ORDINANCE NO. 2019-10-01

AN ORDINANCE OF THE CITY OF WESTON, COLLIN COUNTY, TEXAS, ADOPTING AN ENGINEERING DESIGN STANDARDS MANUAL; PROVIDING A PENALTY FOR VIOLATION NOT TO EXCEED TWO-HUNDRED ($200) DOLLARS PER DAY; PROVIDING FOR CUMULATIVE REPEALER, SEVERABILITY, SAVINGS AND PUBLICATION CLAUSES; AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, the City of Weston, Texas is a Type A general-law municipality located in Collin County, created in accordance with the provisions of Chapter 6 of the Local Government Code and operating pursuant to the enabling legislation of the State of Texas;

WHEREAS, the City Council wishes to adopt uniform engineering design standards to provide for the orderly development of land; and

WHEREAS, the City Council has determined that these regulations are in the best interest of the public health, safety, and general welfare.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF WESTON, TEXAS:

SECTION 1
ADOPTION

The City of Weston Engineering Design Standards Manual, Attachment A, is hereby adopted as an integral tool to guide and manage future growth.

SECTION 3
PENALTY

Any person, firm or corporation who shall violate any of the provisions of this article or who shall fail to comply with any provisions hereof shall be guilty of a misdemeanor and upon conviction, shall be subject to a fine not to exceed Two-Hundred Dollars ($200.00), and each day that such violation continues shall constitute a separate offense and shall be punishable accordingly.

SECTION 4
CUMULATIVE REPEALER CLAUSE

This ordinance shall be cumulative of all other Ordinances and shall not repeal any of the provisions of such Ordinances, except for those instances where there are direct conflicts with the provisions of this Ordinance. Ordinances, or parts thereof, in force at the time this Ordinance shall take effect and that are inconsistent with this Ordinance are hereby repealed to the extent that they are inconsistent with this Ordinance. Provided however, that any complaint, action, claim or lawsuit which has been initiated or has arisen under or pursuant to such other Ordinances on the date of adoption of this Ordinance shall continue to be governed by provisions of such Ordinance and for that purpose the Ordinance shall remain in full force and effect.

SECTION 5
SEVERABILITY CLAUSE

It is hereby declared to be the intention of the City Council that the phrases, clauses, sentences, paragraphs, and sections of this ordinance are severable, and if any phrase, clause, sentence, paragraph or section of this ordinance shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs and sections of this ordinance, since the same would have been enacted by the City Council without the incorporation in this ordinance of any such unconstitutional phrase, clause, sentence, paragraph or section.

SECTION 6
SAVINGS CLAUSE

All rights and remedies of the City of Weston are expressly saved as to any and all violations of the provisions of any ordinance that has accrued at the time of the effective date of this Ordinance; and, as to such accrued violations and all pending litigation, both civil and criminal, whether pending in court or not, under such ordinances, same shall not be affected by this Ordinance but may be prosecuted until final disposition by the courts.

SECTION 7
PUBLICATION CLAUSE

The City Secretary of the City of Weston is directed to publish the caption, penalty clause, and effective date of this Ordinance in the official City newspaper in accordance with the provisions of Section 52.011 of the Texas Local Government Code.

SECTION 7
EFFECTIVE DATE

This Ordinance shall be in full force and effect from and after its passage by the City Council.

PASSED AND APPROVED by Council this 8th **day of** October**, 2019.**

APPROVED

Patti Harrington

Patti Harrington, Mayor

ATTEST

Susan Coffer

Susan Coffer, City Secretary

CITY OF WESTON, TEXAS

ENGINEERING DESIGN STANDARDS MANUAL

PREPARED BY:

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APPROVED ORDINANCE 2019-10-01

OCTOBER 2019

TABLE OF CONTENTS

TABLES

APPENDICES

PART 1
Short Title

1.1. PURPOSE

The purpose of the Engineering Design Manual is to provide a set of minimum standards for designing streets, thoroughfares, drainage facilities, water lines, sanitary sewer lines and preparing construction plans for such facilities that are to be owned, operated and/or maintained by the City of Weston, Texas. These standards will be used by the City Staff and consulting engineers employed by the City for the above described improvement projects, and engineers for private developments in the City of Weston. Unusual circumstances or special designs requiring a variance from the standards in this manual may be approved by the City Council or their designee.

1.2. STANDARDS OF DESIGN

The Standards of Design, as adopted by the City of Weston, are set forth herein. These standards shall be considered as the minimum requirements, and it shall be the responsibility of the developer to determine if more stringent requirements are necessary for a particular development. It is not intended that the Standards of Design cover all aspects of a development. For those elements omitted, the developer will be expected to provide designs and facilities in accordance with good engineering practice and to cause to be constructed facilities utilizing first class workmanship and materials.

1.3. STANDARD SPECIFICATIONS FOR CONSTRUCTION

Standard specifications for construction as adopted by the City of Weston shall be supplemented by the latest Edition of the "Standard Specifications for Public Works Construction" as published by the North Central Texas Council of Governments (NCTCOG Standards). These specifications shall be considered as minimum requirements, and such additional requirements of the City or the developer may consider appropriate should be added as supplements. If there is a conflict between the City of Weston Design Standards and NCTCOG Standards and details, the more stringent requirement shall apply as determined by the City Engineer.

1.4. UTILITY ASSIGNMENTS

In general, utilities are to be located in public rights-of-way in the location shown in Appendix A. The City Engineer shall determine the location of utilities where special circumstances prevent the standard utility assignments from being used.

1.5. NOTES

All construction plans for the projects described above shall contain the applicable general notes listed in Appendix B.

1.6. OWNER'S DEDICATION

All plats shall use all applicable portions of the Standard Owner's Certificate shown in Appendix C.

1.7. STANDARD DETAILS

Standard construction details are shown in Appendix D. Additional details are included in the latest Edition of NCTCOG Standards. All construction plans shall either contain the details that apply or make specific reference to these details as being a part of the construction plans. Additional details shall be prepared as required to describe the construction required. If a standard detail must be modified to fit a specific situation, the change must be approved by the City Engineer.

1.8. RECORD DRAWINGS AND CLOSEOUT DOCUMENTS

Record Drawings ("As Built Drawings") are required to be submitted for all public works construction in the City of Weston. Record Drawings shall be submitted to the City in AutoCAD format on electronic media. One copy of Mylar and one full and half size Xerox copy of Record Drawings shall also be furnished. The Construction Materials Engineering Report in the form of a three ring notebook will also be furnished to the City.

The report will contain at a minimum: a letter from the design engineer summarizing the results of the construction project and confirmation the project meets the minimum standards of the City and the design project; maintenance bonds for public improvements; copies of material submittals for the project; copies of the test results for the public improvements; copies of video for the sanitary sewer and storm sewer; variance requests approved for the project; AutoCAD disc; two half size copies of the record drawings; summary of public improvements in linear feet for water, sewer, and storm sewer, square yards for paving broken out by thickness; and any other public improvement with appropriate measurement unit; any owners or operation manuals for equipment. If there is a question about what should be included, the City Engineer will make the determination.

PART 2 – PAVING

2.1 STREET AND THOROUGHFARE CLASSIFICATIONS

City streets and thoroughfares are classified into several types according to their use and locations as indicated in Table 2-1. The basic types include the residential streets that provide direct access and frontage to adjacent properties, collectors that serve as the distributor-collector arteries and provide direct access to adjacent properties, and parkways and major arterial streets thoroughfares that carry higher volumes of traffic through urban areas. Each traffic artery is made up of elements that are related to the use of that particular facility. These elements include right-of-way, pavement width, median width, if required, arrangement of traffic lanes and parking lanes, curb radii at intersections and other characteristics.

2.2 STREET AND THOROUGHFARE GEOMETRICS

A. General

Geometrics of the City streets and thoroughfares may be defined as the geometry of the curbs or pavement areas that governs the movement of traffic within the confines of the right-of-way. Included in the geometrics are the pavement, widths, degree of curvature, width of traffic lanes, parking lanes, or turning lanes, median width separating opposing traffic lanes, median nose radii, curb radii at street intersections, crown height, cross fall, geometric shapes of islands separating traffic movements and other features. Since City streets and thoroughfares are differentiated by their functions and location, there is also a variance in the geometry that describes the path vehicular traffic should follow. All streets and alleys shall be reinforced concrete pavement except Local Residential which shall be either reinforced concrete or asphalt pavement.

B. Design Vehicles

The geometrics of City street and thoroughfare intersections vary with the different dimensions of the intersection facilities. Criteria for the geometric design of intersections must be based on certain vehicle operating characteristics, and vehicle dimensions. The American Association of State Highway and Transportation Officials (AASHTO) has standardized vehicle criteria into three general designs, and this vehicle data is published in the AASHTO Publication, “A Policy on Geometric Design of Highways and Streets.” In the design of street and thoroughfare intersections for Weston, these vehicle designs are adopted for use. Table 2-2, Design Vehicle Criteria, shall serve as a guide in the selection of the design vehicle to be used in the design of intersections.

TABLE 2-1
STREET AND THOROUGHFARE
GEOMETRIC STANDARDS

Street Type	Street Classifi-cation	FF/Curb Pvmt Width	Min Row Width	Lane	Park-ing	Park-way	Median	Min. Pvmt Thickness	Min. Design Speed
Local (Residential)	2	29’	50’	2-11.0’	Yes	10.0’	0	6”	30
C2U Collector (Undivided)	2	36’	60’	2-11.0’	Yes	11.5’	0	7”	30
M4U Minor Arterial (Undivided)	1	44’	80’	4-11.0’	No	18’	0	7”	35
M4D Arterial (Divided)	1	48’	100’	4-11.0’	No	18’	20’	8”	40
M6D Major Arterial (Divided)	1	72’	120’	6-111.0’	No	14.0’	20’	8”	45

NOTE: Pavement thickness for concrete streets is minimum and shall be thicker if required by the required site specific Geotechnical Report.

TABLE 2-2
DESIGN VEHICLES

	Design Vehicle Used in Intersection Design	
Intersecting Streets Classification	Single Unit Truck (SU)	Tractor Semi-Trailer Combination (WB-50)
Class 1 with Class 1		X
Class 2 with Class 1		X
Class 2 with Class 2		X
Class 3 with Class 1	X	
Class 3 with Class 2	X	
Class 3 with Class 3	X	

NOTES:
a. Single Unit Trucks Design shall use a minimum of 30 ft. radius on curbs and turnouts.
b. Tractor Semi (WB-50) design shall use a minimum of 40 ft. radius.

c. Streets that intersect at something different from 90^{o} shall have a radius that will accommodate the specified design.

C. Design Speed

The design speed is a primary factor in the horizontal and vertical alignment on City streets and thoroughfares. Design features such as curvature, superelevation, radii for turning movements and sight distance are directly related to the design speed. The design speed also affects features such as lane widths, pavement width, pavement cross-fall, pavement crown, and clearance.

The design speed is defined as the approximate maximum speed that can be maintained safely by a vehicle over a given section of road when conditions are so favorable that the design features of the roadway govern. The speed limit or posted speed is the maximum legal speed set by local authorities for a certain roadway or area. The design speed should always be greater than the likely legal speed limit for secondary and major thoroughfares.

The various street and thoroughfare classifications, which make up the system within the City, require different design speeds according to their use and location. Presented in Table 2-1 are the minimum design speeds for the various classifications within the City of Weston. Lower design speeds may be required for all classifications for unusual conditions of terrain or alignment.

D. Horizontal Geometrics

1. General

The horizontal geometrics of City streets and thoroughfares include the segment of geometric design associated with the alignment, intersections, pavement widths, and related geometric elements. The various classifications, utilizing the design speed as a control, must have certain horizontal and vertical geometrics to provide a safe economical facility for use by the public.

2. Horizontal Curves and Superelevation

The alignment of City streets and thoroughfares is usually determined by the alignment of the existing right-of-way or structures that cannot be relocated. Changes in the direction of a street or thoroughfare are minimized by construction a simple curve having a radius that is compatible with the speed of vehicular traffic. To increase the safety and reduce discomfort to drivers traversing a curved portion of a street or thoroughfare, the pavement may be superelevated.

Curvature in the alignment of major thoroughfares and collectors is allowed under certain conditions, but greater traffic volume and higher vehicle speeds that accompany these facilities tend to increase accidents on curving roadways. Curves in the alignment of residential streets usually provide aesthetic values to the residential neighborhoods without affecting the orderly flow of traffic or sacrificing safety.

A recommended minimum radius of curvature for vehicle design speed and pavement cross-slopes is shown in Table 2-3. These are based on traffic consisting of typical present day automobiles operating under optimum weather conditions. There are other important consideration in the design of curves on city streets and thoroughfares including the location of intersecting streets, drives, bridges and topographic features. When superelevation is required on collectors and major thoroughfares, the following basic formula shall be used:

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

Where:

e = of roadway superelevation, foot per foot

f = Side friction factor (See Table 2-4)

V = vehicle design speed, mph

R = radius of curve in feet

For local residential streets minimum centerline radius may be 150 feet when the design speed can be considered to be less than 30 MPH. This decision will be made by the City Engineer by considering the type of proposed development, location of street and length of street.

3. Turning Lanes

Turning lanes are provided at intersections to accommodate left-turning and right-turning vehicles. The need for each will be based on a traffic impact analysis (TIA) prepared by the Developer and approved by the City Engineer. The primary purpose of these turning lanes is to provide storage for the turning vehicles. The secondary purpose is to provide space to decelerate from normal speed to a stopped position in advance of the intersection or to a safe speed for the turn in case a stop is unnecessary. Left run lanes at intersections are usually 10 feet in width When turning traffic is too heavy for a single lane and the cross street is wide enough to receive the traffic, two turning lanes may be provided. Availability of right –of –way may limit locations where this is feasible.

TABLE 2-3
MINIMUM CENTERLINE RADIUS
FOR THOROUGHFARES

Ratof Superelevation, ((In. /Ft.)	Design Speed (MPH)			
	30	35	40	45
-1/2	510	720	945	1310
-3/8	470	660	865	1190
-1/4	435	610	795	1090
-1/8	405	565	740	1005
0	370	530	690	935
+1/8	355	495	645	870
+1/4	335	465	610	815
+3/8	315	440	575	770
+1/2	300	415	545	725

TABLE 2-4
SIDE FRICTION FACTORS
FOR THOROUGHFARES

Street Classification	Side Friction Factor (f)
Class 1	0.155
Class 2	0.160

The location of the median nose at the end of the left turn lane should be so located that left turning traffic will clear the median nose while making a left turn. Other considerations include adequate clearance between the median nose and through traffic on the intersection thoroughfare and locations of the median nose to properly clear the pedestrian crosswalks.

Length of the left turn lanes for Class 1 streets shall be as follows:

TABLE 2-5
LENGTH OF LEFT TURN LANES
FOR THOROUGHFARES

Intersecting Street Classification	Range of Length*
Class 1	100'-150'
Class 2	60'-100'

*Unless the TIA requires a longer turn lane.

The actual length shall be approved by City Engineer based upon the approved TIA.

4. Street Intersections

a. Standard

The intersection, at grade, of major thoroughfares, collector streets, and residential streets at or near right angles form the standard intersection. At the intersection of these arterial types the various geometrics including pavement widths, lane widths, curb radii, median widths, turning lane data, crossfall, crown height and other features differ.

b. Special Intersections

Street and thoroughfare types in the City often intersect at angles less than 90 degrees. The radii required to fit the minimum paths of the design vehicles are longer than those for standard or 90 degree intersections. Special intersections shall be designed using data for the design vehicles as specified in Table 2-2.

5. Sidewalks

Paved sidewalks shall be provided along and adjacent to both sides of all thoroughfares and collectors and along residential or local streets. The minimum standard concrete sidewalk is 5 feet in width in residential areas and 6 feet in non-residential areas. The edge of the sidewalk located nearest the street right-of-way is normally 2 feet from the right-of-way line for residential districts and against the curb for commercial districts. Special sidewalk designs to include a 7-foot sidewalk located adjacent to the street will be considered for approval where warranted. In areas where screening walls are required, sidewalks shall be constructed against the screening wall and have a minimum width of 6 feet.

Sidewalk alignments may be varied to avoid the removal of trees or the creating of excessive slopes when approved by City Engineer.

E. Vertical Alignment

1. Street Grades

The vertical alignment of City streets and thoroughfares should be designed to insure the safe operation of vehicles and should allow easy access to adjacent property. A travelway that is safe for vehicles is dependent on criteria that consider operating speeds, maximum grades, vertical curves and sight distance. In addition to these considerations, other factors related to vertical alignment include storm drainage, crown

and crossfall and the grade and right-of-way elevation relationship. The grade of street or thoroughfare, particularly at its intersections with another grade, is of prime importance in providing a safe, comfortable riding surface. The intersection design of two class 1 streets shall include grades that will result in a plane surface or at least a surface that approximates a plane surface. A vehicle traveling on either thoroughfare should be able to traverse the intersection at the design speed without discomfort. To accomplish a smooth transition, crossfall toward the median of one lane of each thoroughfare may be required. The use of storm drainage inlets in the median shall be avoided if possible.

In drawing the grades of intersecting thoroughfares in the profile view of plan/profile sheets, profiles of all four curbs shall be shown as a continuous line through the intersection.

a. Minimum Grades

Minimum longitudinal grades for streets and thoroughfares are required to insure proper flow of surface drainage toward inlets. Minimum grades are one percent (1.0%) for all pavement having curbs. Where valley gutters are used for intersecting drainage, the minimum grade for valley gutters is one percent (1.0%) for concrete.

b. Maximum Grades

Maximum longitudinal grades shall be compatible with the type of facility and the accompanying characteristics including the design speed, traffic conditions and sight distance.

Arterial and Collector streets must move large volumes of traffic at faster speeds and flatter grades will better accommodate these characteristics. Truck and bus traffic on these type facilities often controls traffic movement, particularly if steep grades prevent normal speeds. The normal maximum street grades allowed are shown in Table 2-6. Steeper grades may be permitted for short lengths where dictated by topographical features or restricted alignment.

TABLE 2-6
MAXIMUM STREET GRADES

Street Classification	Normal Maximum Grade In Percent
Class 1	6%
Class 2	8%

2. Vertical Curves

When two longitudinal street grades intersect at a point of vertical intersection (PVI) and the algebraic difference in the grades is greater than one percent (1.0%), a vertical curve is required. Vertical curves are utilized in roadway design to effect a gradual change between tangent grades and should result in a design that is safe, comfortable in operation, pleasing in appearance and adequate for drainage. The vertical curve shall be formed by a simple parabola and may be a crest vertical curve or a sag vertical curve.

3. Stopping Sight Distance

a. Crest Vertical Curve

When a vertical curve is required, it must not interfere with the ability of the driver to see length of street ahead. This length of street, called the stopping sight distance, should be a sufficient length to enable a

person in a vehicle having a height of 3.675 feet above the pavement and traveling at design speed to stop, before reaching an object in his path that is 0.5-foot in height.

The minimum stopping sight distance is the sum of two distances: one, the distance traversed by a vehicle from the instant the driver sights an object for which a stop is necessary, to the instant the brakes are applied; and the other, the distance required to stop the vehicle after the brake application begins.

The minimum safe stopping sight distance and design speeds are shown in Table 2-7. These sight distances are based on each design speed shown and a wet pavement. The length of crest vertical curve required for the safe stopping sight distance of each street type may be calculated using the formula L=KA and the values of K for a crest vertical curve shown in Table 2-7.

b. Sag Vertical Curve

When a sag vertical curve is required, the vertical curve shall be a sufficient length to provide a safe stopping safe stopping sight distance based on headlight sight distance. The minimum length of sag vertical curve required curve required to provide a safe stopping sight distance may be calculated using the formula L=KA and values of K for a sag vertical curve are shown on Table 2-7.

