When required by the OWNER, the nozzle cap chains shall be in accordance with AWWA C502 Dry-Barrel Fire Hydrants.

502.3.1.5. Flanges. All flanges other than barrel flanges shall be equipped with mechanical joints. Gland bolts shall be high-strength, low-alloy, corrosion-resistant steel conforming to ASTM A325 Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength, Type 3.

502.3.1.6. Operating Stems. The spindle of the operating stem and the stem nuts for hydrants having the operating threads located in the barrel or waterway shall be manganese bronze, Everdur or other high-quality noncorrodible metal. Barrel bolts and nuts shall meet the requirements of ASTM A307 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

All working parts in the waterway, except for sliding stem support mechanisms, shall be bronze-to-bronze or bronze-to-iron unless otherwise specified in the special provisions or in the plans.

502.3.1.7. O-Ring. Hydrant stem packing boxes, where needed, shall be provided with O-ring grooves and sealed with O-rings. O-rings shall be furnished in lieu of stem packing. They shall be of the double O-ring type designed so that the rubber rings shall move against a bronze, stainless steel or other noncorrodible metal surface. O-ring shall be in accordance with ASTM D2000, Classification System for Rubber Products in Automotive Applications.

502.3.1.8. Extensions. Fire hydrants shall be designed to accept a 6 in., 12 in. or 18 in. extension and no more than one extension and maximum of 18 in.

502.3.1.9. Hydrant Heads. The hydrant shall be constructed so that the nozzles may be faced in any desired direction.

502.3.1.10. Drawings. Proposals shall be accompanied by catalogue cuts, photographs or drawings in duplicate showing complete detailed dimensions of the hydrants when requested by the OWNER.

502.3.1.11. Upperstem Thread Lubrication. Upperstem thread lubrication may be accomplished with oil or grease. When oil is used, it shall be in conjunction with a functional oil reservoir and an oil filler port. The hydrant shall be factory filled with a USP white mineral oil such as Lubriplate No. 3-V (SAE 20), Mobile Whiterex 425 or equal. Means for field check of oil lubrication level shall be provided. When grease is used, the hydrant shall be factory lubricated with a food grade grease such as Lubriplate No. 630-AA (medium soft), or equal. Means for field lubrication without disassembly shall be provided.

502.3.1.12. Tests and Affidavit of Compliance. Manufacturers shall be required to furnish the OWNER certificate of compliance with AWWA C502 and this specification.

Technical manufacturing drawings or certificate of tests relating to fire hydrants for contract installation must be supplied by the CONTRACTOR to OWNER not later than two weeks after beginning construction when identical hydrants have previously been approved by the OWNER, or prior to installation when identical hydrants have not previously been approved by the OWNER. Technical manufacturing drawings or certificate of tests must be supplied for all hydrants purchased by the OWNER. Technical drawings or certificates shall have the OWNER'S approval before final payment shall be made.

502.3.1.13. Sample Hydrant. The OWNER may purchase one sample hydrant for verification of compliance with these and manufacturer's specifications. The OWNER may test this sample; and, if it fails to meet any of the specifications, the hydrant shall be returned to CONTRACTOR at CONTRACTOR'S expense. CONTRACTOR shall refund to the OWNER the full purchase price of the hydrant.

502.3.1.14. Rejection. Fire hydrants or materials specified in this section may be rejected for failure to meet any of the provisions of this specification or for any defects causing them to be unsuitable for their intended use.

502.3.2. Installation. Fire hydrants shall be installed as shown in Standard Drawing 4120, on the appurtenance sheets or as directed by the OWNER.

Set fire hydrant on the lot line extended when possible. The horizontal center of the hydrant shall be placed not less than 3-feet and not more than 8-feet from the back of the nearest curb or edge of pavement no closer than 18-inches to existing or proposed sidewalks, and located at least 1-foot outside of the area

between the Points of Curvature of the corner turning radii at intersections unless otherwise indicated on the plans.

The hydrant shall set truly vertical and be securely braced and blocked on well-compacted or undisturbed soil surrounded by a minimum of 7-CF clean gravel or stone to permit free draining of the hydrant, with the large pumper nozzle facing the nearest curb.

Fire hydrants shall be braced and blocked on a Class B or Class PB concrete per Item 702. Concrete Structures, or as specified by the OWNER. Concrete slab shall not be less than 4-in thick and not less than 3-ft. by 3-ft. square buried to a depth between 6- and 12-inches below finished grade. A splash pad that extends to the sidewalk, or to curb in the absence of a sidewalk, shall be installed if directed by the OWNER. Hydrant shall be set perpendicular with the pumper nozzle facing the nearest curb, and to a depth such that the center of the nozzle is between 18- and 28-inches from the top of finished grade.

Any adjustment needed after installation shall be made by the CONTRACTOR without extra compensation.

502.3.3. Measurement and Payment. Fire hydrants shall be paid for at the contract unit price per each, complete in place, as provided in the proposal and contract. The contract price shall be the total compensation for the furnishing of all labor, material, tools, equipment, hydrant extensions, concrete, gravel drains, paint or protective coating and incidentals necessary to complete the work.

The hydrant lead shall be paid for at the unit price bid for installing pipe. The gate valve and box installed in leads shall be paid for at the unit price bid for installing gate valves and boxes, or as specified by OWNER.

Fire hydrant extensions shall be paid for at the unit price bid per foot if a separate pay item is established in the contract.

Refer to Standard Drawing 4120.

502.4. THRUST RESTRAINT

Each change in direction of a pressure conduit, fittings, and plugs in pressure conduits shall be restrained in such a manner as shall substantially brace the same against undisturbed trench walls. Type of thrust restraint shall be as specified on the plans.

502.4.1. Concrete Blocking. Standard thrust blocking shall conform to appropriate details and tables of Standard Drawings 4010A through 4040. Special blocking shall be accomplished with Class B or Class PB concrete per Item 702. Concrete Structures, or as specified by the OWNER and as detailed on the appurtenance sheet or as detailed on the plans.

502.4.2. Mechanical Joint Restraint. Mechanical joint restraint may be used on ductile iron or PVC pipe. Installation shall follow manufacturer's recommendations.

Restraining mechanisms for PVC pipe and fittings shall be tested and pressure rated in accordance with ASTM F1674 Standard Test Method for Joint Restraint Products for Use with PVC Pipe.

502.4.2.1. Ring and Wedging. Ring and wedging mechanical joint restraint shall be incorporated into the design of the follower gland. The restraint shall be sized and selected for material compatibility according to manufacturer's instructions. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull-out as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. The joint restraint ring and its wedging components shall be of grade 60-42-10 ductile iron conforming to ASTM A536 Ductile Iron Castings. The wedges shall be ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell conforming to AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings and AWWA C153 Ductile-Iron Compact Fittings for Water Service. Torque limiting twist-off nuts shall be used to insure proper actuation of the restraining wedges. Necessary spacers, gaskets and bolts shall be supplied by the manufacturer of ring and wedging restraint. Ring and wedging shall be coated as specified for pipe and fittings.

Restraint for nominal pipe sizes greater than 48-inches shall be engineered.

502.4.2.2. Integrally Restrained Mechanical Joints. In addition to specifications for Ductile Iron fittings in Item 501.7. Ductile-Iron Pressure Pipe and Fittings or Item 501.14. Polyvinyl Chloride (PVC)

Water Pipe, integrally restrained mechanical joints shall conform to the applicable provisions of the standards listed in Table 502.4.2.2.(a) Integrally Restrained Mechanical Joint Standards.

Table 502.4.2.2.(a) Integrally Restrained Mechanical Joint Standards

Standard	Topic
AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C116	Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service
ASTM D3139	Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe

502.4.3. Welding. Reinforced Concrete Cylinder Pipe (RCCP) may be internally or externally welded, as specified by the OWNER, according to manufacturer criteria in conformance with appropriate AWWA Standards.

502.4.4. Measurement and Payment. No separate payment shall be made for restraint, unless specified otherwise by the OWNER.

502.5. FITTINGS

502.5.1. Brass Stops, Cocks, and Fittings for Waterworks Service.

502.5.1.1. General. Stops, cocks, and other fittings furnished under these specifications shall be in accordance with AWWA C800 Standards for Underground Service Line Valves and Fittings of the size and type specified, except cast solder-joint fittings shall conform to alloy 83-4-6-7, ASTM B584 Practice for Copper Alloy Sand Castings for General Applications. All stops, cocks and fittings shall be full size throughout the size specified.

502.5.1.2. Physicals. Any pipe, fitting, solder or flux used in the installation or repair of any public water system shall be lead-free. For the purpose of these Specifications, the term 'lead free' means

(1) Not containing more than 0.2 percent lead when used with respect to solder and flux; and
(2) Not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.

The weighted average lead content of a pipe, pipe fitting, plumbing fitting, or fixture shall be calculated by using the following formula: For each wetted component, the percentage of lead in the component shall be multiplied by the ratio of the wetted surface area of that component to the total wetted surface area of the entire product to arrive at the weighted percentage of lead of the component. The weighted percentage of lead of each wetted component shall be added together, and the sum of these weighted percentages shall constitute the weighted average lead content of the product. The lead content of the material used to produce wetted components shall be used to determine compliance. For lead content of materials that are provided as a range, the maximum content of the range shall be used.

Brass used shall have a tensile strength (as determined from test bars) of not less than 30,000-psi when tested as prescribed by ASTM B208 Practice for Preparing Tension Test Specimens for Copper-Base Alloys for Sand, Permanent Mold, Centrifugal, and Continuous Castings (Fig. 5).

Fittings shall be designed for 200-psi working pressure and, when subjected to hydrostatic test pressures 1½ times working pressure or when subjected to a minimum of 85-psi air pressure while submerged in water, shall not leak or show signs of structural failure.

Stops and cocks containing brass parts shall be shipped prelubricated with a light fluid lubricant between key and body. Lubricant shall remain fluid indefinitely, either in storage or in service.

502.5.1.3. Design Features of Stops and Cocks. Seating surfaces of the ground key type shall be tapered and shall be accurately fitted together by turning the key and reaming the body. Seating surfaces shall be lapped together using suitable abrasives to insure accurate fit. The large end to the tapered surface of the key shall be reduced in diameter for a distance that shall bring the largest end of the seating surface of the key into the largest diameter of the seating surface of the body, and the taper

seat in the body shall be relieved on the small end, so that the small end of the key may extend through to prevent wearing of a shoulder and to facilitate proper seating of the key. The stem end of the key, key nut and washer shall be so designed that if the key nut is tightened to failure point, the stem of the key shall not fracture. The nut and the stem shall withstand a torque on the nut of at least three-times the necessary effort to properly seat the key without failure in any manner.

The ball stop shall have a full-size round-way opening with straight-through flow, teflon coated bronze ball with a minimum of 0.5-mil thickness coating. The stop must be so constructed that it may be disassembled and the ball removed without special tools.

Plug type stop shall have full size round way opening with straight-through flow. Seating surfaces shall be brass (or teflon coated brass) to rubber O-rings, providing positive pressure seal without mechanical means. The stop must be so constructed that the plug may be removed without special tools. Rubber O-rings should conform to requirements of ASTM D2000 Classification System for Rubber Products in Automotive Applications and test method shall conform to ASTM D1414 for Test Methods for Rubber O-Rings.

Inlet and outlet threads, of the types specified, shall conform to the applicable tables of AWWA Standard C300 Reinforced Concrete Pressure Pipe, Steel-Cylinder Type, and inlet threads shall be protected in shipment by a plastic coating or other equally satisfactory means. If used, coupling nuts shall have a bearing skirt machined to fit the outside diameter of the pipe for a length at least equal to the outside of the pipe.

Corporation stops shall be so designed as to rotate about the axis of the flow passageway within a circle of rotation small enough to properly clear the inside of any standard tapping machine of appropriate size.

The outlet side of ¾-in. brass curb stops shall be female iron pipe with flared copper pipe, compression or female iron pipe thread on the inlet, as specified. The outlet side of 1-in., 1½-in. and 2-in. brass curb stops shall be female iron pipe with compression, streamline or female iron pipe thread on the inlet, as specified.

The outlet side of ¾-in. and 1-in. corporation stops shall be flared copper pipe or compression with male AWWA "tapered" thread or male iron pipe thread on inlet side, as specified. The outlet side of 1½-in. and 2-in. corporation stops shall be compression or streamline with male AWWA "tapered" thread or male iron pipe thread on inlet side, as specified.

502.5.1.4. Design Features of Fittings. All castings shall be smooth, free from burrs, scales, sand holes and defects of every nature which would make them unfit for the use for which they are intended.

Nuts shall be smooth cast and shall have symmetrical hexagonal wrench flats.

Flare-joint fittings shall be smooth cast. Seating surfaces for metal-to-metal seal shall be machined to proper taper or curve, free from any pits or protrusions.

Solder-joint fittings shall be smooth cast. Inside surfaces of solder-joint ends shall be machined smooth to proper inside diameter.

All thread fittings, of all types, shall have N.P.T. threads, and male threaded ends shall be protected in shipment by a plastic coating or other equally satisfactory means.

Compression tube fittings shall have a Buna-N beveled gasket or equal. Compression nut shall have:

(1) for plastic or copper pipe and tubing, an approved restraining device.
(2) for iron pipe, a stainless steel set screw to bite in and lock on the pipe.

502.5.1.5. Tests. All brass stops, cocks and fittings included in this section shall be tested in accordance with the applicable provisions of the specifications relating thereto.

502.5.1.6. Rejection. Brass stops, cocks, and fittings may be rejected for failure to meet any of the requirements of this specification.

502.5.2. All Other Fittings. All other fittings shall conform to respective provisions of Item 501. Underground Conduit Materials, listed according to conduit type. In water pipe, Ductile Iron or Ductile Iron Compact fittings shall consist of standard crosses, tees, bends, reducers, sleeves, plugs, blind flanges, etc. Fittings for reinforced concrete pressure pipe, steel cylinder type, shall consist of special crosses, tees, bends, reducers, dished plugs, closure sections, flanged outlets, blind flanges, bored flanges, etc.

502.5.3. Measurement and Payment. Payment for fittings shall be made only if a separate bid item is established in the Contract. If a separate bid item is not established, the fittings shall be included in the price of the pipe bid item.

Ductile Iron and Ductile Iron Compact Fittings shall be measured for payment per ton if a separate bid item is established in the Contract. Special fittings for reinforced concrete pressure pipe, steel cylinder type, shall be measured for payment per each, grouped as to size and kind. Fittings that are an integral part of a special item, such as a bored flange in an air valve installation, shall not be measured for payment per each, but shall be included in the contract unit price for that special item.

502.6. VALVES

502.6.1. Metal Seated Gate Valves for Ordinary Waterworks Service.

502.6.1.1. General Description. All gate valves 3-in. through 48-in. shall conform to AWWA Standards C500 Metal-Seated Gate Valves for Water Supply Service, except for changes or specified alternatives as detailed in this specification or as shown on the plans and contract documents. Materials must comply with NSF Standard 61 – Drinking Water System Components – Health Effects. Tests and design data may be as designated on the plans and contract specifications.

Valves over 16-in. in diameter shall be installed in a special vault, as indicated in appropriate Division 4000 Standard Drawings, or the gear box shall be enclosed in a manhole and supported on a concrete pad. Smaller valves shall be supported with concrete, all as detailed in appurtenance sheets attached to the plans.

Gate valves larger than 48-in. shall be a special consideration. The OWNER shall hydrostatically test all gate valves larger than 48-in. for a reasonable period after receipt of a specified test pressure.

All gate valves shall be iron body, bronze mounted, double disc, parallel seat, nonrising stem, internal wedging type. Valves must embody the best workmanship and finish. Valve design shall provide minimum torque designs effectively reducing friction and drag through thrust collar design and tracks for gates.

502.6.1.2. Bonnet Bolting. Body bolts, studs and nuts shall be 304 stainless steel.

502.6.1.3. Ends. Valves shall have flanged, push-on, or mechanical-joint ends, or any combination of these as may be specified.

Mechanical-joint ends shall conform to AWWA C111 (ANSI A21.11) American National Standard for Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings. Push-on joint ends shall conform to AWWA C111 (ANSI A21.11). Flanged ends shall conform to AWWA C110 (ANSI A21.10) American National Standard for Gray-Iron and Ductile-Iron Fittings, 3 In. through 48 In. for Water and Other Liquids, Class 125-lb. Bolts and nuts for mechanical joints shall be of a high-strength, low-alloy corrosion-resistant steel conforming to ASTM A325 (A325M) High-Strength Bolts for Structural Steel Joints (Type 3). All mechanical-joint glands shall be ductile iron.

502.6.1.4. Gates and Rings. Gates and rings shall conform to AWWA Standards C500 except as follows: All gates above 4-in. shall be cast iron with bronze-gate rings, and 4-in. gates may be solid bronze. Gates 3-in. and smaller shall be solid bronze.

502.6.1.5. Wedging Device. Wedging devices shall conform to the requirements of AWWA C500, except as follows: Gate valves 4-in. and smaller shall have solid bronze wedges. Wedges for valves above 4-in. may be solid bronze or cast-iron with an integral bronze nut. Wedging surfaces may be bronze, monel, or stainless steel cast integral with the wedge. Stem nuts or wedging surfaces that are attached with fasteners are not acceptable. Wedging surfaces on valves up to 16-in. shall be bronze-, monel-, or stainless-steel- to- iron. Wedging surfaces on valves 16-in. and larger shall be bronze-to-bronze, monel-to-monel, or stainless-to- stainless. Other moving surfaces integral to the wedging action shall be bronze to iron.

502.6.1.6. Rollers and Tracks and Scrapers for Horizontal Valves. Rollers and tracks and scrapers for horizontal valves shall conform to AWWA Standards C500, with the following exception: Babbit tracks shall not be acceptable.

502.6.1.7. Valve Stems and Nuts. Stem and nuts shall be in accordance with AWWA Standards C500, except as follows: Stem nuts shall be of a nongalling, high-grade brass or bronze and shall have threads of sufficient length to develop the full strength of the stem. Stems as received shall meet the minimum strengths as specified. Upset stems on valves larger than 16-in. shall not be permitted under these specifications. Upset stems shall conform to the requirements of AWWA C500.

502.6.1.8. Stuffing Boxes. Stuffing boxes shall conform to the requirements of AWWA Standards C500 with the following exceptions: All valves 2-in. through 16-in. shall be equipped with double O-rings, provided arrangement is made for replacement under pressure of the upper O-ring when the valve is fully open. All geared valves shall be equipped with double O-rings in the main stuffing box. All horizontal valves shall have attached stuffing boxes as per the above AWWA Standards. Stuffing box bolts and nuts shall be 304 stainless steel.

502.6.1.9. Follower Glands and Gland Bolts and Nuts. Glands, gland bolts and nuts shall conform to the requirements of AWWA Standards C500 with the following exceptions: Gland flanges or followers that are a separate part may be cast iron or bronze. Glands for valves over 12-in. in diameter shall be solid bronze or cast-iron bronze bushed. Gland bolts and nuts shall be either bronze or Type 302 stainless steel. For either choice both bolts and nuts shall be of the same material.

502.6.1.10. Hand Wheels and Operating Nuts. All valves 2-in. in diameter and above shall be nut operated unless otherwise ordered. All operating nuts shall be ductile iron or cast iron. Handwheels shall be furnished only when called for on plans or in the contract specifications. All valves shall open by turning counterclockwise or as specified by OWNER.

502.6.1.11. Gearing. Gearing shall be in accordance with AWWA C500. Spur or bevel gearing as called for on the plans or as applicable shall be provided on all valves 18-in. in diameter and larger.

502.6.1.12. Gear Cases. Gear cases shall be furnished on all geared valves. All geared valves shall be equipped with extended type gear cases, with cast iron side plates. Stuffing boxes shall be located on top of the bonnet and shall be outside the gear case. Gear cases shall be lubricated and enclosed with oil seal or O-ring at all shaft openings to prevent the entrance of water which may be in the manhole or vault. Valves equipped with ball or roller type thrust bearings inside the grease case shall have all shaft openings sealed with double O-rings. Gear cases shall be cast iron.

502.6.1.13. Bypass Valves. Bypass valves shall conform to the requirements of AWWA C500 with the following exceptions: Bypass valves are required on all 18-in. valves and larger AWWA C500 valves. Properties, construction and design requirements herein specified are applicable to bypass valves, except stems on bypass valves over 4-in. shall have the same physical qualities as for 30-in. and larger.

502.6.1.14. Cast Iron. All gray cast iron shall conform to the requirements of ASTM A126 Gray Iron Castings for Valves, Flanges, and Pipe Fittings, Class B or ductile iron shall conform to ASTM A536 Ductile Iron Castings.

502.6.1.15. Horizontal Valves. All valves over 16-in. in diameter shall be designated for horizontal installation in a horizontal pipeline unless shown otherwise on the plans. All other valves shall be vertical.

502.6.1.16. Valves for Installation in Vertical Pipeline. Valves 14-in. and larger AWWA C500 valves ordered for installation in vertical pipeline shall be equipped with disc face tracks and wedge springs to prevent pre-wedging. Valves 4-in. through 12-in. shall be double disc, square-bottom valves.

502.6.1.17. Tapping Valves. Tapping valves shall conform to the requirements of AWWA C500, and the other requirements of this section with the following exceptions: Tapping valves shall have oversize seat rings to permit entry of standard tapping machine cutters. In the open position, valve gates shall be clear of the ports so that the cutter shall pass through without making contact with the gates. Valves shall have an inlet flange conforming to AWWA C110 (ANSI A21.10) Class 125, with a machined projection to mate with tapping sleeve outlet flange recess to assure correct alignment. This alignment ring shall comply with MSS Standard SP-60 Connecting Flange Joint Between Tapping Sleeves and Tapping Valves. Valves shall have standard mechanical joint outlet and shall fit any standard tapping machine.

502.6.1.18. Tests and Inspection. All valves shall be tested by the manufacturer in accordance with AWWA C500. Any leaking at the test pressure through any casting or between the bronze ring and the cast iron body shall cause the said casting to be rejected. No plugging or patching to stop any leakage shall be allowed.

When requested at any time, notarized certificates of material and test compliance for these valves shall be provided. Such reports furnished shall be identified by purchase order or contract. The material shall also be identified as to location within the valve and specification or composition.

502.6.2. Resilient-Seated Gate Valves for Ordinary Waterworks Service.

502.6.2.1. General Description. All gate valves 3-in. through 36-in. shall conform to AWWA Standards C515 for Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service, or C509 for Resilient-Seated Gate Valves for Water-Supply Service, except for changes or specified alternatives as detailed in this specification or as shown on the plans and contract documents. Materials must comply with NSF Standard 61 – Drinking Water System Components – Health Effects. Tests and design data may be as designated on the plans and contract specifications.

Gate valves larger than 36-in. shall be a special consideration. The OWNER shall hydrostatically test all gate valves larger than 36-in. for a reasonable period after receipt.

All gate valves shall be iron body, resilient seated, nonrising bronze stem and bronze stem nut. Valves must have the resilient seat bonded and vulcanized to the wedge and employ the best workmanship and finish. Valve design shall provide minimum torque designs effectively reducing friction and drag through thrust collar design and guide tracks for the gate.

502.6.2.2. Bonnet Bolting. Bonnet Bolting shall conform to Item 502.6.1.2. Bonnet Bolting.

502.6.2.3. Ends. Ends shall conform to Item 502.6.1.3. Ends.

502.6.2.4. Gate. Gate shall be encapsulated with an elastomer that meets all requirements of AWWA C515 or C509. The bonding of the rubber to the gate shall meet the requirements of ASTM D429, Test Method A or Method B. Gates 3-in. and smaller shall be rubber encapsulated bronze.

502.6.2.5. Valve Stems and Nuts. Stem and nuts shall be in accordance with AWWA Standards C515 or C509 except as follows: Stem nuts shall be of a nongalling, high-grade brass or bronze and shall have threads of sufficient length to develop the full strength of the stem. Stems as received shall meet the minimum strengths as specified. Upset stems on valves larger than 16-in. shall not be permitted under these specifications.

502.6.2.6. Stuffing Boxes. Stuffing boxes shall conform to the requirements of AWWA Standards C515 or C509 with the following exceptions: Arrangement is made for replacement under pressure of the upper O-ring when the valve is fully open. All geared valves shall be equipped with double o-rings in the main stuffing box. All horizontal valves shall have attached stuffing boxes as per the above AWWA Standards.

502.6.2.7. Follower Glands and Gland Bolts and Nuts. Glands, gland bolts and nuts shall conform to the requirements of AWWA Standards C515 or C509 with the following exceptions: Gland flanges or followers, if used, that are a separate part may be cast iron or bronze. Glands for valves over 12-in. in diameter shall be solid bronze or cast-iron bronze bushed. Gland bolts and nuts shall be either bronze or Type 302 stainless steel. For either choice both bolts and nuts shall be of the same material.

502.6.2.8. Hand Wheels and Operating Nuts. Hand wheels and operating nuts shall conform to Item 502.6.1.10.

502.6.2.9. Gearing. Gearing shall be in accordance with AWWA Standards C515 or C509. Spur or bevel gearing as called for on the plans or as applicable shall be provided on all valves 18-in. in diameter and larger.

502.6.2.10. Gear Cases. Gear cases shall be furnished on all geared valves. Gear cases shall be lubricated and enclosed with oil seal or O-ring at all shaft openings to prevent the entrance of water which may be in the manhole or vault. Valves equipped with ball or roller type thrust bearings inside the grease case shall have all shaft openings sealed with double O-rings. Gear cases shall be gray iron or ductile iron.

502.6.2.11. Bypass Valves. Bypass valves are not required on resilient seated gate valves.

502.6.2.12. Cast Iron. Cast iron shall conform to Item 502.6.1.14.

502.6.2.13. Horizontal Valves. Valves for horizontal installation shall be equipped with wedge guide caps or inserts to guide and support the wedge during travel. All valves over 16-in. in diameter shall be designated for horizontal installation in a horizontal pipeline unless shown otherwise on the plans. All other valves shall be vertical.

502.6.2.14. Valves for Installation in Vertical Pipeline. All resilient seated gate valves shall be suitable for horizontal mounting in a vertical pipeline without special modifications.

502.6.2.15. Tapping Valves. Tapping valves shall conform to the requirements of AWWA Standards C515 or C509 and the other requirements of this section with the following exceptions: Tapping valves shall have a port opening to permit entry of standard tapping machine cutters. In the open position, valve gates shall be clear of the ports so that the cutter shall pass through without making contact with the gate. Valves shall have an inlet flange conforming to AWWA C110 (ANSI A21.10) Class 125, with a machined projection to mate with tapping sleeve outlet flange to assure correct alignment. This alignment ring shall comply with MSS Standard SP-60 Connecting Flange Joint Between Tapping Sleeves and Tapping Valves. Valves shall have standard mechanical joint outlet and shall fit any standard tapping machine.

502.6.2.16. Tests and Inspection. All valves shall be tested by the manufacturer in accordance with AWWA Standards C515 or C509. Any leaking at the test pressure through any casting shall cause the said casting to be rejected. No plugging or patching to stop any leakage shall be allowed.

When requested at any time, notarized certificates of material and test compliance for these valves shall be provided. Such reports furnished shall be identified by purchase order or contract. The material shall also be identified as to location within the valve and specification or composition.

502.6.3. Air Valves.

502.6.3.1. General. Unless otherwise indicated in the plans or contract specifications, air valves shall meet the requirements of AWWA C512 Air Release, Air/Vacuum and Combination Air Valves for Water Works Service with exceptions specified herein. Only wastewater air valves shall be used for wastewater applications.

502.6.3.2. Description. Air valves shall be of two types as follows:

(1) An air valve called for on the plans shall mean an air and vacuum valve of the ball type designed to permit the escape of air from a pipeline when the line is being filled and to permit air to enter the pipeline when the line is being emptied.

(2) A combination air valve called for on the plans shall mean a combination air and vacuum and air release valve designed to fulfill the functions of air and vacuum valve and also designed to permit the escape of air accumulated in the line at the high point when the line is under pressure while in operation. Air valves 3-in. and smaller shall be self-contained in one unit. Air valves larger than 3-in. may be a combination of two valves.

502.6.3.3. Material. The valves shall be stainless steel or iron body, stainless steel, brass or bronze fulcrum levers and links, stainless steel ball floats and pins, steel flange bolts and nuts, Buna-N synthetic rubber seats or equal against bronze or stainless steel, and brass for other parts.

502.6.3.4. Inlets and Outlets. Inlets shall be threaded for 2-in. and smaller and flanged for 3-in. and larger. Outlets shall be threaded through 4-in.

502.6.3.5. Operating Pressure and Testing. The valves shall be designed to operate under an operating pressure of 200-psi and shall be tested to 1½ times that pressure.

502.6.4. Brass Wheel Valves.

502.6.4.1. General. Valves furnished under this specification shall be wedge disc, non-rising stem gate valves with threaded ends. They shall be equipped with bronze hand wheels and nuts and shall have bronze packing gland followers. They shall be of all brass and/or bronze construction.

502.6.4.2. Pressure Rating. Valves shall be rated for 125-psi saturated steam working pressure and 200-psi for liquids and gases up to 150°F.

502.6.4.3. Tests. Each valve furnished under these specifications shall be tested at a hydrostatic pressure of 250-psi with the valve open. Under this test the valve shall not show any indication of leakage at the packing or anywhere on the body. Each valve shall also be tested at hydrostatic pressure of 250-psi applied to one end only with the valve closed. There shall be no indication of leakage by the gate or through the packing under this test.

502.6.4.4. Direction to Open. Valve shall open by turning the handwheel counterclockwise.

502.6.4.5. Material Specifications. The materials used in the manufacture of these valves shall equal or exceed the specifications shown in Table 502.6.4.5.(a) Brass Wheel Valve Materials.

Table 502.6.4.5.(a) Brass Wheel Valve Materials

Part	Material	Designation/Specification
Packing	Teflon impregnated asbestos or approved equal	
Body	Bronze	ASTM B62 Standard Specification for Composition Bronze or Ounce Metal Castings
Bonnet	Bronze	ASTM B62
Gates	Bronze	ASTM B62
Handwheel	Bronze	ASTM B62
Handwheel Nut	Bronze	ASTM B62
Gland & Packing Nut	Lead-free Brass	ASTM B16/B16M Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
Stem	Bronze	ASTM B62, 50,000-psi minimum tensile strength

502.6.4.6. Stem. Stem shall be completely free of visible flaw, and matching shall be smooth and free of defect. A back seating surface shall be provided on the wedge or on the lifting nut to seat tightly against the bonnet when the valve is open to seal the packing gland against line pressure so that the valve may be repacked against line pressure.

502.6.4.7. Threaded Ends. Valve ends shall be threaded internally with American National Taper pipe threads. Thread shall be clean, smooth, true to form and concentric with the axis of the valve. Variations in alignment of thread shall not exceed $^{1}/_{16}$-in.-per-foot. Thread shall be chamfered approximately to the major diameter of the thread at the face of the valve at an angle approximately 45° with the axis of the thread for the purpose of easy entrance in making a joint and for protection of the thread.

502.6.4.8. Valve Body. The body of the valve shall offer sufficient support to the gate while it is moving to keep the gate wedge in place and to accurately align the gate on the body seat. The waterway opening shall be equal to or greater than the nominal pipe size.

502.6.4.9. Gate. The gate shall be of wedge design and may be furnished either solid or two-piece. Two-piece or "split" disc gates shall be equipped with lifting nut. Gate faces shall be accurately machined and fitted into the valve body in such a manner that the center of the gate circle is very slightly above the center of the seat circle when the valve is tightly closed.

502.6.4.10. Workmanship. All valve parts shall be true to form, free from injurious defects and shall be seated and finished in a workmanlike manner. Casting shall be free from blow holes, porosity, hard spots, excessive shrinkage, cracks or other injurious defects. They shall be smooth and well cleaned both inside and outside, and all fins and similar roughness shall be removed. Castings shall not be repaired, plugged, brazed or burned in.

502.6.4.11. Packaging. Valve shall be closed for shipment and wrapped or packaged in accordance with best commercial practice as necessary for mechanical protection and ease in handling.

502.6.5. Butterfly Valves.

502.6.5.1. General. Butterfly valves and actuators shall conform to AWWA C504 Rubber-Seated Butterfly Valves and to these specifications:

(1) Type of body shall be short body, flanged.
(2) Body material shall be cast iron or ductile iron.
(3) Class shall be as specified on the plans or contract specifications.
(4) Shafts shall be Type 304 or 316 stainless steel.
(5) Flange holes shall be drilled full size.
(6) Valve seats shall be natural rubber or Buna-N and polished stainless steel, Type 304 or 316, 90° seating angle only, with a 360° uninterrupted seating surface.
(7) Shaft seals shall be standard split-V packing or double O-ring seal cartridges.
(8) Discs shall be ductile iron, cast iron, or fabricated steel.
(9) Operating nuts shall be ductile iron.

502.6.5.2. Submittals. The following shall be furnished to the OWNER. Incomplete data shall be cause for rejection of bid.

(1) Weights and drawings in accordance with AWWA C504.
(2) Guaranteed delivery time after receipt of purchase order.
(3) Number of turns of handwheel required to close valve.
(4) The required actuator torque (To) in foot-pounds for each butterfly valve based on the specified operating conditions of pressure and flows.
(5) Seating-unseating torque (To) in foot-pounds required for each butterfly valve.
(6) Rated torque capability of each butterfly valve actuator.

The following data shall be furnished if not previously available to the OWNER:

(7) Experience: evidence of at least five years satisfactory experience building butterfly valves to AWWA Standards.
(8) Torque tests in accordance with rubber seated butterfly valves AWWA C504.
(9) Proof of design tests in accordance with AWWA C504.

502.6.5.3. Ends. Valves shall have flanged ends. Flanged ends shall conform to AWWA C110 (ANSI A 21.10), Class 250-lb.

502.6.5.4. Actuators.

502.6.5.4.1. Manual Actuators.

Location. All actuators shall be located at the right end of a horizontal shaft with the input shaft vertical and upward looking in the direction of flow, unless otherwise noted.

Closure. The valve shall close by turning the input shaft clockwise. All handwheels shall turn clockwise to close the valve. All operators shall be equipped with a disc position indicator with each valve. The indicator shall be highly visible, clearly showing the legends "Open" and "Closed" at the ends of a 90° arc, with a pointer to show the disc position (Closed — 0° and Open —90°). The arc shall be graduated in degrees.

Type. All manual actuators shall be totally enclosed worm gear type and traveling-nut type. All manual worm gear type actuators shall be Limitorque, Type HBC or approved equal.

Sizing. Each valve actuator shall be sized for the maximum valve torque requirements based on the operating pressures and flow rates as specified.

502.6.5.4.2. Electric Motor Actuator. Each electric actuator shall conform to AWWA C504 and shall be of sufficient size to open and close the valve against maximum differential pressure and maximum required torque conditions when voltage at motor terminals is 90-percent of nominal voltage and shall have totally enclosed worm gear reducer with spur gear attached. Limit switches shall be of the four traingear with switches adjustable to operate at any point in the opening or closing cycle of the valve.

Limit switches and torque switches shall be located in a special compartment that is an integral part of the actuator and shall be readily accessible. Each limit switch shall have two normal closed contacts. Limit switch gearing shall be in step at all times whether in power or manual operation.

Limit switch gearing shall be stainless steel or high-grade bronze. Two torque switches shall be furnished, one for opening direction and one for closing direction. The torque switches shall be connected in series so that they will operate regardless of the phasing of the power.

Torque and thrust loads in both closing and opening directions shall be limited by torque switches. Each torque switch shall be provided with a micrometer adjustment and reference setting indicator. The adjustment shall permit a variation of approximately 40-percent in torque setting. Switches shall have a rating of not less than 6-amperes at 120-volts-a.c. and 2.2-amperes at 115-d.c. The torque switches shall be in series with the opening and closing coils of the starter.

The torque switches shall be factory adjusted by the manufacture for this application.

A handwheel for manual operation shall be provided. Motor shall not rotate when handwheel is in use. A fused motor shall not interfere with manual operation. For valve control, furnish for each valve a reversing starter in watertight enclosure that is integral with the actuator housing. Furnish a push-button station NEMA-4 with red and green indicating lights separate from the valve actuator. Space heaters shall be provided to protect the motor, reversing starter and limit switch compartments from moisture condensation. Valve control wiring diagrams shall be furnished with submittal data.

Valve actuators shall conform to latest revision of AWWA C504 and shall be designed to hold the valve in any intermediate position between fully opened and fully closed without creeping and fluttering.

502.6.5.4.3. Other Actuators. Other types of actuators shall conform to AWWA C504.

502.6.5.5. Shipment and Storage Requirements. Electric motor actuated valves shall be shipped to bonded covered warehouse storage to be designated by the OWNER. Valves shall be stored indoors and shall have space heaters energized. Full face flange protectors of waterproof plywood shall be at least one-inch thick.

502.6.5.6. Tests. All butterfly valves shall be tested by the manufacturer in accordance with AWWA C504. Test results shall be furnished to the OWNER.

502.6.6. Line Valve Installation. At locations shown on the plans, CONTRACTOR shall furnish and install valves of the type and size indicated. Valve vaults shall be furnished as provided in the special contract documents and constructed in accordance with Item 702.5.8.8. Vaults and applicable Division 4000 Standard Drawings.

502.6.6.1. Gate Valves. Valves shall be carefully handled and lowered into position in such a manner as to prevent damage to any part of the valve. The valve shall be placed in the proper position and held securely until all connections have been made. Where valves are to be placed in a concrete structure, the floor shall be completed before installing the valve. The valve shall be securely blocked so that its weight is carried by the floor rather than being supported by connected piping. See also Standard Drawing 4050.

502.6.6.2. Air Release Valves. The term "air release valve" as used in this section shall apply to the installation of both air release valve and combination air and vacuum release valves. Vaults shall be furnished as an integral part of either air release valve or combination air and vacuum release valve installation.

Air valves shall be installed in the manner shown in Standard Drawings 4090 – 4100B and on the appurtenance sheet unless otherwise indicated on the plans. The proper valve and fitting sizes shall be installed on mains in accordance with the schedule in Table 502.6.6.2.(a) Minimum Air Release Valve Sizing unless otherwise specified by the OWNER.

Table 502.6.6.2.(a) Minimum Air Release Valve Sizing[1]

I.D. of Main (in.)	Size of Valve and Fitting (in.)
16 and smaller	1
18 through 36	2
42 and larger	3

1. This table is for use if no sizing is indicated on the plans.

Matching taps shall be provided for and made in accordance with Item 502.10. Connections to Conduit for Service. Fittings required for mounting air valves shall be as specified in Item 502.5. Fittings. All fittings shall be tight, leak free and plumbed true to the required position.

502.6.7. Rejection. Any valve may be rejected for failure to meet its respective requirements of this specification or referenced specifications.

502.6.8. Measurement and Payment. Where valves are furnished by the OWNER, the valves shall be measured for payment for handling, placing, installing, jointing, testing and all incidentals per each, grouped by size. Where the valves are to be furnished by the CONTRACTOR, the valves shall be measured for payment for furnishing, hauling, handling, placing, installing, jointing, testing and all incidentals per each, grouped by size. The price bid for valves shall include vault, roadway box, cover, extension pipe and pad supports since separate pay items shall not be set up for these items. Manholes or vaults for valve gear boxes shall be paid for at the contract unit price per each, grouped by sizes, complete in place, if provided in the proposal and contract. The contract unit price shall be the total compensation for labor, materials, tools, equipment and incidentals necessary to install valves complete in place in strict accordance with drawings, specifications, and/or instructions of the OWNER.

502.7. PREFORMED FLEXIBLE CONDUIT JOINT SEALANT

502.7.1. General. This specification covers a cold-applied preformed flexible butyl rubber or plastic sealing compound for sealing interior and/or exterior space on concrete sewer pipe and manhole sections, where infiltration or exfiltration is a factor in the design.

502.7.2. Applicable Standards. Except as modified or supplemented herein, all preformed flexible joint sealants shall conform to the applicable requirements of the standard specifications listed in Table 502.7.2.(a) Conduit Joint Sealant Standards.

Table 502.7.2.(a) Conduit Joint Sealant Standards

Publisher	Standard
Federal Specification	SS - S - 210A(1) Sealing Compound, Preformed Plastic, For Expansion Joints
American Association for State Highway and Transportation Officials (AASHTO)	M198

502.7.3. Basis of Acceptance. The acceptability of the preformed flexible joint sealant shall be determined by the results of physical tests, by inspection and by approval of its experience record.

502.7.4. Material. The joint sealer shall be supplied in either extruded rope form of suitable cross-sectional area or flat tape form and shall be sized as recommended by the manufacturer and approved by the Engineer. The joint sealer shall be protected by a suitable removable wrapper. The joint sealer shall not in any way depend on oxidation, evaporation, or any other chemical action for either its adhesive properties or cohesive strength. The joint sealer shall remain totally flexible without shrinking, hardening, or oxidizing regardless of the length of time it is exposed to the elements.

The manufacturer shall furnish an affidavit attesting to the successful use of the product as a preformed flexible joint sealant on concrete pipe and manhole sections for a period of at least 5-years.

If requested by the OWNER, the CONTRACTOR shall provide results of above specified tests to insure product compliance with these specifications or shall supply an affidavit of compliance from the manufacturer insuring compliance with these specifications.

502.7.5. Installation of Joint Sealant. All surfaces to be in contact with the joint sealant shall be thoroughly cleaned of dirt, sand, mud or other foreign matter. A primer shall be applied to all surfaces prior to installing the joint sealant in accordance with recommendations by the manufacturer. The protective paper wrapper shall remain on the joint sealant until immediately prior to placement of the pipe in the trench. After removal of the protective paper wrapper, the joint sealant shall be kept clean.

Backfilling of pipe laid with this joint sealer may proceed after the joint has been inspected by the OWNER.

502.7.6. Rejection. The preformed flexible joint sealant may be rejected for failure to meet any of the requirements of this specification.

502.7.7. Measurement and Payment. Joint sealant shall not be paid for separately, but shall be considered subsidiary to furnishing and installing conduit.

502.8. POLYETHYLENE WRAP FOR METAL PIPE AND FITTINGS

These specifications cover polyethylene film used as a wrap to protect cast iron and other metals in a corrosive soil environment.

502.8.1. Material. Unless otherwise specified, encasement material, sizing, and marking shall conform to AWWA C105 Polyethylene Encasement for Ductile-Iron Pipe Systems.

502.8.2. Installation. Unless otherwise specified, encasement installation shall conform to AWWA C105. Polyethylene wrapping of pipe, fittings or hydrants shall precede blocking or restraint.

Fittings such as bends and reducers shall be wrapped similarly to pipe. Specials such as but not limited to valves, hydrants, and crosses shall be wrapped by splitting, tucking and overlapping the polyethylene tube, then closing the field-made splices with the required tape. All seams shall be folded twice prior to taping in accordance with AWWA C105.

Material to cover valves may be acquired from the overlapping excess polyethylene tub on the adjacent pipe lengths. The tubing shall be drawn over the bell of pipe on either side and insulated with field-made seams as described above.

Hydrants shall be encased with the polyethylene tubing slipped over the hydrant and extended to a point 2-in. to 3-in. above the ground line. The wrap shall be excluded from the drain region to allow normal drain function of the hydrant.

502.8.3. Rejection. Failure to meet any of the specifications contained in this section shall be cause for rejection of the materials.

502.8.4. Measurement and Payment. No separate payment shall be made for polyethylene wrap. It shall be considered subsidiary to the bid items on which the polyethylene wrapping is required.

502.9. CORROSION-RESISTANT COATINGS AND LINERS FOR WASTEWATER CONDUIT AND APPURTENANCES

502.9.1. General. Coatings and liners are used as a protective barrier attached to the interior walls of concrete, ductile iron, or steel pipe or manhole sections, special concrete appurtenances for protection against the corrosive chemical elements which may occur in certain domestic wastewater environments and for protection against certain corrosive wastes from industry.

All work for and in connection with the installation of the coatings and linings, including interlocking liner plates and epoxy lining in concrete pipe and the field sealing and welding of joints, shall be done in strict conformity with all applicable specifications, instructions and recommendations of the manufacturer.

502.9.2. Basis of Acceptance. The acceptability of the protective material and its attachment to the pipe or appurtenance shall be determined by the results of tests, by inspection and by approval of its experience record. The tests are designed to prove, demonstrate and insure:

(1) whether or not the protective material is the same as used in the tests,
(2) surface continuity and lack of holidays and voids,
(3) adhesion,
(4) resistance to temperature changes,
(5) resistance to abrasion,
(6) resistance to fire, and
(7) chemical resistance.

The inspection at the manufacturing plant or in the field is to determine:

(1) whether or not the protective material is the same as used in the tests,
(2) that it is attached in the same manner, and as uniformly, as it is attached to the concrete in the tests,
(3) that the joint areas are adequately protected.

The experience record of the protective material attached to the pipe or appurtenances must be acceptable.

To qualify the material and the attachment of the material to the pipe or appurtenances for acceptance, all tests must be met or certified for the specific protection intended, all conditions to be evaluated by inspection must be met, and the experience record must be submitted and approved.

502.9.3. Testing Requirements. Unless otherwise specified, the manufacturer of the protective material is responsible for meeting the testing, inspection standards and experience records as described herein, except in the case of a pipe manufacture electing to procure the protective material and applying the material as the pipe is manufactured. In such a case the pipe manufacturer would be responsible.

The test results shall be certified by a recognized testing laboratory acceptable to the OWNER and do not necessarily have to be made on each project.

The inspection results shall be attested to in writing by a licensed Professional Engineer or witnessed by the Engineer representing the OWNER. The experience record shall be documented with dates, locations, actual number of feet of protected conduit in the ground, length of time in the ground, the nature of the environment against which the conduit is being protected and the names and addresses of responsible references who shall verify the facts in the experience record.

502.9.4. Physical Requirements.

502.9.4.1. Chemical Resistance. The OWNER may designate which of the solutions mentioned may be used or may designate others.

The chemical resistance test shall be made as follows:

(1) The specimens, approximately 5-in. long, 2¼-in. wide and 1-in. thick, shall be cut from the pipe. The protective material shall be attached to these test specimens in the same manner as it would be attached to the pipe. The protective material shall be to manufacturer's specified minimum thickness. If curing is required, the protective material shall be cured to the manufacturer's recommendations.
(2) The protective material on the prepared test specimens shall be tested for indentation hardness in accordance with the requirements of ASTM D2240 Test Method for Rubber Property—Durometer Hardness and the hardness recorded.
(3) The prepared test specimens shall then be placed in wide mouth glass containers half submerged in the following solutions:

5%	sulphuric acid
5%	hydrochloric acid
3%	salt (NaCl) water
1%	phenol
5%	alum
5%	phosphoric acid
10%	biodegradable detergent
100%	motor oil

(4) The containers shall be closed and held at 100°F for six-months.
(5) After six months the specimens shall be taken from the containers and tested again for indentation hardness in accordance with the requirements of ASTM D2240. The test durometer hardness shall be made in both the area exposed to the liquid and in the area exposed to the vapor above the liquid. There shall be no loss of indentation hardness either in the area below the liquid or in the area above the liquid.

502.9.4.2. Surface Continuity, Holidays, and Voids. Voids and holidays shall be cause for rejection. The surface continuity and holiday test shall be made as follows:

(1) An electrical holiday detector, capable of producing and maintaining a voltage equal to 800 times the square root of the specified minimum protective thickness expressed in mils, shall be used to determine the complete continuity of the protective surface.

(2) The electrical holiday detector shall be used on a full size piece the protective material taken from a production run.

502.9.4.3. Adhesion to the Pipe or Appurtenances.

502.9.4.3.1. Adhesion to Concrete. Where the protective material adheres directly to the concrete, adhesion test shall be made as follows:

(1) Make a test specimen by drilling a core hole through the protective material and the pile to produce a core sample 1-in. in diameter by ¾-in. or more in depth. (This hole may be repaired and the pipe from which the sample was taken may be used.)

(2) Check the protective material for thickness.

(3) Cement the test specimens onto a solid wooden block at least 2-in. x 2-in. x 1-in. in thickness so that the protective material is cemented onto the wooden block.

(4) Allow sufficient time for the cement to set.

(5) Support the wooden block so that the test specimen is on its underside and hang a 40-pound weight on the test specimen. This can be done using an ordinary wooden clamp.

(6) This test should be made at an ambient temperature of between 60°F and 90°F.

(7) The protective material shall adhere to the material for a minimum of two-hours.

502.9.4.3.2. Anchored to Concrete. Where the protective material is anchored to the concrete by fins embedded or dovetailed into the concrete adhesion test shall be made as follows:

(1) Using a large enough square footage of the protective material to be a representative sample, the fins shall not be capable of being pulled out of the material, usually concrete, nor the protective material torn away from the embedded fins using less than a pull equal to 50-psi.

(2) For the adhesion test, either Item 502.9.4.3. Adhesion to the Pipe or Appurtenances or paragraph (1) above shall be used, but not both.

502.9.4.4. Resistance to Temperature Changes. The test for resistance to temperature changes for those materials that adhere directly to the concrete shall be made in accordance with the latest ASTM Method when required by the OWNER.

502.9.4.5. Resistance to Abrasion. The test for resistance to abrasion shall be made as follows:

(1) A 1-foot length of pipe which has been lined with the protective material shall be suitably capped and arranged on rollers so that it can be revolved at high speeds. A door shall be left in one end so that access can be had to the interiors of the test section.

(2) A slurry shall be made composed of six-pounds of gravel and three-pounds of water, and it shall be placed inside the test section and the test section shall be rotated so that the protective material has peripheral speed of four-feet-per-second. After 1,500,000 revolutions, the protective material shall not show visible signs of wear or abrasion.

502.9.4.6. Resistance to Fire. The protective material, if plastic, shall be tested for resistance to fire by meeting the requirements of ASTM D635 Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position. The material shall be self-extinguishing or nonburning according to ASTM D635.

502.9.5. Appurtenance Protection. Adequate protection shall be provided at the ends of joints.

All special shapes such as tees and wyes, branches, slants and curves shall be protected with the protective material, and they shall be given the same degree of protection provided to the production run of pipe. Lift holes, if called for on the plans or in the specifications, shall be sealed with epoxy or sealant recommended by the coating or liner manufacturer that shall pass the tests as set out in this Item 502.9. Corrosion-Resistant Coatings and Liners for Wastewater Conduit and Appurtenances.

502.9.6. Inspection. The tests required under the physical test requirements section of this specification need only be made once on any one project. Each length of pipe or special may be subject to visual

inspection during manufacture, transportation or laying by the OWNER in order to cull and reject pipe as specified in Item 502.9.8. Rejection.

502.9.7. Repair of Coatings and Liners. Where the protective material is damaged or where the adhesion of the protective material to the concrete is damaged, repairs may be made at the discretion of the OWNER.

502.9.8. Rejection. The protective material shall be rejected if:

(1) any the tests described under physical test requirements are not met,
(2) the manufacturing method of applying, adhering and curing the protective material differs from that used on the test samples,
(3) the protective material thickness as used on the test samples exceeds the minimum specified in the manufacturer's specification by more than five-percent, or
(4) it cannot be adequately repaired in the field.

502.9.9. Measurement and Payment. No separate payment shall be made for coating or lining unless otherwise specified by the OWNER. It shall be considered subsidiary to the bid items on which the coating or lining is required.

502.10. CONNECTIONS TO CONDUIT FOR SERVICE

502.10.1. Definitions. "Service" shall be defined as a service line to an individual customer. "Bullheads" shall be defined as an individual service line with branches at the end to serve two or more customers.

502.10.2. Materials.

502.10.2.1. Service Clamps. Service clamps shall be designed for tapping water pipe under normal service pressure. The clamp shall consist of a contoured saddle fastened to the pipe by one U-bolt for the single strap clamp for pipes less than 4-in. I.D., and by two U-bolts for double strapped clamps or shall consist of two sections or halves that shall be fastened together with a minimum of two bolts and nuts for pipes 4-in. I.D. and larger. The saddle shall be sealed against the pipe with a rubber gasket and shall have a heavy hub tapped with a corporation stop thread. The clamp shall be designed for 150-psi water working pressure.

502.10.2.1.1. Service Saddles. The service saddles shall be shaped so as to provide approximately 180° coverage around the pipe. Service saddle shall be material conforming to ASTM B62 Composition Bronze or Ounce Metal Castings or as otherwise specified by OWNER. Casting shall conform to AWWA C800.

Service Saddle Hubs. The service saddle hub for single and double strap clamps shall have a wall thickness of not less than ½-in. including threads. The hub shall be tapped with a corporation stop thread of the size specified.

The thread shall have a taper and pitch in accordance with AWWA Standard C800 for Threads for Underground Service Line Fittings. The hub shall be reinforced so that threads shall not be distorted by bending movements.

Open slots for bolts shall not be allowed.

Clamps. Double strapped clamps 4-in. through 12-in. shall have not less than the thickness from the point of the built-up hub segment to the segment immediately adjoining the holes for the service saddle straps specified in Table 502.10.2.1.1.(a) Clamp Minimum Thickness.

Table 502.10.2.1.1.(a) Clamp Minimum Thickness

Clamp Size (in.)	Minimum Thickness (in.)
4	0.190
6	0.195
8	0.195
10	0.195
12	0.215

Markings. Service saddles shall be distinctly marked with cast letters showing manufacturer's name, type pipe saddle as designed for (cast iron, ductile, etc.) and minimum/maximum o.d. ranges.

502.10.2.1.2. Straps. Straps shall be of materials conforming to ASTM B124 Copper and Copper Alloy Forging Rod, Bar, and Shapes, or ASTM B98 Copper-Silicon Alloy Rod, Bar, and Shapes, or A276 Stainless Steel Bars and Shapes. Straps shall be formed flat on one side to fit uniformly against the wall of the pipe. Rod diameter shall be not less than ⅝-in. flattened to ¾-in. on one side.

Straps shall be threaded ⅝-in. 11-NC-2A for a distance such that ½-in. remains after clamp is fully tightened on pipe.

502.10.2.1.3. Gaskets. Gaskets shall be of neoprene rubber. Shore hardness shall be 65 ± 5. Gasket shall be of O-ring type, 3/16 in. thick and securely fastened to the service saddle to facilitate installation.

502.10.2.1.4. Nuts. Nuts shall be of the same material as service saddles or straps. Nuts are to be semi-finished heavy hexagon tapped ⅝-in. 11-NC-2B.

502.10.2.1.5. Hydrostatic Test. All products not previously approved for use shall be subject to hydrostatic test. Service clamps shall not leak or show any structural deformation under a hydrostatic test pressure of 300-psi for 30-days.

502.10.2.1.6. Rejection. All service clamps furnished under these specifications shall be subject to inspection by the OWNER. If any products are found not to conform to the specifications, the lot or any portion thereof may be rejected.

502.10.2.1.7. Water Tubing. See Item 501.10. for conduit requirements.

502.10.2.2. Tapping Valves. Tapping valves shall conform to the requirements of Item 502.6.1.17. Tapping Valves.

502.10.2.3. Tapping Sleeves. The material for tapping sleeve bodies shall be cast iron or ductile iron in accordance with AWWA C110 (ANSI 21.10) or ASTM A285 Pressure Vessel Plates, Carbon Steel, Low-and Intermediate-Tensile Strength, Grade C carbon steel, in two sections or halves to be bolted together with high-strength, corrosion-resistant, low-alloy steel bolts conforming to AWWA C111 (ANSI A21.11). Branch outlet of tapping sleeves shall be flanged with a machined projection or recess to mate with tapping valve inlet flange to assure correct alignment.

Cast-iron and ductile-iron tapping sleeves shall be mechanical joint, or as specified, with dimensions to secure proper fit on the type and class of pipe on which they are to be used. Bolts, nuts and glands for mechanical-joint ends shall conform to the requirements of Item 502.6.1.3. Ends.

Steel sleeves shall be restricted to use on pipe sizes 12-in. and larger and subject to the following additional specifications:

(1) Flange shall conform to AWWA Standard C207 for Steel Pipe Flanges for Waterworks Service — Sizes 4 In. through 144 in. Class D, ANSI 150 lb. (68.0 kg) drilling. Gasket shall be affixed around the recess of the tap opening in such a manner as to preclude rolling or binding during installation.
(2) All steel sleeves shall be fusion bonded epoxy coated to an average of 12-mil thickness. Finished epoxy coat shall be free of laminations and blisters, shall not peel and shall remain pliable and resistant to impact.
(3) Steel sleeves shall be provided with a ¾-in. NPT test opening so that test can be made prior to tapping. Opening shall be provided with a ¾-in. bronze plug.

502.10.2.4. Meter Boxes. The meter box shall be constructed for impact strength and corrosion resistance. The meter box may not be constructed of a material known to degrade in wet, acidic or alkaline soil. Materials specified by the OWNER may include, but are not limited to, cast or ductile iron, precast polymer concrete, corrugated galvanized sheet metal, and plastics such as HDPE, LDPE and LMDPE.

Cast iron shall meet ASTM A48 Gray Iron Castings, Class 30B. Ductile iron shall meet ASTM A536 Ductile Iron Castings. Corrugated galvanized sheet metal (minimum thickness of .036 inches) made with G-90 galvanized coating shall be minimum 20 gauge and galvanized according to requirements of Item 804.3. Galvanizing. Plastics may be black or white and shall be UV stabilized.

All meter box rings and covers shall be solid, made of gray cast iron conforming to ASTM A48 Class 30B or ductile iron conforming to ASTM A536 and shall bear the MFG ID, casting product number, and Country of Origin.

Where traffic is anticipated, the meter box, with cover installed, shall be able to bear a minimum of 16,000-lb load in a wheel load (H-20) style test.

Box dimensions shall be specified by OWNER. The OWNER may specify boxes compatible with remote meter reading. Meter boxes shall be clearly marked with manufacturers ID and model number.

502.10.3. Water Conduit Connections. This section and Item 506.6. Connections to Existing Water Conduits shall govern for the construction of connections to water conduits.

502.10.3.1. Taps and Tap Assemblies in Water Conduit. Taps and/or tap assemblies of the specified size shall be installed in locations as detailed and indicated on the plans or as specified.

502.10.3.1.1. Taps. Taps for transmission of water or air from the main into system service accessories can be either of two types as follows:

(1) Standard internal pipe threaded holes in wall of water mains. These taps may be either manufactured into the pipe or installed in the field.

(2) Tap installations that are made by clamping a service saddle equipped with a sealed threaded port on the periphery of the main and then drilling through the pipe wall to complete each service port. Taps may be made either on an uncharged system or into a main under pressure.

502.10.3.1.2. Tap Assemblies. The tap assembly shall consist of a corporation stop and an iron to copper connection attached to a hard copper (Type K) tubing terminating approximately 1-ft. below ground surface with a brass gate valve as shown and detailed on the plans to serve as additional air release.

When tap assemblies are an integral part of an air valve installation, measurement and payment shall be in accordance with Item 502.6. Valves.

Tap assemblies may be required by the project plans and specifications adjacent to gate valve installations. Tap assemblies so required shall be installed in the water main on either side of the valve. Payment for the tap assemblies shall be included in the unit price bid for furnishing and installing the gate valve complete in place.

When taps are required for flushing, chlorination and/or testing, the CONTRACTOR shall locate the taps in accordance with Standard Drawing 4110 or other detail drawings, plans or in locations directed by the OWNER. No separate payment shall be made for taps required for testing, flushing, and/or chlorination.

Upon completion of the testing and purification, the CONTRACTOR shall return to the job site, remove the blow-off down to the corporation stop, backfill leaving the corporation stop in place, and replace all pavement. The CONTRACTOR'S removal of the blow-off shall include all labor, materials, tools, equipment and incidentals necessary to complete the work, including excavation, backfill and disposal of surplus materials without additional compensation.

502.10.3.1.3. Tapping Sleeves. Steel sleeves shall not be used for taps greater than 75-percent of the pipe diameter. Use of steel sleeves for "size-on-size" taps is prohibited unless sleeve is full-bodied stainless steel, as approved by OWNER.

All steel sleeves shall be crated in wooden crates that shall provide protection from damage to epoxy coating during transport and storage.

502.10.3.1.4. Tapping Ductile Iron Pipe. Service taps, unless otherwise specified, shall be made in cast iron pipe by direct tapping of the pipe wall (without use of tap saddles) for tap sizes relative to pipe diameters as shown in Table 502.10.3.1.4.(a) Tapping Ductile Iron Pipe.

Table 502.10.3.1.4.(a) Tapping Ductile Iron Pipe

Tap Diameter	Pipe Diameter
¾-in. and 1-in.	4-in. through less than 12-in.
1½-in. and 2-in.	12-in. and larger

When direct tapping of cast iron pipe cannot be made within the limits as provided above, taps shall be made as set forth in this specification, utilizing service saddles.

502.10.3.1.5. Tapping Concrete Pipe. Tap location shall be provided to the pipe manufacturer, when available, and taps shall be made by the manufacturer during the fabrication phase of the pipe when locations are so furnished. Taps fabricated during manufacture with a diameter less than or equal to 2-in. shall be provided with brass or bronze insert bushings. Taps greater than 2-in. shall be provided as flanged outlets with flange to thread insulator adapter kits. When taps are required to be made in the field, the taps shall be made in accordance with the pipe manufacturer's recommended procedures and to the satisfaction of the OWNER.

502.10.3.1.6. Tapping Asbestos Cement (AC) Pipe.

If a tap to existing asbestos cement pipe is necessary, use **EXTREME CAUTION** to avoid the airborne release of asbestos fibers.

Taps to asbestos cement pipe can be made with bronze double strap tapping saddles, tapping tees, or pre-tapped couplings with brass insert bushings. A tapping tee shall be paid for as a fitting. If pre-tapped couplings are called for in the contract and proposal, a separate pay item shall be provided for each, classified as to size.

502.10.3.1.7. Tapping PVC Pipe. Service taps in AWWA C900 PVC pressure pipe shall be made with a shell cutter assembly and the coupon removed for tap sizes relative to pipe class and diameter as shown in Table 502.10.3.1.7.(a) Tapping PVC Pipe.

Table 502.10.3.1.7.(a) Tapping PVC Pipe

Tap Diameter	Pipe Diameter	Pressure Class
¾-in. and 1-in.	6-in. to 12-in.	150 and 200

When direct tapping of PVC pipe cannot be made within the limits as hereinbefore provided, taps shall be made as set forth in this specification, utilizing service saddles.

502.10.3.1.8. Measurement and Payment. Measurement shall be for individual taps made by size, and payment shall be absorbed under Item 506. Water Conduit Installation or Item 502.6. Valves unless otherwise specified.

502.10.3.2. Services and Bullheads. The details on installation and materials required are shown in applicable Division 4000 Standard Drawings or on the appurtenance sheets attached to the plans.

The end of each water service connection shall be marked with heavy gauge polyethylene tape, 6-inches in width with a thickness of 0.004-inches. The tape should be blue in color on which has been printed "Caution Buried Water Line Below" in continuous print. The tape should have a minimum tensile strength of 1700-psi lengthwise and 1200-psi crosswise.

Meter boxes shall be buried to protect the meter from unauthorized access, damage and freezing.

502.10.3.2.1. Procedures for Transferring Service. The CONTRACTOR will inform the customer that the service is being transferred. Splices in service lines shall conform to Standard Details 4130 and 4140, unless otherwise approved by OWNER.

Short Service. A water service shall be classified as a "Short Service" if the existing service line to the water meter is on the same side of the street as the new main and requires the existing service line to be replaced to complete the installation as indicated on the plans and specified herein. A curb stop will be installed on the end of the service line.

Long Service. A water service shall be classified as a "Long Service" if the existing service line to the meter is on the opposite side of the street as the new main and requires a new service line to be installed under the street to complete the installation as indicated on the plans and specified herein.

All new services will be flushed according to Item 506.7. Purging and Disinfection of Water Conduits. The main will then be hydrostatically tested and disinfected. After a good sample is received, the CONTRACTOR will then begin transferring the services.

The water serving the customer through the existing water service will be stopped by closing a corp or curb stop on the existing water service. The existing customer line and new service line will then be cut at the property line and connected. Galvanized customer lines will not be threaded for connection, but will be cut and connected with a coupling.

Any meter box located within a driveway or sidewalk shall be relocated and placed in the parkway or behind the sidewalk as directed by the OWNER. Reuse of the existing water meter box shall be as determined by the OWNER. The connection of the new service water lines to the meter shall be considered subsidiary to the service installation.

502.10.3.2.2. Measurement and Payment. Where water services have to be transferred from a line to be replaced, killed or salvaged to a line being constructed, they shall be paid for per each, as set out in the proposal and contract.

Bullheads or water services shall be measured and paid for at the contract price per each, in accordance with size and location, complete in place, as provided in the proposal and contract. The tapping saddle shall be measured and paid for as part of the service. There shall be no extra pay for extra depth in the installation of service leads (deadheads).

Meter boxes shall be paid for per meter box.

The contract price shall be the total compensation for the furnishing of all labor, materials, tools, equipment and incidentals necessary to complete the work.

502.10.4. Wastewater Conduit Connections. This section shall govern for the construction of connections to wastewater conduits. Connections of wastewater pipe to existing wastewater conduits or wastewater appurtenances shall be as shown on the plans or as directed by the Engineer. Details of construction shall be shown on the plans.

The end of each wastewater service connection shall be marked with heavy gauge polyethylene tape, 6-inches in width with a thickness of 0.004-inches unless a cleanout is present. The tape should be green in color on which has been printed "Caution Buried Wastewater Line Below" in continuous print. The tape should have a minimum tensile strength of 1700-psi lengthwise and 1200-psi crosswise.

502.10.4.1. Service Connection. Service pipe shall be of the same pipe material as the main wastewater conduit unless otherwise specified on the plans or in the contract or approved by the OWNER. Connections shall be made to prevent the occurrence of bi-metallic corrosion or any other corrosion that can result by joining incompatible materials.

Wastewater service connections shall be defined as a service line connecting the customer's wastewater system at the property line or utility easement to the main wastewater conduit and shall consist of the service combination tee wye, the necessary Class B or Class PB (as specified by the OWNER) concrete cradle or crushed stone for the tee wye, the service pipe necessary to extend the line from the main wastewater conduit to the customer's property line and a plug placed in the end of the service line.

Services for single-family residence shall normally be 4-inches in diameter. Standard 4-inch laterals shall consist of a standard wye and bend and the necessary pipe and cleanout as shown on the plans or directed by the OWNER. Larger laterals in non-residential uses shall consist of a manhole and the necessary minimum 6-inch pipe as shown on the plans or directed by the OWNER. If the CONTRACTOR is required to connect or reconnect the service line to the customer's wastewater system, the connection shall be as shown on the plans. If the CONTRACTOR is not required to connect to the customer's wastewater system, the service line shall be plugged and sealed.

Extra depth service connections shall be installed when the wastewater main is at a depth greater than that necessary to serve the abutting property. The service is identical to a standard connection except that pipe risers will be installed at a maximum 45-degree angle into the trench walls to connect the combination tee wye and 45-degree bend to the service pipe. Where possible, a minimum slope of ¼-in.-per-foot (equivalent to a 2% slope) will be maintained. Where the wastewater main is located in the street and the abutting property slopes to the street, the wastewater service shall normally have a minimum depth of 5-feet below the top of the curb at the point where it passes beneath the curb. Where

abutting property slopes away from the wastewater main, service connections shall be placed at a depth adequate to serve the normally expected use of the property.

Where water and wastewater service connections cross, they shall be treated in accordance with TCEQ regulations.

502.10.4.2. Cleanouts. Service line cleanouts shall conform to Standard Drawing 5120. If service line cleanouts are required, double cleanouts shall be installed at the property line, or as specified by OWNER. When specified in the special provisions or in the plans, a test tee shall be installed at the end of the service line (located in the parkway), with the branch in a vertical position.

502.10.4.3. Measurement and Payment. Wastewater conduit connections shall be measured at the contract unit price per each, complete in place. The contract unit price shall be total compensation for the furnishing of all labor, materials, tools, equipment and incidentals necessary to complete the work, including excavation, concrete encasement, if required, disposal of excess material, backfill, embedment, concrete blocking, paving and sod, all in accordance with the plans and specifications.

502.11. MISCELLANEOUS CONDUIT CONNECTIONS

502.11.1. Pitot Outlets. Pitot outlets shall be of the type indicated on the plans or appurtenance sheet. Pitot outlets shall be measured for payment for each. Pitot outlets shall be paid for at the contract unit price per each.

502.11.2. Facilities for Dewatering of Water Lines. There shall be constructed, at the location shown and detailed in the plans, permanent standard blow-offs and drains and special dewatering facilities to permit the blowing off and/or the dewatering of lines or sections of line.

Permanent blow-offs and drains shall be measured as complete units. Payment shall be made for permanent blow-off and drain at the unit price bid which shall be full compensation for the complete installation. Payment for permanent blow-offs with dewatering sump manhole shall be made on a lump sum basis at the unit price bid, which shall be full compensation for complete installation, including excavation and backfill from blow-off fitting to manhole, furnishing and installing sump manhole and other items needed for complete installation exclusive of items for which there are bid items in the proposal.

502.11.3. Wastewater Connections. Connection of wastewater mains to existing manholes and to other wastewater mains where constructing a manhole is not feasible or not required shall be watertight. The use of pipe hammers or jackhammers is prohibited.

502.12. STRUCTURES.

502.12.1. Description. This section shall govern for the construction of all miscellaneous structures such as junctions, transitions, and utility supports, and for the construction of appurtenances such as deep-cut connections, wyes, stoppers and bulkheads, and such other miscellaneous structures or appurtenances which may be shown on the plans. Construction shall conform with any applicable provisions of Division 700. Structures.

Unless otherwise specified on the plans, all storm sewer structures such as junctions, transitions, manholes, cleanouts, wyes, elbows, tees, stoppers and such other miscellaneous structures or appurtenances which may be shown on the plans shall be made of the same base metal and coating (metallic or otherwise) as the pipe on which it is connected. All such structures or appurtenances field fabricated or otherwise will be repaired in accordance with Item 502.9.7. Repair of Coatings and Liners or Item 804.3.5. Repair of Damaged Zinc Coating, as applicable.

In general there shall not be a pay item for pipe support when a temporary part of conduit installation, but the contract prices for the new or re-laid pipe, shall be the total compensation for the furnishing of all labor, tools, materials, equipment and incidentals necessary to complete the work including excavation, installation and removal of the temporary piping, construction of piers, stripping of forms, disposal of surplus materials, in accordance with the plans and specifications. Where a pay item is included, the contract price shall be the additional compensation for all excavation, labor, tools, and materials over and above the bid price for furnishing and installing the conduit.

502.12.2. Permanent Concrete Structures. The construction of reinforced concrete structures, including junctions, transitions, vaults, piers and beam supports, and such other similar structures as may be covered

by this specification, shall be performed in accordance with the requirements of Item 702. Concrete Structures, applicable Division 1000-5000 Standard Drawings, and the following additional requirements. Unless otherwise specified, all concrete shall have an average compressive strength at 28-days equal or greater than 3000-psi. Excavation shall be made to the required depth and of sufficient width to construct the work to grade, form and dimensions. All soft and yielding materials shall be removed and replaced with acceptable materials. The subgrade shall be moistened to a minimum depth of 2-in. before placing concrete. All formed surfaces of the concrete exposed to public view shall be given a textured finish as shown on the plans. All other formed surfaces shall be given the "Type 1 Finish," as described in Item 702.5.13. Finishing Exposed Surfaces. Corrosion protection shall be applied as may be called for on the plans or the proposal and shall be measured for payment and paid for at the contract price as detailed in Item 502.9. Corrosion-Resistant Coatings and Liners for Wastewater Conduit and Appurtenances.

Permanent concrete structures shall be measured and paid for in accordance with Item 702. Concrete Structures, as provided for in the contract documents. No measurement or payment shall be made for reinforcing steel.

502.12.3. Miscellaneous Pipe Structures. Riprap and miscellaneous pipe structures that may be necessary shall be designed in detail on the plans.

The structures shall be measured for payment per each or in linear feet between the limits set out on the plans as provided for in the proposal and contract. Miscellaneous concrete shall be measured for payment paid for at the contract unit price as provided in the proposal and contract, typically in cubic yards. The contract price shall be the total compensation for the furnishing of all labor, materials, tools, equipment and incidentals necessary to complete the work, including all excavation, disposal of surplus materials and backfill, in accordance with the plans and these specifications.

502.12.4. Connections to Existing Structures. The bottom of the existing structure shall be mortared or concreted, if necessary, to eliminate any drainage pockets by the new connection in general accord with details for the new structure as shown on the plans. Where conduit is connected into old structures that are to remain in service, any damage to the structure resulting from the work of making the connection shall be restored by the CONTRACTOR to the satisfaction of the Engineer.

502.12.5. Waterstops. Waterstops shall be of the type and kind and of materials designated on the plans. Care shall be taken that the waterstop is properly located and held in position during placement of concrete. For particular material, the following shall apply:

(1) PVC Material. Splices of waterstop shall be performed by fusing the material, using a heat device thermostatically controlled in accordance with the manufacturer's recommendations.
(2) Copper Material. Any copper sheets which are damaged under construction operations shall be repaired or replaced. Splices shall be made by lapping and soldering or other approved method.

No separate payment shall be made for waterstop material or for installation of this item. The costs shall be included in the price bid for the completed structure into which the materials are incorporated.

502.12.6. Water Migration Barrier. Water migration barrier prevents water flow along an embedded conduit. A 3-ft. ±1-ft. long clay barrier (30< P.I. <40) shall be placed at 200-ft. intervals or as directed by OWNER along all water and wastewater mains. This clay barrier shall be for the full width and depth of the trench, replacing all bedding, embedment and backfill materials, and shall be placed at the mid-point of a length of pipe being placed, but not at a location where a lateral or service connects with the water and wastewater main.

ITEM 503. TRENCHLESS INSTALLATION

503.1. CONDUIT MATERIALS

Conduit materials shall be indicated on the plans and shall conform to the specifications of Item 501. Underground Conduit Materials.

503.2. TUNNEL/CASING PIPE SPACERS

503.2.1. General. This specification covers the materials and requirements for pipe restraining system for pipe installation in tunnels or casing pipe under railroads, highways, streets or other trenchless situations. Restraining systems shall prevent pipe joint separation during and after installation and shall provide dielectric insulation between the carrier pipe and the tunnel liner/casing pipe and shall be resistant to corrosion.

503.2.2. Types.

503.2.2.1. Steel Rib and Wood Lagging System. Steel ribs shall conform to ASTM A36 Carbon Structural Steel. The ribs shall be of the size shown on the plans, special provisions or approved from a design load submittal. The ribs shall be bent by cold pressing in dies.

Wood lagging shall have a minimum thickness of 2.75-in. and a minimum average ultimate stress capacity of 5,000-psi. The ultimate stress capacity to be determined according to ASTM D198 Static Tests of Lumber in Structural Sizes, flexure test on five randomly selected timbers from each shipment of lagging. The maximum load carried by each timber disregarding the highest and lowest one of the five timbers tested shall be averaged to determine the ultimate stress capacity of that shipment.

Nuts shall conform to ASTM A307 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength. The bolts shall conform to ASTM A449 Quenched and Tempered Steel Bolts and Studs for rib thickness equal to or greater than 0.209-in. and to ASTM A307 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength for rib thickness less than 0.209-in.

503.2.2.2. PVC Restrained Casing Spacer System. PVC Restrained Casing Spacers shall be provided at all pipe bell joints and not more than 10-feet apart to support pipe and its contents.

Casing spacer runners shall be an ultra-high molecular weight polymer with a minimum tensile impact of 600-ft-lbs/sq.in. Restrainer body and runner supports shall conform to ASTM A536 High Strength Ductile Iron Grade 65-45-12. Connecting rods and nuts shall conform to high strength, low alloy steel as designated in ANSI/AWWA Standard C-111/A21.11

503.2.2.3. HDPE Casing Spacers. Spacers shall provide full circumferential support in case the carrier pipe twists as it is pushed through the casing. Casing spacers shall have a minimum projection height necessary to clear the bell of the carrier pipe or as otherwise indicated on the plans. Casing spacers shall fasten tightly onto the carrier pipe to prevent spacer movement during installation. The span between spacers should result in conservative long-term load safety factors with carrier pipe full of fluid. Manufacturer shall provide the load carrying capacity of the spacer assembly and maximum spacing shall conform to manufacturer's recommendations.

503.2.2.4. Alternate Casing Spacers. When approved by the OWNER, Nylon, Stainless Steel, Ductile Iron, or Carbon Steel Casing Spacers may be used. Such alternate systems shall conform to all requirements as stated in the plans.

503.2.3. Tests. Tests for compliance with this specification shall be as specified herein. A certification of compliance with this specification along with a report of each test shall be furnished to the OWNER.

503.2.4. Rejection. Tunnel/casing spacers and related materials may be rejected for failure to meet any of the requirements of this specification.

503.3. METHODS OF JACKING, BORING OR TUNNELING

503.3.1. Description. This specification shall govern for the provision of the required opening for the installation of conduits by the methods of jacking, boring or tunneling as shown on the plans and in conformity with this specification.

503.3.2. Materials. The encasement and carrier pipe shall be of the type and strength as indicated on the plans. All necessary materials shall conform to the applicable sections of these specifications or as specified by the OWNER(S) or Engineer.

503.3.3. Construction Methods.

503.3.3.1. General. The CONTRACTOR may request to perform the work by jacking, boring, or tunneling in lieu of open cut.

Where encasement with carrier pipe is required to be installed under railroad embankments or under highways, streets or other facilities by jacking, boring or tunneling methods, construction shall be made in a manner that shall not interfere with the operation of the railroad, highway or other facility and shall not weaken or damage any embankment or structure. The CONTRACTOR shall notify all railroad companies or TxDOT at least 48-hours prior to construction. The CONTRACTOR shall provide insurance as required by the governing authority.

During construction operations, barricades and lights to safeguard traffic and pedestrians shall be furnished and maintained around the excavation, equipment, and materials as required in Item 107.20. Protection of Work and of Persons and Property, until such time as the backfill has been completed and then shall be removed from the site. All excavations shall be safely secured at all times to prevent unauthorized access to the excavation site.

The CONTRACTOR shall take the proper precautions to avoid excavating earth or rock or shattering rock beyond the limits of excavation needed to install the conduit. All damages caused by excavating or blasting, either to surface or subsurface structures, shall be repaired or replaced by the CONTRACTOR at the CONTRACTOR'S own cost and expense. The CONTRACTOR shall dispose of all surplus materials at its own expense.

The drilling of pilot holes for the alignment of pipe prior to its installation by jacking, boring, or tunneling shall not be a requirement but may be necessary to maintain grade.

503.3.3.2. Construction by Jacking. If the grade of the pipe at the jacking end is below the ground surface, suitable pits or trenches shall be excavated for the purpose of conducting the jacking operations and for placing end joints of the pipe. This excavation shall not be carried to a greater depth than is required for placing of the guide and jacking timbers and a horizontal distance no nearer the roadbed than the minimum distance shown on the plans.

At the other end of the pipe, an approach trench shall be excavated accurately to grade. All open trenches and pits shall be braced and shored or their walls sloped in such a manner as shall adequately prevent caving or sliding of the walls into the open trench or pit and be in accordance with the requirements of Item 107.20. Protection of Work and of Persons and Property.

Heavy-duty jacks suitable for forcing the pipe through the embankment shall be provided by the CONTRACTOR. In operating jacks, even pressure shall be applied to all jacks used. Suitable bracing between jacks and the jacking head shall be provided so that pressure shall be applied to the pipe uniformly around the ring of the pipe. The jacking head shall be of such weight and dimensions that it shall not bend or deflect when full pressure is applied at the jack. The jacking head shall be provided with an opening for the removal of excavated material as the jacking proceeds. A suitable jacking frame or backstop shall be provided. The pipe to be jacked shall be set on guides which are straight and securely braced together in such manner as to support the section of pipe and to direct it in the proper line and grade. All timber and other materials used in the construction of the jacking assembly shall be of such quality and dimensions that they shall withstand all stresses to which they are subjected in such a manner as to insure even pressures on the pipe during jacking operations. The whole jacking assembly shall be placed so as to line up with the direction and grade of the pipe.

As the jacking proceeds, the embankment material shall be excavated slightly in advance of the pipe in such a manner as to avoid making the excavation larger than the outside diameter of the pipe, with the excavated material being removed through the pipe. The excavation for the underside of the pipe, for at least $^1/_3$ of the circumference of the pipe, shall conform to the contour and grade of the pipe. The excavation for the top half of the pipe shall conform closely to the outside diameter of the pipe and a clearance greater than 2-in. shall not be permitted. All voids between the pipe and the earth shall be

filled with grout per ASTM C476 Grout for Masonry. Grout holes may be provided in the pipe, or grouting may be made through drill holes from the ground surface if practicable. The grouting shall follow immediately upon completion of the jacking operation. Grout shall have a maximum compressive strength of 100-psi at 28-days.

All carrier pipe installed by jacking shall be supported by a quarter point cradle of Class B or Class PB concrete as specified by the OWNER across the jacking pit and to the first joint in the ditch section on each end.

The distance that the excavation shall extend beyond the end of the pipe depends on the character of the material, but it shall generally not exceed 2-ft. The pipe preferably shall be jacked from the low or downstream end. Lateral or vertical variation in the final position of the pipe from the line and grade established by the OWNER shall be permitted only to the extent of 1-in. per 10-ft., provided that such variation shall be regular and only in one direction and that the final grade of the flow line shall be in the direction indicated on the plans.

Once jacking of pipe is begun, the operation shall be carried on without interruption, insofar as practicable to prevent the pipe from becoming firmly set in the embankment.

Any pipe damaged in jacking operations shall be repaired if approved by the OWNER or removed and replaced by the CONTRACTOR at the CONTRACTOR'S entire expense.

The pits or trenches excavated to facilitate jacking operations shall be filled as soon as practicable or as directed by the OWNER. The pits or trenches shall then be backfilled in accordance with the location and conditions as are covered elsewhere in these specifications.

If a carrier pipe is laid through an encasement pipe, the bedding of crushed rock, concrete, grout or granular material, if any, shall be considered a part of the unit price of the jacking operation.

503.3.3.3. Construction by Boring. The hole shall be bored mechanically with a suitable boring assembly designed to produce a smooth, straight shaft and so operated that the completed shaft shall be at the established line and grade. The size of the bored hole shall be of such diameter to provide ample clearance for bells or other joints. The holes are to be bored mechanically. The boring shall be done by using either a pilot hole or a dry bore method.

A pilot hole boring shall be constructed by the following method: An approximate 2-in. pilot hole shall be bored the entire length of the crossing and shall be checked for line and grade on the opposite end of the bore from the work pit. The pilot hole shall serve as the centerline of the larger diameter hole to be bored.

The dry bore shall be constructed as follows: The casing pipe shall be advanced as the soil is removed by augers. Bentonite may only be used as a lubricant. Casing shall be new or used steel conduit approved by the OWNER, with a minimum inside diameter sufficiently larger than the outside diameter of the carrier pipe or ducts to accommodate placement or removal.

All carrier pipe installed by boring shall be supported by a quarter point cradle of Class B or Class PB concrete as specified by the OWNER across the boring pit and to the first joint in the ditch section on each end. All pits should have crushed rock and sump areas to remove water. Where groundwater is found, pits shall be lined with filter fabric.

All voids shall be grouted per ASTM C476 Grout for Masonry and shall be considered a part of the unit price of the boring operation.

In addition to the requirements stated above, the applicable provisions of Item 503.3.3.2. Construction by Jacking in regard to the construction of trench, tolerance in line and cradle, method of operations, backfilling, etc. shall govern for construction by boring.

503.3.3.4. Construction by Guided Boring or Directional Drilling. Guided boring or directional drilling shall be accomplished according to the standards in *Trenchless Technology Guidelines* published by the International Society for Trenchless Technology.

503.3.3.5. Construction by Tunneling. The tunnel shall be excavated in such a manner and to such dimensions so as to permit placing of the proper supports necessary to protect the excavation. The CONTRACTOR shall take the proper precautions to avoid excavating earth or rock or shattering rock beyond the limits of excavation shown on the plans. All damages caused by excavating and blasting,

either to surface or subsurface structures, shall be repaired or replaced by the CONTRACTOR at its own cost and expense. Adequate provisions shall be made for safety and health of the workers. All equipment operated in the tunnel shall be powered by either air or electricity. No equipment shall be permitted in the tunnel that uses a petroleum product such as fuel.

Electric lights shall be used for illumination of completed portions of the tunnel used for passage and wherever lighting is needed for inspection of the work. A sufficient number of lamps shall be used to properly illuminate the work, and all wiring for electric power and lights shall be installed and maintained in a safe and secure manner in accordance with the current applicable electrical specifications of the OWNER. CONTRACTOR shall maintain the tunnel air in a condition suitable for the health of the workers and sufficiently clear for surveying operations. A sufficient supply of fresh air shall be provided and maintained at all times in all underground places. Provisions shall be made for the quick and complete removal of gases and dust resulting from blasting or other tunnel operations. Except when unnecessary due to natural ventilation, artificial ventilation shall be maintained in the tunnel by ventilating plants of ample capacity operated when needed to meet the preceding requirements.

If required by the plans or if required for safety, suitable steel or timber sheeting, shoring and bracing in accordance with Item 107.20.3. Trench Safety shall be used to support the sides and roof of the excavation. When the installation is completed, and if approved by the OWNER, supports may be left in place, provided that they clear the encasement or carrier pipe. No separate payment shall be made for supports left in place. Nothing contained herein shall prevent the CONTRACTOR from placing such temporary or permanent supports as it shall deem necessary, nor shall anything contained herein be construed as relieving the CONTRACTOR from its full responsibility for the safety of workers and for all damages to personal property caused by its operations.

If the tunnel is to be lined with concrete as a monolithic structure, then the overbreak, if any, or voids shall be poured with Class A or Class PA concrete as specified by the OWNER. The CONTRACTOR shall not be compensated for overbreaks.

No pipe shall be placed until the foundation is in a condition satisfactory to the OWNER. Tunnel dimensions shown on the plans are minimum dimensions. Any excess excavation and subsequent backfill, concrete or grout fill shall be at the expense of the CONTRACTOR. The pipe shall be laid in the tunnel true to line and grade. Tolerance in line and grade shall be as specified in Item 503.3.3.2. Construction by Jacking.

If indicated or specified, the entire void between the outside of the pipe and the tunnel walls or the inside face of the tunnel lining shall be grouted per ASTM C476 Grout for Masonry unless the permanent sheeting, bottom, sides and roof of the tunnel are in a condition satisfactory to the OWNER. The minimum thickness of grout backfill where specified shall be maintained throughout. Grout required for backfill in excess of the minimum dimensions shown on the plans shall be at the entire expense of the CONTRACTOR.

All pipe damaged during construction operations shall be repaired, if approved by the OWNER, or removed and replaced by the CONTRACTOR at the CONTRACTOR'S entire expense.

503.3.3.6. Joints. If corrugated galvanized metal pipe is used, joints may be made by field bolting or by connecting bands, whichever is feasible. When reinforced concrete pipe 24-in. and larger in diameter with tongue-and-groove joints is used for the encasement pipe, the interior joints for the full circumference shall be sealed, packed with mortar and finished smooth and even with the adjacent section of pipe.

503.4. MEASUREMENT AND PAYMENT.

Jacking, boring or tunneling shall be measured for payment in linear feet along the centerline of the pipe measured from face to face of the trench ends or pit walls between which the jacking, boring or tunneling traverses and shall not be classified for payment according to depth. The carrier pipe, when required, shall be measured for payment as provided in the contract documents. Jacking, boring or tunneling shall be paid for at the contract unit price per linear foot (m) complete in place, as provided in the proposal and contract. Open pits required for jacking, boring or tunneling shall be considered incidental and shall not be paid for separately. The contract unit price shall be the total compensation for furnishing and placing all materials including encasement

pipe, if required, and grout backfill; for all jacking, boring, tunneling, excavation and backfill; for all sheeting, shoring, bracing and drainage; for disposal of all surplus materials; and for all labor, tools, equipment and incidentals necessary to complete the work, all in accordance with the plans and these specifications. The carrier pipe, when required, shall be paid for as provided in the contract documents.

No additional compensation will be provided for jacking, boring, or tunneling in lieu of open cut approved by the OWNER. The removal of any obstruction that conflicts with the placing of the pipe will not be measured for payment or paid for as a separate contract pay item. The removal of any such obstruction will be included in such contract pay items as are provided in the proposal and contract. The drilling of pilot holes will be considered as incidental work and the cost thereof shall be included in such contract pay items as are provided in the proposal and contract. The CONTRACTOR shall only be paid for the limits as shown on the plans. Any overrun, except as approved by the OWNER, shall be at the CONTRACTOR'S expense.

ITEM 504. OPEN CUT – BACKFILL

504.1. GENERAL

This section addresses the process of open cut and backfill. Backfill shall mean embedment and final backfill. Embedment shall mean bedding and initial backfill. Bedding shall mean the material upon which a pipe rests. Initial backfill shall mean material that covers the storm sewer, wastewater collection system, and water lines. Final backfill shall mean the material required to fill the trench from the top of the initial backfill to ground elevation or subgrade of a street.

Work shall include:

(1) Pollution Prevention shall be performed in accordance with Item 202. Temporary Erosion, Sedimentation, and Water Pollution Prevention and Control;
(2) Site preparation as part of open cut installation shall be performed in accordance with Item 203. Site Preparation, except shall be considered as incidental work and the cost thereof shall be included in such contract pay item as provided in the proposal and contract;
(3) Excavation shall be performed in accordance with Item 203.2. Unclassified Channel Excavation.
(4) Landscaping shall be performed in accordance with Item 204. Landscaping;
(5) Trench safety shall be performed in accordance with Item 107.20. Protection of Work and of Persons and Property;
(6) Restoration of disturbed areas shall be performed in accordance with Item 107.27. Restoration of Property.

504.2. MATERIALS

504.2.1. Pipe Embedment Material for Special Applications. The pipe shall be embedded in accordance with details shown on the plans for the type of embedment indicated or specified. In general, if no particular type of embedment is shown on the plans nor specified, CONTRACTOR shall use material according to pipe manufacturer recommendation.

504.2.2. Pipe Embedment Material for Storm, Water and Wastewater Mains.

504.2.2.1. Crushed Stone Embedment. The aggregates shall consist of durable particles of crushed stone, free from frozen material or injurious amounts of salt, alkali, organic matter or other material either free or as adherent coating, and its quality shall be reasonably uniform throughout. It shall have a wear of not more than 40-percent when tested in accordance with TxDOT Test Method Tex-410-A Abrasion of Coarse Aggregate Using the Los Angeles Machine.

When tested by standard laboratory methods, crushed stone embedment for each gradation shall meet the requirements of Table 504.2.2.1.(a) Crushed Stone Embedment Gradations.

Table 504.2.2.1.(a) Crushed Stone Embedment Gradations

Passing or Retained on Sieve	Percent by Weight
Standard Crushed Stone — Aggregate Grade 4	
Retained on 1½-in. sieve	0%
Retained on 1-in. sieve	0 to 5%
Retained on ½-in. sieve	40 to 75%
Retained on No. 4 sieve	90 to 100%
Retained on No. 8 sieve	95 to 100%
Blended Crushed Stone — Aggregate Grade 48	
Retained on 1½-in. sieve	0%
Retained on 1-in. sieve	0 to 5%
Retained on ½-in. sieve	40 to 75%
Retained on No. 4 sieve	75 to 100%
Retained on No. 8 sieve	90 to 100%
Fine Crushed Stone — Aggregate Grade 8	
Retained on ½-in. sieve	0%
Retained on ⅜-in. sieve	0 to 5%
Retained on No. 4 sieve	35 to 60%
Retained on No. 8 sieve	90 to 100%
Coarse Crushed Stone	
Passing 1½-in. sieve	100%
Retained on ¾-in. sieve	100%

504.2.2.2. Granular Material. Granular material shall be free flowing, such as sand or hydraulically graded crushed stone fines, or mixed sand and gravel, or sandy loam. The material shall be free from lumps, stones over two inches in diameter, clay and organic matter.

504.2.2.3. Select Material. Select material shall be gravel, fine stone cuttings, sand, sandy loam or loam free from excessive clay. Stone cuttings shall have no dimension greater than two-inches.

504.2.2.4. Crushed Stone for Foundation. Crushed stone for foundation shall meet the requirements for Item 504.2.2.1. Crushed Stone Embedment except the gradation shall be according to Table 504.2.2.4.(a) Crushed Stone for Foundation Gradation.

Table 504.2.2.4.(a) Crushed Stone for Foundation Gradation

Passing or Retained on Sieve	Percent by Weight
Passing 5-in. sieve	100%
Retained on 2-in. sieve	100%

504.2.2.5. Natural Gravel. Natural gravel shall consist of uncrushed stones meeting the requirements for wear as outlined in Item 504.2.2.1. Crushed Stone Embedment. The material shall be washed and screened and not have by weight more than one-percent organic matter, clays or loam and not more than five-percent by weight of any one of or combination of slate, shale, schist or soft particles of sandstone. The gradation shall be according to Table 504.2.2.5. (a) Natural Gravel Gradation.

504.2.2.6. Sand. Sand shall consist of clean, hard, durable, uncoated grains, free from lumps and organic material. All particles must pass a No. 8 sieve.

504.2.3. Final Backfill. The trench shall be backfilled in accordance with details shown on the plans for the type of backfill indicated or specified.

If filter fabric is required by OWNER, place filter fabric conforming to TxDOT Specification DMS-6200 between the native soil and the backfill.

504.2.3.1. Type "A" Backfill. Type "A" backfill shall meet the following requirements:

504.2.3.1.1. Tests. The liquid limit shall not exceed 35 when tested in accordance with ASTM D4318 Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils. The plasticity index shall not exceed 10 when calculated in accordance with ASTM D4318. The linear shrinkage shall not exceed six-percent when Type "A" backfill is used for pavement base material.

504.2.3.1.2. Gradation. The material when tested by standard laboratory methods shall meet the gradation in Table 504.2.3.1.2.(a) Type "A" Gradation.

Table 504.2.3.1.2.(a) Final Backfill Type "A" Gradation

Passing or Retained on Sieve	Percent by Weight
Passing 2-in. sieve (50 mm)	100%
Passing ½-in. sieve (12.5 mm)	50 to 85%
Passing No. 4 sieve (4.75 mm)	20 to 65%
Passing No. 100 sieve (150 um)	0 to 5%

504.2.3.2. Alternate Allowable Type "A". Field sand having the following requirements may be used in lieu of Type "A" backfill for filling trenches. The field sand material shall be obtained from approved sources; shall consist of durable particles; and shall be free of thin or elongated pieces, lumps of clay, soil, loam or vegetable matter. The material shall be required to meet the gradation in Table 504.2.3.2.(a) Alternate Allowable Type "A" Gradation when tested from source of supply test samples.

Table 504.2.3.2.(a) Alternate Allowable Type "A" Gradation

Passing or Retained on Sieve	Percent by Weight
Passing No. 4 sieve (4.75 mm)	100%
Passing No. 16 sieve (1.18 mm)	80 to 100%
Passing No. 50 sieve (300 um)	20 to 60%
Passing No. 100 sieve (150 um)	10 to 40%
Passing No. 200 sieve (75 um)	0 to 10%

504.2.3.3. Type "B" Backfill. Type "B" backfill is native or imported material. Type "B" backfill shall at minimum meet the following quality requirements.

504.2.3.3.1. Tests. The liquid limit shall not exceed 35 when tested in accordance with ASTM D4318. The plasticity index shall not exceed 12 when tested in accordance with ASTM D4318.

504.2.3.3.2. Gradation. Type "B" backfill shall meet the requirements in Table 504.2.3.3.2.(a) Final Backfill Type "B" Requirements.

Table 504.2.3.3.2.(a) Final Backfill Type "B" Requirements

Description	Limits
Stone. All stone must be reasonably uniform in distribution throughout the backfill material in order to be considered acceptable for use, regardless of the width of trench in which the material is to be used.	
Maximum amount of stone permitted, regardless of trench width, as a percent of final backfill volume	50%
Largest dimension of stone allowed in trenches 4-ft. or less in width	3-in.
Largest dimension stone to total final backfill volume, regardless of trench width	3%
Largest dimension of stone allowed in trenches greater than 4 ft. in width	6-in. Total volume not to exceed 1% of backfill
Lumps. All lumps must be reasonably uniform in distribution throughout the backfill material in order to be considered acceptable for use, regardless of the width of trench in which the material is to be used	
Maximum amount of clay or gumbo lumps permitted, regardless of trench width, as a percent of final backfill volume	25%
Largest dimension of clay or gumbo lumps in trenches 4-ft. or less in width	6-in.
Largest dimension of clay or gumbo lumps permitted in trench greater than 4-ft. in width.	10-in. Total volume not to exceed 1% of backfill

504.2.3.3.3. Additional Requirements. Additional requirements for Type "B" backfill when used in streets:

(1) 35 percent or less shall pass the No. 200 sieve.
(2) Material otherwise meeting specifications requirements and having a PI greater than 15 shall be considered as suitable for use only when compaction procedure includes mechanical compaction.
(3) Material shall be of such characteristics that it shall stabilize without the use of lime or other similar additive and form an acceptable street subbase material.

504.2.3.4. Flowable or Stabilized Backfill. Flowable or stabilized backfill shall consist of a mixture of native soils or manufactured materials, cement and/or fly ash, and water which produces a material with unconfined compressive strength of between 250-psi and 450-psi after 28-days. Any materials used shall be primarily granular, with a plasticity index <12 and with 100% passing a ¾-in. sieve. The flowable mixture shall be mixed in a pug mill, concrete mixer, or transit mixer and shall have a minimum slump of 5-in. The flowable mixture must be allowed to set prior to the placement of any overlying material. Stabilized backfill as defined in Item 504.6.2. Stabilized Backfill requires manual compaction.

504.2.3.5. Modified Flowable Backfill. Modified flowable backfill in areas of possible future excavation such as utility installations shall consist of a mixture of native soils or manufactured materials, cement and/or fly ash, air-entraining material, and water which produces a material with unconfined compressive strength of between 50-psi and 150-psi after 28-days. Modified flowable backfill in permanent areas such as abandoned pipe closures, abutments and embankments shall contain similar materials and shall have an unconfined compressive strength of greater than 150-psi after 28 days. Any materials used shall be primarily granular, with a plasticity index <12 and with 100% passing a ¾-in. sieve. The flowable mixture shall be mixed in a pug mill, concrete mixer, or transit mixer and shall have a minimum slump of 5-in. The flowable mixture must be allowed to set prior to the placement of any overlying material.

504.2.3.6. Fast Set Flowable Backfill. Fast Set Flowable Backfill shall be brought to site via volumetric concrete mixer and consist of an appropriate amount of cement (with other additives as necessary) mixed with mortar sand to flow and fill all voids in the excavation. This fill shall develop a compressive strength of 1120 pounds per square foot one hour after placement, and a 28-day compressive strength with the range of 25 to 100 psi. The material must be such that it can be capped in one and one-half to two hours.

504.2.4. Rejection. Materials that fail to meet the requirements of these specifications may be rejected by the OWNER. Such rejection shall incur no cost to the OWNER. Material sources, from which materials with properties not meeting these specifications are delivered, may be rejected as further supply sources to the project by the OWNER. Such rejection shall incur no cost to the OWNER.

504.3. EXCAVATION AND FOUNDATION

504.3.1. Excavation. Excavation shall be performed in accordance with Item 203. Site Preparation.

504.3.2. Foundation. During the progress of the work, should the foundation for the conduits be in material unsuitable for the subgrade of the conduit, which is not the result of the CONTRACTOR'S negligence to make proper provisions for adequate drainage of the excavation, the CONTRACTOR shall remove such unsuitable subgrade material to the depth directed by the OWNER. The space thus created shall be filled with stone as described in Item 504.2.2.4. Crushed Stone for Foundation, coarse crushed stone as described in Item 504.2.2.1. Crushed Stone Embedment, or Class B or Class PB concrete (as specified by the OWNER) as described in Item 702.3. Mix Design and Mixing Concrete for Structures. The type of material to be used for the foundation shall be determined by the OWNER. In lieu of removing the subgrade material or in conjunction with placement of the foundation material, the OWNER may require a geotextile material as described in the contract documents to be placed between the bedding and the subgrade or between the foundation material and the subgrade.

The entire foundation area in the bottom of all excavation shall be firm, stable and at uniform density as nearly as practicable. Unless necessary, materials shall not be disturbed. The final cleaning off and preparing of the foundation area shall be done immediately prior to the placing of the embedment materials or structures.

504.3.2.1. Foundation Measurement. Foundation material shall be measured for payment complete in place to the dimensions prescribed by the OWNER. Geotextile material, if used, shall be measured for payment complete in place to the dimensions prescribed by the OWNER.

504.3.2.2. Foundation Payment. Foundation material shall be paid for at the contract unit bid price in cubic yards as provided for in the contract. Geotextile material shall be paid for at the contract unit bid price per square yard as provided for in the contract. If a bid item is not established in the contract for foundation material and/or geotextile material, it shall be considered subsidiary to the contract (non-pay item).

In case of failure to make adequate pumping, draining and bailing provisions, resulting in unstable subgrade conditions, and which shall require any of the hereinbefore described foundations, such foundations shall be placed at the entire cost of the CONTRACTOR and shall not be measured or paid for as separate contract pay items.

The contract unit price shall be total compensation for furnishing all labor, tools, materials, equipment and incidentals necessary to complete the work, including all excavation and disposal of surplus material.

504.4. BACKFILL – GENERAL REQUIREMENTS

504.4.1. Description. This specification shall govern construction of all types of storm drain, wastewater collection systems, and water structures except where the requirements are revised by another governing specification. All structures shall be constructed in accordance with the design requirements, with the details shown on the plans, and with the requirements herein provided. Other applicable sections or parts of these specifications shall govern for such miscellaneous and incidental construction necessary to complete the work in accordance with the plans and specifications.

For specific applications, pipe materials, etc. refer to Section 504.5.2. Embedment Classes.

504.4.2. Materials and Equipment. All materials used in the construction of work specified in this division shall conform to the applicable sections of these specifications and approved by the OWNER. Any materials placed before approval of the OWNER shall be removed, if directed by the OWNER, and replaced with approved materials.

All machinery and equipment necessary for the construction of the work specified herein shall be on the project and shall be maintained in good condition to insure the completion of the work without excessive delays for repairs and replacements. Equipment used for disposal of surplus materials beyond the limits of the work shall be such as to avoid spilling or wasting of materials along the line of haul. The CONTRACTOR shall immediately clean up all materials spilled or wasted along the line of haul. The OWNER reserves the right to approve the location and methods of disposal for surplus material.

504.4.2.1. Water for Construction. Unless otherwise specified in the contract, water required for construction and furnished from the OWNER'S distribution system shall be paid and accounted for as prescribed by the OWNER. The CONTRACTOR shall make and bear the cost of all necessary arrangements and means for hauling the water. Water shall be furnished free of charge from the OWNER'S main, if available, for filling newly constructed water mains for flushing, sterilizing and hydrostatic testing. Construction water, if delivered through a fire hydrant meter, shall be protected by a reduced pressure zone assembly provided at the CONTRACTOR'S expense.

504.4.2.1.1. Use of Fire Hydrant and Valves. The CONTRACTOR shall not operate any fire hydrant or valve in the existing water system without the permission of the OWNER. If permission is granted, the CONTRACTOR shall use only approved fire hydrant and valve wrenches. The OWNER shall inspect all fire hydrants and/or valves operated by the CONTRACTOR prior to final acceptance of the project. All repairs or replacements required to restore satisfactory operation of fire hydrants and/or valves shall be at the expense of the CONTRACTOR.

504.4.2.2. Material and Equipment Storage. The CONTRACTOR shall confine equipment, storage of materials, and construction operations to the area shown on the Contract Drawings or as directed by OWNER. Storage shall not unreasonably encumber the site or public right-of-way with construction equipment or materials. Materials shall be stored in a manner to best protect and preserve the material to the satisfaction of the OWNER. Materials shall be sorted and stored neatly and accessibly. Materials not properly stored shall not be eligible for inclusion in partial pay estimates. Storage shall also comply with all requirements of Item 106. Control of Material.

504.4.3. Sequence. The sequence of operations to be followed shall be prepared by the CONTRACTOR for approval by the OWNER. The sequence shall meet the job requirements for completion time, avoid interference with plant operations and conform to plan and specification requirements. The construction of all storm drain and wastewater collection systems shall begin at the outlet or lower end, unless otherwise directed by the OWNER. Tributary lines for storm drain and wastewater collection systems shall not be started until the main line has been built to their junction points.

504.4.4. Connections. The connections of conduits or appurtenances to conduits shall be made in accordance with the plans and as directed by the OWNER. This work shall be done in such a manner so as not to damage any of the structures involved. Any damage to the structures due to the connection shall be repaired at the CONTRACTOR'S expense. No connecting conduit shall project beyond the inside surface of other conduits or appurtenances, except in case of pipe laid through a manhole.

504.5. EMBEDMENT

Embedment is the bedding and initial backfill. The type of embedment to be used for storm water collection systems, wastewater collection systems or water mains shall be specified in the contract documents or on the plans.

504.5.1. General

504.5.1.1. Terms.

D — Inside diameter of the pipe.

OD — Outside diameter of the pipe.

B_c — Outside diameter of the pipe.

B_d — Trench width.

Stone cuttings are rock trench excavated material. The maximum allowable dimension of the stone to be used for embedment is 1-in.

Densities shall be shown as a percent of the maximum dry density at not less than 2% below optimum moisture of samples of the material as determined by the ASTM D698 Maximum Density Optimum Moisture Test.

504.5.1.2. Flexible Pipe. 16-in. or greater diameter flexible pipe may be strutted horizontally and vertically prior to backfilling. After backfilling, the struts shall be removed and the deflection checked to verify that excessive deflection as specified has not occurred. If excessive deflection has occurred, the pipe shall be removed and reinstalled.

504.5.1.3. Trench Dimensions. Trench dimensions shall be determined according to Table 504.5.1.3.(a) Trench Dimensions unless otherwise specified as greater.

Table 504.5.1.3.(a) Trench Dimensions

Pipe size	Trench Dimensions
Minimum Depth of Trench Below the Pipe	
27-in. and smaller	3-in.
30-in. to 60-in.	4-in.
66-in and larger	6-in.
Limiting Trench Width	
24-in. pipe and smaller	24-in. or O.D. of the pipe plus 16-in., whichever is greater
Greater than 24-in., to and including 72-in.	O.D. of the pipe installed plus 24-in.
Larger than 72-in.	O.D. times 1.25 plus 1-ft.

504.5.2. Embedment Classes.

504.5.2.1. Class "A" Embedment. See Standard Drawing 3010. The embedment consists of concrete bedding and initial backfill of granular material.

After the trench has been cut to a depth below the barrel of the pipe a distance of $\frac{1}{4}B_c$, minimum of 6 in. measured from the outside of the pipe bell, the pipe shall be laid to grade on supporting brick or concrete block and jointed as specified. A compressible strip shall be placed between the pipe and the support. The pipe shall be restrained, if required, to prevent flotation. Class B or Class PB concrete as specified by the OWNER shall be poured on either side of the pipe to form the bedding under the pipe and up the sides of the pipe $\frac{1}{4}B_c$. The concrete placed under the pipe shall have a sufficient fluidity so it can flow under the haunches and be puddled to insure even support.

The initial backfill layer shall be granular material and shall be brought to a point 12-in. above the top of the pipe.

504.5.2.2. Class "A-1" Embedment. See Standard Drawing 3010. The embedment consists of crushed stone bedding and a cap of concrete as initial backfill.

After the trench has been cut to a depth below the barrel of the pipe a distance of $\frac{1}{4}B_c$, minimum of 6 in. measured from the outside of the pipe bell, the bedding layer shall be brought to a point slightly above grade with compacted standard gradation crushed stone. Bell holes shall be formed, if required, a trough scooped out to grade, and the pipe laid and jointed as specified. The stone shall then be brought up in uniform layers on either side of the pipe $\frac{1}{2}B_c$.

Class B or Class PB concrete as specified by the OWNER, plain or reinforced as specified in the plans, shall be poured over the top of the pipe and bells to cover the pipe with a thickness of $\frac{1}{4}B_c$, 4-in. minimum to form the initial backfill layer.

504.5.2.3. Class "B" Embedment. See Standard Drawing 3020. The embedment consists of crushed stone bedding and initial backfill of select material or granular material.

After the trench has been cut to a depth below the barrel of the pipe a distance of $\frac{1}{8}B_c$, minimum of 6 in. measured from the outside of the pipe bell, the bedding shall be brought up to a point slightly above the grade with stone cuttings or crushed stone, standard gradation. Bell holes shall be formed, a trough scooped out to grade and the pipe laid and joined as specified. The crushed stone or stone cuttings shall then be brought up the sides of the pipe in uniform layers $\frac{1}{2}B_c$.

The initial backfill shall consist of granular material. The material shall be placed on top of the crushed stone in uniform layers on either side of the pipe to a point 12 in. above the top of the pipe and compacted to at least 90-percent of maximum density as determined by ASTM D698.

504.5.2.4. Class "B+" Embedment. See Standard Drawing 3020. The embedment consists of fine crushed stone bedding and initial backfill of granular material.

After the trench has been cut to a depth below the barrel of the pipe a distance of $\frac{1}{8}B_c$, minimum of 6 in. measured from the outside of the pipe bell, the bedding shall be brought up to a point slightly above grade with fine crushed stone. Bell holes shall be formed, a trough scooped out to grade and the pipe laid and jointed as specified. The stone shall then be brought up in uniform layers on either side of the pipe $\frac{1}{2}B_c$.

The initial backfill shall consist of granular material. The material shall be placed on top of the stone and shall be brought up in uniform layers on either side of the pipe to a point 12-in. above the top of the pipe. Density shall be at least 90-percent of maximum density as determined by ASTM D698.

504.5.2.5. Class "B-1" Embedment. See Standard Drawing 3020. The embedment consists of fine crushed stone bedding and initial backfill of select material or granular material.

After the trench has been cut to a depth below the barrel of the pipe a distance of $\frac{1}{8}B_c$, minimum 6 in. for measured from the outside of the pipe bell, the bedding shall be brought up to a point slightly above grade with fine crushed stone. Bell holes shall be formed and the pipe laid and jointed as specified.

The stone shall then be brought up in uniform layers on either side of the pipe $\frac{3}{4}B_c$.

The initial backfill shall consist of compacted granular material brought up to a point 6 in. above the top of the pipe. Density shall be at least 90-percent of maximum density as determined by ASTM D698.

504.5.2.6. Class "B-2" Embedment. See Standard Drawing 3030. The embedment consists of fine crushed stone bedding and initial backfill of select material or granular material.

After the trench has been cut to a depth below the barrel of the pipe 6 in. measured from the outside of the pipe bell, the bedding layer shall be brought to a point slightly above grade with compacted fine crushed stone. Bell holes shall be formed, if required, a trough scooped out to grade, and the pipe laid and jointed as specified. The stone bedding layer shall then be brought up in uniform layers on either side of the pipe $\frac{3}{4}B_c$.

The initial backfill shall consist of compacted granular material and shall be brought to a point 12 in. above the top of the pipe. Density shall be at least 90-percent of maximum density as determined by ASTM D698.

504.5.2.7. Class "B-3" Embedment. See Standard Drawing 3030. The embedment consists of granular material.

After the trench has been cut to a depth below the barrel of the pipe a distance of minimum of 6 in. measured from the outside of the pipe bell, the bedding shall be brought to a point slightly above grade with compacted fine sand. Bell holes shall be formed, if required, a trough scooped out to grade, and the pipe laid and jointed as specified. The granular material shall then be brought up in uniform layers on either side of the pipe and over the pipe to a point 12 in. above the top of the pipe.

504.5.2.8. Class "B-4" Embedment. See Standard Drawing 3030. The embedment consists of cement-treated backfill.

After the trench has been cut to a depth below the barrel of the pipe a distance of minimum of 6 in. measured from the outside of the pipe bell, the bedding shall be brought to a point slightly above grade with cement-treated backfill. Bell holes shall be formed, if required, a trough scooped out to grade and the pipe laid and jointed as specified. The cement-treated backfill shall then be brought up to uniform layers on either side of the pipe and over the pipe to a point 6 in. above the top of the pipe.

504.5.2.9. Class "C" Embedment. See Standard Drawing 3040. The embedment is a bedding of crushed stone or stone cuttings and initial backfill of select material or granular material.

After the trench has been cut to a depth below the barrel of the pipe a distance of $\frac{1}{8}B_c$, minimum of 6 in. measured from the outside of the pipe bell, the bedding shall be brought up to a point slightly above grade with stone cuttings or standard crushed stone. Bell holes shall be formed, a trough scooped out to grade, and the pipe laid and jointed as specified. The stone shall then be brought up in uniform compacted layers on either side of the pipe $\frac{1}{6}B_c$.

The initial backfill shall be granular material and shall be brought up in uniform compacted layers to a point 6 in. above the top of the pipe. Density shall be at least 90-percent of maximum density as determined by ASTM D698.

504.5.2.10. Class "C+" Embedment. See Standard Drawing 3040. The embedment consists of fine crushed stone bedding and initial backfill of granular material.

After the trench has been cut to a depth below the barrel of the pipe a distance of $\frac{1}{8}B_c$, minimum of 6 in. measured from the outside of the pipe bell, the bedding layer shall be brought up to a point slightly above grade with fine crushed stone. Bell holes shall be formed, a trough scooped out to grade, and the pipe laid and jointed as specified. The stone shall then be brought up in uniform, compacted layers on either side of the pipe $\frac{1}{6}B_c$.

The initial backfill shall be granular material and shall be brought up in uniform, compacted layers to a point 6 in. above the top of the pipe. Density shall be at least 90-percent of maximum density as determined by ASTM D698.

504.5.2.11. Class "C-1" Embedment. See Standard Drawing 3040. The embedment shall consist of fine sand bedding and initial backfill of granular material.

After the trench has been cut to a depth below the barrel of the pipe a distance of $\frac{1}{8}B_c$ minimum of 6 in. measured from the outside of the pipe bell, the bedding layer shall be brought up to a point slightly above grade with fine sand. Bell holes shall be formed, a trough scooped out to grade and the pipe laid and jointed as specified. The sand shall then be brought up in uniform compacted layers on either side of the pipe $\frac{1}{6}B_c$.

The embedment backfill shall be granular material and shall be brought up in uniform, compacted layers to a point 6-in. above the top of the pipe. Density shall be at least 90-percent of maximum density as determined by ASTM D698.

504.5.2.12. Class "D+" Embedment. See Standard Drawing 3050. The embedment consists of select material.

After the trench has been cut to a depth below the barrel of the pipe a distance of $\frac{1}{8}B_c$, minimum of minimum of 6 in. measured from the outside of the pipe bell, the embedment shall be brought up to a point slightly above grade with select material. Bell holes shall be formed, a trough scooped out to grade and the pipe laid and jointed as specified. The material shall then be brought up in uniform compacted layers to a point 6 in. over the top of the pipe. Density shall be at least 90-percent of maximum density as determined by ASTM D698.

504.5.2.13. Class "G" Embedment. See Standard Drawing 3050. The embedment consists of Class B or Class PB concrete as specified by the OWNER.

After the trench has been cut to a depth below the barrel of the pipe a distance of $\frac{1}{4}B_c$, 6 in. minimum measured from the outside of the pipe bell, the pipe shall be laid and jointed as specified. The pipe shall be supported by brick or concrete block. A compressible strip shall be placed between the pipe and support. The pipe shall be restrained, if required, to prevent flotation. Class B or Class PB

concrete as specified by the OWNER shall be poured on either side of the pipe to form the embedment under the pipe, up the sides and over the top of the pipe and bells with a minimum thickness of 6 in. The concrete placed under the bell shall have a sufficient fluidity so it can flow under the haunches and be puddled to insure even support.

504.5.2.14. Class "G-1" Embedment. See Standard Drawing 3060. The embedment consists of Class "G" embedment as specified above and a trench backfill of Class B or Class PB concrete as specified by the OWNER or stabilized backfill, whichever is specified in the plans, and a 6 in. thick Class B or Class PB (as specified by the OWNER) concrete cap as initial backfill.

504.5.2.15. Class "H" Embedment. See Standard Drawing 3060. The embedment consists of a completely encased pipe with standard Crushed Stone, Grade 4. After the trench has been cut to a depth below the barrel of the pipe a distance of $\frac{1}{8}B_c$, 6 in. minimum, the bedding layer shall be brought to a point slightly above grade with compacted crushed stone. Bell holes shall be formed, a trough scooped out to grade and the pipe laid and jointed as specified. The material shall then be brought up in uniform compacted layers of 6 in. to a point 6 in. over the top of the pipe.

504.5.2.16. Alternate Embedment for Concrete Pipe. The Engineer may design alternate embedment for concrete pipe. Such embedment shall be designed according to Design Data 40, Standard Installations and Bedding Factors for the Indirect Design Method written by the American Concrete Pipe Association. Such embedment shall be constructed as shown on the plans.

504.5.3. Initial Backfill.

504.5.3.1. General. Initial backfill is the material that covers the storm drain system, wastewater collection system, and water lines. Backfill procedure is that procedure required to return trenches or excavated areas to a condition satisfactory to the OWNER. Such backfilling occurs in two general areas. They are: (1) areas not subject to vehicular traffic; and (2) areas subjected directly to, or influenced by, vehicular traffic.

The methods of backfilling to be used shall vary with the width of trench, the character of the materials excavated, the method of excavation, the type of conduit and the degree of compaction required. The placing of backfill shall not begin until the pipe structure has been properly bedded and jointed and until approval has been given by the OWNER. The excavation shall be backfilled only with approved material.

504.5.3.2. Compaction. Compaction of all backfill material shall be performed in a manner that shall not crack, crush and/or cause the installed pipe to be moved from the established grade and/or alignment, as shown on the plans. Satisfactory density shall be obtained at various depths on all backfill material as indicated from random selected test points prior to the required exfiltration or pressure tests that are to be performed on lines being constructed. The required moisture content shall be at not less than 2% below nor more than 4% above the optimum moisture of the material or as specified by the OWNER. In-place density/moisture content shall be tested and verified as specified by the OWNER, or at a minimum frequency of once per 300-linear-feet per 1-foot of compacted depth.

504.5.3.2.1. Densities — Areas Subjected To or Influenced by Vehicular Traffic. The trench backfill shall be mechanically compacted to the top of the subgrade in 6-in. loose lifts to at least 95-percent of maximum density as determined by ASTM D698 Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3). The embedment shall be compacted by a method approved by the OWNER to a density as specified under the description of the embedment as outlined in Item 504.5. Embedment.

504.5.3.2.2. Densities — Areas Not Subjected To or Influenced by Vehicular Traffic. The trench backfill shall be placed in layers not more than 10-in. loose depth and shall be compacted by mechanical means, subject to the restrictions outlined in Item 504.5.3.2.5. Compaction Methods to at least 90-percent of maximum density as determined by ASTM D698. The embedment shall be compacted by a method approved by the OWNER to a density as specified under the description of the embedment required as outlined in Item 504.5. Embedment.

504.5.3.2.3. Special Situations. In areas specifically designated in the plans and specifications, the entire backfill shall be backfilled and compacted to the density specified.

504.5.3.2.4. Limitations. Densities as specified shall be obtained as the project progresses. No more than 75-percent of the pipe installation on the project is to be completed until specified compaction and density requirements have been ascertained on backfill material for at least 25-percent of the pipe laid, or until an approval to proceed with pipe installation has been given by the OWNER.

504.5.3.2.5. Compaction Methods. The method of compaction shall be left to the discretion of the CONTRACTOR with the following exception, unless otherwise specified, provided the degree of compaction is obtained and provided that the pipe is not damaged in the process. If any potential damage to the pipe due to a method of compaction exists, in the opinion of the OWNER, that method of compaction shall not be allowed.

Compaction of any backfill material by flooding or jetting shall not be permitted.

Hand-operated mechanical tampers may be used with approval of the OWNER for compacting backfill.

504.5.3.3. Rejection. If the backfill does not meet the specified density and optimum moisture requirements throughout its depth, the OWNER shall require its removal and replacement to meet the above requirements at the CONTRACTOR'S expense.

504.6. FINAL BACKFILL

Final backfill material is the material required to fill the trench from the top of the initial backfill to ground elevation or subgrade of a street.

504.6.1. Excavated Material. Excavated material may be used in the trench backfill, provided (1) it meets the requirements of Item 504.2.3.3. Type "B" backfill, and (2) the material is approved for backfill by the OWNER.

504.6.2. Stabilized Backfill. Stabilized backfill shall consist of a mixture of native soils including the trench excavation, approved for use by the OWNER, and two sacks of cement per cubic-yard. All material shall be mixed in a concrete mixer or transit mix unless approved otherwise by the OWNER. The stabilized backfill shall be compacted in a moist condition or water added to provide a free flowing mixture. If a free flowing mixture is used, the initial set must be permitted prior to placement of any material on the surface of the stabilized backfill.

504.6.3. Concrete Backfill. Concrete backfill shall consist of selected stone material or granular material mixed with a minimum of two sacks of cement per cubic-yard. All material shall be mixed in a concrete mixer or transit mixed unless approved otherwise by the OWNER.

504.6.4. Granular Material Backfill. Granular material backfill shall meet the requirements of Item 504.2.2.2. Granular Material.

504.6.5. Sand Backfill. Sand backfill shall meet the requirements of Item 504.2.2.6. Sand.

504.6.6. Flowable Backfill. Flowable backfill shall meet the requirements of Item 504.2.3.4. Flowable Backfill.

504.6.7. Modified Flowable Backfill. Modified flowable backfill shall meet the requirements of Item 504.2.3.5. Modified Flowable Backfill.

504.6.8. Fast Set Flowable Backfill. Fast Set Flowable Backfill shall meet the requirements of Item 504.2.3.6. Fast Set Flowable Backfill.

504.7. MEASUREMENT AND PAYMENT OF BACKFILL

504.7.1. Measurement of Backfill Material. Measurement of backfill, which includes embedment and final backfill, shall be made per linear-foot of pipe only if a separate bid item is established in the Contract.

504.7.2. Payment of Backfill Material. Payment for backfill shall be made at the contract unit price per linear-foot of pipe only if a separate bid item is established in the Contract. This shall include furnishing and placing all materials and for all labor, tools, equipment and incidentals necessary to complete the work, all in accordance with the plans and specifications. No allowance for waste shall be made.

504.7.2.1. Special Embedment. If the OWNER orders an embedment material other than that specified in the Contract, it shall be paid for as an extra in price per linear foot of pipe, as compacted in place, except if another class embedment is ordered by the OWNER because the CONTRACTOR has over-excavated the trench width.

If the CONTRACTOR over-excavates the trench width and the OWNER orders another class of embedment to be used, the embedment shall be paid per linear-foot of pipe, compacted in place for the embedment originally specified if the original embedment was specified to be paid as a separate bid item. In lieu of another class of embedment, the CONTRACTOR may elect to use another class pipe if approved by the OWNER. The pipe shall be paid for as specified in relevant Items of Division 500 Underground Conduit Construction and Appurtenances at the unit price per linear-foot for the pipe originally specified if the original pipe was specified to be paid as a separate bid item.

If the CONTRACTOR elects to use another class embedment and the use of the embedment is approved by the OWNER, but not directed by the OWNER, the embedment shall be paid per linear-foot of pipe, compacted in place for the embedment originally specified if the original embedment was specified to be paid as a separate bid item.

504.7.2.2. Final Trench Backfill. If the CONTRACTOR elects to use a material other than the excavated material as trench backfill and the use of the material is approved by the OWNER, but not directed by the OWNER, the material shall be furnished and placed at no cost to the OWNER. The excavated material shall be disposed of at no cost to the OWNER.

If the OWNER orders the excavated material to be removed and disposed of and replaced with another material and a separate bid item is not established, the material shall be paid as an extra. The disposal of the rejected excavated material shall be at no cost to the OWNER.

If the OWNER orders the excavated material to be removed and disposed of and replaced with another material because of neglect of the CONTRACTOR to properly remove or store the material, or if the CONTRACTOR fails to compact the excavated material in the trench to the density requirements and the OWNER orders the material removed, the excavated material shall be replaced with a material approved by the OWNER at no cost to the OWNER. The disposal of the rejected material shall be at no cost to the OWNER.

504.7.2.3. Trench Safety. Payment for trench safety shall be according to the provisions of Item 107.20. Protection of Work and of Persons and Property.

ITEM 505. OPEN CUT – GENERAL CONDUIT INSTALLATION

505.1. GENERAL

505.1.1. Conduit Location. The location of conduit to be installed will be determined by the Engineer using generally accepted design criteria, which includes the current guidelines of the TCEQ.

505.1.2. Location and Protection of Existing Utilities. Location and protection of existing utilities shall be carried out in accordance with Item 107.24. Existing Structures, Facilities and Appurtenances.

505.1.3. Street Cut Permit. If required by the OWNER, the CONTRACTOR shall obtain a street cut permit prior to beginning the work. The CONTRACTOR shall have the executed permit available on the job site during the duration of the work.

505.1.4. Handling and Protection of Materials. All pipe, fittings and specials shall be handled in such a manner as not to damage the material. All dirt and trash shall be removed from the pipe prior to installation. All pipe and fittings handled with clamps or slings must meet with the approval of the OWNER; no hooks shall be permitted.

When it becomes necessary to deflect the pipe to avoid obstructions, the deflection of each joint must be within the limits provided by the manufacturer and be approved by the OWNER.

The pipe is to be kept clean during the laying operation and free of all dirt and trash. At the close of each operating day, the open end of the pipe is to be effectively sealed against the entrance of all objects and especially water.

505.1.5. Stringing of Pipe. Unless prior approval from the OWNER is granted to do otherwise, stringing of pipe in advance of the laying operation shall be restricted to one week's laying and shall be done in such a manner as to create no hazard to not interfere with traffic. Ready access shall be provided to all streets, alleys and driveways. The pipe shall be protected with barricades and warning signs at all times. Any damage to the pipe shall be corrected at the expense of the CONTRACTOR.

505.1.6. Laying Underground Conduit. Prior to being lowered into the trench, each pipe shall be carefully inspected; those not meeting specifications shall be rejected and either destroyed or removed from the job. All lumps or excrescences on the ends of conduit shall be removed before it is lowered into the trench. No pipe shall be laid except in the presence of the OWNER, unless otherwise specified, and the OWNER may order the removal of and re-laying of any pipe not so laid. The pipe and specials shall be so laid in the trench that after the project is completed the interior surface shall conform accurately to the grade and alignment indicated on the plans. Bell holes shall be excavated and all pipe shall be carefully adjusted to fit snugly in cradling or bedding so that the entire length bears on cradling or bedding material with no wedging or blocking to hold up the bell. All pipe shall be laid in the dry, regardless of the type of joint used.

Pipes shall be laid with the bell or groove end upgrade unless otherwise approved by the OWNER and, in any event, shall be laid with the bell or collar away from the last section placed. Pipe must be swabbed clean before placement in the ditch.

Before laying the pipe, the interior of the joints shall be carefully bored smooth and clean and the annular space shall be kept free from dirt, stones or water. Pipe shall be installed and joints made up in complete conformance with the instructions and recommendations regarding proper installation and assembly furnished by the manufacturer. Proper facilities shall be provided for hoisting and lowering the section of the pipe into the trench without disturbing the prepared foundation and the sides of the trench. All pipe shall be so laid that the contact in the joint between two lengths of pipe shall be uniform throughout the circumference of the joint. Where curves in the alignment are indicated on the drawings, standard pipe (short sections of pipe or bevels) shall be used with the outside edge of the joint pulled away from the seat to make a smooth curve.

When work is suspended on the line for any reason, the end of the line shall be properly closed with an effective watertight seal or plug manufactured for this purpose.

505.1.7. Grades. The grade line shown on the profile is the elevation of the invert or flow line of the conduit. The OWNER shall establish benchmarks, base lines and other principal control points for use in construction. It shall be at the CONTRACTOR'S expense to establish all working or construction lines and grades as required and determined from the base measurements and control points set by the OWNER and shall be solely

responsible for the accuracy thereof. Wherever an offset needs to be over 10-ft., the CONTRACTOR shall be required to furnish a survey type tripod level or its equivalent in order to accurately transfer the grade to the trench or excavation. Where construction operations require the removal of the OWNER'S stakes, the CONTRACTOR shall reference such points in an approved manner. If they cannot be referenced, the CONTRACTOR must obtain authorization for their removal. In the case of their destruction or unauthorized removal, they shall be replaced by the OWNER at the CONTRACTOR'S expense.

The full responsibility for holding to alignment and grade shall rest upon the CONTRACTOR.

If a profile is not furnished for a water main, the main shall be constructed with a minimum cover as shown in Table 505.1.7.(a) Water Main Minimum Cover, unless directed otherwise by the OWNER.

Table 505.1.7.(a) Water Main Minimum Cover

Main Size	Minimum Cover (ft.)[1]	
	Unimproved Streets or Open Areas	Improved Streets (Curb, Gutter, and Subsurface Storm Drain)
Less than 12-in.	5-ft.	4-ft.
12-in. through 18-in.	6-ft.	5-ft.
20-in. and larger[2]	7-ft.	6-ft.

1. The minimum cover requirement shall be measured from a point as designated on the plans.
2. May be greater if Air Relief and Vacuum Control Valves are on the main.
3. Unimproved streets are streets without curb and gutter and minimal surfacing.

505.2. GENERAL INSTALLATION REQUIREMENTS FOR PIPE TYPES

505.2.1. Section Held for Future Use

505.2.2. Concrete Pressure Pipe. When required in the project specifications, the pipe manufacturer shall furnish a factory-trained, job-experienced field representative who shall visit the project periodically during the course of installation. The project visiting schedule shall be approved by the OWNER. The field representative shall also be subject to call by the CONTRACTOR and/or OWNER to advise and assist with the solution of field problems. During visits, the representative shall observe all phases of the project including location and condition of pipe, stockpiled and installed pipe, trench width, if applicable, bedding and backfill, assembly of pipe joints and protection of steel. If, in the opinion of the representative, any phase of the installation is unsatisfactory to the extent of jeopardizing the performance of the pipe, representative shall so advise the CONTRACTOR'S superintendent and the OWNER.

After installation, flanged outlets shall be encased with mortar in a pipe diaper.

Test stations shall be provided at the appropriate locations as indicated on the plans to insure proper bonding and effectiveness of cathodic protection measures for concrete pressure pipe.

505.2.3. Concrete Gravity Pipe. Pipe shall be installed in accordance with ASTM C1479 Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations.

505.2.4. Ductile Iron Pipe. Unless otherwise specified by the OWNER, ductile iron pipe shall be protected with a polyethylene encasement that conforms to Item 502.8. Polyethylene Wrap for Metal Pipe and Fittings.

505.2.5. PVC Water Pipe. Pipe produced to the specifications of Item 501.14. Polyvinyl Chloride (PVC) Water Pipe shall be installed in accordance with AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.

505.2.6. PVC Pressure-Rated Pipe Installation. Pipe produced to the specifications of Item 501.15. Polyvinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series) shall be installed in accordance with ASTM D2774 Practice for Underground Installation of Thermoplastic Pressure Piping. An engineering evaluation of specific installation requirements is recommended.

505.2.7. Molecularly Oriented Polyvinyl Chloride Installation and Special Conditions. Installation of pipe meeting specifications of Item 501.16. Molecularly Oriented Polyvinyl Chloride (PVCO) Water Pipe shall be accomplished according to AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water with the following conditions/exceptions:

(1) Solvent cement shall not be used with PVCO pipe.
(2) PVCO pipe must be tapped through a saddle. Direct tapping the wall is not permitted.
(3) The maximum recommended operating temperature is 130°F

505.2.8. PVC Wastewater Pipe Installation. Pipe produced to the specifications of Item 501.17. Polyvinyl Chloride (PVC) Wastewater Pipe & Fittings With Dimension Control shall be installed in accordance with ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications. Engineering evaluations of specific installation requirements is recommended.

505.2.9. PVC Profile Gravity Pipe Installation. Pipe produced to the specifications of Item 501.18. Polyvinyl Chloride (PVC) Profile Gravity Pipe and Fittings – for Direct Bury and Sliplining Applications shall be installed in accordance with ASTM D2321 Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications. Engineering evaluations of specific installation requirements is recommended.

505.2.10. Section Held for Future Use

505.2.11. PVC Corrugated Pipe. Pipe produced to the plans and specifications shall be installed in accordance with ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications or AASHTO Section 30 for any drainage application. Engineering evaluations of specific installation requirements is recommended.

505.2.12. Solid Wall Polyethylene Pipe Installation. Engineering evaluations of specific installation requirements are recommended.

Water pipe produced to the specifications of Item 501.21. Solid Wall Polyethylene Plastic Pipe for Water, Wastewater, and Pipe Rehabilitation shall be installed according to the standard practice of ASTM D2774 Underground Installation of Thermoplastic Pressure Piping, ASTM F1962 Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings, and/or to appropriate engineered pipe bursting techniques.

Wastewater pipe produced to the specifications of Item 501.21. Solid Wall Polyethylene Plastic Pipe for Water, Wastewater, and Pipe Rehabilitation shall be installed according to the standard practice of ASTM D2321 Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications, ASTM D2774, ASTM F1962, and/or to appropriate engineered pipe bursting techniques.

505.2.13. Thermoplastic Corrugated Drainage Tubing and Corrugated Smooth Lined Storm Water Pipe and Fittings. Engineering evaluations of specific installation requirements and pipe type selection are recommended. Installed per ASTM D2321, or AASHTO Section 30 except where installations are under proposed or existing paving; then, follow Item 508.6.5.2. Backfilling to 1 ft. above the top of the pipe.

The internal diameter of the installed barrel of the tube/pipe must not be reduced by more than 5-percent of the actual inside diameter when measured not less than 30-days following completion of installment.

505.2.14. Fiberglass Pipe Installation. Installed pipe produced to the specifications of Item 501.24. Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Wastewater Pipe shall be installed utilizing an envelope of standard crushed rock bedding materials, Item 504.2.2. Pipe Embedment Material for Water And Wastewater Mains to a minimum of 6-in. above the crown of the pipe. Engineering evaluations of specific installation requirements are recommended. The internal diameter of the installed barrel of the pipe must not be reduced by more than 3-percent of its base inside diameter when measured not less than 30-days following completion of installation. Long term deflection shall not exceed 5-percent.

ITEM 506. OPEN CUT – WATER CONDUIT INSTALLATION

506.1. DESCRIPTION

This work shall include the installation and construction, complete in place, of water conduit and appurtenances as specified herein and in conformity with the lines, grades, dimensions, materials and designs shown on the plans.

506.2. MATERIALS

The pipe shall be of the kind and strength shown on the plans and provided in the proposal and contract. Unless otherwise specified, materials shall meet the requirements of Item 501. Underground Conduit Materials and Item 502. Appurtenances. Materials for corrosion protection of water conduits and appurtenances shall be of the type as may be called for on the plans or in the special specifications.

Any pipe, fitting, solder or flux which is used in the installation or repair of any public water system must be lead-free. For the purpose of these Specifications, the term 'lead free' means:

(1) Not containing more than 0.2 percent lead when used with respect to solder and flux; and

(2) Not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.

506.3. LAYING WATER CONDUIT

Laying pipe shall not begin until after the initial embedment has been placed in the trench and after the condition of trench, line and grade have been approved by the OWNER.

The pipe, after being visually inspected and approved for laying by the OWNER, shall be laid, beginning at an existing opening, unless otherwise approved by the OWNER and, in any event, shall be laid with the bell or collar away from the last section placed.

All pipe shall be so laid that the contact in the joint between 2 lengths of pipe shall be uniform throughout the circumference of the joint. Where curves in the alignment are indicated on the drawings and the curves are flat, standard pipe shall be used with the outside edge of the joint pulled away from the seat to make a smooth curve. Deflection of the joint to form curves shall not exceed the limits of Table 2, AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances. Where curves are sharp, short sections of pipe, bevels or bends shall be used and blocked.

When pipe is cut by the CONTRACTOR to insert a valve or fitting, the bell and remaining section may be laid beyond the valve or fitting.

All pipe, fittings, valves, and hydrants shall be carefully delivered to the site and lowered into the trench, piece by piece, by means of a derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to water conduit materials, protective coatings, and linings. Under no circumstance shall water conduit materials be dropped or dumped into the trench.

The pipe and fittings shall be inspected for defects. All lumps, blisters, and excess coating material shall be removed from the bell and spigot ends of each pipe. Additionally, the inside of the bell or coupling and the outside of the spigot shall be wire brushed and wiped clean, dry, and free of all foreign and objectionable material before the pipe is laid. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in line.

506.4. PIPE JOINTS

All joints in pipe shall be thoroughly cleaned at the time the joint is made.

506.4.1. Rubber Gasket Joints. Rubber gaskets shall conform to the applicable specifications under which the pipe is supplied. Loose gaskets shall be protected from sunlight, contamination and contact with gasoline of fuels.

Rubber gasket joints for water conduits consist of 4 general types:

(1) Push-on type used for ductile iron, steel and plastic pipe.

(2) Mechanical type used for ductile iron and fittings.

(3) Rubber and steel joint ring type used for steel cylinder type, reinforced concrete pipe.

(4) Double rubber gasket couplings used for pressure pipe.

Each type, except mechanical, requires the use of a lubricant to facilitate assembly. The lubricant shall be nontoxic, shall not support the growth of bacteria and shall have no deteriorating effect on the gasket. The lubricant shall not impart taste or odor in a pipe that has been flushed in accordance with Item 506.7. Purging and Disinfection of Water Conduits. Care should be taken not to over-use the lubricant since it would then require excess effort to disinfect.

506.5. HYDROSTATIC TEST

Before being accepted, all ductile iron and plastic pipelines constructed shall be tested with a hydraulic test pressure of not less than 150-psi, maintained over a period of not less than 4-hours unless otherwise specified by the OWNER, except that polyethylene pipe shall be tested as described below in Item 506.5.1. Hydrostatic Testing Polyethylene Pipe, unless otherwise specified by the OWNER. Alternately, a 2-hour test may be conducted on PVC in accordance with AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water and a 2-hour test may be conducted on ductile iron in accordance with AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances. Concrete pressure pipe shall be tested with a hydraulic test pressure of 120-percent of the design pressure. Steel pressure pipe shall be tested with a hydraulic test pressure not to exceed 150-percent and not less than 120-percent of the design working pressure. The rate of leakage of all pipe tested shall not exceed 11.65-gallons-per-inch of nominal diameter of pipe per mile over a 24-hour period. Water lines of materials in combination shall be tested for the type of pipe (material) with the least stringent hydraulic test pressure maintained over a period of not less than 4-hours. Acceptable test values are provided in Table 506.5.(a) Allowable Leakage for 4-Hours at Test Pressure of 150-psi.

All newly laid pipe, or any valve section thereof, shall be subjected to the test with the gauge located at the lowest point in the system to be tested. If the line cannot be tested at its lowest point, a correction factor of minus 0.43 lb./vert. ft. shall be made.

Table 506.5.(a) Allowable Leakage for 4-Hours at Test Pressure of 150-psi (gallons)

Length (Ft.)	Pipe Diameter (Inches)															
	6	8	10	12	14	16	18	20	24	30	36	42	48	54	60	66
5	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.06	0.07	0.08	0.09	0.10	0.11	0.12
10	0.02	0.03	0.04	0.04	0.05	0.06	0.07	0.07	0.09	0.11	0.13	0.15	0.18	0.20	0.22	0.24
15	0.03	0.04	0.06	0.07	0.08	0.09	0.10	0.11	0.13	0.17	0.20	0.23	0.26	0.30	0.33	0.36
20	0.04	0.06	0.07	0.09	0.10	0.12	0.13	0.15	0.18	0.22	0.26	0.31	0.35	0.40	0.44	0.49
25	0.06	0.07	0.09	0.11	0.13	0.15	0.17	0.18	0.22	0.28	0.33	0.39	0.44	0.50	0.55	0.61
50	0.11	0.15	0.18	0.22	0.26	0.29	0.33	0.37	0.44	0.55	0.66	0.77	0.88	0.99	1.10	1.21
75	0.17	0.22	0.28	0.33	0.39	0.44	0.50	0.55	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.82
100	0.22	0.29	0.37	0.44	0.51	0.59	0.66	0.74	0.88	1.10	1.32	1.54	1.77	1.99	2.21	2.43
200	0.44	0.59	0.74	0.88	1.03	1.18	1.32	1.47	1.77	2.21	2.65	3.09	3.53	3.97	4.41	4.85
300	0.66	0.88	1.10	1.32	1.54	1.77	1.99	2.21	2.65	3.31	3.97	4.63	5.30	5.96	6.62	7.28
400	0.88	1.18	1.47	1.77	2.06	2.35	2.65	2.94	3.53	4.41	5.30	6.18	7.06	7.94	8.83	9.71
500	1.10	1.47	1.84	2.21	2.57	2.94	3.31	3.68	4.41	5.52	6.62	7.72	8.83	9.93	11.03	12.14
600	1.32	1.77	2.21	2.65	3.09	3.53	3.97	4.41	5.30	6.62	7.94	9.27	10.59	11.92	13.24	14.56
700	1.54	2.06	2.57	3.09	3.60	4.12	4.63	5.15	6.18	7.72	9.27	10.81	12.36	13.90	15.45	16.99
800	1.77	2.35	2.94	3.53	4.12	4.71	5.30	5.88	7.06	8.83	10.59	12.36	14.12	15.89	17.65	19.42
900	1.99	2.65	3.31	3.97	4.63	5.30	5.96	6.62	7.94	9.93	11.92	13.90	15.89	17.87	19.86	21.85
1000	2.21	2.94	3.68	4.41	5.15	5.88	6.62	7.36	8.83	11.03	13.24	15.45	17.65	19.86	22.07	24.27
Valve	0.19	0.25	0.31	0.37	0.44	0.50	0.56	0.62	0.75	0.94	1.12	1.31	1.50	1.68	1.87	2.06

Allowable Leakage (gal.) for 4 hours = 4 x (S x D $\sqrt{P}$) ÷ 133,200

S = Length of Pipe, Ft.
D = Diameter of Pipe, In.
P = 150 psi
Height Correction = 0.43 psi/Ft.

Valve Leakage Allowable = 0.0078 Gal./Hour/In. of nominal valve size
Test — Ductile Iron, Plastic, and at 150 psi
— Concrete 120% of Design Pressure
— Steel 120% Min. to 150% Max. Design Working Pressure

If the tests indicate a leakage in excess of the above rate, then the CONTRACTOR shall be required to find and repair the leak. Even if the test requirements are met, all apparent leaks shall be stopped. Allowance for valve

leakage to the atmosphere may be determined as no more than 0.0078-gal. /hr. /in. of nominal valve size. The OWNER cannot guarantee that an old existing system valve shall hold the required pressure. The CONTRACTOR has the option of plugging the new conduit prior to tying onto the existing system and testing against the old valve. If the old valve does not hold against the test pressure, then the CONTRACTOR must cut and plug the new conduit, hydrostatic test the new conduit, and then complete the tie-in. Internal test plugs may be used in larger reinforced concrete conduits in lieu of plugging prior to making a tie-in.

The cost of testing and repairing the leaks, including all uncovering, repairing, backfilling and incidental work, shall be at the expense of the CONTRACTOR.

506.5.1. Hydrostatic Testing Polyethylene Pipe. Pipe shall be tested after installation is complete and in accordance with ASTM F2164 Standard Practice for Field Testing of Polyethylene (PE) and Cross linked Polyethylene (PLEX) Pressure Piping Systems using Hydrostatic Pressure.

Testing may be conducted on the full system or in sections. Test section length shall be determined by the capacity of the testing equipment. Lower capacity pressurizing or filling equipment may not be capable of completing the test within permissible time limits. If so, higher capacity test equipment or a shorter test section may be required by the OWNER.

Before applying test pressure, CONTRACTOR shall allow time for the test fluid and the test section to equalize to a common temperature. For pressure piping systems that include polyethylene pipe or fittings:

(1) The maximum permissible test pressure is measured at the lowest elevation in the test section.
(2) The maximum permissible test pressure is 150% of the system design operating pressure when the test section is all polyethylene pressure piping.
(3) The maximum permissible test pressure is the pressure rating of the lowest pressure rated, non-polyethylene part in the system when the system contains non-polyethylene parts.

CONTRACTOR shall not subject lower pressure rated, non-polyethylene parts or devices to pressures above their pressure ratings. Lower pressure rated parts may be removed or isolated from the test section to avoid damage or failure. CONTRACTOR shall vent isolated parts or equipment to atmosphere.

All thermoplastic pipes have reduced strength at elevated temperature. Test pressure must be reduced when the test section is at elevated temperature from service conditions or from environmental conditions such as being warmed by the sun. To determine the allowable elevated temperature test pressure, CONTRACTOR shall multiply the test pressure by the appropriate multiplier in Table 506.5.1.(a) Polyethlyene Pipe Elevated Temperature Test Pressure Multipliers.

Table 506.5.1.(a) Polyethlyene Pipe Elevated Temperature Test Pressure Multipliers

Test Section Temperature, T							
°F	T ≤ 80[1]	80< T ≤90	90< T ≤100	100< T ≤110	110< T ≤120	120< T ≤130	130< T ≤140[2]
°C	T ≤ 27[1]	27< T ≤32	32< T ≤38	38< T ≤43	43< T ≤ 49	49< T ≤54	54< T ≤60[2]
Multiplier	1.00	0.90	0.80	0.75	0.65	0.60	0.50

1. Use the 80°F multiplier for 80°F and lower temperatures.
2. The maximum service temperature for polyethylene pressure piping is 140°F.

When testing at pressures above system design pressure or up to 150% of the system design pressure, the maximum test duration is 8-hours including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize the test section. If the test is not completed due to leakage, equipment failure, or for any other reason, CONTRACTOR shall depressurize the test section completely, and allow it to relax for at least 8-hours before pressurizing the test section again.

Testing procedure shall be carried out as follows:

(1) Filling. CONTRACTOR shall fill the restrained test section completely with test liquid.

> **WARNING** – CONTRACTOR shall ensure that there is no air trapped in the test section. Failure with entrapped air can result in explosive release. CONTRACTOR shall use equipment vents at high points to remove air.

(2) Initial Expansion Phase. CONTRACTOR shall gradually pressurize the test section to test pressure, and maintain test pressure for 3-hours. During the initial expansion phase, polyethylene pipe will expand slightly. Additional test liquid will be required to maintain pressure. It is not necessary to monitor the amount of water added during the initial expansion phase.

(3) Test Phase. Immediately following the initial expansion phase, CONTRACTOR shall reduce test pressure by 10-psi, and stop adding test liquid. If test pressure remains steady (within 5% of the target value) for 1-hour, no leakage is indicated.

(4) Depressurizing. At the conclusion of the test, CONTRACTOR shall carefully depressurize the test section by the controlled release of test liquid. The test liquid may need to be drained and its disposal shall be subject to applicable environmental regulations.

506.6. CONNECTIONS TO EXISTING WATER CONDUITS

Connection to an existing water conduit shall include not only branch connections but in-line connections for the purpose of making required pipe adjustments as well. Any connection or series of connections required to be performed on an existing water conduit shall meet with the OWNER'S specific approval as to the seasonal period when the work can be performed, the length of time required for the work to be completed, the work procedures proposed, and/or any other facet that could affect quality or quantity of water supply to the affected area. The work shall be performed with stringent built-in safeguards (such as adequate back-up equipment, labor and materials available) to insure that time schedules are met without failure and subsequent set-back. Every effort shall be made to accomplish as much of the work as possible before actual tie-in is made into the existing conduit. This is especially applicable where vertical and horizontal concrete thrust blocks are a necessity to impose proper restraint of the pipe when the conduit is returned to full service. See Standard Drawings 4010A – 4040 for vertical and horizontal thrust blocks.

The CONTRACTOR shall notify the OWNER at least 48-hours in advance of a required valve shutdown.

