

ENGINEERING DESIGN AND CONSTRUCTION MANUAL

BUILDING A STRONG COMMUNITY

JANUARY 2020



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RECORD OF REVISIONS

January 14, 2020

Final Approval



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SECTION 1 GENERAL DESIGN REQUIREMENTS

- 1.1 Title – These standards are hereby adopted and may be cited as the “Engineering Design and Construction Manual of the City of Weatherford, Texas” (“EDCM”).
- 1.2 Introduction – The purpose of the EDCM is to protect the public health, safety and welfare by establishing standard engineering practices and minimum engineering construction and design requirements for the City and its extraterritorial jurisdiction (“ETJ”). The EDCM consists of Sections 1 through 9, which provide generally applicable design requirements, as well as specific design requirements for the following facilities: roadway and traffic; drainage; water; wastewater; and miscellaneous improvements. Appendices (Section 9) are attached to supplement the requirements in Sections 1 through 8 by providing greater specificity, checklists and approved material lists.
- 1.3 Interpretation, Applicability, and the Respective Roles of the Engineer and the City
 - 1.3.1 Intent/Conflict Resolution – In the interpretation and application of the provisions of these regulations, it is the intention of the City that the principles, standards, and requirements provided for herein shall be minimum requirements for the design of both public and private development projects and City-maintained facilities located in or outside the City and its ETJ where regulatory authority for design and construction is granted by the Charter or ordinances of the City, state or federal law, or interlocal agreement. Where City, State, Federal, or other applicable regulations are more restrictive than this EDCM, such other ordinances or regulations shall govern.
 - 1.3.2 References – All references herein shall be to the current edition. If there are any discrepancies between the data in this manual and the referenced publication, the data from the current edition of the referenced publication shall be used.
 - 1.3.3 Definitions-Abbreviations – Refer to Section 8, Definitions-Abbreviations for applicable definitions of terms and abbreviations.
 - 1.3.4 Figures – Figures in this manual are not necessarily to scale; the Engineer shall not rely upon the scale of figures included in this manual.
 - 1.3.5 Responsibility of Engineer – The Engineer shall be responsible for the application of the requirements of the EDCM to the design of his/her project.
 - 1.3.6 Role of City Review – City review of construction plans, reports and calculations will be conducted to verify that the submitted design has been performed in compliance with the City’s requirements but shall not be considered a detailed technical review for adequacy, accuracy or completeness. The Engineer performing the design shall remain responsible for the technical adequacy, accuracy and completeness of the design and shall not be relieved of any responsibility for such as a result of the City’s review.
 - 1.3.7 Other Requirements Applicable – The City has adopted various ordinances, master plans, policies, and documents that may apply to a project in addition to the requirements of the EDCM. While not intended to be exhaustive, a list of potentially applicable regulations is provided below. The Engineer is responsible for compliance with all applicable City requirements, whether or not they are included on this list.
 - 1.3.7.A. Checklists, Procedures and Forms – Refer to Appendix A (City Checklists).
 - 1.3.7.B. General Notes – Refer to Appendix B (General Notes).
 - 1.3.7.C. Standard Construction Details – Refer to Appendix C (Standard Construction Details).
 - 1.3.7.D. Approved Materials Lists – Refer to Appendix D (Approved Materials Lists).
 - 1.3.7.E. Technical Specifications – Refer to Appendix E (Technical Specifications).



1.3.7.F. Weatherford City Code, as amended:

https://library.municode.com/tx/Weatherford/codes/code_of_ordinances

1.3.7.G. Corridor-Specific Codes, Form-Based Codes and Overlay Districts – If the project falls within an area covered by a corridor-specific code, form-based code or overlay district, compliance with those regulations is required.

1.3.7.H. Master Plans

- [General Plan](#)
- [Thoroughfare Plan](#)
- [Water Master Plan](#)
- [Wastewater Master Plan](#)

1.4 Enforcement – The City shall enforce the requirements of this EDCM to the full extent authorized by law, including but not limited to the City Charter and Ordinances, State and Federal law.

1.5 Website Posting – While the official copy of the approved EDCM shall be kept on file in the Office of the City Secretary, the EDCM and any updates will be posted on the City's website at www.weatherfordtx.gov/EDCM. To access the latest design standards, the Engineer is directed to the City's website for the most current version of the EDCM. An EDCM Record of Revisions is provided in the posted EDCM to identify significant revisions. A printed copy of the EDCM may be requested through a Public Information Request made through the City Secretary's office.

1.6 EDCM Variance Requests

1.6.1 A formal request for a variance to the requirements of the EDCM may be submitted in writing to the City Engineer for consideration. A variance to the requirements of the EDCM may not be granted unless the variance:

- Is not detrimental to the public welfare;
- Does not adversely impact the public facility in question;
- Is supported by a signed and sealed engineering analysis performed as necessary by a Professional Engineer licensed in the State of Texas;
- Is not based solely on financial interests;
- Preserves the aesthetics of the community;
- Does not adversely impact the life expectancy and maintenance costs of public infrastructure;
- Does not create a potential danger to life and/or property;
- Does not create threats to public safety, increase public expense or create a nuisance;
- Does not conflict with state or federal laws or regulations;
- Does not conflict with any City ordinance or requirement other than the requirements of this EDCM;
- Does not increase the susceptibility of the proposed or an existing facility, its contents or surrounding property to damage;
- Does not result in increased flood heights, create erosive velocities, increase the frequency or duration of flooding, or create other adverse impacts to other property unless the adverse impact is approved by the affected property owner(s) and the City Engineer, and documentation of this approval is provided on a form approved by the



City Attorney;

- Preserves or expands natural floodplain, greenbelts and associated buffer areas of aesthetic and/or environmental value;
- Preserves adequate buffer distances to development and infrastructure from areas of potential flooding or erosion;
- Does not decrease the safety of access to property or facilities for ordinary and emergency vehicles;
- Is the only available and suitable location for the proposed facility that would not require a variance;
- Does not increase cost of providing governmental services, including maintenance and repair of public infrastructure for streets, bridges, storm sewer and channels, water, sanitary sewer, gas, electrical, telephone and other public facilities;
- Does not impede or interfere with the preservation of the historical character of structures or sites listed on the National Register of Historic Places or the State Inventory of Historic Places; and,
- Is the minimum variance necessary to afford relief.

1.6.2 Variance Process – The following process shall be followed for variance requests.

- 1.6.2.A. Submission – Requests for variances to the EDCM shall be submitted in writing to the City Engineer. In considering the variance request, the City Engineer shall review the technical, environmental, financial, social and aesthetic merits of the variance request. The City Engineer shall forward the variance request to other relevant City staff for review and comment.
- 1.6.2.B. Preliminary Recommendation – The City Engineer shall summarize his/her findings in writing and make a preliminary recommendation for approval, approval with conditions or denial. As part of the recommendation, the City Engineer may attach conditions to the granting of the variance as deemed necessary to further the purposes of the EDCM and the public welfare.
- 1.6.2.C. City Manager's Review – The City Engineer will present findings and recommendations to the City Manager, or the City Manager's designee, to approve the variance, approve the variance with conditions or deny the variance request. The City Engineer will submit this recommendation within 15 business days of original receipt of the variance request.
- 1.6.2.D. City Manager's Decision – The City Manager shall review the City Engineer's report, recommendations and conditions, receive or hear other evidence or testimony as deemed necessary and approve the variance, approve the variance with conditions or deny the variance request. The decision of the City Manager, or his designee, shall be provided in writing to the applicant requesting the variance. The City Manager will submit this recommendation within 30 business days of original receipt of the variance request.
- 1.6.2.E. Appeal to City Council – The decision of the City Manager may be appealed to the City Council. In deciding a request for a variance, the City Council shall have all the powers of the City Manager on the action appealed from and shall make its decision based on the evidence provided. The City Council shall have the authority to sustain, reverse, or modify the decision of the City Manager. The decision of the City Council shall be made within a reasonable time from the date of application for the variance and shall be final and recorded in the minutes of the City Council meeting.



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1.6.2.F. Maintenance of Record – The City Engineer shall maintain a record of all variance requests, any appeals, and their outcome.

1.6.3 Time Limits – Unless Chapter 245 of the Texas Local Government Code requires a different time limit, a variance granted pursuant to this section shall expire one year from the date the variance was granted if a permit is not approved and issued within that time and work begun. Should a site development or building permit be issued and diligent work cease for a period of more than 90 days, as determined by the City Engineer and/or Building Official, the variance shall expire and become null and void.

1.7 Submittal Requirements for Construction Plans

1.7.1 Construction Plans – All new construction, reconstruction, modifications, alterations and improvements shall be designed in accordance with the EDCM and State and Federal requirements. Construction plan requirements are listed in the Engineering Plan Submittal Requirements in Appendix A (City Checklists). All engineering plans shall be sealed, or a preliminary statement provided, by a Professional Engineer licensed in the State of Texas in accordance with the Texas Engineering Practice Act except as exempted by the Texas Engineering Practice Act and Policy Advisory Opinions issued by the Texas Board of Professional Engineers. It is the responsibility of the Engineer to ensure that all construction plans submitted for review adhere to the current version of the Engineering Plan Submittal Checklist. The City may specify additional submission requirements, as necessary, to facilitate the review.

1.7.2 Construction Standards – For public projects, the construction of all improvements shall be in accordance with the Construction Contract Documents. For private development projects, the construction of all improvements shall be in accordance with the EDCM. The EDCM shall be supplemented by the North Central Texas Council of Governments (NCTCOG) current edition of the Public Works Construction Standards as to any regulation not covered by the EDCM; compliance with those supplementary regulations is required.

1.7.3 City Permits – Refer to the Weatherford City Code, as amended, for requirements related to City permits, including, but not limited to: Site Development Permits, Building Permits, Grading Permits, Floodplain Development Permits, Right-of-Way Permits, Driveway Permits and Certificates of Occupancy.

1.7.4 Regulatory Agency Permits – For any projects requiring permits from agencies other than the City, including, but not limited to TxDOT, Railroad Commissions, FEMA, USACE, UPRR or TCEQ, the Engineer shall submit the required permit documents to the City for initial review. Authorization to submit permit requests to the agencies is contingent upon the City's approval of the initial review. The City may elect to lead coordination and/or submittal of permit requests to the agencies.

1.7.5 Field Changes – Field changes to plans issued for construction in conjunction with a permit may be made only upon approval by the City Engineer or the City Engineer's designee. For ROW permits, field changes to issued permits may be made without approval by City Engineer if the installation of utility and appurtenances stays within area designated on Standard Details, maintains minimum clearances from all utilities required by the EDCM and is not more than two feet from the alignment approved by the permit.

1.7.6 Record Drawings – Record drawings shall be submitted to the City Engineer at the completion of the project.

1.8 Easements and Right-of-Way (ROW) Requirements

1.8.1 General

1.8.1.A. Dedications – Easements and ROW required for construction of a proposed



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project dedicated to the City must be accepted prior to granting final acceptance of infrastructure. Permission must be obtained from offsite landowners prior to construction of offsite improvements on their property.

- 1.8.1.B. Obstructions – No permanent above ground structures or obstructions shall be allowed to encroach within an easement. Flatwork, landscaping and other at grade improvements may be allowed on a case-by-case basis as approved by the City Engineer.
- 1.8.1.C. Temporary Construction Easements – Temporary construction easements may be required for off-site grading, access, utility lines or other facilities to be constructed outside the Developer's property.
- 1.8.1.D. Maintenance – The existence of an easement dedicated to the City does not change maintenance responsibility of the land. Perpetual maintenance responsibilities must be designated on the plat.

1.8.2 Dedication of ROW and Easements

- 1.8.2.A. Form of Dedication – ROW and easements shall be dedicated to the City by plat or by separate instrument. Refer to the City's Subdivision Ordinance and Zoning Ordinance for platting procedures. Also refer to the City's website for Procedures for Plat Review, Checklist for Plats, and the Final Platting Procedure.
- 1.8.2.B. By Separate Instrument – For easements and ROW by separate instrument, Owner shall submit to the City Engineer on a form provided by the City.
- 1.8.2.C. Process – All easement and deed documents must be approved by the City Engineer prior to procuring any signatures. The Owner shall be responsible for procuring proper signatures and any required notarizations before delivering the fully executed original document to the City Engineer for filing in deed records of the County where the property is located.
- 1.8.2.D. Fees – The Owner is responsible for any document preparation and all filing fees required for the recordation of executed documents with the County's Deeds Records office.

1.8.3 Abandonment of ROW and Easements – Action by the City Council is required to abandon a public easement with an existing utility or ROW.

1.8.4 Sight Visibility Triangle Easements – Sight visibility triangle easements shall be provided where a public access driveway, alley or other street intersects with an existing or proposed street. Refer to Section 2.4 (Sight Visibility) for additional requirements.

1.8.5 Mutual (Joint) Access Easements – Mutual or joint access easements may be required at shared driveways. Refer to Section 2.7 (Driveways) for additional requirements.

1.8.6 Screening Wall Maintenance Easements – Screening walls on private property shall be placed in the center of a minimum five-foot-wide screening wall easement.

1.8.7 Sidewalk and Trail Easements – Where possible, public pedestrian facilities (trails and sidewalks) should be placed within the street ROW. Where public pedestrian facilities are outside of street ROW, the width of the easement shall be a minimum of ten feet or the width of the pavement plus two feet on either side, whichever is greater, to allow sufficient area for maintenance.

1.8.8 Drainage Easements – Drainage easements are required for the following drainage facilities.

- 1.8.8.A. Closed Conduit Underground Systems – These systems shall be located in the center of a 15-foot-wide drainage easement; or 1.5 times the depth to the flowline



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plus the width of the structure, rounded up to the nearest five feet; whichever is greater. If the system is proposed within the ROW, and the easement size calculated above is not contained within ROW, additional drainage easement is required. If on private property, drainage easements shall be provided for all systems that are 18 inches or greater in diameter.

1.8.8.B. **Roadside Ditches** – If the roadside ditch extends beyond the ROW, an additional drainage easement shall be dedicated extending at least five feet beyond the top of bank.

1.8.8.C. **Flumes** – Flumes shall be located in the center of a 15-foot-wide drainage easement; or the width of the flume plus five feet on each side; whichever is greater. Additional width may be required by the City Engineer where necessary.

1.8.8.D. **Positive Overflow Routes, Emergency Spillways, Swales, Berms, or Permanent BMPs** – Minimum width must encompass the structure or graded area and maximum design flow width.

1.8.8.E. **Storm Water Storage Facilities** – An easement must encompass the entire facility plus 15 feet on all sides measured from the top of bank. An access route within an access easement shall be provided from the public roadway. The access easement shall be a minimum of 15' wide. Any portions of the access route shall be within the easement and graded to be traversable by standard maintenance equipment.

1.8.8.F. **Open Channels and Floodplains** – An easement's minimum width must encompass all areas having a ground elevation up to the two-foot freeboard requirement of the ultimate 100-year water surface elevation; or the top of the high bank or channel edge; whichever is greater. The drainage easement shall also include a minimum 15-foot-wide access route along both sides of the channel or a 20- foot-wide access route along one side of the channel.

1.8.8.G. **Outfall** – Drainage easements will generally extend at least twenty-five (25) feet past an outfall headwall to provide an area for maintenance operations. Drainage easements along a required outfall channel or ditch shall be provided until the flowline reaches an acceptable outfall.

1.8.9 **Utility Easements** – Utility easements are required for all public utilities as follows.

1.8.9.A. **Minimum Width** – Utility easement minimum width requirements are summarized in Table 1-1 through Table 1-5. The minimum width for exclusive utility easements is required when facilities are not located within the public ROW. The required easement dimensions shall be centered on the utility and the portion outside of the public ROW shall be dedicated to the City.

1.8.9.B. **Width for Certain Facilities** – The following equation shall be used for water mains, wastewater mains, and force mains with depths greater than 12 feet (measured from ground level to flowline of pipe).

$$\text{Easement Width (W)} = 2D + d + 2$$

Where:

W = Easement width rounded up to nearest 5 feet (feet)
D = Depth of pipe, measured from the surface to flowline of pipe (feet)
d = Outside pipe diameter (feet)

1.8.9.C. **Maximum Width** – Easement shall not exceed 70 feet in width, unless required by the City Engineer for special circumstances.

1.8.9.D. **Widths to be Consistent** – If depths of lines/mains vary across the easement, the



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largest resulting easement width shall apply. Easement widths shall not vary within the same parcel/lot.

Table 1-1 Easement Widths for Water Main and Service Lines

Water Mains and Service Lines	Minimum Easement Width
Water Mains (12-inch and smaller and less than 8 feet deep)	15 feet
Water Mains (16-inch and larger or 8 feet to 12 feet deep)	20 feet
Water Mains Adjacent to Street ROW	10 feet
Water Mains Adjacent to TxDOT ROW	20 feet
Water Service Lines	15 feet

Table 1-2 Easement Widths for Wastewater Main and Service Lines

Wastewater Mains and Service Lines	Minimum Easement Width
Wastewater Mains (12-inch and smaller and less than 8 feet deep)	15 feet
Wastewater Mains (15-inch and larger or 8 feet to 12 feet deep)	20 feet
Wastewater Mains Adjacent to Street ROW	10 feet
Wastewater Mains Adjacent to TxDOT ROW	20 feet
Wastewater Service Lines	15 feet

Table 1-3 Easement Widths for Force Mains

Force Mains	Minimum Easement Width
Force Mains (18-inch and smaller)	15 feet
Force Mains (24-inch and larger)	20 feet
Force Mains Adjacent to Street ROW	10 feet
Force Mains Adjacent to TxDOT ROW	20 feet

Table 1-4 Easement Widths for Combined Mains

Combined Mains	Minimum Easement Width
Combined Mains	Per approval of City Engineer

Table 1-5 Easement Widths for Facilities/Appurtenances¹

Facility/Appurtenance	Minimum Easement Width
Fire Hydrants and Automatic Flushing Valves	5 feet x 5 feet
Air Valve Assembly	10 feet x 10 feet
Blow-Off Valve Assembly	10 feet x 10 feet
Water Meters (smaller than 3-inch)	5 feet x 5 feet
Water Meters (3-inch)	10 feet x 10 feet
Water Meters (larger than 3-inch)	15 feet x 15 feet

1. For appurtenances not listed here, the width of the easement shall be determined by City Engineer as required to ensure adequate area is available for facility maintenance.

1.9 Subsurface Utility Engineering (SUE) Requirements

- 1.9.1 Prior to Initiation – All existing utilities shall be located and marked prior to initiation of survey for design.
- 1.9.2 SUE Provider Requirements – SUE shall be managed by engineer, geologist, or land surveyor licensed in the State of Texas and work shall be conducted by well-trained, experienced, and capable individuals using state-of-the-art designating equipment, vacuum excavation, or comparable nondestructive locating equipment as well as surveying, data



recording equipment, and software systems, as necessary.

1.9.3 Quality Level Attributes – Utility Quality Level (QL) attributes are described in the current edition of Standard Guidelines for Collection and Depiction of Existing Subsurface Utility Data, CI/ASCE 38-02 by American Society of Civil Engineers (ASCE). Accordingly, QL C and QL D shall be conducted for all projects. QL A and QL B shall be conducted in areas with congested utilities, areas where utility information is sparse, where a specific utility of high importance is being crossed (i.e., gas line), or as required by the City Engineer. The requirements for the four SUE QLs are as follows:

- 1.9.3.A. Quality Level D – Information derived from existing records or oral recollections.
- 1.9.3.B. Quality Level C – Information obtained by surveying and plotting visible above-ground utility features and by using professional judgment in correlating this information to Quality Level D.
- 1.9.3.C. Quality Level B – Information obtained through the application of appropriate surface geophysical methods to determine the existence and approximate horizontal position of subsurface utilities. This work shall be performed to obtain horizontal location of subsurface utilities.
- 1.9.3.D. Quality Level A – Precise horizontal and vertical location of utilities obtained by the actual exposure and subsequent measurement of subsurface utilities, usually at a specific point. This work shall be performed to obtain precise horizontal and vertical locations of subsurface utilities.

1.9.4 Additional Field Work – Additional SUE field work shall be required as conditions change from initial SUE field exploration.

1.10 Grading, Excavation, Earthwork, and Erosion Control

- 1.10.1 No person shall fill, grade, excavate, or otherwise disturb the surface of real property within the City without first having secured a Grading or Site Development Permit. No owner of real property shall knowingly permit another person to fill, grade, excavate or otherwise disturb the surface of real property within the City without first having secured a permit from the City Engineer.
- 1.10.2 Requirements of Section 7.3 (Erosion and Sediment Controls) shall be met for any fill, grade, excavation or other activities that disturb the surface of real property.
- 1.10.3 Any required drainage systems, including, but not limited to, detention ponds, that will prevent or reduce impacts to adjacent properties shall be constructed prior to construction of any other facilities.

1.11 Survey Requirements

- 1.11.1 General – The requirements provided herein shall be minimum standards for projects involving a survey. All surveys shall be tied to the appropriate datum used by the City of Weatherford.
- 1.11.2 Markers – Markers consisting of minimum 3/8-inch diameter steel rods, at least 24 inches long with caps identifying responsible surveying firm or RPLS number, shall be placed at all:
 - 1.11.2.A. Lot and block corners (wherever a lot line bearing changes);
 - 1.11.2.B. Intersection points of alley and block lines;
 - 1.11.2.C. Curve and tangent points along block, lot, and ROW lines within the subdivision; and,
 - 1.11.2.D. ROW dedications.



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- 1.11.3 Monuments – Monuments shall be installed, and three-dimensional coordinates shall be noted on the plat. Coordinates shall be based on the horizontal and vertical datum required by the City Engineer.
- 1.11.4 Private Project Monuments – At least two markers shall be placed at property corners. For developments greater than 50 lots and/or 10 acres, at least two monuments at opposing ends of the property and tied into City's system shall be set.
- 1.11.5 Public Project Monuments – Found existing ROW monuments, survey markers or property corners, and proposed monuments shall be shown on the construction plans and located by station and offset, right or left from the control line, baseline or centerline, or by northing and easting.
- 1.11.6 Final Acceptance – If construction damages, destroys, or alters existing survey markers, monuments, or property corners, they must be reset by a licensed surveyor prior to final acceptance.

1.12 Fees

- 1.12.1 Code Provided Fees – Fees shall be in accordance with the Weatherford City Code, as amended. Refer to the City's website for current fee schedules.
- 1.12.2 Other Agency Fees – Additional fees may be assessed by other regulatory agencies.

1.13 Revisions to the EDCM

- 1.13.1 Content of EDCM and Appendices – Sections 1 through 9 of the EDCM provide general procedures and design requirements applicable to all applications, as well as general design requirements for certain public facilities. The appendices to the EDCM provide greater detail on the requirements provided in Sections 1 through 9, as well as practical tools to help facilitate an application.
- 1.13.2 Procedure for Manual Sections Amendments – Sections 1 through 9 may be amended as necessary.
- 1.13.3 Procedure for Appendices Updates – The appendices may be revised in accordance with the following procedures:
 - 1.13.3.A. Committee Review – All revisions to the Appendices will be considered and approved by a Committee consisting of the following:
 - 1.13.3.A.i. Director of Transportation and Public Works
 - 1.13.3.A.ii. Director of Water Utilities
 - 1.13.3.A.iii. City Engineer
 - 1.13.3.A.iv. Director of Capital Projects
 - 1.13.3.A.v. Representatives from the development community
 - 1.13.3.B. Posting – Upon approval by the Committee, the proposed revisions will be incorporated into the EDCM, posted on the Engineering Division Website and will take immediate effect.
- 1.13.4 Requests for Modification – A formal request to modify current design criteria or add new design criteria may be submitted in writing to the City Engineer for consideration by the Committee.



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**SECTION 2 ROADWAY AND TRAFFIC DESIGN REQUIREMENTS*****Section Highlights***

- The geometry (horizontal and vertical) for streets and alleys shall be per Table 2-1 General Roadway Design Criteria. Refer to the City's Thoroughfare Plan for classification designation.
- The pavement section for streets and alleys shall meet the minimum thicknesses shown on the Standard Details. For public roadways, a complete geotechnical report with pavement design shall be completed per Section 2.12 (Pavement and Subgrade).
- Maximum slopes for natural ground is 3H:1V.
- All traffic signal designs and traffic control devices shall at a minimum meet the guidelines in Texas Department of Transportation's (TxDOT) current editions of Texas Manual on Uniform Traffic Control Devices (TMUTCD); Traffic Signals Manual; Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges; Traffic Standard Sheets; and the requirements herein.

2.1 General

2.1.1 This section includes minimum design requirements associated with the City's streets, alleys, pedestrian facilities, off-street parking lots/areas, fire lanes and dumpsters, including geometry, traffic signals, street lighting, new development signage, pavement and subgrade. Traffic Impact Analysis (TIA) requirements and procedures are also included in this section.

2.1.2 The arrangement, character, extent, width, grade and location of all streets shall conform to the City of Weatherford's Thoroughfare Plan and EDCM, and shall be considered in their relation to existing and planned streets or driveways (whether within the City of Weatherford, within its ETJ area, or within adjacent municipal or county areas), to topographical conditions, to public safety, and in their appropriate relation to the proposed uses of the land to be served by such streets. Reserve or residual strips of land controlling access to or egress from other property, or to or from any street or alley, or having the effect of restricting or damaging the adjoining property for subdivision purposes, or which will not be taxable or accessible for improvements shall not be permitted in any subdivision unless such are required by the City in the public interest (such as to enhance public safety or other public interest).

2.1.3 Proposed streets shall provide a safe, convenient and functional system for traffic circulation; shall be properly related to the City's Thoroughfare Plan, road classification system, General Plan and any amendments thereto; and shall be appropriate for the particular traffic characteristics of each development. All streets shall be open and unobstructed at all times. The layout of the street network shall, to the greatest extent possible, be sited and aligned along natural contour lines, and shall minimize the amount of cut and fill on slopes in order to minimize the amount of land area that is disturbed during construction, thereby helping to reduce storm water runoff and preserve natural, scenic characteristics of the land.

2.1.4 Adequacy of streets and thoroughfares

2.1.4.A. Responsibility for adequacy of streets and thoroughfares – The Property Owner shall assure that the subdivision is served by adequate streets and thoroughfares and shall be responsible for the costs of rights-of-way and street improvements, in accordance with the following policies and standards, and subject to the City's cost participation policies on oversized facilities.



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2.1.4.B. General adequacy policy – Every subdivision shall be served by improved streets and thoroughfares adequate to accommodate the vehicular traffic to be generated by the development.

2.1.4.C. Road network – New subdivisions shall be supported by a road network having adequate capacity, ingress/egress, and safe and efficient traffic circulation. The adequacy of the road network for developments generating peak hour trips as indicated in Section 2.17 (Traffic Impact Analysis), or for developments involving traffic signal timing, and/or the geometry of roadway alignments, shall be demonstrated by preparation and submission, prior to or along with the Site Development Permit application, of a TIA prepared in accordance with Section 2.17 (Traffic Impact Analysis), which takes into consideration the need to accommodate traffic generated by the development, land to be developed in common ownership and other developed property. If the property to be developed is intended as a phase in a larger development project or constitutes a portion of the land to be ultimately developed, the City Engineer may require a demonstration of adequacy pursuant to this section for additional phases or portions of the property as a condition of approval for the proposed preliminary plat. If the applicant submits a TIA for an entire phased development project, the City Engineer may require an update of the study for each subsequent phase of the development that reflects any applicable changed conditions.

2.1.4.D. Approach roads and access – All subdivisions must have at least two points of vehicular access (primarily for emergency vehicles) and must be connected via improved roadways to the City's improved thoroughfare and street system by one or more approach roads of such dimensions and improved to such standards as are hereinafter set forth. Requirements for dedication of ROW and improvement of approach roads may be increased depending upon the size or density of the proposed development, or if such need is demonstrated by a TIA.

2.1.4.D.i. "Two points of vehicular access" shall be construed to mean that the subdivision has at least two improved roads accessing the subdivision from the City's improved thoroughfare system, and the subdivision has at least two road entrances. The City Engineer may, at its discretion and upon a finding that such will not compromise public safety or impede emergency access, accept a single median-divided entrance from the City's improved thoroughfare system provided that the median extends into the subdivision for an unbroken length of at least 200 feet to an intersecting internal street which provides at least two routes to the interior of the subdivision. For example, the entrance street is not a dead-end or cul-de-sac, and it does not create a "bottleneck" allowing only one emergency route into the interior of the subdivision.

2.1.4.D.ii. In addition to having at least two points of access from improved public roadways, all residential developments shall provide no less than one point of access for every 50 lots, or portion thereof, including temporary dead-end stubbed streets that will eventually provide connections into adjacent future developments and thence to an arterial or collector street.

2.1.4.D.iii. Driveway access onto roadways shall be provided and designed in accordance with the City's EDCM and construction standards that are in effect at the time the preliminary plat application is officially submitted and deemed a complete application. Residential driveway cuts shall not be allowed on roadways that are larger than a



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residential collector street (60-foot ROW) unless specifically approved by the City Engineer.

- 2.1.4.D.iv. The subdivision shall be designed to provide adequate emergency access for public safety vehicles. Each residential lot in the subdivision shall have a minimum frontage on a dedicated public street as required by applicable zoning or 35 feet, whichever is greater, unless other provisions have been authorized through planned development approval.
- 2.1.5. Offsite improvements – Where a TIA demonstrates the need for such facilities, or where the City believes public safety is at risk, the Property Owner shall make such improvements to offsite collector and arterial streets and intersections as are necessary to mitigate traffic impacts generated by the development or in conjunction with related developments. The City may participate in the costs of oversize improvements with the Property Owner as set out herein, and subject to the City's cost participation policies on oversized improvements.
- 2.1.6. Street dedications
 - 2.1.6.A. Dedication of ROW – The Property Owner shall provide all rights-of-way required for existing or future streets, and for all required street improvements, including perimeter streets and approach roads, as shown in the thoroughfare plan and as required by the EDCM or by other valid development plans approved by City Council. In the case of perimeter streets, half of the total required ROW width for such streets shall be provided unless the proposed development is on both sides of the street, in which case the full ROW width shall be provided, or unless there is some other compelling reason to require more than half of the ROW width (such as avoiding the infringement upon or demolition of existing structures, avoiding crossing a creek or flood plain or some other obstacle, or other similar circumstance). In some instances, more than half of the required width shall be required when a half street is impractical or unsafe and depending upon the actual or proposed alignment of the street, such as in the case of a curved street, as may be required by the City Engineer.
 - 2.1.6.B. Perimeter streets – Where an existing half-street is adjacent to a new subdivision or addition, the other half of the street shall be dedicated, and an appropriate amount of the street shall be improved, by the Developer of the new subdivision or addition.
- 2.1.7. Improvement of adjacent (perimeter) streets and utilities
 - 2.1.7.A. When a proposed subdivision, whether residential or nonresidential, abuts on one or both sides of an existing substandard street, or on a planned or future road as shown on the thoroughfare plan, being substandard according to the then existing current thoroughfare plan, the Developer shall be required to improve his or her reasonable share of the existing onsite facility as that term is defined herein, including appurtenant sidewalks, barrier-free ramps, screening and landscaping, median openings and/or left turn lanes (if a divided thoroughfare), storm drainage structures, water quality or erosion controls, and other utilities, to bring the same to City standards, or to replace it with a standard City street as determined by the TIA, if required, at no cost to the City.
 - 2.1.7.B. The Developer's share of improvements to a substandard perimeter road shall be 18½ feet of pavement (including curb, if any), which is approximately equivalent to half of a collector street width (i.e., two through traffic lanes), along the entire front footage of the subdivision, unless the TIA, if required, indicates that some other pavement width is needed to achieve and maintain an acceptable level of service on the roadway. If the subdivision is to be located on both sides of the



roadway, 18½ feet of pavement shall be constructed by the Developer on each side of the road along the entire front footage of the subdivision on each respective side of the road, unless the TIA determines otherwise. Design and construction of the roadway shall be in accordance with the City's thoroughfare plan (with respect to ROW width and general location, the EDCM manual, and with any other applicable City codes and ordinances. Depending upon the specific roadway in question, and upon the TIA results, any oversizing above the 18½ width shall be borne by the City, the county, the state or by some other entity. The City Council may, at its option, accept escrow funds in lieu of immediate roadway construction if the subdivision derives principal access from another improved roadway and if delaying construction and improvement of the road will not harm or otherwise inconvenience neighboring property owners or the general public.

- 2.1.7.C. Streets which dead-end at power lines or similar rights-of-way or easements, and which are intended for future extension across these rights-of-way or easements, shall be constructed in the ROW or easement for half the distance across the ROW or easement. As with any other dead-end street, a note shall be placed on the final plat clearly labeling the dead-end streets that will, at some point, be extended across the power line easement (or ROW), and signage shall be placed at the end of the constructed street stub, such as on the barricade, also stating that the street will be extended in the future. Signage size and lettering shall be large enough to be legible by a person with normal vision at a distance of 20 feet.
- 2.1.8 Slope easements – The dedication of easements, in addition to dedicated rights-of-way shall be required whenever, due to topography, additional width is necessary to provide adequate earth slopes. Such slopes shall be no steeper than three feet horizontal run to one-foot vertical height, or a three-to-one (3:1) slope.
- 2.1.9 Street construction – All streets and thoroughfares shall be constructed and paved to City standards and within rights-of-way as required by the thoroughfare plan and in accordance with the EDCM and other City standards as may be from time to time amended or adopted.
- 2.1.10 Intersection improvements and traffic control devices – Intersection improvements and traffic control devices shall be installed as warranted in accordance with the TIA, or as may be required by the City for traffic safety and efficiency.
- 2.1.11 Phased development – Where a subdivision is proposed to occur in phases, the applicant, in conjunction with submission of the preliminary plat, shall provide a schedule of development. The schedule shall set forth the intended plan of development and dedication of rights-of-way for streets and street improvements, whether onsite or offsite, intended to serve each proposed phase of the subdivision. The City Engineer shall determine whether the proposed streets and street improvements are adequate pursuant to standards herein established and may require that a TIA be submitted for the entire project or such phases as the City Engineer determines to be necessary to adjudge whether the subdivision will be adequately served by streets and thoroughfares.
- 2.1.12 Private Streets – Private streets shall not be allowed for new residential subdivisions. The City Engineer may consider private streets on a case-by-case basis for new, non-residential subdivisions, and only when a property owners association is designated to maintain the private streets.
- 2.1.13 Arrangement of streets not shown on the thoroughfare plan. – For streets that are not shown on the City's thoroughfare plan, such as local residential streets, the arrangement of such streets within a subdivision shall:
 - 2.1.13.A. Provide for the continuation or appropriate projection of existing streets from or into surrounding areas;



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2.1.13.B. Conform to a plan for the neighborhood approved or adopted by the City Council to meet a particular situation where topographical or other conditions make continuance or conformity to existing streets impractical;

2.1.13.C. Provide for future access, such as by stubbing streets for future extension, to adjacent vacant areas which will likely develop under a similar zoning classification or for a similar type of land use; and

2.1.13.D. Not conflict in any way with existing or proposed driveway openings (including those on the other side of an existing or planned median-divided arterial, in which case new streets shall align with such driveway openings such that median openings can be shared).

2.1.14 Residential collector streets and minor residential streets shall be laid out such that their use by through traffic will be discouraged, such as via circuitous routes or multiple turns or offsets, but such that access is provided to adjacent subdivisions.

2.1.14.A. Wherever the ROW width of a collector or residential street must transition to a greater or lesser width, such transition shall occur along the front, side or rear lot lines of adjacent lots (for a reasonable distance) and shall not occur within the street intersection itself. In other words, the ROW width shall be the same on both sides of the street intersection.

2.1.14.B. To the greatest extent possible, the number of lots fronting along residential collector streets shall be minimized in order to ensure adequate traffic safety and efficiency. No more than 20% of the total centerline length of a collector street may have residential lots fronting onto the collector on each side of the street. For example, a collector street having a total centerline length (from one terminus to another) of 1,000 feet may have lots fronting onto it with a total frontage distance of 200 feet on each side of the street. Calculations shall be submitted with the Site Development Permit application verifying that lots fronting onto a collector street do not exceed the above.

2.1.14.C. At least 50% of the total centerline length of all streets (including collector streets) within a residential subdivision (or within each phase of a residential subdivision, unless otherwise approved by the City Engineer to apply to the subdivision in its entirety rather than each individual phase) shall be curvilinear in design. Calculations shall be submitted with the Site Development Permit application verifying that the above curvilinear street requirement is being met.

2.1.14.C.i. If the curvilinear requirements cannot be met, the City Engineer may consider other traffic calming measures as documented in the City's Traffic Calming Program.

2.1.15 Where a subdivision abuts or contains an existing or proposed arterial street, the City Engineer may require marginal access streets, reverse frontage (lots which back onto the arterial), deep lots with rear service alleys, or such treatment as may be necessary for adequate protection of residential properties and to afford separation of through and local traffic.

2.1.16 Reserve strips controlling access to streets shall be prohibited except where their control is required by the City Engineer.

2.1.17 Intersecting, undivided streets with centerline offsets of less than 150 feet shall be avoided. Intersecting streets onto an existing or future divided roadway must be configured such that the centerline offset will accommodate the appropriate median opening and left-turn lanes (with required transition and stacking distances) on each divided roadway, and shall be aligned with any existing or proposed streets or driveways on the opposite side of the divided roadway (in order to share the median opening).



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2.1.18 Street ROW widths shall be as shown on the thoroughfare plan and as defined by the corresponding roadway classifications on the thoroughfare plan and in the City's EDCM.

2.1.19 Construction of half streets shall be prohibited, except when essential to the reasonable development of the subdivision in conforming with the other requirements of this ordinance and the thoroughfare plan, and where the City Engineer determines that there is no immediate benefit to be gained by constructing the full street section since no access from the street will be needed by the subdivision in question. The City Engineer may also find that it would be more practical, or cost effective, to delay construction of the other half of a street until when the adjoining property is developed.

2.1.19.A. If the Property Owner is responsible for one-half of the street, then the Property Owner shall either construct the facility along with his or her development or shall provide escrow for the construction cost of his or her share of the facility (including all applicable street appurtenances such as median openings, left turn lanes into the development, sidewalks with barrier-free ramps, drainage structures, etc.) unless the City participates in the construction of the facility. Whenever a partial street has been previously platted along a common property line, the other portion of the street ROW shall be dedicated such that the ROW is increased to the street's ultimate planned width. Improvements shall be made to all onsite facilities as defined herein.

2.1.20 The maximum length of any block or street segment (including a looped street) shall be 1,600 feet and the minimum length of any block or street segment shall be 400 feet, as measured along the street centerline and between the point(s) of intersection with other through, but not dead-end or cul-de-sac, streets.

2.1.21 A cul-de-sac street shall not be longer than 600 feet, and at the closed end shall have a turnaround bulb with an outside pavement diameter of at least 96 feet measured from the face of curb and a ROW diameter of at least 116 feet. The length of a cul-de-sac shall be measured from the centerline of the intersecting street to the centerline of the cul-de-sac bulb.

2.1.22 The City Engineer may approve, a variance for overlength streets or cul-de-sac, whether temporary or permanent, upon considering the following:

2.1.22.A. Alternative designs which would reduce street or cul-de-sac length;

2.1.22.B. The effect of overlength streets upon access, congestion, delivery of municipal services, and upon convenience to residents of the subdivision in traveling to and from their homes; and

2.1.22.C. Means of mitigation, including but not limited to additional mid-block street connections, limitation on the number of lots to be served along an overlength street segment or cul-de-sac, temporary (or permanent) points of emergency access, and additional fire protection measures.

2.1.23 Except in unusual cases, no dead-end streets will be approved unless such dead-end streets are provided to connect with future streets on adjacent land. In the case of dead-end streets which will eventually be extended into the adjacent subdivision, no more than one lot (per side) can front onto the dead-end street stub unless a temporary turnaround bulb (with the appropriate temporary street easement) is provided at the end. A temporary dead-end street shall not exceed the maximum allowed length of a normal cul-de-sac, and the temporary turnaround bulb must be constructed like a cul-de-sac, as provided in subsection 2.1.20 above (the City Engineer may authorize the use of asphalt or other durable paving material than concrete for the arc, or "wing," portions of the temporary turnaround bulb in order to minimize the cost of removing those portions later on). A note shall be placed on the final plat clearly labeling any temporary dead-end streets (if any) that will at some point be



extended into the adjacent property, and signage shall be placed at the end of the constructed street stub, such as on the barricade, also stating that the street will be extended in the future. Signage and lettering must be large enough to be legible by a person with normal vision at a 20-foot distance. Any required temporary turnaround easements shall be shown on the final plat along with their appropriate recording information, if they are offsite or established by separate instrument.

2.1.24 New streets that extend existing streets shall bear the names of the existing streets and shall be dedicated at equal or greater ROW widths than the existing streets for an appropriate transition length, if applicable.

2.1.25 Construction of new streets – All new streets dedicated within a subdivision shall be constructed in accordance with paving widths and specifications as set forth in the EDCM of the City of Weatherford at the time at which the preliminary plat application is officially submitted and deemed a complete application.

2.2 Roadway Design

2.2.1 Functional Classification

2.2.1.A. General – The arrangement, character, extent, width, and location of all streets shall conform to the City's current adopted [Thoroughfare Plan](#), and shall be considered in relation to existing and planned streets, topographical conditions, public safety, and the proposed uses of the land to be served by such streets. When such street is not on the City's Thoroughfare Plan, the arrangement of streets shall either:

- Provide for the continuation or appropriate extension of existing streets in surrounding areas; or,
- Conform to a plan for the neighborhood approved or adopted by the City to meet a particular situation where topographical or other conditions make continuance or conformity to existing streets impracticable.

2.2.1.B. Roadway Classifications – Table 2-1 summarizes the general design criteria for the City's adopted thoroughfare plan classifications as well as residential alleys. Typical sections are depicted in Appendix C Standard Details.

2.2.1.C. Exceptions – Exceptions to the design criteria presented in Table 2-1 may be considered on a case-by-case basis and shall require City Engineer approval. Refer to Section 1.6 (Variance Requests). Exceptions may include the following:

2.2.1.C.i. Overlay Districts – Refer to Section 1.3 (Interpretation and Applicability) for standards that apply to Overlay Districts. In all cases, the design criteria within the EDCM shall be satisfied. If the engineering design criteria is not met, a variance is required.

2.2.1.C.ii. Rural Applications – Rural roadways with roadside ditch drainage may be considered on a case-by-case basis. The ROW width required for rural roadways varies based on the width of the ditch. Refer to Section 3.13 for applicable design criteria. In all cases, the following criteria shall be satisfied:

- All lots within the subdivision must be one acre or larger;
- ROW width shall be a minimum of 60 feet;
- Paving width shall be a minimum of 27 feet. If bike lanes are designated on the Trails Master Plan, additional paving width shall be required; and,



- An additional 5 feet of parkway shall be provided between the top of the ditch backslope and ROW line on both sides of the roadway. If sidewalks/trails exist or are planned, an additional 5 feet of parkway beyond the sidewalk/trail shall be required.

2.2.1.C.iii. **Urban Streets** – Transportation facilities that serve established communities, serve an urban mixed-use development, or require multiple modes of travel may follow a context sensitive, multi-modal approach to identifying the typical street section(s). These typical street sections may not comply with those in Table 2-1.

2.3 Complete Streets Policy

- 2.3.1 Complete Streets mean streets that are designed, operated, and maintained to enable safe, accessible, convenient, and comfortable travel and access for all people and travel modes. This includes people traveling as pedestrians, by bicycle, by transit, and by motor vehicle such that people of all ages and abilities are able to safely move along and across a street.
- 2.3.2 **Vision** – Provide safe, accessible, complete, connected, comfortable, efficient, and community-oriented transportation networks. These context-sensitive networks will address the mobility needs of all users and integrate the community values of health, safety and economic vitality in an aesthetically appropriate manner.
- 2.3.3 **Scope and Application** – The City shall provide a complete and connected, context-sensitive transportation system for all users that supports mobility options, accessibility, healthy living, and economic benefit, and will ensure the safety, accessibility, comfort, and convenience of people of all ages and abilities, pedestrians, bicyclists, motorists, public transportation users, emergency responders, freight providers, and adjacent land users.
- 2.3.4 The policy is applicable to all development and redevelopment in the public domain within the City of Weatherford and its extraterritorial jurisdiction. All roadways and routes need not be optimized for all modes; however, people using each mode require a network of safe and convenient travel routes and crossings throughout Weatherford. In determining future need, City staff shall consult relevant City and regional long-range plans for land use and transportation, including the City's General Land Use Plan, Transportation Thoroughfare Plan, and other adopted plans.
 - 2.3.4.A. All transportation facilities approved by the City, including but not limited to, facilities in the public ROW, access easements, and private streets shall be designed, constructed, operated, and maintained so that people of all ages and abilities can travel safely and independently.
 - 2.3.4.B. Complete Streets require connected travel networks that provide complete access to destinations. Streets shall be connected to create complete street networks that provide travelers with choice of travel mode and route, and that helps to reduce congestion on major roadways. This network also includes off-street hard-surface trails for biking and walking.
 - 2.3.4.C. The City shall review all transportation projects designed by other agencies or entities that require funding or approval by the City for conformance with this policy and, where needed, recommend measures and/or require appropriate changes to bring it into compliance.
 - 2.3.4.D. The City shall approach every transportation improvement and project phase as an opportunity to create safer, more accessible streets for all people. These phases include, but are not limited to: planning, programming, design, ROW acquisition, construction, construction engineering, reconstruction, operation and major maintenance. Minor maintenance activities designed to keep existing assets in serviceable condition (e.g. mowing, cleaning, sweeping, and spot repair)



are not required to comply with this policy.

2.3.4.E. The City shall promote partnerships with entities not under its jurisdiction to satisfy this policy, including school districts, Parker County Public Transit Service, counties, adjacent municipalities, NCTCOG, and State of Texas agencies with facilities in the City of Weatherford and its extra-territorial jurisdiction. Partner agencies are encouraged to adopt this Complete Streets Policy or an equivalent.

2.3.5. Exceptions – Any exception to this policy, including for private projects, must be reviewed and approved by the designees of both the Transportation and Public Works and Planning and Development departments and be documented with supporting data that indicates the basis for the decision. Such documentation shall be publicly available. Projects that request Complete Streets exceptions related to the Thoroughfare Plan Subdivision Ordinance shall follow the processes provided for in those documents.

2.3.5.A. Exceptions may be considered for approval when:

2.3.5.A.i. An affected roadway prohibits by law, use by specified users (such as an interstate freeway or pedestrian malls), in which case a greater effort shall be made to integrate mobility options along adjacent corridors and on roadways that cross or otherwise intersect with the affected roadway; and

2.3.5.A.ii. The designees of the Transportation and Public Works and/or Planning and Development department, issue a documented exception concluding that the application of Complete Streets principles is unnecessary, unduly cost prohibitive (guideline: approximately greater than 20% of the project budget), or inappropriate because it would be contrary to public safety.

2.3.5.B. The City shall evaluate previous exception requests and decisions periodically to determine if policy updates are warranted.

2.3.6. Design Standards – The City shall utilize design standards using the best and latest design standards available based on Accessibility Standards, Americans with Disabilities Act, ITE, AASHTO, and NACTO. These guidelines include, but are not limited to: the Weatherford Master Thoroughfare Plan, ITE Designing Walkable Urban Thoroughfares: A Context Sensitive Approach; AASHTO Guide for Planning, Designing and Operating Pedestrian Facilities, and AASHTO Guide for Designing Bicycle Facilities.

2.3.6.A. Other appropriate design standards may be considered, provided that a comparable level of safety for all travel modes is present.

2.3.7. Performance Measures and Reporting

2.3.7.A. The City shall measure the success of this Complete Streets policy by using performance measures such as reductions in injuries and fatalities, reduction in Transportation gaps, improved emergency services response times, impacts and benefits for traditionally disadvantaged communities, increased usage of alternative transportation modes, and economic performance of transportation investments.

2.3.7.B. An annual report will be presented by staff to the Transportation Advisory Board, to the City Planning Commission and to the City Council showing progress made in implementing this policy. The report shall be posted on-line.

2.3.8. Implementation

2.3.8.A. The City of Weatherford shall view Complete Streets as integral to everyday



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transportation decision-making practices and processes. To this end:

- 2.3.8.A.i. The designees of the Transportation and Public Works and Planning and Development departments, and other relevant departments, agencies, or committees will incorporate Complete Streets principles into all existing plans, manuals, checklists, decision-trees, rules, regulations, and programs as appropriate (including, but not limited to the Thoroughfare Plan, the General Land Use Plan, Capital Improvement Plan, and other appropriate planning or guidance documents);
- 2.3.8.A.ii. Transportation and Public Works, Planning and Development, and other relevant City departments, agencies, or committees will update current design guidelines and standards, including subdivision regulations that apply to new roadway construction, to ensure that they reflect the best available design standards and guidelines to effectively implement Complete Streets;
- 2.3.8.A.iii. When available, the City shall encourage staff training on Complete Streets and associated elements through attending conferences, classes, seminars, and workshops;
- 2.3.8.A.iv. The City shall prioritize opportunities to create a complete transportation network that provides connected facilities to serve all people and modes of travel, now and in the future. City staff shall utilize project selection criteria that supports Complete Streets projects;
- 2.3.8.A.v. The Transportation and Public Works and Planning and Development Departments shall prepare a Complete Streets project guide that ensures interdepartmental/interagency coordination during project scoping and consideration of all users and modes, connected travel networks, and nearby land uses;
- 2.3.8.A.vi. Every Complete Streets project shall include an educational component to ensure that all people using the transportation system understand and safely utilize Complete Streets project elements.



Table 2-1 General Roadway Design Criteria

Criteria/Element	Street Classification											
	Major Arterial		Minor Arterial		Major Collector		Minor Collector		Residential Collector	Local A	Rural Collector	Rural Local
	“AA”	“A”	“B”	“B5”	“C”	“C3”	“D”					
R.O.W.	120'	100'	90'	90'	80'	80'	60'	50'	50'	80'	60'	
Roadway Width	(2) 36'	(2) 33'	(2) 26'	(1) 62'	(1) 48'	(1) 45'	(1) 40'	(1) 36'	(1) 30'	(1) 36'	(1) 27'	
# Lanes – Width	6-12'	6-11'	4-13'	4-12' & 1-14'	4-12'	3-15'	2-12' & 2-8'	2-10' & 2-8'	1-14' & 2-8'	2-14' & 2-4' Shoulders	2-12' & 2-1.5' Shoulders	
Parking Lanes	-	-	-	-	-	-	2-8'	2-8'	2-8'	-	-	
Median Width	16'	14'	14'	-	-	-	-	-	-	-	-	
Tn. Ln. Width	-	-	-	14'	-	-	-	-	-	-	-	
Parkway Width	15.5'	9.5'	11.5'	13.5'	15.5'	9.5'	14'	6.5'	9.5'	22'	16.5'	
Sidewalk	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	
Design Speed	45 mph	45 mph	45 mph	40 mph	40 mph	35 mph	35 mph	30 mph	30 mph	30 mph	30 mph	
Maximum Grade	6%	6%	6%	6%	8%	10%	10%	10%	10%	10%	10%	
Minimum Grade	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	
Design Frequency	5 years	5 years	5 years	5 years	5 years	5 years	5 years	5 years	-	-	-	
Lanes Free of Storm Water	1 Each Way	1 Each Way	1 Each Way	1 Each Way	1-12' Ctr. Lane	1-12' Ctr. Lane	1-12' Ctr. Lane	-	-	-	-	
Minimum Stopping Sight Distance	360'	360'	360'	300'	300'	250'	250'	200'	200'	200'	200'	
Minimum Centerline Radius	1000'	1000'	1000'	760'	760'	480'	480'	300'	300'	300'	300'	
Minimum Centerline Radius w/2% Superelevation	-	-	-	700'	700'	-	-	-	-	-	-	
K Value (Crest)	120	120	120	80	80	50	50	30	30	30	30	
K Value (Sag)	90	90	90	70	70	50	50	40	40	40	40	
Design Vehicle	WB-67 Truck/Trailer					Fire Truck						



2.3.9 Horizontal Alignment

- 2.3.9.A. Roadways shall be typically placed in the center of ROW. The City Engineer may require a shift in the horizontal alignment due to the inclusion of pedestrian elements or connection to existing streets.
- 2.3.9.B. The minimum radii shown in Table 2-1 are based on a typical 2% adverse crown (-2%). Smaller radii are discouraged, but may be used with the appropriate super-elevation to maintain the design speed, with approval by the City Engineer.
- 2.3.9.C. The basic formula for determining horizontal alignment is:

$$e + f = \frac{V^2}{15R}$$

Where:

e = rate of roadway superelevation, foot per foot,

f = side friction factor,

V = vehicle speed, in miles per hour, and

R = radius of curve in feet.

2.3.10 Vertical Alignment

- 2.3.10.A. Minimum and maximum street grades shall comply with the requirements provided in Table 2-1.
- 2.3.10.B. A vertical curve is required when two longitudinal street grades intersect at a point of vertical intersection (PVI) and the algebraic difference is more than 1.0% for residential alleys, local streets and residential collectors. Vertical curves are required when the algebraic difference is more than 0.5% for all other roadway classifications. To determine the acceptable length of crest and sag curves, follow the guidelines in AASHTO's current edition of A Policy on Geometric Design of Highways and Streets. The K values for vertical crest curves and vertical sag curves provided in Table 2-1 are minimums for streets with curbs in order to avoid poor drainage associated with long, flat curves and ensure comfort of motorists. The maximum allowed K value shall be 170.
- 2.3.10.C. The City Engineer may approve K values that do not meet the minimum values shown in Table 2-1 if the minimum K values cannot be achieved. In all cases, vertical curve alignment shall provide adequate stopping sight distance in accordance with AASHTO's current edition of A Policy on Geometric Design of Highways and Streets.

2.3.11 Stopping Sight Distance

- 2.3.11.A. Stopping sight distance is the length of roadway ahead visible, measured from a driver's eye height of 3.50 feet to an object height of six inches. It is composed of two parts: (1) brake reaction distance, which is the distance a vehicle travels from the time the driver sees an object to the time the brakes are applied, and (2) braking distance, which is the distance required for the vehicle to stop after the brakes are applied. Stopping sight distance should be adequate at every point along a roadway for drivers to come to a safe stop before reaching an object.

- 2.3.11.A.i. Stopping Sight Distance (SSD) in feet is determined from the formula: $SSD = 1.47PV + \frac{V^2}{30(f \pm G)}$

Where:

V = speed from which stop is made, in miles per hour,

P – perception-reaction time, in seconds (normally 2.5 seconds),

f = coefficient of friction (for wet pavement), and

G = percent of grade divided by 100 (added for upgrade or subtracted for downgrade).

2.3.11.B. Minimum stopping sight distances and design speeds for various street classifications are provided in Table 2-1.

2.3.12 Cross-Sectional Elements

2.3.12.A. Pavement Cross-Slopes – All streets shall have a maximum cross-slope of 2%.

The cross-slope can vary where there is a transition into or out of a maximum 2% straight grade across the entire street width or street intersections. When super-elevation is approved by the City Engineer, the maximum allowable slope is 5%. Super-elevation must be designed in accordance with AASHTO's current edition of A Policy on Geometric Design of Highways and Streets.

2.3.12.B. Clear Zone – A clear zone shall be provided for all streets in accordance with AASHTO's current edition of Roadside Design Guide. In general, a minimum clear zone of 4 feet shall be provided from the face of curb on tangent sections and a minimum clear zone of 6 feet shall be provided from the face of curb on curved sections. Where clear zone requirements cannot be met, a guardrail or other type of barrier shall be required in accordance with AASHTO's current edition of Roadside Design Guide.

2.3.12.C. Horizontal Clearance – Horizontal clearance for 1.5 feet behind the face of curb shall be provided for all streets in accordance with AASHTO's current edition of Roadside Design Guide.

2.3.12.D. Structures – Private fences, walls, screening devices, and other structures shall not be erected within the ROW or visibility triangle. Power poles and street lights are excluded from this restriction provided they maintain visibility.

2.3.13 Knuckles and Partial Cul-de-sacs

2.3.13.A. Knuckles – Knuckle design is to be consistent with cul-de-sac radius criteria.

2.3.13.B. Partial Cul-de-sacs – When partial cul-de-sacs are utilized to provide frontage or irregular shaped lots dictated either by choice or by topography or other constraints, consideration must be given to their effect, or potential effect, on the safety of the motoring public. These facilities, by improper design and location, may encourage both head-in and parallel parking behind the curb line of the through street in a random fashion. Sufficient room must be provided within the partial cul-de-sac to allow complete vehicle maneuvering behind the curb line so that they may turn around and head out, rather than to back out, onto the through street. Dimensions for partial cul-de-sacs shall be as shown in Figure 2-1.

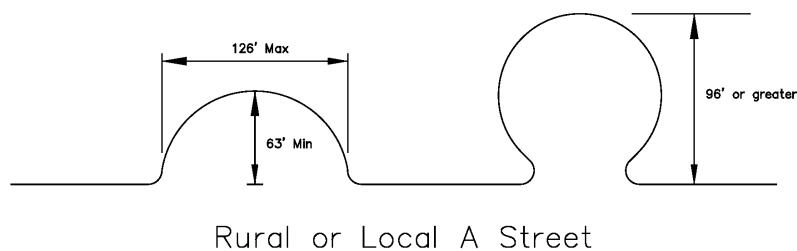


Figure 2-1 Partial Cul-De-Sacs

2.4 Intersections

- 2.4.1 General – Intersections shall be designed to facilitate the safety, convenience, and efficiency of the motor vehicles, bicycles, and pedestrians traveling through it.
- 2.4.2 Grading Plan – A separate grading plan shall be provided for any intersection involving an arterial or collector. The grading plan shall include profiles and/or spot elevations for each curb return, curb ramp, and crosswalk.
- 2.4.3 Alignment – Through lanes shall line up across intersections with no offset.
- 2.4.4 Angles – A street intersection with a major thoroughfare shall be at a 90-degree angle and shall be tangent to the intersecting street for at least 100 feet. All other street intersections shall be laid out so as to intersect as nearly as possible at a ninety-degree angle or radial to the centerline of the intersecting street for the full ROW of the intersecting street, and tangent to the intersecting street for at least 50 feet. No street shall intersect at an angle that is less than 85 degrees.
- 2.4.5 Curb Returns – The curb return radius at an intersection shall be in accordance with Table 2-2. Gutter slope along the curb return shall be a minimum of 0.5%.

Table 2-2 Curb Return Radius

Largest Classification	Intersecting With	Curb Return Radius (feet)
Arterial	Arterial	40
Arterial or Collector	Collector	30
Arterial, Collector, or Local	Local	25

- 2.4.6 Cross-Slopes – Street cross-slopes shall be transitioned to allow for a sloped plane across intersections. Cross-slope shall not exceed 2% at crosswalks in accordance with Section 2.11 (Pedestrian Facilities).
- 2.4.7 Crosswalks – Crosswalks shall be provided in all directions. The City's preference is for crosswalks to pass through intersections prior to the start of the median nose. However, median refuge islands are acceptable. Refer to Section 2.14 (Traffic Control) for additional requirements.
- 2.4.8 Pavement and Subgrade – Refer to Section 2.13 (Pavement and Subgrade) for pavement and subgrade requirements at intersections.
- 2.4.9 Sight Visibility – Adequate sight distances are required at intersections. Refer to Section 2.6 (Sight Visibility).
- 2.4.10 ROW Flares at Intersections – ROW flares at intersections shall be required to accommodate left and right turn lanes for divided and undivided arterials. In addition, ROW flares at major arterial/major arterial intersections shall accommodate dual left turn lanes. ROW flares at all other intersections shall accommodate a single left turn lane per Table 2-3. ROW tapers shall occur with respect to left and right turn lane tapers and median widening (if applicable) as shown in Figure 2-2.

Table 2-3 ROW Flares at Intersections

Largest Classification at Intersection	Additional ROW Required Per Lane ¹ (feet)
Major Arterial	+12
Minor Arterial/Collector	+11

1. Refer to Table 2-1 for ROW width.

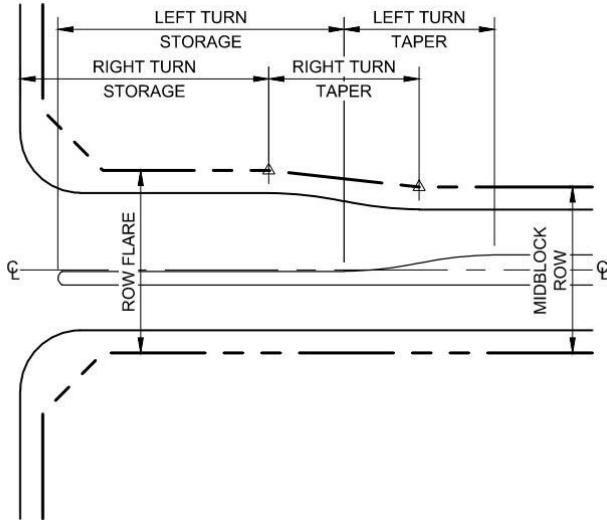


Figure 2-2 ROW Flare at Intersection

2.5 Roundabouts

2.5.1 Roundabouts are generally encouraged as acceptable alternatives to standard or signalized intersections. At the discretion of the City Engineer, certain intersections may be required to be designed with a roundabout.

2.5.2 Roundabouts are a form of circular intersections in which traffic travels counterclockwise around a central island. Features include yield control of all entering traffic, channelized approaches, and geometric features to induce desirable vehicle speed. The design of a roundabout is an iterative process and requires high level discussion between all parties involved. The City recognizes the following documents below as resources for modern roundabout design. Criteria provided in this section is intended to enhance guidance contained within the following documents.

- 2.5.2.A. Current edition of NCHRP Report 672, Roundabouts: An Informational Guide;
- 2.5.2.B. Current edition of NCHRP Report 674, Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities; and,
- 2.5.2.C. Current edition of Texas Manual of Uniform Traffic Control Devices (TMUTCD).

2.5.3 Operational analysis of a roundabout allows a transportation analyst to assess the operational performance of a facility, given information about the usage of the facility and its geometric design elements. Refer to Chapter 4 of the current edition of NCHRP Report 672, Roundabouts: An informational guide for further information pertaining to operational analysis techniques. An operational analysis shall be provided for all proposed roundabouts, and shall include the following:

- 2.5.3.A. Average Control Delay (s/veh),
- 2.5.3.B. Level of Service (LOS)
- 2.5.3.C. Volume to Capacity Ratio. Any design presented with volume to capacity ratio greater than 1.0 will require written authorization from the City Engineer.

2.5.4 Geometric Design

- 2.5.4.A. The geometric design of a roundabout requires a balance of many design objectives: safety, operational performance, and accommodation of a design vehicle. To achieve this, roundabout geometry shall include the typical features



shown in Figure 2-3.

2.5.4.B. All roundabouts shall be designed to accommodate the design vehicle making all possible entry and exit movements within the roundabout limits. The design vehicle shall be accommodated by utilization of both the circulating lanes and truck apron (if provided).

2.5.4.C. Inscribed Circle Diameter is the distance across the roundabout defined by the outer curb of the circulatory lanes. This feature accommodates the design vehicle, traffic volume, and speed control. The following dimensions from Table 2-4 shall be used for inscribed circle diameter. Any deviation from these values will require written authorization from the City Engineer.

Table 2-4 Inscribed Circle Diameter

Type of Roundabout	Design Vehicle	
	Fire Truck*	WB-67 Truck/Trailer
Single-Lane	90'-150'	130'-180'
Multi-Lane (2 or 3 lanes)		150'-300'

*Contact the Engineering Department for current fire vehicle standards.

2.5.4.D. Approaches

2.5.4.D.i. Approaches, entry and exit, are defined as areas where the roadway section becomes atypical in an effort to control vehicle speed. The approach width is measured from the point where the entrance line intersects the left edge of the circulating lanes to the right curb line. Entry and exit widths on single lane roundabouts shall not exceed 18 feet without written authorization from the City Engineer. For multi-lane approaches, refer to the current edition of NCHRP Report 672, Roundabouts: An Informational Guide.

2.5.4.D.ii. Driveways, alley connections, and on-street parking shall not be permitted within the limits of a roundabout approach when a splitter island is also present within those limits.

2.5.4.E. Circulating Lanes

2.5.4.E.i. Circulating width should be at least as wide as the maximum entry width. Lane widths shall remain consistent throughout the roundabout. Excess lane width shall be avoided. Parking shall be prohibited within limits of the circulating lanes.

2.5.4.E.ii. Circulating lanes shall include a single vertical high point and low point within the vertical curve.

2.5.4.E.iii. Circulating lanes shall maintain 1.0% cross-slope and drain to exterior curb. The cross-slope can vary where there is a transition into or out of the circulating lanes. Cross slope transitions must be designed consistent with the guidelines in AASHTO's current edition of A Policy on Geometric Design of Highways and Streets.

2.5.4.F. Truck Apron/Central Island

2.5.4.F.i. Truck apron shall be provided to allow for an additional traversable area around the central island for the larger design vehicle. When sizing the truck apron, a minimum of a 1-foot offset distance from the design vehicle path to interior central island curb shall be provided. The curb height for the mountable truck apron shall be 3 inches in height. Since the loading on the truck apron is like that on

a normal traffic lane, the pavement design for the truck apron shall assume loading conditions similar to the circulating lanes.

2.5.4.F.ii. Central island shall be mounded with minimum height of 3.5 feet to maximum 6 feet from outside edge of outer circulating lane to center of island. This mound is meant to enhance driver recognition of the roundabout upon approach. The central island can also be enhanced aesthetically using landscaping. The interior central island curb shall be 6 inches in height.

2.5.4.F.iii. Like the circulating lanes, both the truck apron and first 6 feet of central island shall maintain a 1.0% slope downward towards outside curbs.

2.5.4.G. Splitter Islands

2.5.4.G.i. Splitter islands shall be provided on all single lane roundabouts. They are meant to provide refuge for pedestrians and guide the traffic safely into the roundabout. The total island length shall be minimum 50 feet, and the width of the island must be a minimum of 6 feet at crosswalk cut-through location.

2.5.4.G.ii. Splitter islands shall be mountable for all single lane roundabout with curb height of 4 inches. Multi-lane roundabout islands shall be mountable with curb heights of 4 inches between crosswalk and circulating lanes.

2.5.4.G.iii. Refer to Exhibit 6-13 of the current edition of NCHRP 672, Roundabouts: An Informational Guide for Splitter Island Geometric Design Criteria.

2.5.4.H. Crosswalks

2.5.4.H.i. Crosswalks shall be located a minimum of 20 feet away from edge of outermost circulating lane and shall be perpendicular to vehicle travel path. In addition, crosswalks shall meet all applicable pedestrian accommodation requirements.

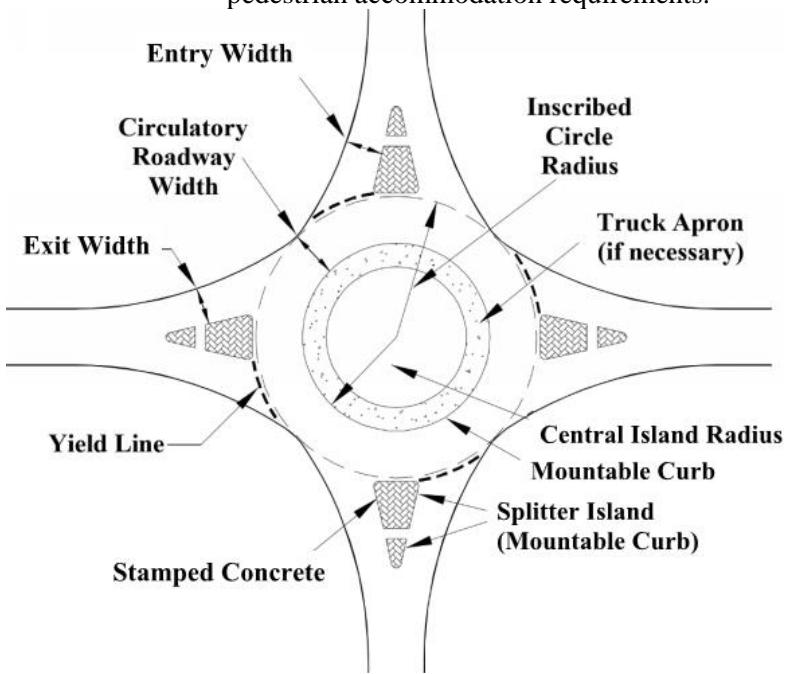


Figure 2-3 Typical Roundabout

2.5.5 Performance Checks

2.5.5.A. Performance checks are important in determining if the design meets the intent of the roundabout objectives. The engineer shall prepare performance checks for fastest path and sight distance and visibility when designing a roundabout.

2.5.5.B. Fastest path calculations shall adhere to Chapter 6.7.1 of the current edition of NCHRP Report 672, Roundabouts: An Informational Guide. Values calculated for the vehicle paths, R₁, R₂, R₃, R₄, and R₅, as shown in Figure 2-4, shall meet a maximum of 25 mph for a single lane roundabout and a maximum of 30 mph for a multi-lane roundabout. The relative speed between vehicle paths shall be minimized such that maximum differential between paths shall be no more than 10 mph.

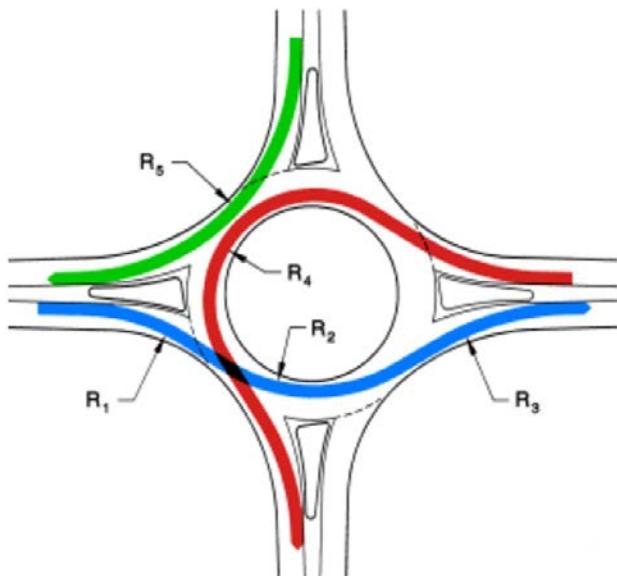


Figure 2-4 Vehicle Path Radii

2.5.5.C. Sight distance and visibility calculations shall adhere to Chapter 6.7.3 of the current edition of NCHRP Report 672, Roundabouts: An Informational Guide. Within a roundabout, sight distance lines shall be provided at the entry approach (both stopping and intersection sight distance), along the circulatory lanes, and to the crosswalk at the exit approach.

2.5.6 Construction Considerations

2.5.6.A. Joints shall be radial within circulating lanes and truck apron and shall not exceed maximum joint spacing as specified in this manual. Circular joints shall be utilized at centers or edges of lanes within circulating lanes. Construction joint shall be utilized to separate all approaches from circulating lane and circulating lanes from truck apron.

2.5.6.B. Within circulating lanes and truck apron, all steel reinforcement shall be placed radially and longitudinally to circulating traffic.

2.5.6.C. Drop slabs/sleeper slabs shall be provided beneath all mountable splitter island locations. No doweled connection shall exist between splitter island and the travel lanes.

2.5.7 Roundabout lighting shall be in accordance with Section 2.14.

2.6 Sight Visibility

2.6.1 General – Sight visibility is required at all intersections via sight visibility triangles and corner clips as described in this section. At a minimum, all intersection visibility requirements shall meet the guidelines in AASHTO's current edition of A Policy on Geometric Design of Highways and Streets.

2.6.2 Sight Visibility Triangles

- 2.6.2.A. Easements for sight visibility triangles shall be provided where a public access driveway, alley or other street intersects with an existing or proposed street.
- 2.6.2.B. Sight visibility triangles shall be free of obstructions between 2 feet and 9 feet above the top of pavement. Obstructions include hedges, trees, shrubs, bushes, plants, foliage, signs, poles, fences, screens, buffers, billboards, structures, walls, motorized or non-motorized vehicles, or any other man- made or natural item that conflicts with the visibility of pedestrians, bicycles, or motor vehicles approaching an intersection, public access driveway, or traffic control device. Power poles and street lights are excluded from this restriction provided they maintain visibility.
- 2.6.2.C. Sight visibility triangles at intersections shall be provided in accordance with Figure 2-5 and Table 2-5. These calculations assume the driver is 15 feet behind the curb line of the intersecting street; at-grade intersection with approaches of 3.0% or less; driver eye height is 3.5 feet above pavement; and, both drivers can see each other. AASHTO's current edition of A Policy on Geometric Design of Highways and Streets shall be used to determine the sight visibility triangles.
- 2.6.2.D. In cases where the street contains a horizontal curve, the intersection sight distance must be measured along the horizontal curve as shown in Figure 2-6.

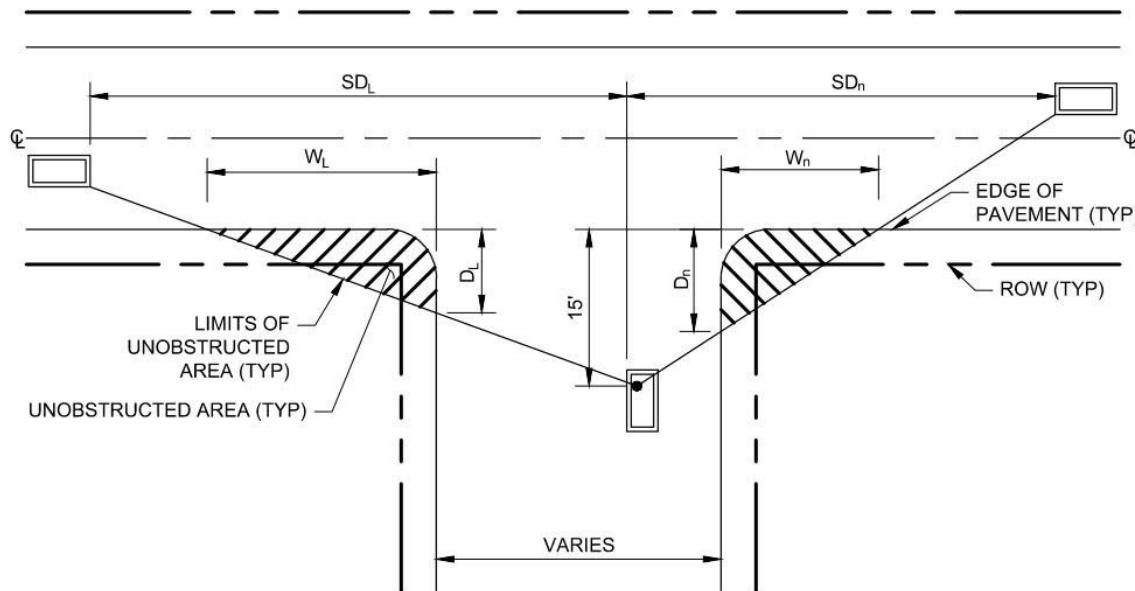


Figure 2-5 Sight Visibility Triangle Measurement

Table 2-5 Sight Visibility Triangle Dimensions

Classification	Design Speed (mph)	Minimum Sight Distance (feet)	
		SD_L^1	SD_n^1
Local	30	245	255
Collector	35/40	315/480	325/545
Arterial	45	580	650

1. SD_L and SD_n are the required sight distances to the left and to the right as measured from the driver's eye on the uncontrolled intersection approach looking toward oncoming cross-traffic.

2. W_L and W_n are the distances along the curb line of the side of the visibility triangle parallel to the path of traffic on the uncontrolled intersection approach.

3. D_L and D_n are the distances along the curb line of the side of the visibility triangle parallel to the path of the driver on the uncontrolled intersection approach.

4. The dimensions for W_L , W_n , D_L , and D_n must be calculated for each intersection.

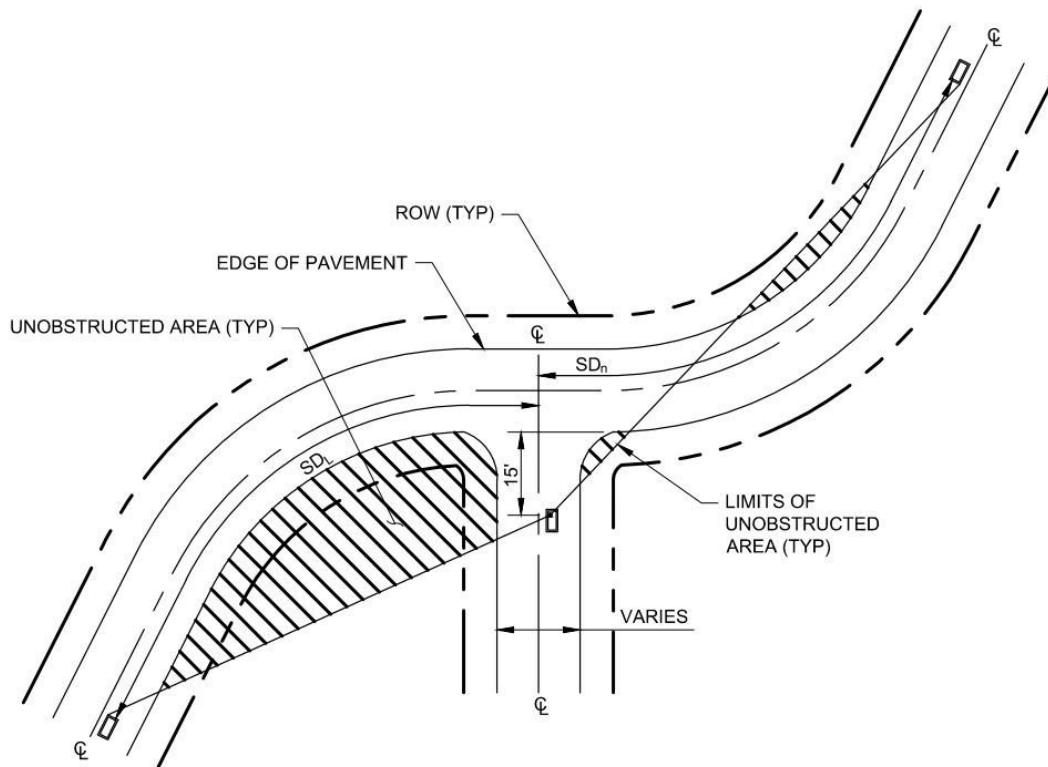


Figure 2-6 Sight Visibility Triangle Along Curve

2.6.3 Corner Clips

2.6.3.A. Corner clips are ROW dedications that shall be provided on all corners of an intersection between two streets or an intersection between an alley and a street. This corner clip aids in street intersection visibility as well as provides sufficient room for sidewalks, barrier free ramps, utility appurtenances, and other street facilities. If the corner clip is within the sight visibility triangle, all sight distance requirements must be maintained. As shown in Figure 2-7, the ROW dedication for the corner clip does not necessarily include the sight visibility easement.

2.6.3.B. All intersections shall have a corner clip as shown in Figure 2-7 and Table 2-6.

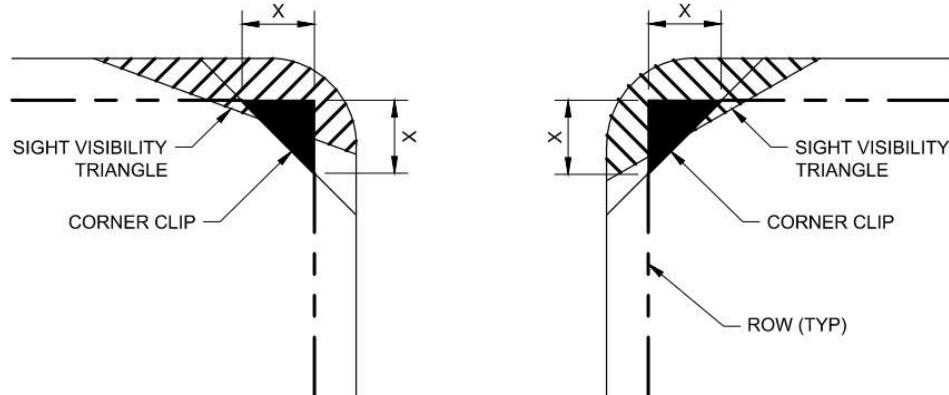


Figure 2-7 Corner Clips at an Intersection

Table 2-6 Corner Clip Distance

Intersection Type ¹	Distance X (feet) ²
Signalized	25
Not Signalized	25

1. The City Engineer may determine corner clip requirements based on existing, proposed, or ultimate (future) conditions.
 2. The corner clip shall have the same dimension on all corners of the intersection, based on the largest classification roadway at the intersection.

2.7 Access Management

2.7.1 General – This section includes general access management requirements. Refer to Section 2.18 (Traffic Impact Analysis) for TIA requirements.

2.7.2 High Volume Drive-Through Requirements – The amount of stacking required on-site for a proposed development shall be based on what is required in the Weatherford Zoning Ordinance or based on a TIA, whichever is greater.

2.7.3 Minimum Access Points – A minimum of two planned points of public ingress and egress are required to facilitate emergency vehicle access and to distribute traffic through the development as determined by the Fire Marshal and the City Engineer.

2.7.4 School Access and Location Criteria

2.7.4.A. General – The location of a daycare or school facility has an impact on adjacent land uses and mobility, and as potential sites are evaluated for future facilities, multiple factors should be considered. Early designation of school sites helps to ensure adequate access and traffic circulation as well as minimizing development costs. The following section is intended to assist City staff and Developers in the provision of proper site locations for these facilities during the development process. When applicable, Developers are encouraged to discuss with the school district where a proposed project is to be located, prior to submittal, to determine district's potential need of a facility as well as best placement within the development.

2.7.4.B. Traffic Management Plan (TMP) – A TMP is required for all public and private schools. This study shall include the estimated maximum peak hour trip generation of the facility, the planned circulation of inbound and outbound traffic during drop-off and pick-up operations, and the estimated length of the queue of cars waiting to pick up students. The TMP must alleviate all conflicts with through-traffic and traffic movements on public ROW abutting and in the vicinity of the application and must include a design for picking-up and dropping-off students without queuing vehicles into public ROW.



2.8 Median Openings and Turn Lanes

2.8.1 General

- 2.8.1.A. Median openings shall be provided at driveways in accordance with this section. Refer to Section 2.9 (Driveways) for additional design criteria.
- 2.8.1.B. Turn lanes shall be provided at all intersections in accordance with this section. Refer to Section 2.4 (Intersections) for additional considerations at intersections.
- 2.8.1.C. Dimensions given are minimum design requirements. The City Engineer may alter parameters to fit the needs of specific situations, including, but not limited to, requiring longer storage lengths or regarding cross-access to properties.

2.8.2 Medians and Median Openings

- 2.8.2.A. Access points to subdivisions and developments shall be spaced per these requirements. At the intersection of a new subdivision or development street with an existing divided arterial, the Developer of the subdivision shall construct a median opening in the divided arterial to allow direct access to the property from the arterial per these spacing and dimensional requirements. The Developer shall be required to construct a left turn lane in the arterial to ensure adequate traffic control and safety at that intersection.

- 2.8.2.B. Median Access Classifications – The following median classifications may apply:

- Full Median Opening – An opening in the median of a roadway permitting midblock median opening traffic movements into and out of a properly aligned driveway;
- Left Turn Entry Only (Hooded Left) – An opening in the median of a roadway that permits left turns into a properly aligned driveway but prevents all other cross-median traffic movements;
- Left Turn Exit Only – An opening in the median of a roadway that permits left turns from a properly aligned driveway but prevents all other cross-median traffic movements; and,
- U-Turn Only – A median opening without driveways that permits U-turns.

- 2.8.2.C. Cross-Median Access – Cross-median access to or from an existing or proposed driveway may be allowed if:

- The median is of sufficient length to be subdivided into multiple medians, each of which meets or exceeds the minimum median length described in this section;
- The median is of sufficient width to permit the construction of an exclusive left turn lane; and,
- Such access does not adversely impact the provision for cross-median access to a lot, parcel, or tract of land on the opposite side of the street. If an existing driveway, street, or access point is already constructed on the opposite side of the roadway, the new driveway should align with the existing driveway, street, or access point.

- 2.8.2.D. Median Opening Length – Median openings shall be a minimum of 20 feet wider than the width of the driveway/street/access point throat width which they are serving. Regardless of driveway width, the minimum length of a full median opening shall be 60 feet and shall accommodate all the turning maneuvers of the

design vehicle for which the driveway is designed. Refer to Table 2-1 for design vehicles. The minimum length of a full median opening shall be of sufficient length so that concurrent turning maneuvers from exclusive left turn lanes serving the driveways on each side of the roadway do not conflict with each other. The maximum length of a full median opening shall be limited so that the median opening serves only a single driveway on each side of the roadway. Turning movements of design vehicle shall be shown plan submittal.

2.8.3 Left Turn Lanes and Median Islands

- 2.8.3.A. Requirement – Single left turn lanes shall be provided for all intersections and driveways that connect at a median opening or as recommended by the TIA. Dual left turn lanes shall be required for all arterial/arterial intersections when peak hour turning volumes exceed 300 vehicles.
- 2.8.3.B. Storage Length – Left turn storage lengths shall be sized to store the number of vehicles expected to queue in the lane during an average peak period. At a minimum, left turn storage length shall meet the minimum dimensions shown in Table 2-7 and Table 2-8. Additional length may be required based on traffic volumes or TIA storage requirements discussed in Section 2.18 (Traffic Impact Analysis).
- 2.8.3.C. Width – Single left turn lanes on arterials shall be 12 feet in width. Dual left turn lanes on arterials shall be 11 feet in width. All other left turn lanes shall be 11 feet in width.
- 2.8.3.D. Taper Lengths – Single left turn lane taper lengths shall be per Table 2-7 and Table 2-8. Left turn lane tapers shall be designed using either:
 - Symmetrical reverse curves of at least 250 feet minimum radius; or,
 - Asymmetrical reverse curves where the leading reverse curve is twice the radius of the following reverse curve and the leading reverse curve has a minimum radius of at least 300 feet.
- 2.8.3.E. Minimum Length of Median Islands and Associated Left Turn Lanes at Midblock Openings – Median island, storage, and taper lengths shall be as shown in Figure 2-8 and Table 2-7.

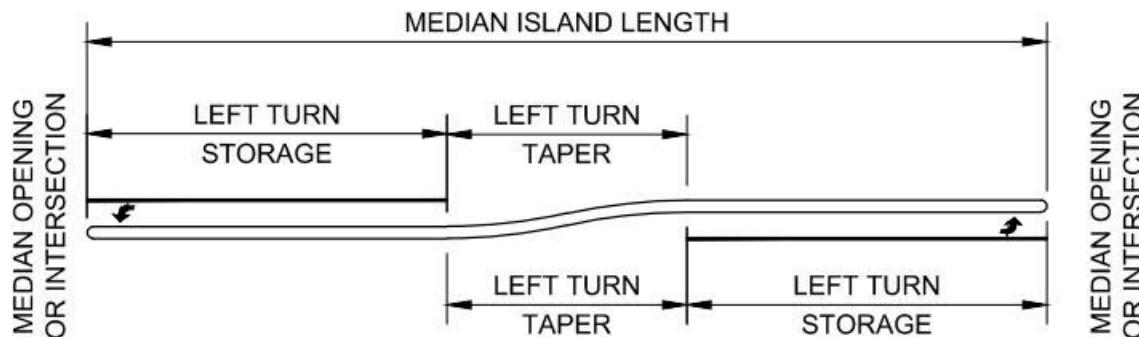


Figure 2-8 Minimum Spacing Between Median Opening or Intersection for Divided Arterials

Table 2-7 Minimum Spacing Between Median Opening or Intersection for Divided Arterials

Classification	Upstream Midblock Opening Classification	Downstream Midblock Opening Classification	Minimum Median Island Length (feet)	Left Turn Lane Lengths		
				Upstream Storage (feet)	Taper (feet)	Downstream Storage (feet)
Arterial Single Left	Arterial	All (Local)	500	150	200	150 (100)
Arterial Dual Left	Arterial	All (Local)	600	250	200	150 (100)
Arterial	Non-Residential Collector, Local, or Driveway	Non-Residential Collector, Local, or Driveway	400	150	100	150
	Non-Residential Collector, Local, or Driveway	Residential Local	350	150	100	100
	Residential Local	Residential Local	300	100	100	100

2.8.3.F. Minimum Length of Left Turn Lanes for Undivided Arterials – Turn lane storage and taper lengths shall be as shown in Table 2-8.

Table 2-8 Minimum Left Turn Lane Lengths for Undivided Arterials

Classification	Intersecting Classification	Left Turn Lane Lengths	
		Storage (feet)	Taper (feet)
Arterial	Arterial	200	100
	Non-Residential Collector, Local, or Driveway	150	100
	Residential Local	100	100
Collector	Arterial	150	100
	Non-Residential Collector, Local, or Driveway	100	100
	Residential Local	100	100

2.8.4 Right Turn Lanes

2.8.4.A. Requirement – Right turn lanes shall be provided at all intersections with arterials, and as recommended by the TIA.

2.8.4.B. Placement

2.8.4.B.i. Upstream Right Turn Lanes – A minimum tangent section of 30 feet shall be provided between the preceding driveway or cross-street curb return and the taper of a right turn lane as shown in Figure 2-9.

2.8.4.B.ii. Downstream Right Turn Lanes – Refer to Section 2.8 (Driveways) for corner clearance required at driveways.

2.8.4.B.iii. Continuous Right Turn Lanes – Where several successive driveways require exclusive right turn lanes, and the driveway spacing is not adequate to avoid encroachment of the right turn lane on another driveway, a continuous right turn lane shall be used.

2.8.4.C. Storage Measurement – Right turn storage length shall be measured from the end of the right turn taper to the point of curvature of the curb return radius into the driveway or intersection as shown in Figure 2-9.

2.8.4.D. Storage Length – Right turn storage lengths shall be sized to store the number of vehicles expected to queue in the lane during an average peak period. At a minimum, right turn storage length shall meet the minimum dimensions shown in Table 2-9. Additional length may be required based on traffic volumes or TIA storage requirements discussed in Section 2.17 (Traffic Impact Analysis).

2.8.4.E. Width – Right turn lanes on arterials shall be 12 feet in width. All other right turn lanes shall be 11 feet in width.

2.8.4.F. Taper Length – Right turn lane taper lengths shall be 100 feet in length as shown in Table 2-9. Right turn lane tapers shall be designed using either:

- Symmetrical reverse curves of at least 250 feet minimum radius;
- Asymmetrical reverse curves where the leading reverse curve is twice the radius of the following reverse curve and the leading reverse curve has a minimum radius of at least 300 feet; or,
- A drop transition at the nearest driveway 100 feet or more upstream from the start of the required right turn lane length.

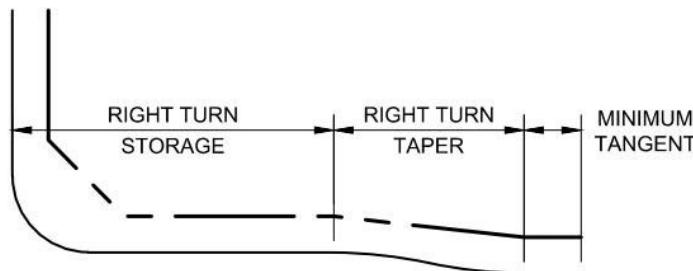


Figure 2-9 Minimum Right Turn Lane Lengths

Table 2-9 Minimum Right Turn Lane Lengths

Classification	Intersecting With	Right Turn Lane Lengths	
		Storage (feet)	Taper (feet)
Major Arterial, Minor Arterial, or Collector	Arterial, Non-Residential Collector, Local, or Driveway	150	100
	Residential Local	100	100

2.9 Driveways

2.9.1 General

2.9.1.A. All driveways shall be provided to accommodate all vehicular and pedestrian movements as specified in this section. Driveways shall meet the minimum



dimensions and spacing shown in Standard Details C26 and C27.

2.9.1.B. Driveway Types – Driveways are permitted to intersect with the City’s roadway classifications as follows:

- Single-Family Residential – Access prohibited to arterials; and,
- Multi-Family, Industrial, Commercial – Access permitted only to arterials and collectors unless otherwise approved by the City Engineer.

2.9.1.C. Approval – Typical residential driveways are reviewed and approved by the Transportation and Public Works Department. Proposed commercial or industrial driveways are reviewed during the plan review process by applicable City staff. Widening of an existing approach shall be required to be permitted.

2.9.1.D. Minimum Standards – All driveways shall be concrete and shall be designed in accordance with the Standard Details.

2.9.1.E. Mutual Access – Encroachment of driveways shall not occur on an adjacent property without a mutual access easement being executed between both property owners. A shared driveway connection is created when the driveways of adjacent properties both abut the shared property line.

2.9.1.F. Driveways on TxDOT Roads – Unless the area TxDOT office defers to the City’s requirements, driveway spacing on all TxDOT roads shall be governed by TxDOT and shall meet minimum standards in accordance with TxDOT’s current edition of the Roadway Engineering Design Manual and the Access Management Manual.

2.9.2 Geometry

2.9.2.A. Flare/Radius – The flare or radius cannot extend past the adjoining property line without written permission of adjacent property owner. The termination point of a driveway radius or fillet shall be a minimum of 10 feet from a storm sewer inlet and 5 feet from a fire hydrant.

2.9.2.B. Driveway/Public Street Intersection Angle

2.9.2.B.i. The deflection angle of all full access or right turn in/right turn out partial access driveway connections to public streets may vary from 80 degrees to 100 degrees. The driveway shall be tangent and without curve from the ROW line to a point 25 feet within the lot, parcel or tract of land the driveway is accessing.

2.9.2.B.ii. The deflection angle of all entry only or exit only partial access driveway connections to public streets may vary from 45 degrees to 90 degrees. The driveway shall be tangent until it has fully entered private property.

2.9.2.C. Street Intersection Corner Clearance – When the adjacent street frontage is within the minimum corner clearance distance:

2.9.2.C.i. If the lot, tract or parcel is in the process of being subdivided or replatted from a larger tract of land with sufficient frontage to meet the minimum corner clearance distance, a joint access easement by plat shall be required of the Developer so that the minimum corner clearance requirement is met.

2.9.2.C.ii. If the lot, tract or parcel cannot obtain a joint access easement to meet the minimum corner clearance requirements, a single driveway connection may be made at the point along the public street frontage

that provides the maximum clearance distance.

2.9.3 Grades – Refer to the Standard Details for minimum and maximum grades.

2.9.4 Circular Residential Driveways

2.9.4.A. Circular driveways for single-family detached residential land uses may be approved for a lot on one street frontage on a local residential or collector street with a maximum of two connections in the front yard subject to the corner and property line clearance requirements.

2.9.4.B. The deflection angle of a circular driveway connection to the public street may vary from 45 degrees to 90 degrees.

2.9.4.C. The curb return radius of the obtuse entry or exit angle of each circular driveway connection shall be a minimum of 20 feet.

2.9.4.D. Circular driveways shall not be approved for duplex residential land uses.

2.9.5 Commercial, Industrial, and Multi-Family Driveways

2.9.5.A. A maximum of three driveways shall be permitted for each 1,000 feet of roadway frontage, regardless of the minimum spacing requirements.

2.9.5.B. Opposite Driveway Offset – Non-residential and multi-family driveways on opposite sides of an undivided street shall align with each other or be spaced a minimum of 75 feet apart to ensure that conflicting movements do not overlap as shown in Figure 2-10. This spacing shall also apply to a driveway that is on the opposite side of an undivided street from an intersecting street.

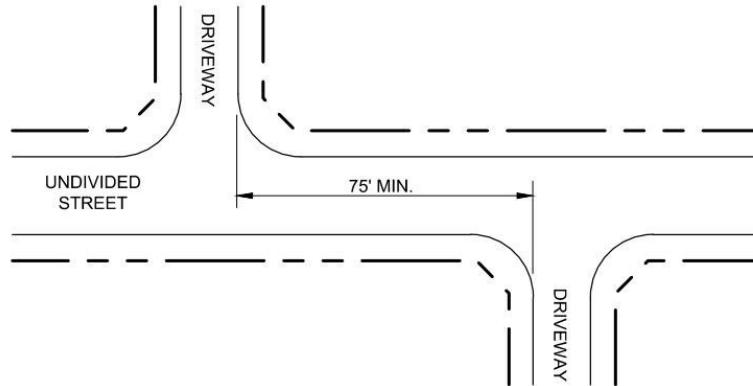


Figure 2-10 Driveway Spacing on Opposite Sides of an Undivided Street

2.10 Alleys

2.10.1 Geometry – Residential alleys shall be designed in accordance with the minimum design criteria provided in the Standard Detail.

2.10.2 Alignment – Alleys shall be provided parallel to the property frontage on the street. Sudden changes in alignment are not allowed.

2.10.3 Offsets – Where the deflection of alley alignment exceeds 30 degrees, a cutback of a minimum 15 feet shall be established on the inside property line and the paving of the alley shall be cut back in the same manner as shown in Figure 2-11 and Figure 2-12.

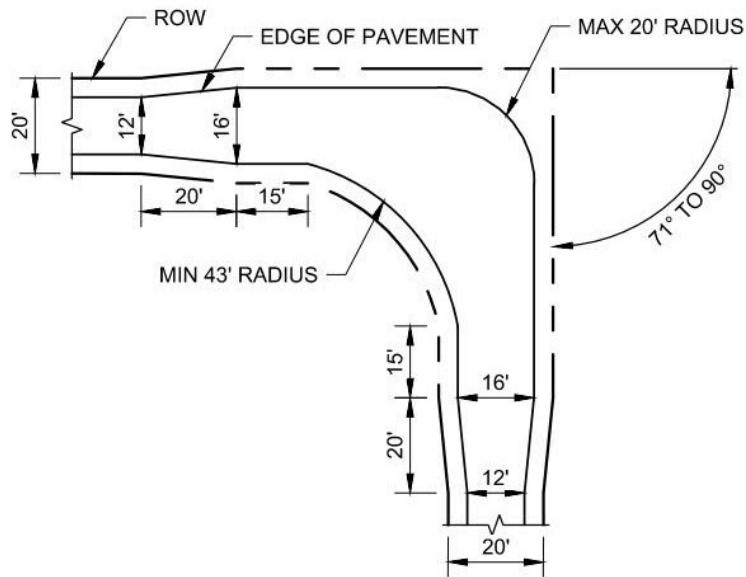


Figure 2-11 Alley Offsets – 71 to 90 Degrees

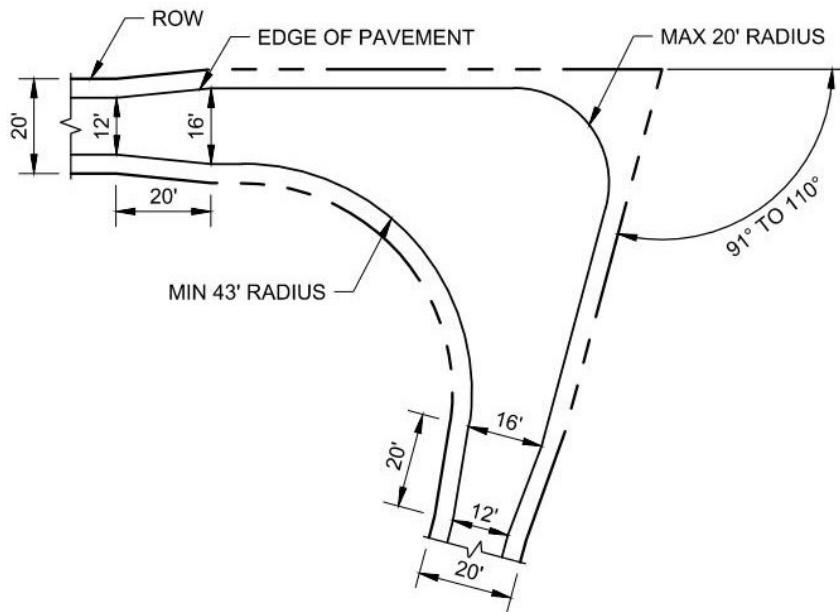


Figure 2-12 Alley Offsets – 91 to 110 Degrees

- 2.10.4 Dead-End Alleys – Dead-end alleys are not allowed.
- 2.10.5 Alley Length – The maximum length of alleys between outlets shall not exceed 600 feet.
- 2.10.6 Obstructions – All alley ROW shall be kept free and clear of obstructions. Power poles and street lights are excluded from this restriction provided they maintain visibility and are within the zone shown on the Standard Details.
- 2.10.7 Alley to Street Intersections
 - 2.10.7.A. Alleys shall only intersect with local or collector streets.
 - 2.10.7.B. Alley intersection cannot be within 100 feet of an arterial intersection.
 - 2.10.7.C. Alleys that run parallel to a major arterial shall turn away from the major arterial

not less than one subdivision lot width or a minimum of 50 feet (whichever is greater) from the cross-street intersection. Where this occurs, a 5-foot common area shall be provided adjacent to the ROW.

2.10.7.D. Alleys shall be flared at intersections with streets in accordance with Figure 2-13.

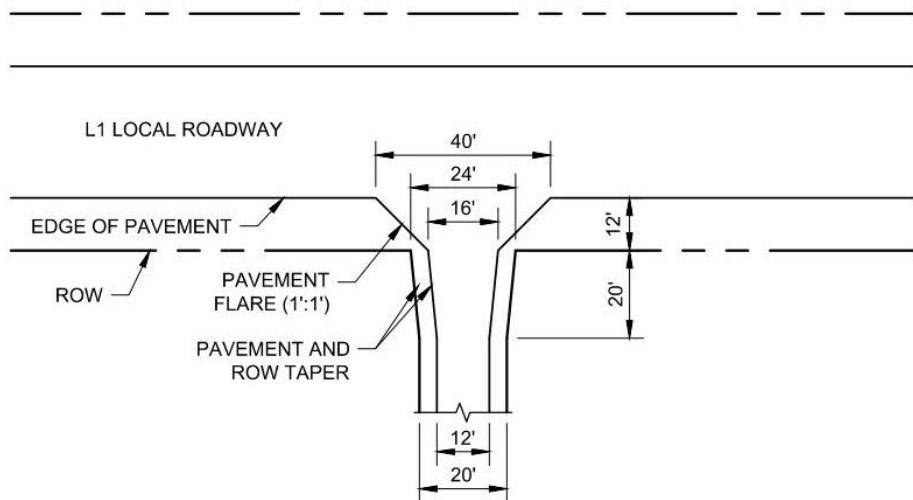


Figure 2-13 Alley to Street Intersection

2.10.8 Alley to Alley Intersections

2.10.8.A. Alley intersections should be avoided.

2.10.8.B. Four-way alley intersections are not permitted.

2.10.8.C. Alley to alley intersections shall be designed in accordance with Figure 2-14, Figure 2-15, and Figure 2-16.

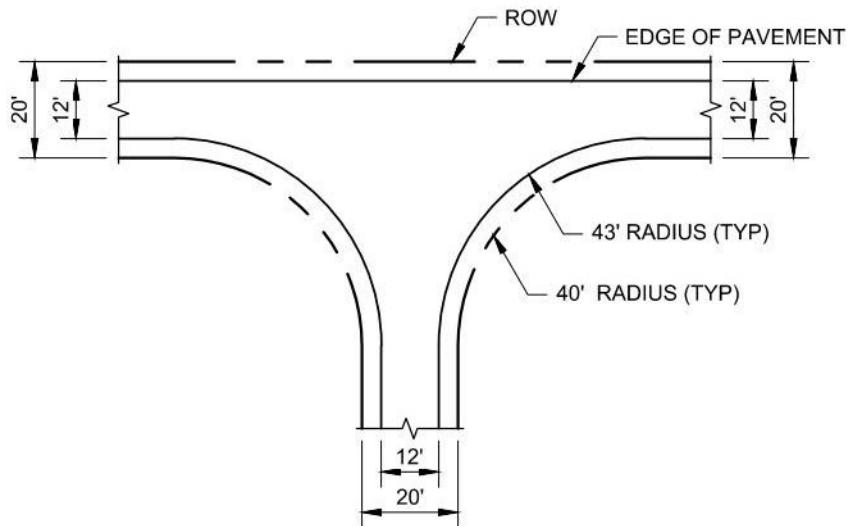


Figure 2-14 Alley to Alley Intersection – 90 Degrees

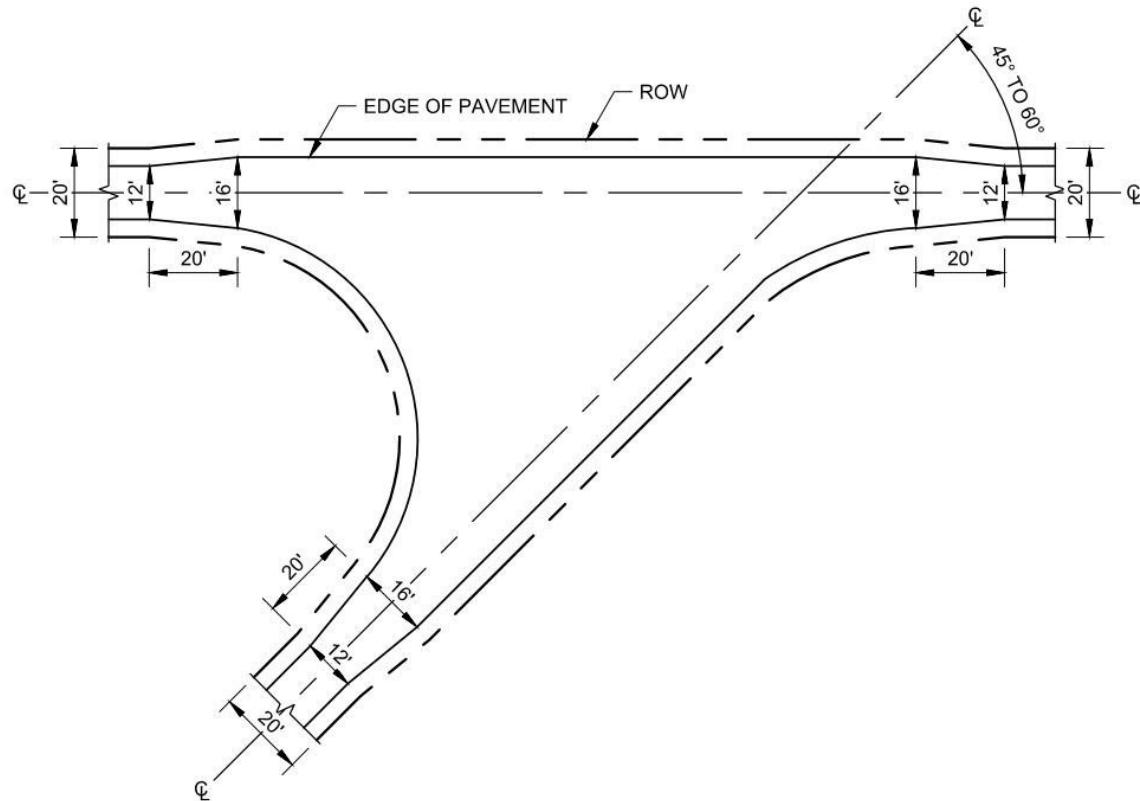


Figure 2-15 Alley to Alley Intersection – 45 to 60 Degrees

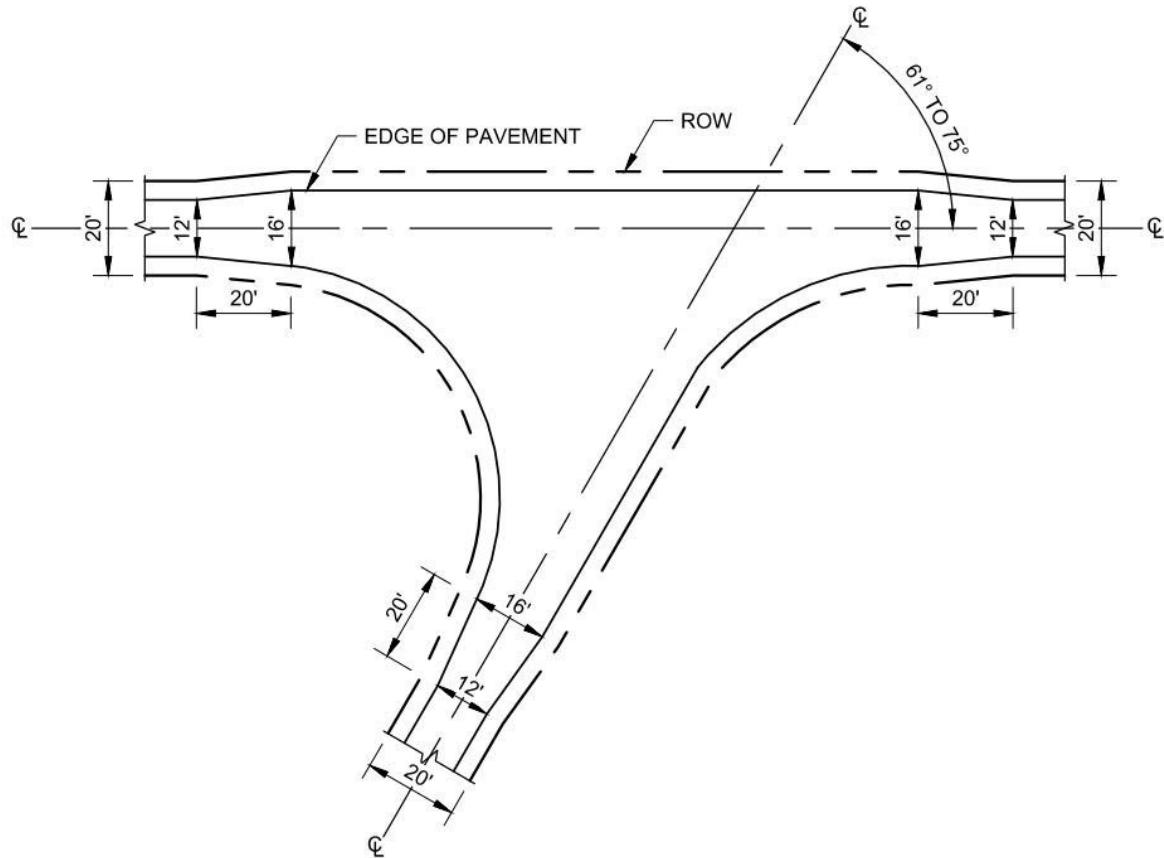


Figure 2-16 Alley to Alley Intersection – 61 to 75 Degrees

2.11 Pedestrian Facilities

2.11.1 General – Pedestrian facilities shall be designed to promote pedestrian safety and efficiency, minimize conflicts with motorized and non-motorized vehicle traffic, minimize tripping hazards and protruding objects, and accommodate accessibility needs of pedestrians. All pedestrian facilities must conform to current Federal, State, and Local ADA requirements and to the criteria in this section. Additionally, pedestrian facilities shall be designed and constructed in accordance with the City's [Thoroughfare Plan](#) and [General Plan](#). For the purpose of this section, pedestrian facilities include sidewalks, trails, hike and bike routes, and barrier free ramps.

2.11.2 Pedestrian Facilities Design Guidelines – Pedestrian facilities shall comply with the following standards:

- United States Access Board's current edition of Americans with Disabilities Act Accessibility Guidelines (ADAAG);
- United States Access Board's current edition of Proposed Accessibility Guidelines for Pedestrian Facilities in Public Right-of-Way (PROWAG);
- Texas Department of Licensing and Regulation's (TDLR) current edition of Texas Accessibility Standards (TAS); and,
- TxDOT's current edition of TMUTCD.

2.11.3 Cross-Sectional Elements – The following denotes maximum grades for pedestrian facilities.

2.11.3.A. All Pedestrian Paths – All pedestrian paths shall have a typical and maximum 2% cross-slope. The least possible running slope should be used to maximize accessibility. The running slope of pedestrian facilities and crosswalks within the ROW may follow the grade of the parallel roadway.

2.11.3.B. Barrier Free Ramps – Accessible ramps for sidewalk crossings at all street intersection corners, at all crosswalks, and across any stop control on- residential or multi-family driveways shall be in accordance with Section 2.10.2.

2.11.4 Sidewalks and Trails

2.11.4.A. Definition of a Sidewalk – A sidewalk is defined as the paved area designated for pedestrians use which is generally located between the curb of the roadway and the adjacent property line.

2.11.4.B. Requirement

2.11.4.B.i. Sidewalks shall be provided around the perimeter of all blocks, 1-foot offset inside the ROW or easement.