TABLE 2-7
MINIMUM LENGTH OF VERTICAL CURVE

CREST VERTICAL CURVE		SAG VERTICAL CURVE	
L =	KA where	L =	KA where
L =	Minimum Length Vertical Curve required for safe stopping	L =	Minimum Length Vertical Curve required for headlight control
K =	Horizontal Distance in feet required to effect a one percent change in gradient	K =	Horizontal Distance in feet required to effect a one percent change in gradient
A =	Algebraic Difference in grade	A =	Algebraic Difference in grade

Street Type	Design Speed	Safe Stopping Distance	Normal Crest Vertical Curve K	Normal Sag Vertical Curve K	Minimum Length of Curve
Class 1	45	400	120	90	120
Class 1	40	325	80	70	80
Class 2	35	250	50	50	50
Class 2	30	200	30	40	40

4. Intersection Grades

The grade of an interesting street with the principal street gutter should not be generally more than four percent (4%) either up or down within the first 20 feet beyond the curb line of the principal street. Grade changes greater than one percent (1%) will require vertical curves.

5. Street Cross Section

For curbed streets, the right-of-way shall be graded to drain to the street at a slope of ¼" per foot. Street back slopes and embankment slopes shall not be steeper than 4:1

2.3 SIGHT DISTANCES AT INTERSECTIONS

An important consideration in the design of City streets and thoroughfares is the vehicle attempting to cross the street or thoroughfare from the side street or drive. The operator of the vehicle attempting to cross should have an unobstructed view of the whole intersection and a length of the thoroughfare to be crossed sufficient to permit control of the vehicle to avoid collisions. The minimum sight distance considered safe under various assumptions of physical conditions and driver behavior is related directly to vehicle speeds and to the resultant distance traversed during perception and reaction time and during braking. This sight distance, which is termed intersection sight distance, can be calculated for different street or thoroughfare widths and for various grades upwards and downwards. Intersection sight distance shall be as set forth in AASHTO publication "A Policy on Geometric Design of Highways and Streets," latest Edition. A minimum 10-foot corner clip shall be included at all intersections to be larger if warranted by street classification and posted speeds.

2.4 MEDIAN OPENINGS

The following standards for median openings are established to facilitate traffic movement and promote traffic safety:

Median openings will normally be permitted at all intersections with dedicated City streets. Exceptions would be at certain class 1 streets where due to unusual conditions a hazardous situation would result.

Midblock median openings or other openings with turns permitted into adjacent property will not normally be permitted unless all the following conditions exist:

A. The property to be served is a significant traffic generator with demonstrated or projected trip generation of not less than two hundred and fifty (250) vehicles in a twelve-hour period.

B. The median opening is not less than 400 feet from an intersection with a major thoroughfare.

C. The median opening is not less than 300 feet from an intersection with a minor street.

D. The median opening is not less than 300 feet from any other existing or proposed midblock median opening.

E. The median width is sufficient to permit the construction of a left turn storage lane.

2.5 STREET AND CUL-DE-SAC DIMENSIONS

The maximum length of any cul-de-sac shall be 600 feet measured from curb line of the intersection street to the radius point of turn around. The maximum length between intersecting streets shall not exceed 1200 feet. The maximum number of houses with a single entry shall meet the requirements of the fire code. Right-of-way and pavement widths shall be as follows:

STREET TYPE	RIGHT-OF-WAY RADIUS	PAVEMENT RADIUS

Collector	60	48
Local Street-Residential	60	48

All cul-de-sac turnarounds shall be visible from the intersecting street. The requirements of the City adopted Fire Code will supersede these requirements if more stringent numbers are contained in the fire code.

2.6 DRIVEWAY STANDARDS

A. Maximum Number of Driveways; Minimum Corner Clearance

The maximum number of driveways per platted lot and the minimum spacing between such driveways shall be as provided for in Table 2-8.

TABLE 2-8
MAXIMUM NUMBER OF DRIVEWAYS AND
MINIMUM SPACING BETWEEN DRIVEWAYS
(PER PLATTED LOT)

Land use	Frontage (Feet)	Maximum Number of Driveways Per Property	Minimum Spacing Between Driveways on Same Property
Single-Family	90' or more	2	20
Single-Family	Less than 90'	1	N/A
Attached Housing	90' or more	2	20
Attached Housing	Less than 90'	1	N/A
Non Residential	Less than 250'	1	N/A
Non Residential*	More than 250'	2	100

*One additional driveway may be added for each additional 500 feet of lot width in excess of 250 feet. For driveways on Class 1 thoroughfares, only one driveway is allowed for each 500 feet of lot width instead of 250 feet of width.

NOTE: State standards, if more restrictive, shall apply for properties fronting state or federal roads.

The minimum corner clearance between a driveway and an intersection shall be as provided for in Table 2-9. Corner clearance shall be defined as follows:

The distance between the intersection of the projected curb lines of the two streets and the point of tangency of the driveway curb returns at the street curb.

In no case shall the driveway curb return or the edge of the driveway pavement encroach into the curb return or edge of pavement radius of a street intersection. Encroachment by the curb return or edge of pavement of a driveway onto the frontage of an adjoining property is not permitted.

TABLE 2-9
MINIMUM CORNER CLEARANCES
BETWEEN DRIVEWAY AND INTERSECTION

Type of Street Driveway is On	Type of Street Intersected	MINIMUM CORNER CLEARANCE	
		Approach Side of Intersection	Departure Side of Intersection
Class 1	Class 1	200	150
Class 1	Class 2	200	100
Class 2	Class 1	100	150
Class 2	Class 2	100	100

NOTES:
1) The above distances notwithstanding, any platted lot may have at least one (1) minimum width driveway onto each street that the lot abuts.

2) Service roads shall be classified as an arterial for driveway purposes.

B. Design Standards; Storage Length

Driveway design standards shall be as provided for in Table 2-10.

Driveway storage shall be defined as the distance between the street right-of-way line and the near side of the first intersecting interior aisle. The minimum length of this storage shall be as provided for in Table 2-11.

C. Driveway Grades

The normal driveway grade within the street right-of-way is set at one-quarter inch (1/4") per foot rise above the top of curb at the property line. The minimum elevation of a driveway at the right-of-way line is two inches (2") above the top of curb. Barrier free sidewalk construction requires a maximum driveway grade as measured from the gutter of eight percent (8%).

Where driveway construction or reconstruction must occur off the street right-of-way, the usual maximum grade is fourteen percent (14%). The maximum change in grade without vertical curve is twelve percent (12%) for any 10 feet in distance. Driveways should be profiled for a distance of at least 25 feet outside the right-of-way to insure adequate replacement design.

Due to state laws requiring barrier free construction of sidewalks, steps or other abrupt changes in sidewalk grades are prohibited at driveways.

TABLE 2-10
DRIVEWAY DESIGN STANDARDS

Land Use	Driveway Approach			
	Approach Width in Feet		Curb Radius in Feet	
	Minimum	Maximum	Minimum	Maximum
RESIDENTIAL				
Single Family	10	17	5	10
Attached Housing	20	24	15	30
NON-RESIDENTIAL (UNDIVIDED DRIVEWAYS)				
Office	24	30	15	30
Retail (except Service Station)	24	30	15	30
Service Station	24	40	15	30
Industrial	24	45	25	50
DIVIDED DRIVEWAYS				
Non-Residential	18	24	15	40

NOTES:
1) The minimum and maximum approach widths are for the point where curb radii (from the public street) end or the approach width at the right-of-way line.

2) Where the width of an aislechange or where the approach width is different from the width of the aisle or driveway farther into the property, the following formula shall be used to determine the minimum taper length:

$L = 20 \times W$

Where: L = taper length and

W = difference in width

TABLE 2-11
MINIMUM DRIVEWAY STORAGE LENGTH

Number of Parking Spaces Per Driveway	Minimum Storage Length* (Feet)
Less than 50	18
50 to 200	50
More than 200	78

*Storage length is defined as the distance between the street right-of-way line and the first intersecting aisleway on site.

2.7 Pavement Design

A. Standard Street and Thoroughfare Pavement Design

Table 2-12 shows the minimum required pavement thickness for rigid pavement and the subgrade requirements for various street and thoroughfare types within the City of Weston.

B. Site Specific Pavement Design

A site specific Geotechnical pavement design for 30 year life based on the TIA traffic to be provided by the Developer to determine final design. Use the more stringent of the table or Geotechnical design.

TABLE 2-12
MINIMUM STANDARD STREET AND THOROUGHFARE PAVEMENT DESIGN

Facility Type	Usual Cross Slope	Subgrade Requirements	Concrete Pavement Thickness	Min. Concrete Compressive Strength (PSI)
Local	2%	6" Lime; PI<15	6"	3600
C2U Collector	2%	6" Lime; PI<15	7"	3600
M4U Minor Arterial	2%	6" Lime; PI<15	7"	3600
M4D Minor Arterial	2%	6" Lime; PI<15	8"	4200
M6D Major Arterial	2%	6" Lime; PI<15	8"	4200

NOTE:

1) No Flexible Pavement will be permitted as permanent pavement.

2) Lime is not required where PI is less than 15.

3) Extra thickness of concrete (2") may be used instead of lime treated subgrade with the approval of the City Engineer.

4) Concrete mix to include the number of cement sacks per NCTCOG requirements for the required strength; e.g. 3600 psi to be a six sack cement mix.

5) Fire lanes to meet or exceed the minimum requirements for local streets. These are privately owned and maintained and must meet the requirements of the fire code including 24-foot width and striping.

2.8 PERMANENT LANE MARKINGS

A. Purpose

The purpose of this section is to describe the typical layout of permanent lane markings used by the City of Weston. These marking standards are designated by number or letter types. Numerical designation (i.e., TYPE 1, TYPE 2, etc.) is used to denote markings separating lanes of traffic moving in the same direction and are markings separating lanes of traffic moving in the same direction and are white markings. Alphabetical designations (i.e., TYPE A, TYPE B, etc.) is used to denote marking separating lanes of traffic moving in opposing directions. Therefore, any street section with pavement markings can be fully described by a TYPE number and/or letter combination.

B. Types of Markings

Lane lines and center lines will utilize reflecorized thermoplastic hot applied coatings. The width of the marking shall be as indicated below, four inch (4") buttons only, unless otherwise stated. Lane and cross walk markings are required on all Class 1 and Class 2 thoroughfares. Stop bars are required for each lane at all traffic lights and stop signs.

C. Types of Layouts

The following describes the types of layouts as designated in these standards. Drawings that include specifications of each type are available from the City of Weston.

TYPE 1: is a skipped white line normally used on streets having four or more lanes. The normal stripe/skip cycle of 15'/25' is used with a 4-inch wide stripe.

TYPE 2: consists of a single solid white line, four inches wide, normally to designate special lane control (RIGHT LANE MUST TURN RIGHT).

TYPE 3: consists of a single solid white line, eight inches wide to designate a left turn bay.

TYPE 4: consists of a 12-inch wide solid white line used to designate each side of a cross walk.

TYPE 5: consists of a 24-inch wide solid white line used to designate a stop bar.

TYPE A: is a skipped yellow centerline used on roadways of only tow lanes of traffic. The normal stripe/skip cycle of 15'/25' is used with a four-inch wide stripe.

TYPE B: is a solid yellow centerline used on undivided four lane roadways. These markings consist of two solid four-inch wide yellow stripes with a four-inch space.

2.9 STREET SIGNS AND STREET LIGHTING

A. Street Signs

The developer shall furnish and install all streets signs required for the development. The minimum signage is as follows:

1. One street sign at each street intersection displaying the name of each street.

2. Stop signs and yield right-of-way signs at locations designated by the City Engineer.

3. Speed limit signs located at the entrance to each alley.

4. For each street terminating in a cul-de-sac, a "Dead End Street – No Outlet" sign.

Other signage shall be installed as required by the City Engineer to provide for the safety of the public.

B. Street Lights

The developer shall erect street lights meeting the City's subdivision ordinance. Street lights shall be installed at spacing of not more than 400 feet and at each street intersection and each cul-de-sac. Street lights shall be installed in accordance with the National Electrical Code and the City's Standard Details.

2.10 CONSTRUCTIONS PLAN PREPARATION

A. General

All paving plans for constructing street and thoroughfare improvements in the City of Weston shall be prepared in accordance with the City of Weston's procedures.

Plans for subdivision construction should be adequate to allow for review and construction inspection.

If the paving project includes storm drainage improvements, the hydraulic design of the proposed storm shall be accomplished based on procedures and criteria outlined in this manual.

B. Plan Set

Plans shall include a cover sheet, paving plan-profile sheets, typical paving section, paving cross sections, drainage area map, drainage plan-profile sheets and drainage cross sections if required.

C. Paving Plan-Profile Sheets

Usually, paving plan-profile sheets shall be prepared on a horizontal scale of one-inch equals twenty feet and a vertical scale of one-inch equals five feet. Plans shall be prepared on 22"x34" sheets – sized to be true scale when printed half size.

1. Plan

a. In the plan view the centerline of the street shall be drawn and stationed at one hundred foot intervals and each sheet shall begin and end with even or fifty foot stations.

b. Sufficient data including monuments and other survey controls shall be shown on the plans to permit establishment and staking of the centerline of the project from the construction plans.

c. If a survey line or transit line is required to locate the street or right-of-way, it shall be properly identified and dimensioned from the centerline. Also shown on the plan view shall be the geometrics and dimensions of the proposed paving improvements including curbs, curb and gutter median, pavement edges, driveways, sidewalks, alley approaches, street headers, temporary pavement. Where the cut or fill at the property line exceeds on foot, the top of the cut slope or the toe of the fill slope shall be shown on the plan.

d. Property line and right-of-way line information shall include dimensions of existing and proposed property lines and right-of-way. Right-of-way dimensions shall be shown on the proposed street and on intersection streets. Each lot fronting on the proposed street shall be dimensioned and the lot and block number, house number, and ownership shown on the plan.

e. The proposed paving improvements may be shaded as necessary to clarify the intent of the plans. Pavement dimensions, unless otherwise noted, shall be to the face of the curbs.

f. Proposed storm drains and inlets shall be shown on the plan and the paving station at the centerline of the inlet shall be shown as well as the inlet size, type inlet, top of curb elevation and inlet flow line. Existing storm drains and utilities shall be shown located by dimension and the name and size of each noted.

g. Other data shown on the plan shall include a benchmark which will remain after construction of the improvements, flow arrows indication direction of storm water run-off, street names, match lines, scale and north arrow.

2. Profile

a. The profile portion of the plan-profile sheet shall show the existing ground profile at each right-of-way line, the proposed top of curb profile at each side of the street. If the street has a median, the profiles of the median curbs shall also be shown. At street intersections, the top of the curb elevation at the horizontal P.C. and P.I. of the curb radius and the paving station shall be shown in the profile and the name of the intersection street shall also be shown.

b. Street grades should be set according to generally accepted engineering principles. Of overriding importance is the safety of all persons and vehicles using the street. The convenience and comfort of thru traffic must be balanced against the necessity to serve the abutting property keeping in mind that the property owners will be assessed for part of the cost of paving.

c. The proposed street grade shall be indicated in percent to the nearest hundredth percent. Vertical curve data shall be shown including length of vertical curve, external distance, station and elevation at point of vertical curvature (PVC) and the station and elevation at point of vertical tangency (PVT)

d. Elevations of the proposed top of curb shall be shown at each one hundred-foot station and fifty-foot station including elevations on vertical curves at these stations. Low points on sag vertical curves and high points on crest vertical curves shall also be shown.

2. At some convenient locations (preferably on a separate detail sheet), one or more typical paving sections shall be presented including the required dimensions of pavement width, lane widths, right-of-way width, type of thickness of pavement, subgrade, curb, driveway grades and the location of walks.

3. Special Details and Specifications

a. Special details not shown on Standard Construction Details shall be included in the plans. Structural details for bridges, special retaining walls, headwalls, junction boxes, culverts, and special inlets shall be provided as well as bridge railings, hard railings, special barricades (permanent and temporary) and warning signs. Material and installation specifications not included n the NCTCOG Specifications for Public Works Construction shall be submitted in writing as a part of the special Provisions. A sequence of Construction shall be prepared were applicable which will allow traffic movement through projects along existing streets.

b. Structural analysis computations shall be provided in a legible form for any existing structure which will act as a support or supplement to the designed facility. Items on the plans requiring special provision and special construction techniques shall be clearly delineated on the plans and specifically called to the City’s attentions by letter prior to final plan submission.

PART 3 – DRAINAGE

3.1 STORM DRAINAGE SYSTEM

General:

The city of Weston has adopted the North Central Texas Council of Governments iSWM Technical Manual, latest edition, to be used for design and construction of drainage facilities. Manuals adopted include: Planning, Water Quality, Hydrology, Hydraulics, Site Development Controls, Construction Controls, Construction Control Standard Details, Landscape, and Revisions to Manuals. Questions related to the use of the design methods to be used shall be determined by the City Engineer. These manuals are available from NCTOG at http://iswm.nctcog.org/.

Drainage facilities shall be designed and constructed at such locations and of such size and dimensions to adequately serve the development and the contributing drainage area above the development. The developer shall provide all the necessary easements and right-of-ways required for drainage structures including storm drains and open channels, lined or unlined. Easement widths for storm drain pipelines shall not be less than fifteen (15') feet, and easement widths for open channels shall be at least twenty-five (25') feet wider than the top width of the channel. In all cases, easements shall be of an adequate size to allow proper maintenance, including unobstructed access to the easements.

The design flows for the drainage system shall be calculated in accordance with the referenced iSWM methods referenced in this document. Curbs, inlets, manholes, etc., shall be designed and constructed in accordance with the Standard Details. Materials and construction procedures shall conform with the requirements of the Standard Specifications for Construction.

The developer shall comply to all requirements of the Environmental Protection Agency, the U.S. Army Corps of Engineers, State and Local Agencies and shall obtain all permits required by these agencies.

The developer shall provide plans and specifications and design calculations for all drainage structures. The drainage facility requirements will depend on the type of street used within the subdivision as follows:

All storm water shall be carried within the paved street surface or in an enclosed pipe system or both.

Where an enclosed pipe system is required, a rock gabion lined open channel may be substituted for the pipe system when the equivalent pipe size exceeds 66-inches. For flows that exceed the capacity of an equivalent 84-inch pipe, an unlined open channel with a concrete pilot channel constructed in accordance with the drainage details may be used. All open channels that are not rock gabion lined shall be designed to prevent erosion. The methods used to prevent erosion specifically shall be approved by the City Engineer.

The design, size, type and location of all storm drainage facilities shall be subject to the approval of the City Engineer. The requirements set forth herein are considered minimum requirements. The developer and his engineer shall bear the total responsibility for the adequacy of design. The approval of the facilities by the City Engineer in no way relieves the developer of this responsibility.

The developer shall be responsible for the necessary facilities to provide drainage patterns and drainage controls such that properties within the drainage area, whether upstream or downstream of the development, are not adversely affected by storm drainage from facilities on the development.

Storm drainage released from the site will be discharged to a natural water course of an adequate size to control the peak runoff expected after development.

3.2 HYDROLOGY

A. Design Criteria

In the iSWM Hydrology Manual, Table 1.1 Applications of the Recommended Hydrologic Methods, outlines the applicability of the various methods available to calculate rainfall runoff. The specific site characteristics shall be utilized to select the proper method of analysis.

B. Rainfall Intensities

In the iSWM Hydrology Manual, Section 5.0 Rainfall Tables provides rainfall intensities to be used for applicable hydrology methods.

The minimum storm frequency used will be according to the facility to be designed as listed in Table 3-1. Emergency overflows where used are to be located at sags and T-intersections of streets and designed to prevent erosion and surface water damage.

