

City Council Special Meeting

Aubrey City Hall
107 S. Main St
Aubrey, TX 76227
August 28, 2024
6:00 PM



**(Notice of Potential Quorum for Planning & Zoning Commission, Board of Adjustment, Library Board, Municipal Development District, and Parks and Recreation Board - even though a quorum of the members of these boards may or may not be present, no official action will be taken by their members.)*

Notice Regarding Remote Participation of Council Members

Pursuant to Section 551.127, Texas Government Code, one or more Council Members may attend this meeting remotely using videoconferencing technology. A quorum of the board will be physically present at the location provided above. The video and audio feed of the videoconferencing equipment can be viewed and heard by the public by accessing Zoom utilizing the Public Participation link identified below.

Notice Regarding Public Participation

Individuals may attend the meeting in person at the above address, or access the meeting via videoconference, or telephone conference call.

Join the Zoom Meeting by clicking on the following link:

<https://us06web.zoom.us/j/85756951607?pwd=E9zZ2NVzjab2jPbMRpyowTqjNYXFcA.1>

Meeting ID: 857 5695 1607 Password: 838093

To join the meeting by phone, dial 1 (346) 248-7799 and use the Meeting ID and password above.

Call to Order - Determine if a Quorum is Present:

Invocation & Pledge of Allegiance: Pledge of Allegiance to the Texas Flag - "Honor the Texas flag; I pledge allegiance to thee, Texas, one state, under God, one, and indivisible."

Community Announcements: Items of community interest may include recognizing Citizens and Staff for outstanding contributions to the community, a reminder about an upcoming event that is organized or sponsored by the governing body, and announcements of an imminent threat to public safety that has arisen after the posting of this agenda.

Citizen Input: Any person may address the City Council. If your comments are concerning an agenda item, you may wait until the discussion on that item if you prefer. Once recognized by the Mayor, please step forward to the speaker's podium, state your name and address and speak directly into the microphone so that people in the room and those attending remotely can hear comments and see presentations. To request to speak via videoconference, click on "Participants" at the bottom of the screen, and click "Raise Hand." The Mayor will acknowledge your request and allow you to speak. Citizen comments are limited to three (3) minutes per individual unless additional time is otherwise required by law. No discussion or action may be taken at this meeting on any item not listed on the agenda, other than to make statements of factual information or recite existing policy in response to a citizen's inquiry.

New Business: New items requested for consideration.

1. Conduct the second public hearing in accordance with Texas Local Government Code Section 43.063(a) and other applicable law, to consider testimony and provide members of the public an opportunity to be heard on the proposed annexation of a portion of FM 2931, beginning at the intersection of FM 2931 and Frontier Parkway, continuing north to the intersection of FM 2931 and Spring Hill Road, and any additional adjacent right-of-way, Denton County, Texas.
2. Hold Public Hearing, consider and act on Ordinance 871-24 approving the City of Aubrey's Technical Construction Standards and Specifications.
3. Consideration and action on a Resolution urging the Texas Legislature to repeal or amend Senate Bill 2038.
4. Consideration and action on casting a vote for a candidate for the Texas Municipal League Intergovernmental Risk Pool Board of Trustees.
5. Consideration and action on an Ordinance approving the fiscal year 2024-2025 Aubrey Municipal Development District Budget.

-ADJOURN-

I, Jenny Hicks, City Secretary, certify that this Notice of Meeting was posted, per the Open Meetings Act, on the official bulletin board at the City Hall of the City of Aubrey, Texas and on the City's website at www.aubreytx.gov in accordance with Chapter 551, Texas Government Code, and shall remain posted until the meeting is adjourned.

I certify that the attached notice and agenda of items to be considered by the City Council of the City of Aubrey, Texas was removed by me from the official bulletin board of the City of Aubrey, Texas, 107 South Main St, Aubrey, Texas on the _____ day of _____, 2024.

(The City Council reserves the right to adjourn into closed session at any time during the course of this meeting to consult with its attorney regarding any of the matters listed on this document, as authorized by Texas Government Code Section 551.071 Consultation with Attorney.)

This facility is wheelchair accessible and accessible parking spaces are available. Requests for accommodation or interpretive services must be made 48 hours prior to this meeting. Please contact the City Secretary's office at (940) 440-9343 for further information.



**City Council Special Meeting
Staff Report
August 28, 2024**

Agenda Item

Conduct the second public hearing in accordance with Texas Local Government Code Section 43.063(a) and other applicable law, to consider testimony and provide members of the public an opportunity to be heard on the proposed annexation of a portion of FM 2931, beginning at the intersection of FM 2931 and Frontier Parkway, continuing north to the intersection of FM 2931 and Spring Hill Road, and any additional adjacent right-of-way, Denton County, Texas.

Staff Contact

Charles Kreidler, City Manager
kreidler@aubreytx.gov
940-440-9343

Summary

This item is the second public hearing for an annexation of a portion of FM 2931, beginning at the intersection of FM 2931 and Frontier Parkway, continuing north to the intersection of FM 2931 and Spring Hill Road, and any additional adjacent right-of-way,

Financial Summary

None

Staff Recommended Motion

Approve

Conditions

N/A



MESSER ★ FORT

THE MUNICIPAL LAW FIRM

FRISCO | DALLAS | AUSTIN | ABILENE

July 26, 2024

Via CMRRR #9589 0710 5270 0920 7020 81
and via First Class Mail

Texas Department of Transportation
Right-of-Way Division
125 E. 11th Street
Austin, Texas 78701-2483

RE: City of Aubrey, Texas; ROW Annexation Notice of ± 40 acres

Dear Sir or Madam,

The purpose of this letter is to notify you that certain right-of-way is included in a proposed annexation by the City of Aubrey, Texas (the "City"). Under state law, the City may annex the area after following certain notice and hearing procedures contained in Chapter 43 of the Texas Local Government Code. The City will provide all necessary services to the property upon annexation.

Section 43.1056 requires that the City provide written notice of the annexation to the owner of the right-of-way not later than the sixty-first (61st) day before the date of the proposed annexation. Therefore, notice is hereby given that the City Council of the City proposes to annex ± 40 acres of right-of-way owned by the State of Texas (the "State") on **September 26, 2024, at 6:00 p.m.** at Aubrey City Hall, located at **107 S. Main Street, Aubrey, Texas 76227**. A large majority of the right-of-way is located in the extraterritorial jurisdiction ("ETJ") of the city with less than 10% being located in the county which the City intends to annex into the City's ETJ so the road segment is completely located in the city limits. Any objection to the annexation by the owner of the right-of-way must be in writing and must be received by the municipality prior to the date of the proposed annexation. The proposed annexations by the City are described below:

A tract of land known as the portion of FM 2931, beginning at the intersection of FM 2931 and Frontier Parkway, continuing north to the intersection of FM 2931 and Spring Hill Road, and any additional adjacent right-of-way, Denton County, Texas.

Enclosed please find a map showing the property proposed for annexation as described above. Please do not hesitate to call if you have any questions.

Sincerely,

Kaira Cabranes

KAIRA CABRANES
PARALEGAL

Encl.

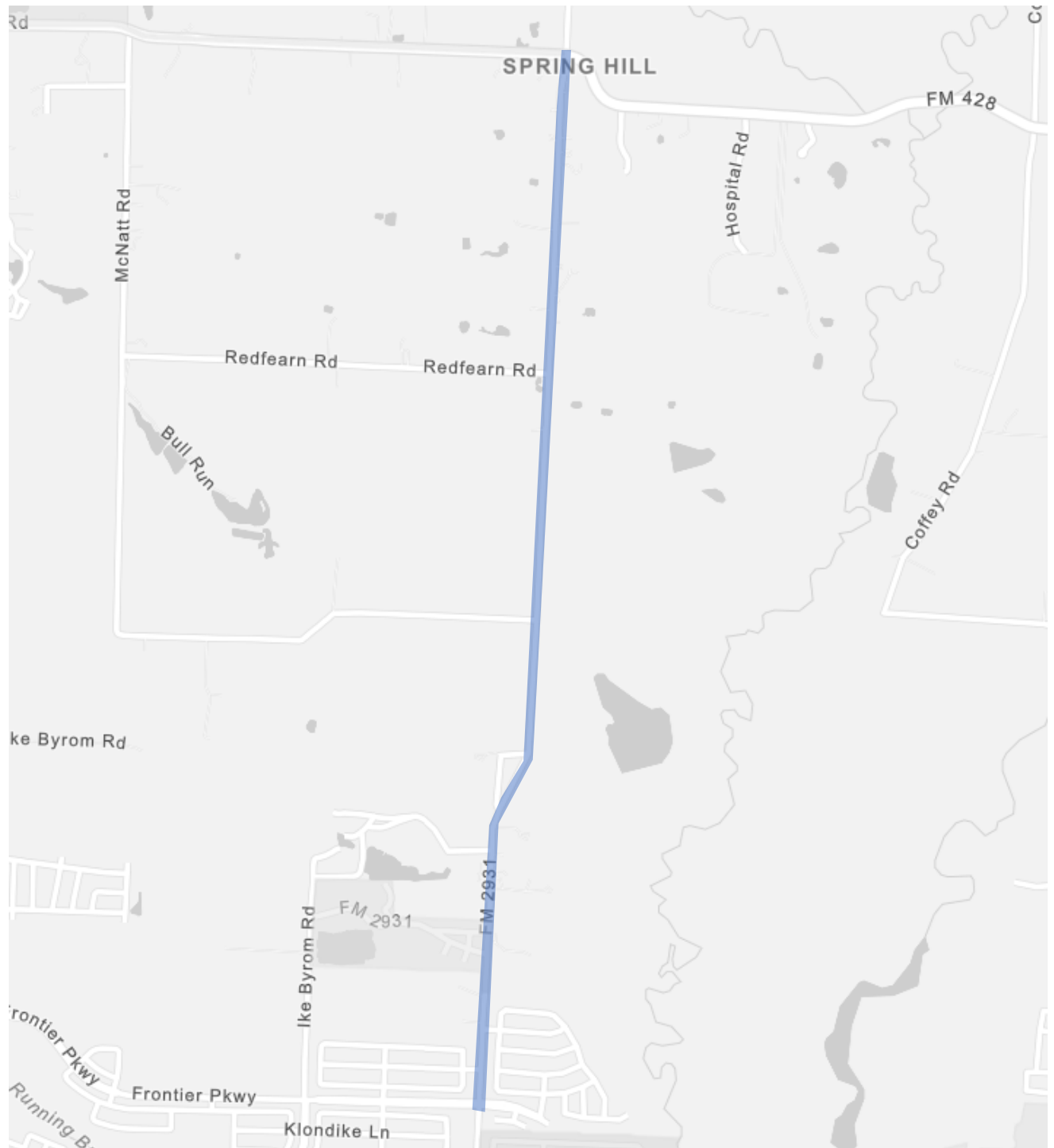


EXHIBIT "A"
METES AND BOUNDS DESCRIPTION
FOR ANNEXATION INTO THE CITY LIMITS OF THE CITY OF AUBREY, TEXAS
IN THE F. H. POLLARD SURVEY, ABSTRACT 995, THE F. TREVINO SURVEY,
ABSTRACT NO. 1243, THE WM. LUMPKIN SURVEY, ABSTRACT NO. 730, AND THE
J. BRIDGES SURVEY, ABSTRACT NO. 36, DENTON COUNTY, TEXAS

Being a 32.06 acre tract of land, for annexation into the City Limits of the City of Aubrey, Texas, and being the full right-of-way width of Farm to Market Road 2931 (FM 2931) (a variable width right-of-way) as it exists today, or as it may exist in the future, from the existing Aubrey City Limits line as defined by Aubrey Annexation Ordinance 220, dated March 15, 1996, and recorded in Instrument Number 1996-19494 of the Deed Records of Denton County, Texas (D.R.D.C.T.), to the existing Aubrey City Limits line as defined by Aubrey Annexation Ordinance 750, dated July 26, 2022, and recorded in Instrument Number 2022-113314 of the Official Public Records of Denton County, Texas (O.P.R.D.C.T.), said 32.06 acre tract, in the F. H. Pollard Survey, Abstract No. 995, the F. Trevino Survey, Abstract No. 1243, the WM. Lumpkin Survey, Abstract No. 730, and the J. Bridges Survey, Abstract No. 36, Denton County, Texas, said 32.06 acre tract being more particularly described as follows:

BEGINNING at a point for corner, said point being on the south right-of-way (ROW) line of FM 428 (a variable width right-of-way), and the west right-of-way line of said FM 2931, said point also being on the Existing City Limits of the City of Aubrey as established by said Aubrey annexation ORD. 220, dated 3/15/1996;

THENCE, S43°12'59"E, along the west right-of-way line of FM 2931, a distance of 97.40 feet to a point for corner, said point also being the beginning of a curve to right, having a central angle of 09 degrees 06 minutes 00 seconds, a radius of 1090.88 feet and being subtended by a chord bearing of S06°20'01"W, a chord distance of 173.08 feet;

THENCE, along the west right-of-way line of said FM 2931, and along said curve to the right, an arc distance of 173.26 feet to a point for corner;

THENCE, S10°53'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 67.70 feet to a point for corner, said point also being the beginning of a curve to left, having a central angle of 09 degrees 24 minutes 00 seconds, a radius of 1200.90 feet and being subtended by a chord bearing of S06°11'01"W, a chord distance of 196.80 feet;

THENCE, along the west right-of-way line of said FM 2931, and along said curve to the left, an arc distance of 197.02 feet to a point for corner;

THENCE, S01°29'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 116.50 feet to a point for corner;

THENCE, S01°22'44"E, continuing along the west right-of-way line of said FM 2931, a distance of 100.12 feet to a point for corner;

THENCE, S01°29'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 400.00 feet to a point for corner;

THENCE, S07°11'39"W, continuing along the west right-of-way line of said FM 2931, a distance of 100.5 feet along the west ROW line of FM 1358 to a point for corner;

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J. BRIDGES SURVEY, ABSTRACT NO. 36, DENTON COUNTY, TEXAS

THENCE, S01°29'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 200.00 feet to a point for corner;

THENCE, S04°13'37"E, continuing along the west right-of-way line of said FM 2931, a distance of 100.5 feet to a point for corner;

THENCE, S01°29'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 600.00 feet to a point for corner;

THENCE, S07°11'39"W, continuing along the west right-of-way line of said FM 2931, a distance of 100.5 feet to a point for corner;

THENCE, S01°29'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 200.00 feet to a point for corner,;

THENCE, S04°33'40"E, continuing along the west right-of-way line of said FM 2931, a distance of 94.96 feet to a point for corner;

THENCE, S01°52'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 1405.23 feet to a point for corner;

THENCE, S07°34'39"W, continuing along the west right-of-way line of said FM 2931, a distance of 100.50 feet to a point for corner;

THENCE, S01°52'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 100.00 feet to a point for corner;

THENCE, S03°50'37"E, continuing along the west right-of-way line of said FM 2931, a distance of 100.50 feet to a point;

THENCE, S01°52'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 248.07 feet to a point for corner;

THENCE, S46°49'31"W, continuing along the west right-of-way line of said FM 2931, a distance of 99.07 feet to a point for corner;

THENCE, S43°10'29"E, continuing along the west right-of-way line of said FM 2931, a distance of 98.92 feet to a point for corner;

THENCE, S01°52'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 3111.93 feet to a point for corner;

THENCE, S07°34'39"W, continuing along the west right-of-way line of said FM 2931, a distance of 100.5 feet to a point for corner;

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THENCE, S01°52'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 172.52 feet to a point for corner;

THENCE, S46°52'44"W continuing along the west right-of-way line of said FM 2931, a distance of 84.83 feet to a point for corner;

THENCE, S44°07'16"E, continuing along the west right-of-way line of said FM 2931, a distance of 99.02 feet to a point for corner;

THENCE, S01°52'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 1553.47 feet to a point for corner, said point also being the beginning of a curve to right, having a central angle of 25 degrees 30 minutes 00 seconds, a radius of 516.92 feet and being subtended by a chord bearing of S14°37'01"W, a chord distance of 228.17 feet;

THENCE, along the west right-of-way line of said FM 2931, and along said curve to the right, an arc distance of 230.06 feet to a point for corner;

THENCE, S54°25'59"W, continuing along the west right-of-way line of said FM 2931, a distance of 109.17 feet to a point for corner;

THENCE, S38°41'52"E, continuing along the west right-of-way line of said FM 2931, a distance of 84.10 feet to a point for corner, said point also being the beginning of a curve to right, having a central angle of 25 degrees 30 minutes 00 seconds, a radius of 264.44 feet and being subtended by a chord bearing of S14°37'01"W, a chord distance of 116.72 feet;

THENCE, along the west right-of-way line of said FM 2931, and along said curve to the right, an arc distance of 117.69 feet to a point for corner;

THENCE, S27°22'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 616.60 feet to a point for corner, said point also being the beginning of a curve to left, having a central angle of 26 degrees 27 minutes 00 seconds, a radius of 1195.93 feet and being subtended by a chord bearing of S14°08'30"W, a chord distance of 547.20 feet;

THENCE, along the west right-of-way line of said FM 2931, and along the said curve to the left, an arc distance of 552.09 feet to a point for corner;

THENCE, S00°55'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 744.33 feet to a point for corner;

THENCE, S02°42'01"W, continuing along the west right-of-way line of said FM 2931, a distance of 428.98 feet to a point for corner, said point also being on the Existing Unincorporated City Limits of the City of Aubrey as established by Aubrey annexation ORD. 750, dated 7/26/2022, same being the northeast corner of a 25-foot right-of-way dedication as shown on the Pecan Creek Addition, Phase 1, an addition to the City of Aubrey, by plat recorded in Document Number 2020-349, P.R.D.C.T.

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THENCE, N88°31'21"W, continuing along the west right-of-way line of said FM 2931, and along the north line of said right-of-way dedication, a distance of 25.00 feet to a point for corner, said point being on the northwest corner of said right-of-way dedication, and the northeast corner of Lot 2 of said Pecan Creek Addition;

THENCE, S02°42'01"W, continuing along the west right-of-way line of said FM 2931, and being along the west line of said right-of-way dedication, and the east line of said Lot 2, a distance of 729.69 feet to a point for corner, said point being on the southwest corner of said right-of-way dedication, and the southeast corner of Lot 1 of said Pecan Creek Addition;

THENCE, S87°17'59"E, along the south line of said right-of-way dedication, and continuing across the right-of-way of said FM 293, a distance of 125.23 feet to a point for corner on the east right-of-way line of said FM 2931;

THENCE, N02°42'01"E, continuing along the east right-of-way line of said FM 2931, a distance of 1154.34 feet to a point for corner;

THENCE, N00°55'01"E, continuing along the east right-of-way line of said FM 2931, a distance of 745.87 feet to a point for corner, said point also being the beginning of a curve to right, having a central angle of 26 degrees 27 minutes 00 seconds, a radius of 1095.92 feet and being subtended by a chord bearing of N14°08'31"E, a chord distance of 501.44 feet;

THENCE, along the east right-of-way line of said FM 2931, and along said curve to the right, an arc distance of 505.92 feet to a point for corner;

THENCE, N27°22'01"E, continuing along the east right-of-way line of said FM 2931, a distance of 616.60 feet to a point for corner, said point also being the beginning of a curve to left, having a central angle of 25 degrees 30 minutes 00 seconds, a radius of 1195.93 feet and being subtended by a chord bearing of N14°37'01"E, a chord distance of 527.88 feet;

THENCE, along the east right-of-way line of said FM 2931, and along said curve to the left, an arc distance of 532.26 feet to a point for corner;

THENCE, N01°52'01"E, continuing along the east right-of-way line of said FM 2931, a distance of 1456.00 feet to a point for corner;

THENCE, N07°34'39"E, continuing along the east right-of-way line of said FM 2931, a distance of 100.50 feet to a point corner;

THENCE, N01°52'01"E, continuing along the east right-of-way line of said FM 2931, a distance of 300.00 feet to a point for corner;

THENCE, N03°50'37"W, continuing along the east right-of-way line of said FM 2931, a distance of 100.5 feet to a point for corner;

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THENCE, N01°52'01"E, continuing along the east right-of-way line of said FM 2931 a distance of 5205.57 feet to a point for corner;

THENCE, N01°29'01"E, continuing along the east right-of-way line of said FM 2931, a distance of 894.77 feet to a point for corner;

THENCE, N12°47'37"E, continuing along the east right-of-way line of said FM 2931, a distance of 101.98 feet to a point for corner;

THENCE, N01°29'01"E, continuing along the east right-of-way line of said FM 2931, a distance of 200.00 feet to a point for corner;

THENCE, N04°13'37"W, continuing along the east right-of-way line of said FM 2931, a distance of 100.50 feet to a point for corner;

THENCE, N01°29'01"E, continuing along the east right-of-way line of said FM 2931, a distance of 500.00 feet to a point for corner;

THENCE, N06°20'58"W, continuing along the east right-of-way line of said FM 2931, a distance of 73.38 feet to a point for corner;

THENCE, N01°29'01"E, continuing along the east right-of-way line of said FM 2931, a distance 143.81 feet to a point for corner, said point also being the beginning of a curve to right, having a central angle of 09 degrees 24 minutes 00 seconds, a radius of 1095.93 feet and being subtended by a chord bearing of N06°11'00"E, a chord distance of 179.80 feet;

THENCE, along the east right-of-way line of said FM 2931, and along said curve to the right, an arc distance of 179.80 feet to a point for corner;

THENCE, N10°53'01"E, continuing along the east right-of-way line of said FM 2931, a distance 67.70 feet to a point for corner, said point also being the beginning of a curve to left, having a central angle of 09 degrees 06 minutes 00 seconds, a radius of 1195.97 feet and being subtended by a chord bearing of N06°20'01"E, a chord distance of 189.75 feet;

THENCE, along the east right-of-way line of said FM 2931, and along said curve to the left, an arc distance of 189.95 feet to a point for corner;

THENCE, N46°47'01"E, continuing along the east right-of-way line of said FM 2931, a distance of 69.32 feet to a point for corner, said point also being the beginning of a curve to left, having a central angle of 13 degrees 08 minutes 05 seconds, a radius of 384.44 feet and being subtended by a chord bearing of N76°13'24"W, a chord distance of 87.94 feet;

THENCE, along the north right-of-way line of said FM 2931, and along said curve to the left, an arc distance of 88.13 feet to a point for corner, said point also being the beginning of a curve to left, having a central angle of 02 degrees 28 minutes 53 seconds, a radius of 424.44 feet and being subtended by a chord bearing of N84°01'53"W, a chord distance of 18.38 feet;

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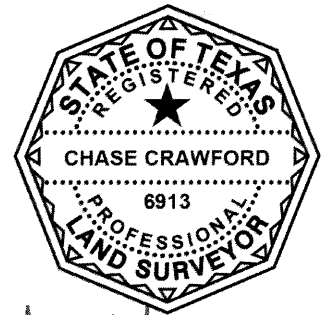
THENCE, along the north right-of-way line of said FM 2931, and along said curve to the left, an arc distance of 18.38 feet to a point for corner;

THENCE, N88°06'00"W, continuing along the north right-of-way line of said FM 2931, a distance of 118.54 feet to the POINT OF BEGINNING, said annexation tract containing 32.06 acres (1,396,342 square feet) of land, more or less.

Notes:

1. This document was prepared under 22 TAC § 663.21, and does not reflect the results of an on the ground survey, and is not to be used to convey or establish interests in real property except those right and interests implied or established by the creation or reconfiguration of the boundary of the political subdivision for which it was prepared.
2. Basis of Bearings & Distances: TxDOT Right-of-way strip map for F.M. 2931 from JCT FM 428 & FM 2931 south to SH 24 (US 380), dated 6-30-1969, Control 2979, Section 1, Job 2. Rotated 00°29'59" counterclockwise to match Denton County Parcel Map
3. A Plat of even date herewith accompanies this Metes and Bounds Description.

Chase Crawford, R.P.L.S.
Texas Registration No. 6913
Birkhoff, Hendricks & Carter, L.L.P.
TBPLS Firm No. 100318-00
11910 Greenville Ave., Suite 600
Dallas, Texas 75243



Chase Crawford
08/22/24

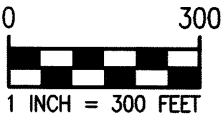
H:\Projects\Aubrey\4000\393-Annexations\2024 Annexations\FM 2931 ROW (FM 428 to Loyd Ranch)\4000-393 FM2931 ROW Exhibits
REVISED: 8/22/24 - KMIRELS

EXHIBIT "A"

PAGE 7 OF 11

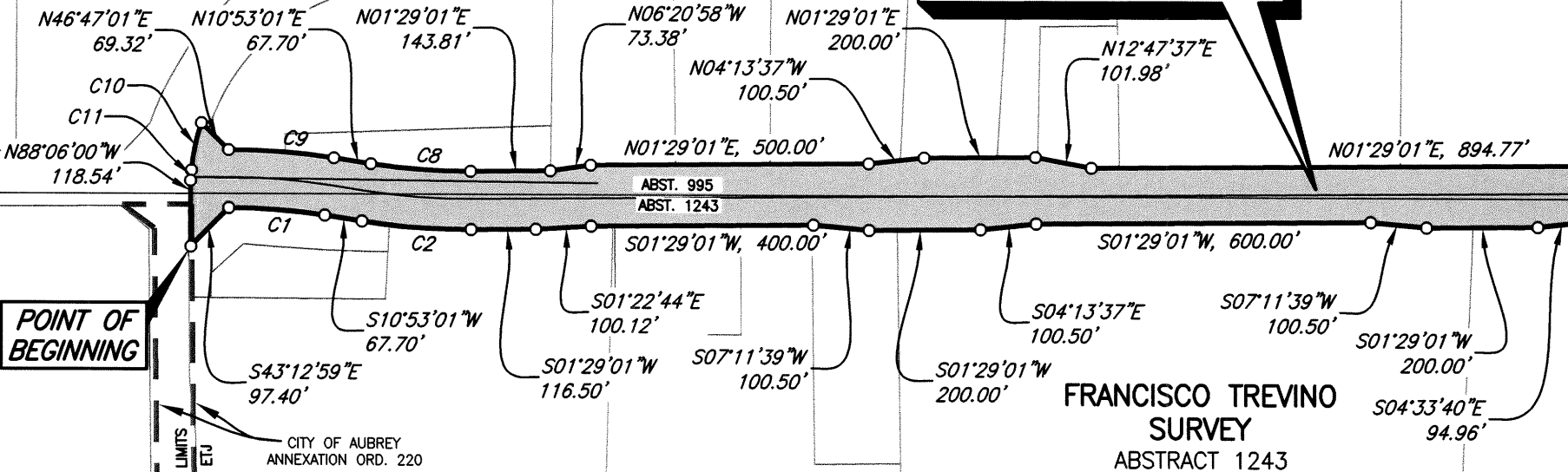
FREDERICK POLLARD
SURVEY
ABSTRACT 995

CURVE DATA TABLE					
CURVE #	RADIUS	CENTRAL ANGLE (Δ)	ARC LENGTH	CHORD BEARING	CHORD DISTANCE
C1	1090.88'	9°06'00"	173.26'	S06°20'01"W	173.08'
C2	1200.90'	9°24'00"	197.02'	S06°11'01"W	196.80'
C8	1095.93'	9°24'00"	179.80'	N06°11'00"E	179.80'
C9	1195.97'	9°06'00"	189.95'	N06°20'01"E	189.75'
C10	384.44'	13°08'05"	88.13'	N76°13'24"W	87.94'
C11	424.44'	2°28'53"	18.38'	N84°01'53"W	18.38'



FM 428

FM 2931 ANNEXATION
AREA: 32.06 AC.

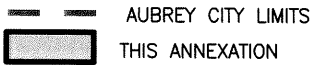


MATCH LINE 1

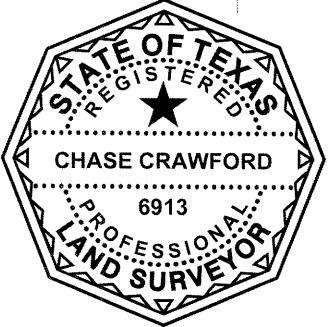
POINT OF
BEGINNING

FRANCISCO TREVINO
SURVEY
ABSTRACT 1243

MAP LEGEND



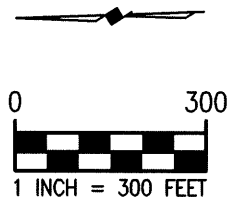
Chase Crawford
08/22/24



- NOTES:
1. THIS DOCUMENT WAS PREPARED UNDER 22 TAC §663.21, DOES NOT REFLECT THE RESULTS OF AN ON THE GROUND SURVEY, AND IS NOT TO BE USED TO CONVEY OR ESTABLISH INTERESTS IN REAL PROPERTY EXCEPT THOSE RIGHTS AND INTERESTS IMPLIED OR ESTABLISHED BY THE CREATION OR RECONFIGURATION OF THE BOUNDARY OF THE POLITICAL SUBDIVISION FOR WHICH IT WAS PREPARED.
 2. BASIS OF BEARING & DISTANCES: TXDOT RIGHT-OF-WAY STRIP MAP FROM JCT FM 428 & FM 2931 SOUTH TO SH 24 (US 380), DATED 6/30/1969, CONTROL 2979, SECTION 1, JOB 2. ROTATED 00°29'59" COUNTERCLOCKWISE TO MATCH THE DENTON COUNTY PARCEL MAP.
 3. A METES AND BOUNDS DESCRIPTION OF EVEN DATE HEREWITH ACCOMPANIES THIS EXHIBIT.

CITY OF AUBREY, TEXAS	
FM 2931 RIGHT-OF-WAY ANNEXATION	
32.06 ACRES, F. H. POLLARD SURVEY, ABSTRACT NO. 995, AND F. TREVINO SURVEY, ABSTRACT NO. 1243, DENTON COUNTY, TEXAS	
BIRKHOFF, HENDRICKS & CARTER, L.L.P. PROFESSIONAL ENGINEERS TBPELS PE Firm 526; Survey Firm 10031800 11910 Greenville Ave., Suite 600 Dallas, Texas 75243 (214) 361-7900	AUGUST 2024

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REVISED: 8/22/24 - KMIRELES



FREDERICK POLLARD
SURVEY
ABSTRACT 995

MAP LEGEND

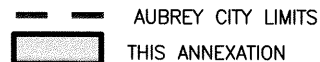


EXHIBIT "A"

PAGE 8 OF 11

MATCH LINE 1

MATCH LINE 2

FM 2931 ANNEXATION
AREA: 32.06 AC.

N01°29'01"E
894.77'

N01°52'01"E, 5205.57'

ABST. 995
ABST. 1243

S01°52'01"W, 1405.23'

S04°33'40"E
94.96'

S07°34'39"W
100.50'

S01°52'01"W
100.00'

S03°50'37"E
100.50'

S01°52'01"W
248.07'

S46°49'31"W
99.07'

S01°52'01"W, 3111.93'

S43°10'29"E
98.92'

FRANCISCO TREVINO
SURVEY
ABSTRACT 1243

REDFEARN RD.

NOTES:

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3. A METES AND BOUNDS DESCRIPTION OF EVEN DATE HEREWITH ACCOMPANIES THIS EXHIBIT.

Chase Crawford
08/22/24



CITY OF AUBREY, TEXAS

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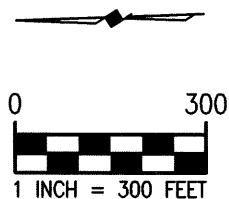
PROFESSIONAL ENGINEERS

TBPELS PE Firm 526; Survey Firm 10031800

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AUGUST
2024

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FREDERICK POLLARD
SURVEY
ABSTRACT 995

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AREA: 32.06 AC.

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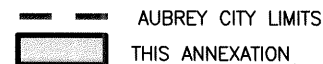


EXHIBIT "A"

PAGE 9 OF 11

MATCH LINE 2

MATCH LINE 3

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ABST. 995
ABST. 1243

S01°52'01"W, 3111.93'

N03°50'37"W
100.50'

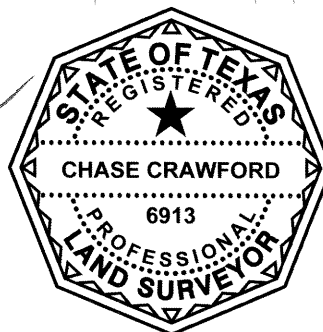
S07°34'39"W
100.50'

FRANCISCO TREVINO
SURVEY
ABSTRACT 1243

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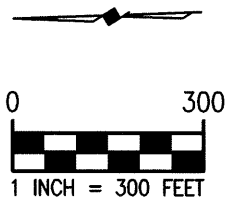
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AUGUST
2024

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REVISED: 8/22/24 - KMIRELES



CURVE DATA TABLE					
CURVE #	RADIUS	CENTRAL ANGLE (Δ)	ARC LENGTH	CHORD BEARING	CHORD DISTANCE
C3	516.92'	25°30'00"	230.06'	S14°37'01"W	228.17'
C4	264.44'	25°30'00"	117.69'	S14°37'01"W	116.72'
C7	1195.93'	25°30'00"	532.26'	N14°37'01"E	527.88'

EXHIBIT "A"
PAGE 10 OF 11

MATCH LINE 3

FREDERICK POLLARD
SURVEY
ABSTRACT 995

FM 2931 ANNEXATION
AREA: 32.06 AC.

WILLIAM LUMPKINS
SURVEY
ABSTRACT 730

MATCH LINE 4

N01°52'01"E
300.00'

N07°34'39"E
100.50'

N01°52'01"E, 1456.00'

ABST. 995
ABST. 1243

S01°52'01"W, 1553.47'

S44°07'16"E
99.02'

S46°52'44"W
84.83'

S01°52'01"W
172.52'

MCNATT RD.

FRANCISCO TREVINO
SURVEY
ABSTRACT 1243

S54°25'59"W
109.17'

C7

C3

N27°22'01"E
616.60'

S27°22'01"W, 616.60'
S38°41'52"E
84.10'

KNUCKLES RD.

ABST. 730
ABST. 36

KNUCKLES RD.

MAP LEGEND

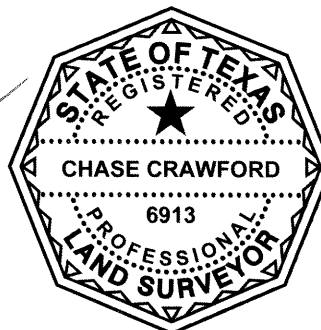


AUBREY CITY LIMITS
THIS ANNEXATION

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CHC
08/22/24



CITY OF AUBREY, TEXAS

FM 2931 RIGHT-OF-WAY ANNEXATION

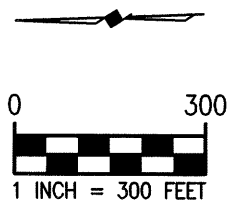
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F. TREVINO SURVEY, ABSTRACT NO. 1243, AND, WM. LUMPKINS SURVEY, ABSTRACT NO. 730 DENTON COUNTY, TEXAS

BIRKHOFF, HENDRICKS & CARTER, L.L.P.
PROFESSIONAL ENGINEERS
TBPELS PE Firm 526; Survey Firm 10031800
11910 Greenville Ave., Suite 600 Dallas, Texas 75243 (214) 361-7900

AUGUST
2024

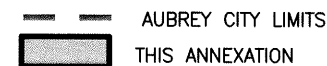
EXHIBIT "A"

PAGE 11 OF 11



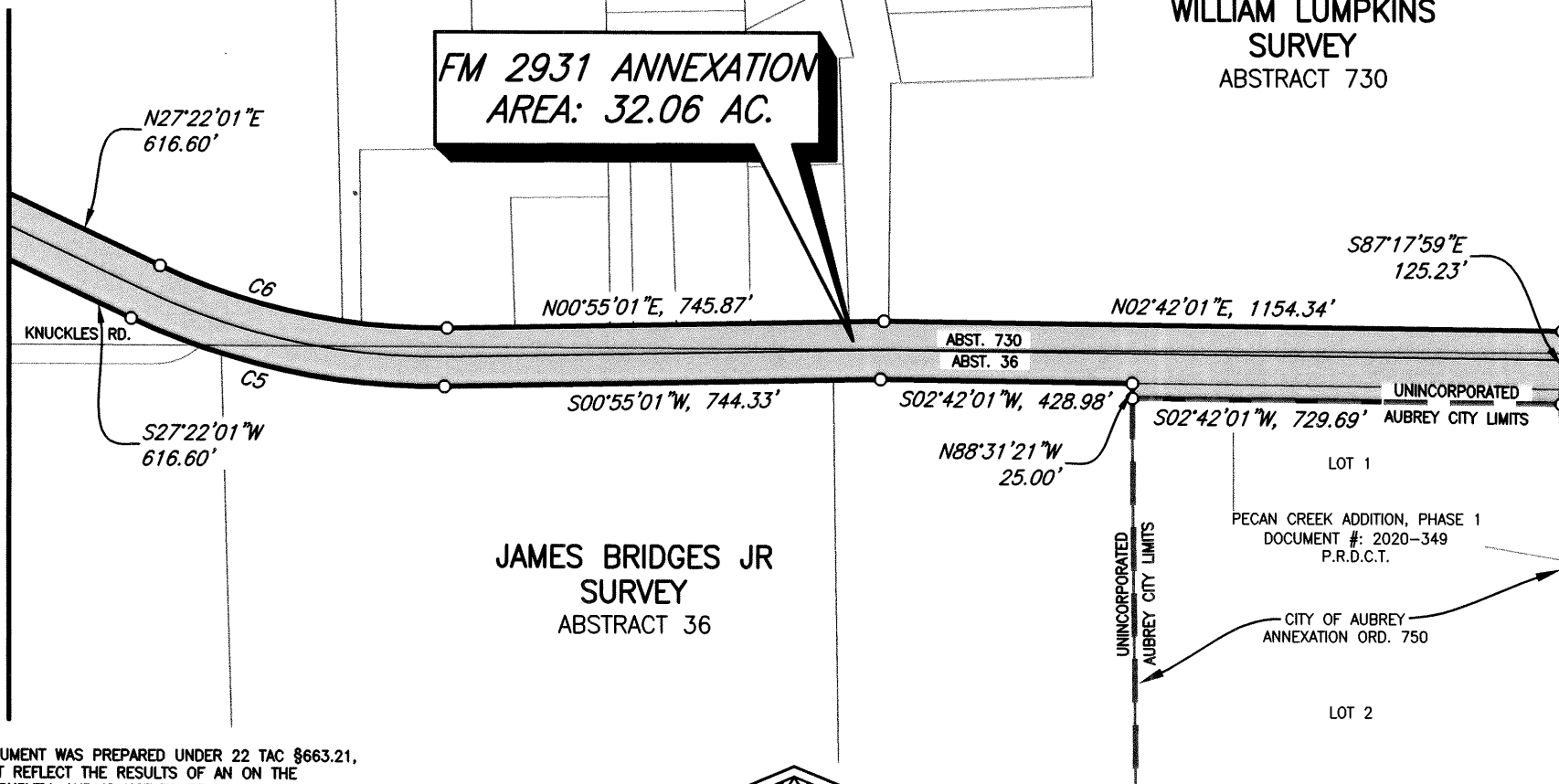
CURVE DATA TABLE					
CURVE #	RADIUS	CENTRAL ANGLE (Δ)	ARC LENGTH	CHORD BEARING	CHORD DISTANCE
C5	1195.93'	26°27'00"	552.09'	S14°08'30"W	547.20'
C6	1095.92'	26°27'00"	505.92'	N14°08'31"E	501.44'

MAP LEGEND



**WILLIAM LUMPKINS
SURVEY
ABSTRACT 730**

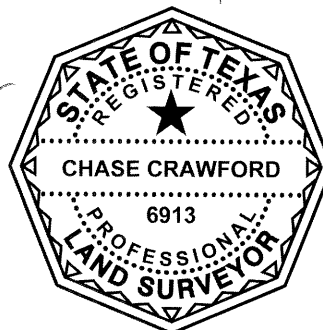
MATCH LINE 4



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CITY OF AUBREY, TEXAS

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J. BIDES SURVEY, ABSTRACT NO. 36, DENTON COUNTY, TEXAS

BIRKHOFF, HENDRICKS & CARTER, L.L.P.

PROFESSIONAL ENGINEERS

TBPELS PE Firm 526; Survey Firm 10031800
11910 Greenville Ave., Suite 600 Dallas, Texas 75243 (214) 361-7900

**AUGUST
2024**



**City Council Special Meeting
Staff Report
August 28, 2024**

Agenda Item

Hold Public Hearing, consider and act on Ordinance 871-24 approving the City of Aubrey's Technical Construction Standards and Specifications.

Staff Contact

Leanne Wilson, Director of Public Works and Development Services
lwilson@aubreytx.gov

Summary

This ordinance adopts engineering standards referenced in the subdivision ordinance and provides for a standard design and implementation of orderly, safe, healthy and uniform development of the area within the corporate city limits and within our ETJ.

Our current standards were last adopted in 2014 and as we have been working through new development it was necessary to update some outdated standards. Aubrey Special Provisions to the NCTCOG Standard Specifications for Public Works Construction as adopted by the city are referenced in these standards. These standards set forth the minimum requirements for materials and workmanship for streets, parking lots, sidewalks, drainage, water and wastewater systems. These standards shall be considered as the minimum requirements, and it is the responsibility of the developer to determine if more stringent requirements are necessary for a particular development.

Some of the major areas of amendment include:

- Right-of-way revisions for consistency with the most recently adopted master thoroughfare plan
- Aubrey decorative street sign standards
- Aubrey standard light pole design
- Aubrey logo manhole covers
- Details for sewer clean-outs and locations
- Details for water meter boxes and locations
- Details for sidewalks
- Fire hydrant standards
- General notes
- Automatic flush stations
- Sample stations
- Metering vaults
- Solid waste enclosures
- Project sign details
- Street roundabouts

Financial Summary

None

Staff Recommended Motion

Approve

Conditions

N/A

ORDINANCE NO. ____

AN ORDINANCE OF THE CITY OF AUBREY, TEXAS, REPEALING ORDINANCE NO. 533-14 AND AMENDING THE AUBREY CODE OF ORDINANCES CHAPTER 10(A), "SUBDIVISION ORDINANCE", ARTICLE 3, "SUBDIVISION DESIGN STANDARDS", TO ADD A NEW SECTION 13, "STANDARDS OF DESIGN", AND ADD SUBSECTION 13.1, "TECHNICAL CONSTRUCTION STANDARDS AND SPECIFICATIONS MANUAL" AND A NEW SUBSECTION 13.2, "PENALTY"; PROVIDING FOR THE INCORPORATION OF PREMISES; PROVIDING A PENALTY OF A FINE NOT TO EXCEED FIVE HUNDRED DOLLARS (\$500.00) FOR VIOLATIONS; PROVIDING FOR SAVINGS, SEVERABILITY, AND REPEALING CLAUSES; PROVIDING FOR CODIFICATION; AND PROVIDING FOR AN EFFECTIVE DATE.

WHEREAS, the City of Aubrey ("City") is a home rule municipality in Denton County, created in accordance with provision of the Texas Local Government Code and operating pursuant to the enabling legislation of the State of Texas;

WHEREAS, the Engineering Standards, also referenced as or titled "Technical Construction Standards and Specifications (TCSS) Manual", has been updated to provide for new standards and requirements in terms of performance and nationally accepted standards;

WHEREAS, the City is currently operating under the 2014 TCSS;

WHEREAS, the City is experiencing rapid growth that is increasing demands upon all public infrastructure and has determined it necessary to update Construction Standards and design and desires to make infrastructure improvements, as a result of the increased public demand;

WHEREAS, the City noticed the public and held a public hearing and accepted public input;

WHEREAS, and Staff has reviewed the updates to the TCSS attached hereto as **Exhibit "A"**, and incorporated herein as if set forth in full for all purposes, and has determined that the updates would be beneficial to the City and therefore recommends adoption of the Engineering Standards; and

WHEREAS, the City Council ("City Council") finds and determines that the adoption of Technical Construction Standards and Specifications Manual attached hereto as Exhibit "A" to provide minimum standards to safeguard the health, property, and welfare of the citizens of Aubrey by regulating and controlling Engineering Standards with in the City is in the best interest of the public and the City.

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

SECTION 1. Incorporation of Premises. The findings set forth above are incorporated into the body of his Ordinance as if fully set forth herein.

SECTION 2. Amendments.

SECTION 2.01. Repeal. That Ordinance No. 533-14 is hereby repealed.

SECTION 2.02. Adopt. That Chapter 10(A), “Subdivision Ordinance”, Article 3, “Subdivision Design Standards”, is hereby amended to adopt a new Section 13, “Standards of Design”, and add Subsection 13.1, “Technical Construction Standards and Specifications Manual” of the Code of Ordinances of the City of Aubrey, Texas, set forth in its entirety in Exhibit A, attached and incorporated.

SECTION 2.03. Penalty. That Chapter 10(A), “Subdivision Ordinance”, Article 3, “Subdivision Design Standards”, is hereby amended to adopt a new Section 13, “Standards of Design”, and add a new Subsection 13.2, “Penalty”, of the Code of Ordinances of the City of Aubrey, Texas, is hereby established and shall be and read in its entirety and incorporated with all other provisions of Article 3 not herein expressly amended to remain in full force and effect:

“Article 3 Subdivision Design Standards

Section 13 Standards of Design

13.2 Penalty. Any person, firm, or corporation violating any of the provisions of this ordinance or of the Code of Ordinances as amended hereby, shall be subject to the same penalty as provided for in the Code of Ordinances of the City, and upon conviction, shall be punished by a fine not to exceed five hundred dollars (\$500.00) for each offense, and a separate offense shall be deemed committed upon each day during or on which a violation occurs and continues.”

SECTION 4. Savings and Repealing Clauses. This Ordinance shall be cumulative of all other ordinances of the City and shall not repeal any of the provisions of those ordinances except in those instances where the provisions of those ordinances are in direct conflict with the provisions of this Ordinance. Provided; however, that the repeal of such ordinances or parts of such ordinances, and the amendments and changes made by this Ordinance, shall not affect any right, property or claim which was or is vested in the City, or any act done, or right accruing or accrued, or established, or any suit, action or proceeding had or commenced before the time when this Ordinance shall take effect; nor shall said repeals, amendments or changes affect any offense committed, or any penalty or forfeiture incurred, or any suit or prosecution pending at the time when this Ordinance shall take effect under any of the ordinances or sections thereof so repealed, amended or changed; and to that extent and for that purpose the provisions of such ordinances or parts of such ordinances shall be deemed to remain and continue in full force and effect.

SECTION 5. Severability. Should any section, subsection, sentence, clause, or phrase of this Ordinance be declared unconstitutional or invalid by a court of competent jurisdiction, it is expressly provided that any and all remaining portions of this Ordinance shall remain in full force and effect. The City of Aubrey hereby declares that it would have passed this Ordinance, and each section, subsection, clause, or phrase thereof irrespective of the fact that any one or more sections, subsections, sentences, clauses and phrases be declared unconstitutional or invalid.

SECTION 6. Codification. The City Secretary is hereby directed to authenticate this Ordinance by seal and signature and properly codifying this Ordinance and providing a printed copy for public review as required by Section 3.16 of the Aubrey Home Rule Charter.

SECTION 7. Effective Date. The Ordinance shall become effective from and after its date of adoption and publication as provided by law, and it is so ordained.

**PASSED AND APPROVED BY THE CITY COUNCIL OF THE CITY OF AUBREY,
TEXAS THIS THE ____ DAY OF _____, 2024.**

APPROVED:

Chris Rich, Mayor

ATTEST:

Jenny Hicks, City Secretary

APPROVED AS TO FORM:

Patricia A. Adams, City Attorney

Exhibit “A”
Technical Construction Standards and Specifications (TCSS) Manual



***TECHNICAL CONSTRUCTION
STANDARDS AND
SPECIFICATIONS (TCSS) MANUAL***

PUBLIC WORKS DEPARTMENT

JULY 2024

TABLE OF CONTENTS

Section 1.	General Requirements
Section 2.	Streets
Section 3.	Storm Drainage Design Criteria and Procedures
Section 4.	Vegetation
Section 5.	Water System
Section 6.	Wastewater System
Section 7.	Miscellaneous Requirements

1. GENERAL REQUIREMENTS

1.1 Introduction:

The “Standards of Design” are designed to implement the provisions of the Subdivision Ordinance and to provide for the orderly, safe, healthy and uniform development of the area within the corporate city limits and within the area surrounding the City, extraterritorial jurisdiction (ETJ).

The 4th Edition of the NCTCOG Standard Specifications for Public Works Construction dated October 2004 as modified by the City of Aubrey Special Provisions are supplemental and are made a part of these Standards of Design. These documents are to be considered as the minimum requirements of engineering design. The adherence to the requirements of these documents and/or the approval by the City of Aubrey and its agents in no way relieves the developer of the responsibility for adequacy of design, which may require more stringent standards than these, the completeness of plans and specifications or the suitability of the completed facilities. In unusual circumstances, the City of Aubrey may determine that designs other than those of the Standards are necessary and will inform the developer of such requirements before final engineering review.

The developer shall obtain authorization from the City of Aubrey, in writing, for any deviations from the requirements set forth in the Standards of Design, Standard Specifications for Construction or Standard Details.

1.2 Standards of Design:

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

1.3 Standard Specifications for Construction:

The City of Aubrey Special Provisions to the NCTCOG Standard Specifications for Public Works Construction as adopted by the City of Aubrey is referenced in this document. The Standard Specifications for construction set forth the minimum requirements for materials and workmanship for streets, parking lots, sidewalks, drainage, water and wastewater systems. These specifications should be considered as minimum requirements and such additional requirements as the developer of the City may consider appropriate should be added as supplements.

1.4 Standard Details:

In an effort to have uniformity and to facilitate maintenance, the City has adopted the North Central Texas Council of Governments (NCTCOG) Standard Drawings as modified by the City of Aubrey Special Provisions for certain facilities such as manholes, street sections, sidewalks, water, wastewater, storm water, curb inlets, barrier free ramps, etc. The City of Aubrey Special Provisions to the NCTCOG Standard Details are located in Section 9 of this document. The NCTCOG Standard Specifications can be obtained from the North Central Texas Council of Governments at 616 Six Flags Drive, Suite 200, Arlington, Texas, 76005, (817) 640-3300.

The City's General Notes for Construction shall be included in all construction plans. A copy of the City's General Construction Notes is included in Section 9 of this document.

1.5 Materials Testing and Quality Control

Testing of materials and quality control for all development construction shall be performed by an approved materials testing laboratory and payment for such services shall be made by the contractor. The City Engineer shall approve the testing laboratory nominated to perform the service. It is the contractor's responsibility to show, through test procedures and results, that the work is in conformance with these design standards.

1.6 Utilities to be Underground:

All utilities within a residential development shall be placed underground. Utilities are defined for this purpose as water pipelines, wastewater pipelines, storm water pipelines, natural gas pipelines, telephone wires, cable TV wires and electric wires. In case of special or unique circumstances, the City may grant variances or exceptions to this requirement. Any request for variance or exception should be submitted in writing to the City Manager setting forth the justification for an exception. The granting of a variance or exception by the City will be in writing. No work will be accepted without written approval from the City Manager or his/her City designee, or in the case of franchise utilities, the City Council. Commercial developments may have overhead utilities as approved by the City.

1.7 Submittal to Utility Companies:

The developer shall be responsible for submittal of information needed to design private utilities for the development. This information shall be submitted to TXU-Electric, ONCOR, Southwestern Bell, ATMOS-Gas, the cable TV franchise and any other appropriate utility.

Written confirmation shall be submitted with the final engineering drawings, verifying that the affected Utility companies have reviewed the final plat and easement description and agree that the easement locations and sizes are adequate and consistent with the design requirements of the utilities.

1.8 Requirements of the Final Engineering Drawings:

The final engineering drawings shall conform to the established "Engineering Drawings Checklist" and these Standards of Design.

The final engineering drawings will consist of drawings showing all information necessary to completely review the engineering design of improvements proposed for or affected by the site and sealed by a Registered Professional Engineer, licensed in the State of Texas.

1.9 Final Acceptance:

After improvements have been constructed, the developer shall be responsible for providing to the City "As Built" or "Record Drawings" mylars and one (1) set of "Black line prints". The City will not accept the subdivision until the prints are submitted to the City. Prints shall be sized 11"X17". The City shall also be furnished pdf images of each sheet named according to the sheet title and sheet number and AutoCAD 2010 or later format drawings on a CD-ROM (No XREFS) of the "As Built" or "Record Drawings" (digital).

1.10 Warranty

As a condition of final acceptance the contractor shall furnish a two (2) year maintenance bond in the amount of 100% of the public improvements, which shall become effective from the date of acceptance.

2. STREETS

2.1 General:

The street system, including the street layout, shall be in accordance with generally accepted engineering practices and in compliance with the Comprehensive Plan, the latest Thoroughfare Plan, the Zoning Ordinances, the Subdivision Regulations and other applicable regulations. The drainage system, as incorporated into the street system, shall comply with Section 3 of this document. The plans and specifications, design computations, if required, and other applicable data shall be submitted to the City for review. Construction shall not commence prior to approval of the plans and specifications by the City. All changes during construction shall be submitted to the City's Engineer for approval and acceptance by the City prior to any construction modifications.

2.2 Street Arrangement:

Unless otherwise approved by the City, provisions shall be made for the extension of existing major arterials, collector streets and local streets in accordance with the Thoroughfare Plan and any specific street alignments as adopted by the City Council.

Off-center intersections will be considered for approval only for minor collector and local streets and only when there is a minimum property line separation of 125' unless otherwise approved by the City's Engineer.

Within residential areas, the following design elements are encouraged: (A) Developing only a limited number of access points to arterial streets bordering the subdivision; (B) Incorporating curvilinear streets into the plan; (C) More than one point of access; and (D) Incorporating a discontinuous residential street network, which utilizes three-way intersections in lieu of four-way intersections. When these factors are incorporated into a residential street plan, the result is enhanced character and traffic safety.

2.3 Thoroughfare and Street Geometry:

Geometric design standards are presented in two formats within this section. Table 2.1 identifies specific design criteria for each standard roadway type. Figure 2.1A and 2.1B shows the typical cross-section for each standard roadway type. It is noted that dimensions shown are to the face of curb, unless specifically identified otherwise.