2.11.4.B.ii. Sidewalks are to be constructed with the paving of streets or building construction unless deferred by the Director of Transportation and Public Works.

2.11.4.B.iii. Sidewalks constructed as part of a new development or re-development are considered public facilities and shall be constructed according to the requirements outlined in this section.

2.11.4.B.iv. When a lot is developed, pedestrian facilities along frontage of property shall be required at time of lot development. Sidewalks, ramps, and landing areas shall be installed along all roadways and common areas prior to final acceptance.

2.11.4.B.v. At least one accessible route shall be provided within the site from



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accessible parking spaces and accessible passenger loading zones; public streets and sidewalks; and public transportation stops to the accessible building or facility entrance they serve.

2.11.4.C. Geometry

- 2.11.4.C.i. Width – In residential areas, pedestrian facilities shall have a minimum width of 4 feet when not adjacent to the back of curb and 5 feet when adjacent to the back of curb. In nonresidential areas, pedestrian facilities width shall have a minimum width of 6 feet at any location within the ROW.
- 2.11.4.C.ii. Meandering Sidewalks – Meandering sidewalks shall have a minimum 200-foot radius.
- 2.11.4.D. Material – Sidewalks shall be concrete in accordance with the Standard Details.
- 2.11.4.E. Sidewalks at Culverts and Retaining Walls – All culvert crossings shall have a sidewalk constructed across and on each side of the culvert. The sidewalk shall have a standard pedestrian handrail in accordance with Section 2.10.2. Combination rails or parapet walls may be required.
- 2.11.5 Trail Enhancement Elements – Street Enhancements, Signed Shared Roadways (Bike Routes), Trail-Roadway Crossings, and Signing and Striping at Roadway Crossings shall be designed in accordance with the City's Thoroughfare Plan. The placement and location of enhanced sidewalks and trails shall be determined by the City Engineer. Additional ROW and easements may be needed to accommodate these improvements.

2.12 Site Paving

- 2.12.1 General – This section includes site paving requirements for fire lanes, off-street- parking, and dumpsters. This section does not apply to public streets.
- 2.12.2 Fire Lanes
 - 2.12.2.A. Fire Department access routes shall be provided by the Developer as required by Ordinance and shall be approved by the Fire Marshal. Cul-de-sacs shall conform to the dimensions shown in Figure 2-17. Hammer heads shall conform to the dimensions shown in Figure 2-18. Minimum dimensions may vary based on direction from the Fire Marshal.

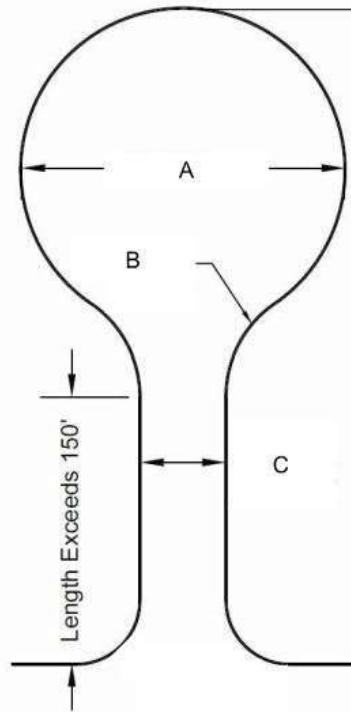


Figure 2-17 Typical Cul-de-Sac

Table 2-10 Typical Cul-de-Sac Dimensions

Dimensions	Street	Site
A	96' minimum	96' minimum
B	28' typical	Refer to Table 2-1.
C	31' minimum	20' minimum

1. Minimum dimensions may vary based on direction from the Fire Marshal.

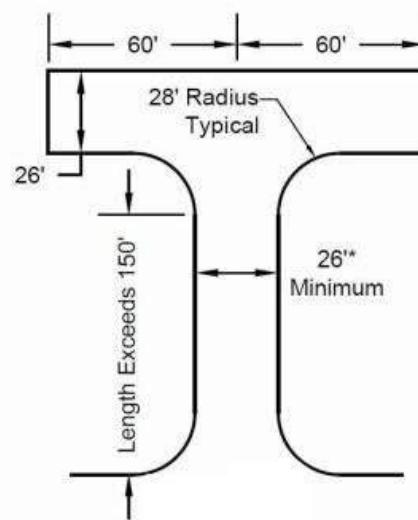


Figure 2-18 Typical 120-foot Hammer Head

2.12.2.B. There shall be adequate provision for safe and efficient ingress and egress to all off-street fire vehicle parking spaces. Except for single-family and duplex residential land uses, no fire vehicle parking space may require the use of public



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ROW or a private street for entering or leaving the parking space.

2.12.2.C. When a parking aisle is also serving as a fire lane, the aisle must meet the minimum width, radius, and construction standards for a fire lane, if these are greater than the requirements for a parking aisle.

2.12.2.D. Continuous marked fire lane access is required throughout the project in accordance with the Standard Details.

2.12.3 Parking Lots

2.12.3.A. Parking Placement – Parking lots shall be provided in accordance with the Weatherford City Code, as amended.

2.12.3.B. Paving Requirements – Required parking shall be steel reinforced 5-inch thick minimum concrete or 1 ½" thick hot mix asphaltic concrete with a 6-inch thick flexible base layer. A variance may be pursued for permeable pavement or other materials subject to City Engineer approval. The variance must prove requested section of alternative material will support equivalent axial load or projected site loads (whichever is greater) designed in accordance with Section 2.13 (Pavement and Subgrade).

2.13 Pavement and Subgrade

2.13.1 General

2.13.1.A. The following specifies minimum standards required for pavement and subgrade design for public streets. These minimum standards are not intended to replace the professional judgment of the Geotechnical Engineer for any specific project. The standards may need to be expanded or modified on a case-by-case basis as determined necessary and appropriate by the Geotechnical Engineer, and as approved by the City Engineer in writing. Refer to the Standard Details for other pavement and subgrade requirements for local roadways, collectors, alleys, and fire lanes.

2.13.1.B. Pavement Design Life – Pavement design life shall be 30 years.

2.13.1.C. Minimum Thickness – In no case shall the pavement and subgrade thicknesses be less than the minimums provided in the City's Standard Details.

2.13.1.D. Geotechnical Report Requirement – All public streets shall have a geotechnical investigation and pavement and subgrade design performed meeting the following requirements:

- Results of the geotechnical investigations, engineering analyses, and recommendations shall be presented in a Geotechnical Report for Roadways (Report). The Report and any subsequent re-evaluations and/or supplemental reports shall be prepared, signed, and sealed by a Professional Engineer licensed in the State of Texas, trained and qualified to provide geotechnical engineering analyses and pavement and subgrade design recommendations;
- The information and recommendations contained in the Report and any subsequent re-evaluation and/or supplement reports shall be accepted by the City Engineer in writing prior to release of construction.

2.13.2 Geotechnical Investigation

2.13.2.A. Field Investigation – Field investigation shall include the following:

- Borings shall be drilled along proposed roadway, or within proposed roadway widening, at 500-foot spacing (or less), to a depth of at least 20 feet below finished subgrade or until competent rock is encountered, whichever is



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shallower. Where existing roadways exist, borings shall be taken just outside the limits of the existing roadway. Additional borings may be requested by the Director of Transportation and Public Works or designee;

- Geotechnical investigation must address heavily treed areas, where such trees are to be removed. Additional borings may be required in these areas;
- Borings shall be sampled at 3-foot intervals or less to a depth of 10 feet below finished subgrade, and at 5-foot intervals or less thereafter; and,
- Bulk samples of each soil type encountered in the upper 5 feet shall be taken for laboratory investigation.

2.13.2.B. Laboratory Investigation – Laboratory investigation shall include the following:

2.13.2.B.i. Moisture Content Tests – Moisture Content Tests (ASTM D 2216) shall be performed. When the samples are wetter than normally expected due to seasonal variability, the samples shall be air dried such that the samples represent the drier portion of the year.

2.13.2.B.ii. Swell Test Results – Swell test results should be averaged to determine the mean maximum swell percentage and the standard deviation. For samples taken during the months of June through September, use the mean swell percentage to determine the design swell percentage. For samples taken during the months of October through May, use the mean plus one standard deviation to determine the design swell percentage.

2.13.2.B.iii. Soil Classifications – Soil types in each boring shall be classified by the following:

- Atterberg limits (ASTM D 4318);
- Percent Passing the No. 200 sieve (ASTM D 1140); and,
- Moisture/Density.

2.13.2.C. Re-Evaluation Applicability – A geotechnical re-evaluation will be required in the following situations:

- If more than two months transpire between the end of moisture conditioning and beginning of liming operations;
- When conditions have changed significantly between moisture conditioning and liming operations;
- When Contractor and/or Owner have not properly maintained moisture content; and/or,
- As deemed necessary by the Director of Transportation and Public Works.

2.13.2.D. Re-Evaluation Requirements – If required, a re-evaluation shall include additional field and laboratory testing to either confirm moisture conditioning is still acceptable or determine how to rectify the substandard condition prior to liming operations. Borings for the re-evaluation will be required on center of roadway at 1,000-foot spacing (or less) to a depth of at least 20 feet below finished grade or until competent rock is encountered, whichever is shallower.

2.13.3 Subsurface Design

2.13.3.A. Laboratory investigation elements shall include determining swell characteristics and movement potential using the Swell Test and the calculated Potential



Vertical Rise (PVR) – TxDOT Tex-124-E methods for a 20- foot depth of moisture penetration. The results of both tests shall be included in the Report. The Geotechnical Engineer shall use the more conservative value in determining swell potential and depths of moisture treatment.

- Swell Test – Test for swell potential using swell test (ASTM D 4546) at 200 psf stress at least two samples per boring to approximate overburden pressure at the specific test depth to determine the average swell potential of the subgrade.
- PVR-TxDOT Tex-124-E – Test for swell potential using swell test (ASTM D 4546) necessary to calculate PVR for a 20-foot moisture penetration. The PVR shall be calculated based upon 20-foot moisture penetration and shall provide moisture treatment depth to limit PVR to 4.5 inches.

2.13.3.B. Average swell shall be determined to 10 feet or top of rock, whichever is less. Table 2-11 shall be used to determine the minimum depth of moisture treatment based on average swell potential. The Geotechnical Engineer shall provide a recommendation for the subsurface to achieve swell less than 2%.

Table 2-11 Minimum Subbase Treatment Standards

Average Swell	Moisture Conditioning Depth
Average Swell < 2%	0"
2% ≤ Average Swell < 6%	60"
6% ≤ Average Swell < 8%	72"
8% ≤ Average Swell < 10%	84"
Average Swell ≥ 10%	96"

2.13.3.C. If moisture conditioning is required, a moisture barrier shall be placed 3 feet behind back of curb.

2.13.3.D. The Geotechnical Engineer shall address transitions between zones of varying depths of moisture treatment. Zones shall remain at the most conservative depth 150 feet from the location of the boring resulting in the greatest depth, prior to transitioning to a zone with less moisture conditioning depth. In no case shall the transitions be greater than 1H:1V.

2.13.3.E. If trees are existing or proposed within the limits of the moisture treated subgrade and moisture barriers, the Geotechnical Engineer shall address this condition in the Report and propose an alternate moisture/root barrier that is acceptable to the Director of Transportation and Public Works.

2.13.4 Subgrade Design

2.13.4.A. Subgrade design shall be as recommended by the geotechnical report and/or as required by the Transportation and Public Works Department.

2.13.4.B. Typically, the subgrade shall be stabilized with cement or lime as recommended by the Geotechnical Engineer and the geotechnical report. The Transportation and Public Works Department may require different stabilization methods depending on field conditions.

2.13.4.C. Subgrade design shall be approved prior to subgrade preparation. On a case-by-case basis, the City Engineer and Transportation and Public Works Department may allow the subgrade design to be completed after the grading of the streets is complete.



2.13.4.D. Lime Stabilization Series – Laboratory Investigation elements shall include:

2.13.4.D.i. Lime stabilization series for each soil type expected to be in the upper 12 inches of the subgrade. The Eades-Grimm method of pH testing shall be used to obtain a beginning point. Additional testing shall be performed for each soil type to determine lime content. Minimum design criteria are:

- pH = 12.4 (or maximum pH) after mellowing (ASTM D 2976);
- Swell potential <1.0% under 200 psf stress test (ASTM D 4546); and,
- The minimum lime content shall be the percentage, by weight, of hydrated lime as determined by lime stabilization series plus 1.0%, and in no case be less than the City's minimum requirements.

2.13.4.D.ii. Test for sulfates in the upper 3 feet of the subgrade in each boring using EPA 9038 or EPA 375.4 with 10:1 dilution ratio. Provide testing to determine the levels of sulfate present in all soil types in the upper 3 feet.

2.13.4.E. Formations having over 6,000 ppm (0.6%) sulfates shall be lime-stabilized using a double application method.

2.13.4.F. Alternative subgrade options may be proposed by the Geotechnical Engineer and may be approved by the City Engineer.

2.13.4.G. If proposed as an alternate subgrade, flexible base shall have a minimum depth of 8 inches and shall extend a minimum of 1 foot behind the back of curb. Refer to the Standard Details for additional information.

2.13.5 Pavement Design

2.13.5.A. The minimum pavement thicknesses shall meet the requirements as shown on the Standard Details. It is the Geotechnical Engineer's responsibility to ensure those values are applicable. In no case shall the pavement sections be less than the City's minimum.

2.13.5.B. Additional pavement reinforcing shall be evaluated and determined for all concrete pavement sections thicker than 9 inches.

2.13.5.C. Pavement design shall be based on AASHTO's current edition of Guide for Design of Pavement Structures utilizing Pavement Analysis Software (WinPAS). A printout from the software program shall be required.

2.13.5.D. Concrete thickness results from WinPAS shall be rounded up to the nearest inch.

2.13.5.E. Pavement at intersections shall be based on the highest classification at the intersection plus an additional 2 inches of concrete. This increased pavement thickness section shall extend from all approaches through the intersection as shown in Figure 2-19.

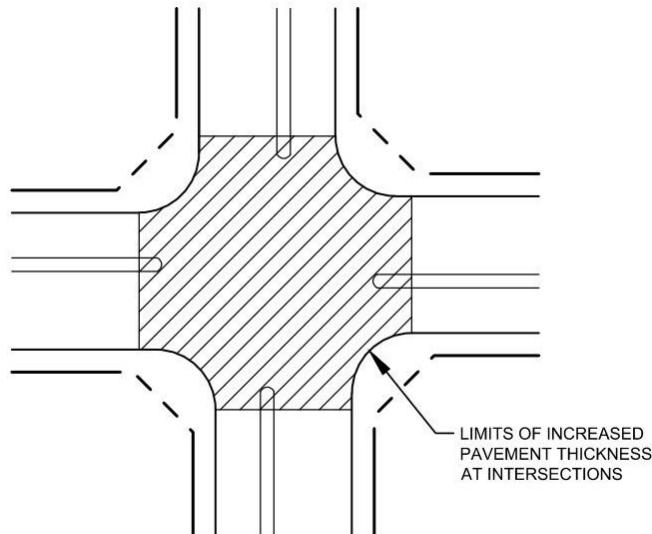


Figure 2-19 Pavement at Intersections

2.14 Traffic Control

2.14.1 General – All permanent and temporary traffic control shall be in accordance with TxDOT's current edition of TMUTCD and this section. General requirements for traffic control devices in the City are described in the following sections. Refer to the Approved Materials List and the Standard Details.

2.14.2 Pavement Markings – The following pavement markings are required per street classification in accordance with the Standard Details.

2.14.2.A. Arterials

- Centerline stripe for undivided sections;
- Lane lines;
- Turn lane lines;
- Traffic arrows;
- Stop bars;
- Crosswalk markings;
- Delineators for roadside obstructions;
- Raised pavement markers;
- Bike Lanes, including signs; and,
- Edge lines for non-curbed streets and bridges.

2.14.2.B. Collectors

- Centerline stripe;
- Lane lines, turn lane lines, and traffic arrows, if requested by the Director of Transportation and Public Works, at intersections;
- Bike Lanes, including signs; and,
- Lane lines and edge lines for non-curbed streets.



2.1.1.B. Other pavement markings and signs may be required on all streets as required by the City's Complete Streets Policy.

2.14.3 Temporary Traffic Control

2.14.3.A. General – When the normal function of the roadway is suspended through closure of any portion of the ROW, temporary construction work zone traffic control devices shall be installed to guide the motoring public through the area. Consideration for roadway user safety, worker safety, and the efficiency of roadway user flow is an integral element of every traffic control zone.

2.14.3.B. All Temporary Traffic Control Plans shall be prepared and submitted in accordance with the standards identified in Part VI: Temporary Traffic Control of TxDOT's current edition of TMUTCD.

2.15 Street Lighting

2.15.1 General

2.15.1.A. This section includes street lighting and conduit system requirements for illumination on all roadway classifications. Continuous lighting is required on arterials. On collectors and residential local roadways, streetlights are installed at intersections, culs-de-sac, and curves as specified in this section.

2.15.1.B. The Developer shall pay for the procurement and installation of the poles and fixtures, with prior approval from the electric service provider and the Director of Transportation and Public Works. Developer shall coordinate street light installation and any civil work with the electric service provider. The electric service provider shall inspect and approve all streetlight pole foundations, conduit, and grounding prior to concrete being poured. The electric service provider shall install and energize poles.

2.15.1.C. Street lighting shall be installed by the Developer, inspected by City staff, and approved by the electric service provider prior to final acceptance of the construction of a roadway.

2.15.1.D. Spacing Measurement – Streetlight spacing shall be measured along the ROW from center of pole to center of pole.

2.15.2 Lighting Plan – A lighting plan shall be required for all new street lighting or street lighting modifications. The lighting plan shall be reviewed and approved by the City Engineer, or his/her designee, prior to receiving a construction permit. The lighting plan shall be prepared, signed, and sealed by a Professional Engineer licensed in the State of Texas trained and qualified to provide lighting planning, engineering, and preparation of similar analyses. At a minimum, the submittal shall include the following:

- Plans indicating the location of the light poles, and the type of illuminating devices, fixtures, lamps, supports, reflectors, and other devices;
- Description of the illuminating devices, fixtures, lamps, supports, reflectors, and other devices and the description may include, but is not limited to, catalog cuts by manufacturers and drawings (including sections where required), light pole foundation details and height of the luminaires; and,
- Existing and proposed utilities shall be shown on plans identifying any conflict locations with underground and overhead utilities in proximity to light poles, arms, foundation and wires.

2.15.3 Continuous Arterial Lighting – Continuous arterial lighting shall be provided based on the following standards:



- Luminaires – Luminaires shall be cobra head style with 250-Watt (W) LED equivalent lamps;
- Poles – Poles shall be 30-foot-tall round galvanized steel pole;
- Spacing – Streetlights shall be spaced normally at 140-foot intervals, but no further apart than 180 feet;
- Intersections – At intersections with median openings, the pole shall be located 20 feet from the median nose; and,
- Orientation – Orientation shall alternate for the single luminaire (left to right) in the parkway along the arterial if there is no median present. For divided arterials, dual-arm light poles shall be placed in the median. A single luminaire shall be placed over left turn lanes. A single luminaire shall be oriented toward the side-street at an intersection with no median opening.

2.15.4 Collector and Local Roadway Lighting – Street lighting shall be provided on collectors and residential local roadways based on the following standards:

- Luminaires – Luminaires shall be cobra head style with 150 W LED equivalent lamps. Streetlights shall have a single luminaire;
- Poles – Poles shall be 25-foot-tall round galvanized steel pole;
- Spacing – Streetlights shall be spaced no further apart than 500 feet along tangent sections streets and shall be placed along horizontal curves where the road centerline changes by 30-degrees or more;
- Intersections – Streetlights shall be placed at all intersections; and,
- Cul-de-Sac – Shall be placed at the end of all culs-de-sac except if the cul-de-sac is less than 250 feet from the streetlight at an intersection.

2.15.5 Decorative Poles and Luminaires – Decorative poles may be approved by the electric service provider and the Director of Transportation and Public Works. Decorative poles shall be in accordance with the electric service provider's requirements.

2.15.6 Exceptions – The following are exempt from these requirements:

2.15.6.A. Temporary lighting approved in writing by the Director of Transportation and Public Works and at the expense of the requesting party.

2.15.6.B. Lighting luminaires in existence on the effective date of these requirements shall be exempt from these standards and shall be considered legally non-conforming. Such fixtures may be repaired, maintained, and/or replaced. If an identical replacement of non-conforming luminaires is not available, the new luminaires shall comply with these requirements.

2.15.7 Ground Boxes – Ground boxes shall be per electric utility provider's requirements.

2.15.8 Foundations – Street lighting foundations shall be designed in accordance with the electric service provider's requirements. Designer shall ensure that the bolt pattern of the foundation will accommodate the light poles selected.

2.15.9 Conduit Systems

2.15.9.A. Street Lighting Conduit shall be installed in accordance with the electric service provider requirements.

2.15.9.B. Electrical Service Pedestals – Electrical service pedestals shall be coordinated with the electric service provider.



2.16 Traffic Signals

2.16.1 General

2.16.1.A. All traffic signals shall be designed in accordance with this section. Any necessary variations proposed by the designer for consideration during design shall be approved by the City prior to installation.

2.16.1.B. Warrant Criteria – Traffic control signals should not be installed unless one or more of the signal warrants are met in accordance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD). The satisfaction of a warrant or warrants is not in itself justification for a signal. Traffic signals should only be used where an Engineering Study indicates the installation of a traffic signal will improve the overall safety and/or operation of the intersection. If these requirements are not met, a traffic signal should neither be put into operation nor continued in operation (if already installed).

2.16.1.C. Minimum Standards – All traffic signal designs shall be done in accordance with current editions TxDOT's of TMUTCD; Traffic Signals Manual; Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges; and Traffic Signal Standards.

2.16.1.C.i. Traffic signal poles shall be steel round-type following the 80-mph standard in accordance with TxDOT's current details.

2.16.1.C.ii. Traffic signal poles and all appurtenances (cabinets, signs, hardware) shall be powder coated black to the City's specifications.

2.16.1.D. General notes regarding specifications for standard equipment and materials are provided in Appendix E Technical Specifications. Requests for alternative equipment or materials may be considered on a case-by-case basis by the Director of Transportation and Public Works.

2.16.1.E. Traffic Signal Spacing – Signal spacing is an important factor in being able to provide progressive flow for a platoon of traffic. Traffic signal spacing shall be analyzed as part of a detailed traffic study and impact analysis. Final approval of signal spacing is at the discretion of the City Engineer. Final analysis and City Engineer discretion may preclude some locations from ever being signalized.

2.16.1.F. Equipment Placement – All equipment shall be placed within ROW or appropriate easements.

2.16.1.G. Electrical Service Pedestals – Electrical service pedestals shall be powder coated black, 120V/240V, and meet the electric service provider's specifications.

2.16.1.H. Number of Heads – There shall be a signal head for each through lane and right and left turn heads for any overlaps. A minimum of two (2) signal heads is required for the major movement on each approach of the signalized intersection.

2.16.1.C. Head Mounting – All signal heads shall be mounted in the horizontal orientation to the mast arm. Nearside heads shall be mounted on the right side of the roadway if the distance between the stop bar and signal heads exceed 180 feet. If roadway curvature necessitates mounting the nearside head on the left side of the roadway, the nearside head should be mounted vertically on a signal pole.

2.16.2 Standards for Conduits and Wiring

2.16.2.A. Conduits Sizes – Conduit sizes shall be as follows:

- Schedule 40 PVC conduits shall be provided. Unless otherwise approved by the City, all signalized intersections shall have conduit ring consisting of a 4-



inch conduit for signal and detector cables.

- Provide a 3-inch conduit between conduit ring and standard/pedestal poles.
- The home run shall have minimum two 4-inch conduits.

2.16.2.B. Wire in Conduits – Wire in conduits shall be as follows:

- 2-conductor, 12 American Wire Gage (AWG) Type C cable shall be used for each push button. All push buttons shall be wired separately.
- 10-conductor, 14 AWG cable shall be used to service pedestal poles.
- 20-conductor, 14 AWG cable shall be used to service standard poles. This can accommodate flashing yellow arrow, right turn overlaps, and nearside displays for one direction.
- 25-conductor, 14 AWG cable shall be used in lieu of 20-conductor if nearside displays are needed for two different directions on one pole.
- No. 6 Bare wire shall be used for grounding in all conduits except the run between the power service and disconnect.
- No. 4 or No. 6 XHHW shall be used between power service and disconnect.
- Three wires (hot, neutral, and ground) shall be used.
- 2-single conductor No. 12 XHHW shall be used for illumination and illuminated signs.

2.16.2.C. Wire in Traffic Signal Poles – Wire in traffic signal poles shall be as follows:

- 5-conductor, 14 AWG cable in pole shall be used for each ped head. For example, standard with two ped heads will have two 5-conductor cables. Provide 10 feet for each ped signal cable inside of pole.
- 5-conductor, 14 AWG cable shall be used for each three-section head. Provide 25 feet vertical plus the mast arm distance to the center of each head.
- 7-conductor, 14 AWG cable shall be used for each four- or five-section head. Provide 25 feet vertical plus the mast arm distance to the center of each head.
- 2-single conductor No. 12 XHHW shall be used for illumination and illuminated signs.

2.16.2.D. Standard Wiring Charts –Conductor wiring scheme shall be in accordance with Table 2-12.

Table 2-12 Color Code for Conductor Wiring Scheme

Conductor Number	Conductor Color	Signal Indication
1	Red	Red Ball – Through
2	Orange	Yellow Ball – Through
3	Green	Green Ball – Through
4	Blue	Yellow Arrow – Left Turn
5	Black	Green Arrow – Left Turn
6	White	Signal Common
7	Red/White	Don't Walk Phase 2 or 6
8	Green/White	Walk Phase 2 or 6



9	Blue/White	Ped Phase 2 or 6
10	Red/Black	Don't Walk Phase 4 or 8
11	Green/Black	Walk Phase 4 or 8
12	Blue/Black	Ped Phase 4 or 8
13	White/Black	Push Button Common
14	Black/Red	Yellow Arrow – Right Turn
15	Orange/Red	Green Arrow – Right Turn
16	Blue/Red	Spare
17	White/Red	Spare
18	Orange/Black	Spare
19	Black/White	Spare
20	Red/Green	Spare

2.16.3 Illuminated Street Name Signs (ILSN) – ILSNs shall be used for every signalized intersection. An ILSN shall be installed on each dedicated street leg. ILSNs shall contain block numbers and be mounted directly on the mast arm. Where necessary ILSNs may be approved to be mounted as hanging from the mast arm, but dedicated ILSN mast arms are to be avoided if possible. ILSNs shall be Duralight JXM-STN Series with standard white background and black letters with approved City logo on the left side. Preliminary shop drawings shall be submitted to Transportation and Public Works Department for approval prior to fabrication.

2.16.4 Signal Design Tables – Signal design tables summarizing the following information shall be included on the plans.

2.16.4.A. Percent Full – The sizing of the conduits and assignment of the field wiring should keep the percent full estimate below 40%. However, it is not necessary to include the percent full estimate on the plans. Use the following Schedule 40 conduit sizes: 2-inch, 3-inch, 4-inch, 5-inch, or 6-inch.

2.16.4.B. Wire and Conduit Quantities – Estimated wire and conduit quantities shall be shown in the plans in a conduit and wiring table. Conduit lengths shown in the conduit and wiring table should be plan view distances rounded up to the nearest 5 feet. Wire lengths should be increased by 6 feet spare for conduit stub up into the controller box or foundation (3 feet each end of run). Wire lengths should be increased by 2 feet spare wire in each pull-box (2 feet per pull-box that the wire runs through).

2.16.4.C. Conduit Run Labels – Conduit run label or number in the signal design table must correspond to the letter label on the plan drawings. If more than one conduit exists in the same run, each conduit should be shown in a separate row in the table and designated with a text label “A1”, “A2”, “A3”, and so on.

2.16.4.D. Total Run Length – Total run length shall be specified in feet from the center of each pole or pull-box rounded up to the nearest 5 feet. Specify bore length measuring 1 foot in back of the curb or edge of roadway.

2.16.4.E. Run Status – Specify run status as “Installed” (I), “Existing” (E) or “Spare” (S).

2.17 New Development Signage

2.17.1 General

2.17.1.A. This section includes requirements for street name, regulatory, and warning signs.

2.17.1.B. Warrant Criteria – If required by the City Engineer or Director of Transportation



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and Public Works, signs should be used only where justified by engineering judgment and demonstrated in an Engineering Study that indicates the location of necessary signs.

2.17.1.C. Requirement – The Developers of all new residential and commercial developments shall pay for all street name, regulatory, and warning signs at the locations designated by the City Engineer or Director of Transportation and Public Works. An estimate shall be provided by the Transportation and Public Works Department in accordance with the approved plans. Once the estimate is paid, the signs shall be installed by the City.

2.17.1.D. Signing Plans – All signing plans shall be designed in accordance with TxDOT's current edition of TMUTCD and shall be reviewed and approved by the City Engineer of designee.

2.18 Traffic Impact Analysis (TIA)

2.18.1 General

2.18.1.A. This section includes the general requirements for the preparation of a TIA.

2.18.1.B. Applicability – A TIA report may be required as part of the approval process for zoning changes, development plans, agreement approvals, building permit applications, subdivision platting, or changes of occupancy. If the TIA indicates traffic volumes that will significantly impact the capacity and/or safety of the transportation network, it may be necessary to obtain ROW for off-site, abutting, and internal thoroughfares to support new development at the time of platting or development of the land.

2.18.1.C. Preparation – The TIA report shall be prepared, signed, and sealed by a Professional Engineer licensed in the State of Texas trained and qualified to provide transportation planning, engineering, and preparation of similar analyses.

2.18.1.D. Purpose – The purpose of the TIA is to:

- Identify the existing and future level of service (LOS) of the transportation system and ensure it is not degraded by the new development worse than LOS C along street segments and at intersections without recommended mitigation;
- Ensure that both on-site and off-site development impacts are mitigated through monetary contributions to and/or improvements of the transportation system; and,
- Ensure that new development does not contribute more than their proportionate share of costs or construction of the transportation system and only contribute that which is necessary and attributable to the development.

2.18.2 Determining TIA Requirements

2.18.2.A. When Traffic Impact Analyses Are Required – At the discretion of the City Engineer, a TIA shall be required for any development proposal expected to generate traffic volumes that will significantly impact the capacity and/or safety of the transportation network. A TIA may also be required for a proposed development located near a sensitive area, a high accident location, or an area already suffering from congestion. Additionally, a queuing analysis shall be required for sites such as schools or drive-through restaurants to demonstrate that the anticipated peak queuing will be accommodated on-site and not queued back onto City streets.

2.18.2.B. Preliminary Trip Generation Assessment – To determine if a TIA may be



required, a preliminary trip generation assessment of the proposed development shall be conducted based on Institute of Transportation Engineers (ITE) current edition of Trip Generation Manual. If trip generation data is not available from the ITE Trip Generation Manual, the City Engineer may consider other sources of trip generation data. For developments involving a significant change to a proposed roadway alignment from that shown on the City of Weatherford's Thoroughfare Plan, involving a development of 50 or more dwelling units, or for developments generating 500 or more "one-way" trips per day, the Developer shall have a TIA prepared and submitted for review.

2.18.2.C. Preliminary Meeting – Prior to beginning a TIA, the Engineer shall contact the City Engineer or designee to schedule a preliminary meeting. The purpose of this meeting is to discuss the project concepts, to establish the analysis requirements and identify issues pertinent to the TIA. The following items shall be determined during the preliminary meeting:

- The level of detail needed for the analysis;
- Identification of the study area, land uses, study intersections, and driveways;
- The study scenarios (phase years, build-out year, horizon);
- Trip generation rates to be used;
- If pass-by or modal split analysis is appropriate;
- The need for internal circulation and queuing analysis;
- Reductions to trips due to internal circulation, if appropriate;
- List of committed developments near the proposed site to be considered;
- Assumptions for area-wide growth (appropriate background traffic calculation methods);
- Consideration of phased development and transportation improvements;
- Identification of existing high accident areas;
- If consideration of pedestrian or bicycle impacts are needed;
- If consideration for school connectivity is needed;
- Acceptable trip distribution methods to be used;
- Approval of traffic analysis software to be used (any capacity analysis may be performed with traffic analysis software that applies the Transportation Research Board (TRB) current edition of the Highway Capacity Manual);
- Analysis period and typical peak hours for the proposed land use;
- If traffic counts should be collected on typical weekdays (Tuesdays, Wednesdays, or Thursdays), or weekends and at what times during the day;
- If any traffic counts should be taken in addition to those listed herein; and,
- If any additional requirements are anticipated by the City.

2.18.2.D. Level of Analysis

2.18.2.D.i. Study Area – The study area shall be a one-mile radius for less than 10,000 trips per day. A larger radius shall be considered for more



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than 10,000 trips per day. The study area shall be based on the total daily estimated trip generation and shall include all existing and planned streets contained therein. When a development is adjacent to a major highway, the study area shall terminate at the further frontage road intersection from the site. If an intersection within the study area is not intended to be analyzed, justification as to why should be listed (ex: low amount if site traffic anticipated to route).

2.18.2.D.ii. **Study Horizon** – The study horizon shall include the year of completion, assuming full build-out and occupancy and five years after completion. The study horizon may be divided into additional phases depending on the development and as approved by the City Engineer.

2.18.3 **Roadway impact analysis** – The TIA will describe the V/C ratio (volume/capacity) for all thoroughfares as shown on the City of Weatherford Major Thoroughfare Plan and delay projections for intersections in the studied area to determine if level of service is maintained at an acceptable level. The analysis shall contain the following minimum information:

2.18.3.A. **Transportation impacts:**

2.18.3.A.i. **Trip generation** – The average weekday trip generation rates (trip ends), the average weekend trip generation rates (if determined necessary during preliminary meeting), the highest average a.m. and p.m. hourly weekday trip generation rates, and the highest hourly weekend generation rates (if determined necessary during preliminary meeting) for the proposed use shall be determined based upon the trip generation rates contained in the most recent edition of the Institute of Transportation Engineers' Trip Generation book or shall be based upon data generated by actual field surveys of area uses compatible to the proposed use and approved by the City Engineer. Trip generation calculations shall assume full development and occupancy.

2.18.3.A.ii. **Trip distribution** – The distribution of trips to arterial and collector roadways within the study shall be in conformity with accepted traffic engineering principles, taking into consideration the land use categories of the proposed development, the area from which the proposed development will attract traffic, competing developments (if applicable), the size of the proposed development, development phasing, surrounding existing and anticipated land uses, population and employment, existing and projected daily traffic volumes, existing traffic conditions, and the existing and future roadway network.

2.18.3.A.iii. **Existing trip generation** – Show in tabular form by land use the trips generated based on existing land use and zoning within the study area.

2.18.3.B. **Adequacy determination**. The roadway network included within the TIA shall be considered adequate to serve the proposed development if existing roadways identified as arterials and collectors can accommodate the existing service volume, and the service volume of the proposed development, and the service volume of approved but unbuilt developments holding valid, unexpired building permits at a level of service "C" or above.

2.18.4 **Intersection analysis.**



2.18.4.A. Level of service analysis – For intersections within the study area described in, a level of service analysis shall be performed for all arterial to arterial, arterial to collector, collector to arterial, and collector to collector intersections, and for any other pertinent intersections identified by the City Engineer. Also, level of service analyses will be required on all proposed site driveway locations for all developments. The City Engineer may waive analysis of minor intersections and site driveway locations within the study. The level of service analysis shall be based upon the highest hourly average a.m. or p.m. peak weekday volume or highest average hourly peak weekend volume as determined from a two-day survey of weekday volumes and, where necessary, a one-day survey of weekend volumes. These daily counts are to be tube counts collected along the adjacent roadways. From these tube counts, the peak hour trim times (typically 2-hour windows of data collection) to be studied are to be determined. Once these peak hour trim times have been determined, peak hour turning movement counts are to be collected at each study area intersection. The level of service analysis shall take into consideration the lane geometry, traffic volume, percentage of right-hand turns, percentage of left-hand turns, percentage (and typical size) of trucks, intersection width, number of lanes, signal timing and progression, roadway grades, pedestrian and bicycle flows, school routes, number of accidents, and peak hour factors. Conclusions shall be included that describe the following:

2.18.4.A.i. Summary of points of conflict and congestion with all thoroughfare links or intersections that exceed a level of service "C" being identified. For unsignalized intersections, level of service is to be reported by lane, while for signalized intersections, level of service is to be reported overall. For signalized intersections, approach and lane levels of service can be further considered if the overall intersection is not anticipated to operate at an acceptable level; and,

2.18.4.A.ii. The percentage of change produced by the proposed development.

2.18.4.B. Adequacy analysis – The intersections included within the TIA shall be considered adequate to serve the proposed development if existing intersections can accommodate the existing service volume, the service volume of the proposed development, and the service volume of approved but unbuilt developments holding valid, unexpired building permits at level of service "C" or above.

2.18.5 Submittal and Review Procedures

2.18.5.A. A copy of the TIA report, including all necessary backup data, are required for review.

2.18.5.B. The City Engineer or designee shall review the TIA in conjunction with the other elements of the development application. If the TIA is not of the proper scope or is executed improperly, the Developer shall be notified of the deficiencies and be required to submit corrections on the same schedule that applies to the other elements of the development application. Failure to submit corrections in a timely fashion may lead to a postponement of the application.

2.18.5.C. City Engineer approval is valid for 24 months, provided that significant changes in the development proposal or surrounding conditions have not occurred. At the discretion of the City Engineer, the TIA shall be revised if the proposed land use is changed by type or size, if existing conditions have changed enough to invalidate the TIA results, or if the initial TIA assumptions are no longer valid.

2.18.5.D. If the site plan changes after initial TIA approval, then any established Traffic Management Plan (TMP) shall be revised accordingly and resubmitted for City



Engineer approval.

2.18.6 Mitigation and Mitigation Funding

2.18.6.A. The TIA may take into account City, State, and/or County approved traffic improvements with dedicated funding. The City Engineer will determine which approved traffic improvements may be considered. Prior to acceptance of the public improvements and the issuance of a Certificate of Occupancy, the Developer shall complete any required traffic improvements that have not been funded or otherwise completed by government agencies for which the Developer is responsible.

2.18.6.B. When it can be demonstrated that a development will only partially contribute to the need for additional off-site improvements, the City may require a pro-rata contribution or agreement according to impacts of traffic added by the development.

2.18.6.C. If the existing LOS for streets or intersections is below C, or if traffic from the development degrades the LOS below C, where the development is contributing five percent or more of the total trips, the Developer shall mitigate the increase in traffic if possible. Mitigation measures may include, but are not limited to the following:

2.18.6.C.i. A reduction in density or intensity of development;

2.18.6.C.ii. Requirements in addition to those provided in this EDCM relating to driveway and median opening location design and distance between drives;

2.18.6.C.iii. Onsite improvements including access controls and site circulation adjustments; and,

2.18.6.C.iv. Offsite improvements, including the construction of additional lanes where the surrounding thoroughfares are not fully developed or intersection improvements where the surrounding area is approaching full development. Right and left-turn lanes at site access locations are required where determined necessary based on guidance in the NCHRP Report 457. If a development is taking access from a divided road, left-turn lanes should be required at the median opening.

2.18.7 TIA Report Requirements – At a minimum, the TIA shall incorporate all current and available transportation and land development information and include the following sections.

2.18.7.A. Introduction – Include a description of the site location and study area, including a location map identifying key intersections and other approved projects in the vicinity.

2.18.7.A.i. Development Description – Include type of land use and the following information where applicable:

- If residential, number and type of dwelling units;
- If commercial or industrial, square footage and type of development;
- Detailed site plan; and,
- Development phasing and timing.



2.18.7.A.ii. Analysis Period – Selection of analysis period shall be based on the proposed land use and the typical peak hours.

2.18.7.B. Site Conditions – Include a description of site conditions for the study area, including the following:

- Existing and proposed land use and zoning;
- Site access;
- Posted speed limits on all existing, adjoining, or impacted roadways;
- Distances from existing streets, driveways, and/or median cuts to the proposed development;
- Alignment of existing streets, driveways, and/or median cuts to the proposed development;
- Intersection layout, lane usage, lane widths, and roadway configuration;
- Traffic control devices;
- Traffic signal timing and phasing;
- ROW widths for all existing roadways that may be impacted by the development;
- Daily (ADT) and peak-hour (AM and PM) traffic counts (collected at the specified days of week based on the preliminary meeting), peak-hour intersection turning movement counts at key intersections taken at 15- minute increments, and any additional required traffic counts. Traffic counts used in a TIA shall be less than one year old. The existing counts shall be presented in diagrammatic form for each intersection counted;
- Pedestrian facilities and volumes;
- LOS of existing roadways and intersections as defined by TRB's current edition of Highway Capacity Manual; and,
- Photographs documenting existing transportation conditions.

2.18.7.C. Projected Traffic – The calculation of the projected traffic shall be shown in sufficient detail so that all calculations can be verified. Descriptions and figures of the following items shall be included in the report.

2.18.7.C.i. Site Traffic – Site traffic for peak periods shall include trip generation, trip distribution methods, and assignments. Include a list of trip rates and sources of rates used for the study. ITE's current edition of Trip Generation Manual shall be used. Calculate trip ends assuming 100% occupancy and development.

2.18.7.C.ii. Background Traffic – Background traffic (daily and peak periods) shall account for all approved developments in the study area as well as area growth beyond study area.

2.18.7.C.iii. Reassignment Rates – Reassignment rates for pass-by, diverted trips, and internal capture shall follow ITE's current edition of Trip Generation Manual based on different land use classifications. Reduction for any other land use types must be thoroughly documented and approved by the City Engineer.

2.18.7.C.iv. Total Traffic – Total traffic shall be shown combining site and



background traffic for each intersection and driveway.

2.18.7.C.v. Future Traffic – If required, future traffic shall be calculated using background traffic volumes adjusted for the TIA horizon year per discussion in the Preliminary Meeting.

2.18.7.D. Traffic Analysis – The following information shall be included in the report describing the detailed analyses performed.

2.18.7.D.i. Projected volume to capacity (V/C) ratios, vehicular delays, and LOS (background traffic and total traffic) for the study horizon shall include the following:

- Identification of any traffic analysis software used;
- Signalized intersection analysis;
- A LOS analysis using projected traffic volumes must be conducted using the Transportation Research Board's (TRB) current edition of Highway Capacity Manual;
- If signalization is warranted by the traffic signal warrants set forth in TxDOT's current edition of TMUTCD, conduct a complete warrant analysis and analyze the intersections as signalized intersections;
- Impacts to LOS on arterials shall be determined; and,
- Turning vehicle storage space needed or the adequacy of storage space for turning vehicles at intersections in the study area shall be analyzed. This analysis shall consider signal phasing and overall signal cycle length as well as vehicle volumes. Analysis of queuing on-site may also be required.

2.18.7.D.ii. A table for each of the following shall be provided. All peak-hour data shall be shown.

- Existing LOS, delay, and V/C ratios;
- Background LOS, delay, and V/C ratios without development;
- Future LOS, delay, and V/C ratios with development; and,
- Net changes in LOS, delay, and V/C ratios between future and background scenarios, both with and without mitigation; and,
- Percentage of traffic contributed by the development to intersections and roadways within the study area.

2.18.7.D.iii. Intersections, turn lanes, median openings, and driveways shall comply with Section 2.3 (Intersections), Section 2.7 (Median Openings and Turn Lanes), and Section 2.8 (Driveways), respectively.

2.18.7.D.iv. Determine impacts to nearby neighborhoods.

2.18.7.D.v. Accident analysis covering the past five years may be required at intersections that currently have more than four property and/or injury accidents per year. The Police Department shall provide recent reportable accident history for evaluation.

2.18.7.D.vi. The analysis should take additional facilities into account, such as



sidewalks, crosswalks, school bus stops, and railroad crossings.

2.18.7.E. Traffic Management Plan (TMP) – A TMP shall be required for any school, multifamily, commercial, industrial use or other applicable land use as determined in the Preliminary Meeting and must be based on the current site plan. If the site plan changes after the TIA is approved, the TMP shall be revised to demonstrate the final site plan and resubmitted to the City Engineer for approval.

2.18.7.F. Conclusions and Recommendations – The final section of the report shall summarize the overall impact of the development and include the following:

2.18.7.F.i. Site Access, Driveway, and Circulation Plan

2.18.7.F.ii. Adjacent intersection and driveway improvements addressing, at a minimum, the following:

- Traffic control devices – modify existing or need for new;
- Additional lanes needed (left, right, or through);
- Median openings;
- Intersection channelization;
- Acceleration and/or deceleration lanes;
- Length of storage bays;
- Correction of any site visibility issues;
- A detailed drawing of any intersection improvements for which the Developer is responsible; and,
- Implementation schedule.

2.18.7.F.iii. Off-site capital improvements and Transportation System Management (TSM) improvements to be programmed by the City may include the following:

- Modifications to existing traffic control devices;
- Additional traffic control devices, additional lanes at major intersections, and additional roadways; and,
- Other improvements, if applicable.

2.18.7.G. Appendix – The following appendices shall be included in the report:

- Conceptual site plan matching plat submittal;
- Raw traffic count data;
- Printouts of analysis results;
- Photographs of site; and,
- Additional tables or figures not included in the report.



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SECTION 3 DRAINAGE DESIGN REQUIREMENTS

Section Highlights

- A downstream assessment is required for all development that propose greater than 5,000 square feet of impervious area, regardless if a storm water storage facility is proposed.
- Open channels may be used when the flow exceeds the conveyance capacity of a 72-inch pipe.
- Refer to Title 13-Flood Damage Prevention of the City of Weatherford Municipal Code for requirements for development within the floodplain.

3.1 Purpose – The purpose of this section is to present and explain hydrologic and hydraulic analysis and design criteria for storm water systems in the City of Weatherford and its extraterritorial jurisdiction. It is intended to provide guidelines for consistent storm water design in new development, redevelopment and remedial improvements projects. It is anticipated that this section will not address every circumstance that may occur in urban storm water design. Coordination with City staff is recommended and encouraged during the planning, design and construction process.

3.2 Goals and Objectives

- 3.2.1 Establish and implement drainage policy and criteria to protect the general health, safety and welfare of the public;
- 3.2.2 Ensure adequate storm drainage and flood control;
- 3.2.3 Reduce flooding potential and excessive storm water runoff;
- 3.2.4 Minimize erosion and siltation problems; and,
- 3.2.5 Minimize the maintenance costs of constructed drainage facilities.

3.3 Definitions

3.3.1 Adequate Outfall – Storm drainage from a development must be carried to an “adequate outfall” or “acceptable outfall.” An adequate outfall is one that does not create adverse flooding or erosion conditions downstream and is in all cases subject to the approval of the City Engineer. See “Zone of Influence” definition for the required conditions or criteria to determine the adequacy of an outfall from a proposed development.

3.3.2 Drainage Studies and Downstream Assessment

3.3.2.A. Studies of the proposed development and drainage areas, including a downstream assessment of properties that could be impacted by the development, will accompany the preliminary and final site development plans. The “Zone of Influence” and “adequate outfall point” for the proposed development will be identified in the study and site plan.

3.3.2.B. These studies will include adequate hydrologic analysis to determine the existing, proposed, and fully developed runoff for the drainage area that is affected by the proposed development. They will also include hydraulic studies that help define the Zone of Influence and any upstream or downstream offsite effects. The study, as part of the development site plan, shall address existing downstream, off-site drainage conveyance system(s) and define the drainage path from the outfall of the on-site water facilities, to the off-site drainage system(s) and/or appropriate receiving waters. It will include a capacity analysis of all existing constraint points such as existing floodplain developments, underground storm drainage systems, culverts, bridges, or channels from the point of storm water discharge of the development downstream to the limits of the Zone of Influence. Storms



to be analyzed will be the 2-, 10-, and 100-year event.

3.3.3 Zone of Influence and Parameters – A Zone of Influence from a proposed development extends to a point downstream where the discharge from a proposed development no longer has a significant impact upon the receiving stream or storm drainage system. Downstream impacts due to a development must be analyzed and mitigated for the 2-, 10-, and 100-year storm events for the entire Zone of Influence, as determined by the development engineer's analysis. The Zone of Influence for any proposed development must be identified by the development engineer, based on a drainage study that determines the specific location along the drainage route where no adverse impacts from the new development exist.

A drainage study (see definition) will include the necessary hydrologic and hydraulic analyses to clearly demonstrate that the limits of the Zone of Influence have been identified and the following parameters are met along the drainage route to that location:

- No new or increased flooding of existing insurable (FEMA) structures (habitable buildings);
- No significant (0.1') increase in flood elevations over existing roadways for the 2-, 10-, and 100-year storm events;
- No significant rise (0.1' or less) in 100-year flood elevations, unless contained in existing channel, roadway, drainage easement and/or ROW;
- No significant increase (maximum of 5%) in channel velocities for the 2-, 10-, and 100-year storm events. Post-development channel velocities cannot be increased by more than 5% above pre-development velocities, nor exceed the applicable maximum permissible velocity shown in Table 3-7. If existing natural or vegetated channel velocities exceed six (6) feet per second, no additional increase in velocities will be allowed;
- No increases in downstream discharges caused by the proposed development that, in combination with existing discharges, exceeds the existing capacity of the downstream storm drainage system. Evaluation of ditch and driveway culverts on rural roadways may be required;
- For watersheds of 100 acres or less at any proposed outfall, the downstream assessment may use the ten percent rule of thumb or a detailed study in order to determine the Zone of Influence; and,
- For all other watersheds, the Zone of Influence will be defined by a detailed hydrologic and hydraulic analysis.

3.4 Drainage Plans

3.4.1 A drainage plan for development of all or a portion (i.e. phase one or phase two, etc.) of the overall development shall be prepared and submitted with the final plans and specifications. This submittal shall include at a minimum:

- 3.4.1.A. Submission of detailed plans and profiles of drainage improvements;
- 3.4.1.B. Submission of detailed drainage calculations and detailed design plans;
- 3.4.1.C. Detailed hydrologic/hydraulic analysis for storm water storage facilities and outlet control structures;
- 3.4.1.D. Any required Corps of Engineer's Section 404 permits, Conditional Letters of Map Revision (CLOMR), Letters of Map Revision (LOMR) or other permits relating to lakes and streams required by any federal, state or local authorities. Requirements for permits from federal and state authorities should be initiated as



early as possible to avoid delays in the development process; and,

3.4.1.E. Refer to the appropriate checklist in APPENDIX A for specific items that are required to be included in the plans.

3.5 Hydrologic Analysis

3.5.1 Rational Method – The rational method shall be used for calculating peak runoff from watersheds of 200 acres or less. Use this method for the design of gutter flows, drainage inlets, storm sewer pipe, culverts and small ditches.

The Rational Formula is expressed as $Q = CIA$, where:

Q = maximum rate of runoff (cubic feet per second (cfs))

C = runoff coefficient representing a ratio of runoff to rainfall

I = average rainfall intensity for a duration equal to the t_c (inches per hour (in/hr))

A = drainage area contributing to the design location (acres)

3.5.1.A. Runoff Coefficient – Table 3-1 presents the runoff coefficient, C , for the standard land use classifications used by the City of Weatherford. Runoff shall be based on the fully developed watershed as depicted by the Future Land Use Plan found in the City of Weatherford's General Plan.

Table 3-1 Runoff Coefficients (C)

Land Use	C - Value
Park, Undeveloped and Unimproved Areas	0.30
Park, Developed and Schools	0.40
Single Family Rural Residential (1 acre lots or larger)	0.45
Single Family Estate (1/2 lots or larger)	0.50
Single Family (6,500 ft ² lots or larger)	0.60
Single Family Patio Homes	0.65
Single Family Licensed Lake Lots	0.50
Single Family Townhomes	0.80
Two-Family Residential	0.80
Multifamily	0.70
Neighborhood Services	0.80
General Retail	0.80
Central Business District	0.95
Commercial	0.90
Interstate	0.90
Mixed Use	Varies by site plan
Light Industrial	0.90
Heavy Industrial	0.90

3.5.1.B. Rainfall Intensities – Table 3-2 shows the rainfall intensities, I , for Parker County. The values in the table are based on data from the latest version of the NCTCOG Integrated Stormwater Management (iSWM) Technical Manual.



Table 3-2 Rainfall Intensities

Hours	Minutes	Return Period (Years)						
		1	2	5	10	25	50	100
0.083	5	5.17	5.94	7.10	7.93	9.13	10.06	11.01
	6	4.86	5.61	6.76	7.57	8.74	9.65	10.59
	7	4.60	5.33	6.45	7.25	8.39	9.28	10.21
	8	4.36	5.07	6.18	6.96	8.07	8.94	9.85
	9	4.15	4.84	5.92	6.69	7.77	8.63	9.52
	10	3.96	4.63	5.69	6.44	7.50	8.34	9.22
	11	3.79	4.44	5.48	6.22	7.25	8.07	8.93
	12	3.63	4.27	5.29	6.01	7.01	7.82	8.67
	13	3.49	4.11	5.11	5.81	6.80	7.59	8.42
0.250	14	3.36	3.96	4.94	5.63	6.59	7.37	8.19
	15	3.24	3.83	4.79	5.46	6.41	7.17	7.97
	16	3.13	3.70	4.65	5.30	6.23	6.98	7.76
	17	3.02	3.59	4.51	5.16	6.06	6.80	7.57
	18	2.93	3.48	4.38	5.02	5.90	6.62	7.38
	19	2.84	3.38	4.27	4.89	5.76	6.46	7.21
	20	2.75	3.28	4.15	4.76	5.61	6.31	7.05
	21	2.68	3.19	4.05	4.65	5.48	6.17	6.89
	22	2.60	3.11	3.95	4.54	5.36	6.03	6.74
	23	2.53	3.03	3.85	4.43	5.24	5.90	6.60
	24	2.47	2.95	3.77	4.33	5.12	5.77	6.46
	25	2.41	2.88	3.68	4.24	5.01	5.65	6.33
	26	2.35	2.81	3.60	4.15	4.91	5.54	6.21
	27	2.29	2.75	3.52	4.06	4.81	5.43	6.09
	28	2.24	2.69	3.45	3.98	4.72	5.33	5.98
0.500	29	2.19	2.63	3.38	3.90	4.63	5.23	5.87
	30	2.14	2.58	3.31	3.82	4.54	5.13	5.77
	31	2.10	2.52	3.25	3.75	4.46	5.04	5.67
	32	2.06	2.47	3.19	3.68	4.38	4.95	5.57
	33	2.02	2.43	3.13	3.62	4.30	4.87	5.48
	34	1.98	2.38	3.07	3.55	4.23	4.79	5.39
	35	1.94	2.33	3.02	3.49	4.16	4.71	5.30
	36	1.90	2.29	2.97	3.43	4.09	4.63	5.22
	37	1.87	2.25	2.92	3.38	4.02	4.56	5.14
	38	1.83	2.21	2.87	3.32	3.96	4.49	5.06
	39	1.80	2.17	2.82	3.27	3.90	4.42	4.98
	40	1.77	2.14	2.78	3.22	3.84	4.36	4.91
	41	1.74	2.10	2.73	3.17	3.78	4.29	4.84
	42	1.71	2.07	2.69	3.12	3.73	4.23	4.77
	43	1.68	2.04	2.65	3.08	3.68	4.17	4.71
0.750	44	1.66	2.01	2.61	3.03	3.62	4.12	4.64
	45	1.63	1.98	2.57	2.99	3.57	4.06	4.58
	46	1.61	1.95	2.54	2.95	3.52	4.01	4.52
	47	1.58	1.92	2.50	2.91	3.48	3.95	4.46
	48	1.56	1.89	2.47	2.87	3.43	3.90	4.41
	49	1.54	1.86	2.43	2.83	3.39	3.85	4.35
	50	1.52	1.84	2.40	2.79	3.34	3.80	4.30
	51	1.50	1.81	2.37	2.76	3.30	3.76	4.25
	52	1.47	1.79	2.34	2.72	3.26	3.71	4.20
	53	1.45	1.77	2.31	2.69	3.22	3.67	4.15
	54	1.44	1.74	2.28	2.66	3.18	3.62	4.10
	55	1.42	1.72	2.25	2.62	3.15	3.58	4.05
	56	1.40	1.70	2.23	2.59	3.11	3.54	4.01
	57	1.38	1.68	2.20	2.56	3.07	3.50	3.96
	58	1.36	1.66	2.17	2.53	3.04	3.46	3.92
	59	1.35	1.64	2.15	2.50	3.00	3.42	3.88
1	60	1.33	1.62	2.12	2.48	2.97	3.39	3.84
2	120	0.79	0.97	1.29	1.52	1.84	2.10	2.40
3	180	0.58	0.71	0.95	1.12	1.36	1.57	1.79
6	360	0.33	0.41	0.56	0.66	0.80	0.93	1.06
12	720	0.19	0.24	0.32	0.38	0.47	0.54	0.62
24	1440	0.11	0.14	0.18	0.22	0.27	0.31	0.36

3.5.1.C. Time of Concentration – Time of concentration, t_c , shall be based on fully developed conditions for the upstream watershed, while also considering existing storm water storage facilities. The total time of concentration shall include overland and channelized flow. The maximum length allowed for the overland

portion of the calculation is 50 feet. The remainder of the watershed shall be considered channelized flow. Refer to Figure 3-1 and Figure 3-2 to determine the velocity that is used to calculate the time of concentration. For the most upstream inlet of the drainage system, minimum and maximum inlet times have been established based by land use as shown in Figure 3-1.

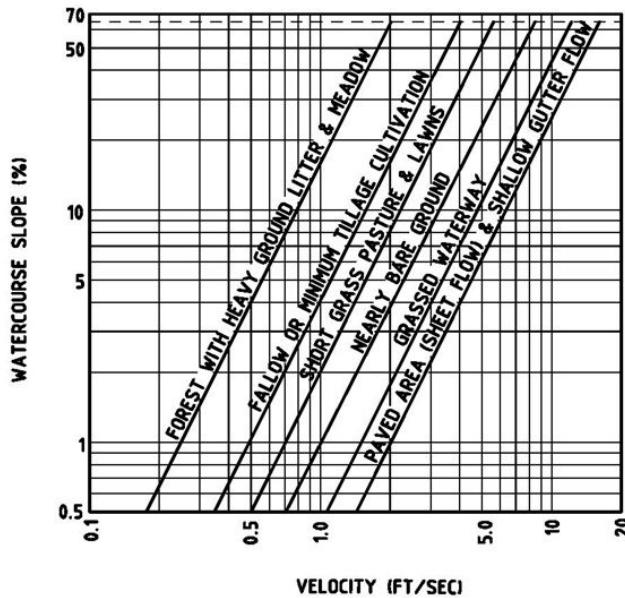


Figure 3-1 Average Velocities - Upland Flow

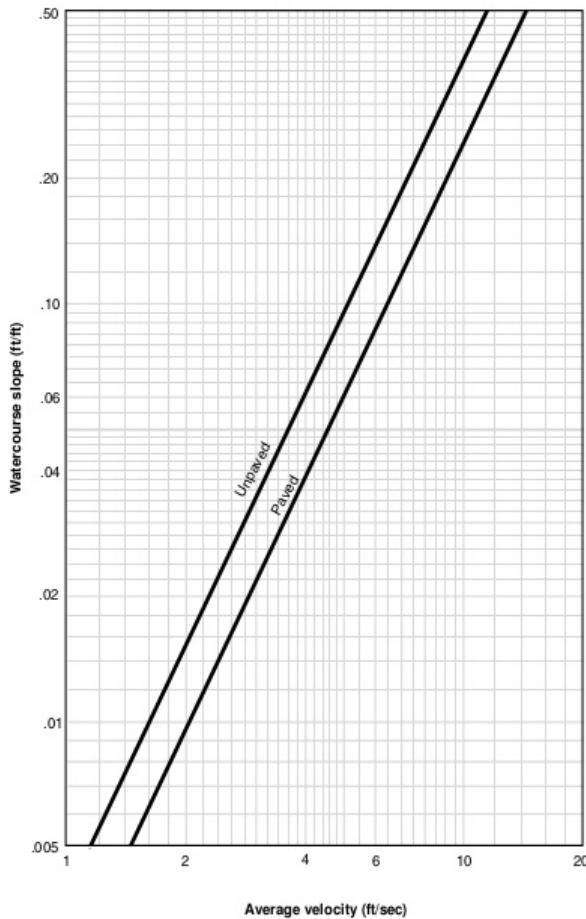


Figure 3-2 Average Velocities - Shallow Concentrated Flow

Table 3-3 Minimum/Maximum Time of Concentration

Land Use	Minimum Time (minutes)	Maximum Time (minutes)
S.F. Residential, duplex, schools, parks	15	30
Multi-Family, local business, commercial, industrial	10	25
Central Business District	10	15

3.5.1.D. Minimum Design Frequency – Table 3-4 shows the minimum design frequency to be used when designing drainage facilities.

Table 3-4 Minimum Design Frequency

Type of Facility	Minimum Design Frequency
On-grade inlets	10 year w/100 year in ROW
Low point inlets	25 year w/100 year positive overflow
Storm sewer upstream of low points	10 year
Storm sewer downstream of low pts	25 year w/100 year positive overflow
Street ROW	100 year*
Channels and creeks	100 year
Creek culverts and bridges	100 year
Permanent bar ditch & associated culverts	5 year w/100 year in ROW

*Depending on the amount of flow in the ROW, additional drainage infrastructure may be required to reduce the flow in order to protect the health, safety and welfare of the general public.

3.5.1.E. Drainage Area – The drainage area shall be based on fully developed areas within and contributing to the development, shall follow natural drainage features, and shall not be diverted. Existing or anticipated features modified by the development shall be considered when outlining drainage areas. A drainage area map shall be prepared that complies with the checklist in APPENDIX A.

3.5.2 Soil Conservation Service (SCS) Hydrologic Method – The SCS method can be used for estimating peak flows and generation of hydrographs for all design applications, including storm drain systems, culverts, open channels, energy dissipators, storage basins and outlet structures. This method is generally used for watersheds greater than 100 acres and less than 2000 acres. This method may be used for watersheds greater than 100 acre and less than 200 acres if the results are more conservative than the Rational Method.

3.5.2.A. The SCS method is based on Rainfall-Runoff Equations and Runoff Curve Numbers (CN) influenced by hydrologic soil classification. Consideration is also given to the effects of urbanization on the natural soil group.

3.5.2.B. The simplified SCS method is not accepted by the City of Weatherford for final design calculations of runoff volume and peak rate discharges.

3.5.3 Snyder's Unit Hydrograph Method – Snyder's unit hydrograph method is used by the U.S. Army Corp of Engineers, Fort Worth District, for hydrologic studies. This method may be used for watersheds greater than 100 acres.

3.5.3.A. Additional sources detailing use of this method are "Flood-Hydrograph Analysis and Computations," USACE Engineering Manual EM 1110-2-1405 and the "Flood Hydrology Manual, A Water Resources Technical Publication," The Bureau of Reclamation.

3.6 Downstream Evaluation

3.6.1 A downstream evaluation is a procedure to protect properties from flood and erosion impacts due to upstream development. Timing of flow released from detention basins can sometimes combine with the peak flow of the natural drainage way in such a manner that



actually increases the downstream peak discharge.

3.6.2 Evaluation of the downstream impacts extends from the outfall of the proposed development to a point downstream identified by the Zone of Influence or an Adequate Outfall.

3.6.2.A. *Zone of Influence* extends to a point downstream where the discharge from a proposed development no longer has a significant impact upon the receiving stream or storm drainage system.

3.6.2.B. *Adequate Outfall* is the location of acceptable outfall that does not create adverse flooding or erosion conditions downstream.

3.6.2.C. These methods recognize the fact that a structural control providing detention has a Zone of Influence downstream where its effectiveness can be experienced. Beyond this Zone of Influence, the storm water effects of a structural control become relatively small and insignificant compared to the runoff from the total drainage area at that point. Based on studies and master planning results for a large number of sites, a general rule of thumb is that the Zone of Influence can be considered to be the point where the drainage area controlled by the detention or storage facility comprises 10% of the total drainage area. This is known as the 10% Rule. As an example, if a structural control drains 10 acres, the Zone of Influence ends at the point where the total drainage area is 100 acres or greater.

3.6.3 Typical steps in a downstream assessment include:

3.6.3.A. Determine the outfall location of the site and the pre- and post-development site conditions.

3.6.3.B. Using a topographic map, determine a preliminary lower limit of the Zone of Influence (approximately 10% point).

3.6.3.C. Using a hydrologic model, determine the pre-development peak flows and velocities at each junction beginning at the development outfall and ending at the next junction beyond the 10% point. Undeveloped off-site areas are modeled as fully developed for both the pre- and post-development analyses. The discharges and velocities are evaluated for three storms events:

3.6.3.C.i. Streambank Protection storm, 2-year, 24-hour event

3.6.3.C.ii. Conveyance storm, 10-year, 24-hour event

3.6.3.C.iii. Flood Protection storm, 100-year, 24-hour event

3.6.3.D. Change the land use on the site to post-development conditions and rerun the model.

3.6.3.E. Compare the pre- and post-development peak discharges, flow patterns and velocities at the downstream end of the model. If the post-developed flows are higher than the pre-developed flows for the same frequency event, or the post-developed velocities are higher than the allowable velocity of the downstream receiving system, extend the model downstream. Repeat steps 3 and 4 until the post-development flows are less than the pre-developed flows, and the post-developed velocities are below the allowable velocity. See Table 3-7 for allowable velocities.

3.6.3.F. If shown that no peak flow increases occur downstream and post-developed velocities are allowable, then the control of the flood protection volume may be waived by the City Engineer.

3.6.3.G. If peak discharges are increased due to development, or if downstream velocities



are erosive, one of the following options is required:

- Document that existing downstream conveyance is adequate to convey post-developed storm water discharges with no erosion or flooding.
- Reduce the flow elevation and/or velocity through channel or flow conveyance structure improvements downstream.
- Design a structural control facility such that the post-development flows do not increase the peak flows, and the velocities are not erosive, at the outlet and the determined junction locations.

3.7 General Design Storm Requirements

- 3.7.1 Drainage design requirements for streets, closed systems, and open channels shall provide protection for property during a storm having a 100-year recurrence interval. The design shall assume a fully developed watershed (ultimate build out) for all areas contributing to the storm water flow.
- 3.7.2 Closed Conduit Systems – Closed conduit systems shall be designed for a minimum 10-year storm with a combined capacity in the closed system and a surface drainage system (i.e. street) that will convey the 100-year storm. The 5-year storm must be within the permissible spread of water in the gutter. The 100-year storm flow must be contained within the ROW. The closed conduit HGL shall be at least two (2) feet below the top of curb and one (1) foot below curb line in inlets. The capacity of the underground system may be required to exceed the 10-year storm in order to satisfy the 100-year storm criteria (contained within the ROW). Adequate inlet capacity shall be provided to intercept surface flows before the ROW capacity is exceeded.
- 3.7.3 Low point inlets in sag or sump conditions shall be sized to intercept and convey the 25-year storm, provided that a positive overflow is constructed for the remainder of the 100-year storm. The positive overflow structure must be concrete or other acceptable non-earthen structure extending from the sump inlet to the storm sewer outfall. In the event that a structural overflow is not practical, then the underground system must be sized to convey the 100-year storm.
- 3.7.4 Culverts and channels shall be sized to convey the 100-year storm for the fully developed watershed with required freeboard.

3.8 Street and Gutter Capacity

- 3.8.1 A roof top cross-section (uniform cross-slope, triangular gutter) shall be used for concrete streets. Asphaltic streets may be either roof top or parabolic cross-sections. Pavement material and cross-section shall be designated on the plans. Field changes will not be allowed. The following assumptions shall be made for street and gutter capacity calculations:
 - 3.8.1.A. Manning's "n" for concrete streets=0.015;
 - 3.8.1.B. Manning's "n" for asphalt streets=0.018;
 - 3.8.1.C. Manning's "n" for ROW=composite value based on width of pavement and parkway;
 - 3.8.1.D. Parkway slopes are 2.00% towards the curb; and,
 - 3.8.1.E. Undivided streets have the same curb elevation.
- 3.8.2 Maximum allowable flow in street ROWs shall meet the requirements show in Table 3-5.

**Table 3-5 Maximum Allowable Flow in Street ROW**

Street Section	Maximum Flow (cfs)
Local Street (31' B-B)	45
Local Street (37' B-B)	47
Minor Collector "D" (41' B-B)	55
All others	As determined by permissible spread of water (see Section 3.8.3)

3.8.3 Permissible Spread of Water – Permissible spread of water refers to the amount of water that is allowed to collect in streets during a 5-year storm event. To prevent excess storm water from collecting in streets or thoroughfares during a design storm, the following spread of water values shall be used for the various types of streets.

3.8.3.A. Divided Arterials "A" and "AA"

3.8.3.A.i. Permissible Spread of Water – The permissible spread of water in gutters of major divided thoroughfares shall be limited so that one traffic lane on each side remains clear during the 5-year storm. Gutter flow shall be based on storm duration of 10 minutes. The 100-year storm shall be contained within the ROW.

3.8.3.A.ii. Conditions – Recessed curb inlets on arterials shall be located at street intersections as necessary, low points of grade or where the gutter flow exceeds the permissible spread of water criteria. Inlets shall be located, when possible, on the side streets when grade permits. In no case shall the gutter depression at curb inlets exceed 4 inches. In super-elevated sections, curb inlets shall be placed against the center medians as needed to intercept gutter flow to prevent flow from crossing the thoroughfares on the surface in valley gutters or otherwise.

3.8.3.B. Minor Arterial "B5" and Commercial Collector Streets "C" and "C3"

3.8.3.B.i. Permissible Spread of Water – The permissible spread of water in gutters shall be limited so that one standard lane of traffic will remain clear during the 5-year storm. The 100-year storm shall be contained within the ROW.

3.8.3.B.ii. Conditions – Recessed curb inlets shall be located at street intersections as necessary, low points of grade or where the gutter flow exceeds the permissible spread of water criteria. Inlets shall be located, when at all possible, on the side streets when grade permits. Recessed curb inlets shall be used on streets without parking lanes. Standard curb inlets may be used on streets where parking lanes are provided. In no case shall the gutter depression at curb inlets exceed 4 inches.

3.8.3.C. Local/Residential Streets

3.8.3.C.i. Permissible Spread of Water – The permissible spread of water for local streets shall be limited by height of the curb for 5-year storms. The 100-year storm shall be contained within the ROW.

3.8.3.C.ii. Conditions – Inlets shall be located at street intersections as necessary, low points of grade or where the gutter flow exceeds the permissible spread of water criteria. Standard curb inlets (not recessed) shall be used in all cases. In no case shall the gutter depression at inlets exceed 4 inches.



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3.8.3.C.iii. Flow of water shall be evaluated at "T" intersections and short radius horizontal curves to prevent storm water overtopping the curbs. If extending storm sewer to the location is not a reasonable alternative in such an occurrence, a minimum finished floor elevation shall be established on affected lots based on a 100-year flow in the street.

3.8.3.D. Rural Streets (Roadside Ditches)

3.8.3.D.i. Permissible Spread of Water – The roadside ditch shall be designed to convey the flow for the 100-year storm without leaving the ROW.

3.8.3.D.ii. Culverts in Roadside Ditches – Culverts at roadway intersections shall be a minimum 24-inch diameter. Culverts at driveways shall be a minimum 18-inch diameter. Culverts shall be designed to carry the 5-year storm at a minimum. The driveway or roadway above the pipe shall have an invert or low point in the pavement for positive overflow. The culvert and pavement invert shall be designed to carry the 100-year storm.

3.8.4 Gutter Flow is based on Manning's Formula, $Q = (1.486/n) A R^{2/3} S^{1/2}$, where:

Q = gutter flow rate, cfs

n = Manning's roughness coefficient

A = cross-sectional area of the flow, sq. ft.

R = hydraulic radius of the flow, ft ($R = A/WP$)

WP = wetted perimeter of the flow area, ft.

S = longitudinal slope of the gutter, ft/ft

3.9 Inlets

3.9.1 Inlets are classified as "on grade inlets" and "low point inlets." On grade inlets are either standard (in line) curb inlets or recessed curb inlets. Both standard and recessed inlets are constructed with a 4-inch gutter depression at the inlet opening. Grate inlets are not acceptable for use in the public storm drain system.

3.9.2 Curb Inlets on Grade

3.9.2.A. Curb inlets on grade with a depressed gutter have a design capacity based on the equation, $Q_L = 0.7 [1/(H_1 - H_2)] [(H_1)^{5/2} - (H_2)^{5/2}]$, where:

Q_L = Discharge into inlet in cfs per linear foot of opening

H_1 = $a + y$

H_2 = a = gutter depression in feet (4" = 0.33')

y = Depth of flow in approach gutter in feet.

3.9.3 Low Point Inlets

3.9.3.A. Low point inlets (in sump) can be curb inlets on a street or drop inlets (y inlets) at off street locations. Low point inlets operate as a rectangular broad-crested weir at water depths within the opening height. The capacity is based on the weir equation, $Q = 3.087 y^{3/2} L$ or $Q/L = 3.087 y^{3/2}$, where:

Q = Inlet capacity in cfs

y = Head at the inlet in feet

L = Length of inlet opening in feet.

3.9.3.B. Where the depth of water is such that the opening at the curb inlet or drop inlet is completely submerged, the proper orifice formula should be used in computing the discharge rather than the weir formula. The inlet operates as an orifice at depths greater than 1.4 times the opening height. The flow is in transition



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between these two operational stages. Capacity of the orifice is based on the equation, $Q=0.67A(2gh)^{1/2}$, where:

Q = Capacity of the opening in cfs
A = Area of the opening in square feet
g = Acceleration due to gravity, 32.2 feet/sec²
h = Depth of water to center of opening in feet.

3.9.3.C. The maximum capacity of the curb inlets at low points with submerged openings shall be limited to two (2) cfs per linear foot of opening.

3.10 Closed Conduit System

3.10.1 Closed systems shall be used when the flow can be carried in a 72-inch diameter pipe or smaller. The closed system shall be connected to an existing system or extended until it reaches an open channel or natural creek. Improvements will include appropriate transitions to the centerline of creeks, ditches or drainage channels of sufficient capacity to adequately serve the drainage area.

3.10.2 Minimum velocities and grades shall be sufficient to prevent excessive deposits of solid materials, otherwise objectionable clogging may result. The controlling velocity is near the bottom of the conduit and considerably less than the mean velocity of the sewer. Storm drains shall be designed to have a minimum mean velocity flowing full of 2.5 fps. Velocities in storm sewers are important mainly because of the possibilities of excessive erosion of the storm drain inverts. Table 3-6 shows the desirable velocities for most storm drainage design. Storm drains shall not have a grade less than 0.003 feet per feet (0.30%).

Table 3-6 Roughness Coefficients and Permissible Velocities

Type of Section/Feature	Coefficient of Roughness "n"	Velocity, fps ¹
I. Natural Creeks		
A. Creek Section		
1. Some grass & weeds; little or no brush	0.045	3.0 to 6.0
2. Dense growth of grass or brush	0.055	3.0 to 6.0
3. Dense brush and trees	0.065	3.0 to 6.0
B. Floodplain/Overbank Areas		
1. Grass, Weeds, Some brush & trees	0.045	3.0 to 6.0
2. Dense Grass, Weeds or Brush	0.055	3.0 to 6.0
3. Dense Brush & Trees	0.080	3.0 to 6.0
II. Improved Open Channels		
A. Gabion Channels	0.035	3.0 to 10.0
B. Pre-Cast Concrete Block Channels	0.035	3.0 to 10.0
C. Natural Stone Channels	0.035	3.0 to 10.0
D. Grass Vegetated Channels (maintained)	0.035	3.0 to 6.0
E. Concrete Channels	0.016	5.0 to 15.0
F. Rock Rip-Rap Channels	0.035	5.0 to 10.0
III. Streets		
A. Concrete	0.015	N/A
B. Asphalt	0.018	N/A
VI. Pipe		
A. Reinforced Concrete Pipe		
1. Inlet Laterals	0.013	3.0 to 10.0
2. Storm Sewer Mains	0.013	3.0 to 12.0
3. Culverts	0.013	3.0 to 15.0
*B. Corrugated Metal Pipe	0.022	3.0 to 15.0
*C. High Density Polyethylene Pipe	0.011	3.0 to 15.0
VII. Reinforced Concrete Box	0.015	3.0 to 15.0

*Not used in design of the public storm drain system.

¹Froude number should not be between 0.86 and 1.13.

3.10.3 Pipe Materials

3.10.3.A. Pipe materials used in construction of the public storm drain system in the City of Weatherford shall be limited to reinforced concrete pipe (RCP). Class III RCP shall be used when the pipe cover is 3 feet to 13 feet. Class IV RCP is used when cover is 13 feet or less than 3 feet. In no case shall pipe cover be less than one (1) foot.

3.10.3.B. Corrugated plastic pipe (profile wall with smooth interior), including High-Density Polyethylene (HDPE) pipe, corrugated PVC (CPVC) and CMP may be used in the following specific situations:

3.10.3.B.i. HDPE, CPVC and CMP pipe is permitted for use as driveway culverts in roadside ditches. Minimum allowable size shall be 18 inches. Driveway permits will be required from the Transportation and Public Works Department.

3.10.3.B.ii. On a case-by-case basis, the City Engineer may allow the use of plastic storm drain pipe where maximum velocities are exceeded for

RCP. Where allowed, plastic storm drain pipes shall be installed in accordance with all manufacturer's specifications and shall meet or exceed ASTM D-2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

3.10.3.C. See APPENDIX D for approved materials for storm drains.

3.10.4 Storm Drain Pipe Flowing Full

3.10.4.A. Storm drains under full flow conditions shall be designed by the application of the Continuity Equation and Manning Equation either through the appropriate charts or nomographs or by direct solutions of the equations as follows:

$Q = A V$, and

$Q = (1.486/n) A R^{2/3} S_f^{1/2}$, where

Q = Runoff in cubic feet per second

A = Cross-sectional area of pipe in square feet

V = Velocity of flow in feet per second

n = Coefficient of roughness

r = Hydraulic radius = A/WP

S = Friction slope in feet per foot

P = Wetted perimeter in feet

3.10.5 Circular Pipe Flowing Partially Full

3.10.5.A. For storm drains under partial flow conditions, values for depth, quantity and velocity of flow shall be determined by using modeling software, using an iterative process to solve for the depth of flow using the Manning's equation or by using Figure 3-3. This graph is from the American Society of Civil Engineers, ASCE Manual #37, 1969. The graph relates depth, quantity and velocity of flow based on a value of Manning's "n" that varies with the depth of flow in the pipe.

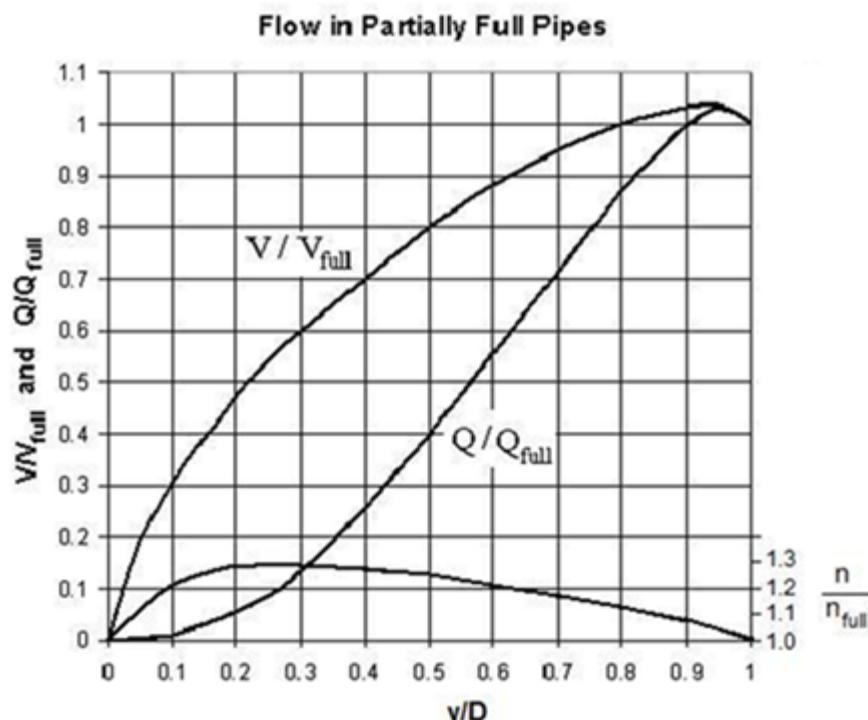


Figure 3-3 Flow in Partially Full Pipes

3.10.6 Hydraulic Gradient

3.10.6.A. Hydraulic gradients in storm drain systems shall be shown on the storm drain profile plans. All losses of energy through resistance with flow in pipes, by changes of momentum or by interference with flow patterns at junctions, must be accounted for by accumulative head losses along the system from its initial upstream inlet to its outlet. The purpose of accurate determinations of head losses at junctions is to include these values in a progressive calculation of the hydraulic gradient along the storm drain system. All head losses shall be calculated whether the system is flowing partially full or surcharged. In this way, it is possible to determine the water surface elevation which will exist at each structure. The hydraulic grade line (HGL) represents the pressure head at any given point within the system.

3.10.6.B. The HGL is often controlled by the conditions of the storm drain outfall. Therefore, the elevation of the tailwater pool must be known. The hydraulic gradient is constructed upstream from the downstream end, taking into account all of the head losses that may occur along the line. Generally, the HGL shall start at the inside top of pipe (soffit) or at the HGL of a connecting feature, whichever is higher. See Section 3.10.7 to consider the joint probability of two rainfall events occurring at the outfall junction at the same time.

3.10.6.C. The friction head loss shall be determined by direct application of Manning's Equation or by appropriate nomographs or charts. Minor losses due to turbulence at structures shall be determined by the procedure Section 3.10.8.

3.10.6.D. HGL of the storm water main shall be at least two (2) feet below the top of curb and one (1) foot below top of curb in inlets.

3.10.7 Storm Drain Outfalls to a River or Stream

3.10.7.A. Outfalls to a river or stream may create a need to consider the joint or coincidental probability of two hydrologic events occurring at the same time to adequately determine the elevation of the tailwater in the receiving stream. The relative independence of the discharge from the storm drainage system can be qualitatively evaluated by a comparison of the drainage area of the receiving stream to the area of the storm drainage system. For example, if the storm drainage system has a drainage area much smaller than that of the receiving stream, the peak discharge from the storm drainage system may be out of phase with the peak discharge from the receiving watershed. In this case, it would be necessary to establish an appropriate design tailwater elevation for a storm drainage system based on the expected coincident storm frequency on the outfall channel. The area ratio shown in Table 3-8 is the ratio of the main stream (receiving area) to the tributary (storm system drainage area).

Table 3-7 Frequencies for Coincidental Occurrences

Area Ratio	2-Year design		5-Year Design	
	Main Stream	Tributary	Main Stream	Tributary
10,000:1	1	2	1	5
	2	1	5	1
1,000:1	1	2	2	5
	2	1	5	2
100:1	2	2	2	5
	2	2	5	5
10:1	2	2	5	5
	2	2	5	5
1:1	2	2	5	5
	2	2	5	5
Area Ratio	10-year design		25-year design	
	Main Stream	Tributary	Main Stream	Tributary
10,000:1	1	10	2	25
	10	1	25	2
1,000:1	2	10	5	25
	10	2	25	5
100:1	5	10	10	25
	10	5	25	10
10:1	10	10	10	25
	10	10	25	10
1:1	10	10	25	25
	10	10	25	25
Area Ratio	50-year design		100-year design	
	Main Stream	Tributary	Main Stream	Tributary
10,000:1	2	50	2	100
	50	2	100	2
1,000:1	5	50	10	100
	50	5	100	10
100:1	10	50	25	100
	50	10	100	25
10:1	25	50	50	100
	50	25	100	50
1:1	50	50	100	100
	50	50	100	100

3.10.7.B. Frequencies for coincidental occurrences are discussed in both the TXDOT “Hydraulic Design Manual,” November 2002, and the NCTCOG “Design Manual for site Development,” January 2006.

3.10.7.C. There may be instances where excessive tailwater elevation causes flow to back up in the storm drain system and out of inlets and manholes. The potential for flooding from this condition should be evaluated.

3.10.8 Minor Head Losses at Structures

3.10.8.A. Minor losses shall be determined for junction boxes, manholes, wye branches or bends in the design of closed conduits. Minimum head loss used at any structure



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shall be 0.10 foot. The basic equation, where there are velocities upstream and downstream of the junction or structure, is $h_j = (v_2^2/2g) - K_j(v_1^2/2g)$, where:

- h_j = Junction or structure head loss in feet
- v_1 = Velocity in upstream pipe in fps
- v_2 = Velocity in downstream pipe in fps
- K_j = Junction or structure coefficient of loss
- g = Acceleration of gravity, 32.2 ft/sec/sec

- 3.10.8.B. Where the upstream velocity (v_1) is greater than the downstream velocity (v_2), the formula becomes $h_j = (v_2^2/4g) - K_j(v_1^2/4g)$
- 3.10.8.C. In cases where the manhole or inlet is at the beginning of a line, or the alignment is constructed with manufactured bends or on a curve, the equation, $h_j = (v_2^2/2g)$, without any velocity of approach.
- 3.10.8.D. Figure 3-4 through Figure 3-9 includes K_j values and equations at typical structures. If the proposed design is not represented by one of the figures, the engineers shall provide documentation and references of headlosses for the proposed structure.

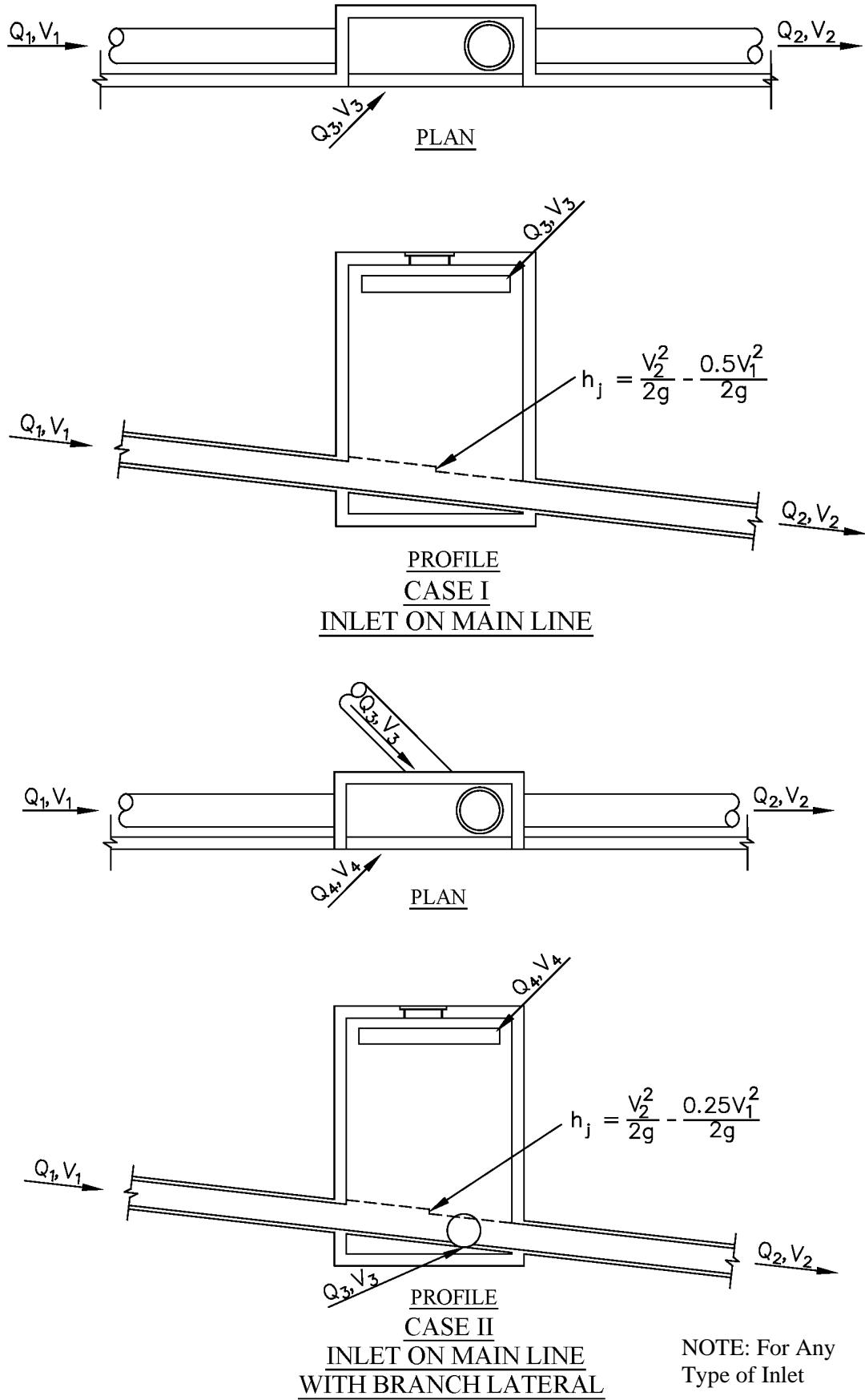
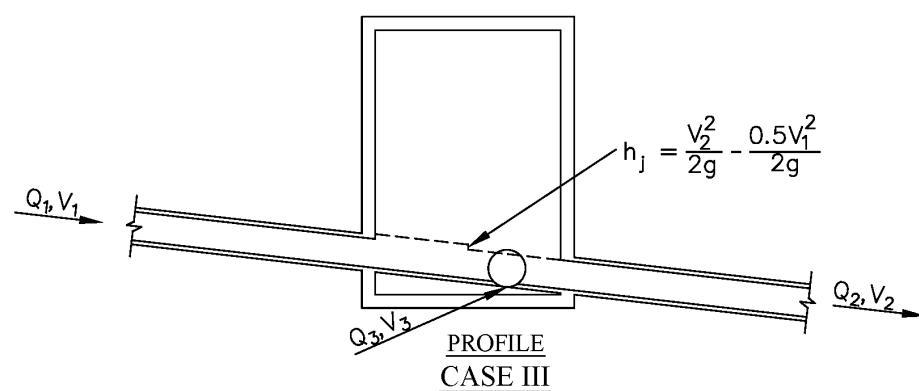
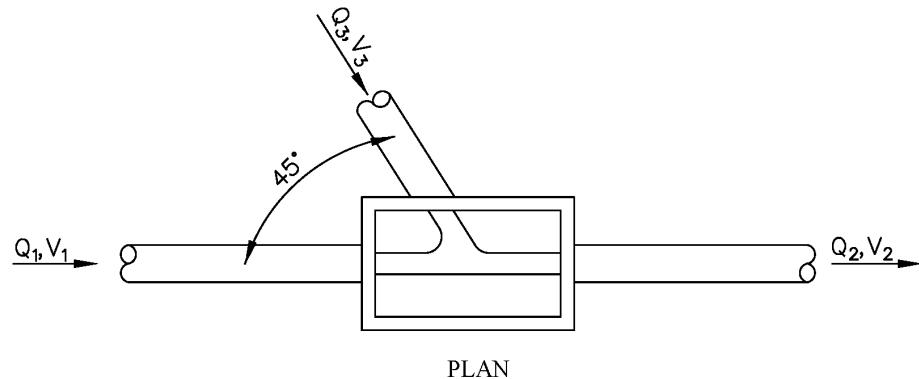


Figure 3-4 Minor Losses Due to Turbulence at Inlets

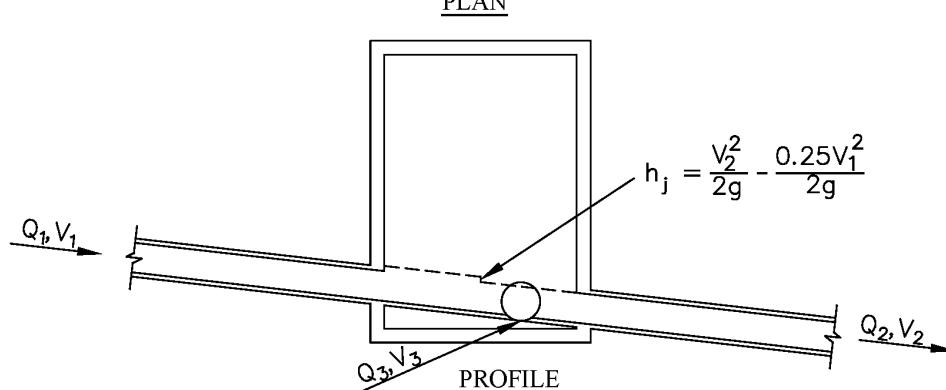
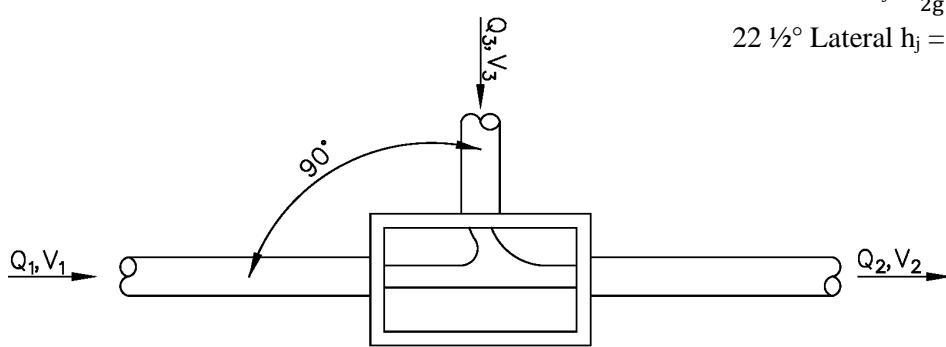


MANHOLE ON MAIN LINE
WITH 45° BRANCH LATERAL

NOTE:

$$60^\circ \text{ Lateral } h_j = \frac{V_2^2}{2g} - \frac{0.35V_1^2}{2g}$$

$$22\frac{1}{2}^\circ \text{ Lateral } h_j = \frac{V_2^2}{2g} - \frac{0.75V_1^2}{2g}$$



MANHOLE ON MAIN LINE
WITH 90° BRANCH LATERAL

Figure 3-5 Minor Losses Due to Turbulence at Manholes

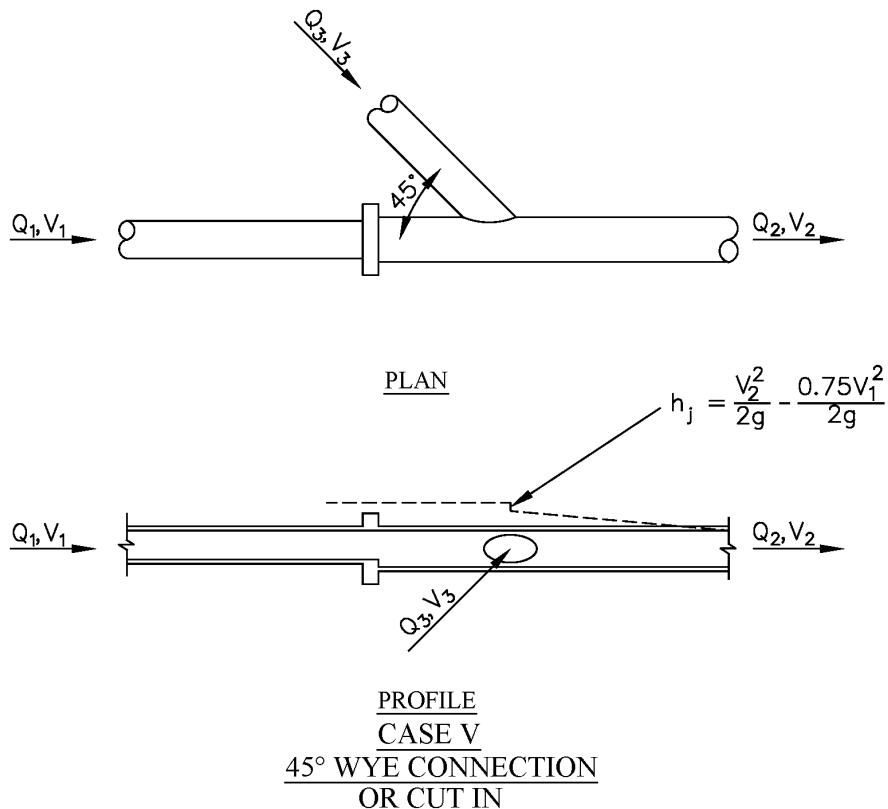


Figure 3-6 Minor Losses Due to Turbulence at Wyes

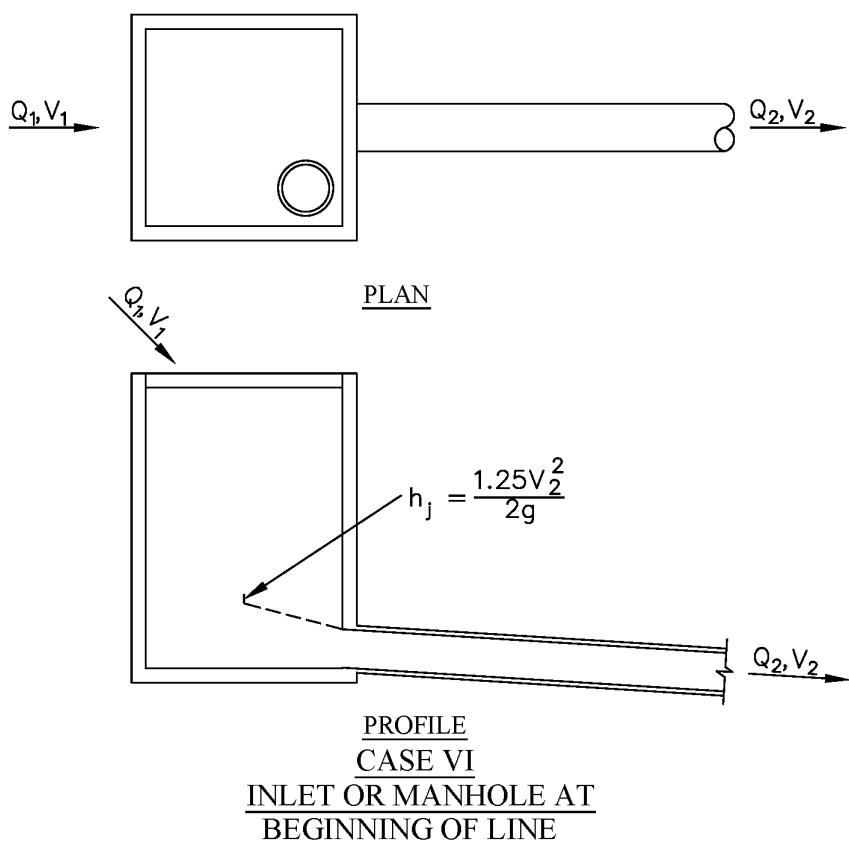
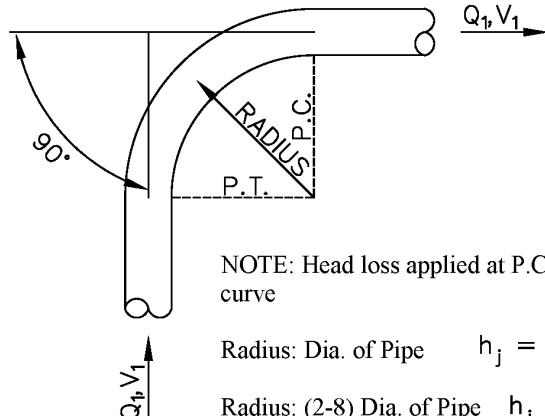


Figure 3-7 Minor Losses Due to Turbulence at an Inlet at the Beginning of a Line



NOTE: Head loss applied at P.C. for length of curve

$$\text{Radius: Dia. of Pipe } h_j = \frac{0.5V_2^2}{2g}$$

$$\text{Radius: (2-8) Dia. of Pipe } h_j = \frac{0.25V_2^2}{2g}$$

$$\text{Radius: (8-20) Dia. of Pipe } h_j = \frac{0.10V_2^2}{2g}$$

$$\text{Radius: Greater than 20 Dia. of Pipe } h_j = 0$$

*When curves other than 90° are used, apply the following factors to 90° curves

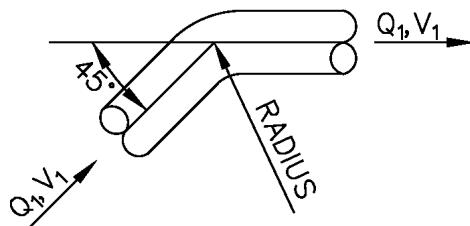
60° curve: 85%

45° curve: 70%

22 1/2° curve: 40%

CASE VII
CONDUIT ON 90° CURVES*

Figure 3-8 Minor Head Losses Due to Turbulence a Curves



NOTE: Head loss applied at beginning of bend

$$90^\circ \text{ Bend } h_j = \frac{0.50V_2^2}{2g}$$

$$60^\circ \text{ Bend } h_j = \frac{0.43V_2^2}{2g}$$

$$45^\circ \text{ Bend } h_j = \frac{0.35V_2^2}{2g}$$

$$22\frac{1}{2}^\circ \text{ Bend } h_j = \frac{0.20V_2^2}{2g}$$

CASE VIII
BENDS WHERE RADIUS IS
EQUAL TO DIAMETER OF PIPE

Figure 3-9 Minor Head Losses Due to Turbulence a Bends

Table 3-8 Junction or Structure Coefficient of Loss

Case No.	Description of Condition	Coefficient K_j
I	Inlet on Main Line	0.50
II	Inlet on Main Line with Branch Lateral	0.25
III	Manhole on Main Line with 45° Branch Lateral	0.50
IV	Manhole on Main Line with 90° Branch Lateral	0.25
V	45° Wye Connection or Cut-in	0.75
VI	Inlet or Manhole at Beginning of Line	1.25
VII	Conduit with Curves for 90°* Curve radius = diameter Curve radius = 2 to 8 diam. Curve radius = 8 to 20 diam.	0.5 0.25 0.10
VIII	Bends where radius is equal to diameter 90° Bend 60° Bend 45° Bend 22 1/2° Bend Manhole on Line with 60° Lateral Manhole on Line with 22 1/2° Lateral	0.50 0.43 0.35 0.20 0.35 0.75
	*Where bends other than 90° are used, the 90° bend coefficient can be used with the following percentage factor applied. 60° Bend 45° Bend 22 1/2° Bend	85% 70% 40%

3.10.8.E. The values of the coefficient “ K_j ” for determining the loss of head due to obstructions in pipes are shown in the Table 3-10 and the coefficients are used in the equation $h_j = K_j(V^2/2g)$ to calculate the head loss at the obstruction.

Table 3-9 Head Loss Coefficients Due to Obstructions

A/A ₀ *	K _j	A/A ₀ *	K _j
1.05	0.10	3.0	15.0
1.1	0.21	4.0	27.3
1.2	0.50	5.0	42.0
1.4	1.15	6.0	57.0
1.6	2.40	7.0	72.5
1.8	4.00	8.0	88.0
2.0	5.55	9.0	104.0
2.2	7.05	10.0	121.0
2.5	9.70	-	-

*A/A₀ = Ratio of area of pipe to area of opening at obstruction.

3.10.8.F. The values of the coefficient “ K_j ” for determining the loss of head due to sudden enlargements and sudden contractions in pipes are shown in Table 3-11, and the coefficients are used in the equation $h_j = K_j(V^2/2g)$ to calculate the head loss at the change in section, where V=velocity in smaller pipe.

Table 3-10 Head Loss Coefficients Due to Sudden Enlargements and Contractions

D_2/D_1^*	Sudden Enlargements K_j	Sudden Contractions K_j
1.2	0.10	0.08
1.4	0.23	0.18
1.6	0.35	0.25
1.8	0.44	0.33
2.0	0.52	0.36
2.5	0.65	0.40
3.0	0.72	0.42
4.0	0.80	0.44
5.0	0.84	0.45
10.0	0.89	0.46
∞	0.91	0.47

* D_2/D_1 = Ratio of larger to smaller diameter

3.10.9 General Construction Standards

3.10.9.A. Utilities

3.10.9.A.i. General – In the design of a storm drainage system, the engineer is frequently confronted with the problem of crossings between the proposed storm drain and existing or proposed utilities, such as water, gas and sanitary sewer lines.

3.10.9.A.ii. Water Lines – All existing water lines in the immediate vicinity of the proposed storm drains shall be clearly indicated on both the plan and profile sheets. When design indicates that an intersection of the storm drain line and the water main exists and the proposed storm drain cannot be economically relocated, then the existing water line shall be adjusted per Utilities Department specifications.

3.10.9.A.iii. Wastewater Lines – All existing or proposed wastewater lines in the immediate vicinity of the proposed storm drains shall be clearly indicated on both plan and profile sheets. When the design indicates that an intersection of the storm drain line and the wastewater lines exist, then either line should be adjusted by relocation. If neither line can be economically relocated, then an alternative design may be considered, provided it is supported by hydraulic calculations and approved by City Engineer.

3.10.9.A.iv. All Other Utilities – All other utilities in the immediate vicinity of the proposed storm drain shall be clearly indicated on both the plan and profile sheets. Gas lines and other utilities not controlled by elevation shall be adjusted when the design indicates that an intersection of the storm drain line and the utility exists and the proposed storm drain cannot be economically relocated.

3.10.9.B. Headwalls, Culverts, and Other Structures

3.10.9.B.i. For headwalls, culverts, and other structures, standard details adopted by TxDOT shall be used. The appropriate detail sheets should be included in any construction plans. All headwalls and culverts should be extended to or beyond the street ROW. TxDOT-approved pedestrian rail shall be used for any headwall within ten (10) feet of a sidewalk or other normal pedestrian area. Headwalls



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or sloped end treatments shall be constructed at the pipe ends of all storm sewer systems. Sloped end treatments are required along streets when the drainage feature is adjacent and parallel to traffic flow. The sloped end treatment shall be a 6H:1V end section. Gabion mattresses shall be installed at the outfall structure to lower velocities and prevent erosion.

3.10.9.C. Manholes

3.10.9.C.i. Manholes shall be located at intervals not to exceed 500 feet. Where the storm main will accommodate a 36-inch diameter lateral, the inlet lateral may be considered an acceptable access point in lieu of a manhole. Manholes shall preferably be located at street intersections, sewer junctions, changes of grade and changes of alignment. When the storm drain is a concrete box instead of an RCP, four-foot diameter manhole risers may be installed instead of vaults to provide access. In all cases, steps shall be installed in the manhole.

3.10.9.D. Minimum Pipe Sizes

3.10.9.D.i. Minimum pipe sizes are 24-inch diameter for mains and 18-inch diameter for inlet laterals.

3.10.9.E. Pipe Connections

3.10.9.E.i. All bends, tees and wyes shall be prefabricated by the pipe manufacturer. Radius pipe is allowed and shall be placed according to the pipe manufacturer's laying schedule. A copy of the laying schedule shall be provided for review prior to start of construction. When field connections are unavoidable, they must be approved by Transportation and Public Works Department prior to construction. Field connections may be allowed when the storm main is twice the diameter of the lateral and the lateral grade is 10% or less. A reinforced concrete collar is required when field connections are used.

3.10.9.F. Inlets

3.10.9.F.i. All curb inlets shall be 5, 10, 15, or 20 feet opening and shall have a 4" gutter depression at the opening. Recessed inlets shall be provided on arterial streets and major collectors, where on-street parking is not allowed. Care shall be taken in laying out inlets to allow for adequate driveway access between the inlet and the property line. Standard inlet depth is 4.5 feet at the lateral line, with the bottom sloped to drain to the laterals. Manhole steps shall be installed for any inlet over five feet deep. To expedite mechanical cleaning and inspection, the manhole ring and cover shall be positioned at the outfall end of the inlet. Drop inlets deeper than 3 feet shall be minimum four-foot square. Manhole steps are required for inlets over 5 feet deep.

3.10.9.F.ii. Due to excessive clogging, grate inlets are not allowed on any public storm drain.

3.10.9.G. Streets

3.10.9.G.i. The minimum street grade shall be 0.50%. Along a curve, this grade shall be measured along the outer gutter line. The minimum grade



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along a cul-de-sac or elbow gutter shall be 0.70%. Alternatively, elbows may be designed with a valley gutter along the normal outer gutter line, with two percent cross slope from the elbow curb to the valley gutter. For a crest or sag on a residential street, a PVI shall be used instead of a vertical curve when the total gradient change is no more than one percent ($\Delta \leq 1.0\%$).

3.10.9.H. Post Construction Inspection

- 3.10.9.H.i. Visual Inspection – All storm drain pipes must be visually inspected by closed circuit television inspection (CCTV). The City Inspector shall be on site during video inspection, and the City shall be furnished a video copy of inspection along with a report. The report shall document the presence of cracks for reinforced concrete pipe and deflections for plastic pipe.
- 3.10.9.H.ii. Mandrel Testing – If it is observed that there is deflection in the pipe, a mandrel test will be required in accordance with NCTCOG specifications. The City Inspector shall be on site during the inspection, and the City shall be furnished copy of the inspection report.

3.11 Culverts, Bridges and Channels

- 3.11.1 Culverts in the City of Weatherford shall be designed for a 100-year storm with fully developed watershed and headwater elevation one foot (1') below the adjacent curb. Maximum culvert velocity is 15 fps. Reinforced concrete pipe or box is required for new construction of the public storm drain system. The culvert shall be aligned with the skew angle and bottom of the channel. Headwalls or sloped end treatments are required at both ends of the culvert. Inlet coefficient, K_e , is shown in Table 3-12 for various entrance conditions.

**3-11 Culvert Inlet Coefficients**

Type of Structure and Design Entrance	Coefficient K _e
Pipe, Concrete	
Projecting from fill, socket end (groove-end)	0.2
Projecting from fill, square cut end	0.5
Headwall or headwall and wingwalls	
Socket end of pipe (groove-end)	0.2
Square-edge	0.5
Rounded [radius = 1/12 (D)]	0.2
Mitered to conform to fill slope	0.7
*End-Section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side- or slope-tapered inlet	0.2
Box, Reinforced Concrete	
Headwall parallel to embankment (no wingwalls)	
Square-edged on 3 edges	0.5
Rounded on 3 edges to radius of [1/12(D)] or beveled edges on 3 sides	0.2
Wingwalls at 30° to 75° to barrel	
Square-edged at crown	0.4
Crown edge rounded to radius of [1/12(D)] or beveled top edge	0.2
Wingwalls at 10° or 25° to barrel	
Square-edged at crown	0.5
Wingwalls parallel (extension of sides)	
Square-edged at crown	0.7
Side- or slope-tapered inlet	0.2

*End sections conforming to fill slope, made of either metal or concrete, are the sections commonly available from manufacturers. From limited hydraulic tests they are equivalent in operation to a headwall in both inlet and outlet control. Some end sections incorporating a closed taper in their design have a superior hydraulic performance. These latter sections can be designed using the information given for the beveled inlet.

- 3.11.2 Inlet control flow condition occurs when the culvert barrel is capable of conveying more flow than the inlet will accept. This typically happens when a culvert is operating on a steep slope. The control section is located just inside the entrance. Critical depth occurs at or near this location, and the flow regime immediately downstream is supercritical.
- 3.11.3 Outlet control flow condition occurs when the culvert barrel is not capable of conveying as much flow as the inlet opening will accept. The control section for outlet control flow in a culvert is located at the barrel exit or further downstream. Either subcritical or pressure flow exists in the culvert barrel under these conditions.
- 3.11.4 Culvert design requires checking for both inlet and outlet control to determine which will govern particular culvert designs.

3.12 Bridges

- 3.12.1 Bridge design shall be based on the 100-year storm from the fully developed watershed. For bridges up to 100 feet wide at low chord, a two (2) foot freeboard is required. For bridges greater than 100 feet wide, one (1) foot of freeboard is required.
- 3.12.2 Backwater analysis will be required for any proposed bridge to determine accurate tailwater elevations, velocities, headlosses, headwater elevations, profiles and floodplains affected by the proposed structure. If the current effective FEMA model is a HEC-2 model,



the engineer has the option to either use that model or convert to HEC-RAS for analysis of proposed conditions.

3.13 Channels

3.13.1 Channels are permitted when the design runoff exceeds the capacity of a 72-inch pipe. Channels shall be designed for the 100-year storm with a fully developed watershed. To improve stability and better mimic natural channel dimensions, channels may be designed with multiple stages, a low flow channel section containing the 2-year to 5-year flows and a high flow section that contains the design discharge.