TABLE 3-1
DESIGN STORM FREQUENCY

Drainage Facility	Storm Frequency
Pipe storm sewers with emergency overflow to give a combined capacity of 100-year frequency	10 years
Pipe storm sewer with no emergency overflow	100 years
All open channels with a minimum of 2 feet freeboard above to the top of the bank	100 years
Culverts (pipe or concrete box)	100 years
Bridges, low point of bridge beams or similar bridge deck supporting structure to be 2 feet above 100-year storm or highest flood recorded, whichever is greater	100 years

C. Rational Method

Refer to the iSWM Hydrology Manual, Table 1.1 Applications of the Recommended Hydrologic Methods, for details of the use of the Rational and Modified Rational Methods.

D. Unit Hydrograph Method

Refer to the iSWM Hydrology Manual, Table 1.1 Applications of the Recommended Hydrologic Methods, for details on the unit hydrograph method.

E. Design According to FEMA-FIA Requirements

All streams have floodway or flood plains designation by FEMA-FIA must be designated to meet the requirements of these agencies.

3.3 Runoff Coefficients and Time of Concentration

Runoff coefficients and time of concentration calculations to be per the appropriate iSWM methodology.

3.4 Design of Drainage Facilities

In the iSWM Hydraulics Manual, the following information can be found related to design of street drainage, closed conduit drainage, storage/detention design, open channels, culverts, bridges, and energy dissipation.

A. Flow in Gutters and Inlet Locations

Storm drain conduits shall begin at the point where the depth of flow based on the 100-year storm frequency reaches a point not greater than the top of curb elevation. For pavement sections that do not have curbs, including alleys, the 100-year storm shall be contained within the right-of-way. Inlets are then located as necessary to remove the flow based on a 10-year storm frequency. If, in the judgment of the Engineer, the flow in the gutter would be excessive under either of these conditions, then consideration should be given to extending the storm sewer to a point where the gutter flow can be intercepted by more reasonable inlet locations. Multiple inlets at a single location are permitted in extenuating circumstances. Where possible, inlets should be placed upstream from an intersection to prevent large amounts of water from running through intersections. Inlets should also be located on the approach street to an intersection and in alleys where necessary to prevent water from entering these intersections in amounts that would cause the allowed street capacity to be exceeded.

The use of the street for carrying storm water shall be limited to the following:

Spread of Water – 10-year Storm Frequency

Class 1 Streets with curbs and gutters – One traffic lane on each side to remain clear.

Class 2 Street – One traffic lane to remain clear.

Spread of Water – 100-year Storm Frequency

Notwithstanding the requirements above, all storm water in the 100-year storm frequency shall be contained within the street or alley right-of-way or within the drainage easement. The water depth shall not be greater than any top of curb elevation.

B. Capacity of Streets and Alleys

Figure 1.2 in the iSWM Hydraulics Manual provides flow in triangular channels that may be used for computing the capacity of streets and alleys having a straight cross slope. The capacity of streets with parabolic crowns may be calculated from this nomograph using the composite section that most closely approximates the parabolic section. All street and alley capacities shall be calculated using a roughness coefficient of n = 0.0175

C. Capacity of Swales

The capacity of swales shall be calculated according to the Manning Equation. All calculations shall be made using a roughness coefficient from Table 3.5 of the iSWM Hydraulic Manual.

D. Valley Gutters

The use of valley gutters to convey storm water across a street intersection is subject to the following criteria:

1. A Class 1 street shall not be crossed with a valley gutter.

2. Wherever feasible, a Class 2 street shall not be crossed with a valley gutter.

3. At any intersection, perpendicular valley gutters will not be permitted and parallel valley gutters should cross only the lower classified street.

E. Alley Capacities

In residential areas where the standard alley section capacity is exceeded, curbs may be used to provide needed capacity. However, all storm drainage shall be contained in the alley right-of-way and may not encroach onto private property especially at connecting driveways.

F. Sizing and Location of Inlets

For determining the size and locations of inlets, the following shall be used as a minimum:

TABLE 3-2
INLET OPENING REQUIREMENTS

Street Grade	Length of Inlet Opening for Each C.F.S. of Gutter Flow
Sags	0.6 Feet
Less than 2%	1.0 Feet
Greater than 3.5%	2.0 Feet

Inlets shall be spaced no closer than 300 feet apart without special permission from the City. The maximum length of an inlet at one location shall be 20 feet on each side of the street.

No more than 5 cfs can cross intersections in residential areas and no bypass of storm water across major intersections shall be allowed.

G. Hydraulic Gradient of Conduits

After the computation of the quantity of storm runoff entering each inlet, the size and gradient of pipe required to carry off the design storm are to be determined. All hydraulic gradient calculations shall begin at the outfall of the system. The following are the criteria for the starting elevation of the hydraulic gradient:

1. The 100-year water surface elevation in a creek, stream or other open channel is to be calculated for the time of peak pipe discharge in the same storm and that elevation used for beginning the hydraulic gradient.

2. When a proposed storm sewer is to be connected to an existing storm sewer system that has a design flow less than the proposed, the hydraulic gradient for the proposed storm sewer should start at the elevation of the existing storm sewers hydraulics gradient based on the proposed design year of the upstream system.

H. Hydraulic Design of Closed Conduits

All closed conduits shall be hydraulically designed for full flow as shown in Section 1 of the iSWM Hydraulics Manual.

The crown of the pipe should be near the elevation of the hydraulic gradient, in most cases to eliminate excessive excavation. The hydraulic gradient shall not be designed above the top of any inlet. The permissible difference between the hydraulic gradient and top of curb is normally 2 feet or 1.5 $V^2/2g$ where V is the velocity in feet per second and g is 32.2 feet per second. The hydraulic gradient in the inlet shall not be higher than 1 foot below the top of the inlet.

I. Velocity in Closed Conduits

Pipe grade shall be set to produce a velocity of not less than 3 feet per second (fps) when flowing full. Grades producing velocities of less than 3 fps will not be allowed. All storm sewer pipe and driveway culverts shall be a minimum of 18 inches in diameter. Discharge velocity shall be calculated with a tailwater depth not greater than the lesser of the top of the pipe at the pipe outlet or the actual 100-year water surface elevation in the channel.

Table 3-5 shows the maximum allowable velocities in closed conduits:

TABLE 3-3
RECOMMENDED MAXIMUM VELOCITY

Type of Conduit	Maximum Velocity
Culverts	15.0 fps
Inlet Laterals	15.0 fps
Storm Sewers	12.5 fps

Discharge velocities cannot exceed the permitted velocity of the channel or conduit at the outfall.

J. Roughness Coefficients for Conduits

The recommended value for the roughness coefficient “n” for concrete conduits with smooth joints and good alignment is 0.013. Where engineering judgment indicates a value other than 0.013 be used, the appropriate adjustments should be made in the calculations and the variance noted.

K. Head Losses

1. Head losses and gains for wyes and pipe size changes will be calculated by the formulas:

Where $V_1 < V_2$

$$H_1 = \frac{V_2^2}{2g} - \frac{V_1^2}{2g}$$

Where $V_1 > V_2$

$$H_1 = \frac{V_2^2}{4g} - \frac{V_1^2}{4g}$$

Where:

H_1 = the head loss in feet measured at the point of wye or pipe size change
V_1 = upstream velocity
V_2 = downstream velocity

2. Head losses and gains for inlets, manholes and junction boxes will be calculated by the formula:

$$H_1 = \frac{V_2^2}{2g} - K\frac{V_1^2}{2g}$$

Where:

H_1 = the head loss in feet measured from the downstream water surface elevation
V_1 = upstream velocity or velocity in the lateral
V_2 = downstream velocity
K = 0.50 for Inlet or junction box on main line
K = 1.25 for Manhole or inlet at beginning of line
K = 0.60 for 60° Wye Connection
K = 0.75 for 45° Wye Connection
K = 0.95 for 22.5° Wye Connection

Head losses for pipe bends will be calculated by the formula:

$$H_1 = K\frac{V^2}{2g}$$

Where:

H_1 = the head loss in feet measured at the upstream end of the bend
V = the pipe velocity
K = 0.50 for 90° Bend
K = 0.43 for 60° Bend
K = 0.35 for 45° Bend
K = 0.20 for 22.5° Bend

The use of pipe bends is discouraged and will be allowed only in special situations with the permission of the City Engineer.

In the case where the inlet is at the very beginning of a line, the equation becomes the following without any velocity of approach:

$$H_1 = K_1\frac{V^2}{2g}$$

Where: K_1 = 1.25

The minimum head loss to be used at wyes, junctions, manholes, and pipe size changes for design of storm drainage system is 0.10 foot.

L. Open Channels

Open channels may be used to convey storm waters where closed conduits are not justified economically. A wide variety of lined, partially lined or unlined channels are permitted except that lined channels may not be constructed in single family, multi-family or City housing residential developments. All lined channels must be screened by continuous adjacent landscaping of at least 4 feet in height. In general, the use of existing channels in their natural condition is encouraged. Low flow pilot channel lining of earthen channels will be required for any earthen channel carrying more than the capacity of an equivalent 84" diameter pipe. The design of the low flow pilot channel shall be as shown in Figure 3-2.

For residential developments, no more than two barrel box culverts will be permitted for stream crossings, except in unusual conditions. For unlined channel sections, the maximum side slopes are 4:1 and the maximum permitted mean velocity in the channel is 6 feet per second. Channel side slopes that are steeper than 5:1 shall be hydromulched in accordance with sections 202.6 of the NCTCOG Specifications. Temporary erosion control per Section 201 of the NCTCOG specifications is required for all channels.

For lined portions of channel sections, the sides may be vertical if the height of vertical wall does not exceed 3 feet. Paved and rip-rapped slopes are to have a side slope of 2:1 maximum. Permitted velocities in totally lined channels are 15 feet per second for finished concrete and 10 feet per second for rock rip-rap. Discharge velocities from lined channels may not exceed 6 feet per second. The minimum velocity in any channel shall be greater than 2 fps, including roadway ditches.

M. Hydraulic Design of Open Channels

The water surface as designed in an open channel is to be a minimum of 1 foot below the top of the channel section for concrete lined channels and 2 feet below the top of the channel section for rock rip-rap and earthen channels to provide a margin of safety for channel obstructions and for flows that exceed the design storm frequency.

Special care must be taken at entrances to closed conduits and culverts to provide the headwater requirements.

On all channels the water surface elevation, which is coincident with the hydraulic gradient, shall be calculated and shown on the construction plans.

Maximum allowable velocities and roughness coefficients for open channels are shown in Section 3.2.3 of the iSWM Hydraulics Manual. When the normal available grade would cause velocities in excess of the maximums, it may be necessary to design special drops or channel retards.

N. Hydraulic Design of Culverts

In the design of culverts, the Engineer shall keep head losses and velocities within reasonable limits while selecting the most economical structure. This normally requires selecting a structure that creates a head water condition and has a velocity of flow safely below the allowed maximum.

The vertical distance between the upstream design water surface and the roadway or bridge elevation is termed "freeboard". The dimension is included as a safety factor to protect against unusual clogging of the culvert and to provide a margin for future modifications in surrounding physical conditions. Normally, a minimum of 2 feet shall be considered a reasonable freeboard when the structure is designed to pass a

design storm frequency of 100-years. Unusual surrounding physical conditions may be cause for a change in this requirement.

Hydraulic design of culverts shall be in accordance with Chapter 3, iSWM Hydraulics Manual.

O. Headwalls and Entrance Conditions

Headwalls are to be used to protect the embankment from erosion and the culvert from displacement. Sloped headwalls conforming to the minimum slope specified in this Design Manual shall be constructed at the end of all pipe drainage facilities and vertical headwalls with wingwalls and aprons shall be constructed for all rectangular shaped hydraulic structures.

Special headwalls and wingwalls may be required at the entrance of all hydraulic structures where approach velocities are in excess of 8 feet per second. Culvert exit and headwall shall be designed such as the flow line of the culvert is coincident with the flow line of the stream or channel into which the culvert discharges.

The maximum exit velocity form the culvert is limited to the maximum velocity allowed in the stream or channel. Concrete rip-rap is to be sued to protect the stream bed from scour and erosion. The rip-rap shall be reinforced and have toe walls to prevent undermining.

P. Headwalls and Exit Conditions

Headwalls are used to protect the embankment from erosion and the culvert from displacement. The headwalls, with or without wingwalls and aprons, shall be constructed in accordance with the standard drawings as required by the physical conditions of the particular installation.

Culvert exits and headwalls shall be designed such that the flow line of the culvert is coincident with the flow line of the stream or channel into which the culvert discharges. The maximum exit velocity from the culvert is limited to the maximum velocity allowed in the stream or channel.

Due to the geometry of the culvert-stream intersection, turbulence or other conditions may tend to produce erosion. Concrete rip-rap will be used to protect the stream bed from scour and erosion. The rip-rap shall be reinforced and have toe walls to prevent undermining.

Q. Bridge Design Hydraulics

Once a design discharge and a downstream depth of flow have been determined, the size of the bridge opening can be determined. Determination of head losses through bridge structures shall be calculated.

The City of Weston has the following policy with regard to the hydraulic design of bridge structures:

1. Minor head loss due to the structure is allowed. Normal losses due to channel cross sections are allowable.

2. Excavation of the natural channel is not normally allowed as compensation for loss of cross sectional area.

3. Channelization upstream or downstream of the proposed bridge will normally not be permitted.

Hydraulic design for bridges shall conform to the requirements of Chapter 3, iSWM Hydraulics Manual.

5 2-foot freeboard is required between the 100-Year water surface and the bottom of the lowest beam.

6 Bridge design shall meet all FEMA requirements when a designated floodway is crossed.

3.5 CONSTRUCTION PLANS PREPARATION

A. Drainage Area Map

The drainage area map shall have a minimum scale of 1" = 200', and show the street right-of-way. For large drainage areas, a map having a minimum scale of 1" = 2000' is usually sufficient.

The following items/information shall be included:

1. Acres, coefficient, and intensity for each drainage sub-are;

2. Inlets, their size and location, the flow bypass for each, the direction of flow as indicated by flow arrows, the station for the centerline of the line;

3. A chart including data shown shall be submitted with the first review, and included on the map with the final review;

4. Existing and proposed storm sewers;

5. Sub-areas for alleys, streets, and off-site areas;

6. Points of concentration;

7. Runoff to all inlets, dead-end streets, and alleys or to adjacent additions and/or lots;

8. A table for runoff computations;

9. Flow arrows to indicate all crests, sags and street and alley intersections;

10. North arrow;

11. Any off-site drainage shall be included;

12. Street names shall be included;

13. 100-year floodplain shall be indicated on the drainage area map.

When calculating runoff, the drainage area map shall show the boundary of the drainage area contributing runoff into the proposed system. This boundary should be determined from a map having a maximum contour interval of 2 feet. The area shall be further divided into sub-areas to determine flow concentration points or inlet locations. The centerline of all streets (except Residential of Local Streets) will normally be a boundary of a drainage area, to insure that inlets are sized and positioned to fill the need without depending on storm water crossing over the street crown for proper drainage.

In residential areas, the centerline of the street will only be used as a drainage area boundary if the flow in either gutter has not exceeded the street crown elevation.

Direction of flow within streets, alleys, natural and man-made drainage ways, and at all system intersections, shall be clearly shown on the drainage area map and/or paving plans. Existing and proposed drainage inlets, storm sewer pipe systems and drainage channels shall also be clearly shown and identified on the drainage area map. Storm sewers shall show and mark station ticmarks at 100-foot intervals. Plan-profile storm sewer or drainage improvement sheet limits and match lines shall be shown with pipes and channels identified.

The drainage area map should show enough topography to easily determine its location within the City.

B. Plan-profile Sheets

1. Inlets

Inlets shall be given the same number designation as the area or sub-area contributing runoff to the inlet. The inlet number designation shall be shown opposite the inlet. Inlets shall be located at or immediately downstream of drainage concentration points. At intersections, where possible, the end of the inlet shall be ten feet from the curb return P.T., and the inlet location shall also provide minimum interference with the use of adjacent property. Inlets in residential areas should be located in streets and alleys so the driveway access is not prohibited to the lots. Inlets located directly above storm sewer lines, as well as lateral passing through an inlet, shall be avoided. Drainage from abutting properties shall not be impaired, and shall be designed into the storm drainage system.

Data opposite each inlet shall include paving or storm sewer stationing at centerline of inlet, size and type of inlet number or designation, top of curb elevation and flow line of inlet as shown on construction plans.

2. Laterals

Inlet laterals leading to storm sewers, where possible, shall enter the inlet and the storm drain main at a 60-degree angle from the street side. Laterals shall be four feet from top of curb to flow line of inlet, unless utilities or storm sewer depth requires otherwise. Laterals shall not enter the corners or bottoms of inlets. Lateral profiles shall be drawn showing appropriate information including the hydraulic gradient and utility crossings. Short lateral (30 feet or less) crossings utility lines will be profiled.

3. Storm Sewer

In the plan view, the storm sewer designations, size of pipe, and length of each size pipe shall be shown adjacent to the storm sewer. The sewer plan shall be stationed at one hundred (100) foot intervals, and each sheet shall begin and end with even or fifty (50) foot stationing. All storm sewer components shall be stationed.

The profile portion of the storm sewer plan-profile sheet shall show the existing and proposed ground profile along the centerline of the proposed sewer, the hydraulic gradient of the sewer, the proposed storm sewer, and utilities that intersect the alignment of the proposed storm sewer. Also, shown shall be the diameter of the proposed pipe in inches, and the physical grade in percent. Hydraulic data for each length of storm sewer between interception points shall be shown on the profile. This data shall consist of pipe diameter in inches, the 100-year design storm discharge in cubic feet per second, slope of hydraulic gradient in percent, Manning capacity of the pipe flowing full in cubic feet per second, velocity in feet per second, and $V^2/2g$. Also, the head loss at each interception point shall be shown.

Elevations of the flow line of the proposed storm sewer shall be shown at one hundred (100) foot intervals on the profile. Stationing and flow line elevations shall also be shown at all pipe grade changes, pipe size changes, lateral connections, manholes and wye connections. All soffits shall be connected.

4. Creek Cross-Sections

All plan sheets shall be drawn in ink on 24” x 36” material, to a standard engineering scale, and shall be clearly legible when sheets are reduced to half scale. After each review, all review comments shall be

addressed, additional data incorporated, and drafting of plans completed. Each plan-profile sheet shall have a benchmark shown.

3.6 CHECK LIST FOR STORM DRAINAGE PLANS

A. Drainage Area Map

1. Normally, use 1" = 200' scale for on-site, and 1" = 400' for off-site. Show match lines between any two (2) or more maps.

2. Show existing and proposed storm drains and inlets with designations.

3. Indicate sub-areas for alley, street, and off-site areas.

4. Indicate contours on map for on and off-site.

5. Use design criteria as shown in design manual.

6. Indicate zoning on drainage area map.

7. Show points of concentration and their designations.

8. Indicate runoff at all inlets, dead-end streets and alleys, or to and from adjacent additions or acreage.

9. Provide runoff calculations for all areas showing acreage, runoff coefficient, and inlet time. (Q = CIA table)

10. For cumulative runoff, show calculations.

11. Indicate all crests, sags, and street and alley intersections with flow arrows.

12. Identify direction of north to top page or the left.

13. Show limits of 100-year fully developed flood plain on drainage area map.

B. Storm Sewers

1. Diversion of flow from one natural drainage area to another will not be allowed.

2. Show plan and profile of all storm sewers.

3. Specify Class III Reinforced Concrete Pipe (RCP) unless otherwiseapproved by the City Engineer in private drainage easements maintained by other than the city of Weston.

4. Use heavier than Class III pipes where crossing railroads, areas of deep fill and areas subjected to heavy loads.

5. Specify concrete strength for all structures. The minimum allowable is 3600 psi.

6. Provide inlets where street capacity is exceeded. Provide inlets where alley runoff exceeds intersecting street capacity.

7. Do not allow storm water flow from streets into alleys.

8. Do not use high velocities in storm sewer design. A maximum discharge velocity of six (6) fps at the outfall is required. Velocity dissipation may be necessary to reduce erosion.