Where indicated on the plans and/or herein specified, the CONTRACTOR shall connect the new conduit to existing conduits. The CONTRACTOR shall furnish all labor, materials, equipment and services required for the locating and uncovering of the existing line; the making of cuts in the existing line; the removal, relocation, and/or lowering of existing lines as required (See Standard Drawing 4200); dewatering of the trench; connecting of the existing lines to the new conduit; and all appurtenant work required for complete connection. Appurtenant work shall follow the requirements stated herein and as specified in Item 502. Appurtenances. Relocated conduits or lines shall be laid so that all valves shall be set vertically. The CONTRACTOR shall be required to plug and block lines, crosses, tees or other fittings installed in the new conduit to permit hydrostatic testing and chlorination prior to making connections. Such plugs and blocking shall be adequate to withstand an applicable test pressure.

Where cut-ins are made immediately adjacent to valves which are under pressure, the CONTRACTOR shall take all necessary precautions to brace such valves with temporary blocking. Bracing shall be of ample size and properly placed to prevent movement or blowing off of any pipe, valves or fittings due to water pressure on the conduit.

Connections to existing water conduits shall be made at the locations shown, as specified, and/or as directed by the OWNER. All such connections shall be made in a most expeditious and workmanlike manner to cause the least inconvenience to water customers and to traffic. The detailed schedule of operations for making each connection shall be approved by the OWNER before any work thereupon is commenced.

In the case where blow-off connections or fire hydrants are not provided for flushing, the CONTRACTOR shall be required to leave one end of the new conduit open for flushing and then plug and block the end for chlorination and testing.

There shall be no separate pay items for taps, blow-offs for hydrostatic testing, disinfection purposes, and connections to existing water mains unless otherwise approved by the OWNER. Taps and blow-offs for hydrostatic testing and disinfection purposes shall be installed by the CONTRACTOR, at locations specified by the OWNER. This may include placing a blow-off on an existing conduit at the tie-in, or addition of a blow-off(s) at an isolated existing valve, for facilitation of hydrostatic testing and/or chlorination. Compression type curb stops are not permitted for blow-offs

Upon completion of the hydrostatic testing and disinfection the CONTRACTOR shall return to the job site and remove the blow-off down to the corporation stop. CONTRACTOR shall leave the corporation stop and backfill,

replacing all pavement. Removal of the blow-off shall include all labor, materials, tools, equipment, and incidentals necessary to complete the work, including excavation, disposal of surplus materials, and backfill with no separate pay item.

506.6.1. Water Main Tie-In During Off Hours. Tie-in connections affecting curtailment of quality or quantity of water to an area, businesses, etc., must be performed during the weekend or off-hours. All work must be coordinated through the OWNER or its representatives. Delay costs due to shut down and connection issues are considered incidental work and shall be borne by the CONTRACTOR. Unless otherwise stated in the contract, this item is a No Separate Pay Item.

506.7. PURGING AND DISINFECTION OF WATER CONDUITS

506.7.1. General. Before any newly constructed water conduit shall be permitted to be placed into service, it shall be purged and tested or purged, disinfected and tested until the bacterial count within the conduit meets the standards of disinfection according to Federal and State regulations.

The CONTRACTOR shall perform the purging, disinfection and testing activities unless the OWNER specifies otherwise. Should the CONTRACTOR'S carrier be required to transport potable water to the job site for conduit testing, tankage and all piping, including pumps used to transport or transfer potable water into the conduit, shall be disinfected and/or approved for that use by the OWNER.

When the entire pipeline or selected sections, as approved by the OWNER, have been completed, the line or section shall be disinfected according to the following procedures.

Table 506.7.1.(a) Required Flow and Openings to Flush Pipelines at 40 psi Pressure

Pipe Diameter (in)	Flow Required 2.5 ft/sec (gpm)	Size of Tap			Number of 2½ " Hydrant Outlets on Pipe
		1	1½	2	
4"	100	1	-	-	1
6"	200	-	1	-	1
8"	400	-	2	1	1
10"	600	-	3	2	1
12"	900	-	-	2	2

506.7.2. Pre-Disinfection. Before being chlorinated, the main(s) shall be filled to eliminate air pockets and shall be flushed to remove particulates. The flushing velocity in the main shall not be less than 2.5 ft/s unless the OWNER determines that conditions do not permit the required flow to be discharged to waste. Flushing is no substitute for disinfection measures during construction.

Certain contaminates, such as caked deposits, resist flushing at any feasible velocity. In mains of 24 inch diameter and larger, an acceptable alternative to flushing is to broom-sweep the main, carefully removing all sweepings prior to chlorinating the main.

For convenience in certain locations, it may be directed by the OWNER that hypochlorite be placed in the pipe as laid.

506.7.3. Purging. Purging may be accomplished by passing an appropriate sized "poly-pig(s)" through the pipe or by flushing, as determined by the OWNER.

506.7.3.1. Poly-Pig Method. If the poly-pig method of purging is to be used, the CONTRACTOR shall be required to prepare the conduit for the installation and removal of "poly-pigs." The OWNER shall purge the system unless the CONTRACTOR is specified to do the work. This method shall include the following:

(1) In general, this shall consist of furnishing all equipment, material, and labor to satisfactorily expose cleaning wye, remove cleaning wye covers, etc., as directed by the OWNER.

(2) Where expulsion of the "poly-pig" is required through a dead-ended conduit, the CONTRACTOR shall make every effort to prevent back flow of purged water into the conduit after passage of the pig. On small pipe, such as cast iron pipe through 12-in., backwater re-entry into the pipe can be prevented

by the temporary installation of mechanical joint shallow bends and pipe joints to provide a riser out of the trench. On larger pipe, additional excavation of the trench may serve the same purpose.

(3) Where the pipe in the conduit forms a loop distribution system, every effort shall be made to sweep the entire system.

(4) Short dead-end pipe sections not swabbed by the pig shall be flushed.

(5) Backflow water which has inadvertently entered the pipe under conditions similar to those described in Item 506.7.3.1. (2) preceding shall be flushed from the system.

(6) After passage of the "poly-pig," flushing of all backwater from the pipe, and satisfactory test results, at the direction of the OWNER, the CONTRACTOR shall: secure test location openings by plugging and blocking, installing cleaning wye blind flanges, etc.; then backfill; and complete all appurtenant work necessary to secure the system, or proceed with disinfection.

506.7.3.2. Flushing Method. If the "flushing" method of purging is used, the CONTRACTOR shall be required to prepare the conduit by installing blow-offs at locations and sized as directed by the OWNER. This method shall also include the following:

(1) In general, this shall consist of furnishing all equipment, material and labor to satisfactorily install blow-offs of sizes shown in Table 506.7.3.2.(a) Flushing Method Blow-Off Requirements.

Table 506.7.3.2.(a) Flushing Method Blow-Off Requirements

Size Conduit	Size Blow-Off
2-in. thru 8-in.	¾-in.
10-in. thru 12-in.	1½-in.
16-in. and greater	2-in.

(2) After flushing is complete and satisfactory test results are received at the direction of the OWNER, the CONTRACTOR shall secure the conduit, backfill, and complete all appurtenant work to secure the system, or proceed with disinfection. The CONTRACTOR shall, in the securing of the conduit, remove the blow-off down to the corporation stop.

506.7.4. Water Sample Analysis. After purging, an analysis may be made on the water sample drawn from a chlorination blow-off and sampling point at the OWNER'S request. (Samples drawn from fire hydrants have in the past proved unreliable and except in extreme cases shall not be used for the purpose of analysis.) Should the analysis indicate that the bacteria count is below the limits of the established standards for purity, no further disinfection is necessary unless specifically required by the OWNER.

506.7.5. Disinfection. Disinfection of the conduit shall be accomplished by the "continuous feed" method or the "slug" method as directed by the OWNER and described as follows. The free chlorine amounts shown are minimum. Higher rates may be required by the OWNER. Calcium hypochlorite granules shall be used as the source of chlorine.

506.7.5.1. CONTRACTOR Requirments. No matter who performs the disinfection activities described below, the CONTRACTOR shall be required, as a minimum, to prepare the conduit for disinfection and secure same after chlorination is complete. This shall include the following:

(1) In general, this shall consist of furnishing all equipment, material and labor to satisfactorily prepare the conduit for the disinfection method selected by the OWNER. The CONTRACTOR shall also be required to provide adequate provisions for sampling.

(2) Unless otherwise specified in the special contract documents, the CONTRACTOR shall make all necessary taps into the pipe to accomplish chlorination of a new line.

(3) After satisfactory completion of the disinfection operation and at the direction of the OWNER, the CONTRACTOR shall remove surplus pipe at the chlorination and sampling points, plug the remaining pipe, backfill, and complete all appurtenant work necessary to secure the conduit.

506.7.5.2. Continuous Feed Method. If the "continuous feed" method of chlorination is used, the following steps shall be taken:

(1) Water from the existing distribution system or other approved source of supply shall be made to flow at a constant rate in the newly laid conduit.

(2) At a point not more than 10-ft. downstream from the beginning of the new conduit, water entering the new conduit shall receive a dose of chlorine such that the water shall have not less than 100-mg/L free chlorine, or as required by TCEQ, whichever is greater. Chlorine applications shall not cease until the entire conduit is filled with heavily chlorinated water.
(3) The chlorinated water shall be retained in the conduit for at least 24-hours, during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. Every effort shall be made to prevent the flow of chlorinated water into conduits in active service. At the end of the 24-hour period, the treated water in all portions of the conduit shall have a residual of at least 10-mg/L free chlorine.
(4) The heavily chlorinated water shall then be flushed from the conduit and disposed of in a manner and at a location specified by the OWNER.
(5) The chlorine residual shall be tested prior to flushing operations. If the chlorine residual exceeds 4-mg/L, the water shall remain in the new water conduit until the chlorine residual is less than 4-mg/L. The CONTRACTOR may choose to evacuate the water into water trucks or other approved storage facility and treat the water with Sodium Bisulfite or another dechlorination chemical or method appropriate for potable water and approved by the OWNER until the chlorine residual is reduced to 4-mg/L or less. After the specified chlorine residual is obtained, the water may then be discharged into the drainage system or utilized by the CONTRACTOR.

506.7.5.3. Slug Method. If the "slug" method of chlorination is used, the following steps shall be taken:
(1) Water from the existing distribution system or other approved source of supply shall be made to flow at a constant rate in the newly laid conduit.
(2) At a point not more than 10-ft. downstream from the beginning of the new conduit, water entering the conduit shall receive a dose of chlorine such that the water shall have not less than 100-mg/L free chlorine. The chlorine shall be applied continuously and for a sufficient time to develop a solid column or "slug" of chlorinated water that shall expose all interior surfaces to the "slug" for at least 3-hours.
(3) As the chlorinated water flows past the fittings and valves, they shall be operated so as to disinfect the appurtenances. Every effort shall be made to prevent the flow of chlorinated water into conduits in active service.
(4) The heavily chlorinated water shall then be flushed from the conduit and disposed of in a manner and at a location specified by the OWNER.

506.7.5.4. Sampling. Unless otherwise specified, the OWNER'S personnel or representative shall inject the chlorine disinfectant into the conduit, monitor the solution and perform the water analysis.

An OWNER'S representative shall take water samples from a suitable tap (not through a fire hydrant) for analysis by the OWNER'S laboratory, unless otherwise specified in the special provisions or in the plans. No hose or fire hydrant shall be used in the collection of samples.

Microbiological sampling shall be done prior to connecting the new conduit into the existing distribution system in accordance with AWWA C651 Disinfecting Water Mains. Samples for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate. Two consecutive sets of acceptable samples, taken at least 24-hours apart, shall be collected from the new conduit. At least one set of samples shall be collected from every 1,000-linear-feet of the new water conduit, plus one set from the end of the line and at least one set from each branch. If trench water has entered the new conduit during construction or, if in the opinion of the Engineer, excessive quantities of dirt or debris have entered the new conduit, bacteriological samples shall be taken at intervals of approximately 200-linear-feet. Samples shall be taken of water that has stood in the new conduit for at least 16-hours.

Unsatisfactory test results shall require a repeat of the disinfection process and resampling as required above until a satisfactory sample is obtained.

506.8. PLUGS

Permanent plugs shall be placed at the ends of all pipe.

506.8.1. Cut and Plugs. Cut and plugs will only be paid when a CONTRACTOR is required to excavate at a separate location outside of the on-going pipeline installation. All other cut and plugs (those that require plugs only) associated with the same excavation when connecting the new pipeline to an existing pipeline is considered incidental work and is not a separate pay item. Actual cut & plugs shall be paid under appropriate bid item numbers.

506.9. MEASUREMENT AND PAYMENT

506.9.1. Measurement. Pipe, including corrosion protection if in place on the pipe, shall be measured for payment in linear feet along the center line of the pipe actually laid. No deductions shall be made for fittings and valves, measurements being from center to center of fittings. Where a change in the size of the pipe occurs in the line, the measurement shall be to the center of the fitting. Where a change in the size of the pipe occurs in line, the measurement shall be to the center of the reducer. Conduits shall not be classified for payment according to the depth of the cut.

A pay item shall be included for connections to existing conduits unless otherwise specified in the Contract.

506.9.2. Payment. Pipe, including corrosion protection in placed on the pipe, shall be paid for at the contract unit price per linear foot, and completed in place, as provided by the proposal and contract.

Connections to existing conduits shall include furnishing and placing of fittings, valves, pipe and concrete blocking in accordance with Item 502. Appurtenances.

Where plugs are classified separately as contract pay items, payment shall be made in accordance with the contract unit price per each, complete in place, as provided in the contract. Such price shall be total compensation for furnishing all labor, materials, tools, equipment and incidentals necessary to complete the work, including all excavation, disposal of surplus material and backfill, all in accordance with the plans and specifications.

The contract price per linear foot of conduit shall be the total compensation for the furnishing of all labor, materials, tools, equipment and incidentals necessary to complete the work, including excavations, backfill, and disposal of surplus materials in accordance with the plans and these specifications.

Measurement and payment for hydrostatic testing and disinfection shall not be applicable under this construction specification unless specified otherwise. The CONTRACTOR shall provide materials, equipment and services in support of both purging and disinfection of the conduit. All costs for these services shall be included in the unit price bid in the proposal per foot of pipe complete in place, and no other compensation shall be allowed.

ITEM 507. OPEN CUT – WASTEWATER CONDUIT INSTALLATION

507.1. DESCRIPTION

This work shall include the installation and construction, complete in place, of wastewater conduits and appurtenances as specified herein and in conformity with the lines, grades, dimensions, materials and designs shown on the plans.

507.2. MATERIALS

The pipe shall be of the kind and strength shown on the plans and provided in the proposal and contract. Unless otherwise specified, materials shall meet the requirements of Item 501. Underground Conduit Materials and Item 502. Appurtenances.

507.3. LAYERING WASTEWATER CONDUIT

CONTRACTOR shall follow the same standard of care and general sequence as that described in Item 506.3. Laying Water Conduit. Appurtenance installation shall meet the requirements of Item 502. Appurtenances.

507.4. WASTEWATER CONDUIT JOINTS

507.4.1. Rubber Gasket Joints. Rubber gaskets shall conform to applicable specifications under which the pipe is supplied. Loose gaskets shall be protected from sunlight, contamination and contact with gasoline or fuels. On pipe for which the gasket is not fixed in place by the manufacturer, the bell-and-spigot or tongue-and-groove shall be thoroughly cleaned by wire brushing and wiping until clean and dry. On pipe which does not require the rubber gasket to be cemented in place, the rubber gasket shall be placed in position on the spigot ring just prior to laying the pipe. The lower edge of the gasket shall be placed under the spigot, in the seat and stretched evenly upward on each side to fit over the top of the spigot, and the rubber gasket shall fit snugly and not have uneven tensile stresses.

After checking to be sure that the bell-and-spigot are thoroughly clean, the inside surface of the bell shall be lubricated with a suitable solution (flax soap) to facilitate the telescoping of the joint. Petroleum lubrication shall not be permitted. The spigot end of the pipe shall be entered into the bell of the adjoining pipe until it contacts the gasket uniformly. The pipe shall then be pushed into the bell to the reference mark (a distinct circumferential line), which is placed on the pipe's spigot end by the manufacturer to indicate the correct depth of penetration. If undue resistance to insertion of the pipe end is encountered, or if the reference mark does not position properly, CONTRACTOR shall dissemble the joint and check the position of the gasket. If the gasket is twisted or pushed out of its seat, CONTRACTOR shall inspect components, repair or replace damaged items, clean the components, and repeat the assembly steps. Exceptional care shall be taken in making the field joint. Bumping of the pipe shall not be permitted. On small pipe, if the bottom of the trench is firm enough, a bar having a blade on the end may be pushed into the ground; then the bar may be used as a lever to push the pipe home. However, if trench conditions are too unstable or are in rock, it shall be necessary to use mechanical means to bring the pipe together positively. Each joint shall be partially backfilled or suitably blocked to prevent creeping.

Unless otherwise specified in the special provisions or in the plans, for all sizes of concrete pipe larger than 24-in. in diameter, the inside annular space provided for that purpose shall be completely filled with a plastic Portland cement mortar (composed of 1-part-cement to 2½-parts-sand), preformed flexible joint sealant in rope form, or toweling type.

Where the pipe has been corrosion protected and an annular space is open, only the bottom half of the inside annular space shall be filled with mortar, and a ready-mix cold-pour compound shall be used in the upper half, as hereinbefore described, that is resistant to acid alkalis and gases and is compatible with rubber. The joint shall be finished smoothly and all surface materials removed.

507.4.2. Chemically Welded Joints. The joint materials shall conform to the applicable specifications under which the pipe is supplied. The joint shall be installed per recommendations of the manufacturer. The ditch embedment should be to grade, with the advance bell hole scooped out prior to laying so that the pipe shall be to grade as the joint is made.

507.4.3. Compression Joints. The joint materials shall conform to the applicable specifications under which the pipe is supplied. The bells and spigots must be thoroughly clean. Extreme care must be

exercised to prevent damage to the joint. The spigot end shall be inserted into the bell and pushed home after a suitable lubricant, as recommended by the pipe manufacturer, is applied. Petroleum lubrication shall not be permitted. The ditch embedment should be to grade, with the advance bell hole scooped out prior to laying so that the pipe should be to grade as the joint is made.

507.4.4. Joints for Closure Sections. Spigot-to-spigot closures: clay pipe (4-, 6- and 8-in.) to clay pipe (4-, 6- and 8-in.), cast iron soil pipe (4-, 5- and 6-in.) to clay pipe (4- and 6-in.) and asbestos-cement pipe (4-, 6- and 8-in.) to clay pipe (4-, 6- and 8-in.) shall be made using a synthetic rubber or plastic compressible type coupling as detailed on the appurtenance sheet that shall conform to Item 501.2.4. Joints. The two bands for patching the coupling shall be corrosion-resistant steel or stainless steel. The band shall be tensioned to provide a residual compression of at least 30-psi between coupling and the pipe.

Closures of 4-in. clay bell to 4-in. cast iron spigot (for lateral cleanouts) and of 6-in. clay spigot to 6-in. concrete bell (rubber gasket type joint) shall be made, using compression type, wedge shaped synthetic rubber or plastic adapter rings, as detailed on the appurtenance sheet that shall conform to Item 501.2.4. Joints. The adapter shall be lubricated to facilitate making the joint after the ends and bells have been thoroughly cleaned. All closure section and sections jointed shall be sawed at right angles to the centerline of the section.

507.4.5. Other Joints. Other type joints should be installed as per instructions from the pipe or joint manufacturer, after approval of the joint by the OWNER.

507.5. TESTS AND INSPECTIONS

In order to ascertain that the main shall perform the function for which it was designed and constructed, performance tests shall be routinely executed. Inspection by closed circuit television shall be performed when so desired by the OWNER. Infiltration or exfiltration or air tests, as determined by the OWNER, may be made on sections of the contract work to assure that contract performance is satisfactory. All wastewater pipe shall be air tested upon completion of backfill. Wastewater force mains shall be hydrostatically tested.

507.5.1. Pipe Testing. Tunneled, bored or jacked sections of all pipe shall be tested by a method to be determined by the OWNER.

Testing shall be performed by the CONTRACTOR in the presence of the OWNER after all backfilling and compaction are complete. All sections between manholes or between a manhole and a dead end shall be tested separately. In the making of all tests, the CONTRACTOR shall furnish the required equipment and labor, under the direction of the OWNER. Tests may be repeated until each wastewater conduit individually meets the specifications as to quantity of allowable infiltration or exfiltration or air leakage as set out below. All testing work shall be included in the bid price.

If a gravity main is specified to be hydrostatically tested, the test shall be in accordance with Item 506.5. Hydrostatic Test, except that the test pressure, duration of the test, and allowable leakage shall be specified. The CONTRACTOR shall remove the test water from the main after the test if required by the OWNER.

507.5.1.1. Infiltration Test (Not Commonly Used). The total seepage in infiltration of ground water as determined by test shall in no case exceed 50-gallons-per-inch of nominal diameter of pipe per mile over a 24-hour period, and shall be the same regardless of piping material used. The allowable leakage of each manhole, or other structure, shall be as specified on the plans. An infiltration test or tests shall be made on all sections of the project where air testing could not be adequately performed or if ordered by the OWNER and on each manhole individually before placing the system in service and before any connections are made to other wastewater conduits. If the quantity of the effluent into the conduit or conduits is in excess of the maximum quantity as hereinbefore specified, the joints shall be repaired or the wastewater conduit relayed, if necessary, or other remedial construction shall be performed by and at the expense of the CONTRACTOR, in order to reduce the quantity of ground water infiltration to an amount within limits as specified.

The test shall be made by utilizing ground water, if any, or flooding a section at a time. Observation from jetting is not acceptable.

It is the intent of the OWNER that no allowance shall be made for seepage of ground water at the time the test is performed (zero infiltration). The actual connection to the existing system will not be permitted without prior approval of the OWNER. It is the intent of the OWNER to complete the construction

of new wastewater mains and test the system prior to any connection to the existing system. Exceptions may be made by the OWNER in the event an existing main is to be connected to the new main upstream of the outfall of the new main. A stopper may be used until a tie-in is approved by the OWNER.

507.5.1.1.1. Using Existing High Ground Water. Where the natural ground water, after well points are removed, is above the top of the pipe for a section, the flowing of water in the pipe and the rate of seepage and infiltration for the section so submerged can be measured.

507.5.1.1.2. Flooding by Sections. Backfill shall be brought up to at least 1-ft. over the pipe on the section to be tested. More cover may be required on larger pipes to prevent the pipe from floating out of grade. Dams or dikes are placed tightly around pipe at either end and the ditch filled with water to an average depth of 4-ft. over the pipe. Flow at the lower end is measured for the section so submerged.

Dikes shall be placed around each manhole, and the area adjacent to the manhole shall be flooded to the top of the manhole and the flow into the manhole measured.

507.5.1.2. Exfiltration. A section of pipe below a manhole is bulk headed at either end with a 6-in. pipe inserted into lower bulkhead and by use of a 90-degree bend. The 6-in. pipe is set in a vertical position. A 2-in. vent pipe is inserted in lower end and extended upward 4-ft.. The 6-in. pipe is filled with water, filling the wastewater conduit until all air is forced out through the vent tube. When the water levels are level in the 2-in. and 6-in. pipes, the drop in the 6-in. pipe due to exfiltration over a specific time shall be measured and the loss of water due to exfiltration calculated. This amount shall be reduced by 25-percent to obtain equivalent infiltration over a specific time and the loss of water due to exfiltration calculated. Conditions encountered in construction may vary this procedure slightly, but essentially this method shall be used.

507.5.1.3. Low Pressure Air Testing. The CONTRACTOR shall furnish adequate personnel and equipment required to perform the tests. This test covers procedures for testing wastewater pipelines when using the low pressure air test method to demonstrate the integrity of the installed pipe line and the construction procedures. This test is used for testing 4-in. to 33-in. circular wastewater pipelines utilizing gasketed joints. Lines with a 27-in. and larger inside diameter may be tested by the individual joint method.

The low pressure air test was developed to enable detection of damaged pipe or improper jointing and is a test which determines the rate at which air under pressure escapes from an isolated section of wastewater conduit. The rate of air loss is intended to indicate the presence or absence of pipe damage and whether or not the joints have been properly constructed. The test is not intended to indicate water leakage limits and cannot be used as a measure of infiltration or exfiltration leakage under service conditions.

507.5.1.3.1. Preparation of the Wastewater Line to be Tested. The section of wastewater line to be tested shall be flushed and cleaned prior to conducting the low pressure air test. This serves to clean out the debris, wet the pipe and produces the most consistent results.

507.5.1.3.2. Low Pressure Air Line Test Procedures. The procedure for the low pressure air test shall conform to the procedures described in ASTM C828 Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines, ASTM C924 Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method, ASTM F1417 Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air, or other appropriate procedures, except for testing times. Testing times shall be as outlined in this Item.

Isolate the section of wastewater line to be tested by means of inflatable stoppers or other suitable test plugs. The ends of all branches, laterals, tees, wyes and stubs to be included in the test should be plugged to prevent air leakage. All plugs should be securely braced to prevent possible blow out due to the internal air pressure. One of the plugs should have an inlet tap, or other provision for connecting a hose to a portable air control source.

Connect the air hose to the inlet tap and a portable air control source. The air equipment shall consist of necessary valves and pressure gauges to control the rate at which air flows into the test

section and to enable monitoring of the air pressure within the test section. The testing apparatus shall be equipped with a pressure relief device to prevent the possibility of loading the test section with the full capacity of the compressor.

Add air slowly to the test section until the pressure inside the pipe is raised to 3.5-psi greater than the pressure exerted by groundwater above the pipe.

After adequate pressure is obtained, regulate the air supply so that the pressure is maintained for a period of 2-minutes. This allows the air temperature to stabilize in equilibrium with the temperature of the pipe walls. The pressure will normally drop slightly until equilibrium is obtained. During this period all assessable plugs shall be checked with soap solution to detect any plug leakage.

Once the pressure is stabilized, the minimum time allowable for the pressure to drop from 3.5-psig to 2.5-psig shall be computed from the following equation:

$$T = (0.0850 \times D \times K) \div Q$$

where
- T = time, seconds
- K = 0.000419 DL, but not less than 1.0
- D = average inside pipe diameter, in.
- L = length of line of same pipe size being tested, ft.
- Q = rate of loss, 0.0015 cu. ft./min./sq. ft. internal surface shall be used

Minimum holding times required according to pipe diameter are shown in Table 507.5.1.3.2.(a) Duration Requirements for Air Testing. The test may be stopped if no pressure loss has occurred during the first 25% of the calculated testing time. If any pressure loss or leakage has occurred during the first 25% of the testing period, then the test shall continue for the entire test duration, as outlined in Table 507.5.1.3.2.(a), or until failure.

Upon completion of the test, the bleeder valve is opened and all air is allowed to escape. Plugs shall not be removed until all air pressure in the test section has been released. No one shall be allowed in the trench or manhole while the test is being conducted.

Table 507.5.1.3.2.(a) Duration Requirements for Air Testing

Time Required for Loss of Pressure from 3.5 psig to 2.5 psig for Size and Length of Pipe Indicated for Q = 0.0015 and initial K = 1.0

Pipe Dia. (in.)	Minimum Time[1] (sec.)	Length for Min. Time (ft.)	X for Longer Length[2]	Test Time (sec.) for Length (L) (ft.) Shown							
				100 ft.	150 ft.	200 ft.	250 ft.	300 ft.	350 ft.	400 ft.	450 ft.
4	227	597	0.380	227	227	227	227	227	227	227	227
6	340	398	0.855	340	340	340	340	340	340	342	385
8	453	298	1.520	453	453	453	453	456	532	608	684
10	567	239	2.374	567	567	567	567	712	831	950	1068
12	680	199	3.419	680	680	684	855	1026	1197	1368	1539
15	850	159	5.342	850	850	1068	1336	1603	1870	2137	2404
18	1020	133	7.693	1020	1020	1539	1923	2308	2692	3077	3462
21	1190	114	10.471	1190	1571	2094	2618	3141	3665	4188	4712
24	1360	99	13.676	1368	2051	2735	3419	4103	4787	5470	6154
27	1530	88	17.309	1731	2596	3462	4327	5193	6058	6924	7789
30	1700	80	21.369	2137	3205	4274	5342	6411	7479	8548	9616
33	1870	72	25.856	2586	3878	5171	6464	7757	9050	10343	11635

1. The test may be stopped if no pressure loss has occurred during the first 25% of the calculated testing time. If any pressure loss or leakage has occurred during the first 25% of the testing period, then the test shall continue for the entire test duration, as outlined above, or until failure.
2. X is a factor used to find test duration time (t) for total length (L), where L must be greater than minimum length in the following equation: t = X(L)

507.5.1.3.3. Individual Joint Test Method. All wastewater conduit 36-in. and larger in diameter shall be 100% air tested at each joint connection only. A visual inspection of each joint shall be performed immediately after testing. The method of testing shall be described in Item 507.5.1.3.2.

Low Pressure Air Line Test Procedures except for test time. The time allowed for the pressure drop from 3.5 psig to 2.5 psig shall be 10-seconds. No joint shall be air tested until the pipe has been backfilled. Air testing shall be performed as pipe installation progresses. At no time shall pipe installation exceed 100-feet from the last joint tested. If the joint fails to pass the joint air test, necessary repairs as recommended by the pipe manufacturer may be made if approved by the OWNER and the joint retested. Failure to pass the air test after repairs have been made may be cause for rejection.

507.5.1.4. Flexible Pipe (Deflection) Testing. Upon completion of flexible wastewater pipe installation, the CONTRACTOR shall test pipe for vertical deflection. Deflection tests shall be performed no sooner than 30-days after complete pipe placement and densification of backfill. The pipe shall be cleaned and inspected for offsets and obstructions prior to testing.

Deflection testing shall be performed by the CONTRACTOR at no cost to the OWNER. No payment will be made for delays that result from the CONTRACTOR's performance of deflection testing.

Nominal inner diameter 27-in. or smaller shall be tested by mandrel. For all pipes 27-in. ID or smaller, the mandrel shall be pulled through the pipe by hand to ensure that maximum allowable deflections have not been exceeded. Pipe with nominal ID larger than 27-in. up to and including 36-in. nominal ID may be tested by an alternate method as approved by the OWNER. If a mandrel is selected to test pipe between 27-in. up to and including 36-in., the minimum diameter, length and other requirements shall conform to the dimensions and requirements as stated below. Deflection measurement for ID's nominally larger than 36-in. shall be determined using a 1-in. diameter rigid, nonadjustable metal bar approved by the OWNER; a minimum-radius rigid template; or by a method approved by the OWNER.

507.5.1.4.1. Mandrel. Prior to use, the mandrel shall be certified by the Engineer or by another entity approved by the Engineer. Use of an uncertified mandrel or a mandrel altered or modified after certification will invalidate the deflection test. Mandrel requirements are as follows:

(1) odd-number of legs with 9 legs minimum
(2) effective length not less than its nominal diameter
(3) fabricated of rigid and nonadjustable steel
(4) fitted with pulling rings at each end
(5) stamped or engraved on some segment other than a runner indicating the pipe material specification, nominal size, and mandrel OD (e.g., PVC D3034-200nim-187.10mm; PVC D3034-8"-7.366")
(6) furnished in a suitable carrying case labeled with the same data as stamped or engraved on the mandrel
(7) minimum diameter at any point along the full length as indicated in Table 507.5.1.4.1.(a) Mandrel Sizing

Table 507.5.1.4.1.(a) Mandrel Sizing

Pipe Material	Nominal Size	ASTM Baseline Minimum Mandrel Diameter[1]
	Inches	Inches
PVC-ASTM D3034 (SDR 26)	6	5.33
	8	7.11
	10	8.87
	12	10.55
	15	12.90
PVC-ASTM D3034 (SDR 35)	6	5.46
	8	7.28
	10	9.08
	12	10.79
	15	13.20
PVC-ASTM F679	18	16.92
	21	19.95
	24	22.45
	27	25.30
	30	28.50

1. Metric mandrel diameters are rounded conversions of mandrel diameters in U.S. Standard Measures. If and when the types of pipe are available and specified by the appropriate ASTM in metric dimensions as the primary measure, the Engineer shall determine the appropriate mandrel diameter according to the requirements of this subsection.
2. Mandrels for Fiberglass Reinforced Polymer Mortar (FRPM) shall be per manufacturer's specification at maximum 3% deflection.
3. For pipe sizes and mandrels not specified on table, mandrels should be sized to pipe manufacturer's maximum recommended deflections.
4. For larger diameter mandrel sizes, consult with the manufacturer.

507.5.1.4.2. Maximum Allowable Deflections. The maximum average ID shall be equal to the average OD per applicable ASTM Standard minus two minimum wall thicknesses per applicable ASTM Standards. Manufacturing and other tolerances shall not be considered for determining maximum allowable deflections.

Maximum allowable deflections shall be governed by the mandrel requirements as stated above and shall nominally be as follows, except that deflections of up to 6.5% of the nominal inside diameter are acceptable for drainage applications:

(1) Three (3) percent of the maximum average ID for PVC Composite Pipe.

(2) For all plastic pipe other than PVC Composite Pipe, the percentage listed of maximum average ID shall be as in Table 507.5.1.4.2.(a) Maximum Percentage Deflection Allowed.

Table 507.5.1.4.2.(a) Maximum Percentage Deflection Allowed

Nominal Pipe Size (in.)	Percentage Deflection Allowed
Up to and including 12	5.0
Over 12, up to and including 30	4.0
Over 30, up to and including 60	3.0
Over 60, up to and including 90	2.5
Over 90, up to and including 120	2.0
Over 120	1.5

If the mandrel fails to pass, the pipe shall be considered to be overdeflected. Any overdeflected pipe shall be uncovered and, if not damaged, reinstalled. Damaged pipe shall not be reinstalled, but shall be removed and replaced. Any pipe subjected to any method or process other than removal,

which attempts, even successfully, to reduce or cure any overdeflection, shall be uncovered, removed and replaced with new pipe.

507.5.2. Television Inspection. If television inspection is not performed by the OWNER, it shall be performed by the CONTRACTOR in accordance with these specifications.

Experienced personnel shall perform the inspection by closed circuit color television. A digital file and suitable log shall be submitted to the OWNER after installation of the pipe. Digital file shall include voice description, as appropriate with stationing of services indicated. Data and stationing shall be included on video. The OWNER'S representative must be present during the CONTRACTOR'S television inspection, unless otherwise authorized by the OWNER. Generally, the representative will be present for at least a portion of the television inspection.

All videos and run sheets shall be given to the OWNER'S representative for storage and inspection by the OWNER. All videos and run sheets will become the property of the OWNER. Should any portion of the inspection tapes be of inadequate quality or coverage, as determined by the OWNER, the CONTRACTOR will have the portion reinspected and recorded at no additional expense to the OWNER.

If repairs are required, another television inspection must be made after the repairs are complete at no cost to the OWNER.

The CONTRACTOR may employ a firm qualified in this type of work to make the television inspection. The video(s) and run sheets should be furnished directly to the OWNER not the CONTRACTOR. The firm must attach a decal to the video(s) that states the following and signed by the officer of the firm: "I certify this video represents all or a part of the television inspection performed on Contract No. XXXXX and has not been altered or changed in any manner."

507.5.2.1. Equipment, Video and Run Sheet Requirements. Video must be compatible with the OWNER'S equipment. All information gathered must be legible, easily read or viewed, and of high definition color in accordance with National Association of Sewer Service Companies (NASSCO) or equal. By voice on the video the operator must:

(1) Note the date and time the recording was made.
(2) Note the CONTRACTOR'S name, project name, and contract number.
(3) Note the name of the company performing the television inspection and the name of the operator.
(4) Note the location, designation, and size of the main and the direction in which the test was made.
(5) Identify every 50-foot station.
(6) Identify the station of each manhole.
(7) Identify the location and station of deficiencies in accordance with Pipeline Assessment and Certification Program (PACP) (as defined by NASSCO).
(8) Identify the location and direction of entry of laterals.

A run sheet, compatible with the video, must be made noting deficiencies.

507.5.2.2. Television Inspection Special Procedures. CONTRACTOR shall follow procedural recommendations of camera manufacturer, or as approved by OWNER.

All wastewater conduit must be filled with enough water to fill all low points. The television inspection must be done immediately following the filling of the conduit. The depths of standing water allowable for mains that are greater than 24-in. in diameter shall be evaluated by the OWNER and the OWNER will determine if corrective action is required. Allowable standing water depths at the end of construction for 6-in. through 24-in. conduits shall be no greater than indicated in Table 507.5.2.2.(a) Allowable Depth of Standing Water.

Table 507.5.2.2.(a) Allowable Depth of Standing Water

Grade	Maximum Depth of Standing Water
Less than 0.7%	½-in.
0.7% and greater	0

507.5.2.3. Criteria for Acceptance of TV-Inspected Pipe. The OWNER shall decide if repairs are required, which decision shall be final. Repairs shall be no additional cost to the OWNER. Acceptance criteria are as follows unless otherwise specified.

(1) No pulled or slipped joints.
(2) No water infiltration.
(3) No cracked or damaged pipe.
(4) No structural damage to the pipe.
(5) Wastewater lines are clean.

507.6. MEASUREMENT AND PAYMENT FOR WASTEWATER CONDUIT INSTALLATION

507.6.1. Measurement. Pipe, including corrosion protection, if in place on the pipe, or unless otherwise covered by a special bid item, shall be measured for payment in linear feet along the centerline of the pipe measured from centerline of manhole to centerline of manhole or to the end of the line in a case where no manhole exists. Deductions shall be made for special structures. Pipe which extends only through the wall of the structure shall be measured to the actual end of the pipe. No deductions shall be made for fittings, measurements being from center to center of fitting. Conduits shall not be classified for payment according to depth unless a separate trenching item is not included.

507.6.2. Payment. Pipe, including corrosion protection in place on the pipe, or unless otherwise covered by a separate bid item, shall be paid for at the contract unit price per linear foot, complete in place, as provided by the contract. The contract price per linear foot shall be the total compensation for furnishing of all labor, materials, tools, equipment, and incidentals necessary to complete the work in accordance with the plans and these specifications.

ITEM 508. OPEN CUT – STORMWATER CONDUIT INSTALLATION

508.1. DESCRIPTION

This item shall govern and control the furnishing and placing of culvert pipe and/or conduits or drainage lines, including pipe fittings, connecting drain lines to curb inlets, all joints, all connections to new or existing pipe or headwalls, manholes, catch basins etc., to the lines and grades shown on the plans. All pipe and fittings shall be of the types, shapes, classes, sizes and dimensions as shown thereon; and as may be required to complete the work as shown on the plans.

508.2. GENERAL

508.2.1. Excavation, Embedment, and Backfill. All excavation, pipe embedment, and backfill shall conform to the relevant requirements of Item 504. Open Cut – Backfill, with modifications specified herein.

508.2.2. Trenchless Installation. Where tunneling or jacking methods are shown on the plans or permitted by the OWNER, methods shall conform to the requirements of Item 503. Trenchless Installation.

508.3. REINFORCED CONCRETE PIPE AND BOX FOR STORMWATER

This item shall govern and control the furnishing and placing of reinforced concrete storm water collection system.

508.3.1. Materials. Reinforced concrete pipe and jointing materials shall conform to the requirements of Item 501.6. Reinforced Concrete Culvert, Storm Drain, Pipe and Box Section.

508.3.2. Installation.

508.3.2.1. Pipe. All activities shall be in compliance with ASTM C1479. Bedding and backfill shall be as described in Item 504. Open Cut - Backfill. The CONTRACTOR shall furnish, at its own expense, and place in position as directed by the OWNER all necessary batter boards, string lines, plummets, graduated poles, lasers, etc., required in establishing and maintaining the lines and grades. The batter boards and all location stakes must be protected from possible damage or change of location.

All pipe and fittings shall be laid and jointed in a dry trench.

Unless otherwise authorized, start the laying of pipe on the bedding at the outlet end with the spigot or tongue end pointing downstream, and proceed toward the inlet end with the abutting sections properly matched, true to the established lines and grades. Fit, match, and lay the pipe to form a smooth, uniform conduit. Where bell-and-spigot pipe is used, cut cross trenches in the foundation to allow the barrel of the pipe to rest firmly upon the bedding. Do not cut cross trenches more than 2 in. larger than the bell ends of the pipe. Lower sections of pipe into the trench without damaging the bedding and the sides of the trench. Carefully clean the ends of the pipe before the pipe is jointed. Prevent the earth or bedding from entering the pipe when it is laid. Fill all lifting holes with plugs.

The bedding grade under the middle third of the pipe outside diameter shall be prepared before laying the pipe section. Making adjustments in grade by exerting force on the barrel of the pipe with excavating equipment, by lifting and dropping the pipe, or by lifting the pipe and packing bedding material under it shall be prohibited. If the installed pipe section is not on grade, the pipe section shall be completely unjoined, the grade corrected, and the pipe then rejoined.

When elliptical pipe with circular reinforcing or circular pipe with elliptical reinforcing is used, the pipe shall be laid in the trench in such a position that the markings "top" or "bottom" shall not be more than 5° from the vertical plane through the longitudinal axis of the pipe.

508.3.2.2. Box. All activities shall be in compliance with ASTM C1675. Bedding and backfill shall be as described in Item 504. Open Cut - Backfill. When precast boxes are used to form multiple barrel structures, place the box sections in conformance with the plans or as directed. Place material to be used between barrels as shown on the plans or as directed. Unless otherwise authorized, start the laying of boxes on the bedding at the outlet end and proceed toward the inlet end with the abutting sections properly matched. Fit, match, and lay the boxes to form a smooth, uniform conduit true to the established lines and grades. For trench installations, lower the box sections into the trench without damaging the box or disturbing the bedding and the sides of the trench. Carefully clean the ends of the box before it is placed. Prevent the earth or bedding material from entering the box as it is laid. Proper facilities and equipment shall be provided for hoisting and lowering the box sections without disturbing

the leveling course and the sides of the excavation or damaging the box section. Proper equipment, such as a come-along or puller, should be utilized to join the sections together. Remove and re-lay, without extra compensation, boxes that are not in alignment or that show excessive settlement after laying. Unless otherwise approved by the OWNER, loads from construction equipment transferred to a box before, during, or after fill placement, either directly or through the fill, shall not be greater than the loads assumed in the design.

508.3.3. Jointing. Jointing shall be one of the following types: Cold applied preformed plastic gaskets, flexible joint sealant, expanded cellular gaskets, or rubber gaskets. Jointing materials shall conform to the requirements of Item 501.6.1.3. Joints. Gasket installation practices shall be in accordance with the manufacturer's recommendations.

508.3.3.1. Cold Applied Preformed Plastic Gaskets or Flexible Joint Sealant (Mastic). If required by OWNER, a suitable primer of the type recommended by the manufacturer of the gasket joint sealer may be brush applied to the tongue-and-groove joint surfaces and the end surfaces and allowed to dry and harden. No primer shall be applied over mud, sand or dirt or sharp cement protrusions. The surface to be primed must be clean and dry when primer is applied. Primer that shows cracking or flaking at time of installation shall not be accepted.

Before laying the pipe in the trench, attach the plastic gasket sealer around the tapered tongue or tapered groove near the shoulder or hub of each pipe joint. Remove the paper wrapper from one side only of the two-piece wrapper on the gasket and press it firmly to the clean, dry pipe-joint surface. The outside wrapper is not to be removed until immediately before pushing the pipe into its final position.

When the tongue is correctly aligned with the flare of the groove, remove the outside wrapper on the basket and pull or push the pipe home with sufficient force and power (backhoe shovel, chain hoist, ratchet hoist or winch) to cause the evidence of squeeze-out of the gasket material on the inside or outside around the complete pipe joint circumference. Remove any joint material that pushed out onto the interior of the pipe that would tend to obstruct the flow. Pipe shall be pulled home in a straight line with all parts of the pipe on line and grade at all times. Pipe damaged by this operation shall be subject to review by the OWNER and, if necessary, a change in the jointing procedure may be required. Backfilling of pipe laid with plastic gasket joints may proceed as soon as the joint has been inspected and approved by the OWNER. Special precautions shall be taken in placing and compacting backfill to avoid damage to the joints.

When the atmospheric temperature is below 60°F, plastic joint seal gaskets shall either be stored in an area warmed to above 70°F, or artificially warmed to this temperature in a manner satisfactory to the OWNER. Gaskets shall then be applied to pipe joints immediately prior to placing the pipe in the trench, followed by connection to previously laid pipe.

Refer to ASTM C990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

508.3.3.2. Flexible Cellular Materials. Joints using flexible cellular gaskets do not need to be primed. If they are primed, be certain the primer is cured and non-tacky before installing gaskets.

The CONTRACTOR shall provide a copy of the manufacturer's installation instructions to the OWNER. Just before laying the pipe in the trench, stretch the gasket around the tapered tongue (or wedge it into the tapered groove) near the shoulder or hub of each pipe joint. Treat these low-tensile gaskets gently when handling. When the tongue is correctly aligned with the flare of the groove, pull or push home with sufficient force and power (winch, ratchet hoist, chain hoist or backhoe shovel) to compress the gasket to the extent that the joint gap falls within the recommended range around the entire pipe joint circumference.

CAUTION: Do not close the joint flush, or completely flatten the gasket.

Joint gap ranges for each gasket size are shown in Table 508.3.3.2.(a) Joint Gap Ranges.

Table 508.3.3.2.(a) Joint Gap Ranges

Gasket Sizes as Printed on Parts	Joint Gap Range Minimum	Maximum
3/8″ x 3/8″	3/8″	3/4″
1/2″ x 3/8″	3/8″	7/8”
3/4″ x 3/8″	3/8″	1”
1/2″ x 1/2″	1/2″	1-1/8”
3/4″ x 1/2″	1/2″	1-1/4”
7/8″ x 1/2″	1/2″	1-1/4”
1-1/8″ x 1/2″	1/2″	1-3/8”
1/2″ x 3/4″	3/4″	1-1/2”
5/8″ x 3/4″	3/4″	1-1/2”
3/4″ x 3/4″	3/4″	1-5/8”
7/8″ x 3/4″	3/4″	1-5/8”

508.3.3.3. Rubber Gaskets.

(1) Ensure that bell and spigot are free from cracks, chips, and other defects.
(2) Brush loose dirt and debris from the inside surface of the bell, the spigot, and the gasket.
(3) Stretch the gasket around the spigot, with the nose against the step, and the tube lying flat against the spigot.
(4) If not self-lubricating, apply manufacture recommended water-based lubricant on the gasket and bell.
(5) Align the spigot with the bell, ensuring that the gasket is in contact with the bell around the complete periphery, then thrust pipe home using suitable manual or mechanical means.

508.3.4. Fittings.

508.3.4.1. Poured Concrete Pipe Collars. At all changes in pipe sizes in the conduit line, except at manholes, a pipe collar, as shown in detail on the plans, shall be provided. The locations at which such collars are to be provided are shown on the plan-profile sheets, and their costs are to be included in the price bid for furnishing and installing reinforced concrete pipe. No extra payment shall be made for the installation of concrete pipe collars as shown on the plan-profile sheets.

508.3.4.2. Shop and Field Fabricated Wyes, Tees, Crosses and Bends. Shop or field fabricated wyes, tees, crosses or bends shall be furnished and installed where indicated or required by the OWNER. Fittings for pipe, the largest size of which is less than 24-in. in diameter, shall be shop fabricated. Fittings for larger pipe, which is 24-in. in diameter and increasingly larger, may be field fabricated. Care shall be taken in the fabrication that the concrete walls of the pipe are broken back only enough to provide the required finishing opening. The reinforcing mesh or bars in each pipe shall be joined by bending, twisting or spot welding, which shall provide a rigid connection. Concrete or mortar meeting the requirements of Item 303. Portland Cement Concrete Pavement or Item 702. Concrete Structures shall be wiped over the reinforcing wires connecting the two-pipe joints, compacted by light blows, shaped to the contour of the pipe barrels, lightly brushed for finish and cured under wet burlap.

508.3.4.3. Poured Concrete Pipe Plugs. When conduit lines terminate at locations which do not include connection to drainage structures, the end of the pipe shall be plugged with a field-cast unit as shown on the plan-profile sheets, and the costs thereof are to be included in the price bid to furnish and install reinforced concrete pipe. No extra payment shall be made for the installation of concrete pipe plugs as shown on the plan-profile sheets.

508.4. CORRUGATED METAL PIPE

This item shall govern and control the furnishing and placing of corrugated metal storm water collection system.

508.4.1. Pipe Materials. Unless otherwise specified on the plans or required herein, corrugated metal pipe may be aluminum, galvanized steel, aluminized steel, or precoated galvanized or aluminized steel. Pipe

shall be full circle or pipe arch type as shown on the plans. Damage to materials incurred prior to backfilling shall be corrected according to Item 501.11.7. Repairs.

508.4.2. Couplings. Materials shall conform to the requirements of Item 501.11.9. Couplings. Joints shall prevent infiltration of side material during the life of the installation. Connecting bands shall be placed with the clamping angles and bolts at the tops of the pipe. When it is necessary to join a new pipe of helical corrugations to an existing pipe which was installed with no circumferential end corrugations, the two pipes shall be field jointed with helically corrugated bands.

508.4.3. Excavation of Backfilling. In addition to the requirements of Item 508.2.1. Excavation, Embedment, and Backfill, the provisions contained herein apply.

When pipes are laid in a trench, the trench when completed and shaped to receive the pipe shall be of sufficient width to provide free working space for satisfactory bedding and jointing and thorough tamping of the backfill and bedding material under and around the pipe.

Backfilling for the metal pipe structures is a critical phase of the construction and strict adherence of Item 504. Open Cut – Backfill is required. Unless otherwise shown on the plans or permitted in writing by the OWNER, no heavy earth moving equipment will be permitted to haul over the structure until a minimum of 4-ft. of permanent or temporary, compacted fill has been placed thereon. Until a minimum cover over pipe of 12-in. is obtained, only hand operated tamping equipment will be allowed within vertical planes 2-ft. beyond the horizontal projection of the outside surfaces of the structure. Prior to adding each new layer of loose backfill material, until a minimum of 12-in. of cover is obtained, an inspection will be made of the inside periphery of the structure for local or unequal deformation caused by improper construction methods. Evidence of such will be reason for such corrective measures as may be directed by the OWNER. OWNER may require CONTRACTOR to remove and replace pipe damaged by the CONTRACTOR'S backfilling operation at no additional cost to the OWNER.

508.4.4. Laying Corrugated Metal Pipe. Unless otherwise authorized by the OWNER, the laying of pipes on the prepared foundation shall be started at the outlet end, and separate sections firmly joined together, with outside laps of circumferential joints pointing upstream and with longitudinal laps on the sides. Any metal in joints which is not protected by galvanizing or aluminizing shall be coated as approved by the OWNER. Proper facilities shall be provided for hoisting and lowering the sections of pipe in to the trench without damaging the pipe or disturbing the prepared foundation and the sides of the trench. Any pipe which is not in alignment or which shows any undue settlement after laying, or is damaged, shall be taken up and re-laid without extra compensation.

Multiple installations of corrugated metal pipe and pipe arches shall be laid with the center lines of individual barrels parallel. Unless otherwise indicated on the plans, the clear distances between outer surfaces of adjacent pipes listed in Table 508.4.4.(a) Clear Distances shall be maintained.

Table 508.4.4.(a) Clear Distances

Diameter of Pipe	Clear Distance Between Pipes Full Circle and Pipe Arch	Pipe Arch
18-in.	1-ft. 2-in.	21-in. x 15-in.
24-in.	1-ft. 5-in.	28-in. x 20-in.
30-in.	1-ft. 8-in.	35-in. x 24-in.
36-in.	1-ft. 11-in.	42-in. x 29-in.
42-in.	2-ft. 2-in.	49-in. x 33-in.
48-in.	2-ft. 5-in.	57-in. x 38-in.
54-in.	2-ft. 10-in.	64-in. x 43-in.
60-in.	3-ft. 2-in.	71-in. x 47-in.
66-in.	3-ft. 2-in.	77-in x 52-in.
72-in. through 84-in.	3-ft. 2-in.	—
90-in. through 120-in.	3-ft. 5-in.	—

508.4.5. Connections. Where new structures are constructed as extensions to structures in place or are jointed to existing structures, the construction shall include all work necessary to provide a proper connection between the new structure and the old as indicated on the plans, including coating of the connection when required.

508.4.6. Reuse of Existing Headwalls. When existing headwalls and aprons are specified on the plans for reuse, the portion to be reused shall be severed from the existing pipe and moved to the new position previously prepared, by approved methods.

Connections shall conform to the requirements for joining sections of pipes as indicated herein or as shown on the plans. Any headwalls, aprons or pipe attached to the headwall damaged during moving operations shall be restored to their original condition at the CONTRACTOR'S expense. The CONTRACTOR, if it so desires, may remove and dispose of the existing headwalls and aprons and construct new headwalls at its own expense, in accordance with the pertinent specifications and design indicated on the plans or as furnished by the OWNER.

508.5. STRUCTURAL PLATE CONDUIT

This work shall consist of furnishing and installing structural plate conduit of standard or special shapes conforming to these specifications of the sizes, out dimensions, the minimum gage or thickness of metal, footing design, if required, and material required by plans, at the places designated on the plans or by the OWNER, in conformity with established lines and grades.

508.5.1. Materials.

508.5.1.1. Structural Plates. The plates used for construction of structural plate conduits shall conform to the specifications in Item 501.12. Structural Plate Structures.

508.5.1.2. Concrete. Concrete, curing and reinforcing steel shall conform to Item 702. Concrete Structures. Unless otherwise shown on the plans, concrete for footings and headwalls shall be Class A or Class PA as specified by the OWNER. Concrete for longitudinal stiffeners (thrust beams), when specified for steel structures, shall be Class B or Class PB as specified by the OWNER and shall be reinforced in accordance with the plans. Concrete used in longitudinal stiffeners (thrust beams) on steel structures shall cure a minimum of 3-days before backfilling against or over the stiffener. Riprap for slope protection and for invert paving, when required, shall be Class B or Class PB concrete as specified by the OWNER, with reinforcement as specified on the plans and shall conform to the requirements of Item 803.3. Riprap.

508.5.2. General Construction Methods. Structural plate conduits shall be constructed from the specified materials in accordance with the plans and this item.

Steel plates will have approximately a 2-in. lip beyond each end crest, which results in the actual length of a given structure being approximately 4-in. longer than the nominal length, except when skewed or beveled. Footings for arches shall be designed and constructed to accommodate this additional length.

The distance between multiple structures shall be shown on the plans with the minimum distance being that space required to permit adequate compaction of backfill material.

508.5.3. Excavation. Unless otherwise required, all structural excavation shall be in accordance with the requirements of Item 701.2. Structural Removal, Excavation, and Backfill, and the additional requirements herein. The excavation will be of sufficient width to provide ample working space for erection and proper compaction of backfill and bedding material. The CONTRACTOR shall provide adequate drainage of the cut and bedding during the construction operation.

If the quality of the native soil is as good as or better than the proposed backfill material, excavation shall be to the limits set forth in the Item 701.2. Structural Removal, Excavation, and Backfill. If the quality of the native soil is less than that of the proposed backfill material, the excavation shall extend, from each side of the barrel, a minimum horizontal distance of ½-span or ⅔-rise, whichever is greater.

508.5.4. Substructures for Structural Plate Arches. The substructure for structural plate arches shall be as detailed on the plans. Concrete footings, when required, shall be placed entirely on either rock or firm soil. When footing area is partially rock and partially soil, the rock shall be removed below grade and replaced with suitable materials so that a slightly yielding, compacted earth cushion is provided below the

footing for a minimum of 12-in. When a thin layer of soil is partially covering rock within the bearing area and when practical to do so, the soil may be removed and the footings placed directly on rock in accordance with details shown on the plans.

Footings shall be formed and finished to true lines and grades as established by the OWNER. Anchors or slots shall be set to true line and grade when placing concrete for each substructure unit. No plates for arch structures shall be placed until the substructure has cured for a minimum of 3-days.

Any portion of an aluminum structure that is in contact with a metal other than aluminum or in contact with concrete containing chlorides shall be insulated from this other metal or concrete containing chlorides by a coating of bituminous material or a plastic coating, such as asphalt, mastic or polymeric coating. The coating shall be applied to the aluminum structure to provide insulation between the aluminum and other metal or concrete containing chlorides and shall extend a minimum distance of 1-foot beyond the area of contact.

508.5.5. Foundations for Structural Plate Conduits with Metal Inverts. Horizontal ellipses, box culverts, or other structural plate shapes with metal inverts shall be placed on a shaped bed of granular material carefully and accurately shaped to fit the lower part of the structure for at least 10-percent of its overall height, except that the length of bedding arc need not exceed the width of the bottom plate. The granular material shall be at least 3-in. in thickness, so as to obtain uniform seating of the corrugations on the structure bed. For culverts, the bedding specified herein shall be the full width of the invert. Where rock, in either ledge or boulder formation, is encountered, it shall be removed below grade and replaced with a compacted earth cushion having a thickness of not less than ½-in.-per-foot height of fill over the top of the structure, with the minimum allowable thickness of 12-in. and a maximum of 24-in. under the structure. Where the soil encountered at the established grade is a quicksand, muck or similar unstable material, it shall be removed and replaced in accordance with the requirements of Item 701.2. Structural Removal, Excavation, and Backfill.

508.5.6. Skewed Structures. The end skew shall not exceed 45°. When the skew of arches is more than 15°, the length of the structure shall be such that no portion of the live load will be carried by the cut portion of the arch end. Where right-of-way or other conditions do not permit the required length, the cut end shall be supported by a rigid headwall designed to meet the conditions. When the skew angle of pipes exceeds 20° and the structure has the ends cut to fit a slope, the ends shall be reinforced with concrete riprap or other suitable end treatment as indicated on the plans or as directed by the OWNER. If headwalls are required, the plates shall be anchored to the headwall with not less than ¾-in. diameter by 6-in. minimum length bolts, at not over 19-in. centers. If structures are to have skewed ends, bevels, step-bevels or other special end treatment, this information will be shown on the plans.

508.5.7. Erection and Shape Control. When all plates of a structure are in position, all bolts not already in place shall be inserted and all nuts tightened progressively and uniformly, beginning at one end of the structure. All nuts shall be tightened a second time to a torque of not less than 150-ft.-lbs. nor more than 300-ft.-lbs. for steel structures, and not less than 125-ft.-lbs. nor more than 150-ft.-lbs. for aluminum structures.

It is essential that bolts be well tightened. If an impact wrench is used, a sufficient number of bolts shall be checked with a long-handled, structural or socket wrench or torque wrench to insure that they are properly tightened. All service bolts used in drawing the plates together shall be replaced with standard high strength bolts.

Lateral ties, struts and/or false-work may be required on some structures to maintain proper shape and alignment during erection and backfill operations. Monitoring of the structure shape throughout erection and backfill requires careful observations of the symmetry and uniform curvature of the periphery of the structure. If there is any tendency toward loss of symmetry in shape or loss of curvature in the structure periphery, even though the structure is within the tolerances stated herein, construction involving the structure shall cease until a proper course of action is established.

CONTRACTOR shall furnish acceptable devices for monitoring the horizontal and vertical shape of the structure. For box culverts and structures not requiring longitudinal or transverse stiffeners, the shape shall be kept within 2-percent of design measurements (span or rise, whichever is greater) or 5-in., whichever is less, during erection and backfilling. For structures requiring either longitudinal stiffeners or transverse

stiffeners (except box culverts), a minimum of 5 monitoring devices shall be furnished at transverse sections, with one at each longitudinal stiffener, one at the top of the structure, and one at each mid span of the top arc. These shall be installed at each end and as a minimum on 24-ft. increments for the entire structure length.

For the shape factor furnished (shape factor = Rt/Rs, where Rt is the radius of the top arc and Rs is the radius of the side arc), unless otherwise shown on the plans, the allowable sag from design shape during erection, as a percentage of the rise shall not exceed tolerances shown in Table 508.5.7.(a) Allowable Sag.

Table 508.5.7.(a) Allowable Sag

Shape Factor	Allowable Sag (expressed as percentage of the rise)
up to 2.74	4%
2.75 through 3.24	2%
3.25 and greater	1%

Shape shall be checked at least after each two, 1-ft. compacted lifts of backfill, with the upward movement of the top of the structure during backfilling, not to exceed 2-percent of the rise, nor more than 50-percent loss of the mid-ordinate of the side plates, nor more than 25-percent deviation of any mid-ordinate of the top plates, all measured from the design shape. Selective top loading of the structure may sometimes be required to prevent distortion in excess of tolerances given herein.

508.5.8. Backfilling. Backfilling and/or construction of the embankment around and over the structure is a critical phase of the construction, and strict adherence to these construction methods is required. Backfilling and/or embankment construction around the structure shall be performed in accordance with Item 203. Site Preparation and Item 504. Open Cut – Backfill, except as modified herein.

Any damage to plates or structures caused by equipment and/or backfilling operations shall be corrected or removed and replaced to the OWNER'S satisfaction at the entire expense of the CONTRACTOR.

508.5.8.1. Structural Plate Conduits Without Longitudinal or Transverse Stiffeners and Box Culverts. Unless otherwise shown on the plans or permitted in writing by the OWNER, no heavy earth moving equipment will be permitted to haul over the structure until a minimum of 4-ft. of permanent or temporary compacted fill has been placed thereon. Within vertical planes 2-ft. beyond the horizontal limits of the structure and until a minimum of 2-ft. of cover has been compacted over the structure, only hand operated, mechanical tamping equipment will be permitted.

During the backfilling operations, extreme care shall be taken to avoid unequal pressures and to obtain uniformly compacted backfill material of uniform density throughout the length of the structure and to insure proper backfill under the structure.

The structure shall be backfilled so that when backfill is complete, the inside dimensions shall be within tolerances set forth in Item 508.5.7. Erection and Shape Control. Backfill material will be placed and compacted in maximum 8-in. lifts simultaneously along each side of the structure until the height of the backfill has reached the crown of the structure. Backfill shall continue to be placed in maximum 12-in. lifts over the crown in layers extending laterally from the crown and compacted using hand operated or light compaction equipment until the design height is obtained.

For multiple structures the same backfill phases will be performed for all structures more or less simultaneously. Backfilling between the barrels will usually require that the material be placed with a crane and bucket or other suitable equipment. Backfill material shall not be dropped from a height or concentrated in such an amount prior to distribution over the top arc that damage to the flexible structure will result. Compaction of this backfill shall be with hand operated tampers or other acceptable equipment.

508.5.8.2. Structural Plate Conduits Requiring Longitudinal or Transverse Stiffeners Except Box Culverts. The plans will designate, when appropriate, the longitudinal stiffener designs for steel structures or a transverse stiffener design for aluminum structures. The backfill material to be used adjacent to and over the structure to the minimum required cover (as shown on the plans) shall be a

granular type material such as a well graded sand and gravel (preferably sharp, rough and angular if possible), or a uniform sand or gravel. Plastic soils will not be permitted. The structure backfill material shall conform to one of the following soil classifications as defined in Table 508.5.8.2.(a) Classification of Soils and Soil-Aggregate Mixtures.

(1) For height of fill less than 12-ft.: A-1, A-3, A-2-4 and A-2-5 may be used.
(2) For height of fill of 12-ft. or greater: A-1 and A-3 may be used.

Table 508.5.8.2.(a) Classification of Soils and Soil-Aggregate Mixtures

GENERAL CLASSIFICATIONS = GRANULAR MATERIALS (35-Percent or Less Passing No. 200)					
Characteristic	**Group Classification**				
	A-1		**A-3**	**A-2**	
	A-1-a	**A-1-b**		**A-2-4**	**A-2-5**
Sieve Analysis, Percent Passing:					
(No. 10)	50 max.	—	—	—	—
(No. 40)	30 max.	50 max.	51 max.	—	—
(No. 200)	15 max.	25 max.	10 max.	35 max.	35 max.
Characteristics of Fraction Passing 0.425 mm. (No. 40)					
Liquid limit	—		—	40 max.	41 min.
Plasticity index	6 max.		N. P.	10 max.	10 max.
Usual Types of Significant Constituent Materials	Stone Fragments, Gravel and Sand		Fine Sand	Silty or Clayey Gravel and Sand	

The backfill material shall be compacted to at least 95-percent of maximum density as determined by ASTM D698 Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3). Moisture content shall be within minus-2- to plus-4-of-optimum. It may not be possible to develop this compacted density in the first lift of material over the top arc (Phase 2 described below) due to the influence of the flexible structure; therefore, density in at least the first lift over the top arc (Phase 2) will be the highest density attainable using equipment authorized herein.

The backfill pattern and sequence, up to at least the depth of minimum required cover, shall be in three phases. Phase 1 of the backfill operation will be to backfill under the haunches and/or along the side-walls of the structure. Backfill material will be placed in maximum 8-in. lifts simultaneously along each side of the structure until the height of backfill has reached the top of the longitudinal stiffeners or that longitudinal seam (edge of structure crown where the top arc plates connect to the side arc plates).

Phase 2 will be to work simultaneously symmetrically from both sides of the structure with light track type equipment pushing material over the crown until three 12-in. lifts of backfill have been placed and compacted uniformly over the crown. The light track equipment shall not exceed 20,000-pounds gross weight with a track pressure less than 1700-pounds-per-square-foot.

After the crown has been uniformly covered, Phase 3 will be to continue to place maximum 12-in. lifts of backfill, compacted, which extend laterally from the crown and compact over the crown and at the sides of the structure using hand operated or light tractor drawn compaction equipment working at the same time on each side of the structure at the same longitudinal location, until at least the minimum required depth of cover is attained. Wheel type equipment will not be allowed over the crown of the structure until Phase 3 is complete.

For multiple structures the same backfill phases will be performed for all structures more or less simultaneously. Backfilling between the barrels will usually require that the material be placed with a crane and bucket or other suitable equipment. Backfill material shall not be dropped from a height or concentrated in such an amount prior to distribution over the top arc that damage to the flexible structure will result. Compaction of this backfill shall be with hand operated tampers or other acceptable equipment.

508.6. CORRUGATED THERMOPLASTIC PIPE

This item shall govern and control the furnishing and placing of corrugated thermoplastic pipe to be used in storm water collection systems.

508.6.1. Pipe Materials. Unless otherwise specified on the plans or as required herein, corrugated thermoplastic pipe shall meet the requirements of Item 501.23. Thermoplastic Corrugated Drainage Tubing and Corrugated Smooth Lined Storm Water Pipe and Fittings. Pipe shall be full circle as shown on the plans. Damage to the materials incurred prior to backfilling shall be removed and replaced.

508.6.2. Couplings. Materials shall conform to the requirements of Item 501.23.4. Joints shall prevent infiltration of side material during the life of the installation. Soil-tight Joints shall be bell and spigot or utilize couplings that engage at least two full corrugations on each pipe section in accordance with AASHTO M330.

508.6.3. Installation of Pipe. The CONTRACTOR shall furnish, at its own expense, and place in position as directed by the OWNER all necessary batter boards, string lines, plummets, graduated poles, lasers, etc., required in establishing and maintaining the lines and grades. The batter boards and all location stakes must be protected from possible damage or change of location. The cost of replacement of location stakes shall be at no additional cost to the OWNER.

All pipe and fittings shall be laid and jointed in a dry trench of a minimum width as shown in Table 508.6.3.(a) Minimum Trench Widths for the Installation of Corrugated Thermoplastic Pipe.

The minimum depth of cover and trench width should be established by the OWNER based on evaluation of specific project conditions or ASTM D2321.

Table 508.6.3.(a) Minimum Trench Widths for the Installation of Corrugated Thermoplastic Pipe

Nominal Inside Pipe Diameter (Inches)	Typical Outside Pipe Diameter (inches)			Minimum Trench Width[1] (Inches)
	HDPE	PP	PVC	
4	4.9	NA	4.3	21
6	6.9	NA	6.4	23
8	9.1	NA	8.6	25
10	11.2	NA	10.8	27
12	14.3	14.5	12.8	30
15	17.5	17.6	15.7	33
18	21.5	21.2	19.2	38
24	28.0	28.0	25.6	46
30	35.5	35.4	32.2	55
36	42.0	41.1	38.7	63
42	47.5	47.2	NA	71
48	54.0	53.8	NA	79
54	61.0	NA	NA	88
60	67.0	66.5	NA	95

[1]For pipe sizes larger than those shown above, use pipe manufacturer's recommendation or ASTM D2321.

Install foundation and bedding as required by the OWNER. Unless otherwise authorized by the OWNER, the laying of the pipe on the prepared foundation shall be started at the outlet or downstream end with the spigot or tongue end of the pipe joint pointing downstream. Place pipe and fittings in the trench with the invert conforming to the required elevations, slopes, and alignment. Place embedment materials by methods that will not disturb or damage the pipe. Work in and tamp the haunching material in the area between the bedding and the underside of the pipe before placing and compacting the remainder of the embedment in the pipe zone.

Laying shall proceed toward the inlet or upstream end with each abutting section of pipe properly matched, true to the established lines and grades. Approved facilities shall be provided for hoisting and lowering the sections of pipe or the sides of the trench. The ends of the pipe shall be carefully cleaned before the pipe is placed in the trench. As each length of the pipe is laid, the open end shall be protected to prevent

the entrance of earth or bedding material. The pipe shall be fitted and matched so that when laid in the prepared bedding, it shall form a smooth, uniform conduit.

508.6.4. Jointing. Jointing shall be one of the following types: Soil-tight joints shall meet the requirements of Item 501.23.4. Joints; Water-tight Joints shall meet the requirements of Item 501.23.4. Joints. The CONTRACTOR is to comply with manufacturer's recommendations for assembly of joint components, lubrication, and making of joints.

508.6.5. Excavation and Backfilling. In addition to the requirements of Item 504. Open Cut – Backfill, the provisions contained herein apply.

When pipes are laid in a trench, the trench when completed and shaped to receive the pipe shall be of sufficient width to provide free working space for satisfactory bedding and jointing and thorough tamping of the backfill and bedding material under and around the pipe. Backfilling for thermoplastic pipe structures is a critical phase of the construction and strict adherence of Item 504. Open Cut – Backfill is required. Unless otherwise shown on the plans or permitted in writing by the OWNER, no heavy earth moving equipment will be permitted to haul over the structure until a minimum of 2 feet of depth for 24 inch diameter and smaller pipes or a minimum of 3 feet on pipes larger than 24 inches in diameter of permanent or temporary, compacted fill has been placed thereon. Until a minimum cover over pipe of 12 inches is obtained, only hand operated tamping equipment will be allowed within vertical planes 2 feet beyond the horizontal projection of the outside surfaces of the structure. Prior to adding each new layer of loose backfill material, until a minimum of 12 inches of cover is obtained, an inspection will be made of the inside periphery of the structure for local or unequal deformation caused by improper construction methods. Evidence of such will be reason for such corrective measures as may be directed by the OWNER. OWNER may require CONTRACTOR to remove and replace pipe damaged by the CONTRACTOR'S backfilling operation at no additional cost to the OWNER.

508.6.5.1. Shaping and Bedding. Bed the pipe in a foundation of compacted cohesionless material, such as sand, crushed stone, or pea gravel, with a maximum allowable size of 1 in. Extend this material a minimum of 6 in. below the outermost corrugations or ribs, and carefully and accurately shape it to fit the lowest part of the pipe exterior for a minimum of 10% of the overall height. When requested by the OWNER, furnish a template for each size and shape of pipe to be placed for use in checking the shaping of the bedding. Provide a template consisting of a thin plate or board cut to match the lower half of the cross section of the pipe.

508.6.5.2. Backfilling. Backfill from the pipe bedding up to 1 ft. above the top of the pipe to provide necessary structural support to the pipe and control pipe deflection. Take special precautions when placing and compacting backfill material. Place special emphasis obtaining uniform compacted density throughout the length of the pipe, to avoid unequal pressure. Use extreme care to ensure proper backfill under the pipe, in the haunch zone.

Provide backfill material meeting the following specifications:

(1) Type I- Provide backfill consisting of flowable fill in accordance with Item 504.2.3.4 Flowable Backfill. Place the flowable backfill across the entire width of the trench and maintain a minimum depth of 12 in. above the pipe. Wait a minimum of 24 hours before backfilling the remaining portion of the trench with other backfill material in accordance with Item 504.2.3. Final Backfill.

(2) Type II- Provide backfill consisting of cement stabilized backfill in accordance with Item 504.2.3.5. Modified Flowable Backfill. Place and compact cement stabilized backfill to completely fill any voids.

(3) Type III- Provide backfill consisting of hard, durable, clean granular material that is free of organic matter, clay lumps, and other deleterious matter. Provide backfill meeting the gradation requirement shown in Table 508.6.5.2.(a). Place the backfill material along both sides of the completed structure to a depth of 12 in. above the pipe. Place the backfill in uniform layers a minimum of 6 in. deep (loose measurement), wet if required and thoroughly compacted between adjacent structures and between the structure and the sides of the trench. Until a minimum cover of 12 in. is obtained, only hand-operated tamping equipment will be allowed within vertical planes 2 ft. beyond the horizontal projection of the outside surfaces of the structure. If using Type III backfill,

place filter fabric between the native soil and the backfill as directed by OWNER. Filter fabric shall meet TxDOT Specification DMS-6200.

Table 508.6.5.2.(a) Gradation Requirements for Type III Backfill Material

Sieve Size	Percent Retained (Cumulative)
1 in.	0-5
7/8 in.	0-35
1/2 in.	0-75
3/8 in.	0-95
No. 4	35-100
No. 10	50-100
No. 200	90-100

508.6.6. Pipe Testing. Upon completion of pipe installation, the CONTRACTOR shall test thermoplastic and thermoset pipe for deflection. Deflection tests shall be performed no sooner than 30-days after densification of backfill.

Deflection testing shall be performed by the CONTRACTOR at no cost to the OWNER. No payment will be made for delays that result from the CONTRACTOR's performance of deflection testing.

The CONTRACTOR shall test all thermoplastic pipes for deflection by one of the following methods: 1. Mandrel, or 2. Laser Video.

Nominal diameter 27-in. or smaller shall be tested by mandrel. The mandrel shall be pulled through the pipe by hand to ensure that maximum allowable deflections have not been exceeded. Pipe with nominal ID larger than 27-in. may be tested by an alternate method as approved by the OWNER. If a mandrel is selected to test pipe 27-in. and larger, the minimum diameter, length and other requirements shall conform to the dimensions and requirements as stated below. Deflection measurement for ID's nominally larger than 27-in. shall be determined using a 1-in. diameter rigid, nonadjustable metal bar approved by the OWNER; a minimum-radius rigid template; or by a method approved by the OWNER.

508.6.6.1. Mandrel. Prior to use, the mandrel shall be certified by the OWNER. Mandrel requirements are as follows:

(1) odd-number of legs with 9 legs minimum
(2) effective length not less than its nominal diameter
(3) fabricated of steel
(4) fitted with pulling rings at each end
(5) stamped or engraved on some segment other than a runner indicating the pipe specification, nominal size, and mandrel OD

If the mandrel fails to pass, the pipe shall be considered to be "overdeflected". Any overdeflected pipe shall be uncovered and, if not damaged, reinstalled. Damaged pipe shall not be reinstalled, but shall be removed and replaced. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure any overdeflection, shall be uncovered, removed and replaced with new pipe. Final remediation to be approved by OWNER.

508.6.6.2. Laser Video Equipment. A combination color CCTV pipeline survey system with a cable distance counter, laser profiling system, non-contact video micrometer and measurement software shall be used to perform a measurement survey of thermoplastic pipelines with nominal inside diameter 60-in. or smaller. The equipment used shall be certified by a recognized independent testing group and includes a certified accuracy of 0.5% or better and a repeatability of 0.12% or better. Refer to ASTM E691 and ASTM E177 for equipment calibration.

508.6.7. Multiple Installations of Corrugated Thermoplastic Pipe. Multiple installations of corrugated thermoplastic pipe shall be laid with the center lines of individual barrels parallel. Unless otherwise indicated on the plans, the clear distances between outer surfaces of adjacent pipes are listed in Table 508.6.7.(a) Clear Distances shall be maintained.

The minimum clear distance should be established by the OWNER based on evaluation of specific project conditions or pipe manufacturer's recommendations.

Table 508.6.7.(a) Clear Distances

Diameter of Pipe (Inches)	Clear Distance Between Outside surfaces of Pipes – Full Circle (Inches)
18 and smaller	14 in.
24	17 in.
30	20 in.
36	23 in.
42	26 in.
48	29 in.
54	34 in.
60	38 in.
66	38 in.

508.7. MEASUREMENT AND PAYMENT FOR STORMWATER CONDUIT INSTALLATION

508.7.1. Measurement. Pipe, including corrosion protection, if in place on the pipe, or unless otherwise covered by a special bid item, shall be measured for payment in linear feet along the centerline of the pipe measured from centerline of manhole to centerline of manhole or to the end of the line in a case where no manhole exists. Deductions shall be made for special structures. Pipe which extends only through the wall of the structure shall be measured to the actual end of the pipe. No deductions shall be made for fittings, measurements being from center to center of fitting. Conduits shall not be classified for payment according to depth unless a separate trenching item is not included.

508.7.2. Payment. Pipe, including corrosion protection in place on the pipe, or unless otherwise covered by a separate bid item, shall be paid for at the contract unit price per linear foot, complete in place, as provided by the contract. The contract price per linear foot shall be the total compensation for furnishing of all labor, materials, tools, equipment, and incidentals necessary to complete the work in accordance with the plans and these specifications.

ITEM 509. CROSSINGS

509.1. GENERAL

This specification shall govern for the construction of underground conduits (water, wastewater, stormwater mains, etc.) on or across streets, alleys, highways or railroads, creeks or rivers as detailed in the plans. The CONTRACTOR shall provide and employ adequate warning signs, barricades, lights, watchmen, etc. to fully protect its workers and the traveling public as required in Item 107.20. Protection of Work and of Persons and Property and Item 107.19. Public Convenience and Safety. No changes shall be made in location as shown on the plans without prior authorization of the appropriate agency and the OWNER. Bore pits and related appurtenances are to comply with the requirements of the franchise owner. For crossings not mentioned below, the crossing requirements of the affected owner shall be followed.

509.2. STATE HIGHWAY CROSSINGS

All crossings shall conform to the TxDOT *Utility Accommodation Policy Manual Special Specifications*. Permits from TxDOT are required for all highway crossings. A copy of permits obtained from TxDOT shall be at the construction site available for the OWNER to review.

509.3. STREET AND ALLEY CROSSINGS

The construction of underground conduits on or across street and alley rights-of-way and the removal and replacement of pavement, curb and gutter, etc., shall be in accordance with the following requirements.

The CONTRACTOR shall protect the street and alley surface and all existing improvements from excavated materials, equipment operations and other construction operations. If jacking, boring or tunneling is indicated or specified, the work shall be performed in accordance with the requirements of Item 503. Trenchless Installation. If open-cut method is indicated or specified, the construction operations shall be conducted in accordance with the requirements in Item 504. Open Cut – Backfill.

509.4. RAILROAD CROSSINGS

All railroad crossings shall conform to the respective railroad company's requirements. The CONTRACTOR must obtain insurance and other requirements of the railroad company prior to beginning any work within the railroad right-of-way.

509.5. CREEK AND RIVER CROSSINGS

Creek crossing using pier construction shall be made in accordance with the details shown on the plans. River crossings, siphons and miscellaneous pipe structures as may be necessary shall be designed in detail on the plans.

509.6. MEASUREMENT AND PAYMENT OF CROSSINGS

Each crossing within the limits noted on the plans and/or set forth in the proposal shall constitute a separate pay item where indicated on the plans and specifications and shall be paid for as shown in the proposal. The contract price shall be the total compensation for the furnishing of all labor, materials, tools, equipment and incidentals necessary to complete the work, including all excavation, disposal of surplus materials and backfill, in accordance with the plans and these specifications. The contract price or combination of prices includes compensation for excavation for piers, erecting piers, stripping forms, erecting pipe and supporting pipe (if required), in accordance with the plans and specifications.

DIVISION 600 CONDUIT & APPURTENANCE REHABILITATION

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ITEM 601. PIPELINE REHABILITATION

601.1. DESCRIPTION

This item shall govern the rehabilitation of pipe using materials and methods that may be used as an alternative to pipeline replacement. Unless indicated otherwise, these methods shall be used for non-pressure (gravity flow) pipeline rehabilitation. Other processes not specified in this section may be approved for use by OWNER.

601.2. GENERAL

No pipe shall be reconstructed without prior notification of the OWNER. Work shall include the furnishing of all labor, equipment and materials necessary to complete the rehabilitation of pipelines and service reconnections as stipulated herein and as specified in Contract Documents. Work shall include the preparation of the construction site, including cleaning and flushing of existing piping; flow control bypass pumping; protection of existing conditions during installation work; unloading; hauling; distributing and installation; testing of all pipe, fittings, scaffolding, valves, boilers, etc. and other accessories as required for proper installation. It shall also include restoration or replacement of all removed or damaged pavement, curb, sidewalk, gutter, shrubbery, fence, sod or other disturbed surfaces or structures in a condition equal to that before the work began, to the satisfaction of the OWNER, and shall furnish all labor and material incidental thereto.

The OWNER shall locate and designate all manhole access points open and accessible for the work, and provide rights of access to these points. The OWNER shall also provide access to water hydrants for cleaning, inversion, and other work items requiring water.

601.2.1. Submittals. Submittals shall be made according to the OWNER'S schedule so that project schedules can be met.

CONTRACTOR shall submit the following to the OWNER:

(1) Method of pipe rehabilitation and restoration of existing service connections. This shall include detail drawings and written description of the entire construction procedure to install pipe, bypass flow in the section of existing pipe to be reconstructed, and reconnection of service connections. Drawings shall include showing the cross sectional profile of the pipe wall and pipe joint details. For pipes larger than 12-in diameter, bypass specifications shall be sealed by a registered OWNER. The process shall not be detrimental to liner pipe material and its properties;

(2) A complete list of all materials proposed to be furnished and installed, including manufacturer's name and catalog number for each item, complete information on material composition, physical properties, and dimensions of new pipe and fittings and technical data, and manufacturer's recommendations for handling, storage, installation, and repair of pipe and fittings damaged;

(3) Manufacturer's design calculations, including minimum thickness of the pipe materials being supplied;

(4) Prior to use of the materials, if required, written certification of the CONTRACTOR'S compliance with the manufacturer's standards and specifications for all materials;

(5) After reviewing the site, but prior to starting any rehabilitation process, the CONTRACTOR shall make a plan of all work activities. If required by the OWNER, the CONTRACTOR shall plan its work after review of pre-construction television inspection tape and reports. If required by the OWNER, the CONTRACTOR shall furnish its work plan to the OWNER;

(6) Flow control implementation plan shall be pre-approved by OWNER prior to any construction.

601.2.2. Inspections and Testing. Prior to all work, the CONTRACTOR shall carefully inspect the area for existing conditions.

Each pipe or pipe material shall be subject to inspection by the OWNER immediately before it is installed and defective pipe or pipe material may be rejected at no cost to the OWNER.

CONTRACTOR shall perform pre-construction and post-construction television inspection. Television inspection shall be performed according to Item 507.5.2. Television Inspection, with the following modifications:

(1) The interior of the pipeline shall be carefully inspected to determine the location of any condition that may prevent proper installation of the new pipe;

(2) These conditions shall be indicated to the OWNER prior to installation and corrected as determined by the OWNER;

(3) A digital file and suitable log shall be submitted to the OWNER prior to and after installation of the pipe, which become property of the OWNER.

Where applicable, the CONTRACTOR shall provide a pipe "coupon" specimen from each run of pipe for testing, after installation, by an approved laboratory. All expenses for the testing of these specimens will be paid by the OWNER. The cost of retests made necessary by the failure of the samples of specimens to meet the specified requirements shall be paid for by the CONTRACTOR. CONTRACTOR shall conduct Pre- and Post-TV inspections at no cost to the OWNER.

601.3. GENERAL MATERIALS

Materials shall be appropriate to the size of the existing pipeline to be reconstructed.

Pipe interior shall be a light color to facilitate video inspection.

The CONTRACTOR shall verify all existing pipe diameters prior to ordering pipe materials.

The CONTRACTOR shall not permit any pipe rehabilitation component to be brought onto the job site until it has been approved by the OWNER.

Tests for compliance with these specifications shall be made as specified herein and in accordance with applicable ASTM specifications. Upon request, the manufacturer shall furnish a certificate for all material furnished under this specification.

All materials shall be transported, handled, and stored as recommended by manufacturer.

Pipe, pipe materials, or fittings may be rejected for failure to meet any requirements of these specifications.

601.4. GENERAL METHODS

601.4.1. Pre-Construction. Methods used shall minimize disruption or interference with traffic flow, public right-of-way, local business, or adjacent private property in the area.

Any required excavation shall conform to the requirements of Item 203. Site Preparation, including identification and protection of utilities.

Upon approval of the OWNER, the manufacturer's recommendations shall become the basis for acceptance or rejection of actual methods of installation.

The CONTRACTOR shall make every effort to maintain service usage throughout the duration of the project. In the event that a service connection will be out of service, the CONTRACTOR shall notify the OWNER and each customer whose service will be disrupted by construction in writing a minimum of 24-hours in advance of construction. Notice shall include the work to be conducted, work schedule including when service will be off-line, effect to each customer, and a local telephone number of the CONTRACTOR to call to discuss the project or any problems that could arise. The maximum amount of time of no service shall be 12-hours for any property served by the existing pipeline. The OWNER may also require the CONTRACTOR to attempt personal contact with affected residents prior to the beginning of work being conducted on the section relative to the residents affected. The CONTRACTOR shall attempt personal contact with any home or business that cannot be reconnected within the time schedule stated in the written notice.

601.4.2. General Construction Requirements. The CONTRACTOR shall certify it has a minimum of two (2) complete working units. Spare key components shall be on the site prior to construction.

The CONTRACTOR's supervisor shall be on the job full-time during any and all steps of the pipe installation.

The CONTRACTOR shall carry out its operations in strict accordance with all OSHA and manufacturer's safety requirements. Particular attention is drawn to those safety requirements involving working with hazardous/combustible material, scaffolding, and entering confined spaces.

In the event of a discrepancy, the CONTRACTOR shall immediately notify the OWNER. No work shall be performed in an area of discrepancy until it has been fully resolved by the OWNER.

The CONTRACTOR shall maintain in operating condition all active pipes encountered during the pipeline rehabilitation. The CONTRACTOR shall be responsible for continuity of service to each facility connected to the section of pipe being reconstructed during execution of the work. The CONTRACTOR, when necessary, shall provide for the flow around the section of pipe designated for rehabilitation. At no time shall wastewater be pumped into the streets, alleys, waterways or storm drain systems. Bypass shall be made by plugging the

line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system. Pump and bypass lines shall be of adequate capacity and size to handle the flow. The CONTRACTOR shall ensure that no wastewater overflows from the existing pipe into access pit(s). If wastewater does overflow, the CONTRACTOR shall provide suitable means to contain the wastewater and return it to the existing pipe. If flow backup occurs and enters buildings, the CONTRACTOR shall be responsible for clean up, repair, property damage cost, and claims. CONTRACTOR shall be liable for any damages incurred as a result of inadequate flow bypass measures.

It shall be the responsibility of the CONTRACTOR to clear the existing pipeline of obstructions such as debris, a protruding service connection, dropped joint, or collapsed pipe that will prevent rehabilitation. Any required work must be approved in writing by the OWNER and done by the CONTRACTOR. The OWNER reserves the right to approve or disapprove of any point repairs identified. If inspection reveals an obstruction that cannot be removed by conventional pipe cleaning equipment, then the CONTRACTOR shall hydraulically reround the pipe or make a point repair excavation to uncover and remove or repair the obstruction. Extreme care shall be used to prevent debris from entering existing pipe prior to rehabilitation.

Pipe grades shall be maintained equal to the grade of the line being rehabilitated. The CONTRACTOR shall correct all grade deficiencies to the satisfaction of the OWNER at no additional cost to the OWNER.

In the event of damage caused to materials, the CONTRACTOR shall make all repairs and replacement necessary to the approval of the OWNER at no additional cost to the OWNER.

During the warranty period, defects that may affect the integrity or strength of the pipe, in the opinion of the OWNER, shall be repaired or the pipe replaced at the CONTRACTOR'S expense.

The CONTRACTOR shall make all required connections to existing pipes and manholes within 12-hours of pipe rehabilitation completion and carry out such work in accordance with local standards and requirements and as directed by the OWNER. The CONTRACTOR shall be responsible to confirm the active services prior to reconnection.

601.4.2.1. Point Repairs on Private Property. Point repairs may be required on private property. Point repairs on private property shall be excavated using mini equipment to cause as little damage as may be necessary to accomplish the work. If fences must be removed to accomplish the work, the CONTRACTOR shall install temporary fencing of like size and construction until permanent fence replacement is accomplished.

601.4.3. Post-Construction Requirments. After the installation work has been completed and all testing acceptable, the CONTRACTOR shall clean up the entire project area in accordance with Item 107.25. Project Clean-Up. The CONTRACTOR shall remove surplus pipe, excess materials, tools and temporary structures. All dirt, rubbish and pipe material from the operation and debris collected as a result of cleaning shall be legally disposed of by the CONTRACTOR.

The CONTRACTOR shall restore or replace all removed or damaged pavement, curb, sidewalk, gutter, shrubbery, fence, sod or other disturbed surfaces or structures in a condition equal to that before the work began, to the satisfaction of the OWNER, and shall furnish all labor and material incidental thereto.

601.5. SECTION HELD FOR FUTURE USE.

601.6. SECTION HELD FOR FUTURE USE.

601.7. CURED-IN-PLACE PIPE LINER (CIPP LINER)

It is the intent of this specification to provide for the rehabilitation of pipelines and conduits by the installation of a resin-impregnated flexible tube, which is inverted into the original conduit by use of a hydrostatic head. The resin is cured by circulating hot water or steam within the tube.

601.7.1. Material. In case of conflicting requirements between this specification and referenced standards, this specification shall govern.

The tube shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM D5813 Cured-In-Place Thermosetting Resin Sewer Pipe. The tube shall be constructed to withstand inversion pressures, have sufficient strength to bridge missing pipe, stretch to fit

irregular pipe sections, and shall invert smoothly around bends. The tube shall be made to a size that when installed, will tightly fit the internal circumference and length of the original pipe. Allowance should be made for circumferential stretching during inversion. Overlapped layers of felt that cause lumps in the final product shall not be allowed.

The outside layer of the tube (before wetout) shall be polyethylene- or polyurethane-coated, a translucent flexible membrane that clearly allows inspection of the resin impregnation (wetout) procedure. The plastic coating shall separate the resin inside the tube from the inversion water without leakage, accommodate inversion, stretch to size, and shall not delaminate before, during, or after curing. The wetout tube shall have a uniform thickness that when compressed at installation pressures will meet or exceed the design thickness.

The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination in the cured CIPP. Seams in the tube shall be stronger than the unseamed felt. Where the length requires joining, the joint shall not be perpendicular to the long axis but spirally formed.

The outside of the tube shall be marked for distance at regular intervals along its entire length, not to exceed 5-ft. The manufacturer's name or identifying symbol shall also appear at intervals not exceeding 10-ft.

The resin system shall be a corrosion-resistant polyester, vinyl ester or epoxy, and catalyst system that when properly cured within the tube composite meets the requirements of ASTM D5813 Cured-In-Place Thermosetting Resin Sewer Pipe, the physical properties herein, and those specifications utilized in the design of the CIPP for a particular project.

The CIPP shall be designed as per ASTM F1216 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube, Appendix X1. The CIPP design shall assume no bonding to the original pipe wall.

The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If separation of the layers occur during testing of field samples, new samples shall be cut from the work. Any reoccurrence may cause rejection of the work.

The cured pipe material (CIPP) shall conform to the minimum structural properties, as indicated in Table 601.7.1.(a) Cured-in-Place Pipe Liner Properties.

Table 601.7.1.(a) Cured-in-Place Pipe Liner Properties

1. Property	2. ASTM Test Method	3. Minimum Value	4. Materials with 5. 400,000 psi
Modulus of Elasticity	D790 Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials	(short term) 250,000-psi	400,000-psi
Flexural Stress	ASTM D790 (same as above)	4500-psi	4500-psi

No dry or unsaturated layers shall be evident. Any layers of the tube that are not saturated with resin prior to insertion into the existing pipe shall not be included in the structural CIPP wall thickness computation.

The CIPP shall meet the chemical resistance requirements of ASTM F1216, Appendix X2. CIPP samples for testing shall be of tube and resin system similar to that proposed for actual construction. It is required that CIPP samples with and without plastic coating meet these chemical testing requirements.

Overall, the hydraulic profile shall be maintained as large as possible. The CIPP shall have a minimum of full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition. The roughness coefficient of the CIPP shall be verified by third party test data.

CIPP samples shall be prepared and physical properties tested in accordance with ASTM F1216 Section 8.1 using either method proposed. The flexural modulus must meet or exceed the value used in design (structural requirements for the pipe size and thickness furnished in design).

When requested by the OWNER, the CONTRACTOR shall submit test results from previous field installations in the USA of the same resin system and tube materials as proposed for the actual installation. These test results must verify that the CIPP physical properties specified in this section have been achieved in previous field applications. Testing samples for this project shall be made and tested as described in this specification.

601.7.2. Methods. The CIPP Liner shall be continuous and tight fitting. Installation shall be in accordance with manufacturer's recommendations.

601.7.2.1. Intallation. CIPP installation shall be in accordance with ASTM F1216 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube, Section 7, or ASTM F1743 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP), or ASTM F2019 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP) with the following additional requirements:

The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall. A vacuum impregnation process shall be used. After vacuum in the tube is established, a vacuum point shall be no further than 75-feet from the leading edge of the resin. The leading edge of the resin slug shall be as near to perpendicular as possible. A roller system shall be used to uniformly distribute the resin throughout the tube. If the installer uses an alternate method of resin impregnation, the method must produce the same results. Any alternate resin impregnation method must be proven.

Curing shall be accomplished by utilizing hot water under pressure.

601.7.2.2. Finishing. Branch connections to buildings shall be reopened without excavation utilizing a remotely controlled cutting device, monitored by a video TV camera.

No additional payment shall be made for excavations for the purpose of reopening connections, and the CONTRACTOR shall be responsible for all costs and liability associated with such excavation and restoration work.

Visual inspection of the CIPP shall be in accordance with ASTM F1216, Section 8.6 or ASTM F1743.

Leakage testing of the CIPP shall be accomplished during cure while under a positive head. CIPP products in which the pipe wall is cured while not in direct contact with the pressurizing fluid (e.g., a removable bladder) must be tested by an alternative method approved by the OWNER.

601.8. PIPE BURSTING WITH POLYETHYLENE

This section includes requirements to rehabilitate existing pipelines by the pipe bursting method, which splits the existing pipe and immediately installs a new polyethylene pipe. Hydraulically- pneumatically- and statically-operated equipment may be allowed for this replacement.

The CONTRACTOR shall be certified by the particular pipe bursting system manufacturer that such firm is a licensed installer of its system.

Polyethylene pipe jointing shall be performed by personnel trained in the use of thermal butt-fusion equipment and recommended methods for new pipe connections. Personnel directly involved with installing the new pipe shall receive training in the proper methods for handling and installing the polyethylene pipe. Training shall be performed by qualified representative.

601.8.1. Materials. Materials shall conform to the requirements of Item 501.21. Solid Wall Polyethylene Plastic Pipe for Water, Wastewater, and Pipe Rehabilitation with modifications as stated herein.

The Polyethylene Plastic Pipe shall be high density polyethylene pipe and meet the applicable requirements of AWWA C906 Polyethylene Pressure Pipe and Fittings, 4-in through 63-in. for Water Distribution and Transmission for potable water pipe replacement, or ASTM F714 for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter for other applications. All pipe shall be made of virgin material. No rework except that obtained from the manufacturer's own production of the same formulation shall be used. The pipe shall be homogenous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

Saddles shall be heat fusion saddles, unless otherwise approved by OWNER. Mechanical saddles made of polyethylene pipe compounds shall meet the requirements of pipe as stated above. Mechanical saddles shall have stainless steel straps and fasteners, neoprene gasket and backup plate. Sizes of the pipe insertions to be used shall be as shown on the plans or to renew the pipeline to its original or greater than flow capacity. The minimum wall thickness of the polyethylene pipe shall meet the greater of either the thickness required to meet internal pressure or the thickness determined by burial depth as indicated in Table 601.8.1.(a) Pipebursting (with PE) Required Pipe Thickness.

Table 601.8.1.(a) Pipebursting (with PE) Required Pipe Thickness

Depth of Cover	Standard Dimension Ratios (Ductile Iron Pipe Size): Minimum DR of Pipe
0 - 10.0-ft.	21
> 10.0-ft	17

601.8.2. Methods. All service connections shall be identified, located, and excavated prior to the pipe insertion to expedite reconnection.

601.8.2.1. Insertion. Insertion of launching pits shall only be allowed at locations of existing or proposed manholes, unless otherwise approved by OWNER.

Equipment used to perform the work shall be located away from buildings so as to minimize noise impact. CONTRACTOR shall provide silencers or other devices to reduce machine noise as required to meet requirements.

The CONTRACTOR shall install all pulleys, rollers, bumpers, alignment control devices, and other equipment required to protect existing manholes, and to protect the pipe from damage during installation. Lubrication may be used as recommended by the manufacturer. Under no circumstances shall the pipe be stressed beyond its elastic limit.

The design, selection considerations and installation procedures for the construction of new wastewater and storm conduit by the insertion of polyethylene pipe through existing pipe and along previously existing line and grade shall be performed in accordance with ASTM F585 Standard Practice for Insertion of Flexible Polyethylene Pipe into Existing Sewers.

Upon commencement, pipe insertion shall be continuous and without interruption from one manhole to another, except as approved by the OWNER.

The polyethylene pipe shall be assembled and joined at the site using the thermal butt-fusion method to provide a leak-free joint. Threaded or solvent-cement joints and connections are not permitted. All equipment and procedures used shall be used in strict compliance with the manufacturer's recommendations. Fusing shall be accomplished by personnel certified as fusion technicians by a manufacturer of polyethylene pipe and/or fusing equipment. The butt-fused joint shall be true alignment and shall have uniform roll-back beads resulting from the use of proper temperature and pressure. The joint shall be allowed adequate cooling time before removal of pressure. The fused joint shall be watertight and shall have tensile strength equal to that of the pipe. All joints shall be subject to acceptance by the OWNER prior to insertion. All defective joints shall be cut out and replaced at no cost to the OWNER. Any section of the pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than ten-percent (10%) of the wall thickness, shall not be used and must be removed from the site. However, a defective area of the pipe may be cut out and the joint fused in accordance with the procedures stated above. In addition, any section of pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness, or any other defect of manufacturing or handling as determined by the OWNER shall be discarded and not used.

The installed pipe shall be allowed the manufacturer's recommended amount of time, but not less than 4-hours, for cooling and relaxation due to tensile stressing prior to any reconnection of service lines, sealing of the annulus or backfilling of the insertion pit. Sufficient excess length of new pipe, but not less than 4-in., shall be allowed to protrude into the manhole to provide for occurrence.

601.8.2.2. Finishing. Following the relaxation period, the annular space shall be sealed. Sealing shall be made with material approved by the OWNER and/or its representative and shall extend a minimum of 8-in. into the manhole wall in such a manner as to form a smooth, uniform, watertight joint.

Terminal sections pipe that are joined within the insertion pit shall be connected with a full circle pipe repair clamp. The butt gap between pipe ends shall not exceed ½-in.

Once a saddle is secured in place, CONTRACTOR shall drill hole full inside diameter of saddle outlet in pipe liner. CONTRACTOR shall make both the inside and outside of drilled holes smooth.

At all points where the polyethylene pipe has been exposed, as in starter excavations, at service connection fittings, outside of manholes, etc., the CONTRACTOR shall encase the pipe and fittings in minimum of 6-in. of concrete or flowable backfill. If flowable backfill is used, the CONTRACTOR shall remove all debris and create a void along each side of the pipe at the spring line to undisturbed soil in preparation for the cement stabilized sand backfill. Width of the void shall not exceed (main O.D. + 2-ft.) or (service line O.D. + 2-ft.).

Reconnections shall be accomplished as described in the required submittals.

601.9. PIPE BURSTING WITH RIGID PIPE

For the purpose of this specification, pipe rehabilitation by bursting is defined as the trenchless installation of new wastewater pipe by bursting the pipe behind an apparatus which expands the existing wastewater pipe, tees, wyes, and couplings into the adjacent ground forming a clear space to insert the new wastewater piping.

601.9.1. Materials. Pipe shall meet or exceed the requirements of Item 501.3. Vitrified Clay Pipe Used in Trenchless Applications.

All materials supplied under this section shall be warranted for a period of two (2) years by the manufacturer and CONTRACTOR. The materials shall be warranted to be free from defects in workmanship, design, and materials.

Packaging and shipping shall be done in accordance with manufacturer instructions. Each standard and random length of pipe shall be clearly marked with the following information: pipe size, class, profile number, and production code. Each box or package shall be properly marked to show its actual weight in addition to its contents.

601.9.2. Methods. Equipment employed in the pipe bursting procedure shall be approved by the OWNER and the pipe supplier prior to award of a contract.

A hydraulic or mechanical pipe-pushing device that exerts pressure on the jacking pipe may be used. The machine operator shall closely and continuously monitor and control the jacking load imposed on the new pipe. A jacking ring or device shall be used to distribute the jacking load evenly on the entire surface perimeter of the end of the jacking pipe. The CONTRACTOR shall also utilize a device capable of holding a nearly inserted joint of liner pipe without damage or danger while the following joint is shoved home to complete the joint makeup. Joints shall be made in full view of the operator and inspector.

601.9.2.1. Access Pits. It is the CONTRACTOR's responsibility to locate, design, and determine the necessary number of access pits, excavation methods, and all other items required for the successful completion of the work. CONTRACTOR shall submit an access pit(s) plan showing location(s), dimensions, equipment set up, sheeting, shoring, bracing, and calculations.

Earthwork for access pits shall be performed in accordance with Item 504. Open Cut – Backfill.

The walls of the access pit(s) shall be vertical and supported by sheeting, shoring, and bracing in accordance with Item 107.20. Protection of Work and of Persons and Property with the following additions:

(1) No side sloping of pit walls shall be allowed.

(2) All four walls of each pit shall be properly protected against inflow of groundwater or soil materials. The control of groundwater shall be such that softening of the bottom of excavations or formation of "quick" conditions or "boils" do not occur. Dewatering systems shall be designed and operated to prevent removal of the natural soils.

Access pit dimensions shall be constructed at the minimum size necessary to accommodate the maximum length and diameter of pipe used, in addition to auxiliary pushing equipment, and to provide sufficient working room on either side of the existing pipe to replaced. The depth of the pit(s) shall be

sufficient to expose the existing pipe to the invert, allowing for the placement of concrete or shotcrete coating, whichever is necessary, at the bottom of the pit(s). The thickness of concrete or shotcrete shall be necessary to prevent groundwater infiltration into the pit and to prevent any wastewater from infiltrating into the soil.

Access pits shall be adequately covered when not in use to control odors and shall be securely fenced and barricaded to prevent unauthorized entry.

601.9.2.2. Installation. The CONTRACTOR shall be responsible for locating and exposing all service laterals and cleanouts prior to replacement pipe insertion.

The pipe shall be jacked or pushed into the existing pipe utilizing equipment as herein specified. An aqueous solution such as bentonite may be used to minimize the jacking load and provide lubrication during the new pipe installation. For each section to be rehabilitated, insertion shall be one continuous operation until the planned termination point is reached. Pipe jointing shall be accomplished in strict accordance with the pipe manufacturer's recommendations, and each joint shall be completely made-up in the access pit(s) in full view of the OWNER.

Total jacking loads shall not exceed 75% of the manufacturer's maximum recommendations. The CONTRACTOR shall provide a suitable means of measuring a jacking load and shall monitor the load as the new pipe is being installed. If, at any time, the load appears to rise erratically indicating possible obstruction of the pipe, jacking operations shall be terminated and the obstruction or other impediment removed before continuing. The entire cost for all work associated with an unanticipated access pit(s) shall be borne by the CONTRACTOR.

If portions of the line being jacked have curves with a radius of curvature less than 700-ft, the pipe manufacturer shall be consulted. In no case should a joint be pulled in excess of the maximum degrees of angular deflection recommended by the manufacturer for any given pipe diameter.

When the pipe is pushed through a manhole, the top half of the pipe within the manhole shall be removed using a saw and additional portions shall be removed to allow side connections to flow into the new pipe. The pipe shall be inserted through the manhole such that no pipe joint is located inside the manhole. The pipe shall be cut out at manholes as required after insertion and grouting. The methods of cutting shall be such as to leave smooth, clean, straight edges. The pipe shall be suitably blocked during grout and concrete placement so that no bowing or other deviation from a parallel-sided channel occurs.

601.9.2.3. Finishing. The CONTRACTOR shall reconnect all service connections to the new pipe. A portion of the existing pipe around each service connection shall be removed to expose the new pipe and provide sufficient working space for making the new service connections. The CONTRACTOR may propose alternative methods for reinstatement of service connections. Saddle stub-out dimensions shall be the same size or larger than the existing service lateral. Saddles shall be connected to existing service laterals by using flexible couplings.

At points where the liner has been exposed, the liner pipe and fittings shall be encased to prevent deflection due to earth loading or subsidence. In preparation for the placing of the encasement material, debris and soil shall be removed along each side of the existing pipe down to the spring line. After the encasement material is in place and accepted by the OWNER, CONTRACTOR shall place and compact backfill to required finished grades in accordance with these specifications.

601.10. SEGMENTAL SLIPLINING

This section includes requirements to rehabilitate existing wastewater pipelines, storm conduit and culverts by the method of segmental sliplining with pipe as specified in Section 501. Segmental sliplining is defined as a trenchless installation of new liner pipe, which is either pushed or pulled inside an existing pipeline.

601.10.1. Materials. Appropriate pipe material shall meet or exceed all requirements of Item 501.18. Polyvinyl Chloride (PVC) Profile Gravity Pipe and Fittings – For Direct Bury and Sliplining Applications.

Pipe joints shall be furnished in minimum 2½-ft joints to maximum 20-ft joint. The pipe wall must be smooth and consistent on the inside surfaces. The maximum outside diameter including the bell has to be such that the liner pipe can be inserted into the existing pipe without binding, damaging or deflecting the liner pipe.

Unless otherwise specified on the plans, the pipe shall be field connected with bell and spigot joints, or as recommended by the manufacturer. Gaskets suitable for the service intended and meeting the requirements of ASTM F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe shall be used. Joint shall be designed to meet the performance requirements of ASTM D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

601.10.2. Methods. The CONTRACTOR shall completely grout the annular void between the existing host pipe and the new liner pipe with grout as recommended by the manufacturer. Bypass pumping may not be necessary when the liner pipe is installed during live flow applications. CONTRACTOR shall adhere to the following conditions, unless approved otherwise by the OWNER.

601.10.2.1. Insertion/Access Pits. The location of the insertion pits shall be determined to facilitate sliplining the amount of pipe shown on the plans. The exact location and number of insertion/access pits must be planned by the CONTRACTOR and submitted in writing for approval by the OWNER prior to excavation. Pit locations shall coincide with existing pipe joints such that the total number of pits is minimized, and the footage of liner pipe installed in a single pull maximized. Location of damaged pipe/point repairs can be used for insertion pits if approved by the OWNER. Earthwork for access pits shall be performed in accordance with Item 504. Open Cut – Backfill.

Access pits shall be adequately covered when not in use to control odors and shall be securely fenced and barricaded to prevent unauthorized entry.

The cost of the insertion is incidental to the bid price for sliplining and includes all work, equipment, labor, tools, etc., required for diverting and pumping flow, opening and closing the pit(s), and restoring the site satisfactory to the OWNER.

After completing the insertion pit excavation and diverting flow as necessary, CONTRACTOR shall remove the top of the existing wastewater pipe down to the spring line by neatly sawing the pipe and shall take care not to disturb the bottom portion of the existing pipe, thus providing a stable base for the liner pipe.

601.10.2.2. Installation. CONTRACTOR shall install sliplining material according to the manufacturer's written procedures and instructions.

Liner pipe sections shall be jointed prior to insertion of the complete pipe section into the host pipe. The liner pipe shall be equipped with a lead piece to help guide the pipe through without any disruption. Liner pipe may be pulled or pushed through the existing host pipe with aid of a backhoe or jacking device, providing the pushing or jacking loads are monitored and remain in accordance with the safe compressive/jacking loads as set forth by the manufacturer.

Once insertion is complete, CONTRACTOR shall reinstall the exiting top pipe section removed and construct new manhole at the end of the pipeline. CONTRACTOR shall connect liner pipe to new manhole according to manufacturer recommendations.

601.10.2.3. Grouting. The CONTRACTOR shall utilize the grout for solidification of the annular void between the host and liner pipe. Grout mixture shall have an approximate compressive strength of 150-psi unless specified otherwise by the OWNER, and a minimum density of 30-pcf. Grout mix shall have less than 1-percent (1%) shrinkage by volume. Materials for sliplining grout shall comply with the following:

(1) Cement shall comply with ASTM C150 Portland Cement. Pozzolans and other cementitious materials may be permitted.
(2) Fly Ash shall comply with ASTM C618 Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Concrete; either Type C or Type F shall be used.
(3) Sand if utilized, shall conform to ASTM C144 Aggregate for Masonry Mortar, except as modified in Table 601.10.2.3.(a) Segmental Sliplining Grouting Sand.

Table 601.10.2.3.(a) Segmental Sliplining Grouting Sand.

U.S. Standard Sieve Size	% Passing by Weight
No. 16	100
No. 30	60 – 85
No. 50	10 – 35
No. 100	5 – 25
No. 200	0 – 10

(4) Potable water free from deleterious amounts of alkali, acid and organic materials, which would adversely affect the set time, or strength of the sliplining grout.
(5) Admixtures shall be selected by the manufacturer of the sliplining grout to meet the performance requirements, to improve pumpability, to control set time, and reduce segregation.

601.11. MEASUREMENT AND PAYMENT

Measurement shall be as specified in the proposal and contract documents. The unit price bid for rehabilitating pipe shall be full compensation for all materials, labor, equipment, and incidentals required to insert the liner pipe within the existing pipe or replace existing pipe. Payment shall also include the cost of flow bypass, sealing liners in the manholes, reworking the manhole inverts and benches, and other work necessary to complete installation. Payment shall be for actual linear footage of pipe installed in the field and shall be measured between the centerlines of the manholes. Cleaning, pre-construction television inspection, post-construction television inspection, testing and all relevant submittals shall be incidental to the pipe rehabilitation items. Retesting that results from failure to pass initial testing shall be at the CONTRACTOR'S expense.

If excavation is required for point removal or repair of obstructions, it shall be approved in writing by the OWNER prior to the commencement of the work and shall be considered as a separate pay item.

Reconnection of services shall be paid for per each reconnection made.

ITEM 602. REHABILITATION OF MANHOLES OR UNDERGROUND VAULTS

602.1. GENERAL

This specification covers work and materials required for protecting and/or rehabilitating manholes and other underground vaults to eliminate inflow, infiltration and exfiltration, provide corrosion protection, repair voids and restore structural integrity. Procedures for repair, surface preparation, application and testing are described herein.

602.2. SUBMITTALS

The following items shall be submitted:

(1) Technical data sheet on each product used, including applicable ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications.
(2) Material Safety Data Sheets (MSDS) for each product used.
(3) Manufacturer's product data, including physical properties, results of applicable ASTM tests for the material supplied, and requirements for surface preparation, repair, application, curing, and field quality control.
(4) Project specific guidelines and recommendations.
(5) Manufacturer Qualifications: Submit list of a minimum of ten (10) successful similarly sized manhole rehabilitation projects completed during past 3-years.
(6) CONTRACTOR and Applicator Qualifications:
    (a) Manufacturer certification that Applicator has been trained and approved by manufacturer in the handling, mixing and application of the specified products.
    (b) Certification that the equipment to be used for applying the products has been manufactured or approved by the protective coating manufacturer and Applicator personnel have been trained and certified for proper use of the equipment.
    (c) List of recently completed successful similarly sized manhole rehabilitation projects, including project name and location, names of OWNER, and description of products used, substrates, and application procedures.
    (d) Proof of any necessary federal, state or local permits or licenses necessary for the project.
(7) Design details for any additional ancillary systems and equipment to be used in site and surface preparation, application and testing.
(8) Bypass pumping submittal will include, but not be limited to, pumps, piping materials, and emergency plan.

602.3. QUALITY ASSURANCE

CONTRACTOR shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE and SSPC standards and the protective coating manufacturer's recommendations.

The OWNER will observe surface preparation, application and material handling procedures to ensure adherence to the specifications. Inspection by the OWNER or the waiver of inspection of any portion of the work shall not relieve the CONTRACTOR of responsibility to perform the work as specified.

Deficiencies in the finished coating shall be marked and repaired by the CONTRACTOR.

602.4. DELIVERY, STORAGE AND HANDLING

Materials shall be delivered to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer. Containers shall be kept sealed until ready for use. Materials shall be kept dry, protected from weather and stored under cover and in accordance with manufacturer's instructions. Materials shall be handled according to their material safety data sheets. Material damage shall be prevented.

602.5. REHABILITATION

602.5.1. General. CONTRACTOR shall conform with all local, state and federal regulations including those set forth by OSHA, RCRA and the USEPA and any other applicable authorities. Method statements and design procedures are to be provided by CONTRACTOR when confined space entry, flow diversion or bypass is necessary to perform the specified work.

CONTRACTOR shall examine surfaces to receive manhole rehabilitation. CONTRACTOR shall notify the OWNER in writing if surfaces are not acceptable. Surface preparation, repair, or application shall not begin until unacceptable conditions have been corrected.

Contaminants such as oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed if necessary for successful rehabilitation, based on manufacturer's recommendations. Loose, unsound, and protruding brick, mortar, and concrete shall be removed and disposed of as described in Item 203. Site Preparation.

Covers shall be placed over invert to prevent extraneous material from entering sewer lines.

602.5.1.1. Serious Structural Rehabilitation. Structural requirements of the rehabilitative method shall be specified by the OWNER per project. Methods of serious structural rehabilitation for high infiltration and/or gas deteriorated structures may be one of the following:

(1) Pre-formed Fiberglass Inserts
(2) Poured-in-place concrete rehab
(3) Cured-in-place fiberglass Liner
(4) Cast-in-place plastic liners

602.5.1.2. Other Structural Rehabilitation.

Methods where less serious problems exist because of infiltration or gas deterioration, but where rehabilitation, preventative maintenance, or protection of newly rehabilitated manholes is required may be one of the following:

(1) Cured-in-place fiberglass Liner.
(2) Epoxy coating.
(3) Polyurea coating.
(4) Polyurethane coating.
(5) Calcium aluminate concrete or Calcium aluminate concrete with epoxy top coat.
(6) Cured-in-place structural epoxy/fiberglass coating.

602.5.2. General Repair Procedures. Infiltration shall be stopped prior to any rehabilitative measures. Weep holes may be installed as required to localize infiltration during application of patching material or infiltration control material. Weep holes shall be plugged after application with infiltration control material before application of liner material. For severe infiltration, drill as required to pressure grout using a cementitious or chemical grout. Grout shall be applied in accordance with manufacturer's instructions.

Areas where structural steel has been exposed or removed shall be repaired in accordance with the OWNER's recommendations.

Inverts shall be repaired when there is visible damage, where infiltration is present, or when vacuum testing is specified.

Patching and repair materials should not be used unless their manufacturer provides information as to suitability and procedures for preparation of material to bond with the specified rehabilitative materials. Repair materials shall be applied and cured in accordance with the manufacturer's recommendations.

Repair materials shall be used to fill voids, structurally reinforce and/or rebuild surfaces, etc. as determined necessary by the OWNER and protective coating Applicator. At minimum, voids greater than 2-in in depth shall be repaired with approved patching material.

The repair material thickness shall be specified by the OWNER.

The repair materials shall be permitted to cure according to manufacturer recommendations. Curing compounds should not be used unless approved for compatibility with the specified protective coating.

Application of the repair materials shall be inspected by the protective coating certified Applicator to ensure proper finishing for suitability to receive the specified coating.

Before application of each material, surfaces to be rehabilitated shall be inspected by the OWNER. CONTRACTOR shall correct defects or deficiencies identified by the OWNER before application of subsequent material.

602.5.3. Surface Preparation. All concrete or mortar that is not sound or has been damaged by chemical exposure shall be removed to a sound concrete surface or replaced.

CONTRACTOR is to maintain strict adherence to published standards and recommendations of the National Association of Corrosion Engineers (NACE International) and the applicable published standards and recommendations of the Society of Protective Coatings (SSPC) with regard to proper surface preparation and compatibility with existing coatings. If recommended by the manufacturer of the specified rehabilitative materials, existing coatings shall be removed prior to application of the new protective coating(s).

Surface preparation method(s) shall be based upon the conditions of the substrate, service environment and the requirements of the protective coating to be applied.

At minimum, surfaces to receive rehabilitation shall be cleaned and abraded to produce a sound surface with adequate profile and porosity to provide a strong bond between the rehabilitative method and the substrate. Generally, this can be achieved with pressure water cleaning equipment capable of 5000-psi at 4-gpm. Other methods such as high pressure water jetting (refer to NACE Standard Nos. SSPC-SP WJ-1/NACE WJ-1, SSPC-SP WJ-2/NACE WJ-2, SSPC-SP WJ-3/NACE WJ-3, and SSPC-SP WJ-4/NACE WJ-4), abrasive blasting, shotblasting, grinding, scarifying or acid etching may also be used, as necessary. Detergent water cleaning and hot water blasting may be necessary to remove contaminants. Method(s), as approved, shall be performed in a manner that provides a uniform, sound clean neutralized surface that is not excessively damaged.

If abrasive blast and leak repair is performed, all surfaces shall be inspected for remaining laitance prior to protective coating application. Any evidence of remaining contamination or laitance shall be removed by additional abrasive blast, shotblast or other approved method.

602.5.4. Application of Rehabilitative and Protective Materials. Application procedures shall conform to the recommendations of the manufacturer of the specified rehabilitative materials, including material handling, mixing, environmental controls during application, safety, and equipment.

Spray equipment shall be specifically designed to accurately ratio and apply the specified materials, shall be regularly maintained, and in proper working order. Air assisted spray application equipment may be acceptable only if the air source is filtered to completely remove all oil and extraneous water.

Prior to and during application, care should be taken to avoid exposure of air movement and direct sunlight or other intense heat source to the structure being coated. Where varying surface temperatures do exist, care should be taken to apply the coating when the temperature is falling rather than when it is rising. The structure shall be covered if time between application of coats is to be longer than 15-minutes. Finished materials shall not be exposed to sunlight or air movement for longer than 15-minutes before covering or closing access.

If coatings do not bond properly to the manhole surfaces, such coating shall be removed and replaced at no expense to the OWNER.

Follow manufacturer's instructions whenever more than 12-hours have elapsed between layer applications.

Other than for application of cementitious products, surfaces shall be completely dry.

Thicknesses specified below are minimum thicknesses. The material thickness shall be specified by the OWNER.

602.5.4.1. Pre-Formed Fiberglass Inserts. Inserts shall meet requirements of ASTM D3753 Glass-Fiber-Reinforced Polyester Manholes and Wetwells. Chimney and corbel areas of the manhole shall be removed. Then the insert shall be lowered into position, back poured with concrete of the class specified by the OWNER, and completed at the surface area.

602.5.4.2. Poured-In-Place Concrete. This method shall use inside-the-manhole forming. The use of this process may be in conjunction with a synthetic liner material placed to the inside area of the manhole in the form in order to provide interior surface that is resistant to sewer gases and chemicals, as specified on the plans. Thickness shall be specified on the plans.

602.5.4.3. Cured-In-Place Fiberglass Inserts. A custom-manufactured liner shall be molded into place with a non-porous membrane bonded between the layers of structural fiberglass, forming a permanent barrier to stop future infiltration or gas deterioration to the existing structure. This system shall be bonded to the existing surface.

602.5.4.4. Cast-In-Place Plastic Liners. Liner may be polyvinyl chloride (PVC) or high density polyethylene (HDPE) as specified by the OWNER. Liner system shall be designed to eliminate infiltration.

602.5.4.5. Calcium Aluminate Concrete or Portland Cement Mixtures. Cementitious product shall be reinforced by adding approximately 10% by volume synthetic reinforcing fibers to material being used. Product shall be applied at least ⅜-in. thick, and applied in layers of approximately ¼-inch during each application in order to minimize hair line cracks in the material as it cures.

602.5.4.6. Polyurethane Coating. Coating shall be applied properly and in multiple layers of thin coats to minimize shrinkage. Polyurethane layers shall be applied in thicknesses that prevent running, curing problems, or excessive shrinkage. Material applications shall provide a finish coat per the manufacturer's recommendations. Lower sections of the manhole may require additional thickness of coating to resist hydrostatic head of infiltration. Manhole surface must be dry for proper adhesion.

602.5.4.7. Epoxy Coating. 1-oz. of ¼-in solid core, synthetic reinforcing fibers shall be used per gallon of epoxy resin. Epoxy layers shall be applied in thicknesses that prevent running, per the manufacturer's recommendations.

602.5.4.8. Polyurea Coating. Material applications shall provide a finish coat of per the manufacturer's recommendations. Manhole surface must be dry for proper adhesion.

602.5.4.9. Calcium Aluminate Coating with Epoxy Finish for Preventative Maintenance. Calcium aluminate concrete shall be applied in two separate layers totaling 375-mil thick. Epoxy shall be applied 60-mil thick in two coats of 30-mil each. The calcium aluminate concrete shall be blended with approximately 10% by volume synthetic reinforcing fibers. The epoxy top coat shall be blended with 1-oz. of ¼-in synthetic reinforcing fibers per gallon of material in order to inhibit future cracks.

602.5.4.10. Epoxy/Fiberglass, Structural Coating for Preventative Maintenance. The coating shall be cured-in-place under heat and pressure. The structural coating shall contain 27-oz.-per-sq.-yard of laminated structural fiberglass and felt, stitched together and saturated with epoxy resin that will bond to wet or dry surfaces. Chopped glass may be substituted for fiberglass and felt if structural effects are equal upon approval from the OWNER.

602.5.4.11. Curing and Finishing. CONTRACTOR shall cure materials in accordance with manufacturer's instructions. Cure time before subjecting manholes to flows shall be as recommended by the manufacturer.

Opening to traffic shall be as recommended by the manufacturer, but not less than 24-hours after final application of rehabilitative or protective material.

602.6. INSPECTION AND TESTING

During application of epoxy coatings, a wet film thickness gage meeting ASTM D4414 Standard Practice for Measurement of Wet Film Thickness by Notched Gages, shall be used to ensure a monolithic coating and uniform thickness during application. All holiday testing shall conform to ASTM D5162 Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates.

Measurement of bond strength of the coatings to the substrate shall be measured in accordance with ASTM D7234 Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Adhesion Testers. Any areas detected to have inadequate bond strength shall be removed and replaced at no cost to the OWNER. Further bond tests may be performed in that area to determine the extent of potentially deficient bonded area and repairs shall be made by CONTRACTOR in strict accordance with manufacturer's recommendations.

Testing shall be conducted according to Item 502.1. Manholes. Manholes lined in their entirety shall be vacuum tested unless specified otherwise by the OWNER. Manholes lined in their entirety (including invert) shall be subjected to an exfiltration test unless specified otherwise by the OWNER.

If the manhole fails the initial test due to extenuating circumstances (i.e. pipe joint, liner, plug sealing), repairs and adjustments necessary shall be made. Retesting shall proceed until a satisfactory test is obtained.

602.7. MEASUREMENT AND PAYMENT

Manhole rehabilitation shall be measured by depth of manhole from bottom of invert to top of ring seat of manhole cover. Payment shall be based on a vertical foot or a square-foot basis and shall include all work required including repair, surface preparation, bypass pumping, testing, and rehabilitative and protective measures.

DIVISION 700 STRUCTURES

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ITEM 701. GENERAL STRUCTURES

701.1. STRUCTURAL WOOD PRODUCTS

No trees shall be removed unless so noted on the plans or upon the specific approval of the OWNER. Where trees, plants, shrubbery, etc., are adjacent to the line of the work and are not to be removed or are designated on the plans to be removed and replanted, the CONTRACTOR shall protect such trees, plants, shrubbery, and etc.in accordance to the contract documents. If, in the opinion of the OWNER, such trees, plants, shrubbery, etc., would be damaged by machinery, etc., hand excavation may be required. Shrubbery, plants, etc. to be relocated or reused shall be removed with a ball of dirt about their roots and shall be carefully stored and given proper attention.

701.2. STRUCTURAL REMOVAL, EXCAVATION, AND BACKFILL

This item shall govern for the structural removal, excavation, and backfill.

701.2.1. Structural Removal. Removal of existing structures shall consist of the removal and satisfactory disposal of all existing structures and pavements, on the surface or below the ground, which are to be abandoned or removed or that interfere in any way with the new construction, which existing structures are designated for removal on the plans and in these specifications.

Existing structures shall be defined as buildings, foundations, bridges, culverts, headwalls, walls, linings, enclosures, manholes, inlets, cleanouts, valve boxes, pipes, conduits, junction structures, access structures, and other miscellaneous structures or portions thereof of various material composition.

Removal of existing structures shall include the furnishing of all labor, materials, and equipment to accomplish the work to the limits and requirements of the plans and these specifications.

701.2.1.1. Removal of Existing Structures. Materials or parts of the structures not designated for salvage shall become the property of the CONTRACTOR and shall be disposed of by the CONTRACTOR at CONTRACTOR'S own cost and expense at sites approved by the OWNER.

Existing structures which are to be abandoned shall be broken off or removed to a depth of not less than 1 foot below the foundation or subgrade of the new work, unless otherwise provided for in the plans and specifications or approved by the OWNER. Construction of bulkheads and structural plugs shall be done as directed by the OWNER and the cost of such work shall be considered incidental to the contract pay items provided. All operations that endanger new work shall be completed prior to the construction of the new work. Pavement shall be removed only between the lines indicated on the plans. Surface course and sub-base select materials shall be as nearly as practicable removed separately from earth or other excavated materials, stored and utilized as directed by the OWNER. The edges of all openings shall be trimmed smooth and to line, and the face shall be perpendicular to the subgrade.

After removal of structures, all excavations not to be occupied by new work, and all holes created, shall be backfilled in accordance with Item 504. Open Cut-Backfill of these Standard Specifications with approved materials thoroughly compacted in place in lifts of no more than 8 inch thickness (before compaction) and to a density of at least 90 percent of the maximum density determined by ASTM D698 with moisture content within minus 2 to plus 4 of optimum, except that under paved areas, compaction shall be to a density of at least 95 percent.

Damages to adjacent property or structures shall be repaired in a timely fashion, as directed by the OWNER, and shall be repaired by the CONTRACTOR at his sole cost and expense, and to the satisfaction of the OWNER. Any unsightly places created shall be cleaned up and the site of the work left in a neat, clean, and orderly condition.

701.2.1.2. Removal of Existing Pavement. Existing concrete pavements, driveways, curbs, gutters, sidewalks, etc., to be removed shall be broken up and disposed of. Care shall be exercised to leave a neat, uniform edge or joint at the excavation limits or sections removed where only portions are to be removed. Removals shall be to the limits shown on the plans, as directed by the OWNER. Materials designated for salvage shall be salvaged in accordance with Item 701.2.2. Removal and Salvage of Existing Structures. Any additional removal required after the initial removal has been made will be

performed to the limits directed by the OWNER and be paid for in the manner as prescribed under Item 104.2. Change or Modification of Contract of these Standard Specifications.

Removal of asphalt and aggregate pavements shall be considered part of unclassified street excavation work, unless otherwise specifically provided for in the plans and specifications.

701.2.1.3. Measurement and Payment. When the removal work is called for in the plans and specifications, with separate pay items for such work included, measurement for payment shall be as required. Unless otherwise provided in the proposals, no payment shall be made for removal of structures and concrete pavements as such, but such work shall be considered as incidental work and the cost thereof shall be included in the contract pay items provided in the proposal and contract.

When provided for in the proposal and contract, payment for removal of existing structures shall be made at the unit price bid per each or per lump sum, as specified, for removal of existing structures, which price shall be full compensation for all excavation and backfill; for all breaking up and removal of concrete, steel and associated materials; for loading, hauling, unloading, storage, and disposal of materials and structures, including any disposal fees; and for all materials, labor, tools and incidentals necessary to complete the work in accordance with the plans and specifications.

When provided for in the proposal and contract, payment for removal of concrete pavement or modular block paver pavement, when not with concrete base, shall be made at the unit price bid per square yard of concrete or modular block paver pavement actually removed, to the limits shown in the plans and specifications and as directed by the OWNER. Payment for removal of composite block paver and concrete pavements shall be made per square yard of composite pavement actually removed to the limits authorized. Removal of concrete pavement includes removal of variable dimensioned, variable thickness, nonreinforced or reinforced concrete pavement, drives, slabs, integral curbs, and aprons. Pay limits shall be to the back of integral curb removed. Removal of integral curbs shall be considered incidental to removal of the pavement.

When provided for, payment for removal of nonreinforced or reinforced concrete sidewalk shall be made at the unit price bid per square foot of concrete sidewalk removed, to the limits shown in the plans and specifications and as directed by the OWNER. Payment for removal of concrete separate curb or curb with gutter shall be made at the unit price bid per linear foot of concrete curb or curb with gutter actually removed, to the limits shown in the plans and specifications and as directed by the OWNER.

The removal of structures, pavements, sidewalks, curbs, or curbs and gutter in excess of the limits shown in the plans and specifications or in excess of what is directed by the OWNER shall be at the entire cost and expense of the CONTRACTOR and such excess removal areas shall be replaced with adequate structure, pavement and materials as determined and directed by the OWNER, at the CONTRACTOR's entire cost and expense.

701.2.2. Removal and Salvage of Existing Structures. Removal and salvage of existing structures shall consist of the removal and salvage of all existing structures and pavements, on the surface, or below the ground, which are to be removed and salvaged, and which interfere in any way with the new construction and which are designated for removal and salvaging on the plans or in these specifications.

Existing structures shall be defined in Item 701.2.1. Structural Removal, and Item 701.2.2. Removal and Salvage of Existing Structures, shall include the furnishing of all labor, materials, and equipment to accomplish the work to the limits and requirements of the plans and these specifications.

701.2.2.1. Removal and Salvage of Existing Structures. All structures which are to be salvaged will be designated as such, and shall be removed by the CONTRACTOR under the direction of the OWNER, in such a manner as to prevent their being broken or unduly damaged.

Materials or parts of structures which are designated to be salvaged, such as lumber, pipe, brick, modular block pavers, concrete, gravel, castings, etc., shall be removed in a manner approved by the OWNER, and stacked at the site of their removal as directed by the OWNER, and shall remain the property of the City. The salvaged materials will be removed from the site by the City unless otherwise specified in the plans and specifications.

701.2.2.2. Measurement and Payment. If the removal and salvage work is called for in the plans and specifications, with separate bid items for such work included, measurement for payment shall be as required. Otherwise, no payment shall be made for removal and salvage of structures and concrete pavements as such, but such work shall be considered as incidental work and the cost thereof shall be included in the contract pay items provided in the bid proposal and contract.

If specifically provided for in the bid proposal and contract, payment for removal and salvage of existing structures shall be made at the unit price bid per each or per lump sum, as specified, for removal and salvage of existing structures which price shall be full compensation for all excavation and backfill; for all removal of concrete, steel and associated materials; for salvage and storage of materials and structures; and for all materials, labor, tools and incidentals necessary to complete the work in accordance with the plans and specifications.

When provided for in the proposal and contract, payment for removal and salvage of modular block paver pavement shall be made at the unit price bid per square yard of modular block paver pavement actually removed and salvaged, to the limits shown in the plans and specifications and as directed by the OWNER. Payment for removal and salvage of composite block paver and concrete pavements shall be made per square yard of composite pavement actually removed, to the limits authorized.

Payment for removal and salvage of concrete separate curb or curb with gutter performed shall be made at the unit price bid per linear foot of concrete curb or curb with gutter actually removed and salvaged, to the limits shown in the plans and specifications and as directed by the OWNER.

The removal and salvage of structures, pavements, curbs, or curbs and gutter in excess of the limits shown in the plans and specifications, or in excess of what is directed by the OWNER, shall be at the entire cost and expense of the CONTRACTOR and such excess removal areas shall be replaced with adequate structure, pavement and materials as determined and directed by the OWNER, at the CONTRACTOR's entire cost and expense.

701.2.3. Adjustment of Existing Structures. Adjustment of existing structures shall consist of the adjustment of all existing structures and pavements, on the surface, or below the ground, which are to be adjusted or rebuilt, and which interfere in any way with the new construction and which are designated for adjustment on the plans or in these specifications.

Adjustment of existing structures shall include the furnishing of all labor, materials, and equipment to accomplish the work to the limits and requirements of the plans and these specifications.

701.2.3.1. Construction Methods. Existing structures such as manholes, inlets, cleanouts, valve boxes, pipes, etc. which are designated for adjustment in the plans or specifications shall be adjusted, altered or reset to the required elevation and alignment shown in the plans and specifications, as directed by the OWNER. New materials and workmanship necessary shall conform to the requirements of these specifications covering the particular work. Where manholes are to be built up for 1-ft. or less, the walls may be carried up vertically where the walls are to be built up for more than 1-ft., the existing walls shall first be removed down to the bottom of the batter or draw-in section of the walls, or to such an elevation that the inside diameter of the manhole is not less than 3-1/2-ft., the manhole shall then be rebuilt in conformity with the size and shape requirements for new manholes. Salvaged materials in good condition may be used in rebuilding such structures with consent of the OWNER, provided the materials are thoroughly cleaned before their use.

701.2.3.2. Measurement and Payment. If the adjustment of existing structures work is called for in the plans and specifications, with separate bid items for such work included, measurement for payment shall be as required in this item. Otherwise, no payment shall be made for adjustment of structures and concrete pavements as such, but such work shall be considered as incidental work and the cost thereof shall be included in the contract pay items provided in the bid proposal and contract.

If specifically provided for in the bid proposal and contract, payment for adjusting of existing structures shall be made at the unit price bid per each or per lump sum, as specified, for adjusting of existing structures, which price shall be full compensation for all excavation and backfill; for all breaking up and removal of concrete, steel and associated materials; and for all materials, labor, tools and incidentals necessary to complete the work in accordance with the plans and specifications.

701.2.4. Structural, Excavation and Backfill. Structural excavation shall consist of the removal of material for the construction of foundations for bridges, retaining walls, head walls for culverts, or other structures and other excavation designated on the plans or in these specifications as structural excavation, along with the subsequent backfill of these same structures.

Structural backfill shall consist of furnishing material, if necessary, and placing and compacting backfill material around structures to the line designated on the plans, specifications, and/or as directed by OWNER.

Structural excavation and structural backfill shall include the furnishing of all materials and equipment, the construction or installation of all cofferdams in accordance with Item 802.4. Cofferdams and other facilities that may be necessary to perform the work shall be removed, except where they are required or permitted to remain by the plans, specifications, and/or as directed by OWNER.

Structural excavation shall be considered subsidiary to each bid item for which structural excavation is necessary.

For structural excavation and backfill items not covered here, refer to TxDOT Item 400 Excavation and Backfill for Structures.

701.3. STRUCTURAL BOLTING

This item shall govern for the materials to be used and for the method of installation of high-strength bolts used in structural joints.

701.3.1. Materials. Materials shall be as specified and meet the requirements of Item 806.6. Bolts, Nuts and Washers.

701.3.2. Construction Methods.

701.3.2.1. General Requirements. Surfaces of bolted parts in contact with the bolt head and nut shall not have a slope of more than 1:20 with respect to a plane normal to the bolt axis. Bolted parts shall fit solidly together when assembled and shall not be separated by gaskets or any other interposed compressible material. Holes shall be punched, sub-punched and reamed or drilled as required by Item 703.3. Steel Structure Construction. Holes shall be of a nominal diameter not more than $^{1}/_{16}$-in. in excess of the nominal bolt diameter. Field erection and fit-up of joints and splices shall conform to the requirements of Item 703.3. Steel Structure Construction.

When assembled, all joint surfaces, including those adjacent to the washers, shall be free of dirt, rust, loose scale, burrs, and other defects that would prevent solid seating of the parts.

Contact surfaces shall be free of oil, paint, lacquer, or galvanizing.

701.3.2.2. Installation. Bolts shall be installed with a hardened washer under the nut or bolt head, whichever is the element turned in tightening. A hardened washer shall also be used under the head of regular semi-finished hexagon bolts and under finished hexagon nuts, even when these are not the elements turned in tightening. The washer may be omitted under the head of heavy semi-finished hexagon bolts, interference-body bolts, and heavy semi-finished hexagon nuts when these are not the elements turned.

701.3.2.3. Pre-Tightening. Prior to actual tightening of the bolts, the following procedures shall be followed:

(1) A minimum of 20-percent of the holes at a connection point shall be filled with erection pins to "fair-up" all holes.
(2) Install bolts in all remaining holes.
(3) Tighten a minimum of 20-percent of the bolts, following a pattern of progression from the center or most rigid part of the joint toward the free edges, making sure that all plies of the metal in the connection are properly fitted and in contact.
(4) Mark those bolts used for fit-up bolts.
(5) Tighten all the remaining bolts per Item 701.3.2.4.Tightening, then remove the erection pins.
(6) Fill the remaining holes with bolts and loosen all bolts used for fit-up.
(7) Tighten the rest of the bolts per Item 701.3.2.4.Tightening.

701.3.2.4. Tightening. All fasteners shall be tightened to give at least the required minimum bolt tension values shown in Table 701.3.2.4.(a) Bolt Tension on completion of the joint.

Table 701.3.2.4.(a) Bolt Tension

Nominal Bolt Size (in.)	Minimum Tension (kips)	
	ASTM A325 Bolts	ASTM A490 Bolts
½	12	15
5/8	19	24
¾	28	35
7/8	39	49
1	51	64
1-1/8	56	80
1-1/4	71	102
1-3/8	85	121
1-1/2	103	148

Tightening shall be done by one of the following methods:
(1) The Turn-of-the-Nut Method.
(2) The Calibrated-Power Wrench Method.
(3) Gauge Washer Method.

701.3.2.4.1. Turn-of-the-Nut Method. This method indicates the following:

(1) Tighten all bolts used as fit-up bolts to a "snug-tight" condition. (A snug-tight condition is indicated by the wrench when it ceases to spin and just begins to impact, or with a spud wrench by tightening with slight pressure.)
(2) The nut shall be matched-marked with the protruding bolt point before final tightening, thus affording the inspector visual means of noting the actual nut rotation. Such marks shall be made by the operator with a keel, crayon or spot of paint, after the bolts have been brought up to snug-fit.
(3) Tighten the nuts by the amount specified in Table 701.3.2.4.1.(a) Nut Rotation from Snug-Tight Condition. Impact wrenches shall be of adequate capacity and sufficiently supplied with air to perform the required tightening in approximately 10-seconds.

Table 701.3.2.4.1.(a) Nut Rotation from Snug-Tight Condition[1].

Bolt length (underside of head to end of bolt)	Disposition of Outer Face of Bolted Parts		
	Both faces normal to bolt axis	One face normal to bolt axis and other face sloped less than 1:20 (beveled washer not used)	Both faces sloped less than 1:20 from bolt axis (beveled washer not used)
Up to and including 4 bolt diameters	1/3 turn	½ turn	2/3 turn
Over 4 bolt diameters up to and including 8 diameters	½ turn	2/3 turn	5/6 turn
Over 8 bolt diameters up to and including 12 diameters	2/3 turn	5/6 turn	1 turn

1. Nut rotation is relative regardless of the element (nut or bolt) being turned. The tolerance is ± 30° for bolts installed by ½ turn of less and 45° for bolts installed by 2/3 turn or more.

For bolt lengths greater than 12 diameters, determine the required rotation using the installation verification test in a simulated connection of solidly fitted steel.

(4) Fill the remaining holes with bolts and loosen all bolts used for fit-up.
(5) Tighten the rest of the bolts by the required amount.
(6) Tightening crew to mark finished work with identifying symbol.
(7) Inspector mark accepted work.

701.3.2.4.2. Calibrated-Power Wrench Method. When calibrated wrenches are used to provide the bolt tension, their settings shall be such as to induce a bolt tension of 1.05 of the value shown in Table 701.3.2.4.(a) Bolt Tension. The nut shall be matched-marked with the protruding bolt point before final tightening, thus affording the inspector visual means of noting the actual nut rotation. Such marks shall be made by the operator with a keel, crayon or spot of paint, after the bolts have been brought up to snug-fit.

A torque wrench shall be used to check bolts for tightness when the calibrated-power-wrench method is used. The following procedure shall be used to calibrate the torque wrench:

(1) One bolt of the type, size and condition of thread as those to be inspected shall be tightened with the impact wrench, in a device capable of measuring actual bolt tension to the required minimum bolt tension required in Table 701.3.2.4.(a) Bolt Tension.
(2) In this tightened condition, the inspector's torque wrench shall be used to rotate the nut slowly in the tightening direction to move just the nut. The amount required to move the unit shall be used for the inspection torque (use the average of 3 torque values).
(3) When inspecting the bolts installed in the structure, the torque wrench shall be used to tighten the nut; and the torque read just as the nut is set in motion.

Readings higher than the required minimum tension required shall not be cause for rejection. Bolts giving values lower than the required value shall be removed and replaced.

One or two bolts of each size in every connection and a minimum of 10-percent of the bolts in large connections shall be checked. If one or more bolts in a connection are below the required value, all the bolts shall be re-impacted with the calibrated power wrench.

When the calibrated wrench body type of bolt is allowed and used, setting shall be such as to induce a bolt tension slightly in excess of the value shown. The wrenches shall be calibrated by tightening not less than 3 typical bolts of each size from the lot to be installed in a device capable of indicating actual bolt tension.

Power wrenches shall be adjusted to stall out or cut out complete at the selected tension.

When using calibrated wrenches to install bolts, the operator should return to "touch-up" bolts previously tightened, until all bolts are tightened to the prescribed tension. This shall include:

(1) Tightening all bolts not used as fit-up bolts to the tension required by Table 701.3.2.4.(a) Bolt Tension.
(2) Fill the remaining holes with bolts and loosen all bolts used for fit-up.
(3) Tighten the rest of the bolts by the required amount.
(4) Tightening crew to mark finished work with identifying symbol.
(5) Inspector mark accepted work.

701.3.2.4.3. Gauge Washer Method. Use of gauge washers to determine torque shall follow manufacturer instructions.

701.3.3. Inspection. The OWNER shall approve the procedures for calibration of wrenches and installation of bolts. The inspector shall further observe the field installation to determine that these procedures are followed.

Bolts, nuts and washers are normally shipped with a light residual coating of oil. This coating is not detrimental to friction-type connections and need not be removed. Heavy coatings of oil shall be removed. Bolts tightened by the turn-of-the-nut method shall have the outer face of the nut marked along with the end of the bolt with permanent felt markers in order to determine the amount of turn. Close inspection shall be made to insure that the bolts are a tight fit; and that there is no movement of the head in the tightening operation. When the calibrated-wrench method of tightening is used, the CONTRACTOR shall furnish the calibration equipment (Skidmore Wilhelm bolt calibrator or equal).

For the turn-of-the-nut method, the CONTRACTOR shall not be required to furnish equipment or make tests for establishing bolt tension. Such tests, if required, shall be performed by the OWNER. However, the

CONTRACTOR shall not be relieved of the responsibility for re-tightening bolts in case tests indicate the required tension is not being obtained.

701.3.4. Measurement and Payment. No direct compensation shall be made for the installation of bolts. Payment shall be subsidiary to the pertinent item requiring the use of high-strength bolts.

ITEM 702. CONCRETE STRUCTURES

702.1. DESCRIPTION

This specification shall govern for the construction of all types of structures involving the use of structural concrete except where the requirements of this section are not applicable. All concrete structures shall be constructed in accordance with the design requirements and details shown on the plans, with the pertinent provisions of other applicable sections of the specifications, and with the requirements herein provided.

702.2. CONCRETE STRUCTURE MATERIALS

702.2.1. Aggregates for Portland Cement Concrete Structures.

702.2.1.1. General Requirements. Aggregates shall conform to the provisions of Item 303.2.1.1. General Requirements in Item 303.2.1. Aggregates for Portland Cement Concrete Pavement.

702.2.1.2. Fine Aggregates. Fine aggregates shall conform to the provisions of Item 303.2.1.2. Fine Aggregates.

702.2.1.3. Coarse Aggregates. Coarse aggregates shall conform to the provisions of Item 303.2.1.3. Coarse Aggregates.

702.2.1.4. Lightweight Aggregates. Lightweight aggregates shall consist of expanded clay or shale having strong, durable particles; and conforming to the requirements of ASTM C330 Lightweight Aggregates for Structural Concrete.

702.2.1.4.1. Foreign Material and Deleterious Substances. Deleterious substances, elements, or components are those that are damaging, harmful, undesirable, or adulterating to the integrity or purity of the specified base material. The maximum permissible percentage, by weight, of deleterious substances shall not exceed the amounts in Table 702.2.1.4.1.(a) Deleterious Substances in Lightweight Aggregates.

Lightweight aggregates that, upon being subjected to the test for organic impurities, produce a color darker than the standard shall be rejected, unless it can be demonstrated that the discoloration is due to small quantities of materials not harmful to the concrete.

If, after a test for staining materials (ASTM C641 Staining Materials in Lightweight Concrete Aggregates), the aggregates are classified as "heavy stain" or darker, a test following the chemical procedure shall be performed. If 1.5-mg or more of ferric oxide (Fe_2O_3) per 200-g sample is found, the aggregate shall be rejected.

Table 702.2.1.4.1.(a) Deleterious Substances in Lightweight Aggregates

Substance	Maximum % by Weight
Loss on ignition	5%
Clay lumps	2%

702.2.1.4.2. Gradation. The lightweight aggregate shall be well graded in size from coarse to fine. When tested by standard laboratory methods lightweight aggregate shall meet the requirements in Table 702.2.1.4.2.(a) Grading Requirements for Lightweight Aggregates for percentage passing each sieve by weight.

Table 702.2.1.4.2.(a) Grading Requirements for Lightweight Aggregates

Sieve	Percent Passing
3/4 in. sieve (19.0 mm)	90 to 100%
3/8 in. sieve (9.5 mm)	20 to 55%
Passing No. 4 sieve (4.75 mm)	0 to 10%
Passing No. 8 sieve (2.36 mm)	0 to 5%

702.2.1.4.3. Natural Fine Aggregate. At the option of the CONTRACTOR, natural fine aggregate may be substituted for fine lightweight aggregate, provided such substitution does not result in producing concrete that has a weight in excess of the permissible maximum specified herein. Natural fine aggregate shall meet the grading requirements of Table 303.2.1.2.2.(a) Grading Requirements for Fine Aggregates. Natural fine aggregate shall have a percent of wear not more than 40 when tested according to ASTM C131 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

702.2.1.4.4. Rejection. Lightweight aggregates which fail to meet the requirements for these specifications may be rejected by the OWNER. Such rejection shall incur no cost to the OWNER.

If lightweight aggregate with properties not meeting these specifications are delivered to the project, the source of the material may be rejected as a further supply source by the OWNER. Such rejection shall incur no cost to the OWNER.

702.2.1.5. Pit-Run and Re-Mix Aggregate. Pit-run aggregate is the natural gravel and sand obtained from pits without the addition of other fine or coarse aggregates and shall consist of hard, durable, uncoated pebbles or stone particles mixed with sand. Pit-run aggregate shall not be used for high strength concrete of 3000-psi and above. Pit-run aggregate may be used only for concrete cushion, cradle and protection for pipe.

Re-mix aggregate is native rock and sand that has been washed and screened and meets the specified gradation. Re-mix aggregate shall not be used for high-strength concrete of 3000-psi and above. Re-mix aggregate may be used only as a substitute for pit-run aggregate or when specified.

702.2.1.5.1. Foreign Material and Deleterious Substances. Pit-run and re-mix aggregate shall be free from lumps of clay and from injurious amounts of dust, shale, soft or flaky particles, salt and alkali.

702.2.1.5.2. Gradation. Pit-run and re-mix aggregate shall be well graded from coarse to fine when tested by standard laboratory methods and shall meet the minimum requirements for percentages by weight in Table 702.2.1.5.2.(a) Grading Requirements for Pit-Run and Re-Mix Aggregate.