3.13.2 Graded Earthen Channels

3.13.2.A. Graded earthen channels shall have a trapezoidal shape with side slopes not steeper than a 4:1 ratio and a pilot channel at least eight (8) feet in width. The pilot channel shall have 6-inch curbs and an invert with 2% cross-slop. Portions of the bottom that are outside of the pilot channel shall have a cross-slope not less than 12:1.

3.13.2.B. One (1) foot of freeboard above the 100-year frequency ultimate development water surface elevation must be available within all designed channels at all locations along the channel.

3.13.2.C. The side slopes and earth bottom of the channel shall be smooth, free of rocks, and contain a minimum of six (6) inches of topsoil. The side slopes and channel bottom shall be re-vegetated with grass. No channel shall be accepted for maintenance by the City until a uniform (e.g. evenly distributed, without large bare areas) vegetative cover with a density of 70% has been established.

3.13.2.D. Each reach of a channel must have a ramp for maintenance access. Ramps shall be at least ten (10) feet wide and have 15% maximum grade. Twelve-foot (12') width is required if the ramp is adjacent to a vertical wall.

3.13.2.E. Minimum channel slope is 0.0020 ft/ft. Maximum velocity shall be no more than six (6) feet per second.

3.13.2.F. Erosion protection is to be provided at the outfall to the receiving stream. Typically, a gabion mattress will be required as a transition material from the concrete pilot channel to the natural stream.

3.13.3 Concrete Lined Channels

3.13.3.A. Channels shall be trapezoidal in shape and lined with reinforced concrete in accordance with City Standards and Specifications with side slopes of two (2) foot horizontal to one (1) foot vertical.

3.13.3.B. Concrete lining shall extend to and include the water surface elevation of the 100-year design storm plus one-foot freeboard above the 100-year water surface elevation. The top width of the concrete lining shall not be greater than 50 feet.

3.13.3.C. The channel bottom must be a minimum of eight (8) feet in width.

3.13.3.D. The maximum water flow velocity in a lined channel shall be no more than fifteen (15) feet per second and shall not be supercritical. A gabion liner will be required as a transition material from the concrete channel to the natural outfall.

3.13.3.E. The design of the channel lining shall take into account the superelevation of the water surface around curves and other changes in direction.

3.13.3.F. In lieu of channel improvements, the City Engineer may allow the dedication of a permanent drainage ROW encompassing all land within the 100-year floodway of the existing channel plus adequate maintenance access.

3.13.4 Roadside Ditches

3.13.4.A. A roadside ditch (i.e. rural) street section is permissible only where approved. No median ditches are allowed.

3.13.4.B. The design storm for the roadside ditches shall be at least the 5-year storm. The 100-year flow shall not exceed the ROW capacity defined as the natural ground at the ROW line or top of the roadside ditch at or near the ROW line.

3.13.4.C. Design Considerations

3.13.4.C.i. For grass lined sections, the maximum design velocity shall be 6.0 feet per second during the 100-year design storm.

3.13.4.C.ii. A grass lined or unimproved roadside ditch shall have side slopes no steeper than 4:1 on the front slope and 3:1 on the back slope. There shall be a four-foot strip at maximum 2% cross slope between the edge of pavement and the beginning of the ditch.

3.13.4.C.iii. Maximum depth will not exceed 4 feet from center-line of pavement except as specifically approved by the City Engineer.

3.13.4.C.iv. If the ditch extends beyond the ROW line, an additional drainage easement shall be dedicated extending at least two (2) feet beyond the top of bank. Utility easements must be separate and beyond any drainage easements.

3.13.4.D. Culverts in Roadside Ditches

3.13.4.D.i. Culverts will be placed at all driveway and roadway crossings and other locations where appropriate.

3.13.4.D.ii. Roadside culverts are to be sized based on drainage area, assuming inlet control. Calculations are to be provided for each block based on drainage calculations. The size of culvert used shall not create a head loss of more than 0.20 feet greater than the normal water surface profile without the culvert.

3.13.4.D.iii. Roadside ditch culverts will be no smaller than 24 inches inside diameter or equivalent for roadway crossings and no smaller than 18 inches for driveway culverts. The driveway or roadway above the pipe shall have an invert, or low point, in the pavement for positive overflow.

3.13.4.D.iv. A driveway culvert schedule shall be included on the drainage/grading plan. For each lot, it shall include an approximate culvert flowline depth below top of pavement, number and size of pipe required, and horizontal distance from edge of pavement to center of culvert (based on horizontal control requirements above).

3.13.5 Gabion mattresses shall be a minimum of twelve (12) inches in thickness, filled with four (4) to six (6) inch stone ($d_{50}=5"$), and a geotextile filter under the mattress. Enclosures shall be coated to prevent corrosion.

3.14 Storage Facilities

3.14.1 Storm water storage facilities shall be provided to mitigate increased peak flows in waterways in specific circumstances as defined below. The purpose of the mitigation is to minimize downstream impacts from upstream development. In some cases, detention has been known to exacerbate downstream flooding conditions. Therefore, the Zone of Influence criteria shall be applied in addition to the following:



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3.14.1.A. Detention Basins shall be required when downstream facilities within the Zone of Influence are not adequately sized to convey a design storm based on current City criteria for hydraulic capacity.

3.14.1.B. Calculated proposed storm water discharge from a site shall not exceed the calculated discharges from existing conditions, unless sufficient downstream capacity above existing discharge conditions is available.

3.14.1.C. Detention Basins for watersheds of up to 100 acres in size may be designed using the "Method."

3.14.1.D. Detention basins draining watersheds over 100 acres in size shall be designed using a detailed Unit Hydrograph method. These include Snyder's Unit Hydrograph (>200 acres) or the SCS Dimensionless Unit Hydrograph (>100 acres) method.

3.14.1.E. Detention Basins shall be designed for the 2-year, 10-year and 100-year storm for the critical storm duration (i.e. 3-hour, 6-hour, or 24-hour storm duration) that results in the maximum (or near maximum) peak flow. Hydrographs are required for both existing and post-development (fully developed) watershed.

3.14.1.F. Detention Basins shall be designed with access for earthwork equipment.

3.14.1.G. No earthen (grassed) embankment slopes shall exceed 4:1.

3.14.1.H. A calculation summary shall be provided on construction plans. For detailed calculations of unit hydrograph studies, a separate report shall be provided to the City for review and referenced on the construction plans. Stage-storage-discharge values shall be tabulated and flow calculations for discharge structures shall be shown on the construction plans.

3.14.1.I. An emergency spillway shall be provided at the 100-year maximum storage elevation with sufficient capacity to convey the 100-year storm with six inches of freeboard. Design calculations shall be shown on the plans.

3.14.1.J. All detention basins shall be stabilized against erosion.

3.14.1.K. Maintenance of detention/retention facilities located on private property (not dedicated to the City of Weatherford) shall be addressed in the Property Owners' or Homeowners' Association Agreement.

3.14.1.L. State rules and regulations regarding impoundments shall be observed including 30 TAC Chapter 299, Dams and Reservoirs (TCEQ). All above ground facilities that store more than a total depth of four feet shall be designed to meet all state and federal criteria for small dams. In accordance with Texas Water Code §11, all surface impoundments not used for domestic or livestock purposes must obtain a water rights permit from the TCEQ. A completed permit for the proposed use, or written documentation stating that a permit is not required, must be obtained and furnished to the City prior to approval of the final construction plans.

3.14.2 Design Data for storage basins shall include the following items to be shown on the plans:

3.14.2.A. Inflow hydrograph for all selected design storms

3.14.2.B. Stage-storage curve for proposed storage facility

3.14.2.C. Stage-discharge curve for outlet control structures

3.14.3 Stage-Storage Curve

3.14.3.A. A stage-storage curves define the relationship between the depth of water and storage volume in a storage facility. The volume of storage can be calculated by

using simple geometric formulas expressed as a function of depth. An example of a stage-storage curve is shown in Figure 3-10.

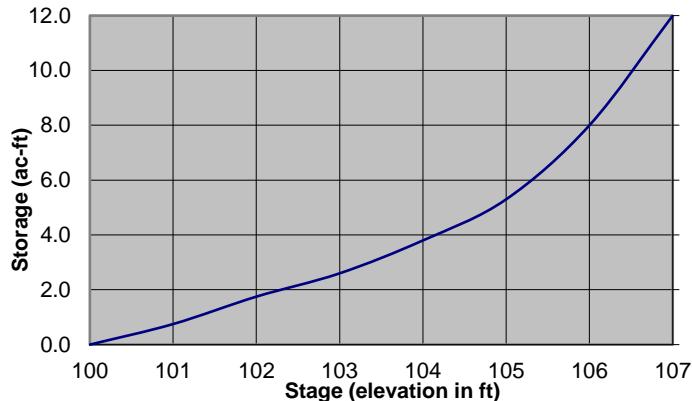


Figure 3-10 Stage-Storage Curve

3.14.4 Stage-Discharge Curve

3.14.4.A. A stage-discharge curve defines the relationship between the depth of water and the discharge or outflow from a storage facility. A typical storage facility has a principal outlet and a secondary (or emergency) outlet. The principal outlet is designed with a capacity sufficient to convey the design flows without allowing flow to enter the emergency spillway. A pipe culvert, weir, or other appropriate outlet can be used for the principal spillway or outlet.

3.14.4.B. The emergency spillway is sized to provide a bypass for floodwater during a flood that exceeds the design capacity of the principal outlet. This spillway should be designed taking into account the potential threat to downstream areas if the storage facility were to fail. The stage-discharge curve should take into account the discharge characteristics of both the principal spillway and the emergency spillway. An example of a stage-discharge curve is shown in Figure 3-11.

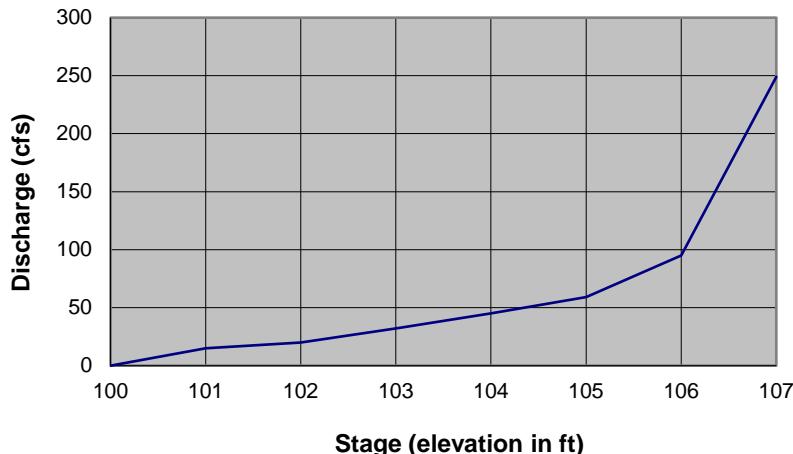


Figure 3-11 Stage-Discharge Curve

3.14.5 Outlet Structures

3.14.5.A. Outlet structures shall consist of a primary outlet and a secondary outlet



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(emergency spillway) to provide controlled release of the storage volume.

3.14.5.B. Primary Outlets

3.14.5.B.i. Primary outlets may be single stage structures or several outlet structures combined to form a multi-stage outlet control. Some common outlet structures are listed below:

- Orifice
- Perforated Riser
- Pipe or Box Culvert
- Sharp-crested weir
- Broad-crested weir
- V-notch weir
- Proportional weir
- Combination or Multi-stage outlet

3.14.5.B.ii. Larger inlet openings need trash racks or safety grates to prevent clogging by debris without significantly interfering with capacity of the outlet.

3.14.5.B.iii. The design engineer is referred to standard hydrology/hydraulics textbooks for examples of outlets structures and design.

3.14.5.C. Secondary Outlets

3.14.5.C.i. Secondary outlets, or emergency spillways, shall be sized to pass the 100-year storm with a minimum six (6) inches of freeboard. The typical spillway is a trapezoidal channel with a broad-crested weir overflow section.

3.14.5.C.ii. As customary, the potential for downstream damage, flooding and safety must be evaluated. Any dam four feet or higher must meet state and federal standards, especially spillway design requirements.

3.15 Energy Dissipaters

3.15.1 Energy dissipaters are required as a flow transition device from discharges of pipes and lined channels to the earthen outfall receivers. At a minimum, a 12-inch thick gabion mattress shall be installed as a riprap apron. Typical outlet protection devices (energy dissipaters) include the following:

- Riprap Apron (gabion mattress or basket)
- Outlet Basin
- Baffled Outlets
- Grade Control Structures

3.16 Flood Study

3.16.1 If a development includes, or is adjacent to a creek, submittal of a Flood Study is required to determine easements and minimum finished floor (MFF) elevations, or to modify existing floodplain or floodway. The requirements for each flood study differ according to the existing creek designation (i.e., within a FEMA designated floodplain) and whether improvements are proposed for the creek.



3.16.2 Unimproved Creeks (Natural)

3.16.2.A. If an existing creek is to be left in its natural undisturbed state, a flood study shall be submitted to determine the easement limits and MFF elevations for the property. MFF elevations shall be at least two (2) feet above the water surface elevation of the one hundred (100) year event based on a completely developed watershed. The requirements for this type of submittal are included in Table 3-13.

3.16.2.B. Where improved systems connect to natural creeks, permanent transitional materials are required (12-inch thick gabion mattress is a minimum).

3.16.3 Improved Open Channels

3.16.3.A. If an existing creek is to be improved, a flood study shall be submitted to the City for review. The study shall define the easement limits and MFF elevations. If the creek is located in a FEMA designated floodplain (i.e., on the FIRM map), then the study will be sent to FEMA. Additional hydraulic analyses are required and shall be in accordance with the information outlined in Table 3-13.

3.16.3.B. Where a closed system connects to improved open channels, natural creeks, or a channel of a different material, a transitional area shall be designed.

3.16.4 FEMA Designated Floodplain

3.16.4.A. In order to remove all or portion of property from the floodplain, or to improve a creek and construct a channel, the hydraulic analyses must be submitted to the City for review and then to FEMA for approval. There are several types of map changes available through FEMA.

3.16.4.A.i. Conditional Letter of Map Amendment (CLOMA) – A CLOMA is FEMA's concurrence that a proposed structure upon construction would be excluded from the Special Flood Hazard (SFHA) shown on the effective National Flood Insurance Program (NFIP) map. The letter becomes effective on the date sent. The letter does not revise an effective NFIP map; it indicates whether the project, if built as proposed, will be recognized by FEMA.

3.16.4.A.ii. Letter of Map Amendment (LOMA) – A LOMA is an official amendment, by letter, to an effective NFIP map. This is typically used to correct erroneous conditions on the map and is based on current detailed topographic information. A LOMA establishes a property/structure's location in relation to the SFHA based on natural ground. The letter becomes effective on the date sent.

3.16.4.A.iii. Conditional Letter of Map Revision Based on Fill (CLOMR-F) – A CLOMR-F is FEMA's concurrence that a proposed structure/property involving the placement of fill outside of the floodway would exclude an area from the SFHA shown on the NFIP map. The letter becomes effective on the date sent. This letter does not revise an effective NFIP map; it indicates whether the project, if built as proposed, will be recognized by FEMA.

3.16.4.A.iv. Letter of Map Revision Based on Fill (LOMR-F) – A LOMR-F is an official revision, by letter, to an effective NFIP map. A LOMR-F provides FEMA's determination concerning whether a structure or parcel has been elevated on fill above the Base Flood Elevation (BFE) and excluded from the SFHA. The letter becomes effective on the date sent.



3.16.4.A.v. Conditional Letter of Map Revision (CLOMR) – A CLOMR is FEMA's concurrence that a proposed project that would affect the hydrologic and/or hydraulic characteristics of a channel/creek and would result in the modification of the existing regulatory floodway or effective base flood elevations (BFEs). The letter becomes effective on the date sent. This letter does not revise an effective NFIP map; it indicates whether the project, if built as proposed, will be recognized by FEMA.

3.16.4.A.vi. Letter of Map Revision (LOMR) – A LOMR is an official revision, by letter, to an effective NFIP map. A LOMR may change flood insurance risk zones, floodplain and/or floodway boundary delineations, and BFE.

3.16.4.B. Structures and Property – In order to remove structures or property from a FEMA designed floodplain, an application for a either a LOMA, LOMR or LOMR-F must be submitted by the Developer and approved by the City and FEMA. To remove an entire lot and structure from the SFHA, both the lowest point on the lot and the lowest floor of the structure must be above the 100-year flood elevation. The community must determine that the land and any existing or proposed structures to be removed from the SFHA are “reasonably safe from flooding.” Applications for LOMAs and LOMRs shall be made on forms required by FEMA. The information shall be submitted to the City, and upon acceptance, will be forwarded to FEMA for approval.

3.17 Flood Study Submittal Requirements

3.17.1 Unimproved Creeks and Improved Open Channels

3.17.1.A. The following information shall be submitted for all flood studies:

3.17.1.A.i. Letter/report from the engineer that explains the purpose of the study, (i.e. to define easement limits, determine minimum finished floor elevations, revise the floodplain/floodway, etc.), describes the project and details all information submitted.

3.17.1.A.ii. Hydrology

- Provide a current drainage area map
- Provide a proposed drainage area map (include all offsite area and adjacent subdivisions)
- Provide all hydrology computations and describe the method used
- Provide channel cross sections showing property lines, easement lines, 100-year floodplain, and floodway
- Any other calculations, including verification that the downstream systems (bridges, pipes, bar ditches, etc.) are designed to handle the increased runoff

3.17.1.A.iii. Hydraulics

- Provide a site map showing existing topography and cross section locations
- Provide a site map showing proposed contours and cross section locations



- Provide the required HEC models (see the following sections for details)
- Provide corresponding maps for each HEC run submitted

3.17.1.A.iv. Submit the flood study in a bound notebook with all pertinent information included. For a LOMC, the necessary documents shall be included in the report to be submitted to FEMA.

3.17.2 Flood Study Models

3.17.2.A. Various hydrologic and hydraulic models are required to establish criteria set by the City and FEMA. The United States Army Corps of Engineers' Hydrologic Engineering Center (HEC) software is considered the industry standard for hydrologic and hydraulic models and is accepted by the City. Other modeling software may be used as approved by the City Engineer.

3.17.2.B. Table 3-13 indicates which HEC models are required for the type of creek and improvements proposed. The table is divided into creek type (i.e. whether the creek is proposed to remain in its natural unimproved condition or be improved as an earthen or concrete channel). For each type, the creek is further classified as special flood hazard areas (SFHA) or unmapped. Additional HEC models may be required depending on the analysis.

Table 3-12 Flood Study Modeling Requirements

		City	FEMA				
SFHA		1	2	3	4	5	
Unimproved Creeks	Mapped Zones A & AE	x					
	Unmapped	x					
Improved Open Channels	Mapped Zone A	x			x	x	
	Mapped Zone AE	x	x	x	x	x	
	Unmapped	x					
<u>HEC Models</u>							
Type 1: 100-year fully developed conditions model							
Type 2: Duplicate effective model							
Type 3: Corrected effective model							
Type 4: Existing or pre-project conditions model							
Type 5: Revised or post-project conditions model							

3.17.2.C. Unimproved Creeks (to Remain Natural) – The following HEC models are required when a natural creek is mapped or unmapped. The information will not be submitted to FEMA.

3.17.2.C.i. HEC analysis based on the 100-year storm event for a fully developed watershed (used to define easement limits and MFF elevations).

3.17.2.D. Improved Open Channels (Earthen/Concrete) – The following HEC models will be required when the development changes the FIRM maps or cross sections of the creek. The information will be submitted to FEMA for the appropriate LOMC.

3.17.2.D.i. The following information is required by the City for all mapped or unmapped creeks. This information will not be submitted to FEMA.



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- HEC analysis based on the 100-year storm event for a fully developed watershed (used to define easement limits and the MFF elevations).

3.17.2.D.ii. The following HEC models are required and will be sent to FEMA for review if the creek is within Zone A:

- HEC model based on existing or pre-project conditions to reflect current conditions prior to the construction of the project using current cross sections and flows from development within the drainage area since the date of effective model.
- HEC model based on revised or post-project conditions based on current flows plus additional flow caused by the development.

3.17.2.D.iii. The following additional HEC models are required and will be sent to FEMA for review if the creek is within Zone AE:

- Duplicate Effective Model – model used in the effective Flood Insurance Study (can be obtained from FEMA).
- Corrected Effective Model – corrects any errors that occur in the duplicate effective model, adds cross sections, or incorporates more detailed topographic information.



SECTION 4 GENERAL UTILITY DESIGN REQUIREMENTS

Section Highlights

- All utilities designs shall at a minimum comply with the City's current adopted Water Master Plan and Wastewater Master Plan.
- Refer to Section 5 (Water Design Requirements) and Section 6 (Wastewater Design Requirements) for additional utilities design requirements.

4.1 Governing Specifications and Details – The design and construction of water and wastewater facilities, whether being a capital improvement project, rehabilitation project or serving a subdivision or a development shall be in accordance with these regulations:

- City of Weatherford requirements and Standard Construction Details;
- The *Standard Specifications and Drawings for Public Works Construction* as published by the North Central Texas Council of Governments (NCTCOG);
- Texas Commission on Environmental Quality (TCEQ) criteria; and,
- Good engineering principals.

Materials and procedures shall be in accordance with City standard details and materials list and shall supersede NCTCOG specifications.

4.2 Warranty Period – All water and wastewater improvements shall have a warranty period of two (2) years. A maintenance bond or other acceptable form of surety shall be submitted for all public water and wastewater improvements. The surety shall cover 100% of the public improvements for a period of two (2) years. Surety types and amounts shall be approved by the Director of Water/Wastewater Utilities or his/her designee and shall be based on engineering estimates or contractor prices.

4.3 Minimum Line Sizes

4.3.1 Water – The minimum line size to serve single family residential areas shall be six (6) inches in diameter, and the minimum line size to serve apartments, commercial property, industrial property or property that requires fire protection shall be eight (8) inches in diameter. Smaller sizes may be considered for quality purposes if approved by the City Engineer.

4.3.2 Wastewater – The minimum line size shall be eight (8) inches in diameter.

4.4 Service Line Sizes

4.4.1 Water Service – Service lines shall be installed for each lot within the subdivision. The minimum line size for a residential water service on a lot shall be one (1) inch in diameter.

4.4.2 Wastewater Service – Wastewater services shall be sized in accordance with the International Plumbing Code currently adopted by the City of Weatherford. In no case shall a service size be smaller than four (4) inches in diameter.

4.5 Location of Facilities

4.5.1 Lines within Street ROW – Water and wastewater lines shall be located in the parkways between the back of curb and the street ROW. Water and wastewater lines shall not be installed on the same side of the street unless approved by the City.

4.5.2 Lines at Other Locations – Where possible, water and wastewater lines shall be located within landscape areas and open areas. Lines proposed to be installed under pavement or structures shall be avoided.



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4.5.3 Separation from Other Utilities – The location and separation distances of water and wastewater facilities shall meet the requirements of Chapter 217 and 290 of the TCEQ Rules and Regulations. Water and wastewater lines shall be no closer than two (2) feet in all directions from any other underground utilities unless approved by the City.

4.5.4 Curved horizontal and/or vertical alignments and joint deflections shall be no more than 50% of the curve and joint deflections allowed by pipe manufacturer's specifications.

4.6 Connecting to Existing Facilities – Prior to finalizing the design of any proposed water or wastewater facilities, the Developer shall meet with the City to discuss the proposed water and wastewater connection points. Connections will be allowed only at locations where the City believes that sufficient quantity and pressures are available to meet the projected requirements of the subdivision or development. No connections to the City's water and wastewater facilities will be allowed without the approval of the City's inspector and until all new lines have successfully completed the required testing.

4.7 Abandonment of Existing Facilities – All existing facilities shall be abandoned or removed as specified in the approved plans.

4.7.1 Existing water or wastewater mains to be abandoned in place shall be capped in accordance with the requirements herein and as instructed in the field by the City Inspector.

4.7.2 Existing manholes to be abandoned shall be done in accordance with the requirements herein and as instructed in the field by the City Inspector.

4.8 Future Extensions beyond Subdivision Boundary – Depending on the location of the proposed subdivision or development, the City may require the Developer to provide accommodations for future water and wastewater extensions to the adjacent properties. The accommodations, as well as any required easement dedications, shall be provided at no cost to the City.

4.9 Emergency Maintenance by City – If, during the warranty period of subdivision's/development's water distribution or wastewater collection system, if a situation arises that requires immediate attention, the City may perform emergency maintenance or repair operations. The cost of such work shall be paid for by the Developer/contractor.

4.10 Service Lines – Water and wastewater service line locations may vary with each development. The Developer must obtain City approval of service line locations prior to construction. Where appropriate, after the curb and gutter has been installed, the service lines shall be marked by inscribing a "W" or "S" in the face of the curb at the service line location.

4.11 Route Markers – Where, in the opinion of the City, a proposed water or wastewater line route requires additional identification, the Developer shall install City provided route markers at all locations required by the City.

4.12 Detector Wire – 12-gauge Copper Head (or approved equivalent) tracing wire system shall be used on all water and wastewater pipelines. The detector wire shall be placed on top of the pipeline and taped in place at five (5) foot intervals. No underground splices are allowed. Above ground tracing stations are required at splice points and/or as directed City staff. Detector wire for water lines shall be blue in color. Detector wire for wastewater lines shall be green in color.

4.13 Boring Requirements – All boring operations shall comply with City of Weatherford requirements and Division 500 "Underground Construction & Appurtenances" of the NCTCOG Specifications. Spacers for cased bores shall be Raci Spacers, or an approved equivalent.

4.14 Aerial Crossings – Generally, aerial crossings are to be avoided. If an aerial crossing cannot be avoided, it shall be designed by a structural engineer licensed in the State of Texas. All aerial crossings shall be installed with steel casing pipe. The carrier pipe shall be installed with Raci spacers or approved equivalent. Aerial crossings shall be designed to withstand hydrostatic and buoyancy forces for the 100-year storm event. Bank stabilization shall be provided to prevent



erosion of bank sections. Pier supports shall be spaced and designed to ensure that adequate grade, slope and structural integrity are maintained.

4.15 Private Water and Wastewater Infrastructure Policy

- 4.15.1 On rare occasions, the Developer may find it advantageous to serve the development by private water and wastewater infrastructure. Private water and wastewater facilities will only be considered for projects such as multi-family residential complexes, mobile home parks, recreational vehicle parks, condominiums, industrial complexes and retail complexes. The approval of private water and wastewater infrastructure shall be considered only on a case-by-case basis. This does not include the use of water wells and onsite sewer facilities (OSSFs).
- 4.15.2 If private water and/or wastewater facilities are allowed, the Property Owner and/or Developer will be required to submit an affidavit to the City stating that infrastructure is privately owned and maintained in perpetuity and include a copy of this policy as an attachment.
- 4.15.3 The Property Owner and/or Developer shall also comply with all applicable provisions of Federal, State and Local regulations which require submetering. In accordance with the Texas Water Code Chapter 13, the owner of a condominium, apartment house, manufactured home rental community, or multiple use facility, on which construction begins after January 1, 2003, shall provide for the measurement of the quantity of water, if any, consumed by the occupants of each unit through the installation of submeters or individual meters. Projects under construction or completed prior to January 1, 2003 may install or request individual meter from the City. All infrastructure up to the meter point must be in compliance with this policy. Conditions stated herein shall be required in order to allow the City to approve such requests. No exceptions to any of the requirements will be considered.
- 4.15.4 All provisions for the construction of water and wastewater improvements shall be applied, in entirety, as specified herein. The following additional requirements shall also apply:

4.15.4.A. Water

- 4.15.4.A.i. Master Water Meter – A master water meter shall be constructed meeting all requirements as specified herein. The meter shall be sized to allow the unobstructed flow of water as required for fire suppression. The master meter shall be placed in public ROW or easement.
- 4.15.4.A.ii. Backflow Prevention – An approved backflow prevention assembly shall normally consist of a Double Check Detector Backflow-Prevention Assembly, installed in a watertight concrete vault and in accordance with AWWA Manual M14. Care must be taken on the location of the assembly so as not to adversely affect the proper functioning of the master meter. The backflow prevention assembly must also comply with all provisions of 30 TAC Chapter 290, Subchapter D. The Owner will be perpetually responsible for all testing requirements. Failure of the assembly to pass tests or the failure to conduct such tests will result in service interruption.

4.15.4.B. Sewer

- 4.15.4.B.i. Flow Measurement – If it is deemed necessary, the Developer will be required to install a suitable, solids handling flow metering device. Flow measurement should occur immediately adjacent to the development as the sewer main exits the property and be placed in public ROW or easement.



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4.15.4.B.ii. Whether or not flow measurement is required, the City may monitor wastewater exiting the development for quantity and characteristics. Should the City reasonably suspect abnormal amounts or uncharacteristic wastewater discharge is occurring, the Owner will be required to undertake any engineering studies, laboratory testing and/or construction to correct the situation.



SECTION 5 WATER DESIGN REQUIREMENTS

Section Highlights

- Refer to Section 4 (General Utilities Design Requirements) for additional compliance requirements.
- Water lines twelve (12) inches or less in diameter shall be PVC, AWWA C900, DR-14, blue in color. Pipe material for water lines sizes greater than twelve (12) inches shall be evaluated on a case-by-case basis.
- Water Line Fittings – Fittings shall be ductile iron (cement lined, bituminous coated and double poly wrapped) and shall be installed with retainer glands meeting NCTCOG Specifications.
- Gate valves shall be used for water lines up to 16 inches in diameter. Valve types for water lines greater than 16-inch shall be approved by the City.
- Water lines shall be installed with a minimum cover of 42 inches over the top of the pipe.

- 5.1 Water System Materials and Installation – All material and appurtenances must comply with City of Weatherford and NCTCOG specifications and must be approved by the City prior to construction.
- 5.2 Water Pipe – All water pipe materials shall comply with City of Weatherford requirements and Division 500 “Underground Construction & Appurtenances” of the NCTCOG Specifications.
 - 5.2.1 Water lines twelve (12) inches or less in diameter shall be PVC, AWWA C900, DR-14, blue in color. Pipe material for water lines sizes greater than twelve (12) inches shall be evaluated on a case-by-case basis.
- 5.3 Water Line Fittings – Fittings shall be ductile iron (cement lined, bituminous coated and double poly wrapped) and shall be installed with retainer glands. Fittings shall comply with City of Weatherford requirements and Section 502.5 of the NCTCOG Specifications.
- 5.4 Thrust Restraint – Thrust restraint for water lines shall be provided in compliance with City of Weatherford requirements and Section 502.4 of the NCTCOG Specifications.
- 5.5 Service Tap and Service Line – All service taps and service lines shall comply with City of Weatherford requirements and Section 502.10 of the NCTCOG Specifications and be installed in accordance with Division 500 “Underground Construction & Appurtenances” of the NCTCOG Specifications. All service lines and fittings shall be lead-free. Service line connections shall not be allowed on transmission mains larger than 12” in diameter.
- 5.6 Connections to Existing Water Mains – All connections to existing water mains shall be coordinated with the City Inspector. When possible, connections shall be made with the appropriate fittings. Connections with tapping sleeves may be considered on a case-by-case basis if approved by the City Engineer.
- 5.7 Fire Hydrants – Fire hydrants shall be provided as necessary to comply with City policy and be spaced in accordance with Table C-105.1 of the City’s Fire Code. Only approved national standard three-way fire hydrants with threads that match fire hydrants in use by the City will be allowed. Fire hydrants shall comply with City of Weatherford requirements and Section 502.3 of the NCTCOG Specifications and be painted with Sherwin Williams International Red – F75RC7.
- 5.8 Valves – Gate valves shall be used for water lines up to 16 inches in diameter. Valve types for water lines greater than 16-inch shall be approved by the City. Valves shall comply with City of Weatherford requirements and Section 502.6 of the NCTCOG Specifications. All lids for water valves shall be marked “WATER.”



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5.9 Combination Air Release & Vacuum Relief Valves – Combination air release and vacuum relief valves shall be installed at high points along feeder mains, transmission mains or major mains to exhaust trapped air or relieve vacuum from the water distribution system. Additional valves may be required along long sections of water line, downstream of mainline valves, increased downslopes or decreased upslopes, or long ascents or descents. Combination air and vacuum relief valves shall comply with City of Weatherford requirements, Section 502.6.3.1 of the NCTCOG Specifications and AWWA standards, including Manual “M51”. All combination air release and vacuum relief valves shall be installed in vault in accordance with the City’s standard details with lids marked “WATER.” The minimum size and type are as follows:

<u>Water Line Size</u>	<u>Minimum Size of Relief Valve</u>	<u>Type of Relief Valve</u>
12-inch & smaller	1-inch	Combination
16-inch to 36-inch	2-inch	Combination
42-inch and above	3-inch	Combination

5.10 Water Meters – All water meters shall comply with City of Weatherford requirements. All meters less than two (2) inches shall be provided by the City. Meters larger than two (2) inches in size shall be compound-type meters equipped with testing and calibration ports, shall have a metered bypass, and installed in a meter vault. All water meters larger than two (2) inches in size and associated equipment and vaults shall be supplied and installed by the Developer or Property Owner and approved by the City of Weatherford.

5.11 Meter Boxes – Meter boxes shall comply with City of Weatherford requirements and Section 502.10.2.4 of the NCTCOG Specifications. Meter boxes shall be of appropriate size and type for each application.

5.12 Pressure Regulators – In low areas where pressures may exceed 80 psi, Developers, Property Owners, builders and plumbers should be advised that in such locations, individual pressure reducing devices should be installed in accordance with the current Plumbing Code adopted by the City. Pressure reducing valves will not be installed in the public water system unless approved by the City Engineer.

5.13 Fire Lines – All projects requiring fire lines shall be presented to the City for review. The following design criteria shall be considered the normal requirements for fire lines in the City’s water distribution system:

5.13.1 Double Detector Check Valve – All fire lines are required to have a double gate double detector check valve assembly. The double detector check valve and vault is to be located on private property. The detector check assembly may be located within a fire riser room if an appropriate floor drain is installed. Maximum distance from the water main to double detector check valve shall be 150 feet as measured in pipe lay length.

5.13.2 Fire Line Testing – The City is responsible for inspection and testing of all fire lines on the owner’s side of the meter, gate valve, or back flow preventer.

5.14 Looping Requirements – In general, all water lines shall be looped with no dead-end lines. Where dead-end lines cannot be avoided, the maximum allowable dead-end length shall be 500 feet. Fire hydrants shall be provided at the end of all dead-end lines.

5.15 Water Sample Stations – Water sample stations may be installed at the request of the City at major intersections, water transmission line tees/crosses, large water meters, or other locations to be designated by the City.

5.16 Location of Facilities



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5.16.1 Meter Boxes – Water meter boxes shall be centered on the property line or easement line. When possible, the meter box should be located a minimum of two feet behind the back of curb.

5.16.2 Fire Hydrants

5.16.2.A. Single Family Residences – Generally, fire hydrants must be installed along a street at 500-foot intervals to comply with the City's Fire Code.

5.16.2.B. Other Land Uses – For all other land uses, fire hydrants must be installed at 300-foot intervals and be able to cover the entire building with 500-foot "hose lay."

5.16.2.C. Street Location – All fire hydrants must be installed at least three (3) feet, but less than eight (8) feet, from the back of the curb of the paved street or edge of a designated approved fire lane. Normal location is three (3) feet behind the curb and near a property corner if possible. Location of fire hydrants should be selected to provide shortest possible lead under street pavement. The location of fire hydrants that are not proposed near a street shall be approved by the City.

5.16.2.D. Fire Hydrant Elevation – The elevation of the fire hydrant shall be set to where the breakaway flange is two (2) to six (6) inches above finished.

5.16.3 Valves – Valves should be located at water line intersections and all fire hydrant leads. A 24 inch by 24 inch by six (6) inch concrete pad shall be installed around all valve boxes in all areas. For stub-outs for future extensions, a valve shall be installed as close as possible to the connection to the active line.

5.17 Typical Trench Requirements

5.17.1 Minimum Cover – Water lines shall be installed with a minimum cover of 42 inches over the top of the pipe.

5.17.2 Embedment and Backfill – Embedment and backfill shall be installed in accordance with Division 500 "Underground Construction & Appurtenances" of the NCTCOG Specifications.

5.17.2.A. Typically, embedment for water mains shall consist of a six (6) inch sand bedding and a sand envelope surrounding the pipe. The envelope shall extend a minimum of six (6) inches either side of outside pipe wall and a minimum of six (6) inches over the top of the pipe. Sand embedment shall comply with City of Weatherford requirements and Section 504.5 of the NCTCOG Specifications.

5.17.3 In general, excavated material may be used in the trench backfill, provided:

5.17.3.A. All hard rock and stones having any dimensions greater than two (2) inches in diameter and debris and roots larger than two (2) inches are removed.

5.17.3.B. The material is approved for backfill by the City Inspector. Testing of the material may be required if the City Inspector finds that the material may be unsuitable.

5.17.3.C. In areas where the trench excavated material is unacceptable, the backfill shall be granular material complying with City of Weatherford requirements and Section 504 of the NCTCOG Specifications.

5.17.3.D. In areas where the water line will be under pavement, the water line shall be backfilled and pavement repaired in accordance with the City standard details for utility trench repairs.

5.18 Testing and Disinfection

5.18.1 Hydrostatic Testing – All pipelines shall be hydrostatically tested in accordance with the procedures set forth in the TCEQ Rules and Regulations, City of Weatherford requirements



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and Section 506 of the NCTCOG Specifications. All testing shall be completed in the presence of a City representative.

- 5.18.2 Disinfection – All pipelines and facilities shall be purged and disinfected in accordance with the TCEQ Rules and Regulations, City of Weatherford requirements and Section 506 of the NCTCOG Specifications. The contractor will be required coordinate with City staff to collect the sample. The first sample will be tested at the expense of the City. Any subsequent sample shall be tested at the expense of the Developer/contractor. Facilities shall be disinfected and sampled as necessary until satisfactory results are achieved. A minimum of 2 samples will be required at sample rate of one (1) per 1000 linear feet of new line installed.
- 5.19 Water Wells – If public water facilities are within 500 feet of the development, and the City Engineer determines the extension of water facilities will not create adverse water quality or maintenance impacts, developments shall be connected to the City's water system and shall be capable of providing water for health and emergency purposes, including fire protection. Private, onsite water wells will be evaluated on a case-by-case basis by the City Engineer and only where lot sizes are two acres or larger. A ground water availability study shall be submitted for subdivisions with ten (10) or more lots. The Upper Trinity Ground Water Conservation District and the City Engineer shall review the development and groundwater availability study and determine if a ground water availability certificate will be required in compliance with TCEQ requirements. In no case will a private water well be allowed to serve more than one lot. All private water wells within City limits are subject to City approval and provided that all appropriate permits are procured from the City, the Upper Trinity Groundwater Conservation District, the TCEQ, and any other applicable agency(s). The design and construction of water system improvements and private water wells shall comply with the following standards:
 - 5.19.1 Design and construction of a water source on the site shall be in accordance with applicable regulations of the TCEQ.
 - 5.19.2 Design and construction of water service from the City shall be in accordance with the standards in the City's EDCM manual, and in accordance with TCEQ standards.
 - 5.19.3 Design and construction of a fire protection and suppression system shall be in accordance with the standards in the EDCM manual, and in accordance with the City's fire department and fire code.



SECTION 6 WASTEWATER DESIGN REQUIREMENTS

Section Highlights

- Refer to Section 4 (General Utilities Design Requirements) for additional compliance requirements.
- The minimum wastewater main size is eight (8) inches inside diameter.
- All wastewater mains shall have a minimum cover of 2 ½ feet from the top of pipe to the top of ground or proposed pavement top of curb.
- Manholes shall be placed at all points of change in alignment, grade, size, material, or inside diameter of the wastewater main. In addition, manholes shall be placed at an intersection of two or more wastewater mains, at the end of the main (at or after the last service), and any locations required to provide accessibility for maintenance.

- 6.1 Wastewater System Materials and Installation – All material and appurtenances must comply with City of Weatherford and NCTCOG specifications and must be approved by the City prior to construction.
- 6.2 Wastewater Pipe – All wastewater materials for main lines and service lines (pipes and fittings) shall comply with City of Weatherford requirements and Division 500 “Underground Construction & Appurtenances” of the NCTCOG Specifications. Wastewater lines and services twelve (12) inches or less in diameter at all depths shall be PVC SDR-26. Pipe material for sewer main lines greater than twelve (12) inches in diameter shall be evaluated on a case-by-case basis. Wastewater pipe shall be green in color.
- 6.3 Service Tap – Service taps shall be standard wye and a 45° bend. No tees will be allowed.
- 6.4 Force Main Pipe – All force main materials (pipes and fittings) shall comply with City of Weatherford requirements and Division 500 “Underground Construction & Appurtenances” of the NCTCOG Specifications. Force mains twelve (12) inches or less in diameter shall be green, PVC, AWWA C-900, DR-18. Pipe material for line sizes greater than twelve (12) inches shall be evaluated on a case-by-case basis. All force mains shall have isolation gate valves located at intervals no greater than 2,000 feet. Gate valves shall comply with City of Weatherford requirements and Section 502.6 of the NCTCOG Specifications. Combination air and vacuum relief valves shall be required at high points along force mains and shall comply with City of Weatherford requirements and Section 502.6.3.1 of the NCTCOG Specifications. All combination air release and vacuum relief valves shall be installed in vault in accordance with the City’s standard details. All lids for force main valves shall be marked “SEWER.”
- 6.5 Manholes – Manholes shall comply with City of Weatherford requirements and Section 502.1 of the NCTCOG Specifications. All lids for wastewater manholes shall be marked “SANITARY SEWER” or “WASTEWATER.” All manholes shall be either cast-in-place concrete or precast concrete. Drop manholes shall be exterior drop only as shown on the City’s details. Manholes in flood-prone areas shall be constructed with watertight frames and covers.
 - 6.5.1 Placement – Manholes shall be placed at all points of change in alignment, grade or size of wastewater main, intersection of two or more wastewater mains, at the end of the line, and any locations to provide accessibility for maintenance ease. Manholes will be required for all size on size taps to the sewer main. Manholes may be required for certain types of businesses regardless of the size of the business’s sewer service.
 - 6.5.2 Distance between Manholes – On wastewater mains, the maximum distance between wastewater manholes shall be 500 feet for straight segments. For curved segments, the maximum distance between manholes shall be 300 feet.



6.5.3 Manholes in Streets – Manhole proposed in streets within the wheel path of vehicles shall be avoided.

6.5.4 Wastewater Manholes in the Floodplain – For wastewater main manholes located in the 100-year flood plain, manhole covers and rings shall have gaskets and shall be bolted or have approved means of preventing inflow. Where gasket manholes are required for more than three manholes in a sequence, a venting method, such as raising the rim at least one foot above 100-year flood plain, shall be provided on every third manhole. If this is not practical, an approved alternate venting method, which will minimize inflow, shall be provided.

6.5.5 Manhole at End of Line – All wastewater mains shall end (highest point) with a manhole.

6.5.6 Flow Lines of Wastewater Mains – In manholes with pipes of different sizes (diameters), the tops of pipes shall be placed at the same elevation (crown to crown). Exterior drop invert installation is required if the connecting wastewater main having an elevation difference greater than 24 inches. Elevation difference 24 inches or less shall have a hydraulic slide to reduce turbulence.

6.5.7 Manhole Frame and Cover – Manhole covers for all wastewater manholes are required to have an opening of 30 inches in diameter or larger. All wastewater manholes in unpaved areas, in which the rim is at approximate ground level, shall have a concrete pad to secure manhole frame.

6.6 Lift Stations – Prior to construction, the City shall approve the location and design of any proposed lift station. The Developer should give consideration to items such as odor, floodplain location and aesthetics when selecting a proposed lift station site. Lift stations shall be designed in accordance with City and TCEQ requirements.

6.7 Cleanouts – Cleanouts shall comply with City of Weatherford requirements and Section 502.2 of the NCTCOG Specifications. All lids for wastewater cleanouts shall be marked “SEWER”. Prior to installation, the City shall approve the cleanout frame, cover, pipe and fittings. All cleanouts lids in unpaved areas shall be install with a 24 inch by 24 inch by six (6) inch concrete pad at the ground surface.

6.8 Minimum Grades and Velocities – Minimum grades shall be maintained in constructing sewer lines in accordance with the requirements of the City of Weatherford and the TCEQ. The use of flatter grades may be approved by the City in special situations, but in no case shall the grades be less than that required to provide a minimum velocity of two (2) feet per second.

6.9 Minimum Horizontal Curvature – Typically, sewer lines should be designed with straight alignments. When horizontal curvatures must be used, the minimum radius shall comply with the pipe manufacturer’s recommendation, but in no case shall the radius of curvature be less than 300 feet. A manhole will be required at the point of curvature (PC), point of tangency (PT) and any point of reverse curvature (PRC) or compound curvature (PCC) of a curve. Maximum manhole spacing along curves shall be 300 feet.

6.10 Typical Trench Requirements

6.10.1 Minimum Cover – Where topography requires that a wastewater main line is to be installed with less than 2 ½ feet cover, the pipe shall be installed in steel casing pipe through the restricted area.

6.10.2 Embedment and Backfill – Embedment and backfill shall be installed in accordance with Division 500 “Underground Construction & Appurtenances” of the NCTCOG Specifications.

6.10.2.A. Typically, embedment for wastewater mains shall consist of a six (6) inch crushed stone bedding and a crushed stone envelope surrounding the pipe. The



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envelope shall extend a minimum of six (6) inches on either side of outside pipe wall and a minimum of six (6) inches over the top of the pipe. Crushed stone embedment shall comply with City of Weatherford requirements and Section 504.5 of the NCTCOG Specifications.

6.10.3 In general, excavated material may be used in the trench backfill, provided:

6.10.3.A. All hard rock and stones having any dimensions greater than two (2) inches in diameter and debris and roots larger than two (2) inches are removed.

6.10.3.B. The material is approved for backfill by the City Inspector. Testing of the material may be required if the City Inspector finds that the material may be unsuitable.

6.10.3.C. In areas where the trench excavated material is unacceptable, the backfill shall be granular material complying with City of Weatherford requirements and Section 504 of the NCTCOG Specifications.

6.10.3.D. In areas where the wastewater line will be under pavement, it shall be backfilled and pavement repaired in accordance with the City standard details for utility trench repairs.

6.11 Testing

6.11.1 Air and Mandrel Testing – Prior to acceptance, all gravity wastewater lines shall be air and deflection tested in accordance with the procedures set forth by the TCEQ Rules and Regulations, City of Weatherford requirements and Section 507 of the NCTCOG Specifications. All testing shall be accomplished in the presence of a City representative.

6.11.2 Hydrostatic Testing of Force Mains – All force mains shall be hydrostatically tested in accordance with the procedures set forth in the TCEQ Rules and Regulations, City of Weatherford requirements and Section 506 of the NCTCOG Specifications. All testing shall be accomplished in the presence of a City representative.

6.11.3 Visual Inspection – All gravity wastewater mains must be visually inspected by closed circuit television inspection (CCTV). The City Inspector shall be on site during video inspection, and the City shall be furnished a video copy of inspection along with a report. The inspection and report shall be completed by a Pipeline Assessment Program (PACP) certified inspector at the expense of the Developer/contractor.

6.11.4 Manholes – Manholes shall be tested separately and independently of wastewater lines by hydrostatic exfiltration or vacuum testing. The test shall be in accordance with the procedures set forth by the TCEQ Rules and Regulations, City of Weatherford requirements and Section 507 of the NCTCOG Specifications.

6.12 Onsite Sewage Facilities (OSSF) – If public wastewater facilities are within 500 feet of the development, and the City Engineer determines the extension of wastewater facilities will not create adverse capacity or maintenance impacts, developments shall be served by the City's wastewater collection and treatment system. OSSFs will be evaluated on a case-by-case basis by the City Engineer and only where lot sizes are one acre or larger. In no case will an OSSF be allowed to serve more than one lot. All OSSFs are subject to City and Parker County approval, provided that all appropriate permits are procured from the City, the County Health Department, the TCEQ, and any other applicable agency(s). The design and construction of OSSFs shall comply with applicable regulations of the TCEQ.



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SECTION 7 MISCELLANEOUS REQUIREMENTS

7.1 Permitting

7.1.1 For development within the City of Weatherford and the extra-territorial jurisdiction (ETJ) of the City of Weatherford, a Site Development Permit or a grading permit shall be obtained.

7.1.2 Completeness Review – In order to complete the review of engineering documents required for development, all necessary information must be submitted to the Department of Development and Neighborhood Services. Please refer to the appropriate Ordinance and design criteria for additional information. After the applicant has reviewed the City's Ordinances and design criteria, the General Project Completeness Checklist (see Appendix A for development checklists) shall be completed and submitted with appropriate permit application and required documents. Each item on the check list shall be acknowledged as provided by the applicant or not required. If an item is acknowledged as not required, a comment shall be provided stating why the item is not required. When the application and checklist is received by the Department of Development and Neighborhood Services, City staff will perform a completeness review of the application within ten (10) business days. If City staff determines that any required item is missing, the application will be determined to be incomplete and returned to the applicant. Below is a list of typical engineering documents that may be required to be submitted with a permit application:

7.1.2.A. Engineering Documents

- 7.1.2.A.i. List of Approved Waivers from City Ordinances and/or Design Criteria – A concise list of waivers from Ordinance and/or design criteria requirements that have been granted, including references to Ordinance or design criteria sections and the body or staff that authorized the approval.
- 7.1.2.A.ii. List of Requested Waivers from City Ordinances and/or Design Criteria – A concise list of additional waivers from Ordinance and/or design criteria requirements that are requested that have not been granted, including references to Ordinance or design criteria sections.
- 7.1.2.A.iii. Site Development Construction Plans – A complete set of plans prepared by a Professional Engineer, licensed in the State of Texas, for the construction of public and/or private site improvements. The plans shall meet the requirements of the City of Weatherford Technical Construction Standards and Specifications (TCSS).
- 7.1.2.A.iv. Anticipated Trips Per Day Generated by the Development – Daily trips that are anticipated to be generated by the development as determined by using the Institute of Transportation Engineers (ITE) manual or other method approved by the City Engineer.
- 7.1.2.A.v. Traffic Impact Analysis (TIA) – A report documenting the impacts to the City's roadway system due to the increased traffic from the proposed development. A TIA is required for developments that include 50 or more dwelling units or generate more than 500 trips per day. Refer to the City's Subdivision Ordinance and TCSS for more information. The report shall be prepared by a Professional Engineer licensed in the State of Texas.
- 7.1.2.A.vi. Geotechnical Report – A report that documents the conditions of the soil within the development and provides recommendations for



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retaining wall design, street pavement and subgrade preparation. This report may be deferred until after the site is graded to provide additional analysis of the proposed conditions. The report shall be prepared by a Professional Engineer licensed in the State of Texas.

7.1.2.A.vii. Downstream Drainage Assessment Report – A report that documents the drainage impacts due to increased storm water runoff caused by a development. This report is required for any development that proposes 5,000 or more square feet of additional impervious surfaces. Refer to the City's Stormwater Design Criteria Manual for more information. The report shall be prepared by a Professional Engineer licensed in the State of Texas.

7.1.2.A.viii. Flood Study – A report that documents the impacts to special flood hazard areas (SFHA) as determined by the Federal Emergency Management Agency (FEMA), within and/or adjacent to the development. Refer to the City's Stormwater Design Criteria Manual and Title 13-Flood Damage Prevention of the City's Municipal Code for more information. The report shall be prepared by a Professional Engineer licensed in the State of Texas.

7.1.2.A.ix. Groundwater Availability Report – A report that documents the availability of groundwater for developments not served by surface water systems. This report is required for developments that propose ten (10) or more lots to be served by individual wells, commercial wells or community wells. The report shall be prepared by a Professional Engineer licensed in the State of Texas.

7.1.3 Site Development Permit – A site development permit is required when public improvements are proposed with a development. A Site Development Permit may also be required with site improvements for commercial developments that are not included under a commercial building permit.

7.1.3.A. The following are required prior to approval of a Site Development Permit:

- 7.1.3.A.i. Permit Application and Fee
- 7.1.3.A.ii. Approved Preliminary Plat
- 7.1.3.A.iii. Approved Engineering Documents
- 7.1.3.A.iv. Approved Tree Preservation Plan
- 7.1.3.A.v. Paper Copies of Approved Construction Plans as Required by the City
- 7.1.3.A.vi. Copies of Executed Contract for Construction of all Public Improvements and 4% Inspection Fee
- 7.1.3.A.vii. Hold a Pre-construction Meeting

7.1.3.B. Site Development Construction Plans – Site development construction plans typically include the following sheets for the development of residential and/or nonresidential projects:

- 7.1.3.B.i. Cover Sheet
- 7.1.3.B.ii. Approved Plat
- 7.1.3.B.iii. General Notes
- 7.1.3.B.iv. Paving Plan (for nonresidential projects)



- 7.1.3.B.v. Street Improvements
- 7.1.3.B.vi. Grading
- 7.1.3.B.vii. Drainage Area Map (Existing and Proposed)
- 7.1.3.B.viii. Drainage Improvements
- 7.1.3.B.ix. Water Improvements
- 7.1.3.B.x. Wastewater Improvements
- 7.1.3.B.xi. Erosion Control Plan
- 7.1.3.B.xii. Standard Construction Details

7.1.4 Grading Permit – A grading permit shall be required when a development is proposed to disturb an area greater than 5,000 square feet or alter existing drainage patterns that will impact other properties.

7.1.4.A. The following are required prior to approval of a grading permit:

- 7.1.4.A.i. Permit Application and Fee
- 7.1.4.A.ii. Approved Preliminary Plat
- 7.1.4.A.iii. Approved Grading Plan
- 7.1.4.A.iv. Approved Drainage Plan
- 7.1.4.A.v. Approved Tree Preservation Plan
- 7.1.4.A.vi. Approved Erosion Control Plan
- 7.1.4.A.vii. Paper Copies of Approved Construction Plans as Required by the City
- 7.1.4.A.viii. Copies of Executed Contract for Construction of all Public Improvements and 4% Inspection Fee
- 7.1.4.A.ix. Hold a Pre-construction Meeting

7.1.4.B. If approved on a case-by-case basis by the City Engineer, an abbreviated grading plan may be submitted for projects where grading is proposed on one lot and is not part of an overall development. At a minimum, erosion control measures and areas of excavation, fill and disturbance shall be shown in the plans.

7.1.4.C. Proposed slopes steeper than three feet horizontal to one foot vertical (3:1) shall be justified by a slope stability analysis prepared by a Professional Engineer licensed in the State of Texas.

7.1.4.D. All erosion control measures shall be installed prior to the start of construction. An erosion control inspection shall be conducted prior to the start of construction.

7.1.4.E. All drainage plans shall be approved prior to the approval of a grading permit. Drainage improvements (i.e. storm water detention facilities, outlet structures, etc.) necessary to prevent adverse downstream impacts shall be constructed prior to removing vegetation and grading the construction site.

7.2 Construction Processes

7.2.1 It is the Developer's responsibility to obtain the appropriate permits and notify the appropriated inspector for any proposed developments.

7.2.2 Prior to permit approval, an inspection fee equal to four percent of the public infrastructure construction cost must be submitted with an executed copy of the contract. The contract



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shall include an itemized cost for the public infrastructure portion of the improvements, broken down into water, wastewater, streets, drainage and sidewalk improvements.

- 7.2.3 For any projects requiring a Site Development Permit or grading permit, the Developer, the project engineer and all contractors participating in the construction shall meet for a preconstruction meeting to discuss the project prior to release of a permit and before any filling, excavation, clearing or removal of vegetation and any trees that are larger than six-inch caliper. All contractors shall be familiar with, and shall conform to, applicable provisions of the City's landscape ordinance and tree protection/preservation ordinance.
- 7.2.4 For developments where a public street is proposed to be constructed, a pre-paving meeting shall be required with the appropriate City staff prior to placing any pavement material.
- 7.2.5 No work shall commence for a development until the following are complete:
 - 7.2.5.A. The preliminary plat has been approved by the City Council (and any conditions of such approval have been satisfied), if necessary;
 - 7.2.5.B. All required engineering documents are completed and approved by the City Engineer;
 - 7.2.5.C. All necessary offsite easements and dedications required for City-maintained facilities and not shown on the plat must be conveyed solely to the City, such as by filing of a separate instrument, with the proper signatures affixed. The original filed easement documents (per Parker County requirements and the City's submission guidelines, as may be amended from time to time) shall be returned to the City Secretary prior to approval and release of the engineering plans by the City Engineer;
 - 7.2.5.D. All contractors participating in the construction shall be presented with a set of approved plans bearing the stamp of release of the City Engineer, as appropriate, and at least one set of these plans shall remain on the job site at all times;
 - 7.2.5.E. A complete list of the contractors, their representatives on the site, and telephone numbers where a responsible party may be reached at all times must be submitted to the City; and
 - 7.2.5.F. All applicable fees must be paid to the City.
- 7.2.6 During construction, the Developer shall provide control points, benchmarks and construction staking as required by the City Engineer and City Inspector. It is the Developer's responsibility to provide accurate construction surveying by a qualified surveyor. At a minimum, the following shall be required for construction surveying:
 - 7.2.6.A. Control points and/or benchmarks shall be provided no further than 500 feet away from another control point or benchmark;
 - 7.2.6.B. A list of all control points and benchmarks shall be provided to the City Inspector or referenced in the approved plans. The list shall include the control point or benchmark name, northing, easting, elevation and description;
 - 7.2.6.C. Construction stakes shall be provided indicating the station number, offset, and name of street or line. For improvements to be installed at specific elevations, the proposed cut or fill depth and a hub or reference point shall be provided for all construction stakes.
 - 7.2.6.D. Construction staking shall be provided as follows:
 - 7.2.6.D.i. Water Lines Eight (8) Inches in Diameter or Smaller – At all bends, fittings, valves, fire hydrants, service connections, points of curvature, points of intersection, points of tangency, connections,



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and at intervals of 100 feet or less.

- 7.2.6.D.ii. Water Lines Ten (10) Inches in Diameter or Larger – At all bends, fittings, valves, fire hydrants, service connections, points of curvature, points of intersection, points of tangency, connections, and at intervals of 100 feet or less. Proposed elevations, cuts and fills shall be measured at the top of pipe.
- 7.2.6.D.iii. Wastewater Lines – At all manholes, service connections, points of curvature, points of intersection, points of tangency, connections, and at intervals of 50 feet or less. Proposed elevations, cuts and fills shall be measured at the flow line of the pipe.
- 7.2.6.D.iv. Storm Drainage Improvements – At all manholes, inlets, fittings, points of curvature, points of intersection, points of tangency, connections, headwalls, and at intervals of 50 feet or less. Proposed elevations, cuts and fills shall be measured at the flow line of the pipe.
- 7.2.6.D.v. Streets – At all points of curvature, points of intersection, points of tangency, points of vertical curvature, points of vertical intersection, points of vertical tangency, high points, low points, pavement limits, and at intervals of 50 feet or less. Construction stakes shall reference the proposed back of curb (edge of pavement if no curb is proposed). Proposed elevations, cuts and fills shall be measured at the top of curb (or top of pavement if no curb is proposed).

- 7.2.6.E. All control points, benchmarks and construction staking shall be based on the coordinate system and datum used by the City;
- 7.2.6.F. If a control point or benchmark is damaged or removed, it shall be replaced near its original location by the Developer, and its updated information shall be provided to the City Inspector.

7.3 Erosion and Sediment Controls

- 7.3.1 General – This section includes Best Management Practices (BMP) requirements for construction and post-construction activities.
- 7.3.2 The following shall be submitted with grading and Site Development Permit applications:
 - 7.3.2.A. Submission by the applicant of a Stormwater Pollution Prevention Plan (SWPPP) for all work disturbing 1 acre of land or more. This SWPPP must be prepared by a licensed Professional Engineer in accordance with applicable Environmental Protection Agency (EPA) and Texas Commission on Environmental Quality (TCEQ) regulations and approved by the City Engineer prior to issuing the permit.
 - 7.3.2.B. Submission by the applicant of a copy of Notice of Intent (NOI) and/or a Construction Site Notice (CSN) as required by the TCEQ regulations for all work disturbing 1 acre of land or more.
 - 7.3.2.C. The City Engineer may exclude that portion of tracts in excess of 10 acres that he determines to be so situated as to not contribute to erosion due to location and topography.
 - 7.3.2.D. The applicant provides a notarized statement from the Property Owner giving permission for the applicant to fill, grade, excavate, or otherwise disturb the property.
- 7.3.3 Construction Permitting – Construction permitting shall be in accordance with the TCEQ's



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Construction General Permit (TXR150000). Temporary erosion control BMPs shall be provided to control and reduce the discharge of sediment, silt, soil, and other materials to the Municipal Separate Storm Sewer System (MS4) and to waters of the United States during construction activities. Proof of compliance with applicable Local, State, and Federal environmental regulations shall be provided to the City upon request.

7.3.4 Temporary Erosion Control BMPs – The following temporary erosion control BMPs shall be designed to retain soil in place and to minimize the amount of sediment in runoff. Refer to the NCTCOG iSWM™ Technical Manuals and Fact Sheets for applicable design criteria.

7.3.4.A. Temporary Stabilization – Portions of a site that have been disturbed but where no work will occur for more than 21 days shall be temporarily stabilized as soon as possible, and no later than 14 days from cessation of work, except when precluded by seasonal arid conditions or prolonged drought. Temporary stabilization shall consist of providing a protective cover, without large bare areas, that is designed to reduce erosion on disturbed areas. Temporary stabilization may be achieved using the following BMPs: temporary seeding, soil retention blankets, fibrous mulches, hydro-mulches, and other techniques that cover 100% of the disturbed areas until final stabilization can be achieved or until further construction activities take place.

7.3.4.B. Slope Protection – Slope protection shall be provided for disturbed or cut/fill slopes that are steeper than 4H:1V, 50 feet in length or longer, or on highly erodible soils. The location and type of BMPs shall be shown in the plans.

7.3.4.C. Channel Protection – Show the location and type of BMPs used to prevent the erosion of channels, drainage ways, streambanks, and outfalls until permanent structures and final stabilization measures are installed.

7.3.4.D. Sediment Controls – Sediment control BMPs shall be designed to capture sediment on the site when preventing erosion is not feasible due to ongoing construction activity. Sediment control BMPs and their locations shall be designed to change with the different phases of construction as site conditions and drainage patterns change. Sediment controls for the initial phase of construction shall be installed before any site disturbing activities begin. Sediment barriers may be linear controls, check dams, berms, sediment basins, sediment traps, active treatment systems, and other structural BMPs designed to capture sediment suspended in stormwater.

7.3.4.E. Perimeter Controls – A linear BMP shall be provided at all down slope boundaries of the construction activity and side slope boundaries where stormwater runoff may leave the site. Linear sediment barriers may be used to satisfy the requirement for perimeter controls.

7.3.4.F. Storm Drain Inlet Protection – Storm drain inlet protection shall not be used as a primary sediment control BMP unless all other primary controls are infeasible due to site configuration or the type of construction activity. Inlet protection is intended to be a last line of defense in the event of a temporary failure of other sediment controls.

7.3.4.G. Construction Access Controls – BMPs shall be provided to prevent off-site vehicle tracking of soil and pollutants.

7.3.4.H. Dewatering Controls – Water pumped from foundations, vaults, trenches and other low areas shall be discharged through a BMP or treated to remove suspended soil and other pollutants before the water leaves the site. The plans shall include notes that prohibit discharging the water directly into flumes, storm



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drains, creeks or other drainage ways. Where State or Local discharge permit requirements exist for the pollutant(s) suspected of being in the water, the plan shall include the discharge permit conditions.

- 7.3.4.I. Final Stabilization – Final stabilization practices shall be specified for disturbed areas that are not covered by buildings, pavement or other permanent structures upon completion of construction. Final stabilization measures shall be coordinated with the construction plans.
- 7.3.5. Post-Construction Requirements – Post-construction stabilization shall be provided in accordance with the EPA's NPDES and TCEQ's TPDES regulations for all new development and redevelopment.
 - 7.3.5.A. Construction and Maintenance Requirements – The Owner shall construct all permanent controls in accordance with this section and is responsible for maintenance of the controls. When the control falls within a drainage easement, the plat or separate instrument dedicating the easement shall include a statement of the Owner's responsibility for maintenance. Refer to NCTCOG iSWM™ Construction Controls Technical Manual for permanent control options.
 - 7.3.5.B. Operations and Maintenance Form – Submittal of an Operations and Maintenance Form in Appendix A (City Checklists) is required to demonstrate the long-term maintenance of the permanent controls. The Operations and Maintenance Form must be accepted by the City before the final engineering plans are approved for construction. The Owner shall agree to the operations and maintenance procedures and frequency of maintenance for each permanent control specified on the form.

7.4 Retaining Walls

- 7.4.1. In general, the use of retaining walls shall be minimized, wherever possible, through minimal and balanced cut and fill on property.
- 7.4.2. Retaining walls shall be maintained by the owner of the property where such retaining wall is located.
- 7.4.3. Retaining walls shall not be constructed within any portion of a utility or drainage easement, unless approved by the City Engineer.
- 7.4.4. A retaining wall permit shall be required for any proposed retaining walls.
- 7.4.5. Proposed retaining walls shall be shown on the grading plans with top and bottom of wall elevations indicated.
- 7.4.6. Construction details shall be provided for all proposed retaining walls. The details shall include, but not be limited to:
 - detail name or number identifying to which proposed retaining wall(s) the detail applies;
 - specifications for backfill material;
 - specifications, including approved manufacturers, for geosynthetic materials (i.e. sediment barrier, geogrids, etc.);
 - drainage systems; and,
 - any other necessary components of the proposed retaining wall system.
- 7.4.7. For retaining walls that are proposed to be four (4) feet or taller (as measured from the bottom of the footing to the top of the wall) and/or retaining walls that are supporting a surcharge load, a structural design prepared by a Professional Engineer licensed in the State of Texas shall be submitted for review and approval. The proposed retaining wall shall be



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considered to support a surcharge load if a load is within 1.5 times the height of the proposed retaining wall.

- 7.4.8 Retaining walls along property lines shall account for existing or future surcharges. Assumptions for future surcharges shall include the worst-case scenario in order to not limit or restrict development on adjacent properties.
- 7.4.9 Design calculations for overturning, sliding and bearing capacity for the proposed retaining wall shall be included in all structural designs.
- 7.4.10 The structural design of proposed retaining walls shall meet the following customary factors of safety:
 - 1.5 for retaining walls overturning with granular backfill;
 - 2.0 for retaining walls overturning with cohesive backfill;
 - 1.5 for retaining walls sliding with active earth pressures;
 - 2.0 for retaining walls sliding with passive earth pressure.

7.5 Screening Walls

- 7.5.1 Where subdivisions are platted so that the rear and/or side yards of single-family or two-family residential lots are adjacent to an arterial thoroughfare (greater than 60 feet in ROW width on the thoroughfare plan), a four lane collector street, are separated from a thoroughfare by an alley, or back up to a collector or residential street (which is not allowed unless specifically approved by City Council), the Developer shall provide, at his or her sole expense, a minimum six-foot tall masonry screening wall, or some other alternative form of screening, if approved by the City Planner, according to the following alternatives and standards. All screening shall be adjacent to the ROW or property line and fully located on the private lot(s), including columns and decorative features. All forms of screening shall conform to the requirements of City ordinances and policies that govern sight distance for traffic safety.
- 7.5.2 Screening alternatives. Screening shall be provided in accordance with, and shall be constructed to, standards and criteria as set forth herein and other related City code(s) and policy(s). An alternative form of screening, in lieu of the six- to eight-foot tall masonry wall, may be approved by the City Planner on a landscaping/screening wall plan submitted with the Site Development Permit application. Such possible alternatives may include, but may not be limited to, the following:
 - 7.5.2.A. Living/landscaped screen with decorative metal (e.g., wrought iron) fence sections with masonry columns;
 - 7.5.2.B. A combination of berms and living/landscaped screening, either with or without a decorative metal or "WoodCrete" type of fence with masonry columns;
 - 7.5.2.C. A combination of berms, decorative masonry retaining walls (no taller than six feet in height where facing or visible to a public street) and living/landscaped screening, either with or without a decorative metal or "WoodCrete" type of fence with masonry columns; or
 - 7.5.2.D. Some other creative screening alternative may be approved if it meets the spirit and intent of this section, if it is demonstrated to be long lasting and generally maintenance-free, and if the City Council finds it to be in the public interest to approve the alternative screening device.
- 7.5.3 Any required screening device shall be, or shall achieve, at least six feet in height and at least 90% opacity within three years of initial installation/planting. Any landscaping used to achieve the purpose of required screening shall be equipped with an underground



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irrigation system with appropriate double-check valve(s), automatic controller(s), and automatic moisture- and freeze-sensors. Trees used for overstory screening shall be on a separate bubbler irrigation system that can be programmed to provide deep-watering of trees at intervals that may differ from the rest of the irrigation system.

- 7.5.4 The use of wood or other privacy fences immediately behind or abutting an alternative screening device that utilizes living screening elements (i.e., landscaping), berms, retaining walls and/or open (i.e., nonopaque) fence sections shall not be permitted due to the creation of a "no man's land" and subsequent maintenance nuisance in the area between the two devices/fences, and due to the detrimental visual appearance of this type of arrangement.
- 7.5.5 Screening walls and/or the use of any alternative form of screening in lieu of the masonry wall, particularly a device utilizing landscaping, shall be maintained by a property/homeowners' association.
- 7.5.6 A wall/screening maintenance easement at least five feet in width shall be dedicated to a Property Owners association on the private lot side and adjacent to the entire length of the screening wall or device.
- 7.5.7 The screening wall/device shall be installed prior to approval of the final plat and prior to final acceptance of the subdivision (or appropriate surety provided). Landscape materials may be installed after the subdivision is accepted, upon approval of the City Planner, but in no case later than six months following acceptance of the subdivision. Failure to properly install all components of a required screening wall or device within the allowed time frame, and without the appropriate Developer's agreement and surety, shall constitute a violation and the Developer may be subject to a penalty pursuant to the City's Code of Ordinances.
- 7.5.8 All plants, such as trees, shrubs and ground covers, shall be living and in sound, healthy, vigorous and growing condition, and they shall be of a size, fullness and height that is customary for their container or ball size, as per the latest edition of the "American Standard for Nursery Stock," by the American Association of Nurserymen, as may be amended.
- 7.5.9 All masonry, wrought iron, steel or aluminum screening wall or fence plans and details must be designed and sealed by a licensed Professional Engineer, and must be approved by the City Engineer. Masonry walls shall be in accordance with the City's design standards, and the use of "thin wall" type of construction is greatly discouraged (and may be disallowed altogether) due to problems with inferior strength and the higher cost of long-term maintenance. Decorative metal fencing shall be solid stock, not tubular, and shall have masonry columns at a minimum spacing of 100 feet on center.
- 7.5.10 The height of required screening devices, including spans between columns, shall be a minimum of six feet and shall be no more than eight feet tall. Decorative columns, pilasters, stone caps, sculptural elements, and other similar features may exceed the maximum eight-foot height by up to two (2) feet for a total maximum height of ten feet for these features, provided that such taller elements comprise no more than ten percent of the total wall length in elevation view. Features that are taller than ten (10) feet in height shall require City Planner approval on the landscaping/screening plans submitted with the Site Development Permit application.
- 7.5.11 Screening fences, walls and devices shall not be constructed within any portion of a utility or drainage easement unless specifically authorized by the City Engineer and by any other applicable utility provider(s).

7.6 Acceptance of Public Facilities

- 7.6.1 The following shall be required prior to the City's acceptance of the public facilities for a development:



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7.6.1.A. Complete the public facilities in accordance with the approved site development plans;

7.6.1.B. Submission of accurate record drawings showing any changes that occurred during construction. The record drawings shall be prepared by the design engineer and submitted in the following forms:

- 7.6.1.B.i. 1-full size paper copy;
- 7.6.1.B.ii. 1-half size paper copy;
- 7.6.1.B.iii. PDF file; and,
- 7.6.1.B.iv. CAD files in a form acceptable to the City Engineer.

7.6.1.C. Submission of security for a two-year maintenance period, which shall be one of the following:

- 7.6.1.C.i. Maintenance bond;
- 7.6.1.C.ii. Letter of Credit; and,
- 7.6.1.C.iii. Escrow funds.

All forms of security shall be approved by the City Engineer and City Attorney and shall cover the total cost of the public improvements for a period of two years.

7.6.2 No building permit will be issued for a property until all required public facilities to serve the property have been accepted by the City.

7.6.3 Upon acceptance of the public facilities, the City Engineer shall issue a Letter of Acceptance to the Developer.

7.7 Development in the Floodplain

7.7.1 Any development proposed within the 100-year floodplain as shown on the effective Flood Insurance Rate Maps as published by the FEMA is required to comply with Title 13 Flood Damage Prevention of the City's Municipal Code.

7.8 Other Local, State and Federal Environmental Regulations

7.8.1 The Developer is responsible for obtaining any required permits or permissions from other local, State or Federal agencies. The City Engineer may request copies of permits or permissions from other agencies or proof that no permits or permissions are required from other agencies.

7.8.2 The following is a list of other local, State and Federal requirements and agencies that may regulate certain development activities (this is not intended to be a complete list and is provided for informational purposes only):

- 7.8.2.A. Section 404 of the Clean Water Act (33 USC 1344) as regulated by the United States Army Corps of Engineers;
- 7.8.2.B. Water Rights as regulated by the TCEQ;
- 7.8.2.C. Migratory Bird Treaty Act as regulated by the U.S. Fish and Wildlife Service;
- 7.8.2.D. Water Well Drilling as regulated by the Upper Trinity Groundwater Conservation District and the TCEQ;
- 7.8.2.E. Threatened and Endangered Species as regulated by the Texas Parks and Wildlife Department;
- 7.8.2.F. The Antiquities Code of Texas as regulated by the Texas Historical Commission;



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- 7.8.2.G. Air quality as regulated by the TCEQ;
- 7.8.2.H. Construction General Permit for Stormwater Discharges by the TCEQ; and,
- 7.8.2.I. Dams as regulated by the TCEQ.



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**SECTION 8 DEFINITIONS AND ABBREVIATIONS****8.1 Definitions**

8.1.1 The definitions within this section are intended to provide descriptions for terms used within the Engineering Design Manual. When words and terms are defined herein and in other City ordinances, they shall be read in harmony. If an irreconcilable conflict exists, the definition contained herein shall control in the construction and application of this Engineering Design Manual. Where no definition appears, the term should be interpreted according to their customary usage in the practice of municipal planning and engineering. The Director of Public Works has the final determination of interpretation. Words used in the present tense include the future tense. Words in the singular tense include the plural tense. The word "shall" is mandatory and not directory. The word "may" is directory and not mandatory.

8.1.2 100-year – A flood event that statistically has a recurrence interval (return period) of 100 years and a one percent chance of being equaled or exceeded in any given year. The event shall be based upon fully developed watershed conditions unless otherwise specified.

8.1.3 Alley – A minor public ROW, not intended to provide the primary means of access to abutting lots, which is used primarily for vehicular service access to the back or sides of properties otherwise abutting on a public way.

8.1.4 Applicant – Any firm, entity, partnership, company, public utility company, or individual submitting a formal request or application.

8.1.5 Arterial – A roadway designed to carry large volumes of traffic of a local nature to the freeway or expressway systems. Interchange of traffic from freeway systems to the local streets occurs via the arterial street.

8.1.6 Base Flood – The flood event having a one percent chance of being equaled or exceeded in any given year based on existing watershed conditions, FEMA guidelines, and SFHA as shown in the current effective FIS and FIRM. Differs from design flood. The resulting water surface elevation from the base flood shall correspond with the FEMA BFE.

8.1.7 Best Management Practice (BMP) – Schedules of activities, prohibitions of practices, maintenance procedures, structural controls, local ordinances, and other management practices to prevent or reduce the discharge of pollutants. BMPs also include treatment requirements, operating procedures, and practices to control runoff, spills or leaks, waste disposal, or drainage from raw material storage areas. A BMP may be temporary to protect during construction, or permanent to protect from long-term impacts of the development.

8.1.8 Casing Pipe – An exterior protective pipe that encases a carrier pipe for various types of crossings, including roadways, creeks, and railroads. Also known as encasement pipe.

8.1.9 Collection System – A system of pipe and facilities that conveys wastewater from consumers to the wastewater treatment plant. Collection systems include pump stations, wastewater mains, wastewater service lines, and all associated appurtenances, but excludes wastewater customer service lines.

8.1.10 Collector – A roadway designed to pass through neighborhoods collecting traffic from local streets and distributing the traffic to arterial streets. These streets also serve neighborhood facilities.

8.1.11 Connection – The point at which a facility is provided service by the City water or wastewater system.

8.1.12 Corner Clip – ROW dedication at intersection corners to provide sufficient room for intersection visibility, pedestrian access, and other street facilities.

8.1.13 Crown – Depending on context, (a) the highest point on the inside of a closed conduit; or



(b) the highest point of a roadway cross section. Also known as soffit.

8.1.14 Deceleration Lane – A speed-change lane, including tapered areas, which enables a vehicle exiting a roadway to leave the travel lanes and slow before making a turn.

8.1.15 Design Flood – The flood event that is used as the basis for design to provide a stated degree of protection or other specified result. The design flood for the City of Weatherford is the frequency flood specified in Table 3-4 based on fully developed watershed conditions. Also known as design storm. Differs from base flood. The City of Weatherford design flood elevation will not necessarily correspond with the FEMA BFE.

8.1.16 Design Speed – A selected speed used to determine the various geometric design features of the roadway.

8.1.17 Detention Basin – A dry basin or depression constructed to temporarily store stormwater runoff and discharge the water over time at a reduced rate than would have otherwise occurred.

8.1.18 Developer – The person or entity financially responsible for developing a particular site or project. Also referred to as Owner.

8.1.19 Director of Public Works – The Director of Public Works or his/her designee.

8.1.20 Distribution System – A system of pipes that conveys potable water from a water treatment plant to consumers. Distribution systems include pump stations, ground and elevated storage tanks, potable water mains, potable water service lines, and all associated valves, fittings, and meters, but excludes potable water customer service lines.

8.1.21 Drainage System – Storm drainage facilities including streets, alleys, ditches, inlets, storm drain systems, creeks, floodplains, bridges, culverts, detention facilities, retention facilities, overflow routes, and any other facility through which or over which stormwater flows.

8.1.22 Engineer – The Professional Engineer (P.E.) licensed in the State of Texas through the Texas Board of Professional Engineers (TBPE) who is responsible for the signing and sealing of construction plans, studies, calculations, and/or any other engineering documents in accordance with TBPE's requirements for professional practice.

8.1.23 Flood Control – The elimination or reduction of stormwater damage by means of land use restrictions, detention storage, erosion control, drainage systems, channel improvements, dikes and levees, bypass channels, and/or other engineering works. Also known as stormwater management.

8.1.24 Floodplain Administrator – The City Engineer or his/her designee appointed to administer and implement the provisions of the Drainage and Flood Hazard Area Regulations Ordinance and other appropriate sections of 44 CFR (Emergency Management and Assistance – NFIP Regulations) pertaining to floodplain management.

8.1.25 Floodplain, FEMA – The entire geographic area subject to flooding based on the base flood. The FEMA floodplain shall refer to the area subject to flooding resulting from the 100-year base flood (based on existing watershed conditions).

8.1.26 Floodplain, Ultimate – The entire geographic area that must be reserved in order to discharge the design flood without cumulatively increasing the water surface elevation. The ultimate floodplain shall refer to the area subject to flooding resulting from the ultimate 100-year design flood (based on fully developed watershed conditions). Formerly referred to as natural floodway. The ultimate floodplain shall encompass all areas identified in FEMA floodplain. Areas of ineffective flow around bridges, topographic constrictions and other constrictions are excluded from the ultimate floodplain. The effective flow area and limits of the ultimate floodplain are determined using 4:1 flow expansions downstream of constrictions and 1:1 flow expansions upstream of constrictions.



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8.1.27 **Floodway, FEMA** – The channel of a watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation by more than one foot. Also known as regulatory floodway.

8.1.28 **Flowline** – The floor, bottom, or lowest elevation of an open channel or closed conduit. Also known as invert.

8.1.29 **Freeboard** – The distance between the design flood elevation and the freeboard reference point.

8.1.30 **Improved Channel** – A channel or area of concentrated drainage that has been cleared, excavated, realigned, lined, graded, stabilized, or created by equipment. Also known as improved creek and improved stream.

8.1.31 **Intersection** – Any at-grade connection with a roadway. Includes the connection of two roadways or a driveway and a roadway. The junction of an alley with a roadway shall not constitute an intersection.

8.1.32 **Level of Service (LOS)** – A measure of traffic flow and congestion. LOS is a qualitative measure describing operational conditions within a traffic stream, generally described in terms of speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

8.1.33 **Local Street** – A roadway designed to provide the basic function of serving private property with access to other streets. Also known as residential street.

8.1.34 **Median** – The portion of a divided roadway separating the opposing traffic flows. A median may be traversable or non-traversable.

8.1.35 **Median Opening** – An opening in a non-traversable median that allows accessing or crossing the opposing traffic lanes.

8.1.36 **Natural Channel** – An unlined and unimproved existing drainage channel that has not been graded, modified, cleared, or created by equipment. Also known as natural creek and natural stream.

8.1.37 **Non-traversable Median** – A physical barrier in a roadway or driveway that separates vehicular traffic traveling in opposite directions and prohibits movement of traffic across the median. Non-traversable medians include, but are not limited to, concrete barriers, raised concrete curbs and/or islands, and grass or swale medians.

8.1.38 **Open Channel** – A channel in which water flows with a free surface. Includes creeks, lakes, flood control sags, or natural water ways.

8.1.39 **Owner** – The person or entity financially responsible for developing a particular site or project. Also referred to as Developer.

8.1.40 **Parkway** – An area within the ROW but outside the edge of pavement which is typically reserved for public use other than vehicular traffic.

8.1.41 **Post-development** – The condition of the given site and drainage area after the anticipated development has taken place. Also known as proposed condition or post-project.

8.1.42 **Pre-development** – The existing condition of the given site and drainage area prior to development. Also known as existing condition or pre-project.

8.1.43 **Right-of-Way (ROW)** – A strip of land dedicated by plat for use of public roadways and/or related facilities. Other facilities include, but are not limited to, utilities, drainage systems, and other transportation uses. Unless otherwise specified, the term ROW shall refer to a public ROW. **ROW Width** – The shortest horizontal distance between the lines which delineate the limits of right-of way.

8.1.44 **Schools** – A public, private, or parochial institution for the education of students in any



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grade between pre-kindergarten through twelfth grade or any combination thereof. A public school includes an open enrollment charter school as defined under the Texas Education Code. Includes elementary and secondary schools. Does not include trade, vocational, or commercial schools.

- 8.1.45 Sidewalk – A paved area behind the curb intended for the use of pedestrians and/or bicyclists.
- 8.1.46 Sight Distance – The distance visible to the driver of a passenger vehicle measured along the normal travel path of a roadway from a designated location and to a specified height above the roadway when the view is unobstructed by traffic.
- 8.1.47 Site Development Permit – A permit that is required when public improvements are proposed with a development. A Site Development Permit may also be required for site improvements for commercial developments that are not included under a commercial building permit.
- 8.1.48 Storage Length – The portion of a turn lane required to store the number of vehicles expected to accumulate in the lane during an average peak period.
- 8.1.49 Time of Concentration – The estimated time required for runoff to flow from the most hydraulically remote point of the drainage area to the point at which the flow is to be determined. Hydraulically remote refers to the travel path with the longest flow travel time, not necessarily the longest linear distance.
- 8.1.50 Utility Easement – An easement for the use of any City owned and/or maintained utility, including storm, water, sewer, fiber optic, etc. The utility and appurtenances may be located above and/or below ground.
- 8.1.51 Watershed – The area contributing stormwater runoff to a stream or drainage system. Also known as drainage area, drainage basin, and catchment area.

8.2 Abbreviations

% – Percent.

' – Foot or feet.

" – Inch or inches.

A – Major arterial.

AASHTO – American Association of State Highway and Transportation Officials.

ACI – American Concrete Institute.

ADA – Americans with Disabilities Act.

ADAAG – Americans with Disabilities Act Accessibility Guidelines.

ASCE – American Society of Civil Engineers.

ASTM – American Society for Testing and Materials.

AWWA – American Water Works Association.

B – Minor arterial.

b-b – Back of curb to back of curb distance.

BFE – Base Flood Elevation.

BMP – Best Management Practice.

C – Collector or Runoff Coefficient (depending on context).

CFR – Code of Federal Regulations.



cfs – Cubic feet per second.

CLOMR – Conditional Letter of Map Revision.

CSS – Concrete stabilized sand.

D – Minor Collector.

EGL – Energy grade line.

EPA – Environmental Protection Agency.

ETJ – Extraterritorial Jurisdiction.

FDC – Fire Department Connection.

FEMA – Federal Emergency Management Agency.

f-f – Face of curb to face of curb distance.

FFE – Finished Floor Elevation.

FHWA – Federal Highway Administration.

FIRM – Federal Insurance Rate Map.

FIS – Flood Insurance Study.

fps – Feet per second.

gpcd – Gallons per capita per day.

GPS – Global Positioning System.

H – Horizontal or Height (depending on context).

HDPE – High Density Polyethylene.

HEC-HMS – Hydrologic Engineering Center Hydrologic Modeling System.

HEC-RAS – Hydrologic Engineering Center River Analysis System.

HGL – Hydraulic grade line.

I.D. – Inside Diameter.

IFC – International Fire Code.

ILSN – Illuminated Street Name Sign.

in – Inch.

iSWM – Integrated Stormwater Management.

ITE – Institute of Transportation Engineers.

L – Length.

lbs – Pound or pounds.

LED – Light-emitting diode.

LF – Linear Feet.

LI – Licensed Irrigator.

LOMR – Letter of Map Revision.

LOS – Level of Service.

Max – Maximum.



MGD – Million gallons per day.

Min – Minimum or Minutes (depending on context).

mph – Miles per hour.

NCHRP – National Cooperative Highway Research Program.

NCTCOG – North Central Texas Council of Governments.

NFIP – National Flood Insurance Program.

NOI – Notice of Intent.

NOT – Notice of Termination.

NRCS – National Resources Conservation Service (formerly SCS).

OSHA – Occupational Safety and Health Administration.

OSSF – On-site sewage facilities.

P.E. – Professional Engineer.

PC – Point of curvature.

PI – Plasticity Index or Point of intersection (depending on context).

ppm – Parts per million.

PROWAG – Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way.

psi – Pounds per square inch.

PT – Point of tangency.

PVC – Polyvinyl Chloride.

PVI – Point of Vertical Intersection.

PVR – Potential Vertical Rise.

QL – Quality Level.

RCP – Reinforced concrete pipe.

ROW – Right-of-Way.

SCADA – Supervisory Control and Data Acquisition.

SCS – Soil Conservation Service.

SD – Sight Distance.

SFHA – Special Flood Hazard Area.

SUE – Subsurface Utility Engineering.

SWPPP – Stormwater Pollution Prevention Plan.

TAC – Texas Administrative Code.

TAS – Texas Accessibility Standards.

TBPE – Texas Board of Professional Engineers.

TC – Time of Concentration.

TCEQ – Texas Commission on Environmental Quality.

TDLR – Texas Department of Licensing and Regulation.



ENGINEERING DESIGN AND CONSTRUCTION MANUAL

TIA – Traffic Impact Analysis.

TMP – Traffic Management Plan.

TMUTCD – Texas Manual on Uniform Traffic Control Devices.

TRB – Transportation Research Board.

TSM – Transportation System Management.

TxDOT – Texas Department of Transportation.

U.S. – United States.

USACE – United States Army Corps of Engineers.

V – Vertical, Velocity, or Volume (depending on context).

WinPAS – Windows Pavement Analysis Software.



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SECTION 9 APPENDICES



APPENDIX A CITY CHECKLISTS

Item No.	WEATHERFORD 1858 TRUE TEXAS	GENERAL PROJECT COMPLETENESS CHECKLIST		
		Provided By Applicant	Not Required	Comments
1	ENGINEERING DOCUMENTS			
2	List of Approved Waivers from City Ordinances and/or Design Criteria			
3	List of Requested Waivers from City Ordinances and/or Design Criteria That Have Not Been Granted			
4	Memo Describing How the Project Meets the Complete Streets Policy			
5	Documentation Indicating Existing Fire Flows			
6	Response Letter to Comments on Previous Submittal			
7	Site Development Construction Plans			
8	Anticipated Trips per Day Generated by the Development			
9	Traffic Impact Analysis (TIA)			
10	Geotechnical Report			
11	Downstream Drainage Assessment Report			
12	Flood Study			
13	Groundwater Availability Report			
14	SITE DEVELOPMENT PERMIT			
15	Permit Application and Fee			
16	Approved Preliminary Plat			
16	Approved Engineering Documents			
17	Approved Tree Preservation Plan			
17	Paper Copies of Approved Plans as Required by the City			
18	Copies of Executed Contract for Construction of all Public Improvements and 4% Inspection Fee			
19	Hold a Pre-construction Conference			
20	GRADING PERMIT			
21	Permit Application and Fee			
22	Approved Preliminary Plat			
23	Approved Grading Plan			
24	Approved Drainage Plan			
25	Approved Tree Preservation Plan			
26	Approved Erosion Control Plan			
27	Paper Copies of Approved Plans as Required by the City			
28	Copies of Executed Contract for Construction of all Public Improvements and 4% Inspection Fee			
29	Hold a Pre-construction Conference			
30	ACCEPTANCE OF PUBLIC FACILITIES			
31	Complete Improvements in Accordance with Approved Engineering Documents			
32	Submit Maintenance Bond			
33	Submit Record Drawings			
REFERENCES	WMC-City of Weatherford Municipal Code			
	EDCM-Engineering Design and Construction Manual			

- See following sheet for procedure and applicant signature (to be submitted with checklist)
- Attach additional pages for additional comments as necessary.



ENGINEERING PROJECT COMPLETENESS CHECKLIST

In order to complete the review of engineering documents required for development, all necessary information must be submitted to the Department of Development and Neighborhood Services. The enclosed checklist includes typical engineering documents necessary for development. Below is a brief description of each item that is typically required for engineering review. Please refer to the appropriate Ordinance and design criteria for additional information.

After the applicant has reviewed the City's Ordinances and design criteria, the enclosed checklist shall be completed and submitted with appropriate permit application. Each item on the check list shall be acknowledge as provided by the applicant or not required. If an item is acknowledged as not required, a comment shall be provided stating why the item is not required.

When the application and checklist is received by the Department of Development and Neighborhood Services, City staff will perform a completeness review of the application within ten (10) business days. If City staff determines that any required item is missing, the application will be determined to be incomplete and returned to the applicant.

Acknowledgement Statement: I hereby certify that I have read and examined this document and know the same to be true and correct. I acknowledge and certify that I have reviewed the appropriate City Ordinances and design criteria and completed the enclosed checklist. All provisions of laws and ordinances governing this type of work will be complied with whether specified herein or not. The completion of this checklist does not presume to give authority to violate or cancel the provisions of any other state or local law, ordinance, or regulation. The issuance of a permit neither exempts nor modifies any covenants, deed restrictions, city ordinances and/or state or federal laws, whether herein specified or not.

Printed Applicant Name: _____

Applicant Signature: _____ Date: _____

Description of Typical Engineering Documents

1. List of Approved Waivers from City Ordinances and/or Design Criteria

A concise list of waivers from Ordinance and/or design criteria requirements that have been granted, including references to Ordinance or design criteria sections and the body or staff that authorized the approval.

2. List of Requested Waivers from City Ordinances and/or Design Criteria

A concise list of additional waivers from Ordinance and/or design criteria requirements that are requested that have not been granted, including references to Ordinance or design criteria sections.

3. Memo Describing How the Project Meets the Complete Streets Policy

A brief report documenting how the project meets the requirements and intent of the City's Complete Streets Policy.

4. Documentation Indicating Existing Fire Flows

A report or memo that includes information regarding the existing fire flows that will be provided with the existing water system in the area. If there are deficiencies with regard to meeting the required fire flow, the engineer shall document what is required to correct those deficiencies.

5. Response Letter to Comments on Previous Submittal

A letter or memo providing a response to each comment provided on the previous submittal. If a comment was not addressed, the engineer or applicant shall provide justification as to why the comment was not addressed.

6. Site Development Construction Plans

A complete set of plans prepared by a professional engineer, licensed in the State of Texas, for the construction of public and/or private site improvements. The plans shall meet the requirements of the City of Weatherford Technical Construction Standards and Specifications (TCSS).

7. Anticipated Trips Per Day Generated by the Development

Daily trips that are anticipated to be generated by the development as determined by using the Institute of Transportation Engineers (ITE) manual or other method approved by the City Engineer.

8. Traffic Impact Analysis (TIA)

A report documenting the impacts to the City's roadway system due to the increased traffic from the proposed development. A TIA is required for developments that include 50 or more dwelling units or generate more than 500 trips per day. Refer to the City's Subdivision Ordinance and TCSS for more information. The report shall be prepared by a professional engineer licensed in the State of Texas.

9. Geotechnical Report

A report that documents the conditions of the soil within the development and provides recommendations for retaining wall design, street pavement and subgrade preparation. This report may be deferred until after the site is graded to provide additional analysis of the proposed conditions. The report shall be prepared by a professional engineer licensed in the State of Texas.

10. Downstream Drainage Assessment Report

A report that documents the drainage impacts due to increased storm water runoff caused by a development. This report is required for any development that proposes 5,000 or more square feet of additional impervious surfaces. Refer to the City's Stormwater Design Criteria Manual for more information. The report shall be prepared by a professional engineer licensed in the State of Texas.

11. Flood Study

A report that documents the impacts to special flood hazard areas (SFHA) as determined by the Federal Emergency Management Agency (FEMA), within and/or adjacent to the development. Refer to the City's Stormwater Design Criteria Manual and Title 13-Flood Damage Prevention of the City's Municipal Code for more information. The report shall be prepared by a professional engineer licensed in the State of Texas.

12. Groundwater Availability Report

A report that documents the availability of groundwater for developments not served by surface water systems. This report is required for developments that propose ten or more lots to be served by individual wells, commercial wells or community wells. The report shall be prepared by a professional engineer licensed in the State of Texas.

Item No.	COVER SHEET			
	Provided By Applicant	Not Required	Comments	City Staff Concurrence
0.01	Project Name			
0.02	Type of Project			
0.03	Plan Preparation Date (Month and Year)			
0.04	Sheet Index			
0.05	Location Map			
0.06	Consultant Engineer Company Name			
0.07	Consultant Engineer Address			
0.08	Consultant Engineer Phone Number			
0.09	Design Engineer's Seal or Preliminary Statement			
0.10	Developer Company Name			
0.11	Developer Address			
0.12	Developer Phone Number			
0.13	Developer Point of Contact Name			
Item No.	PLAT			
	Provided By Applicant	Not Required	Comments	City Staff Concurrence
1.01	Approved Preliminary or Final Plat			
Item No.	GENERAL NOTES			
	Provided By Applicant	Not Required	Comments	City Staff Concurrence
2.01	Design Engineer's Seal or Preliminary Statement			
2.02	City of Weatherford General Notes for Public Street and Right of Way			
2.03	City of Weatherford General Notes for Public Utility Improvements			
2.04	City of Weatherford General Notes for Erosion Control			
Item No.	DIMENSION CONTROL PLAN (COMMERCIAL DEVELOPMENTS)			
	Provided By Applicant	Not Required	Comments	City Staff Concurrence
3.01	Design Engineer's Seal or Preliminary Statement			
3.02	North arrow			
3.03	Written scale			
3.04	Graphic scale			
3.05	Control points/benchmarks with labels identifying type, northing, easting and elevation (minimum of two per project, no further than 500 feet apart)			

3.06	Location of existing improvements: Curb and gutter, pavement, sidewalks and driveways, storm sewers, inlets, manholes, culverts, streetlight and traffic equipment, fences, utility lines and structures, water meters, power poles and guy wires, etc.			
3.07	Existing and proposed property boundaries			
3.08	Existing and proposed lot and block numbers			
3.09	Existing and proposed easements			
3.10	Proposed improvements (i.e. building footprint, parking stalls, drive aisles, curbs, sidewalks, drive approaches, utilities, etc.) with dimensions indicated.			

GRADING

Item No.		Provided By Applicant	Not Required	Comments	City Staff Concurrence
4.01	Design Engineer's Seal or Preliminary Statement				
4.02	North arrow				
4.03	Written scale				
4.04	Graphic scale				
4.05	Control points/benchmarks with labels identifying type, northing, easting and elevation (minimum of two per project, no further than 500 feet apart)				
4.06	Location of existing improvements: Curb and gutter, pavement, sidewalks and driveways, storm sewers, inlets, manholes, culverts, streetlight and traffic equipment, fences, utility lines and structures, water meters, power poles and guy wires, etc.				
4.07	Existing and proposed property boundaries				
4.08	Existing and proposed lot and block numbers				
4.09	Existing and proposed easements				
4.10	Existing contours as dashed, lighter weight lines				
4.11	Proposed contours				
4.12	Proposed finished pad elevations				
4.13	Existing and proposed storm drainage structures				
4.14	Proposed elevations of storm drain inlets tops				
4.15	Retaining walls with top of wall and bottom of wall elevations				
4.16	Structural design prepared by a professional engineer licensed in the State of Texas for retaining walls that will support a surcharge load and/or retaining walls greater than 4' in height, as measured from the bottom of the footer to the top of the wall.				
4.17	Limits of 100 year floodplain, wetlands and waters of the U.S.				

STREET IMPROVEMENTS

Item No.		Provided By Applicant	Not Required	Comments	City Staff Concurrence
5.01	PLAN				
5.02	Design Engineer's Seal or Preliminary Statement				
5.03	North arrow				

5.04	Written scale			
5.05	Graphic scale			
5.06	Control points/benchmarks with labels identifying type, northing, easting and elevation (minimum of two per project, no further than 500 feet apart)			
5.07	Existing and proposed property boundaries			
5.08	Existing and proposed lot and block numbers			
5.09	Existing and proposed easements			
5.10	Location of existing improvements: Curb and gutter, pavement, sidewalks and driveways, storm sewers, inlets, manholes, culverts, streetlight and traffic equipment, fences, utility lines and structures, water meters, power poles and guy wires, etc.			
5.11	Labels identifying street names			
5.12	Proposed right of way limits with labels identifying the width			
5.13	Proposed sidewalk paving limits with labels identifying the width			
5.14	Proposed street paving limits with labels identifying the width			
5.15	Street centerline with station labels (negative stations shall be avoided) at 100-foot intervals			
5.16	Labels identifying the angle of street centerline intersections			
5.17	Centerline labels identifying station, northing and easting of beginning, end, points of curvature (PC), points of tangency (PT), points of reverse curvature (PRC), points of compound curvature (PCC), points of intersection (PI), bearings and distances of straight segments, and length of radii, arch length, chord bearings and chord distances of curved segments			
5.18	Labels identifying centerline station, offset from centerline, elevation, northing and easting of points of curvature (PC), points of reverse curvature (PRC), points of intersection (PI) and lengths of radii for locations of the back of curb or edge of pavement			
5.19	Station equations at street centerline intersections			
5.20	Labels identifying the station, offset and top of curb elevations of curb inlets			
5.21	Valley gutters with flow direction identified			
5.22	Arrows identifying direction of flow at street intersections			
5.23	Handicap ramps			
5.24	Existing and proposed storm drainage structures			
5.25	Barricades at dead end streets			
5.26	PROFILE			
5.27	Written scale (horizontal and vertical, horizontal scale shall be consistent with plan)			
5.28	Existing and proposed utilities			
5.29	Station labels (negative stations shall be avoided)			
5.30	Profile identifying the elevation of top of curb (if curbs are not required, profile shall identify elevation of edge of pavement)			
5.31	Profiles of existing conditions at street centerline and the right and left right of way lines with appropriate labels			

5.32	Profile labels identifying slopes of all street grades			
5.33	Profile labels identifying station and elevation of points of vertical curvature (PVC), points of vertical tangency (PVT), points of reverse vertical curvature (PRVC), points of compound vertical curvature (PCVC), and points of vertical intersection (PVI)			
5.34	Profile labels identifying vertical curve information including PVI station and elevation, low or high point station and elevation, curve lengths and K values			
5.35	Profile labels identifying station and elevation of the PI and PC of right and left curb returns			
5.36	Labels identifying top of curb elevations at intervals of fifty feet			

Item No.	 WEATHERFORD <small>TRUE TEXAS</small>	PAVING PLAN (FOR COMMERCIAL DEVELOPMENTS)		
		Provided By Applicant	Not Required	Comments
6.01	Design Engineer's Seal or Preliminary Statement			
6.02	North arrow			
6.03	Written scale			
6.04	Graphic scale			
6.05	Control points/benchmarks with labels identifying type, northing, easting and elevation (minimum of two per project, no further than 500 feet apart)			
6.06	Existing and proposed property boundaries			
6.07	Location of existing improvements: Curb and gutter, pavement, sidewalks and driveways, storm sewers, inlets, manholes, culverts, streetlight and traffic equipment, fences, utility lines and structures, water meters, power poles and guy wires, etc.			
6.08	Proposed pavement limits for parking areas, drive aisles, drive approaches, sidewalks with pavement materials indicated			
6.09	Proposed methods of controlling traffic (i.e. curbs, wheel stops, etc.)			

Item No.	 WEATHERFORD <small>TRUE TEXAS</small>	EXISTING DRAINAGE AREA MAP		
		Provided By Applicant	Not Required	Comments
7.01	Design Engineer's Seal or Preliminary Statement			
7.02	North arrow			
7.03	Written scale			
7.04	Graphic scale			
7.05	Control points/benchmarks with labels identifying type, northing, easting and elevation (minimum of two per project, no further than 500 feet apart)			
7.06	Existing property boundaries			

7.07	Location of existing improvements: Curb and gutter, pavement, sidewalks and driveways, storm sewers, inlets, manholes, culverts, streetlight and traffic equipment, fences, utility lines and structures, water meters, power poles and guy wires, etc.				
7.08	Existing contours as dashed, lighter weight lines				
7.09	Labels identifying street names				
7.10	Existing drainage areas				
7.11	Labels identifying name and area (acres) of drainage areas				
7.12	Existing hydrologic calculations for each drainage area				

PROPOSED DRAINAGE AREA MAP

Item No.	Comments	Provided By Applicant	Not Required	City Staff Concurrence
8.01	Design Engineer's Seal or Preliminary Statement			
8.02	North arrow			
8.03	Written scale			
8.04	Graphic scale			
8.05	Control points/benchmarks with labels identifying type, northing, easting and elevation (minimum of two per project, no further than 500 feet apart)			
8.06	Existing and proposed property boundaries			
8.07	Existing and proposed lot and block numbers			
8.08	Location of existing improvements: Curb and gutter, pavement, sidewalks and driveways, storm sewers, inlets, manholes, culverts, streetlight and traffic equipment, fences, utility lines and structures, water meters, power poles and guy wires, etc.			
8.09	Existing contours as dashed, lighter weight lines			
8.10	Proposed contours			
8.11	Proposed streets			
8.12	Labels identifying street names			
8.13	Proposed drainage areas			
8.14	Labels identifying name and area (acres) of drainage areas			
8.15	Proposed hydrologic calculations for each drainage area			
8.16	Proposed drainage structures			

DRAINAGE IMPROVEMENTS

Item No.	Comments	Provided By Applicant	Not Required	City Staff Concurrence
9.01	PLAN			
9.02	Design Engineer's Seal or Preliminary Statement			
9.03	North arrow			
9.04	Written scale			
9.05	Graphic scale			
9.06	Control points/benchmarks with labels identifying type, northing, easting and elevation (minimum of two per project, no further than 500 feet apart)			

9.07	Existing and proposed property boundaries			
9.08	Existing and proposed lot and block numbers			
9.09	Existing and proposed easements			
9.10	Location of existing improvements: Curb and gutter, pavement, sidewalks and driveways, storm sewers, inlets, manholes, culverts, streetlight and traffic equipment, fences, utility lines and structures, water meters, power poles and guy wires, etc.			
9.11	Location of proposed improvements: Curb and gutter, pavement, sidewalks and driveways, storm sewers, inlets, manholes, culverts, streetlight and traffic equipment, fences, utility lines and structures, water meters, power poles and guy wires, etc.			
9.12	Labels identifying street names			
9.13	Labels differentiating storm drains (Storm Drain A, Storm Drain B, etc.)			
9.14	Centerline of storm drains with station labels (negative stations shall be avoided) at 100-foot intervals			
9.15	Centerline labels identifying station, northing and easting of beginning, end, points of curvature (PC), points of tangency (PT), points of reverse curvature (PRC), points of compound curvature (PCC), points of intersection (PI), bearings and distances of straight segments, and length of radii, arch length, chord bearings and chord distances of curved segments			
9.16	Labels identifying centerline station, offset from centerline, type, northing and easting of structures			
9.17	Labels identifying pipe size and material			
9.18	Station equations at centerline intersections			
9.19	PROFILE			
9.20	Written scale (horizontal and vertical, horizontal scale shall be consistent with plan)			
9.21	Existing and proposed utilities			
9.22	Station labels (negative stations shall be avoided)			
9.23	Profile of the storm drain pipe and structures			
9.24	Profiles of ground at the storm drain centerline			
9.25	Profile labels identifying station and elevation of points of vertical curvature (PVC), points of vertical tangency (PVT), points of reverse vertical curvature (PRVC), points of compound vertical curvature (PCVC), and points of vertical intersection (PVI)			
9.26	Profile labels identifying pipe size and material			
9.27	Profile labels identifying design flow (cfs), velocity (f/s), and flow capacity (cfs)			
9.28	Profile labels identifying the vertical distances between the proposed pipes and existing utilities.			
9.29	Limits and labels for encasement material, as necessary			
9.30	Design hydraulic grade line			
9.31	Labels identifying flow line elevations at intervals of fifty feet			

Item No.	1858 WEATHERFORD TRUE TEXAS	DRAINAGE CALCULATIONS		
		Provided By Applicant	Not Required	Comments
City Staff	Concurrence			
10.01	Design Engineer's Seal or Preliminary Statement			
10.02	Street capacity calculations			
10.03	Inlet capacity calculations for appropriate design storm events			
10.04	Calculations for each storm drain section that include flow rate, velocity, friction slope, hydraulic grade line elevations, minor headlosses, etc.			
Item No.	1858 WEATHERFORD TRUE TEXAS	STORM WATER STORAGE FACILITIES		
		Provided By Applicant	Not Required	Comments
City Staff	Concurrence			
11.01	Design Engineer's Seal or Preliminary Statement			
11.02	Calculations determining the required storage			
11.03	Stage-storage curve			
11.04	Outlet flow calculations			
11.05	Outlet and outfall detail			
11.06	Emergency spillway design			
11.07	Plan showing grading of detention pond			
11.08	Documentation of water surface elevations			
Item No.	1858 WEATHERFORD TRUE TEXAS	WATER IMPROVEMENTS		
		Provided By Applicant	Not Required	Comments
City Staff	Concurrence			
12	PLAN			
12.02	Design Engineer's Seal or Preliminary Statement			
12.03	North arrow			
12.04	Written scale			
12.05	Graphic scale			
12.06	Control points/benchmarks with labels identifying type, northing, easting and elevation (minimum of two per project, no further than 500 feet apart)			
12.07	Existing and proposed property boundaries			
12.08	Existing and proposed lot and block numbers			
12.09	Existing and proposed easements			
12.10	Location of existing improvements: Curb and gutter, pavement, sidewalks and driveways, storm sewers, inlets, manholes, culverts, streetlight and traffic equipment, fences, utility lines and structures, water meters, power poles and guy wires, etc.			
12.11	Location of proposed improvements: Curb and gutter, pavement, sidewalks and driveways, storm sewers, inlets, manholes, culverts, streetlight and traffic equipment, fences, utility lines and structures, water meters, power poles and guy wires, etc.			
12.12	Labels identifying street names			

12.13	Labels differentiating water lines (Water Line A, Water Line B, etc.)			
12.14	Water pipe centerline with station labels (negative stations shall be avoided) at 100-foot intervals			
12.15	Centerline labels identifying station, northing and easting of beginning, end, points of curvature (PC), points of tangency (PT), points of reverse curvature (PRC), points of compound curvature (PCC), points of intersection (PI), bearings and distances of straight segments, and length of radii, arch length, chord bearings and chord distances of curved segments			
12.16	Labels identifying centerline station, offset from centerline, type, northing and easting of structures and appurtenances			
12.17	Station equations at centerline intersections			
12.18	PROFILE (12" and larger)			
12.19	Written scale (horizontal and vertical, horizontal scale shall be consistent with plan)			
12.20	Existing and proposed utilities including storm drains			
12.21	Station labels (negative stations shall be avoided)			
12.22	Profile of the water pipe and appertanances			
12.23	Existing and proposed profile of ground at the water pipe centerline			
12.24	Profile labels identifying station and elevation of points of vertical curvature (PVC), points of vertical tangency (PVT), points of reverse vertical curvature (PRVC), points of compound vertical curvature (PCVC), and points of vertical intersection (PVI). Elevations shall indicate top of pipe.			
12.25	Profile labels identifying pipe size, material and slope			
12.26	Labels identifying top of pipe elevations at intervals of fifty feet			
12.27	Profile labels identifying the vertical distances between the proposed pipes and existing utilities.			
12.28	Limits and labels for encasement material, as necessary			

Item No.	WASTEWATER IMPROVEMENTS		
	Provided By Applicant	Not Required	Comments
Item No.	Provided By Applicant	Not Required	Comments
13.01	PLAN		
13.02	Design Engineer's Seal or Preliminary Statement		
13.03	North arrow		
13.04	Written scale		
13.05	Graphic scale		
13.06	Control points/benchmarks with labels identifying type, northing, easting and elevation (minimum of two per project, no further than 500 feet apart)		
13.07	Existing and proposed property boundaries		
13.08	Existing and proposed lot and block numbers		
13.09	Existing and proposed easements		

13.10	Location of existing improvements: Curb and gutter, pavement, sidewalks and driveways, storm sewers, inlets, manholes, culverts, streetlight and traffic equipment, fences, utility lines and structures, water meters, power poles and guy wires, etc.			
13.11	Location of proposed improvements: Curb and gutter, pavement, sidewalks and driveways, storm sewers, inlets, manholes, culverts, streetlight and traffic equipment, fences, utility lines and structures, water meters, power poles and guy wires, etc.			
13.12	Labels identifying street names			
13.13	Labels differentiating wastewater lines (Wastewater Line A, Wastewater Line B, etc.)			
13.14	Wastewater centerline with station labels (negative stations shall be avoided) at 100-foot intervals			
13.15	Centerline labels identifying station, northing and easting of beginning, end, points of curvature (PC), points of tangency (PT), points of reverse curvature (PRC), points of compound curvature (PCC), points of intersection (PI), bearings and distances of straight segments, and length of radii, arch length, chord bearings and chord distances of curved segments			
13.16	Labels identifying centerline station, offset from centerline, type, northing and easting of structures and appurtenances			
13.17	Station equations at centerline intersections			
13.18	Pressure system design (if necessary)			
13.19	Lift station design (if necessary)			
13.20	PROFILE			
13.21	Written scale (horizontal and vertical, horizontal scale shall be consistent with plan)			
13.22	Existing and proposed utilities including storm drains			
13.23	Station labels (negative stations shall be avoided)			
13.24	Profile of the wastewater pipe and structures			
13.25	Profiles of existing and proposed ground at the wastewater pipe centerline			
13.26	Profile labels identifying station and elevation of points of vertical curvature (PVC), points of vertical tangency (PVT), points of reverse vertical curvature (PRVC), points of compound vertical curvature (PCVC), and points of vertical intersection (PVI). Elevations shall indicate flow line of pipe			
13.27	Profile labels identifying pipe size and material			
13.28	Profile labels identifying design flow (cfs), velocity (f/s), and flow capacity (cfs)			
13.29	Labels identifying flow line elevations at intervals of fifty feet			
13.30	Profile labels identifying the vertical distances between the proposed pipes and existing utilities.			
13.31	Limits and labels for encasement material, as necessary			

Item No.	WEATHERFORD TRUE TEXAS	EROSION CONTROL PLAN			
		Provided By Applicant	Not Required	Comments	City Staff Concurrence
14.01	Design Engineer's Seal or Preliminary Statement				
14.02	North arrow				
14	Written scale				
14	Graphic scale				
14.1	Control points/benchmarks with labels identifying type, northing, easting and elevation (minimum of two per project, no further than 500 feet apart)				
14.1	Existing and proposed property boundaries				
14.1	Proposed location of construction exit/entrance				
14.1	Proposed location and type of sediment barriers				
14.1	Additional erosion control measures as necessary				
Item No.	WEATHERFORD TRUE TEXAS	STANDARD CONSTRUCTION DETAILS			
		Provided By Applicant	Not Required	Comments	City Staff Concurrence
15	All applicable City details				
15	Additional details necessary for construction				



APPENDIX B GENERAL NOTES

GENERAL CONSTRUCTION NOTES FOR PUBLIC STREETS AND RIGHT-OF-WAY

1. ALL CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH CITY OF WEATHERFORD STANDARD SPECIFICATIONS AND THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS (NCTCOG) STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 5TH EDITION. HEADWALLS AND WING WALLS SHALL BE CONSTRUCTED PER TXDOT DETAILS AND SPECIFICATIONS UNLESS SHOWN OTHERWISE ON THE APPROVED PLANS. IN THE EVENT OF DISCREPANCIES BETWEEN DETAILS, THE CITY OF WEATHERFORD SPECIFICATIONS WILL GOVERN.
2. ALL CONSTRUCTION WITHIN THE CITY OF WEATHERFORD RIGHT-OF-WAY (R.O.W.) SHALL BE IN ACCORDANCE WITH CITY'S ROW MANAGEMENT ORDINANCE 857-2017-41 UPDATED AUGUST 22, 2017. A R.O.W. CONSTRUCTION PERMIT SHALL BE OBTAINED PRIOR TO ANY CONSTRUCTION WORK ON EXISTING AND FUTURE CITY R.O.W.
3. ALL TRENCH BACKFILL UNDER PROPOSED AND FUTURE PAVING AREAS SHALL BE GRANULAR MATERIAL HAVING A PLASTICITY INDEX NOT GREATER THAN 12 (SEE NCTCOG ITEM 504.2.2.2). TRENCH BACKFILL OUTSIDE PAVING AREAS SHALL BE TYPE "B" BACKFILL (SEE NCTCOG ITEM 504.2.3.3). ALL TRENCH BACKFILL WITHIN R.O.W. SHALL BE PLACED IN 8" LOOSE LIFTS AND MECHANICALLY COMPACTED TO 95% STANDARD PROCTOR DENSITY. COMPACTION DENSITY TESTS SHALL BE TAKEN EVERY 200 LINEAR FEET OF TRENCH PER LIFT AND AT CROSSINGS DESIGNATED BY CONSTRUCTION INSPECTOR. BACKFILL MATERIAL PROCTORS MAY BE REQUIRED BY CONSTRUCTION INSPECTOR PRIOR TO BACKFILLING TRENCH FOR COMPLIANCE WITH SPECIFICATION. A COPY OF TRENCH COMPACTION TEST REPORTS SHALL BE SUBMITTED TO CITY PRIOR TO FINAL ACCEPTANCE OF PROJECT OR DEVELOPMENT.
4. TRENCH EXCAVATIONS WITH A DEPTH OF 5 FEET OR MORE SHALL HAVE APPROPRIATE SHEETING, SHORING, AND BRACING PER OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARDS. THE CONTRACTOR SHALL ABIDE BY ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS GOVERNING EXCAVATION. TRENCH SIDE SLOPES SHALL MEET (OSHA) STANDARDS THAT ARE IN EFFECT AT THE TIME OF CONSTRUCTION.
5. A PRE-PAVING MEETING SHALL BE CONDUCTED PRIOR TO ANY STREET CONSTRUCTION. PLEASE CONTACT TRANSPORTATION AND PUBLIC WORKS DEPARTMENT TO SCHEDULE MEETING. PAVING SPECIFICATIONS AND DETAILS FOR ASPHALT OR CONCRETE PLACEMENT SHALL BE COORDINATED WITH CITY CONSTRUCTION INSPECTOR OR DIRECTOR OF TRANSPORTATION AND PUBLIC WORKS.
6. A GEOTECHNICAL STUDY AND REPORT SHALL BE PERFORMED AND SUBMITTED TO THE CITY OF WEATHERFORD FOR REVIEW AND APPROVAL. PLEASE REFER TO CITY OF WEATHERFORD TPW TRANSPORTATION MANUAL SECTION 6 FOR GEOTECHNICAL CONSIDERATIONS AND PAVEMENT DESIGN REQUIREMENTS. THE PAVEMENT DESIGN AND SUBGRADE SHALL BE CONSTRUCTED PER GEOTECHNICAL STUDY RECOMMENDATIONS SO LONG AS IT MEETS CITY'S MINIMUM STANDARDS. THE DIRECTOR OF TRANSPORTATION AND PUBLIC WORKS MAY REQUIRE A PAVEMENT AND SUBGRADE DESIGN THAT EXCEEDS THE CITY'S MINIMUM REQUIREMENTS OR THE GEOTECHNICAL REPORT RECOMMENDATIONS BASED ON EXISTING FIELD CONDITIONS.
7. FINAL STREET SUBBASE AND SUBGRADE IS TO BE COMPACTED TO A 95% STANDARD PROCTOR DENSITY. OWNER/DEVELOPER IS REQUIRED TO APPOINT AN APPROVED LAB FOR SOIL TESTING. ONE COMPACTION TEST IS REQUIRED FOR EVERY 200 LINEAR FEET ON STREET LOCATIONS DESIGNATED BY CONSTRUCTION INSPECTOR. THE



ENGINEERING DESIGN AND CONSTRUCTION MANUAL

LABORATORY AGENCY SHALL SEND COPIES OF ALL COMPACTION REPORTS TO THE CITY FOR VERIFICATION AND COMPLIANCE WITH CITY OF WEATHERFORD STANDARDS AND SPECIFICATIONS. NO STREET PAVING SHALL COMMENCE UNTIL FINAL STREET SUBBASE OR SUBGRADE HAS PASSED COMPACTION TEST AND APPROVED BY CONSTRUCTION INSPECTOR.