Each roadway type is keyed to the City Thoroughfare Plan, with the exception of local streets. The reader is referred to this document for information as to the locations where these roadways are to be used.

2.4 Turn Lanes:

All left turn storage areas shall be ten (10) feet wide with minimum storage requirements for left-turn lanes as in Figure 2.2. The transition curves used in left-turn

lanes shall be two (2), 250-foot radius reverse curves with a total transition length of 100 feet.

TABLE 2.1
GEOMETRIC DESIGN STANDARDS

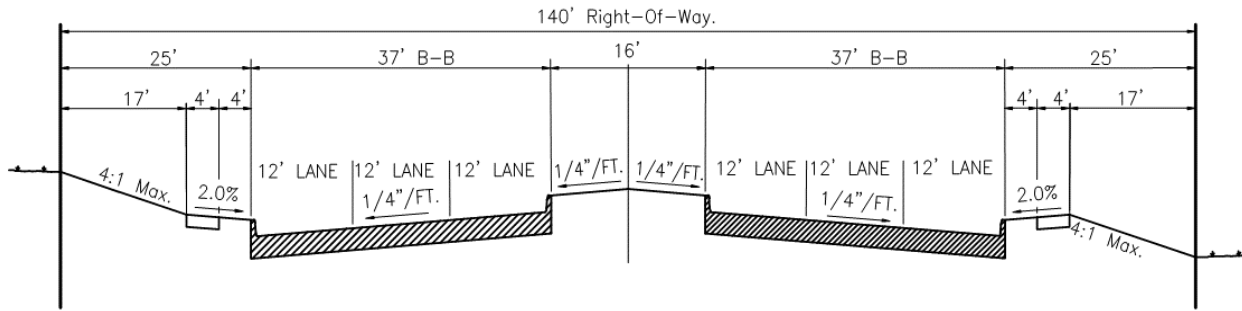
Design Element	Principal Arterial	Major Arterial	Minor Arterial	Major Collector	Minor Collector	Local (Residential)
Number Traffic Lanes	6	6	4	4	2	2
Minimum Lane Width (Feet)	12	12	12	11	11 + 2 Parking	15
Minimum R.O.W. Width* (Feet)	140	120	100	80	60	50
Design Speed (M.P.H.)	45	45	40	40	40	30****
Stopping Sight Distance (Feet)	360	360	305	305	305	200
Median Width ** (Feet)	16	16	14	--	--	--
Minimum Lateral Clearance (Feet)	6	6	6	6	6	--
Parking Permitted	NO	NO	NO	NO	Com. Some Res. Yes	Res. Yes
Minimum Horizontal Centerline Curvature (Feet)	1200	1200	850	Com. 700 Res. 600	Com. 500 Res. 350	Res. 250 ELBOW – 50'

* RIGHT-OF-WAY REQUIREMENTS FOR STATE HIGHWAYS AND OUTER LOOP AND/OR THE PROVISION OF RIGHT TURN LANES OR OTHER INTERSECTION IMPROVEMENTS MAY EXCEED THIS MINIMUM R.O.W. STANDARDS

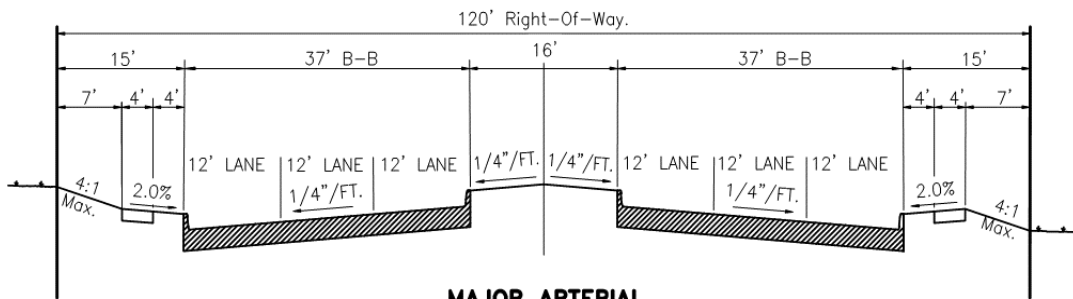
** LARGER MEDIANS MAY BE REQUIRED TO PROVIDE FOR MULTIPLE TURN LANES.

*** LOCAL RESIDENTIAL CUL-DE-SACS SHALL HAVE A MINIMUM R.O.W. RADIUS OF FIFTY-SEVEN AND ONE-HALF FEET (57.5').

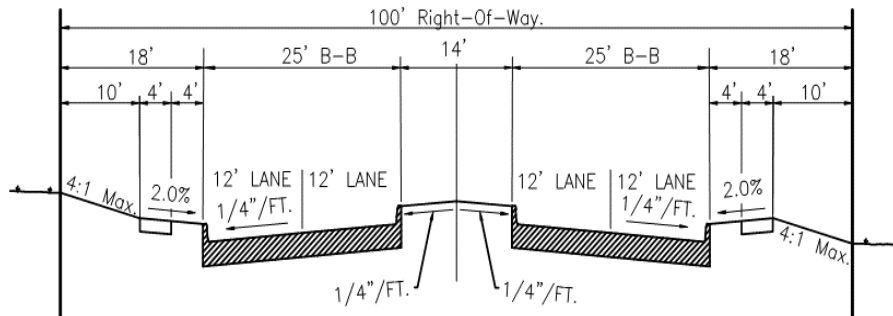
**** A LOWER DESIGN SPEED MAY BE USED IF, IN THE JUDGEMENT OF THE CITY'S ENGINEER, SITE FEATURES (TOPOGRAPHY, STREET PATTERN, ETC.) DICTATE. IN NO CASE SHALL THE DESIGN SPEED BE LOWER THAN 20 MPH.



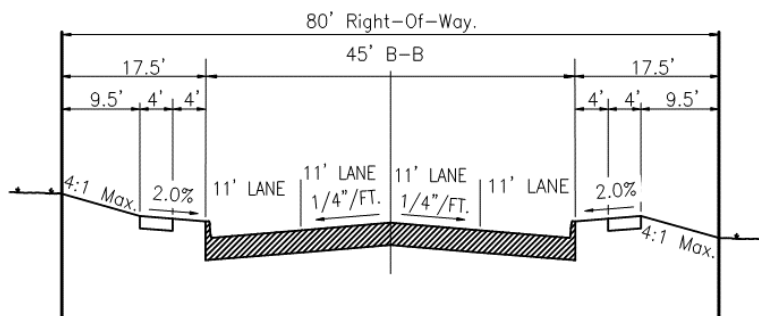
PRINCIPAL ARTERIAL



MAJOR ARTERIAL

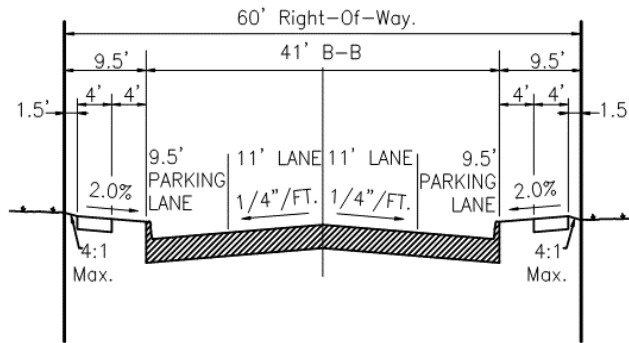


MINOR ARTERIAL

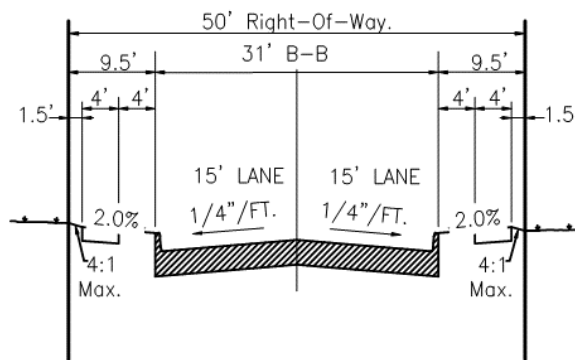


MAJOR COLLECTOR

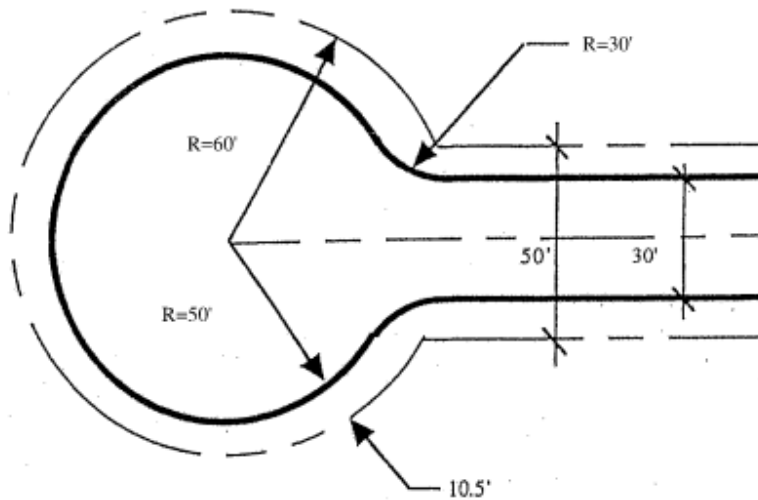
FIGURE 2.1A



MINOR COLLECTOR



RESIDENTIAL STREET

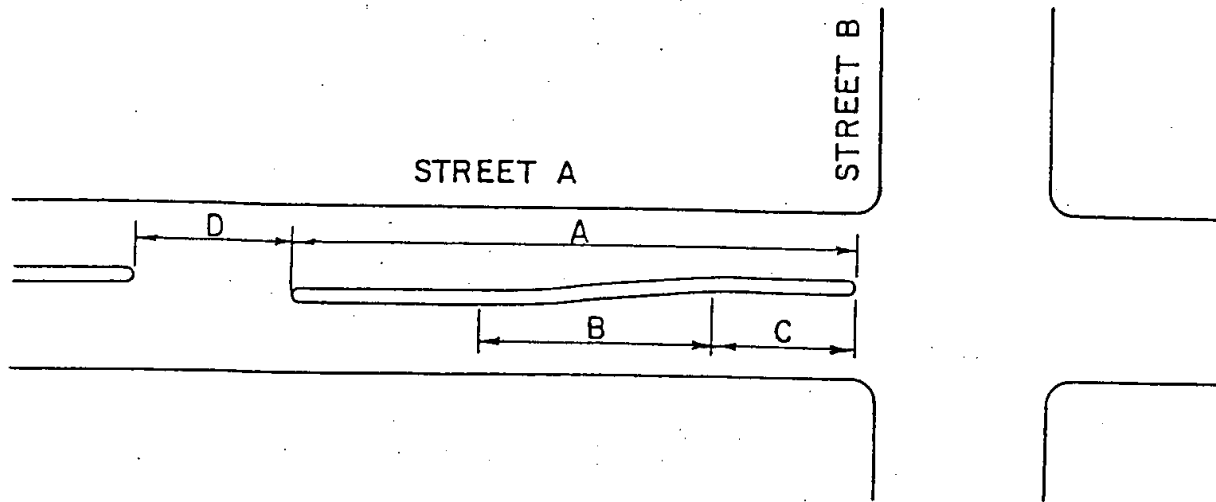


TYPICAL CUL-DE-SAC PLAN VIEW

Typical Cross Sections - Collector and Local Streets

FIGURE 2.1B

FIGURE 2.2
MEDIAN DESIGN STANDARDS



INTERSECTING STREET TYPE		MINIMUM LENGTH (FEET)			
STREET A	STREET B	A	B	C*	D**
Principal Arterial	Principal Arterial Major Arterial	310	100	150	60
Principal Arterial	Minor Arterial	260	100	100	60
Principal Arterial	Major Collector Minor Collector	260	100	100	60
Principal Arterial	Local/Private	220	100	60	60
Minor Arterial	Principal Arterial	310	100	150	60
Minor Arterial	Minor Arterial	260	100	100	60
Minor Arterial	Major Collector Minor Collector	260	100	100	60
Minor Arterial	Local/Private	220	100	60	60

LEFT-TURN STORAGE AREA WIDTH 10' MINIMUM

MEDIAN WIDTH (SEE GEOMETRIC DESIGN STANDARD FOR PRINCIPAL ,MAJOR AND MINOR ARTERIAL).

*** MINIMUM LENGTH – ACTUAL LENGTH DEPENDENT UPON ANTICIPATED TURN VOLUME**

**** OR STREET WIDTH + 8 FEET – WHICHEVER IS GREATER**

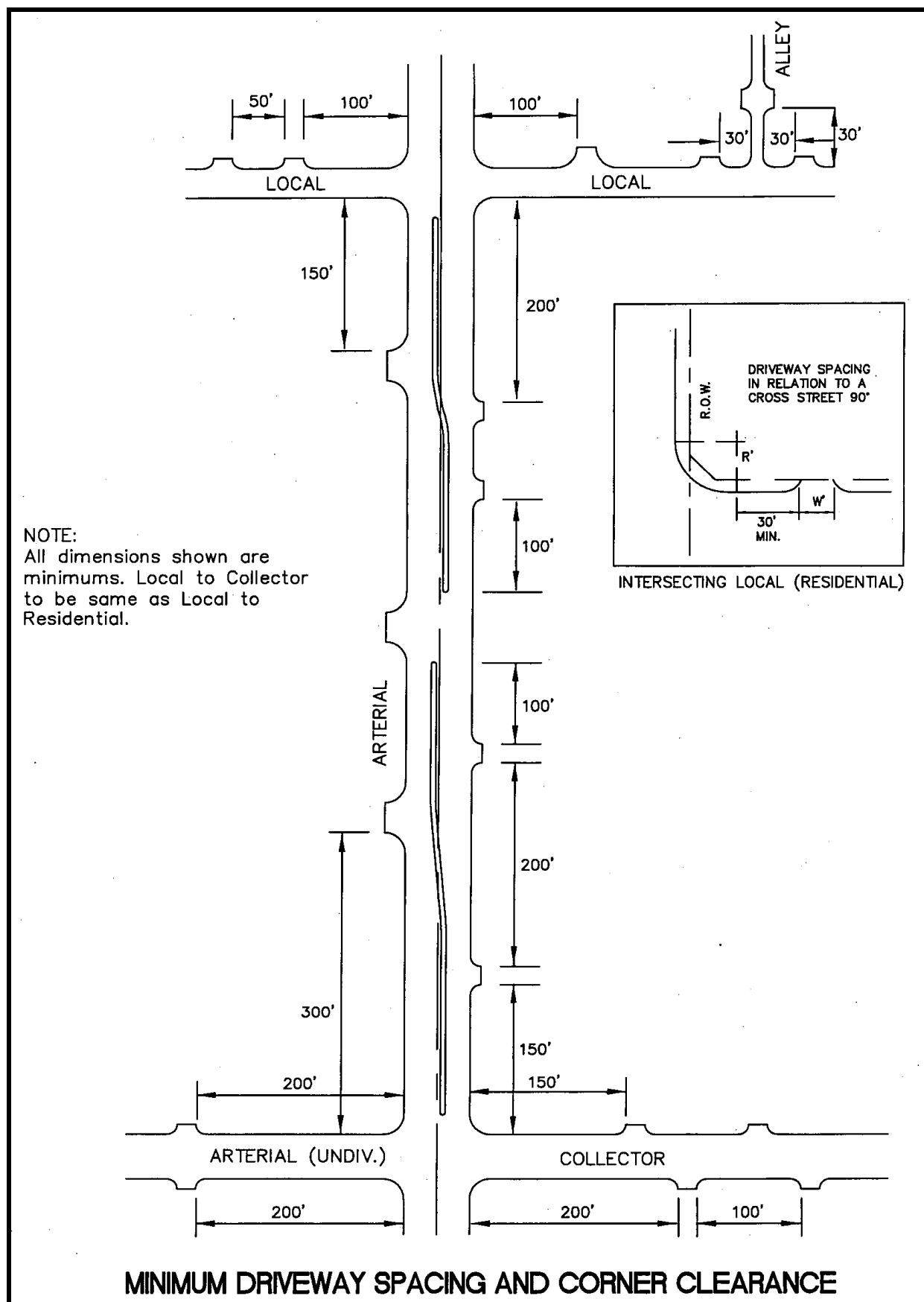


FIGURE 2.3

2.5 Median Openings, Width, Location and Spacing:

Arterial thoroughfares in the City of Aubrey are to have raised medians. Arterials having two-way left turn lanes are discouraged and may be allowed only in special circumstances with the approval of the City Council.

Median openings at intersections shall be from right-of-way to right-of-way of the intersecting street, unless otherwise approved by the City's Engineer.

The width of mid-block median openings shall not be less than 60 feet, or greater than 70 feet.

Using the above requirements, examples of the minimum distance between median openings on a divided street where left-turn storage is provided in both directions are:

- A. 310 feet from nose to nose of the median from the intersection of two arterials to a street or drive (see Figure 2.2);
- B. 260 feet from nose to nose of the median from the intersection of two collectors or a collector and an arterial to a residential street or a drive, and;
- C. 220 feet from nose to nose of the median for intersection combinations of drives and/or residential streets.

2.6 Driveway Locations:

Minimum standards for driveway separation accessing the same site are shown in Figure 2.3. This standard applies to all non-residential uses.

There is a minimum distance upstream and downstream from adjacent intersections within which driveways should not be located. This separation distance varies with the classification of street and is shown in Figure 2.3. This standard applies to all non-residential users.

At mid-block access points, there is a minimum distance from a median nose, within which driveways should not be located. This is shown in Figure 2.3 and is equally applicable along both major and minor arterials for non-residential uses.

2.7 Block Lengths:

In general, streets shall be provided at such intervals as to serve cross traffic adequately and to intersect with existing streets. Where no existing plats control, the blocks shall be not more than 1,200 feet in length. Block arrangements must provide access to all lots, and in no case, shall a block interfere with traffic circulation.

2.8 Street Intersections:

More than two streets intersecting at one point shall not be allowed. All streets and thoroughfares should intersect other streets and thoroughfares at an angle of ninety (90) degrees unless otherwise approved by the City's Engineer.

Arterial and collector street intersections shall have property line corner clips with a minimum tangent distance of thirty (30) feet. Residential streets shall not normally be required to have a corner clip at their intersection with other streets or thoroughfares, but a 10-foot by 10-foot sidewalk corner easement will be required.

Curb radii at intersections shall have a minimum radius of thirty (30) feet along arterials, twenty-five (25) feet along collectors and twenty (20) feet along residential streets.

In any case where streets intersect at an angle of other than ninety (90) degrees, the City shall review and comment regarding non-standard right-of-way corner clips and curb return radii.

2.9 Relation to Adjoining Streets:

The system of streets designed for the development, except in approved cases, must connect with streets already dedicated in adjacent developments. Where no adjacent connections are platted, the streets must be the reasonable projection of streets in the nearest subdivided tracts and must be continued to the boundaries of the tract development, so that other developments may eventually connect with the proposed development.

At the intersection of a new subdivision street with an existing arterial, the Developer of the subdivision shall construct a median opening in the arterial, unless otherwise directed by the City in writing.

Strips of land controlling access to or egress from other property or any street or alley or having the effect of restricting or damaging the adjoining property for development or subdivision purposes or which will not be taxable or accessible for special improvements shall not be permitted in any development unless such reserve strips are conveyed to the City on fee simple. The City Planning Director or the City's Engineer makes this determination. When such access is needed to maintain permanent City owned utilities, the roadway will be an improved right-of-way. If the utilities are temporary, an improved easement may be approved.

2.10 Dead End Streets, Cul-de-Sacs and Courts:

Cul-de-sacs are permitted and encouraged within residential subdivisions. Use of this design shall provide proper access to all lots and shall not exceed six hundred (600) feet in length, measured from the center of the cul-de-sac to the center of the intersecting street (not a dead end street). Specific aspects of the standard cul-de-sac design are given in Figure 2.1B. In lieu of the typical design shown, the City may approve alternative concepts for a specific application.

2.11 Alleys and Alley Widths:

Alleys shall be provided in all residential areas and shall be properly designed and paved with concrete. No alley may be over 1,000 feet long. Prior to the approval of the preliminary plat, the City Council may waive the residential alley requirement upon determination by the Council, if it is in the best interest of the City. Alleys may be required in commercial and industrial districts. The City may waive this requirement

where other definite and assured provisions are made for service access such as off-street loading, unloading and parking consistent with and adequate for the uses proposed. The minimum mid-block right-of-way width of an alley shall be seventeen (17) feet. Dead-end alleys shall not be permitted. The City may waive this requirement where such dead-end alleys are unavoidable and where adequate turnaround facilities have been provided. Adequate provisions shall be made at all intersections in order that equipment, such as garbage collection vehicles and maintenance vehicles, can maneuver the corners. The interior edge of the pavement, at the corners, shall have a minimum radius of thirty (30) feet. The exterior edge of the pavement, at the corners, shall have a minimum radius of twenty (20) feet. The right-of-way limits shall be expanded, if necessary, beyond the minimum requirement in order to include all of the paved section and utilities within the, right-of-way of the alley. Alley turnouts shall be paved to the property line and shall be fifteen (15) feet wide at that point. All alleys shall have a minimum of twelve (12) feet of paved concrete width with 2'-6" parkway widths. The concrete shall be reinforced and have a minimum compressive strength of 4,000 psi (NCTCOG Item 303.3.4.2 Class P1) within 28 days and have a minimum thickness of eight (8) inches in commercial areas and a minimum of six (6) inches in residential areas.

2.12 Street Grades:

Arterial streets may have a maximum grade of seven and one-half (7½) percent, for a maximum continuous distance of two hundred (200) feet. Collector streets may have a maximum grade of seven and one-half (7½) percent. Residential streets may have a maximum grade of ten (10) percent, unless otherwise approved by the City, where the natural topography is such as to require steeper grades. All streets must have a minimum grade of at least five-tenths (0.5) of one (1) percent. Centerline grade changes with an algebraic difference of more than one (1) percent shall be connected with vertical curves in compliance with the minimum length requirements set forth in Table 2.2.

2.13 Pavement Design:

Pavement and pavement subgrades (Roadway and Alley) shall be designed based on a minimum 20-year design life and a geotechnical evaluation utilizing onsite sub-surface soil samples. Pavement design calculations shall be prepared by Professional Engineer licensed in the State of Texas, and be submitted with the preliminary construction plans for review as part of the construction plan review process. The submittal shall include the pavement design traffic loadings and design life.

All new City streets, alleys and rehabilitation of existing streets shall be constructed in accordance the latest City of Aubrey Technical Construction Standards and Specifications and the North Central Texas Council of Governments (NCTCOG) Public Works Construction Standards. The following pavement and subgrade standards are minimum design criteria only:

- A. Residential Pavement: Reinforced concrete pavement thickness shall be determined by pavement design calculations. Minimum thickness of reinforced concrete pavement shall be no less than six (6) inches. Concrete strength shall be NCTCOG Item 303.3.4.2. Class P1 (4,000 psi Compressive Strength in 28-days),

with a cement content of not less than 6 sacks per cubic yard. Subgrade preparation and thickness shall be based on pavement design calculations and shall be no less than six (6) inches in depth. Refer to the City Standard Construction Details.

- B. Arterial, Minor Collector and Major Collector Pavement: Reinforced concrete pavement thickness shall be determined by pavement design calculations. Minimum thickness of reinforced concrete pavement shall be no less than eight (8) inches. Concrete strength shall be NCTCOG Item 303.3.4.2. Class P1 (4,000 psi Compressive Strength in 28-days), with a cement content of not less than 6 sacks per cubic yard. Subgrade preparation and thickness shall be based on pavement design calculations and shall be no less than six (6) inches in depth.
- C. Subgrade: Subgrade design shall be based on representative onsite subsurface soil conditions and testing. Testing shall be in accordance with the NCTCOG Standard Specifications for Public Works Construction and be completed by a geotechnical testing lab. The geotechnical investigation shall be submitted to the City as part of the pavement design submittal. In general, the soils testing shall be based on onsite sub-surface soil samples and the testing of Atterburg limits. Based on the testing results, the pavement design shall provide the type of the subgrade stabilization proposed (Lime Stabilized, Cement Stabilized or Asphalt Stabilized). Stabilization shall span the width of the street, back-of-curb to back-of-curb, plus twelve (12) inches beyond the back of curb on each side. Subgrades shall be mechanically compacted to ninety-five (95) percent standard proctor densities at optimum moisture.

Future driveway cuts on existing streets shall have proposed driveway pavement constructed within 48-hours of driveway excavation or a temporary concrete mud mat shall be constructed to protect the existing street subgrade from excessive moisture penetration or moisture evaporation.

TABLE 2.2
CREST VERTICAL CURVES

Design Speed (MPH)	Coeff. of Friction (a)	Stopping Sight Dist. (Ft.)	Stopping Sight Dist. Rounded for Design (Ft.)	K	K Rounded for Design
15	0.42	72.98	75	4.01	5
20	0.40	106.83	125	8.59	10
25	0.38	146.70	150	16.19	20
30	0.36	193.58	200	28.20	30
35	0.34	248.72	250	46.55	50
40	0.32	313.67	325	74.03	80
45	0.31	383.12	400	110.44	120

(a) AASHTO, p. 316

TABLE 2.2 Cont'd
CREST VERTICAL CURVES

ROUNDED
MINIMUM LENGTH OF VERTICAL CURVE IN FEET
For Speeds and K Values Shown Below
(L - KA)

Algebraic Grade Diff. (%) (A)	MPH K	15 5	20 10	25 20	30 30	35 50	40 80	45 120
1		5	10	20	30	50	80	120
2		10	20	40	60	100	160	240
3		15	30	60	90	150	240	360
4		20	40	80	120	200	320	480
5		25	50	100	150	250	400	600
6		30	60	120	180	300	480	720
7		35	70	140	210	350	560	840
8		40	80	160	240	400	640	960
9		45	90	180	270	450	720	1080
10		50	100	200	300	500	800	1200
11		55	110	220	330	550	880	1320
12		60	120	240	360	600	960	1440
13		65	130	260	390	650	1040	1560
14		70	140	280	420	700	1120	1680
15		75	150	300	450	750	1200	1800

TABLE 2.2 Cont'd

SAG VERTICAL CURVES

Design Speed (MPH)	Coeff. of Friction (a)	Stopping Sight Dist. (Ft.)	Stopping Sight Dist. Rounded for Design (Ft.)	K	K Rounded for Design
15	0.42	72.98	75	8.13	10
20	0.40	106.83	125	14.75	20
25	0.38	146.70	150	23.56	30
30	0.36	193.58	200	34.78	40
35	0.34	248.72	250	48.69	50
40	0.32	313.67	325	65.69	70
45	0.31	383.12	400	84.31	90

(a) AASHTO, p. 316

(b) AASHTO, p. 312

TABLE 2.2 Cont'd
SAG VERTICAL CURVES

ROUNDED
 MINIMUM LENGTH OF VERTICAL CURVE IN FEET
 For Speeds and K Values Shown Below
 (L - KA)

Algebraic Grade Diff. (%) (A)	MPH K	15 10	20 20	25 30	30 40	35 50	40 70	45 90
1		10	20	30	40	50	70	90
2		20	40	60	80	100	140	180
3		30	60	90	120	150	210	270
4		40	80	120	160	200	280	360
5		50	100	150	200	250	350	450
6		60	120	180	240	300	420	540
7		70	140	210	280	350	490	630
8		80	160	240	320	400	560	720
9		90	180	270	360	450	630	810
10		100	200	300	400	500	700	900
11		110	220	330	440	550	770	990
12		120	240	360	480	600	840	1080
13		130	260	390	520	650	910	1170
14		140	280	420	560	700	980	1260
15		150	300	450	600	750	1050	1350

2.14 Parkways, Grades and Sidewalks:

All parkways shall be constructed to conform to top of curb grades with a standard transverse slope of one-quarter ($\frac{1}{4}$) inch per foot rise from top of curb to right-of-way.

Where the natural topography is such as to require steeper grades, transverse slopes (except for sidewalk) up to three-quarter ($\frac{3}{4}$) inch per foot may be used with approval of the City.

Sidewalks shall be provided for all residential streets in subdivisions zoned for one or two family dwellings and on all streets designated on the adopted Master Thoroughfare Plan. Barrier free ramps and sidewalks along screening walls, landscaped areas, trails or in parks, shall be installed by the Developer with street construction and the sidewalks in front of residential lots shall be installed by the home builder. Barrier free ramps shall be directional type ramps. Reference to the TxDOT Pedestrian Facilities Curb Ramp Details. The City may require sidewalks in other locations. Where provided, there shall not be less than five (5) feet in width with the inside edge of the sidewalk to be placed four (4) feet off the back of the street curb and located wholly within the dedicated street right-of-way, sidewalk corner easement or road easement in the case of private streets. This requirement may be waived by the City Council.

Sidewalks placed adjacent to the back of the curb must be five (5) feet wide and approved by the City's Engineer.

Sidewalks shall be of concrete having a minimum of 3000-psi compressive strength in 28 days. The concrete thickness shall be four (4) inches reinforced with No. 3 bars at twelve (12) inch centers both ways. A minimum of 1½ inches of sand must be placed under sidewalk. Subgrade (including sand) shall be compacted to 95% density.

2.15 Driveways:

Residential: Residential driveways shall be six (6) inch concrete; 1½ inches of sand; #3 bars 4000-psi with eighteen-inch (18") centers; #4 bars 4000-psi at twenty-four inch (24") centers to serve single car garages shall not be less than twelve (12) feet or for two car garages, carports and/or storage areas shall be not less than eighteen (18) feet nor more than twenty-four (24) feet in width at the property line. The width of the driveway will be larger at the garage for a three car (width to be twenty-eight (28) feet) or larger garage (case by case basis). Residential driveways shall be separated from one another by a distance of at least ten (10) feet. The radii of all residential driveway returns shall be a minimum of five (5) feet and shall not extend past the adjoining property line. The driveway approaches devoted to one use shall not occupy more than sixty percent (60%) of the frontage abutting the roadway or alley. All residential driveways shall be constructed of concrete or asphalt pavement, to match the same strength and type as the adjacent driveway approach and street. Refer to the City of Aubrey Standard Construction Details for further information.

Multi-Family and Non-Residential: Driveways shall be eight (8) inch concrete; one and one-half (1½) inches of sand; #5 bars with twelve (12) inch centers providing access to multi-family or non-residential uses shall generally have widths between twenty four

(24) and forty five (45) feet when measured at their narrowest point near, or at, the property line. The minimum radius for these uses shall be twenty-five (25) feet. Larger radii are encouraged. Limitations on permissible locations for these driveways are addressed in Section 2.6, Driveway Locations. Driveway radii returns shall not extend across abutting property lines.

2.16 Traffic Information and Control Devices:

The developer shall arrange for the installation of all pavement striping, regulatory, warning and guide signs, including posts, as shown on the approved plans. Street name signs shall be installed at each intersection. Examples of regulatory, warning, information and guide signs are as follows:

- A. Regulatory signs shall include, but are not limited to, STOP, 4-WAY, YIELD, KEEP RIGHT and speed limit signs.
- B. Warning signs shall include, but are not limited to, DEAD END, NO OUTLET, DIVIDED ROAD and PAVEMENT ENDS.
- C. Guide signals shall include, but are not limited to, street name signs, DETOUR, direction arrow and advance arrow.
- D. Traffic striping shall be provided by the developer as shown on the approved plans.

The materials and fabrication of sign posts shall be in accordance with the Standard Specifications for Construction. The developer shall be responsible for the expenses incurred by the City for manufacture and installation of these signs.

House street numbers shall be placed on the curbs for each lot and shall comply with the requirements of the Standard Specifications for Construction.

2.17 Street Lighting:

All developments shall be provided with streetlights. In, general, lights should be located at street intersections and at intervals no greater than four hundred (400) feet apart. Streetlights should be LED with a minimum wattage of 175 watt type fixtures on minor residential streets. All collector and arterial, or commercial streets shall have LED with a minimum wattage of 250 or 400 watts as directed, in writing, by the City. In some instances, the City may require greater wattage and a photometric study. Refer to City Standard Construction Details for style of light.

2.18 Barrier Free Ramps:

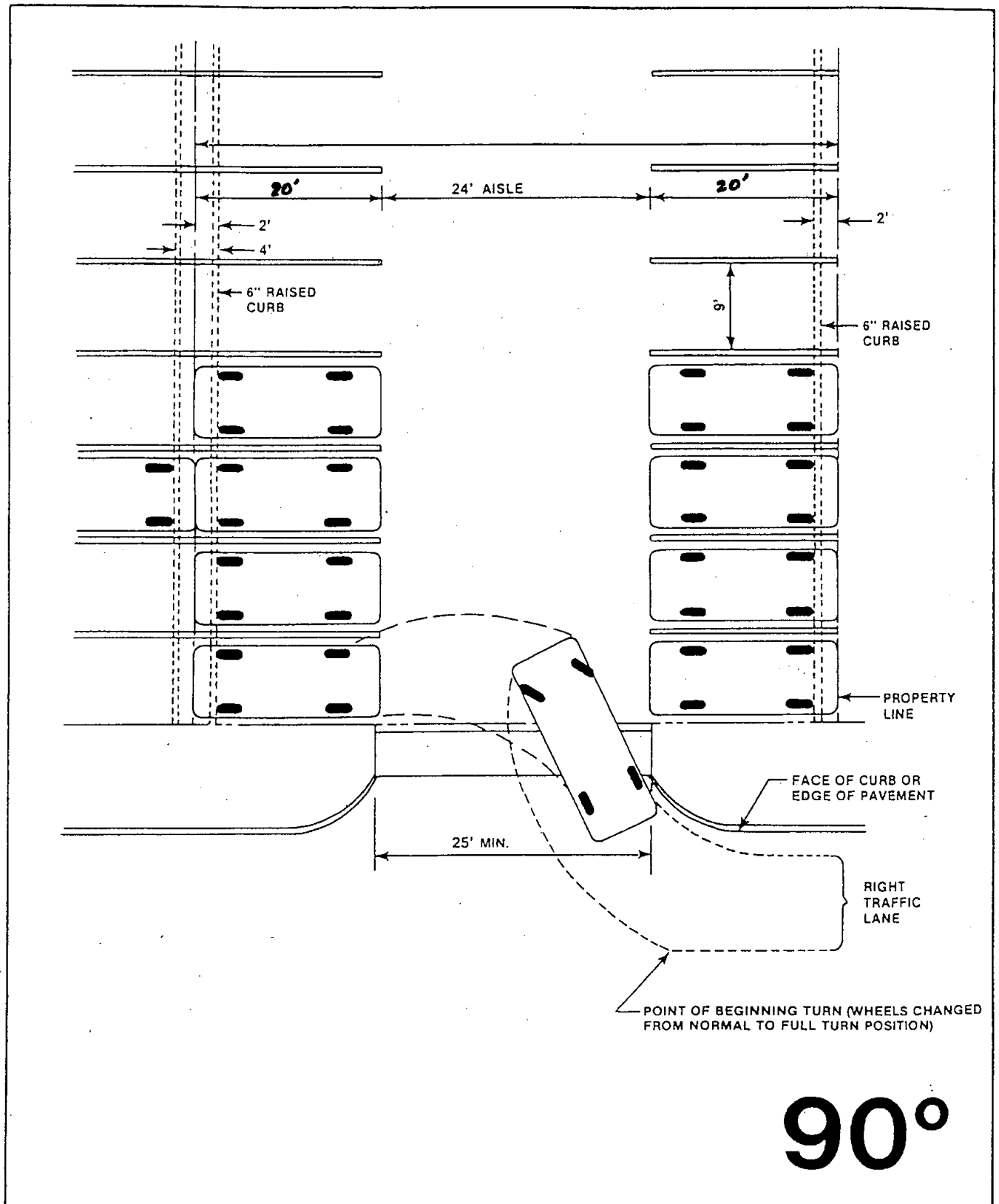
Barrier free ramps shall be provided in all commercial areas and in residential areas which have sidewalks. Ramps shall be directional type, and be located to provide access in accordance with the standards set by the Americans with Disabilities Act (A.D.A.) at all pedestrian sidewalks and meet all Texas Accessibility Standards (TAS). Lay down curbs and ramps shall be constructed at all street intersections and driveways whether or not sidewalks are being installed. Reference TxDOT details. Lay down curbs and ramps shall be constructed by the developer. The developer shall be

responsible for paying for and arranging for all TAS design reviews and post construction inspections. Results of TAS inspections shall be provided to the City. Prior to acceptance of the development by the City, the developer shall request from the Texas Department and Licensing and Regulation a post construction inspection of barrier free ramps. Results shall be provided to the City.

2.19 Off-Street Parking:

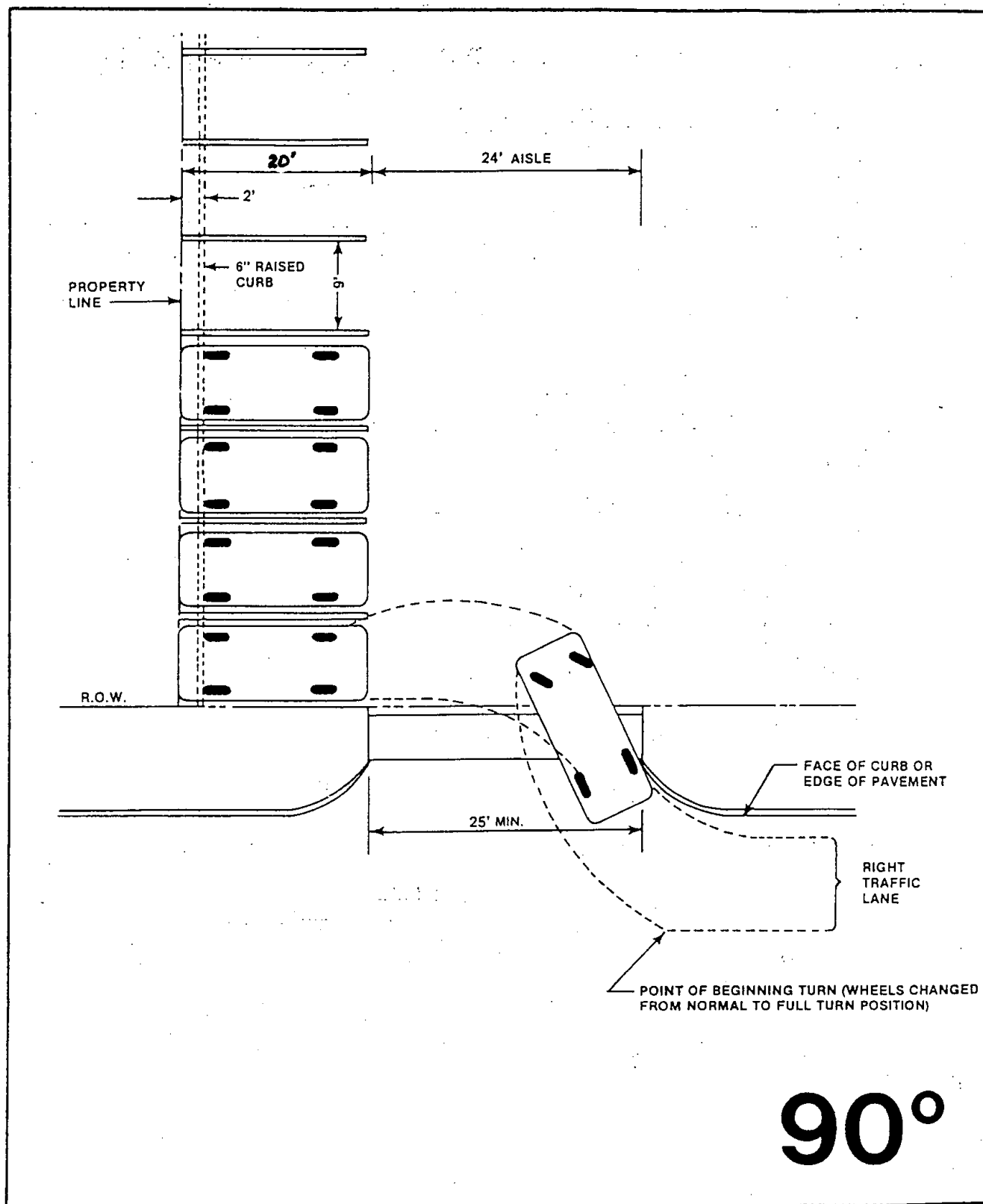
A. All parking areas and spaces shall be designed and constructed in accordance with the following requirements:

1. All parking areas and spaces shall be designed and constructed so as to have free ingress and egress at all times.
2. No parking space or parking area shall be designed so as to require a vehicle to back into a public street or across a public sidewalk, except in the case of one and two family dwelling units.
3. Minimum Dimensions for Off-Street Parking:
 - a) Ninety-degree parking (Figures 2.4a and 2.4b) — Each parking space shall not be less than nine (9) feet in width and eighteen (18) feet in length with two (2) feet of over hang between curb and sidewalk or property line. Dual head in parking spaces should be a minimum of twenty (20) feet in length; Maneuvering space shall not be less than twenty-four (24) feet.
 - b) Sixty-degree angle parking (Figures 2.5a and 2.5b) — Each parking space shall be not less than nine (9) feet wide perpendicular to the parking angle nor less than twenty and one tenth (20.1) feet in length when measured at right angles to the building or parking line. Maneuvering space shall be not less than fourteen and one-half (14½) feet for one way traffic or twenty two (22) feet for two way traffic perpendicular to the building or parking line.
 - c) Forty-five degree angle parking (Figures 2.6a and 2.6b) — Each parking space shall not be less than nine (9) feet wide perpendicular to the parking angle nor less than nineteen (19) feet in length when measured at right angles to the building or parking line. Maneuvering space shall be not less than twelve (12) feet for one way traffic or twenty-one (21) feet for two-way traffic perpendicular to the building or parking line.



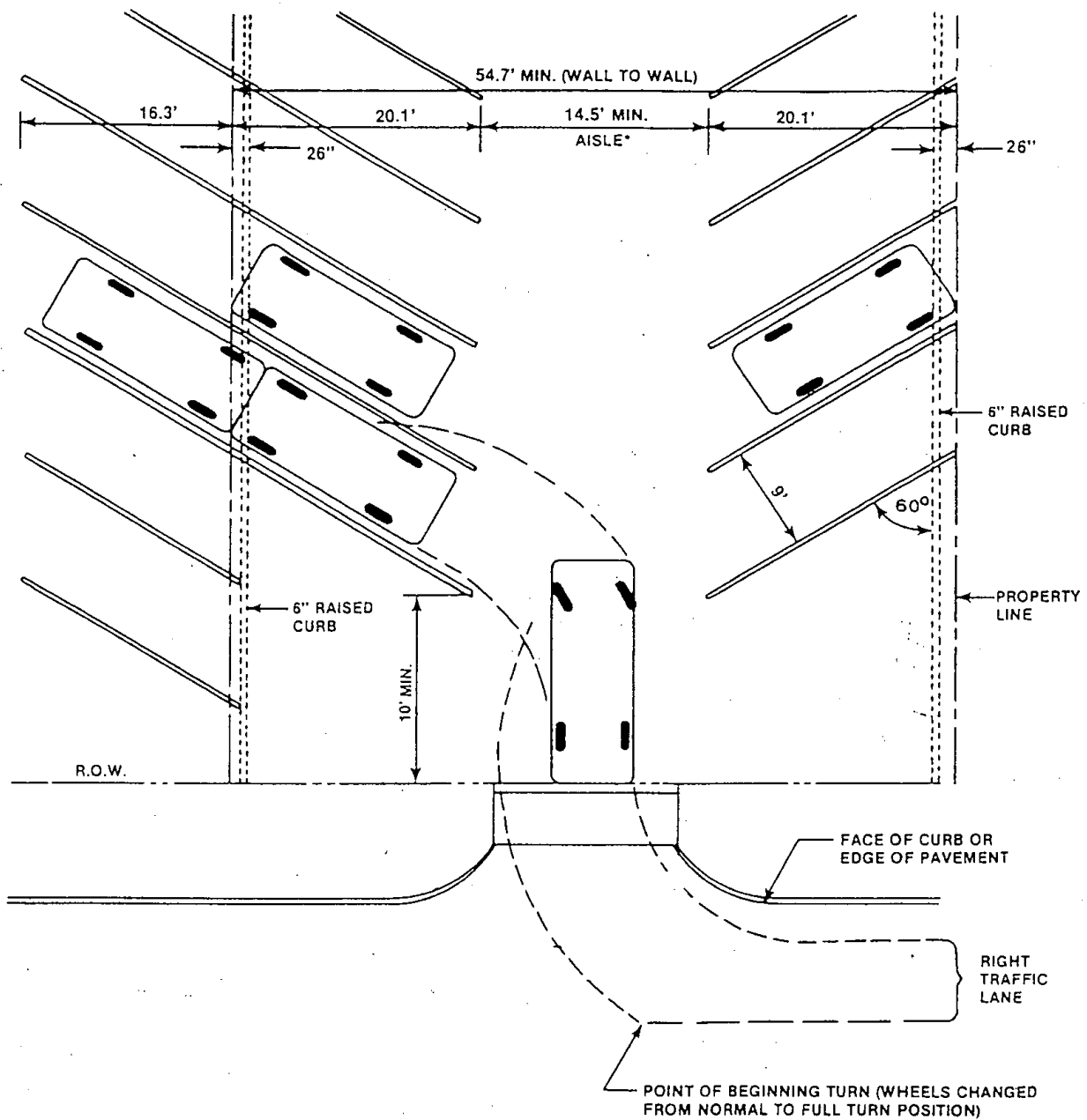
90° Parking – Double Row.

FIGURE 2.4a



90° Parking – Single Row.

FIGURE 2.4b



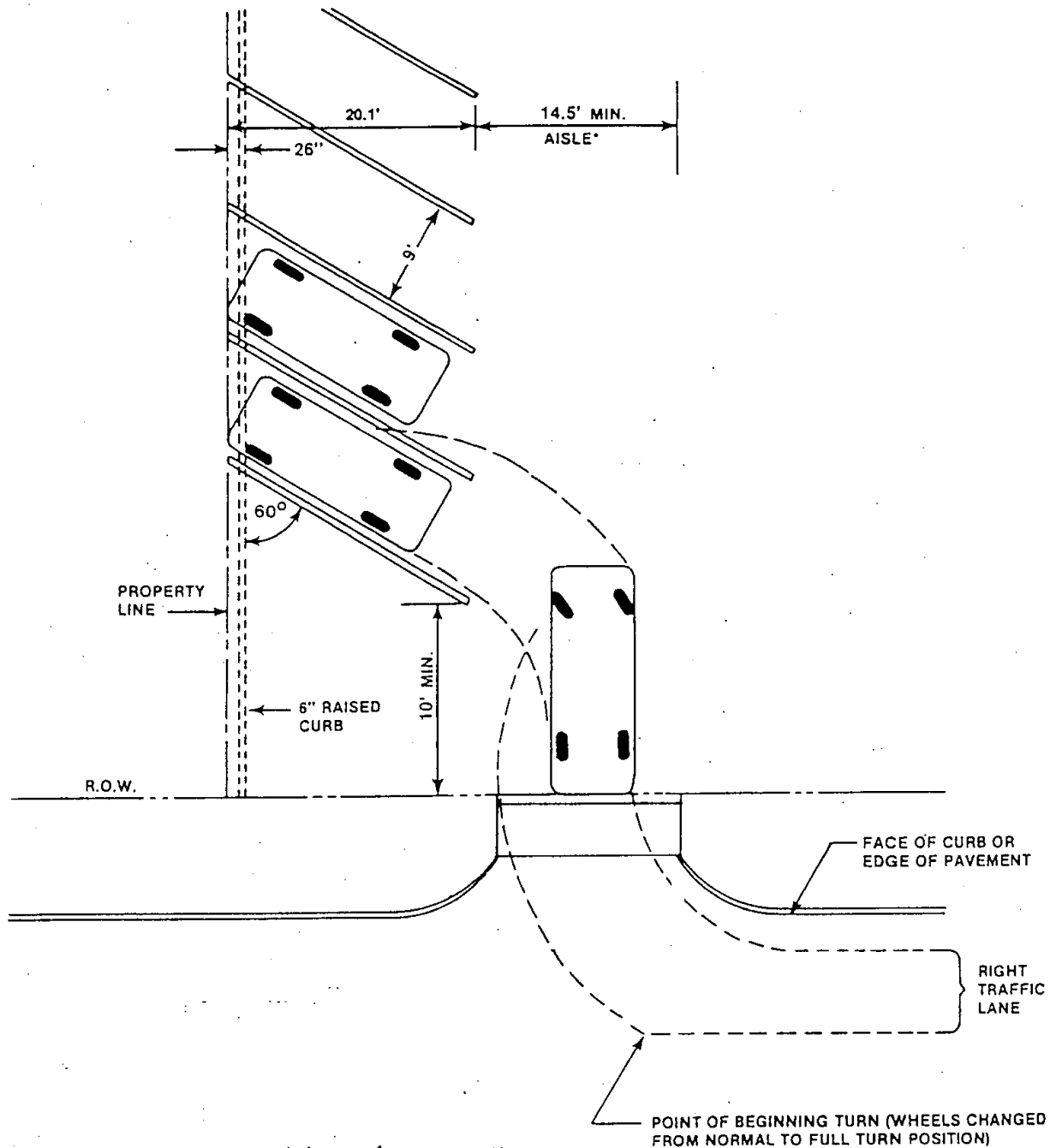
*Aisle width shown is the minimum for one-way traffic. For ease of operation and for long rows of parking, widths should be increased approximately 5'

For two-way traffic, the aisle width must be increased to 22.0' (Clear distance of 24.3')

60°

60° Parking – Double Row.

FIGURE 2.5a



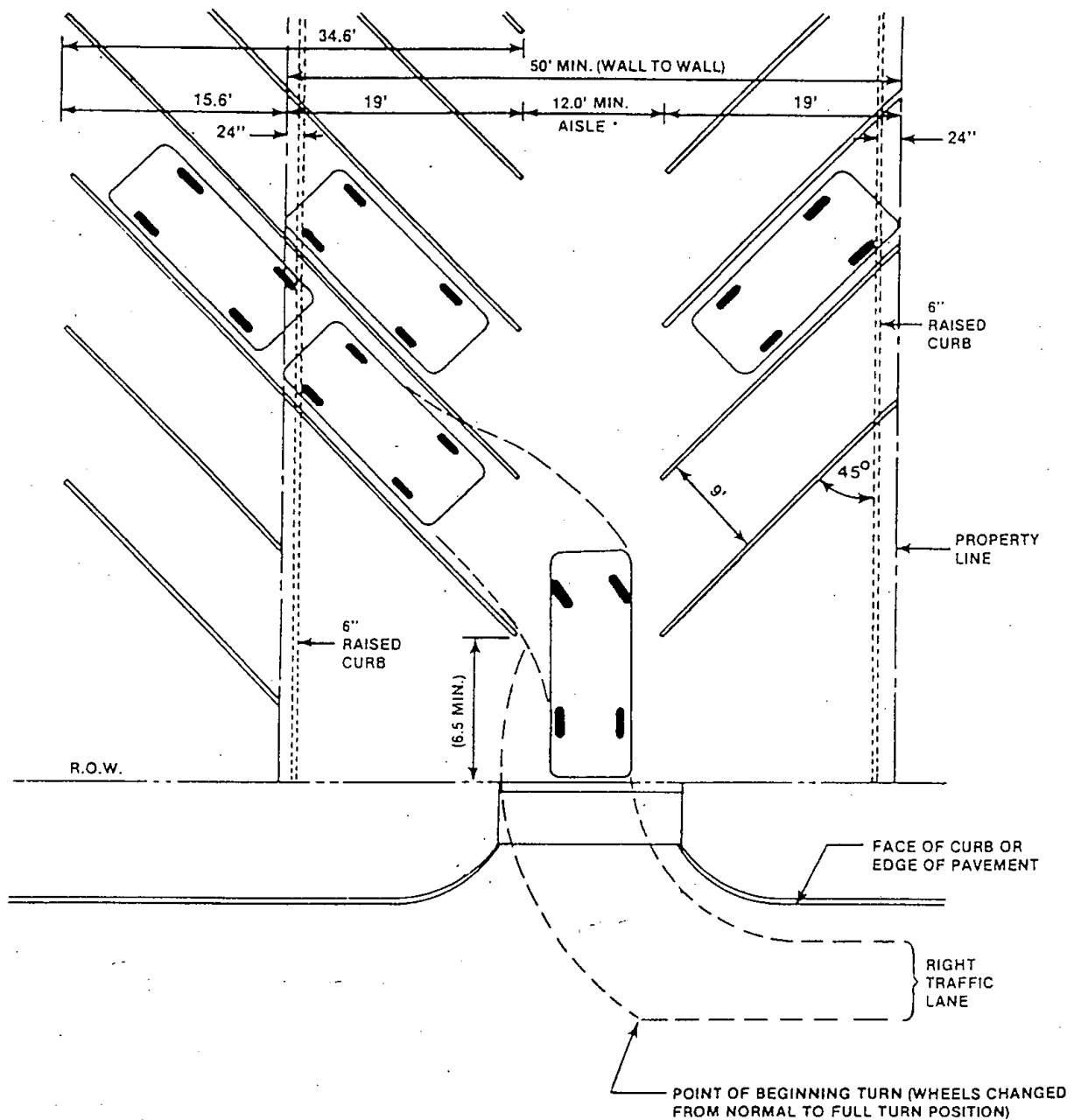
* Aisle width shown is the minimum for one-way traffic. For ease of operation and for long rows of parking, widths should be increased approximately 5'

For two-way traffic, the aisle width must be increased to 22.0' (Clear distance of 24.3')

60°

60° Parking – Single Row.

