GRAYSON COUNTY ENGINEERING AND CONSTRUCTION STANDARD MANUAL

June, 2023

Approved by the Grayson County Commissioners Court on _____

Court Order Number_____

GRAYSON COUNTY ENGINEERING AND CONSTRUCTION STANDARD MANUAL

1.1 Introduction

A. Order

The Commissioners Court of Grayson County, following public notice, investigation, and hearing, has declared this Engineering and Construction Standard Manual (referred to as "Manual,") to be necessary and appropriate to accomplish the purpose stated below. This Manual has been adopted by order of the Grayson County Commissioners Court (Court Order XX) to provide a model for the orderly and efficient design and construction for infrastructure for the rural and suburban areas within Grayson County.

Where industry or governmental codes, orders, or laws require facilities to provide a higher degree of protection than provided herein, the higher degree of protection shall prevail. This includes, but is not limited to, the compliance with the Federal Clean Water Act, the Federal Endangered Species Act, and the Federal Historic Preservation Act.

B. Purpose

This Manual has been developed for the purpose of protecting the health, safety, and welfare of the public by establishing standard engineering and construction practices and minimum engineering and construction criteria for Grayson County.

C. Applicable Jurisdiction

The standards set forth in this Engineering and Construction Standard Manual apply to areas within Grayson County that are located outside of the corporate limits of a municipality. Additionally, standards set forth in this Engineering and Construction Standard Manual exclude areas that are located within the extraterritorial jurisdiction (ETJ) of a municipality provided that an ETJ has been established by the municipality and the municipality has entered into a written interlocal agreement with the County that identifies the municipality as an entity authorized to regulate design and construction within their respective ETJ, in accordance with Section 242, Local Government Code.

D. Exceptions

Requests for exceptions will be considered where it is shown that extreme hardship and/or unusual conditions provide justification and where alternate measures can be prescribed in keeping with the intent of this Order. All requests for such exceptions shall be fully documented with design data, cost comparisons, and other information that may be pertinent. Granting of an exception is at the sole discretion of the Director of Development Services.

E. General Requirements

The arrangement, character, extent, width, alignment, and location of all

streets, public ways, alleys, and driveways shall be in conformity with the County's Thoroughfare Plan and should be considered in their relation to existing and planned streets, alleys and driveways, topographical and environmental features, scenic views, and the land uses proposed to be served by such streets.

The most recently issued version of the TxDOT (Texas Department of Transportation) Roadway Design Manual and TxDOT Hydraulic Design Manual have been incorporated into this Manual by reference. Where conflict occurs between the Grayson County Engineering and Construction Standard Manual and TxDOT manuals, this Manual governs. In the event that information has been omitted from this document, refer to TxDOT guidance including Roadway Design Manual, Hydraulic Design Manual, and Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges.

GRAYSON COUNTY THOROUGHFARE DESIGN REQUIREMENTS

June, 2023

Approved by the Grayson County Commissioners Court on _____

Court Order Number_____

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2.1 General

A. The arrangement, character, extent, width, alignment, and location of all streets, public ways, alleys, and driveways shall be in conformity with the County's Thoroughfare Plan and should be considered in their relation to existing and planned streets, alleys and driveways, topographical and environmental features, scenic views, and the land uses proposed to be served by such streets.

B. All thoroughfare designs shall meet the guidelines in TxDOT's current edition of the *Roadway Design Manual.*

2.2 Street Design

A. Thoroughfare Definitions – The County recognizes five basic classifications of public roadways that include highways, major thoroughfares, minor thoroughfares, collectors, and local streets. Each class provides a certain degree of continuity, capacity, and accessibility to adjacent land uses. While differentiated by function, there is also a variance in geometric design. Table 2.1 summarizes the general design criteria of roadways within the County. The typical cross sections are depicted in Figure 2.1.

1. Major Thoroughfares – Six-lane divided roadways defined herein as Major Arterial thoroughfares. Major Arterial thoroughfares are typically initially constructed as four-lane divided roadways with a wider median and then widened to six lanes later. Frontage roads are also considered major thoroughfares.

2. Minor Thoroughfares – Four-lane divided roadways defined herein as Minor Arterial thoroughfares.

3. Collectors – Commercial Collectors provide access from a Major Arterial or Minor Arterial thoroughfare to nonresidential properties and are defined herein as Commercial Collector thoroughfares.

4. Local Streets – Residential streets with homes fronting on them are defined herein as Residential Collectors, Urban Streets, and Rural Streets; each with different design characteristics depending on whether the homes are front entry or alley served and whether the street is adjacent to a school or park.

5. Private Streets – Private streets shall be designed and constructed to the same standards as public streets. Any gated entrances shall also meet the requirements of Section 2.5.A.

6. Public Ways – Public ways shall be designed and constructed to the same standards as public streets and shall meet the design criteria of a Commercial Collector (Commercial Collector thoroughfare) unless otherwise allowed under Subsection (a) below. Public ways shall be privately maintained, shall be dedicated to public use, and shall not be gated.

    a. A public way can be reduced to the design criteria of an Urban Street if the owner agrees to prohibit parking on the public way and to actively enforce such prohibition. The parking prohibition shall be recorded on the plat and

shall be clearly posted along the public way.

B. Roadway Geometrics – Geometrics of County streets shall be defined as the geometry of the pavement and curb areas that govern the movement of traffic within the confines of the right-of-way (ROW). Included in the geometrics are pavement width, horizontal curvature, width of traffic lanes, median nose radii, curb radii at street intersections, pavement cross-slope, crown height, pavement thickness, and geometric shapes of islands separating traffic movements and other features.

1. Design Speed – The design speed is a primary factor in the horizontal and vertical alignment of roadways. Design features such as curvature, super-elevation, turning movement radii, and sight distance affects roadway lane width,pavement width, pavement cross-slope, pavement crown, and clearances. Referto Table 2.1.

2. Grades – Roadway grades shall be a minimum of half a percent (0.5%) to ensure proper flow of surface drainage toward inlets and a maximum of twelve percent (12%), or as approved by the governing entity.

3. Roadway Centerline

   a. Roadways shall be placed in the center of the ROW. The centerline of curves shall be tangent to the centerline of street at each end of curve.

   b. If offset, roadway centerlines for Commercial Collector, Residential Collector, and Urban Street thoroughfares shall be offset a minimum of one hundred and twenty-five feet (125’). If offset, Major Arterial and Minor Arterial thoroughfares shall be offset to meet the median requirements in Section 2.3.B.

4. Cross-Slope/Crown Height – Major Arterial and Minor Arterial thoroughfares shall have a two percent (2%) cross-slope. The cross-slope can vary where there is a transition into or out of a maximum two percent (2%) superelevation. Refer to the Grayson County Standard Construction Details for Commercial Collector, Residential Collector, Urban Street, and Alley parabolic crown heights.

5. Pavement Thickness and Reinforcement – See Appendix A for the Grayson County Standard Construction Details for subgrade and pavement design requirements.

6. Transitions – A concrete transition shall be constructed where four (4) lanes of a thoroughfare connect to a two (2) lane thoroughfare. The transition occurs only inthe direction in which traffic needs to be shifted laterally to join the thoroughfare with a different cross section.

   a. Transitions from a four (4) lane to a two (2) lane thoroughfare shall be a minimum of sixteen feet (16’) wide, a minimum of three hundred feet (300’) long, and meet TxDOT’s current minimum design requirements based on a design speed of 25 mph.

   b. A transition from a two (2) lane to a four (4) lane thoroughfare that occurs less than one thousand feet (1,000’) from a traffic signal, or from an

intersecting Major Arterial or Minor Arterial thoroughfare, shall be a two (2) lane transition, twenty-four feet (24') wide, a minimum of three hundred feet (300') long, and meet TxDOT's current minimum design requirements based on a design speed of 25 mph.

c. A transition from a two (2) lane thoroughfare to a four (4) lane thoroughfare that occurs more than one thousand feet (1,000') from a traffic signal, and from an intersecting Major Arterial or Minor Arterial thoroughfare, shall be a one (1) lane transition sixteen feet (16') wide, a minimum of three hundred feet (300') long, and meet TxDOT's current minimum design requirements based on a design speed of 25 mph.

C. Dead-End Streets/Cul-de-Sacs/Stub Streets

1. All dead-end streets shall have a turn-around unless otherwise allowed in Subsection D below. Turn-arounds at the end of dead-end streets (cul-de-sacs) shall have a circular driving surface that has a minimum radius of thirty-three feet (33') and a street right-of-way that has a minimum radius of fifty feet (50').

2. Streets shall be laid out so that no more than thirty (30) residential lots are accessible from a single point of access.

3. If any residential lot fronts onto the dead-end portion of a street that will be extended in the future, a temporary turn-around that meets the standards described above shall be constructed at the end of the dead-end street within a temporary street easement. The following note shall be placed on the plat: "Cross-hatched area is temporary street easement for turn-around until street is extended (give direction) with future development of abutting property".

4. A stub street is an undivided dead-end street that will be extended in the future that does not have a turn-around, which is only allowed under the following conditions: No residential lots shall front onto a stub street. Non-residential lots adjacent to a stub street shall have access to another street. If the length of a residential stub street exceeds the depth of the adjacent residential lots, it shall be temporarily blocked at the rear edge of the lots (or alley) with barrel-mounted barricade. If a non-residential stub street extends more than one hundred feet (100') beyond the last driveway on the street, it shall be temporarily blocked at the last driveway with barrel-mounted barricade.

5. A stub street shall have a permanent Type III barricade installed at its terminus. A residential stub street shall also have a 24"x30" sign prominently posted at its terminus with black letters on a white background that state, "NOTICE – This street will be extended as part of a future development." The installation and cost of these barricades and signs shall be the responsibility of the developer.

D. Minimum Horizontal Design Radius

1. The minimum centerline radius is a function of design speed, superelevation, and the vehicle side friction factor. Side friction is the force that keeps a vehicle from sliding off the roadway.

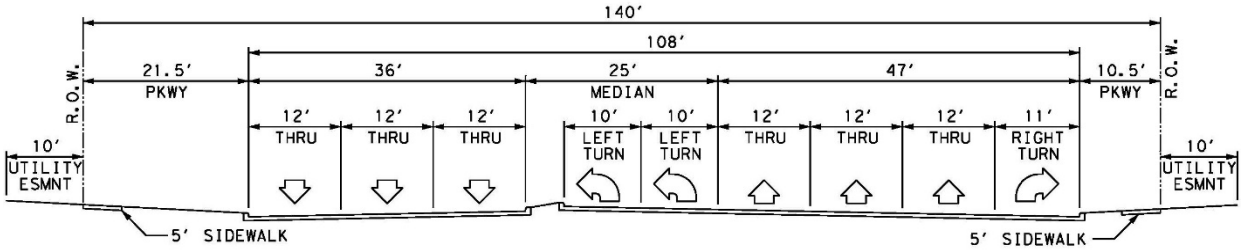
2. The minimum horizontal radii are shown in Table 2.1 and are in accordance with the guidelines in AASHTO's *A Policy on Geometric Design of Highways and Streets, Latest Edition*.

Table 2.1 – General Design Criteria

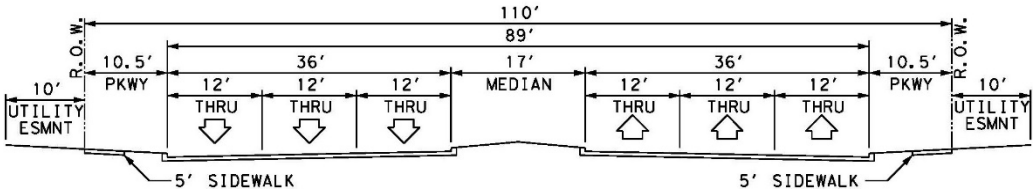
Criteria	Thoroughfare Class						
	Major Arterial	**Minor Arterial**	**Commercial Collector**	**Residential Collector**	**Urban Street**	**Rural Street**	**Alley**
Right-of-Way (ROW)	110'(1)	86'(2)	65'	56'	50'	60'	16'-24'
Pavement Width (face-to-face)	36' in each direction(3)	24' in each direction(3)	44'	36'	30'	24'	12'-20'
Traffic Lanes	6	4	4	2	1	2	1
Left Turn-lane Width	2 @ 10'	1 @ 11'	N.A.	N.A.	N.A.	N.A.	N.A.
Right Turn-Lane Width	11'	11'	N.A.	N.A.	N.A.	N.A.	N.A.
Median Width	4'-25'(3)	4'-17'(3)	N.A.	N.A.	N.A.	N.A.	N.A.
Parkway Width	0'-21.5'(3)	0-21.5'(3)	10'-6"	10'	VARIES(3)	VARIES(3)	2'
Design Speed, V (MPH)	45	45	30	30	25	25	15
Min. Horizontal Radii	1100'	1100'	350'	350'	250'	250'	250'
Min. Tangent Between Curves	100'	100'	100'	100'	N.A.	N.A.	N.A.
Min. Vertical Crest Curve (K)	44	29	29	29	19	19	N.A.
Min. Vertical Sag Curve (K)	64	49	49	49	37	37	N.A.
Stopping Sight Distance	425'	360'	200'	200'	155'	155'	155'
Parking	Prohibited	Prohibited	Prohibited	Allowed	Allowed	Prohibited	Prohibited
Volume Range (VPD)	36-45,000	20-28,000	12-18,000	6-12,000	N.A.	N.A.	N.A.

(1) 140' ROW and 157' ROW at intersections (See Figure 2.1)
(2) 108' ROW and 115' ROW at intersections (See Figure 2.1)
(3) Distance varies. See Grayson County Standard Construction Details and Figure 2.1 for more information.

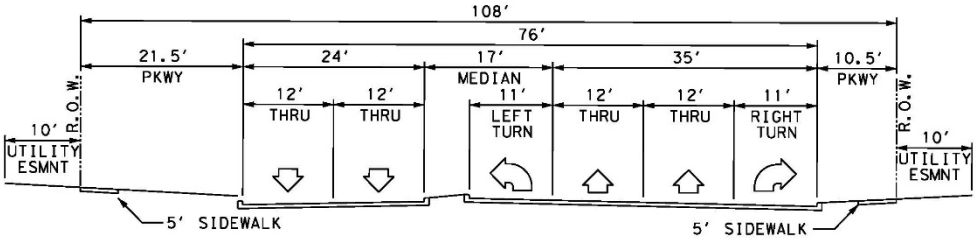
Major Arterial (Intersection)



Major Arterial (Midblock)



Minor Arterial (Intersection)



Minor Arterial (Midblock)

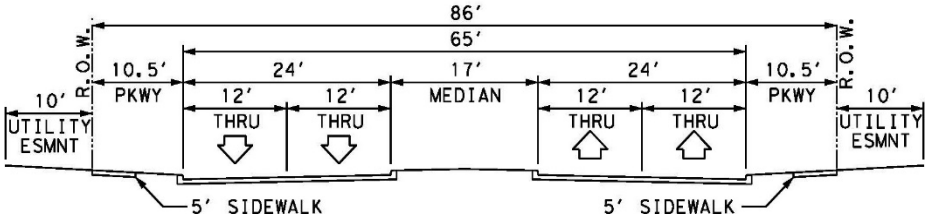
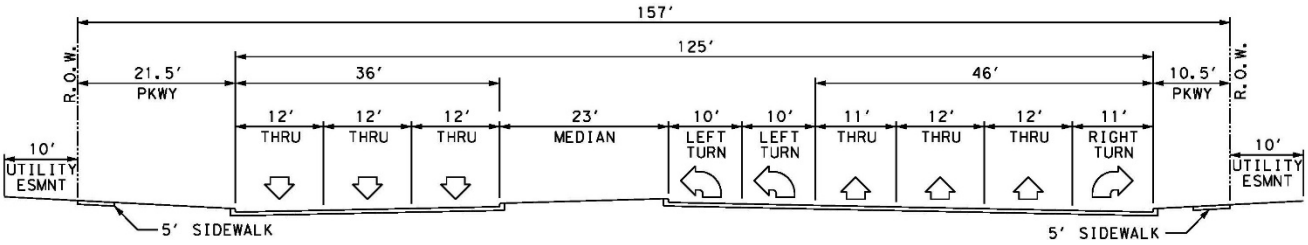
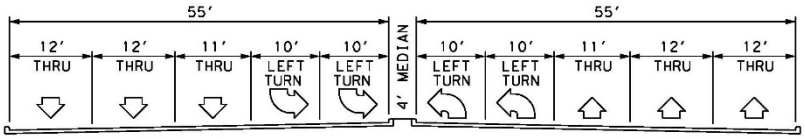


Figure 2.1 - Typical Cross Sections

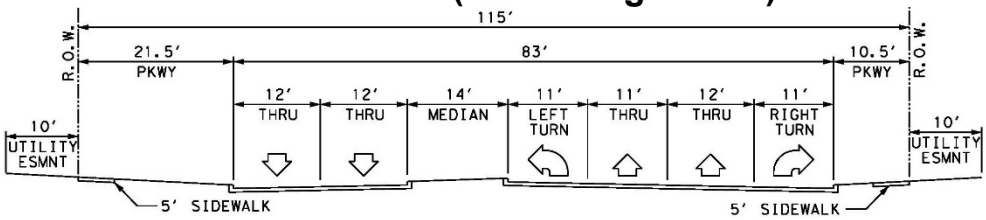
Major Arterial (At Frontage Road)



Major Arterial (Between Frontage Roads)



Minor Arterial (At Frontage Road)



Minor Arterial (Between Frontage Roads)

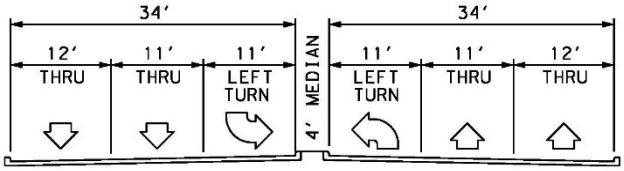
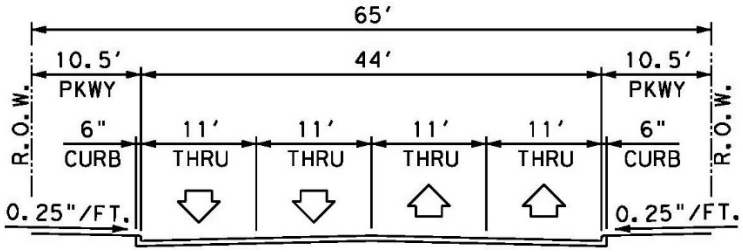
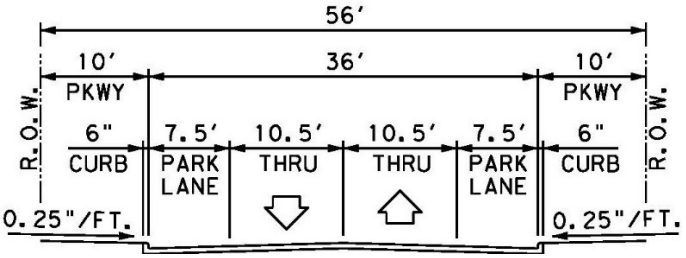


Figure 2.1 - Typical Cross Sections (cont'd.)

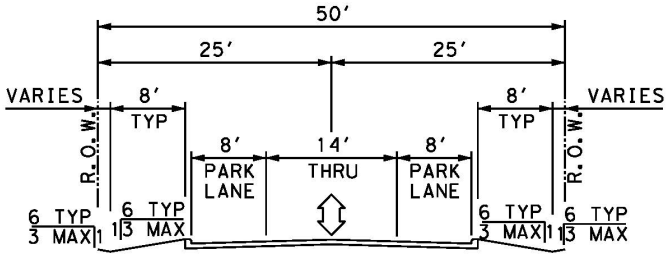
Commercial Collector



Residential Collector



Urban Street



Rural Street

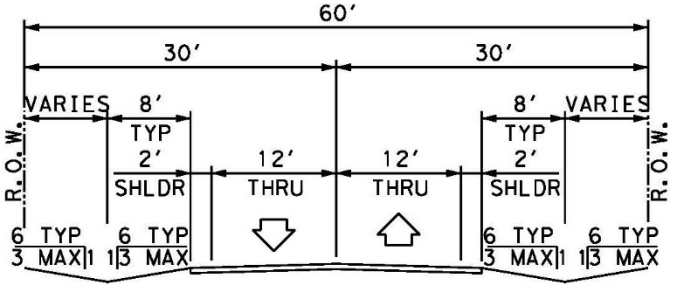


Figure 2.1 - Typical Cross Sections (cont'd.)

E. Minimum Vertical Alignment

1. Vertical curves are utilized in roadway design to affect gradual change between tangent grades and will result in a design which is safe, comfortable in operation, pleasing in appearance and adequate for drainage. Vertical curve alignment shall also provide Stopping Sight Distance (SSD) in all cases. SSD is a function of design speed, perception-reaction time, and deceleration rate. The perception-reaction time is assumed to be 2.5 seconds and is in accordance with the guidelines in TxDOT's current edition of the *Roadway Design Manual*. The equation for SSD on level roadways appears below:

$$SSD = 1.47Vt + 1.075\frac{V^2}{a}$$

SSD	=	stopping Sight Distance (ft)
t	=	brake reaction time (2.5 sec.)
V	=	vehicle design speed (MPH)
a	=	deceleration rate, (11.2 ft/s^2)

Additional information for calculating SSD on roadways on a grade can be found in AASHTO's current *A Policy on Geometric Design of Highways and Streets*.

2. To determine the minimum acceptable length of Crest and Sag curves shown in Tables 2.2 and 2.3, it is assumed that approach grades are between -3% and 3% in the SSD calculation. The SSD for grades steeper than -3 % or 3% shall be in accordance with the guidelines in AASHTO's current *A Policy on Geometric Design of Highways and Streets*.

Table 2.1 shows minimum K values. K is defined as the rate of vertical curvature and is equivalent to the horizontal distance in feet required to make a one percent (1%) change in grade. The values of A are equivalent to the algebraic difference in grade between the two grades that are being joined together by the vertical curve.

Table 2.2 - Minimum Acceptable Crest Curve Given Speed and Difference in Grade of Road

Design Speed, V (MPH)	SSD (ft)	Length of Vertical Curve (L=KA)									
		A=1.6	A=2	A=3	A=4	A=5	A=6	A=7	A=8	A=9	A=10
25	155	50	50	50	50	60	80	90	100	110	120
30	200	50	50	60	80	100	120	140	160	180	190
35	250	50	60	90	120	150	180	210	240	270	290
40	305	70	90	140	180	220	270	310	360	400	440
45	360	100	130	190	250	310	370	430	490	550	610
50	425	140	170	260	340	420	510	590	680	760	840

Table 2.3 - Minimum Acceptable Sag Curve Given Speed and Difference in Grade of Road

Design Speed, V (MPH)	SSD (ft)	Length of Vertical Curve (L=KA)									
		A=1.6	A=2	A=3	A=4	A=5	A=6	A=7	A=8	A=9	A=10
25	155	50	60	80	110	130	160	190	210	240	260
30	200	60	80	120	150	190	230	260	300	340	370
35	250	80	100	150	200	250	300	350	400	450	490
40	305	110	140	200	260	320	390	450	520	580	640
45	360	130	160	240	320	400	480	560	640	720	790
50	425	160	200	290	390	480	580	680	770	870	960

F. Standard Intersection Layout

1. Street intersections shall intersect at ninety degree (90º) angles. Intersection approaches for Major Arterial and Minor Arterial thoroughfares shall remain perpendicular for a minimum distance equal to the corresponding design speed Stopping Sight Distance (SSD) identified in Table 2.1. For residential collector and/or local street intersections, up to a five-degree (5º) tolerance is allowable.

2. When the classification of a thoroughfare changes as it crosses an intersecting street, the design of both thoroughfare approaches shall maintain the characteristics of the higher-class thoroughfare for a minimum distance specified by the governing entity.

3. The through lane(s) on one approach shall align with the receiving lane(s) on the other side of the intersection. If pre-existing physical encroachments make an offset necessary, a through lane can be offset no more than six feet (6') from its receiving lane when crossing a Minor Arterial or smaller thoroughfare and offset no more than eight feet (8') when crossing a Major Arterial thoroughfare. These requirements apply to both public street and private driveway approaches to an intersection.

4. The curb radii shall be a minimum of twenty feet (20') where Residential Collector and Urban Streets intersect with Residential Collector and Urban Streets. The curb radii shall be a minimum of forty feet (40') where Major Arterial, Minor Arterial, and Commercial Collector thoroughfares intersect with Major and Minor Arterial thoroughfares. The curb radii at all other intersecting streets shall be a minimum of thirty feet (30'). Larger curb radii may be required to accommodate fire trucks and/or commercial trucks.

5. Major-Major Arterial, Major-Minor Arterial, and Minor-Minor Arterial intersections shall maintain a maximum slope of two percent (2%) a minimum distance of two hundred feet (200') upstream and downstream of the intersection.

6. Roadway connections to a Major Arterial or Minor Arterial thoroughfare shall maintain a maximum slope of two percent (2%) a minimum distance of one hundred feet (100') upstream and downstream of the intersection.

7. A separate grading plan shall be provided for Major-Major Arterial, Major-Minor Arterial, and Minor-Minor Arterial intersections. Grading plans shall account for future extensions of Major Arterial and Minor Arterial thoroughfares for a minimum distance of six hundred feet (600') beyond the curb return of the intersection in all directions.

8. At four-way intersections of parabolic streets, the reduction of the crown height shall occur on the thoroughfare with the through gutter.

    a. For Commercial Collector and Residential Collectors, the crown height reduction from six inches (6") to three inches (3") shall occur through the intersection and transition from the curb return to a point fifty feet (50') past the curb return.

    b. For Urban Streets, the crown height reduction from four inches (4") to two inches (2") shall occur through the intersection and transition from curb return to a point thirty feet (30') past the curb return.

9. A minimum of ten and a half feet (10.5') of parkway shall be maintained from the face of the curb along the curb's radius.

10. ROW width for a Major Arterial thoroughfare that intersects a Major Arterial or Minor Arterial thoroughfare shall be one hundred forty feet (140') for two hundred feet (200') and then taper at a 15:1 ratio to the standard ROW width. See Figure 2.2.

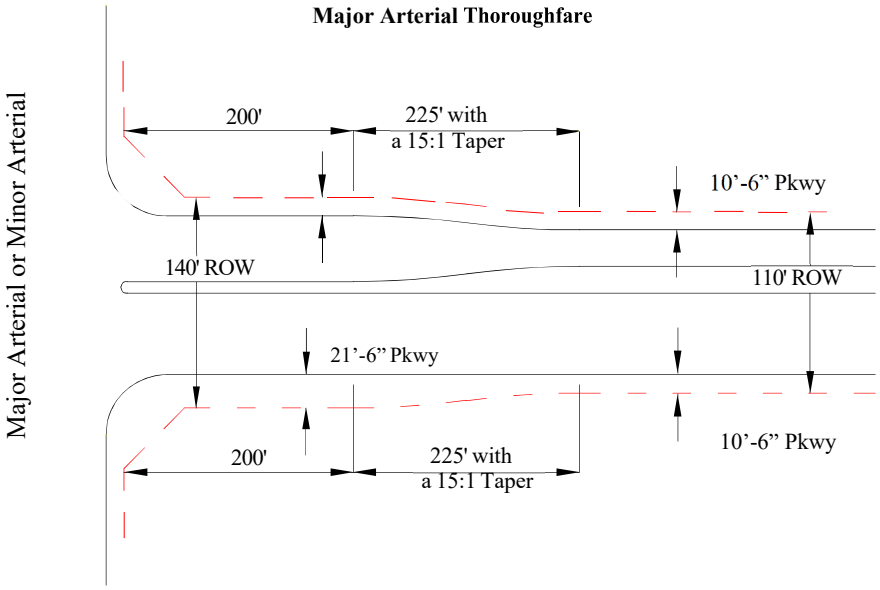


Figure 2.2 - Major Arterial Thoroughfare Intersection Detail

11. ROW width for a Minor Arterial thoroughfare that intersects a Major Arterial or Minor Arterial thoroughfare shall be one hundred eight feet (108') for a distance distance of one hundred fifty feet (150') and then taper at a 15:1 ratio to the standard ROW width to allow build-out of the intersection. See Figure 2.3.

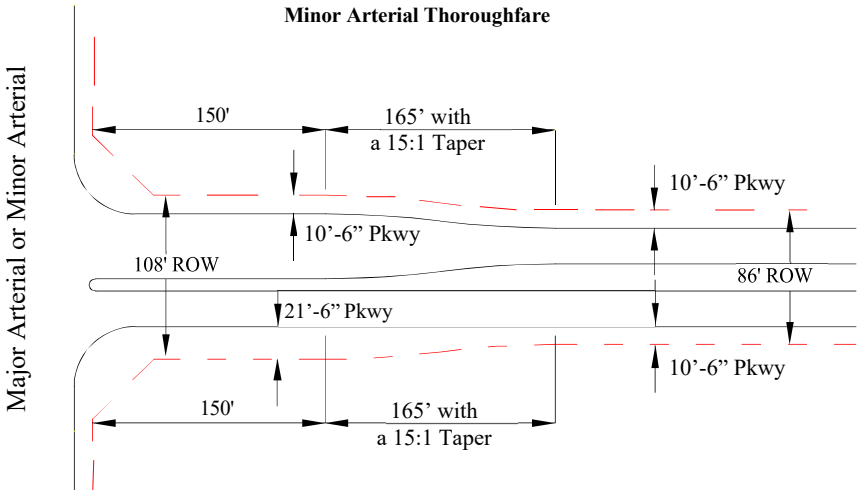


Figure 2.3 - Minor Arterial Thoroughfare Intersection Detail

12. The ROW width for a Major Arterial thoroughfare that intersects with a pair of highway frontage roads shall be one hundred fifty-seven feet (157') for a distance of three hundred feet (300') and then taper at a 15:1 ratio to the standard ROW width to allow build-out of the intersection. The ROW width for a Minor Arterial thoroughfare that intersects with a pair of highway frontage roads shall be one hundred fifteen feet (115') for a distance of three hundred feet (300') and then taper at a 15:1 ratio to the standard ROW width to allow build-out of the intersection. See Figures 2.4 and 2.5.

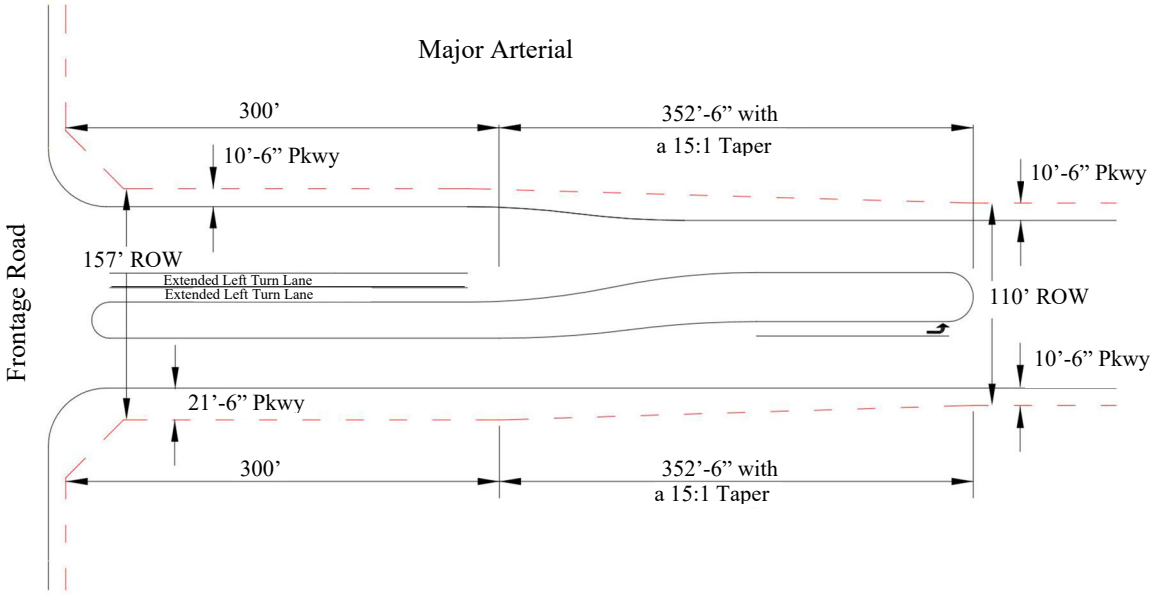


Figure 2.4 - Major Arterial Thoroughfare Intersection with Frontage Road

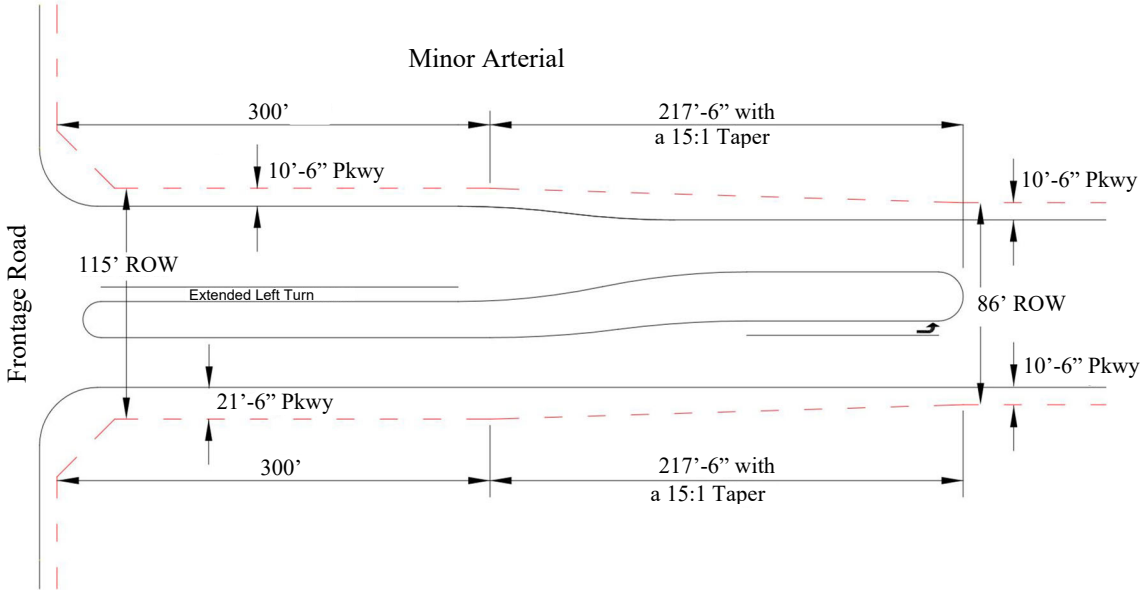


Figure 2.5 - Minor Arterial Thoroughfare Intersection with Frontage Road

G. Roundabouts

1. Roundabouts may be considered for the intersection of Minor Arterial, Commercial Collector, Residential Collector, or Urban Street thoroughfares with Commercial Collector, Residential Collector, or Urban Street thoroughfares. Roundabouts shall not be installed at a Major-Major Arterial, Major-Minor Arterial, or Minor-Minor Arterial intersection without a detailed traffic simulation and cost-benefit analysis approved by the governing entity. Roundabouts shall not be installed along a six-lane Major Arterial thoroughfare.

2. Roundabouts on private property that connect to a private street or to a fire lane shall be designed to the standards in these design requirements.

3. Roundabouts shall be designed to accommodate a fire truck making all possible entry and exit movements. A fire truck shall be able to make the “through” movement without traveling on a truck apron.

4. Roundabouts shall include the typical features of a modern roundabout shown in Figure 2.6 and described in these design requirements.

5. The curb surrounding the central island shall be six inch (6”) vertical curb if a truck apron is provided and six inch (6”) mountable curb if no truck apron is provided. The curb surrounding a truck apron shall be three inch (3”) mountable curb. The curb surrounding all faces of each splitter island shall be four inch (4”) mountable curb.

6. The inscribed circle radius shall be a minimum of fifty-five feet (55’) and a maximum of eighty feet (80’) for a single lane roundabout, and a minimum of seventy-five feet (75’) and a maximum of a hundred feet (100’) for a two-lane roundabout.

7. The circulatory roadway shall have a minimum width of sixteen feet (16’), face-to-face. The circulatory roadway shall be at least as wide as the maximum entry width at the roundabout. If the circulatory roadway is less than twenty-nine feet (29’) wide, face-to-face, a truck apron shall be provided. The combined width of the circulatory roadway and the truck apron shall be a minimum of twenty-nine feet (29’). Truck aprons shall provide a solid surface of concrete pavers that are a contrasting color compared to the pavement of the circulatory roadway and shall not give the appearance of being a sidewalk.

8. Single lane entries and exits shall be a minimum of sixteen feet (16’) wide, face to face.

9. Two-lane entries and exits shall be a minimum of twenty-four feet (24’) wide, face to face.

10. Splitter islands shall provide a solid surface of concrete pavers unless the entry and exit on the same leg of the roundabout are both at least twenty-four feet (24') wide, face-to-face. The pavers shall be a contrasting color compared to the street pavement and no signs shall be installed in the splitter island. If pavers are not required, the splitter island can contain landscaping provided it does not interfere with the necessary sight distance.

11. Crosswalks shall pass through or in advance of each splitter island.

12. All streets, fire lanes, and approved driveways shall intersect radially with a roundabout. Residential driveways shall not intersect with a roundabout.

13. Landscaping and/or monuments within the central island are encouraged but shall be limited so that the minimum sight distances described in FHWA's *Roundabouts: An Informational Guide* are provided at the roundabout. For vehicles approaching the roundabout, this includes the approach stopping sight distance to the crosswalk or the yield line, the stopping sight distance to the crosswalk on the next exit, and the intersection sight distance to circulating vehicles and vehicles entering at the immediate upstream entry. For circulating vehicles, this includes the stopping sight distance on the circulatory roadway.

14. Parking is prohibited within a roundabout.

15. On any approach to a roundabout, driveways, alley connections, and on-street parking shall not be permitted between the crosswalk and the yield line nor along any portion of street that contains a splitter island.

16. The ROW for a roundabout shall extend a minimum of twelve feet (12') beyond the back of its outer curb. The ROW for any street entering the roundabout will flare out as the street flares so that a minimum of twelve feet (12') is provided beyond the back of curb on each side of the street.

17. The roundabout entries and exits and the pavement contained within the inscribed circle radius shall be constructed on a uniform plane of the same grade, which shall not exceed two percent (2%). Roadway approaches to the roundabout shall have a maximum slope of two percent (2%) for a distance of at least two hundred feet (200') for Minor Arterial thoroughfares and at least one hundred feet (100') for Commercial Collector, Residential Collector, and Urban Street thoroughfares.

18. Roundabouts shall be illuminated by streetlights as described in FHWA's *Roundabouts: An Informational Guide*.

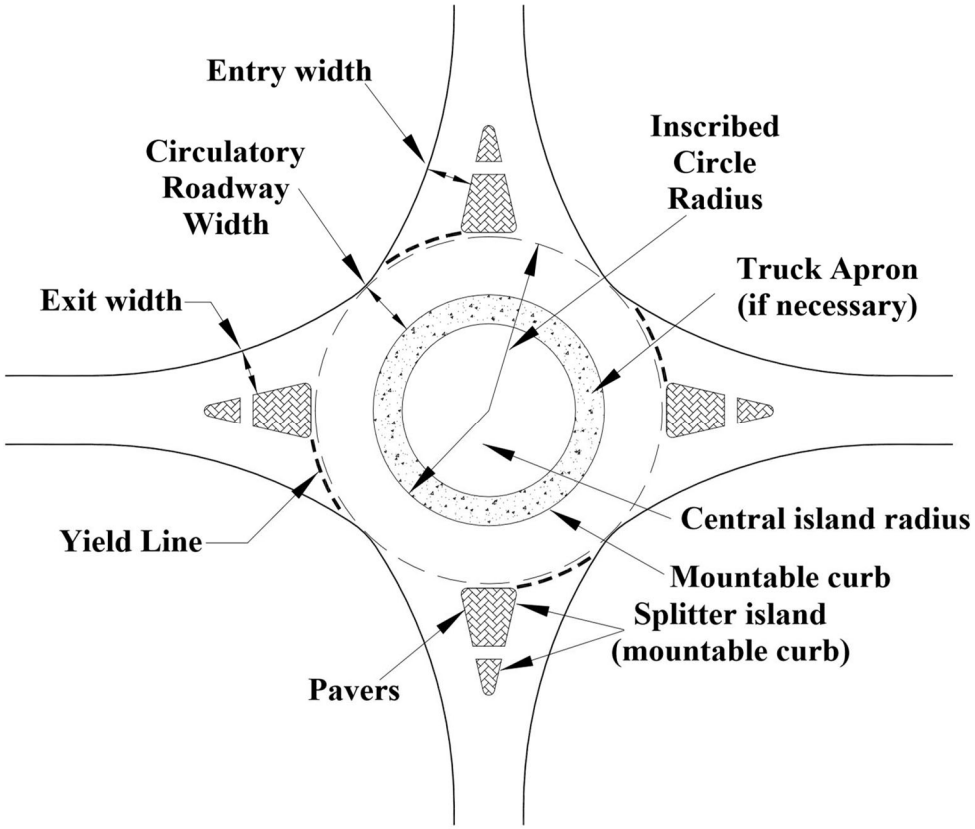


Figure 2.6 - Typical Roundabout

H. Residential Frontage

1. Residential lots shall not front onto a Major Arterial, Minor Arterial, or Commercial Collector unless parallel access roads are provided. The minimum distance between adjacent curbs of the thoroughfare and the access road shall be twenty feet (20'). Access road ROW shall be in addition to the thoroughfare ROW and access roads shall not connect to the adjacent thoroughfare.

2. Residential lots shall not front onto a Residential Collector or Urban Street within one hundred feet (100') of the ROW line of the nearest Major Arterial or Minor Arterial thoroughfare.

3. Residential lots shall not front onto a roundabout. Residential lots adjacent to roundabouts shall be oriented so that their houses do not face the roundabout and their driveways do not intersect with the roundabout or along any section of street with a splitter island.

I. Partial Streets

1. Longitudinal partial dedications of Major Arterial and Minor Arterial thoroughfares shall be permitted when only one side of a future thoroughfare is being developed. In such a case, one-half of the total right-of-way shall be dedicated and a minimum of twenty-four feet (24') of pavement, face-to-face, shall be constructed.

J. Street Lengths

1. Streets shall be laid out so that no more than thirty (30) residential lots are accessible from a single point of access.

2.3 Median, Left-Turn Lane, Right-Turn Lane, Deceleration Lane, and Island Design

A. Required Median Openings

1. Median openings on divided thoroughfares shall be required at all street intersections. Median openings may be constructed to serve non-residential drives provided that the minimum spacing requirements herein are met. Left-turn lanes are required for each street or driveway that connects to a median opening.The design of median openings and left-turn lanes shall accommodate potential future left-turn lanes that might serve undeveloped land.

2. All non-residential lots on a divided thoroughfare shall have direct or indirect access to a median opening. Indirect access shall be provided through a series of fire lane and access easements.

3. Multi-family developments on a divided thoroughfare shall have direct access to a median opening.

4. The County can modify, relocate, or remove any existing or planned median opening to facilitate traffic flow and/or preserve the health, safety, and welfare of the Public, as reasonably determined by the governing entity utilizing recognized industry standards as they exist, may be amended, or in the future arising.

B. Left-Turn Lane Requirements

1. Left-Turn Lane Storage

a. All single left-turn lanes constructed on divided thoroughfares of ultimate cross section width shall be a minimum of eleven feet (11') wide. Where double left-turn lanes are provided, each left-turn lane shall be a minimum of ten feet (10') wide.

b. All left-turn lanes constructed as future through lanes on divided thoroughfares shall be twelve feet (12') wide for the entire storage and taper length requirements as listed in Table 2.4.

c. Minimum storage requirements are listed in Table 2.4. Storage requirements may be increased by the governing entity based upon actual and projected traffic demands of the properties that will be served by the left-turn lane.

d. Left-turn lanes will be delineated by using the County's current Traffic Standard Construction Details.

e. Concrete pavers shall be required in the median where the median width is six feet (6') or less, back of curb to back of curb. If the median width is greater than six feet (6'), then concrete pavers shall be required for a minimum distance of ten feet (10') from the median nose. See Figure 2.7.

2. Taper Length – The taper specifications for left-turn lane entrance areas are specified in Table 2.4. The variables used for the specifications are shown in Figure 2.7.

Table 2.4 - Minimum Left-Turn Lane Design Requirements

Type of Thoroughfare On	Type of Thoroughfare At	Turn Lane Width(s) (ft)	Length of Full-Width Storage(ft)	Taper Specifications		
				Length(ft)	R_1(ft)	R_2(ft)
Major Arterial	Major or Minor Arterial	10(1)(4)	150,250(2)	200	505	505
Minor Arterial	Major or Minor Arterial	11	150	100	250	250
Major or Minor Arterial	Commercial or Residential Collector	11(4)	150	100	250	250
Major or Minor Arterial	Urban Street	11(4)	100(3)	100	250	250
Major or Minor Arterial	Non-Residential Driveway	11(4)	150	100	250	250
TxDOT Road	All types and Non-Residential Driveway	See TxDOT's *Roadway Design Manual and TxDOT Standard Specifications*				
Frontage Road	All types and Non-Residential Driveway	See TxDOT's *Roadway Design Manual and TxDOT Standard Specifications*				

1. Double left-turn lanes
2. 150 feet for the inside left-turn lane; 250 feet for the outside left-turn lane
3. 150 feet of storage shall be required for gated communities.
4. Left-turn lanes that will become a future through lane shall be twelve feet (12') in width and be square at the end and incorporate a street header.

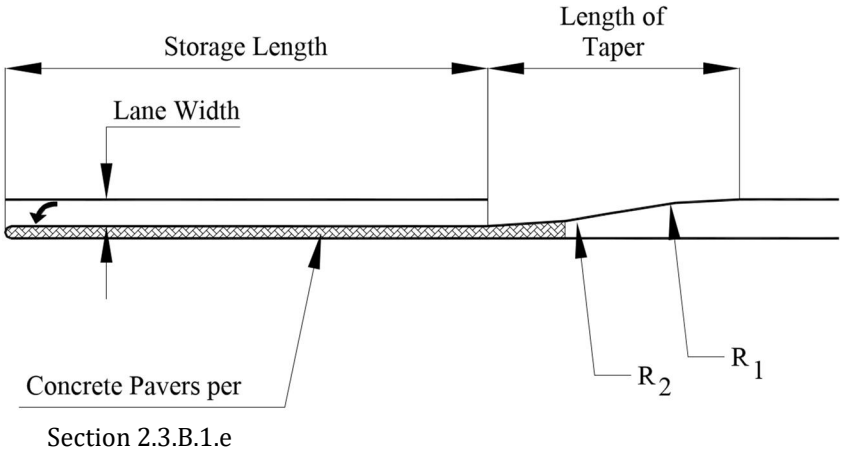


Figure 2.7 - Typical Left Turn Lane Dimensions

3. Median Openings

   a. Median openings shall accommodate all turning paths and crosswalks.

   b. The width of mid-block median openings shall not be less than sixty feet (60'). They may be greater than sixty feet (60') where necessary to accommodate turning paths and crosswalks subject to approval by the governing entity.

4. Median openings shall not be less than seventy-one feet (71') wide at divided high capacity driveways (see AASHTO's current A Policy on Geometric Design of Highways and Streets – Chapter 9).

5. The minimum distance to the first mid-block median opening along a Major Arterial or Minor Arterial thoroughfare that is immediately downstream from a Major Arterial or Minor Arterial thoroughfare is shown in Figure 2.8. This distance varies from three hundred fifty feet (350') to six hundred feet (600'), measured nose to nose, depending on the type of thoroughfare and the type of mid-block opening.

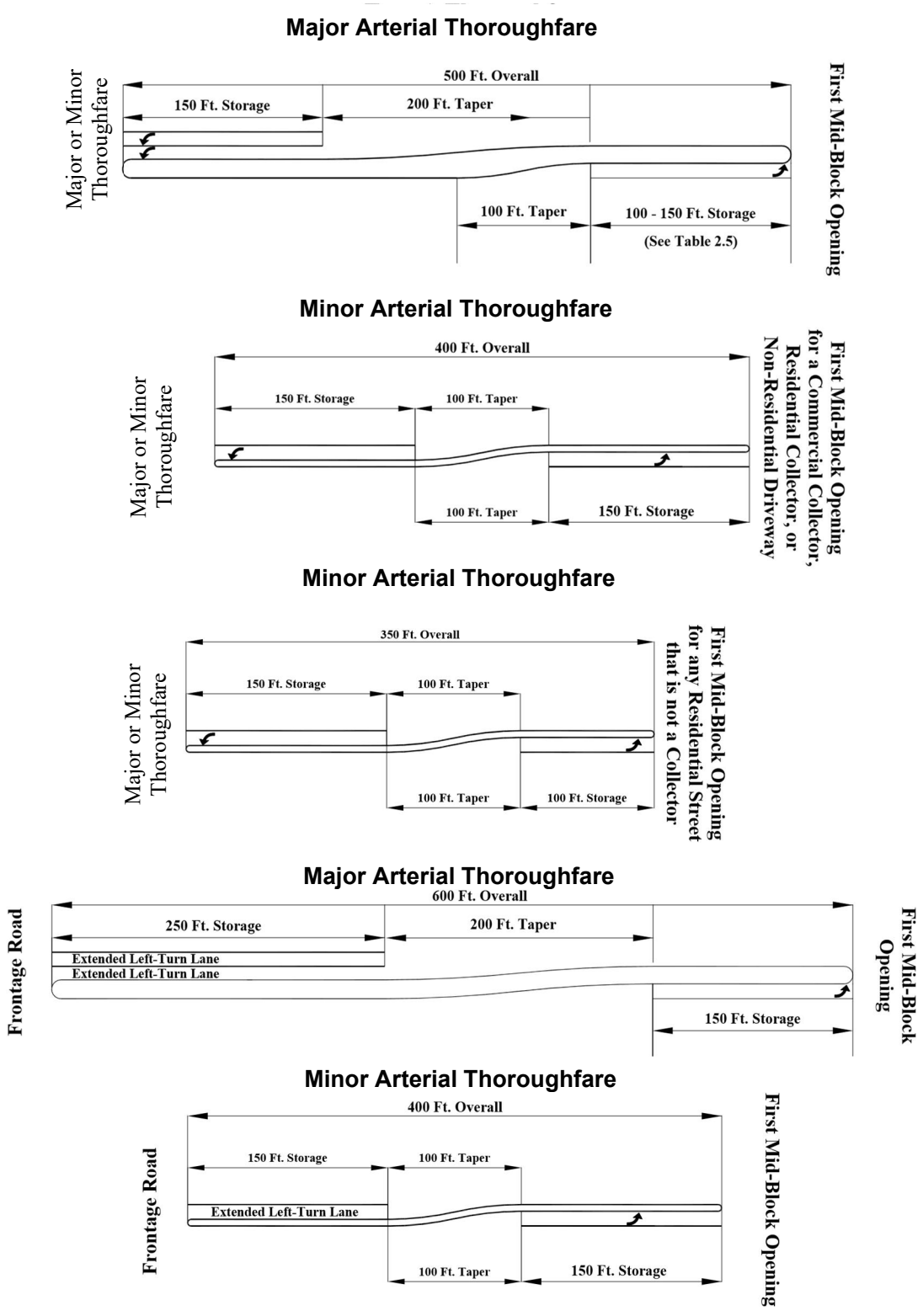


Figure 2.8 - Minimum Spacing between Major Arterial or Minor Arterial Thoroughfares and First Mid-Block Median Opening on a Major Arterial or Minor Arterial Thoroughfare

6. The minimum distance between median openings on a Major Arterial or Minor Arterial thoroughfare where left turn storage is provided in both directions for smaller intersecting thoroughfares and driveways is shown in Figure 2.9. The distances shown are measured nose to nose. Refer to the "Policy, Procedures and Specifications of Grayson County, Texas for the Installation of Driveway Culverts, Road Bores, Use of Heavy Equipment and Utility Lines Within Grayson County Road Right-of-Way" for driveway design requirements.

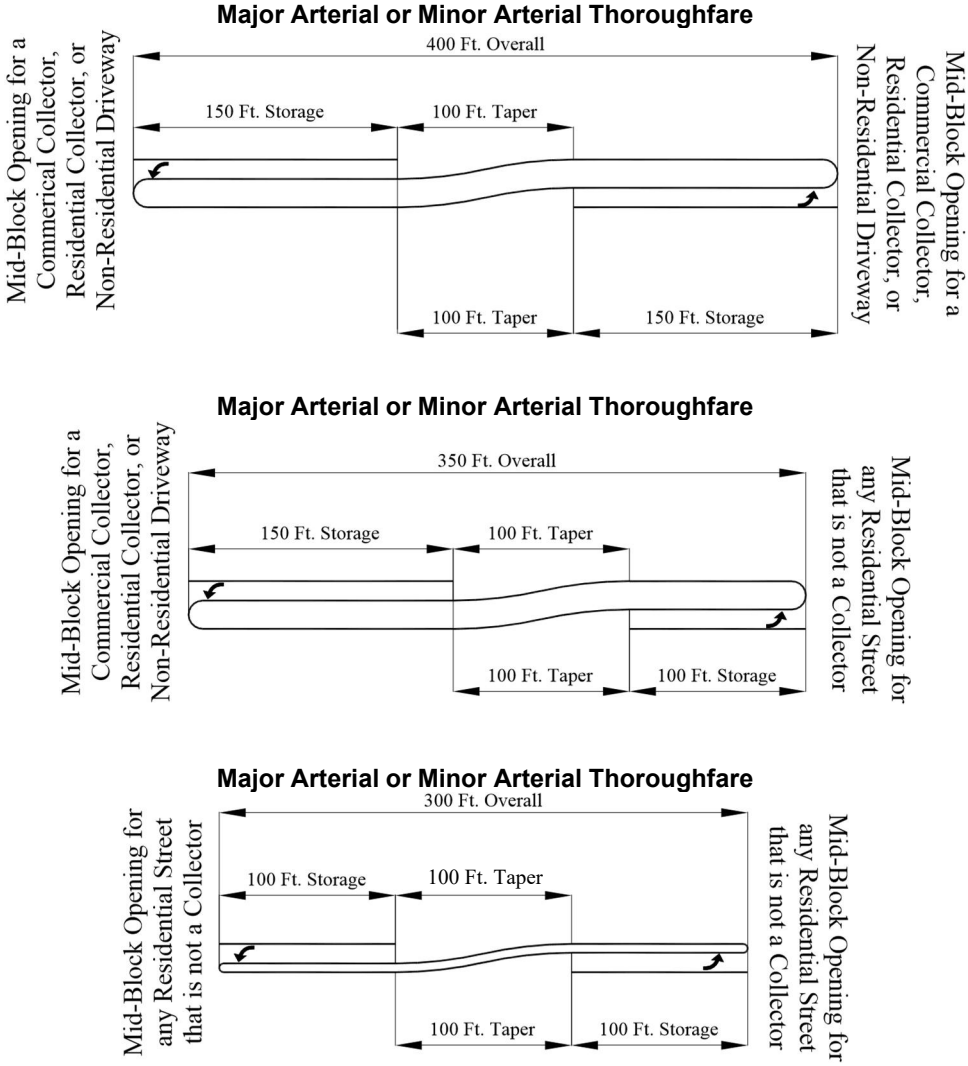


Figure 2.9 - Minimum Distance between Mid-Block Median Openings on a Major Arterial or Minor Arterial Thoroughfare

7. Medians without Left-Turn Lanes in Both Directions

   a. If a left-turn lane is required in only one direction, the minimum length of the median shall be the sum of the required left-turn storage, taper length, fifty-foot (50') tangent, and length of median nose. This requirement is reflected in Figure 2.10. This median design is only allowed if access is not compromised for vacant property on the opposite side of the thoroughfare.

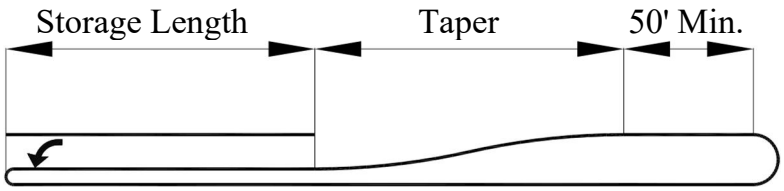


Figure 2.10 - Minimum Length of Median Where a Left-Turn Lane is Needed in Only One Direction

8. Left-Turn Storage Not Required

    a. If the left-turn storage is not required in either direction, but the median is simply a spacer between two median openings, the minimum length of the spacer must be one hundred feet (100') (see Figure 2.11). A minimum spacing of one hundred feet (100') from the median opening to the first non-residential driveway shall be maintained.

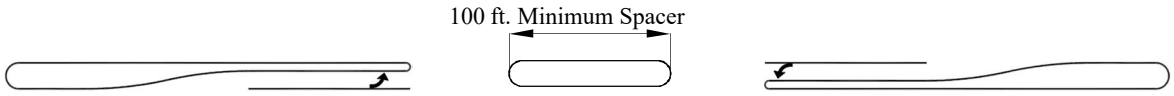


Figure 2.11 - Minimum Spacer Length

    b. If a driveway is not served by a left-turn lane, then seventy-five feet (75') of separation shall be provided from edge of driveway to the median opening.

9. Medians on Public Street Entrances to Developments

    a. Medians installed on undivided thoroughfares at entrances to subdivisions for aesthetics or any other purpose shall be a minimum of thirteen feet (13') wide and one hundred feet (100') long.

    b. A divided residential subdivision entrance shall transition to the normal residential street width upstream or downstream of the first street intersection. No part of the transition shall occur within an intersection.

C. Right-Turn Lane Requirements

1. Right-Turn Lane Storage

    a. At all intersections on Major Arterial and Minor Arterial thoroughfares, right-turn lanes shall be constructed at the time of development.

    b. All right-turn storage areas shall be eleven feet (11') wide.

    c. Additional ROW shall be required adjacent to right-turn lanes so that there is a minimum of ten feet (10') of ROW from the back of curb.

d. Right-turn lanes will be delineated by using the County's current Traffic Standard Construction Details.

e. Minimum storage requirements are listed in Table 2.5. Storage requirements may increase based upon actual and projected traffic demands.

f. A minimum tangent section of thirty feet (30') shall be provided between the preceding driveway or cross street curb return and the taper of a right-turn lane.

2. Taper Length – The taper specifications for right-turn lane entrance areas are specified in Table 2.5. The variables used for the specification are shown in Figure 2.12.

Table 2.5 - Minimum Right-Turn Lane Design Requirements

Type of Thoroughfare On	Type of Thoroughfare At	Turn Lane Width(s) (ft)	Length of Full-Width Storage(ft)(1)	Taper Specifications(2)		
				Length(ft)	R_1(ft)	R_2(ft)
Major Arterial	Major or Minor Arterial	11	225	150	515	515
Minor Arterial	Major or Minor Arterial	11	175	150	515	515
Major or Minor Arterial	Commercial or Residential Collector	11	150	110	280	280
Major or Minor Arterial	Urban Street	11	100	110	280	280
TxDOT Road	All types	See *TxDOT's Roadway Design Manual* and *TxDOT Standard Specifications*				
Frontage Road	All types	See *TxDOT's Roadway Design Manual* and *TxDOT Standard Specifications*				

1. Measured from the intersecting thoroughfare face of curb.
2. No driveways are permitted within the taper area.

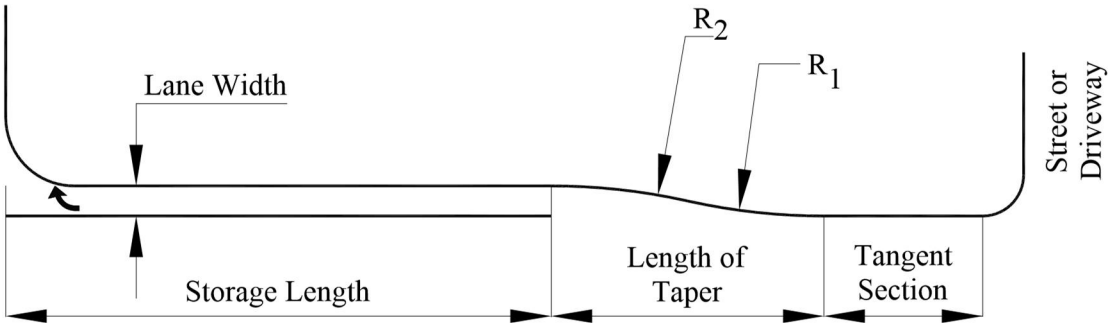


Figure 2.12 - Typical Right-Turn / Deceleration Lane Dimensions

D. Deceleration Lane Requirements

1. Deceleration Lane Storage

   a. Deceleration lanes are required on Major Arterial and Minor Arterial thoroughfares at all non-residential and multi-family driveways.

   b. All deceleration lane storage areas shall be eleven feet (11') wide.

   c. In locations where there will be less than ten feet (10') of ROW adjacent to the deceleration lane, a street easement shall be dedicated such that the combination of ROW and street easement extends at least ten feet (10') from the back of curb of the deceleration lane. Street easements shall extend along the street a minimum of forty feet (40') beyond the far edge of the driveway to allow for utility connections.

   d. Deceleration lanes will be delineated by using the County's current Traffic Standard Construction Details.

   e. Minimum storage requirements are listed in Table 2.6. Storage requirements may increase based upon actual and projected traffic demands.

   f. A minimum tangent section of thirty feet (30') shall be provided between the preceding driveway or cross street curb return and the taper of a deceleration lane.

   g. A tangent section is not required when a deceleration lane is immediately downstream from an intersecting Major Arterial or Minor Arterial thoroughfare.

2. Taper Length – The taper specifications for deceleration lane entrance areas are specified in Table 2.6. The variables used for the specification are shown in Figure 2.12.

Table 2.6 - Minimum Deceleration Lane Design Requirements

Type of Thoroughfare On	Type of Thoroughfare At	Turn Lane Width(s) (ft)	Length of Full-Width Storage(ft)[1]	Taper Specifications		
				Length(ft)	R_1(ft)	R_2(ft)
Major Arterial	Non-Residential Driveway	11	110[2]	110[2]	280	280
Minor Arterial	Non-Residential Driveway	11	90	110[2]	280	280
TxDOT Road	Non-Residential Driveway	See *TxDOT's Roadway Design Manual* and *TxDOT Standard Specifications*				
Frontage Road	Non-Residential Driveway	See *TxDOT's Roadway Design Manual* and *TxDOT Standard Specifications*				

1. Measured from the edge of the driveway.
2. When a deceleration lane is immediately downstream from an intersecting Major Arterial or Minor Arterial thoroughfare, its storage can be reduced to 100 feet and its taper can be reduced to 70 feet.

E. Cost of Median Openings and Turn Lanes

1. Median openings, left-turn lanes, and right-turn lanes constructed for residential streets and/or subdivision entrances not referenced on the Thoroughfare Plan shall be the responsibility of the developer and shall be constructed to County (or TxDOT) standards and inspected by the governing entity.

2. Median openings, left-turn lanes and deceleration lanes for multi-family and non-residential developments shall be the responsibility of the developer and shall be constructed to County (or TxDOT) standards and inspected by the governing entity.

2.4 Alley Design

A. Alley Intersections

1. Alleys shall not intersect any Major Arterial, Minor Arterial, or Commercial Collector thoroughfare.

2. Alleys that are parallel to and share a common ROW line with a Major Arterial, Minor Arterial, or Commercial Collector thoroughfare shall turn away from that thoroughfare not less than forty feet (40') or one subdivision lot width (whichever is greater) from the cross street ROW as shown in Figure 2.13.

3. Alleys shall intersect with a residential street so that the alley ROW line is not less than forty feet (40') or one subdivision lot width (whichever is greater) from the ROW of the nearest cross street as shown in Figure 2.13.

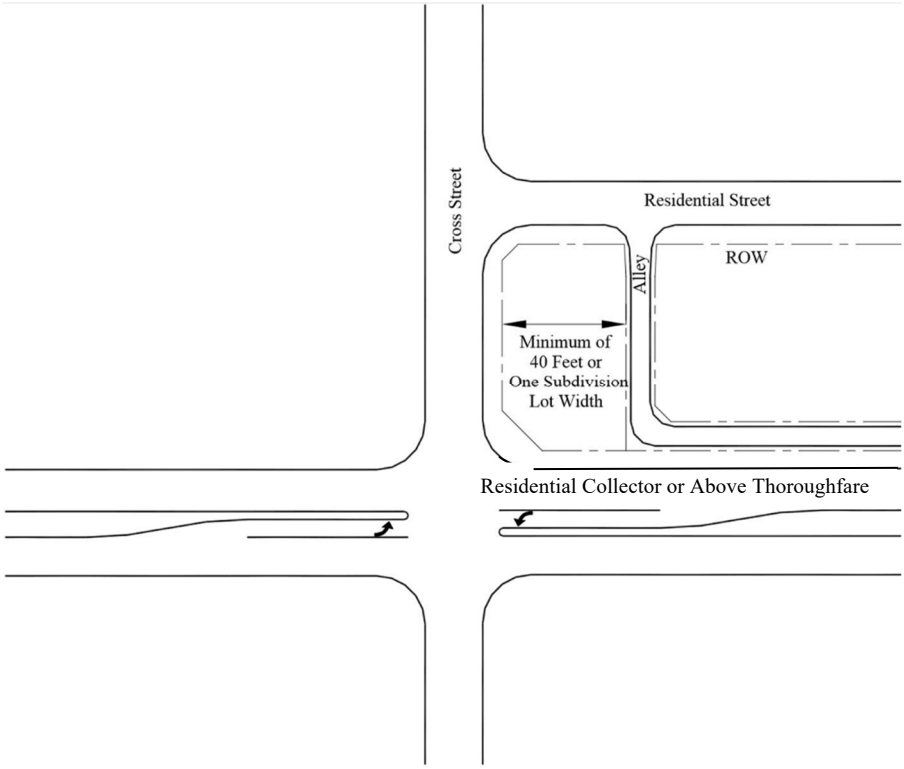


Figure 2.13 - Minimum Distance from Intersection for Parallel Alley

4. All alley intersections with streets shall be perpendicular or radial, within a five degree (5°) tolerance, at the intersection of the ROW lines.

5. The offset between alleys on opposite sides of a residential street shall be less than three feet (3') or greater than seventy-five feet (75') measured from edge of alley to edge of alley.

6. Alleys shall not align with existing or future streets or driveways on the opposite side of a street. Alleys shall be offset from such a street or driveway by a minimum of seventy-five feet (75') measured from edge of alley to edge of street or driveway.

7. Alleys that intersect at "elbow" street intersections shall not intersect within thirty (30°) degrees of the centerline of the adjacent streets. See Figure 2.14.

8. Alleys shall not intersect with a roundabout.

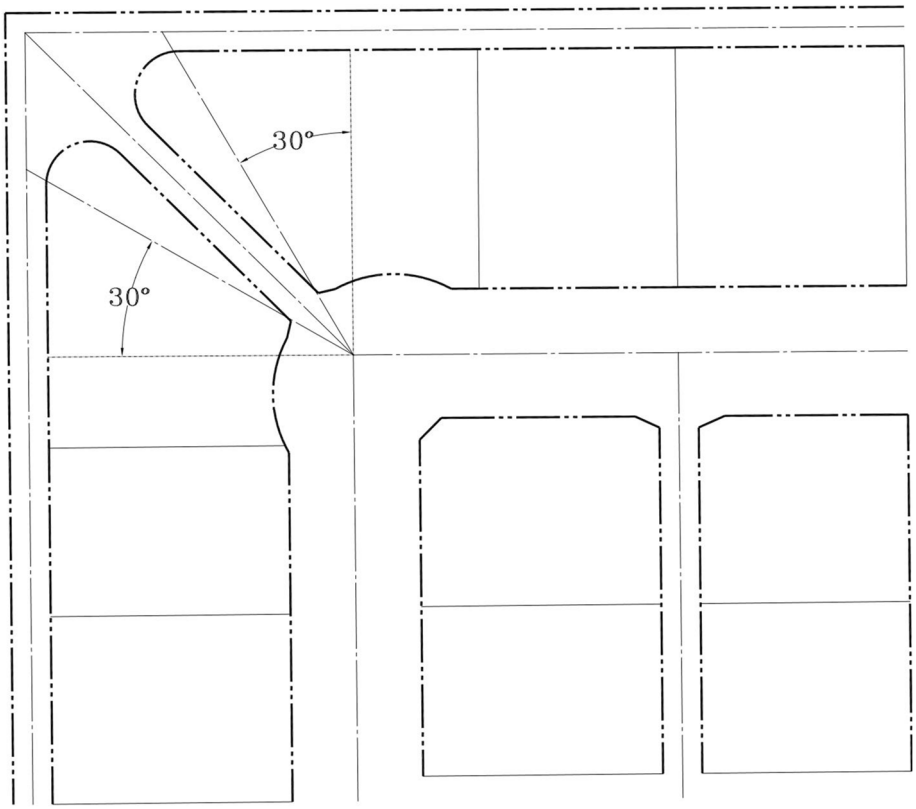


Figure 2.14 - Alley Intersecting an Elbow

9. Internal alley intersections shall consist of no more than three alley approaches.

10. The offset between alleys on the opposite side of an intersecting alley shall be a minimum of one hundred feet (100') measured from centerline to centerline.

11. As an alley approaches an intersection with another alley, the pavement width shall increase to fourteen feet (14') using a taper twenty feet (20') long. The wider pavement shall be maintained for a distance of fifteen feet (15') prior to the radius of the intersection. Two feet (2') of parkway shall be maintained between the pavement and the ROW line at all times. See Figure 2.15.

12. No permanent dead end alley shall be permitted in new subdivisions. Alleys shall connect and/or be aligned with alleys in adjacent subdivisions.

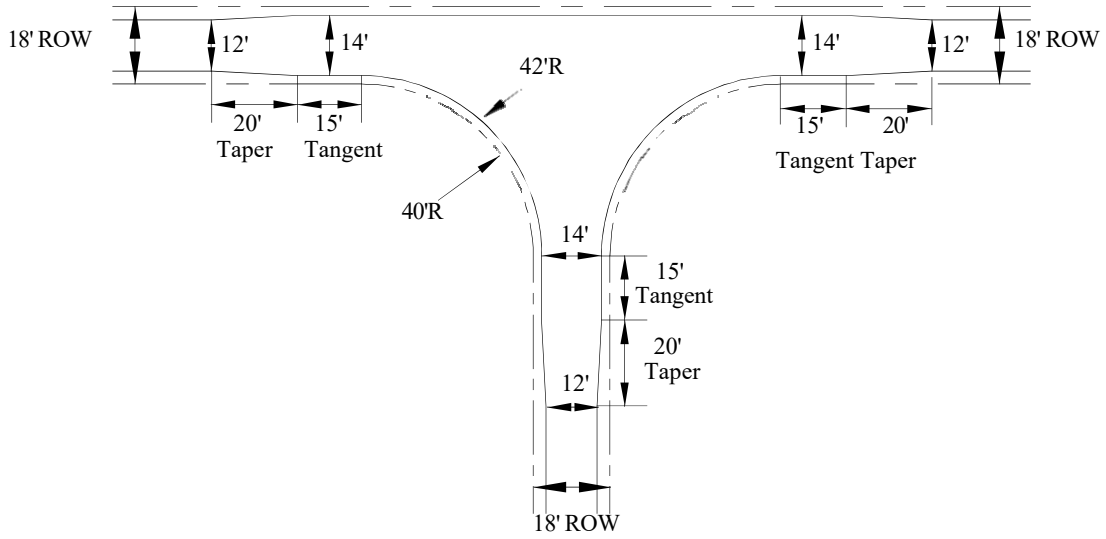


Figure 2.15 - Alley to Alley Intersection

13. The radius of alley pavement at street intersections shall not be less than fifteen feet (15’). At the intersection of two alleys, the radius of the alley ROW is dependent upon the alley ROW intersection angle as listed in Table 2.7. At the intersection of two alleys, the radius of the alley pavement shall be two feet (2’) greater than the radius of the alley ROW.

Table 2.7 - Alley Intersecting Alley Radius

Alley ROW Intersection Angle	Minimum Required ROW Radius (ft)
1°-40°	70
41° -70°	50
71° -90°	40
> 90°	50

B. Alley ROW Width – Typical alley ROW shall be eighteen feet (18’) wide.

C. Alley Pavement Width – Typical alley pavement shall be twelve feet (12’) wide except near alley intersections, as shown in Figure 2.15, and except near street intersections as shown in Figure 2.16.

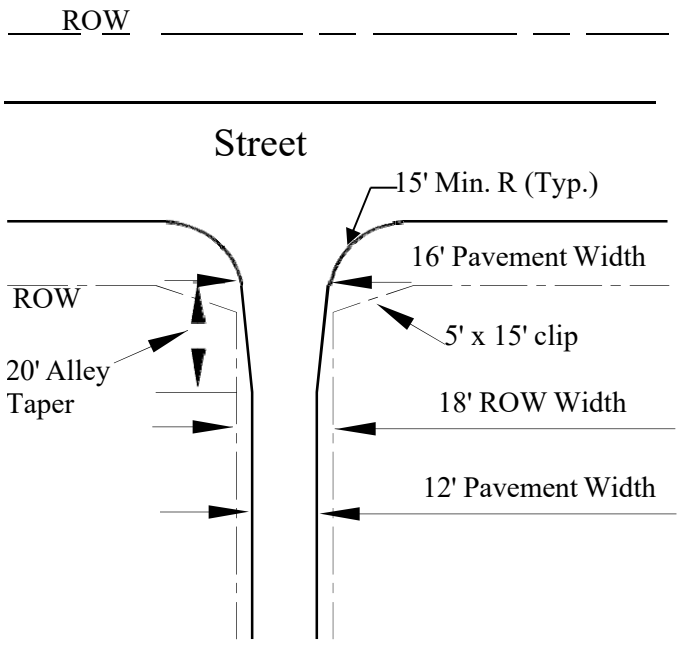


Figure 2.16 - Alley to Street Intersection

D. Alley Length – Alleys shall not exceed eight hundred feet (800') in length without an intermediate connection to a residential street.

E. Alley Pavement Thickness – See the Paving Construction Standard Details for subgrade and pavement design requirements.

F. Alley as Fire Lane – An alley that also serves the purpose of a fire lane shall be constructed to the standards of a fire lane as required by the governing entity or Fire Marshal. These standards include, but are not limited to, a minimum pavement width of twenty-four feet (24') and a minimum radius of alley pavement of twenty feet (20') at street intersections.

G. Rear Alley Frontage – The minimum alley rear frontage shall be twenty feet (20').

H. Alley Visibility Obstructions

1. No fence, wall, screen, sign, structure, landscaping rock greater than four inches (4") in height, or foliage of hedges, trees, bushes, or shrubs shall be erected, planted, or maintained in any alley ROW.

2. Foliage of hedges, trees, bushes, and shrubs planted adjacent to the alley ROW shall be maintained by the property owner such that the overhang or encroachment shall be no less than fourteen feet (14') above the alley surface and no less than one foot (1') outside the edge of the pavement.

I. Alley Grade

1. Alleys shall have a maximum grade of six percent (6%). Steeper grades may be permitted where required by topographical and/or natural features, as approved by the governing entity.

2. Alleys shall maintain a maximum cross-slope of two percent (2%) at the intersection of the adjacent sidewalk.

J. Vertical Curves in Alleys – Vertical curves in alleys shall be used in order to provide a design which is safe, comfortable in operation, pleasing in appearance and adequate for drainage. Vertical curve alignment shall also provide stopping sight distance in all cases based on a design speed of 20 mph.