8. CONCRETE COMPRESSIVE STRENGTH REPORTS ARE REQUIRED FOR EVERY 150 CUBIC YARDS OF CONCRETE PLACED. FOR CONCRETE POURS EXTENDING OVER MULTIPLE DAYS, EACH DAY WILL BE CONSIDERED A SEPARATE POUR. CONTRACTOR/OWNER SHALL SUBMIT BATCH DESIGNS FOR CONCRETE FOR REVIEW AND APPROVAL BY THE CITY PRIOR TO ANY PLACEMENT FOR ANY PUBLICLY DEDICATED INFRASTRUCTURE. CONTRACTOR SHALL HAVE AN APPROVED CONCRETE MIX DESIGN FOR CONCRETE PLACEMENT ON PROJECT/DEVELOPMENT. ALL TESTING SHALL BE IN ACCORDANCE WITH NCTCOG SPECIFICATIONS AND AMERICAN CONCRETE INSTITUTE (ACI).
9. WHEN ADDING FILL TO AN AREA, THE GROUND SURFACE SHALL BE PREPARED TO RECEIVE FILL BY REMOVING VEGETATION, TOPSOIL AND OTHER UNSUITABLE MATERIAL, AND SCARIFYING THE GROUND TO PROVIDE A BOND WITH THE FILL MATERIAL. WHERE EXISTING GRADE IS AT A SLOPE STEEPER THAN 5 HORIZONTAL TO 1 VERTICAL (20%) AND THE DEPTH OF FILL EXCEEDS 5 FEET, BENCHING SHALL BE PROVIDED IN ACCORDANCE WITH FIGURE J107.3 OF THE 2003 INTERNATIONAL BUILDING CODE. A KEY SHALL BE PROVIDED WHICH IS AT LEAST 10 FEET IN WIDTH AND 2 FEET IN DEPTH. FILL MATERIAL SHALL NOT INCLUDE ORGANIC, FROZEN OR OTHER DELETERIOUS MATERIALS. NO ROCK OR SIMILAR IRREDUCIBLE MATERIAL GREATER THAN 6 INCHES IN ANY DIMENSION SHALL BE INCLUDED IN FILLS. ALL FILL MATERIAL SHALL BE COMPACTED TO 95% OF MAXIMUM DENSITY AS DETERMINED BY ASTM D1557, MODIFIED PROCTOR, IN LIFTS NOT EXCEEDING 12 INCHES IN DEPTH. THE FILL MATERIAL SHALL HAVE A PLASTICITY INDEX OF 15 OR LESS. COMPACTION TEST AT EVERY 200 LINEAR FEET AT LOCATIONS DIRECTED BY CONSTRUCTION INSPECTOR. THE SLOPE OF FILL SURFACES SHALL BE NO STEEPER THAN IS SAFE FOR INTENDED USE. FILL SLOPES STEEPER THAN 3 HORIZONTAL TO 1 VERTICAL (33%) SHALL BE JUSTIFIED BY SOILS REPORTS OR ENGINEERING DATA.
10. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR/OWNER TO PROVIDE CONSTRUCTION STAKING OF PUBLIC IMPROVEMENTS CONSTRUCTED WITHIN THE R.O.W. OR CITY EASEMENT. CONSTRUCTION STAKING SHALL BE PLACED AT NO GREATER THAN 50 FOOT SPACING INTERVALS AND AT ALL PIs, PCs, PTs, PCCs, AND PRCs WITH APPROPRIATE OFFSETS AND REFERENCE POINTS (HUB OR NAIL). LATH STAKES SHALL BE 4 FEET IN HEIGHT LABELED WITH STATION, TOP OF CURB OR FLOW LINE ELEVATION, CUT OR FILL, AND OFFSET WITH APPROPRIATE FLAGGING. NO PUBLIC IMPROVEMENTS WILL BE INSPECTED WITHOUT CONSTRUCTION STAKING. STAKING SHALL BE PERFORMED BY OR UNDER THE DIRECTION OF A SURVEYOR LICENSED IN THE STATE OF TEXAS.
11. CONSTRUCTION FIELD CHANGES, IF ANY, SHALL BE NOTIFIED TO THE CONSTRUCTION INSPECTOR IN WRITING PRIOR TO ANY CHANGES. MAJOR FIELD CHANGES WILL BE ADDRESSED BY THE DIRECTOR OF TRANSPORTATION AND PUBLIC WORKS OR CITY ENGINEER OR REPRESENTATIVE. REVISED CONSTRUCTION PLANS MAY BE REQUIRED. ANY CONSTRUCTION WORK THAT IS NOT IN ACCORDANCE WITH THE APPROVED CONSTRUCTION PLANS IS SUBJECT TO NON-ACCEPTANCE BY CITY OF WEATHERFORD.
12. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM THE FOLLOWING:
 - A. PREVENT ANY PROPERTY DAMAGE TO ADJACENT PROPERTY OWNER'S POLES, FENCES, SHRUBS, MAILBOXES, ETC. ANY REPAIRS OF DAMAGES TO ADJACENT PROPERTY CAUSED BY THE CONTRACTOR SHALL BE AT THE CONTRACTOR'S SOLE



EXPENSE.

- B. PROVIDE ACCESS TO ALL ADJACENT PROPERTIES AT ALL TIMES.
- C. NOTIFY ALL UTILITY COMPANIES AND VERIFY LOCATION OF ALL UTILITIES PRIOR TO THE START OF CONSTRUCTION.
- D. ANY TREES, SHRUBS, OR GRASSED AREAS DAMAGED BY THE CONTRACTOR WORK SHALL BE REPLACED AT CONTRACTOR'S EXPENSE TO EXISTING OR BETTER CONDITION.
13. TRAFFIC CONTROL PLANS SHALL BE SUBMITTED WITH THE R.O.W. CONSTRUCTION PERMIT TO THE CITY OF WEATHERFORD TRANSPORTATION AND PUBLIC WORKS (TPW) DEPARTMENT. THE TRAFFIC CONTROL PLAN SHALL BE IN ACCORDANCE WITH THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TXMUTCD) AND/OR TXDOT TRAFFIC CONTROL PLAN TYPICAL SHEETS. TRAFFIC CONTROL PLANS SHALL BE SUBMITTED A MINIMUM OF TWO WEEKS IN ADVANCE OF THE WORK COMMENCING.
14. ALL COMMUNICATION BETWEEN THE CITY AND THE CONTRACTOR/DEVELOPER SHALL BE THROUGH THE CITY CONSTRUCTION INSPECTOR. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT THE APPROPRIATE DEPARTMENT FOR INSPECTIONS OF THE WORK BEING PERFORMED. CONTRACTOR SHALL NOTIFY CONSTRUCTION INSPECTOR AT LEAST 48 HOURS TO SCHEDULE INSPECTION.
15. THESE GENERAL NOTES SHALL BE INCLUDED WITHIN EACH APPROVED CONSTRUCTION PLANS AND SHALL BE SEALED AND SIGNED BY THE ENGINEER OF RECORD; THEREFORE, CERTIFYING THAT THESE NOTES HAVE NOT BEEN ALTERED AS RECEIVED FROM THE CITY OF WEATHERFORD.

PUBLIC UTILITY IMPROVEMENTS GENERAL NOTES

1. PRIOR TO ANY CONSTRUCTION, THE CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE CONSTRUCTION DOCUMENTS, THE PLANS INCLUDING ALL NOTES, THE CITY OF WEATHERFORD 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 FAMILIARIZE HIMSELF WITH ALL THE STANDARDS OR 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. THE CONTRACTOR SHALL HAVE IN HIS POSSESSION, PRIOR TO CONSTRUCTION, ALL NECESSARY PERMITS, LICENSES, ETC. THE CONTRACTOR SHALL HAVE AT LEAST ONE SET OF APPROVED ENGINEERING PLANS AND SPECIFICATIONS ON SITE AT ALL TIMES.
3. THE PROPOSED LINES AT TIMES WILL BE LAID IN CLOSE PROXIMITY TO OTHER EXISTING UTILITIES AND STRUCTURES BOTH ABOVE AND BELOW GROUND. THE CONTRACTOR SHALL MAKE NECESSARY PROVISIONS FOR THE SUPPORT AND PROTECTION OF ALL UTILITY POLES, FENCES, TREES, SHRUBS, GAS MAINS, TELEPHONE CABLES, POWER LINES, DRAINAGE PIPES, UTILITY SERVICES, AND ALL OTHER UTILITIES AND STRUCTURES BOTH ABOVE AND BELOW GROUND DURING CONSTRUCTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY ALL UTILITY OWNERS PRIOR TO ANY CONSTRUCTION IN THE AREA AND VERIFY THE ACTUAL LOCATION OF ALL BURIED UTILITIES THAT MAY OR MAY NOT BE SHOWN ON THE PLANS. THE CONTRACTOR SHALL PRESERVE AND PROTECT ALL UNDERGROUND



ENGINEERING DESIGN AND CONSTRUCTION MANUAL

AND OVERHEAD FACILITIES AND BE RESPONSIBLE FOR ANY DAMAGE CAUSED TO THEM.

4. THE CONTRACTOR SHALL VERIFY THE ELEVATION, CONFIGURATION, AND ANGULATIONS OF EXISTING LINES PRIOR TO CONSTRUCTION OF TIE-IN MATERIALS.
5. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO CITY OF WEATHERFORD SPECIFICATIONS, THE PROJECT DETAILS AND SPECIFICATIONS. IN THE EVENT THAT AN ITEM IS NOT COVERED IN THE CONTRACT DOCUMENTS, THE ENGINEER'S DECISION WILL APPLY.
6. TRENCH SAFETY DESIGN SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARATION, IMPLEMENTATION AND MAINTENANCE OF A TRAFFIC CONTROL PLAN. THE TYPES AND LOCATIONS OF THE TEMPORARY BARRICADES AND SIGNS USED DURING CONSTRUCTION SHALL CONFORM TO THE LATEST VERSION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
8. DRIVEWAYS SHALL REMAIN OPEN AT ALL TIMES. CONTRACTOR SHALL COORDINATE WITH PROPERTY OWNERS REGARDING ANY TEMPORARY DRIVEWAY CLOSINGS.
9. NO EXCAVATED MATERIALS, BACKFILL MATERIALS, EQUIPMENT, OR SUPPLIES SHALL BE STORED WITHIN FLOODWAYS, DRAINAGE EASEMENTS, OR TXDOT ROW.
10. ALL FENCES, DRIVEWAYS, MAILBOXES, LANDSCAPING IRRIGATION SYSTEMS, CULVERT PIPES, DRAINAGE DITCHES, PRIVATE YARDS, ROADWAYS, PARKING LOTS OR OTHER IMPROVEMENTS NOT SCHEDULED FOR REPLACEMENT DURING CONSTRUCTION WHICH ARE DAMAGED OR MOVED BY THE CONTRACTOR SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER CONDITION BY THE CONTRACTOR.
11. THE ALIGNMENTS HAVE BEEN DESIGNED TO MINIMIZE THE REMOVAL OF TREES. THE CONTRACTOR SHALL NOTIFY THE OWNER'S PROJECT REPRESENTATIVE PRIOR TO REMOVING ANY TREES. NO TREES SHALL BE REMOVED WITHOUT OWNER APPROVAL, UNLESS SHOWN ON PLANS.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING GENERAL SAFETY AT AND ADJACENT TO THE PROJECT AREA, INCLUDING THE PERSONAL SAFETY OF THE CONSTRUCTION CREW AND GENERAL PUBLIC AND THE SAFETY OF PUBLIC AND PRIVATE PROPERTY.
13. THE CONTRACTOR IS RESPONSIBLE FOR KEEPING STREETS AND SIDEWALKS ADJACENT TO THE PROJECTS FREE OF MUD AND DEBRIS FROM THE CONSTRUCTION.
14. THE CONTRACTOR SHALL SAWCUT EXISTING CURB AND GUTTER, PAVEMENT, DRIVEWAYS, ALLEYS AND SIDEWALKS AT AREAS WHERE PAVEMENT OR CONCRETE IS TO BE REMOVED. THE CONTRACTOR SHALL PROVIDE COMPACTED SELECT BACKFILL MATERIAL AS NEEDED TO REPAIR DAMAGED STREETS, DRIVEWAYS, WALKS, PARKING LOTS, ETC.
15. CONCRETE BLOCKING SHALL BE INSTALLED ON ALL WATER LINE BENDS, FIRE HYDRANTS, FITTINGS AND VALVES. ALL HORIZONTAL BLOCKING, CRADLE BLOCKING AND VERTICAL TIE-DOWN BLOCKING SHALL BE IN ACCORDANCE WITH THE PLAN DETAILS. BLOCKING SHALL BE SUBSIDIARY TO WATER LINE CONSTRUCTION AND NO EXTRA COMPENSATION WILL BE ALLOWED.
16. ELEVATION ADJUSTMENTS OF WATER LINE AT CONNECTIONS MAY BE MADE WITH BENDS, OFFSETS, OR JOINT DEFLECTIONS. ALL NONSTANDARD BENDS SHALL BE MADE USING THE CLOSEST STANDARD MJ FITTINGS WITH THE REQUIRED JOINT



ENGINEERING DESIGN AND CONSTRUCTION MANUAL

DEFLECTIONS. DEFLECTIONS SHALL NOT EXCEED THE MANUFACTURER'S RECOMMENDED DEFLECTION PER JOINT.

17. UNLESS OTHERWISE SHOWN, ALL WATER LINES SHALL BE PRESSURE TESTED AND DISINFECTED IN ACCORDANCE WITH NCTCOG SPECIFICATIONS. WATER LINES SHALL HAVE A MINIMUM OF 42" OF COVER UNLESS OTHERWISE NOTED.
18. ALL WATER SERVICES SHALL BE 1" TYPE K COPPER PIPE UNLESS OTHERWISE NOTED.
19. CURB STOPS SHALL BE TESTED FOR LEAKAGE AND FULL FLOW WHEN THE SYSTEM IS PRESSURE TESTED.
20. ALL FIRE HYDRANTS ARE TO BE EQUIPPED WITH A SIX (6) INCH GATE VALVE AND BOX. ALL VALVES AND FIRE HYDRANTS ARE TO BE PER CITY STANDARD SPECIFICATIONS. HYDRANTS SHALL BE PAINTED AS FOLLOWS: 2 COATS SHERWIN WILLIAMS INTERNATIONAL RED – F75RC7 OVER SHOP PRIME COAT FOR BONNET AND END CAPS.
21. IN ORDER TO MINIMIZE SERVICE DISRUPTIONS, THE CONTRACTOR SHALL COORDINATE ALL CONNECTIONS TO EXISTING WATER AND SEWER LINES WITH THE CITY'S INSPECTOR. NO CONNECTIONS TO EXISTING WATER AND/OR WASTEWATER FACILITIES WILL BE ALLOWED WITHOUT THE APPROVAL OF THE CITY INSPECTOR.
22. THE CONTRACTOR SHALL PROVIDE CLOSURE PIECES FOR PIPELINES AS REQUIRED TO CONSTRUCT THE PROJECT, INCLUDING THOSE REQUIRED FOR SPECIAL CONSTRUCTION PROCEDURES TO COORDINATE CHANGES TO THE SEQUENCE OF CONSTRUCTION.
23. THE CONTRACTOR SHALL BE REQUIRED TO INSTALL TEMPORARY PLUGS FOR HYDROSTATIC TESTING AS NECESSARY.
24. THE CONTRACTOR SHALL OBTAIN A PERMIT FROM THE CITY OF WEATHERFORD DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS PRIOR TO ANY CONSTRUCTION WITHIN THE CITY ROW.
25. THE CONTRACTOR SHALL BACKFILL ALL OPEN TRENCHES AS SOON AS POSSIBLE AND IN NO CASE SHALL UNPROTECTED TRENCHES REMAIN OPEN DURING NON-WORKING HOURS.
26. ALL TRENCH BACKFILL IN UNPAVED AREAS SHALL BE PLACED TO EXISTING GRADE PLUS SIX INCHES TO ALLOW FOR SETTLEMENT AND PREVENT PONDING OF STORM WATER RUNOFF DUE TO CONSTRUCTION ACTIVITIES UNLESS PROPOSED FINISHED GRADE IS SHOWN.
27. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE MEASURES FOR PREVENTING STORM WATER RUNOFF FROM ENTERING THE TRENCH DURING CONSTRUCTION.
28. ALL EXCAVATIONS, TRENCHING AND SHORING OPERATIONS SHALL COMPLY WITH THE REQUIREMENTS OF THE U.S. DEPARTMENT OF LABOR, OSHA "CONSTRUCTION SAFETY AND HEALTH REGULATIONS," VOLUME 29, SUBPART P, PAGES 128-137, AND ANY AMENDMENTS THERETO.
29. THE CONTRACTOR SHALL TAKE ADEQUATE MEASURES TO PREVENT EROSION. IN THE EVENT THAT SIGNIFICANT EROSION OCCURS AS A RESULT OF CONSTRUCTION, THE CONTRACTOR SHALL RESTORE THE ERODED AREA TO ORIGINAL CONDITION.
30. THE CONTRACTOR SHALL NOT OPERATE ANY EXISTING WATER VALVES UNLESS THE CITY INSPECTOR IS PRESENT.
31. THE CONTRACTOR SHALL VIDEO ALL POTENTIALLY IMPACTED PROPERTY AREAS



PRIOR TO WORK. VIDEOS SHALL INCLUDE DATE, NOTATION AND AUDIO IDENTIFICATION OF PROPERTY ADDRESS AND PROJECT NAME. THE CONTRACTOR SHALL PROVIDE ONE COPY OF THE VIDEO FILE OR DVD TO THE CITY'S INSPECTOR PRIOR TO CONSTRUCTION.

32. ALL TESTING OF EMBEDMENT AND BACKFILL MATERIAL SHALL BE BY THE CONTRACTOR AT THEIR OWN EXPENSE.
33. THE CONTRACTOR IS RESPONSIBLE FOR ALL CONSTRUCTION STAKING.
34. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSING OF ALL EXCESS EXCAVATION AND SPOIL IN ACCORDANCE WITH CITY, STATE AND FEDERAL GUIDELINES.
35. THE CONTRACTOR'S PERSONNEL SHALL WEAR IDENTIFYING CLOTHING AT ALL TIMES.
36. THE CONTRACTOR SHALL:
 - a) MAINTAIN A MINIMUM OF ONE FOOT (1') CLEARANCE FROM ALL UTILITIES, UNLESS OTHERWISE NOTED ON THE PLANS;
 - b) MAINTAIN NEAT AND ACCURATE RECORD PLANS OF CONSTRUCTION, INDICATING LAYOUT OF WORK AND ITS RELATION TO UTILITIES IN THE FIELD;
 - c) MAINTAIN A CLEAN WORK SITE AND DAILY REMOVE ALL TRASH AND DEBRIS;
 - d) ENSURE THAT ALL LANDSCAPE ELEMENTS, INCLUDING, BUT NOT LIMITED TO, ROCKS, PAVERS AND PLANTERS ARE RESTORED TO THEIR EXISTING CONDITION AT THE COMPLETION OF THE WORK. ANY DAMAGED ELEMENTS SHALL BE REPLACED IN KIND BY THE CONTRACTOR AT HIS EXPENSE;
 - e) RESTORE GRASSED AREAS TO THEIR ORIGINAL GRADE AND VEGETATIVE CONDITION. ALL DISTURBED AREAS SHALL BE HYDRO-MULCH SEEDED OR SOD AS STATED ON THE PLANS, 20' ON EACH SIDE OF THE PIPELINE ALIGNMENT. THIS SHALL BE SUBSIDIARY TO THE COST OF THE PROJECT.
 - f) GIVE ANY AFFECTED RESIDENT AT LEAST 48 HOURS NOTICE PRIOR TO ANY TEMPORARY BLOCKING, REMOVAL OR REPLACEMENT OF DRIVEWAY APPROACHES;
 - g) REPAIR ANY DAMAGE TO PAVEMENT THAT IS OUTSIDE THE ESTABLISHED WORKING AREA AND WAS CAUSED BY THE CONTRACTOR'S OPERATIONS.
 - h) SHALL RESTORE ALL DRIVEWAYS AND SURFACES ON PUBLIC AND PRIVATE PROPERTY TO MAINTAIN PROPER ACCESS TO THEIR PROPERTY OUTSIDE OF STANDARD WORKING HOURS.

EROSION AND POLLUTION CONTROL NOTES

1. ALL CONTRACTORS SHALL COMPLY WITH THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS (NCTCOG) MANUAL FOR BEST MANAGEMENT PRACTICES FOR CONSTRUCTION AS IT RELATES TO PREVENTING POLLUTANTS IN STORM WATER DISCHARGE FROM CONSTRUCTION ACTIVITIES.
2. THE CONTRACTOR SHALL INSTALL EROSION AND POLLUTION CONTROL MEASURES AS INDICATED ON THE PLANS AND AS FIELD CONDITIONS WARRANT TO PREVENT OFFSITE MIGRATION OF SOILS OR OTHER POLLUTANTS BY VEHICULAR TRACKING OR IN STORM WATER RUNOFF. PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITY, INSTALLATION OF CONTROL MEASURES, REPAIRS OR MODIFICATIONS TO THE



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MEASURES WILL BE MADE BY THE CONTRACTOR IF THE CONTROL MEASURES PROVE INEFFECTIVE OR IF ADDITIONAL CONTROL MEASURES ARE NECESSARY.

3. THE CONTRACTOR SHALL INSTALL THE STABILIZED CONSTRUCTION EXIT AND SHALL TAKE APPROPRIATE MEASURES TO PREVENT TRACKING OF MUD AND/OR SOILS TO OFFSITE PAVEMENT. THE CONTRACTOR SHALL IMMEDIATELY REMOVE ANY OFFSITE TRACKING THAT OCCURS.
4. ALL STOCKPILED SOILS WILL BE SURROUNDED BY A SILT FENCE, SEDIMENT CONTROL SWALE OR EQUIVALENT MEASURE TO PROPERLY CONTROL SEDIMENT RUNOFF.
5. THE CONTRACTOR SHALL DESIGNATE A CONCRETE TRUCK WASHOUT AREA. WASTE CONCRETE AND ASSOCIATED WATER AND MATERIAL WILL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH THE APPLICABLE REGULATIONS.
6. THE CONTRACTOR SHALL CONSTRUCT A BERM OR OTHER SPILL PROTECTION MEASURE FOR ANY TEMPORARY FUEL STORAGE TANK(S) ON SITE TO CONTAIN AT LEAST ONE HALF (1/2) OF THE CAPACITY OF EACH TANK.
7. IF SUMP PUMPS ARE USED TO REMOVE WATER FROM EXCAVATED AREAS, THE DISCHARGE SHALL BE FILTERED OR DISCHARGED TO A SETTLING BASIN TO REMOVE SEDIMENT AND OTHER POLLUTANTS BEFORE THE WATER ENTERS A STORM DRAIN OR LEAVES THE SITE.
8. INLET PROTECTION SHALL BE INSTALLED AT ALL ONSITE OR NEW INLETS TO PREVENT SEDIMENT AND SOILS FROM ENTERING THE STORM DRAIN SYSTEM UNTIL PERMANENT VEGETATION IS ESTABLISHED. INLET PROTECTION SHALL BE DESIGNED TO FILTER ALL FLOW FROM A TWO-YEAR STORM EVENT. A MEANS OF OVERFLOW OR BYPASS SHALL BE PROVIDED FOR STORM FLOWS GREATER THAN THE TWO-YEAR STORM.
9. CONTROL MEASURES MAY ONLY BE PLACED IN FRONT OF INLETS OR IN CHANNELS, DRAINAGE WAYS OR BORROW DITCHES AT THE CONTRACTOR'S RISK. CONTRACTOR SHALL REMAIN LIABLE FOR ANY DAMAGE CAUSED BY THE MEASURE INCLUDING FLOOD DAMAGE THAT OCCURS AS A RESULT OF BLOCKED DRAINAGE.
10. AT A MINIMUM, PERIMETER CONTROLS SUCH AS SILT FENCE SHALL BE INSTALLED AT ALL DOWN SLOPE BOUNDARIES OF DISTURBED AREAS AND AS WARRANTED WHERE PAVEMENT REMOVAL, UTILITY CONSTRUCTION, GRADING OR OTHER CONSTRUCTION ACTIVITIES ARE TO BE PERFORMED. THE CONTRACTOR SHALL AT ALL TIMES TAKE SUCH MEASURES AS NECESSARY TO PREVENT OFFSITE MIGRATION OF SEDIMENT AND DEBRIS.
11. IF DISCHARGE OF SOIL OR OTHER POLLUTANTS OCCURS, THE CONTROL MEASURES SHALL BE EVALUATED AND CHANGES OR ADDITIONAL MEASURES IMPLEMENTED WITHIN SEVEN (7) DAYS TO PREVENT FUTURE DISCHARGES.
12. DAMAGE TO ADJACENT PROPERTY AND/OR TO RECEIVING WATER CAUSED BY IMPROPERLY INSTALLED OR POORLY MAINTAINED EROSION AND POLLUTION CONTROL MEASURES WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. THIS RESPONSIBILITY INCLUDES REMOVAL AND DISPOSAL OF ANY SILTATION, DEBRIS OR OTHER POLLUTANTS CAUSED BY HIS/HER OPERATIONS AND/OR FAILURE OF THE CONTROL MEASURES. FAILURE TO ADDRESS THE CAUSES OF DAMAGES WILL RESULT IN A STOP WORK ORDER.
13. THE CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF ACCUMULATED SEDIMENT BEFORE IT REACHES A DEPTH OF SIX (6) INCHES OR IMPAIRS THE EFFECTIVENESS OF THE CONTROL MEASURE.



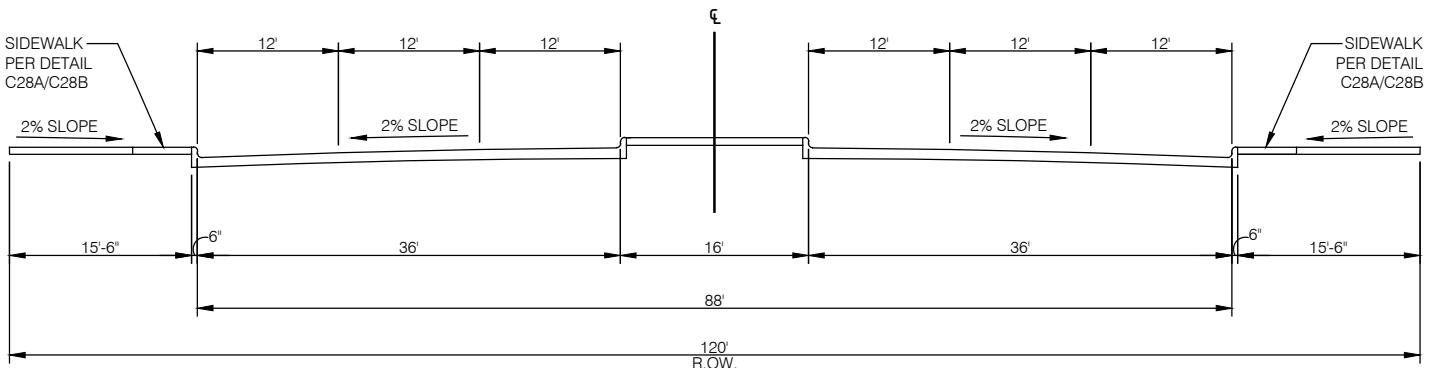
ENGINEERING DESIGN AND CONSTRUCTION MANUAL

14. THE OWNER'S REPRESENTATIVE WILL INSPECT THE PROJECT EVERY FOURTEEN (14) DAYS, AT A MINIMUM, AND AFTER EVERY RAIN EVENT OF ONE-HALF INCH OR GREATER TO DETERMINE THE INTEGRITY AND EFFECTIVENESS OF THE EROSION AND POLLUTION CONTROL MEASURES. A WRITTEN INSPECTION REPORT, SIGNED BY THE PERSON MAKING THE INSPECTION, WILL BE FILED WITH ONSITE POLLUTION CONTROL PLAN AND A COPY OF THE REPORT SENT TO THE CITY FOR THEIR RECORDS. THIS INSPECTION DOES NOT RELIEVE THE CONTRACTOR OF RESPONSIBILITY FOR INSPECTION AND MAINTENANCE OF THE CONTROL MEASURES. FAILURE TO FILE REPORTS MAY RESULT IN A STOP WORK ORDER.
15. THE CONTRACTOR SHALL STABILIZE, WITH SOME FORM OF GROUND COVER, ANY AREA WHERE CONSTRUCTION ACTIVITY IS TO BE CEASED (TEMPORARILY OR PERMANENTLY) FOR MORE THAN TWENTY-ONE (21) DAYS.
16. AT THE CONCLUSION OF THE PROJECT, ALL CHANNELS, DRAINAGE WAY AND BORROW DITCHES IN THE WORK ZONE SHALL BE CLEARED OF ANY SEDIMENT AND DEBRIS GENERATED BY THE PROJECT OR DEPOSITED AS A RESULT OF THE EROSION AND POLLUTION CONTROL MEASURES.
17. REVEGETATION OF ALL DISTURBED SOIL SHALL BE INITIATED WITHIN TWENTY-ONE (21) DAYS OF FINAL CONSTRUCTION OPERATIONS.



ENGINEERING DESIGN AND CONSTRUCTION MANUAL

APPENDIX C STANDARD DETAILS

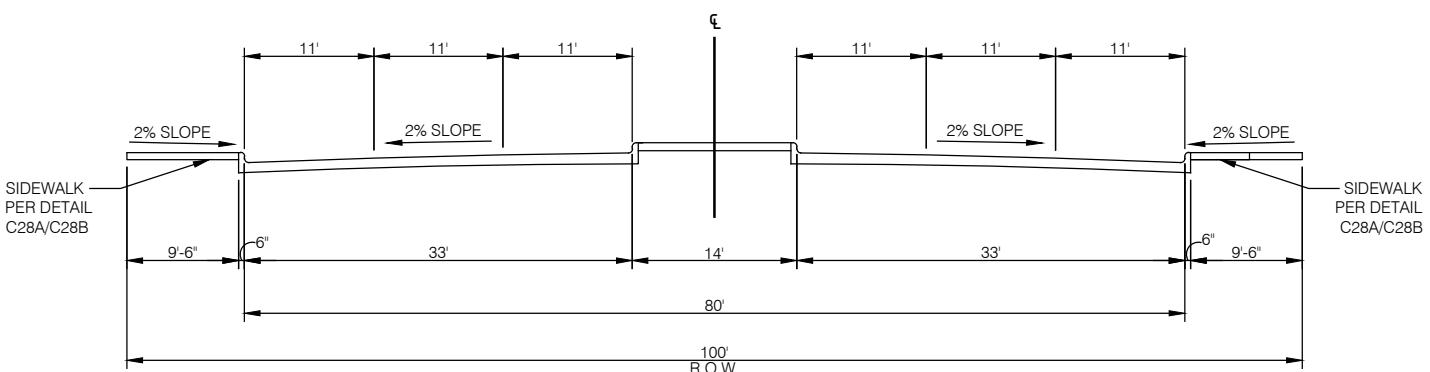


1

TYPE 'AA' - MAJOR ARTERIAL

NOT TO SCALE

NOTE: SEE PAVEMENT DETAIL SHEET
FOR STREET CONSTRUCTION
SPECIFICATIONS



2

TYPE 'A' - MAJOR ARTERIAL

NOT TO SCALE

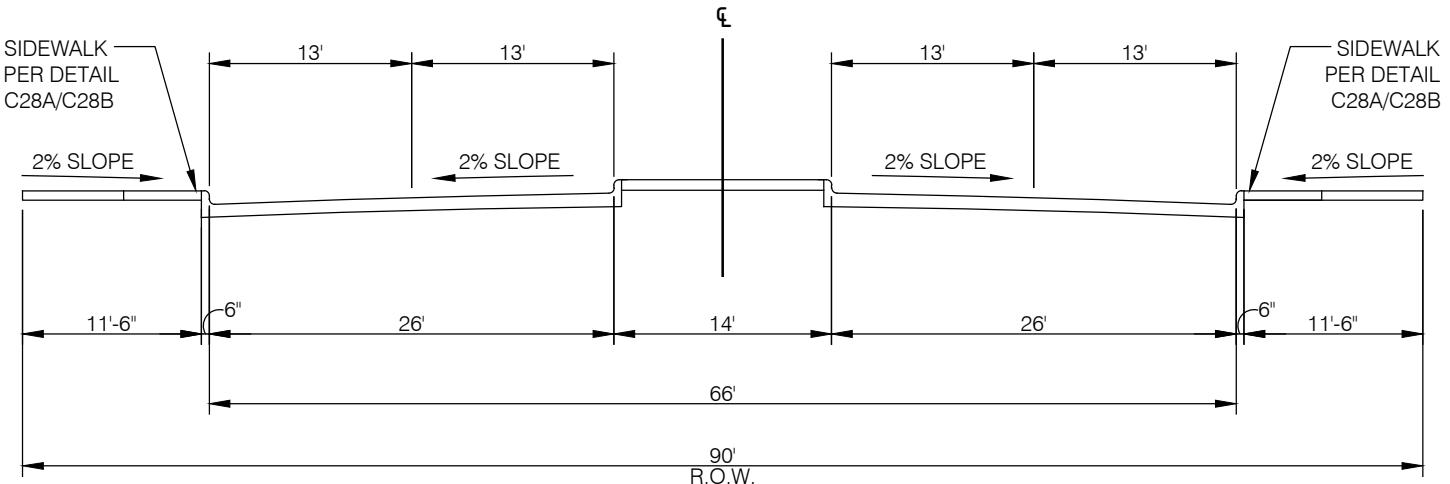


DATE
01/2020
DRAWN BY

CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT
MAJOR ARTERIAL STREET SECTION
DETAILS

SHEET. #
C1

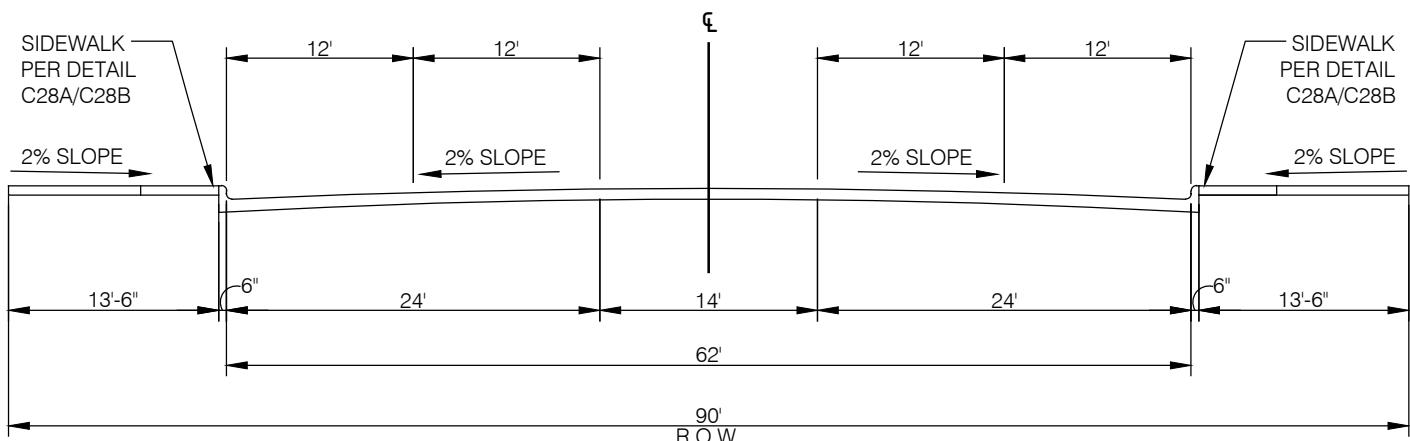


1

TYPE 'B' - MINOR ARTERIAL

NOT TO SCALE

NOTE: SEE PAVEMENT DETAIL SHEET
FOR STREET CONSTRUCTION
SPECIFICATIONS



2

TYPE 'B5' - MINOR ARTERIAL COMMERCIAL

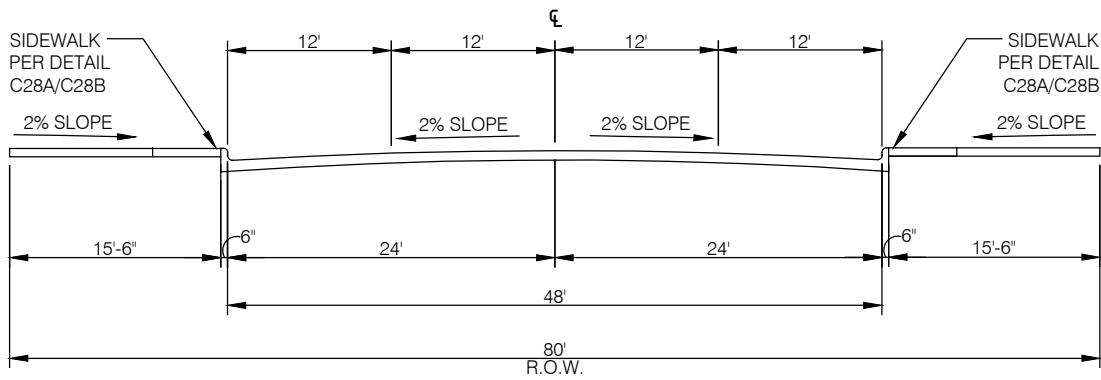
NOT TO SCALE



DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT
MINOR ARTERIAL STREET SECTION
DETAILS

SHEET. #
C2

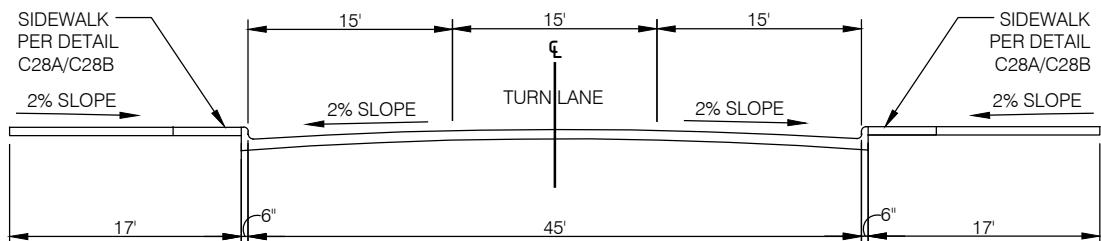


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TYPE 'C' - MAJOR COLLECTOR

NOT TO SCALE

RESIDENTIAL



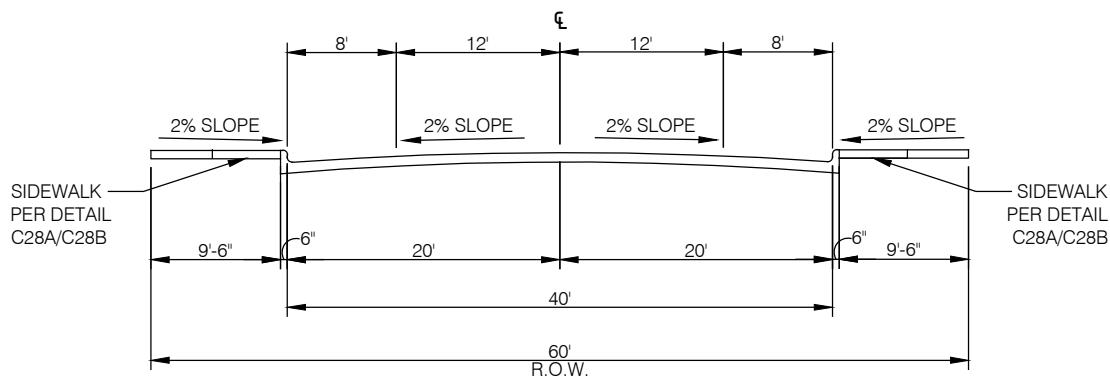
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TYPE 'C3' - MAJOR COLLECTOR

NOT TO SCALE

COMMERCIAL

NOTE: SEE PAVEMENT DETAIL SHEET
FOR STREET CONSTRUCTION
SPECIFICATIONS



3

TYPE 'D' - MINOR COLLECTOR

NOT TO SCALE

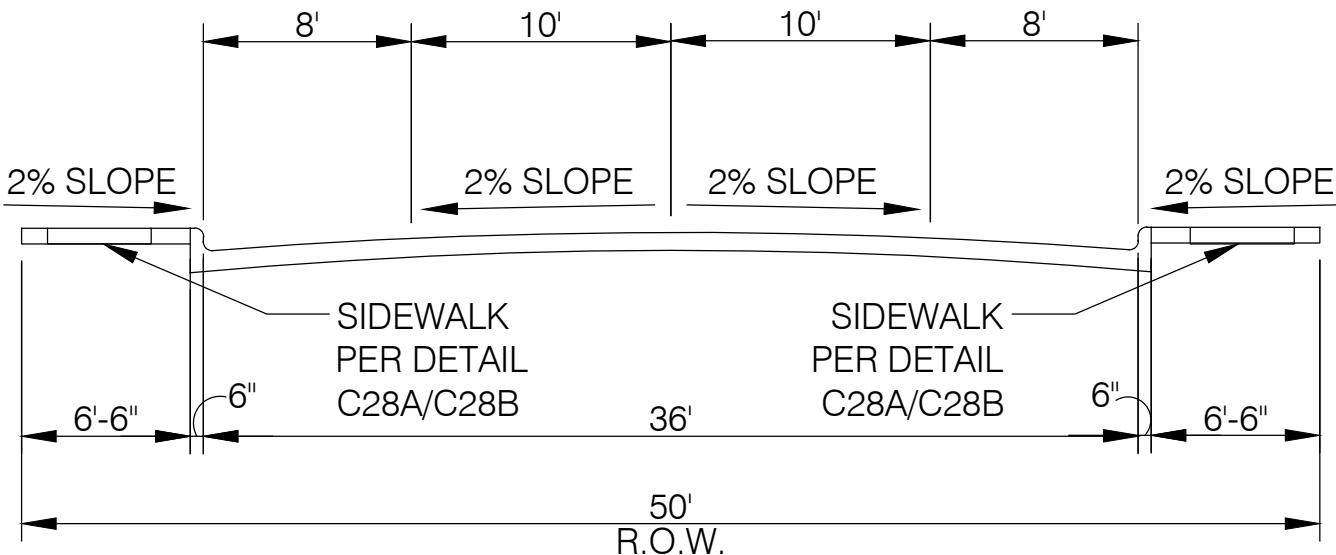
COMMERCIAL



DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT
COLLECTOR STREET SECTION
DETAILS

SHEET. #
C3

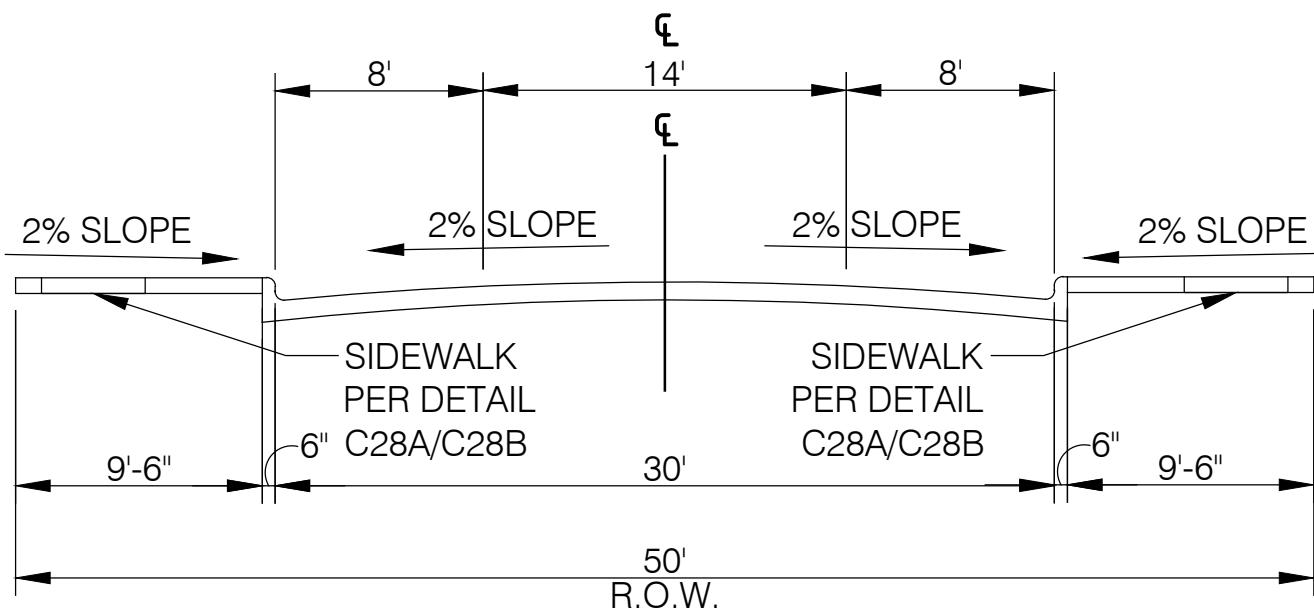


1

RESIDENTIAL COLLECTOR

NOT TO SCALE

NOTE: SEE PAVEMENT DETAIL SHEET
FOR STREET CONSTRUCTION
SPECIFICATIONS



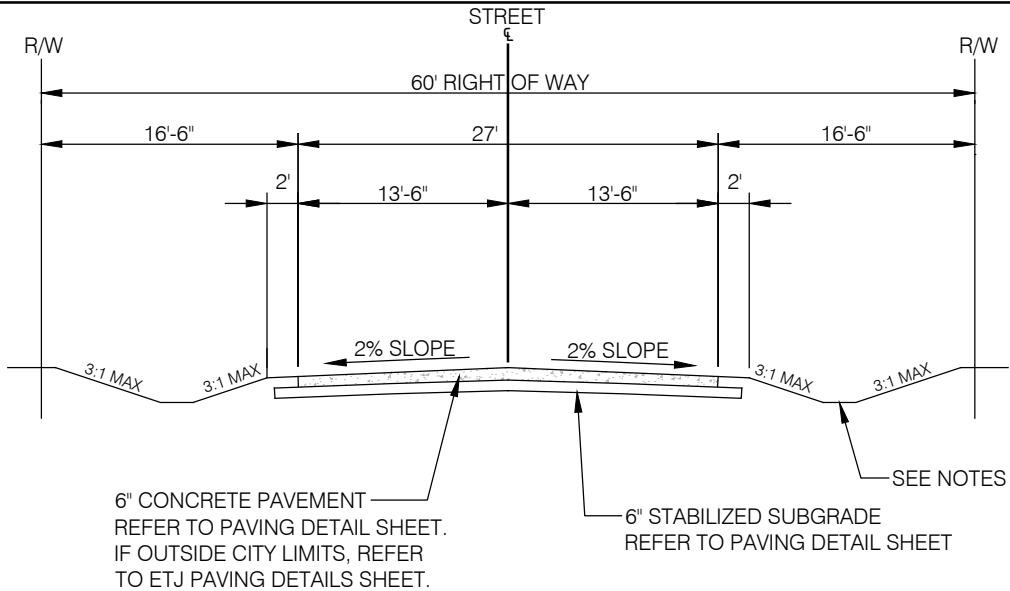
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LOCAL 'A' - RESIDENTIAL

NOT TO SCALE



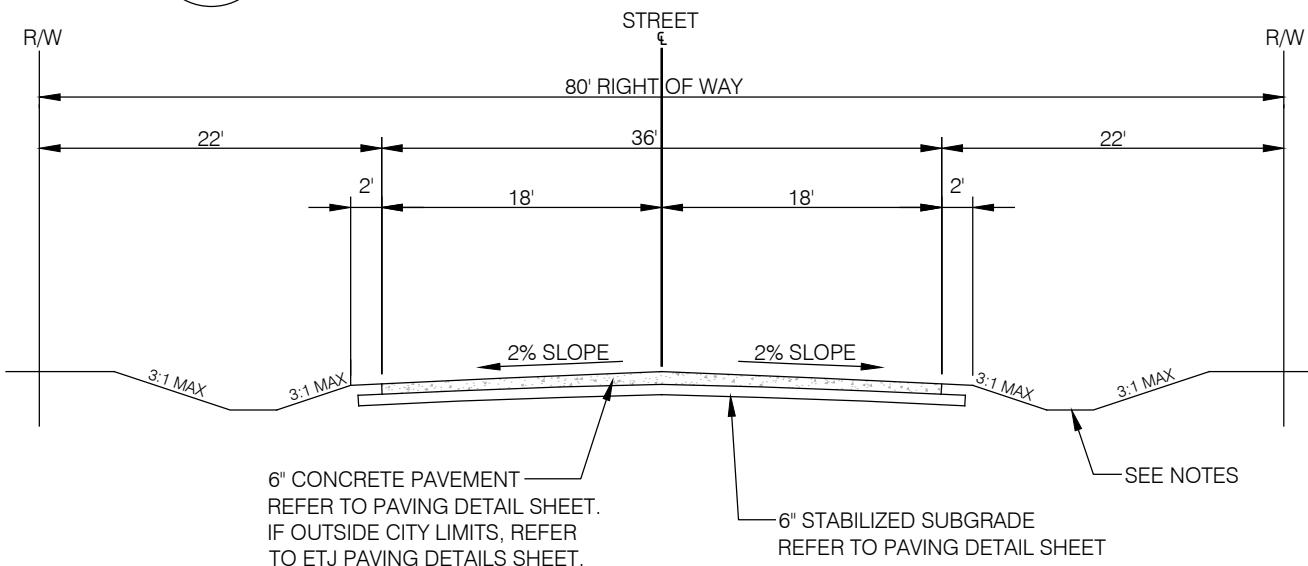
DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT		SHEET. #
01/2020			
DRAWN BY			
CITY OF WEATHERFORD	LOCAL STREET SECTION DETAILS		C4



1

RURAL LOCAL SECTION

NOT TO SCALE



2

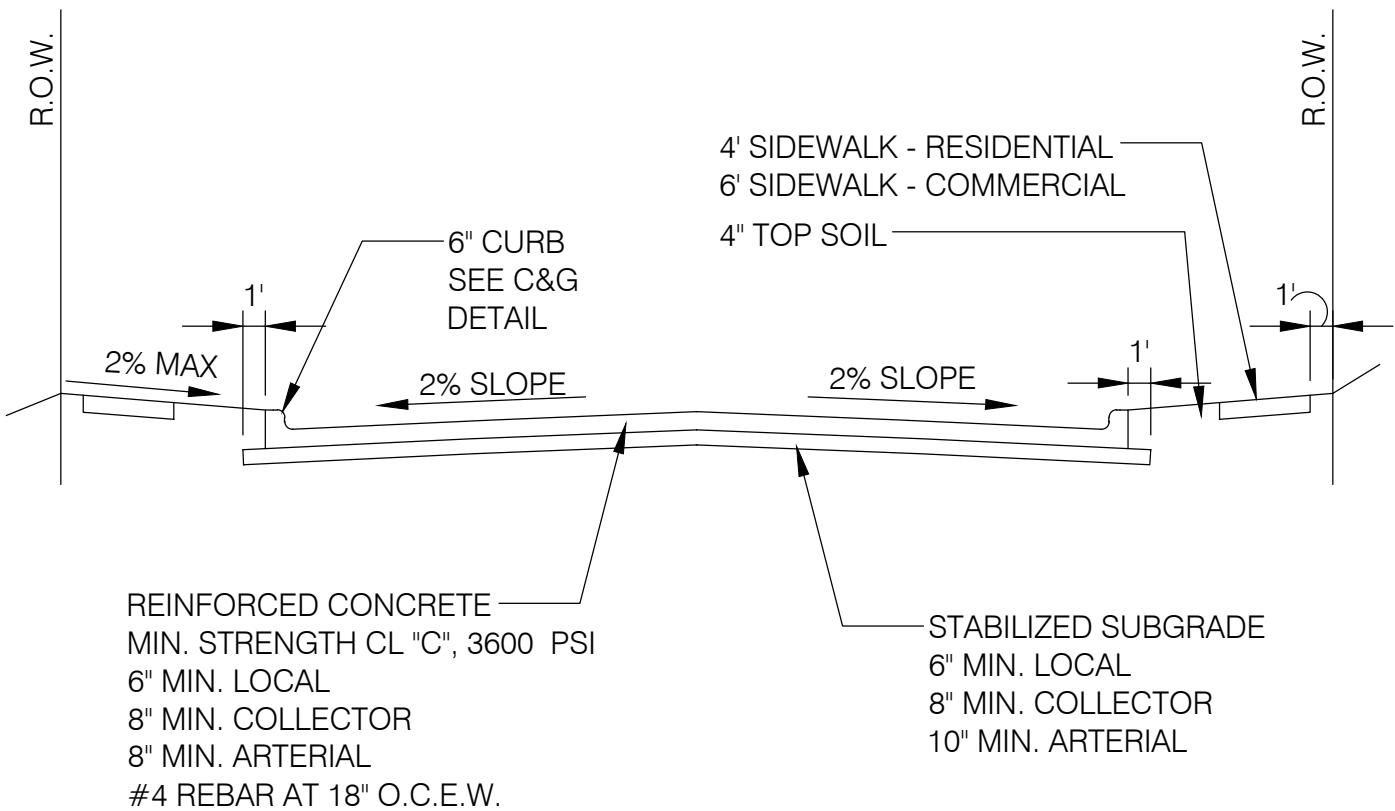
RURAL COLLECTOR SECTION

NOT TO SCALE

ROADSIDE DRAINAGE CHANNEL/DITCH NOTES:

1. TYPICAL DITCH SECTION - ACTUAL DRAINAGE CHANNEL DITCH SHALL BE DESIGNED TO MEET CURRENT CITY STORM WATER DESIGN MANUAL REQUIREMENTS.
2. ADDITIONAL RIGHT-OF-WAY AND/OR EASEMENTS MAY BE REQUIRED TO ACCOMMODATE DRAINAGE DITCH DESIGN.
3. DRAINAGE DITCH SIDE SLOPES SHALL NOT BE STEEPER THAN 3:1 WITHOUT SPECIAL CONSIDERATION. DITCHES PROPOSED STEEPER THAN 3:1 SHALL BE CONSTRUCTED FOR SLOPE STABILITY BASED ON A DESIGN AND GEOTECHNICAL REPORT PREPARED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF TEXAS.
4. DRAINAGE DITCHES SHALL BE FULLY STABILIZED WITH ALL PROPOSED DESIGN MEASURES, INCLUDING VEGETATION, PRIOR TO DEVELOPMENT ACCEPTANCE.
5. GRASS-LINED DRAINAGE DITCHES SHALL HAVE A MAXIMUM DESIGN VELOCITY OF 6.0 FEET PER SECOND (FT/S) AND A MINIMUM GRADE SLOPE OF 1.0 PERCENT.
6. DRAINAGE DITCHES DESIGNED WITH VELOCITIES EXCEEDING 6.0 FT/S SHALL REQUIRE EROSION CONTROL COUNTERMEASURES APPROVED BY TPW. MAXIMUM VELOCITY ALLOWED IS 10 FT/S.
7. DRIVEWAY DRAINAGE CULVERT SIZES, MATERIAL, AND PROPOSED END TREATMENTS SHALL BE REFERENCED ON THE DEVELOPMENT DRAINAGE PLAN FOR EACH LOT AND SUBMITTED FOR APPROVAL TO TPW. SAFETY END TREATMENTS OR CONCRETE HEADWALLS ARE REQUIRED BOTH UPSTREAM AND DOWNSTREAM OF ALL DRIVEWAY CULVERTS.
8. DRAINAGE CULVERTS UNDER ALL ROADWAYS SHALL BE CLASS III REINFORCED CONCRETE PIPE (RCP) OR CORRUGATED METAL PIPE (CMP) WITH CONCRETE HEADWALLS UPSTREAM AND DOWNSTREAM. CONCRETE RIP-RAP SHALL BE INSTALLED UPSTREAM OF THE DRAINAGE STRUCTURE. WHERE ADEQUATE COVER IS NOT AVAILABLE OVER PROPOSED RCP, CLASS IV RCP WILL BE REQUIRED FOR TPW APPROVAL.
9. ALL APPLICABLE TEMPORARY EROSION CONTROLS, TO INCLUDE SILT FENCE AND INLET PROTECTION, SHALL BE IN PLACE AS SHOWN IN APPROVED DESIGN DRAWINGS BEFORE CONSTRUCTION CAN COMMENCE.

DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
01/2020		
DRAWN BY	RURAL ROAD SECTION RESIDENTIAL 1 ACRE LOT SUBDIVISION	C5
WEATHERFORD TRUE TEXAS	CITY OF WEATHERFORD	



NOTES:

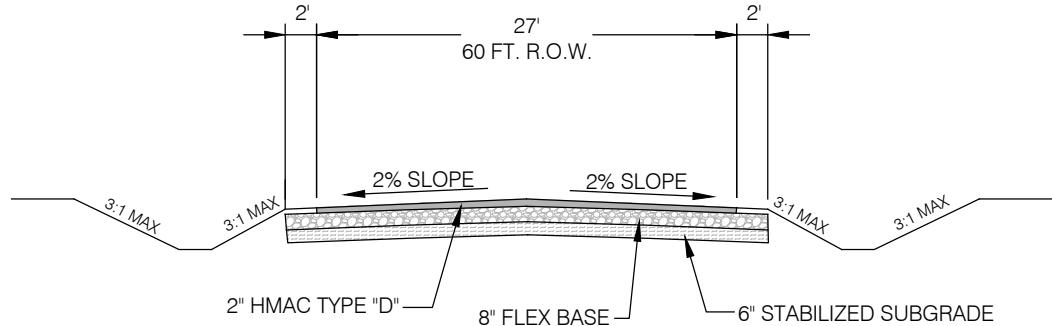
1. A GEOTECHNICAL REPORT SHALL BE PROVIDED FOR SUBGRADE DESIGN. THE GEOTECHNICAL REPORT SHALL BE A RECOMMENDATION ONLY TO DETERMINE IF ANY ADDITIONAL SOIL STABILIZATION IS REQUIRED. REGARDLESS OF THE PAVEMENT TYPE TO BE CONSTRUCTED, ALL SUBBASE MATERIALS SHALL BE MODIFIED BY EITHER LIME STABILIZATION OR CEMENT STABILIZATION PER MINIMUM REQUIREMENTS AS SPECIFIED. TPW SHALL MAKE THE FINAL DETERMINATION REGARDING SUBGRADE PREPARATION IF DIFFERENT SOIL CONDITIONS ARE DISCOVERED DURING CONSTRUCTION.
2. LIME STABILIZED SUBGRADE IS REQUIRED WHEN $PI \geq 15$ AT 6% BY WEIGHT (27LBS/SY MIN.)
3. PORTLAND CEMENT STABILIZED SUBGRADE IS REQUIRED WHEN $PI < 15$ AT 5% BY WEIGHT (26LBS/SY MIN.)
4. CONCRETE PAVEMENT SHALL BE MACHINE PLACED EITHER BY MECHANICAL VIBRATORY SCREED OR SLIP FORM PAVER UNLESS OTHERWISE APPROVED BY CITY.
5. REINFORCEMENT REBAR ON CONCRETE PAVEMENTS SHALL BE AMERICAN MADE.
6. ASPHALT PAVEMENTS ARE NOT ALLOWED UNLESS APPROVED BY CITY COUNCIL.
7. PAVEMENT IMPROVEMENTS ADJACENT TO EXISTING CITY STREETS MAY REQUIRE ALTERNATE PAVING DESIGN AS APPROVED BY DIRECTOR OF TRANSPORTATION AND PUBLIC WORKS. PAVEMENT IMPROVEMENTS ADJACENT TO CITY STREETS SHALL BE APPROVED BY TPW PRIOR TO CONSTRUCTION.
8. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS OF THE CITY OF WEATHERFORD AND THE LATEST EDITION OF THE "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION NORTH CENTRAL TEXAS" HEREIN REFERRED TO AS "N.C.T.C.O.G."

1

TYPICAL PAVEMENT SECTION

NOT TO SCALE

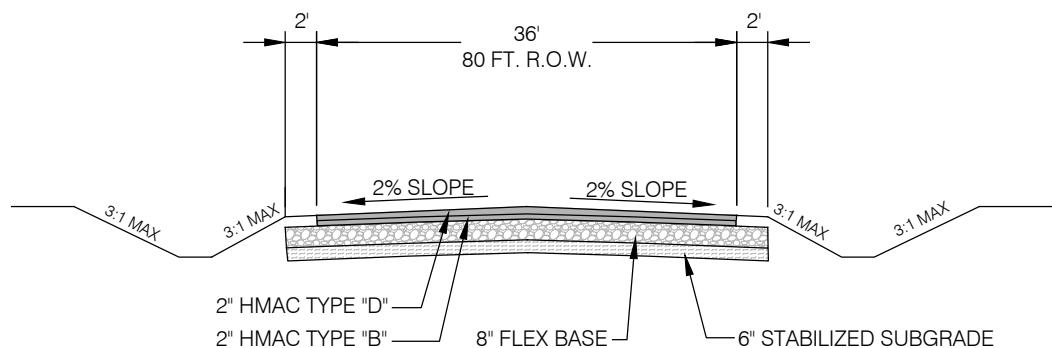
<p>WEATHERFORD TRUE TEXAS</p>	DATE	<p>TRANSPORTATION AND PUBLIC WORKS DEPARTMENT</p> <p>PAVEMENT DETAIL</p>	SHEET. #
	01/2020		
<p>DRAWN BY</p> <p>CITY OF WEATHERFORD</p>	C6		



LOCAL - RURAL PAVEMENT DETAIL WITHIN E.T.J.

1

NOT TO SCALE



COLLECTOR - RURAL PAVEMENT DETAIL WITHIN E.T.J.

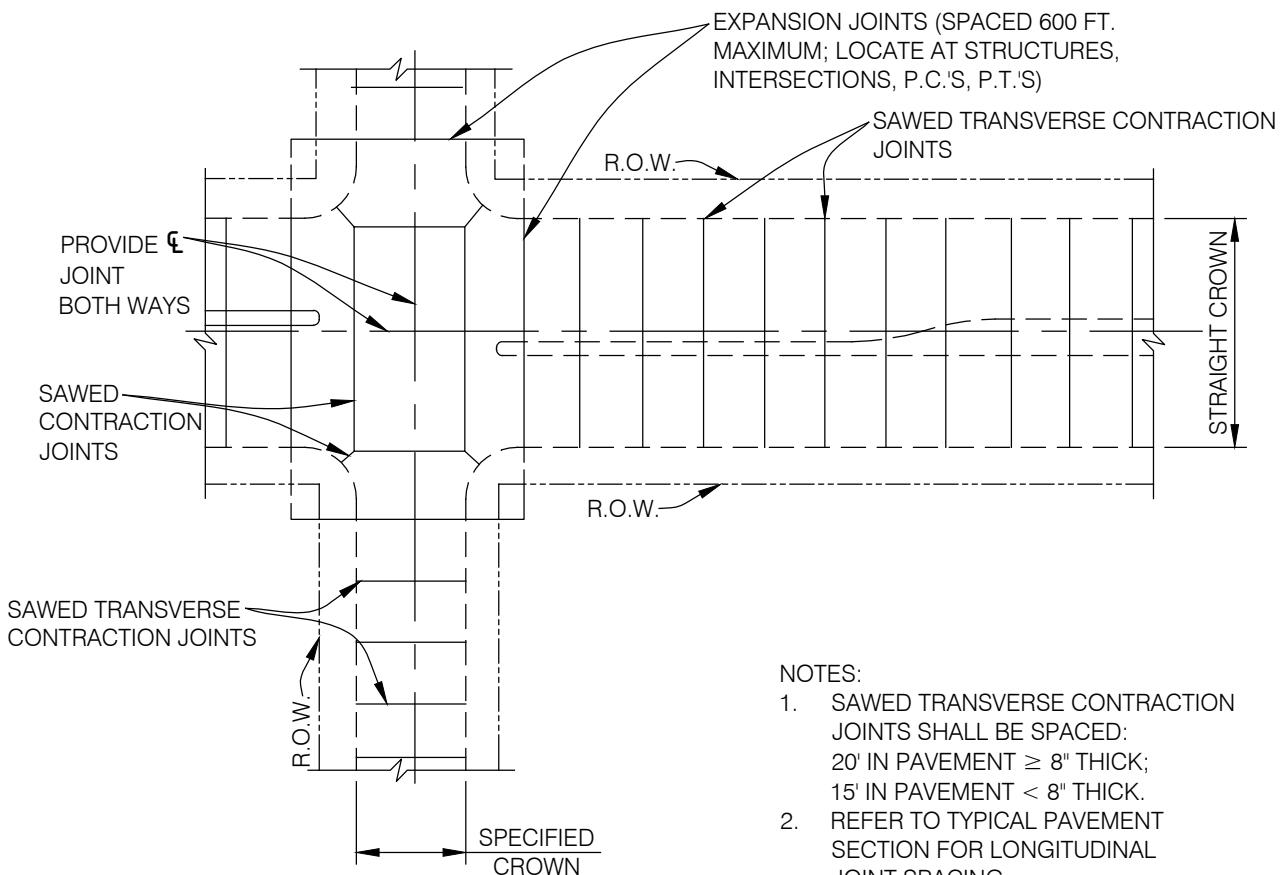
2

NOT TO SCALE

NOTES:

- A SOIL INVESTIGATION FOR SUBGRADE DESIGN SHALL BE CONDUCTED BY A GEOTECHNICAL ENGINEER TO DETERMINE IF ANY SOIL STABILIZATION IS REQUIRED.
- FOR DETAILS ON PLACEMENT OF ASPHALT PAVEMENT AND BASE COURSE REFER TO DIVISION 300 OF "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION-NORTH CENTRAL TEXAS." LATEST EDITION.
- BASE COURSE SHALL BE COMPACTED TO 95% STANDARD PROCTOR WITH A MOISTURE CONTENT WITHIN MINUS 2 TO PLUS 4 PERCENT OPTIMUM REFER TO N.C.T.C.O.G.
- DEVELOPER SHALL SUBMIT COPIES OF SOIL REPORTS, COMPACTION REPORTS, AND INSPECTION REPORTS TO CITY INSPECTOR FOR REVIEW AND APPROVAL THROUGHOUT CONSTRUCTION. ALL REPORTS SHALL BE PERFORMED BY AN APPROVED LICENSED GEOTECHNICAL ENGINEER.
- ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS OF THE CITY OF WEATHERFORD, AND LATEST EDITION OF THE "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION-NORTH CENTRAL TEXAS" HEREIN REFERRED TO AS "N.C.T.C.O.G."
- REFER TO "RURAL ROAD SECTION" DETAIL SHEET FOR DRAINAGE CHANNEL/DITCH NOTES.

	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	RURAL PAVEMENT DETAIL WITHIN EXTRA TERRITORIAL JURISDICTION (E.T.J.)	C7



NOTES:

1. SAWED TRANSVERSE CONTRACTION JOINTS SHALL BE SPACED:
20' IN PAVEMENT \geq 8" THICK;
15' IN PAVEMENT < 8" THICK.
2. REFER TO TYPICAL PAVEMENT SECTION FOR LONGITUDINAL JOINT SPACING

SPACING DIAGRAM FOR TRANSVERSE JOINTS

1

TRANSVERSE JOINTS

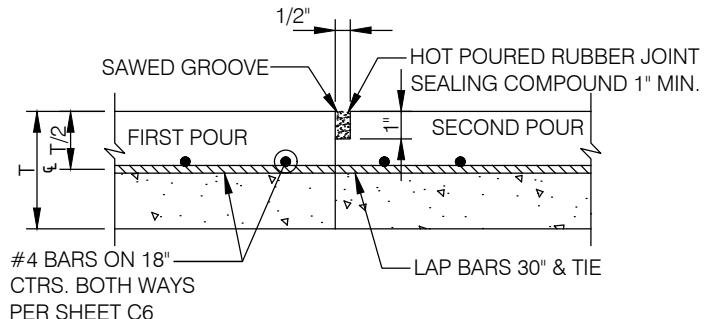
NOT TO SCALE



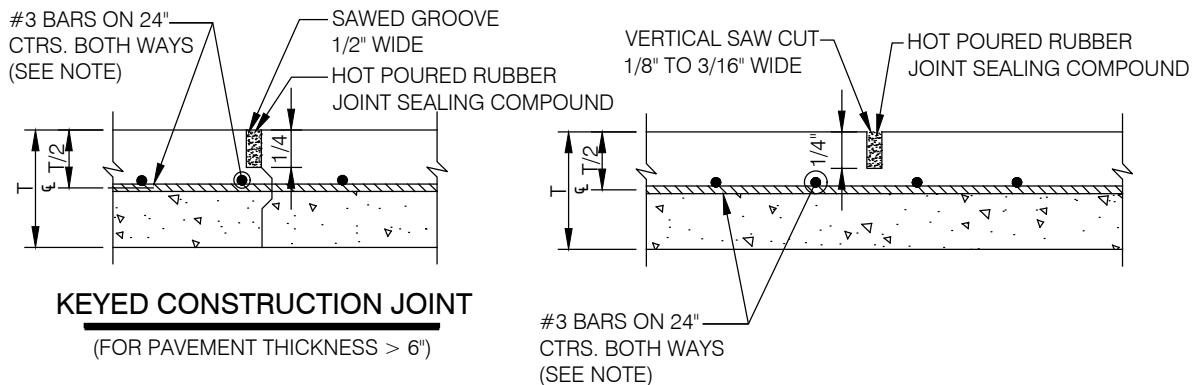
DATE
01/2020
DRAWN BY

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT
REINFORCED CONCRETE PAVEMENT
TRANSVERSE JOINT SPACING

SHEET. #
C8



CONSTRUCTION JOINT



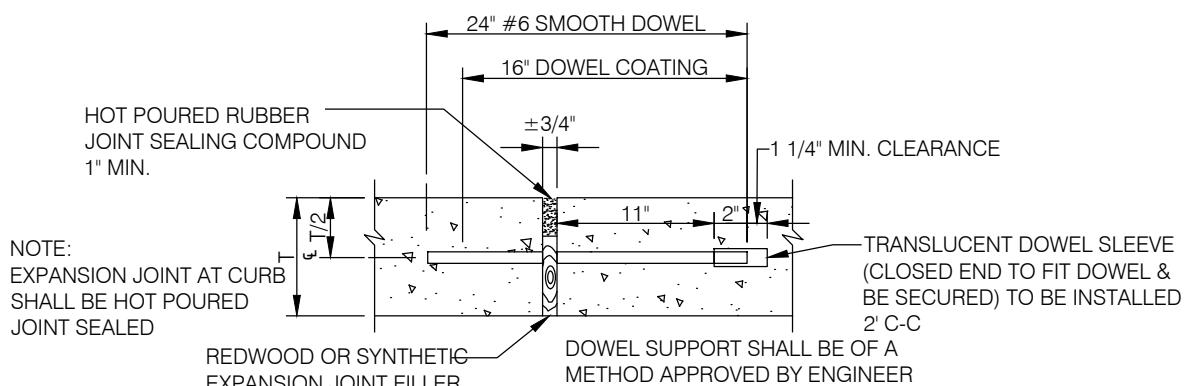
KEYED CONSTRUCTION JOINT

(FOR PAVEMENT THICKNESS > 6")

NOTE:
ALTERNATE REINFORCEMENT
#4 BARS ON 18" CTRS.
BOTH WAYS. PER SHEET C6.

SAWED CONTRACTION JOINT

(REFER SHEET C8)



EXPANSION JOINT

(SPACED 600FT MAXIMUM; LOCATE AT
STRUCTURES AND AT INTERSECTION P.C.'S & P.T.'S)

REINFORCED CONCRETE PAVEMENT JOINTS

NOT TO SCALE

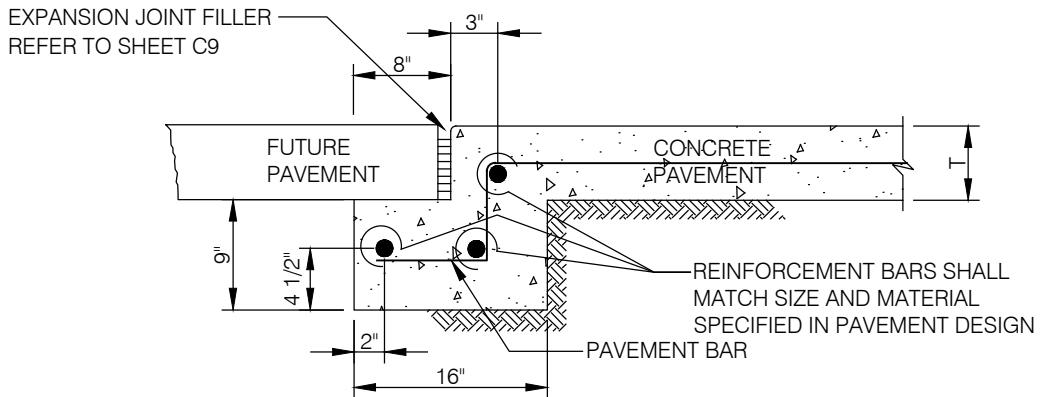
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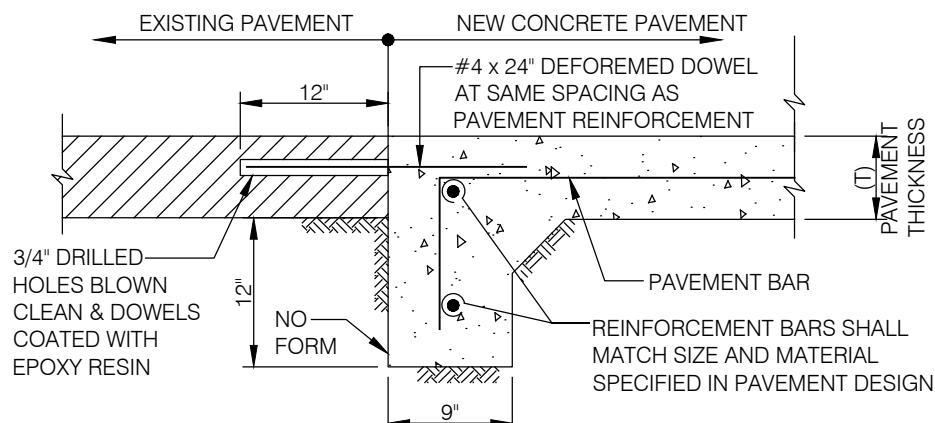
DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

TRANSPORTATION AND PUBLIC WORKS DEPARTMENT
REINFORCED CONCRETE PAVEMENT JOINTS

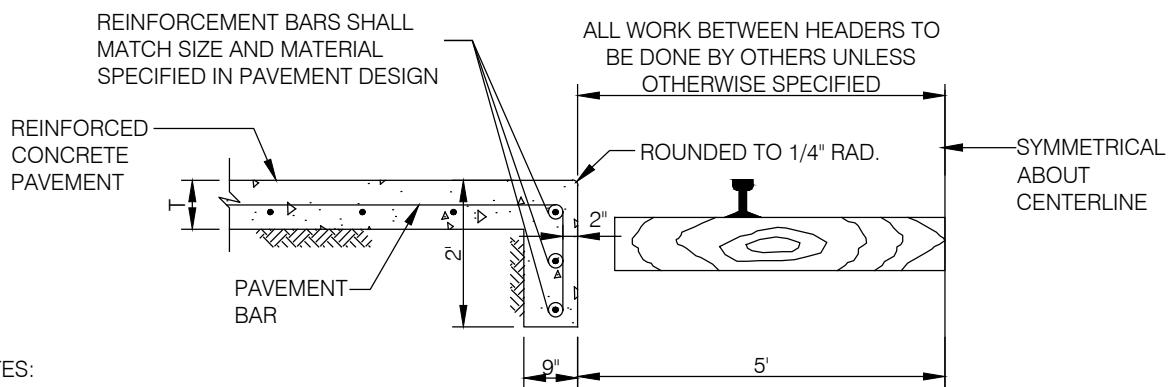
SHEET. #
C9



STREET HEADER FOR FUTURE PAVEMENT



STREET HEADER AT EXISTING PAVEMENT



NOTES:

1. PAVEMENT BARS TO BE BENT
DOWN INTO HEADER.
2. HEADER AND PAVEMENT TO
BE MONOLITHIC.

STREET HEADER AT RAILROAD

1

STREET HEADERS

NOT TO SCALE



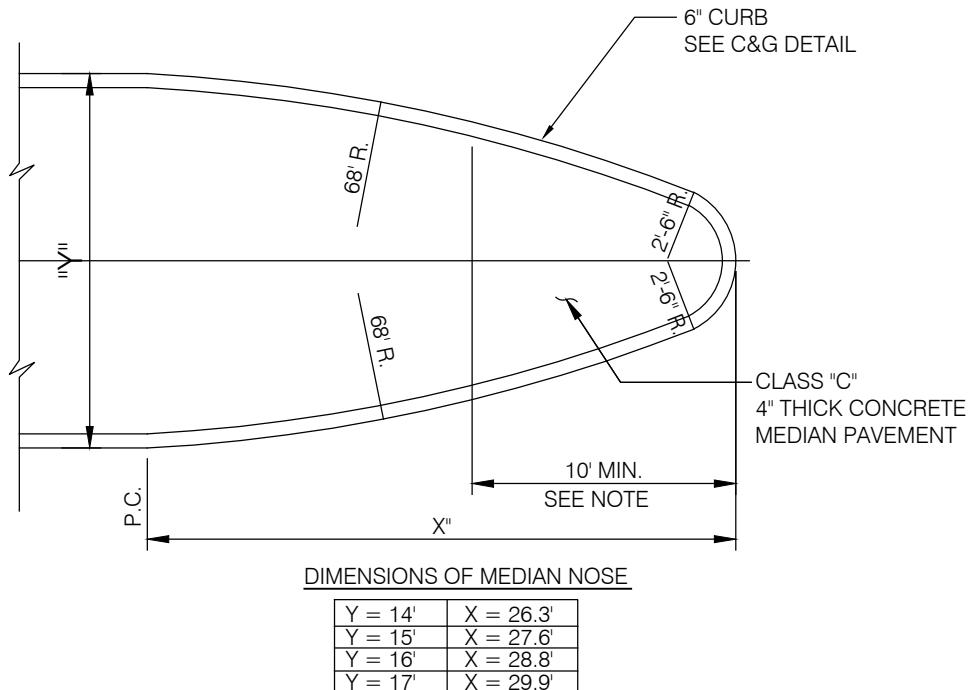
DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

REINFORCED CONCRETE
STREET HEADERS

SHEET. #

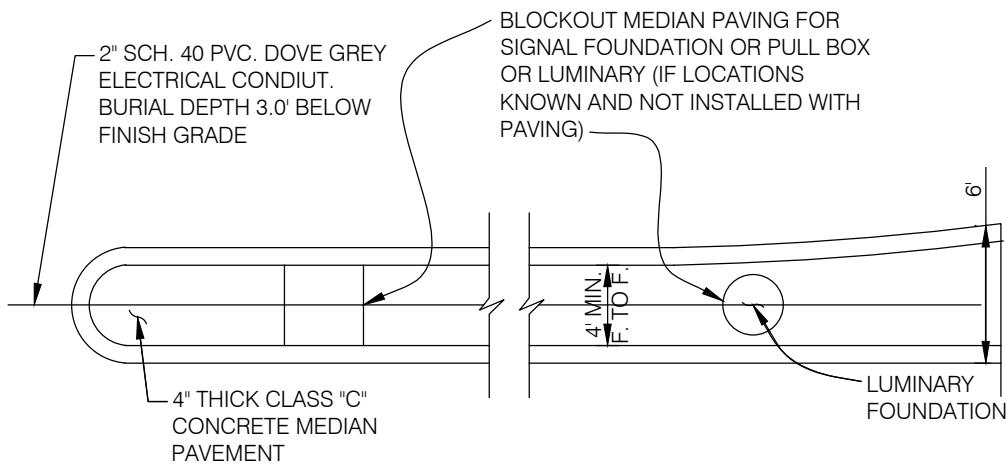
C10



CONCRETE NOSE FOR MEDIAN ISLAND

NOTE:

MEDIAN PAVING SHALL EXTEND TO POINT WHERE MEDIAN IS 6' WIDE. IF MEDIAN IS 6' WIDE, PAVING SHALL EXTEND 15' FROM NOSE. FOR MEDIAN WIDER THAN 6' PAVING SHALL EXTEND 10' FROM NOSE. ALL DISTANCES ARE MINIMUM.



LEFT TURN LANE MEDIAN PAVEMENT

1

MEDIAN ISLAND PAVEMENT

NOT TO SCALE



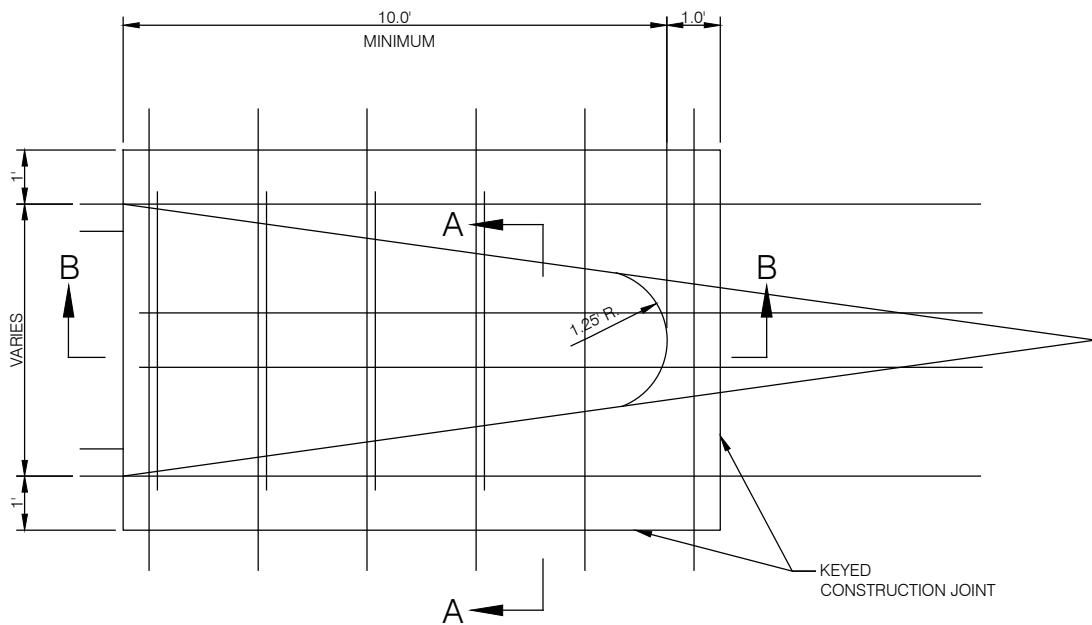
DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

MEDIAN ISLAND PAVEMENT

SHEET. #

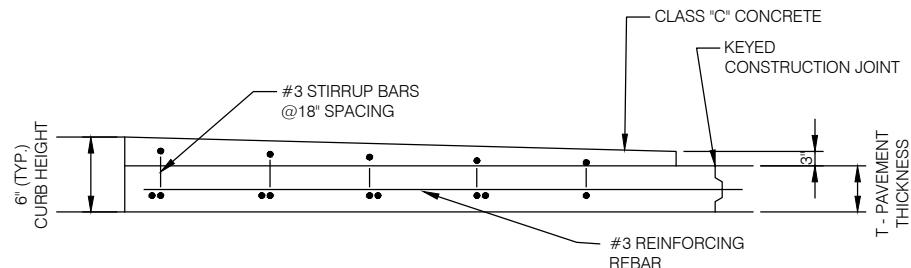
C11



1

MONOLITHIC CONCRETE MEDIAN NOSE

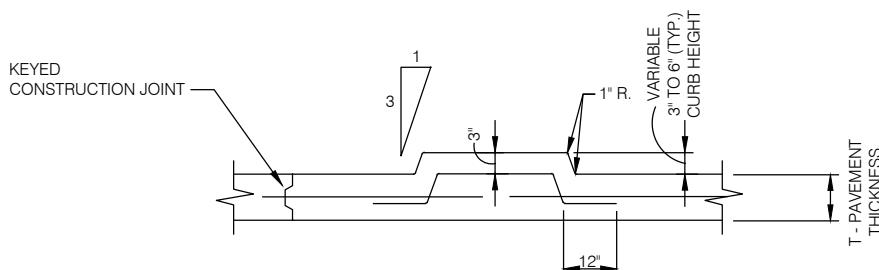
NOT TO SCALE



2

SECTION B-B

NOT TO SCALE



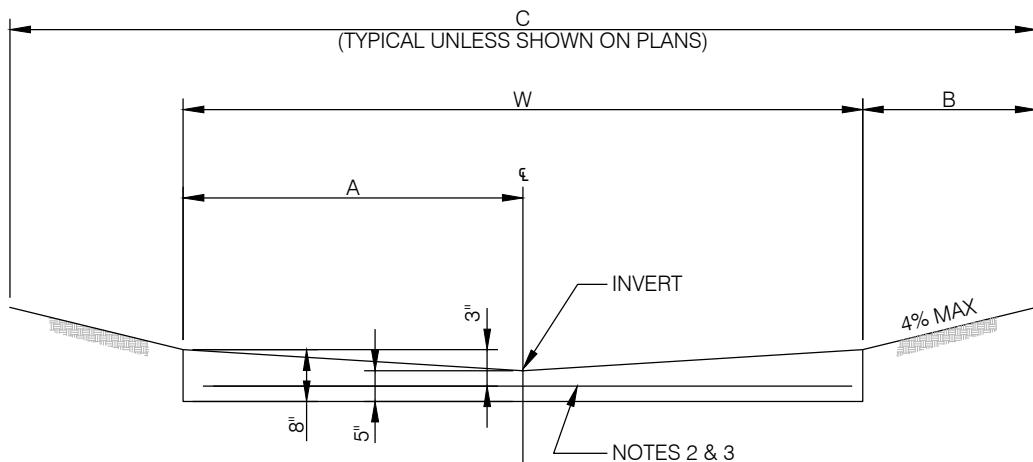
3

SECTION A-A

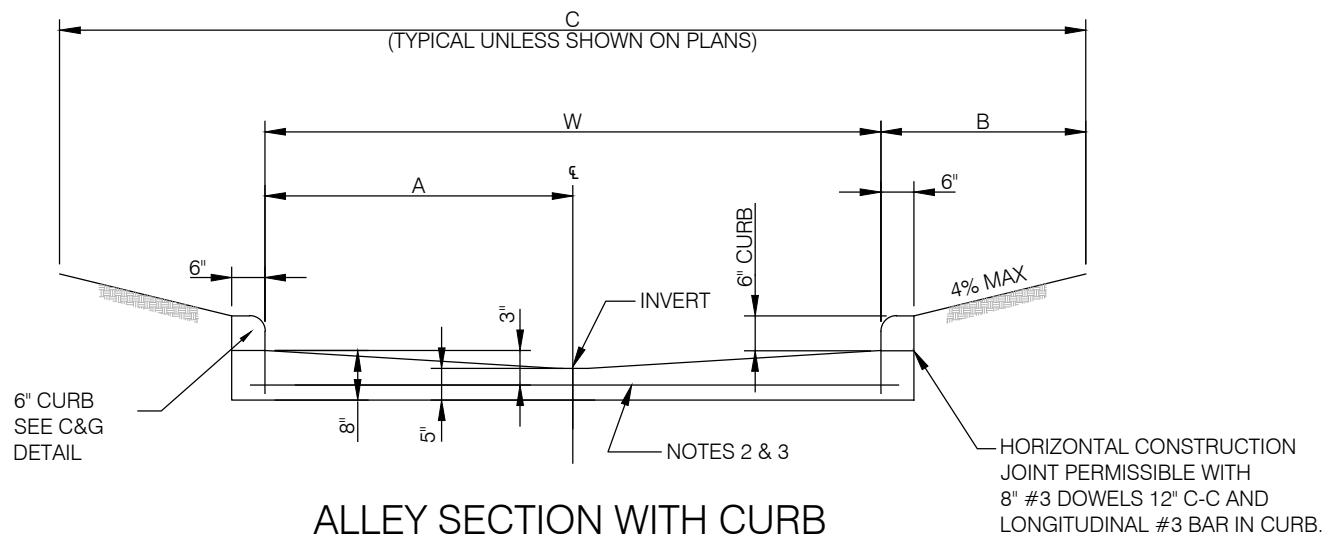
NOT TO SCALE

NOTE:
1. REINFORCEMENT BARS SHALL
MATCH SIZE AND MATERIAL SPECIFIED
IN PAVEMENT DESIGN.

<p>WEATHERFORD TRUE TEXAS</p>	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT		SHEET. #
	01/2020	DRAWN BY	MEDIAN ISLAND PAVEMENT MONOLITHIC CONCRETE NOSE	
CITY OF WEATHERFORD				C12



ALLEY SECTION WITHOUT CURB



ALLEY SECTION WITH CURB

NOTES:

1. PROVIDE SAWED TRANSVERSE CONTRACTION JOINTS NOT MORE THAN 20' C-C.
2. REINFORCED WITH NO. 3 BARS AT 18" C-C BOTH WAYS.
3. EXPANSION JOINTS TO BE PLACED AT ALL INTERSECTIONS AND NOT TO EXCEED 600' BETWEEN JOINTS.
4. CONCRETE SHALL BE 5" THICK CLASS "C", 3600 PSI
5. COMPACTED SUBGRADE TO 95% STANDARD PROCTOR WITH PI < 20.

ALLEY WIDTH (W)	A	B	R.O.W. WIDTH (C)
10'	5'	2'-6"	15'
15'	7.5'	2'-6"	20'

1

ALLEY SECTION
NOT TO SCALE

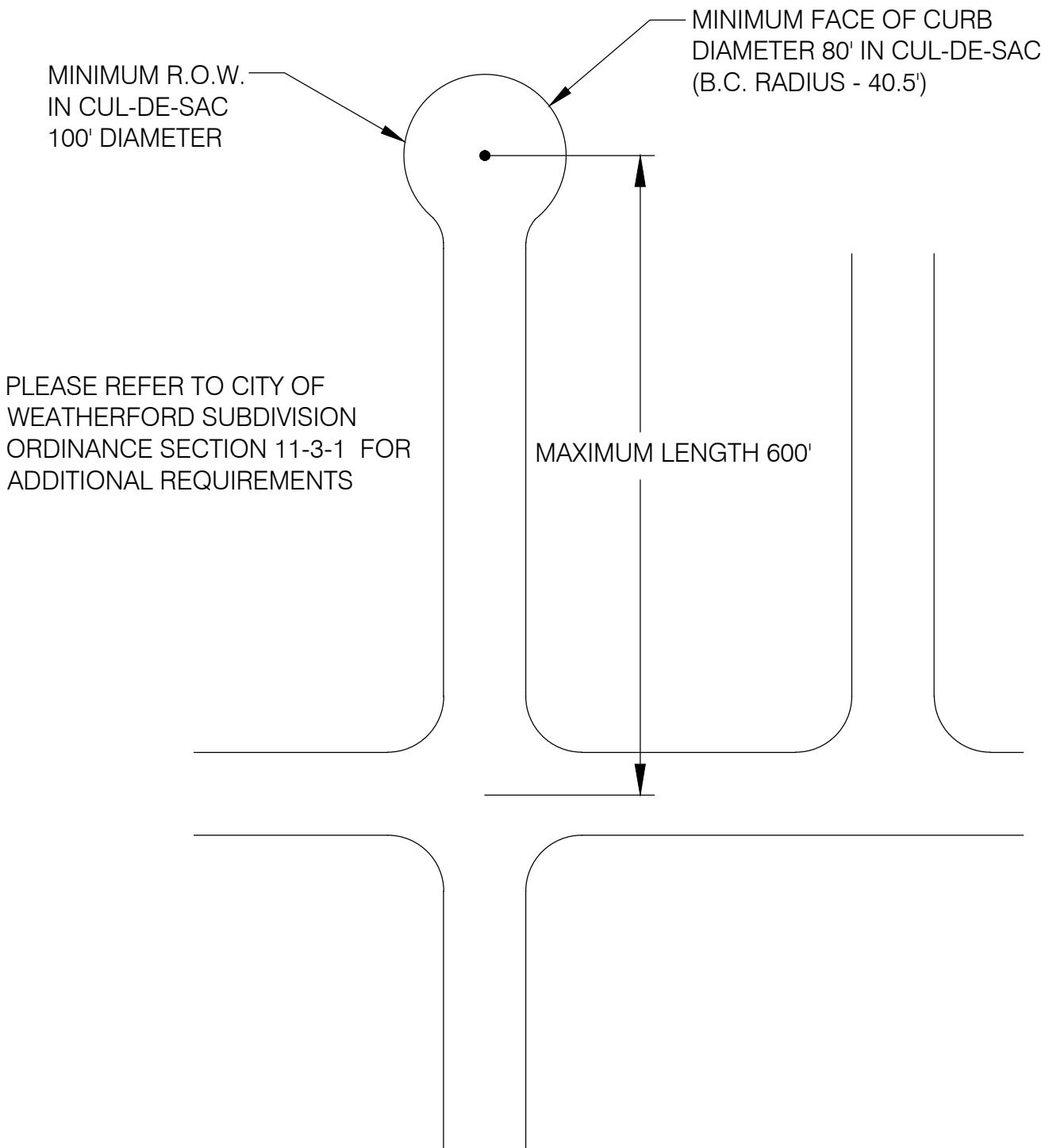


DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

ALLEY SECTION WITH
AND WITHOUT CURB

SHEET. #
C13



1

RESIDENTIAL CUL-DE-SAC

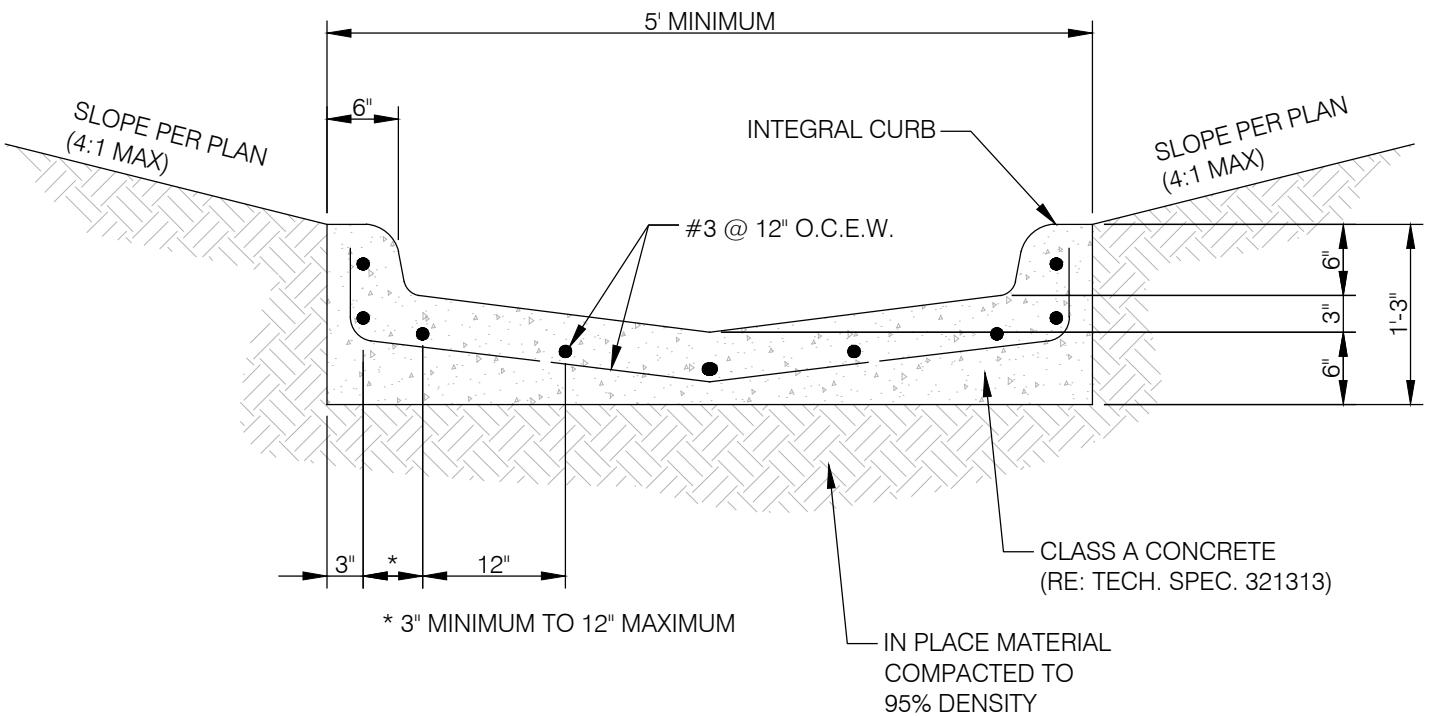
NOT TO SCALE



DATE
01/2020
DRAWN BY

TRANSPORTATION AND PUBLIC WORKS DEPARTMENT
TYPICAL RESIDENTIAL CUL-DE-SAC

SHEET. #
C14



1 CURBED FLUME

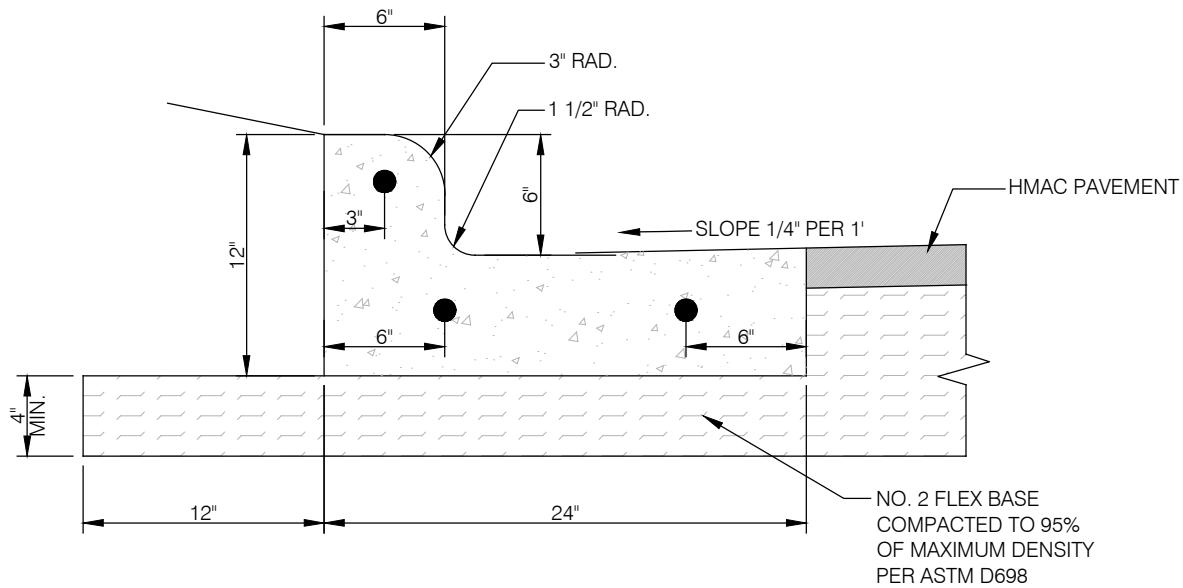
NOT TO SCALE

NOTES:

1. IF FLUME IS 7' OR WIDER, INSTALL REMOVABLE STEEL BOLLARDS BURIED TO 4'-0" DEPTH AT BOTH START AND END OF FLUME AT 5' SPACING. CONTACT TPW FOR ADDITIONAL INFORMATION AND DETAILS ON BOLLARDS.
2. SLOPES SHALL BE STABILIZED WITH VEGETATION OR OTHER APPROVED METHODS.



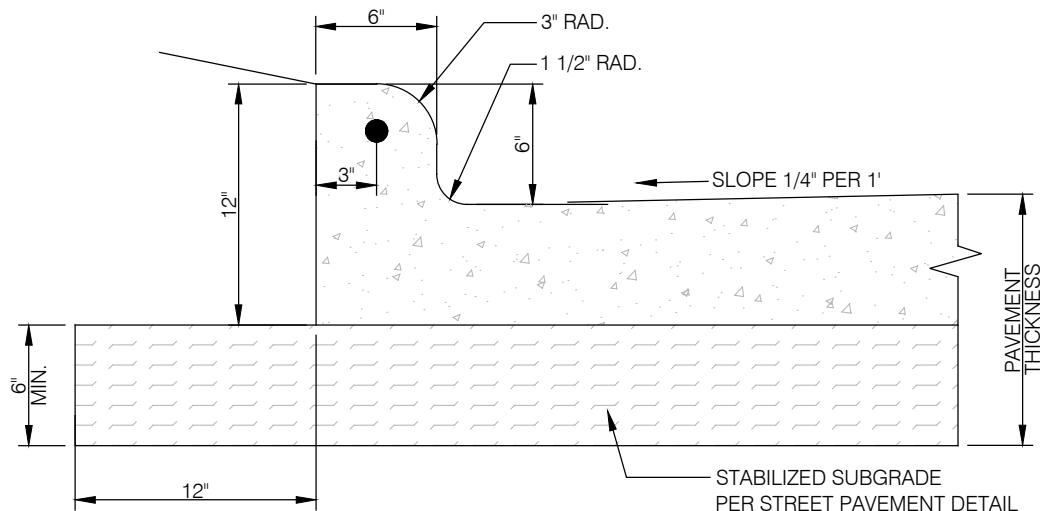
	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY		CURBED FLUME DETAIL	C15
	CITY OF WEATHERFORD		



1

SEPARATE CURB AND GUTTER

NOT TO SCALE



2

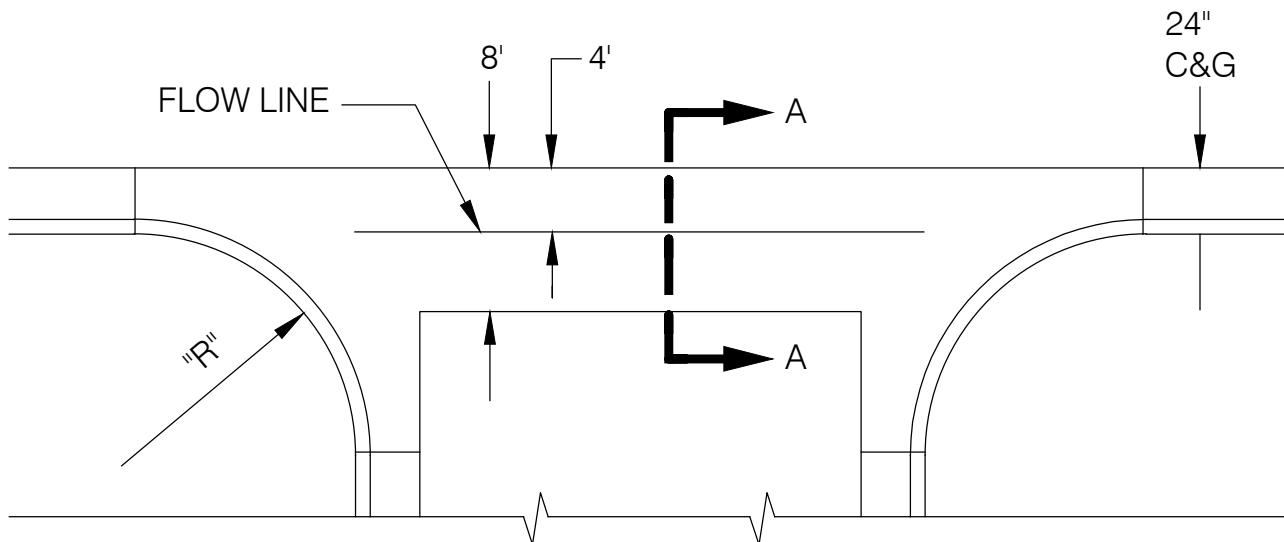
INTEGRAL CURB AND GUTTER

NOT TO SCALE

NOTES:

1. REINFORCEMENT SHALL BE NO. 4 BARS, UNLESS OTHERWISE SPECIFIED.
2. CONCRETE SHALL BE CLASS "C", 3600 PSI MINIMUM. ALL CURBS ARE CONSTRUCTED OF PORTLAND CEMENT CONCRETE UNLESS OTHERWISE SHOWN.
3. FOR SEPERATE C&G CONTRACTOR SHALL PLACE EXPANSION JOINTS EVERY 60 FT. AND CONSTRUCT TOOL JOINT SPACING AT 10' INTERVALS UNLESS OTHERWISE SPECIFIED BY INSPECTOR.
4. FOR INTEGRAL C&G CONTRACTOR SHALL PLACE EXPANSION JOINTS AND TOOL JOINTS PER STREET PAVEMENT DETAIL OR AS SPECIFIED BY INSPECTOR.
5. GRADE SHALL BE MEASURED AT BACK OF CURB AND TOP OF CURB.

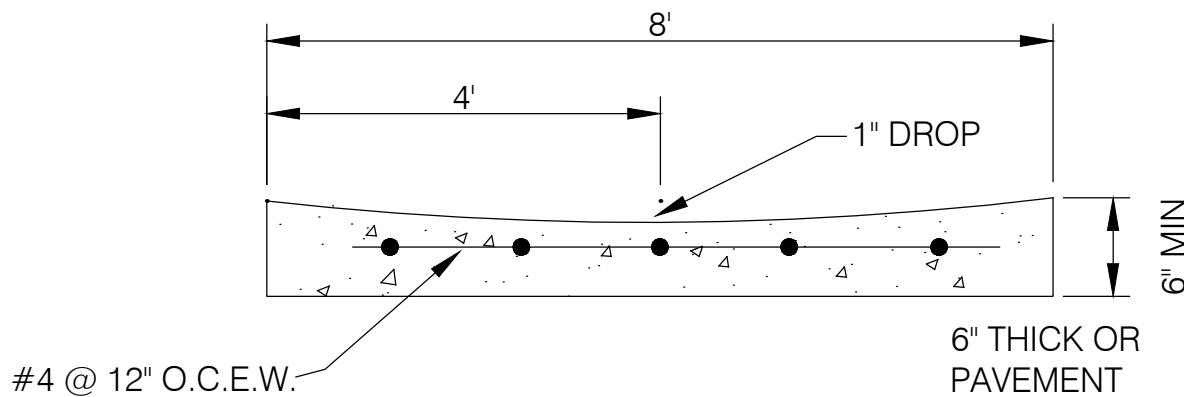
	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	CONCRETE CURB AND GUTTER	C16



1

VALLEY GUTTER

NOT TO SCALE



NOTE:

ALL CONCRETE FOR VALLEY GUTTER SHALL BE
CLASS "A"

REINFORCEMENT STEEL SHALL BE NO.4 ON
12" CENTERS BOTH WAYS.