Table 702.2.1.5.2.(a) Grading Requirements for Pit-Run and Re-Mix Aggregate

Sieve	Percent Retained by Weight
1/4-in. (6 mm) sieve	55 to 60%

702.2.1.5.3. Rejection. Pit-run and re-mix aggregate may be rejected for failure to meet any of the requirements of this specification. Such rejection shall incur no cost to the OWNER.

Aggregate sources from which materials with properties not meeting these specifications are delivered may be rejected as a further supply source to the project by the OWNER. Such rejection shall incur no cost to the OWNER.

702.2.1.6. Alkali-Silica Reactions (ASR) and Delayed Ettringite Formation (DEF) Mitigation. Refer to TxDOT Item 421 Hydraulic Cement Concrete.

702.2.2. Portland Cement. Portland Cement shall conform with the requirements of Item 303.2.2. Portland Cement.

702.2.3. Concrete Additives and Modifiers. Concrete additives and modifiers shall conform to the applicable requirements of Item 303.2.3. Chemical Admixtures, Item 303.2.4. Mineral Admixtures, Item 303.2.5. Mineral Filler, and/or Item 303.2.6. Fibrous Reinforcement.

702.2.4. Water. Water shall conform to the requirements of Item 303.2.7. Water.

702.2.5. Reinforcement. Reinforcement, if any, shall conform to the requirements of Item 303.2.9. Steel Reinforcement, except that axle steel shall not be permitted on structures and the use of rail steel or axle steel shall not be permitted for use in railroad underpass structures. At the OWNER'S option the use of welded wire fabric in accordance with Item 303.2.10. Steel Wire Reinforcement may be used.

702.2.5.1. Epoxy Coated Bars. For use of epoxy coated bars, refer to TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges.

702.2.6. Joint Filler and Joint Sealer. Joint filler shall conform to the requirements of Item 303.2.12. Joint Filler. Joint sealer shall conform to the requirements of Item 303.2.14. Joint Sealant.

702.2.7. Curing Materials. Curing materials shall conform to the requirements of Item 303.2.13. Curing Materials.

702.2.8. Elastomeric Materials. Elastomeric materials shall conform to the requirements of Item 303.2.15. Elastomeric Materials.

702.3. MIX DESIGN AND MIXING CONCRETE FOR STRUCTURES

702.3.1. Description. This section shall govern for the concrete used in bridges, box culverts, and such other miscellaneous structures and incidentals necessary to complete the work.

702.3.2. Equipment. All machinery and equipment necessary for the prosecution of the work specified herein shall be on the project and shall be approved by the OWNER as to condition before the CONTRACTOR shall be permitted to begin operations on which the machinery or equipment is to be used. All machinery and equipment shall be maintained in good condition to insure the completion of the work without excessive delays for repairs and replacements.

702.3.3. Concrete Mix Design and Control. The OWNER shall furnish plant control of the concrete by securing the services of an independent local testing laboratory. Within a period of not less than 10-days prior to the start of concreting operations, the CONTRACTOR shall submit to the OWNER a design of the concrete mix it proposes to use, together with samples of all materials to be incorporated into the mix and a full description of the source of supply of each material component. The design of the concrete mix shall produce a concrete complying with the requirements of concrete classes in Table 702.3.4.2.(a) Standard Classes of Structural Concrete or Table 702.3.4.3.(a) Performance Classes of Structural Concrete and slump in Table 702.3.4.4.(a) Structural Concrete Slump Requirements.

The dry loose volume of coarse aggregate shall not be more than 0.82 cubic-feet-per-cubic-foot of concrete, except in cases where the voids in the coarse aggregate as determined by standard test methods exceed 48-percent of the total dry loose volume. Where voids exceed 48-percent, the dry loose volume of coarse aggregate shall not exceed 0.85-cubic-feet-per-cubic-foot of concrete.

If the strength required for the class of concrete being produced is not secured with the cement specified in Table 702.3.4.2.(a) Standard Classes of Structural Concrete or Table 702.3.4.3.(a) Performance Classes of Structural Concrete, the CONTRACTOR may use, or the OWNER may require, an approved cement dispersing agent, or the CONTRACTOR shall furnish additional aggregates or aggregates with different characteristics which shall produce the required results. Additional cement may be required or permitted as a temporary measure until aggregates are changed and designs checked with the different aggregates or cement dispersing agent.

All material samples submitted to the OWNER shall be sufficiently large to permit laboratory batching for the construction of test beams to check the adequacy of the design. When the design mix has been approved by the OWNER, there shall be no change or deviation from the proportions thereof or sources of supply except as hereinafter provided. No concrete may be placed on the job site until the mix design has been approved by the OWNER in writing to the CONTRACTOR.

702.3.4. Quality of Concrete.

702.3.4.1. Consistency. In general, the consistency of concrete mixtures shall be such that:

(1) the mortar shall cling to the coarse aggregate,
(2) the aggregate shall not segregate in concrete when it is transported to the place of deposit,
(3) the concrete, when dropped directly from the discharge chute of the mixer, shall flatten out at the center of the pile, but the edges of the pile shall stand and not flow,
(4) the concrete and mortar shall show no free water when removed from the mixer,
(5) the concrete shall slide and not flow into place when transported in metal chutes at an angle of 30° with the horizontal, and
(6) the surface of the finished concrete shall be free from a surface film or laitance.

(7) The concrete shall be uniform and workable.

The cement content, maximum allowable water cement ratio, the average and maximum slump and the strength requirements of the various classes of concrete shall conform to the requirements of the tables below, and as required herein.

The consistency of the concrete as placed should allow the completion of all finishing operations without the addition of water to the surface. When field conditions are such that additional moisture is needed for the final concrete surface finishing operation, the required water shall be applied to the surface by misting only and shall be held to a minimum amount. The concrete shall be workable, cohesive, possess satisfactory finishing qualities and be of the stiffest consistency that can be placed and vibrated into a homogeneous mass. Excessive bleeding shall be avoided.

If the strength or consistency required for the class of concrete being produced is not secured with the minimum cement specified or without exceeding the maximum water/ cement ratio, the CONTRACTOR may use, or the OWNER may require, an approved cement dispersing agent (water reducer); or the CONTRACTOR shall furnish additional aggregates, or aggregates with different characteristics, or the CONTRACTOR may use additional cement in order to produce the required results. The additional cement may be permitted as a temporary measure, until aggregates are changed and designs checked with the different aggregates or cement-dispersing agent.

The CONTRACTOR is solely responsible for the quality of the concrete produced. The OWNER reserves the right to independently verify the quality of the concrete through inspection of the batch plant, testing of the various materials used in the concrete, and by casting and testing concrete cylinders or beams on the concrete actually incorporated in the structure.

Unless otherwise shown on the plans or detailed specifications, the Standard Classes of Concrete table shall be used.

702.3.4.2. Standard Classes. Standard classes of structural concrete shall meet the requirements in Table 702.3.4.2.(a) Standard Classes of Structural Concrete.

Table 702.3.4.2.(a) Standard Classes of Structural Concrete.

Class of Concrete[1]	Minimum Cementitious Lb./CY	Minimum Cementitious Sacks/CY	28 Day Min. Compressive Strength[2] psi	28 Day Min. Beam Strength[2,3] psi	Maximum Water/ Cementitious Ratio	Coarse Aggregate Maximum Size[4]
A	470	5.0	3000	500	0.58	1½"
B	376	4.0	2000	330	0.71	1½"
C	564	6.0	3600	600	0.53	1½"
D	282	3.0	1500	250	0.97	1½"
E	564	6.0	3000	500	0.62	1½"
F	611	6.5	4200	700	0.49	1½"
S	564	6.0	3600	600	0.44	1½"
H[5]	611	6.5	As Specified On Plans	N/A	0.49	1"
M	As directed by the OWNER or as shown on the plans					

1. All exposed concrete shall have entrained – air (See 303.2.3. Chemical Admixtures).
2. Minimum Strength Required by OWNER [Compressive or Flexural]
3. ASTM C78 (Third-Point); Reduce by 10% when Type II Cement is Used
4. Smaller Nominal Maximum Size Aggregate May be Used if Strength requirement is Satisfied
5. Prestressed Concrete

702.3.4.3. Performance Classes. Performance Classes of structural concrete shall meet the requirements in Table 702.3.4.3.(a) Performance Classes of Structural Concrete.

Table 702.3.4.3.(a) Performance Classes of Structural Concrete

Class of Concrete[1]	Minimum Cementitious Lb./CY	Minimum Cementitious Sacks/CY	28-Day Compressive Strength[2] psi	28-Day Flexural Strength[3,4] psi	Maximum Water/ Cementitious Ratio[4]	Coarse Aggregate Maximum Size[5]
PA	423	4.5	3000	425	0.58	1½"
PB	350	4.0	2000	N/A	0.71	1½"
PC	517	5.5	3600	510	0.53	1½"
PD	250	3.0	1500	N/A	0.97	1½"
PE	470	5.0	3000	425	0.62	1½"
PF	564	6.0	4200	595	0.49	1½"
PS	517	5.5	3600	510	0.44	1½"
PH[6]	611	6.5	As specified on plans	N/A	0.49	1"
PM		As directed by the OWNER or as shown on the plans				

1. All exposed concrete shall have entrained – air (See 303.2.3. Chemical Admixtures).
2. Calculated Average Required Compressive Strength Considering ACI 318 - Sec. 5.3.2.1 shall be strength shown times 1.15.
3. ASTM C78 (Third-Point); Reduce by 10% when Type II Cement is Used
4. Consistent with ACI 211.1 Table 6.3.4(a) Relationship between water-cementitious materials ratio and compressive strength of concrete
5. Smaller maximum size aggregate may be used if strength requirement is satisfied
6. Prestressed Concrete

702.3.4.4. Slump. Slump requirements for structural concrete shall be as specified in Table 702.3.4.4.(a) Structural Concrete Slump Requirements. No concrete shall be permitted with slump in excess of the maximums shown. Any concrete mix failing to meet the above consistency requirements, although meeting the slump requirements, shall be considered unsatisfactory, and the mix shall be rejected and changed to correct such unsatisfactory conditions at no cost to the OWNER.

Table 702.3.4.4.(a) Structural Concrete Slump Requirements.

Concrete Use	Avg. Slump (in.)	Max. Slump (in.)
Cased Drilled Shafts and Thin-walled Sections (9 in. or less)	6	7
Slabs, Caps, Wall Sections Over 9 in., etc.	3	4
Columns, Piers	4	5
Underwater or Seal Concrete	7	8
Other Miscellaneous Concrete	As specified by OWNER	

702.3.4.5. Tests. During the progress of the work, the CONTRACTOR shall cast test cylinders in accordance with ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field to maintain a check on the compressive strengths of the concrete being placed. In accordance with ASTM C31 and ASTM C172 Standard Practice for Sampling Freshly Mixed Concrete, four test cylinders shall be taken from a representative portion of the concrete being placed for every 40-cubic-yards of concrete placed. After the cylinders have been cast, they shall remain on the job site and then transported, moist cured, and tested by the OWNER in accordance with ASTM C31 and C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

The CONTRACTOR shall provide and maintain curing facilities for the purpose of curing concrete test specimens on site in accordance with ASTM C31. The CONTRACTOR shall be responsible for the proper storage, maintenance, and any required curing of concrete test samples made by the OWNER, and any costs thereof.

In each set, two of the cylinders shall be tested at 7-days, two cylinders shall be tested at 28-days. If the 28-day test results indicate deficient strength, the CONTRACTOR may, at its option and expense, core the concrete in question and have the cores tested by an approved laboratory, in accordance with ASTM C42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete and ACI 318 protocol, to override the results of the cylinder tests.

Cylinders and/or cores must meet the specified strength in accordance with ACI 318 protocol. The testing does not in any way change the penalties imposed on the CONTRACTOR for deficient strength outlined elsewhere in these specifications.

At the OWNER'S direction, beam test may be required and utilized for acceptance of the final product.

702.3.5. Mixing.

702.3.5.1. General. Concrete shall be mixed in a machine, of approved design and capacity, which receives a complete charge of proportioned materials and thoroughly and evenly mixes the charge as a whole before any part is withdrawn from the machine. The mixing shall be continued until each particle of stone or gravel is completely covered with mortar and the batch is of uniform color and consistency. The manufacturer's recommended mixing time shall be adhered to or mixing shall continue until a uniform concrete mixture is obtained. The mixer shall be equipped with an attachment for satisfactorily locking the discharging device so as to prevent the emptying of the mixer until all the materials have been mixed together for the minimum time required. The entire contents of the drum shall be discharged before any materials are placed therein for the succeeding batch.

702.3.5.2. Transit Mix Concrete. Transit mix concrete shall meet the following conditions:

(1) all requirements otherwise specified for mixing on the job shall apply,
(2) sufficient transit mix equipment shall be assigned exclusively to the project as required for continuous operation,
(3) satisfactory evidence shall be furnished so that the delivery of concrete shall be continuous at regular and uniform intervals, without stoppages or interruption,
(4) the supplier of transit mix concrete shall furnish a written statement addressed to the OWNER, stating that the concrete shall be produced in accordance with these specifications and subject to the approval of the OWNER, and
(5) concrete shall not be placed on the job after a period of 1½-hours after the cement has been placed in the mixer.

702.3.5.3. Continuous Volumetric Mix Concrete. For all miscellaneous concrete placements, a mobile, continuous, volumetric mixer of the rotating paddle type may be used when approved or specified by the OWNER.

These mixers shall be designed to receive all the concrete ingredients, including admixtures, required by the mix design in a continuous uniform rate and mix them to the required consistency before discharging. The mixers shall have adequate water supply and metering devices. Calibration of these mixers will be required.

The mixing time shall be in accordance with the recommendations of the manufacturer of the mixer unless otherwise revised by the Engineer.

For continuous volumetric mixers, the materials delivered during a revolution of the driving mechanism, or in a selected time interval, will be considered a batch, and the proportion of each ingredient will be calculated in the same manner as for a batch type plant.

702.4. MIX DESIGN AND MIXING LIGHTWEIGHT CONCRETE FOR STRUCTURES

702.4.1. Description. This item shall govern the equipment used; the storing, measuring and handling of materials; and for the mixing, placing, finishing and curing of lightweight concrete for bridges and other structures. The concrete shall be composed of Portland cement, natural sand fine aggregate, lightweight coarse aggregate, a cement dispersing agent, an air-entraining admixture and water, proportioned and mixed as hereinafter provided.

702.4.2. Quality of Concrete.

702.4.2.1. Consistency. Concrete shall be of such consistency so as to insure the required workability and result in compact masses having dense, uniform surfaces. The proportions of the ingredients shall be varied only with the approval of the OWNER. In general, the consistency of lightweight concrete should be similar to that of natural aggregate concrete. Batches which are harsh and unworkable shall be redesigned at the CONTRACTOR'S expense.

702.4.2.2. Classifaction and Proportions. Lightweight concrete shall be proportioned by weight in such manner as to secure a uniform and workable mix which shall produce cured concrete of the weight and strength specified herein. Prior to mixing any concrete which shall be used in the structure, the CONTRACTOR shall prepare trial batches, proportioned and tested in accordance with TxDOT Construction Bulletin C-11. Additional sand may be required to improve workability of the mix.

The cement content, maximum air content and slump of the various classes of concrete, shall conform to Table 702.4.2.(a) Classes of Lightweight Concrete. If the strength required for the class of concrete being produced is not secure with the minimum cement content specified, additional cement shall be used or other aggregates provided at the CONTRACTOR'S expense.

Table 702.4.2.(a) Classes of Lightweight Concrete

Class	Min. - Max. Bags Cement per C.Y.	Min. Comp. Strength 28-Day (psi)	Max. Slump (in.)	Air-Dried Weight Max. (lb./CF)[1]	Total Air Content, %	Use
X	5.5 - 7.5	3000	See note [2]	110	6 – 9	General Structural
Y	5.5. - 7.0	5000	3	115	6 – 9	Prestressed Concrete
Z	5.5 - 8.0	As specified on plans	3	118	6 – 9	Prestressed Concrete

1. Air-dried weight shall be measured after 7-days moist curing at 100-percent relative humidity at 73°±2°F and stored for 21-days at 50±2-percent relative humidity.
2. Class X concrete shall be placed so that the average slump shall be maintained at approximately 3-in. No concrete shall be permitted with a slump in excess of 4-in.

702.4.2.3. Tests. During the progress of the work, the OWNER shall cast and test cylinders to maintain a check on the compressive strength of the concrete being placed.

For prestressed lightweight concrete, two tests (6-test cylinders) for each pertinent strength test required by Table 702.4.2.(a) Classes of Lightweight Concrete shall be required for each separate stressing line of beams, spans, piling, etc., as the case may be. Testing and curing of cylinders shall be in accordance with Item 702.3.4.5. Tests. Job control cylinders may be tested on a hand operated compression machine. Equipment shall be furnished by the CONTRACTOR if required.

Air content shall be checked by use of a pressure type air meter in accordance with ASTM C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

Test for wet weight shall be made in accordance with ASTM C138 Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.

The relationship between the air-dried weight of concrete and the wet weight of concrete shall be established by the OWNER, based upon trial batches and checks made during progress of the work.

For each change in batch design weight and for each 25-cubic-yards of concrete placed in the structure, two tests for weight shall be made. At any time that the average of these tests indicates a wet weight in excess of that which has been determined to produce air-dried concrete of the specified weight, the batch shall be adjusted to reduce the wet weight of concrete by the amount required.

702.4.3. Mixing. The following shall govern the mixing of lightweight concrete:

(1) The cement dispersing agent and at least two-thirds of the total mixing water shall be introduced in the mixer and mixed for 15-seconds,

(2) the fine and coarse aggregate shall be added and mixed for 45-second, and
(3) the cement and final water shall be added and mixing completed. The minimum mixing time shall be determined by the OWNER for the concrete batch and the equipment used, but in no case shall the total mixing time be less than 3-minutes. Minimum mixing for concrete mixed in trucks shall be 100 revolutions of the drum.

The drum on truck mixers shall be operated at high speed while charging it with aggregate. Cement shall be introduced into the mixing drum while it is rotating at slow speed. Immediately prior to discharge of the concrete, the drum shall be rotated at high speed for 30-seconds.

702.5. CONSTRUCTING CONCRETE STRUCTURES

702.5.1. Submittals. Before starting work, the CONTRACTOR shall inform the OWNER fully of the methods of construction it proposes to follow and the amount and character of equipment it proposes to use, the adequacy of which shall be subject to the approval of the OWNER. Plans for forms and false-work for concrete piers and concrete superstructure spans over 20-ft. in length and for all widening details shall be submitted to the OWNER for review and approval. Similar plans shall be submitted for other units of the structure if required by the OWNER. The plans shall be prepared on standard 24-in. by 36-in. sheets or on mutually agreeable standard sheet sizes, such as, 11-in. by 17-in. sheets. Plans shall show all essential details of the proposed forms, false-work and bracing so that a structural analysis may be made. Six sets (or as directed by OWNER) of such plans, sealed by a Professional Engineer registered in the state of Texas shall be required.

Concurrence on the part of the OWNER in any proposed construction methods, approval of equipment or approval of form and false-work plans does not relieve the CONTRACTOR of the responsibility for the safety or correctness of its methods and adequacy of its equipment or from carrying out the work in full accordance with the contract.

702.5.2. Time Sequence. Unless otherwise provided, the following requirements shall govern for the time sequence in which construction operations may be carried on:

(1) No superstructure members, forms, false-work or erection equipment shall be placed on the substructure before the substructure concrete has attained 75-percent design strength, as indicated by field-cured test specimens as approved by the OWNER.
(2) The use of completed portions of a structure for storage of materials shall not be permitted until all curing requirements for the particular part of the structure have been met.
(3) Forms for wall or columns shall not be erected on concrete footings until the concrete in the footing has cured at least 2-days. Concrete may be placed in the wall or column as soon as the forms and reinforcing steel placement are approved.
(4) The support tie beam and/or cap forms by false-work placed on previously placed tie beams is permissible, provided such supporting beams have attained 75-percent design strength as indicated by field-cured test specimens as approved by the OWNER, curing requirements are completed, and the beams are properly supported to eliminate stresses not provided for in the design.

702.5.3. Drains. Weep hole drains and roadway drains shall be installed and constructed as shown on the plans in the designated locations. When the concrete is not formed at the weep hole location, a sheet of building paper shall be placed over the gravel to prevent the entrance of concrete into the pocket during operations.

702.5.4. Joints.

702.5.4.1. Expansion Joints. Expansion joints and devices to provide for expansion and contraction shall be constructed where indicated herein or on the plans.

The bearing area under the expansion ends of concrete slabs, prestressed concrete beams, girders and slab and girder spans shall be given a steel trowel finish. These areas shall be finished to the exact grades required. The material used in separate expansion surfaces shall be that shown on the plans and shall be placed carefully so that concrete or mortar cannot be subsequently worked around or under the material.

Immediately after the removal of forms and again when necessary after surface finishing, all projecting concrete shall be removed along exposed edges in order to secure full effectiveness of the expansion joints.

Refer to Item 303.5.4.2. Expansion Joints for more information.

702.5.4.2. Construction Joints. The joint formed by placing plastic concrete in direct contract with concrete that has attained its initial set shall be deemed a construction joint. When concrete is to be placed monolithically, the term monolithic shall be interpreted to mean that the manner and sequence of concrete placing shall be such that construction joints shall not be created.

Construction joints shall be of the type and at the locations shown on the plans. Additional joints shall not be permitted without written authorization from the OWNER. Any additional construction joints shall have details equivalent to those shown on the plans for joints in similar locations.

Unless otherwise provided, construction joints shall be square and normal to the forms. Bulkheads shall be provided in the forms for all joints except horizontal joints.

Construction joints requiring the use of joint sealing material shall be as detailed on the plans. The material shall be specified on the plans without reference to joint type.

The top surface of a concrete placement which terminates at a horizontal construction joint shall have the surface roughened thoroughly as soon as practicable after the concrete has attained initial set. The surfaces at bulkheads shall be roughened as soon as the forms are removed.

Before joining plastic concrete to concrete that has already set, the surface of the concrete in place shall be free from all loose material, laitance, dirt or foreign matter; shall be washed, scrubbed clean and drenched thoroughly with water until saturated; and shall be kept moist until the plastic concrete has been placed. Immediately prior to the placing of additional concrete, all forms shall be drawn tight against the existing concrete and the existing joint surface shall be flushed with a coating of grout mixed in the proportions of one part of cement to two parts of sand.

Refer to Item 303.5.4.4. Construction Joints for more information.

702.5.5. False-work. All false-work shall be designed and constructed to safely carry the maximum anticipated loads and to provide the necessary rigidity. Details of false-work construction shall be subject to review and approval by the OWNER in accordance with the provisions of Item 702.5.6. Forms. When the false-work is no longer required, it shall be removed. False-work piling shall be pulled or cut off a minimum of 6-in. below finished ground level. False-work and piling in a stream or lake shall be removed completely to a point specified by the OWNER to prevent any obstruction to the waterway. Removal shall also be subject to the provisions of Item 702.5.11. Removal of Forms and False-Work.

702.5.6. Forms.

702.5.6.1. General. Forming plans shall be submitted for approval. Forms shall be designed for the pressure exerted by a liquid weighing 150-lb-per-cubic-foot. The rate of placing the concrete shall be taken into consideration in determining the depth of the equivalent liquid. An additional live load of 50-lb-per-square-foot shall be allowed on horizontal surfaces. The maximum unit stresses shall not exceed 125-percent of the allowable stresses used by TxDOT for the design of structures.

Forms shall be of suitable material and of a type, size, shape, quality and strength to insure construction as designed. Wood products for use in forming concrete shall conform to ACI Standard SP-4 Formwork for Concrete. The forms shall be true to line and grade, mortar tight and sufficiently rigid to resist deflection during placing of the concrete. The responsibilities for adequacy shall rest with the CONTRACTOR. All dirt, chips, sawdust, nails and other foreign matter shall be completely removed from forms before any concrete is deposited therein. The surfaces of forms shall be smooth and free from irregularities, dents, sags and holes that would deface the finished surfaces. Forms previously used shall be thoroughly cleaned of all dirt, mortar and foreign matter before being reused. Before concrete is placed in forms, all inside surfaces of the forms shall be thoroughly treated with an approved releasing agent which shall leave no objectionable film on the surface of the forms that can be absorbed by the concrete. Care shall be exercised that no releasing agent is deposited on previously placed concrete, reinforcement or embedded metal items.

Forms for all surfaces that shall not be completely enclosed or hidden below the permanent surface of the ground shall be made of surfaced lumber or material which shall provide a surface at least equal to surfaced lumber or plywood. Any lumber or material which becomes badly checked or warped prior to placing concrete shall not be used.

Forms for all exposed surfaces of bridges, viaducts, over-crossings and similar structures shall be constructed of plywood or an approved equal. Plywood for forms shall be exterior type, of the grade "Concrete-Form Exterior," conforming to the specifications of the U.S. Department of Commerce, "National Bureau of Standards, Commercial Standards," latest edition. Plywood shall be furnished and placed in 48-in. widths and in uniform lengths of not less than 96-in., except where the dimension of the member formed is less than the specified panel dimension. Plywood shall be placed with the grain of the outer plys in the direction of the span. Where plywood is attached directly to the studs or joists, the panels shall not be less than ⅝-in. thick, and the studs or joists shall be spaced not more than 12-in. center to center. Plywood form panels otherwise conforming to the requirements specified herein may be used with a continuous backing of ¾-in. sheeting. All form panels shall be placed in a neat, symmetrical pattern with the horizontal joints level and continuous. All joints shall be filled with an approved quick-setting compound and finished flush with the interior of the form.

Forms for round columns exposed to view shall be of steel, except that other materials shall be allowed with written permission of the OWNER.

Removal shall be accomplished according to the provisions of Item 702.5.11. Removal of Forms and False-Work.

702.5.6.2. Molding. Molding specified for chamfer strips and other uses shall be made of redwood, cypress or white pine materials of such grade that it shall not split when nailed and which can be maintained to a true line without warping. The molding shall be mill-cut and dressed on all surfaces.

702.5.6.3. Form Ties and Spreaders. Metal form ties of an approved type or an approved substitute shall be used to hold forms in place. Pipe spreaders shall not be permitted. Metal and wooden spreaders which are separate from the forms shall be entirely removed as the concrete is being placed. All metal ties, wire or other appliances used inside the forms to hold them in correct alignment shall be removed to a depth of at least ½-in. from the surface of the concrete. Burning off of rods, bolts or ties shall not be permitted. The cavities produced shall be carefully cleaned and completely filled with retempered sand-cement mortar mixed in proportions of 1-to-3 and the concrete shall be left smooth and even.

702.5.6.4. Form Supports for Overhanging Slabs. Form supports which transmit a horizontal force to a steel girder or beam or to a prestressed concrete beam shall be permitted but shall not be used unless a structural analysis has been made of the effect on the girder or beam and approval is granted by the OWNER.

Holes in steel members for support of overhanging brackets may be punched or drilled full size or may be torch cut to ¼-in. under size and reamed full size as provided for in Item 703. Steel Structures. In no case shall the holes be burned full size. All such holes must be approved by the OWNER in writing prior to punching, drilling or burning. Holes shall be left open unless specified on the plans to be filled with a button head bolt. In no case shall the holes be filled by welding.

702.5.7. Placing Reinforcement. Reinforcement in concrete structures shall be placed carefully and accurately and rigidly supported as provided in Item 303.5.3. Placing Reinforcing Steel, Tie, and Dowel Bars and as shown on the plans.

702.5.8. Placing Concrete.

702.5.8.1. General. The CONTRACTOR shall give the OWNER sufficient advance notice before starting to place concrete in any unit of the structure to permit the inspection of forms, the reinforcing steel placement and preparation for casting. No concrete shall be placed in any unit prior to the completion of the formwork, the placement of the reinforcement and approval by the OWNER. Concrete mixing, placing and finishing shall be done in daylight hours, unless adequate provisions are made to light the entire site of all operations.

The minimum temperature of all concrete at the time of placement shall be not less than 50°F. The maximum temperature of Class C, F, H, X, Y and Z or Class PC, PF, PH (as specified by the OWNER) cast-in-place concrete used in bridge superstructures shall not be more than 85°F at the time of placement. Concrete diaphragms, parapets, concrete portions of railings, curbs and sidewalks, unless monolithically placed with the slab, may not be subject to the preceding control if approved by the OWNER in writing. Other portions of structures, when so noted on the plans, shall require the temperature control specified thereon.

A retarding admixture shall be used when the continuous placing method is used in the deck of continuous units. The initial set of the concrete shall be retarded sufficiently to insure that the concrete remains plastic in not less than 3 spans immediately preceding the one being placed. For simple spans, retardation shall be required only if necessary to complete finishing operations or as required by Item 303. Portland Cement Concrete Pavement. The retarding admixture shall be in accordance with the requirements of Item 702.2.3. Concrete Additives and Modifiers.

The consistency of the concrete as placed should allow the completion of all finishing operations without the addition of water to the surface. When conditions are such that additional moisture is needed for finishing, the required water shall be applied to the surface by misting only and shall be held to a minimum amount.

The maximum time interval between the addition of cement or mixing water to the batch and the placing of concrete in the forms shall not exceed amounts shown in Table 702.5.8.1.(a) Interval Between Mixing and Placing Concrete.

Table 702.5.8.1.(a) Interval Between Mixing and Placing Concrete.

Type	Air or Concrete Temperature		Maximum Time[1]
	°F	°C	
Nonagitated Concrete			
	80°F or above	26.6°C or above	15 minutes
	38°F[2] or 79°F	3.3° to 26.1°C	30 minutes
Agitated Concrete			
	90°F or above	32.2°C or above	45 minutes
	75°F to 89°F	23.9° to 31.6°C	60 minutes
	38°F[2] to 74°F	3.3° to 23.3°C	90 minutes

1. The use of an approved cement dispersing agent in the concrete shall permit the extension of each of the temperature-time maximums by 30-minutes, except that for non-agitated concrete, the maximum time shall not exceed 30-minutes.
2. Minimum temperature is 38°F and rising.
3. The maximum temperature shall not be more than 85°F at the time of placement.

The sequence of placing concrete shall be as provided on the plans or in the specifications. The placing shall be so regulated that the pressures caused by the plastic concrete shall not exceed the loads used in the design of forms.

The method of handling, placing and consolidation of concrete shall minimize segregation or the displacement of the reinforcement and shall produce a compact mass of uniform texture. Concrete shall not have a free fall of more than 3-ft. except in the case of thin walls such as culvert walls. The spattering of forms or reinforcement bars shall be prevented if the concrete so spattered shall dry or harden before being incorporated into the mass.

Laitance or foreign matter of any kind shall not be permitted to accumulate inside the forms, and openings in forms necessary for removal of same shall be provided.

Any hardened concrete spatter ahead of the plastic concrete shall promptly be removed from the work.

Each part of the forms shall be filled by depositing concrete as near its final position as possible. The coarse aggregate shall be worked back from the face and concrete forced under and around the

reinforcement bars without displacing them. Depositing large quantities at one point in the forms and running or working it along the forms shall not be allowed.

After the concrete has taken initial set, the forms shall not be jarred or any strain placed on projecting reinforcement.

Chutes, troughs, conveyors or pipes used in placing concrete shall be arranged and used so that the ingredients of the concrete shall not be separated. When steep slopes are necessary, the chutes shall be equipped with baffle boards or made in short lengths that reverse the direction of movement, or the ends of such chutes shall terminate in vertical downspouts. Open troughs and chutes shall extend, if necessary, down inside the forms or through holes left in the forms. All chutes, troughs, conveyors and pipes shall be kept clean and free from coatings of hardened concrete by a thorough flushing with water before and after each placement. Water used for flushing shall be discharged clear of the concrete.

Concrete shall be deposited in the forms in layers of suitable depth but not more than 36-in. in thickness, unless otherwise directed by OWNER.

Holes for anchor bolts in piers, abutments, bents or pedestals may be drilled or may be formed by the insertion of oiled wooden plugs or metal sleeves in the plastic concrete. The plugs or sleeves shall be withdrawn after the concrete has set. Formed holes shall be of such diameter to permit horizontal adjustments of the bolts. The bolts shall be set carefully in mortar in lieu of the above methods of placing. Anchor bolts may be set to exact location in concrete when it is placed.

The placing of concrete for deck slabs shall be done from a mixing plant located off the structure. Carting or wheeling concrete batches over a completed slab shall not be permitted until the slab has reached its specified compressive strength. If carts are used, timber planking shall be required for the remainder of the curing period. Carts shall be equipped with pneumatic tires. Curing operations shall not be interrupted for the purpose of wheeling concrete over finished slabs.

702.5.8.2. Vibration. Successive layers or adjacent portions of concrete shall be placed in a sequence so that they can be vibrated into a homogeneous mass with the previously placed concrete without a cold joint. No more than one hour shall elapse between adjacent or successive placement of concrete. Unauthorized construction joints shall be avoided by placing required portions of abutments, piers, walls or superstructure in one continuous operation. For mass placements, placements on false-work where differential setting time may include stress cracking, placement in deep girder stems, etc., an approved retarder (cement dispersing agent) in accordance with Item 702.2.3. Concrete Additives and Modifiers (Chemical Admixtures) shall be used to control stress cracks and/or unauthorized cold joints.

All concrete shall be well consolidated and the mortar flushed to the surface of the forms by continuous working with mechanical vibrators of an approved type. Vibrators of the type which operate by attachment to forms or reinforcement shall not be permitted, except that external vibration may be allowed when the forms are of steel, but shall be subject to regulation by the OWNER.

At least one standby vibrator shall be provided for emergency use in addition to ones required for placement.

For lightweight concrete, vibrators of the high-frequency type, which produce a minimum of 7,000-impulses-per-minute, shall be required.

The vibrators shall be applied to the concrete immediately after deposit. Prior to the beginning of work, a systematic spacing of the points of vibration shall be established to insure complete consolidation of the concrete being placed and the thorough working of the concrete around the reinforcement, embedded fixtures and into the corners and angles of the forms. Immersion type vibrators shall be inserted vertically, at points 18-in. to 30-in. apart and slowly withdrawn.

For shallow slabs or for concrete inaccessible to vertical insertion of the vibrator, the vibrator may be inserted in a sloping horizontal position. The entire depth of each lift of concrete shall be vibrated, and the vibrator shall be allowed to penetrate several inches into the preceding lift of plastic concrete. New concrete placed against hardened concrete or against fresh concrete that is not plastic shall be thoroughly consolidated along the joint surface. The vibration shall be of sufficient duration to produce thorough consolidation and complete embedment of reinforcement and fixtures but shall not be done to an extent that shall cause segregation. Vibration may be supplemented by hand spading or rodding, if necessary, to insure the flushing of mortar to the surface of all forms.

702.5.8.3. Fogging. For Curing methods, see Item 702.5.10.2.2. Water Curing.

702.5.8.4. Placing Concrete Under Adverse Weather Conditions. Concrete placement shall not be permitted when impending weather conditions may result in rainfall or low temperatures which shall impair the quality of the finished work. In case rainfall should occur after placing operations are started, the CONTRACTOR shall provide ample covering to protect the work. In case of a drop in temperature, the provisions set forth herein shall be applied.

Concrete for structures shall not be placed on frozen ground nor shall it be mixed or placed while the atmospheric temperature is below 40°F, unless adequate means are employed to heat the aggregates and water and satisfactory provisions have been made for protecting the work.

Concrete slabs shall not be placed on frozen ground, nor shall concrete be mixed or placed when the atmospheric temperature is below 40°F or when conditions indicate that the temperature may fall to 40°F within a 24 hour period, except with the written permission of the OWNER and only after such precautionary measures for the protection of the work have been taken as the OWNER may direct.

Concrete shall be effectively protected from freezing or frost for a period of 5 days after placing. When the temperature of the air is above 85°F, an approved retarding mixture shall be required in all concrete used in superstructures, top slabs of direct traffic culverts and cased drilled shafts.

Concrete placement shall be stopped when rainfall is sufficient to cause damage to the work.

702.5.8.5. Placing Concrete in Water. Concrete shall be deposited in water only when specified on the plans or with written permission of the OWNER. The forms, cofferdams or caissons shall be sufficiently tight to prevent any water current passing through the space in which the concrete is being deposited. Pumping shall not be permitted while the concrete is being placed, or until it has set for at least 36-hours.

The concrete shall be placed carefully in a compact mass by means of a tremie or other approved method that does not permit the concrete to fall through the water without adequate protection. The concrete shall not be disturbed after being deposited. Depositing shall be regulated to maintain approximately horizontal surfaces at all times.

When a tremie is used, it shall consist of a tube having a diameter of not more than 10-in., constructed in sections having watertight connections. The tremie shall be equipped with a device for sealing the bottom of the tube, the positive opening thereof and for the placing of the tremie through the water to the point of placement. The means of supporting the tremie shall permit the movement of the discharge over the entire surface of the work and shall permit the tremie to be lowered rapidly when necessary to choke off or retard the flow.

702.5.8.6. Placing Concrete in Superstructure. To insure operation and maintenance of grades and clearances, one or more passes of the screed shall be made over the section of bridge spans to be placed prior to the placement of concrete.

For transverse finishing, concrete in the superstructure shall be placed in transverse strips, beginning at the lowest end of the unit or length of spans to be placed and proceeding to the other end.

For longitudinal screeding, concrete shall be placed in longitudinal strips. Placing, preferably, shall be started at a point in the center of the section adjacent to one curb. The strip thus started shall be completed by depositing concrete uniformly in both directions toward the ends except that for spans on a grade of $1^1/_2$-percent or more, the placing shall start at the lowest end. The width of strips shall be such that the concrete therein shall remain plastic until the adjacent strip is placed.

The forms for the bottom surface of concrete slabs, girders and overhangs shall be maintained true to the required vertical alignment during the concrete placing. For convenience in checking the vertical alignment, an approved system of "tell-tales" attached to the forms shall be installed and maintained by the CONTRACTOR. They shall provide a convenient means of match-marking with reference to points set on stakes or other suitable reference points set independently of the forms and false-work for the span being placed. Unless otherwise provided, the girders, slab and curbs of deck girder spans shall be placed in one continuous operation.

The filling of girder stems ahead of placing the concrete in the slab shall be permitted, provided the slab concrete is placed in the time as specified in Item 702.5.8.1. General. The location of construction

joints and the sequence of placements of the slab on steel and prestressed concrete beams shall be as shown on the plans. Where plans do not specify a particular sequence, any logical placing sequence which shall not result in the over-stressing of any of the supporting members shall be permitted subject to the approval of the OWNER.

On steel truss spans the false-work under the span shall be released and the span swung free on its permanent supports before placing any concrete in the floor slab.

As soon as concrete is placed in a section of the slab of sufficient width to permit finishing operations, the slab shall be finished as specified in Item 702.5.13. Finishing Exposed Surfaces. When the surface of the slab is to receive an additional wearing surface or level-up (widening), the slab shall be given a reasonably smooth float or screed finish and shall not be finished as stated above.

702.5.8.7. Placing Concrete in Box Culverts. In general, construction joints shall be permitted only at the points shown on the plans.

Where the top slabs and side-walls are placed monolithically in culverts more than 4-ft. in clear height, an interval of not less than 1-hour nor more than 2-hours shall elapse between the placing of the concrete in the walls and that in the top slab. Such interval is to allow for shrinkage in the wall concrete.

The top surface of the base slab shall be finished accurately at the proper time to provide a smooth uniform surface. The upper surface of the top slab which shall carry direct traffic shall be finished as specified for finishing roadway slabs in Item 303.5.6. Finishing. On a fill-type culvert which does not carry direct traffic, the top slab shall be given a reasonably smooth finish.

702.5.8.8. Vaults. Vaults shall be provided as specified and/or detailed for access to manholes, gate valves, air release valves, etc.

702.5.8.8.1. Construction. Vaults may be of concrete, reinforced concrete, or precast reinforced concrete pipe as detailed in Item 501.6. Reinforced Concrete Culvert, Storm Drain, Pipe and Box Section or as shown on the project plans. General construction shall include the following:

(1) Vaults used for blow-off manhole applications shall be of water containment construction, utilizing either the monolithic pour-in-place concrete or precast reinforced concrete pipe with trapped O-ring gasket as further defined in Item 501.6. Reinforced Concrete Culvert, Storm Drain, Pipe and Box Section.

(2) Vaults used for non-water containment construction, such as for valve installations, shall be either pour-in-place 2500# reinforced concrete or precast reinforced concrete tongue-and-groove design pipe meeting ASTM C76 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, Class III, using trapped O-ring type rubber seals.

(3) Material requirements for vaults shall be as controlled under the material requirements of these specifications and the contract documents, as applicable, with specific inference placed on material specifications.

Walls. For in-place vaults, walls shall be formed on all sides to the thickness specified. Unless specified otherwise, walls shall not be less than 6-in. thick.

Top Slabs and Grade Adjustment. Top slabs shall normally be poured below final grade and grade rings used to achieve final grade ring elevations. Manhole grade rings, covers, vents, etc. shall be installed as detailed in Item 502.1. Manholes, shown on project plans, or as directed by the OWNER.

Finish. The vault top slab invert and inside wall shall be given a rubbed finish in accordance with Item 702.5.13. Finishing Exposed Surfaces.

702.5.8.8.2. Testing. Water-containment vault structures shall be tested for exfiltration as required in Item 507.5.1.2. Exfiltration of this specification. In the event that leakage occurs in excess of allowable limits, the vault shall be completely sealed with an approved mastic sealer. Any visible seepage of free water shall require sealing on either water containment vaults or manholes.

702.5.8.8.3. Measurement and Payment for Vaults. Measurement and payment for vaults shall be as hereinafter defined, unless specified otherwise in the special contract documents.

Measurement for vault structures shall be on a per each basis complete in place with all accessories and shall include appurtenant work including excavation through backfill to provide for the structure complete in place as designed for the project. Each vault structure is to be complete in place with all system components to be housed as further outlined as follows:

(1) Access Manhole Vault. Since the flanged access outlet and cover are usually furnished as a fitting for concrete cylinder pipe, the vault shall be the only item considered for payment under this bid item category in the proposal.

(2) Air Valve or Combination Air and Vacuum Release Valve in Vault. Payment under this bid item category in the proposal shall include furnishing and installing the air valve or combination air and vacuum release valve, together with all subsidiary piping valves and other appurtenances complete in place as detailed as well as construction of the vault structure. The connecting taps on the main shall be included in the bid price for furnishing and installing fittings or shall be subsidiary to the price bid for furnishing and installing pipe, whichever is more applicable for a specified project.

(3) Gate Valve in Vault. Payment under this bid item category in the proposal shall include the construction of the vault as well as furnishing and installing the gate valve complete in place on concrete blocking along with all appurtenances as detailed for complete and functional installation.

(4) Blow-off and Vault. Payment under this bid item category in the proposal shall include the construction of a water containment vault structure as well as furnishing and installing piping (exclusive of the M.J. bell outlet on concrete mains or M.J. tee on cast iron mains), valves, blocking and other appurtenances as detailed with polyethylene wrapping.

702.5.8.9. Placing Concrete in Foundations and Substructure. Concrete shall not be placed in footings until the depth and character of the foundation has been inspected by the OWNER and permission has been given to proceed.

The placing of concrete bases above seal courses shall be permitted after the caissons or cofferdams are free from water and the seal course cleaned. Any necessary pumping or bailing during the concreting operations shall be done from a suitable sump located outside the forms.

All temporary wales or braces on the inside of cofferdams or caissons shall be constructed or adjusted as the work proceeds to prevent unauthorized construction joints in bases or shafts.

When footings can be placed in dry foundation pits without the use of cofferdams or caissons, forms may be omitted, if desired by the CONTRACTOR and approved by the OWNER, and the entire excavation filled with concrete to the elevation of the top of footing. Where this procedure is followed, no measurement for payment shall be made for concrete placed outside of the footing dimensions shown on the plans.

Concrete in columns shall be placed monolithically unless otherwise provided. Columns and caps and/or tie beams supported thereon may be placed in the same operation. To allow for shrinkage of the column concrete, it shall be placed to the lower level of the cap or each tie beam and placement delayed for not less than 1-hour nor more than 2-hours before proceeding.

702.5.9. Finishing Concrete. All upper horizontal surfaces not covered by forms shall be struck off to grade and finished. The use of mortar topping for surfaces under this classification shall not be permitted.

After concrete has been struck off as described above, the surface shall be floated with a suitable float. Bridge sidewalks shall be given a wood float or broom finish or may be striped with a brush, as specified by the OWNER. Unless otherwise specified, top of caps and piers shall be given a smooth finish with a steel trowel. Other surfaces shall be wood float finished and striped with a fine brush leaving a fine-grained texture.

702.5.10. Curing Concrete. Careful attention shall be given to the proper curing of all concrete. CONTRACTOR shall inform OWNER fully of the methods and procedures proposed for curing, shall provide proper equipment and material in adequate amounts, and shall have approval of the proposed method, equipment and material prior to placing concrete.

Inadequate curing facilities or lack of attention to the proper curing of concrete shall be cause for OWNER to stop all construction on the job until approved curing is provided.

702.5.10.1. Curing Period. All concrete shall be cured for a period of time noted in Table 702.5.10.1.(a) Curing Period, unless otherwise specified by the OWNER. In continuous placement of concrete, the required curing period shall begin when all concrete has been placed and has attained its initial set.

Table 702.5.10.1.(a) Curing Period

Concrete Structure	Curing Days[1,2]
Top Slabs of Direct Traffic Culverts	8-days
Other Structures	4-days

1. A curing day is defined as a day when the ambient temperature, taken in the shade away from artificial heat, is above 50°F for at least 19-hours, or the ambient temperature is 50°F or less; and if satisfactory provisions are made to maintain the temperature at all surfaces of the concrete above 40°F for the entire 24-hours.
2. In addition, concrete must meet 75-percent of the minimum compressive strength requirements.

702.5.10.2. Curing Methods. The following methods are permitted for curing concrete subject to the restrictions of Table 702.5.10.2.(a) Curing Methods, and the requirements of this specification for each method of curing.

Table 702.5.10.2.(a) Curing Methods

Structure Unit Description		REQUIRED		PERMITTED	
		Water for Complete Curing	Membrane for Interim Curing	Water for Complete Curing	Membrane for Interim Curing
1.	Top slabs of direct traffic culverts, top surface of any concrete unit upon which concrete is to be placed and bonded at a later interval (stub walls, risers, etc.). Other superstructure concrete (wing-walls, parapet walls, etc.).	X			
2.	Top surface of precast and/or prestressed piling	X	X		
3.	All substructure concrete, culverts, box sewers, inlets, manholes, retainer walls, riprap.			X[1]	X[1]

1. Polyethylene sheeting or burlap polyethylene mats fastened to prevent outside air from entering shall be considered equivalent to water or membrane curing per this item.

702.5.10.2.1. Form Curing. When forms are left in contact with the concrete, other curing methods shall not be required except for cold weather protection.

702.5.10.2.2. Water Curing. All exposed surfaces of the concrete shall be kept wet continuously for the required curing time. The water used for curing shall meet requirements for concrete mixing water as specified in Item 303, Portland Cement Concrete Pavement.

Wet Mat. Cotton mats shall be used for this curing method. The mats shall not be placed in contact with the concrete until such time that damage shall not occur to the surfaces. Damp burlap blankets made from 9-oz. stock may be placed on the damp concrete surface for temporary protection prior to the application of the cotton mats. The mats may be placed dry and wetted down after placement. Mat curing, except for continuous placements, shall commence not later than 3-hours after finishing the roadway slab. The mats shall be weighted down adequately to provide continuous contact with all concrete surfaces where possible. The surfaces of the concrete shall be kept wet for the required curing time. Surfaces which cannot be cured by contact shall be enclosed

with mats, anchored positively to the forms or to the ground, so that outside air cannot enter the enclosure to keep all surfaces of the concrete wet.

Water Spray. This method shall be accomplished by overlapping sprays or sprinklers, so that all unformed surfaces are kept continuously wet.

Ponding. This method requires the covering of the surfaces with a minimum of 2-in. of clean granular material, kept wet at all times, or water to a minimum depth of 1-in. Satisfactory provisions shall be made to provide a dam to retain the granular material or water.

Fogging. All the unformed surfaces of slab concrete for bridge decks and the top slab of direct traffic culverts shall be protected against rapid surface drying by the use of fog sprays. Fog sprays, powered by pressure pumps and capable of covering the entire area of freshly placed concrete with a fine mist, shall be installed, ready for use prior to the start of placing operations.

On individual placements of 15-cubic-yards or less, hand operated spray nozzle equipment of the stirrup pump type may be substituted for the equipment specified above.

Fogging shall be carefully controlled to prevent accumulation of standing or flowing water on the surface of the fresh concrete. Fogging shall continue, as required, through the finishing operations and shall be used as interim curing until the selected curing medium is in place, except that in lieu of continuous fogging over the entire area, that portion of the finished concrete surface which is sufficiently hardened may be covered with wet burlap. The burlap shall be kept wet until the final curing media is in place.

702.5.10.2.3. Membrane Curing. Membrane curing shall not be applied to dry surfaces but shall be applied to horizontal surfaces just before free moisture has disappeared. Formed surfaces and surfaces which have been given a first rub shall be dampened and shall be moist at the time of application of the membrane. Unless otherwise shown on the plans, Type 2 membrane curing compound in accordance with Item 303.2.13. Curing Materials may be used where permitted. Membrane shall be applied in a single, uniform coating at the rate of coverage recommended by the manufacturer and as approved by the OWNER. Tests for acceptance shall be at the specified rate of application.

When membrane is used for complete curing, the film shall remain unbroken for the minimum curing period specified. Membrane which is damaged shall be corrected immediately by re-application of membrane.

702.5.11. Removal of Forms and False-Work. Except as herein provided, forms for vertical surfaces may be removed when the concrete has aged not less than 1 curing day. A curing day is defined as a day when the ambient temperature, taken in the shade away from artificial heat, is above 50°F for at least 19-hours, or the ambient temperature is 50°F or less; and if satisfactory provisions are made to maintain the temperature at all surfaces of the concrete above 40°F for the entire 24-hours.

Weight supporting forms and false-work for all bridge components, culverts and slabs shall remain in place a minimum of 4-curing-days. Forms may then be removed if the concrete has attained 75-percent of design strength, as evidenced by strength tests using test specimens made from the same concrete and cured under the same conditions as the portion of the structure involved. Forms for other structural components may be removed as specified by OWNER. If all test specimens made for the purpose of form removal have been tested without attaining the required strength, forms shall remain in place for a total of 14-curing-days.

The above provisions relative to form removal shall apply only to forms or parts of forms which are so constructed as to permit removal without disturbing forms or false-work which are required to be left in place for a longer period on other portions of the structures.

702.5.12. Defective Work. Any defective work discovered after the forms have been removed shall be repaired or replaced as soon as possible. If the surface of the concrete is bulged, uneven or shows excess honeycombing or form marks which in the opinion of the OWNER cannot be repaired satisfactorily, the entire section shall be removed and replaced. In repairing honeycombed areas, all loose material shall be removed before the repair work is started. No extra compensation shall be allowed for extra work or materials involved in repairing or replacing defective concrete.

702.5.13. Finishing Exposed Surfaces. The type of surface finish shall be one of the types described herein and as designated on the plans. Where the plans do not specify the type of finish, a Type 1 Finish shall be required.

702.5.13.1. Type 1 Finish. The following areas shall require lined forms and shall receive a first and second rubbing:

(1) The top, exterior and roadway faces of curbs; all concrete surfaces of railing, including the parapet types; the exterior vertical faces of slab spans, rigid frames, arches and box girders; the outside and bottom surfaces of fascia beams or girders (precast prestressed concrete beams excluded); the underside of overhanging slabs to the point of juncture of the supporting beam; all vertical surfaces of piers, columns, bent caps, (including the bottom sloped portions only of variable depth caps), abutments, wing-walls and retaining walls, which are exposed to view after all backfill and embankment are placed.

(2) On slab spans and rigid frame structures, the underside of the slab shall be finished for a width of 2-feet in from the outer edge, but lined forms shall be required for the entire bottom surfaces.

(3) For rigid frame structures, finishing shall be required on the inside sloping and vertical surfaces.

(4) Culvert headwalls and wing-walls, inlets, manholes and sewer appurtenances shall receive a first rubbing only.

No rubbing shall be required on any area inside culvert barrels. Horizontal surfaces of bridge sidewalk slabs shall be finished in accordance with Item 303.5.6. Finishing.

702.5.13.2. Type 2 Finish. All concrete surfaces of railing, including the parapet types, the top and roadway faces only of curbs, and wing-walls of bridges shall be given a first and second rubbing. All other surfaces described under Type 1 Finish shall be given a first rubbing only. Lining of forms shall be as required in a Type 1 Finish.

702.5.13.3. Type 3 Finish. All concrete surfaces of railing, including the parapet types, the top and roadway faces only of curbs, and wing-walls of bridges shall be given a first and second rubbing. All other surfaces described under Type 1 Finish shall not require rubbing but shall require lining of forms.

702.5.13.4. Type 4 Finish. All concrete surfaces of railing, including the parapet types, the top and roadway faces of curbs, and wing-walls of bridges and culverts shall be given a first rubbing only. Form lining shall not be required. Rubbing of culvert wing-walls shall not be required, provided lined forms are used.

702.5.13.5. Surface Finishing Methods. The first rubbing shall be done immediately upon removal of the forms. Membrane curing, if used, shall be applied after the first rub has been completed. Prior to the second rubbing, any remaining curing membrane shall be removed from the surface by brushing, buffing or other satisfactory methods. Removal of the membrane shall not be required except when a second rubbing is required.

After all repair work and pointing has set sufficiently, rubbing shall be performed as follows:

(1) All surfaces to be finished shall be wet and given a first rubbing with a carborundum stone. The rubbing shall bring the surface to a paste and produce a smooth dense surface without pits, form marks or other irregularities. The use of cement to form a paste shall not be permitted.

(2) Where a single rubbing is specified, the paste shall be spread uniformly, striped with a brush and allowed to take a reset, after which the surfaces shall be washed with clean water, leaving them with a neat and uniform appearance and texture. Chamfered corners shall also be rubbed.

(3) When a second rubbing is required, striping with a brush and washing after the first rubbing shall not be required. Chambered corners generally should not be rubbed in the first rubbing.

(4) The second rubbing shall be performed during the process of conditioning the structure for final acceptance. The surfaces requiring finish shall be cleaned of drip marks and discolorations and shall be given a final rubbing with a carborundum stone. The surface shall be striped neatly with a brush, and the mortar shall be allowed to take a reset, after which the surfaces shall be washed with clean water, leaving them with a neat and uniform appearance and texture.

Surfaces other than those specified herein shall not require rubbing unless they are not true or have porous or honeycombed areas which are not designated for replacement. When such defects occur,

the areas affected shall be given a first rubbing, which shall extend over a sufficient area to blend it into the surrounding unfinished surface. This shall not be construed to require the rubbing of large adjacent unblemished areas to gain absolute uniformity of color and texture on the structure part in question. All surfaces shall be free of discolorations and should present a uniform appearance. Unsightly discoloration shall be removed prior to acceptance.

702.5.13.6. Painting in Lieu of Rubbing. When so indicated on the plans, or with written permission of the OWNER, painting of concrete surfaces in lieu of rubbing shall be permitted. When painting is permitted, it shall be accomplished as follows or as according to the OWNER:

(1) Soon after form removal, any porous spots, honeycombed areas, untrue surfaces and lines shall be corrected. All fins, form marks, runs, drips or mortar shall be removed, leaving a smooth and uniform surface.
(2) When preparing the completed structure for final acceptance, all grease, dirt, mortar drips and remaining curing membrane shall be removed from the pertinent surfaces.
(3) Surfaces shall be painted with a latex-base adhesive grout. The grout shall consist of one part latex-base adhesive, two parts white cement, two parts natural cement, two parts fine masonry sand and one part water. Mixture should have the consistency of a thick paint.
(4) The finished surface shall have a uniform appearance and texture. Thickness of coating shall be approximately $^1/_{16}$-in. to $^1/_8$-in.

702.5.14. Measurement and Payment. The quantity of concrete which constitutes the completed structure shall be measured by the cubic yard of accepted work in place. The dimensions used shall be those shown on the plans or ordered in writing by the OWNER. No deductions in measurement shall be made for embedded reinforcing steel or for embedded portions of structural steel members.

The concrete quantities, measured as provided, shall be paid for at the unit price bid per cubic yard for concrete, which price shall be full compensation for furnishing, hauling and mixing all concrete materials, including trial batches; placing, curing and finishing all concrete; all grouting and joints; furnishing and placing all expansion and construction joints, except as hereinafter provided; furnishing and placing metal flashing strips and waterstops; and all forms and false-work, labor, tools, equipment and incidentals necessary to complete the work.

The above provision for payment for expansion joints shall not be interpreted to provide payment for cast steel or structural steel shapes and plates, used expansion joints and armored joints, or for structural steel, cast iron or cast bearing plates. Payment for these materials shall be as provided for in Item 806. Metal Materials.

The preceding provisions for payment shall not be interpreted to provide payment for concrete in railing, piling, precast prestressed concrete units or other concrete items for which provision is otherwise made in these specifications or in the contract documents.

702.6. PRESTRESSED CONCRETE FOR STRUCTURES

702.6.1. Description. This item shall govern the complete construction, furnishing, storing, handling and erection of precast prestressed concrete structures, in accordance with the plans, with the exception of piling, which shall be in accordance with Item 704.1.2. Concrete Piling. For additional information, refer to TxDOT Specifications and OWNER-provided specifications.

702.6.2. General. The method of construction and of prestressing shall be as shown on the project plans and on the approved shop drawings. Prior to beginning the casting of prestressed members, the CONTRACTOR shall give the OWNER notice.

702.6.3. Materials. Materials for concrete shall be in accordance with Item 702.2. Concrete Structure Materials, and Item 702.3. Mix Design and Mixing Concrete for Structures. Reinforcing steel, not prestressed, shall conform to the requirements of Item 303.2.9. Steel Reinforcement. Structural steel bearing plates, fittings, etc. shall be in accordance with Item 806. Metal Materials. Bearing pads shall be in accordance with TxDOT Item 435. Elastomeric Materials and with special specifications contained in the Contract.

702.6.4. Handling and Erection. Fabrication and erection plans shall indicate the method of handling and erecting prestressed members. An adequate factor of safety shall be included in all calculations for handling and erection to preclude over-stressing any part of the member due to dynamic forces or impact.

Prestressed concrete beams shall be maintained in an upright position at all times and shall be picked up and supported near the end of the beams only and in such a way as to prevent torsional stress in the beam. Beams may be lifted with the lifting devices as approved on the shop plans or by other methods approved by the OWNER in writing.

No prestressed concrete structural member shall be moved from the casting yard until all requirements for tensioning, curing and strength have been attained. The strength of a prestressed member shall be considered adequate after curing and tensioning requirements are fulfilled if the design strength compressive cylinders indicate that the required design strength has been attained.

702.6.5. Defects and Breakage. If any prestressing tendon or portion thereof is broken prior to placing concrete in the member, it shall be replaced with a satisfactory unit properly prestressed at no cost to the OWNER. The breaking of one wire of a 7-wire strand in a unit during concrete placing operations shall be subject to a structural review prior to acceptance.

Fine hair cracks or checks on the surface of the member which, as determined by the OWNER, do not extend to the plane of the nearest reinforcement, shall not be cause for rejection unless such cracks are so numerous and extensive as to indicate inadequate curing, in which case the members shall be rejected. Diagonal cracks on the vertical surfaces which indicate damage from torsion shall be subject to a structural review prior to acceptance or rejection by the OWNER. Vertical and horizontal cracks which are $^1/_{16}$-in. or less in width and which tend to close upon release of stress are acceptable. Cracks in excess of this are subject to review prior to acceptance or rejection by the OWNER. Cracks which extend into the plane of reinforcing steel and/or prestressed tendons and are acceptable otherwise shall be repaired by sealing with a latex-base adhesive grout or with epoxy.

All replacements as herein specified as well as all other replacements due to faulty materials or construction methods shall be made at the CONTRACTOR'S expense.

702.6.6. Workmanship and Tolerance. Variations greater than specified shall be cause for rejection.

702.6.6.1. Prestressed Beams, Girders, Spans and Box Type Beams. Requirements shall include the following:

(1) variation from shop plan lengths: plus or minus 1-in.
(2) variation from plan height, box type beams: plus or minus ¼-in. Others: plus or minus ½-in. maximum deviation of ¼-in. per 10-ft. of length. Box-type beams ¾-in total deviation.
(3) out-of-square (vertical or horizontal) or deviation from plane skew angle: maximum ⅛-in.-per-ft. of dimension.
(4) bearings. Requirements include:
  (a) out-of-perpendicular with vertical axis: maximum $^1/_{16}$-in.
  (b) honeycomb in bottom soffit of beams at the bearing shall not exceed 15-percent of the bearing area (width x length). No tendon shall be exposed and the maximum depth of honeycomb shall not exceed 1-in. Honeycomb shall be chipped out to sound concrete and repaired satisfactorily prior to acceptance.
(5) form fit-up. Where sections of forms are to be butt-jointed, an offset of $^1/_{16}$-in. for flat surfaces and ⅛-in. for corners and bends shall be permitted.

702.6.6.2. Repair. Small areas of honeycomb which are purely surface in nature (not over 1-in.) may be repaired. Honeycomb extending to the plane of the prestressed strands shall be rejected tentatively, subject to structural review prior to acceptance or rejection by the OWNER.

702.6.6.3. Steel. Reinforcing steel shall not project above the top of the member more than ½-in. nor less than ¾-in. from plan dimension. In the plane of the steel parallel to the nearest surface of concrete, bars shall not vary from plan placement by more than ¼-in. or $^1/_{12}$ of the spacing between bars, whichever is greater. In the plane of the steel perpendicular to the nearest surface of the concrete, bars shall not vary from plan placement by more than ¼-in.

702.6.7. Measurement and Payment.

702.6.7.1. Measurement. Precast, prestressed concrete beams or girders of the type specified, cast and stressed, as required on the plans, shall be measured by the linear foot complete in place.

Precast, prestressed concrete spans of the size and type specified, cast and stressed, as required by the plans, shall be measured as each prestressed span, complete in place.

Other precast, prestressed members of the type and size specified, cast and stressed, as required by the plans, may be measured by the linear foot or by each member as the case may be and as noted on the plans.

Cast-in-place structures (or structures where the CONTRACTOR has the option of casting-in-place) shall be measured as follows:

(1) concrete, non-prestressed reinforcing steel and structural steel (except bearing and anchorage devices integrally a part of the post-tensioning system) shall be measured by the cubic yard or by the pound in accordance with the applicable specifications for these items. Grout and ducts for post-tensioning shall not be measured but shall be considered subsidiary to this item.

(2) the prestressing steel required and the work involved in the prestressing of the cast-in-place structures or units shall not be measured but shall be considered as one unit for "prestressing" each different structure type or unit as itemized on the plans and in the proposal.

702.6.7.2. Payment. Precast, prestressed concrete beams or girders shall be paid for at the unit price bid per linear foot (m) for "prestressed concrete beams" of the type specified.

Precast, prestressed concrete spans shall be paid for at the unit price bid for each "prestressed concrete span."

Other prestressed concrete members shall be paid for at the unit price bid per linear foot for "prestressed concrete members" (specify name and type) as the case may be.

A partial allowance shall be made for materials and for precast or prestressed concrete members cast, but not erected.

The above prices shall be full compensation for constructing the member; furnishing and tensioning prestressed steel; furnishing and placing reinforcing steel, conduit and attached bearing plates, etc. for same; grouting holes; and for all bars, anchorage plates, and other appurtenances which become an integral part of the precast structure and for any special treatment of end anchorages and shoes as indicated on the plans; and for furnishing all materials, tools, equipment, labor and incidentals necessary to fabricate, transport and erect the members in the structure as indicated on the plans. The cost of all materials used in the test specimens and the cost of providing and maintaining curing facilities shall be included in the unit price bid for the various prestressed concrete members.

702.7. PNEUMATICALLY PLACED CONCRETE (GUNITE)

702.7.1. Description. Pneumatically placed concrete shall consist of premixed sand and Portland cement pneumatically transported through a pipe or hose in a dry state to a nozzle where hydration takes place immediately prior to expulsion. For additional information, refer to TxDOT Specifications and OWNER-provided specifications.

702.7.2. Materials. The concrete shall conform to the requirements of Item 702.2. Concrete Structure Materials. Bar reinforcement and wire fabric reinforcement shall conform to the requirements of Item 303.2.9. Steel Reinforcement. Expansion joints shall conform to the relevant requirements Item 303. Portland Cement Concrete Pavement.

Steel drive pins or studs used for the attachment of reinforcing when covering designed portions of concrete structures with pneumatically placed concrete shall be capable of being driven to the specified depth without deforming or otherwise becoming unsuitable for the purpose intended. The pins shall have a minimum diameter of $^1/_8$-in. and a minimum length of 2-in. Size and location of drive pins or studs and method of attachment of reinforcing shall be as specified herein or as detailed on the plans.

702.7.3. Equipment and Workers. The gun mechanism should be operated at a minimum air pressure of 45-psi on the gun tank when 100-ft. or less of material hose is used and the pressure should be increased 5-psi for each additional 50-ft. of hose required. Nozzles used for guniting shall have a maximum size of 1⅝-

in. unless otherwise permitted by the OWNER. Water used for hydration shall be maintained at a uniform pressure, which shall be at least 15-psi above air pressure at the gun.

The equipment used for driving the pins or studs shall be of the type which uses an explosive for the driving force and shall be capable of inserting the stud or pin to the required depth without damage to the concrete. The OWNER may require that a test be made of equipment prior to approving it for use.

Only experienced foremen, gunmen, nozzlemen, and rodmen shall be employed, and satisfactory written evidence of such experience shall be furnished to the OWNER or its representative upon demand.

702.7.4. Proportions, Mixing, and Testing. Unless otherwise specified, the concrete shall consist of a mixture of cement and sand in the proportions by volume of 1 part of cement to 4½ parts of sand.

The sand shall contain not less than 3-percent nor more than 6-percent moisture by weight. The sand and cement shall be mixed thoroughly in a power mixer for at least 1½-minutes before placement in the chamber of the gun mechanism. The dry mixed material shall be used promptly after mixing. Any material that has been mixed for more than 45-minutes shall be rejected and removed from the worksite.

The use of approved admixtures conforming to the requirements of Item 702.2.3. Concrete Additives and Modifiers shall be permitted at the option of the CONTRACTOR.

The mixer shall be cleaned at regular intervals to remove all adherent material from the mixing vanes and from the drum.

At the beginning of work the OWNER may require that cylinders be made to represent the quality of the pneumatically placed concrete. Additional cylinders shall be made during performance of the work as directed by the OWNER. If in the opinion of the OWNER, the cylinder strengths are indicating undesirable variation in the concrete, the CONTRACTOR may be required to change the mix design and/or method of placing so as to correct this condition. The CONTRACTOR shall furnish specially constructed cylinders 6-in. in diameter and 12-in. high, made of ¾-in square mesh hardware cloth. Test cylinders for pneumatically placed concrete shall be shot with the same air pressure and nozzle tip as the pneumatically placed concrete. At the end of the first 24-hour curing period, the hardware cloth form shall be removed and the cylinders stored and cured as directed by the OWNER.

702.7.5. Construction Methods. Concrete shall not be applied to a surface containing frost or ice. Where standing or running water is encountered, it shall be removed before applying the concrete. No work shall be done without the permission of the OWNER when the temperature is lower than 40°F. After placing, the concrete shall be protected from freezing or quick drying.

702.7.5.1. Placement. Earth surfaces to which concrete is to be applied shall be neatly trimmed to line and grade and shall be free of all loose material. The surface need not be compacted by slope rolling or other measure unless required by the plans or specifications.

No high subgrade shall be permitted. Excavation made below subgrade shall be backfilled with compacted fill or, at the CONTRACTOR'S option, with concrete. However, no additional compensation shall be allowed for such compacted fill nor for increased thickness of concrete placed because of low subgrade.

Asphaltic concrete surfaces shall be thoroughly cleaned of any organic material, silt and clay, or any other material detrimental to the concrete and then washed with water under pressure. Masonry, rock and concrete surfaces shall be examined and all loose material removed therefrom. The surface shall be thoroughly cleaned with steel scrapers or brushes to remove all dust, dirt, mortar, grease or other deleterious substances and then washed with water. Whenever brushing and scraping do not secure suitable results, sandblasting may be required.

All surfaces shall be wetted with water before application of concrete. Concrete shall not be applied to surfaces on which free water exists.

The velocity of the material as it leaves the nozzle shall be maintained uniformly at a rate determined for given job conditions. Material which rebounds and does not fall clear of the work, or which collects on the surfaces, shall be blown off or otherwise removed. Rebound shall not be used in any portion of the work, and no payment shall be made for rebound or other concrete losses.

The nozzle shall be held at such distance and position that the stream of flowing material shall impinge at approximately right angles to the surface being covered. Any portion of the placed concrete

which tends to sag or which shows soft or sandy pockets or is otherwise unsatisfactory shall be cut out and replaced with new concrete. Reinforcement damaged or destroyed by such repairs shall be replaced by trimming the concrete back and properly lapping and tying additional steel as may be required by the OWNER.

Reinforcement shall be firmly supported in the position shown on the plans. Mortar blocks, metal chairs, clips or spacers with wire ties or other acceptable means shall be used to anchor and place the reinforcement properly.

Where material is placed on overhead surfaces, the amount of water used shall be so adjusted that approximately 3/4-in. of the placed material shall adhere without support. The limit of thickness shall be considered to have been exceeded when the material begins to sag or slough.

702.7.5.2. Forms and Ground Wires. The forms shall be built in accordance with applicable provisions of the specifications, except all forms shall be built so as to permit the escape of air and rebound.

Ground wires shall be installed in such a manner that they accurately outline the finished surfaces as indicated on the plans. They shall be located at intervals sufficient to insure proper thickness throughout. Wire shall be stretched tight and shall not be removed prior to application of the finish coat.

Headers shall be required where the plans indicate a formed edge and at plane joints.

702.7.5.3. Joints. Construction joints shall be sloped off at an angle of approximately 45° to the surface to which the concrete is being applied. Before applying concrete in the adjacent sections, the sloped portion shall be thoroughly cleaned and wetted by means of air and water blast.

The plane joints shall be formed in accordance with and placed in the locations designated on the plans.

702.7.5.4. Finish. Upon reaching the thickness and shape outlined by forms and ground wire, the surface shall be rodded off to true lines. Any low spots or depressions shall be brought up to proper grade by placing additional concrete. Ground wires shall then be removed. Unless otherwise specified, the surface shall then be broom finished to secure a uniform surface texture. Rodding and working with a wood float shall be held to a minimum.

Rebound or accumulated loose sand shall be thoroughly cleaned up and disposed of by the CONTRACTOR. In no case shall they be floated into the surface of the work.

When a nozzle finish is specified on the plans, ground wires shall not be used, and the surface shall be left as uniform as possible without rodding. Nozzle finish shall not be permitted where the underlay has been floated.

702.7.5.5. Curing. Pneumatically placed concrete shall be cured in accordance with Item 702.5.10.2. Curing Methods.

702.7.6. Measurement and Payment. Measurement for pneumatically placed concrete shall be made by the square foot in place. For encasement of structural steel members and covering portions of structures, the actual contact area shall be the basis for measurement.

Pneumatically placed concrete, measured as provided in this item, shall be paid for at the unit price bid per square-foot for "pneumatically placed concrete" of the type specified. The unit price bid per square-foot shall be full compensation for all cement, sand, water, reinforcement, furnishing and driving all steel drive pins, mixing and placing pneumatically placed concrete, and for all labor, tools, equipment and incidentals necessary to complete the work. Excavation for channel and canal lining shall be paid for in accordance with Item 203.2. Unclassified Excavation. Shaping and fine grading of channel or canal slopes and floors are not to be paid for directly but shall be included in the unit price bid for "pneumatically placed concrete." When header-banks upon which "pneumatically placed concrete" is to be placed have been built by prior contract, excavation for shaping of slopes shall be paid for in accordance with Item 701.2. Structural Removal, Excavation, and Backfill.

702.8. DRILLED SHAFT FOUNDATIONS

702.8.1. Description. This item shall govern the construction of foundations consisting of reinforced concrete shafts with or without bell type concrete footings. Such foundations shall be constructed in

accordance with this item and in conformance with the details and governing dimensions shown on the plans.

702.8.2. Materials. All concrete materials and their preparations shall be in accordance with the requirements of Item 702.2. Concrete Structure Materials, Item 702.3. Mix Design and Mixing Concrete for Structures, and the additional requirements herein. All concrete shall be Class A or Class PA, as specified by the OWNER, unless otherwise shown on the plans.

When casing of the shaft is required, the following shall apply:

(1) The maximum size coarse aggregate shall be 1½-in.

(2) The elapsed time from beginning of placement of concrete in the cased portion of the shaft until extraction of the casing is begun shall not exceed 30 minutes. If a cement dispersing agent is used, this time shall not exceed one hour. If non-agitating equipment is used to haul the concrete from a central mixing plant, the elapsed time for discharge of concrete from the mixer to placement in the shaft shall not exceed 10-minutes. If a cement dispersing agent is used, this time shall not exceed 30-minutes.

(3) When the temperature of the air or concrete is above 85°F., an approved cement reactive polymeric dispersant shall be required in all drilled shaft concrete. Reinforcing steel shall conform to the requirements of Item 303.2.9. Steel Reinforcement.

702.8.3. Construction Methods.

702.8.3.1. Excavation. The CONTRACTOR shall do all excavation required for the shafts and bell footings, through whatever materials are encountered, and to the dimensions and elevations shown on the plans or required by the site conditions. Unless otherwise shown on the plans, all shafts shall be bored to plumb to a tolerance of 1-in. for depths up to and including 10-ft. For shafts over 10-ft., tolerance will be approved by OWNER. Shafts and bells shall be excavated so as to form a bearing area of the size and shape shown on the plans. Blasting methods shall not be used without prior written approval of the OWNER. If blasting methods are approved, methods shall conform to Item 203.2.7. Alternate Methods of Excavation.

The plans indicate the expected depths and elevations at which satisfactory bearing material shall be encountered; this information shall be used as a basis for the contract. If satisfactory foundation materials are not encountered at plan elevations, the footings may be raised or lowered as determined by the OWNER. Alterations in plan depths shall be made as judged proper to satisfactorily comply with the design requirements.

Casings shall be required for shaft excavations when such provision is necessary to prevent caving of the material or when necessary to shut off seepage water. Casings shall be of ample strength to withstand handling stresses, along with the pressure of concrete and of the surrounding earth or backfill materials, and shall be watertight. The inside diameter of the casing shall not be less than the normal size of the shaft. No extra compensation shall be allowed for the concrete required to fill an oversize casing or oversize excavation.

When the drilling operation reaches a point where caving condition and/or excess ground water is encountered, no further drilling shall be allowed until a construction method is employed which shall prevent any caving that tends to make the excavation appreciably larger than the size of casings to be used. Construction methods that control the size of the excavation, such as drilling in a mud slurry without the removal of cuttings, shall be permitted.

If the elevation of the top of the shaft is below ground level at the time of concrete placement, an oversize casing from ground elevation to a point below the top of the shaft shall be required to control caving of any material into the freshly placed concrete.

Any excavation for the footing bells or shafts beyond the lines required shall be backfilled with Class A or Class PA concrete as specified by the OWNER at the CONTRACTOR'S expense. Where casings are used, the CONTRACTOR shall be permitted to backfill around the upper portion of the casing with pea gravel or other granular material. Where a double casing is required for a portion of the shaft, no material shall be placed between the casings but rather this area shall be filled with Class A or Class PA concrete as specified by the OWNER.

Under normal operations when the casing is to be removed, the removal shall not be started until concrete placement is completed in the shaft. Movement of the casing for short pulls of a few inches or rotating of the casing shall be permitted. When unusual conditions warrant, the casing may be pulled in partial stages. In all cases a sufficient head of concrete shall be maintained at all times above the bottom of the casing to overcome hydrostatic pressure. Extraction of the casing shall be at a slow, uniform rate and the full pull shall be in a truly vertical direction. If any upward movement of the concrete and/or inside the casing occurs at any time during the pulling operations, the following criteria shall govern:

(1) if the upward movement is 1-in. or less, the casing shall be left in place. Vibration or rodding shall not be used to attempt to break the casing loose for extraction unless the entire shaft is to be replaced.

(2) if the upward movement is greater than 1-in., all of the material shall be removed and the entire drilled shaft operation shall be redone.

Placing of drilled shaft concrete under water shall not be done without the permission of the OWNER.

Material excavated from shafts and bells and not used in the backfill around the completed bents or piers shall be disposed of as directed by the OWNER. The disposal of such material shall be in such manner as not to impair adjacent water bodies or otherwise impair the efficiency or appearance of the structure or other parts of the work.

At the time concrete is placed, the excavation shall be free from accumulated seepage water and all loose material shall be removed from the base area.

The CONTRACTOR shall provide suitable access and lighting for the OWNER to inspect the completed foundation excavation and check the dimensions and alignment of drilled shafts and the under-reamed excavation when under-reaming is required. Any required lighting shall be by electric lights. Any mechanical equipment used in the excavations shall be operated by air or electricity. The use of gasoline-driven engines placed in the excavation for pumping or drilling shall not be permitted.

In order that the OWNER may judge the adequacy of a proposed foundation, the CONTRACTOR, if requested, shall make soundings or take cores at its expense to determine the character of the supporting materials. The depth of such soundings or cores shall not be required to exceed 5-ft. below the proposed footing grade. It is the intent of this provision that soundings shall be made or cores taken at the time the excavation in each foundation is approximately complete.

When the plans require drilled shafts in the abutments, the embankment at the bridge ends shall be made to grade as shown and thoroughly compacted, as provided in the governing specifications, prior to drilling for abutment shafts.

702.8.3.2. Reinforcing Steel. The reinforcing steel cage for the shaft, consisting of longitudinal bars and spiral hooping or lateral ties, shall be completely assembled and placed into the shaft as a unit. Generally, the reinforcing steel unit shall not be placed until immediately before concreting operations are to be started. The longitudinal bars shall be tied to the spiral hooping at intervals not to exceed 12-in. on centers to provide a rigid unit. For cased shafts where the reinforcing steel cage is over 30-ft. in length, the longitudinal bars shall be tied at each intersection of the spiral hooping for a distance of $^1/_5$ the depth of shaft from the bottom of the cage. The cage of reinforcing steel shall be supported from the top by some positive method to prevent slumping downward during extracting of the casing.

In uncased shafts, side spacer blocks of concrete shall be used at intervals along the shaft to insure concentric spacing for the entire length of shaft. In cased shafts, concrete spacer blocks shall not be used, but instead metal "chair" type spacers shall be placed vertically at intervals around the steel cage to insure concentric spacing inside the casing.

702.8.3.3. Concrete. The work shall be performed in accordance with the provisions of Item 702.5. Constructing Concrete Structures, and in conformance with the requirements herein.

Preferably concrete shall be placed immediately after all excavation is complete and reinforcing steel placed.

Concrete placing shall be continuous from the beginning of placement in the shaft or footing bell to the top of shaft or to a construction joint as may be indicated on the plans. Time intervals shall be

allowed for pulling casings, placing forms and other operations necessarily carried on in sequence with the placing operations. The reinforcing steel cage shall be held vertically in some manner to restrain the steel from slumping during the concrete placement operation. Concrete shall be placed through a suitable tube to prevent segregation of concrete materials and unnecessary splashing on the reinforcing steel cage. The tube shall be made in sections to permit the discharge and raising as the placement progresses. A non-jointed pipe may be used if sufficient openings of the proper size are provided to allow for the flow of concrete into the shaft.

Whenever a casing is used, the casing shall be smooth and well-oiled and shall extend sufficiently above the grade of the finished shaft to provide excess concrete to be placed for the anticipated slump due to the casing removal.

Where a casing is to be pulled, the concrete placed in casing shall be of such workability as to require no vibrating or rodding. Where a cap block or ground line strut is shown on the plans to be placed at the top of the drilled shaft, and the cap or strut is shown to be placed monolithic with the drilled shaft, a time interval shall be allowed for placing the required form and reinforcing after any necessary casing removal.

After a placement is completed, the top surface shall be cured and any construction joint area shall be treated as prescribed in Item 702.5. Constructing Concrete Structures.

702.8.4. Test Holes. When shown on the plans, or when ordered by the OWNER in writing, test holes shall be required to establish elevation for "belling" to determine elevation of ground water or to determine other soil characteristics. The diameter and depth of test hole or holes shall be as shown on the plans or as directed by the OWNER.

702.8.5. Test Bells. When shown on the plan, or when ordered by the OWNER in writing, the under-reaming of bells on specified test holes shall be required to establish the ability to under-ream in the soil strata present. The diameter and shape of the test bell shall be as shown on the plans or as directed by the OWNER.

702.8.6. Measurement and Payment. Acceptable drilled shafts in place of the specified diameter shall be measured by the linear foot. At interior bents and piers, shafts shall be measured from 1-ft. below ground for drill shafts at stream crossings, and measured from a point of 6-in. below the ground elevation for grade crossings at the center of shaft unless otherwise indicated on the plans. At street grade separations and at railroad underpasses, the ground elevation shall be the completed roadway section under the structure. At stream crossings and at railroad overpasses, the ground elevation shall be considered as the elevation existing at the time drilling begins. At abutment bents, the length of shaft shall be measured from the bottom of cap elevation.

Footing bells, constructed to the specified dimensions or to the altered dimensions as authorized by the OWNER, shall be measured by the cubic yard of concrete in the acceptable footings placed. The bell shall consist of the authorized footing volume outside the dimensions of the drilled shaft, which for the purpose of measurement shall be considered as extending to the bottom of the bell.

Test holes of the specified diameter shall be measured from the elevation of the ground at the time drilling begins, by the linear foot of acceptable test hole drilled.

Test bells of the specified diameter and shape shall be measured by each test bell acceptably under-reamed.

Drilled shafts shall be paid for at the unit price bid per linear foot of the specified diameter of "drilled shafts," measurements being made as hereinbefore outlined. Where vertical and spiral reinforcing bars from the shaft extend into footings, caps, columns or other concrete members, the cost of such reinforcing shall be included with and paid for as part of "drilled shafts."

Payment shall include the following:

(1) payment for individual completed shaft lengths, up to and including 5-ft. in excess of the maximum plan length shaft as defined herein, shall be made at the unit price bid per linear foot (m) of the specified diameter of "drilled shafts."

(2) payment for that portion of individual completed shaft length in excess of 5-ft. and up to and including 15-ft. more than the maximum plan length shaft as defined herein shall be made at a unit price equal to 115-percent of the unit price bid per linear foot of the specified diameter of "drilled shafts."

(3) payment for individual completed shaft lengths, over 15-ft. in excess of the maximum plan length shafts as defined herein, shall be in accordance with one of the following methods as determined by the OWNER:

(a) Method "A." By unit prices agreed to in writing by the OWNER before said extra work is commenced, subject to all other conditions of the contract.

(b) Method "B." By lump sum price agreed to in writing by the OWNER and the CONTRACTOR before said extra work is commenced, subject to all other conditions of the contract.

Footing bells, constructed to the specified dimensions or to the altered dimensions as authorized by the OWNER, shall be paid for at the contract unit price bid per cubic yard for "bell footing."

Test holes, of the specified diameter, shall be paid for at the contract unit price bid per linear foot for "test hole."

Test bells, of the specified diameter, shall be paid for at the contract unit price for each "test bell."

The foregoing unit prices shall be full compensation for making all excavations; drilling all test holes and test bells; pumping, placing and removing any required casings; furnishing and placing all concrete and reinforcing steel; all backfilling; and furnishing all tools, labor, equipment, materials and incidentals necessary to complete the work. No extra payment shall be made for casings left in place.

702.9. PRECAST AND CAST-IN-PLACE CONCRETE UNITS

702.9.1. Description. This item shall govern the materials used and for constructing, furnishing and placing precast and cast-in-place concrete units at the locations shown and in accordance with the details shown on the plans. Unless otherwise shown on the plans, the CONTRACTOR shall have the option of furnishing cast-in-place, precast (formed) or precast (machine-made) concrete units.

702.9.2. General. Cast-in-place and precast (formed) concrete units shall conform to the requirements of Item 702.2. Concrete Structure Materials, Item 702.3. Mix Design and Mixing Concrete for Structures, Item 702.5. Constructing Concrete Structures, and ASTM Designations C857 Minimum Structural Design Loading for Underground Precast Concrete Utility Structures, and C858 Underground Precast Concrete Utility Structures, as applicable. Concrete units shall be of the various types shown on the plans and designated by letters or numbers to indicate the particular design of each. Each type shall be constructed in accordance with the details shown on the plans or approved by the OWNER, to the depth required by the profiles and schedules given.

702.9.3. Materials.

702.9.3.1. Concrete. Unless otherwise shown on the plans, concrete for cast-in-place and precast formed concrete units shall be Class A or Class PA (as specified by the OWNER) conforming to the requirements of Item 702.3. Mix Design and Mixing Concrete for Structures except that Class C or Class PC concrete (as specified by the OWNER) shall be required when a unit is used with monolithic pipe sewer construction.

Concrete for precast machine-made units shall meet the requirements of ASTM C76 Sections: Reinforced Concrete, Cement, Aggregate, Mixture and Concrete Test Requirements for Concrete and shall have a minimum 28-day compressive strength of 4,000-psi. Vibrating equipment used in making concrete test cylinders must be approved by the OWNER. Testing shall be conducted in accordance with Item 702.3.4.5. Tests.

702.9.3.2. Steel Reinforcement. Steel reinforcement shall conform to the requirements of Item 303.2.9. Steel Reinforcement and the details shown on the plans. A positive means of holding the steel cages in place throughout production of the concrete units shall be provided and shall be subject to approval of the OWNER. Welding of steel reinforcement will not be permitted unless specifically shown on the plan details and shall conform to the requirements of Item 703.3.7. Welding. The maximum variation in the position of the reinforcement shall be plus or minus 10-percent of the wall thickness or plus or minus ½-in., whichever is lesser. In no case, however, shall the cover over the reinforcement be less than shown on the plans.

702.9.4. Forms, Precast Machine-Made Concrete Units. Forms for precast machine-made concrete units shall be made of steel and shall comply with the requirements of Item 702.5.6. Forms.

The thickness of form metal shall be as required to maintain the true shape without warping or bulging. All bolt heads on the facing sides shall be countersunk. Clamps, pins or other connecting devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete. Metal forms which do not present a smooth surface or which line up improperly shall not be used. Metal shall be kept free from rust, grease or other foreign materials. Metal forms shall be welded except that these will not require lining unless specifically noted on the plan.

702.9.5. Casting Tolerances. Allowable casting tolerances for concrete units shall not vary more than plus or minus $^1/_4$-in. from the dimensions and configuration shown on the plans. Thickness in excess of that required shall not be cause for rejection, provided that such excess thickness does not interfere with proper jointing or operation as determined by the OWNER.

702.9.6. Marking. The following information shall be clearly marked on each section of precast unit prior to leaving the casting yard.

(1) The date of manufacture.
(2) The name or trademark of the manufacturer.

702.9.7. Storage and Shipment. Precast units shall be stored on level blocking in a manner acceptable to the OWNER. No loads shall be placed on them until design strength is reached. Shipment of acceptable units may be made when the 28-day strength requirements have been met.

702.9.8. Rejection. Precast units may be rejected for nonconformity with any part of these specifications and also for any of the following reasons:

(1) Fractures or cracks passing through the shell, except for a single end crack that does not exceed the depth of the joint.
(2) Surface defects indicating honeycombed or open texture.
(3) Damaged or misshapen ends, where such damage would prevent making a satisfactory joint.

All rejected units shall be so marked by the OWNER and shall be replaced by the CONTRACTOR with acceptable ones meeting the requirements herein. Rejected units shall be removed immediately from the site of work.

702.9.9. Repairs. Occasional imperfections in manufacture or accidental injury during handling may be repaired and will be acceptable if, in the opinion of the OWNER, the repairs are sound, properly finished and cured, and the repaired units conform to the requirements of this specification.

702.9.10. Construction Methods. All excavation shall be in accordance with the requirements of Item 701.2. Structural Removal, Excavation, and Backfill or with excavation in Item 203. Site Preparation.

Precast concrete units shall be bedded on foundations of firm and stable material accurately shaped to conform to their bases.

The CONTRACTOR shall provide adequate means to lift and place the concrete units. Lifting holes may be formed during production, or punched through the fresh concrete immediately after stripping forms; however, care shall be taken not to damage the unit by spalling large areas. All lifting holes shall be repaired in accordance with Item 702.9.9. Repairs.

Connections to new or existing structures shall be made in accordance with details shown on the plans. Jointing material shall be in accordance with Item 501.6. Reinforced Concrete Culvert, Storm Drain, Pipe and Box Section, or as specified in the plans.

Frames, grates, rings and covers, when required by the plans for use in a concrete unit, shall be installed in accordance with Item 806. Metal Materials or Item 502. Appurtenances, as applicable.

702.9.11. Measurement and Payment. Precast and cast-in-place units of each size and type, satisfactorily complete in accordance with the plans and specifications, will be measured by each concrete unit completed to the stage of construction required by the plans.

Excavations and backfill, unless otherwise noted on the plans, will be measured as required by Item 701.2. Structural Removal, Excavation, and Backfill with excavation in Item 203. Site Preparation, or Item 504. Open Cut – Backfill, as appropriate.

Payment for precast concrete units of the types shown on the plans, complete, in place, and in accordance with this specification as measured above, shall be made at the unit bid price for each type

specified. Unless otherwise provided for in the proposal, payment for work performed under this specification shall be full compensation for furnishing, transporting, and placing all concrete, steel reinforcement, brick, mortar, castings for shaping of bed, jointing to new or existing structures, and all other materials, tools, equipment, labor, and incidentals necessary to perform the work prescribed above.

Excavation and backfill, unless otherwise provided in the proposals, shall be paid for as appropriate under Item 701.2. Structural Removal, Excavation, and Backfill with excavation in Item 203. Site Preparation, or Item 504. Open Cut – Backfill.

ITEM 703. STEEL STRUCTURES

703.1. DESCRIPTION

This specification shall govern the fabrication and erection of structural steel and other metals (except reinforcing steel), which are used for steel structures or steel portions of structures.

703.2. MATERIALS FOR STEEL STRUCTURES

The metal used for the various portions of the structure shall be as specified and shall conform to the requirements of Item 806. Metal Materials.

703.3. STEEL STRUCTURE CONSTRUCTION

703.3.1. General.

703.3.1.1. Shop Drawings. Unless otherwise provided on the plans, the CONTRACTOR shall prepare and submit detailed shop drawings for each detail of the general plans requiring the use of structural steel, forgings, wrought iron, castings or bearings. Camber and erection diagrams shall be required. The drawings shall be prepared on standard 24-in. by 36-in. sheets or on mutually agreeable standard sheet sizes, such as, 11-in. by 17-in. sheets.

All shop drawings shall be checked by the fabricator before being submitted for approval by the OWNER. The CONTRACTOR shall furnish to the OWNER as many prints of the drawings as are necessary for carrying out the work. At the request of the OWNER, shop drawings may be submitted electronically in lieu of printed copies, or a combination of printed and electronic copies.

The CONTRACTOR shall be responsible for the correctness and completeness of the drawings and for shop-fit and field connections, even though the drawings have been approved by the OWNER.

When required by the plans or specifications, the CONTRACTOR shall furnish to the OWNER, before formal acceptance of the work, detailed drawings of the structure as built. Inasmuch as the drawings shall be retained by the OWNER as permanent records, they must be in the form of printable transparencies of a quality satisfactory to the OWNER.

703.3.1.2. Methods and Equipment. Before starting work the CONTRACTOR shall inform the OWNER fully as to the method of erection it proposes to follow and as to the amount and character of the equipment it proposes to use, the adequacy of which shall be subject to the approval of the OWNER. The approval of the OWNER shall not be considered as relieving the CONTRACTOR of the responsibility for the safety or adequacy of its methods or equipment or from carrying out the work in full accordance with the plans and specifications. No work shall be done without the sanction of the OWNER.

The CONTRACTOR shall prepare and submit erection plans for the erection of all steel structures. The plans shall be completed in all details of procedure, sequence of work, equipment to be used, etc., and submitted to the OWNER for review.

703.3.1.3. Notice of Beginning Work. The CONTRACTOR shall give the OWNER ample notice of the beginning of work in the shop so that inspection may be provided. No work shall be performed in the shop before the OWNER has authorized fabrication. Any purchases of material prior to fabrication authorization shall be at the CONTRACTOR'S risk.

703.3.1.4. Inspection. An inspector or other authorized representative of the OWNER may examine the metals and metal items to be fabricated in the shop and may exercise constant surveillance over the work during the progress, with full power to reject all materials or workmanship not conforming to the plans and specifications.

The CONTRACTOR shall give the OWNER 5-days minimum advance notice before commencement of the fabricating operations to permit ample time for the inspection of the materials.

The OWNER shall be furnished complete copies of mill reports prior to commencing fabrication. The CONTRACTOR shall furnish ample means and assistance for sampling all materials. Arrangements shall be made for the OWNER to have free access at all times to any portion of the workshops where work is being done under these specifications.

No fabricating, machining, cutting, welding, assembling, or painting shall be done except with the knowledge of the OWNER. Any work done otherwise shall be subject to rejection.

The acceptance of any material or finished member by the OWNER shall not be a bar to subsequent rejection if it is later found to be defective. Rejected material and workmanship shall be promptly repaired or replaced by the CONTRACTOR.

Samples of materials, except castings, shall be cut from stock designated by the OWNER or shall be selected from items furnished. Gray iron, steel, and bronze castings shall be cast with test coupons.

Payment for structural steel shall not be made until shipping invoices indicating total weight of material used have been received and checked by the OWNER.

703.3.1.5. Workmanship. Workmanship and finish shall be equal to the best general practice in modern steel fabricating shops.

Rolling tolerances for rolled shapes, plates, and bars shall conform to the requirements of ASTM A6 General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.

Before being laid out or worked, rolled material shall be straight. If straightening is necessary, it shall be done by methods approved by the OWNER. Kinks and bends in the material shall be cause for rejection. Heat shrinking of low alloy structural steels shall not be permitted.

If straightening is necessary in the field, only methods approved by the OWNER shall be used.

Following the straightening of a bend or buckle, the surface of the metal shall be carefully inspected for evidence of fracture.

Portions of the work exposed to view shall be finished neatly. Shearing, flame cutting, and chipping shall be done carefully and accurately.

Undercut gusset plates shall not be accepted. All sharp corners and edges, and edges that are marred, cut, or roughened in handling or erection, shall be slightly rounded by grinding or other suitable means.

703.3.2. Bolted Structures/Bolted Connections. High strength bolts conforming to Item 806.6. Bolts, Nuts and Washers shall be used. Pitch and edge distance not shown on the plans shall be in accordance with AASHTO Load and Resistant Factor Design (LRFD) Bridge Design Specifications.

Spot welding for the purpose of eliminating field erection bolts or for holding steel parts together shall not be permitted. The CONTRACTOR shall provide the false-work and all tools, machinery and appliances, including drift pins and fitting-up bolts necessary for the expeditious handling of the work. Drift pins sufficient to fill at least one-quarter (¼) of the field holes for main connections shall be provided.

703.3.2.1. Holes for Bolts. Holes shall be either punched full size, punched and reamed, or drilled. The finished hole shall be $^{1}/_{16}$-in. larger than the nominal diameter of the bolt.

The accuracy of the punching shall be such that for any group of holes when assembled, 75-percent shall admit a rod equal to the diameter of the bolt at right angles to the plane of the connection. Otherwise, the holes shall be reamed. When the extent of the reaming is such that the holes cannot be properly filled or accurately adjusted after reaming, the faulty member shall be discarded and replaced at no cost to the OWNER.

Mispunched members shall not be corrected by welding without the approval of the OWNER.

Holes punched full size shall have all burrs and sharp edges removed. The diameter of the die shall not exceed that of the punch by more than $^{3}/_{32}$-in. Holes shall be as follows:

703.3.2.1.1. Sub-Punched or Sub-Drilled Holes. Holes for bolts shall be sub-punched or sub-drilled at the fabricator's option, ¼-in. less in diameter than that of the finished holes and shall be reamed to size with the parts assembled, with the following exceptions:

(1) holes in material thicker than ⅞-in. shall not be punched; however, at the fabricator's option, they may be sub-drilled to the diameter specified for sub-punching or may be drilled full size with the parts assembled, provided that the parts are adequately bolted or clamped together.

(2) holes in rolled beams and plate girders, including stiffeners and active fillers at bearing points, may be sub-punched ⅛-in. less in diameter than that of the finished holes, and reamed to size (after assembly) in material not thicker than the nominal diameter of the bolt less ⅛-in.

703.3.2.1.2. Holes for Bolts Which Do Not Transfer Stress. Holes in material not more than ⅞-in. thick for bolts which do not transfer stress caused by external vertical loading may be punched full size or, at the fabricator's option, may be sub-punched ⅛-in. less in diameter than the finished holes

and reamed to size after assembly. This applies to holes for lateral, longitudinal or sway bracing and connecting material, lacing stay plates, diaphragms which do not transfer shear or stress, inactive fillers and stiffeners not at bearing points. However, holes through assembled material shall not pass through both reamed plies and plies punched full size unless the reamed holes have been sub-punched for the fabricator's convenience, or the assembled material is not over 5 plies thick, of which the main material consists of not more than 3 plies.

703.3.2.1.3. Holes for Field Bolts. Holes for field bolts shall be sub-punched or sub-drilled at the fabricator's option, ¼-in. less in diameter than that of the finished holes and shall be reamed to size through steel templates with hardened steel bushings, with the following exceptions:

(1) field splices in plate girders and in the chords of trusses shall be reamed with the members assembled. Other field connections may be reamed with the members assembled, at the fabricator's option. Chord splices or truss members shall, in all cases, be reamed or drilled with at least 3 abutting sections assembled and with milled ends of compression chords in full bearing.

(2) assemblies, such as floor systems to girders, complete trusses, rolled beam spans connected by diaphragms and portals to trusses shall be reamed with the members assembled if so indicated on the plans, or otherwise at the fabricator's option.

(3) field connections of lateral, longitudinal or sway bracing shall conform to the requirements of holes for shop bolts.

(4) holes in material thicker than ⅞-in. shall not be punched but shall be sub-drilled to the diameter specified for sub-punching or drilled full size with parts assembled.

703.3.2.2. Reamed Work. Reaming work shall be done after the pieces forming a built-up member are assembled and so firmly bolted together that the surfaces are in close contact. Burrs and sharp edges of each reamed hole under both bolts shall be removed with a counter-sinking tool making $^1/_{16}$-in. fillets. The pieces shall be taken apart before bolting, if necessary, and any shavings removed. If it is necessary to take the members apart for shipping or handling, the pieces reamed together shall be so marked that they may be reassembled in the same position. Reamed parts shall not be interchanged.

703.3.3. Assembling Steel. Steel parts shall be assembled in the shop or in the field in accordance with the following specifications.

703.3.3.1. Shop Work. At the time of assembling, bolting or welding steel surfaces in contact for shop or field connection shall be thoroughly cleaned of rust, loose mill scale, dirt, grease or other material foreign to the steel. No paint shall be applied to contact surfaces prior to bolting or welding.

Bolted trusses, continuous plate girder and rolled shapes, skew portals, skew connections, rigid frames, bents and towers shall be completely assembled in the shop and accurately adjusted to line and camber and holes for field connections and shall be drilled or reamed while assembled. Holes for other field connections, except those in lateral, longitudinal and sway bracing, shall be drilled or reamed in the shop with the connecting parts assembled, or drilled or reamed to a metal template with hardened bushings, without assembling.

Long span truss work shall be assembled in lengths of not less than 3 abutting panels, the members adjusted for line and camber, and holes for field connections drilled or reamed while assembled. Field bolted joints for welded girders shall be completely assembled with the members adjusted for line and camber and prepared to fit for welding. All machinery shall be completely assembled. All bearings shall be fitted to the specified clearances and alignment. Gear reductions and all line gear shall have gear center distance set and the gears properly match-marked.

703.3.3.2. Field Work. The parts shall be accurately assembled as shown on the plans and all match-marks shall be followed. The material shall be carefully handled so that no part shall be bent, broken or otherwise damaged. Hammering which shall injure or distort the members shall not be permitted. Bearing surfaces and surfaces to be in permanent contact shall be cleaned before the members are assembled. Unless erected by the cantilever method, truss spans shall be erected on blocking so placed as to give the trusses proper camber. The blocking shall be left in place until the tension chord splices are fully bolted and all other truss connections pinned and bolted. Bolts in splices of butt joints

of compression members and bolts in railing shall not be driven or torqued until the span has been erected in place, temporarily bolted and the member is supporting its own weight. Splices and field connections shall have one-half (½) of the holes filled with bolts and cylindrical erection pins (half bolts and half pins) before bolting.

Splices and connections carrying traffic during erection shall have three-quarters (¾) of the holes so filled.

Fitting-up bolts shall be of the same nominal diameter as the bolts, and cylindrical erection pins shall be 1/32-in. larger.

The drifting done during assembling shall be only such as to bring the parts into position and not sufficient to enlarge the holes or distort the metal. If any holes must be enlarged to admit the bolts, they shall be reamed.

Connecting parts assembled in the shop for the purpose of reaming holes in field connections shall be match-marked, and a diagram showing such marks shall be furnished to the OWNER.

703.3.4. Joints and Connections.

703.3.4.1. Edge Planing. Sheared edges of plates more than ⅝-in. in thickness and carrying calculated stress shall be planed to a depth of ¼-in.

703.3.4.2. Facing of Bearing Surfaces. Surfaces of bearing and base plates and other metal bearing surfaces that are to come in contact with each other, with ground concrete surfaces or with sheet packing, shall be finish-machined flat to within 1/32-in. tolerance in 12-in. and to within 1/16-in. tolerance overall. Surfaces of bearing and base plates and other metal bearing surfaces that are to come in contact with preformed fabric pads, elastomeric and elastic bearing pads, or Portland cement grout, shall be finished machine flat to within ⅛-in. tolerance in 12-in. and to within 3/16-in. tolerance overall.

At the option of the CONTRACTOR, steel slabs, where not in contact with other metal bearing surfaces, may be heat straightened in lieu of machining, provided the above tolerances are met.

703.3.4.3. Abutting Joints. When shown on the plans, abutting joints shall be faced and brought to an even bearing. Where joints are not faced, the opening shall not exceed ¼-in.

703.3.4.4. End Connection Angles. Floor beams, stringers and girders having end connection angles shall be built to exact length back-to-back of connection angles. If end connections are faced, the finished thickness of the angle shall be not less than that shown on the detail drawings.

703.3.4.5. Web Plates. In girders having no cover plates and which are not to be encased in concrete, the top edge of the web plate shall not extend above the backs of the flange angles and shall not be more than ⅛-in. below at any point.

703.3.4.6. Fit of Stiffeners. End stiffener angles of girders and stiffener angles intended as supports for concentrated loads shall be milled or ground to secure an even bearing against the flange angles. All fillers under stiffener angles shall be sufficiently tight to exclude water after being painted.

703.3.4.7. Pin and Bolted Connections. Pilot and driving nuts shall be used in driving pins. Pins shall be so driven that the members shall take full bearing on them. In field assembling, the pin nuts on pin connections and the bolts on bolted connections shall be screwed up tight and the threads, except when high-strength bolts are used, burred at the face of the nuts with a pointed tool.

703.3.4.8. Pins and Rollers. Pins and rollers shall be accurately turned to the dimensions shown on the drawings and shall be straight, smooth and free from flaws. The final surface shall be produced by a finishing cut.

Pins and rollers more than 7-in. in diameter shall be forged and annealed.

In pins larger than 9-in. in diameter, the forging shall be permitted to cool to a temperature below the critical range cooling, and a hole not less than 2-in. in diameter shall be bored full length along the axis of the pin before being annealed.

Pinholes in structural members shall be bored true to the specified diameter, smooth and straight, at right angles with the axis of the member and parallel with each other unless otherwise required. The final surface shall be produced by a finishing cut.

The distance outside-to-outside of holes in tension members and inside-to-inside of holes in compression shall not vary from that specified more than $^{1}/_{32}$-in. Holes in built up members shall be bored after bolting or welding is completed.The diameter of the pinhole shall not exceed that of the pin by more than $^{1}/_{50}$-in. for pins 5-in. or less in diameter, or $^{1}/_{32}$-in. for larger pins.

703.3.4.9. Screw Threads. Screw threads shall make close fits in the nuts and conform to ASME B1.1-1989 Unified Inch Screw Threads (UN and UNR Thread Form).

703.3.5. Bearings and Anchorage. Anchor bolts shall be either headed bolts, installed with or without pipe sleeves, or swedge bolts installed in drilled holes, as detailed on the plans. The anchor bolts shall be carefully installed to permit true positioning of the bearing assemblies.

When anchor bolts are installed in pipe sleeves, the pipes shall be completely filled with grout at the time the grout pads are constructed or at the time the bearing assemblies on masonry plates are placed.

Swedge bolts installed in holes shall be either sulfured-in or grouted-in as shown on the plans.

All bearing assemblies shall be set level and to the elevations shown on the plans. Adjustments in the horizontal positions of bearing assemblies shall be made for temperature as directed by the OWNER.

In conformance with the details shown on the plans, masonry plates and the bearing plates of bearing assemblies shall be set on ground concrete surfaces, or elastomeric bearings, per Item 303.2.15. Elastomeric Materials.

Immediately before setting bearing assemblies or masonry plates directly on ground concrete surfaces, the CONTRACTOR shall thoroughly clean the surfaces of the concrete and the metal to be in contact and shall apply a thick coating of approved paste to contact areas to provide full bedding of the metal in the approved paste.

703.3.6. Expansion and Rotation Assemblies. Before leaving the shop or foundry, the rockers or roller nests shall be completely assembled with the bearing plates for checking and approval by the OWNER.

703.3.7. Welding. All welding shall conform to the requirements of appropriate ANSI Standards, the requirements of these specifications. A welder must be qualified or certified per TxDOT Item 448. Structural Field Welding.

Inspection of welding made to control the quality of welds and workmanship shall be performed in accordance with the requirements of ANSI Standards. All welding shall be subject to radiographic and other non-destructive testing which shall be performed without charge to the CONTRACTOR, except that if a weld is shown to be defective, all costs involved in re-inspection shall be borne by the CONTRACTOR.

Weld metal shall be sound throughout except that very small gas pockets and small inclusions of oxide or slag may be permitted if well dispersed and if none exceeds $^{1}/_{16}$-in. in greatest dimension; and provided further that the sum of the greatest dimension of all such defects in any square-inch of weld does not exceed $^{3}/_{8}$-in.

All welding shall be performed in such a manner that the Brinnell hardness of the weld metal and heat-affected zone is within the limits in Table 703.3.7.(a) Brinnell Hardness Limits for Welded Structures.

Table 703.3.7.(a) Brinnell Hardness Limits for Welded Structures

Minimum	(Minimum specified tensile strength of parent metal/500) + 50
Maximum	(Maximum specified or tested tensile strength of parent metal/500) + 50

All welding of structural steel (ASTM Designations A36 Carbon Structural Steel, A242 High-Strength Low-Alloy Structural Steel and A808 High-Strength, Low-Alloy Carbon, Manganese, Columbium, Vanadium Steel of Structural Quality with Improved Notch Toughness) shall be performed by either the submerged or gas-shielded arc process or with low-hydrogen electrodes. Low-hydrogen electrodes for welding low-alloy steels shall conform to the requirements of the Federal Specifications for Electrodes (mineral covered, low hydrogen) for Welding Medium and High Tensile Steels, MIL-E-18038. All welding of low-alloy structural steel shall be qualified by procedure tests before fabrication is commenced.

Low-hydrogen electrodes shall be stored for holding in an approved low-hydrogen oven at a temperature of 300°F to 400°F to control the moisture in the coating on the electrode.

Low-hydrogen electrodes which have been removed from their moisture-proof containers shall be stored in an approved oven at a temperature of 300°F to 400°F after re-baking.

Areas contiguous to welding operations shall be preheated to a minimum temperature of 300°F when necessary to prevent distortion or weld cracking. Preheating to a temperature in excess of 400°F shall not be required.

Unless otherwise shown on the plans or specified, bearing assemblies that are to be machined after welding shall be stress relieved by heat treatment before machining, in accordance with AWS Specifications.

Portions of members in bearing assemblies or in direct bearing shall be straightened, planed or otherwise corrected after fabrication as necessary to provide full bearing on bearing assemblies or bearing areas on level bearing plates.

Where the end of a stiffener plate is shown "tight-fit" on the plans, the end of the plate shall be so fitted that it bears on the beam flange with at least point bearing. Local clearances between the end of the plate and flange shall not exceed $^1/_{16}$-in.

Unless otherwise shown on the plans or specified, erection bolts required for welded splices or welded connections may be left in place, and the ends of all such erections bolts which project beyond the nut shall be burned off flush with the face of the nut. Where the bolt does not project, the end of the bolt and nut shall be tack welded to prevent loosening of the nut. Burning off projecting bolt ends and tack welding shall be performed prior to painting.

703.3.8. False-Work. The false-work shall be properly designed for the loads to be supported and shall be constructed substantially and maintained. The CONTRACTOR shall prepare and submit plans for false-work to the OWNER for approval.

The false-work plans shall be complete in all details of members, connection equipment, etc. so that a structural check can be made of the false-work.

Approval of the CONTRACTOR'S plans shall not be considered as relieving the CONTRACTOR of any responsibility.

703.3.9. Grading Deck on Continuous Units. Forms shall not be erected or concrete placed until after all welding or bolting is complete, the unit positioned and bearing properly set.

An accurate measurement shall be made of the elevation of girder or beam flanges at all grading control points as shown on the plans. Subsequent grading of forms and placing and finishing of concrete shall be governed by these measurements only, taking into account the dead load deflection of the slab and rail as shown on the dead load deflection diagram.

703.3.10. Misfits. Corrections of minor misfits and a reasonable amount of reaming and cutting of excess stock shall be considered a legitimate part of the operations. Any error in shop work which prevents the proper assembling and fitting-up of parts by the moderate use of drift pins or a moderate amount of reaming and slight chipping or cutting shall be reported immediately to the OWNER. OWNER approval of the method of correction shall be obtained. The correction shall be made in the presence of the OWNER, who shall check the material. Such work is to be done at the entire expense of the CONTRACTOR.

703.4. PAINTING METAL STRUCTURES

The application of shop paint shall conform to the requirements of Item 804. Painting and Other Protective Treatments; Pavement Marking. Unless otherwise provided, the application of field paints shall conform to the requirements of Item 804. Painting and Other Protective Treatments; Pavement Marking.

For structures that require that the steel be erected and assembled on false-work and moved into place as a unit, all field paint, except the final coat, shall be applied to the steel while on the false-work and prior to moving into final position. Those surfaces which are inaccessible for painting in the final position shall have the final paint coat applied prior to move-in. Touch-up of paint which is damaged due to move-in to final position shall be done, and the final field coat applied.

703.5. MEASUREMENT AND PAYMENT

Measurement and payment for quantities of structural metal, concrete, reinforcement, railing and other proposal items which constitute the completed and accepted structures shall be made in accordance with the provisions of pertinent specifications.

Payment for structural steel shall not be made until shipping invoices indicating total weight of material used have been received and checked by the OWNER.

ITEM 704. PILING

704.1. PILING MATERIALS

704.1.1. Steel Piling. Steel H and steel sheet piling shall conform to all provisions of TxDOT Item 407. Steel Piling.

704.1.2. Concrete Piling. Concrete piling shall be designed by the Engineer. Piling shall be cast-in-place and prestressed. Cast-in-place, prestressed concrete piling shall conform to TxDOT Item 409. Prestressed Concrete Piling and TxDOT Items referenced therein.

704.1.3. Rejection. Any piling not conforming to these specifications and applicable provisions of other sections shall be rejected. Any defect causing it to be unsuitable for its intended use shall be cause for rejection of the piling.

704.2. DRIVING PILING

704.2.1. Description. This specification shall govern the equipment to be furnished in order to perform the methods to be followed in the driving of piling.

The requirements herein are minimum. Strict compliance with these minimum requirements shall not relieve the CONTRACTOR of the responsibility for adopting whatever additional provisions may be necessary to insure the successful completion of the work.

704.2.2. General. Unless otherwise shown on the plans, the embankment at bridge ends shall be made to grade and thoroughly compacted as provided in the governing specifications prior to the driving of abutment piling. Foundation piling shall not be driven until after the excavation is approximately complete.
All piling raised during the process of driving adjacent piling shall be driven again. Broken, split or misplaced piling shall be withdrawn and properly replaced or corrected as directed by the OWNER based on design analysis.

704.2.3. Tolerance for Driving. Piling shall be driven to the vertical or batter line indicated. The allowable variation from the plan alignment shall not exceed 4-in. in any direction. If the center of gravity of a pile group varies by more than 3-in. from the center of gravity determined from plan location, a structural analysis shall be required to see if the group shall be acceptable.

The minimum concrete cover for piling in footings shall be 5-in., and the pile shall be in such position to permit proper placement and cover of reinforcing steel.

704.2.4. Protection of Pile Heads. A structural steel driving head suitable for the type and size of pile being driven shall be used. Wood cushion blocks shall be used as necessary to prevent damage to the pile. Rope mat, belting or similar cushioning material may be used in addition to wood cushion blocks. Cushion blocks shall be changed as necessary to prevent damage to the pile.

704.2.5. Driving Equipment. The driving of piling shall be done with power hammers (steam or diesel). When specified on the plans, gravity hammers shall be permitted. Either steam or compressed air may be used as the operation medium for steam hammers.

Steam hammers shall be furnished with boiler or air compressor capacity at least equal to that specified by the manufacturers of the hammers to be used. The boiler or compressor shall be equipped with an accurate pressure gauge at all times.

Diesel hammers which have an enclosed ram shall be equipped with a gauge and charts which shall evaluate the equivalent energy actually being produced under any driving condition.

The valve mechanism and other parts of all power hammers shall be maintained in first-class condition so that the length of stroke and number of blows per minute for which the hammer is designed shall be obtained.

Power hammers shall be operated at not less than 80-percent of the manufacturer's rated capacity.

The driving equipment for steel sheet piling shall be of such size as required to drive the piling to the required depths with no damage to the piling. The equipment shall be equipped with a head suitable to the shape of the sheet pile.

When gravity (drop) hammers are used, the height of drop shall be regulated to avoid injury to the piling and in no case shall exceed the maximum drop shown in Table 704.2.5.(a) Size of Driving Equipment. The CONTRACTOR shall furnish the OWNER with a certified scale weight of the hammer to be used.

When rating diesel hammers for energy to determine compliance with the requirements of the table below, the height of fall of the ram of the single-acting (open end) hammer shall be 7-ft.

Table 704.2.5.(a) Size of Driving Equipment

Piling Type	Hammer Type		Minimum Hammer Energy (Foot - Pounds)	Weight of Ram lb.		Maximum Ram Stroke, ft.
				Min.	Max.	
Steel H or Steel Sheet	Gravity		250 x R[note 1] or 2.5 x Wp[note 2] (whichever is larger)	2000	5000	10
	Power	Steam, Air, Hydraulic		3000		5
		Diesel		2000		10

1. R = Design load in tons.
2. Wp = Weight of piling in pounds based on plan length.

Where test piling or test loads are required, the hammer used in driving all other piling shall be of the same type and size as the hammer used in driving the test piling.

Pile drivers shall be equipped with heads which are constructed in such manner as to afford freedom of movement of the hammer and which provide adequate support to the pile during driving. The vertical axis of the leads and hammer shall coincide with the vertical axis of the pile.

Except where piling is driven through water, the leads shall be of sufficient length that a follower shall not be necessary. Where a follower is required for the driving of piling under water, one piling out of every 10 shall be of sufficient length that a follower is not required. This piling shall be driven as a test piling for proper correlation of the follower-driven piling in the group.

704.3. PENETRATION

The length of piling shown on the plans is the length estimated to give the required bearing and is for estimating purposes only.

Piling shall be driven to the "minimum penetration" shown on the plans and to such greater depths required to obtain the specified bearing resistance. Where the plans indicate a "required penetration" into a particular stratum, this penetration into the strata shall be required although the strata may be found at a higher or lower elevation than is indicated on the plans.

Where no specific information is shown on the plans as to penetration and where test piling is not required, the pile lengths shown shall be considered as the "plan penetration" and shall be driven to this approximate elevation and to such greater depths required to obtain the specified bearing resistance.

When the specified penetration cannot be obtained without over-driving of the piling, pilot holes or jetting may be required.

704.4. BEARING RESISTANCE

The bearing resistance of all piling shall be determined by the following formulas:

For gravity hammers:

$$p = \frac{2WH}{S + 1.0}$$

When the energy delivered (W x H) by the gravity hammer is 24,000-foot-pounds or greater, and the penetration does not exceed 1/4-in. per blow for the last 40 blows delivered (without increasing), the bearing resistance shall be determined by:

$$p = \frac{2WH}{3S} \times N$$

For single-acting hammers:

$$p = \frac{2WH}{S + 0.1}$$

For double-acting hammers:

$$p = \frac{2E}{S + 0.1}$$

where p = bearing resistance in pounds
S = average penetration in inches per blow for the last 20 blows (40 blows for special formula for gravity hammer)
W = weight of ram in pounds
H = height of fall of ram in feet
N = ratio of weight of ram to the weight of the pile. N shall not be used when greater than 1
E = manufacturer's rated energy in foot-pounds
(double-acting steam hammers)
E = the equivalent energy in foot - pounds, determined by gauge attached to the hammer taken during the period when the average penetration in inches per blow is determined. Maximum E allowed for the double-acting (enclosed ram) hammer shall be manufacturer's rated energy in foot - pounds
(enclosed ram diesel hammer.)

704.5. CONSTRUCTING CAST-IN-PLACE, PRESTRESSED CONCRETE PILING

Cast-in-place concrete piling shall be of the concrete class specified on the plans. Piling construction shall conform to TxDOT Item 409. Prestressed Concrete Piling and TxDOT Items referenced therein, unless otherwise specified by the OWNER.

704.6. MEASUREMENT AND PAYMENT

704.6.1. Measurement. Items specified in this section to be paid for as separate contract pay items shall be measured for payment as indicated in the following:

704.6.1.1. Steel Piling. Steel H Piling shall be measured for payment in linear feet of acceptable piling in place after all cut-offs and build-ups have been made. For that piling specified to be driven to a "minimum penetration," no measurement shall be made on that portion of piling below the elevation at which the penetration and bearing requirements were first obtained.

Steel sheet piling shall be measured for payment by the square foot of acceptable piling in place. Sheet piling driven below the elevation required by the plans or as directed by the OWNER shall not be measured for payment.

704.6.1.2. Concrete Piling. Cast-in-place prestressed concrete structures and units shall be measured as follows:

Prestressed concrete piling and prestressed concrete test piling will be measured for payment by the linear foot of acceptable piling in place after all cutoffs and buildups have been made. When the Contractor elects to drive piling deeper than required to meet the specified length and bearing requirements, no measurement will be made on that portion below the elevation at which length and bearing requirements were first obtained.

704.6.2. Payment. All items specified in this section shall be paid for as indicated below. The work performed and material furnished as prescribed herein, measured as provided under Measurement, shall be paid for at the contract unit price.

704.6.2.1. Steel Piling. Steel H piling shall be paid for at the contract unit price per linear foot for "steel H piling" or "steel H test piling," as the case may be, of the specified size and weight. Steel sheet piling shall be paid for at the contract unit price per square foot for "sheet piling" of the specified weight and size required. No direct payment shall be made for cut-offs, pile heads, concrete collars, painting or for excavation and backfill required in placing the collars and in the painting or for excavation and backfill required in placing the collars and in the painting of portions of piling below ground line; such items shall be considered as incidental work, and the cost thereof shall be included in such contract pay items as are provided in the proposal and contract.

Splices for steel H piling shall be paid for each at two times the contract unit price for steel H piling of the size and weight on which the splice is made, except that no payment shall be made for any splice on any pile whose actual length left in place after all cut-offs, splices or build-ups have been made is not greater than the length shown on the plans or directed by the OWNER; nor shall payment be made for more than one splice on any one pile.

No payment shall be made for cut-off or build-up of sheet piling. The foregoing unit prices shall be full compensation for furnishing all materials, tools, labor, equipment, jetting, pilot holes, alignment holes and incidentals necessary to complete the work.

704.6.2.2. Concrete Piling. Payment for the work and all materials for prestressing of cast-in-place members as specified above shall be paid for at the unit price bid for "prestressed concrete piling" or "prestressed concrete test piling" of the size specified.

The preceding payment shall be full compensation for furnishing all prestressing steel, all materials, fabrication, transportation, erection, prestressing and for furnishing all metal encasing ducts, grout fittings, anchorage bearing plates and all tools, labor and incidentals necessary to complete the work unless otherwise specified by the OWNER.

DIVISION 800 MISCELLANEOUS CONSTRUCTION & MATERIALS

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ITEM 801. BARRIERS, WARNINGS AND DETOUR SIGNS, AND FENCES

801.1. BARRIERS AND WARNING AND DETOUR SIGNS

801.1.1. Description. This item shall consist of the basic requirements which the CONTRACTOR must comply with in order to assure the safety of the public, the OWNER and the CONTRACTOR'S employees. The type and location of signs and barriers shall be provided as required in Item 107.19. Public Convenience and Safety and Item 107.20. Protection Work and of Persons and Property. Additional signs and/or barriers shall be erected if so directed by the OWNER in writing.

801.1.2. General. The amount of street space taken up by construction and maintenance work should be not more than is absolutely necessary, though this does not justify any failure to use such signs, warning devices and channelization as may be required in the roadway for public protection and guidance. The CONTRACTOR shall be held responsible for all damage to the work due to failure of barricades, signs, lights and watchmen to protect it. Whenever evidence is found of such damage, the OWNER may order the damaged portion immediately removed and replaced by the CONTRACTOR at its cost and expense. The CONTRACTOR'S responsibility for the maintenance of barricades, signs and lights and for providing watchmen shall not cease until the project is finally accepted by the OWNER.

801.1.3. Payment. The furnishing, placing and maintaining of barriers, warning devices, detour devices, lights, signs, or other precautionary measures required by law or by the OWNER for the protection of persons or property shall be paid for at the contract unit price for the time they are maintained by the CONTRACTOR until the project is finally accepted by the OWNER.

801.2. METAL BEAM GUARD FENCE

Metal beam guard fence shall conform to TxDOT Item 540. Metal Beam Guard Fence and current version of TxDOT CAD Standard Drawing Metal Beam Guard Fence (MBGF).

801.3. RAILING

801.3.1. Description. This item shall govern for the construction of steel, aluminum, cast iron or pipe railing, including necessary anchorages on bridges, walls or incidental structures as designated on the plans. For concrete railing, refer to TxDOT Item 450.3. Construction, Section B. Concrete Railing.

801.3.2. Materials. All materials shall conform to the requirements of Item 806. Metal Materials.

Railing materials shall be stored above the ground on platforms, skids or other supports. The materials shall be kept free from grease, dirt and contact with dissimilar metals. Care shall be taken at all times to avoid scratching, marring, denting, discoloring or otherwise damaging the railing. Unpacking and storing of rail members, upon arrival at the job site, shall be in accordance with manufacturer's recommendations.

801.3.3. Construction Methods. Railing shall be of size and type shown on the plans and constructed in accordance with details shown on the plans and in conformance with the requirements herein. It shall be constructed to the alignment, grade and camber as designated on the plans. Shop fabricated railing shall be of such uniformity as to insure good joints and continuous lines after erection. Any appreciable amount of cutting, bending or filling required on erection to produce a reasonable fit shall be cause for rejection of the rail. Unless otherwise shown on the plans, rail posts shall be erected plumb, with the top rails parallel to the roadway grade indicated on the plans or to the surface of the structure on which the rail is mounted. The fabrication and erection of metal for railing shall conform to the pertinent provisions of Item 703.3. Steel Structure Construction, and to the requirements of this specification.

Shop drawings shall be prepared and forwarded for approval in accordance with the requirements of Item 703.3. Steel Structure Construction. Splicing of members shall be permitted only as provided by the contract plans.

Splices shall be at rail posts only. All splice locations and details shall be shown on the shop drawings.

The vertical members of the railing may be placed in the correct position and alignment at the time of placing the concrete, or oversize sleeves may be embedded in the proper location and position for subsequent installation of the railing in the sleeves. If sleeves are used, the railing shall be placed in the sleeves and set with molten sulfur compound.

Unless otherwise indicated, aluminum members shall be separated from concrete or steel by a bearing pad conforming to the requirements for preformed rubber fabric pads as described in Item 703.3. Steel Structure Construction. The material shall be ⅛-in. in thickness, unless otherwise specified. All welding shall conform with the recommendations of the American Welding Society. Welding of aluminum material shall be done by an inert gas shielded electric arc welding process in which no flux is used. Torch or flame cutting of aluminum shall not be permitted.

After erection, the railing shall be painted with one prime coat of the type of paint specified on the plans and two field coats of aluminum paint conforming to the requirements of Item 804.2. Painting and Marking. Aluminum railings shall not require field painting. Prior to acceptance, all extrusion marks, grease, dirt and grime shall be cleaned from aluminum railing.

Steel railing shall be given a top coat of the type of paint specified on the plans. This coating shall be of sufficient quality and coverage to protect the metal from corrosion. After erection, the railing shall be cleaned, spot painted and painted in accordance with Item 804.2. Painting and Marking.

If galvanized rail is used, all parts of the rail on which the galvanizing has become scratched, chipped or otherwise damaged shall be thoroughly cleaned painted according to the requirements of Item 804.3.5. Repair of Damaged Zinc Coating. No compensation shall be made for repairing damaged coatings.

Unless otherwise provided, railing shall not be placed until after the false-work for the span has been released. During the construction of railing, care shall be exercised to insure proper functioning of expansion joints, if any.

801.3.4. Measurement and Payment. Railing shall be measured as the number of linear feet of satisfactorily completed railing. Payment shall be made at the contract price bid per linear foot for "railing," which price shall be full compensation for all pipe structural shapes, paint, labor, tools and equipment, and all incidentals necessary for completing the railing in conformity with the plans and these specifications.

801.4. CHAIN LINK FENCE

801.4.1. Description. This item shall consist of one line of chain link fabric supported on posts and constructed as prescribed by this specification at such places as shown on the plans or as designated by the OWNER. The fence overall height and the fabric height shall be as shown on the plans.

801.4.2. Materials. This item covers materials used to construct chain link fencing in accordance with the plans and any typical details which may be shown on the plans. All fence materials furnished shall be in accordance with these specifications, unless otherwise shown on the plans. Failure to meet any of the specifications contained in this section or on the plans shall be cause for rejection and materials shall be replaced at no cost to the OWNER.

801.4.2.1. Chain Link Fencing Fabric. The base metal of the fabric shall be a good commercial quality of steel wire. The wire shall be woven throughout in the form of approximately uniform square mesh, having parallel sides and horizontal and vertical diagonals of approximately uniform dimensions. The top and bottom of the fabric shall be knuckled or barbed as specified. The sizes of wire and mesh shall be as specified. The entire fabric shall be one of the following types:

(1) zinc coated in accordance with ASTM A392 Zinc-Coated Steel Chain-Link Fence Fabric and Item 804.3. Galvanizing;
(2) aluminum coated in accordance with ASTM A491 Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric; or
(3) PVC vinyl coated in accordance with ASTM F668 Standard Specification for Poly (Vinyl Chloride) (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric and colored in accordance with ASTM F934 Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.

801.4.2.2. Posts. Posts may be rolled, formed or tubular in cross section and shall be in accordance with ASTM F1043 Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework. All posts shall meet the weight and length requirements as shown on the plans.

801.4.2.3. Rails, Gates, Braces and Fittings. Rails, gates and braces may be rolled, formed or tubular in cross section and shall be in accordance with ASTM F1083 Standard Specification for Pipe, Steel,

Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures. Colored rails, gates, and braces shall be in accordance with ASTM F1043 Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework. Fittings and appurtenances shall be in accordance with ASTM F626 Standard Specification for Fence Fittings.

801.4.2.4. Concrete. Concrete footings shall be Class B or Class PB, as specified by the OWNER, in accordance with Item 702. Concrete Structures.

801.4.3. Construction Methods.

801.4.3.1. General. The chain link fence shall be constructed in accordance with the details on the plans and ASTM F567 Standard Practice for Installation of Chain-Link Fence, and as specified herein, with new materials unless specified otherwise. Chain Link Fence for Tennis Courts shall be constructed in accordance with ASTM F969 Standard Practice for Construction of Chain-Link Tennis Court Fence. Chain link fence for ballfeilds and other sports facilities shall be constructed in accordance with ASTM F2000 Standard Guide for Fences for Ballfields and Other Sports Facilities. All work shall be performed in a workmanlike manner satisfactory to the OWNER. Prior to the beginning of the work, the CONTRACTOR shall locate the position of the work by establishing and marking the line and grade for the fences according to the plans.

801.4.3.2. Clearing Fence Line. The site of the fence shall be sufficiently cleared of obstructions, and surface irregularities shall be graded so that the fence shall conform to the general contour of the ground. The fence line shall be cleared to a minimum width of 2-ft on each side of the centerline of the fence. This cleaning shall consist of the removal of all stumps, brush, rocks, trees or other obstructions which shall interfere with proper construction of the fence. Stumps within the cleared area of the fence line shall be grubbed or excavated.

The bottom of the fence shall be placed a uniform distance above the ground and as specified on the plans. When shown on the plans, or as directed by the OWNER, the existing fences which coincide with or are in a position to interfere with the new fence location shall be removed by the CONTRACTOR as a part of the construction work, unless such removal is listed as a separate item in the bid schedule. All holes remaining after post and stump removal shall be refilled with suitable soil, gravel or other material acceptable to the OWNER and shall be compacted properly with tampers. The work shall include the handling and disposal of all material cleared, excavated or removed, regardless of the type, character, composition or condition of such material encountered.

801.4.3.3. Installing Posts. All posts shall be spaced not more than 10-ft. apart and as shown on the plans. Terminal (end, corner, and pull) posts, gate posts and line posts shall be set in concrete footings of the diameter and depth as shown on the plans. The concrete footings for the posts shall be of sufficient depth to provide a minimum of 2-in. of concrete below the bottom of the posts. The top of the concrete footings shall be slightly above the ground and sloped to drain away from the posts. Holes of full depth and size for the concrete footings for posts shall be dug to the size and depth as shown on the plans. All post settings shall be made carefully so that all posts shall be vertical, in true alignment, centered in the footing, and rigidly secured in position. On terminal (end, corner, and pull) posts and gate posts, the post tops and brace rail clamps around the posts shall be placed before setting the posts in the concrete footings or at such a time that heavy clamps can be installed without spreading them to accommodate the post.

In setting the gate posts, great care must be taken to make sure that gate posts are set apart by the distance shown on the plans. A line drawn across from the top of one gate post to the other must be level regardless of the grade of the groundline. If the ground is not level, the upgrade posts shall be set first to get the proper height for the downgrade gate post. The concrete for post setting shall be allowed to cure for 3-days. Stretcher bar bands and truss bands shall be spread and slipped on end, corner, pull, brace and gate posts as the next operation. Post tops are then inserted on all other posts. Pull posts shall be placed not over 500 ft. apart in straight runs and at each vertical angle point, all as directed by the OWNER. Corner posts shall be placed at each horizontal angle point. Corner and pull posts shall have horizontal braces and truss rods as shown on the plans or as specified. Posts to be

placed in concrete structures shall be placed in previously embedded oversize pipe sleeves and then packed with sulfur compound.

801.4.3.4. Installing Fabric. The fabric shall be placed on the outward facing side of the posts and shall be installed so that the top edge projects over the top rail of the fence. The fabric shall be stretched taut and securely fastened to the post, the top rail and the bottom tension wire. The tension wire shall be installed parallel to the line of the fabric. The bottom of the fabric shall extend to within 2-in. of the natural ground or paved surface. However, over irregular ground, this distance may vary between 1-in. and 6-in. for a distance not to exceed 8-ft. High points of ground shall be excavated to clear the bottom of the fabric; depressions shall be filled and compacted to within 2-in. of the bottom fabric; both shall be considered as incidental work. In locations where chain link fence is installed as a guard or barrier in or on concrete structures such as retaining walls and headwalls, the fabric shall extend to within 6-in. above the concrete surface for structures.

The fabric shall be fastened to end, corner, slope and gate posts with high carbon steel tension bars and steel tension bar bands spaced at 16-in. intervals; and to line posts, top rail and tension wire with tie wires or metal bands. Tie wires or metal bands shall be placed on line posts at intervals of approximately 16-in. and top rail and tension wire at intervals of approximately 24-in.

801.4.3.5. Installing Gates. The widths of any gates to be installed shall be indicated on the plans or in the special provisions.

Gates with fabric 7-ft or more in height shall have a horizontal stiffener. Vertical stiffeners shall be installed at a maximum of 8-ft. centers. A ⅜-in. adjustable tension rod shall be installed on all gates over 4-ft. in width. The corners of gate frames shall be fastened together and reinforced with a fitting designed for the purpose or by welding. All welds shall be ground smooth.

Chain link fence fabric shall be attached to the gate frame by the use of tension bars and tie wires as specified and by suitable tension connectors spaced at approximately 16-in. intervals. The swing gates shall be hung up by at least two (2) steel or malleable iron hinges, so designed as to securely clamp to the gate post and permit the gate to be swung back 180° from the closed position. Gates shall be provided with a combination steel or malleable iron catch and locking attachment of approved design. Stops to hold gates open and a center rest with catch shall be provide where required.

801.4.3.6. Existing Fence Connections. Wherever the new fence joins an existing fence, either at a corner or at the intersection of straight fence lines, a corner post with a brace post shall be set at the junction and braced the same as for corner posts. If the connection is made at other than the corner of the new fence, the last span of the old fence shall contain a brace span.

801.4.3.7. Repair of Damaged Coating. On all galvanized parts where zinc coating has been omitted, chipped off or removed, the steel or iron left exposed shall be repaired. Damaged zinc coating shall be repaired by cleaning and coating according to the requirements of Item 804.3.5. Repair of Damaged Zinc Coating. No compensation shall be made for repairing damaged coatings.

801.4.4. Measurement and Payment. Chain link fence shall be measured in place from center to center of end posts or corner post and shall be the length of fence actually constructed, except the space occupied by the gates. Gates shall be measured in units for each gate installed and accepted.

Payment shall be made at the contract price per linear foot for chain or guard-link fences. This price shall be full compensation for furnishing all material; for all preparation, erection and installation of these materials; and for all labor, equipment, tools and incidentals necessary to complete the work.

Payment shall be made at the contract unit price per each for gates. This price shall be full compensation for furnishing all materials; for all preparation, erection and installation of these materials; and for all labor, equipment, tools and incidentals necessary to complete the work.

Gates measured as provided in this item shall be paid for at the unit price bid for "gate" of the type, height and opening shown on the plans, which price shall be full compensation for furnishing all materials; fabricating; all preparation, hauling, and erection; and for all labor tools, equipment and incidentals necessary for a complete in- place gate installation.

801.5. WIRE FENCE

801.5.1. Description. "Wire fence" shall consist of constructing fence supported on metal or wood posts in accordance with the details and at the locations shown on the plans. The fence shall consist of woven wire fence fabric with or without barbs as specified on the plans.

801.5.2. Materials. This item covers materials used to construct wire fencing in accordance with the plans and any typical details which may be shown on the plans. All materials furnished shall be in accordance with these specifications unless otherwise shown on the plans. Failure to meet all of the specifications contained in this section shall be cause for rejection and materials shall be replaced at no cost to the OWNER.

801.5.2.1. Wire Fencing Fabric. The base metal of the fabric shall be of a good commercial quality of steel or iron as specified. The wire shall be the height and design shown on the plans. The top and bottom wires shall be a minimum No. 10 AWS gauge, and the intermediate wires and vertical stays shall be No. 12½ AWS gauge. The entire fabric shall be zinc coated in accordance with ASTM A116 Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric and Item 804.3. Galvanizing.

801.5.2.2. Posts.

801.5.2.2.1. Metal. Metal posts may be rolled, formed or tubular in cross section and shall be in accordance with ASTM A702 Standard Specification for Steel Fence Posts and Assemblies, Hot Wrought. All posts shall meet the weight and length requirements as shown on the plans. All posts not galvanized shall be painted with an anti-corrosive paint approved by the OWNER.

801.5.2.2.2. Wood. Wood posts shall be the length and dimensions shown on the plans. The timbers shall be sound and free from all decay, shakes, splits, unsound or excessive knots or any other defects that might impair their strength or durability. Knots shall not exceed one-third of the small dimension or diameter of the post. A line drawn between the center of each end shall not fall outside the center of the post at any point more than by 2-in. Knots shall be trimmed flush and the ends cut square. Untreated posts may be cedar, redwood, cypress or live oak. Treated posts may be pine, spruce or fir. Posts shall be preservative treated according to American Wood-Preservers' Association (AWPA) Standards.

801.5.2.3. Rails, Gates, Braces and Fittings. Rails, gates, and braces may be rolled, formed or tubular in cross section and shall be in accordance with ASTM F669 Strength Requirements of Metal Posts and Rails for Industrial Chain Link Fence. Fittings and appurtenances shall be in accordance with ASTM F626 Fence Fittings. All rails, braces and fittings not galvanized shall be painted with an anti-corrosive paint approved by the OWNER.

801.5.2.4. Barbed Wire. Barbed wire shall be two strand twisted No. 12½ AWS gauge galvanized steel wire with two-point barbs of No. 14 AWS gauge galvanized steel wire and conforming to Class 1 ASTM A121 Metallic Coated Steel Barbed Wire.

801.5.3. Construction Methods. Fence posts shall be spaced at intervals as shown on the plans and set to a minimum depth of 2-ft for wood posts and 2½-ft. for metal posts. Posts shall be set in a vertical position. Corner and pull posts shall be braced in two (2) directions. End and gate posts shall be braced in one (1) direction. Where alignment changes 30° or more, a corner post shall be installed. At alignment angles varying from 15° to less than 30°, the angle post shall be braced to adjacent line posts by diagonal tension wires. Where steel posts are specified, a pull post assembly shall be installed at approximately 500-ft. intervals; where wooden posts are specified, the spacing of pull-post assemblies shall be approximately 1,000-ft. Metal line posts may be driven in place, provided such driving does not damage the posts. Metal corner, end, pull post and braces shall be set in portland cement concrete footings crowned at the top to shed water. All posts shall be placed the minimum depth below ground. Posts shall be set plumb and firm to the line shown on the plans. Backfill shall be thoroughly tamped in 4-in. layers. The timber post braces shall be notched.

The corner, end angle post assembly shall be installed before stretching the wire between the posts. At all grade depressions where stress tends to pull the posts out of the ground, the fencing shall be snubbed or guyed at the critical point by means of a double No. 9-gauge galvanized wire connected to each horizontal line of barbed wire or to the top and bottom wire or wire mesh fabric and to a deadman weighing not less

than 100-lb., buried in the ground. The fencing shall be stretched before being snubbed and guyed. Existing cross fences shall be connected to the new fences and corner posts with braces which shall be placed at junctions with existing fences. The barbed wire and wire fabric shall be drawn taut and fastened to posts with galvanized ties or staples.

801.5.4. Measurement and Payment. Fencing shall be measured by the linear foot of wire fence, measured at the bottom of the fabric along the centerline of the fence from center to center of end posts, excluding gates. Gates shall be measured per each gate, complete in place.

The work performed and material furnished as prescribed by this item, measured as provided in this item, shall be paid for at the unit price bid for "wire fence," which price shall each be full compensation for furnishing and installing all fencing materials (except gates); for all preparation, hauling and installing of same; and for all labor, tools, equipment and incidentals necessary to complete the work, including excavation, backfilling and disposal of surplus material.

Gates measured as provided in this item shall be paid for at the unit price bid for "gate" of the type, height and opening shown on the plans, which price shall be full compensation for furnishing all materials; fabricating; all preparation, hauling and erection; and for all labor, tools, equipment and incidentals necessary for a complete in place gate installation.

ITEM 802. STEPS AND RETAINING WALLS

802.1. CONCRETE STEPS

802.1.1. Description. This item shall govern the construction of reinforced concrete steps with or without buttress walls at the location(s) shown on the plans or as directed by the OWNER.

802.1.2. Materials. Material requirements shall be the same as those for Item 303. Portland Cement Concrete Pavement.

802.1.3. Construction Methods.

802.1.3.1. General. Concrete steps shall be constructed at the location(s) shown on the plans or as directed by the OWNER and as detailed on the plans.

802.1.3.2. Finishing. Concrete steps may be finished by the use of mortar topping and shall be troweled and lightly brushed.

802.1.3.3. Curing. Concrete steps shall be cured in accordance with the requirements of Item 305.1. Concrete Curb and Gutter.

802.1.4. Measurement and Payment. Concrete steps shall be measured by the sq.ft. of tread complete in place. If buttress walls are included, they shall be measured by the sq.ft. of wall top.

Concrete steps and buttress walls shall be paid for at the contract unit price bid, which price shall be full compensation for all excavation sand cushion; furnishing and placing all materials, including reinforcement and expansion joint material; and for all labor, tools, equipment and incidentals necessary to complete the work.

802.2. CONCRETE RETAINING WALLS

802.2.1. Description. This item shall govern the construction of concrete retaining walls of the size and shape detailed on the plans and at the location(s) shown on the plans. The requirements of Item 701.2. Structural Removal, Excavation, and Backfill, shall apply to the construction of retaining walls.

802.2.2. Materials.

802.2.2.1. Concrete. Concrete shall be of the grade specified on the plans and shall conform to the requirements of Item 702. Concrete Structures.

802.2.2.2. Reinforcing Steel. Reinforcing steel shall be of the size and type shown on the plans.

802.2.3. Construction Methods. Concrete retaining walls shall be constructed in accordance with the details shown on the plans and in conformance with the requirements of Item 701.2. Structural Removal, Excavation, and Backfill, and Item 702. Concrete Structures.

802.2.4. Measurement and Payment. Concrete used in the construction of retaining walls shall be measured by the cubic yard. Calculations shall be based upon plan dimensions and quantities.

Structural excavation shall be measured in accordance with Item 701.2. Structural Removal, Excavation, and Backfill.

Reinforcing steel shall be measured by unit weight or as specified on the plans.

Payment for all work prescribed under this item shall be made at the unit prices bid for the various items. This price shall be full compensation for all labor, tools, equipment, materials and incidentals necessary to complete the work.

When pay items are not provided for structural excavation and/or reinforcing steel, these items shall be subsidiary to the pay item for concrete for retaining walls.

802.3. SEGMENTAL RETAINING WALL SYSTEMS

802.3.1. Description. This item shall govern furnishing and installing segmental retaining wall (SRW) units to the lines and grades designated on the construction drawings or as directed by the OWNER. Site preparation, furnishing appurtenant materials, and installing appurtenant materials required for construction of the retaining wall as shown on construction plans and drawings are also included.

802.3.2. General. Segmental retaining wall systems are to be engineered on a site-specific basis only. The OWNER shall specify the special material and construction requirements for each location. Should the soil

conditions encountered during construction differ from those used for the design, the OWNER shall review the design, and provide the CONTRACTOR with any design revisions.

Wall systems that are found to be deficient and not in conformance with the construction drawings must be corrected at the CONTRACTOR'S expense.

802.3.3. Materials.

802.3.3.1. General. The CONTRACTOR shall submit manufacturers' certifications two weeks prior to start of work stating that the SRW units and geotextile reinforcement meet specified requirements. The CONTRACTOR shall furnish one (1) unit in the color and face pattern specified by the OWNER for approval. The approved unit shall be one of three (3) replacement units that the CONTRACTOR shall furnish the OWNER. The CONTRACTOR shall also furnish a square 12-inches-per-side or larger piece of the geotextile reinforcement specified if requested by the OWNER.

802.3.3.2. Delivery, Storage and Handling. The CONTRACTOR shall check materials upon delivery to assure that specified type and grade of materials have been received and proper color and texture of SRW units have been received. SRW units shall be sound and free of cracks or other defects that would interfere with the proper placing of the unit or significantly impair the strength or permanence of the structure. Units showing cracks longer than ½-inch shall not be used within the wall.

Retaining wall units shall be stored above ground on wood pallets or blocking, shall protect materials from damage, and shall prevent excessive mud, wet cement, epoxies, and like materials which may affix themselves from coming in contact with retaining wall materials.

802.3.3.3. Segmental Retaining Wall (SRW) Systems.

802.3.3.3.1. Unit Production. Color, texture, finish, face pattern geometry, type (solid or hollow), strength and structural requirements, maximum moisture absorption, size and weight dimensions and ratios of SRW units shall be specified per project and indicated on the plans. If units are not solid, fill which is contained within the dimensions of the units shall be included as effective weight. SRW units shall include an integral concrete shear connection flange/locator or pins, clips or some other device to provide proper setback and shear resistance.

Segmental retaining wall units shall be machine formed, Portland cement concrete blocks specifically designed for retaining wall applications and shall conform to applicable standards in Table 802.3.3.3.1.(a) Segmental Retaining Wall Unit Standards. Where values specified on the plans disagree with referenced standards, the plans shall take priority. All vertical surfaces that will be exposed after completion of wall shall have a split face, textured surface.

Table 802.3.3.3.1.(a) Segmental Retaining Wall Unit Standards

Standard Designation	Topic
ASTM C90 Standard Specification for Load bearing Concrete Masonry Units	Hollow Load Bearing Masonry Units
ASTM C1262 Test Method for Evaluating the Freeze-Thaw Durability of Dry Cast Segmental Retaining Wall units and Related Concrete Units	Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units
ASTM C1372 Standard Specification for Segmental Retaining Wall Units	Segmental Retaining Wall Units

802.3.3.3.2. SRW System Testing. Segmental retaining wall system testing shall conform to standards listed in Table 802.3.3.3.2.(a) Segmental Retaining Wall Unit Tests. Compressive strength test specimens shall conform to the saw-cut coupon provisions of Section 5.2.4 of ASTM C140 Test Methods for Sampling and Testing Concrete Masonry Units and Related Units, with the following exception: Coupon shall be taken from the least dimension of the unit of a size and shape representing the geometry of the unit as a whole.

Table 802.3.3.3.2.(a) Segmental Retaining Wall Unit Tests

Test Designation	Topic
National Concrete Masonry Association SRWU-1	Test Method for Determining Connection Strength of Segmental Retaining Wall
National Concrete Masonry Association SRWU-2	Test Method for Determining Shear Strength of Segmental Retaining Wall
ASTM C140 Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units	Sampling and Testing Concrete Masonry Units

802.3.3.3.3. Backfill Soils. The backfill soils shall be tested in accordance with the standards listed in Table 802.3.3.3.3.(a) SRW Backfill Soil Tests.

Table 802.3.3.3.3.(a) SRW Backfill Soil Tests

Test Designation	Title
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Backfill soil shall be free of debris. Native materials may be used provided they meet design criteria unless otherwise specified. The backfill material shall consist of the inorganic USCS soil types GP, GW, SW, SP, SM meeting the gradation described in Table 802.3.3.3.3.(b) SRW Backfill Soil Gradation, as determined in accordance with ASTM D422. The maximum particle size of poorly graded gravels (GP) (no fines) should not exceed ¾-in (1.9-cm) unless field tests have been performed to evaluate potential strength reductions to the geotextile due to damage from larger sized aggregate. The plasticity of the fine fraction shall be less than 20.

Table 802.3.3.3.3.(b) SRW Backfill Soil Gradation

Sieve Size	Percent Passing
2-in	100
¾-in	100-75
No. 40	0-50
No. 200	0-35

802.3.3.3.4. Drainage Aggregate. Aggregate shall be angular, clean stone or granular fill meeting the gradation in described in Table 802.3.3.3.4.(a) SRW Drainage Aggregate Gradation as determined in accordance with ASTM D422.