9. Flumes may not be allowed unless specifically designated, and will not be allowed on Class 1 & 2 thoroughfares.

10. Provide headwalls and aprons for all storm sewer outfalls. Provide rip-rap around headwalls where slopes exceed 4:1.

11. Discharge flow lines of storm sewers to be two (2) feet above the flow line or creeks and channels, unless channel lining is present. Energy dissipation shall be provided when specified by the City Engineer.

12. Where fill is proposed for trench cut in creeks or outfall ditches, compaction shall be 95% of the maximum density as determined by ASTM D 698.

13. Investigations shall be made by the engineer to validate the adequacy of the storm sewer outfall to a major stream.

14. Outfall area must have adequate capacity to carry the discharge. Provide erosion control facilities with hydraulic data.

15. Any off-site drainage work or discharge to downstream property will require an easement. Easements shall be sized such that the developed flows can be conveyed within the easement. Submit field notes for off-site easement that may be required (Private development only).

C. Plan and Profile

1. Indicate property lines and lot lines along storm sewers, and show easements with dimensions.

2. If necessary, provide separate plan and profile of storm sewers, the storm drain pipes should also be shown on paving plans with a dashed line, and on sanitary sewer profiles showing the full pipe section.

3. Tie storm sewer system stationing with paving stations.

4. Show pipe sizes in plan and profile.

5. Show hydraulics on each segment of pipe profile to include: Q_{10} , Q_{100} , C = Manning full flow capacity, S, V, $V^2 / 2g$.

6. Show curve data for all storm sewer system.

7. Show all existing utilities in plan and profile. On storm sewer profiles, as a minimum, the sanitary sewer profile will be shown.

8. Indicate existing and proposed ground line and improvements on all street, alley, and storm sewer profiles.

9. Show future streets and grades where applicable.

10. Where connections are made to existing storm sewer show computations on existing system when available. HGL will be calculated from the outfall to the connections point including the designed flows of the addedon systems.

11. Indicate flow line elevations of storm sewers on profile, show pipe slope (percent grade). Match top inside of pipe where adjacent to other size pipe.

12. Intersect laterals at sixty (60) degrees with trunk line.

13. Show details of all junction boxes, headwalls, storm sewers, flumes, and manholes, when more than one pipe intersects the drainage facility or any other item that is not a standard detail.

14. Pipe direction changes will be curves using radius pipe unless approved by the City Engineer.

15. Bends in pipe may be used in unusual circumstances with approval of the City Engineer. No bend at one location may exceed thirty (30) degrees.

16. Do not use 90-degree turns on storm sewers or outfalls. Provide good alignment with junction structures or manholes (for small systems).

17. Profile outfall with typical flat bottom section.

18. Show all hydraulics, velocity head changes, gradients, and computations.

19. Show water surface at outfall or storm drain.

20. On all dead-end streets and alleys, show grade out to “daylight” for drainage on the profiles and provide erosion control. Show typical section and slope of “daylight” drainage. Side slopes shall not exceed 4H:1V.

21. At sags in pavement, provide a positive overflow (paved sidewalk in a swale) to act as a safety path for failure of the storm drain system. Minimum finished floor elevations will be shown on the plat to protect building against flooding should the positive overflow be used.

22. Where quantities of runoff are shown on plans or profiles, indicate storm frequency design.

23. Provide sections for road, railroad and other ditches with profiles and hydraulic computations. Show design water surface on profile.

24. For drainage ditches located in street right-of-way running parallel to street paving, show the size of each driveway culvert on the ditch profile. Assume the maximum number and width of driveways allowed for each lot. Show the hydraulic grade lines as required herein.

D. Laterals

1. Show laterals on trunk profile with stations.

2. Provide lateral profiles for laterals exceeding thirty (30) feet in length.

3. Where laterals tie into trunk lines, place at sixty (60) degree angles with centerlines. Connect them so that the longitudinal centers intersect.

4. Calculate hydraulic grade line for laterals and inlets to insure collection of storm water. Check 1.5 $V^2/2g$, using trunk line velocity on laterals less than 80-feet long. Final the H.G. at the gutter or inlet lip by adding the 1.5 $V^2/2g$ to the hydraulic gradient of the trunk line at the lateral connection. For all inlets, provide HGL and hydraulic data on profile for all profiled laterals. Lateral longer than eight (80) feet require special analysis.

5. All inlets shall have a minimum eighteen (18) inch laterals.

E. Inlets and Intakes

1. Provide inlets where street capacity is exceeded. Provide inlets where runoff from alley causes the capacity of the intersecting street to be exceeded.

2. Indicate runoff concentrating at all inlets and direction of flow. Show runoff for all stub outs, pipes and intakes.

3. On plan view, indicate size of inlet, lateral size, flow line, top-of-curb elevations, paving station, and inlet designation number.

4. Use standard curb inlets in streets. Use recessed inlets in divided streets. Use combination inlets in alleys when on a straight run. Do not use grate or combination inlet unless other solution is not available (special situation).

5. Use type “Y” or special “Y” inlets in ditches or swales. No “Glory Holes” allowed as intake for a storm sewer or at a culvert. A three (3) foot concrete apron shall be constructed around “Y” inlets.

F. Paving

1. Provide six (6) inch curb on alleys parallel to creek or channel on creek side of alley.

2. For a proposed driveway turnout, curb return P.T. must be 10 feet upstream from any existing or proposed inlet, or 5 feet downstream of a standard inlet.

3. Check the need for curbing at all alley turns and “T” intersections. Flatten grades ahead of turns and intersections.

4. Where inlets are placed in an alley, provide curbing for 10 feet on each side of combination inlets.

G. Detention Basins (When required by the City Engineer)

1. Provide drainage area map and show all computations for runoff affecting the detention basin.

2. Provide a plot plan with existing and proposed contours for the detention basing and plan for structural measures.

3. Where earth embankment is proposed for impoundment, furnish a typical embankment section and specifications for fill include profile for the structural outflow structure and geotechnical report.

4. Provide structural details and calculations for any item not a standard detail.

5. Provide detention basin volume calculations and elevation versus storage curve.

6. Provide hydraulic calculations for outflow structure and elevation versus discharge curve.

1. Provide routings or modified rational determination of storage requirements, demonstrating that critical duration is used as allowed by iSWM.

7. Fencing may be required around detention area.

H. Bridges

1. Clear the lowest member of the bridge by 2 feet above the design water surface, unless otherwise directed by the City Engineer.

2. Show geotechnical soil boring information on plan.

3. Show bridge sections upstream and downstream.

4. Provide structural details and calculations with dead load deflection diagram.

5. Provide vertical and horizontal alignment.

6. Show soil erosion protection measures and concrete rip-rap.

PART 4 – WATER AND SEWER LINES

4.1 WATER MAINS

A. General

Water mains shall be looped and placed on the north and east sides of a street, at a distance of 4 feet behind the curb or otherwise as directed by the City Engineer. Refer to the Utility Assignments detail sheets that accompany this manual for location of water and sewer lines.

1. Mains over 1200 feet in length or mains supplying more than one fire hydrant shall be a minimum size of 8-inch diameter pipe in residential districts. For mains in commercial and manufacturing districts, a minimum of 12-inch diameter pipe will be required if the main is over 600 feet in length.

2. In residential districts and in those supplying only one fire hydrant, a 6-inch diameter pipe is required for mains less than 150 feet in length. Dead end mains are to be avoided by looping lines. If a dead end cannot be avoided, at least one fire hydrant or blow-off valve will be required, at or near the end of the main.

3. In commercial and industrial districts, minimum 8-inch mains are required. In any event, water mains must be of adequate size to provide for the building total fire flow. Fire flow shall be Needed Fire Flow (NFF) as determined from the "Fire Suppression Rating Schedule" as published by the Insurance Services Office. Fire flow requirements shall be met at peak day demand.

4. Peak day domestic demand shall be as shown in Table 4-1:

TABLE 4-1
WATER CONSUMPTION RATES

Density	Peak Day Water Consumption (gallons per acre per day)
1.0 D.U./Acre	700
2.0 D.U./Acre	1,400
3.0 D.U./Acre	2,100
3.8 D.U./Acre	2,800

The density shall be determined by dividing the total number of dwelling units by the total platted area. The domestic water demand shall be calculated by multiplying the water consumption values in Table 4-1 by the total acreage in the platted area.

For densities other than those listed in Table 4-1, water consumption rates may be interpolated or extrapolated from the values given in the table.

Peak hourly rates may be considered to be two times the peak day consumption. Water lines shall be sized to meet the peak hourly domestic demand as well as the fire flow requirements as described previously.

B. Water Main Material

1. All water mains shall be AWWA C900 or C905 PVC, DR 18, mechanical joint, or a bell and spigot joint. Double bell couplings may not be used for jointing pipe. Full body ductile iron fittings shall be used.

2. For water mains 24-inches in diameter and larger, Reinforced Concrete, Pre-tensioned Reinforced (Steel Cylinder Type), complying with AWWA C303, Class 150 may be considered on a case by case basis.

3. Profiles with elevations shall be provided for mains 12-inches in diameter and larger.

4. All water mains outside utility easements that supply fire sprinkler systems shall be minimum 200 PSI working pressure and UL listed.

5. All water line easements shall be a minimum of fifteen (15) feet wide.

C. Water Valves

Valves 12-inches and smaller shall be Mueller or approved equal placed on or near street property lines and shall be spaced at a minimum of 800 feet apart in residential, duplex and apartment districts and not over 500 feet apart in all other districts. They shall be placed in such a manner as to require preferably two, but not more than three valves to shut down each City block, or as may be required to prevent shutting off more than one fire hydrant. On cross-feed mains without services, a maximum of four valves shall be used to shut down each block. Also, valves shall be placed at or near the ends of mains in such a manner that a shut down can be made for a future main extension without causing loss of service on the existing main. The location of valves larger than 12-inches will be as approved by the City Engineer. Valves 12-inches and under will be Resilient Seat Gate Valves (RSGV). Sixteen and eighteen inch valves shall be non-rising stem double disc gate valves placed in the vertical position. Valves larger than 18 inches will be Butterfly Valves.

D. Fire Hydrants

1. Number and Locations

A sufficient number of fire hydrants shall be installed to provide hose stream protection for every point on the exterior wall of the building. There shall be sufficient hydrants to concentrate the required fire flow, as recommended by the publication “Guide for Determination of Required Fire Flow” published by the Insurance Services Office, around any building with an adequate flow available from the water system to meet this required flow. The latest Fire Code adopted by the City will also be used to evaluate requirements for location and flow of fire hydrants. In addition, the following guidelines shall be met or exceeded:

a. Single Family and General Residential

As the property is developed, fire hydrants shall be located at all intersecting streets and at intermediate locations between intersections at a maximum spacing of 500 feet between fire hydrants as measured along the route that fire hose is laid by a fire vehicle.

b. Attached Housing

As the property is developed, fire hydrants shall be located at all intersecting streets and at intermediate locations between intersections at a maximum spacing of 400 feet as measured along the length of the center line of the roadway, and the front of any structure at grade and shall be no further than 400 feet from a minimum of two fire hydrants as measured along the route that a fire hose is laid by a fire vehicle.

c. Other Districts

As the property is developed, fire hydrants shall be located at all intersecting streets and at intermediate locations between intersections at a maximum spacing of 300 feet as measured along the length of the center line of the roadway, and the front of any structure at grade and shall be no further than 400 feet from a minimum of tow fire hydrants as measured along the route that a fire hose is laid by a fire vehicle.

d. Protected Properties

Fire hydrants required to provide a supplemental water supply for automatic fire protection systems shall be within 100 feet of the fire department connection for such system.

e. Buildings Fire Sprinkled

An 8-inch fire line stub-out with valve shall be provided for all buildings to be sprinkled. A small stub-out can only be used with Fire Department approval.

f. Fire hydrants shall be installed along all fire lane areas as follows:

(1) Attached Housing

(a) Within 150 feet of the main entrance.

(b) At maximum intermediate spacing of 400 feet as measured along the length of the fire lane.

(2) Non-Residential Property or Use

(a) Within 150 feet of the main entrance.

(b) Within 100 feet of any fire department connection.

(c) At a maximum intermediate spacing of 300 feet as measured along the length of the fire lane.

(3) Fire lanes shall be minimum of 24-feet wide. All radiuses shall be set to accommodate a standard SU vehicle.

(4) Generally, no fire hydrant shall be located closer than fifty (50) feet to a non-residential building or structure unless approved by the City Engineer.

(5) In instances where access between the fire hydrant and the building that it is intended to serve may be blocked, extra fire hydrants shall be provided to improve the fire protection. Railroads expressways major thoroughfares and other man-made or natural obstacles are considered barriers.

2. Restrictions

a. All required fire hydrants shall be Mueller Super Centurian or approved equal and shall be placed on water mains of no less than six (6) inches in size.

b. Valves shall be placed on all fire hydrant leads.

c. Required fire hydrants shall be installed so the break away point will be no less than three (3) inches, and no greater than five (5) inches above the grade surface.

d. Fire hydrants shall be located as shown in Appendix A. The fire hydrant shall not be in the sidewalk.

e. In non-residential developments an 8-inch lead will be required on all fire hydrants that are located more than 50 feet from the looped main.

f. All required fire hydrants placed on private property shall be adequately protected by either curb stops or concrete filled steel posts or other methods as approved by the Engineer and shall be in easements. Such stops or posts to be the responsibility of the landowner on which the said fire hydrant is placed.

g. All required fire hydrants shall be installed so that the pumper nozzle connection will face the fire lane or street, or as directed by the Engineer.

h. Fire hydrants, when placed at intersections or access drives to parking lots, when practical, shall be placed so that no part of the fire truck will block the intersection or parking lot access when connections to the fire hydrant are made.

i. Fire hydrants, required by this article, ad located on private property, shall be accessible to the Fire Department at all times.

j. Fire hydrants shall be located at street or fire lane intersections, when feasible.

k. Fire hydrant bonnet shall be painted according to North Central Texas Council of Governments Specifications and Addenda.

3. Main Size for Hydrant Supply

Six-inch lines shall be connected so that not more than one hydrant will be between intersection lines and not more than two hydrants on an 8-inch main between intersecting lines. The maximum length of a six-inch fire hydrant lead is 150'. Dead end lines are to be avoided by looping lines.

4. Fire Line Metering

Generally, the City of Weston will own, operate and maintain all fire lines serving fire hydrants. Such fire lines shall be designed and constructed in accordance with the City's standards and shall be placed in an easement dedicated to the City for this purpose. Sprinkler service lines, fire line connections and other fire lines that are not maintained by the City shall be equipped with either a water meter or a detector check valve having a capacity equal to the required fire flow. Water meters and detector check valves shall be constructed in accordance with City standards.

E. Minimum Cover

The minimum cover to the top of the pipe must vary with the valve stem. In general, the minimum cover below the street grade or furnished grade (whichever is lower) should be as follows: 8-inch and smaller, 4.0 feet; 12-inch, 4.5 feet to 5 feet; 16-inch, 5.0 feet to 5.5 feet. Lines larger than 16-inch shall have a minimum of 6 feet of cover that is sufficient to allow water and sewer and other utilities to go over the large main. For water lines to be constructed along county type roads, which are commonly built with a high crown about the surrounding property, increase the cover as required to allow for future paving grade changes.

F. Meter Box and Service

A service with a meter box is constructed from the main to a point just behind the curb line, usually in advance of paving. On multiple apartments and business properties, the desired size and location are usually specified by the owners. Minimum requirements for water service sizes are:

1. Three quarter-inch water services are required to serve all residential lots including City house lots, patio homes and duplexes. Separate meter connections shall be provided for each of the family units.

2. The size of apartment, condominium, multi-family services or commercial will depend on the number of units served with a minimum of one meter per building.

G. Service Connections – Hydrants

A service connection shall not be allowed on fire hydrant.

4.2 SANITARY SEWERS

A. General

All platted lots must be served by an approved means of wastewater collection and treatment.

B. Location of Sewer Lines

Sizes, location and grades for sanitary sewer shall be as required by the City Engineer. Sewers shall be constructed with extensions to the development boundary to allow for direct connection by future developments. If feasible, sewers shall be placed in the street parkway. If in the street, sewers should be near the outside lane to reduce lane closures if servicing sewers in the future. Each addition has its individual problems: therefore, no fixed rules will apply to all cases. Where easements are used, they shall be not less than fifteen (15) feet wide.

C. Minimum Cover

Minimum cover shall be 3.5 feet; exceptions authorized by the City Engineer shall have concrete protection. For sanitary sewers in streets, the minimum cover shall be 5.0 feet. In general, the minimum depth required for the sewer to serve given property with a 4-inch lateral shall be 3 feet (4.5 feet if the water line is on the same side of the street as the lateral in question) plus 2% times the length of the house lateral (the distance from the sewer to the center of the house). Thus, for a house 135 feet from the sewer, the depth would be 3 feet plus 2% X 135 feet = 2.7 plus 3.0 = 5.7 feet. The depth of the flow line of the sewer should then be at least 5.7 feet below the elevation of the ground at the point where the service enters the house. Profiles of the ground line 20 feet past the building line will be required to verify that these criteria are met. A minimum of 3 feet of cover on sewer services is required at all points in Street R.O.W. where swales are constructed. On lines deeper than 12 feet, a parallel sewer line will be required when laterals are to be attached. This requirement should be discussed with City Engineer.

D. Sewage Flows, Size and Grades

Sewage flow shall be computed in accordance with the following:

Residential sewage flow shall be the larger of either the result of the calculation in Table 4-2 or the following equation:

$Q = C^{(0.89)} / 295$

Where:

Q = Peak Wastewater flow, mgd
C = Equivalent single family dwelling units

Table 4-2
Sanitary Sewer Daily Flow Calculations

Land Use	Design	Calculation
Apartment	• 100 gallons per person per day • 20 units per acre • 3 persons per unit	(100*20*3*PF) + Infiltration = (100*20*3*3)+650= 18,650 gallons per acre per day
Residential	• 100 gallons per person per day • 4.5 units per acre • 3.5 persons per unit	(100*4.5*3.5*PF)+ Infiltration = (100*4.5*3.5*3)+650 = 5,375 gallons per acre per day
Town Home	• 100 gallons per person per day • 10 units per acre • 3.5 persons per unit	(100*10*3.5*PF) + Infiltration = (100*10*3.5*3)+650 = 11,150 gallons per acre per day
Hospital	• 200 beds • 200 gallons per day per bed	(200*200) + Infiltration = (200*200)+650 = 40,650 gallons per day
Nursing Home	• 150 beds • 90 gallons per day per bed	(150*90) + Infiltration = (150*90) + 650 = 14,150 gallons per day
Commercial / Industrial / Office	• 3,100 parking spaces per 34.7 acres • 1 person per parking space • 35 gallons per person per day	3,100/34.7 acres = 90 persons per acre (90*35) + Infiltration = (90*35)+650 = 3,800 gallons per acre per day

Note: Infiltration shall be 650 gallons per acre per day and the daily peak factor (PF) shall be 3.0

Pipes should be placed on such a grade that the velocity when flowing full is no less than two (2) feet or more than ten (10) feet per second. Minimum grades shall be as follows:

6” – 0.60%; 8” – 0.40%; 10” – 0.26%; 12” – 0.22%

15” – 0.16%; 18” – 0.12%; 21” – 0.10%; 24” – 0.09%

All grades shall be shown to the nearest 0.01 foot. Grades shall be evenly divisible by 4, and if practical, they should be even, such as: 0.20%, 0.40%, 0.60% and 1.00%, etc., in order to facilitate field computations. When the slope of a sewer changes, a manhole will be required. Vertical curves may be used only at manholes to eliminate drop manholes. The length of vertical curves in this instance shall not exceed 100 feet. No other vertical curves will be allowed. Horizontal curves to match change in street direction will be allowed as approved by the City Engineer.