2

SECTION A-A

NOT TO SCALE



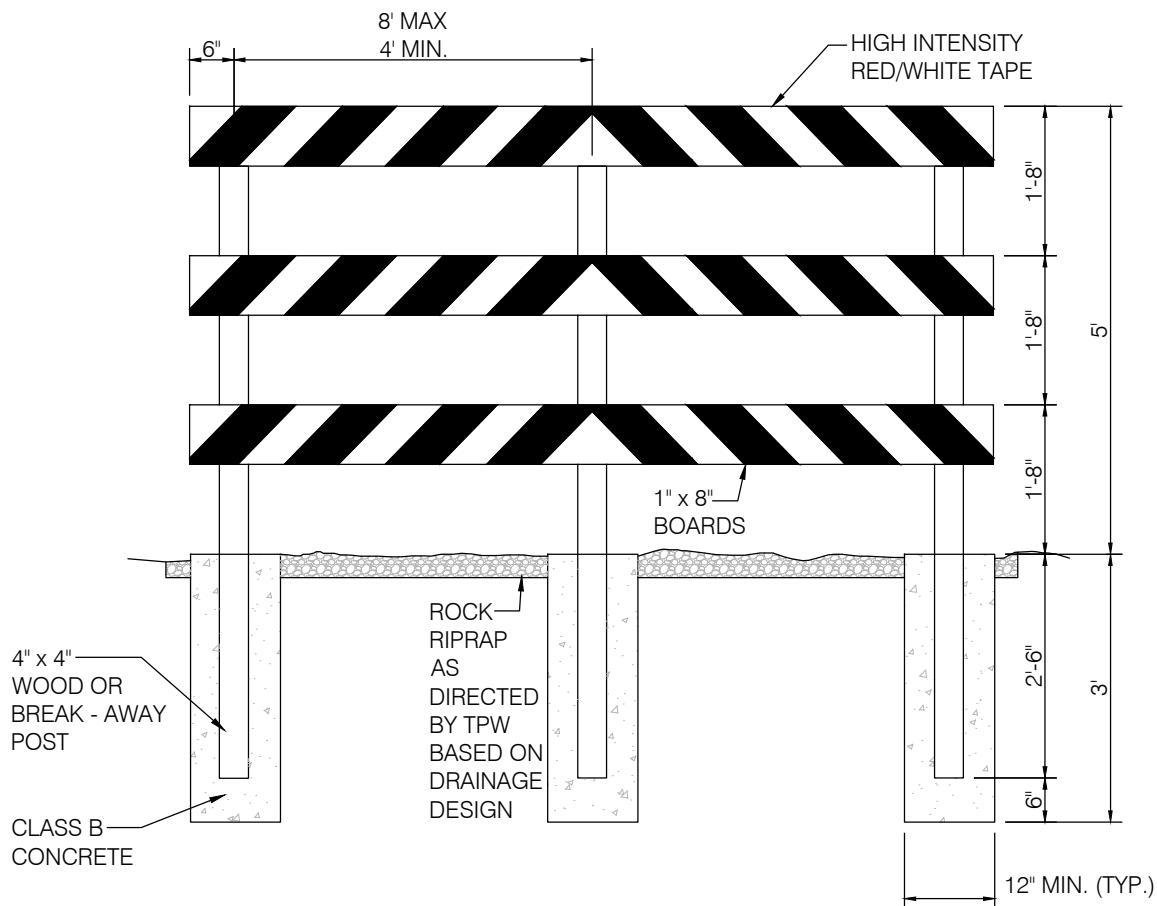
DATE	01/2020
DRAWN BY	CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

VALLEY GUTTER

SHEET. #

C17



TYPICAL INSTALLATION

NOTE:

1. ALL BARRICADES SHALL BE IN ACCORDANCE WITH THE LATEST REVISION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) AND THE STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD).
2. BARRICADE MUST COVER ENTIRE WIDTH OF PAVED ROADWAY OR FIRELANE SURFACE.
3. ALL 1" x 8" AND 4" x 4" WOOD POSTS MUST BE PAINTED WHITE.
4. BARRICADES SHALL BE DESIGNED AND CONSTRUCTED TO THE STANDARDS OF THE COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICE LIST.
5. BARRICADE STRIPING MATERIAL SHALL BE RED AND WHITE HIGH INTENSITY REFLECTIVE SHEETING.
6. DIAGONAL STRIPING SHALL BE PLACED IN A MANNER THAT DIRECTS TRAFFIC IN THE APPROPRIATE DIRECTION OF TRAVEL.
7. PROPOSED BARRICADE STRIPING SHALL BE APPROVED BY THE CITY PRIOR TO PLACEMENT OF BARRICADE

1

ROAD CLOSED BARRICADE

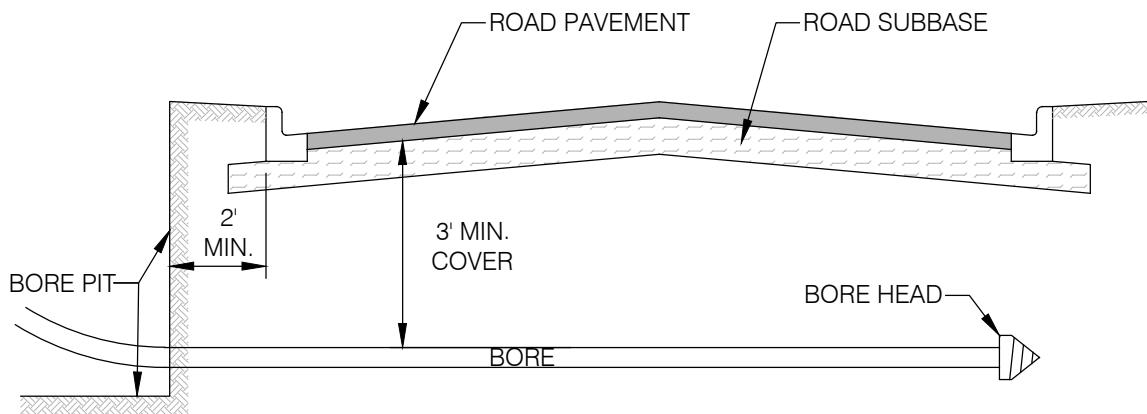
NOT TO SCALE



DATE
01/2020
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CITY OF WEATHERFORD

TRANSPORTATION AND PUBLIC WORKS DEPARTMENT
ROAD CLOSED BARRICADE TYPICAL INSTALLATION

SHEET. #
C18



1

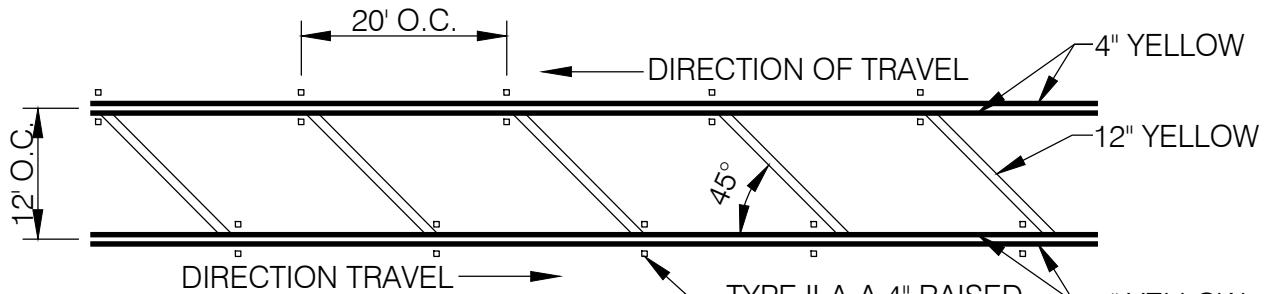
JACK & BORE DETAILS

NOT TO SCALE

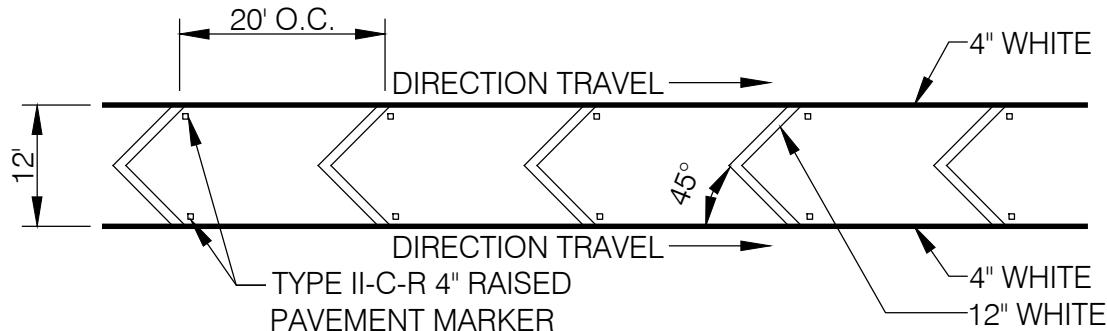
NOTES:

1. A RIGHT-OF-WAY EXCAVATION PERMIT IS REQUIRED WHEN JACKING OR BORING WITHIN CITY RIGHT-OF-WAY. PERMIT APPLICATION AVAILABLE THROUGH TPW DEPARTMENT.
2. WHEN CONSTRUCTION IS WITHIN TXDOT RIGHT-OF-WAY JURISDICTION, A TXDOT PERMIT IS REQUIRED.
3. ALL CONSTRUCTION METHODS FOR JACKING & BORING SHALL CONFORM TO ITEM 503.1 THROUGH 503.4 OF N.C.T.C.O.G. STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 4TH EDITION.
4. WHEN CONSTRUCTION ACTIVITY IS COMPLETED, THE CONTRACTOR SHOULD BACKFILL ALL BORE PITS TO 90% OF MAXIMUM DENSITY AND REPLACE, IF ANY, SURFACE VEGETATION TO THE SAME OR BETTER CONDITION PRIOR TO CONSTRUCTION.
5. CHECK WITH TPW DEPARTMENT FOR SPECIFIC REQUIREMENTS NOT CONTAINED HEREIN.

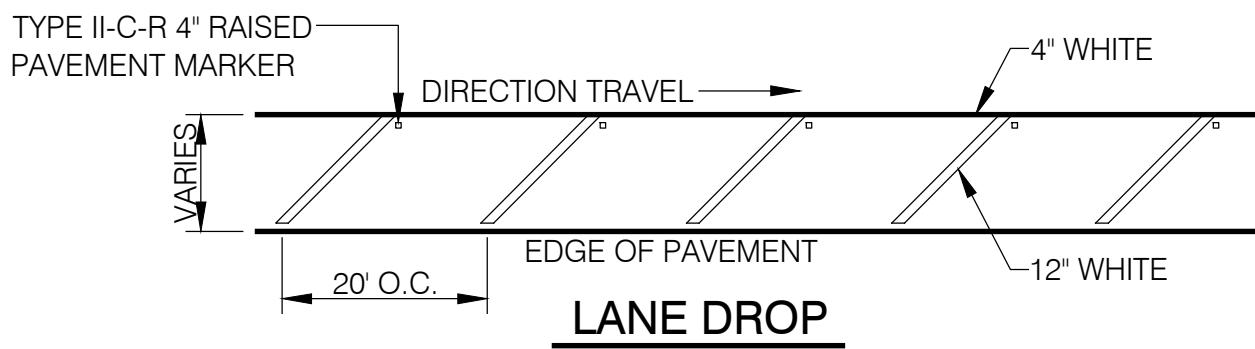
	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	JACK & BORE DETAILS	C19



OPPOSING TRAFFIC GORE DETAIL



OPPOSING TRAFFIC GORE DETAIL



NOTES:

1. REFER TO TxDOT PM(4)-03 DETAIL "A" FOR DIMENSION BETWEEN PAVEMENT MARKINGS AND MARKERS.
2. REFER TO N.C.T.C.O.G. SPECIFICATIONS AND TXMUTCD.
3. ALL PAVEMENT MARKINGS SHALL BE THERMOPLASTIC (TxDOT TYP I).

1

PAVEMENT MARKINGS AND DETAILS

NOT TO SCALE

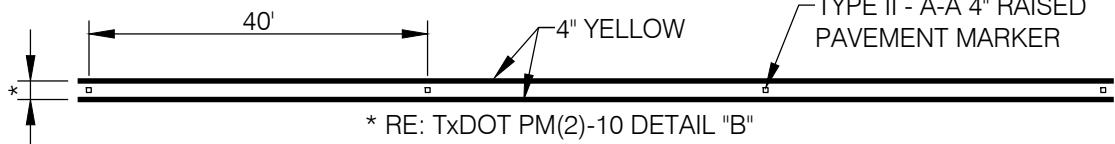


DATE
01/2020
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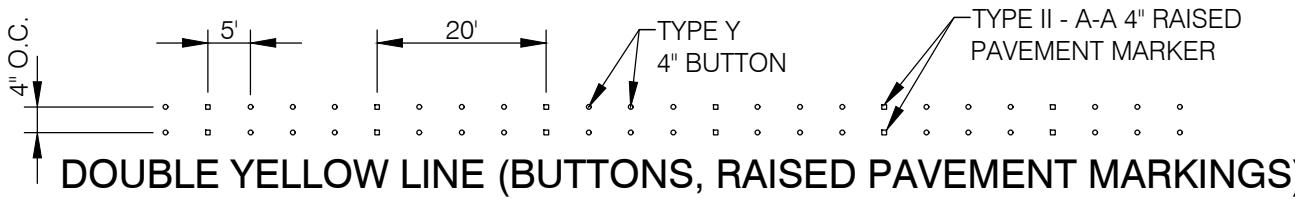
CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT
PAVEMENT MARKINGS DETAIL

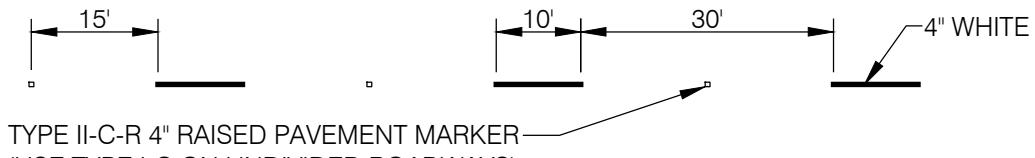
SHEET. #
C20



DOUBLE YELLOW LINE (PAVEMENT MARKINGS)



DOUBLE YELLOW LINE (BUTTONS, RAISED PAVEMENT MARKINGS)

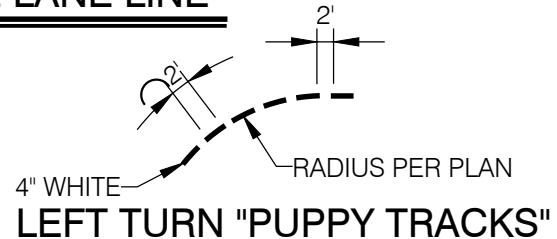


TYPE II-C-R 4" RAISED PAVEMENT MARKER
(USE TYPE I-C ON UNDIVIDED ROADWAYS)

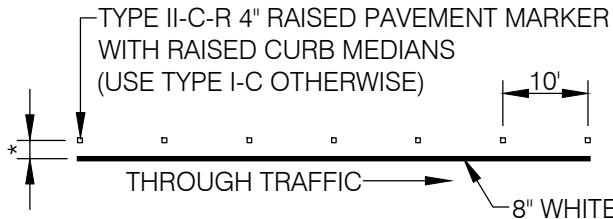
BROKEN WHITE LANE LINE



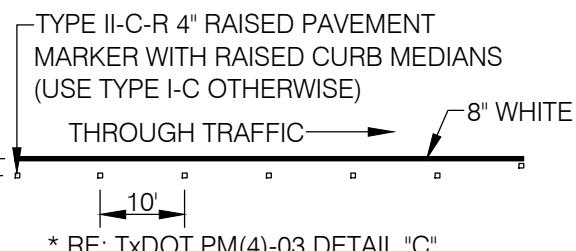
WHITE OR YELLOW EDGE LINE



RADIUS PER PLAN



LEFT TURN BAY LINE



RIGHT TURN BAY LINE

NOTES:

1. ALL STRIPING, ARROWS AND WORDS ON PAVEMENT SHALL BE THERMOPLASTIC UNLESS NOTED OTHERWISE NOTED IN PLANS.
2. REFER TO N.C.T.C.O.G. SPECIFICATIONS AND TXMUTCD

1

PAVEMENT MARKINGS AND DETAILS

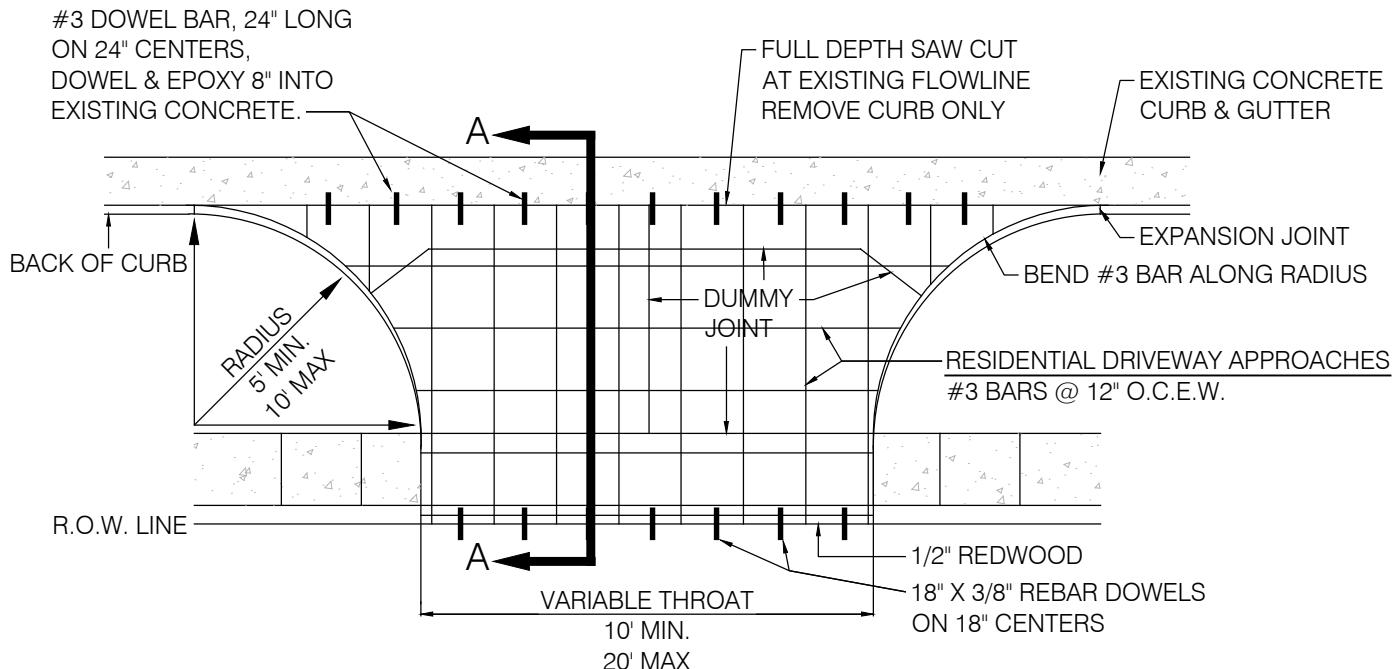
NOT TO SCALE



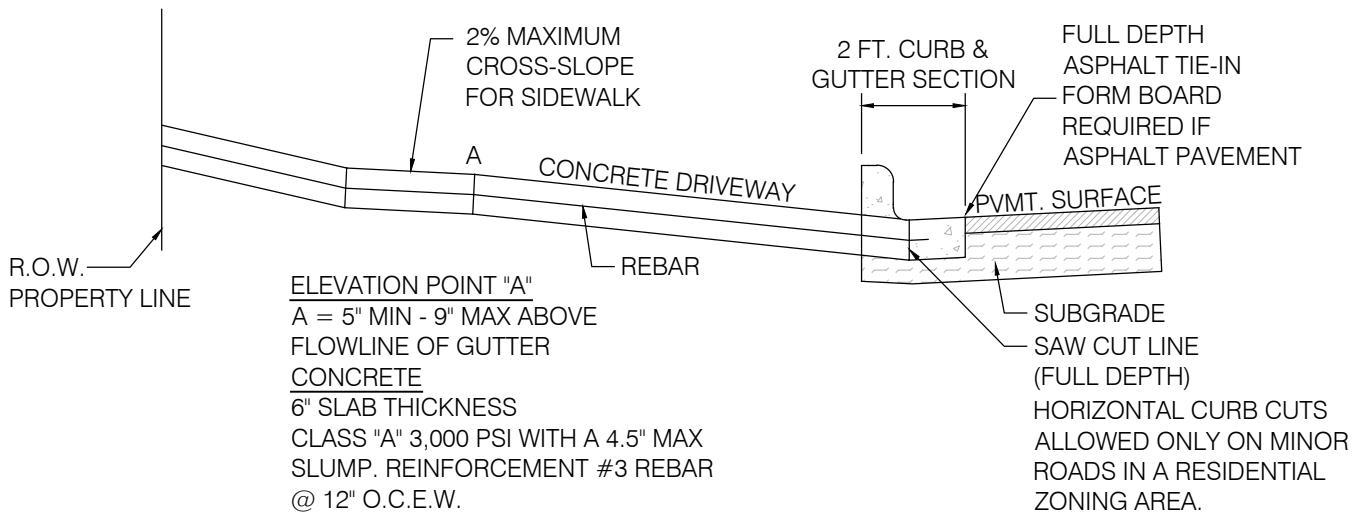
DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

TRANSPORTATION AND PUBLIC WORKS DEPARTMENT
PAVEMENT MARKINGS DETAIL

SHEET. #
C21



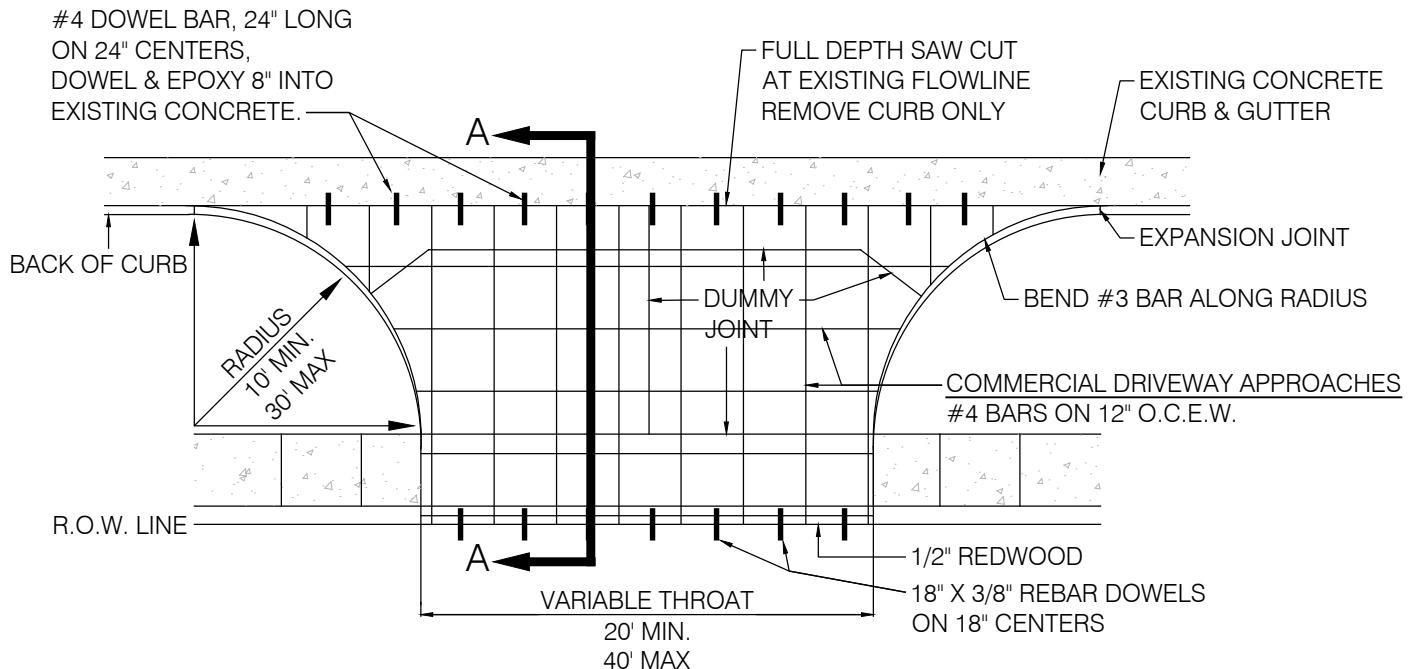
SECTION A-A



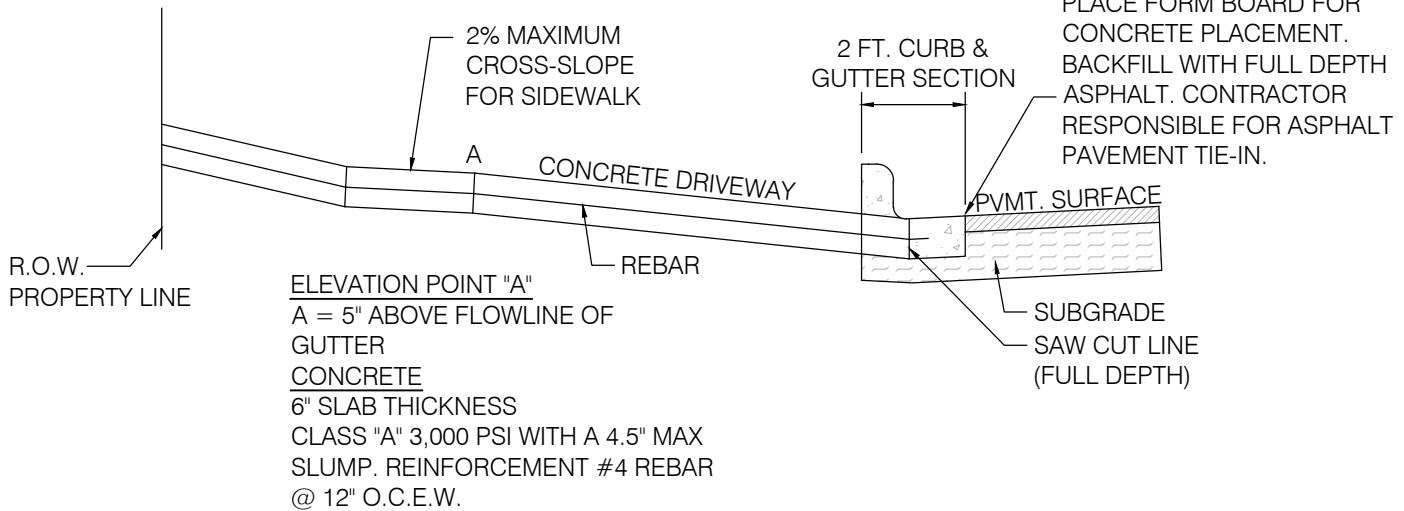
NOTES:

1. ABOVE GROUND PUBLIC UTILITY STRUCTURES SHALL BE A MINIMUM DISTANCE OF 4 FEET FROM THE DRIVEWAY APPROACH RADIUS.
2. SEE TABLE 6-4 FOR DRIVEWAY SPACING AND DESIGN STANDARDS.
3. DRIVEWAY EXCAVATION WITHIN R.O.W. SHALL NOT BE LEFT OPEN CUT FOR OVER 72 HOURS.
4. A DRIVEWAY APPROACH PERMIT IS REQUIRED PRIOR TO ANY CONSTRUCTION WITHIN CITY RIGHT OF WAY.

	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	RESIDENTIAL DRIVEWAY APPROACH	C22



SECTION A-A

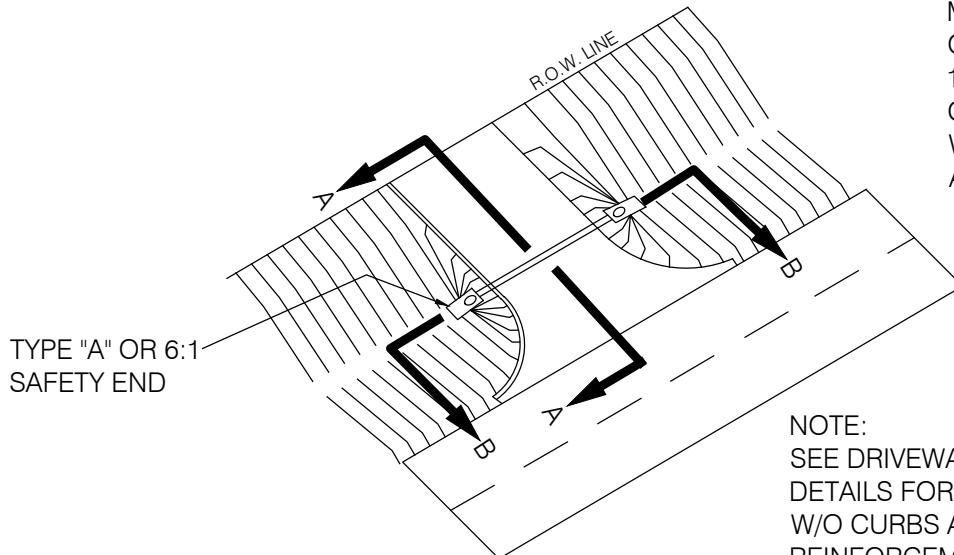


NOTES:

1. ABOVE GROUND PUBLIC UTILITY STRUCTURES SHALL BE A MINIMUM DISTANCE OF 4 FEET FROM THE DRIVEWAY APPROACH RADIUS.
2. SEE TABLE 6-4 FOR DRIVEWAY SPACING AND DESIGN STANDARDS.
3. DRIVEWAY EXCAVATION WITHIN R.O.W. SHALL NOT BE LEFT OPEN CUT FOR OVER 72 HOURS.
4. A DRIVEWAY APPROACH PERMIT IS REQUIRED PRIOR TO ANY CONSTRUCTION WITHIN CITY RIGHT OF WAY.

	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	COMMERCIAL DRIVEWAY APPROACH	
		C23	

6" CLASS "A" CONCRETE
MINIMUM 3000 PSI
OR
1 1/2" HMAC
OVER 4" ROAD BASE
WITH CITY OF WEATHERFORD
APPROVAL

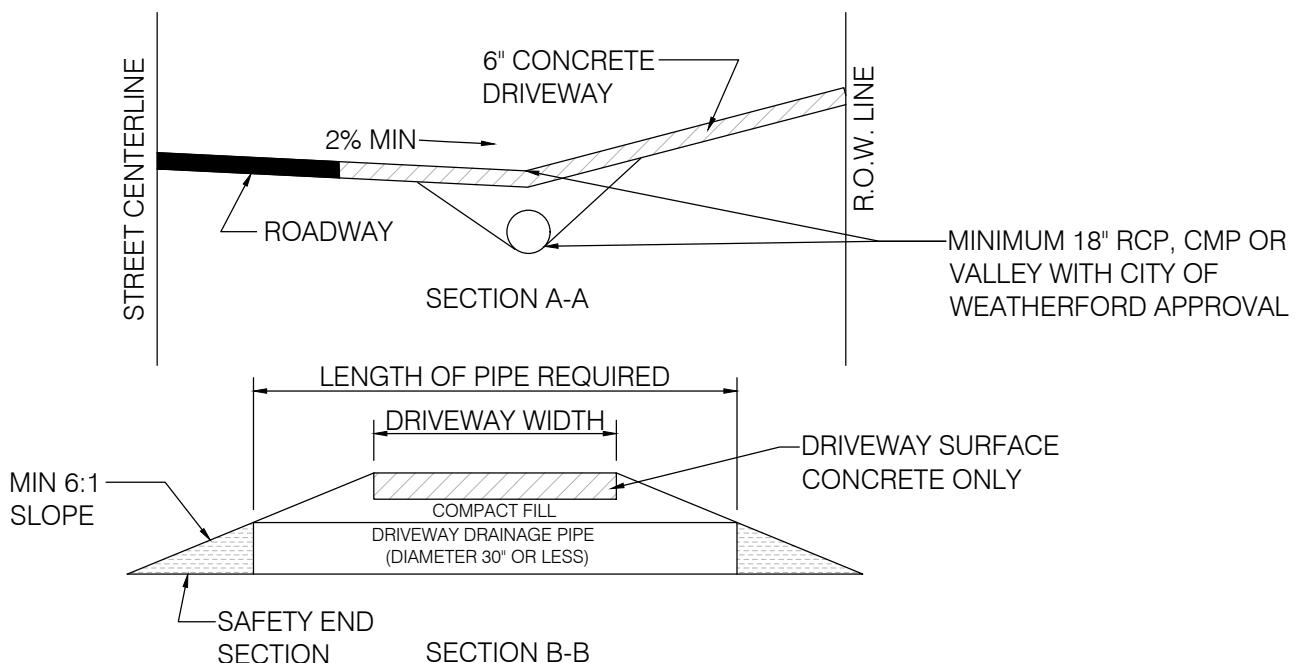


NOTE:
SEE DRIVEWAY APPROACH
DETAILS FOR FLAT DRIVEWAY
W/O CURBS AND STEEL
REINFORCEMENT LAYOUT

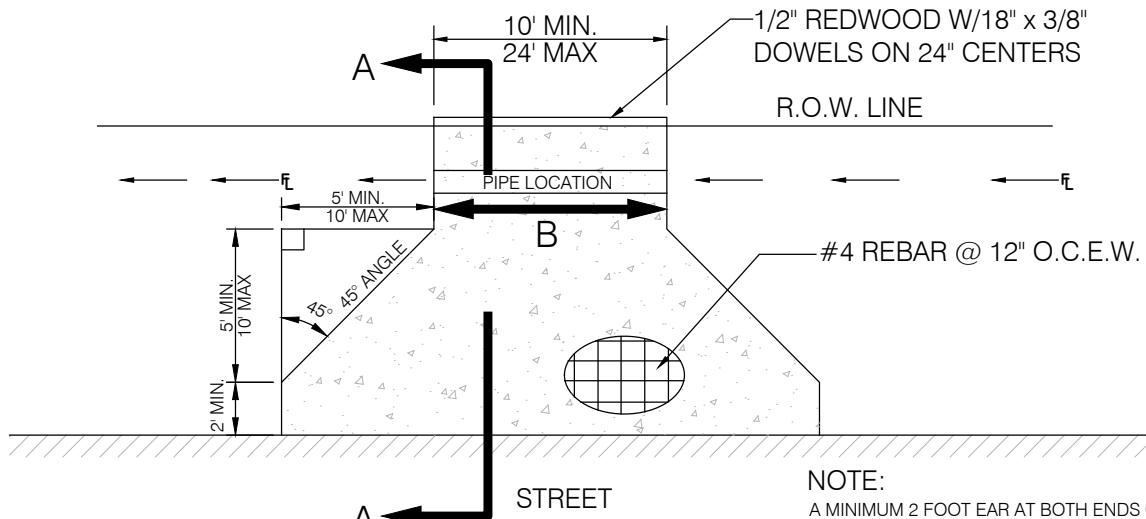
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STANDARD DRIVEWAY APPROACH W/CULVERT

NOT TO SCALE



	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD		C24
	RURAL DRIVEWAY APPROACH WITH CULVERT		



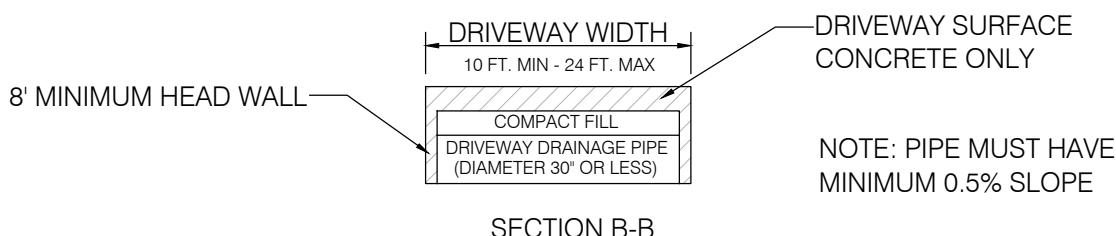
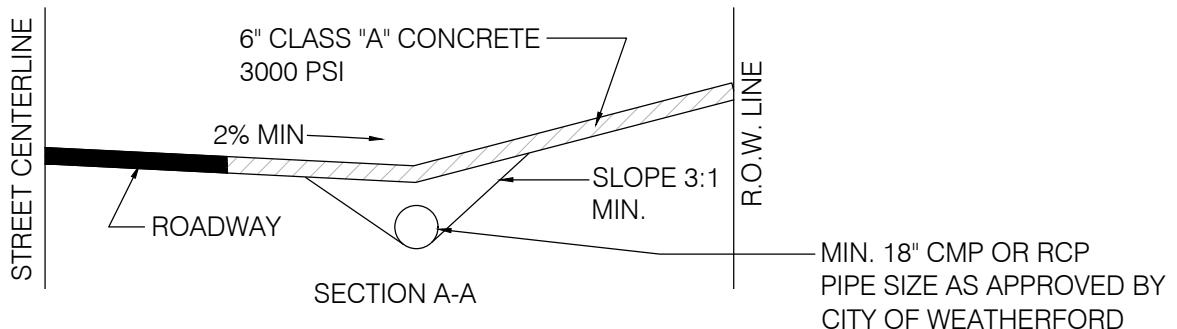
NOTE:

A MINIMUM 2 FOOT EAR AT BOTH ENDS OF DRIVEWAY APPROACH REQUIRED. A STRAIGHT EDGE FORM MUST BE PLACED IN FRONT OF DRIVEWAY APPROACH FLUSH WITH EXISTING ROADWAY PAVEMENT

STANDARD DRIVEWAY APPROACH W/CULVERT

1

NOT TO SCALE

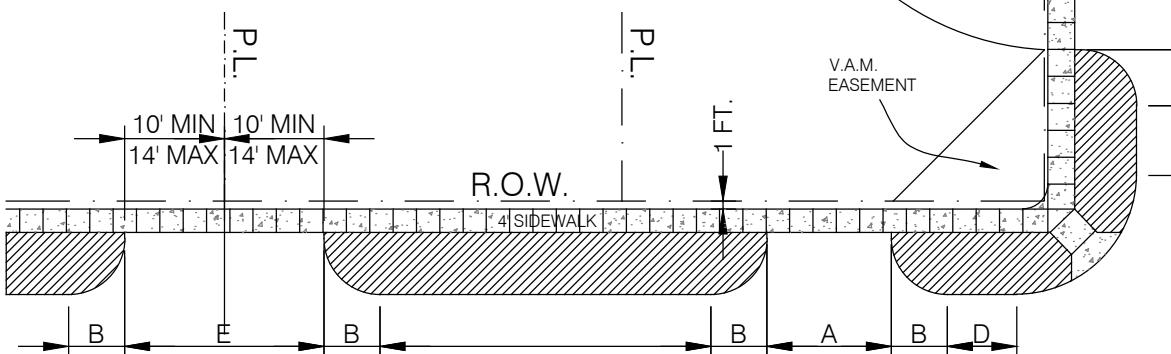


	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	RURAL DRIVEWAY APPROACH WITH CULVERT FOR USE IN RURAL ROADS WITHIN RESIDENTIAL ZONING AREAS ONLY		C25
	CITY OF WEATHERFORD		

DIMENSION	MINIMUM	MAXIMUM
A	10'	24' *
B	5' R	10' R
C	50'	---
D	10'	---
E	20'	28'
F	---	---
G	---	---

NOTES:

1. THE ENTRANCE AND EXIT FROM A CIRCULAR RESIDENTIAL DRIVEWAY SHALL BE FROM THE SAME STREET. ENTRANCE FROM ONE STREET WITH EXIT TO ANOTHER STREET SHALL NOT BE PERMITTED.
2. NO PORTION OF ANY DRIVEWAY SHALL BE LOCATED WITHIN FOUR (4') FEET OF ANY FIRE HYDRANT, ELECTRICAL POLE, OR ANY ABOVE GROUND UTILITY STRUCTURE.
3. DRIVEWAYS ONTO THOROUGHFARE AND/OR COLLECTOR STREETS SHALL NOT BE PERMITTED WITHOUT WRITTEN APPROVAL OF THE DIRECTOR OF TRANSPORTATION AND PUBLIC WORKS DEPARTMENT OR HIS DESIGNATE.
4. *A MAXIMUM THROAT WIDTH OF 30' SHALL BE ALLOWED FOR RESIDENTIAL STRUCTURES WITH A THREE CAR GARAGE ONLY. ALL OTHERS A VARIANCE SHALL BE REQUESTED AND APPROVED BY THE DIRECTOR OF TRANSPORTATION AND PUBLIC WORKS DEPARTMENT.
5. FOR SIDEWALK DIMENSION AND SPECIFICATIONS PLEASE REFER TO STANDARD DETAIL SHEET. ALL SIDEWALKS CROSSING DRIVEWAYS SHALL BE SAME THICKNESS AS DRIVEWAY WITH A CROSS-SLOPE NOT TO EXCEED 2%.



STREET C.L.
LOCAL STREET

1

RESIDENTIAL DRIVEWAY DESIGN

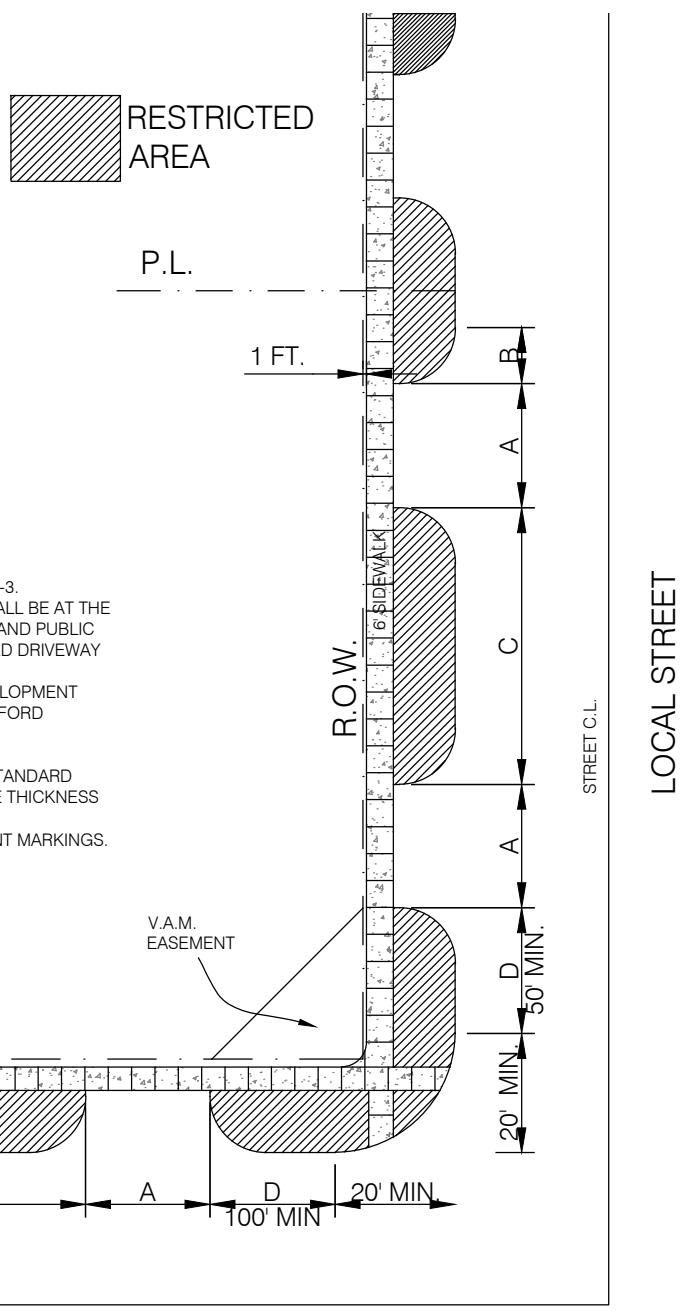
NOT TO SCALE

	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT		SHEET. #
	01/2020			
DRAWN BY	CITY OF WEATHERFORD			
	RESIDENTIAL DRIVEWAY DESIGN			
				C26

DIMENSION	MINIMUM	MAXIMUM
A	16' (ONE WAY) 20' (TWO WAY)	40'
B	10' R	30' R
C	LOCAL 50' COLLECTOR 100'	---
D	LOCAL 50' COLLECTOR 100'	---
E	100'	---
F	---	---
G	---	---

NOTES:

1. FOR DRIVEWAY SPACING ON ARTERIAL STREETS PLEASE SEE FIGURE 6-3.
2. THE LOCATION OF ACCESS POINTS FOR COMMERCIAL DRIVEWAYS SHALL BE AT THE SOLE DISCRETION OF THE CITY OF WEATHERFORD TRANSPORTATION AND PUBLIC WORKS DEPARTMENT AFTER PROPER CONSIDERATION OF ANTICIPATED DRIVEWAY VOLUMES AND THEIR AFFECT ON TRAFFIC SAFETY.
3. A TRAFFIC IMPACT ANALYSIS MAY BE REQUIRED FOR PROPOSED DEVELOPMENT PROJECTS WHICH SHALL BE IN ACCORDANCE WITH CITY OF WEATHERFORD SUBDIVISION ORDINANCE.
4. FOR RESIDENTIAL DRIVEWAY DESIGN PLEASE SEE FIGURE 6-4 (A).
5. FOR SIDEWALK DIMENSION AND SPECIFICATIONS PLEASE REFER TO STANDARD DETAIL SHEET. ALL SIDEWALKS CROSSING DRIVEWAYS SHALL BE SAME THICKNESS AS DRIVEWAY WITH A CROSS-SLOPE NOT TO EXCEED 2%.
6. ONE WAY DRIVEWAYS SHALL HAVE APPROPRIATE SIGNS AND PAVEMENT MARKINGS.

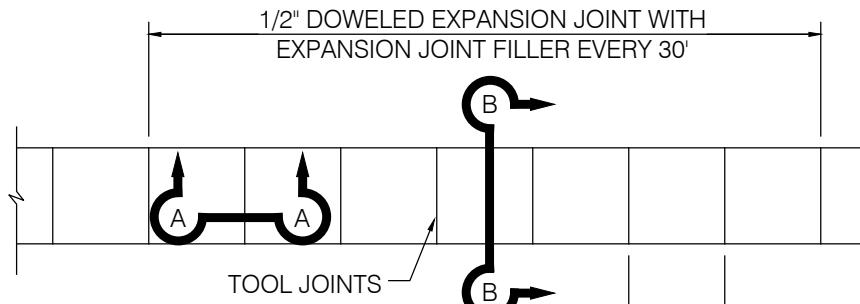


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COMMERCIAL DRIVEWAY DESIGN

NOT TO SCALE

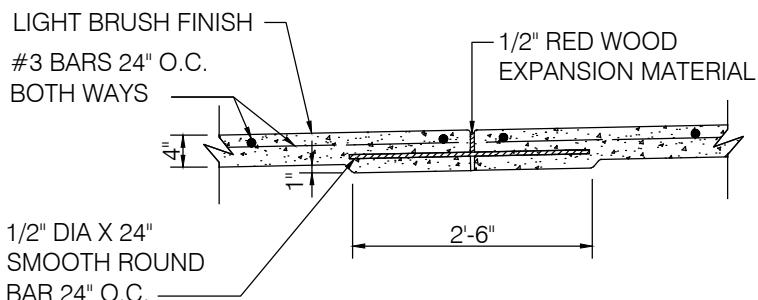
 <p>WEATHERFORD TRUE TEXAS</p>	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT		SHEET. #
	01/2020	DRAWN BY	COMMERCIAL DRIVEWAY DESIGN	
	DRAWN BY	COMMERCIAL DRIVEWAY DESIGN		C27
	CITY OF WEATHERFORD			



1

PLAN

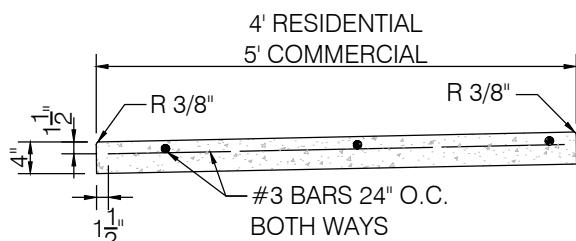
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2

SECTION A-A

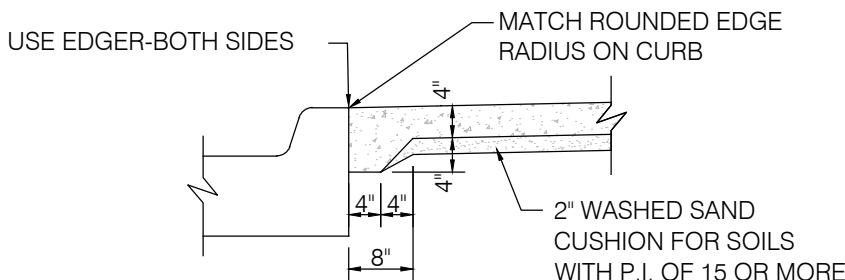
NOT TO SCALE



3

SECTION B-B

NOT TO SCALE



4

JOINT LUG DETAIL FOR SIDEWALK ADJACENT TO CURB

NOT TO SCALE

NOTES:

1. MAXIMUM GRADE OF THE SIDEWALK SHALL BE FIVE PERCENT (5%) OR THE GRADE OF ADJACENT OF STREET.
2. CROSS SLOPE OF SIDEWALK SHALL BE TWO PERCENT (2%) MAX PER A.D.A. OTHER THAN 5' SIDEWALK MAY BE SPECIFIED BY OWNER.
3. SIDEWALK SHALL BE CLASS "A" CONCRETE WITH #3 REBAR AT 18" CENTERS UNLESS OTHERWISE SPECIFIED BY OWNER.
4. ALL HONEYCOMB IN BACK OF CURB TO BE TROWEL-PLASTERED BEFORE POURING SIDEWALK.
5. LUG MAY BE FORMED BY SHAPING SUBGRADE TO APPROXIMATE DIMENSIONS SHOWN.
6. 1/2" EXPANSION JOINTS SHALL BE SPACED A 30' MAXIMUM INTERVALS OR AS OTHERWISE SPECIFIED. JOINTS SHALL BE RED WOOD WITH MINIMUM THREE (3) #4 SMOOTH DOWELS AT 12" SPACING.
7. ALL EXPANSION JOINTS SHALL BE SEALED WITH APPROVED JOINT SEALANT PER N.C.T.C.O.G. SPECIFICATIONS.
8. ALL SIDEWALKS CROSSING DRIVEWAYS SHALL BE SAME THICKNESS OF DRIVEWAY APPROACH.
9. SIDEWALK SUBGRADE SHALL BE COMPAKTED TO 95% STANDARD PROCTOR DENSITY.
10. A MAXIMUM OF 1" SAND MAY BE USED FOR LEVEL UP ONLY.
11. ALL SIDEWALK CONSTRUCTION SHALL CONFORM TO THE LATEST A.D.A. RULES AND GUIDELINES AND TEXAS ACCESSIBILITY STANDARDS.
12. ALL SIDEWALK CONSTRUCTION SHALL CONFORM TO THE LATEST EDITION OF THE PUBLIC WORKS CONSTRUCTION STANDARDS, NORTH CENTRAL TEXAS.
13. OWNER/CONTRACTOR SHALL OBTAIN A R.O.W. EXCAVATION PERMIT PRIOR TO ANY WORK OR CONSTRUCTION. CONTACT TPW AT 817-598-4254.



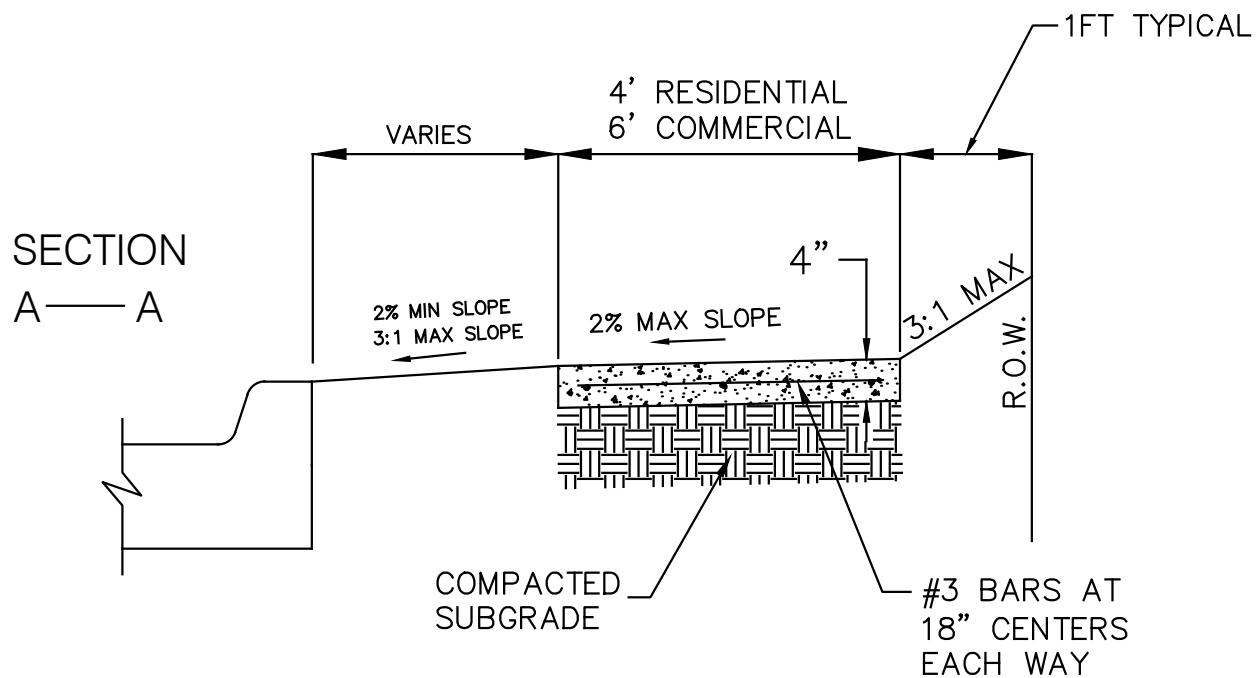
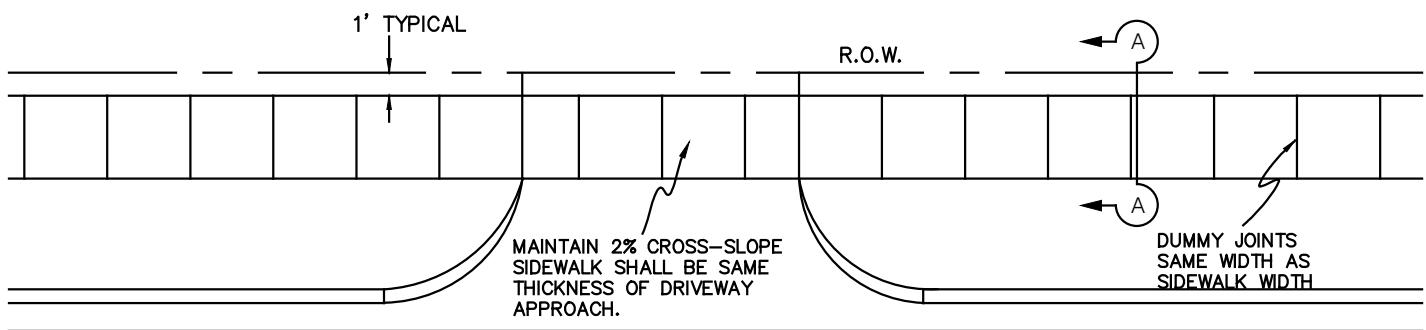
DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

REINFORCED CONCRETE SIDEWALK

SHEET. #

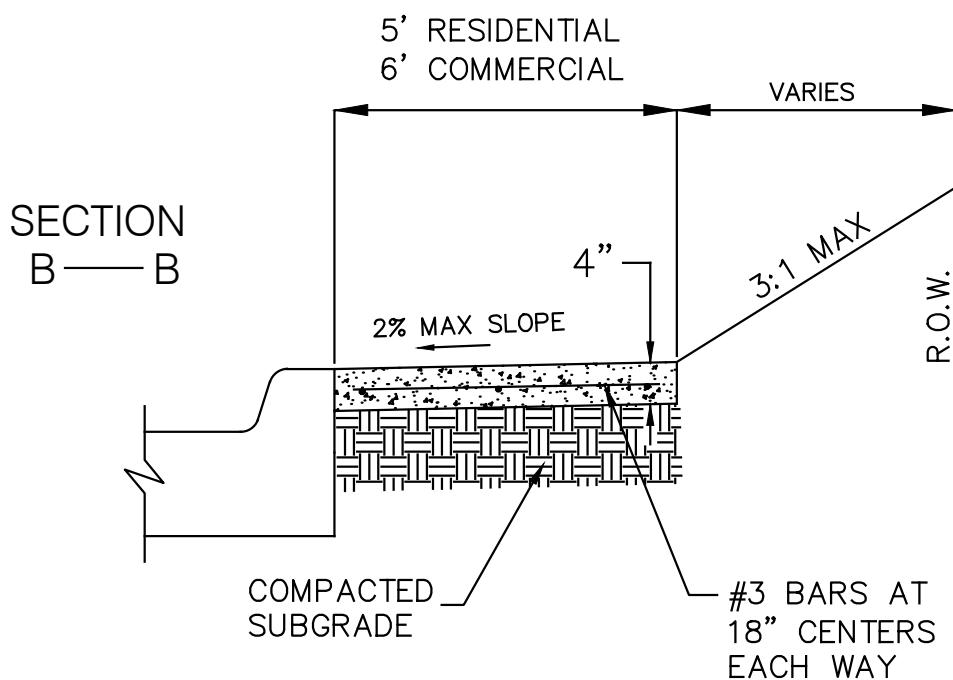
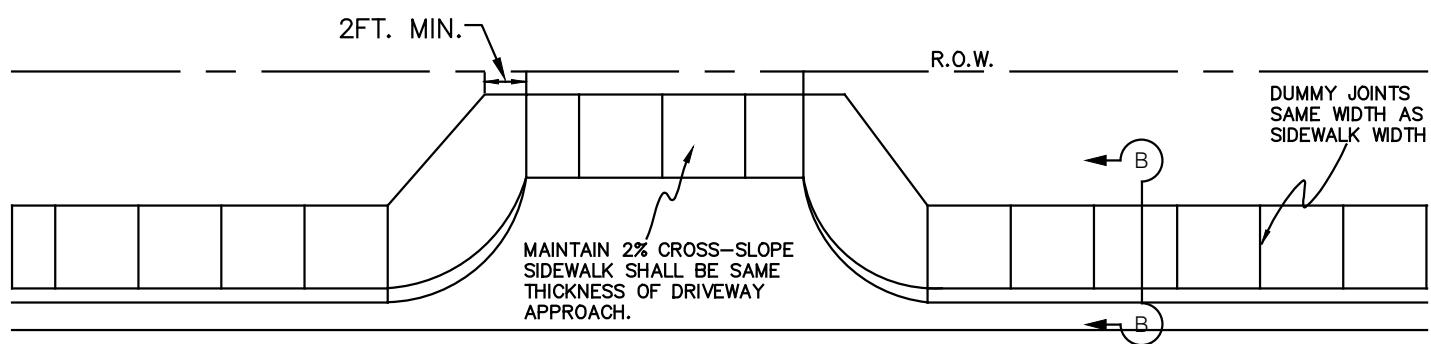
C28



NOTES:

1. CROSS SLOPE OF SIDEWALK SHALL BE TWO PERCENT (2%) MAX INCLUDING OVER DRIVEWAY APPROACH.
2. SIDEWALK SHALL BE 4" THICKNESS, CLASS "A" CONCRETE WITH #3 REBAR AT 18" CENTERS UNLESS OTHERWISE SPECIFIED BY TPW.
3. 1/2" EXPANSION JOINTS SHALL BE SPACED AT 40' MAXIMUM INTERVALS OR AS OTHERWISE SPECIFIED. JOINTS SHALL BE RED WOOD WITH MINIMUM THREE (3) #4 SMOOTH DOWELS AT 12" SPACING.
4. ALL SIDEWALKS CROSSING DRIVEWAYS SHALL BE SAME THICKNESS OF DRIVEWAY APPROACH.
5. ALL SIDEWALK CONSTRUCTION SHALL CONFORM TO THE LATEST A.D.A. RULES AND GUIDELINES AND TEXAS ACCESSIBILITY STANDARDS.
6. FOR ITEMS NOT SPECIFIED IN THIS DETAIL PLEASE REFER TO N.C.T.C.O.G. PUBLIC WORKS CONSTRUCTION STANDARDS.
7. OWNER/CONTRACTOR SHALL OBTAIN A R.O.W. CONSTRUCTION PERMIT PRIOR TO ANY WORK OR CONSTRUCTION. CONTACT TPW AT 817-598-4254.

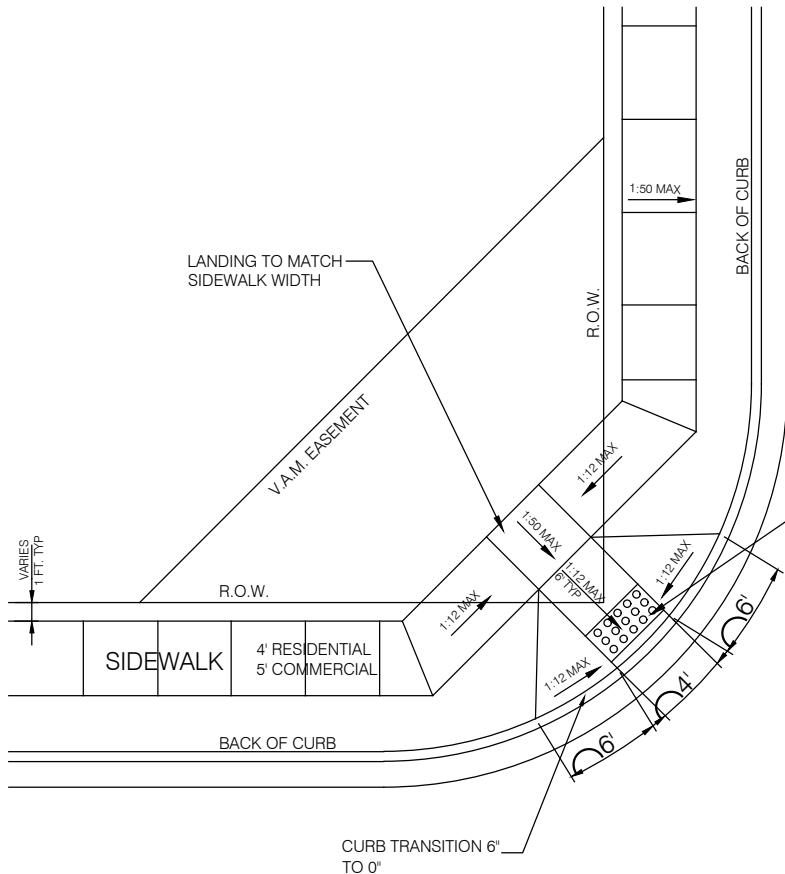
	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	CONCRETE SIDEWALK WITH PARKWAY	C28A



NOTES:

1. CROSS SLOPE OF SIDEWALK SHALL BE TWO PERCENT (2%) MAX INCLUDING OVER DRIVEWAY APPROACH.
2. SIDEWALK SHALL BE 4" THICKNESS, CLASS "A" CONCRETE WITH #3 REBAR AT 18" CENTERS UNLESS OTHERWISE SPECIFIED BY TPW.
3. 1/2" EXPANSION JOINTS SHALL BE SPACED AT 40' MAXIMUM INTERVALS OR AS OTHERWISE SPECIFIED. JOINTS SHALL BE RED WOOD WITH MINIMUM THREE (3) #4 SMOOTH DOWELS AT 12" SPACING.
4. ALL SIDEWALKS CROSSING DRIVEWAYS SHALL BE SAME THICKNESS OF DRIVEWAY APPROACH.
5. ALL SIDEWALK CONSTRUCTION SHALL CONFORM TO THE LATEST A.D.A. RULES AND GUIDELINES AND TEXAS ACCESSIBILITY STANDARDS.
6. FOR ITEMS NOT SPECIFIED IN THIS DETAIL PLEASE REFER TO N.C.T.C.O.G. PUBLIC WORKS CONSTRUCTION STANDARDS.
7. OWNER/CONTRACTOR SHALL OBTAIN A R.O.W. CONSTRUCTION PERMIT PRIOR TO ANY WORK OR CONSTRUCTION. CONTACT TPW AT 817-598-4254.

	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	CONCRETE SIDEWALK ADJACENT TO CURB	C28B



TYPE "A" RAMP
BARRIER FREE RAMP
AT INTERSECTION TYPICAL
FOR RESIDENTIAL
DEVELOPMENTS

INSTALL DETECTABLE
WARNING SURFACE
A MINIMUM OF 6" FROM
BACK OF CURB. SEE
NOTES

NOTES:

1. DIMENSIONS SHOWN ON STANDARD DETAILS ARE APPROXIMATE AND WILL VARY ON EXISTING SIDEWALK AND STREET LONGITUDINAL AND CROSS SLOPES. DIMENSIONS SHOWN ASSUME EXISTING LONGITUDINAL AND CROSS SLOPES ARE LESS THAN 2%. RAMP LOCATIONS WITH LONGITUDINAL OR CROSS SLOPES EXCEEDING 2% SHOULD BE ADDRESSED BY SEPARATE DESIGN DETAILS THAT COMPLY WITH TEXAS ACCESSIBILITY STANDARDS AND MATCH CITY OF WEATHERFORD STANDARD DETAILS IN APPEARANCE AS MUCH AS POSSIBLE.
2. RAMPS FOR SIDEWALKS (WITH WIDTHS OTHER THAN SHOWN ON THESE DETAILS) SHOULD BE ADJUSTED TO FIT DIMENSIONS OF THE APPROACH SIDEWALKS CALLED FOR ON PLAN SHEETS.
3. FULL LENGTH OF RAMP (SLOPE 1:12) NOT TO EXCEED 6' IN LENGTH.
4. THE CONTRACTOR MUST NOTIFY THE CITY PRIOR TO INSTALLATION OF CONCRETE IF THE APPROACH SLOPE OF THE EXISTING SIDEWALK EXCEEDS 1:20 (5%) OR HAS A CROSSFALL GREATER THAN 1:50 (2%) AND NO DESIGN DETAILS ARE PROVIDED FOR THAT SPECIFIC LOCATION.
5. CONTRACTOR TO VERIFY ALL SLOPES PRIOR TO POURING CONCRETE. ALL SLOPES SHOULD BE IN COMPLIANCE WITH APPLICABLE STANDARDS FROM THE TEXAS DEPARTMENT OF LICENSING AND REGULATION.
6. CURB RAMPS SHALL BE CONSTRUCTED AT THE BACK OF THE WHEELCHAIR RAMP WHEN ELEVATION DIFFERENCE EXCEEDS 6".
7. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO ENSURE SLOPES MEET REQUIREMENTS OF THE TEXAS ACCESSIBILITY STANDARDS.
8. CONTRACTOR SHALL CONTACT TPW FOR INSPECTION PRIOR TO ANY PLACEMENT OF CONCRETE IN R.O.W.
9. A CURB SHALL BE CONSTRUCTED AT THE BACK OF THE WHEELCHAIR RAMP WHEN ELEVATION DIFFERENCE EXCEEDS 6".
10. CURB RAMPS SHALL BE CONSTRUCTED WITH SAME SPECIFICATIONS FOR SIDEWALK CONSTRUCTION UNLESS OTHERWISE NOTED.
11. FOR SIDEWALK DETAILS AND SPECIFICATIONS REFER TO SIDEWALK DETAIL SHEET.
12. ADA REPLACEABLE (WET SET) COMPOSITE TACTILE WARNING SURFACE UNIT (RED) AVAILABLE FROM ADA SOLUTIONS SHALL BE INSTALLED FOR ALL ADA RAMPS. DETECTABLE WARNING SHALL BE 24" LENGTH BY 48" WIDTH TRUNCATED DOMES THAT ARE TAS APPROVED. CONTRACTOR SHALL PROVIDE A MINIMUM 4" CONCRETE THICKNESS BEHIND THE ADA REPLACEABLE COMPOSITE TACTILE WARNING SURFACE UNIT.

CONVERSIONS

1:12 - APPROXIMATELY 8.3%
1:20 - APPROXIMATELY 5%
1:50 - APPROXIMATELY 1/4" PER 1' OR 2%

1

CURB RAMP DETAIL

NOT TO SCALE



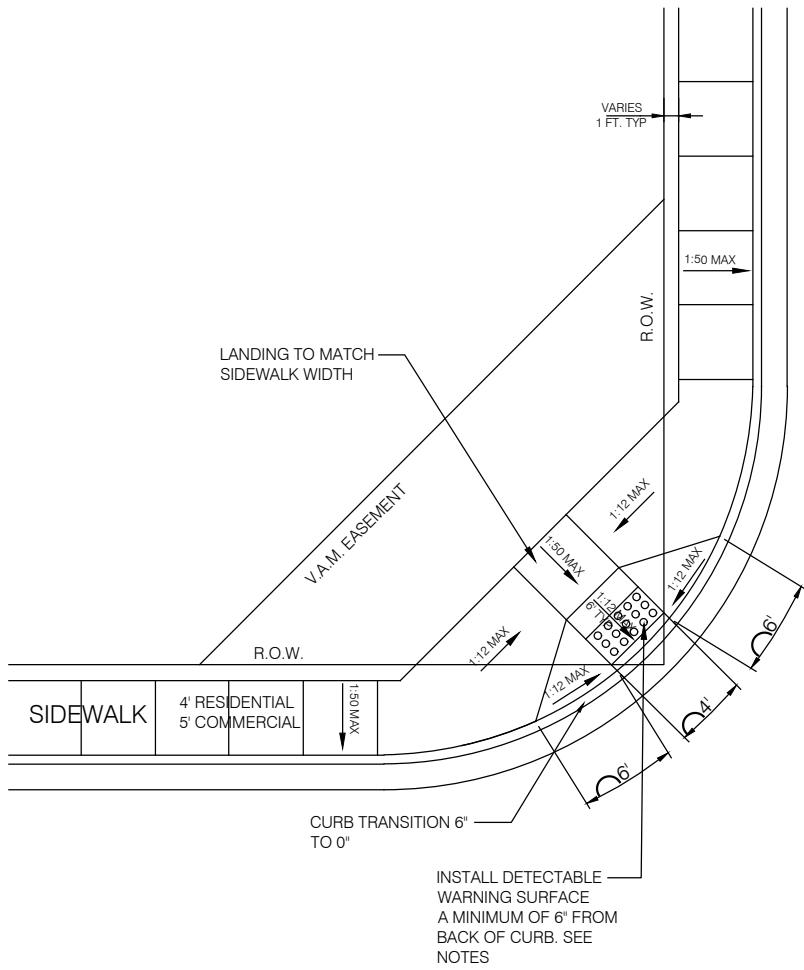
DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

CURB RAMP DETAIL
TYPE "A" RAMP

SHEET. #

C29



TYPE "B" RAMP
BARRIER FREE RAMP
WITH SIDEWALK AT CURB.

NOTES:

1. DIMENSIONS SHOWN ON STANDARD DETAILS ARE APPROXIMATE AND WILL VARY ON EXISTING SIDEWALK AND STREET LONGITUDINAL AND CROSS SLOPES. DIMENSIONS SHOWN ASSUME EXISTING LONGITUDINAL AND CROSS SLOPES ARE LESS THAN 2%. RAMP LOCATIONS WITH LONGITUDINAL OR CROSS SLOPES EXCEEDING 2% SHOULD BE ADDRESSED BY SEPARATE DESIGN DETAILS THAT COMPLY WITH TEXAS ACCESSIBILITY STANDARDS AND MATCH CITY OF WEATHERFORD STANDARD DETAILS IN APPEARANCE AS MUCH AS POSSIBLE.
2. RAMPS FOR SIDEWALKS (WITH WIDTHS OTHER THAN SHOWN ON THESE DETAILS) SHOULD BE ADJUSTED TO FIT DIMENSIONS OF THE APPROACH SIDEWALKS CALLED FOR ON PLAN SHEETS.
3. FULL LENGTH OF RAMP (SLOPE 1:12) NOT TO EXCEED 6' IN LENGTH.
4. THE CONTRACTOR MUST NOTIFY THE CITY PRIOR TO INSTALLATION OF CONCRETE IF THE APPROACH SLOPE OF THE EXISTING SIDEWALK EXCEEDS 1:20 (5%) OR HAS A CROSSFALL GREATER THAN 1:50 (2%) AND NO DESIGN DETAILS ARE PROVIDED FOR THAT SPECIFIC LOCATION.
5. CONTRACTOR TO VERIFY ALL SLOPES PRIOR TO POURING CONCRETE. ALL SLOPES SHOULD BE IN COMPLIANCE WITH APPLICABLE STANDARDS FROM THE TEXAS DEPARTMENT OF LICENSING AND REGULATION.
6. LANDING PAD SHALL BE A MINIMUM OF 48" WIDTH AND MATCH SIDEWALK WIDTH. NO LANDING PAD SHALL BE LESS THAN THIS DIMENSION UNLESS OTHERWISE DIRECTED BY CITY. CROSS SLOPE SHALL NOT EXCEED 1:50 (2%) AT ANY DIRECTION.
7. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ENSURE SLOPES MEET REQUIREMENTS OF THE TEXAS ACCESSIBILITY STANDARDS.
8. CONTRACTOR SHALL CONTACT TPW FOR INSPECTION PRIOR TO ANY PLACEMENT OF CONCRETE IN R.O.W.
9. A CURB SHALL BE CONSTRUCTED AT THE BACK OF THE WHEELCHAIR RAMP WHEN ELEVATION DIFFERENCE EXCEEDS 6".
10. CURB RAMPS SHALL BE CONSTRUCTED WITH SAME SPECIFICATIONS FOR SIDEWALK CONSTRUCTION UNLESS OTHERWISE NOTED.
11. FOR SIDEWALK DETAILS AND SPECIFICATIONS REFER TO SIDEWALK DETAIL SHEET.
12. ADA REPLACEABLE (WET SET) COMPOSITE TACTILE WARNING SURFACE UNIT (RED) AVAILABLE FROM ADA SOLUTIONS SHALL BE INSTALLED FOR ALL ADA RAMPS. DETECTABLE WARNING SHALL BE 24" LENGTH BY 48" WIDTH TRUNCATED DOMES THAT ARE TAS APPROVED. CONTRACTOR SHALL PROVIDE A MINIMUM 4" CONCRETE THICKNESS BENEATH THE ADA REPLACEABLE COMPOSITE TACTILE WARNING SURFACE UNIT.

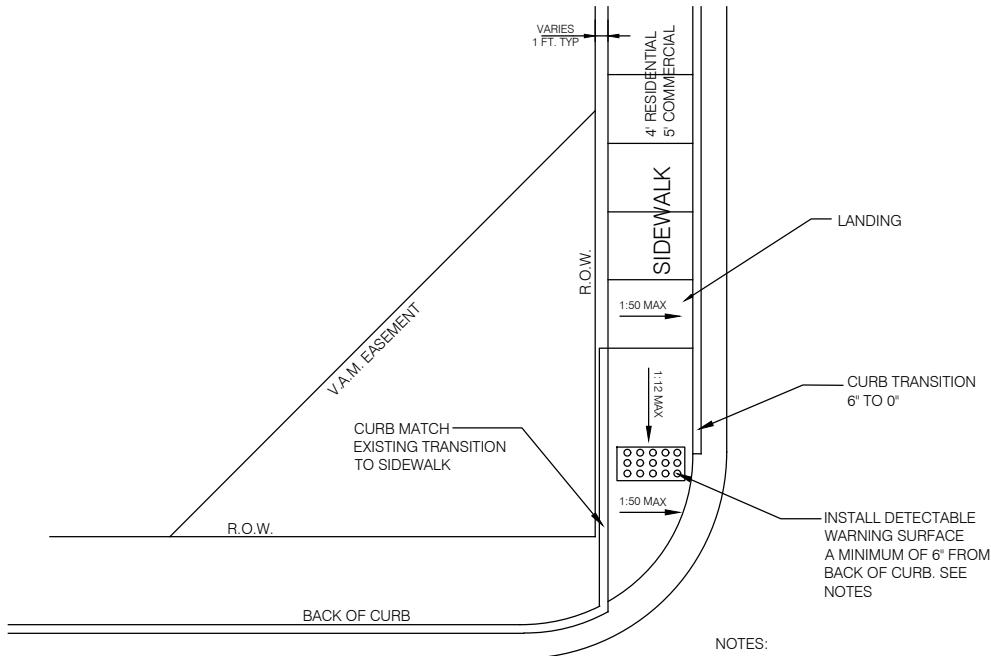
CONVERSIONS
1:12 - APPROXIMATELY 8.3%
1:20 - APPROXIMATELY 5%
1:50 - APPROXIMATELY 1/4" PER 1' OR 2%

1

CURB RAMP DETAIL

NOT TO SCALE

	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	CURB RAMP DETAIL TYPE "B" RAMP	C30



NOTES:

1. DIMENSIONS SHOWN ON STANDARD DETAILS ARE APPROXIMATE AND WILL VARY ON EXISTING SIDEWALK AND STREET LONGITUDINAL AND CROSS SLOPES. DIMENSIONS SHOWN ASSUME EXISTING LONGITUDINAL AND CROSS SLOPES ARE LESS THAN 2%. RAMP LOCATIONS WITH LONGITUDINAL OR CROSS SLOPES EXCEEDING 2% SHOULD BE ADDRESSED BY SEPARATE DESIGN DETAILS THAT COMPLY WITH TEXAS ACCESSIBILITY STANDARDS AND MATCH CITY OF WEATHERFORD STANDARD DETAILS IN APPEARANCE AS MUCH AS POSSIBLE.
2. RAMPS FOR SIDEWALKS (WITH WIDTHS OTHER THAN SHOWN ON THESE DETAILS) SHOULD BE ADJUSTED TO FIT DIMENSIONS OF THE APPROACH SIDEWALKS CALLED FOR ON PLAN SHEETS.
3. FULL LENGTH OF RAMP (SLOPE 1:12) NOT TO EXCEED 6' IN LENGTH.
4. THE CONTRACTOR MUST NOTIFY THE CITY PRIOR TO INSTALLATION OF CONCRETE IF THE APPROACH SLOPE OF THE EXISTING SIDEWALK EXCEEDS 1:20 (5%) OR HAS A CROSSFALL GREATER THAN 1:50 (2%) AND NO DESIGN DETAILS ARE PROVIDED FOR THAT SPECIFIC LOCATION.
5. CONTRACTOR TO VERIFY ALL SLOPES PRIOR TO POURING CONCRETE. ALL SLOPES SHOULD BE IN COMPLIANCE WITH APPLICABLE STANDARDS FROM THE TEXAS DEPARTMENT OF LICENSING AND REGULATION.
6. LANDING PAD SHALL BE A MINIMUM OF 48" WIDTH AND MATCH SIDEWALK WIDTH. NO LANDING PAD SHALL BE LESS THAN THIS DIMENSION UNLESS OTHERWISE DIRECTED BY CITY. CROSS SLOPE SHALL NOT EXCEED 1:50 (2%) AT ANY DIRECTION.
7. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ENSURE SLOPES MEET REQUIREMENTS OF THE TEXAS ACCESSIBILITY STANDARDS.
8. CONTRACTOR SHALL CONTACT TPW FOR INSPECTION PRIOR TO ANY PLACEMENT OF CONCRETE IN R.O.W.
9. A CURB SHALL BE CONSTRUCTED AT THE BACK OF THE WHEELCHAIR RAMP WHEN ELEVATION DIFFERENCE EXCEEDS 6".
10. CURB RAMPS SHALL BE CONSTRUCTED WITH SAME SPECIFICATIONS FOR SIDEWALK CONSTRUCTION UNLESS OTHERWISE NOTED.
11. FOR SIDEWALK DETAILS AND SPECIFICATIONS REFER TO SIDEWALK DETAIL SHEET.
12. ADA REPLACEABLE (WET SET) COMPOSITE TACTILE WARNING SURFACE UNIT (RED) AVAILABLE FROM ADA SOLUTIONS SHALL BE INSTALLED FOR ALL ADA RAMPS. DETECTABLE WARNING SHALL BE 24" LENGTH BY 48" WIDTH TRUNCATED DOMES THAT ARE TAS APPROVED. CONTRACTOR SHALL PROVIDE A MINIMUM 4" CONCRETE THICKNESS BENEATH THE ADA REPLACEABLE COMPOSITE TACTILE WARNING SURFACE UNIT.

CONVERSIONS

1:12 - APPROXIMATELY 8.3%
 1:20 - APPROXIMATELY 5%
 1:50 - APPROXIMATELY 1/4" PER 1' OR 2%

CURB RAMP DETAIL

NOT TO SCALE

1



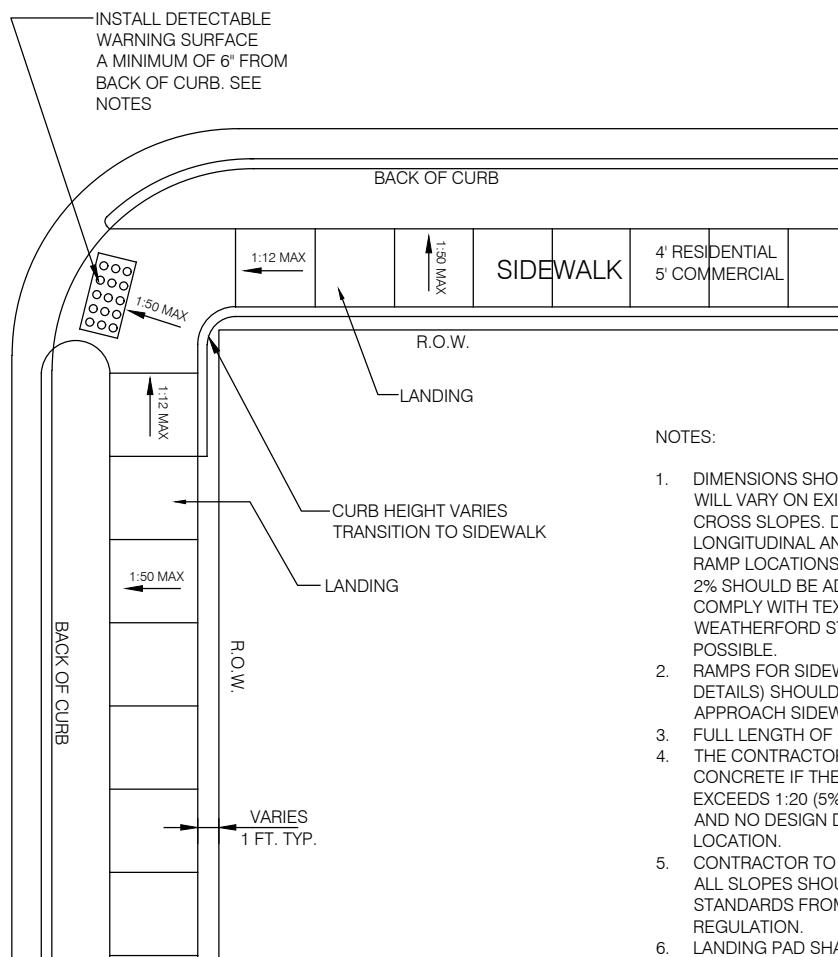
DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

CURB RAMP DETAIL
TYPE "C" RAMP

SHEET. #

C31



NOTES:

1. DIMENSIONS SHOWN ON STANDARD DETAILS ARE APPROXIMATE AND WILL VARY ON EXISTING SIDEWALK AND STREET LONGITUDINAL AND CROSS SLOPES. DIMENSIONS SHOWN ASSUME EXISTING LONGITUDINAL AND CROSS SLOPES ARE LESS THAN 2%. RAMP LOCATIONS WITH LONGITUDINAL OR CROSS SLOPES EXCEEDING 2% SHOULD BE ADDRESSED BY SEPARATE DESIGN DETAILS THAT COMPLY WITH TEXAS ACCESSIBILITY STANDARDS AND MATCH CITY OF WEATHERFORD STANDARD DETAILS IN APPEARANCE AS MUCH AS POSSIBLE.
2. RAMPS FOR SIDEWALKS (WITH WIDTHS OTHER THAN SHOWN ON THESE DETAILS) SHOULD BE ADJUSTED TO FIT DIMENSIONS OF THE APPROACH SIDEWALKS CALLED FOR ON PLAN SHEETS.
3. FULL LENGTH OF RAMP (SLOPE 1:12) NOT TO EXCEED 6' IN LENGTH.
4. THE CONTRACTOR MUST NOTIFY THE CITY PRIOR TO INSTALLATION OF CONCRETE IF THE APPROACH SLOPE OF THE EXISTING SIDEWALK EXCEEDS 1:20 (5%) OR HAS A CROSSFALL GREATER THAN 1:50 (2%) AND NO DESIGN DETAILS ARE PROVIDED FOR THAT SPECIFIC LOCATION.
5. CONTRACTOR TO VERIFY ALL SLOPES PRIOR TO POURING CONCRETE. ALL SLOPES SHOULD BE IN COMPLIANCE WITH APPLICABLE STANDARDS FROM THE TEXAS DEPARTMENT OF LICENSING AND REGULATION.
6. LANDING PAD SHALL BE A MINIMUM OF 48" WIDTH AND MATCH SIDEWALK WIDTH. NO LANDING PAD SHALL BE LESS THAN THIS DIMENSION UNLESS OTHERWISE DIRECTED BY CITY. CROSS SLOPE SHALL NOT EXCEED 1:50 (2%) AT ANY DIRECTION.
7. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ENSURE SLOPES MEET REQUIREMENTS OF THE TEXAS ACCESSIBILITY STANDARDS.
8. CONTRACTOR SHALL CONTACT TPW FOR INSPECTION PRIOR TO ANY PLACEMENT OF CONCRETE IN R.O.W.
9. A CURB SHALL BE CONSTRUCTED AT THE BACK OF THE WHEELCHAIR RAMP WHEN ELEVATION DIFFERENCE EXCEEDS 6".
10. CURB RAMPS SHALL BE CONSTRUCTED WITH SAME SPECIFICATIONS FOR SIDEWALK CONSTRUCTION UNLESS OTHERWISE NOTED.
11. FOR SIDEWALK DETAILS AND SPECIFICATIONS REFER TO SIDEWALK DETAIL SHEET.
12. ADA REPLACEABLE (WET SET) COMPOSITE TACTILE WARNING SURFACE UNIT (RED) AVAILABLE FROM ADA SOLUTIONS SHALL BE INSTALLED FOR ALL ADA RAMPS. DETECTABLE WARNING SHALL BE 24" LENGTH BY 48" WIDTH TRUNCATED DOMES THAT ARE TAS APPROVED. CONTRACTOR SHALL PROVIDE A MINIMUM 4" CONCRETE THICKNESS BENEATH THE ADA REPLACEABLE COMPOSITE TACTILE WARNING SURFACE UNIT.

CONVERSIONS

1:12 - APPROXIMATELY 8.3%

1:20 - APPROXIMATELY 5%

1:50 - APPROXIMATELY 1/4" PER 1' OR 2%

1

CURB RAMP DETAIL

NOT TO SCALE



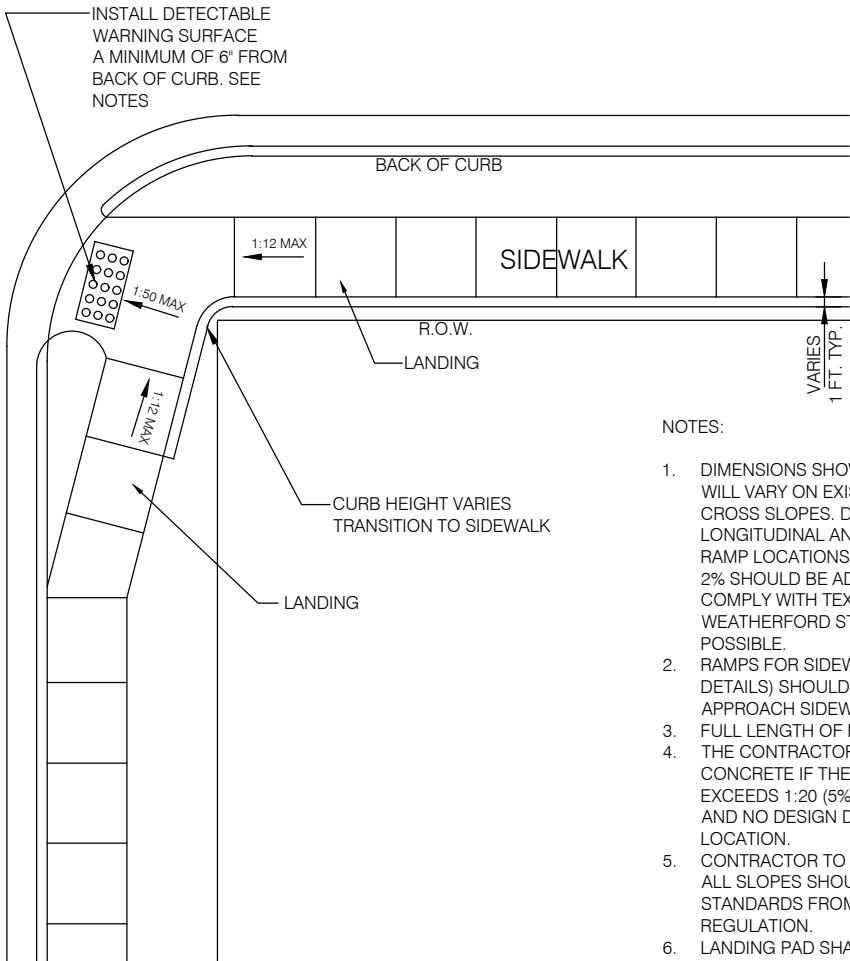
DATE
01/2020
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CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

CURB RAMP DETAIL
TYPE "D" RAMP

SHEET. #

C32



TYPE "E" RAMP
BARRIER FREE RAMP
WITH NO V.A.M. EASEMENT

NOTES:

1. DIMENSIONS SHOWN ON STANDARD DETAILS ARE APPROXIMATE AND WILL VARY ON EXISTING SIDEWALK AND STREET LONGITUDINAL AND CROSS SLOPES. DIMENSIONS SHOWN ASSUME EXISTING LONGITUDINAL AND CROSS SLOPES ARE LESS THAN 2%. RAMP LOCATIONS WITH LONGITUDINAL OR CROSS SLOPES EXCEEDING 2% SHOULD BE ADDRESSED BY SEPARATE DESIGN DETAILS THAT COMPLY WITH TEXAS ACCESSIBILITY STANDARDS AND MATCH CITY OF WEATHERFORD STANDARD DETAILS IN APPEARANCE AS MUCH AS POSSIBLE.
2. RAMPS FOR SIDEWALKS (WITH WIDTHS OTHER THAN SHOWN ON THESE DETAILS) SHOULD BE ADJUSTED TO FIT DIMENSIONS OF THE APPROACH SIDEWALKS CALLED FOR ON PLAN SHEETS.
3. FULL LENGTH OF RAMP (SLOPE 1:12) NOT TO EXCEED 6' IN LENGTH.
4. THE CONTRACTOR MUST NOTIFY THE CITY PRIOR TO INSTALLATION OF CONCRETE IF THE APPROACH SLOPE OF THE EXISTING SIDEWALK EXCEEDS 1:20 (5%) OR HAS A CROSSFALL GREATER THAN 1:50 (2%) AND NO DESIGN DETAILS ARE PROVIDED FOR THAT SPECIFIC LOCATION.
5. CONTRACTOR TO VERIFY ALL SLOPES PRIOR TO POURING CONCRETE. ALL SLOPES SHOULD BE IN COMPLIANCE WITH APPLICABLE STANDARDS FROM THE TEXAS DEPARTMENT OF LICENSING AND REGULATION.
6. LANDING PAD SHALL BE A MINIMUM OF 48" WIDTH AND MATCH SIDEWALK WIDTH. NO LANDING PAD SHALL BE LESS THAN THIS DIMENSION UNLESS OTHERWISE DIRECTED BY CITY. CROSS SLOPE SHALL NOT EXCEED 1:50 (2%) AT ANY DIRECTION.
7. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO ENSURE SLOPES MEET REQUIREMENTS OF THE TEXAS ACCESSIBILITY STANDARDS.
8. CONTRACTOR SHALL CONTACT TPW FOR INSPECTION PRIOR TO ANY PLACEMENT OF CONCRETE IN R.O.W.
9. A CURB SHALL BE CONSTRUCTED AT THE BACK OF THE WHEELCHAIR RAMP WHEN ELEVATION DIFFERENCE EXCEEDS 6".
10. CURB RAMPS SHALL BE CONSTRUCTED WITH SAME SPECIFICATIONS FOR SIDEWALK CONSTRUCTION UNLESS OTHERWISE NOTED.
11. FOR SIDEWALK DETAILS AND SPECIFICATIONS REFER TO SIDEWALK DETAIL SHEET.
12. ADA REPLACEABLE (WET SET) COMPOSITE TACTILE WARNING SURFACE UNIT (RED) AVAILABLE FROM ADA SOLUTIONS SHALL BE INSTALLED FOR ALL ADA RAMPS. DETECTABLE WARNING SHALL BE 24" LENGTH BY 48" WIDTH TRUNCATED DOMES THAT ARE TAS APPROVED. CONTRACTOR SHALL PROVIDE A MINIMUM 4" CONCRETE THICKNESS BENEATH THE ADA REPLACEABLE COMPOSITE TACTILE WARNING SURFACE UNIT.

CONVERSIONS

1:12 - APPROXIMATELY 8.3%

1:20 - APPROXIMATELY 5%

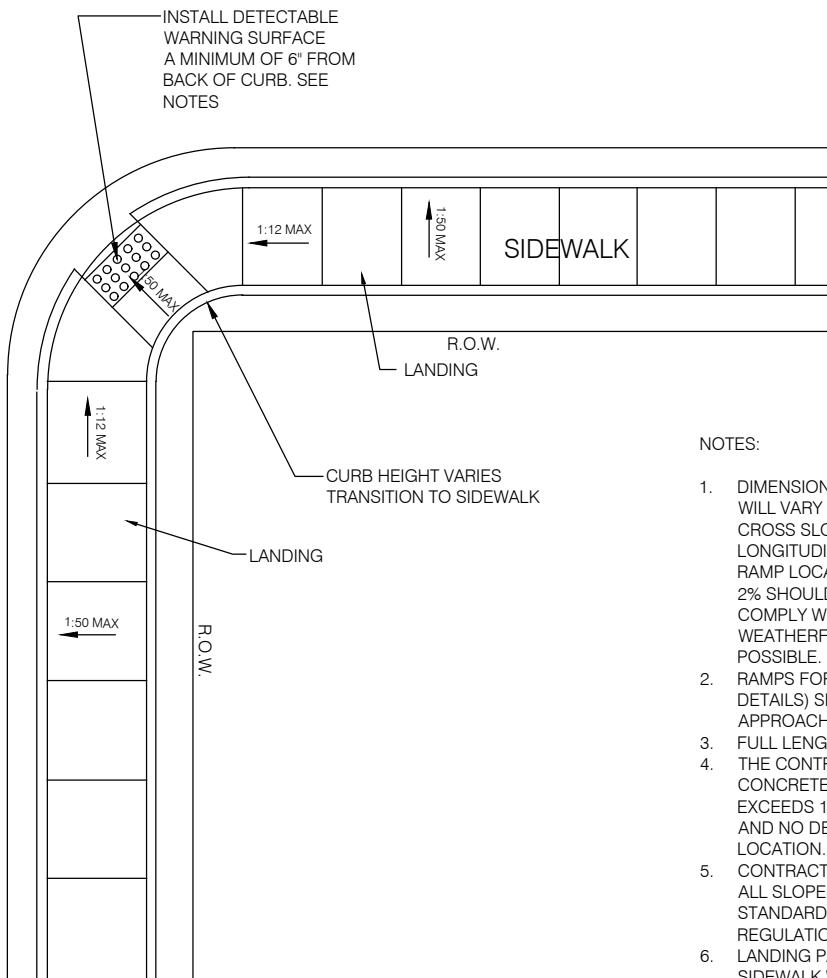
1:50 - APPROXIMATELY 1/4" PER 1' OR 2%

1

CURB RAMP DETAIL

NOT TO SCALE

 <p>WEATHERFORD TRUE TEXAS</p>	DATE	<p>TRANSPORTATION AND PUBLIC WORKS DEPARTMENT</p> <p>CURB RAMP DETAIL TYPE "E" RAMP</p>	SHEET. #
	01/2020		
<p>DRAWN BY</p> <p>CITY OF WEATHERFORD</p>	C33		



TYPE "F" RAMP
BARRIER FREE RAMP
WITH SIDEWALK AT CURB
NO V.A.M. EASMENT

NOTES:

1. DIMENSIONS SHOWN ON STANDARD DETAILS ARE APPROXIMATE AND WILL VARY ON EXISTING SIDEWALK AND STREET LONGITUDINAL AND CROSS SLOPES. DIMENSIONS SHOWN ASSUME EXISTING LONGITUDINAL AND CROSS SLOPES ARE LESS THAN 2%. RAMP LOCATIONS WITH LONGITUDINAL OR CROSS SLOPES EXCEEDING 2% SHOULD BE ADDRESSED BY SEPARATE DESIGN DETAILS THAT COMPLY WITH TEXAS ACCESSIBILITY STANDARDS AND MATCH CITY OF WEATHERFORD STANDARD DETAILS IN APPEARANCE AS MUCH AS POSSIBLE.
2. RAMPS FOR SIDEWALKS (WITH WIDTHS OTHER THAN SHOWN ON THESE DETAILS) SHOULD BE ADJUSTED TO FIT DIMENSIONS OF THE APPROACH SIDEWALKS CALLED FOR ON PLAN SHEETS.
3. FULL LENGTH OF RAMP (SLOPE 1:12) NOT TO EXCEED 6' IN LENGTH.
4. THE CONTRACTOR MUST NOTIFY THE CITY PRIOR TO INSTALLATION OF CONCRETE IF THE APPROACH SLOPE OF THE EXISTING SIDEWALK EXCEEDS 1:20 (5%) OR HAS A CROSSFALL GREATER THAN 1:50 (2%) AND NO DESIGN DETAILS ARE PROVIDED FOR THAT SPECIFIC LOCATION.
5. CONTRACTOR TO VERIFY ALL SLOPES PRIOR TO POURING CONCRETE. ALL SLOPES SHOULD BE IN COMPLIANCE WITH APPLICABLE STANDARDS FROM THE TEXAS DEPARTMENT OF LICENSING AND REGULATION.
6. LANDING PAD SHALL BE A MINIMUM OF 48" WIDTH AND MATCH SIDEWALK WIDTH. NO LANDING PAD SHALL BE LESS THAN THIS DIMENSION UNLESS OTHERWISE DIRECTED BY CITY. CROSS SLOPE SHALL NOT EXCEED 1:50 (2%) AT ANY DIRECTION.
7. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO ENSURE SLOPES MEET REQUIREMENTS OF THE TEXAS ACCESSIBILITY STANDARDS.
8. CONTRACTOR SHALL CONTACT TPW FOR INSPECTION PRIOR TO ANY PLACEMENT OF CONCRETE IN R.O.W.
9. A CURB SHALL BE CONSTRUCTED AT THE BACK OF THE WHEELCHAIR RAMP WHEN ELEVATION DIFFERENCE EXCEEDS 6".
10. CURB RAMPS SHALL BE CONSTRUCTED WITH SAME SPECIFICATIONS FOR SIDEWALK CONSTRUCTION UNLESS OTHERWISE NOTED.
11. FOR SIDEWALK DETAILS AND SPECIFICATIONS REFER TO SIDEWALK DETAIL SHEET.
12. ADA REPLACEABLE (WET SET) COMPOSITE TACTILE WARNING SURFACE UNIT (RED) AVAILABLE FROM ADA SOLUTIONS SHALL BE INSTALLED FOR ALL ADA RAMPS. DETECTABLE WARNING SHALL BE 24" LENGTH BY 48" WIDTH TRUNCATED DOMES THAT ARE TAS APPROVED. CONTRACTOR SHALL PROVIDE A MINIMUM 4" CONCRETE THICKNESS BENEATH THE ADA REPLACEABLE COMPOSITE TACTILE WARNING SURFACE UNIT.

CONVERSIONS

1:12 - APPROXIMATELY 8.3%
1:20 - APPROXIMATELY 5%
1:50 - APPROXIMATELY 1/4" PER 1' OR 2%

1

CURB RAMP DETAIL

NOT TO SCALE



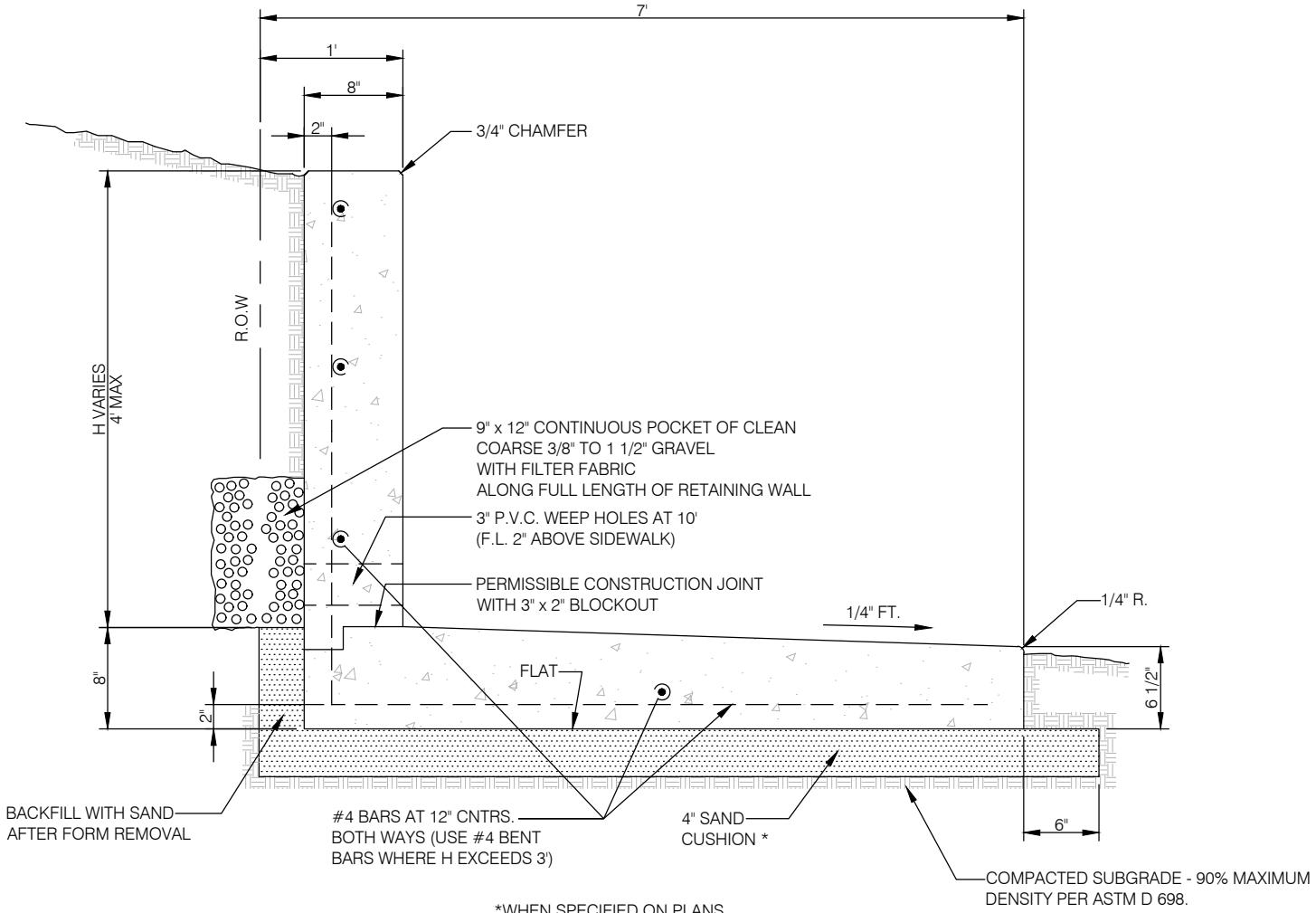
DATE
01/2020
DRAWN BY

TRANSPORTATION AND PUBLIC WORKS DEPARTMENT
CURB RAMP DETAIL TYPE "F" RAMP

SHEET. #
C34

NOTE:

1. PROVIDE VERTICAL EXPANSION IN WALL AT 25' MAX. SPACING.
2. WALL DESIGN ASSUMES NO SURCHARGE. A SPECIAL ENGINEERING ANALYSIS IS REQUIRED FOR OTHER CONDITIONS.



RETAINING WALL WITH
INTEGRAL SIDEWALK

1

RETAINING WALL SECTION

NOT TO SCALE



DATE
01/2020
DRAWN BY

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

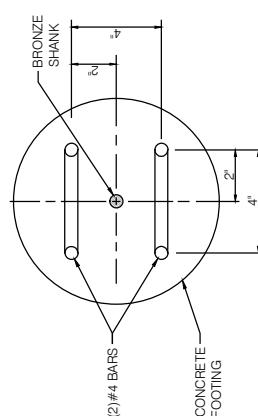
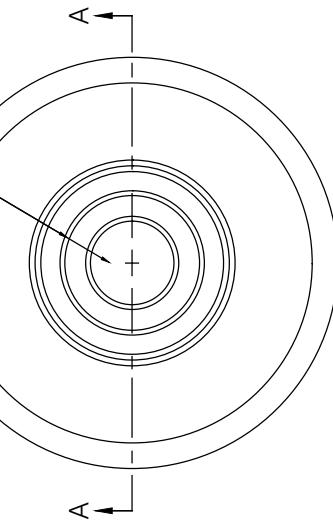
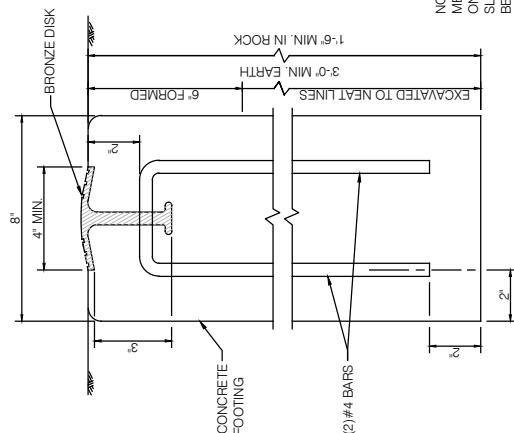
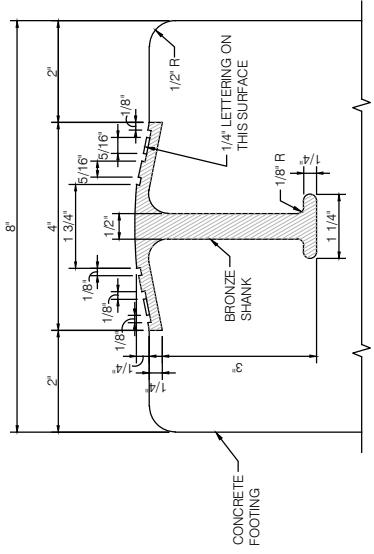
RETAINING WALL WITH
INTEGRAL SIDEWALK

SHEET. #

C35

GENERAL NOTES:

1. ALL MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH TXDOT ITEM 538 "RIGHT-OF-WAY MARKERS".
2. RIGHT-OF-WAY MARKER CONCRETE SHALL BE POURED IN PLACE.
3. THE BRONZE DISK IS AVAILABLE THROUGH CITY OF WEATHERFORD TPW DEPARTMENT. PLEASE CONTACT FIELD SERVICES DIVISION AT 817-588-4170. EXCAVATION OF THE MARKER LOCATIONS SHALL BE MADE OF UNIFORM LINES EXCEPT FOR THE TOP OF 6 INCHES WHICH SHALL BE FORMED WITH REMOVABLE FORMS. THE TOP PART OF THE MARKER AROUND THE BRONZE DISK SHALL RECEIVE A TROWEL FINISH.
4. ONCE THE CONCRETE HAS SET, THE SURVEYOR WILL STENCIL THE REQUIRED SURVEY DATA AND WITH A CHISEL OR CENTER PUNCH, CUT ACROSS MARKER THE EXACT LOCATION OF THE RIGHT-OF-WAY LINE OR PROPERTY CORNER IN THE BRONZE DISK.