FIGURE 2.5b



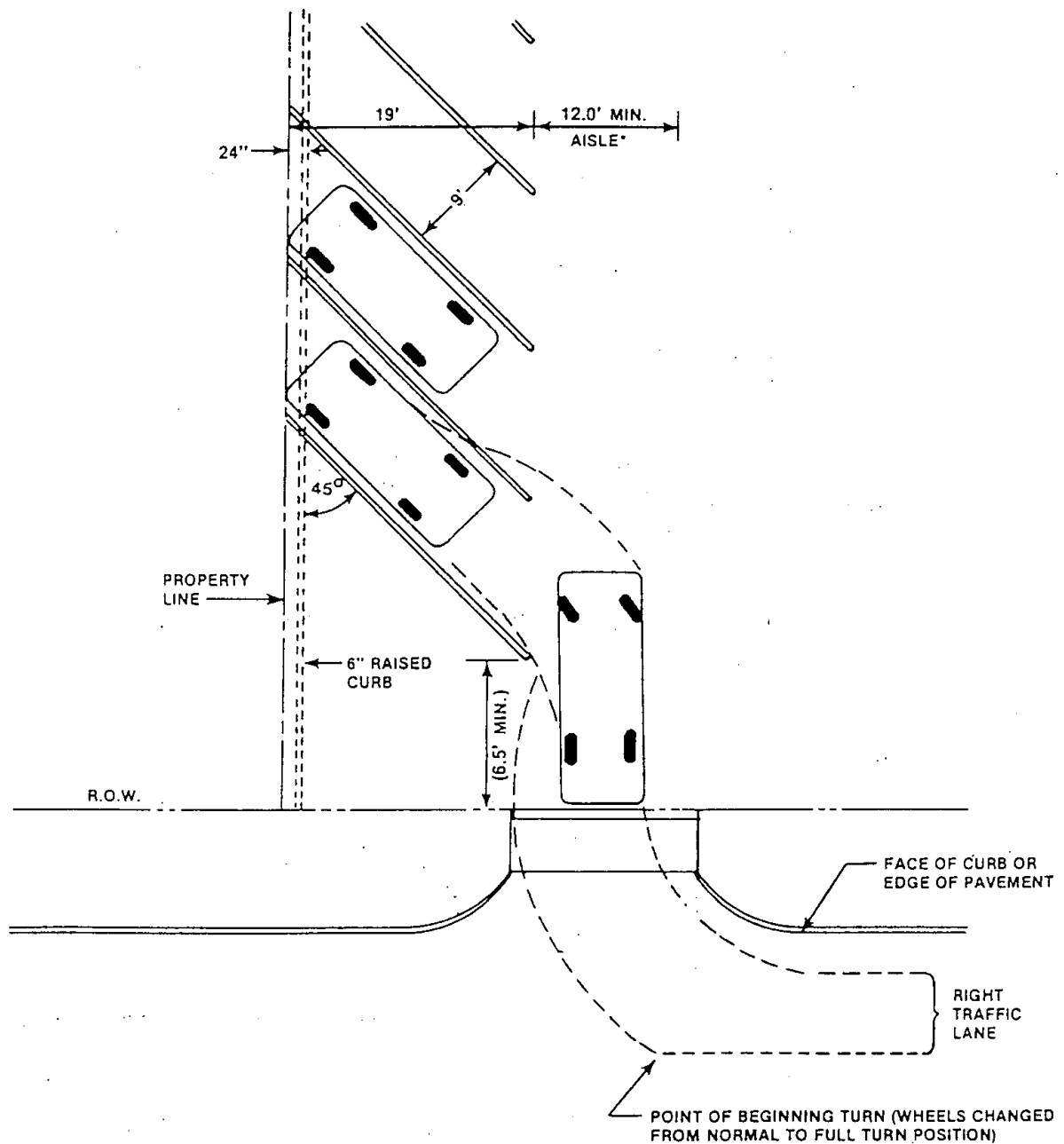
* Aisle width shown is the minimum for one-way traffic. For ease of operation and for long rows of parking, width should be increased approximately 5'

For two-way traffic the aisle width must be increased to 21' (Clear distance of 24.2')

45°

45° Parking – Double Row.

FIGURE 2.6a



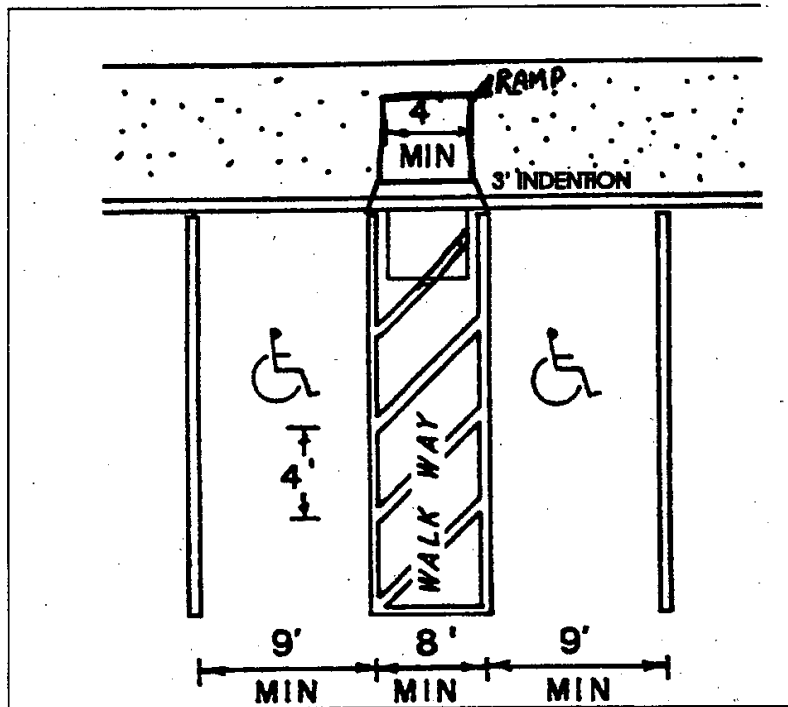
* Aisle width shown is the minimum for one-way traffic. For ease of operation and for long rows of parking, widths should be increased approximately 5'

For two-way traffic, the aisle width must be increased to 21.0' (Clear distance of 24.2')

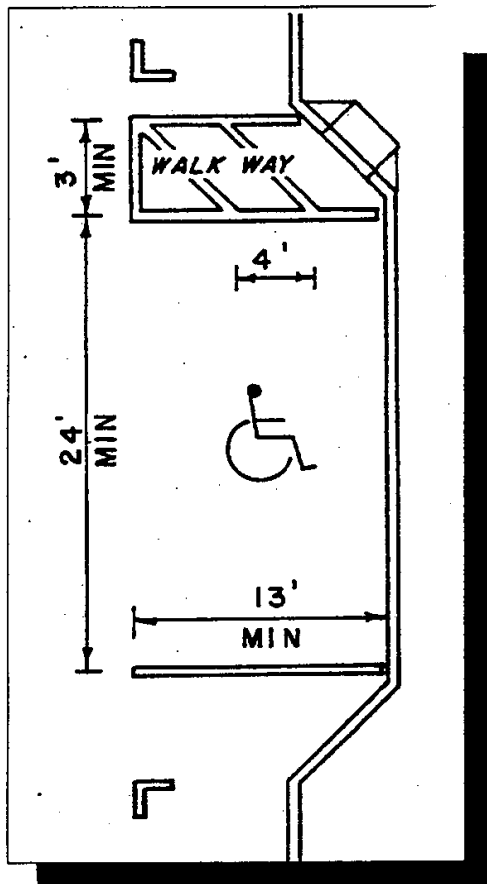
45°

45° Parking – Single Row.

FIGURE 2.6b



**HANDICAPPED
PARKING STANDARDS**
Head-in or Angle
parking Dimensions



**HANDICAPPED
PARKING
STANDARDS**
Parallel parking
Dimensions

- d) Parallel Parking — Each parking space shall not be less than eight (8) feet in width and twenty-two (22) feet in length. Maneuvering space will not be less than twenty (20) feet.
- e) Handicap Space Parking — Where handicapped parking is required or installed, the design shall be as in Figure 2.7.
- f) When off-street parking facilities are located adjacent to a public alley, the width of said alley may be utilized as a portion of the maneuvering space requirement, provided the alley is paved.
- g) When off-street parking facilities are provided' in excess of minimum amounts herein specified, or when off-street parking facilities are provided, but not required by this chapter, said off-street parking facilities shall comply with the minimum requirements for parking and maneuvering space herein specified.

4. Paving Standards:

- a) Unless otherwise approved by the City Council or as specified in these standards, all parking lots shall be paved with concrete and designed according to City standards and specifications. The parking lanes must be clearly marked by approved paint, buttons or other material. All driveway approaches shall be constructed of concrete in the same strength as the adjacent street and shall be curbed per City standards. All residential driveways shall be constructed of concrete or asphalt pavement, to match the same strength and type as the adjacent driveway approach and street.
- b) All parking lot pavement and drive isles shall be concrete except for new car dealership's display area parking and existing asphalt parking lots being rehabilitated. A concrete or asphalt pavement (parking lot) design shall be provided to the City's Engineer for review. The minimum concrete design shall be five-inch (5"), NCTCOG Item 303.3.4.2. Class P1 (4000 psi in 28-days) concrete and minimum asphalt design shall be three-inch (3") asphalt base course on three (3) inch asphalt surface course on compacted subgrade.
- c) Industrial and commercial parking lot pavement shall be concrete and designed by a Professional Engineer, licensed in Texas. Pavement design shall be submitted to the City's Engineer for review.
- d) The pavement within a designated loading area shall be designed and constructed to carry the additional loading of merchandise, goods, sanitation pick-up, etc., in order to prevent any unnecessary failure in the pavement itself. The pavement design shall be included in the engineering construction plans and specifications and submitted to the City's Engineer for review.
- e) Fire lane pavement shall be a minimum of six (6) inches — Concrete strength shall be NCTCOG Item 303.3.4.2. Class P1 (4000 psi in 28-days).

5. No parking area more than three (3) parking spaces in depth shall be designed or constructed which ends in a dead end, unless adequate turnaround space is provided.
6. All entrances or exits in a parking lot shall be a minimum of thirty (30) feet from the beginning point of any corner radius.
7. All entrances or exits in a parking lot shall be a minimum of twenty-four (24) feet and a maximum of forty-five (45) feet in width, unless One-way, in which case they shall both be a minimum of twelve (12) feet, or as approved by the City Council.
8. The driveway approach angle to any parking area shall be a maximum of sixteen (16) degrees; the departure angle a maximum of ten (10) degrees; the ramp angle a maximum of eleven (11) degrees; or otherwise shall be approved by the City's Engineer.
9. No parking areas or parking spaces shall be allowed to pave over or utilize public right-of-way, with the exception of approved entrances and exits, unless the Board of Adjustment and City Council grants an exception.
10. Any lighting used to illuminate any off-street parking area shall be so designed and constructed as to direct the light onto the property and away from any adjoining property or street.
11. All multi-family and commercial parking areas and parking spaces shall be designed and constructed to protect adjacent residences from the direct glare of headlights of vehicles using the parking area.
12. All multi-family, retail, commercial and industrial parking lots shall be required to provide a fire lane with a minimum width of twenty (20) feet (requires minimum thirty (30) foot inside curve radius) or a width of twenty-four (24) feet (requires minimum twenty (20) foot inside curve radius) and shall be approved by the City's Engineer and Fire Marshall.
13. All fire lanes shall loop back to another fire lane or street or have a circular turnaround at the end with a minimum outside pavement radius of forty (40) feet. Dead end fire lanes up to one hundred fifty (150) feet long will be allowed with the Fire Chief and City's Engineer's approval.
14. No City street curb, alley or street pavement may be cut without, a permit from the City.

2.20 Roundabouts:

All developers shall design roundabouts with general guidance information provided by the National Cooperative Highway Research Program (NCHRP) Report 672, or their latest edition for information and guidance on all aspects of roundabouts or the Federal Highway Administration for Roundabout Geometric Design Guidance. Reference general details in the City of Aubrey Standard Construction Details.

3. STORM DRAINAGE DESIGN CRITERIA AND PROCEDURES

3.1 General:

This section contains storm drainage design criteria and demonstrates the design procedures to be employed on drainage projects in the City of Aubrey.

Applicable forms that can be used for the design of various storm drainage facilities are contained in this manual or online at the City of Aubrey Development Services page and shall be part of the drainage submittal to the City. These forms and spreadsheets or other reports from approved software shall be reproduced in the plans. The design engineer is solely responsible for verifying the accuracy and completeness of all design calculations and the City of Aubrey and the City's Engineer do not accept any responsibility for use of forms or electronic files provided for use in design.

3.2 Rainfall Intensities and Determination of Design Discharge

Rainfall intensities for storm sewers shall be based on the Intensity-Duration-Frequency formula presented in the most recent version of the North Central Texas Council of Governments integrated Storm Water Management (iSWM) program for Denton County, Texas. The current table for Denton County is on page 3-3 of this manual.

The formula to calculate intensity for Rational Method flows is:

$$I = b / (t + d)^e$$

Where I is the rainfall intensity in inches per hour and t is the time of concentration in minutes. Values for b, d, and e are listed on the following Table 5.3 for various events.

Example Problem: Calculate intensities for the 100-year and 10-year events with a time of concentration of 16 minutes.

$$I_{100} = 95.776 / (16 + 12)^{0.75660} = 7.70 \text{ in/hr}$$

$$I_{10} = 70.683 / (16 + 11)^{0.78388} = 5.34 \text{ in/hr}$$

Prior to hydraulic design of drainage facilities, the amount of runoff from the particular drainage area must be determined. The Rational Method, the Modified Rational Method, and the HEC-HMS Computer Program are the accepted methods, for computing volumes of storm water runoff depending on the size of the overall drainage basin. Data from the Flood Insurance Study shall be used in lieu of Rational Method,

Unit Hydrograph or HEC-HMS for determination of drainage and floodway easement elevations and design discharge flows, if such data is available. There shall be three models developed for large drainage basins (over 300 acres), including pre-project (existing) conditions on-site and offsite, post-project (developed) conditions on-site and existing conditions offsite, and full development of the drainage basin as outlined on the current zoning maps available from the City or using 1/8 acre Residential Lots for future development where the Zoning Map does not provide detailed information. If the Flood Insurance Study is not based on current zoning, the study should be reanalyzed, revised and submitted to FEMA for acceptance. If the revised study indicates a water surface is less than that shown in the Flood Insurance study the higher of the two values shall be used if the study is not submitted to FEMA.

The Rational Method for computing storm water runoff is to be used for hydraulic design of storm sewer facilities serving a drainage area of less than 300 acres. The Modified Rational Method can be used in calculation of runoff for detention and retention facilities for drainage basins less than 100 acres; however, this method is based on a multiple of the time of concentration and does not determine the peak flow over a 24-hour event, which is less conservative than the unit hydrograph method. Therefore, all detention and/or retention facilities designed using the Modified Rational Method shall provide increased freeboard of 3.0 feet above the calculated 100-year water surface elevation. The runoff calculation model for pre-developed and post-developed flows shall be included for review and shall include plots for both pre-developed and post-developed conditions. Several software programs are available for the modified rational method and design of detention and retention ponds such as PondPac, HydroCAD, and Hydrology Studio. The modified rational method is not acceptable for design of drainage basins larger than 100 acres.

For drainage areas of more than 300 acres and less than 600 acres, the runoff shall be calculated by both the Rational Method and the Unit Hydrograph Method for a 24-hour event, using a software program such as HEC-HMS with the larger of the two values being used for hydraulic design. For drainage areas larger than 600 acres the runoff shall be calculated by the Unit Hydrograph Method for a 24-hour event using a software program such as HEC-HMS, or as approved.

The SCS Type II Unit Hydrograph Method is used for a HEC-HMS (Flood Hydrograph) Computer Analysis. The City at its option can require the use of HEC-HMS Computer Analysis in lieu of the Unit Hydrograph Method. The HEC-HMS Computer Program is available from the U.S. Army Corps of Engineers, the Hydrologic Engineering Center,

609 Second Street, Davis, California 95616, 916/440-2105 or can be downloaded from their website. User-friendly versions are available from several vendors.

Total 24-hour rainfall amounts for hydrologic calculations shall be based on NOAA Atlas 14 data. The Aubrey, Texas NOAA Atlas 14 table is included on page 3-4 of this manual.

Table 5.3 Denton County Rainfall Data								
Coefficients e b d		Return Period (Years)						
		1	2	5	10	25	50	100
		0.82089	0.80553	0.79891	0.78388	0.76912	0.76817	0.75660
		43.381	50.455	65.467	70.683	78.538	89.853	95.776
Hours	Minutes	T8	9	11	11	11	12	12
Rainfall Intensity (inches per hour)								
0.083	5	5.28	6.02	7.15	8.04	9.31	10.19	11.23
	6	4.97	5.70	6.81	7.67	8.89	9.76	10.75
	7	4.70	5.41	6.50	7.33	8.50	9.36	10.32
	8	4.46	5.15	6.23	7.03	8.16	9.00	9.93
	9	4.24	4.92	5.98	6.75	7.84	8.67	9.57
	10	4.04	4.71	5.75	6.50	7.55	8.36	9.24
	11	3.87	4.52	5.54	6.27	7.29	8.08	8.93
	12	3.71	4.34	5.35	6.05	7.04	7.82	8.65
	13	3.56	4.18	5.17	5.85	6.82	7.58	8.39
0.250	14	3.43	4.04	5.00	5.67	6.61	7.36	8.14
	15	3.31	3.90	4.85	5.50	6.41	7.14	7.91
	16	3.19	3.77	4.70	5.34	6.23	6.95	7.70
	17	3.09	3.66	4.57	5.19	6.05	6.76	7.50
	18	2.99	3.55	4.44	5.05	5.89	6.59	7.31
	19	2.90	3.44	4.32	4.91	5.74	6.43	7.13
	20	2.81	3.35	4.21	4.79	5.60	6.27	6.96
	21	2.73	3.26	4.11	4.67	5.46	6.12	6.80
	22	2.66	3.17	4.01	4.56	5.34	5.99	6.65
	23	2.59	3.09	3.91	4.45	5.21	5.85	6.50
	24	2.52	3.02	3.82	4.35	5.10	5.73	6.36
	25	2.46	2.95	3.74	4.26	4.99	5.61	6.23
	26	2.40	2.88	3.66	4.17	4.89	5.50	6.11
	27	2.34	2.81	3.58	4.08	4.79	5.39	5.99
	28	2.29	2.75	3.51	4.00	4.69	5.28	5.88
0.500	29	2.24	2.69	3.44	3.92	4.60	5.18	5.77
	30	2.19	2.64	3.37	3.85	4.51	5.09	5.66
	31	2.14	2.58	3.31	3.77	4.43	5.00	5.56
	32	2.10	2.53	3.24	3.71	4.35	4.91	5.47
	33	2.06	2.49	3.18	3.64	4.28	4.83	5.38
	34	2.02	2.44	3.13	3.58	4.20	4.75	5.29
	35	1.98	2.39	3.07	3.51	4.13	4.67	5.20
	36	1.94	2.35	3.02	3.46	4.06	4.59	5.12
	37	1.91	2.31	2.97	3.40	4.00	4.52	5.04
	38	1.87	2.27	2.92	3.35	3.94	4.45	4.96
	39	1.84	2.23	2.88	3.29	3.88	4.38	4.89
	40	1.81	2.19	2.83	3.24	3.82	4.32	4.82
	41	1.78	2.16	2.79	3.19	3.76	4.26	4.75
	42	1.75	2.13	2.74	3.15	3.71	4.20	4.68
	43	1.72	2.09	2.70	3.10	3.65	4.14	4.62
0.750	44	1.69	2.06	2.66	3.06	3.60	4.08	4.56
	45	1.67	2.03	2.63	3.01	3.55	4.02	4.50
	46	1.64	2.00	2.59	2.97	3.50	3.97	4.44
	47	1.62	1.97	2.55	2.93	3.46	3.92	4.38
	48	1.59	1.94	2.52	2.89	3.41	3.87	4.32
	49	1.57	1.92	2.49	2.85	3.37	3.82	4.27
	50	1.55	1.89	2.45	2.82	3.33	3.77	4.22
	51	1.53	1.86	2.42	2.78	3.28	3.73	4.17
	52	1.51	1.84	2.39	2.75	3.24	3.68	4.12
	53	1.49	1.82	2.36	2.71	3.21	3.64	4.07
	54	1.47	1.79	2.33	2.68	3.17	3.60	4.02
	55	1.45	1.77	2.30	2.65	3.13	3.55	3.98
	56	1.43	1.75	2.28	2.62	3.09	3.51	3.93
	57	1.41	1.73	2.25	2.59	3.06	3.48	3.89
	58	1.39	1.71	2.22	2.56	3.03	3.44	3.85
	59	1.37	1.69	2.20	2.53	2.99	3.40	3.81
1	60	1.36	1.67	2.17	2.50	2.96	3.36	3.77
2	120	0.81	1.01	1.33	1.55	1.85	2.11	2.38
3	180	0.59	0.74	0.99	1.15	1.38	1.58	1.79
6	360	0.34	0.43	0.58	0.68	0.83	0.95	1.09
12	720	0.19	0.25	0.34	0.40	0.49	0.57	0.65
24	1440	0.11	0.14	0.20	0.23	0.29	0.33	0.39



NOAA Atlas 14, Volume 11, Version 2
Location name: Aubrey, Texas, USA*
Latitude: 33.3017°, Longitude: -96.98°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypanuk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aeriels](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.422 (0.319-0.557)	0.488 (0.374-0.642)	0.599 (0.457-0.788)	0.689 (0.517-0.917)	0.810 (0.588-1.10)	0.900 (0.637-1.26)	0.989 (0.682-1.42)	1.08 (0.725-1.58)	1.20 (0.778-1.80)	1.28 (0.813-1.98)
10-min	0.675 (0.511-0.892)	0.782 (0.599-1.03)	0.960 (0.732-1.26)	1.10 (0.829-1.47)	1.30 (0.945-1.78)	1.45 (1.02-2.02)	1.59 (1.10-2.27)	1.73 (1.16-2.53)	1.90 (1.24-2.87)	2.03 (1.28-3.13)
15-min	0.843 (0.638-1.11)	0.973 (0.746-1.28)	1.19 (0.909-1.57)	1.37 (1.03-1.82)	1.61 (1.17-2.19)	1.79 (1.26-2.50)	1.96 (1.35-2.81)	2.14 (1.44-3.13)	2.37 (1.54-3.57)	2.54 (1.61-3.92)
30-min	1.17 (0.889-1.55)	1.35 (1.04-1.78)	1.65 (1.26-2.18)	1.90 (1.42-2.52)	2.22 (1.61-3.03)	2.46 (1.74-3.44)	2.70 (1.86-3.87)	2.95 (1.98-4.32)	3.28 (2.13-4.94)	3.53 (2.23-5.44)
60-min	1.52 (1.16-2.01)	1.76 (1.35-2.32)	2.16 (1.65-2.85)	2.49 (1.87-3.31)	2.93 (2.12-3.99)	3.25 (2.30-4.54)	3.58 (2.47-5.12)	3.92 (2.63-5.74)	4.38 (2.85-6.61)	4.74 (3.00-7.31)
2-hr	1.86 (1.42-2.43)	2.18 (1.68-2.82)	2.70 (2.08-3.51)	3.13 (2.37-4.12)	3.73 (2.74-5.03)	4.19 (2.99-5.78)	4.66 (3.24-6.59)	5.17 (3.50-7.47)	5.87 (3.84-8.74)	6.42 (4.09-9.77)
3-hr	2.06 (1.58-2.67)	2.43 (1.88-3.11)	3.03 (2.34-3.91)	3.54 (2.70-4.62)	4.25 (3.13-5.69)	4.81 (3.45-6.59)	5.39 (3.77-7.56)	6.02 (4.10-8.63)	6.89 (4.53-10.2)	7.59 (4.86-11.4)
6-hr	2.42 (1.88-3.11)	2.89 (2.25-3.65)	3.63 (2.83-4.63)	4.27 (3.29-5.52)	5.18 (3.86-6.86)	5.90 (4.27-7.99)	6.66 (4.70-9.22)	7.49 (5.14-10.6)	8.65 (5.73-12.4)	9.59 (6.18-14.3)
12-hr	2.86 (2.24-3.62)	3.42 (2.69-4.27)	4.31 (3.40-5.43)	5.08 (3.94-6.48)	6.16 (4.63-8.06)	7.02 (5.12-9.39)	7.93 (5.63-10.8)	8.92 (6.17-12.4)	10.3 (6.88-14.8)	11.5 (7.43-16.8)
24-hr	3.35 (2.65-4.20)	4.01 (3.19-4.95)	5.06 (4.02-6.30)	5.95 (4.67-7.51)	7.22 (5.47-9.32)	8.22 (6.05-10.8)	9.27 (6.64-12.5)	10.4 (7.27-14.4)	12.1 (8.11-17.1)	13.4 (8.76-19.3)
2-day	3.90 (3.12-4.83)	4.66 (3.74-5.69)	5.86 (4.71-7.22)	6.89 (5.46-8.59)	8.34 (6.38-10.6)	9.48 (7.05-12.4)	10.7 (7.73-14.2)	12.0 (8.45-16.3)	13.9 (9.43-19.4)	15.5 (10.2-22.0)
3-day	4.26 (3.43-5.24)	5.08 (4.11-6.16)	6.38 (5.16-7.80)	7.50 (5.98-9.28)	9.08 (6.98-11.5)	10.3 (7.71-13.3)	11.7 (8.46-15.4)	13.1 (9.26-17.7)	15.2 (10.3-21.0)	16.9 (11.2-23.8)
4-day	4.51 (3.65-5.52)	5.39 (4.36-6.49)	6.76 (5.49-8.22)	7.94 (6.36-9.78)	9.64 (7.44-12.1)	11.0 (8.23-14.1)	12.4 (9.05-16.3)	14.0 (9.92-18.7)	16.3 (11.1-22.4)	18.1 (12.0-25.4)
7-day	5.04 (4.11-6.11)	6.03 (4.91-7.17)	7.55 (6.18-9.09)	8.89 (7.18-10.8)	10.8 (8.45-13.5)	12.4 (9.39-15.8)	14.1 (10.4-18.3)	16.0 (11.4-21.2)	18.7 (12.9-25.5)	20.9 (14.0-29.0)
10-day	5.51 (4.51-6.63)	6.58 (5.38-7.77)	8.23 (6.76-9.84)	9.69 (7.86-11.7)	11.8 (9.26-14.7)	13.6 (10.3-17.2)	15.4 (11.4-19.9)	17.5 (12.5-23.0)	20.5 (14.1-27.7)	23.0 (15.4-31.5)
20-day	7.13 (5.90-8.48)	8.42 (7.00-9.87)	10.4 (8.69-12.4)	12.2 (10.0-14.6)	14.7 (11.6-17.9)	16.7 (12.8-20.8)	18.8 (14.0-23.8)	21.1 (15.2-27.3)	24.4 (16.9-32.4)	27.0 (18.3-36.6)
30-day	8.49 (7.07-10.0)	9.95 (8.35-11.6)	12.3 (10.3-14.5)	14.3 (11.8-17.0)	17.1 (13.5-20.7)	19.2 (14.8-23.7)	21.5 (16.1-27.0)	23.9 (17.4-30.7)	27.4 (19.1-36.1)	30.2 (20.5-40.5)
45-day	10.4 (8.71-12.2)	12.1 (10.2-14.1)	14.9 (12.6-17.4)	17.2 (14.3-20.3)	20.5 (16.4-24.6)	23.0 (17.8-28.2)	25.5 (19.2-31.9)	28.3 (20.6-36.0)	32.1 (22.5-41.8)	35.0 (23.9-46.5)
60-day	12.1 (10.2-14.1)	14.0 (11.9-16.3)	17.2 (14.6-20.0)	19.9 (16.6-23.3)	23.6 (18.9-28.2)	26.4 (20.5-32.1)	29.2 (22.1-36.3)	32.2 (23.6-40.8)	36.3 (25.5-47.0)	39.4 (26.9-52.0)
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.										

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PF graphical

3.3 Design Storm Frequency

Drainage design requirements for open and closed systems shall provide protection for property during a 100-year Design Frequency Storm, with this projected flow carried in the streets and closed drainage systems in accordance with the following:

- a) Residential Streets: The 100-year design frequency flow shall not exceed a depth of the top of curb. A maximum flow of 20 cfs will be allowed in each gutter or where gutter capacity is reached. Bypass from upstream inlets shall not exceed 5 cfs through residential street intersections for the 100-year event.
- b) Collector Streets: One dry lane a minimum of 8 feet wide shall be provided for all collector streets. A maximum flow of 20 cfs will be allowed in each gutter. Bypass from upstream inlets shall not exceed 5 cfs through collector street intersections for the 100-year event.
- c) Major and Secondary Thoroughfares: One dry lane a minimum of 11 feet wide shall be provided in each direction for all major and secondary thoroughfares. Major thoroughfares shall be designed to provide at least one 8-foot wide dry lane in each direction where 2 lanes of a future 3 lane roadway are being constructed. The 100-year design frequency flow shall not exceed the elevation of the lowest top of curb. A maximum of 35 cfs will be allowed in the street. Bypass from upstream inlets shall not exceed 1 cfs through thoroughfare intersections for the 100-year event.
- d) Alleys: Based on a slope of a positive 4% outside the edge of pavement, the 100-year design frequency flows shall not exceed a depth of 1" above the edge of pavement.
- e) Excavated Channels: Excavated channels shall have concrete pilot channels if the slope is less than 2% or if deemed necessary by the City's Engineer, for maintenance or erosion control as outlined below. All excavated channels shall have a design water surface with 2 feet of freeboard. Concrete lined channels shall be designed according to the City of Aubrey Standard Construction Details unless otherwise approved by the City's Engineer.
- f) Minimum Lot and Floor Elevations: Minimum lot and floor elevations shall be established as follows:
 - i) Lots abutting a natural or excavated channel shall have a minimum elevation for the buildable area of the lot at least 1-foot above the 100-year water surface elevation of the channel. Retaining walls abutting channels shall be designed to withstand hydrostatic forces resulting from a 100-year

event and shall be provided with appropriately designed underdrains to relieve hydrostatic pressures after the rainfall event. Retaining walls adjacent to channels shall be included in the drainage and floodway easement described in (g) Easements.

- ii) Any habitable structure on property abutting a natural or excavated channel shall have a finished floor elevation at least 2-feet above the 100-year design storm water surface elevation, and the lowest adjacent grade shall be at least 1-foot above the 100-year design storm water surface elevation. The minimum finished floor elevation shall be at least 1-foot above the fully developed 100-year water surface elevation where that is more than 1-foot above the proposed 100 year water surface elevation.
 - iii) Where lots do not abut a natural or excavated channel, minimum finished floor elevations shall be a minimum of 1-foot above the street curb or edge of alley; whichever is lower. In no case, shall the minimum finished floor elevation be lower than the adjacent street, unless otherwise approved by the City's Engineer.
- g) Easements: Drainage and floodway easements shall be provided for all open channels and for all underground storm sewer crossing property lines. Drainage and floodway easements for storm sewer pipe shall be the outside diameter of the conduit plus 10-feet with the minimum being 15 feet, and easement width for open or lined channels shall be at least 20 feet wider than the top of the channel, 15 feet of which shall be on one side to serve as an access for maintenance purposes. The easement language shall include a requirement that fences constructed across drainage and floodway easements may be removed and the cost of replacement shall be the property owner's responsibility.
- h) Positive Overflow: The approved drainage system shall provide for positive overflow at all low points or sags. The term "Positive Overflow" means that when the inlets do not function properly or when the design capacity of the conduit is exceeded the excess flow can be conveyed overland without excessive ponding. It is preferred for conveyance along a street or alley but can require the dedication of special drainage easements on private property. Reasonable judgment should be used to limit the easements on private property to a minimum. In specific cases where the chances of substantial flood damage could occur, the City of Aubrey may require special investigations and designs by the design engineer. Alternatively, where positive overflow is not practical, inlets at low points may be designed to provide

200% of the calculated length required to allow for up to 50% blockage by debris with approval of the City's Engineer.

- i) Inlet Design: Inlet spacing shall be in accordance with the design criteria contained in this manual, minimum distance between inlets is 300 feet, or as required in Section 3.8, maximum length of inlets at one location shall not exceed 20 feet on each side of street without prior approval from the City's Engineer.
- j) Culverts and Bridges: All drainage structures shall be designed for the 100-year design frequency flow capacity with 2-feet of freeboard to the top of curb for culverts and 2-feet of freeboard to the lowest beam elevation for bridges. Bridges and culverts shall be designed for a water surface elevation as outlined in Section 3.6.
- k) Minimum Street or Alley Elevations: Streets or alleys adjacent to an open channel shall be designed with an elevation not lower than 1-foot above the 100-year water surface elevation or 1-foot above the drainage and floodway easements defined in (g) above or as directed by the City's Engineer.

3.4 Runoff Coefficients and Time of Concentration

Runoff coefficients, as shown in TABLE 1, shall be used, based on total development under existing land zoning regulations. Where land uses other than those listed in TABLE 1 are planned, a coefficient shall be developed utilizing values comparable to those shown.

Times of concentration for inlets shall be based on the minimum time of concentration shown on TABLE 1. Time of concentration for storm sewers shall be the actual time of concentration to the upstream inlet. This time is a combination of sheet flow time and shallow flow time for water to flow over the surface of the ground from the upper limit of the drainage area to the first storm sewer inlet and shall be calculated using the USDA NRCS TR-55 approach and use of the WinTR-55 software is encouraged. Sheet flow shall not exceed 100 feet in length and shall use a Manning's "n" value of 0.24 for residential lawns, and 0.13 for pasture and open space. The flow time in the conduit or channel to the point of concentrated discharge will be calculated. The flow time in the conduit or channel is computed by dividing the length of the conduit by the average velocity in the conduit. Time of concentration for drainage areas less than 200 acres shall be determined using the USDA NRCS TR-55 approach. Time of concentration of 200 acres or larger areas may use the SCS Method, or the USDA NRCS TR-55 approach.

3.5 Criteria for Channels, Bridges and Culverts

Discharge flows and water surface elevations shall be based on the City's design criteria for the 100-year design storm frequency. Channels and culverts shall be provided with 2-feet of freeboard from the top of slope for channels and below the top of curb for culverts. Bridges shall be designed to provide 2-feet of freeboard above the lowest beam elevation.

3.6 Procedure for Determination of Design Discharge

Drainage area calculations shall be included on an excel spreadsheet available from the City of Aubrey's website under the Development Services Department tab. Use of this spreadsheet or an approved similar spreadsheet or approved software such as StormCAD is required. In general, this form will be used in calculation of runoff for design of open channels, culverts, and bridges. Explanation for use of the spreadsheet and Forms A through D are included at the end of this section. The design engineer is solely responsible for verifying the accuracy and completeness of all design calculations and the City of Aubrey and the City's Engineer do not accept any responsibility for use of forms or electronic files provided for use in design.

3.7 Flow in Gutters and Inlet Design

Unless there are specific agreements to the contrary prior to beginning design of the storm drainage project, the City of Aubrey requires a storm drain conduit to begin, and consequently the first inlet to be located, at the point where the street gutter flows full based upon the appropriate design storm frequency. If, in the opinion of the City's Engineer, the flow in the gutter would be excessive under these conditions, then the storm sewer shall be extended to a point where the gutter flow can be intercepted by more reasonable inlet locations.

3.8 Capacity of Straight Crown Streets

An excel spreadsheet is available from the City of Aubrey's website under the Development Services Department tab, use of this spreadsheet or an approved similar spreadsheet or software such as StormCAD is required. The excel spreadsheet applies to all width streets having a straight cross slope varying from 1.00% to 4.00% which are the minimum and maximum allowable slopes. Cross slopes other than 2.00% shall not be used without the City's approval.

3.9 Capacity of Parabolic Crown Streets

The design engineer shall provide calculations to illustrate the capacity and depth of flow in parabolic crown streets for each inlet location. The capacity of gutters in streets with parabolic crowns shall be calculated and shown on the plans. The following formulas can be used for determining the gutter capacity or refer to the figures for solution.

$$Q = \frac{1.486 AR^{2/3} S^{1/2}}{n} \quad (\text{Equation 2})$$

$$R = \frac{A}{P} \quad (\text{Equation 3})$$

$$A = \frac{W_o C_o}{2} - \frac{8 C_o}{W_o^2} \frac{W_o}{2} X^2 dx \quad (\text{Equation 4})$$

A simplified equation for the gutter area is:

$$A = (C_o \times W/2) / 3 \quad (\text{Equation 4A})$$

Where:

- "n" is the coefficient of roughness; (use a value of 0.0175 for concrete pavement)
- "A" is the cross section flow area in square feet.
- "R" is the hydraulic radius in feet.
- "S" is the longitudinal slope of the street gutter in feet per foot.
- "P" is the wetted perimeter in feet.
- "Q" is quantity of gutter flow in cubic feet per second.
- "W_o" is the width of the street in feet.
- "C_o" is the crown height of the street in feet.

3.10 Street Intersection Drainage

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

- a) A major thoroughfare shall not be crossed with more than 1 cfs of surface drainage unless approved by the City's Engineer.
- b) Wherever possible, a collector street shall not be crossed with surface drainage and cross drainage shall not exceed 5 cfs unless approved by the City's Engineer.

- c) Wherever possible, a residential street shall not be crossed with surface drainage cross drainage shall not exceed 5 cfs unless approved by the City's Engineer.
- d) At any intersection, only one street shall be crossed with surface drainage, and this shall be the lower classified street.

3.11 Alley Capacities

The storm drain capacity of various alley sections shall be calculated and shown on the plans. In residential areas where the standard 10-foot wide alley section capacity is exceeded, a wider alley may be used to provide storm drain capacity.

The 20-foot wide alley section is the largest available. Curbs shall not be added to alleys to increase capacity unless approved by the City's Engineer. Where a standard 10-foot width alley does not provide adequate capacity, a wider alley, such as a 12-foot or 16-foot width, may be required for greater capacity. Appropriate increased right-of-way widths will be necessary. Alley capacities are calculated for the entire alley right-of-way carrying flow, not to exceed 1" above paving edge and based on 4% positive slope outside the edge of pavement.

3.12 Inlet Design

An excel spreadsheet is available from the City of Aubrey's website under the Development Services Department tab, use of this spreadsheet or an approved similar spreadsheet or software such as Storm CAD is required. Calculations shall be reproduced in the plans. Explanation for use of the spreadsheet and Forms A through D are included at the end of this section. The design engineer is solely responsible for verifying the accuracy and completeness of all design calculations and the City of Aubrey and the City's Engineer do not accept any responsibility for use of forms or electronic files provided for use in design.

Inlets shall be sized to intercept all flow in the approaching gutter. In cases where the selection of an inlet size results in intercepting more than 90% of the gutter flow, consideration may be given to such an inlet on a residential or collector street. Refer to Section 3.3 Design Storm Frequency, for the maximum allowable bypass at residential and collector street intersections.

3.13 Procedure for Sizing and Locating Inlets

The minimum distance between inlets on streets, especially major thoroughfares, shall be 300 feet or as required in Section 3.3. Remainder of flow is to be collected offsite before flowing into street unless approved by the City's Engineer.

3.14 Hydraulic Gradient of Conduits

A storm drainage conduit must have sufficient capacity to convey a 100-year design storm with a minimum of interruption and inconvenience to the public using streets and thoroughfares. The elevation of the hydraulic gradient shall not exceed the bottom of subgrade unless approved by the City's Engineer.

All closed conduit designs shall include calculation of hydraulic gradient for the 100-year event and the hydraulic gradient shall be plotted on the storm sewer profile sheets with the flow capacity, slope of hydraulic gradient and velocity labeled. Conduits in a partial flow condition shall include calculations for partial flow depth and velocity based on the hydraulic conditions and that information shall be plotted on the storm sewer profile sheets with the partial flow depth and the velocity labeled. An example of a partial flow hydraulic calculator that uses the Manning's equation can be found at www.engineersedge.com.

The size of the conduit is determined by accumulating runoff from contributing inlets and calculating the slope of a hydraulic gradient from Manning's Equation:

$$S = \left(\frac{Q_n}{1.486 AR^{2/3}} \right)^2$$

Beginning at the upper most inlet on the system a tentative hydraulic gradient for the selected conduit size is plotted approximately 2 feet below the gutter between each contributing inlet to ensure that the selected conduit will carry the design flow at an elevation 1-foot below the gutter profile. As the conduit size is selected and the tentative hydraulic gradient is plotted between each inlet pickup point, a head loss due to a change in velocity and pipe size must be incorporated in the gradient profile. (See Table 5 for VELOCITY HEAD LOSS COEFFICIENTS FOR CLOSED CONDUITS.)

Also, at each point where an inlet lateral enters the main conduit the gradient must be sufficiently low to allow the hydraulic gradient in the inlet to be below the pavement subgrade unless a variance is granted by the City's Engineer.

At the discharge end of the conduit (generally a creek, stream or channel) the hydraulic gradient of the creek or channel for the 100-year design storm must coincide with the gradient of the storm drainage conduit. Discharge velocity of the conduit shall not exceed 6 fps unless grouted rock riprap, a minimum of 12-inches thick is provided at least 10 feet downstream of discharge for all velocities between 6 fps and 8 fps. A velocity dissipater device shall be provided for any discharge velocity exceeding 8 fps.

No discharge velocity greater than 10 fps will be allowed. An adjustment is usually required in the tentative conduit gradient and, necessarily, the initial pipe selection could also change. The hydraulic gradient of the creek or stream for the design storm can be calculated by use of the HEC-RAS Computer Program.

Concrete pipe conduit shall be used to carry stormwater in City right-of-way, fire lanes and other areas maintained by the City. An excel spreadsheet for storm sewer calculations can be found on the City of Aubrey's website under the Development Services Department tab, use of this spreadsheet or an approved spreadsheet or approved software such as Storm CAD is required. The design engineer is solely responsible for verifying the accuracy and completeness of all design calculations and the City of Aubrey and the City's Engineer do not accept any responsibility for use of forms or electronic files provided for use in design.

With the hydraulic gradient established, considerable latitude is available for establishment of the conduit flow line. The inside top of the conduit should be at or below the hydraulic gradient thus allowing the conduit to be lowered where necessary. The hydraulic gradient for the storm sewer line and associated laterals shall be plotted directly on the construction plan profile worksheet and adjusted as necessary.

Hydraulic conditions can cause the conduits to flow partially full. An example of an acceptable partial flow hydraulic calculator that uses the Manning's equation can be found at EngineersEdge.com. Conduits in partial flow usually have a greater velocity than full flowing pipes on the same slope. All storm sewers with velocities greater than 10 fps in full or partial flow conditions shall either be increased in size or provided with cement stabilized backfill or modified flowable fill.

3.15 Velocity in Closed Conduits

TABLE 2 is a tabulation of minimum pipe grades, which will produce a velocity of not less than 2.5 fps when flowing full unless a pipe smaller than 18-inches is required to increase the velocity above 2.0 fps. Grades less than those shown will not be allowed. Only those pipe sizes shown in TABLE 3 should be used in designing pipe storm sewer systems. All storm sewer pipes in City right-of-way, fire lanes or other areas maintained by the City shall be a minimum of 18-inches unless approved by the City's Engineer.

TABLE 3 shows the maximum allowable velocities in closed conduits. All storm sewers with velocities greater than 10 fps in full or partial flow conditions shall either be increased in size or provided with cement stabilized backfill or modified flowable fill.

3.16 Roughness Coefficients for Conduits

Recommended values for the roughness coefficient "n" are tabulated in TABLE 4. Where engineering judgment indicates values other than those shown should be used, special note of this variance should be taken, and the appropriate adjustments made in the calculations. Materials other than concrete pipe and box culverts shall only be allowed with the approval of the City's Engineer.

3.17 Minor Head Losses

The values of K_j to be used are tabulated for various conditions in TABLE 5. In designing storm sewer systems, the head losses that occur at points of turbulence shall be computed and reflected in the profile of the hydraulic gradient.

3.18 Procedure for Hydraulic Design of Closed Conduits

An excel spreadsheet is available for storm sewer design calculations from the City of Aubrey's website under the Development Services Department tab, use of this spreadsheet or an approved similar spreadsheet or approved software such as StormCAD is required. The design engineer is solely responsible for verifying the accuracy and completeness of all design calculations and the City of Aubrey and the City's Engineer do not accept any responsibility for use of forms or electronic files provided for use in design.

3.19 Open Channels

Open channels are to be used to convey storm waters where closed conduits are not justified. Consideration must be given to such factors as relative location to streets, schools, parks and other areas subject to frequent pedestrian use as well as basic economics.

Type II Channel Figure 24 is an improved section recommended for use where larger storm flows are to be conveyed or where the grade creates a velocity under 2-feet per second. The concrete flume or pilot channel in the channel bottom is to be used as a maintenance aid. The indicated width of the flume is a minimum width and as the width of the channel increases, the required width of the flume may be required to increase.

Type III Channel, Figure 24, is a concrete lined section to be used for large flows in higher valued property areas and where exposure to pedestrian traffic is limited.

The recommended side slope is 4 feet vertical for one foot rise and the maximum side slope is 3 feet vertical for one foot rise for open channels. The Engineer shall use the

recommended slope unless prior approval has been obtained from the City's Engineer or soil conditions required a flatter slope.

The most efficient cross section of an open channel, from a hydraulic standpoint, is one that, with a given slope, area, and roughness coefficient, has the maximum capacity. This cross section is the one having the smallest wetted perimeter. There are usually practical obstacles to using cross sections of the greatest hydraulic efficiency, but the dimensions of such sections should be considered and adhered to as closely as conditions will allow.

Landscaping is intended to protect the channel right-of-way from erosion, as well as an aesthetically pleasing view. The Engineer shall include in his plans the type of grass and placement. Full coverage of grass must be established prior to acceptance by the City.

Erosion and sediment control shall be included in the design and shown on the construction plans. These controls shall meet EPA and TCEQ requirements.

Special care must be taken at entrances to closed conduits, such as culverts, to provide for the headwater requirements. HEC-RAS includes procedures to account for these conditions. Refer to Paragraph 3.31, PROCEDURE FOR HYDRAULIC DESIGN OF CULVERTS.

On all channels the water surface elevations, which may be assumed as coincident with the hydraulic gradient, shall be calculated, and shown on the construction plans. One exception to the water surface coinciding with the hydraulic gradient would be when the channel is in supercritical flow, which generally is not encountered, and discouraged in this geographical area. Designs utilizing supercritical flow should be discussed with the City of Aubrey and approved by the City's Engineer in the preliminary stages of design. The channel velocity shall also be shown on the construction plans. Channel velocities shall not exceed 6 fps or be less than 2.5 fps where practical. Velocities greater than 6 fps may require special armoring and velocities less than 2.5 fps will require a pilot channel.

The preferred method for performing hydraulic calculations on existing and Type I Channels is to use an approved software such as HEC-RAS. The other procedure utilizes Bernoulli's Energy Equation to establish the water surface elevations at succeeding points along the channel.

Hydraulic calculations for other channels shall be made using a HEC-RAS model developed for the purpose, and the cross section plots shown from the model output.

In general, the use of existing channels in their natural condition or with a minimum of improvement and with reasonable safety factors is encouraged. Care should be taken to minimize the impact to "Waters of the US" (WOUS) to avoid 404 Permit implications. It shall be the developer's responsibility to determine if a 404 Permit is required and to secure all necessary 404 Permits.

3.20 Types of Channels

Types I, II, and III channels are defined below and are to be used wherever possible.

A Type I Channel is to be used when the development of land allows its use. It is intended to be left as nearly as possible in its natural state with improvements primarily limited to those which will allow the safe conveyance of storm waters, minimize public health hazards, and make the floodplain usable for recreation purposes. In some instances, it may be desirable to remove undergrowth.

Type II and Type III channels are improved or manmade channel sections. The general dimensions of bottom with and side slope may be adjusted within the limitations described earlier to efficiently convey the design flow.

3.21 Quantity of Flow for Channels

In the design of open channels, it is usually necessary that quantities of flow be estimated for several points along the channel. These are locations where recognized discharge points enter the channel and the flows are calculated as previously outlined under "Determination of Design Discharge." The channel shall be designed for the maximum anticipated 100-year flow downstream of all points where design flow has been calculated.

3.22 Channel Alignment and Grade

While it is recognized that channel alignments must necessarily be controlled primarily by existing topography and right-of-way, changes in alignment should be as gradual as possible. Whenever practicable, changes in alignment should be made in sections with flatter grades.

Normally, the grade of channels will be established by existing conditions, such as an existing channel at one end and a storm sewer at the other end. There are times,

however, when the grade is subject to modification, especially between controlled points and to provide the appropriate freeboard.

Whenever possible the grades should be sufficient to prevent sedimentation (Velocity > 2.5 fps) and should not be overly steep to cause excessive erosion (Velocity > 6.0 fps).

For any given discharge and cross-section of channel, there is always a slope just sufficient to maintain flow at critical depth. This is termed critical slope and a relatively large change in depth corresponds to relatively small changes in energy. Because of this instability, slopes at or near critical values should be avoided.

Maximum allowable velocities are shown in TABLE 7. When the normal available grade would cause velocities more than the maximums, plans shall include details for any special structures required to retard this flow.

3.23 Roughness Coefficients for Open Channels

Roughness coefficients to be used in solving Manning's Equation are shown in TABLE 6, together with maximum allowable velocities. Channels designed using less than the normal value shown on TABLE 6 shall be required to be perpetually maintained by the property owner or an HOA with a drainage easement so the City can maintain the channel if necessary.

3.24 Procedure for Calculation of Water Surface Profile for Unimproved Channels

The HEC-RAS Computer Program is the preferred method for calculation of water surface elevations on unimproved channels and may be required by the City. Roughness coefficients for unimproved channels are shown in TABLE 6. The Engineer shall provide an explanation for the use of roughness coefficients less than the normal value shown on TABLE 6 those areas may be required to be perpetually maintained by the property owner or an HOA with a drainage easement so the City can maintain the channel if necessary.

3.25 Procedure for Hydraulic Design of Open Channels

An excel spreadsheet from the City of Aubrey's website under the Development Services Department tab is available for the design of simple trapezoid channel sections. Use of this spreadsheet or an approved similar spreadsheet is required unless the HEC-RAS Computer Program is used. The use of HEC-RAS is encouraged for calculations for unimproved channels, channels with variable geometry and/or variable roughness coefficients.

3.26 Hydraulic Design of Culverts

The function of a culvert or bridge is to pass storm water from the upstream side of a roadway to the downstream side without submerging the roadway, creating hydraulic gradient problems for connecting storm sewer systems, or causing increased water surface elevations on upstream properties.

The Engineer shall keep head losses and velocities within reasonable limits while selecting the most economical structure. In general, this means selecting a structure that creates a headwater condition and has a maximum velocity of flow safely below the allowed maximums.

The vertical distance between the upstream design water surface and the roadway elevation should be maintained to provide a safety factor to protect against unusual clogging of the culvert and to provide a margin for future modifications in surrounding physical conditions. In general, a minimum of two feet shall below the lowest top of curb or edge of pavement shall be considered reasonable when the structure is designed to pass a 100-year design storm frequency as calculated by Aubrey's design criteria. Unusual surrounding physical conditions may cause for an increase in this freeboard requirement as determined by the City's Engineer.

3.27 Quantity of Flow for Culverts

The quantity of flow which the culvert must convey shall be based on the 100-year event.

3.28 Headwalls and Entrance Conditions

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

In general, straight or parallel headwalls should be used where the approach velocities in the channel are below 6 feet per second, where headwater pools are formed and where no downstream channel protection is required. Headwalls with wingwalls and aprons should be used where the approach velocities are from 6 to 12 feet per second and downstream channel protection is desirable.

Special headwalls and wingwalls may be required where approach velocities exceed 12 to 15 feet per second. This requirement varies according to the axis of the approach velocity with respect to the culvert entrance.

3.29 Culvert Discharge Velocities

Velocities in culverts shall be limited to no more than 10 feet per second, but downstream conditions may impose more stringent controls. Consideration must be given to the effect of high velocities and turbulence on the channel, adjoining property and embankment. TABLE 7 is a tabulation of maximum allowable velocities based on downstream channel conditions. Discharge velocities greater than 6 fps and less than 8 fps may require special armoring and discharge velocities greater than 8 fps and less than 10 fps will require armoring. Discharge velocities greater than 10 fps are discouraged and will require velocity dissipators and armoring. The head loss for velocity dissipators shall be included in the calculation of hydraulic gradient at the downstream side of the culvert.

3.30 Procedure for Hydraulic Design of Culverts

HY-8 software or HEC-RAS software may be used for the calculation of culvert hydraulics. HY-8 should only be used for the calculation of residential culverts. The use of HEC-RAS is encouraged for the design of all other culverts.

3.31 Hydraulic Design of Bridges

Wherever possible the proposed bridge should be designed to span a channel section equal to the approaching channel section. If a reduction in channel section is desired this should be accomplished upstream of the bridge and appropriate adjustments made in the hydraulic gradient.

Wherever possible bridges should be constructed to cross channels at a 90-degree angle, which normally will result in the most economical construction. Wherever the bridge structure is skewed the bents should be constructed parallel to the flow of water. Values of K_b , head loss coefficient, normally will vary from 0.2 to 0.5 with the exact value to be determined by an appraisal of the hydraulic conditions associated with the specific project. With a minimum of constriction and change in velocity, a clear span bridge would have a minimum coefficient. This would increase for a multi-span bridge, skewed or with piers not placed perpendicular to the flow. The Bureau of Public Roads "Hydraulic of Bridge Waterways" should be used for determining the K coefficient.

In more complex bridge design such as long multiple spans and relief structures crossing an irregular channel section, the procedures outlined in the Texas Highway Department "Hydraulic Manual" or the Bureau of Public Roads "Hydraulics of Bridge Waterways", should be utilized.

A minimum distance of 2-feet between the maximum 100-year design water surface and the lowest point of the bridge beams shall be maintained.

3.32 Quantity of Flow for Bridges

The quantity of flow which the structure must convey shall be the 100-year flow. The Rational Method can be used for drainage areas under 200 acres. The HEC-HMS Computer Program is the required method for areas 200 acres or larger and may be required by the City depending on the size of the drainage area. 24-hour rainfall intensities for various storm events shall be based on NOAA Atlas 14 data for the City of Aubrey. Soil data shall either be assumed to be Hydrologic Group D (clay) or shall be obtained from the US Geologic Service Web Soil Survey at the NRCS website. A detailed listing of the soil characteristics and SCS Curve number used in the design shall be provided.