Table 802.3.3.3.4.(a) SRW Drainage Aggregate Gradation

Sieve Size	Percent Passing
1-in	100
¾-in	75-100
No. 4	0-60
No. 40	0-50
No. 200	0-5

802.3.3.3.5. Drainage Pipe. Pipe shall be a perforated or slotted PVC, or corrugated HDPE pipe, and shall meet relevant requirements under Item 501. Underground Conduit Materials. Owner may require video inspection of completed underdrain.

802.3.3.3.6. Leveling Pad/Base. Material for leveling pad (base) shall be as shown on the construction drawings. Material may consist of compacted sand, gravel, crushed stone or combination thereof. Lean, unreinforced concrete with a strength of 200-psi to 300-psi may also be used as a leveling pad material. A reinforced footing may also be required.

802.3.3.3.7. Geotextiles. Geotextile reinforcement used in segmental retaining wall systems may consist of polyester fiber geogrid or geotextile, polyethylene expanded sheet geogrid, polypropylene woven geotextile or other appropriate geotextiles manufactured for use as soil reinforcement. Geotextile manufacture shall conform to applicable standards. The geotextile manufacturer shall have a manufacturing quality control program that includes independent laboratory testing of Tensile Strength, Melt Flow Index (HDPE), and Molecular Weight (Polyester). Geotextile testing shall conform to standards Table 802.3.3.3.7.(a) SRW Geotextile Tests.

Geotextiles used for segmental retaining walls shall resist peeling, cracking, and stripping, and shall be treated as necessary to meet this requirement.

Table 802.3.3.3.7.(a) SRW Geotextile Tests

Test Designation	Title/Topic
ASTM D4595	Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
ASTM D5262	Test Method for Evaluating the Unconfined Tension Creep Behavior of Geosynthetics
Geosynthetic Research Institute GRI-GG4	Determination of Long Term Design Strength of Geogrids
Geosynthetic Research Institute GRI-GG5	Determination of Geogrid Pullout
National Concrete Masonry Association SRWU-1	Test Method for Determining Connection Strength of SRW

802.3.4. Construction Methods. Construction methods for each type unit shall be provided by the manufacturer and approved by the OWNER based on the site-specific use.

802.3.4.1. Inspections. The CONTRACTOR shall examine the areas and conditions under which the retaining wall is to be erected and notify the OWNER in writing of conditions detrimental to the proper and timely completion of the work. Work shall not proceed until unsatisfactory conditions have been corrected. The CONTRACTOR shall promptly notify the OWNER of any site conditions that may affect wall performance or may require a reevaluation of the wall design.

CONTRACTOR'S field construction supervisor shall have demonstrated experience and be qualified to direct all work at the site.

802.3.4.2. Excavation. Excavation shall be carried out to the lines and grades as shown on the plans and in accordance with methods in Item 701.2. Structural Removal, Excavation, and Backfill.

802.3.4.3. Foundation Soil and Base Preparation.

802.3.4.3.1. Foundation Soil. Following the excavation, the foundation soil shall be examined by the OWNER to assure actual foundation soil strength meets or exceeds the assumed design bearing strength. Soils not meeting the required strength shall be removed and replaced with backfill soils, as directed by the OWNER. Foundation soil shall have adequate moisture content, be proof rolled, and compacted to 95% standard Proctor density, or density specified on the plans, and inspected by the OWNER'S Representative prior to placement of leveling pad materials. Standard Proctor density shall be determined per ASTM D698.

802.3.4.3.2. Leveling Pad/Base. Base materials shall be installed upon undisturbed soils or prepared foundation soils. The leveling pad (base) shall be placed as shown on the construction drawings with a minimum thickness of 6-in when composed of aggregate and a minimum of 3-in when composed of concrete. The leveling pad shall extend laterally at least a distance of 6-inches from the toe and heel of the lower most SRW Unit. Soil leveling pad material shall be compacted to provide a firm, level-bearing surface on which to place the first course of units. Base materials shall be prepared to ensure complete contact of retaining wall unit. When approved by the OWNER, well-graded sand may be allowed to smooth the top, but shall not exceed ½-in of leveling sand.

802.3.4.4. Segmental Retaining Wall Unit Installation. All SRW units shall be installed at the proper elevation and orientation as shown on the wall profiles and details on the construction plans or as directed by the OWNER. The SRW units shall be installed in general accordance with the manufacturer's recommendations, including the sequence of SRW unit, drainage material and backfill courses. Typically, the maximum stacked vertical height of wall units, prior to unit drainage fill and backfill placement and compaction, shall not exceed two (2) courses. The specifications and drawings shall govern in any conflict between the two (2) requirements.

Lay out of curves and corners shall be installed in accordance with the plan details or in general accordance with SRW manufacturer's installation guidelines. Walls meeting at a corner shall be interlocked and continuous.

First course of SRW units shall be leveled side-to-side, front-to-rear and with adjacent units, and aligned to ensure intimate contact with the leveling pad. Excess debris shall be cleaned from the top of units before installation of the next course.

Damaged units shall be replaced with new units during construction.

SRW units shall have positive horizontal interlock. Shear/connecting devices shall be installed according to manufacturer's recommendations.

802.3.4.5. Drainage Materials Placement. Drainage aggregate shall be installed to the line, grades, and sections shown on the final plans. All voids between and within concrete wall units shall be filled with drainage aggregate. Drainage fill shall be placed to the thickness shown on the construction plans behind units, minimum 12-in. Drainage collection pipes shall be installed to maintain gravity flow of water outside the reinforced soil zone. The drainage collection pipe shall daylight into a storm water conduit manhole or other location along a continuous slope at an elevation lower than the lowest point of the pipe within the aggregate drain, as approved by the OWNER.

802.3.4.6. Geotextile Reinforcement Placement. The type and strength of the reinforcing geotextile shall be as shown on the construction plans. All geotextile reinforcement shall be installed in accordance with manufacturer's recommendations at the proper elevation and orientation as shown on the wall profiles and details on the construction plans or as directed by the OWNER.

At the elevations shown on the final plans, the geotextile reinforcement shall be laid horizontally on compacted backfill and on top of the concrete SRW units. Embedment of the geotextile in the SRW units shall be consistent with SRW manufacturer's recommendations. Correct orientation of the geotextile reinforcement shall be verified by the CONTRACTOR to be in accordance with the geotextile manufacturer's recommendations. The highest strength direction of the geotextile must be perpendicular to the wall face.

Geotextile reinforcement layers shall be one continuous piece for the entire embedment length. Overlap of the geotextile in the design strength direction (perpendicular to the wall face) shall not be permitted.

Tracked construction equipment shall not be operated directly on the geotextile reinforcement. A minimum of 6-in of backfill is required prior to operation of tracked vehicles over the geotextile.

802.3.4.7. Backfill Placement. The reinforced backfill shall be placed as shown in the construction plans in the maximum compacted lift thickness of 10-in, or 6-in where hand compacted, and shall be compacted at a moisture content within 2% of optimum to 95% standard Proctor density, or density specified on the plans. Standard Proctor density shall be determined per ASTM D698. The backfill shall be placed and spread in such a manner as to eliminate wrinkles, movement or damage of the geotextile reinforcement and the SRW units.

Only hand-operated compaction equipment shall be allowed within 3-ft of the back of the SRW unit.

At the end of each day's operation, the CONTRACTOR shall slope the last level of backfill away from the wall units to direct water runoff away from the wall face. The CONTRACTOR shall not allow surface runoff from adjacent areas to enter the wall construction site.

At completion of wall construction, final backfill shall be placed to the lines and grades indicated on the plans.

802.3.4.8. SRW Cap Unit Installation. When SRW caps are specified, they shall be properly aligned and glued to underlying units with a suitable, flexible, high-strength all-weather adhesive recommended by the manufacturer. Rigid adhesive or mortar is not acceptable. Cap units may be cut to obtain the proper fit.

802.3.4.9. Completion. The retaining wall will not be considered complete until accepted by the OWNER.

If final grading, paving, landscaping, and/or storm drainage installation adjacent to the wall is not placed immediately after wall completion, the CONTRACTOR shall provide temporary surface drainage to ensure water runoff is not directed at the wall nor allowed to collect or pond behind the wall until final grading and surface drainage construction adjacent to the wall is completed.

CONTRACTOR shall remove debris caused by SRW construction and leave adjacent paved areas broom clean.

802.3.5. Measurement and Payment. Measurement of segmental retaining wall shall be on an installed square foot basis computed on the total face area of wall installed. Wall height is taken from the top of the leveling pad to the top of the wall.

Payment for the wall will be made on an installed square foot basis at the contract unit price. Payment shall include all labor, preparation, equipment, materials, tools, testing, and incidentals necessary to complete the work.

802.4. COFFERDAMS

802.4.1. Description. Cofferdam is a temporary watertight chamber used for construction underwater.

802.4.2. General. Cofferdams for foundation construction shall be carried well below the bottom of the footings and shall be well braced and reasonably watertight. The interior dimensions of cofferdams shall provide sufficient clearance inside the walls for constructing forms and driving piles and to permit pumping outside the forms.

If, in the judgment of the CONTRACTOR, the clearance provided on the plans between the outside line of the footing and any pipe or interior wall or surface is not sufficient to permit the driving of piles or building of forms, it may provide such necessary clearance, structuring the cofferdam sufficiently large to provide such clearance as it may deem necessary. Any such enlargement in excess of 1-ft outside the dimensions of the footing as shown on the plans shall be considered as being for the sole purpose of expediting the work of the CONTRACTOR, and such excavation and backfill shall be at the CONTRACTOR'S expense.

Cofferdams which are tilted or moved out of position by any cause during the process of sinking shall be plumbed or enlarged so as to provide the necessary clearance and proper pier location, and such work shall be at the CONTRACTOR'S expense.

In streams at a time of probable flood, cofferdam walls shall be vented at low water elevation to insure equal hydrostatic head both inside and outside of the cofferdam during the period of pouring and settings of seals.

No shoring shall be permitted in cofferdams which shall induce stress, shock or vibration in the permanent structure.

When permitted by the OWNER, cross struts or bracing may extend through foundation concrete. Struts or bracing shall be removed and the resulting space filled with concrete of the same mix as that specified for the surrounding concrete.

For substructure work, the CONTRACTOR shall submit sealed drawings prepared by an OWNER showing its proposed method of cofferdam construction and other details left open to its choice or not fully shown on the plans. The type and clearance of cofferdams, insofar as such details affect the character of the finished work, shall be subject to the approval of the OWNER, but other details of design shall be left to the CONTRACTOR who shall be responsible for the successful construction of the work. The drawings shall be submitted at least 30-days in advance of the time the CONTRACTOR begins construction of the cofferdams.

After completion of the substructure, the cofferdams with all sheeting and bracing shall be removed at least 2-ft below the level of the streambed by the CONTRACTOR at its expense, and such removal shall be performed in a manner that shall not disturb or mar the finished concrete or masonry.

802.4.3. Construction Methods.

802.4.3.1. Excavation. Excavation shall include the following:

(1) When concrete or masonry footings are to rest upon rock, the rock shall be removed to a depth sufficient to expose sound rock. The rock shall be roughly leveled off or cut to approximate horizontal and vertical steps, and shall be roughened. Seams in the rock shall be grouted under pressure or treated as the OWNER may direct. The cost thereof shall be included for payment in the quantities for the unit of the structure for which the excavation is made. When concrete or masonry footings are to rest on an excavated surface other than rock, care shall be taken not to disturb the bottom of the excavation, and the final removal of the foundation material to grade shall not be made until just before the concrete or masonry is placed.

(2) Excavated material required to be used for backfill may be deposited by the CONTRACTOR in storage piles at points convenient for the rehandling of the material during the backfill operations. The location of storage piles shall, however, by subject to the approval of the OWNER, who may require that the survey centerline of the structure and the transverse or hub line of any unit of the structure be kept free of any obstruction.

(3) Excavated material required to be wasted shall be disposed of as directed by the OWNER, and the disposal shall be in such manner as not to obstruct the stream or otherwise impair the efficiency or appearance of the structure or other part of the work.

(4) Trench safety provisions of Item 107.20. Protection of Work and of Persons and Property shall be followed.

(5) For all single and multiple box culverts, pipe culverts and pipe arch culverts, where the soil encountered at established footing grade is a quicksand, muck or similar unstable material, the following procedure shall be used unless other methods are called for on the plans: All unstable soil shall be removed below the bottom of the culvert. Such excavation shall be carried at least 1-ft beyond the horizontal limits of the surface on all sides. All unstable soil so removed shall be replaced with suitable stable material, placed in uniform layers of suitable depth for compaction as directed by the OWNER. Each layer shall be wetted, if necessary, and compacted by rolling or tamping as required to provide a stable foundation for the structure.

(6) When the material encountered at footing grade of a culvert is found to be partially rock or incompressible materials and partially a soil or material that is compressible but otherwise satisfactory for the foundation, the incompressible material shall be removed for a depth of 6-in below the footing grade and backfilled with a material similar to the compressible foundation used for the rest of the structure.

(7) When the material encountered at footing grade of a bridge bent or pier is found to be partially of rock or incompressible material, and partially of a compressible material, the foundation shall not be placed until the OWNER has inspected the footing and authorized such changes found necessary to provide an adequate foundation.

802.4.3.2. Backfill. No backfill shall be permitted to be placed except in the presence of the OWNER. Structural backfill shall not be placed until the structure footings or other portions of the structure or facility have been inspected by the OWNER and approved for backfilling. As soon as practicable, all spaces excavated under this item and not occupied by the permanent structure shall be backfilled, except that no backfill shall be placed until the concrete has reached the design strength required. When called for on the plans, special backfill material, such as pit run gravel, shall be placed at the locations and in the manner called for on the plans. All other backfill material shall be earth, free of any appreciable amount of stone or gravel particles more than 4-in in the greatest dimension, large or frozen lumps, wood or other extraneous material, and shall be of such gradation as to permit thorough compaction as required by the OWNER. Class C or Class PC concrete as specified by the OWNER will be used in inaccessible locations when a mechanical device cannot compact to required densities and as directed by the OWNER, i.e., under pipes, roads, washouts, paving, etc. Compaction testing will be performed by the OWNER or its approved testing laboratory. If the compacted material does not meet the specified compaction, the CONTRACTOR will be required to rework the material and pay the cost of retesting.

802.4.4. Measurement and Payment. Measurement for payment when payment is provided in the special provisions shall be for material excavated within the limits shown on the plans or as directed by the OWNER. Unless otherwise provided in the special provisions or proposals, no payment shall be made for structural excavation or backfill as such, the cost thereof under normal circumstances being considered as included in the price bid for the construction or installation of the item to which such excavation or backfill pertain. Payment shall be made only when provided for in the special provisions or proposal. When provided for, payment for work performed under this specification shall be made at the unit price bid per cubic yard for unclassified structural excavation, which price shall be full compensation for all excavation and backfill and for all materials, labor, tools and incidentals necessary to complete the work.

ITEM 804. PAINTING AND OTHER PROTECTIVE TREATMENTS; PAVEMENT MARKING

804.1. DESCRIPTION

This item shall govern for the type, quality and application of paint or appropriate coatings or treatments to structures, materials, and pavement surfaces. Such applications include liquid coatings and galvanizing. Items to receive applications may include, but are not limited to, concrete structures, bridges, aerial crossing steel carrier pipes, fences, barriers, concrete pavement, and asphalt pavement. Water tanks and towers are exceptions to these specifications; material specifications and instructions for preparation, cleaning, coating/painting water tanks and towers shall be specified by the OWNER. Painting, coating and other protective treatments shall include, unless otherwise provided in the contract, the preparation and testing of the surfaces; the application, protection and drying of the paint, coating(s) or treatments; the protection of all traffic upon, underneath, or near the structure, material or pavement; the protection of all parts of the structure, material or pavement against disfigurement by any and all painting operations; and the supplying of all tools, tackle, scaffolding, labor, workmanship, paint, coating and/or other materials necessary for the completion of the entire work in accordance with the plans and these specifications.

The intent of the design herein specified is to procure the paints, coatings or treatments in and on structures, materials and surfaces so that the durability and protective value of these designs shall be realized in service. Accordingly, the best quality materials and workmanship are implied throughout. Surface conditions and application requirements are specified with the intent to obtain full adhesion of paint, coatings or treatments to clean, dry, firm surfaces. This shall require careful attention to preparation of surface, to the prevention of contamination and marring of the coating during and after drying, and to uniform, skilled application.

804.2. PAINTING AND MARKING

804.2.1. Safety. Some paints are harmful to the health. All paints shall be handled according to the information contained on the paint safety data sheet. The CONTRACTOR shall be responsible for safety during all cleaning and painting operations.

Unless shown otherwise on the plans, the CONTRACTOR shall be responsible for necessary precautions to contain refuse, dust and paint overspray generated during cleaning and painting operations. Containment shall be such that all falling material is contained and collected for disposal. Noncontainment of airborne particles is permissible provided they are not visible over 100-feet from the actual cleaning or painting operation. A skimmer shall be used when cleaning and painting is over bodies of water. Disposal of collected refuse shall be in accordance with Federal, State and Local rules and regulations.

If spray application is used, workers shall be adequately protected with respirators, and provisions shall be made to prevent infliction of harm upon all other humans and/or animals that might be exposed to the fumes or might eat food upon which the fumes have deposited. This warning shall absolve the OWNER from blame in the event of harm to persons or property from the named cause, and full responsibility for any such harm shall rest upon the CONTRACTOR.

804.2.2. Paint and Marking Materials. All materials used in the painting and marking herein specified shall conform to the material and composition requirements of the applicable TxDOT Material Specification:

DMS-8100 Structural Paints - Formula
DMS-8101 Structural Steel Paints- Performance
DMS-8200 Traffic Paint
DMS-8220 Hot Applied Thermoplastic
DMS-8240, Permanent Prefabricated Pavement Markings
DMS-8241, Temporary Removable, Prefabricated Pavement MarkingsDMS-8242, Temporary Flexible, Reflective Roadway Marker Tabs
DMS-8290, Glass Traffic Beads,

including any official TxDOT amendment or modification of these specifications, where reference to TxDOT or its representatives shall mean the OWNER. The CONTRACTOR shall certify to the OWNER that paint or coatings provided meet TxDOT material requirements.

804.2.2.1. Testing. All paint and paint materials shall be sampled and tested prior to use. All tests shall be conducted in accordance with the methods specified by ASTM or methods set forth in Federal

Standard FED-STD-141C/GEN Paint, Varnish, Lacquer, and Related Materials: Methods of Inspection, Sampling, and Testing. In the absence of any such methods, other suitable methods may be designated and utilized by the OWNER.

804.2.2.2. Rejection. Raw materials and finished products that fail to meet any requirements of these specifications shall be subject to rejection. Final acceptance or rejection shall be based on results of tests on samples of raw materials and finishes as soon as practicable after their arrival at the shipping destination. Approval of materials, as a result of preliminary testing prior to manufacture into finished coatings, shall not be binding upon final approval or rejection. The judgment of the OWNER shall be final in all questions relative to conformance with the provisions of these specifications.

804.2.3. Preparing Structures for Paint.

804.2.3.1. Descaling, Cleaning and Preparation of Surface. Throughout paint application, including shop and field painting, no paint shall be applied over a surface that evidences a loose or scaly condition. Every effort shall be made by means of the most effective and practical methods to remove all loose mill scale, rust, dirt, oil and grease, as well as all other foreign surfaces which would be deleterious to the procurement of the firm paint coating. The original cleaning and preparation of the surface necessarily must be done at the fabricating plant before application of the shop coat, but the same general requirements for painting over a clean, firm surface shall be applicable to all coats.

The OWNER shall look for evidence of faulty surface preparation preceding the shop coat by close inspection of the surface directly prior to application of first field coat, likewise, between first and second field coats. This careful inspection directly in advance of paint application may disclose not only loose, scaly conditions on the surface as a result of faulty preparation but also failure of the paint to harden because of contamination and changes which might have taken place beneath the paint film as a result of rusting and loosening of mill scale after paint has been applied.

The OWNER will test and make determination of the presence of lead or asbestos in the coatings of existing structures. These findings will be addressed via specifications set by the OWNER. Refer to Item 603. Abatement of Coatings Containing Certain Heavy Metals for additional information for information regarding heavy metals.

Therefore, whenever the OWNER has the slightest doubt as to the firm condition of the surface at any time throughout the application of any coats, OWNER shall be expected to explore underneath the surface of any paint coats already applied so as to uncover evidence of infirmity and to direct remedial measures. Any effective methods for removal of rust, scale and dirt, such as through the use of sandblast, hand or rotating metal brushes, scrapers, chisels, hammers or other effective means, shall be acceptable. Undesirable contaminants, which are not allowed to be present on the surface directly prior to paint application and which shall prevent proper hardening and adhesion of the paint film, are grease, oil, oily grime and moisture. Condensed moisture shall be avoided, and other grease-like contaminants shall be removed with solvents, applied with clean rags in such a manner that the oily substance is actually removed and not simply diluted or spread out over a greater area. Particular attention shall be given to the cleaning of fillets, riveted areas, rivet-heads, bolt heads, nuts, washers, drilled or punched holes and welds where loose mill scale, rust, oil and flux are likely to be present.

Unless cleaning is to be done by sandblasting, all weld areas shall be flushed thoroughly with clean water before painting so as to remove any alkaline residue. The flushed surface shall be allowed to thoroughly dry before paint application.

804.2.3.2. Weather Conditions and Dryness of Surface. Paint shall not be applied to any surface where moisture is present and discernible to the eye. Paint shall not be applied at air temperatures below 40°F nor when there is a likelihood of change in weather conditions within 2-hrs after application which would result in air temperatures below 40°F or depositing of moisture in the form of rain. Paint shall not be applied when, in the OWNER'S opinion, impending weather conditions might result in injury to the fresh paint. Weather condition requirements may be waived if the OWNER approves dehumidification or other climate control methods to successfully control the painting environment so as to ensure an equal or improved product.

804.2.3.3. Protecting Surrounding Features. The CONTRACTOR shall protect pedestrian, vehicular and other traffic in the vicinity, and also all portions of the structures not intended to receive paint, against damage or disfigurement by spatters or splashes of paint or paint materials.

804.2.4. Paint Handling and Application.

804.2.4.1. Stirring, Mixing and Care of Paints. All mixed paints shall be made ready for use through reincorporating settled pigment by means of thorough stirring, boxing and straining so that the paint is in its original homogeneous form, free from large agglomerates and skins greater than 9.8-mil in diameter. Paint in mixing pots shall be kept tightly covered when not in use so as to reduce volatile losses and skinning. Paint always shall be in a complete mixed condition when filled into painter's pots, and this filling always shall be through a strainer of 20 mesh cloth or wire or finer. Paint from the painter's pots shall be concentrated into tightly covered mixing pots at the end of the day and shall at no time during application contain skins or large agglomerates, and the interior sides of pots shall be periodically cleaned free of soft skins which might cling to brushes.

804.2.4.2. Thinning. At temperatures above 70°F, all of the paints herein specified for use, when freshly opened from sealed containers and thoroughly stirred, are of normal consistency suitable for good brush application without thinning. At temperatures below 70°F, the consistency may be heavy enough to require some thinning for proper brush application. Adjustments of paint consistency shall be accomplished by heating in hot water or on steam radiators. Adjustments of paint consistency by thinning so as to meet any and all conditions shall be done only at the discretion of the OWNER and with the OWNER's specific permission. The general rule which shall be applied for thinning paints shall be that the full hiding coat can be applied so as to thoroughly obscure the surface being painted, whether bare metal or undercoat, without sags and runs. Proper use of paints should remove the necessity for thinning because of evaporated volatiles as a result of allowing the paints to stand in uncovered containers.

804.2.4.3. Brush Application. Painting shall be done by workers skilled in the craft of structural metal painting. Good workmanship by skilled workers is evidenced by the following outstanding features: all crevices, sharp angles, etc., are first traced; the entire surface is then coated without attempt to "layoff" the paint in one direction; lastly, runs from crevices are picked up and the paint is laid off in one direction so as to leave a uniform film free from runs, sags or brush marks caused by not "feathering" or blending one lap into another. Brushes preferably shall be round or oval in shape, but if flat brushes are used, they shall not exceed 4-in in width; brushes should be springy and not flabby. Brushes shall not be permitted to become seedy from skins.

804.2.4.4. Spray Application. The equipment used for spray painting shall meet the approval of the OWNER and shall have adequate provisions for separation of moisture from the air stream in contact with the paint. Before thinning for spray application is permitted by the OWNER, at least 50-psi air pressure shall be present at the gun, the gun is not clogged with dried or semi-dried paint, and the spray gun is adequate for the work and has a proper spray head for application of paints used. A spray gun correctly held is approximately 8-in from and always perpendicular to the surface being painted. The painter shall steadily move the gun through a deliberate pattern that permits overlapping of the previous pass by 50-percent and at a speed that shall produce a full uniform coat. Over spray shall be held at a minimum.

804.2.5. Painting New Structures.

804.2.5.1. Number of Coats and Color. Except for surfaces specified herein or otherwise provided for on the plans, all structural steel shall be painted with one (1) shop coat of primer, one (1) field coat primer and two (2) field coats of paint as specified on plans. The paint shall be omitted from the surface of structural steel which shall be in contact with concrete in the finished structure. At the time concrete is placed, such surfaces of structural steel shall be free from dirt, scale, rust, paint, oil or other foreign material.

804.2.5.2. Shop Coat. It shall be mandatory to apply the shop coat by brushing or rolling, unless the surfaces to be painted are cleaned by sandblasting, in which case spray application of the shop coat shall be permitted. When all fabrication work is completed and has been tentatively accepted as such,

all surfaces not painted before assembling shall be cleaned as provided in Item 804.2.3.1. Descaling, Cleaning and Preparation of Surface and painted with one coat of primer. Pieces shall not be loaded for shipment until thoroughly dry. No painting shall be done after loading material on cars. Erection marks for the field identification of members shall be painted on previously painted surfaces. The top of the top flange of stringers shall not be painted. Machine finished surfaces shall be coated as soon as practicable after being accepted.

Surfaces of iron and steel castings milled for the purpose of removing scale, scabs, fins, blisters or other surface deformations shall generally be given the shop coat of paint.

All metal surfaces which shall be within 2-in of field welds shall be coated with linseed oil in advance of the application of shop coat paint and left bare of paint until field welding has been completed. The shop coat shall be applied as uniformly as possible by brushing with the intent of securing an average wet film thickness of 3.5-mils or 468-sq.ft.-of-surface-per-gallon of paint. The corresponding dry film thickness shall be 2.1-mils.

Portions of structures entailing difficult application of the field coats after erection may be completely painted before assembling or erection at the discretion of the OWNER.

804.2.5.3. Field Cleaning and Spot Painting. When the erection work is complete, including straightening of bent metal, etc., the shop-coated surface shall be restored to a serviceable condition acceptable to the OWNER by means of preparation of surface as outlined in Item 804.2.3.1. Descaling, Cleaning and Preparation of Surface and smoothing and touching up marred places in the shop coat film with primer. Field welds, heads of field rivets and bolts and any other surfaces to be painted which have not yet been shop coated shall be painted with primer.

The coating of linseed oil specified in Item 804.2.5.2. Shop Coat shall be thoroughly removed, as directed for removal of grease and oil in Item 804.2.3.1. Descaling, Cleaning and Preparation of Surface, immediately prior to erection.

804.2.5.4. First Field Coat. When field cleaning and restoration of shop coat has been completed and all shop coat is thoroughly dry, the first field coat of primer may be applied. Finished surfaces intended for sliding contact shall be given a coat of approved graphite grease immediately prior to being placed in the structure. Graphite grease shall be composed of dry graphite flakes mixed with sufficient light grease or heavy oil so as to form a thick paste suitable for the purpose. Field coats shall not be required on the bottom surface of shoe castings or bearing plates in direct contact with concrete nor on the top surfaces of beams, girders, etc. on which a concrete slab is to be placed in direct contact. The first field coat shall be applied as uniformly as possible, either by spraying, rolling, brushing, or a combination of these with the intent of securing an average wet film thickness of 3.5-mils.

804.2.5.5. Finish Coats. When the first field coat, including all touched-up marred places, has thoroughly hardened, the finishing field coats of finish paint may be applied. Cracks and cavities which have not been sealed in a watertight manner by the first field coat shall be suitably corrected. This correction shall be allowed to sufficiently surface dry before the second field coat is applied so as not to work up into finish paint. After application of the finishing field coat, the painted portion of the structure shall present a uniform color and appearance throughout.

The finish paint coat shall be applied as uniformly as possible by spraying, rolling, or brushing, with the intent of securing an average dry film thickness of 1.5-mils for each coat of paint applied.

804.2.6. Cleaning and Painting Existing Structures. All structures to be painted shall be cleaned thoroughly in accordance with Item 804.2.3.1. Descaling, Cleaning and Preparation of Surface to prepare the surfaces to receive new paint. Rust spots shall be cleaned to bare metal. Structures shall be spot painted with primer in accordance with Item 804.2.5.3. Field Cleaning and Spot Painting prior to application of paint to the entire surface unless otherwise specified. After the cleaning and spot-paint have dried thoroughly, the application of two (2) field coats of paint shall be applied. The application of paints shall conform to the pertinent articles of this specification.

804.2.7. Removal of Paint Improperly Applied. All paint which has been improperly applied and fails to dry and harden properly, or to adhere tightly to underlying metal or other paint film, or does not evidence a normal, workmanlike appearance in conformance with the intent of these specifications, shall be remedied or

thoroughly removed and replaced at the expense of the CONTRACTOR. When the final field coat does not have a uniform color and appearance throughout the structure, it shall be corrected by the use of whatever additional coats are necessary. Removal of freshly applied paint which has not yet set shall be effected with the use of appropriate solvents. Removal of dried paint films shall be effected either by means of sandblasting or scraping, meeting the approval of the OWNER.

804.2.8. Cleaning and Marking Pavements. When the CONTRACTOR is responsible for marking pavements, as identified in the plans, cleaning and marking shall conform to these specifications and the Texas Manual on Uniform Traffic Control Devices.

Markings shall be applied only when the pavement surface is dry and clean, which may be accomplished with machinery specialized to prepare pavement in front of the marking operation. The CONTRACTOR shall be comply with all environmental condition restrictions recommended by the manufacturer of pavement paints or other markings. Glass beads or other refractive material and application rates shall be as identified on the plans.

Temporary markings shall be thoroughly removed to the satisfaction of the OWNER using an approved method prior to the application of permanent markings.

804.3. GALVANIZING

804.3.1. General. Zinc used for galvanizing shall be grade Prime Western conforming to ASTM B6 Zinc (Slab Zinc). Except as otherwise specified, materials shall be galvanized by the hot-dip or electro-depositing process.

804.3.2. Coating Requirements. The minimum weight of coating and other requirements shall be as shown in Table 804.3.2.(a) Galvanizing Minimum Weight. The weight shown is ounces per square foot of the surface area. All surfaces, when tested separately, shall meet the minimum requirement.

804.3.3. Workmanship. The zinc coating shall adhere tenaciously to the surface of the base metal. The finished product shall be free from blisters and excess zinc, and the coating shall be even, smooth and uniform throughout. Machine work, die work, cutting, punching, bending, welding, drilling, thread cutting, straightening and other fabricating shall be done as far as is practicable before the galvanizing. All members, nuts, bolts, washers, etc. shall be galvanized before a structural unit is assembled. All uncoated spots or damaged coatings shall be cause for rejection.

Products that are warped or distorted to the extent of impairment for the use intended shall be rejected.

804.3.4. Testing. Test coupons for determining the quantity and quality of galvanizing shall be of such size and shall be wired to the materials to be galvanized before immersion so as to represent the amount of coating deposited on the finished product.

The weight of coating shall be determined in accordance with ASTM A90 Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings, modified to determine the coating of each surface separately.

Nondestructive tests for uniformity of coating may be made by the OWNER with a magnetic instrument in accordance with ASTM E376 Standard Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods.

Table 804.3.2.(a) Galvanizing Minimum Weight

Material	ASTM Designation	Min. Weight of Coating oz./sq.ft.
Steel product including structural shapes, tie rods, handrails, and miscellaneous items	A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products	2.00
Hardware including casting, rolled, pressed, and forged articles	A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware	2.00
Bolts, screws, nuts, and washers	A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware	1.25
Chain link fence fabric (galvanized after fabrication)	A392, Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric	1.20
Chain link fence fittings & accessories	F626 Standard Specification for Fence Fittings	1.20
Chain link fence post, gates, rails, and braces	F1083 Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures	1.80
CMP culverts and underdrains	A929 Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe	1.00
Steel pipe	A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless	1.80
Iron or steel wire fencing	A116, Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric	0.80
Steel or iron sheets	A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process	0.63
Barbed wire	A121 Standard Specification for Metallic-Coated Carbon Steel Barbed Wire	0.80
Electrolier standards, 7-gauge steel and over	A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products	2.00
Electrolier standards, under 7-gauge steel	A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products	1.50

804.3.5. Repair of Damaged Zinc Coating. Zinc coating, which has been field or shop cut, burned by welding, abraded, or otherwise damaged to such extent as to expose the base metal, shall be repaired and recoated by one of the following methods:

804.3.5.1. Hot-Dip Process. The damaged areas shall be thoroughly stripped and cleaned, and a coating of zinc shall then be applied by the hot-dip process.

804.3.5.2. Metalizing Process. The damaged area shall be thoroughly cleaned by blasting with sharp sand or steel grit. The blasted area shall lap the undamaged zinc coating at least ½-in.

Zinc wire containing not less than 99.98-percent zinc shall be used in the metalizing operation. A zinc coating shall be applied to the damaged area with a metalizing gun to a thickness of not less than 0.005-in. on the damaged area and shall taper to zero thickness at the edge of the blasted undamaged section.

804.3.5.3. Zinc Rich Paint. The damaged area shall be thoroughly cleaned by wire brushing and all traces of welding flux and loose or cracked zinc coating removed prior to painting. The cleaned area shall be painted with two coats of zinc oxide-zinc dust paint. The coating thickness shall be 50-percent

greater than the surrounding coating thickness, but not more than 4.0-mils. Zinc-rich paints shall be based on organic binders, premixed and formulated specifically for use on steel surfaces and shall provide a dried film containing a minimum of 92-percent zinc dust, by weight.

804.3.6. Rejection. Raw materials and finished products that fail to meet any requirements of these specifications shall be subject to rejection. Final acceptance or rejection shall be based on results of tests on samples of raw materials and finishes as soon as practicable after their arrival at the shipping destination. Approval of materials, as a result of preliminary testing prior to manufacture into finished coatings, shall not be binding upon final approval or rejection. The judgment of the OWNER shall be final in all questions relative to conformance with the provisions of these specifications.

804.4. MEASUREMENT AND PAYMENT

Unless otherwise provided in the plans and special provisions, painting, coating, marking, or other treatments such as galvanizing shall not be measured for payment, nor shall payment be made as a separate contract item. The cost thereof shall be included in the contract pay items as are provided for the item to be painted, treated or marked, which prices shall be the total compensation for cleaning, spot painting or treatment, application of paint, coating, marking or treatment, and for furnishing all labor, equipment, material, scaffolding, protection of traffic, tools and incidentals necessary to complete the work, all in accordance with the plans and these specifications.

804.5. SPECIALTY COATINGS

Manufacturer's specifications shall be followed when applying specialty coatings, such as shown in the contract documents.

Town of Addison, Texas, Dallas County

WASTEWATER BASIN I SEWER OUTFALL RE-ROUTE AND WATER IMPROVEMENTS

BELTWAY DRIVE FROM MIDWAY ROAD TO PARKING LOT-BELTWOOD PARKWAY (2550 LF)

BID NUMBER 20-54

January, 2020

MAYOR
Joe Chow

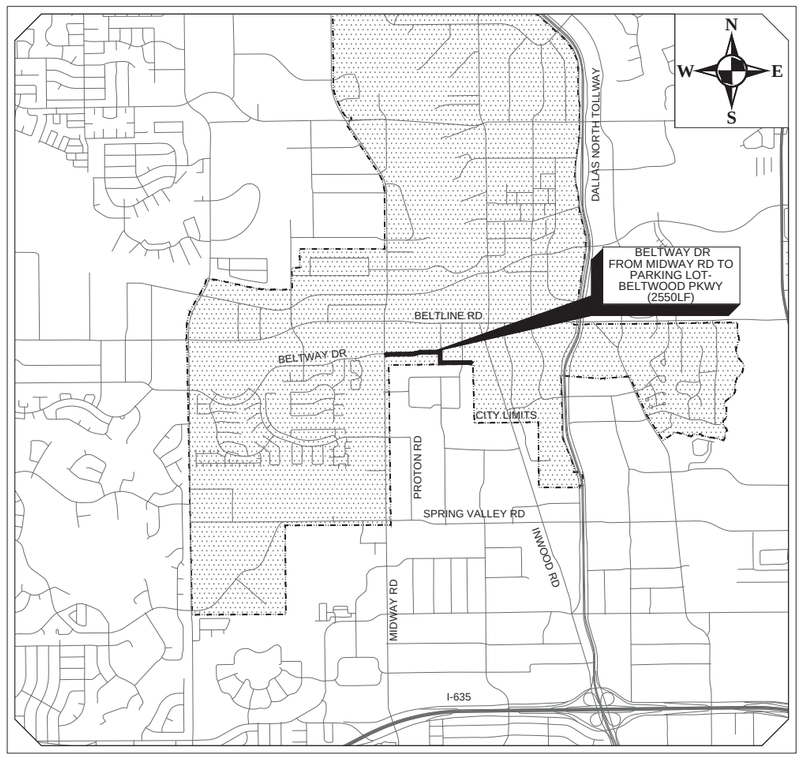
COUNCIL

Tom Braun	Mayor Pro Tempore
Lori Ward	Deputy Mayor Pro Tempore
Paul Walden	Council Member
Ivan Hughes	Council Member
Guillermo Quintanilla	Council Member
Marlin Willesen	Council Member

CITY MANAGER
Wesley S. Pierson

Director of Public Works & Engineering Services
Lisa A. Pyles

Capital/Development Projects Manager - Public Works & Engineering Services
Wilson K. Kakembo, P.E.



Town of Addison Location Map MAPSCO 14 G

Scale: N.T.S.

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STATE OF TEXAS
WM BART HINES
49126
REGISTERED
PROFESSIONAL ENGINEER
1/2/2020

SUBMITTED BY: _____ DATE: 1/2/2020
Wm. Bart Hines, P.E.
Dannenbaum Engineering Company-Dallas, LLC

APPROVED BY: _____ DATE: 1/2/2020
Wilson K. Kakembo, P.E.

REV. NO.	DESCRIPTION	CHK. BY	DATE

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Drawing file: G:\1220\5133-01 Addison Basin I Final Design\CAD\Sheets\01-COVER.dwg
DATE: Jan 02, 2020 TIME: 2:05pm

GENERAL NOTE

1. PRIOR TO ANY CONSTRUCTION THE CONTRACTOR SHALL BE FAMILIAR WITH THE CONTRACT DOCUMENTS AND SPECIFICATIONS, THE PLANS (INCLUDING ALL NOTES), THE TOWN OF ADDISON SPECIFICATIONS AND ANY OTHER APPLICABLE STANDARDS OR SPECIFICATIONS RELEVANT TO THE PROPER COMPLETION OF THE WORK SPECIFIED. FAILURE ON THE PART OF THE CONTRACTOR TO BE FAMILIAR WITH ALL STANDARDS AND SPECIFICATIONS PERTAINING TO THIS WORK SHALL IN NO WAY RELIEVE THE CONTRACTOR OF RESPONSIBILITY FOR PERFORMING THE WORK IN ACCORDANCE WITH ALL SUCH APPLICABLE STANDARDS AND SPECIFICATIONS.
2. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL HAVE IN THEIR POSSESSION ALL NECESSARY PERMITS, PLANS, LICENSES, ETC. CONTRACTOR SHALL HAVE AT LEAST ONE SET OF APPROVED ENGINEERING PLANS AND SPECIFICATIONS ON-SITE AT ALL TIMES.
3. ALL WORK SHALL CONFORM TO THE TOWN OF ADDISON DESIGN MANUALS AND STANDARDS. IN THE EVENT AN ITEM IS NOT COVERED IN THE PLANS OR THE TOWN OF ADDISON DESIGN MANUALS AND STANDARDS, THE MOST CURRENT NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS (NCTCOG) STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION SHALL APPLY WITH CONCURRING NOTIFICATION TO THE TOWN ENGINEER AND PROJECT ENGINEER. THE TOWN ENGINEER SHALL HAVE THE FINAL DECISION ON ALL CONSTRUCTION MATERIALS, METHODS, AND PROCEDURES.
4. CONSTRUCTION INSPECTION WILL BE PERFORMED BY REPRESENTATIVES OF THE THE TOWN, ENGINEER, TOWN, GEOTECHNICAL ENGINEER, AND REVIEWING AUTHORITIES AND AGENCIES. UNRESTRICTED ACCESS SHALL BE PROVIDED TO THEM AT ALL TIMES. CONTRACTOR IS RESPONSIBLE FOR UNDERSTANDING AND SCHEDULING REQUIRED INSPECTIONS. TESTING SAMPLES SHALL BE COLLECTED AND PROCESSED BY CERTIFIED TECHNICIANS.
5. ALL CONTRACTORS MUST CONFINE THEIR ACTIVITIES TO THE WORK AREA. NO ENCROACHMENTS ONTO DEVELOPED OR UNDEVELOPED AREAS WILL BE ALLOWED. ANY DAMAGE RESULTING THEREFROM SHALL BE CONTRACTOR'S RESPONSIBILITY TO REPAIR AT NO ADDITIONAL COST TO THE TOWN.
6. IT WILL BE THE RESPONSIBILITY OF EACH CONTRACTOR TO PROTECT ALL EXISTING PUBLIC AND PRIVATE UTILITIES THROUGHOUT THE CONSTRUCTION OF THIS PROJECT. CONTRACTOR SHALL CONTACT THE APPROPRIATE UTILITY COMPANIES FOR LINE LOCATIONS PRIOR TO COMMENCEMENT OF CONSTRUCTION AND SHALL ASSUME FULL LIABILITY TO THOSE COMPANIES FOR ANY DAMAGES CAUSED TO THEIR FACILITIES.
7. TRENCH SAFETY DESIGN WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. CONTRACTOR SHALL SUBMIT A TRENCH SAFETY AND SHORING DESIGN, SEALED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS, TO THE TOWN ENGINEERING INSPECTOR FOR REVIEW PRIOR TO THE START OF ANY UNDERGROUND UTILITY CONSTRUCTION.
8. IF ANY CONFLICT ARISES BETWEEN THESE GENERALS NOTES AND ANY OTHER NOTES FOUND IN THE PLANS, THE ADDISON GENERAL NOTES SHALL TAKE PRECEDENCE.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ANY TEMPORARY RIGHT OF WAY/ LAND RIGHTS FOR THE DURATION OF THE CONTRACT FOR THE PURPOSE OF A STAGING AREA: STORING OF EQUIPMENT AND MATERIAL, EMPLOYEE PARKING, ETC. THE TOWN OF ADDISON IS NOT SUPPLYING THE PARCEL 5 (PLAN SHEET 5) FOR A STAGING AREA FOR THIS PROJECT.
10. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, PRIOR TO THE INITIATION OF CONSTRUCTION ON EASEMENTS THROUGH PRIVATE PROPERTY, TO INFORM THE PROPERTY OWNER OF ITS INTENT TO BEGIN CONSTRUCTION. BEFORE BEGINNING CONSTRUCTION IN AREAS OF PUBLIC DEDICATION, THE CONTRACTOR SHALL INFORM THE AGENCY HAVING JURISDICTION IN THE AREA FORTY_EIGHT (48) HOURS PRIOR TO INITIATION OF THE WORK. ALL EASEMENTS SHALL BE CLEANED UP AFTER USE AND RESTORED TO THEIR ORIGINAL CONDITIONS OR BETTER.
11. THE CONTRACTOR WILL BE REQUIRED TO WORK ONLY DURING THE EVENING HOURS (8:00PM TO 6:00AM) FOR THE AREAS WITHIN PARCELS 1, 2 AND 3. ANY DAY TIME CONSTRUCTION IN THE PARCELS 1, 2 AND 3 AREA MUST BE APPROVED BY THE TOWN OF ADDISON AND NEGOTIATED WITH THE PROPERTY OWNERS/ TENANTS.
12. THE CONTRACTOR WILL BE REQUIRED TO WORK ONLY DURING THE EVENING HOURS (8:00PM TO 6:00AM) FOR THE AREAS WITHIN PARCELS 1, 2 AND 3. IF WORK, PIPELINE PLACEMENT, IN A TRENCH IS INCOMPLETE OR TRENCH IS NOT BACKFILLED BEFORE 6:00AM, THEN THAT AREA MUST BE COVERED DURING THE NON-WORKING (DAYLIGHT) HOURS WITH STEEL PLATES, DESIGNED TO WITHSTAND H-20 TRUCK LIVE LOADS. TEMPORARY ASPHALT PAVING MAY BE ALLOWED FOR PAVEMENT OVER COMPLETED PIPE INSTALLATION AND BEFORE PERMANENT CONCRETE PAVING IS PLACED, IN LIEU OF STEEL PLATES AND AS DIRECTED BY THE TOWN OF ADDISON

WATER NOTES

1. DESIGN CRITERIA FOR THE TOWN OF ADDISON (TOA) WATER SYSTEM SHALL COMPLY WITH THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) CHAPTER 290 RULES AND REGULATIONS FOR PUBLIC WATER SYSTEMS, (MOST CURRENT REVISION).
2. APPROVED PERMITS FROM AGENCIES OTHER THAN THE TOWN SHALL BE SUBMITTED TO THE TOWN.
3. ALL PLANS SHALL BE PREPARED BY A PROFESSIONAL CIVIL ENGINEER LICENSED IN THE STATE OF TEXAS.
4. MINIMUM COVER FOR WATERLINES IS 48" OR AS REQUIRED TO CLEAR EXISTING UTILITIES, WHICHEVER IS GREATER.
5. ALL WATER MAINS TWELVE INCHES (12') IN DIAMETER OR SMALLER SHALL BE AWWA C-900 PVC PRESSURE PIPE (BLUE), WITH CAST IRON OUTSIDE DIAMETER (C.I.O.D.) OR APPROVED EQUAL. PIPES THAT PENETRATE CONCRETE VAULT WALLS SHALL BE DUCTILE IRON. PIPE JOINTS SHALL BE THICKENED BELL WITH INTEGRAL RUBBER RING GASKET, ASSEMBLED WITH FACTORY SUPPLIED LUBRICANT. JOINT MATERIAL SHALL CONFORM TO ASTM F477 AND ASTM D3139. WATER MAINS SHALL HAVE A MINIMUM PRESSURE CLASS RATING OF 235 PSI (DR-18). PIPE FOR FIRE SERVICE OR FIRE HYDRANT LEADS SHALL HAVE A PRESSURE CLASS RATING OF 305 PSI (DR-14).
6. MARKING TAPE SHALL BE INSTALLED OVER PVC WATER LINES.
7. ALL WATER MAIN FITTINGS SHALL BE FULL-BODIED, DOMESTIC (USA) DUCTILE IRON, MECHANICAL JOINT TYPE, RATED AT 250 PSI. ALL MECHANICAL JOINTS SHALL EMPLOY RESTRAINING GLANDS (EBAA MEGA-LUG OR APPROVED EQUAL). ALL FITTINGS SHALL BE WRAPPED WITH 8MIL POLY PRIOR TO EMBEDMENT AND BACKFILL. COMPACT FITTINGS ARE NOT PERMITTED UNLESS PRE-APPROVED BY ADDISON PUBLIC WORKS & ENGINEERING SERVICES (APWES).
8. VALVES SHALL BE MUELLER RESILIENT SEAT GATE VALVES.
9. ALL DIRECT BURIAL VALVES SHALL BE PROVIDED WITH CAST IRON VALVE BOXES WITH PVC STACKS. VALVE STACKS SHALL BE VERTICAL AND CONCENTRIC WITH THE VALVE STEM. STAINLESS STEEL VALVE EXTENSIONS ARE REQUIRED ON ALL VALVES WHERE THE OPERATING NUT IS GREATER THAN 4 FEET BELOW FINISHED GRADE.
10. FIRE HYDRANTS SHALL BE MUELLER SUPER CENTURION AND BE FIELD PAINTED AND COLOR CODED AS DIRECTED BY THE THE TOWN.
11. THE DISTANCE FROM FIRE HYDRANTS TO THE EDGE OF PAVEMENT FOR PUBLIC STREETS OR EDGE OF FIRE LANE SHALL NOT EXCEED FIVE FEET UNLESS OTHERWISE PERMITTED BY THE TOWN ENGINEER.
12. ALL EXPOSED BOLTING ON ANY BURIED EQUIPMENT OR MATERIAL SHALL BE STAINLESS STEEL. INCLUDED ARE:
    A. BONNET AND STUFFING BOX BOLTS ON VALVES.
    B. SHOE BOLTS ON FIRE HYDRANTS.
    C. FLANGE BOLTS."COR-TEN" MECHANICAL JOINT "T" BOLTS ARE ACCEPTABLE FOR DIRECT BURIAL SERVICE.
13. METER BOXES SHALL BE AS APPROVED BY THE TOWN CONTACT THE TOWN ENGINEER FOR SPECIFICATIONS. METER BOX SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.
14. ALL WATER MAIN FITTINGS SHALL BE FULL-BODIED, DOMESTIC (USA) DUCTILE IRON, MECHANICAL JOINT TYPE, RATED AT 250 PSI.
15. ALL MECHANICAL JOINTS SHALL EMPLOY RESTRAINING GLANDS (EBAA MEGA-LUG OR APPROVED EQUAL).
16. ALL FITTINGS SHALL BE WRAPPED WITH 8MIL POLY PRIOR TO EMBEDMENT AND BACKFILL.
17. COMPACT FITTINGS ARE NOT PERMITTED UNLESS PRE-APPROVED BY APWES
18. ALL FIRE HYDRANTS INSTALLED FOR USE IN THE TOWN OF ADDISON SHALL MEET OR EXCEED AWWA STANDARD C502-85 (MOST CURRENT REVISION).
19. FIRE HYDRANTS SHALL HAVE A 5¼" MINIMUM VALVE OPENING. RATED WORKING PRESSURE SHALL BE AT LEAST 150 PSI; TEST PRESSURE SHALL BE 300 PSI AND THE HYDRANT SHALL BE CAPABLE OF FLOWING 1000 GPM (CLASS A).
20. ALL HYDRANTS SHALL BE MANUFACTURED IN THE UNITED STATES.
21. HYDRANT SHALL BE WARRANTED BY THE MANUFACTURER FOR A MINIMUM OF 5 YEARS.
22. LARGE FIRE SERVICES SHALL, AT MINIMUM, CONSIST OF A DOUBLE-CHECK DETECTOR ASSEMBLY (DCDA) IN A VAULT (SEE TOA STANDARD CONSTRUCTION DETAIL SD-W22), PLACED WITHIN THE ROW OR A WATER EASEMENT.
23. IF SITE CONDITIONS PRECLUDE THE INSTALLATION OF A VAULT AT THE PROPERTY LINE, ALTERNATIVE INSTALLATIONS MUST BE APPROVED BY APWES. SUCH CASES WILL REQUIRE A "DEMARCATION VALVE" AND A 2" SERVICE TAP TO BE INSTALLED ON THE UPSTREAM SIDE OF THE VALVE AT THE PROPERTY LINE.
24. THERE SHALL BE NO TAPS OR T'S INSTALLED BETWEEN THAT VALVE AND THE FIRE SERVICE RISER.
25. ALL LARGE FIRE SERVICES SHALL PASS A 200 PSI, TWO HOUR PRESSURE TEST, AND A BACTERIOLOGICAL TEST, FROM THE SERVICE VALVE TO THE RISER.
26. FIRE SERVICES LESS THAN OR EQUAL TO TWO INCH (2') SHALL BE A HERSEY CLASS I MVR™ TURBINE, AND SHALL HAVE THE APPROPRIATE BPA INSTALLED DOWNSTREAM OF THE METER.
27. ALL WATER SERVICES/METER BOXES SHALL BE SET IN THE RIGHT-OF-WAY OR UTILITY EASEMENT, LOCATED AS APPROVED BY APWES.
28. NO METER SHALL BE INSTALLED IN AN AREA PAVED FOR VEHICULAR TRAFFIC OR PARKING.
29. ALL SERVICES SHALL INCLUDE AN APPROVED BACKFLOW PREVENTION ASSEMBLY (BPA) IMMEDIATELY DOWNSTREAM OF THE METER, OR AS APPROVED BY APWES (SEE STANDARD CONSTRUCTION DETAIL SD-W20 SHEET 22).
30. ALL SERVICE TAPS SHALL BE INSPECTED AND APPROVED BY APWES.

SANITARY SEWER NOTES

1. DESIGN CRITERIA FOR ALL WASTEWATER SYSTEMS SHALL COMPLY WITH TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) CHAPTER 217 (DESIGN CRITERIA FOR DOMESTIC WASTEWATER SYSTEMS), LATEST REVISION.
2. NO WASTEWATER MAIN, OTHER THAN LATERALS AND FORCE MAINS, SHALL BE LESS THAN EIGHT-INCH (8") IN DIAMETER.
3. PERMITS FROM AGENCIES OTHER THAN THE TOWN MUST BE SUBMITTED THROUGH THE TOWN.
4. WASTEWATER MAINS IN RIGHT OF WAY SHALL BE INSTALLED IN THE STREET AT FIVE FEET (5') FROM THE FACE OF CURB ON THE OPPOSITE SIDE OF THE STREET AS THE WATER MAIN OR AS OTHERWISE DIRECTED BY THE PUBLIC WORKS DEPARTMENT.
5. THE SIZES AND LOCATIONS OF MANHOLES, WYES, BENDS, TAP CONNECTIONS, ETC., SHALL BE APPROVED BY THE TOWN ENGINEER.
6. PUBLIC WASTEWATER MAIN SHALL BE LOCATED AT LEAST FIVE FEET (5') FROM ANY TREE UNLESS APPROVED BY THE PUBLIC WORKS & ENGINEERING SERVICES.
7. WHERE A NEW NON-PRESSURE RATED WASTEWATER MAIN OR LATERAL CROSSES UNDER A NEW WATER MAIN, THE WASTEWATER MAIN OR LATERAL SHALL BE EMBEDDED IN CEMENT STABILIZED SAND FOR THE TOTAL LENGTH OF ONE PIPE SEGMENT PLUS TWELVE INCHES (12') BEYOND THE JOINT ON EACH END AND THERE SHALL BE A MINIMUM OF TWENTY-FOUR INCHES (24") OF CLEARANCE OR OTHERWISE AS GOVERNED BY TCEQ CHAPTER 217 REQUIREMENTS.
8. ALL GRAVITY WASTEWATER MAINS SHALL BE IN GREEN IN COLOR. FOUR-INCH (4") TO FIFTEEN-INCH (15") PIPE SHALL BE PVC SDR 35 OR 26 (ASTM D3034). EIGHTEEN-INCH (18") AND LARGER PIPE SHALL BE PVC ASTM F679. PVC FITTINGS MAY BE EITHER GREEN OR WHITE IN COLOR.
9. ALL MAINS TO BE INSTALLED UNDER EXISTING ROADWAY SHOULD BE INSTALLED BY BORE UNLESS OTHERWISE APPROVED BY THE TOWN ENGINEER. RUST RESISTANT STEEL CASING MINIMUM ONE-FOURTH-INCH (1/4") THICK, OR THICKER IF DEEMED NECESSARY BY THE DESIGN ENGINEER, SHALL BE USED WITH RACI PATENTED CASING SPACERS, OR APPROVED EQUAL. NO WOOD SKIDS WILL BE PERMITTED.
10. PVC PIPE USED FOR FORCE MAINS SHALL BE WHITE IN COLOR. TWELVE-INCH (12") AND SMALLER PIPE SHALL BE ASTM 2241 SDR 21. PIPES LARGER THAN TWELVE-INCH (12") SHALL BE C905 DR25.
11. PROFILE WALL PIPE SHALL NOT BE PERMITTED IN THE TOWN OF ADDISON WITHOUT WRITTEN AUTHORIZATION BY THE TOWN ENGINEER. IF ALLOWED BY THE TOWN ENGINEER, TWENTY-FOUR INCHES (24") AND LARGER PROFILE WALL PIPE SHALL CONFORM TO ASTM 794 AND THE TOWN OF ADDISON SPECIFICATIONS. "HELICALLY WOUND" OR "PIPE STIFFNESS SERIES 10" PROFILE WALL PIPE WILL NOT BE ALLOWED.
12. CEMENT STABILIZED SAND SHALL HAVE A MINIMUM OF TEN PERCENT (10%) CEMENT PER CUBIC YARD OF CEMENT STABILIZED SAND MIXTURE, BASED ON LOOSE DRY WEIGHT VOLUME (AT LEAST 2.5 BAGS OF CEMENT PER CUBIC YARD OF MIXTURE). THE CEMENT STABILIZED SAND BEDDING SHALL BE A MINIMUM OF SIX INCHES (6") ABOVE AND FOUR INCHES (4") BELOW THE WASTEWATER MAIN OR LATERAL. BROWN COLORING SHALL BE ADDED TO THE CEMENT STABILIZED SAND MIXTURE FOR PRESSURE RATED WASTEWATER MAIN OR LATERAL BEDDING.
13. LINE AND GRADE STAKES FOR CONSTRUCTION OF ALL MAINS AND LATERALS SHALL BE FURNISHED BY THE DEVELOPER'S ENGINEER OR THEIR DESIGNATED REPRESENTATIVE. PROPERTY LINES AND CORNERS MUST BE PROPERLY STAKED TO ENSURE CORRECT ALIGNMENT. THE TOWN WILL NOT BE LIABLE FOR IMPROPER ALIGNMENT OR DELAY OF ANY KIND CAUSED BY IMPROPER OR INADEQUATE SURVEYS BY THE DEVELOPER OR BY INTERFERENCE OF OTHER UTILITIES.
14. ALL WASTEWATER MAINS SHALL BE TESTED FOR INFILTRATION AND EXFILTRATION IN ACCORDANCE WITH STANDARD SPECIFICATIONS AND AS SHOWN ON THE PLANS. VIDEO CAMERA INSPECTIONS, LOW PRESSURE AIR TESTING, VACUUM TESTING OF THE MANHOLES AND MANDREL TESTING ARE REQUIRED ON ALL SEWER LINES. IN ADDITION, ALL RESIDENTIAL AND COMMERCIAL WASTEWATER SERVICES SHALL HAVE VIDEO CAMERA INSPECTIONS. ALL VIDEO CAMERA INSPECTIONS SHALL INCLUDE AN INCLINATION STUDY. ALL TESTING SHALL BE COMPLETED, REVIEWED AND APPROVED BY THE TOWN OF ADDISON PRIOR TO ANY FINAL INSPECTIONS OR ISSUE OF CERTIFICATE OF OCCUPANCY.
15. MINIMUM COVER SHALL BE FOUR FEET (4').
16. MANHOLES SHALL HAVE A 400LBS TRAFFIC BEARING FRAME AND COVER WITH A DESIGN STRENGTH OF 4000 PSI AT TWENTY-EIGHT (28) DAYS.
17. DROP MANHOLES SHALL BE REQUIRED WHEN THE INFLOW ELEVATION IS MORE THAN TWENTY-FOUR INCHES (24") ABOVE THE OUTFLOW ELEVATION.
18. IN FLOOD PLAINS, SEALED MANHOLES "TYPE S" SHALL BE USED TO PREVENT THE ENTRANCE OF STORM WATER. COATING IN MANHOLE WHERE MORE THAN THREE MANHOLES IN SEQUENCE ARE TO BE BOLTED AND GASKETED, EVERY THIRD MANHOLE SHALL BE VENTED TWO FEET (2') ABOVE THE ONE HUNDRED (100) YEAR FLOODPLAIN ELEVATION OR TEN FEET (10') ABOVE THE ADJACENT GROUND LINE, WHICHEVER IS HIGHER.
19. WHERE PIPES ENTER A MANHOLE THERE SHALL BE A MINIMUM OF ONE-TENTH OF A FOOT (0.1') DROP BETWEEN INLET AND OUTLET INVERTS. WHERE UNEQUAL SIZE PIPES ENTER A MANHOLE, CROWN OF PIPES SHOULD BE AT THE SAME ELEVATION.
20. MANHOLES SHALL HAVE INFLOW PROTECTION INSERTS, MINIMUM THICKNESS OF ONE-EIGHT INCH (1/8"), MADE OF HDPE MEETING ASTM D 1248 CLASS A, CATEGORY 5, TYPE 111. INSERT SHALL INCLUDE A LIFT STRAP AS MANUFACTURED BY KNUTSON MANHOLE INSERTS OR APPROVED OTHER.
21. CONSTRUCT MANHOLES AT EACH END OF MAINS THAT ARE INSTALLED BY OTHER THAN OPEN CUT AND AT EACH END OF AERIAL CROSSING LINES.
22. MANHOLES WILL BE REQUIRED ON SIX-INCH (6") AND LARGER LATERALS WHERE THEY CONNECT TO THE MAIN LINE.
23. MANHOLES WILL BE REQUIRED WHERE WASTEWATER LATERALS INTERSECT WASTEWATER MAINS THAT ARE DEEPER THAN TWELVE FEET (12'). DEEP CUT OR DROP CONNECTIONS SHALL NOT BE PERMITTED.
24. A DOUBLE CLEANOUT SHALL BE INSTALLED ON THE LATERAL AT THE RIGHT-OF-WAY OR EASEMENT LINE. FITTINGS ARE NOT PERMITTED ON LATERALS BETWEEN THE WYE AND THE DOUBLE CLEANOUT.
25. A MINIMUM OF ONE (1) LATERAL PER BUILDING SHALL BE REQUIRED. ALSO, A MINIMUM OF ONE (1) LATERAL PER RESIDENTIAL LOT SHALL BE REQUIRED. SHARED LATERALS ARE NOT PERMITTED UNLESS OTHERWISE APPROVED BY THE PUBLIC WORKS DEPARTMENT.
26. ALL MAINS INSTALLED IN FUTURE DEVELOPED AREAS SHALL INSTALL LATERALS; THE USE OF BOOTS WILL NOT BE PERMITTED.
27. ALL SEWER LATERALS CROSSING WATER MAINS SHALL CONFORM TO THE REQUIREMENTS OF THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) CHAPTER 217 (DESIGN CRITERIA FOR DOMESTIC WASTEWATER SYSTEMS), LATEST REVISION.
28. THE CONTRACTOR SHALL INSTALL AND MAINTAIN WATER TIGHT PLUGS IN ALL CONNECTIONS TO THE TOWN'S SANITARY SEWER SYSTEM UNTIL THE PROJECT IS ACCEPTED BY THE TOWN.
29. ALL SANITARY SEWER LINES AND MANHOLES SHALL BE LEAK TESTED BEFORE THE PROJECT IS ACCEPTED. DEFLECTION TESTING OF PVC SEWER LINES IS REQUIRED.

* LEGEND *

CIRF	IRON ROD WITH CAP FOUND	SV	IRRIGATION CONTROL VALVE
IRF	IRON ROD FOUND		IRRIGATION SPRINKLER HEAD
XCF	"X" CUT FOUND		BOLLARD POST
P.R.D.C.T.	PLAT RECORDS ADDISON COUNTY, TEXAS		SIGN
	CONTROL POINT	RR	RAILROAD SIGNAL
		U	UTILITY RISER/BOX
	PROPERTY CORNER MARKER FOUND - AS NOTED	MH	UTILITY MANHOLE
	PROPERTY CORNER SET	U	UTILITY PULL BOX
	POWER POLE	U	UTILITY METER
	GUY WIRE	UMK	UTILITY LINE MARKER
	LIGHT POLE	W	MONITORING WELL
E	ELECTRIC METER	OHE	OVERHEAD ELEC.
EMK	ELECTRIC LINE MARKER		U.G. ELECTRIC
E	ELECTRIC PULL BOX		U.G. TELE. LINE
E	ELECTRIC MANHOLE	FO	U.G. FIBER OPTIC
	ELECTRIC BOX (PANEL)	CATV	U.G. CABLE TV
	YARD LIGHT	GAS	U.G. GAS
CMK	CATV MARKER	W	U.G. WATER
TV	CATV RISER	SS	U.G. SAN. SEWER
TV	CATV PULL BOX		U.G. STORM SEWER
TV	CATV MANHOLE		CHAIN LINK FENCE
TMK	TELEPHONE MARKER		WOOD FENCE
T	TELEPHONE RISER		WIRE FENCE
T	TELEPHONE MANHOLE		WROUGHT IRON FENCE
T	TELEPHONE PULL BOX		ASPHALT EDGE
FMK	FIBER OPTIC MARKER		CONCRETE AREA
F	FIBER OPTIC PULL BOX		GRAVEL AREA
AC	AC COMPRESSOR UNIT	Ci	CURB INLET
M	MAILBOX	Gi	GRATE INLET
GMK	GAS MARKER	DP	DIESEL PUMP
G	GAS MANHOLE	GP	GASOLINE PUMP
G	GAS METER	OWS	ONE WAY SIGN
G	GAS VALVE	NPS	NO PARKING SIGN
G	GAS TEST STATION	NTS	NO TRUCKS SIGN
		SLS	SPEED LIMIT SIGN
	TREE (AS DESCRIBED)	STS	STOP SIGN
		R/W	RETAINING WALL
	BUSH (GENERAL)	RTS	RIGHT TURN SIGN
		TOS	TURN ONLY SIGN
	CM (CREPE MYRTLE)	TES	TOWING ENFORCED SIGN
W	WATER MANHOLE	X 555.55	SPOT ELEVATION
WM	WATER METER	EC 555.55	EDGE OF CONCRETE ELEVATION
	WATER VALVE	GT 555.55	GUTTER ELEVATION
	WATER FAUCET	TC 555.55	TOP OF CURB ELEVATION
	FIRE HYDRANT	TW 555.55	TOP OF WALL ELEVATION
S	SAN. SEWER MANHOLE		SUBJECT PROPERTY LINE
	SAN. SEWER CLEANOUT		EXISTING EASEMENT LINE
D	STORM DRAIN MANHOLE		BUILDING SETBACK LINE
	INLET RIM		FIRELINE PAINT MARKS
	TRAFFIC SIGNAL LIGHT	1 / 1	INVERT REFERENCE
TR	TRAFFIC SIGNAL BOX		PHOTO LOCATION REFFERNCE
			CANOPY - COVERED AREA

SPECIAL NOTE

1. BEFORE BEING ACCEPTED ALL PVC PLASTIC PIPE CONSTRUCTED SHALL BE TESTED WITH A HYDROSTATIC TEST PRESSURE OF NOT LESS THAN 150 PSI, MAINTAINED OVER A PERIOD OF TIME NOT LESS THAN 4 HOURS UNLESS OTHERWISE SPECIFIED BY THE THE TOWN. SEE SPECIFICATION 506.5 HYDROSTATIC TEST.
2. THE CONTRACTOR MUST NOTIFY THE THE TOWN AT LEAST 48 HOURS IN ADVANCE OF A REQUIRED VALVE SHUTDOWN OR IMPACTS TO THE EXISTING WATER AND SEWER SYSTEM.
3. THE CONTRACTOR MUST NOTIFY THE THE TOWN AT LEAST 5 DAYS IN ADVANCE OF A REQUIRED VALVE SHUTDOWN OR IMPACTS TO THE EXISTING WATER AND SEWER SYSTEM THAT OCCURS **AFTER NORMAL BUSINESS HOURS.**
4. WATER TIE IN CONNECTIONS AFFECTING CURTAILMENT OF QUALITY OR QUANTITY OF WATER TO AN AREA, BUSINESS, ETC. MUST BE PERFORMED DURING THE WEEKEND OR OFF HOURS OR AS DETERMINED TO BE MOST ADVANTAGEOUS TO THE THE TOWN. ALL TIE IN MUST BE COORDINATED THROUGH THE THE TOWN OR ITS REPRESENTATIVE.
5. BEFORE NEWLY CONSTRUCTED WATER PIPELINES/ CONDUITS SHALL BE PERMITTED TO BE PLACED IN SERVICE, IT SHALL BE PURGED AND DISINFECTED (VIA CHLORINATION) AND TESTED FOR BACTERIAL COUNT. DISINFECTION OF THE WATER PIPELINE SHALL BE ACCOMPLISHED BY A "CONTINUOUS FEED" METHOD AS PER AWWA STANDARD C651-92.
6. HIGHLY CHLORINATED WATER USED TO DISINFECT THE NEW WATER LINES CAN BE TOXIC TO LIVING THINGS. THE CHLORINATED WATER SHOULD BE DISCHARGED INTO A SEWER MANHOLE, PROVIDED THE SYSTEM HAS CAPACITY TO HANDLE THE FLOW.
7. GRAVITY SEWER FLEXIBLE PIPE SHALL BE TESTED FOR DEFLECTION NO SOONER THAN 30 DAYS AFTER COMPLETE PIPE PLACEMENT AND COMPACTION OF BACKFILL. DEFLECTION MEASUREMENT REQUIRES A RIGID MANDREL. A RIGID MANDREL SHALL HAVE AN OUTSIDE DIAMETER NOT LESS THAN 95% OF THE BASE INSIDE DIAMETER OF THE PIPE, AS SPECIFIED BY ASTMS, AWWA, UNIBELL AND ANSI. SEE SPEC. 507.5.1.4.1 MANDREL
8. ALL MANHOLES MUST PASS A LEAKAGE TEST, AFTER ASSEMBLY AND BACKFILL.
9. PORTIONS OF THIS PROJECT CONTAIN EXTREMELY DENSE SOIL. REFER TO THE GEOTECHINCAL REPORT BY ALLIANCE TECHNICAL GROUP DATED OCTOBER 5, 2018.

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

FLOODPLAIN NOTE: THE ENTIRE PROJECT IS LOCATED WITHIN ZONE 'X' (AREA OF MINIMAL FLOODING) PER FEMA FIRM MAP 48113C0180K, EFFECTIVE 07/07/2014.

THE LOCATION AND DIMENSIONS OF EXISTING UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. IT IS CONTRACTOR'S SOLE RESPONSIBILITY TO VERIFY LOCATION. DEPTH AND DIMENSION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.

WARNING! UNDERGROUND UTILITIES IN AREA OF CONSTRUCTION. CONTACT THE FOLLOWING AT LEAST 48 HOURS PRIOR TO EXCAVATION IN THIS AREA.

PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS · WM BART HINES · 49126 · REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

GENERAL NOTES
& LEGEND

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: NTS
FILE: 02-GENERAL NOTES.dwg	SHEET NO: 02

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PLOTTED: Jan 02,2020 - 1:52pm
Crystal.Read

TRAFFIC CONTROL PLAN NOTES

1. MAINTENANCE OF TRAFFIC AND TRAFFIC CONTROL MEASURES IMPLEMENTED DURING CONSTRUCTION SHALL BE IN CONFORMANCE WITH THE REQUIREMENTS OF THE LATEST TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) AND THE LATEST TEXAS DEPARTMENT OF TRANSPORTATION (TXDOT) BC, WZ AND TCP STANDARD DRAWINGS OF THE TRAFFIC ENGINEERING STANDARD SHEETS.MAINTENANCE AND PROTECTION OF TRAFFIC SHALL BE PROVIDED IN ACCORDANCE WITH ITEM 502, "BARRICADES, SIGNS, AND TRAFFIC HANDLING", OF THE TEXAS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS, THE TMUTCD, AND ANY PROVISIONS CONTAINED IN THESE PLANS AND CONTRACT DOCUMENTS.
2. THE CONTRACTOR SHALL INSURE THAT ALL IMPLEMENTED TRAFFIC CONTROL MEASURES ARE MAINTAINED IN A CLEAN AND FUNCTIONAL CONDITION AT ALL TIMES, INCLUDING MAINTENANCE DUE TO ACTS OF VANDALISM OR ACCIDENT. THE CONTRACTOR SHALL HAVE ADEQUATE REPLACEMENT TRAFFIC CONTROL DEVICES AVAILABLE AT ALL TIMES TO REPLACE THOSE SO DAMAGED WITHIN 24 HOURS OF NOTIFICATION.
3. THE CONTRACTOR SHALL BE REQUIRED TO MAINTAIN ONE LANE OPEN TO TRAFFIC AT ALL TIMES UNLESS APPROVED BY THE THE TOWN. ANY ADDITIONAL TRAFFIC CONTROL MEASURES REQUIRED TO MEET THESE PROVISIONS SHALL BE SUBSIDIARY TO ITEM 502, "BARRICADES, SIGNS, AND TRAFFIC HANDLING".
4. ACCESS FOR EMERGENCY VEHICLES, SCHOOL BUSES AND UNITED STATES POSTAL DELIVERY SHALL BE MAINTAINED AT ALL TIMES.
5. CONTRACTOR SHALL PLACE PROJECT LIMIT SIGNS PRIOR TO CONSTRUCTION AS REQUIRED BY THE THE TOWN
6. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER A SCHEDULE FOR THE PROPOSED CONSTRUCTION OPERATIONS. THIS SCHEDULE SHALL INCLUDE THE DATES AND DURATION OF EACH PARTIAL ROADWAY AND DRIVEWAY CLOSURE. CONSTRUCTION SHALL NOT BEGIN UNTIL THIS SCHEDULE IS APPROVED IN WRITING BY THE THE TOWN. ONCE CONSTRUCTION BEGINS, ANY CHANGES REQUESTED BY THE CONTRACTOR TO THIS SCHEDULE SHALL REQUIRE WRITTEN APPROVAL FROM THE THE TOWN.
7. NIGHTTIME WORK ON THIS PROJECT SHALL BE REQUIRED IN THE PARKING LOT AREAS OF PARCELS 1, 2, AND 3 (SEE SHEET 05). NIGHTTIME WORK FOR ALL OTHER AREAS WILL REQUIRE A NIGHTTIME WORK PLAN BE SUBMITTED IN WRITING BY THE CONTRACTOR, 48 HOURS IN ADVANCE, AND APPROVED IN WRITING BY THE TOWN FOR WORK FROM SUNSET TO 7:00A.M.
8. THE CONTRACTOR SHALL PROVIDE A LIST OF THE NAMES, ADDRESSES, AND TELEPHONE NUMBERS OF HIS PRIMARY PERSONNEL CONTACTS AND AUTHORIZED REPRESENTATIVES WHO MAY BE CONTACTED AT ALL TIMES IN CASES OF EMERGENCY.
9. THE CONTRACTOR SHALL COVER OR OTHERWISE REMOVE FROM VIEW OF THE TRAVELING PUBLIC EXISTING TRAFFIC SIGNS THAT CONFLICT WITH THE TRAFFIC CONTROL SIGNS OR THE INTENT OF THE TRAFFIC CONTROL. THE COVERING OF EXISTING SIGNS SHALL BE WITH A MATERIAL AS APPROVED BY THE ENGINEER AND ATTACHED TO THE SIGN IN A MANNER WHICH WILL PRESENT A NEAT APPEARANCE AND NOT DAMAGE THE SIGN. ALL WORK AND MATERIALS REQUIRED FOR THE COVERING OF EXISTING SIGNS SHALL BE SUBSIDIARY TO ITEM 502, "BARRICADES, SIGNS, AND TRAFFIC HANDLING".
10. THE CONTRACTOR SHALL NOT PARK HIS EQUIPMENT WITHIN THE RIGHT-OF-WAY OVERNIGHT, WHERE IT IS DEEMED BY THE ENGINEER TO BE A SAFETY HAZARD.
11. VEHICLES BELONGING TO THE CONTRACTOR, SUBCONTRACTORS, OR THEIR EMPLOYEES SHALL NOT USE THE ADJACENT LOCAL ROADS FOR PARKING OR FOR STORING EQUIPMENT AND MATERIALS.
12. CONTRACTOR SHALL COORDINATE THE SEQUENCE OF WORK AND TRAFFIC CONTROL PLAN FOR THIS PROJECT WITH THE SEQUENCE OF WORK AND TRAFFIC CONTROL PLAN OF ANY ADJACENT PROJECTS, IF APPLICABLE, TO INSURE THE UNINTERRUPTED AND SAFE FLOW OF TRAFFIC.
13. THE CONTRACTOR SHALL FULLY COORDINATE HIS WORK WITH THE UTILITY AND PIPELINE COMPANIES IN THE PROJECT AREA.
14. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MAINTAINING TEMPORARY DRAINAGE THROUGHOUT THE PROJECT LIMITS, DURING ALL PHASES OF CONSTRUCTION, IN ORDER TO AVOID CREATING HAZARDOUS ROAD CONDITIONS AND FLOODING OF PROPERTIES ADJACENT TO THE PROJECT AREA.
15. REMOVE EROSION CONTROL MEASURES WHEN 70% OF THE ORIGINAL VEGETATION COVER IS ESTABLISHED, OR AS DIRECTED BY THE THE TOWN.
16. REMOVE TEMPORARY WORK ZONE SIGNS AND CHANNELIZING DEVICES WHEN PROJECT IS ACCEPTED BY THE THE TOWN.
17. THE CONTRACTOR SHALL PREPARE AND SUBMIT A SEQUENCE OF WORK AND TRAFFIC CONTROL PLAN TO THE ENGINEER FOR REVIEW. THE CONTRACTOR SHALL NOT IMPLEMENT ANY SEQUENCE OF WORK WITHOUT THE PRIOR WRITTEN APPROVAL OF THE THE TOWN. THE SEQUENCE OF WORK AND TRAFFIC CONTROL PLAN SHALL BE DESIGNED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF TEXAS. THE CONTRACTOR WILL NOT BE COMPENSATED FOR THE DESIGN OF THE SEQUENCE OF WORK OR TRAFFIC CONTROL PLAN WHETHER ACCEPTED OR REJECTED BY THE THE TOWN AND ANY SUCH EFFORT SHALL BE SUBSIDIARY TO ITEM 502, "BARRICADES, SIGNS, AND TRAFFIC HANDLING".
18. CONTRACTOR SEQUENCE OF WORK DESCRIPTION SERVES AS A GUIDE FOR THE SEQUENCING OF CONSTRUCTION AND THE SAFE HANDLING OF TRAFFIC DURING CONSTRUCTION OF THE PROPOSED IMPROVEMENTS. THE SEQUENCE OF WORK DESCRIPTION DOES NOT ATTEMPT TO ADDRESS EVERY ASPECT OF CONSTRUCTION THAT IS REQUIRED OR COULD BE ENCOUNTERED DURING EACH PHASE OF CONSTRUCTION. THIS DOES NOT, HOWEVER, RELIEVE THE CONTRACTOR FROM HIS SOLE RESPONSIBILITY OF CONSTRUCTING THE PROPOSED IMPROVEMENTS AND PROVIDING FOR THE SAFE HANDLING OF TRAFFIC DURING CONSTRUCTION.
19. ANY CHANGES TO THE TRAFFIC CONTROL PLANS SHALL BE SUBMITTED TO THE TRAFFIC MANAGEMENT AND MAINTENANCE DIVISION ENGINEER IN WRITING WITH APPROPRIATE DRAWINGS AND BASIS FOR CHANGE TWO WEEKS PRIOR TO PROPOSED IMPLEMENTATION. THESE PLANS SHALL BE DRAWN TO AN ACCEPTABLE SCALE ON REPRODUCIBLE MYLARS AND SEALED BY A REGISTERED PROFESSIONAL ENGINEER. THESE PLANS SHALL BE A PART OF THE CONTRACT DRAWINGS AND SHALL NOT BE IMPLEMENTED WITHOUT THE WRITTEN APPROVAL OF THE TOWN STAFF ENGINEER.
20. CONTRACTOR TO COORDINATE THIS TRAFFIC CONTROL WITH OTHER ONGOING PROJECTS.
21. CONTRACTOR SHALL PROVIDE ACCESS TO ALL BUSINESSES AND PRIVATE-RESIDENTIAL PROPERTIES ALONG THIS PROJECT AT ALL TIMES DURING CONSTRUCTION UNLESS OTHERWISE AUTHORIZED IN WRITING BY THE ENGINEER.
22. ANY EXCAVATED PAVEMENT EXPOSED TO TRAFFIC DURING NON-WORKING HOURS SHALL BE COVERED WITH ANCHORED STEEL PLATES.
23. AT CORNERS WHERE CONSTRUCTION FENCE OR CONSTRUCTION TRAFFIC CONTROL DEVICES ARE INSTALLED, CONTRACTOR SHALL MAKE SURE THAT EXISTING TRAFFIC SIGNALS ARE NOT BLOCKED FROM MOTORISTS FIELD OF VIEW.
24. MATERIALS, EXCAVATED OR OTHERWISE, SHALL NOT BE STOCKPILED SO AS TO BLOCK DRAINAGE PATTERNS.
25. CONTRACTOR SHALL RESTORE ALL ITEMS NOT SPECIFICALLY INCLUDED IN STREET RECONSTRUCTION, WHICH ARE DISTURBED DURING INSTALLATION OF TEMPORARY TRAFFIC CONTROL, TO ORIGINAL OR BETTER CONDITION. IE. THE CONTRACTOR SHALL REPLACE ANY PAVEMENT MARKING, DRIVEWAYS, SIGNS ETC. THAT ARE REMOVED OR DAMAGED DURING CONSTRUCTION.
26. AN APPROVED SET OF TRAFFIC CONTROL PLANS AND SIDEWALK CLOSURE PERMIT SHALL BE AVAILABLE FOR INSPECTION ON JOB SITE AT ALL TIMES.
27. REQUEST FOR SIDEWALK, LANE OR COMPLETE STREET CLOSURES, SHALL BE DIRECTED TO PUBLIC WORKS AND TRANSPORTATION 48-HOURS IN ADVANCE OF SUCH CLOSURE. PERMISSION MAY BE OBTAINED BY CALLING OUR TRAFFIC CONSTRUCTION COORDINATOR. CLOSURE OF TRAFFIC LANES AND SIDEWALKS ALONG ANY PUBLIC ROADWAY SHALL BE SUBMITTED TO THE TOWN STAFF FOR APPROVAL.
28. CONTRACTOR SHALL INSTALL ORANGE PLASTIC CONSTRUCTION FENCING (3 FEET TALL MINIMUM) AROUND ALL OPEN EXCAVATION OR AS DIRECTED BY THE ENGINEER. SUCH FENCE SHALL NOT OBSTRUCT SIGHT LINES OF THE TRAVELING PUBLIC.
29. THESE SUGGESTED TRAFFIC CONTROL PLANS SERVE AS A GUIDE FOR THE SEQUENCING OF CONSTRUCTION TO MAINTAIN TRAFFIC FLOW DURING CONSTRUCTION OR THE PROPOSED IMPROVEMENTS. THESE SUGGESTED TRAFFIC CONTROL PLANS DO NOT ATTEMPT TO ADDRESS EVERY ASPECT OF THE CONSTRUCTION THAT IS REQUIRED OR COULD BE ENCOUNTERED DURING EACH PHASE OF CONSTRUCTION. THIS DOES NOT, HOWEVER, RELIEVE THE CONTRACTOR FROM HIS SOLE RESPONSIBILITY OF CONSTRUCTING THE PROPOSED IMPROVEMENTS AND PROVIDING FOR THE SAFE HANDLING OF TRAFFIC DURING CONSTRUCTION.
30. THE CONTRACTOR SHALL REMOVE ALL EXISTING PAVEMENT MARKINGS IN DETOUR AREAS TO AVOID CONFLICTS WITH TEMPORARY PAVEMENT MARKINGS, AS DIRECTED BY ENGINEER. DETOURS OUTSIDE THE PROJECT LIMITS THAT ROUTE TRAFFIC AROUND A CLOSED ROADWAY SHALL UTILIZE EXISTING PAVEMENT MARKINGS.

TRAFFIC GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" AND THE TOWN OF ADDISON'S ADDENDUM THERETO.
2. BEFORE BEGINNING CONSTRUCTION, THE CONTRACTOR SHALL PREPARE A CONSTRUCTION SEQUENCE AND CONSTRUCTION SCHEDULE. THE CONSTRUCTION SCHEDULE SHALL BE SUCH THAT THERE IS MINIMUM INTERFERENCE WITH TRAFFIC ALONG OR ADJACENT TO THE PROJECT.
3. CONSTRUCTION MAY NOT BE BEGUN EARLIER THAN 7:00 A.M. ON WEEKDAYS NOR CONTINUED AFTER DARK WITHOUT PERMISSION FROM THE THE TOWN. CONSTRUCTION ON SATURDAY MAY NOT BE BEGUN BEFORE 8:00 A.M. AND WORK ON SUNDAY IS PROHIBITED WITHOUT SPECIAL PERMISSION FROM THE THE TOWN.
4. UTILITIES SHOWN ON THE PLANS WERE TAKEN FROM FIELD SURVEYS AND INFORMATION PROVIDED BY THE UTILITY COMPANIES. THE COMPLETENESS AND THE ACCURACY OF THIS DATA IS NOT GUARANTEED. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES AND PROTECTING THEM FROM DAMAGE DURING CONSTRUCTION. CONTACT TEXAS ONE CALL SYSTEM 1-800-245-4545 AT LEAST 48 HOURS BEFORE EXCAVATING.
5. WORK MAY NOT BE BACKFILLED OR COVERED UNTIL IT HAS BEEN INSPECTED BY THE THE TOWN.
6. MATERIAL TESTING SHALL BE PERFORMED BY AN INDEPENDENT TESTING LABORATORY AND PAID FOR BY THE CONTRACTOR.
7. ALL EXCAVATION ON THE PROJECT IS UNCLASSIFIED.
8. UTILITY COMPANIES AND CONTRACTORS SHALL OBTAIN A STREET CUT PERMIT BEFORE DISTURBING ANY PAVEMENT IN PUBLIC RIGHT-OF-WAY.
9. THE CONTRACTOR SHALL MAINTAIN ONE LANE OF TRAFFIC ALONG BELTWAY DRIVE AND BELTWOOD PARKWAY.
10. REMOVE, SALVAGE AND REPLACE ALL STREET AND TRAFFIC CONTROL SIGNS WHICH MAY BE DAMAGED BY THE CONSTRUCTION OF THE PROJECT.
11. ALL TRENCHING AND EXCAVATION SHALL BE PERFORMED IN ACCORDANCE WITH OSHA STANDARDS.

GRADING NOTES

1. TOP SOIL SHALL NOT BE REMOVED FROM RESIDENTIAL LOTS OR USED AS SPOIL, BUT SHALL BE STRIPPED AND REDISTRIBUTED SO AS TO PROVIDE AT LEAST SIX (6) INCHES OF COVER ON THE LOTS, PARKWAYS AND MEDIANS. PERMANENT EROSION CONTROL MEASURES SHALL BE PROVIDED THROUGHOUT THE DEVELOPMENT PRIOR TO FINAL ACCEPTANCE OF THE IMPROVEMENTS.
2. TEMPORARY EROSION CONTROL SHALL BE USED TO MINIMIZE THE SPREAD OF SILT AND MUD FROM THE PROJECT ON TO EXISTING STREETS, ALLEYS, DRAINAGE WAYS AND PUBLIC AND PRIVATE PROPERTY. TEMPORARY EROSION CONTROLS MAY INCLUDE SILT FENCES, STRAW BALES, BERMS, DIKES, SWALES, STRIPS OF UNDISTURBED VEGETATION, CHECK DAMS AND OTHER METHODS AS REQUIRED BY THE TOWN ADMINISTRATOR OR HIS REPRESENTATIVE AND AS SPECIFIED IN THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS CONSTRUCTION (N.C.T.C.O.G) BMP MANUAL.
3. ALL STREET RIGHTS-OF-WAY, REGARDLESS OF SLOPE; ALL FINISHED GRADE SLOPES THAT ARE STEEPER THAN 6: 1; AND THE FLOW LINES OF ALL DRAINAGE DITCHES AND SWALES SHALL BE COMPLETELY COVERED WITH EROSION CONTROL MATTING AS SPECIFIED IN THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS CONSTRUCTION (N.C.T.C.O.G) BMP MANUAL.
4. GRASS SHALL BE ESTABLISHED ON THE SLOPES OF ALL DRAINAGE CHANNELS THAT ARE STEEPER THAN 6: 1. GRASS SHALL MEET THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS OF THE TEXAS DEPARTMENT OF TRANSPORTATION.
5. ALL PERMEABLE SURFACES WITHIN THE DEVELOPMENT SHALL BE GRADED TO A SMOOTH AND UNIFORM APPEARANCE THAT CAN BE EASILY MOWED WITH A SMALL RESIDENTIAL RIDING LAWN MOWER.

PAVING NOTES

1. ALL EMBANKMENT SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.
2. ALL STREETS AND ALLEYS SHALL BE PLACED ON LIME STABILIZED SUBGRADE WITH A LIME CONTENT OF NOT LESS THAN 6%.
3. THE MINIMUM 28 DAY COMPRESSIVE STRENGTH OF CONCRETE STREET PAVING SHALL NOT BE LESS THAN 4,000 PSI AND SHALL BE AIR ENTRAINED. WATER MAY NOT BE APPLIED TO THE SURFACE OF CONCRETE PAVING TO IMPROVE WORKABILITY.
4. ALL CURB AND GUTTER SHALL BE INTEGRAL WITH THE PAVEMENT.
5. PARABOLIC CROWNS ARE REQUIRED ON ALL STREET PAVEMENT EXCEPT ON MAJOR THOROUGHFARES WHERE STRAIGHT SECTIONS ARE REQUIRED.
6. STREETS AND ALLEYS SHALL BE CONSTRUCTED WITH PROVISIONS FOR SIDEWALK RAMPS AT ALL INTERSECTIONS.
7. ALL CONCRETE PAVEMENT, SHALL BE CONSTRUCTED WITH 8" 4,000 PSI CONCRETE WITH #3 REBAR ON 18 INCH CENTERS IN BOTH DIRECTIONS.
8. ALTERNATE BID ITEM, OF CONCRETE PAVEMENT IN PRIVATE DRIVEWAYS, MAY BE CONSTRUCTED WITH 8" HIGH EARLY STRENGTH CONCRETE. FLY ASH MAY NOT BE USED IN CONCRETE MIX DESIGN WHERE HIGH EARLY STRENGTH IS DESIRED.

DRAINAGE NOTES

1. STORM SEWER PIPE SHALL BE REINFORCED CONCRETE, CLASS III UNLESS OTHERWISE NOTED.
2. ALL STRUCTURAL CONCRETE SHALL BE CLASS "C" (4,000 P.S.I. COMPRESSIVE STRENGTH AT 28 DAYS), AIR ENTRAINED.
3. THE CONTRACTOR SHALL INSTALL PLUGS IN STORM SEWER LINES OR OTHERWISE PREVENT MUD FROM ENTERING THE STORM SEWER SYSTEM DURING CONSTRUCTION.

WARRANTY NOTES

1. THE CONTRACTOR SHALL MAINTAIN THE REQUIRED PUBLIC IMPROVEMENTS FOR A PERIOD OF TWO (2) YEARS FOLLOWING ACCEPTANCE BY THE TOWN AND SHALL PROVIDE A MAINTENANCE BOND IN THE AMOUNT OF 100% OF THE COSTS OF THE IMPROVEMENTS.
2. THIRTY DAYS PRIOR TO THE EXPIRATION OF THE WARRANTY, THE CONTRACTOR SHALL NOTIFY THE TOWN OF THE APPROACHING END OF THE TWO-YEAR WARRANTY. IN THE EVENT THE CONTRACTOR FAILS TO NOTIFY THE TOWN OF THE END OF WARRANTY, THE WARRANTY AND BOND SHALL AUTOMATICALLY BE EXTENDED TO END THIRTY DAYS AFTER NOTICE OF END-OF-WARRANTY IS FILED WITH THE TOWN.

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

FLOODPLAIN NOTE: THE ENTIRE PROJECT IS LOCATED WITHIN ZONE 'X' (AREA OF MINIMAL FLOODING) PER FEMA FIRM MAP 48113C0180K, EFFECTIVE 07/07/2014.

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PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED
PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

TRAFFIC NOTES

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'H; 1"=4'V
FILE: 02-GENERAL NOTES.dwg	SHEET NO: 03

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Town of Addison

Wastewater Basin I Sewer Outfall Re-route and Water Improvements

Beltway Drive From Midway Rd. To Parking Lot- Beltwood Parkway (2550LF)

Bid Number 19-59

Pay Items and Bid Quantitites

Pay Item No.	Item Description	Unit	Sanitary Sheet 07	Sanitary Sheet 08	Sanitary Sheet 09	Sanitary Sheet 10	Sanitary Sheet 11	Sanitary Sheet 12	Sanitary Sheet 13	Sanitary Sheet 14	Water - Sheet 19	Water - Sheet 20	Water - Sheet 21	Pvmt - Sheet 25	Pvmt - Sheet 26	Pvmt - Sheet 27	Pvmt - Sheet 28	Calc. Total	Bid Total
1	Mobilization & Demobilization / Clean up	LS																	1
2	Traffic Control Plan	LS																	1
3	Project Signs	EA																	2
4	Barricade, Signs, Traffic Control and Pavement Markings	LS																	1
5	Site Protection and Site Preparation	LS																	1
6	Construction Staking	LS																	1
7	Stabilized Construction Entrance	EA																	2
8	Temporary Erosion, Sedimentation Control	LS																	1
9	Inlet Protection	EA												3	2	0	4	9	9
10	Trench Safety Plan for Wastewater Pipelines	LF	310	300	350	400	425	425	338	82								2630	2630
11	8" PVC SS Pipe (SDR 35) by Open Cut- Day Time Const.	LF								82								82	82
12	15" PVC SS Pipe (SDR 26) by Open Cut- Daytime Const.	LF	310	300	350	400	344											1704	1704
13	15" PVC SS Pipe (SDR 26) by Open Cut- Nighttime const.	LF					81	425	338									844	844
14	Jumper Pipe on Beltway	LS			1													1	1
15	New Stand. 5' Dia SSMH with Epoxy Lining	EA	1	1	3	1	2	1	4	1								14	14
16	Rehabiliate Existing SSMH	EA							1									1	1
17	Extra Depth SSMH with Epoxy Lining	VF	9.3	11.4	39.6	14.8	21.8	5.4	22.1	2.6								127	128
18	Temp. Bypass Pump & FM	LS							1									1	1
19	Trench Safety Plan for Water Pipelines	LF									375	325	198					898	
20	Remove and Replace existing WL Pipeline with 8" PVC (DR 18) by Open Cut - Day Time Const.	LF									331							331	331
21	8" PVC WL Pipe (DR 18) by Open Cut- Nighttime Const.	LF									94	325	148					567	
22	12" Dia Steel Encasement Pipe by Open Cut	LF									43							43	43
23	8" Resilient Gate Valve Assembly	EA									1	1	3					5	5
24	Cut & Plug exist. Water Line	LS									2		2					4	4
25	Various Water Fittings, Tees & Bends	Ton									0.2	0.2	0.2					1	1
26	New Water Service Line Assembly	EA									1							1	1
27	Cement Stabilized backfill embedment, as directed	CY	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5					6	6
28	Perm. Concrete Repair of Pvmt. At 8" thickness	SY												582	1303	1087	791	3763	3763
29	Temp Asphalt Paving & Flex Base	CY																100	100
30	Curb & Gutter Replace & Repair, as directed	LF														10	60	70	70
31	Sidewalk Replace or Repair, as directed	LF														11	4	15	15
32	High Early Stength (HES) Concrete misc., as directed	CY	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	1	1	1	10	10
33	Sod Replacement, as directed	SY															13	13	13
34	Permananet Pavement Markings, as directed	LF												317	650	464	113	1544	1544
35	Remove and Replace Fence	LF															20	20	20
36	Misc. Repairs/ Contingency	LS																1	1
Alt. 1	Extra Cost for using High Early Strength Concrete HES for all Permananet Concrete Repair of Pavement as per Bid Item 28	SY												582	1303	1087	791	3763	3763

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
94126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PAY ITEMS AND BID QUANTITIES

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: NTS
FILE: 02-GENERAL NOTES.dwg	SHEET NO: 04

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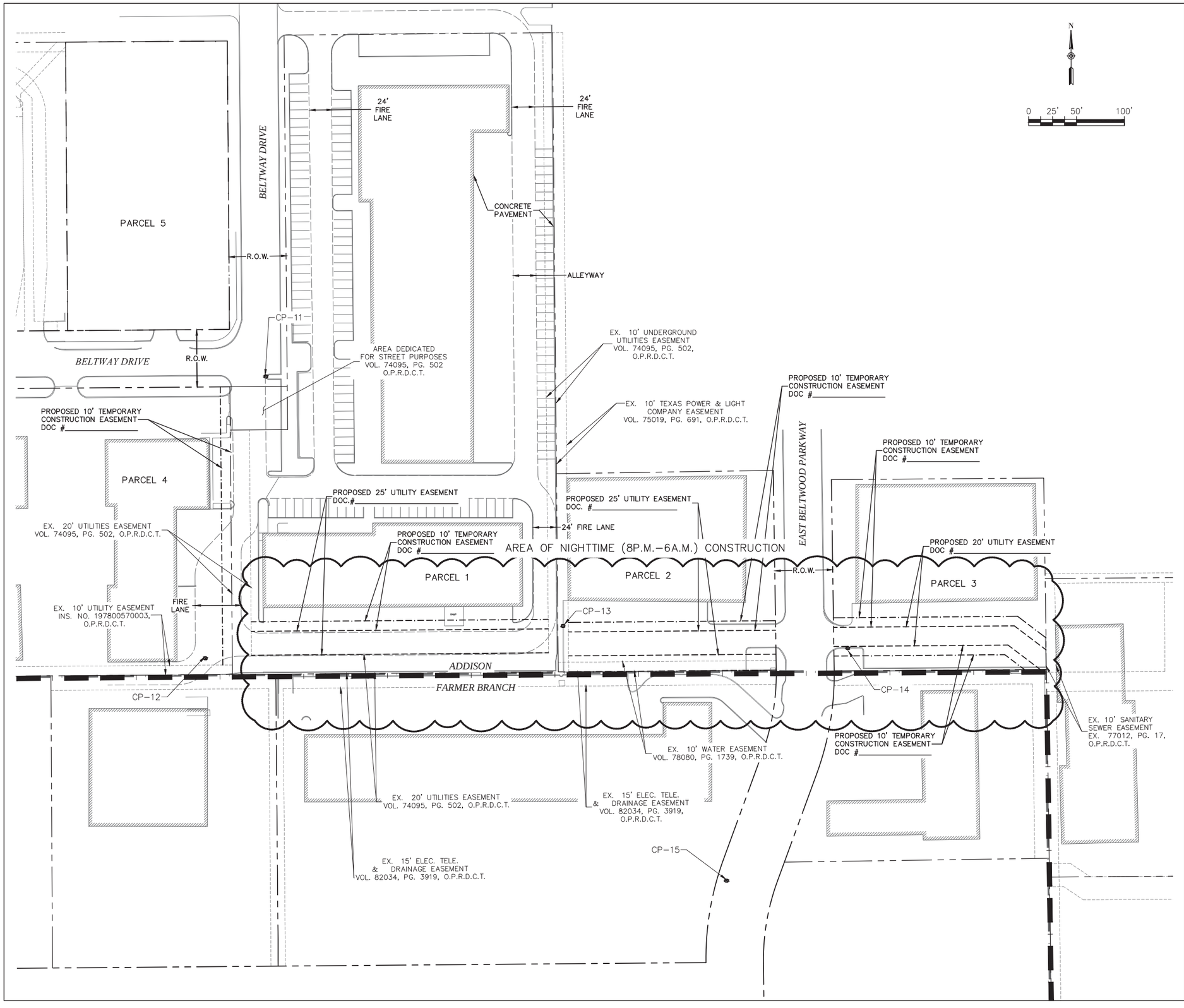

LEGEND

- R.O.W LINE/PROPERTY LINE
- EXISTING EASEMENT
- PROPOSED EASEMENT
- TEMPORARY CONSTRUCTION EASEMENT
- TOWN LIMITS

NOTE:
THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ANY TEMPORARY RIGHT OF WAY/LAND RIGHTS, FOR THE DURATION OF THE CONTRACT, FOR THE PURPOSE OF A STAGING AREA: STORING OF EQUIPMENT AND MATERIAL, EMPLOYEE PARKING, ETC. THE TOWN OF ADDISON IS NOT SUPPLYING A STAGING AREA FOR THIS PROJECT.

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PROPOSED EASEMENTS

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=50'
FILE: 04 EASEMENTS.dwg	SHEET NO: 05

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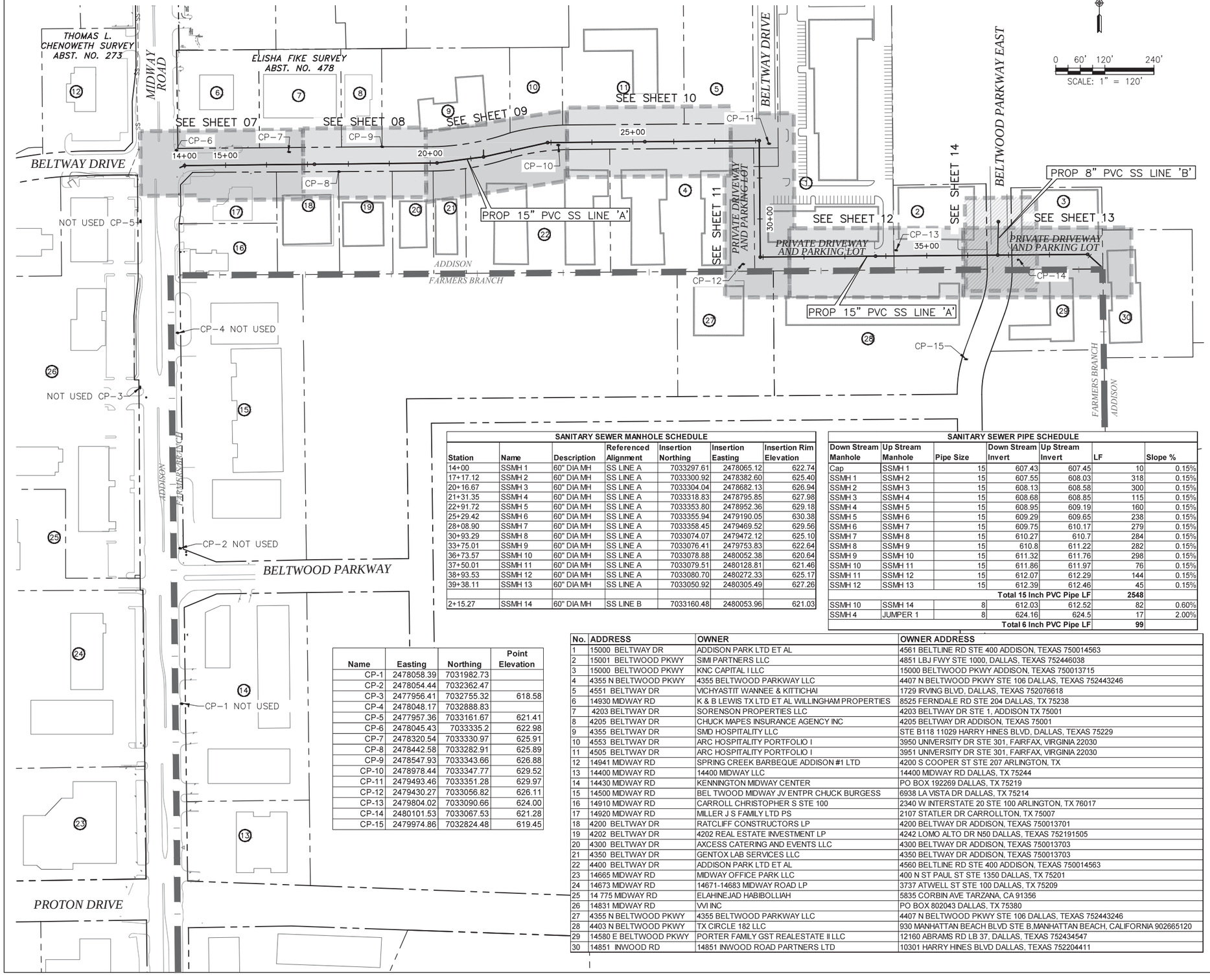

SANITARY SEWER MANHOLE SCHEDULE

Station	Name	Description	Referenced Alignment	Insertion Northing	Insertion Easting	Insertion Rim Elevation
14+00	SSMH 1	60" DIA MH	SS LINE A	7033297.61	2478065.12	622.74
17+17.12	SSMH 2	60" DIA MH	SS LINE A	7033300.92	2478382.60	625.40
20+16.67	SSMH 3	60" DIA MH	SS LINE A	7033304.04	2478682.13	626.94
21+31.35	SSMH 4	60" DIA MH	SS LINE A	7033318.83	2478795.85	627.98
22+91.72	SSMH 5	60" DIA MH	SS LINE A	7033353.80	2478952.36	629.18
25+29.42	SSMH 6	60" DIA MH	SS LINE A	7033355.94	2479190.05	630.38
28+08.90	SSMH 7	60" DIA MH	SS LINE A	7033358.45	2479469.52	629.56
30+93.29	SSMH 8	60" DIA MH	SS LINE A	7033074.07	2479472.12	625.10
33+75.01	SSMH 9	60" DIA MH	SS LINE A	7033076.41	2479753.83	622.64
36+73.57	SSMH 10	60" DIA MH	SS LINE A	7033078.88	2480052.38	620.64
37+50.01	SSMH 11	60" DIA MH	SS LINE A	7033079.51	2480128.81	621.46
38+93.53	SSMH 12	60" DIA MH	SS LINE A	7033080.70	2480272.33	625.17
39+38.11	SSMH 13	60" DIA MH	SS LINE A	7033050.92	2480305.49	627.26
2+15.27	SSMH 14	60" DIA MH	SS LINE B	7033160.48	2480053.96	621.03

SANITARY SEWER PIPE SCHEDULE

Down Stream Manhole	Up Stream Manhole	Pipe Size	Down Stream Invert	Up Stream Invert	LF	Slope %
Cap	SSMH 1	15	607.43	607.45	10	0.15%
SSMH 1	SSMH 2	15	607.55	608.03	318	0.15%
SSMH 2	SSMH 3	15	608.13	608.58	300	0.15%
SSMH 3	SSMH 4	15	608.68	608.85	115	0.15%
SSMH 4	SSMH 5	15	608.95	609.19	160	0.15%
SSMH 5	SSMH 6	15	609.29	609.65	238	0.15%
SSMH 6	SSMH 7	15	609.75	610.17	279	0.15%
SSMH 7	SSMH 8	15	610.27	610.7	284	0.15%
SSMH 8	SSMH 9	15	610.8	611.22	282	0.15%
SSMH 9	SSMH 10	15	611.32	611.76	298	0.15%
SSMH 10	SSMH 11	15	611.86	611.97	76	0.15%
SSMH 11	SSMH 12	15	612.07	612.29	144	0.15%
SSMH 12	SSMH 13	15	612.39	612.46	45	0.15%
			Total 15 Inch PVC Pipe LF		**2548**	
SSMH 10	SSMH 14	8	612.03	612.52	82	0.60%
SSMH 4	JUMPER 1	8	624.16	624.5	17	2.00%
			Total 6 Inch PVC Pipe LF		**99**	

Name	Easting	Northing	Point Elevation
CP-1	2478058.39	7031982.73	
CP-2	2478054.44	7032362.47	
CP-3	2477956.41	7032755.32	618.58
CP-4	2478048.17	7032888.83	
CP-5	2477957.36	7033161.67	621.41
CP-6	2478045.43	7033335.2	622.98
CP-7	2478320.54	7033330.97	625.91
CP-8	2478442.58	7033282.91	625.89
CP-9	2478547.93	7033343.66	626.88
CP-10	2478978.44	7033347.77	629.52
CP-11	2479493.46	7033351.28	629.97
CP-12	2479430.27	7033056.82	626.11
CP-13	2479804.02	7033090.66	624.00
CP-14	2480101.53	7033067.53	621.28
CP-15	2479974.86	7032824.48	619.45

No.	ADDRESS	OWNER	OWNER ADDRESS
1	15000 BELTWAY DR	ADDISON PARK LTD ET AL	4561 BELTLINE RD STE 400 ADDISON, TEXAS 750014563
2	15001 BELTWOOD PKWY	SIMI PARTNERS LLC	4851 LBJ FWY STE 1000, DALLAS, TEXAS 752446038
3	15000 BELTWOOD PKWY	KNC CAPITAL I LLC	15000 BELTWOOD PKWY ADDISON, TEXAS 750013715
4	4355 N BELTWOOD PKWY	4355 BELTWOOD PARKWAY LLC	4407 N BELTWOOD PKWY STE 106 DALLAS, TEXAS 752443246
5	4551 BELTWAY DR	VICHYASTIT WANNEE & KITTICHAI	1729 IRVING BLVD, DALLAS, TEXAS 752076618
6	14930 MIDWAY RD	K & B LEWIS TX LTD ET AL WILLINGHAM PROPERTIES	8525 FERNDALE RD STE 204 DALLAS, TX 75238
7	4203 BELTWAY DR	SORENSON PROPERTIES LLC	4203 BELTWAY DR STE 1, ADDISON TX 75001
8	4205 BELTWAY DR	CHUCK MAPES INSURANCE AGENCY INC	4205 BELTWAY DR ADDISON, TEXAS 75001
9	4355 BELTWAY DR	SMD HOSPITALITY LLC	STE B118 11029 HARRY HINES BLVD, DALLAS, TEXAS 75229
10	4553 BELTWAY DR	ARC HOSPITALITY PORTFOLIO I	3950 UNIVERSITY DR STE 301, FAIRFAX, VIRGINIA 22030
11	4505 BELTWAY DR	ARC HOSPITALITY PORTFOLIO I	3951 UNIVERSITY DR STE 301, FAIRFAX, VIRGINIA 22030
12	14941 MIDWAY RD	SPRING CREEK BARBEQUE ADDISON #1 LTD	4200 S COOPER ST STE 207 ARLINGTON, TX
13	14400 MIDWAY RD	14400 MIDWAY LLC	14400 MIDWAY RD DALLAS, TX 75244
14	14430 MIDWAY RD	KENNINGTON MIDWAY CENTER	PO BOX 192269 DALLAS, TX 75219
15	14500 MIDWAY RD	BEL TWOOD MIDWAY JV ENTPR CHUCK BURGESS	6938 LA VISTA DR DALLAS, TX 75214
16	14910 MIDWAY RD	CARROLL CHRISTOPHER S STE 100	2340 W INTERSTATE 20 STE 100 ARLINGTON, TX 76017
17	14920 MIDWAY RD	MILLER J S FAMILY LTD PS	2107 STATLER DR CARROLLTON, TX 75007
18	4200 BELTWAY DR	RATCLIFF CONSTRUCTORS LP	4200 BELTWAY DR ADDISON, TEXAS 750013701
19	4202 BELTWAY DR	4202 REAL ESTATE INVESTMENT LP	4242 LOMO ALTO DR N50 DALLAS, TEXAS 752191505
20	4300 BELTWAY DR	AXCESS CATERING AND EVENTS LLC	4300 BELTWAY DR ADDISON, TEXAS 750013703
21	4350 BELTWAY DR	GENTOX LAB SERVICES LLC	4350 BELTWAY DR ADDISON, TEXAS 750013703
22	4400 BELTWAY DR	ADDISON PARK LTD ET AL	4560 BELTLINE RD STE 400 ADDISON, TEXAS 750014563
23	14665 MIDWAY RD	MIDWAY OFFICE PARK LLC	400 N ST PAUL ST STE 1350 DALLAS, TX 75201
24	14673 MIDWAY RD	14671-14683 MIDWAY ROAD LP	3737 ATWELL ST STE 100 DALLAS, TX 75209
25	14 775 MIDWAY RD	ELAHINEJAD HABIBOLLIAH	5835 CORBIN AVE TARZANA, CA 91356
26	14831 MIDWAY RD	VVI INC	PO BOX 802043 DALLAS, TX 75380
27	4355 N BELTWOOD PKWY	4355 BELTWOOD PARKWAY LLC	4407 N BELTWOOD PKWY STE 106 DALLAS, TEXAS 752443246
28	4403 N BELTWOOD PKWY	TX CIRCLE 182 LLC	930 MANHATTAN BEACH BLVD STE B,MANHATTAN BEACH, CALIFORNIA 902665120
29	14580 E BELTWOOD PKWY	PORTER FAMILY GST REALESTATE II LLC	12160 ABRAMS RD LB 37, DALLAS, TEXAS 752434547
30	14851 INWOOD RD	14851 INWOOD ROAD PARTNERS LTD	10301 HARRY HINES BLVD DALLAS, TEXAS 752204411

LEGEND

- R.O.W LINE/PROPERTY LINE
- SHEET LAYOUT
- TOWN LIMITS
- (X) PROPERTY IDENTIFICATION NUMBER

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
89126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

SANITARY SEWER
SHEET LAYOUT

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=120'
FILE: SSWR_LAYOUT.dwg	SHEET NO: 06

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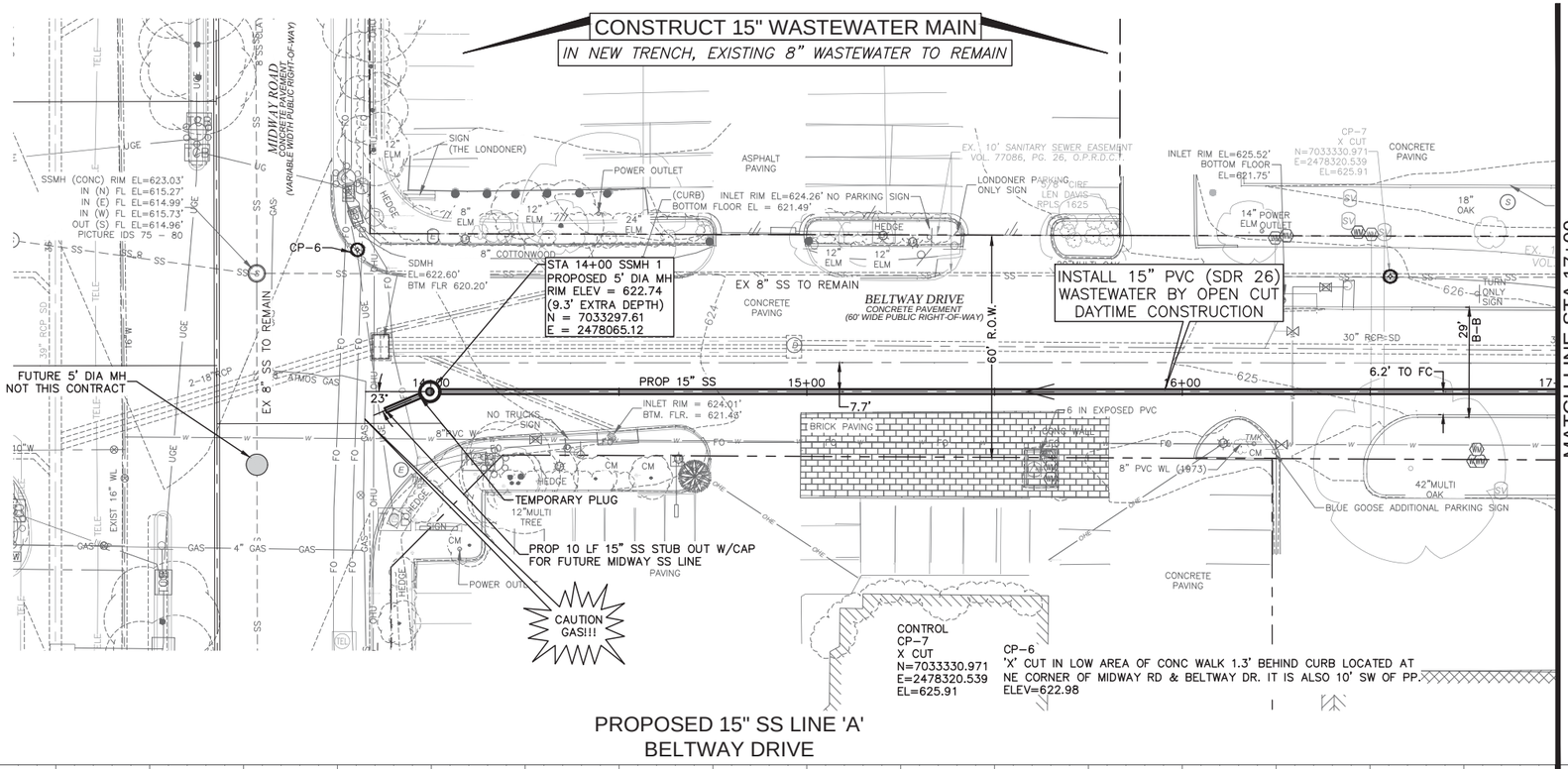
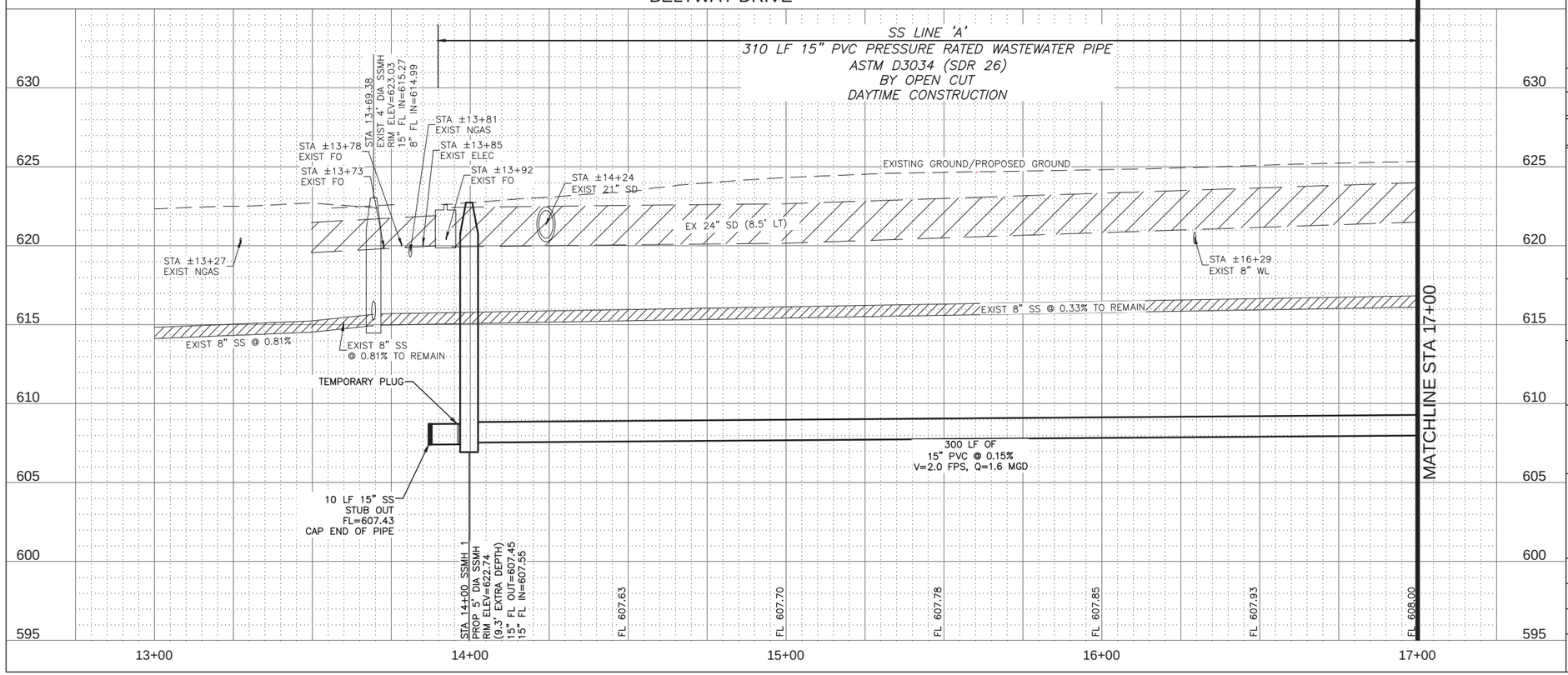


PROPOSED 15" SS LINE 'A'
BELTWAY DRIVE



SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

FLOODPLAIN NOTE: THE ENTIRE PROJECT IS LOCATED WITHIN ZONE 'X' (AREA OF MINIMAL FLOODING) PER FEMA FIRM MAP 48113C0180K, EFFECTIVE 07/07/2014.

THE LOCATION AND DIMENSIONS OF EXISTING UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. IT IS CONTRACTOR'S SOLE RESPONSIBILITY TO VERIFY LOCATION. DEPTH AND DIMENSION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.

WARNING! UNDERGROUND UTILITIES IN AREA OF CONSTRUCTION. CONTACT THE FOLLOWING AT LEAST 48 HOURS PRIOR TO EXCAVATION IN THIS AREA.

PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PROPOSED 15" SS
LINE 'A' PLAN & PROFILE
BEGIN-STA 17+00

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'H; 1"=5'V
FILE: SSWR_PnP_1.dwg	SHEET NO: 07

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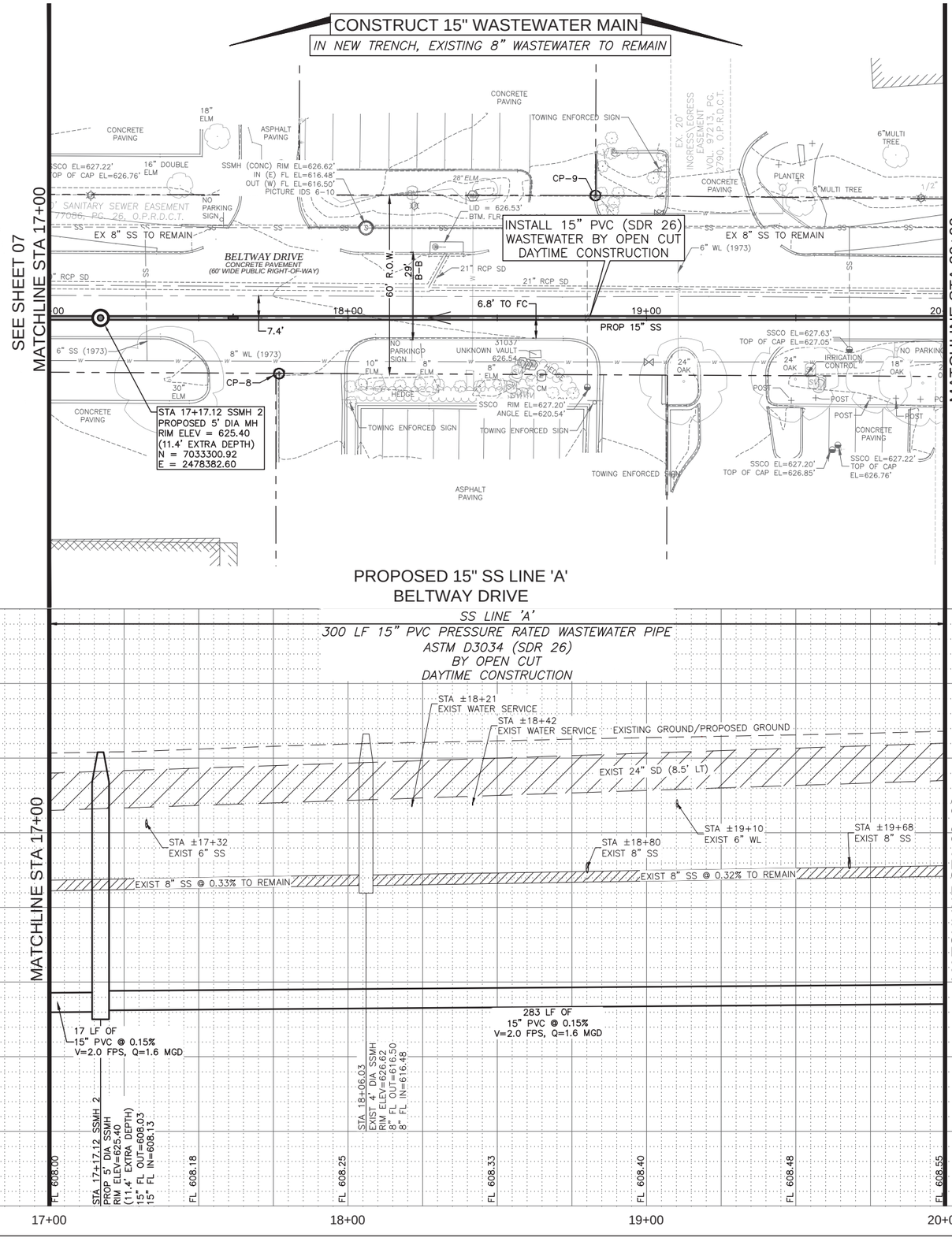

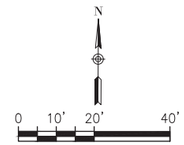

SPECIAL NOTES
CONTRACTOR MUST HAVE AN APPROVED TRENCH SAFETY AND SHORING DESIGN, SEE ADDITIONAL NOTES SHEET 02.

AT LEAST ONE LANE OF TRAFFIC IS TO REMAIN OPEN ON BELTWAY DRIVE AT ALL TIMES, SEE ADDITIONAL TRAFFIC NOTES SHEET 03.

CP-8	CP-9
'X' CUT	'X' CUT
N=7033282.9139	N=7033343.6603
E=2478442.5775	E=2478547.9288
ELEVATION =625.89	ELEVATION 626.88

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

FLOODPLAIN NOTE: THE ENTIRE PROJECT IS LOCATED WITHIN ZONE 'X' (AREA OF MINIMAL FLOODING) PER FEMA FIRM MAP 48113C0180K, EFFECTIVE 07/07/2014.

THE LOCATION AND DIMENSIONS OF EXISTING UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. IT IS CONTRACTOR'S SOLE RESPONSIBILITY TO VERIFY LOCATION. DEPTH AND DIMENSION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.

WARNING! UNDERGROUND UTILITIES IN AREA OF CONSTRUCTION. CONTACT THE FOLLOWING AT LEAST 48 HOURS PRIOR TO EXCAVATION IN THIS AREA.

PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PROPOSED 15" SS
LINE 'A' PLAN & PROFILE
STA 17+00-20+00

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'H; 1"=5'V
FILE: SSWR_PnP_1.dwg	SHEET NO: 08

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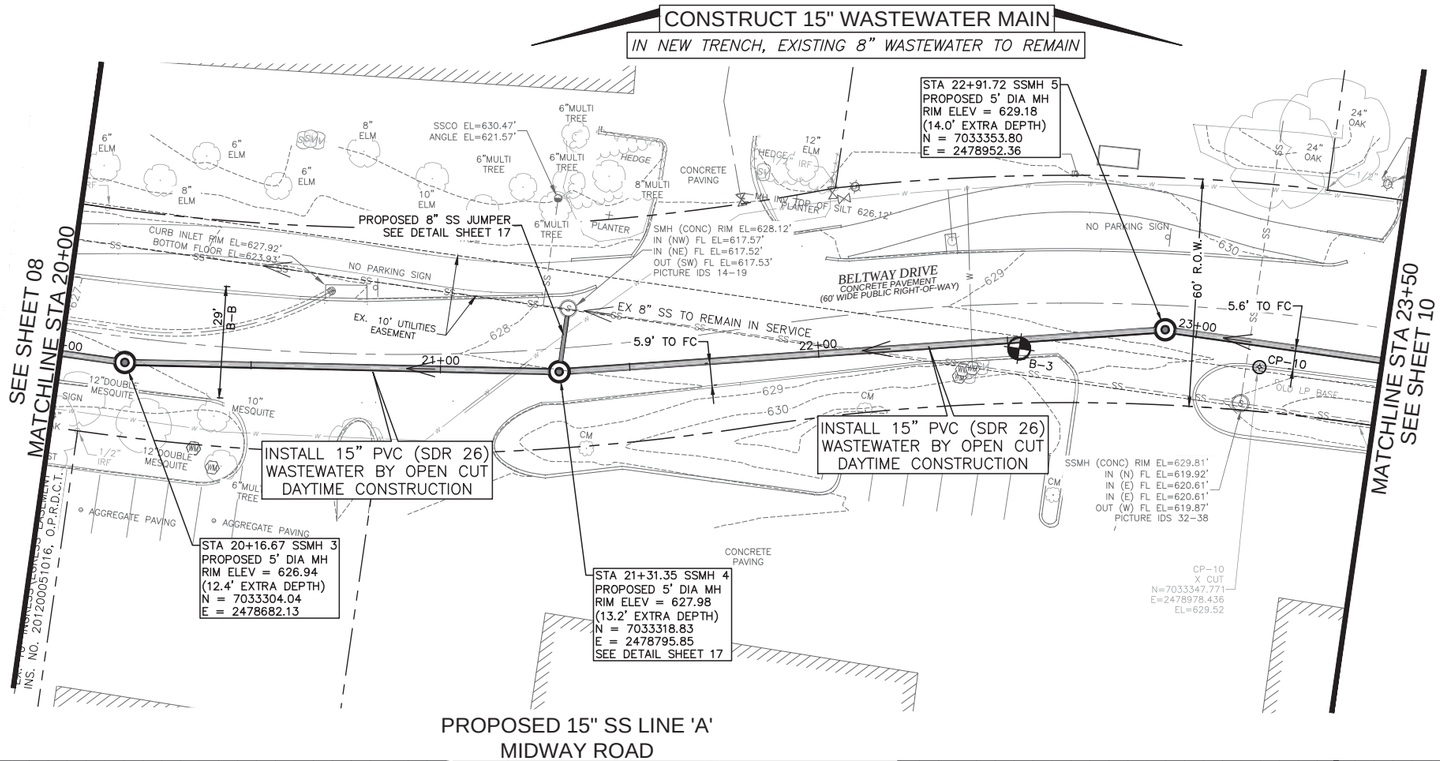
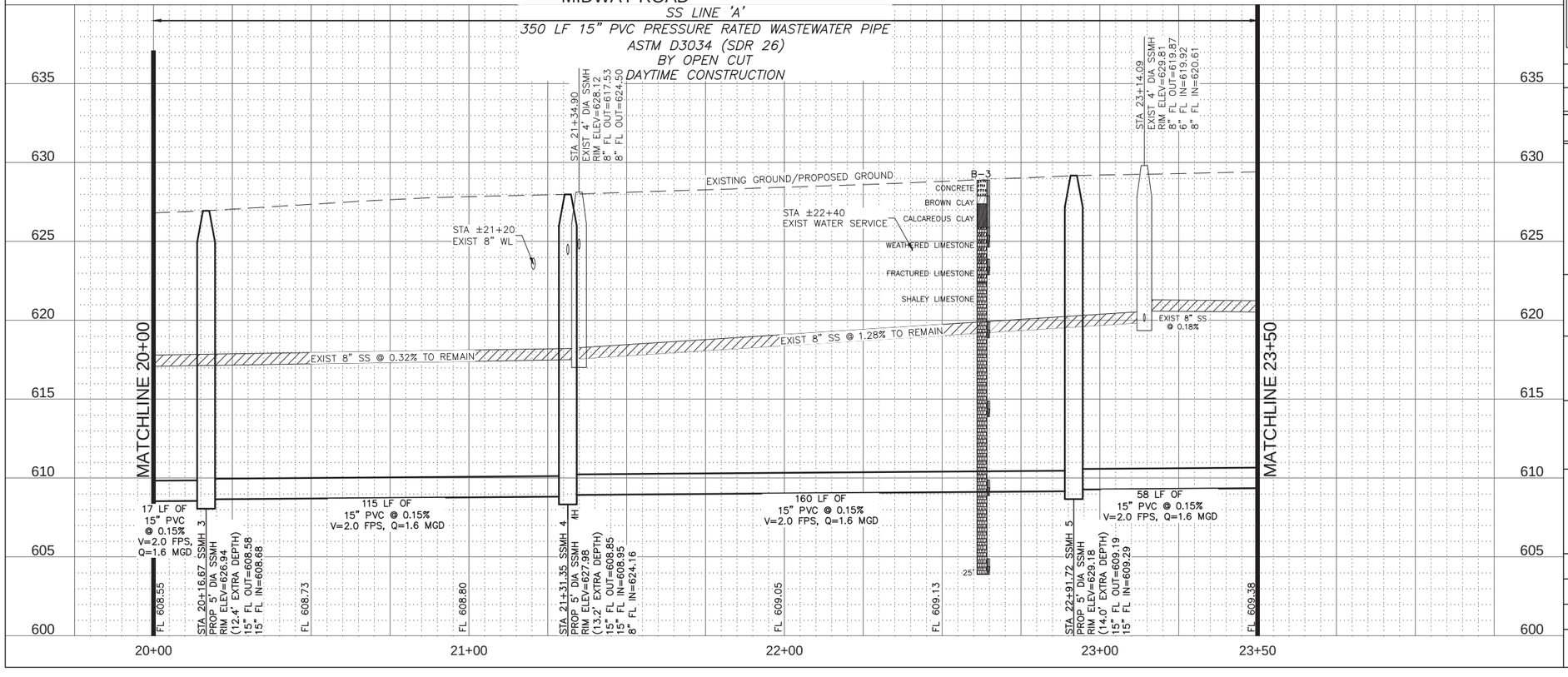


PROPOSED 15" SS LINE 'A'
MIDWAY ROAD



SPECIAL NOTES
CONTRACTOR MUST HAVE AN APPROVED TRENCH SAFETY AND SHORING DESIGN, SEE ADDITIONAL NOTES SHEET 02.

CONTRACTOR SHOULD NOTE THE PRESENCE OF LIMESTONE ROCK LAYER

AT LEAST ONE LANE OF TRAFFIC IS TO REMAIN OPEN ON BELTWAY DRIVE AT ALL TIMES, SEE ADDITIONAL TRAFFIC NOTES SHEET 03.

CONTROL
CP-10
X CUT
N=7033347.771
E=2478978.436
EL=629.52

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

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WARNING! UNDERGROUND UTILITIES IN AREA OF CONSTRUCTION. CONTACT THE FOLLOWING AT LEAST 48 HOURS PRIOR TO EXCAVATION IN THIS AREA.

PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PROPOSED 15" SS
LINE 'A' PLAN & PROFILE
STA 20+00-23+50

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'H; 1"=5'V
FILE: SSWR_PnP_2.dwg	SHEET NO: 09

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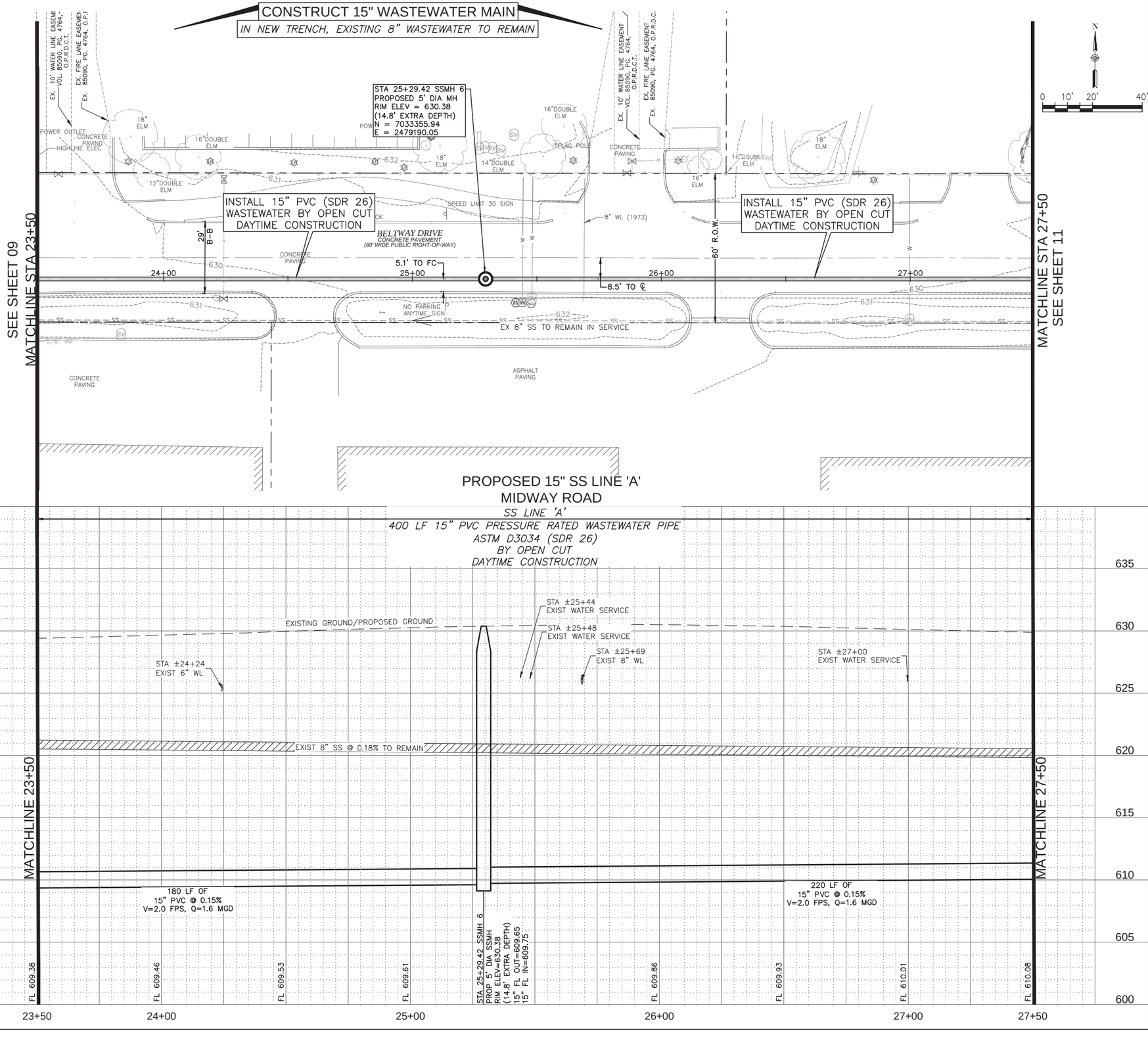

SPECIAL NOTES
CONTRACTOR MUST HAVE AN APPROVED TRENCH SAFETY AND SHORING DESIGN, SEE ADDITIONAL NOTES SHEET 02.

AT LEAST ONE LANE OF TRAFFIC IS TO REMAIN OPEN ON BELTWAY DRIVE AT ALL TIMES, SEE ADDITIONAL TRAFFIC NOTES SHEET 03.

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

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WARNING! UNDERGROUND UTILITIES IN AREA OF CONSTRUCTION. CONTACT THE FOLLOWING AT LEAST 48 HOURS PRIOR TO EXCAVATION IN THIS AREA.

PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
91126
REGISTERED
PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PROPOSED 15" SS
LINE 'A' PLAN & PROFILE
STA 23+50-27+50

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'H; 1"=5'V
FILE: SSWR_PnP_2.dwg	SHEET NO: 10

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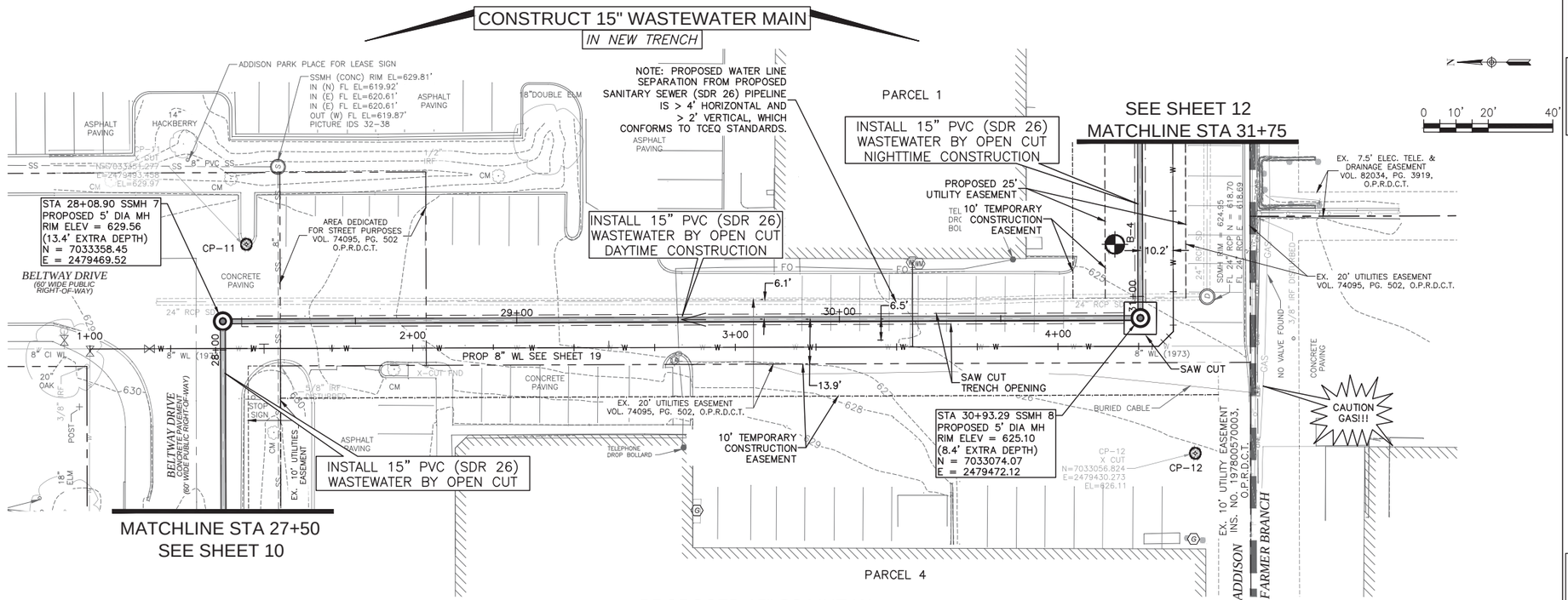
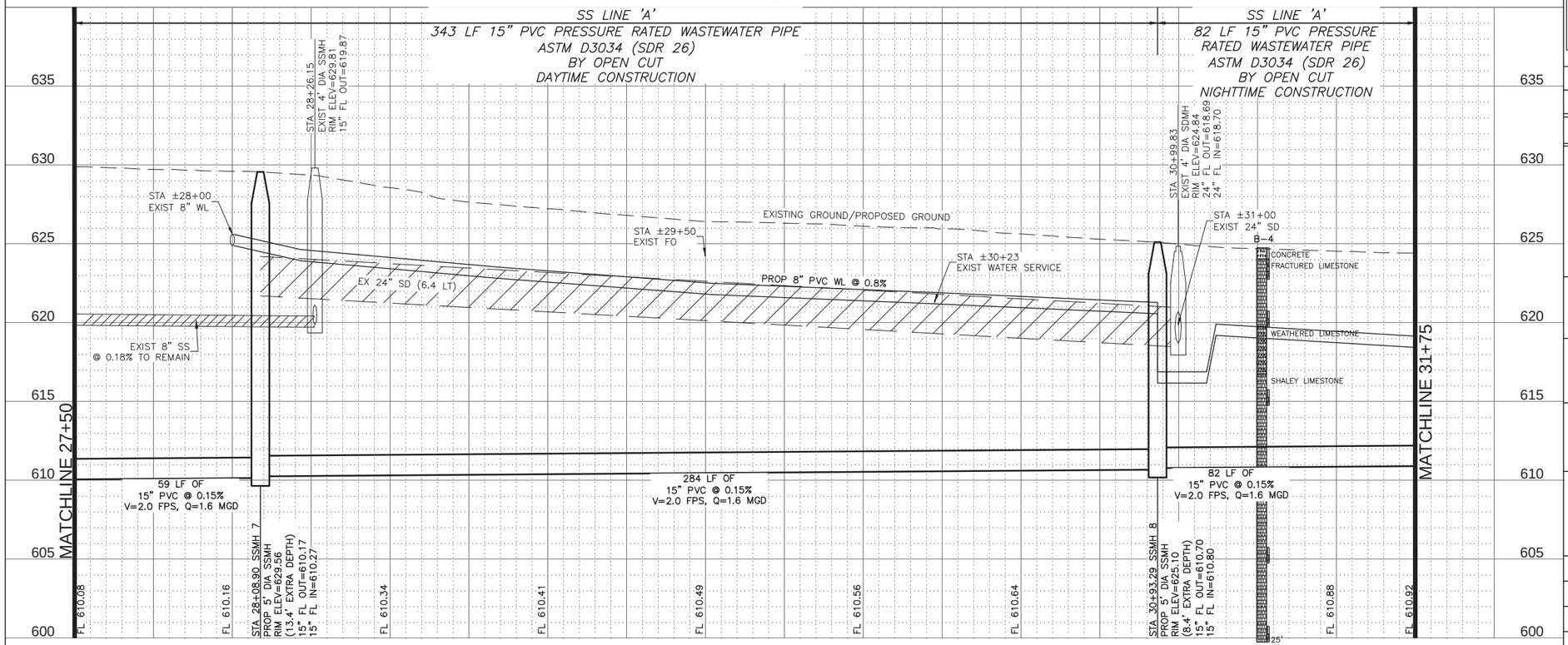


PROPOSED 15" SS LINE 'A'
PRIVATE DRIVE



ATTENTION :
THE CONTRACTOR SHALL NOT DO ANY WORK OR CONSTRUCTION IN THE FARMER'S BRANCH CITY LIMITS. PLEASE CONTACT THE TOWN OF ADDISON STAFF IF THERE IS ANY QUESTION REGARDING WORK THAT IMPACTS IN THE FARMERS BRANCH CITY LIMITS.

SPECIAL NOTES
CONTRACTOR MUST HAVE AN APPROVED TRENCH SAFETY AND SHORING DESIGN, SEE ADDITIONAL NOTES SHEET 02.

AT LEAST ONE LANE OF TRAFFIC IS TO REMAIN OPEN ON BELTWAY DRIVE AT ALL TIMES, SEE ADDITIONAL TRAFFIC NOTES SHEET 03.

ATTENTION :
FOR INSTALLATION OF SS LINE 'A' FROM STA 30+99 TO 39+45, THE CONTRACTOR SHALL BE RESTRICTED TO WORK HOURS BETWEEN 8:00 P.M. TO 6:00 A.M. THE CONTRACTOR SHALL BACKFILL OR PLACE STEEL PLATES OVER WORKING AREA TO ALLOW FOR VEHICLE TRAFFIC AND DELIVERY TRUCKS TO ACCESS LOADING DOCKS AND SERVICE AREAS.

SPECIAL NOTE:
STA 29+09 TO 39+38 SAW CUT PAVEMENT PER WASTEWATER MAIN EMBEDMENT DETAIL SHEET 15

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

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WARNING! UNDERGROUND UTILITIES IN AREA OF CONSTRUCTION. CONTACT THE FOLLOWING AT LEAST 48 HOURS PRIOR TO EXCAVATION IN THIS AREA.

PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED
PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PROPOSED 15" SS
LINE 'A' PLAN & PROFILE
STA 27+50-31+75

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'H; 1"=5'V
FILE: SSWR_PnP_2.dwg	SHEET NO: 11

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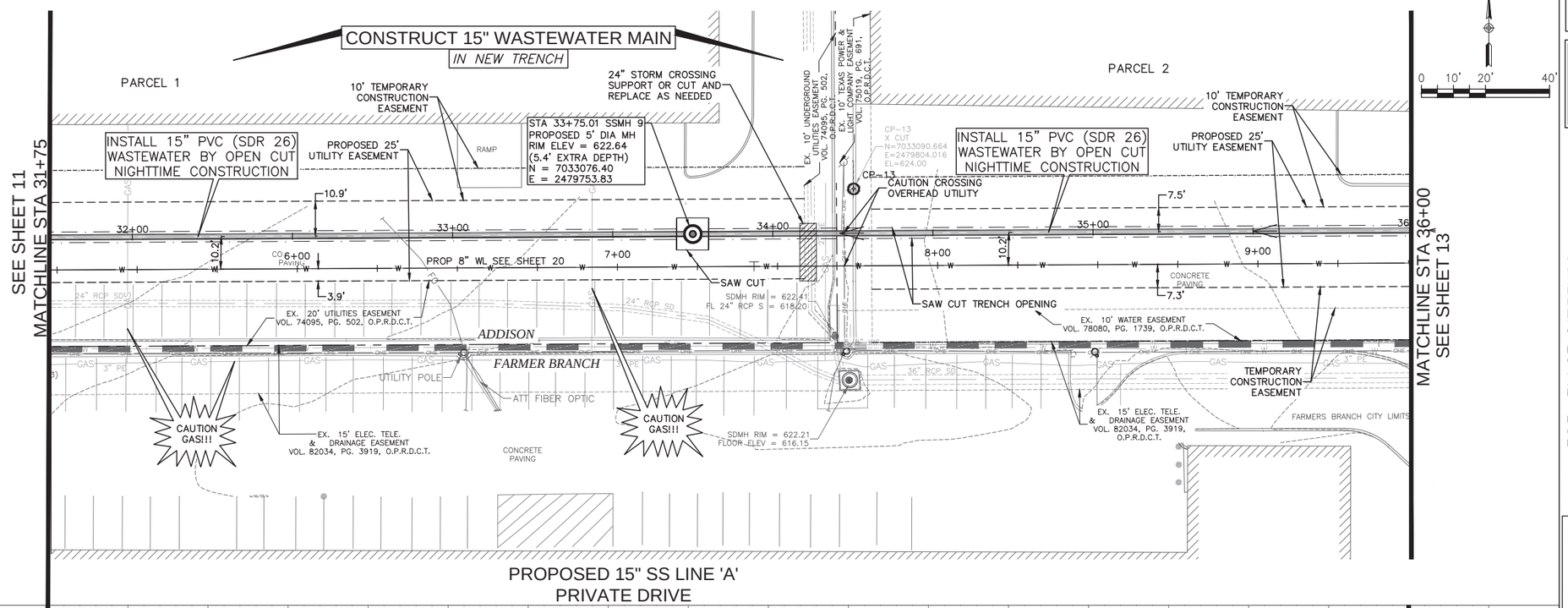
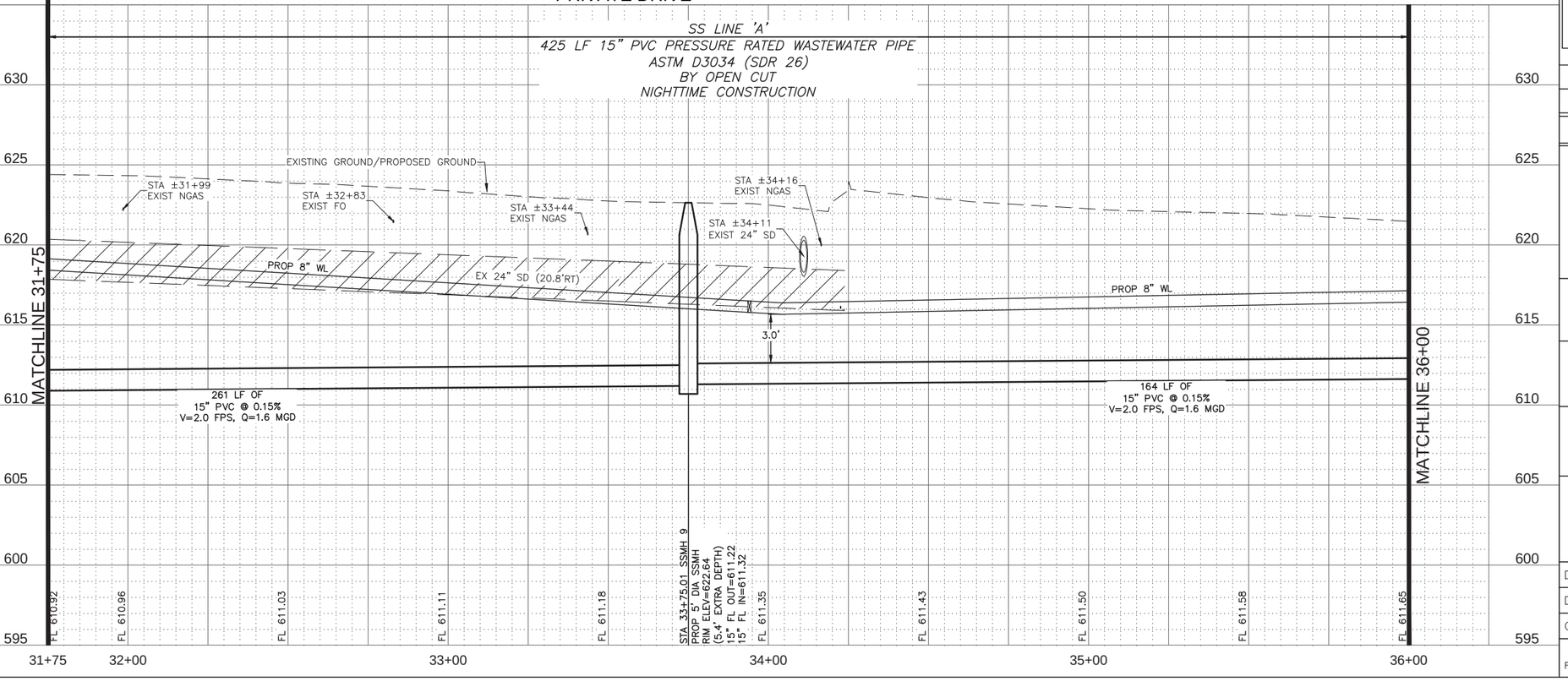


PROPOSED 15" SS LINE 'A'
PRIVATE DRIVE



ATTENTION :
THE CONTRACTOR SHALL NOT DO ANY WORK OR CONSTRUCTION IN THE FARMER'S BRANCH CITY LIMITS. PLEASE CONTACT THE TOWN OF ADDISON STAFF IF THERE IS ANY QUESTION REGARDING WORK THAT IMPACTS IN THE FARMERS BRANCH CITY LIMITS.

ATTENTION :
FOR INSTALLATION OF SS LINE 'A' FROM STA 30+99 TO 39+45, THE CONTRACTOR SHALL BE RESTRICTED TO WORK HOURS BETWEEN 8:00 P.M. TO 6:00 A.M. THE CONTRACTOR SHALL BACKFILL OR PLACE STEEL PLATES OVER WORKING AREA TO ALLOW FOR VEHICLE TRAFFIC AND DELIVERY TRUCKS TO ACCESS LOADING DOCKS AND SERVICE AREAS.

SPECIAL NOTE:
STA 29+09 TO 39+38 SAW CUT PAVEMENT PER WASTEWATER MAIN EMBEDMENT DETAIL SHEET 15

CONTROL
CP-13
X CUT
N=7033090.664
E=2479804.016
EL=624.00
SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

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WARNING! UNDERGROUND UTILITIES IN AREA OF CONSTRUCTION. CONTACT THE FOLLOWING AT LEAST 48 HOURS PRIOR TO EXCAVATION IN THIS AREA.

PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
89126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PROPOSED 15" SS
LINE 'A' PLAN & PROFILE
STA 31+75-36+00

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'H; 1"=5'V
FILE: SSWR_PnP_2.dwg	SHEET NO: 12

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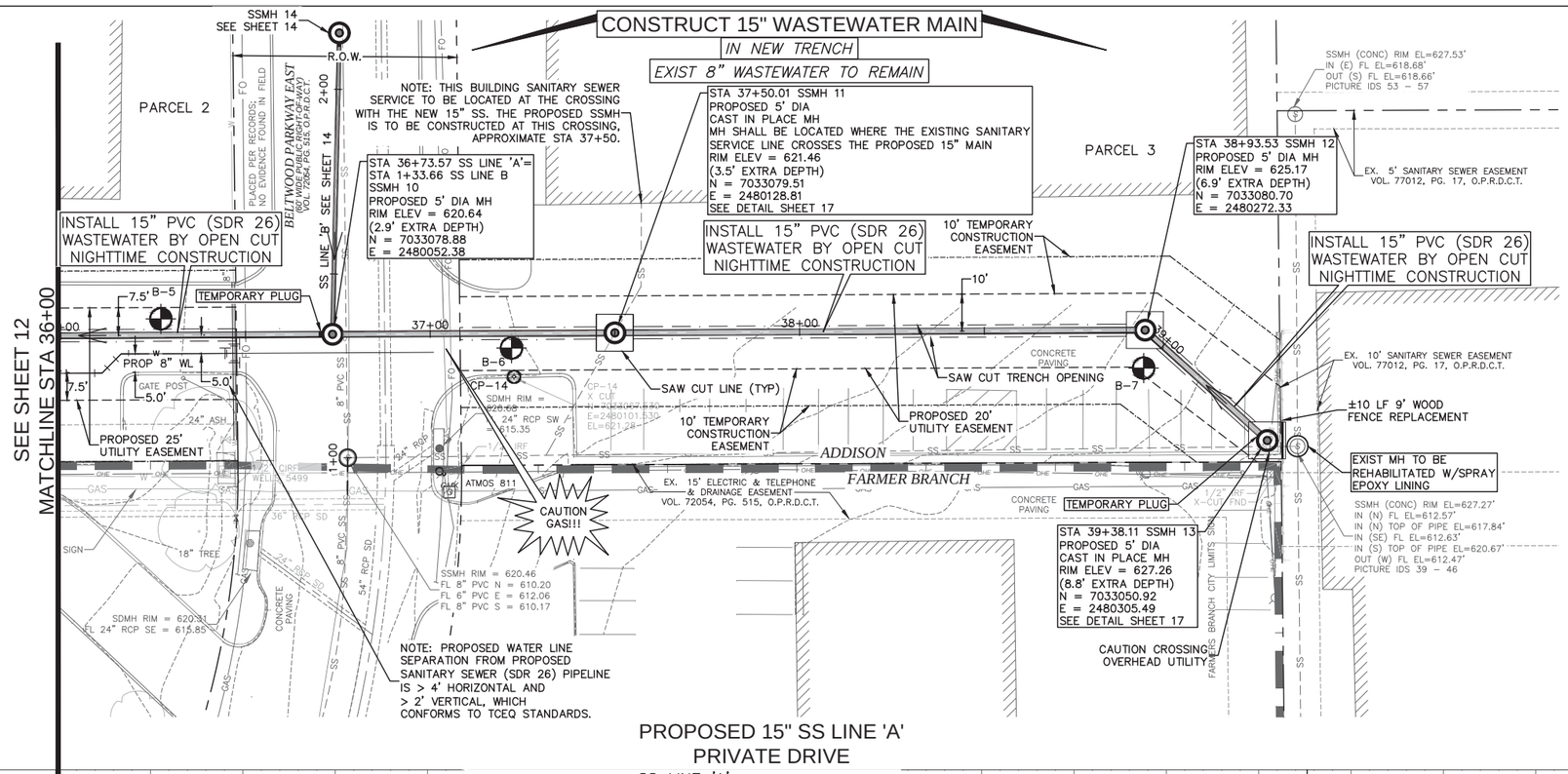

ATTENTION :
THE CONTRACTOR SHALL NOT DO ANY WORK OR CONSTRUCTION IN THE FARMER'S BRANCH CITY LIMITS. PLEASE CONTACT THE TOWN OF ADDISON STAFF IF THERE IS ANY QUESTION REGARDING WORK THAT IMPACTS IN THE FARMERS BRANCH CITY LIMITS.

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SPECIAL NOTE:
STA 29+09 TO 39+38 SAW CUT PAVEMENT PER WASTEWATER MAIN EMBEDMENT DETAIL SHEET 15

CONTROL
CP-14
X CUT
N=7033067.530
E=2480101.530
EL=621.28

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PROPOSED 15" SS
LINE 'A' PLAN & PROFILE
STA 36+00-END

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'H; 1"=5'V
FILE: SSWR_PnP_2.dwg	SHEET NO: 13

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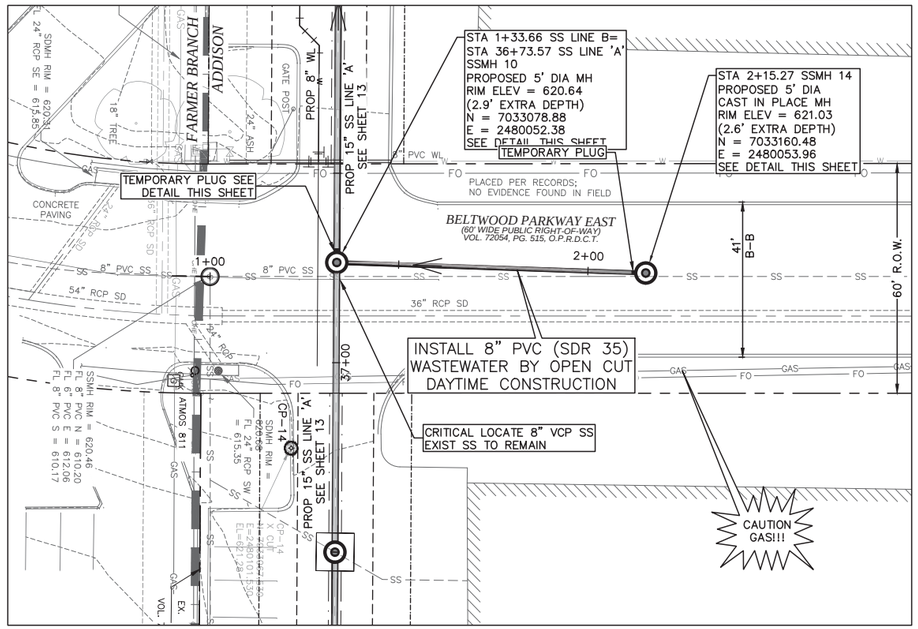
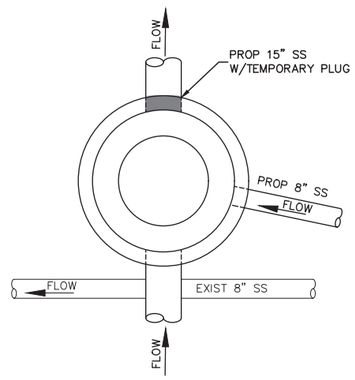
Crystal.Read
..\VREF\Border\xbdf.dwg
..\VREF\DEC\X_5131-01_Exist Base.dwg
..\civil 3d\5131-01-pipe network.dwg

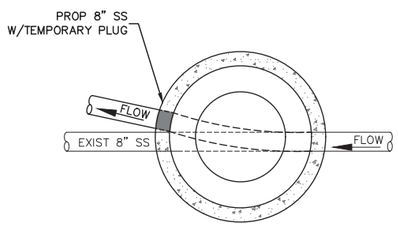
CONSTRUCT 8" WASTEWATER MAIN
IN PARALLEL TRENCH TO EXISTING 8" WASTEWATER
EXISTING 8" WASTEWATER TO REMAIN



PROPOSED 8" SS LINE 'B'
BELTWOOD PARKWAY EAST



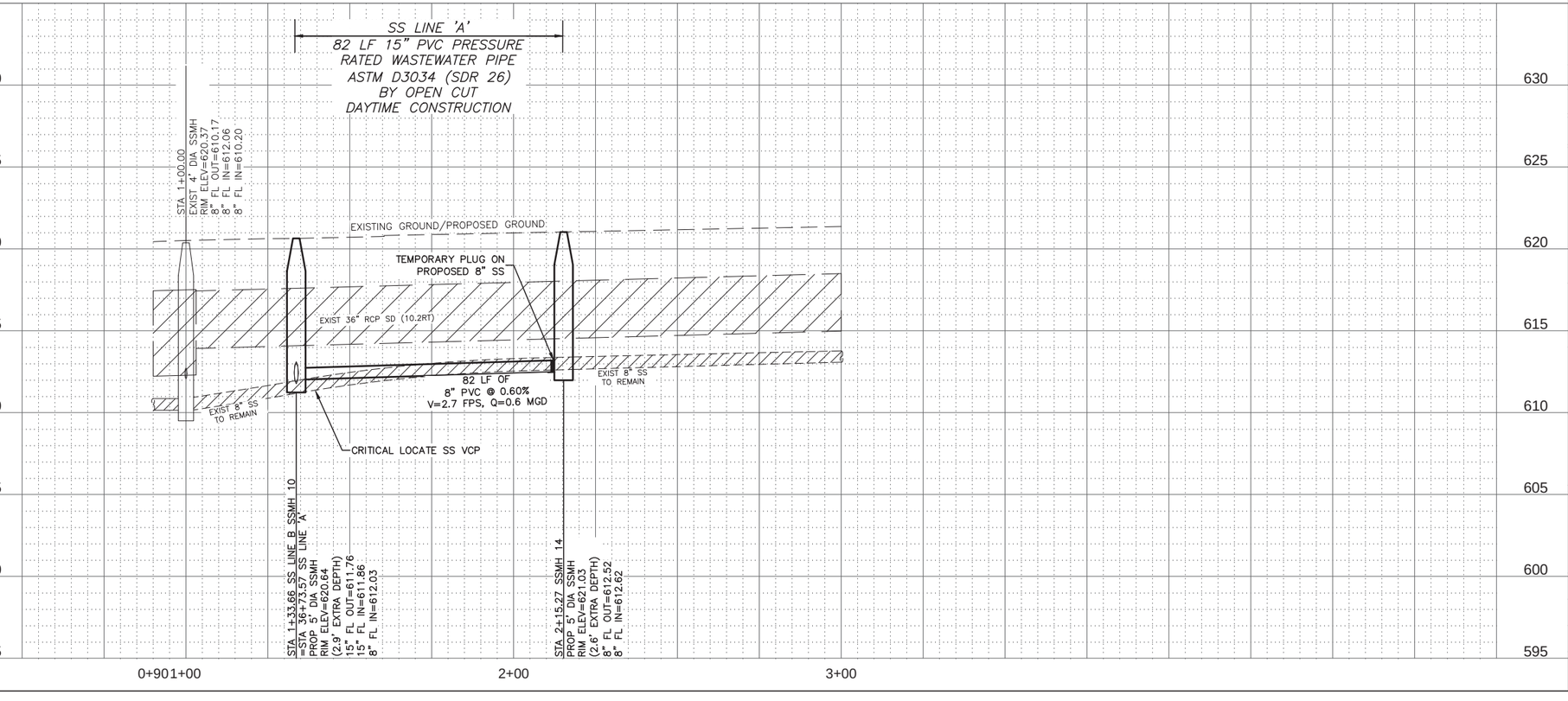
PROPOSE 5' SSMH
STA 1+34
SSMH 10



PROPOSE 5' SSMH
STA 2+15
SSMH 14

NOTE:
1. CONTRACTOR TO BUILD NEW MH, AT STA 2+15, AROUND EXISTING 8" SS MAIN W/WATER TIGHT FITTING.
2. THE CONTRACTOR MUST PREPARE A CONCRETE BENCH THAT WILL CHANNEL FLOW TO NEW 8" SS
3. DO NOT CUT EXISTING 8" SEWER MAIN.

LINE 'B' MANHOLE DETAILS
NTS



ATTENTION :
THE CONTRACTOR SHALL NOT DO ANY WORK OR CONSTRUCTION IN THE FARMER'S BRANCH CITY LIMITS. PLEASE CONTACT THE TOWN OF ADDISON STAFF IF THERE IS ANY QUESTION REGARDING WORK THAT IMPACTS IN THE FARMERS BRANCH CITY LIMITS.

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PROPOSED 8" SS
LINE 'B' PLAN & PROFILE

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

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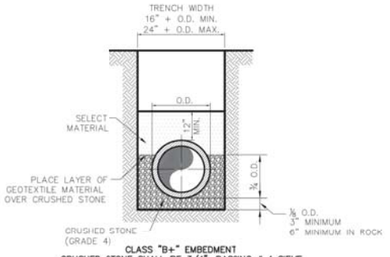
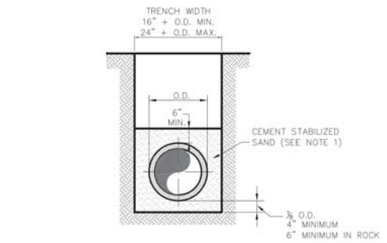
..\civil 3d\5131-01-pipe network.dwg



CLASS "B+" EMBEDMENT
CRUSHED STONE SHALL BE 3/4", PASSING # 4 SIEVE

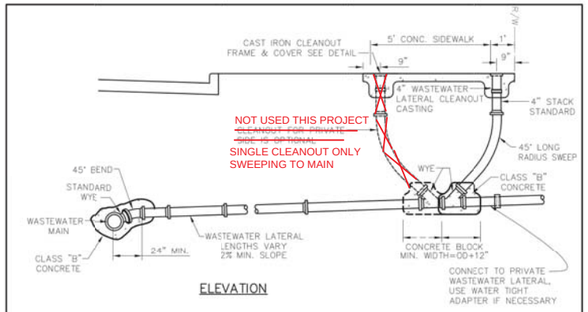
TYPICAL P.V.C. WASTEWATER MAIN EMBEDMENT



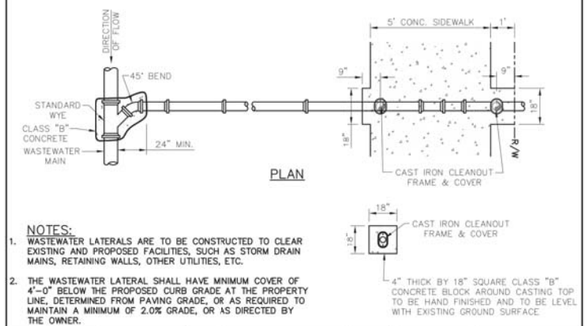
NOTE:
1. CEMENT STABILIZED SAND SHALL HAVE A MINIMUM OF 10% CEMENT PER CUBIC YARD OF CEMENT STABILIZED SAND MIXTURE, BASED ON LOOSE DRY WEIGHT VOLUME (AT LEAST 2.5 BAGS OF CEMENT PER CUBIC YARD OF MIXTURE). THE USE OF BROWN COLORING IN CEMENT STABILIZED SAND IS REQUIRED FOR PRESSURE RATED WASTEWATER MAIN AND LATERAL BEDDING.

P.V.C. WASTEWATER MAIN CEMENT STABILIZED SAND EMBEDMENT

Addison! PUBLIC WORKS DEPARTMENT	P.V.C. WASTEWATER MAIN EMBEDMENT	STANDARD CONSTRUCTION DETAILS WASTEWATER	
		DATE: AUGUST, 2010	REV DATE: –	SHEET: SD-WW01



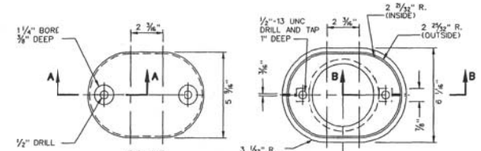
ELEVATION

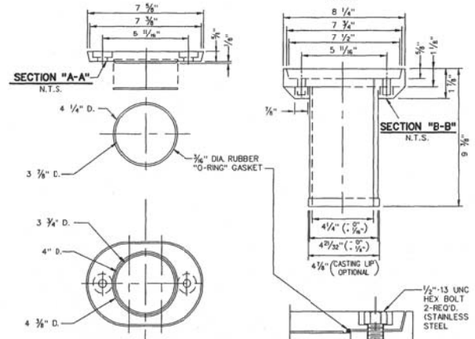


PLAN

NOTES:
1. WASTEWATER LATERALS ARE TO BE CONSTRUCTED TO CLEAR EXISTING AND PROPOSED FACILITIES, SUCH AS STORM DRAIN MAINS, RETAINING WALLS, OTHER UTILITIES, ETC.
2. THE WASTEWATER LATERAL SHALL HAVE MINIMUM COVER OF 4'-0" BELOW THE PROPOSED CURB GRADE AT THE PROPERTY LINE, DETERMINED FROM PAVING GRADE, OR AS REQUIRED TO MAINTAIN A MINIMUM OF 2.0% GRADE, OR AS DIRECTED BY THE OWNER.

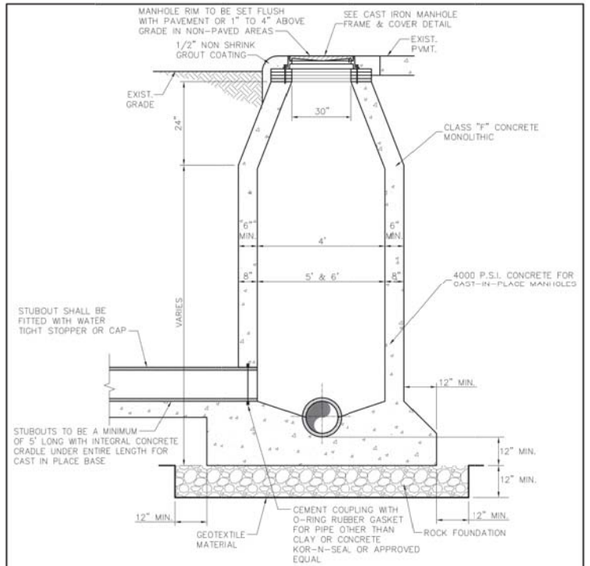
Addison! PUBLIC WORKS DEPARTMENT	TWO-WAY CLEANOUT NEW CONSTRUCTION	STANDARD CONSTRUCTION DETAILS WASTEWATER	
		DATE: AUGUST, 2010	REV DATE: –	SHEET: SD-WW02





1. THE WORDS "WASTEWATER LATERAL CLEANOUT" SHALL BE CAST INTO TOP OF COVER.
2. MATERIALS TO BE CAST IRON.

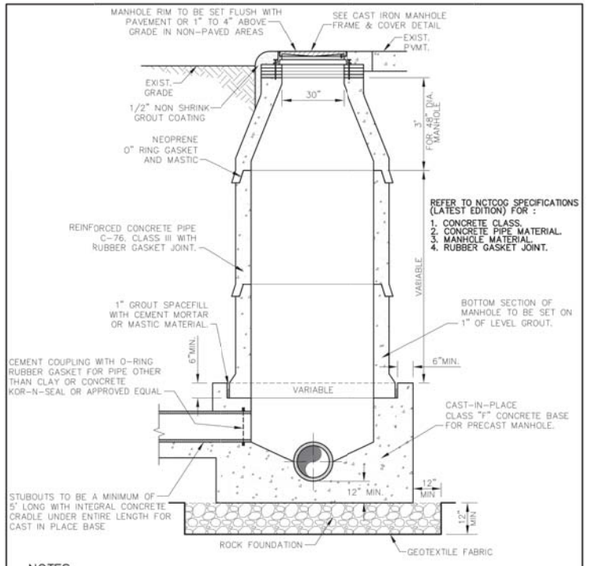
Addison! PUBLIC WORKS DEPARTMENT	CAST IRON CLEANOUT FRAME & COVER	STANDARD CONSTRUCTION DETAILS WASTEWATER	
		DATE: AUGUST, 2010	REV DATE: –	SHEET: SD-WW03



NOTES:
1. IF FALSE MANHOLE BOTTOMS ARE REQUIRED, THEY SHALL BE CONSTRUCTED, INSTALLED, AND REMOVED PER WASTEWATER MANHOLE FALSE BOTTOM STD. DETAIL.
2. WHERE MANHOLE'S ARE OUTSIDE OF PAVEMENT, FRAME & COVER SHALL BE CENTERED IN 5'x5' CONCRETE PAD CLASS 'A' CONCRETE, 4" THICK
3. ALL MANHOLES SHALL PASS VACUUM TEST AS PER NCTCOG SPECIFICATIONS

CAST-IN-PLACE NOTES:
1. KEYWAYS REQUIRED FOR ALL CONSTRUCTION JOINTS.
2. P.V.C. WATER STOP REQUIRED FOR ALL JOINTS IN LOWER 4'-0" OF MANHOLES
3. CONCRETE SHALL BE 4000 P.S.I.

Addison! PUBLIC WORKS DEPARTMENT	CAST-IN-PLACE MANHOLE	STANDARD CONSTRUCTION DETAILS WASTEWATER	
		DATE: AUGUST, 2010	REV DATE: –	SHEET: SD-WW04



REFER TO NCTCOG SPECIFICATIONS (LATEST EDITION) FOR :
1. CONCRETE CLASS.
2. CONCRETE PIPE MATERIAL.
3. MANHOLE MATERIAL.
4. RUBBER GASKET JOINT.

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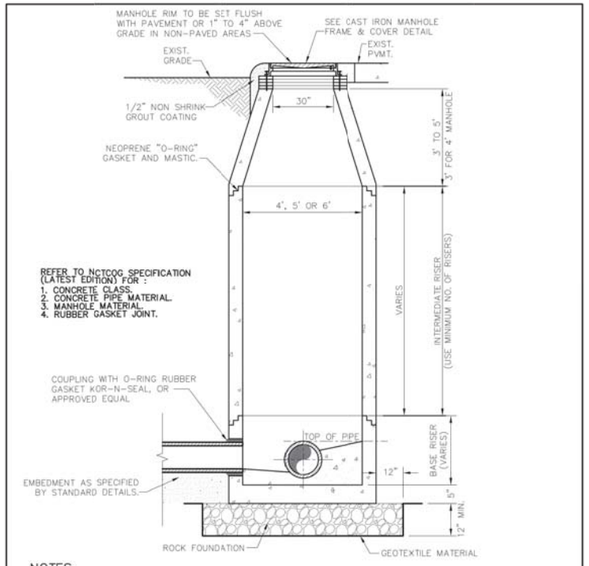
Addison! PUBLIC WORKS DEPARTMENT	PRECAST CONCRETE PIPE MANHOLE ALTERNATE "A"	STANDARD CONSTRUCTION DETAILS WASTEWATER	
		DATE: AUGUST, 2010	REV DATE: –	SHEET: SD-WW06



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2. CONCRETE PIPE MATERIAL.
3. MANHOLE MATERIAL.
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3. ALL MANHOLES SHALL PASS VACUUM TEST AS PER NCTCOG SPECIFICATIONS

Addison! PUBLIC WORKS DEPARTMENT	PRECAST CONCRETE PIPE MANHOLE ALTERNATE "B"	STANDARD CONSTRUCTION DETAILS WASTEWATER	
		DATE: AUGUST, 2010	REV DATE: –	SHEET: SD-WW07

SPECIAL NOTE:
ALL CONCRETE MANHOLES SHALL BE COATED WITH A SPRAY EPOXY LINING SYSTEM, SUCH AS WARREN ENVIRONMENTAL EPOXY SYSTEMS, S-301-14 OR APPROVED EQUAL. NO POLYUREA TYPE COATINGS WILL BE ACCEPTED. MINIMUM THICKNESS OF 125 MILS

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
LICENSED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS & ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

SANITARY SEWER DETAILS
(1 OF 3)

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: NTS
FILE: DETAILS_SS.dwg	SHEET NO: 15

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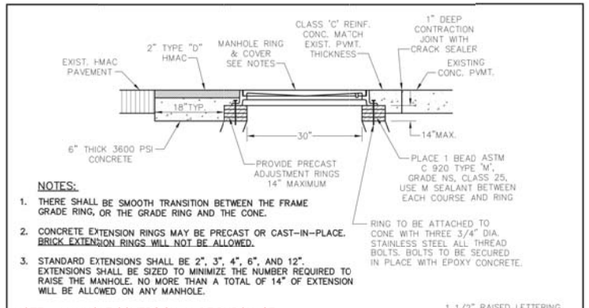
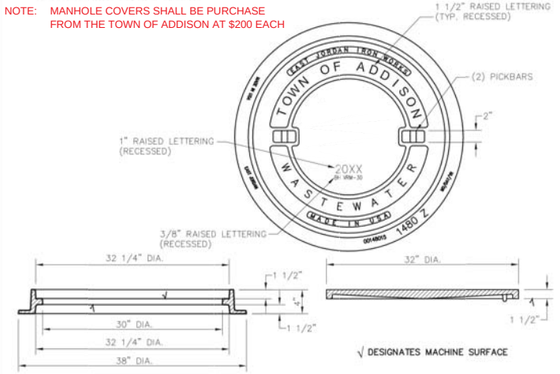


NOTES:

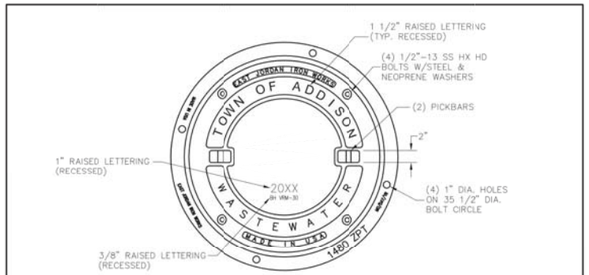
1. THERE SHALL BE SMOOTH TRANSITION BETWEEN THE FRAME GRADE RING, OR THE GRADE RING AND THE CONE.
2. CONCRETE EXTENSION RINGS MAY BE PRECAST OR CAST-IN-PLACE. BRICK EXTENSION RINGS WILL NOT BE ALLOWED.
3. STANDARD EXTENSIONS SHALL BE 2", 3", 4", 6", AND 12". EXTENSIONS SHALL BE SIZED TO MINIMIZE THE NUMBER REQUIRED TO RAISE THE MANHOLE. NO MORE THAN A TOTAL OF 14" OF EXTENSION WILL BE ALLOWED ON ANY MANHOLE.

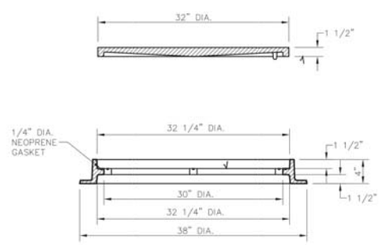
NOTE: MANHOLE COVERS SHALL BE PURCHASE FROM THE TOWN OF ADDISON AT $200 EACH



√ DESIGNATES MACHINE SURFACE

Addison! PUBLIC WORKS DEPARTMENT	CAST IRON MANHOLE FRAME AND COVER	STANDARD CONSTRUCTION DETAILS WASTEWATER		
		DATE: AUGUST, 2010	REV DATE: –	SHEET : SD-WW11





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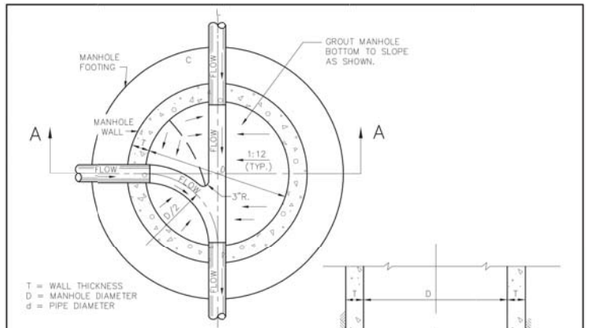
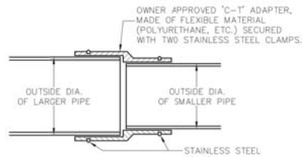
√ DESIGNATES MACHINE SURFACE

Addison! PUBLIC WORKS DEPARTMENT	PRESSURE TYPE MANHOLE FRAME AND COVER	STANDARD CONSTRUCTION DETAILS WASTEWATER		
		DATE: AUGUST, 2010	REV DATE: –	SHEET : SD-WW12



WASTEWATER MANHOLE LINE INTERSECTION



'C-T' PIPE ADAPTER

Addison! PUBLIC WORKS DEPARTMENT	WASTEWATER MANHOLE LINE INTERSECTION & 'C-T' PIPE ADAPTER	STANDARD CONSTRUCTION DETAILS WASTEWATER		
		DATE: AUGUST, 2010	REV DATE: –	SHEET : SD-WW13

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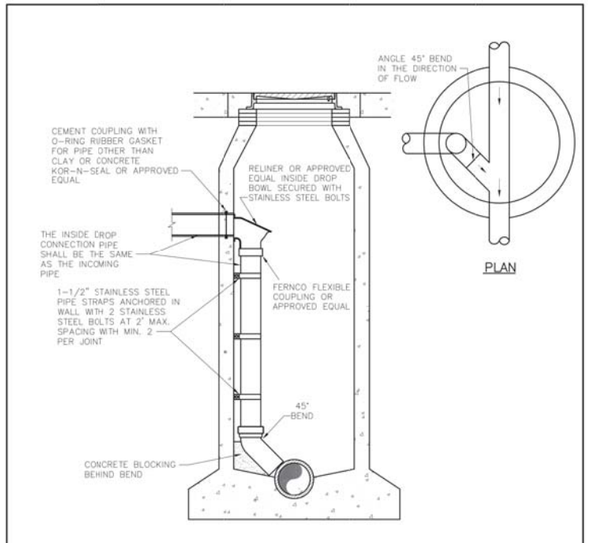
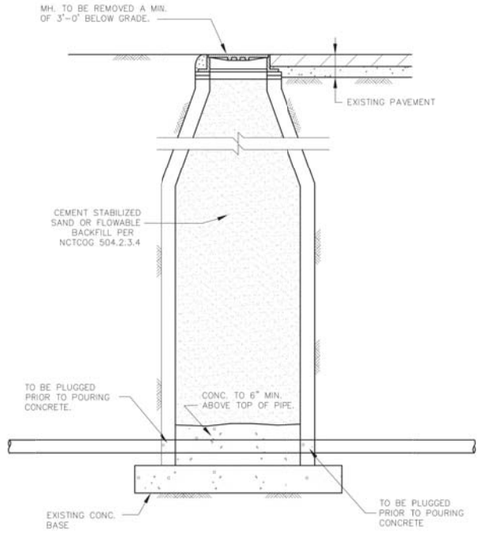
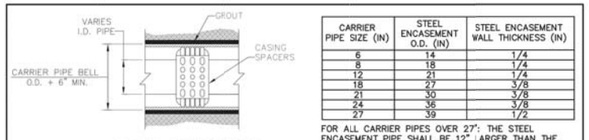


INTERIOR DROP MANHOLE CONNECTION

Addison! PUBLIC WORKS DEPARTMENT	INTERIOR DROP MANHOLE CONNECTION	STANDARD CONSTRUCTION DETAILS WASTEWATER		
		DATE: AUGUST, 2010	REV DATE: –	SHEET : SD-WW09



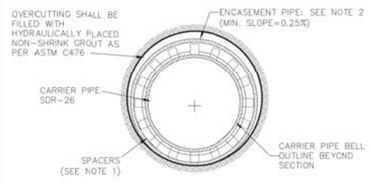
Addison! PUBLIC WORKS DEPARTMENT	ABANDONMENT OF MANHOLE	STANDARD CONSTRUCTION DETAILS WASTEWATER		
		DATE: AUGUST, 2010	REV DATE: –	SHEET : SD-WW15



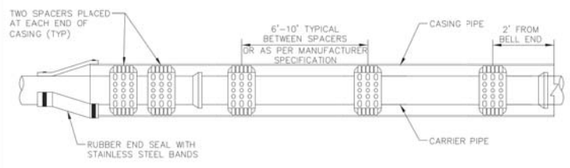
TYPICAL CASING SECTION

CARRIER PIPE SIZE (IN)	STEEL ENCASEMENT O.D. (IN)	STEEL ENCASEMENT WALL THICKNESS (IN)
6	14	1/4
8	18	1/4
12	21	1/4
18	27	3/8
21	30	3/8
24	36	3/8
27	39	1/2

FOR ALL CARRIER PIPES OVER 27": THE STEEL ENCASEMENT PIPE SHALL BE 12" LARGER THAN THE CARRIER PIPE AND THE STEEL ENCASEMENT WALL THICKNESS SHALL BE 1/2".



WASTEWATER ENCASEMENT



INSULATOR SPACING DETAIL

NOTES:

1. HIGH DENSITY POLYETHYLENE SPACERS, RACI OR EQUAL, SHALL BE USED. WHERE NO CASING PIPE IS REQUIRED OVERCUTTING AROUND UTILITY SHALL BE FILLED WITH HYDRAULICALLY PLACED NON-SHRINK GROUT AS PER ASTM C476.
2. ENCASEMENT PIPE SHALL BE HIGH DENSITY STEEL PIPE. ALL JOINTS TO BE WELDED 100%.

Addison! PUBLIC WORKS DEPARTMENT	CASING	STANDARD CONSTRUCTION DETAILS WASTEWATER		
		DATE: AUGUST, 2010	REV DATE: –	SHEET : SD-WW16

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS & ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

SANITARY SEWER DETAILS
(2 OF 3)

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: NTS
FILE: DETAILS_SS.dwg	SHEET NO: 16

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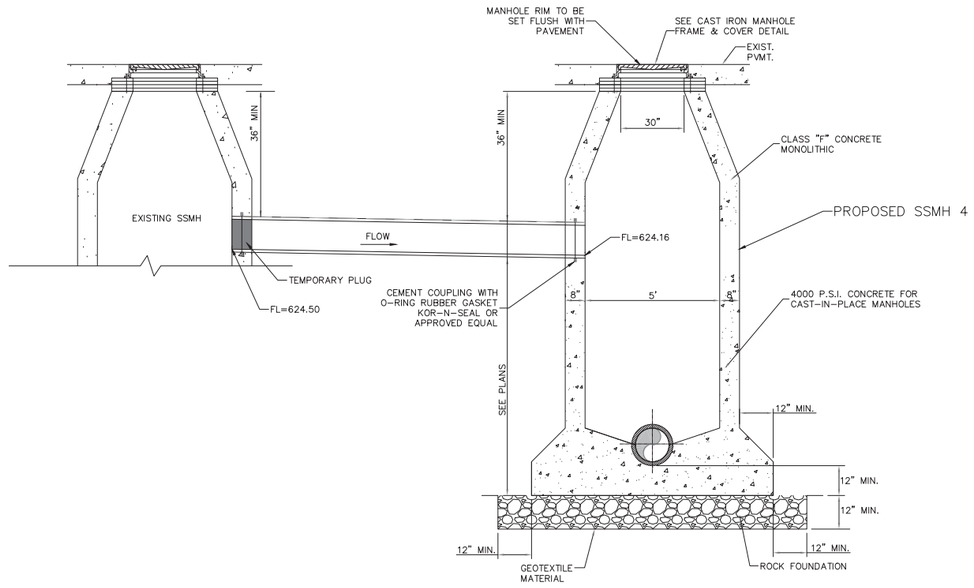
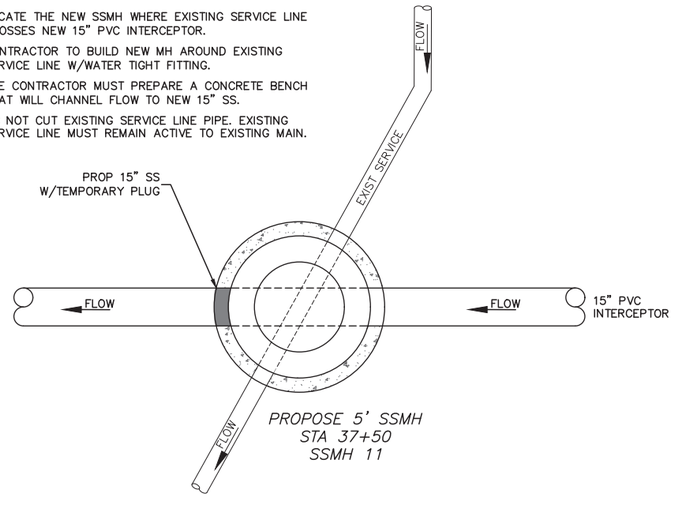
PLOTTED: Jan 02,2020 - 1:56pm
Crystal.Read



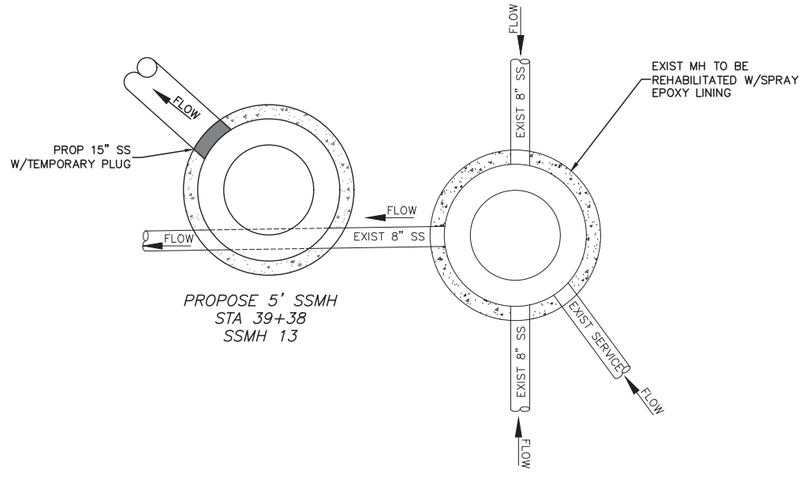
JUMPER LINE DETAIL STA 21+31
NTS

NOTE:
1. LOCATE THE NEW SSMH WHERE EXISTING SERVICE LINE CROSSES NEW 15" PVC INTERCEPTOR.
2. CONTRACTOR TO BUILD NEW MH AROUND EXISTING SERVICE LINE W/WATER TIGHT FITTING.
3. THE CONTRACTOR MUST PREPARE A CONCRETE BENCH THAT WILL CHANNEL FLOW TO NEW 15" SS.
4. DO NOT CUT EXISTING SERVICE LINE PIPE. EXISTING SERVICE LINE MUST REMAIN ACTIVE TO EXISTING MAIN.



LINE 'A' MANHOLE DETAIL STA 37+50
NTS

NOTE:
1. CONTRACTOR TO BUILD NEW MH AROUND EXISTING 8" SS MAIN W/WATER TIGHT FITTING.
2. THE CONTRACTOR MUST PREPARE A CONCRETE BENCH THAT WILL CHANNEL FLOW TO NEW 15" SS.
3. DO NOT CUT EXISTING 8" SEWER MAIN.



LINE 'A' MANHOLE DETAIL STA 39+38
NTS

SPECIAL NOTE:
ALL CONCRETE MANHOLES SHALL BE COATED WITH A SPRAY EPOXY LINING SYSTEM, SUCH AS WARREN ENVIRONMENTAL EPOXY SYSTEMS, S-301-14 OR APPROVED EQUAL. NO POLYUREA TYPE COATINGS WILL BE ACCEPTED. MINIMUM THICKNESS OF 125 MILS

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

FLOODPLAIN NOTE: THE ENTIRE PROJECT IS LOCATED WITHIN ZONE 'X' (AREA OF MINIMAL FLOODING) PER FEMA FIRM MAP 48113C0180K, EFFECTIVE 07/07/2014.

THE LOCATION AND DIMENSIONS OF EXISTING UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. IT IS CONTRACTOR'S SOLE RESPONSIBILITY TO VERIFY LOCATION. DEPTH AND DIMENSION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.

WARNING! UNDERGROUND UTILITIES IN AREA OF CONSTRUCTION. CONTACT THE FOLLOWING AT LEAST 48 HOURS PRIOR TO EXCAVATION IN THIS AREA.

PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

SANITARY SEWER DETAILS
(3 OF 3)

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: NTS
FILE: DETAILS_SS.dwg	SHEET NO: 17

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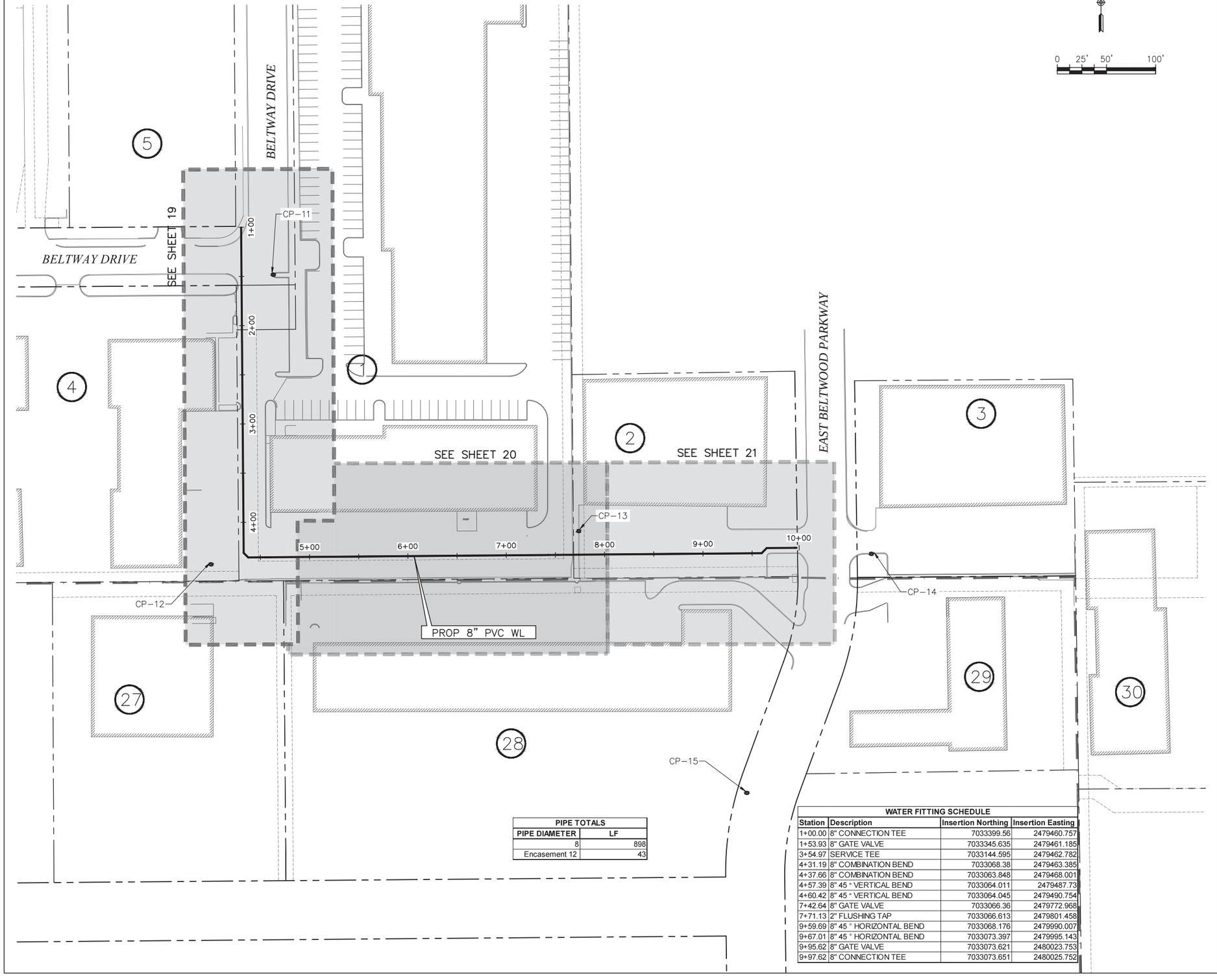
Crystal.Read



LEGEND

- R.O.W LINE/PROPERTY LINE
- SHEET LAYOUT
- PROPOSED WATERLINE
- (X) PROPERTY IDENTIFICATION NUMBER

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

PIPE TOTALS	
PIPE DIAMETER	LF
8	898
Encasement 12	43

WATER FITTING SCHEDULE

Station	Description	Insertion Northing	Insertion Easting
1+00.00	8" CONNECTION TEE	7033399.56	2479460.757
1+53.93	8" GATE VALVE	7033345.635	2479461.185
3+54.97	SERVICE TEE	7033144.595	2479462.782
4+31.19	8" COMBINATION BEND	7033068.38	2479463.385
4+37.66	8" COMBINATION BEND	7033063.848	2479468.001
4+57.39	8" 45 ° VERTICAL BEND	7033064.011	2479487.73
4+60.42	8" 45 ° VERTICAL BEND	7033064.045	2479490.754
7+42.64	8" GATE VALVE	7033066.36	2479772.968
7+71.13	2" FLUSHING TAP	7033066.613	2479801.458
9+59.69	8" 45 ° HORIZONTAL BEND	7033068.176	2479990.007
9+67.01	8" 45 ° HORIZONTAL BEND	7033073.397	2479995.143
9+95.62	8" GATE VALVE	7033073.621	2480023.753
9+97.62	8" CONNECTION TEE	7033073.651	2480025.752

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED
PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

WATERLINE SHEET LAYOUT

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=50'
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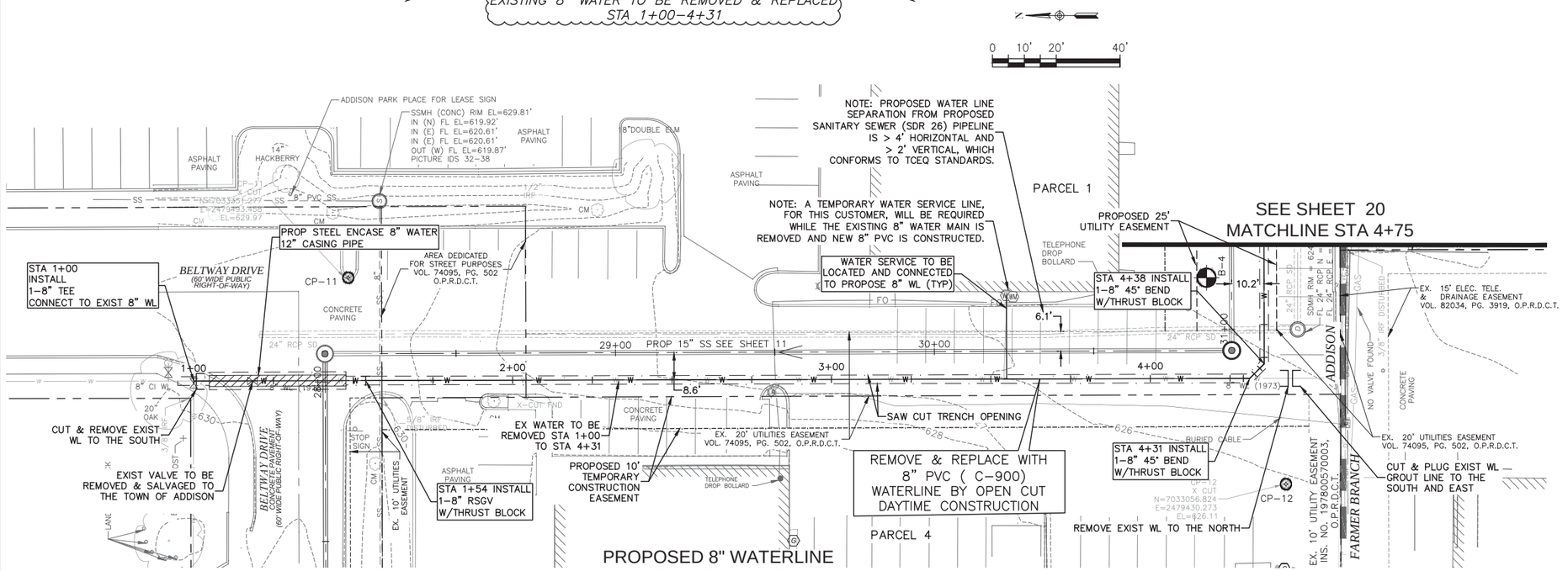
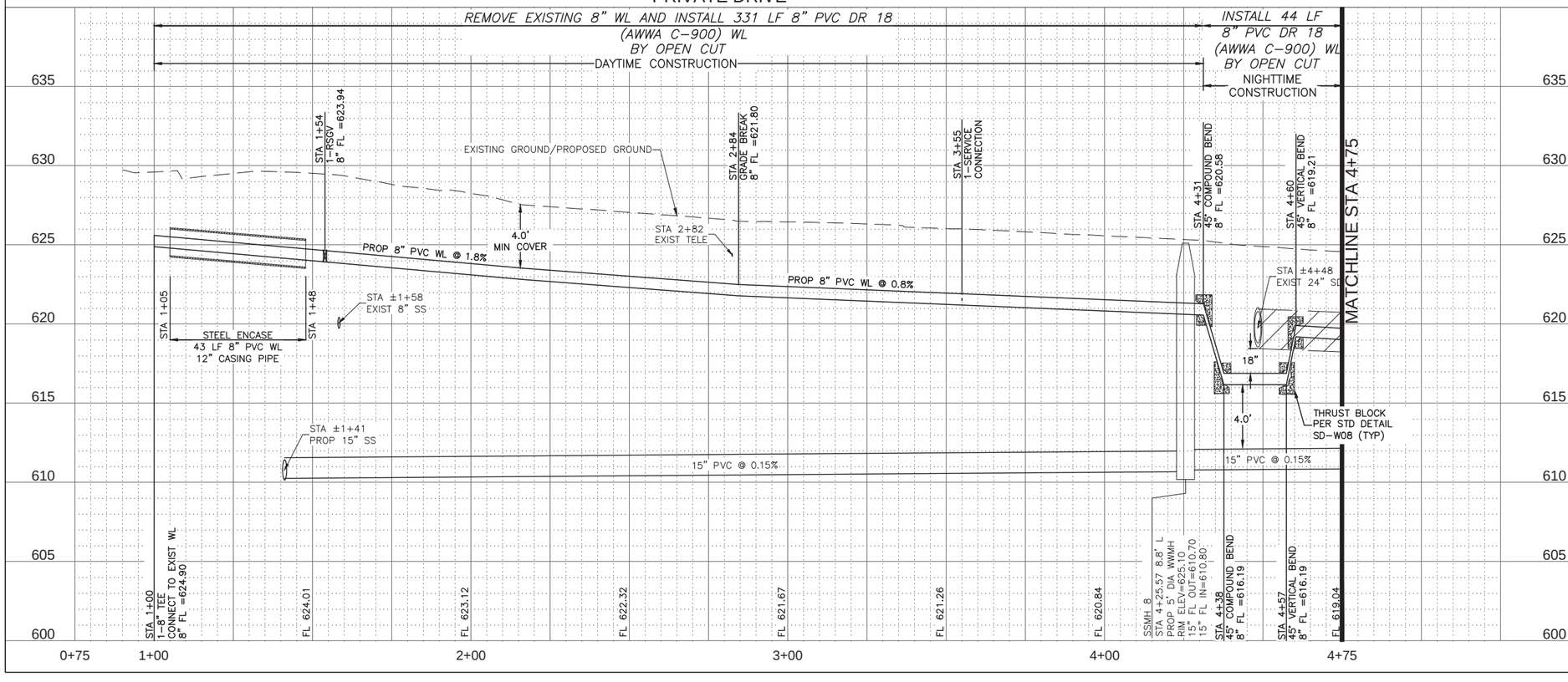
..\Civil 3D\5131-01-Pipe Network.dwg

CONSTRUCT 8" PVC DR 18 WATER MAIN

EXISTING 8" WATER TO BE REMOVED & REPLACED
STA 1+00-4+31





ATTENTION :
THE CONTRACTOR SHALL NOT DO ANY WORK OR CONSTRUCTION IN THE FARMER'S BRANCH CITY LIMITS. PLEASE CONTACT THE TOWN OF ADDISON STAFF IF THERE IS ANY QUESTION REGARDING WORK THAT IMPACTS IN THE FARMERS BRANCH CITY LIMITS.

SPECIAL NOTE:
STA 1+00 TO 9+98 SAW CUT PAVEMENT PER WATER MAIN EMBEDMENT DETAIL SHEET 22

CONTROL	CONTROL
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X CUT	X CUT
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E=2479493.458	E=2479430.273
EL=629.97	EL=626.11

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

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PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
91126
REGISTERED
PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PLAN & PROFILE
WL STA 1+00-4+75

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'H; 1"=5'V
FILE: WATR_PnP.dwg	SHEET NO: 19

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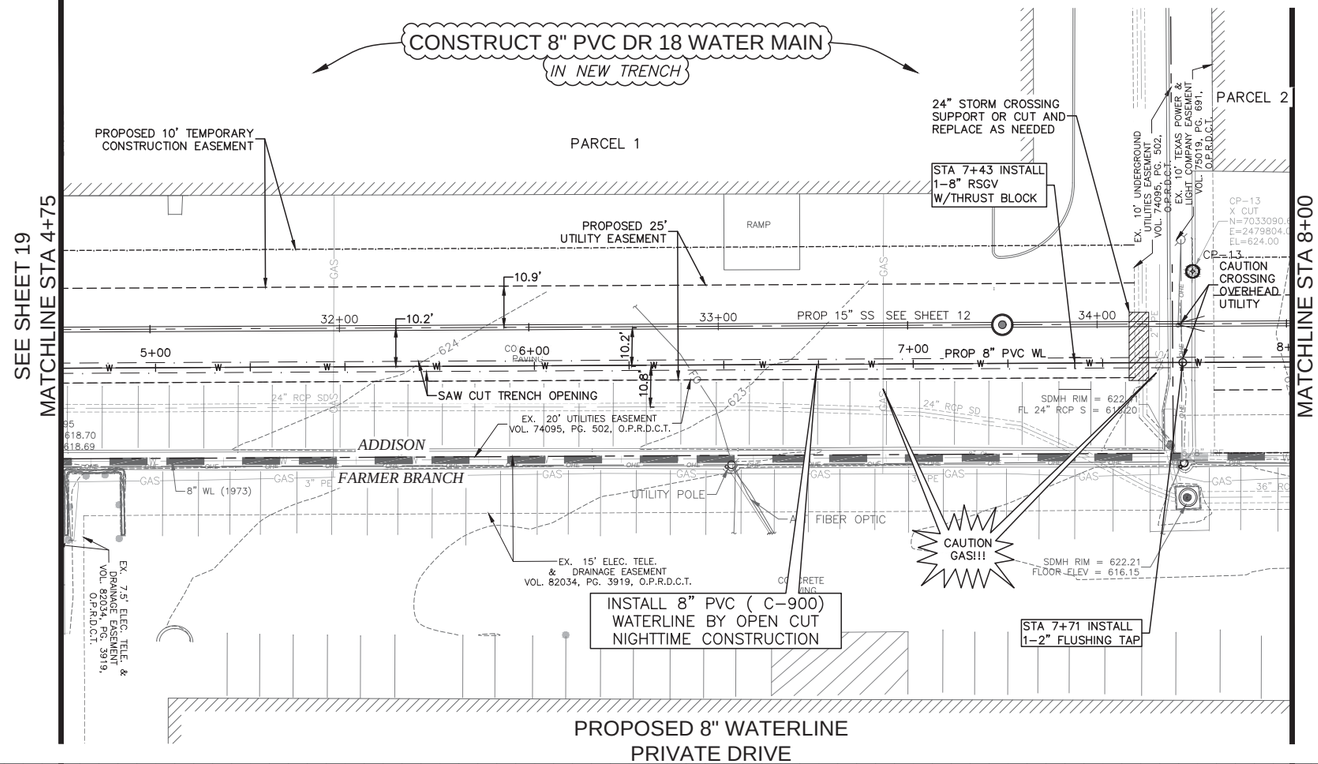

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SPECIAL NOTE:
STA 1+00 TO 9+98 SAW CUT PAVEMENT PER WATER MAIN EMBEDMENT DETAIL SHEET 22

CONTROL
CP-13
X CUT
N=7033090.664
E=2479804.016
EL=624.00

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

FLOODPLAIN NOTE: THE ENTIRE PROJECT IS LOCATED WITHIN ZONE 'X' (AREA OF MINIMAL FLOODING) PER FEMA FIRM MAP 48113C0180K, EFFECTIVE 07/07/2014.

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WARNING! UNDERGROUND UTILITIES IN AREA OF CONSTRUCTION. CONTACT THE FOLLOWING AT LEAST 48 HOURS PRIOR TO EXCAVATION IN THIS AREA.

PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PLAN & PROFILE
WL STA4+75-8+00

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'H; 1"=5'V
FILE: WATR_PnP.dwg	SHEET NO: 20

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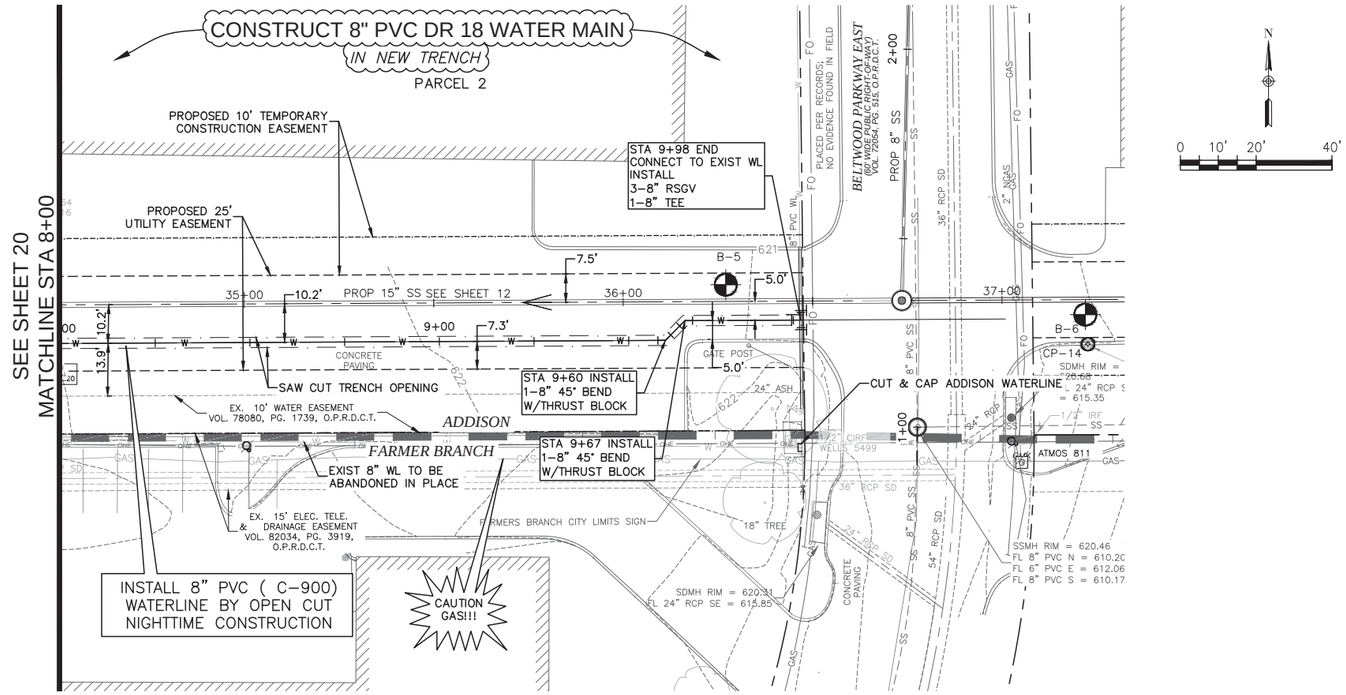
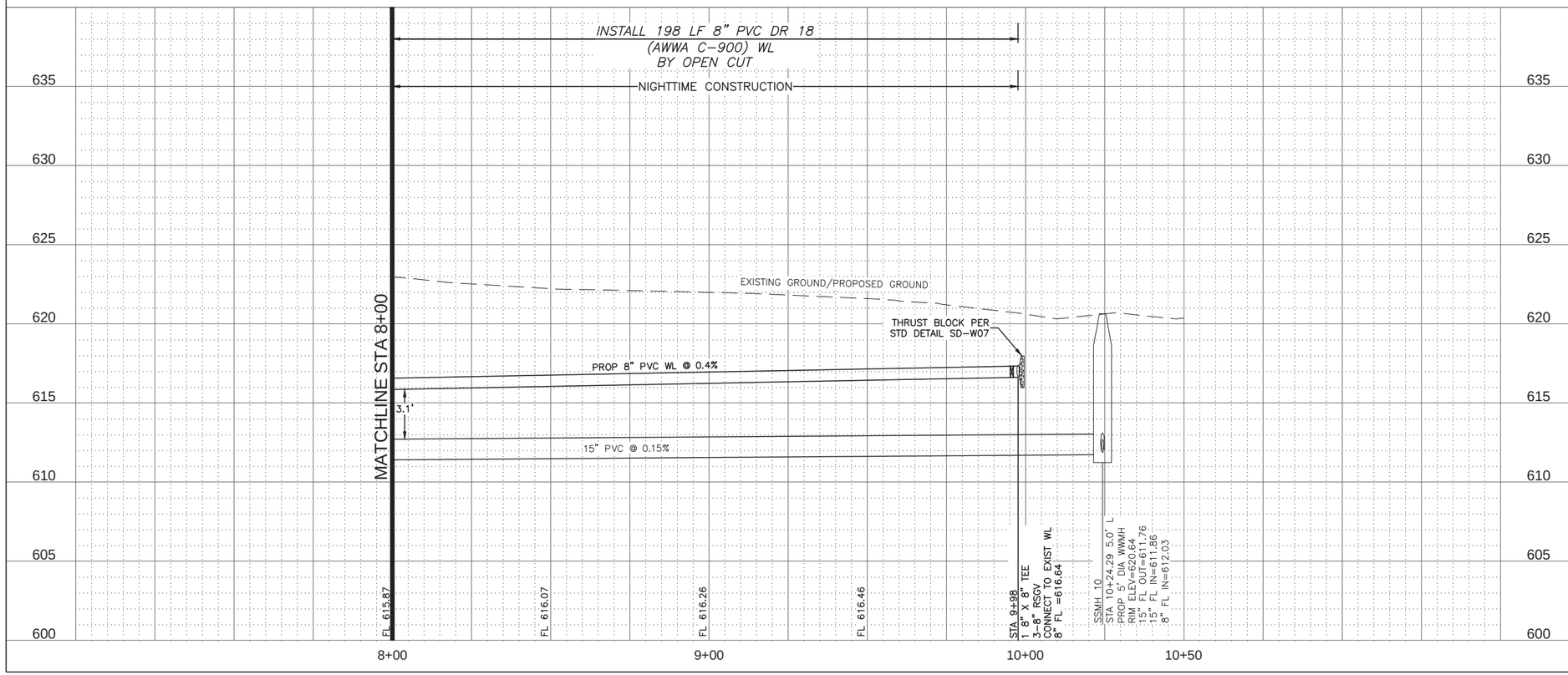


PROPOSED 8" WATERLINE
BELTWAY DRIVE TO BELTWOOD PARKWAY EAST



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SPECIAL NOTE:
STA 1+00 TO 9+98 SAW CUT PAVEMENT PER WATER MAIN EMBEDMENT DETAIL SHEET 22

CONTROL
CP-14
X CUT
N=7033067.530
E=2480101.530
EL=621.28

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
89126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PLAN & PROFILE
WL STA 8+00-END

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'H; 1"=5'V
FILE: WATR_PnP.dwg	SHEET NO: 21

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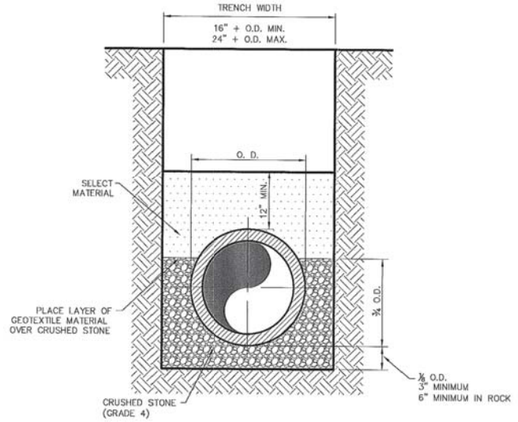
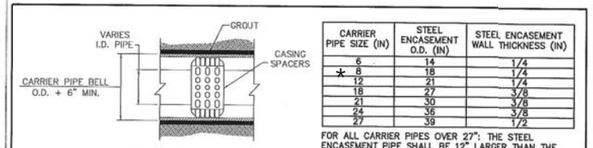


CLASS "B+" EMBEDMENT

CRUSHED STONE SHALL BE 3/4", PASSING # 4 SIEVE

TYPICAL P.V.C. WATER MAIN
EMBEDMENT

Addison! PUBLIC WORKS DEPARTMENT	P.V.C. WATER MAIN EMBEDMENT	STANDARD CONSTRUCTION DETAILS WATER
		DATE: AUGUST, 2010 / REV DATE: – / SHEET #: SD-W01

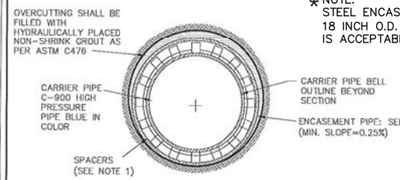


TYPICAL CASING SECTION

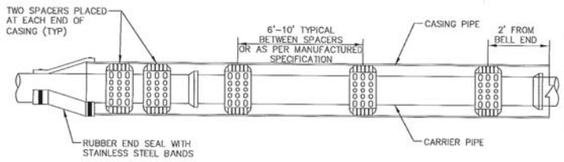
CARRIER PIPE SIZE (IN)	STEEL ENCASEMENT O.D. (IN)	STEEL ENCASEMENT WALL THICKNESS (IN)
6	14	1/4
* 8	16	1/4
12	21	1/4
18	27	3/8
21	30	3/8
24	36	3/8
27	39	1/2

FOR ALL CARRIER PIPES OVER 27": THE STEEL ENCASEMENT PIPE SHALL BE 12" LARGER THAN THE CARRIER PIPE AND THE STEEL ENCASEMENT WALL THICKNESS SHALL BE 1/2".

* NOTE:
STEEL ENCASEMENT LESS THAN 18 INCH O.D. (I.E. 12 INCH O.D.) IS ACCEPTABLE FOR THIS PROJECT



WATER MAIN ENCASEMENT

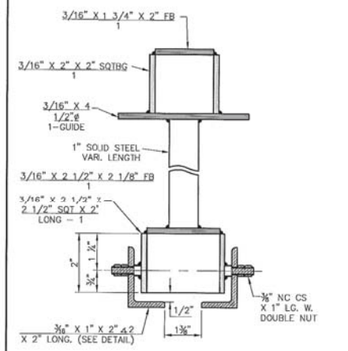


INSULATOR SPACING DETAIL

NOTES:

1. HIGH DENSITY POLYETHYLENE SPACERS, RAC OR EQUAL, SHALL BE USED. WHERE NO CASING PIPE IS REQUIRED OVERCUTTING AROUND UTILITY SHALL BE FILLED WITH HYDRAULICALLY PLACED NON-SHRINK GROUT AS PER ASTM C476.
2. ENCASEMENT PIPE SHALL BE HIGH DENSITY STEEL PIPE. ALL JOINTS TO BE WELDED 100%

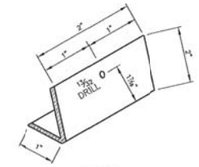
Addison! DEPARTMENT OF PUBLIC WORKS	CASING	STANDARD CONSTRUCTION DETAILS WATER
		DATE: AUGUST, 2010 / REV DATE: – / SHEET #: SD-W03



NOTE: TO BE USED ON ALL VALVES DEEPER THAN 5'-0".

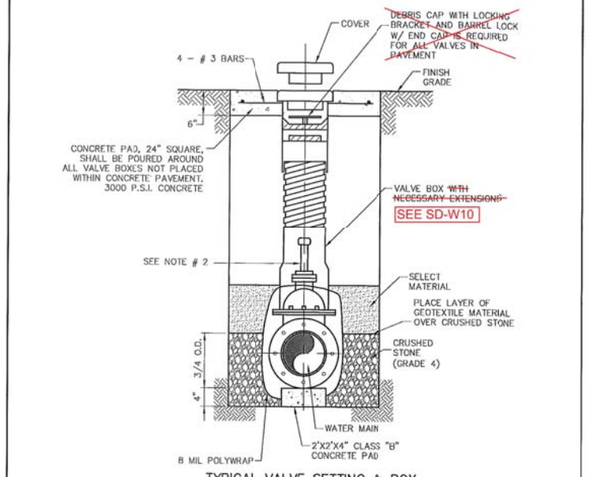
TYPE – B
VALVE EXTENSION

SPRING LOCK
VALVE EXTENSION



DETAIL

Addison! PUBLIC WORKS DEPARTMENT	VALVE EXTENSION	STANDARD CONSTRUCTION DETAILS WATER
		DATE: AUGUST, 2010 / REV DATE: – / SHEET #: SD-W11

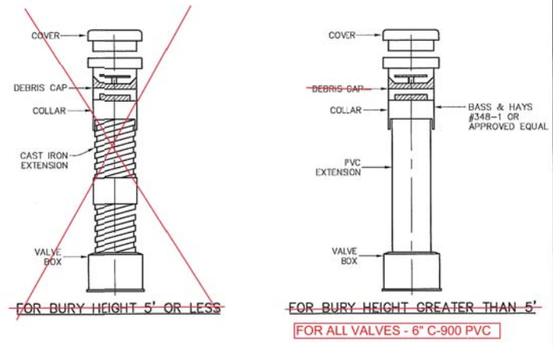


TYPICAL VALVE SETTING & BOX

NOTE:

1. 4"–12" R.S. GATE VALVES SHALL BE IN ACCORDANCE WITH TOWN OF ADDISON WATER SYSTEM REQUIREMENTS.
2. A PERMANENTLY ATTACHED VALVE EXTENSION STEM SHALL BE REQUIRED FOR ANY VALVE WHERE THE OPERATING NUT IS LOCATED IN EXCESS OF 5 FEET BELOW THE TOP OF VALVE BOX. THIS EXTENSION SHALL BE OF SUFFICIENT LENGTH TO INSURE THAT ITS TOP IS WITHIN 5 FEET OF VALVE BOX LID.
3. BLUE "V" (3") CUT INTO FACE OF NEAREST CURB AND POINTING TOWARD THE VALVE.
4. ALL IRON MATERIALS SHALL BE DOMESTIC. (MADE IN USA)
5. CRUSHED STONE SHALL BE 3/4", PASSING #4 SIEVE.

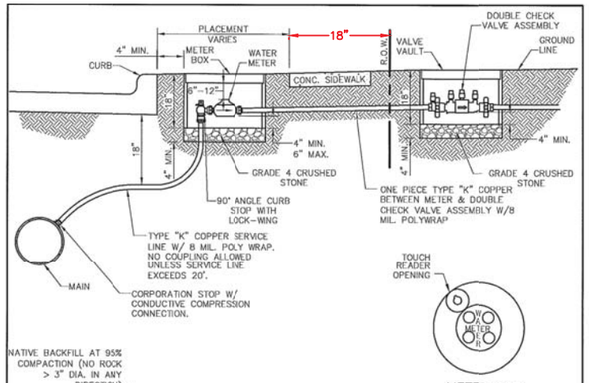
Addison! PUBLIC WORKS DEPARTMENT	VALVE SETTING ~~BOX~~	STANDARD CONSTRUCTION DETAILS WATER
		DATE: AUGUST, 2010 / REV DATE: 04/06/17 / SHEET #: SD-W09



NOTE

1. ALL CAST IRON FITTINGS SHALL BE DOMESTIC. (MADE IN U.S.A.)
2. ~~VALVE BOXES SHALL BE PROVIED FOR BURIED VALVES. THESE BOXES SHALL BE THREE (3) PIECE SCREW TYPE CAST IRON OF THE EXTENSION TYPE AND SHALL BE: BASS & HAYS THREE (3) PIECE ADJUSTABLE SCREW TYPE, EAST JORDAN IRON WORKS 8560 W/ 8600 LID, MUELLER NO. H-10360 OR APPROVED EQUAL. THE THREE (3) PIECES SHALL CONSIST OF THE TOP SECTION, BOTTOM SECTION AND COVER.~~

Addison! PUBLIC WORKS DEPARTMENT	VALVE BOX WITH EXTENSION	STANDARD CONSTRUCTION DETAILS WATER
		DATE: ~~AUGUST, 2010~~ JANUARY 2017 / REV DATE: – / SHEET #: SD-W10



GENERAL INSTALLATION NOTES:

1. WATER METER SHALL BE PLACED IN CENTER OF LOT WITH THE SANITARY SEWER SERVICE TO BE LOCATED 10' DOWNSTREAM.
2. METER AND BOX SHALL BE SET BY THE CONTRACTOR TO ADDISON STANDARDS IN ALL CASES.
3. THE METER BOX SHALL BE SET WITHIN THE R.O.W. OR A DEDICATED UTILITY EASEMENT. IN ALL CASES, THE METER BOX SHALL BE PROTECTED FROM VEHICULAR TRAFFIC.
4. WATER SERVICES SHALL NOT BE CONNECTED TO DEAD END LINES OR FIRE HYDRANT LEADS.
5. ALL MATERIALS SHALL CONFORM TO THE TOWN OF ADDISON WATER SYSTEM REQUIREMENTS.

Type "K" Copper Service Pipe.	Double Strap Bronze Service Saddle with C.C. Threads	East Jordan Iron Works Galvanized Meter Box With Iron Ring & Cover				
		Min. Dia.	Covers & Rings	Min. Ht.	Min. Con Weight	Min. Total Weight
3/4 Inch	3/4 Inch	18 Inches	12½ Inches	18 Inches	13 lbs.	42 lbs.
1 Inch	1 Inch	24 Inches	20½ Inches	18 Inches	17 lbs.	98 lbs.
1 1/2 Inch	1 1/2 Inch	28 Inches	20½ Inches	18 Inches	20 lbs.	127 lbs.
2 Inch	2 Inch	28 Inches	20½ Inches	18 Inches	20 lbs.	127 lbs.

Addison! PUBLIC WORKS DEPARTMENT	SERVICE CONNECTION WITH METER BOX	STANDARD CONSTRUCTION DETAILS WATER
		DATE: AUGUST, 2010 / REV DATE: – / SHEET #: SD-W20

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

FLOODPLAIN NOTE: THE ENTIRE PROJECT IS LOCATED WITHIN ZONE 'X' (AREA OF MINIMAL FLOODING) PER FEMA FIRM MAP 48113C0180K, EFFECTIVE 07/07/2014.

THE LOCATION AND DIMENSIONS OF EXISTING UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. IT IS CONTRACTOR'S SOLE RESPONSIBILITY TO VERIFY LOCATION. DEPTH AND DIMENSION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.

WARNING! UNDERGROUND UTILITIES IN AREA OF CONSTRUCTION. CONTACT THE FOLLOWING AT LEAST 48 HOURS PRIOR TO EXCAVATION IN THIS AREA.

PUBLIC WORKS & ENGINEERING SERVICES	972–450–2871
TEXAS ONE CALL/DIG TESS	1–811–344–8377
ONCOR	1–888–313–6862
AT&T	1–800–331–0500
SPECTRUM/CHARTER COMMUNICATIONS	1–888–438–2427
ATMOS ENERGY	1–888–286–6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

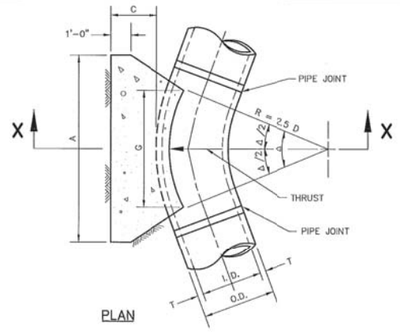
SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

WATER DETAILS (1 OF 3)

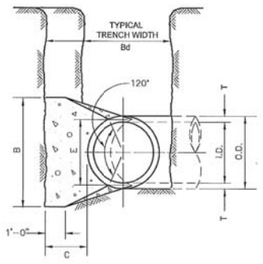
DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: NTS
FILE: DETAILS_WTR.dwg	SHEET NO: 22

G:\1220\5133–01 Addison Basin I Final Design\CAD\Sheets\ ..\XREF\Border\Vbdr.dwg
PLOTTED: Jan 02,2020 – 1:56pm
Crystal.Read



PLAN



SECTION X–X

I.D. (IN.)	T (IN.)	Δ = 11.25° (FT.)	Δ = 22.50° (FT.)	E (FT.)
4,6,8	0.4	1.5	1.5	0.9
10,12	0.5	1.5	1.5	1.2
16,18	0.6	1.5	1.5	1.6
20	0.7	1.5	1.5	1.8
24	0.9	1.5	1.5	2.1
30	2.9	1.5	1.9	2.8
36	4.5	1.5	2.3	3.3
42	5.0	1.8	2.6	3.8
48	5.5	2.0	3.0	4.3
54	6.0	2.3	3.4	4.8
60	6.5	2.5	3.8	5.3
66	6.8	2.8	4.1	5.7
72	7.5	3.0	4.5	6.3
78	7.5	3.3	4.9	6.7
84	8.0	3.5	5.3	7.2
90	8.5	3.8	5.6	7.7
96	9.0	4.0	6.0	8.2

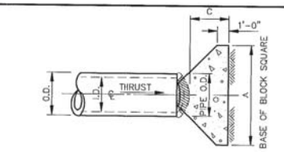
I.D. (IN.)	Δ = 11.25° G (FT.)	THRUST (TONS)	EARTH A (FT.)	EARTH B (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK B (FT.)	ROCK VOL. (C.Y.)	I.D. (IN.)	Δ = 22.50° G (FT.)	THRUST (TONS)	EARTH A (FT.)	EARTH B (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK B (FT.)	ROCK VOL. (C.Y.)
4,6,8	0.4	1.0	1.0	1.5	0.1	1.0	1.0	0.1	4,6,8	0.8	2.0	1.5	1.5	0.1	1.0	1.0	0.1
10,12	0.6	2.2	1.5	1.5	0.1	1.0	1.5	0.1	10,12	1.1	4.4	2.0	2.5	0.3	1.5	1.5	0.1
16,18	0.8	5.0	2.0	2.5	0.3	1.5	2.0	0.2	16,18	1.6	9.9	3.0	3.5	0.6	2.0	2.5	0.3
20	0.9	6.2	2.0	3.5	0.4	1.5	3.0	0.3	20	1.8	12.3	3.5	3.5	0.7	2.0	3.0	0.4
24	1.1	8.9	3.0	3.5	0.5	1.5	3.0	0.3	24	2.2	17.7	4.0	4.5	1.0	3.0	3.5	0.5
30	1.4	10.4	3.0	3.5	0.6	2.0	3.5	0.4	30	2.7	20.7	5.0	4.5	1.5	3.0	4.0	0.8
36	1.7	15.0	3.5	4.5	0.9	2.0	4.0	0.5	36	3.3	29.8	5.5	5.5	2.3	4.0	4.0	1.3
42	1.9	20.4	4.5	5.0	1.5	2.5	5.0	0.8	42	3.8	40.5	7.0	6.0	3.9	4.5	5.0	2.1
48	2.2	26.6	4.5	6.0	2.0	2.5	6.0	1.1	48	4.4	52.9	8.0	7.0	5.7	4.5	6.0	2.8
54	2.5	33.7	6.0	6.0	3.0	3.0	6.0	1.4	54	4.9	67.0	9.0	8.0	8.0	6.0	6.0	4.1
60	2.7	41.6	6.0	7.0	3.8	3.0	7.0	1.8	60	5.5	82.7	9.5	9.0	10.6	6.0	7.0	5.3
66	3.0	50.3	6.5	8.0	5.1	3.5	8.0	2.7	66	6.0	100.1	10.5	10.0	14.1	6.5	8.0	7.2
72	3.3	59.9	7.5	8.0	6.3	4.0	8.0	3.3	72	6.6	119.1	11.0	11.0	17.6	7.5	8.0	9.1
78	3.6	70.2	8.0	9.0	8.1	4.0	9.0	3.9	78	7.1	139.8	12.0	12.0	22.5	8.0	9.0	11.7
84	3.8	81.5	8.5	10.0	10.3	4.5	10.0	5.3	84	7.6	162.1	13.0	12.5	27.2	8.5	10.0	14.8
90	4.1	93.5	9.5	10.0	12.2	5.0	10.0	6.3	90	8.2	186.1	14.0	13.5	33.7	9.5	10.0	17.7
96	4.4	106.4	10.0	11.0	15.0	5.0	11.0	7.4	96	8.7	211.7	15.0	14.5	41.2	10.0	11.0	21.8

TABLES OF DIMENSIONS AND QUANTITIES

I.D. (IN.)	Δ = 30° G (FT.)	THRUST (TONS)	EARTH A (FT.)	EARTH B (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK B (FT.)	ROCK VOL. (C.Y.)	I.D. (IN.)	Δ = 45° G (FT.)	THRUST (TONS)	EARTH A (FT.)	EARTH B (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK B (FT.)	ROCK VOL. (C.Y.)
4,6,8	1.0	2.6	2.0	1.5	0.2	1.0	1.5	0.1	4,6,8	1.5	3.9	2.0	2.0	0.2	1.5	1.5	0.1
10,12	1.5	5.9	2.5	2.5	0.3	2.0	1.5	0.2	10,12	2.2	8.7	3.5	2.5	0.5	2.0	2.5	0.3
16,18	2.2	13.2	3.5	4.0	0.8	2.5	3.0	0.4	16,18	3.2	19.5	4.5	4.5	1.2	3.0	3.5	0.6
20	2.4	16.3	4.5	4.0	1.0	3.0	3.0	0.5	20	3.6	24.1	5.5	4.5	1.5	3.5	3.5	0.7
24	2.9	23.4	6.0	4.0	1.4	3.5	3.5	0.7	24	4.3	34.6	8.0	4.5	2.3	4.5	4.0	1.1
30	3.6	27.5	6.5	5.0	1.9	3.5	4.0	0.9	30	5.4	40.6	8.5	5.0	3.2	5.5	4.0	1.6
36	4.4	39.5	7.0	6.0	3.4	4.5	4.5	1.6	36	6.5	58.5	10.0	6.0	5.3	5.5	4.5	2.6
42	5.1	53.8	8.0	7.0	5.1	5.5	5.0	2.5	42	7.5	79.6	11.5	7.0	8.1	8.0	5.0	4.2
48	5.8	70.3	9.0	8.0	7.4	6.0	6.0	3.7	48	8.6	104.0	13.0	8.0	11.9	9.0	6.0	6.3
54	6.5	89.0	10.0	9.0	10.3	7.0	6.5	5.3	54	9.7	131.5	15.0	9.0	17.1	10.5	6.5	8.9
60	7.3	110.0	11.0	10.0	13.9	7.5	7.5	7.3	60	10.7	162.4	16.5	10.0	23.1	11.0	7.5	12.0
66	8.0	132.9	12.5	11.0	18.9	8.5	8.0	9.6	66	11.8	196.5	18.0	11.0	30.1	12.0	8.5	16.2
72	8.7	158.2	13.5	12.0	24.0	9.0	9.0	12.3	72	12.9	233.9	19.5	12.0	38.6	14.0	8.5	20.7
78	9.4	185.6	14.5	13.0	30.0	10.0	9.5	15.6	78	13.9	274.5	21.5	13.0	49.8	14.5	9.5	25.9
84	10.1	215.3	15.5	14.0	37.1	10.5	10.5	19.5	84	15.0	318.4	23.0	14.0	61.2	15.5	10.5	32.6
90	10.9	247.1	16.5	15.0	45.0	11.5	11.0	23.9	90	16.1	365.5	24.5	15.0	74.5	17.5	10.5	39.6
96	11.6	281.2	18.0	16.0	55.5	12.5	11.5	28.9	96	17.1	415.8	26.0	16.0	89.5	18.5	11.5	48.5

I.D. (IN.)	Δ = 67.50° G (FT.)	THRUST (TONS)	EARTH A (FT.)	EARTH B (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK B (FT.)	ROCK VOL. (C.Y.)	I.D. (IN.)	Δ = 90° G (FT.)	THRUST (TONS)	EARTH A (FT.)	EARTH B (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK B (FT.)	ROCK VOL. (C.Y.)
4,6,8	2.1	5.6	3.0	2.0	0.3	2.0	1.5	0.2	4,6,8	2.7	7.1	5.0	1.5	0.4	2.0	2.0	0.2
10,12	3.1	12.6	5.5	2.5	0.8	3.5	2.0	0.4	10,12	4.0	16.0	6.5	2.5	1.0	3.5	2.5	0.5
16,18	4.7	28.3	7.5	4.0	1.9	5.5	3.0	0.9	16,18	6.0	36.0	9.0	4.0	2.4	4.5	4.0	1.0
20	5.2	34.9	9.0	4.0	2.3	5.5	3.5	1.2	20	6.6	44.4	10.0	4.5	3.1	6.0	4.0	1.5
24	6.2	50.3	11.5	4.5	3.5	6.5	4.0	1.6	24	7.9	64.0	14.5	4.5	5.0	8.0	4.0	2.1
30	7.8	58.9	12.0	5.0	4.8	7.5	4.0	2.2	30	9.9	75.0	15.0	5.0	6.7	10.0	4.0	3.3
36	9.4	84.9	14.5	6.0	8.2	9.5	4.5	3.8	36	11.9	108.0	18.0	6.0	11.4	12.0	4.5	5.3
42	10.9	115.5	17.0	7.0	12.8	11.0	5.5	6.3	42	13.9	147.0	21.0	7.0	17.8	14.0	5.5	8.7
48	12.5	150.9	19.0	8.0	18.4	13.0	6.0	9.2	48	15.9	192.0	24.0	8.0	26.2	16.0	6.0	12.4
54	14.0	191.0	21.5	9.0	26.0	15.0	6.5	12.9	54	17.9	243.0	27.0	9.0	36.9	18.0	7.0	18.1
60	15.6	235.8	24.0	10.0	35.6	16.0	7.5	17.6	60	19.9	299.8	30.0	10.0	50.3	20.0	7.5	24.0
66	17.1	285.3	26.0	11.0	46.0	18.0	8.0	23.0	66	21.8	362.8	33.0	11.0	66.2	22.0	8.5	32.5
72	18.7	339.5	28.5	12.0	57.8	19.0	9.0	28.4	72	23.8	431.8	36.0	12.0	85.6	24.0	9.0	41.0
78	20.2	398.5	31.0	13.0	75.7	21.0	9.5	37.4	78	25.7	506.7	39.0	13.0	108.2	26.0	10.0	53.2
84	21.8	462.1	33.5	14.0	94.7	22.0	10.5	46.5	84	27.7	587.7	42.0	14.0	134.4	28.0	10.5	64.8
90	23.3	530.5	35.5	15.0	114.4	24.5	11.0	58.2	90	29.0	674.6	45.0	15.0	164.9	30.0	11.5	81.2
96	24.9	603.6	38.0	16.0	138.9	25.5	12.0	70.0	96	31.6	767.5	48.0	16.0	199.0	32.0	12.0	95.1

TABLES OF DIMENSIONS AND QUANTITIES



PLAN OF PLUG THRUST BLOCK

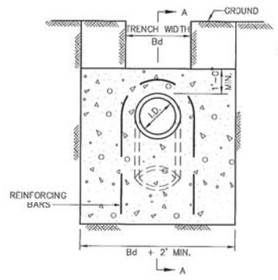


PLAN OF TEE THRUST BLOCK

I.D. (IN.)	THRUST (TONS)	C (FT.)	EARTH A (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK VOL. (C.Y.)
4,6,8	5.1	1.5	2.5	0.3	2.0	0.2
10,12	11.3	1.5	3.5	0.6	2.5	0.3
16,18	25.5	2.0	5.5	1.6	4.0	0.9
20	31.5	2.0	6.0	1.9	4.0	0.9
24	45.2	2.5	7.0	3.1	5.0	1.7
30	53.0	3.0	7.5	4.1	5.5	2.4
36	76.3	4.0	9.0	7.3	6.5	4.2
42	104.0	4.5	10.5	11.0	7.5	6.2
48	136.0	5.0	12.0	15.6	8.5	8.7

I.D. (IN.)	THRUST (TONS)	C (FT.)	EARTH A (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK VOL. (C.Y.)
54	172.0	5.5	13.5	21.4	9.5	11.9
60	212.0	6.0	15.0	28.4	10.5	15.7
66	257.0	6.5	16.5	36.8	11.5	20.5
72	305.0	7.5	17.5	47.2	12.5	27.2
78	358.0	8.0	19.0	58.9	13.5	33.7
84	416.0	8.5	20.5	72.3	14.5	41.2
90	477.0	9.0	22.0	87.7	15.5	49.7
96	543.0	9.5	23.5	104.8	16.5	61.0

TABLES OF DIMENSIONS AND QUANTITIES



ELEVATION "B–B" SECTION "A–A"

Δ → I.D. (IN.)	11.25° THRUST (TONS)	11.25° VOL. (C.Y.)	22.50° THRUST (TONS)	22.50° VOL. (C.Y.)	30° THRUST (TONS)	30° VOL. (C.Y.)	45° THRUST (TONS)	45° VOL. (C.Y.)	67.50° THRUST (TONS)	67.50° VOL. (C.Y.)	90° THRUST (TONS)	90° VOL. (C.Y.)	← Δ I.D. (IN.)
4,6,8	1.0	0.5	2.0	1.0	2.5	1.3	3.6	1.8	4.6	2.3	5.0	2.5	4,6,8
10,12	2.2	1.1	4.3	2.2	5.7	2.8	8.0	4.0	10.5	5.2	11.3	5.7	10,12
16,18	5.0	2.5	9.7	4.9	12.7	6.4	18.0	9.0	23.5	11.8	25.5	12.7	16,18
20	6.1	3.1	12.0	6.0	15.7	7.9	22.2	11.1	29.2	14.5	31.4	15.7	20
24	8.2	4.4	17.3	8.7	22.6	11.3	32.0	16.0	41.8	20.9	45.2	22.6	24
30	10.5	5.2	20.3	10.1	26.5	13.3	37.5	18.8	49.0	24.5	53.1	26.5	30
36	14.9	7.5	29.2	14.6	38.2	19.1	54.0	27.0	70.5	35.3	76.4	38.2	36
42	20.3	10.1	39.8	19.9	52.0	26.0	73.5	36.7	96.0	48.0	104.0	52.0	42
48	26.5	13.2	51.9	26.0	67.9	33.9	96.0	48.0	126.0	62.7	136.0	67.9	48
54	33.5	16.8	65.7	32.9	85.9	42.9	122.0	60.7	159.0	79.4	172.0	85.9	54
60	41.4	20.7	81.2	40.6	106.0	53.0	150.0	75.0	196.0	98.0	212.0	106.0	60
66	50.1	25.0	98.2	49.1	128.0	64.2	182.0	90.7	237.0	119.0	257.0	128.0	66
72	59.6	29.8	117.0	58.4	153.0	76.3	216.0	108.0	282.0	141.0	305.0	153.0	72
78	69.9	35.0	137.0	68.6	179.0	90.0	254.0	127.0	331.0	166.0	358.0	179.0	78
84	81.1	40.5	159.0	79.5	208.0	104.0	294.0	147.0	384.0	192.0	416.0	208.0	84
90	93.1	46.5	183.0	91.3	239.0	119.0	337.0	169.0	441.0	221.0	477.0	239.0	90
96	106.0	53.0	208.0	104.0	272.0	136.0	384.0	192.0	502.0	251.0	543.0	272.0	96

VERTICAL THRUST BLOCK

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

FLOODPLAIN NOTE: THE ENTIRE PROJECT IS LOCATED WITHIN ZONE 'X' (AREA OF MINIMAL FLOODING) PER FEMA FIRM MAP 48113C0180K, EFFECTIVE 07/07/2014.

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PUBLIC WORKS & ENGINEERING SERVICES	972–450–2871
TEXAS ONE CALL/DIG TESS	1–811–344–8377
ONCOR	1–888–313–6862
AT&T	1–800–331–0500
SPECTRUM/CHARTER COMMUNICATIONS	1–888–438–2427
ATMOS ENERGY	1–888–286–6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

WATER DETAILS (2 OF 3)

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: NTS
FILE: DETAILS_WTR.dwg	SHEET NO: 23

Addison PUBLIC WORKS DEPARTMENT | HORIZONTAL THRUST BLOCK AT PIPE BEND | STANDARD CONSTRUCTION DETAILS WATER | DATE: AUGUST, 2010 | REV DATE: – | SHEET : SD–W04

Addison PUBLIC WORKS DEPARTMENT | HORIZONTAL THRUST BLOCK DIMENSIONS & QUANTITIES | STANDARD CONSTRUCTION DETAILS WATER | DATE: AUGUST, 2010 | REV DATE: – | SHEET : SD–W05

Addison PUBLIC WORKS DEPARTMENT | HORIZONTAL THRUST BLOCK DIMENSIONS & QUANTITIES | STANDARD CONSTRUCTION DETAILS WATER | DATE: AUGUST, 2010 | REV DATE: – | SHEET : SD–W06

Addison PUBLIC WORKS DEPARTMENT | HORIZONTAL THRUST BLOCK AT TEES & PLUGS | STANDARD CONSTRUCTION DETAILS WATER | DATE: AUGUST, 2010 | REV DATE: – | SHEET : SD–W07

Addison PUBLIC WORKS DEPARTMENT | VERTICAL THRUST BLOCK AT PIPE BEND | STANDARD CONSTRUCTION DETAILS WATER | DATE: AUGUST, 2010 | REV DATE: – | SHEET : SD–W08

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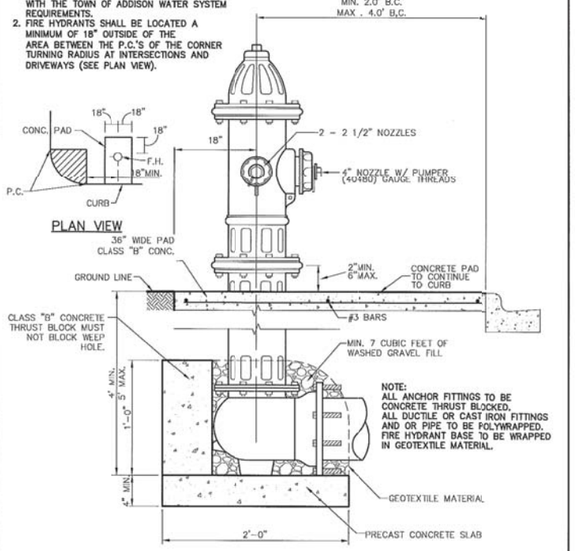
PLOTTED: Jan 02,2020 - 1:56pm
Crystal.Read

NOTE:

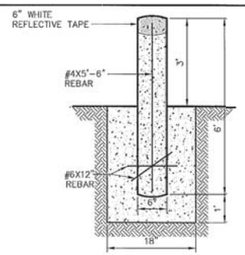
1. DESIGN, SITE REQUIREMENTS, THE GENERAL OPERATION, PAINTING AND DELIVERY OF ALL FIRE HYDRANTS SHALL BE IN ACCORDANCE WITH THE TOWN OF ADDISON WATER SYSTEM REQUIREMENTS.
2. FIRE HYDRANTS SHALL BE LOCATED A MINIMUM OF 18" OUTSIDE OF THE AREA BETWEEN THE P.C.'S OF THE CORNER TURNING RADIUS AT INTERSECTIONS AND DRIVEWAYS (SEE PLAN VIEW).



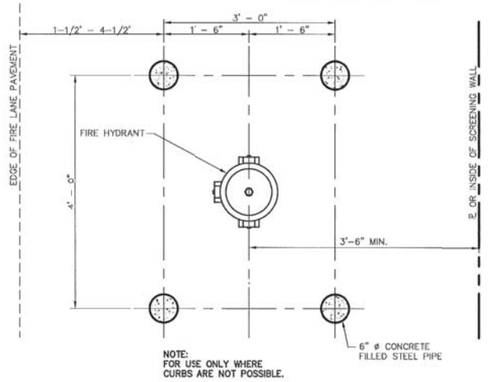
TYPICAL FIRE HYDRANT INSTALLATION

Addison!. PUBLIC WORKS DEPARTMENT	TYPICAL FIRE HYDRANT INSTALLATION	STANDARD CONSTRUCTION DETAILS WATER		
		DATE: AUGUST, 2010	REV DATE: –	SHEET : SD–W16

NOTE
6"ø STEEL PIPE W/CONCRETE FILL 6' LENGTH (3' ABOVE PAVING, 3' BELOW PAVING) WITH 1–#4X5'–6" TO BE CASED IN 18"ø PIER TO DEPTH OF 1'–0" BELOW BOTTOM OF PIPE. USE 2–#6x12" REBAR THRU PIPE INTO CONCRETE PIER. PIPES TO BE PAINTED TRAFFIC YELLOW W/ 6" WHITE RELECTOR TAPE.



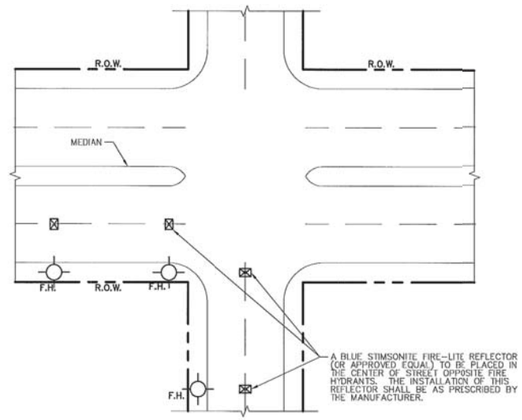
GUARD POST SECTION



NOTE:
FOR USE ONLY WHERE CURBS ARE NOT POSSIBLE.

FIRE HYDRANT GUARD POST DETAIL

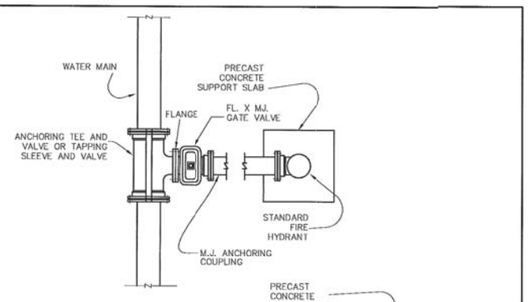
Addison!. PUBLIC WORKS DEPARTMENT	FIRE HYDRANT GUARD POST	STANDARD CONSTRUCTION DETAILS WATER		
		DATE: AUGUST, 2010	REV DATE: –	SHEET : SD–W18



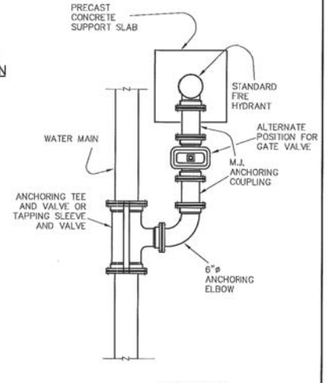
NOTE:
FIRE HYDRANT SHALL BE LOCATED OUTSIDE OF RADIUS.

TYPICAL FIRE HYDRANT REFLECTOR INSTALLATION

Addison!. PUBLIC WORKS DEPARTMENT	FIRE HYDRANT REFLECTOR INSTALLATION	STANDARD CONSTRUCTION DETAILS WATER		
		DATE: AUGUST, 2010	REV DATE: –	SHEET : SD–W19



STANDARD INSTALLATION



NOTE:
MEGALUGS SHALL BE USED AT ALL TEES AND BENDS.

ALTERNATE INSTALLATION

Addison!. PUBLIC WORKS DEPARTMENT	TYPICAL FIRE HYDRANT INSTALLATION	STANDARD CONSTRUCTION DETAILS WATER		
		DATE: AUGUST, 2010	REV DATE: –	SHEET : SD–W17

SPECIAL NOTE:
ALL CONCRETE MANHOLES SHALL BE COATED WITH A SPRAY EPOXY LINING SYSTEM, SUCH AS WARREN ENVIRONMENTAL EPOXY SYSTEMS, S–301–14 OR APPROVED EQUAL. NO POLYURIA TYPE COATINGS WILL BE ACCEPTED. MINIMUM THICKNESS OF 125 MILS

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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AT&T	1–800–331–0500
SPECTRUM/CHARTER COMMUNICATIONS	1–888–438–2427
ATMOS ENERGY	1–888–286–6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

WATER DETAILS (3 OF 3)

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: NTS
FILE: DETAILS_WTR.dwg	SHEET NO: 24

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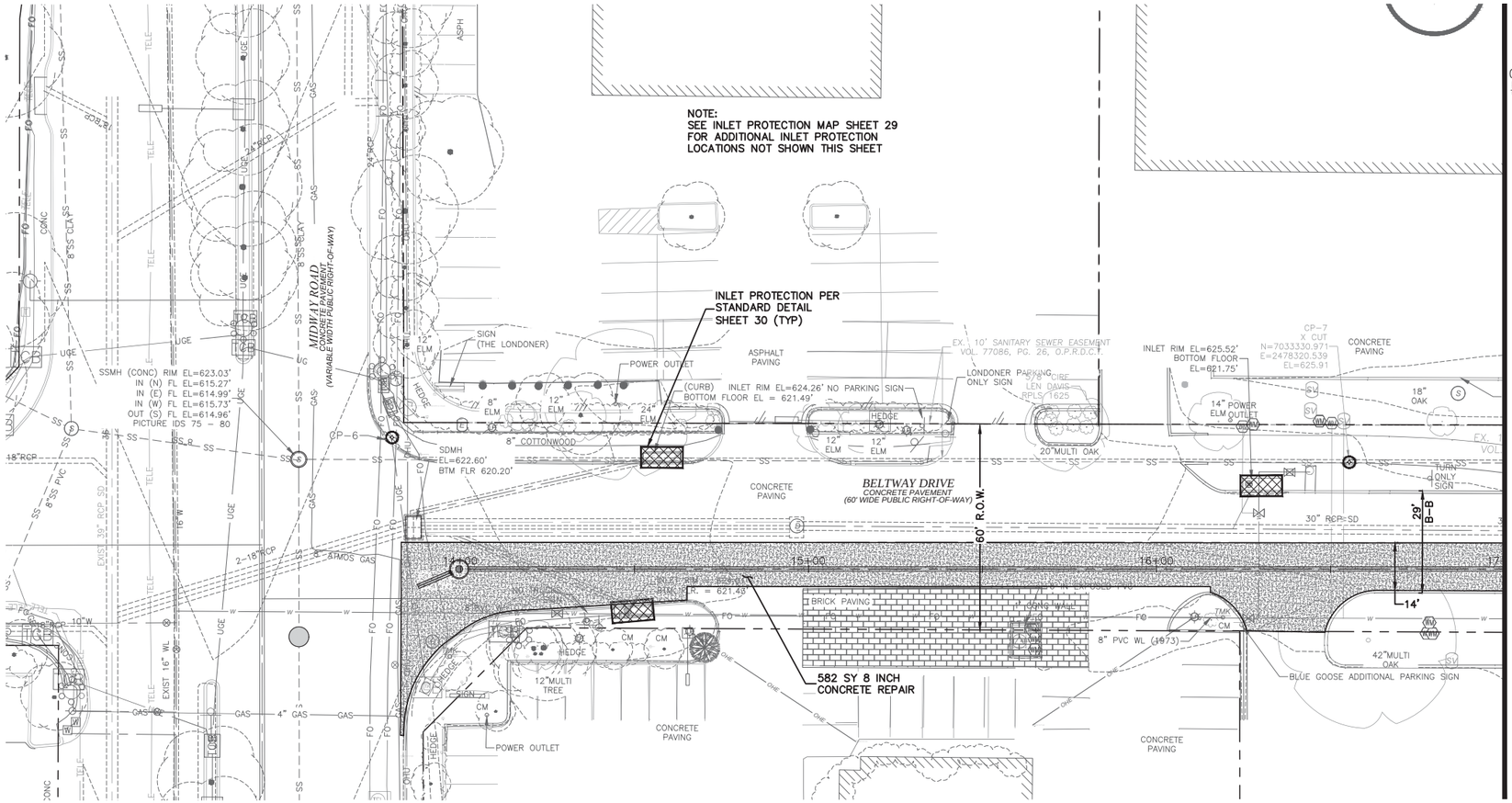
PLOTTED: Jan 02,2020 – 1:56pm
Crystal.Read



BELTWAY DRIVE

ASPHALT PAVEMENT REPAIR

8 INCH PRIVATE DRIVEWAY CONCRETE PAVEMENT REPAIR

8 INCH CONCRETE PAVEMENT REPAIR

SOD REPLACEMENT

INLET PROTECTION

CONTROL	CONTROL
CP-5	CP-4
X CUT	FOUND 5/8"CIRS
N=7033161.667	N 7032888.8263
E=2477957.363	E 2478048.1677
EL=621.41	

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED
PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PAVE RESTORATION
BEGIN TO STA 17+00

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'
FILE: PAVING.dwg	SHEET NO: 25

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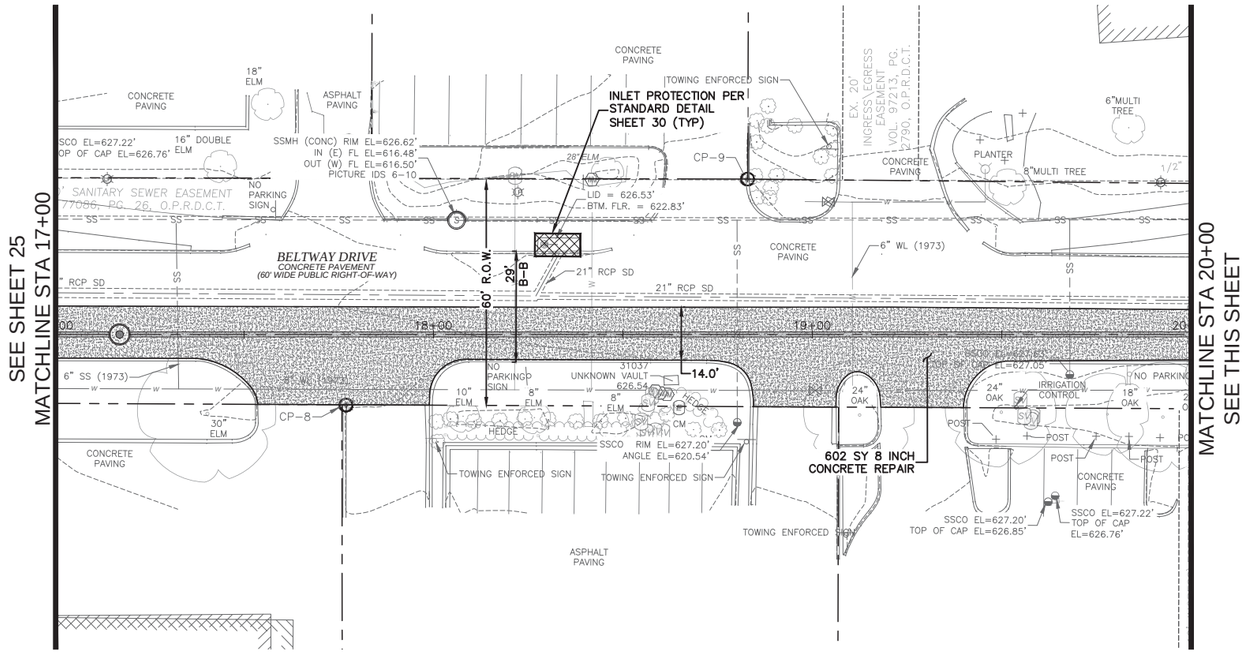
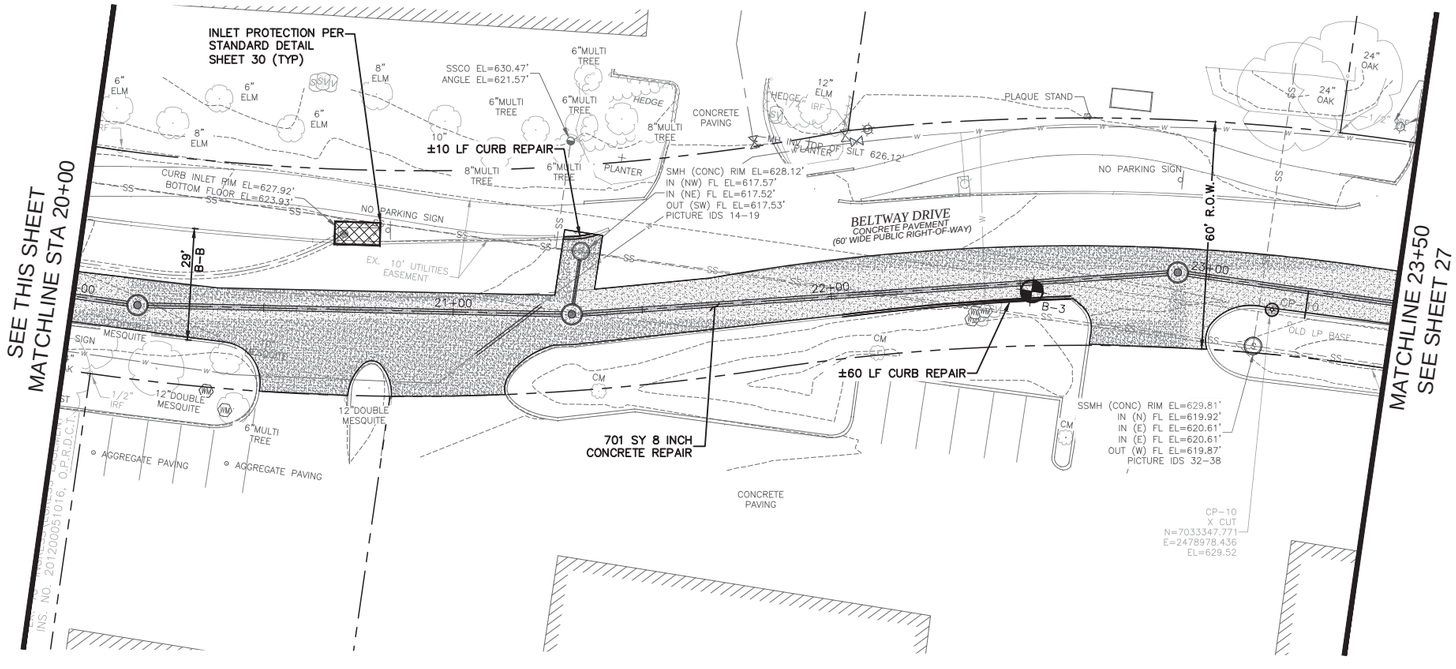
..\Civil 3D\5131-01-Pipe Network.dwg



BELTWAY DRIVE



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N

0 10' 20' 40'

ASPHALT PAVEMENT REPAIR

8 INCH PRIVATE DRIVEWAY CONCRETE PAVEMENT REPAIR

8 INCH CONCRETE PAVEMENT REPAIR

SOD REPLACEMENT

INLET PROTECTION

CP-8
'X' CUT
N=7033282.9139
E=2478442.5775
ELEVATION =625.89

CP-9
'X' CUT
N=7033343.6603
E=2478547.9288
ELEVATION 626.88

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED
PROFESSIONAL ENGINEER
1/2/2020

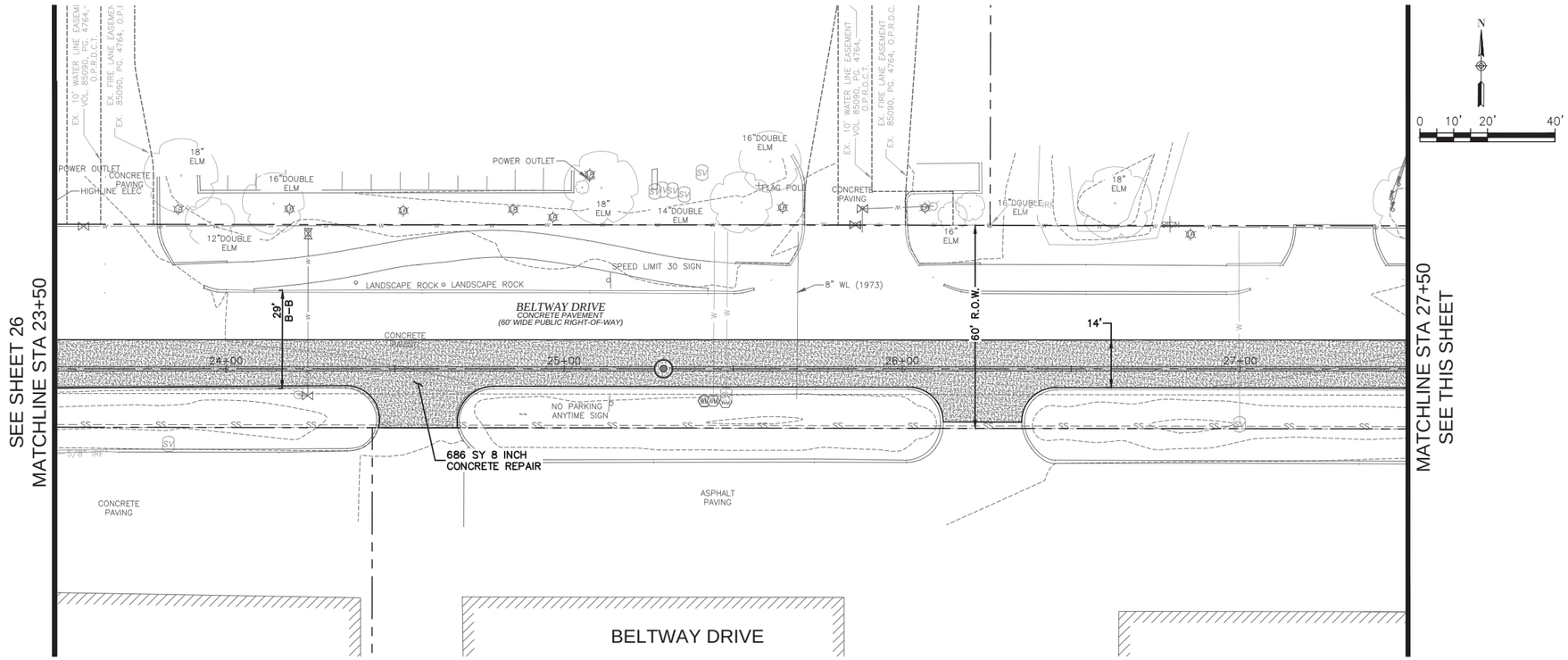
ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

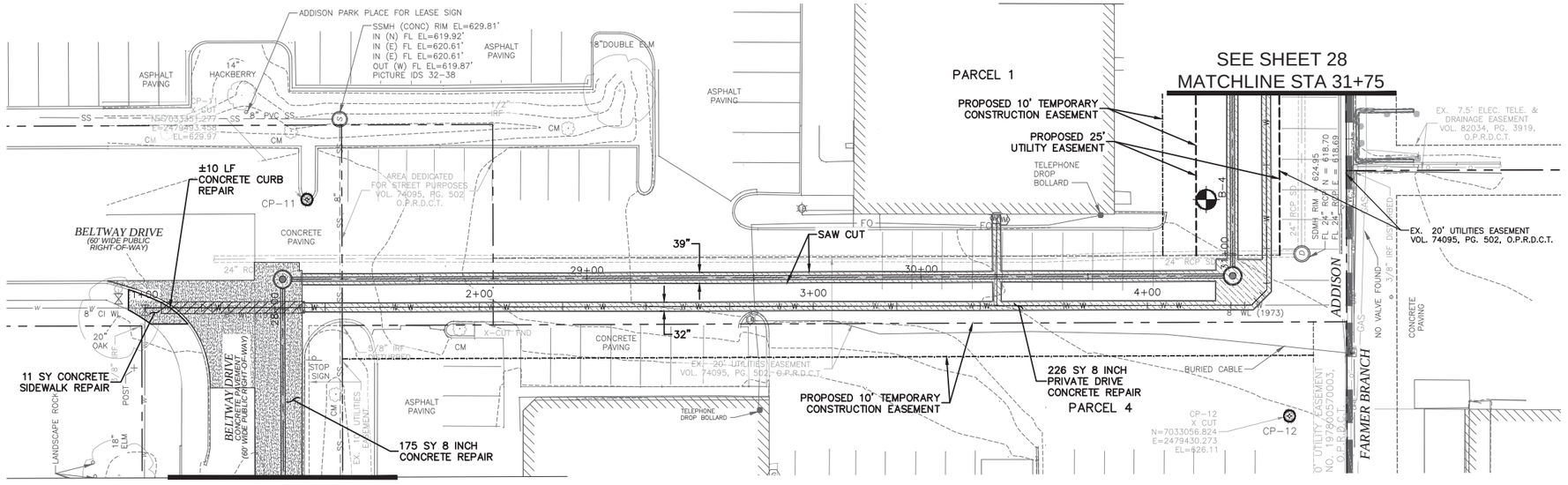
SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PAVE RESTORATION
STA 17+00 TO 23+50

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'
FILE: PAVING.dwg	SHEET NO: 26





ASPHALT PAVEMENT REPAIR

8 INCH PRIVATE DRIVEWAY CONCRETE PAVEMENT REPAIR

8 INCH CONCRETE PAVEMENT REPAIR

SOD REPLACEMENT

INLET PROTECTION

ATTENTION :
THE CONTRACTOR SHALL NOT DO ANY WORK OR CONSTRUCTION IN THE FARMER'S BRANCH CITY LIMITS. PLEASE CONTACT THE TOWN OF ADDISON STAFF IF THERE IS ANY QUESTION REGARDING WORK THAT IMPACTS IN THE FARMERS BRANCH CITY LIMITS.

SPECIAL NOTE:
STA 29+09 TO 39+38 SAW CUT PAVEMENT PER WASTEWATER MAIN EMBEDMENT DETAIL SHEET 15

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED
PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PAVE RESTORATION
STA 23+50 TO 31+75

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=20'
FILE: PAVING.dwg	SHEET NO: 27

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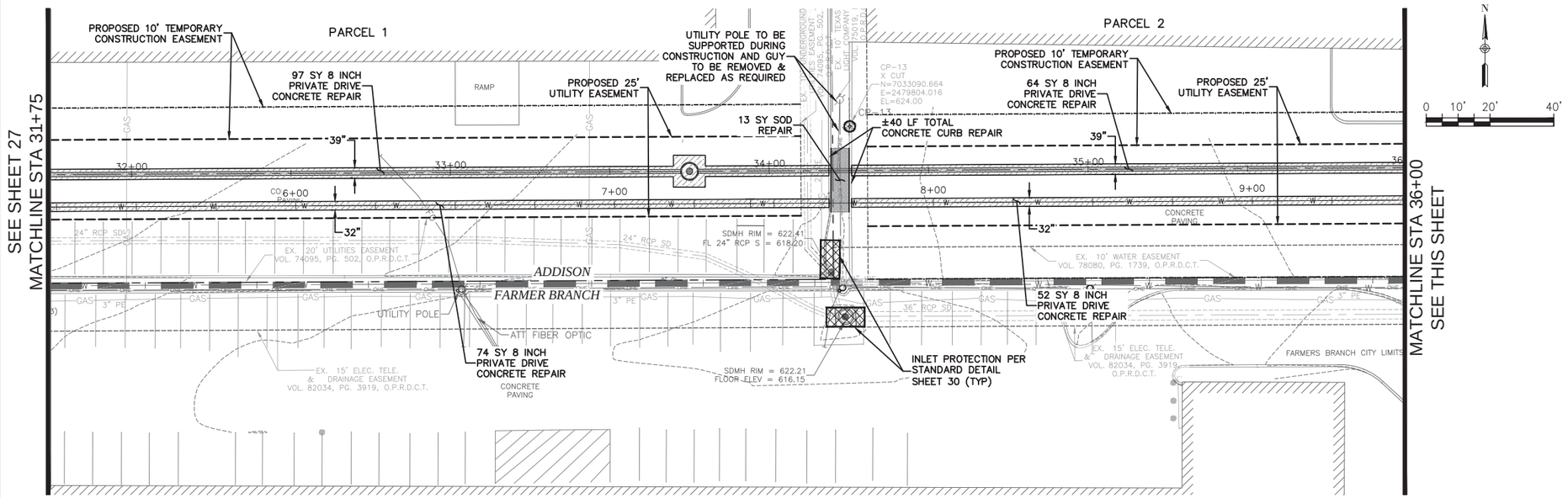

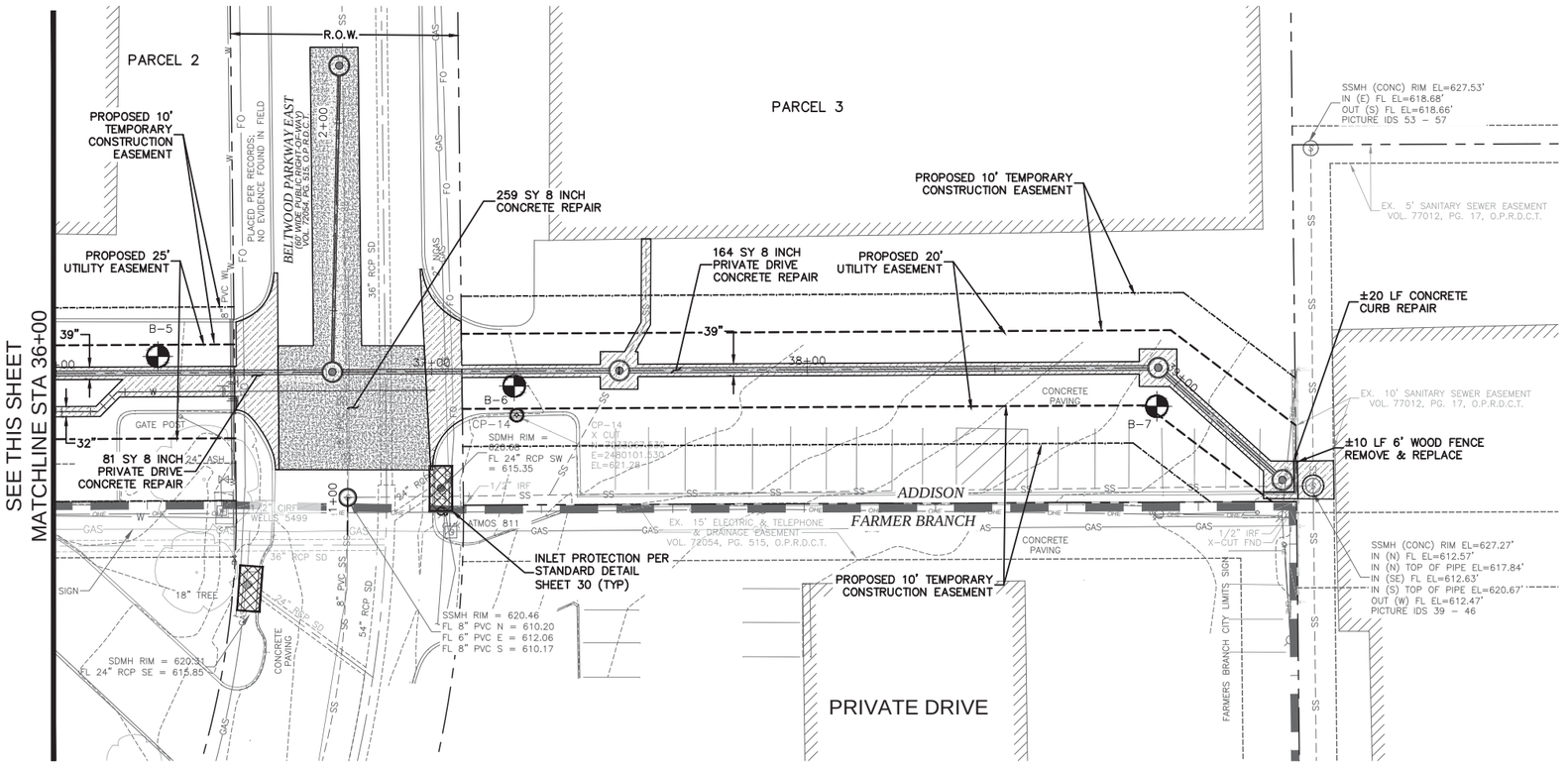

N

0 10' 20' 40'

- ASPHALT PAVEMENT REPAIR
- 8 INCH PRIVATE DRIVEWAY CONCRETE PAVEMENT REPAIR
- 8 INCH CONCRETE PAVEMENT REPAIR
- SOD REPLACEMENT
- INLET PROTECTION

ATTENTION :
THE CONTRACTOR SHALL NOT DO ANY WORK OR CONSTRUCTION IN THE FARMER'S BRANCH CITY LIMITS. PLEASE CONTACT THE TOWN OF ADDISON STAFF IF THERE IS ANY QUESTION REGARDING WORK THAT IMPACTS IN THE FARMERS BRANCH CITY LIMITS.

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

FLOODPLAIN NOTE: THE ENTIRE PROJECT IS LOCATED WITHIN ZONE 'X' (AREA OF MINIMAL FLOODING) PER FEMA FIRM MAP 48113C0180K, EFFECTIVE 07/07/2014.

THE LOCATION AND DIMENSIONS OF EXISTING UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. IT IS CONTRACTOR'S SOLE RESPONSIBILITY TO VERIFY LOCATION. DEPTH AND DIMENSION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.

WARNING! UNDERGROUND UTILITIES IN AREA OF CONSTRUCTION. CONTACT THE FOLLOWING AT LEAST 48 HOURS PRIOR TO EXCAVATION IN THIS AREA.

PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED
PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

PAVE RESTORATION
STA 31+75 TO END

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

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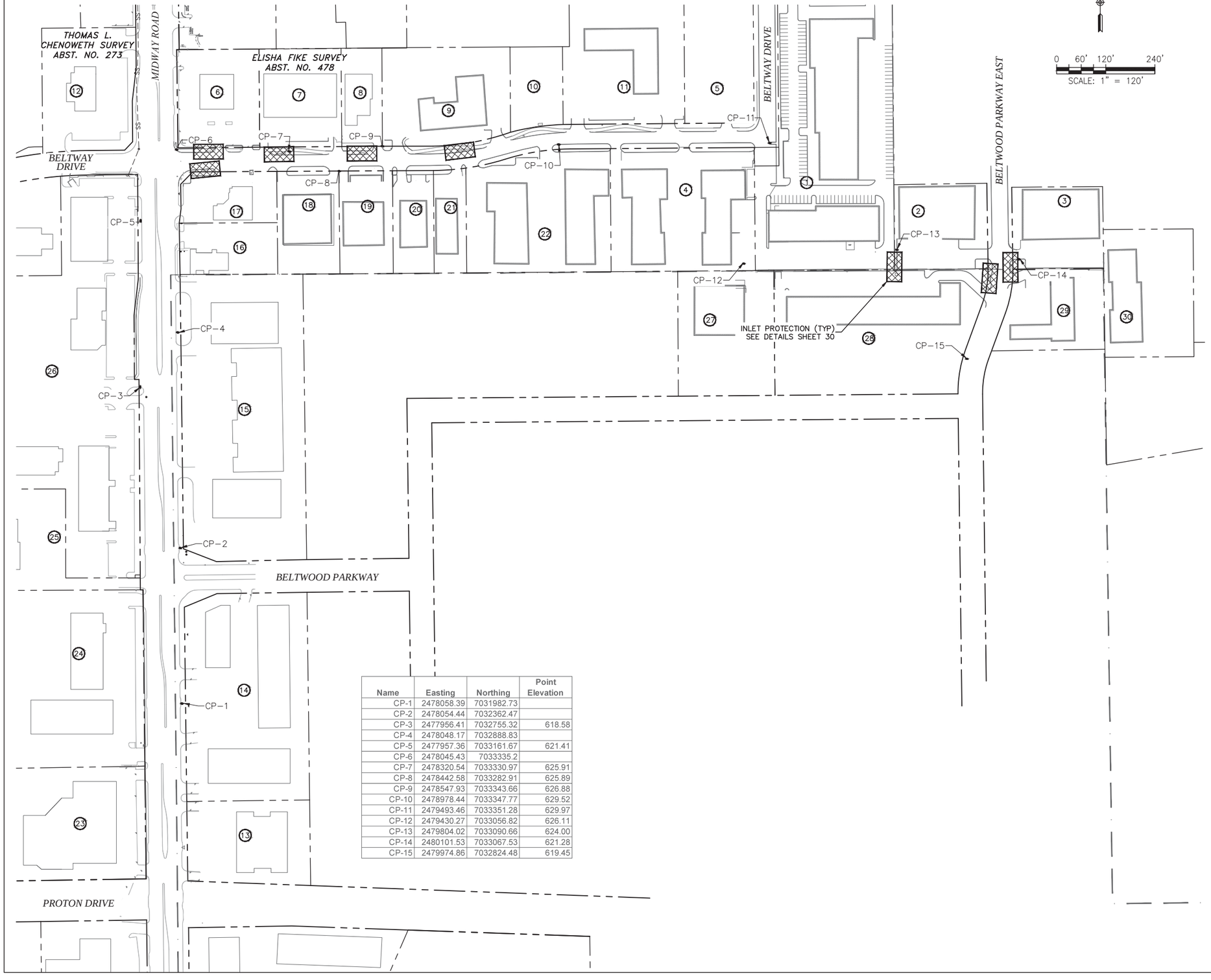

Name	Easting	Northing	Point Elevation
CP-1	2478058.39	7031982.73	
CP-2	2478054.44	7032362.47	
CP-3	2477956.41	7032755.32	618.58
CP-4	2478048.17	7032888.83	
CP-5	2477957.36	7033161.67	621.41
CP-6	2478045.43	7033335.2	
CP-7	2478320.54	7033330.97	625.91
CP-8	2478442.58	7033282.91	625.89
CP-9	2478547.93	7033343.66	626.88
CP-10	2478978.44	7033347.77	629.52
CP-11	2479493.46	7033351.28	629.97
CP-12	2479430.27	7033056.82	626.11
CP-13	2479804.02	7033090.66	624.00
CP-14	2480101.53	7033067.53	621.28
CP-15	2479974.86	7032824.48	619.45

LEGEND

- R.O.W LINE/PROPERTY LINE
- SHEET LAYOUT
- (X) PROPERTY IDENTIFICATION NUMBER
- INLET PROTECTION

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED
PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

INLET PROTECTION MAP

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: 1"=120'
FILE: 05 inlet protection.dwg	SHEET NO: 29

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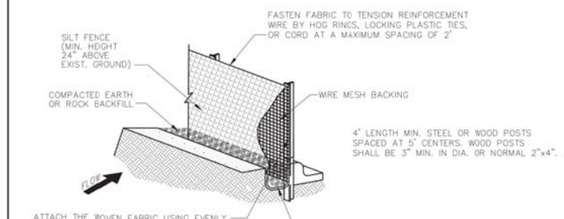
EROSION CONTROL PLAN NOTES

1. ALL OPERATORS AND/OR CONTRACTORS SHALL CONFORM TO THE TERMS AND CONDITIONS OF THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ), TPDES GENERAL PERMIT NO. TXR 150000 ISSUED AND DATED MARCH 5, 2003.
2. THE NOTICE OF INTENT (NOI), AS REQUIRED BY THE GENERAL PERMIT, MUST BE PROPERLY DISPLAYED ON SITE AT ALL TIMES BY EACH OPERATOR.
3. ALL RELEASES OF THE REPORTABLE QUANTITIES OF HAZARDOUS SUBSTANCES SHALL BE REPORTED IMMEDIATELY TO THE FACILITY OPERATOR, EPA AND TCEQ.
4. QUALIFIED OPERATOR PERSONNEL MUST INSPECT THE SITE AT LEAST ONCE EVERY 14 DAYS AND WITHIN 24 HOURS OF A STORM EVENT OF 0.5 INCHES OR GREATER. AS AN ALTERNATIVE, AN INSPECTION CAN BE CONDUCTED ONCE EVERY SEVEN (7) CALENDAR DAYS ON A DEFINED DAY. A DECISION ON WHICH METHOD TO USE MUST BE DECIDED BEFORE WORK BEGINS AND MUST BE FOLLOWED THROUGHOUT THE PROJECT.
5. MODIFICATIONS TO THE STORM WATER POLLUTION PREVENTION PLAN SHALL BE IMPLEMENTED AND BE IN-PLACE WITHIN A SEVEN CALENDAR DAY PERIOD.
6. IF ANY CONTRACTOR SEES A VIOLATION BY AN OPERATOR OR ANOTHER CONTRACTOR, THAT OPERATOR OR CONTRACTOR IN VIOLATION SHALL BE NOTIFIED AS WELL AS THE FACILITY OPERATOR.
7. EROSION CONTROL SHALL BE INSTALLED PRIOR TO GRADING.
8. ACCUMULATED SILT DEPOSITS SHALL BE REMOVED FROM SILT FENCES AND HAY BALE DIKES WHEN SILT DEPTH REACHES THREE INCHES OR 25%.
9. THE CONTRACTOR SHALL ADD OR DELETE EROSION PROTECTION AT THE REQUEST AND DIRECTION OF THE OPERATOR OR TOWN.
10. AFTER INSTALLATION OF PAVEMENT, FINAL LOT BENCHING AND GENERAL CLEANUP, THE CONTRACTOR SHALL ESTABLISH GRASS GROUNDCOVER IN ALL STREET PARKWAYS, LOT AND ALL OTHER DISTURBED AREAS. SODDING SHALL BE DONE AS SPECIFIED BY SECTION 202.5 AND SEEDING AS SPECIFIED BY SECTION 202.6 OF THE OCTOBER 2004 OR LATEST EDITION OF NCTCOG STANDARD SPECIFICATION.
11. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTROL AND LIMIT SILT AND SEDIMENT LEAVING THE SITE. SPECIFICALLY, THE CONTRACTOR SHALL PROTECT ALL PUBLIC STREETS, ALLEYS, STREAMS AND STORM DRAINAGE SYSTEMS FROM EROSION DEPOSITS.
12. A DRAINAGE AREA MAP WILL BE INCLUDED WITH THE EROSION CONTROL PLAN.
13. CONSTRUCTION WASTE DISPOSAL CONTAINERS SHALL BE PROVIDED ON THE SITE FOR DISPOSAL OF ALL NON-HAZARDOUS CONSTRUCTION WASTE MATERIALS. THE CONTAINERS SHALL BE HAULED TO LANDFILL BY THE CONTRACTOR.
14. ALL HAZARDOUS MATERIALS SHALL BE HANDLED AND DISPOSED OF BY THE CONTRACTOR IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS.

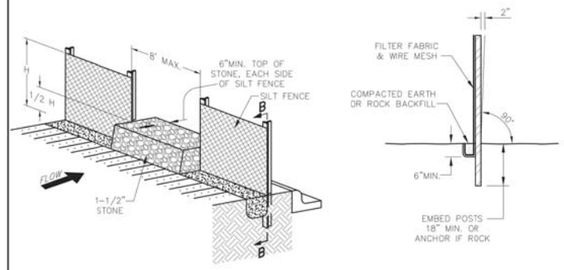
SILT FENCE NOTES

1. POSTS WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED ON A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. THE POST MUST BE EMBEDDED A MINIMUM OF 18 INCHES.
2. THE TOE OF THE SILT FENCE SHALL BE TRENCHED IN WITH A SPADE OR MECHANICAL TRENCHER, SO THAT THE DOWNSLOPE FACE OF THE TRENCH IS FLAT AND PERPENDICULAR TO THE LINE OF FLOW. WHERE FENCE CANNOT BE TRENCHED IN (E.G. PAVEMENT), WEIGHT FABRIC FLAP WITH WASHED GRAVEL ON THE UPHILL SIDE TO PREVENT FLOW UNDER FENCE.
3. THE TRENCH MUST BE A MINIMUM OF 6 INCHES DEEP AND 6 INCHES WIDE TO ALLOW FOR THE SILT FENCE FABRIC TO BE LAID IN THE GROUND AND BACKFILLED WITH COMPACTED MATERIAL.
4. SILT FENCE SHALL BE SECURELY FASTENED TO EACH SUPPORT POST OR TO WOVEN WIRE, WHICH IS IN TURN ATTACHED TO THE SUPPORT POST. THERE SHALL BE A 6 INCH DOUBLE OVERLAP, SECURELY FASTENED WHERE ENDS OF FABRIC MEET.
5. INSPECTION SHALL BE MADE EVERY TWO WEEKS OR AFTER EACH RAINFALL. REPAIR OR REPLACEMENT SHALL BE PROMPTLY AS NEEDED.
6. SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.
7. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 3 INCHES. THE SILT SHALL BE DISPOSED OF AT AN APPROVED SITE AND IN SUCH A MANNER AS TO NOT CONTRIBUTE TO ADDITIONAL SILTATION.

Addison! PUBLIC WORKS DEPARTMENT | EROSION CONTROL & SILT FENCE NOTES | STANDARD CONSTRUCTION DETAILS EROSION CONTROL | DATE: AUGUST, 2010 | REV DATE: - | SHEET: SD-EC01

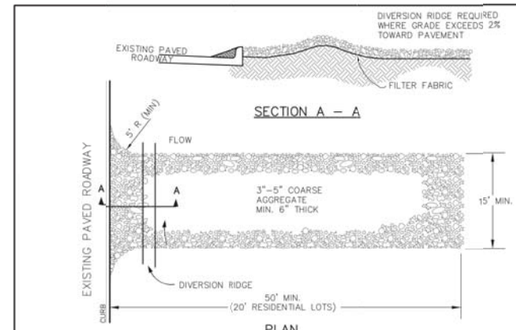


ISOMETRIC PLAN VIEW
N.T.S.



SILT FENCE
STONE OVERFLOW STRUCTURE
N.T.S.

Addison! PUBLIC WORKS DEPARTMENT | SILT FENCE DETAIL | STANDARD CONSTRUCTION DETAILS EROSION CONTROL | DATE: AUGUST, 2010 | REV DATE: - | SHEET: SD-EC02

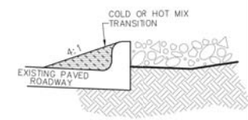


PLAN

TEMPORARY STONE CONSTRUCTION ENTRANCE/EXIT
N.T.S.

STABILIZED CONSTRUCTION ENTRANCE GENERAL NOTES:

1. WHEN NECESSARY, VEHICLES SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO A PUBLIC ROADWAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AREA STABILIZED WITH CRUSHED STONE WITH DRAINAGE FLOWING AWAY FROM BOTH THE STREET AND THE STABILIZED ENTRANCE. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH OR WATERCOURSE USING APPROVED METHODS.
2. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PAVED SURFACES. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND. ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO PAVED SURFACES MUST BE REMOVED IMMEDIATELY.
3. THE ENTRANCE MUST BE PROPERLY GRADED OR INCORPORATE A DRAINAGE SWALE TO PREVENT RUNOFF FROM LEAVING THE CONSTRUCTION SITE.
4. WHEN SEDIMENT HAS SUBSTANTIALLY CLOGGED THE VOID AREA BETWEEN THE ROCKS, THE AGGREGATE MAT MUST BE WASHED DOWN OR REPLACED. PERIODIC RE-GRADING AND TOP DRESSING WITH ADDITIONAL STONE MUST BE DONE TO KEEP THE EFFICIENCY OF THE ENTRANCE FROM DIMINISHING.



TRANSITION

Addison! PUBLIC WORKS DEPARTMENT | TEMPORARY STONE CONSTRUCTION ENTRANCE/EXIT | STANDARD CONSTRUCTION DETAILS EROSION CONTROL | DATE: AUGUST, 2010 | REV DATE: - | SHEET: SD-EC03

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
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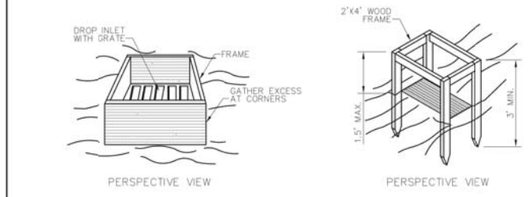
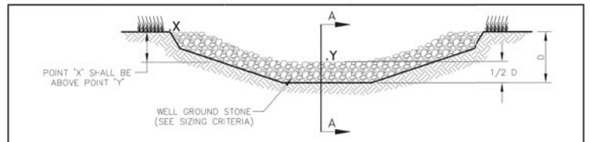
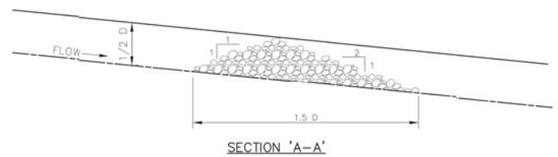


SPECIFIC APPLICATION
THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE THE INLET DRAINS A RELATIVELY FLAT AREA (SLOPE NO GREATER THAN 5%) WHERE THE INLET SHEET OR OVER-LAND FLOWS (NOT TO EXCEED 1 C.F.S.) ARE TYPICAL. THE METHOD SHALL NOT APPLY TO INLETS RECEIVING CONCENTRATED FLOWS SUCH AS IN STREETS OR HIGHWAY MEDIANS.