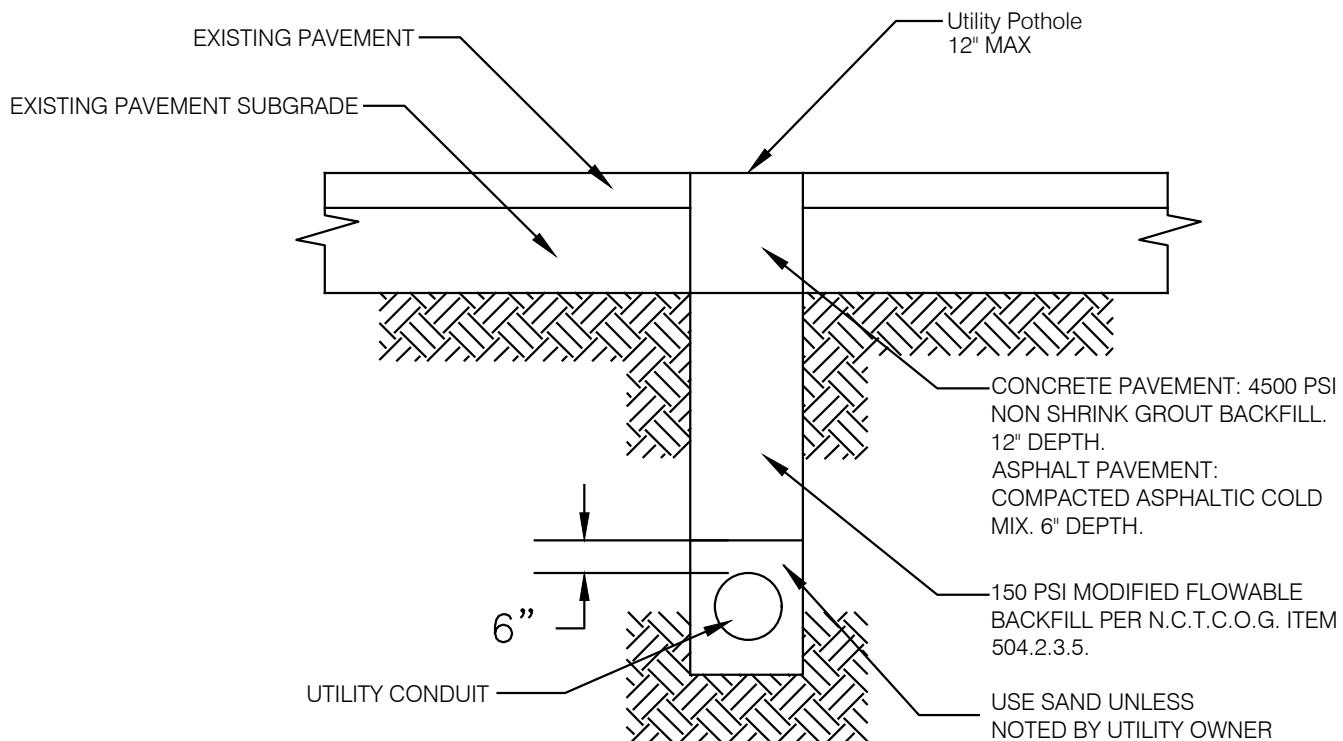
TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

MONUMENT DETAIL



DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

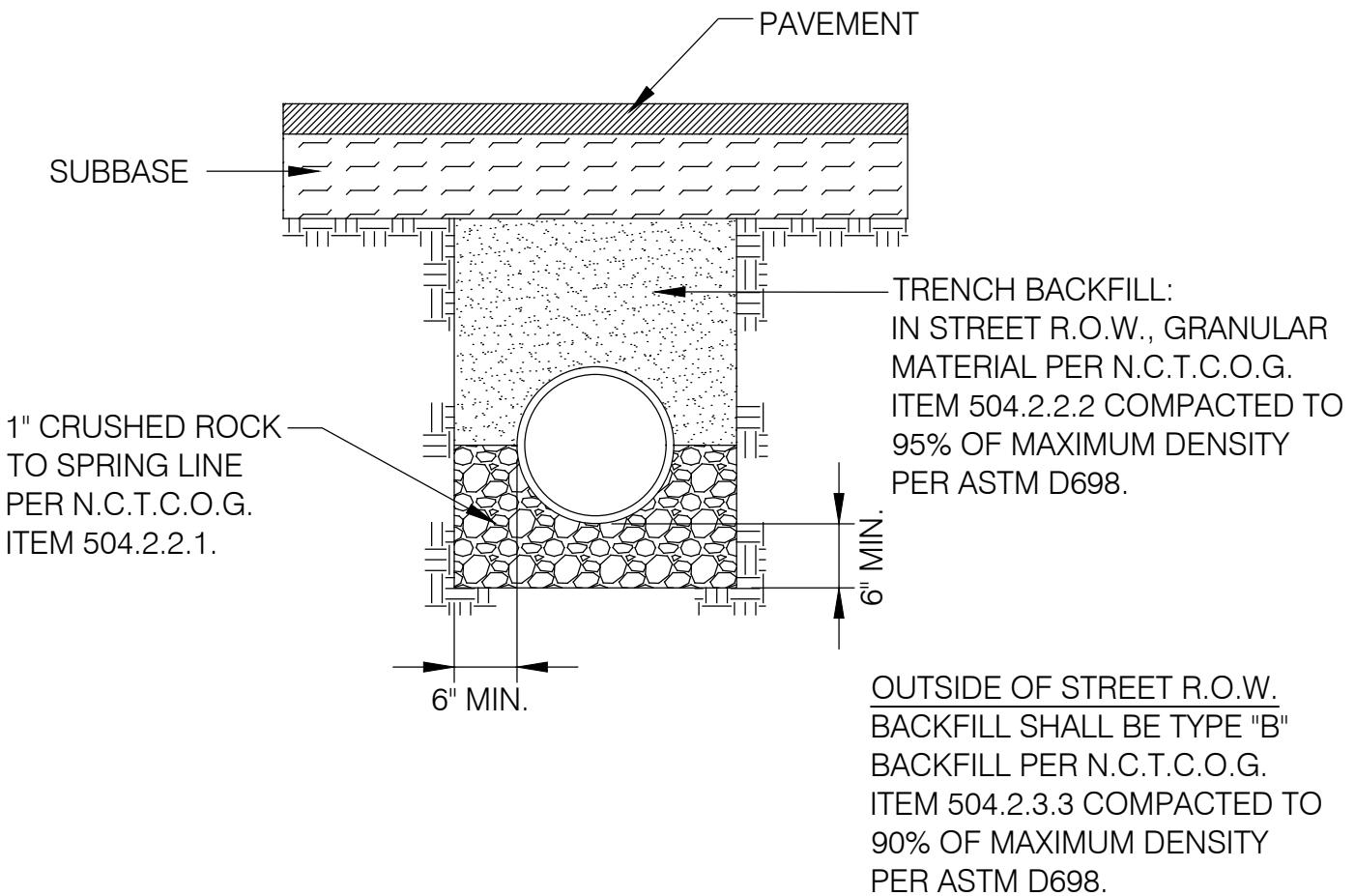
SHEET. #
C36



NOTES:

1. A right-of-way construction permit is required for all pavement utility pothole excavations.
2. Keyhole cores through the roadway pavement shall use diamond core drilling equipment. Open pavement cut utility pothole shall be sawcut in a square shape. Any other method shall be approved by the Transportation and Public Works Director.
3. Drilled core holes or pavement cuts over 12" shall be repaired per City's utility pavement repair cut detail or as determined by Director.
4. Adjacent utility potholes shall not be closer than 3 feet from each other (edge to edge), shall not be adjacent to pavement crack greater than $\frac{1}{8}$ " wide, and shall not be closer than 4 feet from a tool or construction pavement joint.
5. No more than four multiple utility potholes within a 200 square foot area, as measured within the smallest rectangular area that fully encompasses any four utility potholes, will be allowed unless approved by the TPW Director.
6. Keyhole pothole excavation and repair shall be completed within 48 hours.

	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #	
	01/2020			
DRAWN BY	PAVEMENT CORE AND UTILITY POTHOLING REPAIR		C37	
	CITY OF WEATHERFORD			



1

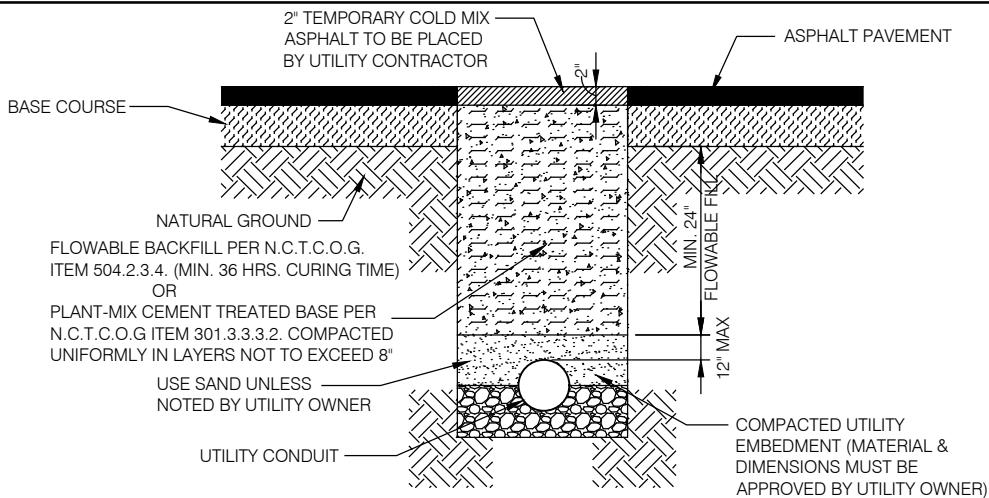
STORM SEWER DETAIL

NOT TO SCALE

NOTES:

1. ITEM NUMBERS REFER TO N.C.T.C.O.G. "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" 4TH EDITION.
2. ALL STORM SEWER PIPE IS CLASS III RCP UNLESS OTHERWISE SPECIFIED ON PLANS. CONCRETE PIPE SPECIFICATIONS SHALL MEET THE REQUIREMENTS SET FORTH IN N.C.T.C.O.G. ITEM 501.6 THRU 501.6.2. PIPE JOINTS SHALL BE SEALED WITH COLD-APPLIED PREFORMED GASKET MATERIAL, PER ITEM 501.6.1.3.1.

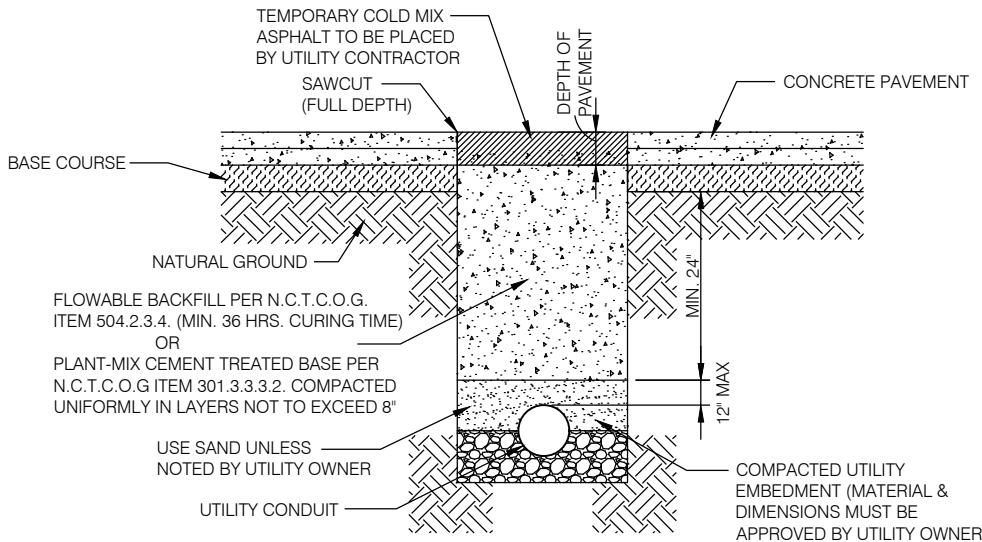
	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #	
	01/2020			
DRAWN BY	STORM SEWER DETAIL		S1	
	CITY OF WEATHERFORD			



ASPHALT PAVEMENT CUT FLOWABLE FILL & C.T.B. BACKFILL

1

NOT TO SCALE



CONCRETE PAVEMENT CUT FLOWABLE FILL & C.T.B. BACKFILL

2

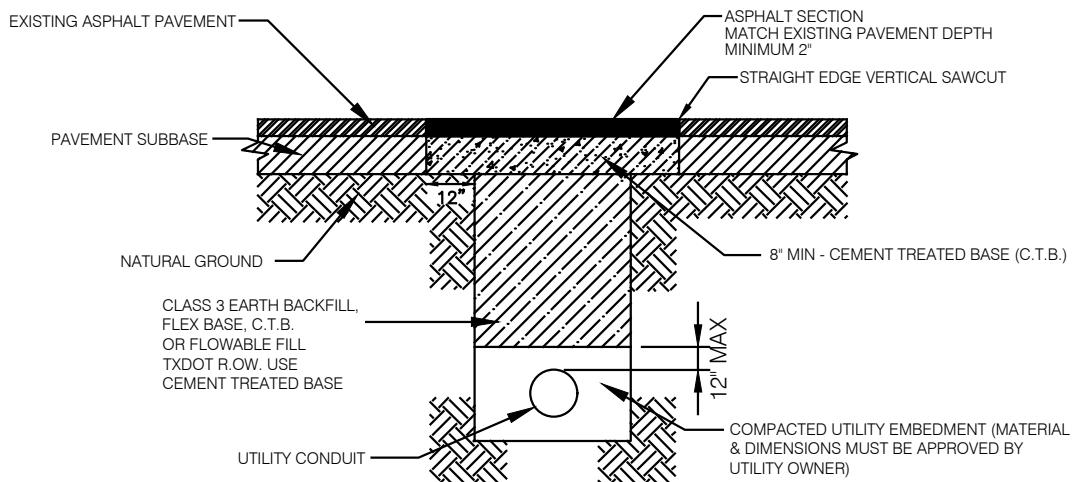
NOT TO SCALE

NOTES:

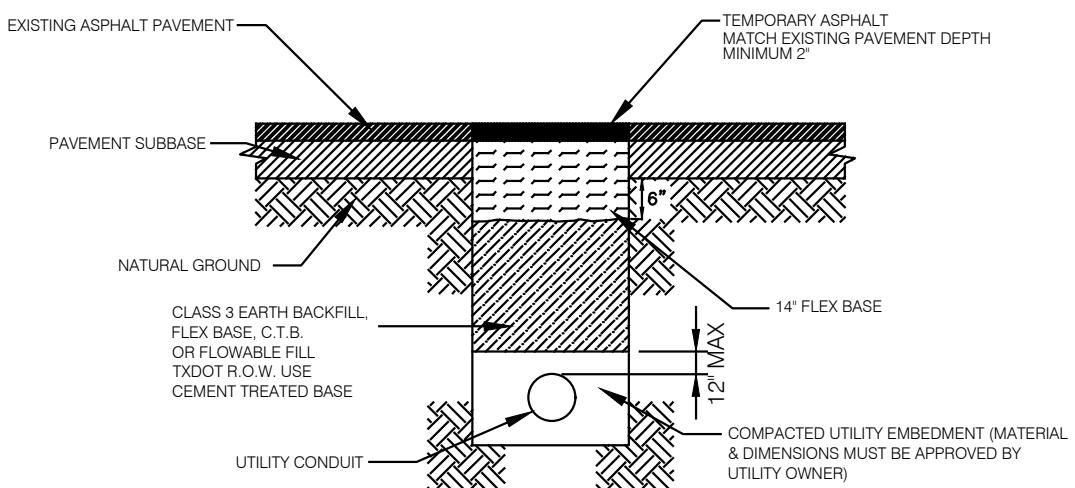
1. CHECK WITH TRANSPORTATION AND PUBLIC WORKS DEPARTMENT FOR SPECIFIC REQUIREMENTS NOT CONTAINED HEREIN.
2. CONTRACTOR IS REQUIRED TO OBTAIN A R.O.W. EXCAVATION PERMIT PRIOR TO EXCAVATION AND LEAVE A MONETARY DEPOSIT FOR PAVEMENT REPAIR AT TIME OF PERMITTING.
3. CONTRACTOR SHALL CONTACT TRANSPORTATION AND PUBLIC WORKS DEPARTMENT INSPECTOR PRIOR TO BACKFILLING TO INSURE PROPER EMBEDMENT COMPACTION AND CORRECT BACKFILL OPTION.
4. CONTRACTOR IS RESPONSIBLE FOR BACKFILL PROCEDURES AS SHOWN ABOVE AND FINAL ASPHALT PAVEMENT REPAIR IS TO BE PERFORMED ONLY BY CITY FORCES OR CITY APPROVED CONTRACTOR.
5. FINAL PAVEMENT REPAIRS ARE TYPICALLY EXTENDED 1 FOOT FROM EDGE OF PAVEMENT CUT UNLESS OTHERWISE DIRECTED BY TPW.

	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	PAVEMENT CUT CEMENT TREATED BASE & FLOWABLE FILL	
		S2	

PERMANENT ASPHALT PAVEMENT REPAIR



TEMPORARY ASPHALT PAVEMENT REPAIR

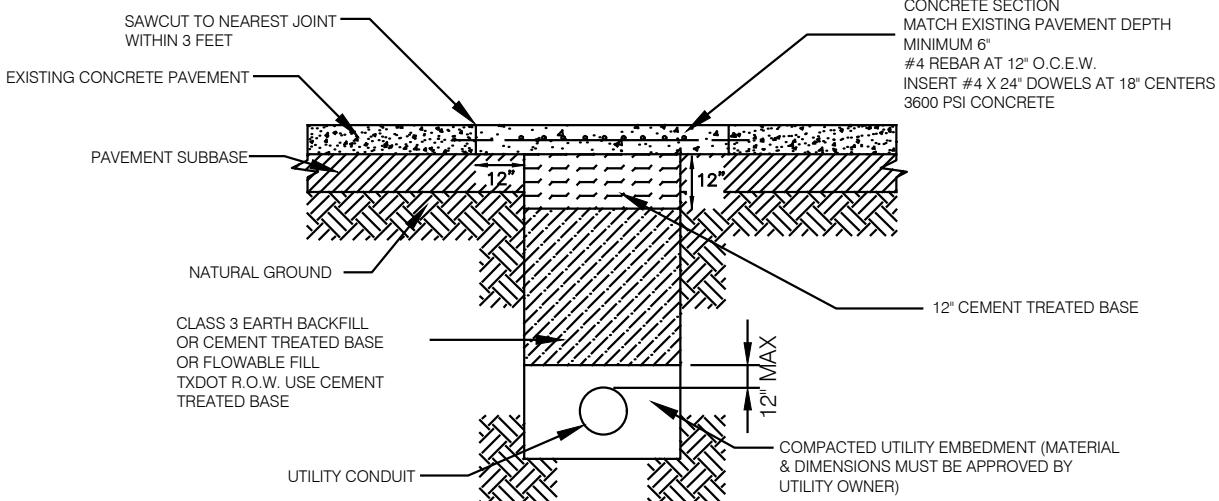


NOTES:

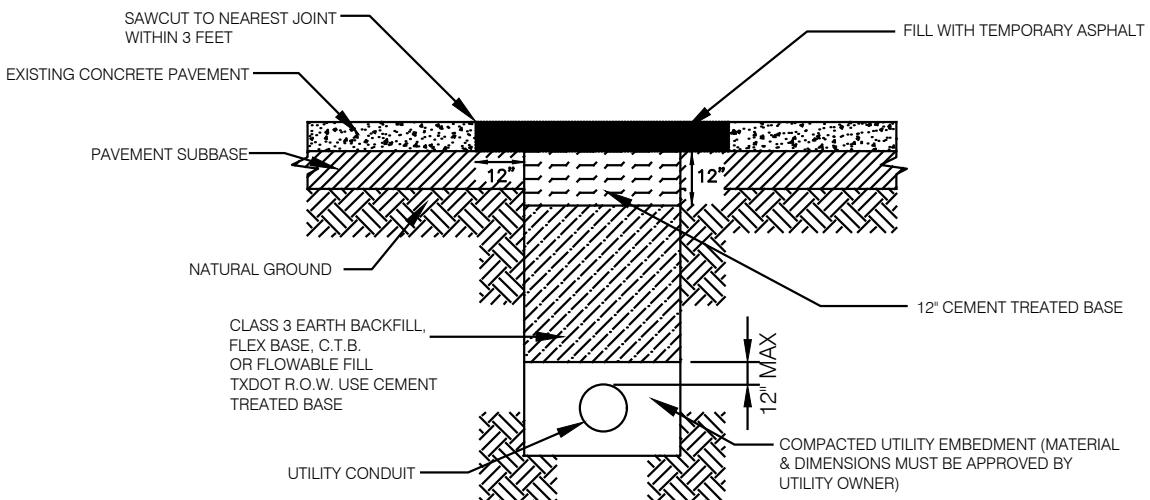
1. Contractor is required to obtain a R.O.W Construction permit prior to any work within the public right-of-way including public alleyway or easements.
2. All loose material within the excavation/ trench shall be mechanically compacted in lifts no more than 12" to 95% compaction per standard proctor. Compaction testing shall be required for every lift. Compaction test reports shall be submitted to TPW for all excavations/ trenches. For longitudinal trenches a compaction test is required every 200 linear feet for each lift and at crossings designated by inspector.
3. Class 3 earth backfill shall meet the requirements of Type B backfill per N.C.T.C.O.G. section 504.2.3. with the exception of stone shall be less than 2 inches in diameter.
4. Flowable Fill Material shall be per N.C.T.C.O.G. specification 504.2.3.4.
5. Cement Treated Base shall consist of flex base material with two sacks of cement type I/II per cubic yard mixed in a concrete mixer or transit mixed. Road mixed may be allowed subject to approval from director of TPW. No compaction test required for CTB.
6. Temporary asphalt shall be placed over trench as soon as backfill is completed.
7. Final pavement repairs shall be performed by City forces or City approved contractors. Contractors may perform final pavement repairs if approved by Director of TPW. Monetary deposits will be required for final pavement repairs at time of permitting. TXDOT R.O.W. use City contractor or TxDOT approved contractor.
8. Final pavement repair section layout shall be determined and approved by Director of TPW or representative. All Asphalt and Concrete repairs shall be per City specifications and N.C.T.C.O.G. Public Works Construction Standards and Specifications, latest edition.

<p>WEATHERFORD TRUE TEXAS</p>	DATE	<p>TRANSPORTATION AND PUBLIC WORKS DEPARTMENT</p> <p>ASPHALT PAVEMENT UTILITY TRENCH REPAIR</p>	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD		S2.1

PERMANENT CONCRETE PAVEMENT



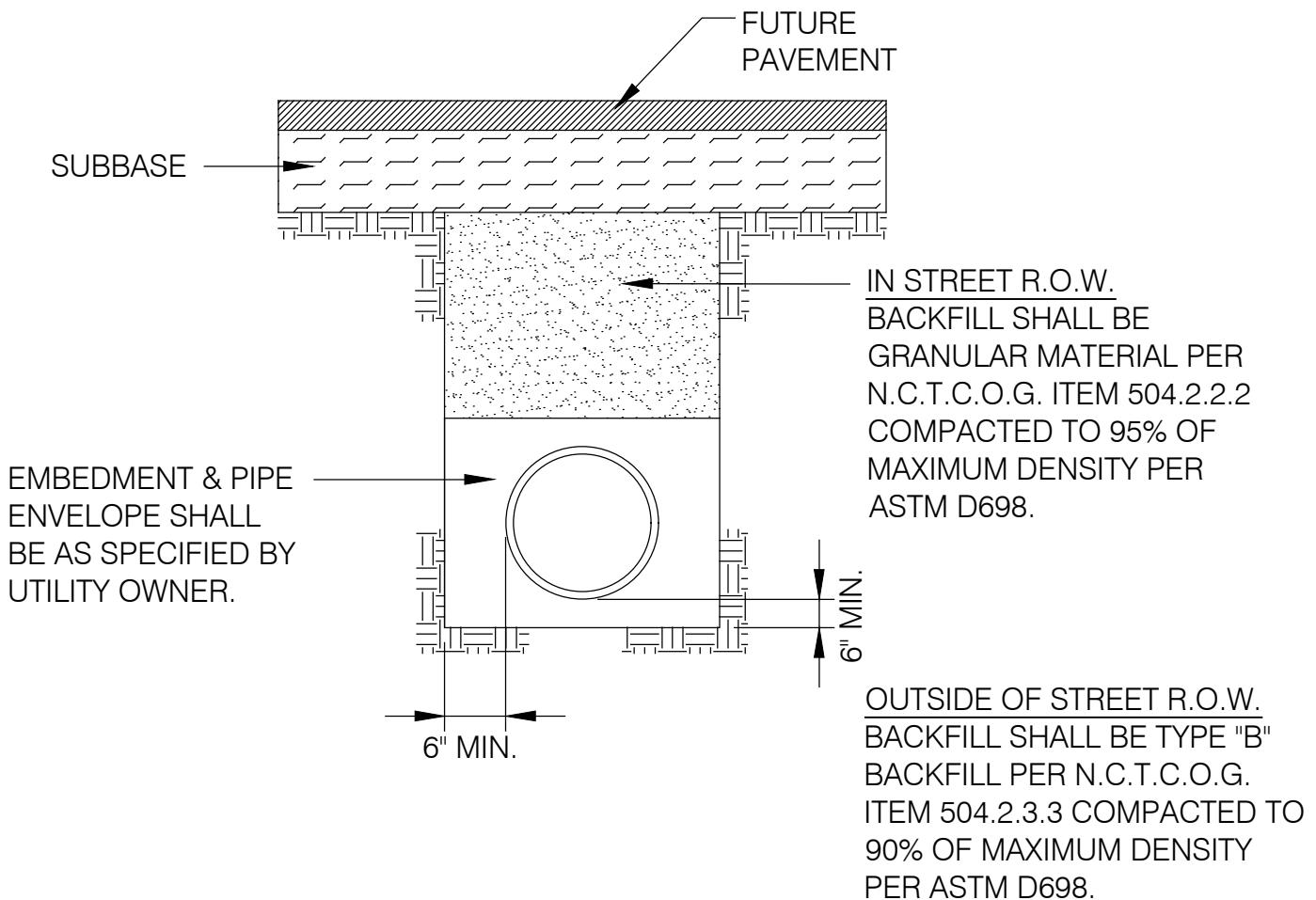
TEMPORARY CONCRETE PAVEMENT



NOTES:

1. Contractor is required to obtain a R.O.W Construction permit prior to any work within the public right-of-way including public alleyway or easements.
2. All loose material within the excavation/ trench shall be mechanically compacted in lifts no more than 12" to 95% compaction per standard proctor. Compaction testing shall be required for every lift. Compaction test reports shall be submitted to TPW for all excavations/ trenches. For longitudinal trenches a compaction test is required every 200 linear feet for each lift and at crossings designated by inspector.
3. Class 3 earth backfill shall meet the requirements of Type B backfill per N.C.T.C.O.G. section 504.2.3. with the exception of stone shall be less than 2 inches in diameter.
4. Flowable Fill Material shall be per N.C.T.C.O.G. specification 504.2.3.4.
5. Cement Treated Base shall consist of flex base material with two sacks of cement type I/II per cubic yard mixed in a concrete mixer or transit mixed. Road mixed may be allowed subject to approval from director of TPW. No compaction test required for CTB.
6. Temporary asphalt shall be placed over trench as soon as backfill is completed.
7. Final pavement repairs shall be performed by City forces or City approved contractors. Contractors may perform final pavement repairs if approved by Director of TPW. Monetary deposits will be required for final pavement repairs at time of permitting. TxDOT ROW either use City contractor or TxDOT approved contractor.
8. Final pavement repair section layout shall be determined and approved by Director of TPW or representative. All Asphalt and Concrete repairs shall be per City specifications and N.C.T.C.O.G. Public Works Construction Standards and Specifications, latest edition. Final concrete repairs shall be repaired to the nearest joint within three feet.

	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	CONCRETE PAVEMENT UTILITY TRENCH REPAIR	S2.2



1

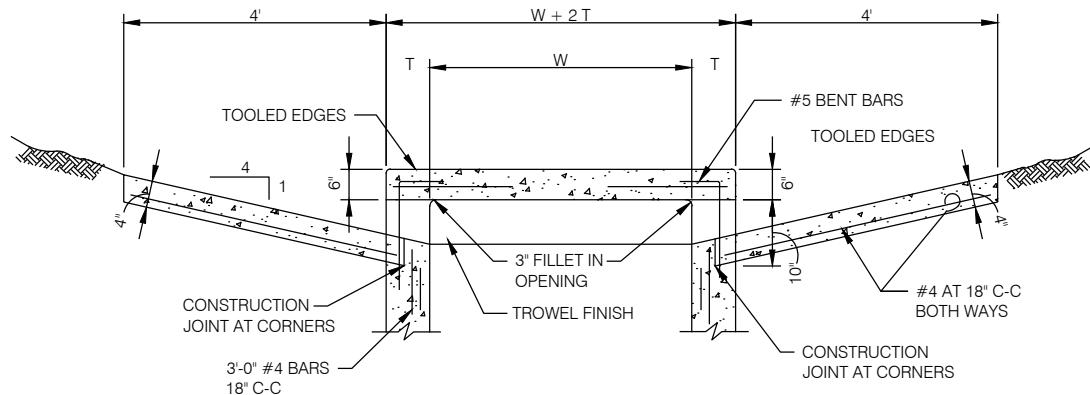
TRENCH BACKFILL DETAIL

NOT TO SCALE

NOTES:

1. ITEM NUMBERS REFER TO N.C.T.C.O.G. "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" 4TH EDITION.
2. COMPACTION METHOD FOR TRENCH BACKFILL SHALL BE PER N.C.T.C.O.G. ITEM 504.5.3 THRU 504.5.3.3.
3. DENSITIES REQUIRED FOR EVERY 200 LINEAR FEET OF TRENCH PER LIFT AND AT CROSSINGS DESIGNATED BY FIELD SERVICES INSPECTOR.

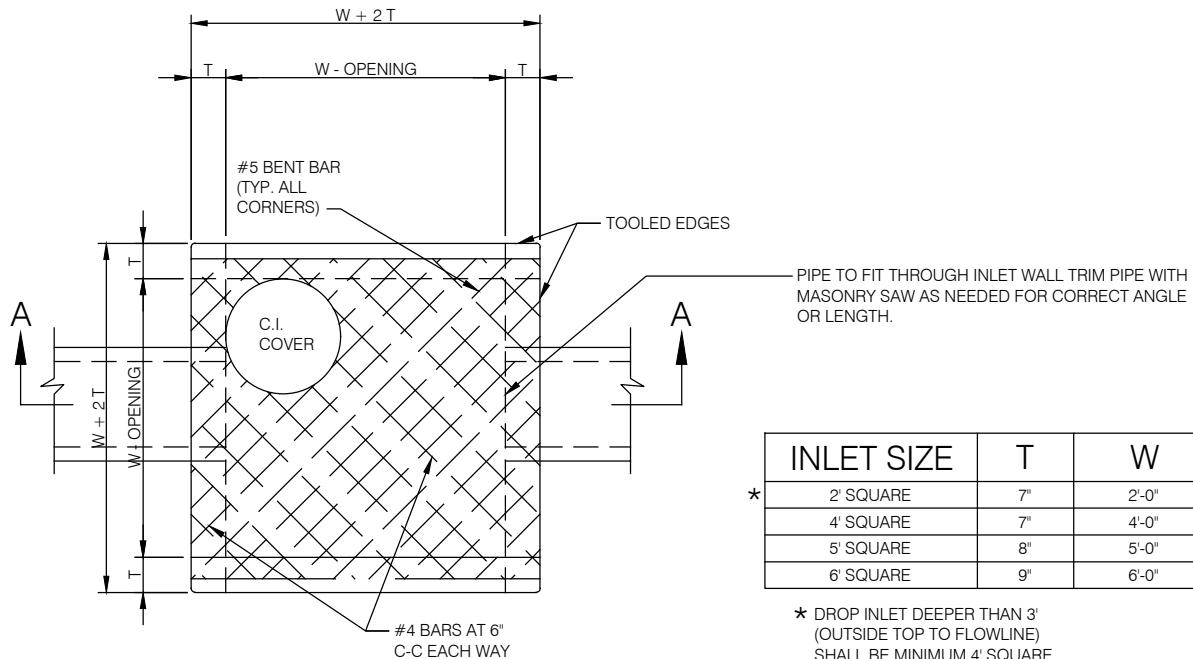
	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	TRENCH BACKFILL DETAIL	
		S3	



2

SECTION "A-A"

NOT TO SCALE



INLET SIZE	T	W
2' SQUARE	7"	2'-0"
4' SQUARE	7"	4'-0"
5' SQUARE	8"	5'-0"
6' SQUARE	9"	6'-0"

* DROP INLET DEEPER THAN 3'
(OUTSIDE TOP TO FLOWLINE)
SHALL BE MINIMUM 4' SQUARE.

1

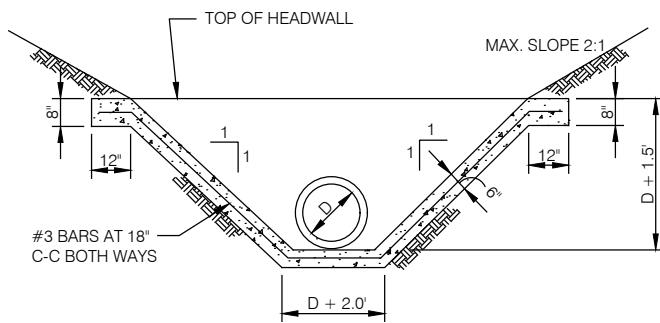
PLAN OF TOP SLAB

NOT TO SCALE

NOTES:

1. MATERIAL AND WORKMANSHIP SHALL CONFORM WITH THE REQUIREMENTS OF N.C.T.C.O.G. STANDARD SPECIFICATIONS FOR STANDARD CONCRETE MANHOLES. MINIMUM CLASS "A" CONCRETE.
2. LAYERS OF REINFORCING STEEL NEAREST THE INTERIOR AND EXTERIOR SURFACES SHALL HAVE A COVER OF 2" TO THE CENTER OF BARS. UNLESS OTHERWISE NOTED.
3. FOR DETAILS OF REINFORCING OF LOWER PORTIONS OF INLET SEE APPROPRIATE SQUARE MANHOLE DETAILS.
4. DEPTH OF DROP INLET FROM FINISHED GRADE TO FLOW LINE OF INLET IS VARIABLE. APPROXIMATE DEPTH WILL BE SHOWN ON PLANS AT LOCATION OF INLET.
5. ALL STANDARD DROP INLETS SHALL HAVE ONE OPENING ON EACH SIDE UNLESS OTHERWISE SHOWN ON PLANS.
6. DECK MAY BE REINFORCED SAME AS 4' SQUARE MANHOLE.
7. MANHOLES OVER 3' DEPTH SHALL HAVE STEPS. STEP DETAILS AVAILABLE THROUGH TPW.

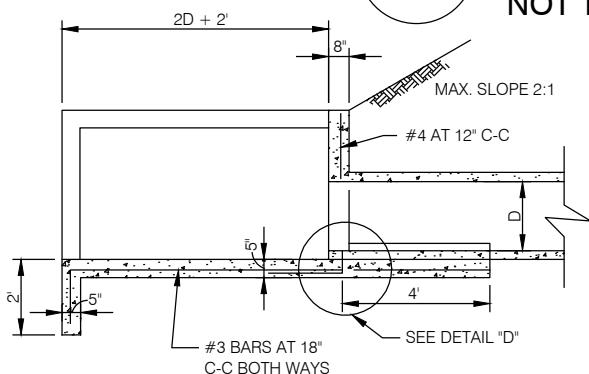
	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	DROP INLET 2', 4', 5' OR 6' SQUARE	
		S4	



3

SECTION "B-B"

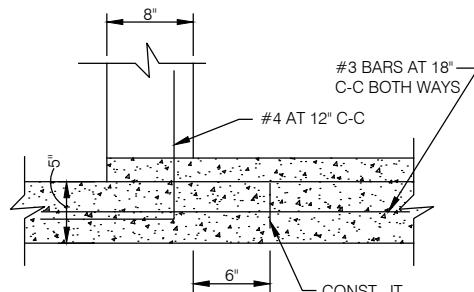
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2

SECTION "A-A"

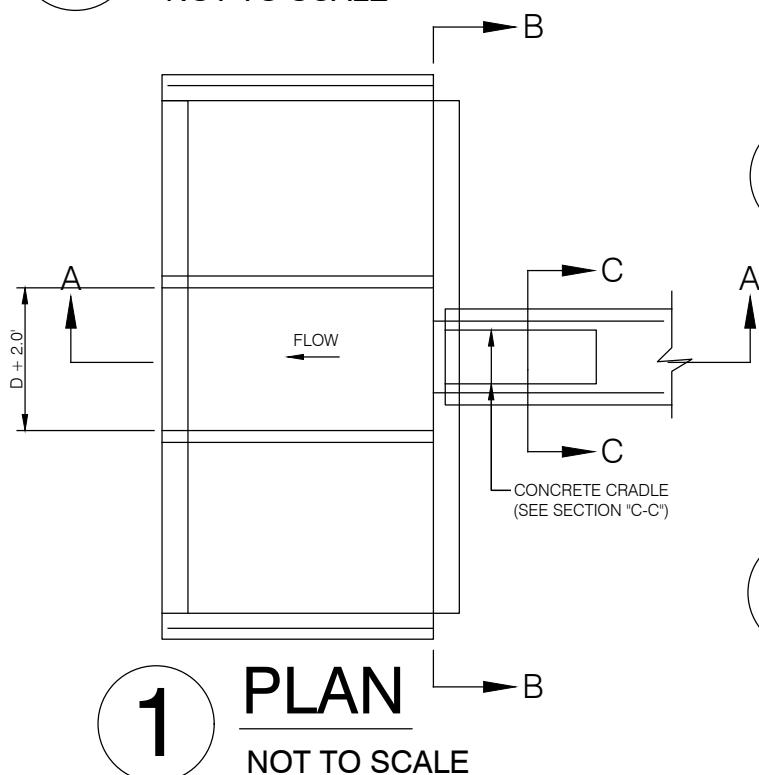
NOT TO SCALE



4

DETAIL "D"

NOT TO SCALE



1

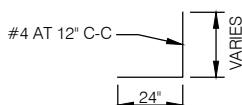
PLAN

NOT TO SCALE

5

BAR DETAIL

NOT TO SCALE



6

SECTION "C-C"

NOT TO SCALE

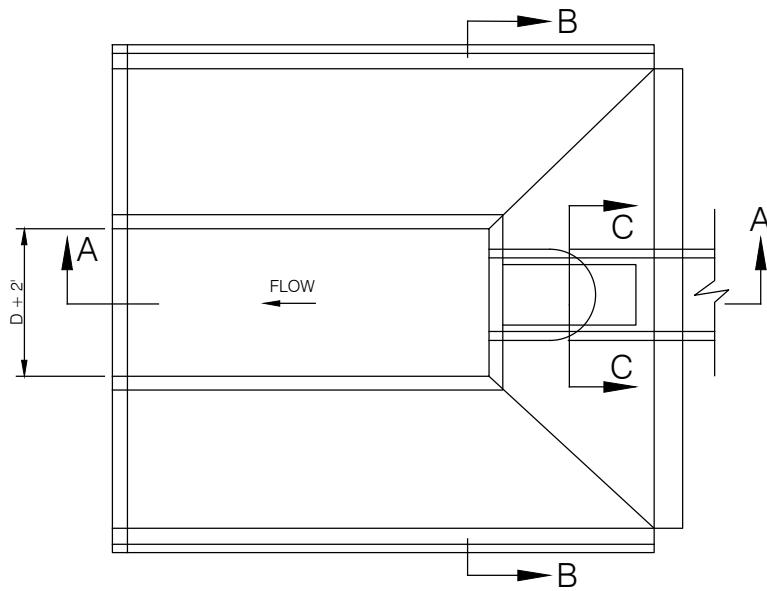
NOTE:
1. CONCRETE SHALL BE CLASS "A".



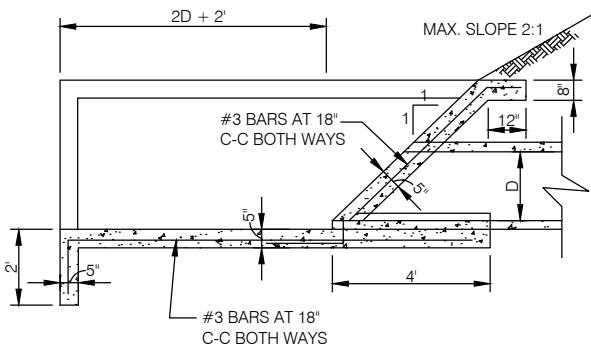
DATE
01/2020
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CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT
CONCRETE APRON
VERTICAL HEADWALL

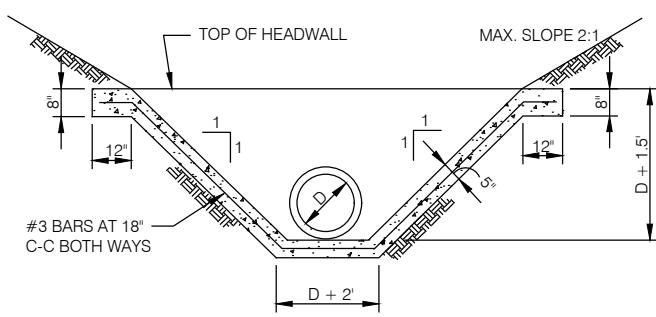
SHEET. #
S5



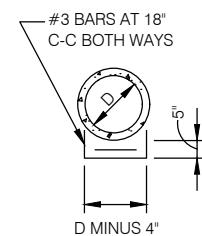
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NOT TO SCALE



2 **SECTION "A-A"**
NOT TO SCALE



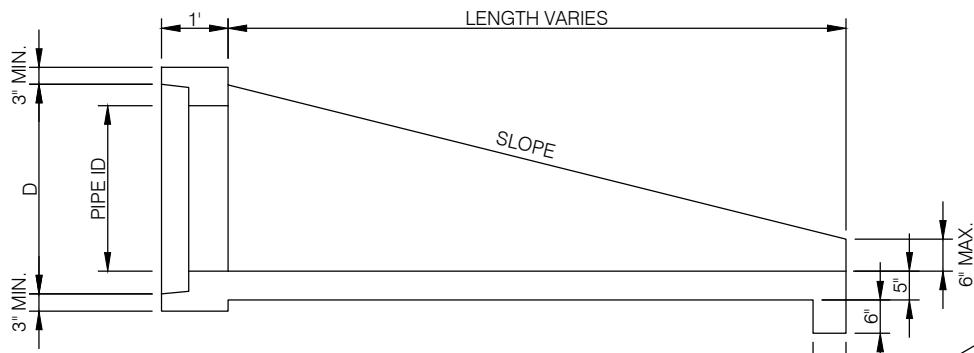
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4 **SECTION "C-C"**
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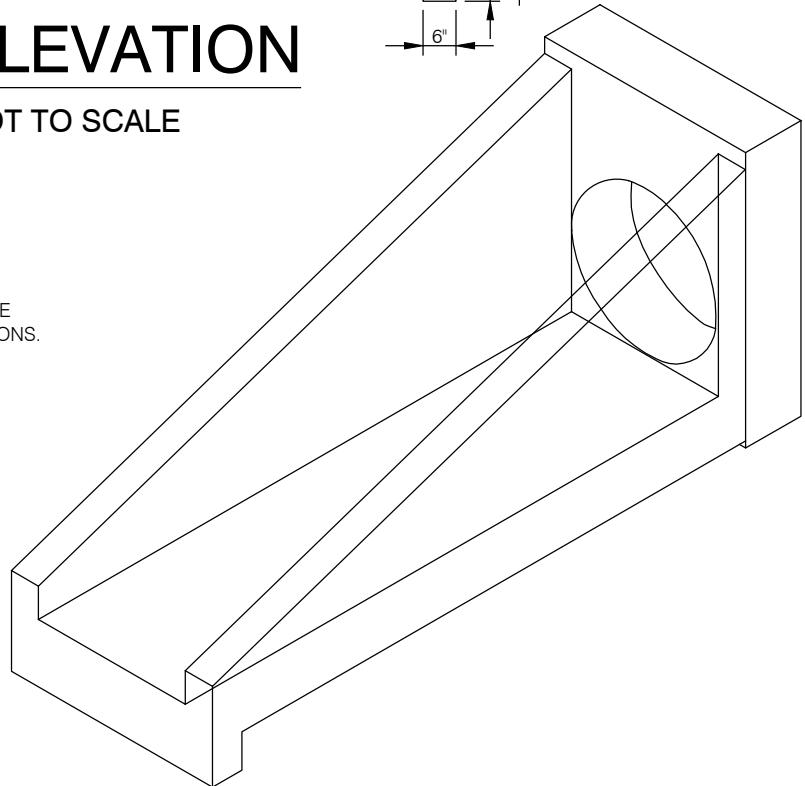
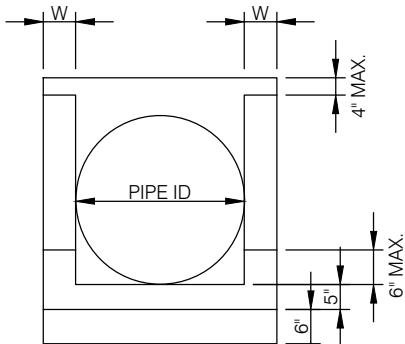
NOTE:
1. CONCRETE SHALL BE CLASS "A".

	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT		SHEET. #
	01/2020			
DRAWN BY CITY OF WEATHERFORD	CONCRETE APRON SLOPING HEADWALL			
				S6



NOTES:

1. 4500 PSI CONCRETE.
2. #4 GRADE 60 REBAR 9" O.C.E.W.
3. ALL EXPOSED CORNERS ARE CHAMFERED 3/4".
4. SWIFT LIFT ANCHORS, LOCATED IN THE FLOOR, SHALL BE USED FOR HANDLING.
5. GALVANIZED STEEL PIPE RUNNERS ARE AVAILABLE FOR CROSS AND PARALLEL DRAINAGE APPLICATIONS.



PIPE ID	PIPE OD	SLOPE	D	W
18"	23"	3:1	24"	5"
		4:1		
		6:1		
24"	30"	3:1	31"	5"
		4:1		
		6:1		
30"	37"	3:1	38"	6"
		4:1		
		6:1		
36"	44"	3:1	45-1/2"	6"
		4:1		
		6:1		
42"	51"	3:1	52-3/4"	6"
		4:1		
		6:1		
48"	58"	3:1	60"	8"
		4:1		
		6:1		
54"	65"	3:1	67"	8"



DATE
01/2020

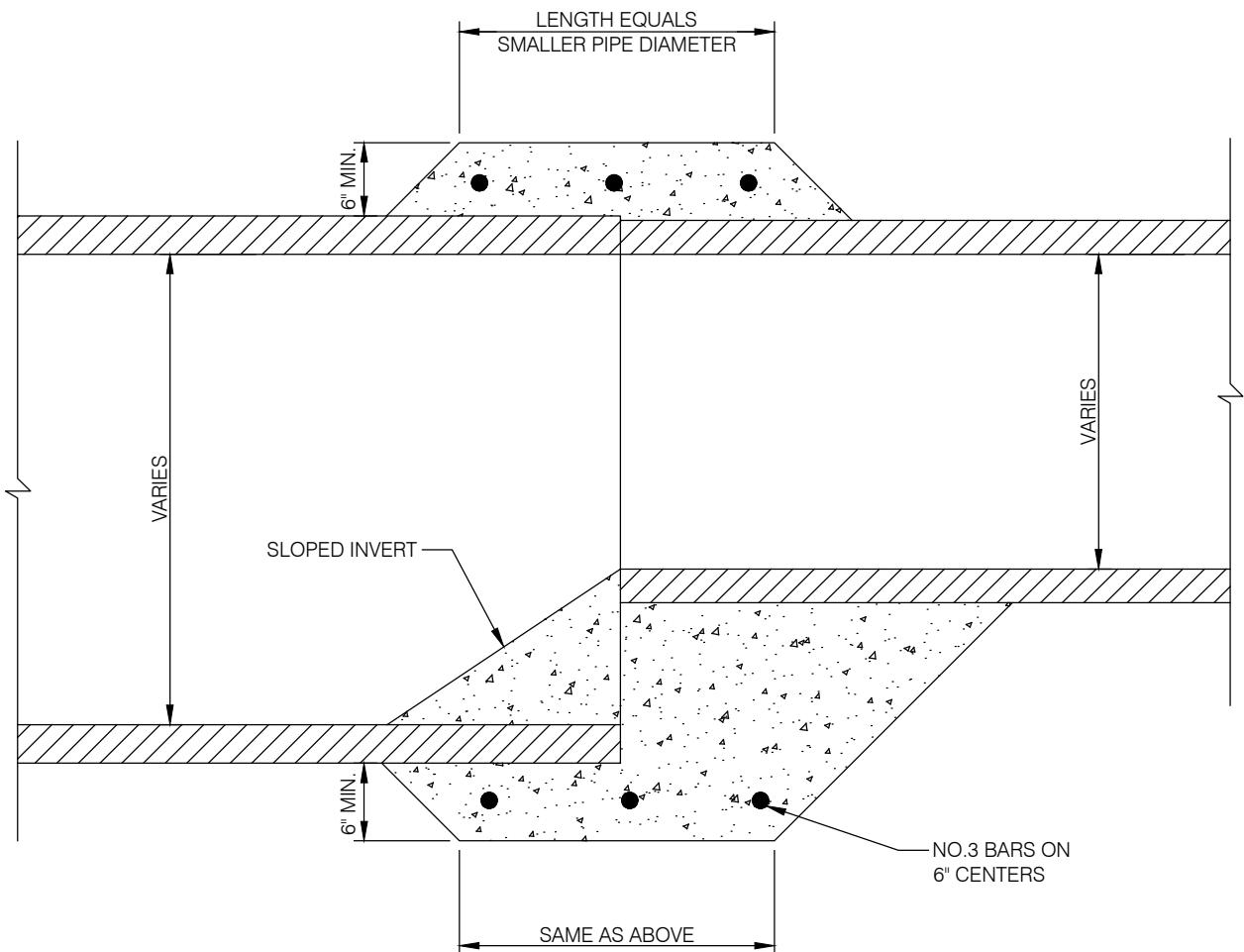
TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

SHEET. #

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CITY OF WEATHERFORD

STANDARD STORM SEWER
CULVERT W/SAFETY END TREATMENTS

S7



1

PIPE COLLAR DETAIL

NOT TO SCALE

NOTES:

1. THIS PROCEDURE/DETAIL WILL ONLY BE USED WHEN A PREFAB REDUCTION IS NOT POSSIBLE.
2. CONCRETE FOR COLLAR WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO THE VARIOUS OTHER BIDS.
3. CONCRETE SHALL BE 5 SACK 3000 PSI.



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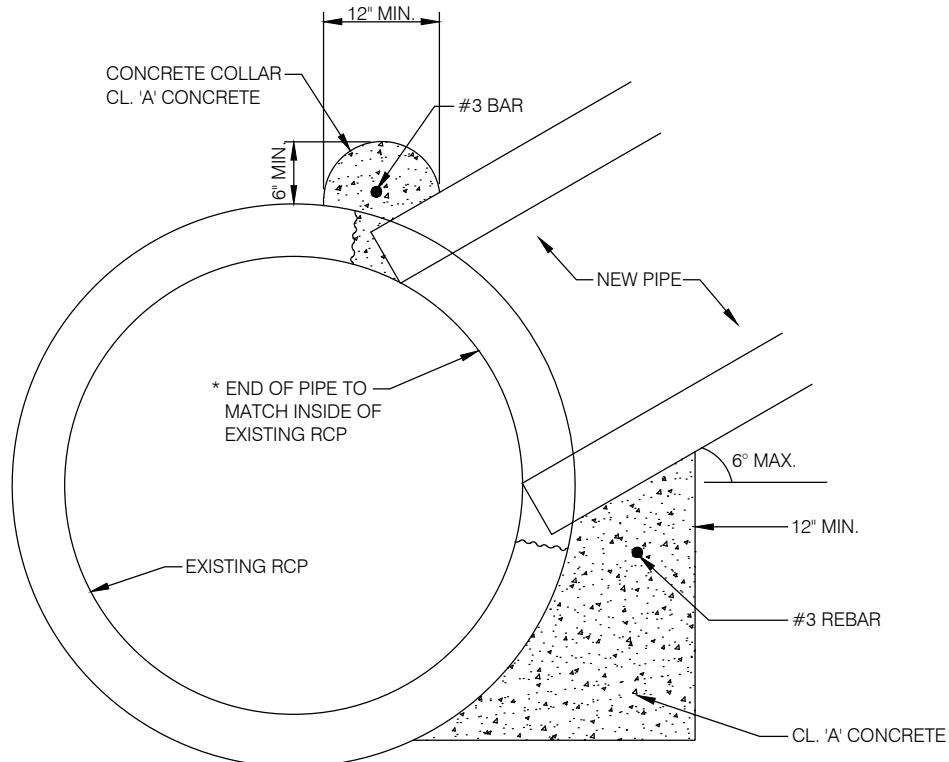
TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

PIPE COLLAR DETAIL

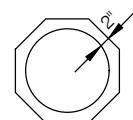
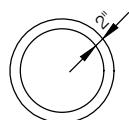
SHEET. #

S8

* MAXIMUM DIAMETER OF NEW PIPE EQUALS ONE HALF OF EXISTING PIPE'S DIAMETER.



* REMOVAL OF PLUG FROM EXISTING RCP TO BE ACCOMPLISHED BY USING A MASONRY DRILL AT A SPACING EQUAL TO THE DRILL BIT DIAMETER IN A CIRCULAR PATTERN OR A MASONRY SAW IN AN OCTAGONAL PATTERN PER DETAIL.



STORM DRAIN CONNECTION TO EXISTING RCP

1

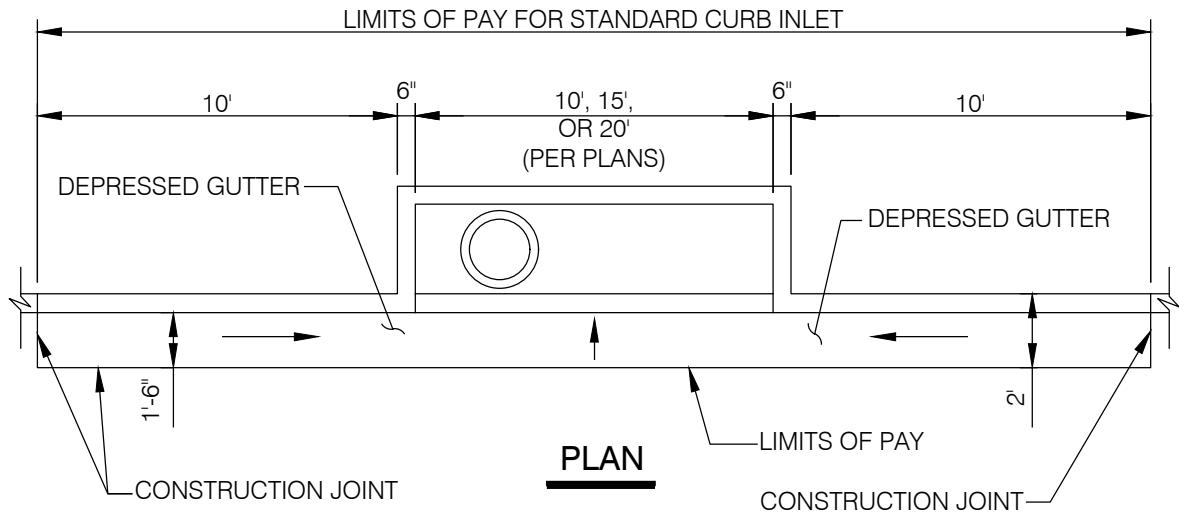
NOT TO SCALE



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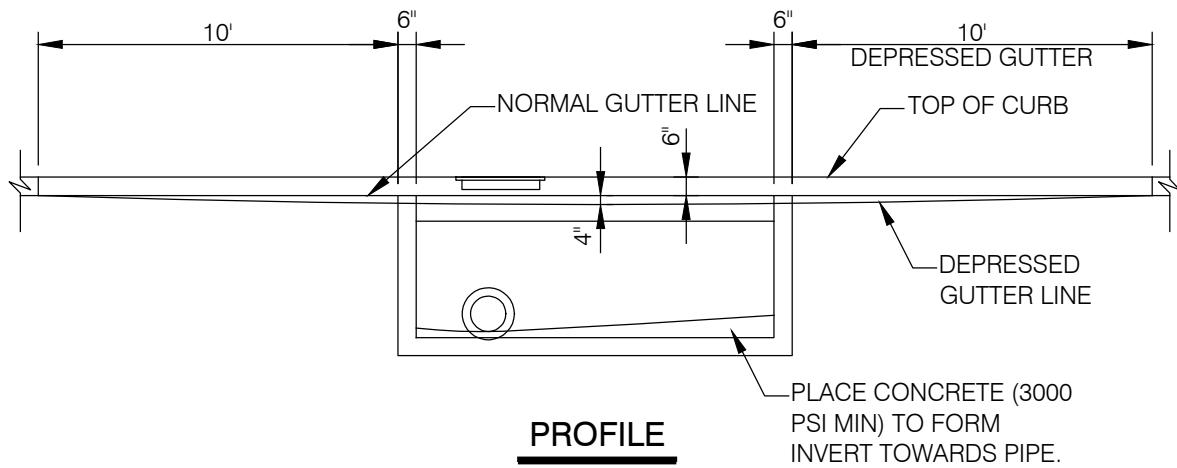
TRANSPORTATION AND PUBLIC WORKS DEPARTMENT
STORM DRAIN CONNECTION TO EXISTING RCP

SHEET. #
S9



NOTES:

1. TOP OF INLET TO SLOPE 2% TOWARDS STREET OR PER PLAN
2. CENTER SUPPORT BEAM REQUIRED FOR 15' AND 20' STANDARD CURB INLETS.
3. ADDITIONAL REINFORCING STEEL TO BE PLACED AROUND MANHOLE OPENING.



NOTES:

1. MANHOLE TO BE PLACED AT LOW END OF INLET. TWO MANHOLES ARE REQUIRED ON 15' AND 20' INLETS.

1

STANDARD CURB INLET

NOT TO SCALE

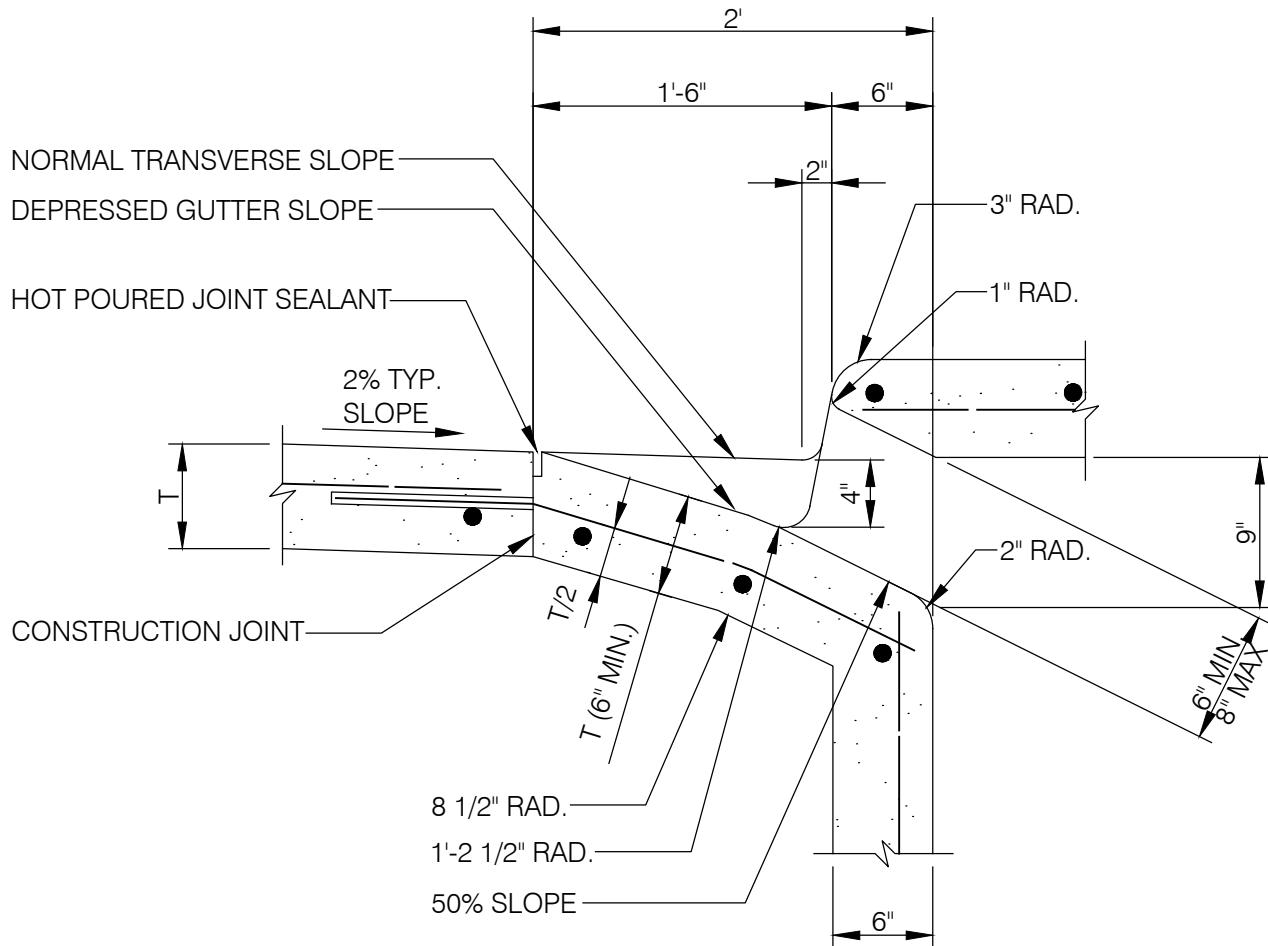


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TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

STANDARD CURB INLET

SHEET. #
S10



THROAT SECTION

1

STANDARD CURB INLET

NOT TO SCALE



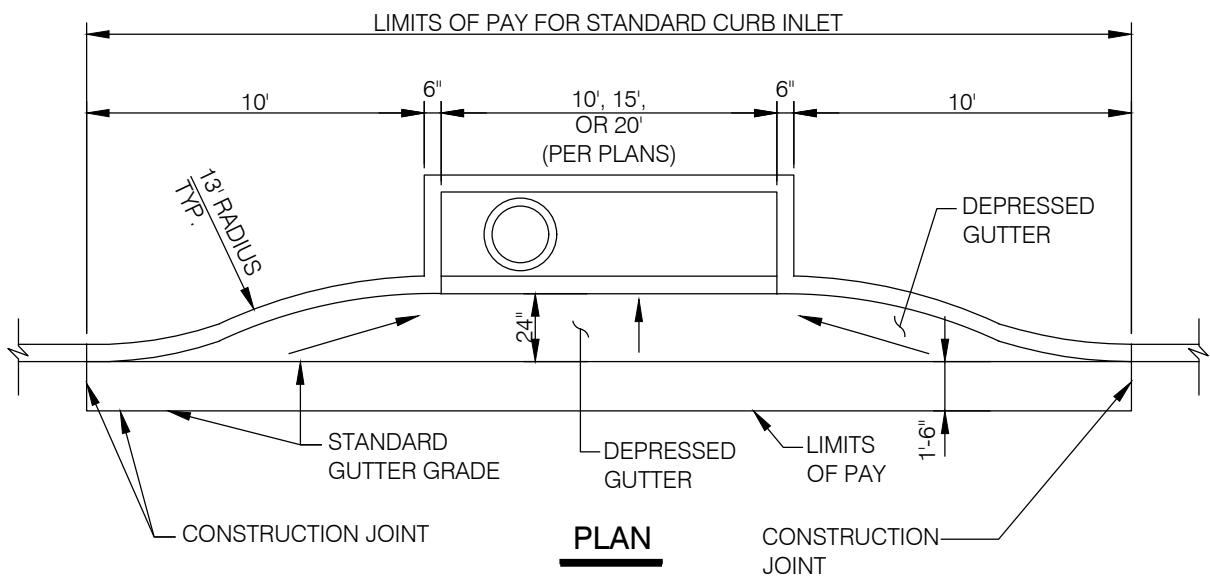
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PUBLIC WORKS DEPARTMENT

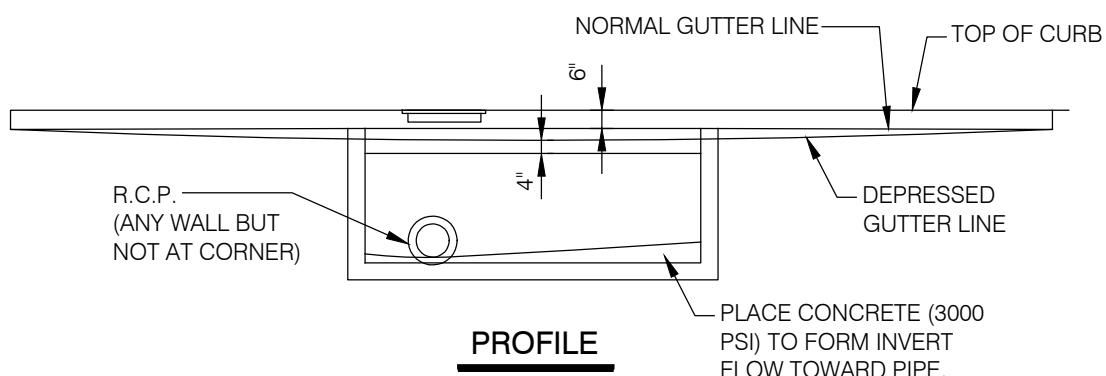
STANDARD CURB INLET

SHEET. #
S11



NOTES:

1. TOP OF INLET TO SLOPE 2% TOWARDS STREET OR PER PLAN.
2. CENTER SUPPORT BEAM REQUIRED FOR 15' AND 20' STANDARD CURB INLETS.
3. ADDITIONAL REINFORCING STEEL TO BE PLACED AROUND MANHOLE OPENING.



NOTES:

1. MANHOLE TO BE PLACED AT LOW END OF INLET. TWO MANHOLES ARE REQUIRED ON 15' AND 20' INLETS.

1

RECESSED CURB INLET

NOT TO SCALE

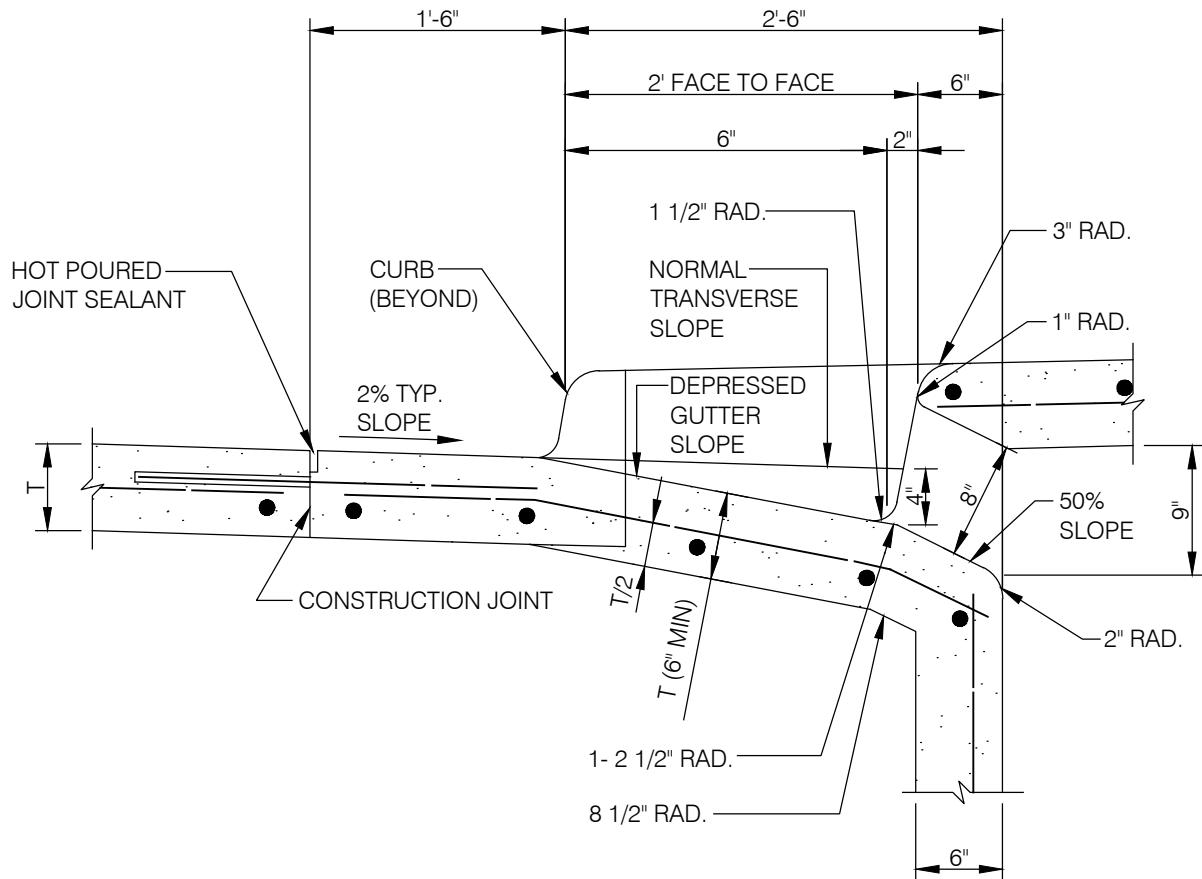


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PUBLIC WORKS DEPARTMENT

RECESSED CURB INLET

SHEET. #
S12



THROAT SECTION

1

RECESSED CURB INLET

NOT TO SCALE



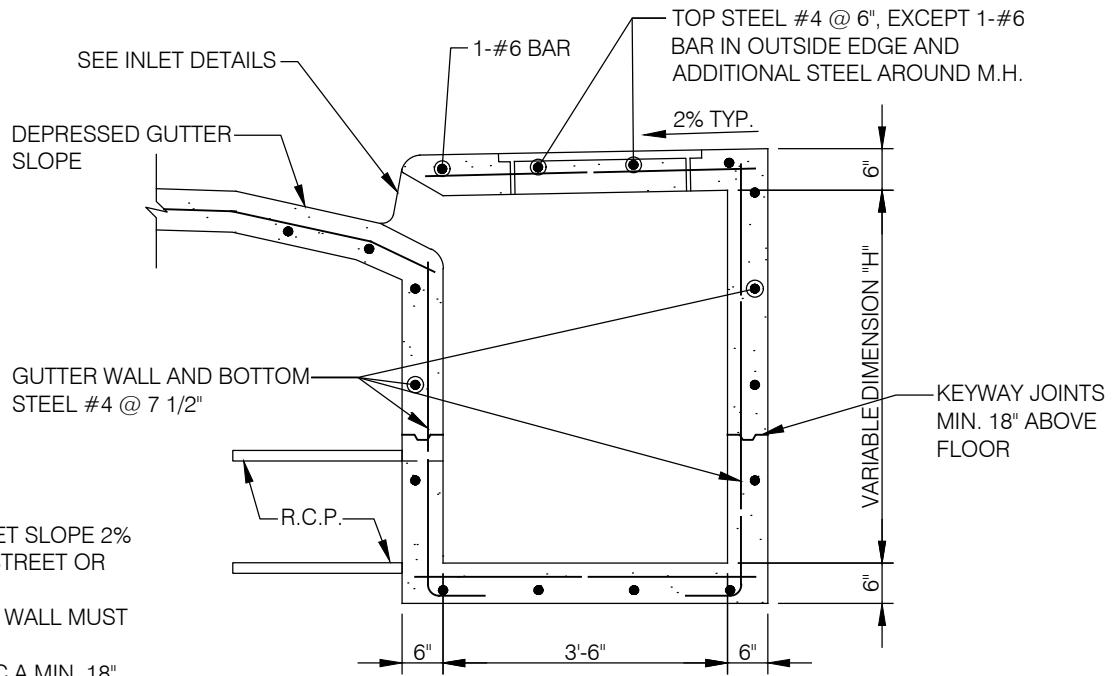
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TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

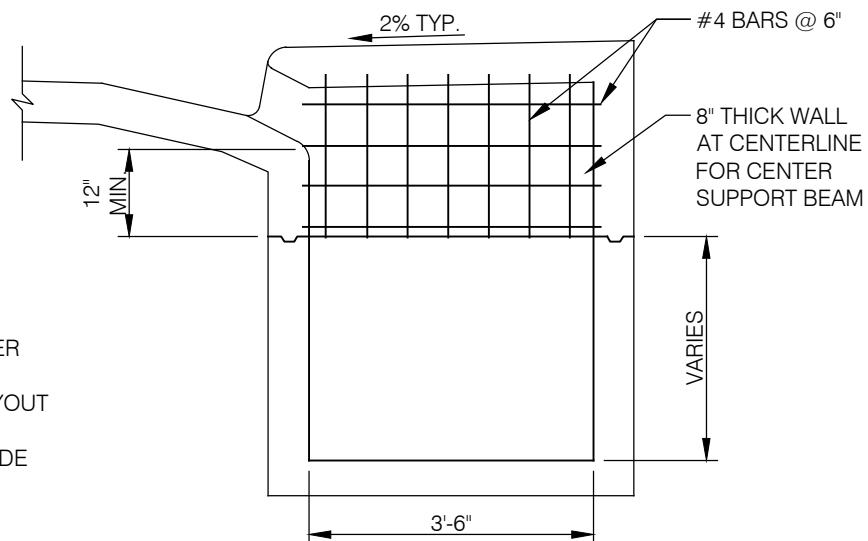
RECESSED CURB INLET

SHEET. #

S13



INLET SECTION FOR RECESSED AND STANDARD INLETS



CENTER SUPPORT BEAM FOR 15' & 20' RECESSED AND STANDARD INLETS

CENTER SUPPORT BEAM AND INLET SECTION

1

NOT TO SCALE



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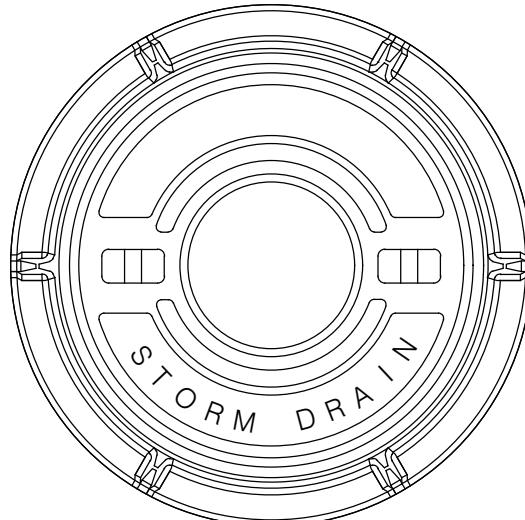
TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

CENTER SUPPORT BEAM AND INLET SECTION
FOR RECESSED AND STANDARD INLETS

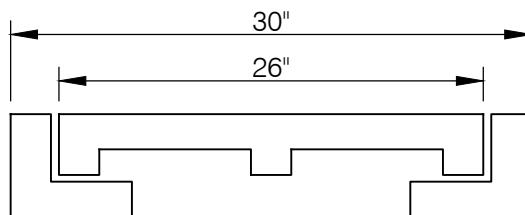
SHEET. #
S14

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS A.
2. ALL REINFORCING STEEL SHALL BE NEW BILLET STEEL CONFORMING TO ASTM A-615 AND AMERICAN MADE.
3. CHAMFER ALL EXPOSED CORNERS 3/4" EXCEPT WHERE OTHERWISE NOTED.
4. DIMENSIONS RELATING TO REINFORCING STEEL ARE TO CENTER OF BARS.
5. FIELD CUT AND BEND BARS AS NECESSARY TO ACCOMMODATE STORM SEWER PIPE.
6. ALL REINFORCING STEEL SHALL HAVE A MINIMUM COVER OF 2".
7. ROCK FOUNDATION SHALL BE USED DURING PREFABRICATED INLET BOX INSTALLATION. 6" FOR BACKFILL WITH FLOWABLE FILL TO FILL Voids OR COMPACT WITH SELECT SURPLUS EXCAVATION COMPACTED IN 8" LIFTS TO 95% STANDARD PROCTOR DENSITY.
8. STANDARD CURB INLET SIZES ARE 10', 15', OR 20'. NO OTHER SIZES WILL BE ALLOWED WITHOUT APPROVAL FROM DIRECTOR OF T.P.W.
9. MANHOLE RING SHALL BE CHAINED TO RING.
10. MANHOLES AND CURB INLETS DEEPER THAN 3' SHALL HAVE STEPS. CONTACT TPW FOR STEP DETAILS.



INLET LID DETAIL



CAST IRON FRAME AND COVER

1

INLET LID

NOT TO SCALE



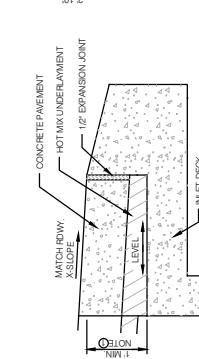
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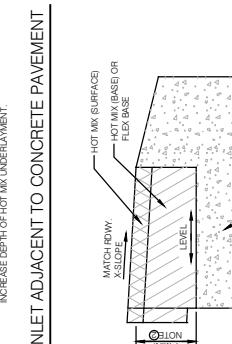
INLET LID DETAIL AND GENERAL NOTES

SHEET. #
S15

BILL OF REINFORCING STEEL FOR INLET DEPTH OF 6											
LENGTH OF OPENING NO.	#5 BARS A @ 6"	#5 BARS B @ 6"	#5 BARS C @ 6"	#5 BARS D @ 6"	#5 BARS E @ 6"	#5 BARS F @ 6"	#4 BARS G @ 12"	#4 BARS H @ 12"	#4 BARS I @ 12"	#4 BARS J @ 12"	#4 BARS K @ 12"
NO. WT.	NO. WT.	NO. WT.	NO. WT.	NO. WT.	NO. WT.	NO. WT.	NO. WT.	NO. WT.	NO. WT.	NO. WT.	NO. WT.
5' 13	13	75	6	54	7	38	6	56	7	35	13
10 23	23	132	16	143	7	38	16	149	7	35	23
19 33	33	189	26	233	7	38	26	242	7	35	33
20 43	43	247	36	322	7	38	36	335	7	35	43



INLET ADJACENT TO CONCRETE PAVEMENT



INLET ADJACENT TO HOT MIX PAVEMENT

CONCRETE QUANTITY REDUCTION TABLE	
Pipe Diameter	Reduction Factor
12"	0.93
15"	0.88
18"	0.83
21"	0.78
24"	0.73
27"	0.68
30"	0.63
33"	0.58
36"	0.53
39"	0.48
42"	0.43
45"	0.38