3.33 Procedure for Hydraulic Design of Bridges

A HEC-RAS model is required by the City for the design of all bridges.

The Engineer should investigate several different bridge configurations on each project to determine the most economical that can be constructed within the velocity limitations and other criteria included in this manual.

3.34 Procedure for Filling in a Floodplain or Adjacent to a Stream

Fill and development of floodplains, which is not damaging to the environment is permitted where it will not create other flood problems or adverse conditions to any properties adjacent to, upstream or downstream of the development. The requirements of the Flood Damage Prevention Ordinance and the following minimum criteria must be met before requesting a Floodplain Development Permit:

- a) Alterations of the floodplain shall result in no increase in water surface elevation on other properties. No alteration of the channel or adjacent floodplain will be permitted which could result in any increased flood risk to other properties, adjacent, upstream, or downstream. Increased flood elevation could cause inundation and damage to areas not presently inundated by the "design flood". The "design flood" for a creek or stream is defined by either the 100-year flood (the event having a one percent chance of being equaled or exceeded at least once in any given year, or flow from the Flood Insurance Study (FIS) for Denton County, Texas, whichever results in the highest peak flood discharges. Streams on the Federal Insurance

Rate Maps must be designed using the FIS 100-year flow or the City design 100-year flow, whichever is greater.

- b) Alterations of the floodplain shall not create an erosive water velocity on or off site. The mean velocity of stream flow at the downstream end of the site after development shall be no greater than the mean velocity of the stream flow under existing conditions.

No alteration to the floodplain will be permitted which would increase velocities of flood waters to above 6 fps. Soil erosion results in loss of existing vegetation as well as augments destructive sedimentation downstream. Eventual public costs in channel improvements and maintenance (such as removal of debris and dredging of lakes) can be expected as a result.

- c) Alterations of the floodplain shall be permitted only to the extent permitted by equal conveyance reduction on both sides of the natural channel without increased 100-year water surface elevation or increased velocities. The impact of the proposed alteration will be based on the "equal conveyance" principle to ensure equitable treatment for all property owners. Under equal conveyance, if the City allows a change in the flood carrying capacity (capacity to carry a particular volume of water per unit of time) on one side of the creek due to a proposed alteration of the flood plain, it must also allow an equal change to the owner on the other side. The combined change in flood carrying capacity, due to the proposed alteration plus a corresponding alteration to the other side of the creek, may not cause either an increase in flood elevation or an erosive velocity (Criteria 1 and 2) or violate the other criteria.
- d) Alterations to the floodplain shall not be permitted that reduce the predevelopment valley storage for all developments discharging runoff to any stream shown with a Zone A or Zone AE floodplain on the appropriate Flood Insurance Rate Map where the development is located. The predeveloped floodplain storage for all other streams shall not be reduced by more than 5%.
- e) The toe of any fill slope shall parallel the natural channel to prevent an unbalancing of stream flow in the altered floodplain. If the alignment of the proposed fill slope departs from the contours of the natural floodplain, the flow characteristics of the floodwaters may be altered, causing possible damaging erosion and deposition in the altered floodplain. If the fill slope follows the natural channel, it will also tend to minimize the visual impact of the alteration.

- f) To ensure maximum accessibility to the floodplain for maintenance and other purposes and to lessen the probability of slope erosion during periods of high water, maximum slopes of filled area shall usually not exceed 4 to 1. Vertical walls, terracing and other slope treatments will be considered only as a part of a landscaping plan submission and if no unbalancing of stream flow results and shall be designed based on the appropriate hydrodynamic forces. The purposes of the slope restrictions are to maintain stability and prevent erosion of the slopes, to ease maintenance (e.g., mowing) on the slopes themselves, and to provide accessibility to the areas below the slopes. Being more frequently inundated and therefore subject to greater hazard of erosion, cut slopes must be shallower than fill slopes.
- g) Landscaping plan submission shall include plans for erosion control of cut and fill slopes, restoration of excavated areas, and tree protection where possible in and below the fill area. Landscaping should incorporate natural materials (earth, stone, wood) on cut or fill slopes wherever possible. The applicant shall show in plan the general nature and extent of existing vegetation on the tract, and which areas will be preserved, altered, or removed resulting from the proposed alterations. Locations and construction details should be provided showing how trees will be preserved in areas which will be altered by filling or paving within the drip line of those trees. The applicant shall also submit plans showing location, type, and size of new plant materials and other landscape features planned for altered flood plain areas. Trees and landscape planting are not permitted within any detention or retention pond or required visibility triangles. Privacy and solid fencing shall not be allowed within the 100-year floodplain.
- h) Erosion control plans should demonstrate how the developer intends to minimize soil erosion and sedimentation from his site during and after the fill operation. Plans should include a timing schedule showing anticipated start and completion dates for each step of the proposed operation. Area and time of exposed soils should be minimized, and existing vegetation should be retained and protected wherever feasible. Disturbed areas should be sodded or covered with mulch and/or temporary vegetation immediately. Structural measures (e.g., drop structures, sediment ponds, etc.) should be utilized where necessary for effective erosion control, but measures should also minimize structures and materials that detract from the natural appearance of the floodplain.
- i) A detailed downstream assessment will be required for all developments impacting a FEMA Mapped Floodplain and a CLOMR may be required by the Floodplain Administrator. Downstream Assessments and CLOMRs shall be followed by a

LOMR after final grading is completed and before any habitable structures are built in the FEMA Mapped Floodplain. A detailed engineering report such as a downstream assessment and/or a flood study shall be provided for review and approval by the City's Engineer for all other areas along streams. The downstream assessment and/or flood study shall include at least the items described under Engineering Report under Section 3.35.

3.35 Filling in a 100 Year Floodway Fringe

a) Definitions

- i) 100 Year Floodplain Elevation (100 Year F.P.El.): That water surface elevation established by applying the Manning Equation ($Q = 1.486/n \ AR^{1/2} \ S^{1/2}$) to the backwater analysis of a stream (river, creek or tributary) using the 100-year storm as the rate of flow (Q). The 100-Year Floodplain Elevations are those based on the Corps of Engineer's analysis or letters of map revision approved by the Federal Emergency Management Agency (FEMA) and form the basis of the Flood Insurance Rate Map (FIRM) as adopted by the Federal Insurance Administration, or subsequent amendments.
- ii) Flood Plain or Floodplain: Area of land lying at or below the 100-year floodplain elevation.
- iii) Floodway: That central portion of the floodplain which would remain clear of filling or other obstructions unless modifications are made within or along the stream bed to offset the effect of additional filling or obstructions within the floodway. This term does not apply to most of the streams in the City of Aubrey since the City of Aubrey does not allow for increases to the floodplain elevations. Alterations of the stream are subject to 404 Permit requirements.
- iv) Floodway Fringe: Area between floodplain limit and the floodway limit that, if filled, would not produce an adverse rise in the 100-year floodplain elevation.
- v) Significant Rise: A rise in the 100-year water surface elevation greater than 0.01-foot.
- vi) Base Flood: A 100-year frequency storm event.
- vii) Floodway Line: The inter-boundary of the floodway fringe determined by filling within a flood plain along the entire reach of a stream in such a manner that the total cumulative effect of the filling will not create a significant rise in the 100-year water surface elevation.

viii) Equal Conveyance Principle: An area of the cross section of a stream in its existing condition carrying a percentage of the stream flow, will continue to carry the same percentage of the stream flow after filling in the floodplain occurs without creating a significant rise in the 100-year floodplain elevation.

b) Criteria for Filling in the 100 Year Floodway Fringe

- i) Applies only to creeks or portions of creeks with a drainage area of five (5) square miles, or less.
- ii) Fill and development of the floodplains shall not create an adverse impact on any adjacent property or the 100-year flood plain elevation.
- iii) Fill and/or other development within the floodway is not allowed.
- iv) In beginning a backwater analysis for development within a floodplain, the downstream water surface elevation will be determined as follows:
 - Use the studied elevation for the next effective section downstream of the development for streams in a Zone AE floodplain.
 - Use the normal depth method to determine the beginning water surface elevation for a section located at least 500 feet downstream of the development with the energy gradient equal to the slope of the stream from the most downstream section to the first section within the development.
- v) Alterations of the floodway are not allowed.
- vi) The Floodway Line shall be established in accordance with the definition in (a) above.
- vii) Equal Conveyance shall be required in accordance with the definition of Equal Conveyance Principle in (a) above.
- viii) The requirements of 3.36, Paragraphs d, e and f shall apply.

ix) Preparation of an Engineering Report that includes at a minimum

Flood Study:

- Description of the project and the hydrologic and hydraulic analyses used and a summary of the results.
- Vicinity Map.

- Summary Table comparing existing and proposed base flood elevations and velocities.
- Documentation that the principle of equal conveyance has been achieved.
- Documentation that the City requirement for valley storage was achieved.
- Copies of input and output data for hydrologic and hydraulic models for the existing and proposed conditions for the existing base flood (100-year) and the fully developed base flood (100-year) together with the 10-year, 50-year and 500-year floods. Input/output reports should include summary tables for “n” values, reach lengths and expansion and contraction coefficients with Standard Table 1. The report should be in landscape format with narrow margins and small font minimizing text wrapping on Standard Table 1.
- Prints of the existing base flood profile and the proposed base flood profile.
- Prints of the existing cross sections and the proposed cross sections with the “n” values, base flood water surface elevation and energy gradient shown.
- Evaluation of the effective floodway and any proposed modifications to the floodway for the existing base flood and the fully developed base flood.
- Engineering plans shall include the following recommended elements: (a) existing and proposed water surface profiles including existing and proposed channel flow lines showing the location and number designation of cross sections, (b) existing and proposed floodplain and floodway limits, boundary lines (property lines and city limits), streets, lots and existing and proposed contours showing the location and number designation of cross sections, (c) the location, dimensions, etc., of all other associated improvements or alterations to the creek or floodplain, (d) the location of all existing and proposed easements and other dedications, (e) plots of cross sections showing scale, existing and proposed ground elevations with cut and/or fill areas labeled, limits and values for existing and proposed “n” values and equal conveyance reduction from both sides.

Downstream Assessment:

- All elements required by the North Central Texas Council of Governments (NCTOG) Integrated Storm Water Management (iSWM) Technical Manual.

- x) Final approval shall be required by FEMA through submittal of an application for a Letter of Map Revision for any development requesting to alter the existing floodplain boundary or development on a stream with a Zone A floodplain boundary to revise it to a Zone AE floodplain or to alter an existing Zone AE floodplain boundary.

3.36 Detention and Retention Ponds

On-site detention shall be used to control post-development runoff. Developments shall be required to provide adequate detention so that post-development 100-year peak flows do not exceed the peak flows calculated for the area using the rational method with the coefficient for runoff and time of concentration appropriate for the conditions prior to development. Inflow volumes shall be calculated for the 2, 10, and 100-year storm frequencies. Peak flows for the developed 2-year and 10-year frequency events shall not be more than 5% higher than the predevelopment flows for those events. For total areas less than 100 acres a form of the Rational Method will be acceptable; however, if the Modified Rational Method is used the freeboard will be increased from 2.0 feet to 3.0 feet. Design using a 24-hour rainfall event with HEC-HMS or other approved software based on a 24-hour rainfall event will require a minimum freeboard of 2.0 feet. Several software programs are available for the modified rational method and design of detention and retention ponds such as PondPac, HydroCAD, and Hydrology Studio. The modified rational method is not acceptable for design of drainage basins 100 acres or larger. For total areas 100 acres and larger a 24-hour duration will be required using the HEC-HMS software or other approved software. A hydraulic study that illustrates no adverse conditions are created downstream resulting from development may be accepted in lieu of storm water detention. The City Council may waive storm water detention requirements upon determination by the Council that such waiver is in the best interest of the City.

The detention or retention system shall be designed for the 100-year storm frequency, 24-hour design storm duration and the pond shall be greater than 90% empty within 24 hours after the 100-year event. All types of pond design shall be designed with a freeboard of 30% the nominal depth of the pond, but not less than 2.0 feet. The maximum allowable headwater must be kept within the range of slope stability of the embankment construction. All design calculations shall be a part of the construction plans.

An outlet control structure such as an orifice or a weir shall be placed at the inlet end of the outfall pipe provides an integrated stage-discharge such that a wide range of storms

can be effectively controlled. Perforated riser pipes, weirs and special outlet control boxes are acceptable. Pipe/culvert type outlet control will only be allowed with written approval from the City. All vertical structures shall have anti-vortex and trash rack devices. Emergency overflow structures and paved positive overflow channels shall be included with the design of detention systems.

Whenever possible, detention and retention ponds shall fit in the natural contour of the land, be aesthetically pleasing and be free draining. A grading plan with 2-foot intervals shall be included with the construction plans and submitted with the CLOMR, LOMR, Flood Study or Downstream Assessment. Maintenance access shall be provided for each pond. The bottom slope shall be a minimum of 2% to the outfall structure. A concrete flume will be required where the 2% slope cannot be achieved. Detention basins shall be designed with short and long term erosion control.

A detention system maintenance program shall be prepared and submitted to the City for approval before final acceptance of the construction plans.

Retention ponds shall be designed to include a safety shelf no more than 6-inches below the normal water surface elevation. Retention ponds shall also be designed to have a minimum depth of 6 feet below the normal water surface to reduce the growth of aquatic plants and shall include some form of aeration to reduce mosquitoes and other undesirable vectors. A maintenance plan shall be submitted to the City for approval before acceptance of the construction plans.

Detention and Retention Options

- a) Detention Storage: Detention storage facilities are generally designed to control short, high-intensity local storms, as these are the major cause of flooding on small streams. Detention storage serves to attenuate the peak flow by reducing the peak outflow to a rate less than the peak inflow, which effectively lengthens the time base of the outflow hydrograph. The total volume of water discharged is the same; it is merely distributed over a long period of time. Discharge from detention storage facilities begins immediately at the start of the storm, and the facility shall be completely drained 24 hours after the storm event.
- b) Retention Storage: Retention storage refers to those facilities where stormwater is collected and stored above a normal water surface in the pond during flood events. The stored water is released after the flood event by means of controlled outlets. Alternatively, the water may be allowed to infiltrate into the ground or evaporate. For maximum effectiveness, the water contained in the retention storage facility must be

released or lost before the next flood event occurs. In some cases, it may be desirable to maintain a permanent pool within the retention area. Such a facility is called wet storage. The volume of water above the normal pond shall drain within 24 hours after the storm event.

- c) Conveyance Storage: As stormwater enters and flows in channels, floodplains, drains, and storm sewers, the flow is being stored in a transient form and is termed conveyance storage. Conveyance storage is generally obtained by constructing low-velocity channels with large cross-sectional areas.
- d) Upstream Storage: This storage occurs upstream of the design area to be protected. It is intended to contain runoff, which originates upstream and beyond the area to be protected. Upstream storage is only possible with written permission of other impacted property owners.
- e) Within-Area Storage: This storage occurs in the area to be protected. It is intended to store runoff originating in and around the area to be protected. It is common for such storage to be provided at the development sites.
- f) Downstream Storage: This is storage located downstream from the area to be protected. The general purpose of downstream storage is to manage storm flows from the area to be protected and to control any detrimental downstream effects from development in the protected area. Downstream storage is only possible with written permission of other impacted property owners.
- g) Rainfall Storage: Rainfall storage refers to the storage of water in the vicinity of the rainfall occurrence or before storm water accumulates significantly. This storage classification is similar to "within-area storage" as described above.
- h) Runoff Storage: Runoff storage refers to the storage of larger quantities of water, which have accumulated significantly and have begun to flow in the drainage system. This storage classification is similar to "upstream storage" and "downstream storage" described above.
- i) Driveway Storage: This storage method involves the construction of a depressed section in the driveway such that runoff from the lot and/or roof may be routed and stored there. A properly designed outlet system will regulate the discharge of this runoff into the drainage system.
- j) Cistern/Infiltration: A cistern or tank can be located within the property area to collect runoff from the lot and roof. If local subsurface soil properties and geologic

conditions permit, the water can be infiltrated after the storm subsides. If soil conditions are not conducive to draining the underground facility of 90% of runoff within 24-hours then appropriately designed pumps may be used to empty runoff within 24-hours.

- k) Cistern/Irrigation: This method is identical to the "cistern/infiltration" method except that the option is provided for the water in the cistern to be used for an irrigation water supply or to be discharged into the storm sewer system if allowed.
- l) Rooftop Storage: This storage method is most applicable to industrial, commercial, and apartment buildings with large flat roofs. Rooftop storage is often an economical and effective alternative. Since it is common for buildings to be designed for snow loads, it is possible to accommodate an equivalent depth of water without significant structural changes. A six-inch depth of water is equivalent to 31.2 pounds per square foot, less than most snow load requirements in the northern United States and Canada (4).

Special roof drains with controlled outlet capacity are typically installed as an integral part of the rooftop storage method. With proper installation of such drains, peak runoff from roofs may be reduced by up to 90 percent.

An important consideration for the rooftop storage method would be to provide overflow mechanisms to ensure that the structural capacity of the roof is not exceeded. An additional consideration would be the watertightness of the rooftop.

- m) Parking Lot Storage: Parking lots can be graded to route runoff to desired storage areas or areas of infiltration. If the flow is routed to a storage area, outlet works such as grated inlets or overflow weirs serve to regulate the design flow. Normally the depth of flow within the parking lot is limited to not greater than 6-inches. Parking lots shall also have a minimum slope of 1.00% for drainage purposes. Alternatively, the runoff may be routed to grassed or gravel filled areas for infiltration and percolation if soil conditions are appropriate.
- n) On-Site Ponds: On-site ponds provide for the collected stormwater to be released in a controlled manner by overflow weirs or orifices. When properly designed, on-site ponds can serve the hydraulic function while providing recreational and aesthetic benefits.
- o) Slow-Flow Drainage Patterns: This storage method involves the design of conveyance systems with reduced grades to provide reduced flow velocities. The desired effect is to obtain temporary ponding and a form of transient storage. Slow

flow drainage may be augmented by providing controls (e.g., weirs, checks) along channels to create a system of linear reservoirs (2). The use of such controls will provide temporary storage while allowing for a possible increase in infiltration. This method is usually not appropriate for clay soils.

- p) Open Space Storage: Open spaces such as parks and recreation fields generally have a substantial area of grass covering and provide increased infiltration opportunities. Such open spaces produce only minimal quantities of runoff. Therefore, open spaces provide excellent opportunities for the temporary storage of storm runoff, provided the primary use of the open space is not altered. This is generally not a problem since recreation areas are seldom used during storm events. Excess siltation shall be avoided when using this method.
- q) Retention Reservoirs: Retention reservoirs located in a watershed generally represent major storage facilities (2). They are most effective when located in valleys or recessed areas and should have the ability to regulate stream flow. Retention reservoirs maintain a permanent pool in the form of ponds or lakes. As such, they are sometimes well suited for water-oriented recreational features.
- r) Detention Reservoirs: Detention reservoirs are generally located on streams and are frequently located above the reaches where there is a continuous flow (2). Since a permanent pool is not maintained, detention reservoirs do not provide opportunities for water-oriented recreation. However, they may be conveniently integrated into a park and open space plan.
- s) Underground Detention: Detention basins located underground and generally under parking lots or other paved areas. These facilities are similar to Cistern/Infiltration or Cistern/Irrigation and may use infiltration with appropriate soil conditions or other means to empty the detention basin within 24 hours after a rainfall event.
- t) Gravel Pits and Quarries: Gravel pits and quarries are located off-channel such that a side-channel spillway is necessary to intercept and direct the peak flow to the pit location. Outfall from such storage facilities must generally be pumped or integrated with a staged discharge returning flow to the channel. The volume used for detention shall be emptied within 24 hours after a rainfall event.

Table 1

Coefficients of Runoff and Minimum Inlet Times

Land Use	Runoff Coefficient C	Minimum Inlet Time In Minutes For Inlet Calculations
Residential		
Single Family Residential (<= 1/8 acre)	0.65	15
Single Family Residential (<= 1/4 acre)	0.60	15
Single Family Residential (<= 1/2 acre)	0.55	15
Single Family Residential (> 1/2 acre)	0.45	15
Multi-Family Apartments	0.80	10
Patio Homes/Duplexes	0.60	15
Open Space	0.40	15
Business		
Downtown	0.90	10
Commercial and Light Industrial	0.80	10
Heavy Industrial	0.90	10
Retail and Shopping Centers	0.90	10
Railroad Yards	0.70	10
Miscellaneous Developed Areas		
Churches	0.80	10
Schools	0.70	15
Parks, Playgrounds, and Cemeteries	0.40	15
Street right-of-way	0.90	10
Undeveloped Floodplain (Good Condition)	0.35	15
Pasture	0.40	15
Woods	0.30	15
Cultivated	0.50	20

Note: Minimum Inlet Times are only for inlet design, initial time for storm sewers shall be calculated based on the TR-55 approach and the minimum initial time for storm sewers shall be 5 minutes.

Table 2

Minimum Slopes for Pipes & Box Culverts (n = 0.013)

Pipes

Pipe Diameter (Inches)	Slope (Feet/100 Feet)
18	.180
21	.150
24	.120
27	.110
30	.090
33	.080
36	.070
39	.062
42	.056
45	.052
48	.048
51	.045
54	.041
60	.036
66	.032
72	.028
84	.023
90	.021
96	.020*
* Min. Slope = 0.02' /100 For Constructability	

Box Culverts

Pipe Diameter (Inches)	Slope (Feet/100 Feet)
3' x 2'	.120
4' x 2'	.104
3' x 3'	.090
4' x 3'	.074
5' x 3'	.066
6' x 3'	.061
4' x 4'	.061
5' x 4'	.053
6' x 4'	.048
7' x 4'	.044
8' x 4'	.042
5' x 5'	.045
6' x 5'	.040
7' x 5'	.037
8' x 5'	.034
9' x 5'	.033
10' x 5'	.031
6' x 6'	.036
7' x 6'	.032
* Min. Slope = 0.02' /100 For Constructability	

NOTE: Minimum pipe diameter to be used in construction of storm sewers shall be 18-inches.
Minimum velocity = 2.50 fps

Table 3
Maximum Velocities in Closed Conduits

Type of Conduit	Maximum Velocity
Culverts	15 f.p.s.
Inlet Laterals	30 f.p.s.
Storm Sewers	12 f.p.s.

Storm sewers discharging into open channels shall have a maximum velocity of 8-feet per second (f.p.s.). Channel protection shall be provided for the reach from the point of discharge until velocity is less than 6-feet per second in the channel. This maximum velocity of 8 f.p.s. must be maintained in the last 200-feet of storm sewer conduit. Flow dissipaters and channel protection will both be required for discharge velocities greater than 8 f.p.s. with approval of the City's Engineer.

All storm sewers and laterals with velocities greater than 10 f.p.s. shall be provided with cement stabilized backfill or flowable fill to a minimum 3-inches above the top of pipe.

TABLE 4

ROUGHNESS COEFFICIENTS FOR CLOSED CONDUITS

<u>Material of Construction</u>	<u>Recommended Roughness Coefficient "n"</u>
New Monolithic Concrete Conduit	0.015
Concrete Pipe Storm Sewer	
Good Alignment, Smooth Joints	0.013
Fair Alignment, Ordinary Joints	0.015
Poor Alignment, Poor Joints	0.017
Concrete Pipe Culverts.....	0.012
Monolithic Concrete Box Culverts	0.012

NOTE: Reinforced concrete pipe is the accepted material for construction of storm sewers. The use of other materials for the construction of storm sewers shall have prior approval from the City's Engineer. For design of all pipe material an "n" of 0.013 shall be used unless otherwise shown.

TABLE 5

VELOCITY HEAD LOSS COEFFICIENTS FOR CLOSED CONDUITS

MANHOLE AT CHANGE IN PIPE DIRECTION		
Description	Angle	Head Loss Coefficient K _j
	> 90	1.25
	90	1.00
	60	0.80
	45	0.65
Angle	30	0.50
BEND IN PIPES		
Description	Angle	Head Loss Coefficient K _j
	*90°	0.80
	*60°	0.60
	**45°	0.50
Angle	**30°	0.45
ENLARGEMENTS IN PIPE SIZES WITH CONSTANT FLOW		
Description	Ratio of Upstream Diameter to Downstream Diameter	Head Loss Coefficient K _j
	≤ 0.80	1.20
	0.81	1.00
	0.82	0.90
	0.84	0.80
	0.85	0.70
	0.86	0.60
	0.88	0.50
	0.90	0.40
	0.92	0.30

* Only as authorized by City's Engineer.

** Horizontal curves are the accepted method of construction. Joints shall not be deflected more than 80% of manufacturer's recommendation.

TABLE 6**ROUGHNESS COEFFICIENTS FOR OPEN CHANNELS**

Channel Description	Roughness Coefficient			Maximum Velocity Ft/sec
	Minimum	Normal	Maximum	
MINOR NATURAL STREAMS –TYPE I CHANNEL				
Moderately Well Defined Channel - Grass and Weeds, Little Brush - Dense Weeds, Little Brush - Weeds, Light Brush on Banks - Weeds, Heavy Brush on Banks - Weeds, Dense Willows on Banks	0.025 0.030 0.030 0.035 0.040	0.030 0.035 0.035 0.050 0.060	0.033 0.040 0.040 0.060 0.080	8 8 8 8 8
Irregular Channel with Pools and Meanders - Grass and Weeds, Little Brush - Dense Weeds, Little Brush - Weeds, Light Brush on Banks - Weeds, Heavy Brush on Banks - Weeds, Dense Willows on Banks	0.030 0.036 0.036 0.042 0.048	0.036 0.042 0.042 0.060 0.072	0.042 0.048 0.048 0.072 0.096	8 8 8 8 8
Flood Plain, Pasture - Short Grass, No Brush - Tall Grass, No Brush	0.025 0.030	0.030 0.035	0.035 0.050	8 8
Flood Plain, Cultivated - No Crops - Mature Crops	0.025 0.030	0.030 0.040	0.035 0.050	8 8
Flood Plain, Uncleared - Heavy Weeds, Light Brush - Medium to Dense Brush - Trees with Flood Stage below Branches	0.035 0.070 0.080	0.050 0.100 0.100	0.070 0.160 0.120	8 8 8
MAJOR NATURAL STREAMS - TYPE I CHANNEL				
The roughness coefficient is less than that for minor stream of similar description because banks offer less effective resistance.				
- Moderately Well Defined Channel - Irregular Channel	0.025 0.035	--- ---	0.060 0.100	8 8
UNLINED VEGETATED CHANNELS - TYPE II CHANNEL				
- Mowed Grass, Clay Soil - Mowed Grass, Sandy or Sandy Loam Soil	0.025 0.025	0.030 0.030	0.035 0.035	8 6

TABLE 7
CULVERT DISCHARGE VELOCITIES

Culvert Discharges On	Maximum Allowable Velocity (f.p.s.)
Earth (Sandy or Sandy Loam)	6
Earth (Clay)	8
Sodded Earth (Stapled)	8
Rock Gabions (Engineered)	12
Concrete Riprap	15
Shale (Limestone)	10

LIST OF FORMS AND SPREADSHEETS

Form

- A. Storm Water Runoff Calculations (Integrated Spreadsheet Available)
- B. Inlet Design Calculations (Integrated Spreadsheet Available)
- C. Storm Sewer Calculations (Integrated Spreadsheet Available)
- D. Open Channel Calculations (Spreadsheet Available)

Use HEC-RAS or other approved software for

Water Surface Profile Calculations, Hydraulic Design of Culverts, and Bridge Design Calculations

NOTES:

1. An excel spreadsheet that links the runoff calculations, inlet design calculations and storm sewer calculations is available for download. A similar approved spreadsheet or software such as StormCAD may be used to perform these calculations based on City of Wylie Design Criteria.
2. A copy of each applicable form or spreadsheet must be submitted with the drainage plans to the City to review. Final plans must include these forms in the drainage plans.
3. The design engineer is solely responsible for verifying the accuracy and completeness of all design calculations and the City of Aubrey and the City's Engineer do not accept any responsibility for use of forms or electronic files provided for use in design.

FORM "A"

STORM WATER RUNOFF CALCULATION SPREADSHEET

Lines that are to receive user input are highlighted in a light blue color.

Row 1	Input the date the calculation spreadsheet is completed or insert the TODAY() function to have this automatically update each time the spreadsheet is saved.
Row 2	Input the project name or identifier on the left and the initials of the person preparing the calculations on the right.
Row 3	Input the calculation conditions. (i.e., Existing, Proposed, Fully Developed)
Rows 12 to 72	The sheet starts with 10 rows per area. To add a row, insert a row then copy and paste the previous row. Note, this will require all subsequent linked spreadsheets to be updated.
Column 1	Input the name of the drainage area.
Column 2	Input the size of inlet. Note this is completed later.
Column 3	No input required unless additional columns are required. This cell includes a formula to add areas for up to three different land uses. If less than three land uses are required leave one as 0.0. If more than three land uses are required this will require inserting a column and updating the formula in Column 3.
Column 4	Input brief land use description in Row 7 and the appropriate runoff coefficient in Row 9. Size of the drainage area tributary to the Area shown in Column 1 in acres. The sheet can also convert from square feet to acres by updating the formula to divide the square feet input by the value in cell B77.
Columns 5 and 6	Input brief land use description in Row 7 and the appropriate runoff coefficient in Row 9. Size of the drainage area tributary to the Area shown in Column 1 in acres. See directions for Column 4 to input square feet.
Column 7	No input required unless additional land use columns are required. This cell includes a formula to calculate an effective runoff coefficient based on the values in Columns 4, 5, and 6.
Column 8	No input required. This cell includes a formula that calculates the incremental "CA" for the drainage area in Column 1.
Column 9	No input required. This cell includes a formula that calculates the accumulated "CA" for the drainage areas in Column 1 for the same basin.
Column 10	Input the inlet time of concentration. The value may be greater than the minimum inlet time with a TR-55 calculation but shall not be less than 5 minutes.
Column 11	No input required. Storm drainage calculations are all based on a 100-year event.
Column 12	No input required. The intensity comes from the linked lookup table.
Column 13	No input required. The amount of flow is calculated from previous inputs.

RUNOFF CALCULATIONS FORM "A" EXAMPLE

CITY OF AUBREY, TEXAS - RUNOFF CALCULATIONS

Project: _____

Condition: _____

Date: _____

By: _____

FORM "A" - PROPOSED

Area No.	Inlet Size	Incremental Drainage Area					Incremental "CA"	Accumulated "CA"	Inlet Time of Concentration (Min.)	Design Storm Frequency (Yrs.)	Intensity (1) (In./Hr.)	Total Flow (Q) (c.f.s.)
		Total Area (Ac.)	ROW Area 0.90	SFR-0.5 Area 0.55	Open Area 0.40	Effective Runoff "C"						
1	2	3	4	5	6	7	8	9	10	11	12	13
Name												
A-1		2.250	0.250	1.000	1.000	0.522	1.175	1.175	10.00	100-yr.	9.20	10.80
A-2		2.750	0.250	1.000	1.500	0.500	1.375	2.550	10.00	100-yr.	9.20	23.45
A-3		2.750	0.250	1.000	1.500	0.500	1.375	3.925	10.00	100-yr.	9.20	36.09
A-4		2.750	0.250	1.000	1.500	0.500	1.375	5.300	10.00	100-yr.	9.20	48.73
A-5		2.750	0.250	1.000	1.500	0.500	1.375	6.675	10.00	100-yr.	9.20	61.38
A-6		2.750	0.250	1.000	1.500	0.500	1.375	8.050	10.00	100-yr.	9.20	74.02
A-7		2.750	0.250	1.000	1.500	0.500	1.375	9.425	10.00	100-yr.	9.20	86.66
A-8		2.750	0.250	1.000	1.500	0.500	1.375	10.800	10.00	100-yr.	9.20	99.31
A-9		2.750	0.250	1.000	1.500	0.500	1.375	12.175	10.00	100-yr.	9.20	111.95
A-10		2.750	0.250	1.000	1.500	0.500	1.375	13.550	10.00	100-yr.	9.20	124.60
Name												
B-1		2.803	0.173	1.000	1.630	0.484	1.358	1.358	10.00	100-yr.	9.20	12.48
B-2		1.202	0.202	1.000	0.000	0.609	0.732	2.090	10.00	100-yr.	9.20	19.22
B-3		2.309	0.166	1.000	1.143	0.501	1.157	3.246	10.00	100-yr.	9.20	29.85
B-4		2.506	0.200	1.000	1.306	0.500	1.252	4.499	10.00	100-yr.	9.20	41.37
B-5		5.000	0.250	1.000	3.750	0.455	2.275	6.774	10.00	100-yr.	9.20	62.29
B-6		3.057	0.300	1.000	1.757	0.498	1.523	8.297	10.00	100-yr.	9.20	76.29
B-7		1.206	0.306	0.900	0.000	0.639	0.770	9.067	10.00	100-yr.	9.20	83.37
B-8		2.393	1.393	0.250	0.750	0.707	1.691	10.758	10.00	100-yr.	9.20	98.92
B-9		1.119	0.119	1.000	0.000	0.587	0.657	11.415	10.00	100-yr.	9.20	104.97
B-10		1.178	0.178	1.000	0.000	0.603	0.710	12.125	10.00	100-yr.	9.20	111.50
Name												
C-1		2.000	1.000	1.000	0.000	0.725	1.450	1.450	10.00	100-yr.	9.20	13.33
C-2E		0.820	0.320	0.500	0.000	0.687	0.563	0.563	10.00	100-yr.	9.20	5.18
C-2W		0.820	0.320	0.500	0.000	0.687	0.563	0.563	10.00	100-yr.	9.20	5.18
C-3		1.229	0.229	1.000	0.000	0.615	0.756	3.332	10.00	100-yr.	9.20	30.64
C-4		1.555	0.555	1.000	0.000	0.675	1.050	4.382	10.00	100-yr.	9.20	40.29
C-5		1.182	0.182	1.000	0.000	0.604	0.713	5.095	10.00	100-yr.	9.20	46.85
C-6		4.800	0.000	1.000	3.800	0.431	2.070	7.165	10.00	100-yr.	9.20	65.89
C-7		5.000	0.000	1.000	4.000	0.430	2.150	9.315	10.00	100-yr.	9.20	85.66
C-8		1.226	0.226	1.000	0.000	0.614	0.753	10.068	10.00	100-yr.	9.20	92.58
C-9		3.000	2.000	1.000	0.000	0.783	2.350	12.418	10.00	100-yr.	9.20	114.19
C-10		1.647	0.381	1.000	0.266	0.607	0.999	13.418	10.00	100-yr.	9.20	123.38
Name												
D-1		4.000	0.000	1.000	3.000	0.438	1.750	1.750	12.00	100-yr.	8.60	15.05
D-2		1.224	0.224	1.000	0.000	0.614	0.752	2.502	10.00	100-yr.	9.20	23.00
D-3		2.012	0.364	1.000	0.648	0.565	1.137	3.639	10.00	100-yr.	9.20	33.46
D-4		1.175	0.175	1.000	0.000	0.602	0.708	4.347	10.00	100-yr.	9.20	39.97
D-5		3.587	0.000	1.000	2.587	0.442	1.585	5.932	10.00	100-yr.	9.20	54.54
D-6		3.901	0.000	1.000	2.901	0.438	1.710	7.642	10.00	100-yr.	9.20	70.27
D-7		1.231	0.231	1.000	0.000	0.616	0.758	8.399	10.00	100-yr.	9.20	77.23
D-8		2.145	0.387	1.000	0.758	0.560	1.202	9.601	10.00	100-yr.	9.20	88.29
D-9		1.163	0.163	1.000	0.000	0.599	0.697	10.298	10.00	100-yr.	9.20	94.69
D-10		3.500	0.000	1.000	2.500	0.443	1.550	11.846	10.00	100-yr.	9.20	108.94
Name												
E-1		4.500	0.500	1.000	3.000	0.489	2.200	2.200	12.50	100-yr.	8.46	18.62
E-2		3.900	0.800	1.000	2.100	0.541	2.110	4.310	10.00	100-yr.	9.20	39.63
E-3		4.600	0.300	1.000	3.300	0.465	2.140	6.450	10.00	100-yr.	9.20	59.31
E-4		3.300	0.000	1.000	2.300	0.445	1.470	7.920	10.00	100-yr.	9.20	72.83
E-5		1.100	0.100	1.000	0.000	0.582	0.640	8.560	10.00	100-yr.	9.20	78.71
E-6		4.750	0.000	1.000	3.750	0.432	2.050	10.610	10.00	100-yr.	9.20	97.56
E-7		4.900	0.000	1.000	3.900	0.431	2.110	12.720	10.00	100-yr.	9.20	116.96
E-8		4.900	0.450	1.000	3.450	0.477	2.335	15.055	10.00	100-yr.	9.20	138.43
E-9		3.790	0.950	1.000	1.840	0.565	2.141	17.196	10.00	100-yr.	9.20	158.12
E-10		1.500	0.500	1.000	0.000	0.667	1.000	18.196	10.00	100-yr.	9.20	167.32

Intensity Lookup Based on City of Wylie Drainage design Criteria Values for e, b and d
 $I = b / (T_c + d)^e$

Sf to Ac. = 43560 sf/Ac.

 = Inlet time greater than 10 minutes per TR-55
 Special Formula for Low Point Inlet Accumulated CA

FORM "B"

INLET DESIGN CALCULATION SPREADSHEET

Lines that are to receive user input are highlighted in a light blue color.

Row 1	This row includes "All Curb Inlets Assumed 10% Blocked". The amount will need to be increased for curb inlets at low points.
Row 2	Input the date the calculation spreadsheet is completed or insert the TODAY() function to have this automatically update each time the spreadsheet is saved.
Row 3	Input the project name or identifier on the left and the initials of the person preparing the calculations on the right.
Rows 4 to 11	No input required.
Rows 12 to 72	The sheet starts with 10 inlet rows for Lines A, B, D, and E. Line C includes two rows for a Low Point Inlet to be described below. To add a row, insert a row then copy and paste the previous row. Note, this will require all linked spreadsheets to be updated.
Column 1	Input the inlet number, sometimes corresponds with the drainage area number.
Column 2	No input required. This is linked with the runoff calculation spreadsheet.
Column 3	Input the approximate roadway centerline station for the inlet.
Columns 4 to 14	No input required. This information is linked to the runoff calculation spreadsheet. Note, Columns 7 and 8 are the same, area does not accumulate for inlet calculations. Column 13 is the bypass calculated for the previous inlet. Column 14 is the total flow for each inlet including bypass as appropriate.
Column 15	Input the inverse of the pavement cross slope. Value starts as 50 for a 2% cross slope $= (1/.02)$.
Column 16	No input required. This value is calculated based on the inverse of the cross slope divided by 0.0175 ("n" value for concrete pavement).
Column 17	Input the longitudinal slope of the pavement where the inlet is located. Note, this value will need to be calculated if the inlet is located in a vertical curve. Also note this value is assumed as 0.20% for low point inlets in a vertical curve. The calculated slope at the end of recess may be used in lieu of 0.20%. Area C-2 is an example of a low point inlet with flow divided to approach from both sides of the area. Note under Column 32 the cells for C-2E and C-2W are combined into one inlet description.
Column 18	No input required. This cell includes a formula that calculates the depth of flow for a triangular street section based on information provided.
Column 19	No input required. This cell calculates the spread of flow (ponded width) for a triangular street section based on information provided.
Column 20	No input required unless inlet depression is other than 4-inches.

Column 21	No input required. This cell calculates the flow intercepted per foot of length based on other input information based on 90% of the maximum capacity. The 0.9 should be revised to 0.75 for a low point standard or recessed inlet with positive overflow, or 0.5 for low point inlets without positive overflow as approved by the City's Engineer, or as appropriate based on the type of inlet.
Column 22	No input required. This cell calculates the minimum inlet length required to intercept 100% of the gutter flow.
Column 23	Input the total length of inlet opening provided.
Column 24	No input required. This cell calculates the ratio of the length of inlet provided to the length of inlet required to intercept 100% of the flow. (less than 1.0 will result in carryover to the next inlet.
Column 25	No input required. This cell calculates the ratio of inlet recess to street flow depth.
Column 26	No input required. This cell calculates the ratio of capacity to calculated flow.
Column 27	No input required. This cell calculates the capacity of the length provided.
Column 28	No input required. This cell calculates the bypass for inlets unable to intercept 100% of the calculated flow.
Column 29	No input required. This cell calculates the depth of total flow for a drop inlet.
Column 30	Input 0.8 times the total length of drop inlet opening to account for 25% blockage.
Column 31	No input required. There should be no bypass for drop inlets.
Column 32	Input a description of the length and type of inlets provided.

(This form is set up for 11" x 17" print)

- Depth of flow and spread at LOW POINT INLETS is based on 0.20% grade
- 25-ft. F-F pavement provided (Target Max. Spread 16-ft. @ Low Point)

All Inlets Curb Assumed 10% Blocked For Capacity
100-Year Frequency Flows
Pavement "n" = 0.0175

Date:
By:

FORM "C"

STORM SEWER CALCULATIONS SPREADSHEET

Lines that are to receive user input are highlighted in a light blue color.

Row 1	Input the date the calculation spreadsheet is completed or insert the TODAY() function to have this automatically update each time the spreadsheet is saved.
Row 2	Input the project name or identifier on the left and the initials of the person preparing the calculations on the right.
Rows 3 to 8	No input required.
Rows 9	Input name of storm sewer line.
Rows 12 to 72	The sheet starts with 10 inlet rows for each line. Line C includes a Low Point Inlet adding the area from each side of the inlet together. To add a row, insert a row then copy and paste the previous row. Note, this will require all linked spreadsheets to be updated.
Column 1	Input the storm sewer ID.
Column 2	This column lists the upstream storm sewer stations. The stationing begins with 0.00 at the downstream end with the change of flow listed in Column 2 and the Downstream Station in Column 3.
Column 3	Input the downstream storm sewer station.
Columns 4 to 9	No input required. This information is linked to the runoff spreadsheet. Note, Column 4 is the length of storm sewer between flow change points. Column 5 is the name of the drainage area from the runoff calculation sheet and will need to be renamed for low point inlets. Columns 6 through 9 are from the runoff calculation sheet. Column 9 accumulates CA from the previous upstream inlet.
Column 10	Input the actual time of concentration for the most upstream inlet. This value should be calculated using the TR-55 method. Use 5 minutes as minimum.
Column 11	No input required. This value is calculated based on the pipe velocity and length.
Column 12	No input required. This value is the previous time plus time of flow.
Column 13	No input required. All storm sewers are designed based on 100-year flow.
Column 14	No input required. The intensity comes from the linked lookup table.
Column 15	No input required. The value is calculated from previously input information.
Column 16	No input required. This value is calculated from the selected number and size of the storm sewer pipes. Note box culvert example Row 19.
Column 17	Input the number of identical pipes (or boxes) selected. Row 19 includes and example of a box culvert selection.
Column 18	Input the size of the identical pipes (or boxes) selected. Row 19 includes an example of a box culvert selection.

Column 19	No input required. This cell calculates pipe velocity based on full flow. Line A includes an option for a box culvert to reduce velocity below 6 fps. The procedure for using this option is described after the normal description.
Column 20	Input the appropriate head loss coefficient based on the Wylie manual. The default value shown is 0.60 for a 60° pipe bend or true Y at a lateral.
Column 21	No input required. This cell calculates the Velocity Head Loss based on the pipe or box velocity in Column 19 and the coefficient in Column 20.
Column 22	No input required. This cell calculates the flow time in the pipe between sections based on the length of pipe calculated in Column 4 and the velocity calculated in Column 19.
Column 23	No input required. This cell calculates the time at the downstream station of the storm sewer.
Column 24	Input the design slope of the storm sewer.
Column 25	No input required. This cell calculates the capacity of the storm sewer pipe based on the size .
Column 26	Input remarks regarding initial time of concentration and other notes for reviewer.
Column 27	No input required. This cell calculated the upstream hydraulic gradient elevation based on input beginning hydraulic gradient elevation in Column 28.
Column 28	No input required except the beginning hydraulic gradient elevation input below the last line of a storm sewer calculation.
Column 29	Input the top of curb elevation or top of inlet elevation.
Column 30	No input required. This cell calculates the difference between the top of curb or inlet and the hydraulic gradient. Note, normally this value should be > 2.0 feet to place hydraulic gradient below subgrade.
Rows 77 to 89	These cells include information for box culverts. The light blue shaded cells are to be calculated and input by the design engineer. Other cells will be calculated based on the information input into the light blue cells.

(This form is set up for 11" x 17" print)

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FORM “D” OPEN CHANNEL CALCULATION SPREADSHEET

Lines that are to receive user input are highlighted in a light blue color.

Row 3	Input the Names of Channels calculated on the spreadsheet. Input the date the calculation spreadsheet is completed or insert the TODAY() function to have this automatically update each time the spreadsheet is saved.
Row 4	Input the project name or identifier on the left and the initials of the person preparing the calculations on the right.
Row 12	Input name of channel with calculations below.
Rows 12 to 72	The sheet starts with 10 rows for each channel. To add a row, insert a row then copy and paste the previous row. For unnecessary rows either leave “0” as the input value or delete the unnecessary row.
Column 1	This column lists the downstream channel station on the first line, after that it automatically shows the upstream station input into Column 2.
Column 2	This column lists the upstream channel stations. The stationing should include breaks at all significant changes in flow or changes in slope, Manning’s “n”, or channel geometry.
Column 3	Input the type of channel section “V” for no bottom width and “Trapezoid” for channels with a bottom width greater than 0.
Column 4	Input the design flow for the channel section.
Column 5	Input the Manning’s “n” value for the channel based on Wylie’s design manual.
Column 6	Input the channel design slope in (ft/ft). Not less than 0.004 or 0.40%.
Columns 7 & 8	No input required. Note, Column 7 is the square root of the slope entered in Column 6. Column 8 is the shape number required to convey the flow.
Column 9	Input the bottom width of the design channel. Input “0” for a “V” channel with no bottom width. Usual width for trapezoid channel sections starts with 2 feet and increase by even foot increments.
Column 10	Input the design depth of flow. Start with the approximate depth desired. Adjust the depth until the design shape number in Column 16 matches or slightly exceeds the shape number in Column 8. Adjust bottom width (Column 9) and or side slopes (Column 11) until depth is close to desired and shape number (Column 16) matches or slightly exceeds the shape number in Column 8.
Column 11	Input the side slope for both sides of the channel. The minimum value is 3, for a channel with 3’ horizontal to 1’ vertical slope on an unlined channel.
Column 12	No input required. This cell calculates area of flow based on previously input data.
Column 13	No input required. This cell calculates wetted perimeter based on previously input data.

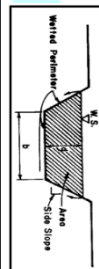
Column 14	No input required. This cell calculates hydraulic radius based on previously input data.
Column 15	No input required. This cell calculates the hydraulic radius raised to 2/3 based on previously input data.
Column 16	No input required. This cell calculates the shape number based on data input for Columns 9, 10, and 11. Match or slightly exceed the shape number in Column 8.
Column 17	No input required. This cell calculates the channel velocity based on data input for Columns 4, 9, 10, and 11. Note, channel velocities between 6 fps and 8 fps may require armoring to protect against erosion and all velocities greater than 8 fps shall be armored to protect against erosion.
Column 18	No input required. This cell calculates the velocity head based on the channel velocity from Column 17.
Column 19	Add remarks related to lined or unlined, pilot channel, etc.

Form "E" should be used only to size open channels of uniform size and slope. HEC-RAS or other approved hydraulic software should be used to calculate stream water surface profiles.

OPEN CHANNEL CALCULATIONS FORM "D" EXAMPLE

(This form is set up for 8-1/2" X 11" landscape print)

FORM "D" OPEN CHANNEL CALCULATIONS CHANNEL NAMES PROJECT NAME



CHANNEL STATION		Channel Type	Flow "Q" (cfs)	Roughness "n"	Slope "S" (ft/ft)	S ₁₂ " (ft/ft)	Q x S 1.48 x S ₁₂	Width "b" (feet)	Depth "d" (feet)	Side Slope	Area "A" (sq. ft.)	Wetted Perimeter "WP" (feet)	Hydraulic Radius "R" = A / WP (feet)	R ^{2.5}	A x R ^{2.5}	Velocity "V" = Q / A (fps)	Velocity Head "V" / 2g (ft)	REMARKS
From	To																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CHANNEL NAME																		
0	250	V	42.00	0.035	0.0050	0.0707	13.99	0	1.90	4	14.440	15.20	0.950	0.966	13.95	2.91	0.13	Unlined
250	500	Trapezoid	75.00	0.035	0.0050	0.0707	24.98	2	2.13	4	22.408	19.04	1.177	1.151	24.98	3.35	0.17	Pilot Channel Only
500	750	Trapezoid	120.00	0.035	0.0050	0.0707	39.97	2	2.58	4	31.786	22.64	1.404	1.254	39.86	3.78	0.22	Pilot Channel Only
750	1000	Trapezoid	155.00	0.035	0.0050	0.0707	51.63	3	2.76	4	38.730	25.08	1.545	1.371	51.80	4.00	0.25	Pilot Channel Only
1000	1250	Trapezoid	250.00	0.040	0.0050	0.0707	95.17	8	3.06	4	61.934	32.48	1.907	1.538	95.26	4.04	0.25	Unlined
1250			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
0			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
0			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
0			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
CHANNEL NAME																		
0	250	V	42.00	0.035	0.0050	0.0707	13.99	0	1.90	4	14.440	15.20	0.950	0.966	13.95	2.91	0.13	Unlined
250	500	Trapezoid	75.00	0.030	0.0050	0.0707	21.41	2	2.00	4	20.000	18.00	1.111	1.073	21.46	3.75	0.22	Gabion Mattress Lined
500	750	Trapezoid	120.00	0.030	0.0050	0.0707	34.26	2	2.43	4	28.480	21.44	1.328	1.209	34.42	4.21	0.28	Gabion Mattress Lined
750	1000	Trapezoid	160.00	0.018	0.0050	0.0707	26.65	3	2.08	4	23.546	19.64	1.199	1.129	26.57	6.80	0.72	Concrete Lined
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
			0.00	0.000	0.0000	0.0000	#DIV/0!	0	0.00	0	0.000	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
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4. VEGETATION

4.1 General:

All seeding, sodding and fertilizer requirements are to be completed in accordance with the North Central Texas Council of Governments (NCTCOG) Standards and Specifications (Item 202.1 through 202.7) and as modified by the City of Aubrey, herein.

Block sod may be utilized for erosion control and primary source for establishing grass. Block sod shall be growing grass sod of the type specified in the plans. Sod shall have a healthy and dense root system, be stored and maintained in a moist condition from the time of harvest until planted and be free from noxious weeds.

Seed shall be used at the approval of the City (in lieu of block sod from previous season's crop meeting the Texas Seed Law, including testing and labeling for pure live seed (PLS = Purity x Germination). Furnish seed of designated species, in labeled unopened bags or containers for inspection by the City's Public Works Department. Seed shall be used within 12-months from the date of the season harvested. When Buffalo grass is utilized, use seed that is treated with Potassium Nitrate to overcome dormancy.

4.2 Coverage:

The developer shall establish grass and maintain the sodded or seeded area, including watering, until a "Stand of Grass" is obtained. A "Stand of Grass" shall consist of 75% to 80% coverage and a minimum of one-inch (1") in height. If a "Stand of Grass" has not been established within four weeks, re-sodding or re-seeding shall be required. Re-grading, Re-sodding and re-seeding will be required in all washed areas and areas that do not grow.

4.3 Planting Season for Seeding:

- February 1 through May 15 (**Permanent Rural** Seed Mix)
 - Green Spangletop – 0.3 LB. PLS/Ac.
 - Bermuda Grass – 1.2 LB. PLS/Ac.
 - Sideoats Grama (El Reno) 2.7 LB. PLS/Ac.
 - Little Bluestem (Native) 2.0 LB. PLS/Ac.
 - Buffalogras (Texoka) 1.6 LB. PLS/Ac.
 - Illinois Bundleflower 1.0 LB. PLS/Ac.
- February 1 through May 15 (**Permanent Urban** Seed Mix)
 - Green Spangletop – 0.3 LB. PLS/Ac.
 - Bermuda Grass – 2.4 LB. PLS/Ac.
 - Sideoats Grama (El Reno) 3.6 LB. PLS/Ac.
 - Buffalogras (Texoka) 1.6 LB. PLS/Ac.

- September 1 through November 30 (**Temporary Cool** Season Seeding)
Tall Fescue – 4.5 LB./Ac.
Western Wheatgrass – 5.6 LB./Ac.
Wheat 34 LB./Ac.
- May 1 through August 31 (**Temporary Warm** Season Seeding)
Foxtail Millet – 34 LB./Ac.

A mix of seed shall be used in overlapping planting seasons.

No Seeding shall occur during the months of December and January.

5. WATER SYSTEM

5.1 General:

The design and construction of the water distribution system to serve the development shall be in accordance with good engineering principles, with these Standards of Design, the Standard Specifications for Construction and the Standard Details and with the requirements of the Texas Commission on Environmental Quality (TCEQ). All off-site water mains shall be sized and located to conform to projected demands in accordance with the latest Water Master Plan and the computer model with regard to the impact of each development on the existing and proposed water distribution system. No construction shall commence prior to the approval of the complete construction plans and specifications by the City.

All facilities shall be of sufficient size to provide adequate capacity for ultimate development. The pipelines shall be sized to meet the maximum instant domestic requirements plus an appropriate allowance for fire protection water. The design criteria for water demand shall be submitted to the City with the plans and specifications. The City reserves the right to require larger pipelines than required for the proposed development in order to provide capacities for areas outside the development. The developer will be responsible to construct water lines adjacent to his property in accordance with the latest Water Master Plan or as required by the City's Engineer.

The minimum pipeline size to serve residential areas shall be eight (8) inches in diameter, and the minimum pipeline size serving commercial, business, industrial, etc. shall be eight inches (8"). In general, all lines shall be looped with no dead-ends. Dead-end lines will be considered on a case by case basis and shall be furnished with an approved flush valve arrangement. The developer shall provide facilities sufficient for fire flows in accordance with the minimum criteria of the State Board of Insurance or the Fire Code adopted by the City.