K. Alley Screening Walls – The area between screening walls and alleys shall be paved and graded to drain to the invert.

2.5 Driveway Design

A. Driveways shall be designed and constructed in accordance with the "Policy, Procedures and Specifications of Grayson County, Texas for the Installation of Driveway Culverts, Road Bores, Use of Heavy Equipment and Utility Lines Within Grayson County Road Right-of-Way."

2.6 Sidewalk Location and Design

A. Definition of Sidewalk – A sidewalk is defined as the paved area designated for pedestrian use which is generally located between the curb of the roadway and the right-of-way line. The inside edge of the sidewalk is the edge closest to the street while the outside edge of the sidewalk is farthest from the street.

B. Sidewalk Design – Sidewalks shall conform to the most current federal, state, and local ADA requirements and to the following standards:

1. Sidewalk Grade – The maximum grade of the sidewalk shall be five percent (5%) or the grade of the adjacent street, whichever is greater. The maximum cross-slope of the sidewalk shall be two percent (2%).

2. Major Arterial and Minor Arterial Thoroughfares – A concrete sidewalk, a minimum five feet (5') in width, shall be located along all Major Arterial and Minor Arterial thoroughfares. The sidewalk should typically be located within the street ROW but may extend into an easement. The inside edge of the sidewalk shall be no closer than five feet (5') from the back-of-curb.

3. Commercial Collector, Residential Collector, and Urban Street Thoroughfares – A concrete sidewalk, a minimum four feet (4') in width, may be located along Commercial Collector, Residential Collector, and Urban Street thoroughfares. The sidewalk shall be located within the street ROW unless pre-existing physical encroachments (e.g., utility infrastructure or trees) dictate otherwise. The outside edge of the sidewalk shall be located one feet (1') inside the ROW. Sidewalk design shall meet the requirements as shown in the Grayson County Paving

Standard Construction Details.

4. See the Paving Construction Standard Details for sidewalk thickness requirements.

5. Sidewalk Easements – Any portion of sidewalk extending outside the ROW shall be contained within a sidewalk easement, the inside edge of which extends to the ROW line and the outside edge of which extends a minimum of two feet (2') beyond the outside edge of the sidewalk.

6. Parkways – The area between the curb and ROW line shall be graded at two percent (2%) above the top of street curb. If the area between the curb and the sidewalk is at least three feet (3') wide, it shall contain grass that is maintained by the adjacent property owner. If the area between the curb and sidewalk is less than three feet (3') wide, it shall be paved with concrete for a minimum length of fifteen feet (15'). If a parkway is adjacent to a nonresidential or multi-family land use, the area between the curb and the sidewalk may be paved with concrete or concrete pavers in lieu of grass.

7. Meandering Sidewalks – Sidewalks along Major Arterial, Minor Arterial, and Commercial Collector thoroughfares and residential collectors may meander for aesthetics and/or to avoid pre-existing physical encroachments. Sidewalk easements adjacent to the standard ROW line will be required to contain any portion of the meandering sidewalk that extends beyond the ROW. Sidewalk easements shall provide a minimum clearance of two feet (2') beyond the outside edge of the sidewalk. The inside edge of a meandering sidewalk shall never be less than five feet (5') from the back-of-curb. A tangent calculated at any point along the centerline of a meandering sidewalk shall not be less than thirty degrees (30°) from perpendicular to the street. These requirements are shown in Figure 2.17.

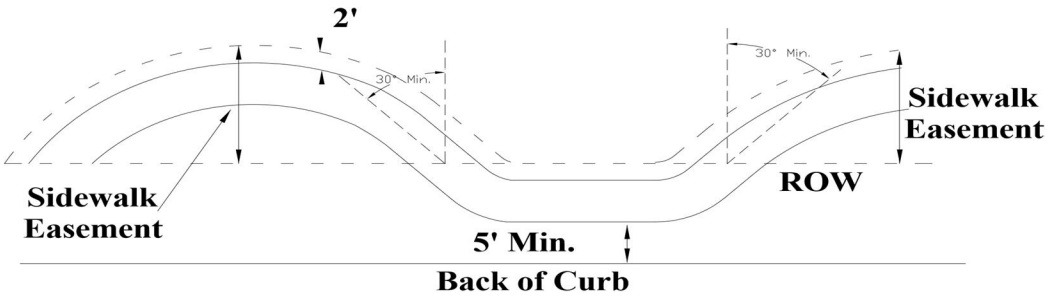


Figure 2.17 - Meandering Sidewalk Detail

8. Sidewalks Adjacent to Screening Walls – In areas where a screening wall is provided along a thoroughfare, the outside edge of the sidewalk shall either remain a minimum of two feet (2') from the wall or the sidewalk shall be paved up to the wall.

9. Access Ramps – Barrier-free ADA access ramps shall be provided at all street intersection corners, at all crosswalks, and across any non-residential or multi-family driveway.

10. Sidewalks on Bridges

    a. All street bridges shall have a sidewalk constructed on each side of the bridge. The sidewalk shall have a minimum width of six feet (6') with a parapet wall that is separated from the travel lane by an eighteen-inch (18") shoulder. An example is shown in Figure 2.18.

    b. A standard pedestrian bridge rail protecting the sidewalk shall be provided on the outside edge of the bridge. An example is shown in Figure 2.18.

    c. When an eight-foot (8') sidewalk is required on the bridge as part of a hike and bike trail, the center lane may be reduced to eleven feet (11') and the shoulders may be reduced to twelve inches (12").

11. Sidewalks Under Bridges – When new bridges are built as a part of the construction of a roadway or the reconstruction of a roadway and a pedestrian crossing is needed beneath the bridge, a sidewalk shall be built as a part of the embankment design underneath the structure for future hike and bike trails.

12. Sidewalks on Culverts – All culvert crossings shall have a sidewalk, a minimum of five feet (5') wide, constructed on each side of the culvert. A standard pedestrian handrail shall be provided on the outside edge of the culvert. A parapet wall may be required by the governing entity.

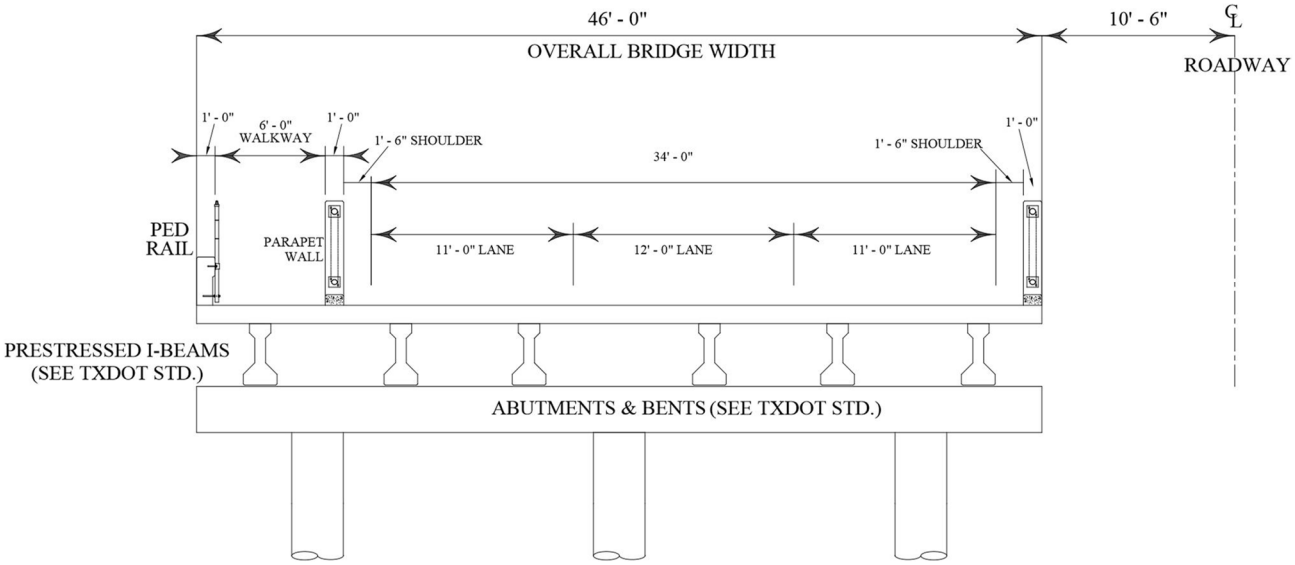


Figure 2.18 - Example Sidewalk on Bridge Section

2.7 Public Right-of-Way Visibility Requirements

A. Adequate Sight Distance

1. Adequate sight distance at the intersection of a thoroughfare and a proposed thoroughfare, driveway, or alley must be ensured. This sight distance is provided through the use of Corner Visibility Triangles and/or Sight Line

Triangles. Corner Visibility Triangles are also known as ROW Corner Clips and Sight Line Trianglesare also known as Visibility, Access and Maintenance Easements (VAMs). All intersection visibility requirements shall meet the guidelines for sight triangles in AASHTO's current *A Policy on Geometric Design of Highways and Streets*.

2. Corner Visibility Triangles shall be provided on all corners of an intersection between two thoroughfares or an intersection between an alley and a thoroughfare.

3. Sight Line Triangles shall be provided where a driveway, an alley, or a stop-controlled thoroughfare intersects an uncontrolled thoroughfare and on any signalized intersection approach where right turn on red operation is permitted.

4. No fence, wall, screen, sign, structure, foliage, hedge, tree, bush, shrub, berm, driveways, parking, drive aisles, or any other item, either man-made or natural shall be erected, planted, or maintained in a position that will obstruct or interfere with a driver's clear line of sight within a corner visibility triangle or a sight line triangle (i.e., a VAM).

5. The County has the right to prune or remove any vegetation within County right-of-way,including within the corner visibility triangle, and within sight line triangle easements (including VAMs), to abate a safety hazard and/or a nuisance.

B. Corner Visibility Triangles

1. The corner visibility triangle is defined at an intersection of two thoroughfares by extending the two ROW lines from their point of intersection to a distance as shown on Table 2.8. These two points are then connected with an imaginary line to form the corner visibility triangle as shown in Figure 2.19. This corner visibility triangle shall be dedicated as ROW.

Table 2.8 - Corner Visibility Triangle Distances

Type of Thoroughfare On	Type of Thoroughfare At	Distance[1] (X)
Major or Minor Arterials and Commercial Collectors	Major or Minor Arterials, Commercial Collectors, or any residential street that potentially will be signalized	40’
Major or Minor Arterials and Commercial Collectors	Urban Street that will remain unsignalized	25’
Residential Collector or Urban Street	Residential Collector or Urban Street	10’
TxDOT Road or Frontage Road	Use the specifications for a Major Arterial Thoroughfare unless otherwise determined by TxDOT guidance.	

1. The corner visibility triangle shall have the same dimension on all corners of the intersection.

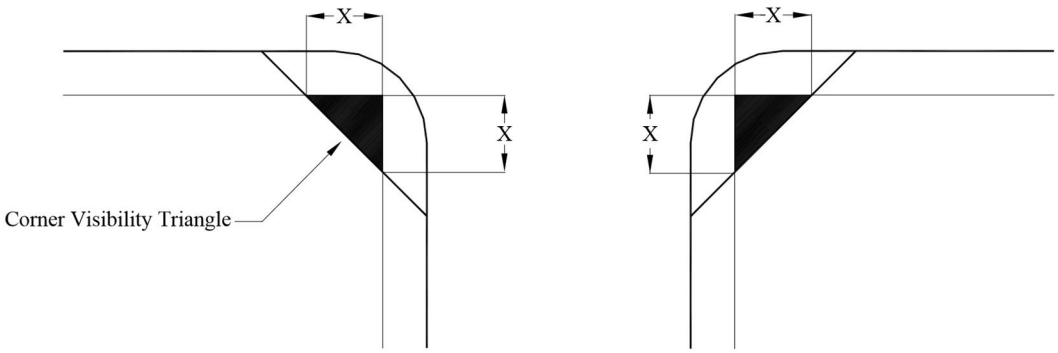


Figure 2.19 - Corner Visibility Triangle for an Intersection

2. Vision at all intersections of thoroughfares shall be clear at elevations between thirty inches (30”) and nine feet (9’) above the average gutter elevation within the corner visibility triangle and meet AASHTO’s current minimum requirements.

3. Where alleys intersect residential Urban Street thoroughfares, the corner visibility triangle is measured as fifteen feet (15’) along the residential street ROW and five feet (5’) along the alley ROW from the point of intersection. These two points are then connected with an imaginary line to form the corner visibility triangle as shown in Figure 2.20. The alley corner visibility triangle shall be dedicated as ROW.

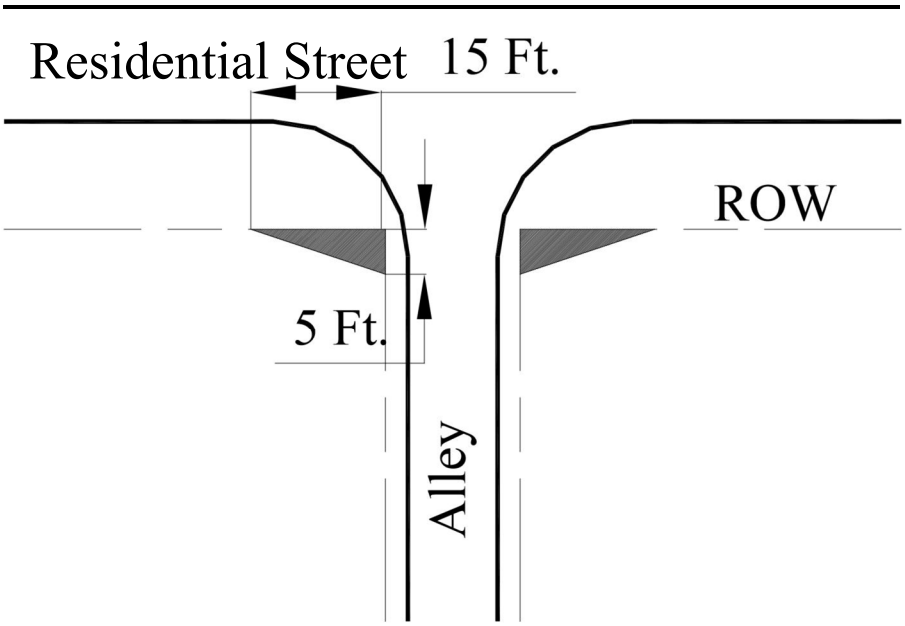


Figure 2.20 - Corner Visibility Triangle for an Alley

C. Sight Line Triangles

1. Drivers shall have an unobstructed view of roadways they are crossing. A Clear Sight Triangle shall be provided at all intersections. See Figure 2.21.
   a. The MAJOR ROAD is a through road and is not required to stop.
   b. The MINOR ROAD may be controlled or uncontrolled.

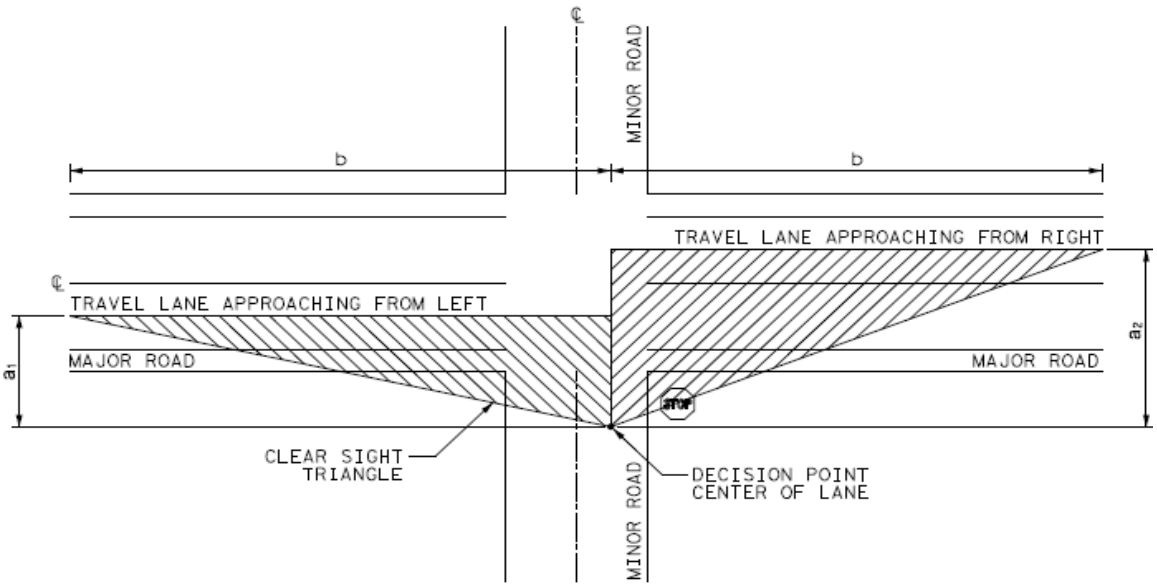


Figure 2.21 - Intersection Clear Sight Distance

2. No vertical objects with a height of more than 2 ft. shall be placed inside the Clear Sight Triangle. This includes fences, trees, shrubs, parked vehicles, mailboxes, above ground utility appurtenances, signs other than those necessary for traffic control and identification of roadway names, etc. Guard fence may be placed inside the Clear Sight Triangle provided the horizontal and vertical alignment of intersecting roadways allows an unobstructed view of oncoming traffic from the minor roadway over the guard fence/railing.
3. For intersections with County Roadways, the Clear Sight Triangle shall be based on future roadway widths shown on the Grayson County Thoroughfare Plan.

Table 2.9 - Intersection Clear Sight Triangle

Intersecting Roadway Types	Minor Roadway Stop Controlled			Uncontrolled (No Stop Signs)		
	a_1 (ft)	a_2 (ft)	b (ft)	a_1 (ft)	a_2 (ft)	b (ft)
Local Streets	21	33	340	140	140	140
Arterials or Collectors	21	33	560	N/A	N/A	N/A

4. Stop Controlled Intersections
   a. The length of the Clear Sight Triangle along the minor roadway measured from the center of the apparent travel lane approaching from the left should be as shown for "a_1" for Minor Roadway Stop Controlled Intersections in Table 2-9. This is depicted as "a_1" in Figure 2.21.
   b. The length of the Clear Sight Triangle along the minor roadway measured from the center of the apparent travel lane approaching from the right should be as shown for "a_2 " for Minor Roadway Stop Controlled Intersections in Table 2-9. This is depicted as "a_2 " in Figure 2.21.
   c. The length of the Clear Sight Triangle along the major (through) roadway from the center of the minor roadway apparent travel lane should be as shown for "b" for Minor Roadway Stop Controlled Intersections in Table 2-9. This is depicted as "b" in Figure 2.21.
5. Uncontrolled Intersections (No Stop Sign)
   a. The dimensions of the Clear Sight Triangle shall measure as described in Section 2.7.C.4 for the lengths shown Table 2.9 for Uncontrolled Intersections.
   b. This condition is only applicable to the intersection of two (2) local streets.

D. Traffic Control Devices – Any landscape shall not interfere with the placement, visibility, or maintenance of traffic control devices under governmental authority and control.

2.8 Traffic Signal Design

A. Introduction

According to the *Texas Manual on Uniform Traffic Control Devices* (TMUTCD), traffic control signals should not be installed unless one or more of the signal warrants in the manual are met. The satisfaction of a warrant or warrants is not in itself justification for a signal. Information should be obtained by means of engineering studies and compared with the requirements set forth in the warrants. The engineering study should indicate the installation of a traffic signal will improve the overall safety and/or operation of the intersection. If these requirements are not met, a traffic signal should neither be put into operation nor continued in operation (if already installed).

B. Warrant Criteria

1. To justify the installation of a traffic signal, Part IV in the TMUTCD shall be followed. Part IV describes the warrants for a traffic signal installation and provides guidelines and requirements for the actual design and operation of a traffic signal.

2. Engineering studies must be conducted in order to assess whether a particular location satisfies the warrant criteria listed in the TMUTCD. These studies may include one or more of the following:

    a. Traffic volume counts

    b. Pedestrian volume counts

    c. Delay studies

    d. Speed studies

    e. Gap studies

    f. Diagram of physical conditions

    g. Accident studies

C. Traffic Signal Spacing – Signal spacing is an important factor in being able to provide progressive flow for a platoon of traffic. Traffic signal spacing shall be determined by the governing entity.

D. Traffic Signal Design and Installation – The design and installation of traffic signals shall follow the County's Standards Construction Details.

2.9 Traffic Impact Analysis and Mitigation

A. Purpose

The purpose of a Traffic Impact Analysis (TIA) is to assess the effects of specific development activity on the existing and planned thoroughfare system. Development activity may include but is not limited to rezoning requests for the Lake Ray Roberts or NTRA zoning areas, driveway permits, and on-site sewage facility permits hereafter referred to as development requests.

B. Applicability of TIA Requirements

1. Development – These TIA requirements shall apply to all development requests for land uses, except single-family residential development with thirty (30) or less dwelling units after development, which will generate over 100 total trips during the AM or PM peak hour. Applicable development requests include concept plans, preliminary site plans, site plans and preliminary plats. Special cases, in which site generated peak hour trip activity is different from that of the adjacent street (weekdays 7:00-9:00 a.m. and 4:00-6:00 p.m.), may require an additional separate analysis as determined by the governing entity. Such circumstances may include, but are not limited to, commercial/retail, entertainment, or institutional activity. The governing entity may waive the TIA for a development request if a TIA was performed previously and conditions listed in the report are still current.

2. Single-Family Residential Exception – A TIA for single-family residential development will not be required if the development contains thirty (30) or less dwelling units unless special circumstances exist, as determined by the governing entity. These special circumstances may include, but are not limited to, impacts to other residential development from cut-through traffic, inadequate siteaccessibility, the implementation of the surrounding Thoroughfare Plan is not anticipated during the estimated time period of the proposed development, the internal street or access system is not anticipated to accommodate the expected traffic generation.

3. Daycares and Schools – All development requests for a daycare, Montessori school, private school, charter school, or public school shall include, at a minimum, a traffic circulation study. This study shall include the estimated maximum peak hour trip generation of the facility, the planned circulation of inbound and outbound traffic during drop-off and pick-up operations, and the estimated length of the queue of cars waiting to pick up students. The design of the site and the circulation plan shall ensure that school traffic does back up onto any public street. The traffic circulation study shall include a statement that the owner and/or operator of the daycare or school agrees to operate the facility in accordance with the approved circulation plan. The circulation plan must be approved by the governing entity before the development request can be approved.

4. Determination of Applicability – The need for a TIA shall be determined by the governing entity. It shall be the responsibility of the applicant to demonstrate that a TIA should not be required. If a TIA is required, the level of effort for a TIA submission shall be determined based on the criteria set forth in Table 2.10. Depending upon the specific site characteristics of the proposed development, one or more of the following elements may also be required as part of the TIA: an accident analysis, sight distance survey, traffic simulation, traffic signal warrant analysis, queuing analysis, turn lane analysis, and/or traffic circulation plan.

Table 2.10 - Criteria for Determining TIA Study Requirements

Analysis Category	Site Trips Generated at Full Build-Out	TIA Analysis Periods[1]	Minimum Study Area[3]
I	>50 peak hour driveway trips; or 100-500 total peak hour trips	1. Existing year 2. Opening year[2] 3. Five years after opening	1. All site access drives 2. All signalized intersections and/or major unsignalized intersections within 0.5 mile to 1 mile of site boundary
II	>500 total peak hour trips	1. Existing year 2. Opening year of each phase 3. Five years after initial opening 4. Ten years after final opening with full build-out	1. All site access drives 2. All signalized intersections and/or major unsignalized intersections within 1.5 miles of site boundary

1. Analysis periods shall include build and no-build scenarios. Assume full occupancy when each phase opens.
2. Assume full build-out.
3. For certain projects, the governing entity may require an enlarged study area. Land uses within the study area should include recently approved or pending development adjacent to the site.

C. Requirements for TIA Updates – A TIA shall be updated when time or circumstances of the original study fall within the parameters presented in Table 2.11. The applicant is responsible for preparation and submittal of appropriate documentation in order for County staff to process the development request. A TIA for site development requests must be updated if two (2) years have passed since the original submittal, or if existing or assumed conditions have changed within the defined study area. The governing entity shall make the final determination as to the extent of a TIA update.

Table 2.11 - Criteria for Determining TIA Update Requirements

Original TIA Report was based on:	Changes to the Originally Proposed Development:	
	Access Changed[1] or Trip Generation Increased by more than 10%	Access Not Changed and Trip Generation Increased by less than 10%
Development Request that is less than 2 years old	Letter Amendment Required: Identify and report only analysis conditions that have changed.	Letter Documenting Change (No analysis is required)
Development Request that is more than 2 years old	Prepare New Study. Must meet all current TIA requirements.	Prepare New Study. Must meet all current TIA requirements.

1. Changed access includes proposed new access or refinement of general access locations not specifically addressed in original proposed development.

D. Responsibility of TIA Preparation and Review

1. A TIA shall be prepared in accordance with all of the guidelines in this section and submitted to the governing entity. The responsibility for TIA preparation shall rest with the applicant and must be performed by a Professional Engineer (P.E.) licensed in the State of Texas with experience in traffic and transportation engineering. The final TIA report must be signed and sealed by the P.E. responsible for the analysis to be considered for review by the governing entity. Application and review fees are due at the time of each submittal. The governing entity shall serve primarily in a review and advisory capacity and will only provide data to the applicant when available.

2. It shall be the responsibility of the applicant to submit two (2) draft TIA reports and executive summaries with the development request submission. Incomplete TIAs or failure to submit a TIA with the submission shall delay consideration of development requests. Should it be determined during the review of any development requests that a TIA is required, consideration shall be deferred until the applicant submits a completed TIA and the governing entity has reviewed the assessment.

3. The governing entity shall review the TIA and provide comments to the applicant. It shall be the responsibility of the applicant to submit one (1) original and a PDF version of the finalized TIA report and executive summaries once all review comments have been addressed.

E. TIA Standards

1. Design Level of Service – The minimum acceptable level of service (LOS) within the County shall be defined as LOS "D" in the peak hour for all critical movements and links. All development impacts on both thoroughfare and intersection operations must be measured against this standard.

2. Trip Generation Resources – The County's standard for trip generation rates for various land use categories shall be those found in the latest edition of *Trip Generation* published by the Institute of Transportation Engineers (ITE) or other published or recognized sources applicable to the region. Alternate trip generation rates may be accepted on a case-by-case basis if the applicant can provide current supporting data substantiating that their development significantly differs from the ITE rates. The governing entity must approve alternative trip generation rates in writing in advance of the TIA submission.

3. Trip Reductions – Trip reductions for passer-by trips and mixed-use developments will be permitted, subject to analytical support provided by the applicant and approval by the governing entity on a case-by-case basis. Assumptions relative to automobile occupancy, transit mode share, or percentage of daily traffic to occur in the peak hour must be documented and will be considered subject to analytical support provided by the applicant.

4. Study Horizon Years – The TIA must evaluate the impact of the proposed development on both existing traffic conditions and future traffic conditions for the horizon year(s) as specified in Table 2.10. These applications should also assume full development of the Thoroughfare Plan or pending amendments.

F. TIA Methodology

1. Site Location/Study Area – A brief description of the size, general features, and location of the site, including a map of the site in relation to the study area and surrounding vicinity;

2. Existing Zoning – A description of the existing zoning for the site and adjacent property, including land area by zoning classification and density by FAR, square footage, number of hotel rooms, and dwelling units (as appropriate);

3. Existing Development – A description of any existing development on the site and adjacent to the site and how it would be affected by the development proposal;

4. Site Development – A description of the proposed development for the site, including land area by land use and density by FAR, square footage, number of hotel rooms, and dwelling units (as appropriate); identification of other adjacent land uses that have similar peaking characteristics as the proposed land use; identification of recently approved or pending land uses within the area;

5. Thoroughfare System – A description and map of existing planned or proposed thoroughfares and traffic signals for horizon year(s) within the study area;

6. Existing Traffic Volumes – Recent traffic counts for existing thoroughfares and major intersections within the study area;

7. Projected Traffic Volumes – Background traffic projections for the planned thoroughfare system within the study area for the horizon year(s);

8. Density of Development – A table displaying the amount of development assumed for existing land use and/or the proposed development (using gross floorarea, dwelling units, occupied beds, etc., as required by the trip generation methodology);

9. Existing Site Trip Generation – A table displaying trip generation rates and total trips generated by land use category for the AM and PM peak hours and on a daily basis, assuming full development and occupancy based on existing land use (if applicable), and including all appropriate trip reductions (as approved by the governing entity);

10. Proposed Site Trip Generation – A table displaying trip generation rates and total trips generated by land use category for the AM and PM peak hours and on a daily basis, assuming full development and occupancy for the proposed development, and including all appropriate trip reductions (as approved by the governing entity);

11. Trip Distribution and Traffic Assignment – Tables and figures of trips generated by the proposed development (or net change in trips, if applicable) added to the existing and projected volumes, as appropriate, with distribution and assignment assumptions, unless computer modeling has been performed;

12. Level of Service Evaluations – Capacity analyses for weekday AM and PM peak hours of the roadway and peak hour of the site, if different from the roadway, for both existing conditions and horizon year projections for intersections, thoroughfare links, median openings and turn lanes associated with the site, as applicable;

13. Traffic Signal Evaluations – The need for new traffic signals based on warrants and their impact on the performance of the transportation system;

14. Evaluation of Proposed/Necessary Mitigation – Capacity analyses for weekday AM and PM peak hours of the roadway and peak hour of the site, if different from the roadway, for intersections, thoroughfare links, median openings and turn lanes associated with the site under proposed/necessary traffic mitigation measures;

15. Conclusions – Identification of all thoroughfares, driveways, intersections, and individual movements that exceed LOS D or degrade by one or more LOS, the percentage of roadway volume change produced by the proposed development, and any operational problems likely to occur;

16. Recommendations – Proposed impact mitigation measures consistent with Section H below; and

17. Other information required for proper review – As requested by the governing entity.

G. TIA Report Format

1. The TIA report must be prepared on 8½" x 11" sheets of paper. However, it may contain figures on larger sheets, provided they are folded to this size. All text and map products shall be computer-based and provided in both published format and computer file format (PDF). In addition, all electronic files used as part of the traffic analysis (i.e., Synchro, HCS, Passer II/III, CORSIM, VISSIM, etc.) shall be provided.

2. The sections of the TIA report should be categorized according to the outline shown below:

I. Executive Summary
II. Introduction
    1. Purpose
    2. Methodology
III. Existing and Proposed Land Use
    1. Site Location/Study Area
    2. Existing Land Use (if applicable)
    3. Proposed Land Use (if applicable)
IV. Existing and Proposed Transportation System
    1. Thoroughfare System
    2. Existing Traffic Volumes
    3. Projected Traffic Volumes
V. Site Traffic Characteristics
    1. Existing Site Trip Generation (if applicable)
    2. Proposed Site Trip Generation
    3. Net Change in Trip Generation (if applicable)
    4. Trip Distribution and Traffic Assignment
VI. Traffic Analysis
    1. Level of Service Evaluations
    2. Traffic Signal Evaluations
VII. Mitigation
VIII. Conclusions
IX. Recommendations
X. Appendices

H. Traffic Impact Mitigation

1. Mitigation of traffic impacts shall be required if the proposed development would cause a facility or traffic movement to exceed LOS D, or where it already exceeds LOS D and the development would contribute five percent (5%) or more of the total traffic during any projected horizon year. If mitigation is required, the applicant must only mitigate the impact of the proposed development and would not be responsible for alleviating any deficiencies in the thoroughfare system that may occur without the proposed development.

2. Acceptable mitigation measures shall include:

a. Staging of development in order to relate site development to the construction of the required thoroughfare system;

b. Staging of development so that the site contributes less than five percent (5%) of the total traffic to the affected facility or traffic movement during the projected horizon year;

c. Off-site improvements, including the provision of right-of-way and/or the participation in funding for needed thoroughfare and intersection improvement projects (including, but not limited to, through lanes, turn lanes or traffic signals); and

d. On-site improvements, including access controls and site circulation adjustments.

3. Mitigation is not required if it can be shown that the traffic impacts of the project are fully mitigated ten (10) years after the final opening with any improvements that are already programmed to be implemented within five (5) years of the initial opening.

I. Administration of the TIA – Based on the results of the TIA, the governing entity shall take one or more of the following actions:

1. Approve the development request, if the project has been determined to have no significant impact or where the impacts can be adequately mitigated;

2. Approve the development request, subject to a phasing plan;

3. Recommend study of the County Thoroughfare Plan to determine amendments required to increase capacity;

4. Recommend amendment of the Capital Improvement Program (CIP) to expedite construction of needed improvements; or

5. Deny the development request, where the impacts cannot be adequately mitigated.

J. Cost of TIA Review by County – The cost for review of TIA submittals shall be based on the parameters set forth in the County's Development Fee Schedule and paid in full at time of submission.

GRAYSON COUNTY
DRAINAGE DESIGN STANDARDS

June, 2023

Approved by the Grayson County Commissioners Court on _____

Court Order Number_____

TABLE OF CONTENTS – SECTION 3

3.1 Purpose

These Standards establish criteria, procedures, and data for drainage evaluation to ensure the adequacy of new drainage facilities. These Regulations also establish post-construction runoff control objectives for new development and redevelopment projects to protect water quality and mitigate potential negative impacts caused by development.

3.2 Definitions

For the purpose of these Standards, the following terms, phrases, words, and their derivations shall have the meaning given herein. Definitions not expressly prescribed herein are to be determined in accordance with customary usage in planning and engineering practice. The word "shall" means mandatory and the word "may" means permissive.

100-YR STORM EVENT – The rainfall event having a 1 percent chance of being equaled or exceeded in any given year.

ADVERSE IMPACT – Changes to drainage patterns, flooding, erosion, and water quality on adjacent property caused by development of a property.

APPLICANT – An Owner or Developer who seeks approval of a development proposal pursuant to these Standards.

BASE FLOOD – The flood having a 1 percent chance of being equaled or exceeded in any given year. Also, the flood resulting from the 100-yr storm event.

BASE FLOOD ELEVATION (BFE) – The WSEL resulting from any flood in Grayson County, including outside of SFHAs, that has a 1 percent chance of equaling or exceeding that level in any given year, also called the 100-yr storm event. The BFE is used to delineate the Base Flood in plan view. The BFE may be calculated by the Applicant's Engineer or as shown on the FIRM and found in the accompanying FIS for Zones AE, or AH for Grayson County. The BFE shall be in relation to the datum specified in the FIS for Grayson County.

BEST MANAGEMENT PRACTICES – Physical, structural, or managerial procedures that decrease the potential for facilities to pollute downstream channels, lakes, and waterways.

COUNTY – Grayson County, Texas.

DEVELOPER – Any owner of property who wishes to divide it into two or more smaller tracts and including persons, corporations, organizations, estates, trusts, partnerships, agents, associates and other entities which act toward the development of a subdivision, within the intent, scope, and purview of these Standards.

DEVELOPMENT – All land modification activity, including the grading or construction of buildings, roadways, parking lots, and/or other impervious structures or surfaces.

COUNTY ENGINEER – The Grayson County Engineer and his authorized and/or appointed representatives.

DRAINAGE PLAN OR STUDY – A plan for handling stormwater affecting existing and proposed property and/or roadways due to development, including water surface elevations, floodplains,

velocities, and mitigation measures. Drainage plans or studies include all areas handling stormwater, including SFHAs and areas outside of SFHAs.

EASEMENT – A right given by the owner of a parcel of land to another person, public agency or private corporation for specific and limited use of that parcel.

ENGINEER – A person licensed under the provisions of the Texas Engineering and Land Surveying Practice Act to practice the profession of engineering in the State of Texas. May also be referred to as Professional Engineer.

EXISTING CONDITIONS WATERSHED – The land use of any watershed or drainage area at the time the Applicant submits a request for development permit or plat approval.

FEMA – Federal Emergency Management Agency.

FLOOD OR FLOODING – A general and temporary condition of partial or complete inundation of normally dry land areas from:

(1) the overflow of inland waters.
(2) the unusual and rapid accumulation or runoff of surface waters from any source.

FLOOD INSURANCE RATE MAP (FIRM) – An official map of a Community on which FEMA has delineated both the SFHAs and the risk premium zones applicable to the Community.

FLOOD INSURANCE STUDY (FIS) – The official report provided by FEMA. The report contains flood profiles, water surface elevation of the base flood, as well as the FIRM.

FLOOD STUDY – An examination, evaluation, and determination of flood hazards and corresponding water surface elevations, floodplains, and velocities. Flood studies, when used herein, are associated with analysis of regulated SFHAs as part of an overall drainage study to determine BFEs.

FLOODPLAIN OR FLOOD-PRONE AREA – Any land area susceptible to being inundated by water from any source (see definition of flooding). A floodplain is a plan view depiction of the extent of flooding based on calculated water surface elevations.

FULLY DEVELOPED WATERSHED – The land use of any watershed or drainage area at full build-out based on the best available information for planned future land use.

HEADWATER DEPTH – The depth of the upstream water surface measured from the invert at the entrance of a drainage structure.

OWNER – The owner of land of record subject to these requirements.

PLAT – A drawing or map depicting the division or subdivision of land into lots, blocks, parcels, tracts, or other parts.

POST-DEVELOPMENT – The land use of the subject property after completion of development.

PRE-DEVELOPMENT – The land use of the subject property at the time the Applicant submits a request for development permit or plat approval.

RIGHT-OF-WAY – A parcel of land that is occupied or intended to be occupied by a roadway that is subject to a right of access by someone other than the owner. The parcel of land can be dedicated or acquired through the claimant's adverse actions taken under a mere semblance of

legal rights that have persisted for at least ten (10) years. The right of access does not necessarily contain written documentation or language and can be simply implied.

SPECIAL FLOOD HAZARD AREA (SFHA) – The land in the floodplain subject to a 1 percent or greater chance of flooding in any given year. Areas of special flood hazard are depicted on the Grayson County FIRM as Zones A, AO, AH, or AE.

SURVEYOR – A person licensed under the provisions of the Texas Engineering and Land Surveying Practice Act to practice the profession of surveying in the State of Texas.

TCEQ – Texas Commission on Environmental Quality.

WATER SURFACE ELEVATION (WSEL) – The height, in relation to the datum shown in the FIS for Grayson County, of floods of various magnitudes and frequencies.

X-YR STORM EVENT – The flood having 1/X percent chance of being equaled or exceeded in any given year.

ZONE OF INFLUENCE – The 10% rule states the zone of influence is the point where the drainage area controlled by the drainage facility comprises 10% of the total drainage area. As an example, if a drainage area for a structural control is 10 acres, the zone of influence ends at a point downstream where the total drainage area is at least 100 acres.

3.3 General Requirements

A. These Standards have been prepared to aid in the orderly development of land within the unincorporated areas of Grayson County. Refer to the Grayson County Subdivision Regulations for additional requirements within municipal extraterritorial jurisdictions (ETJ).

B. The standards and methods described in these Standards represent minimum requirements. Alternatives that are higher standards may be approved by the governing entity.

C. Exceptions to these Standards may be allowed by the governing entity when they are in the best interest of the public and the alternative will be equivalent to the commonly accepted engineering practices.

D. All drainage structures and appurtenances shall be designed and sized by an Engineer.

E. Calculations, plans, and details are the responsibility of the Developer's Engineer. The governing entity's review and acceptance of civil construction plans does not represent that the governing entity has re-engineered or verified the engineering of the proposed construction. The Developer's Engineer is responsible for all engineering and recognizes that specific site circumstances or conditions may require improvements constructed to exceed the minimum standards contained herein. The Developer's Engineer is responsible for the applicability and accuracy of the civil construction plans and specifications.

F. No final plat, replat, or development certificate shall be approved without stormwater drainage improvements and flood control measures provided in accordance with these Standards and approved by the governing entity.

G. Stormwater discharges from all development projects shall conform to all applicable federal, state, and local regulations including but not limited to the National Pollutant Discharge Elimination System (NPDES) requirements of the Clean Water Act and the requirements of the TCEQ and the Texas Water Code (TWC).

H. Development within the 100-yr floodplain shall be in accordance with the Grayson County Flood Damage Prevention Order.

I. Lot-to-lot drainage, defined as runoff from one individually owned private lot to another, is not allowed without dedication of a drainage easement. Once runoff is conveyed to a public right-of-way or drainage or floodplain easement, it may not be directed back onto private property outside of a drainage or floodplain easement.

3.4 Drainage Design

Drainage calculations shall be based on methods described herein or other method(s) approved by the governing entity based on commonly accepted engineering practices outlined in the most recently adopted Texas Department of Transportation (TxDOT) Hydraulic Design Manual. All appropriate calculations showing runoff and capacity of on-site and receiving drainage structures, including creeks and ditches, shall be provided for all drainage areas and structures must include the following:

- Design year flow rate
- 100-yr flow rate

- Velocity
- Outlet velocity
- Hydraulic grade line
- Capacity
- Headwater depth

The depth of the upstream water surface measured from the invert at the culvert entrance is generally referred to as headwater depth. The headwater shall be based on the design storm and shall not increase the flood hazard of adjacent property. In addition to performing widely accepted hydraulic calculations for pipe culverts, a backwater analysis is encouraged. Headwater can also be calculated through various culvert analysis programs such as HY-8 or HEC-RAS. The governing entity may require submittal of documentation on any such program used to analyze culverts. If the culvert is being analyzed as part of a stream or waterway, which is being modeled using a water surface profile program such as HEC-RAS, then the water surface profile model may be used to analyze the culvert. All pre-development and post-development outfall locations, where runoff leaves the project site, shall be identified and classified as sheet flow or concentrated flow.

A. Hydrologic Analysis

The following methods have been selected as acceptable methods for estimating runoff.

Table 3.1 Hydrology Methods

Hydrologic Method	Drainage Area Size Limitation	Corresponding Publication
Rational Method	< 200 acres	TxDOT Hydraulic Design Manual, Ch. 4, Sec. 12 and described below
Unit Hydrograph (SCS)	Any size	TxDOT Hydraulic Design Manual, Ch. 4, Sec. 13
Unit Hydrograph (Snyder's)	> 1 acre	TxDOT Hydraulic Design Manual, Ch. 4, Sec. 13
TxDOT Regression Equation	10 to 100 sq mi (rural design applications)	TxDOT Hydraulic Design Manual, Ch. 4, Sec. 10

Rational Method

The Rational Method shall be used, where a factor accounts for antecedent precipitation for various recurrence intervals of storm events. The formula for the Rational Method is:

$$Q = CIA$$

Where:

Q = maximum rate of discharge (cfs).

C = runoff coefficient based on topography, soil, land use and moisture content of the soil at the time the rainfall producing runoff occurs.

I = the average rainfall rate for a specific rainfall duration and a selected frequency. The duration is assumed to be equal to the time of concentration (in/hr).

A= the drainage area contributing to the runoff at the specified concentration point/outfall (acres).

The following should be considered:

1. Land Use
   a. The Developer's Engineer shall evaluate onsite runoff conditions for pre-development (existing) conditions and post-development conditions.
   b. Where the subject property is located within a larger watershed or where offsite flows travel through the subject property, the Developer's Engineer shall evaluate runoff conditions for all offsite watersheds and drainage areas based on existing land use.

2. Time of Concentration
   a. The Developer's Engineer must identify the flow path along which the longest travel time is likely to occur. Methods acceptable for calculating the time of concentration are outlined in the most recently adopted TxDOT Hydraulic Design Manual. Alternative methods may be approved by the governing entity.

3. Rainfall Estimation
   a. Rainfall rates for drainage design purposes shall be estimated in accordance with standard technical information provided in the most recently adopted TxDOT Hydraulic Design Manual.

   See Appendix B for IDF curves.

B. Hydraulic Design & Analysis

Table 3.2 - Hydraulic Design Criteria

MINIMUM DESIGN STANDARD FOR VARIOUS FACILITIES		
Structure Type	Design Frequency	Check Frequency (Fully Developed)
Closed Storm Sewers	25-YR	100-YR
Open Channel Design	25-YR	100-YR
Roadside Ditches	25-YR	100-YR
Driveway Culvert	25-YR	100-YR
Cross Street Culvert (≥ 20' wide)	25-YR	100-YR
Span Bridge	100-YR	100-YR

1. General Design Requirements

   a. Drainage structures shall be of sufficient size to carry the design frequency shown in Table 3.2 for post-development conditions and any offsite flows that are routed through the development. All drainage structures, systems, and appurtenances shall be evaluated for a 100-yr storm event in onsite post-development, offsite existing conditions watershed to ensure no insurable structure is negatively impacted by the proposed drainage improvement.

i. The design-yr and 100-yr headwater and tailwater elevations shall be shown on all culvert profiles.
ii. The 100-yr headwater and tailwater elevations and associated floodplains for all drainage structures shall be maintained within the right-of-way and/or drainage easements.

b. No obstructions to design frequency floodplains are allowed. Fences and utility appurtenances shall not be placed within the design frequency floodplain.

2. Closed Storm Sewer

a. Storm sewer lines are considered public if they cross property lines and collect runoff from adjacent properties. Enclosed pipe systems require twenty feet (20') minimum drainage easement when serving more than one lot or property.
b. Storm sewer systems shall be reinforced concrete. Alternative materials may be submitted to the governing entity for consideration.
c. Inlets shall be spaced such that one (1) twelve-foot (12') lane is passable during the 25-yr flood.
d. Inlets shall generally be placed upstream of intersections. Minimum inlet size shall be five feet (5'), and no more than twenty feet (20') of inlets shall be placed along the gutter at any location.
e. Minimum lateral pipe size shall be eighteen inches (18"). Where a lateral ties in to a trunk line, place the laterals on a sixty-degree (60^{o}) angle with the trunk line. The lateral shall be connected to the trunk line to match the soffit of the pipe.

3. Open Channel Design

a. The use of existing channels in their original condition is encouraged when possible. Existing channels shall be analyzed to show adequate capacity to meet the design frequency shown in Table 3.2 and channel linings are suitable for calculated erosive forces.
b. New open channels shall have a minimum flowline grade of 0.50% with maximum 4H:1V side slopes or flatter.
c. An adequate drainage easement shall be dedicated to meet channel requirements.
    i. The 100-yr flood shall be wholly contained within a dedicated drainage easement.
    ii. Provide an Erosion Hazard Setback and Maintenance Easement of twenty-five feet (25') horizontally, parallel to and measured from the top of open channel bank on both sides of the open channel. This easement may be reduced to fifteen feet (15') on one side of the open channel if stabilization measures are provided to prevent channel erosion and meander.

4. Roadside Ditch Design

a. Existing and proposed ditches shall be analyzed to show adequate capacity to contain the design frequency shown in Table 3.2 and ditch linings are suitable for the anticipated erosive forces.
b. Roadside ditches shall be sized such that one (1) twelve-foot (12') lane is passable during the 25-yr storm event.
c. Roadside ditches shall have a minimum flowline grade of 0.50% with maximum 4H:1V side slopes or flatter, unless otherwise approved by the governing entity.
d. The 100-yr storm event shall be wholly contained within a dedicated drainage easement.
e. Culverts must be designed according to the most recently adopted TxDOT Hydraulic Design Manual and must be evaluated using the following criteria:

i. Headwater under inlet control,
ii. Headwater under outlet control, and
iii. Energy losses through conduit

5. Driveway Culverts

a. Culvert/Driveway permits are required for any new driveway connection or culvert installation along roadways maintained by the County. Culvert/Driveway permit applications must be submitted to the Grayson County Development Services Department at the same time as the E911 Address. The application can be found at the link below: https://www.co.grayson.tx.us/page/dev.home
b. All new driveway culverts shall be sized by the appropriate Grayson County Precinct or a Professional Engineer and meet the requirements as set forth in the Grayson County "Policy, Procedures and Specifications of Grayson County, Texas for the Installation of Driveway Culverts, Road Bores, Use of Heavy Equipment and Utility Lines Within Grayson County Road Right of Way" and Grayson County Standard Construction Details.
c. Installation of all driveways and driveway culverts are the responsibility of the individual lot owner.
d. Direct drive culverts shall be provided at locations where the top of the culvert encroaches into driveway pavement or subgrade.
e. Non-compliant culverts will be removed at the Owner's expense.
f. All driveway culverts shall be installed prior to issuance of an E911 Address, OSSF Permit, or construction activities on the lot.

6. Cross Street Culverts

a. Cross street culverts shall be made of CMP, RCP, or RCB, or as otherwise approved by the governing entity. Cross street culverts shall have a minimum flowline slope of 0.30% and be no less than eighteen inches (18") in diameter.
b. A minimum cover of twelve inches (12"), measured from the top of culvert to finished grade, shall be placed above all new culverts. If less cover is desired, an engineering analysis of the structural adequacy of the culvert for the anticipated use of the roadway shall be submitted to and approved by the governing entity.
c. Direct drive culverts shall be provided at locations where the top of the culvert encroaches into roadway pavement or subgrade.
d. RCB shall be structurally designed using TxDOT Box Culvert Standards.
e. All cross street culverts shall be designed by a Professional Engineer.
f. Safety end treatments, headwalls, or wingwalls shall be constructed at both the ends of all cross street culverts. Guard fence shall be specified if slopes exceed 4H:1V. The safety end treatments, guard fence, headwalls, or wingwalls shall be constructed in accordance with TxDOT standards. Where safety end treatments are used, sloped safety end treatments with pipe runners shall be provided on all cross culverts matching the front slope of the roadway. Safety end treatments shall be constructed in accordance with TxDOT standards.

7. Span Bridges

a. Span bridges shall be designed to accommodate one and a half feet (1.5') of freeboard above the design frequency water surface elevation.

8. Energy Dissipators

   a. Energy dissipaters shall be designed, where required, at exits to culverts, bridges, and in channels to convey flow safely. Excessive velocities and erosion potential shall be considered for all proposed storm drain outfalls, culverts, detention ponds, bridges, and open channels. Design of these structures shall be according to standard methods and shall result in a calculated velocity below the maximum allowable velocity notes in Table 3-3.
   b. Resources are available for the design of energy dissipator structures. The most recently adopted TxDOT Hydraulic Design Manual contains design guidelines for rock riprap protection. Other techniques and design methods may be utilized, such as those documented in Engineering Manual 1110-2-1601 (USACE) and HEC-14, Hydraulic Design of Energy Dissipators for Culverts and Channels (FHWA).

Table 3.3 - Hydraulic Design Criteria

Channel Description	Maximum Velocity (fps)
Minor Natural Stream	8
Major Natural Streams	8
Unlined Vegetated Channels	8 (Clay soil) 6 (Sandy soil)
Unlined Non-Vegetated Channels	8 (Clean gravel section) 10 (Shale) 15 (Smooth rock)
Lined Channels	10 (Riprap, rubble or grouted) 15 (Smooth finished concrete)
Pavements	15 (Asphalt or concrete)

3.5 Discharge Evaluation

1. Each outfall shall be designed to mitigate the adverse impacts resulting from increased runoff, velocity, or concentrated flow on adjacent properties for all storm events. All storm events may be mitigated within the subject development or downstream by containment within easements or right-of-way obtained from downstream property owners.

2. The Developer's Engineer shall make every attempt to maintain existing sheet flow conditions. Level spreaders are recommended to mitigate adverse impacts due to concentrated flows.

3. The Developer's Engineer shall incorporate the following design elements when evaluating concentrated flow outlet conditions.

   a. The last fifteen feet (15') of the outfall pipe shall be laid at a maximum grade of 0.50% unless otherwise approved by the governing entity.
   b. Outfall protection shall be designed for the maximum calculated shear forces.
   c. Erosion protection shall be provided at the downstream end of concrete flumes or concentrated flow locations.
   d. Discharge from culverts shall be evaluated to ensure they are non-erosive. Discharge velocities in excess of six (6) feet per second shall be analyzed for possible erosion. Erosion protection shall be installed should the potential for erosion exist.

3.6 Stormwater Detention

It is the intent of Grayson County that all new subdivisions and developments of all types have no adverse impact on properties adjacent to the proposed development for all storm events. In order to ensure this, the following statement shall be signed by the Engineer of Record:

"I, _____, a Texas Licensed Engineer, do hereby affirm that to the best of my knowledge, information and belief and based upon the information provided, the drainage improvements shown on these plans will have no adverse effect on any property adjacent to the property shown."

Should the Engineer feel that additional mitigation is warranted, Stormwater Detention may be utilized. Stormwater Detention involves collecting excess runoff before it enters the adjacent property, regional streams, channels, rivers, lakes, etc. It can be used effectively and economically to reduce peak flow rates and mitigate problems of flooding, pollution, and soil erosion. A detention facility includes the pond or other storage area, outfall structure, and downstream erosion control devices.

A. General Requirements

1. All detention facilities shall be fully contained within a single lot and be owned by an individual lot owner or a Homeowners Association.

2. Lots with detention facilities shall have restrictive covenants to preserve the facilities and include a maintenance plan.

B. Design Criteria

1. The Modified Rational Method may be used for drainage areas less than fifty (50) acres for all systems where it applies. An example of this method can be found in Appendix A. For larger drainage areas and more complex smaller areas, a Unit Hydrograph Method that employs reservoir routing calculations shall be used.

2. The facilities may be detention ponds or underground storage.

C. Detention Pond Layout

1. The bottom of all detention (dry bottom) ponds shall have a minimum 2.0% slope and a concrete pilot channel with minimum 0.5% slope from the most upstream point and any inlet points to the pond outlet.

2. A minimum one foot (1') of freeboard above the 100-yr storm event must be provided for detention facilities, unless otherwise approved by the governing entity.

3. Spot elevations for proposed and existing grades in the detention pond area shall be shown with differentiation on the plans.

4. Detention ponds shall be designed, signed, and sealed by a Professional Engineer and meet the requirements of the Texas Dam Safety Program, when applicable.

D. Outlet Structures

1. Outlets shall be typically composed of one or all of the following elements:
   - Corrugated metal pipe (CMP)
   - Reinforced concrete pipes (RCP)
   - Reinforced concrete box structure
   - Reinforced concrete weir
   - V-notch structure
   - Level spreader

2. For all detention ponds, a stabilized earthen or concrete overflow structure must be provided just above the 100-yr storm event WSEL and have a minimum depth of twelve inches (12″).

3. Spot elevations for proposed and existing grades for at least one hundred and fifty feet (150′) downstream of all outlet structures shall be shown with differentiation on the plans.

E. Construction

1. Detention ponds shall be designed, signed, and sealed and their installation inspected by a Professional Engineer. Engineer certification that the detention pond has been constructed according to plan shall be submitted to the governing entity.

2. All detention ponds shall be sodded in the entirety of the pond and shall retain 100% vegetative coverage prior to final acceptance.

F. Maintenance

1. Detention facilities shall be required to have a maintenance plan that considers debris removal, mowing, trimming, and a regular inspection schedule. The plan shall be provided to the governing entity and implemented by the lot owner or Homeowners Association.

2. At a minimum, the following maintenance guidelines apply to all detention ponds:
   a. A maintenance ramp shall be provided for vehicular access for maintenance purposes. The slope of the ramp shall not exceed 6H:1V, and the minimum width shall be twelve feet (12’).
   b. All open detention ponds shall have an access boundary with minimum width of ten feet (10’) adjacent to the entire top bank of the pond. The access boundary shall be clear of obstructions to vehicles and shall have a cross slope of 10H:1V or flatter, unless otherwise approved by the governing entity.

3. Access shall be provided for cleaning of underground detention facilities.

3.7 Stormwater Quality

A. General Requirements

1. The Contractor is responsible for complying with the requirements of the Texas Commission on Environmental Quality (TCEQ) General Permit for Stormwater Discharges Associated with Construction Activities (TXR150000) (Construction General Permit). Additional information on the Texas Construction General Permit can be found at the following link: https://www.tceq.texas.gov/permitting/stormwater/construction

2. The Owner shall provide proof of compliance with applicable local, state, and federal environmental regulations upon request by the governing entity.

3. Sites that disturb less than one (1) acre and that are not part of a larger common plan of development that would disturb one (1) or more acres are not required to have coverage under the Construction General Permit. An erosion and sedimentation control plan must be prepared and submitted to the governing entity.

4. All pervious disturbed areas within a construction site shall be sodded, plugged, sprigged, hydro-mulched, or seeded, except that solid sod shall be used in new open channels and detention ponds.

5. Erosion control mats shall be installed in roadside ditches and slopes steeper than 4H:1V. These areas shall be seeded, sodded or hydro-mulched as soon as the roadway has received final inspection.

6. All designed drainage easements outside of the roadway right-of-way shall be sodded or hydro-mulched as soon as constructed.

7. Grass areas shall be established with 100% coverage with appropriate grass for the growing season. An approved perennial grass shall be planted at the soonest growing season for that grass before construction activities will be accepted by the governing entity. If 100% coverage cannot be established prior to acceptance, temporary cover protection of all disturbed areas will be required as well as the addition of the cost of 100% vegetative coverage into the Maintenance Bond, when applicable.

3.8 Drainage Easements

A. The Owner shall dedicate all drainage easements in accordance with the requirements of the Grayson County Subdivision Regulations, as may be amended from time to time, and the requirements specified in these Standards.

B. Where the improvement or construction of a stormwater drainage facility is required along a property line common to two (2) or more owners, the Developer shall be responsible for the required improvements at the time of development, including the dedication of all necessary rights-of-way or easements, to accommodate the improvements.

C. Drainage easements shall include the drainage facility and a ten-foot (10') maintenance access strip on either side.

D. Off-site drainage easements may be required downstream to address adverse impacts to adjoining properties. These easements may be required to encompass streambank stabilization measures, rock riprap, headwalls, or velocity dissipators. The easement shall include sufficient area to disperse concentrated flows to pre-development conditions. It is the responsibility of the Owner or Applicant to obtain such easements prior to plat approval.

E. Drainage easements shall be provided for access and maintenance of channels, swales, ditches, and other drainage structures and systems.

F. Drainage easements shall be provided to contain the 100-yr floodplain of ditches, channels, swales, and other drainage facilities, including those not located in FEMA special flood hazard areas.

G. Drainage easements shall be maintained by the property owner or Homeowners Association and such maintenance shall be specified in the restrictive covenants.

H. All drainage easements shall be identified on the Final Plat.

3.9 Modified Rational Method Detention Basin Example

Given: A 25-acre site, currently open space, is to be developed for retail use. The entire site is the drainage area of the proposed detention basin.

Determine: The maximum release rate and required detention storage, detention basin size and shape, and outlet structure configuration for the 2-, 10-, and 100-year events (sample calculations for the 100-yr storm are provided below)

Solution: **Step 1.**

Determine peak runoff rate prior to site development. This is the maximum release rate from the site after development.

Step 2.

Determine inflow for storms of various durations in order to determine maximum volume required with release rate determined in Step 1.

NOTE: Incrementally increase durations to determine maximum required volume. The duration with a peak inflow less than maximum release rate, or where required storage is less than storage for the prior duration, is the last increment.

Present Conditions Q = CIA

C = 0.30

T_c = 20 min.

I_{100} = 7.05 in./hr.

Q_{100} = 0.30 X 7.05 X 25 = 52.9 cfs (Maximum release rate)

Future Conditions (Retail)

C = 0.90

T_c = 15 min. (calculated)

I_{100} = 7.99 in./hr.

Q_{100} = 0.90 X 7.99 X 25 = 179.8 cfs

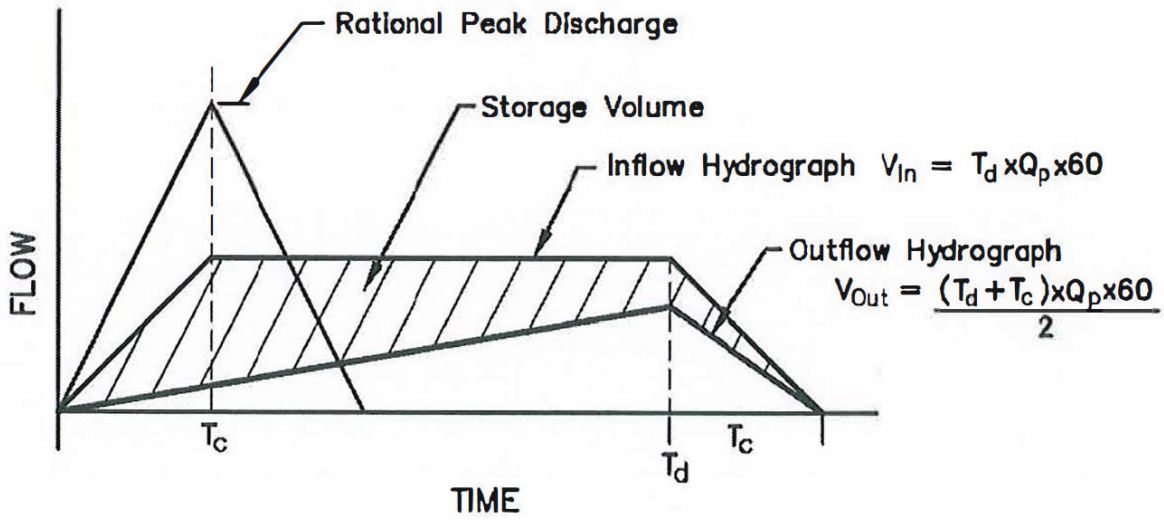
Check various duration storms: $Q_P = C \times I \times A$

15 min.	I = 7.99	QP = 0.90 X 7.99 X 25 = 179.8 cfs
20 min.	I = 7.05	QP = 0.90 X 7.05 X 25 = 158.6 cfs
30 min.	I = 5.77	QP = 0.90 X 5.77 X 25 = 129.8 cfs
40 min.	I = 4.92	QP = 0.90 X 4.92 X 25 = 110.7 cfs
50 min.	I = 4.32	QP = 0.90 X 4.32 X 25 = 97.2 cfs
60 min.	I = 3.86	QP = 0.90 X 3.86 X 25 = 86.9 cfs
70 min.	I = 3.50	QP = 0.90 X 3.50 X 25 = 78.8 cfs
80 min.	I = 3.21	QP = 0.90 X 3.21 X 25 = 72.2 cfs
90 min.	I = 2.97	QP = 0.90 X 2.97 X 25 = 66.8 cfs

Maximum Storage Volume is determined by deducting the volume of runoff released during the time of inflow from the total inflow volume.

Inflow= Storm duration x respective peak discharge x 60 sec./min.

Outflow= Half of inflow time (Td + Tc) x control release discharge x 60 sec./min.



15 min. storm	Inflow	15 X 179.8 X 60 sec./min.	= 161,820 cf
	Outflow	0.5 X 30 X 52.9 X 60 sec./min.	= 47,610 cf
	Storage		114,210 cf
20 min. storm	Inflow	20 X 158.6 X 60 sec./min.	= 190,320 cf
	Outflow	0.5 X 35 X 52.9 X 60 sec./min.	= 55,545 cf
	Storage		134,775 cf
30 min. storm	Inflow	30 X 129.8 X 60 sec./min.	= 233,640 cf
	Outflow	0.5 X 45 X 52.9 X 60 sec./min.	= 71,415 cf
	Storage		162,225 cf
40 min. storm	Inflow	40 X 110.7 X 60 sec./min.	= 265,680 cf
	Outflow	0.5 X 55 X 52.9 X 60 sec./min.	= 87,285 cf
	Storage		178,395 cf

50 min. storm	Inflow	50 X 97.2 X 60 sec./min.	= 291,600 cf
	Outflow	0.5 X 65 X 52.9 X 60 sec./min.	= 103,155 cf
	Storage		188,445 cf
60 min. storm	Inflow	60 X 86.9 X 60 sec./min.	= 312,840 cf
	Outflow	0.5 X 75 X 52.9 X 60 sec./min.	= 119,025 cf
	Storage		193,815 cf
70 min. storm	Inflow	70 X 78.8 X 60 sec./min.	= 330,960 cf
	Outflow	0.5 X 85 X 52.5 X 60 sec./min.	= 133,875 cf
	Storage		197,085 cf
80 min. storm	Inflow	80 X 72.2 X 60 sec./min.	= 346,560 cf
	Outflow	0.5 X 95 X 52.9 X 60 sec./min.	= 150,765 cf
	Storage		195,795 cf
90 min. storm	Inflow	90 X 66.8 X 60 sec./min.	= 360,720 cf
	Outflow	0.5 X 105 X 52.9 X 60 sec./min.	= 166,635 cf
	Storage		194,085 cf

Maximum volume required is 197,085 cf and the critical storm duration is 70 minutes for the 100-yr storm.

Step 3.

Size the basin to contain the required volume for the 100-yr storm while maintaining minimum slope and freeboard requirements.

Step 4.

Using the selected geometry of the basin as determined above and the storage volumes required for each storm event, determine the maximum depth in the basin for each storm. To design the outlet structure for the required multiple frequencies, the calculations shown above may be repeated for each frequency in tabular form as shown below. For each storm event, the highest storage value calculated, along with the selected basin size and shape, determines the maximum depth for each event. This depth is the head used in outlet structure design.

Step 5.

A trial outlet structure is selected, and may be a weir, an orifice (pipe), a V-notch weir, or a combination of outlets.

The outlet structure is designed using the head calculated above, to provide a peak discharge that is no greater than two percent (2%) above existing (undeveloped) peak runoff for each of the 2-, 10-, and 100-yr storm events.

Several iterations may be necessary to balance discharge from the outlet structure pond geometry and head. If the discharge is significantly different (either higher or lower) than the discharge assumed in Step 2, the actual operation of the pond will not correspond to the calculations. Discharge for any given event may not exceed the allowable discharge determined in Step 1 by more than two percent (2%) nor may actual discharge be more than 10% below the allowable discharge.

3.10 IDF Curves

$$I = \frac{b}{(t_c + d)^e}$$

Where:

I = design rainfall intensity (in./hr.)

t_c = time of concentration (min.) as discussed in TxDOT Hydraulic Design Manual

b, d, e = coefficients based on rainfall IDF data developed by Grayson County Development Services

IDF Coefficients - Grayson County

			Storm Frequency (X-yr event)					
			2	**5**	**10**	**25**	**50**	**100**
		b =	52	65	78	95	104	108
		d =	8.3	8.9	8.9	8.9	8.9	8.3
		e =	0.790	0.778	0.779	0.790	0.781	0.769
Minutes			in/hr					
tc =	5	**I =**	6.73	8.39	10.04	11.88	13.31	14.76
tc =	10	**I =**	5.23	6.60	7.90	9.32	10.47	11.55
tc =	15	**I =**	4.32	5.50	6.58	7.74	8.72	9.59
tc =	30	**I =**	2.92	3.77	4.50	5.27	5.96	6.55
tc =	60	**I =**	1.85	2.41	2.88	3.35	3.81	4.20
tc =	120	**I =**	1.12	1.48	1.77	2.04	2.34	2.58
tc =	180	**I =**	0.83	1.10	1.31	1.51	1.73	1.92
tc =	360	**I =**	0.49	0.65	0.78	0.89	1.03	1.15
tc =	720	**I =**	0.28	0.39	0.46	0.52	0.60	0.68
tc =	1440	**I =**	0.17	0.23	0.27	0.30	0.35	0.40

GRAYSON COUNTY
CONSTRUCTION PLAN SUBMISSION AND REVIEW

June, 2023

Approved by the Grayson County Commissioners Court on _____

Court Order Number_____

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4. Construction Plan Submission and Review

4.1 General

A. If the proposed Subdivision involves new Road and Drainage Infrastructure Improvements, an Applicant whose preliminary plat has been approved proceeds to the construction plan submission and review step of the Subdivision process. This requires the Applicant to submit civil construction plans and other information regarding Infrastructure. For the protection of the public, this information may be required to include general plans or general dimensions and specifications for Infrastructure in addition to Road and Drainage Infrastructure Improvements.

B. All Construction Plan submissions must comply with the Subdivision Rules. In addition, construction plans must comply with the County's Engineering Design Standard Manual.

C. All construction plans must comply with the County's Order Entitled On-Site Sewage Facility Regulations and its Flood Damage Prevention Ordinance.

4.2 General Civil Construction Plan Requirements

A. Submission

1. Civil construction plans shall be submitted to the Director of Development Services for review and approval prior to the approval of the Developer's Contract and the final plat or Declaration of Intent when financial guarantees are not posted and prior to commencement of construction.

B. General Requirements

1. All improvements shall be designed in accordance with the Grayson Engineering Design Standard Manual, the Grayson County Flood Damage Prevention Ordinance, and other applicable agency regulations.

2. All submitted items shall be 100% complete at the time of the submittal. Any incomplete components of a submittal shall result in the entire submittal being considered incomplete and shall be returned to the Applicant not reviewed.

3. Three (3) hard copies as well as a digital file (PDF) of the complete civil construction plans, technical specifications, construction details, requested calculations, and a geotechnical report are required to be submitted to the Director of Development Services for review and approval. The digital file (PDF) may be submitted through the online portal, e-mail, Dropbox, or other means.

4. Mixture designs for hot-mix asphalt or concrete pavement, or type and application rates for prime coat, surface coat, and fog seals must be reviewed and approved by the Applicant's Engineer for conformance to the construction plans and specifications, shall be submitted. Refer to Grayson County Engineering and Construction Standard Manual.

5. The civil construction plans shall be submitted on standard size sheets not to exceed 24"x36". Each sheet of the civil construction plans shall contain a title block, including space for the notation of revisions. This space is to be completed with each revision to the plan sheet and shall clearly note the nature of the revision and the date that the revision was made.

6. Each civil construction plan sheet shall bear the seal and signature of the Engineer who prepared the plans. When standard details are included in the civil construction plan submittal, the Engineer shall provide the following certification on the title sheet of the 0plans:

   "The standard [County, City, TxDOT, etc.] details specifically identified in this set of construction plans [or specifically included in these bidding/contract documents] have been selected by me or under my direct responsible supervision as being applicable to this project."

   _____, P.E., Firm Registration # or P.E. # _____

7. Once plans have been approved by the County, the Applicant's Engineer shall provide the following certification on the title sheet of the plans:

   "RELEASED FOR CONSTRUCTION DATE: BY:
   The County has determined that these plans are in general compliance with Engineering Standards. The County's review and release of these plans does not represent that the County has re-engineered or verified the engineering of the proposed improvements. The Design Engineer is responsible for all engineering and recognizes that specific site circumstances or conditions may require improvements constructed to exceed minimum standards contained in the County's Engineering Standards. The Design Engineer is responsible for the applicability and accuracy of the plans and specifications contained herein. _____, P.E., Firm Registration # or P.E. # _____"

4.3 General Drainage Plan Requirements

A. General

1. The drainage plans shall include all appropriate calculations depicting the anticipated flow of all drainage onto and from the proposed development and showing all major topographic features on or adjacent to the property, including, but not limited to the following:
   a. All water courses
   b. 100-yr floodplain boundaries
   c. Ravines
   d. Bridges
   e. Culverts

2. The drainage plan shall show how and where water will be collected, handled, and routed within the proposed development. In addition, show how and where it will outfall to a recognized drainage way.

3. The drainage plans shall also include such off-site drainage improvements as are necessary to assure that the proper transition between on-site and off-site drainage can be maintained. The criteria for on-site drainage facilities shall also apply to off-site.

4. The drainage plans and accompanying calculations and studies shall be sealed by the Developer's Engineer.

5. Cross sections shall include a proportionate number of sections with driveways/culverts shown on one and both sides of the roadway.

6. The 100-yr storm event shall be encompassed within the total right-of-way and/or drainage easement.

7. Submit proposed restrictive covenants with the drainage plan.

8. If the development is to be multi-phased, the drainage plan must include the areas where the future phases will be developed.

4.4 Civil Construction Plan Checklist

The following information is intended to assist the Applicant's Engineer in preparation of civil construction plans for review by the Director of Development Services. It is not intended to be an all-inclusive list of all information or a list of design requirements. Additional plan requirements are found in the Grayson County Engineering and Construction Standard Manual. Plans not meeting these requirements may be returned without a review and marked "Incomplete". An accompanying letter will identify what is missing.

A. Requirements for all Civil Construction Plan Sheets

1. Title block with engineering firm information, registration number, Engineer's seal, sheet title, and page numbers clearly shown.

2. A minimum of two (2) benchmarks are required on all pertinent sheets.

3. North Arrow and scale clearly shown on each plan sheet.

4. Legend (relevant to each sheet) showing all special symbols, line types and hatch used.
5. Roadway names labeled on all existing, proposed, and future roadways.

6. Lot & block numbers and ownership information (if lots not owned by one entity) shown for all lots.

7. Caution notes shown when working next to any existing utilities (public and franchise).

B. Order of sheets (as applicable)

1. Cover Sheet.

2. Plat.

3. General Notes.
4. Erosion Control and Sediment Pollution Protection Plan.
5. Post Construction Stormwater Quality Plan.
6. Roadway Typical Section.
7. Roadway Plan and Profile.
8. Grading Plan.
9. Drainage Area Map.
10. Closed Storm Sewer Systems (as applicable).
11. Hydraulic Calculations.
12. Detention Design and Hydraulic Calculations.
13. Water and Sewer Plans.
14. Utility Plans.
15. Illumination and Signage Plan.
16. Traffic Control Plan (site specific).
17. Roadway Cross Sections.
18. Construction Standards and Details.

C. Erosion Control

1. Existing and proposed contours clearly shown/labeled.
    a. Contour intervals shall not be greater than one (1) foot for land with less than 5% grade.
    b. Contour intervals shall not be greater than two (2) feet for land with greater than 5% grade.
2. Existing and proposed storm lines and inlets shown with protective measures.
3. List the total disturbed acreage including offsite and delineate limits of construction.
4. Label outfall locations with description of nearest and ultimate receiving waters.
5. 100-yr floodplain for FEMA-mapped creeks (SFHAs), 100-yr floodplain for non-FEMA mapped creeks, ditches, and open channels.
6. Appropriate BMPs used and identified.

7. Phasing of BMPs with construction activities listed/described.

8. BMP details per current Texas Department of Transportation Standards and Specifications or the Grayson County Standard Construction Details.

9. Stockpile areas shown and labeled.
10. Areas to be sodded or seeded shown and specified with warm and cool weather options for vegetation.

    a. Seeding options shall meet the requirements of TxDOT Item 164 – Seeding for Erosion Control.

11. Watering plan for vegetation.

D. Roadway Typical Section

1. Roadway type as defined in the Grayson County Engineering and Construction Standard Manual.

2. Section dimensions tied to the roadway centerline.

3. Right of way width.

4. Pavement width.

5. Sidewalk locations (if any).

6. Pavement section including subgrade, materials with application rates, and depths.

E. Roadway Plan

1. For all new Collector Roadways, a site-specific geotechnical evaluation and pavement design, in accordance with the Grayson County Engineering and Construction Standard Manual, submitted with plans.

2. For roadways, centerline stationing at 100-foot intervals, PCs, PTs, and curve data labeled.

3. Intersection, driveway, and island curb radii labeled.

4. Existing, proposed, future roadways and drives shown and labeled.

5. Right of way corner clips and sight visibility easements provided, in accordance with the final plat.

6. Storm inlets identified with paving stations and top of curb elevations at center of inlet.

7. Drainage clarified by flow arrows at crests, sags, ridges, intersections, and valley gutters.

F. Roadway Profile

1. Existing ground line for center of roadway shown.
2. Proposed profile grade line shown for all roadways, labeled at 100-foot station intervals.
3. For Urban Roadways, show right and left top of curbs at intersections where split grade occurs.
4. For Rural Roadways, show right and left ditch flowlines water surface elevation (WSEL), velocity (V), and runoff (Q) for the design storm.
5. Vertical curve stationing and elevations including PVC, PVI, PVT, crest/sag location, curve length, algebraic grade difference, and “K” values shown.
6. Roadway grades shown to the nearest 0.01%. Max and min grades per Grayson County Engineering and Construction Standard Manual.
7. Show “compacted fill” and “minimum percentage” callout/note for all areas of fill.