E. Manholes, Wyes, Bends, Taps, and Cleanouts

The sizes and locations of manholes, wyes, bends, tap connections, cleanouts, etc., shall be designated by the City Engineer. In general, manholes shall be placed at all four-way connections and three-way connections. The diameter of a manhole constructed over the center of a sewer should vary with size of the sewer. For 6”, 8”, and 10” sewers, the manhole shall be 4.0 foot minimum diameter; for 12”, 15”, and 18”

sewers – 4.5 foot minimum diameter; for 21", 24", and 27" sewers – 5.0 foot minimum diameter; for 30" sewers – 5.5 foot minimum diameter; and for 36" sewers – 6 foot minimum diameter. In Flood Plains, sealed manholes "Type S" are used. Cleanouts shall be placed on the ends of all lines. Drop manholes shall be required when the inflow elevation exceeds the outflow elevation by more than 18 inches.

In order to provide access for sewer lines for cleaning, manholes and/or cleanouts shall be so located that 250 feet of sewer rod can reach any point in the line. This means that manhole spacing shall be a maximum of 500 feet; that spacing between a manhole and an upstream cleanout shall be limited to 400 feet. Cleanouts may be located at the end of the line only.

F. Laterals

The sizes and locations of laterals shall be as designated by the City Engineer. In general, for single family dwellings, the lateral size shall be 4" minimum; for multiple units, apartments, local retail and commercial – 6" minimum; for manufacturing and industrial, the size should be 8" or larger as required. House laterals usually come out 10 feet downstream from the center of the lot, and shall have a 10-foot lateral separation from the water service. Manholes will be required on 8-inch and larger laterals where they connect to the main line. Laterals will not be attached to sewer mains that are deeper than 12 feet. A minimum of one lateral per building shall be required. Also, a minimum of one lateral per residential lot shall be required.

G. Railroad, Highway and Creek Crossings

Railroad, State Highway and creek crossings, etc., shall be as approved by the City Engineer.

H. Sewer Line Materials

1. All sewer pipe shall be PVC minimum SDR 26 or approved alternative material.

2. Sewer pipe shall conform to the North Central Texas Council of Governments (NCTCOG) Specifications.

3. Sewer pipe joint materials shall have resilient properties, conforming to the NCTCOG Specifications.

4.3 PREPARATION OF WATER AND SEWER PLANS

A. Form of Plans

1. Plans shall be clear, legible, and neatly drawn on bordered sheets, size 24' X 36". Each sheet shall clearly display the Texas Professional Engineer's seal of the Engineer under whose direction the plans were designed. A title block in the lower right-hand corner shall be filled in to include: (1) project name; (2) Engineer's name, address, and telephone number; and (3) space for notation of revisions.

2. The plan sheet should be drawn so that the north arrow points to the top or to the left side of the sheet. It is important that the plan show sufficient surrounding streets, lots, and property lines so the existing water and sewer may be adequately shown and so that proper consideration may be given to future extensions. Proposed water and sewer lines shall be stubbed out to the addition extremities in order that future extensions may be made with a minimum of expense and inconvenience. Unless it would make the plan very difficult to read, both water and sewer lines should be shown on the same sheet. The line son the profile sheet shall be drawn in the same direction as on the plan. Lettering shall be oriented to be read upward or to the left.

3. On large additions or layouts requiring the use of more than six sheets (total of plan & profile), key sheets may be required on a scale of 1'=400' or 1'=1000', as designated by the City Engineer. They shall show the overall layout with the specific project clearly indicated with reference to individual sheets.

4. The use of "off-standard" scales will not be permitted. A plan shall be drawn to scales of 1" = 100', or 1" = 40'. Plans for water and sewer that do not involve great detail should be drawn on a scale of 1" = 50'. Plans in and along creeks, heavily wooded sections, streets with numerous utilities, or as may be required to produce a clean and legible drawing, shall be drawn on plan-profile sheets or separate plan and profile sheets on a scale 1" = 40'. If the plan is in an extremely congested area, a scale of 1" = 20' may be necessary and will be permitted. All profiles shall be drawn on a vertical scale as required for clarity, and the horizontal scale shall be the same as for the plan unless otherwise directed by the City Engineer.

B. Data to Be Included

1. Sewer Data to be Included on Plan Street

The plan shall show the existing and proposed water and sewer lines and all appurtenances thereto. The plan should also have the storm sewer system dashed in. All lines shall be numbered, lettered or otherwise designated on both plan and profile sheets. All lines shall show sizes and direction of flow on both plan and profile sheets. Stationing shall be shown to the nearest 0.1 foot and each new line shall begin at 0+00 at the outlet and increase up the sewer. Station pluses at all junctions or sewers, horizontal P.C.'s and P.T.'s bends, angle points, wyes, cleanouts, manholes, the centerlines of all cross streets and railroads, and all crossing utilities, etc., shall be shown on both plan and profile. The degree of angles and horizontal curve data shall be shown on the plan only. Minimum Radius for sanitary sewer mains is 200 feet. Sewer laterals shall be shown at a location most convenient to serve the property. Sewer laterals will usually be near the center of the lot, either at the street or alley. If the lateral is to be adjacent to the water service, then show the lateral 10 feet downstream. The location shall be designated on the plans.

2. Sewer Data to be Included on the Profile Sheet

The data for the profile sheet shall be obtained by running a line of levels along the actual route and by taking any other necessary observations. Profiles shall show the elevations to the nearest 0.1 foot of the ground at the centerline of the sewer and to the right and left of the centerline of the sewer at the locations of approximate center of the proposed houses or buildings to be served, and the approved street or alley grade. Profiles shall also show the sewer pipe, manholes, cleanouts, etc. The size of the sewer, the direction of the flow, and the grade to the nearest 0.01 foot should be indicated just over the "pipe" and the total linear footage of line, size, kind of pipe, and type of embedment or encasement shown below the "pipe". All of the information pertaining to the horizontal data, station pluses, appurtenances to be built, etc., is usually shown above the ground lie, whereas, the flow line (invert) elevations shall be shown to the nearest 0.01 foot. Invert elevations shall be recorded at all junctions (all lines-in and out), at grade breaks, the ends of lines, or other points as requested by the City Engineer. Bench marks used shall also be clearly shown, giving the descriptive locations and elevations. Elevations must be from sea level datum, not assumed. Bench marks used shall also be clearly shown, giving the descriptive locations and elevations. Elevations must be from sea level datum, not assumed. Bench level circuits should begin at a USGS monument and bench mark of second order accuracy established at least every one-half mile through the project. All existing water, sewer, gas, storm crossing the proposed sewer or water line shall be adequately designated as to size, type, and location. Drainage area maps and capacity calculations for mains 10" and larger will be required.

3. Data to be Included for Water Plan and Profile

For water lines in new subdivisions, very little data need to be included. Indicate the location of any existing valves require for shut down purposes and of any tees, ends, etc., to be tied into. Indicate clearly the sizes

of the lines to be installed, and all proposed valves, fire hydrants, tees, crosses, bends, reducers, plugs, sleeves, wet connections, tap connections, creeks, railroad or highway crossing, tunnels, meter boxes, valve vaults, and other appurtenances at each intersection or as required. Where the pipe is a curve, the curve data in the plat is usually sufficient unless otherwise requested. The size and type of services and the material, type of joint, and class of pipe may be indicated by adequate notation in the lower left or right-hand corners of the plan sheet. Water services and meter boxes shall be indicated and shall be located at or near the center of the front of each lot. If a water line requires a profile, then follow the general procedures as outlined for sewers, except that the grades and elevations of the proposed water line usually need not be shown closer than the nearest 0.01 foot.

4.4 On-site Treatment of Wastewater

A. Design Criteria

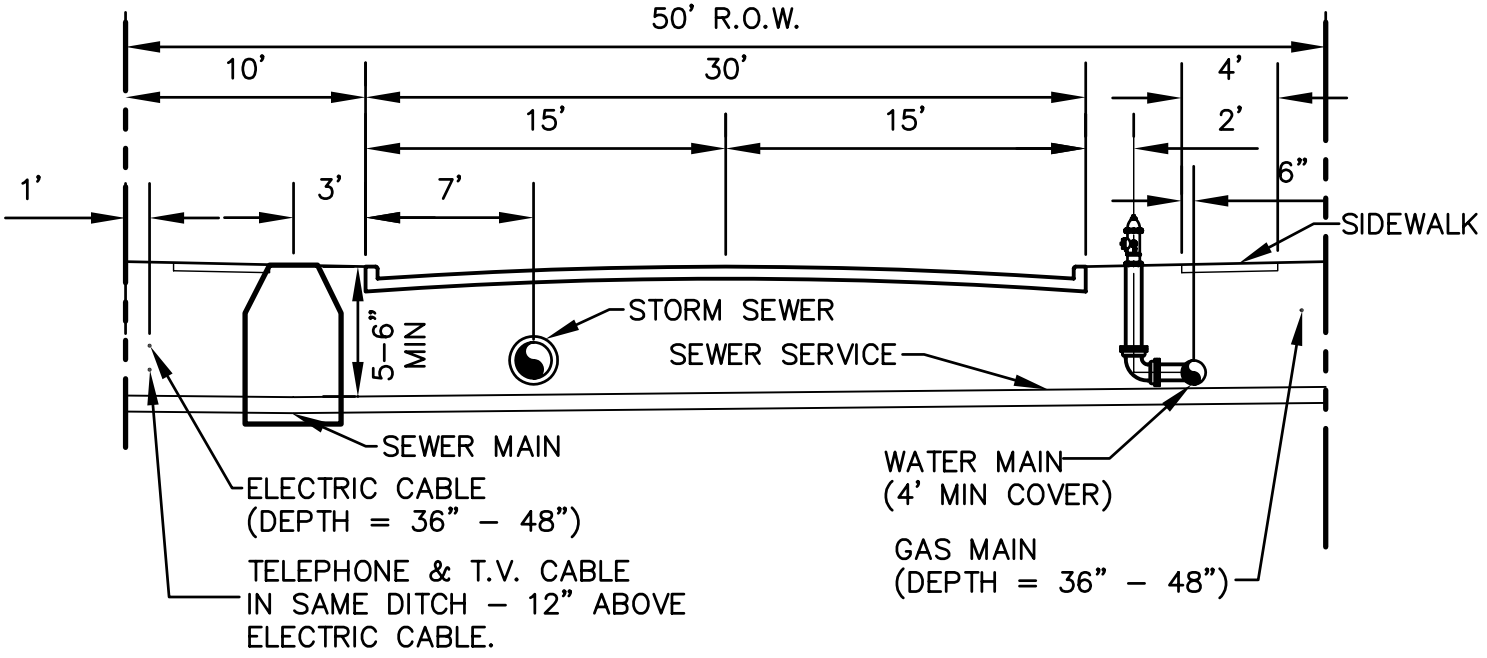
All applicable design criteria shall be used in the design and construction of on site wastewater treatment systems including the Texas Commission on Environmental Quality (TCEQ) North Texas Municipal Water District and Collin County. All on site treatment systems shall be approved by the City of Weston. The minimum lot size for on site treatment systems is 1 acre.

B. Platting Requirements

Where on site wastewater treatment systems are allowed, the location of the proposed drain field shall be shown on the preliminary plat. The final plat shall indicate the minimum finished floor elevation if a gravity system is used. The minimum finished floor elevation shall not be less than 3.5 feet above the highest elevation of ground at the proposed drain field unless documentation is submitted and approved that demonstrates that a lower finished floor elevation will allow the on site treatment system to function properly. No easements will be allowed in the drain field area.

APPENDIX A

UTILITY ASSIGNMENTS



LOCAL STREET - RESIDENTIAL

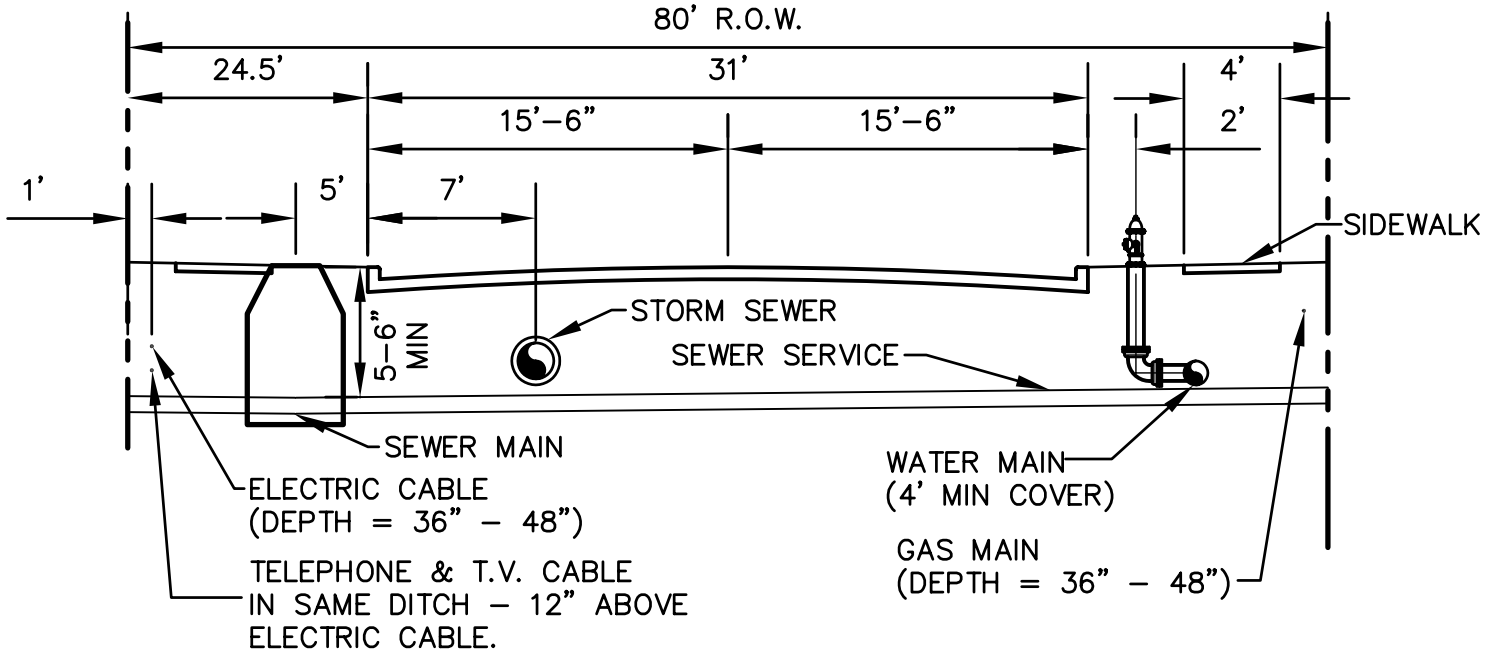
SECTION LOOKING NORTH OR WEST

JAMES ENGINEERING, LLC
9901 E. VALLEY RANCH PARKWAY
SUITE 2002
IRVING, TEXAS 75063
PH. (972) 830-9072 FAX: (972) 830-9073

CITY OF WESTON
ENGINEERING DESIGN MANUAL

UTILITY ASSIGNMENTS

SCALE:	NTS
DATE:	DEC 2005
JOB #:	N/A
SHEET:	N/A



MINOR COLLECTOR STREET

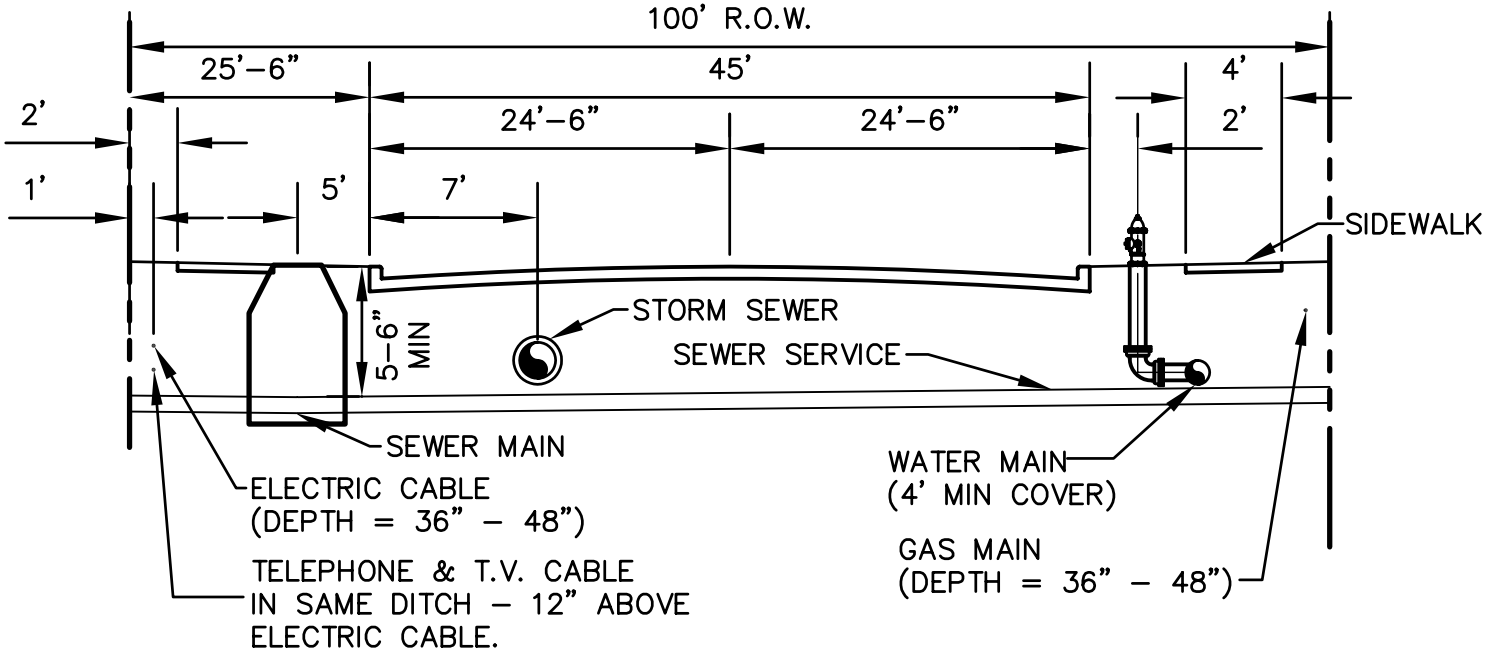
SECTION LOOKING NORTH OR WEST

JAMES ENGINEERING, LLC
9901 E. VALLEY RANCH PARKWAY
SUITE 2002
IRVING, TEXAS 75063
PH. (972) 830-9072 FAX: (972) 830-9073