Fire flows to be calculated with a minimum of thirty five pounds per square inch (35psi) of residual pressure at the fire hydrant with a 35 psi residual in the water distribution system.

5.2 Connections to Existing Distribution System:

Preliminary discussions concerning take-off points in the distribution system should be conducted with the City of Aubrey's Public Works Department prior to finalizing the preliminary designs of the distribution system, which will serve the development. Connections to the City's existing system will be allowed only at locations where the City has determined that sufficient quantity and pressures are available to meet the projected requirements of the development. In general, the connections to the existing distribution system shall be made in such a manner to keep "shut-downs" to a minimum. Preference will be given to a tapping sleeve and valve connections.

In a proposed development where City water is not adjacent to the property but is accessible, the developer shall provide, at his expense, an off-site water main of sufficient size to serve his development or as shown on the City's Water Master Plan, whichever is larger. The City may participate or collect pro-rata for the oversizing of the required line. The City participation must be approved by the City Council, prior to plans approval. The proposed development will normally require a loop into the existing water distribution system in order to provide adequate water pressure. The loop will be at the developer's expense.

In general, the City will not approve a development, which cannot be served by extensions to the City distribution system. Some areas in the City may be served by private water companies. In those cases, the Developer shall contact and make proper arrangements with the private water company. The Developer shall always be responsible to construct water facilities that meet City requirements and as shown on the City's Water Master Plan. The City will observe the facilities during construction for compliance with these standards. This in no way relieves or reduces the obligations of the developer to comply fully with these requirements. Under certain circumstances, the City may consider approval of a private water system, which will supply an adequate quantity of potable water for all uses, including residential, commercial and fire fighting requirements. Such systems must meet the approval of the City, the TCEQ, the State Board of Insurance and all other appropriate regulatory agencies. In addition, an agreement between the City and the developer shall be executed whereby the City may acquire the system when it can be connected into the City's owned and operated distribution network. In all cases, the engineering drawings shall show the source of water for the development.

5.3 Location of Facilities:

- A. Pipelines: Water pipelines shall be located in the parkways between the back of the curb and the concrete sidewalk, within the street right-of-way. The location shall be at least two feet (2') from the back of curb. A blue EMS Locator Pad will be located as shown in the Standard Drawings, and a mark as a vertical cut "I" (painted blue) on the concrete curb.
- B. Gate Valves: Gate valves shall be located outside the paved streets and shall be two feet (2') from back of curb of the intersecting street. In general, gate valves shall be located at street intersections (except for fire hydrant leads). Unless otherwise approved by the City, valves shall be located in the northwest quadrant of the street intersection. All valve boxes shall be encased in a concrete pad that shall be twelve inches by twelve inches by six inches (12" x 12" x 6") and reinforced with No. 3 steel bars.
- C. Fire Hydrants: In general, fire hydrants shall be located at each street intersection and at intervals on the interior of each block. All fire hydrants shall have isolation valves constructed as described above. No services lines or other connections will be allowed to the fire hydrant leads.
 - 1. Residential and Duplex: Residential and duplex areas shall have a fire hydrant at each street intersection and at four hundred foot (400') intervals on

the interior of each block. In no case, shall there be more than four hundred feet (400') of hose lay from a fire hydrant and fire lane to any main building.

2. Multi-Family: Multi-Family areas shall have a fire hydrant at each street intersection and at three hundred foot (300') intervals on the interior of each block and along fire lanes. In no case, shall there be more than one hundred and fifty feet (150') of hose lay from a fire lane or two hundred and fifty feet (250') from a fire hydrant to any portion of a building.
3. Commercial, Retail and Industrial: Commercial, retail and industrial areas shall have a fire hydrant at each street intersection and at a maximum of three hundred foot (300') intervals on the interior of each block and along fire lanes. In no case, shall there be more than one hundred and fifty feet (150') from a fire hydrant and fire lane to any portion of a building in any development.

All fire hydrants, which are placed in off street rights-of-way, shall have a paved concrete access road and proper pavement markings, which have been accepted by the Fire Marshall and City's Engineer.

All fire hydrants shall be marked in the center of the adjacent street with a Blue Stimsonite (or approved equal) Model 88-SSA Fire Hydrant Marker

The spacing of fire hydrants shall be measured along the street frontage or fire lanes. The City Fire Marshall and City's Engineer shall review all fire hydrant spacing. When a special condition exists due to land use, the Fire Marshall or City's Engineer may require additional hydrants for fire protection.

5.4 Water Service Connections:

A water service pipeline shall be laid to each lot with fittings and a meter box in accordance with the Standard Specifications for Construction and the Standard Details. All service pipelines, which supply water to each single-family lot, shall be constructed of 1-inch SDR 9 Polyethylene (Poly) Pipe with tracer wire or Endotrace underground detectable polyethylene water pipe system, with 1-inch Meter Standard having a minimum size of 1-inch (1") from the service tap to the curb stop.

All water services under pavement shall be sleeved in a minimum 2" diameter SDR 21 PVC encasement pipe or approved equivalent.

All residential services shall be tapped to the PVC water main with 1-inch (1") or 2-inch (2") double strap brass saddles or City approved equal. Tapping tees required for all services 3-inches and larger will be mechanical joint or flanged tapping tees.

Meter box tops shall be set one-half inch to one and one-half inch ($\frac{1}{2}$ " to $1\frac{1}{2}$ ") above the curb, and an angle meter stop shall be set six inches (6") below the meter box top. Meter boxes shall have a one-inch (1") wide slot from five inches (5") below the top of the box to the bottom of the box on the side facing the lot for service connection. All meter boxes shall be set at least two feet (2') behind the curb. Single and multi-family units will have one service per unit.

- A. Installation of Multiple Meter Boxes: Installation of multiple meter boxes for multi-family, condominium and townhouse developments may be installed only at approved locations. Each service box shall service one (1) single-family unit or two (2) single-family units (one or two water meters with a maximum capacity of approximately twenty (20) gallons per minute each). The minimum size service line for multiple meter box installations is tabulated in Table 5.1.

Service pipeline size for commercial and industrial developments shall be designed by the developer in accordance with the City's adopted Uniform Plumbing Code.

1-inch (1") meter boxes shall be DFW37C-14-1SF Small Aubrey. 2-inch (2") meter boxes shall be DFW65C-14-1SF Small Aubrey.

5.5 Materials and Installation:

- A. Pipe: 4" through 12" diameter Water pipelines shall be PVC pipe conforming to the Standard Specifications for Construction. In general, the water pipelines shall be AWWA Standard C-900, (minimum DR 14 – 305 psi rating), with cast-iron outside dimensions, and installed with a minimum of four feet (4') of cover, unless otherwise approved by the City.

16" through 24" diameter water lines shall be AWWA C900 (DR 14 – 305 psi rating) or Ductile Iron AWWA C151 (Class 150) with cement mortar lined interior and polyethylene encased exterior, and installed with a minimum of six feet (6') of cover. For diameters larger than 24", pipe material and cover shall be approved by the City's engineer or designee.

- B. All pipes not under pavement shall be installed in embedment material as shown on the Standard Drawings and in conformance with the Standard Specifications for Construction.
- C. All water pipe shall be installed with a "tracer wire or tape" blue in color over the top of the pipe. The tape shall be Terra Tape "D" Detectable as supplied by Griffolyn Co., Inc. of Houston, Texas or approved equal. Locator marker pads shall be installed at 250 feet along water lines.

TABLE 5.1

MINIMUM-SIZE SERVICE CONNECTIONS FOR MULTIPLE UNITS

Water Caps

<u>Maximum Number of Family Unit Connections</u> <u>(Water Meters at 20 gpm)</u>	<u>Minimum Size Service Pipeline</u> <u>(Inches)</u>
2	1
5	4
10	4

- D. Gate Valves: All gate valves shall be conformed to AWWA C-509 standards, shall be approved by the City, be manufactured by Mueller, M&H, Clow, or a City approved equal with resilient seat and American made fittings and valve bodies only and shall conform to and shall be installed according to the Standard Specifications for Construction.
- E. Fire Hydrants: Fire hydrants shall be approved by the City, M&H, Mueller, Mueller Super Centurian 250, or Clow, with 5-inch Storz connector, bonnet, and caps. Storz connection shall be provided by the manufacturer. Fire hydrant shall conform to the requirements set forth in the Standard Specifications for Construction. All fire hydrants shall be installed with a six-inch (6") gate valve on the hydrant lead and located 3-feet off the back of curb. The installation shall be as set forth in the Standard Specifications for Construction shall be American made fittings and valve bodies. Fire hydrants shall be painted to meet the City's requirements for color code as set forth in the Standard Specifications. In general, the fire hydrant will be painted aluminum with differing cap color, which corresponds to the size of hydrant feeder line, as detailed in Table 5.2. Fire hydrants shall be installed at the end of each dead end line. Minimum main size for a fire hydrant for residential and non-residential uses shall be eight inches (8").
- Fire hydrants shall be three-way breakaway type and conform to AWWA C-502 specifications.
- Fire hydrants shall be painted aluminum bodies with primer bonnet caps. Paint shall be Protective and Marine Coatings. Ultra Deep base (B55 T 104 136-0064) in accordance with Table 5.2.
- F. Water Service Connections: Service pipelines shall be in accordance with the designs shown on the Standard Drawings. The materials shall be Mueller or approved equal and shall be installed in accordance with the Standard Specifications for Construction. All connections shall be compression type or approved equal. Materials shall be brass fittings and ball valves.
- G. Bends: Mega-lugs or approved equal shall be installed at horizontal change in directions 45° or greater and at all vertical change in directions that require a bend. The restraints shall be placed at the bend and at the next pipe joint in each direction from the bend.
- H. Commercial irrigation meters shall have a testable double check backflow preventer.

TABLE 5.2

FIRE HYDRANT COLOR CODE

Fire hydrants should be color coded to NFPA Standard 291 *Recommended Practice for Fire Flow Testing and Marking of Hydrants*, 2013 Edition. Color-coded fire hydrants provide an immediate visual indication of available hydrant flow. Without color-coding, firefighters probably do not have a clue of the flow potential from a hydrant, especially if the firefighters are responding to a mutual aid call.

Paint the top (bonnet) and nozzle caps (discharges) appropriate colors to indicate hydrant capacity (NFPA 291 § 5.2.1.2).

Fire hydrant bonnets and caps shall be coded as follows (NFPA 291 § 5.2.1.2):

COLOR	CLASS	AVAILABLE FLOW @ 20 psi residual
BLUE	AA	1500 GPM or more
GREEN	A	1000-1499 GPM
ORANGE	B	500-999 GPM
RED	C	Below 500 GPM

5.6 Test Stations and AUI Flush Systems:

Test Stations and Auto Flush Systems shall be provided throughout the development utilizing City approved equipment. Auto Flush Systems shall be K-Rain, or City approved equal.

6. WASTEWATER SYSTEM

6.1 General:

The design and construction of the wastewater collection system to serve the development shall be in accordance with good engineering principles, these Standards of Design, the Standard Specifications for Construction, the Standard Details and the requirements of the Texas Commission on Environmental Quality (TCEQ). No construction shall commence prior to the approval of the plans and specifications by the City of Aubrey. All sewer mains and lift stations shall be sized and located to conform to the projected flows in accordance with the latest sanitary Wastewater Master Plan.

All facilities shall be of sufficient size to provide adequate capacity for the ultimate development. The wastewater lines shall be sized to meet the peak wet weather flow plus an appropriate allowance for infiltration of storm water. The minimum wastewater pipeline size (other than service lines) for all developments shall be eight inches (8") in diameter. The design criteria and calculations shall be submitted to the City with the plans and specifications. The City reserves the right to require a pipeline of a larger size than that required by the development in order to provide capacities for areas outside of the development.

All wastewater lines shall be installed at a depth sufficient to permit all water pipelines to be above the wastewater when the water pipeline has a minimum cover of four feet (4'). In such cases where water pipelines either cross or otherwise come within nine feet (9') of a wastewater pipeline, the wastewater pipe may be PVC pressure pipe with a minimum working pressure class of 150 psi.

6.2 Connections to Existing Wastewater Collection System:

Preliminary discussion concerning entrance points in the collection system shall be conducted with the City of Aubrey's Public Works Department prior to finalizing the preliminary designs of the collection system. In a proposed development where City waste water collection facilities are not adjacent to the property but are accessible, the developer shall provide, at his expense, a wastewater interceptor of sufficient size to serve his development and the contributing service area (using fully developed flows).

In general, the City will not approve a development which cannot be served by extensions to the City's wastewater collection system.

6.3 Location of Facilities:

- A. Wastewater Pipelines: Wastewater pipelines shall be located along and under the centerline of the proposed street pavement, unless approved otherwise by the City. A green EMS Locator Pad is to be installed. Main sanitary sewer lines with depths greater than ten feet (10') shall include a parallel sanitary sewer line so that no wastewater services can be connected to wastewater mains at depths greater than ten feet (10').

- B. Wastewater Service Pipelines: Wastewater service pipelines shall be laid to each lot. The service pipelines shall be PVC pipes having a minimum diameter of four inches (4") and shall extend to the property corner. Wastewater service pipelines shall be located at alternating corners of each lot and as approved on the final construction plans by the City. Special wastewater service sizing may be required. No sewer line shall be located nearer than five feet (5') from any tree or structure, nor any closer than ten feet (10)' from any water service or main.

All sewer services shall be connected to the main using a wye connection with a 45-degree bend to complete the connection. No tee connections will be allowed.

The service shall be stubbed out a minimum of 10-feet from the back of curb and at a depth no greater than five feet (5'). The stub-out shall be capped with a proper fitting and shall have a single stack sweep cleanout towards the sewer main, installed within five feet (5') of the lot corner and which extends to at least two feet (2') above the finished lot grade. The cleanout stack shall be set to grade during construction of the structure to be served and before a certificate of occupancy will be issued. After the street paving is complete, two vertical cuts "I" shall be cut into the concrete curb to locate the service, and painted green.

- C. Manholes: In general, manholes shall be located at all intersections of wastewater pipelines, changes in grade, changes in alignment and at distances not to exceed five hundred feet (500'). All manholes will be hydrostatically, or vacuum tested. For sewer line flowlines connecting eighteen inches (18") or greater above invert, an internal drop manhole shall be constructed. Manhole size shall be per Table 6.1. Construct manholes at both ends of lines that are installed by other than open cut and at each end of aerial crossing lines. All manhole concrete mix design shall include antimicrobial concrete additive, Conshield, or City approved equal. Refer to Section 6.5.C.

TABLE 6.1
MINIMUM MANHOLE SIZES

<u>Sanitary Sewer Line Size</u>	<u>Minimum Manhole Diameter</u>
6", 8" and 10"	4.0 feet
12", 15", 18", 21", 24" and 27"	5.0 feet
30" and 36"	6.0 feet

- D. Cleanouts shall be installed at the ends of all lines that do not end with manholes. The maximum distance between a manhole and an upstream cleanout is 300 feet. Cleanouts may be used in residential developments and located at the ends of lines only. Commercial and industrial developments require manholes at the ends of all lines.

6.4 Flows in Wastewaters and Their Appurtenances:

- A. Minimum Grades: Wastewater lines should operate with velocities of flow sufficient to prevent excessive deposits of solid materials, otherwise objectionable clogging may result. The controlling velocity with regard to sediment deposition is near the bottom of the conduit and considerably less than the mean velocity flowing full of 2.5 feet per second (f.p.s.). TABLE 6.2 indicates the minimum grades for wastewater pipe with a Manning's "n" = 0.013 and flowing at 2.4 f.p.s.
- B. Maximum Velocities: The slope of a wastewater should also be such that excessive velocities will not damage the pipeline. The maximum desirable velocities for wastewater wastewaters shall be based upon the pipe manufacturer recommendations not to exceed 10 feet per second (fps).

TABLE 6.2

MINIMUM GRADES FOR WASTEWATER PIPELINES

Pipe Size (Inches)	Slope in Foot/Foot (n = 0.013)
8	0.0033
10	0.0025
12	0.0023
15	0.0023
18	0.0018
21	0.0015
24	0.0013
27	0.0011
30	0.0009
33	0.0008
36	0.0007
39	0.0006
42	0.0006
45	0.0005
48	0.0005
54	0.0004
60	0.0004
66	0.0004
72	0.0003
78	0.0003
84	0.0003
96	0.0002

6.5 Materials and Installation:

- A. Pipe: Pipe used for wastewater collection systems shall be PVC pipe conforming to the Standard Specifications for Construction. The wastewater pipeline shall conform to ASTM D3034 for sewer pipe and fittings from 4" to 15" in diameter and with ASTM F679, for Sewer pipes and fittings greater than 15" in diameter and shall have a minimum earth cover of three feet (3'). For depths of ten feet (10') or greater, the wastewater pipeline shall be a minimum pipe stiffness of 115-psi (SDR 26).

All pipes shall be installed in embedment material as shown on the Standard Details, and in conformance for the Standard Specification for Construction. All pipelines shall be tested as specified in the NCTCOG Standard Specifications for Public Works Construction and shall include tracer tap green in color.

- B. Curved Sewers: No vertical curves will be allowed. Horizontal curvature may be by joint deflection or pipe flexure but not both. The Engineer must specify on the plans the method of deflection allowed and the allowable radius or joint deflection for each pipe size.

When pipe flexure is used, the minimum radius of curvature shall be equal to that recommended by the pipe manufacturer or $300 \cdot D_0$, where D_0 is the average outside diameter of the pipe in inches, whichever is greater. The Engineer shall note on the plans that when using pipe flexure, all joints are to remain fully seated.

If a joint deflection will be used to provide horizontal curvature, the allowable deflection shall be 5° or 80% of the Manufacturer's recommended maximum joint deflection, or 80% of the National Reference Standard maximum recommended joint reflection, whichever is less. When joint reflection is used, the Engineer must specify the size of mandrel used for reflection testing. The mandrel shall be sized to verify that the maximum joint deflection has not been exceeded.

Horizontal curves shall match change in street direction as near as possible, but will not be allowed across residential single family and duplex lots.

Slopes on curved sewers shall be a minimum of 3% greater than the corresponding minimum slope of sewers on a straight line.

Manholes on curved sewers shall be located at the P.C. and P.T. of the curve and at a maximum spacing of three hundred feet (300') along the curve.

- D. Manholes: Manholes shall be of pre-cast concrete or cast in place and shall conform to Standard Details and the Standard Specifications for Construction and M/H ring and lid Aubrey logo. Concrete mix design shall include antimicrobial concrete additive, Conshield, or City approved equal.

Exterior of manhole joints shall be sealed with exterior joint sealing compound, Gator Wrap, or City approved equal.

- D. Cleanouts: In general, manholes shall be installed at the upper end of all wastewater collector mains. Cleanouts may be installed in lieu of manholes at some locations subject to the approval of the final engineering plans by the City. Cleanouts shall not be more than three hundred feet (300') from a manhole. Cleanouts shall conform to the Standard Details and the Standard Specifications for Construction.

6.6 Testing:

All wastewater lines shall be tested for infiltration in accordance with the procedures set forth in the NCTCOG Standard Specifications for Construction. A television survey shall be performed at the end of the construction period and will again be performed as part of the final testing in the tenth (10th) month of the maintenance period. Deficiencies noted shall be promptly corrected by the developer. The City's representative shall be present at all testing and copies of the testing reports shall be provided to the City upon completion. All expenses for this work shall be the developer's responsibility.

6.7 Wastewater Lift Stations and Force Mains:

All lift station design plans and specifications shall be submitted to the City Public Works Department and TCEQ for review and approval prior to construction. Developments which increase the flow to existing lift stations will be subject to a pro-rata charge if sufficient capacity is available in the existing lift station or will be required to increase the capacity of the existing facility. Lift stations and force mains shall be designed and built for the upstream drainage area using a fully developed condition. This will include off-site areas if applicable. Developers are responsible for the construction of regional lift stations and force mains, as required by the Wastewater Master Plan. Developers may request a pro-rata agreement be executed with the City, where the City collects a pro-rated amount as other developments connect to the system and then reimburses the developer for the portion of the oversized system. The pro-rata agreement requires approval by City Council, prior to approval of the plans.

No butterfly valves shall be used at the lift stations or force mains, only plug valves shall be used.

7 MISCELLANEOUS REQUIREMENTS

7.1 Grading

A sheep-foot roller shall be utilized for compaction of all fill material.

7.2 Grading Permit

A grading permit (Exhibit 7.1) shall be obtained prior to stockpiling or filling property within the City limits. Care shall be taken to avoid filling in drainage swales, creeks, wetlands, etc. Erosion protection shall be installed around stockpiled or stored material until grass is established. If fill is placed for use other than stockpiling or storage, a grading plan shall be prepared by a Professional Engineer and submitted with the grading permit. Densities shall be taken and proper compaction techniques used when placing the fill. In all cases a Professional Engineer shall certify that the proposed fill location is not within a stream or creek (flowing or not) flood plain. If the City's Engineer determines the fill is to be placed near a creek or stream or possible drainage way, the 100-year floodplain shall be staked by a registered surveyor.

7.3 Private Utility Construction

A. Trench Backfill — City Right-of-Way

1. No concrete streets shall be open cut by utility companies without City approval, by permit. Utilities crossing concrete streets shall be tunneled or bored.
2. Asphalt streets may be open cut, by permit. Backfill above utilities shall be concrete stabilized sand or cement. The asphalt pavement shall be repaired per City detail.
3. All trench backfill is to be compacted to 95% Standard Proctor Density within City rights-of-way. The compaction may be obtained by mechanical tamping, rolling, etc. No water jetting is allowed. In the parkway, the backfill material may be from the excavated trench, except no rocks larger than two inches (2") shall be used. Material from rock or shale excavation shall not be used. The contractor for the utility company or the utility company shall furnish density reports from a materials testing company verifying the densities. Densities shall be taken at each twelve-inch (12") lift at a maximum spacing of 150 feet.

B. Parkway Cleanup

The contractor for the utility company or utility company shall remove any rocks or excess trench material from the parkway and replace any disturbed areas with grass sod.

CITY OF AUBREY CITY

FILL MATERIAL REQUEST FORM

The following property owner has requested to place fill material at the below noted property location(s). All fill material placed is to be relatively clean and free from debris. The City of Aubrey is not responsible for any placement, distribution, removal or testing of material that is placed at the below noted location. The City may require that fill material be removed from the site, if discovered that non-suitable material has been placed.

Any fill material placed or dispersed at the designated site shall be graded and compacted so as to not significantly affect or impede any existing drainage flow nor is it to be placed in any area designated as flood plain. An engineered grading plan shall be submitted to the City for review, if deemed necessary by the City Engineer. Methods of placement and compaction of fill material shall comply with City of Aubrey specifications. Laboratory testing may be required at the discretion of the City Engineer. Placement of material can only occur after a site review has been conducted by a City of Aubrey Engineering Department representative and approval to place fill has been granted by the City Engineer. Signature of all below noted parties are to be in place prior to fill material placement.

Proper erosion control devices may be required at the discretion of the City of Aubrey. If required silt fencing and other erosion control devices are to be installed and inspected by the City prior to any fill material placement.

Areas or Locations of Fill Material Placement:

Signature of Property Owner(s):

Phone: _____

Name of Project Where Material Originated:

Name of Contact/Representative:

Phone: _____

Signature of Project Contractor/Representative:

Signature of City of Aubrey Representative:

City Engineer Comments:

(SEE BACK FOR INSTRUCTIONS)

EXHIBIT 7.1

INSTRUCTIONS FOR
CITY OF AUBREY FILL REQUEST
(- -2024)

I. Permanent Placement

- A. Grading Plan prepared by Professional Engineer. Grading plan should have proposed and existing topography, including creeks, draws, floodplains and existing tree locations.
- B. Limits of fill to be staked in the field.
- C. Erosion control shall be in the form of an approved SW3P.
- D. No fill in drainage ways, floodplains, or wetlands.
- E. No trees to be removed without approval of City Planning Department.
- F. Maximum slope is 3:1.
- G. Grass to be established within 21 days of placement.
- H. Compaction to be 95% density using a sheep foot roller in 8" to 12" lifts.
- I. Density to be verified by certified materials testing lab.

2. Temporary Stockpiling

- A. A stockpile location map shall be prepared by engineer showing stockpile location, existing topography, including existing creeks, draws, floodplains, and tree locations.
- B. Items 1-B through 1-G shall apply.
- C. Material may not be spread without City approval.
- D. If stockpile material is decided to be used as permanent fill material, it shall be re-spread and placed per 1-H and 1-I.

3. Signatures

- A. Property owner must sign permit.
- B. All Contractors furnishing material to the site shall sign the Fill Material Permit and have a copy at the receiving site or on each truck.
- C. Contractors without a signed permit shall be turned away from the site.

4. Miscellaneous

- A. Violations of this permit can result in citations for owner and dirt generator with fines up to \$2,000.00 per violation.
- B. City will inspect dirt placement.
- C. All fill material placed is to be relatively clean and free from debris.

CATMIS102 Fill Request
CAT/em

EXHIBIT 7.1 Cont'd.

7.4 Additional Permits or Approvals

Developer or developer's representative is responsible for obtaining any other approvals or permits needed for their development, for example: TCEQ, City of Dallas, FEMA, railroads, etc., prior to start of construction. Permitting from TxDOT must be through the City. The developer shall be responsible to prepare all necessary studies and documents required to complete this process. Copies of the permits/approvals shall be furnished to the City.

7.5 Retaining Walls

- A. Retaining walls or concrete slope protection shall be installed where lot slope is greater than 3:1.
- B. No railroad tie retaining walls shall be constructed.
- C. All retaining walls shall be stone, masonry or reinforced concrete.
- D. Retaining walls four feet (4') and higher shall be designed and inspected by a Professional Engineer and an engineering report furnished to the City.
- E. Gabion retaining walls may be used only with City's Engineer's approval for walls less than four feet (4') along drainage ways.

7.6 Franchise Utilities

Franchise utilities shall be located behind the parkways and sidewalks in a 7 ½-foot private utility easement.

7.6.1 Fiber Optic Network Conduit and Fiber Optic Cable

- (1) Requirements. All subdivisions and road improvement and other capital improvements projects involving the creation of new improved streets, alleys, roadways, sidewalks or walkways by the City or any other person or entity, including private developers, or the installation of any new drainage or sewer pipes or infrastructure within City property, easements or public rights-of-way, or where feasible the resurfacing, overlaying, refurbishment, replacement and/or widening of existing public streets, alleys, roadways, sidewalks or walkways, shall include as part of their projects and the costs thereof the construction and installation of fiber optic network conduit that contains at least one fiber optic cable within City property, easements, or public rights-of-way to which the City has access or ownership as well as installation and construction of proper appurtenances and attendant facilities thereto, which shall be located parallel to the nearest public street or roadway and meets or exceeds specifications of emerging industry standards for provision of ultra-speed broadband service, with the exact locations of such infrastructure and the specifications of which to be determined by the City Engineer or his or her designee in reliance on such industry standards and consideration of the

needs, objectives and findings of the City's department. The following additional requirements shall also apply:

- (A) In addition to installing fiber optic network conduit, the party constructing the street will be required to install such vaults, manholes, hand-holes and other appurtenances and facilities as are necessary or needed to accommodate installation and connection of fiber optic cable within the fiber optic network conduit.
 - (B) All construction and installation required in this Subsection shall be accomplished according to construction standards adopted by the City Engineer or the City's designee in consideration of the needs of the City's Gigabit City Initiative. Such standards shall be adopted with due consideration given to existing and anticipated technologies and industry standards.
 - (C) All fiber optic network conduit, fiber optic cable, facilities and appurtenances installed by private parties or developers or by persons or entities other than the City pursuant to this Section shall be conveyed and dedicated to the City either with or as part of the dedication and conveyance of the public street and/or right-of-way to the City or otherwise.
 - (D) All construction and installation costs shall be the responsibility of the party constructing the public street, roadway or improvements project that falls within the purview of this Ordinance.
- (2) Definitions. For purposes of this Subsection, the following terms have the meanings ascribed below:
- Fiber optic network conduit means a minimum four inch (4") conduit containing a minimum of four (4) inner-ducts used to enclose or carry fiber optic cable or other wires or lines and attendant parts and accessories buried alongside a roadway or surface mounted on bridges, overpasses and other facilities where below-ground placement is impossible or impractical, all in accordance with emerging industry standards and as determined by the City Engineer or his or her designee.
- Fiber optic cable means a minimum 288-count fiber cable bundle.
- (3) Use by Broadband Service Providers. Whenever fiber optic network conduit and/or fiber optic cable installed or to be installed under this Subsection is available or will become available within a newly constructed public street or right-of-way or other improvements project that falls with the scope or purview of this Subsection upon dedication, all

broadband service providers thereafter locating fiber optic cable, wire or lines within or along such street or right-of-way shall be required to use available dark fiber (currently unused fiber optic strands) within the then-existing infrastructure or to locate their cable, wire or lines within such fiber optic network conduit unless it can be demonstrated to the reasonable satisfaction of the City Engineer that such use or location is not technologically feasible or reasonably practicable or unless such provider is exempt or otherwise not required by other law to comply with the provisions of this Subsection. Fiber optic cable and strands as well as fiber optic network conduit capacity shall be allocated to broadband service providers on a first-come, first served basis; provided, however, that the City may reserve capacity within such fiber and conduits for its own use; and provided further, that the City Engineer may adopt additional reasonable rules for fiber optic cable or strand and fiber optic network conduit allocation in order to ensure that all broadband service providers have reasonable access to the City's rights-of-way and that no barriers to entry or competition result from the allocation of cable, strand or conduit space.

- (4) Depth Details. The minimum depth of cover for Cable TV and Copper Cable Communication Lines shall be twenty-four inches (24").

The minimum depth of cover for Fiber Optic Facilities shall be forty-two inches (42").

The minimum depth of cover for Cable Television and Copper Cable Communication Lines shall be twenty-four inches (24") under ditches or eighteen inches (18") beneath the bottom of pavement structure, whichever is greater.

CITY OF AUBREY, TEXAS

STANDARD CONSTRUCTION DETAILS



JULY, 2024

<u>SECTION</u>	<u>DESCRIPTION</u>	<u>SHEET NO.</u>	<u>SECTION</u>	<u>DESCRIPTION</u>	<u>SHEET NO.</u>
GENERAL NOTES	GENERAL CONSTRUCTION NOTES	00	SANITARY SEWER	SANITARY SEWER / MANHOLES	23
STREET	PAVING / SECTIONS	01	SANITARY SEWER	SANITARY SEWER	24
STREET	PAVING / SECTIONS	02	EMBEDMENT	TYPICAL EMBEDMENTS	25
STREET	PAVING / SECTIONS	03	WALL	THIN BRICK SCREENING WALL	26
STREET	PAVING / SECTIONS / DETAILS	04	WALL	BRICK SCREENING / RETAINING	27
STREET	PAVING / JOINTS	05	FENCE	FENCING	28
STREET	PAVING / DETAILS	06	FENCE	FENCING	29
STREET	PAVING / ALLEY / DRIVEWAYS	07	FENCE	FENCING	30
STREET	PAVING / DRIVEWAYS	08	MISCELLANEOUS	DUMPSTER DETAILS	31
STREET	PAVING / ALLEY / GEOMETRICS	09	MISCELLANEOUS	DUMPSTER DETAILS	32
STREET	PAVING / DETAILS / EROSION	10	MISCELLANEOUS	MISCELLANEOUS	33
STREET	PAVING / SIDEWALKS	11	MISCELLANEOUS	JUNCTION BOX	34
STORM SEWER	STORM SEWER / INLET	12	SIGNS	GROUND MOUNTED STREET NAME BLADE	35
STORM SEWER	STORM SEWER / INLET	13	SIGNS	TYPICAL HARD SURFACE INSTALLATION SIGN	36
STORM SEWER	STORM SEWER / INLET / DETAILS	14	SIGNS	GROUND MOUNTED STREET NAME BLADE	37
STORM SEWER	CHANNELS / CONCRETE	15	SIGNS	OVERHEAD STREET NAME BLADE	38
STORM SEWER	CHANNELS / GABIONS	16	SIGNS	TYPICAL STREET NAME SIGN PLACEMENT	39
WATER	WATER	17	SIGNS	TRAFFIC SIGNS BLANK DIMENSIONS	40
WATER	WATER	18	SIGNS	TYPICAL SCHOOL ZONE FLASHER ASSEMBLY	41
WATER	METER VAULT	19	SIGNS	FOUNDATION AND FLASHER ASSEMBLY	42
WATER	METER VAULT	20	LIGHTING	STREET LIGHT DETAILS	43
WATER	WATER	21	PAVING	STREET ROUND ABOUT DETAILS	44
SANITARY SEWER	SANITARY SEWER	22	PAVING	DESIGN DETAILS	45

GENERAL NOTES

1. ALL MATERIALS MUST BE DOMESTICALLY SOURCED AND PRODUCED UNLESS OTHERWISE APPROVED BY THE PUBLIC WORKS DIRECTOR.

PAVING NOTES

1. CONCRETE FOR ALL STREETS, ALLEYS, & DRIVEWAYS SHALL BE IN ACCORDANCE WITH NCTCOG CLASS "C" CONCRETE (3,600 P.S.I. COMPRESSIVE STRENGTH @ 28 DAYS). DRIVEWAYS SHALL BE HAND POURED. CONCRETE FOR ALL SIDEWALKS SHALL BE IN ACCORDANCE WITH NCTCOG CLASS "A" CONCRETE (3,000 COMPRESSIVE STRENGTH @ 28 DAYS).
2. REINFORCING STEEL SHALL BE DEFORMED BARS NO. 3 ON 18 INCH CENTERS OR NO. 4 BARS ON 24 INCH CENTERS UNLESS OTHERWISE NOTED IN THE DETAILS. REINFORCING SHALL BE IN BOTH DIRECTIONS ON CENTER. REINFORCING STEEL SHALL BE IN ACCORDANCE WITH ASTM 615, 616 AND 617.
3. ALL REINFORCING STEEL SHALL BE TIED (100%). REINFORCING STEEL SHALL BE SET ON PLASTIC CHAIRS. BAR LAPS BE MINIMUM 30 DIAMETERS.
4. EXPANSION JOINTS SHALL BE SPACED EVERY 200 FEET AND AT ALL INTERSECTIONS. ALLEYS SHALL HAVE A MINIMUM OF TWO EXPANSION JOINTS.
5. SAWED TRANSVERSE DUMMY JOINTS SHALL BE SPACED EVERY 20 FEET ON PAVING 8 INCHES OR THICKER AND EVERY 15 FEET FOR PAVING THICKNESS LESS THAN 8 INCHES SAWING SHALL OCCUR WITHIN 5 TO 12 HOURS AFTER THE POUR INCLUDING SEALING. OTHERWISE THE SECTION SHALL BE REMOVED AND LONGITUDINAL BUTT JOINT CONSTRUCTED.
6. SUBGRADE UNDER PAVEMENTS SHALL BE A MINIMUM OF 8 INCHES OF EITHER HYDRATED LIME OR CEMENT TREATED SUBGRADE, WITH OPTIMUM CONTENT AND COMPACTION REQUIREMENTS AS RECOMMENDED BY THE GEOTECHNICAL DESIGN, AS WELL AS APPROVED BY THE PUBLIC WORKS DIRECTOR. CONTENT AND COMPACTION TESTS SHALL BE TAKEN ALONG THE EXCAVATION AT ALL CHANGES IN SOIL AND A MINIMUM OF 300 FEET DISTANCES. ALL TESTS SHALL BE COMPLETED BY AN INDEPENDENT LABORATORY APPROVED BY THE CITY AND PAID FOR BY THE CONTRACTOR.
7. LIME TREATED SUBGRADE SHALL BE COMPACTED TO A DENSITY OF NOT LESS THAN 95 PERCENT OF THE MAXIMUM DENSITY AS DETERMINED BY ASTM D 698. MOSTURE CONTENT SHALL BE WITHIN -2 TO +4 OF OPTIMUM. DENSITY TEST RESULTS SHALL BE COMPLETED BY AN INDEPENDENT LABORATORY APPROVED BY THE CITY. ALL RESULTS SHALL BE PROVIDED TO THE CITY.
8. LIME TRIMMINGS ARE NOT ACCEPTABLE FOR ANY USE.
9. ALL FILL SHALL BE COMPACTED BY MECHANICAL METHODS. MAXIMUM LOOSE LIFT FOR COMPACTION SHALL BE 8 INCHES. ALL LIFTS SHALL BE TESTED FOR DENSITY BY AN INDEPENDENT LABORATORY APPROVED BY THE CITY. DENSITY REQUIREMENT SHALL BE AS SHOWN ON THE PLANS FOR THE TYPE OF MATERIAL CALLED FOR IN THE PLANS.
10. ALL DISTURBED AREAS OF ROADWAY WORK SHALL HAVE GRASS ESTABLISHED IMMEDIATELY. GRASS SHALL MEET THE REQUIREMENTS OF ITEM 3.8, 3.9, 3.10 & 3.11 OF NCTCOG.
11. ALL AREAS TO BE EXCAVATED OR FILLED SHALL HAVE EROSION CONTROL PLACED PRIOR TO COMMENCING EARTHWORK. EROSION CONTROL DEVICES SHALL BE MAINTAINED THROUGHOUT THE PROJECT IN ACCORDANCE WITH NCTCOG ITEM 3.12.
12. ALL SIDEWALKS SHALL INCLUDE BARRIER FREE RAMPS AT INTERSECTING STREETS, ALLEYS, DRIVEWAYS, ETC. BARRIER FREE RAMPS SHALL MEET CURRENT ADA REQUIREMENTS AND BE APPROVED BY THE TEXAS LICENSING BOARD.
13. SIDEWALKS SHALL BE DOWELED INTO PAVEMENT WHERE IT ABUTS DRIVEWAYS. REDWOOD EXPANSION JOINT MATERIAL SHALL BE USED AT THESE LOCATIONS.
14. NO VEHICLES SHALL BE PERMITTED ON CONCRETE PAVEMENT WITHOUT APPROVAL FROM THE CITY. THE CITY WILL MAKE DETERMINATION BASED ON CONCRETE BREAK REPORT.
15. SIDEWALKS REQUIRE 2-INCH SAND CUSHION ON SUBGRADE COMPACTED WITHIN 95% STANDARD PROCTOR DENSITY.
16. POURS SHALL REQUIRE A PRE-POUR INSPECTION FOR FORMWORK, REINFORCEMENT AND GEOMETRY. VISUAL INSPECTIONS MAY BE MADE AFTER THE POUR TO ADDRESS TOOLED JOINTS, FINISH, SUBGRADE INTEGRITY, ETC.
17. ENSURE THAT FLATWORK DOES NOT OBSCURE ABOVE-GROUND APPURTENANCES (I.E. VALVES, MH LIDS).
18. EXPOSED AGGREGATE CONCRETE IS NOT ACCEPTABLE FOR SIDEWALK WITHIN PUBLIC RIGHT-OF-WAY.
19. SIDEWALKS SHALL BE 5' WIDE MINIMUM WIDTH.

LINED CHANNELS

1. CONSTRUCTION JOINT SHOWN IN DETAILS FOR CONVENIENCE ONLY, MONOLITHIC CONSTRUCTION MAY BE USED.
2. ALL VISIBLE SURFACES SHALL BE A TROWEL FINISH.
3. ALL REINFORCING STEEL SHALL BE 3/8" DIAMETER AND SPACED 12" CENTER TO CENTER BOTH WAYS UNLESS OTHERWISE SPECIFIED.
4. IF WOOD FORMS ARE USED WITH CONSTRUCTION JOINT, THEY SHALL BE TWO, 2"x4", AND SHALL NOT BE REMOVED UNTIL CONCRETE ON SLOPES IS READY TO BE PLACE.
5. ALL CONCRETE IN LINED CHANNEL SHALL BE NCTCOG CLASS "A" (MINIMUM 3,000 P.S.I.) CONCRETE.
6. FLAT BOTTOM TO BE CONSTRUCTED WHEN CHANNEL WIDTH IS LESS THAN 12 FOOT.
7. 3/4" CHAMFER ON ALL CONCRETE CORNERS.

STORM SEWER

1. THE FLOOR OF THE EXCAVATION FOR INLET BOX MUST PROVIDE A FIRM, LEVEL BED FOR THE BASE SECTION TO REST UPON.
2. A MINIMUM OF 6 INCHES OF 1" DIAMETER (MAXIMUM) ROCK OR GRAVEL SHALL BE USED TO PREPARE THE BEDDING TO FINAL GRADE OR IN LIEU OF THIS, AT LEAST 6 INCHES OF 2- SACK CEMENT STABILIZED SAND SHALL BE USED TO PREPARE THE BEDDING TO GRADE CEMENT STABILIZED-SAND SHALL BE ALLOWED TO SET BY KEEPING HOLE PUMPED DRY.
3. AFTER PIPE HAS BEEN LAID ON PROPER BEDDING, BACKFILLING TO COMMENCE WITH 8' MAXIMUM LOOSE LIFTS MECHANICALLY COMPACTED TO 95% STANDARD PROCTOR UNDER ROADWAY OR 12" MAXIMUM LOOSE LIFT BEHIND CURB. MAXIMUM SIZE ROCK IN BACKFILL SHALL NOT EXCEED 4 INCHES IN DIAMETER.
4. PRECAST INLETS MUST BE APPROVED BY THE CITY.
5. CONCRETE TO BE MINIMUM 4,200 P.S.I.
6. LOCKING DEVICE IS REQUIRED ON ALL STORM SEWER LIDS.
7. "NO DUMPING" WARNING PLAQUE TO BE INSTALLED ON ALL STANDARD AND RECESSED INLETS.
8. CONCRETE CAST-IN-PLACE INLETS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,200 PSI @ 28 DAYS.
9. STORM DRAIN TILE SHALL BE PLACED IN THE CENTER OF THE INLET, 2 INCHES FROM THE EDGE OF OPENING AS SHOWN IN THE DRAWING USE PL-200 CONSTRUCTION ADHESIVE FOR APPLICATION. TILES CAN BE ORDERED FROM: CENTERLINE SUPPLY. INC., 425 JESSE STREET, GRAND PRAIRIE, TEXAS 75061-1141. 1-800-321-1731, METRO: 214-647-8300, FAX: 214-641-1221.
10. EXISTING STORM SEWER PIPE AND/ OR LATERALS SHALL BE LOCATED PRIOR TO SETTING OF CONSTRUCTING INLET BOXES. IF ADJUSTMENT IN GRADE OF LATERAL IS REQUIRED, A REVISED DESIGN BY THE ENGINEER OF RECORD SHALL BE SUBMITTED TO THE CITY FOR APPROVAL.
11. REINFORCED CONCRETE PIPE CLASS III MINIMUM.

SANITARY SEWER

1. ALL SEWER LINES CROSSING POTABLE WATERLINES SHALL BE AS SHOWN IN THE PLANS AND MEET TNRCC REQUIREMENTS
2. ALL SANITARY SEWER MAINS SHALL BE A MINIMUM OF 6" INSIDE DIAMETER. ALL SERVICE LINES SHALL BE A MINIMUM OF 4" INSIDE DIAMETER. PIPES 6 INCHES THROUGH 24 INCHES SHALL BE IN ACCORDANCE WITH ASTM D3034 WITH A MINIMUM SDR OF 26.
3. PIPES LARGER THAN 24 INCHES SHALL BE CCFRPM, CENTRIFUGALLY CAST FIBER REINFORCED POLYMER MORTAR PIPE(HOBAS OR APPROVED EQUIVALENT) OR AS DIRECTED BY THE PUBLIC WORKS DIRECTOR. SHALL BE IN ACCORDANCE WITH ASTM STANDARDS D3262, D4161, D2412, D3681, D638.
4. MANHOLES SHALL BE CAST IN PLACE OR PRECAST. ALL MANHOLES SHALL BE WATER TIGHT. ALL RING AND COVERS SHALL INCLUDE AN INTERNAL CHIMNEY SEAL.
5. ALL PIPE OPENINGS IN MANHOLES SHALL INCLUDE COUPLINGS WITH "O" RING RUBBER GASKETS.
6. STUBOUTS OUT OF MANHOLES SHALL BE FITTED WITH A STOPPER AND CAP. STUBOUTS SHALL BE A MINIMUM OF 5 FEET FROM MANHOLE AND BE SUPPORTED BY A CONCRETE CRADLE.
7. ALL DROP MANHOLES SHALL BE OF THE EXTERNAL TYPE.
8. MANHOLES SHALL BE VENTED IN ACCORDANCE WITH TCEQ REQUIREMENTS.
9. ALL SANITARY SEWER PIPE SHALL BE TESTED (NCTCOG ITEM 6.7.2) AFTER CONSTRUCTION. TESTING SHALL INCLUDE PRESSURE TESTING, MANDREL TEST (TCEQ REQUIRED) AND COLOR TV INSPECTION. COLOR TV INSPECTION SHALL BE COMPLETED IN PRESENCE OF CITY REPRESENTATIVE AND THE ORIGINAL VHS FORMATTED TAPE SHALL BE GIVEN TO THE CITY AT THE COMPLETION OF THE INSPECTION.
10. MANHOLES SHALL BE VACUUM TESTED IN THE PRESENCE OF THE CITY REPRESENTATIVE.

WATER

1. ALL WATER LINE CROSSINGS OF SANITARY SEWER LINES SHALL BE AS SHOWN IN THE PLANS AND MEET TNRCC REQUIREMENTS.
2. PIPES 12 INCHES IN DIAMETER AND SMALLER SHALL BE POLYVINYL CHLORIDE (P.V.C.) MEETING THE REQUIREMENTS OF AWWA C900 DR 18 OR DUCTILE IRON PIPE (D.I.P.) MEETING THE REQUIREMENTS OF AWWAC 151 CLASS 50 PIPE. ALL D.I.P. SHALL BE WRAPPED WITH A POLYETHYLENE LINER.
3. FOR PIPES LARGER THAN 12 INCHES IN DIAMETER, THE PIPE SHALL BE DUCTILE IRON PIPE (AWWA C151 CLASS 50) OR POLYVINYL CHLORIDE PIPE UP TO 18 INCHES MEETING THE REQUIREMENTS OF AWWA C905 - 235 P.S.I. RATED PIPE.
4. ALL VALVES ON PIPES 12 INCHES AND SMALLER SHALL BE RESILIENT SEALED WEDGE VALVES (AWWA C509).
5. ALL VALVES ON PIPES LARGER THAN 12 INCHES BUT SMALLER THAN 30 INCHES SHALL BE BUTTERFLY VALVES (AWWA C504) OR WEDGE VALVES (AWWA C509).
6. ALL VALVES ON PIPES 30 INCHES AND LARGER SHALL BE BUTTERFLY VALVES (AWWA C504).
7. EMBEDMENT SHALL BE AS SHOWN IN THE PLANS. BACKFILL WITHIN THE LIMITS OF EXISTING AND PROPOSED PAVEMENT SHALL BE COMPACTED TO 95% STANDARD PROCTOR. OUTSIDE PAVEMENT (EXISTING OR PROPOSED) SHALL BE COMPACTED TO MINIMUM OF 95% STANDARD PROCTOR ALL COMPACTION SHALL BE BY MECHANICAL METHODS.
8. WATER LINES SHALL BE PRESSURE TESTEDCOG ITEM 6.7.3..
9. ALL HORIZONTAL AND VERTICAL BENDS SHALL BE BLOCKED USING 3,000 PSI COMMERCIAL CONCRETE. NO HAND MIXING OF SAID CONCRETE SHALL BE PERFORMED ON SITE.
10. ALL SADDLES SHALL BE MUELLER/HYMAX BR2B 4"-16" SADDLES, FORD METER 202B DOUBLE STRAP BRASS SADDLE, OR APPROVED EQUIVALENT.

SCREENING WALLS

1. CONCRETE - MINIMUM COMPRESSIVE STRENGTH OF 3,000 P.S.I. @28 DAYS.
2. REINFORCEMENT - ASTM A-36.
3. MASONRY - COMPRESSIVE STRENGTH SHALL BE PRESCRIBED IN ITEM 2.3.6 SPECIAL PROVISIONS.
4. WIND LOAD FOR DESIGN - 20 P.S.F.
5. PIER BEARING STRESSES - SEE BRICK SCREENING WALL NOTES.
6. MORTAR - TYPE "S".
7. PROVIDE CONTROL JOINTS AT 50 FEET.
8. PROVIDE EXPANSION JOINTS AT 200 FEET CENTER MAXIMUM.
9. PROVIDE PIER WITH MINIMUM 9 FOOT W/ 24 INCH DIAMETER BELL IN CLAY OR OTHER MATERIAL EXCEPT BLUE SHALE, 6 FOOT MINIMUM WITH 3 FOOT MINIMUM INTO BLUE SHALE.
10. ALL EXPOSED CONCRETE SHALL BE CLASS 2 RUBBED FINISHED SURFACE.
11. SIDEWALKS ADJACENT TO WALLS MUST BE 5 FOOT MINIMUM WIDTH FROM ALL PORTIONS OF THE WALL (INCLUDING PILASTERS, COLUMNS, ETC.).
12. MAXIMUM PILASTER SPACING 40 FEET.
13. WALLS SHALL NOT BE PLACED IN THE VISIBILITY EASEMENT OR STREET RIGHT OF WAY.
14. THE WALL SHALL BE A MINIMUM OF EIGHT FEET IN HEIGHT AS MEASURED FROM THE NEAREST ALLEY EDGE OR SIDEWALK GRADE, WHICHEVER IS THE HIGHER. THE COLOR OF THE WALL SHALL BE LIMITED TO EARTH-TONE COLORS, EXCLUDING GRAY, GREEN AND WHITE. THE COLOR OF THE WALL SHALL BE UNIFORM ON EACH SIDE OF A THOROUGHFARE FOR THE ENTIRE LENGTH BETWEEN INTERSECTING THOROUGHFARES, UNLESS OTHERWISE APPROVED BY THE CITY'S PUBLIC WORKS DEPARTMENT. THE FINISH OF THE WALL SHALL BE CONSISTENT ON ALL SURFACES.
15. IF WROUGHT IRON FENCING IS TO BE UTILIZED ON REQUIRED SCREENING, ALL WROUGHT IRON MUST BE SOLID STOCK, NO TUBULAR STEEL WILL BE ALLOWED.
16. A 3"x3"x10" GALVANIZED ANGLE IRON PLATE SHALL BE INSTALLED BELOW THE BOTTOM ROW OF BRICKS & ANCHORED INTO THE COLUMNS FOR MASONRY SCREENING WALLS.

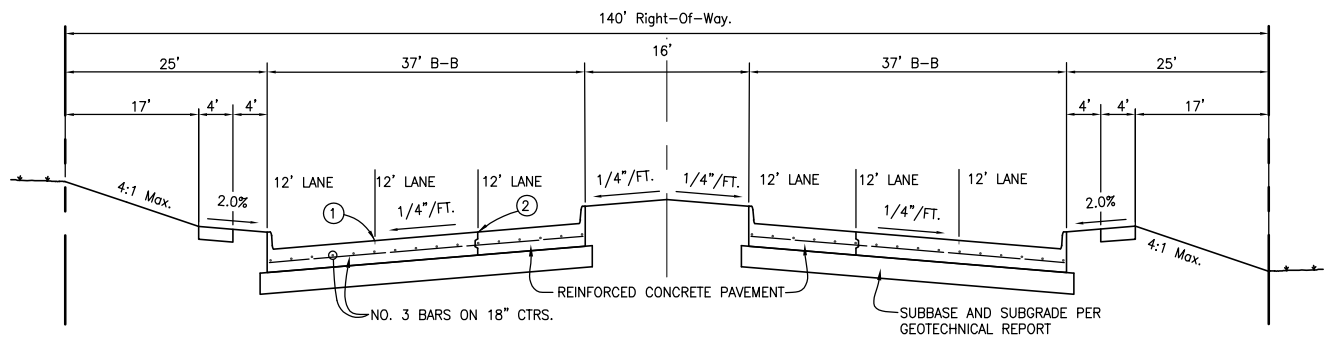
TRAFFIC SIGNS AND LIGHTING

1. THE EXISTING SIGNS LOCATED ON PUBLIC CONSTRUCTION SITES ARE THE PROPERTY OF THE CITY OF AUBREY. THROUGHOUT THE PERIOD OF THE CONTRACT, THE CONTRACTOR SHALL PROTECT THESE SIGNS SUCH THAT THEY ARE NOT DAMAGED IN THE COURSE OF CONSTRUCTION ACTIVITY.
2. PRIOR TO THE START OF CONSTRUCTION, ALL EXISTING SIGNS WITHIN THE AREA OF CONSTRUCTION WILL BE INVENTORIED AND DOCUMENTED JOINTLY BY THE CITY INSPECTOR AND THE CONTRACTOR. THIS DOCUMENT WILL BE JOINTLY SIGNED BY BOTH PARTIES REFLECTING THE SIGN TYPE, SIGN SIZE, SIGN CONDITION, SIGN LOCATION, REFLECTIVITY ADEQUACY, ETC.THE CONTRACTOR IS HELD ACCOUNTABLE FOR THESE SIGNS THROUGHOUT THE PROJECT AND AT THE COMPLETION OF THE PROJECT.
3. ALL GROUND MOUNTED AND OVERHEAD SIGNS SHALL USE ANSI STANDARD BQ1528 ALUMINUM BLANKS.
4. ALL BLANKS TO BE INSTALLED SHALL BE 5052-H38 ALUMINIUM (ASTM B --209).
5. THE THICKNESS FOR ALL SIGN BLANKS IS 0.080" EXCEPT OVERHEAD STREET NAME BLADES WHICH ARE 0.100".
6. ALL HOLES SHALL BE 3/8" DIAMETER DRILLED OR PUNCHED AS SHOWN ON EACH BLANK DETAIL AND SHALL BE FREE OF BURRS AND / OR ROUGH EDGES.
7. ALL SIGN FACE MATERIALS SHALL BE ASTM-4956 TYPE XI FULL CUBE PRISMATIC GRADE RETROREFLECTIVE SHEETING OR EQUIVALENT.
8. ALL STREETNAME SIGNS SHALL HAVE 1/4" DIAMETER HOLES DRILLED ON EACH END AND AFFIXED TOGETHER.
9. SIGN BLANK CORNERS TO BE ROUNDED AS SHOWN ON SHEET 5.
10. ALL SIGN BLANK ARE TO BE ETHCHED, DEGREASEODINE FINISH PRIOR TO APPLICATION OF LEGENDS.
11. ALL SIGNS SHALL BE MANUFACTURED AND INSTALLED IN CONFORMANCE TO THE LATEST CITY OF AUBREY SIGN STANDARDS.
12. DETAILS ARE FOR ALL NEW AND REPLACEMENT SIGN INSTALLATIONS.
13. ALL ADVISORY SPEED SIGNS SHALL BE BASED ON A TRAFFIC STUDY, PLEASE FOLLOW TXDOT PROCEDURES FOR ESTABLISHING SPEED ZONES. THE PROCEDURES ARE AVAILABLE AT <http://onlinemanuals.txdot.gov/txdotmanuals/szn/szn.pdf>.
14. ALL SCHOOL ZONE WARNING SIGNS SHALL HAVE FLUORESCENT YELLOW GREEN BACKGROUNDS.
15. REFER TO STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS AVAILABLE AT <https://www.txdot.gov/inside-txdot/forms-publications/publications/highway-signs.html> OR CONTACT THE PUBLIC WORKS MAINTENANCE MANAGER FOR GUIDANCE.
16. **SPEED LIMIT WITHIN CITY LIMIT SHALL BE 25 MPH**

DETAILS

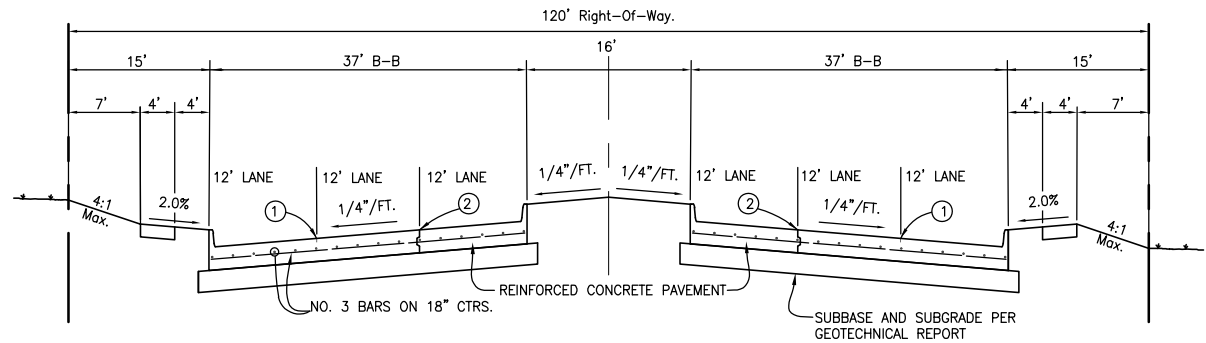
1. ALL DETAILS ARE NOT TO SCALE
2. SPECIAL DETAILS OR MODIFICATIONS TO THESE STANDARD DETAILS TO BE UTILIZED ON ANY GIVEN PROJECT SHALL BE SUBMITTED TO THE CITY FOR APPROVAL FOR USE.
3. The minimum depth of cover for cable television and copper cable communications lines shall be 24 inches. The minimum depth of cover for fiber optic facilities shall be 42 inches. The minimum depth of cover for cable television and copper cable communication line shall be 24 inches under ditches or 18 inches beneath the bottom of the pavement structure, whichever is greater.