G. Drainage Area Map

1. Pre-development and post-development contours clearly shown for entire drainage basin, both onsite and offsite.
    a. Contour intervals shall not be greater than one foot (1’) for land with less than 5% grade.
    b. Contour intervals shall not be greater than two feet (2’) for land with greater than 5% grade.
2. Show contours for fifty feet (50’) outside the subject property and zone of influence. Aerial topography or similar is acceptable for offsite areas with major contour labels shown.
3. Zone of influence.
4. Adjacent roadways shown from the subject property line to the opposed right-of-way or property line.
5. Post-development drainage areas delineated and labeled.
6. Post-development outfall locations and classification (sheet flow, concentrated flow).
7. Flow arrows shown to indicate direction of surface drainage.
8. Existing and proposed storm lines and open channels shown.
9. Detention facilities shown and labeled, if applicable.
10. Drainage and utility easements shown and labeled.

11. Post-development Peak Runoff Computation Table showing the following:

    a. Runoff computation method used
    b. Outfall location
    c. Flow rate
    d. Contributing drainage area

12. Label where the outfall flows to.

13. Time of concentration and Rational Method runoff coefficient/CN Value calculations shown as needed.

14. Runoff Computation Table may be shown with Hydraulic Calculations on a “Hydrologic and Hydraulic Calculations” sheet.

15. List the total site impervious area (area of all paving, roof areas, etc.)

16. 100-yr floodplain and easements along streams/creeks, open channels (mapped and unmapped), and ditches.

17. FEMA 100-yr floodplain.

18. Off-site ponds, lakes, or other impoundments with earthen embankment dams located upstream of the development. No structures shall be permitted within the dam breach inundation zone of such impoundments.

19. Post-development sub areas for inlets delineated and labeled.

20. Inlet designation labels shown.

H. Closed Storm Sewer Plan

1. Show and label all existing and proposed utilities.

2. Dimension location/spacing of utilities.

3. Show easement for closed storm sewer system and adjacent utility easements.

4. FEMA 100-yr floodplain.

5. Adjacent roadways shown from the subject property line to the opposed right-of-way or property line.

6. Label inlet type, inlet block-outs, size, paving station, and top of curb elevation at a minimum.

7. Label type and size of existing/proposed structures (i.e. headwalls, manholes/junction boxes).

8. Label type, size, and dimensions of all permanent outfall erosion protection.

    a. Show centerline stationing for pipe with PC & PT stations and curve data.
    b. Label centerline stations for the following:
    c. Lateral connections
    d. Manhole locations
    e. Junction box locations
    f. Changes in pipe size
    g. Headwalls
    h. Future stub out connections

9. Design-yr gutter flows and ponding widths at each inlet.

10. 100-yr gutter flows and bypass shown at each inlet.

11. Provide applicable construction details for all drainage structures.

I. Closed Storm Sewer Profile

1. Existing and proposed ground line at centerline of pipe shown and labeled.

2. Show all hydraulic data including the following:

    a. Design flow and/or 100-yr flow
    b. Full flow capacity
    c. Hydraulic grade line
    d. Friction slope
    e. Velocity
    f. Velocity head

3. For partial flow conditions show the design flow, full flow capacity, normal depth, normal velocity, and velocity head.

4. Label station and flowline elevation information for all structures, crossings, laterals, etc.

5. Label flowlines at every 50-foot station.

6. Indicate length, type/class, slope, and size of all storm pipes.

7. Show and label 100-yr and/or design-yr hydraulic grade line (HGL), label HGL elevations at all junctions.

8. All utility crossings and parallel utility lines shown in profile.

J. Hydraulic Calculations

1. Proposed Roadside Ditch Flow Computation Table provided for all roadways (public and private) for design-yr and/or 100-yr storm events. Indicate the following:

    a. Flow rate
    b. Velocity
    c. Ditch depth

d. Flow depth
e. Where the velocity exceeds six (6) feet per second, the following shall be shown:

- Shear forces
- Shear resistance of ditch lining

2. The following information shall be submitted for storm sewers on the plan set in a table format:

a. Description of pipe location (i.e., from which manhole or inlet to which manhole or inlet)
b. Length of pipe
c. Required discharge
d. Pipe size
e. Slope of hydraulic gradient
f. Upstream hydraulic gradient elevation
g. Velocity
h. Sum of minor losses through the pipe system
i. Hydraulic gradient elevation at design point
j. Incoming pipe invert elevation at design point
k. Outgoing pipe invert elevation at design point

3. The following information shall be submitted for storm sewer laterals on the plan set in a table format:

a. Description of pipe location (to what inlet)
b. Length of pipe
c. Required discharge
d. Pipe size
e. Slope of hydraulic gradient
f. Upstream hydraulic gradient elevation
g. Downstream hydraulic gradient elevation
h. Upstream pipe invert elevation of lateral
i. Downstream pipe invert elevation of lateral

4. The following information shall be submitted for inlets on the plan set in a table format:

a. Inlet number
b. Description of inlet location (where along street)
c. Design storm frequency
d. Time of concentration (Tc)
e. Rainfall intensity (I)
f. Runoff coefficient (C)
g. Area contributing to runoff (A)
h. Discharge at inlet
i. Carryover flow from upstream inlets
j. Street capacity
k. Gutter slope
l. Length of inlet
m. Inlet capacity per foot
n. Flow captured by inlet
o. Percent intercepted flow

p. Flow that passes by inlet
q. Pipe sizes in and out of inlet
r. Hydraulic gradient at inlet
s. Elevation of gutter at inlet
t. Elevation of top of curb
u. Downstream pipe invert elevation at inlet
v. Upstream pipe invert elevation at inlet, if applicable

5. The following information shall be provided for each section of open channel in the Construction Plans in a table format:

   a. A typical cross section with all hydraulic data
   b. Flow rate
   c. Velocity
   d. Channel depth
   e. Flow depth
   f. Where velocities exceed six (6) feet per second, the following shall be shown:

      - Shear forces
      - Shear resistance of channel lining

6. Culvert computations for design-yr and/or 100-yr storm events for all driveway and cross street culverts shall be submitted in the Construction Plans in a table format and must include the following:

   a. Culvert size
   b. Culvert shape
   c. Culvert material
   d. Required and design discharges
   e. Upstream and downstream flowline elevations
   f. Headwater and tailwater elevations
   g. Outlet velocities
   h. Where velocities exceed six (6) feet per second, the following shall be shown:
      - Shear forces
      - Shear resistance of lining channel
   i. Plan and profile of cross street culverts with depiction of WSEL containment.

7. The following information shall be submitted for storm sewer outfalls on the plan set in a table format:

   a. Description of outfall location
   b. 100-yr water surface elevation at outfall
   c. Description of outfall stream dimensions
   d. Maximum allowable velocity of outfall stream
   e. Maximum capacity of outfall stream

8. Pipe Hydraulics Computation Table provided for all public lines for design-yr and/or 100-yr storm events. Include flow rate, velocity, WSEL, pipe flowline elevations, inlet opening elevations, and hydraulic grade line.

9. Inlet Interception Computation Table including roadway ponding widths provided for all public inlets for design-yr and/or 100-yr storm events.

K. Detention Design and Hydraulic Calculations (When Applicable)

1. Property or Lot lines.

2. Detention facility design calculations shown and method used specified.

3. Provide detention facility volume sizing calculations and/or computation table.

4. Provide stage-discharge table and/or curve information.

5. Provide weir and/or orifice sizing calculations for outfall structure.
6. Provide electronic copies of all hydraulic computations or data files (HMS, RAS, StormCAD, PondPack, etc.) on USB drive or other media.

7. Existing and proposed contours shown and labeled.

8. Cross-section of pond including side slopes, normal pool elevation (if applicable), show 25-yr, and/or 100-yr water surface elevations.

9. Outfall channel - Include a typical cross section with all hydraulic data. Include the following:
   a. Flow rate
   b. Velocity
   c. Channel depth
   d. Flow depth
   e. Where velocities exceed six (6) feet per second, the following shall be provided:
      - Shear
      - Shear resistance of channel lining

10. Maintenance ramp and access boundary provided (when applicable).

11. Provide pilot channel design and details (when applicable).

12. Spot elevations for proposed and existing grades in the detention pond area and for at least one hundred and fifty feet (150′) downstream of all outlet structures.

13. Detail of outfall structure showing all elevations as necessary.

14. Trash rack (and detail) provided for smaller orifice openings.

15. Provide outfall channel with dissipators as needed to distribute flow.

16. Overflow spillway location, stabilization method, and design information provided.

17. Submit documentation that detention pond embankment is designed to meet the requirements of the Texas Dam Safety Program, if applicable.

L. Water Plan

1. Show and label all existing and proposed utilities.
2. Show and label water line leading to fire sprinkler systems as “fire line” where applicable.
3. Label size, type, and pressure class for all proposed water mains.
4. Show location for all water services and meters.
5. Show and label all easements.
6. Dimension location of all mains, services, meters, and spacing from other utilities.
7. Curve data and stationing provided.
8. Show and label all fire hydrants, valves, fittings, fire department, connection locations, and back-flow prevention.

M. Water Profile

1. Profile all water mains.
2. Existing and proposed ground line at centerline of pipe shown and labeled correctly.
3. Label station and flowline elevations at 100-foot intervals, and for all fittings, laterals, and crossings.
4. Indicate length, type/class, slope, and size of all lines.
5. All utility crossings and parallel sewer/storm lines shown in profile.
6. Indicate length, type and size of encasement needed.

N. Sanitary Sewer Plan

1. Show and label all existing and proposed utilities.
2. Dimension location of all mains from other utilities.
3. Label line name, size, thickness, and type of all proposed sanitary sewer lines.
4. Stub-outs labeled with size, slope, length, and flowline elevations (if not profiled).
5. Show and label all easements.
6. Show centerline stationing for sanitary sewer.
7. Show and label all manholes with rim elevations, as well as cleanouts.

8. Indicate type and size of encasement where needed.
9. Show flow direction arrows for sewer main.
10. Topographic contours shown to delineate sewer basins.

O. Sanitary Sewer Profile

1. Profile shown for all mains.
2. Existing and proposed ground line at centerline of pipe shown and labeled.
3. Label station and flowline elevation information for all manholes, cleanouts, crossings, laterals.
4. Manhole inflow and outflow elevations to be designed with a minimum of 0.1’ drop.
5. Indicate the type and diameter for all manholes.
6. Indicate length, type/class, slope, and size of all sanitary sewer pipe between manholes.
7. All utility crossings and parallel storm lines shown in profile.
8. Indicate length, type and size of encasement as needed.

P. Illumination (if applicable) and Signage Plan

1. Show all illumination locations, consideration should be given to electrical layout from utility company.
2. Show all stop signs and traffic related signage locations.
3. Illumination located on opposite side of roadway from stop sign.
4. Verification of fire hydrant placement relative to illumination and stop signs (3’ clear zone).
5. If symbols used in plan, include appropriate legend for clarification.
6. Details of sign faces including sizes, colors, graphics, and text.
7. Traffic Control Plan (Site specific if needed)
8. Design site specific traffic control plan, TxDOT standard alone will not be accepted.
9. Indicate posted speed limit or design speed.
10. Show all sign designation, sign graphic, and sign size.
11. Show channelization device type, locations, and spacing.
12. Show all traffic barricades and indicate type.

13. Show all detour routes and detour signage.

14. Show flagger locations where applicable.

15. Show message boards with text for two (2) phases.

16. Show flashing arrow boards where applicable.

17. TxDOT TCP Details

18. If symbols used in plan, include appropriate legend for clarification.

4.5 Compliance With Subdivision Rules

Construction Plans shall comply with the Subdivision Requirements set forth in the Grayson County Subdivision Regulations except where otherwise noted or applicable provisions of Chapter 232 of the Texas Local Government Code.

GRAYSON COUNTY
CONSTRUCTION REQUIREMENTS

June, 2023

Approved by the Grayson County Commissioners Court on _____

Court Order Number_____

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5. Construction Requirements

5.1 General Construction Requirements

The requirements of this section are for the purpose of addressing the actual construction of the infrastructure.

5.2 General

A. Unless otherwise noted in these Regulations or the Grayson County Engineering and Construction Standard Manual, all construction and materials shall conform to the most recently adopted version of the Grayson County Engineering and Construction Standard Manual; Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges; or to any other construction specifications adopted by the Grayson County Commissioners Court. In the event an item is not covered, the Contractor shall bring the item to the attention of the Director of Development Services for approval or modification.

B. A preconstruction meeting with the Director of Development Services is required prior to the commencement of any work. The Contractor's Project Manager is required to attend.

C. The Contractor shall provide the name, phone number, and email address of the Contractor's Project Manager to the Director of Development Services. The Contractor's Project Manager shall be on site or in daily communication with the project. The Director of Development Services shall be contacted if there is a change in any of the contact information for the Contractor's Project Manager.

D. The Applicant shall contact the Director of Development Services forty-eight (48) hours prior to the commencement of any construction. Saturdays and Sundays and holidays observed by Grayson County shall not be considered as part of notification.

E. The Director of Development Services, or his or her designee, shall inspect the construction of all infrastructure in the development during construction for compliance with the County's regulations and specifications. The Applicant shall provide free access to the development to the Director of Development Services. Inspection by Grayson County, or a failure to inspect construction as required herein, shall not in any way impair or diminish the obligation of the Applicant to install improvements in the development in accordance with plans and specifications therefore as approved by Grayson County and in accordance with the County's Regulations. Such inspections are not a representation that the work is compliant or free from defects. Neither the Applicant, the Applicant's Engineer, nor the Applicant's contractor shall be entitled to rely on such inspections and no liability to the inspector or the County may arise from such inspections. The Applicant, the Applicant's Engineer, and the Applicant's contractor shall rely solely on their own inspection and review although they are obligated to correct matters pointed out by the inspector.

F. The Contractor is responsible for damages to existing County Roads. Grayson County and the Contractor shall document the existing County Road prior to and following construction. The Contractor must agree to reimburse the County for the cost of repairs.

G. Existing paving, utilities, fences, etc., damaged by the construction of the proposed improvements shall be replaced to a condition equal to or better than its original condition.

The Applicant shall make these repairs at the Applicant's own expense or reimburse for the actual cost thereof.

H. The Contractor shall take appropriate measures to prevent tracking of mud and/or soils onto existing and/or new pavement. Any tracking that occurs shall be removed immediately by the Contractor.

I. Drainage structures, swales, ditches, and detention facilities shall be clean and fully functional.

5.3 Construction Sequencing

A. All erosion control Best Management Practices (BMPs) shown in the Erosion Control Plan shall be in place prior to commencement of any work.

B. The Contractor is responsible for complying with the requirements of the Texas Commission on Environmental Quality General Permit for Stormwater Discharges Associated with Construction Activities (TXR150000) (Construction General Permit).

C. Individual lots in a subdivision are considered part of a larger common plan of development, regardless of when construction activity takes place on that lot in relation to the other lots and are required to have BMPs and comply with the Construction General Permit.

D. The Director of Development Services must be notified so that the initial installation of BMPs can be inspected prior to any earth disturbing activities.

E. Temporary stabilization measures must be installed within 14 calendar days of a temporary or permanent cessation of construction activity.

F. Detention ponds and vegetated drainage swales shall be sodded. Roadside ditches and slopes steeper than 4H:1V shall be seeded and protected with erosion control mats. All other areas within the subdivision shall be seeded with evidence of germination and 100% coverage in order to be accepted.

G. Construction sequencing shall adhere to the following:

1. Install required site notices.

2. Install and inspect perimeter BMPs, including construction entrances. The Director of Development Services shall perform an inspection of perimeter BMPs prior to continuation of work.

3. Begin clearing and grubbing.

4. Construct required detention ponds and ensure they are fully functional as detention ponds or as temporary sediment basins.

5. Construct ditches and other drainage features and associated BMPs to protect downstream properties before the remainder of construction is started.

6. Install utilities and storm sewer systems, as applicable.

7. Construct roadways and ditches, as applicable.

8. Place fog seal for 2-course surface treatment on roadways.

9. Seal joints for concrete roadways.

10. Install all signage.

11. Final BMPs and vegetation installation.

5.4 Temporary Traffic Control

A. Temporary traffic control is required for work on all County Roads.

B. Roadway closure requests must be submitted to the Grayson County Public Works Department at least 48 hours prior to the desired closure time, exclusive of weekends and Grayson County holidays.

C. Roadway closure requests must be submitted on the Grayson County Road Closure Form.

D. All barricades, warning signs, lights, devices, etc., for the guidance and protection of traffic and pedestrians must conform to the installation shown in the current edition of TxDOT's Texas Manual of Uniform Traffic Control Devices. Deviation from this standard must be approved by the Director of Development Services.

E. The Contractor shall be responsible for traffic control, warning and safety devices until all work has been accepted by as complete by Grayson County.

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

G. Traffic control plans shall be site specific and included either with all civil construction plans or as a submittal by the Contractor as determined by the County. All traffic control plans shall be prepared and submitted in accordance with the standards identified in Part VI of the current edition of the Texas Manual on Uniform Traffic Control Devices.

H. All traffic control plans must be prepared by an Engineer or an individual that is certified in their preparation. Certification may be achieved through approved organizations such as International Municipal Signal Association (IMSA), American Traffic Safety Services Association (ATSSA) or another recognized organization.

5.5 Compliance With Subdivision Rules

Construction shall comply with the Subdivision Requirements set forth in these Regulations except where otherwise provided in these Regulations or applicable provisions of Chapter 232 of the Texas Local Government Code.

5.6 Work that has been "Accepted" As Used Herein

The term accepted or acceptance as used in this Section relates to acceptance of the construction as complete in accordance with the plans and specifications and being free of obvious material defects. Such does not mean acceptance by the County for maintenance.

5.7 Acceptance Of Construction As Complete In Accordance With The Approved Plans And Specifications

A. Applicant Or Contractor Request For Inspection

When the construction is believed to be complete in accordance with the County-approved plans and specifications, the Applicant, or the Applicant's contractor, may submit to the County Engineering Department in writing a request for inspection. The inspection should generally take place within 10 days after receipt of the request.

B. Post-Inspection

After completion of the inspection, the Director of Development Services or his/her designee shall decide as to whether the construction is complete in accordance with the County-approved plans and specifications and free of obvious defects. The Director of Development Services or his/her designee shall issue to the Applicant in writing one of the following:

1. Notice that the construction is approved as complete;

2. Notice that the construction is approved as complete to become effective on the performance of identified punch-list items (reinspection not required-the Applicant or contractor shall submit a report and photographs showing the completion of the correction work);

3. Notice of non-acceptance of the construction with an explanation of the deficiencies (a re-inspection is required for any corrective work).

4. Acceptance of construction as being complete is NOT acceptance for County maintenance purposes.

If the noted deficiencies are not corrected within a timeline set by the Director of Development Services, which shall not be less than 30 days, the Director of Development Services will send a demand in writing to the Applicant for the deficiencies to be corrected. If the Applicant fails to correct the deficiencies, the County will either: 1) refuse to release the approved final plat to the Applicant for recordation or, if applicable, 2) draw upon or make demand upon the Applicant's performance guarantee (Performance Bond, Letter of Credit, cash deposit, etc.) to have the corrective work completed.

No applicable permits shall be issued until the Road and Drainage Infrastructure Improvements are accepted by the County as complete.

As a separate condition for acceptance of the Road and Drainage Infrastructure Improvements as complete, the Applicant must provide the Warranty and Maintenance Bond required by these Regulations.

IMPORTANT NOTE: On acceptance of the work as complete the Applicant or the Applicant's contractor must provide one (1) hard copy as well as digital files (PDF and CAD) on USB drive or other media of the As-Built Plans for all projects. The CAD file shall include linework for property boundaries, right of way, easements, roadway, signals, lighting, drainage, water, and sewer facilities. CAD files shall be compatible Grayson County GIS Services. The submission of the As-Builts to the County Development Services Department as set out above is a condition of plat recording.

GRAYSON COUNTY
WARRANTY AND MAINTENANCE OBLIGATIONS

June, 2023

Approved by the Grayson County Commissioners Court on _____

Court Order Number_____

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6. Warranty and Maintenance Obligation

6.1 Required For Acceptance As Complete

The Warranty and the Maintenance Bond described herein must be provided to the County Director of Development Services or his/her designee as a condition of the issuance of a notice of acceptance of the Road and Drainage Infrastructure Improvements as complete. No determination of completion will be provided to the Applicant until the Warranty and Maintenance Bond are in place.

6.2 Nature of Warranty

The Applicant shall provide or cause to be provided a warranty in favor of the County securing the completed work against defects in materials, workmanship, and including damage to or deterioration of the Subdivision Improvements, that occur before and during the Warranty Period due to any cause and to ensure that the Subdivision Improvements remain serviceable and maintained during such period.

6.3 Warranty Period

The warranty must begin when the civil construction is accepted as complete by the County and shall run for two (2) years thereafter ("Warranty Period"). If a road is intended to be submitted to the County for acceptance of maintenance, no such acceptance shall take place until after the Warranty Period has expired.

6.4 Bond For Maintenance During Warranty Period

The Applicant must provide a bond to secure the Applicant's obligation to provide or cause to be provided repairs and maintenance on the Road and Drainage Infrastructure Improvements during the Warranty Period for the benefit of the County. The Maintenance Bond must protect the County against defects in materials or workmanship including damage to or deterioration of the Subdivision Improvements that occur before and during the Warranty Period due to any cause and to ensure that the Road and Drainage Infrastructure Improvements remain serviceable and maintained during such period. If the Performance Bond in effect extends to cover such matters during the Warranty Period or is extended by the surety to provide such coverage, a new bond is not required. If not, the Applicant must provide or cause to be provided a Maintenance Bond with the County Judge or his/her successors in office being the named payee. The Maintenance Bond amount shall be equal to one hundred percent (100%) of the cost of roadways, signs, stormwater control improvements, drainage structures and all other construction of Road and Drainage Infrastructure Improvements. If full vegetative cover (100% cover) is not established prior to acceptance as complete, the addition of the cost for 100% vegetative coverage shall be added into the Maintenance Bond.

The surety must be authorized to make surety bonds in Texas and must be acceptable to the Director of Development Services.

In some cases, as determined by the Director of Development Services, it may be necessary to allow the maintenance obligation to be secured by a Letter of Credit or other acceptable Financial Guarantee.

The Applicant is responsible to provide the Maintenance Bond for the benefit of Grayson County. Generally. the Applicant is the Developer. In certain situations where the Applicant is not able to secure a Maintenance Bond in the amount or for the term required, the County may allow for the Applicant's prime contractor to provide the Maintenance Bond, which must be payable to the Grayson County Judge or his/her successors in office. If this is allowed only one bond will

accepted. The County will not accept a series of separate bonds from contractors or subcontractors on the project. Rather, the Maintenance Bond must be made by a prime contractor responsible for the complete Road and Drainage Infrastructure Improvements. The Director of Development Services or his/her designee makes all decisions regarding approval of Maintenance Bonds.

6.5 Maintenance During the Warranty Period

A. Preventative Maintenance

The best way for the Applicant and/or contractor to avoid liability under the warranty and to avoid bond claims is for the Road and Drainage Infrastructure Improvements to be kept maintained during the Warranty Period. FURTHERMORE, if acceptance for County maintenance is desired, the County will not accept a defective or unmaintained Roadway.

B. Roadway Repairs

All pavement repairs shall be in accordance with the Grayson County Engineering and Construction Standard Manual. If repairs have been extensive, the Director of Development Services may require that before the Warranty Period expires the Applicant provide or cause to be provided a one-course surface treatment for the full length and width of the Roadway to seal joints created by pavement repair and restore uniform appearance of the Roadway depending on the extensiveness of the repairs and the appearance of the Roadway.

C. Geotechnical Review of Problem Areas

Cracking can be a sign of defective surfacing or a defective road base. If significant cracking is occurring beyond that which would be expected under the facts and circumstances the Director of Development Services, at the Applicant's cost, shall have core samples taken and a geotechnical report prepared to determine whether the Roadway was built to specifications and/or whether there are other factors at work, such as underground water. The Director of Development Services shall provide a copy of the report to the Applicant and contractor. A reasonable timeline shall be set for the Applicant to provide a plan for addressing the Roadway's deficiencies with the plan to be provided to the Director of Development Services. An additional warranty and warranty period shall be required for the remedial work upon completion of such work to resolve the Road's defects. The Applicant will reimburse the County for the cost of the geotechnical services within 30 days after receiving an invoice from the County for such costs. The geotechnical consultant's suggestions for repairing the Roadway shall be given due consideration.

D. Inspections

The Director of Development Services or his/her designee will conduct periodic inspections of the Road and Drainage Improvements and will notify the Applicant and contractor regarding any defects identified. If the defects are not cured within 30 days of the notice (or such longer period that has been granted in writing by the Director of Development Services), the County will resort to a claim on the Performance or Maintenance Bond, payment under the letter of credit, or application of monies on deposit to perform the corrective work or have it performed.

6.6 Provision For Maintenance Of Drainage Improvements

Except for ditches that are adjacent to Roadways and/or culverts and other improvements that are a part of a Roadway accepted for maintenance by the County, the County generally will not accept drainage improvements for maintenance, including retention and detention ponds. Therefore, the Applicant must provide for this work to be done either by way of an HOA with a maintenance fund or by providing in the Deed Restrictions that each lot owner is responsible for maintaining the portions of the drainage improvements on or adjacent to their lot.

If the growth of weeds and/or brush is allowed to materially diminish the ability of drainage improvements to handle stormwater, such is a public nuisance under Section 343.011(c)(11) of the Texas Health & Safety Code, and the County reserves the right to seek injunctive relief that the condition be abated or to undertake abatement of the public nuisance itself as provided for in the Health & Safety Code and assess the cost against the owner(s) of the property, and, if necessary, place a lien upon the property for the cost of the abatement.

6.7 Acceptance of Roadways For County Maintenance

As stated in Section 4.2 of the Grayson County Subdivision Regulations, acceptance of roadways and drainage improvements for County maintenance requires a separate action of the Commissioners Court and is at the discretion of the precinct Commissioner.

A. Identified Defects And Deficiencies Must Be Remedied

1. Inspection

   Inspections will take place to determine whether the Roadways are to be accepted for County Maintenance.

2. All Defects and/or Deficiencies Must be Remedied

   All defects and/or deficiencies must be remedied/corrected to the satisfaction of the Director of Development Services or his/her designee before the Roadway(s) will be accepted for County Maintenance. This includes remedying items noted regarding drainage Infrastructure.

3. Procedure

   After correction of all issues identified by the Director of Development Services or his/her designee. The Applicant files a written request for acceptance of the Roadways for County Maintenance with the Director of Development Services. The request must identify all Roadways made the subject of the request and include a location map showing the locations of the Roadways. The request must also identify the total linear feet of the road(s) for which the request is made by the Applicant. The Director of Development Services shall schedule the request for a Commissioners Court meeting for action by the Commissioners Court on the request. The Director of Development Services or his/her designee shall notify the Applicant of the date and time that the request will be considered. The Applicant is entitled to attend the meeting and be heard on the request.

   The Commissioners Court, in an open Commissioners Court meeting, votes whether to accept the Roadways for maintenance. A majority vote of those present and voting is

required for acceptance. The request and the vote thereon shall be recorded in the Official Minutes of the Commissioners Court.
If the vote is not to accept the Roadways for maintenance, the reasons for such determination shall be included in the motion preceding the vote. If the reasons are matters that can be corrected, the Applicant may, upon remedying those matters, submit a future request.

B. Roadways Not Eligible For County Maintenance

The County may only maintain public roads, so private roads are not eligible for County maintenance.

A public road for which no request for County maintenance has been submitted and approved is not eligible for County maintenance. If a request for maintenance is made at a later date, the road must be brought up to Grayson County's Engineering Design Standard Manual before it will be considered by the Commissioners Court.

APPENDIX A – GRAYSON COUNTY STANDARD CONSTRUCTION DETAILS

STANDARD CONSTRUCTION DETAILS

PAVING

FEBRUARY 2021

GRAYSON COUNTY

DEVELOPMENT SERVICES DEPARTMENT

100 W HOUSTON ST

SHERMAN, TX 75090

TABLE OF CONTENTS

PAVING

PAVING – GENERAL NOTES

1. GENERAL:
   UNLESS OTHERWISE NOTED, ITEM SPECIFICATIONS REFER TO THE MOST RECENTLY ADOPTED VERSION OF THE TEXAS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES.

2. PAVEMENT THICKNESS IS AS SHOWN IN ITEM 8. SUBGRADE DESIGN SHALL CONFORM TO THE REQUIREMENTS IN ITEM 3, AND SHALL EXTEND 12" MIN. BEHIND THE BACK OF CURB.

3. REINFORCED CONCRETE PAVEMENT:
   A. CONCRETE STRENGTH SHALL BE AS SHOWN IN ACCORDANCE WITH TXDOT ITEMS 360 AND 421.
   B. ALL CURBS SHALL BE INTEGRAL WITH PAVEMENT AND SHALL BE OF THE SAME STRENGTH AS CONCRETE PAVEMENT.
   C. DETAIL AND ARRANGEMENT OF PAVEMENT JOINTS, ALL TYPES, SHALL BE AS SHOWN ON GRAYSON COUNTY STANDARD CONSTRUCTION DETAILS.
   D. BAR LAPS SHALL BE THIRTY DIAMETERS.
   E. REINFORCING STEEL SHALL BE #3 REBAR (3/8") ON 18" CENTERS FOR 7" OR LESS. #4 ON 24" CENTERS FOR 8" OR ABOVE.

4. SUBGRADE:
   SUBGRADE UNDER ALL PAVEMENT SHALL BE 6" THICK AND SHALL BE STABILIZED WITH AT LEAST 30 LBS. PER SQ. YD. HYDRATED LIME, COMPACTED TO A DENSITY NOT LESS THAN 95 PERCENT. LABORATORY TESTS MUST BE SUBMITTED TO THE COUNTY ENGINEER FOR APPROVAL TO DETERMINE AMOUNT OF LIME REQUIRED. LABORATORY TEST MAY BE WAIVED PROVIDED AT LEAST 36 LBS. OF LIME PER SQ. YD. IS USED. SEE TXDOT ITEM 260 "LIME TREATMENT". FLEXIBLE BASE (CRUSHED STONE/CONCRETE) PER TXDOT ITEM 247 MAY BE SUBSTITUTED FOR LIME TREATMENT WITH THE APPROVAL OF THE GRAYSON COUNTY ENGINEER.

5. REBAR SHALL BE SUPPORTED BY BAR CHAIRS OR OTHER DEVICES APPROVED BY THE GRAYSON COUNTY ENGINEER.

6. NO TRAFFIC ON FINISHED SUBGRADE SHALL BE PERMITTED AFTER REINFORCING STEEL IS INSTALLED ABOVE SUBGRAGE. NO TRAFFIC SHALL BE PERMITTED BEFORE OR DURING THE PLACING OF CONCRETE.

7. CROSS SLOPE OF STRAIGHT CROWN STREETS SHALL BE 1/4" PER FOOT UNLESS OTHERWISE APPROVED BY THE GRAYSON COUNTY ENGINEER.

8. PAVEMENT THICKNESS AND STRENGTHS SHALL BE AS FOLLOWS:
   MAJOR ARTERIAL – 8" CLASS "P" OR "CO."
   MINOR ARTERIAL – 8" CLASS "P" OR "CO."
   COMMERCIAL/INDUSTRIAL COLLECTOR – 7" CLASS "P" OR "CO."
   RESIDENTIAL COLLECTOR – 7" CLASS "P" OR "CO."
   URBAN/RURAL STREET – 6" CLASS "P" OR "CO."
   SIDEWALK AND BFR's–4"–CLASS "A"
   DRIVE APPROACH–6"–CLASS "CO"
   ALLEY–6" CLASS "P" OR "CO."

9. CONCRETE MIX DESIGN SHALL BE AS DEFINED BY TXDOT ITEM 360.

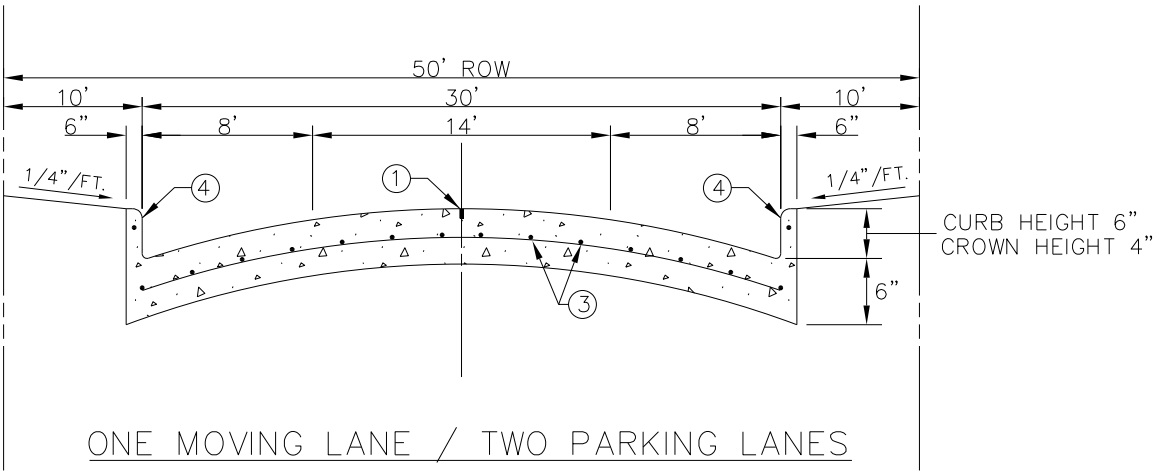
10. ALL MEDIANS AND PARKWAYS SHALL BE PROVIDED WITH BERMUDA GROUND COVER.

11. ONCE A CURB ABUTTING A THOROUGHFARE HAS BEEN SAWCUT AND REMOVED, THE CONTRACTOR MUST REPLACE THE CONCRETE WITH A NEW POUR (i.e. DRIVEWAY) WITHIN 14 CALENDAR DAYS. LIQUIDATED DAMAGES WILL BE ASSESSED AT $500 PER DAY FOR EACH CALENDAR DAY IN EXCESS OF 14 CALENDAR DAYS. PAYMENT SHALL BE MADE PRIOR TO ACCEPTANCE OR ISSUANCE OF A DEVELOPMENT CERTIFICATE.

12. ALL SIDEWALKS AND ACCESSIBLE ROUTES SHALL HAVE A MAXIMUM LONGITUDINAL SLOPE OF 5% AND A MAXIMUM CROSS SLOPE OF 2%.

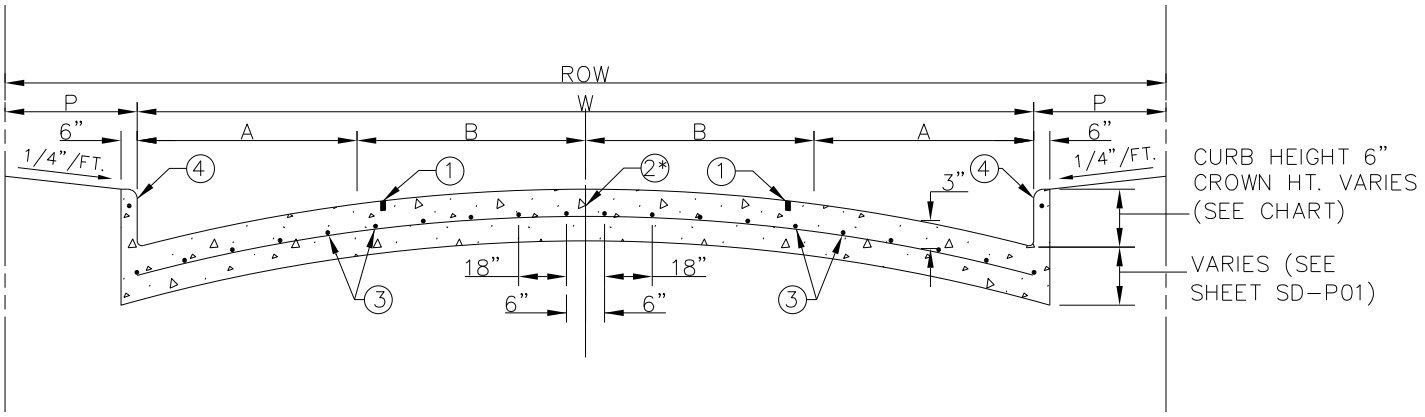
13. ALLEYS AND DRIVEWAYS

    A. CONCRETE FOR ALLEY RETURNS AND DRIVEWAYS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS IDENTICAL TO THAT SPECIFIED FOR THE STREET PAVEMENT OR BASE WHEN BUILT AS COMPONENTS OF A CONCRETE PAVING PROJECT. WHEN BUILT SEPARATELY, THE STRENGTH SHALL BE AS SPECIFIED ON THE CONSTRUCTION PLAN.
    B. SPACING AND CONSTRUCTION OF JOINTS SHALL CONFORM TO PARABOLIC STREET PAVEMENT.



ONE MOVING LANE / TWO PARKING LANES
URBAN STREET

NTS



* FULL WIDTH PAVEMENT OF 36' WIDTH STREETS IS ALLOWED WHERE APPROVED BY THE GRAYSON COUNTY ENGINEER.

STREET TYPE	STREET WIDTH (W)	A	B	ROW WIDTH	P	CROWN HT.
RESIDENTIAL COLLECTOR	36' *	7'-6"	10'-6"	56'	12'	5"
COMMERCIAL / INDUSTRIAL COLLECTOR	44'	11'	11'	65'	10'-6"	6"

FOUR MOVING LANES OR
TWO MOVING LANES / TWO PARKING LANES

NTS

① SAWED LONGITUDINAL DUMMY JOINT.
② CONSTRUCTION JOINT (FULL WIDTH PAVEMENT IS ALLOWED WHERE APPROVED BY THE GRAYSON COUNTY ENGINEER).
③ ALL REINFORCING BARS SHALL BE No. 3 TRANSVERSE BARS TO BE SPACED ON 18" CENTERS. LONGITUDINAL BARS SHALL BE PLACED ON 18" CENTERS EXCEPT WHERE NOTED.
④ CURB REINFORCEMENT SHALL BE CONTINUOUS No. 3 BAR.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
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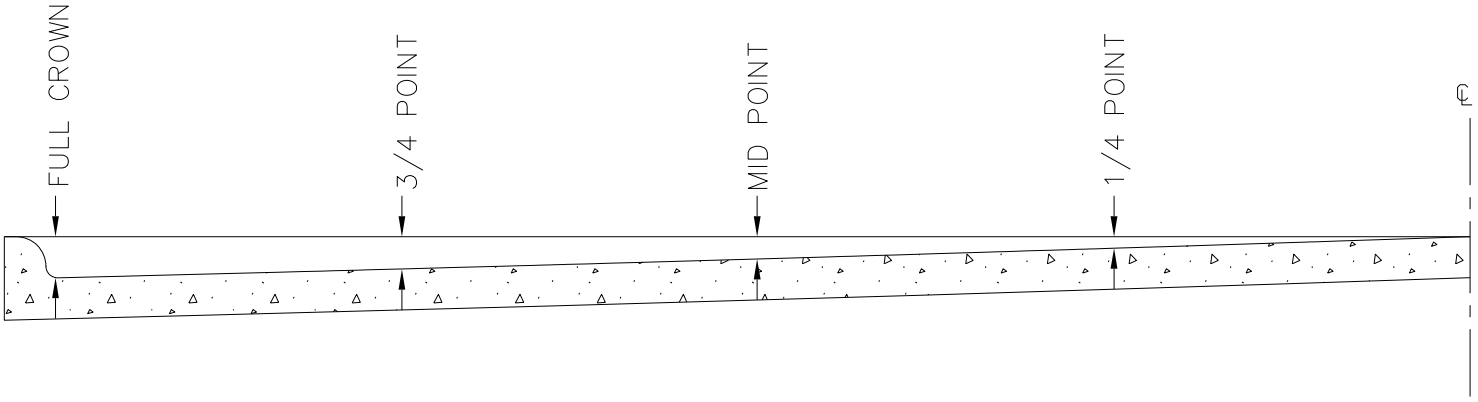
URBAN STREET AND COLLECTOR SECTION

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-P02



SLIP–FORM PAVEMENT MUST MEET CROWN GRADES AT GUTTERS, AT MID–POINTS AND CENTERLINE. WIDTHS OF PAVEMENT ARE FACE TO FACE.

ROADWAY WIDTH (W)	TOTAL CROWN HEIGHT	3/4 POINT	MID–POINT	1/4 POINT
31'	4"	2–3/16"	7/8"	1/4"
36'	5"	2–7/8"	1–1/4"	3/8"
44'	6"	3–3/8"	1–1/2"	1/2"

TABLE OF CROWN HEIGHTS AND ORDINATES FOR VARIOUS PARABOLIC SECTIONS

NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
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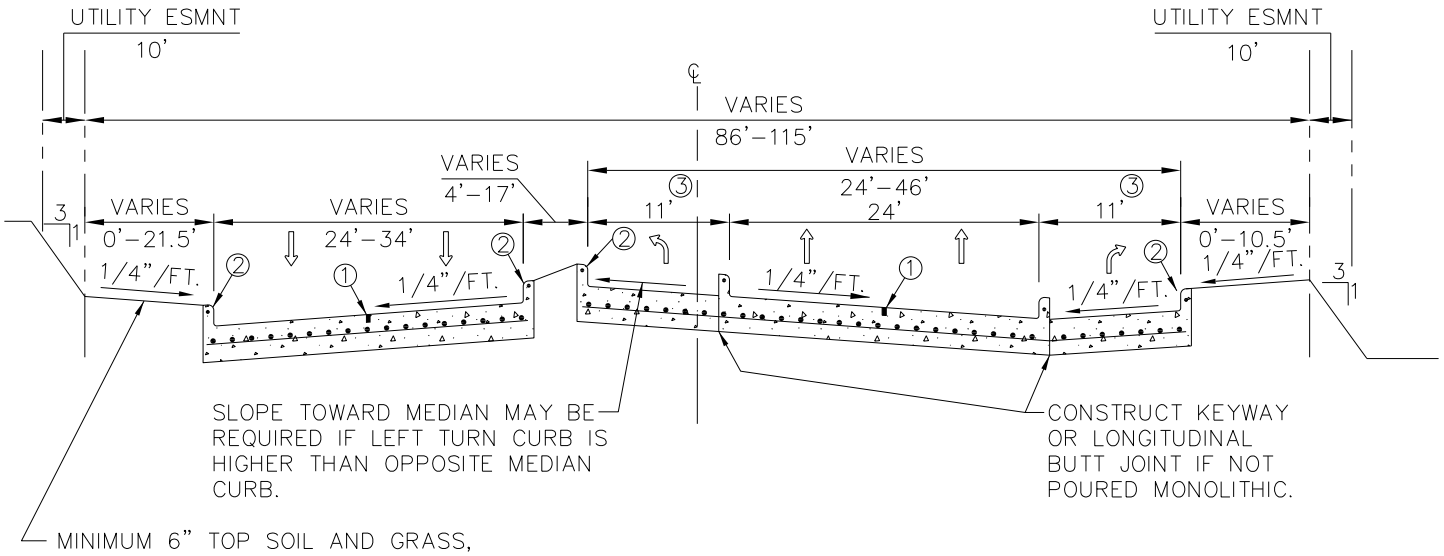
PARABOLIC PAVEMENT CROWN

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–P03



MINOR ARTERIAL PAVEMENT SECTION

NTS

(1) SAWED LONGITUDINAL DUMMY JOINT.

(2) REINFORCEMENT SHALL BE A CONTINUOUS No. 3 BAR.

(3) LANE CONFIGURATION VARIES. SEE GRAYSON COUNTY THOROUGHFARE DESIGN REQUIREMENTS FOR TYPICAL CROSS SECTIONS.

GRAYSON COUNTY
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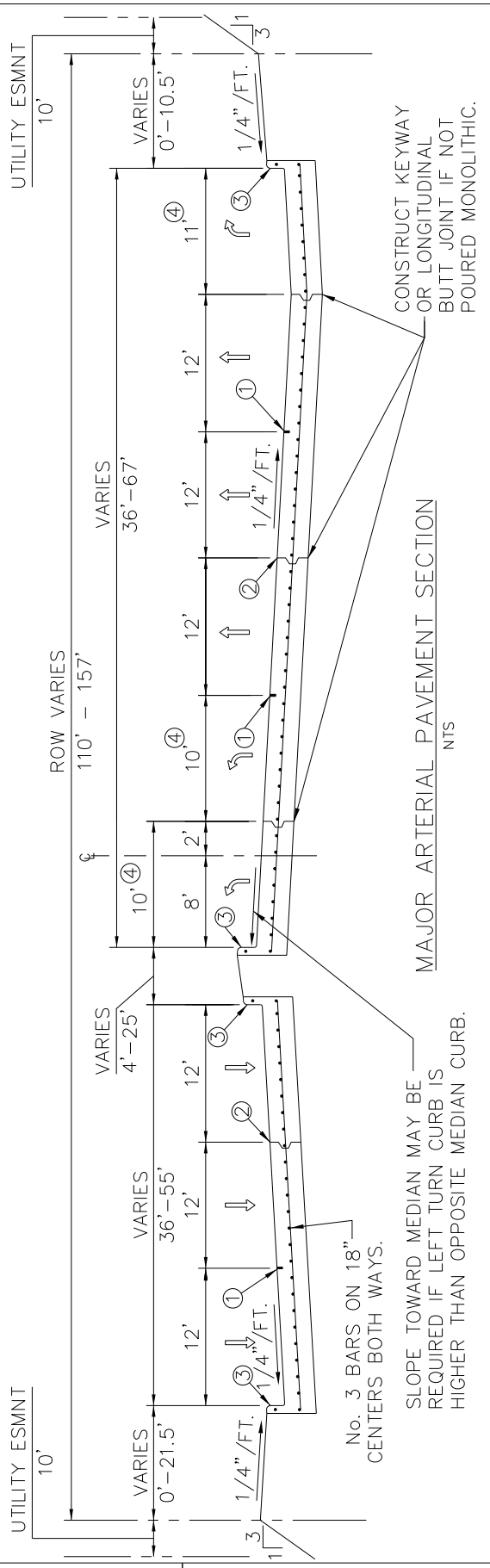
MINOR ARTERIAL SECTION

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–P04



① SAWED LONGITUDINAL DUMMY JOINT.

② CONSTRUCTION JOINT (FULL WIDTH PAVEMENT IS ALLOWED WHERE APPROVED BY THE GRAYSON COUNTY ENGINEER). DELETE IF PAVING IS 25 FT. WIDTH TO BE WIDENED LATER. INSTALL CURB IF PAVING IS LESS THAN FULL WIDTH OF 36'.

③ A NUMBER 3 BAR CONTINUOUS SHALL BE PROVIDED FOR CURB REINFORCEMENT.

④ LANE CONFIGURATION VARIES. SEE GRAYSON COUNTY THOROUGHFARE DESIGN REQUIREMENTS FOR TYPICAL CROSS SECTIONS.

GRAYSON COUNTY
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MAJOR ARTERIAL SECTION

STANDARD CONSTRUCTION DETAILS
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FEB, 2021	–	SD-P05

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
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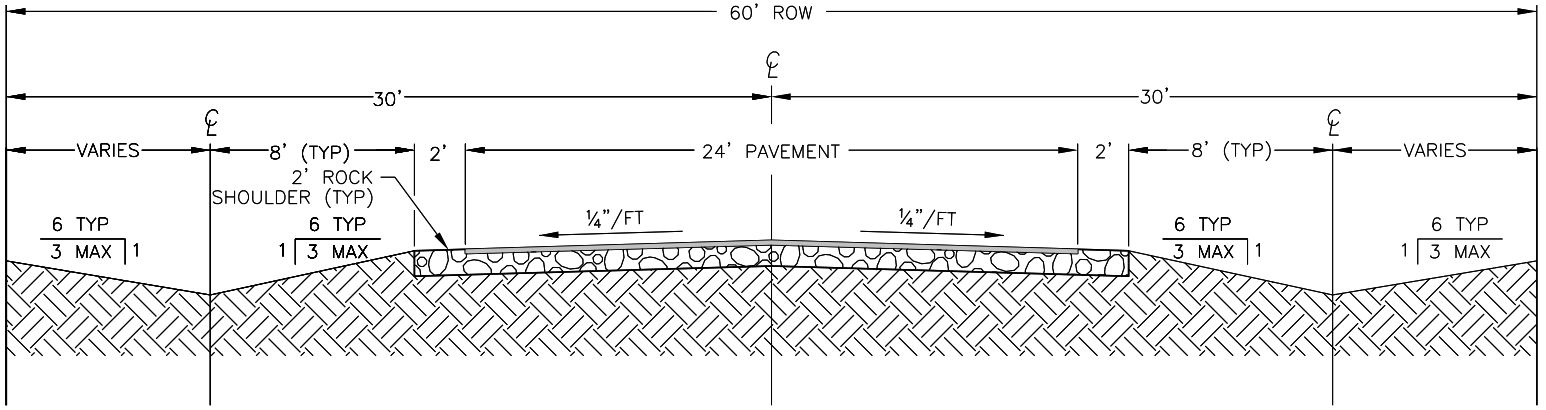
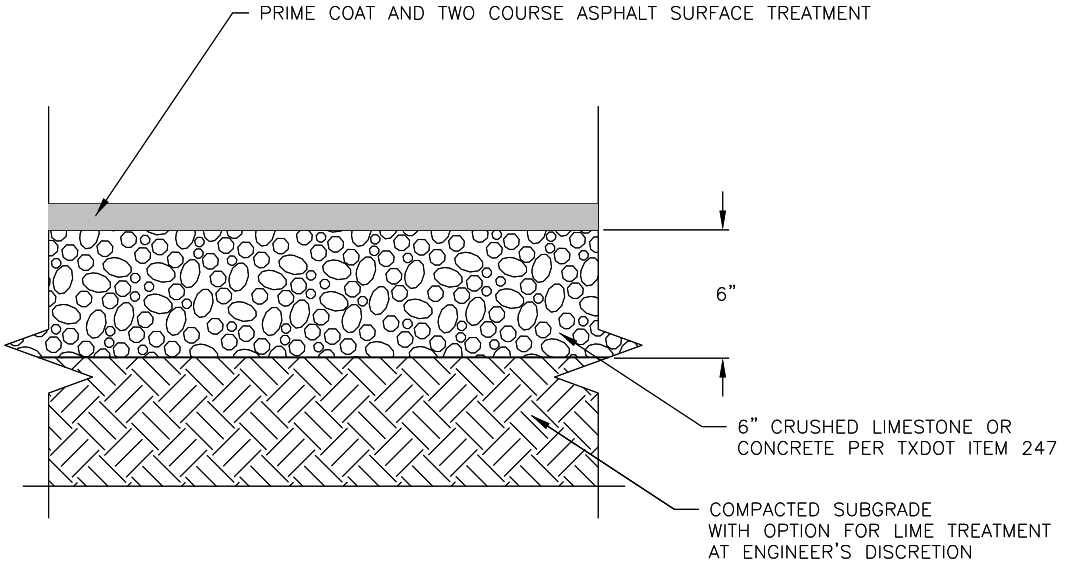
RURAL STREET SECTION



TYPICAL ROADWAY SECTION

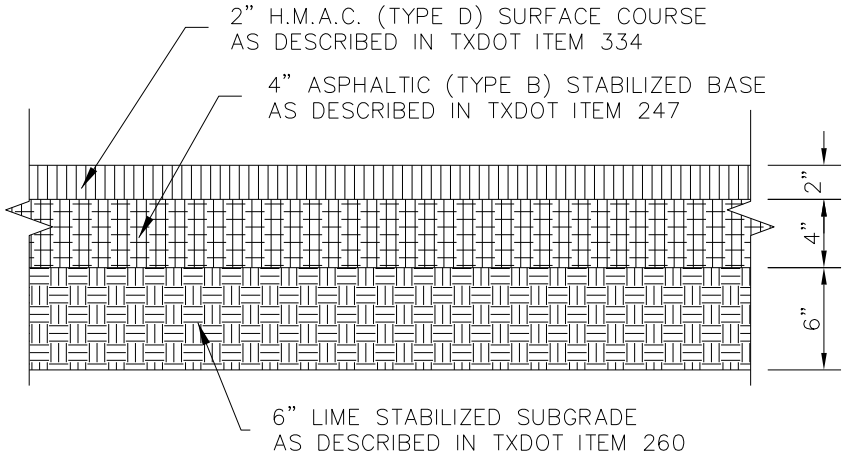


CHIPSEAL PAVING SECTION

NOTE:
AN ADDITIONAL DRAINAGE EASEMENT MAY BE REQUIRED ADJACENT TO THE ROW.

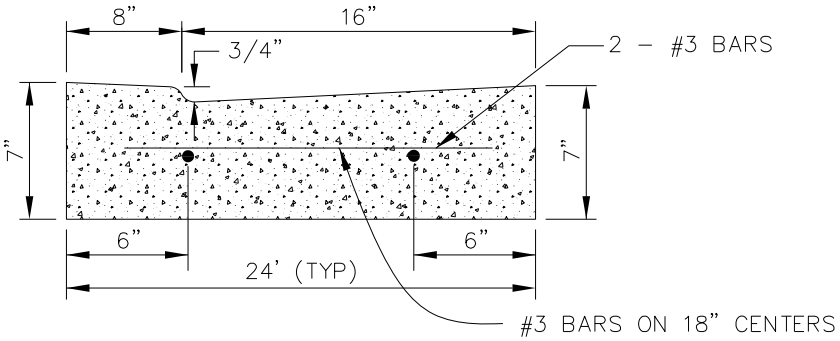
STANDARD CONSTRUCTION DETAILS
PAVING

DATE: FEB, 2021
REV DATE: _
SHEET: SD-P06

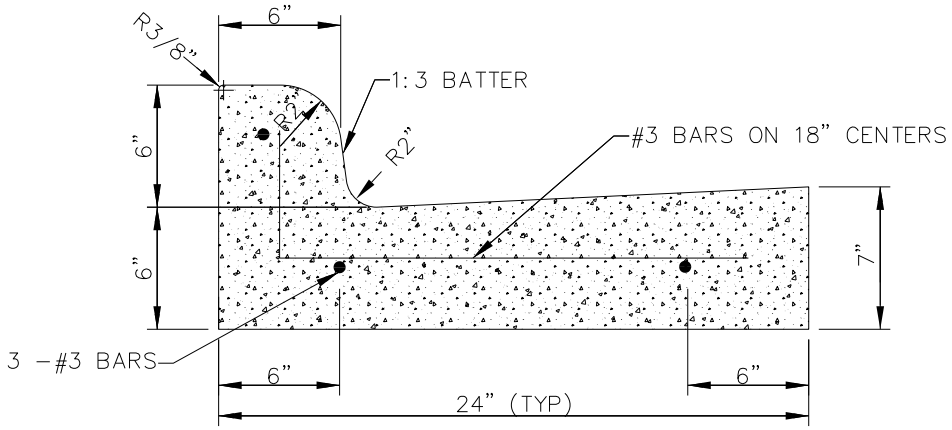


ASPHALT PAVING CROSS SECTION

NOTE:
CUT OF 6" INTO EXISTING PAVEMENT IS REQUIRED FOR CONSTRUCTION JOINT WITH NEW POURS TO GET A SMOOTH FINISH.



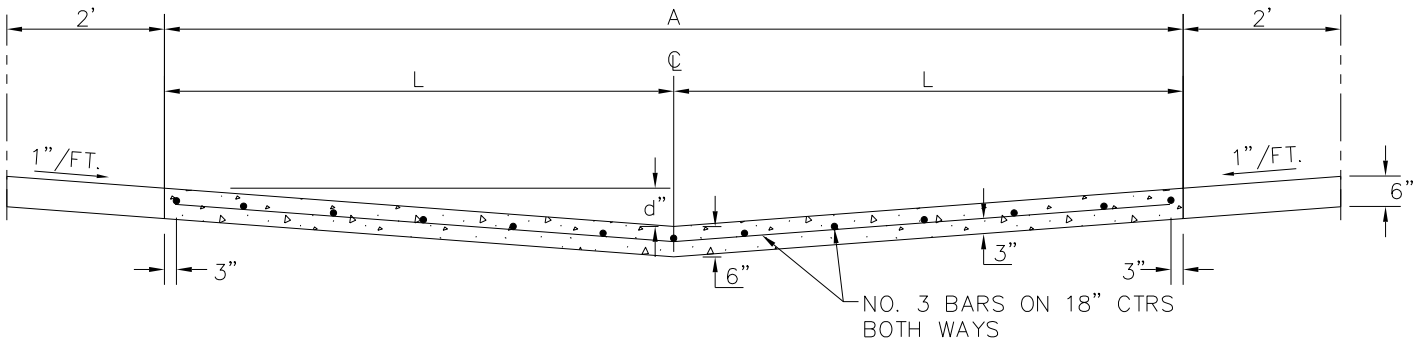
GUTTER DETAIL



CURB & GUTTER DETAIL

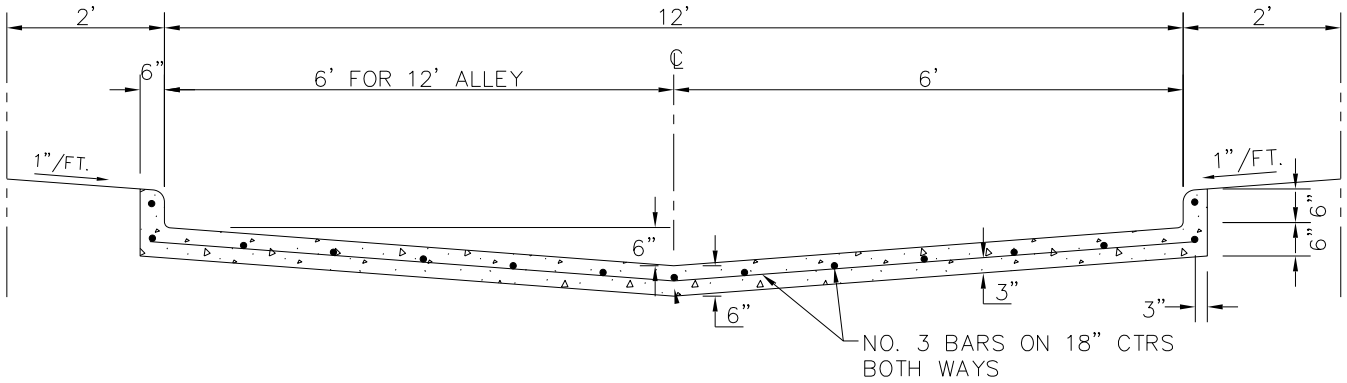
GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	CURB AND GUTTER & ASPHALT PAVING CROSS SECTION	STANDARD CONSTRUCTION DETAILS PAVING		
		DATE: FEB, 2021	REV DATE: –	SHEET: SD–P07

ALLEY WIDTH (A)	HALF SECTION WIDTH (L)	INVERT DEPTH (d)
12'	6'	4"
16'	8'	5"
20'	10'	6"



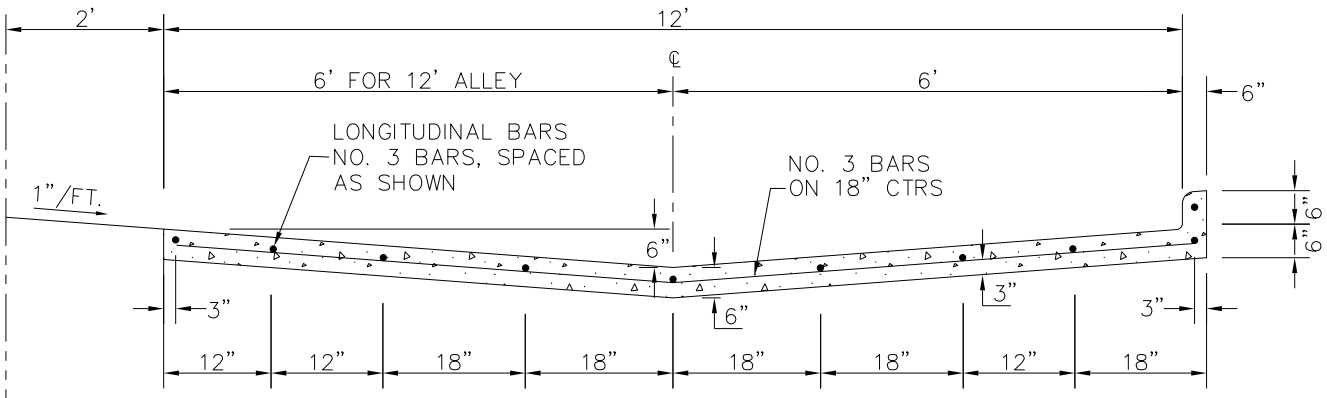
STANDARD 12', 16', & 20' ALLEY SECTION

NTS



STANDARD ALLEY SECTION WITH CURB

NTS



ALTERNATE 12' ALLEY SECTION WITH CURB

NTS

NOTES:

1. CURBS NOT ALLOWED IN RESIDENTIAL AREAS EXCEPT AS APPROVED BY THE GRAYSON COUNTY ENGINEER.
2. NO. 3 BAR CONTINUOUS IN CURB.
3. ALL ALLEYS TO BE LIMED IN ACCORDANCE WITH ITEM 4 ON THE PAVING GENERAL NOTES.

GRAYSON COUNTY
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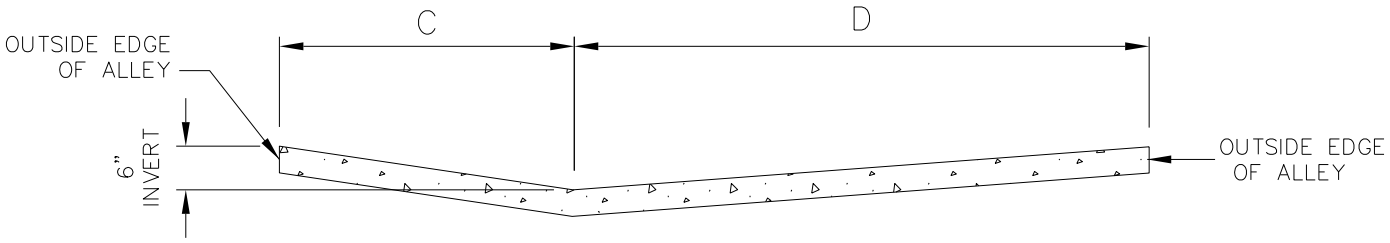
ALLEY SECTION

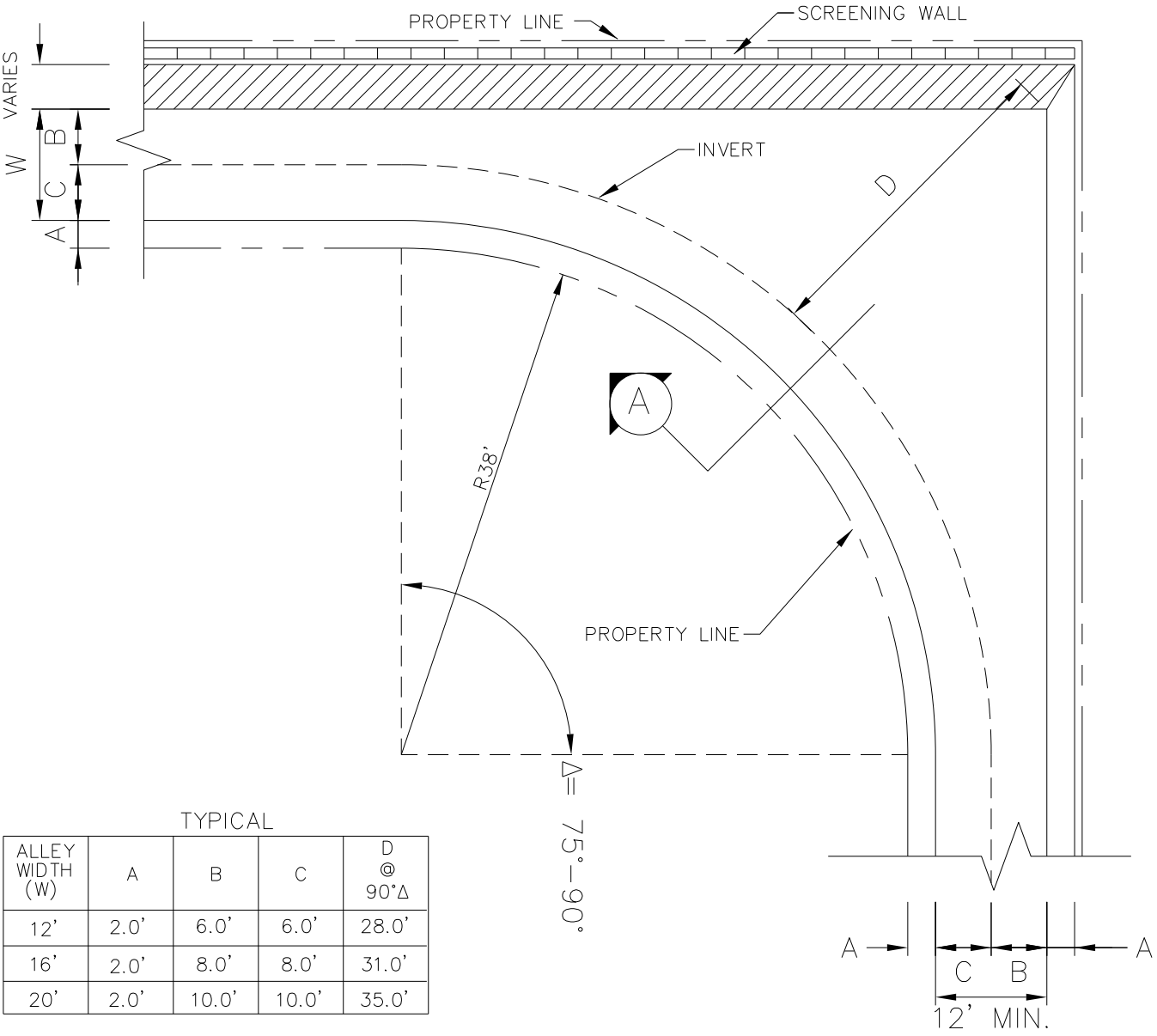
STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-P08



SECTION A
NTS

NOTE :
ALLEY PAVING TO BE PLACED IN SHADED AREA WHEN SCREENING WALL IS ALONG PROPERTY LINE.