CITY OF WESTON
ENGINEERING DESIGN MANUAL

UTILITY ASSIGNMENTS

SCALE:	NTS
DATE:	DEC 2005
JOB #:	N/A
SHEET:	N/A



MAJOR COLLECTOR STREET
MINOR ARTERIAL STREET

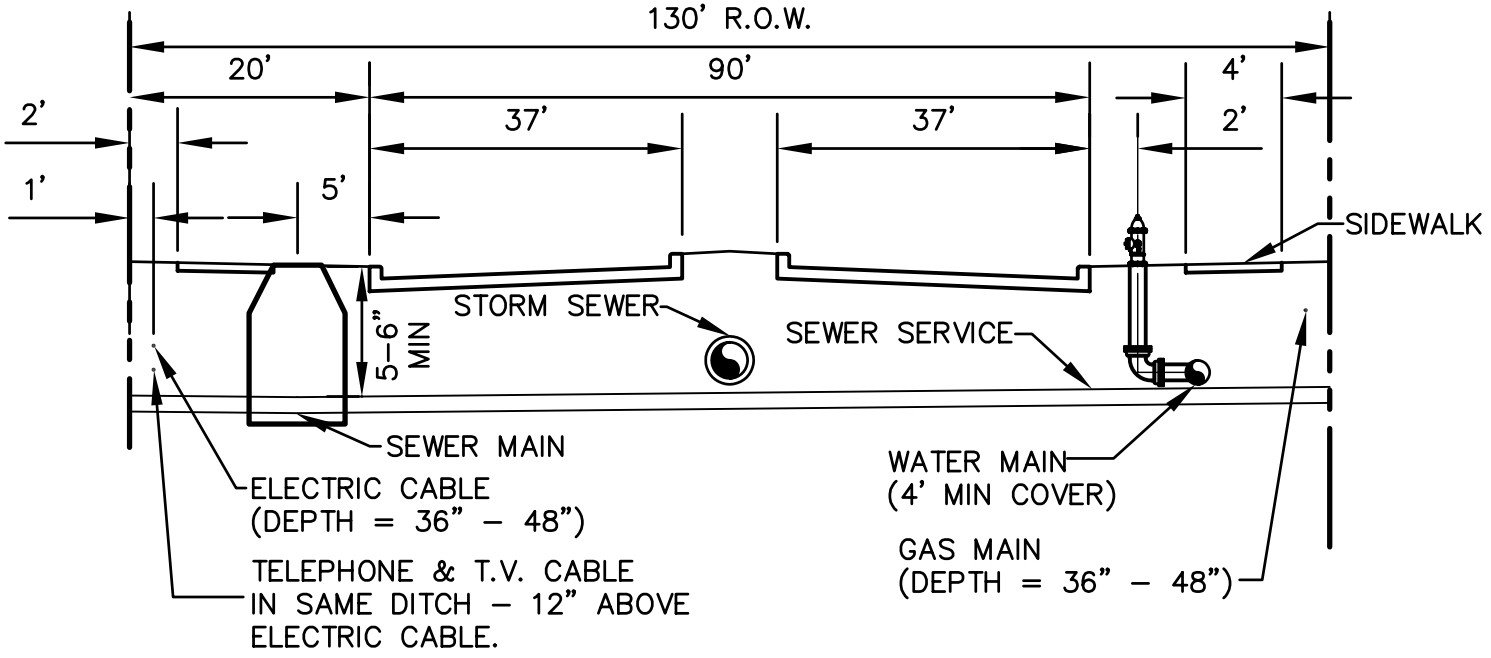
SECTION LOOKING NORTH OR WEST

JAMES ENGINEERING, LLC
9901 E. VALLEY RANCH PARKWAY
SUITE 2002
IRVING, TEXAS 75063
PH. (972) 830-9072 FAX: (972) 830-9073

CITY OF WESTON
ENGINEERING DESIGN MANUAL

UTILITY ASSIGNMENTS

SCALE: NTS
DATE: DEC 2005
JOB #: N/A
SHEET: N/A



MAJOR ARTERIAL STREET

SECTION LOOKING NORTH OR WEST

JAMES ENGINEERING, LLC
9901 E. VALLEY RANCH PARKWAY
SUITE 2002
IRVING, TEXAS 75063
PH. (972) 830-9072 FAX: (972) 830-9073

CITY OF WESTON
ENGINEERING DESIGN MANUAL

UTILITY ASSIGNMENTS

SCALE:	NTS
DATE:	DEC 2005
JOB #:	N/A
SHEET:	N/A

APPENDIX B

GENERAL NOTES FOR CONSTRUCTION PLANS

CITY OF WESTON

ENGINEERING DESIGN MANUAL

APPENDIX B

GENERAL NOTES

GENERAL

1. All construction shall be in accordance with the North Central Texas Council of Governments Standard Specifications for Public Works Construction" (NCTCOG Standards) latest Edition unless modified by city of Weston Engineering Design Standards, notes, and details. Where the City has modified the NCTCOG Standards the City modifications shall be used.

2. Before beginning construction, the contractor shall prepare a construction sequence schedule. The construction sequence schedule shall be such that there is the minimum interference with traffic along or adjacent to the project.

3. Construction may not begin earlier than 7:00 A.M. on weekdays nor continued after dark without permission from the city of Weston. Construction on Saturday may not begin before 8:00 A.M. nor continue after dark and work on Sunday is prohibited without special permission.

4. The contractor is responsible for verifying the location of all underground utilities and structures and protecting them from damage during construction.

5. Work may not be backfilled or covered until it has been inspected by the City.

6. Material testing shall be performed by an independent testing laboratory and paid for by the Contractor.

7. All excavation on the project is unclassified.

8. Temporary erosion control shall be used to minimize the spread of silt and mud from the project on to existing streets, alleys, drainage ways and public and private property. Temporary erosion controls may include straw bales, berms, dikes, swales, strips of undisturbed vegetation, check dams and other methods as required by the City of Weston.

9. Finished Slopes on public rights-of-way and easements shall not be steeper than 4:1. All slopes steeper than 6:1 shall be hydro mulched, watered and maintained by the contractor until grass covers all parts of the slope with at least 70% coverage.

10. The contractor shall maintain two-way traffic at all times along the project.

11. Remove, salvage and replace all street and traffic control signs which may be damaged by the construction of the project.

12. All trenching and excavation shall be performed in accordance with OSHA standards.

13. All backfill will be compacted at a moisture content of +2% or higher of optimum moisture as determined by ASTM D-698 where ASTM D-698 is the applicable method. TEX 113-E and 114-E may be used for granular materials.

14. A two year 100% maintenance bond shall be provided to the City to guarantee the performance and repair of all public facilities upon completion and acceptance of the project by the City.

15. The minimum geotechnical material testing requirements will be those identified in NCTCOG with the exception of the following: for utility and other trenches (public and private) under pavement, backfill shall be tested at 100-foot spacing in each lift. For manholes and junction boxes the spiral testing method shall be utilized; however, two tests per lift 180 degrees apart will be taken. Trenches outside the pavement can be tested at the recommended frequency in NCTCOG.

GRADING

1. Top soil shall not be removed from residential lots or used as spoil, but shall be stripped and redistributed so as to provide at least six (6) inches of cover on the lots, parkways, and medians. Permanent erosion control measures shall be provided throughout the development prior to final acceptance of the improvements.

2. Temporary erosion control shall be used to minimize the spread of silt and mud from the project on to existing streets, alleys, drainage ways and public and private property. Temporary erosion controls may include silt fences, straw bales, berms, dikes, swales, strips of undisturbed vegetation, check dams and other methods as required by the City Engineer and as specified in the North Central Texas Council of Governments Construction BMP Manual.

3. All street rights-of-way, regardless of slope, all finished grade slopes that are steeper than 6H:1V, and the flow lines of all drainage ditches and swales shall be seeded and completely covered with erosion control matting as specified in the North Central Texas Council of Governments Construction BMP Manual.

4. Grass shall be established on the slopes of all drainage channels. Grass shall meet the requirements of the Standard Specifications of the NCTCOG.

5. Finished slopes on public rights-of-way and easements shall not be steeper than 4H:1V. All slopes steeper than 6H:1V shall be hydro mulched, watered and maintained by the Contractor until grass covers all parts of the slope. Grass must be lush, green, vigorous and growing. No bare spots over one square foot will be allowed. All ruts from washing must be filled and grassed.

6. All permeable surfaces within the development shall be graded to a smooth and uniform appearance that can be easily mowed with a small residential riding lawn mower.

7. If franchise utilities are installed after planting grass, any areas disturbed by the installation of the franchise utilities shall be repaired and grass re-established before acceptance of the improvements.

8. Where retaining walls are required as part of the lot grading plan, the walls are to be constructed at the same time as the public improvements. The Final Plat shall contain wall maintenance easements and indicate the ownership and maintenance responsibility for the walls.

PAVING

1. All embankment shall be compacted to 95% Standard Proctor Density at a moisture content of +2% or higher of optimum moisture content.

2. Unless excessive sulfate content is found during subgrade testing, all streets and alleys shall be placed on lime stabilized subgrade with a lime content of not less than 6% and a PI<15. For small projects

where the cost of lime stabilization is prohibitive, two additional inches of concrete may be substituted for the lime treated subgrade.

3. The minimum 28day compressive strength of concrete street paving shall not be less than 3,600 PSI and shall be air entrained. Water may not be applied to the surface of concrete paving to improve workability.

4. Concrete used for pavement shall be NCTCOG Class C, six sack mix with a minimum 28 day strength of 3,600 psi.

5. Fly ash will not be allowed in place of cement.

6. All curb and gutter shall be integral with the pavement.

7. All street pavement must be cross-sloped or constructed on a parabolic crown section.

8. Streets and alleys shall be constructed with provisions for sidewalk ramps at all intersections.

9. All reinforcing rebar to be minimum No. 4 on 18-inch spacing each way.

DRAINAGE

1. Storm sewer pipe shall be reinforced concrete, Class III unless otherwise noted.

2. Storm sewer embedment to be: Class B+.

3. All structural concrete shall be Class "C" (3,600 PSI compressive strength at 28 days), air entrained.

4. The contractor shall install plugs in storm sewer lines or otherwise prevent mud from entering the storm sewer system during construction.

5. Storm sewer and laterals shall be videotaped before acceptance and again at least six months prior to expiration of the two year maintenance bond. Defects shall be repaired by the Contractor.

WATER AND SANITARY SEWER

1. Water mains shall be AWWA C-900 PVC class 150 unless otherwise noted. Minimum cover for waterlines is 48" or as required to clear existing utilities, whichever is greater.

2. Marking tape shall be installed over PVC water lines.

3. Fittings for PVC water lines shall be full body ductile iron and be encased in a polyethylene sheath.

4. Valves shall be resilient seat gate valves.

5. All direct burial valves shall be provided with cast iron valve boxes with PVC stacks. Valve stacks shall be vertical and concentric with the valve stem. Stainless steel valve extensions are required on all valves where the operating nut is greater than 4 feet below finished grade.

6. Fire hydrants shall be field painted per City of Weston specifications.

7. All exposed bolting on any buried equipment or material shall be stainless steel. Included are:

a. Bonnet and stuffing box bolts on valves
b. Shoe bolts on Fire Hydrants
c. Flange bolts

"Cor-ten" mechanical joint "T" bolts are acceptable for direct burial service.

8. Meter boxes shall be as approved by the City of Weston. Contact the City Engineer for specifications.

9. Water service connections to be seamless 200 psi blue colored polyethylene ASTM D2737 SDR9, CTS water service pipe, NSF61 approved.

10. Sanitary sewer mains shall be SDR 26 PVC.

11. A geotextile fabric shall be placed below all new manholes.

12. All sanitary sewer service connections between the main and ROW line to be six (6) inches in diameter.

13. All sanitary sewer mains and service connections to be videotaped prior to acceptance and again at least six months prior to expiration of the maintenance bond. Defects shall be repaired by the Contractor.

14. The Contractor shall install and maintain water tight plugs in all connections to the City's sanitary sewer system until the project is accepted by the City.

15. All sanitary sewer lines and manholes shall be leak tested before the project is accepted. Deflection testing of PVC sewer lines is required.

16. All sanitary sewer manholes shall be made with ConShield or approved equal additive to concrete.

17. All sanitary sewer manholes shall have joints protected with Gator Wrap or approved equal.

18. All fittings for pressure pipe to be full body.

19. No meter boxes, cleanouts, or service connections will be allowed in sidewalks or driveways.

20. Mega-lugs required on all MJ fittings.

21. The following types of backfill are required at a minimum:

a. Water Line and Sewer Force Main: B-4
b. Sanitary Sewer: Class B+ modified to have fine gradation crushed stone 6" above the pipe.

Use of other materials will be considered upon proper engineering justification.

22. Design must meet all applicable requirements of TCEQ Chapters 290 and 217.

CONSTRUCTION ENGINEERING

1. The Design Engineer will be responsible for previewing and approving all submittals for Materials used for public improvements on the project. After review and approval, the Design Engineer will forward one copy to the City of Engineer for concurrence. After the material submittals are approved, the Developer can request a preconstruction conference. At a minimum, the Design Engineer, Developer Representative, member of each construction discipline, and a representative of the Geotechnical Materials Testing Laboratory shall attend the preconstruction conference. Copies of the approved plans, approved material submittals, and permits such as NOI will be distributed at the meeting.

2. The Contractor and Design Engineer will be responsible for reviewing all Geotechnical test results to ensure the proper number of passing tests are taken.

3. Upon completion of the project, prior to acceptance of the public improvements, the Design Engineer shall prepare and submit the final project report described in Section 1.8 Record Drawings and Closeout Documents.

APPENDIX C

STANDARD OWNER'S CERTIFICATE

APPENDIX C

CITY OF WESTON

STANDARD OWNER'S CERTIFICATE

All applicable portions of the following certificate shall be placed on all final plats:

NOW THEREFORE, KNOW ALL MEN BY THESE PRESENTS:

THAT_____, acting herein and through its duly authorized officers, does hereby adopt this plat designating the hereinabove described property as _____, an addition to the City of Weston, Texas, and does hereby dedicate to the public use forever the streets and alleys thereon; and does hereby dedicate the easement strips shown on the plat for mutual use and accommodation of all public utilities desiring to use, or using same. No buildings, fences, trees, shrubs, or other improvements shall be constructed or placed upon, over, or across the easement strips on said plat. Any public utility shall have the right to remove and keep removed all or part of any buildings, fences, trees, shrubs, or other improvements, or growths, which in any way endanger or interfere with the construction, maintenance, or efficiency of its respective system on any of these easement strips, and any public utility shall at all times have the right of ingress or egress to and from and upon any of said easements for the purpose of constructing, reconstructing, inspecting, patrolling, maintaining, and adding to or removing all or part of its respective system without the necessity at any time of procuring the permission of anyone.

Witness my hand this _____ day of _____, 20__.

_____
Owner's Signature

All signatures shall be notarized.

APPENDIX D

CONSTRUCTION DETAILS

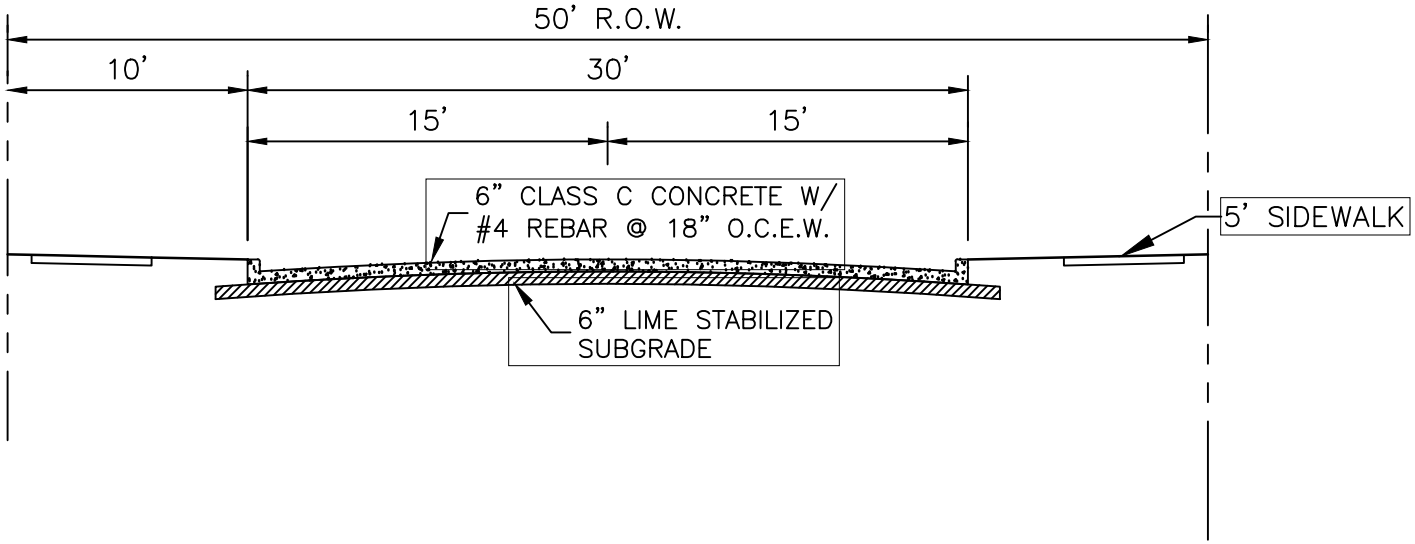
APPENDIX D

CONSTRUCTION DETAILS

The city of Weston provides the following details as guides for design and construction of public improvements in the City. Where the water provider is not the City, the requirements of the City and water provider shall be taken into consideration when designing the public improvements.

The details are limited in scope. For necessary information not covered in Appendix D, the NCTCOG "Standard Specifications for Public Works Construction" Latest Edition Details can be used. If there is a conflict between the city of Weston Engineering Design Standards (EDS) and the NCTCOG Details, the City EDS will prevail. If a situation arises where a detail is needed that is not covered by either source, the design engineer can provide a detail for consideration and approval by the City Engineer.

PAVING



LOCAL STREET - RESIDENTIAL

SECTION LOOKING NORTH OR WEST

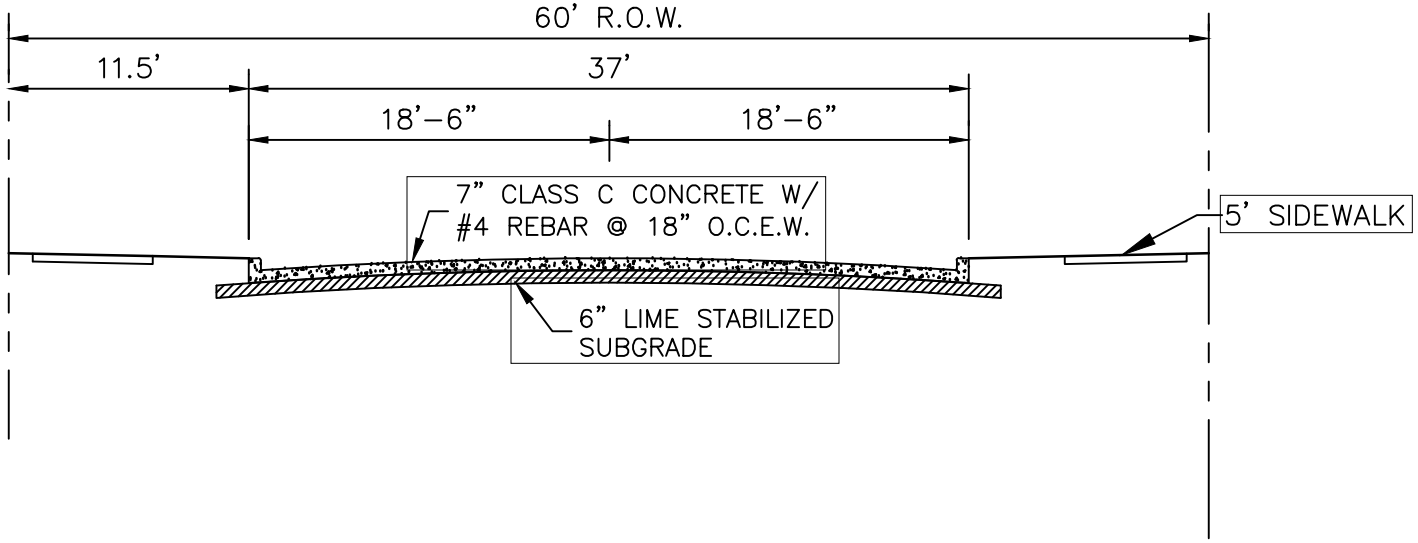
NOTES:
1: LIME STABILIZED SOIL TO BE MAXIMUM PI<15 & TO EXTEND 1' MINIMUM BEYOND PAVEMENT.
2: SIDEWALK TO BE MINIMUM OF 5" THICK WITH #3 REBAR @ 18" O.C.E.W.
3: THICKNESS IS MINIMUM & WOULD BE THICKER BASED ON SITE SPECIFIC DESIGN FOR A 30 YEAR LIFE AND THE TIA FOR THE DEVELOPMENT.