						CITY OF AUBREY, TEXAS STANDARD CONSTRUCTION DETAILS GENERAL NOTES	JULY, 2024	SHEET NO. 00



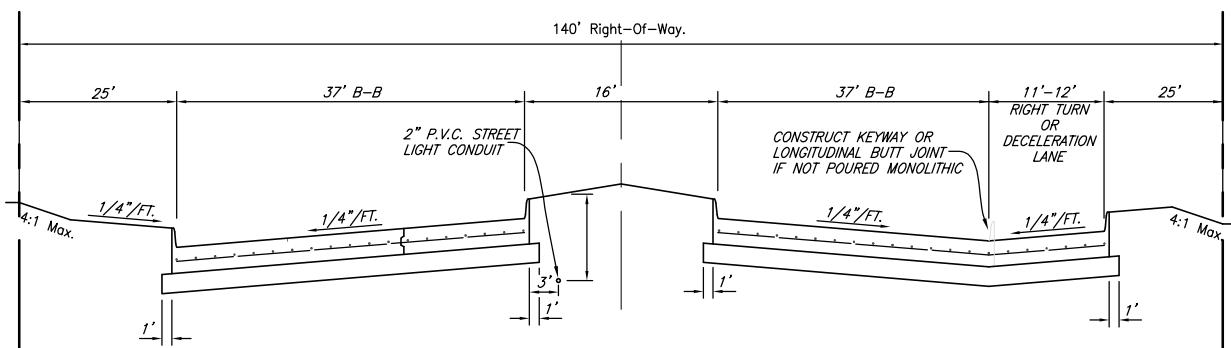
PRINCIPAL ARTERIAL REGULAR SECTION

(Typical TxDOT Section)
N.T.S.



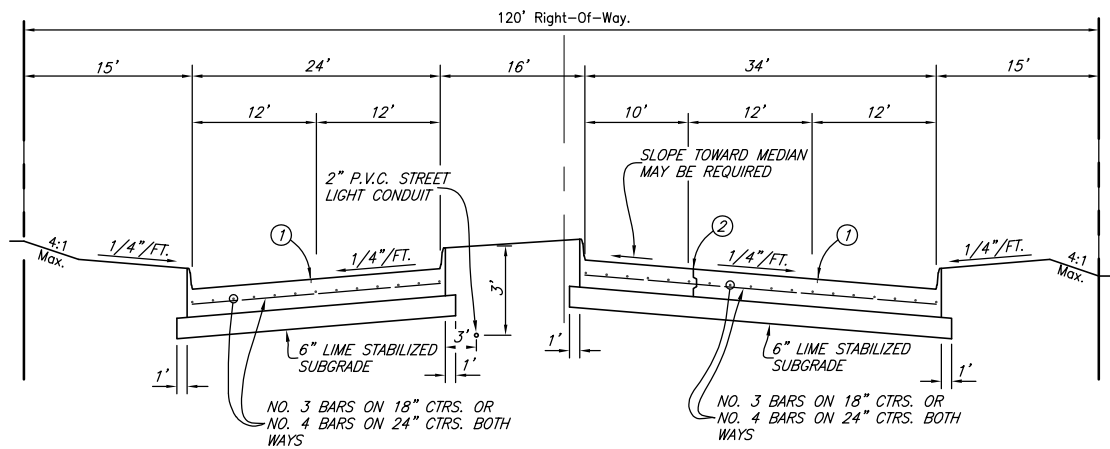
MAJOR ARTERIAL REGULAR SECTION

N.T.S.



PRINCIPAL ARTERIAL RIGHT TURN OR DECELERATION LANE SECTION

(Typical TxDOT Section)
N.T.S.



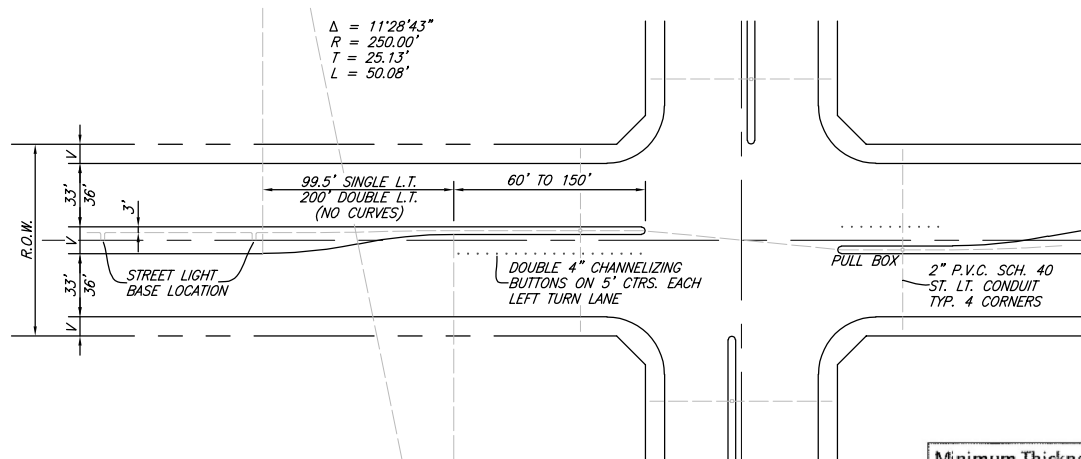
NOTE:
FOR RETROFIT TURN LANES AND MEDIAN OPENINGS. TWO ADDITIONAL INCHES OF CONCRETE CAN BE PLACED IN LIEU OF LIME STABILIZATION.

MAJOR ARTERIAL LEFT TURN SECTION

N.T.S.

LEGEND

- ① - SAWED LONGITUDINAL DUMMY JOINT
 - A. CONSTRUCTION JOINT (FULL WIDTH PVMT. IS ALLOWED WHERE APPROVED BY CITY).
 - ② - B. DELETE IT WHEN PAVING IS 25 FT. WIDTH TO BE WIDENED IN FUTURE.
 - C. INSTALL CURB IF PAVING IS LESS THAN FULL WIDTH OF 33'-36'.
- (LEGNEED_PVMT)



LEFT TURN PLAN

(PVMT-PLAN)

Minimum Thickness	Arterial	Collector	Local	Truck Lane	Fire Lane	Industrial
Pavement	10"	10"	8"	12"	8"	12"
Subgrade	8"	8"	8"	8"	8"	8"

NOTE
1. CONCRETE SECTION SHALL CONFIRM TO THE CITY OF AUBREY TECHNICAL CONSTRUCTION STANDARDS AND SPECIFICATIONS MANUAL



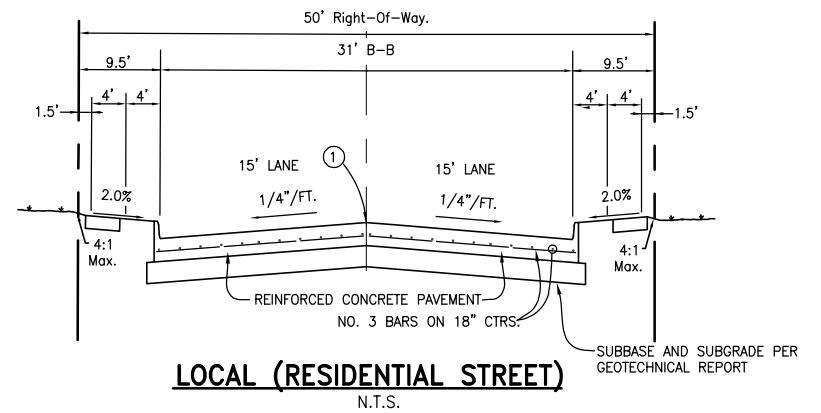
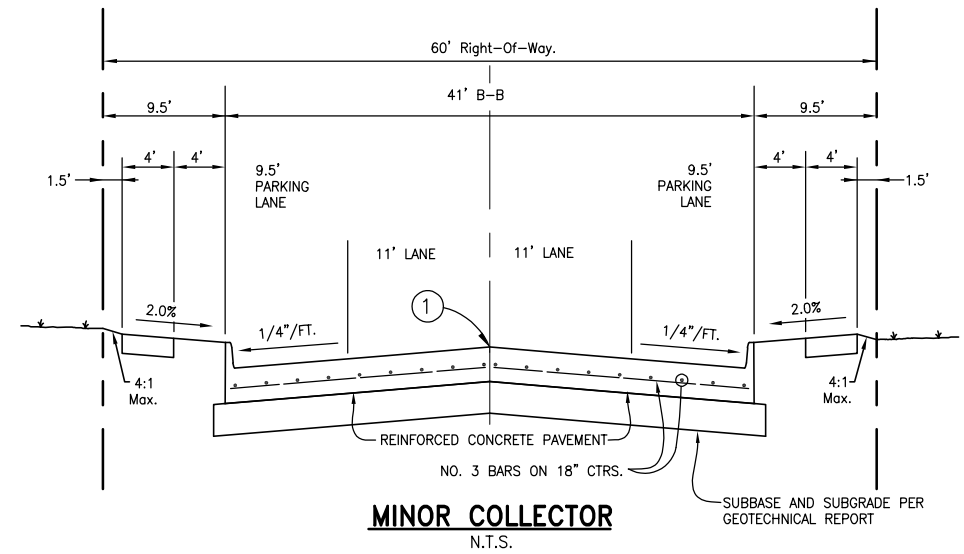
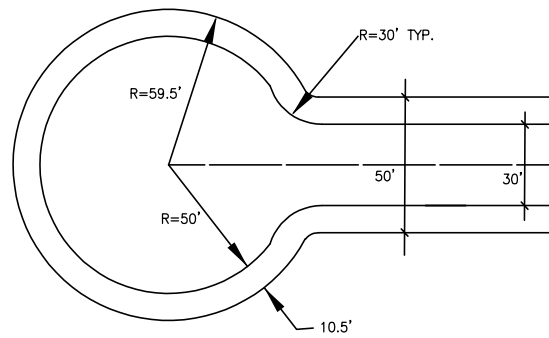
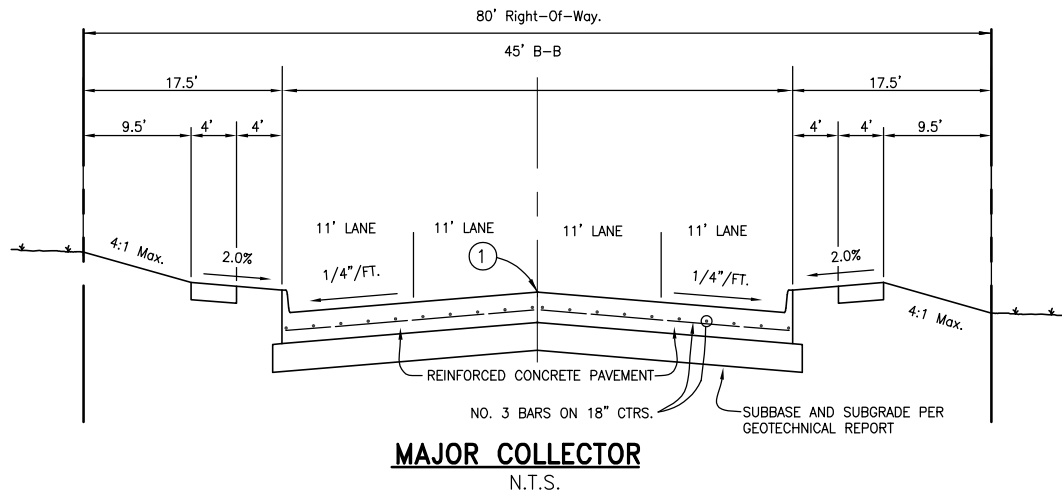
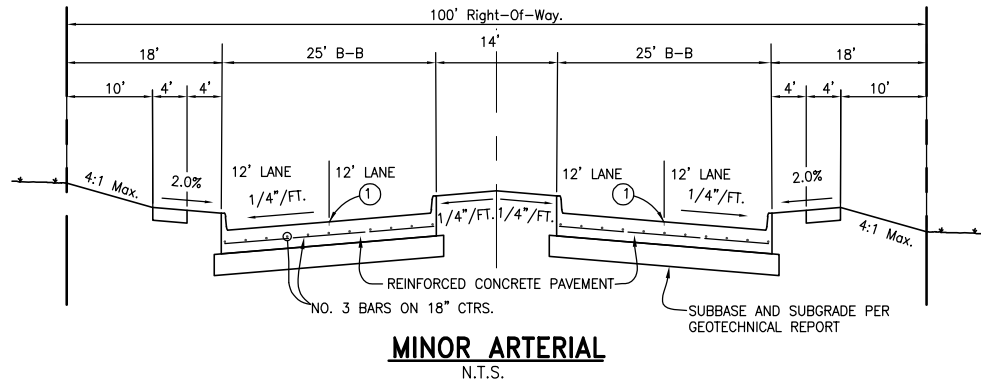
CITY OF AUBREY, TEXAS

STANDARD CONSTRUCTION DETAILS
PAVING / SECTIONS / MAJOR ARTERIAL, MINOR ARTERIAL & LEFT TURN PLAN

JULY, 2024

SHEET NO.

01



LEGEND

- ① - SAWED LONGITUDINAL DUMMY JOINT
- ② - A. CONSTRUCTION JOINT (FULL WIDTH PVMT. IS ALLOWED WHERE APPROVED BY CITY).
B. DELETE IT WHEN PAVING IS 25 FT. WIDTH TO BE WIDENED IN FUTURE.
C. INSTALL CURB IF PAVING IS LESS THAN FULL WIDTH OF 33'-36'.
(LEGEND_PVMT)

NOTE
1. CONCRETE SECTION SHALL CONFIRM TO THE CITY OF AUBREY TECHNICAL CONSTRUCTION STANDARDS AND SPECIFICATIONS MANUAL



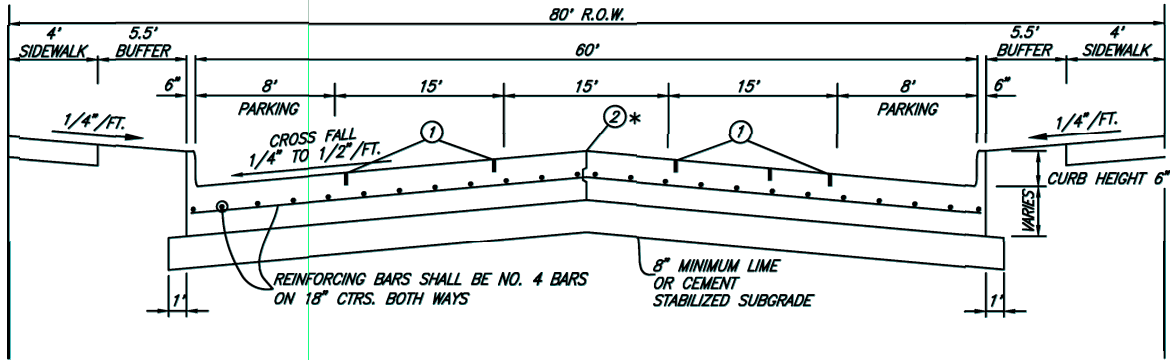
CITY OF AUBREY, TEXAS

STANDARD CONSTRUCTION DETAILS
PAVING / SECTIONS / MINOR ARTERIAL, LOCAL & COLLECTOR STREETS & CUL-DE-SAC

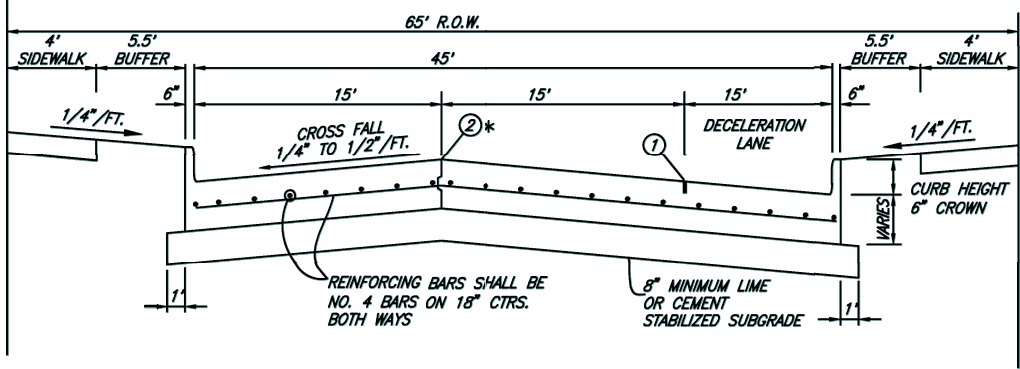
JULY, 2024

SHEET NO.

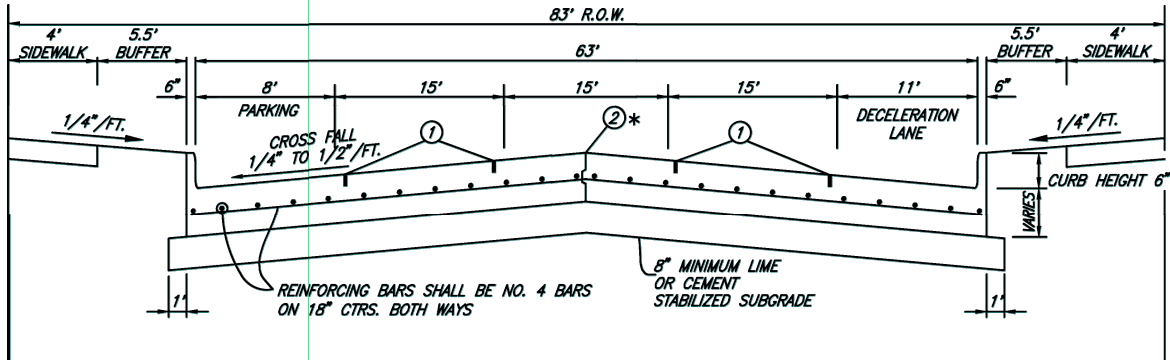
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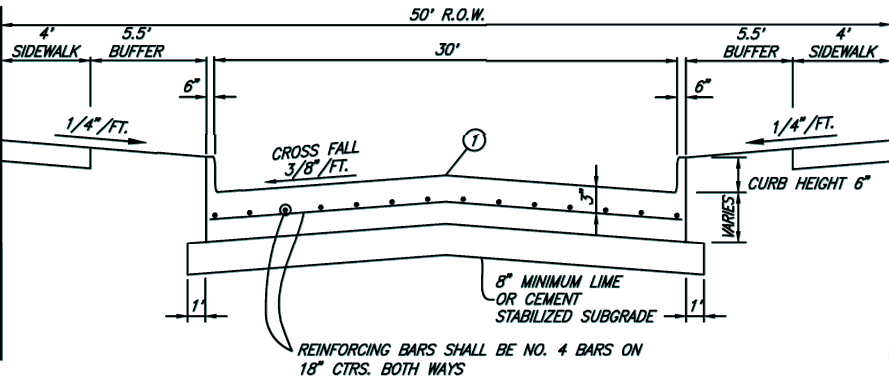
CONCRETE INDUSTRIAL STREET WITH PARKING SECTION



CONCRETE INDUSTRIAL LOCAL STREET WITH RIGHT TURN DECELERATION LANE SECTION



CONCRETE INDUSTRIAL STREET WITH DECELERATION LANE SECTION



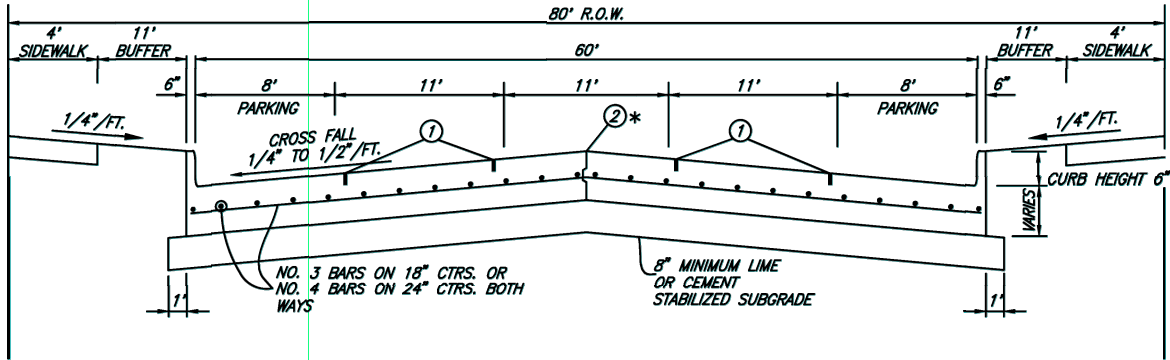
CONCRETE INDUSTRIAL STREET REGULAR SECTION

LEGEND

- ① - SAWED LONGITUDINAL DUMMY JOINT
- ② - CONSTRUCTION JOINT (FULL WIDTH P.V.M.T. IS ALLOWED WHERE APPROVED BY CITY)

Minimum Thickness	Arterial	Collector	Local	Truck Lane	Fire Lane	Industrial
Pavement	10"	10"	8"	12"	8"	12"
Subgrade	8"	8"	8"	8"	8"	8"

NOTE:
LIME OR CEMENT SUBGRADE DESIGN TO BE RECOMMENDED BY GEOTECHNICAL ENGINEER AND MUST BE APPROVED BY THE PUBLIC WORKS DIRECTOR.



MAJOR COLLECTOR WITH PARKING SECTION



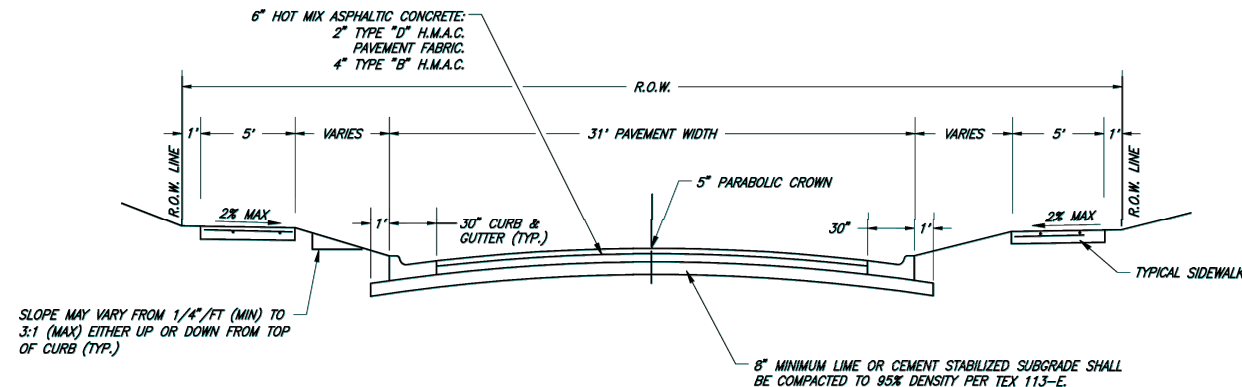
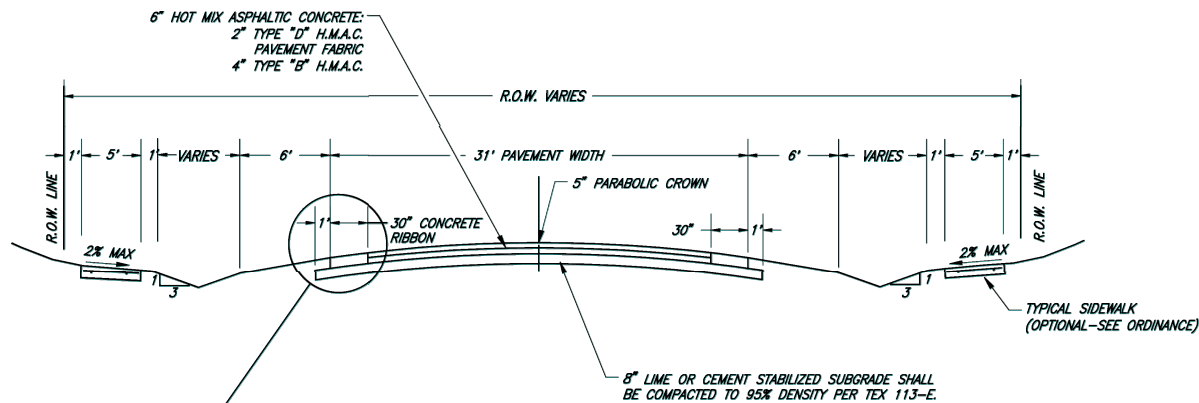
CITY OF AUBREY, TEXAS

STANDARD CONSTRUCTION DETAILS
PAVING / SECTIONS / INDUSTRIAL STREETS

JULY, 2024

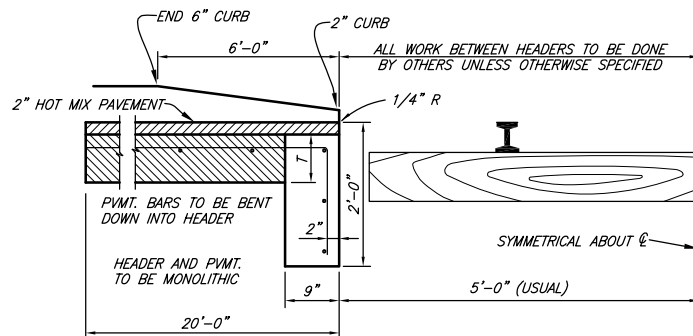
SHEET NO.

03



31' HMAC PAVEMENT SECTION ESTATE LOT TYPICAL CROSS SECTION

- NOTES:**
1. BAR DITCH SIDE SLOPE VARIES DEPENDING UPON DESIGN. NO GREATER THAN 3:1 WITHOUT ARMORING.
 2. CUL DE SAC SHALL HAVE A 7 INCH PARABOLIC CROWN.
 3. PAVING AND SUBGRADE ARE MINIMUMS AND SHALL BE VERIFIED BY GEOTECHNICAL RECOMMENDATION.
 4. HMAC SECTIONS SHALL ONLY BE USED FOR REPAIR OF EXISTING HMAC STREET. NO PROPOSED STREETS MAY BE HMAC.



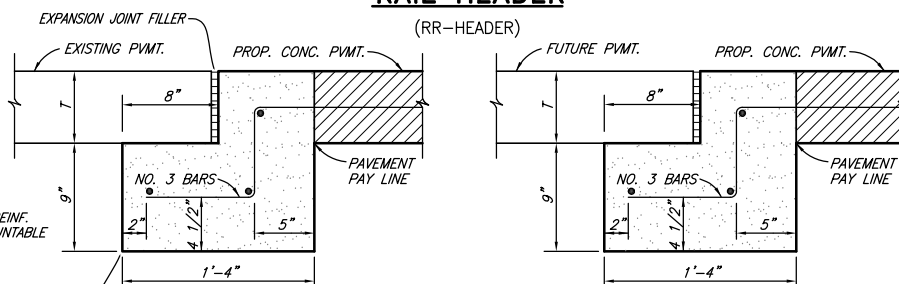
31' HMAC PAVEMENT SECTION LOCAL STREET TYPICAL CROSS SECTION

- NOTES:**
1. FOR 30" GUTTER DETAIL, SEE "SEPARATE CURB & GUTTER" DETAIL.
 2. CUL DE SAC SHALL HAVE A 7 INCH PARABOLIC CROWN.
 3. PAVING AND SUBGRADE ARE MINIMUMS AND SHALL BE VERIFIED BY GEOTECHNICAL RECOMMENDATION.
 4. HMAC SECTIONS SHALL ONLY BE USED FOR REPAIR OF EXISTING HMAC STREET. NO PROPOSED STREETS MAY BE HMAC.

NOTE:
LIME OR CEMENT SUBGRADE DESIGN TO BE RECOMMENDED BY GEOTECHNICAL ENGINEER AND MUST BE APPROVED BY THE PUBLIC WORKS DIRECTOR.

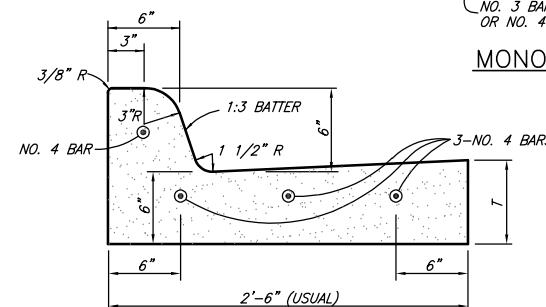
RAIL HEADER

(RR-HEADER)



STREET HEADER

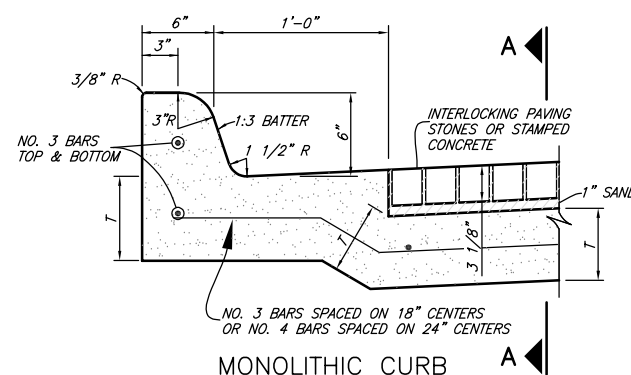
(HEADER)



SEPARATE CURB AND GUTTER

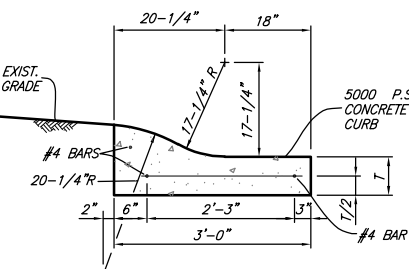
CURB AND CURB AND GUTTER

(CURB-GUT)

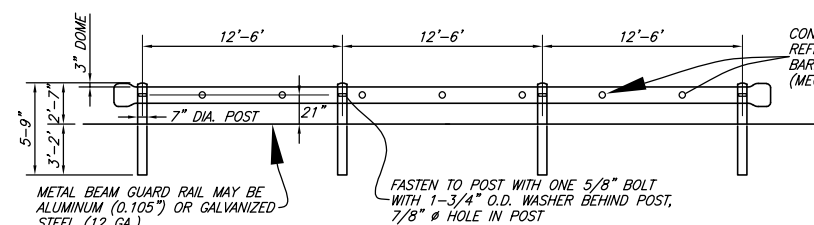


SECTION A-A

PAVING STONES SHALL BE PER NCTCOG ITEMS 2.1.6 AND 8.17



MOUNTABLE CURB SECTION



TYPICAL PERMANENT BARRICADE DETAIL

(PERM-BARRICADE)

ROADWAY WIDTH (W)	TOTAL CROWN HEIGHT	3/4 POINT	MID-POINT	1/4 POINT
26'	4"	2-1/4"	1"	1/4"
36'	6"	3-3/8"	1-1/2"	3/8"
44'	6"	3-3/8"	1-1/2"	3/8"

TABLE OF CROWN HEIGHTS AND ORDINATES FOR VARIOUS PARABOLIC SECTIONS

SLIP-FORM PAVEMENT MUST MEET CROWN GRADES AT GUTTERS, AT MID-POINTS & E

PARABOLIC ROADS ONLY TO BE CONSTRUCTED WITH SLIP FORM PAVERS
(PARA-TABLE)

NON CONSTRUCTION BARRICADES (PERMANENT BARRICADES) SHALL CONSIST OF TxDOT GF(TD)-87 METAL BEAM GUARD FENCE WITH TERMINAL CONNECTOR SECTIONS AT EACH END. PERMANENT BARRICADES SHALL BE MANUFACTURED AND CONSTRUCTED IN ACCORDANCE WITH TxDOT DETAILS. BARRICADE SHALL EXTEND FROM OUTSIDE CURB TO OUTSIDE CURB.



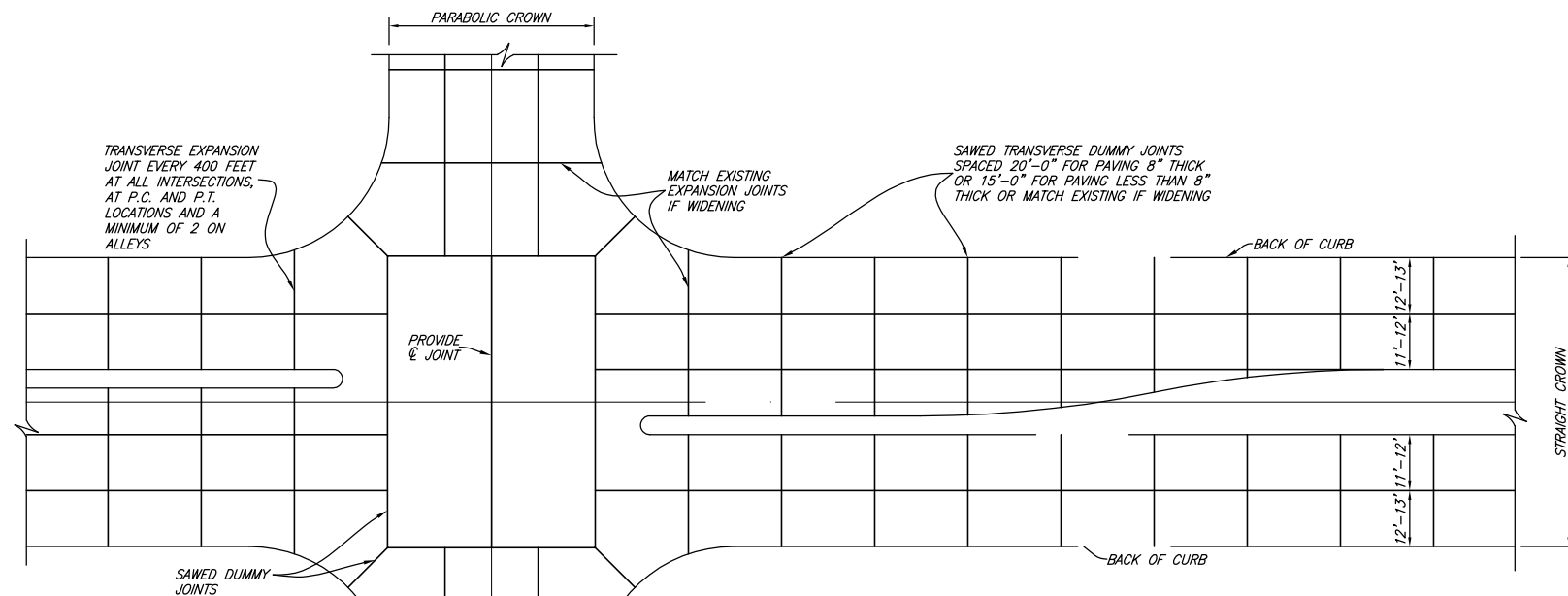
CITY OF AUBREY, TEXAS

STANDARD CONSTRUCTION DETAILS
PAVING / SECTIONS / DETAILS

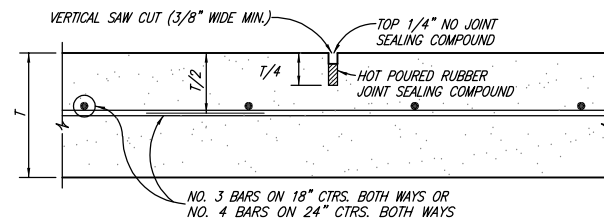
JULY, 2024

SHEET NO.

04

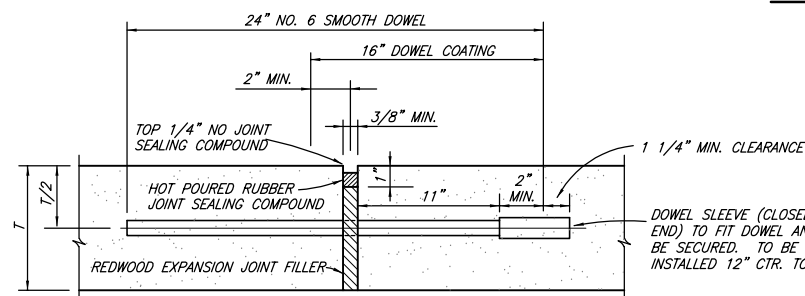


SPACING DIAGRAM FOR TRANSVERSE JOINTS
(ROADWAYS AND ALLEYS)
(JOINT-SPACING)



TRANSVERSE JOINTS SPACED 15 FT. C.-C. (MAX.)
LONGITUDINAL JOINTS SPACED 20 FT. C.-C. (MAX.)

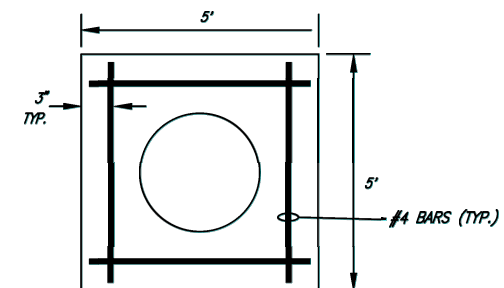
SAWED DUMMY JOINT
(DUMMYJNT)



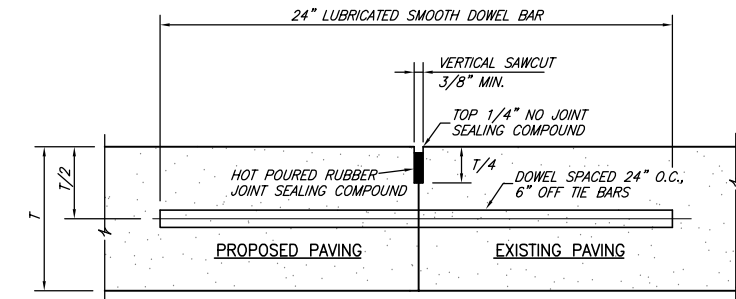
TRANSVERSE EXPANSION JOINT NOTES:

1. DOWELS AND REINFORCING BARS SHALL BE SUPPORTED BY AN APPROVED DEVICE.
2. TRANSVERSE EXPANSION JOINTS SHALL BE SPACED AT 400 FT. MAXIMUM AND AT ALL INTERSECTIONS.

TRANSVERSE EXPANSION JOINT
(EXPJNT)



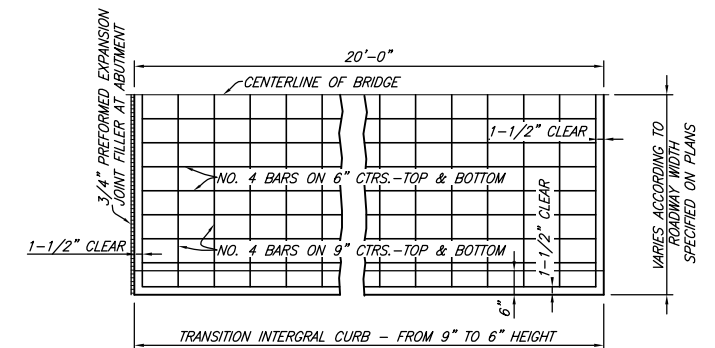
MANHOLE PAD PLAN



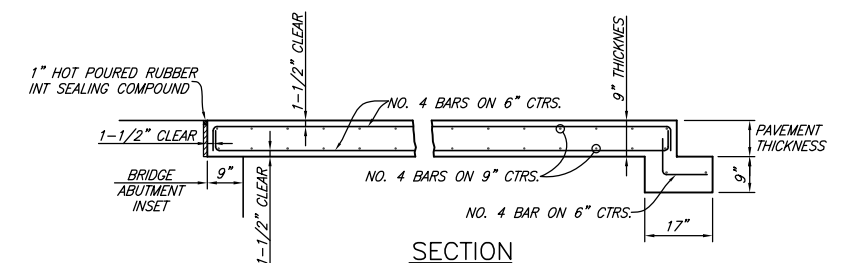
NOTE:

1. T-8" AND GREATER NO. 6 BAR, T-6" AND LESS NO. 5 BAR
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. HAND DRILLING NOT ACCEPTABLE. DAMAGE TO EXISTING PAVEMENT SHALL BE REMOVED BY CONTRACTOR AND JOINT CONSTRUCTED AT CONTRACTORS EXPENSE.
4. DOWEL BAR SHOWN IS IN ADDITION TO TIE BARS (12" O.C.-6" OFF DOWELS).
5. TIE BARS SHALL BE NO. 5 BAR DEFORMED. TIE BAR SHALL HAVE A LENGTH OF 24 INCHES.

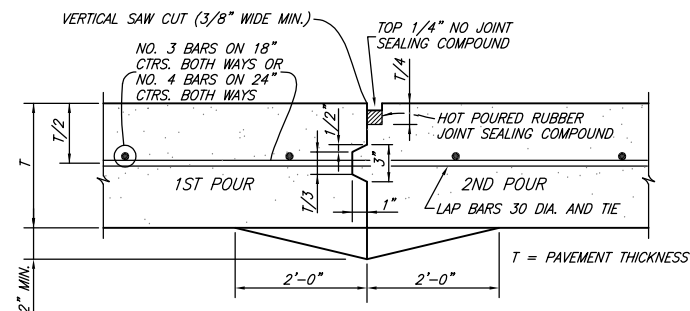
LONGITUDINAL BUTT JOINT
(BUTTJNT)



PLAN



BRIDGE APPROACH SLAB
(APPROACHSLAB)

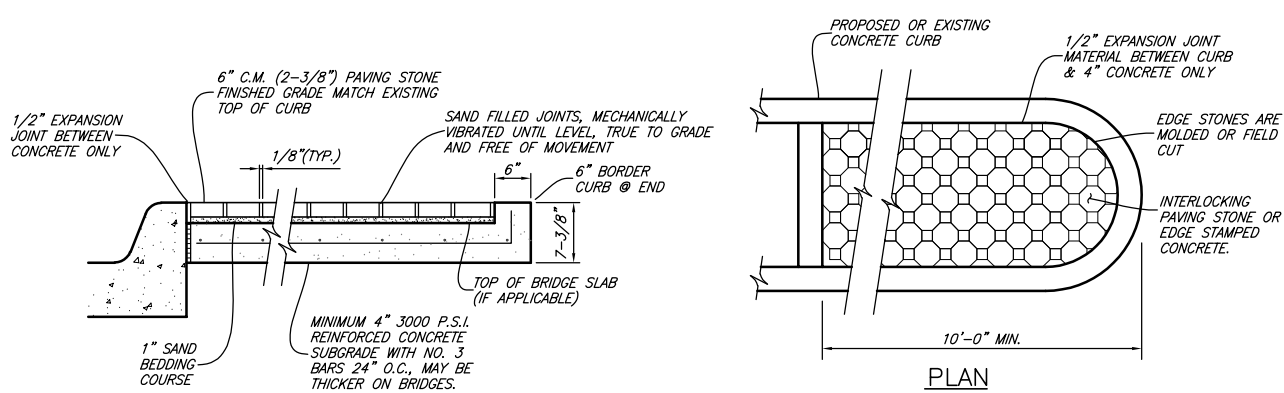


CONSTRUCTION JOINT NOTES:

1. CONTRACTOR SHALL PROTECT KEYWAY PRIOR TO SECOND POUR. IF LONGITUDINAL KEYWAY IS DAMAGED, CONTRACTOR SHALL REPAIR WITH THE USE OF LONGITUDINAL BUTT JOINT (DRILL DOWELS INTO FIRST POUR).
2. THICKENED EDGES ARE REQUIRED FOR FUTURE WIDENING ONLY.

CONSTRUCTION JOINT
(CONSTJNT)

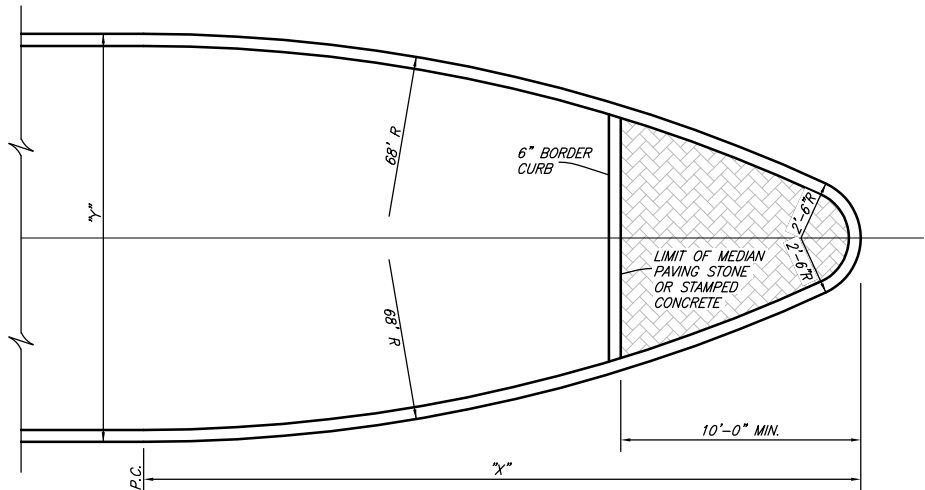
				CITY OF AUBREY, TEXAS STANDARD CONSTRUCTION DETAILS PAVING / JOINTS	JULY, 2024	SHEET NO. 05
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TYPICAL CROSS SECTION

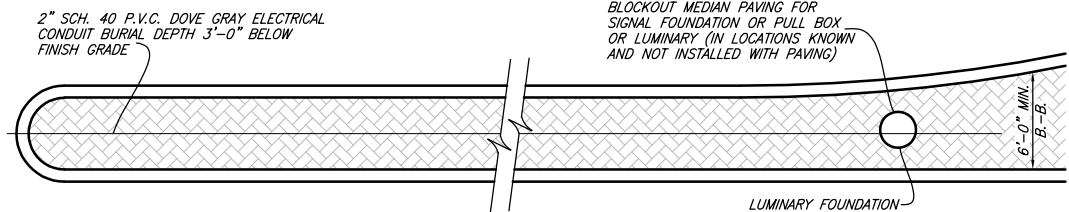
STAMPED CONCRETE OR INTERLOCKING PAVING STONE

COLOR AND STYLE TO BE SELECTED BY CITY
(MEDIAN_STONE)



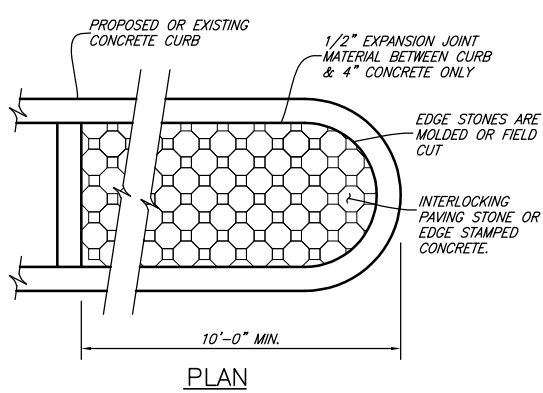
DETAIL OF NOSE FOR MEDIAN ISLAND

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 = 18.06'	Y = 9.0'	X = 32.93'	Y = 20.0'
X = 20.42'	Y = 10.0'	X = 36.47'	Y = 24.0'



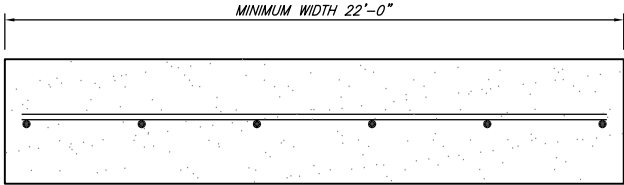
DETAIL OF MEDIAN PAVEMENT

(MEDIAN_DTL)



PLAN

MEDIAN PAVING SHALL EXTEND TO A POINT WHERE MEDIAN IS 6' WIDE. IF MEDIAN IS 6' WIDE, SHALL EXTEND 15' FROM NOSE. FOR MEDIANS WIDER THAN 6', PAVING SHALL EXTEND 10' FROM NOSE. ALL DISTANCES ARE MINIMUM.



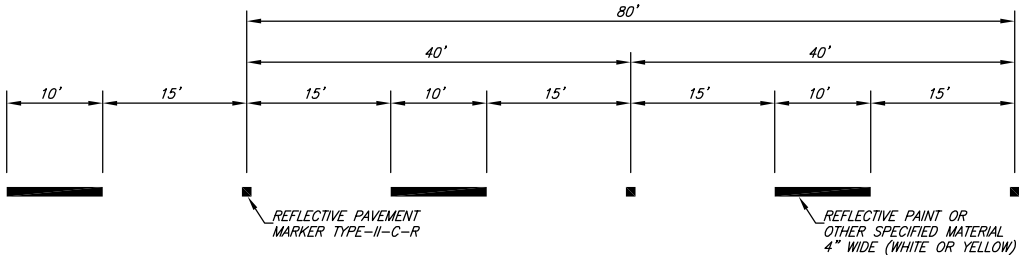
1. ALL FIRE LANES SHALL BE PAVED WITH A MINIMUM OF 8 INCHES OF 3000 P.S.I. CONCRETE REINFORCED WITH #3 REBAR PLACED ON 18 INCH CENTERS EACH WAY ON A 6 INCH LIME STABILIZED SUBGRADE. THE SUBGRADE SHALL BE STABILIZED WITH HYDRATED LIME IN SUFFICIENT AMOUNT TO REDUCE THE PLASTICITY INDEX BELOW FIFTEEN (15). IF NO LABORATORY CONTROL IS USED, THE AMOUNT OF LIME SHALL BE EQUAL TO SEVEN AND ONE HALF (7-1/2) PERCENT BY UNIT DRY WEIGHT OF SOIL ESTIMATED AT 75 POUNDS PER CUBIC FEET OF 32 POUNDS OF LIME PER SQUARE YARD OF SURFACE AREA TREATED TO A 6 INCH THICKNESS.

2. ALL FIRE LANES MAY BE PAVED WITH 6 INCHES OF 3000 P.S.I. CONCRETE (28 DAYS COMPRESSIVE STRENGTH) REINFORCED WITH #3 REBAR PLACED ON 18 INCH CENTERS EACH WAY ON A SUBGRADE SCARIFIED AND COMPACTED TO AT LEAST 95% STANDARD PROCTOR DENSITY. CONTRACTION JOINTS SHALL BE SPACED AT A MAXIMUM OF 15.5 FEET ON CENTERS EACH WAY. CONTRACTION JOINTS MAY BE DUMMY OR SAWED JOINTS T A DEPTH OF AT LEAST ONE (1) INCH DEEP. TO INSURE PROPER RUNOFF IN ORDER TO PREVENT PONDING, THE PAVEMENT SURFACE SHOULD HAVE A MINIMUM SLOPE OF 1%(12" PER 100 FEET.).

3. ALTERNATE PAVING DESIGN:
IN LIEU OF ITEMS LISTED ABOVE, THE DEVELOPER MAY SUBMIT AN ENGINEERED DESIGN THAT WILL BE EQUIVALENT IN PERFORMANCE OF THE SPECIFICATIONS ABOVE. THE EQUIVALENT DESIGN MUST TAKE INTO ACCOUNT THE SOIL CONDITIONS OF THE SITE TO BE DEVELOPED. SUCH DESIGN SHALL REQUIRE APPROVAL BY PUBLIC WORKS DIRECTOR.