TYPICAL

ALLEY WIDTH (W)	A	B	C	D @ 90°Δ
12'	2.0'	6.0'	6.0'	28.0'
16'	2.0'	8.0'	8.0'	31.0'
20'	2.0'	10.0'	10.0'	35.0'

ALLEY TURN 75° OR GREATER
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
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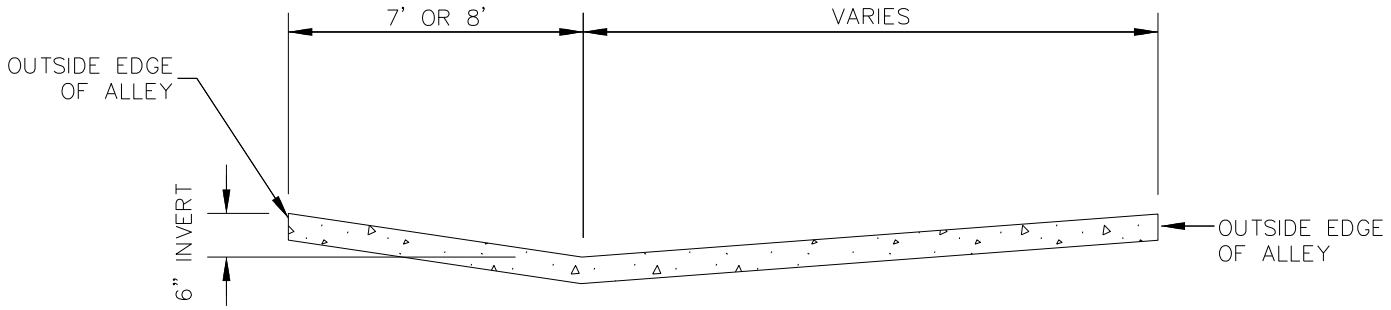
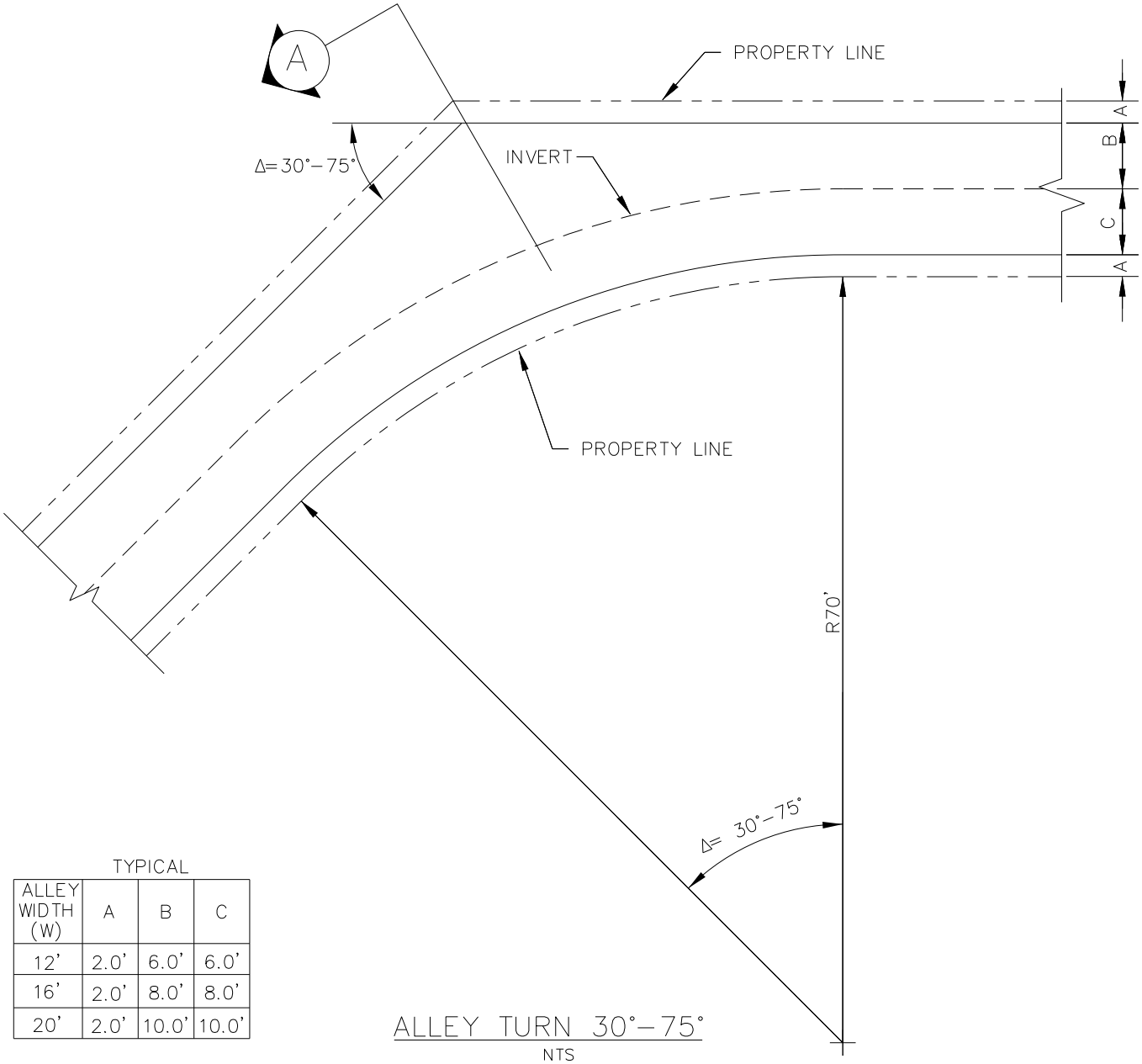
ALLEY TURN 75° OR GREATER

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-P09



SECTION A
NTS



TYPICAL

ALLEY WIDTH (W)	A	B	C
12'	2.0'	6.0'	6.0'
16'	2.0'	8.0'	8.0'
20'	2.0'	10.0'	10.0'

ALLEY TURN 30°-75°
NTS

GRAYSON COUNTY
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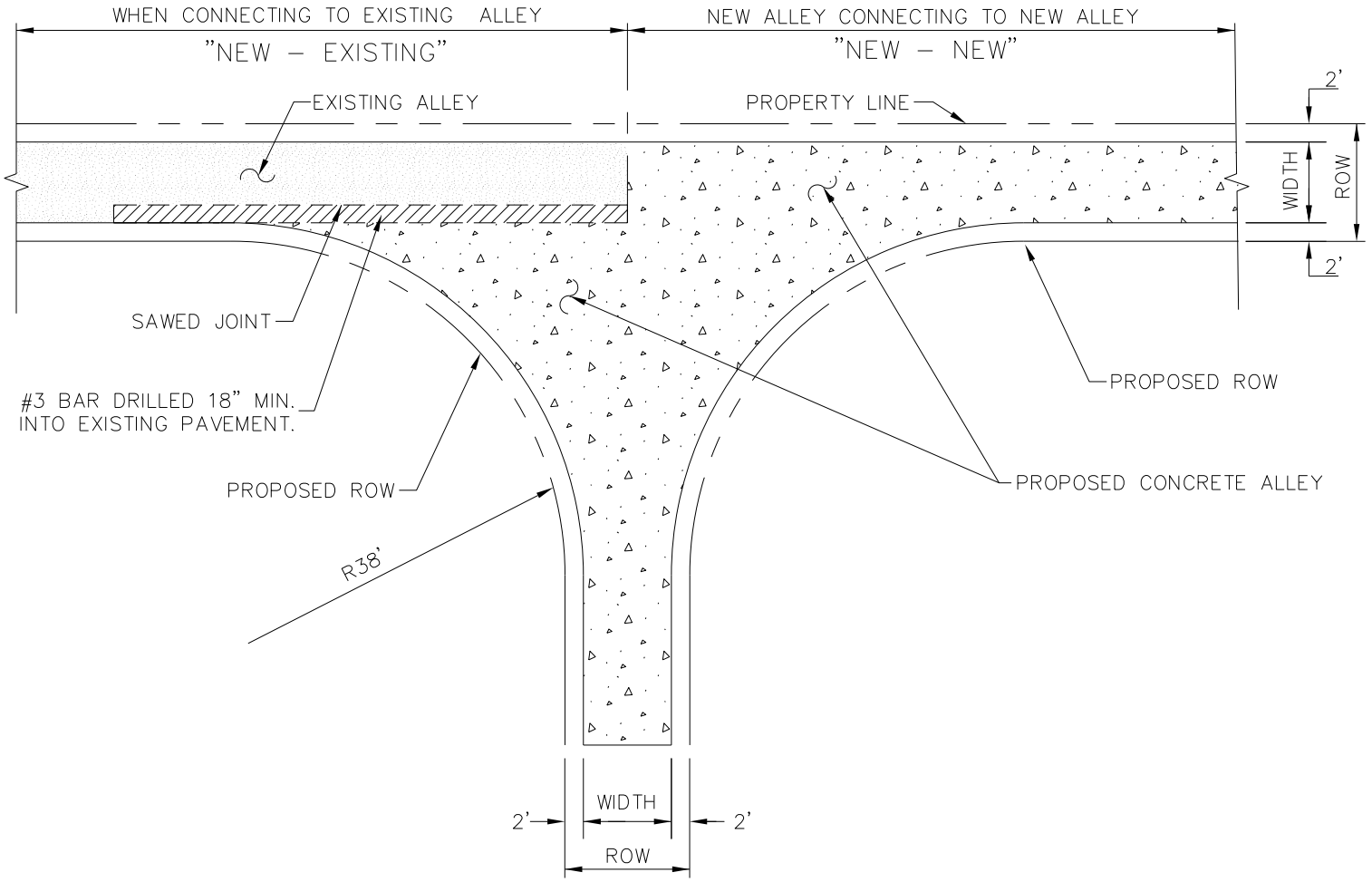
ALLEY TURN 30°-75°

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	-	SD-P10



ALLEY INTERSECTING ALLEY

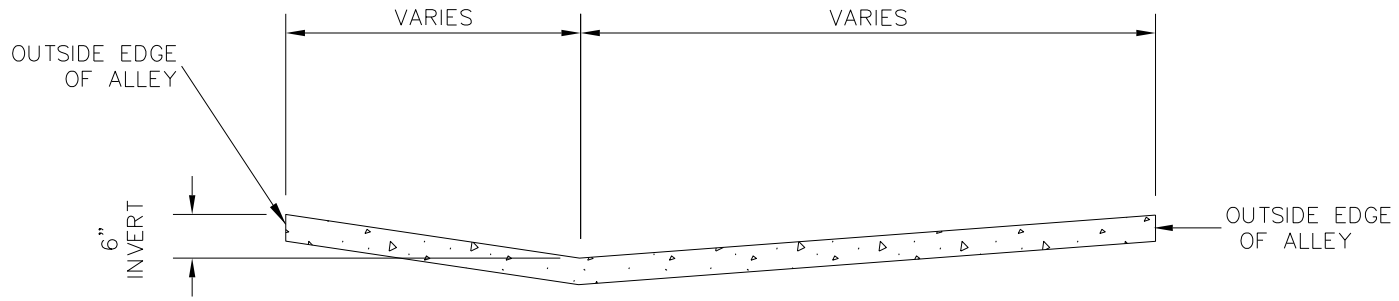
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

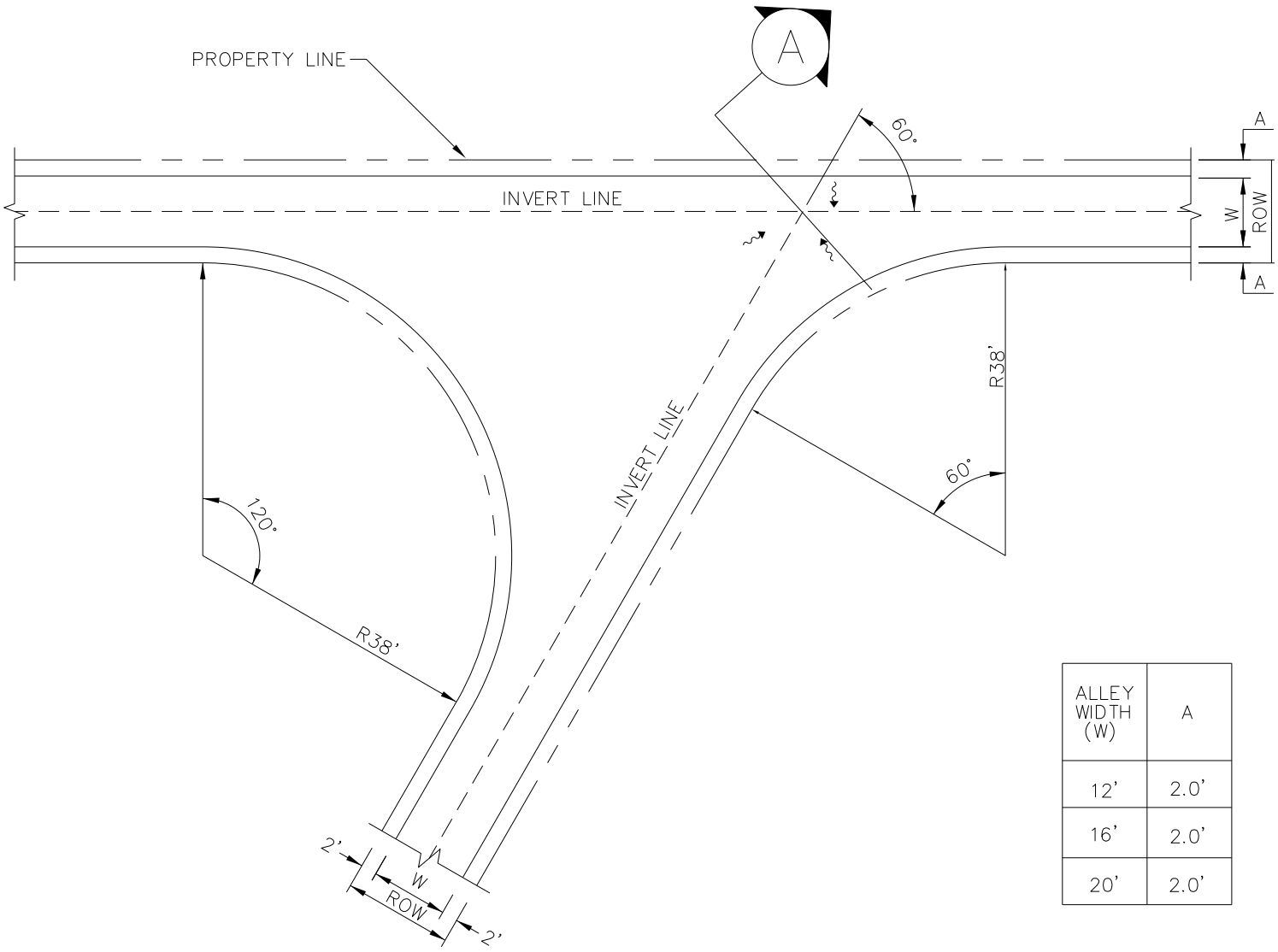
ALLEY INTERSECTING ALLEY

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–P11



SECTION A
NTS



ALLEY WIDTH (W)	A
12'	2.0'
16'	2.0'
20'	2.0'

ALLEY TURN 60°–120°
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
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ALLEY TURN 60°–120°

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
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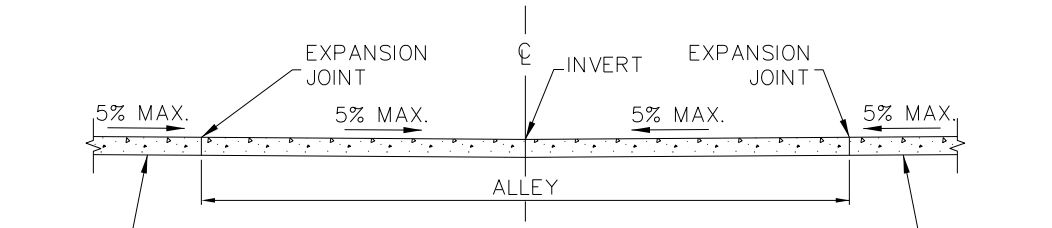
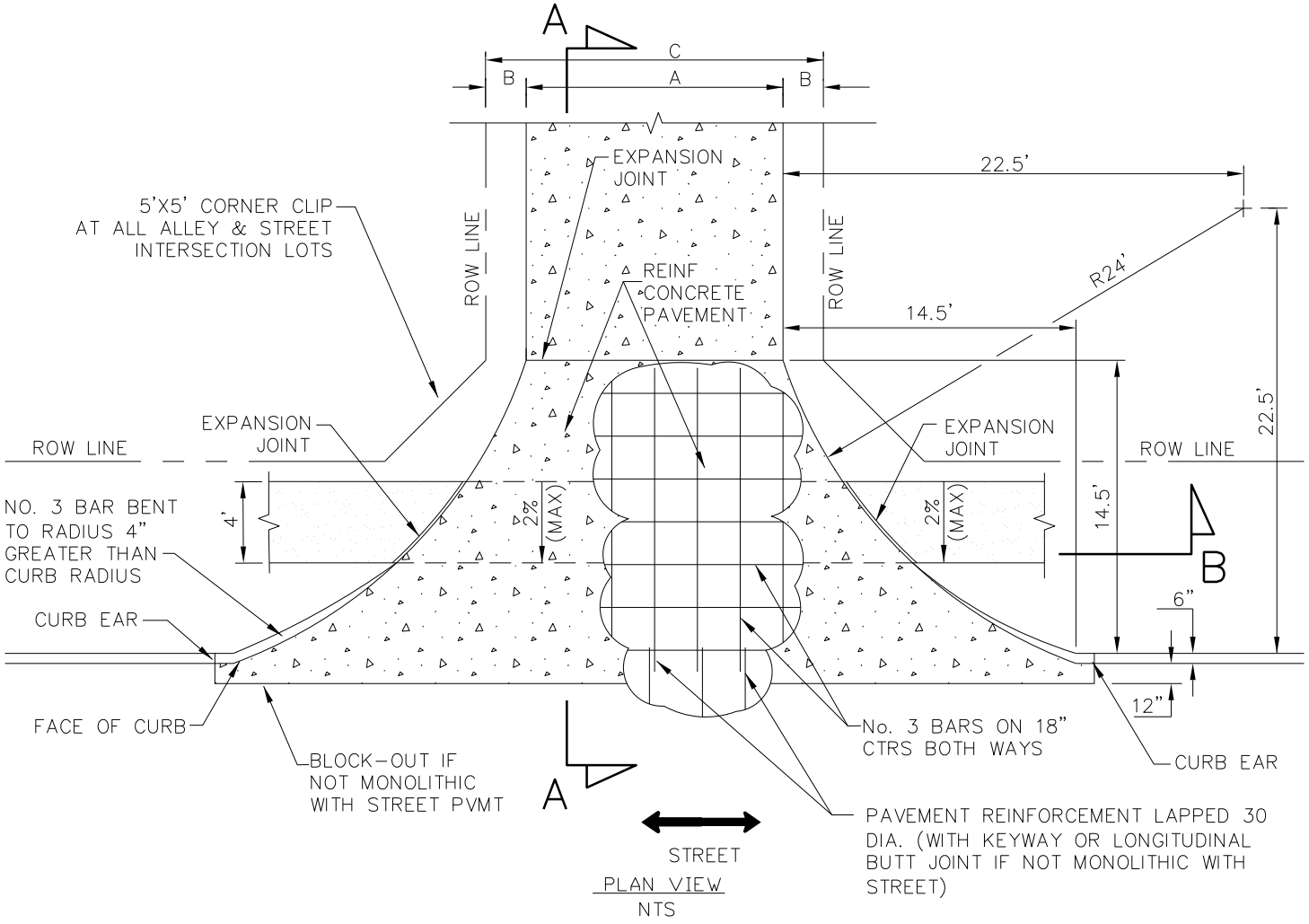
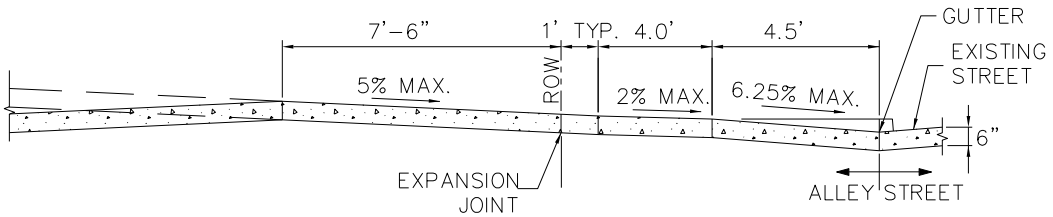


SECTION B–B
NTS



PLAN VIEW
NTS



INVERT SECTION A–A
NTS

ALLEY WIDTH	A	B	C
12'	12'	2'–0"	16'
16'	16'	2'–0"	20'
20'	20'	2'–0"	24'

* ACCESSIBLE PATH MUST NOT BE OBSTRUCTED BY CURB AND MUST NOT EXCEED 2% CROSS–SLOPE.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
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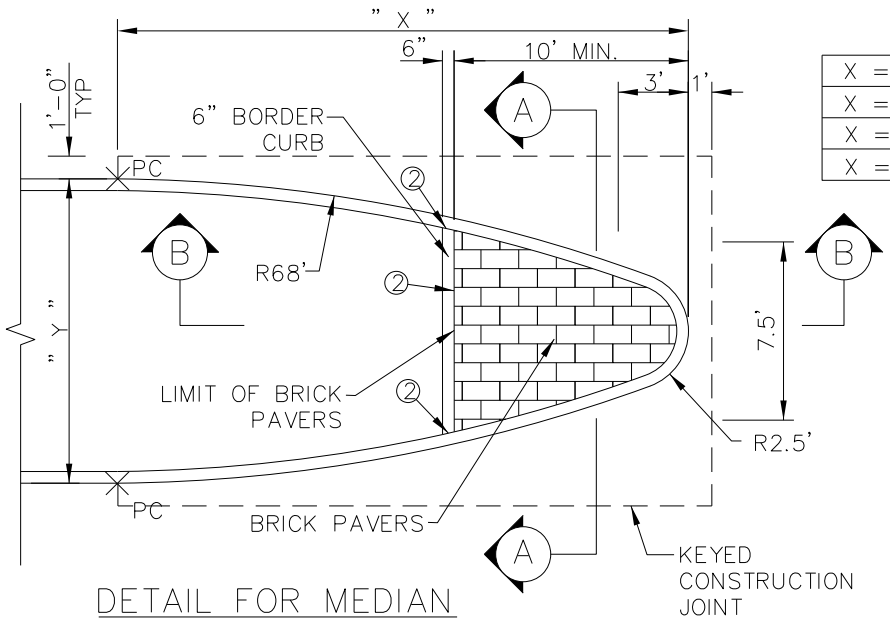
SHERMAN, COUNTY

ALLEY RETURN DETAIL

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–P13



DETAIL FOR MEDIAN WIDER THAN 6' (Y>6')

NTS

DIMENSIONS OF MEDIAN NOSE

X = 13.90'	Y = 7.0'	X = 26.36'	Y = 14.0'
X = 16.44'	Y = 8.0'	X = 29.89'	Y = 17.0'
X = 18.08'	Y = 9.0'	X = 32.93'	Y = 20.0'
X = 20.42'	Y = 10.0'	X = 36.47'	Y = 24.0'

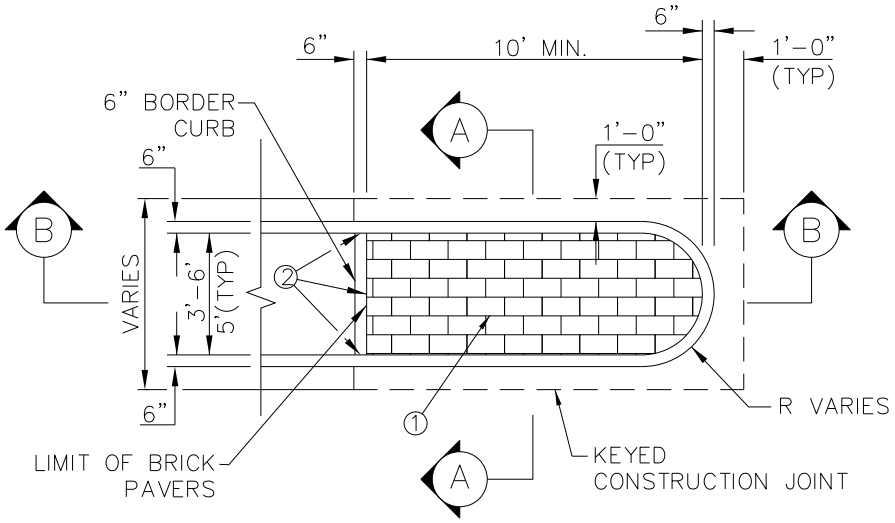
① VEHICULAR BRICK PAVER

② $\frac{1}{2}$" BITUMINOUS EXPANSION JOINT MATERIAL SHALL BE SUFFICIENT TO PREVENT CONTACT BETWEEN WALK & CURB. STOP EXPANSION JOINT AT $\frac{1}{4}$" BELOW TOP OF CURB AND FILL WITH CONC. GRAY SEALANT.

③ JOINT SAND COMPRISED OF CRUSHED GRANITE SAND CONFORMING TO ASTM C144 AND A DRY MIX POLYMER BASED JOINT SAND STABILIZER. JOINT SAND STABILIZER SHALL BE APPROVED BY THE GRAYSON COUNTY ENGINEER PRIOR TO INSTALLATION.

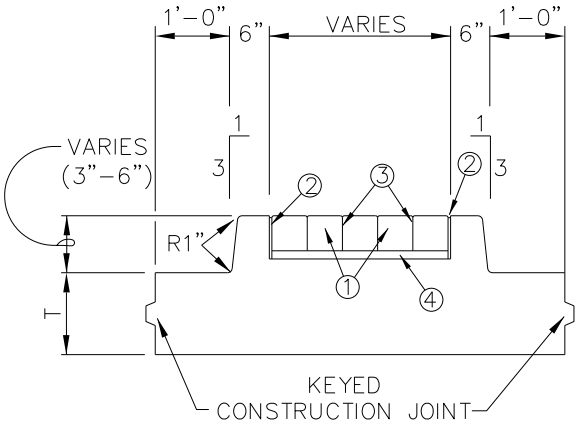
④ BEDDING SAND COMPRISED OF 90% NATURAL OR CRUSHED GRANITE SAND CONFORMING TO ASTM C33 AND 10% PORTLAND CEMENT.

T=PAVEMENT THICKNESS
B=BRICK PAVER THICKNESS



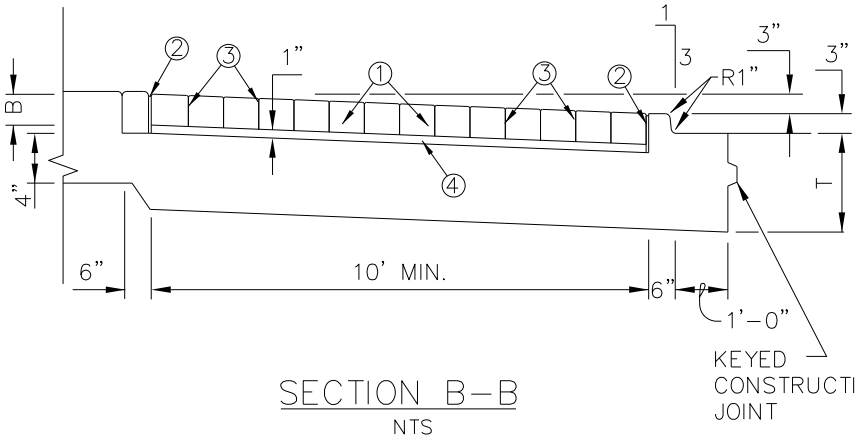
DETAIL FOR MEDIAN 3'-0" TO 6'-0"

NTS



SECTION A-A

NTS



SECTION B-B

NTS

NOTES:

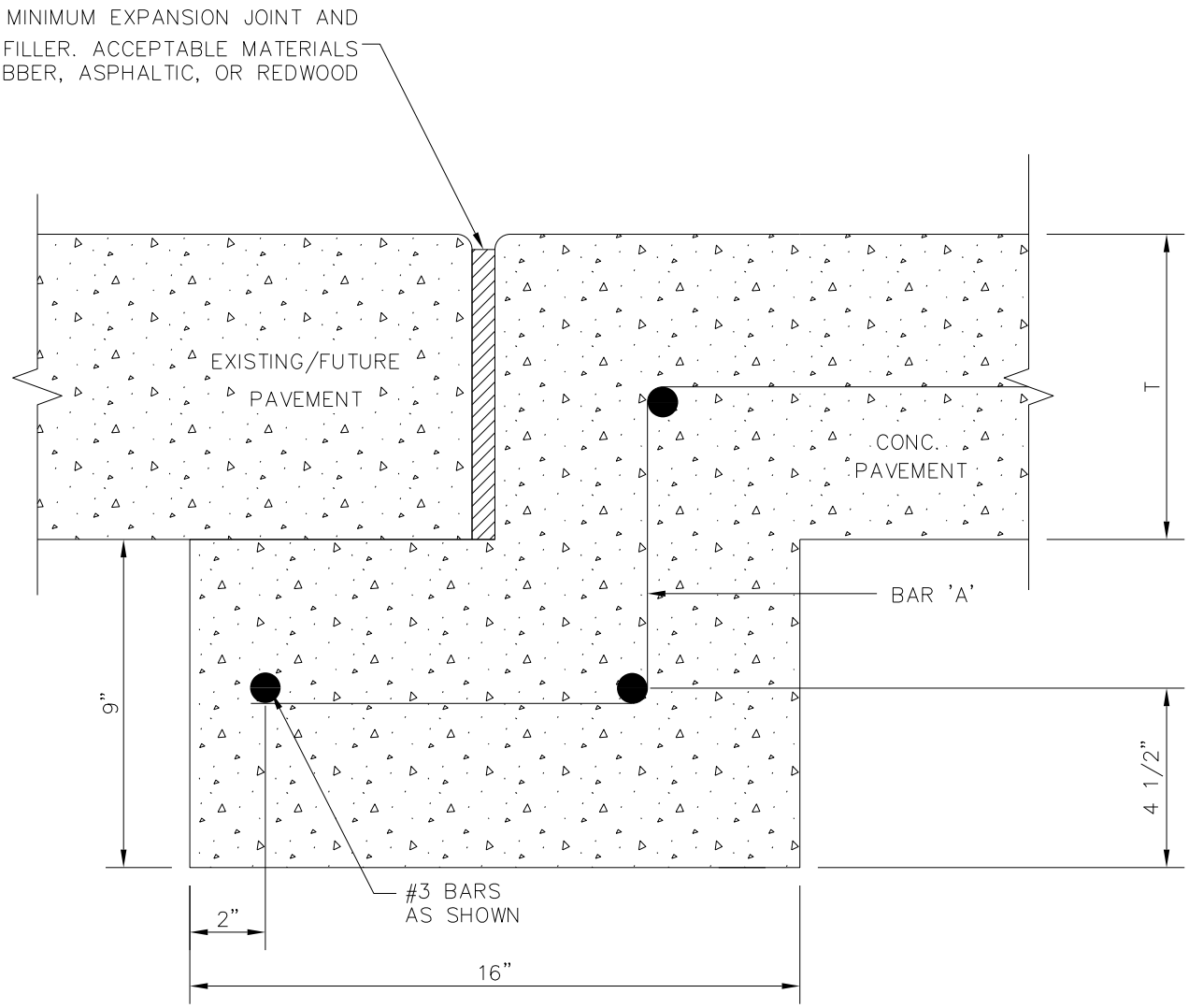
1. BRICK PAVERS SHALL BE VEHICULAR PAVERS CONFORMING TO ASTM C1272, TYPE R APPLICATION AND SHALL BE APPROVED BY THE GRAYSON COUNTY ENGINEER.
2. BRICK PAVERS SHALL BE WITHOUT FROGS OR CORES IN SURFACE EXPOSED TO VIEW IN THE COMPLETED WORK.
3. MEDIAN PAVERS SHALL EXTEND TO A POINT WHERE MEDIAN IS AT LEAST 6' WIDE. IF MEDIAN IS 6' WIDE, PAVERS SHALL EXTEND 10' FROM THE NOSE.
4. ALL DISTANCES ARE MINIMUM.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

MEDIAN DETAILS

STANDARD CONSTRUCTION DETAILS
PAVING

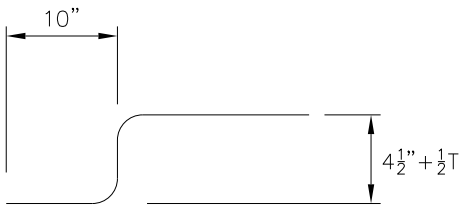
DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-P14



NOTES:

1. PAVEMENT BARS TO BE BENT DOWN INTO HEADER.
2. HEADER AND PAVEMENT TO BE MONOLITHIC.

T=PAVEMENT THICKNESS

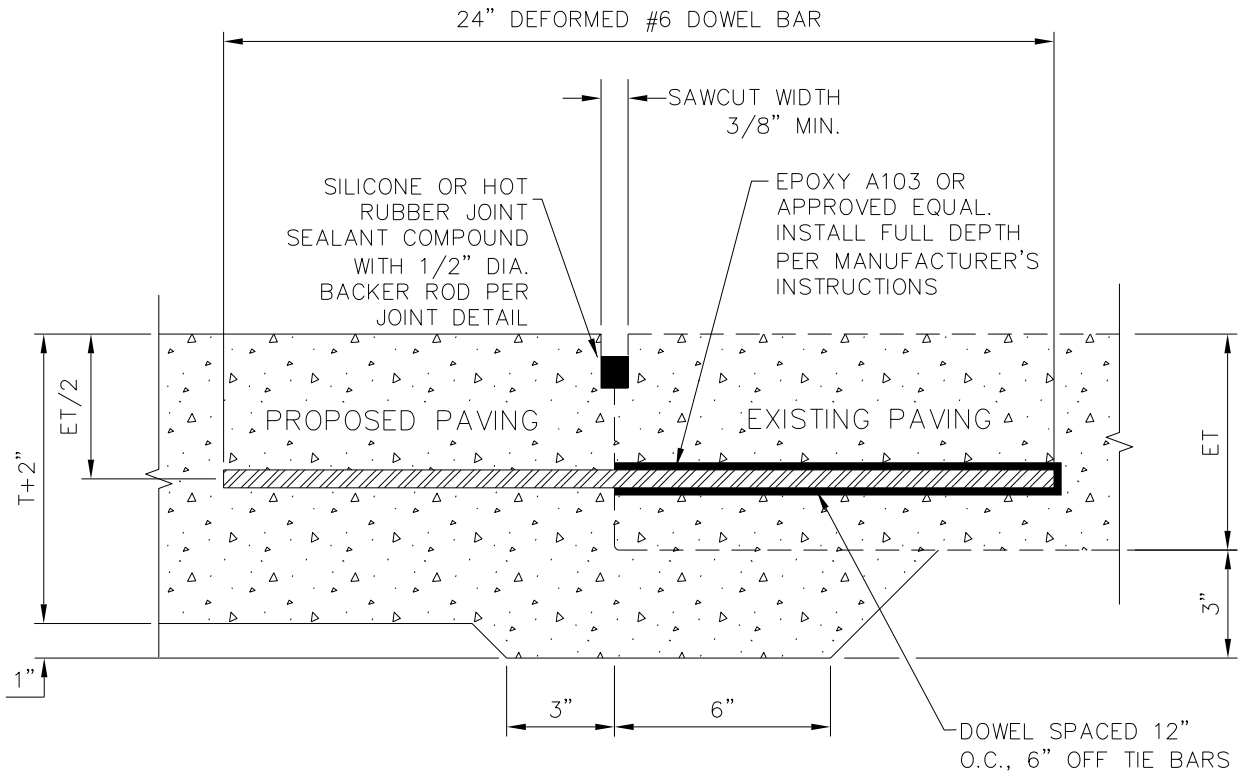


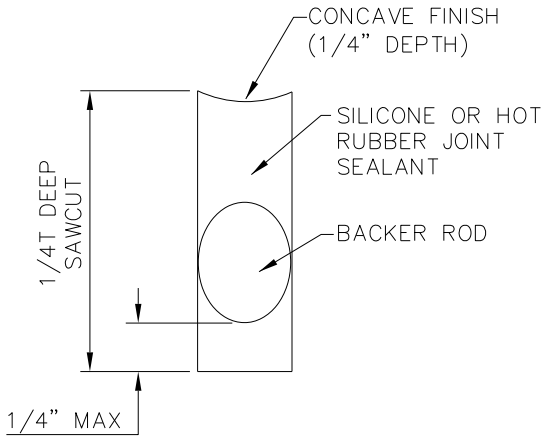
BAR 'A'

STREET HEADER

NTS

GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	STREET HEADER	STANDARD CONSTRUCTION DETAILS PAVING
		DATE: FEB, 2021 / REV DATE: – / SHEET: SD–P15





JOINT DETAIL
NTS

NOTE:

1. NO. 5 DEFORMED DOWEL BAR MAY BE USED IN 6 INCH PAVEMENT.
2. DOWEL BARS SHALL BE DRILLED INTO PAVEMENT HORIZONTALLY BY USE OF A MECHANICAL RIG.
3. DRILLING BY HAND IS NOT ACCEPTABLE, PUSHING DOWEL BARS INTO GREEN CONCRETE IS NOT ACCEPTABLE.

T=PROPOSED PAVEMENT THICKNESS
ET=EXISTING PAVEMENT THICKNESS

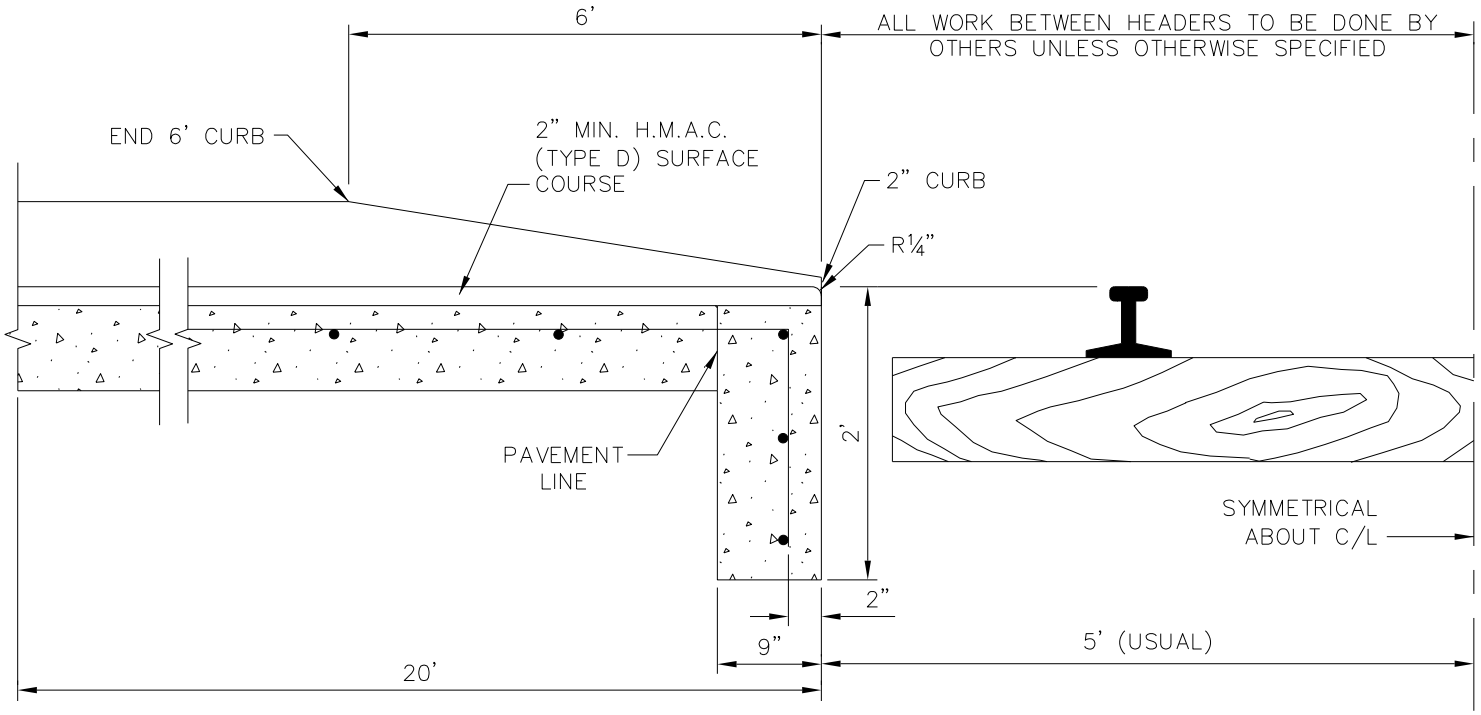
PAVEMENT REPAIR HEADER
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

PAVEMENT REPAIR HEADER

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–P16



RAIL HEADER
NTS

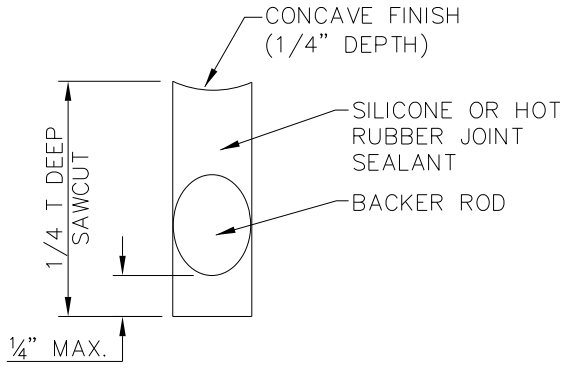
NOTE:
PAVEMENT BARS TO BE BENT DOWN INTO HEADER.
HEADER AND PAVEMENT TO BE MONOLITHIC.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

RAIL HEADER

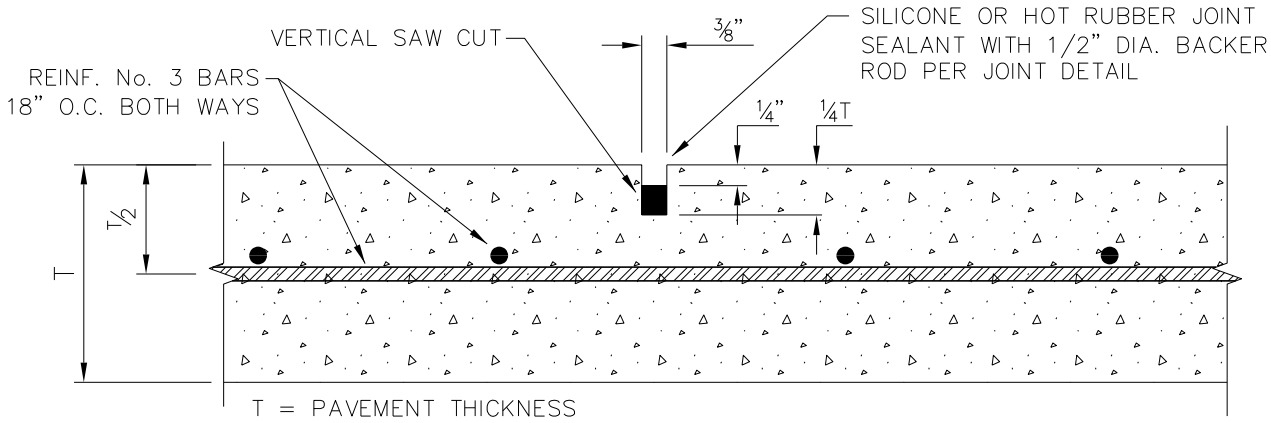
STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–P17



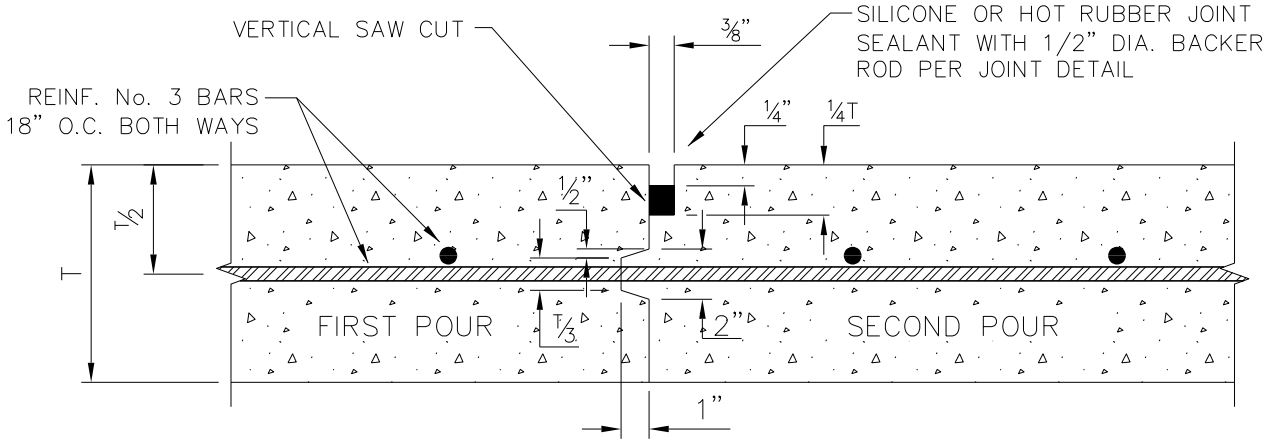
JOINT DETAIL

NTS



SAWED DUMMY JOINTS

NTS



T = PAVEMENT THICKNESS

NOTE: CONTRACTOR SHALL PROTECT KEYWAY PRIOR TO SECOND POUR. IF LONGITUDINAL KEYWAY IS DAMAGED, CONTRACTOR SHALL REPAIR WITH THE USE OF LONGITUDINAL BUTT JOINT. DRILL AND EPOXY DOWELS INTO FIRST POUR.

CONSTRUCTION JOINTS FOR PAVEMENT

NTS

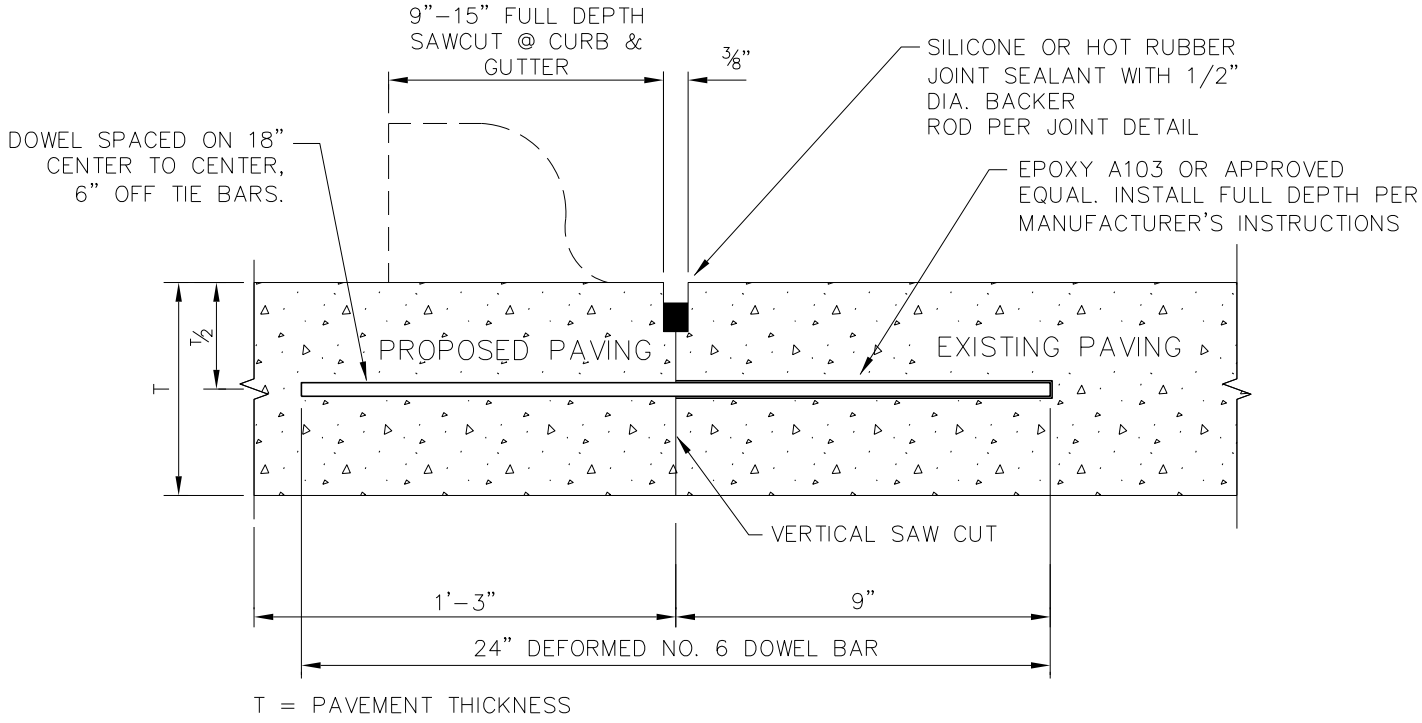
TRANSVERSE AND LONGITUDINAL JOINTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

JOINT DETAILS

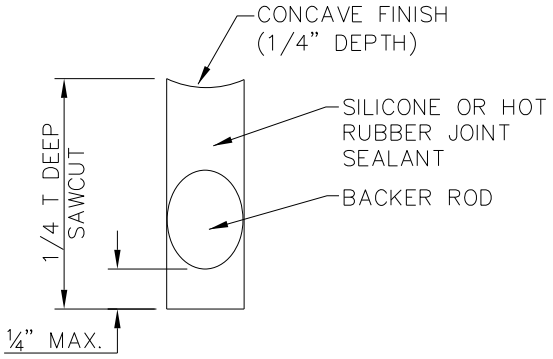
STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–P18



NOTES:

1. NO. 5 DEFORMED BAR MAY BE USED IN 6 INCH PAVEMENT.
2. LONGITUDINAL BUTT CONSTRUCTION MAY BE UTILIZED IN PLACE OF LONGITUDINAL HINGED (KEYWAY) JOINT AT CONTRACTORS OPTION.
3. DOWEL BARS SHALL BE DRILLED INTO PAVEMENT HORIZONTALLY BY USE OF A MECHANICAL RIG.
4. DRILLING BY HAND IS NOT ACCEPTABLE, PUSHING DOWEL BARS INTO GREEN CONCRETE IS NOT ACCEPTABLE.
5. SAWCUT WATER SHALL BE VACCUMED AND DISPOSED PROPERLY.
6. NO SAWCUT SHALL BE WITHIN 30" OF AN EXISTING JOINT, OTHERWISE REMOVE PAVEMENT TO NEAREST JOINT.



JOINT DETAIL
NTS

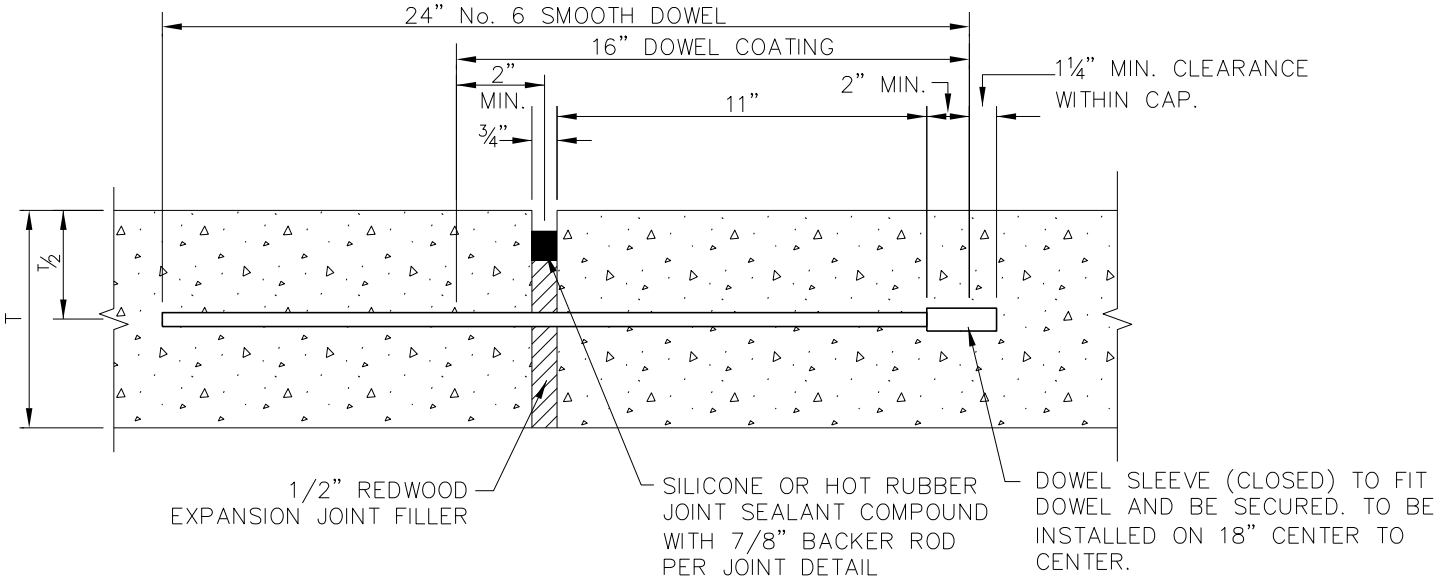
LONGITUDINAL BUTT JOINT
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

LONGITUDINAL BUTT JOINT

STANDARD CONSTRUCTION DETAILS
PAVING

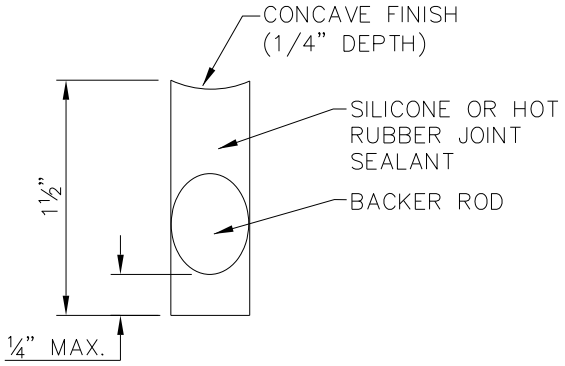
DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–P19



T=PAVEMENT THICKNESS

NOTES:

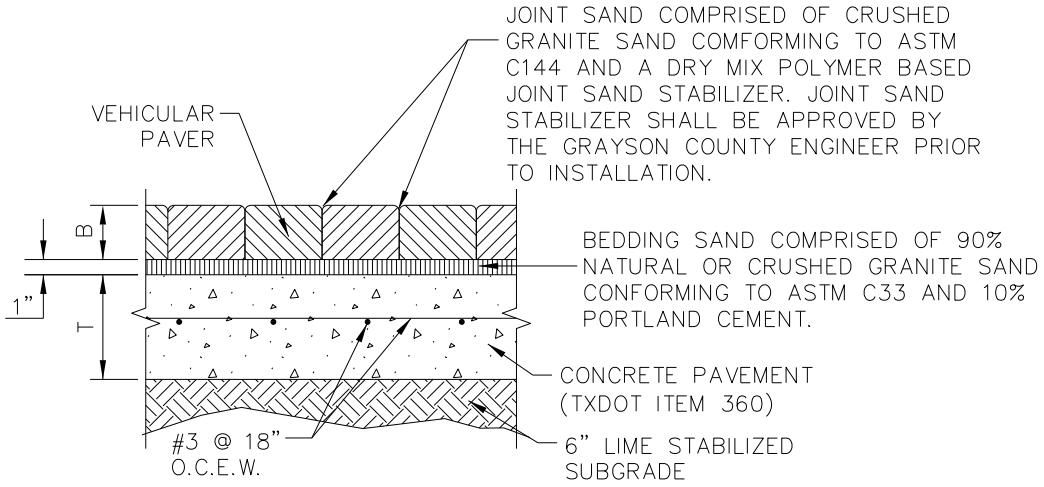
1. DOWELS AND REINFORCING BARS SHALL BE SUPPORTED BY AN APPROVED DEVICE AND MUST BE TIED OR CHAIRED ON EACH SIDE.
2. DOWELS MUST BE PERPENDICULAR TO FACE OF CONCRETE.
3. NO. 5 SMOOTH DOWEL BARS MAY BE USED IN 6" PAVEMENT.
4. TRANSVERSE EXPANSION JOINTS SHALL HAVE A MAXIMUM SPACING OF 600 FT.
5. TRANSVERSE EXPANSION JOINTS SHALL BE LOCATED AT INTERSECTIONS.



JOINT DETAIL
NTS

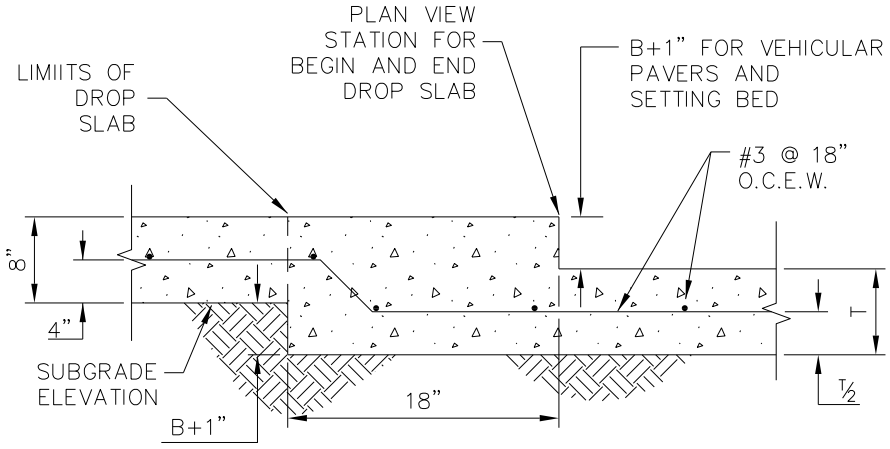
TRANSVERSE EXPANSION JOINT
N.T.S.

GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	TRANSVERSE EXPANSION JOINT	STANDARD CONSTRUCTION DETAILS PAVING		
		DATE: FEB, 2021	REV DATE: –	SHEET: SD–P20



VEHICULAR BRICK INSTALLATION IN VEHICULAR AREAS

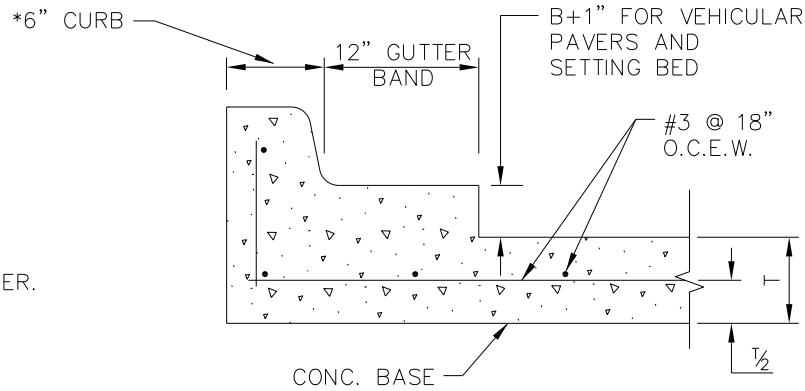
NTS



LONGITUDINAL SECTION AT DROP SLAB

NTS

* NO CURB AT BARRIER FREE RAMP.



SECTION THRU CURB AT DROP SLAB

NTS

NOTES:

1. VEHICULAR PAVERS SHALL BE HEAVY PAVING BRICK MEETING ASTM C1272, TYPE R, APPLICATION AND BE APPROVED BY THE GRAYSON COUNTY ENGINEER.

2. PROVIDE BRICK WITHOUT FROGS OR CORES, IN SURFACES EXPOSED TO VIEW IN COMPLETED WORK.

T=PAVEMENT THICKNESS
B=BRICK PAVER THICKNESS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
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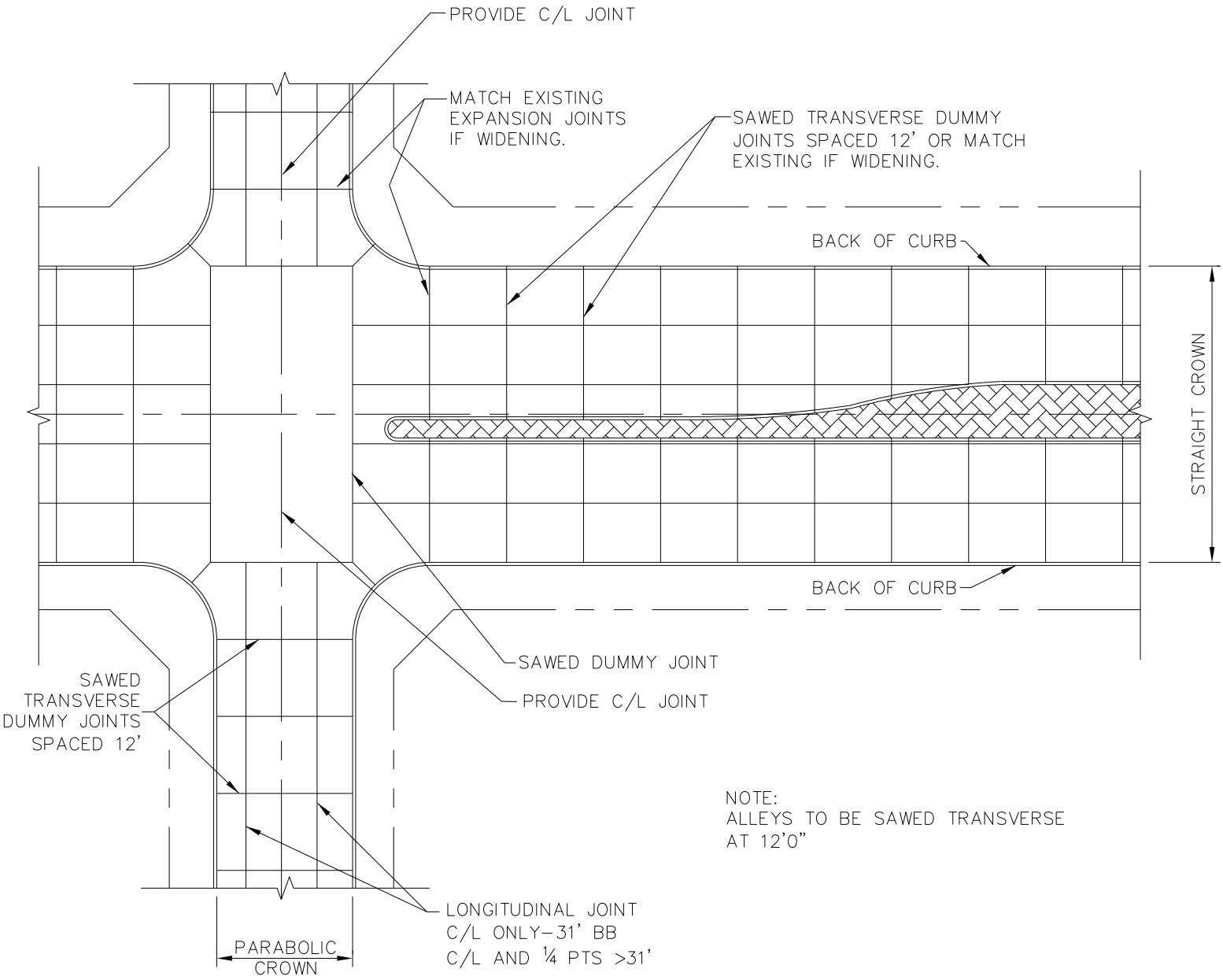
VEHICULAR BRICK INSTALLATION IN VEHICULAR AREAS

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-P21



SPACING DIAGRAM FOR TRANSVERSE JOINTS

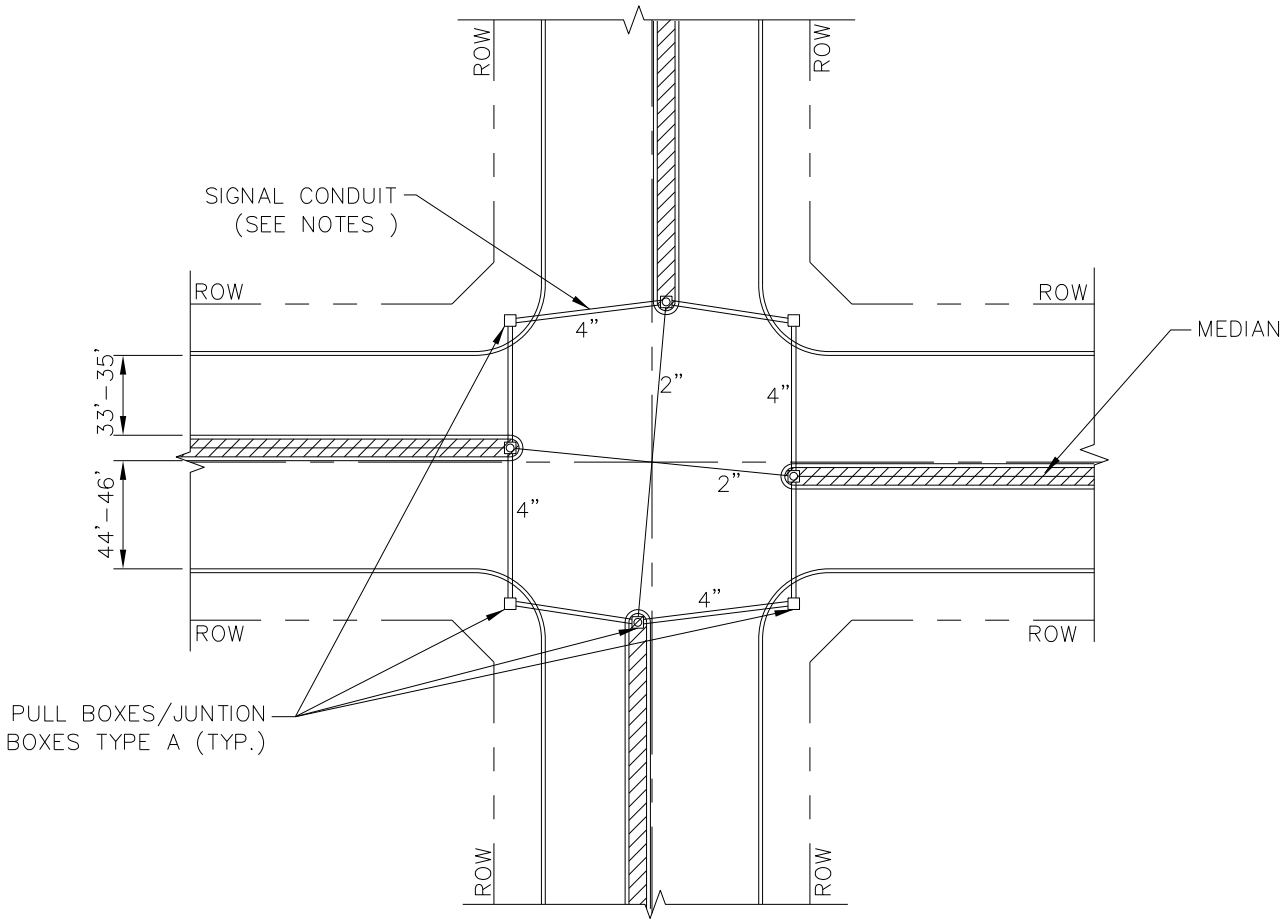
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

SPACING DIAGRAM FOR TRANSVERSE JOINTS

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-P22



NOTES:

1. 4" PVC SCEDULE 40 DOVE GRAY ELECTRICAL TRAFFIC SIGNAL CONDUIT TO BE INSTALLED CONTINUOUS ACROSS INTERSECTION, EXTENDED TO 2' BEHIND CURBS. SWEEP BENDS TO BE USED AT ALL PULL BOXES.
2. RED MARKER TAPE IS TO BE INSTALLED ON THE ENDS OF THE CONDUIT.
3. THE EXACT LOCATIONS WHERE THE CONDUIT CROSSES UNDER THE PAVING ARE TO BE CHISELED WITH AN "X" AND PAINTED WITH RED PAINT ON THE CURB OR PAVING.
4. A NO. 9 GALVANIZED WIRE SHALL BE PLACED IN ALL CONDUIT. THIS WIRE SHALL EXTEND A MINIMUM OF 1' FROM THE END OF THE CONDUIT.
5. TRAFFIC SIGNAL PULL BOXES SHALL BE #36 FROM TRAFFIC SIGNAL EQUIPMENT COMPANY, FT. WORTH, TEXAS OR APPROVED EQUAL. BOXES ARE APPROXIMATELY 10 1/2" X 17" X 12" AND SHALL BE PROVIDED WITH A CONCRETE COVER. BURIAL DEPTH OF CONDUIT SHALL BE 18 INCHES BELOW BOTTOM OF PAVEMENT.
6. 2" PVC SCHEDULE 40 DOVE GRAY ELECTRICAL STREET LIGHT CONDUIT SHALL BE PLACED IN ALL MEDIANS, 3' OFF C/L UNLESS OTHERWISE SHOWN ON THE PLANS. BURIAL DEPTH SHALL BE 3'-0" BELOW FINISH GRADE. 30 INCH RADIUS SWEEP BENDS TO BE USED AT ALL HANDHOLE BOXES.

INTERSECTION CONDUIT LAYOUT

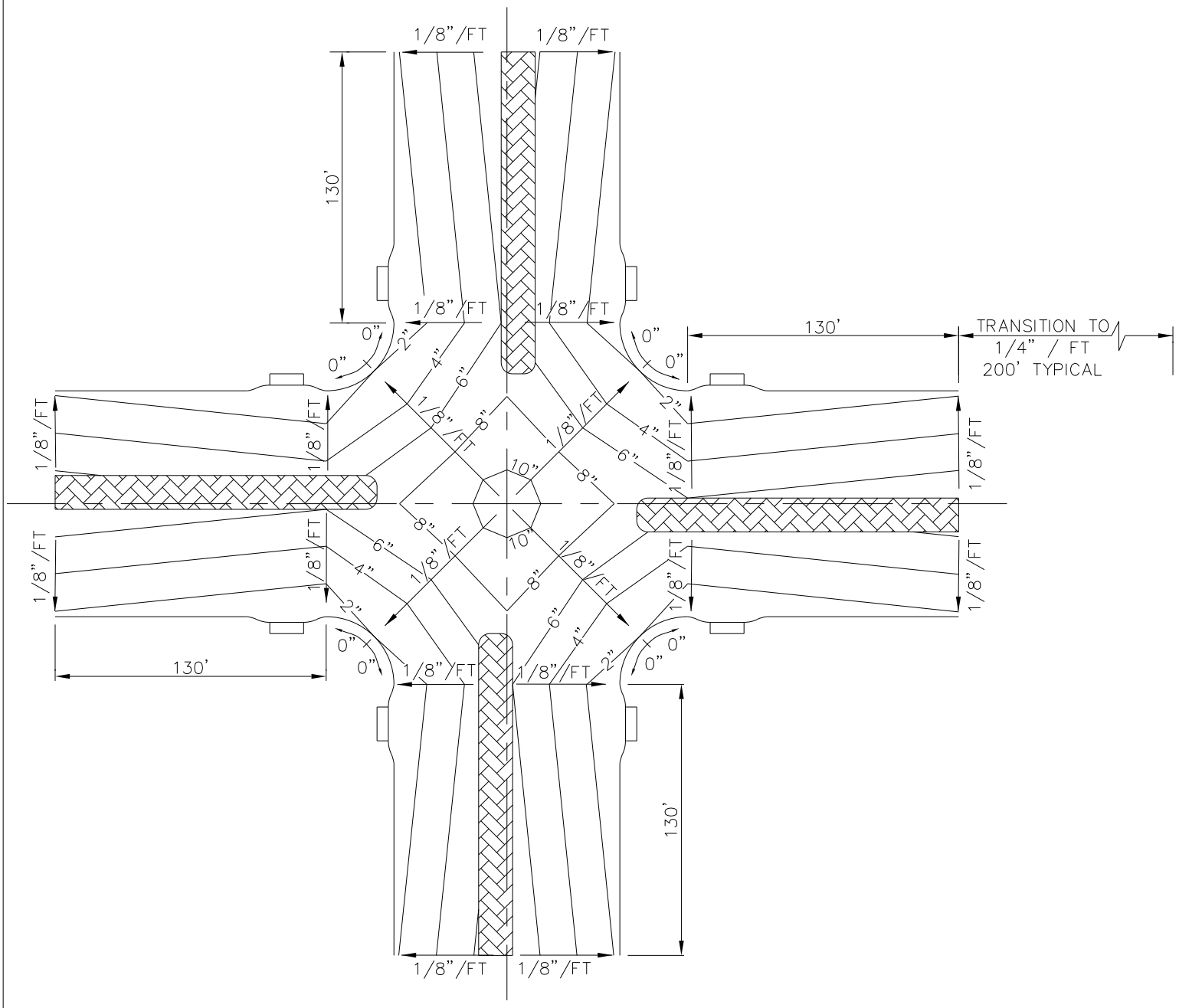
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

INTERSECTION CONDUIT LAYOUT

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-P23



NOTE:
INLETS REQUIRED WHEN DRAINAGE IS TOWARD INTERSECTION.

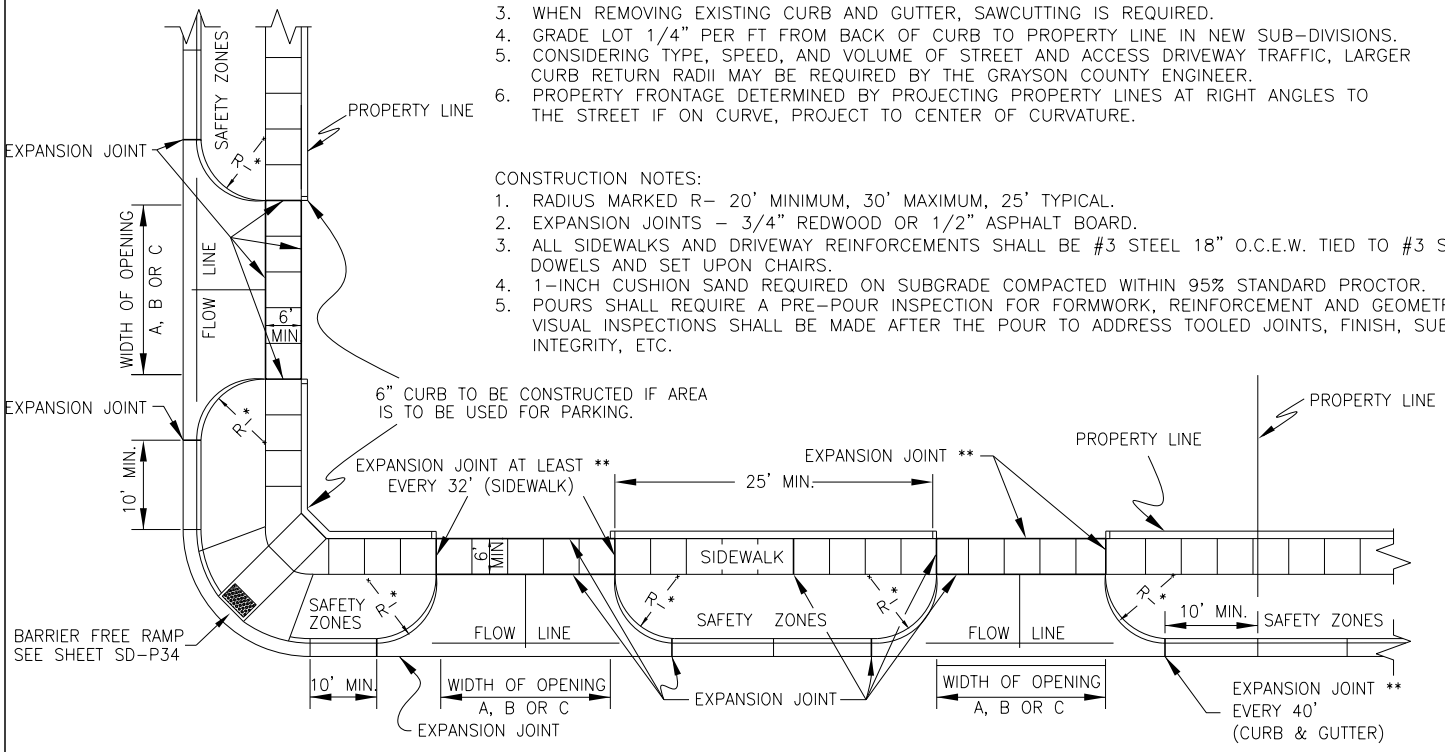
TYPICAL CONTOURS FOR MAJOR–MAJOR INTERSECTION

NTS

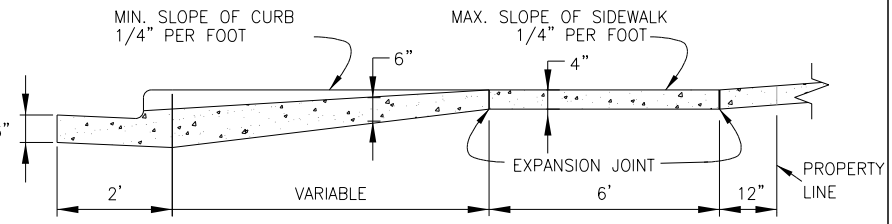
GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	TYPICAL CONTOURS FOR MAJOR–MAJOR INTERSECTION	STANDARD CONSTRUCTION DETAILS PAVING	
		DATE: FEB, 2021	REV DATE: –	SHEET: SD–P24

GENERAL NOTES:
1. CONSTRUCTION OF NEW SIDEWALKS SHALL BE DOWELED INTO EXISTING SIDEWALKS.
2. DRIVE APPROACHES SHALL BE DOWELED INTO EXISTING GUTTER.
3. WHEN REMOVING EXISTING CURB AND GUTTER, SAWCUTTING IS REQUIRED.
4. GRADE LOT 1/4" PER FT FROM BACK OF CURB TO PROPERTY LINE IN NEW SUB-DIVISIONS.
5. CONSIDERING TYPE, SPEED, AND VOLUME OF STREET AND ACCESS DRIVEWAY TRAFFIC, LARGER CURB RETURN RADII MAY BE REQUIRED BY THE GRAYSON COUNTY ENGINEER.
6. PROPERTY FRONTAGE DETERMINED BY PROJECTING PROPERTY LINES AT RIGHT ANGLES TO THE STREET IF ON CURVE, PROJECT TO CENTER OF CURVATURE.

CONSTRUCTION NOTES:
1. RADIUS MARKED R= 20' MINIMUM, 30' MAXIMUM, 25' TYPICAL.
2. EXPANSION JOINTS – 3/4" REDWOOD OR 1/2" ASPHALT BOARD.
3. ALL SIDEWALKS AND DRIVEWAY REINFORCEMENTS SHALL BE #3 STEEL 18" O.C.E.W. TIED TO #3 SMOOTH DOWELS AND SET UPON CHAIRS.
4. 1-INCH CUSHION SAND REQUIRED ON SUBGRADE COMPACTED WITHIN 95% STANDARD PROCTOR.
5. POURS SHALL REQUIRE A PRE-POUR INSPECTION FOR FORMWORK, REINFORCEMENT AND GEOMETRY. VISUAL INSPECTIONS SHALL BE MADE AFTER THE POUR TO ADDRESS TOOLED JOINTS, FINISH, SUBGRADE INTEGRITY, ETC.



DRIVEWAY DIMENSIONS				
ITEM	FRONTAGE		DRIVEWAY WIDTH MAX.	DRIVEWAY ANGLE
	INTERIOR LOT	CORNER LOT		
A	UP TO 149'	UP TO 159'	30'	60° – 90°
B	150' – 175'	160' – 185'	35'	45° – 90°
C	OVER 175'	OVER 185'	35'	45° – 90°



DRIVEWAY SECTION
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

COMMERCIAL DRIVEWAY RETURN DETAIL

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET :
FEB, 2021	–	SD-P25

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

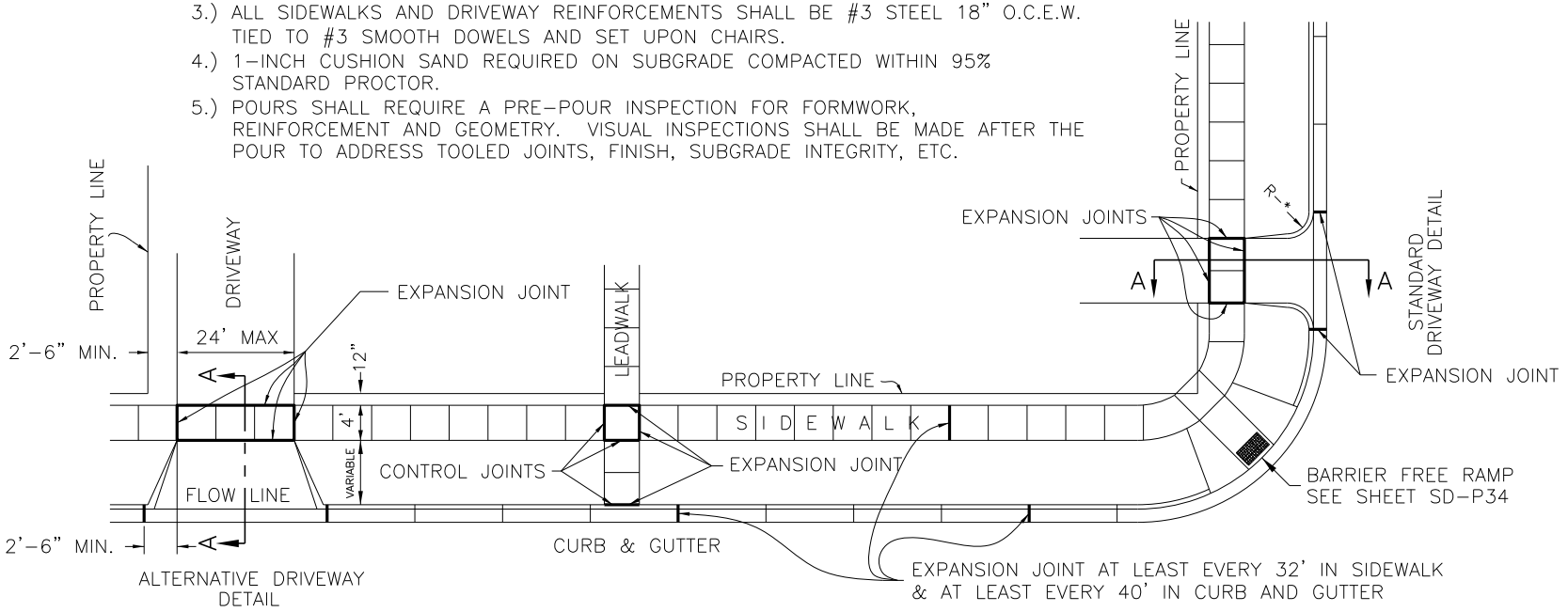
RESIDENTIAL DRIVEWAY RETURN DETAIL

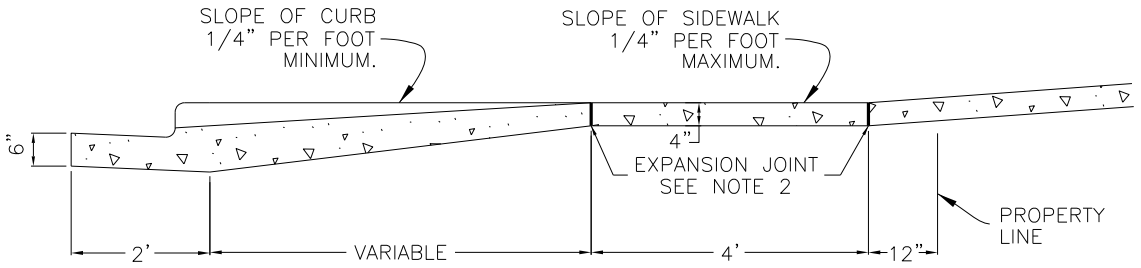
GENERAL NOTES:

1.) CONSTRUCTION OF NEW SIDEWALKS SHALL BE DOWELED INTO EXISTING SIDEWALKS.
2.) DRIVE APPROACHES SHALL BE DOWELED INTO EXISTING GUTTER.
3.) WHEN REMOVING EXISTING CURB AND GUTTER, SAWCUTTING IS REQUIRED.
4.) GRADE LOT 1/4" PER FT FROM BACK OF CURB TO PROPERTY LINE IN NEW SUB-DIVISIONS.