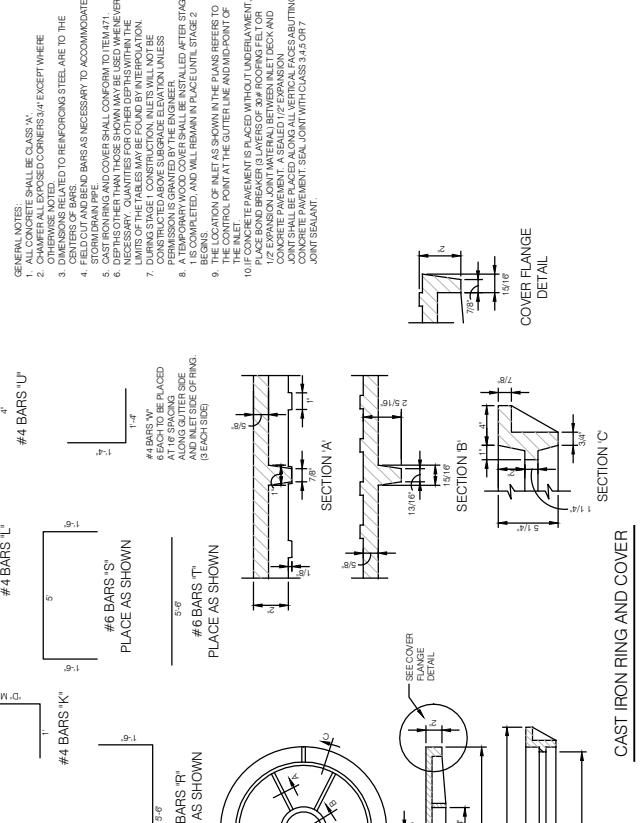
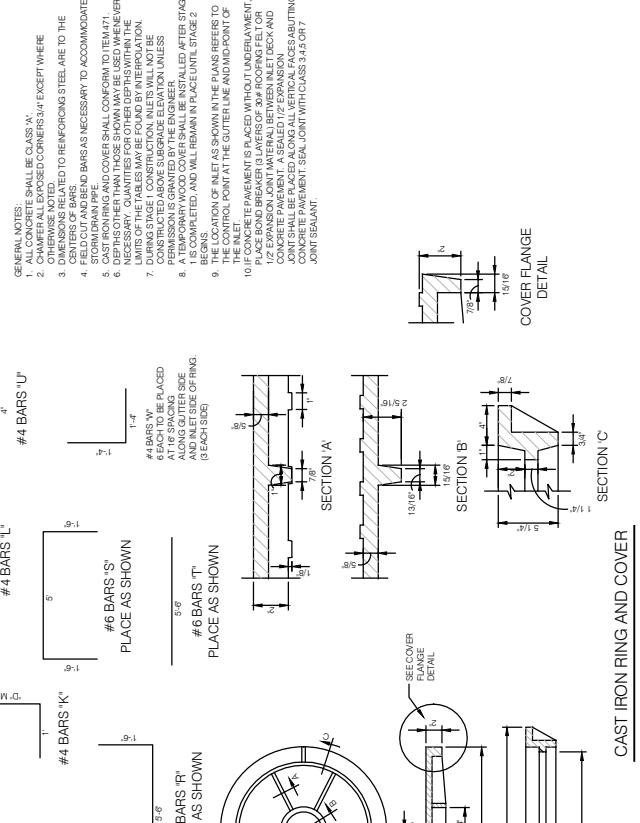
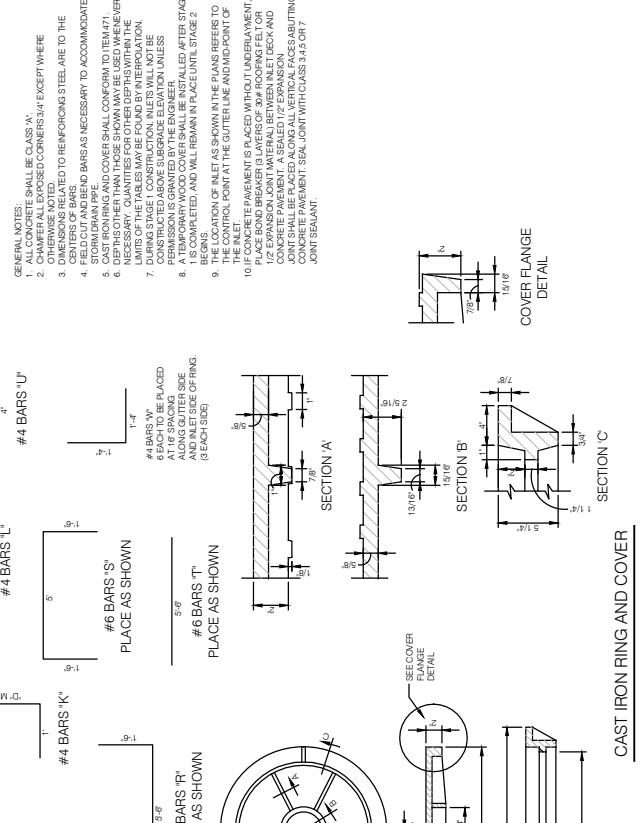
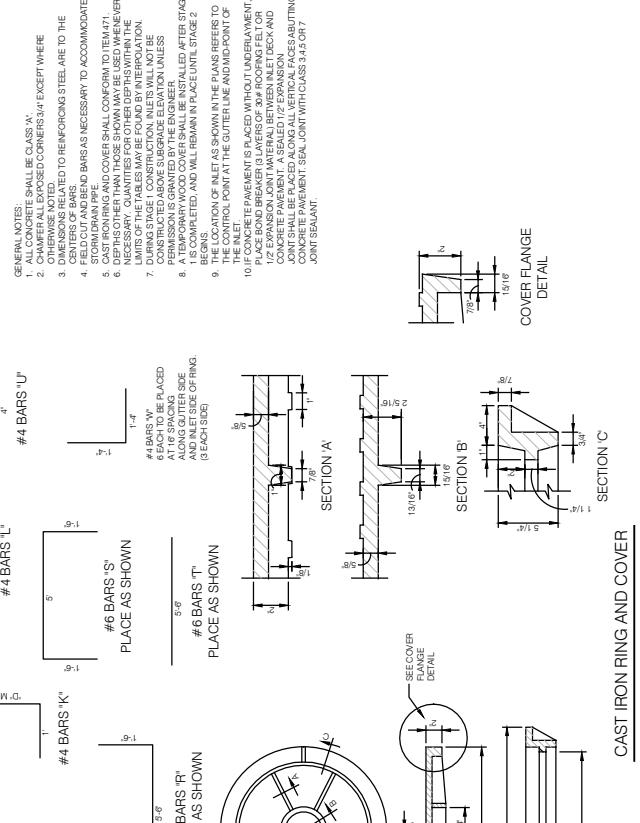
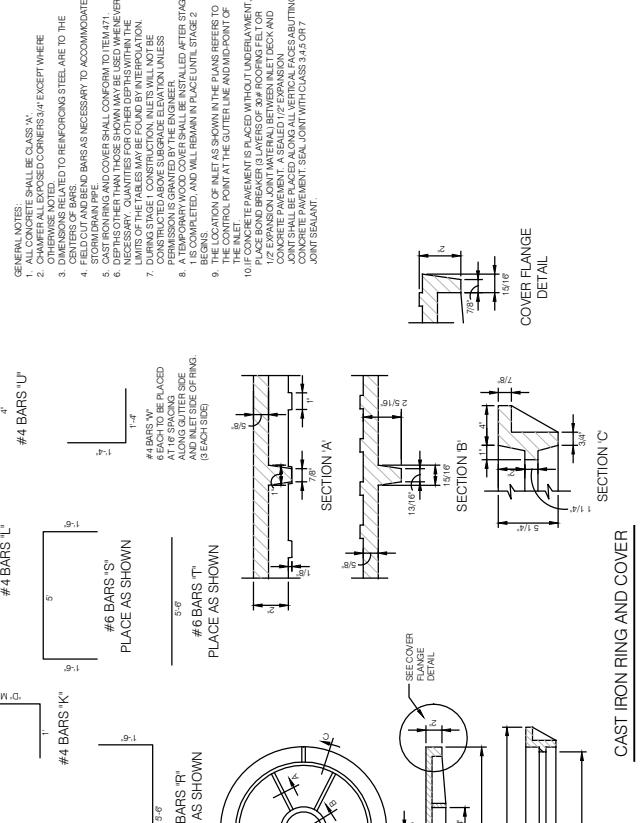
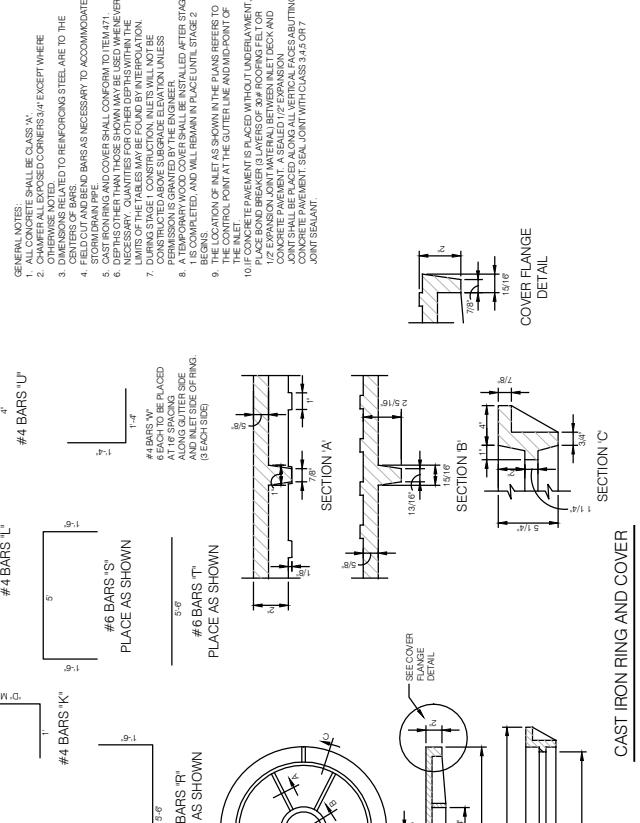
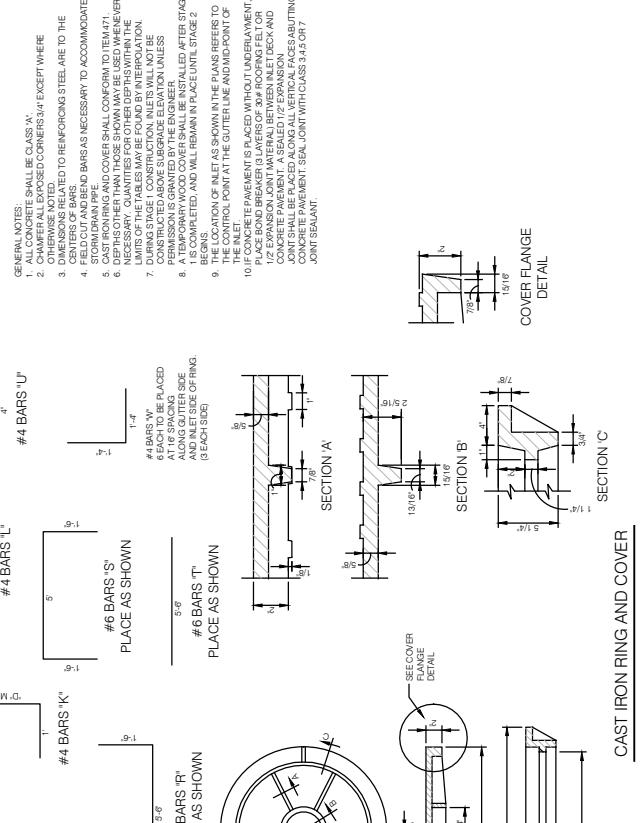
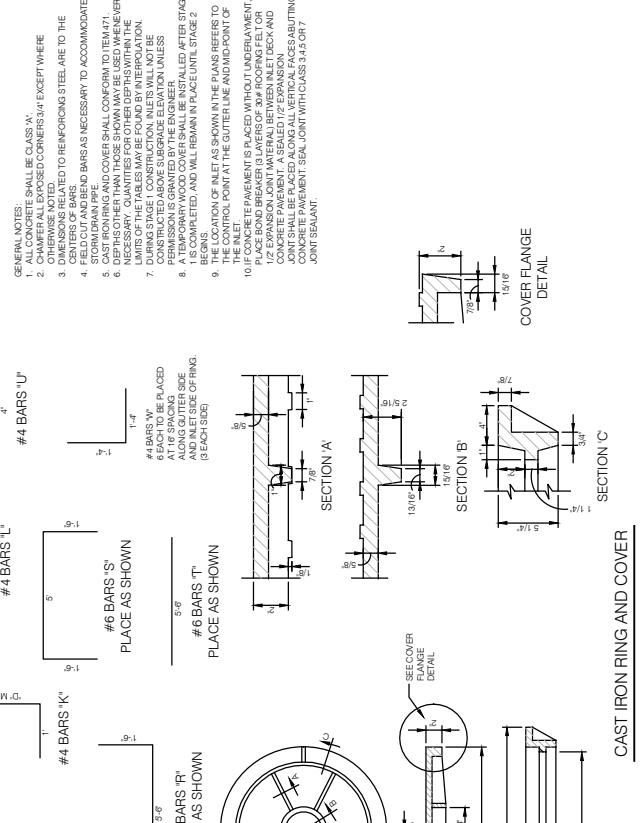
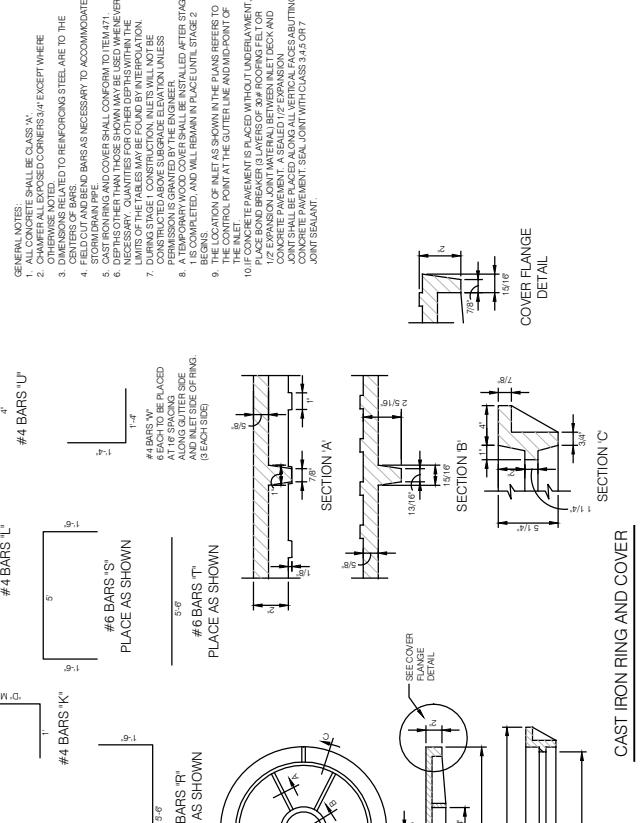
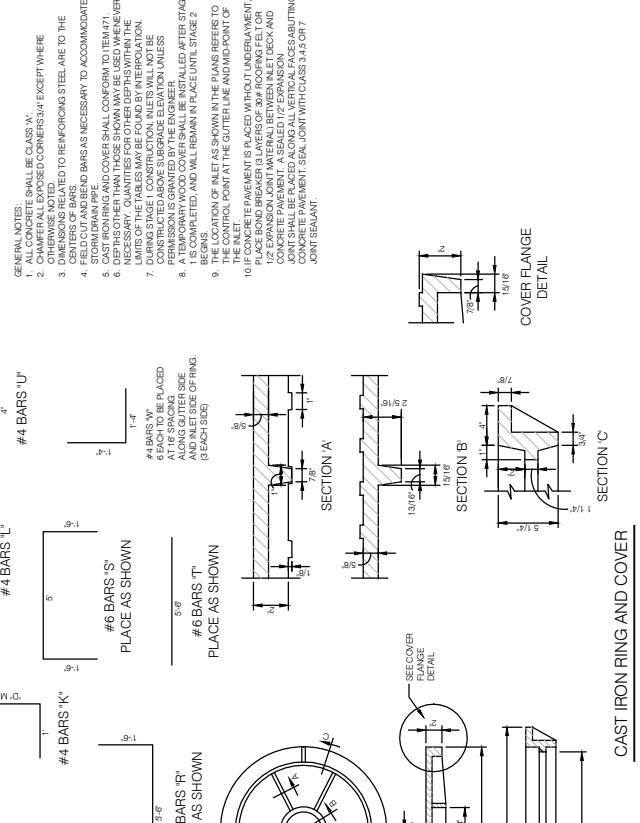
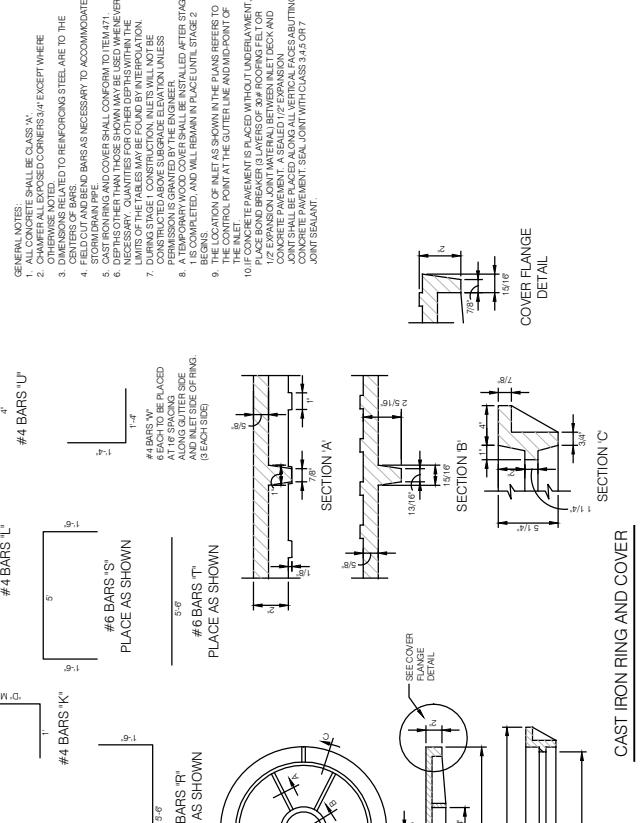
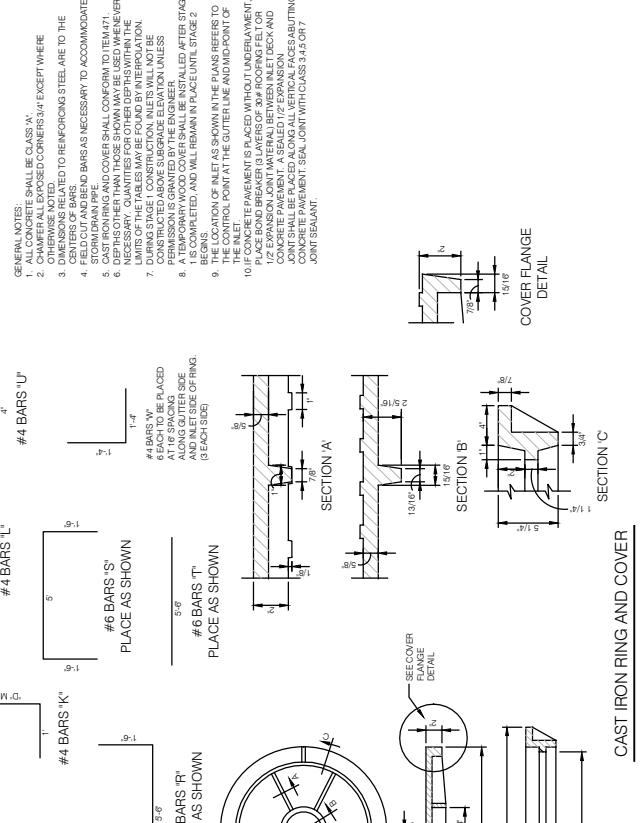
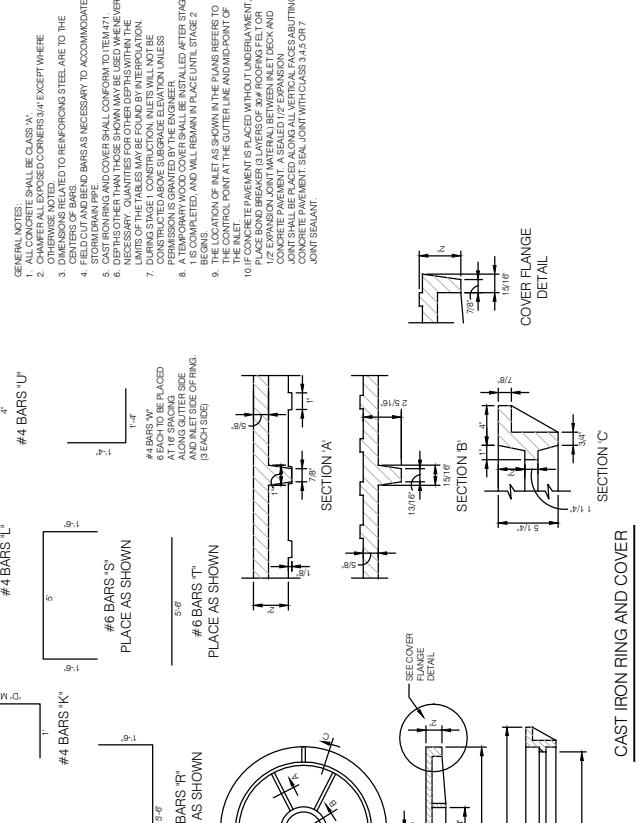
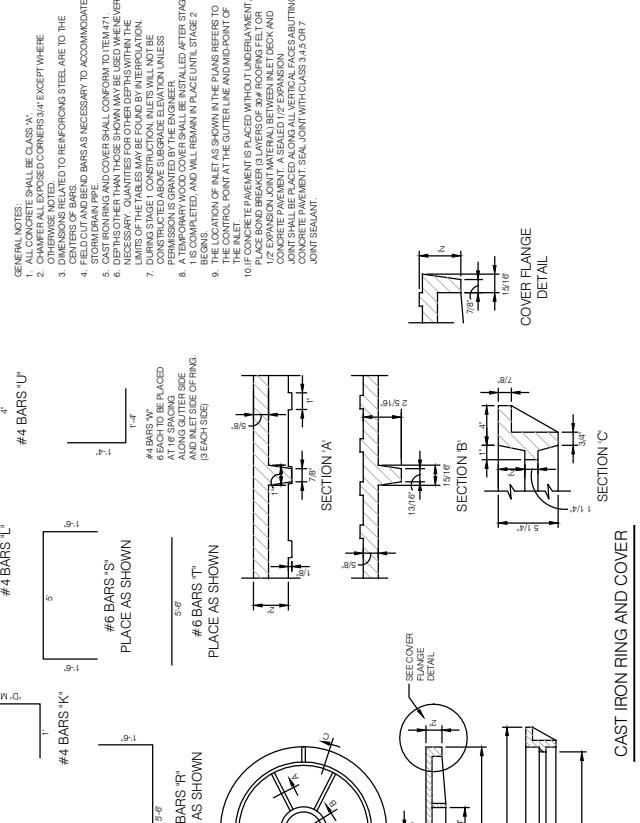
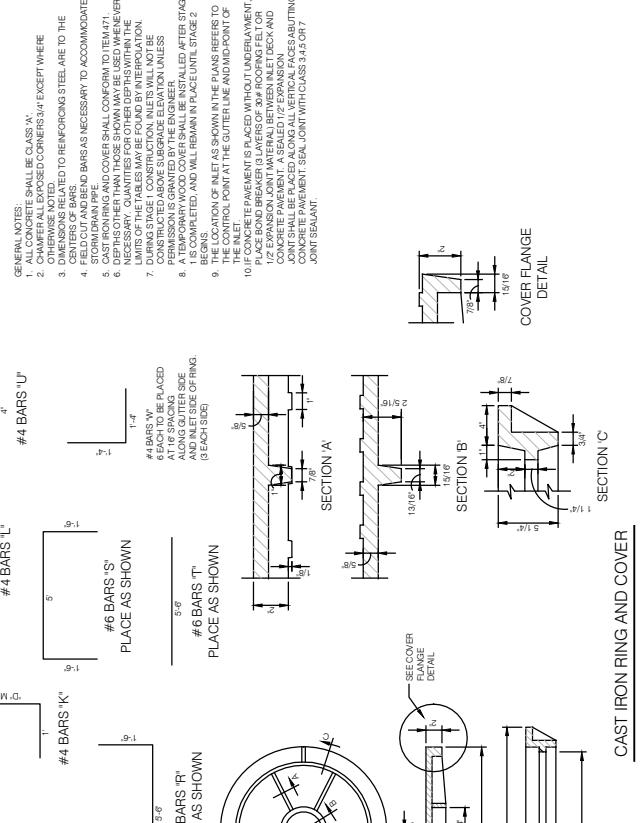
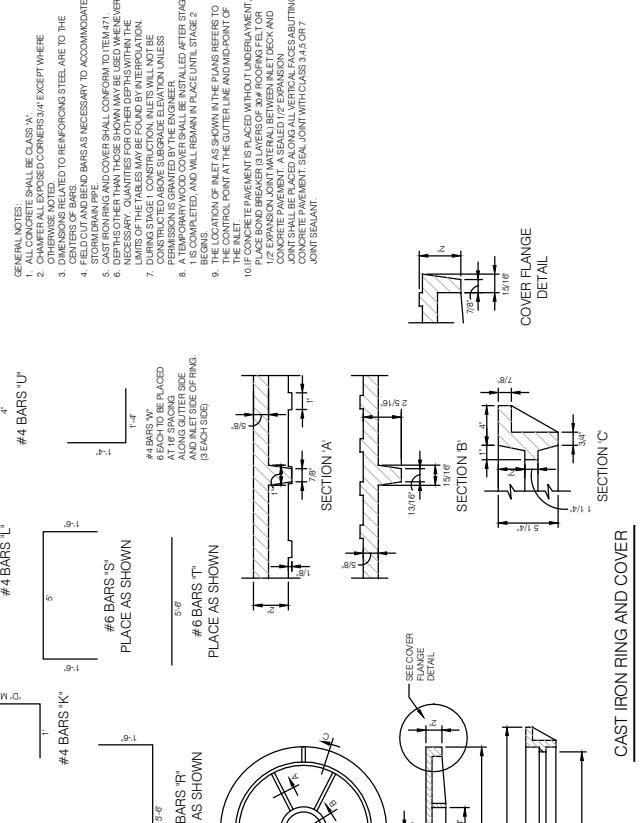
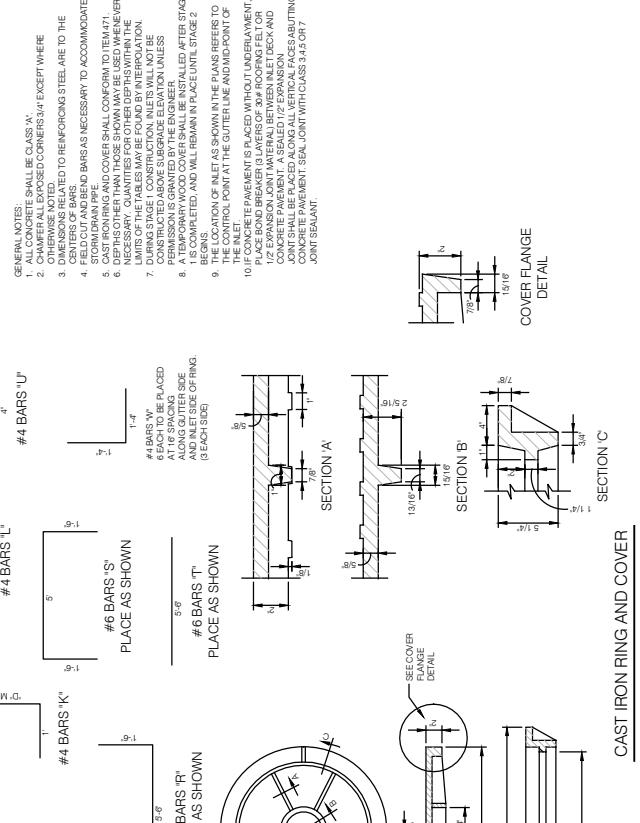
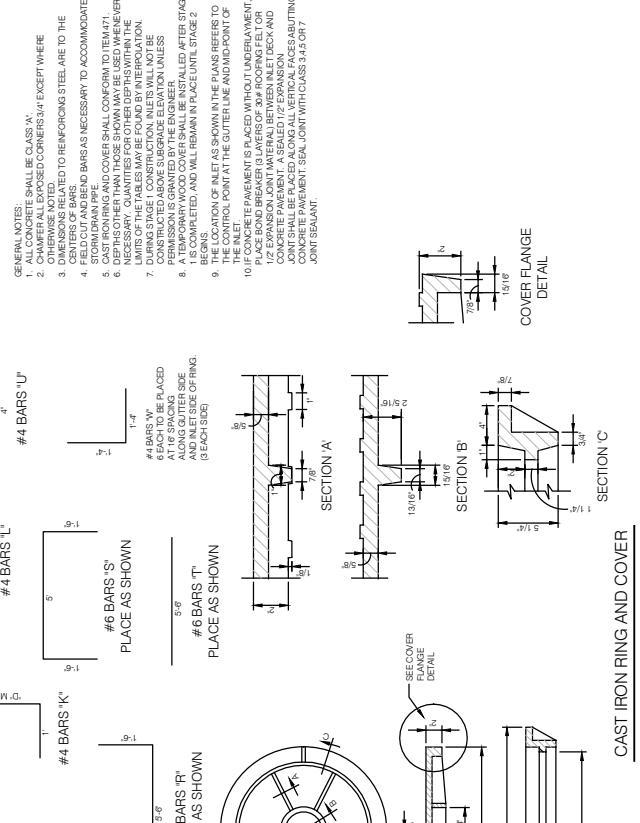
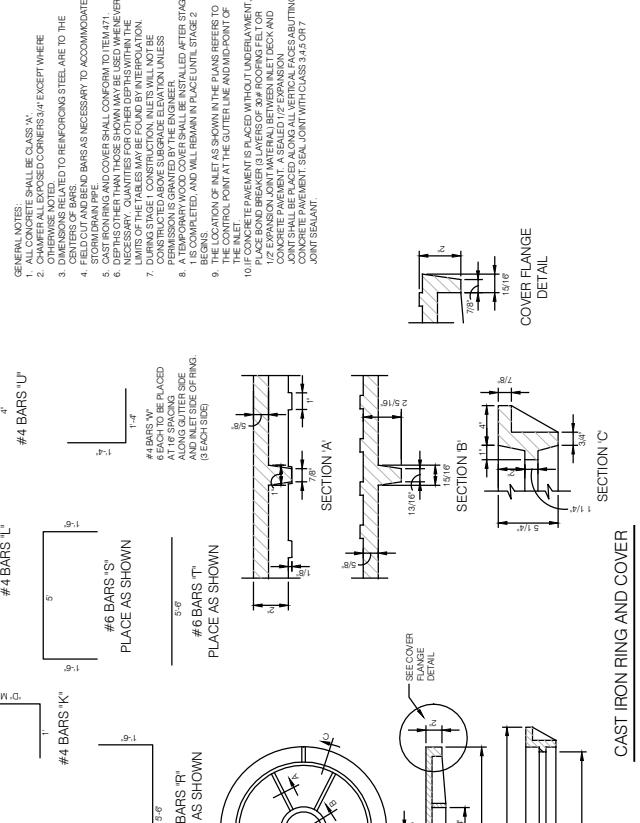
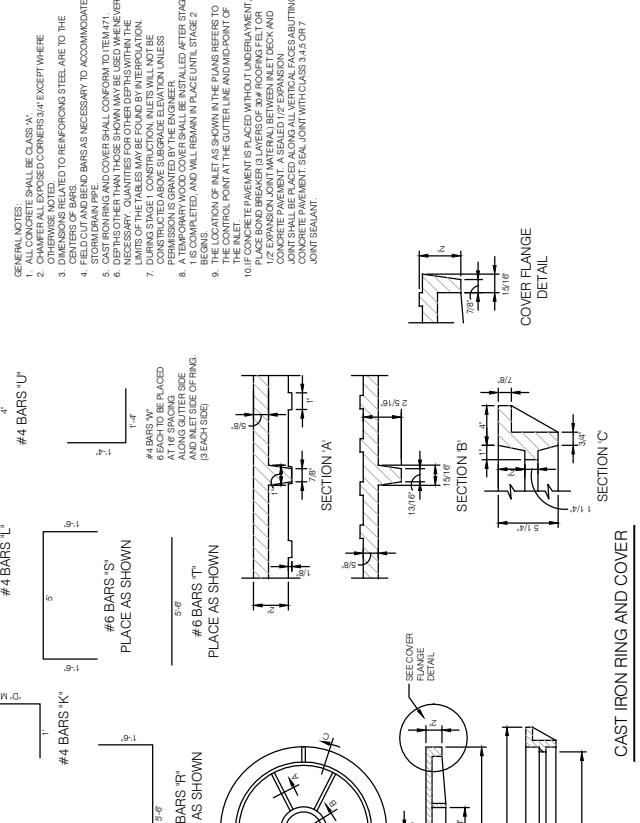
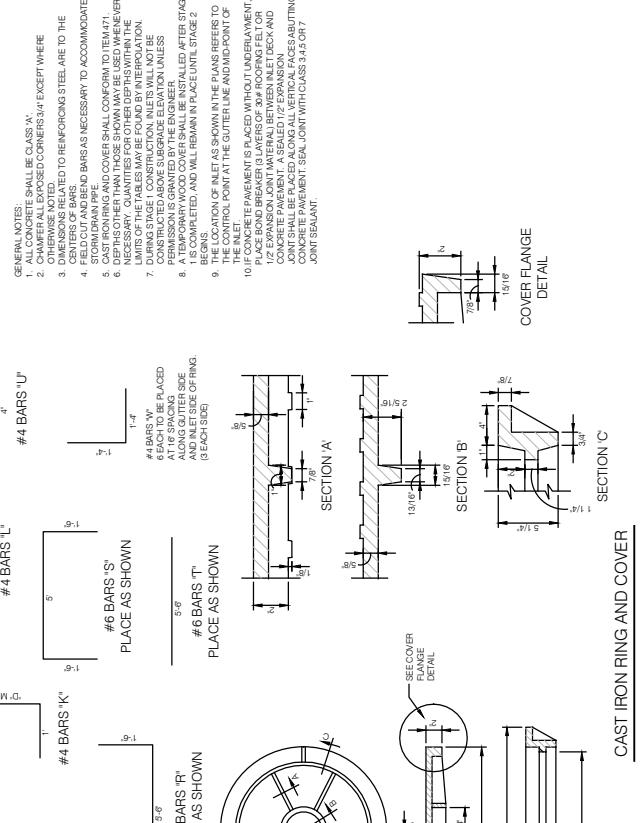
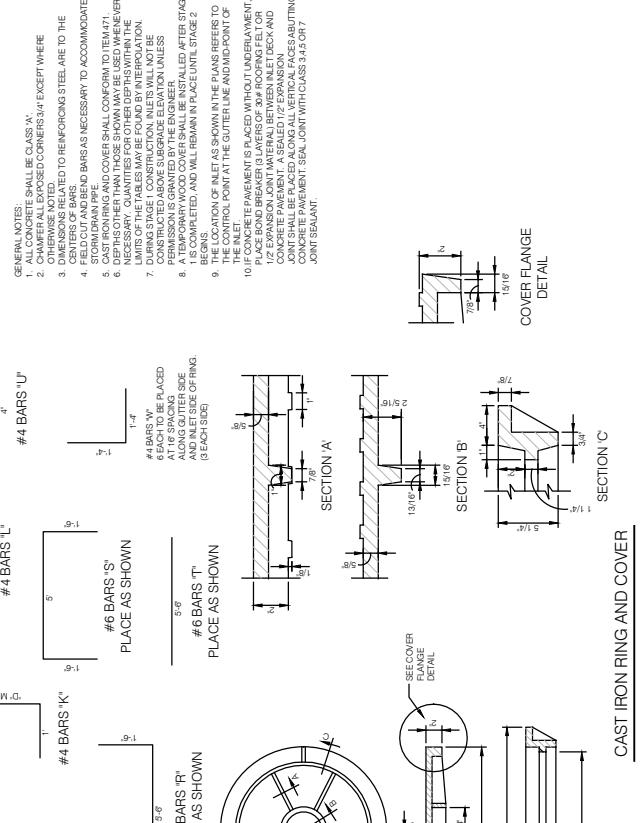
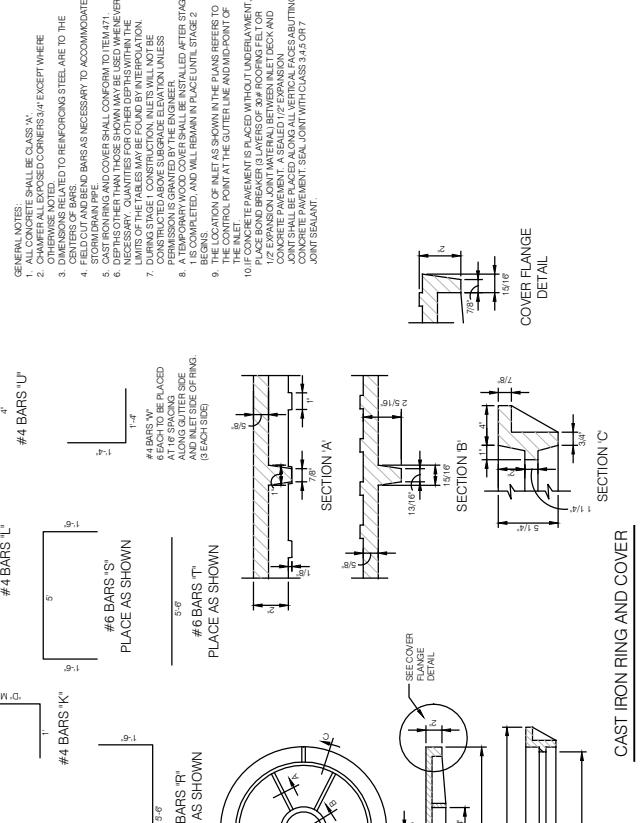
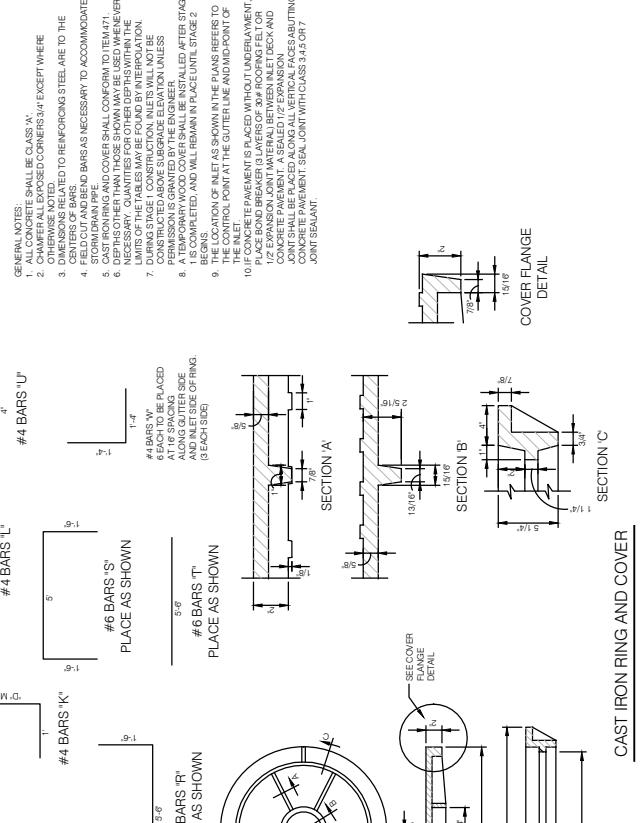
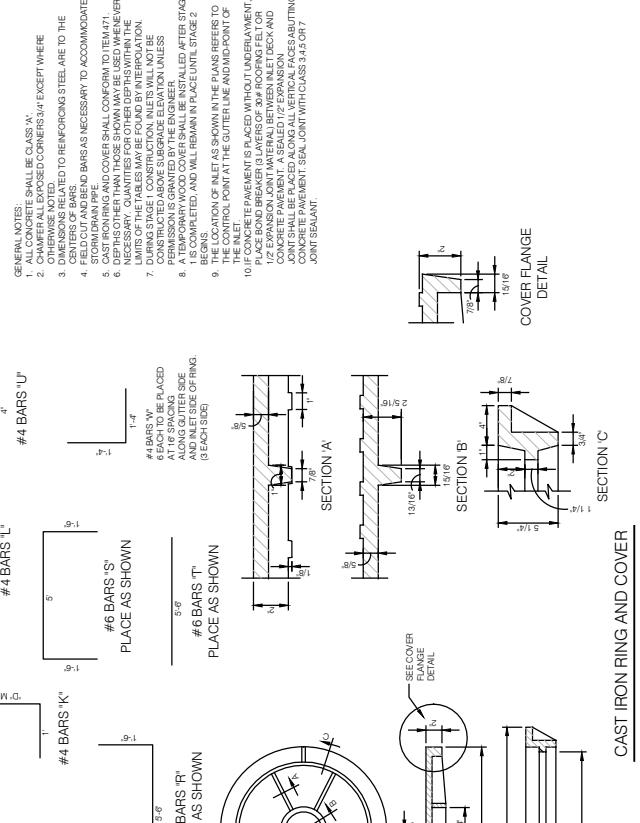
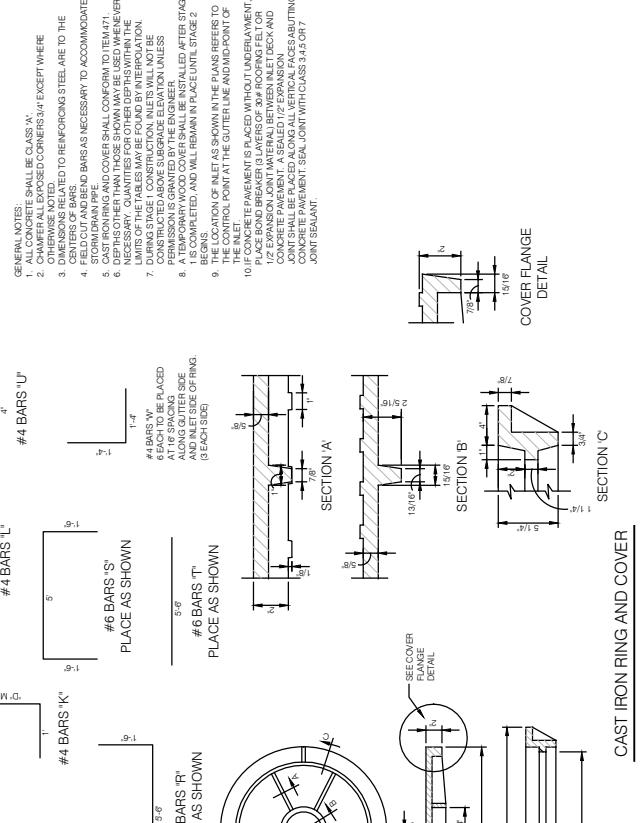
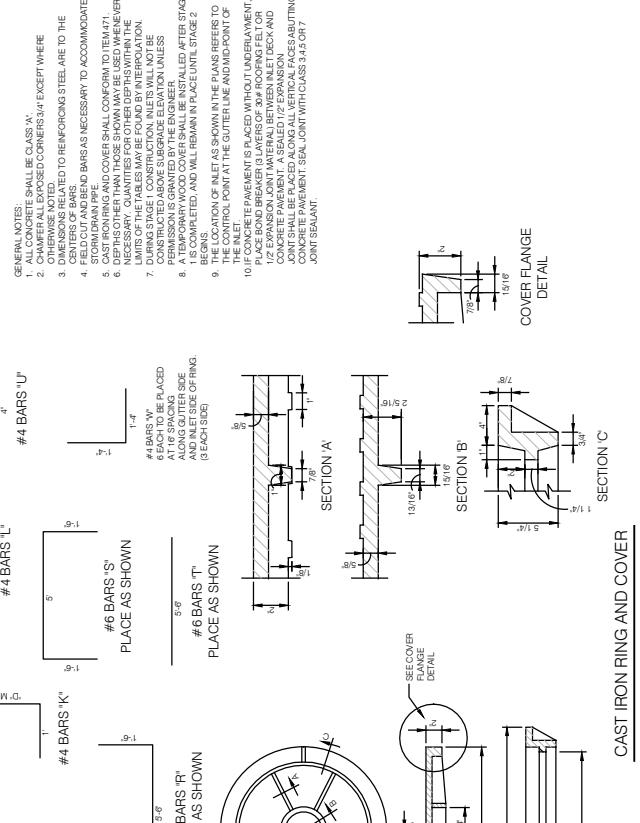
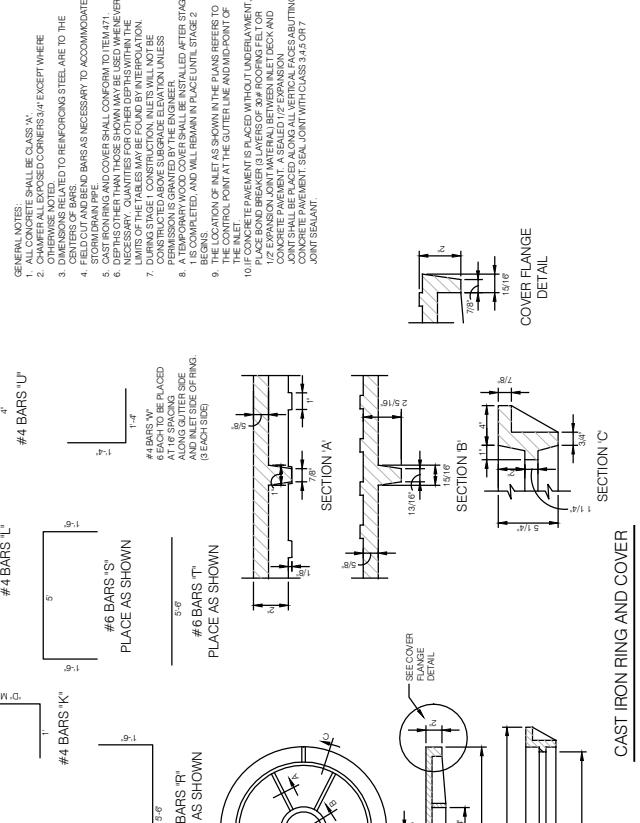
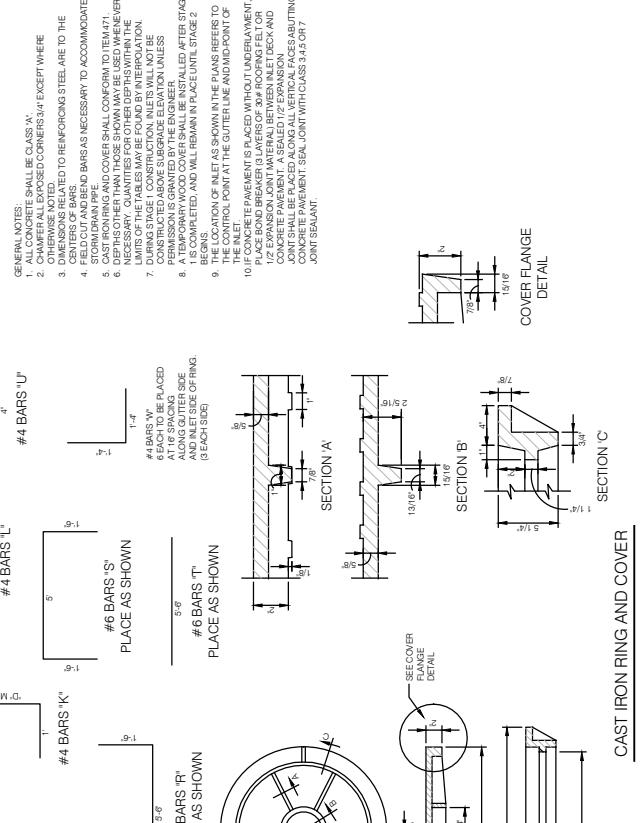
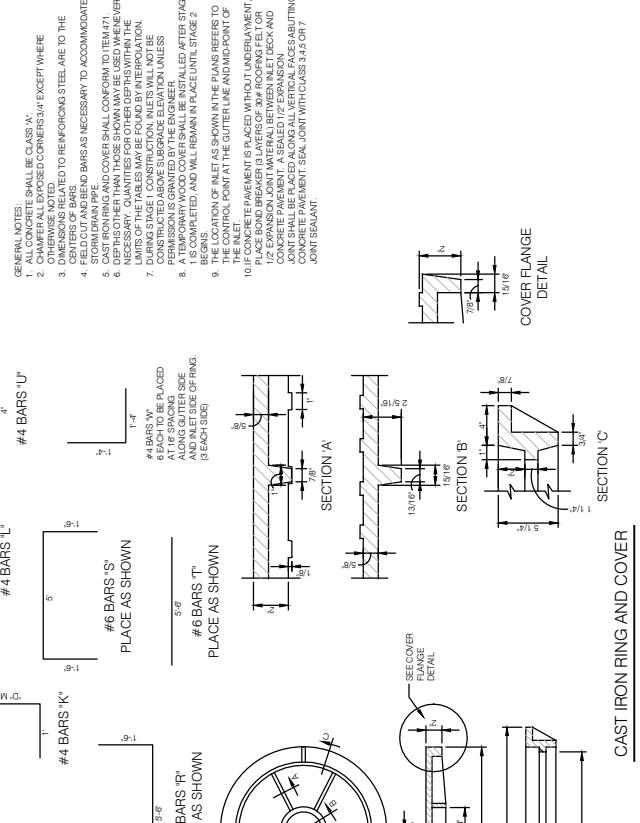
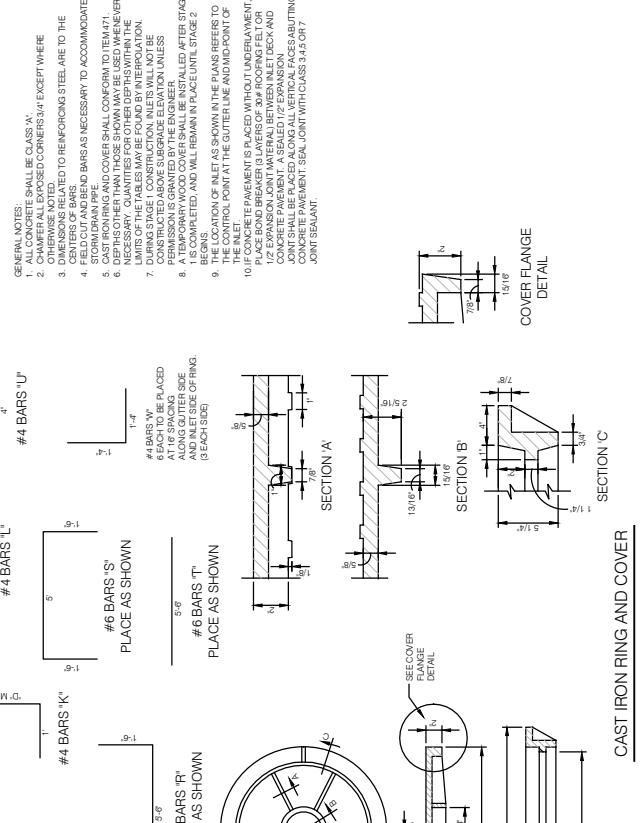
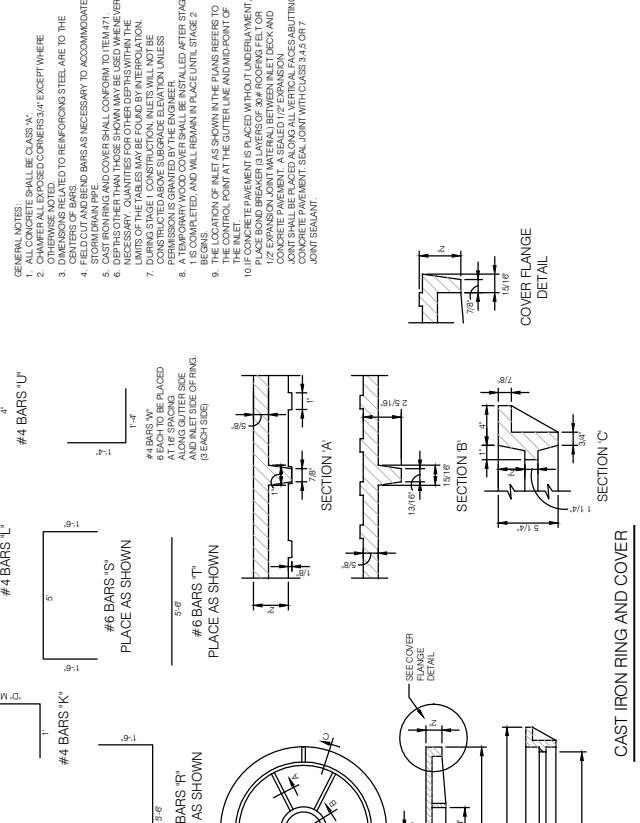
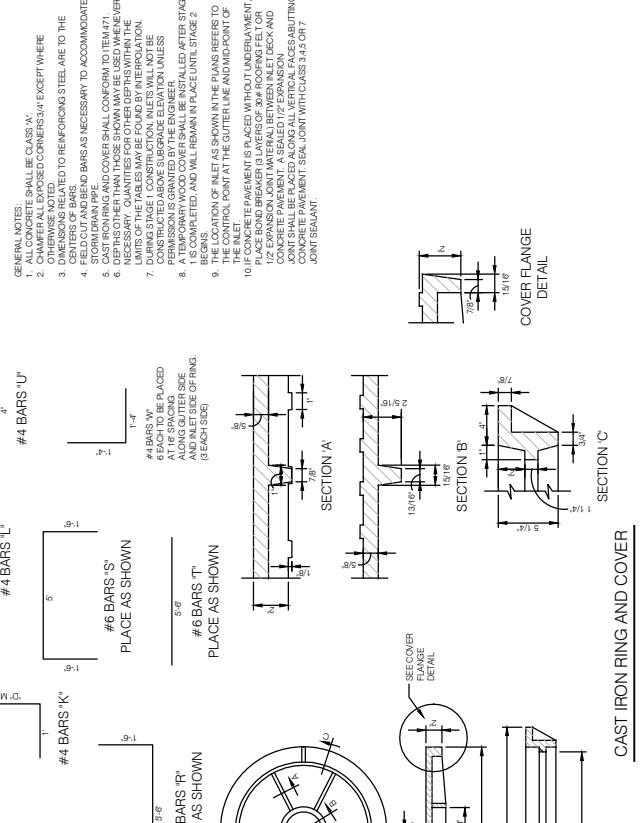
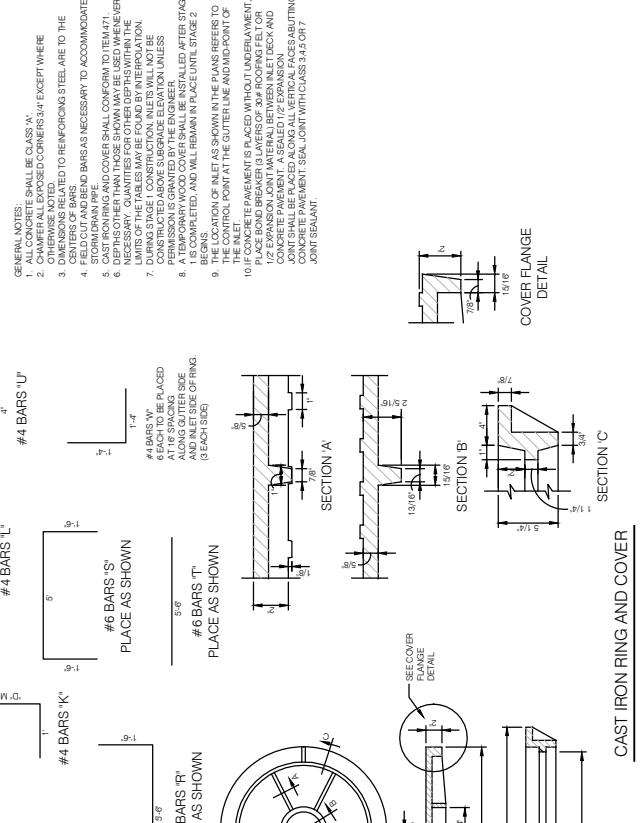
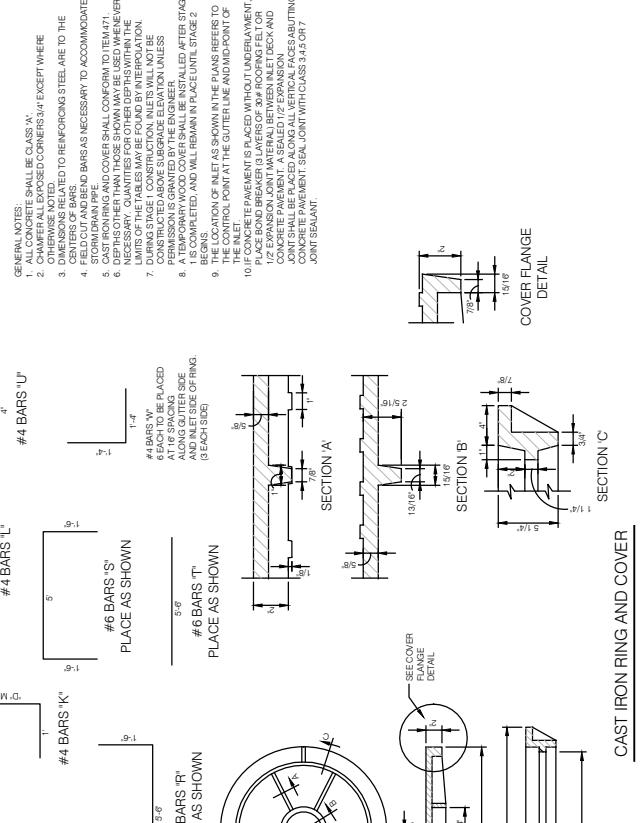
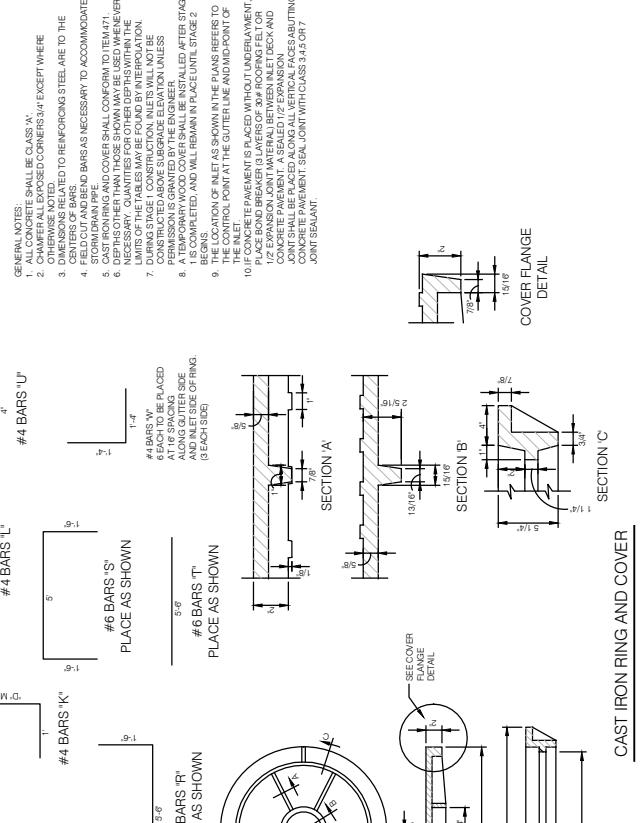
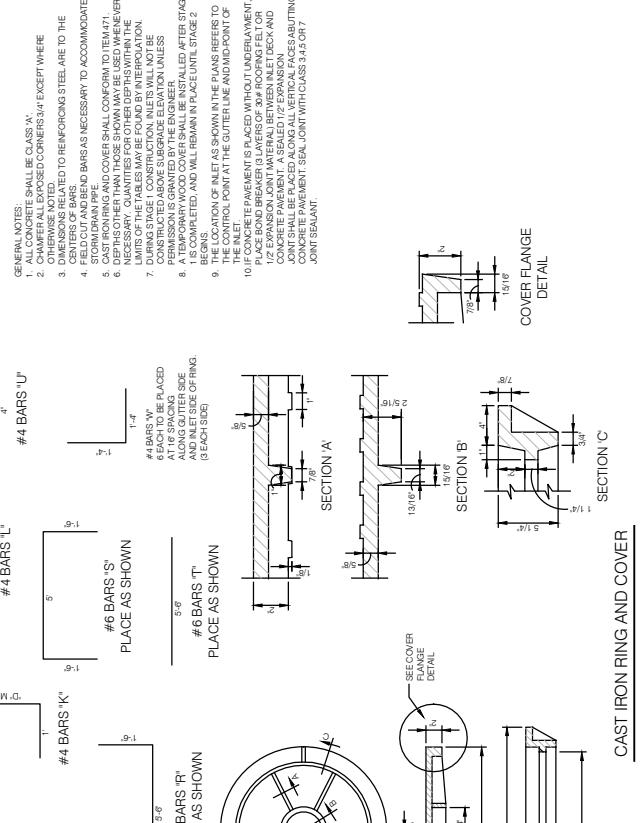
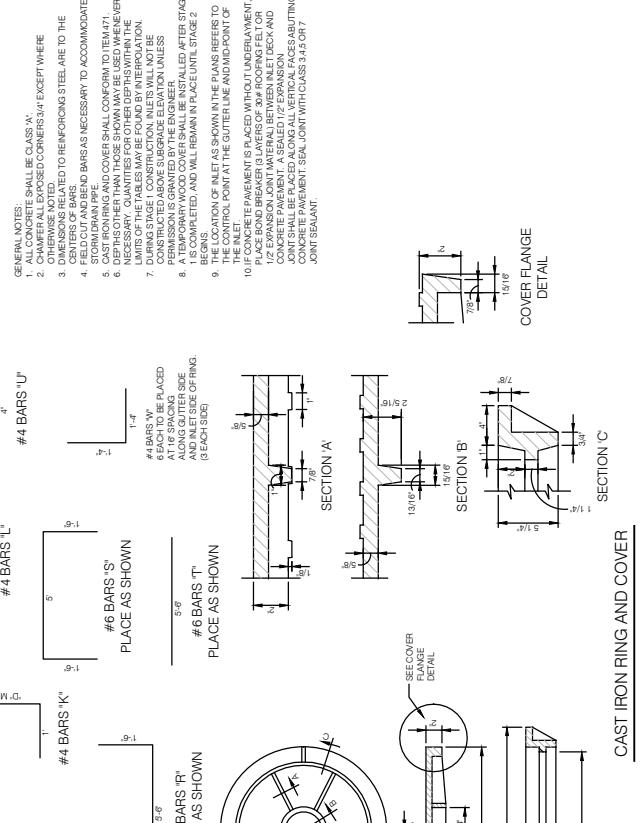
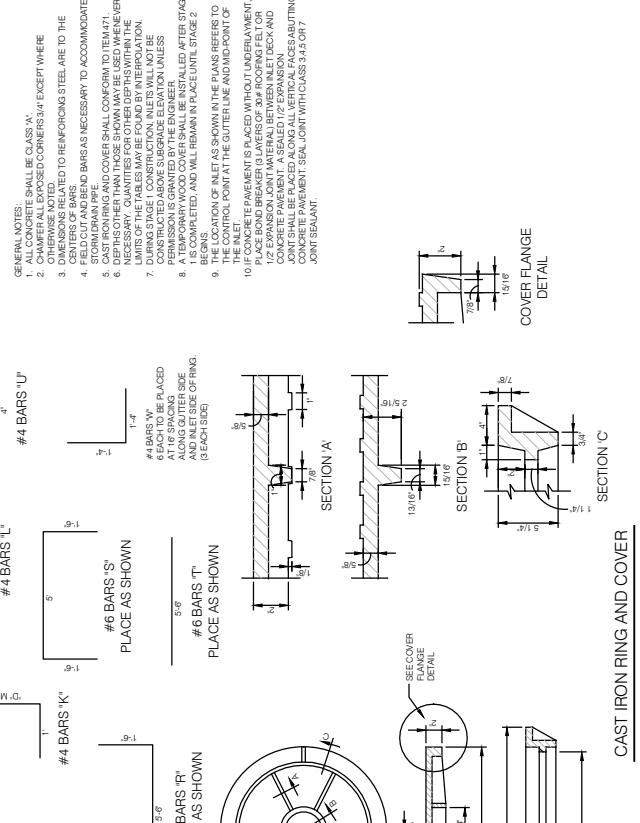
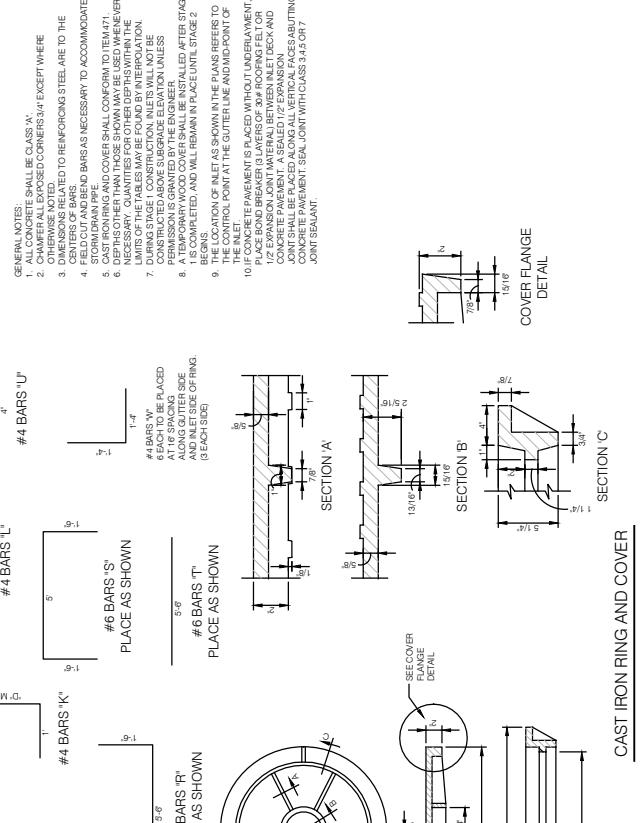
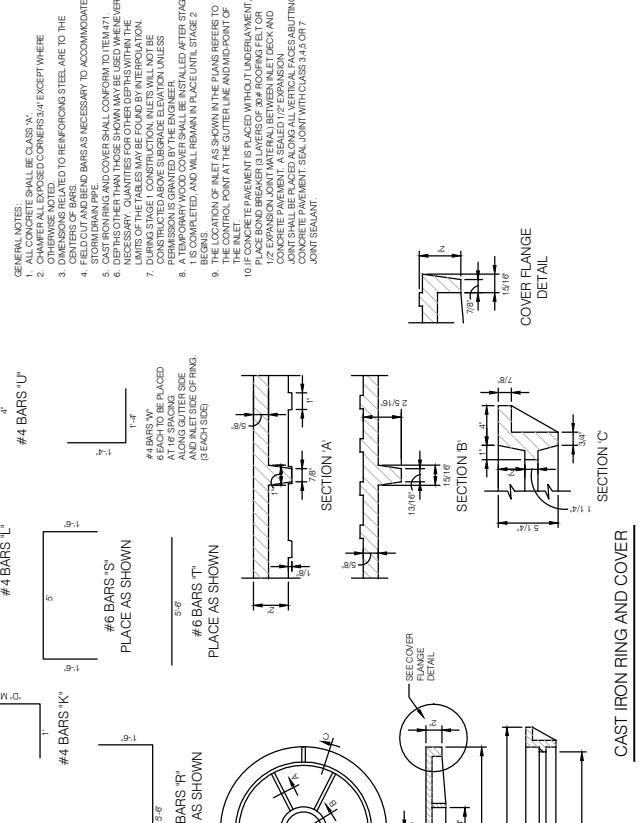
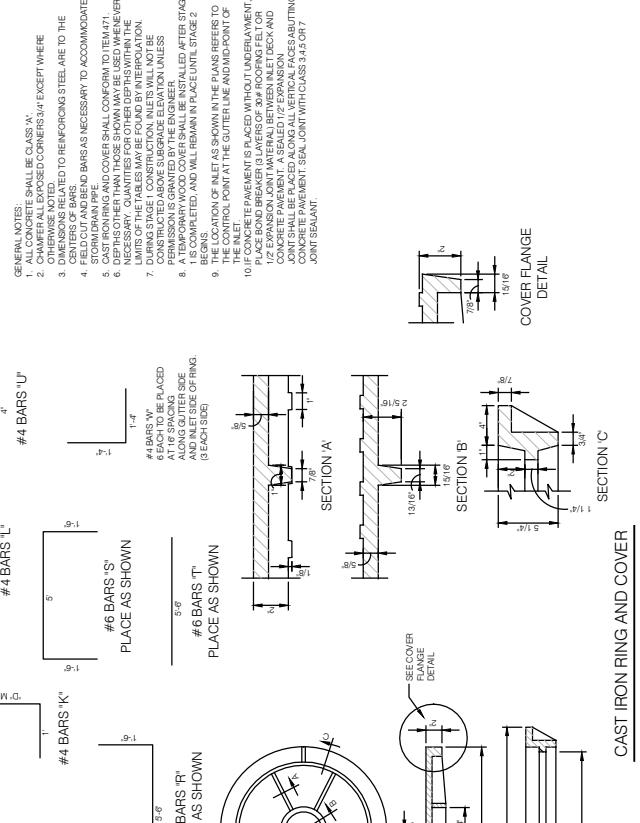
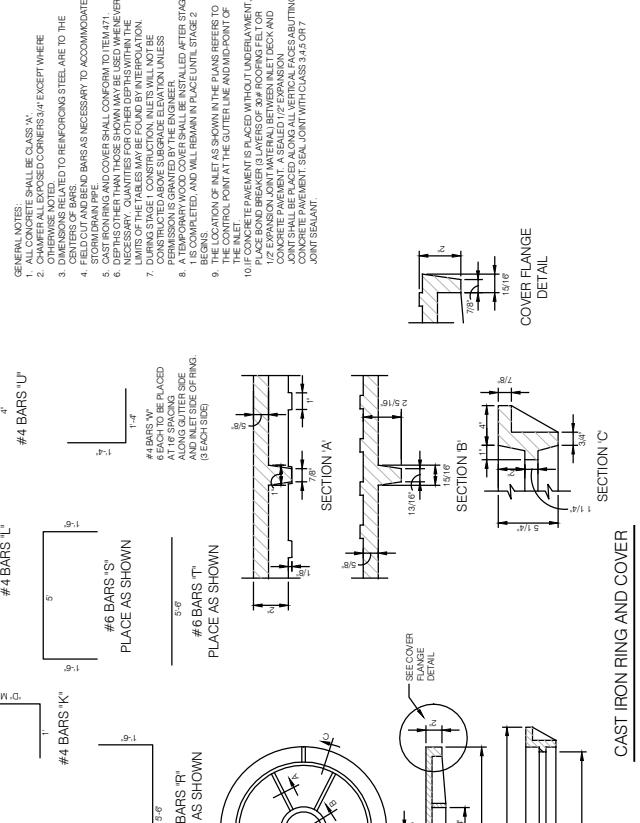
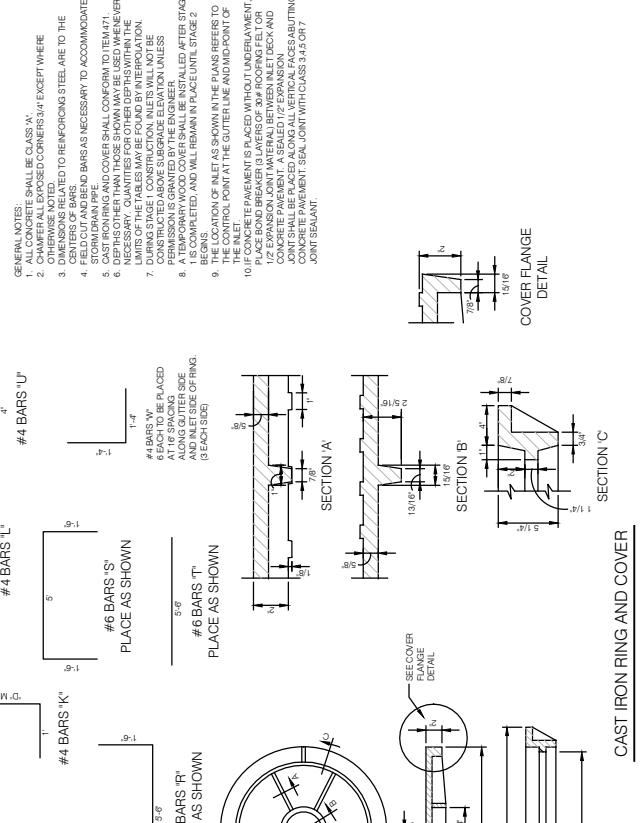
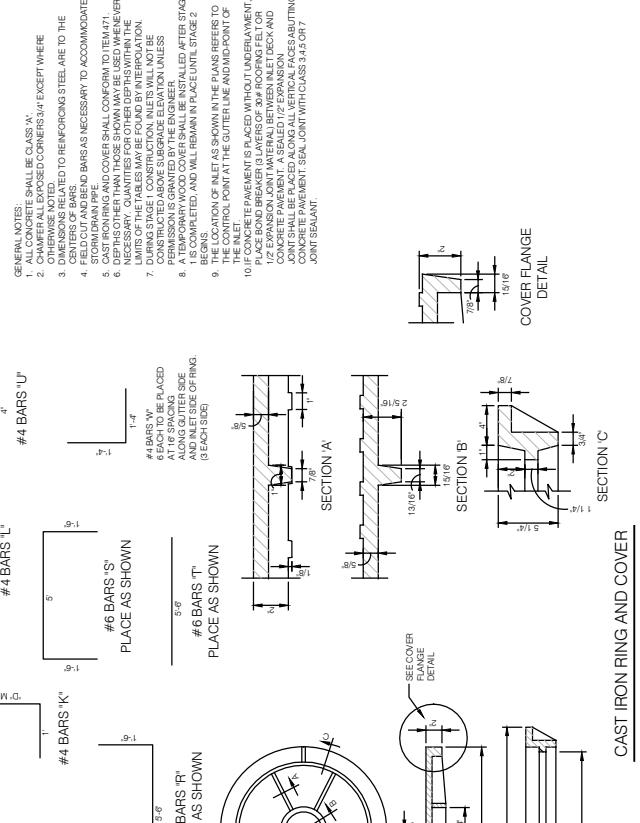
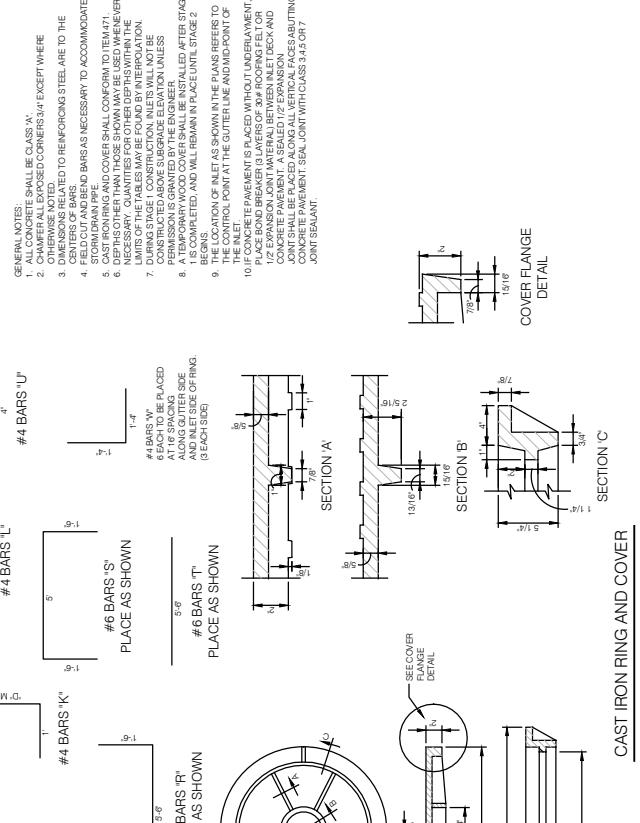
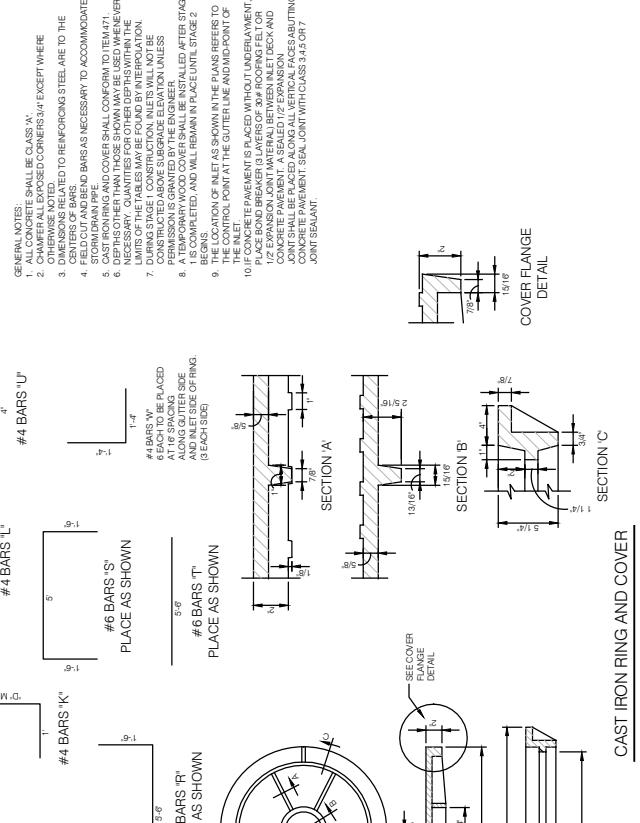
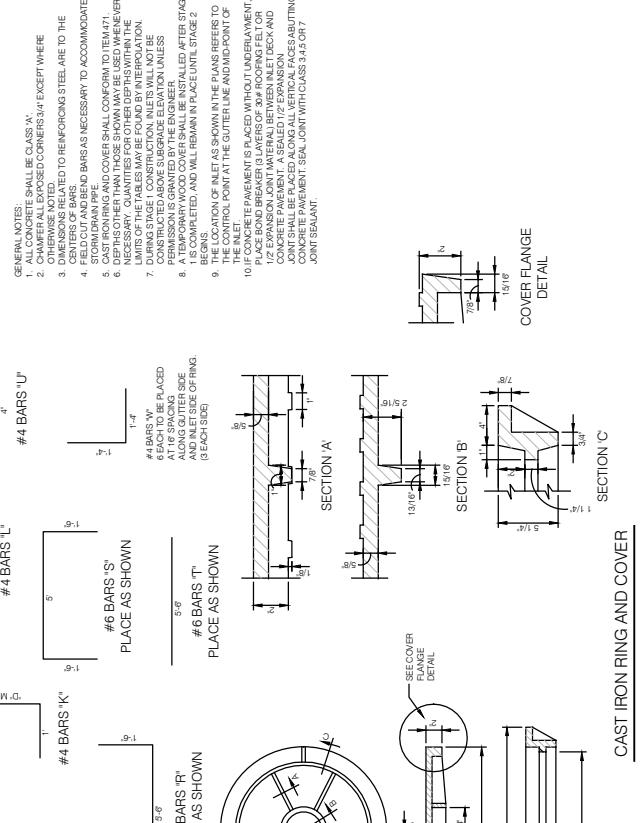
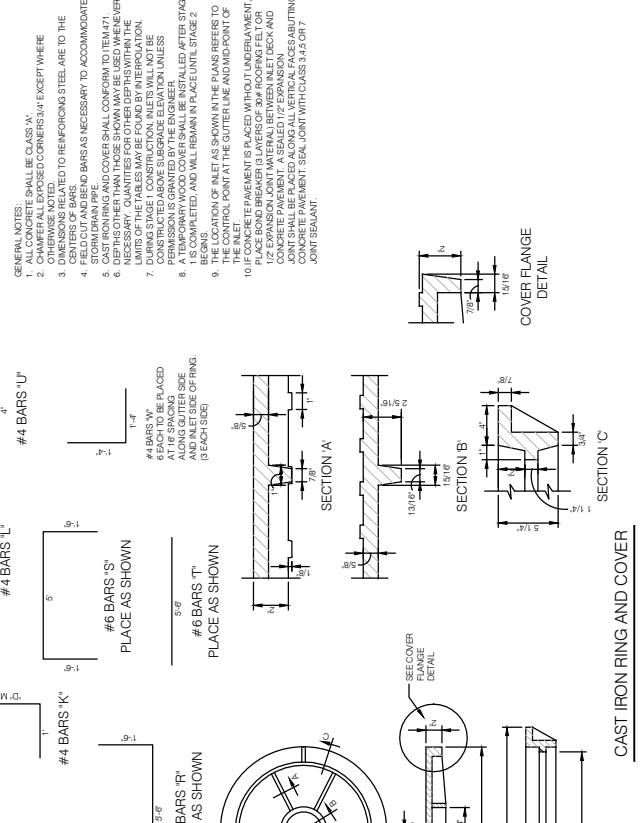
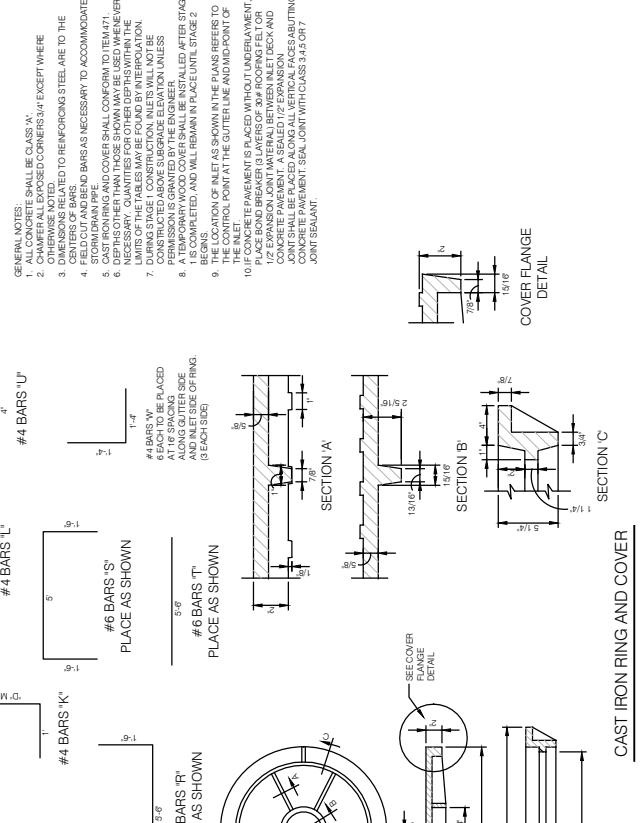
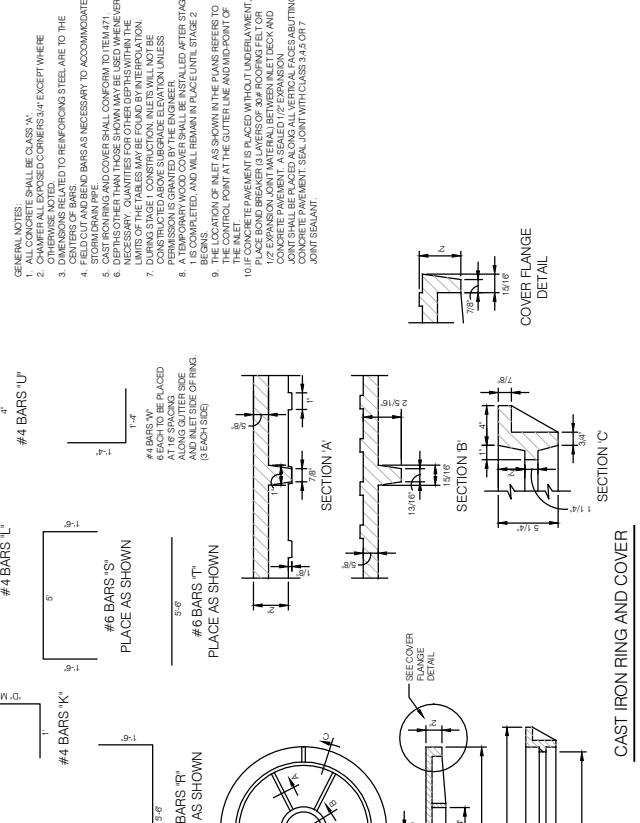
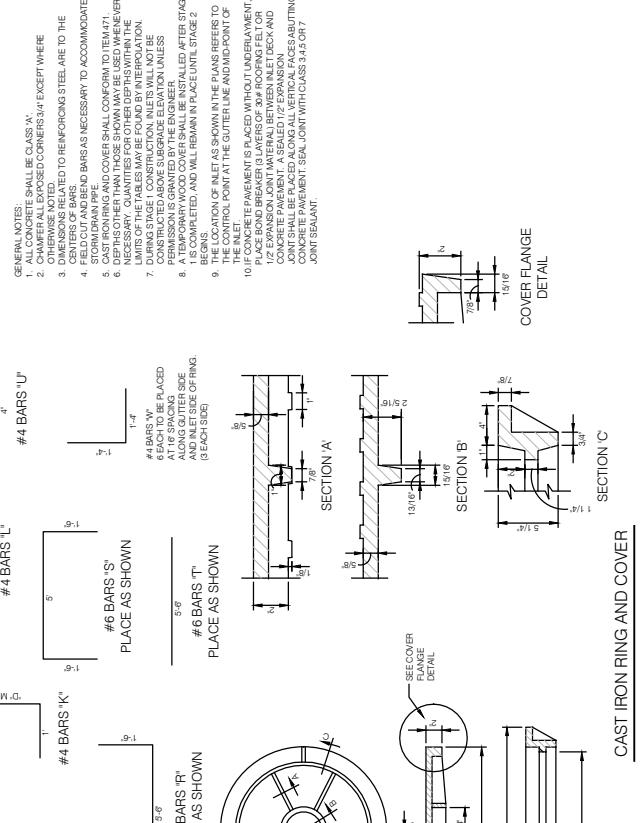
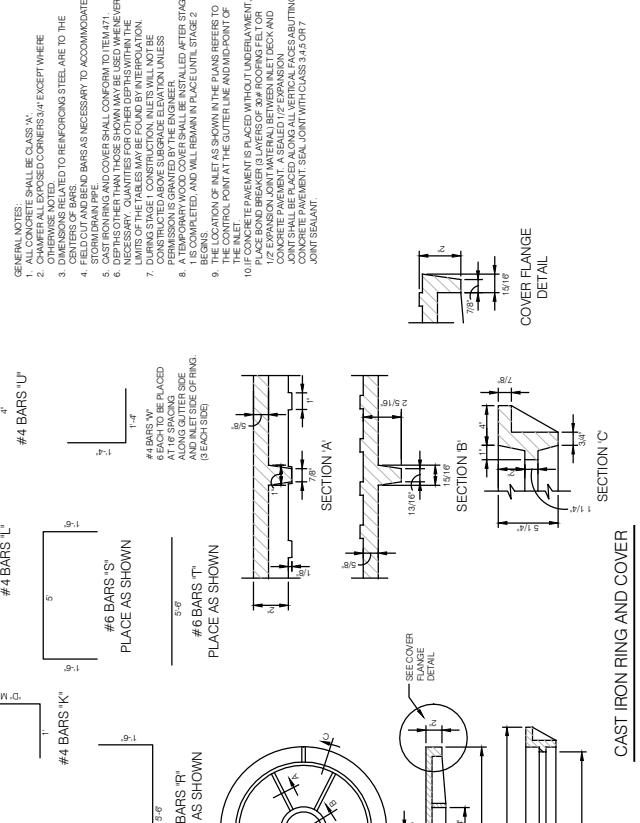
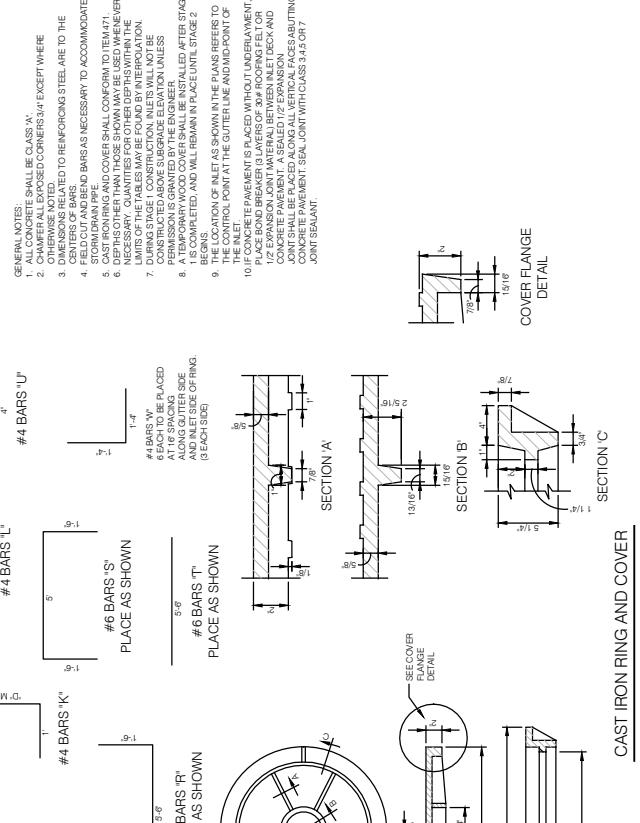
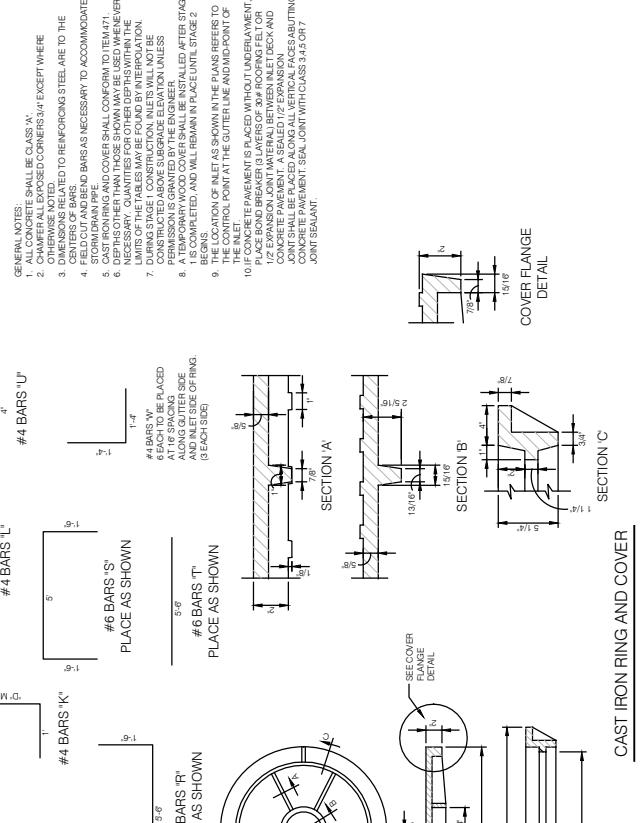
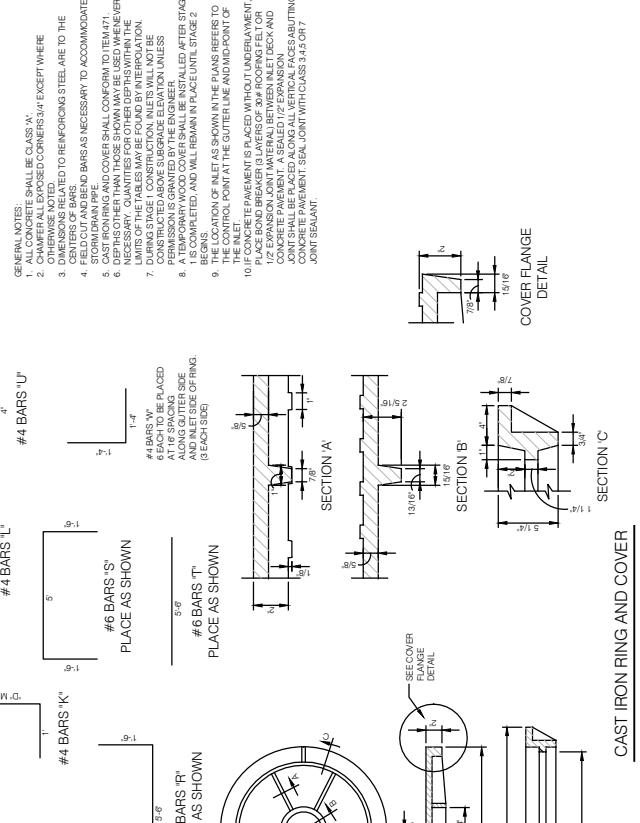
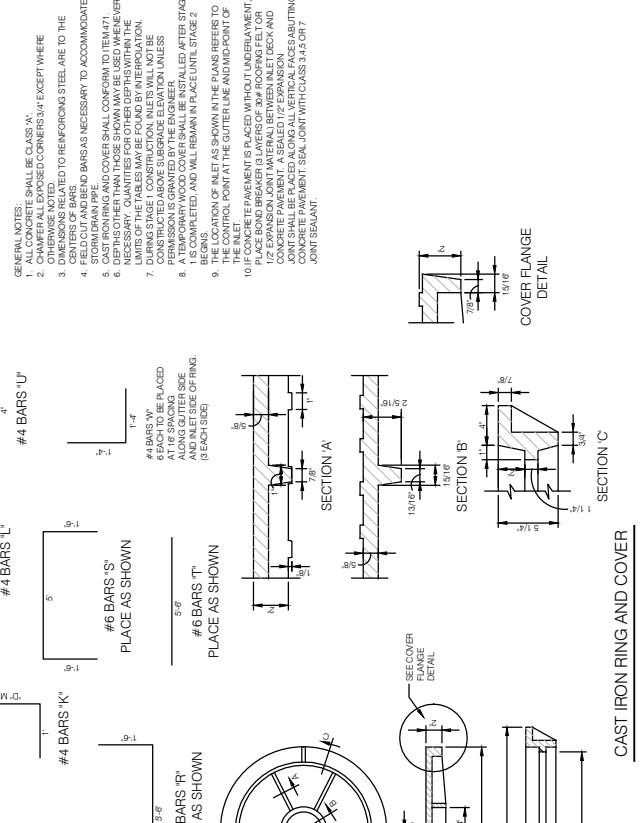
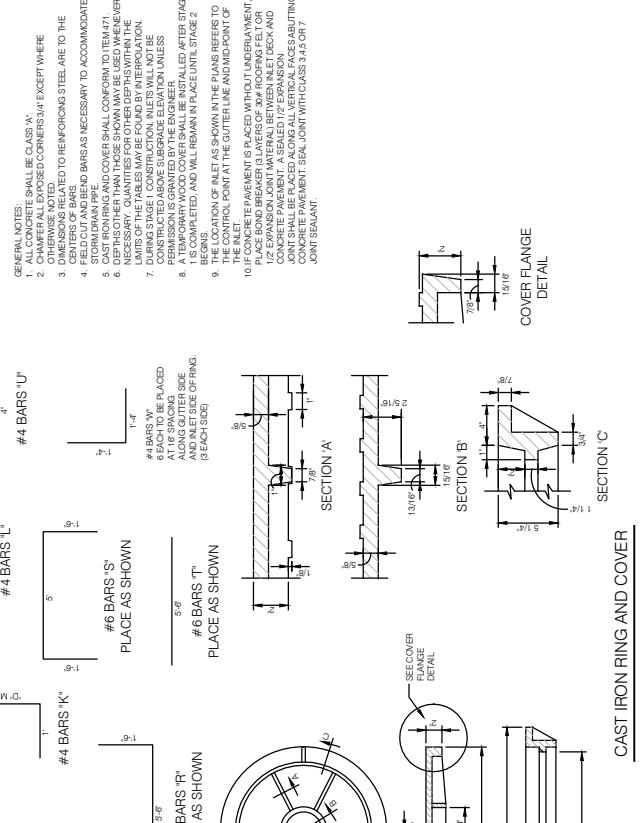
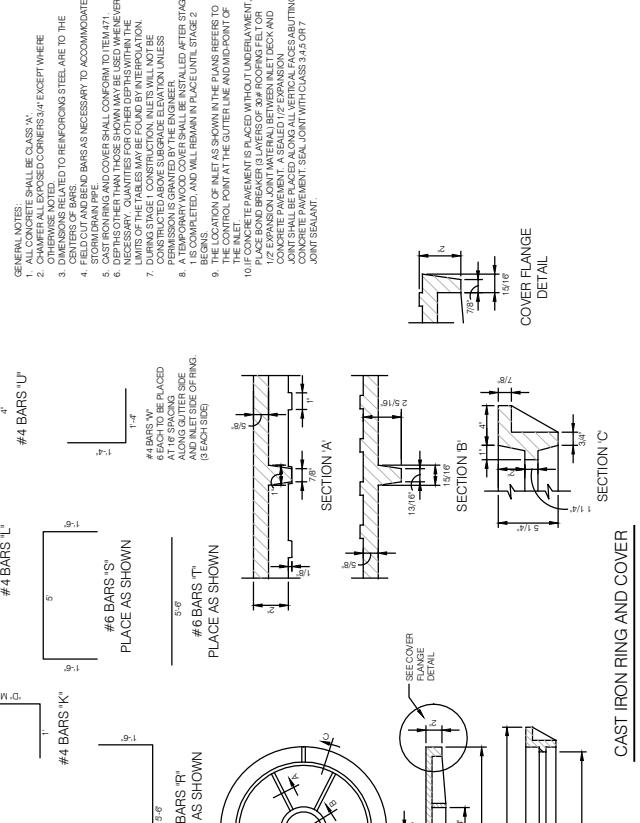
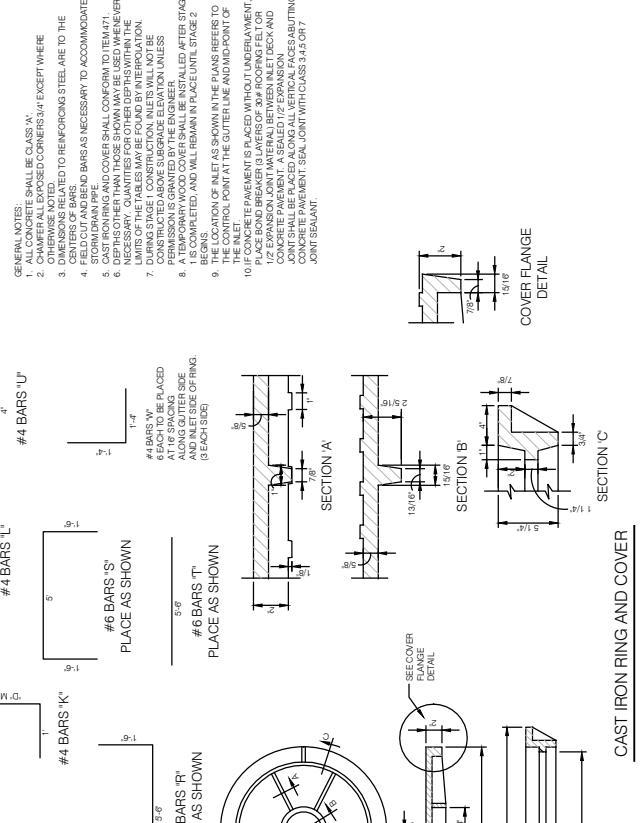
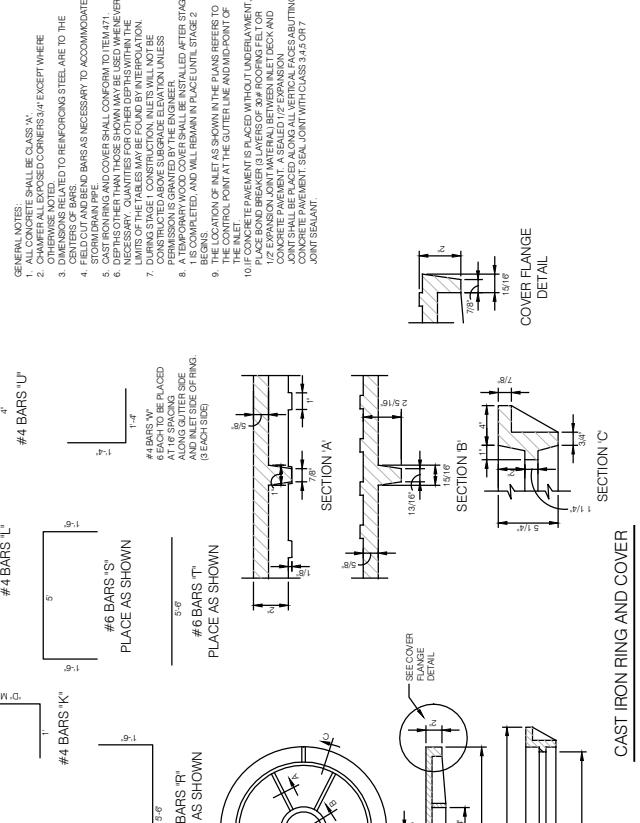
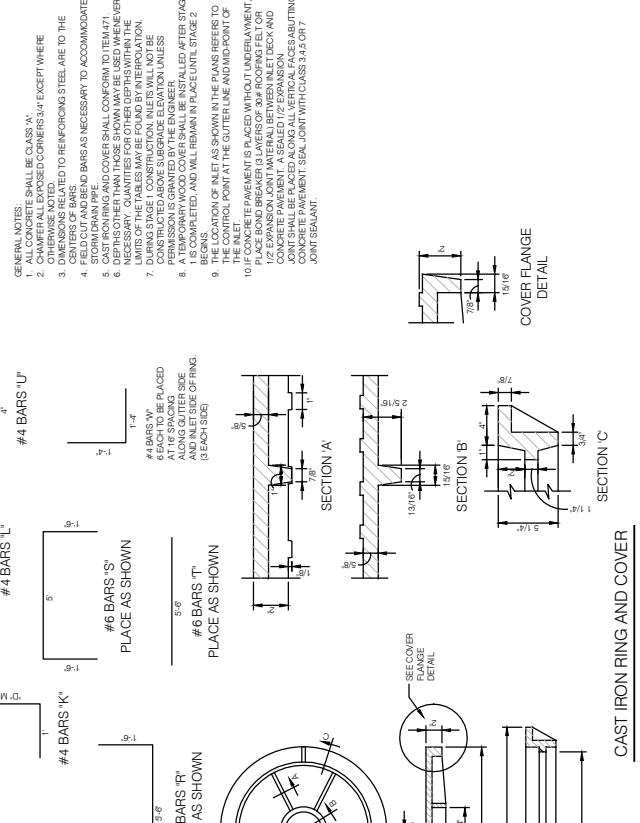
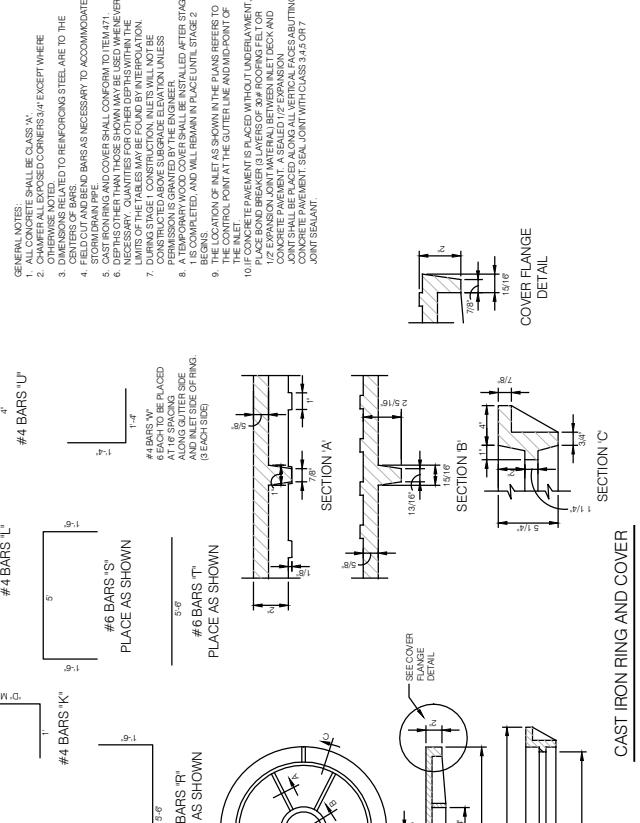
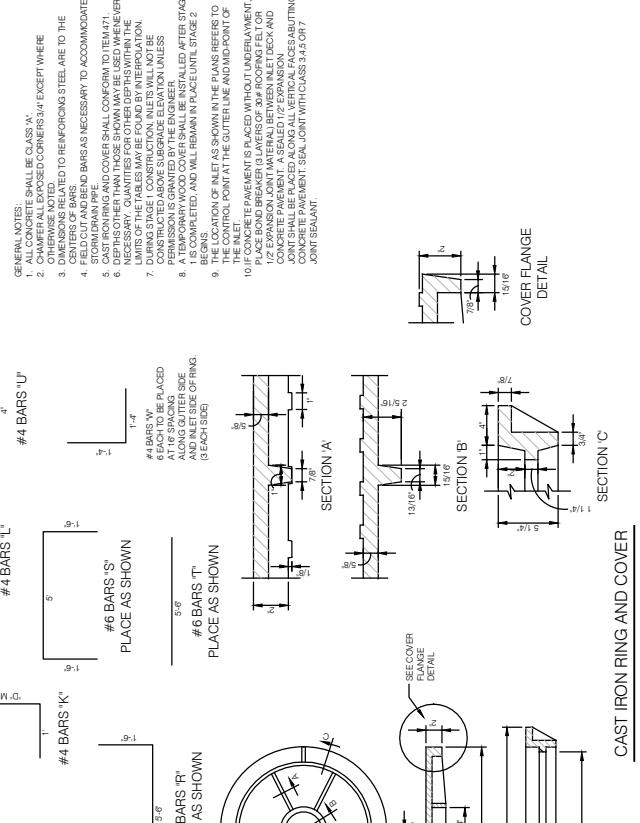
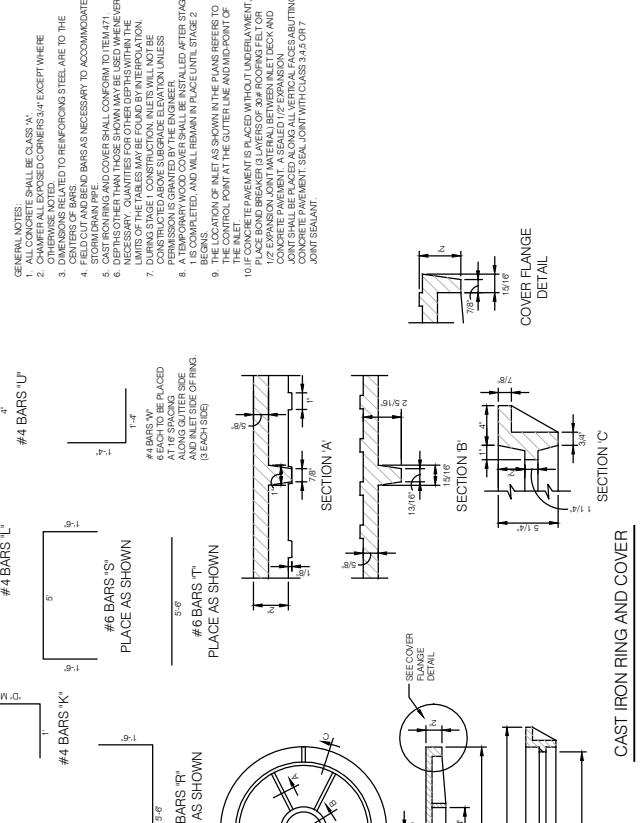
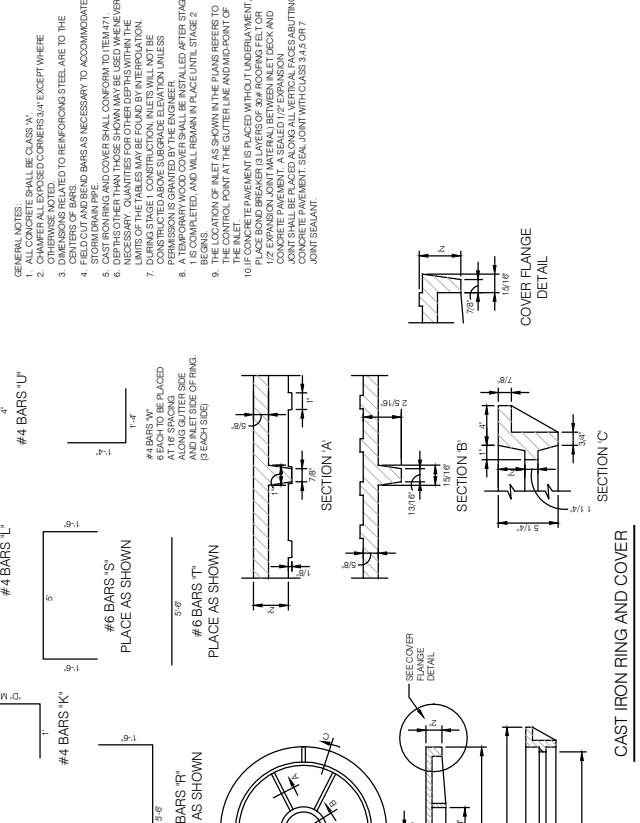
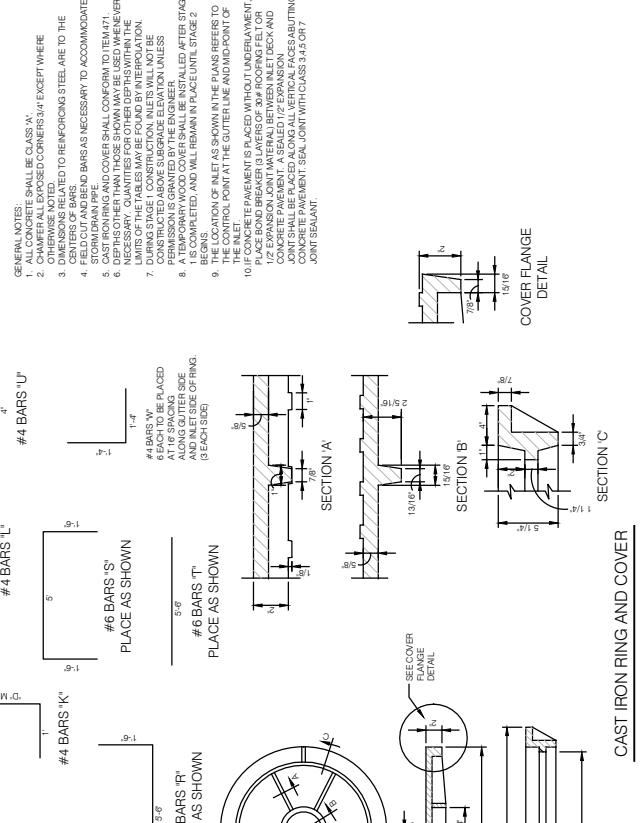
SUMMARY OF QUANTITIES	
1' (ft)	cu yds of concrete
5'	1.43
10'	3.31
15'	11.19
20'	14.07

ONE PIPE CUL-OD	ADDITIONAL
12"	0.00
15"	0.09
18"	0.19
21"	0.29
24"	0.39
27"	0.49
30"	0.59
33"	0.69
36"	0.79
39"	0.89
42"	0.99
45"	1.09

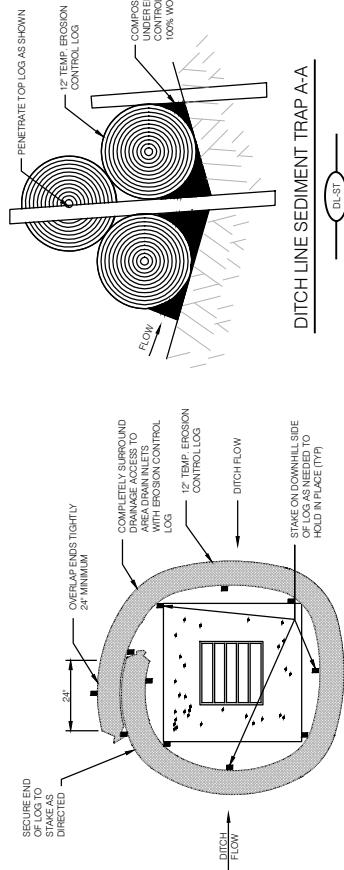
TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT
TYPE II CURB INLET UNDER PAVEMENT

DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

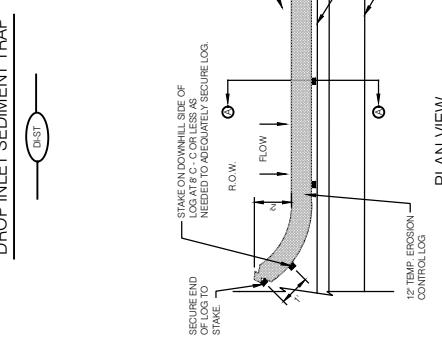
SHEET. #
S17



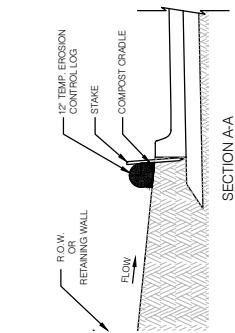
PLANS SHEET LEGEND



111



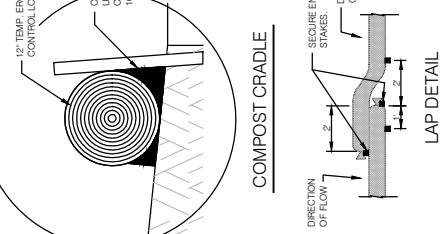
-CAN VIEW



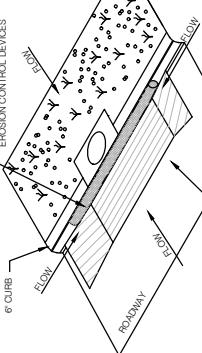
SECTION AA



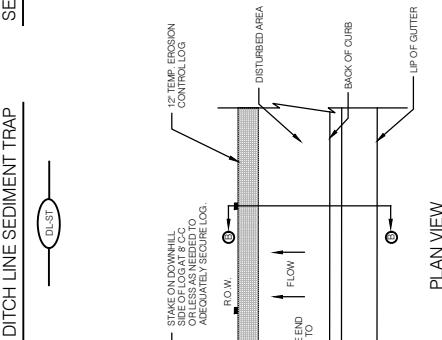
DL-ST



1



11



111



SEDIMENT BASIN & TRAP USAGE GUIDELINES

OUT OF RUNOFF DRAINING FROM AN UNSTABILIZED AREA. THE DRAINAGE AREA SHOULD NOT EXCEED ONE HUNDRED ACRES. THE TRAP CAPACITY SHOULD BE 1,000 CFS/ACRE (0.1 OVER THE DRAINAGE AREA).

SEDIMENT TRAPS SHOULD BE PLACED IN THE FOLLOWING LOCATIONS:

1. IMMEDIATELY PRECEDING DRAINAGE INLETS
2. JUST BEFORE THE DRAINAGE ENTERS A WATER COURSE
3. JUST BEFORE THE DRAINAGE LEAVES THE CONSTRUCTION LIMITS WHERE DRAINAGE FLOWS FROM THE PROJECT TO A DEPOT IF THE HORIZONTAL LENGTH OF A CALAMITATED SEDIMENT DEPOTS HAS BEEN REDUCED BY 1/2 OR THE SEDIMENT HAS ACCUMULATED TO A DEPTH OF 12 INCHES.



DATE

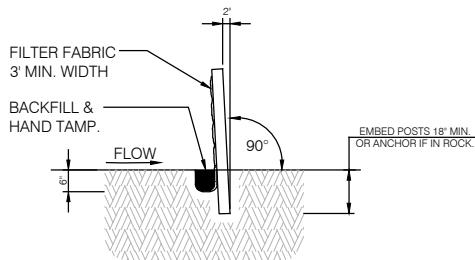
01/2020

DRAWN BY

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

SHEET, #

S18



GENERAL NOTES:

1. THE GUIDELINES SHOWN HEREON ARE SUGGESTIONS ONLY AND MAY BE MODIFIED BY THE ENGINEER.

PLAN SHEET LEGEND

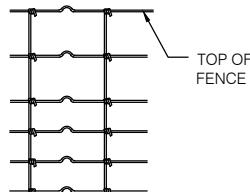
SEDIMENT CONTROL FENCE —

SECTION A-A

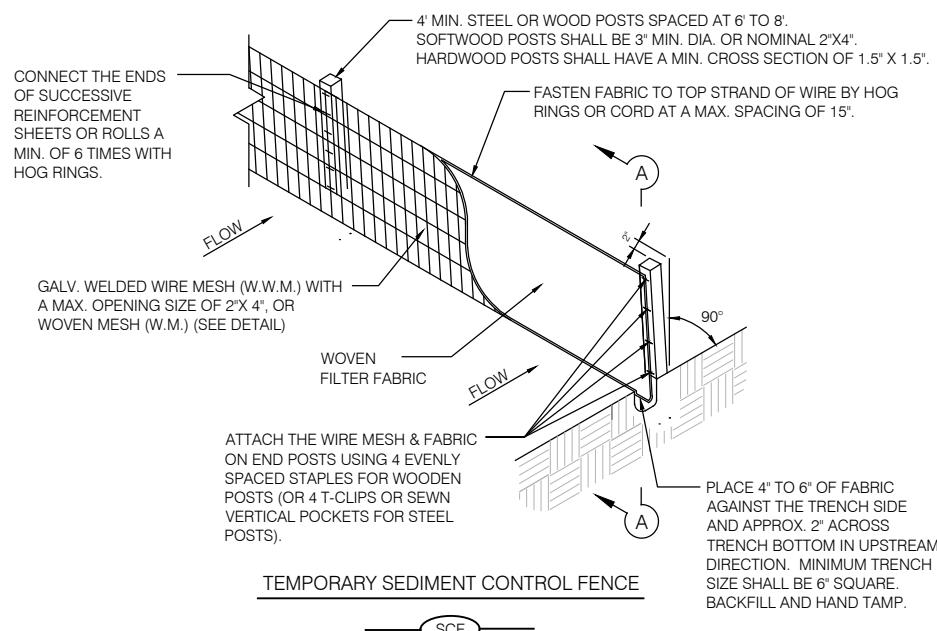
SEDIMENT CONTROL FENCE USAGE GUIDELINES

A SEDIMENT CONTROL FENCE MAY BE CONSTRUCTED NEAR THE DOWNSTREAM PERIMETER OF A DISTURBED AREA ALONG A CONTOUR TO INTERCEPT SEDIMENT FROM OVERLAND RUNOFF. A 2 YEAR STORM FREQUENCY MAY BE USED TO CALCULATE THE FLOW RATE TO BE FILTERED.

SEDIMENT CONTROL FENCE SHOULD BE SIZED TO FILTER A MAX. FLOW THROUGH RATE TO 100 GPM/FT². SEDIMENT CONTROL FENCE IS NOT RECOMMENDED TO CONTROL EROSION FROM A DRAINAGE AREA LARGER THAN 2 ACRES.



HINGE JOINT KNOT WOVEN MESH (OPTION)



TEMPORARY SEDIMENT CONTROL FENCE

—



DATE	01/2020
DRAWN BY	CITY OF WEATHERFORD

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

TEMPORARY EROSION, SEDIMENT AND WATER
POLLUTION CONTROL MEASURES
FENCE

SHEET. #

S19

FILL AREAS SHALL BE COMPAKTED TO 95% STD. PROCTOR DENSITY AT OPTIMUM MOISTURE CONTENT PRIOR TO CHANNEL EXCAVATION.

ALL CONCRETE SHALL BE CLASS "A"

TRANSPORTATION AND
PUBLIC WORKS DEPARTMENT

FULL CHANNEL LINING
CONCRETE REINFORCED

SHEET. #

S20



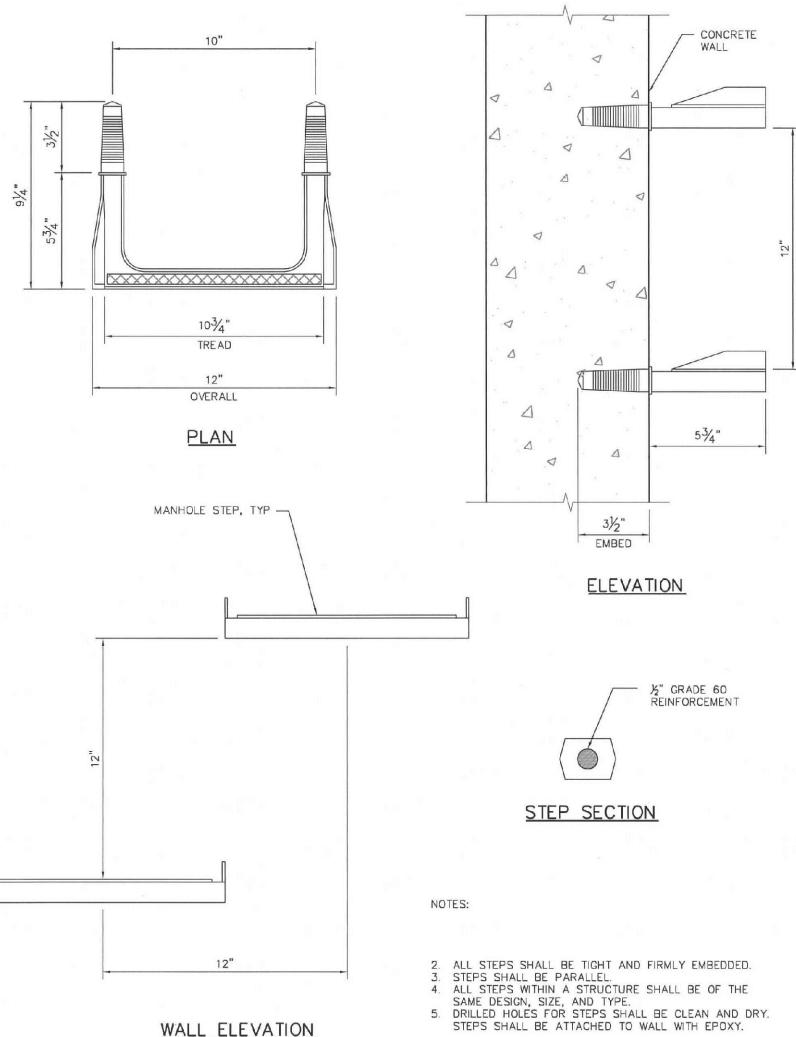
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01/2020

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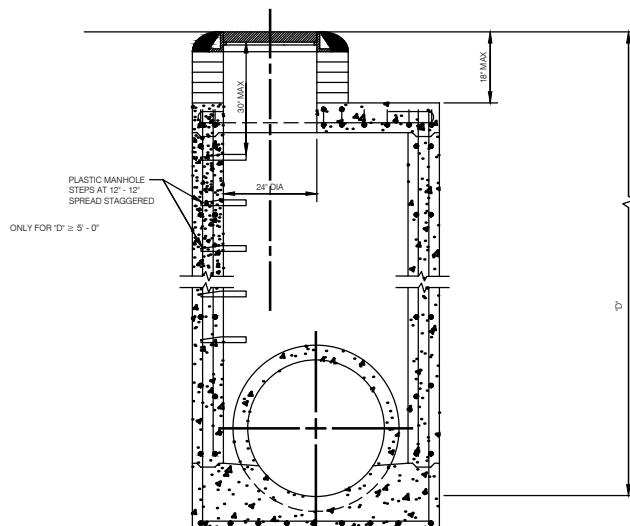
SHEET. #

S20

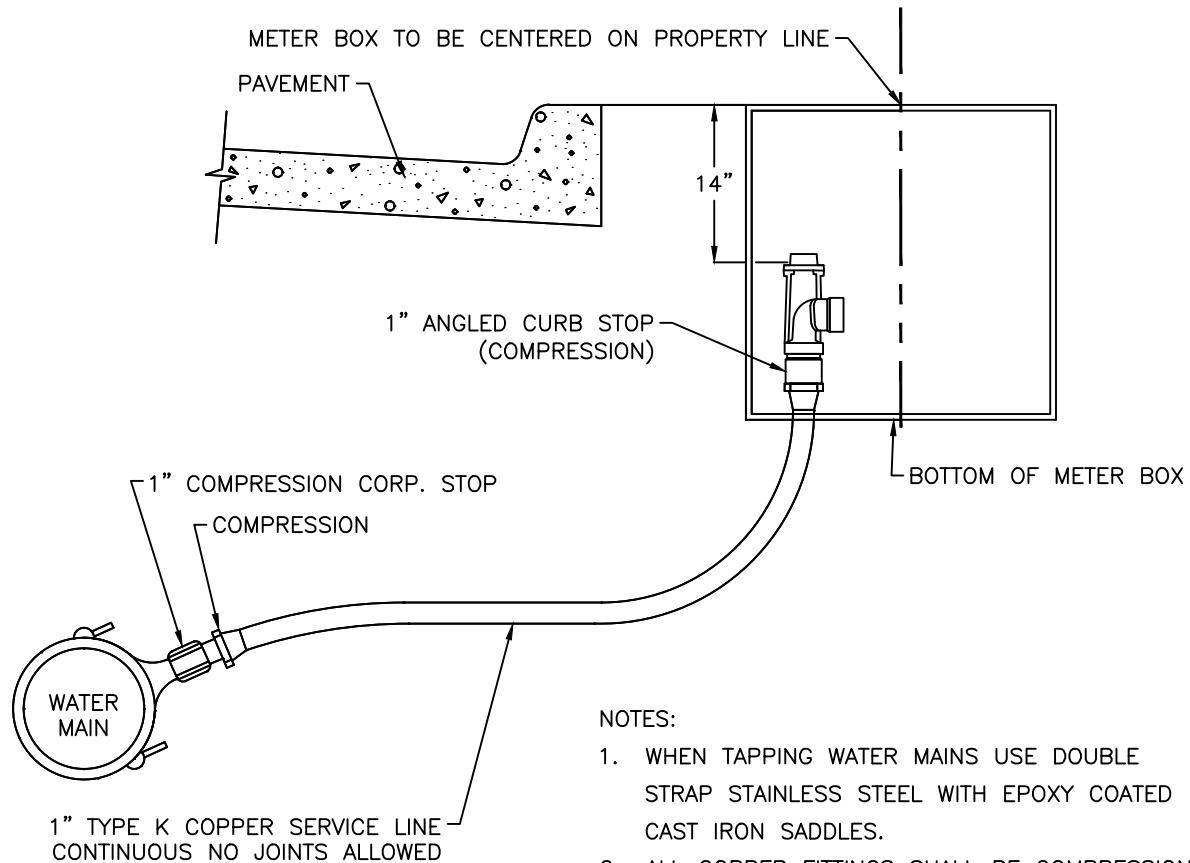


NOTES:

2. ALL STEPS SHALL BE TIGHT AND FIRMLY EMBEDDED.
3. STEPS SHALL BE PARALLEL.
4. ALL STEPS WITHIN THE STRUCTURE SHALL BE OF THE SAME DESIGN SIZE, AND TYPE.
5. DRILLED HOLES FOR STEPS SHALL BE CLEAN AND DRY. STEPS SHALL BE ATTACHED TO WALL WITH EPOXY.



	DATE	TRANSPORTATION AND PUBLIC WORKS DEPARTMENT		SHEET. #
	01/2020	DRAWN BY	MANHOLE STEP DETAIL	
	CITY OF WEATHERFORD			S21

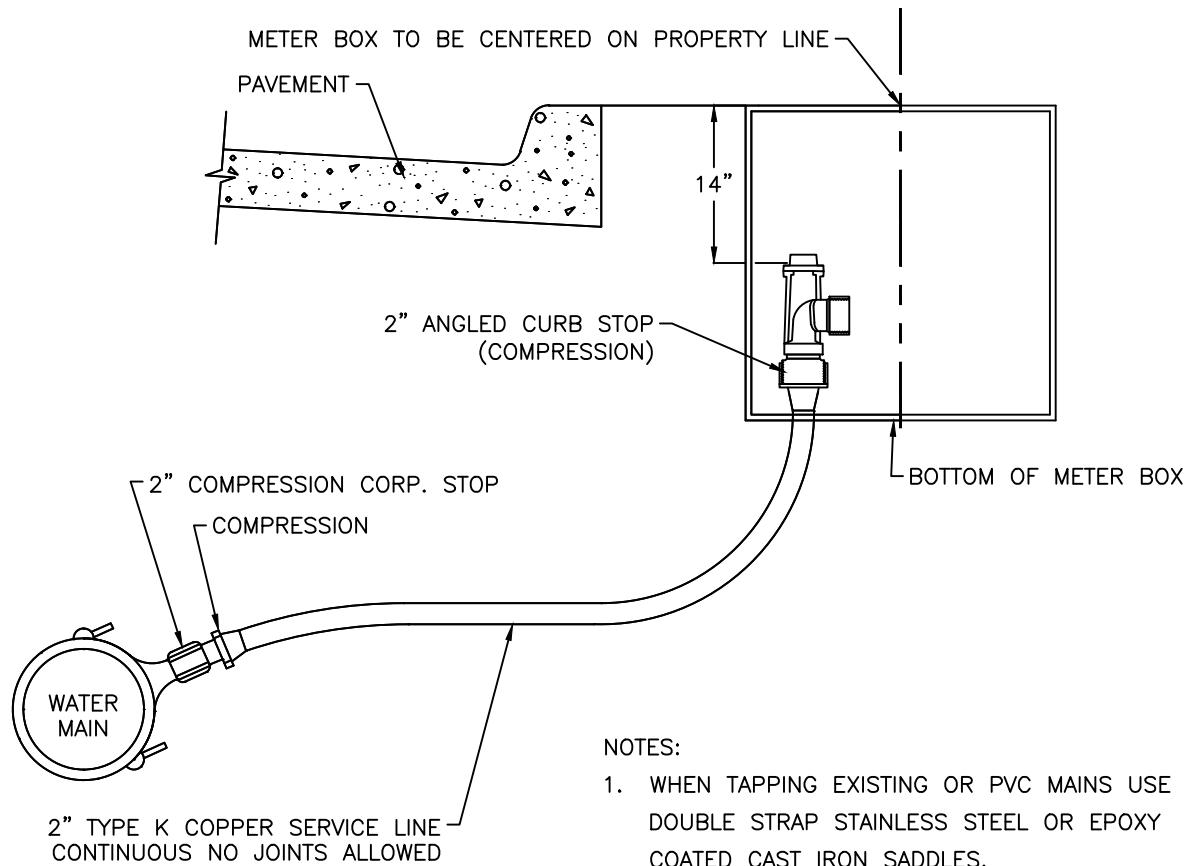


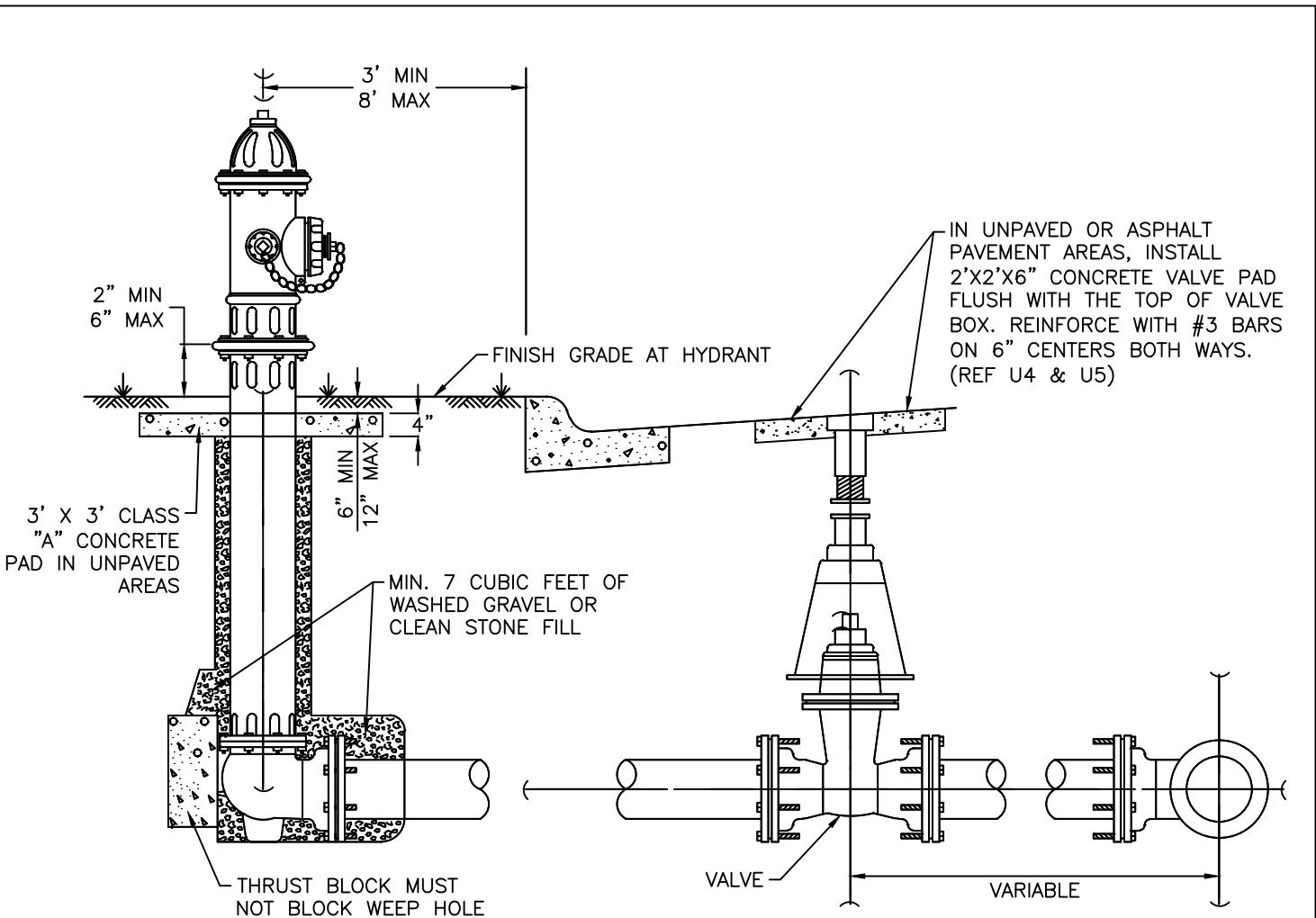
NOTES:

1. WHEN TAPPING WATER MAINS USE DOUBLE STRAP STAINLESS STEEL WITH EPOXY COATED CAST IRON SADDLES.
2. ALL COPPER FITTINGS SHALL BE COMPRESSION FITTINGS.
3. ALL SADDLES AND CORP. STOPS SHALL HAVE CC THREADS.
4. METER SHALL NOT BE INSTALLED IN SIDEWALKS.
5. METER BOX TO BE FURNISHED BY AND INSTALLED BY CONTRACTOR.
6. METER BOX SHALL BE 18" DIAMETER PVC WITH CAST IRON RING AND LID. WHITE RHINO OR APPROVED EQUAL.
7. CURB STOP SHALL BE MUELLER H-14258N OR EQUIVALENT (110 CTS X SWIVLE NUT).
8. ALL METER CAN LIDS SHALL HAVE AMR READER HOLE.
9. CORP. STOP SHALL BE MUELLER H-15008N OR EQUIVALENT.
10. METERS INSTALLED IN DRIVEWAYS MUST BE TRAFFIC RATED DFW PLASTICS DFW37C-14-1-MBF_DEEP OR EQUIVALENT.

NOT TO SCALE

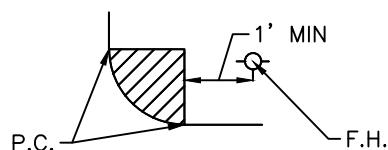
	DATE	UTILITY DEPARTMENT	SHEET. #	
	01/2020			
DRAWN BY	1 INCH SERVICE DETAIL		U1	
	CITY OF WEATHERFORD			





NOTES:

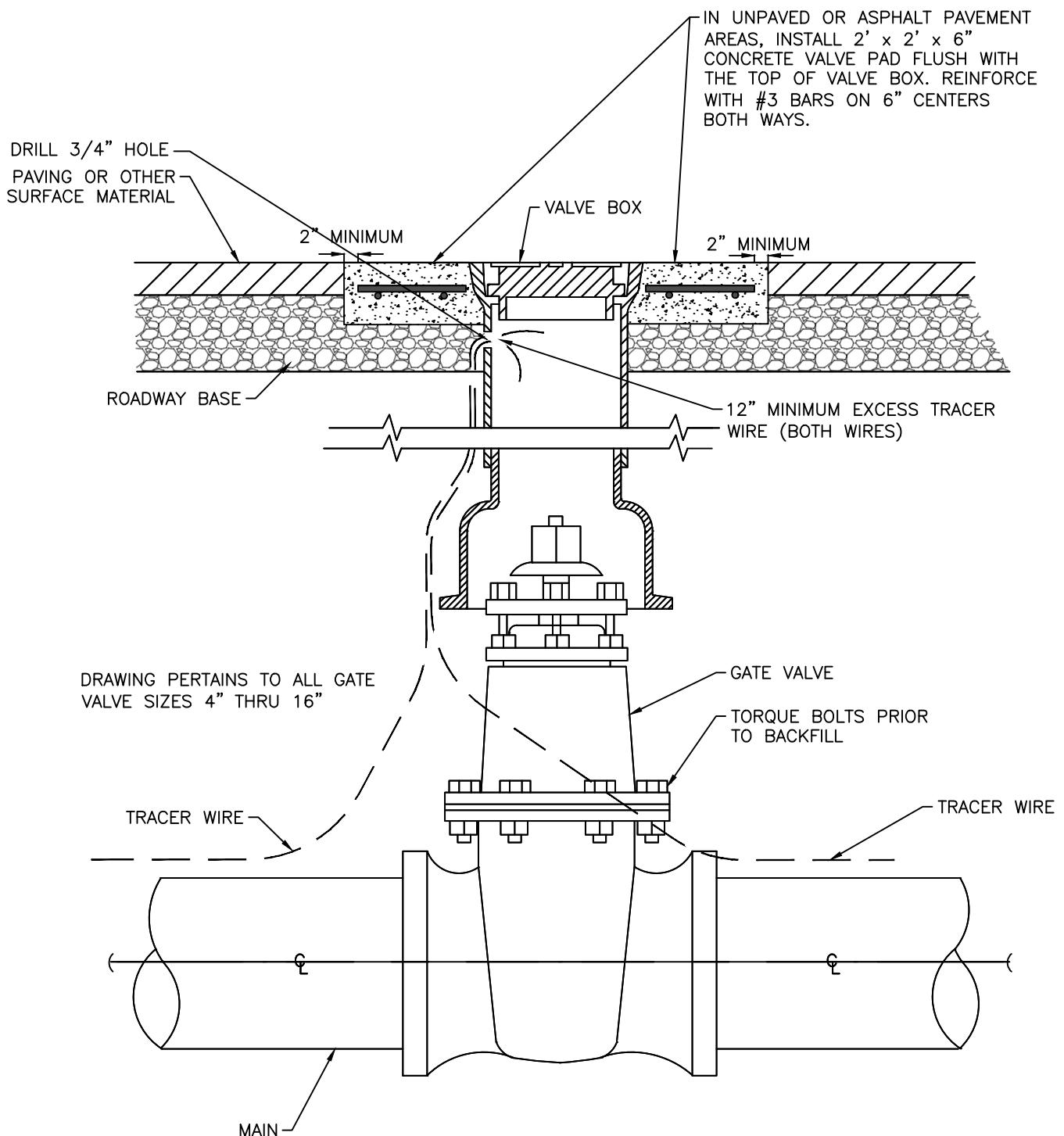
1. IN GENERAL, ALL FIRE HYDRANTS SHALL CONFORM TO AWWA STANDARD SPECIFICATIONS FOR FIRE HYDRANTS FOR ORDINARY WATER WORKS SERVICE, C-502. FIRE HYDRANTS SHALL HAVE A 5 1/4 " MIN. VALVE OPENING AND A BARREL APPROXIMATELY 7" INSIDE DIAMETER. ALL HYDRANTS SHALL BE EQUIPPED WITH A BREAKAWAY FLANGE.
2. ALL JOINTS SHALL BE RESTRAINED MECHANICAL JOINTS.
3. ACTUAL VALVE LOCATION WILL DEPEND ON LOCATION OF WATER MAIN.
4. F.H. NO CLOSER THAN 18" TO EXISTING OR PROPOSED SIDEWALKS.
5. STANDARD BURY DEPTH 5' FEET.
6. LOCATE HYDRANTS NEAR CORNERS OF LOTS.
7. F.H. SHALL BE LOCATED MINIMUM 1 FT. OUTSIDE OF THE AREA BETWEEN THE P.C.'S OF THE CORNER TURNING RADII AT INTERSECTIONS. (SEE PLAN VIEW).
8. FIRE HYDRANT SHALL BE MUELLER CENTURION, M&H MODEL 129, OR CLOW MEDALLION.
9. FIELD PAINT WITH SHERWIN WILLIAMS INTERNATIONAL RED - F75RC7.



PLAN VIEW
N.T.S.

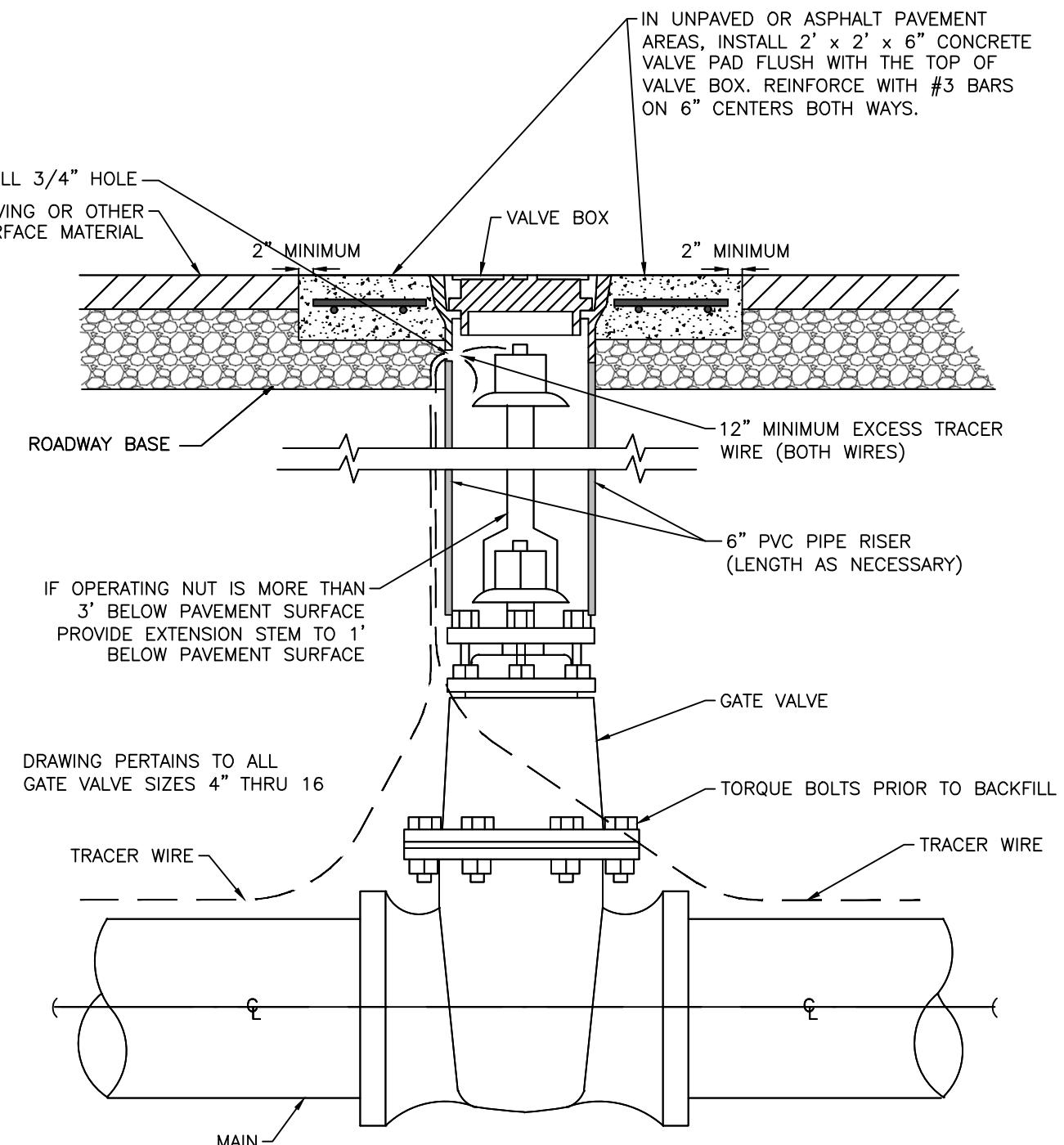
NOT TO SCALE

	DATE	UTILITY DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	FIRE HYDRANT INSTALLATION	
		U3	



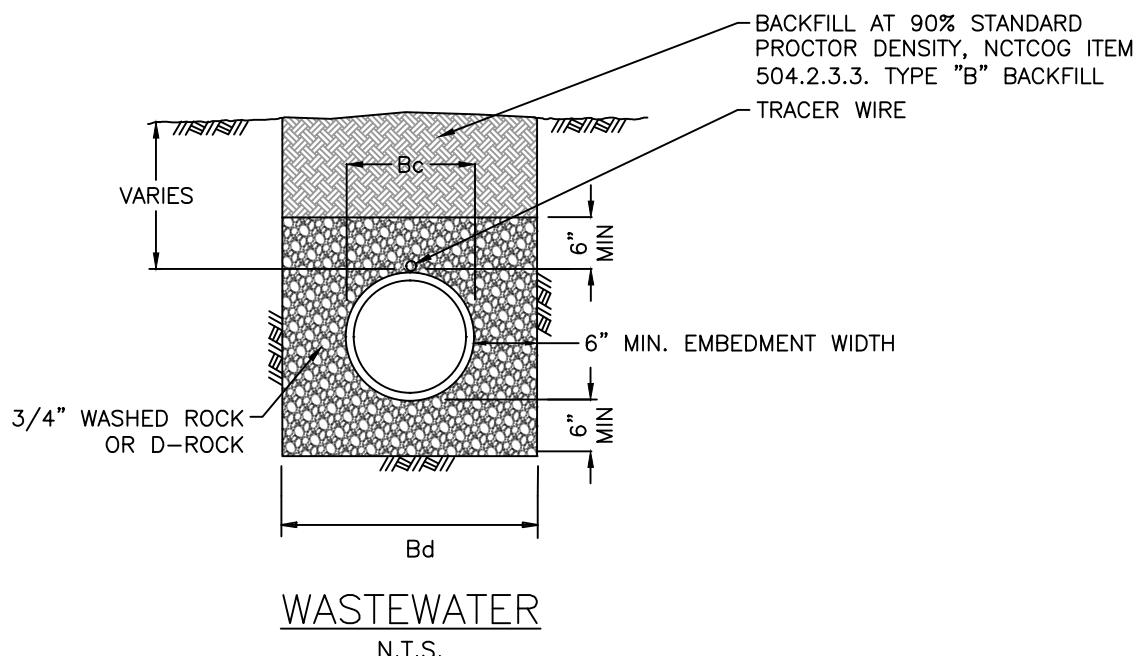
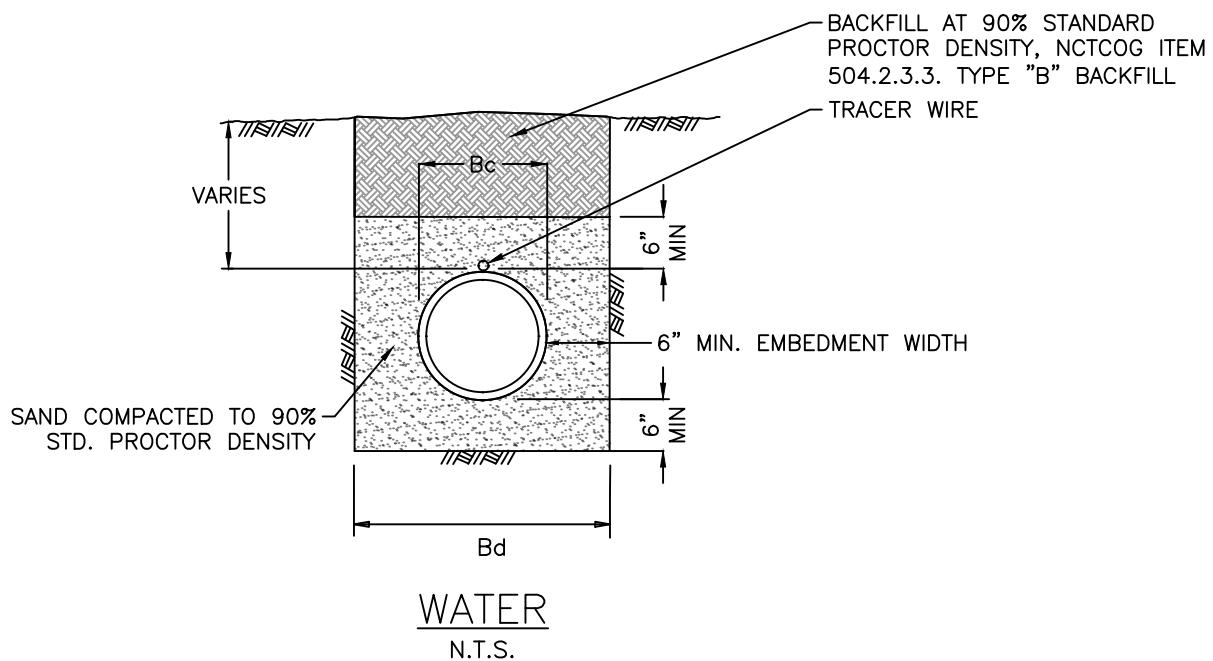
NOT TO SCALE

	DATE	UTILITY DEPARTMENT	SHEET. #	
	01/2020			
DRAWN BY	GATE VALVE BOX 4 FOOT OR LESS		U4	
	CITY OF WEATHERFORD			



NOT TO SCALE

	DATE	UTILITY DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	GATE VALVE BOX & EXTENSION STEM DEEPER THAN 4 FOOT	
		U5	



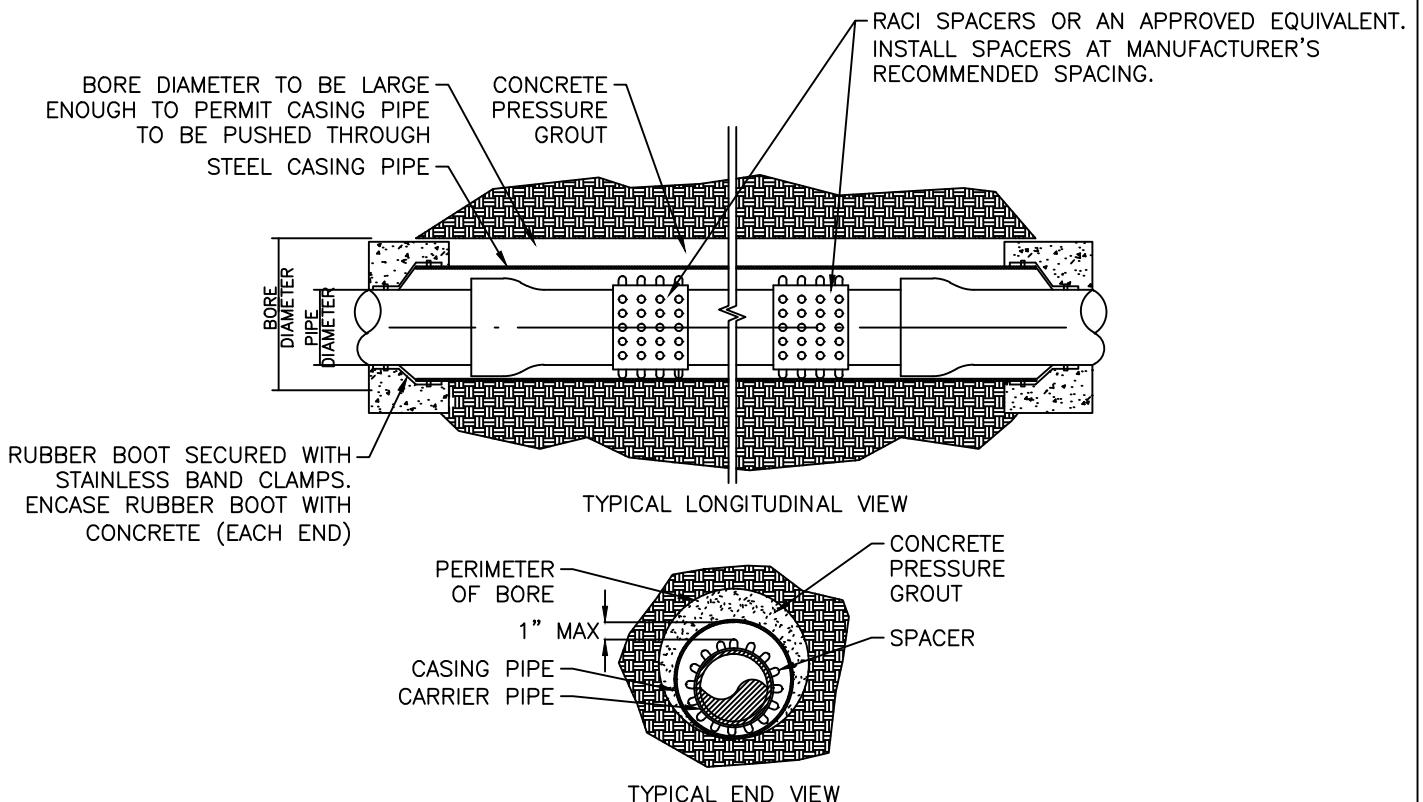
NOTES:

NOTES:
1. B_c = OUTSIDE DIAMETER OF PIPE
2. B_d = TRENCH WIDTH

NOT TO SCALE



	DATE	UTILITY DEPARTMENT	SHEET. #
	01/2020		
	DRAWN BY		
	CITY OF WEATHERFORD	TYPICAL UTILITY TRENCH SECTION NON-PAVED AREAS	U6



BORE AND CASING DETAIL FOR ROAD AND RAILROAD CROSSINGS
N.T.S.