FREEMAN-MILLICAN, INC.
ENGINEERS - ARCHITECTS - PLANNERS
12160 N. ABRAMS RD, SUITE 508 DALLAS, TX 75243 PH: 214.503.0555
WWW.FMI-DALLAS.COM TEXAS ENGINEERING FIRM REGISTRATION F-2827

CITY OF WESTON
ENGINEERING DESIGN MANUAL

PAVING DETAILS

SCALE:	N.T.S.
DATE:	SEPT 2019
JOB #:	16015
SHEET:	1 OF 5

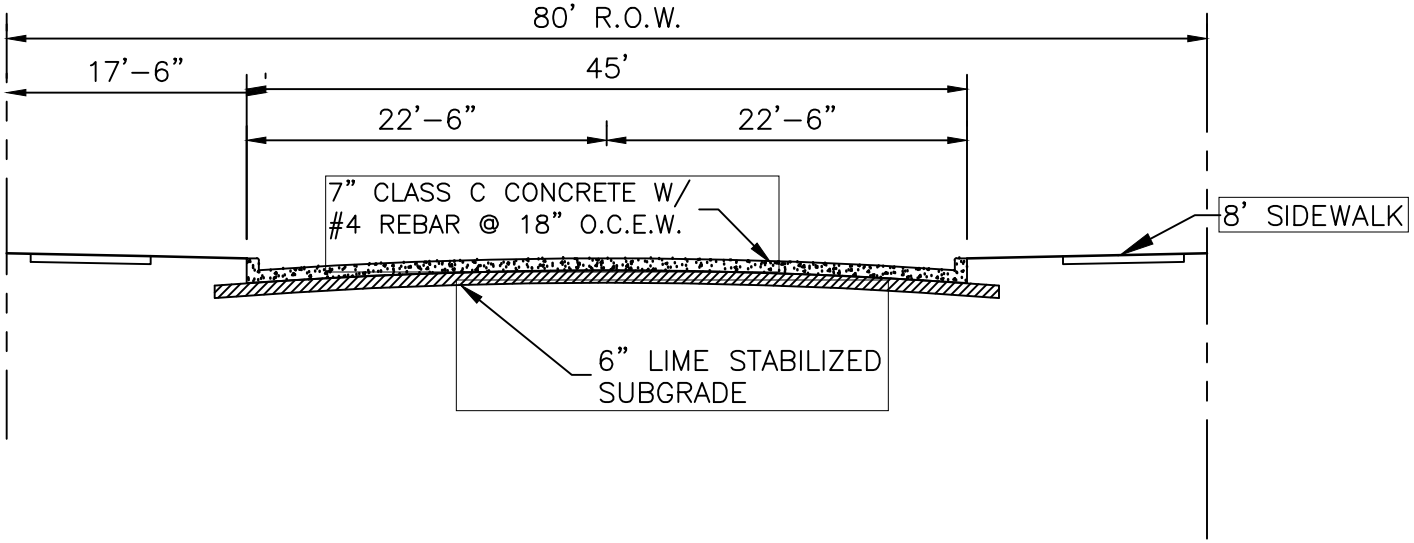


C2U COLLECTOR (MIDBLOCK)

SECTION LOOKING NORTH OR WEST

NOTES:
1: LIME STABILIZED SOIL TO BE MAXIMUM PI<15 & TO EXTEND 1' MINIMUM BEYOND PAVEMENT.
2: SIDEWALK TO BE MINIMUM OF 5" THICK WITH #3 REBAR @ 18" O.C.E.W.
3: THICKNESS IS MINIMUM & WOULD BE THICKER BASED ON SITE SPECIFIC DESIGN FOR A 30 YEAR LIFE & THE TIA FOR THE DEVELOPMENT.

FREEMAN-MILLICAN, INC.
ENGINEERS - ARCHITECTS - PLANNERS
12160 N. ABRAMS RD, SUITE 508 DALLAS, TX 75243 PH: 214.503.0555
WWW.FMI-DALLAS.COM TEXAS ENGINEERING FIRM REGISTRATION F-2827



M4U MINOR ARTERIAL (MIDBLOCK)

SECTION LOOKING NORTH OR WEST

NOTES:
1: LIME STABILIZED SOIL TO BE MAXIMUM PI<15 & TO EXTEND 1' MINIMUM BEYOND PAVEMENT.
2: SIDEWALK TO BE MINIMUM OF 5" THICK WITH #3 REBAR @ 18" O.C.E.W.
3: THICKNESS IS MINIMUM & WOULD BE THICKER BASED ON SITE SPECIFIC DESIGN FOR A 30 YEAR LIFE & THE TIA FOR THE DEVELOPMENT.

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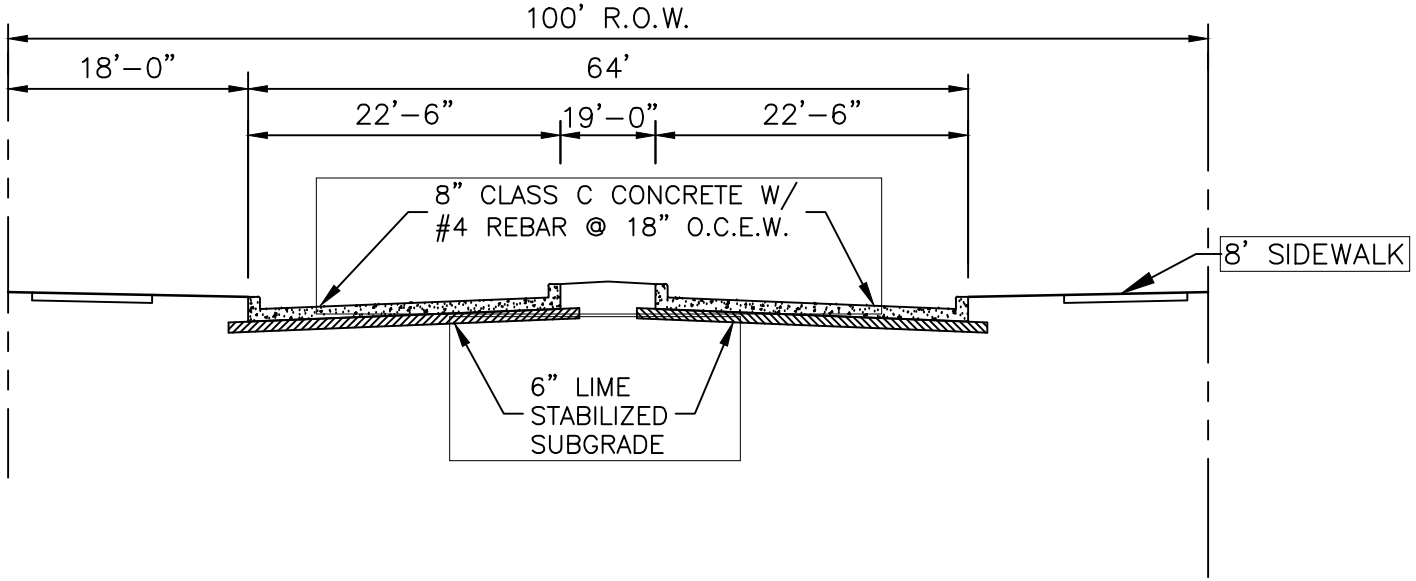
ENGINEERS - ARCHITECTS - PLANNERS
12160 N. ABRAMS RD, SUITE 508 DALLAS, TX 75243 PH: 214.503.0555
WWW.FMI-DALLAS.COM TEXAS ENGINEERING FIRM REGISTRATION F-2827

CITY OF WESTON
ENGINEERING DESIGN MANUAL

PAVING DETAILS

SCALE:	N.T.S.
DATE:	SEPT 2019
JOB #:	16015
SHEET:	3 OF 5



M4D MINOR ARTERIAL (MIDBLOCK)

SECTION LOOKING NORTH OR WEST

NOTES:
1: LIME STABILIZED SOIL TO BE MAXIMUM PI<15 & TO EXTEND 1' MINIMUM BEYOND PAVEMENT.
2: SIDEWALK TO BE MINIMUM OF 5" THICK WITH #3 REBAR @ 18" O.C.E.W.
3: THICKNESS IS MINIMUM & WOULD BE THICKER BASED ON SITE SPECIFIC DESIGN FOR A 30 YEAR LIFE & THE TIA FOR THE DEVELOPMENT.

FREEMAN-MILLICAN, INC.
ENGINEERS - ARCHITECTS - PLANNERS
12160 N. ABRAMS RD, SUITE 508 DALLAS, TX 75243 PH: 214.503.0555
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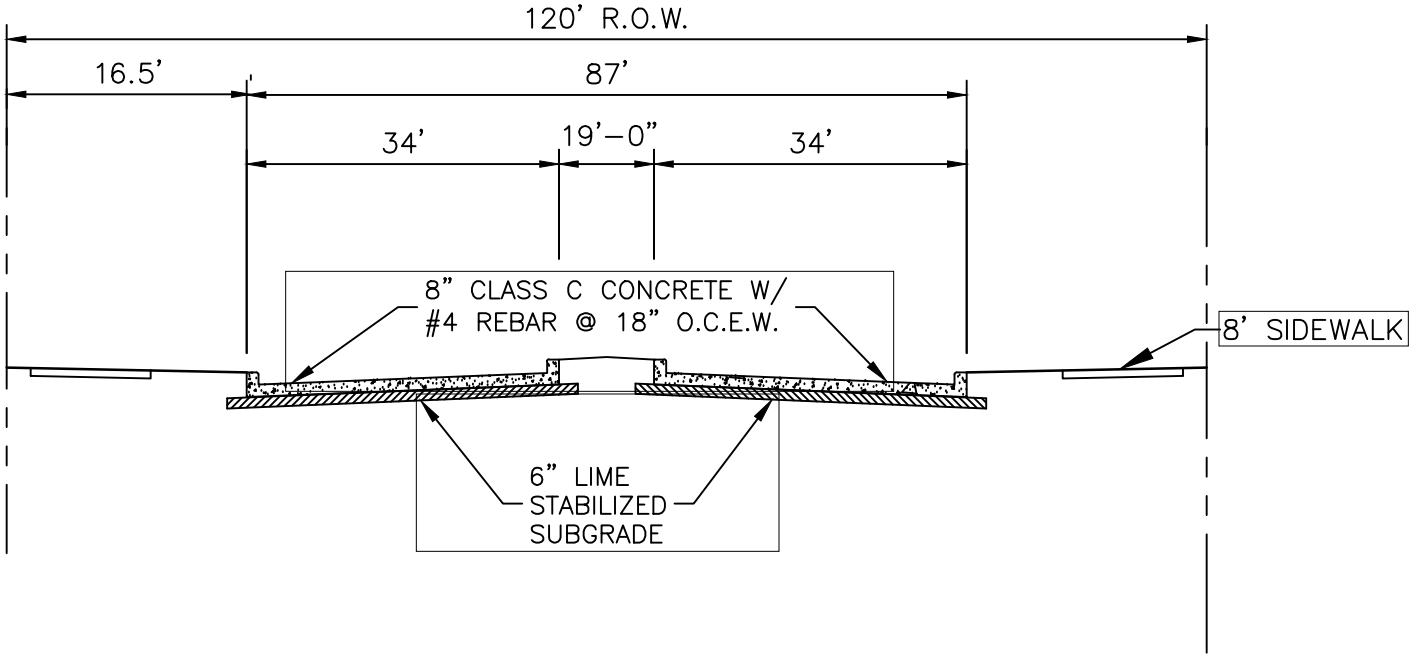
CITY OF WESTON
ENGINEERING DESIGN MANUAL

PAVING DETAILS

SCALE:	N.T.S.
DATE:	SEPT 2019
JOB #:	16015
SHEET:	4 OF 5



M6D MAJOR ARTERIAL (MIDBLOCK)

SECTION LOOKING NORTH OR WEST

NOTES:
1: LIME STABILIZED SOIL TO BE MAXIMUM PI<15 & TO EXTEND 1' MINIMUM BEYOND PAVEMENT.
2: SIDEWALK TO BE MINIMUM OF 5" THICK WITH #3 REBAR @ 18" O.C.E.W.
3: THICKNESS IS MINIMUM & WOULD BE THICKER BASED ON SITE SPECIFIC DESIGN FOR A 30 YEAR LIFE & THE TIA FOR THE DEVELOPMENT.

FREEMAN-MILLICAN, INC.
ENGINEERS - ARCHITECTS - PLANNERS
12160 N. ABRAMS RD, SUITE 508 DALLAS, TX 75243 PH: 214.503.0555
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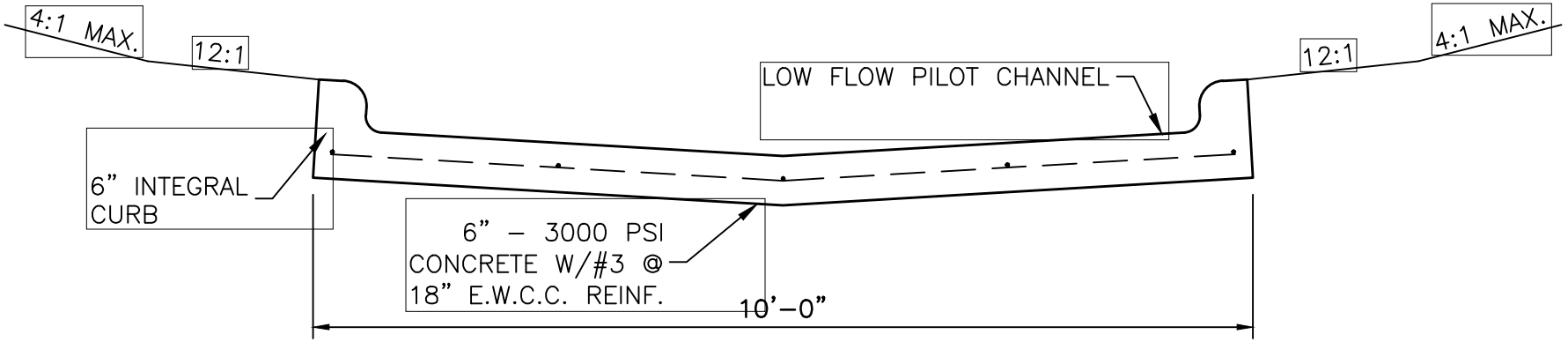
CITY OF WESTON
ENGINEERING DESIGN MANUAL

PAVING DETAILS

SCALE:	N.T.S.
DATE:	SEPT 2019
JOB #:	16015
SHEET:	5 OF 5

DRAINAGE



SECTION

LOW FLOW PILOT CHANNEL

N.T.S.

FREEMAN-MILLICAN, INC.
ENGINEERS - ARCHITECTS - PLANNERS
12160 N. ABRAMS RD, SUITE 508 DALLAS, TX 75243 PH: 214.503.0555
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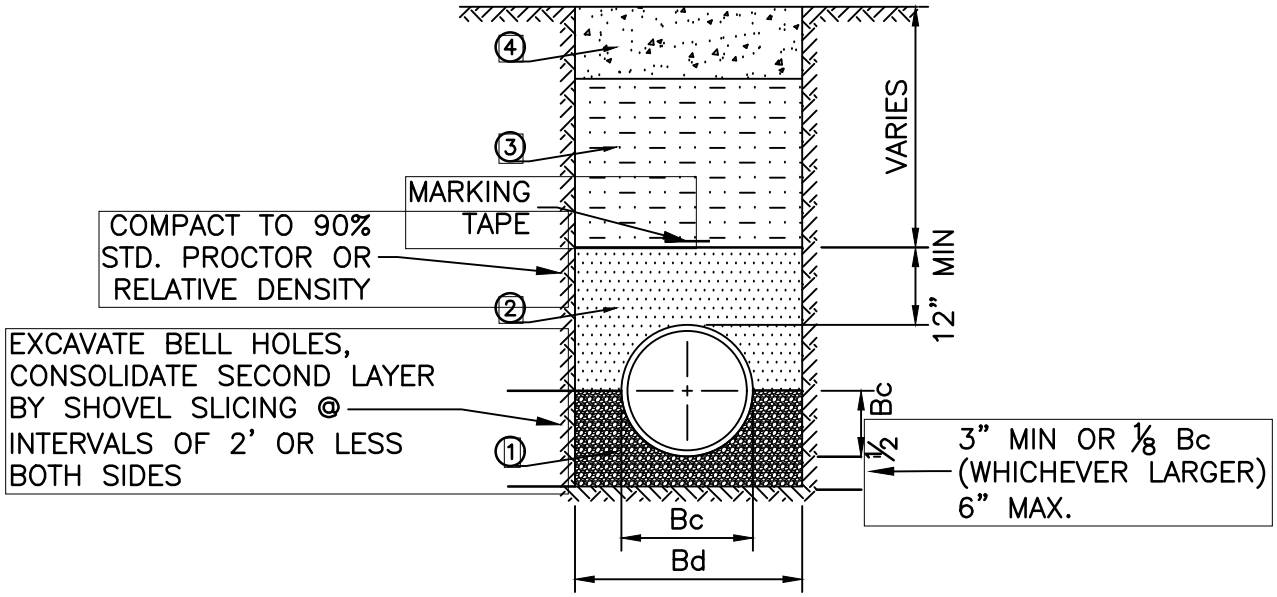
CITY OF WESTON
ENGINEERING DESIGN MANUAL

DRAINAGE DETAILS

SCALE:	N.T.S.
DATE:	SEPT 2019
JOB #:	16015
SHEET:	1 OF 2



①	FINE GRADATION CRUSHED STONE–TOP LAYER 12" ABOVE PIPE. GRADE TO PROVIDE UNIFORM SUPPORT OF PIPE BARREL, EXCAVATE BELL HOLES.
②	FINE GRADATION SAND OR CRUSHED STONE TO SPECIFIED DENSITY. IF SAND IS USED, GRADATION OF SAND & STONE TO BE CHECKED FOR COMPATIBILITY.
③	SELECT MATERIAL FREE OF ROCKS, CLUMPS OR DEBRIS LARGER THAN 6" IN GREATEST DIMENSION. COMPACT TO 95% STANDARD PROCTOR DENSITY AT +2% OR HIGHER OF OPTIMUM MOISTURE CONTENT.
④	FOR CREEK CROSSINGS, THE UPPER 18" OF TRENCH BACKFILL SHALL BE STABILIZED WITH CEMENT TREATED BASE (CTB) OR FLOWABLE FILL TO TOP OF CREEK BANK.

CLASS "B+" EMBEDMENT (RCP STORM SEWER)

N.T.S.