CONSTRUCTION NOTES:

1.) RADIUS MARKED R-* 2'-6" MINIMUM.
2.) EXPANSION JOINTS - 3/4" REDWOOD OR 1/2" ASPHALT BOARD.
3.) ALL SIDEWALKS AND DRIVEWAY REINFORCEMENTS SHALL BE #3 STEEL 18" O.C.E.W. TIED TO #3 SMOOTH DOWELS AND SET UPON CHAIRS.
4.) 1-INCH CUSHION SAND REQUIRED ON SUBGRADE COMPACTED WITHIN 95% STANDARD PROCTOR.
5.) POURS SHALL REQUIRE A PRE-POUR INSPECTION FOR FORMWORK, REINFORCEMENT AND GEOMETRY. VISUAL INSPECTIONS SHALL BE MADE AFTER THE POUR TO ADDRESS TOOLED JOINTS, FINISH, SUBGRADE INTEGRITY, ETC.





SECTION A - A

STANDARD CONSTRUCTION DETAILS
PAVING

DATE: FEB, 2021
REV DATE: -
SHEET: SD-P26

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
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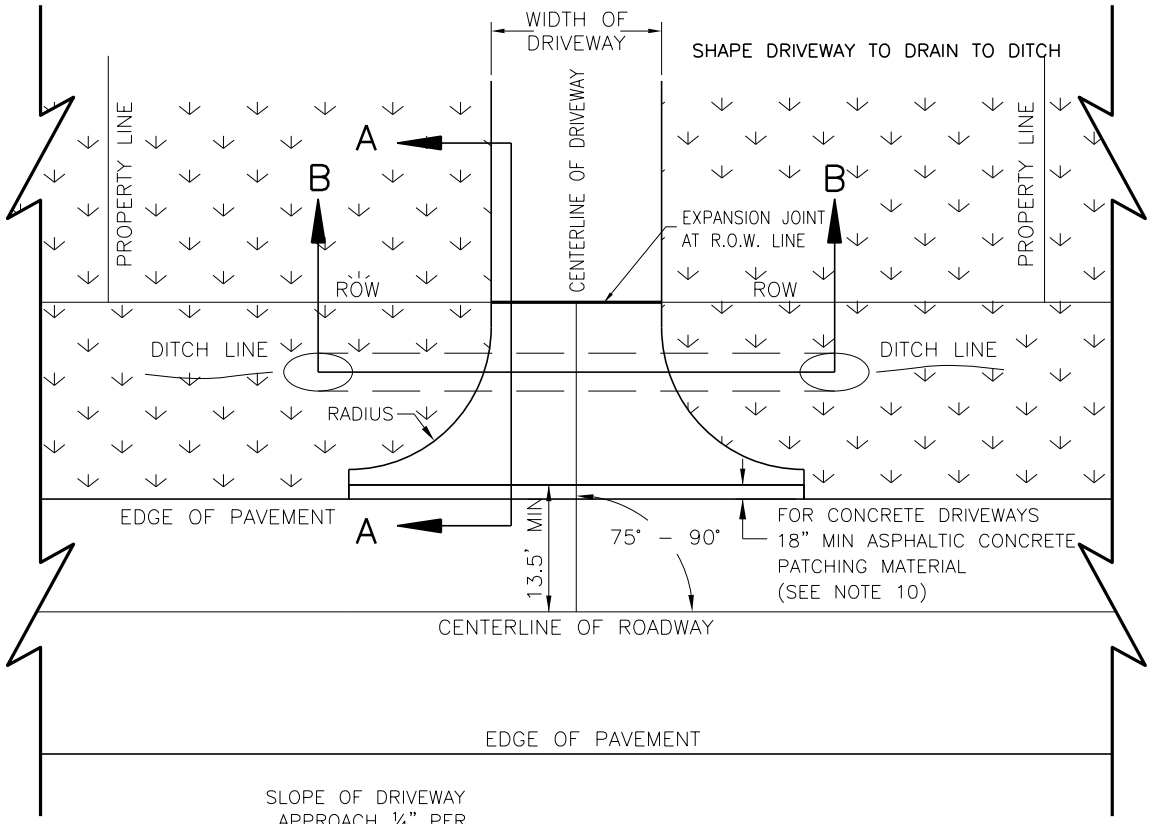
RURAL DRIVEWAY RETURN DETAIL

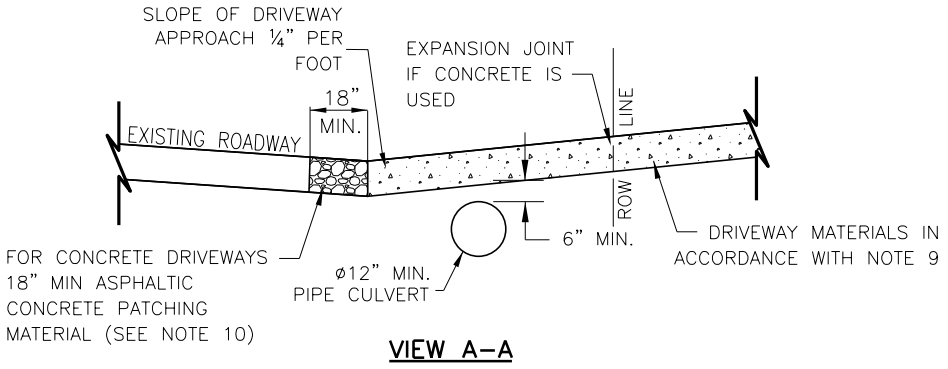
STANDARD CONSTRUCTION DETAILS
PAVING

DATE: FEB, 2021

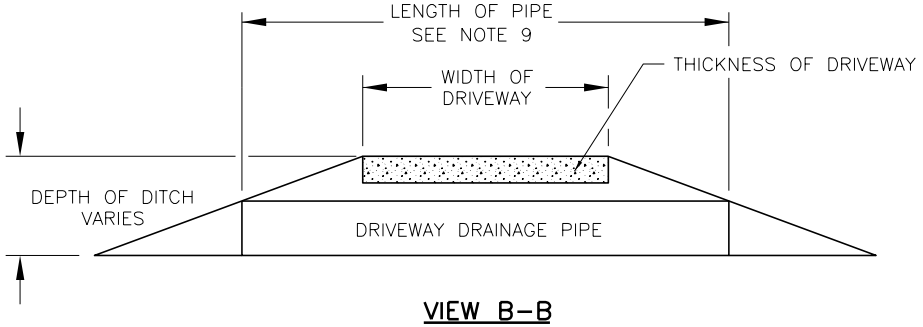
REV DATE: _

SHEET: SD-P27





VIEW A–A



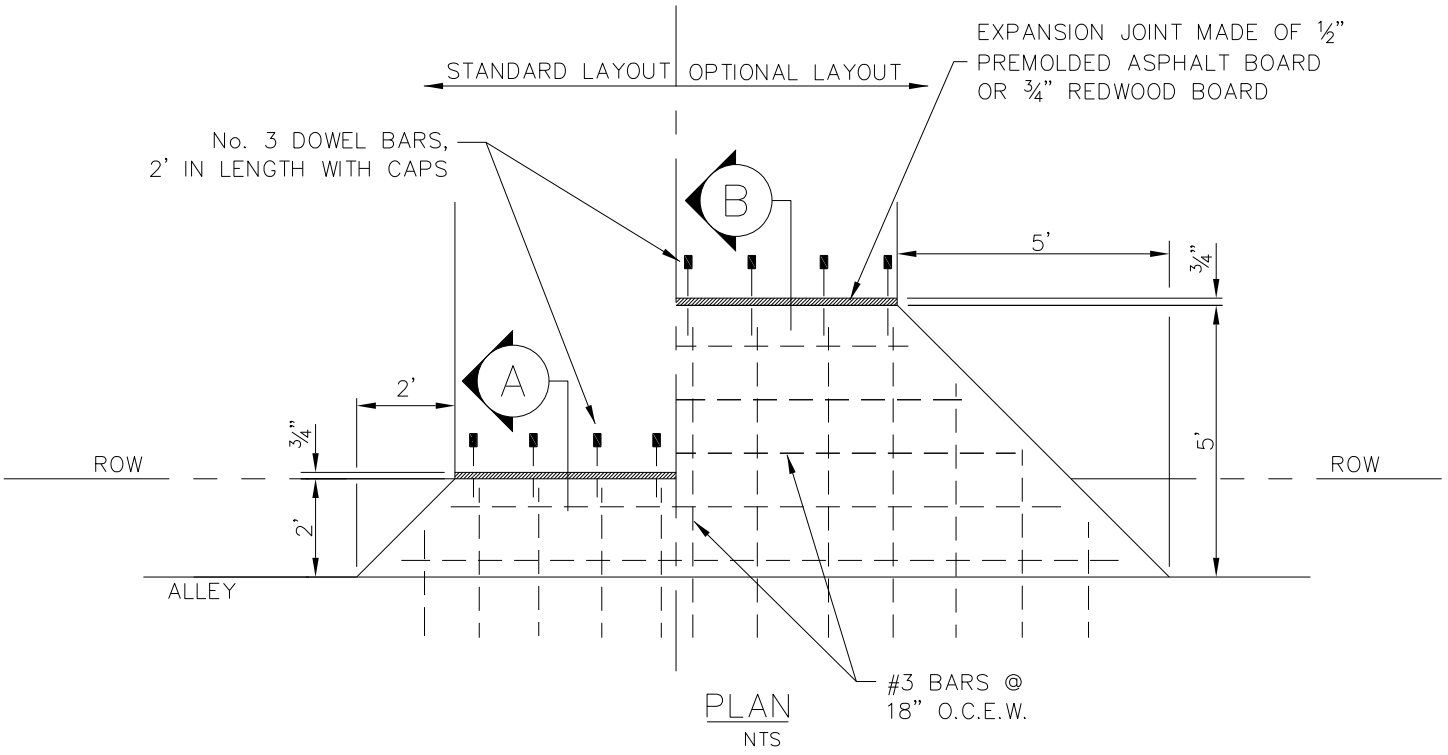
VIEW B–B

GENERAL NOTES:

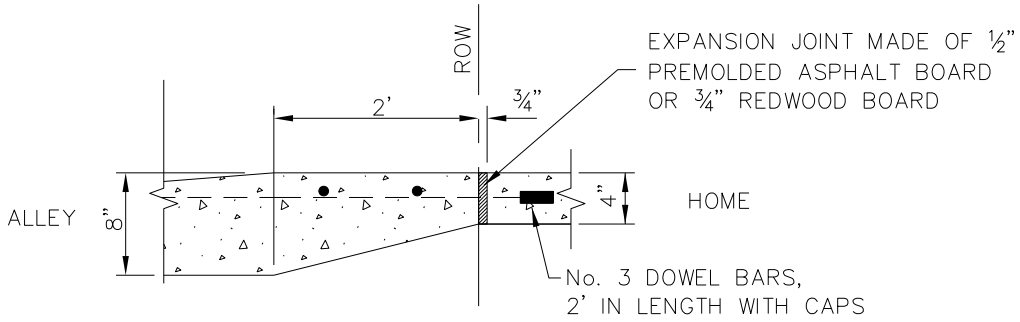
1. A CONCRETE DRIVEWAY APPROACH WITH AN 12" MIN. CULVERT PIPE IS REQUIRED BY GRAYSON COUNTY. THE CONCRETE DRIVEWAY APPROACH SHALL EXTEND FROM PAVEMENT OR SHOULDER OF ROADWAY TO THE COUNTY RIGHT–OF–WAY (R.O.W.) / PROPERTY LINE.
2. COSTS OF ALL MATERIALS AND INSTALLATION OF ALL PRIVATE AND PUBLIC DRIVEWAYS AND APPROACHES SHALL BE THE RESPONSIBILITY OF THE PROPERTY OWNER/PERMIT HOLDER.
3. WHEN REMOVING EXISTING CURB AND GUTTER OR REPLACING AN EXISTING DRIVEWAY APPROACH, SAWCUTTING AT FULL DEPTH IS REQUIRED.
4. WHERE APPLICABLE, CONSTRUCTION OF SIDEWALKS SHALL BE DOWELLED INTO EXISTING SIDEWALKS. PEDESTRIAN RAMPS PER A.D.A. REGULATIONS TO BE CONSTRUCTED WHERE REQUIRED.
5. ALL CONNECTIONS TO GRAYSON COUNTY RIGHT–OF–WAY SHALL USE COUNTY DRIVEWAY APPROACH DETAILS. ALL CONNECTIONS TO STATE RIGHT–OF–WAY SHALL USE TXDOT DETAILS.
6. EXPANSION JOINTS – ¾" REDWOOD OR ½" ASPHALT BOARD.
7. REINFORCING – #3 REBAR @ 18" O.C.E.W. FOR DRIVEWAY (AND SIDEWALK AS NEEDED).
8. LOW WATER CROSSING (DIP) MAY BE USED IN CASES WHERE DEPTH OF DITCH WILL NOT ACCOMMODATE 12" CULVERT.
9. REFER TO GRAYSON COUNTY REGULATIONS (POLICY, PROCEDURES, AND SPECIFICATIONS OF GRAYSON COUNTY, TEXAS FOR THE INSTALLATION OF DRIVEWAY CULVERTS, ROAD BORES, USE OF HEAVY EQUIPMENT AND UTILITY LINES WITHIN GRAYSON COUNTY RIGHT OF WAY).
10. ASPHALTIC CONCRETE PATCHING MATERIAL SHALL MEET THE TXDOT REQUIREMENTS OF DMS–9202 OR APPROVED EQUIVALENT.

DIMENSION TABLE

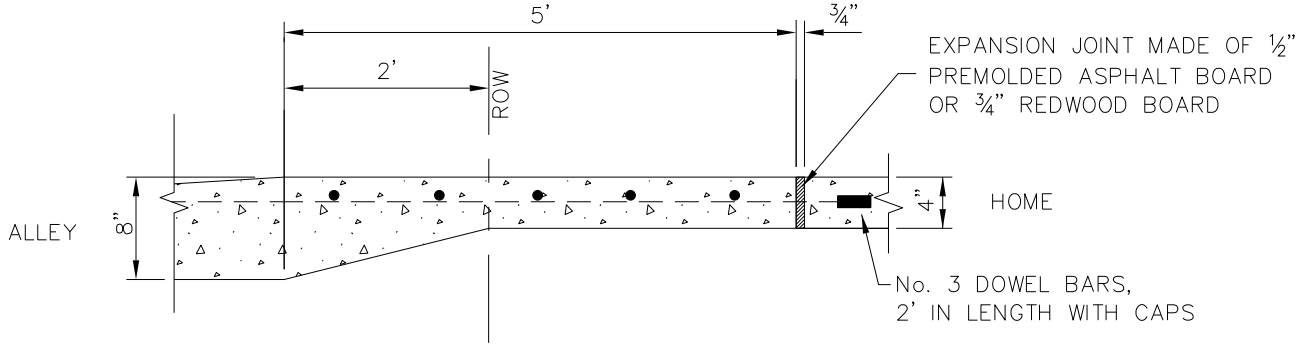
DESCRIPTION	RESIDENTIAL		COMMERCIAL	
	MIN.	MAX.	MIN.	MAX.
WIDTH OF DRIVEWAY	–	24'–0"	–	45'–0"
RADIUS	2'–6"	30'–0"	2'–6"	30'–0"
THICKNESS OF CONCRETE	0'–4"	N/A	0'–6"	N/A



PLAN
NTS



SECTION A
NTS



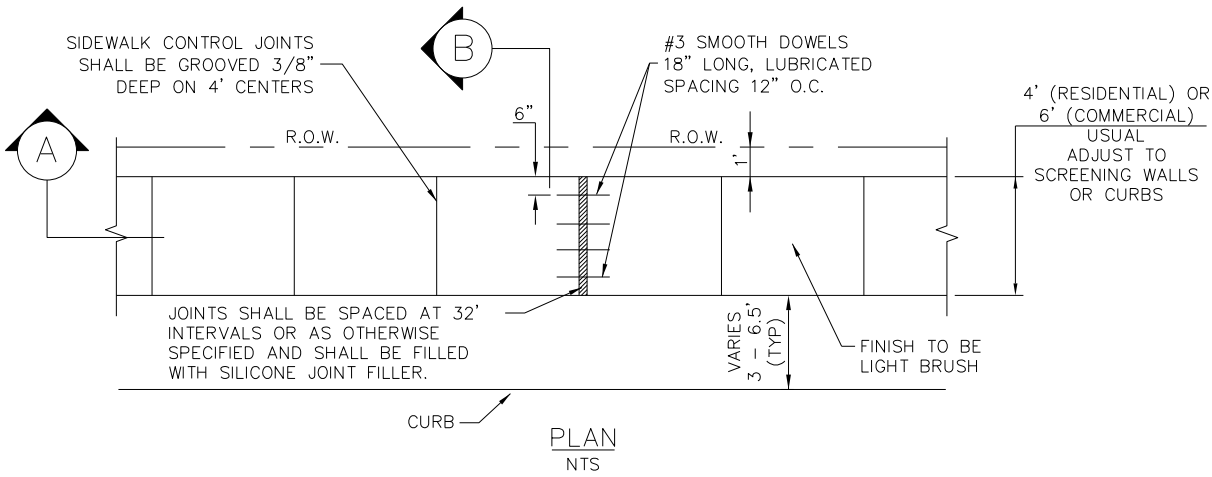
SECTION B
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

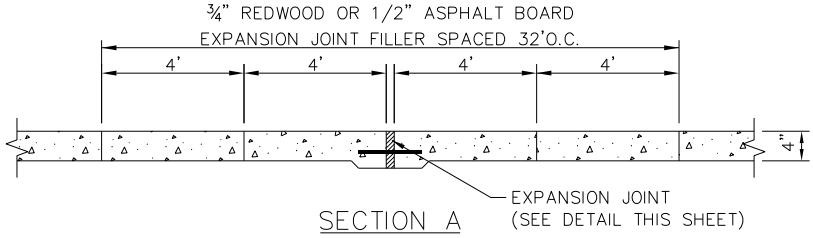
DRIVEWAY RETURN FOR ALLEY

STANDARD CONSTRUCTION DETAILS
PAVING

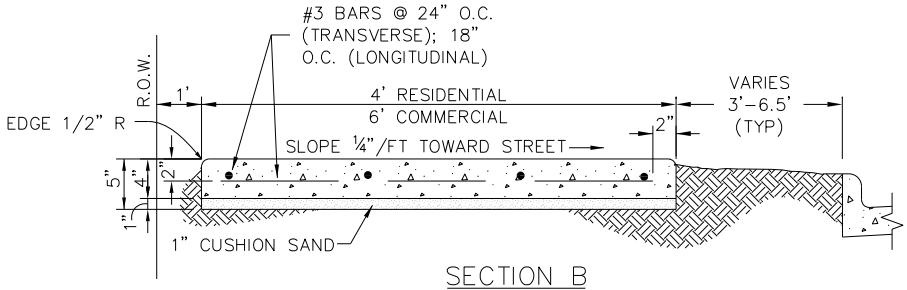
DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-P28



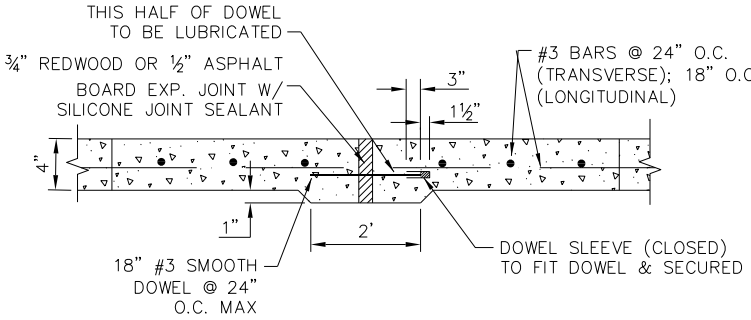
PLAN
NTS



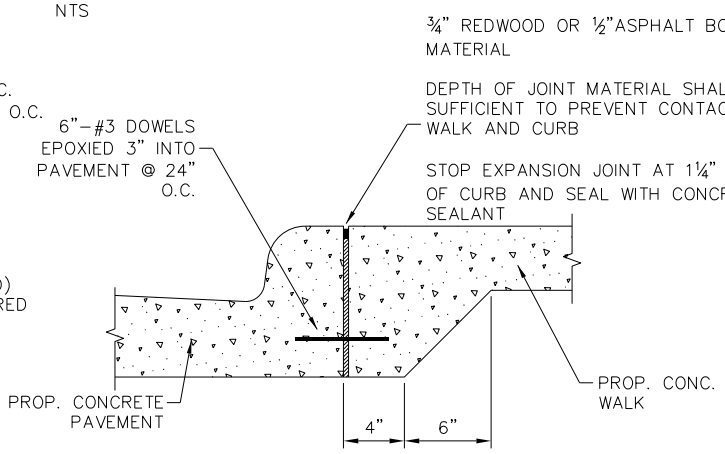
SECTION A
NTS



SECTION B
NTS



EXPANSION JOINT DETAIL
NTS



JOINT DETAIL FOR SIDEWALKS ADJACENT TO CURB
NTS

NOTE:

1. SIDEWALK SHALL BE PLACED 1' INSIDE PUBLIC R.O.W. UNLESS OTHERWISE APPROVED BY THE COUNTY ENGINEER.
2. WHEN CONCRETE SIDEWALK IS ADJACENT TO CURB, THE JOINT DETAIL FOR SIDEWALK ADJACENT TO CURB SHALL BE UTILIZED.

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CONCRETE SIDEWALK

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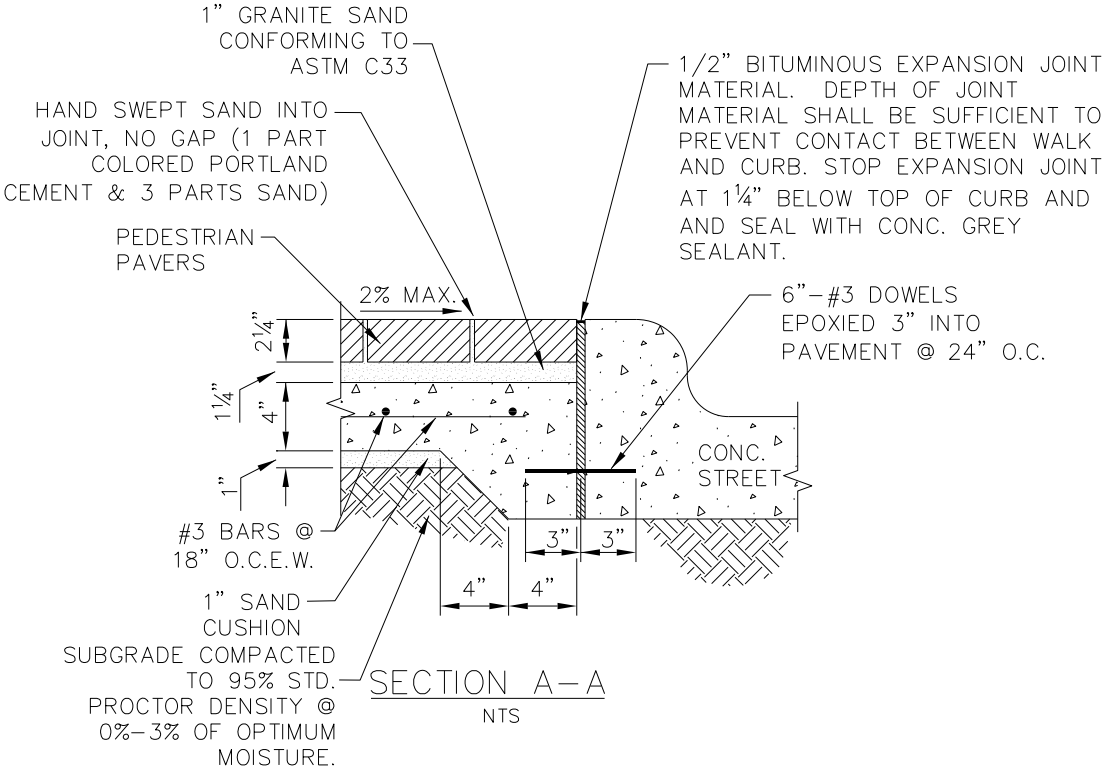
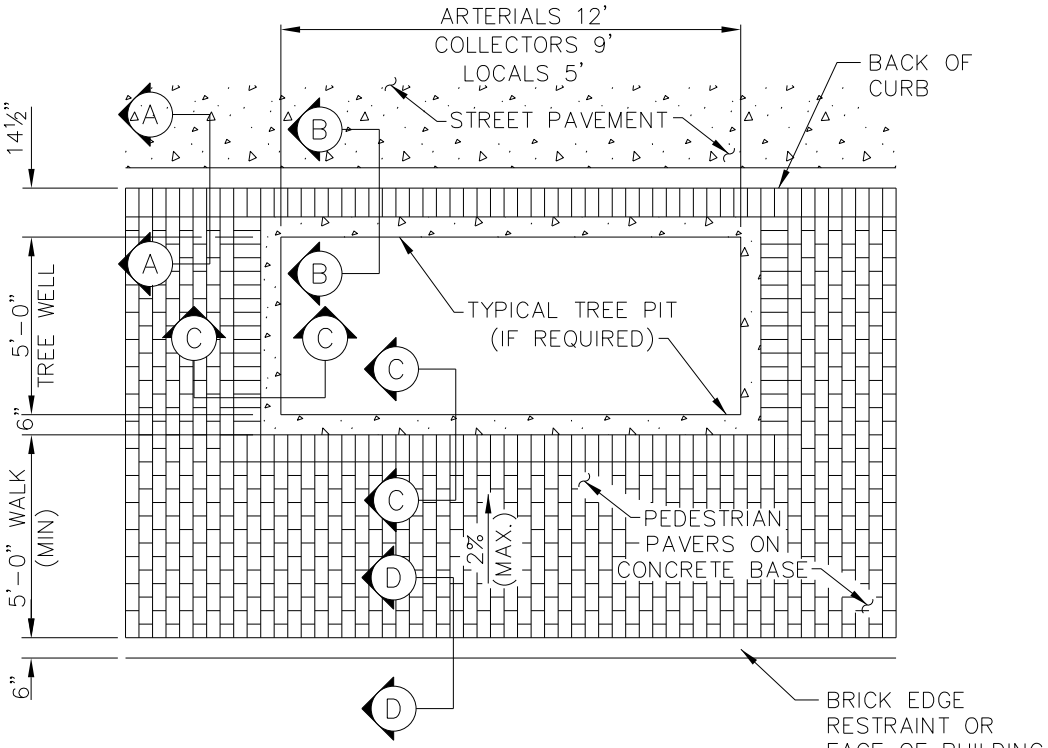


SECTION A-A

NTS



SIDEWALK PLAN: BRICK PAVERS

NTS

NOTE:
SEE SD-P31 FOR ADDITIONAL SECTIONS AND GENERAL NOTES

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
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SIDEWALK BRICK PAVERS

STANDARD CONSTRUCTION DETAILS
PAVING

DATE:	REV DATE:	SHEET:
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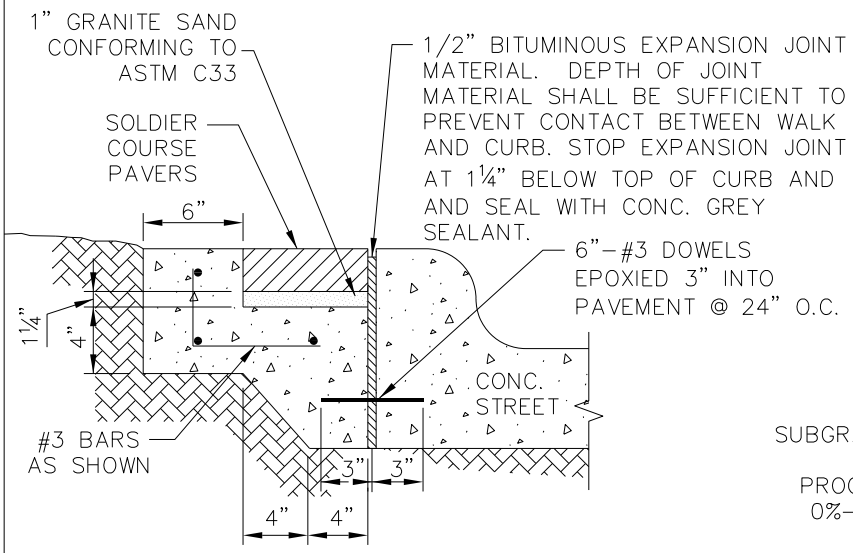
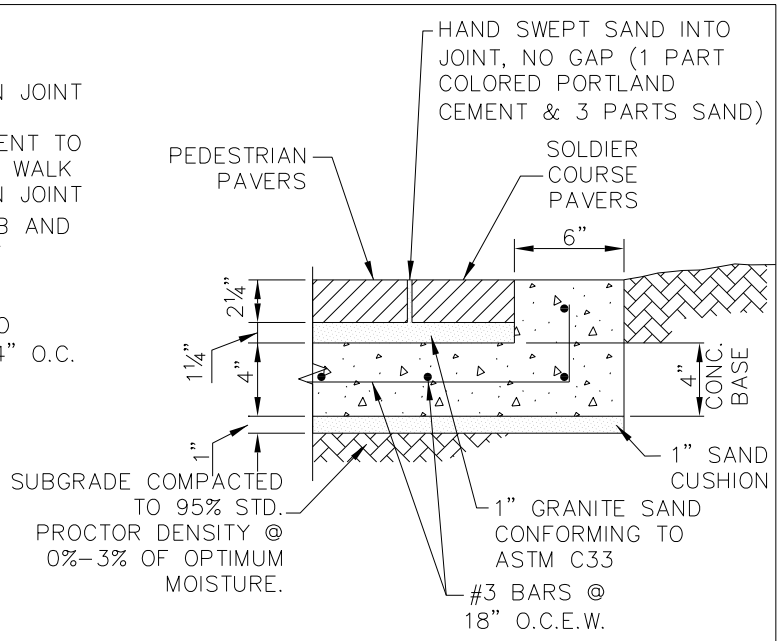
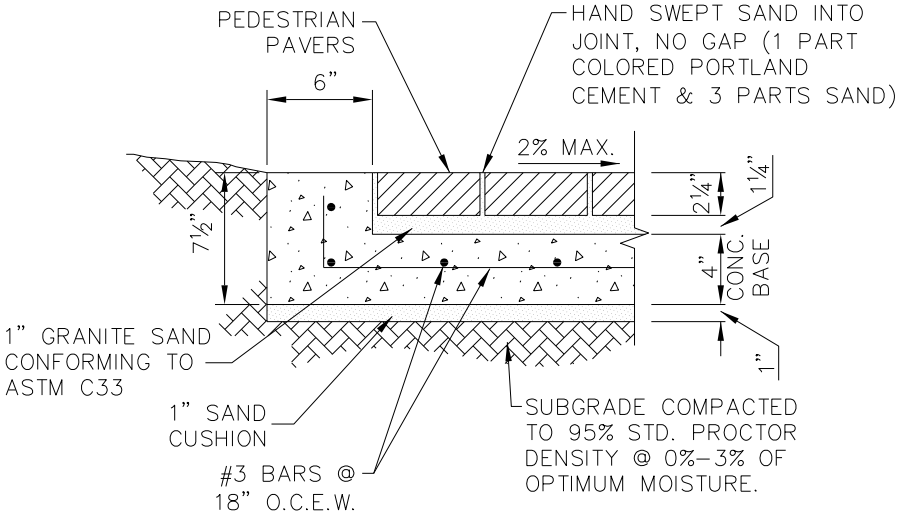


SECTION B–B
NTS



SECTION C–C
NTS



SECTION D–D
NTS

NOTES:

1. PEDESTRIAN PAVERS AND SOLDIER COURSE PAVERS SHALL BE LIGHT TRAFFIC PAVING BRICK MEETING ASTM C902, CLASS SX, TYPE II, APPLICATION PX, W/ DIMENSIONS (W)4"X(L)8"X(T)2¼".

2. PEDESTRIAN PAVERS SHALL BE APPROVED BY THE GRAYSON COUNTY ENGINEER.

3. PROVIDE BRICK WITHOUT FROGS OR CORES, IN SURFACES EXPOSED TO VIEW IN COMPLETED WORK.

GRAYSON COUNTY
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SIDEWALK BRICK PAVERS CONTINUED

STANDARD CONSTRUCTION DETAILS
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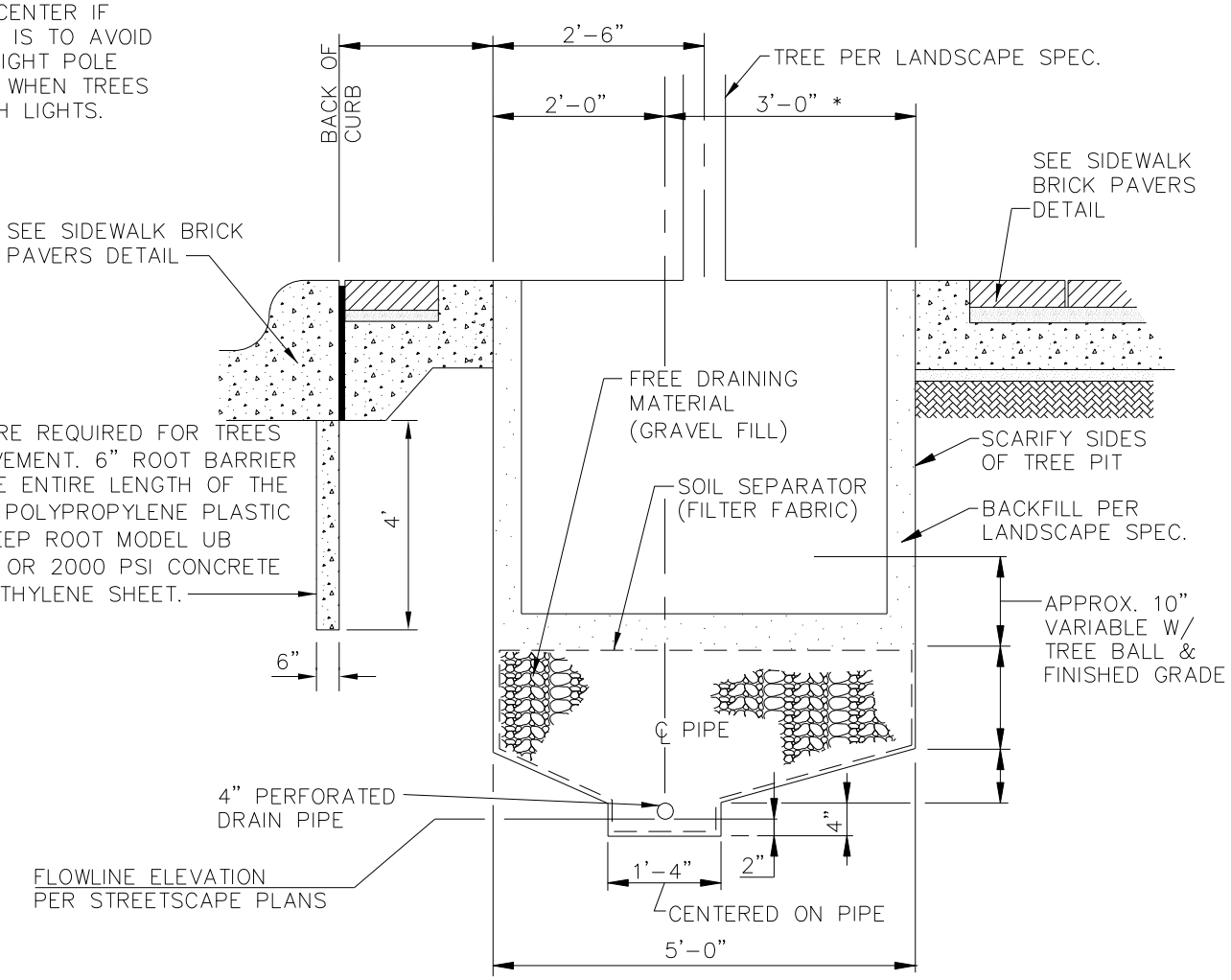
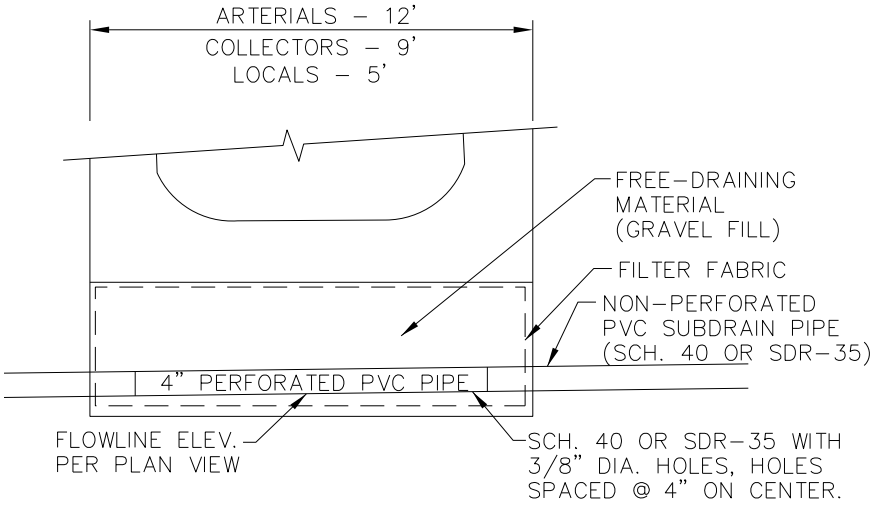
* DRAIN PIPE MAY BE OFFSET FURTHER FROM CENTER IF DESIRED. OFFSET IS TO AVOID CONFLICT WITH LIGHT POLE GROUNDING ROD WHEN TREES ARE IN LINE WITH LIGHTS.



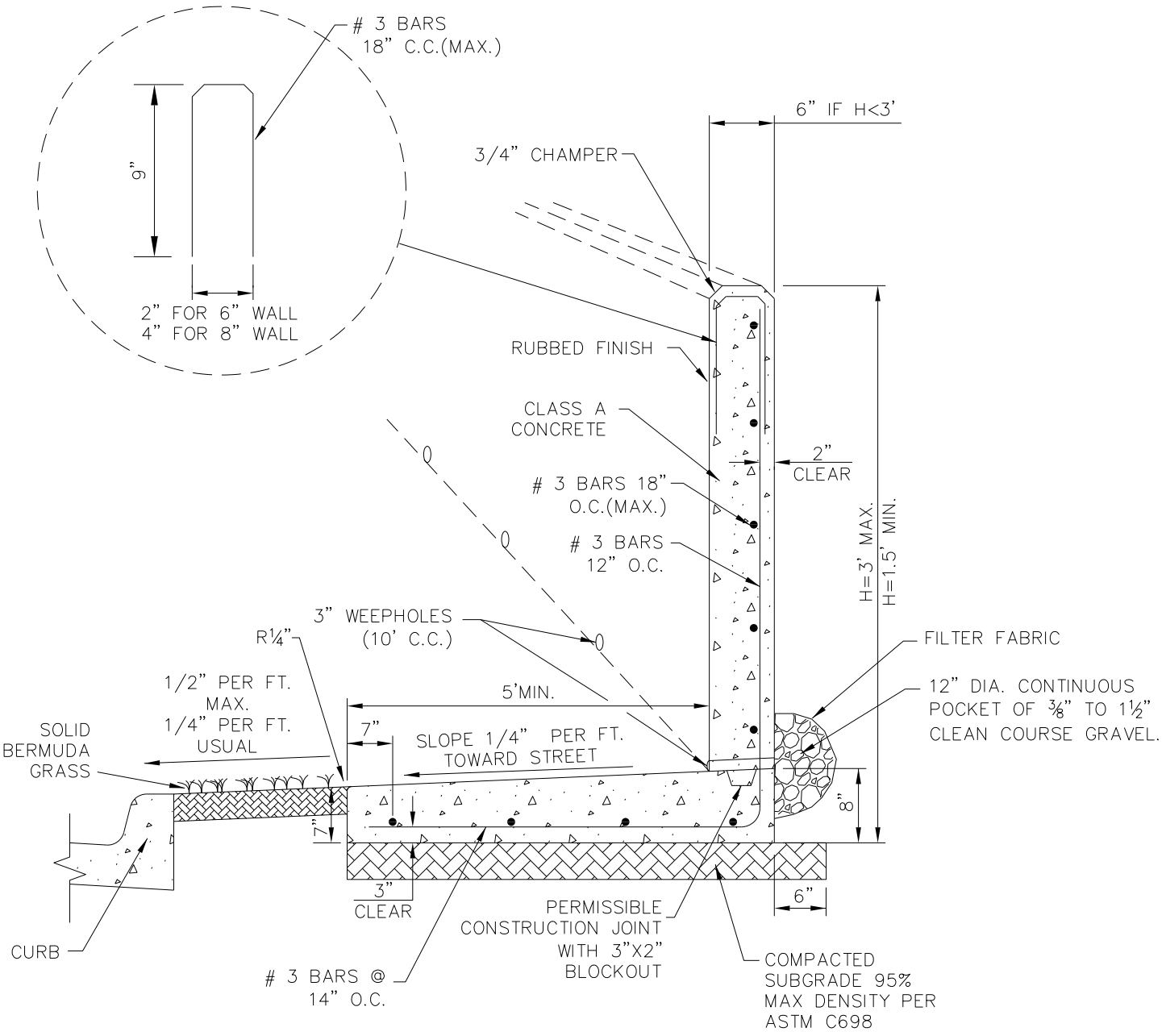
SECTION PERPENDICULAR TO CURB
NTS



SECTION PARALLEL TO CURB
NTS

GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	SUBSURFACE DRAIN SYSTEM	STANDARD CONSTRUCTION DETAILS PAVING		
		DATE: FEB, 2021	REV DATE: -	SHEET: SD-P32

NOTE:
PROVIDE VERTICAL EXPANSION IN WALL
AT 25' MAX. SPACING.



SIDEWALK WITH INTEGRAL RETAINING WALL

NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

SIDEWALK WITH INTEGRAL RETAINING WALL

STANDARD CONSTRUCTION DETAILS
PAVING

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GENERAL NOTES FOR PEDESTRIAN FACILITIES

1. ALL SLOPES ARE MAXIMUM ALLOWABLE. THE LEAST POSSIBLE SLOPE THAT WILL STILL DRAIN PROPERLY SHOULD BE USED. ADJUST CURB RAMP LENGTH OR GRADE OF APPROACH SIDEWALKS AS DIRECTED.
2. LANDINGS SHALL BE 5'X5' MINIMUM WITH A MAXIMUM 2% SLOPE IN ANY DIRECTION.
3. MANEUVERING SPACE AT THE BOTTOM OF CURB RAMPS SHALL BE A MINIMUM OF 4'X4' WHOLLY CONTAINED WITHIN THE CROSSWALK AND WHOLLY OUTSIDE THE PARALLEL VEHICULAR TRAVEL PATH.
4. MAXIMUM ALLOWABLE CROSS SLOPE ON SIDEWALK AND CURB RAMP SURFACES IS 2%
5. CURB RAMPS WITH RETURNED CURBS MAY BE USED ONLY WHERE PEDESTRIANS WOULD NOT NORMALLY WALK ACROSS THE RAMP, EITHER BECAUSE THE ADJACENT SURFACE IS PLANTING OR OTHER NON-WALKING SURFACE OR BECAUSE THE SIDE APPROACH IS SUBSTANTIALLY OBSTRUCTED. OTHERWISE, PROVIDE FLARED SIDES.
6. ADDITIONAL INFORMATION ON CURB RAMP LOCATION, DESIGN, LIGHT REFLECTIVE VALUE AND TEXTURE MAY BE FOUND IN THE CURRENT EDITION OF THE TEXAS ACCESSIBILITY STANDARDS (TAS) AND 16 TAC §68.102.
7. CURB RAMPS SHALL BE ALIGNED WITH THEORETICAL CROSSWALKS, OR AS DIRECTED BY THE GRAYSON COUNTY ENGINEER.
8. HANDRAILS ARE NOT REQUIRED ON CURB RAMPS. PROVIDE CURB RAMPS WHEREVER AN ACCESSIBLE ROUTE CROSSES (PENETRATES) A CURB.
9. FLARE SLOPE SHALL NOT EXCEED 10% MEASURED ALONG CURB LINE.
10. BARRIER FREE RAMPS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CURRENT EDITION OF THE TEXAS ACCESSIBILITY STANDARDS (TAS).
11. ALL BARRIER FREE RAMPS MUST PASS AN INDEPENDENT INSPECTION. A LETTER OF COMPLIANCE ACCEPTANCE IS REQUIRED PRIOR TO FINAL ACCEPTANCE BY GRAYSON COUNTY.
12. STREETS ON STEEP GRADE WILL REQUIRE LONGER TRANSITION ON UPGRADE SIDE.
13. MAXIMUM SLOPE ON RAMP PORTION SHALL NOT EXCEED 1" PER FOOT AT ANY LOCATION. VERTICAL DISTANCE BETWEEN STREET AND RAMP SHALL NOT EXCEED ¼".

GENERAL NOTES FOR DETECTABLE WARNINGS

1. DETECTABLE WARNING MATERIAL SHALL CONSIST OF CONCRETE PAVERS, FIRED CLAY PAVERS, CAST IRON PLATES OR STAINLESS STEEL PLATES.
2. CURB RAMPS MUST CONTAIN A DETECTABLE WARNING SURFACE THAT CONSIST OF RAISED TRUNCATED DOMES COMPLYING WITH SECTION 4.29 OF THE TEXAS ACCESSIBILITY STANDARDS (TAS). THE SURFACE MUST CONTRAST VISUALLY WITH THE ADJOINING SURFACES, INCLUDING SIDE FLARES.
3. DETECTABLE WARNING SURFACES MUST BE SLIP RESISTANT AND NOT ALLOW WATER TO ACCUMULATE.
4. ALIGN TRUNCATED DOMES IN THE DIRECTION OF PEDESTRIAN TRAVEL WHEN ENTERING THE STREET.
5. DETECTABLE WARNING SURFACES SHALL BE A MINIMUM OF 24" IN DEPTH IN THE DIRECTION OF PEDESTRIAN TRAVEL, AND EXTEND THE FULL WIDTH OF THE CURB RAMP OR LANDING WHERE THE PEDESTRIAN ACCESS ROUTE ENTERS THE STREET.
6. DETECTABLE WARNING SURFACES SHALL BE LOCATED SO THAT THE EDGE NEAREST THE CURB LINE IS A MINIMUM OF 6" AND A MAXIMUM OF 8" FROM THE EXTENSION OF THE FACE OF CURB AND SHALL BE AN INTEGRAL PART OF THE WALKING SURFACE. DETECTABLE WARNING SURFACES MAY BE CURVED ALONG THE CORNER RADIUS.

GENERAL NOTES FOR CONCRETE AND FIRED CLAY PAVER UNITS

1. CONCRETE PAVER UNITS SHALL MEET OR EXCEED ALL REQUIREMENTS OF ASTM C-936. FIRED CLAY PAVER UNITS SHALL MEET OR EXCEED ALL REQUIREMENTS OF ASTM C-1272.
2. PAVER UNITS SHALL BE LAID IN A TWO BY TWO UNIT BASKET WEAVE PATTERN OR AS DIRECTED.
3. LAY FULL-SIZE UNITS FIRST FOLLOWED BY CLOSURE UNITS CONSISTING OF AT LEAST 25 PERCENT OF A FULL UNIT. CUT PAVER UNITS USING A POWER SAW.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
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PEDESTRIAN FACILITIES
GENERAL NOTES

STANDARD CONSTRUCTION DETAILS
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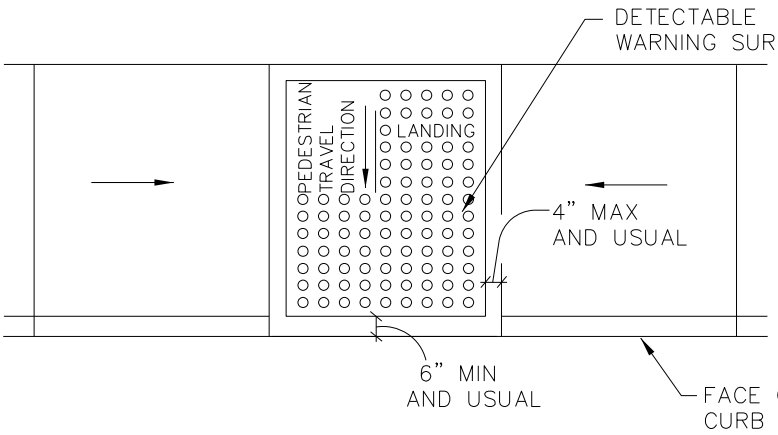
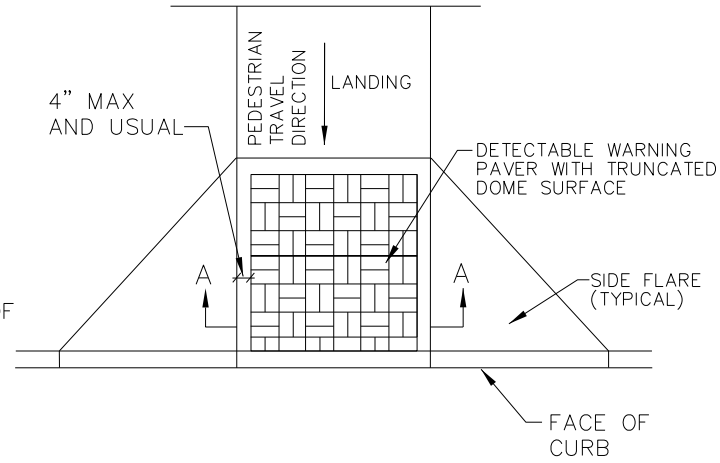
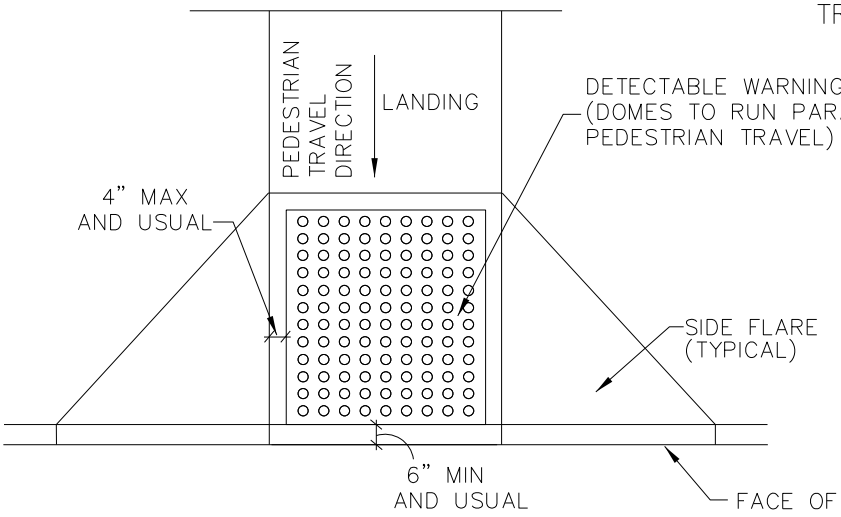


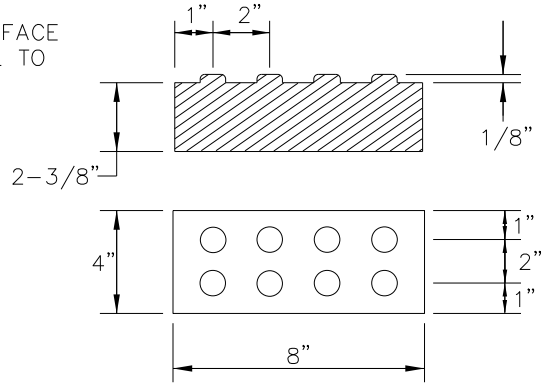
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE



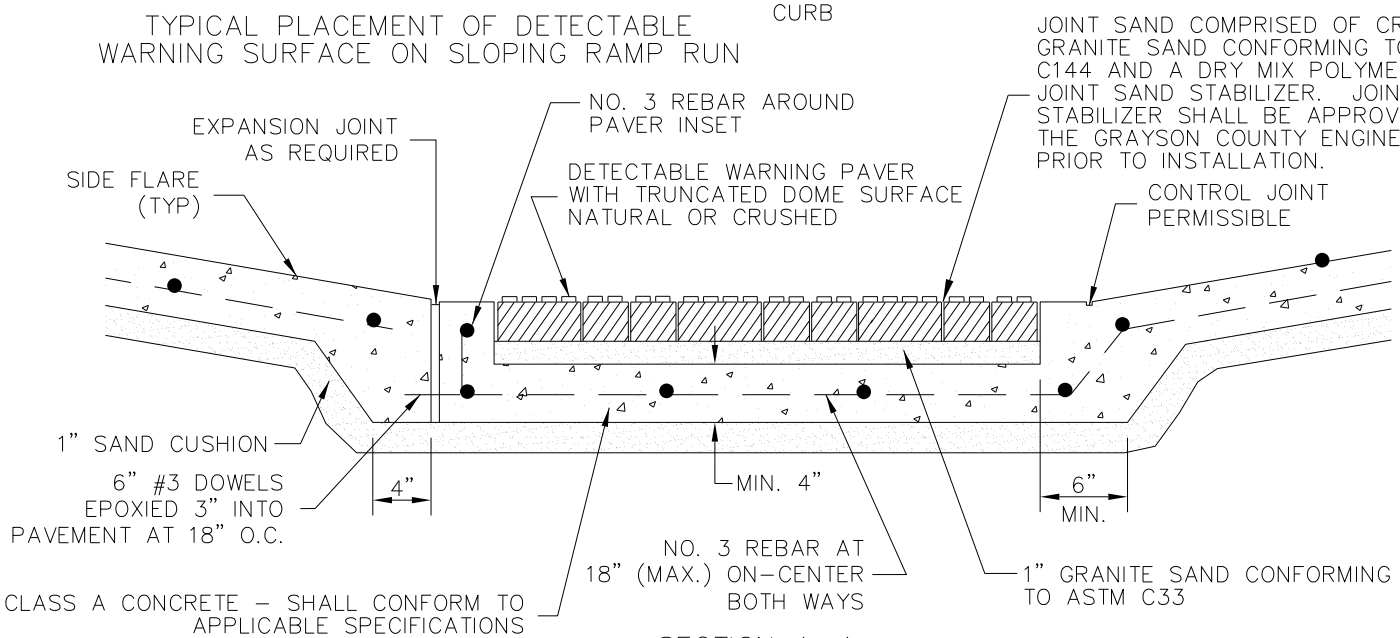
TRUNCATED DOME PATTERN CURB RAMP



TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN



DETECTABLE WARNING PAVER



SECTION A-A

DETECTABLE WARNING PAVER (OPTION)

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
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DETECTABLE WARNING PAVER

STANDARD CONSTRUCTION DETAILS
PAVING

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STANDARD CONSTRUCTION DETAILS

STORM DRAINAGE

FEBRUARY 2021

GRAYSON COUNTY

DEVELOPMENT SERVICES DEPARTMENT

100 W HOUSTON ST

SHERMAN, TX 75090

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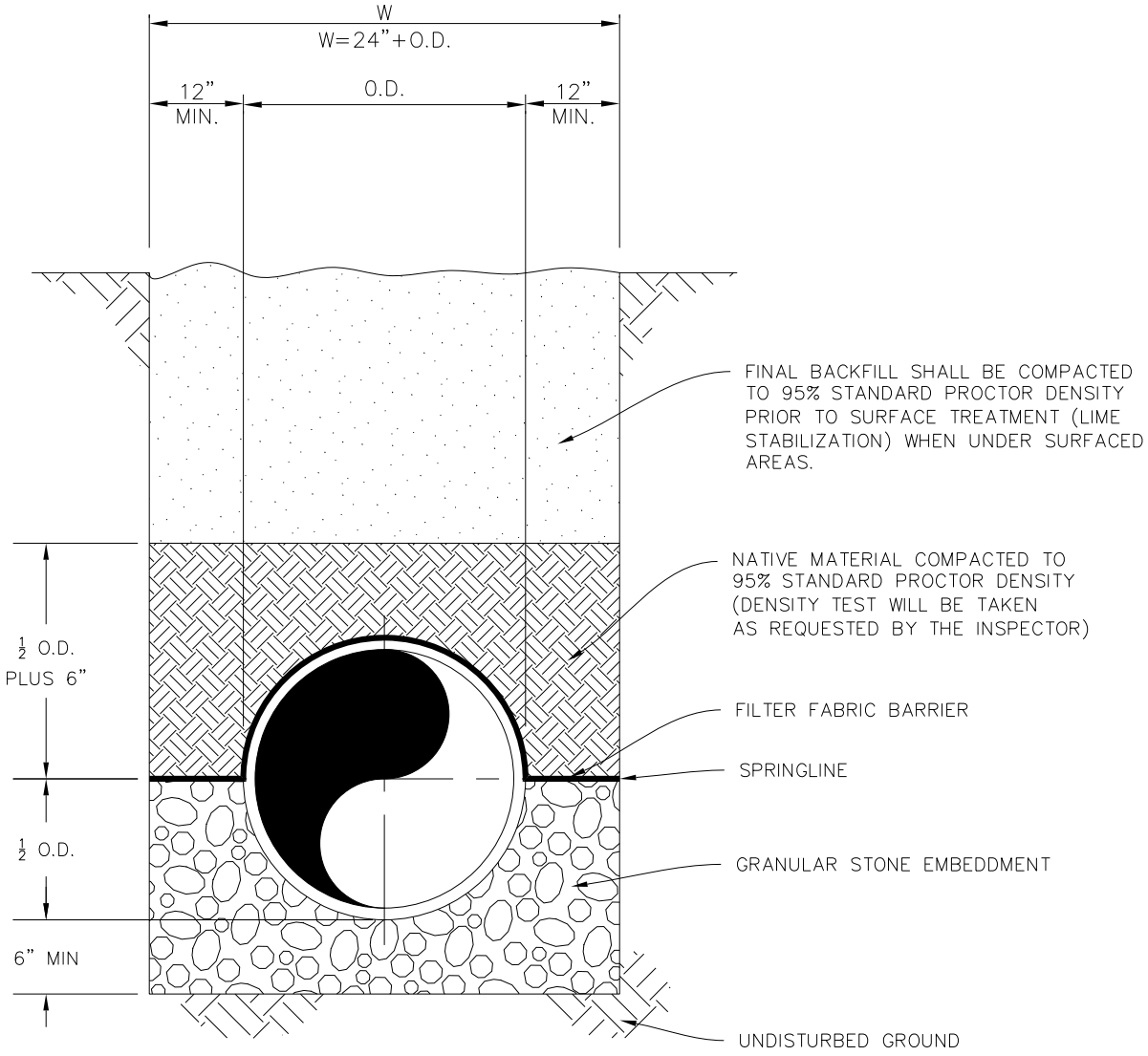
STORM DRAINAGE

STORM SEWER – GENERAL NOTES:

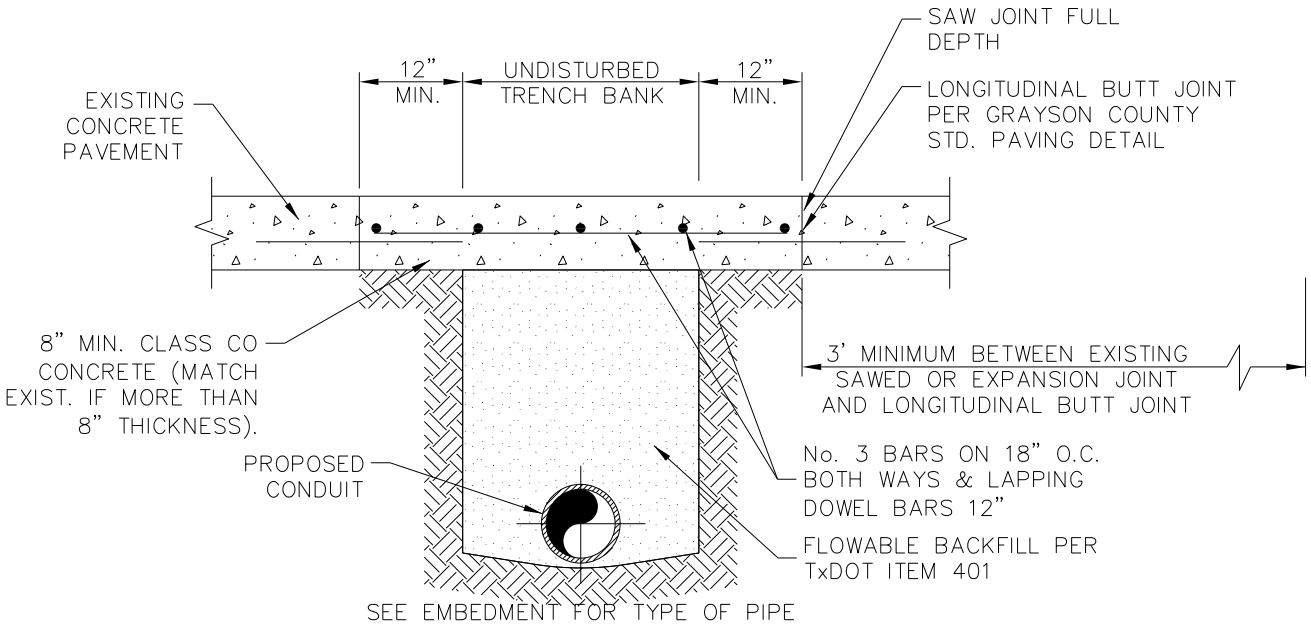
1. ALL CONCRETE DRAINAGE STRUCTURES SHALL BE CLASS C CONCRETE MINIMUM.
2. ALL CRUSHED STONE SHALL PASS A #4 SIEVE (GRADE 4).
3. ALL FIELD JOINTS WILL BE APPROVED BY THE COUNTY ENGINEER IF NECESSARY. FIELD JOINTS SHALL BE WIPED ON THE INSIDE AND OUTSIDE TO PROVIDE FOR SMOOTH FLOW OF WATER.
4. RAMNECK COMPOUND OR APPROVED EQUAL SHALL BE USED FOR JOINT SEALS.
5. ALL STORM SEWER PIPE SHALL BE CAMERA INSPECTED AFTER THE INSTALLATION OF ALL PAVING AND UTILITIES AND PRIOR TO FINAL ACCEPTANCE OF THE PROJECT.
6. UNLESS OTHERWISE NOTED, ITEM SPECIFICATIONS REFER TO THE MOST RECENTLY ADOPTED VERSION OF THE TEXAS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES.



RCP STORM SEWER PIPE BEDDING

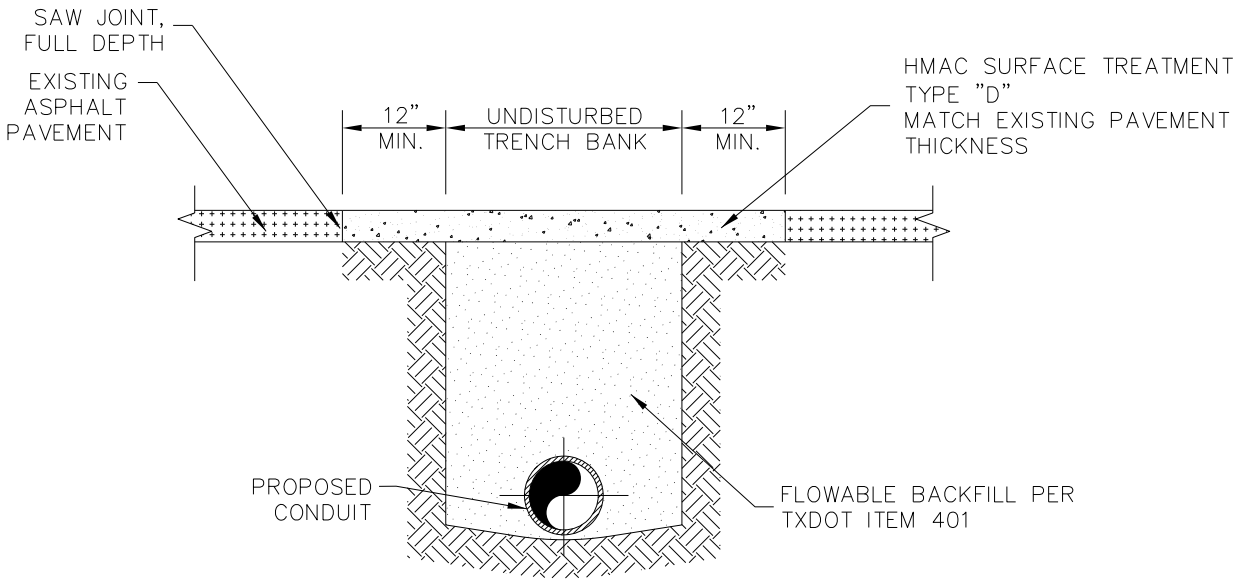
NTS

GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	STORM SEWER GENERAL NOTES & RCP STORM SEWER PIPE BEDDING	STANDARD CONSTRUCTION DETAILS STORM DRAINAGE
		DATE: FEB, 2021 / REV DATE: – / SHEET: SD-D01



CONCRETE STREET OR DRIVE REPAIR

NTS



ASPHALT STREET OR DRIVE REPAIR

NTS

NOTES:

1. ALL JOINTS SHALL BE PARALLEL OR PERPENDICULAR TO THE DIRECTION OF TRAVEL.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
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CONCRETE & ASPHALT STREET & DRIVE REPAIR

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
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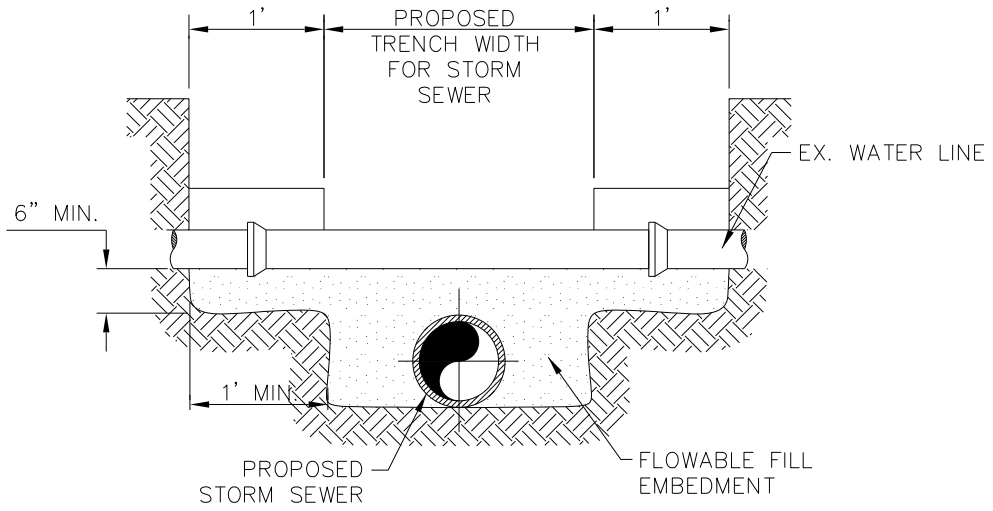
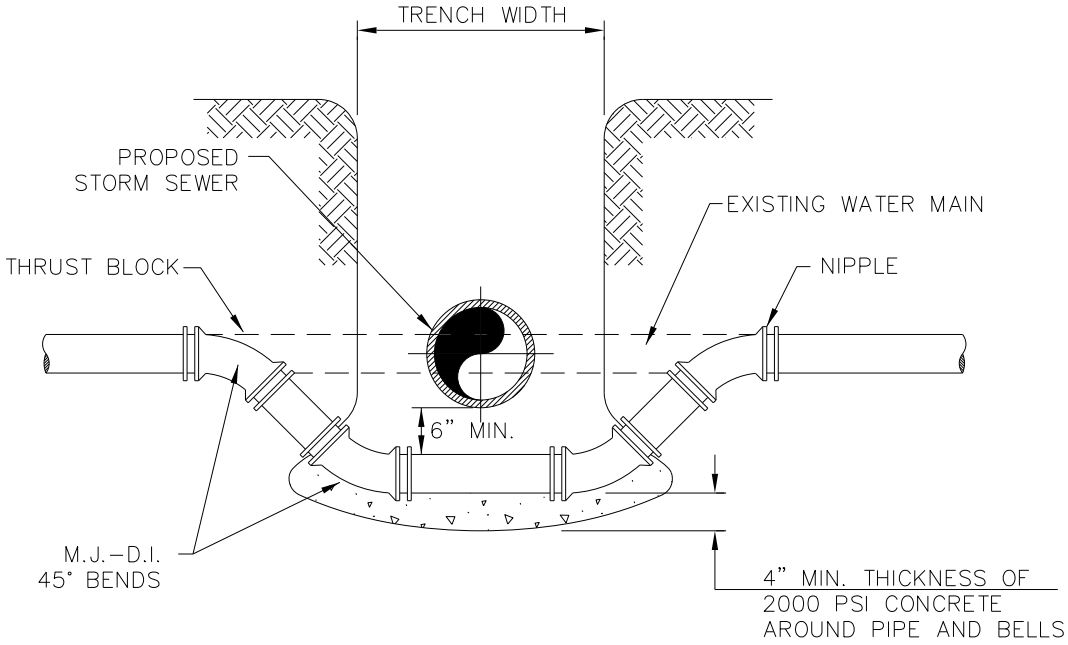


UTILITY SUPPORT DETAIL

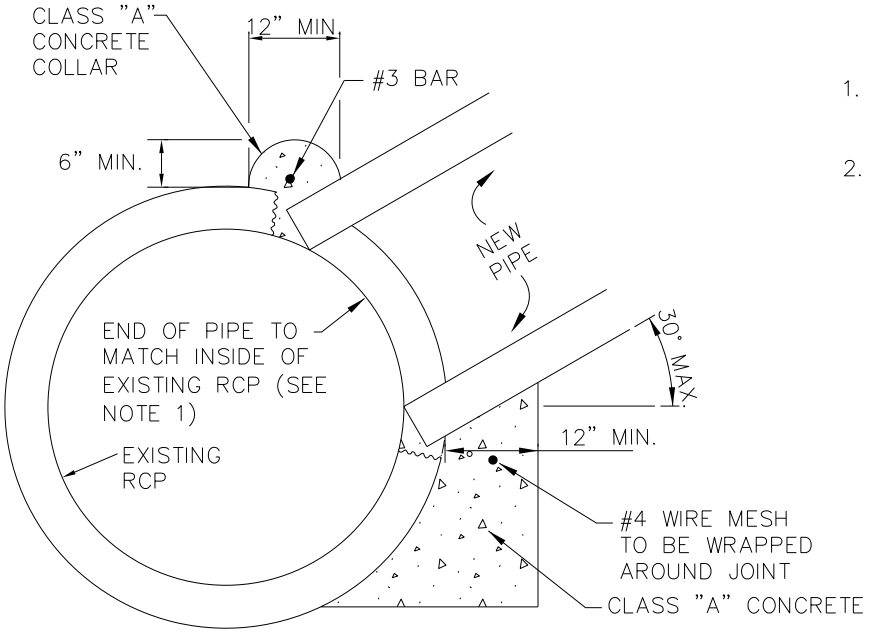
NTS



WATER MAIN LOWERING DETAIL

NTS

GRAYSON COUNTY DEVELOPEMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	WATER MAIN LOWERING & UTILITY SUPPORT DETAILS	STANDARD CONSTRUCTION DETAILS STORM DRAINAGE
		DATE: FEB, 2021 | REV DATE: – | SHEET: SD-D03

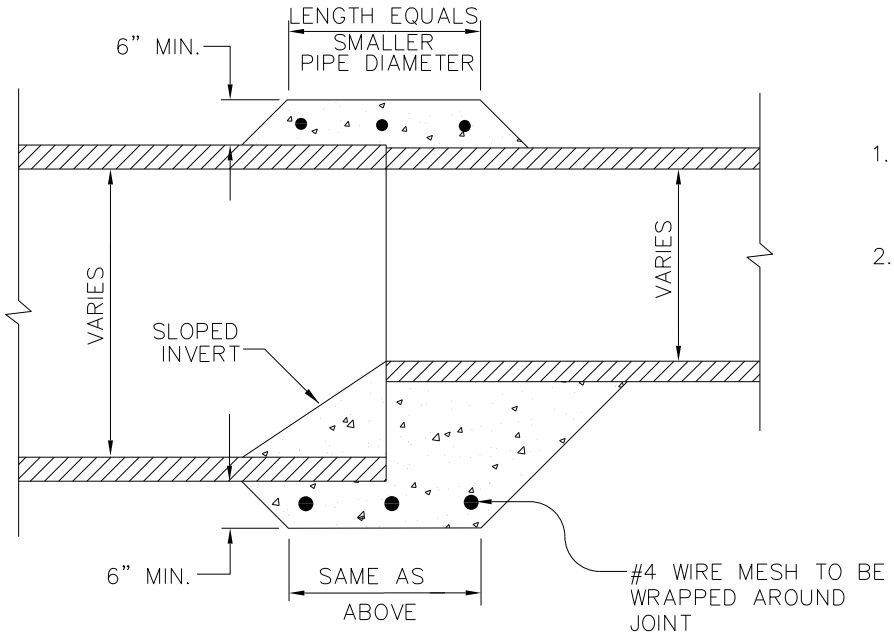


NOTES:

1. MAXIMUM DIAMETER OF NEW PIPE EQUALS ONE HALF OF EXISTING PIPE'S DIAMETER.
2. REMOVAL OF PLUG FROM EXISTING RCP TO BE ACCOMPLISHED BY USING A MASONRY DRILL AT A SPACING EQUAL TO THE DRILL BIT DIAMETER IN A CIRCULAR PATTERN OR A MASONRY SAW IN AN OCTAGONAL PATTERN PER DETAIL.

CONNECTION TO EXISTING RCP STORM DRAIN

NTS



NOTES:

1. THIS PROCEDURE/DETAIL WILL ONLY BE USED WHEN A PREFAB REDUCTION IS NOT POSSIBLE.
2. CONCRETE SHALL BE CLASS A, AS DEFINED IN TXDOT ITEM 421.