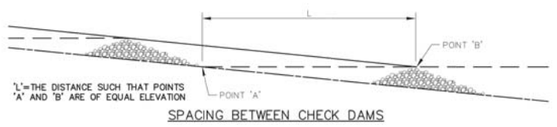
Addison! PUBLIC WORKS DEPARTMENT | GRATE AND WYE INLET PROTECTION | STANDARD CONSTRUCTION DETAILS EROSION CONTROL | DATE: AUGUST, 2010 | REV DATE: - | SHEET: SD-EC04



VIEW LOOKING UPSTREAM



SECTION 'A-A'

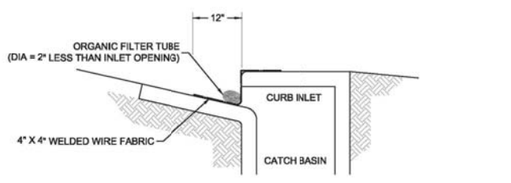


SPACING BETWEEN CHECK DAMS

ROCK CHECK DAM NOTES:

1. STONE SHALL BE WELL GRADED STONE WITH SIZE RANGE FROM 1-1/2 TO 3-1/2 INCHES IN DIAMETER DEPENDING ON EXPECTED FLOWS.
2. THE CHECK DAM SHALL BE INSPECTED AS SPECIFIED IN THE SWPPP AND SHALL BE REPLACED WHEN THE STRUCTURE CEASES TO FUNCTION AS INTENDED DUE TO SILT ACCUMULATION AMONG THE ROCKS, WASHOUT, CONSTRUCTION TRAFFIC DAMAGE, ETC.
3. WHEN SILT REACHES A DEPTH EQUAL TO ONE-THIRD OF THE HEIGHT OF THE CHECK DAM OR ONE FOOT, WHICHEVER IS LESS, THE SILT SHALL BE REMOVED AND DISPOSED OF PROPERLY.
4. WHEN THE SITE HAS ACHIEVED FINAL STABILIZATION OR ANOTHER EROSION OR SEDIMENT CONTROL DEVICE IS EMPLOYED, THE CHECK DAM AND ACCUMULATED SILT SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED MANNER.

Addison! PUBLIC WORKS DEPARTMENT | ROCK CHECK DAM | STANDARD CONSTRUCTION DETAILS EROSION CONTROL | DATE: AUGUST, 2010 | REV DATE: - | SHEET: SD-EC05



ORGANIC FILTER TUBE CURB INLET PROTECTION CROSS SECTION
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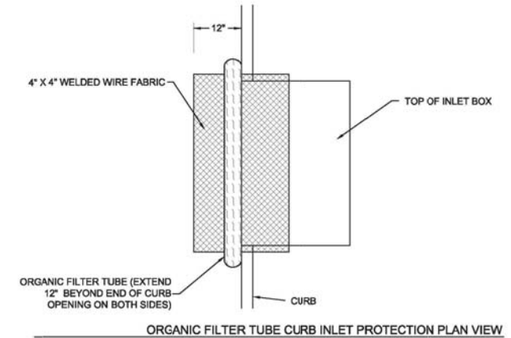

ORGANIC FILTER TUBE CURB INLET PROTECTION PLAN VIEW
N.T.S.

NOTE: THIS CONTROL WILL DECREASE THE CAPACITY OF THE INLET. IT SHALL ONLY BE USED WHEN AN ENGINEER HAS DETERMINED THERE IS ADEQUATE STORAGE OR POSITIVE OVERFLOW.

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

STANDARD DETAILS
EROSION CONTROL

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

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CHECKED BY: DEG	DRAWING SCALE: NTS
FILE: DETAILS_PAVE.dwg	SHEET NO: 30

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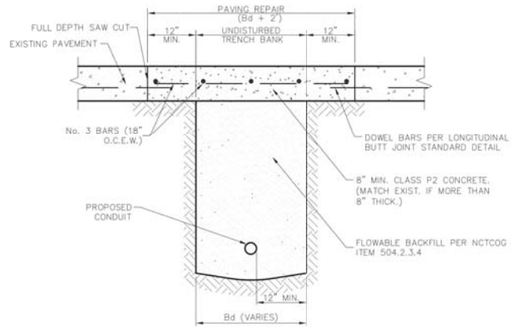
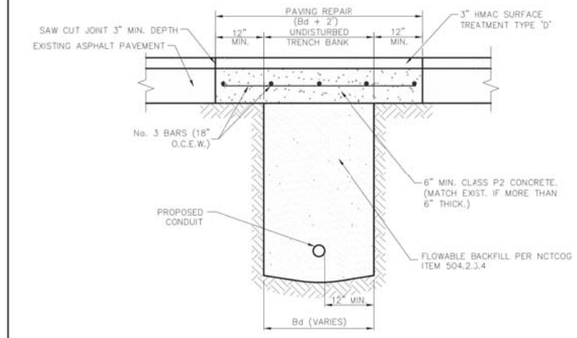


NOTES:
1. REPAIRS SHALL EXTEND TO 1' BEYOND EACH SIDE OF TRENCH (Bd).
2. REINFORCEMENT CHAIRS OR APPROVED DEVICE SHALL BE USED.
3. REPAIRS SHALL MATCH EXISTING GRADE.

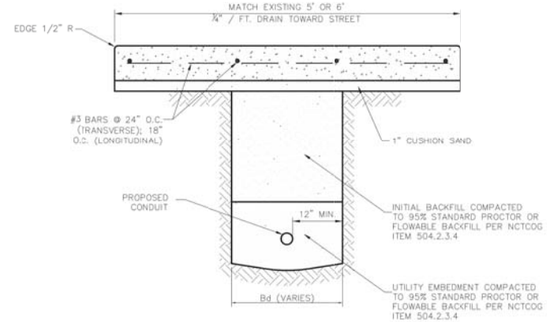
Addison! PUBLIC WORKS DEPARTMENT	UTILITY INSTALLATION BENEATH CONCRETE ROAD SURFACE	STANDARD CONSTRUCTION DETAILS UTILITIES TRENCHLINE & STREET RESTORATION		
		DATE: AUGUST, 2010	REV DATE: -	SHEET : SD-U01



NOTES:
1. REPAIR SHALL EXTEND TO 1' BEYOND EACH SIDE OF TRENCH (Bd).
2. REPAIRS SHALL MATCH EXISTING GRADE.

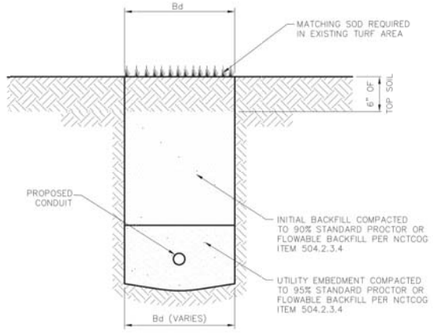
UTILITY INSTALLATION BENEATH ASPHALT ROAD SURFACE
NTS

Addison! PUBLIC WORKS DEPARTMENT	UTILITY INSTALLATION BENEATH ASPHALT ROAD SURFACE	STANDARD CONSTRUCTION DETAILS UTILITIES TRENCHLINE & STREET RESTORATION		
		DATE: AUGUST, 2010	REV DATE: -	SHEET : SD-U02



NOTES:
1. REPAIRS SHALL INCLUDE FULL PANELS FROM JOINT TO JOINT, AND ANY ADJACENT DAMAGED PANELS INDEPENDENT OF Bd.
2. REINFORCEMENT CHAIRS OR APPROVED DEVICE SHALL BE USED.
3. SEE CONCRETE SIDEWALK STANDARD DETAIL FOR SIDEWALK JOINT DETAIL.
4. ALL DISTURBED AREAS SHALL BE SODDED (UNLESS OTHERWISE APPROVED).
5. BACKFILL AND EMBEDMENT PARTICLE SIZE SHALL NOT EXCEED 3" IN ANY DIRECTION.
6. CONNECT TO EXISTING SIDEWALK WITH BARS MATCHING EXISTING INSTALLATION.

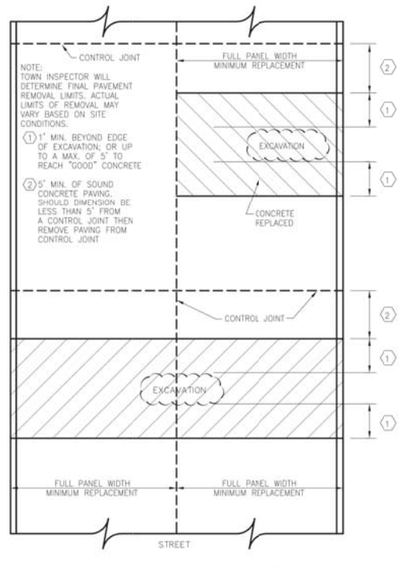
Addison! PUBLIC WORKS DEPARTMENT	UTILITY INSTALLATION BENEATH SIDEWALK	STANDARD CONSTRUCTION DETAILS UTILITIES TRENCHLINE & STREET RESTORATION		
		DATE: AUGUST, 2010	REV DATE: -	SHEET : SD-U03



NOTES:
1. ALL DISTUREED AREAS SHALL BE SODDED (UNLESS OTHERWISE APPROVED).
2. BACKFILL AND EMBEDMENT PARTICLE SIZE SHALL NOT EXCEED 3" ANY DIRECTION.

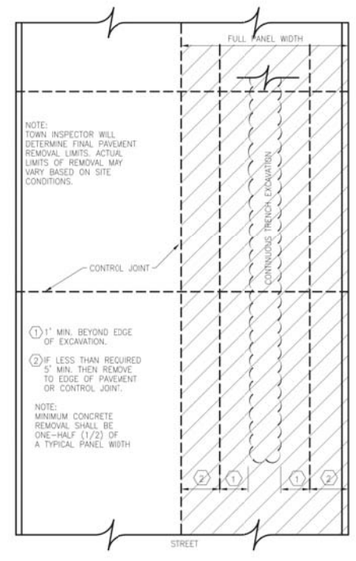
UTILITY INSTALLATION WITHIN TURF AREAS
NTS

Addison! PUBLIC WORKS DEPARTMENT	UTILITY INSTALLATION WITHIN TURF AREAS	STANDARD CONSTRUCTION DETAILS UTILITIES TRENCHLINE & STREET RESTORATION		
		DATE: AUGUST, 2010	REV DATE: -	SHEET : SD-U04



TYPICAL CONCRETE STREET REMOVAL/REPLACEMENT
EXAMPLE 1

Addison! PUBLIC WORKS DEPARTMENT	STREET CUT REPAIRS EXAMPLE 1	STANDARD CONSTRUCTION DETAILS UTILITIES TRENCHLINE & STREET RESTORATION		
		DATE: AUGUST, 2010	REV DATE: -	SHEET : SD-U05



TYPICAL CONCRETE STREET REMOVAL/REPLACEMENT
EXAMPLE 2

Addison! PUBLIC WORKS DEPARTMENT	STREET CUT REPAIRS EXAMPLE 2	STANDARD CONSTRUCTION DETAILS UTILITIES TRENCHLINE & STREET RESTORATION		
		DATE: AUGUST, 2010	REV DATE: -	SHEET : SD-U06

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

NOTE: ALL COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, NAD 83. ALL DISTANCES AND COORDINATES ARE EXPRESSED IN US SURVEY FEET. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SURFACE FACTOR OF 0.9998496003.

FLOODPLAIN NOTE: THE ENTIRE PROJECT IS LOCATED WITHIN ZONE 'X' (AREA OF MINIMAL FLOODING) PER FEMA FIRM MAP 48113C0180K, EFFECTIVE 07/07/2014.

THE LOCATION AND DIMENSIONS OF EXISTING UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. IT IS CONTRACTOR'S SOLE RESPONSIBILITY TO VERIFY LOCATION. DEPTH AND DIMENSION OF EXISTING UTILITIES PRIOR TO CONSTRUCTION.

WARNING! UNDERGROUND UTILITIES IN AREA OF CONSTRUCTION. CONTACT THE FOLLOWING AT LEAST 48 HOURS PRIOR TO EXCAVATION IN THIS AREA.

PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
TEXAS ONE CALL/DIG TESS	1-811-344-8377
ONCOR	1-888-313-6862
AT&T	1-800-331-0500
SPECTRUM/CHARTER COMMUNICATIONS	1-888-438-2427
ATMOS ENERGY	1-888-286-6700

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

STANDARD DETAILS TRENCHLINE & RESTORATION (1 OF 2)

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: NTS
FILE: DETAILS_PAVE.dwg	SHEET NO: 31

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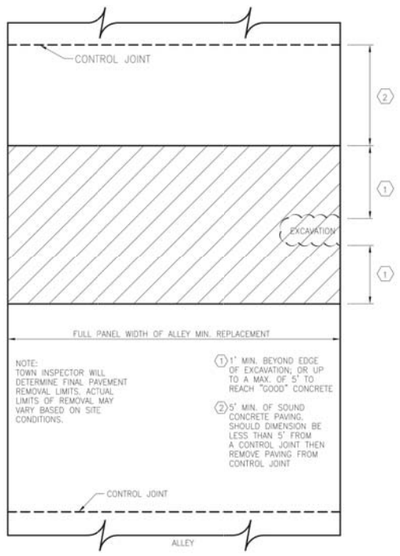
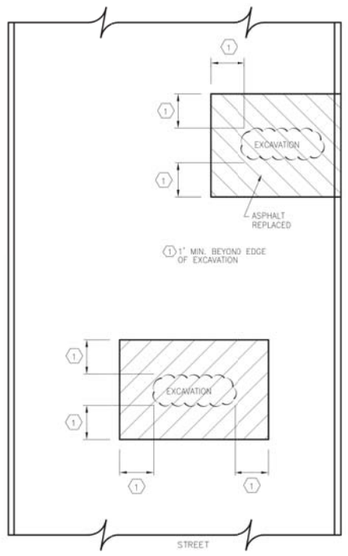
PLOTTED: Jan 02,2020 - 1:57pm
Crystal.Read



TYPICAL CONCRETE ALLEY REMOVAL/REPLACEMENT
EXAMPLE 3

Addison! PUBLIC WORKS DEPARTMENT	STREET CUT REPAIRS EXAMPLE 3	STANDARD CONSTRUCTION DETAILS UTILITIES TRENCHLINE & STREET RESTORATION		
		DATE: AUGUST, 2010	REV DATE: -	SHEET: SD-U07



TYPICAL ASPHALT STREET REMOVAL/REPLACEMENT
EXAMPLE 4

Addison! PUBLIC WORKS DEPARTMENT	STREET CUT REPAIRS EXAMPLE 4	STANDARD CONSTRUCTION DETAILS UTILITIES TRENCHLINE & STREET RESTORATION		
		DATE: AUGUST, 2010	REV DATE: -	SHEET: SD-U08

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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PUBLIC WORKS & ENGINEERING SERVICES	972-450-2871
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AT&T	1-800-331-0500
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REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
WM BART HINES
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REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS &
ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

STANDARD DETAILS TRENCHLINE
& RESTORATION (2 OF 2)

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: NTS
FILE: DETAILS_PAVE.dwg	SHEET NO: 32

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PLOTTED: Jan 02,2020 - 1:57pm
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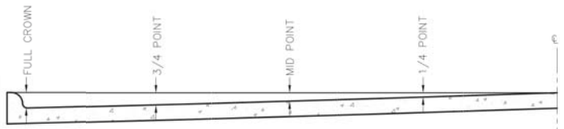
PAVING – GENERAL NOTES

1. GENERAL:
   PAVEMENT THICKNESS IS AS SHOWN IN ITEM 7. SUBGRADE DESIGN SHALL CONFORM TO TOWN OF ADDISON PUBLIC WORKS REQUIREMENTS IN ITEM 3, AND SHALL EXTEND 12" MIN. BEHIND THE BACK OF CURB.
2. REINFORCED CONCRETE PAVEMENT:
   A. CONCRETE STRENGTH SHALL BE AS SHOWN IN ITEM 7 (NCTCOG LATEST EDITION).
   B. ALL CURBS SHALL BE INTEGRAL WITH PAVEMENT AND SHALL BE OF THE SAME STRENGTH AS CONCRETE PAVEMENT.
   C. DETAIL AND ARRANGEMENT OF PAVEMENT JOINTS, ALL TYPES, SHALL BE AS SHOWN ON THE TOWN STANDARD CONSTRUCTION DETAILS.
   D. BAR LAPS SHALL BE THIRTY DIAMETERS.
   E. REINFORCING STEEL SHALL BE #3 REBAR (3/8") ON 18" CENTERS FOR 8" OR LESS. #4 FOR 10" OR ABOVE
3. SUBGRADE:
   SUBGRADE UNDER ALL PAVEMENT SHALL BE 6" THICK AND SHALL BE STABILIZED WITH AT LEAST 30 LBS. PER SQ. YD. HYDRATED LIME, COMPACTED TO A DENSITY NOT LESS THAN 95 PERCENT. LABORATORY TESTS MUST BE SUBMITTED TO THE PUBLIC WORKS DEPARTMENT FOR APPROVAL TO DETERMINE AMOUNT OF LIME REQUIRED. LABORATORY TEST MAY BE WAIVED PROVIDED AT LEAST 36 LBS. OF LIME PER SQ. YD. IS USED. SEE NCTCOG ITEM 301.2 "LIME TREATMENT". FLEXIBLE BASE (CRUSHED STONE/CONCRETE) PER NCTCOG ITEM 301.5 MAY BE SUBSTITUTED FOR LIME TREATMENT WITH THE APPROVAL OF THE TOWN ENGINEER.
4. REBAR SHALL BE SUPPORTED BY BAR CHAIRS OR OTHER DEVICES APPROVED BY TOWN ENGINEER.
5. NO TRAFFIC ON FINISHED SUBGRADE SHALL BE PERMITTED AFTER REINFORCING STEEL IS INSTALLED ABOVE SUBGRAGE. NO TRAFFIC SHALL BE PERMITTED BEFORE OR DURING THE PLACING OF CONCRETE.
6. CROSS SLOPE OF STRAIGHT CROWN STREETS SHALL BE 1/4" PER FOOT UNLESS APPROVED BY THE TOWN ENGINEER.
7. PAVEMENT THICKNESS AND STRENGTHS SHALL BE AS FOLLOWS:
   MAJOR ARTERIAL – 10" CLASS "P1" OR "P2."
   MINOR ARTERIAL – 8" CLASS "P1" OR "P2."
   COMMERCIAL/INDUSTRIAL COLLECTOR – 8" CLASS "P1" OR "P2."
   RESIDENTIAL COLLECTOR – 8" CLASS "P1" OR "P2."
   RESIDENTIAL LOCAL – 8" CLASS "P1" OR "P2."
   SIDEWALK AND BFR's–4"–CLASS "A"
   DRIVE APPROACH–8"–CLASS "P2"
   ALLEY–6" CLASS "P1" OR "P2."
8. CONCRETE MIX DESIGN SHALL BE AS DEFINED BY NCTCOG 303.3.
9. ALL MEDIANS AND PARKWAYS SHALL BE PROVIDED WITH BERMUDA GROUND COVER.
10. ONCE A CURB ABUTTING A THOROUGHFARE HAS BEEN SAWCUT AND REMOVED, THE CONTRACTOR MUST REPLACE THE CONCRETE WITH A NEW POUR (i.e. DRIVEWAY) WITHIN 14 CALENDAR DAYS. LIQUIDATED DAMAGES WILL BE ASSESSED AT $500 PER DAY FOR EACH CALENDAR DAY IN EXCESS OF 14 CALENDAR DAYS. PAYMENT SHALL BE MADE PRIOR TO ACCEPTANCE OR ISSUANCE OF A CERTIFICATE OF OCCUPANCY.
11. ALL SIDEWALKS AND ACCESSIBLE ROUTES SHALL HAVE A MAXIMUM LONGITUDINAL SLOPE OF 5% AND A MAXIMUM CROSS SLOPE OF 2%
12. ALLEYS AND DRIVEWAYS
    A. CONCRETE FOR ALLEY RETURNS AND DRIVEWAYS SHALL HAVE A MINIMUM COPRESSIVE STRENGTH AT 28 DAYS IDENTICAL TO THAT SPECIFIED FOR THE STREET PAVEMENT OR BASE WHEN BUILT AS COMPONENTS OF A CONCRETE PAVING PROJECT. WHEN BUILT SEPARATELY, THE STRENGTH SHALL BE AS SPECIFIED ON THE CONSTRUCTION PLAN.
    B. SPACNG AND CONSTRUCTION OF JOINTS SHALL CONFORM TO PARABOLIC STREET PAVEMENT.

Addison! PUBLIC WORKS DEPARTMENT	PAVING GENERAL NOTES	STANDARD CONSTRUCTION DETAILS PAVING		
		DATE: AUGUST, 2010	REV DATE: –	SHEET: SD–P01

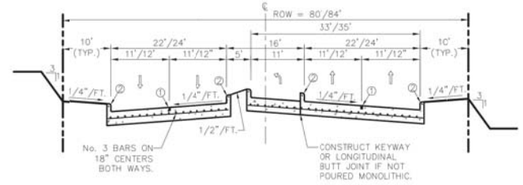


SLIP–FORM PAVEMENT MUST MEET CROWN GRADES AT GUTTERS, AT MID–POINTS AND CENTERLINE. WIDTHS OF PAVEMENT ARE FACE TO FACE.

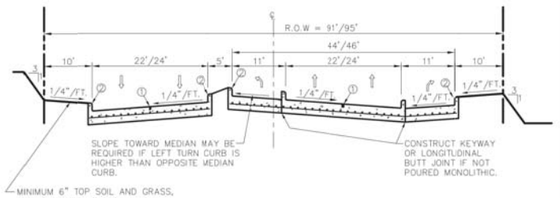
ROADWAY WIDTH (W)	TOTAL CROWN HEIGHT	3/4 POINT	MID–POINT	1/4 POINT
27'	4"	2–1/4"	1"	1/4"
36'	5"	2–7/8"	1–1/4"	3/8"
44'	6"	3–3/8"	1–1/2"	1/2"
48'	6"	3–3/8"	1–1/2"	1/2"

TABLE OF CROWN HEIGHTS AND ORDINATES FOR VARIOUS PARABOLIC SECTIONS
NTS

Addison! PUBLIC WORKS DEPARTMENT	PARABOLIC PAVEMENT CROWN	STANDARD CONSTRUCTION DETAILS PAVING		
		DATE: AUGUST 2010	REV DATE: –	SHEET: SD–P03



MINOR ARTERIAL PAVEMENT REGULAR SECTION
NTS



MINOR ARTERIAL PAVEMENT AT COLLECTOR OR GREATER SECTION
NTS

① SAWED LONGITUDINAL DUMMY JOINT
② REINFORCEMENT SHALL BE A CONTINUOUS No. 3 BAR.

Addison! PUBLIC WORKS DEPARTMENT	MINOR ARTERIAL PAVEMENT	STANDARD CONSTRUCTION DETAILS PAVING		
		DATE: AUGUST, 2010	REV DATE: –	SHEET: SD–P04

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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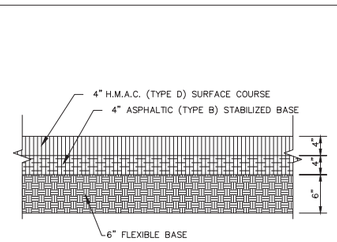
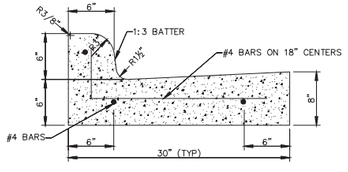
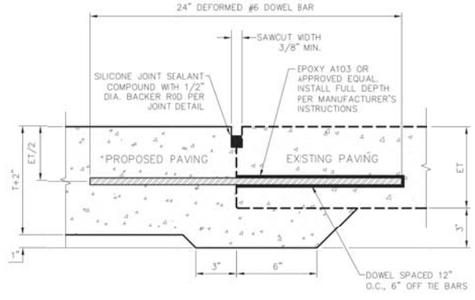


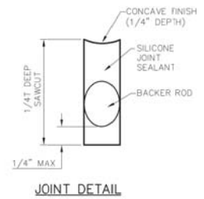
ASPHALT PAVING CROSS SECTION

NOTE:
CUT OF 6" INTO EXISTING PAVEMENT IS REQUIRED FOR CONSTRUCTION JOINT WITH NEW POURS TO GET A SMOOTH FINISH.



CURB AND GUTTER & ASPHALT PAVING CROSS SECTION





JOINT DETAIL
NTS

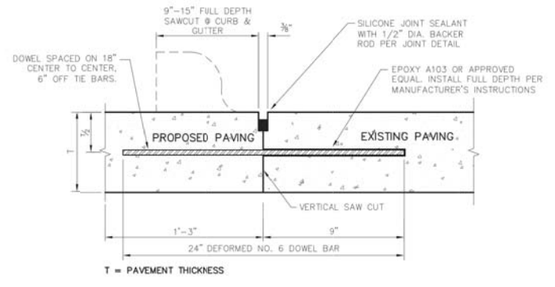
T (FOR BELTWAY DR & BETWOOD PKWY) = 8"
T (FOR ALLEYS & PARKINGLOTS) = 8"
T (FOR MIDWAY RD) = 8"

NOTE:
1. NO. 5 DEFORMED DOWEL BAR MAY BE USED IN 6 INCH PAVEMENT.
2. DOWEL BARS SHALL BE DRILLED INTO PAVEMENT HORIZONTALLY BY USE OF A MECHANICAL RIG.
3. DRILLING BY HAND IS NOT ACCEPTABLE, PUSHING DOWEL BARS INTO GREEN CONCRETE IS NOT ACCEPTABLE.

T=PROPOSED PAVEMENT THICKNESS
ET=EXISTING PAVEMENT THICKNESS

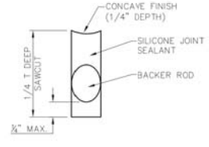
PAVEMENT REPAIR HEADER
NTS

Addison! PUBLIC WORKS DEPARTMENT	PAVEMENT REPAIR HEADER	STANDARD CONSTRUCTION DETAILS PAVING		
		DATE: AUGUST, 2010	REV DATE: –	SHEET: SD–P16



T = PAVEMENT THICKNESS

NOTES:
1. NO. 5 DEFORMED BAR MAY BE USED IN 6 INCH PAVEMENT.
2. LONGITUDINAL BUTT CONSTRUCTION MAY BE UTILIZED IN PLACE OF LONGITUDINAL HINGED (KEYWAY) JOINT AT CONTRACTORS OPTION.
3. DOWEL BARS SHALL BE DRILLED INTO PAVEMENT HORIZONTALLY BY USE OF A MECHANICAL RIG.
4. DRILLING BY HAND IS NOT ACCEPTABLE, PUSHING DOWEL BARS INTO GREEN CONCRETE IS NOT ACCEPTABLE.



JOINT DETAIL
NTS

LONGITUDINAL BUTT JOINT
NTS

Addison! PUBLIC WORKS DEPARTMENT	LONGITUDINAL BUTT JOINT	STANDARD CONSTRUCTION DETAILS PAVING		
		DATE: AUGUST, 2010	REV DATE: –	SHEET: SD–P19

REV. NO.	DESCRIPTION	CHK. BY	DATE

STATE OF TEXAS
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49126
REGISTERED PROFESSIONAL ENGINEER
1/2/2020

ADDISON, TEXAS
PUBLIC WORKS & ENGINEERING SERVICES

SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

STANDARD DETAILS PAVING
(1 OF 2)

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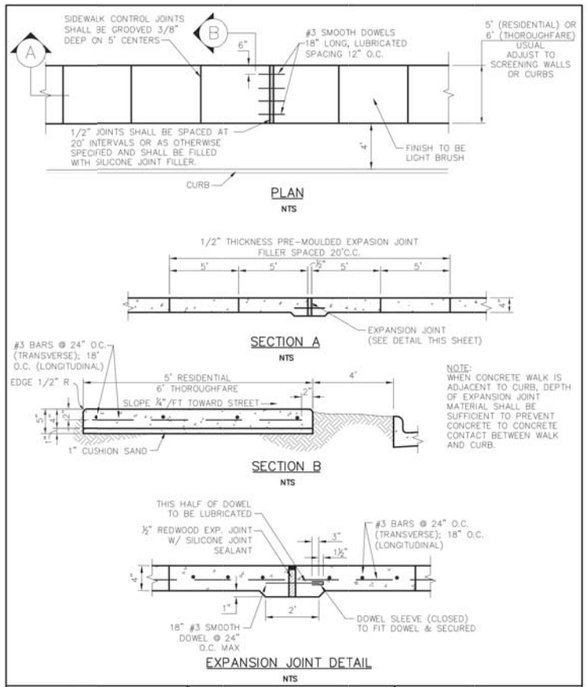
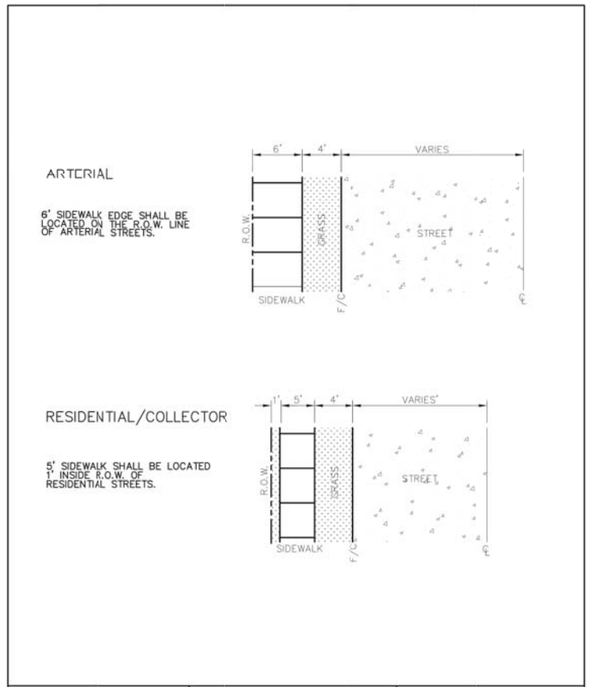


Addison! PUBLIC WORKS DEPARTMENT	CONCRETE SIDEWALK	STANDARD CONSTRUCTION DETAILS PAVING	
		DATE: AUGUST, 2010	REV DATE: -
			SHEET: SD-P26



Addison! PUBLIC WORKS DEPARTMENT	CONCRETE SIDEWALK CONTINUED	STANDARD CONSTRUCTION DETAILS PAVING	
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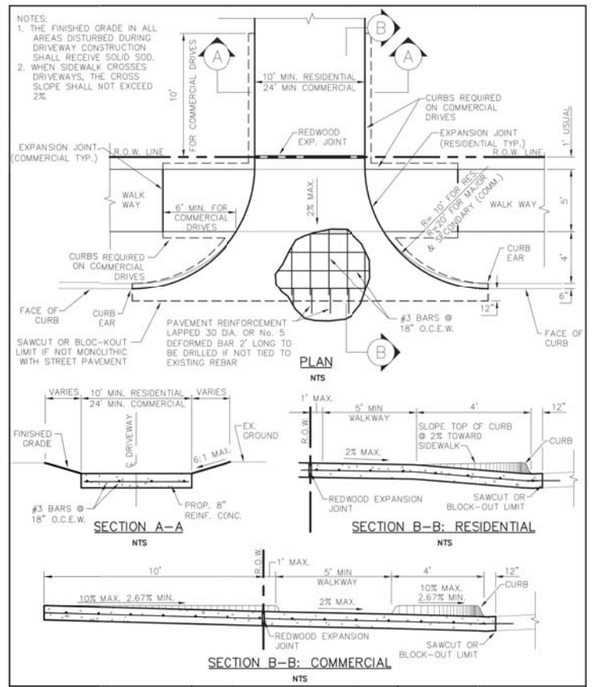
			SHEET: SD-P27



Addison! PUBLIC WORKS DEPARTMENT	DRIVEWAY RETURN DETAILS	STANDARD CONSTRUCTION DETAILS PAVING	
		DATE: AUGUST, 2010	REV DATE: -
			SHEET: SD-P35

SURVEY CONTROL
CITY OF ADDISON MONUMENT NO. 11 (611.74') HELD FOR VERTICAL

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ENGINEERING SERVICES

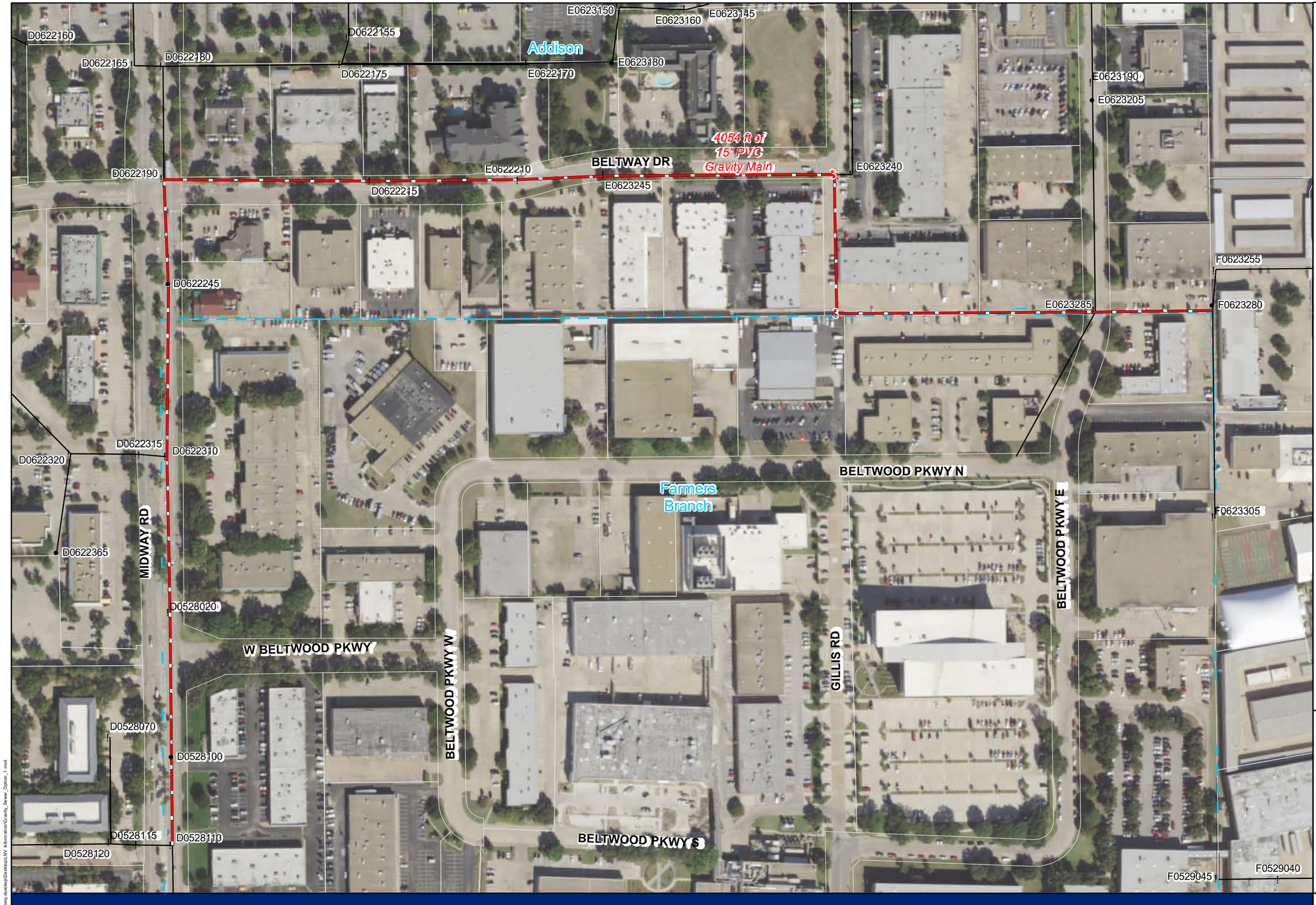
SANITARY SEWER RE-ROUTE TO MIDWAY ROAD
PROJECT NO. 513301

STANDARD DETAILS PAVING
(2 OF 2)

DANNENBAUM
ENGINEERING COMPANY - DALLAS, LLC
T.B.P.E. FIRM REGISTRATION #8996
3030 LBJ FWY #910, DALLAS, TX 75234 (972) 239-2002

DESIGNED BY: WBH	DATE: 1/2/2020
DRAWN BY: CMR	PROJECT NO: 513301
CHECKED BY: DEG	DRAWING SCALE: NTS
FILE: DETAILS_PAVE.dwg	SHEET NO: 34

G:\1220\5133-01 Addison Basin I Final Design\CAD\Sheets\ ..\VREF\Border\bbdr.dwg
PLOTTED: Jan 02,2020 - 1:57pm
Crystal.Read



Legend

- Proposed Manholes
- Modeled Manholes
- Proposed Gravity Line
- Modeled Sewer Main
- Parcel Boundary
- Municipal Boundary

Alt . B-1

E

0 100 200

Feet

1 inch = 200 feet

Disclaimer:
The routing, timing, and all other matters shown herein, are preliminary only and should not be relied upon as definite, complete or accurate. They are subject to change at any time, without notice.

Gravity Sewer Option B-1

DANNENBAUM

Date: 2/27/2018

Document Path: C:\Users\tony.dunlap\Desktop\LNV - Information\Gravity_Sewer_Option_1.mxd

Work Session and Regular Meeting **10.**

Meeting Date: 02/25/2020

Department: Parks & Recreation

Pillars: Excellence in Asset Management
Excellence in Transportation Systems

AGENDA CAPTION:

Present, Discuss and Consider Action on a **Resolution to Approve the Agreement for the Construction of Belt Line 1.5 Enhancements Between Marsh Lane and Midway Road Between the Town of Addison and J.B. & CO. LLC and Authorize the City Manager to Execute theAgreement** in an Amount not to Exceed $1,798,287.95 and set a total project budget of $2,378,000.

BACKGROUND:

The purpose of this item is to award of a contract to J.B. & CO. LLC for the construction of enhancements on Belt Line Road between Marsh Lane and Midway Road, referred to as Belt Line 1.5. Bids for this project were based on construction documents that were developed from the master plan adopted by Council on February 20, 2019.

Following adoption of the master plan, staff requested direction from Council on the construction scope and budget for the project. During this presentation staff informed Council that approximately $2,127,022 was available for the design, Right-of-Way (ROW) acquisition and construction of the project. The available funds included an anticipated $135,022 from DART Street Repair Funds.

As a result of a presentation from the Town's design consultant (Pacheco Koch) on the proposed project scope, Council directed staff to develop a total project budget based on the consultant's recommended scope ($2,263,250) with the addition of two additional bus shelters (+$180,000), reduction of landscape repair items (-$100,000) and updating the design services fee to reflect the actual contracted amount (+34,636). From this direction, staff projected a total project budget of $2,378,000, of which $223,000 was allocated for design fees, $176,884 was allocated for ROW acquisition and $1,975,000 was allocated for construction.

Following Council's direction for the project scope and project budget, staff indicated that current funds allocated for the project were approximate and would not be adequate to meet the total project budget that Council desired. Staff indicated that additional funds would need to be identified and the

estimated funds available for the project would be updated and shared with the Council when a construction contract was to be brought to Council for consideration.

The current available funds for this project have been allocated from several different sources and total $2,378,000. The various funding sources are listed below:

- Addison Project Funds $1,936,481
- DART Street Repair Funds $135,022*
- DART LAP Funds $306,497*

* Restricted to items defined in the Interlocal Agreement with DART approved by Council on February 13, 2020.

Bids for the construction of the project were issued on Bid Sync January 2, 2020 as Bid Number 20-52. Bidders were asked to provide pricing for a base bid construction project and also include pricing for one alternate bid item. The alternate bid item is related to implementing Master Transportation Plan elements at 3820 Belt Line Road. The property owner has been made aware that funding of this alternate bid is contingent on the property owner sharing in the cost and granting an easement to the town to construct and access the project. A total of five bids were received at the bid opening on January 30, 2020, they are listed below.

Contractor	Base Bid	Alternate Bid	Total Bid
J.B. & CO.	$1,602,963.55	$195,324.40	$1,798,287.95
C.Greenscaping	$1,909,871.43	$226,707.77	$2,136,579.10
North Rock Construction	$2,111,717.25	$170,918.09	$2,282,635.34
Fain	$2,235,748.69	$247,106.22	$2,482,854.91
Cole Construction	$2,421,775.82	$269,130.00	$2,690,905.82

The table below identifies the total project budget which includes expenses for professional services, current ROW acquisition and construction of the project if Council were to approve a contract with the low bidder J.B. & CO.

Low Bidder	Total Bid	Professional Services	ROW Acquisition	Project Contingency	Total Projected Cost *
J.B. & CO.	$1,798,288	$223,000	$176,884	$179,828	$2,378,000

Note: Numbers have been rounded up.

J.B. & CO. was identified as the qualified low bidder. Staff is requesting Council consider approval of a construction contract with J.B. & CO. for the Base Bid and Alternate Bid Items (contingent upon property owner cost sharing), allow for a 10% Construction Contingency and set a total project budget of $2,378,000. The construction contingency will be applied to testing fees and to address any unforeseen issues that might arise.

RECOMMENDATION:

Administration recommends approval.

Attachments

Resolution - J.B & CO., LLC

Bid Specifications - Belt Line 1.5

RESOLUTION NO. _____

A RESOLUTION OF THE CITY COUNCIL OF THE TOWN OF ADDISON, TEXAS APPROVING THE AGREEMENT BETWEEN THE TOWN AND J.B. & CO. LLC FOR CONSTRUCTION OF BELT LINE 1.5 ENHANCEMENTS BETWEEN MARSH LANE AND MIDWAY ROAD IN AN AMOUNT NOT TO EXCEED $1,798,287.95, SETTING A TOTAL PROJECT BUDGET AMOUNT NOT TO EXCEED $2,378,000, AUTHORIZING THE CITY MANAGER TO EXECUTE THE AGREEMENT, AND PROVIDING AN EFFECTIVE DATE.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE TOWN OF ADDISON, TEXAS:

SECTION 1. The Agreement between the Town of Addison and J.B. & CO LLC, for Belt Line 1.5 Enhancements in an amount not to exceed $1,798,287.95 (the "Contract Amount"), a copy of which is attached to this Resolution as **Exhibit A**, incorporating the Town of Addison's General and Specific Conditions for construction contracts, the Advertisement for Bids, Instructions to Bidders, General Provisions, Special Provisions, Plans and other bid documents is hereby approved. The City Manager is hereby authorized to execute the Agreement.

SECTION 2. This resolution also establishes a total project budget of $2,378,000 which includes professional services, construction, ROW acquisition and project set aside.

SECTION 3. This resolution also establishes a project set aside, equal to 10% of the Contract Amount, as contingency funds available to be applied to the project if deemed necessary. Including the 10% set aside, the total construction budget shall not exceed $1,978,116.74

SECTION 4. This Resolution shall take effect from and after its date of adoption.

DULY RESOLVED AND ADOPTED by the City Council of the Town of Addison, Texas, on this the ***25th*** day of ***FEBRUARY 2020*.**

TOWN OF ADDISON, TEXAS

_____
Joe Chow, Mayor

ATTEST:

_____
Irma Parker, City Secretary

APPROVED AS TO FORM:

_____
Brenda N. McDonald, City Attorney

Exhibit A
CONTRACT AGREEMENT

STATE OF TEXAS

COUNTY OF DALLAS

THIS AGREEMENT is made and entered into this **25th** day of **February**, 2020, by and between the Town of Addison, of the County of Dallas and State of Texas, acting through its City Manager, thereunto duly authorized so to do, Party of the First Part, hereinafter termed the OWNER, and **J.B. & Co. LLC,** of the City of **Dallas,** County of **Dallas,** State of **Texas,** Party of the Second Part, hereinafter termed CONTRACTOR.

WITNESSETH: That for and in consideration of the payment and agreement hereinafter mentioned, to be made and performed by the OWNER, the said CONTRACTOR hereby agrees with the said OWNER to commence and complete construction of certain improvements as follows:

BELT LINE 1.5 LANDSCAPE ENHANCEMENTS BID NUMBER 20-52

and all extra work in connection therewith, under the terms as stated in the General and Specific Conditions of the AGREEMENT; and at his own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance and other accessories and services necessary to complete the said construction, in accordance with the conditions and prices stated in the Proposal attached hereto and in accordance with the Advertisement for Bids, Instructions to Bidders, General Provisions, Special Provisions, Plans, and other drawings and printed or written explanatory matter thereof, and the Technical Specifications and Addenda thereto, as prepared by the OWNER, each of which has been identified by the endorsement of the CONTRACTOR and the OWNER thereon, together with the CONTRACTOR's written Proposal and the General Provisions, all of which are made a part hereof and collectively evidence and constitute the entire AGREEMENT.

The CONTRACTOR hereby agrees to commence work within ten (10) calendar days after the date of written notice to do so shall have been given to him, to **substantially complete the work by July 1, 2020,** subject to such extensions of time as are provided by the General Provisions. The contractor agrees to fulfill the intent of the plans and specifications associated with Bid # 20- 52

The OWNER agrees to pay the CONTRACTOR **One Million, Six Hundred Two Thousand, Nine Hundred Sixty-Three Dollars and Fifty Five Cents ($1,602,963.55)** for base bid items and at its sole discretion, OWNER may also request CONTRACTOR to complete the alternate bid item identified in the Bid in the amount of **One Hundred Ninety-Five Thousand, Three Hundred Twenty-Four Dollars and Forty Cents ($195,324.40)** all payable from current funds for the performance of the Contract in accordance with the Proposal submitted thereof, subject to additions and deductions, as provided in the General Provisions, and to make payments of account thereof as provided therein.

IN WITNESS WHEREOF, the parties of these presents have executed this AGREEMENT in the year and day first above written.

TOWN OF ADDISON, TEXAS (OWNER)

By:_____
Wes Pierson, City Manager

ATTEST:

By:_____
Irma Parker, City Secretary

(CONTRACTOR)

By:_____

ATTEST:

By:_____

The following to be executed if the CONTRACTOR is a corporation:

I,_____certify that I am the secretary of the corporation named as CONTRACTOR herein; that_____, who signed this Contract on behalf of the CONTRACTOR is the (official title) of said corporation; that said Contract was duly signed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

Signed: _____

Corporate Seal

SPECIFICATIONS AND CONTRACT DOCUMENTS

FOR THE CONSTRUCTION, OF

TOWN OF ADDISON
Belt Line 1.5
Landscape Enhancements

TOWN OF ADDISON, TEXAS
BID NUMBER 20-52

January 2020

PREPARED BY:

PACHECO KOCH CONSULTING ENGINEERS, INC
4060 Bryant Irvin Rd
FORT WORTH, TX 76109

TOWN OF ADDISON, TEXAS

MAYOR

Joe Chow

MAYOR PRO TEMPORE

Tom Braun

DEPUTY MAYOR PRO TEMPORE

Lori Ward

COUNCILMEMBERS

Paul Walden
Ivan Hughes
Guillermo Quintanilla
Marlin Willesen

CITY MANAGER

Wes Pierson

DEPUTY CITY MANAGER

Ashley Mitchell

DIRECTOR OF PARKS AND RECREATION

Janna Tidwell

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SECTION AB

ADVERTISEMENT FOR BIDS

ADVERTISEMENT FOR BIDS

1. Sealed bids addressed to the Town of Addison, Texas, for the **Belt Line Road Landscape Enhancements** in the Town of Addison, Texas, hereinafter called "City" or "Owner" in accordance with specifications and contract documents prepared by **Pacheco Koch Consulting Engineers, Inc.** will be received at the office of Wil Newcomer, Finance Building, 5350 Belt Line Road, Addison, Texas until **2:00 p.m. on 30th day of January, 2020**. Bids received by the appointed time will be opened and read aloud. Any bids received after closing time will be returned unopened.

2. The Contractor shall identify his bid on the outside of the envelope by writing the words **PARKS DEPARTMENT #20-52, Belt Line Road Landscape Enhancements**

3. Bids shall be accompanied by a Bid Bond in an amount not less than five percent (5%) of the total maximum bid price, from a reliable surety company licensed by the State of Texas to act as a Surety and be listed on the current U.S. Treasury Listing of Approved Sureties; or a Binder of Insurance executed by a surety company licensed by the State of Texas to act as a surety or its authorized agent as a guarantee that the bidder will enter into a contract and execute a Performance Bond within ten (10) days after notice of award of contract to him. Bid bonds need to be signed originals to be valid –no photocopied, faxed, or scanned copies will be accepted.

4. Plans, specifications and bidding documents may be secured electronically through www.bidsync.com. Interested bidders are strongly encouraged to register with the site, as registration will provide automatic notifications of any addenda which are posted. Bidders may select either the paid or free registration options- either will provide equal access to Addison's bid material.

5. The right is reserved by the Mayor and the City Council, as the interests of the City may require, to reject any or all bids and to waive any informality in bids received.

6. The Bidder (Proposer) must supply all the information required by the Proposal Form.

7. For information on bidding, call Wil Newcomer, Town of Addison Purchasing Manager, (972) 450-7091.

8. The project consists of Landscape Enhancements and Pedestrian Amenities at Belt Line Road between Marsh Lane and Midway Road.

9. An optional Pre-Bid meeting will be held at 16801 Westgrove Dr., Addison, TX at 10:00 a.m. on January 16, 2020.

SECTION IB

INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

A. PROJECT: BELT LINE 1.5 LANDSCAPE ENAHNCEMENTS, in the Town of Addison. The bids will be evaluated as stated in Section "O" of these Instructions to Bidders.

B. PROJECT DESCRIPTION: The project consists of Landscape Enhancements and Pedestrian Amenities at Belt Line Road between Marsh Lane and Midway Road. Work includes concrete, pavers, landscape, site furniture, monument sign and bus shelters.

C. PROPOSALS: Proposals must be in accordance with these instructions in order to receive consideration.

D. DOCUMENTS: Bidding Documents include the Project Manual (consisting of the Advertisement for Bids, these Instructions to Bidders, Proposal Forms, Contract Agreement, and Technical Specifications), a Waiver of Lien, Drawings, and Addenda which may be issued by the Town of Addison during the bidding period. Bidding Documents may be viewed and/or obtained under the terms and conditions set forth in the Advertisement for Bids, Section AB of this Project Manual.

E. EXAMINATION OF DOCUMENTS AND SITE: Bidders shall carefully examine the Bidding Documents and the construction site to obtain firsthand knowledge of the scope and the conditions of the Work. Each Contractor, Subcontractor and Sub-subcontractor, by submitting a proposal to perform any portion of the Work, represents and warrants that he has examined the Drawings, Specifications (Project Manual) and the site of the Work, and from his own investigation has satisfied himself as to the scope, accessibility, nature and location of the Work; the character of the equipment and other facilities needed for the performance of the Work; the character and extent of other work to be performed; the local conditions; labor availability, practices and jurisdictions; and other circumstances that may affect the performance of the Work. No additional compensation will be allowed by the Owner for the failure of such Contractor, Subcontractor or Sub-subcontractor to inform himself as to conditions affecting the Work.

F. INTERPRETATION OF DOCUMENTS: If any person contemplating submitting a bid for the proposed Contract is in doubt as to the meaning of any part of the Drawings, Specifications (Project Manual) or other proposed Contract Documents, he may submit to the Town of Addison, not later than seven (7) calendar days prior to the date set for opening bids, a written request for an interpretation or clarification. Bidders should act promptly and allow sufficient time for a reply to reach them before preparing their bids. Any interpretation or clarification will be in the form of an Addendum duly issued. No alleged verbal interpretation or ruling will be held binding upon the Owner.

G. SUBSTITUTIONS: Conditions governing the submission of substitutions for specific materials, products, equipment and processes are in the Special Provisions. Requests for substitutions must be received by the Town of Addison seven (7) calendar days prior to the established bid date.

H. ADDENDA: Interpretations, clarifications, additions, deletions and modifications to the Documents during the bidding period will be issued in the form of Addenda and a copy of such Addenda will be emailed, faxed or delivered to each person who has been issued a set of

the Bidding Documents. Addenda will be a part of the Bidding Documents and the Contract Documents, and receipt of them shall be acknowledged in the Bid Form. All such interpretations and supplemental instructions will be in the form of written addenda to the contract documents which, if issued, will be sent by telegram, certified or registered mail, facsimile, email or hand delivered to all prospective bidders (at the respective addresses furnished for such purposes) not later than three (3) calendar days prior to the date fixed for the opening of bids. If any bidder fails to acknowledge the receipt of such addenda in the space provided in the bid form, his bid will nevertheless be construed as though the receipt of such addenda had been acknowledged.

I. COMPLETION TIME: The completion time of the project will be set through the bidding technique used in the Proposal Form. A more detailed explanation of the bidding technique is given in section O that follows below.

J. PREPARATION OF BIDS: Prices quoted shall include all items of cost, expense, taxes, fees and charges incurred by, or arising out of, the performance of the work to be performed under the Contract. Bids shall be submitted in duplicate and shall be signed in ink. Any bid on other than the required form will be considered informal and may be rejected. Erasures or other changes in a bid must be explained or noted over the initials of the bidder. Bids containing any conditions, omissions, unexplained erasures and alterations, or irregularities of any kind may be rejected as informal. The prices should be expressed in words and figures as shown on the bid tab or they may be deemed informal and may be rejected. In case of discrepancy between the price written in the bid and that given in the figures, the price in writing will be considered as the bid. In the case of a discrepancy between a unit price and its extension, the unit price will govern. Failure to submit all requested information will make a bid irregular and subject to rejection. Bids shall be signed with name typed or printed below signature, and, if a partnership, give full name of all partners. Where bidder is a corporation, bids must be signed with the legal name of the corporation followed by the name of the state of incorporation and the legal signature of an officer authorized to bind the corporation to a contract.

NOTE: A COMPUTER-GENERATED PROPOSAL FORM MAY BE USED IN LIEU OF THE ENCLOSED FORMS. THE FORM SHALL BE 8 1/2" BY 11" IN SIZE, AND WILL BE ATTACHED TO THE PROPOSAL IN THE PROPER SECTION, AND WILL BE MADE PART OF THE PROPOSAL AND CONTRACT DOCUMENTS.

NOTE: THE SPREADSHEET OPTION IS FOR THE CONVENIENCE OF THE BIDDER. NO WORDING IN THE SPREADSHEET SHALL MODIFY OR AMEND THE WORDING IN THE BID PROPOSAL OR PLANS. THE UNIT PRICE ON THE FORM SHALL BE THE PRICE OF THE ITEM, AND ERRORS THAT MAY BE PRESENT IN THE PRINTOUT WILL NOT BE RECOGNIZED AS AN OPPORTUNITY TO REVISE THE PROPOSAL. THE SUMMARY SHEET INCLUDED IN THIS BID DOCUMENT SHALL BE UTILIZED FOR SUMMARIZING THE BID. THE SPREADSHEET SHALL PRESENT EACH ITEM IN THE ORDER AND NUMBER AS SHOWN IN THE CITY'S PROPOSAL AND BID SCHEDULE FOR THIS PROJECT. THE SPREADSHEET SHALL BE IN A COLUMN FORMAT WITH THE FOLLOWING COLUMNS:

1. ITEM NUMBER
2. BID QUANTITY
3. UNIT OF MEASURE

4. DESCRIPTION OF ITEM
5. UNIT PRICE
6. AMOUNT BID

K. SUBMITTAL OF BIDS: Sealed proposals, containing one (1) original, three (3) copies and one (1) USB, will be received at the time, date and place stated in the Advertisement for Bids. Proposals shall be made on unaltered Proposal Forms furnished by the Town of Addison. Bidders shall submit proposals in an opaque, sealed envelope addressed to the Owner and plainly mark on the outside of the envelope the name and address of the bidder. The envelopes shall also be marked with the following project description:

PARKS DEPARTMENT #20-52
Belt Line 1.5 Landscape Enhancements

The Bid Bond must be completed and signed by each bidder and submitted with the bid. A separate bid must be submitted for each discipline that a contractor wishes to be awarded. Submit Bids by mail or in person prior to the time for receiving bids set forth in the Advertisement for Bids issued by the Town.

L. MODIFICATION AND WITHDRAWAL OF BIDS: Prior to the time set for bid opening, bids may be withdrawn or modified. Bids may be modified only on the official bid form and must be signed by a person legally empowered to bind the bidder. No bidder shall modify, withdraw, or cancel his bid or any part thereof for sixty (60) calendar days after the time agreed upon for the receipt of bids.

M. DISQUALIFICATION: The Owner reserves the right to disqualify proposals, before or after the opening, upon evidence of collusion with intent to defraud or other illegal practices relating to this proposal upon the part of the bidder.

N. SUBMISSION OF POST-BID INFORMATION: Upon notification of acceptance, the selected bidder shall, within five (5) calendar days, submit the following:

1. A designation of the portions of the Work proposed to be performed by the bidder with his own force.
2. A list of names of the Subcontractors or other persons or organizations, including those who are to furnish materials and equipment fabricated to a special design proposed for such portions of the Work as may be designated in the Bidding Documents or as may be requested by the Town of Addison. The bidder will be required to establish to the satisfaction of the Owner the reliability and responsibility of the proposed Subcontractors and suppliers to furnish and perform the Work.

O. AWARD: The Owner reserves the right to accept any or to reject any bids without compensation to bidders and to waive irregularities and informalities. The Town of Addison Parks Department will select the bidder with the best overall value for the Town. The evaluation committee will be formed by (1) representative from Purchasing Department, (1) representative from the Parks Department, (1) representative from the Design Team and (1) representative from the Town Managers office. The evaluation committee will open, read and evaluate the proposals with each representative providing a score for categories 1-3. The 'average' score for each category as calculated by adding all and dividing by four will be the official point total for each category.
The selected best overall value will be based on the following criteria and the associated value of each:

1. Two references for the General Contractor. **0-30 points.**

2. Price of Bid: The Bid will be awarded, and the value paid, to the contractor based on the cumulative costs of the total bid items. Payment will NOT be made based on actual quantities installed. Quantities for the individual unit cost items shown on the bid form and plans are for the Contractor's convenience only. The Contractor is wholly responsible to establish his/her own takeoffs in developing the bid. No change orders will be approved for any item required by the plans and/or specifications on the basis that is not specifically itemized as an estimated quantity, or that the quantity identified on the plans or in the Contractor's own bid form was not accurate. Unit costs are being asked of the Contractor for ease in evaluating pay applications and the fairness of additive or deductive change orders.

Low Bidder: **70 Point Maximum**

Alternate items may or may not be awarded. Addition or deletion of other items or schedules will be governed by the *Standard Specifications for Public Works Construction – North Central Texas, 4th Edition*, (hereinafter called SSPWC) Item 104.2 "Change or Modification of Contract". Alternate item samples will be provided to the town at no cost to the town, upon request.

P. EXECUTION OF THE CONTRACT: The successful bidder will be required to enter into a contract with the Owner within ten (10) days of notice by the Owner that his bid has been accepted. Failure to enter into a contract within the established time limit shall be considered grounds for forfeiture of the bid bond.

Q. CONSTRUCTION SCHEDULE: It is the Owner's desire to have the project completed and operational to meet specific functions of the space for annual social events. The number of calendar days for completion of the project will begin with the date specified in the Notice to Proceed. The Notice to Proceed will be issued in a manner to facilitate a smooth construction of the project. The Contractor shall begin construction within ten (10) calendar days of the issuance of the Notice to Proceed. **The date of substantial completion is set for JULY 2, 2020**. Substantial completion shall be defined as **"A condition that will allow for the safe use of the space with all primary elements of the project being usable, functional and open for pedestrian use by Kaboom Town July 3, 2020."**

R. LIQUIDATED DAMAGES: Monetary damages will be paid to the City (or deducted from outstanding pay applications) in the total of $500.00 per calendar day for each day past the required substantial completion date until such time as the project is accepted as "Substantially Complete."

S. FORM OF CONTRACT: The contract for the construction of the project will be drawn up by the Owner. A sample form of agreement is included in the Contract Agreement Section.

T. BONDS: A Bid Bond will be required by the Owner. The Bid Bond shall name the Town of Addison, and others as directed by the Town, as joint obligees. Sample forms have been included in the Bid Bond sections. (Contractor shall confirm the legal names of obligees prior to execution of Bonds.)

U. BID SECURITY: Bids shall be accompanied by a bid bond in an amount not less than five percent (5%) of the total maximum bid price, from a surety company licensed to do business in the State of Texas as a guarantee that the bidder will enter into a contract and execute a Performance Bond and Payment Bond within ten (10) calendar days after notice of award of contract to him. Such bid bonds will be returned to the vendor at any time following the bid upon request via email, so long as he has not been notified of the acceptance of his bid.

V. RESOLUTIONS: If the bidder is a corporation, a copy of the resolution empowering the person submitting the bid to bind the bidder must be included with the bid.

W. CONSTRUCTION STAKING: Construction staking and re-staking will not be provided by the Owner. Benchmarks and Horizontal Control are shown on the plans. There is no separate bid item for staking, therefore, the contractor must include value for staking in the various bid items as subsidiary to the contract. Any staking or re-staking that is required shall be the responsibility of the Contractor and shall be at no cost to the Owner.

X. FINAL PAYMENT: The general provisions for Final Payment shall be as stated in Item 109.5.4 of the SSPWC including all Amendments and Additions. Prior to final payment the Contractor shall provide the Owner with the following items:

1. A Contractor's Affidavit of Bills Paid in accordance with Section BP.
2. A Consent of Surety Company to Final Payment.
3. A complete set of record plans which indicate all construction variations from the original construction documents in accordance with Item 5 of the Special Provisions.
4. A one (1) year Maintenance Bond in accordance with Section MB.

Y. PREVAILING WAGE RATES: Wage rates paid on this project shall not be less than specified in the schedule of general prevailing rates of per diem wages as attached in the Special Provisions.

Z. PRIORITY OF CONTRACT DOCUMENTS: In case of conflict between contract documents, priority of interpretation shall be in the following order: signed agreement; performance and payment bonds; proposal; special provisions (or conditions); technical specifications; general provisions; advertisement for bids; project drawings; technical specifications as provided herein; Town of Addison Standard Drawings. This priority list shall take precedence over Item 105.1.1 of the SSPWC.

SECTION PF

PROPOSAL FORM

PROPOSAL FORM

01-29, 2020

TO: The Honorable Mayor and Town Council
Town of Addison, Texas

Gentlemen:

The undersigned bidder, having examined the plans, specifications and contract documents, and the location of the proposed work, and being fully advised as to the extent and character of the work, proposes to furnish all equipment and to perform labor and work necessary for completion of the work described by and in accordance with the Plans, Specifications and Contract for the following prices, to wit:

Signed by: _____

ACKNOWLEDGMENT OF ADDENDA:

The Bidder acknowledges receipt of the following addenda:

Addendum No. 1 _____

Addendum No. 2 _____

Addendum No. 3 _____

The following pages contain all bid items for:

BID SCHEDULE 1 – TOWN OF ADDISON: BELT LINE 1.5 LANDSCAPE ENHANCEMENTS

NOTES: 1. All items included in the plans and specifications including but not limited to, labor, materials, equipment, facilities, incidentals and work required for construction of the project are to be provided and installed by the Contractor as part of the project and payment for the cost of such shall be included in the price bid for the construction of the project.

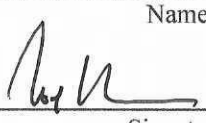
2. Total price must be shown in words and figures on the Bid Form. In the event of discrepancy, the words shall control.

3. Materials, which are "tax exempt", are those items which are physically incorporated into the facilities constructed for the Town of Addison, as set forth in the Special Provisions. Materials include, but are not limited to purchased items such as water pipe, sanitary sewer pipe, storm drain pipe, etc.

   Services, which are "not tax exempt", are those items which are used by the Contractor but are not physically incorporated into the Town of Addison's facility and/or items which are consumed by construction, as set forth in the Special Provisions. Services include, but are not limited to, items such as supplies, tools, skill and labor, the purchase, rental or lease of equipment, etc.

Joel Brown

Name of Person Signing Bid



Signature of Person Signing Bid

3131 McKinney Ave Suit 600 Dallas, TX 75204

Address

972-515-3646

Telephone No. Fax No.

47-5605397

T.I.N. (Tax Identification or Employer's Number)

If BIDDER is:

AN INDIVIDUAL

By _____ (Seal)
(Individual's Name)

doing business as _____

Business address: _____

_____

_____

Phone No. _____

A PARTNERSHIP

By _____ (Seal)
(Firm Name)

_____
(General Partner)

doing business as _____

Business address: _____

_____

_____

Phone No. _____

A CORPORATION

By Joel Brown & Co. LLC dba J.B. & Co. LLC
(Corporation Name)

Texas
(State of Incorporation)

By Joel Brown
(Name of Person Authorized to Sign)

Manager
(Title)

(Corporate Seal)

Attest _____
(Secretary)

Business address: 3131 McKinney Ave Suit 600

Dallas, TX 75204

Phone No. 972-515-3646

A JOINT VENTURE

By _____
(Name)

_____
(Address)

By _____
(Name)

_____
(Address)

(Each joint venture must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above.)

BID FORM - BELT LINE 1.5 LANDSCAPE ENHANCEMENTS

BASE BID

Call Out No.	Bid Qty	Unit	Description	Unit Price	Total
GENERAL CONDITIONS, SITE PREP & DEMOLITION					
D101	5,715	SF	Concrete Removal	$1.75	$10,001.25
D103	243	LF	Concrete Curb Removal	$7.80	$1,895.40
D104	12,851	SF	Paver Removal	$2.95	$37,910.45
D105	38,437	SF	Clearing and Grubbing (Existing Planting)	$0.75	$28,827.75
D108	320	LF	Retaining Wall Removal	$29.50	$9,440.00
D110	16	EA	Tree Removal	$1,200.00	$19,200.00
D112	338	LF	Tree Protection Fencing	$4.50	$1,521.00
D113	62	EA	Tree Trunk Protection Fencing	$15.00	$930.00
C 1 Sheets	1	LS	Traffic Control	$48,000.00	$48,000.00
C 2 Sheets	1	LS	SWPPP Measures	$30,000.00	$30,000.00
			GENERAL CONDITIONS, SITE PREP & DEMOLITION TOTAL IN FIGURES		**$187,725.85**
GENERAL CONDITIONS, SITE PREP & DEMOLITION TOTAL IN WORDS: One Hundred Eighty-Seven Thousand, Seven Hundred Twenty-Five Dollars & Eighty-Five Cents					
GRADING					
L200 Seets	1	LS	MISCELLANEOUS CUT/FILL, SUB-BASE AND FINE GRADING AS REQUIRED, INCLUDING ANY ADJUSTMENTS TO UTILITY BOXES AS SHOWN	$85,000.00	$85,000.00
			GRADING AND DRAINAGE TOTAL IN FIGURES		**$85,000.00**
			GRADING AND DRAINAGE TOTAL IN WORDS: Eighty-Five Thousand Dollars		
HARDSCAPE					
1	3,080	SF	Standard 4" Concrete Paving	$7.10	$21,864.45
2	3,423	SF	Enhanced Pedestrian Pavers on existing concrete base - Hanover	$14.50	$49,633.50
2A	4,279	SF	Enhanced Pedestrian Pavers w/ new concrete base - Hanover	$20.00	$85,580.00
3	1,804	SF	Enhanced Pedestrian Pavers w/ new concrete base - Hanover	$20.00	$36,080.00
4	504	SF	Enhanced Pedestrian Pavers w/ new concrete base - Hanover	$20.00	$10,080.00
5	9,511	SF	Enhanced Pedestrian Pavers on existing concrete base - Keystone	$19.00	$180,709.00
5A	8,868	SF	Enhanced Pedestrian Pavers w/ new concrete base - Keystone	$19.00	$168,492.00

BASE BID

Call Out No.	Bid Qty	Unit	Description	Unit Price	Total
6	48	SF	Tekaway High Performance ADA Dome Tile	$450.00	$21,600.00
7	6	EA	Bus Shelter - Connect 2.0 w/ SOLAR Panels	$35,825.00	$214,950.00
8	13	EA	Bench (Steel)	$1,500.00	$19,500.00
9	17	EA	Trash Receptacle	$1,500.00	$25,500.00
10	37	EA	2' X 2' X 2' Lueders Cut Stone Bench	$520.00	$19,240.00
11	30	EA	2' X 2' X 2' Steel Planter	$1,250.00	$37,500.00
12	460	LF	Stone Veneer and Cap at Existing Retaining Wall/Turn-up Curb	$16.00	$7,360.00
13	166	LF	Concrete Retaining Wall/Turn-up Curb Sidewalk w/ Stone Veneer and Cap	$300.00	$49,800.00
14	590	LF	Low Cut Stone Retaining Wall (Gravity Wall Blocks)	$175.00	$103,250.00
15	6	EA	Bike Rack	$295.00	$1,770.00
16	1	EA	Gateway Monument, Footings, Finishes, CIP	$42,500.00	$42,500.00
17	4	EA	Directional Ramp	$4,500.00	$18,000.00
18	381	LF	Steel Edging	$6.25	$2,381.25
19	4	EA	Leaning Rails at Bus Shelters	$2,540.00	$10,160.00
20	3,042	LF	6" Concrete Paver Edge Restraint (Concrete Mow Curb)	$10.50	$31,941.00
21	371	SF	6" Vehicular Paving Driveway	$15.00	$5,557.50
			HARDSCAPE TOTAL IN FIGURES		**$1,163,448.70**
			HARDSCAPE TOTAL IN WORDS: One Million, One Hundred Sixty-Three Thousand Dollars, Four Hundred Forty-Eight Dollars and Seventy Cents		
IRRIGATION SYSTEM					
L400 Sheets	1	LS	Irrigation	$56,000.00	$56,000.00
			IRRIGATION TOTAL IN FIGURES		**$56,000.00**
			IRRIGATION TOTAL IN WORDS: Fifty-Six Thousand Dollars and No Cents		
PLANTING					
L300 Sheets	8	EA	Canopy Tree	$1,400.00	$11,200.00
L300 Sheets	3	EA	Ornamental Tree	$800.00	$2,400.00
L300 Sheets	1,631	EA	3 Gallon Shrub	$26.00	$42,406.00
L300 Sheets	5,194	EA	1 Gallon Shrub/Grass/Groundcover	$5.50	$28,567.00

BASE BID

Call Out No.	Bid Qty	Unit	Description	Unit Price	Total
L300 Sheets	24,960	SF	Soil Prep	$0.50	$12,480.00
L300 Sheets	24,960	SF	Mulch	$0.35	$8,736.00
L300 Sheets	5,000	SF	Sod	$1.00	$5,000.00
			PLANTING TOTAL IN FIGURES		**$110,789.00**
			PLANTING TOTAL IN WORDS: One Hundred Ten Thousand, Seven Hunred Eighty-Nine Dollars and No Cents		
			BASE BID TOTAL IN FIGURES		**$1,602,963.55**
			BASE BID TOTAL IN WORDS: One Million Six Hundred Two Thousand Nine Hundred Sixty-Three Dollars and Fifty-Five Cents		
ADD ALTERNATE					

BASE BID

Call Out No.	Bid Qty	Unit	Description	Unit Price	Total
D102	2,010	SF	Concrete Removal	$1.75	$3,517.50
D106	5,240	SF	Clearing and Grubbing (Existing Planting)	$2.00	$10,480.00
D108	247	LF	Retaining Wall Removal	$29.50	$7,286.50
D111	18	EA	Tree Removal	$1,200.00	$21,600.00
1	3,255	SF	Standard 4" Concrete Paving	$8.00	$26,040.00
8	1	EA	Bench (Steel)	$1,500.00	$1,500.00
9	1	EA	Trash Receptacle	$1,500.00	$1,500.00
13	390	LF	Concrete Retaining Wall w/ Stone Veneer	$265.00	$103,350.00
L300 Sheets	450	EA	1 Gallon Shrub	$5.00	$2,250.00
L300 Sheets	3,259	SF	Soil Prep	$0.50	$1,629.50
L300 Sheets	3,259	SF	Mulch	$0.35	$1,140.65
L300 Sheets	2,809	SF	Sod	$1.00	$2,809.00
L400 Sheets	3,259	SF	Irrigation	$3.75	$12,221.25
				ADD ALTERNATE TOTAL IN FIGURES	**$195,324.40**
			ADD ALTERNATE TOTAL IN WORDS: One Hundred Ninety-Five Thousand, Three Hundred Twenty-Four dollars and Forty Cents		

*All items in the plans and specificaitons are to be reflected in the bid. Items not individually listed are subsidary to the project and must be reflected in the overall bid.

INSURORS
INDEMNITY COMPANIES

Phone: 877 816 2800 | PO Box 32577
Waco, Texas 76703-4200

BID BOND

Bond No. CNB-35709-00

KNOW ALL MEN BY THESE PRESENTS:

THAT we, J. B. & Co., LLC, as Principal, hereinafter called the Principal, and INSURORS INDEMNITY COMPANY, Waco, Texas, as Surety, hereinafter called the Surety, are held and firmly bound unto Town Of Addison, as Obligee, hereinafter called the Obligee, in the amount of 5 % of the amount of this bid not to exceed 5% of the Greatest Amount Bid Dollars ($ 5% of G.A.B), for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the principal has submitted a bid for
Bid #20-52,Belt Line 1.5 Landscape Enhacements

NOW, THEREFORE, If the contract be timely awarded to the Principal and the Principal shall within such time as specified in the bid, enter into a contract in writing and give bond with good and sufficient surety, or, in the event of the failure of the Principal to enter into such Contract and give such bond or bonds; if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect

PROVIDED, HOWEVER, neither Principal nor Surety shall be bound hereunder unless Obligee prior to execution of the final contract shall furnish evidence of financing in a manner and form acceptable to Principal and Surety that financing has been firmly committed to cover the entire cost of the project.

SIGNED, SEALED AND DATED this 30th day of January, 2020.

Principal:
J. B. & Co., LLC
(Seal)
By: _____ Manager
(title)

Surety:
INSURORS INDEMNITY COMPANY
(Seal)
By: _____
Monica Hernandez, Attorney-in-Fact

Bond verification: bonddept@insurorsindemnity.com

INSURORS
INDEMNITY COMPANIES

Phone: 877 816 2800 | PO Box 32577
Waco, Texas 76703-4200

IMPORTANT NOTICE - AVISO IMPORTANTE

To obtain information or make a complaint:

You may call Insurors Indemnity Company's toll-free telephone number for information or to make a complaint at:

1-877-816-2800

You may also write to Insurors Indemnity Company at:

P.O. Box 32577
Waco, TX 76703-4200
Or
225 South Fifth Street
Waco, TX 76701

You may contact the Texas Department of Insurance to obtain information on companies, coverages, rights or complaints at

1-800-252-3439

You may write the Texas Department of Insurance at:

Consumer Protection (111-1A)
P.O. Box 149091
Austin, TX 78714-9091
Fax: 512-490-1007

Web: http://www.tdi.texas.gov

E-mail: ConsumerProtection@tdi.texas.gov

PREMIUM OR CLAIM DISPUTES:

Should you have a dispute concerning your premium or about a claim, you should contact the agent or the company first. If the dispute is not resolved, you may contact the Texas Department of Insurance.

ATTACH THIS NOTICE TO YOUR POLICY:

This notice is for information only and does not become a part or condition of the attached document.

Para obtener informacion o para someter una queja:

Usted puede llamar al numero de telefono gratis de Insurors Indemnity Company's para informacion o para someter una queja al

1-877-816-2800

Usted tanbien puede escribir a Insurors Indemnity Company:

P.O. Box 32577
Waco, TX 76703-4200
O
225 South Fifth Street
Waco, TX 76701

Puede comunicarse con el Departamento de Seguros de Texas para obtener informacion acerca de companias, coberturas, derechos o quejas al

1-800-252-3439

Puede escribir al Departamento de Seguros de Texas:

Consumer Protection (111-1A)
P.O. Box 149091
Austin, TX 78714-9091
Fax: 512-490-1007

Web: http://www.tdi.texas.gov

E-mail: ConsumerProtection@tdi.texas.gov

DISPUTAS SOBRE PRIMAS O RECLAMOS:

Si tiene una disputa concemiente a su prima o a un reclamo, debe comunicarse con el agente o la compania primero. Si no se resuelve la disputa, puede entonces comunicarse con el departamento (TDI).

UNA ESTE AVISO A SU POLIZA:

Este aviso es solo para proposito de informacion y no se convierte en parte o condicion del documento adjunto.

INSURORS
INDEMNITY COMPANIES

POWER OF ATTORNEY of INSURORS INDEMNITY COMPANY
Waco, Texas

KNOW ALL PERSONS BY THESE PRESENTS: **Number:** CNB-35709-00

That INSURORS INDEMNITY COMPANY, Waco, Texas, organized and existing under the laws of the State of Texas, and authorized and licensed to do business in the State of Texas and the United States of America, does hereby make, constitute and appoint

Monica Hernandez of the City of Waco, State of TX

as Attorney in Fact, with full power and authority hereby conferred upon him to sign, execute, acknowledge and deliver for and on its behalf as Surety and as its act and deed, all of the following classes of document, to-wit:

Indemnity, Surety and Undertakings that may be desired by contract, or may be given in any action or proceeding in any court of law or equity; Indemnity in all cases where indemnity may be lawfully given and with full power and authority to execute consents and waivers to modify or change or extend any bond or document executed for this Company.

INSURORS INDEMNITY COMPANY

Attest: Tammy Tieperman
Tammy Tieperman, Secretary

By: Dave E. Talbert
Dave E. Talbert, President

State of Texas
County of McLennan

On the 11th day of November, 2014, before me a Notary Public in the State of Texas, personally appeared Dave E. Talbert and Tammy Tieperman, who being by me duly sworn, acknowledged that they executed the above Power of Attorney in their capacities as President, and Corporate Secretary, respectively, of Insurors Indemnity Company, and acknowledged said Power of Attorney to be the voluntary act and deed of the Company.

Sheri Carnes
Notary Public, State of Texas

Sheri Carnes
Notary Public, State of Texas
My Comm. Exp. 5/21/21
Notary ID 228589-7

Insurors Indemnity Company certifies that this Power of Attorney is granted under and by authority of the following resolutions of the Company adopted by the Board of Directors on November 11, 2014:

RESOLVED, that all bonds, undertakings, contracts or other obligations may be executed in the name of the Company by persons appointed as Attorney in Fact pursuant to a Power of Attorney issued in accordance with these Resolutions. Said Power of Attorney shall be executed in the name and on behalf of the Company either by the Chairman and CEO or the President, under their respective designation. The signature of such officer and the seal of the Company may be affixed by facsimile to any Power of Attorney, and, unless subsequently revoked and subject to any limitation set forth therein, any such Power of Attorney or certificate bearing such facsimile signature and seal shall be valid and binding upon the Company and any such power so executed and certified by facsimile signature and seal shall be valid and binding upon the Company with respect to any bond or undertaking to which it is validly attached.

RESOLVED, that Attorneys in Fact shall have the power and authority, subject to the terms and limitations of the Power of Attorney issued to them, to execute and deliver on behalf of the Company and to attach the seal of the Company to any and all bonds and undertakings, and any such instrument executed by such Attorneys in Fact shall be binding upon the Company as if signed by an Executive Officer and sealed and attested to by the Secretary or Assistant Secretary of the Company.

I, Tammy Tieperman, Secretary of Insurors Indemnity Company, do hereby certify that the foregoing is a true excerpt from the Resolutions of the said Company as adopted by its Board of Directors on November 11, 2014, and that this Resolution is in full force and effect. I certify that the foregoing Power of Attorney is in full force and effect and has not been revoked.

In Witness Whereof, I have set my hand and the seal of INSURORS INDEMNITY COMPANY on this 30th day of January, 2020.

Tammy Tieperman
Tammy Tieperman, Secretary

NOTE: IF YOU HAVE ANY QUESTION REGARDING THE VALIDITY OR WORDING OF THIS POWER OF ATTORNEY, PLEASE CALL 800 933 7444 OR WRITE TO US AT P. O. BOX 32577, WACO, TEXAS 76703 OR EMAIL US AT BONDDEPT@INSURORSINDEMNITY.COM.

Town of Addison

Indemnification Agreement

Contractor's Indemnity Obligation. Contractor covenants, agrees to, and shall DEFEND (with counsel reasonably acceptable to Owner), INDEMNIFY, AND HOLD HARMLESS Owner, its past, present and future elected and appointed officials, and its past, present and future officers, employees, representatives, and volunteers, individually or collectively, in both their official and private capacities (collectively, the "Owner Persons" and each being an "Owner Person"), from and against any and all claims, liabilities, judgments, lawsuits, demands, harm, losses, damages, proceedings, suits, actions, causes of action, liens, fees (including attorney's fees), fines, penalties, expenses, or costs, of any kind and nature whatsoever, made upon or incurred by Owner and/or Owner Person, whether directly or indirectly, (the "Claims"), that arise out of, result from, or relate to: (i) the services to be provided by Contractor pursuant to this Agreement, (ii) any representations and/or warranties by Contractor under this Agreement, (iii) any personal injuries (including but not limited to death) to any Contractor Persons (as hereinafter defined) and any third persons or parties, and/or (iv) any act or omission under, in performance of, or in connection with this Agreement by Contractor or by any of its owners, directors, officers, managers, partners, employees, agents, contractors, subcontractors, invitees, patrons, guests, customers, licensees, sublicensees, or any other person or entity for whom Contractor is legally responsible, and their respective owners, directors, officers, directors, officers, managers, partners, employees, agents, contractors, subcontractors, invitees, patrons, guests, customers, licensees, sublicensees (collectively, "Contractor Persons"). SUCH DEFENSE, INDEMNITY AND HOLD HARMLESS SHALL AND DOES INCLUDE CLAIMS ALLEGED OR FOUND TO HAVE BEEN CAUSED IN WHOLE OR IN PART BY THE NEGLIGENCE OR GROSS NEGLIGENCE OF OWNER OR ANY OTHER OWNER PERSON, OR CONDUCT BY OWNER OR ANY OTHER OWNER PERSON THAT WOULD GIVE RISE TO STRICT LIABILITY OF ANY KIND.

Contractor shall promptly advise Owner in writing of any claim or demand against any Owner Person related to or arising out of Contractor's activities under this Agreement and shall see to the investigation and defense of such claim or demand at Contractor's sole cost and expense. The Owner Persons shall have the right, at the Owner Persons' option and own expense, to participate in such defense without relieving Contractor of any of its obligations hereunder. This defense, indemnity, and hold harmless provision shall survive the termination or expiration of this Agreement.

The provisions in the foregoing defense, indemnity and hold harmless are severable, and if any portion, sentence, phrase, clause or word included therein shall for any reason be held by a court of competent jurisdiction to be invalid, illegal, void, or unenforceable in any respect, such invalidity, illegality, voidness, or unenforceability shall not affect any other provision thereof, and this defense, indemnity and hold harmless provision shall be considered as if such invalid, illegal, void, or unenforceable provision had never been contained in this Agreement. **In that regard, if the capitalized language included in the foregoing indemnity is so determined to be void or unenforceable, the parties agree that:**

(i) the foregoing defense, indemnity, and hold harmless obligation of Contractor shall be to the extent Claims are caused by, arise out of, or result from, in whole or in part, any act or omission of Contractor or any Contractor Persons; and

(ii) notwithstanding the provisions of the foregoing subparagraph (i), to the fullest extent permitted by law, Contractor shall INDEMNIFY, HOLD HARMLESS, and DEFEND Owner and Owner Persons from and against all Claims arising out of or resulting from bodily injury to, or sickness, disease or death of, any employee, agent or representative of Contractor or any of its subcontractors, regardless of whether such Claims are caused, or are alleged to be caused, in whole or in part, by the negligence, or any act or omission, of Owner or any Owner Persons, it being the expressed intent of Owner and Contractor that IN SUCH EVENT THE CONTRACTOR'S INDEMNITY, HOLD HARMLESS, AND DEFENSE OBLIGATION SHALL AND DOES INCLUDE CLAIMS ALLLEGED OR FOUND TO HAVE BEEN CAUSED IN WHOLE OR IN PART BY THE NEGLIGENCE OR GROSS NEGLIGENCE OF OWNER OR ANY OTHER OWNER PERSON, OR CONDUCT BY OWNER OR ANY OTHER OWNER PERSON THAT WOULD GIVE RISE TO STRICT LIABILITY OF ANY KIND. The indemnity obligation under this subparagraph (ii) shall not be limited by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor under workers compensation acts, disability benefit acts, or other employee benefit acts.

I understand that the indemnification provisions are required of all Town of Addison Contracts. I have read the provisions and agree to the terms of these provisions.

Project/Bid#: 20-52

Company Name: J.B. & Co. LLC

Signature: 

Date: 01-29-2020

TOWN OF ADDISON, TEXAS
CONTRACTOR INSURANCE REQUIREMENTS & AGREEMENT

REQUIREMENTS

Contractors performing work on TOWN OF ADDISON property or public right-of-way shall provide the TOWN OF ADDISON a certificate of insurance or a copy of their insurance policy(s) (and including a copy of the endorsements necessary to meet the requirements and instructions contained herein) evidencing the coverages and coverage provisions identified herein within ten (10) days of request from TOWN OF ADDISON. Contractors shall provide TOWN OF ADDISON evidence that all subcontractors performing work on the project have the same types and amounts of coverages as required herein or that the subcontractors are included under the contractor's policy. Work shall not commence until insurance has been approved by TOWN OF ADDISON.

All insurance companies and coverages must be authorized by the Texas Department of Insurance to transact business in the State of Texas and must have a A.M. Best's rating A-:VII or greater.

Listed below are the types and minimum amounts of insurances required and which must be maintained during the term of the contract. TOWN OF ADDISON reserves the right to amend or require additional types and amounts of coverages or provisions depending on the nature of the work.

TYPE OF INSURANCE	AMOUNT OF INSURANCE	PROVISIONS
1. **Workers' Compensation Employers' Liability** to include: (a) each accident (b) Disease Policy Limits (c) Disease each employee	Statutory Limits per occurrence Each accident $1,000,000 Disease Policy Limits $1,000,000 Disease each employee$1,000,000	**TOWN OF ADDISON to be provided a *WAIVER OF SUBROGATION AND 30 DAY NOTICE OF CANCELLATION or*** material change in coverage. **Insurance company must be A-:VII rated or above.**
2. **Commercial General (Public) Liability** to include coverage for: a) Bodily Injury b) Property damage c) Independent Contractors d) Personal Injury e) Contractual Liability	Bodily Injury/Property Damage per occurrence $1,000,000, General Aggregate $2,000,000 Products/Completed Aggregate $2,000,000, Personal Advertising Injury per occurrence $1,000,000, Medical Expense 5,000	**TOWN *OF ADDISON to be listed as ADDITIONAL INSURED and provided 30 DAY NOTICE OF CANCELLATION* or material change in coverage.** **Insurance company must be A-:VII rated or above.**
3. **Business Auto Liability** to include coverage for: a) Owned/Leased vehicles b) Non-owned vehicles c) Hired vehicles	Combined Single Limit $1,000,000	**TOWN *OF ADDISON to be listed as ADDITIONAL INSURED and provided 30 DAY NOTICE OF CANCELLATION* or material change in coverage.** **Insurance company must be A:VII-rated or above.**

Certificate of Liability Insurance forms (together with the endorsements necessary to meet the requirements and instructions contained herein)may be **faxed** to the Purchasing Department: **972-450-7074 or emailed to: purchasing@addisontx.gov**. Questions regarding required insurance should be directed to the Purchasing Manager.

With respect to the foregoing insurance,

1. All liability policies shall contain no cross liability exclusions or insured versus insured restrictions applicable to the claims of the Town of Addison.

2. All insurance policies shall be endorsed to require the insurer to immediately notify the Town of Addison, Texas of any material change in the insurance coverage.

3. All insurance policies shall be endorsed to the effect that the Town of Addison, Texas will receive at least thirty (30) days' notice prior to cancellation or non-renewal of the insurance.

4. All insurance policies, which name the Town of Addison, Texas as an additional insured, must be endorsed to read as primary coverage regardless of the application of other insurance.

5. Insurance must be purchased from insurers that are financially acceptable to the Town of Addison and licensed to do business in the State of Texas.

All insurance must be written on forms filed with and approved by the Texas Department of Insurance. Upon request, Contractor shall furnish the Town of Addison with complete copies of all insurance policies certified to be true and correct by the insurance carrier.

This form must be signed and returned with your quotation. You are stating that you do have the required insurance and if selected to perform work for TOWN OF ADDISON, will provide the certificates of insurance (and endorsements) with the above requirements to TOWN OF ADDISON within 10 working days.

A CONTRACT/PURCHASE ORDER WILL NOT BE ISSUED WITHOUT EVIDENCE AND APPROVAL OF INSURANCE.

AGREEMENT

I agree to provide the above described insurance coverages within 10 working days if selected to perform work for TOWN OF ADDISON. I also agree to require any subcontractor(s) to maintain insurance coverage equal to that required by the Contractor. It is the responsibility of the Contractor to assure compliance with this provision. The TOWN accepts no responsibility arising from the conduct, or lack of conduct, of the Subcontractor.

Project/Bid# 20-52

Company: J.B. & Co. LLC

Printed Name: Joel Brown

Signature: _____ **Date:** 01-29-2020

J.B. & Co. LLC
3131 McKinney Ave. Suite 600
joel@joelbrownco.com **Dallas, TX 75204** **Tel: (972) 515-3646**

January 30, 2020

Recent Projects:

City of Garland Dog Park $1,357,000
Ziad Kharrat, 972-205-2756
Central Park Renovations, utilities, parking lot, lighting, dog park, landscaping erosion control

Texas Parks & Wildlife $1,231,000
Lake Ray Roberts Shoreline Repairs, landscaping, rip rap, flatwork and tree removal
Park P.M.: M.L. Hill 512-627-4318

City of Coppell
Hunterwood Park Creek Stabilization $1,648,000
City Inspector- Derrick Thomas 469-576-5999 DThomas@coppelltx.gov

City of Plano $662,150
Lance Knox 972-941-7819 lknox@plano.gov
Stoney Hollow Park including landscaping, underground utilities, flatwork, irrigation system

City of Coppell
Grapevine Springs Community Center Parking Lot and Landscaping $548,000
John Elias Parks Dept. 972-462-5115 JElias@coppelltx.gov

City of Frisco
Walkway & Ramps various locations throughout city $615,025
Engineering Mark Misun mmisun@friscotexas.gov 972.292.5417 Inspector: Glynn Tidwell 469-980-8069

City of Plano
McDermott/Razor Blvd. mass grading, tree removal, creek landscaping
Jessica Walden 972-816-8153 Jwalden@plano.gov
1520 K Avenue Suite 370, Plano, TX 75074

Greene Family Camp
Randy Stumberg, AIA (254) 771-2054 Randy.Stumberg@mrbgroup.com
Jared Picket (713) 502-8870 JPickett@urj.org
Multiple projects of all types ranging from $150,000-990,000 from 2011-2019

Let me know if you need any other references and I will be happy to send a list with more

Please do not hesitate to contact me if you have any questions.

Respectfully Submitted,

Joel Brown
J.B. & Co. LLC

SECTION CA

CONTRACT AGREEMENT

Exhibit A
CONTRACT AGREEMENT

STATE OF TEXAS

COUNTY OF DALLAS

THIS AGREEMENT is made and entered into this **25th** day of **February**, 2020, by and between the Town of Addison, of the County of Dallas and State of Texas, acting through its City Manager, thereunto duly authorized so to do, Party of the First Part, hereinafter termed the OWNER, and **J.B. & Co. LLC,** of the City of **Dallas,** County of **Dallas**, State of **Texas**, Party of the Second Part, hereinafter termed CONTRACTOR.

WITNESSETH: That for and in consideration of the payment and agreement hereinafter mentioned, to be made and performed by the OWNER, the said CONTRACTOR hereby agrees with the said OWNER to commence and complete construction of certain improvements as follows:

BELT LINE 1.5 LANDSCAPE ENHANCEMENTS BID NUMBER 20-52

and all extra work in connection therewith, under the terms as stated in the General and Specific Conditions of the AGREEMENT; and at his own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance and other accessories and services necessary to complete the said construction, in accordance with the conditions and prices stated in the Proposal attached hereto and in accordance with the Advertisement for Bids, Instructions to Bidders, General Provisions, Special Provisions, Plans, and other drawings and printed or written explanatory matter thereof, and the Technical Specifications and Addenda thereto, as prepared by the OWNER, each of which has been identified by the endorsement of the CONTRACTOR and the OWNER thereon, together with the CONTRACTOR's written Proposal and the General Provisions, all of which are made a part hereof and collectively evidence and constitute the entire AGREEMENT.

The CONTRACTOR hereby agrees to commence work within ten (10) calendar days after the date of written notice to do so shall have been given to him, to **substantially complete the work by July 1, 2020**, subject to such extensions of time as are provided by the General Provisions. The contractor agrees to fulfill the intent of the plans and specifications associated with Bid # 20- 52

The OWNER agrees to pay the CONTRACTOR **One Million, Six Hundred Two Thousand, Nine Hundred Sixty-Three Dollars and Fifty Five Cents ($1,602,963.55)** for base bid items and at its sole discretion, OWNER may also request CONTRACTOR to complete the alternate bid item identified in the Bid in the amount of **One Hundred Ninety-Five Thousand, Three Hundred Twenty-Four Dollars and Forty Cents ($195,324.40)** all payable from current funds for the performance of the Contract in accordance with the Proposal submitted thereof, subject to additions and deductions, as provided in the General Provisions, and to make payments of account thereof as provided therein.

IN WITNESS WHEREOF, the parties of these presents have executed this AGREEMENT in the year and day first above written.

TOWN OF ADDISON, TEXAS (OWNER)

By:_____
Wes Pierson, City Manager

ATTEST:

By:_____
Irma Parker, City Secretary

(CONTRACTOR)

By:_____

ATTEST:

By: _____

The following to be executed if the CONTRACTOR is a corporation:

I,_____certify that I am the secretary of the corporation named as CONTRACTOR herein; that_____, who signed this Contract on behalf of the CONTRACTOR is the (official title) of said corporation; that said Contract was duly signed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

Signed: _____

Corporate Seal

SECTION PrB

PERFORMANCE BOND

STATUTORY PERFORMANCE BOND PURSUANT TO CHAPTER 2253 OF THE TEXAS GOVERNMENT CODE (PUBLIC WORKS)

(Penalty of this Bond must be 100% of Contract Amount)

KNOW ALL MEN BY THESE PRESENTS, That _____ (hereinafter called the Principal), as Principal, and _____ (hereinafter called the Surety), as Surety are held and firmly bound unto the **Town of Addison** (hereinafter called the Obligee), in the amount of _____ _____ Dollars ($ _____) for the payment whereof the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the _____ day of _____, 2020 to

BELT LINE 1.5 LANDSCAPE ENHANCEMENTS
BID NUMBER 20-52

which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall faithfully perform the work in accordance with the plans, specifications and contract documents, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government Code and all liabilities on this bond shall be determined in accordance with the provisions, conditions and limitations of said Chapter to the same extent as if it were copied at length herein.

IN WITNESS, WHEREOF, the said Principal and Surety have signed this instrument this _____ day of _____, 2020.

_____
(Principal)

_____ By: _____

_____
(Surety)

_____ By: _____
(Attorney-in-Fact)

SECTION PyB

PAYMENT BOND

STATUTORY PAYMENT BOND PURSUANT TO CHAPTER 2253
OF THE TEXAS GOVERNMENT CODE
(PUBLIC WORKS)

(Penalty of this Bond must be 100% of Contract Amount)

KNOW ALL MEN BY THESE PRESENTS, That _____

(hereinafter called the Principal), as Principal, and _____

(hereinafter called the Surety), as Surety are held and firmly bound unto the **Town of Addison** (hereinafter called the Obligee), in the amount of _____

_____ Dollars ($ _____) for the payment whereof the said Principal and Surety bind themselves and their heirs, administrators, executors, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the _____ day of _____, 2020 to

BELT LINE 1.5 LANDSCAPE ENHANCEMENTS
BID NUMBER 20-52

which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall pay all claimants supplying labor and material to him or a subcontractor in the prosecution of the work provided for in said contract, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government Code and all liabilities on this bond shall be determined in accordance with the provisions, conditions, and limitations of said Chapter to the same extent as if it were copied at length herein.

IN WITNESS, WHEREOF, the said Principal and Surety have signed this instrument this _____ day of _____, 2020.

_____
(Principal)

_____ By: _____

_____
(Surety)

_____ By: _____
(Attorney-in-Fact)

SECTION MB

MAINTENANCE BOND

MAINTENANCE BOND

STATE OF TEXAS

COUNTY OF DALLAS

That _____as principal and _____

_____ , a corporation organized under the laws of _____

and as sureties, said sureties being authorized to do business in the _____

State of Texas, do hereby expressly acknowledge themselves to be held and bound to pay unto the Town of Addison, a municipal corporation, chartered by virtue of a Special Act of Legislature of the State of Texas, as Addison, Dallas County, Texas, the sum of

_____

_____

_____

($_____) for the payment of which sum will and truly to be made unto said Town of Addison and its successors, said principal and sureties do hereby bind themselves, their assigns and successors, jointly and severally.

This obligation is conditioned, however, that whereas said

_____

has this day entered into a written contract with the said Town of Addison to build and construct the

BELT LINE 1.5 LANDSCAPE EHANCEMENTS
BID NUMBER 20-52

_____

which contract and the Plans and Specifications therein mentioned adopted by the Town of Addison, are hereby expressly made a part hereof as though the same were written and embodied herein.

WHEREAS, under the Plans, Specifications and Contract it is provided that the Contractor will maintain and keep in good repair the work herein contracted to be done and performed for a period of one (1) year from the date of startup, and to do all necessary repairs that may arise on account of workmanship, or otherwise, and to do and perform all necessary work and repair any defective condition growing out of or arising from the improper joining of the same, or on account of any breaking of the same caused by the said Contractor in laying or building the same, or on account of any defect arising in any of said part of said work laid or constructed by the said Contractor, or on account of improper excavation or backfilling; it being understood that the purpose of this section is to cover all defective conditions arising by reason of defective materials, work or labor performed by the said Contractor; and in case the said Contractor shall fail to do, it is agreed that the City may do said work and supply such materials, and charge the same against the said Contractor and sureties on this obligation, and the said Contractor and sureties hereon shall be subject to the liquidated damages mentioned in said contract for each day's failure on its part to comply with the terms of the said provisions of said contract;

NOW THEREFORE, if the said Contractor shall keep and perform its said agreement to maintain said work and keep the same in repair for the said maintenance period of one (1) year, as provided, then these presents shall be null and void and have no further effect; but if default shall be made by the said Contractor in the performance of its contract to so maintain and repair said work, then these presents shall have full force and effect, and said Town of Addison shall have and recover from the Contractor and its sureties damages in the premises, as provided, and it is further understood and agreed that this obligation shall be a continuing one against the principal and sureties hereon and that successive recoveries may be had hereon for successive branches until the full amount shall have been exhausted; and it is further understood that the obligation herein to maintain said work shall continue throughout said maintenance period, and the same shall not be changed, diminished, or in any manner affected from any cause during said time.

IN WITNESS, WHEREOF, the said _____ has caused these presents to be executed by _____ and the said _____ has hereunto set his hand this the _____ day of _____, 2020

SURETY

_____

_____

By: _____
Attorney in Fact

By: _____
Surety

_____

_____
Agency and Address

PRINCIPAL

_____

By: _____

ATTEST

_____
Secretary

NOTE: Date of Maintenance Bond must be same as date of City acceptance.

SECTION BP

CONTRACTOR'S AFFIDAVIT OF BILLS PAID

CONTRACTOR'S AFFIDAVIT OF BILLS PAID

STATE OF TEXAS

COUNTY OF DALLAS

Personally, before me the undersigned authority, on this day appeared_____who, being duly sworn, on oath, says that he is a legal representative of _____

(full name of Contractor as in contract)

and that the contract for the construction of the project, designated as

BELT LINE 1.5 LANDSCAPE ENHANCEMENTS
BID NUMBER 20-52

has been satisfactorily completed and that all bills for materials, apparatus, fixtures, machinery and labor used in connection with the construction of this project have, to the best of my knowledge and belief, been fully paid.

_____
Signature

_____
Title

Sworn to and subscribed before me this_____day of_____, 2020.

_____
Notary Public in and for

_____ County, Texas

Instructions:

If the contractor is an individual, he shall sign the affidavit. If the contractor is a partnership, any partner may sign the affidavit. If the contractor is a corporation, a person authorized by the by-laws or by the Board of Directors shall sign the affidavit. If the Contractor is a joint-venture of individuals, any of the individuals may sign the affidavit. If the Contractor is a joint-venture of partnerships, or of individuals and partnerships, the affidavit may be signed by the individual or any partner of any partnership. If the contractor is a joint-venture in which a corporation is a party, separate affidavits must be executed in the name of the joint-venture: one by each corporation and one by each individual or partnership. Signatures for corporations should be by a duly authorized officer. If signature is by another, a showing of authority to sign must accompany the affidavit.

SECTION GP

GENERAL PROVISIONS

GENERAL PROVISIONS

The General Provisions of the Contract shall be as stated in the *Standard Specifications for Public Works Construction – North Central Texas, 4th Edition (2004)*, under Division 100, "General Provisions," Items 101.1 through 109.6 inclusive, as amended or supplemented and except as modified by the Special Provisions.

Work Session and Regular Meeting **11.**

Meeting Date: 02/25/2020

Department: Police

Pillars: Gold Standard in Public Safety

AGENDA CAPTION:

Present and Discuss the **Addison Police Department's 2019 Annual Report.**

BACKGROUND:

The Addison Police Department has prepared an Annual Report for 2019. This report includes a statistical review of the year, notable events from the patrol and criminal investigation divisions, community outreach events, and goals and objectives for Fiscal Year 2020.

With the conclusion of the 2019 calendar year, the Addison Police Department is also pleased to provide the results of an internal and external audit of it's License Plate Recognition and Optical Camera system. This annual audit is assurance to the public, the department's License Plate Recognition and Optical Camera System has operated according to Council's policy direction, and that all internal activities surrounding it's use were found to be in line with those adopted polices and procedures.

RECOMMENDATION:

Information only, no action required.

Attachments

2019 Annual Report - Police

License Plate Recognition Audit Letter - 2019 Annual Report



Addison Police Department

Statistical Review and Annual Report

2019

Uniform Crime Reporting (UCR)
Long Term Trends

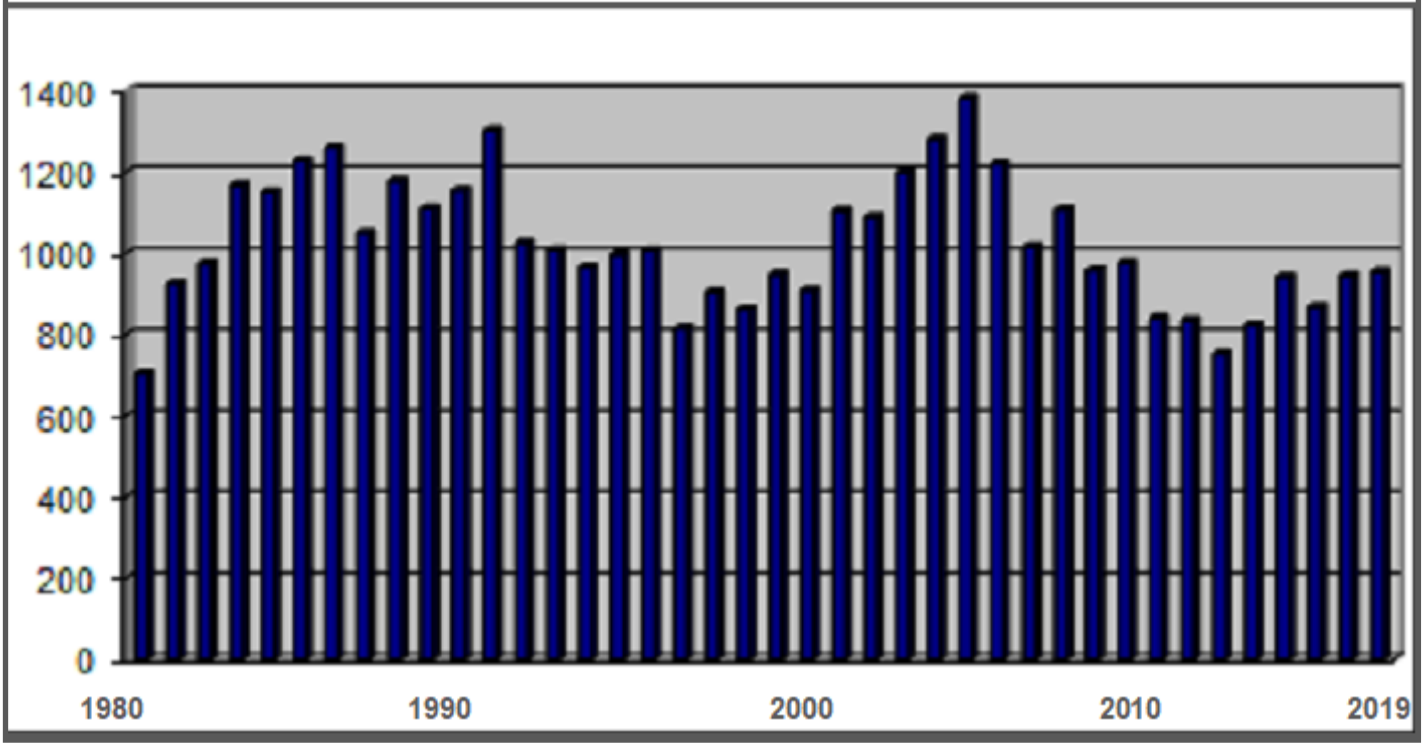
What are UCR Part 1 Offenses?

The Uniform Crime Reporting (UCR) program was started by the FBI to develop a system of consistent police crime statistics across the nation based on population.

Part 1 Offenses are the highest level offense in each incident. These seven major crimes provided a standardized reporting system for the crime rates throughout the United States for over four decades.

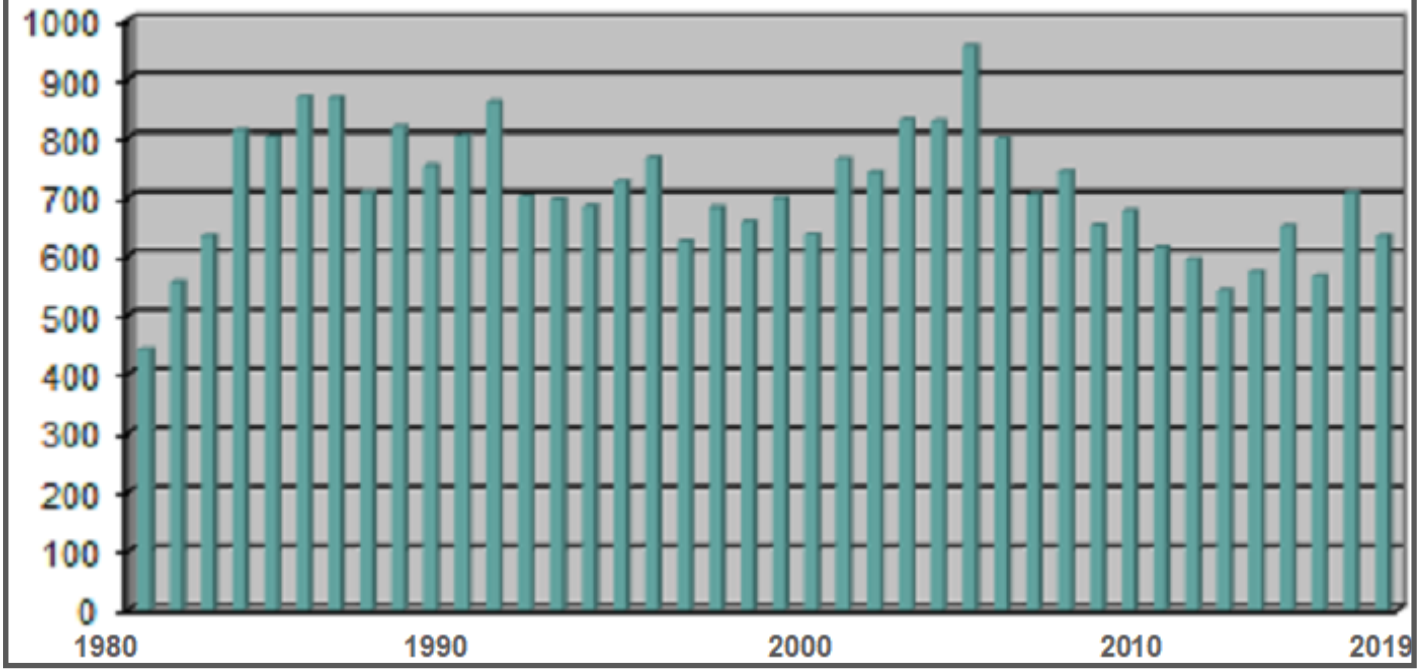
The graph below shows the total number of UCR Part 1 Offenses over a 30 year period. This visual representation best demonstrates the cyclical nature of crime as it slowly increases and decreases over time.

Graph shows Addison UCR total Part 1 Offenses from 1980-2019

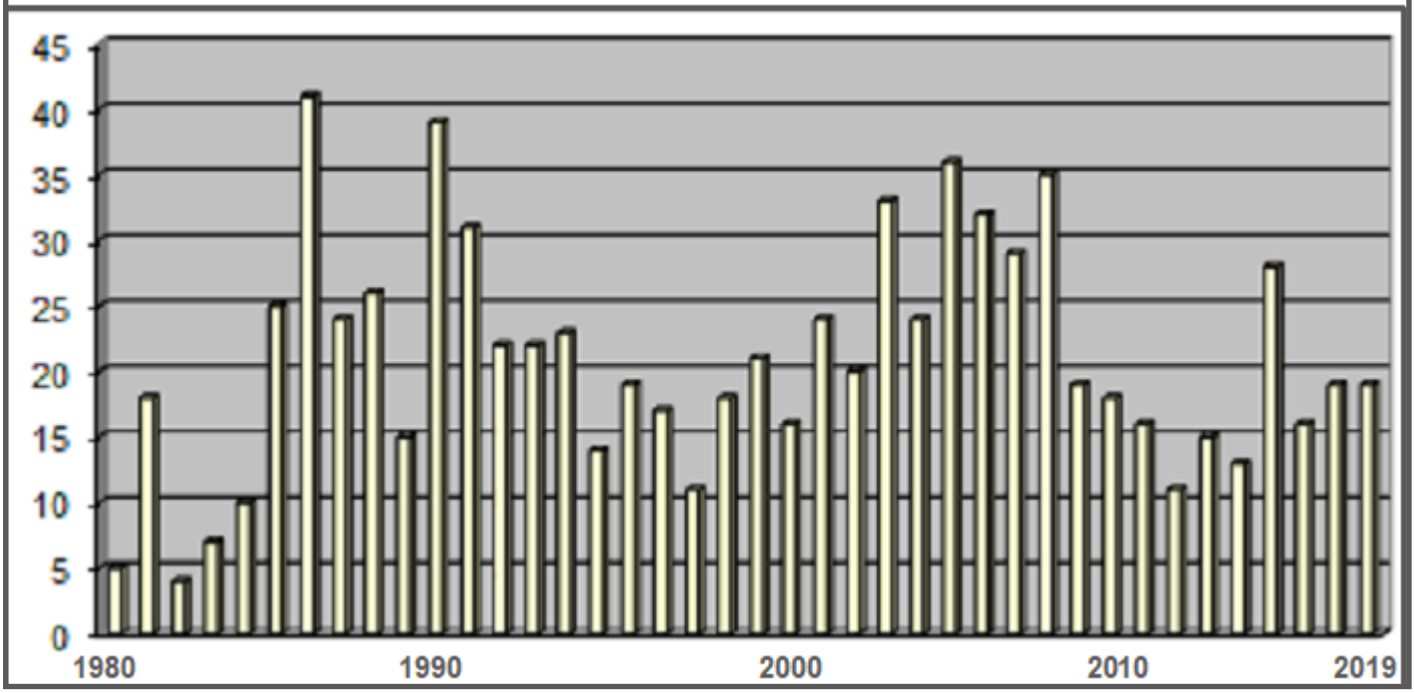


Uniform Crime Reporting (UCR)
Long Term Trends

Graph shows Addison Larceny-Theft Offenses from 1980-2019



Graph shows Addison Robbery Offenses from 1980-2019

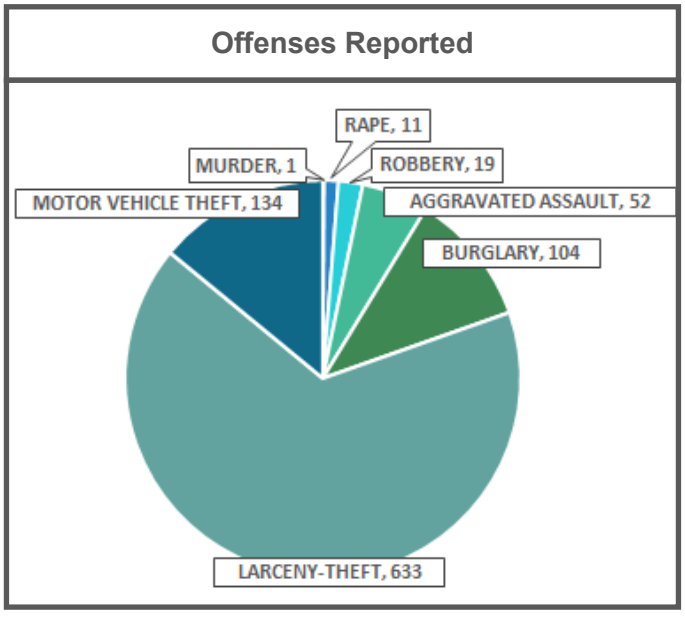


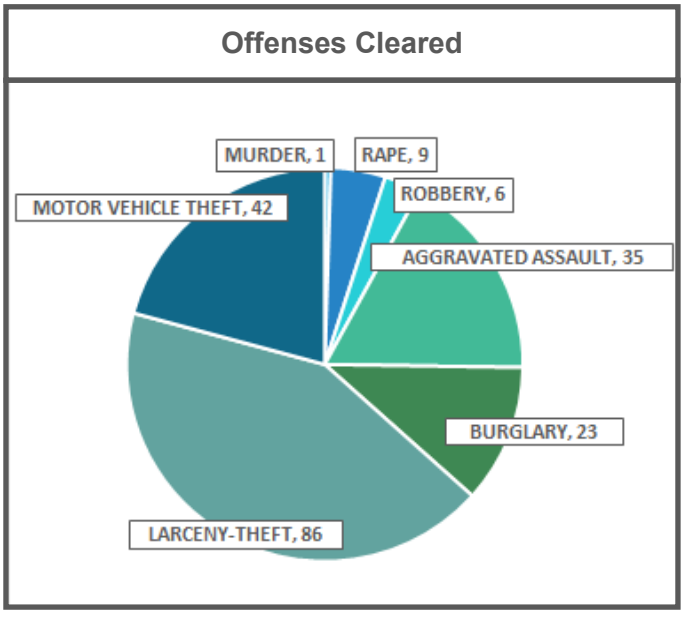
Uniform Crime Reporting (UCR)
2019 Part 1 Offenses

Statistics

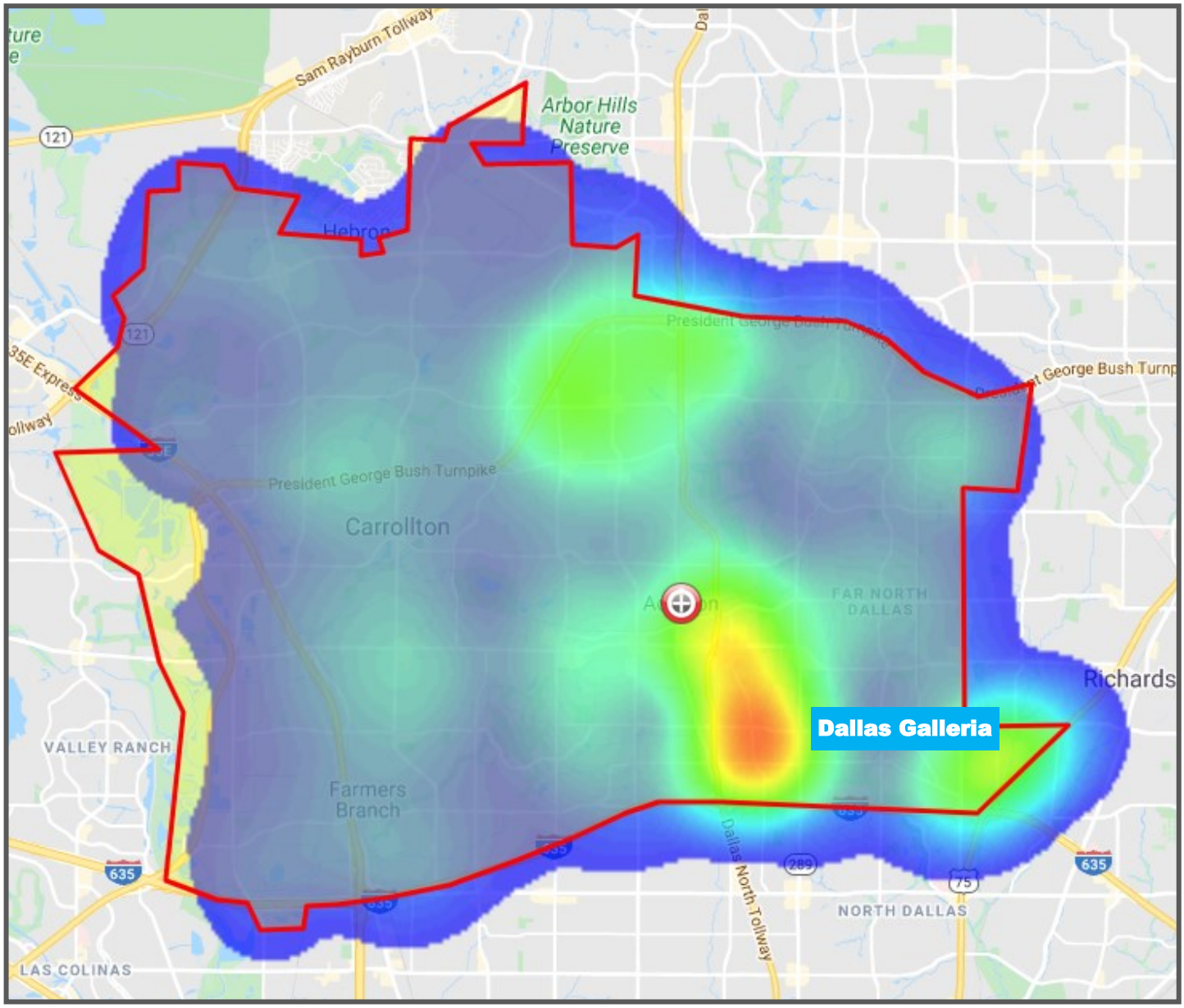
	Offenses Reported	Offenses Cleared	Clearance Rate (2019)	Clearance Rate (2018)
MURDER	1	1	100%	N/A
RAPE	11	9	82%	62%
ROBBERY	19	6	32%	42%
AGGRAVATED ASSAULT	52	35	67%	75%
BURGLARY	104	23	22%	14%
LARCENY-THEFT	633	86	14%	27%
MOTOR VEHICLE THEFT	134	42	31%	30%
TOTAL	954	202	21%	29%

Visual Representation





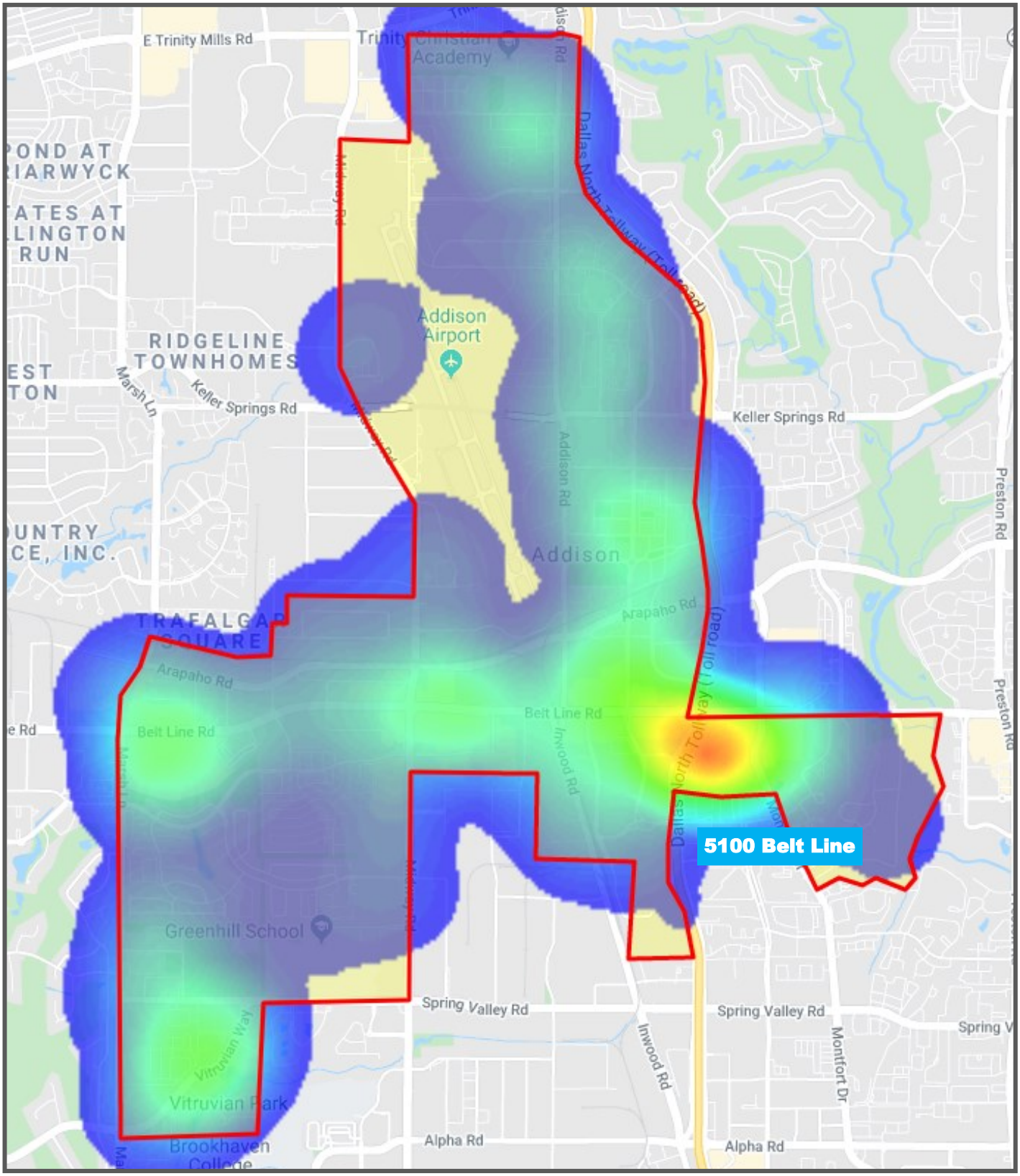
2019 UCR Crime: North Dallas Area



Map includes Addison, Carrollton, Farmers Branch, and Far North Dallas (north of 635, west of 75)

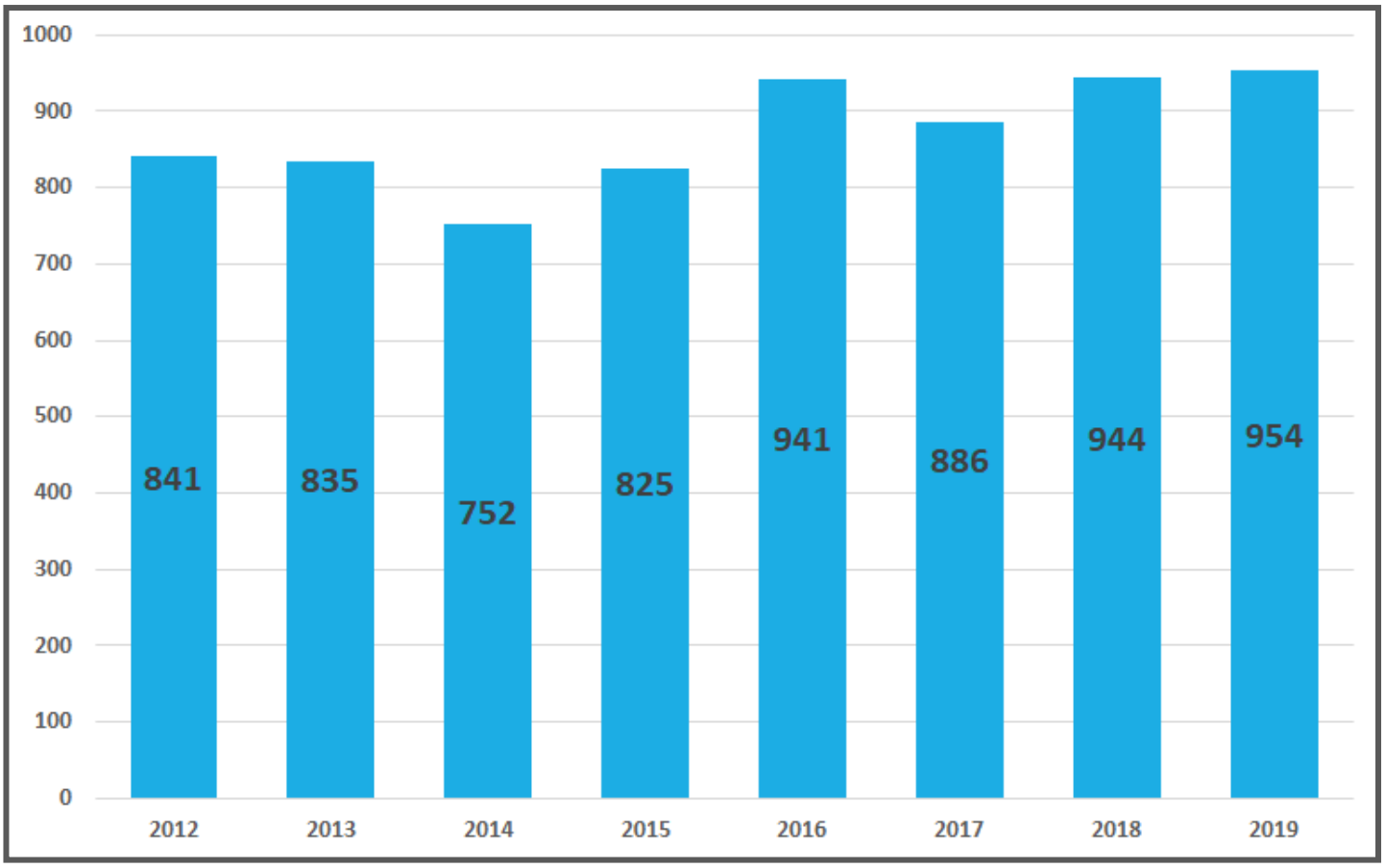
Hotspots include the Dallas Galleria (property crimes) and businesses near major streets and highways.

2019 UCR Crime: Addison



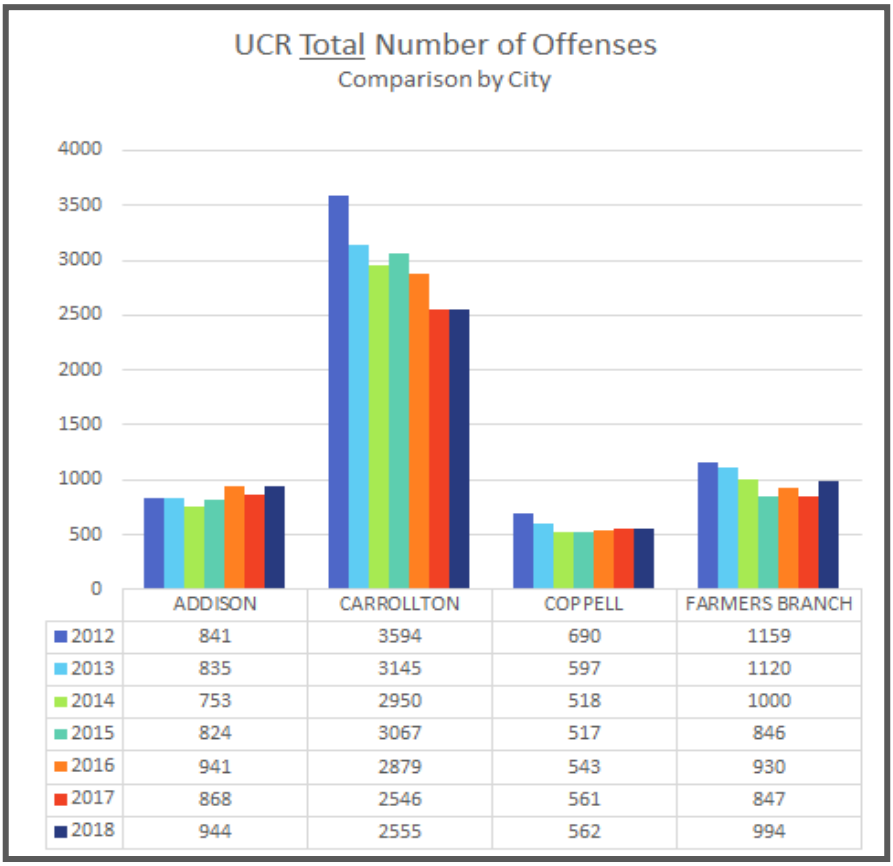
Addison's UCR History

Total UCR Offenses Each Year

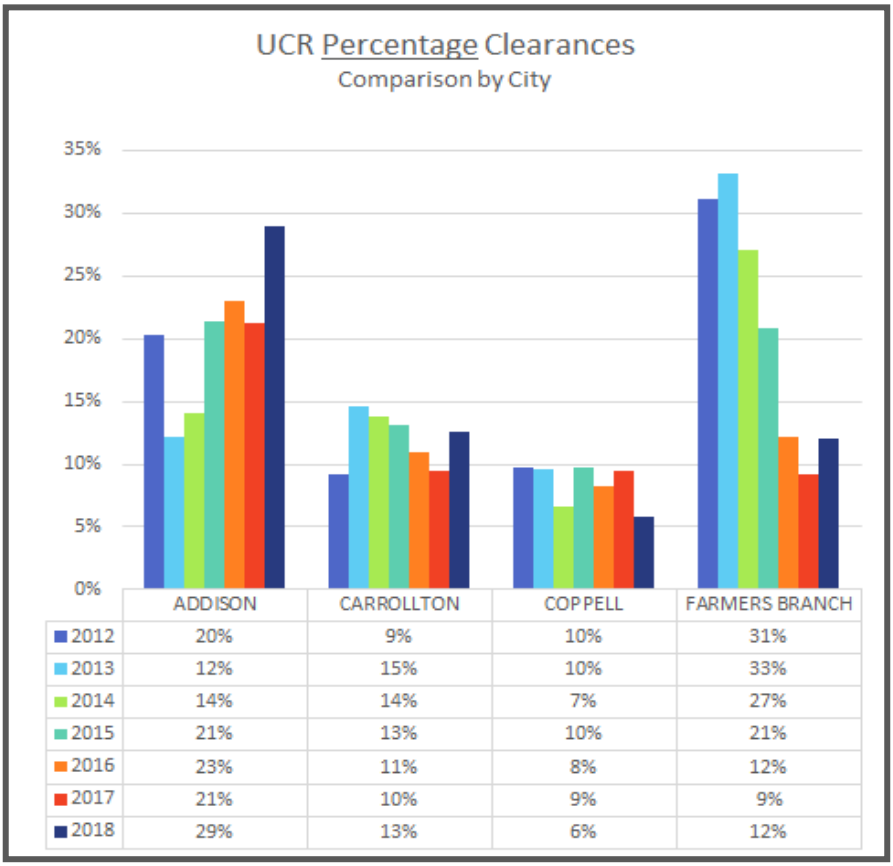


	2012	2013	2014	2015	2016	2017	2018	2019
MURDER	0	1	0	0	1	0	0	1
RAPE	5	4	7	10	12	22	13	11
ROBBERY	16	11	15	13	28	16	19	19
AGGRAVATED ASSAULT	51	35	44	42	60	56	40	52
BURGLARY	84	129	83	104	100	111	78	104
LARCENY	613	593	541	574	650	585	706	633
AUTO THEFT	72	62	62	82	90	96	88	134
TOTAL	**841**	**835**	**752**	**825**	**941**	**886**	**944**	**954**

UCR Crimes and Clearance Rates



	ADDISON	CARROLLTON	COPPELL	FARMERS BRANCH
2012	841	3594	690	1159
2013	835	3145	597	1120
2014	753	2950	518	1000
2015	824	3067	517	846
2016	941	2879	543	930
2017	868	2546	561	847
2018	944	2555	562	994



	ADDISON	CARROLLTON	COPPELL	FARMERS BRANCH
2012	20%	9%	10%	31%
2013	12%	15%	10%	33%
2014	14%	14%	7%	27%
2015	21%	13%	10%	21%
2016	23%	11%	8%	12%
2017	21%	10%	9%	9%
2018	29%	13%	6%	12%

Comparison between Metrocrest cities: Addison, Carrollton, Coppell, and Farmers Branch

Part 1 Offense totals are obtained from fbi.gov for the purposes of comparison between Addison and nearby cities.

The most recently available data is from 2018. Therefore the charts show data between 2012-2018.

What do the Metrocrest's crime and clearance rates look like over the years?

- Carrollton has the highest number of UCR crimes committed, followed by Farmers Branch and Addison. Coppell has the lowest number.
- At 29% Addison has the highest percentage of UCR crimes cleared by investigators in 2018. Carrollton and Farmers Branch cleared a more average number of 13% and 12%. Coppell cleared 6%.
- For 2018, Addison had the highest clearance rate and the third most crimes.

National Incident Based Reporting System (NIBRS)

The department received official approval from the State of Texas on December 9, 2019, stating we are a certified NIBRS agency.

What are the limitations of the Uniform Crime Reporting System (UCR)?

UCR can give a brief comparison of major crime across the country over time. It is best used for showing long term crime trends.

However many categories of crime are excluded from UCR such as financial crime, cyber crime, and crimes relating to public safety.

In 2020 Addison will present statistics compliant with NIBRS UCR.

What is the National Incident-Based Reporting System (NIBRS)?

NIBRS is designed to capture a significant number of details on each crime incident. It will also capture separate offenses within the same incident.

This includes information on the victims and offenders, their relationship if any, and the nature and type of each offense.

This goes allows our officers to provide the circumstances and context for the crime, like where and when it happened as well as whether the incident was eventually cleared.

When will the transition from UCR to NIBRS UCR begin?

The Addison Police Department's NIBRS submissions started with October 2019 data as we sought certification from the State. To lessen confusion we will include only the UCR data format for our 2019 Annual Report.

However, we will include some examples of our NIBRS submissions so Council can see the difference between the two types of submission formats. For calendar year 2020 we will be 100% NIBRS format for all crime data submissions to the State of Texas.

The Addison Police Department began the transition last year with the purchase of the Mark43 Record Management System. We also received a $95,000 grant from the State of Texas to expedite the project.

National Incident Based Reporting System (NIBRS)

NIBRS is a method of incident reporting created to capture more details about criminal offenses.

The FBI will require all agencies to comply with NIBRS by 2021.

Ideally NIBRS will allow investigators across the country to compare and contrast specific crime trends.

Reporting more offense types will also allow for fewer data spikes to disrupt the perception of crime.

Additional Data Points:

- Location type
- Attempted vs completed offense
- Weapon used
- Property involved
- Descriptors of persons involved
- Relationship type between victim and suspect
- If computers are involved
- Gang and drug information
- Case disposition

SUMMARY UCR	NIBRS UCR
Collects offense data in 7 categories. Only the highest charge in an incident is reported. Reports general information.	Collects offense data in 62 categories. Multiple charges per incident can be reported. Reports detailed information.

Murder →

Rape

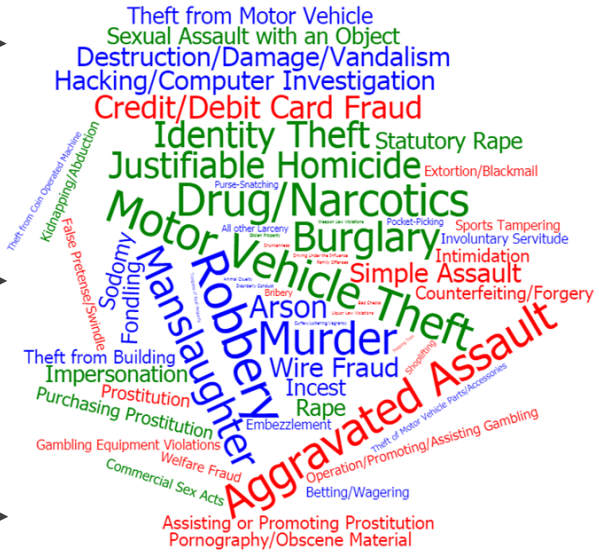
Robbery

Aggravated Assault →

Burglary

Larceny-Theft

Motor Vehicle Theft →



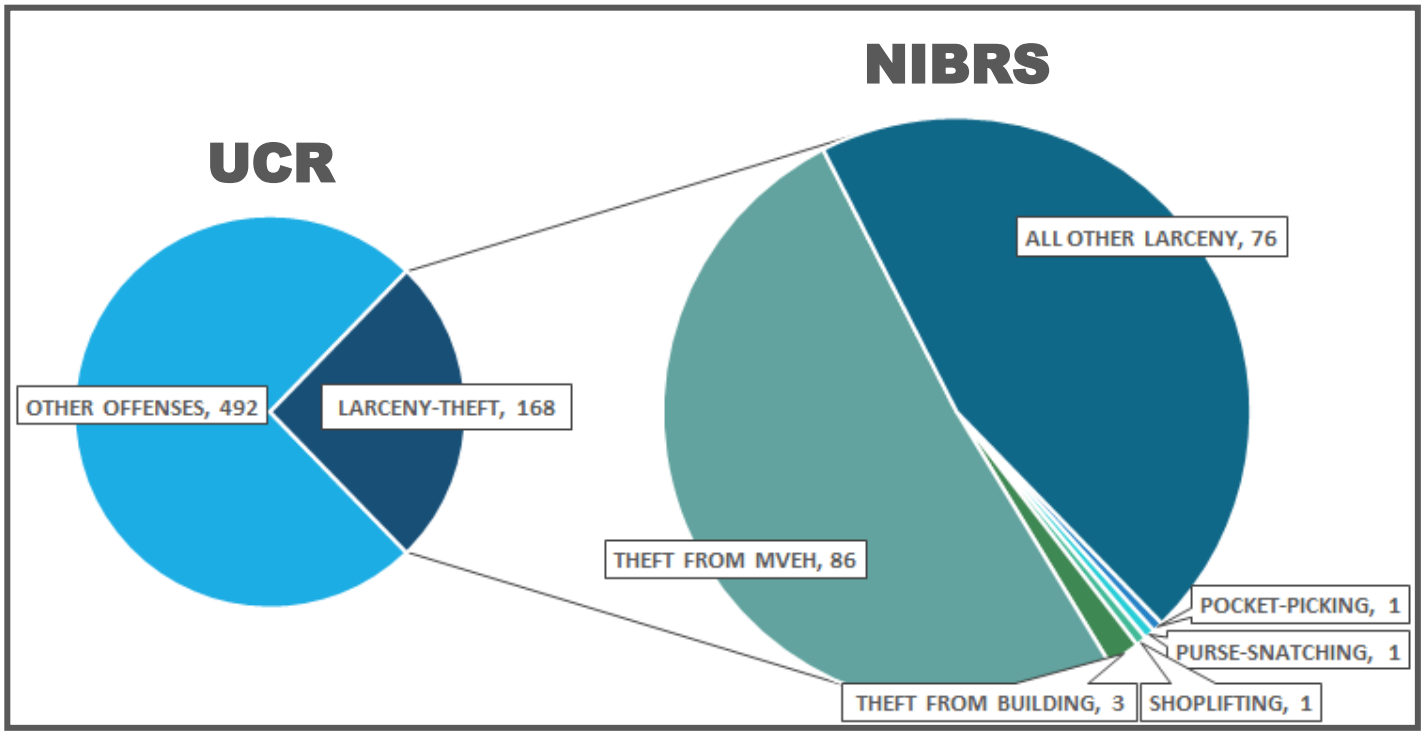
NIBRS UCR Reporting Example: Larceny

Statistics

NIBRS CODE	NIBRS CODE NAME	OCT 2019	NOV 2019	DEC 2019	TOTAL
23A	POCKET-PICKING	0	1	0	1
23B	PURSE-SNATCHING	1	0	0	1
23C	SHOPLIFTING	1	0	0	1
23D	THEFT FROM BUILDING	0	1	2	3
23E	THEFT FROM COIN-OP	0	0	0	0
23F	THEFT FROM MVEH	39	18	29	86
23G	THEFT OF MVEH PARTS	0	0	0	0
23H	ALL OTHER LARCENY *	26	26	24	76

* EXAMPLES INCLUDE THEFT OF MAIL, PACKAGES, ITEMS FROM GYM LOCKERS, LOST ITEMS NOT TURNED IN OR FOUND, ETC

Visual Representation



Online Resources

How can citizens see what crimes are happening and where?

https://communitycrimemap.com

Very similar to Google Maps, this website plots a variety of crimes on a map so citizens can see what offenses are occurring in surrounding neighborhoods, in prospective towns, or across the United States.

What specific tools are available to use on this website?

- **Date Range:** Select a time frame of data.
- **Event:** Choose which offenses to view.
- **Offenders:** See where sexual offenders reside.
- **Density Map:** Create Heat Maps to see concentrations of offenses.
- **Agency Layers:** Pick which police agency's reported offenses to view.

www.addisontx.net

www.facebook.com/townofaddison/

www.facebook.com/townofaddisonpolicedepartment/

www.facebook.com/townofaddisonanimalcontrol/

Criminal Investigations Division

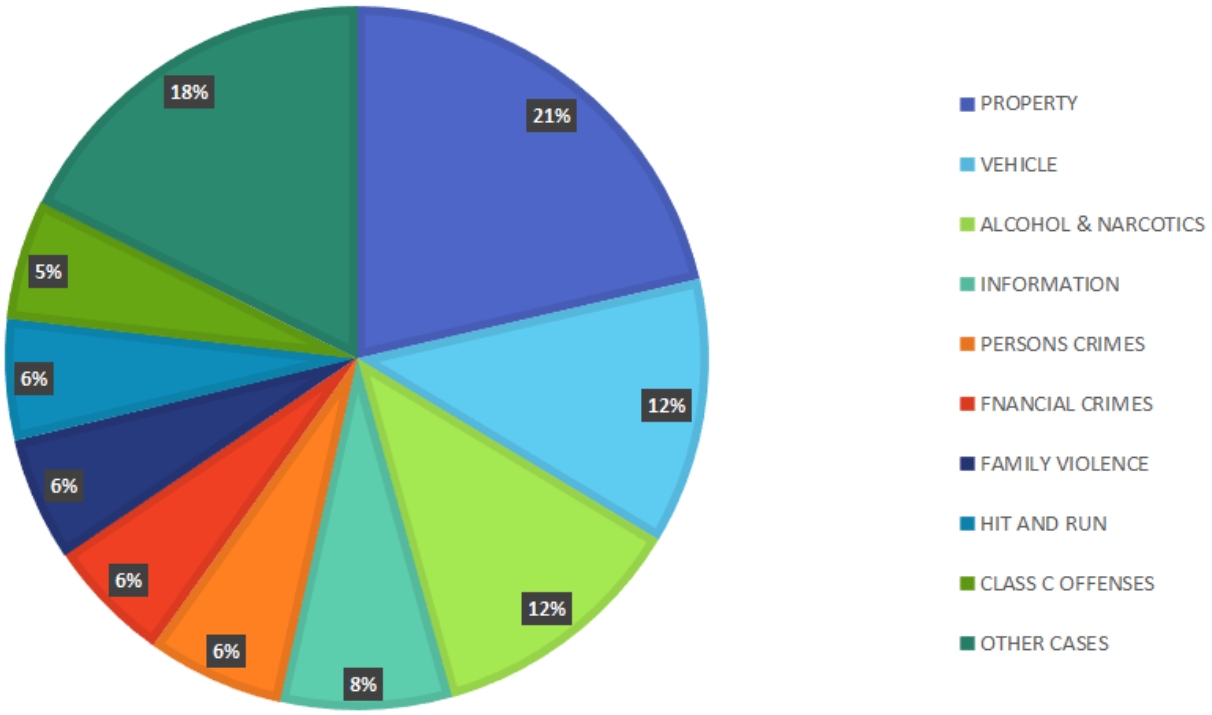
TOTAL CASES

- ASSIGNED: 4,259
- CLEARED: 2,653
- SUSPENDED: 1,544
- ACTIVE: 62

STAFFING

- INVESTIGATORS: 10
- WORKING DAYS: 252
- CASES ASSIGNED/DAY: 16.9
- CASES CLEARED/DAY: 10.5

CASE TYPES

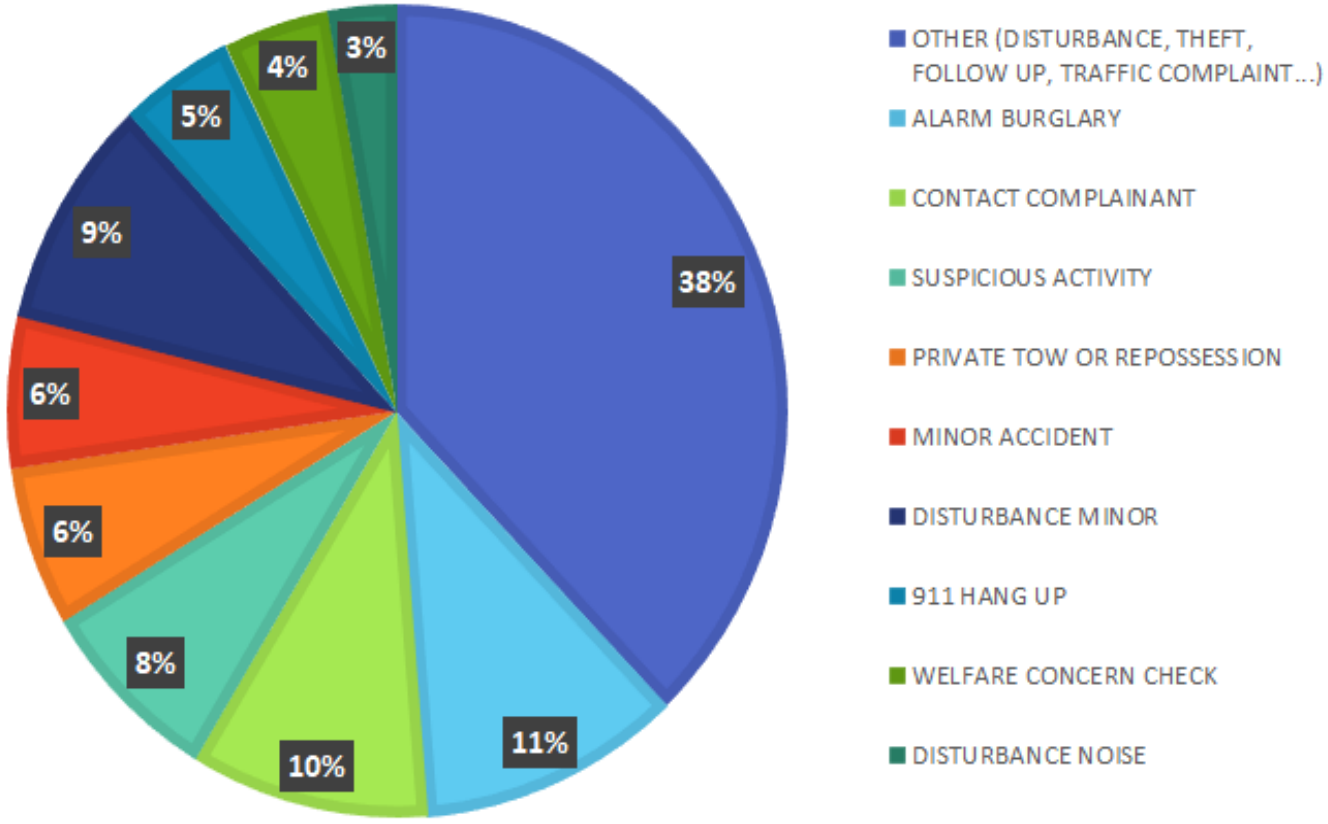


CID GOALS FOR 2020

- Maintain License Plate Reader system and continue to solve crime using vehicle location information.
- Explore Ring For Law Enforcement and other community policing programs.
- Fill two open detective positions and complete relevant specialized training.
- Strengthen interagency connections with daily communication, intelligence sharing, and training.