FIRE LANE PAVING & JOINT DETAIL

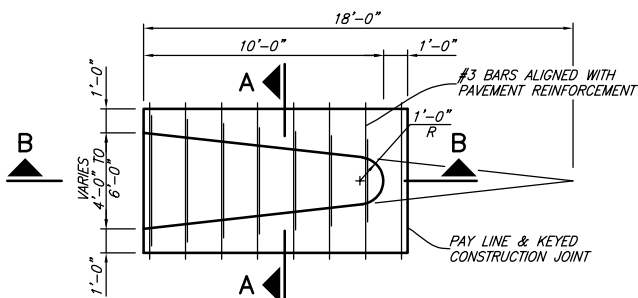
(FIRELANEJNT)



PAVEMENT MARKERS (REFLECTORIZED) TYPE II-C-R SHALL BE SPACED ON 40' CENTERS WITH THE CLEAR FACE TOWARD NORMAL TRAFFIC AND THE RED FACE TOWARD THE WRONG WAY TRAFFIC.

LANE LINE PAVEMENT MARKING

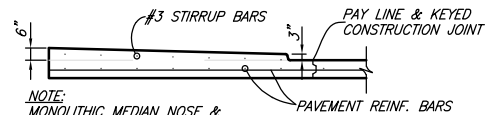
(MARKING)



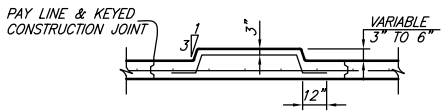
PLAN

MONOLITHIC MEDIAN NOSE

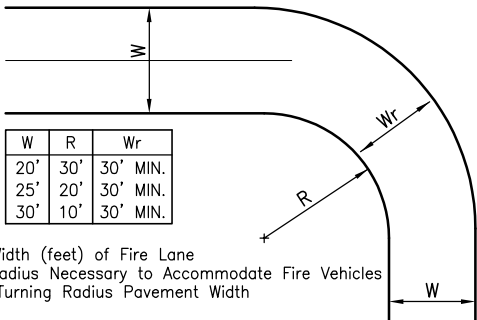
(MONO_MEDIAN)



SECTION B-B

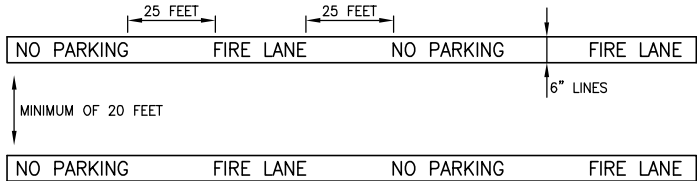


SECTION A-A



FIRE LANE DESIGN

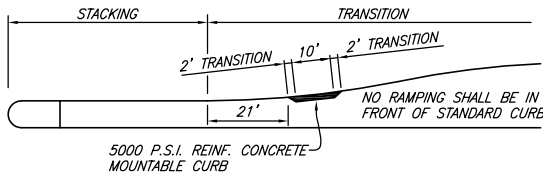
W=Width (feet) of Fire Lane
R=Radius Necessary to Accommodate Fire Vehicles
Wr=Turning Radius Pavement Width



1. THE FIRE CHIEF IS AUTHORIZED TO DESIGNATE FIRE LANES.
2. FIRE LANES SHALL BE MARKED BY SIX INCH (6") WIDE LINES USING RED TRAFFIC PAINT, WITH THE WORDING "NO PARKING" AND "FIRE LANE" PAINTED ON THE LINES AT INTERVALS OF TWENTY-FIVE (25'). THE LETTERING WILL BE FOUR INCHES (4") HIGH WITH A ONE INCH (1") WIDE STROKE PAINTED WITH WHITE TRAFFIC PAINT.
3. FIRE LANES SHALL BE A MINIMUM OF TWENTY-FEET (20') IN WIDTH.
4. ANY DEAD-END FIRE LANE MORE THAN ONE HUNDRED FIFTY-FEET (150') LONG SHALL PROVIDE A TURN AROUND OF ONE HUNDRED FEET (100') IN DIAMETER AT THE CLOSED END, IN ACCORDANCE WITH THE CITY OF LANCASTER CUL-DE-SAC PLAN DRAWING NO. 6F-7.

FIRE LANE MARKING

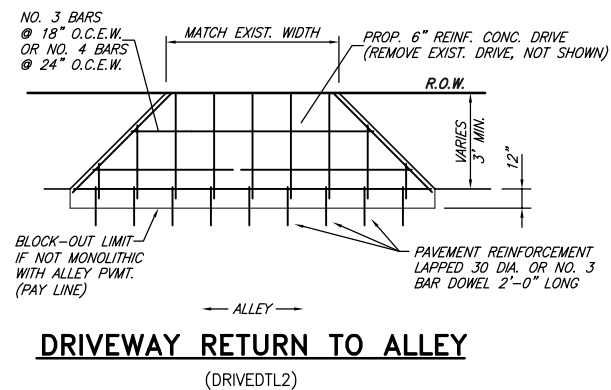
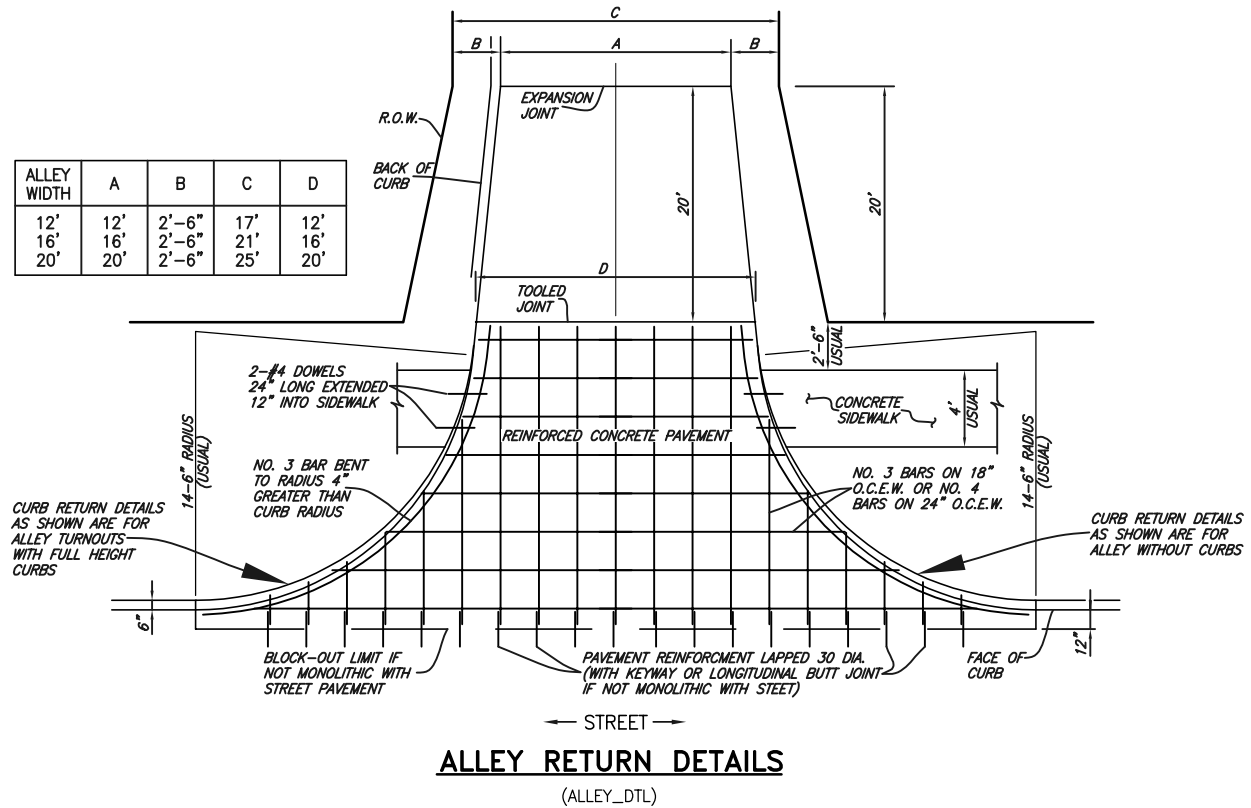
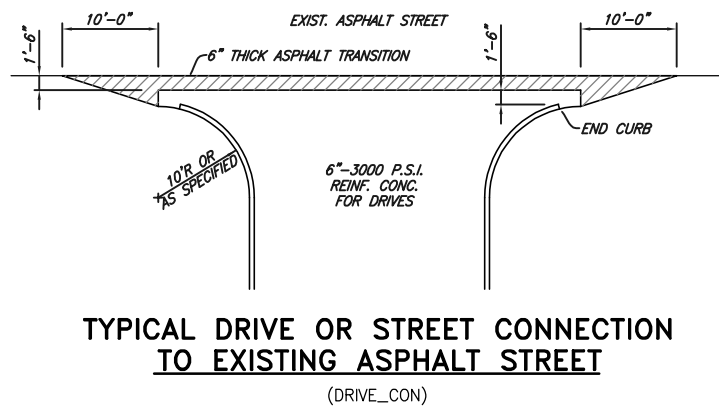
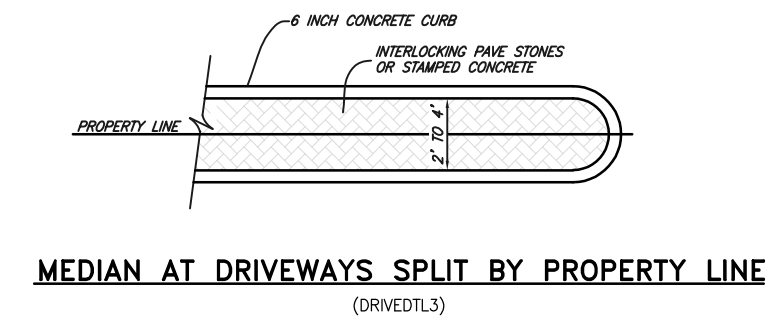
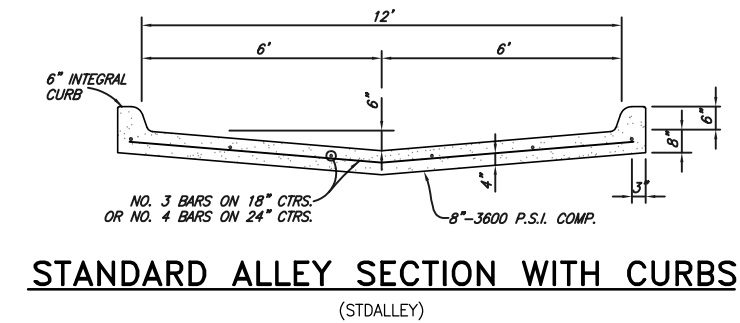
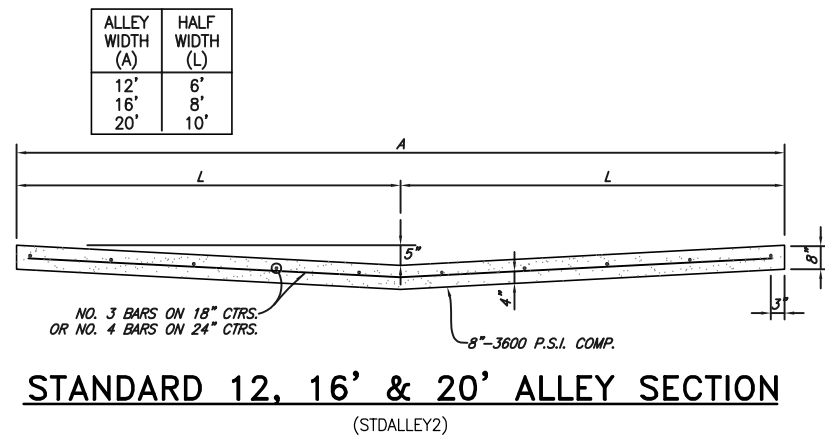
(FIRELANE)

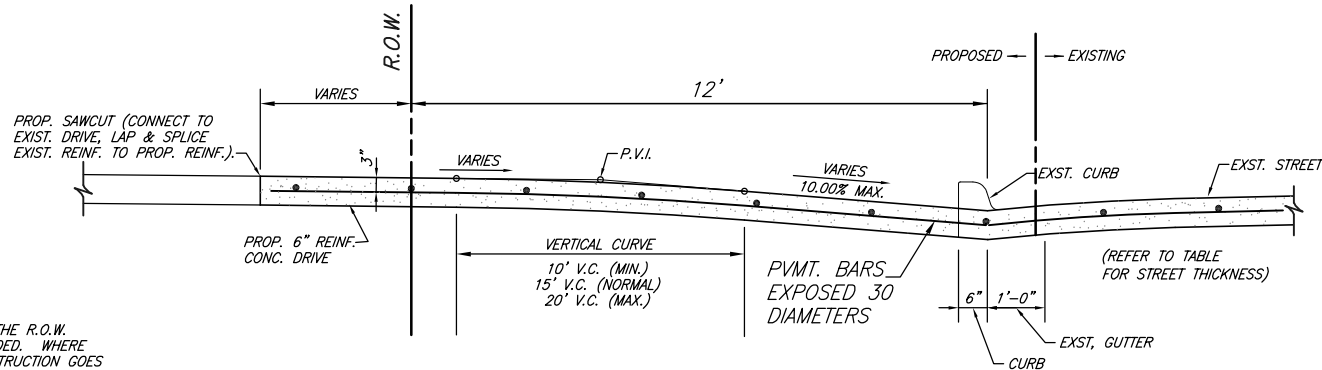


MOUNTALBE CURB DETAIL-PLAN VIEW

LANDSCAPE MAINTENANCE RAMP

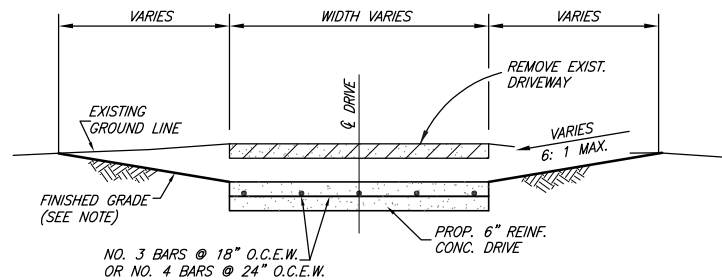
(LANDSCAPE_RAMP)





NOTE:
FINISHED GRADING WITHIN THE R.O.W.
SHALL BE BROADCAST SEED. WHERE
PROPOSED DRIVEWAY CONSTRUCTION GOES
BEYOND THE R.O.W. AND INTO PRIVATE
PROPERTY, THE FINISHED GRADING SHALL
BE BLOCK SODDED TO RESTORE THE
LANDSCAPING TO ITS PRE-CONSTRUCTION
APPEARANCE.

SECTION B-B



SECTION A-A

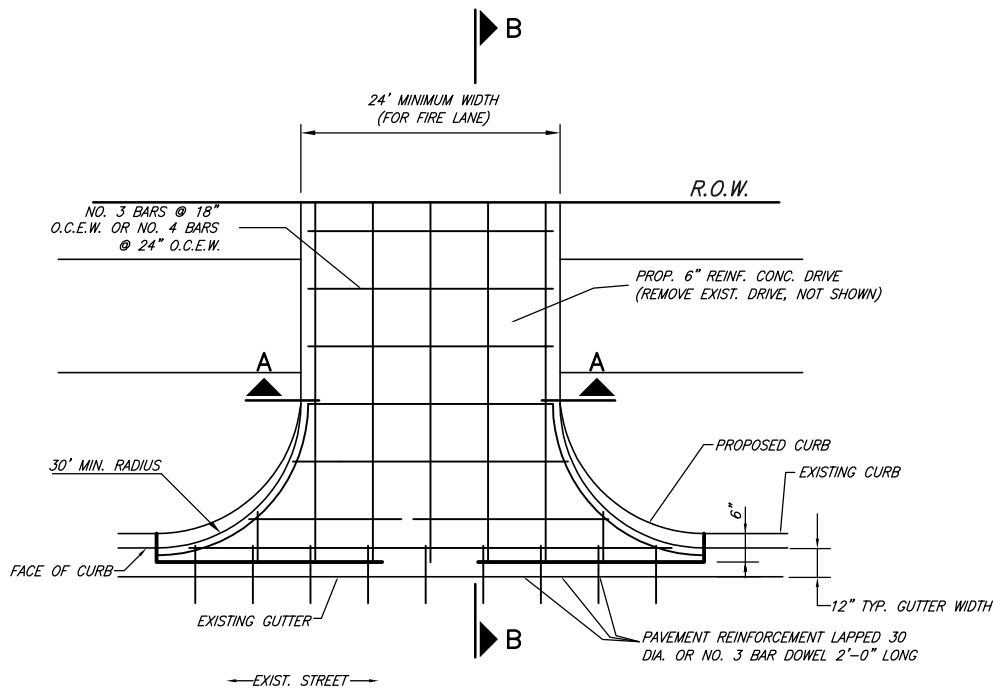
Minimum Thickness	Arterial	Collector	Local	Truck Lane	Fire Lane	Industrial
Pavement	10"	10"	8"	12"	8"	12"
Subgrade	8"	8"	8"	8"	8"	8"

DRIVEWAY RETURN SECTIONS

(DRIVEDTL)

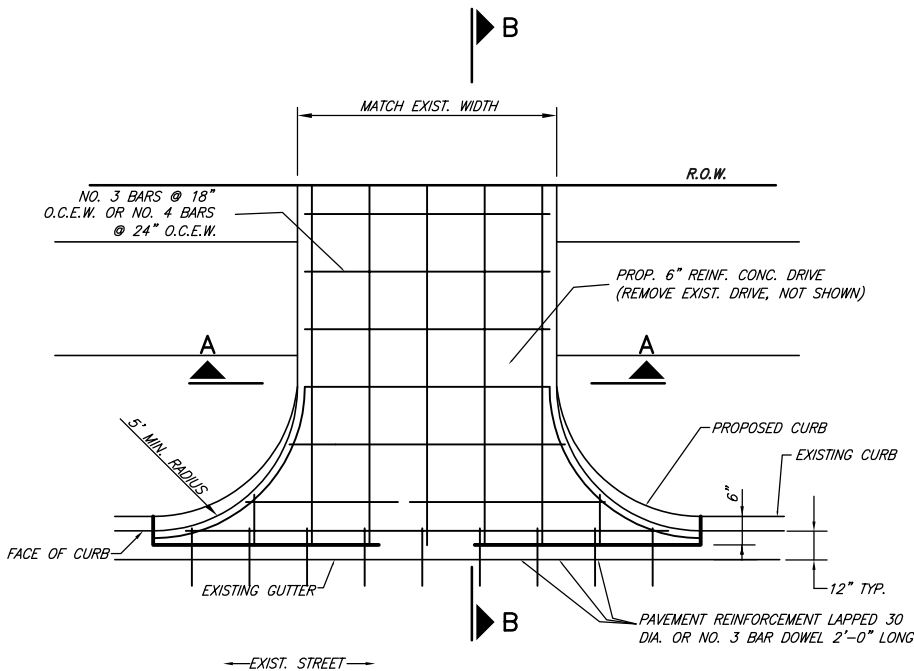
NOTES:

- 30' RADIUS SHALL BE WITHIN THE PROPERTY BOUNDARY LIMITS OTHERWISE ACCESS EASEMENT MUST BE OBTAINED FROM ADJACENT PROPERTY OWNER.
- FOR HEAVY INDUSTRIAL COMMERCIAL USE, PAVEMENT THICKNESS SHALL BE MINIMUM 12 INCHES.



COMMERCIAL TYPICAL DRIVE CONNECTION TO EXISTING CONCRETE STREET

(DRIVE_CON)



RESIDENTIAL TYPICAL DRIVE CONNECTION TO EXISTING CONCRETE STREET

(DRIVE_CON)



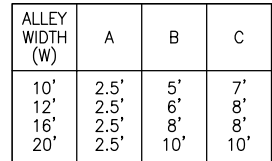
CITY OF AUBREY, TEXAS

STANDARD CONSTRUCTION DETAILS
PAVING / DRIVEWAYS

JULY, 2024

SHEET NO.

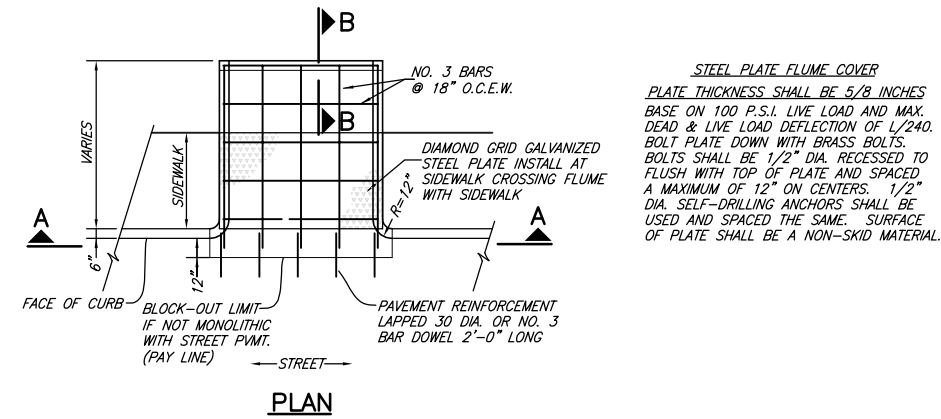
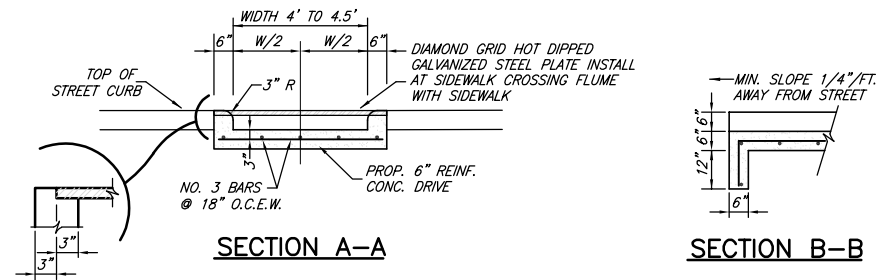
08



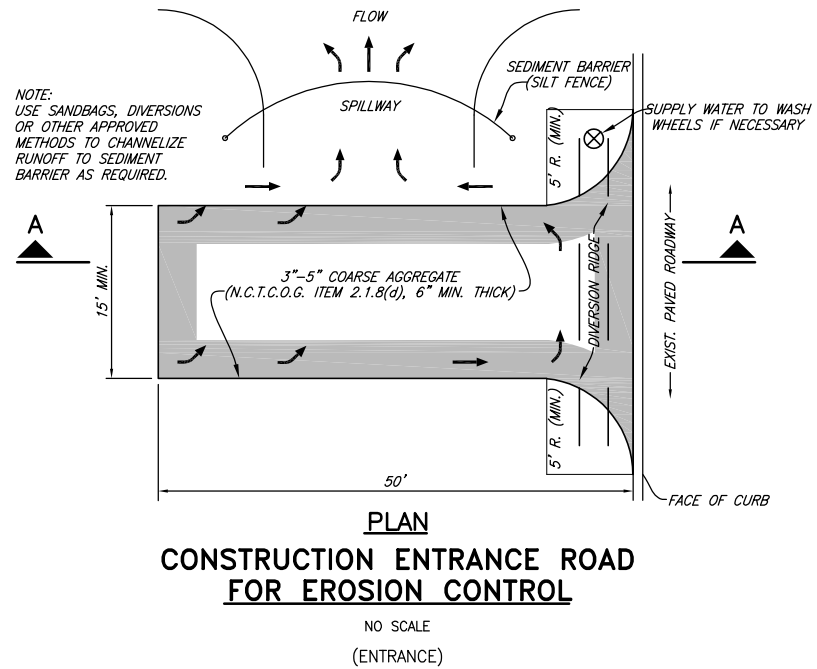
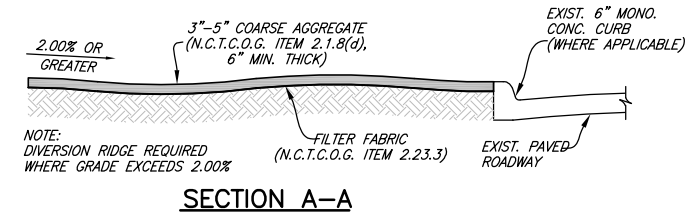
SECTION A-A
(ALLEY_SECA)



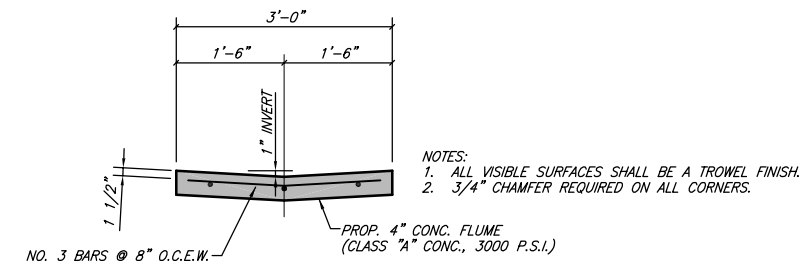
ALLEY INERSECTING ALLEY
(ALLEY_ALLEY)



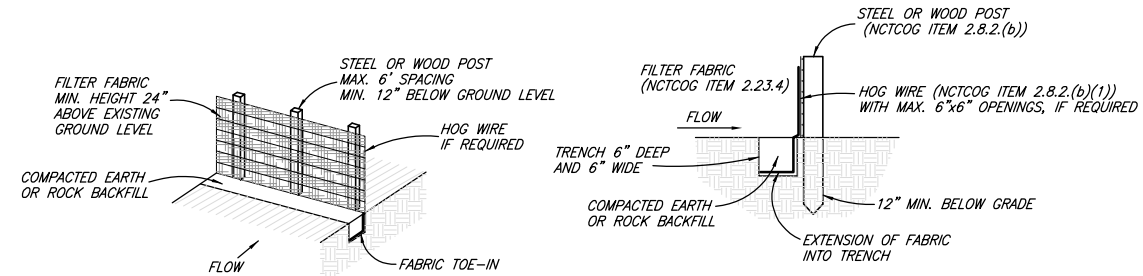
REINFORCED CONCRETE FLUME WITH CURBS
(FLUME)



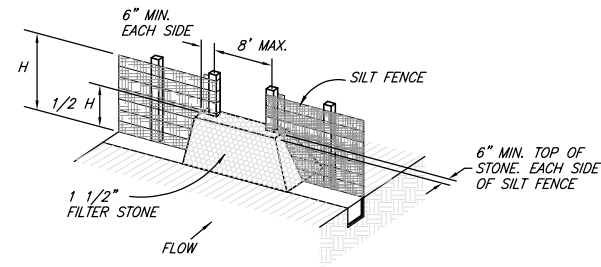
CONSTRUCTION ENTRANCE ROAD FOR EROSION CONTROL
NO SCALE
(ENTRANCE)



REINFORCED CONCRETE FLUME WITHOUT CURBS
(FLUMESEC)



SILT FENCE DETAIL

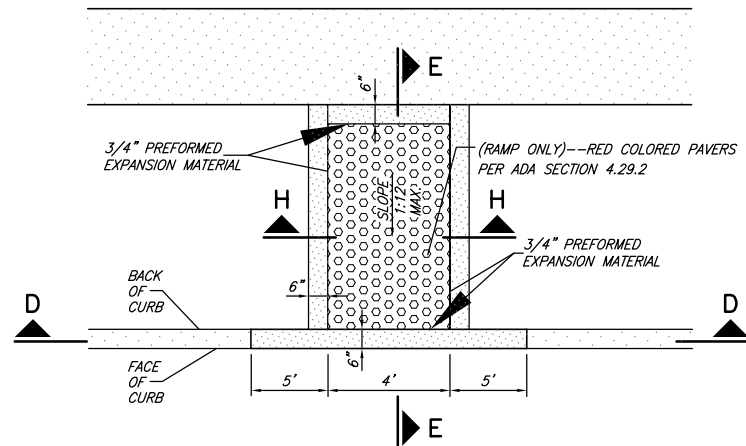


STONE OVERFLOW STRUCTURE
LOCATION AS CALLED FOR IN PLANS

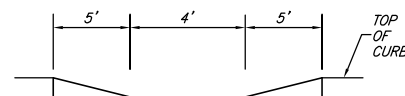
- NOTES:
- 1) THE CONTRACTOR SHALL INSPECT SILT FENCE WEEKLY AND AFTER MAJOR RAIN EVENTS TO ENSURE THAT THE DEVICE IS FUNCTIONING PROPERLY AND MAINTAIN IN ACCORDANCE WITH NCTCOG ITEM 3.12.
 - 2) THE CONTRACTOR SHALL REMOVE SEDIMENT FROM BEHIND FENCE WHEN THE DEPTH OF SEDIMENT HAS BUILT UP TO ONE-THIRD THE HEIGHT OF THE FENCE ABOVE GRADE.
 - 3) THE CONTRACTOR SHALL INSPECT THE BASE OF THE FENCE TO ENSURE THAT NO GAPS HAVE DEVELOPED AND RE-TRENCH AS NECESSARY.
 - 4) THE CONTRACTOR SHALL INSPECT FENCE POSTS TO ENSURE THAT THEY ARE PROPERLY SUPPORTING THE FENCE. IF NECESSARY, THE CONTRACTOR SHALL RESET AND ADD POSTS.
 - 5) IF FILTER FABRIC IS RIPPED, DAMAGED OR DETERIORATED, THE CONTRACTOR SHALL REPLACE IT IN ACCORDANCE WITH THE ORIGINAL SPECIFICATIONS AND DETAILS. (MAINTENANCE OF THE SILT FENCE SHALL BE AT THE CONTRACTOR'S OWN EXPENSE)

EROSION CONTROL
(SILT-DTL)

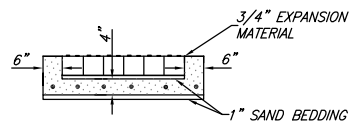
					CITY OF AUBREY, TEXAS		JULY, 2024	SHEET NO. 10
					STANDARD CONSTRUCTION DETAILS CONCRETE FLUME / EROSION CONTROL			



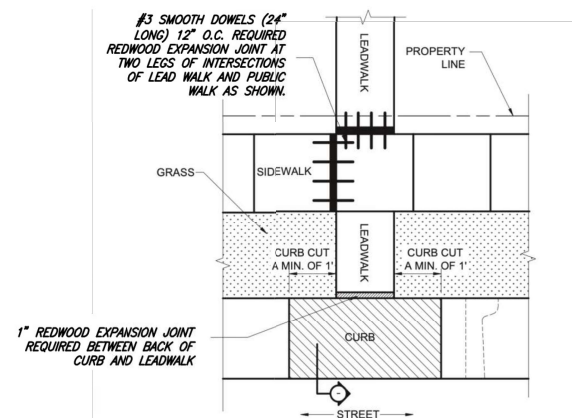
BARRIER FREE RAMP @ STRAIGHT CURB



SECTION D-D

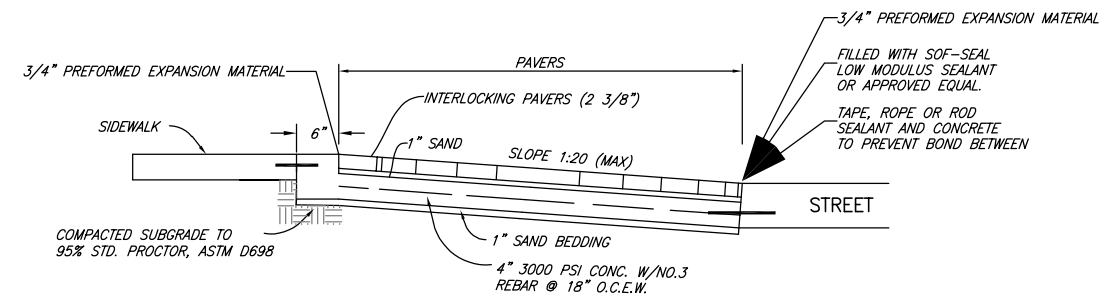


SECTION H-H



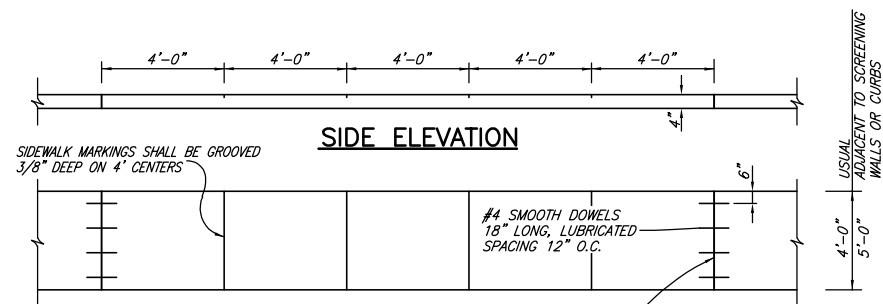
SIDEWALK CONNECTION

NOTE:
1. BARRIER FREE RAMP SHALL BE DIRECTIONAL TYPE.
2. REFER TO THE TxDOT PEDESTRIAN FACILITIES CURB RAMP DETAILS.



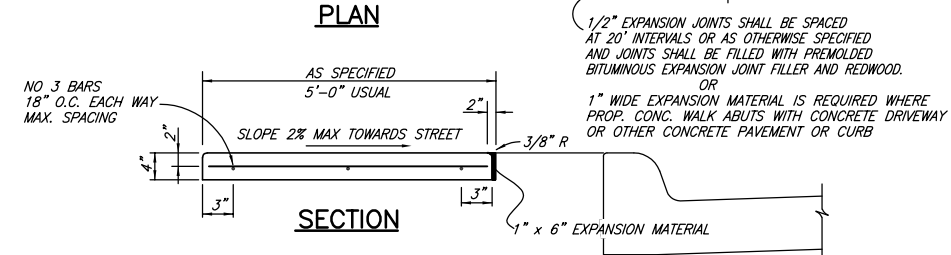
SECTION E-E

(BARRIER_FREE)



SIDE ELEVATION

PLAN



SECTION

REINFORCED CONCRETE SIDEWALK

(SIDEWALK)



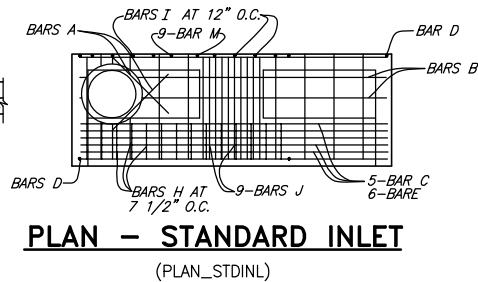
CITY OF AUBREY, TEXAS

**STANDARD CONSTRUCTION DETAILS
PAVING / SIDEWALKS**

JULY, 2024

SHEET NO.

11



SECTION C-C
(SECT_C-C)



SECTION E-E
(SECT_E-E)

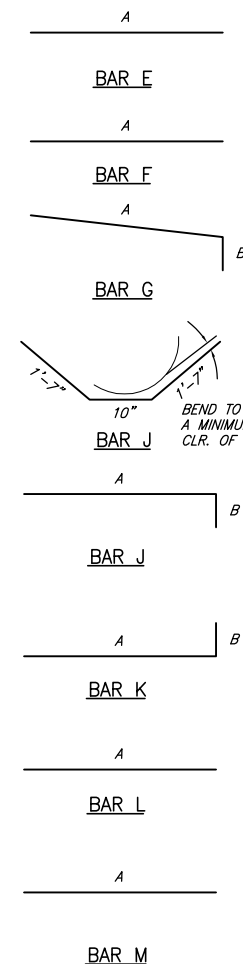
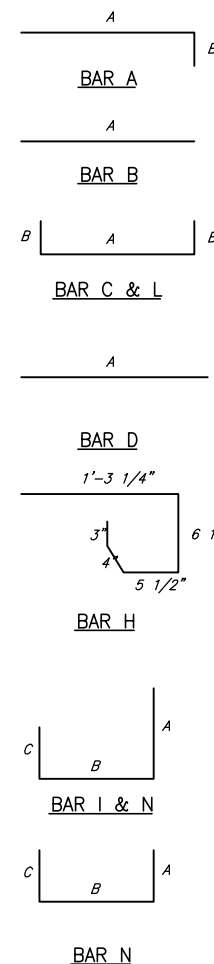


STORM DRAIN INLET COVER

BASS & HAYS, COVER PART# 30024C82LID,
FRAME PART# 28024R RING
(MH-COV4)



4, 6, 8 AND 10 FOOT INLETS



REINFORCING STEEL SCHEDULE

DIMENSIONS SHOWN ARE FOR MAXIMUM SIZE INLETS

INLET LENGTH	BAR TYPE	BAR DIA. (1/8 IN.)	NO. REQ'D	BAR DIMENSIONS		
				A	B	C
4	A	3	6	3'-2"	0'-3"	—
	B	3	1	2'-10"	—	—
	C	4	15	4'-8"	0'-6"	—
	D	4	5	4'-8"	—	—
	F	4	1	3'-2"	—	—
	G	3	5	2'-0"	1'-3"	—
	H	3	6	*	*	*
	N	3	3	3'-2"	3'-2"	3'-2"
6	A	3	9	3'-2"	0'-3"	—
	B	3	1	4'-10"	—	—
	C	4	15	6'-8"	0'-6"	—
	D	4	5	4'-8"	—	—
	F	4	1	3'-2"	—	—
	G	3	5	2'-0"	1'-3"	—
	H	3	9	*	*	*
	N	3	3	3'-2"	3'-2"	3'-2"
8	A	3	12	3'-2"	0'-3'	—
	B	4	1	6'-10"	—	—
	C	4	15	8'-8"	0'-6"	—
	D	4	5	4'-8"	—	—
	F	4	1	3'-2"	—	—
	G	3	5	2'-0'	1'-3"	—
	H	3	12	*	*	*
	N	3	3	3'-2"	3'-2"	3'-2"
10	A	3	13	3'-2"	0'-3'	—
	B	3	2	8'-10"	—	—
	C	4	16	10'-8"	0'-6"	—
	D	4	4	4'-8"	—	—
	E	5	6	10'-8"	—	—
	G	3	5	2'-0"	1'-3"	—
	H	3	14	*	*	*
	I	4	8	4'-8"	3'-2"	3'-2"
	L	4	5	4'-3"	—	—

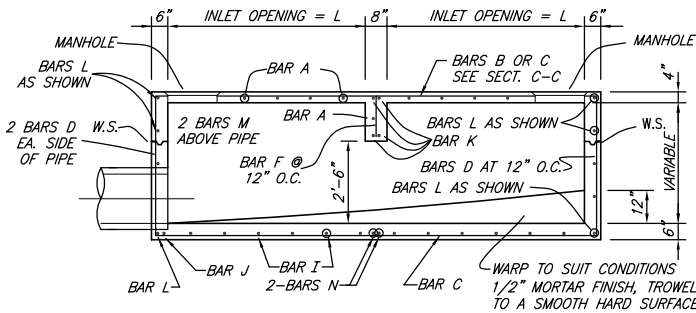
* SEE DIAGRAM FOR DIMENSIONS.
4', 6', 8' AND 10' INLETS

BAR DIAGRAMS

(BARDIAG)

NOTES:

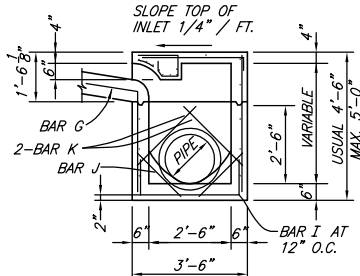
1. THE FLOOR OF THE EXCAVATION FOR INLET BOX MUST PROVIDE A FIRM, LEVEL BED FOR THE BASE SECTION TO REST UPON.
2. A MINIMUM OF 6 INCHES OF 1" DIAMETER (MAXIMUM) ROCK OR GRAVEL SHALL BE USED TO PREPARE THE BEDDING TO FINAL GRADE OR LIEU OF THIS, AT LEAST 6 INCHES OF 2-SACK CEMENT STABILIZED SAND SHALL BE USED TO PREPARE THE BEDDING TO GRADE. CEMENT STABILIZED-SAND SHALL BE ALLOWED TO SET BY KEEPING HOLE PUMPED DRY.
3. AFTER CASING HAS BEEN INSTALLED ON THE PROPER BEDDING, THE BACKFILL MATERIAL, WHICH IS FREE FLOWING AND CLEAR OF ROCKS, IN EXCESS OF 4" DIAMETER AND OTHER LUMPS WHICH WOULD PROHIBIT PROPER COMPACTION, SHALL BE COMMENCED IN LIFTS OF NO MORE THAN 18". THE MATERIAL USED FOR BACKFILL SHOULD BE A TYPE SUITABLE TO OBTAIN THE DENSITY REQUIREMENTS FOR THE SPECIFIC JOB.



SECTION A-A

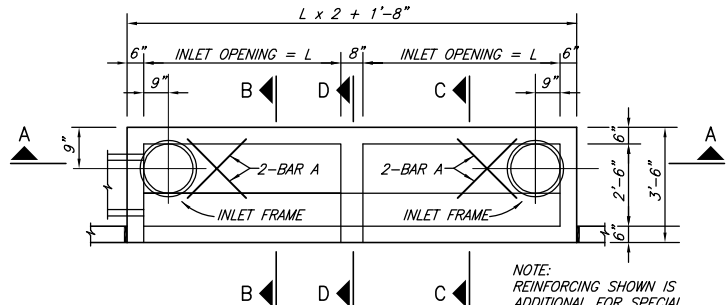
12, 14, 16 AND 20 FOOT INLETS

(SECT_A-A)



SECTION B-B

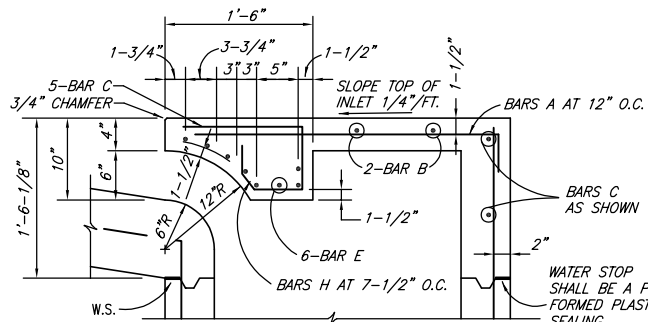
(SECT_B-B)



PLAN
20 FOOT INLETS

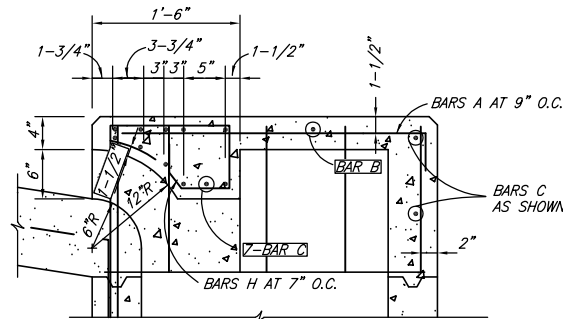
(PLAN_20)

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



SECTION C-C

(SECT_C-C)



SECTION D-D

(SECT_D-D)

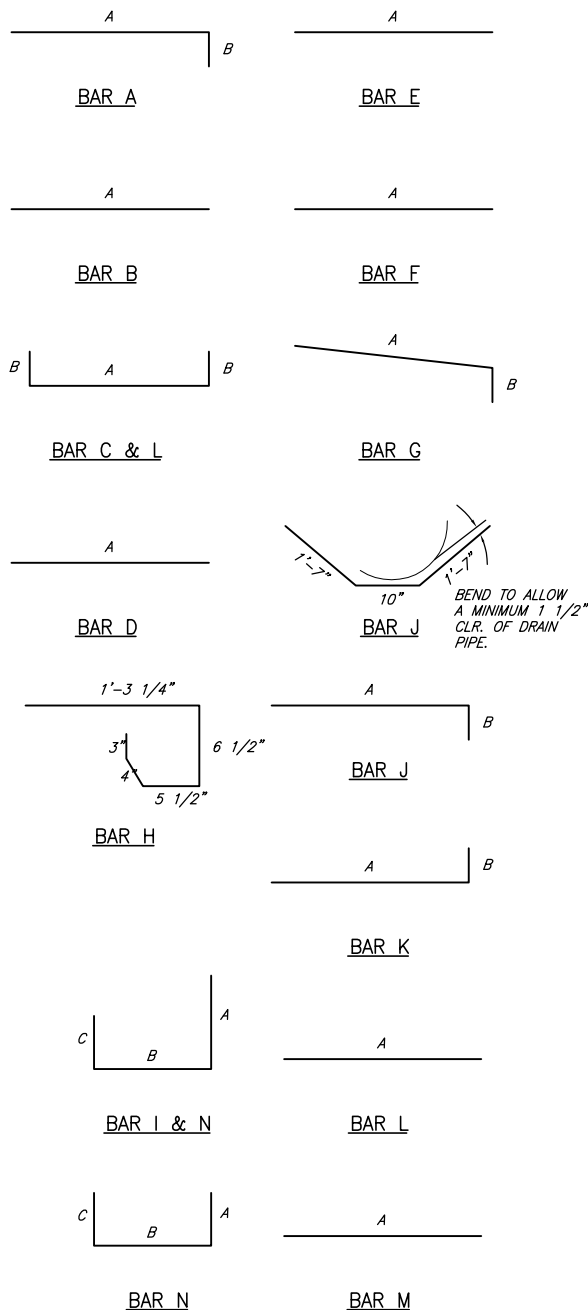
NOTE: FOR ADDITIONAL INFORMATION SEE SECTION C-C

DOUBLE INLETS
DIMENSIONS SHOWN ARE FOR MAXIMUM SIZE INLETS

INLET LENGTH	BAR TYPE	BAR DIA. (1/8 IN.)	NO. REQ'D	BAR DIMENSIONS		
				A	B	C
6 FT.	A	3	15	3'-2"	0'-6"	-
	B	3	2	11'-6"	-	-
	C	4	16	13'-4"	0'-6"	-
	D	4	9	4'-8"	-	-
	E	5	6	13'-4"	-	-
	F	4	5	1'-2"	-	-
	G	3	12	2'-0"	1'-3"	-
	H	3	26	*	*	*
	I	4	12	4'-8"	3'-2"	3'-2"
	J	5	1	*	*	*
	K	5	6	3'-2"	0'-6"	-
	L	4	11	3'-2"	0'-6"	-
	M	4	2	3'-0"	**	-
	N	4	2	4'-8"	3'-2"	4'-8"
7 FT.	A	3	17	3'-2"	0'-6"	-
	B	3	2	13'-6"	-	-
	C	4	16	15'-4"	0'-3'	-
	D	4	9	4'-8"	-	-
	E	5	6	15'-4"	-	-
	F	4	5	1'-2"	-	-
	G	3	15	2'-0"	1'-3"	-
	H	3	32	*	*	*
	I	4	14	4'-8"	3'-2"	3'-2"
	J	5	1	*	*	*
	K	5	6	3'-2"	0'-6"	-
	L	4	11	3'-2"	0'-6"	-
	M	4	2	3'-0"	**	-
	N	4	2	4'-8"	3'-2"	4'-8"
8 FT.	A	3	19	3'-2"	0'-6"	-
	B	3	2	15'-6"	-	-
	C	4	16	17'-4"	0'-6"	-
	D	4	9	4'-8"	-	-
	E	5	6	17'-4"	-	-
	F	4	5	1'-2"	-	-
	G	3	12	2'-0"	1'-3"	-
	H	3	26	*	*	*
	I	4	16	4'-8"	3'-2"	3'-2"
	J	5	1	*	*	*
	K	5	6	3'-2"	0'-6"	-
	L	4	11	3'-2"	0'-6"	-
	M	4	2	3'-0"	**	-
	N	4	2	4'-8"	3'-2"	4'-8"
10 FT.	A	3	23	3'-2"	0'-6"	-
	B	3	2	19'-6"	-	-
	C	4	16	21'-4"	0'-6"	-
	D	4	9	4'-8"	-	-
	E	5	6	21'-4"	-	-
	F	4	5	1'-2"	-	-
	G	3	15	2'-0"	1'-3"	-
	H	3	32	*	*	*
	I	4	20	4'-8"	3'-2"	3'-2"
	J	5	1	*	*	*
	K	5	6	3'-2"	0'-6"	-
	L	4	11	3'-2"	0'-6"	-
	M	4	2	3'-0"	**	-
	N	4	2	4'-8"	3'-2"	4'-8"

* SEE DIAGRAM FOR DIMENSIONS.
** FIELD CUT AS REQUIRED TO ACCOMMODATE DRAIN PIPE
16' AND 20' INLETS

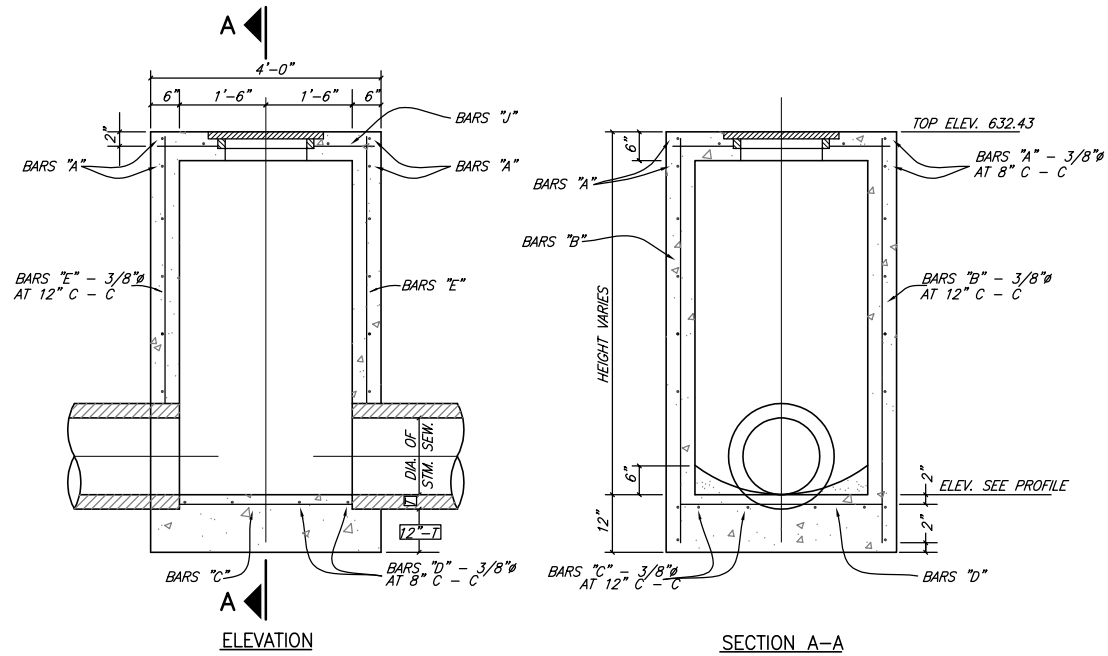
REINFORCING STEEL SCHEDULE



△ BEND TO ALLOW A MINIMUM 1 1/2" CIR. OF DRAIN PIPE
* SEE DIAGRAMS FOR DIMENSIONS
** FIELD CUT AS REQUIRED TO ACCOMMODATE DRAIN PIPE

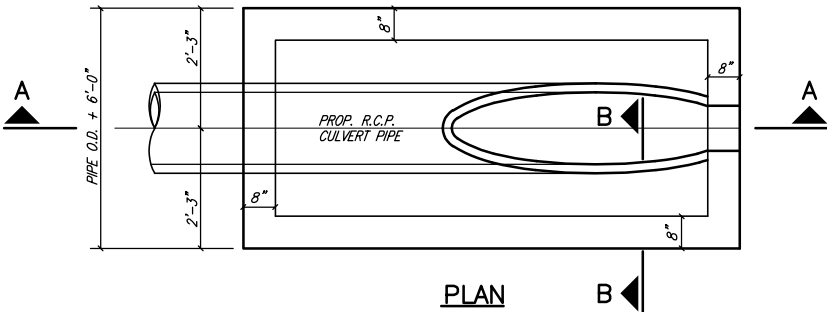
BAR BENDING DIAGRAMS

(BARLIST2)

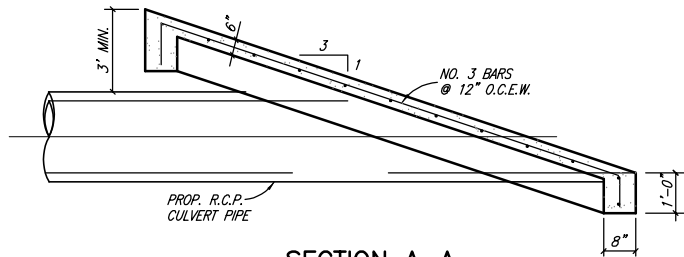


STORM SEWER TYPE A MANHOLE

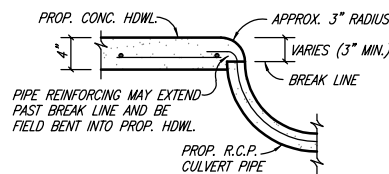
MAX. PIPE SIZE 30"
(TYPEAMH)