PIPE COLLAR

NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
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CONNECTION TO EXISTING RCP STORM DRAIN PIPE COLLAR

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
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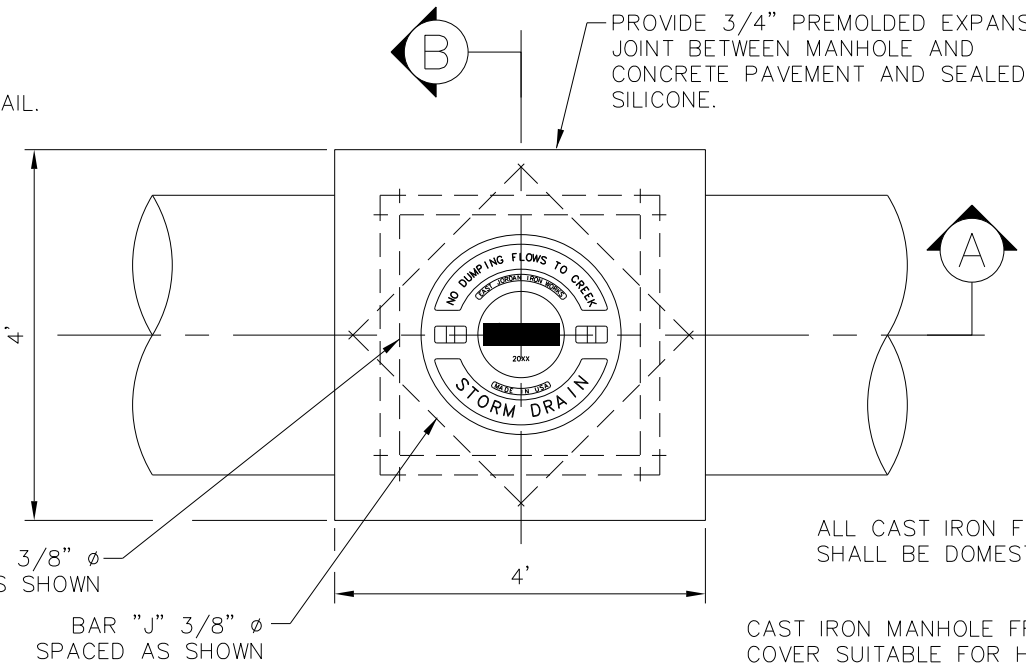
NOTE:
SEE GRAYSON COUNTY STD. STORM MANHOLE FRAME AND COVER DETAIL.

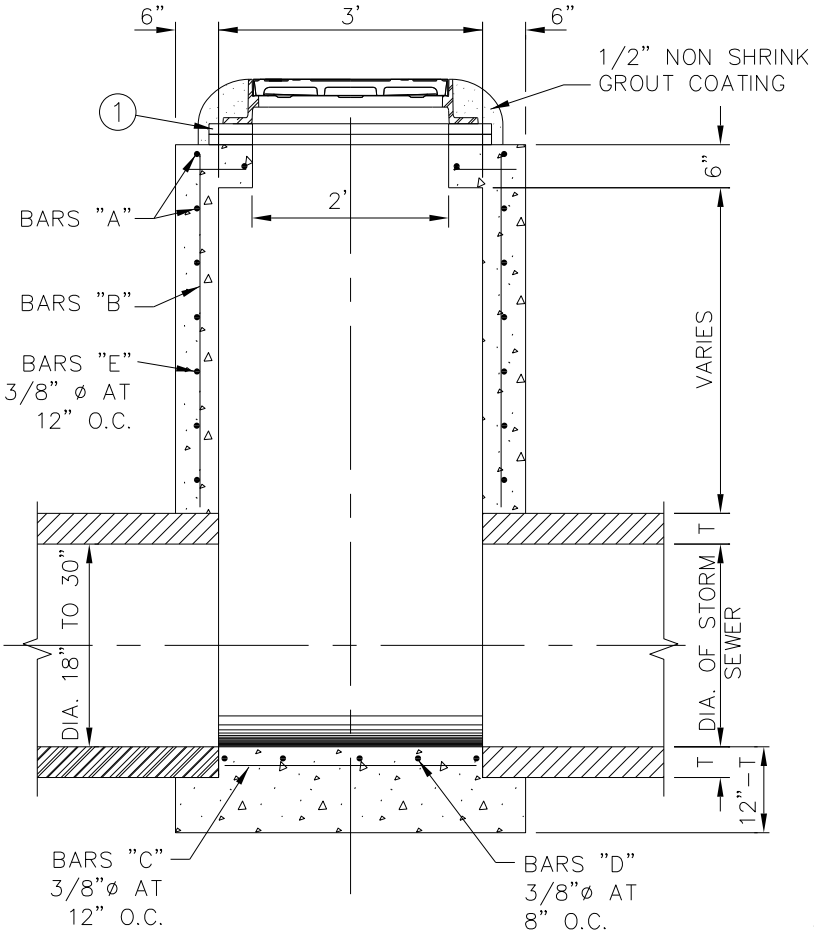


ALL CAST IRON FITTINGS SHALL BE DOMESTIC.

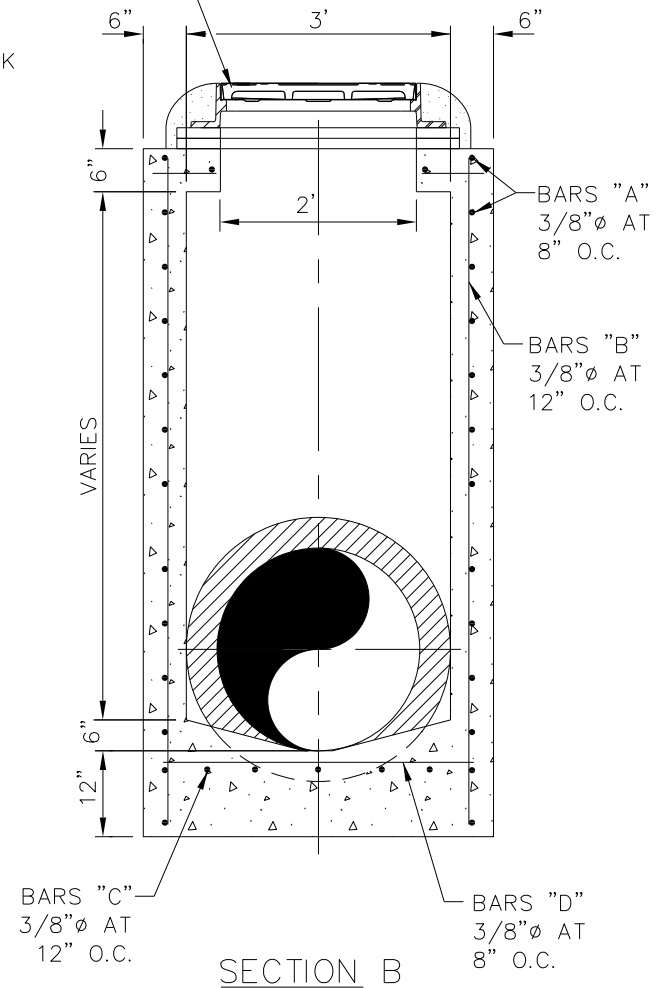
PLAN
NTS

(1) USE PRECAST CONCRETE GRADE RINGS SET IN MORTAR TO RAISE TO GRADE 2" MIN. 18" MAX.

CAST IRON MANHOLE FRAME AND COVER SUITABLE FOR HEAVY TRAFFIC. MANHOLE RIM TO BE SET FLUSH WITH PAVEMENT OR 1" TO 4" ABOVE GRADE IN NON-PAVED AREAS



SECTION A
NTS



SECTION B
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
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TYPE "A" STORM SEWER MANHOLE (FOR 18" TO 30" RCP)

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
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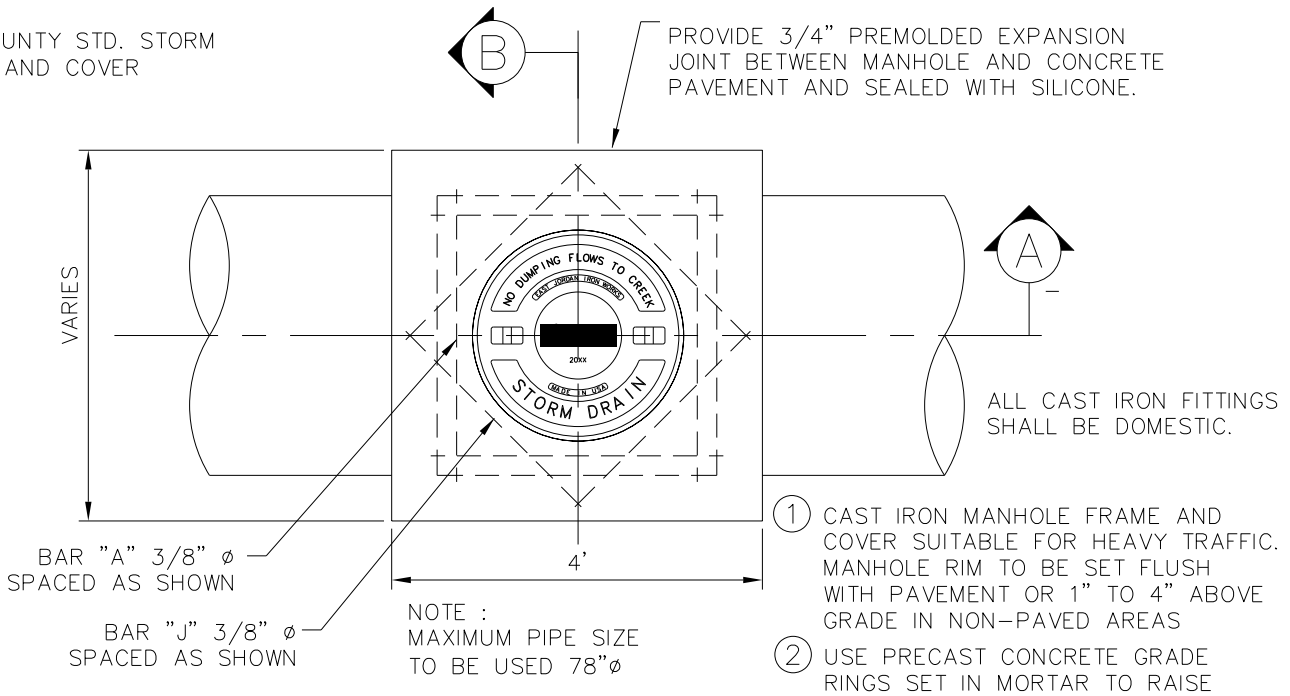
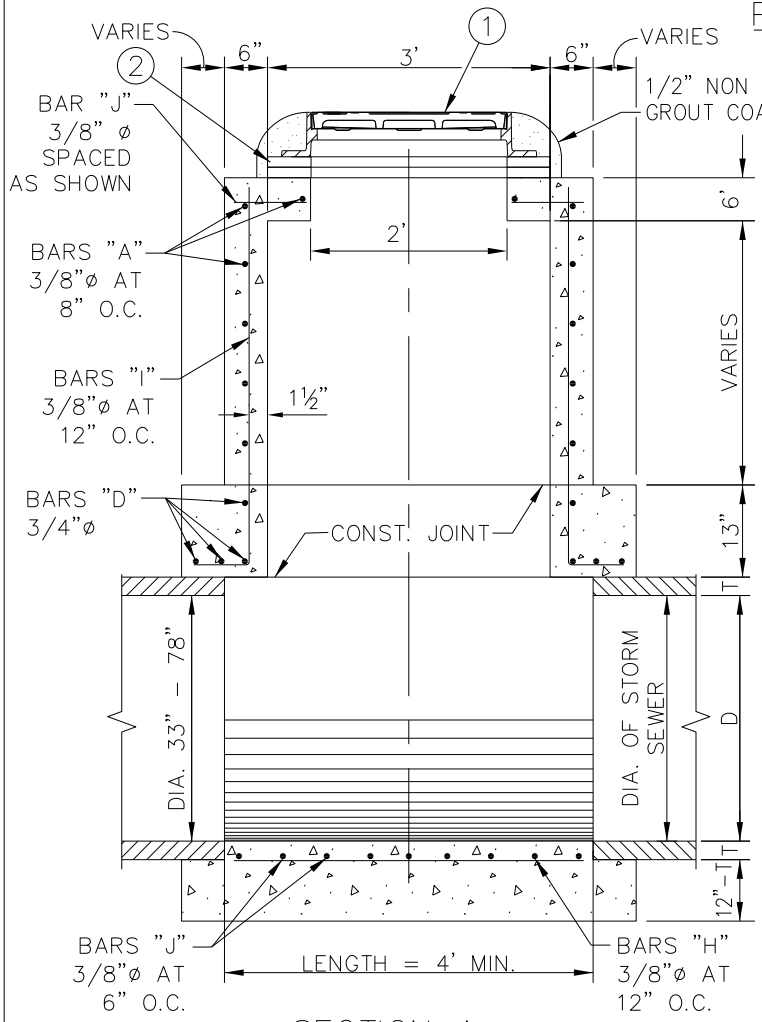
NOTE:
SEE GRAYSON COUNTY STD. STORM MANHOLE FRAME AND COVER DETAIL.

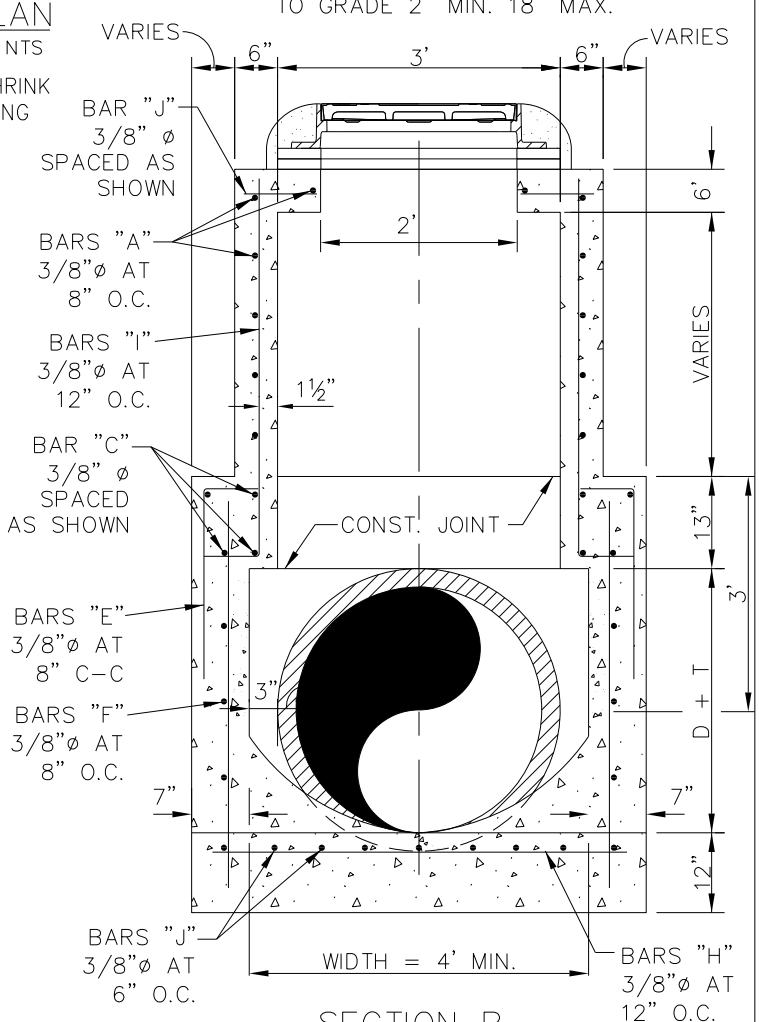


1. CAST IRON MANHOLE FRAME AND COVER SUITABLE FOR HEAVY TRAFFIC. MANHOLE RIM TO BE SET FLUSH WITH PAVEMENT OR 1" TO 4" ABOVE GRADE IN NON-PAVED AREAS
2. USE PRECAST CONCRETE GRADE RINGS SET IN MORTAR TO RAISE TO GRADE 2" MIN. 18" MAX.

PLAN
NTS

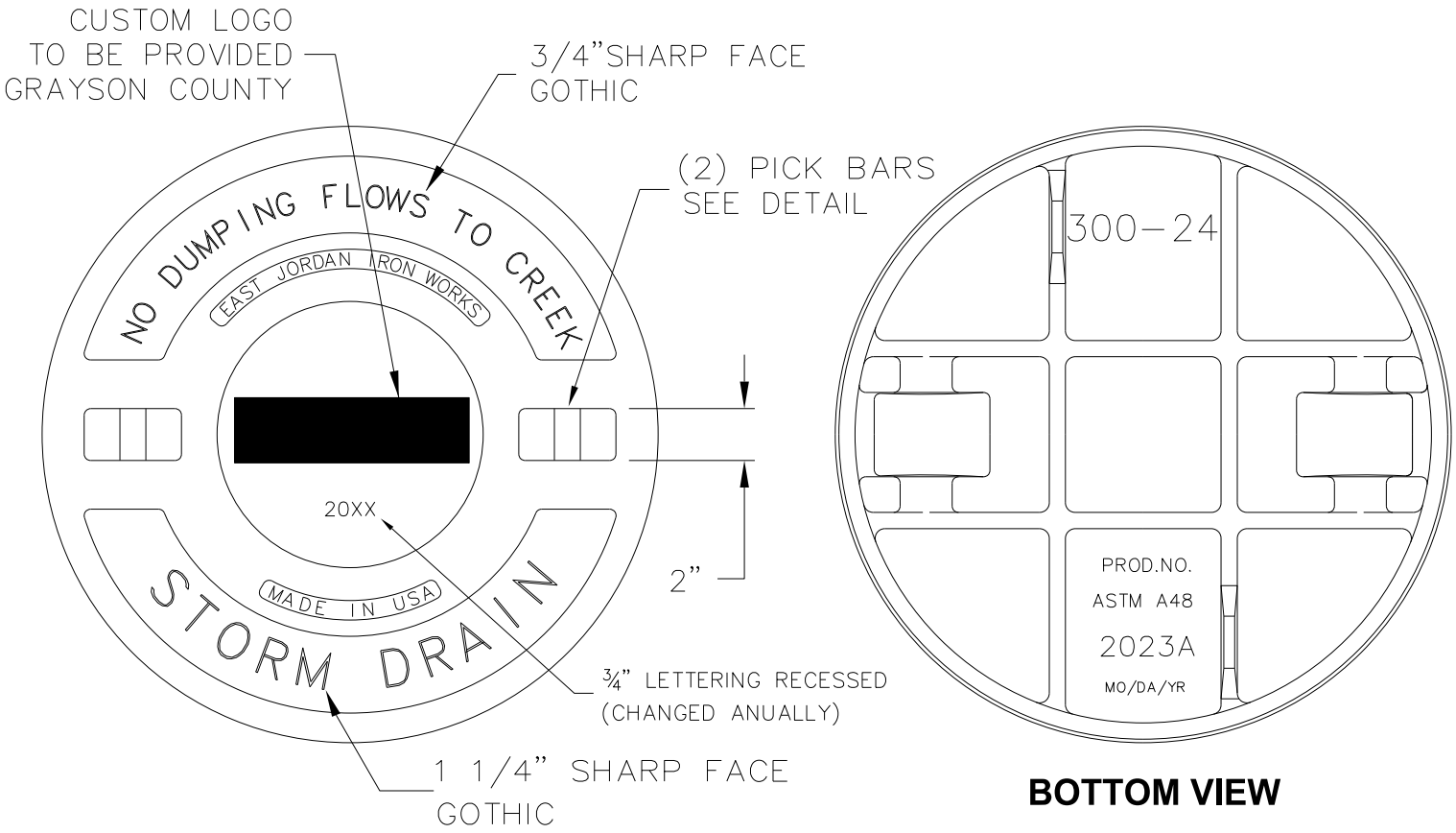


SECTION A
NTS

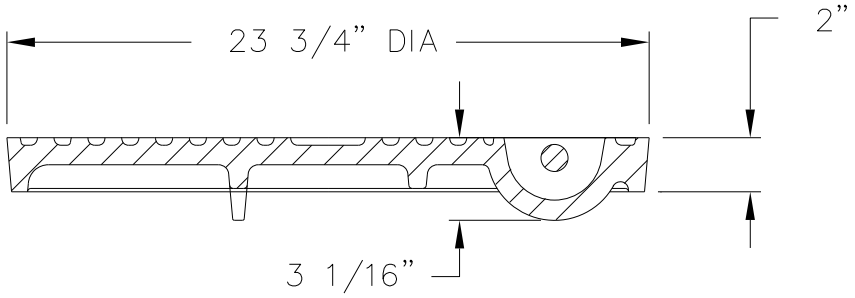


SECTION B
NTS

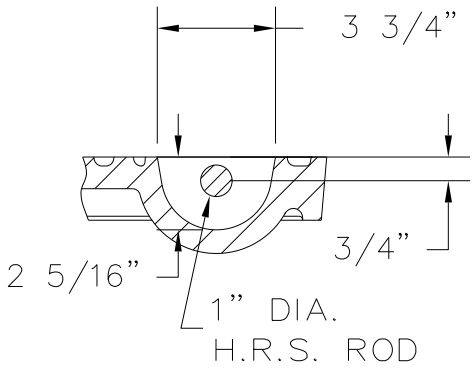
GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	TYPE "B" STORM SEWER MANHOLE (FOR 33" TO 78" RCP)	STANDARD CONSTRUCTION DETAILS STORM DRAINAGE
		DATE: FEB, 2021 / REV DATE: - / SHEET: SD-D06



BOTTOM VIEW



COVER SECTION



PICK BAR DETAIL

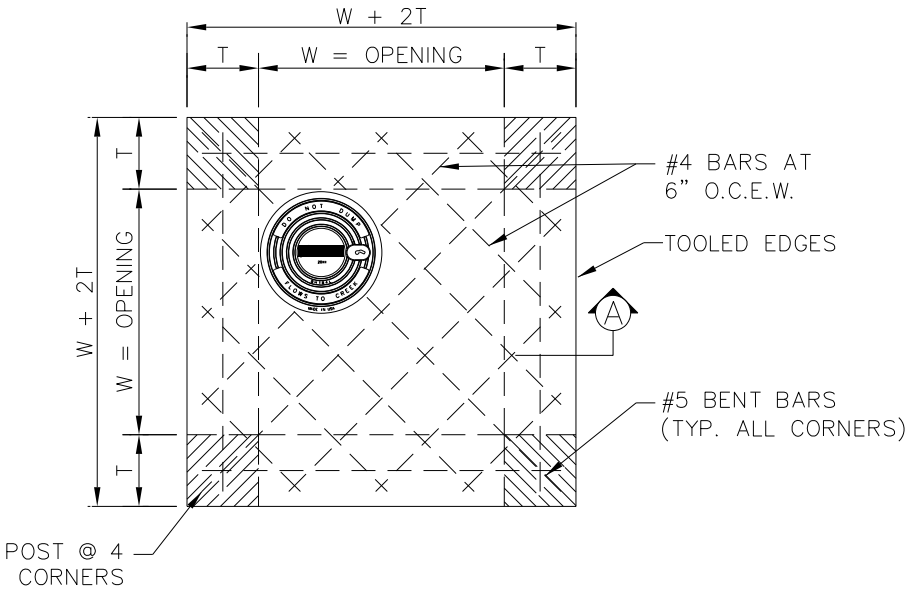
NOTE:
FRAME AND COVER SHALL BE EAST JORDAN IRON WORKS FRAME PRODUCT AND COVER PRODUCT #2023A OR APPROVED EQUAL AND SHALL BE GRAY CAST IRON CONFORMING TO ASTM A48-CL35B.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

STORM MANHOLE
FRAME & COVER

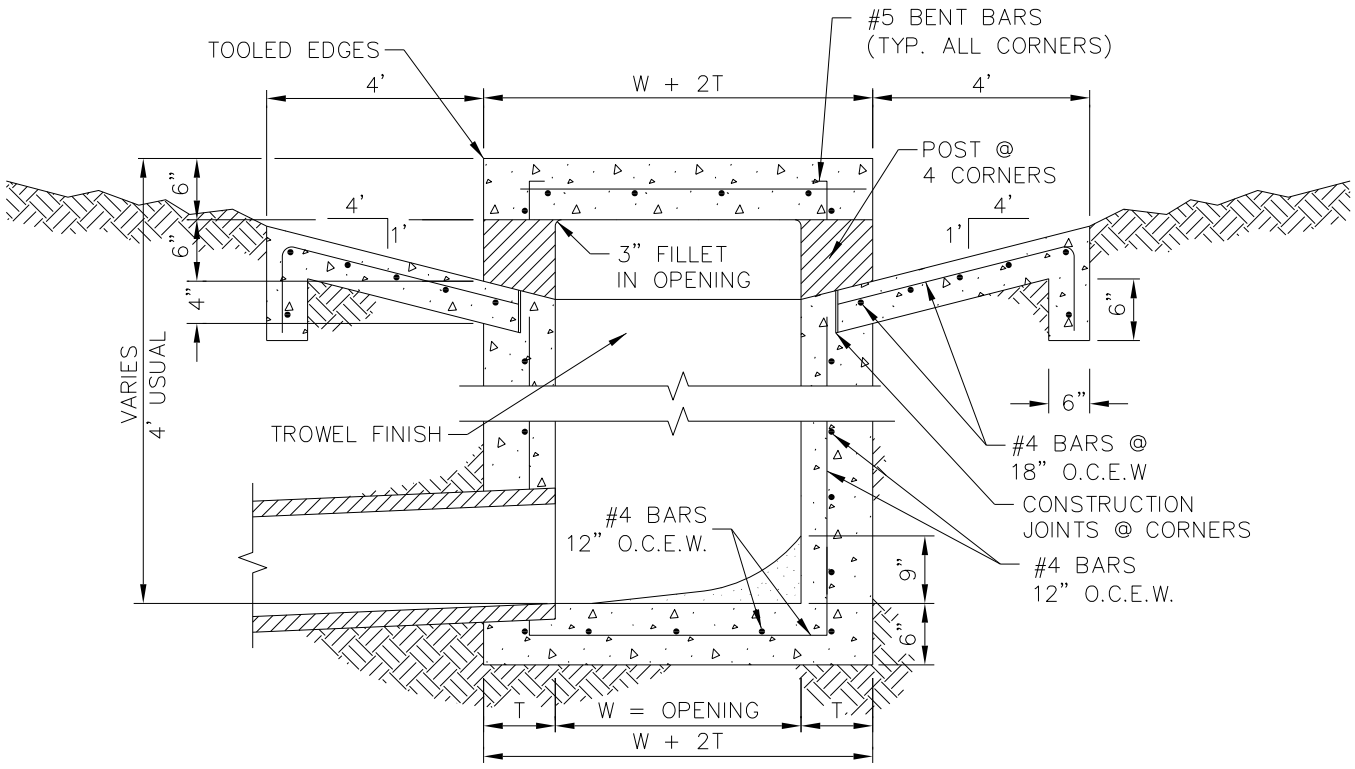
STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-D07



INLET SIZE	T	W
2' SQUARE	7"	2'-0"
3' SQUARE	7"	3'-0"
4' SQUARE	7"	4'-0"
5' SQUARE	8"	5'-0"
6' SQUARE	9"	6'-0"

PLAN OF TOP SLAB
NTS



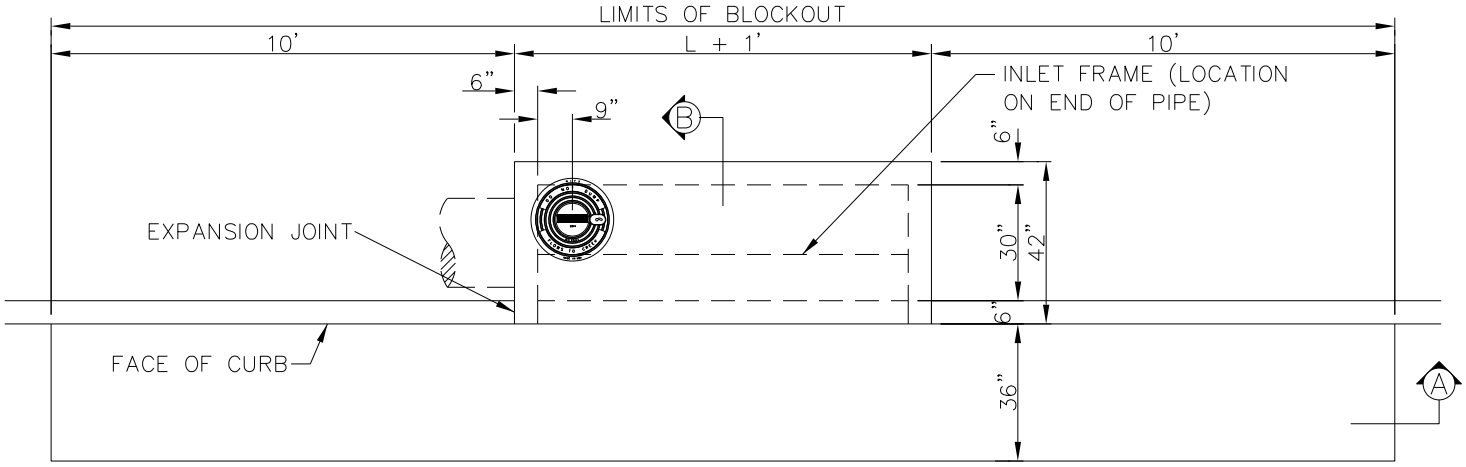
SECTION A
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

WYE INLET DETAIL

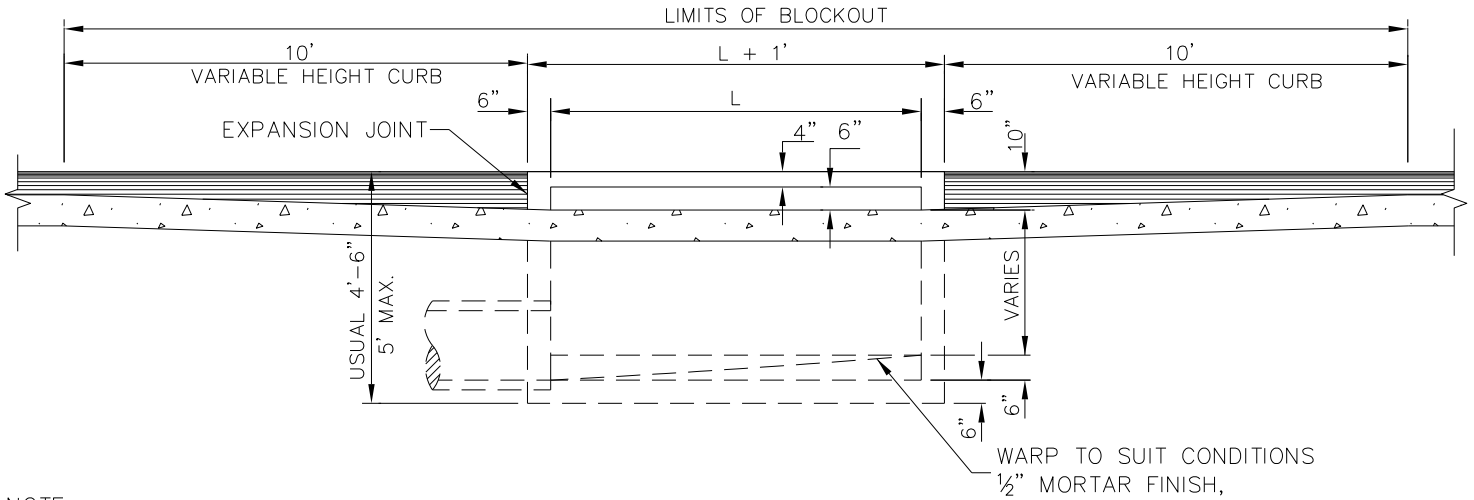
STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-D08



PLAN–STANDARD INLET

NTS



SECTION A

NTS

NOTE:

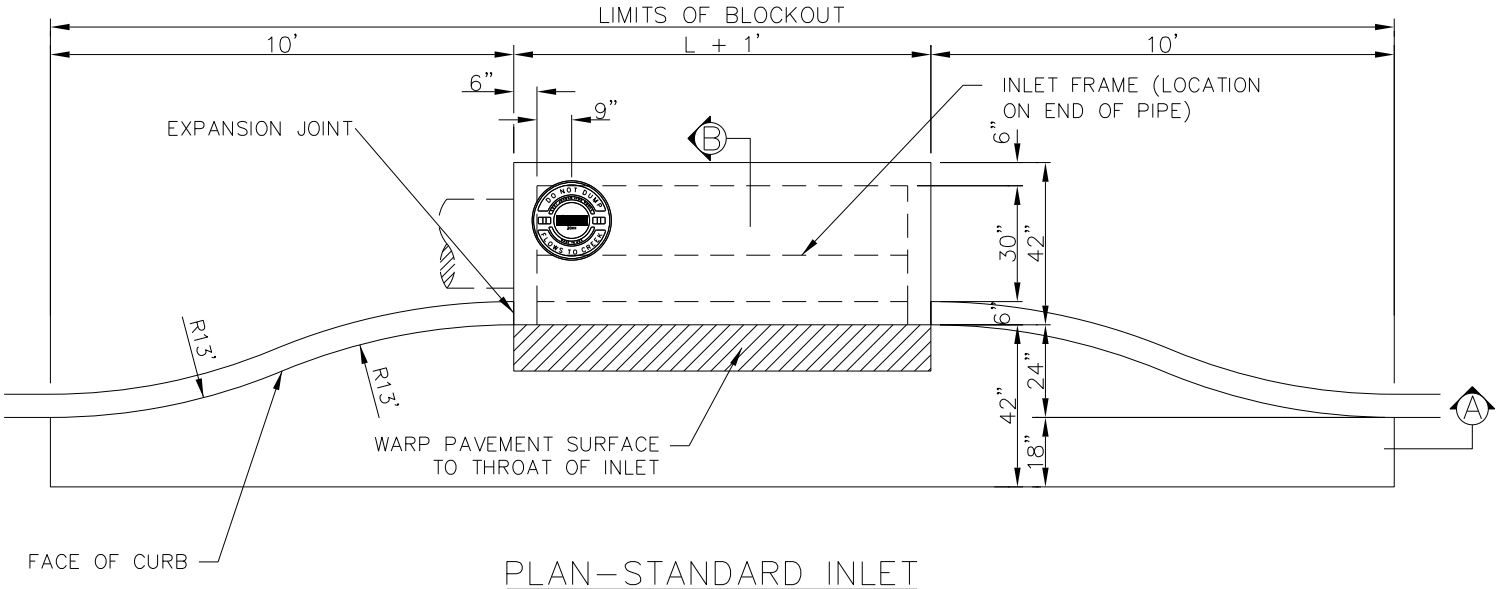
1. PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER OR BOTTOM.
2. #3 BAR 18" O.C.E.W. IN BLOCK OUT DRILLED INTO EXISTING CONCRETE.
3. BACKFILL AROUND INLET SHALL BE FLOWABLE BACKFILL PER TXDOT ITEM 401.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

STANDARD CURB INLET

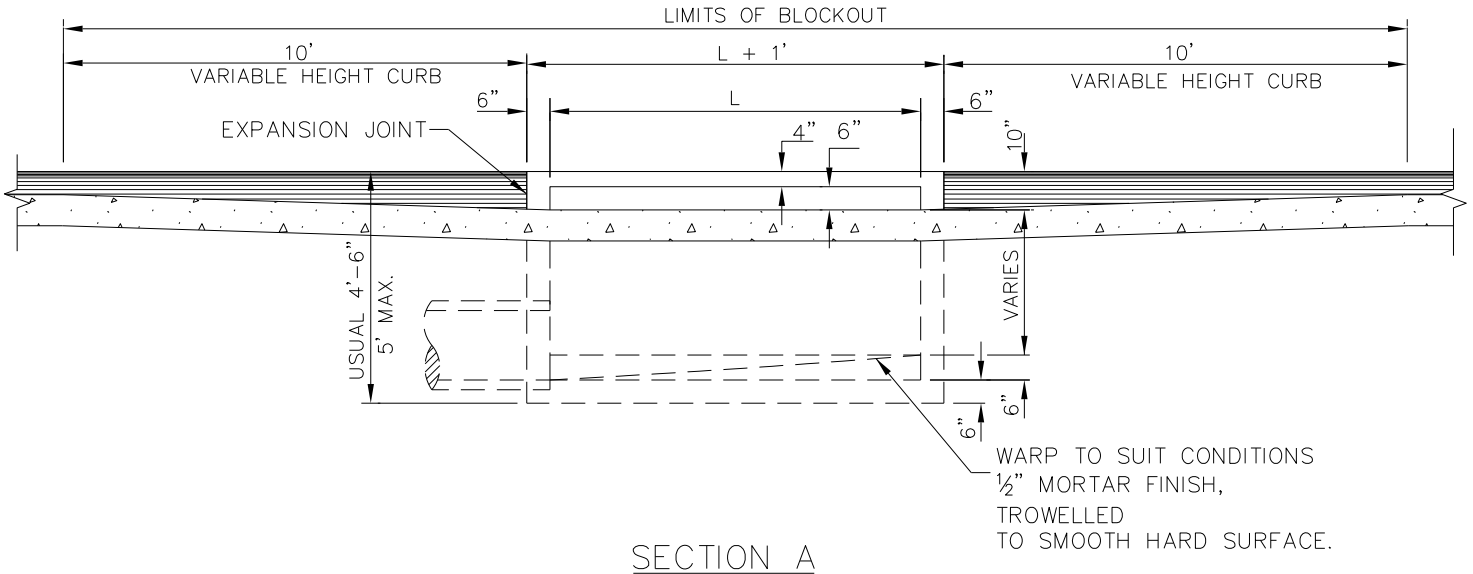
STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–D09



PLAN–STANDARD INLET

NTS



SECTION A

NTS

NOTE:

1. PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER OR BOTTOM.
2. #3 BAR 18" O.C.E.W. IN BLOCK OUT DRILLED INTO EXISTING CONCRETE.
3. BACKFILL AROUND INLET SHALL BE FLOWABLE BACKFILL PER TXDOT ITEM 401.

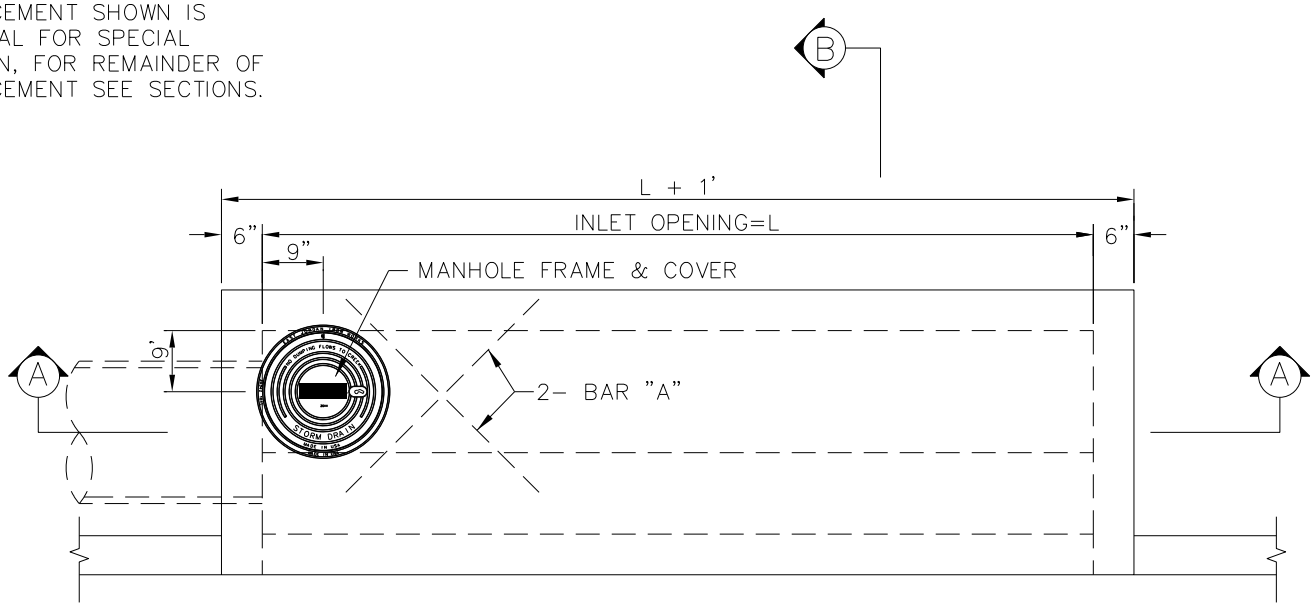
GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

RECESSED CURB INLET

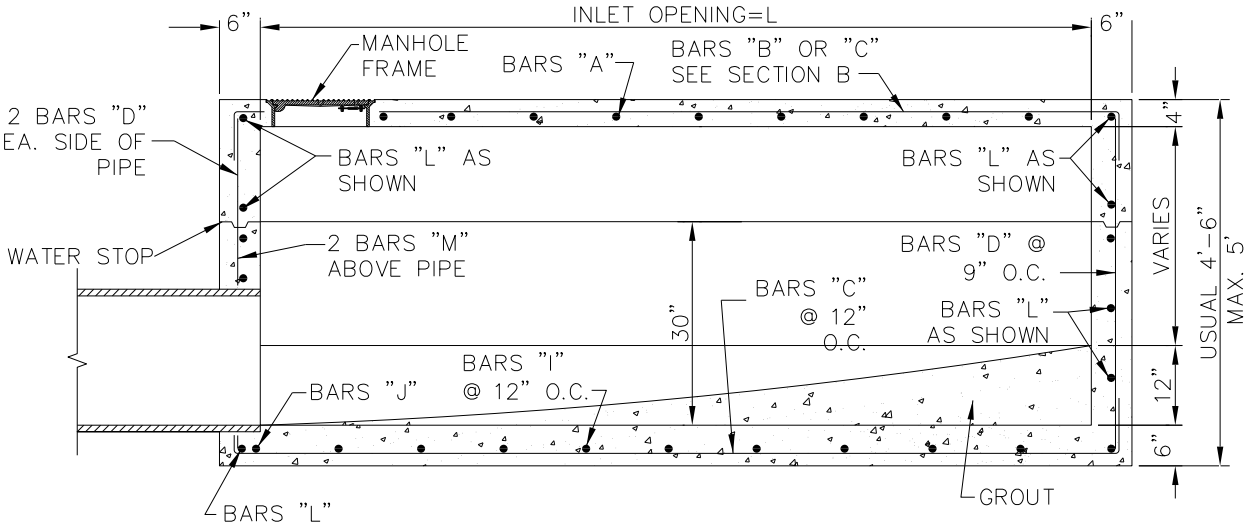
STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–D10

NOTE:
REINFORCEMENT SHOWN IS ADDITIONAL FOR SPECIAL CONDITION, FOR REMAINDER OF REINFORCEMENT SEE SECTIONS.



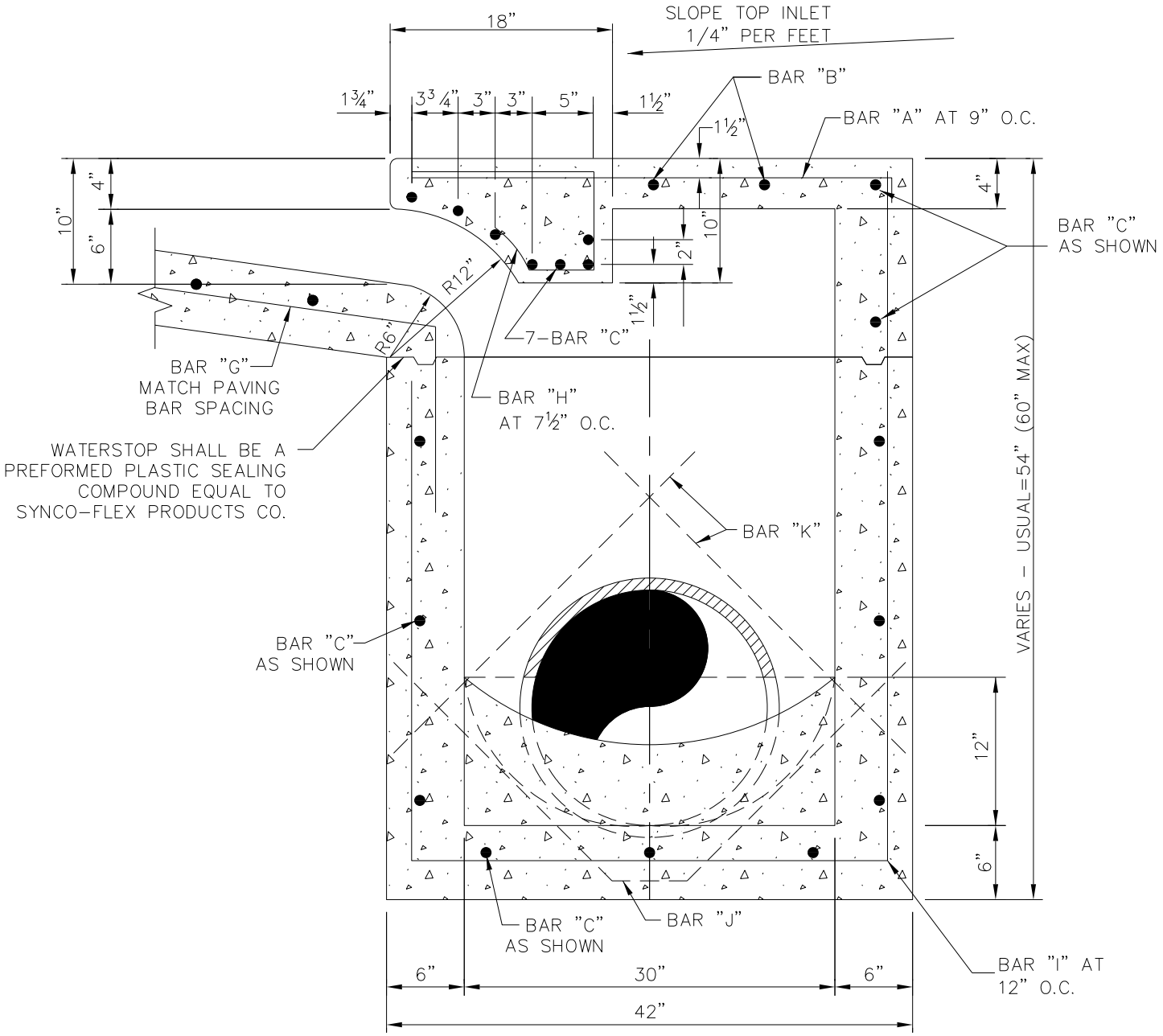
PLAN–STANDARD INLET
NTS



SECTION A
NTS

NOTE:
SECTION B SHOWN ON SD–D12.

GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	STANDARD CURB INLET 4, 6, 8 & 10 FOOT INLETS	STANDARD CONSTRUCTION DETAILS STORM DRAINAGE
		DATE: FEB, 2021 / REV DATE: – / SHEET: SD–D11



SECTION B
NTS

GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	STANDARD & RECESSED CURB INLETS – SECTION B (4, 6, 8 & 10 FOOT INLETS)	STANDARD CONSTRUCTION DETAILS STORM DRAINAGE		
		DATE: FEB, 2021	REV DATE: –	SHEET: SD-D12

REINFORCING STEEL SCHEDULE DIMENSIONS SHOWN ARE FOR MAXIMUM SIZE INLET						
INLET LENGTH	BAR TYPE	BAR DIA. (1/8")	NO REQ'D	BAR DIMENSIONS		
				A	B	C
4'	A	3	6	3'-2"	0'-3"	–
	B	3	2	2'-10"	–	–
	C	4	18	4'-8"	0'-6"	–
	D	4	9	4'-8"	–	–
	G	3	4	2'-0"	1'-3"	–
	H	3	7	*	*	*
	I	4	3	3'-2"	3'-2"	4'-8"
	J	5	1	*	*	*
	K	5	2	3'-2"	0'-6"	–
	L	4	11	3'-2"	0'-6"	–
	M	4	2	3'-0"**	–	–
6'	A	3	9	3'-2"	0'-3"	–
	B	3	2	4'-10"	–	–
	C	4	18	6'-8"	0'-6"	–
	D	4	9	4'-8"	–	–
	G	3	6	2'-0"	1'-3"	–
	H	3	11	*	*	*
	I	4	5	3'-2"	3'-2"	4'-8"
	J	5	1	*	*	*
	K	5	2	3'-2"	0'-6"	–
	L	4	11	3'-2"	0'-6"	–
	M	4	2	3'-0"**	–	–
8'	A	3	12	3'-2"	0'-3"	–
	B	3	2	6'-10"	–	–
	C	4	18	8'-8"	0'-6"	–
	D	4	9	4'-8"	–	–
	G	3	7	2'-0"	1'-3"	–
	H	3	14	*	*	*
	I	4	7	3'-2"	3'-2"	4'-8"
	J	5	1	*	*	*
	K	5	2	3'-2"	0'-6"	–
	L	4	11	3'-2"	0'-6"	–
	M	4	2	3'-0"**	–	–
10'	A	3	15	3'-2"	0'-3"	–
	B	3	2	8'-10"	–	–
	C	4	18	10'-8"	0'-6"	–
	D	4	9	4'-8"	–	–
	G	3	9	2'-0"	1'-3"	–
	H	3	17	*	*	*
	I	4	9	3'-2"	3'-2"	4'-8"
	J	5	1	*	*	*
	K	5	2	3'-2"	0'-6"	–
	L	4	11	3'-2"	0'-6"	–
	M	4	2	3'-0"**	–	–

* SEE DIAGRAM FOR DIMENSIONS
** FIELD CUT AS REQUIRED TO ACCOMMODATE DRAIN PIPE

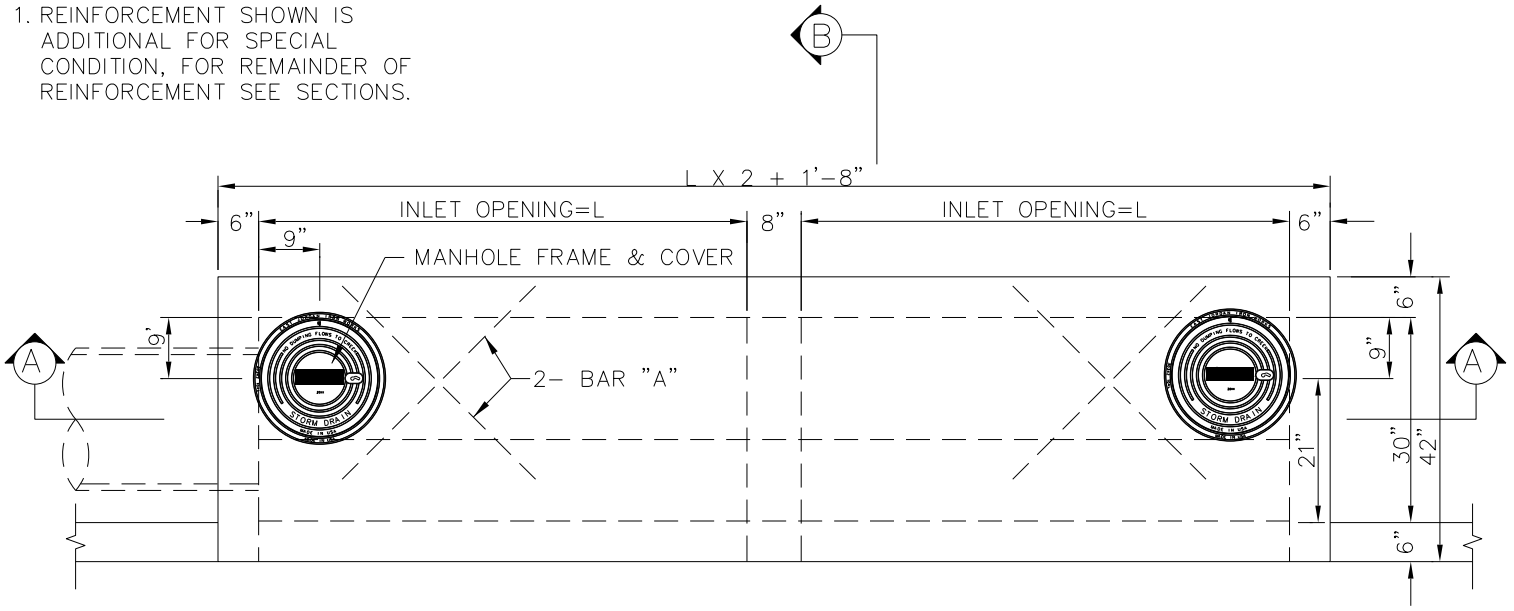
GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

REINFORCING STEEL SCHEDULE 4, 6, 8 & 10 FOOT INLETS

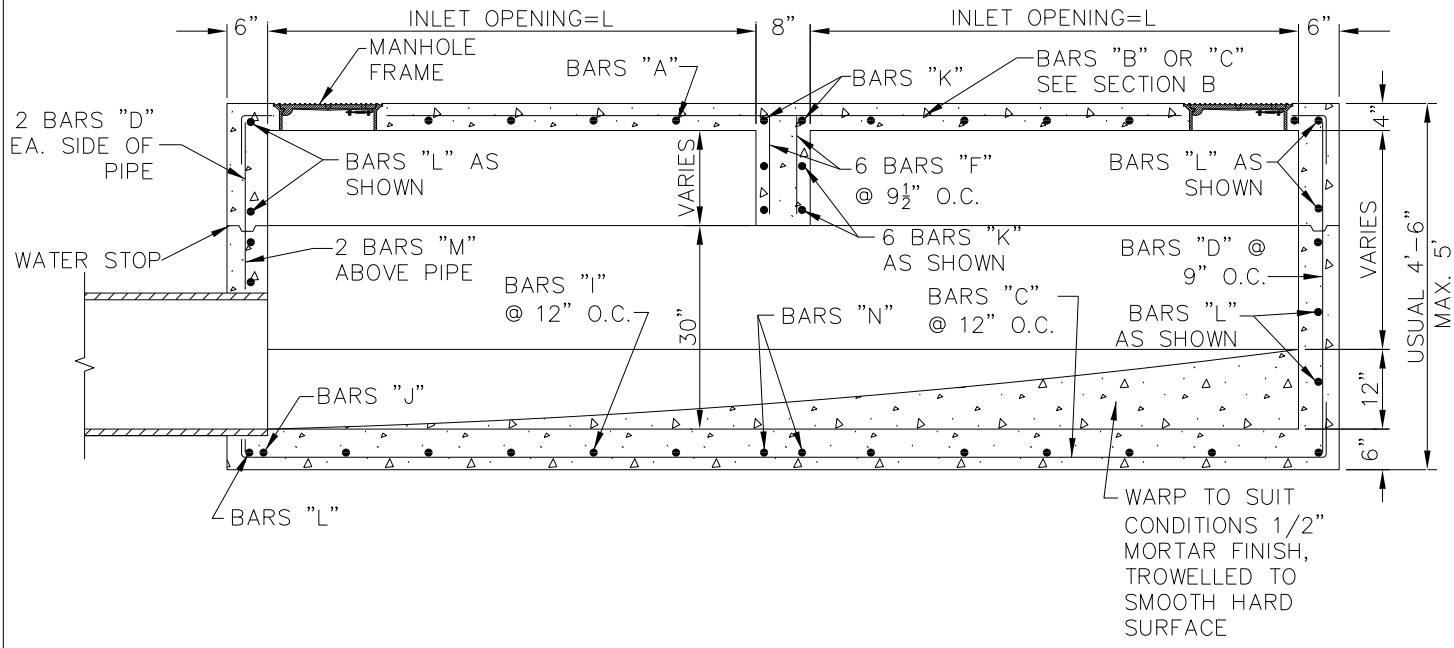
STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-D13

NOTE:
1. REINFORCEMENT SHOWN IS ADDITIONAL FOR SPECIAL CONDITION, FOR REMAINDER OF REINFORCEMENT SEE SECTIONS.



PLAN–STANDARD INLET
NTS



NOTE:
1. BACKFILL AROUND INLET SHALL BE FLOWABLE BACKFILL PER TXDOT ITEM 401.
2. SECTION B SHOWN ON SD–D15.

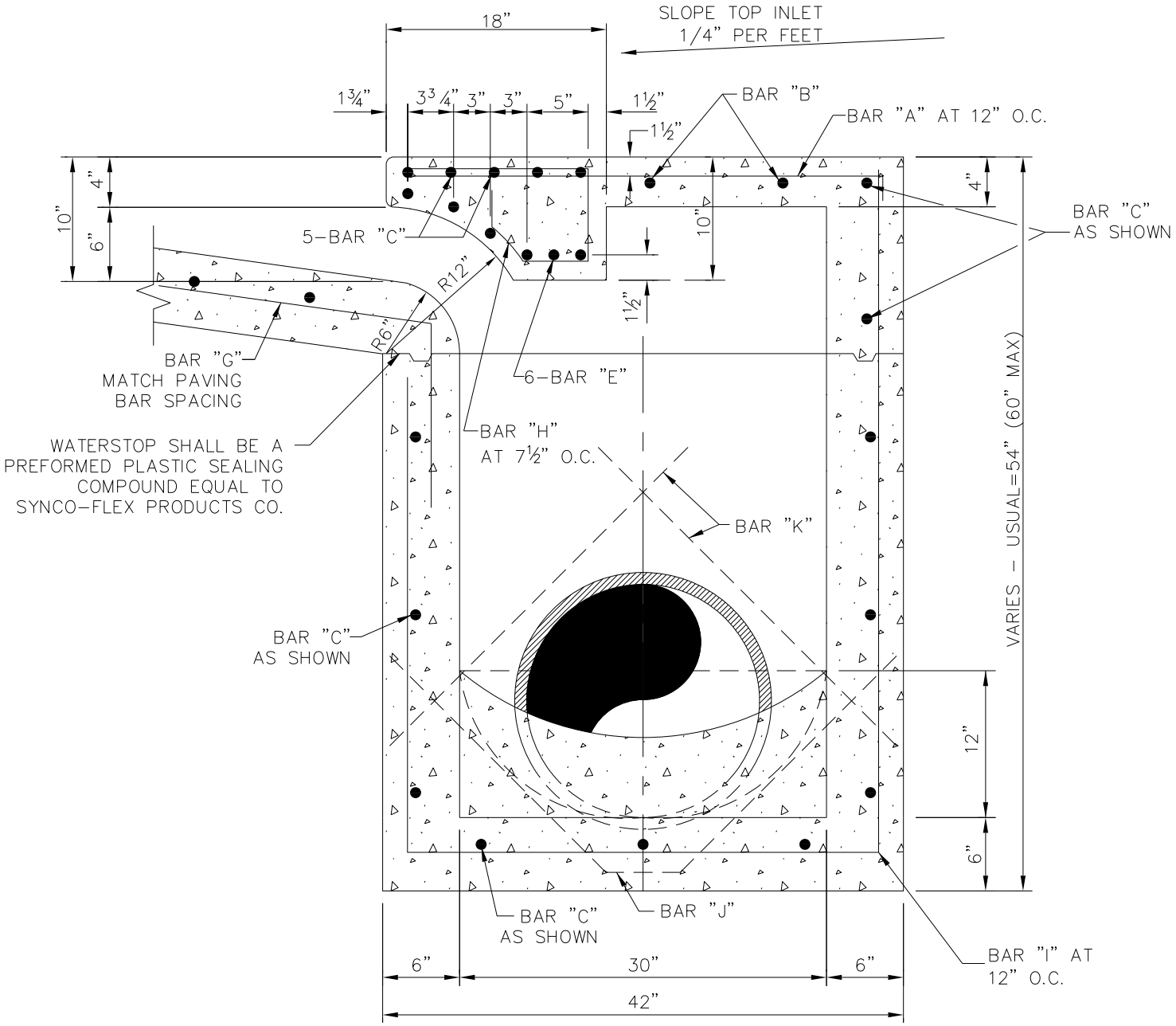
SECTION A
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

STANDARD CURB INLET
12, 14, 16 & 20 FOOT INLETS

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–D14



SECTION B
NTS

GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	STANDARD & RECESSED CURB INLETS – SECTION B (12, 14, 16 & 20 FOOT INLETS)	STANDARD CONSTRUCTION DETAILS STORM DRAINAGE		
		DATE: FEB, 2021	REV DATE: –	SHEET: SD-D15

REINFORCING STEEL SCHEDULE
DIMENSIONS ARE FOR MAXIMUM SIZE INLETS

INLET LENGTH	BAR TYPE	BAR DIA (1/8")	NO REQ'D	BAR DIMENSIONS			INLET LENGTH	BAR TYPE	BAR DIA. (1/8")	NO REQ'D	BAR DIMENSIONS		
				A	B	C					A	B	C
6'	A	3	12	3'–2"	0'–6"	–	8'	A	3	16	3'–2"	0'–6"	–
	B	3	2	11'–6"	–	–		B	3	2	15'–6"	–	–
	C	4	16	13'–4"	0'–6"	–		C	4	16	17'–4"	0'–6"	–
	D	4	9	4'–8"	–	–		D	4	9	4'–8"	–	–
	E	5	6	13'–4"	–	–		E	5	6	17'–4"	–	–
	F	4	10	1'–2"	–	–		F	4	10	1'–2"	–	–
	G	3	11	2'–0"	1'–3"	–		G	3	13	2'–0"	1'–3"	–
	H	3	20	*	*	*		H	3	26	*	*	*
	I	4	12	3'–2"	3'–2"	4'–8"		I	4	16	3'–2"	3'–2"	4'–8"
	J	5	1	*	*	*		J	5	1	*	*	*
	K	5	8	3'–2"	0'–6"	–		K	5	8	3'–2"	0'–6"	–
	L	4	11	3'–2"	0'–6"	–		L	4	11	3'–2"	0'–6"	–
	M	4	2	3'–0"**	–	–		M	4	2	3'–0"**	–	–
	N	4	2	3'–2"	4'–8"	–		N	4	2	3'–2"	4'–8"	–
7'	A	3	14	3'–2"	0'–6"	–	10'	A	3	20	3'–2"	0'–6"	–
	B	3	2	13'–6"	–	–		B	3	2	19'–6"	–	–
	C	4	16	15'–4"	0'–6"	–		C	4	16	21'–4"	0'–6"	–
	D	4	9	4'–8"	–	–		D	4	9	4'–8"	–	–
	E	5	6	15'–4"	–	–		E	5	6	21'–4"	–	–
	F	4	10	1'–2"	–	–		F	4	10	1'–2"	–	–
	G	3	12	2'–0"	1'–3"	–		G	3	16	2'–0"	1'–3"	–
	H	3	22	*	*	*		H	3	32	*	*	*
	I	4	14	3'–2"	3'–2"	4'–8"		I	4	20	3'–2"	3'–2"	4'–8"
	J	5	1	*	*	*		J	5	1	*	*	*
	K	5	8	3'–2"	0'–6"	–		K	5	8	3'–2"	0'–6"	–
	L	4	11	3'–2"	0'–6"	–		L	4	11	3'–2"	0'–6"	–
	M	4	2	3'–0"**	–	–		M	4	2	3'–0"**	–	–
	N	4	2	3'–2"	4'–8"	–		N	4	2	3'–2"	4'–8"	–

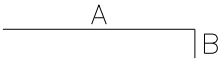
* SEE DIAGRAM FOR DIMENSION
** FIELD CUT AS REQUIRED TO ACCOMMODATE DRAIN PIPE

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

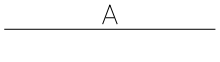
REINFORCING STEEL SCHEDULE
12, 14, 16 & 20 FOOT INLETS

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

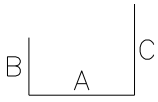
DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–D16



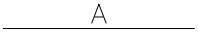
BAR "A"



BAR "E"

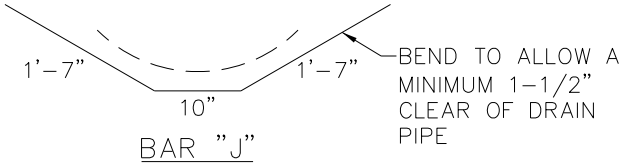


BAR "I"



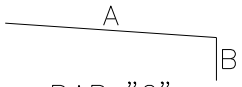
BAR "B"

BAR "F"



BAR "J"

BAR "C"

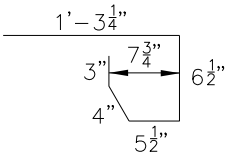


BAR "G"

BAR "K"

BAR "M"

BAR "D"



BAR "H"

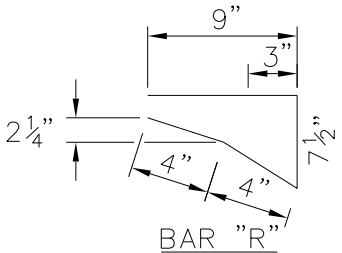
BAR "L"

BAR "N"

REINFORCING BAR DIAGRAMS

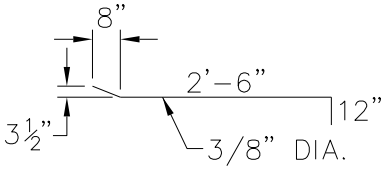
NTS

BAR "O"

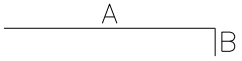


BAR "R"

BAR "T"



BAR "Q"



BAR "S"

BAR "U"

BAR DIAGRAMS (BRICK ON INLET)

NTS

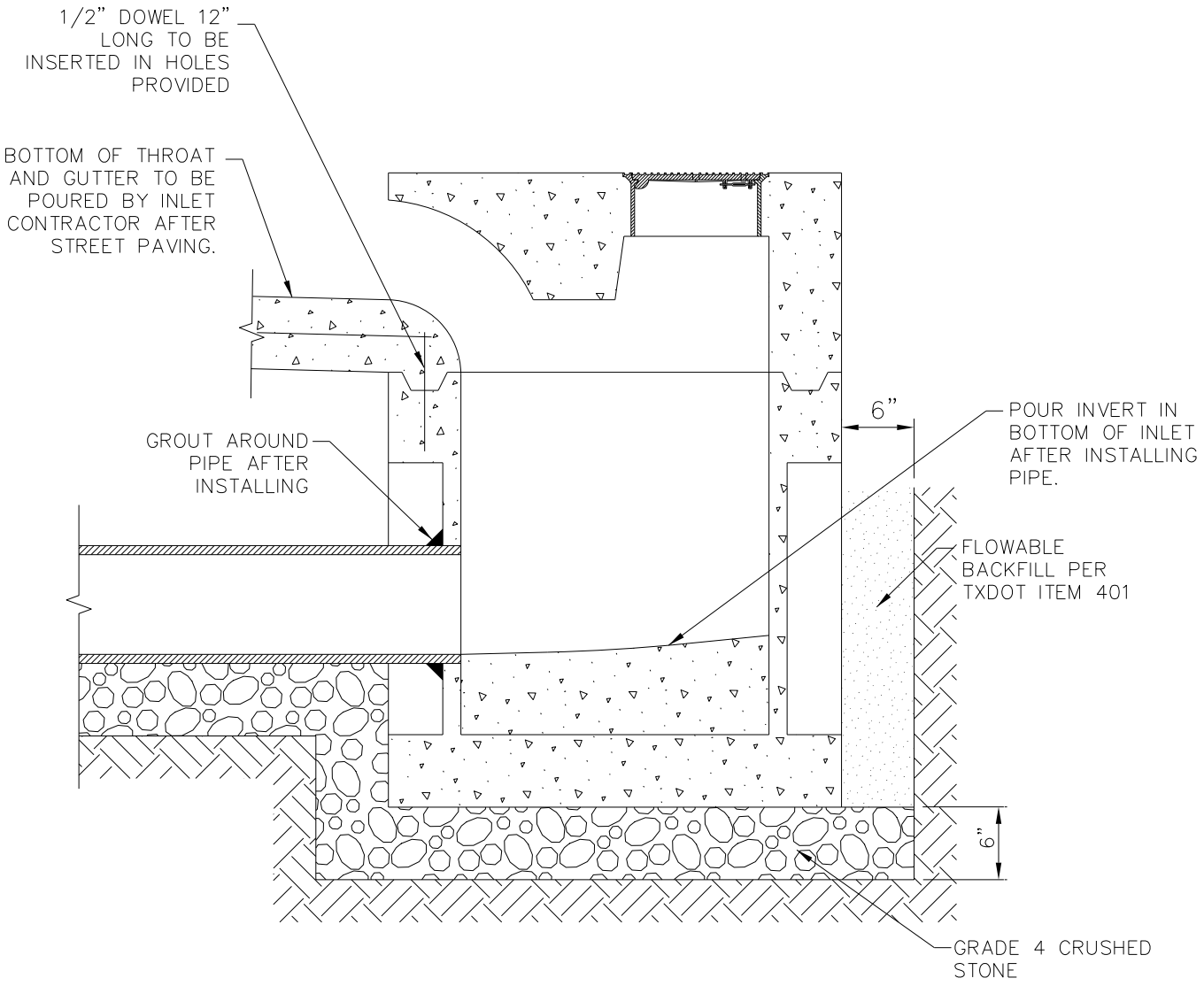
NOTE:
BAR DESIGNATIONS AND DIMENSIONS ARE DIFFERENT FROM STEEL SCHEDULE FOR REGULAR INLETS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

REINFORCING BAR DIAGRAMS

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-D17



INSTALLATION DRAWING FOR PRECAST 5' AND 10' CURB INLETS

NTS

NOTES:

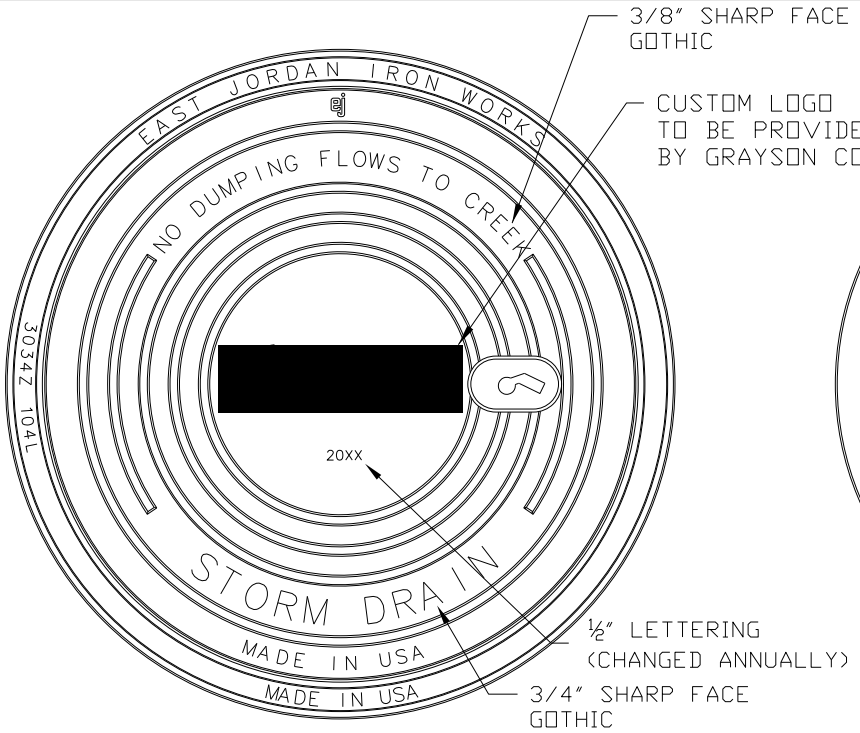
1. FOR PRECAST INLET THE FLOOR OF THE EXCAVATION MUST PROVIDE A FIRM, LEVEL BED FOR THE BASE SECTION TO REST UPON.
2. PIPES SHALL CONNECT TO THE SIDES OF THE INLETS. CONNECTIONS NOT TO BE MADE AT CORNERS OR BOTTOM.
3. PRECAST INLETS MUST BE APPROVED BY THE COUNTY ENGINEER.