Patrol Division

TYPES OF CALLS FOR SERVICE



ARRESTS
1750
CITATIONS
5295
WARNINGS
6903

SWORN OFFICER STAFFING CHANGES FOR 2019

OFFICERS HIRED:	5	OFFICERS RESIGNED:	5
PRIOR LEO EXPERIENCE:	4	CURRENT STAFFING:	60
NO PRIOR LEO EXPERIENCE:	1	MAXIMUM STAFFING:	66

SELF-INITIATED ACTIVITY

- ASSIST MOTORIST CALLS
- AIRPORT PATROLS
- BUSINESS CONTACTS
- CRIME RISK WARNINGS
- FOLLOW UP
- PARK PATROLS
- PARKING VIOLATIONS
- SPECIAL ASSIGNMENTS
- SUSPICIOUS ACTIVITY
- TRAFFIC STOPS
- VACATION WATCH
- WELFARE CHECKS

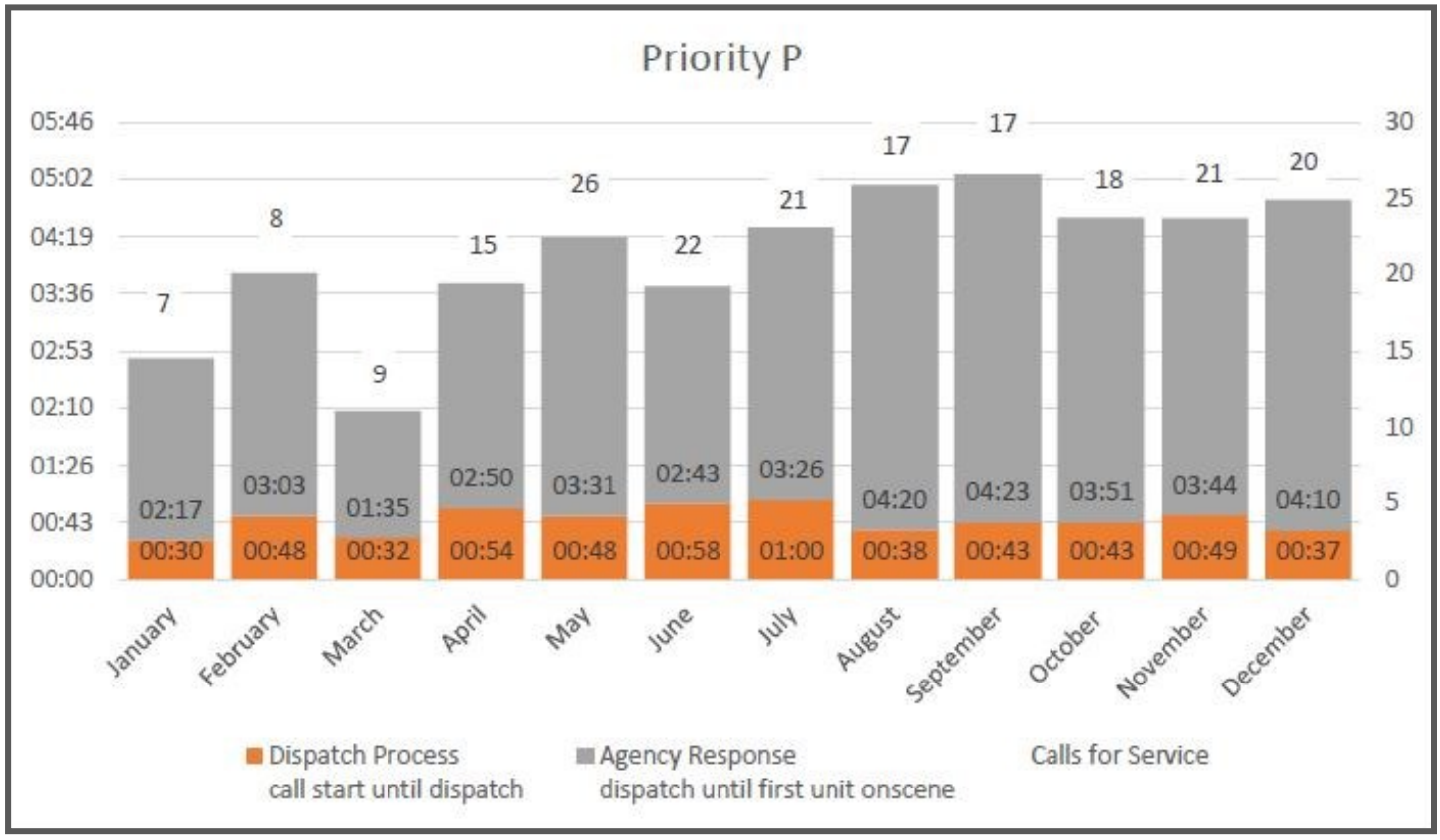
Patrol Division

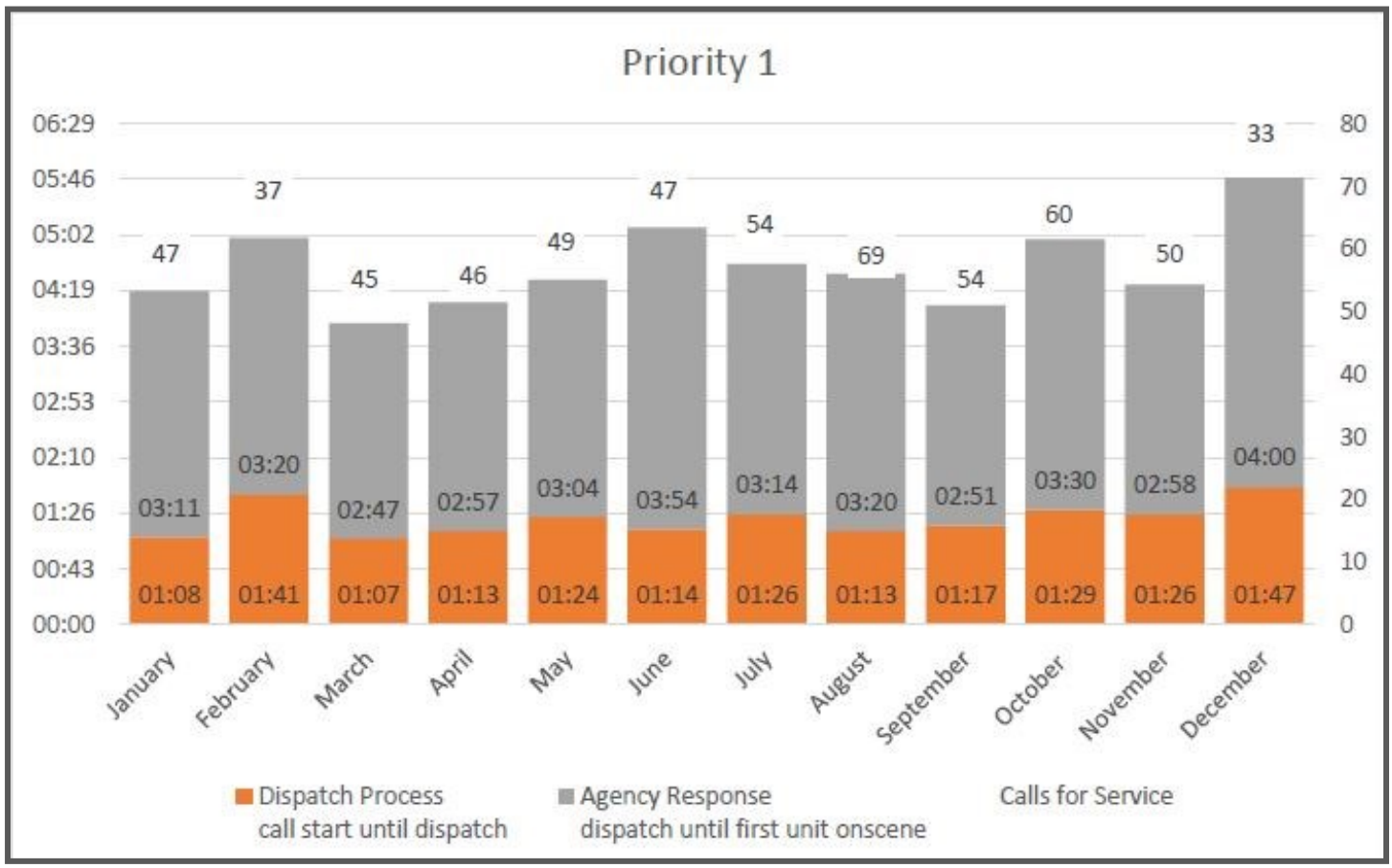
DISPATCHED CALL INFORMATION		
	2018	2019
ALL DISPATCHED CALLS:	16,967	17,298
COMMERCIAL LOCATIONS:	71%	67%
RESIDENTIAL LOCATIONS:	29%	33%

CALL PRIORITIES		
PRIORITY	EXPLANATION	EXAMPLES
P	Calls of the utmost severity that pose an immediate risk to life	Active Shooter, Stabbing, Kidnapping
1	Offense against persons, in progress	Burglary in Progress, DWI, Major Disturbance
2	Offense against property, in progress	Theft in Progress, Forgery in Progress
3	Offense against persons, just occurred	Death Investigation, Drug Investigation
4	Offense against property, just occurred	Open Door/Window, Theft in Custody
5	Non-criminal offense calls with potential for hazardous conditions	Minor Disturbance, Traffic Complaint
6	Offense against persons, delayed report	Delayed Forgery, Harassment
7	Offense against property, delayed report	Delayed Theft, Delayed Criminal Mischief
8	Non-criminal offense with little to no potential for hazardous potential	Abandoned Vehicle, Contact Complainant, Parking Violation
9	Administrative or information broadcasts	Private Tow, NCIC Recovery, BOLO

RESPONSE TIME BY PRIORITY (2019)		
	P	1
AVERAGE DISPATCH TIME:	0:45	1:22
AVERAGE POLICE RESPONSE TIME:	3:19	3:16

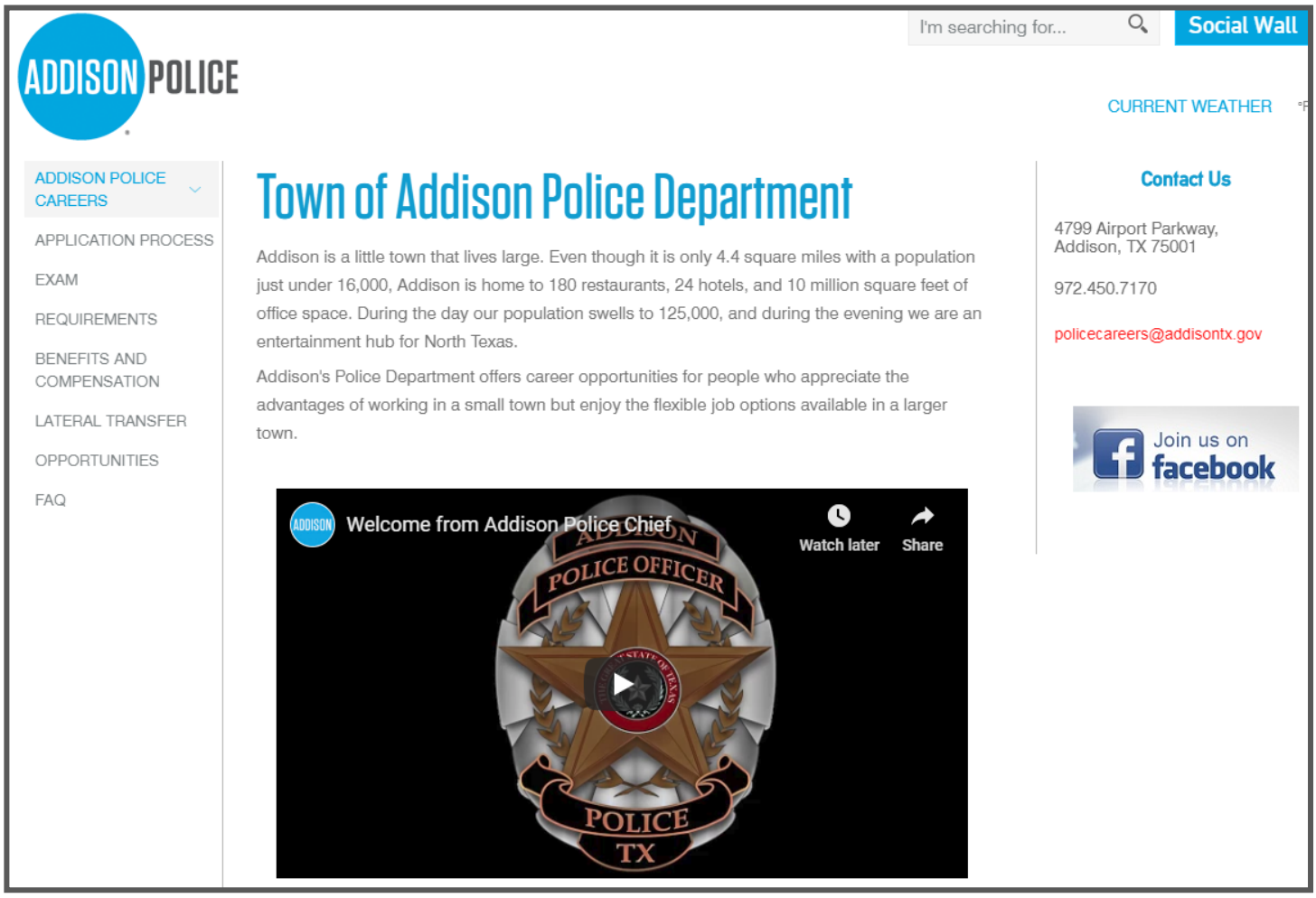
Patrol Division
2019





Police Recruitment Efforts

ADDISON POLICE CAREERS



TOWN OF ADDISON POLICE DEPARTMENT FACEBOOK



Community Outreach Events and Programs

Coffee with a Cop

Santa's Heroes Toy Drive

Neighborhood Watch Meetings

Addison Police Department Tours

Addison Athletic Club Kids Program

Police & Fire Open House

Child Safety Seat
Installation and Inspection

Kids and Cops





Updates in Technology and Software

Mark43 Records Management System (RMS)

Successfully implemented on 10/01/2019.
NIBRS and UCR compliant for 2020.
Additional Analytics and Property modules.

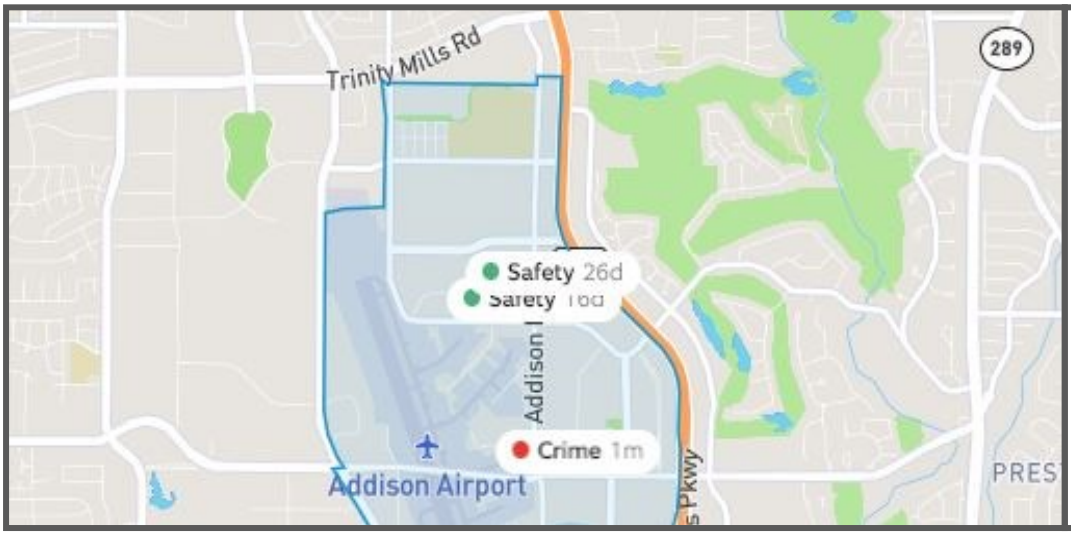
Vigilant Solutions License Plate Recognition Pilot Project

Personnel training completed in July 2018.
Camera installation completed in March 2019.
17 successful LPR uses.

Pilot project concludes in April 2020.

Ring Neighbors App for Law Enforcement

Personnel training completed in December 2019.
Investigators will both request videos and monitor feed.
Information gathered at town borders given to correct agency.



Contact us on Neighbors!

- Share videos
- Talk to people in the area
- Smartphone app welcomes all camera users

Note: Ring cannot be used to request a police report or immediate response.

Please continue to call 911 or 972-450-7156 to have an officer dispatched to you.

License Plate Recognition Pilot Project

Cameras:

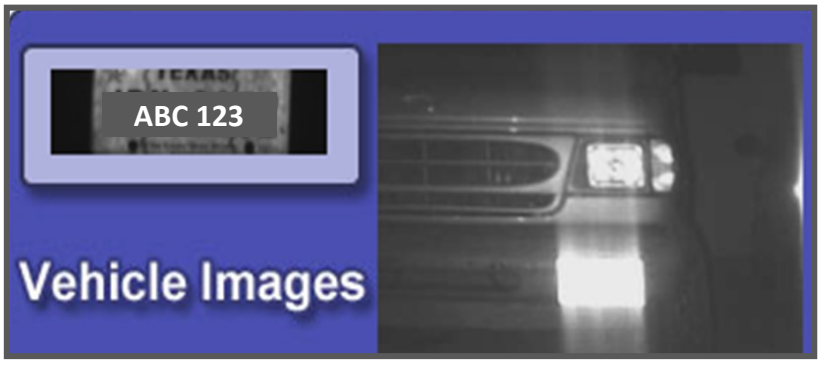
- 8 cameras were successfully installed in the Les Lacs, Winnwood, and Oaks North neighborhoods.
- Investigators have access to software from our 8 cameras, over 350 other police agencies' cameras, and every commercial vehicle contributing license plate scans.

TAS Alerts:

- Software immediately alerts officers of any missing persons, stolen vehicles, or felony warrants scanned by our 8 cameras.
- Alerts are delivered to officers' in-car computers so quick action can be taken.
- One wanted person has been arrested so far after officers received a TAS alert.

LPR Software:

- Investigators use historical scans to identify suspect vehicles or possible suspect locations.
- A stolen vehicle scanned anywhere else in Addison is sent to shift supervisors as a secondary alert.
- 10 vehicles have been recovered using these secondary alerts.



LPR Successes:

So far LPR has been critical in the investigation of 17 felony cases.

2-3 stolen vehicles are recovered per month in the field by shift supervisors receiving secondary alerts.

Investigators also use LPR to identify:

- Suspect vehicles used by vehicle burglars.
- Correct addresses for wanted persons.
- Possible suspect vehicles in violent crimes.

License Plate Recognition Pilot Project

Auditing:

Two audits take place each quarter to protect from hacking or misuse.

- **Internal personnel examine software use, cases, and reason for searches.**
- **External personnel examine attempted log-ins, general functioning of hardware, and any data breaches.**

At the end of one year APD will present a summary of use to city council to ensure best practices.

Please see License Plate Recognition Addendum for auditing transparency and specifics.



LEARN

Audit Queries
List Report

VIGILANT SOLUTIONS

No	Query Type	Username	User Type	Case Number	Requestor	Query Pars	Date Time	IP Address	Reason
79	Email Hit Alert	[redacted]@addisontx.gov	User		Email Hit Alert	_User:[redacted]@addisontx.gov _Plate: [redacted] _ Source: TCIC _ Alert: Stolen License Plate _ State ID: TX _ Agency: Addison Police Department (TX) _ Time of Scan: 09/27/19 6:52:58 PM _ Time of Email: 09/27/19 11:02:42 PM _ EmailAddress[redacted]@addisontx.gov _ Email Hit Alert	09-27-19 17:02:42		
80	User Management	[redacted]@addisontx.gov	Agency Manager	[redacted]	[redacted]	_ User:[redacted]@addisontx.gov _ Edit User	09-27-19 17:02:34	[redacted]	BURGLARY

What are Addison's guidelines for use?

- **License Plate Recognition systems will be used by the police department for legitimate law enforcement purposes only investigating circumstances in which law enforcement officers reasonably believe that the plate data are relevant to an ongoing criminal investigation.**
- **Unless plate data has been flagged, retention periods should be measured in days and weeks, not months and years. The Town will not store data about innocent people for more than 45 days and will only keep flagged data when it is necessary for legitimate law enforcement investigative purposes.**
- **Citizens will be able to find out if plate data of vehicles registered to them are contained in the data base used by the police department.**
- **The Town will not share plate data with non-law enforcement, third-parties. The Town will also not share data with other law enforcement agencies that do not follow proper retention and access policies or that do not have clear policies in place to ensure such practices are followed.**
- **The police department will report data usage publicly and on an annual basis.**
- **The Town will not collect personally identifiable information.**

Addison Police Department Use of Facial Recognition Technology



Facial Recognition Program:

- Software compares suspect photos to book-in photos.
- Trained personnel use surveillance camera footage and photos taken by officers during an investigation to help develop leads.
- Possible matches are further examined by detectives to develop their own probable cause.
- Software is only used to generate leads; it is not evidence for a case.

Facial Recognition Use:

- Software is not used by officers or supervisors in the field. Identification is only attempted retroactively by specially trained and certified personnel at their desks.
- *There are no automatic wanted person alerts going to officers or investigators.*
- *There is no live feed from any cameras running through recognition software.*

Facial Recognition Successes:

- Investigators have used Facial Recognition to identify suspects partially or completely unknown to the victims in robbery, burglary, theft, and fraud cases.
- Suspects who refuse to identify themselves can be verified in hours instead of weeks.

Animal Control



Primary Duties

Bite and cruelty investigation

Caretaking of loose, stray, and injured animals

Animal adoption and transfers

Wildlife

Yearly Statistics

Impounded Animals:	190
Adoptions/Reclamations:	120
Transferred:	34
Trap/Neuter/Release:	27
Bite Investigations:	20
Average Length of Stay:	25 days
Most Common Name:	Jake

Addison Goes National

Animal Control Officer Chambers was awarded a scholarship to travel to the National Animal Control Association's annual conference in Orlando, Florida.

Topics included disaster response protocols, social media usage, and effective utilization of technology to track trends.

This was the first time an Addison Animal Control Officer was able to attend a national event of this scale.



Goals and Objectives: Review of 2019

Selected Records Management System: Mark43

Completed firearms range rehabilitation

Implemented License Plate Recognition (LPR) program and optical cameras pilot project

Upgraded to National Incident-Based Reporting System (NIBRS) after being awarded a $95,000 grant by the Office of the Governor

Developed peer support group and community mental health team

Finalized CRYWOLF commercial and residential alarm management to reduce alarm calls by 13%



Goals and Objectives: 2020

Complete Mark43 Records Management System project on time and in budget

Complete fleet purchase and buildout

Activate peer support group and community mental health team

Complete cosmetic building renovations for common areas, breakroom, and jail transition

Build and maintain trust with citizens

Continue developing License Plate Recognition pilot program



February 18, 2020

Mr. Wesley Pierson
City Manager
Town of Addison
5300 Belt Line Road
Dallas, TX 75254

Mr. Wesley Pierson,

Reference: 2019 Annual Report Addendum, License Plate Recognition and Optical Camera Audits

Background

Based on Council direction to explore technologies assisting Addison's public safety efforts, the police department identified two key programs; License Plate Recognition (LPR) and optical cameras.

The Addison Police Department receives most of its calls for service out of the business community. On a busy day, or night, our officers may not be able to spend the time within our residential areas that many of our citizens expect or desire. Not being able to meet that expectation may lead some residents to perceive a lack of safety within their neighborhoods. Envisioned to be a force multiplier for the police department, the License Plate Recognition and optical camera system will assist them in keeping the community safe. This will happen two ways. First, by alerting Addison Police when a criminal enters an area covered by the License Plate Recognition cameras. Second, providing valuable forensic evidence should a crime occur.

Town of Addison Public Safety Data Management Policy

Policy Statement: These principles will act as policy guidelines for the police department as they develop and implement their standard operating procedures. Transparency and accountability for these systems is incredibly important and at the forefront of all our decision-making processes. Cooperation between law enforcement and the community it serves is the key to any program's success. These policy guidelines serve that purpose. Giving clear direction and boundaries, from the community, regarding how the police department will manage data collected via license plate recognition and optical cameras.

It shall be the policy of the Town of Addison that the data collected by License Plate Recognition and Optical Camera technologies be managed according to the following principles:

1. License Plate Recognition systems will be used by the police department for legitimate law enforcement purposes only investigating circumstances in which law enforcement officers reasonably believe that the plate data are relevant to an ongoing criminal investigation.

2. Unless plate data has been flagged, retention periods should be measured in days and weeks, not months and years. The Town will not store data about innocent people for more than 45 days and will only keep flagged data when it is necessary for legitimate law enforcement investigative purposes.
3. Citizens will be able to find out if plate data of vehicles registered to them are contained in the data base used by the police department.
4. The Town will not share plate data with non-law enforcement, third-parties. The Town will also not share data with other law enforcement agencies that do not follow proper retention and access policies or that do not have clear policies in place to ensure such practices are followed.
5. The police department will report data usage publicly and on an annual basis.
6. The Town will not collect personally identifiable information.

Audits

Since the LPR system went live on April 12, 2019, the Addison Police Department's License Plate Recognition and Optical Camera system has operated according to Council's policy direction. The APD's internal policy and procedures, that are aligned with Council adopted policies, are being followed. The following internal and external audits were conducted, and the activities were found to be in line with adopted policies and procedures:

Audit Period April 2019 through December 2019

1. *Agency Data Sharing:* Currently, the Addison Police Department is not sharing our LPR data with any other law enforcement agencies while we continue to work through our matrix for agency approval as the pilot project concludes in April 2020.
2. *User Permissions:* Audit conducted and verified access only allowed to supervisors and Criminal Investigative section personnel per Addison Police Department's internal policy and procedures.
3. *Log-in Tracking:* Audit conducted, and no unauthorized access detected.
4. *Search Queries:* Audit conducted to ensure queries are for legitimate law enforcement purposes only; no discrepancies detected.
5. *Records Viewed:* Audit conducted to ensure viewed records are for legitimate law enforcement purposes; no discrepancies detected.
6. *Camera Status:* Audit confirmed all cameras are online and functioning without errors. Our vendor also confirmed, to date, there has not been any reported physical or electronic breaches of the enclosures since the time of installation.

Respectfully Submitted,

Paul Spencer
Chief of Police

Work Session and Regular Meeting **12.**

Meeting Date: 02/25/2020
Department: Police
Pillars: Gold Standard in Public Safety
Milestones: Clarify and protect the Addison Way

AGENDA CAPTION:

Present, Discuss and Consider Action **to Accept the Addison Police Department's 2019 Racial Profiling Report And Motor Vehicle Contact Search Analysis Report.**

BACKGROUND:

Article 2.132 (7) of the Texas Code of Criminal Procedure requires the annual reporting to the local governing body of data collected on the race or ethnicity of individuals stopped and issued citations or arrested for traffic violations and whether or not those individuals were searched. The department submitted its data to Del Carmen Consulting, LLC for analysis and review.

During the 85th Texas Legislative Session, Senate Bill 1849, known as the Sandra Bland Act, was passed and made the Motor Vehicle Contact Search Analysis mandatory for all law enforcement agencies in Texas, effective September 1, 2017.

This report provides information related to data collected from motor vehicles stops in which a citation or warning is issued and to arrests made as a result of those stops, including information such as:

- The race or ethnicity of the individual detained;
- Whether a search was conducted and, if so, whether the detained individual consented to the search; and
- Whether the peace officer knew the race or ethnicity of the individual before detaining them. The overall objective of this analysis is to determine if local search patterns reflect national trends.

The department’s 2019 motor vehicle contact data was analyzed, and the results are included, as required, within the department's 2019 Racial Profiling report. The data discussed in the analysis shows that Addison Police Officers are finding contraband when they expect to based on sound law enforcement practices and not due to a focus on a person's race, ethnicity, or biased-based factors.

The attached Calendar Year 2019 Racial Profiling Report verifies that the Addison Police Department is in full compliance with the state racial profiling

statute regarding prevention policies, data collection, vehicle search analysis and reporting.

RECOMMENDATION:

Administration recommends approval.

Attachments

Presentation - 2019 Racial Profiling Report

Report - 2019 Racial Profiling

2019 Racial Profiling Report



Addison Police Department

Chief Paul Spencer

Texas Racial Profiling Law

- **SB 1074 (2001)** – Created Texas Racial Profiling Law
- **HB 3389 (2009)**– Updated requirements to the Racial Profiling Law
- **Sandra Bland Act (2017)**– Major changes to Racial Profiling Law

Requires us to collect specific data on all vehicle stops that result in an arrest, citation, or warning.

Required Data Collection

- Race
- Gender
- Was race known prior to stop?
- Reason for stop
- Stop location
- Search conducted?
- Reason for search
- Contraband found?
- Contraband type
- Result of stop
- If arrest, what violation?
- Use of force on stop?

Data is entered by officers into electronic Ticket Writers and then checked and analyzed for accuracy by Crime Analyst and racial profiling expert Dr. Alex del Carmen.

Data Audit and Analysis

- Data is audited by Dr. del Carmen each quarter from a random sample of citations. Data completeness and accuracy is evaluated each audit.

- The Sandra Bland Act requires comprehensive analysis of the data. This is performed by Dr. del Carmen and included in the report.

Other Requirements

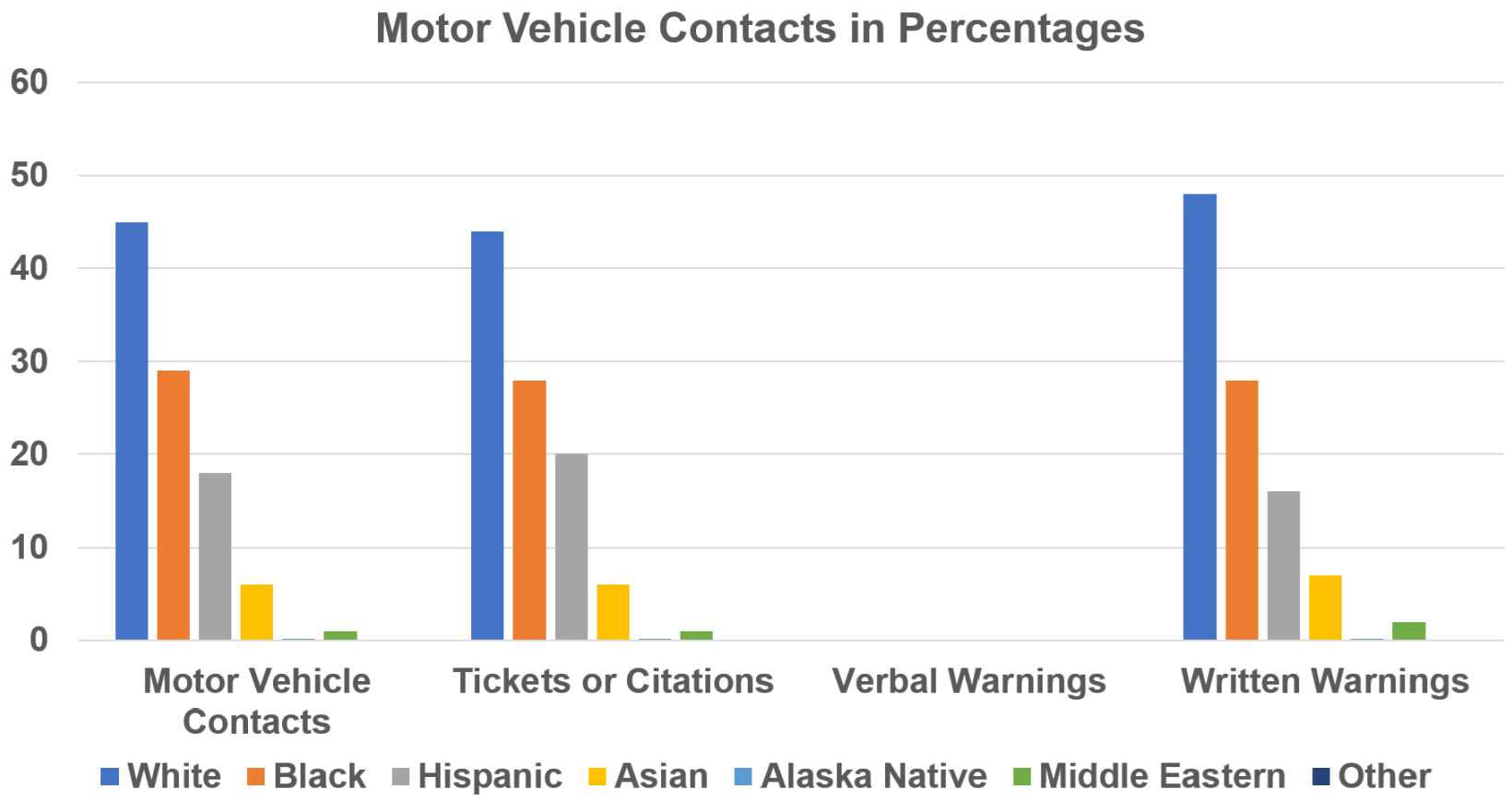
- Agency policy on racial profiling and bias reduction
- Public education on filing compliments & complaints
  - Website and brochures at Town Hall and PD Lobby
- Training for all sworn officers on racial profiling
  - Completed in police academy or departmental in-service training
- Quarterly video review of random sample of traffic stops
  - Supervisor reviews 5 traffic stops from each officer
  - TPCA Best Practices

2019 Data

Motor Vehicle Contacts Including Tickets, Citations and Warnings

Race/Ethnicity	All Motor Vehicle Contacts*		Tickets or Citations		Verbal Warnings		Written Warnings	
	N	%	N	%	N	%	N	%
White	4,027	45	1,388	44	0	0	2,394	48
Black	2,566	29	888	28	0	0	1,425	28
Hispanic or Latino	1,597	18	640	20	0	0	793	16
Asian or Pacific Islander	521	6	177	6	0	0	330	7
Alaska Native or American Indian	15	.2	5	.2	0	0	8	.2
Middle Eastern**	129	1	42	1	0	0	78	2
Other**	0	0	0	0	0	0	0	0
Total	8,855	100	3,140	100	0	0	5,028	100

2019 Data


Motor Vehicle Contacts in Percentages
60
50
40
30
20
10
0
Motor Vehicle Contacts
Tickets or Citations
Verbal Warnings
Written Warnings
White
Black
Hispanic
Asian
Alaska Native
Middle Eastern
Other

2019 Data

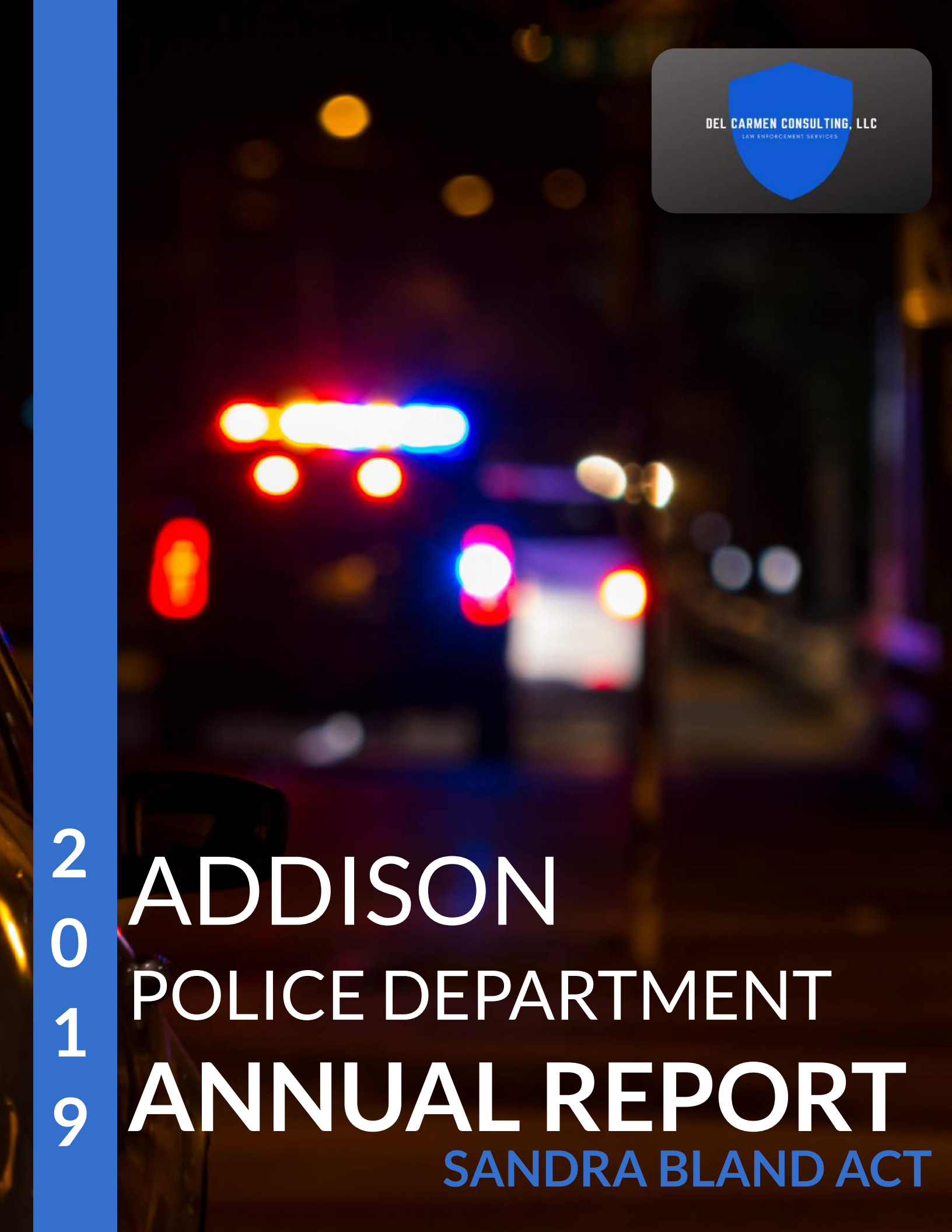
Search Data

Race/Ethnicity*	Searches		Contraband/ Evidence Found		Contraband/Evidence Not Found		Arrests	
	N	%	N	%	N	%	N	%
White	350	35	112	34	238	36	245	36
Black	374	38	133	40	241	37	253	37
Hispanic or Latino	232	23	81	24	151	23	164	24
Asian or Pacific Islander	20	2	6	2	14	2	14	2
Alaska Native or American Indian	2	.2	0	0	2	.3	2	.3
Middle Eastern*	11	1	2	.6	9	1	9	1
Other**	0	0	0	0	0	0	0	0
Total	989	100	334	100	655	100	687	100

Compliance

- Full report on Racial Profiling has been submitted to the Texas Commission on Law Enforcement and is available to the public on the TCOLE website:
  - https://www.tcole.texas.gov/content/racial-profiling-reports

- Addison is in full compliance with all directives and laws governing racial profiling.



2019

ADDISON POLICE DEPARTMENT ANNUAL REPORT

SANDRA BLAND ACT

January 31, 2020

Addison Police Department
4799 Airport Pkwy
Addison, Texas 75001



Dear Distinguished Members of the City Council,

In 2001, The Texas Legislature, with the intent of addressing the issue of racial profiling in policing, enacted the Texas Racial Profiling Law. In previous years, the Addison Police Department, in accordance with the law, has collected and reported traffic and motor vehicle-related contact data for the purpose of identifying and addressing (if necessary) areas of concern regarding racial profiling practices. In the 2009 Texas legislative session, the Racial Profiling Law was modified and additional requirements were implemented. Moreover, in 2017, the Sandra Bland Act was passed and signed into law (along with HB 3051 which introduced new racial and ethnic designations). The Sandra Bland Law requires that law enforcement agencies in the state collect additional data and provide a more detailed analysis. All of these requirements have been met by the Addison Police Department and are included in this report.

This particular report contains three sections with information on motor vehicle-related contact data. In addition, when appropriate, documentation is also a component of this report, aiming at demonstrating the manner in which the Addison Police Department has complied with the Texas Racial Profiling Law. In section 1, you will find the table of contents in addition to the Texas Senate Bill (SB1074); which later became the Texas Racial Profiling Law. Further, you will find the Texas HB 3389, which, in 2009, introduced new requirements relevant to racial profiling as well as the Sandra Bland Act. Also, in this section, a list of requirements relevant to the Racial Profiling Law as established by TCOLE (Texas Commission on Law Enforcement) is included. In addition, you will find, in sections 2 and 3 documentation which demonstrates compliance by the Addison Police Department relevant to the requirements as established in the Texas Racial Profiling Law. That is, you will find documents relevant to the implementation of an institutional policy banning racial profiling, the incorporation of a racial profiling complaint process and the training administered to all law enforcement personnel.

The last section of this report includes statistical data relevant to contacts, made during the course of motor vehicle stops and in accordance with the law, between 1/1/19 and 12/31/19. In addition, this section contains the TCOLE Tier 2 form, which is required to be submitted to this particular organization by March 1st of each year. The data in this report has been analyzed and compared to data derived from the U.S. Census Bureau's Fair Roads Standard. The final analysis and recommendations are also included in this report. The findings in this report serve as evidence of the Addison Police Department's commitment to comply with the Texas Racial Profiling Law.

Sincerely,

Alex del Carmen, Ph.D.

DEL CARMEN CONSULTING, LLC
LAW ENFORCEMENT SERVICES

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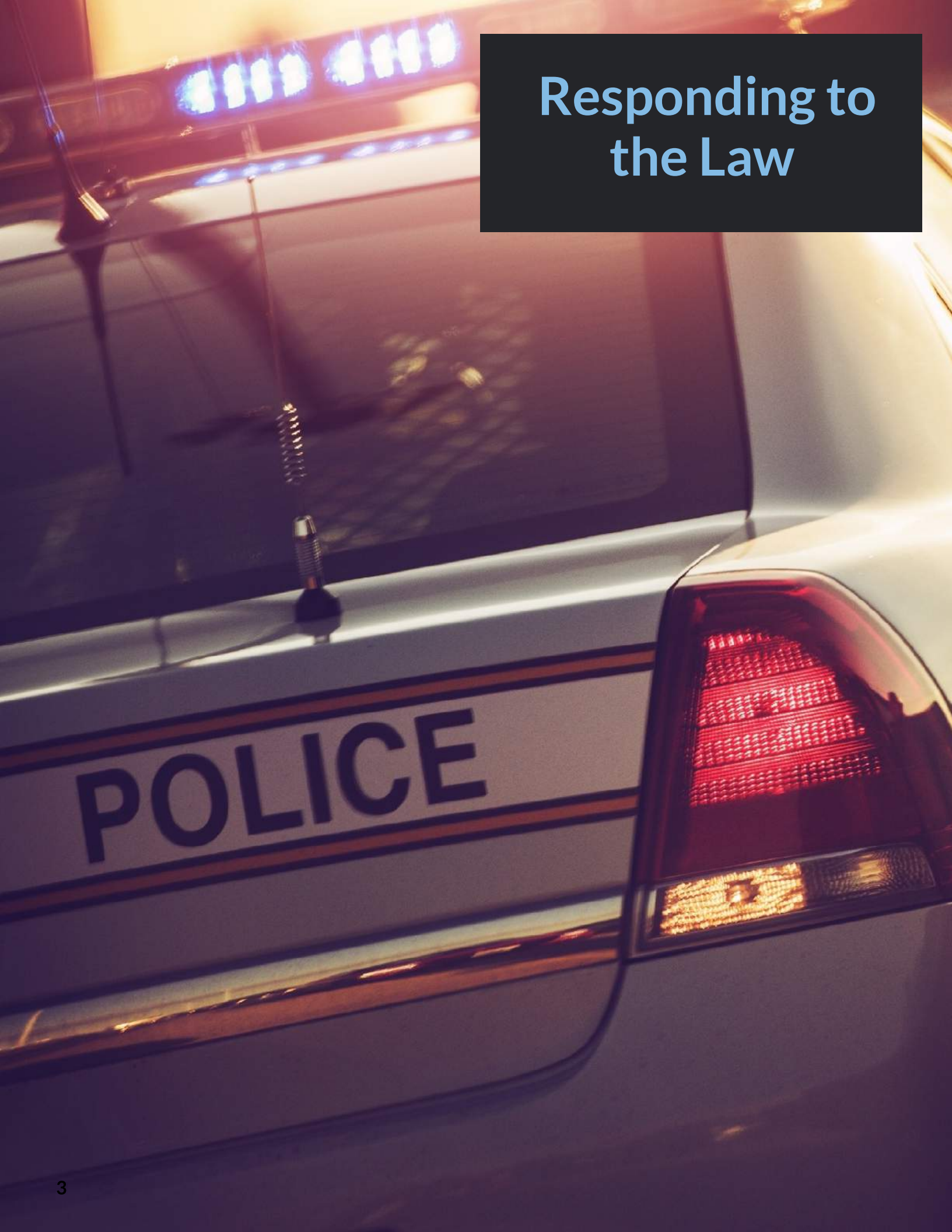
Responding to the Law







Public Education on Filing Compliments and Complaints

Informing the Public on the Process of Filing a Compliment or Complaint with the Addison Police Department

The Texas Racial Profiling Law requires that police agencies provide information to the public regarding the manner in which to file a compliment or racial profiling complaint. In an effort to comply with this particular component, the Addison Police Department launched an educational campaign aimed at informing the public on issues relevant to the racial profiling complaint process.

The police department made available, in the lobby area and on its web site, information relevant to filing a compliment and complaint on a racial profiling violation by a Addison Police officer. In addition, each time an officer issues a citation, ticket or warning, information on how to file a compliment or complaint is given to the individual cited. This information is in the form of a web address (including in the document issued to the citizen), which has instructions and details specifics related to the compliment or complaint processes.

It is believed that through these efforts, the community has been properly informed of the new policies and the complaint processes relevant to racial profiling.



Photo Caption

Photo Caption

Training

All Addison Police officers have been instructed, as specified in the Texas Racial Profiling Law, to adhere to all Texas Commission on Law Enforcement (TCOLE) training and the Law Enforcement Management Institute of Texas (LEMIT) requirements. To date, all sworn officers of the Addison Police Department have completed the TCOLE basic training on racial profiling. The main outline used to train the officers of Addison has been included in this report.

It is important to recognize that the Chief of the Addison Police Department has also met the training requirements, as specified by the Texas Racial Profiling Law, in the completion of the LEMIT program on racial profiling. The satisfactory completion of the racial profiling training by the sworn personnel of the Addison Police Department fulfills the training requirement as specified in the Education Code (96.641) of the Texas Racial Profiling Law.





Racial Profiling Course Number 3256

Texas Commission on Law Enforcement

September 2001

Racial Profiling 3256

Instructor's Note:

You may wish to teach this course in conjunction with Asset Forfeiture 3255 because of the related subject matter and applicability of the courses. If this course is taught in conjunction with Asset Forfeiture, you may report it under Combined Profiling and Forfeiture 3257 to reduce data entry.

Abstract

This instructor guide is designed to meet the educational requirement for racial profiling established by legislative mandate: 77R-SB1074.

Target Population: Licensed law enforcement personnel in Texas

Prerequisites: Experience as a law enforcement officer

Length of Course: A suggested instructional time of 4 hours

Material Requirements: Overhead projector, chalkboard and/or flip charts, video tape player, handouts, practical exercises, and demonstrations

Instructor Qualifications: Instructors should be very knowledgeable about traffic stop procedures and law enforcement issues

Evaluation Process and Procedures

An examination should be given. The instructor may decide upon the nature and content of the examination. It must, however, sufficiently demonstrate the mastery of the subject content by the student.

Reference Materials

Reference materials are located at the end of the course. An electronic copy of this instructor guide may be downloaded from our web site at http://www.tcleose.state.tx.us.

Racial Profiling 3256

1.0 RACIAL PROFILING AND THE LAW

1.1 UNIT GOAL: The student will be able to identify the legal aspects of racial profiling.

1.1.1 LEARNING OBJECTIVE: The student will be able to identify the legislative requirements placed upon peace officers and law enforcement agencies regarding racial profiling.

Racial Profiling Requirements:

Racial profiling CCP 3.05
Racial profiling prohibited CCP 2.131
Law enforcement policy on racial profiling CCP 2.132
Reports required for traffic and pedestrian stops CCP 2.133
Liability CCP 2.136
Racial profiling education for police chiefs Education Code 96.641
Training program Occupations Code 1701.253
Training required for intermediate certificate Occupations Code 1701.402
Definition of "race or ethnicity" for form Transportation Code 543.202

A. Written departmental policies

1. Definition of what constitutes racial profiling
2. Prohibition of racial profiling
3. Complaint process
4. Public education
5. Corrective action
6. Collection of traffic-stop statistics
7. Annual reports

B. Not prima facie evidence

C. Feasibility of use of video equipment

D. Data does not identify officer

E. Copy of complaint-related video evidence to officer in question

F. Vehicle stop report

1. Physical description of detainees: gender, race or ethnicity
2. Alleged violation
3. Consent to search
4. Contraband
5. Facts supporting probable cause
6. Arrest
7. Warning or citation issued

G. Compilation and analysis of data

H. Exemption from reporting – audio/video equipment

I. Officer non-liability

J. Funding

K. Required training in racial profiling

1. Police chiefs

2. All holders of intermediate certificates and/or two-year-old licenses as of 09/01/2001 (training to be completed no later than 09/01/2003) – see legislation 77R-SB1074





Racial Profiling
Course Number 3256

Texas Commission on Law Enforcement
September 2001

1.1.2 LEARNING OBJECTIVE: The student will become familiar with Supreme Court decisions and other court decisions involving appropriate actions in traffic stops.

A. Whren v. United States, 517 U.S. 806, 116 S.Ct. 1769 (1996)

1. Motor vehicle search exemption
2. Traffic violation acceptable as pretext for further investigation
3. Selective enforcement can be challenged

B. Terry v. Ohio, 392 U.S. 1, 88 S.Ct. 1868 (1968)

1. Stop & Frisk doctrine
2. Stopping and briefly detaining a person
3. Frisk and pat down

C. Other cases

1. Pennsylvania v. Mimms, 434 U.S. 106, 98 S.Ct. 330 (1977)
2. Maryland v. Wilson, 117 S.Ct. 882 (1997)
3. Graham v. State, 119 MdApp 444, 705 A.2d 82 (1998)
4. Pryor v. State, 122 Md.App. 671 (1997) cert. denied 352 Md. 312, 721 A.2d 990 (1998)
5. Ferris v. State, 355 Md. 356, 735 A.2d 491 (1999)
6. New York v. Belton, 453 U.S. 454 (1981)

2.0 RACIAL PROFILING AND THE COMMUNITY

2.1 UNIT GOAL: The student will be able to identify logical and social arguments against racial profiling.

2.1.1 LEARNING OBJECTIVE: The student will be able to identify logical and social arguments against racial profiling.



A. There are appropriate reasons for unusual traffic stops (suspicious behavior, the officer's intuition, MOs, etc.), but police work must stop short of cultural stereotyping and racism.

B. Racial profiling would result in criminal arrests, but only because it would target all members of a race randomly – the minor benefits would be far outweighed by the distrust and anger towards law enforcement by minorities and the public as a whole .

C. Racial profiling is self-fulfilling bad logic: if you believed that minorities committed more crimes, then you might look for more minority criminals, and find them in disproportionate numbers.

D. Inappropriate traffic stops generate suspicion and antagonism towards officers and make future stops more volatile – a racially-based stop today can throw suspicion on tomorrow's legitimate stop.

E. By focusing on race, you would not only be harassing innocent citizens, but overlooking criminals of all races and backgrounds – it is a waste of law enforcement resources.





Racial Profiling
Course Number 3256

Texas Commission on Law Enforcement
September 2001

3.0 RACIAL PROFILING VERSUS REASONABLE SUSPICION

3.1 UNIT GOAL: The student will be able to identify the elements of both inappropriate and appropriate traffic stops.

3.1.1 LEARNING OBJECTIVE: The student will be able to identify elements of a racially motivated traffic stop.

A. Most race-based complaints come from vehicle stops, often since race is used as an inappropriate substitute for drug courier profile elements

B. "DWB" – "Driving While Black" – a nickname for the public perception that a Black person may be stopped solely because of their race (especially with the suspicion that they are a drug courier), often extended to other minority groups or activities as well ("Driving While Brown," "Flying While Black," etc.)

C. A typical traffic stop resulting from racial profiling

1. The vehicle is stopped on the basis of a minor or contrived traffic violation which is used as a pretext for closer inspection of the vehicle, driver, and passengers

2. The driver and passengers are questioned about things that do not relate to the traffic violation

3. The driver and passengers are ordered out of the vehicle

4. The officers visually check all observable parts of the vehicle

5. The officers proceed on the assumption that drug courier work is involved by detaining the driver and passengers by the roadside

6. The driver is asked to consent to a vehicle search – if the driver refuses, the officers use other procedures (waiting on a canine unit, criminal record checks, license-plate checks, etc.), and intimidate the driver (with the threat of detaining him/her, obtaining a warrant, etc.)

3.1.2 LEARNING OBJECTIVE: The student will be able to identify elements of a traffic stop which would constitute reasonable suspicion of drug courier activity.

A. Drug courier profile (adapted from a profile developed by the DEA)

1. Driver is nervous or anxious beyond the ordinary anxiety and cultural communication styles
2. Signs of long-term driving (driver is unshaven, has empty food containers, etc.)
3. Vehicle is rented
4. Driver is a young male, 20-35
5. No visible luggage, even though driver is traveling
6. Driver was over-reckless or over-cautious in driving and responding to signals
7. Use of air fresheners

B. Drug courier activity indicators by themselves are usually not sufficient to justify a stop

3.1.3 LEARNING OBJECTIVE: The student will be able to identify elements of a traffic stop which could constitute reasonable suspicion of criminal activity.

A. Thinking about the totality of circumstances in a vehicle stop

B. Vehicle exterior

1. Non-standard repainting (esp. on a new vehicle)
2. Signs of hidden cargo (heavy weight in trunk, windows do not roll down, etc.)
3. Unusual license plate suggesting a switch (dirty plate, bugs on back plate, etc.)
4. Unusual circumstances (pulling a camper at night, kids' bikes with no kids, etc.)

C. Pre-stop indicators

1. Not consistent with traffic flow
2. Driver is overly cautious, or driver/passengers repeatedly look at police car
3. Driver begins using a car- or cell-phone when signaled to stop
4. Unusual pull-over behavior (ignores signals, hesitates, pulls onto new street, moves objects in car, etc.)

D. Vehicle interior

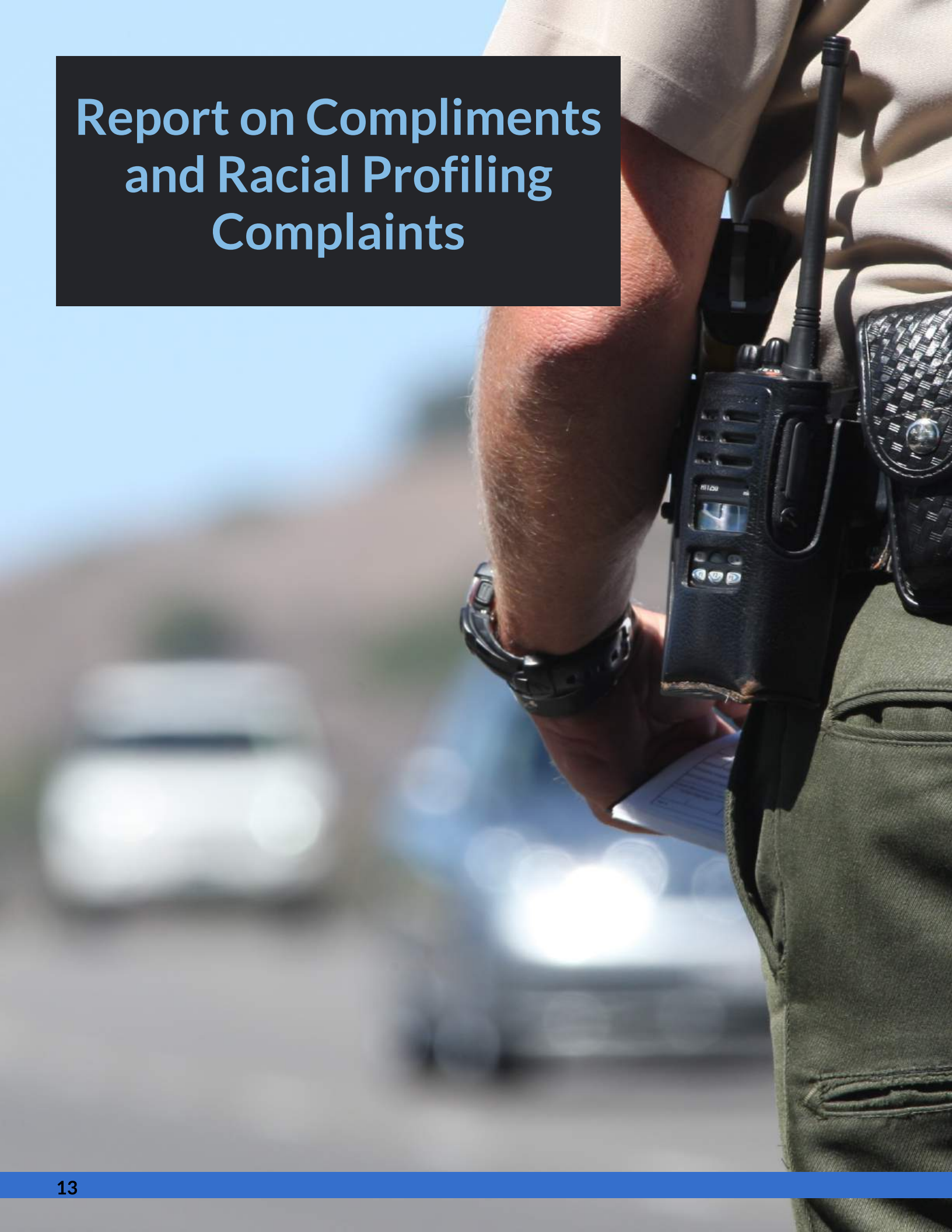
1. Rear seat or interior panels have been opened, there are tools or spare tire, etc.
2. Inconsistent items (anti-theft club with a rental, unexpected luggage, etc.)

Resources

Proactive Field Stops Training Unit – Instructor's Guide, Maryland Police and Correctional Training Commissions, 2001. (See Appendix A.)

Web address for legislation 77R-SB1074: http://tlo2.tlc.state.tx.us/tlo/77r/billtext/SB01074F.htm

Report on Compliments and Racial Profiling Complaints



Report on Complaints

The following table contains data regarding officers that have been the subject of a complaint, during the time period of 1/1/19---12/31/19, based on allegations outlining possible violations related to the Texas Racial Profiling Law. The final disposition of the case is also included.

☐

A check above indicates that the Addison Police Department has not received any complaints, on any members of its police force, for having violated the Texas Racial Profiling Law during the time period of 1/1/19 - 12/31/19.

Complaints Filed for Possible Violations of The Texas Racial Profiling Law

Complaint No.	Alleged Violation	Disposition of the Case
19-P-004	Unlawful Arrest/Racial Profiling	Unfounded

Additional Comments:

Tables Illustrating Motor Vehicle-Related Contacts



Tier 2 Data





Total stops: 8,855

1. Gender

1.1 Female: **3,387**

1.2 Male: **5,468**

2. Race or ethnicity

2.1 Black: **2,566**

2.2 Asian/Pacific Islander: **650**

2.3 White: **4,027**

2.4 Hispanic/Latino: **1,597**

2.5 Alaska Native/American Indian: **15**

3. Was race or ethnicity known prior to stop?

3.1 Yes: **435**

3.2 No: **8,420**

4. Reason for stop?

4.1 Violation of law: **624**

4.2 Pre-existing knowledge: **302**

4.3 Moving traffic violation: **5,694**

4.4 Vehicle traffic violation: **2,235**



5. Street address or approximate location of the stop

5.1 City street: **7,402**

5.2 US highway: **0**

5.3 County road: **22**

5.4 State Highway: **1**

5.5 Private Property: **1,430**

6. Was a search conducted?

6.1 Yes: **989**

6.2 No: **7,866**

7. Reason for Search?

7.1 Consent: **130**

7.2 Contraband in plain view: **34**

7.3 Probable cause: **328**

7.4 Inventory: **62**

7.5 Incident to arrest: **435**

8. Was Contraband discovered?

8.1 Yes: **334**

8.2 No: **655**

9. Description of contraband

9.1 Drugs: **274**

9.2 Currency: **0**

9.3 Weapons: **21**

9.4 Alcohol: **13**

9.5 Stolen property: **2**

9.6 Other: **24**

10. Result of the stop

10.1 Verbal warning: **0**

10.2 Written warning: **5,028**

10.3 Citation: **3,140**

10.4 Written Warning and Arrest: **10**

10.5 Citation and Arrest: **11**

10.6 Arrest: **666**

11. Arrest based on

11.1 Violation of Penal Code: **463**

11.2 Violation of Traffic Law: **41**

11.3 Violation of City Ordinance: **7**

11.4 Outstanding Warrant: **176**

12. Was physical force resulting in bodily injury used during stop?

12.1 Yes: **3**

12.2 No: **8,852**



Table 1. (Motor Vehicle Contacts Including Tickets, Citations and Warnings). (1/1/19-12/31/19).

Race/Ethnicity	All Motor Vehicle Contacts		Tickets or Citations*		Verbal Warnings		Written Warnings	
	N	%	N	%	N	%	N	%
White	4,027	45	1,388	44	0	0	2,394	48
Black	2,566	29	888	28	0	0	1,425	28
Hispanic or Latino	1,597	18	640	20	0	0	793	16
Asian or Pacific Islander	521	6	177	6	0	0	330	7
Alaska Native or American	15	.2	5	.2	0	0	8	.2
Middle Eastern **	129	1	42	1	0	0	78	2
Other	0	0	0	0	0	0	0	0
TOTAL	8,855	100	3,140	100	0	0	5,028	100

*Includes stops for alleged violation of a law or ordinance, tickets/citations, and verbal and written warnings
"N"represents"number"of all motor vehicle-related contacts
**Race/Ethnicity is defined by HB 3051.
**Not Required Racial/Ethnic Components



Table 2. Motor Vehicle Contacts and Fair Roads Standard Comparison (DFW)

Comparison of motor vehicle-related contacts with households that have vehicle access (in percentages). (1-1-2019 to 12-31-2019).

Race/Ethnicity*	Contacts (in percentages)	Households With Vehicle Access (in percentages)
White	45	60
Black	29	14
Hispanic or Latino	18	19
Asian or Pacific Islander	6	5
Alaska Native or American Indian	.2	N/A
Middle Eastern	1	N/A
Other**	0	N/A
TOTAL	100	100

"N" represents "number" of all motor vehicle contacts
** Race/Ethnicity is defined by HB 3051
** Not Required Racial/Ethnic Components

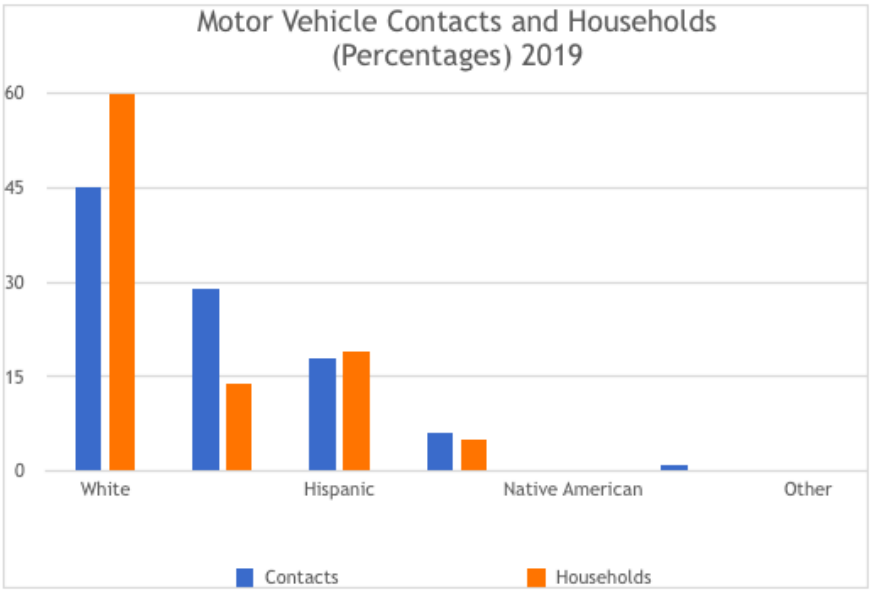


Table 3. Motor Vehicle Searches and Arrests
(1-1-2019 to 12-31-2019),

Race/Ethnicity	Searches		Consensual Searches		Custody Arrests	
	N	%	N	%	N	%
White	350	35	51	39	245	36
Black	374	38	50	38	253	37
Hispanic or Latino	232	23	23	18	164	24
Asian or Pacific Islander	20	2	4	3	14	2
Alaska Native or American	2	.2	1	.8	2	.3
Middle Eastern **	11	1	1	.8	9	1
Other**	0	0	0	0	0	0
TOTAL	989	100	130	100	687	100

"N" represents "number" of all motor vehicle contacts
** Race/Ethnicity is defined by HB 3051
** Not Required Racial/Ethnic Components

Table 4. Total Number of Instances where Officers Knew/Did not Know Race/Ethnicity of Individuals Before Being Detained (1-1-2019 to 12-31-2019)

Total Number of Instances Officers KNEW Race and Ethnicity of Individuals Before Being Detained	Total Number of Instances Officers DID NOT KNOW Race and Ethnicity of Individuals Before Being Detained
435	8,420

Table 5. Instances where Peace Officers Used Physical Force that Resulted in Bodily Injury (1-1-2019 to 12-31-2019).

Instances Where Peace Officers Used Physical Force that Resulted in Bodily Injury	Location of Stop	Reason for Stop
#19-2585	15100 Dallas Pkwy, Dallas, TX	Traffic Violation
#19-1660	15100 Marsh Ln, Addison, TX	Penal Code Violation
#19-2100	4103 Belt Line, Addison, TX	Traffic Violation



Table 6. Search Data. (1-1-2019 to 12-31-2019).

Race/Ethnicity	Searches		Contraband/ Evidence Found		Contraband/ Evidence Not Found		Arrests	
	N	%	N	%	N	%	N	%
White	350	35	112	34	238	36	245	36
Black	374	38	133	40	241	37	253	37
Hispanic or Latino	232	23	81	24	151	23	164	24
Asian or Pacific Islander	20	2	6	2	14	2	14	2
Alaska Native or American	2	.2	0	0	2	.3	2	.3
Middle Eastern **	11	1	2	.6	9	1	9	1
Other**	0	0	0	0	0	0	0	0
TOTAL	989	100	334	100	655	100	687	100

"N" represents "number" of all motor vehicle contacts
** Race/Ethnicity is defined by HB 3051
** Not Required Racial/Ethnic Components



Table 7. Report on Audits.

The following table contains data regarding the number and outcome of required data audits during the period of 1-1-2019 to 12-31-2019.

Data Audits on Racial Profiling Data (1-1-2019 to 12-31-2019).

Number of Data Audits Completed	Date of Completion	Outcome of Audit
3	2019	Data reviewed is valid and reliable.

Additional Comments:





Analysis and Interpretation of Data

In an effort to understand the analysis provided in this report, it is crucial that the evolution of the Texas Racial Profiling Law and its requirements, is discussed. That is, in 2001, the Texas legislature passed Senate Bill 1074 which became the Texas Racial Profiling Law. Thus, the law came into effect on January 1, 2002 and required all police departments in Texas, to collect traffic-related data and report this information to their local governing authority by March 1st of each year. In 2009, the racial profiling law was modified to include the collection and reporting of all motor vehicle related contacts where a citation was issued or arrest made. In addition, the modification to the law further requires that all police officers indicate whether or not they knew the race or ethnicity of the individual before detaining them. Further, it was required that agencies report motor vehicle related data to their local governing authority and to the Texas Commission on Law Enforcement (TCOLE) by March 1st of each year. The purpose in collecting and presenting this information is to determine if police officers in a particular municipality are engaging in the practice of racially profiling minority motorists.

The Texas Racial Profiling Law also requires police departments to interpret motor vehicle-related data. Even though most researchers would probably agree with the fact that it is within the confines of good practice for police departments to be accountable to the citizenry while carrying a transparent image before the community, it is very difficult to determine if individual police officers are engaging in racial profiling, from a review and analysis of aggregate/institutional data. In other words, it is challenging for a reputable researcher to identify specific “individual” racist behavior from aggregate-level “institutional” data on traffic or motor vehicle-related contacts.

As mentioned previously, in 2009, the Texas Legislature passed House Bill 3389, which modified the Racial Profiling Law by adding new requirements; this took effect on January 1st, 2010. These changes included, but are were not limited to, the re-definition of a contact to include motor vehicles where a citation was issued or an arrest made. In addition, it required police officers to indicate if they knew the race or ethnicity of the individual before detaining them. Also, the 2009 law required adding "middle eastern" to the racial and ethnic category and submitting the annual data report to TCOLE before March 1st of each year.

In 2017, the Texas Legislators passed H.B. 3051 which removed the Middle Eastern data requirement but standardized the racial and ethnic categories relevant to the individuals that came in contact with the police. In addition, the Sandra Bland Act (S.B. 1849) was passed and became law. Thus, the most significant legislative act in Texas history regarding data requirements on law enforcement contacts, became law and took effect on January 1, 2018. The Sandra Bland Act not only requires the extensive collection of data relevant to police motor vehicle contacts, but it also mandates for the data to be analyzed while addressing the following:

1. *A comparative analysis of the information compiled (under Article 2.133):*

    a. Evaluate and compare the number of motor vehicle stops, within the applicable jurisdiction, of persons who are recognized as racial or ethnic minorities and persons who are not recognized as racial or ethnic minorities;

    b. Examine the disposition of motor vehicle stops made by officers employed by the agency, categorized according to the race or ethnicity of the affected persons, as appropriate, including any searches resulting from stops within the applicable jurisdiction;

    c. Evaluate and compare the number of searches resulting from motor vehicle stops within the applicable jurisdiction and whether contraband or other evidence was discovered in the course of those searches.

2. *Information related to each complaint filed with the agency alleging that a peace officer employed by the agency has engaged in racial profiling.*

In an effort to comply with The Texas Racial Profiling/Sandra Bland Law, the Addison Police Department commissioned the analysis of its 2019 contact data. Thus, two different types of data analyses were performed. The first of these involved a careful evaluation of the 2019 motor vehicle-related data. This particular analysis measured, as required by the law, the number and percentage of Whites, Blacks, Hispanics or Latinos, Asians and Pacific Islanders, Alaska Natives and American Indians (Middle Easterners and individuals belonging to the "other" category, as optional categories), that came in contact with the police in the course of a motor vehicle related contact, and were either issued a ticket, citation, warning were issued or an arrest was made. Also, included in this data were instances where a motor vehicle contact took place for an alleged violation of the law or ordinance. The Tier 2 data analysis included, but was not limited to, information relevant to the number and percentage of contacts by race/ethnicity, gender, reason for the stop, location of stop, searches while indicating the type of search performed, result of stop, basis of an arrest and use of physical force resulting in bodily injury.

The additional data analysis performed was based on a comparison of the 2019 motor vehicle contact data with a specific baseline. When reviewing this particular analysis, it should be noted that there is disagreement, in the literature, regarding the appropriate baseline to be used when analyzing motor vehicle-related contact information. Of the baseline measures available, the Addison Police Department opted to adopt, as a baseline measure, the Fair Roads Standard. This particular baseline is based on data obtained through the U.S. Census Bureau (2010) relevant to the number of households that have access to vehicles while controlling for the race and ethnicity of the heads of households.

It is clear that census data presents challenges to any effort made at establishing a fair and accurate racial profiling analysis. That is, census data contains information on all residents of a particular community, regardless of the fact they may or may not be among the driving population. Further, census data, when used as a baseline of comparison, presents the challenge that it captures information related to city residents only. Thus, excluding individuals who may have come in contact with the Addison Police Department in 2019 but live outside city limits. In some cases, the percentage of the population that comes in contact with the police but lives outside city limits represents a substantial volume of all motor vehicle-related contacts made in a given year.

Since 2002, several civil rights groups in Texas expressed their desire and made recommendations to the effect that all police departments should rely, in their data analysis, on the Fair Roads Standard. This source contains census data specific to the number of "households" that have access to vehicles. Thus, proposing to compare "households" (which may have multiple residents and only a few vehicles) with "contacts" (an individual-based count). This, in essence, constitutes a comparison that may result in ecological fallacy. Despite this, the Addison Police Department accepted the recommendation to utilize this form of comparison (i.e., census data relevant to households with vehicles) in an attempt to demonstrate its "good will" and "transparency" before the community. Thus, the Fair Roads Standard data obtained and used in this study is specifically relevant to the Dallas Fort-Worth (DFW) Metroplex.

Tier 2 (2019) Motor Vehicle-Related Contact Analysis

When analyzing the enhanced Tier 2 data collected in 2019, it was evident that most motor vehicle-related contacts were made with males and most of the contacts were made with White drivers. This was followed by Black and Hispanic drivers. In most instances, police officers report not knowing the race or ethnicity prior to the stop. Further, they cite as the primary reason for the stop to have been a "moving traffic violation". This was followed by "vehicle traffic violation".

In 2019, most of the contacts made took place in state city streets. The Addison Police Department cites that most contacts did not result in a search. Of those searches made, most were based on incident to arrest. The second most significant reason for a search was "probable cause". In addition, contraband was not found as a result of most searches. Of the contraband found, in most instances, drugs were cited as the most frequent contraband found.

The data also shows that the majority of stops resulted in a written warning. This was followed by "citations". When an arrest was made, the most frequent reason provided was a violation of the penal code. Also, three of the contacts resulted in the use of physical force which caused bodily injury.

Comparative Analysis

The data analysis of motor vehicle contacts to the census data relevant to the number of "households" in DFW who indicated, in the 2010 census, that they had access to vehicles, produced interesting findings. Specifically, the percentage of Whites and Hispanics that came in contact with the police was lower than the percentage of White and Hispanic households in DFW that claimed, in the 2010 census, to have access to vehicles. The opposite was true of Blacks and Asians. That is, a higher percentage of Blacks and Asians came in contact with the police than the percentage of Black and Asian households in DFW that claimed, in the 2010 census, to have access to vehicles. It should be noted that the percentage difference among Asians contacts with households was of less than 3%; thus, deemed by some as being statistically insignificant.

The analysis of the searches performed shows that most searches did not produce contraband. This is consistent with national law enforcement trends. In addition, of those searches that produced contraband, the majority of them involved Black contacts. This was followed by Whites.

Summary of Findings

The most recent Texas Racial Profiling Law requires that police department perform data audits in order to validate the data being reported. Consistent with this requirement, the Addison Police Department has engaged del Carmen Consulting, LLC in order to perform these audits in a manner consistent with normative statistical practices. As shown in table 7, the audits performed have shown that the data is valid and reliable. Further, as required by law, this report also includes an analysis on the searches performed. This analysis includes information on whether contraband was found as a result of the search while controlling for race/ethnicity. The search analysis demonstrates that the police department is engaging in search practices consistent with national trends in law enforcement.

While considering the findings made in this analysis, it is recommended that the Addison Police Department should continue to collect and evaluate additional information on motor vehicle contact data (i.e., reason for probable cause searches, contraband detected) which may prove to be useful when determining the nature of the contacts police officers are making with all individuals.

As part of this effort, the Addison Police Department should continue to:

1) Perform an independent analysis on contact and search data in future years.
2) Commission data audits in 2020 in order to assess data integrity; that is, to ensure that the data collected is consistent with the data being reported.

The comprehensive analysis of the data included in this report demonstrates that the Addison Police Department has complied with the Texas Racial Profiling Law and all of its requirements. Further, the report demonstrates that the police department has incorporated a comprehensive racial profiling policy, currently offers information to the public on how to file a compliment or complaint, commissions quarterly data audits in order to ensure validity and reliability, collects and commissions the analysis of tier 2 data, and ensures that the practice of racial profiling is not tolerated.





Checklist

The following requirements **were** met by the Addison Police Department in accordance with The Texas Racial Profiling Law:

- ☑ Implement a Racial Profiling Policy citing act or actions that constitute racial profiling.
- ☑ Include in the racial profiling policy, a statement indicating prohibition of any peace officer employed by the Addison Police Department from engaging in racial profiling.
- ☑ Implement a process by which an individual may file a complaint regarding racial profiling violations.
- ☑ Provide public education related to the compliment and complaint process.
- ☑ Implement disciplinary guidelines for officers found in violation of the Texas Racial Profiling Law.
- ☑ Collect, report and analyze motor vehicle data (Tier 2).
- ☑ Commission Data Audits and a Search Analysis.
- ☑ Indicate total number of officers who knew and did not know, the race/ethnicity of individuals before being detained.
- ☑ Produce an annual report on police contacts (Tier 2) and present this to the local governing body and TCOLE by March 1, 2020.
- ☑ Adopt a policy, if video/audio equipment is installed, on standards for reviewing video and audio documentation.

LEGISLATIVE & ADMINISTRATIVE ADDENDUM





Contact Information

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TCOLE GUIDELINES

Guidelines for Compiling and Reporting Data under Senate Bill 1074

Background

Senate Bill 1074 of the 77th Legislature established requirements in the Texas Code of Criminal Procedure (TCCP) for law enforcement agencies. The Commission developed this document to assist agencies in complying with the statutory requirements.

The guidelines are written in the form of standards using a style developed from accreditation organizations including the Commission on Accreditation for Law Enforcement Agencies (CALEA). The standards provide a description of ***what*** must be accomplished by an agency but allows wide latitude in determining ***how*** the agency will achieve compliance with each applicable standard.

Each standard is composed of two parts: the standard statement and the commentary. The *standard statement* is a declarative sentence that places a clear-cut requirement, or multiple requirements, on an agency. The commentary supports the standard statement but is not binding. The commentary can serve as a prompt, as guidance to clarify the intent of the standard, or as an example of one possible way to comply with the standard.

Standard 1

Each law enforcement agency has a detailed written directive that:

- clearly defines acts that constitute racial profiling;
- strictly prohibits peace officers employed by the agency from engaging in racial profiling;
- implements a process by which an individual may file a complaint with the agency if the individual believes a peace officer employed by the agency has engaged in racial profiling with respect to the individual filing the complaint;
- provides for public education relating to the complaint process;
- requires appropriate corrective action to be taken against a peace officer employed by the agency who, after investigation, is shown to have engaged in racial profiling in violation of the agency's written racial profiling policy; and
- requires the collection of certain types of data for subsequent reporting.

Commentary

Article 2.131 of the TCCP prohibits officers from engaging in racial profiling, and article 2.132 of the TCCP now requires a written policy that contains the elements listed in this standard. The article also specifically defines a law enforcement agency as it applies to this statute as an " agency of the state, or of a county, municipality, or other political subdivision of the state, that employs peace officers who make traffic stops in the routine performance of the officers' official duties."

The article further defines race or ethnicity as being of "a particular descent, including Caucasian, African, Hispanic, Asian, or Native American." The statute does not limit the required policies to just these ethnic groups.

This written policy is to be adopted and implemented no later than January 1, 2002.

Standard 2

Each peace officer who stops a motor vehicle for an alleged violation of a law or ordinance regulating traffic, or who stops a pedestrian for any suspected offense reports to the employing law enforcement agency information relating to the stop, to include:

- a physical description of each person detained, including gender and the person's race or ethnicity, as stated by the person, or, if the person does not state a race or ethnicity, as determined by the officer's best judgment;
- the traffic law or ordinance alleged to have been violated or the suspected offense;
- whether the officer conducted a search as a result of the stop and, if so, whether the person stopped consented to the search;
- whether any contraband was discovered in the course of the search, and the type of contraband discovered;
- whether probable cause to search existed, and the facts supporting the existence of that probable cause;
- whether the officer made an arrest as a result of the stop or the search, including a statement of the offense charged;
- the street address or approximate location of the stop; and
- whether the officer issued a warning or citation as a result of the stop, including a description of the warning or a statement of the violation charged.

Commentary

The information required by 2.133 TCCP is used to complete the agency reporting requirements found in Article 2.134. A peace officer and an agency may be exempted from this requirement under Article 2.135 TCCP Exemption for Agencies Using Video and Audio Equipment. An agency may be exempt from this reporting requirement by applying for the funds from the Department of Public Safety for video and audio equipment and the State does not supply those funds. Section 2.135 (a)(2) states, "the governing body of the county or municipality served by the law enforcement agency, in conjunction with the law enforcement agency, certifies to the Department of Public Safety, not later than the date specified by rule by the department, that the law enforcement agency needs funds or video and audio equipment for the purpose of installing video and audio equipment as described by Subsection (a) (1) (A) and the agency does not receive from the state funds for video and audio equipment sufficient, as determined by the department, for the agency to accomplish that purpose."

Standard 3

The agency compiles the information collected under 2.132 and 2.133 and analyzes the information identified in 2.133.

Commentary

Senate Bill 1074 from the 77th Session of the Texas Legislature created requirements for law enforcement agencies to gather specific information and to report it to each county or municipality served. New sections of law were added to the Code of Criminal Procedure regarding the reporting of traffic and pedestrian stops. Detained is defined as when a person stopped is not free to leave.

Article 2.134 TCCP requires the agency to compile and provide and analysis of the information collected by peace officer employed by the agency. The report is provided to the governing body of the municipality or county no later than March 1 of each year and covers the previous calendar year.

There is data collection and reporting required based on Article 2.132 CCP (tier one) and Article 2.133 CCP (tier two).

The minimum requirements for "tier one" data for traffic stops in which a citation results are:

1) the race or ethnicity of individual detained (race and ethnicity as defined by the bill means of "a particular descent, including Caucasian, African, Hispanic, Asian, or Native American");
2) whether a search was conducted, and if there was a search, whether it was a consent search or a probable cause search; and
3) whether there was a custody arrest.

The minimum requirements for reporting on "tier two" reports include traffic and pedestrian stops. Tier two data include:

1) the detained person's gender and race or ethnicity;
2) the type of law violation suspected, e.g., hazardous traffic, non-hazardous traffic, or other criminal investigation (the Texas Department of Public Safety publishes a categorization of traffic offenses into hazardous or non-hazardous);
3) whether a search was conducted, and if so whether it was based on consent or probable cause;
4) facts supporting probable cause;
5) the type, if any, of contraband that was collected;
6) disposition of the stop, e.g., arrest, ticket, warning, or release;
7) location of stop; and
8) statement of the charge, e.g., felony, misdemeanor, or traffic.

Tier one reports are made to the governing body of each county or municipality served by the agency an annual report of information if the agency is an agency of a county, municipality, or other political subdivision of the state. Tier one and two reports are reported to the county or municipality not later than March 1 for the previous calendar year beginning March 1, 2003. Tier two reports include a comparative analysis between the race and ethnicity of persons detained to see if a differential pattern of treatment can be discerned based on the disposition of stops

including searches resulting from the stops. The reports also include information relating to each complaint filed with the agency alleging that a peace officer employed by the agency has engaged in racial profiling. An agency may be exempt from the tier two reporting requirement by applying for the funds from the Department of Public Safety for video and audio equipment and the State does not supply those funds [See 2.135 (a)(2) TCCP].

Reports should include both raw numbers and percentages for each group. Caution should be exercised in interpreting the data involving percentages because of statistical distortions caused by very small numbers in any particular category, for example, if only one American Indian is stopped and searched, that stop would not provide an accurate comparison with 200 stops among Caucasians with 100 searches. In the first case, a 100% search rate would be skewed data when compared to a 50% rate for Caucasians.

Standard 4

If a law enforcement agency has video and audio capabilities in motor vehicles regularly used for traffic stops, or audio capabilities on motorcycles regularly used to make traffic stops, the agency:

- adopts standards for reviewing and retaining audio and video documentation; and
- promptly provides a copy of the recording to a peace officer who is the subject of a complaint on written request by the officer.

Commentary

The agency should have a specific review and retention policy. Article 2.132 TCCP specifically requires that the peace officer be promptly provided with a copy of the audio or video recordings if the officer is the subject of a complaint and the officer makes a written request.

Standard 5

Agencies that do not currently have video or audio equipment must examine the feasibility of installing such equipment.

Commentary

None

Standard 6

Agencies that have video and audio recording capabilities are exempt from the reporting requirements of Article 2.134 TCCP and officers are exempt from the reporting requirements of Article 2.133 TCCP provided that:

- the equipment was in place and used during the proceeding calendar year; and
- video and audio documentation is retained for at least 90 days.

Commentary

The audio and video equipment and policy must have been in place during the previous calendar year. Audio and video documentation must be kept for at least 90 days or longer if a complaint has been filed. The documentation must be retained until the complaint is resolved. Peace officers are not exempt from the requirements under Article 2.132 TCCP.

Standard 7

Agencies have citation forms or other electronic media that comply with Section 543.202 of the Transportation Code.

Commentary

Senate Bill 1074 changed Section 543.202 of the Transportation Code requiring citations to include:

- race or ethnicity, and
- whether a search of the vehicle was conducted and whether consent for the search was obtained.

The Texas Law on Racial Profiling

S.B. No. 1074 - An Act relating to the prevention of racial profiling by certain peace officers.
BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

SECTION 1. Chapter 2, Code of Criminal Procedure, is amended by adding Articles 2.131 through 2.138 to read as follows:

Art. 2.131. RACIAL PROFILING PROHIBITED. A peace officer may not engage in racial profiling.

Art. 2.132. LAW ENFORCEMENT POLICY ON RACIAL PROFILING. (a) In this article:

(1) "Law enforcement agency" means an agency of the state, or of a county, municipality, or other political subdivision of the state, that employs peace officers who make traffic stops in the routine performance of the officers' official duties.

(2) "Race or ethnicity" means of a particular descent, including Caucasian, African, Hispanic, Asian, or Native American descent.

(b) Each law enforcement agency in this state shall adopt a detailed written policy on racial profiling. The policy must:

(1) clearly define acts constituting racial profiling;

(2) strictly prohibit peace officers employed by the agency from engaging in racial profiling;

(3) implement a process by which an individual may file a complaint with the agency if the individual believes that a peace officer employed by the agency has engaged in racial profiling with respect to the individual;

(4) provide public education relating to the agency's complaint process;

(5) require appropriate corrective action to be taken against a peace officer employed by the agency who, after an investigation, is shown to have engaged in racial profiling in violation of the agency's policy adopted under this article;

(6) require collection of information relating to traffic stops in which a citation is issued and to arrests resulting from those traffic stops, including information relating to:

(A) the race or ethnicity of the individual detained; and

(B) whether a search was conducted and, if so, whether the person detained consented to the search; and

(7) require the agency to submit to the governing body of each county or municipality served by the agency an annual report of the information collected under Subdivision (6) if the agency is an agency of a county, municipality, or other political subdivision of the state.

(c) The data collected as a result of the reporting requirements of this article shall not constitute prima facie evidence of racial profiling.

(d) On adoption of a policy under Subsection (b), a law enforcement agency shall examine the feasibility of installing video camera and transmitter-activated equipment in each agency law enforcement motor vehicle regularly used to make traffic stops and transmitter-activated equipment in each agency law enforcement motorcycle regularly used to make traffic stops. If a law enforcement agency installs video or audio equipment as provided by this subsection, the

policy adopted by the agency under Subsection (b) must include standards for reviewing video and audio documentation.

(e) A report required under Subsection (b)(7) may not include identifying information about a peace officer who makes a traffic stop or about an individual who is stopped or arrested by a peace officer. This subsection does not affect the collection of information as required by a policy under Subsection (b)(6).

(f) On the commencement of an investigation by a law enforcement agency of a complaint described by Subsection (b)(3) in which a video or audio recording of the occurrence on which the complaint is based was made, the agency shall promptly provide a copy of the recording to the peace officer who is the subject of the complaint on written request by the officer.

Art. 2.133. REPORTS REQUIRED FOR TRAFFIC AND PEDESTRIAN STOPS. (a) In this article:

(1) "Race or ethnicity" has the meaning assigned by Article 2.132(a).

(2) "Pedestrian stop" means an interaction between a peace officer and an individual who is being detained for the purpose of a criminal investigation in which the individual is not under arrest.

(b) A peace officer who stops a motor vehicle for an alleged violation of a law or ordinance regulating traffic or who stops a pedestrian for any suspected offense shall report to the law enforcement agency that employs the officer information relating to the stop, including:

(1) a physical description of each person detained as a result of the stop, including:

(A) the person's gender; and

(B) the person's race or ethnicity, as stated by the person or, if the person does not state the person's race or ethnicity, as determined by the officer to the best of the officer's ability;

(2) the traffic law or ordinance alleged to have been violated or the suspected offense;

(3) whether the officer conducted a search as a result of the stop and, if so, whether the person detained consented to the search;

(4) whether any contraband was discovered in the course of the search and the type of contraband discovered;

(5) whether probable cause to search existed and the facts supporting the existence of that probable cause;

(6) whether the officer made an arrest as a result of the stop or the search, including a statement of the offense charged;

(7) the street address or approximate location of the stop; and

(8) whether the officer issued a warning or a citation as a result of the stop, including a description of the warning or a statement of the violation charged.

Art. 2.134. COMPILATION AND ANALYSIS OF INFORMATION COLLECTED.

(a) In this article, "pedestrian stop" means an interaction between a peace officer and an individual who is being detained for the purpose of a criminal investigation in which the individual is not under arrest.

(b) A law enforcement agency shall compile and analyze the information contained in each report received by the agency under Article 2.133. Not later than March 1 of each year, each local law enforcement agency shall submit a report containing the information compiled

during the previous calendar year to the governing body of each county or municipality served by the agency in a manner approved by the agency.

(c) A report required under Subsection (b) must include:

(1) a comparative analysis of the information compiled under Article 2.133 to:

(A) determine the prevalence of racial profiling by peace officers employed by the agency; and

(B) examine the disposition of traffic and pedestrian stops made by officers employed by the agency, including searches resulting from the stops; and

(2) information relating to each complaint filed with the agency alleging that a peace officer employed by the agency has engaged in racial profiling.

(d) A report required under Subsection (b) may not include identifying information about a peace officer who makes a traffic or pedestrian stop or about an individual who is stopped or arrested by a peace officer. This subsection does not affect the reporting of information required under Article 2.133(b)(1).

(e) The Commission on Law Enforcement Officer Standards and Education shall develop guidelines for compiling and reporting information as required by this article.

(f) The data collected as a result of the reporting requirements of this article shall not constitute prima facie evidence of racial profiling.

Art. 2.135. EXEMPTION FOR AGENCIES USING VIDEO AND AUDIO EQUIPMENT. (a) A peace officer is exempt from the reporting requirement under Article 2.133 and a law enforcement agency is exempt from the compilation, analysis, and reporting requirements under Article 2.134 if:

(1) during the calendar year preceding the date that a report under Article 2.134 is required to be submitted:

(A) each law enforcement motor vehicle regularly used by an officer employed by the agency to make traffic and pedestrian stops is equipped with video camera and transmitter-activated equipment and each law enforcement motorcycle regularly used to make traffic and pedestrian stops is equipped with transmitter-activated equipment; and

(B) each traffic and pedestrian stop made by an officer employed by the agency that is capable of being recorded by video and audio or audio equipment, as appropriate, is recorded by using the equipment; or

(2) the governing body of the county or municipality served by the law enforcement agency, in conjunction with the law enforcement agency, certifies to the Department of Public Safety, not later than the date specified by rule by the department, that the law enforcement agency needs funds or video and audio equipment for the purpose of installing video and audio equipment as described by Subsection (a)(1)(A) and the agency does not receive from the state funds or video and audio equipment sufficient, as determined by the department, for the agency to accomplish that purpose.

(b) Except as otherwise provided by this subsection, a law enforcement agency that is exempt from the requirements under Article 2.134 shall retain the video and audio or audio documentation of each traffic and pedestrian stop for at least 90 days after the date of the stop. If a complaint is filed with the law enforcement agency alleging that a peace officer employed by the agency has engaged in racial profiling with respect to a traffic or pedestrian stop, the agency shall retain the video and audio or audio record of the stop until final disposition of the complaint.

(c) This article does not affect the collection or reporting requirements under Article 2.132.

Art. 2.136. LIABILITY. A peace officer is not liable for damages arising from an act relating to the collection or reporting of information as required by Article 2.133 or under a policy adopted under Article 2.132.

Art. 2.137. PROVISION OF FUNDING OR EQUIPMENT.

(a) The Department of Public Safety shall adopt rules for providing funds or video and audio equipment to law enforcement agencies for the purpose of installing video and audio equipment as described by Article 2.135(a)(1)(A), including specifying criteria to prioritize funding or equipment provided to law enforcement agencies. The criteria may include consideration of tax effort, financial hardship, available revenue, and budget surpluses. The criteria must give priority to:

(1) law enforcement agencies that employ peace officers whose primary duty is traffic enforcement;

(2) smaller jurisdictions; and

(3) municipal and county law enforcement agencies.

(b) The Department of Public Safety shall collaborate with an institution of higher education to identify law enforcement agencies that need funds or video and audio equipment for the purpose of installing video and audio equipment as described by Article 2.135(a)(1)(A). The collaboration may include the use of a survey to assist in developing criteria to prioritize funding or equipment provided to law enforcement agencies.

(c) To receive funds or video and audio equipment from the state for the purpose of installing video and audio equipment as described by Article 2.135(a)(1)(A), the governing body of a county or municipality, in conjunction with the law enforcement agency serving the county or municipality, shall certify to the Department of Public Safety that the law enforcement agency needs funds or video and audio equipment for that purpose.

(d) On receipt of funds or video and audio equipment from the state for the purpose of installing video and audio equipment as described by Article 2.135(a)(1)(A), the governing body of a county or municipality, in conjunction with the law enforcement agency serving the county or municipality, shall certify to the Department of Public Safety that the law enforcement agency has installed video and audio equipment as described by Article 2.135(a)(1)(A) and is using the equipment as required by Article 2.135(a)(1).

Art. 2.138. RULES. The Department of Public Safety may adopt rules to implement Articles 2.131-2.137.

SECTION 2. Chapter 3, Code of Criminal Procedure, is amended by adding Article 3.05 to read as follows:

Art. 3.05. RACIAL PROFILING. In this code, "racial profiling" means a law enforcement-initiated action based on an individual's race, ethnicity, or national origin rather than on the individual's behavior or on information identifying the individual as having engaged in criminal activity.

SECTION 3. Section 96.641, Education Code, is amended by adding Subsection (j) to read as follows:

(j) As part of the initial training and continuing education for police chiefs required under this section, the institute shall establish a program on racial profiling. The program must include an examination of the best practices for:

(1) monitoring peace officers' compliance with laws and internal agency policies relating to racial profiling;

(2) implementing laws and internal agency policies relating to preventing racial profiling; and

(3) analyzing and reporting collected information.

SECTION 4. Section 1701.253, Occupations Code, is amended by adding Subsection (e) to read as follows:

(e) As part of the minimum curriculum requirements, the commission shall establish a statewide comprehensive education and training program on racial profiling for officers licensed under this chapter. An officer shall complete a program established under this subsection not later than the second anniversary of the date the officer is licensed under this chapter or the date the officer applies for an intermediate proficiency certificate, whichever date is earlier.

SECTION 5. Section 1701.402, Occupations Code, is amended by adding Subsection (d) to read as follows:

(d) As a requirement for an intermediate proficiency certificate, an officer must complete an education and training program on racial profiling established by the commission under Section 1701.253(e).

SECTION 6. Section 543.202, Transportation Code, is amended to read as follows:

Sec. 543.202. FORM OF RECORD. (a) In this section, "race or ethnicity" means of a particular descent, including Caucasian, African, Hispanic, Asian, or Native American descent.

(b) The record must be made on a form or by a data processing method acceptable to the department and must include:

(1) the name, address, physical description, including race or ethnicity, date of birth, and driver's license number of the person charged;

(2) the registration number of the vehicle involved;

(3) whether the vehicle was a commercial motor vehicle as defined by Chapter 522 or was involved in transporting hazardous materials;

(4) the person's social security number, if the person was operating a commercial motor vehicle or was the holder of a commercial driver's license or commercial driver learner's permit;

(5) the date and nature of the offense, including whether the offense was a serious traffic violation as defined by Chapter 522;

(6) whether a search of the vehicle was conducted and whether consent for the search was obtained;

(7) the plea, the judgment, and whether bail was forfeited;

(8) [~~(7)~~] the date of conviction; and

(9) [~~(8)~~] the amount of the fine or forfeiture.

SECTION 7. Not later than January 1, 2002, a law enforcement agency shall adopt and implement a policy and begin collecting information under the policy as required by Article 2.132, Code of Criminal Procedure, as added by this Act. A local law enforcement agency shall first submit information to the governing body of each county or municipality served by the agency as required by Article 2.132, Code of Criminal Procedure, as added by this Act, on March 1, 2003. The first submission of information shall consist of information compiled by the agency during the period beginning January 1, 2002, and ending December 31, 2002.

SECTION 8. A local law enforcement agency shall first submit information to the governing body of each county or municipality served by the agency as required by Article 2.134, Code of Criminal Procedure, as added by this Act, on March 1, 2004. The first submission of information shall consist of information compiled by the agency during the period beginning January 1, 2003, and ending December 31, 2003.

SECTION 9. Not later than January 1, 2002:

(1) the Commission on Law Enforcement Officer Standards and Education shall establish an education and training program on racial profiling as required by Subsection (e), Section 1701.253, Occupations Code, as added by this Act; and

(2) the Bill Blackwood Law Enforcement Management Institute of Texas shall establish a program on racial profiling as required by Subsection (j), Section 96.641, Education Code, as added by this Act.

SECTION 10. A person who on the effective date of this Act holds an intermediate proficiency certificate issued by the Commission on Law Enforcement Officer Standards and Education or has held a peace officer license issued by the Commission on Law Enforcement Officer Standards and Education for at least two years shall complete an education and training program on racial profiling established under Subsection (e), Section 1701.253, Occupations Code, as added by this Act, not later than September 1, 2003.

SECTION 11. An individual appointed or elected as a police chief before the effective date of this Act shall complete a program on racial profiling established under Subsection (j), Section 96.641, Education Code, as added by this Act, not later than September 1, 2003.

SECTION 12. This Act takes effect September 1, 2001

_____ _____

President of the Senate Speaker of the House

I hereby certify that S.B. No. 1074 passed the Senate on April 4, 2001, by the following vote: Yeas 28, Nays 2; May 21, 2001, Senate refused to concur in House amendments and requested appointment of Conference Committee; May 22, 2001, House granted request of the Senate; May 24, 2001, Senate adopted Conference Committee Report by a viva-voce vote.

_____
Secretary of the Senate

I hereby certify that S.B. No. 1074 passed the House, with amendments, on May 15, 2001, by a non-record vote; May 22, 2001, House granted request of the Senate for appointment of Conference Committee; May 24, 2001, House adopted Conference Committee Report by a non-record vote.

_____
Chief Clerk of the House

Approved:

_____
Date

_____
Governor

Modifications to the Original Law (H.B. 3389)

Amend CSHB 3389 (Senate committee report) as follows:

(1) Strike the following SECTIONS of the bill:

(A) SECTION 8, adding Section 1701.164, Occupations Code (page 4, lines 61-66);

(B) SECTION 24, amending Article 2.132(b), Code of Criminal Procedure (page 8, lines 19-53);

(C) SECTION 25, amending Article 2.134(b), Code of Criminal Procedure (page 8, lines 54-64);

(D) SECTION 28, providing transition language for the amendments to Articles 2.132(b) and 2.134(b), Code of Criminal Procedure (page 9, lines 40-47).

(2) Add the following appropriately numbered SECTIONS to the bill and renumber subsequent SECTIONS of the bill accordingly: SECTION ____. Article 2.132, Code of Criminal Procedure, is amended by amending Subsections (a),(b), (d), and (e) and adding Subsection (g) to read as follows:

(a) In this article:

(1) "Law enforcement agency" means an agency of the state, or of a county, municipality, or other political subdivision of the state, that employs peace officers who make motor vehicle[~~traffic~~] stops in the routine performance of the officers' official duties.

(2) "Motor vehicle stop" means an occasion in which a peace officer stops a motor vehicle for an alleged violation of a law or ordinance.

(3) "Race or ethnicity" means of a particular descent, including Caucasian, African, Hispanic, Asian, [~~or~~] Native American, or Middle Eastern descent.

(b) Each law enforcement agency in this state shall adopt a detailed written policy on racial profiling. The policy must:

(1) clearly define acts constituting racial profiling;

(2) strictly prohibit peace officers employed by the agency from engaging in racial profiling;

(3) implement a process by which an individual may file a complaint with the agency if the individual believes that a peace officer employed by the agency has engaged in racial profiling with respect to the individual;

(4) provide public education relating to the agency's complaint process;

(5) require appropriate corrective action to be taken against a peace officer employed by the agency who, after an investigation, is shown to have engaged in racial profiling in violation of the agency's policy adopted under this article;

(6) require collection of information relating to motor vehicle [~~traffic~~] stops in which a citation is issued and to arrests made as a result of [~~resulting from~~] those [~~traffic~~] stops, including information relating to:

(A) the race or ethnicity of the individual detained; and

(B) whether a search was conducted and, if so, whether the individual [~~person~~] detained consented to the search; and

(C) whether the peace officer knew the race or ethnicity of the individual detained before detaining that individual; and

(7) require the chief administrator of the agency, regardless of whether the administrator is elected, employed, or appointed, to submit [~~to the governing body of each county or~~

~~municipality served by the agency~~] an annual report of the information collected under Subdivision (6) to:

(A) the Commission on Law Enforcement Officer Standards and Education; and

(B) the governing body of each county or municipality served by the agency, if the agency is an agency of a county, municipality, or other political subdivision of the state.

(d) On adoption of a policy under Subsection (b), a law enforcement agency shall examine the feasibility of installing video camera and transmitter-activated equipment in each agency law enforcement motor vehicle regularly used to make motor vehicle [~~traffic~~] stops and transmitter activated equipment in each agency law enforcement motorcycle regularly used to make motor vehicle [~~traffic~~] stops. If a law enforcement agency installs video or audio equipment as provided by this subsection, the policy adopted by the agency under Subsection (b) must include standards for reviewing video and audio documentation.

(e) A report required under Subsection (b)(7) may not include identifying information about a peace officer who makes a motor vehicle [~~traffic~~] stop or about an individual who is stopped or arrested by a peace officer. This subsection does not affect the collection of information as required by a policy under Subsection (b)(6).

(g) On a finding by the Commission on Law Enforcement Officer Standards and Education that the chief administrator of a law enforcement agency intentionally failed to submit a report required under Subsection (b)(7), the commission shall begin disciplinary procedures against the chief administrator.

SECTION ____. Article 2.133, Code of Criminal Procedure, is amended to read as follows:

Art. 2.133. REPORTS REQUIRED FOR MOTOR VEHICLE [~~TRAFFIC AND PEDESTRIAN~~] STOPS. (a) In this article, "race[~~:~~

[~~(1) "Race~~] or ethnicity" has the meaning assigned by Article 2.132(a).

[~~(2) "Pedestrian stop" means an interaction between a peace officer and an individual who is being detained for the purpose of a criminal investigation in which the individual is not under arrest.~~]

(b) A peace officer who stops a motor vehicle for an alleged violation of a law or ordinance [~~regulating traffic or who stops a pedestrian for any suspected offense~~] shall report to the law enforcement agency that employs the officer information relating to the stop, including:

(1) a physical description of any [~~each~~] person operating the motor vehicle who is detained as a result of the stop, including:

(A) the person's gender; and

(B) the person's race or ethnicity, as stated by the person or, if the person does not state the person's race or ethnicity, as determined by the officer to the best of the officer's ability;

(2) the initial reason for the stop [~~traffic law or ordinance alleged to have been violated or the suspected offense~~];

(3) whether the officer conducted a search as a result of the stop and, if so, whether the person detained consented to the search;

(4) whether any contraband or other evidence was discovered in the course of the search and a description [~~the type~~] of the contraband or evidence [~~discovered~~];

(5) the reason for the search, including whether:

(A) any contraband or other evidence was in plain view;

(B) any probable cause or reasonable suspicion existed to perform the search; or

(C) the search was performed as a result of the towing of the motor vehicle or the arrest of any person in the motor vehicle [~~existed and the facts supporting the existence of that probable cause~~];
(6) whether the officer made an arrest as a result of the stop or the search, including a statement of whether the arrest was based on a violation of the Penal Code, a violation of a traffic law or ordinance, or an outstanding warrant and a statement of the offense charged;
(7) the street address or approximate location of the stop; and
(8) whether the officer issued a written warning or a citation as a result of the stop[~~, including a description of the warning or a statement of the violation charged~~].
SECTION ____. Article 2.134, Code of Criminal Procedure, is amended by amending Subsections (a) through (e) and adding Subsection (g) to read as follows:
(a) In this article:
(1) "Motor vehicle[~~, "pedestrian~~] stop" has the meaning assigned by Article 2.132(a) [~~means an interaction between a peace officer and an individual who is being detained for the purpose of a criminal investigation in which the individual is not under arrest~~].
(2) "Race or ethnicity" has the meaning assigned by Article 2.132(a).
(b) A law enforcement agency shall compile and analyze the information contained in each report received by the agency under Article 2.133. Not later than March 1 of each year, each [~~local~~] law enforcement agency shall submit a report containing the incident-based data [~~information~~] compiled during the previous calendar year to the Commission on Law Enforcement Officer Standards and Education and, if the law enforcement agency is a local law enforcement agency, to the governing body of each county or municipality served by the agency [~~in a manner approved by the agency~~].
(c) A report required under Subsection (b) must be submitted by the chief administrator of the law enforcement agency, regardless of whether the administrator is elected, employed, or appointed, and must include:
(1) a comparative analysis of the information compiled under Article 2.133 to:
(A) evaluate and compare the number of motor vehicle stops, within the applicable jurisdiction, of persons who are recognized as racial or ethnic minorities and persons who are not recognized as racial or ethnic minorities [~~determine the prevalence of racial profiling by peace officers employed by the agency~~]; and
(B) examine the disposition of motor vehicle [~~traffic and pedestrian~~] stops made by officers employed by the agency, categorized according to the race or ethnicity of the affected persons, as appropriate, including any searches resulting from [~~the~~] stops within the applicable jurisdiction; and
(2) information relating to each complaint filed with the agency alleging that a peace officer employed by the agency has engaged in racial profiling.
(d) A report required under Subsection (b) may not include identifying information about a peace officer who makes a motor vehicle [~~traffic or pedestrian~~] stop or about an individual who is stopped or arrested by a peace officer. This subsection does not affect the reporting of information required under Article 2.133(b)(1).
(e) The Commission on Law Enforcement Officer Standards and Education, in accordance with Section 1701.162, Occupations Code, shall develop guidelines for compiling and reporting information as required by this article.

(g) On a finding by the Commission on Law Enforcement Officer Standards and Education that the chief administrator of a law enforcement agency intentionally failed to submit a report required under Subsection (b), the commission shall begin disciplinary procedures against the chief administrator.

SECTION ____. Article 2.135, Code of Criminal Procedure, is amended to read as follows:

Art. 2.135. PARTIAL EXEMPTION FOR AGENCIES USING VIDEO AND AUDIO EQUIPMENT. (a) A peace officer is exempt from the reporting requirement under Article 2.133 and the chief administrator of a law enforcement agency, regardless of whether the administrator is elected, employed, or appointed, is exempt from the compilation, analysis, and reporting requirements under Article 2.134 if:

(1) during the calendar year preceding the date that a report under Article 2.134 is required to be submitted:

(A) each law enforcement motor vehicle regularly used by an officer employed by the agency to make motor vehicle [~~traffic and pedestrian~~] stops is equipped with video camera and transmitter-activated equipment and each law enforcement motorcycle regularly used to make motor vehicle [~~traffic and pedestrian~~] stops is equipped with transmitter-activated equipment; and

(B) each motor vehicle [~~traffic and pedestrian~~] stop made by an officer employed by the agency that is capable of being recorded by video and audio or audio equipment, as appropriate, is recorded by using the equipment; or

(2) the governing body of the county or municipality served by the law enforcement agency, in conjunction with the law enforcement agency, certifies to the Department of Public Safety, not later than the date specified by rule by the department, that the law enforcement agency needs funds or video and audio equipment for the purpose of installing video and audio equipment as described by Subsection (a)(1)(A) and the agency does not receive from the state funds or video and audio equipment sufficient, as determined by the department, for the agency to accomplish that purpose.

(b) Except as otherwise provided by this subsection, a law enforcement agency that is exempt from the requirements under Article 2.134 shall retain the video and audio or audio documentation of each motor vehicle [~~traffic and pedestrian~~] stop for at least 90 days after the date of the stop. If a complaint is filed with the law enforcement agency alleging that a peace officer employed by the agency has engaged in racial profiling with respect to a motor vehicle [~~traffic or pedestrian~~] stop, the agency shall retain the video and audio or audio record of the stop until final disposition of the complaint.

(c) This article does not affect the collection or reporting requirements under Article 2.132.

(d) In this article, "motor vehicle stop" has the meaning assigned by Article 2.132(a).

SECTION ____. Chapter 2, Code of Criminal Procedure, is amended by adding Article 2.1385 to read as follows:

Art. 2.1385. CIVIL PENALTY. (a) If the chief administrator of a local law enforcement agency intentionally fails to submit the incident-based data as required by Article 2.134, the agency is liable to the state for a civil penalty in the amount of $1,000 for each violation. The attorney general may sue to collect a civil penalty under this subsection.

(b) From money appropriated to the agency for the administration of the agency, the executive director of a state law enforcement agency that intentionally fails to submit the incident-based

data as required by Article 2.134 shall remit to the comptroller the amount of $1,000 for each violation.

(c) Money collected under this article shall be deposited in the state treasury to the credit of the general revenue fund.

SECTION ____. Subchapter A, Chapter 102, Code of Criminal Procedure, is amended by adding Article 102.022 to read as follows:

Art. 102.022. COSTS ON CONVICTION TO FUND STATEWIDE REPOSITORY FOR DATA RELATED TO CIVIL JUSTICE. (a) In this article, "moving violation" means an offense that:

(1) involves the operation of a motor vehicle; and

(2) is classified as a moving violation by the Department of Public Safety under Section 708.052, Transportation Code.

(b) A defendant convicted of a moving violation in a justice court, county court, county court at law, or municipal court shall pay a fee of 10 cents as a cost of court.

(c) In this article, a person is considered convicted if:

(1) a sentence is imposed on the person;

(2) the person receives community supervision, including deferred adjudication; or

(3) the court defers final disposition of the person's case.

(d) The clerks of the respective courts shall collect the costs described by this article. The clerk shall keep separate records of the funds collected as costs under this article and shall deposit the funds in the county or municipal treasury, as appropriate.

(e) The custodian of a county or municipal treasury shall:

(1) keep records of the amount of funds on deposit collected under this article; and

(2) send to the comptroller before the last day of the first month following each calendar quarter the funds collected under this article during the preceding quarter.

(f) A county or municipality may retain 10 percent of the funds collected under this article by an officer of the county or municipality as a collection fee if the custodian of the county or municipal treasury complies with Subsection (e).

(g) If no funds due as costs under this article are deposited in a county or municipal treasury in a calendar quarter, the custodian of the treasury shall file the report required for the quarter in the regular manner and must state that no funds were collected.

(h) The comptroller shall deposit the funds received under this article to the credit of the Civil Justice Data Repository fund in the general revenue fund, to be used only by the Commission on Law Enforcement Officer Standards and Education to implement duties under Section 1701.162, Occupations Code.

(i) Funds collected under this article are subject to audit by the comptroller.

SECTION ____. (a) Section 102.061, Government Code, as reenacted and amended by Chapter 921 (H.B. 3167), Acts of the 80th Legislature, Regular Session, 2007, is amended to conform to the amendments made to Section 102.061, Government Code, by Chapter 1053 (H.B. 2151), Acts of the 80th Legislature, Regular Session, 2007, and is further amended to read as follows:

Sec. 102.061. ADDITIONAL COURT COSTS ON CONVICTION IN STATUTORY COUNTY COURT: CODE OF CRIMINAL PROCEDURE. The clerk of a statutory county court shall collect fees and costs under the Code of Criminal Procedure on conviction of a defendant as follows:

(1) a jury fee (Art. 102.004, Code of Criminal Procedure) . . . $20;

(2) a fee for services of the clerk of the court (Art. 102.005, Code of Criminal Procedure) . . . $40;

(3) a records management and preservation services fee (Art. 102.005, Code of Criminal Procedure) . . . $25;
(4) a security fee on a misdemeanor offense (Art. 102.017, Code of Criminal Procedure) . . . $3;
(5) a juvenile delinquency prevention and graffiti eradication fee (Art. 102.0171, Code of Criminal Procedure) . . . $50 [~~$5~~]; [~~and~~]
(6) a juvenile case manager fee (Art. 102.0174, Code of Criminal Procedure) . . . not to exceed $5; and
(7) a civil justice fee (Art. 102.022, Code of Criminal Procedure) . . . $0.10.
(b) Section 102.061, Government Code, as amended by Chapter 1053 (H.B. 2151), Acts of the 80th Legislature, Regular Session, 2007, is repealed. Section 102.061, Government Code, as reenacted and amended by Chapter 921 (H.B. 3167), Acts of the 80th Legislature, Regular Session, 2007, to reorganize and renumber that section, continues in effect as further amended by this section.
SECTION ____. (a) Section 102.081, Government Code, as amended by Chapter 921 (H.B. 3167), Acts of the 80th Legislature, Regular Session, 2007, is amended to conform to the amendments made to Section 102.081, Government Code, by Chapter 1053 (H.B. 2151), Acts of the 80th Legislature, Regular Session, 2007, and is further amended to read as follows:
Sec. 102.081. ADDITIONAL COURT COSTS ON CONVICTION IN COUNTY COURT: CODE OF CRIMINAL PROCEDURE. The clerk of a county court shall collect fees and costs under the Code of Criminal Procedure on conviction of a defendant as follows:

(1) a jury fee (Art. 102.004, Code of Criminal Procedure) . . . $20;
(2) a fee for clerk of the court services (Art. 102.005, Code of Criminal Procedure) . . . $40;
(3) a records management and preservation services fee (Art. 102.005, Code of Criminal Procedure) . . . $25;
(4) a security fee on a misdemeanor offense (Art. 102.017, Code of Criminal Procedure) . . . $3;
(5) a juvenile delinquency prevention and graffiti eradication fee (Art. 102.0171, Code of Criminal Procedure) . . . $50 [~~$5~~]; [~~and~~]
(6) a juvenile case manager fee (Art. 102.0174, Code of Criminal Procedure) . . . not to exceed $5; and
(7) a civil justice fee (Art. 102.022, Code of Criminal Procedure) . . . $0.10.
(b) Section 102.081, Government Code, as amended by Chapter 1053 (H.B. 2151), Acts of the 80th Legislature, Regular Session, 2007, is repealed. Section 102.081, Government Code, as amended by Chapter 921 (H.B. 3167), Acts of the 80th Legislature, Regular Session, 2007, to reorganize and renumber that section, continues in effect as further amended by this section.
SECTION ____. Section 102.101, Government Code, is amended to read as follows:
Sec. 102.101. ADDITIONAL COURT COSTS ON CONVICTION IN JUSTICE COURT: CODE OF CRIMINAL PROCEDURE. A clerk of a justice court shall collect fees and costs under the Code of Criminal Procedure on conviction of a defendant as follows:
(1) a jury fee (Art. 102.004, Code of Criminal Procedure) . . . $3;
(2) a fee for withdrawing request for jury less than 24 hours before time of trial (Art. 102.004, Code of Criminal Procedure) . . . $3;
(3) a jury fee for two or more defendants tried jointly (Art. 102.004, Code of Criminal Procedure) . . . one jury fee of $3;

(4) a security fee on a misdemeanor offense (Art. 102.017, Code of Criminal Procedure) . . . $4;
(5) a fee for technology fund on a misdemeanor offense (Art. 102.0173, Code of Criminal Procedure) . . . $4;
(6) a juvenile case manager fee (Art. 102.0174, Code of Criminal Procedure) . . . not to exceed $5;
(7) a fee on conviction of certain offenses involving issuing or passing a subsequently dishonored check (Art. 102.0071, Code of Criminal Procedure) . . . not to exceed $30; [~~and~~]
(8) a court cost on conviction of a Class C misdemeanor in a county with a population of 3.3 million or more, if authorized by the county commissioners court (Art. 102.009, Code of Criminal Procedure) . . . not to exceed $7; and
(9) a civil justice fee (Art. 102.022, Code of Criminal Procedure) . . . $0.10.
SECTION ____. Section 102.121, Government Code, is amended to read as follows:
Sec. 102.121. ADDITIONAL COURT COSTS ON CONVICTION IN MUNICIPAL COURT: CODE OF CRIMINAL PROCEDURE. The clerk of a municipal court shall collect fees and costs on conviction of a defendant as follows:
(1) a jury fee (Art. 102.004, Code of Criminal Procedure) . . . $3;
(2) a fee for withdrawing request for jury less than 24 hours before time of trial (Art. 102.004, Code of Criminal Procedure) . . . $3;
(3) a jury fee for two or more defendants tried jointly (Art. 102.004, Code of Criminal Procedure) . . . one jury fee of $3;
(4) a security fee on a misdemeanor offense (Art. 102.017, Code of Criminal Procedure) . . . $3;
(5) a fee for technology fund on a misdemeanor offense (Art. 102.0172, Code of Criminal Procedure) . . . not to exceed $4; [~~and~~]
(6) a juvenile case manager fee (Art. 102.0174, Code of Criminal Procedure) . . . not to exceed $5; and
(7) a civil justice fee (Art. 102.022, Code of Criminal Procedure) . . . $0.10.
SECTION ____. Subchapter D, Chapter 1701, Occupations Code, is amended by adding Section 1701.164 to read as follows:
Sec. 1701.164. COLLECTION OF CERTAIN INCIDENT-BASED DATA SUBMITTED BY LAW ENFORCEMENT AGENCIES. The commission shall collect and maintain incident-based data submitted to the commission under Article 2.134, Code of Criminal Procedure, including incident-based data compiled by a law enforcement agency from reports received by the law enforcement agency under Article 2.133 of that code. The commission in consultation with the Department of Public Safety, the Bill Blackwood Law Enforcement Management Institute of Texas, the W. W. Caruth, Jr., Police Institute at Dallas, and the Texas Police Chiefs Association shall develop guidelines for submitting in a standard format the report containing incident-based data as required by Article 2.134, Code of Criminal Procedure.
SECTION ____. Subsection (a), Section 1701.501, Occupations Code, is amended to read as follows:
(a) Except as provided by Subsection (d), the commission shall revoke or suspend a license, place on probation a person whose license has been suspended, or reprimand a license holder for a violation of:
(1) this chapter;

(2) the reporting requirements provided by Articles 2.132 and 2.134, Code of Criminal Procedure; or

(3) a commission rule.

SECTION ____. (a) The requirements of Articles 2.132, 2.133, and 2.134, Code of Criminal Procedure, as amended by this Act, relating to the compilation, analysis, and submission of incident-based data apply only to information based on a motor vehicle stop occurring on or after January 1, 2010.

(b) The imposition of a cost of court under Article 102.022, Code of Criminal Procedure, as added by this Act, applies only to an offense committed on or after the effective date of this Act. An offense committed before the effective date of this Act is covered by the law in effect when the offense was committed, and the former law is continued in effect for that purpose. For purposes of this section, an offense was committed before the effective date of this Act if any element of the offense occurred before that date.

Racial and Ethnic Designations (H.B. 3051)

H.B. No. 3051 - An Act relating to the categories used to record the race or ethnicity of persons stopped for or convicted of traffic offenses.
BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:
SECTION 1. Article 2.132(a)(3), Code of Criminal Procedure, is amended to read as follows:
(3) "Race or ethnicity" means the following categories:
(A) Alaska native or American Indian;
(B) [~~of a particular descent, including Caucasian, African, Hispanic,~~] Asian or Pacific Islander;
(C) black;
(D) white; and
(E) Hispanic or Latino [~~, Native American, or Middle Eastern descent~~].

SECTION 2. Section 543.202(a), Transportation Code, is amended to read as follows:
(a) In this section, "race or ethnicity" means the following categories:
(1) Alaska native or American Indian;
(2) [~~of a particular descent, including Caucasian, African, Hispanic,~~] Asian or Pacific Islander;
(3) black;
(4) white; and
(5) Hispanic or Latino [~~, or Native American descent~~].
SECTION 3. This Act takes effect September 1, 2017.

_____ _____
President of the Senate Speaker of the House

I certify that H.B. No. 3051 was passed by the House on May 4, 2017, by the following vote: Yeas 143, Nays 2, 2 present, not voting.

_____
Chief Clerk of the House

I certify that H.B. No. 3051 was passed by the Senate on May 19, 2017, by the following vote: Yeas 31, Nays 0.

_____
Secretary of the Senate
APPROVED: _____
Date

_____
Governor

The Sandra Bland Act
(S.B. 1849)

S.B. No. 1849

An Act relating to interactions between law enforcement and individuals detained or arrested on suspicion of the commission of criminal offenses, to the confinement, conviction, or release of those individuals, and to grants supporting populations that are more likely to interact frequently with law enforcement.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

ARTICLE 1. SHORT TITLE

SECTION 1.01. SHORT TITLE. This Act shall be known as the Sandra Bland Act, in memory of Sandra Bland.

ARTICLE 2. IDENTIFICATION AND DIVERSION OF AND SERVICES FOR PERSONS SUSPECTED OF HAVING A MENTAL ILLNESS, AN INTELLECTUAL DISABILITY, OR A SUBSTANCE ABUSE ISSUE

SECTION 2.01. Article 16.22, Code of Criminal Procedure, is amended to read as follows:

Art. 16.22. EARLY IDENTIFICATION OF DEFENDANT SUSPECTED OF HAVING MENTAL ILLNESS OR INTELLECTUAL DISABILITY [MENTAL RETARDATION]. (a)(1) Not later than 12 [72] hours after receiving credible information that may establish reasonable cause to believe that a defendant committed to the sheriff's custody has a mental illness or is a person with an intellectual disability [mental retardation], including observation of the defendant's behavior immediately before, during, and after the defendant's arrest and the results of any previous assessment of the defendant, the sheriff shall provide written or electronic notice of the information to the magistrate. On a determination that there is reasonable cause to believe that the defendant has a mental illness or is a person with an intellectual disability [mental retardation], the magistrate, except as provided by Subdivision

(2), shall order the local mental health or intellectual and developmental disability [mental retardation] authority or another qualified mental health or intellectual disability [mental retardation] expert to:

(A) collect information regarding whether the defendant has a mental illness as defined by Section 571.003,

Health and Safety Code, or is a person with an intellectual disability [mental retardation] as defined by Section 591.003, Health and Safety Code, including information obtained from any previous assessment of the defendant; and

(B) provide to the magistrate a written assessment of the information collected under Paragraph (A).

(2) The magistrate is not required to order the collection of information under Subdivision (1) if the defendant in the year preceding the defendant's applicable date of arrest has been determined to have a mental illness or to be a person with an intellectual disability [mental retardation] by the local mental health or intellectual and developmental disability [mental retardation] authority or another mental health or intellectual disability [mental retardation] expert described by Subdivision (1). A court that elects to use the results of that previous determination may proceed under Subsection (c).

(3) If the defendant fails or refuses to submit to the collection of information regarding the defendant as required under Subdivision (1), the magistrate may order the defendant to submit to an examination in a mental health facility determined to be appropriate by the local mental health or intellectual and developmental disability [mental retardation] authority for a reasonable period not to exceed 21 days. The magistrate may order a defendant to a facility operated by the Department of State Health Services or the Health and Human Services Commission [Department of Aging and Disability Services] for examination only on request of the local mental health or intellectual and developmental disability [mental retardation] authority and with the consent of the head of the facility. If a defendant who has been ordered to a facility operated by the Department of State Health Services or the Health and Human Services Commission [Department of Aging and Disability Services] for examination remains in the facility for a period exceeding 21 days, the head of that facility shall cause the defendant to be immediately transported to the committing court and placed in the custody of the sheriff of the county in which the committing court is located. That county shall reimburse the facility for the mileage and per diem expenses of the personnel required to transport the defendant calculated in accordance with the state travel regulations in effect at the time.

(b) A written assessment of the information collected under Subsection (a)(1)(A) shall be provided to the magistrate not later than the 30th day after the date of any order issued under Subsection (a) in a felony case and not later than the 10th day after the date of any order issued under that subsection in a misdemeanor case, and the magistrate shall provide copies of the written assessment to the defense counsel, the prosecuting attorney, and the trial court. The written assessment must include a description of the procedures used in the collection of information under Subsection (a)(1)(A) and the applicable expert's observations and findings pertaining to:

(1) whether the defendant is a person who has a mental illness or is a person with an intellectual disability [mental retardation];

(2) whether there is clinical evidence to support a belief that the defendant may be incompetent to stand trial and should undergo a complete competency examination under Subchapter B, Chapter 46B; and

(3) recommended treatment.

(c) After the trial court receives the applicable expert's written assessment relating to the defendant under Subsection (b) or elects to use the results of a previous determination as described by Subsection (a)(2), the trial court may, as applicable:

(1) resume criminal proceedings against the defendant, including any appropriate proceedings related to the defendant's release on personal bond under Article 17.032;

(2) resume or initiate competency proceedings, if required, as provided by Chapter 46B or other proceedings affecting the defendant's receipt of appropriate court-ordered mental health or intellectual disability [mental retardation] services, including proceedings related to the defendant's receipt of outpatient mental health services under Section 574.034, Health and Safety Code; or

(3) consider the written assessment during the punishment phase after a conviction of the offense for which the defendant was arrested, as part of a presentence investigation report, or in connection with the impositions of conditions following placement on community supervision, including deferred adjudication community supervision.

(d) This article does not prevent the applicable court from, before, during, or after the collection of information regarding the defendant as described by this article: (1) releasing a defendant who has a mental illness [mentally ill] or is a person with an intellectual disability [mentally retarded defendant] from custody on personal or surety bond; or

(2) ordering an examination regarding the defendant's competency to stand trial.

SECTION 2.02. Chapter 16, Code of Criminal Procedure, is amended by adding Article 16.23 to read as follows:

Art. 16.23. DIVERSION OF PERSONS SUFFERING MENTAL HEALTH CRISIS OR SUBSTANCE ABUSE ISSUE. (a) Each law enforcement agency shall make a good faith effort to divert a person suffering a mental health crisis or suffering from the effects of substance abuse to a proper treatment center in the agency's jurisdiction if:

(1) there is an available and appropriate treatment center in the agency's jurisdiction to which the agency may divert the person;

(2) it is reasonable to divert the person;

(3) the offense that the person is accused of is a misdemeanor, other than a misdemeanor involving violence; and

(4) the mental health crisis or substance abuse issue is suspected to be the reason the person committed the alleged offense.

(b) Subsection (a) does not apply to a person who is accused of an offense under Section 49.04, 49.045, 49.05, 49.06, 49.065,
49.07, or 49.08, Penal Code.

SECTION 2.03. Section 539.002, Government Code, is amended to read as follows:

Sec. 539.002. GRANTS FOR ESTABLISHMENT AND EXPANSION OF COMMUNITY COLLABORATIVES. (a) To the extent funds are appropriated to the department for that purpose, the department shall make grants to entities, including local governmental entities, nonprofit community organizations, and faith-based community organizations, to establish or expand community collaboratives that bring the public and private sectors together to provide services to persons experiencing homelessness, substance abuse issues, or [and] mental illness. [The department may make a maximum of five grants, which must be made in the most populous

municipalities in this state that are located in counties with a population of more than one million.] In awarding grants, the department shall give special consideration to entities:

(1) establishing [a] new collaboratives; or

(2) establishing or expanding collaboratives thatserve two or more counties, each with a population of less than 100,000 [collaborative].

(b) The department shall require each entity awarded a grant under this section to:

(1) leverage additional funding from private sources in an amount that is at least equal to the amount of the grant awarded under this section; [and]

(2) provide evidence of significant coordination and collaboration between the entity, local mental health authorities, municipalities, local law enforcement agencies, and other community stakeholders in establishing or expanding a community collaborative funded by a grant awarded under this section; and

(3) provide evidence of a local law enforcement policy to divert appropriate persons from jails or other detention facilities to an entity affiliated with a community collaborative for the purpose of providing services to those persons.

SECTION 2.04. Chapter 539, Government Code, is amended by adding Section 539.0051 to read as follows:

Sec. 539.0051. PLAN REQUIRED FOR CERTAIN COMMUNITY COLLABORATIVES. (a) The governing body of a county shall develop and make public a plan detailing:

(1) how local mental health authorities, municipalities, local law enforcement agencies, and other community stakeholders in the county could coordinate to establish or expand a community collaborative to accomplish the goals of Section 539.002;

(2) how entities in the county may leverage funding from private sources to accomplish the goals of Section 539.002 through the formation or expansion of a community collaborative; and

(3) how the formation or expansion of a community collaborative could establish or support resources or services to help local law enforcement agencies to divert persons who have been arrested to appropriate mental health care or substance abuse treatment.

(b) The governing body of a county in which an entity that received a grant under Section 539.002 before September 1, 2017, is located is not required to develop a plan under Subsection (a).

(c) Two or more counties, each with a population of less than 100,000, may form a joint plan under Subsection (a).

ARTICLE 3. BAIL, PRETRIAL RELEASE, AND COUNTY JAIL STANDARDS

SECTION 3.01. The heading to Article 17.032, Code of Criminal Procedure, is amended to read as follows:

Art. 17.032. RELEASE ON PERSONAL BOND OF CERTAIN [MENTALLY ILL] DEFENDANTS WITH MENTAL ILLNESS OR INTELLECTUAL DISABILITY.

SECTION 3.02. Articles 17.032(b) and (c), Code of Criminal Procedure, are amended to read as follows:

(b) A magistrate shall release a defendant on personal bond unless good cause is shown otherwise if the:

(1) defendant is not charged with and has not been previously convicted of a violent offense;

(2) defendant is examined by the local mental health or intellectual and developmental disability [mental retardation] authority or another mental health expert under Article 16.22 [of this code];

(3) applicable expert, in a written assessment submitted to the magistrate under Article 16.22:

(A) concludes that the defendant has a mental illness or is a person with an intellectual disability [mental retardation] and is nonetheless competent to stand trial; and

(B) recommends mental health treatment or intellectual disability treatment for the defendant, as applicable; and

(4) magistrate determines, in consultation with the local mental health or intellectual and developmental disability [mental retardation] authority, that appropriate community-based mental health or intellectual disability [mental retardation] services for the defendant are available through the [Texas] Department of State [Mental] Health Services [and Mental Retardation] under Section 534.053, Health and Safety Code, or through another mental health or intellectual disability [mental retardation] services provider.

(c) The magistrate, unless good cause is shown for not requiring treatment, shall require as a condition of release on personal bond under this article that the defendant submit to outpatient or inpatient mental health or intellectual disability [mental retardation] treatment as recommended by the local mental health or intellectual and developmental disability [mental retardation] authority if the defendant's:

(1) mental illness or intellectual disability [mental retardation] is chronic in nature; or

(2) ability to function independently will continue to deteriorate if the defendant is not treated.

SECTION 3.03. Article 25.03, Code of Criminal Procedure, is amended to read as follows:

Art. 25.03. IF ON BAIL IN FELONY. When the accused, in case of felony, is on bail at the time the indictment is presented, [it is not necessary to serve him with a copy, but] the clerk shall [on request] deliver a copy of the indictment [same] to the accused or the accused's [his] counsel[,] at the earliest possible time.

SECTION 3.04. Article 25.04, Code of Criminal Procedure, is amended to read as follows:

Art. 25.04. IN MISDEMEANOR. In misdemeanors, the clerk shall deliver a copy of the indictment or information to the accused or the accused's counsel at the earliest possible time before trial [it shall not be necessary before trial to furnish the accused with a copy of the indictment or information; but he or his counsel may demand a copy, which shall be given as early as possible

SECTION 3.05. Section 511.009(a), Government Code, as amended by Chapters 281 (H.B. 875), 648 (H.B. 549), and 688 (H.B. 634), Acts of the 84th Legislature, Regular Session, 2015, is reenacted and amended to read as follows:

(a) The commission shall:

(1) adopt reasonable rules and procedures establishing minimum standards for the construction, equipment, maintenance, and operation of county jails;

(2) adopt reasonable rules and procedures establishing minimum standards for the custody, care, and treatment of prisoners;

(3) adopt reasonable rules establishing minimum standards for the number of jail supervisory personnel and for programs and services to meet the needs of prisoners;

(4) adopt reasonable rules and procedures establishing minimum requirements for programs of rehabilitation, education, and recreation in county jails;

(5) revise, amend, or change rules and procedures if necessary;

(6) provide to local government officials consultation on and technical assistance for county jails;

(7) review and comment on plans for the construction and major modification or renovation of county jails;

(8) require that the sheriff and commissioners of each county submit to the commission, on a form prescribed by the commission, an annual report on the conditions in each county jail within their jurisdiction, including all information necessary to determine compliance with state law, commission orders, and the rules adopted under this chapter;

(9) review the reports submitted under Subdivision (8) and require commission employees to inspect county jails regularly to ensure compliance with state law, commission orders, and rules
and procedures adopted under this chapter;

(10) adopt a classification system to assist sheriffs and judges in determining which defendants are low-risk and consequently suitable participants in a county jail work release program under Article 42.034, Code of Criminal Procedure;

(11) adopt rules relating to requirements for segregation of classes of inmates and to capacities for county jails;

(12) require that the chief jailer of each municipal lockup submit to the commission, on a form prescribed by the commission, an annual report of persons under 17 years of age securely detained in the lockup, including all information necessary to determine compliance with state law concerning secure confinement of children in municipal lockups;

(13) at least annually determine whether each county jail is in compliance with the rules and procedures adopted under this chapter;

(14) require that the sheriff and commissioners court of each county submit to the commission, on a form prescribed by the commission, an annual report of persons under 17 years of age securely detained in the county jail, including all information necessary to determine compliance with state law concerning secure confinement of children in county jails;

(15) schedule announced and unannounced inspections of jails under the commission's jurisdiction using the risk assessment plan established under Section 511.0085 to guide the inspections process;

(16) adopt a policy for gathering and distributing to jails under the commission's

jurisdiction information regarding:

(A) common issues concerning jail administration;

(B) examples of successful strategies for maintaining compliance with state law and the rules, standards, and procedures of the commission; and

(C) solutions to operational challenges for jails;

(17) report to the Texas Correctional Office on Offenders with Medical or Mental Impairments on a jail's compliance with Article 16.22, Code of Criminal Procedure;

(18) adopt reasonable rules and procedures establishing minimum requirements for jails to:

(A) determine if a prisoner is pregnant; and

(B) ensure that the jail's health services plan addresses medical and mental health care, including nutritional requirements, and any special housing or work assignment needs for persons who are confined in the jail and are known or determined to be pregnant;

(19) provide guidelines to sheriffs regarding contracts between a sheriff and another entity for the provision of food services to or the operation of a commissary in a jail under the commission's jurisdiction, including specific provisions regarding conflicts of interest and avoiding the appearance of impropriety; [and]

(20) adopt reasonable rules and procedures establishing minimum standards for prisoner visitation that provide each prisoner at a county jail with a minimum of two in-person, noncontact visitation periods per week of at least 20 minutes duration each;

(21) [(20)] require the sheriff of each county to:

(A) investigate and verify the veteran status of each prisoner by using data made available from the Veterans Reentry Search Service (VRSS) operated by the United States Department of Veterans Affairs or a similar service; and

(B) use the data described by Paragraph (A) to assist prisoners who are veterans in applying for federal benefits or compensation for which the prisoners may be eligible under a program administered by the United States Department of Veterans Affairs;

(22) [(20)] adopt reasonable rules and procedures regarding visitation of a prisoner at a county jail by a guardian, as defined by Section 1002.012, Estates Code, that:

(A) allow visitation by a guardian to the same extent as the prisoner's next of kin, including placing the guardian on the prisoner's approved visitors list on the guardian's request and providing the guardian access to the prisoner during a facility's standard visitation hours if the prisoner is otherwise eligible to receive visitors; and

(B) require the guardian to provide the sheriff with letters of guardianship issued as provided by Section 1106.001, Estates Code, before being allowed to visit the prisoner; and

(23) adopt reasonable rules and procedures to ensure the safety of prisoners, including rules and procedures that require a county jail to:

(A) give prisoners the ability to access a mental health professional at the jail through a telemental health service 24 hours a day;

(B) give prisoners the ability to access a health professional at the jail or through a telehealth service 24 hours a day or, if a health professional is unavailable at the jail or through a telehealth service, provide for a prisoner to be transported to access a health professional; and

(C) if funding is available under Section 511.019, install automated electronic sensors or cameras to ensure accurate and timely in-person checks of cells or groups of cells confining at-risk

individuals.

SECTION 3.06. Section 511.009, Government Code, is amended by adding Subsection (d) to read as follows:

(d) The commission shall adopt reasonable rules and procedures establishing minimum standards regarding the continuity of prescription medications for the care and treatment of prisoners. The rules and procedures shall require that a qualified medical professional shall review as soon as possible any prescription medication a prisoner is taking when the prisoner is taken into custody.

SECTION 3.07. Chapter 511, Government Code, is amended by adding Sections 511.019, 511.020, and 511.021 to read as follows:

Sec. 511.019. PRISONER SAFETY FUND. (a) The prisoner safety fund is a dedicated account in the general revenue fund.

(b) The prisoner safety fund consists of:

(1) appropriations of money to the fund by the legislature; and

(2) gifts, grants, including grants from the federal government, and other donations received for the fund.

(c) Money in the fund may be appropriated only to the commission to pay for capital improvements that are required under Section 511.009(a)(23).

(d) The commission by rule may establish a grant program to provide grants to counties to fund capital improvements described by Subsection (c). The commission may only provide a grant to a county for capital improvements to a county jail with a capacity of not more than 96 prisoners.

Sec. 511.020. SERIOUS INCIDENTS REPORT. (a) On or before the fifth day of each month, the sheriff of each county shall report to the commission regarding the occurrence during the preceding month of any of the following incidents involving a prisoner in the county jail:

(1) a suicide;

(2) an attempted suicide;

(3) a death;

(4) a serious bodily injury, as that term is defined by Section 1.07, Penal Code;

(5) an assault;

(6) an escape;

(7) a sexual assault; and

(8) any use of force resulting in bodily injury, as that term is defined by Section 1.07, Penal Code.

(b) The commission shall prescribe a form for the report required by Subsection (a).

(c) The information required to be reported under Subsection (a)(8) may not include the name or other identifying information of a county jailer or jail employee.

(d) The information reported under Subsection (a) is public information subject to an open records request under Chapter 552.

Sec. 511.021. INDEPENDENT INVESTIGATION OF DEATH OCCURRING IN COUNTY JAIL. (a) On the death of a prisoner in a county jail, the commission shall appoint a law enforcement agency, other than the local law enforcement agency that operates the county jail, to investigate the death as soon as possible.

(b) The commission shall adopt any rules necessary relating to the appointment of a law enforcement agency under Subsection (a), including rules relating to cooperation between law enforcement agencies and to procedures for handling evidence.

SECTION 3.08. The changes in law made by this article to Article 17.032, Code of Criminal Procedure, apply only to a personal bond that is executed on or after the effective date of this Act. A personal bond executed before the effective date of executed, and the former law is continued in effect for that purpose.

SECTION 3.09. Not later than January 1, 2018, the Commission on Jail Standards shall:

(1) adopt the rules and procedures required by Section 511.009(d), Government Code, as added by this article, and the rules required by Section 511.021(b), Government Code, as added by this article; and

(2) prescribe the form required by Section 511.020(b), Government Code, as added by this article.

SECTION 3.10. Not later than September 1, 2018, the Commission on Jail Standards shall adopt the rules and procedures required by Section 511.009(a)(23), Government Code, as added by this article. On and after September 1, 2020, a county jail shall comply with any rule or procedure adopted by the Commission on Jail Standards under that subdivision.

SECTION 3.11. To the extent of any conflict, this Act prevails over another Act of the 85th Legislature, Regular Session, 2017, relating to non-substantive additions to and corrections in enacted codes.

ARTICLE 4. PEACE OFFICER AND COUNTY JAILER TRAINING

SECTION 4.01. Chapter 511, Government Code, is amended by adding Section 511.00905 to read as follows:

Sec. 511.00905. JAIL ADMINISTRATOR POSITION; EXAMINATION REQUIRED. (a) The Texas Commission on Law Enforcement shall develop and the commission shall approve an examination for a person assigned to the jail administrator position overseeing a county jail.

(b) The commission shall adopt rules requiring a person, other than a sheriff, assigned to the jail administrator position overseeing a county jail to pass the examination not later than the 180th day after the date the person is assigned to that position. The rules must provide that a person who fails the examination may be immediately removed from the position and may not

be reinstated until the person passes the examination.

(c) The sheriff of a county shall perform the duties of the jail administrator position at any time there is not a person available who satisfies the examination requirements of this section.

(d) A person other than a sheriff may not serve in the jail administrator position of a county jail unless the person satisfies the examination requirement of this section.

SECTION 4.02. Section 1701.253, Occupations Code, is amended by amending Subsection (j) and adding Subsection (n) to read as follows: commission shall require an officer to complete a 40-hour statewide education and training program on de-escalation and crisis intervention techniques to facilitate interaction with persons with mental impairments. An officer shall complete the program not later than the second anniversary of the date the officer is licensed under this chapter or the date the officer applies for an intermediate proficiency certificate, whichever date is earlier. An officer may not satisfy the requirements of this subsection [section] or Section 1701.402(g) by taking an online course on de-escalation and crisis intervention techniques to facilitate interaction with persons with mental impairments.

(n) As part of the minimum curriculum requirements, the commission shall require an officer to complete a statewide education and training program on de-escalation techniques to facilitate interaction with members of the public, including techniques for limiting the use of force resulting in bodily injury.

SECTION 4.03. Section 1701.310(a), Occupations Code, is amended to read as follows:

(a) Except as provided by Subsection (e), a person may not be appointed as a county jailer, except on a temporary basis, unless the person has satisfactorily completed a preparatory training program, as required by the commission, in the operation of a county jail at a school operated or licensed by the commission. The training program must consist of at least eight hours of mental health training approved by the commission and the Commission on Jail Standards.

SECTION 4.04. Section 1701.352(b), Occupations Code, is amended to read as follows:

(b) The commission shall require a state, county, special district, or municipal agency that appoints or employs peace officers to provide each peace officer with a training program at least once every 48 months that is approved by the commission and consists of:

(1) topics selected by the agency; and

(2) for an officer holding only a basic proficiency certificate, not more than 20 hours of education and training that contain curricula incorporating the learning objectives developed by the commission regarding:

(A) civil rights, racial sensitivity, and cultural diversity;

(B) de-escalation and crisis intervention techniques to facilitate interaction with persons with mental impairments; [and]

(C) de-escalation techniques to facilitate interaction with members of the public, including techniques for limiting the use of force resulting in bodily injury; and

(D) unless determined by the agency head to be inconsistent with the officer's assigned duties:

(i) the recognition and documentation of cases that involve child abuse or neglect, family violence, and sexual assault; and

(ii) issues concerning sex offender characteristics.

SECTION 4.05. Section 1701.402, Occupations Code, is amended by adding Subsection (n) to read as follows:

(n) As a requirement for an intermediate proficiency certificate or an advanced proficiency certificate, an officer must complete the education and training program regarding de-escalation techniques to facilitate interaction with members of the public established by the commission under Section 1701.253(n).

SECTION 4.06. Not later than March 1, 2018, the Texas Commission on Law Enforcement shall develop and the Commission on Jail Standards shall approve the examination required by Section 511.00905, Government Code, as added by this article.

SECTION 4.07. (a) Not later than March 1, 2018, the Texas Commission on Law Enforcement shall establish or modify training programs as necessary to comply with Section 1701.253, Occupations Code, as amended by this article.

(b) The minimum curriculum requirements under Section 1701.253(j), Occupations Code, as amended by this article, apply only to a peace officer who first begins to satisfy those requirements on or after April 1, 2018.

SECTION 4.08. (a) Section 1701.310, Occupations Code, as amended by this article, takes effect January 1, 2018.

(b) A person in the position of county jailer on September 1, 2017, must comply with Section 1701.310(a), Occupations Code, as amended by this article, not later than August 31, 2021.

ARTICLE 5. MOTOR VEHICLE STOPS, RACIAL PROFILING, AND ISSUANCE OF CITATIONS

SECTION 5.01. Article 2.132, Code of Criminal Procedure, is amended by amending Subsections (b) and (d) and adding Subsection (h) to read as follows:

(b) Each law enforcement agency in this state shall adopt a detailed written policy on racial profiling. The policy must:

(1) clearly define acts constituting racial profiling;

(2) strictly prohibit peace officers employed by the agency from engaging in racial profiling;

(3) implement a process by which an individual may file a complaint with the agency if the individual believes that a peace officer employed by the agency has engaged in racial profiling with respect to the individual;

(4) provide public education relating to the agency's compliment and complaint process, including providing the telephone number, mailing address, and e-mail address to make a compliment or complaint with respect to each ticket, citation, or warning issued by a peace officer;

(5) require appropriate corrective action to be taken against a peace officer employed by the agency who, after an investigation, is shown to have engaged in racial profiling in violation of

the agency's policy adopted under this article;

(6) require collection of information relating to motor vehicle stops in which a ticket, citation, or warning is issued and to arrests made as a result of those stops, including information relating to:

(A) the race or ethnicity of the individual detained;

(B) whether a search was conducted and, if so, whether the individual detained consented to the search; [and]

(C) whether the peace officer knew the race or ethnicity of the individual detained before detaining that individual;

(D) whether the peace officer used physical force that resulted in bodily injury, as that term is defined by Section 1.07, Penal Code, during the stop;

(E) the location of the stop; and

(F) the reason for the stop; and

(7) require the chief administrator of the agency, regardless of whether the administrator is elected, employed, or appointed, to submit an annual report of the information collected under Subdivision (6) to:

(A) the Texas Commission on Law Enforcement; and

(B) the governing body of each county or municipality served by the agency, if the agency is an agency of a county, municipality, or other political subdivision of the state.

(d) On adoption of a policy under Subsection (b), a law enforcement agency shall examine the feasibility of installing video camera and transmitter-activated equipment in each agency law enforcement motor vehicle regularly used to make motor vehicle stops and transmitter-activated equipment in each agency law enforcement motorcycle regularly used to make motor vehicle stops. The agency also shall examine the feasibility of equipping each peace officer who regularly detains or stops motor vehicles with a body worn camera, as that term is defined by Section 1701.651, Occupations Code. If a law enforcement agency installs video or audio equipment or equips peace officers with body worn cameras as provided by this subsection, the policy adopted by the agency under Subsection (b) must include standards for reviewing video and audio documentation.

(h) A law enforcement agency shall review the data collected under Subsection (b)(6) to identify any improvements the agency could make in its practices and policies regarding motor vehicle stops.

SECTION 5.02. Article 2.133, Code of Criminal Procedure, is amended by amending Subsection (b) and adding Subsection (c) to read as follows:

(b) A peace officer who stops a motor vehicle for an alleged violation of a law or ordinance shall report to the law enforcement agency that employs the officer information relating to the stop, including:

(1) a physical description of any person operating the motor vehicle who is detained as a result of the stop, including:

(A) the person's gender; and

(B) the person's race or ethnicity, as stated by the person or, if the person does not state the person's race or ethnicity, as determined by the officer to the best of the officer's ability;

(2) the initial reason for the stop;

(3) whether the officer conducted a search as a result of the stop and, if so, whether the person detained consented to the search;

(4) whether any contraband or other evidence was discovered in the course of the search and a description of the contraband or evidence;

(5) the reason for the search, including whether:

(A) any contraband or other evidence was in plain view;

(B) any probable cause or reasonable suspicion existed to perform the search; or

(C) the search was performed as a result of the towing of the motor vehicle or the arrest of any person in the motor vehicle;

(6) whether the officer made an arrest as a result of the stop or the search, including a statement of whether the arrest was based on a violation of the Penal Code, a violation of a traffic law or ordinance, or an outstanding warrant and a statement of the offense charged;

(7) the street address or approximate location of the stop; [and]

(8) whether the officer issued a verbal or written warning or a ticket or citation as a result of the stop; and

(9) whether the officer used physical force that resulted in bodily injury, as that term is defined by Section 1.07, Penal Code, during the stop.