NOTES:

1. CARRIER PIPE COMPRESSION TYPE JOINTS TO BE USED IF POSSIBLE.
2. IF COMPRESSION TYPE JOINT IS NOT AVAILABLE FOR CARRIER PIPE, RESTRAINED MJ TYPE SHALL BE USED AND JOINTS BOLTED BEFORE PULLING PIPE INTO PLACE.
3. MINIMUM WALL THICKNESS OF 36" AND LARGER CASING SHALL BE 0.50".
4. PIPE SHALL BE COATED AND LINED IN ACCORDANCE WITH AWWA C-210 OR APPROVED EQUAL.
5. ALL CASING JOINTS JOINTS SHALL BE WELDED IN ACCORDANCE WITH AWWA C-206. AFTER PIPE IS WELDED, COATING AND LINING SHALL BE REPAIRED.
6. CASING PRODUCT SHALL BE FROM A MANUFACTURER THAT HAS NOT LESS THAN FIVE(5) YEARS SUCCESSFUL EXPERIENCE MANUFACTURING PIPE IN THE UNITED STATES OF PARTICULAR TYPE AND SIZE. ALL PIPE MANUFACTURING INCLUDING CYLINDER PRODUCTION, LINING, COATING AND FITTINGS SHALL BE PRODUCED BY ONE MANUFACTURER. THE PIPE MANUFACTURER MUST HAVE A CERTIFIED QUALITY ASSURANCE PROGRAM. THE CERTIFIED PROGRAM SHALL BE ISO 9001: 2000 OR OTHER EQUIVALENT NATIONALLY RECOGNIZED PROGRAM.

For lines crossing State highways or roads, crossing intersecting streets/county roads, or passing through the protected root area of desirable trees, it shall be clearly shown in description and on ALL plans that the line will be installed by conventional dry auger boring unless otherwise approved by a TxDOT engineer or Inspector. In addition, casing shall be shown under highways and paved city street/county road intersections.

STEEL CASING WALL THICKNESS	
DIA OF CASING PIPE	MIN THICKNESS
12" OR LESS	0.25"
12"-18"	0.3125"
18"-22"	0.3750"
22"-28"	0.4375

CASING PIPES SHALL BE SMOOTH STEEL PIPES WITH A MIN YIELD STRENGTH OF 35,000 PSI.

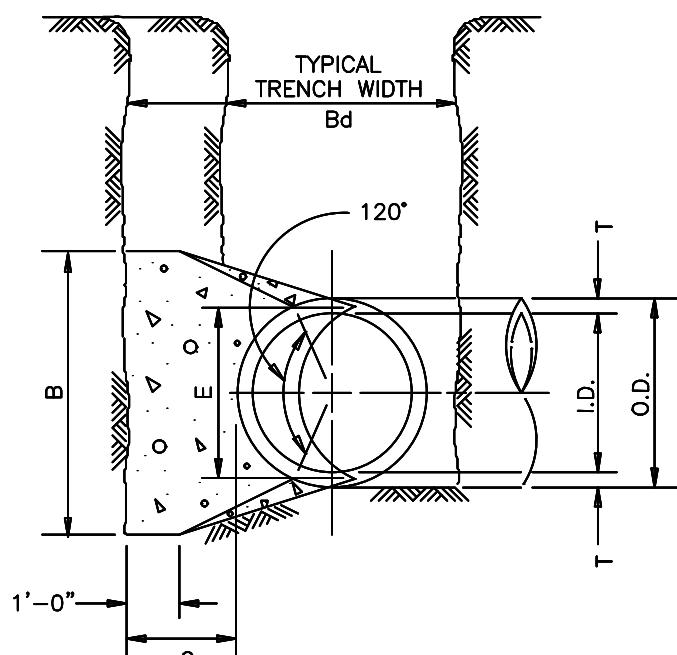
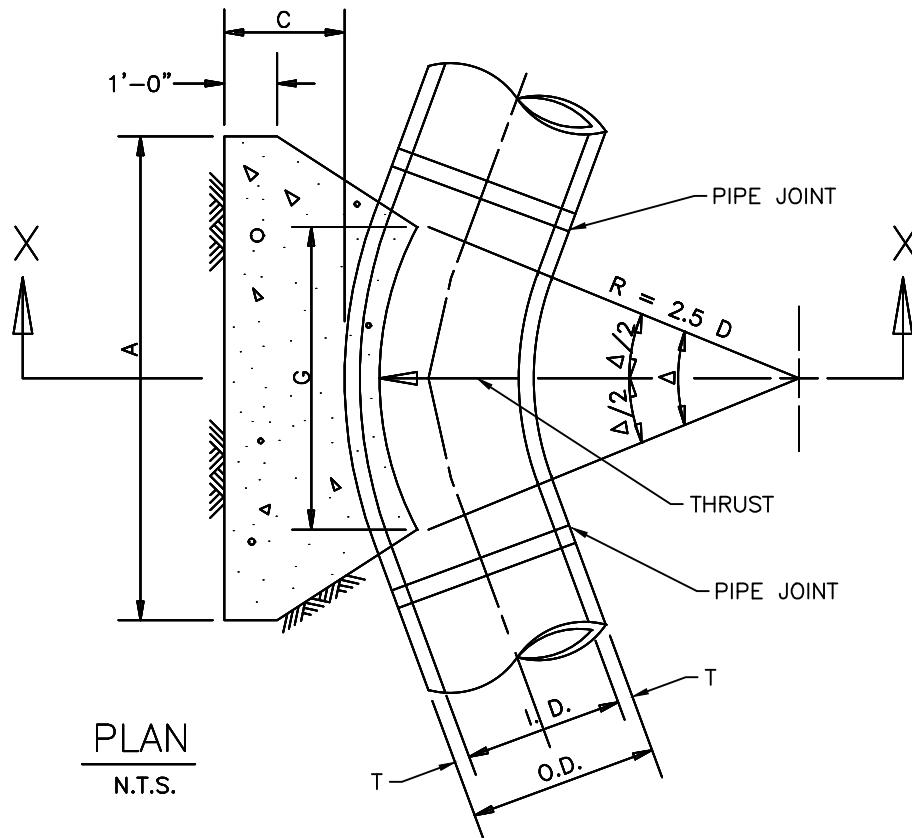
NOT TO SCALE

	DATE	UTILITY DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	BORE & CASING DETAIL	U8

GENERAL NOTES FOR ALL THRUST BLOCKS:

1. CONCRETE FOR BLOCKING SHALL BE CLASS "B".
2. ALL CALCULATIONS ARE BASED ON INTERNAL PRESSURE OF 200 PSI FOR DUCTILE IRON, P.V.C., AND 150 PSI FOR CONCRETE PIPE. IF PRESSURES EXCEEDED, RECALCULATE FOR THRUST BLOCKING DIMENSIONS.
3. VOLUMES OF THRUST BLOCKS ARE NET VOLUMES OF CONCRETE TO BE FURNISHED. THE CORRESPONDING WEIGHT OF THE CONCRETE (CLASS "B") IS EQUAL TO OR GREATER THAN THE VERTICAL COMPONENT OF THE THRUST ON THE VERTICAL BEND.
4. WALL THICKNESS (T) ASSUMED HERE FOR ESTIMATING PURPOSES ONLY.
5. POUR CONCRETE FOR BLOCK AGAINST UNDISTURBED EARTH.
6. DIMENSIONS MAY BE VARIED AS REQUIRED BY FIELD CONDITIONS WHERE AND AS DIRECTED BY THE ENGINEER. THE VOLUME OF CONCRETE BLOCKING SHALL NOT BE LESS THAN SHOWN HERE.
7. THE SOIL BEARING PRESSURES ARE BASED ON 1000 LBS./S.F. IN SOIL AND 2000 LBS./S.F. IN ROCK.
8. USE POLYETHYLENE WRAP OR EQUAL BETWEEN CONCRETE AND BEND, TEE, OR PLUG TO PREVENT THE CONCRETE FROM STICKING TO IT.
9. CONCRETE SHALL NOT EXTEND BEYOND JOINTS.
10. ALL FITTINGS THAT REQUIRE THRUST BLOCKING SHALL ALSO INCLUDE MECHANICAL JOINT RESTRAINTS, EBBA IRON SERIES 2000 PV.

 WEATHERFORD TRUE TEXAS	DATE	UTILITY DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	THRUST BLOCK GENERAL NOTES	U9



NOTE:
REFER TO U9 FOR GENERAL NOTES

NOT TO SCALE

DATE	UTILITY DEPARTMENT	SHEET. #
01/2020		
DRAWN BY	HORIZONTAL THRUST BLOCK AT PIPE BEND	U10
CITY OF WEATHERFORD		



I.D. (IN.)	$\Delta = 30^\circ$								I.D. (IN.)	$\Delta = 45^\circ$								
	G (FT.)	THRUST (TONS)	EARTH			ROCK				G (FT.)	THRUST (TONS)	EARTH			ROCK			
			A (FT.)	B (FT.)	VOL. (C.Y.)	A (FT.)	B (FT.)	VOL. (C.Y.)				A (FT.)	B (FT.)	VOL. (C.Y.)	A (FT.)	B (FT.)	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	6.5	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	415.6	26.0	16.0	89.5	18.5	11.5	48.5	

I.D. (IN.)	$\Delta = 67.50^\circ$								I.D. (IN.)	$\Delta = 90^\circ$								
	G (FT.)	THRUST (TONS)	EARTH			ROCK				G (FT.)	THRUST (TONS)	EARTH			ROCK			
			A (FT.)	B (FT.)	VOL. (C.Y.)	A (FT.)	B (FT.)	VOL. (C.Y.)				A (FT.)	B (FT.)	VOL. (C.Y.)	A (FT.)	B (FT.)	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

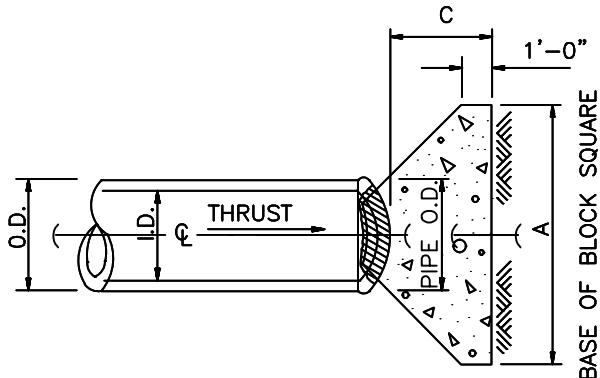
 WEATHERFORD TRUE TEXAS	DATE	UTILITY DEPARTMENT HORIZONTAL THRUST BLOCK AT PIPE BEND - TABLES 1										SHEET. #
	01/2020											DRAWN BY

I.D. (IN.)	T (IN.)	$\Delta = 11.25^\circ$ (FT.)	$\Delta \geq 22.50^\circ$ (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	2.6
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.)	$\Delta = 11.25^\circ$								I.D. (IN.)	$\Delta = 22.5^\circ$								
	G (FT.)	THRUST (TONS)	EARTH			ROCK				G (FT.)	THRUST (TONS)	EARTH			ROCK			
			A (FT.)	B (FT.)	VOL. (C.Y.)	A (FT.)	B (FT.)	VOL. (C.Y.)				A (FT.)	B (FT.)	VOL. (C.Y.)	A (FT.)	B (FT.)	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	

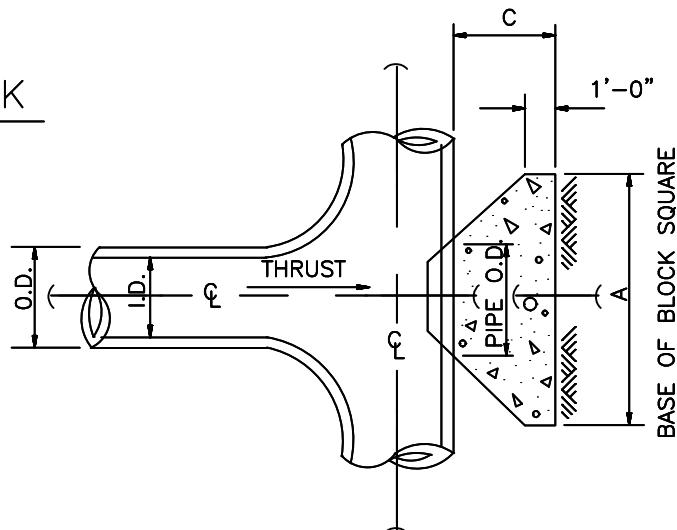
TABLES OF DIMENSIONS AND QUANTITIES

	DATE	UTILITY DEPARTMENT										SHEET. #
	01/2020											U12
DRAWN BY	HORIZONTAL THRUST BLOCK AT PIPE BEND - TABLES 2											
CITY OF WEATHERFORD												



PLAN OF PLUG THRUST BLOCK

N.T.S.



REFER TO U9
FOR GENERAL NOTES.

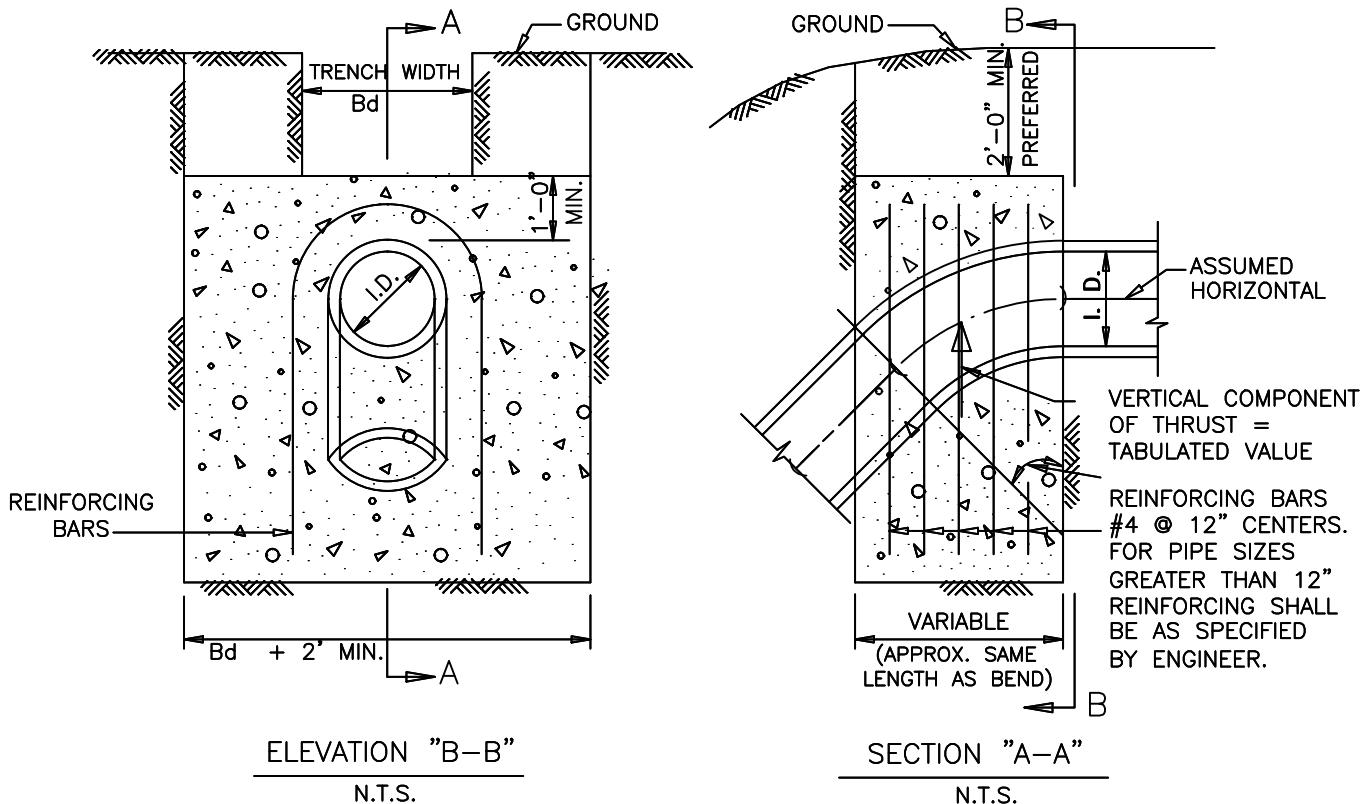
PLAN OF TEE THRUST BLOCK

N.T.S.

I.D. (IN.)	THRUST (TONS)	EARTH		ROCK		
		C (FT.)	A (FT.)	VOL. (C.Y.)	A (FT.)	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
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

NOT TO SCALE

	DATE	UTILITY DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	HORIZONTAL THRUST BLOCK AT TEES & PLUGS		
CITY OF WEATHERFORD			
			U13



REFER TO U9
FOR GENERAL NOTES.

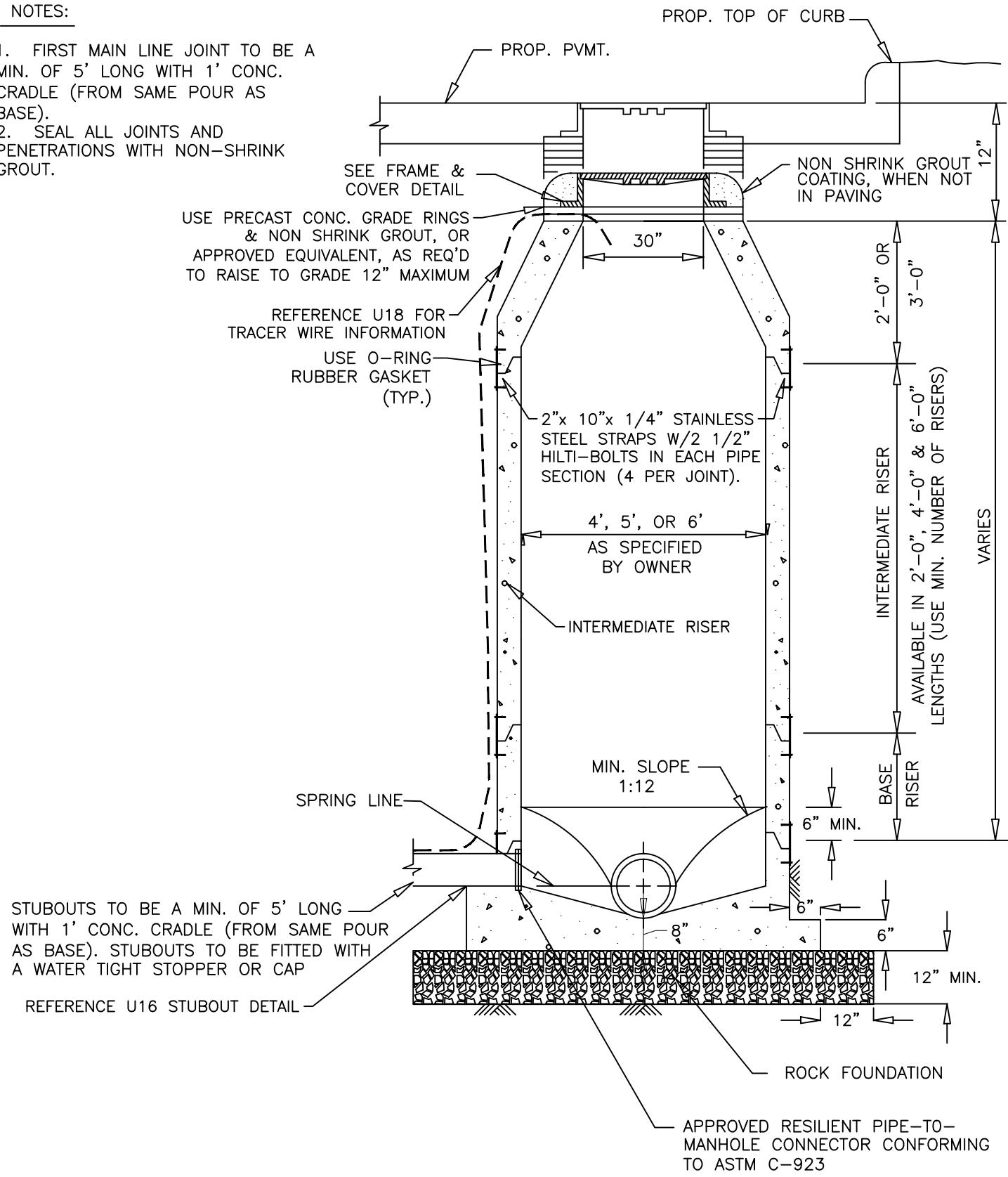
$\Delta \rightarrow$	11.25°		22.5°		30°		45°		67.5°		90°		$\Delta \leftarrow$
I.D. (IN.)	THRUST (TONS)	VOL. (C.Y.)	I.D. (IN.)										
4,6,8	1.0	0.5	2.0	1.0	2.5	1.3	3.6	1.8	4.6	2.3	5.0	2.5	4,6,8
10,12	2.2	1.1	4.3	2.2	5.7	2.8	8.0	4.0	10.5	5.2	11.3	5.7	10,12
16,18	5.0	2.5	9.7	4.9	12.7	6.4	18.0	9.0	23.5	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

NOT TO SCALE

	DATE	UTILITY DEPARTMENT				SHEET. #
	01/2020					DRAWN BY

NOTES:

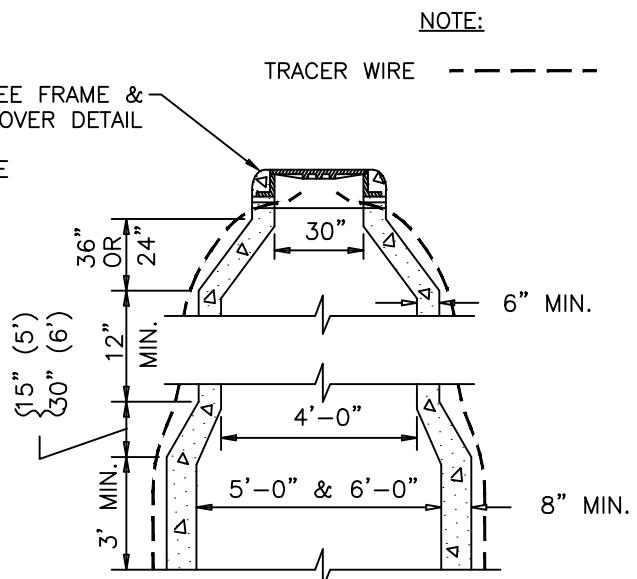
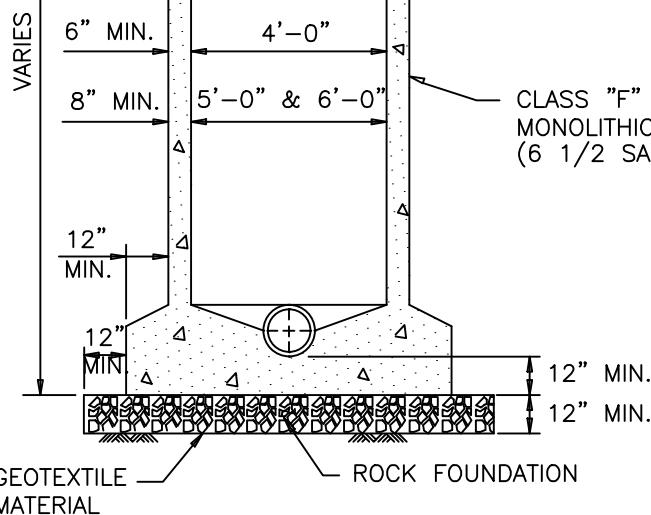
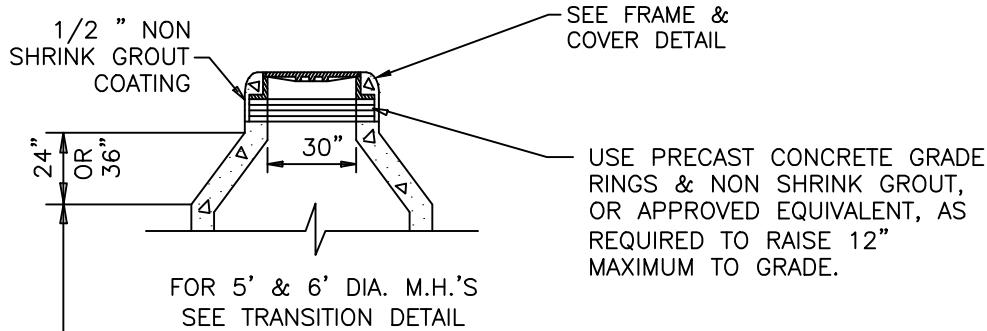
1. FIRST MAIN LINE JOINT TO BE A MIN. OF 5' LONG WITH 1' CONC. CRADLE (FROM SAME POUR AS BASE).
2. SEAL ALL JOINTS AND PENETRATIONS WITH NON-SHRINK GROUT.



DATE	01/2020
DRAWN BY	CITY OF WEATHERFORD

UTILITY DEPARTMENT
WASTEWATER MANHOLE
PRECAST

SHEET. #
U15



TRANSITION DETAIL FOR
5' & 6' DIA. M.H.'S

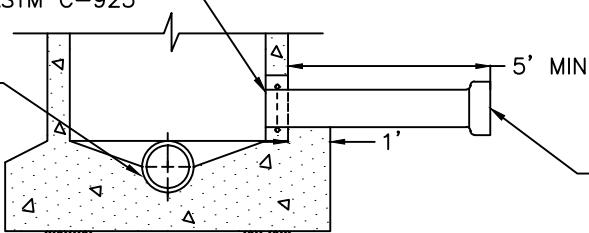
N.T.S.

NOTES

1. WHERE M.H.'S ARE IN "PROPOSED" PAVING, FRAME & COVER SHALL BE SET 6" BELOW THE PROPOSED PAVEMENT GRADE.

APPROVED RESILIENT PIPE-TO-MANHOLE CONNECTOR CONFORMING TO ASTM C-923

FIRST MAIN LINE JOINT TO BE A MIN. OF 5' LONG WITH 1' CONC. CRADLE (FROM SAME POUR AS BASE)



STUBOUT TO BE FITTED WITH WATERTIGHT STOPPER OR CAP STUBOUTS TO BE A MIN. OF 5' LONG WITH 1' CONC. CRADLE (FROM SAME POUR AS BASE)

STUBOUT CONNECTION

N.T.S.

NOT TO SCALE



DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

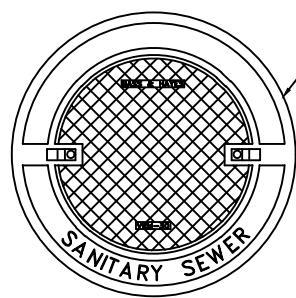
UTILITY DEPARTMENT
WASTEWATER MANHOLE
CAST IN PLACE

SHEET. #

U16

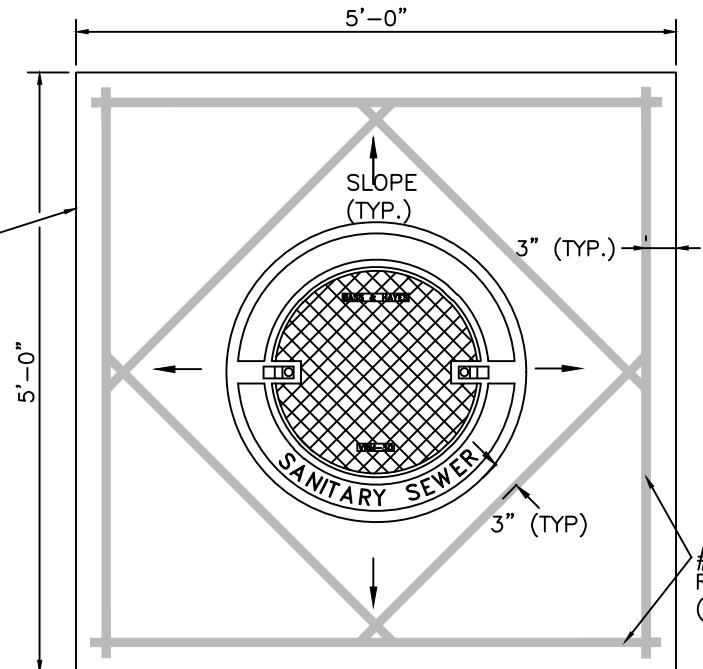
NOTE:

MANHOLE PAD SHALL BE SLOPED TO PROVIDE ADEQUATE DRAINAGE AWAY FROM MANHOLE COVER.



MANHOLE COVER

N.T.S.

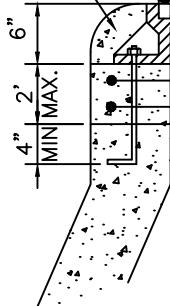


MANHOLE PAD FOR ALL MANHOLES IN
UNPAVED OR ASPHALT PAVEMENT AREAS

N.T.S.

(4) S.S. BOLTS
(WATERTIGHT MANHOLES)

GROUT (TYP)



RUBBER GASKET
(WATERTIGHT MANHOLES ONLY)

(4) BOLTS 1/2"Ø
316 S.S.

(2) #4 REBAR HOOPS

PRECAST RING OR CAST
IN PLACE LEVELING RING
3000 PSI CONCRETE
REINFORCED AS SHOWN.

NOTES:

1. IF PRECAST ANCHOR BOLTS ARE UNAVAILABLE, 316 S.S. HILTI EPOXY TYPE ANCHOR BOLTS OF SIMILAR SIZE AND STRENGTH WILL BE ALLOWED.
2. FOR UNEVEN SLOPES LESS THAN 4:1% LADTECH ADJUSTING RING WEDGE OR APPROVED EQUAL MAY BE USED.

MANHOLE FRAME & COVER

N.T.S.

NOT TO SCALE



DATE
01/2020
DRAWN BY

UTILITY DEPARTMENT
WASTEWATER MANHOLE
FRAME, COVER & PAD

SHEET. #

U17

STANDARD
DROP CONNECTION
N.T.S.

SEE FRAME &
COVER DETAIL

This technical diagram illustrates a manhole construction detail, specifically the installation of a tracer wire and the placement of a concrete pipe with a double 45-degree bend.

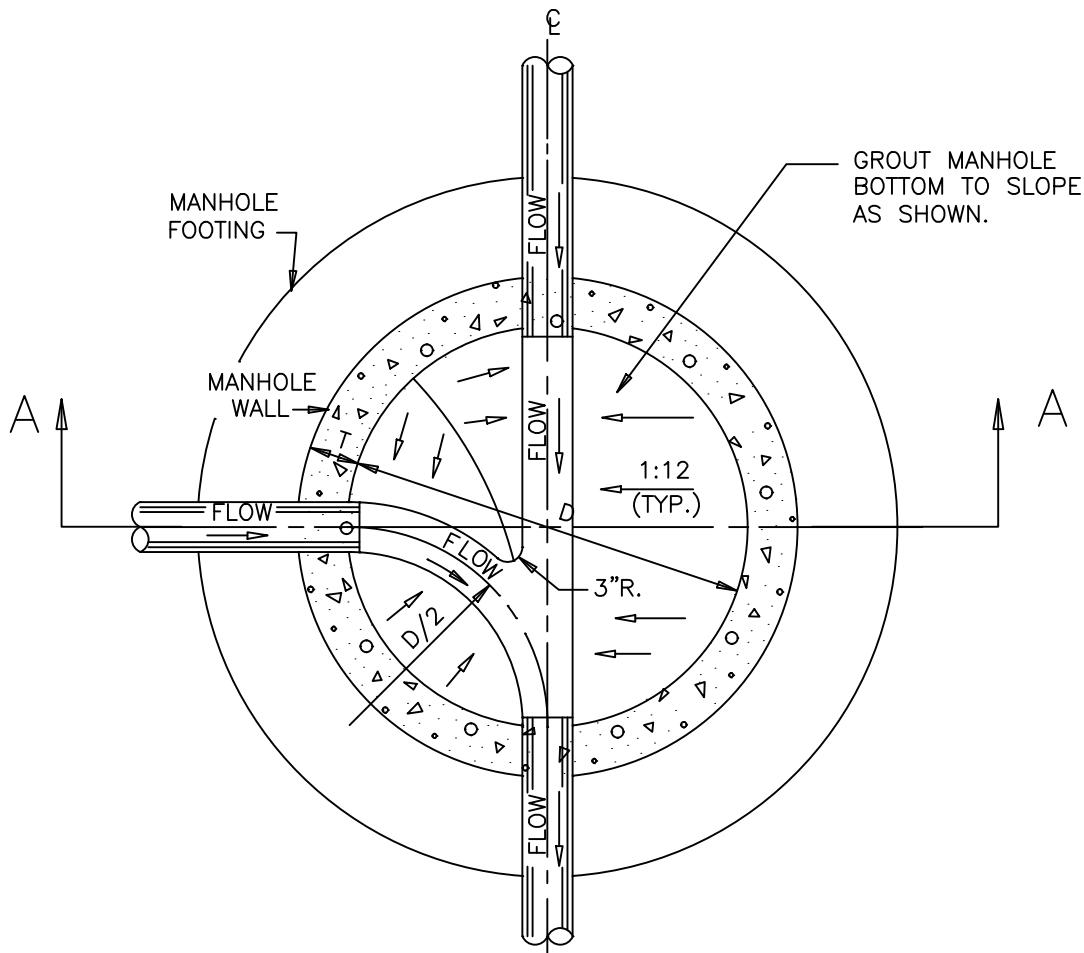
Key Labels and Dimensions:

- CONTINUE TRACER WIRE**: Points to the top of the manhole structure.
- INSTALL TRACER WIRES UNDER FRAME**: Points to the interior of the manhole frame.
- TRACER WIRE**: Points to the wire installed under the frame.
- REVERSE 45° WYE ONLY**: Points to the end of the tracer wire.
- EXTEND TRACER WIRES MIN. 2' INTO MANHOLE**: Provides a callout for the extension of the tracer wires into the manhole.
- CUT 4" SPRINGLINE NOTCH**: Points to a notch cut into the concrete frame.
- 6" (TYP)**: Provides a typical dimension of 6 inches for the height of the concrete frame.
- 3/4" WASHED ROCK**: Points to the bedding material used for the pipe.
- 4" MIN. 24" MAX.**: Provides a range dimension for the thickness of the concrete pipe.
- 45° BEND**: Points to the first 45-degree bend of the concrete pipe.
- 6" MIN.**: Provides a minimum dimension of 6 inches for the thickness of the concrete pipe.
- DOUBLE 45° BEND**: Points to the second 45-degree bend of the concrete pipe.
- ROCK FOUNDATION**: Points to the base of the manhole structure.
- 12" MIN.**: Provides a minimum dimension of 12 inches for the thickness of the concrete pipe.
- 12" MIN.**: Provides a minimum dimension of 12 inches for the thickness of the concrete pipe.

NOT TO SCALE



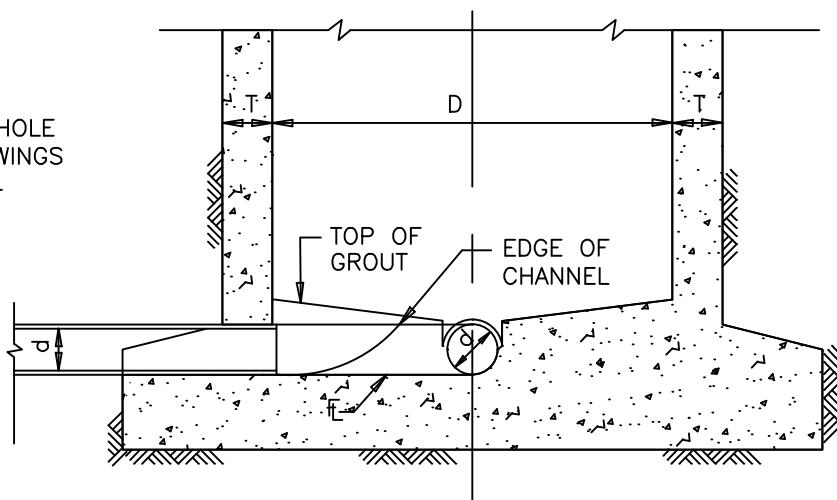
	DATE	UTILITY DEPARTMENT	SHEET. #
	01/2020		
	DRAWN BY		
	CITY OF WEATHERFORD	WASTEWATER MANHOLE OUTSIDE DROP CONNECTIONS	U18



PLAN
N.T.S.

T = WALL THICKNESS
D = MANHOLE DIAMETER
d = PIPE DIAMETER

NOTE:
REFER TO MANHOLE
STANDARD DRAWINGS
FOR ADDITIONAL
DETAIL OF M.H.



SECTION A-A
N.T.S.

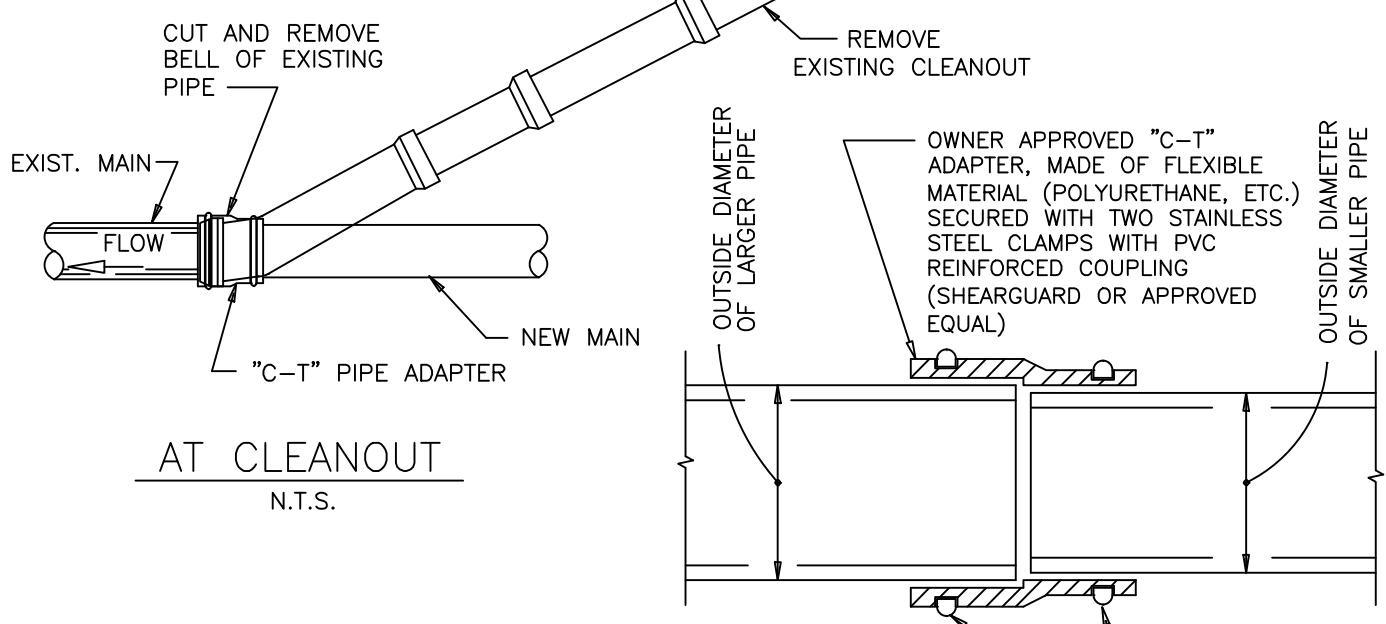
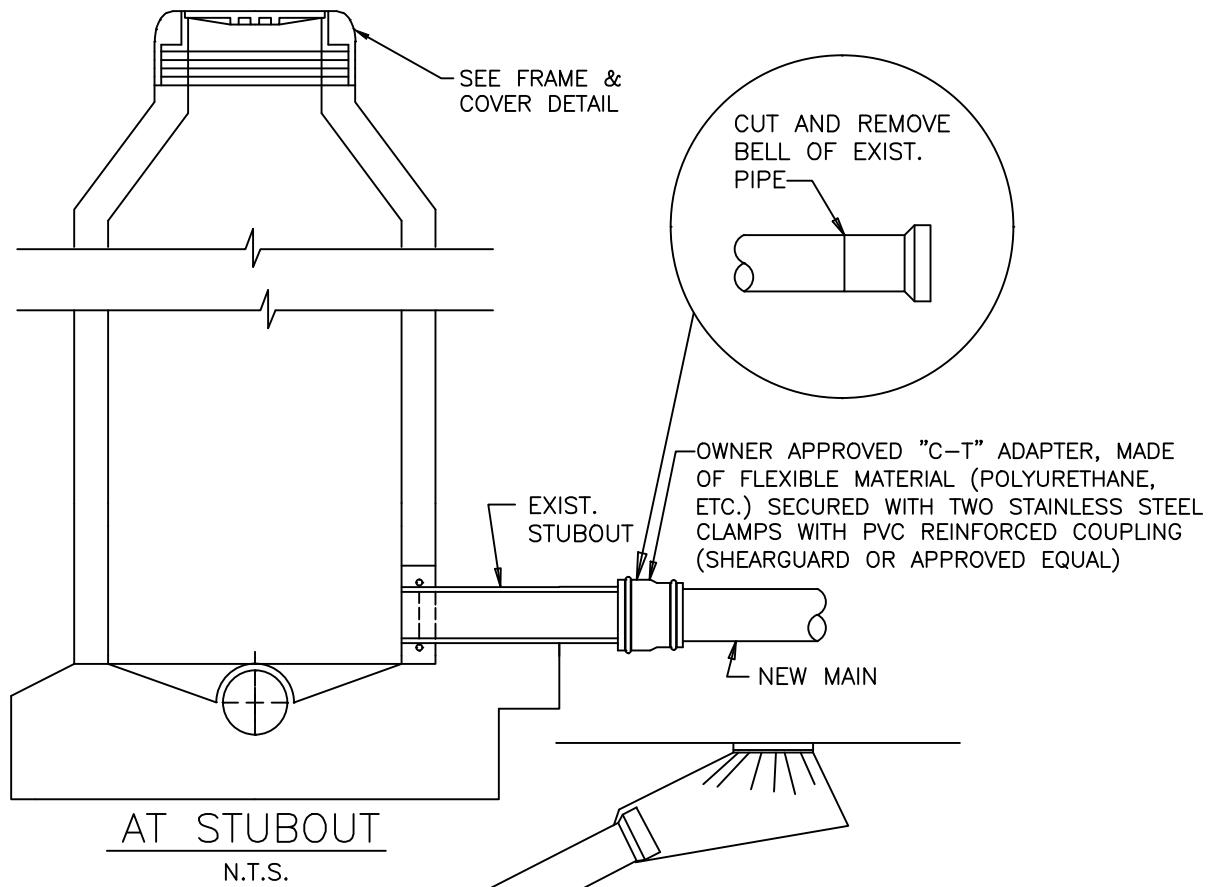
NOT TO SCALE



DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

UTILITY DEPARTMENT
WASTEWATER MANHOLE
LINE INTERSECTION

SHEET. #
U19



NOTE:

THIS DETAIL FOR USE ONLY WHEN NEW MAIN WILL NOT MATE WITH EXISTING MAIN JOINT DUE TO DIFFERENT DIMENSIONS OR MATERIALS AND A MANHOLE IS NOT REQUIRED.

ALL "C-T" ADAPTERS MUST BE CONCRETE ENCASED

"C-T" PIPE ADAPTER

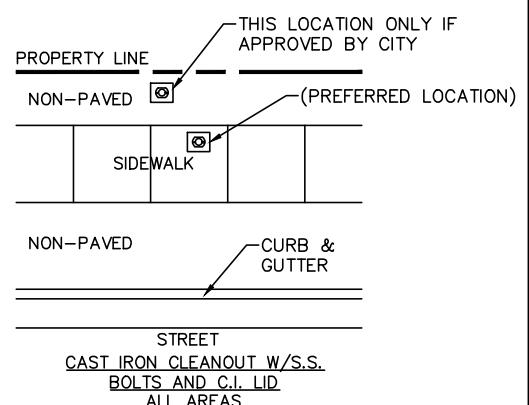
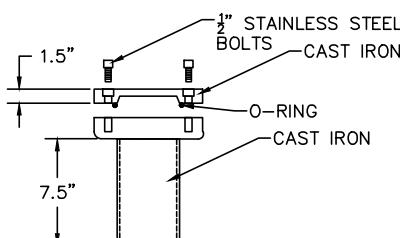
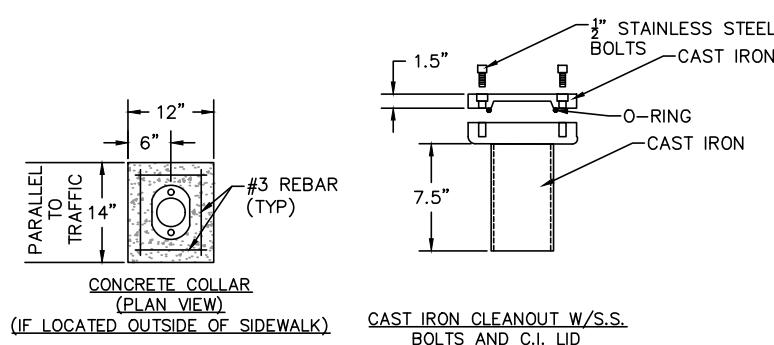
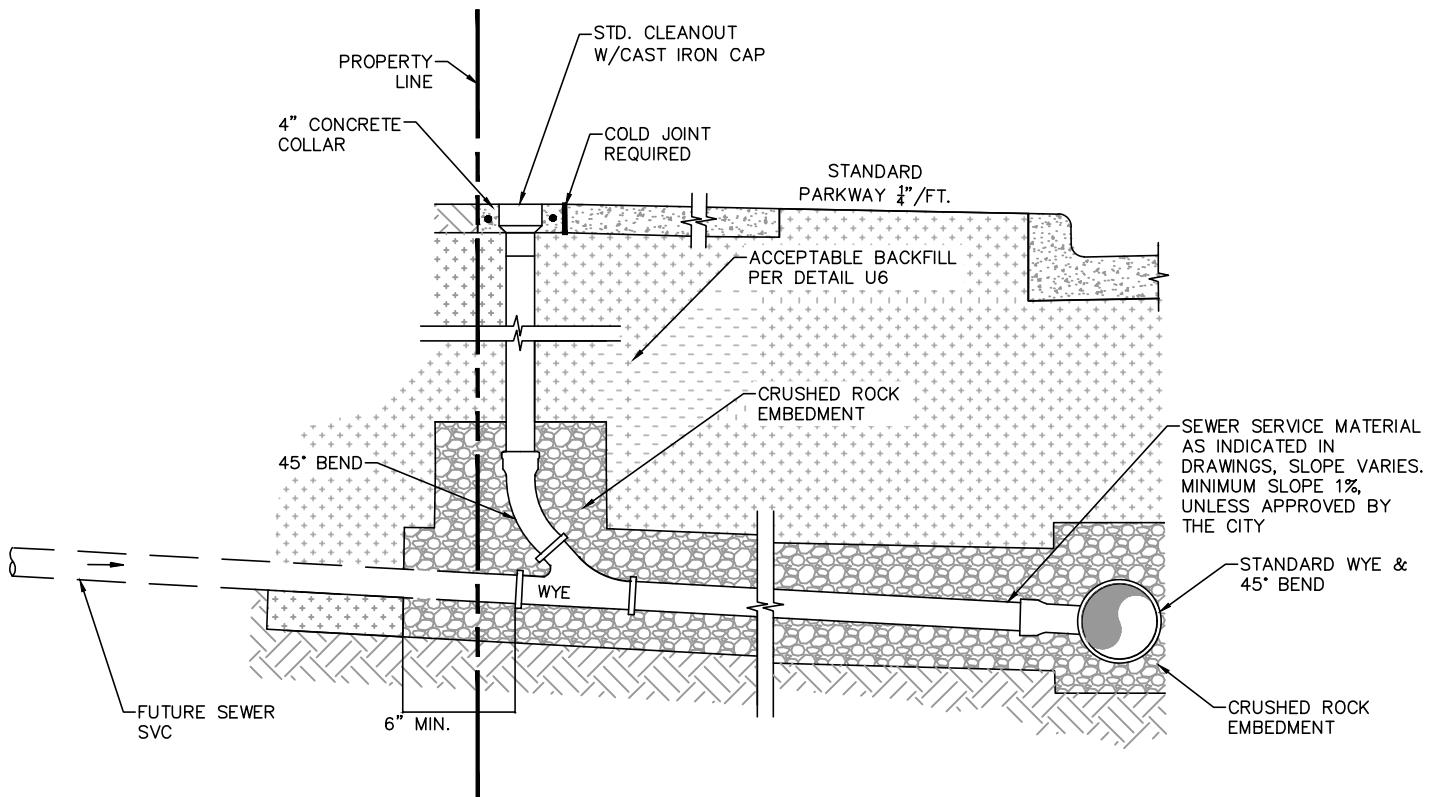
N.T.S.

NOT TO SCALE

	DATE	UTILITY DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	WASTEWATER MANHOLE TIE-IN	U20

NOTES:

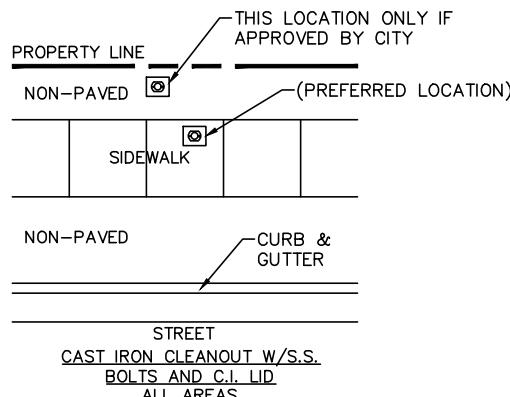
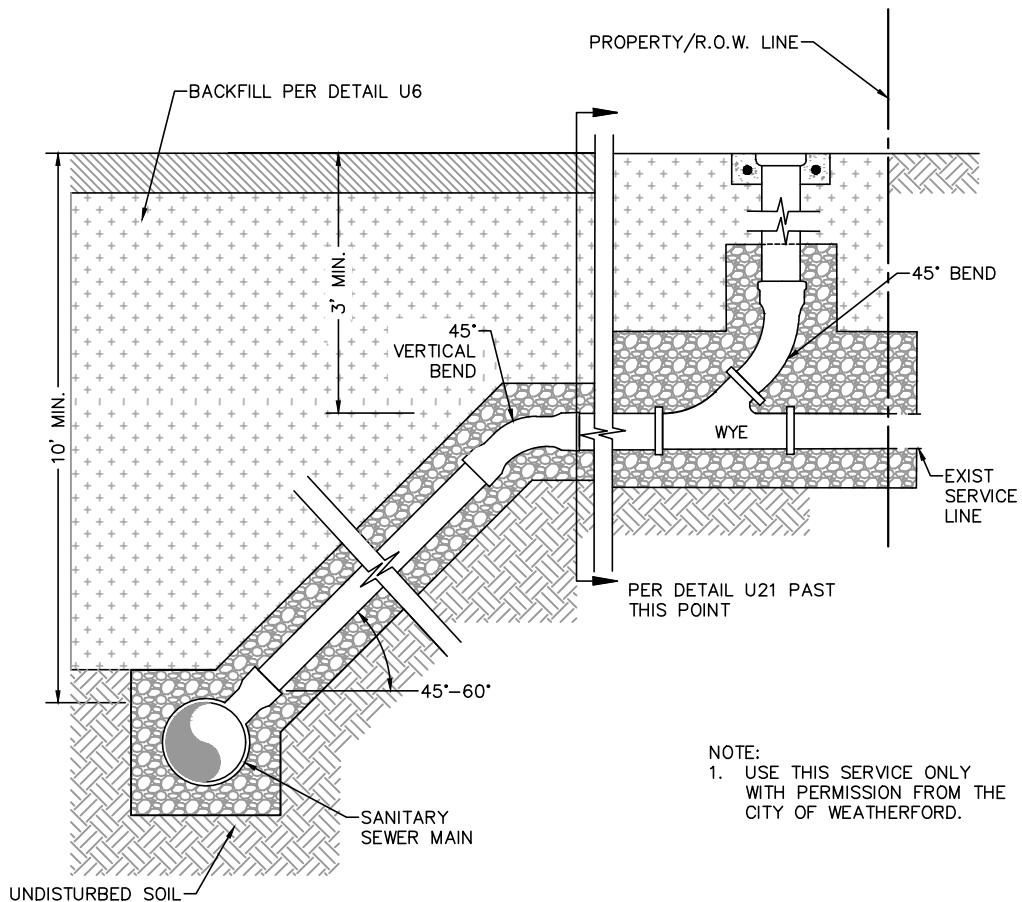
1. PIPE AND FITTINGS MUST BE SDR-26 PVC AS INDICATED IN THE DRAWINGS.
2. PROVIDE RUBBER SLEEVE COUPLINGS WITH STAINLESS STEEL DOUBLE-BAND REPAIR SLEEVES TO CONNECT TO EXISTING SERVICE. TIGHTEN SLEEVES TO THE TORQUE RECOMMENDED BY THE MANUFACTURER.
3. SEWER SERVICE SHALL INCLUDE ALL APPURTENANCES FROM SEWER MAIN UP TO AND INCLUDING RUBBER SLEEVE COUPLING OR PLUG.
4. CLEANOUTS SHALL BE LOCATED 10' OFFSET FROM CENTER OF LOT ON THE DOWNSTREAM SIDE.



NOT TO SCALE

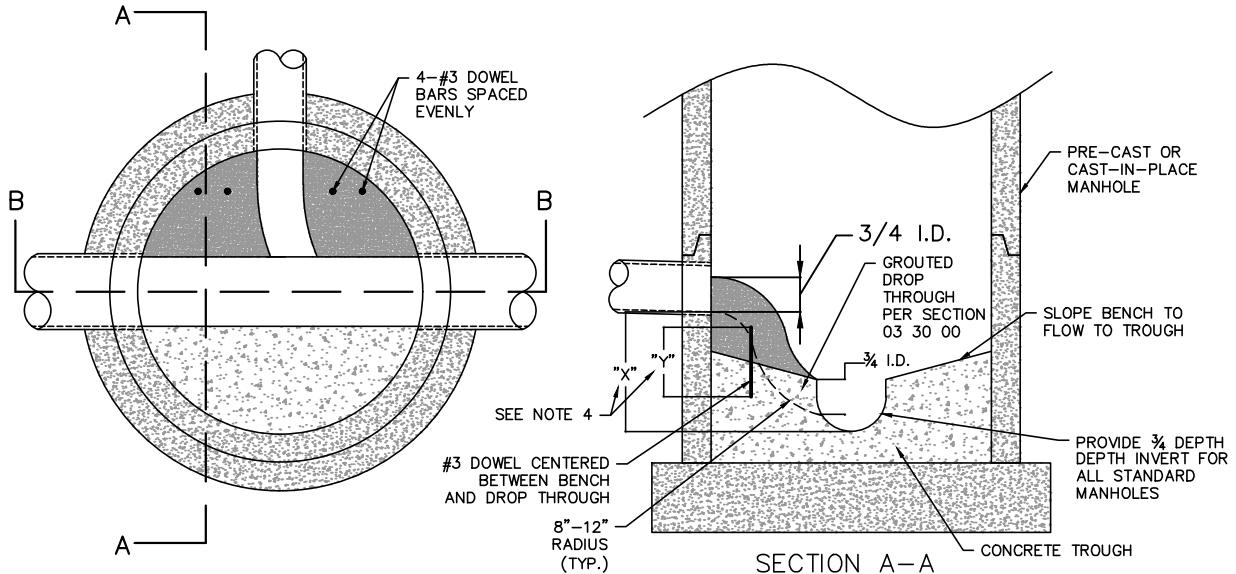
DATE	UTILITY DEPARTMENT	SHEET. #
01/2020	WASTEWATER LATERAL STANDARD INSTALLATION	U21
DRAWN BY	CITY OF WEATHERFORD	



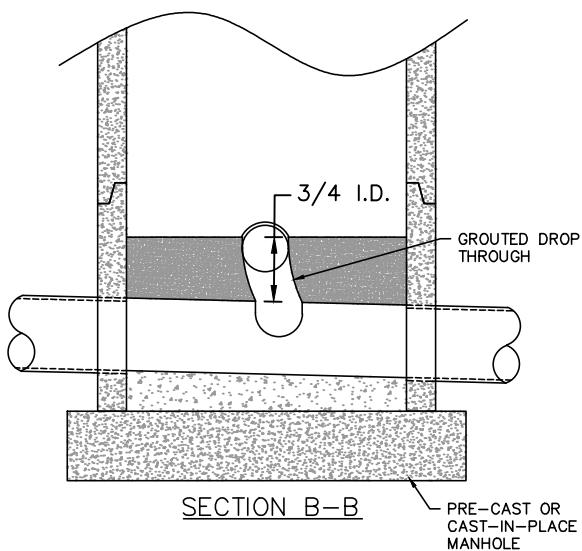


NOT TO SCALE

	DATE	UTILITY DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	WASTEWATER LATERAL DEEP INSTALLATION	
		U22	



PLAN VIEW

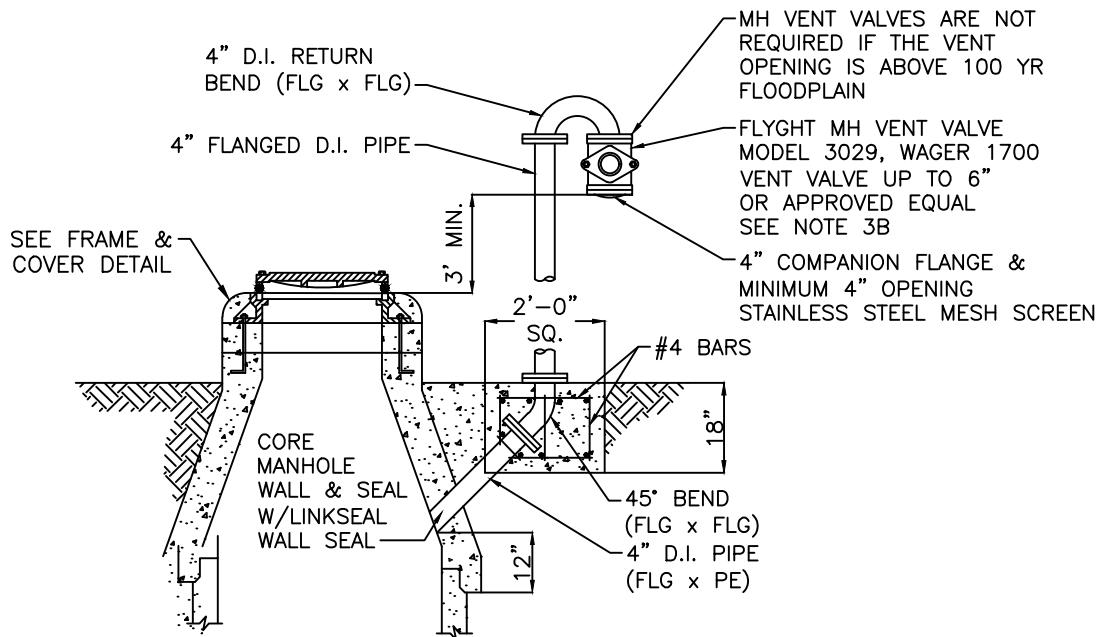


NOTES:

1. DROP THROUGH SHALL BE POURED MONOLITICALLY WITH CAST-IN-PLACE BENCH, OR DOWELED AND GROUTED TO PRE-CAST BENCH.
2. DROP THROUGH SHALL EXTEND INTO MAIN-LINE TROUGH $\frac{1}{2}$ THE INNER DIAMETER OF LATERAL.
3. WHERE LATERAL FLOW-LINE TO MAIN FLOW-LINE IS GREATER THAN 24" AN EXTERNAL DROP SHALL BE REQUIRED.
4. "X" SHALL BE NO MORE THAN 24" FROM FLOW-LINE TO FLOW-LINE. "Y" SHALL BE THE GREATER OF HALF OF "X" OR 6".

NOT TO SCALE

	DATE	UTILITY DEPARTMENT	SHEET. #
	01/2020		
	DRAWN BY		
	CITY OF WEATHERFORD	WASTEWATER MANHOLE HYDRAULIC SLIDE	U23



NOTES:

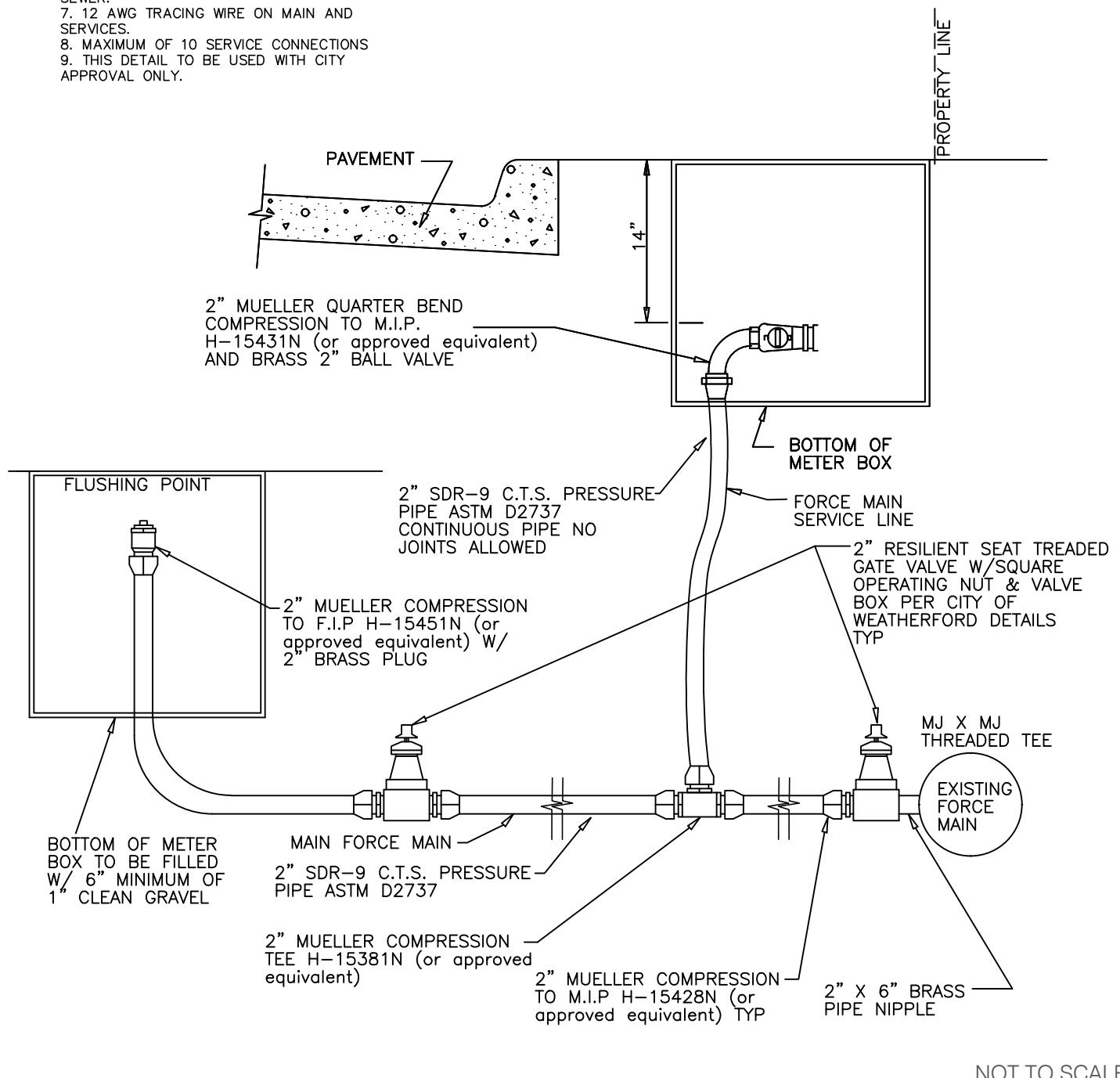
1. DUCTILE IRON PIPE & FITTINGS TO HAVE 40mil POLYETHYLENE INTERIOR COATING.
2. ALL BOLTS & NUTS TO BE 316 STAINLESS STEEL.
3. FINISH COATING:
 - A. WIRE BRUSH TO REMOVE ALL DIRT & CONCRETE AND TO ROUGH UP FINISH.
 - B. APPLY ONE PRIME COAT OF TNEMEC SERIES 37 CHEM PRIME (GRAY) TO 3mils DRY THICKNESS. GIVE SPECIAL ATTENTION AND SECOND COAT TO CORNERS AND BOLTS.
 - C. APPLY ONE FINISH COAT OF TNEMEC SERIES 43-38 ALKYD ALUMINUM TO 2mils DRY THICKNESS.
4. VENT PIPES LONGER THAN 6' TO BE 6"Ø D.I. PIPE AND FITTINGS.

NOT TO SCALE

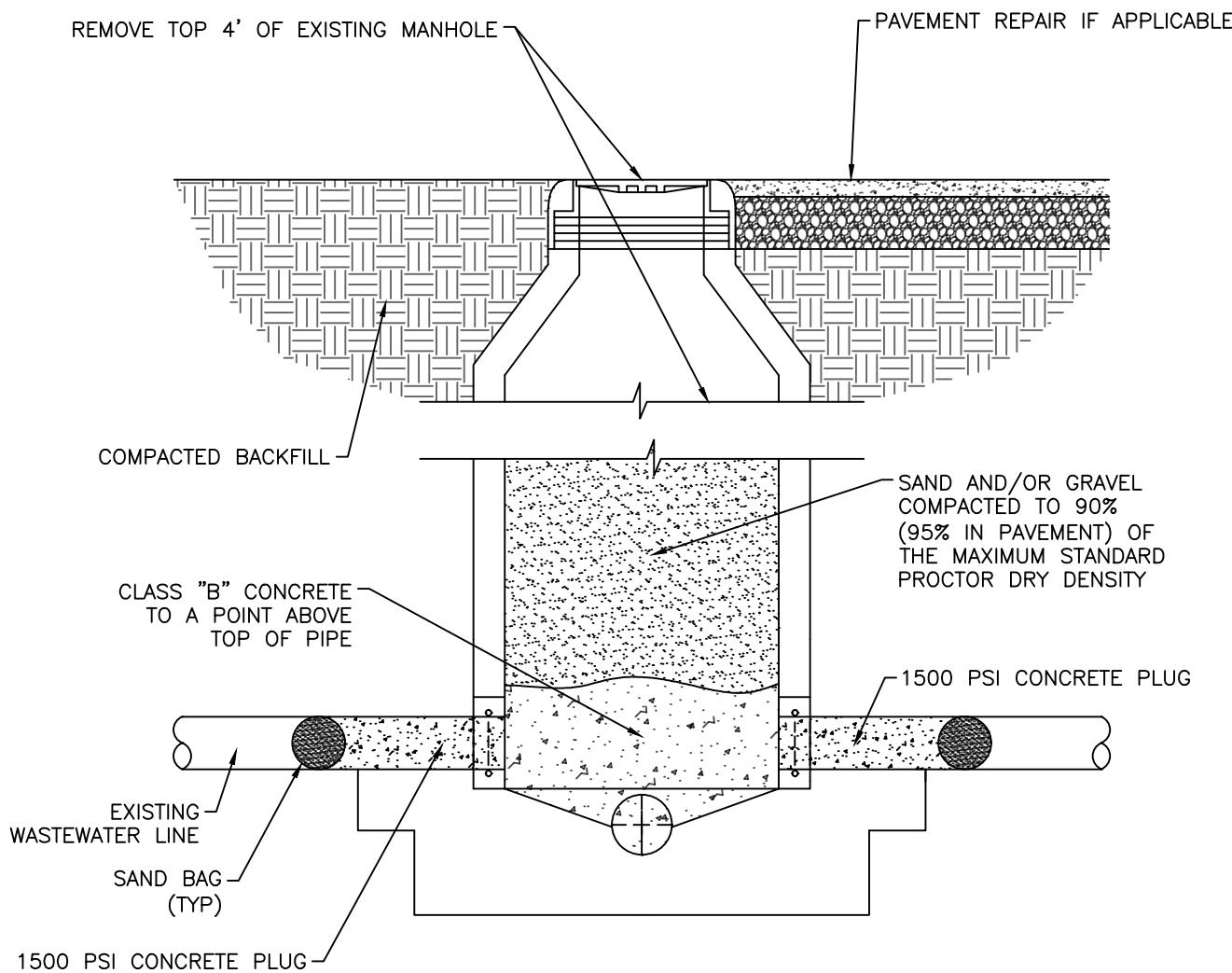
	DATE	UTILITY DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	WASTEWATER MANHOLE VENT	
		U24	

NOTES:

1. ALL PIPE FITTINGS SHALL BE COMPRESSION FITTINGS, STAINLESS STEEL PIPE STIFFENERS REQUIRED.
2. METER BOX FOR SERVICE LINES TO BE INSTALLED AT PROPERTY LINE.
3. METER BOX SHALL NOT BE INSTALLED IN SIDEWALKS OR DRIVEWAYS.
4. METER BOX TO BE FURNISHED BY AND INSTALLED BY CONTRACTOR.
5. METER BOX SHALL BE 18" DIAMETER PVC WITH CAST IRON RING AND LID. WHITE RHINO OR APPROVED EQUAL.
6. ALL METER CAN LIDS SHALL MARKED AS SEWER.
7. 12 AWG TRACING WIRE ON MAIN AND SERVICES.
8. MAXIMUM OF 10 SERVICE CONNECTIONS
9. THIS DETAIL TO BE USED WITH CITY APPROVAL ONLY.

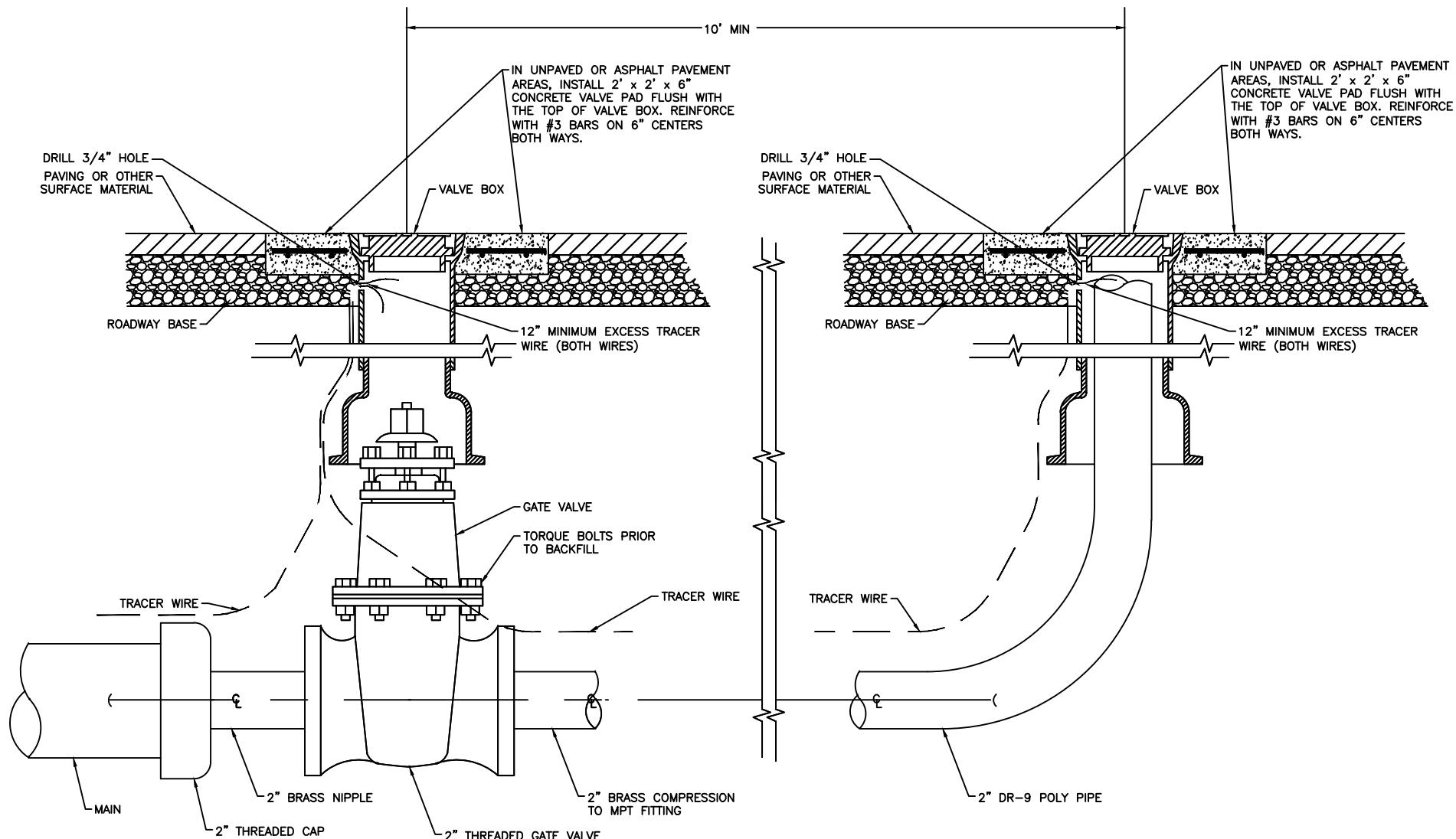


	DATE	UTILITY DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	LOW PRESSURE FORCE MAIN 2" LINE SIZE	U25



NOT TO SCALE

	DATE	UTILITY DEPARTMENT	SHEET. #
	01/2020		
DRAWN BY	CITY OF WEATHERFORD	WASTEWATER MANHOLE ABANDONMENT	
		U26	



NOT TO SCALE

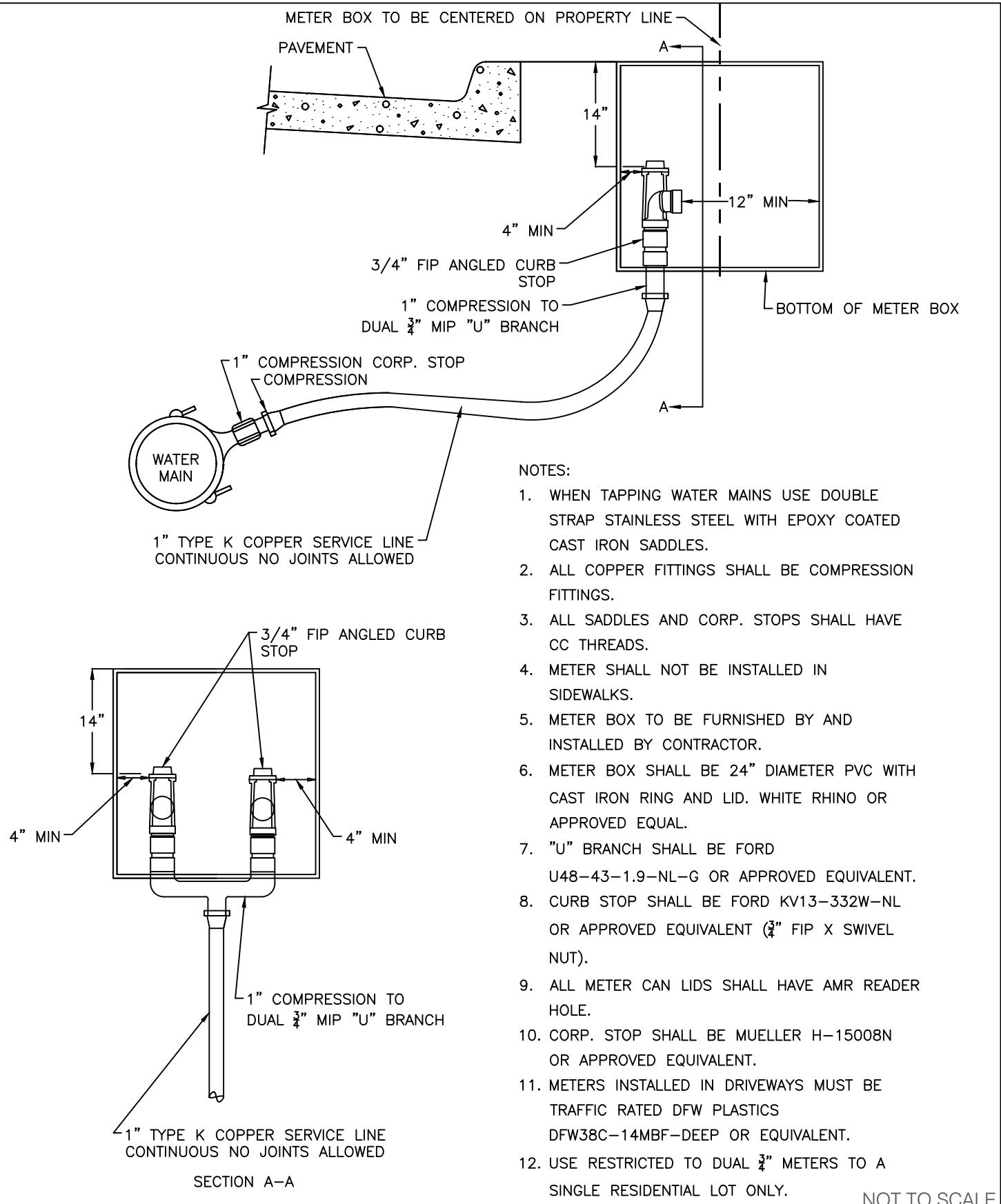


DATE
01/2020
DRAWN BY
CITY OF WEATHERFORD

UTILITY DEPARTMENT

2" FLUSHING POINT

SHEET. #
U27



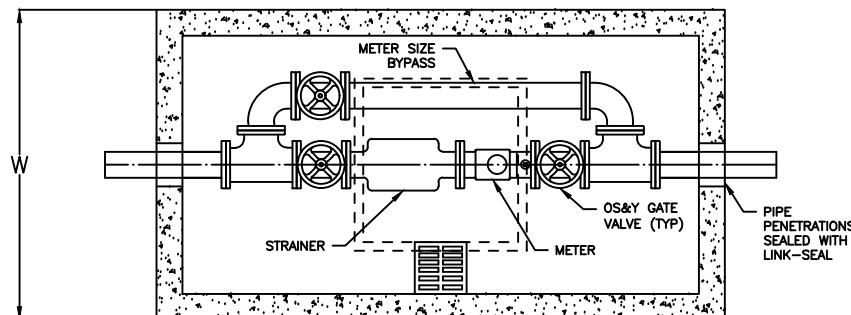
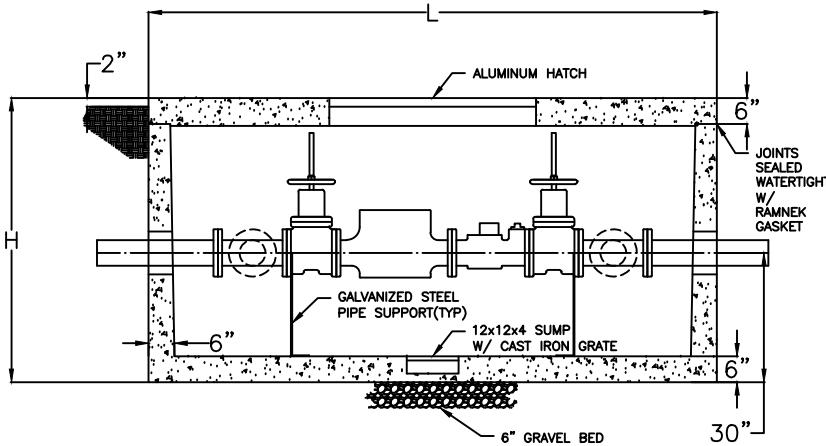
DATE	01/2020
DRAWN BY	CITY OF WEATHERFORD

UTILITY DEPARTMENT
DUAL $\frac{3}{4}$ INCH RESIDENTIAL SERVICE
DETAIL

SHEET. #
U28

NOTES:

1. BY-PASS MUST BE SAME SIZE AS METER
2. ALL PIPE MUST BE DUCTILE IRON & ALL FITTINGS MUST BE FLANGED INSIDE VAULT
3. ALL VALVES TO BE OS&Y GATE VALVES
4. METER TO BE SENSUS OMNI C2 FOR DOMESTIC OR SENSUS OMNI F2 WITH FIRE FLOW
5. METER REGISTER SET TO CUBIC FEET
6. REGISTER NUMBER MUST MATCH SERIAL NUMBER ON MAIN CASE
7. RADIO TO BE MXU520M
8. METER AND BACKFLOW PREVENTER MUST BE IN SEPARATE VAULTS
9. CONCRETE SHALL BE CLASS "F" WITH MINIMUM DESIGN STRENGTH OF 4200psi @ 28 DAYS
10. GRADE 60 STEEL REBAR CONFORMING TO ASTM A615
11. WALLS MUST BE CAST MONOLITHIC WITH FLOOR
12. 1/4" ALUMINUM DIAMOND PLATE HATCH WITH EXTRUDED ALUMINUM FRAME CAST INTO LID WITH 316 STAINLESS STEEL SLAM LOCK & HINGES CENTERED OVER METER



SIZE	L	W	H	HATCH
3"	8'-8"	5'-0"	6'-0"	36" X 36"
4"	8'-8"	5'-0"	6'-0"	36" X 36"
6"	11'-0"	6'-0"	7'-0"	42" X 42"
8"	11'-0"	6'-0"	7'-0"	42" X 42"

NOT TO SCALE



APPENDIX D APPROVED MATERIALS LIST

D.1. Standards for Materials for Water Mains and Services

- D.1.1 All 4" to 12" pipe shall be PVC, AWWA C900, DR 14 class pipe, blue in color.
- D.1.2 All mechanical type fittings shall be ductile iron type that meets all C110/A21-10 ANSI/AWWA standards. Additionally, fittings shall have mechanical joint restraints, EBAA iron series 2000 PV or approved equivalent.
- D.1.3 All valves 2" through 12" shall be a resilient seat gate valve, and must meet all AWWA and fire protection standards. Approved brands include Mueller, Clow, or M&H. Valve larger than 12" shall be approved on a case-by-case basis.
- D.1.4 The construction of all water mains and services shall include the installation of a blue 12 gauge Copper Head (or approved equivalent) tracing wire system.
- D.1.5 Valve boxes shall include an adjustable two piece cast iron box or a non-adjustable 10" cast iron box with lids marked "WATER".
- D.1.6 All ductile iron tees shall be anchor type.
- D.1.7 All ductile iron fittings shall be wrapped with 2 layers of 6 mil plastic wrap and securely taped.
- D.1.8 All water services shall be K type copper with compression type fittings.
- D.1.9 All new water service shall be a minimum of 1" in diameter.
- D.1.10 Tapping sleeves shall be stainless steel or epoxy coated steel. Nuts and bolts shall be stainless steel.
- D.1.11 Meter boxes shall be White Rhino or approved equivalent with 12 5/8" cast iron ring and lid or approved equivalent that will accommodate the City's AMS meter system.
- D.1.12 Fire Hydrants shall be Mueller Centurion, M & H model 129, or Clow Medallion, meet or exceed AWWA C 502 and field painted with Sherwin Williams International Red – F75RC7.

D.2. Standards for Materials for Wastewater Mains and Services

- D.2.1 4" to 12" pipe shall be SDR-26 with gasket.
- D.2.2 4" to 10" force main pipe shall be AWWA C 900, DR 18 minimum and be green in color. Pipe shall also have marking tape with wording; "Wastewater Force Main" attached to the pipe.
- D.2.3 All wastewater service connections shall include a standard wye and a 45° fitting.
- D.2.4 The construction of all wastewater mains and services shall include the installation of green 12 gauge Copper Head (or approved equivalent) tracing wire system.
- D.2.5 All clean-outs located in the ROW shall have cast iron clean-out with a lid.
- D.2.6 Watertight manhole lids and rings shall be Vulcan #330P or approved equivalent, with "Sanitary Sewer" marked on the lid.
- D.2.7 Standard manhole lids and rings shall be EJIW 1495A Cover, EJIW V1420/1480Z1 Frame or approved equivalent, with "Sanitary Sewer" marked on the lid.



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D.2.8 Valve boxes for force mains shall include an adjustable two piece cast iron box or a non-adjustable 10" cast iron box with lids marked "SEWER".

D.3. Standards for Materials for Stormwater Facilities

D.3.1 Reinforced concrete pipe (RCP) and reinforced concrete box (RCB) culverts with tongue and groove joints are authorized for use with the following requirements:

D.3.1.A. RCP shall meet or exceed the requirements of ASTM specifications C76, C506, C507 and C655.

D.3.1.B. RCB shall meet or exceed the requirements of ASTM specifications for C1577 for the loading.

D.3.1.C. Joint sealing compound shall be used in the connection of tongue and groove joints and meet or exceed requirements of ASTM C990 and AASHTO Designation M-198-10.

D.3.1.D. Appropriate strength classification shall be determined during design review based on embedment depth and surcharge loading during and after installation.

D.3.1.E. Manufacturing plant submittal shall be provided prior to construction for approval, all applicable performance requirements from NCTCOG, ASTM and AASHTO shall apply.

D.3.1.F. Installation shall be in accordance with standard City details, NCTCOG or manufacturer recommended installation guidelines, whichever is more conservative, with the exception that minimum and maximum cover situations will require special consideration.

D.3.2 Corrugated Polypropylene pipe (PP) and fittings up to a maximum size of 36" diameter are authorized for use with the following minimum standards:

D.3.2.A. Polypropylene compound for pipe and fitting production shall be impact modified copolymer meeting the material requirements of ASTM F2881, Section 5 and AASHTO M330, Section 6.1.

D.3.2.B. Bell and spigot joints shall be watertight according to ASTM D3212 with gaskets meeting the requirements of ASTM F477.

D.3.2.C. Appropriate backfill and installation details shall be determined and provided by manufacturer during design review based on loading during and after installation.

D.3.2.D. Detailed shop drawings shall be provided during design review and included as part of the construction plan set showing joint and bend locations of all components. As a general rule, all PP systems shall be installed with the manufacturer's full bell and spigot engagement, "cutting to fit" shall not be allowed in the field. Gasket shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

D.3.2.E. Installation shall be in accordance with ASTM D2321, NCTCOG or manufacturer recommended installation guidelines, whichever is more conservative, with the exception that minimum and maximum cover situations will require special consideration.

D.3.3 Precast Concrete Structures are authorized for use with the following conditions:



D.3.3.A. Structures shall be designed for a minimum H20 loading.

D.3.3.B. Concrete shall have a minimum compressive strength of 5,000psi at 28 days. Steel reinforcement shall be grade 60 and meet or exceed ASTM A-615 or consist of ASTM A-497 welded wire fabric where design allows.

D.3.3.C. In general, modifications to precast structures are not allowed. Where necessary, detailed submittals regarding field modifications may be considered by engineering staff for approval.

D.3.3.D. Manufacturing plant submittal shall be provided prior to construction for approval, all applicable performance requirements from NCTCOG, ASTM and AASHTO shall apply.

D.3.3.E. Installation shall be in accordance with standard City details, NCTCOG or manufacturer recommended installation guidelines, whichever is more conservative, with the exception that minimum and maximum cover situations will require special consideration.

D.3.4 Cast-in-Place (CIP) Concrete Structures are authorized with the following conditions:

D.3.4.A. Approved submittals required for all concrete mix designs, reinforcing steel, and other components per NCTCOG standards.

D.3.4.B. CIP structures shall be constructed per standard City details. Where City details are not available, NCTCOG and/or TxDOT standards shall be referenced.

D.3.4.C. Modifications or other proposed CIP structures shall be submitted for review and approval during the design review process.

D.3.5 Underground Stormwater Storage Facilities shall be considered on a case-by-case basis during the design review process.

D.3.6 Other materials or products not listed in this section are prohibited for use unless otherwise approved by the City Engineer.



APPENDIX E TECHNICAL SPECIFICATIONS

E.1. WASTEWATER LIFT STATION STANDARD SPECIFICATIONS

E.1.1 General Requirements – These specifications shall be considered typical requirements for a 480v 3 Phase, 20 HP lift station installation. Detailed specifications will be given once the voltage, pump horse power, wet well size, etc. are provided. 10 HP and above require a separate Soft Start and Bypass Enclosure. The City may consider alternatives for smaller lift stations serving residential developments of 50 or fewer lots or small nonresidential developments. A street or road shall be provided for all lift stations capable of supporting the City's trucks and equipment and shall be accessible during a 25 year storm event. Plans for lift stations shall be reviewed by the City for approval prior to construction. The design of all lift station shall be prepared by a Professional Engineer licensed in the State of Texas. The design shall include detailed specifications the comply with the requirements of this Section.

E.1.2 Pump Control Panels and Equipment

E.1.2.A. Control Panel Enclosures – The pump control panels shall be fully functional duplex pump control panels provided by a manufacturer approve by the City, including:

- E.1.2.A.i. NEMA 4X, 304 grade stainless steel enclosure with inner door and back plate, pad lockable;
- E.1.2.A.ii. 3-point latch, documents pouch on back of front door. Welded brackets for rack mounting;
- E.1.2.A.iii. Label all control wiring to match drawings;
- E.1.2.A.iv. Provide two sets of hard copy and PDF copy of panel drawings including part and model numbers;
- E.1.2.A.v. 24 vdc surge protection for radar and submersible transducer;
- E.1.2.A.vi. Power monitor with over & under voltage and phase loss protection, fuse primary;
- E.1.2.A.vii. Control power 480v to 120v step down transformer. Primary fused with secondary circuit breaker.
- E.1.2.A.viii. Panel heater with thermostat, Enclosure Heaters, RC 016 Series or equal;
- E.1.2.A.ix. Pump 1 & 2 Seal Fail, light indication, NO pump shutdown;
- E.1.2.A.x. HOA for each pump with on and off light indication. No start or stop push buttons needed;
- E.1.2.A.xi. Provide a two position switch on dead front soft start or bypass contactor. The soft starts will be the primary and the contactor will be the secondary;
- E.1.2.A.xii. Time delay relays to prevent both pumps coming on at the same time after power outage;
- E.1.2.A.xiii. Soft start fault light indication (reset button to be located on soft start enclosure dead front);



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E.1.2.A.xiv. Contactor overload light indication (reset to be located on contactor enclosure dead front);

E.1.2.A.xv. High temperature motor winding shutdown with light indication and manual reset;

E.1.2.A.xvi. Pump Alternator: Time Mark 261DT with toggle, 120v;

E.1.2.A.xvii. Wiremold plastic channel, size channel for 50% fill;

E.1.2.A.xviii. Label backside (terminal side) of dead front with the name of push buttons, switches and indicator lights;

E.1.2.A.xix. Red alarm beacon (side mounted, no top penetration; alarm horn not needed);

E.1.2.A.xx. Provide terminal spaces for incoming sub-transducer, radar, Devar 4-20ma output to SCADA panel and a 6 spare terminals;

E.1.2.A.xxi. Provide a terminal strip in the control panel and a terminal strip in the soft start panel to tie both panels together;

E.1.2.A.xxii. Furnish interconnect wiring between the pump control panel and soft start panel;

E.1.2.A.xxiii. Six inches of dead space at the bottom of Control Panel for customer use.

E.1.2.B. Pump Controller

E.1.2.B.i. Devar Model 3020A-4-420 analog retransmission (NO SUBSTITUTE)

- Relay 1 - Low level
- Relay 2 – Lead Pump On
- Relay 3 – Lag Pump On
- Relay 4 – High Level

E.1.2.B.ii. The Devar “pump on” remains latched until it reaches the “off” level. No holding circuit needed;

E.1.2.B.iii. Devar Low Level will shut down pump(s), manual reset, light indication;

E.1.2.B.iv. Primary level detection: Siemens LR250 Radar land on terminal strip;

E.1.2.B.v. Secondary level detection: Siemens submersible transmitter Model 7MF1572-2HA10 land on terminal strip;

E.1.2.B.vi. Two position selector switch on dead front Transducer 1, Transducer 2 (input to Devar pump controller);

E.1.2.B.vii. There will be “High Level” alarms.n.e from the Devar set-point and the other from a separate high level float;

E.1.2.B.viii. Momentary push button on dead front labeled “Maintenance Pump Down”. This will bypass low level circuit;



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E.1.2.B.ix. Provide dry contacts for SCADA use. Bring down to terminal strip;

E.1.2.B.x. Control Panel Power Loss (get power loss from power monitor)

- High Level Devar
- Low Level Devar
- High level float
- Low level float
- P-1 Status
- P-2 Status
- P-1 Motor over temp
- P-2 Motor over temp
- P-1 Seal fail
- P-2 Seal fail
- P-1 Starter overload
- P-2 Starter overload
- P-1 Soft Start fault
- P-2 Soft Start fault
- Pump 1 in Bypass
- Pump 2 in Bypass

E.1.2.C. Soft Start Enclosure – Cabinet that houses soft starts, bypass contactors, pump breakers, inner connecting terminal strip and soft start power supply etc.

E.1.2.C.i. NEMA 4X 304 stainless steel enclosure with back plate and a pad lockable 3 point latch and documents pouch on back of front door. Size 42"X48"X12" welded brackets for rack mounting. Soft Start Cabinet is oversized to accommodate future pump upgrades;

E.1.2.C.ii. P-1 & P-2 Pump breakers for 20 horsepower; Eaton or equal;

E.1.2.C.iii. Bypass-NEMA rated motor contactors with adjustable electronic overload. Size the overload for the 20hp to be in the middle of the current range; Eaton or equal;

E.1.2.C.iv. Soft Starts (Siemens IT S811 no substitute) no contactor needed with soft starts;

E.1.2.C.v. Soft start fault light indication on pump control panel and soft start panel; start dead front panel; P-1 &2 soft start power supply;

E.1.2.C.vi. Motor starter overload to have light indication on soft start panel dead front and pump control panel dead front. Starter overload reset on soft start dead front.



E.1.2.D. Sacrificial Panel

- E.1.2.D.i. Hoffman A36H2410SS6LP continuous hinge w/ clamps, pad lockable, Type 4X,
- E.1.2.D.ii. 36Hx24Wx10D, stainless steel, with backplate. Or equal
- E.1.2.D.iii. Square D Mfr #: 9080GH110, channel, 1 piece
- E.1.2.D.iv. Square D Mfr #: 9080GR6, terminal Blk Section, quantity 20
- E.1.2.D.v. Square D Mfr #: 9080GH10, end caps, quantity 2
- E.1.2.D.vi. Square D Mfr #: 9080LBA362101, Distribution block, quantity 2
- E.1.2.D.vii. Thomas & Betts # ADR25-21 AL, #6 to 250 kcmil
- E.1.2.D.viii. MTL Surge Technologies Model # ZD16104, 277/480V, 3 Phase
- E.1.2.D.ix. MTL Surge Technologies Model # ZD16100, 120/240V, 1 Phase * See detail drawing

E.1.2.E. Pressure Transmitter

- E.1.2.E.i. Siemens DS3 Pressure Transducer part # 7MLF4033-10A10-1NC6-Z+21 (0-232PSI);
- E.1.2.E.ii. Siemens Block and bleed valve Part # 7MF9011-4F;
- E.1.2.E.iii. 2pr, 18ga. shielded twisted pair control cable;
- E.1.2.E.iv. Rittal JB060604H4-Junction Box-Hinged Cover 6x6x4 NEMA 4X (This box is for the Pressure transducer located in the check valve vault. Mount box close to the 1 inch tap on the common pipe downstream from the check valve. Install ½ inch seal tight flex from the box to the pressure transmitter. Run a 2 pair #18 ga. Shielded twisted pair the SCADA panel to the pressure transducer.

E.1.2.F. Submersible Transducer

- E.1.2.F.i. 2-Siemens Submersible Transducer, part # 7MF1570-1NA01;
- E.1.2.F.ii. Range-0-30 ft h2o, O/P 4-20ma, Standard 82ft cable;
- E.1.2.F.iii. 2- Siemens submersible Transducer cable hangers Part number 7MF1572;
- E.1.2.F.iv. 2-J-hook float bar hangers (5 J hooks on each);
- E.1.2.F.v. 2- Keller Bellow assembly p/n 900001.0009;
- E.1.2.F.vi. No splices in the transducer cable will be permitted;
- E.1.2.F.vii. There will be a two position switch located on the pump control panel dead front marked Transducer 1 and Transducer 2. Both submersible transducers will be run to the wet well. Transducer 1 will be dropped down and hung one foot off wet well floor. Transducer 2 will be coiled up and hung on the float hanger bar.



E.1.3 Panel Rack and Canopy

- E.1.3.A. An electrical equipment rack shall be constructed in accordance to and at the location specified in the plans and specifications. The exact location and orientation shall be approved by the City prior to installation;
- E.1.3.B. The equipment rack shall include all posts, racks, members, connecting hardware, roofing, concrete slab, and other parts as designated by the plan details;
- E.1.3.C. The concrete slab shall be slope to drain and be a minimum of two (2) inches above grade;
- E.1.3.D. Racks shall be grounded per the National Electric Code currently adopted by the City of Weatherford;
- E.1.3.E. Panel mounting members shall be Unistrut or approved equal;
- E.1.3.F. Roof frame, columns and supports shall be 4"x4"x14 gauge square steel tubing, painted with Sherwin-Williams Pro Industrial Acrylic Coating Color SW6741, and shall be constructed in accordance City's standard detail drawing;
- E.1.3.G. All members and required connecting hardware shall be zinc plated;
- E.1.3.H. All members shall be welded with 3/16" fillet and partial penetration grove welds, 4/32" effective throat;
- E.1.3.I. Roof shall be Galvalume R-panel or approved equal.

E.1.4 Concrete Transformer Pad – A 6' x 6' concrete slab with a 5" minimum thickness shall be constructed at the location indicated on the plans in accordance with the plan details, Weatherford Electric specifications and the applicable provisions of the NCTCOG specifications.

E.1.5 Lift Station Site Electrical Systems – The following shall furnished and installed the following items per plan details:

- E.1.5.A. Conduits from Transfer switch to Utility Transformer.
- E.1.5.B. Conductors from Utility Transformer to Transfer Switch.
- E.1.5.C. Load Center and breakers
- E.1.5.D. Transfer Switch
- E.1.5.E. 15kva 480-120/240v Transformer
- E.1.5.F. Fiber Enclosure on panel rack
- E.1.5.G. Ground rod
- E.1.5.H. All power, SCADA, pump control, and fiber conduits. Fiber conduit shall be 2 inch PVC w/ long sweep elbows from panel rack fiber enclosure to hand-hole next to Utility Transformer. Hand-hole provided by City Electric Utilities.
- E.1.5.I. All power, SCADA, and pump control wires. Trac-n-Trol shall provide list of conductors and cables that need to be pulled for SCADA.
- E.1.5.J. Interconnect wiring between the Pump Control Panel and the Soft Start Panel. The interconnect wiring list will be provided by the Pump Control Panel Contractor.
- E.1.5.K. Distribution Panel



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E.1.5.K.i. The power panels and conduit runs shall meet the following specifications/details:

- Transfer Switch
 - Siemens FR355DTK, NEMA 3R, 600v, 400 amp 3/P fused Transfer Switch, On-Off-On (normal-off-generator)
 - DS468GK Ground Lug Kit
 - 6- FR325DTK Lugs
 - 9- Ferraz Shawmut A6T225 fuses
 - DS200EK2 Aux switches 2-n/o, 2-n/c

E.1.5.K.ii. Distribution Panel

- Wiegmann Cat# N4242408WW Junction Box with back plate. NEMA 3R, 24"x24"x8", padlock compatible.
- ILSCO PDH-19A-600-3, 3 phase Power Distribution Block
- NSI Industries 8-350T4 Ground Lug
- NSI AL-P2-K6 Neutral Block
- Eaton circuit breaker WMZT2C30, 2P/30A/240v (CB-1)
- Eaton circuit breaker WMZT3C30, 3P/30A/480v (CB-2)
- Schneider Electric Circuit Breaker C60H, 24733, C60H-2P-63A-B curve (CB-3)
- Schneider Electric Circuit Breaker part # 27727, cat # MG24457, 2P/63A/480v (CB-4)

E.1.5.K.iii. Panel Rack

- One light switch mounted in a bell box with an Intermatic WP1000 weatherproof cover
- 8- Globed Incandescent Light Fixtures, Lithonia VC150I
- 4- single gang bell boxes with duplex receptacle and Intermatic WP1000 weatherproof cover, two on each side of panel rack

E.1.5.K.iv. Load Center

- 12 circuit, NEMA 3R, 120/240 Breaker Stab Load Center
- 10- 20amp s/p breakers

E.1.5.K.v. Conduits

- ¾ inch PVC stubbed up 12 inches out of the antenna base. The conduit on the other side to stub up on the panel rack near the ground rod. Install # 6 copper and bond to the panel rack and at the base of the antenna. Bond Panel rack and antenna tower to ground rod.



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- 1-1/4 inch PVC from SCADA panel to Antenna tower. Rough in conduit to stub out of the center of the antenna concrete base 12 inches. SCADA integrator will install antenna cable.
- 3/4 inch PVC conduit from Load center to Odor Control System. 2-20 amp circuits, 1 for the odor control system and 1 circuit for well pump (if needed). Mount 2 gang bell box next to the Odor Control System. Leave well pump circuit in junction box if not needed.
- 3/4 inch PVC from SCADA panel to inside the check valve vault. Core drill 12 inches below finished grade into the side of check valve vault and run PVC over to the common header of the discharge valves close to the 1 inch tap for the pressure switch.

E.1.6 SCADA System Setup and Integration (By Others) – The SCADA RTU Control Panel for all SCADA functions at the proposed Lift Station shall be provided and installed by the City's SCADA system integrator. The system shall include:

E.1.6.A. One (1) Remote Terminal Unit (RTU) for the purpose of monitoring the proposed lift station. The RTU will include the following material:

- NEMA 4X stainless steel enclosure with 3pt latching mechanism
- Schneider Electric P357 Programmable Controller
- GE/MDS Transnet Spread Spectrum Radio
- Omron 24VDC/4A Power Supply
- Altech UPS Module & Batteries
- 120V Surge Suppression for incoming 120V branch circuit
- 24V Surge Suppression for all analog current signals
- SPDT Isolation Relays for both input and output signal wiring
- 120V/15A duplex convenience outlet

E.1.6.B. One (1) Rohn 25G Free-Standing Antenna Tower as required for telemetry communication. Antenna tower will be shipped to the project site for installation by others. Antenna tower base will require a 4ft x 4ft x 4ft excavated hole. See attached tower drawing for reference.

E.1.6.C. Yagi Directional Antenna, coax and polyphasor as required.

E.1.6.D. RTU programming as required

E.1.7 SCADA Antenna Tower – Shall include concrete antenna tower base and antenna tower per plan details. Antenna tower and hardware shall be provided by SCADA integrator. This item also includes the installation of an LED station light fixture and light switch to the antenna tower at a height of 15' above ground level. Light switch shall be housed in an Intermatic WP1000 weatherproof cover.

E.1.8 Pigging Point Installation – A pigging point assembly shall be installed at the location specified in the plans. The exact location and orientation shall be approved by the City



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prior to installation. The assembly shall include all wyes, fittings, pipe, valve, and concrete slab associated with the pigging point, as designated by the plan details.

- E.1.9 Lift Station Site Surface – The lift station site surface shall consist of 2" washed gravel on 4" flexible base. Flexible base shall conform to the requirements of NCTCOG, Item 301.5 "Flexible Subbase or Base (Crushed Stone/Concrete)". Prior to placing the flexible base, the existing subgrade shall be proof rolled & compacted. A geo-textile filter fabric shall be installed between the compacted subgrade and the flexible base.
- E.1.10 Lift Station Site Gate, 6' Chain Link Fence w/ Barbed Wire Security Top, & Mow Strip – This item consists of the work and materials required to install a gate, 6' chain link fence w/barbed wire security top and 12" wide mow strip around the limits of the proposed lift station site. Materials and installation for the fence shall meet the requirements of NCTCOG Item 801.4 "Chain Link Fence", NCTCOG Item 801.5 "Wire Fence" and the plan details. Materials and installation for the mow strip shall meet the requirements of NCTCOG Item 303 "Portland Cement Concrete Pavement" and the plan details.

E.2. TRAFFIC SIGNAL STANDARD SPECIFICATIONS

- E.2.1 General Requirements – These specifications shall be considered typical requirements for a traffic signal to be constructed in the City of Weatherford
- E.2.2 Color – All signal poles, mast arms, heads, backplates, hardware, clamps, cabinets, pedestal service, risers, sign poles, sign backs, covers, pedestrian poles, push buttons, and any other hardware not listed shall be powder coated black. No deviation from this requirement shall be allowed without the written permission of the City Engineer.
- E.2.3 Hardware are as follows:
 - E.2.3.A. Cabinet – Eight-Phase Paradigm Traffic Standard NEMA TS2 cabinet (part number PTSI-PT-M551228TS2-1) and ASC3-2100 Econolite controller meeting the requirements of Departmental Material Specifications DMS-11170. Provide cabinet with an "A" connector harness for NEMA TS2 type 2 controllers. Provide detector panel toggle switches that additionally permit the user to disconnect the detector.
 - E.2.3.B. ILSNs – Duralight JXM-STN Series LED Internally Illuminated Street Name Signs (ILSN), single sided, mounted on mast arms using Astro-Brac mounting hardware. Name, block number, and City logo shall be required on signs. Product rendering submittal required for approval prior to manufacturing.
 - E.2.3.C. LED Luminaires – LED heads shall be Cooper AF-02-D-U-T3R-10K-4-BK_u0053 (Black)
 - E.2.3.D. Signal Heads – Powder coated black aluminum signal heads and aluminum tubing with back plates, louvers and visors. All signal heads shall be 12" LED.
 - E.2.3.E. Signal Poles – Materials and placement.
 - E.2.3.E.i. 12 circuit Buchanan Type 112SN, Kulka Type 985-GP-12 CU, or equal terminal strips in the signal pole access compartment.
 - E.2.3.E.ii. Provide additional terminal strips of 8 circuits each when more than 12 circuits required. Identify all conductors with plastic label with two straps per tag. Mark poles shafts and mast arms with ID numbers from plans.
 - E.2.3.E.iii. Provide nuts on top and bottom of base plate. Anchor bolts shall be set to that two are in tension and two are in compression.



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E.2.3.E.iv. Provide vertical clearance of 17-19 feet from roadway to the lowest point of signal head or mast arm. All signal heads must be placed a minimum of 40 feet and a maximum of 180' from the stop line. Special situations may be considered for nearside signal heads.

E.2.3.E.v. Vibration dampers shall be installed for mast arms 28-48 feet in length.

E.2.3.F. Pedestrian Pole Assemblies – Shall be in accordance with TxDOT standard specifications and powder coated black. Crossing indications shall be programmed with recorded voice rather than tone.

E.2.3.G. Radar – Econolite AccuScan 600 panels and processing system shall be used.

E.2.3.H. Battery Back-up System for Signal Cabinets – Alpha FXM 2000 Module, AlphaCell 220GXL Batteries, Alpha Outdoor Side Mount 6 Enclosure (powder coat black), transfer switches and all other required appurtenances.

E.2.3.I. Spread Spectrum Radio – E-Lite Dual Int 5.8 GHz 300 Mbps Wireless Radio