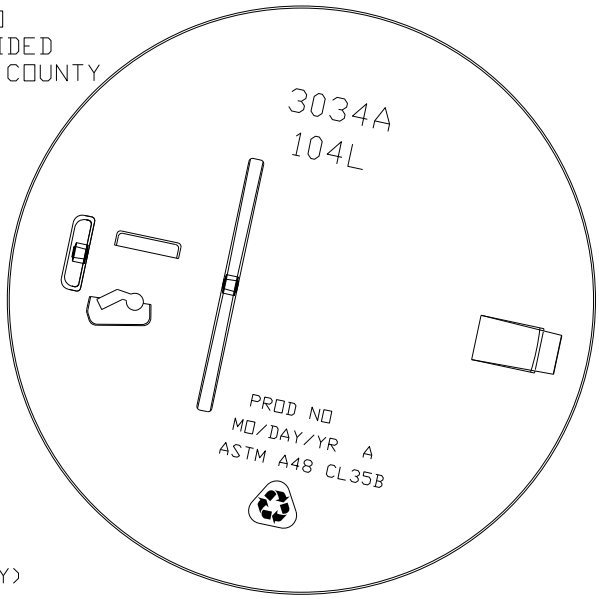
GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

PRECAST CURB INLET

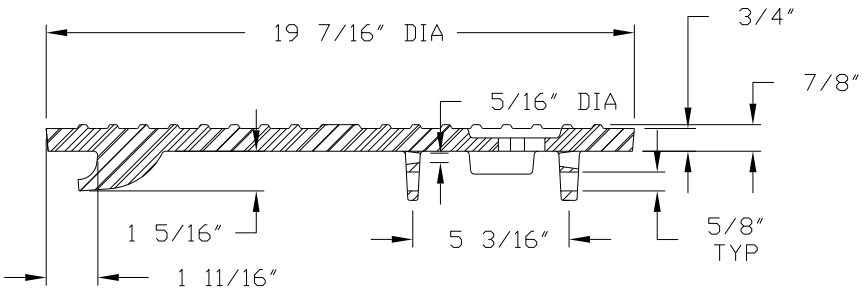
STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-D18

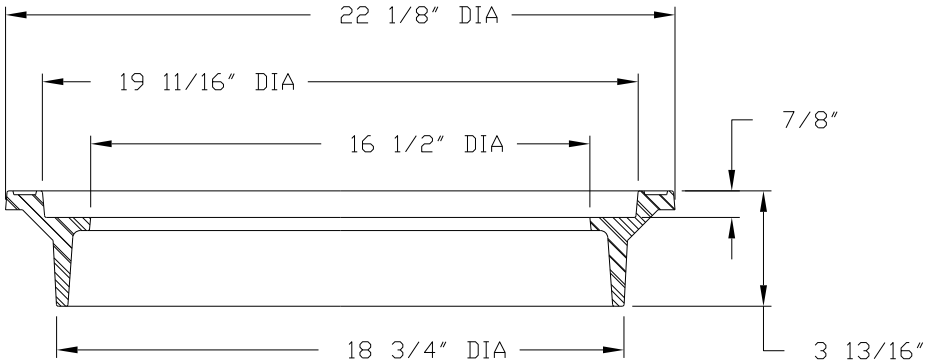




BOTTOM VIEW



COVER SECTION



FRAME SECTION

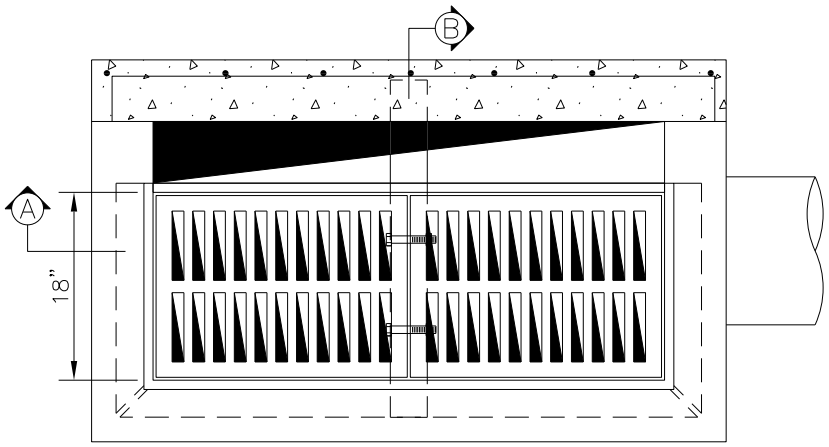
NOTE:
FRAME AND COVER SHALL BE EAST JORDAN IRON WORKS FRAME PRODUCT AND COVER PRODUCT #3034A OR APPROVED EQUAL AND SHALL BE GRAY CAST IRON CONFORMING TO ASTM A48-CL35B.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

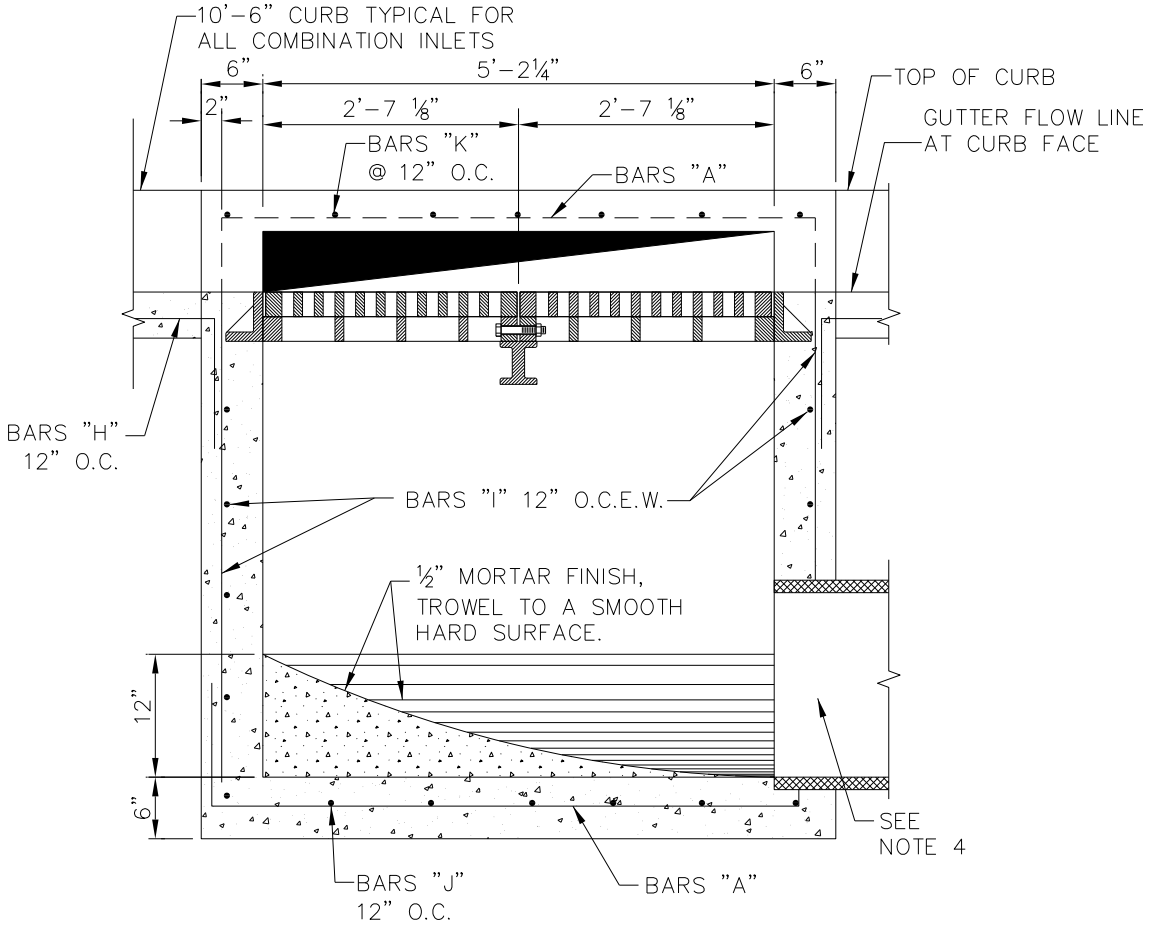
INLET
FRAME & COVER

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-D19



PLAN
NTS



SECTION A
NTS

NOTES:

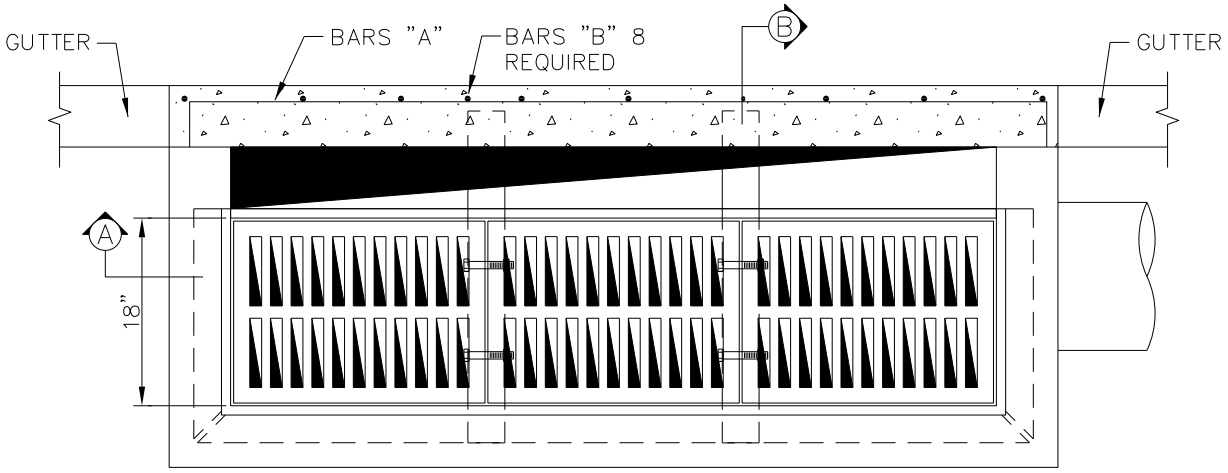
1. COMBINATION INLETS TO BE USED IN ALL ALLEYS WHERE INLETS ARE REQUIRED.
2. ALL LAPS AND EXTENSION OF REINFORCING BARS SHALL BE 36 BAR DIAMETERS UNLESS NOTED OTHERWISE.
3. TACK WELD GRATES IN PLACE.
4. PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER OR BOTTOM.
5. ALL CAST IRON FITTINGS SHALL BE DOMESTIC.
6. ALL FASTENERS SHALL BE GALVANIZED.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

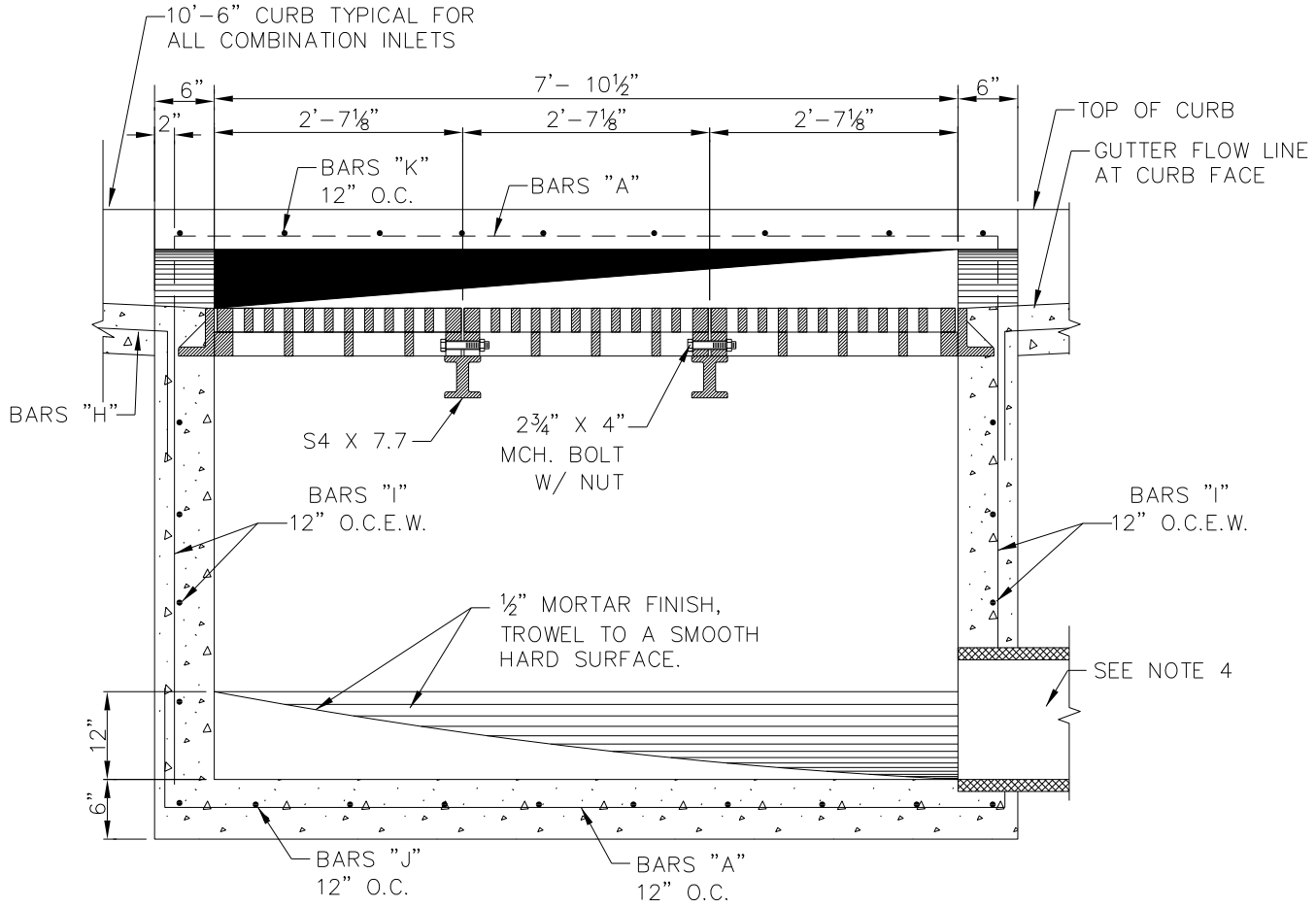
COMBINATION INLET
TWO GRATE INLET

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-D20



PLAN
NTS



SECTION A
NTS

NOTES:

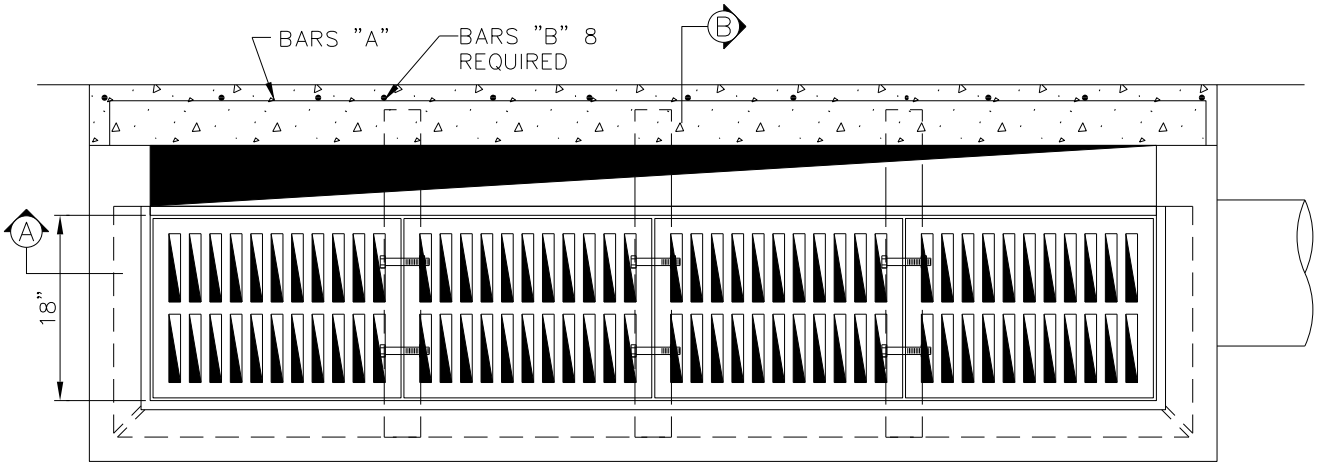
1. COMBINATION INLETS TO BE USED IN ALL ALLEYS WHERE INLETS ARE REQUIRED.
2. ALL LAPS AND EXTENSION OF REINFORCING BARS SHALL BE 36 BAR DIAMETERS UNLESS NOTED OTHERWISE.
3. TACK WELD GRATES IN PLACE.
4. PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER OR BOTTOM.
5. ALL CAST IRON FITTINGS SHALL BE DOMESTIC.
6. ALL FASTENERS SHALL BE GALVANIZED.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

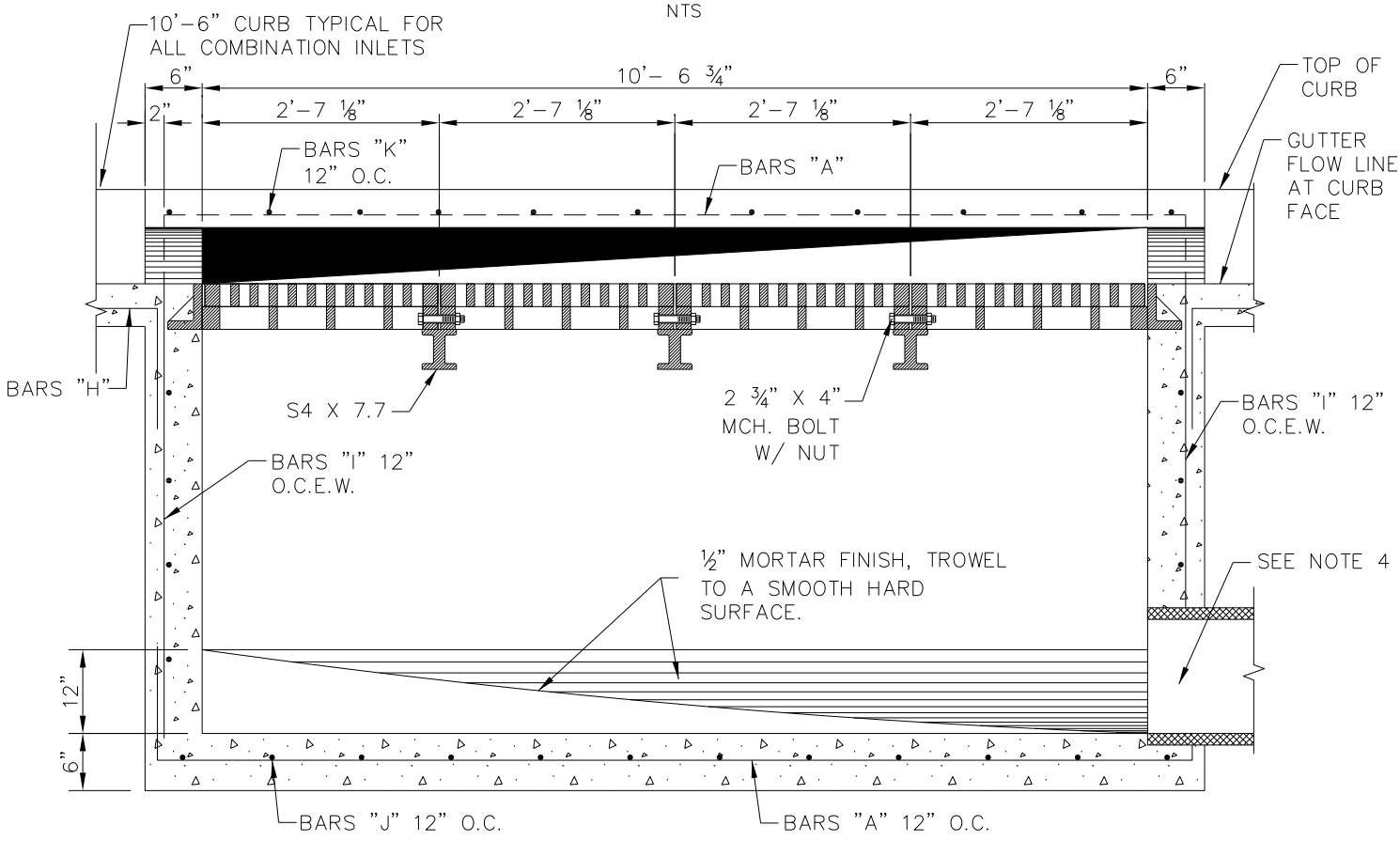
COMBINATION INLET
THREE GRATE INLET

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-D21



PLAN
NTS



SECTION A
NTS

NOTES:

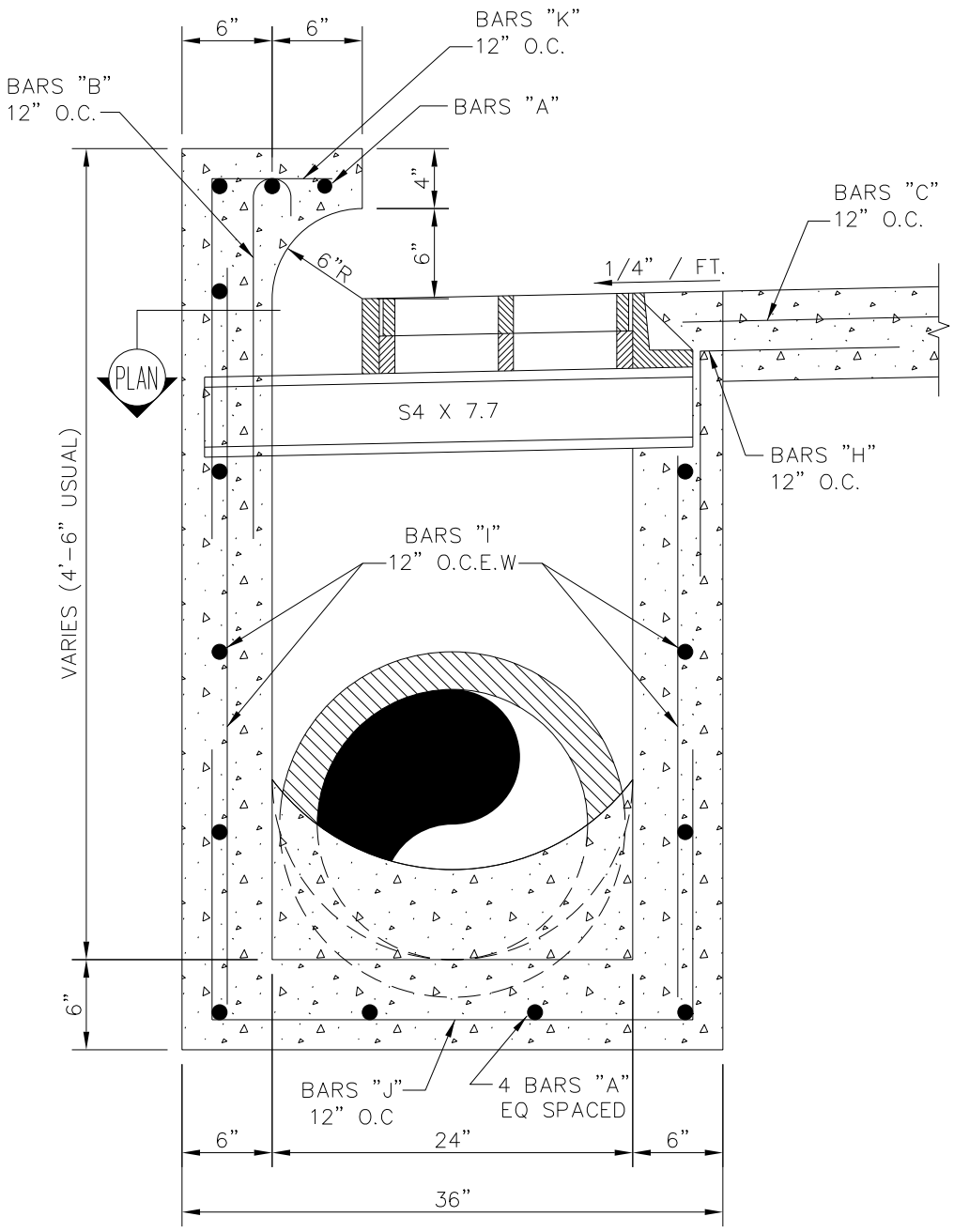
1. COMBINATION INLETS TO BE USED IN ALL ALLEYS WHERE INLETS ARE REQUIRED.
2. ALL LAPS AND EXTENSION OF REINFORCING BARS SHALL BE 36 BAR DIAMETERS UNLESS NOTED OTHERWISE.
3. TACK WELD GRATES IN PLACE.
4. PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER OR BOTTOM.
5. ALL CAST IRON FITTINGS SHALL BE DOMESTIC.
6. ALL FASTENERS SHALL BE GALVANIZED.
7. SECTION B SHOWN ON SD-D23.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

COMBINATION INLET
FOUR GRATE INLET

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-D22



SECTION B

NTS

NOTES:

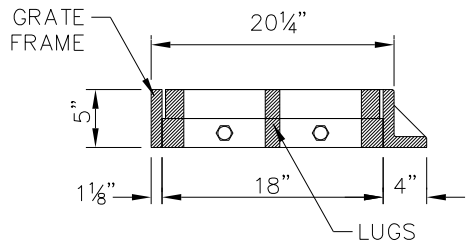
1. COMBINATION INLETS TO BE USED IN ALL ALLEYS WHERE INLETS ARE REQUIRED.
2. ALL LAPS AND EXTENSION OF REINFORCING BARS SHALL BE 36 BAR DIAMETERS UNLESS NOTED OTHERWISE.
3. TACK WELD GRATES IN PLACE.
4. PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER OR BOTTOM.
5. ALL CAST IRON FITTINGS SHALL BE DOMESTIC.
6. ALL FASTENERS SHALL BE GALVANIZED.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

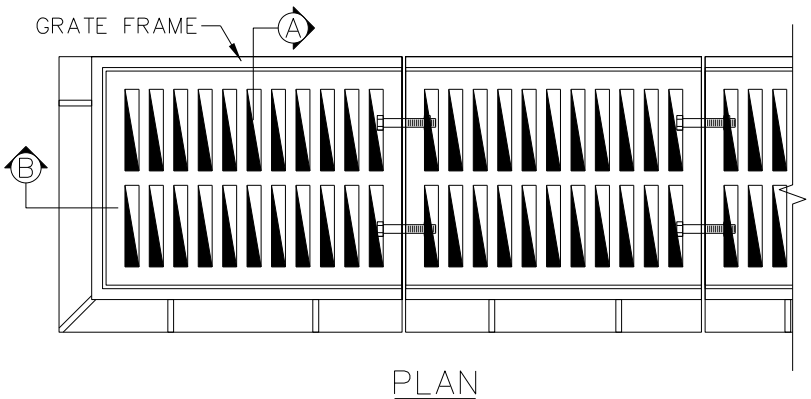
COMBINATION INLET – SECTION B TWO, THREE & FOUR GRATE INLETS

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-D23



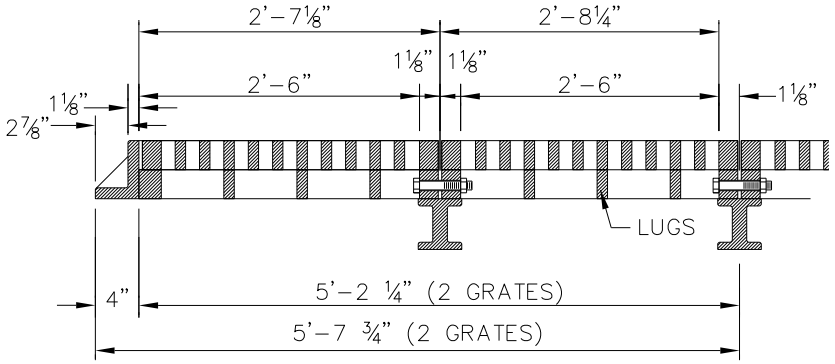
SECTION A
NTS



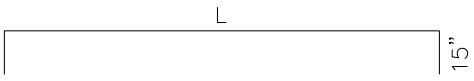
PLAN
NTS

NOTES:

1. ALL LAPS AND EXTENSION OF REINFORCING BARS SHALL BE 36 BAR IN DIAMETERS UNLESS NOTED OTHERWISE.
2. TACK WELD GRATES IN PLACE.
3. PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER OR BOTTOM.
4. GRATE AND FRAME SHALL BE PATTERN No. 814AS MANUFACTURED BY BASS & HAYES FOUNDRY, INC. OR APPROVED EQUAL.
5. ALL CAST IRON FITTINGS SHALL BE DOMESTIC.
6. ALL FASTENERS SHALL BE GALVANIZED.

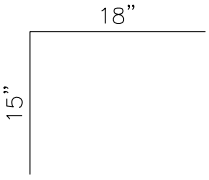


SECTION B
NTS



BARS "A" 5/8"ø

TWO GRATE INLET , L=5'-10 ¼"
THREE GRATE INLET , L=8'-6 ½"
FOUR GRATE INLET , L=11'-2 ¾"

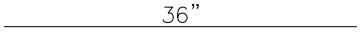


BARS "H" 5/8"ø

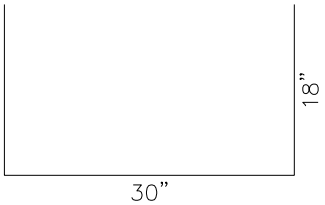
BARS "K" 5/8"ø

BARS "B" 5/8"ø

BARS "I" 5/8"ø



BARS "C" 3/8"ø



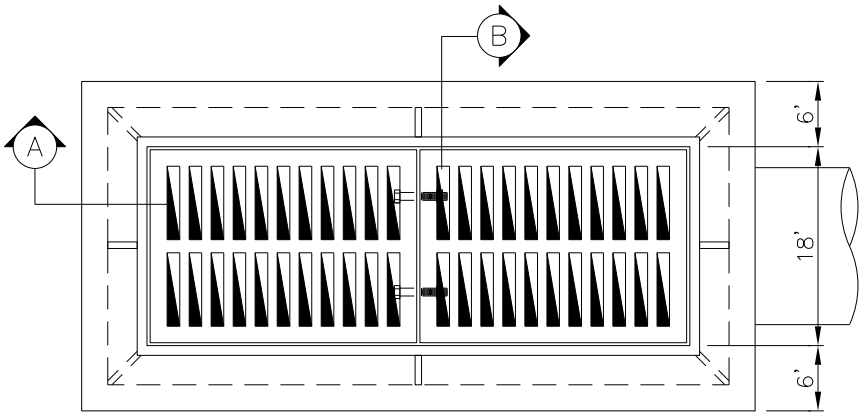
BARS "J" 5/8"ø

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

COMBINATION INLETS GRATE DETAILS AND BAR DIAGRAMS

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

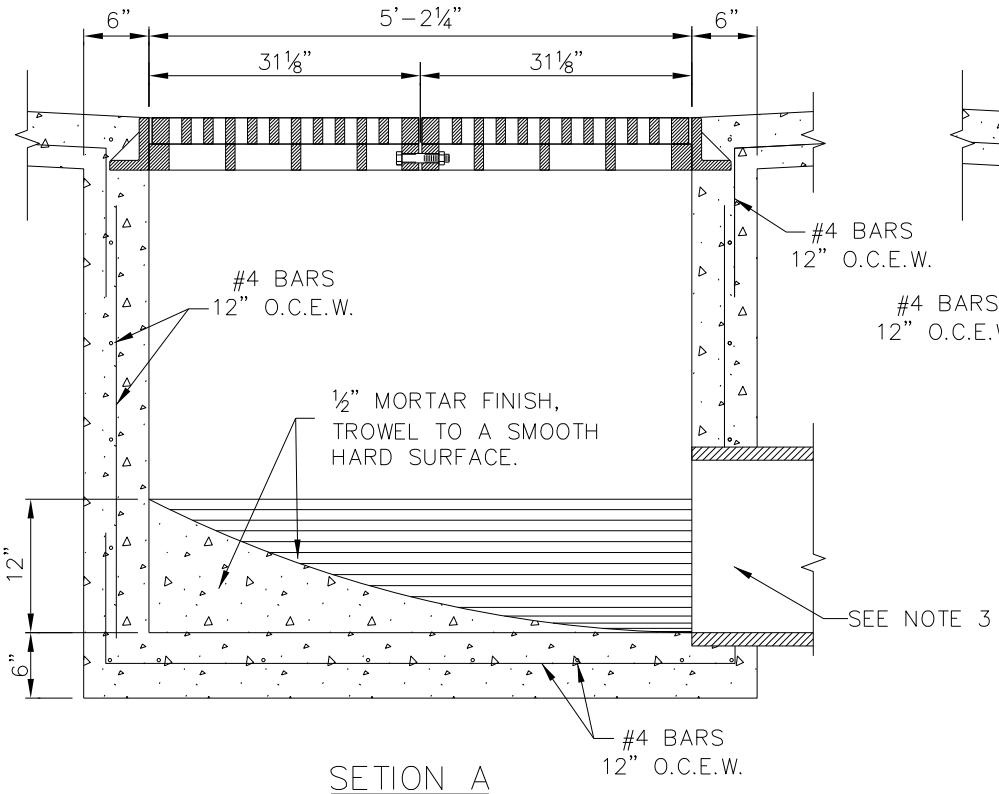
DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-D24



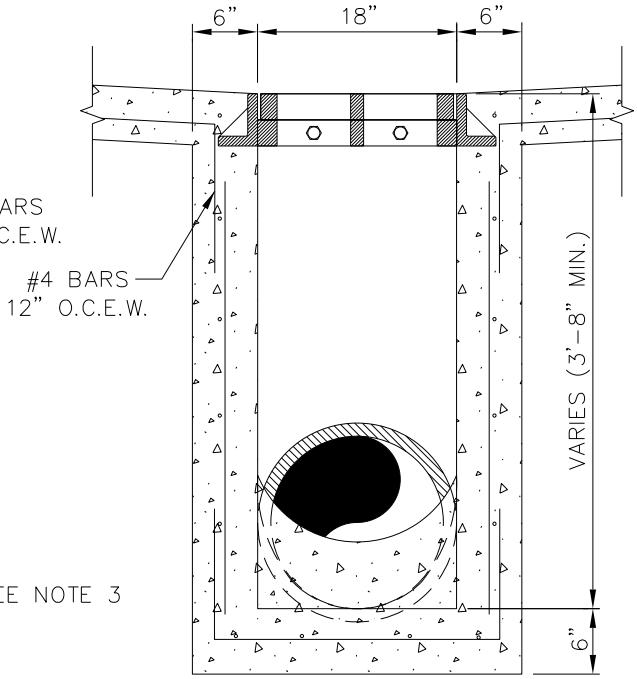
PLAN
NTS

NOTES:

1. ALL LAPS AND EXTENSION OF REINFORCING BARS SHALL BE 36 BAR DIAMETERS UNLESS NOTED OTHERWISE.
2. TACK WELD GRATES IN PLACE.
3. PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER OR BOTTOM.
4. ALL CAST IRON FITTINGS SHALL BE DOMESTIC.
5. ALL FASTENERS SHALL BE GALVANIZED.



SETION A
NTS



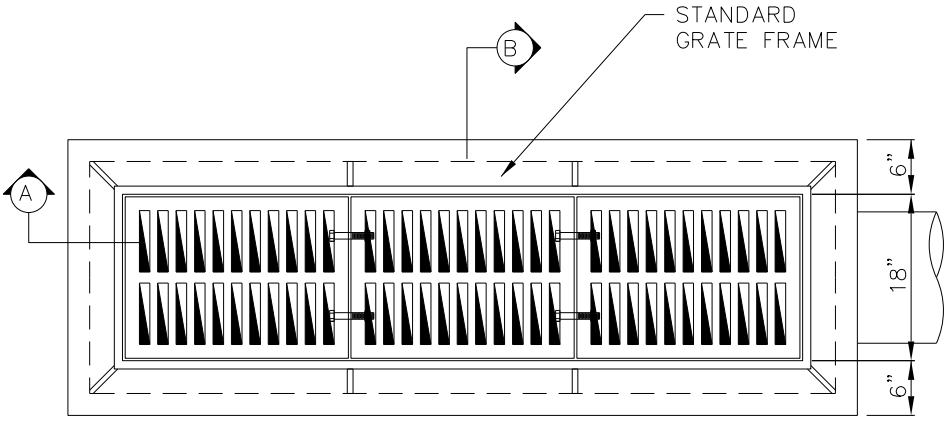
SECTION B
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

TWO GRATE INLET

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

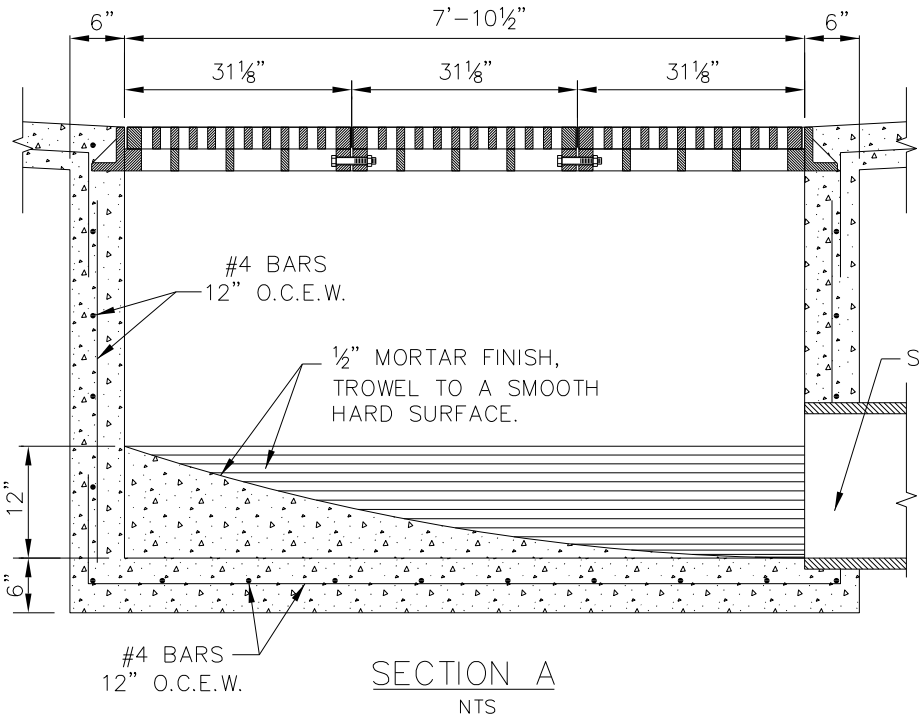
DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-D25



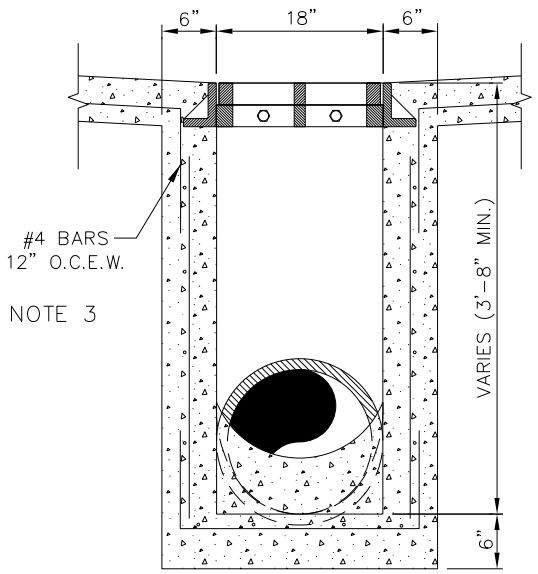
PLAN
NTS

NOTES:

1. ALL LAPS AND EXTENSION OF REINFORCING BARS SHALL BE 36 BAR DIAMETERS UNLESS NOTED OTHERWISE.
2. TACK WELD GRATES IN PLACE.
3. PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER OR BOTTOM.
4. ALL CAST IRON FITTINGS SHALL BE DOMESTIC.
5. ALL FASTENERS SHALL BE GALVANIZED.

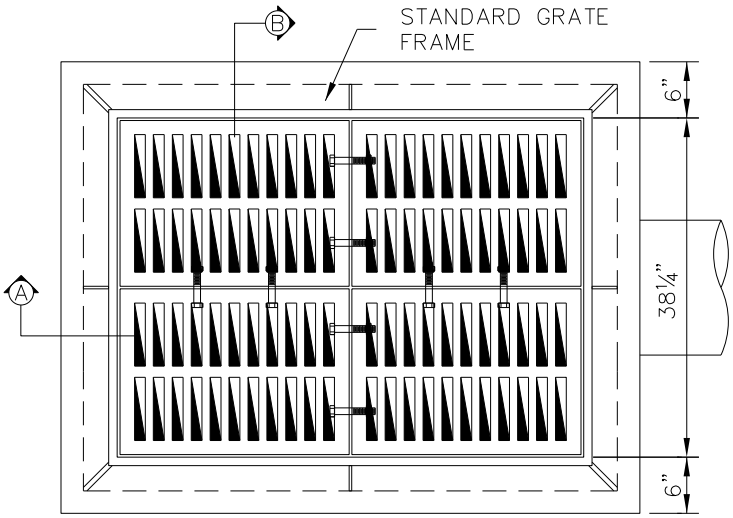


SECTION A
NTS



SECTION B
NTS

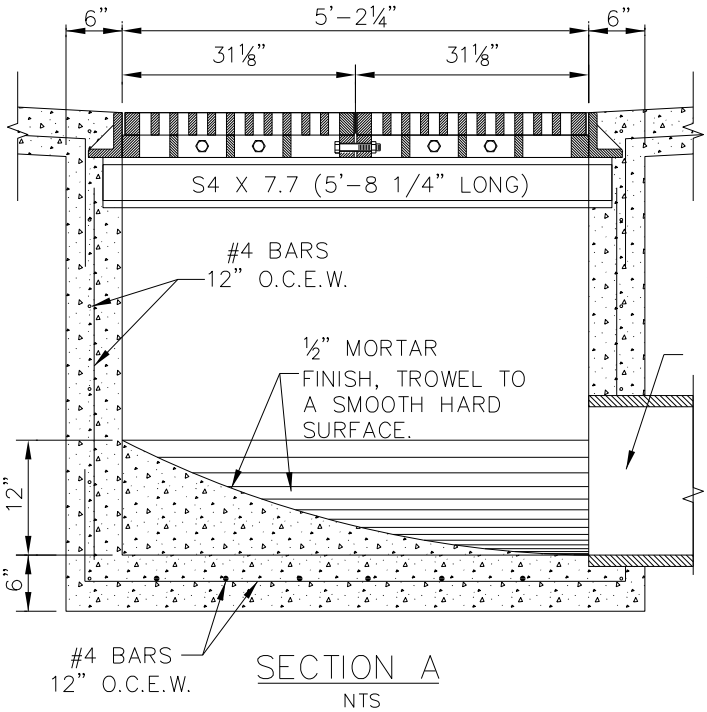
GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	THREE GRATE INLET	STANDARD CONSTRUCTION DETAILS STORM DRAINAGE
		DATE: FEB, 2021 / REV DATE: – / SHEET: SD-D26



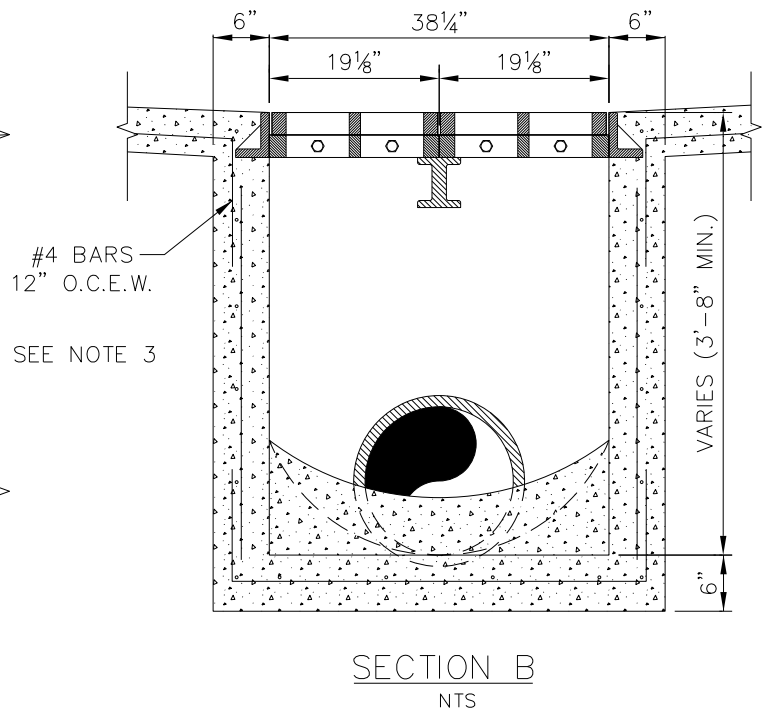
PLAN
NTS

NOTES:

1. ALL LAPS AND EXTENSION OF REINFORCING BARS SHALL BE 36 BAR DIAMETERS UNLESS NOTED OTHERWISE.
2. TACK WELD GRATES IN PLACE.
3. PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER OR BOTTOM.
4. ALL CAST IRON FITTINGS SHALL BE DOMESTIC.
5. ALL FASTENERS SHALL BE GALVANIZED.

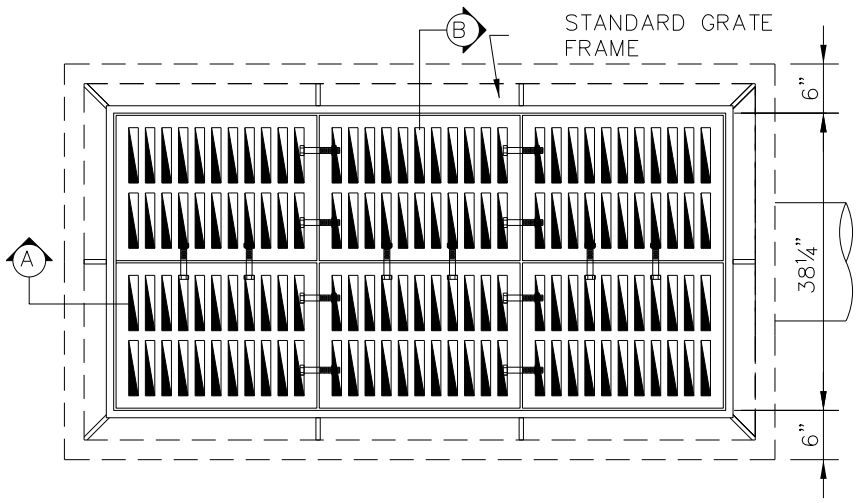


SECTION A
NTS



SECTION B
NTS

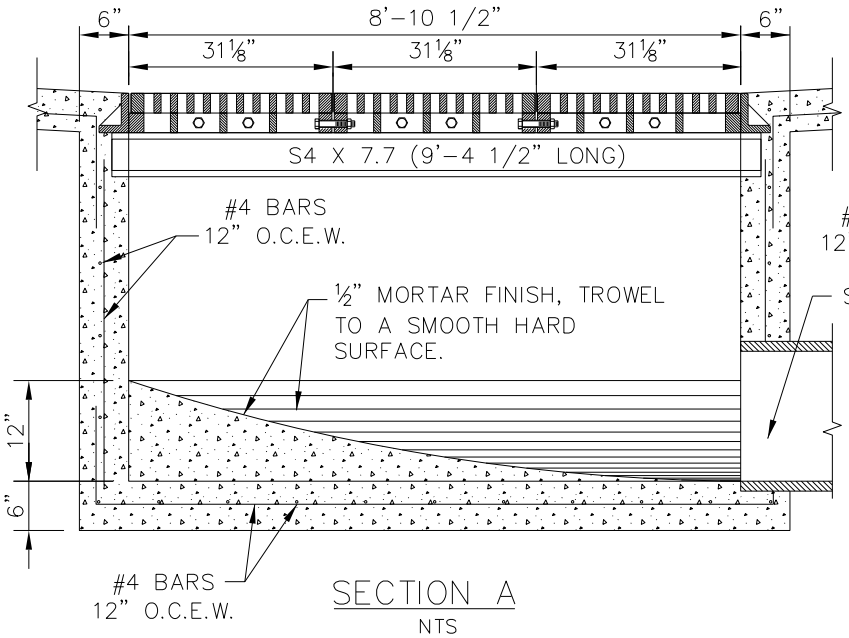
GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	FOUR GRATE INLET	STANDARD CONSTRUCTION DETAILS STORM DRAINAGE
		DATE: FEB, 2021 / REV DATE: – / SHEET: SD-D27



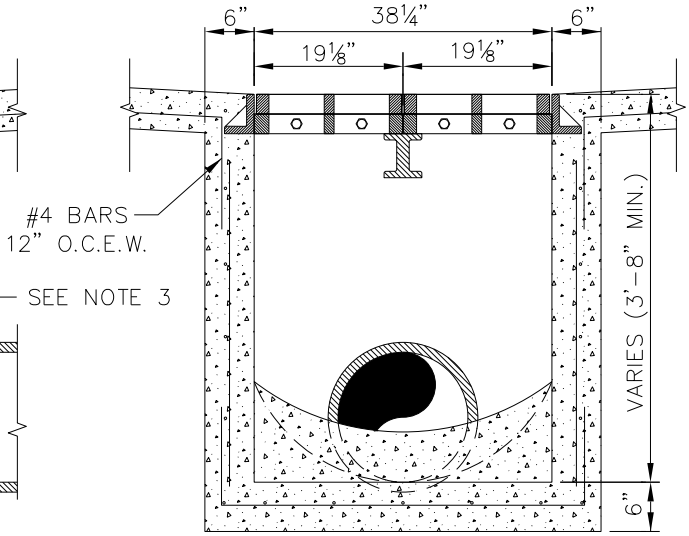
PLAN
NTS

NOTES:

1. ALL LAPS AND EXTENSION OF REINFORCING BARS SHALL BE 36 BAR DIAMETERS UNLESS NOTED OTHERWISE.
2. TACK WELD GRATES IN PLACE.
3. PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER OR BOTTOM.
4. ALL CAST IRON FITTINGS SHALL BE DOMESTIC.
5. ALL FASTENERS SHALL BE GALVANIZED.

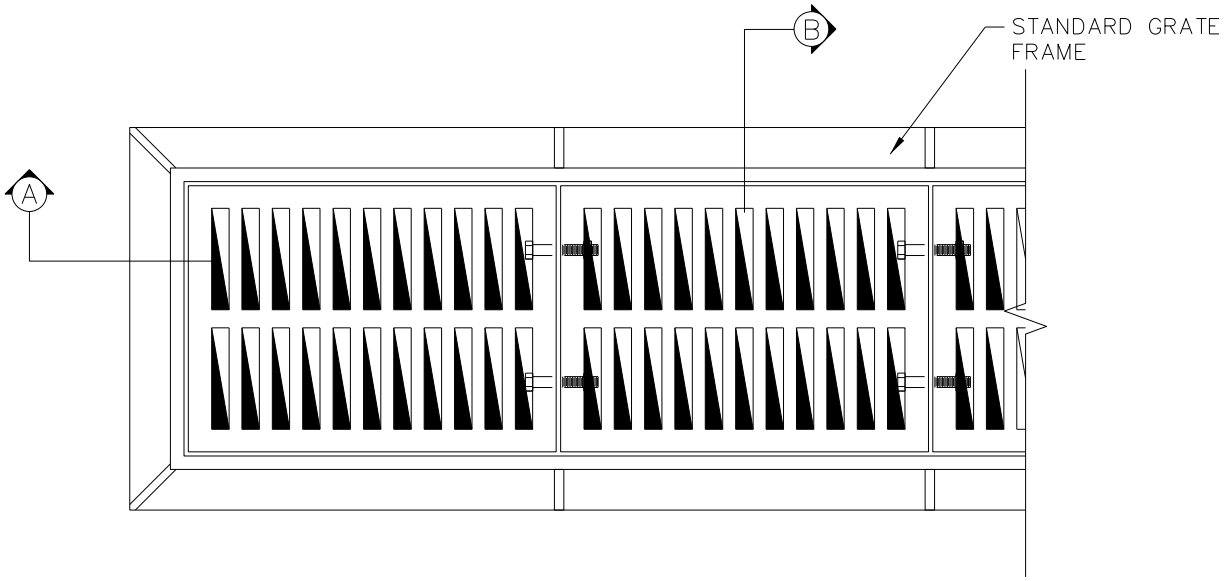


SECTION A
NTS

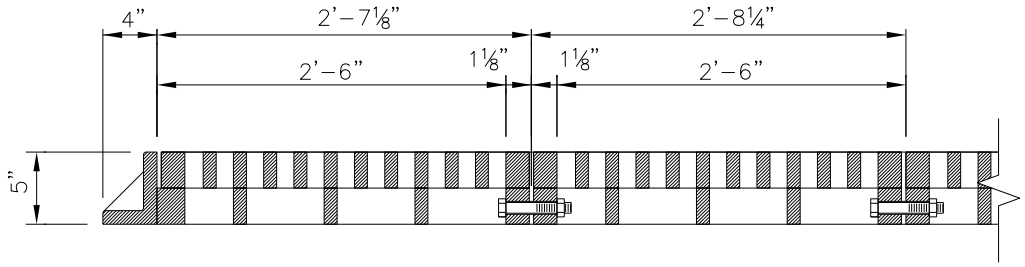


SECTION B
NTS

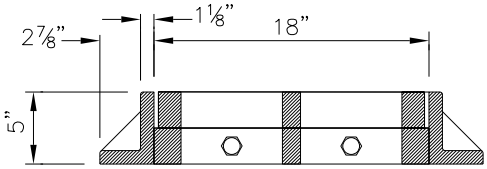
GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	SIX GRATE INLET	STANDARD CONSTRUCTION DETAILS STORM DRAINAGE
		DATE: FEB, 2021 / REV DATE: – / SHEET: SD–D28



PLAN
NTS



SECTION A
NTS



SECTION B
NTS

NOTES:

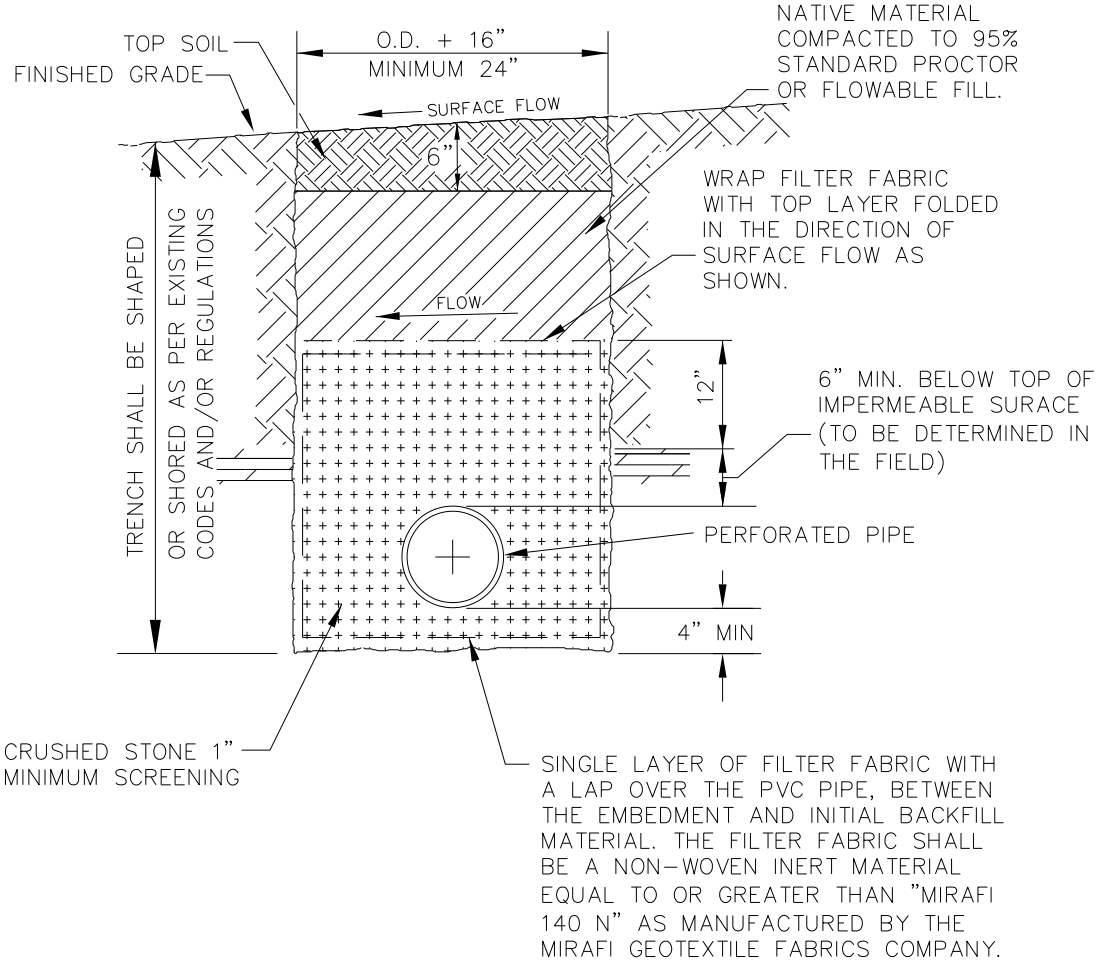
1. GRATE AND FRAME SHALL BE PATTERN No. 814 AS MANUFACTURED BY BASS AND HAYES FOUNDRY OR APPROVED EQUAL.
2. ALL CAST IRON FITTINGS SHALL BE DOMESTIC.
3. ALL FASTENERS SHALL BE GALVANIZED.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

GRATE DETAIL

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-D29



GENERAL NOTES:

1. THE SUBSURFACE DRAINAGE SYSTEM SHALL BE CONSTRUCTED WITH A MINIMUM SIZE OF SIX (6) INCH DIAMETER TYPE PS-46 PVC PIPE OR APPROVED EQUAL. THE PIPE SHALL MEET ALL CURRENT ASTM F758 REQUIREMENTS, AND SHALL HAVE GASKET TYPE JOINTS. THE PERFORATED AND CONDUCTING PIPES SHALL BE WHITE IN COLOR.

2. THE FINAL BACKFILL SHALL CONSIST OF AND BE PLACED IN ACCORDANCE WITH THE TXDOT ITEM 400.

3. CLEANOUTS SHALL BE INSTALLED EVERY 200' AND AT THE END OF EACH PIPING SYSTEM.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

SUBSURFACE DRAIN

STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

DATE:	REV DATE:	SHEET:
FEB, 2021	-	SD-D30

STANDARD CONSTRUCTION DETAILS

TRAFFIC

FEBRUARY 2021

GRAYSON COUNTY

DEVELOPMENT SERVICES DEPARTMENT

100 W HOUSTON ST

SHERMAN, TX 75090

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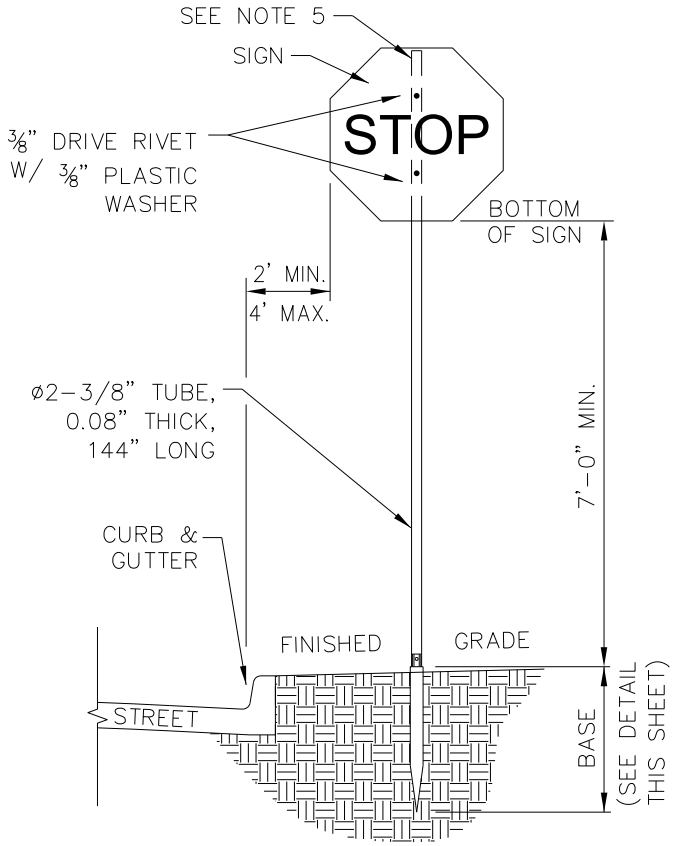
TRAFFIC

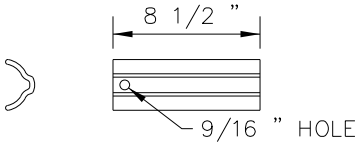


TYPICAL POST DETAIL

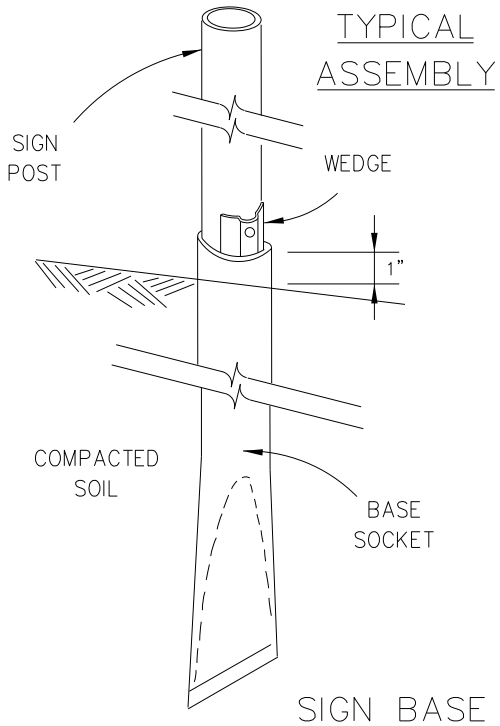
NTS

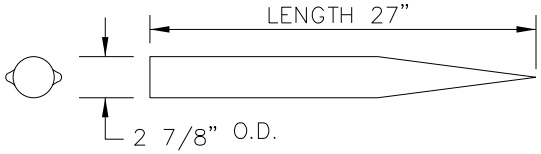
TRAFFIC CONTROL NOTES:

1. ALL SIGNAGE, BARRICADES, AND PAVEMENT MARKINGS SHALL BE IN ACCORDANCE WITH THE LATEST REVISIONS OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (LATEST VERSION) AND THE STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (LATEST VERSION).
2. LOCATIONS SHOWN FOR SIGNAGE AND PAVEMENT MARKINGS ARE APPROXIMATE; FINAL LOCATIONS MAY CHANGE DUE TO POST CONSTRUCTION CONDITIONS AND PRESENCE OF OTHER PHYSICAL FEATURES. FINAL LOCATION OF ALL TRAFFIC CONTROL DEVICES SHALL BE FIELD VERIFIED WITH THE COUNTY ENGINEER PRIOR TO INSTALLATION.
3. ALL SIGNS SHALL BE HIGH INTENSITY AND THE SIZES SHALL BE STANDARD UNLESS OTHERWISE NOTED.
4. ALL SIGNS, POSTS, AND MATERIALS SHALL BE INSTALLED PER DETAILS IN THIS MANUAL.
5. FOR STOP SIGNS THAT WILL ACCEPT FUTURE STREET SIGNS, EXTEND POST ABOVE THE STOP SIGN SO THAT 2 HOLES ARE AVAILABLE FOR MOUNTING. FOR ALL OTHERS, POST SHALL NOT EXTEND ABOVE THE SIGN.
6. CHANGES TO TYPICAL SIGN POST LOCATION MADE AT ENGINEER'S DISCRETION.

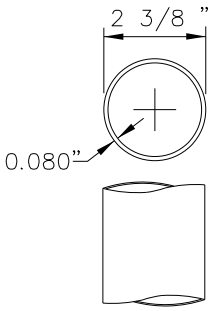


WEDGE





BASE SOCKET



SIGN POST

SIGN BASE DETAIL IN TURF

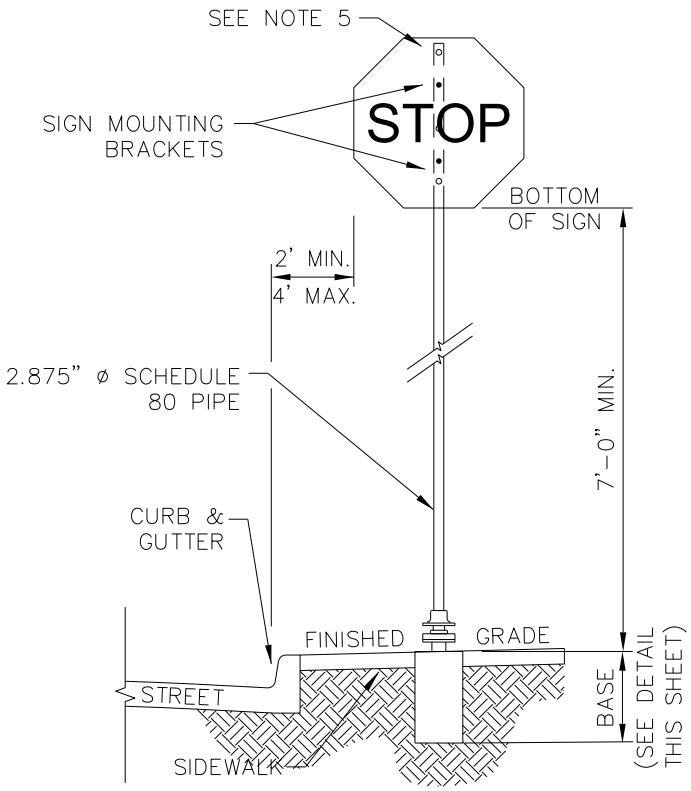
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

SIGN POST IN TURF DETAIL

STANDARD CONSTRUCTION DETAILS
TRAFFIC

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-T01



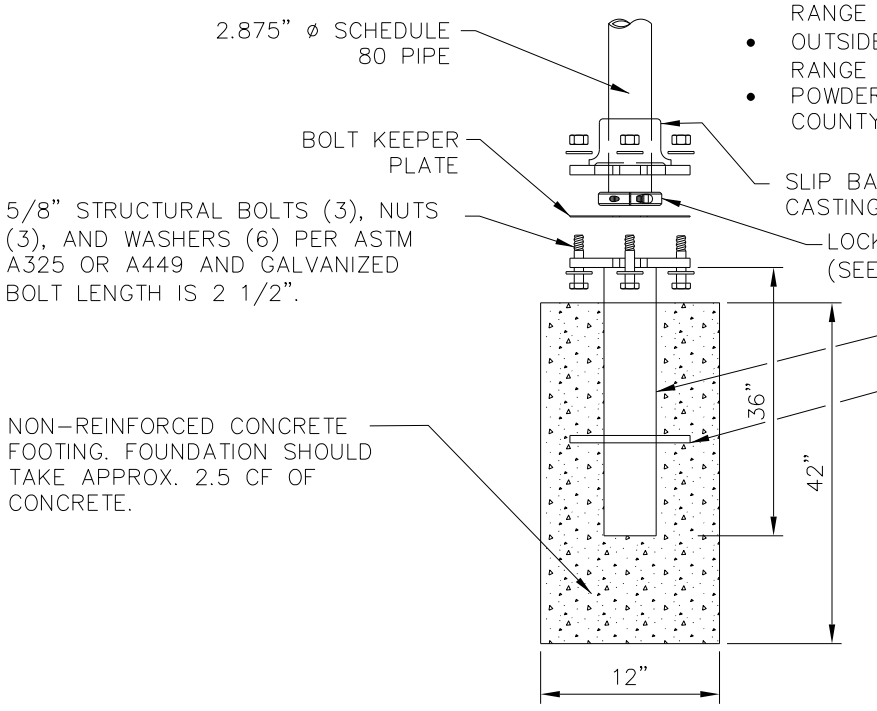
TYPICAL POST DETAIL
NTS

TRAFFIC CONTROL NOTES:

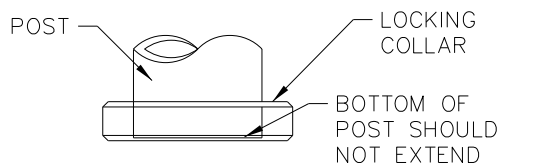
1. ALL SIGNAGE, BARRICADES, AND PAVEMENT MARKINGS SHALL BE IN ACCORDANCE WITH THE LATEST REVISIONS OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (LATEST VERSION) AND THE STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (LATEST VERSION).
2. LOCATIONS SHOWN FOR SIGNAGE AND PAVEMENT MARKINGS ARE APPROXIMATE; FINAL LOCATIONS MAY CHANGE DUE TO POST CONSTRUCTION CONDITIONS AND PRESENCE OF OTHER PHYSICAL FEATURES. FINAL LOCATION OF ALL TRAFFIC CONTROL DEVICES SHALL BE FIELD VERIFIED WITH THE COUNTY ENGINEER PRIOR TO INSTALLATION.
3. ALL SIGNS SHALL BE HIGH INTENSITY AND THE SIZES SHALL BE STANDARD UNLESS OTHERWISE NOTED.
4. ALL SIGNS, POSTS, AND MATERIALS SHALL BE INSTALLED PER DETAILS IN THIS MANUAL.
5. FOR STOP SIGNS THAT WILL ACCEPT FUTURE STREET SIGNS, EXTEND POST ABOVE THE STOP SIGN SO THAT 2 HOLES ARE AVAILABLE FOR MOUNTING. FOR ALL OTHERS, POST SHALL NOT EXTEND ABOVE THE SIGN.
6. CHANGES TO TYPICAL SIGN POST LOCATION MADE AT ENGINEER'S DISCRETION.

SPECIFICATIONS FOR SCHEDULE 80 PIPE (2.875" OUTSIDE DIAMETER)

- 0.267" NOMINAL WALL THICKNESS
- STEEL TUBING PER ASTM A500 Gr C
- OTHER SEAMLESS OR ELECTRIC-RESISTANCE WELDED STEEL TUBING OR PIPE WITH EQUIVALENT
- OUTSIDE DIAMETER AND WALL THICKNESS MAY BE USED IF THEY MEET THE FOLLOWING:
  - 46,000 PSI MINIMUM YIELD STRENGTH
  - 62,000 PSI MINIMUM TENSILE STRENGTH
  - 21% MINIMUM ELONGATION IN 2"
- WALL THICKNESS (UNCOATED) SHALL BE WITHIN THE RANGE OF 0.248" TO 0.304"
- OUTSIDE DIAMETER (UNCOATED) SHALL BE WITHIN THE RANGE OF 2.855" TO 2.895"
- POWDER COATED FINISH, COLOR TO BE SELECTED BY THE COUNTY ENGINEER



SIGN BASE DETAIL
NTS



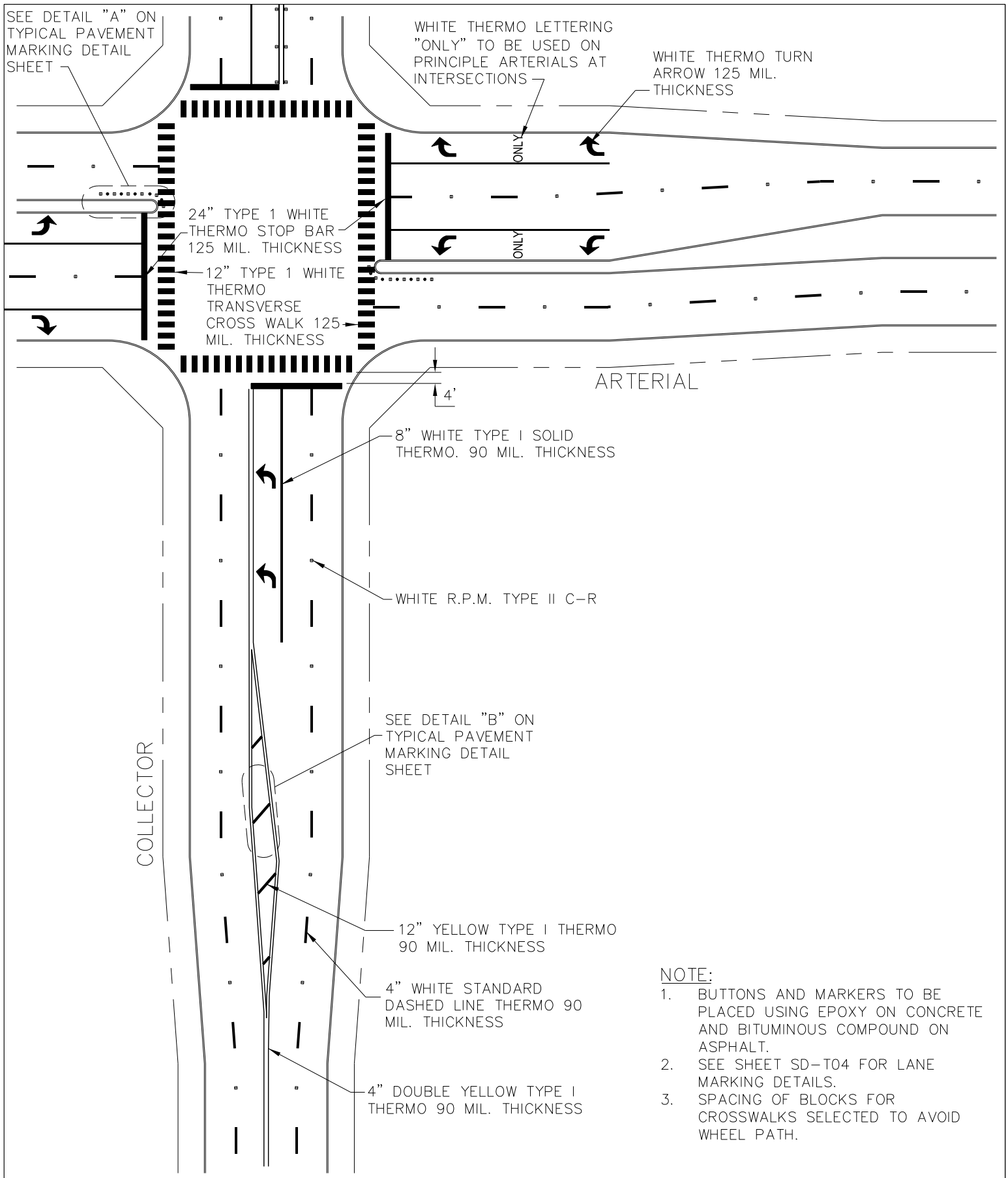
DETAIL A
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

SIGN POST IN SIDEWALK DETAIL

STANDARD CONSTRUCTION DETAILS
TRAFFIC

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-T02



NOTE:

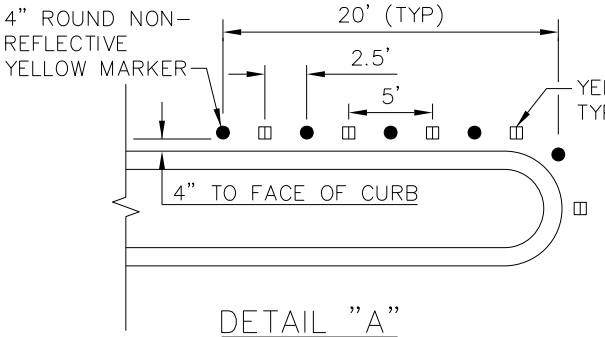
1. BUTTONS AND MARKERS TO BE PLACED USING EPOXY ON CONCRETE AND BITUMINOUS COMPOUND ON ASPHALT.
2. SEE SHEET SD-T04 FOR LANE MARKING DETAILS.
3. SPACING OF BLOCKS FOR CROSSWALKS SELECTED TO AVOID WHEEL PATH.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

TYPICAL PAVMENT MARKING LAYOUT

STANDARD CONSTRUCTION DETAILS
TRAFFIC

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-T03



DETAIL "A"
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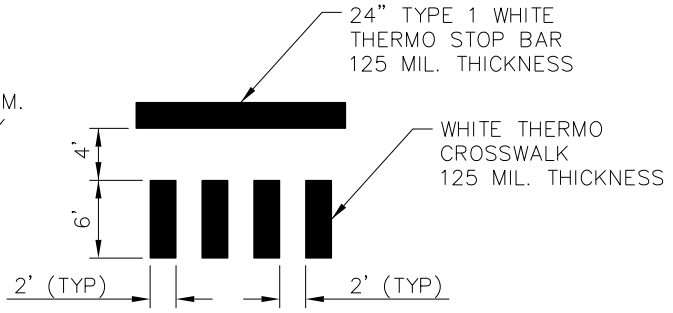
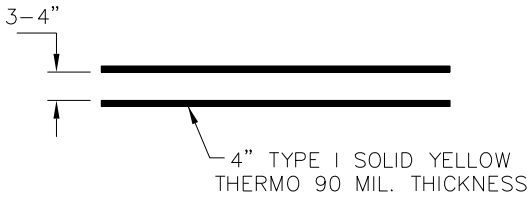
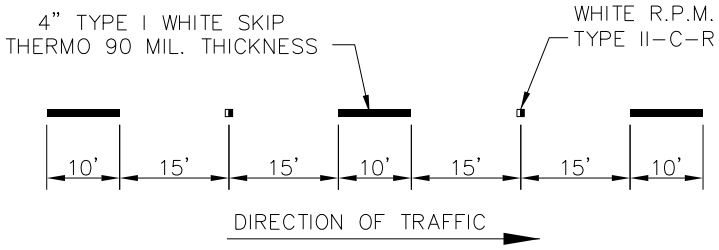


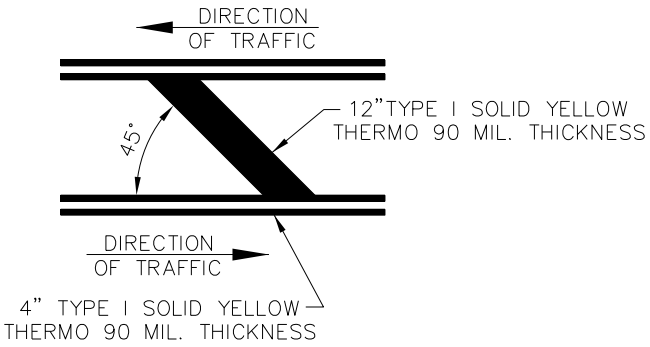
CROSSWALK STRIPING LAYOUT
NTS



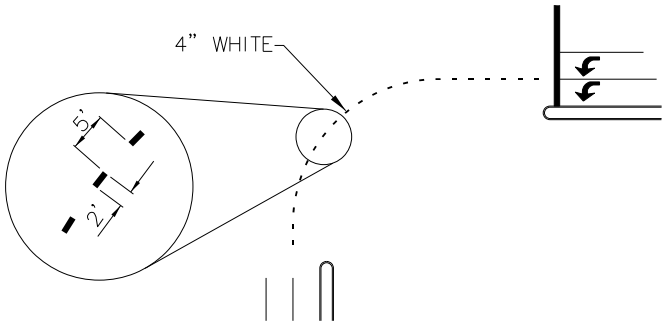
STANDARD DOUBLE YELLOW LINE
NTS



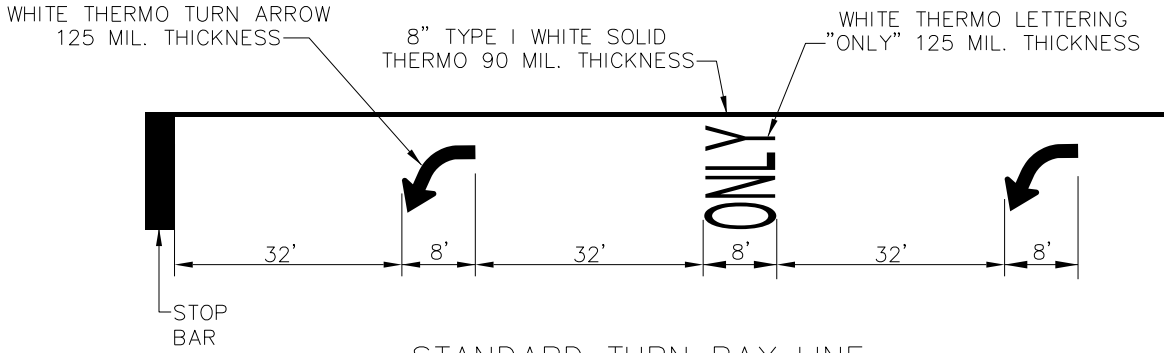
STANDARD DASHED LINE
NTS



DETAIL "B"
NTS



"PUPPY TRACK" MARKING LAYOUT
NTS



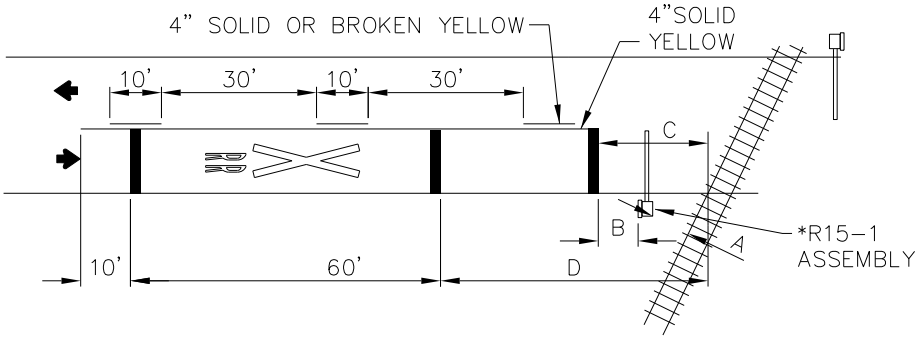
STANDARD TURN BAY LINE
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

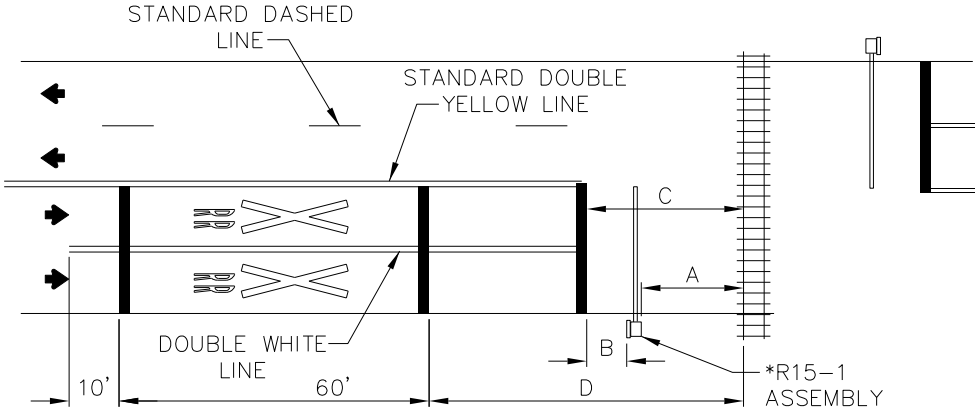
TYPICAL PAVMENT MARKING DETAILS

STANDARD CONSTRUCTION DETAILS
TRAFFIC

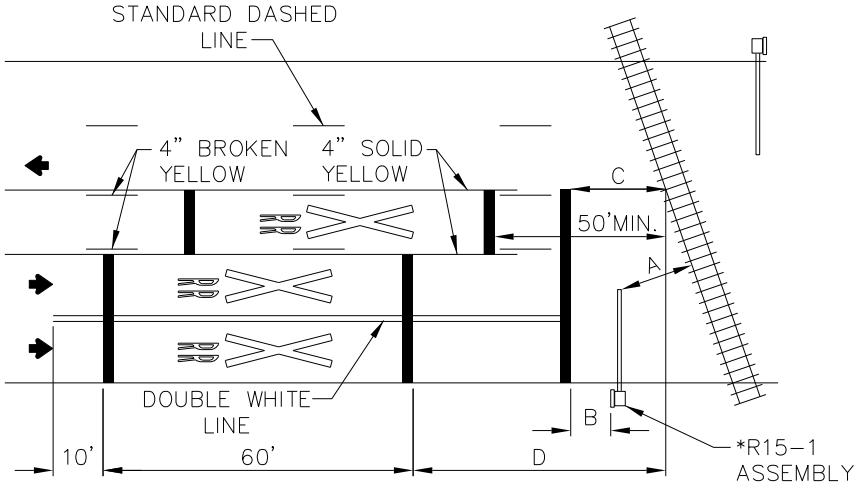
DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-T04



TWO LANE, TWO-WAY



UNDIVIDED MULTILANE ROADWAY



TWO-WAY LEFT TURN LANE (TWLTL)

A = 12 FEET MIN., 15 FEET USUAL. IF AUTOMATIC GATES ARE PRESENT DISTANCE "A" SHOULD BE MEASURED FROM NEAREST EDGE OF AUTOMATIC GATES TO RAILS.