(c) The chief administrator of a law enforcement agency, regardless of whether the administrator is elected, employed, or appointed, is responsible for auditing reports under Subsection (b)
to ensure that the race or ethnicity of the person operating the motor vehicle is being reported.

SECTION 5.03. Article 2.134(c), Code of Criminal Procedure, is amended to read as follows:

(c) A report required under Subsection (b) must be submitted by the chief administrator of the law enforcement agency, regardless of whether the administrator is elected, employed, or appointed, and must include:

(1) a comparative analysis of the information compiled under Article 2.133 to:

(A) evaluate and compare the number of motor vehicle stops, within the applicable jurisdiction, of persons who are recognized as racial or ethnic minorities and persons who are not recognized as racial or ethnic minorities; [and]

(B) examine the disposition of motor vehicle stops made by officers employed by the agency, categorized according to the race or ethnicity of the affected persons, as appropriate, including any searches resulting from stops within the applicable jurisdiction; and

(C) evaluate and compare the number of searches resulting from motor vehicle stops within the applicable jurisdiction and whether contraband or other evidence was discovered in the course of those searches; and

(2) information relating to each complaint filed with the agency alleging that a peace officer employed by the agency has engaged in racial profiling.

SECTION 5.04. Article 2.137, Code of Criminal Procedure, is amended to read as follows:

Art. 2.137. PROVISION OF FUNDING OR EQUIPMENT. (a) The Department of Public Safety shall adopt rules for providing funds or video and audio equipment to law enforcement agencies for the purpose of installing video and audio equipment in law enforcement motor vehicles and

motorcycles or equipping peace officers with body worn cameras [as described by Article 2.135(a)(1)(A)], including specifying criteria to prioritize funding or equipment provided to law enforcement agencies. The criteria may include consideration of tax effort, financial hardship, available revenue, and budget surpluses. The criteria must give priority to:

(1) law enforcement agencies that employ peace officers whose primary duty is traffic enforcement;

(2) smaller jurisdictions; and

(3) municipal and county law enforcement agencies.

(b) The Department of Public Safety shall collaborate with an institution of higher education to identify law enforcement agencies that need funds or video and audio equipment for the purpose of installing video and audio equipment in law enforcement motor vehicles and motorcycles or equipping peace officers with body worn cameras [as described by Article 2.135(a)(1)(A)]. The collaboration may include the use of a survey to assist in developing criteria to prioritize funding or equipment provided to law enforcement agencies.

(c) To receive funds or video and audio equipment from the state for the purpose of installing video and audio equipment in law enforcement motor vehicles and motorcycles or equipping peace officers with body worn cameras [as described by Article 2.135(a)(1)(A)], the governing body of a county or municipality, in conjunction with the law enforcement agency serving the county or municipality, shall certify to the Department of Public Safety that the law enforcement agency needs funds or video and audio equipment for that purpose.

(d) On receipt of funds or video and audio equipment from the state for the purpose of installing video and audio equipment in law enforcement motor vehicles and motorcycles or equipping peace officers with body worn cameras [as described by Article 2.135(a)(1)(A)], the governing body of a county or municipality, in conjunction with the law enforcement agency serving the county or municipality, shall certify to the Department of Public Safety that the law enforcement agency has taken the necessary actions to use and is using [installed] video and audio equipment and body worn cameras for those purposes [as described by Article 2.135(a)(1)(A) and is using the equipment as required by Article 2.135(a)(1)].

SECTION 5.05. Article 2.1385(a), Code of Criminal Procedure, is amended to read as follows:

(a) If the chief administrator of a local law enforcement agency intentionally fails to submit the incident-based data as required by Article 2.134, the agency is liable to the state for a civil penalty in an [the] amount not to exceed $5,000 [of $1,000] for each violation. The attorney general may sue to collect a civil penalty under this subsection.

SECTION 5.06. Article 2.135, Code of Criminal Procedure, is repealed.

SECTION 5.07. Articles 2.132 and 2.134, Code of Criminal Procedure, as amended by this article, apply only to a report covering a calendar year beginning on or after January 1, 2018.

SECTION 5.08. Not later than September 1, 2018, the Texas Commission on Law Enforcement shall:

(1) evaluate and change the guidelines for compiling and reporting information required under Article 2.134, Code of Criminal Procedure, as amended by this article, to enable the

guidelines to better withstand academic scrutiny; and

(2) make accessible online:

(A) a downloadable format of any information submitted under Article 2.134(b), Code of Criminal Procedure, that is not exempt from public disclosure under Chapter 552, Government Code; and

(B) a glossary of terms relating to the information to make the information readily understandable to the public. This Act takes effect September 1, 2017.

_____ _____ President of the Senate Speaker of the House

I hereby certify that S.B. No. 1849 passed the Senate on May 11, 2017, by the following vote: Yeas 31, Nays 0.

_____

Secretary of the Senate

I hereby certify that S.B. No. 1849 passed the House on May 20, 2017, by the following vote: Yeas 137, Nays 0, one present not voting.

ARTICLE 6. EFFECTIVE DATE

SECTION 6.01. Except as otherwise provided by this Act,

Approved:

_____

Date

_____

Governor

_____

Chief Clerk of the House

ADDISON POLICE DEPARTMENT
RACIAL PROFILING POLICY

167.00 BIASED-BASED POLICING (TBBP: 2.01.1)

The purpose of this order is to reaffirm the Town of Addison Police Department's commitment to unbiased policing in all its encounters with any person; to reinforce procedures that serve to ensure public confidence and mutual trust through the provision of services in a fair and equitable fashion; and to protect our officers from unwarranted accusations of misconduct when they act within the dictates of departmental policy and the law.

This policy is for internal use only and does not enhance an officer's civil or criminal liability in any way. It should not be construed as the creation of a higher standard of safety or care in an evidentiary sense, with respect to third party claims. Violations of this General Order, if proven, can only form the basis of a complaint by this Department and only in a non-judicial, administrative setting.

167.01 Policy

It is the policy of this department to police in a proactive manner and to aggressively investigate suspected violations of the law. Officers shall actively enforce local, state and federal laws in a responsible and professional manner, without regard to race, ethnicity or national origin. Officers are strictly prohibited from engaging in racial profiling as defined in this policy. Racial profiling is an unacceptable police tactic and will not be condoned.

This policy is adopted in compliance with the applicable requirements of the Texas Code of Criminal Procedure, which prohibits Texas peace officers from engaging in racial profiling.

167.02 Definitions

a. Racial Profiling -a law enforcement-initiated action based on an individual's race, ethnicity, or national origin, rather than on behavior or information identifying the individual as having engaged in criminal activity. Racial profiling pertains to persons who are viewed as suspects or potential suspects of criminal behavior. The term is not relevant as it pertains to witnesses, complainants, persons needing assistance, or other citizen contacts.

b. Race or Ethnicity -persons of a particular descent, including White, Black, Hispanic/Latino, Asian/Pacific Islander, Middle Eastern, and Alaska Native/American Indian.

c. Acts Constituting Racial Profiling- acts initiating law enforcement action, such as a traffic stop, a detention, a search, issuance of a citation, or an arrest based solely upon an individual's race, ethnicity, or national origin or on the basis of racial or ethnic stereotypes, rather than upon the individual's behavior, information identifying

the individual as having possibly engaged in criminal activity, or other lawful reasons for the law enforcement action.

d. Motor Vehicle Contact -means an occasion in which a peace officer stops a motor vehicle for an alleged violation of law or ordinance.

167.03 Prohibition

a. Officers of the Addison Police Department are strictly prohibited from engaging in racial profiling. The prohibition against racial profiling does not preclude the use of race, ethnicity or national origin as factors in a detention decision by an officer. Race, ethnicity or national origin may be legitimate factors in such a decision when used as part of a description of a suspect or witness for whom an officer is searching.

b. Officers of the Addison Police Department shall not engage in profiling based solely on gender, sexual orientation, religion, economic status, age, culture, or any other identifiable group.

167.04 Complaint Process

a. No person shall be discouraged, intimidated or coerced from filing a complaint, or be discriminated against because they have filed a complaint.

b. Any person who believes that a peace officer employed by the Addison Police Department has engaged in racial profiling with respect to that person, may file a complaint in accordance with the provisions of the Standard Operating Procedure (Professional Standards).

1. An employee who is contacted regarding a complaint against an officer shall follow the procedures set forth in the Standard Operating Procedure (Professional Standards).

2. Citizens who appear in person wishing to file a complaint shall be provided with a departmental brochure, "How to File a Compliment or Complaint." Brochures are maintained in the Addison Police Department lobby, and at Addison Town Hall.

c. Any supervisor who becomes aware of an alleged or suspected violation of this policy shall report the alleged violation in accordance with the Standard Operating Procedure (Professional Standards).

d. All complaints of racial profiling shall be investigated as thoroughly as possible. Final disposition and/or assignment of the investigation will be approved the Chief of Police (or designee). A log of all Racial Profiling Complaints will be maintained by Police Administration.

167.05 Compliment Process

Any person wishing to compliment an officer, is encouraged to do so by calling the main police department phone number, sending an email to the Police Administration email address listed on the Racial Profiling brochures, or appearing in person at the Addison Police Department.

167.06 Disciplinary and Corrective Actions

Any officer of this Department who is found, after investigation, to have engaged in racial profiling in violation of this policy may be subject to disciplinary action, up to and including termination. Disciplinary

or corrective actions may include diversity, sensitivity or other appropriate training or counseling, as determined by the Chief of Police.

167.07 Public Education

a. This Department shall provide education to the public concerning the racial profiling compliment and complaint process. The primary method of public education shall be through a brochure, "How to File a Compliment or Complaint" which are maintained in the lobby of the Addison Police Department, and at the Addison Town Hall. Other education methods may be utilized to inform the public, including news media, civic presentations, the Internet, and/or public meetings.

b. The Department will also include on every written warning, ticket, and citation, the following: “For information on how to file a compliment or complaint related to racial profiling, please visit www.addisontexas.net”.

167.08 Collection of Information and Annual Report

a. For each motor vehicle contact related to an alleged violation of law or ordinance, for each motor vehicle contact in which a ticket, citation, or warning is issued, and/or for each arrest resulting from a motor vehicle contact, an officer involved in the stop shall collect the following information:

1. Information identifying the race or ethnicity of the person detained. The following codes will be used to identify the individual's race:

i. White

ii. Black

iii. Hispanic or Latino

iv. Asian or Pacific Islander

v. Alaska Native or American Indian

vi. Middle Eastern

vii. Other

**Officers may not ask the individual to identify their race. If the officer is unable to determine the race or ethnicity of the person contacted, then the race shall be entered as "Other".

2. Whether the officer knew the race or ethnicity of the individual detained before detaining that individual;

3. Initial reason for stop;

i. Violation of the law (other than Traffic)

ii. Pre-existing knowledge (i.e. Warrants)

iii. Moving Traffic Violation

iv. Vehicle Traffic Violation (equipment, inspection, etc.)

4. If a search was conducted as a result of the stop?

i. If so, did the detained person consent to the search?

5. Was contraband or other evidence discovered as a result of the search?

6. Description of contraband or evidence discovered:

i. Illegal drugs / drug paraphernalia

ii. Currency

iii. Weapons

iv. Alcohol

v. Stolen Property

vi. Other

7. Reason for the search:

i. Consent

ii. Contraband/evidence in plain sight

iii. Probable cause or reasonable suspicion

iv. Inventory as a result of vehicle towing

v. Incident to Arrest/Warrant

8. Information on Arrests:

i. Did the officer make an arrest as a result of the stop or search?

ii. Reasons for arrest:

1) Violation of Penal Code

2) Violation of Traffic Law

3) Violation of City Ordinance

4) Outstanding Warrant

9. Street Address or Approximate Location of Stop

i. City street

ii. US Highway

iii. County Road

iv. Private Property or Other

Officers shall use the final stop location when collecting this data

10. Was a verbal/written warning or ticket/citation issued as a result of the stop?

11. Whether the officer used physical force that resulted in bodily injury (as defined by Sec. 1.07, Penal Code, meaning “physical pain, illness, or any impairment of physical condition), during the stop?

i. Location of the stop

ii. Reason for the stop

b. The information collected shall be entered in to a database by entering Racial Profiling data utilizing the in-car Mobile Data Computer (MDC), electronic ticket-writers, or the computers available in the Department. All contacts requiring Racial Profiling data collection must be entered. In the event the data is unable to be collected electronically, the data will be recorded on temporary forms and entered in the database at a later date.

c. The Support Operations Division Commander shall ensure all Racial Profiling Data is collected and reported to the Chief of Police. The data collected shall be compiled in an annual report covering the period January 1 through December 31 of each year, and shall be submitted to the governing body of the Town of Addison no later than March 1 of the following year. The report will include:

1. A comparative analysis of the information compiled (under Article 2.133):

i. Evaluate and compare the number of motor vehicle stops, within

the applicable jurisdiction, of persons who are recognized as racial or ethnic minorities and persons who are not recognized as racial or ethnic minorities;

ii. Examine the disposition of motor vehicle stops made by officers employed by the agency, categorized according to the race or ethnicity of the affected persons, as appropriate, including any searches resulting from stops within the applicable jurisdiction;

iii. Evaluate and compare the number of searches resulting from motor vehicle stops within the applicable jurisdiction and whether contraband or other evidence was discovered in the course of those searches (SEARCH ANALYSIS).

2. Information related to each complaint filed with the agency alleging that a peace

officer employed by the agency has engaged in racial profiling.

3. Public education efforts concerning the racial profiling complaint process.

**Contacts are defined as motor vehicle stops related to an alleged violation of law or ordinance, OR motor vehicle stops that resulted in a ticket, citation, warning or arrest.

d. The annual report shall not include identifying information about any individual stopped or arrested, and shall not include identifying information about any peace officer involved in a stop or arrest.

e. Racial Profiling Data will also be reported to the Texas Commission on Law Enforcement (TCOLE) by March 1 of each year, following the Commission's prescribed format.

167.09 Audio and Video Equipment

a. Each motor vehicle regularly used by this department to make motor vehicle contacts shall be equipped with a mobile video camera system capable of recording video and audio.

b. Every peace officer employed by the Town of Addison will be issued, or have available for use, a body-mounted camera capable of recording video and audio.

c. Each motor vehicle contact made by an officer of this department capable of being recorded by video and audio, shall be recorded.

d. Supervisors and Officers shall ensure that mobile video camera equipment, and/or audio equipment, is properly functioning prior to commencing their tour of duty. Police units with malfunctioning or inoperable mobile video camera equipment shall not be utilized under normal circumstances.

e. Supervisors shall have the authority to assign patrol units with malfunctioning or inoperable mobile video equipment when situations dictate. Officers assigned to such units are required to have a properly functioning body-mounted camera capable of video and audio recording.

167.10 Review of Video and Audio Documentation

a. Each audio and video recording shall be retained for a minimum period of ninety (90) days, unless a complaint is filed alleging that an officer has engaged in racial profiling with respect to a motor vehicle contact. The Commander of the Field Operations Bureau shall ensure that all audio and recordings are properly stored and retained in accordance with applicable laws and this policy.

b. If a complaint is received alleging that an officer has engaged in racial profiling, the audio/video recording shall be forwarded to Police Administration, along with the complaint documentation. The Administration shall retain the video until final disposition of the complaint has been made.

c. Supervisors shall review a randomly selected sampling of five (5) video and audio recordings, made recently by officers under their direct supervision and employed by the Department, in order to determine if patterns of racial profiling exist. These reviews shall be conducted quarterly and documented on the appropriate Quarterly Inspection Form. Written documentation shall include:

1. The names of the officers whose contacts were reviewed;

2. The date(s) of the videos reviewed;

3. The date the actual review was conducted; and

4. The name of the person conducting the review.

d. The Field Operations Division Commander shall forward the required documentation to Police Administration.

e. Police Administration shall maintain a file of all video review documentation performed, in compliance with this policy.

f. In reviewing audio and video recordings, the supervisor shall seek to determine if the officer(s) reviewed have engaged in a pattern of racial profiling, this includes multiple acts constituting racial profiling for which there is no reasonable, credible explanation based on established police and law enforcement procedures.

167.11 Training

a. Each peace officer employed by the department shall complete the comprehensive education and training program on racial profiling established by the Texas Commission on Law Enforcement (TCOLE) not later than the second anniversary of the date the officer's license was issued or carried by the Addison Police Department.

b. The Chief of Police, in completing the training required by the Texas Education Code for chief administrators, shall complete the program on racial profiling established by the Bill Blackwood Law Enforcement Management Institute of Texas (LEMIT).



Work Session and Regular Meeting **13.**

Meeting Date: 02/25/2020

Department: City Secretary

AGENDA CAPTION:

Present, Discuss, and Consider Action on an **Ordinance Declaring Unopposed Candidates in the May 2, 2020 City General Election, Elected to Office; Canceling the Election; Providing a Severability Clause; and Providing an Effective Date.**

BACKGROUND:

On February 20, 2020 the City Secretary submitted to the City Council a Certification of Unopposed Candidates certifying that no person has made a declaration of write-in candidacy for the May 2, 2020 General Election, and that all the following candidates are unopposed:

- Guillermo "GQ" Quintanilla, Jr.;
- Paul Walden; and
- Marlin Willesen.

Upon receiving the certification, the City Council may declare the unopposed candidates elected to office, in which case the General Election is not held. This ordinance declaring the unopposed candidates elected must be posted at each polling place on Election Day used or that would have been used in the election.

Since the City Council has called for a Special Election on the May 2, 2020 uniform election date, the ballots used in that election, must include:

1. A list of the offices and names of the candidates that have been declared elected;
2. Listed separately after the measures or contested races in the separate election;
3. Under the heading "Unopposed Candidates Declared Elected";
4. With the candidates grouped in the same relative order prescribed for the ballot generally; and
5. Listed in a way that prevents voters from casting votes in connection with these candidates [Election Code 2.053(c)].

The statute provides that a certificate of election is issued to each candidate who is declared elected, in the same manner and at the same time as provided for a candidate elected at the election. Candidates elected through cancellation must

also qualify for office and take the oaths of office, the same as candidates elected at an election.

RECOMMENDATION:

Administration recommends approval.

Attachments

Ordinance Declaring Unopposed Candidates Elected

ORDINANCE NO. O20-___

AN ORDINANCE OF THE TOWN OF ADDISON DECLARING UNOPPOSED CANDIDATES IN THE MAY 2, 2020 GENERAL CITY ELECTION, ELECTED TO OFFICE; CANCELING THE ELECTION; PROVIDING A SEVERABILITY CLAUSE; AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, the General City Election was called for Saturday, May 2, 2020 for the purpose of electing members to the City Council; and

WHEREAS, the City Secretary has submitted a Certification of Unopposed Candidates, **Exhibit A**, advising that no person has made a declaration of write-in candidacy and that each of the candidates on the ballot is unopposed for election to office; and

WHEREAS, under these circumstances, Subchapter C, chapter 2, Election Code, authorizes the City Council to declare the candidates elected to office and cancel the election.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE TOWN OF ADDISION, TEXAS:

SECTION 1. The following candidates, who are unopposed in the Saturday, May 2, 2020 General City Election, are declared elected to office, and shall be issued certificates of election following the time the election would have been canvassed:

Guillermo *"GQ"* Quintanilla, Jr.
Paul Walden
Marlin Willesen

SECTION 2. The May 2, 2020 General City Election is canceled, and the secretary is directed to cause a copy of this ordinance to be posted on election day at each polling placed used or that would have been used in the election.

SECTION 3. It is declared to be the intent of the City Council that the phrases, clauses, sentences, paragraphs, and sections of this ordinance are severable, and if any phrase, clause, sentence, paragraph, or section of this ordinance is declared invalid by the judgment or decree of a court of competent jurisdiction, the invalidity shall not affect any of the remaining phrases, clauses, sentences, paragraphs, or sections of this ordinance since the City Council would have enacted them without the invalid portion.

SECTION 4. This ordinance shall take effect upon its final passage, and it is so ordained.

PASSED AND APPROVED BY THE CITY COUNCIL OF THE TOWN OF ADDISON, TEXAS, on this the ***25th*** day of ***FEBRUARY*** **2020.**

TOWN OF ADDISON, TEXAS

Joe Chow, Mayor

ATTEST:

Irma Parker, City Secretary

APPROVED AS TO FORM:

Brenda N. McDonald, City Attorney

EXHIBIT A

CERTIFICATION OF UNOPPOSED CANDIDATES BY THE CITY SECRETARY

I, *Irma G. Parker*, certify that I am the City Secretary of the Town of Addison and the authority responsible for preparing the ballot for the Saturday, May 2, 2020 General City Election. I further certify that no person has made a declaration of write-in candidacy, and all of the following candidates are unopposed:

Guillermo "GQ" Quintanilla, Jr.
Paul Walden
Marlin Willesen

TOWN OF ADDISON, TEXAS

Irma G. Parker

Irma G. Parker, City Secretary

Dated this ***18th*** day of ***FEBRUARY*** 2020.

CITY SECRETARY | P.O. Box 9010 Addison, TX 75001 | phone: 972.450.7017 fax: 972.450.7043 | ADDISONTEXAS.NET | IT ALL COMES TOGETHER.

Work Session and Regular Meeting **14.**

Meeting Date: 02/25/2020

Department: City Manager

Pillars: Gold Standard for Financial Health

AGENDA CAPTION:

Present and Discuss the **Finance Department Quarterly Financial Report of the Town of Addison for the Fiscal Year 2020 First Quarter Ended December 31, 2019**.

BACKGROUND:

The Town of Addison's financial policies require the publication of a financial report 60 days subsequent to the end of each fiscal quarter. This report covers the financial performance for the first quarter for Fiscal Year 2020 (October 1, 2019 - December 31, 2019). Enclosed in the report is an executive dashboard that provides a high-level look at some of the key financial indicators along with more detailed exhibits that demonstrate the current financial position for the various funds. The report includes information for the following funds: General, Hotel, Economic Development, Airport, Utility, and Stormwater funds.

Key highlights for the first quarter include:

- General Fund revenue totaled $10.1 million which is 26 percent of the fiscal year budget.
- General Fund expenditures totaled $9.04 million which is 21 percent of the fiscal year budget.
- Sales tax collections totaled $3.8 million which is 28.1 percent of the fiscal year budget.
- The Hotel Fund had revenue of $1.3 million and expenditures of $1.2 million which are in line with historical averages.
- Performing Arts expenditures are at 59.4 percent due to the first payment of the Water Tower Theatre grant.
- Special Events revenues totaled 17.2 percent and expenses totaled 16.5 percent of the fiscal year budget. This is in line with historical averages because of the timing of events.
- Airport Fund operating revenue totaled $1.4 million or 25.3 percent and operating expenditures totaled $1.1 million or 20.2 percent of the fiscal year budget.
- Utility Fund operating revenue totaled $2.5 million or 19.3 percent and expenditures totaled $2.3 million or 17.5 percent of the fiscal year budget. This is in line with historical averages (seasonally low water usage).
- Stormwater Fund revenue and expenditures are in line with historical

averages.

The Quarterly Investment Report for Quarter 1 of Fiscal Year 2020 is also being provided for informational purposes. This report has been prepared in accordance with state law and the Town's Financial Policies.

RECOMMENDATION:

Information only, no action required.

Attachments

Presentation - Quarterly Financial Report Fiscal Year 2020 First Quarter

Quarterly Financial Report - Fiscal Year 2020 First Quarter

Quarterly Investment Report - Fiscal Year 2020 First Quarter

Quarterly Financial Report
Fiscal Year 2020 First Quarter

February 25, 2020

Executive Dashboard – Key Revenue Sources

Financial Indicators

Positive variance compared to historical trends	Positive
Negative variance of 3%-5% and more than $50,000 compared to historical trends	Warning
Negative variance of >5% and more than $50,000 compared to historical trends	Negative

Key Revenue Sources	FY2020 Budget	Actual through 12/31/19	% Annual Budget
Ad Valorem Taxes - General Fund	$ 18,752,174	$ 4,718,551	25.16%
Non-Property Taxes - General Fund	14,840,000	3,842,970	25.90%
Hotel Tax	5,540,000	984,296	17.77% (1)
Franchise Fees - General Fund	2,332,100	617,579	26.48%
Service/Permitting/License Fees - General Fund	2,706,790	645,926	23.86%
Rental Income - All Funds	5,223,600	1,258,445	24.09%
Fines and Penalties - All Funds	427,000	109,388	25.62%
Special Event Revenue - Hotel Fund	1,297,500	145,805	11.24% (1)
Fuel Flowage Fees - Airport Fund	916,000	266,788	29.13%
Water and Sewer Charges - Utility Fund	12,927,738	2,431,986	18.81% (1)

(1) Percentages are below the quarterly threshold but actuals are in line with historical trends

Executive Dashboard – Key Expenditures

Financial Indicators

Positive variance compared to historical trends — Positive

Negative variance of 3%-5% and more than $50,000 compared to historical trends — Warning

Negative variance of >5% and more than $50,000 compared to historical trends — Negative

Key Expenditures	FY2020 Budget	Actual through 12/31/19	% Annual Budget
General Fund	$ 43,119,096	$ 9,040,948	20.97%
Hotel Fund	7,937,706	1,230,242	15.50%
Economic Development	1,870,331	315,632	16.88%
Airport Operations	5,635,675	1,135,683	20.15%
Utility Operations	13,112,660	2,301,062	17.55%

(1) Percentages are below the quarterly threshold but actuals are in line with historical trends

Personnel Information

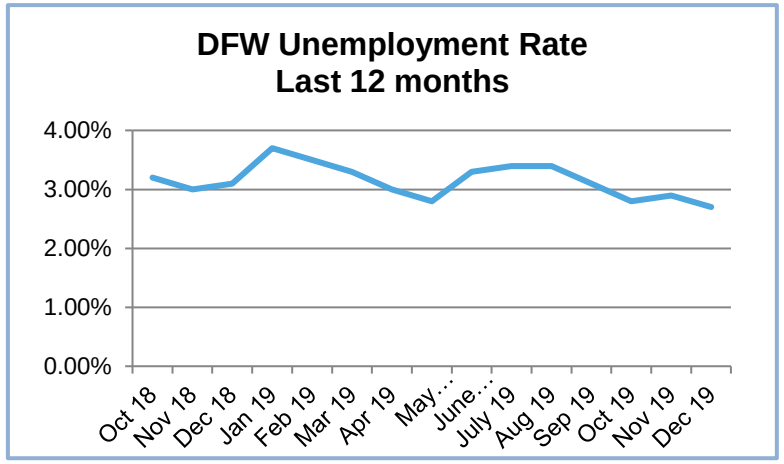
Separations - Benefitted Positions				
	10/2019-12/2019			FY2020
Department	Part-Time Positions	Full-time positions	Total 1st Qtr	YTD
City Manager	0	0	0	0
Conference Centre	0	1	1	1
Development Services	0	0	0	0
Finance	0	2	2	2
Fire	0	0	0	0
Development Services	0	0	0	0
Human Resources	0	0	0	0
Public Works	0	1	1	1
Municipal Court	0	0	0	0
Parks	0	1	1	1
Police	0	1	1	1
Recreation	2	0	2	2
Special Events	0	1	1	1
Streets	0	0	0	0
Grand Total	**2**	**7**	**9**	**9**

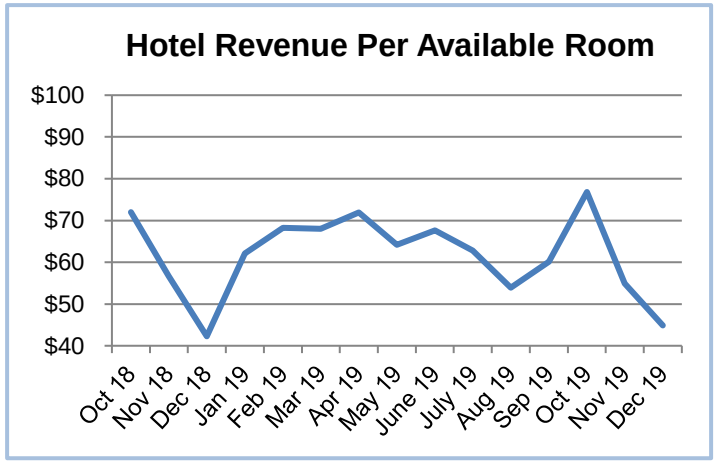
New Hires - Benefitted Positions				
	10/2019-12/2019			FY2020
Department	Part-Time Positions	Full-time positions	Total 1st Qtr	YTD
City Manager	0	0	0	0
Conference Centre	0	1	1	1
Development Services	0	0	0	0
Finance	0	0	0	0
Fire	0	3	3	3
General Services	0	0	0	0
Human Resources	0	0	0	0
Public Works	0	1	1	1
Municipal Court	0	0	0	0
Parks	0	1	1	1
Police	0	2	2	2
Recreation	0	0	0	0
Special Events	0	1	1	1
Streets	0	1	1	1
Grand Total	**0**	**10**	**10**	**10**

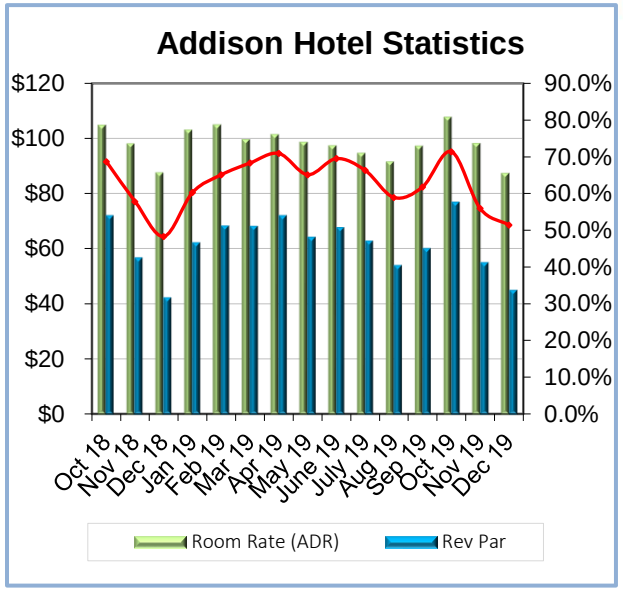
Public Safety Sworn Positions	Budgeted FY 2020	Filled Positions	Percent Filled
Police	62	58	94%
Fire [1]	56	57	102%

[1] Overfill of 1.00 FTE - Firefighter/Paramedic

Economic Indicators







Occupancy Indicators:

Office Occupancy = 82.6% — 1.5%

Retail Occupancy = 94.0% — 1.7%

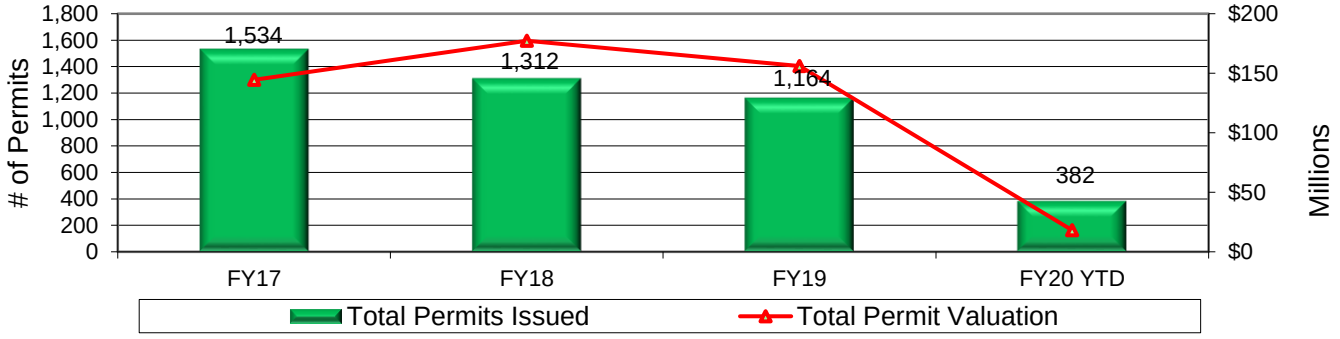
Source: CoStar (compares to prior year Q1)

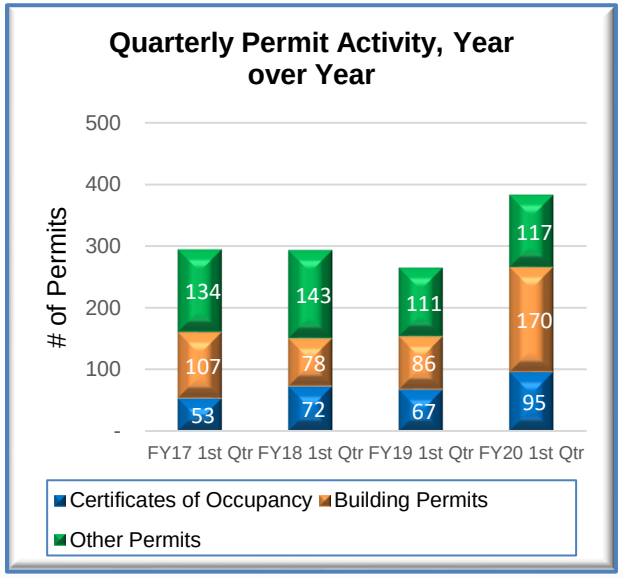
Hotel Indicators

Hotel Occupancy = 59.6% — 1.3%

RevPar = $58.89 — 3.3%

Source: STR Report (compares to prior year Q1)

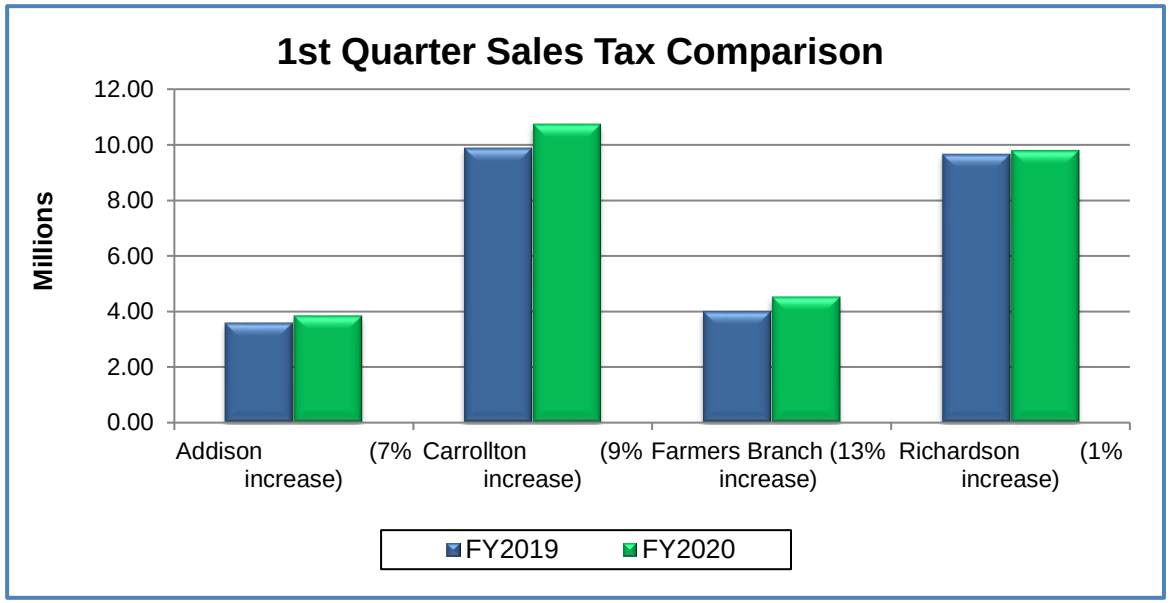




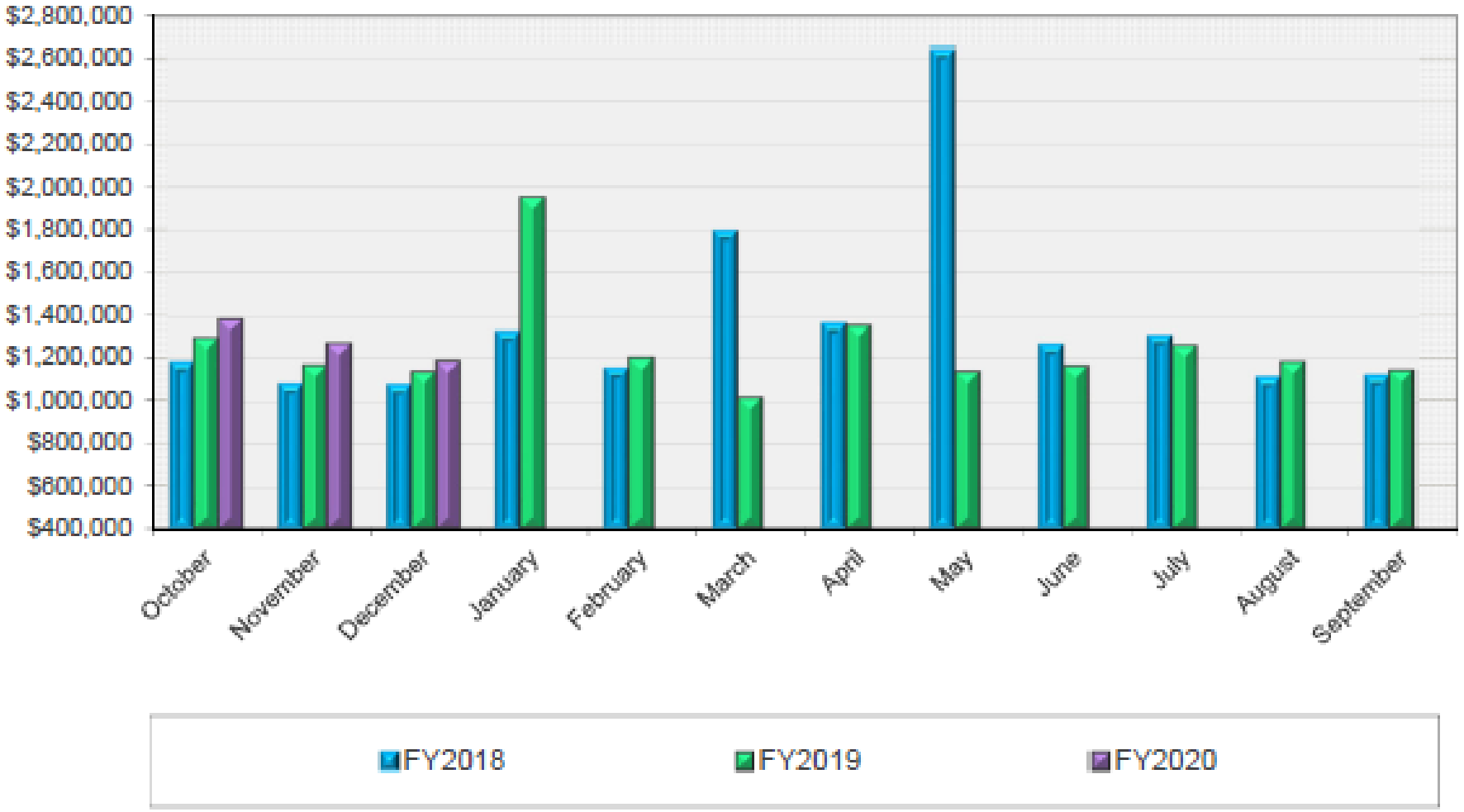
Economic Indicators

Economic Development Incentives:

Executed Agreements	Amount Paid FY20	Total Incentives Committed
5	$0	$505,334



Sales Tax Collections

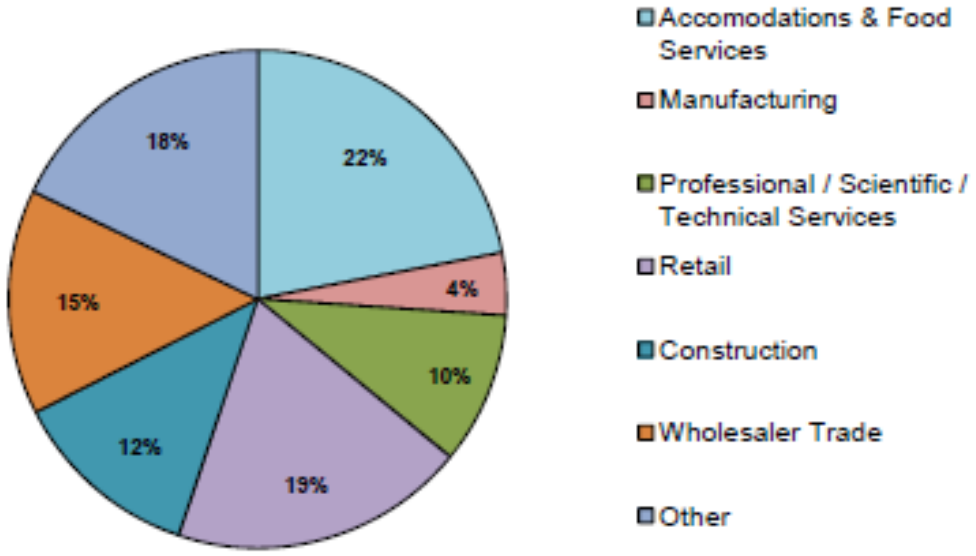


Sales Tax Collections

TOWN OF ADDISON
Schedule of Sales Tax Collections
For the quarter ending December 31, 2019

	FY2020 Monthly Collections	% Change from Prior Year	FY2019 Monthly Collections
October	$ 1,384,839	7.0%	$ 1,294,332
November	1,269,353	8.7%	1,168,041
December	1,188,777	4.5%	1,137,218
January			1,951,678
February			1,202,189
March			1,016,343
April			1,355,558
May			1,138,099
June			1,164,646
July			1,259,503
August			1,184,583
September			1,144,891
	$ 3,842,970		**$ 15,017,081**
Budget:	13,700,000	28.1%	13,400,000

Breakdown of Sales Tax by Economic Category



General Fund Revenue

CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget
Revenues:					
Ad Valorem taxes:					
Current taxes	$ 17,311,698	$ 18,781,674	$ 4,844,094	$ 4,844,094	25.8%
Delinquent taxes	(96,218)	(70,000)	(131,123)	(131,123)	187.3% (1)
Penalty & interest	40,238	40,500	5,580	5,580	13.8%
Non-property taxes:				-	
Sales tax	15,017,081	13,700,000	3,842,970	3,842,970	28.1%
Alcoholic beverage tax	1,151,057	1,140,000	-	-	0.0% (2)
Franchise / right-of-way use fees:					
Electric franchise	1,544,669	1,560,000	456,841	456,841	29.3%
Gas franchise	253,426	216,600	-	-	0.0% (3)
Telecommunication access fees	400,099	400,000	95,889	95,889	24.0%
Cable franchise	270,799	150,000	64,848	64,848	43.2%
Street rental fees	-	5,500	-	-	0.0%
Licenses and permits:					
Business licenses and permits	222,420	165,700	36,816	36,816	22.2%
Building and construction permits	1,161,087	574,500	190,196	190,196	33.1%
Service fees:					
General government	-	-	-	-	0.0%
Public safety	860,710	942,300	202,453	202,453	21.5%
Urban development	2,180	60,300	660	660	1.1%
Streets and sanitation	384,169	377,200	72,692	72,692	19.3%
Recreation	64,452	70,300	13,986	13,986	19.9%
Interfund	349,380	516,490	129,123	129,123	25.0%
Court fines	376,362	352,000	78,395	78,395	22.3%
Interest earnings	643,083	100,000	102,438	102,438	102.4%
Rental income	6,780	7,600	1,802	1,802	23.7%
Other	185,852	3,000	153,374	153,374	5112.5% (4)
Total Revenues	**40,149,324**	**39,093,664**	**10,161,034**	**10,161,034**	**26.0%**

(1) Delinquent property taxes are property taxes billed that will not be collected by the Town
(2) Alcoholic beverage tax has not yet been distributed by the state
(3) Franchise fee payment due in the 3rd quarter
(4) Includes $130,550 in sale of City property during the 1st quarter

General Fund Expenditures

CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget
Expenditures:					
General Government:					
City Secretary	173,173	207,783	38,036	38,036	18.3%
City Manager	1,182,714	1,246,999	279,337	279,337	22.4%
Finance	2,025,571	1,849,829	346,396	346,396	18.7%
General Services	709,740	766,195	134,163	134,163	17.5%
Municipal Court	640,728	739,563	130,202	130,202	17.6%
Human Resources	632,179	713,207	149,265	149,265	20.9%
Information Technology	1,990,604	2,220,737	353,237	353,237	15.9%
Combined Services	1,131,125	1,388,593	243,740	243,740	17.6%
Council Projects	327,325	351,811	161,667	161,667	46.0% [1]
Public Safety:					
Police	9,235,890	9,988,388	2,011,403	2,011,403	20.1%
Emergency Communications	1,365,005	1,432,188	454,460	454,460	31.7%
Fire	7,819,204	8,362,015	1,902,698	1,902,698	22.8%
Development Services	1,341,451	1,626,900	305,620	305,620	18.8%
Streets	1,597,712	2,220,634	385,224	385,224	17.3%
Parks and Recreation:					
Parks	3,886,241	4,044,545	816,978	816,978	20.2%
Recreation	1,593,519	1,899,309	313,422	313,422	16.5%
Other financing uses:					
Transfers to other funds	4,471,504	4,060,400	1,015,100	1,015,100	25.0%
Total Expenditures	**40,123,685**	**43,119,096**	**9,040,948**	**9,040,948**	**21.0%**
Net Change in Fund Balance	25,639	(4,025,432)	1,120,086	1,120,086	
Fund Balance at Beginning of Year	**20,962,956**	**20,962,956**		**20,988,595**	
Fund Balance at End of Year	**$ 20,988,595**	**$ 16,937,524**		**$ 22,108,682**	

[1] Council Special Projects is at 46% because many of the non-profit funding distributions take place in Q1

Hotel Fund

CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget
Revenues:					
Hotel/Motel occupancy taxes	$ 5,401,691	$ 5,540,000	$ 984,296	$ 984,296	17.8% [1]
Proceeds from special events	1,043,162	1,297,500	145,805	145,805	11.2% [2]
Conference centre rental	523,710	630,000	125,161	125,161	19.9%
Theatre centre rental	88,460	77,000	27,599	27,599	35.8%
Interest and miscellaneous	108,265	25,000	18,527	18,527	74.1%
Total Revenues	**7,165,288**	**7,569,500**	**1,301,388**	**1,301,388**	**17.2%**
Expenditures:					
Addison theatre centre	290,457	421,938	54,562	54,562	12.9%
Conference centre	933,014	1,152,735	225,924	225,924	19.6%
General hotel operations	141,706	144,173	21,942	21,942	15.2%
Marketing	949,693	1,134,939	140,368	140,368	12.4%
Performing arts	437,900	505,000	300,000	300,000	59.4% [3]
Special events	2,455,540	2,812,567	130,711	130,711	4.6% [2]
Special events operations	857,682	998,354	164,735	164,735	16.5%
Other financing uses:					
Transfer to Debt service fund	-	-	-	-	0.0%
Transfer to Economic Development Fund	715,000	768,000	192,000	192,000	25.0%
Total Expenditures	**6,780,992**	**7,937,706**	**1,230,242**	**1,230,242**	**15.5%**
Net Change in Fund Balance	384,296	(368,206)	71,146	71,146	
Fund Balance at Beginning of Year	**4,122,537**	**4,506,833**		**4,506,833**	
Fund Balance at End of Year	**$ 4,506,833**	**$ 4,138,627**		**$ 4,577,979**	

[1] Percentages are below the quarterly threshold but actuals are in line with historical trends

[2] Special event revenues and expenses are low due to the timing of events

[3] Initial payment for non-profit grant funding to Water Tower Theatre in October 2019

Economic Development Fund

CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget
Revenues:					
Ad Valorem taxes:	$ 1,114,158	$ 1,105,981	$ 276,856	$ 276,856	25.0%
Business license fee	53,295	50,500	3,453	3,453	6.8% [1]
Interest income and other	59,147	30,000	8,885	8,885	29.6%
Transfers from General/Hotel Fund	715,000	768,000	192,000	192,000	25.0%
Total Revenues	**1,941,600**	**1,954,481**	**481,195**	**481,195**	**24.6%**
Expenditures:					
Personnel services	451,119	479,272	106,586	106,586	22.2%
Supplies	17,769	23,645	1,960	1,960	8.3%
Maintenance	17,721	23,237	1,399	1,399	6.0%
Contractual services	1,040,308	1,327,180	201,437	201,437	15.2%
Capital replacement/lease	22,021	16,997	4,249	4,249	25.0%
Other financing uses:					
Transfers to other funds	-	-	-	-	0.0%
Total Expenditures	**1,548,938**	**1,870,331**	**315,632**	**315,632**	**16.9%**
Net Change in Fund Balance	392,662	84,150	165,562	165,562	
Fund Balance at Beginning of Year	**1,437,025**	**1,829,687**		**1,829,687**	
Fund Balance at End of Year	**$ 1,829,687**	**$ 1,913,837**		**$ 1,995,249**	

[1] Percentage is below the quarterly threshold but actuals are in line with historical trends

Airport Fund

CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget
Operating Revenues:					
Operating grants	$ -	$ 50,000	$ -	$ -	0.0% [1]
Service fees	103,306	138,000	25,625	25,625	18.6% [2]
Fuel flowage fees	1,019,452	916,000	266,788	266,788	29.1%
Rental income	5,488,112	4,509,000	1,103,882	1,103,882	24.5%
Interest income and other	334,809	80,000	46,747	46,747	58.4%
Total Operating Revenues:	**6,945,679**	**5,693,000**	**1,443,042**	**1,443,042**	**25.3%**
Operating Expenses:					
Town - Personnel services	319,907	470,762	77,028	77,028	16.4%
Town - Supplies	32,394	41,000	1,719	1,719	4.2%
Town - Maintenance	58,212	53,441	13,997	13,997	26.2%
Town - Contractual services	184,313	261,983	72,868	72,868	27.8%
Town - Capital Replacement/Lease	222,292	217,258	54,315	54,315	25.0%
Town - Debt service	748,948	853,910	388	388	0.0%
Town - Capital Outlay	-	-	-	-	0.0%
Operator - Operations and maintenance	2,761,617	3,308,028	824,707	824,707	24.9%
Operator - Service contract	458,337	429,293	90,661	90,661	21.1%
Total Operating Expenses:	**4,786,020**	**5,635,675**	**1,135,683**	**1,135,683**	**20.2%**
Net Change in Fund Balance	2,159,659	57,325	307,359	307,359	
Fund Balance at Beginning of Year	**4,854,289**	**7,013,948**		**7,013,948**	
Fund Balance at End of Year	**$ 7,013,948**	**$ 7,071,273**		**$ 7,321,307**	

[1] Routine Airport Maintenance Project (RAMP) grant funds are typically received in the 4th quarter

[2] Percentage is below the quarterly threshold but actuals are in line with historical trends

Utility Fund

CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget
Operating revenues:					
Water sales	$ 5,913,375	$ 7,051,676	$ 1,425,235	$ 1,425,235	20.2% [1]
Sewer charges	4,732,132	5,876,062	1,006,751	1,006,751	17.1% [1]
Tap fees	7,050	25,275	1,425	1,425	5.6% [1]
Penalties	107,593	75,000	30,994	30,994	41.3%
Interest income and other	651,282	94,600	68,938	68,938	72.9%
Total Operating Revenues:	**11,411,432**	**13,122,613**	**2,533,343**	**2,533,343**	**19.3%**
Operating expenses:					
Personnel services	1,696,403	2,264,720	382,560	382,560	16.9%
Supplies	169,159	217,990	51,770	51,770	23.7%
Maintenance	315,130	495,622	68,952	68,952	13.9%
Contractual services					
Water purchases	3,467,867	3,435,039	414,490	414,490	12.1%
Wastewater treatment	3,635,316	3,373,435	1,032,203	1,032,203	30.6% [2]
Other services	855,819	1,390,199	267,762	267,762	19.3%
Capital Replacement/Lease	340,657	331,857	82,964	82,964	25.0%
Debt service	1,133,162	1,513,798	362	362	0.0%
Capital outlay	74,949	90,000	-	-	0.0%
Other financing uses:					
Transfers to other funds	61,494	-		-	0.0%
Total Operating Expenses:	**11,749,956**	**13,112,660**	**2,301,062**	**2,301,062**	**17.5%**
Net Change in Fund Balance	(338,524)	9,953	232,281	232,281	
Fund Balance at Beginning of Year	**12,237,041**	**11,898,517**		**11,898,517**	
Fund Balance at End of Year	**$ 11,898,517**	**$ 11,908,470**		**$ 12,130,798**	

[1] Revenues represent a one-month lag in the collection of utility revenues and there is heavy seasonality with water revenue

[2] Wastewater treatment expenses are high due to the timing of payments

Stormwater Utility Fund

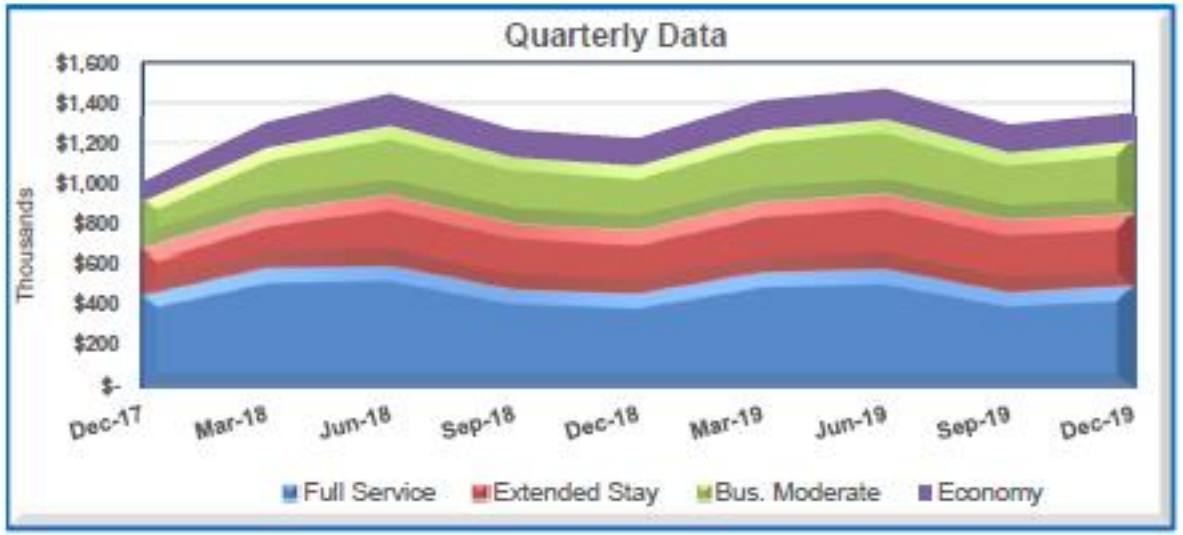
CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget
Operating revenues:					
Drainage Fees	$ 2,068,344	$ 2,349,795	$ 408,233	$ 408,233	17.4% [1]
Interest income and other	159,182	53,900	34,614	34,614	64.2%
Total Operating Revenues:	**2,227,526**	**2,403,695**	**442,847**	**442,847**	**18.4%**
Operating expenses					
Personnel services	272,726	304,134	64,384	64,384	21.2%
Supplies	15,392	20,597	3,884	3,884	18.9%
Maintenance	76,850	210,700	535	535	0.3%
Contractual services	173,228	367,874	29,747	29,747	8.1%
Debt service	546,916	544,466	-	-	0.0%
Capital outlay	21,035	40,000	22,762	22,762	56.9% [2]
Other financing uses:					
Transfers to other funds	500,000	-	-	-	0.0%
Total Operating Expenses:	**1,606,147**	**1,487,771**	**121,312**	**121,312**	**8.2%**
Net Change in Fund Balance	621,379	915,924	321,536	321,536	
Fund Balance at Beginning of Year	**5,417,133**	**6,038,512**		**6,038,512**	
Fund Balance at End of Year	**$ 6,038,512**	**$ 6,954,436**		**$ 6,360,048**	

[1] Fees represent a one-month lag in the collection of stormwater revenue but actuals are in line with historical trends

[2] Capital outlay includes the purchase of one delayed arrival vehicle

Hotel Occupancy Tax Collections

	Rooms		Oct. - Dec. 2019		20 to 19
	Number	%	Amount	%	% Diff.
Full Service					
Marriott Quorum	547	13%	$ 244,279	18%	33%
Renaissance	528	13%	170,990	13%	0%
Crowne Plaza	428	10%	88,371	7%	-20%
	1,503	37%	503,640	37%	8%
Extended Stay					
Budget Suites	344	8%	12,944	1%	571%
Hawthorn Suites	70	2%	16,331	1%	9%
Marriott Residence Inn	150	4%	58,584	4%	-7%
Hyatt House	132	3%	53,357	4%	29%
Homewood Suites	120	3%	53,960	4%	14%
Home2Suites	132	3%	75,242	6%	11%
Springhill Suites	159	4%	72,862	5%	18%
	1,107	27%	343,280	25%	15%
Business Moderate					
Marriott Courtyard Quorum	176	4%	88,389	7%	4%
LaQuinta Inn	152	4%	47,551	4%	0%
Marriott Courtyard Midway	145	4%	57,847	4%	6%
Radisson - Addison	101	2%	36,805	3%	6%
Hilton Garden Inn	96	2%	48,409	4%	6%
Holiday Inn Express	97	2%	40,552	3%	100%
Holiday Inn Beltway	102	2%	20,327	2%	100%
Best Western Plus	84	2%	26,197	2%	11%
	953	23%	366,077	27%	12%
Economy					
Motel 6	127	3%	31,106	2%	20%
Hampton Inn	158	4%	54,640	4%	-2%
Red Roof Inn	105	3%	24,502	2%	-5%
Quality Suites North/Galleria	78	2%	21,184	2%	-2%
America's Best Value Inn	60	1%	7,295	1%	21%
	528	13%	138,727	10%	3%
TOTAL	4,091	100%	1,351,725	100%	10%





Department of Finance

Quarterly Review

For the Period Ended December 31, 2019

Town of Addison

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To: **Wes Pierson, City Manager**

From: **Bill Hawley, Acting Finance Director**

Re: **First Quarter Financial Review**

Date: **2/10/2020**

This is the first quarter report for the 2019-2020 fiscal year. Revenues and expenditures reflect activity from October 1, 2019 through December 31, 2019 or twenty-five percent of the fiscal year.

GENERAL FUND

- Fiscal year to date revenue totaled $10.1 million, which is 26 percent of the overall budget amount. Sales tax collections are 28.1 percent of the fiscal year 2020 budget. Current year alcoholic beverage tax has not yet been distributed by the state.

- Fiscal year-to-date expenditures and transfers totaled approximately $9.0 million, which is 21.0 percent of budget. All departments are on pace with or below their respective budgets.

HOTEL FUND

- Revenues through the first quarter totaled approximately $1.3 million, 17.2 percent of the fiscal year 2020 budget. Hotel occupancy tax collections are 17.8 percent of budget for three months of collections or 25 percent of the fiscal year. Proceeds from Special Events are below budget due to the timing of events; all significant events occur between May and September.

- Hotel Fund expenditures of $1.2 million are 15.5 percent of budget and $15 thousand less than this time a year ago. Performing Arts expenditures are at 59.4 percent due to the first payment of the Water Tower Theater grant, and Special Events expenses are at 16.5 percent due to timing of events.

AIRPORT FUND

- Operating revenue through the first quarter totaled approximately $1.4 million or 25.3 percent of the fiscal year 2020 budget.
- Operating expenditures total $1.1 million, or 20.2 percent of fiscal year 2020 budget.
- Total year-to-date operating income for the Airport Fund is $307 thousand.

UTILITY FUND

- Operating revenue through the first quarter totaled just over $2.5 million or 19.3 percent of the fiscal year 2020 budget. With a one-month lag in the collection of utility revenues, 16.7 percent of the fiscal year has expired. Water revenues are 20.2 percent of the fiscal year 2020 budget. There is heavy seasonality with water revenue. The year-to-date revenue and percent of budget is in line with prior year.

- Operating expenses through the first quarter totaled approximately $2.3 million, or 17.5 percent of the fiscal year 2020 budget. Wastewater treatment expenses, however, are high due to the timing of payments and will continue to be monitored throughout the fiscal year.

STORMWATER FUND

- Operating revenue through the first quarter totaled almost $443 thousand or 18.4 percent of the fiscal year 2020 budget. With a one-month lag in the collection of stormwater revenues, 16.7 percent of the fiscal year has expired.

- Operating expenses through the first quarter totaled approximately $121 thousand or 8.2 percent of the fiscal year 2020 budget. The low percentage to budget is driven by our debt service payment, which is made in Q2 of the fiscal year. Capital expense includes the purchase of a new vehicle.

Executive Dashboard - 1st Quarter, 2020 Fiscal Year

Financial Indicators

Positive variance compared to historical trends	Positive
Negative variance of 3%-5% and more than $50,000 compared to historical trends	Warning
Negative variance of >5% and more than $50,000 compared to historical trends	Negative

Key Revenue Sources	FY2020 Budget	Actual through 12/31/19	% Annual Budget
Ad Valorem Taxes - General Fund	$ 18,752,174	$ 4,718,551	25.16%
Non-Property Taxes - General Fund	14,840,000	3,842,970	25.90%
Hotel Tax	5,540,000	984,296	17.77% (1)
Franchise Fees - General Fund	2,332,100	617,579	26.48%
Service/Permitting/License Fees - General Fund	2,706,790	645,926	23.86%
Rental Income - All Funds	5,223,600	1,258,445	24.09%
Fines and Penalties - All Funds	427,000	109,388	25.62%
Special Event Revenue - Hotel Fund	1,297,500	145,805	11.24% (1)
Fuel Flowage Fees - Airport Fund	916,000	266,788	29.13%
Water and Sewer Charges - Utility Fund	12,927,738	2,431,986	18.81% (1)

Key Expenditures	FY2020 Budget	Actual through 12/31/19	% Annual Budget
General Fund	$ 43,119,096	$ 9,040,948	20.97%
Hotel Fund	7,937,706	1,230,242	15.50%
Economic Development	1,870,331	315,632	16.88%
Airport Operations	5,635,675	1,135,683	20.15%
Utility Operations	13,112,660	2,301,062	17.55%

(1) Percentages are below the quarterly threshold but actuals are in line with historical trends

Executive Dashboard - 1st Quarter, 2020 Fiscal Year

Staffing Indicators

Personnel Information:

Separations - Benefitted Positions				
	10/2019-12/2019			FY2020
Department	Part-Time Positions	Full-time positions	Total 1st Qtr	YTD
City Manager	0	0	0	0
Conference Centre	0	1	1	1
Development Services	0	0	0	0
Finance	0	2	2	2
Fire	0	0	0	0
Development Services	0	0	0	0
Human Resources	0	0	0	0
Public Works	0	1	1	1
Municipal Court	0	0	0	0
Parks	0	1	1	1
Police	0	1	1	1
Recreation	2	0	2	2
Special Events	0	1	1	1
Streets	0	0	0	0
Grand Total	**2**	**7**	**9**	**9**

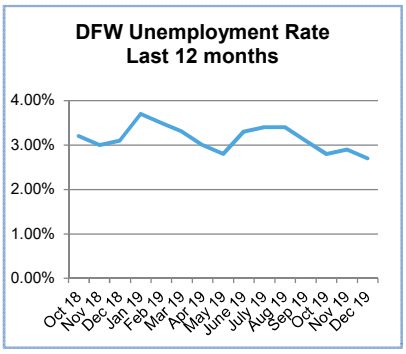
New Hires - Benefitted Positions				
	10/2019-12/2019			FY2020
Department	Part-Time Positions	Full-time positions	Total 1st Qtr	YTD
City Manager	0	0	0	0
Conference Centre	0	1	1	1
Development Services	0	0	0	0
Finance	0	0	0	0
Fire	0	3	3	3
General Services	0	0	0	0
Human Resources	0	0	0	0
Public Works	0	1	1	1
Municipal Court	0	0	0	0
Parks	0	1	1	1
Police	0	2	2	2
Recreation	0	0	0	0
Special Events	0	1	1	1
Streets	0	1	1	1
Grand Total	**0**	**10**	**10**	**10**

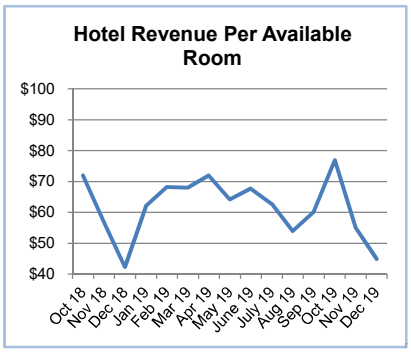
Public Safety Sworn Positions	Budgeted FY 2020	Filled Positions	Percent Filled
Police	62	58	94%
Fire [1]	56	57	102%

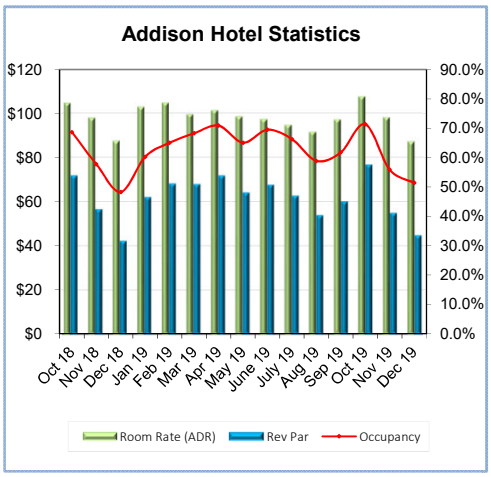
[1] Overfill of 1.00 FTE - Firefighter/Paramedic

Executive Dashboard - 1st Quarter, 2020 Fiscal Year

Economic Indicators







Occupancy Indicators:

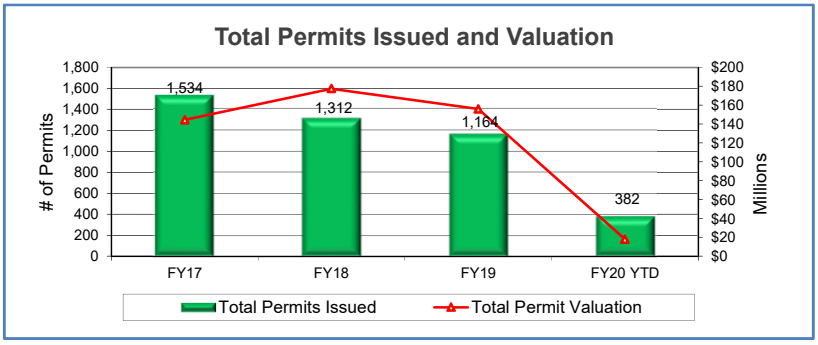
Office Occupancy =	Retail Occupancy =
82.6%	94.0%
1.5%	1.7%

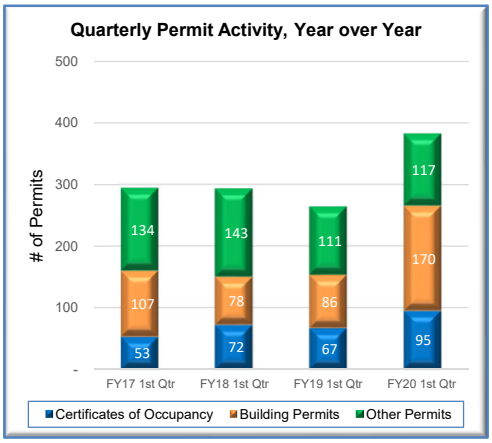
Hotel Indicators

Hotel Occupancy =	RevPar =
59.6%	$58.89
1.3%	3.3%

Source: CoStar (compares to prior year Q1)

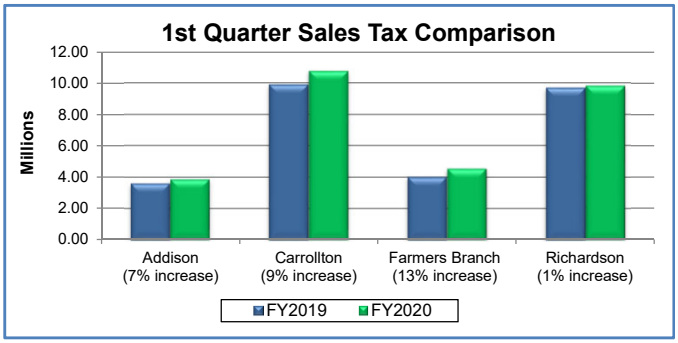
Source: STR Report (compares to prior year Q1)





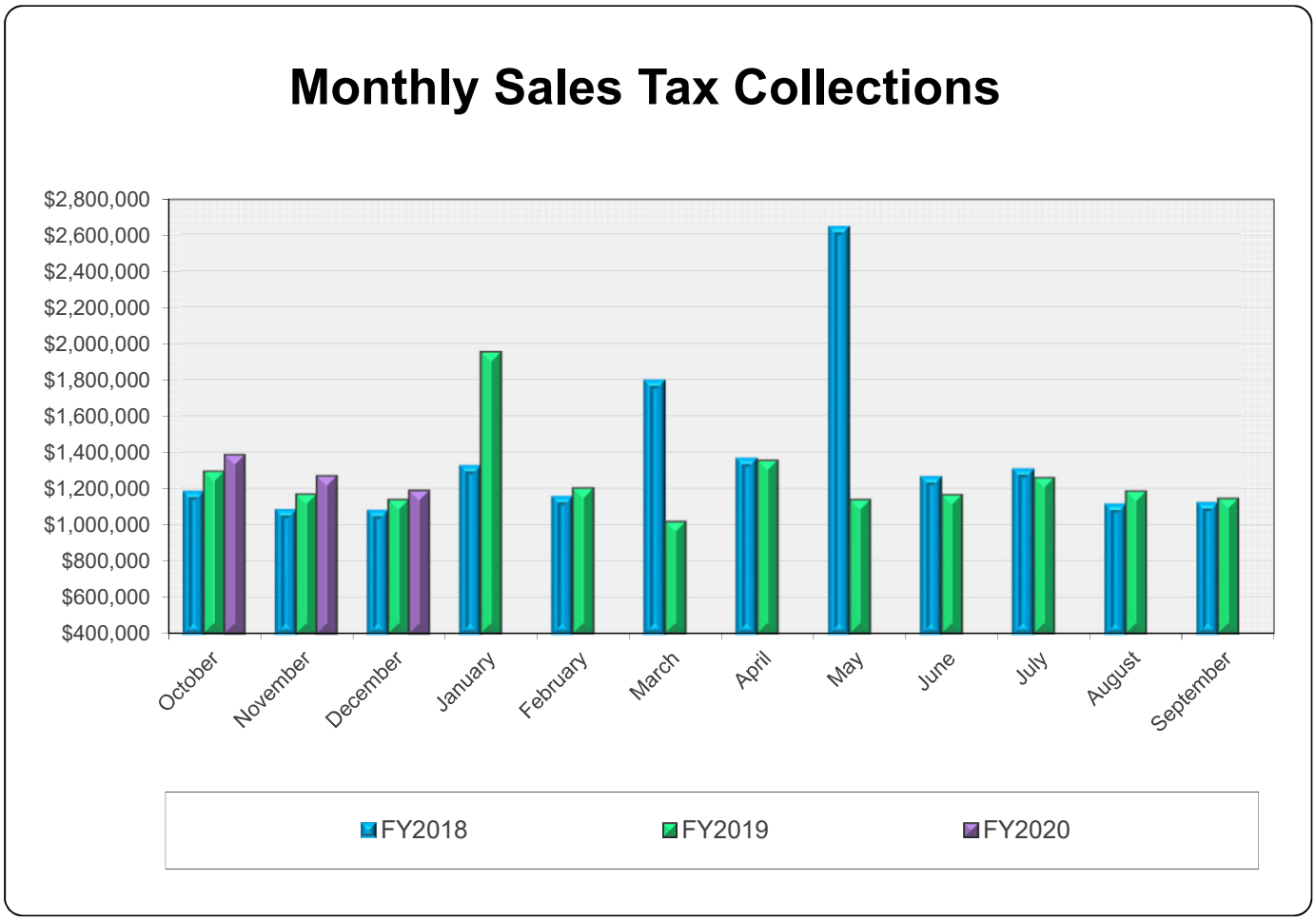
Economic Development Incentives:

Executed Agreements	Amount Paid FY20	Total Incentives Committed
5	$0	$505,334



Executive Dashboard - 1st Quarter, 2020 Fiscal Year

Sales Tax Information



Positive variance compared to historical trends	Positive
Negative variance of 3%-5% and more than $50,000 compared to historical trends	Warning
Negative variance of >5% and more than $50,000 compared to historical trends	Negative

TOWN OF ADDISON

GENERAL FUND

FY2019 QUARTERLY STATEMENT OF REVENUES AND EXPENDITURES COMPARED TO BUDGET

With Comparative Information from Prior Fiscal Year

CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget	
Revenues:						
Ad Valorem taxes:						
Current taxes	$ 17,311,698	$ 18,781,674	$ 4,844,094	$ 4,844,094	25.8%	
Delinquent taxes	(96,218)	(70,000)	(131,123)	(131,123)	187.3%	(1)
Penalty & interest	40,238	40,500	5,580	5,580	13.8%	
Non-property taxes:				-		
Sales tax	15,017,081	13,700,000	3,842,970	3,842,970	28.1%	
Alcoholic beverage tax	1,151,057	1,140,000	-	-	0.0%	(2)
Franchise / right-of-way use fees:						
Electric franchise	1,544,669	1,560,000	456,841	456,841	29.3%	
Gas franchise	253,426	216,600	-	-	0.0%	(3)
Telecommunication access fees	400,099	400,000	95,889	95,889	24.0%	
Cable franchise	270,799	150,000	64,848	64,848	43.2%	
Street rental fees	-	5,500	-	-	0.0%	
Licenses and permits:						
Business licenses and permits	222,420	165,700	36,816	36,816	22.2%	
Building and construction permits	1,161,087	574,500	190,196	190,196	33.1%	
Service fees:						
General government	-	-	-	-	0.0%	
Public safety	860,710	942,300	202,453	202,453	21.5%	
Urban development	2,180	60,300	660	660	1.1%	
Streets and sanitation	384,169	377,200	72,692	72,692	19.3%	
Recreation	64,452	70,300	13,986	13,986	19.9%	
Interfund	349,380	516,490	129,123	129,123	25.0%	
Court fines	376,362	352,000	78,395	78,395	22.3%	
Interest earnings	643,083	100,000	102,438	102,438	102.4%	
Rental income	6,780	7,600	1,802	1,802	23.7%	
Other	185,852	3,000	153,374	153,374	5112.5%	(4)
Total Revenues	**40,149,324**	**39,093,664**	**10,161,034**	**10,161,034**	**26.0%**	

(1) Delinquent property taxes are property taxes billed that will not be collected by the Town

(2) Alcoholic beverage tax has not yet been distributed by the state

(3) Franchise fee payment due in the 3rd quarter

(4) Includes $130,550 in sale of City property during the 1st quarter

Positive variance compared to historical trends	Positive
Negative variance of 3%-5% and more than $50,000 compared to historical trends	Warning
Negative variance of >5% and more than $50,000 compared to historical trends	Negative

TOWN OF ADDISON

GENERAL FUND

FY2019 QUARTERLY STATEMENT OF REVENUES AND EXPENDITURES COMPARED TO BUDGET

With Comparative Information from Prior Fiscal Year

CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget
Expenditures:					
General Government:					
City Secretary	173,173	207,783	38,036	38,036	18.3%
City Manager	1,182,714	1,246,999	279,337	279,337	22.4%
Finance	2,025,571	1,849,829	346,396	346,396	18.7%
General Services	709,740	766,195	134,163	134,163	17.5%
Municipal Court	640,728	739,563	130,202	130,202	17.6%
Human Resources	632,179	713,207	149,265	149,265	20.9%
Information Technology	1,990,604	2,220,737	353,237	353,237	15.9%
Combined Services	1,131,125	1,388,593	243,740	243,740	17.6%
Council Projects	327,325	351,811	161,667	161,667	46.0% (1)
Public Safety:					
Police	9,235,890	9,988,388	2,011,403	2,011,403	20.1%
Emergency Communications	1,365,005	1,432,188	454,460	454,460	31.7%
Fire	7,819,204	8,362,015	1,902,698	1,902,698	22.8%
Development Services	1,341,451	1,626,900	305,620	305,620	18.8%
Streets	1,597,712	2,220,634	385,224	385,224	17.3%
Parks and Recreation:					
Parks	3,886,241	4,044,545	816,978	816,978	20.2%
Recreation	1,593,519	1,899,309	313,422	313,422	16.5%
Other financing uses:					
Transfers to other funds	4,471,504	4,060,400	1,015,100	1,015,100	25.0%
Total Expenditures	**40,123,685**	**43,119,096**	**9,040,948**	**9,040,948**	**21.0%**
Net Change in Fund Balance	25,639	(4,025,432)	1,120,086	1,120,086	
Fund Balance at Beginning of Year	**20,962,956**	**20,962,956**		**20,988,595**	
Fund Balance at End of Year	**$ 20,988,595**	**$ 16,937,524**		**$ 22,108,682**	

(1) Council Special Projects is at 46% because many of the non-profit funding distributions take place in Q1

Positive variance compared to historical trends	Positive
Negative variance of 3%-5% and more than $50,000 compared to historical trends	Warning
Negative variance of >5% and more than $50,000 compared to historical trends	Negative

TOWN OF ADDISON

HOTEL FUND

FY2019 QUARTERLY STATEMENT OF REVENUES AND EXPENDITURES COMPARED TO BUDGET

With Comparative Information from Prior Fiscal Year

CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget
Revenues:					
Hotel/Motel occupancy taxes	$ 5,401,691	$ 5,540,000	$ 984,296	$ 984,296	17.8% [1]
Proceeds from special events	1,043,162	1,297,500	145,805	145,805	11.2% [2]
Conference centre rental	523,710	630,000	125,161	125,161	19.9%
Theatre centre rental	88,460	77,000	27,599	27,599	35.8%
Interest and miscellaneous	108,265	25,000	18,527	18,527	74.1%
Total Revenues	**7,165,288**	**7,569,500**	**1,301,388**	**1,301,388**	**17.2%**
Expenditures:					
Addison theatre centre	290,457	421,938	54,562	54,562	12.9%
Conference centre	933,014	1,152,735	225,924	225,924	19.6%
General hotel operations	141,706	144,173	21,942	21,942	15.2%
Marketing	949,693	1,134,939	140,368	140,368	12.4%
Performing arts	437,900	505,000	300,000	300,000	59.4% [3]
Special events	2,455,540	2,812,567	130,711	130,711	4.6% [2]
Special events operations	857,682	998,354	164,735	164,735	16.5%
Other financing uses:					
Transfer to Debt service fund	-	-	-	-	0.0%
Transfer to Economic Development Fund	715,000	768,000	192,000	192,000	25.0%
Total Expenditures	**6,780,992**	**7,937,706**	**1,230,242**	**1,230,242**	**15.5%**
Net Change in Fund Balance	384,296	(368,206)	71,146	71,146	
Fund Balance at Beginning of Year	**4,122,537**	**4,506,833**		**4,506,833**	
Fund Balance at End of Year	**$ 4,506,833**	**$ 4,138,627**		**$ 4,577,979**	

[1] Percentages are below the quarterly threshold but actuals are in line with historical trends

[2] Special event revenues and expenses are low due to the timing of events

[3] Initial payment for non-profit grant funding to Water Tower Theatre in October 2019

Positive variance compared to historical trends	Positive
Negative variance of 3%-5% and more than $50,000 compared to historical trends	Warning
Negative variance of >5% and more than $50,000 compared to historical trends	Negative

TOWN OF ADDISON

ECONOMIC DEVELOPMENT FUND

FY2019 QUARTERLY STATEMENT OF REVENUES AND EXPENDITURES COMPARED TO BUDGET

With Comparative Information from Prior Fiscal Year

CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget
Revenues:					
Ad Valorem taxes:	$ 1,114,158	$ 1,105,981	$ 276,856	$ 276,856	25.0%
Business license fee	53,295	50,500	3,453	3,453	6.8% [1]
Interest income and other	59,147	30,000	8,885	8,885	29.6%
Transfers from General/Hotel Fund	715,000	768,000	192,000	192,000	25.0%
Total Revenues	**1,941,600**	**1,954,481**	**481,195**	**481,195**	**24.6%**
Expenditures:					
Personnel services	451,119	479,272	106,586	106,586	22.2%
Supplies	17,769	23,645	1,960	1,960	8.3%
Maintenance	17,721	23,237	1,399	1,399	6.0%
Contractual services	1,040,308	1,327,180	201,437	201,437	15.2%
Capital replacement/lease	22,021	16,997	4,249	4,249	25.0%
Other financing uses:					
Transfers to other funds	-	-	-	-	0.0%
Total Expenditures	**1,548,938**	**1,870,331**	**315,632**	**315,632**	**16.9%**
Net Change in Fund Balance	392,662	84,150	165,562	165,562	
Fund Balance at Beginning of Year	**1,437,025**	**1,829,687**		**1,829,687**	
Fund Balance at End of Year	**$ 1,829,687**	**$ 1,913,837**		**$ 1,995,249**	

[1] Percentage is below the quarterly threshold but actuals are in line with historical trends

Positive variance compared to historical trends	Positive
Negative variance of 3%-5% and more than $50,000 compared to historical trends	Warning
Negative variance of >5% and more than $50,000 compared to historical trends	Negative

AIRPORT FUND

FY2019 QUARTERLY STATEMENT OF REVENUES AND EXPENDITURES COMPARED TO BUDGET

With Comparative Information from Prior Fiscal Year

CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget
Operating Revenues:					
Operating grants	$ -	$ 50,000	$ -	$ -	0.0% [1]
Service fees	103,306	138,000	25,625	25,625	18.6% [2]
Fuel flowage fees	1,019,452	916,000	266,788	266,788	29.1%
Rental income	5,488,112	4,509,000	1,103,882	1,103,882	24.5%
Interest income and other	334,809	80,000	46,747	46,747	58.4%
Total Operating Revenues:	**6,945,679**	**5,693,000**	**1,443,042**	**1,443,042**	**25.3%**
Operating Expenses:					
Town - Personnel services	319,907	470,762	77,028	77,028	16.4%
Town - Supplies	32,394	41,000	1,719	1,719	4.2%
Town - Maintenance	58,212	53,441	13,997	13,997	26.2%
Town - Contractual services	184,313	261,983	72,868	72,868	27.8%
Town - Capital Replacement/Lease	222,292	217,258	54,315	54,315	25.0%
Town - Debt service	748,948	853,910	388	388	0.0%
Town - Capital Outlay	-	-	-	-	0.0%
Operator - Operations and maintenance	2,761,617	3,308,028	824,707	824,707	24.9%
Operator - Service contract	458,337	429,293	90,661	90,661	21.1%
Total Operating Expenses:	**4,786,020**	**5,635,675**	**1,135,683**	**1,135,683**	**20.2%**
Net Change in Fund Balance	2,159,659	57,325	307,359	307,359	
Fund Balance at Beginning of Year	**4,854,289**	**7,013,948**		**7,013,948**	
Fund Balance at End of Year	**$ 7,013,948**	**$ 7,071,273**		**$ 7,321,307**	

[1] Routine Airport Maintenance Project (RAMP) grant funds are typically received in the 4th quarter

[2] Percentage is below the quarterly threshold but actuals are in line with historical trends

Positive variance compared to historical trends	Positive
Negative variance of 3%-5% and more than $50,000 compared to historical trends	Warning
Negative variance of >5% and more than $50,000 compared to historical trends	Negative

UTILITY FUND

FY2019 QUARTERLY STATEMENT OF REVENUES AND EXPENDITURES COMPARED TO BUDGET

With Comparative Information from Prior Fiscal Year

CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget
Operating revenues:					
Water sales	$ 5,913,375	$ 7,051,676	$ 1,425,235	$ 1,425,235	20.2% [1]
Sewer charges	4,732,132	5,876,062	1,006,751	1,006,751	17.1% [1]
Tap fees	7,050	25,275	1,425	1,425	5.6% [1]
Penalties	107,593	75,000	30,994	30,994	41.3%
Interest income and other	651,282	94,600	68,938	68,938	72.9%
Total Operating Revenues:	**11,411,432**	**13,122,613**	**2,533,343**	**2,533,343**	**19.3%**
Operating expenses:					
Personnel services	1,696,403	2,264,720	382,560	382,560	16.9%
Supplies	169,159	217,990	51,770	51,770	23.7%
Maintenance	315,130	495,622	68,952	68,952	13.9%
Contractual services					
Water purchases	3,467,867	3,435,039	414,490	414,490	12.1%
Wastewater treatment	3,635,316	3,373,435	1,032,203	1,032,203	30.6% [2]
Other services	855,819	1,390,199	267,762	267,762	19.3%
Capital Replacement/Lease	340,657	331,857	82,964	82,964	25.0%
Debt service	1,133,162	1,513,798	362	362	0.0%
Capital outlay	74,949	90,000	-	-	0.0%
Other financing uses:					
Transfers to other funds	61,494	-		-	0.0%
Total Operating Expenses:	**11,749,956**	**13,112,660**	**2,301,062**	**2,301,062**	**17.5%**
Net Change in Fund Balance	(338,524)	9,953	232,281	232,281	
Fund Balance at Beginning of Year	**12,237,041**	**11,898,517**		**11,898,517**	
Fund Balance at End of Year	**$ 11,898,517**	**$ 11,908,470**		**$ 12,130,798**	

[1] Revenues represent a one-month lag in the collection of utility revenues and there is heavy seasonality with water revenue

[2] Wastewater treatment expenses are high due to the timing of payments

Positive variance compared to historical trends	Positive
Negative variance of 3%-5% and more than $50,000 compared to historical trends	Warning
Negative variance of >5% and more than $50,000 compared to historical trends	Negative

STORMWATER UTILITY FUND

FY2019 QUARTERLY STATEMENT OF REVENUES AND EXPENDITURES COMPARED TO BUDGET

With Comparative Information from Prior Fiscal Year

CATEGORY	FY 2018-19 ACTUAL PRIOR YEAR	FY 2019-20 REVISED BUDGET	FY 2019-20 ACTUAL 1ST QTR	FY 2019-20 ACTUAL YTD	ACTUAL YTD as % of Budget
Operating revenues:					
Drainage Fees	$ 2,068,344	$ 2,349,795	$ 408,233	$ 408,233	17.4% [1]
Interest income and other	159,182	53,900	34,614	34,614	64.2%
Total Operating Revenues:	**2,227,526**	**2,403,695**	**442,847**	**442,847**	**18.4%**
Operating expenses					
Personnel services	272,726	304,134	64,384	64,384	21.2%
Supplies	15,392	20,597	3,884	3,884	18.9%
Maintenance	76,850	210,700	535	535	0.3%
Contractual services	173,228	367,874	29,747	29,747	8.1%
Debt service	546,916	544,466	-	-	0.0%
Capital outlay	21,035	40,000	22,762	22,762	56.9% [2]
Other financing uses:					
Transfers to other funds	500,000	-	-	-	0.0%
Total Operating Expenses:	**1,606,147**	**1,487,771**	**121,312**	**121,312**	**8.2%**
Net Change in Fund Balance	621,379	915,924	321,536	321,536	
Fund Balance at Beginning of Year	**5,417,133**	**6,038,512**		**6,038,512**	
Fund Balance at End of Year	**$ 6,038,512**	**$ 6,954,436**		**$ 6,360,048**	

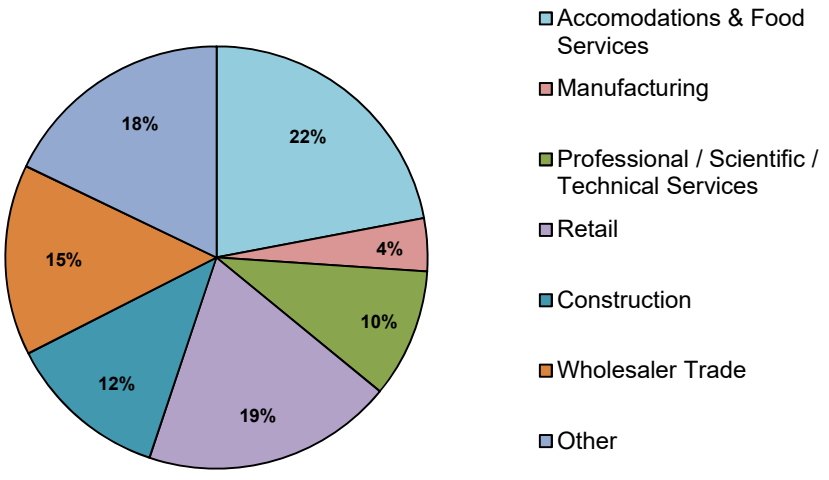
[1] Fees represent a one-month lag in the collection of stormwater revenue but actuals are in line with historical trends

[2] Capital outlay includes the purchase of one delayed arrival vehicle

TOWN OF ADDISON
Schedule of Sales Tax Collections
For the quarter ending December 31, 2019

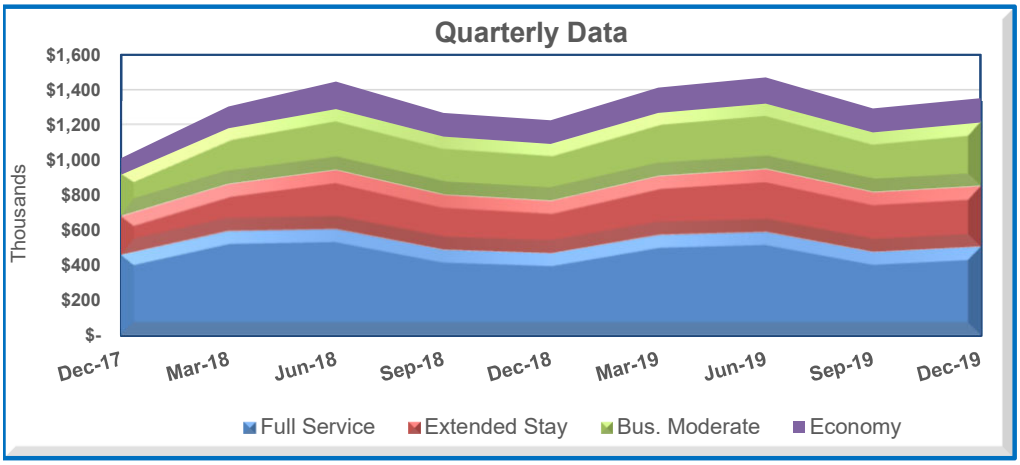
	FY2020 Monthly Collections	% Change from Prior Year	FY2019 Monthly Collections
October	$ 1,384,839	7.0%	$ 1,294,332
November	1,269,353	8.7%	1,168,041
December	1,188,777	4.5%	1,137,218
January			1,951,678
February			1,202,189
March			1,016,343
April			1,355,558
May			1,138,099
June			1,164,646
July			1,259,503
August			1,184,583
September			1,144,891
	$ 3,842,970		**$ 15,017,081**
Budget:	13,700,000	28.1%	13,400,000

Breakdown of Sales Tax by Economic Category



TOWN OF ADDISON
HOTEL OCCUPANCY TAX COLLECTION
Hotels By Service Type for the Quarter and Year-to-Date Ended December 31, 2019
With Comparative Information from Prior Fiscal Year

	Rooms		Oct. - Dec. 2019		20 to 19
	Number	%	Amount	%	% Diff.
Full Service					
Marriott Quorum	547	13%	$ 244,279	18%	33%
Renaissance	528	13%	170,990	13%	0%
Crowne Plaza	428	10%	88,371	7%	-20%
	1,503	37%	503,640	37%	8%
Extended Stay					
Budget Suites	344	8%	12,944	1%	571%
Hawthorn Suites	70	2%	16,331	1%	9%
Marriott Residence Inn	150	4%	58,584	4%	-7%
Hyatt House	132	3%	53,357	4%	29%
Homewood Suites	120	3%	53,960	4%	14%
Home2Suites	132	3%	75,242	6%	11%
Springhill Suites	159	4%	72,862	5%	18%
	1,107	27%	343,280	25%	15%
Business Moderate					
Marriott Courtyard Quorum	176	4%	88,389	7%	4%
LaQuinta Inn	152	4%	47,551	4%	0%
Marriott Courtyard Midway	145	4%	57,847	4%	6%
Radisson - Addison	101	2%	36,805	3%	6%
Hilton Garden Inn	96	2%	48,409	4%	6%
Holiday Inn Express	97	2%	40,552	3%	100%
Holiday Inn Beltway	102	2%	20,327	2%	100%
Best Western Plus	84	2%	26,197	2%	11%
	953	23%	366,077	27%	12%
Economy					
Motel 6	127	3%	31,106	2%	20%
Hampton Inn	158	4%	54,640	4%	-2%
Red Roof Inn	105	3%	24,502	2%	-5%
Quality Suites North/Galleria	78	2%	21,184	2%	-2%
America's Best Value Inn	60	1%	7,295	1%	21%
	528	13%	138,727	10%	3%
TOTAL	4,091	100%	1,351,725	100%	10%



HilltopSecurities
Asset Management

Investment Portfolio Summary

Town of Addison

ADDISON

For the Quarter Ended

December 31, 2019

Prepared by
HilltopSecurities Asset Management

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MARKET RECAP - DECEMBER 2019:

As December began, there were an unusually high number of potential disruptions capable of derailing an already fragile U.S. economy. The December Fed meeting and a U.K. general election, both key events, took a backseat to impending tariff escalation and the possibility of another government shutdown. But one-by-one, all the concerns eased. The December FOMC meeting matched expectations as Fed officials voted to hold monetary policy steady and signaled their intent to maintain the current 1.50% - 1.75% target rate for all of 2020. The U.K. elections produced expected results with Boris Johnson's Conservative party claiming a majority in the British Parliament, which should open the door for the United Kingdom to leave the European Union in 2020. On the U.S. budget front, funding was secured early and with little drama, ensuring the Federal government will continue operating. Recalling the extreme damage caused by last year's 35-day shutdown, both parties were more than willing to kick discussions out into 2021. The December game-changer came on the trade front as the administration announced "Phase 1" of a long anticipated trade deal with China just hours before new tariffs were set to kick in. Investors had apparently expected this painful escalation to be postponed, but the details of the agreement were more upbeat than expected and the announcement of de-escalation was welcomed relief. That relief was bolstered by news that Congress had signed-off on an amended version of the USMCA trade agreement, and representatives from Canada, Mexico and the United States promptly signed the deal.

Turning our attention to the economic data, the ISM manufacturing data retained its crown as the weakest piece of data, slipping from 48.3 to 48.1 in November, a fourth straight month of contraction. ISM's non-manufacturing index fell from 54.7 to 53.9, but remains above 50, indicating continued expansion, albeit at a slower pace. The employment report surprised to the upside as a whopping +266k new jobs were added to payrolls in November, handily beating the +180k median forecast. Upward revisions to the prior two months added another +41k to the tally, taking the monthly average for the last six months to a robust +196k. The unemployment rate dropped from 3.6% to 3.5%, matching a 50-year low. November retail sales rose a slight +0.2%, well shy of the expected +0.5%, however, since Thanksgiving fell so late this year, the tail end of the Black Friday weekend and Cyber Monday both fell into December, suggesting that December sales could get a boost at the expense of November. Inflation remains well contained with CPI running at +2.1% and core PCE well below the Fed's target at +1.5%. Home sales continue to be restrained by lean inventories, but gains in building permits, housing starts, and a 20-year high in the NAHB's builder confidence index all suggest that housing will continue to benefit from a strong labor market and sub-4% mortgage rates. In the year ahead, housing could become an important counter-balance to the recent weakness we have seen in the manufacturing sector.

All in all, December was a positive month with several key risks to the outlook fading, stable economic data, and interest rates holding well within recent ranges. With that backdrop, equity markets extended their rally as all of the major U.S. averages set new highs in the waning days of 2019.

For the Quarter Ended
December 31, 2019

This report is prepared for the **Town of Addison** (the "Entity") in accordance with Chapter 2256 of the Texas Public Funds Investment Act ("PFIA"). Section 2256.023(a) of the PFIA states that: "Not less than quarterly, the investment officer shall prepare and submit to the governing body of the entity a written report of the investment transactions for all funds covered by this chapter for the preceding reporting period." This report is signed by the Entity's investment officers and includes the disclosures required in the PFIA. To the extent possible, market prices have been obtained from independent pricing sources.

The investment portfolio complied with the PFIA and the Entity's approved Investment Policy and Strategy throughout the period. All investment transactions made in the portfolio during this period were made on behalf of the Entity and were made in full compliance with the PFIA and the approved Investment Policy.

Officer Names and Titles:

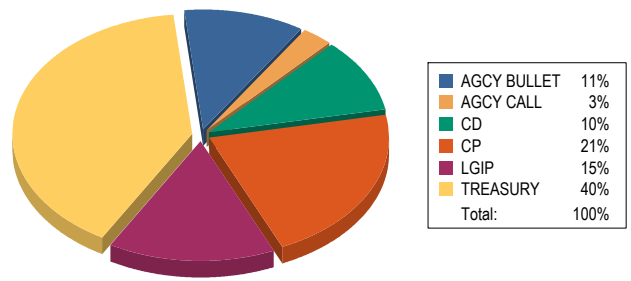
Name: Bill Hawley Title: Interim Chief Financial Officer

Name: Amanda D. Turner, CPA Title: Controller

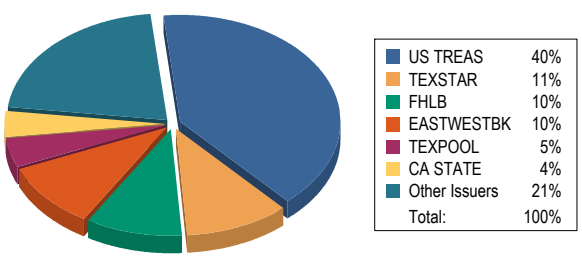
Account Summary

	Beginning Values as of 09/30/19	Ending Values as of 12/31/19
Par Value	87,372,579.68	105,548,863.56
Market Value	87,387,682.58	105,612,832.56
Book Value	87,282,326.73	105,546,641.03
Unrealized Gain /(Loss)	105,355.85	66,191.53
Market Value %	**100.12%**	**100.06%**
Weighted Avg. YTW	2.385%	2.011%
Weighted Avg. YTM	2.385%	2.011%

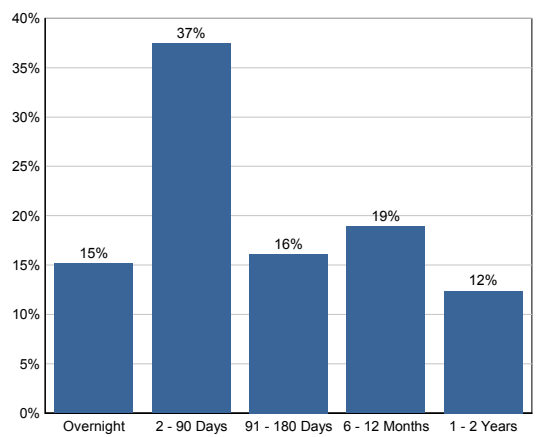
Allocation by Security Type



Allocation by Issuer

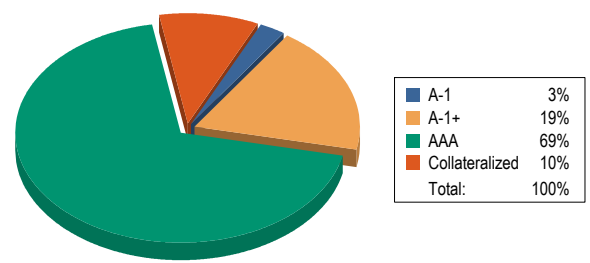


Maturity Distribution %

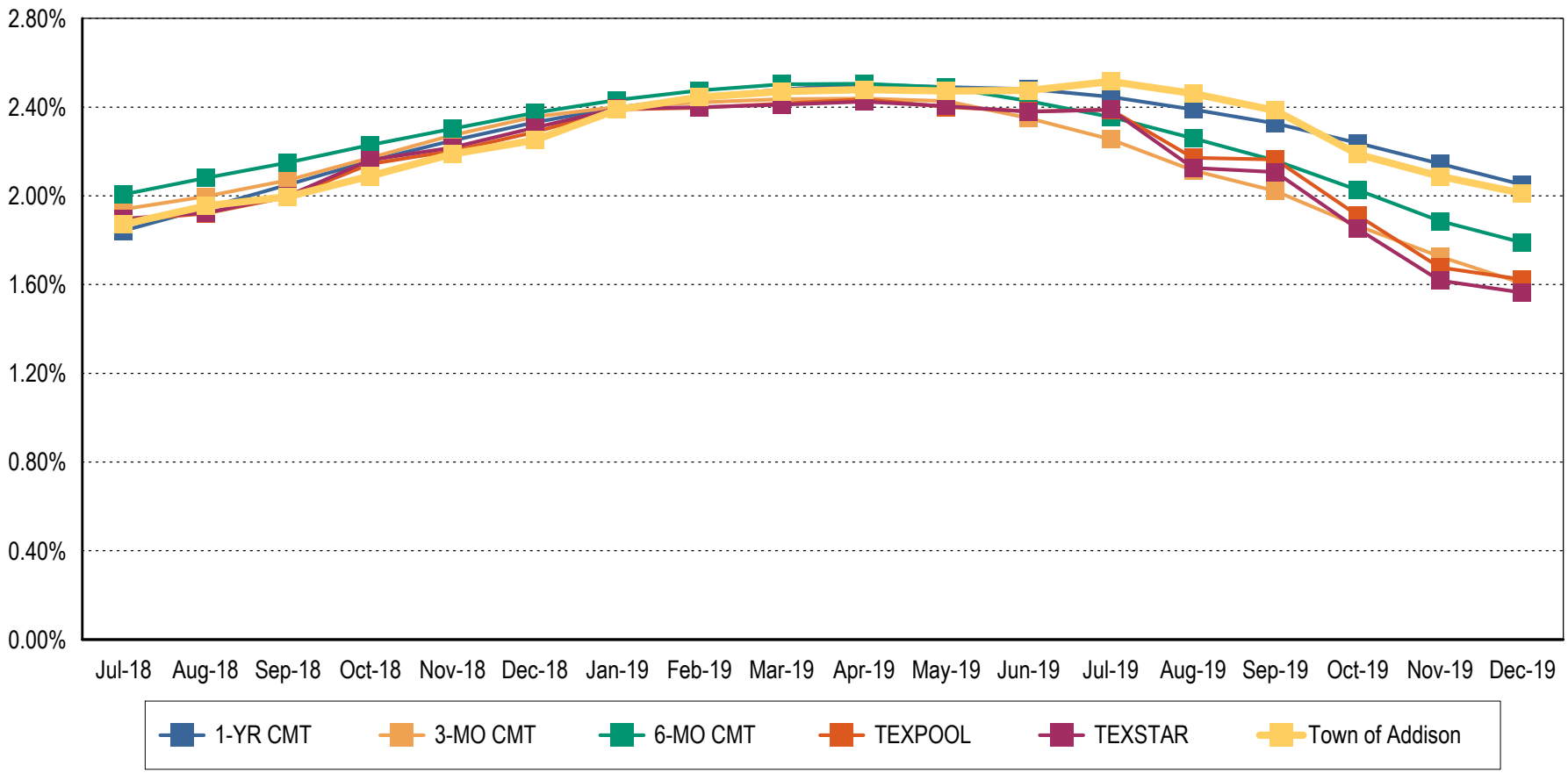


Weighted Average Days to Maturity: 139

Credit Quality



Town of Addison
Benchmark Comparison
As of 12/31/2019



Note 1: CMT stands for Constant Maturity Treasury. This data is published in Federal Reserve Statistical Release H.15 and represents an average of all actively traded Treasury securities having that time remaining until maturity. This is a standard industry benchmark for Treasury securities. The CMT benchmarks are moving averages. The 3-month CMT is the daily average for the previous 3 months, the 6-month CMT is the daily average for the previous 6 months, and the 1-year and 2-year CMT's are the daily averages for the previous 12-months.

Note 2: Benchmark data for TexPool is the monthly average yield.

Note 3: Benchmark data for TexSTAR is the monthly average yield.



Town of Addison

Detail of Security Holdings

As of 12/31/2019

CUSIP	Settle Date	Sec. Type	Sec. Description	CPN	Mty Date	Next Call	Call Type	Par Value	Purch Price	Orig Cost	Book Value	Mkt Price	Market Value	Days to Mty	Days to Call	YTM	YTW
Pooled Funds																	
TEXPOOL		LGIP	TexPool					4,860,363.87	100.000	4,860,363.87	4,860,363.87	100.000	4,860,363.87	1		1.623	1.623
TEXSTAR		LGIP	TexSTAR					11,145,214.27	100.000	11,145,214.27	11,145,214.27	100.000	11,145,214.27	1		1.564	1.564
05249HFU1	10/30/19	CP - INT	City of Austin, TX	1.900	01/08/20			2,740,000.00	100.000	2,740,000.00	2,740,000.00	99.991	2,739,753.40	8		1.900	1.900
66844CAN4	10/22/19	CP - DISC	Northwestern Univ		01/22/20			3,000,000.00	99.527	2,985,816.66	2,996,762.49	99.902	2,997,066.60	22		1.859	1.859
CD-8603-1	07/28/19	CD	East West Bk CD	2.250	01/28/20			5,194,577.65	100.000	5,194,577.65	5,194,577.65	100.000	5,194,577.65	28		2.250	2.250
9128283S7	03/21/19	TREAS NOTE	U.S. Treasury	2.000	01/31/20			3,000,000.00	99.570	2,987,109.38	2,998,782.60	100.026	3,000,793.50	31		2.504	2.504
3130ADN32	03/20/19	AGCY BULET	FHLB	2.125	02/11/20			3,000,000.00	99.634	2,989,020.00	2,998,629.27	100.053	3,001,580.40	42		2.541	2.541
CD-8019-1	08/12/19	CD	East West Bk CD	2.100	02/12/20			5,108,707.77	100.000	5,108,707.77	5,108,707.77	100.000	5,108,707.77	43		2.100	2.100
912828MP2	12/17/18	TREAS NOTE	U.S. Treasury	3.625	02/15/20			4,000,000.00	100.988	4,039,531.25	4,004,205.60	100.232	4,009,270.00	46		2.753	2.753
912828J50	01/30/19	TREAS NOTE	U.S. Treasury	1.375	02/29/20			3,000,000.00	98.699	2,960,976.56	2,994,102.66	99.953	2,998,604.10	60		2.604	2.604
13068CEA9	12/13/19	CP - INT	State of CA	1.730	03/11/20			4,000,000.00	100.000	4,000,000.00	4,000,000.00	100.016	4,000,625.20	71		1.730	1.730
3133XXP50	01/18/19	AGCY BULET	FHLB	4.125	03/13/20			4,500,000.00	101.688	4,575,946.50	4,513,311.05	100.476	4,521,425.40	73		2.627	2.627
89233GCS3	09/03/19	CP - DISC	Toyota Mtr Cr		03/26/20			2,000,000.00	98.878	1,977,563.89	1,990,697.22	99.556	1,991,113.40	86		1.992	1.992
912828X21	02/08/19	TREAS NOTE	U.S. Treasury	1.500	04/15/20			5,000,000.00	98.805	4,940,234.38	4,985,374.65	99.973	4,998,633.00	106		2.533	2.533
912828ND8	02/27/19	TREAS NOTE	U.S. Treasury	3.500	05/15/20			5,000,000.00	101.156	5,057,812.50	5,017,880.20	100.668	5,033,398.50	136		2.524	2.524
78009AEV2	09/30/19	CP - DISC	Royal Bank of Canada		05/29/20			2,500,000.00	98.696	2,467,397.22	2,479,926.40	99.200	2,480,000.00	150		1.966	1.966
78009AFF6	12/16/19	CP - DISC	Royal Bank of Canada		06/15/20			1,500,000.00	99.080	1,486,198.33	1,487,411.67	99.123	1,486,848.75	167		1.837	1.837
912828XU9	02/28/19	TREAS NOTE	U.S. Treasury	1.500	06/15/20			3,000,000.00	98.680	2,960,390.63	2,985,989.04	99.965	2,998,945.20	167		2.543	2.543
89233GGD2	10/17/19	CP - DISC	Toyota Mtr Cr		07/13/20			2,000,000.00	98.545	1,970,900.00	1,979,091.12	98.982	1,979,633.40	195		1.969	1.969
46640PGH0	10/23/19	CP - DISC	J.P.Morgan Sec		07/17/20			1,500,000.00	98.615	1,479,230.00	1,484,655.00	99.019	1,485,290.55	199		1.886	1.886
912828VP2	10/17/19	TREAS NOTE	U.S. Treasury	2.000	07/31/20			4,000,000.00	100.277	4,011,093.75	4,008,216.52	100.206	4,008,246.40	213		1.643	1.643
91514BGW7	11/05/19	CP - INT	Univ of TX	1.860	07/31/20			3,500,000.00	100.000	3,500,000.00	3,500,000.00	99.983	3,499,405.00	213		1.860	1.860
3137EAEJ4	12/10/19	AGCY BULET	FHLMC	1.625	09/29/20			4,000,000.00	99.984	3,999,360.00	3,999,410.12	99.994	3,999,750.40	273		1.644	1.644
9128282Z2	10/16/19	TREAS NOTE	U.S. Treasury	1.625	10/15/20			5,000,000.00	99.992	4,999,609.38	4,999,691.65	99.984	4,999,210.50	289		1.633	1.633
9128283X6	12/27/19	TREAS NOTE	U.S. Treasury	2.250	02/15/21			5,000,000.00	100.672	5,033,593.75	5,033,199.25	100.661	5,033,043.00	412		1.650	1.650
9128284B3	11/26/19	TREAS NOTE	U.S. Treasury	2.375	03/15/21			5,000,000.00	100.902	5,045,117.19	5,041,733.90	100.859	5,042,929.50	440		1.671	1.671
3130AHCE1	10/16/19	AGCY CALL	FHLB	1.750	04/15/21	4/15/2020	QRTLY	3,000,000.00	99.950	2,998,500.00	2,998,707.06	99.947	2,998,402.80	471	106	1.784	1.784
Total for Pooled Funds								**105,548,863.56**	**99.970**	**105,514,264.93**	**105,546,641.03**	**100.062**	**105,612,832.56**	**139**		**2.011**	**2.011**

CUSIP	Settle Date	Sec. Type	Sec. Description	CPN	Mty Date	Next Call	Call Type	Par Value	Purch Price	Orig Cost	Book Value	Mkt Price	Market Value	Days to Mty	Days to Call	YTM	YTW
Total for Town of Addison								105,548,863.56	99.970	105,514,264.93	105,546,641.03	100.062	105,612,832.56	139		2.011	2.011



Town of Addison
Change in Value
From 09/30/2019 to 12/31/2019

CUSIP	Security Type	Security Description	09/30/19 Book Value	Cost of Purchases	Maturities / Calls / Sales	Amortization / Accretion	Realized Gain/(Loss)	12/31/19 Book Value	09/30/19 Market Value	12/31/19 Market Value	Change in Mkt Value
Pooled Funds											
TEXPOOL	LGIP	TexPool	4,839,136.32	21,227.55	0.00	0.00	0.00	4,860,363.87	4,839,136.32	4,860,363.87	21,227.55
TEXSTAR	LGIP	TexSTAR	8,786,502.23	4,842,778.91	(2,484,066.87)	0.00	0.00	11,145,214.27	8,786,502.23	11,145,214.27	2,358,712.04
64105SXF0	CP - DISC	Nestle Finance Intl Ltd 0.000 10/15/19	2,996,919.99	0.00	(3,000,000.00)	3,080.01	0.00	0.00	2,997,474.90	0.00	(2,997,474.90)
912828T59	TREAS NOTE	U.S. Treasury 1.000 10/15/19	2,498,554.68	0.00	(2,500,000.00)	1,445.32	0.00	0.00	2,498,949.25	0.00	(2,498,949.25)
3130ACM92	AGCY BULET	FHLB 1.500 10/21/19	1,998,636.30	0.00	(2,000,000.00)	1,363.70	0.00	0.00	1,999,618.80	0.00	(1,999,618.80)
66844DXM9	CP - DISC	Northwestern Univ 0.000 10/21/19	2,996,316.66	0.00	(3,000,000.00)	3,683.34	0.00	0.00	2,996,250.00	0.00	(2,996,250.00)
91514BGE7	CP - INT	Univ of TX 2.730 11/05/19	2,000,000.00	0.00	(2,000,000.00)	0.00	0.00	0.00	2,000,280.00	0.00	(2,000,280.00)
3130AA3R7	AGCY BULET	FHLB 1.375 11/15/19	3,495,041.73	0.00	(3,500,000.00)	4,958.27	0.00	0.00	3,497,608.10	0.00	(3,497,608.10)
912828U73	TREAS NOTE	U.S. Treasury 1.375 12/15/19	2,992,771.29	0.00	(3,000,000.00)	7,228.71	0.00	0.00	2,996,835.90	0.00	(2,996,835.90)
46640QZT1	CP - DISC	J.P.Morgan Sec 0.000 12/27/19	2,484,654.18	0.00	(2,500,000.00)	15,345.82	0.00	0.00	2,487,576.00	0.00	(2,487,576.00)
05249HFU1	CP - INT	City of Austin, TX 1.900 01/08/20	0.00	2,740,000.00	0.00	0.00	0.00	2,740,000.00	0.00	2,739,753.40	2,739,753.40
66844CAN4	CP - DISC	Northwestern Univ 0.000 01/22/20	0.00	2,985,816.66	0.00	10,945.83	0.00	2,996,762.49	0.00	2,997,066.60	2,997,066.60
CD-8603-1	CD	East West Bk CD 2.250 01/28/20	5,165,202.29	29,375.36	0.00	0.00	0.00	5,194,577.65	5,165,202.29	5,194,577.65	29,375.36
9128283S7	TREAS NOTE	U.S. Treasury 2.000 01/31/20	2,995,049.22	0.00	0.00	3,733.38	0.00	2,998,782.60	3,000,820.20	3,000,793.50	(26.70)
3130ADN32	AGCY BULET	FHLB 2.125 02/11/20	2,995,545.18	0.00	0.00	3,084.09	0.00	2,998,629.27	3,002,200.20	3,001,580.40	(619.80)
CD-8019-1	CD	East West Bk CD 2.100 02/12/20	5,081,738.84	26,968.93	0.00	0.00	0.00	5,108,707.77	5,081,738.84	5,108,707.77	26,968.93
912828MP2	TREAS NOTE	U.S. Treasury 3.625 02/15/20	4,012,803.72	0.00	0.00	(8,598.12)	0.00	4,004,205.60	4,024,687.60	4,009,270.00	(15,417.60)
912828J50	TREAS NOTE	U.S. Treasury 1.375 02/29/20	2,984,906.85	0.00	0.00	9,195.81	0.00	2,994,102.66	2,993,437.50	2,998,604.10	5,166.60
13068CEA9	CP - INT	State of CA 1.730 03/11/20	0.00	4,000,000.00	0.00	0.00	0.00	4,000,000.00	0.00	4,000,625.20	4,000,625.20
3133XXP50	AGCY BULET	FHLB 4.125 03/13/20	4,529,949.89	0.00	0.00	(16,638.84)	0.00	4,513,311.05	4,545,970.65	4,521,425.40	(24,545.25)
89233GCS3	CP - DISC	Toyota Mtr Cr 0.000 03/26/20	1,980,628.34	0.00	0.00	10,068.88	0.00	1,990,697.22	1,980,024.40	1,991,113.40	11,089.00
912828X21	TREAS NOTE	U.S. Treasury 1.500 04/15/20	4,972,584.45	0.00	0.00	12,790.20	0.00	4,985,374.65	4,990,234.50	4,998,633.00	8,398.50
912828ND8	TREAS NOTE	U.S. Treasury 3.500 05/15/20	5,029,926.95	0.00	0.00	(12,046.75)	0.00	5,017,880.20	5,050,390.50	5,033,398.50	(16,992.00)
78009AEV2	CP - DISC	Royal Bank of Canada 0.000 05/29/20	2,467,531.95	0.00	0.00	12,394.45	0.00	2,479,926.40	2,467,061.00	2,480,000.00	12,939.00
78009AFF6	CP - DISC	Royal Bank of Canada 0.000 06/15/20	0.00	1,486,198.33	0.00	1,213.34	0.00	1,487,411.67	0.00	1,486,848.75	1,486,848.75
912828XU9	TREAS NOTE	U.S. Treasury 1.500 06/15/20	2,978,303.43	0.00	0.00	7,685.61	0.00	2,985,989.04	2,992,508.70	2,998,945.20	6,436.50
89233GGD2	CP - DISC	Toyota Mtr Cr 0.000 07/13/20	0.00	1,970,900.00	0.00	8,191.12	0.00	1,979,091.12	0.00	1,979,633.40	1,979,633.40
46640PGH0	CP - DISC	J.P.Morgan Sec 0.000 07/17/20	0.00	1,479,230.00	0.00	5,425.00	0.00	1,484,655.00	0.00	1,485,290.55	1,485,290.55
912828VP2	TREAS NOTE	U.S. Treasury 2.000 07/31/20	0.00	4,011,093.75	0.00	(2,877.23)	0.00	4,008,216.52	0.00	4,008,246.40	4,008,246.40
91514BGW7	CP - INT	Univ of TX 1.860 07/31/20	0.00	3,500,000.00	0.00	0.00	0.00	3,500,000.00	0.00	3,499,405.00	3,499,405.00
3130AH2K8	AGCY CALL	FHLB 2.050 09/10/20	3,999,622.24	0.00	(4,000,000.00)	377.76	0.00	0.00	4,000,063.60	0.00	(4,000,063.60)
3137EAEJ4	AGCY BULET	FHLMC 1.625 09/29/20	0.00	3,999,360.00	0.00	50.12	0.00	3,999,410.12	0.00	3,999,750.40	3,999,750.40
9128282Z2	TREAS NOTE	U.S. Treasury 1.625 10/15/20	0.00	4,999,609.38	0.00	82.27	0.00	4,999,691.65	0.00	4,999,210.50	4,999,210.50
9128283X6	TREAS NOTE	U.S. Treasury 2.250 02/15/21	0.00	5,033,593.75	0.00	(394.50)	0.00	5,033,199.25	0.00	5,033,043.00	5,033,043.00



Town of Addison
Change in Value
From 09/30/2019 to 12/31/2019

CUSIP	Security Type	Security Description	09/30/19 Book Value	Cost of Purchases	Maturities / Calls / Sales	Amortization / Accretion	Realized Gain/(Loss)	12/31/19 Book Value	09/30/19 Market Value	12/31/19 Market Value	Change in Mkt Value
Pooled Funds											
3130AGZE8	AGCY CALL	FHLB 2.050 02/26/21	3,000,000.00	0.00	(3,000,000.00)	0.00	0.00	0.00	2,993,111.10	0.00	(2,993,111.10)
9128284B3	TREAS NOTE	U.S. Treasury 2.375 03/15/21	0.00	5,045,117.19	0.00	(3,383.29)	0.00	5,041,733.90	0.00	5,042,929.50	5,042,929.50
3130AHCE1	AGCY CALL	FHLB 1.750 04/15/21	0.00	2,998,500.00	0.00	207.06	0.00	2,998,707.06	0.00	2,998,402.80	2,998,402.80
Total for Pooled Funds			**87,282,326.73**	**49,169,769.81**	**(30,984,066.87)**	**78,611.36**	**0.00**	**105,546,641.03**	**87,387,682.58**	**105,612,832.56**	**18,225,149.98**
Total for Town of Addison			**87,282,326.73**	**49,169,769.81**	**(30,984,066.87)**	**78,611.36**	**0.00**	**105,546,641.03**	**87,387,682.58**	**105,612,832.56**	**18,225,149.98**



Town of Addison

Earned Income

From 09/30/2019 to 12/31/2019

CUSIP	Security Type	Security Description	Beg. Accrued	Interest Earned	Interest Rec'd / Sold / Matured	Interest Purchased	Ending Accrued	Disc Accr / Prem Amort	Net Income
Pooled Funds									
TEXPOOL	LGIP	TexPool	0.00	21,227.55	21,227.55	0.00	0.00	0.00	21,227.55
TEXSTAR	LGIP	TexSTAR	0.00	58,712.04	58,712.04	0.00	0.00	0.00	58,712.04
64105SXF0	CP - DISC	Nestle Finance Intl Ltd 0.000 10/15/19	0.00	0.00	0.00	0.00	0.00	3,080.01	3,080.01
912828T59	TREAS NOTE	U.S. Treasury 1.000 10/15/19	11,543.72	956.28	12,500.00	0.00	0.00	1,445.32	2,401.60
3130ACM92	AGCY BULET	FHLB 1.500 10/21/19	13,333.33	1,666.67	15,000.00	0.00	0.00	1,363.70	3,030.37
66844DXM9	CP - DISC	Northwestern Univ 0.000 10/21/19	0.00	0.00	0.00	0.00	0.00	3,683.34	3,683.34
91514BGE7	CP - INT	Univ of TX 2.730 11/05/19	35,641.67	5,308.33	40,950.00	0.00	0.00	0.00	5,308.33
3130AA3R7	AGCY BULET	FHLB 1.375 11/15/19	18,180.56	5,881.94	24,062.50	0.00	0.00	4,958.27	10,840.21
912828U73	TREAS NOTE	U.S. Treasury 1.375 12/15/19	12,172.13	8,452.87	20,625.00	0.00	0.00	7,228.71	15,681.58
46640QZT1	CP - DISC	J.P.Morgan Sec 0.000 12/27/19	0.00	0.00	0.00	0.00	0.00	15,345.82	15,345.82
05249HFU1	CP - INT	City of Austin, TX 1.900 01/08/20	0.00	8,985.70	0.00	0.00	8,985.70	0.00	8,985.70
66844CAN4	CP - DISC	Northwestern Univ 0.000 01/22/20	0.00	0.00	0.00	0.00	0.00	10,945.83	10,945.83
CD-8603-1	CD	East West Bk CD 2.250 01/28/20	318.40	29,377.17	29,375.36	0.00	320.21	0.00	29,377.17
9128283S7	TREAS NOTE	U.S. Treasury 2.000 01/31/20	10,108.70	15,000.00	0.00	0.00	25,108.70	3,733.38	18,733.38
3130ADN32	AGCY BULET	FHLB 2.125 02/11/20	8,854.17	15,937.50	0.00	0.00	24,791.67	3,084.09	19,021.59
CD-8019-1	CD	East West Bk CD 2.100 02/12/20	292.37	26,970.49	26,968.93	0.00	293.93	0.00	26,970.49
912828MP2	TREAS NOTE	U.S. Treasury 3.625 02/15/20	18,519.02	36,250.00	0.00	0.00	54,769.02	(8,598.12)	27,651.88
912828J50	TREAS NOTE	U.S. Treasury 1.375 02/29/20	3,513.05	10,425.82	0.00	0.00	13,938.87	9,195.81	19,621.63
13068CEA9	CP - INT	State of CA 1.730 03/11/20	0.00	3,602.19	0.00	(189.59)	3,791.78	0.00	3,602.19
3133XXP50	AGCY BULET	FHLB 4.125 03/13/20	9,281.25	46,406.25	0.00	0.00	55,687.50	(16,638.84)	29,767.41
89233GCS3	CP - DISC	Toyota Mtr Cr 0.000 03/26/20	0.00	0.00	0.00	0.00	0.00	10,068.88	10,068.88
912828X21	TREAS NOTE	U.S. Treasury 1.500 04/15/20	34,631.15	18,852.46	37,500.00	0.00	15,983.61	12,790.20	31,642.66
912828ND8	TREAS NOTE	U.S. Treasury 3.500 05/15/20	66,100.54	43,995.61	87,500.00	0.00	22,596.15	(12,046.75)	31,948.86
78009AEV2	CP - DISC	Royal Bank of Canada 0.000 05/29/20	0.00	0.00	0.00	0.00	0.00	12,394.45	12,394.45
78009AFF6	CP - DISC	Royal Bank of Canada 0.000 06/15/20	0.00	0.00	0.00	0.00	0.00	1,213.34	1,213.34
912828XU9	TREAS NOTE	U.S. Treasury 1.500 06/15/20	13,278.69	11,311.47	22,500.00	0.00	2,090.16	7,685.61	18,997.08
89233GGD2	CP - DISC	Toyota Mtr Cr 0.000 07/13/20	0.00	0.00	0.00	0.00	0.00	8,191.12	8,191.12
46640PGH0	CP - DISC	J.P.Morgan Sec 0.000 07/17/20	0.00	0.00	0.00	0.00	0.00	5,425.00	5,425.00
912828VP2	TREAS NOTE	U.S. Treasury 2.000 07/31/20	0.00	16,521.74	0.00	(16,956.52)	33,478.26	(2,877.23)	13,644.51
91514BGW7	CP - INT	Univ of TX 1.860 07/31/20	0.00	10,307.50	0.00	0.00	10,307.50	0.00	10,307.50
3130AH2K8	AGCY CALL	FHLB 2.050 09/10/20	4,783.33	15,716.67	20,500.00	0.00	0.00	377.76	16,094.43
3137EAEJ4	AGCY BULET	FHLMC 1.625 09/29/20	0.00	3,791.67	0.00	(12,819.44)	16,611.11	50.12	3,841.79
9128282Z2	TREAS NOTE	U.S. Treasury 1.625 10/15/20	0.00	17,093.58	0.00	(221.99)	17,315.57	82.27	17,175.85
9128283X6	TREAS NOTE	U.S. Treasury 2.250 02/15/21	0.00	1,528.54	0.00	(40,964.67)	42,493.21	(394.50)	1,134.04



Town of Addison
Earned Income
From 09/30/2019 to 12/31/2019

CUSIP	Security Type	Security Description	Beg. Accrued	Interest Earned	Interest Rec'd / Sold / Matured	Interest Purchased	Ending Accrued	Disc Accr / Prem Amort	Net Income
Pooled Funds									
3130AGZE8	AGCY CALL	FHLB 2.050 02/26/21	5,295.83	9,395.84	14,691.67	0.00	0.00	0.00	9,395.84
9128284B3	TREAS NOTE	U.S. Treasury 2.375 03/15/21	0.00	11,744.51	0.00	(23,489.01)	35,233.52	(3,383.29)	8,361.22
3130AHCE1	AGCY CALL	FHLB 1.750 04/15/21	0.00	10,937.50	0.00	(145.83)	11,083.33	207.06	11,144.56
Total for Pooled Funds			**265,847.91**	**466,357.89**	**432,113.05**	**(94,787.05)**	**394,879.80**	**78,611.36**	**544,969.25**
Total for Town of Addison			**265,847.91**	**466,357.89**	**432,113.05**	**(94,787.05)**	**394,879.80**	**78,611.36**	**544,969.25**



Town of Addison

Investment Transactions

From 10/01/2019 to 12/31/2019

Trade Date	Settle Date	CUSIP	Security Type	Security Description	Coupon	Mty Date	Call Date	Par Value	Price	Principal Amount	Int Purchased / Received	Total Amount	Realized Gain / Loss	YTM	YTW
Pooled Funds															
Calls															
11/25/19	11/26/19	3130AGZE8	AGCY CALL	FHLB	2.050	02/26/21	11/26/19	3,000,000.00	100.000	3,000,000.00	14,691.67	3,014,691.67		2.050	2.049
12/09/19	12/10/19	3130AH2K8	AGCY CALL	FHLB	2.050	09/10/20	12/10/19	4,000,000.00	100.000	4,000,000.00	20,500.00	4,020,500.00		2.060	2.048
Total for: Calls								**7,000,000.00**		**7,000,000.00**	**35,191.67**	**7,035,191.67**		**2.056**	**2.049**
Maturities															
10/15/19	10/15/19	64105SXF0	CP - DISC	Nestle Finance Intl Ltd		10/15/19		3,000,000.00	100.000	3,000,000.00	0.00	3,000,000.00		2.688	
10/15/19	10/15/19	912828T59	TREAS NOTE	U.S. Treasury	1.000	10/15/19		2,500,000.00	100.000	2,500,000.00	0.00	2,500,000.00		2.531	
10/21/19	10/21/19	3130ACM92	AGCY BULET	FHLB	1.500	10/21/19		2,000,000.00	100.000	2,000,000.00	0.00	2,000,000.00		2.744	
10/21/19	10/21/19	66844DXM9	CP - DISC	Northwestern Univ		10/21/19		3,000,000.00	100.000	3,000,000.00	0.00	3,000,000.00		2.222	
11/05/19	11/05/19	91514BGE7	CP - INT	Univ of TX	2.730	11/05/19		2,000,000.00	100.000	2,000,000.00	40,950.00	2,040,950.00		2.729	
11/15/19	11/15/19	3130AA3R7	AGCY BULET	FHLB	1.375	11/15/19		3,500,000.00	100.000	3,500,000.00	0.00	3,500,000.00		2.549	
12/15/19	12/15/19	912828U73	TREAS NOTE	U.S. Treasury	1.375	12/15/19		3,000,000.00	100.000	3,000,000.00	0.00	3,000,000.00		2.566	
12/27/19	12/27/19	46640QZT1	CP - DISC	J.P.Morgan Sec		12/27/19		2,500,000.00	100.000	2,500,000.00	0.00	2,500,000.00		2.589	
Total for: Maturities								**21,500,000.00**		**21,500,000.00**	**40,950.00**	**21,540,950.00**		**2.563**	
Purchases															
10/15/19	10/16/19	3130AHCE1	AGCY CALL	FHLB	1.750	04/15/21	04/15/20	3,000,000.00	99.950	2,998,500.00	145.83	2,998,645.83		1.784	1.784
10/15/19	10/16/19	9128282Z2	TREAS NOTE	U.S. Treasury	1.625	10/15/20		5,000,000.00	99.992	4,999,609.38	221.99	4,999,831.37		1.633	1.633
10/16/19	10/17/19	912828VP2	TREAS NOTE	U.S. Treasury	2.000	07/31/20		4,000,000.00	100.277	4,011,093.75	16,956.52	4,028,050.27		1.643	1.643
10/16/19	10/17/19	89233GGD2	CP - DISC	Toyota Mtr Cr		07/13/20		2,000,000.00	98.545	1,970,900.00	0.00	1,970,900.00		1.969	1.969
10/21/19	10/22/19	66844CAN4	CP - DISC	Northwestern Univ		01/22/20		3,000,000.00	99.527	2,985,816.66	0.00	2,985,816.66		1.859	1.859
10/22/19	10/23/19	46640PGH0	CP - DISC	J.P.Morgan Sec		07/17/20		1,500,000.00	98.615	1,479,230.00	0.00	1,479,230.00		1.886	1.886
10/29/19	10/30/19	05249HFU1	CP - INT	City of Austin, TX	1.900	01/08/20		2,740,000.00	100.000	2,740,000.00	0.00	2,740,000.00		1.900	1.900
11/04/19	11/05/19	91514BGW7	CP - INT	Univ of TX	1.860	07/31/20		3,500,000.00	100.000	3,500,000.00	0.00	3,500,000.00		1.860	1.860
11/25/19	11/26/19	9128284B3	TREAS NOTE	U.S. Treasury	2.375	03/15/21		5,000,000.00	100.902	5,045,117.19	23,489.01	5,068,606.20		1.671	1.671
12/06/19	12/10/19	3137EAEJ4	AGCY BULET	FHLMC	1.625	09/29/20		4,000,000.00	99.984	3,999,360.00	12,819.44	4,012,179.44		1.644	1.644
12/12/19	12/13/19	13068CEA9	CP - INT	State of CA	1.730	03/11/20		4,000,000.00	100.000	4,000,000.00	189.59	4,000,189.59		1.730	1.730
12/13/19	12/16/19	78009AFF6	CP - DISC	Royal Bank of Canada		06/15/20		1,500,000.00	99.080	1,486,198.33	0.00	1,486,198.33		1.837	1.837
12/26/19	12/27/19	9128283X6	TREAS NOTE	U.S. Treasury	2.250	02/15/21		5,000,000.00	100.672	5,033,593.75	40,964.67	5,074,558.42		1.650	1.650

Trade Date	Settle Date	CUSIP	Security Type	Security Description	Coupon	Mty Date	Call Date	Par Value	Price	Principal Amount	Int Purchased / Received	Total Amount	Realized Gain / Loss	YTM	YTW
Pooled Funds															
Total for: Purchases								**44,240,000.00**		**44,249,419.06**	**94,787.05**	**44,344,206.11**		**1.741**	**1.741**
Income Payments															
10/15/19	10/15/19	912828T59	TREAS NOTE	U.S. Treasury	1.000	10/15/19				0.00	12,500.00	12,500.00			
10/15/19	10/15/19	912828X21	TREAS NOTE	U.S. Treasury	1.500	04/15/20				0.00	37,500.00	37,500.00			
10/21/19	10/21/19	3130ACM92	AGCY BULET	FHLB	1.500	10/21/19				0.00	15,000.00	15,000.00			
10/31/19	10/31/19	CD-8019-1	CD	East West Bk CD	2.100	02/12/20				0.00	9,071.42	9,071.42			
10/31/19	10/31/19	CD-8603-1	CD	East West Bk CD	2.250	01/28/20				0.00	9,879.62	9,879.62			
11/15/19	11/15/19	3130AA3R7	AGCY BULET	FHLB	1.375	11/15/19				0.00	24,062.50	24,062.50			
11/15/19	11/15/19	912828ND8	TREAS NOTE	U.S. Treasury	3.500	05/15/20				0.00	87,500.00	87,500.00			
11/30/19	11/30/19	CD-8019-1	CD	East West Bk CD	2.100	02/12/20				0.00	8,794.20	8,794.20			
11/30/19	11/30/19	CD-8603-1	CD	East West Bk CD	2.250	01/28/20				0.00	9,578.91	9,578.91			
12/16/19	12/15/19	912828U73	TREAS NOTE	U.S. Treasury	1.375	12/15/19				0.00	20,625.00	20,625.00			
12/16/19	12/15/19	912828XU9	TREAS NOTE	U.S. Treasury	1.500	06/15/20				0.00	22,500.00	22,500.00			
12/31/19	12/31/19	CD-8019-1	CD	East West Bk CD	2.100	02/12/20				0.00	9,103.31	9,103.31			
12/31/19	12/31/19	CD-8603-1	CD	East West Bk CD	2.250	01/28/20				0.00	9,916.83	9,916.83			
Total for: Income Payments										**0.00**	**276,031.79**	**276,031.79**			
Capitalized Interest															
10/31/19	10/31/19	CD-8019-1	CD	East West Bk CD	2.100	02/12/20		9,071.42	100.000	9,071.42	0.00	9,071.42			
10/31/19	10/31/19	CD-8603-1	CD	East West Bk CD	2.250	01/28/20		9,879.62	100.000	9,879.62	0.00	9,879.62			
11/30/19	11/30/19	CD-8019-1	CD	East West Bk CD	2.100	02/12/20		8,794.20	100.000	8,794.20	0.00	8,794.20			
11/30/19	11/30/19	CD-8603-1	CD	East West Bk CD	2.250	01/28/20		9,578.91	100.000	9,578.91	0.00	9,578.91			
12/31/19	12/31/19	CD-8019-1	CD	East West Bk CD	2.100	02/12/20		9,103.31	100.000	9,103.31	0.00	9,103.31			
12/31/19	12/31/19	CD-8603-1	CD	East West Bk CD	2.250	01/28/20		9,916.83	100.000	9,916.83	0.00	9,916.83			
Total for: Capitalized Interest								**56,344.29**		**56,344.29**	**0.00**	**56,344.29**			

Trade Date	Settle Date	CUSIP	Security Type	Security Description	Coupon	Mty Date	Call Date	Par Value	Price	Principal Amount	Int Purchased / Received	Total Amount	Realized Gain / Loss	YTM	YTW

Total for All Portfolios

Transaction Type	Quantity	Total Amount	Realized G/L	YTM	YTW
Total Calls	7,000,000.00	7,035,191.67		2.056	2.049
Total Maturities	21,500,000.00	21,540,950.00		2.563	
Total Purchases	44,240,000.00	44,344,206.11		1.741	1.741
Total Income Payments	0.00	276,031.79			
Total Capitalized Interest	56,344.29	56,344.29			

CUSIP	Settle Date	Security Type	Security Description	Next Call Date	Purchase Qty	Orig Price	Original Cost	Amrt/Accr for Period	Total Amrt/Accr Since Purch	Remaining Disc / Prem	Book Value
Pooled Funds											
64105SXF0	02/13/19	CP - DISC	Nestle Finance Intl Ltd 0.000 10/15/19		0.00	98.211	0.00	3,080.01	0.00	0.00	0.00
912828T59	09/07/18	TREAS NOTE	U.S. Treasury 1.000 10/15/19		0.00	98.344	0.00	1,445.32	0.00	0.00	0.00
3130ACM92	11/05/18	AGCY BULET	FHLB 1.500 10/21/19		0.00	98.827	0.00	1,363.70	0.00	0.00	0.00
66844DXM9	07/24/19	CP - DISC	Northwestern Univ 0.000 10/21/19		0.00	99.454	0.00	3,683.34	0.00	0.00	0.00
91514BGE7	02/11/19	CP - INT	Univ of TX 2.730 11/05/19		0.00	100.000	0.00	0.00	0.00	0.00	0.00
3130AA3R7	08/31/18	AGCY BULET	FHLB 1.375 11/15/19		0.00	98.614	0.00	4,958.27	0.00	0.00	0.00
912828U73	01/25/19	TREAS NOTE	U.S. Treasury 1.375 12/15/19		0.00	98.961	0.00	7,228.71	0.00	0.00	0.00
46640QZT1	04/02/19	CP - DISC	J.P.Morgan Sec 0.000 12/27/19		0.00	98.102	0.00	15,345.82	0.00	0.00	0.00
05249HFU1	10/30/19	CP - INT	City of Austin, TX 1.900 01/08/20		2,740,000.00	100.000	2,740,000.00	0.00	0.00	0.00	2,740,000.00
66844CAN4	10/22/19	CP - DISC	Northwestern Univ 0.000 01/22/20		3,000,000.00	99.527	2,985,816.66	10,945.83	10,945.83	3,237.51	2,996,762.49
CD-8603-1	07/28/19	CD	East West Bk CD 2.250 01/28/20		5,194,577.65	100.000	5,194,577.65	0.00	0.00	0.00	5,194,577.65
9128283S7	03/21/19	TREAS NOTE	U.S. Treasury 2.000 01/31/20		3,000,000.00	99.570	2,987,109.38	3,733.38	11,673.22	1,217.40	2,998,782.60
3130ADN32	03/20/19	AGCY BULET	FHLB 2.125 02/11/20		3,000,000.00	99.634	2,989,020.00	3,084.09	9,609.27	1,370.73	2,998,629.27
CD-8019-1	08/12/19	CD	East West Bk CD 2.100 02/12/20		5,108,707.77	100.000	5,108,707.77	0.00	0.00	0.00	5,108,707.77
912828MP2	12/17/18	TREAS NOTE	U.S. Treasury 3.625 02/15/20		4,000,000.00	100.988	4,039,531.25	(8,598.12)	(35,325.65)	(4,205.60)	4,004,205.60
912828J50	01/30/19	TREAS NOTE	U.S. Treasury 1.375 02/29/20		3,000,000.00	98.699	2,960,976.56	9,195.81	33,126.10	5,897.34	2,994,102.66
13068CEA9	12/13/19	CP - INT	State of CA 1.730 03/11/20		4,000,000.00	100.000	4,000,000.00	0.00	0.00	0.00	4,000,000.00
3133XXP50	01/18/19	AGCY BULET	FHLB 4.125 03/13/20		4,500,000.00	101.688	4,575,946.50	(16,638.84)	(62,635.45)	(13,311.05)	4,513,311.05
89233GCS3	09/03/19	CP - DISC	Toyota Mtr Cr 0.000 03/26/20		2,000,000.00	98.878	1,977,563.89	10,068.88	13,133.33	9,302.78	1,990,697.22
912828X21	02/08/19	TREAS NOTE	U.S. Treasury 1.500 04/15/20		5,000,000.00	98.805	4,940,234.38	12,790.20	45,140.27	14,625.35	4,985,374.65
912828ND8	02/27/19	TREAS NOTE	U.S. Treasury 3.500 05/15/20		5,000,000.00	101.156	5,057,812.50	(12,046.75)	(39,932.30)	(17,880.20)	5,017,880.20
78009AEV2	09/30/19	CP - DISC	Royal Bank of Canada 0.000 05/29/20		2,500,000.00	98.696	2,467,397.22	12,394.45	12,529.18	20,073.60	2,479,926.40
78009AFF6	12/16/19	CP - DISC	Royal Bank of Canada 0.000 06/15/20		1,500,000.00	99.080	1,486,198.33	1,213.34	1,213.34	12,588.33	1,487,411.67
912828XU9	02/28/19	TREAS NOTE	U.S. Treasury 1.500 06/15/20		3,000,000.00	98.680	2,960,390.63	7,685.61	25,598.41	14,010.96	2,985,989.04
89233GGD2	10/17/19	CP - DISC	Toyota Mtr Cr 0.000 07/13/20		2,000,000.00	98.545	1,970,900.00	8,191.12	8,191.12	20,908.88	1,979,091.12
46640PGH0	10/23/19	CP - DISC	J.P.Morgan Sec 0.000 07/17/20		1,500,000.00	98.615	1,479,230.00	5,425.00	5,425.00	15,345.00	1,484,655.00
912828VP2	10/17/19	TREAS NOTE	U.S. Treasury 2.000 07/31/20		4,000,000.00	100.277	4,011,093.75	(2,877.23)	(2,877.23)	(8,216.52)	4,008,216.52
91514BGW7	11/05/19	CP - INT	Univ of TX 1.860 07/31/20		3,500,000.00	100.000	3,500,000.00	0.00	0.00	0.00	3,500,000.00
3130AH2K8	09/11/19	AGCY CALL	FHLB 2.050 09/10/20	12/10/19	0.00	99.990	0.00	377.76	0.00	0.00	0.00
3137EAEJ4	12/10/19	AGCY BULET	FHLMC 1.625 09/29/20		4,000,000.00	99.984	3,999,360.00	50.12	50.12	589.88	3,999,410.12
9128282Z2	10/16/19	TREAS NOTE	U.S. Treasury 1.625 10/15/20		5,000,000.00	99.992	4,999,609.38	82.27	82.27	308.35	4,999,691.65
9128283X6	12/27/19	TREAS NOTE	U.S. Treasury 2.250 02/15/21		5,000,000.00	100.672	5,033,593.75	(394.50)	(394.50)	(33,199.25)	5,033,199.25

CUSIP	Settle Date	Security Type	Security Description	Next Call Date	Purchase Qty	Orig Price	Original Cost	Amrt/Accr for Period	Total Amrt/Accr Since Purch	Remaining Disc / Prem	Book Value
Pooled Funds											
3130AGZE8	09/03/19	AGCY CALL	FHLB 2.050 02/26/21	11/26/19	0.00	100.000	0.00	0.00	0.00	0.00	0.00
9128284B3	11/26/19	TREAS NOTE	U.S. Treasury 2.375 03/15/21		5,000,000.00	100.902	5,045,117.19	(3,383.29)	(3,383.29)	(41,733.90)	5,041,733.90
3130AHCE1	10/16/19	AGCY CALL	FHLB 1.750 04/15/21	04/15/20	3,000,000.00	99.950	2,998,500.00	207.06	207.06	1,292.94	2,998,707.06
Total for Pooled Funds					**89,543,285.42**		**89,508,686.79**	**78,611.36**	**32,376.10**	**2,222.53**	**89,541,062.89**
Total for Town of Addison					**89,543,285.42**		**89,508,686.79**	**78,611.36**	**32,376.10**	**2,222.53**	**89,541,062.89**



Town of Addison

Projected Cash Flows

Cash Flows for next 180 days from 12/31/2019

CUSIP	Security Type	Security Description	Pay Date	Interest	Principal	Total Amount
Pooled Funds						
05249HFU1	CP - INT	City of Austin, TX 1.900 01/08/20	01/08/20	9,984.10	2,740,000.00	2,749,984.10
66844CAN4	CP - DISC	Northwestern Univ 0.000 01/22/20	01/22/20	0.00	3,000,000.00	3,000,000.00
CD-8603-1	CD	East West Bk CD 2.250 01/28/20	01/28/20	8,965.98	5,194,577.65	5,203,543.63
CD-8019-1	CD	East West Bk CD 2.100 02/12/20	01/31/20	8,940.23	0.00	8,940.23
9128283S7	TREAS NOTE	U.S. Treasury 2.000 01/31/20	01/31/20	30,000.00	3,000,000.00	3,030,000.00
912828VP2	TREAS NOTE	U.S. Treasury 2.000 07/31/20	01/31/20	40,000.00	0.00	40,000.00
3130ADN32	AGCY BULET	FHLB 2.125 02/11/20	02/11/20	31,875.00	3,000,000.00	3,031,875.00
CD-8019-1	CD	East West Bk CD 2.100 02/12/20	02/12/20	3,527.10	5,108,707.77	5,112,234.87
9128283X6	TREAS NOTE	U.S. Treasury 2.250 02/15/21	02/15/20	56,250.00	0.00	56,250.00
912828MP2	TREAS NOTE	U.S. Treasury 3.625 02/15/20	02/15/20	72,500.00	4,000,000.00	4,072,500.00
912828J50	TREAS NOTE	U.S. Treasury 1.375 02/29/20	02/29/20	20,625.00	3,000,000.00	3,020,625.00
13068CEA9	CP - INT	State of CA 1.730 03/11/20	03/11/20	17,016.39	4,000,000.00	4,017,016.39
3133XXP50	AGCY BULET	FHLB 4.125 03/13/20	03/13/20	92,812.50	4,500,000.00	4,592,812.50
9128284B3	TREAS NOTE	U.S. Treasury 2.375 03/15/21	03/15/20	59,375.00	0.00	59,375.00
89233GCS3	CP - DISC	Toyota Mtr Cr 0.000 03/26/20	03/26/20	0.00	2,000,000.00	2,000,000.00
3137EAEJ4	AGCY BULET	FHLMC 1.625 09/29/20	03/29/20	32,500.00	0.00	32,500.00
3130AHCE1	AGCY CALL	FHLB 1.750 04/15/21	04/15/20	26,250.00	0.00	26,250.00
9128282Z2	TREAS NOTE	U.S. Treasury 1.625 10/15/20	04/15/20	40,625.00	0.00	40,625.00
912828X21	TREAS NOTE	U.S. Treasury 1.500 04/15/20	04/15/20	37,500.00	5,000,000.00	5,037,500.00
912828ND8	TREAS NOTE	U.S. Treasury 3.500 05/15/20	05/15/20	87,500.00	5,000,000.00	5,087,500.00
78009AEV2	CP - DISC	Royal Bank of Canada 0.000 05/29/20	05/29/20	0.00	2,500,000.00	2,500,000.00
78009AFF6	CP - DISC	Royal Bank of Canada 0.000 06/15/20	06/15/20	0.00	1,500,000.00	1,500,000.00
912828XU9	TREAS NOTE	U.S. Treasury 1.500 06/15/20	06/15/20	22,500.00	3,000,000.00	3,022,500.00
Total for Pooled Funds				**698,746.30**	**56,543,285.42**	**57,242,031.72**



Town of Addison

Projected Cash Flows

Cash Flows for next 180 days from 12/31/2019

CUSIP	Security Type	Security Description	Pay Date	Interest	Principal	Total Amount
Total for All Portfolios						
			January 2020	97,890.31	13,934,577.65	14,032,467.96
			February 2020	184,777.10	15,108,707.77	15,293,484.87
			March 2020	201,703.89	10,500,000.00	10,701,703.89
			April 2020	104,375.00	5,000,000.00	5,104,375.00
			May 2020	87,500.00	7,500,000.00	7,587,500.00
			June 2020	22,500.00	4,500,000.00	4,522,500.00
		Total Projected Cash Flows for Town of Addison		**698,746.30**	**56,543,285.42**	**57,242,031.72**