FREEMAN-MILLICAN, INC.
ENGINEERS - ARCHITECTS - PLANNERS
12160 N. ABRAMS RD, SUITE 508 DALLAS, TX 75243 PH: 214.503.0555
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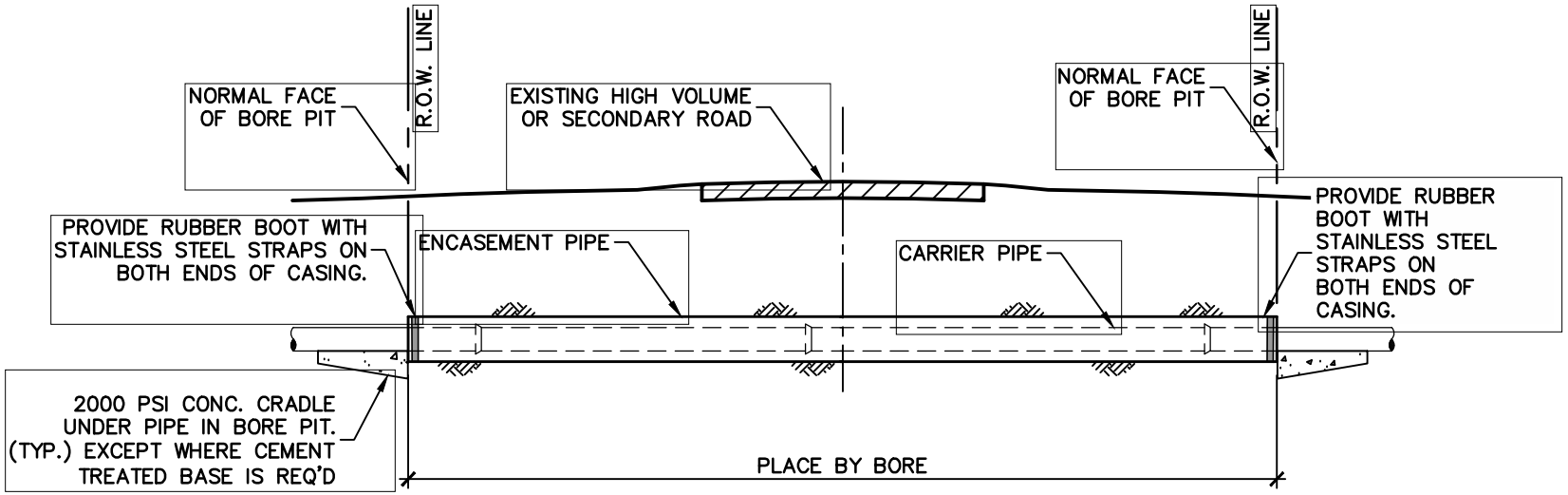
CITY OF WESTON
ENGINEERING DESIGN MANUAL

DRAINAGE DETAILS

SCALE: N.T.S.
DATE: SEPT 2019
JOB #: 16015
SHEET: 2 OF 2

WATER



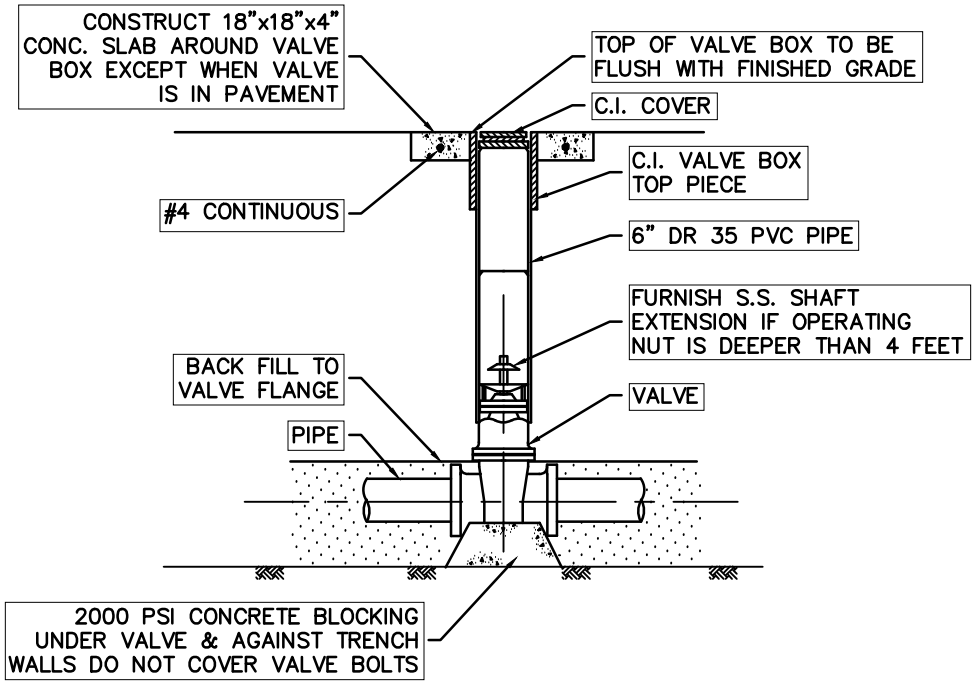
NOTES:

1. ENCASEMENT PIPE, NEW SMOOTH STEEL PIPE WITH WALL THICKNESS =0.625" (5/8"), BITUMINOUS COATING, 35,000 PSI MIN. YIELD STRENGTH.
2. DETAIL AND NOTES SHALL APPLY TO PIPELINE CROSSING BY OPEN CUT.
3. CARRIER PIPE SHALL BE MADE-UP OUTSIDE THE ENCASEMENT PIPE AND PUSHED THROUGH THE BORE. INSTALL RACI CASING SPACERS ACCORDING TO MFR. RECOMMENDATIONS.
4. WET BORES SHALL NOT BE USED.
5. ALL VOIDS BETWEEN THE BORE WALL & ENCASEMENT PIPE (CARRIER PIPE IF NO ENCASEMENT IS USED) SHALL BE FILLED w/ GROUT PER ASTM C-476.
6. REVEGETATE ACCORDING TO TxDOT SPEC 164.
7. MEET ALL TxDOT UTILITY PERMIT REQUIREMENTS & DIRECTIONS OF THE TxDOT ENGINEER.
8. IF SEPARATION IS WIDER THAN REQUIRED SAFETY DISTANCES, AND IF SIDE SLOPES WILL ALLOW, INSPECTION OF BORE PITS MAY BE ALLOWED (WITH TXDOT APPROVAL) WITH ACCESS TO PITS BY MEANS OTHER THAN MAIN TRAFFIC LANES
9. PROVIDE TRAFFIC CONTROL PLAN PER TxDOT REQUIREMENTS.

TxDOT CROSSING FOR PRESSURE PIPE

N.T.S.

FREEMAN-MILLICAN, INC.
ENGINEERS - ARCHITECTS - PLANNERS
12160 N. ABRAMS RD, SUITE 508 DALLAS, TX 75243 PH: 214.503.0555
WWW.FMI-DALLAS.COM TEXAS ENGINEERING FIRM REGISTRATION F-2827



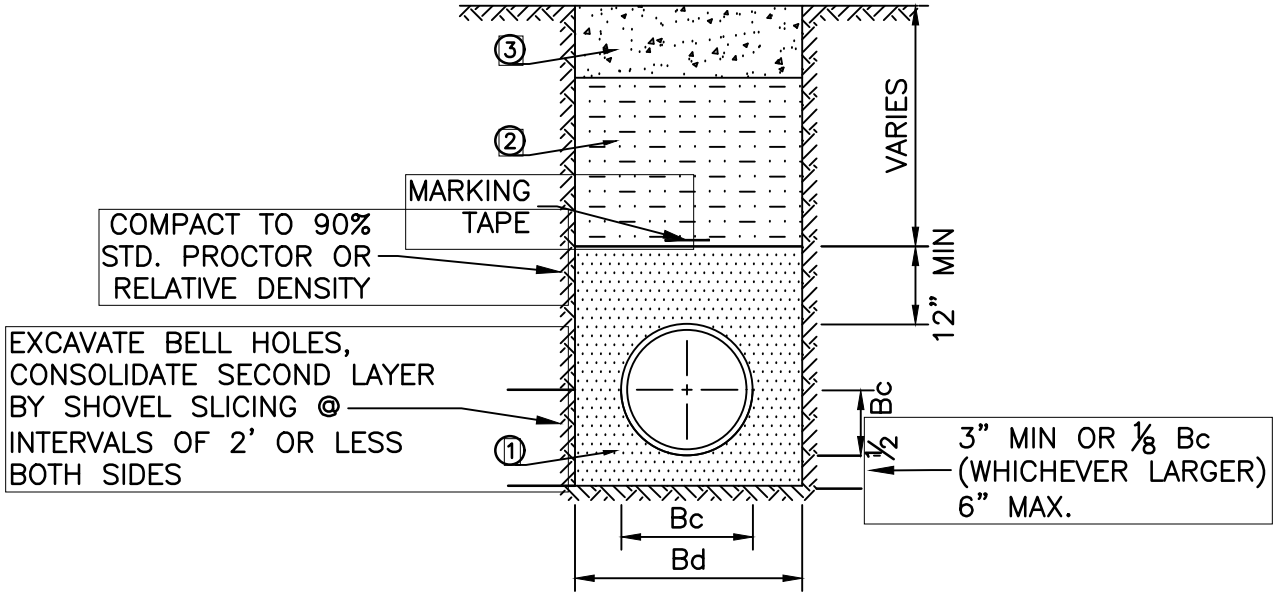
VALVE INSTALLATION
N.T.S.

FREEMAN-MILLICAN, INC.
ENGINEERS - ARCHITECTS - PLANNERS
12160 N. ABRAMS RD, SUITE 508 DALLAS, TX 75243 PH: 214.503.0555
WWW.FMI-DALLAS.COM TEXAS ENGINEERING FIRM REGISTRATION F-2827

CITY OF WESTON
ENGINEERING DESIGN MANUAL

WATER DETAILS

SCALE: N.T.S.
DATE: SEPT 2019
JOB #: 16015
SHEET: 2 OF 3



① STANDARD GRADATION SAND – TOP LAYER 12" ABOVE PIPE. GRADE TO PROVIDE UNIFORM SUPPORT OF PIPE BARREL. EXCAVATE BELL HOLES.

② SELECT MATERIAL FREE OF ROCKS, CLUMPS OR DEBRIS LARGER THAN 6" IN GREATEST DIMENSION. COMPACT TO 95% STANDARD PROCTOR DENSITY AT +2% OR HIGHER OF OPTIMUM MOISTURE CONTENT.

③ FOR CREEK CROSSINGS, THE UPPER 18" OF TRENCH BACKFILL SHALL BE STABILIZED WITH CEMENT TREATED BASE (CTB) OR FLOWABLE FILL TO TOP OF CREEK BANK.

CLASS "B-4" EMBEDMENT (WATER LINES)

N.T.S.

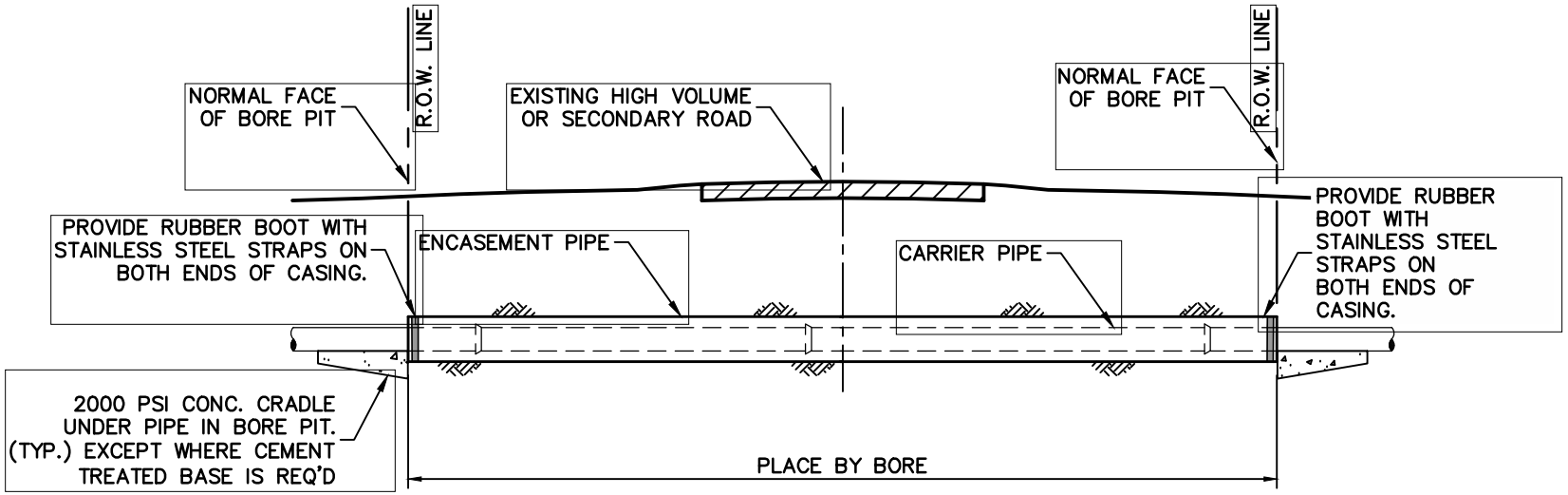
FREEMAN-MILLICAN, INC.
ENGINEERS - ARCHITECTS - PLANNERS
12160 N. ABRAMS RD, SUITE 508 DALLAS, TX 75243 PH: 214.503.0555
WWW.FMI-DALLAS.COM TEXAS ENGINEERING FIRM REGISTRATION F-2827

CITY OF WESTON
ENGINEERING DESIGN MANUAL

WATER DETAILS

SCALE: N.T.S.
DATE: SEPT 2019
JOB #: 16015
SHEET: 3 OF 3

SANITARY SEWER



NOTES:

1. ENCASEMENT PIPE, NEW SMOOTH STEEL PIPE WITH WALL THICKNESS =0.625" (5/8"), BITUMINOUS COATING, 35,000 PSI MIN. YIELD STRENGTH.
2. DETAIL AND NOTES SHALL APPLY TO PIPELINE CROSSING BY OPEN CUT.
3. CARRIER PIPE SHALL BE MADE-UP OUTSIDE THE ENCASEMENT PIPE AND PUSHED THROUGH THE BORE. INSTALL RACI CASING SPACERS ACCORDING TO MFR. RECOMMENDATIONS.
4. WET BORES SHALL NOT BE USED.
5. ALL VOIDS BETWEEN THE BORE WALL & ENCASEMENT PIPE (CARRIER PIPE IF NO ENCASEMENT IS USED) SHALL BE FILLED w/ GROUT PER ASTM C-476.
6. REVEGETATE ACCORDING TO TxDOT SPEC 164..
7. MEET ALL TxDOT UTILITY PERMIT REQUIREMENTS & DIRECTIONS OF THE TxDOT ENGINEER.
8. IF SEPARATION IS WIDER THAN REQUIRED SAFETY DISTANCES, AND IF SIDE SLOPES WILL ALLOW, INSPECTION OF BORE PITS MAY BE ALLOWED (WITH TXDOT APPROVAL) WITH ACCESS TO PITS BY MEANS OTHER THAN MAIN TRAFFIC LANES.
9. PROVIDE TRAFFIC CONTROL PLAN PER TxDOT REQUIREMENTS.

TxDOT CROSSING FOR PRESSURE PIPES

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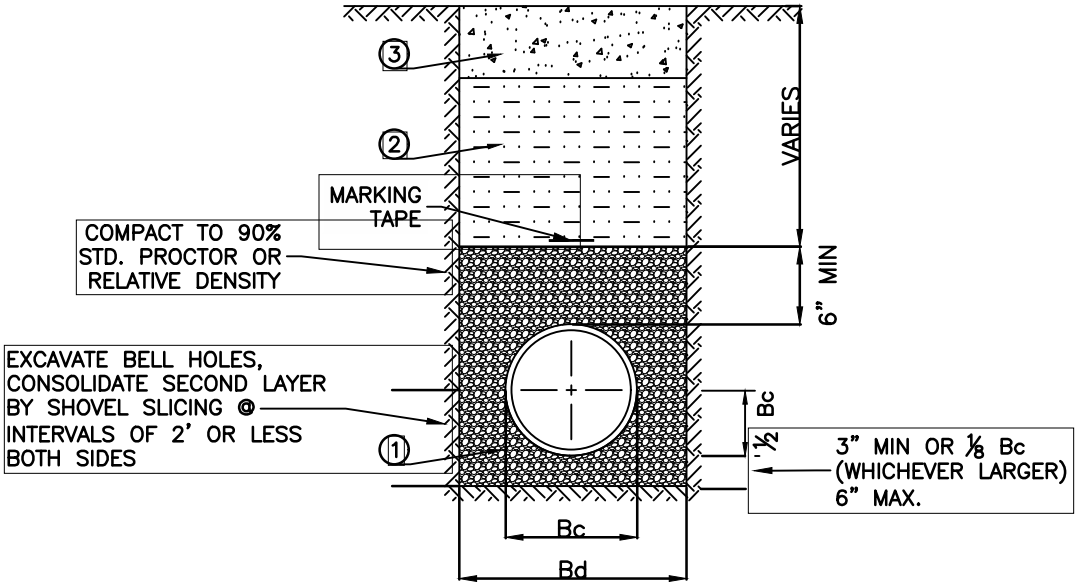
CITY OF WESTON
ENGINEERING DESIGN MANUAL

SEWER DETAILS

SCALE: N.T.S.
DATE: SEPT 2019
JOB #: 16015
SHEET: 1 OF 3



① FINE GRADATION CRUSHED STONE – TOP LAYER 6" MINIMUM ABOVE PIPE. GRADE TO PROVIDE UNIFORM SUPPORT OF PIPE BARREL. EXCAVATE BELL HOLES.

② SELECT MATERIAL FREE OF ROCKS, CLUMPS OR DEBRIS LARGER THAN 6" IN GREATEST DIMENSION. COMPACT TO 95% STANDARD PROCTOR DENSITY AT +2% OR HIGHER OF OPTIMUM MOISTURE CONTENT.

③ FOR CREEK CROSSINGS, THE UPPER 18" OF TRENCH BACKFILL SHALL BE STABILIZED WITH CEMENT TREATED BASE (CTB) OR FLOWABLE FILL TO TOP OF CREEK BANK.

MODIFIED CLASS "B+" EMBEDMENT (GRAVITY SEWER)

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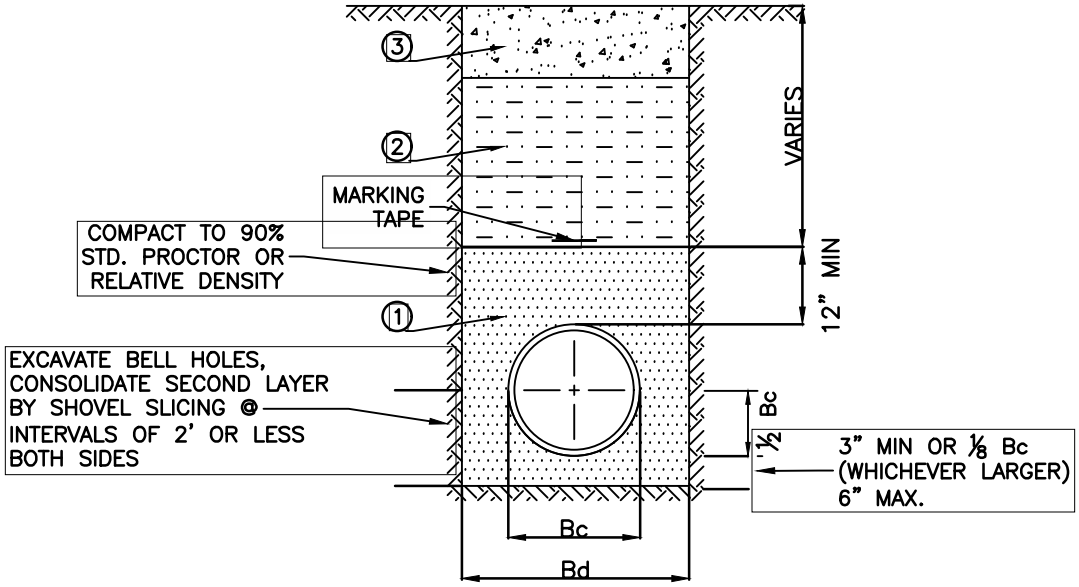

(1) STANDARD GRADATION SAND – TOP LAYER 12" ABOVE PIPE. GRADE TO PROVIDE UNIFORM SUPPORT OF PIPE BARREL. EXCAVATE BELL HOLES.

(2) SELECT MATERIAL FREE OF ROCKS, CLUMPS OR DEBRIS LARGER THAN 6" IN GREATEST DIMENSION. COMPACT TO 95% STANDARD PROCTOR DENSITY AT +2% OR HIGHER OF OPTIMUM MOISTURE CONTENT.

(3) FOR CREEK CROSSINGS, THE UPPER 18" OF TRENCH BACKFILL SHALL BE STABILIZED WITH CEMENT TREATED BASE (CTB) OR FLOWABLE FILL TO TOP OF CREEK BANK.

CLASS "B-4" EMBEDMENT (SEWER FORCE MAIN)

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