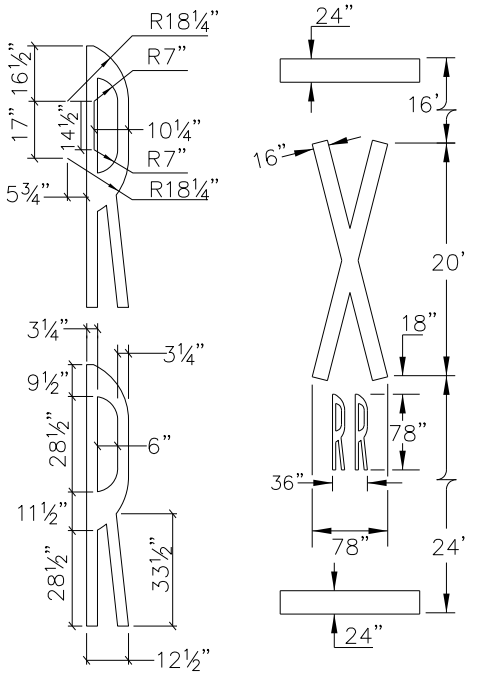
B = STOP LINES SHOULD BE PLACED ON 8 FOOT MIN. DISTANCE IN ADVANCE OF R15-1.

C = 15 FEET DESIRABLE MINIMUM. R15-1 SHOULD BE PLACED BETWEEN STOP LINE AND RAILS WITH ADEQUATE DISTANCE PROVIDED FOR "A".

D =

APPROACH SPEED (MPH)	DESIREABLE PLACEMENT
30	50'MIN (90' USUAL)
35	70'-170'
40	150'-250'
45	235'-335'
50	315'-415'
55	400'-UP (500' USUAL)

*R15-1 ASSEMBLY
MAY CONSIST OF R15-1 AND/OR R15-2, TYPE A, TYPE E OR TYPE F ASSEMBLY.



RAILROAD CROSSING MARKINGS

GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	RAILROAD CROSSING MARKINGS	STANDARD CONSTRUCTION DETAILS TRAFFIC	
		DATE: FEB, 2021	REV DATE: -	SHEET: SD-T05

STANDARD CONSTRUCTION DETAILS

UTILITIES TRENCHLINE & STREET RESTORATION

FEBRUARY 2021

GRAYSON COUNTY

DEVELOPMENT SERVICES DEPARTMENT

100 W HOUSTON ST

SHERMAN, TX 75090

TABLE OF CONTENTS

STREET RESTORATION FOR UTILITIES

I. GENERAL NOTES

A. PERMISSION TO CUT, BORE OR EXCAVATE GRAYSON COUNTY STREETS FOR UTILITY SERVICE INSTALLATION MUST BE GRANTED BY THE GRAYSON COUNTY COMMISSIONERS COURT PRIOR TO ANY WORK.

B. FOLLOWING GRANTING OF PERMISSION TO MAKE ANY STREET CUT OR EXCAVATION FOR UTILITY WORK, AND AT THE TIME THE WORK BEGINS, THE RESPONSIBILE ENTITY OR ITS CONTRACTOR MUST PROPERLY BACKFILL AND REPAIR THE STREET SURFACE WITHIN TEN CALENDAR DAYS.

C. ALL EXPENSES OF THE INSTALLATION AND REPAIR OF THE STREET, ALLEY, OR PUBLIC RIGHT-OF-WAY SHALL BE BORNE BY THE ENTITY GRANTED PERMISSION TO PERFORM THE WORK BY GRAYSON COUNTY.

D. ALL DAMAGE TO THE STREET RESULTING FROM CUTTING THE PAVEMENT AND/OR EXCAVATION OF, OR BORING WILL BE THE RESPONSIBILITY OF THE ENTITY GRANTED PERMISSION TO PERFORM THE WORK.

E. ANY TRAFFIC CONTROL DEVICES WHICH ARE AFFECTED BY ANY WORK DONE IN THE ROADWAY SHALL BE REPAIRED OR REPLACED IN CONFORMANCE WITH CRITERIA SET FORTH IN THE TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) AND GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT.

F. THE TRAVELLING PUBLIC SHALL BE PROTECTED BY THE PROPER USE OF WARNING SIGNS AND/OR LIGHTED SIGNALS BOTH DAY AND NIGHT UNTIL THE STREET IS FULLY REPAIRED. WARNING SIGNS AND SIGNALS SHALL BE INSTALLED BY AND AT THE EXPENSE OF THE RESPONSIBLE ENTITY IN ACCORDANCE WITH SPECIFICATIONS SET FORTH IN THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AND ALL OTHER REQUIREMENTS SPECIFIED BY THE GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT.

G. ANY MATERIALS AND/OR EQUIPMENT USED AS A RESULT OF UTILITY INSTALLATION OR REPAIR SHALL BE REMOVED FROM THE THROUGH LANES BETWEEN THE HOURS OF 4:30 P.M. AND 8:00 A.M. EACH DAY, UNLESS AN EXCEPTION HAS BEEN GRANTED BY THE GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT.

H. ALL SURFACES NOT INCLUDED IN THE UTILITY CUT/EXCAVATION SHALL BE PROTECTED AND KEPT CLEAN BY THE RESPONSIBLE ENTITY OR ITS CONTRACTOR, AND IF DAMAGED, REPLACED TO THE SATISFACTION OF THE GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT.

I. ALL DISTURBED PORTIONS OF THE RIGHT-OF-WAY WHICH ARE NOT PAVED WITH CONCRETE OR ASPHALT SHALL BE RESTORED TO THEIR ORIGINAL CONDITION, INCLUDING GRASS, TREES, SHRUBS, IRRIGATION SYSTEMS, HANDICAP RAMPS, SIDEWALKS, TRAILS, AND BIKEWAYS.

J. WHERE 100 LINEAL FEET OR MORE OF CURB AND/OR GUTTER ARE TO BE REPLACED, PLANS AND SPECIFICATIONS SHALL BE SUBMITTED AND APPROVED BY THE COUNTY ENGINEER.

K. THE CUT OR EXCAVATION PROJECT SHALL BE LIMIITED TO THE LOCATION, SIZE, AND SCOPE OF WORK AS ORIGINALLY PERMITTED BY THE GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT.

L. THE ENTITY RESPONSIBLE FOR THE PROJECT SHALL MAINTAIN THE CUT OR EXCAVATION, AFTER FINAL INSPECTION BY THE GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT, FOR TWO YEARS AND SHALL GUARANTEE TO REPAIR OR REPLACE ANY DEFECTIVE WORK.

M. REFER TO GRAYSON COUNTY REGULATIONS (POLICY, PROCEDURES AND SPECIFICATIONS OF GRAYSON COUNTY, TEXAS FOR THE INSTALLATION OF DRIVEWAY CULVERTS, ROAD BORES, USE OF HEAVY EQUIPMENT AND UTILITY LINES WITHIN GRAYSON COUNTY ROAD RIGHT-OF-WAY).

II. UTILITY CUT REQUIREMENT

A. ALL PAVEMENT REMOVALS SHALL BE IN STRAIGHT LINES. CUTS SHALL BE NEAT RECTANGULAR OR TRAPEZOIDAL IN SHAPE, AND EDGES SHALL BE PARALLEL AND PERPENDICULAR OR SKEWED UP TO 45° FROM PERPENDICULAR TO THE TRAFFIC FLOW. IRREGULAR SHAPED CUTS WITH MORE THAN FOUR SIDES OR CUTS WITHIN EXISTING PATCHES WILL NOT BE ALLOWED.

B. CUTS SHALL BE MADE WITH A WHEEL CUTTING SAW, CUTTING ABRASIVE WATER JET, ROTOTILLING OR AN APPROVED METHOD WHICH ASSURES A STRAIGHT EDGE.

C. TRENCH EXCAVATION, SHORING, AND STOCKPILING SHALL BE IN STRICT COMPLIANCE WITH OSHA, STATE OF TEXAS, AND GRAYSON COUNTY STANDARD CONSTRUCTION DETAILS. ALL TRENCH EXCAVATIONS SHALL BE MADE BY OPEN CUT TO THE DEPTH REQUIRED TO CONSTRUCT OR REPAIR THE FACILITY AND ADEQUATELY BRACED.

D. THE LENGTH OF TRENCH PERMITTED TO BE OPEN MAY BE LIMITED WHEN, IN THE OPINION OF THE COUNTY ENGINEER, SUCH LIMITATION IS NECESSARY FOR SAFETY AND CONVENIENCE OF THE PUBLIC.

III. BACKFILL REQUIREMENTS

A. THE TOP 4" OF THE CUT SHALL BE BACKFILLED WITH A SUITABLE BASE ROCK MATERIAL IF THE ASPHALT SURFACE IS NOT IMMEDIATELY REPLACED.

B. CUTS FILLED WITH FLOWABLE BACKFILL SHALL BE BRIDGED WITH STEEL STREET PLATES THAT OVERLAP THE TRENCH WIDTH TWO FEET ON BOTH SIDES AND SECURED SO THEY ARE NOT ABOVE THE EXISTING STREET SURFACE ELEVATION.

IV. PATCHING REQUIREMENTS

A. ALL PATCHES WILL BE OF SAME MATERIAL AS THE EXISTING STREET AND SHALL BE AT LEAST AS THICK AS THE EXISTING ROADWAY.

B. THE EXPOSED EDGE OF THE EXCAVATED ASPHALT PAVEMENT SHALL BE PAINTED WITH AND EMULSIFIED ASPHALT TACK COAT TO ASSURE A GOOD BOND BETWEEN THE EXISTING AND NEW PAVEMENT.

C. ASPHALT PATCHES SHALL BE PLACED IN THREE INCH LIFTS AND COMPACTED BY MEANS OF A MECHANICAL ROLLER TO ACHIEVE AN OPTIMUM DENSITY.

D. LARGE ASPHALT PATCH MATERIAL SHALL BE PLACED USING A MIXTURE THAT IS APPROVED BY THE COUNTY ENGINEER.

E. CONCRETE SHALL BE PLACED USING A MIXTURE THAT IS APPROVED BY THE COUNTY ENGINEER.

F. THE CONCRETE SHALL BE PLACED AND VIBRATED IN ACCORDANCE WITH GOOD PRACTICE.

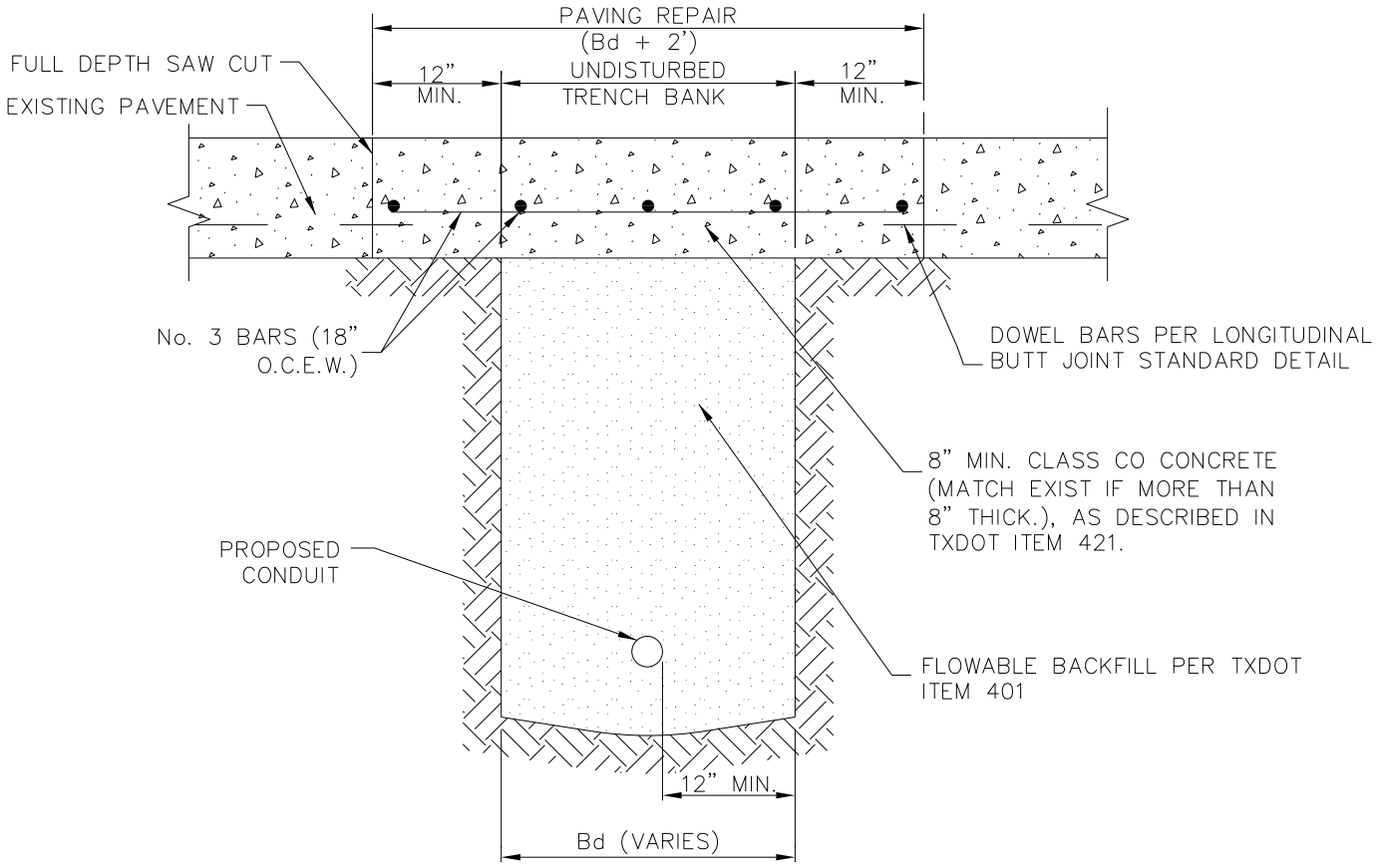
G. THE CONCRETE SURFACE SHALL BE BROOMED OR MATCHED TO THE EXISTING FINISH ALREADY IN PLACE.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

GENERAL NOTES AND REQUIREMENTS

STANDARD CONSTRUCTION DETAILS
UTILITIES TRENCHLINE & STREET RESTORATION

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-U01



NOTES:

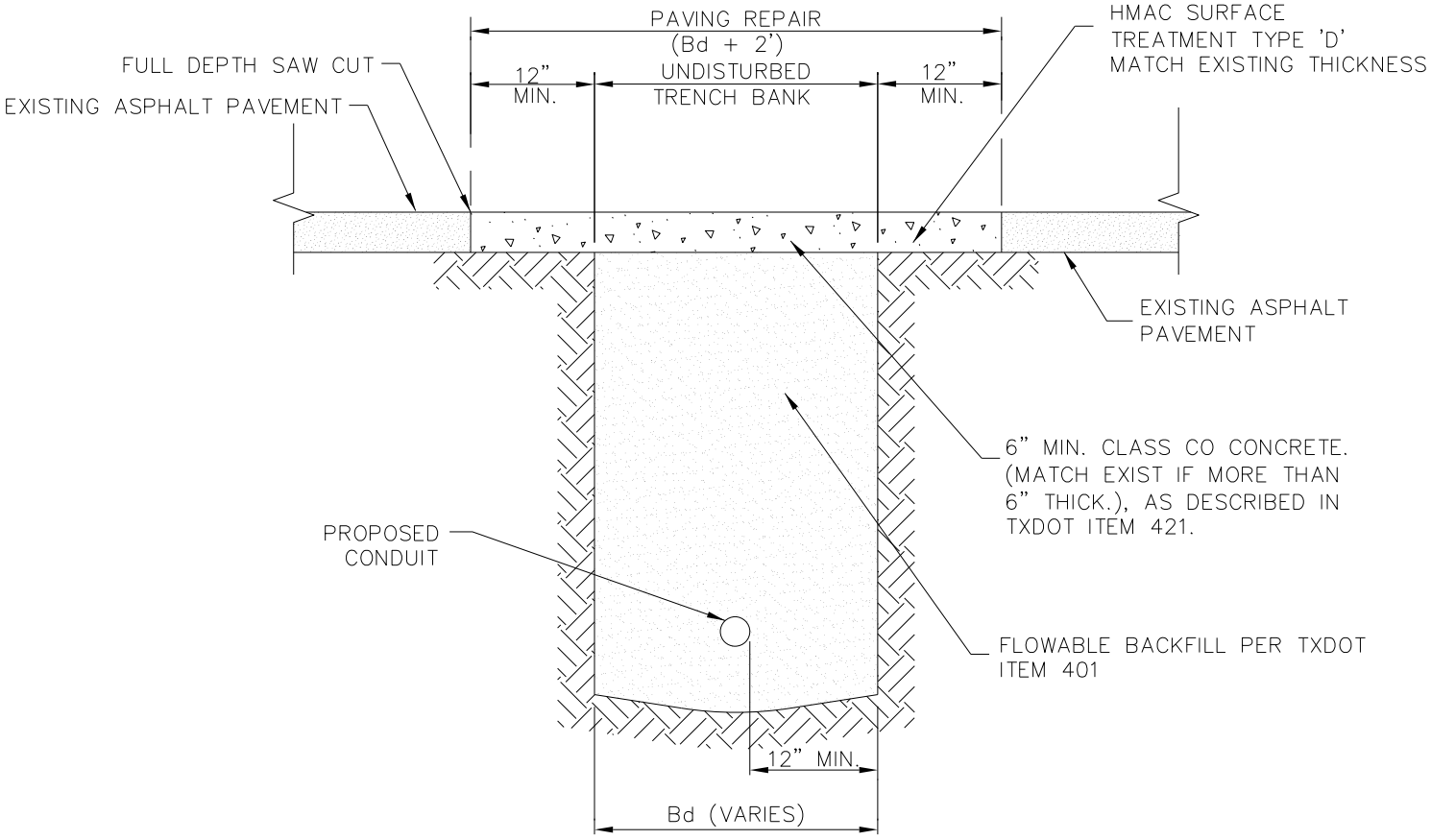
1. REPAIR SHALL EXTEND TO 1' BEYOND EACH SIDE OF TRENCH (Bd).
2. REINFORCEMENT CHAIRS OR APPROVED DEVICE SHALL BE USED.
3. REPAIRS SHALL MATCH EXISTING GRADE.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

UTILITY INSTALLATION BENEATH CONCRETE ROAD SURFACE

STANDARD CONSTRUCTION DETAILS
UTILITIES TRENCHLINE & STREET RESTORATION

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-U02



NOTES:

1. REPAIR SHALL EXTEND TO 1' BEYOND EACH SIDE OF TRENCH (Bd).

2. REPAIRS SHALL MATCH EXISTING GRADE.

UTILITY INSTALLATION BENEATH ASPHALT ROAD SURFACE

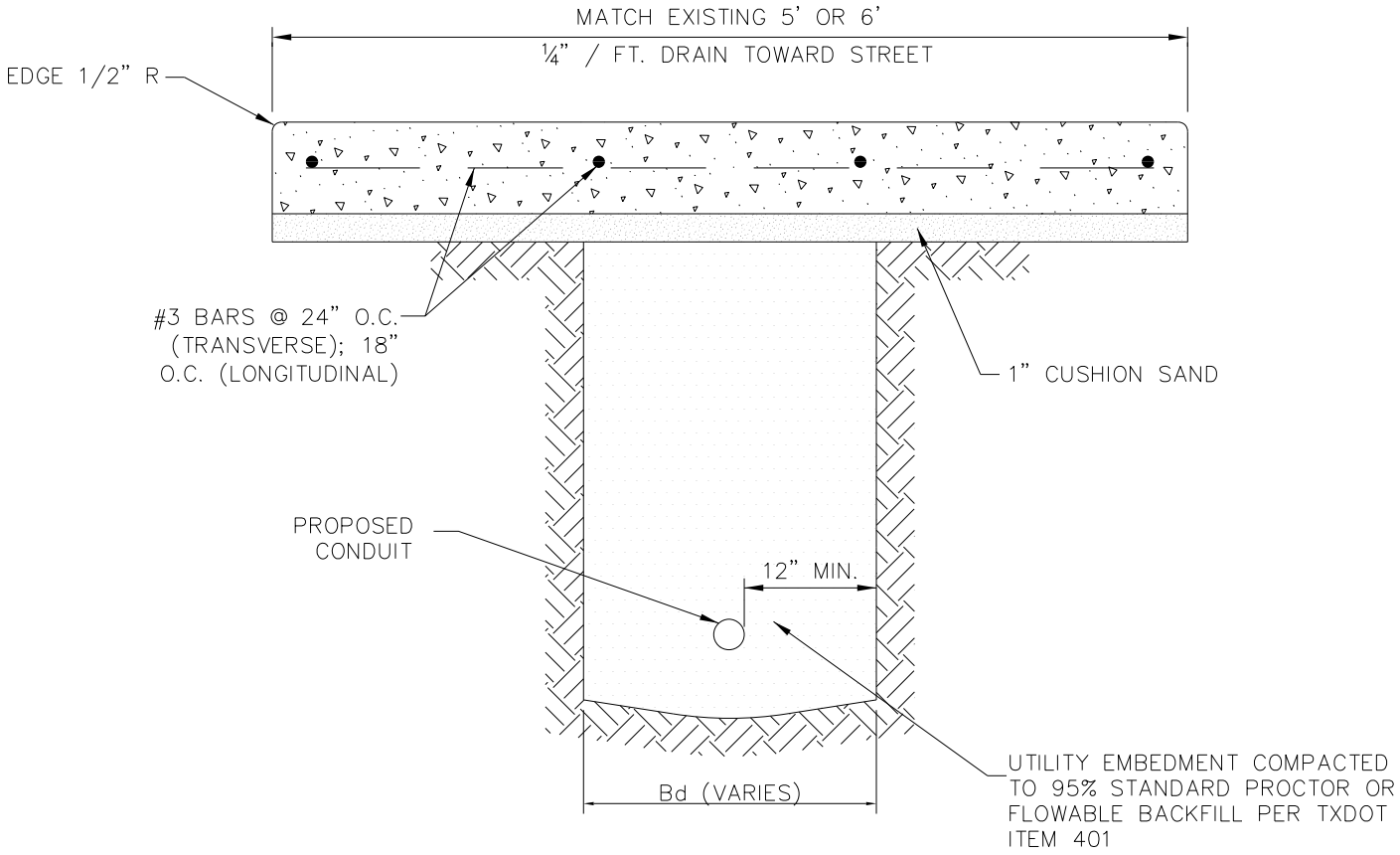
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

UTILITY INSTALLATION BENEATH ASPHALT ROAD SURFACE

STANDARD CONSTRUCTION DETAILS
UTILITIES TRENCHLINE & STREET RESTORATION

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-U03



NOTES:

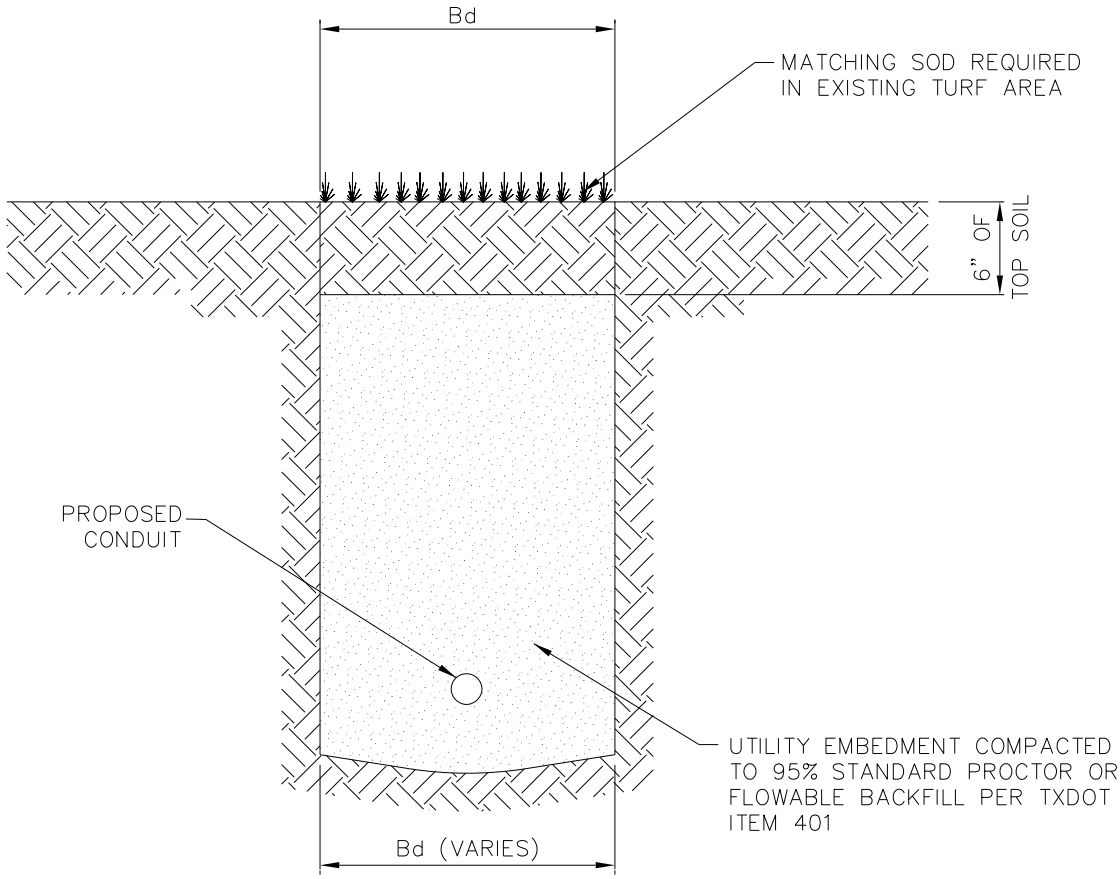
1. REPAIRS SHALL INCLUDE FULL PANELS FROM JOINT TO JOINT, AND ANY ADJACENT DAMAGED PANELS INDEPENDENT OF Bd.
2. REINFORCEMENT CHAIRS OR APPROVED DEVICE SHALL BE USED.
3. SEE CONCRETE SIDEWALK STANDARD DETAIL FOR SIDEWALK JOINT DETAIL.
4. ALL DISTURBED AREAS SHALL BE SODDED (UNLESS OTHERWISE APPROVED).
5. BACKFILL AND EMBEDMENT PARTICLE SIZE SHALL NOT EXCEED 3" IN ANY DIRECTION.
6. CONNECT TO EXISTING SIDEWALK WITH BARS MATCHING EXISTING INSTALLATION.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

UTILITY INSTALLATION BENEATH SIDEWALK

STANDARD CONSTRUCTION DETAILS
UTILITIES TRENCHLINE & STREET RESTORATION

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-U04



NOTES:

1. ALL DISTURBED AREAS SHALL BE SODDED (UNLESS OTHERWISE APPROVED).
2. BACKFILL AND EMBEDMENT PARTICLE SIZE SHALL NOT EXCEED 3" ANY DIRECTION.

UTILITY INSTALLATION WITHIN TURF AREAS

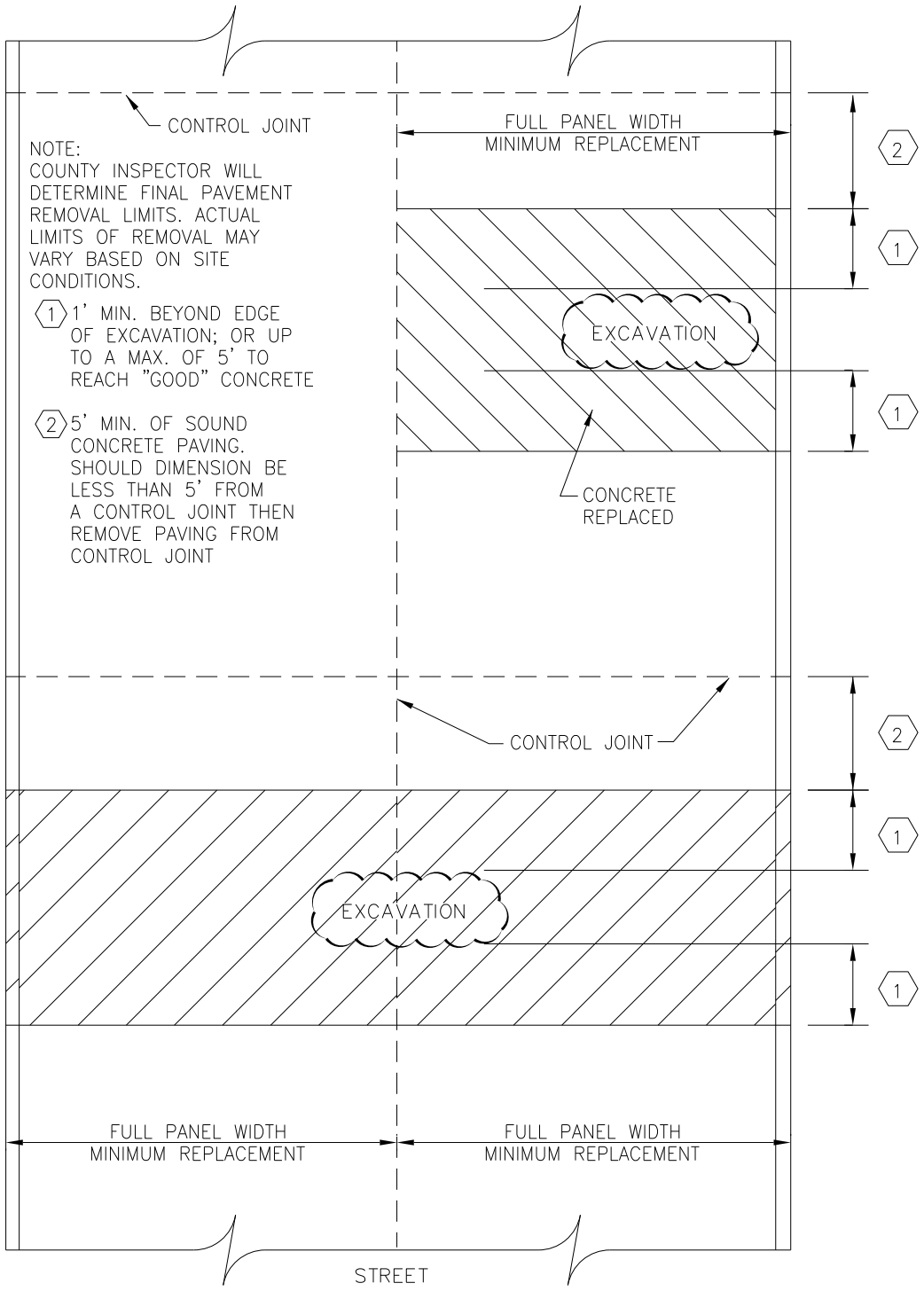
NTS

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

UTILITY INSTALLATION WITHIN TURF AREAS

STANDARD CONSTRUCTION DETAILS
UTILITIES TRENCHLINE & STREET RESTORATION

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-U05



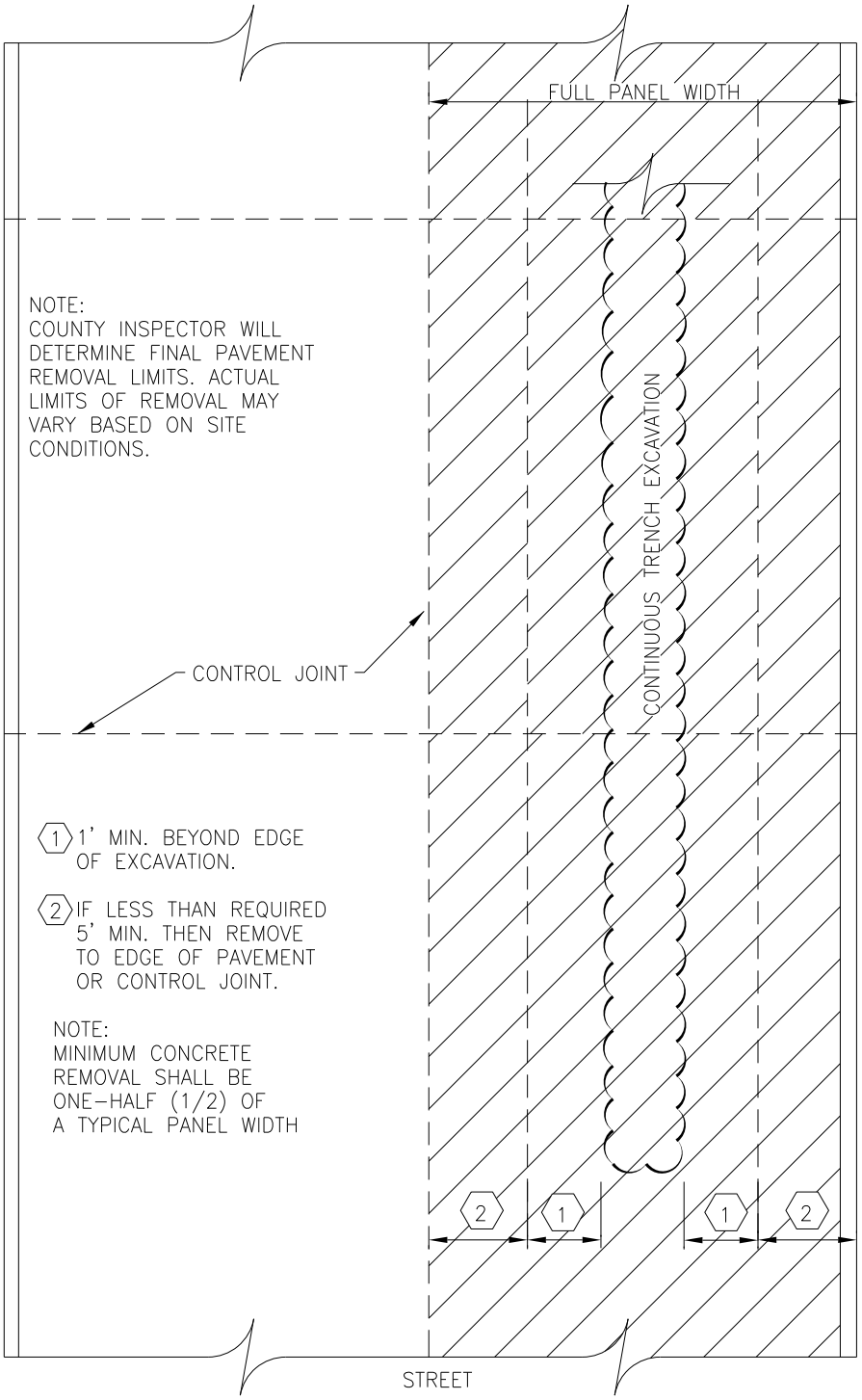
TYPICAL CONCRETE STREET REMOVAL/REPLACEMENT
EXAMPLE 1

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

STREET CUT REPAIRS
EXAMPLE 1

STANDARD CONSTRUCTION DETAILS
UTILITIES TRENCHLINE & STREET RESTORATION

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-U06



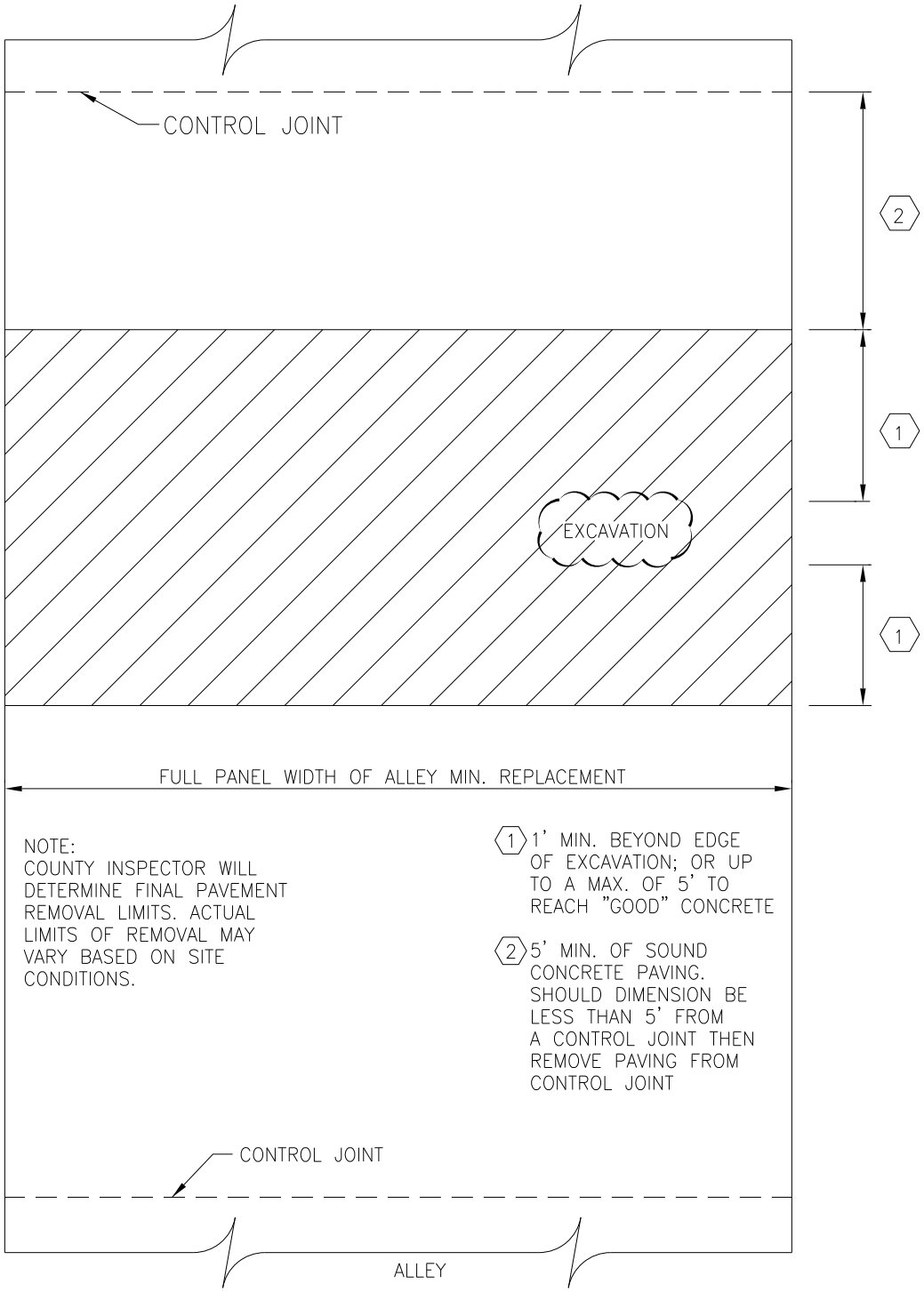
TYPICAL CONCRETE STREET REMOVAL/REPLACEMENT
EXAMPLE 2

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

STREET CUT REPAIRS
EXAMPLE 2

STANDARD CONSTRUCTION DETAILS
UTILITIES TRENCHLINE & STREET RESTORATION

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-U07



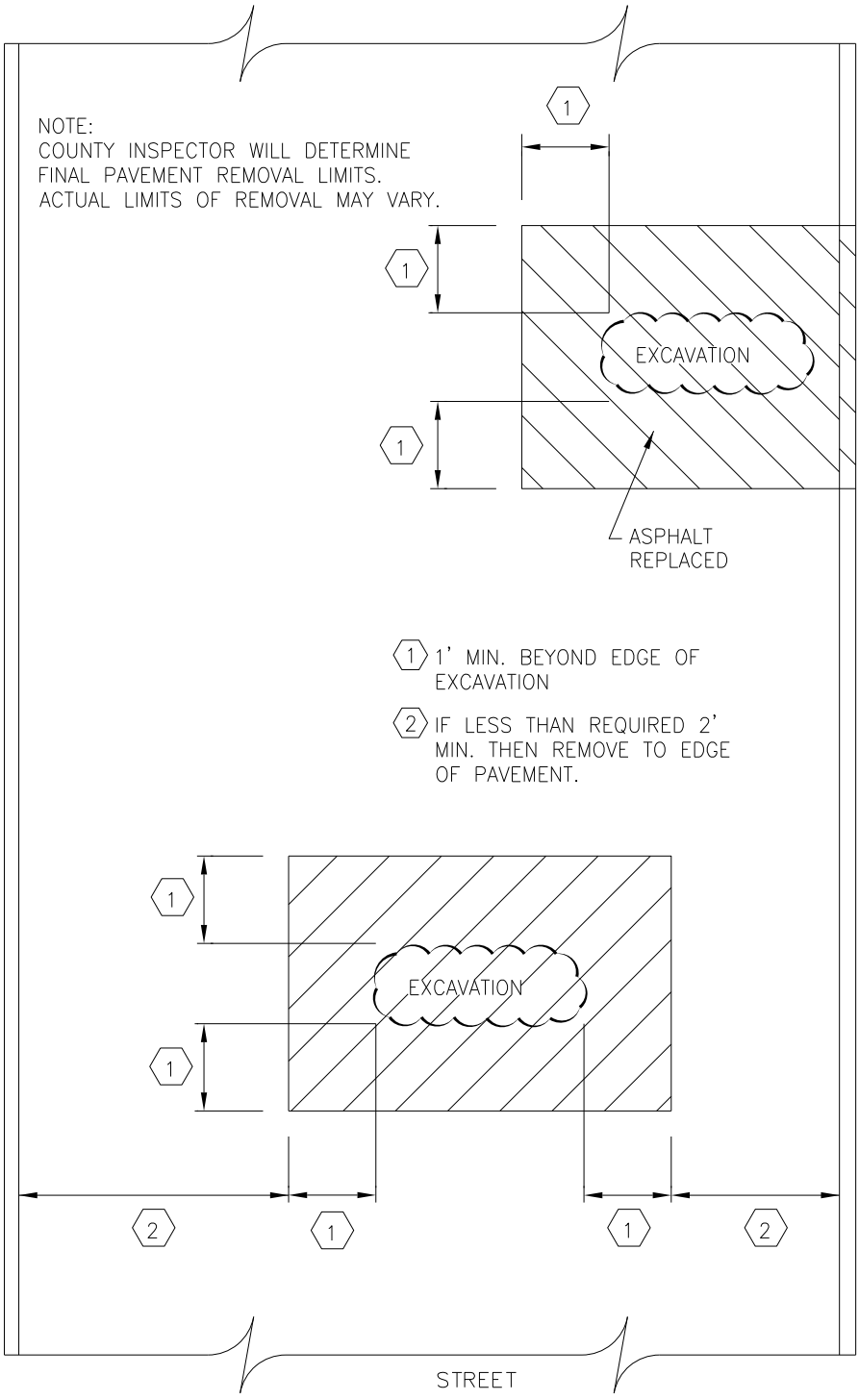
TYPICAL CONCRETE ALLEY REMOVAL/REPLACEMENT EXAMPLE 3

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

STREET CUT REPAIRS
EXAMPLE 3

STANDARD CONSTRUCTION DETAILS
UTILITIES TRENCHLINE & STREET RESTORATION

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-U08



TYPICAL ASPHALT STREET REMOVAL/REPLACEMENT
EXAMPLE 4

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

STREET CUT REPAIRS
EXAMPLE 4

STANDARD CONSTRUCTION DETAILS
UTILITIES TRENCHLINE & STREET RESTORATION

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-U09

STANDARD CONSTRUCTION DETAILS

EROSION CONTROL

FEBRUARY 2021

GRAYSON COUNTY

DEVELOPMENT SERVICES DEPARTMENT

100 W HOUSTON ST

SHERMAN, TX 75090

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EROSION CONTROL

EROSION CONTROL PLAN NOTES

1. ALL OPERATORS AND/OR CONTRACTORS SHALL CONFORM TO THE TERMS AND CONDITIONS OF THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ), TPDES GENERAL PERMIT NO. TXR 040000 ISSUED AND DATED FEBRUARY 9, 2009.
2. THE NOTICE OF INTENT (NOI), AS REQUIRED BY THE GENERAL PERMIT, MUST BE PROPERLY DISPLAYED ON SITE AT ALL TIMES BY EACH OPERATOR OR CONSTRUCTION SITE NOTICE (CSN).
3. ALL RELEASES OF THE REPORTABLE QUANTITIES OF HAZARDOUS SUBSTANCES SHALL BE REPORTED IMMEDIATELY TO THE FACILITY OPERATOR, EPA AND TCEQ.
4. QUALIFIED OPERATOR PERSONNEL MUST INSPECT THE SITE AT LEAST ONCE EVERY 14 DAYS AND WITHIN 24 HOURS OF A STORM EVENT OF 0.5 INCHES OR GREATER. AS AN ALTERNATIVE, AN INSPECTION CAN BE CONDUCTED ONCE EVERY SEVEN (7) CALENDAR DAYS ON A DEFINED DAY. A DECISION ON WHICH METHOD TO USE MUST BE DECIDED BEFORE WORK BEGINS AND MUST BE FOLLOWED THROUGHOUT THE PROJECT.
5. MODIFICATIONS TO THE STORM WATER POLLUTION PREVENTION PLAN SHALL BE IMPLEMENTED AND BE IN-PLACE WITHIN A SEVEN CALENDAR DAY PERIOD.
6. IF ANY CONTRACTOR SEES A VIOLATION BY AN OPERATOR OR ANOTHER CONTRACTOR, THAT OPERATOR OR CONTRACTOR IN VIOLATION SHALL BE NOTIFIED AS WELL AS THE FACILITY OPERATOR.
7. EROSION CONTROL SHALL BE INSTALLED PRIOR TO GRADING.
8. ACCUMULATED SILT DEPOSITS SHALL BE REMOVED FROM SILT FENCES AND HAY BALE DIKES WHEN SILT DEPTH REACHES THREE INCHES OR 25%.
9. THE CONTRACTOR SHALL ADD OR DELETE EROSION PROTECTION AT THE REQUEST AND DIRECTION OF THE OPERATOR OR CITY, WITHIN 24 HOURS OF NOTICE.
10. AFTER INSTALLATION OF PAVEMENT, FINAL LOT BENCHING AND GENERAL CLEANUP, THE CONTRACTOR SHALL ESTABLISH GRASS GROUNDCOVER IN ALL STREET PARKWAYS, LOT AND ALL OTHER DISTURBED AREAS. SODDING SHALL BE DONE AS SPECIFIED BY ITEM 162 AND SEEDING AS SPECIFIED BY ITEM 164 OF THE NOVEMBER 2014 OR LATEST EDITION OF TxDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES.
11. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTROL AND LIMIT SILT AND SEDIMENT LEAVING THE SITE. SPECIFICALLY, THE CONTRACTOR SHALL PROTECT ALL PUBLIC STREETS, ALLEYS, STREAMS AND STORM DRAINAGE SYSTEMS FROM EROSION/SEDIMENT DEPOSITS.
12. A DRAINAGE AREA MAP WILL BE INCLUDED WITH THE EROSION CONTROL PLAN.
13. CONSTRUCTION WASTE DISPOSAL CONTAINERS SHALL BE PROVIDED ON THE SITE FOR DISPOSAL OF ALL NON-HAZARDOUS CONSTRUCTION WASTE MATERIALS.
14. ALL HAZARDOUS MATERIALS SHALL BE HANDLED AND DISPOSED OF BY THE CONTRACTOR IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS.

SILT FENCE NOTES

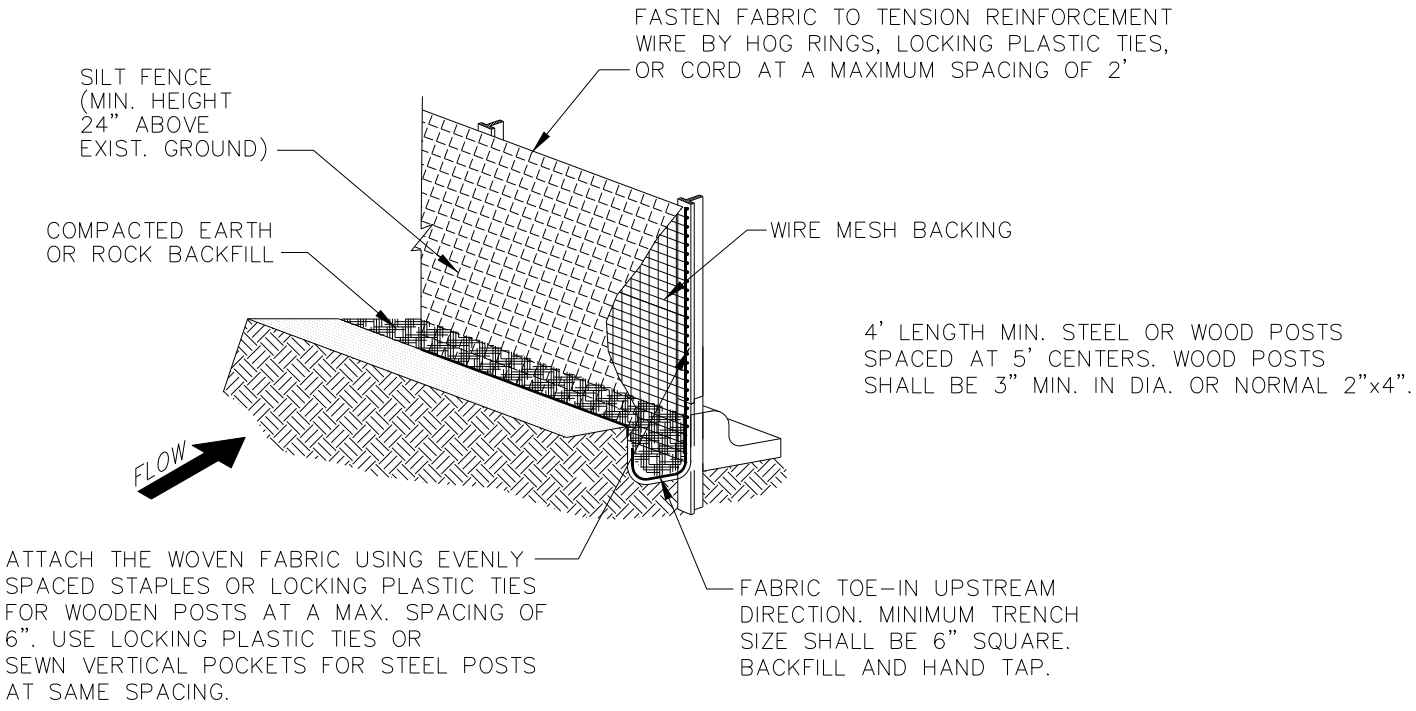
1. POSTS WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED ON A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. THE POST MUST BE EMBEDDED A MINIMUM OF 18 INCHES.
2. THE TOE OF THE SILT FENCE SHALL BE TRENCHED IN WITH A SPADE OR MECHANICAL TRENCHER, SO THAT THE DOWNSLOPE FACE OF THE TRENCH IS FLAT AND PERPENDICULAR TO THE LINE OF FLOW. WHERE FENCE CANNOT BE TRENCHED IN (E.G. PAVEMENT): WEIGHT FABRIC FLAP WITH WASHED GRAVEL ON THE UPHILL SIDE TO PREVENT FLOW UNDER FENCE.
3. THE TRENCH MUST BE A MINIMUM OF 6 INCHES DEEP AND 6 INCHES WIDE TO ALLOW FOR THE SILT FENCE FABRIC TO BE LAID IN THE GROUND AND BACKFILLED WITH COMPACTED MATERIAL.
4. SILT FENCE SHALL BE SECURELY FASTENED TO EACH SUPPORT POST OR TO WOVEN WIRE, WHICH IS IN TURN ATTACHED TO THE SUPPORT POST. THERE SHALL BE A 6 INCH DOUBLE OVERLAP, SECURELY FASTENED WHERE ENDS OF FABRIC MEET.
5. INSPECTION SHALL BE MADE EVERY TWO WEEKS OR AFTER EACH RAINFALL. REPAIR OR REPLACEMENT SHALL BE PROMPTLY AS NEEDED.
6. SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.
7. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 3 INCHES. THE SILT SHALL BE DISPOSED OF AT AN APPROVED SITE AND IN SUCH A MANNER AS TO NOT CONTRIBUTE TO ADDITIONAL SILTATION.

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

EROSION CONTROL & SILT FENCE NOTES

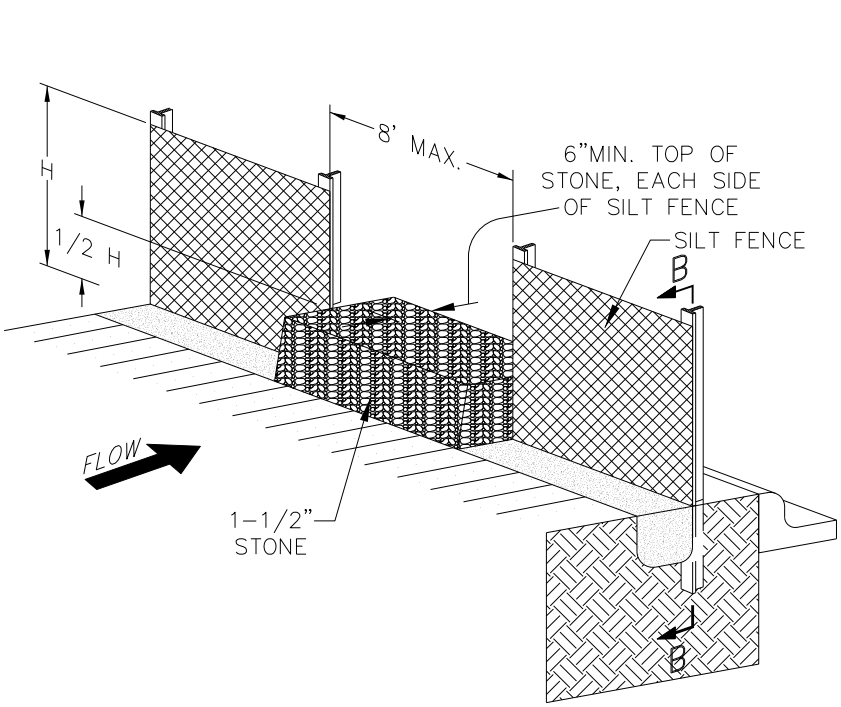
STANDARD CONSTRUCTION DETAILS
EROSION CONTROL

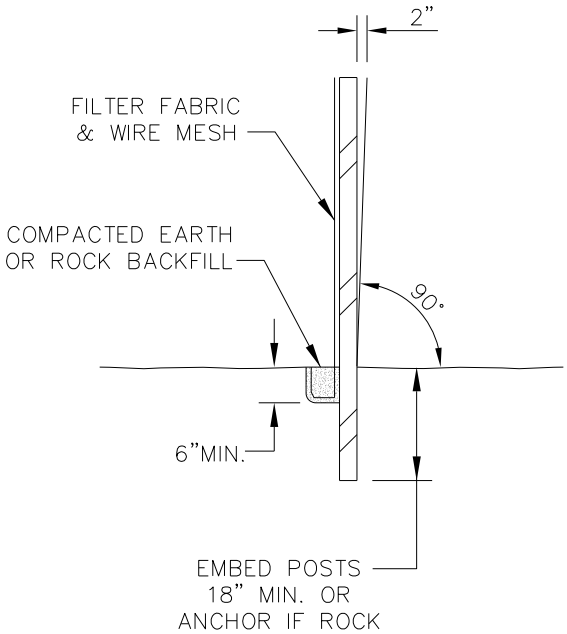
DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD-EC01



ISOMETRIC PLAN VIEW

N.T.S.

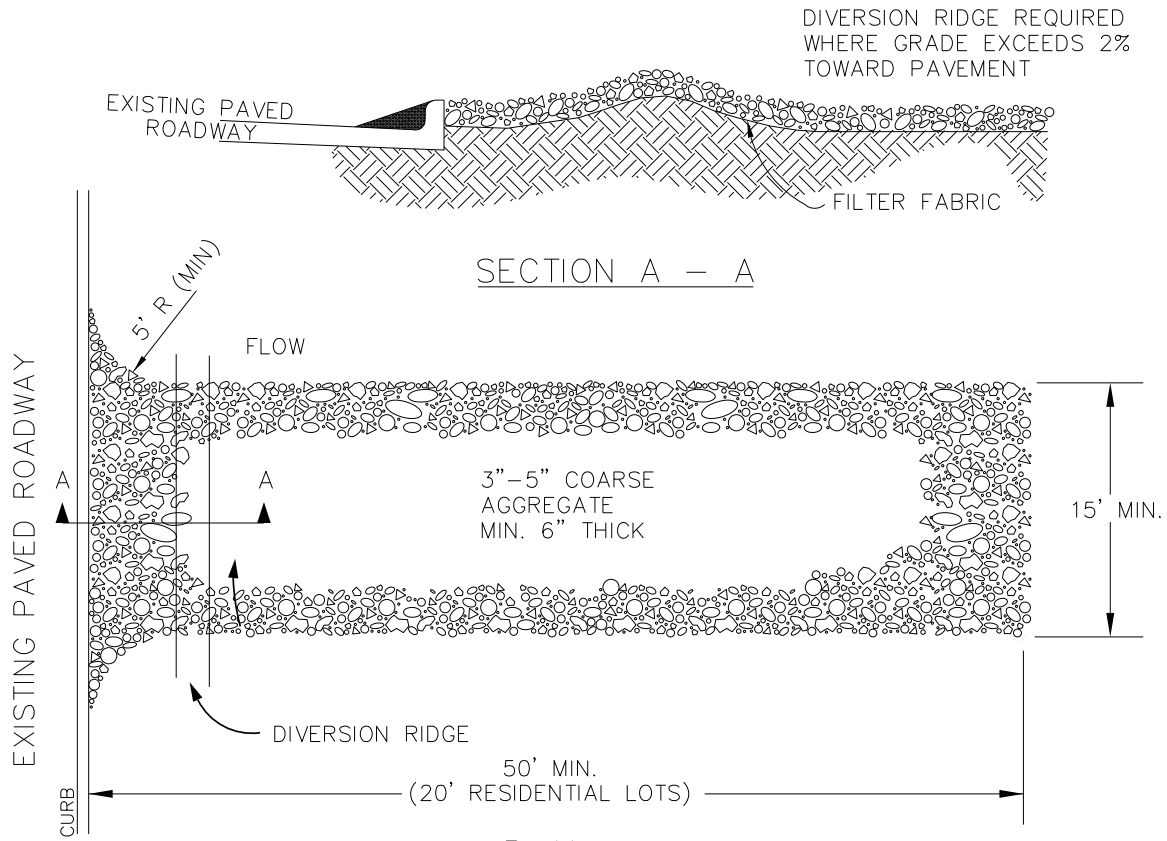




SILT FENCE
STONE OVERFLOW STRUCTURE

N.T.S.

GRAYSON COUNTY DEVELOPMENT SERVICES DEPARTMENT 100 W HOUSTON ST SHERMAN, TX 75090	SILT FENCE DETAIL	STANDARD CONSTRUCTION DETAILS EROSION CONTROL
		DATE: FEB, 2021 / REV DATE: - / SHEET: SD-EC02



TEMPORARY STONE CONSTRUCTION ENTRANCE/EXIT

N.T.S.

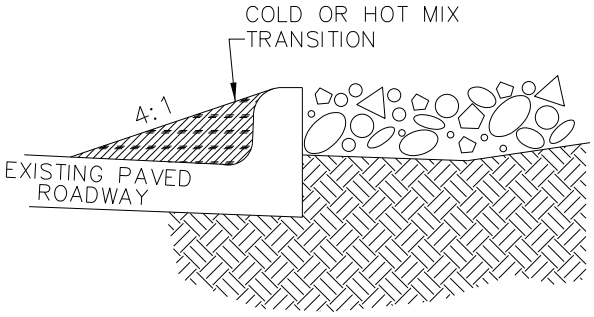
STABILIZED CONSTRUCTION ENTRANCE GENERAL NOTES:

1. WHEN NECESSARY, VEHICLES SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO A PUBLIC ROADWAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AREA STABILIZED WITH CRUSHED STONE WITH DRAINAGE FLOWING AWAY FROM BOTH THE STREET AND THE STABILIZED ENTRANCE. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH OR WATERCOURSE USING APPROVED METHODS.

2. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PAVED SURFACES. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND. ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO PAVED SURFACES MUST BE REMOVED IMMEDIATELY.

3. THE ENTRANCE MUST BE PROPERLY GRADED OR INCORPORATE A DRAINAGE SWALE TO PREVENT RUNOFF FROM LEAVING THE CONSTRUCTION SITE.

4. WHEN SEDIMENT HAS SUBSTANTIALLY CLOGGED THE VOID AREA BETWEEN THE ROCKS, THE AGGREGATE MAT MUST BE WASHED DOWN OR REPLACED. PERIODIC RE–GRADING AND TOP DRESSING WITH ADDITIONAL STONE MUST BE DONE TO KEEP THE EFFICIENCY OF THE ENTRANCE FROM DIMINISHING.



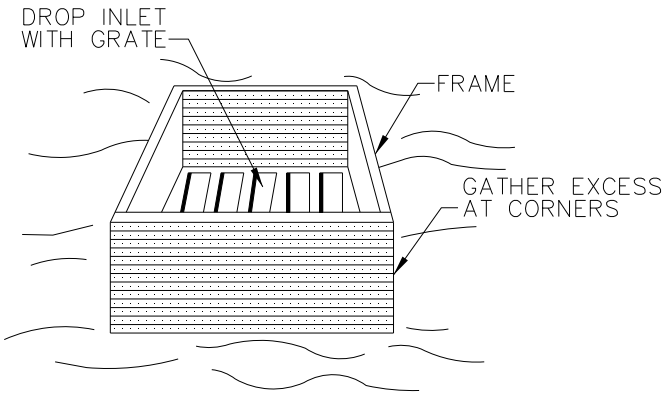
TRANSITION

GRAYSON COUNTY
DEVELOPMENT SERVICES DEPARTMENT
100 W HOUSTON ST
SHERMAN, TX 75090

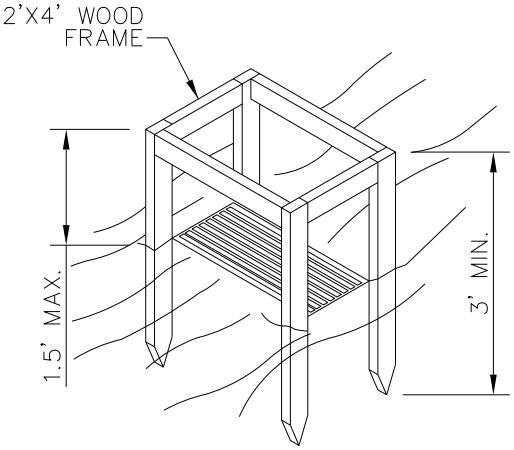
TEMPORARY STONE CONSTRUCTION ENTRANCE/EXIT

STANDARD CONSTRUCTION DETAILS
EROSION CONTROL

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–EC03



PERSPECTIVE VIEW



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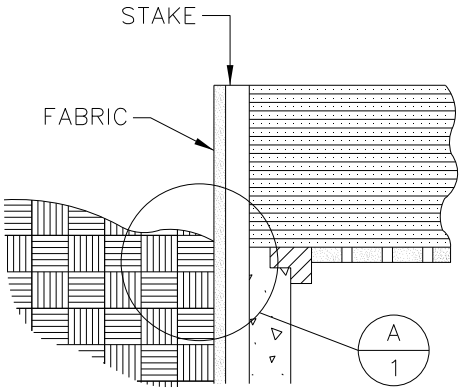
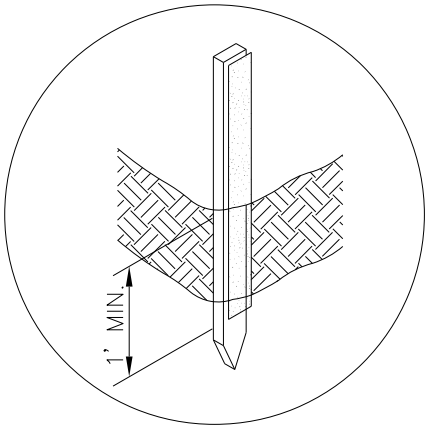


ELEVATION OR STAKE AND
FABRIC ORIENTATION



DETAIL 'A'

SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE THE INLET DRAINS A RELATIVELY FLAT AREA (SLOPE NO GREATER THAN 5%) WHERE THE INLET SHEET OR OVER-LAND FLOWS (NOT TO EXCEED 1 C.F.S.) ARE TYPICAL. THE METHOD SHALL NOT APPLY TO INLETS RECEIVING CONCENTRATED FLOWS SUCH AS IN STREETS OR HIGHWAY MEDIANS.

GRAYSON COUNTY
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GRATE AND WYE INLET PROTECTION

STANDARD CONSTRUCTION DETAILS
EROSION CONTROL

DATE:	REV DATE:	SHEET:
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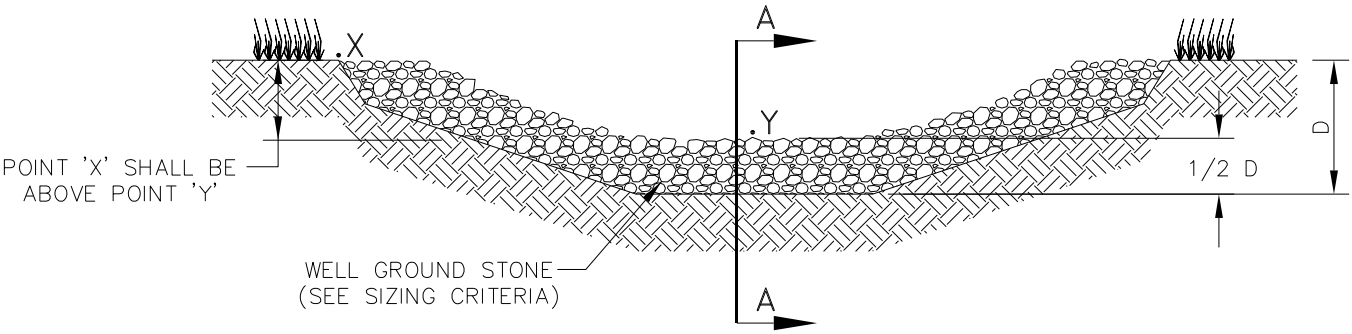
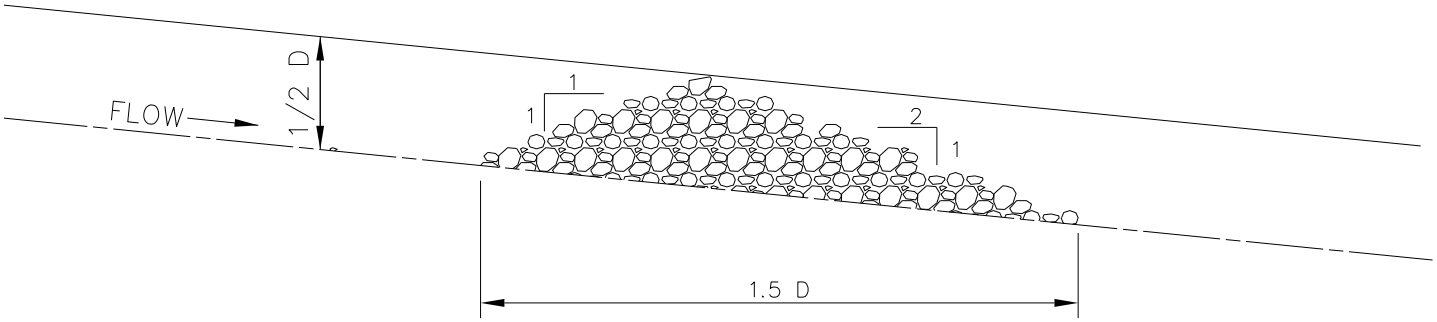
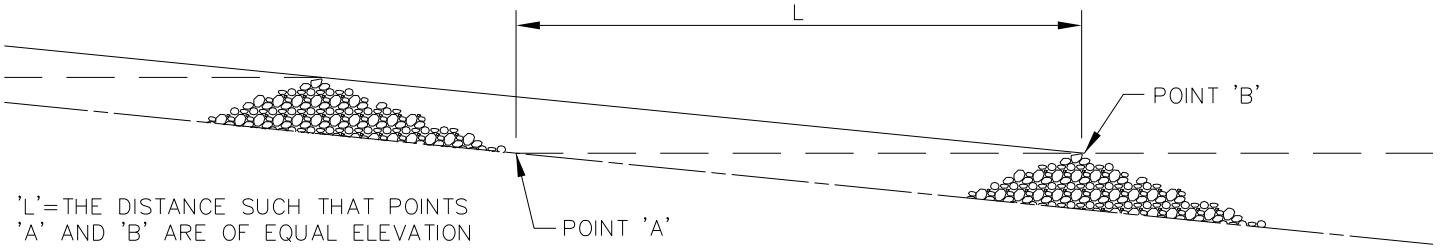


VIEW LOOKING UPSTREAM



SECTION 'A–A'



SPACING BETWEEN CHECK DAMS

ROCK CHECK DAM NOTES:

1. STONE SHALL BE WELL GRADED STONE WITH SIZE RANGE FROM 1–1/2 TO 3–1/2 INCHES IN DIAMETER DEPENDING ON EXPECTED FLOWS.

2. THE CHECK DAM SHALL BE INSPECTED AS SPECIFIED IN THE SWPPP AND SHALL BE REPLACED WHEN THE STRUCTURE CEASES TO FUNCTION AS INTENDED DUE TO SILT ACCUMULATION AMONG THE ROCKS, WASHOUT, CONSTRUCTION TRAFFIC DAMAGE, ETC.

3. WHEN SILT REACHES A DEPTH EQUAL TO ONE–THIRD OF THE HEIGHT OF THE CHECK DAM OR ONE FOOT, WHICHEVER IS LESS, THE SILT SHALL BE REMOVED AND DISPOSED OF PROPERLY.

4. WHEN THE SITE HAS ACHIEVED FINAL STABILIZATION OR ANOTHER EROSION OR SEDIMENT CONTROL DEVICE IS EMPLOYED, THE CHECK DAM AND ACCUMULATED SILT SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED MANNER.

GRAYSON COUNTY
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ROCK CHECK DAM

STANDARD CONSTRUCTION DETAILS
EROSION CONTROL

DATE:	REV DATE:	SHEET:
FEB, 2021	–	SD–EC05