PLAN

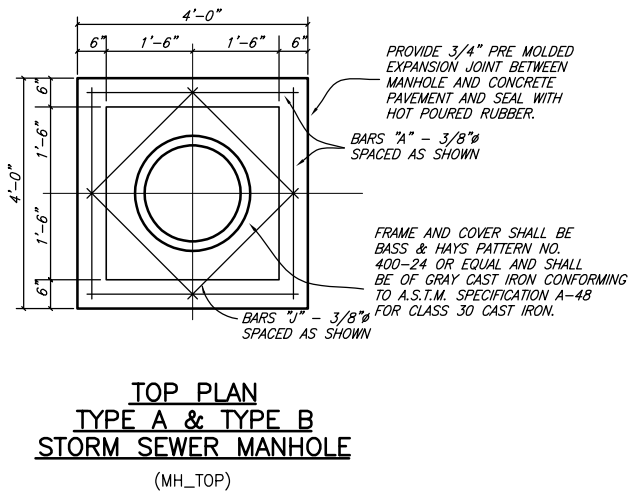


SECTION A-A



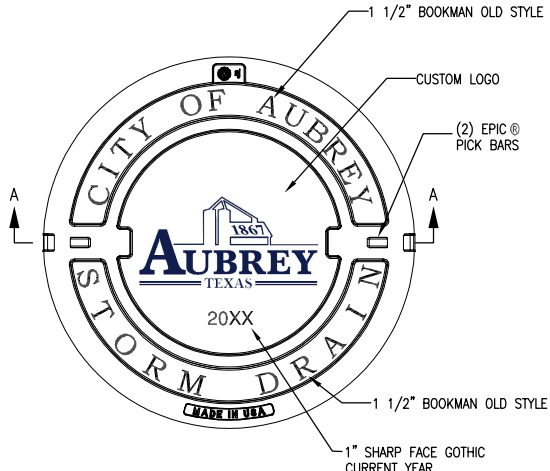
SECTION B-B

SLOPED CONCRETE HEADWALL

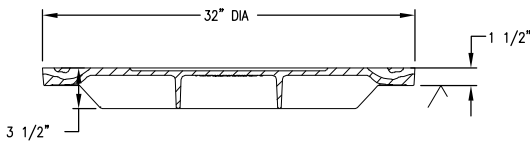


**TOP PLAN
TYPE A & TYPE B
STORM SEWER MANHOLE**

(MH_TOP)



PLAN OF STORM DRAIN COVER

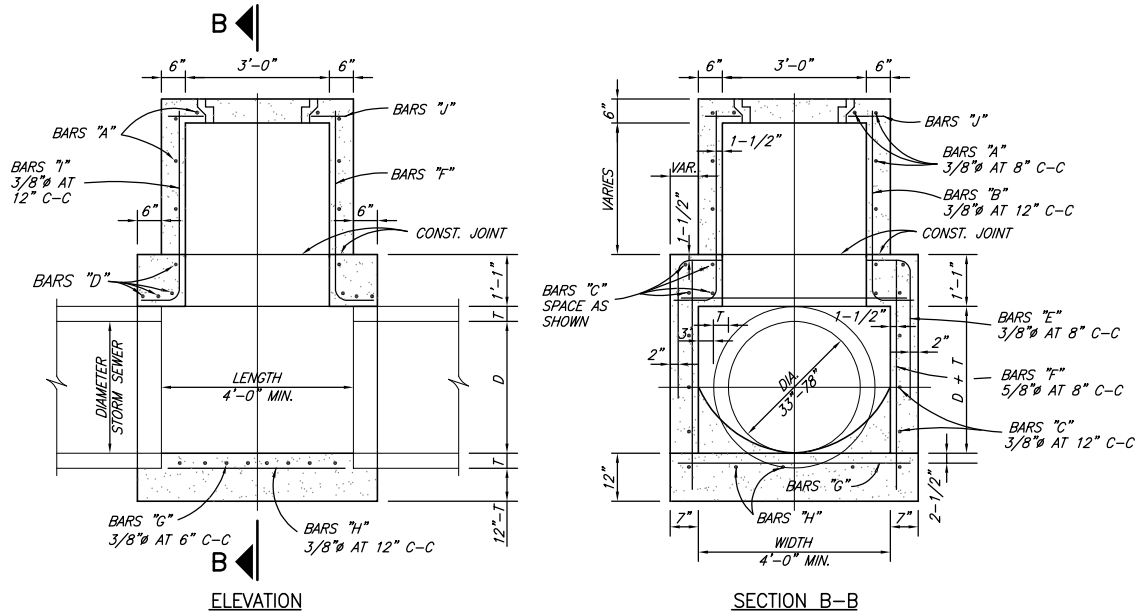


SECTION A-A OF COVER

STORM DRAIN INLET COVER

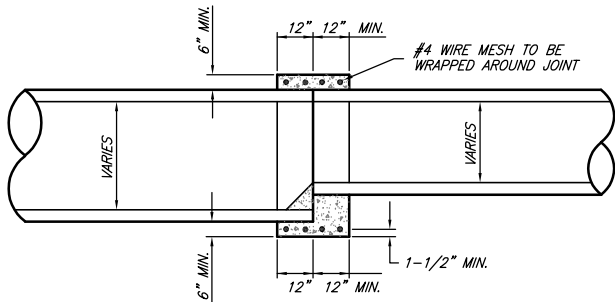
BASS & HAYS COVER, PART# VRM30-LID98
FRAME, PART# VRM30 RING

(MH-COV5)



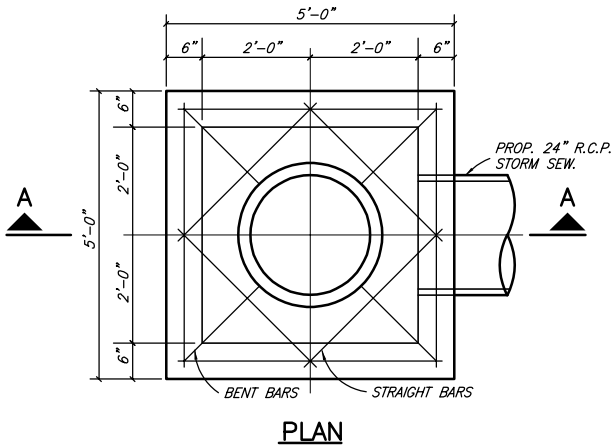
TYPE B STORM SEWER MANHOLE

MAX. PIPE SIZE 78"
(TYPEBMH)



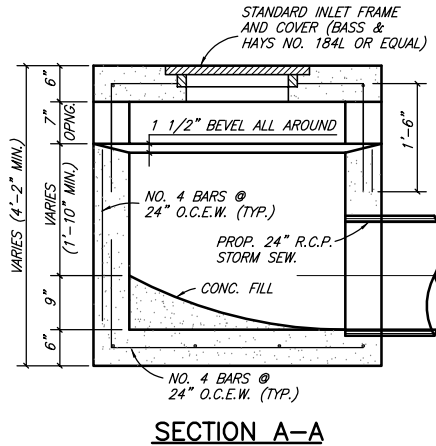
**DETAIL OF CONCRETE COLLAR
FOR R.C.P. OR R.C.A.P. CONNECTIONS**

INSIDE JOINT SHALL BE CONCRETE MORTAR
(CONCCOL)

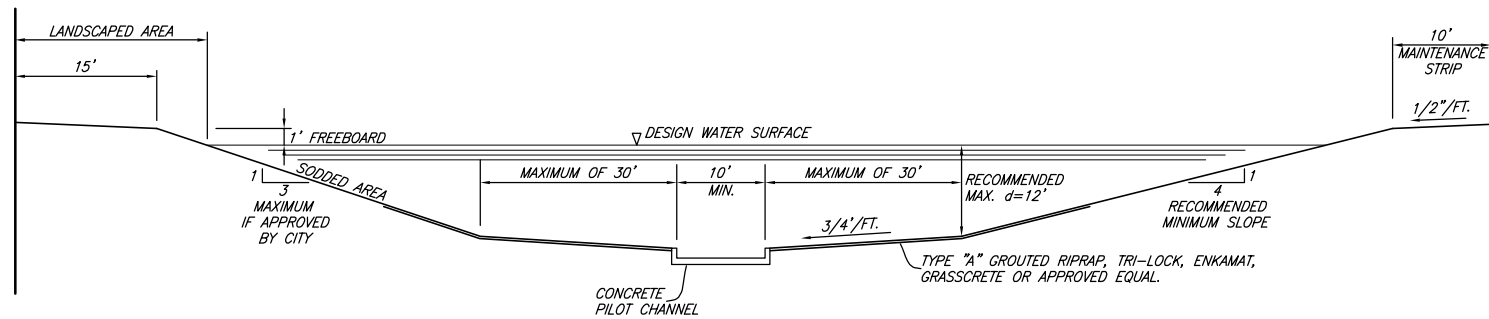


PLAN

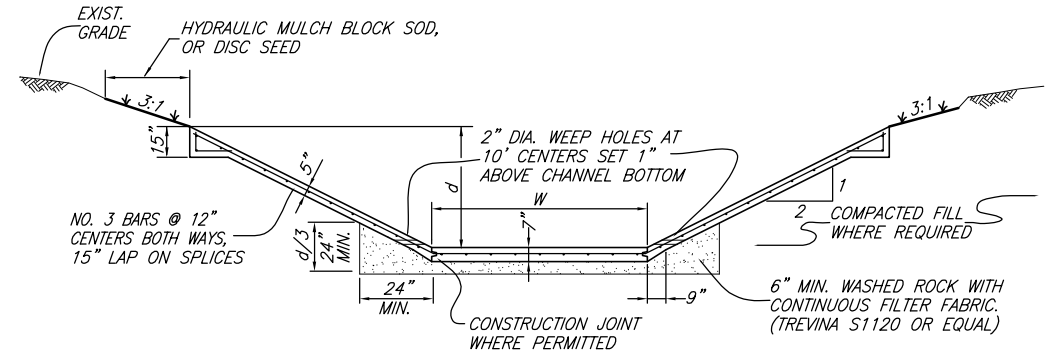
STANDARD DROP INLET



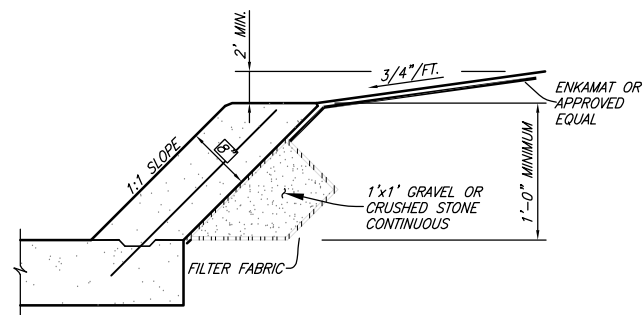
SECTION A-A



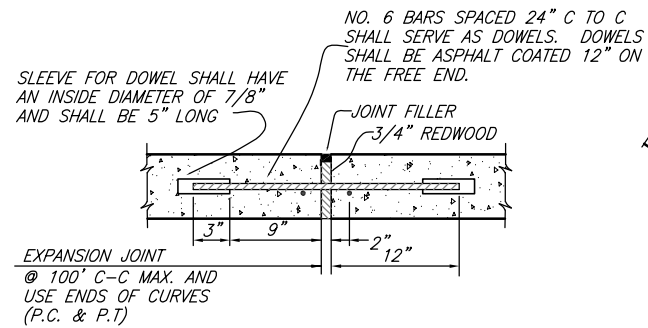
TYPICAL CHANNEL WITH REINFORCED CONCRETE LINED PILOT CHANNEL
(CHANNEL_SECT)



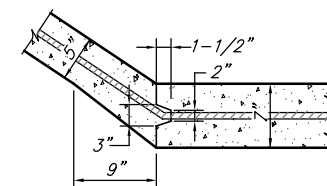
TYPICAL REINFORCED CONCRETE CHANNEL
(CHANNEL_CONC)



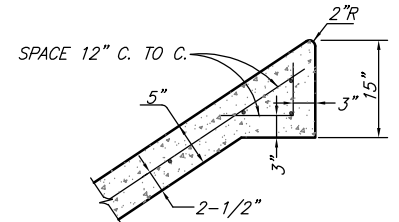
OPTIONAL (SLOPED WALL)



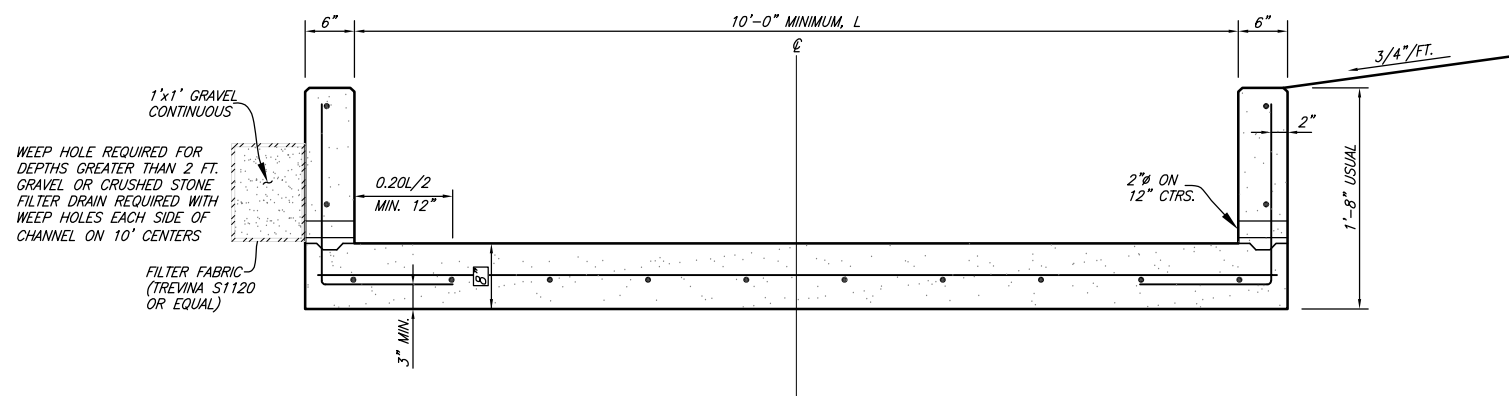
TRANSVERSE EXPANSION JOINT



**CONSTRUCTION JOINT
OPTIONAL
CONCRETE CHANNEL**
(CHANNEL_DTLS)



SLAB EDGE — DETAIL "A"

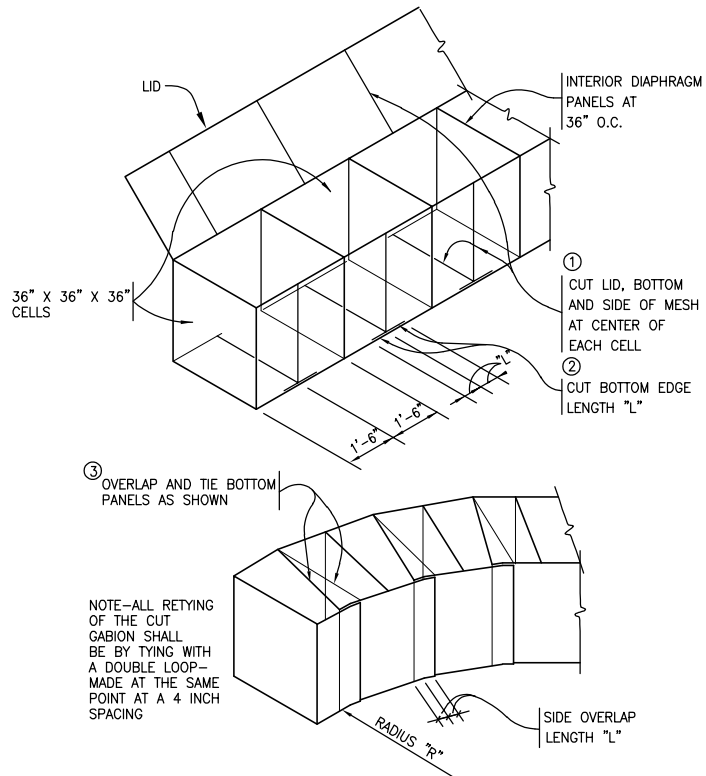


REINFORCED CONCRETE PILOT CHANNEL (VERTICAL WALL)
(CHANNEL_PILOT)

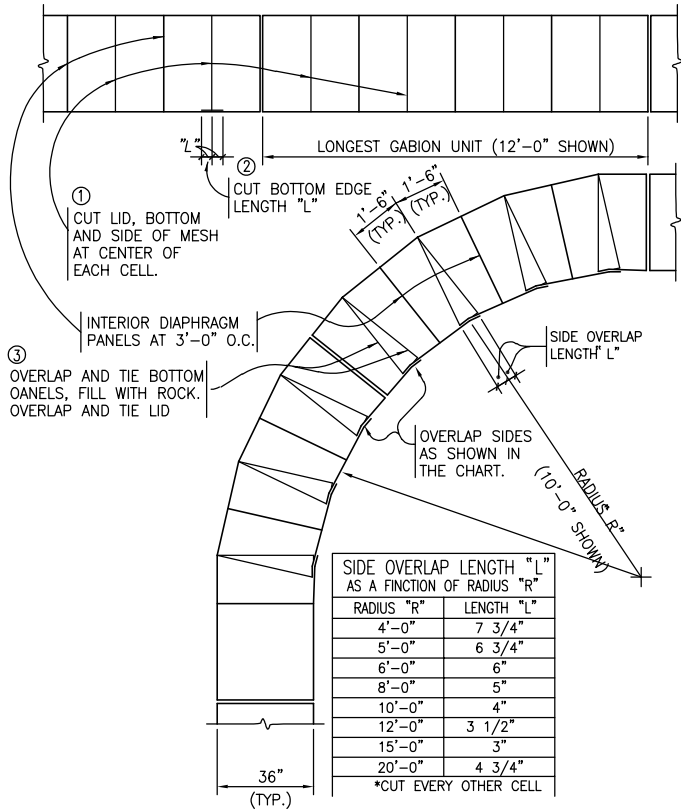
GENERAL NOTES FOR LINED CHANNELS

1. CONSTRUCTION JOINT SHOWN FOR CONVENIENCE ONLY, MONOLITHIC CONSTRUCTION MAY BE USED.
2. ALL VISIBLE SURFACES SHALL BE A TROWEL FINISH.
3. ALL REINFORCING STEEL SHALL BE 3/8" DIA. AND SPACED 12" CENTER TO CENTER BOTH WAYS UNLESS OTHERWISE SPECIFIED.
4. IF WOOD FORMS ARE USED WITH CONSTRUCTION JOINT, THEY SHALL BE TWO, 2"x4". AND SHALL NOT BE REMOVED UNTIL CONCRETE ON SLOPES IS READY TO BE PLACED.
5. ALL CONCRETE IN LINED CHANNEL SHALL BE NCTCOG CLASS "A" (MIN. 3000 P.S.I.) CONCRETE.
6. FLAT BOTTOM TO BE CONSTRUCTED WHEN CHANNEL WIDTH IS LESS THAN 12 FOOT.
7. 3/4" CHAMFER ON ALL CONCRETE CORNERS.
(GEN_CHANNELNOTE)

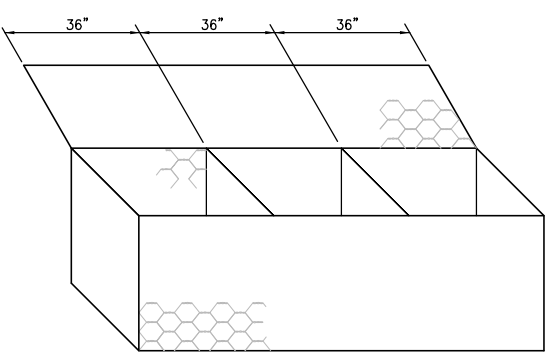
				CITY OF AUBREY, TEXAS STANDARD CONSTRUCTION DETAILS CHANNELS / CONCRETE	JULY, 2024	SHEET NO. 15
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GABION RADIUS PROCEDURE
(RADIUS1)

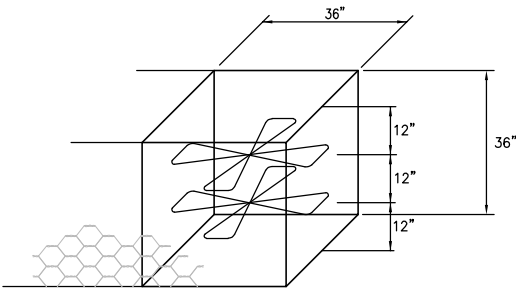


GABION RADIUS PROCEDURE

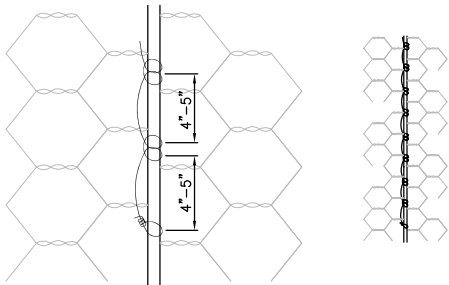


GABION CONTAINER
N.T.S.

NOTE:
GABION MAY BE CUT BUT SHALL BE RETIED
IN A MANNER TO PRODUCE A CLOSED CELL
AND ALL TIES SHALL BE IN CONFORMANCE
WITH DETAILS



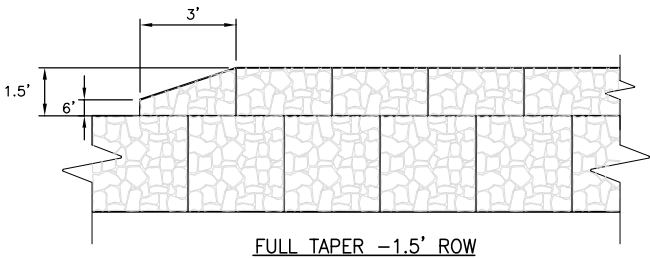
INNER TIE WIRE
N.T.S.



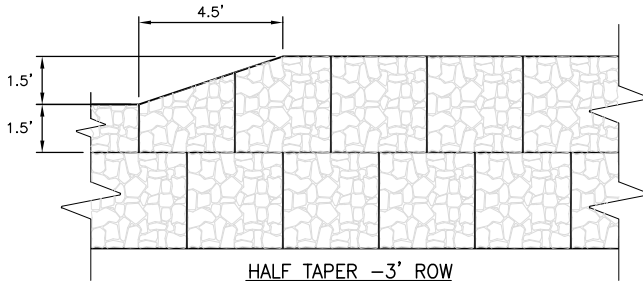
GABION TIE
N.T.S.

NOTE:
ALL TYING OF GABIONS SHALL BE AS SHOWN

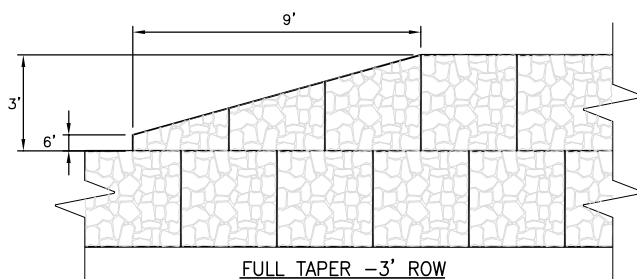
(GABION)



FULL TAPER -1.5' ROW

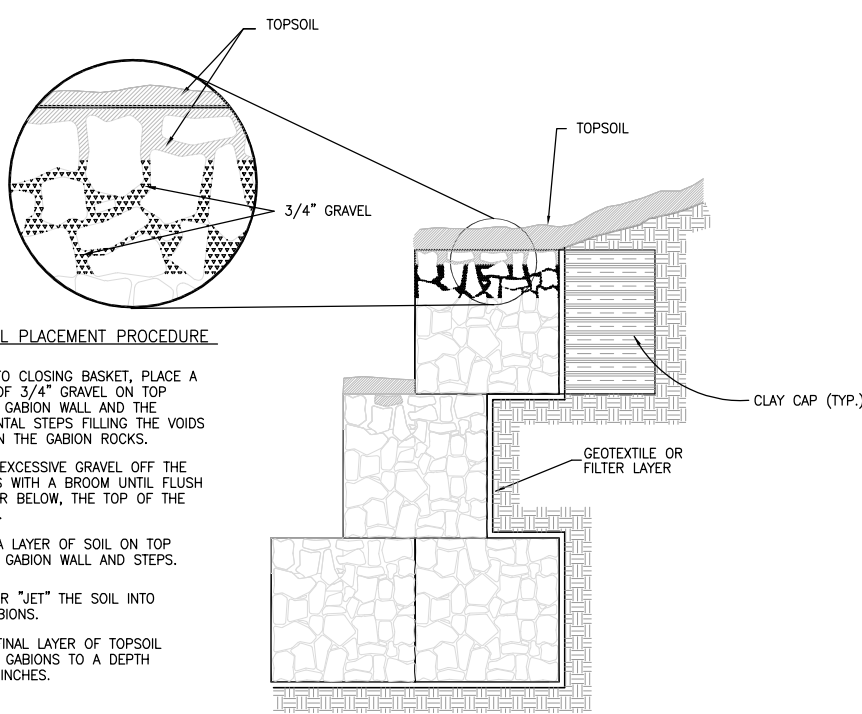


HALF TAPER -3' ROW



FULL TAPER -3' ROW
(WALL-T1)

TAPERED WALL HEIGHT TRANSITION



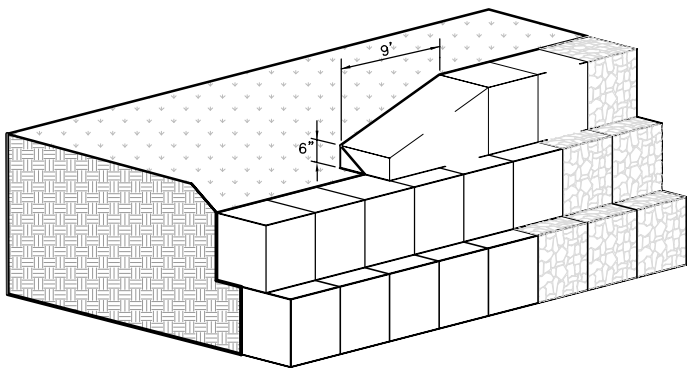
TOPSOIL PLACEMENT PROCEDURE

1. PRIOR TO CLOSING BASKET, PLACE A LAYER OF 3/4\"
2. SWEEP EXCESSIVE GRAVEL OFF THE GABIONS WITH A BROOM UNTIL FLUSH WITH, OR BELOW, THE TOP OF THE GABION..
3. PLACE A LAYER OF SOIL ON TOP OF THE GABION WALL AND STEPS.
4. WASH OR "JET" THE SOIL INTO THE GABIONS.
5. PLACE FINAL LAYER OF TOPSOIL ON THE GABIONS TO A DEPTH OF SIX INCHES.

NOTE:
DO NOT USE SHARP TOOLS WHEN SPREADING TOPSOIL ON GABIONS

SECTION

**VEGETATED GABION WALL
TOPSOIL PLACEMENT**
(VEG-WALL)



**STANDARD TAPER
FOR WALL HEIGHT TRANSITIONS**
(TAPER-1)

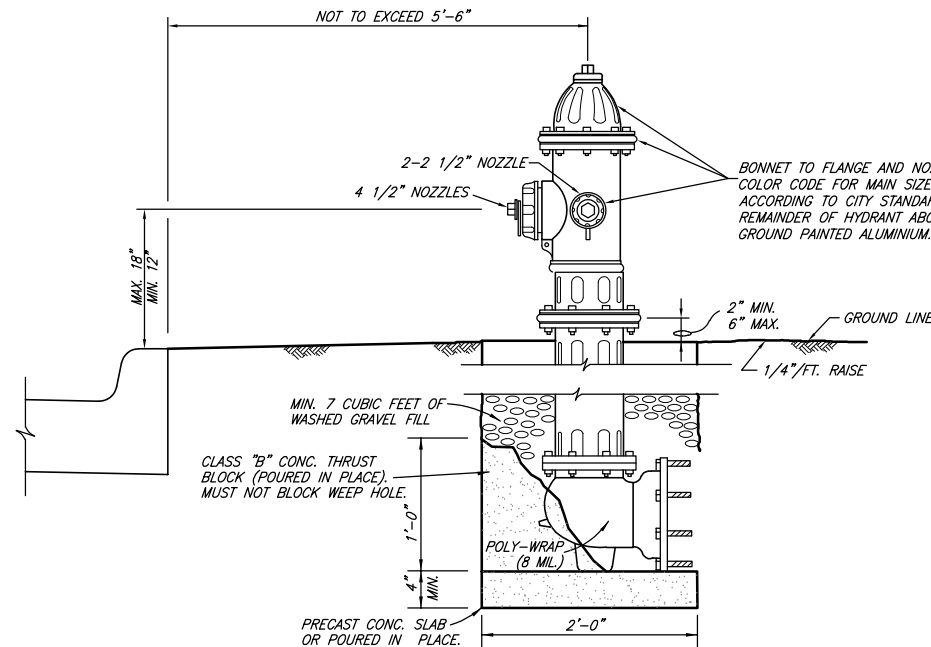


CITY OF AUBREY, TEXAS
STANDARD CONSTRUCTION DETAILS
CHANNELS / GABIONS

JULY, 2024

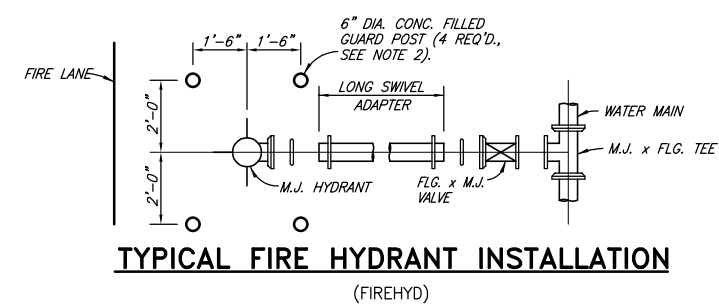
SHEET NO.

16

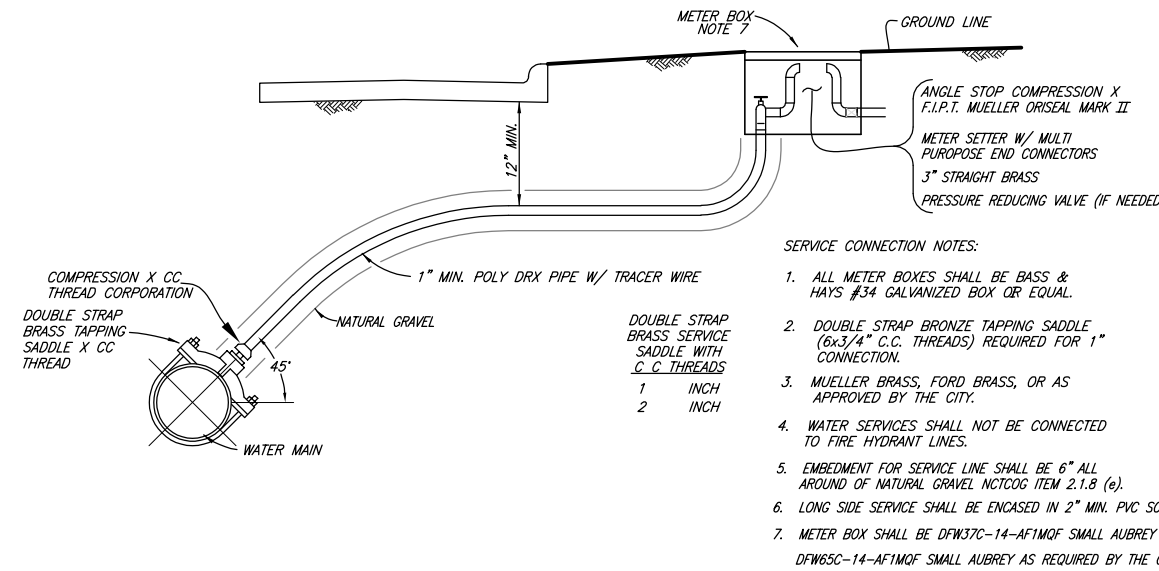


- FIRE HYDRANT NOTES:**
1. IN GENERAL ALL FIRE HYDRANTS SHALL CONFORM TO AWWA STANDARDS SPECIFICATIONS FOR FIRE HYDRANTS FOR ORDINARY WATER WORKS SERVICE FOR WATER IMPROVEMENTS. FIRE HYDRANTS SHALL HAVE A 5-1/4" MINIMUM VALVE OPENING AND WITH A BARREL APPROXIMATELY 7" INSIDE DIAMETER. ALL HYDRANTS SHALL BE EQUIPPED WITH A BREAKAWAY FLANGE. ALL HYDRANTS SHALL BE APPROVED BY THE CITY, M&H, MUELLER, OR CLOW WITH 5" STORZ CONNECTOR, PRIMERED BONNET AND CAP. STORZ SHALL BE PROVIDED BY THE MANUFACTURER.
 2. GUARD POSTS SHALL BE 6 L.F. OF 6" DIA. STEEL PIPE (3' ABOVE & BELOW GROUND LEVEL). POST SHALL BE ENCASED IN 16" DIA. CONC. PIER TO A DEPTH OF 12" BELOW POST BOTTOM. REINF. CONC. PIER WITH 2 NO. 6 BARS (12" LONG) THRU POST INTO PIER. POST ABOVE GROUND LEVEL SHALL BE PAINTED ALUMINUM WITH 2-2 INCH BANDS OF RED AND WHITE REFLECTIVE TAPE.
 3. **BONNET COLOR**

WATER MAIN CAP	COLOR
LESS THAN 500 G.P.M.	RED
500-999 G.P.M.	ORANGE
1,000-1,499 G.P.M.	GREEN
1,500 & GREATER G.P.M.	BLUE

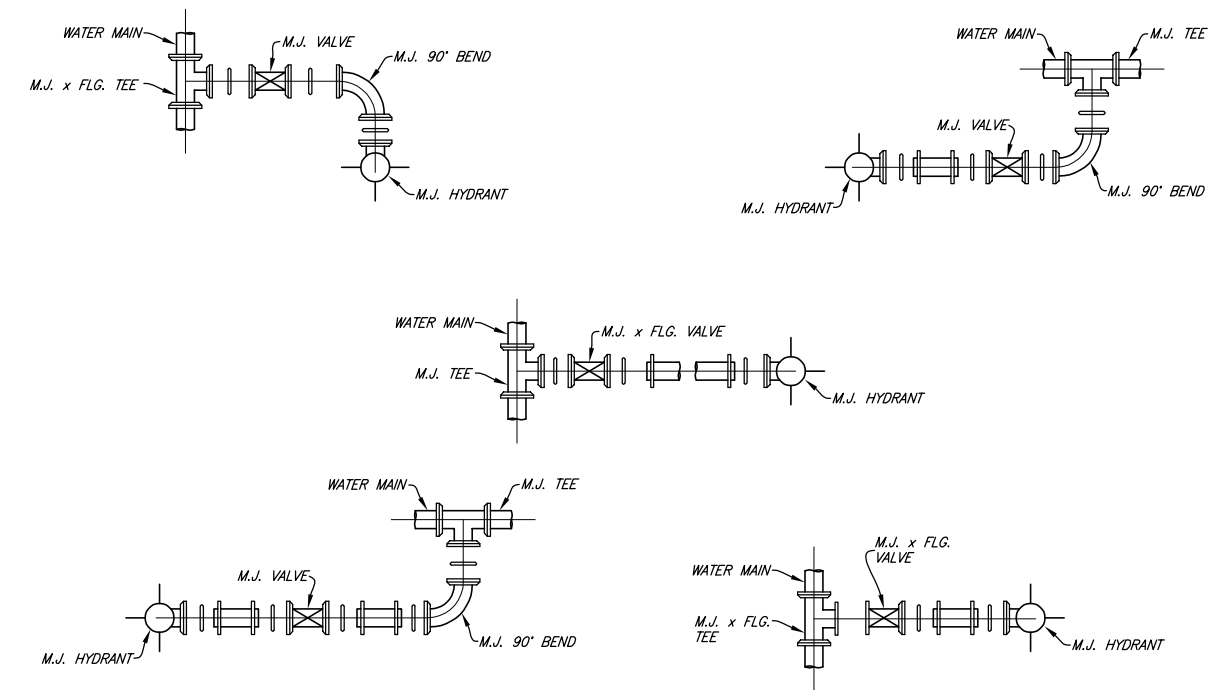


TYPICAL FIRE HYDRANT INSTALLATION
(FIREHYD)

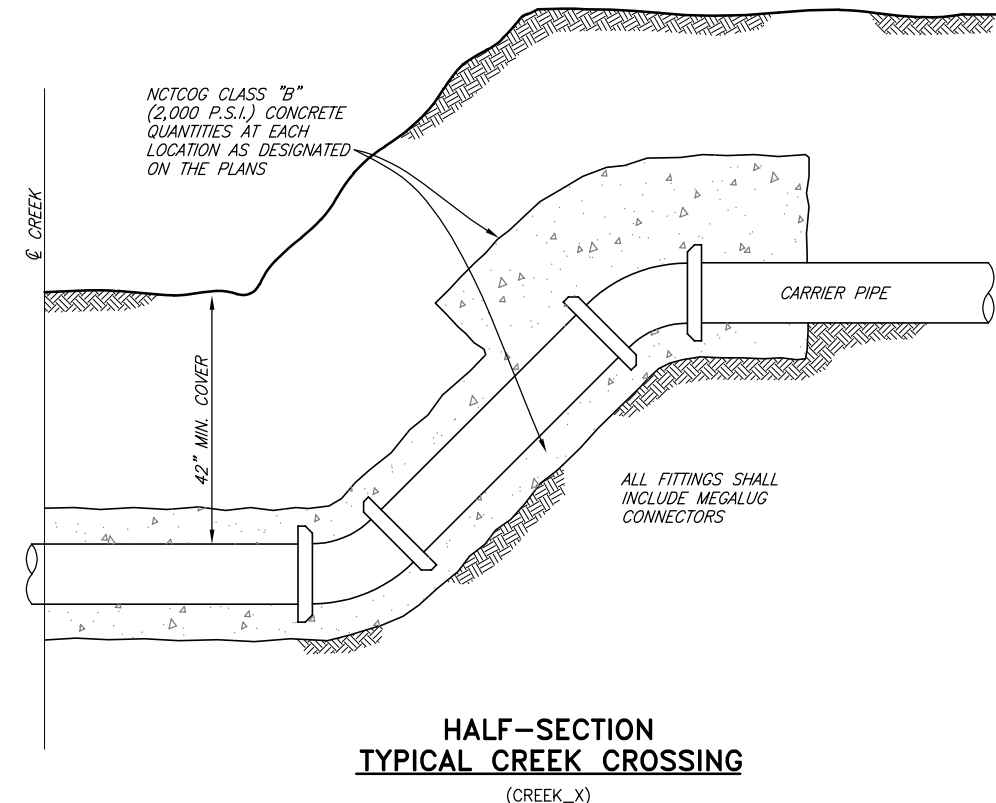


TYPICAL SERVICE CONNECTION WITH METER BOX
(WATERSVC)

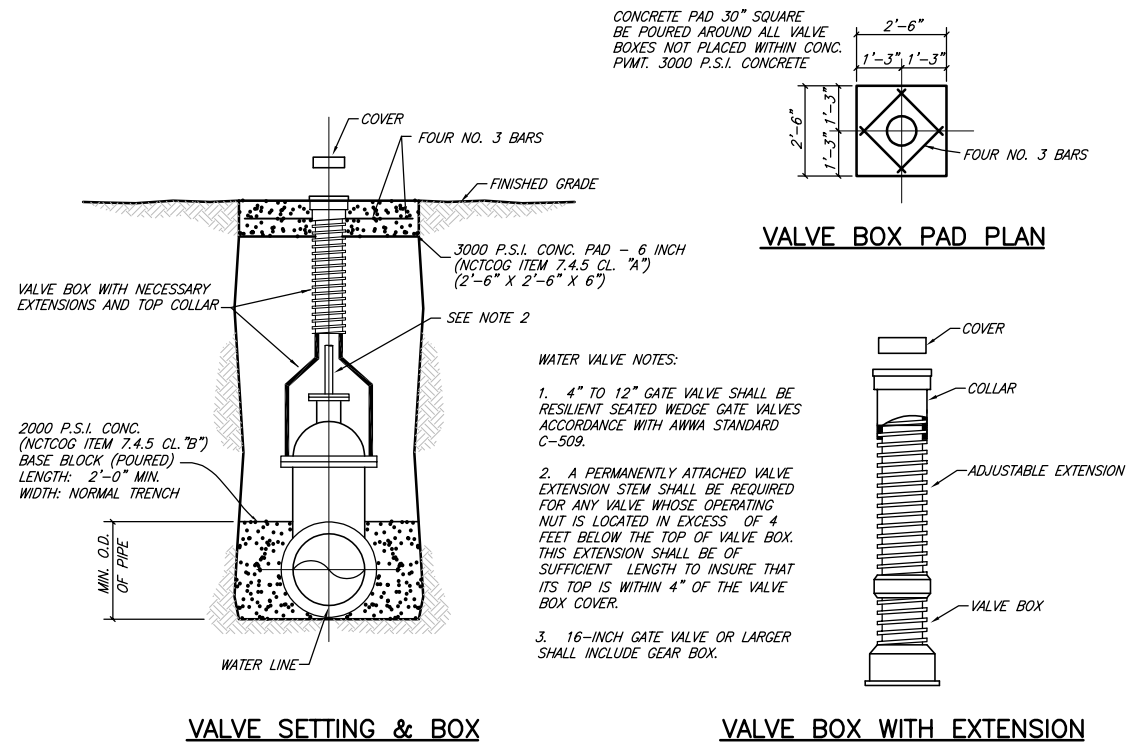
- SERVICE CONNECTION NOTES:**
1. ALL METER BOXES SHALL BE BASS & HAYS #34 GALVANIZED BOX OR EQUAL.
 2. DOUBLE STRAP BRONZE TAPPING SADDLE (6x3/4" C.C. THREADS) REQUIRED FOR 1" CONNECTION.
 3. MUELLER BRASS, FORD BRASS, OR AS APPROVED BY THE CITY.
 4. WATER SERVICES SHALL NOT BE CONNECTED TO FIRE HYDRANT LINES.
 5. EMBEDMENT FOR SERVICE LINE SHALL BE 6" ALL AROUND OF NATURAL GRAVEL NCTCOG ITEM 2.1.8 (e).
 6. LONG SIDE SERVICE SHALL BE ENCASED IN 2" MIN. PVC SCH. 40 PIPE.
 7. METER BOX SHALL BE DFW37C-14-AF1M0F SMALL AUBREY, OR DFW65C-14-AF1M0F SMALL AUBREY AS REQUIRED BY THE CITY.



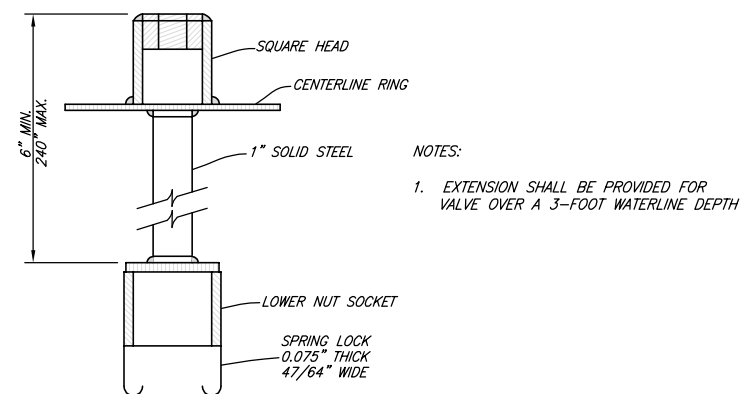
TYPICAL FIRE HYDRANT INSTALLATION PLANS
(FH-PLANS)



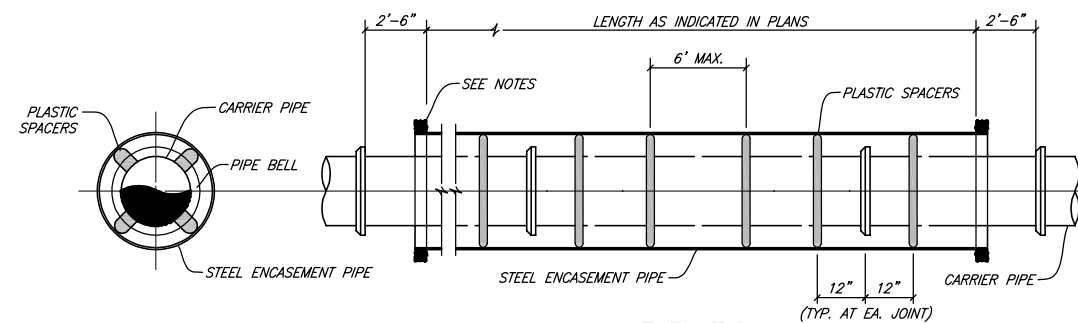
HALF-SECTION TYPICAL CREEK CROSSING
(CREEK_X)



GATE VALVE INSTALLATION
(YARDVLV)



SPRING LOCK VALVE EXTENSION
(LOCK)

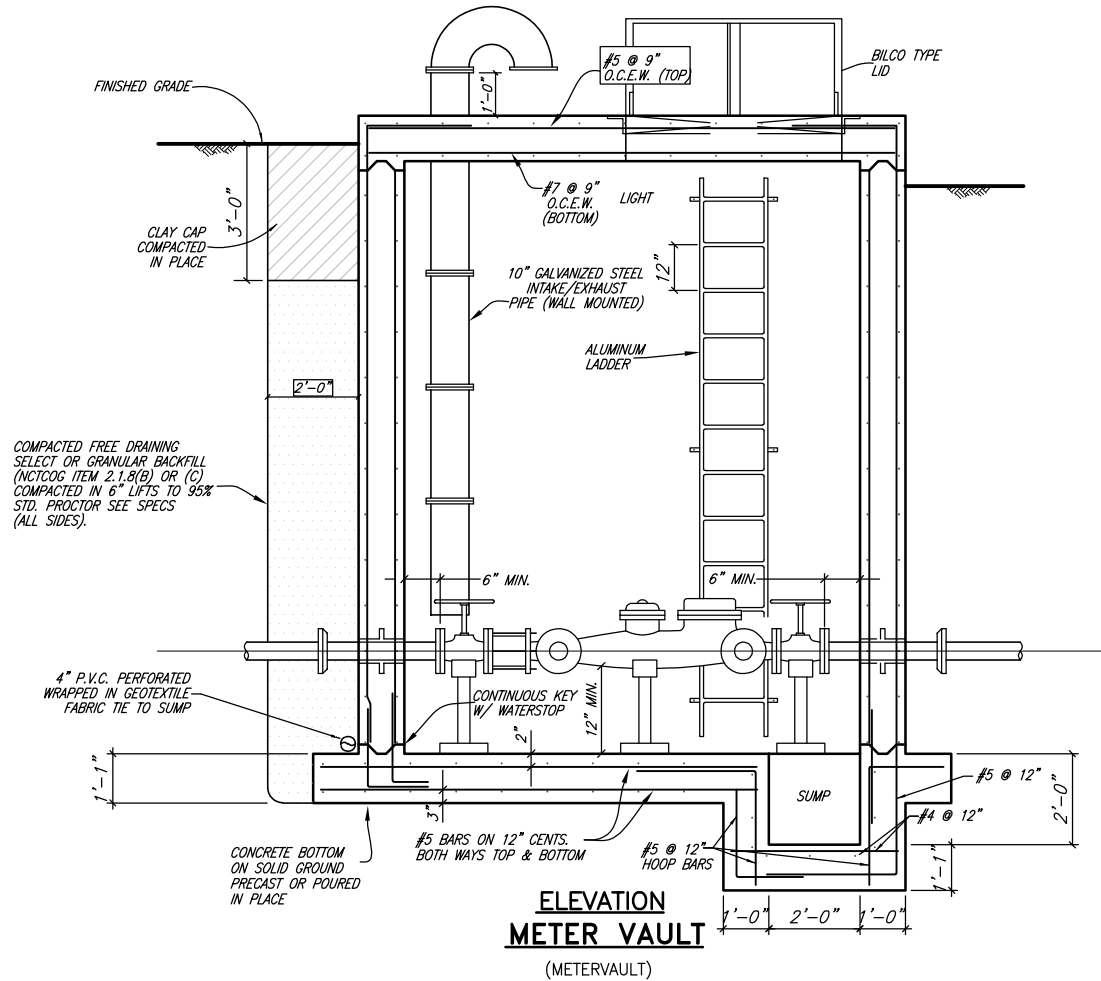
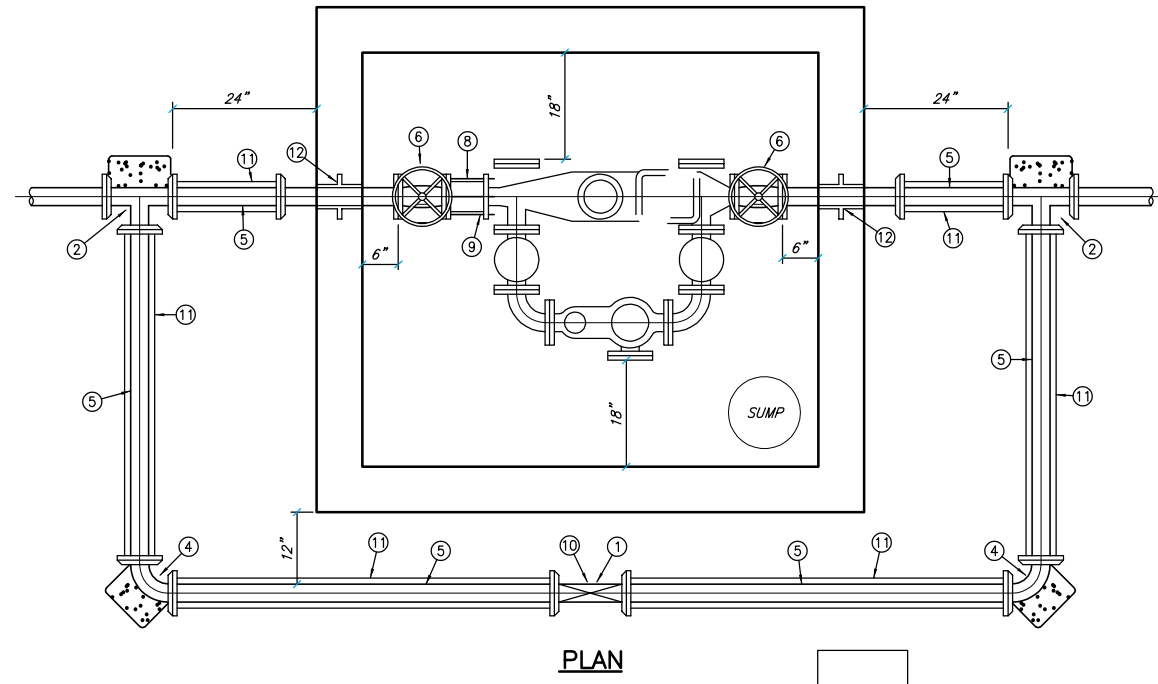


ENCASED ROAD BORE
NO SCALE

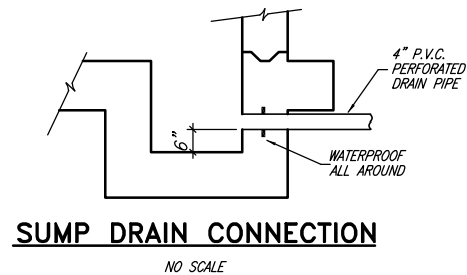
- NOTES:**
- 1) PREFABRICATED PLASTIC SPACERS MUST BE APPROVED BY THE OWNER.
 - 2) CONTRACTOR SHALL PROVIDE SUPPORT UNDER CARRIER PIPE TO HAVE MIN. 1" CLEARANCE BETWEEN PIPE BELL AND ENCASEMENT PIPE.
 - 3) ENDS OF ENCASEMENT PIPE SHALL BE PLUGGED WITH BRICK AND MORTAR FOR ROADWAY CROSSINGS. PLUGS SHALL BE CONSTRUCTED WITH A WEEP HOLE.

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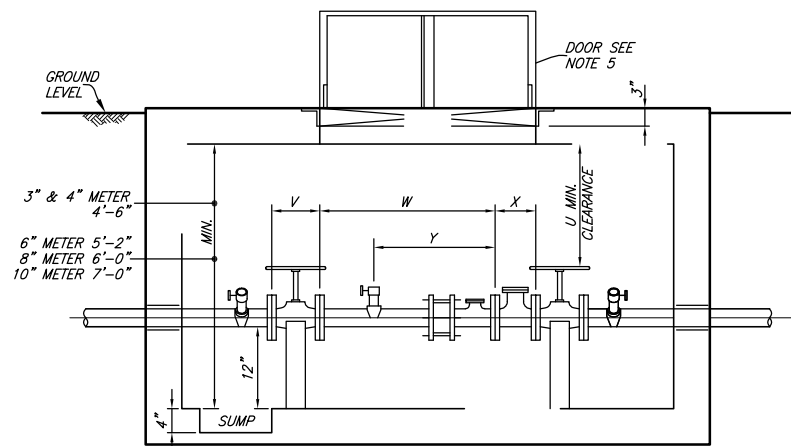
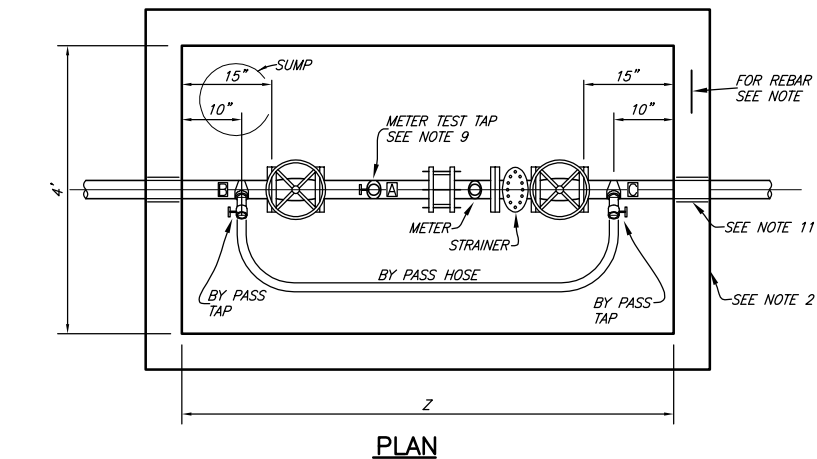
- LEGEND**
- ① GATE VALVE - M.J. & M.J.
 - ② D.I. TEE - M.J., M.J., M.J.
 - ④ D.I. 90° BEND - M.J. & M.J.
 - ⑤ D.I. PIPE - P.E. & P.E.
 - ⑥ O.S. & Y. VALVE - FLG. & FLG.
 - ⑧ FLANGED COUPLING ADAPTER
 - ⑨ D.I. PIPE - FLG. & P.E. NIPPLE
 - ⑩ VALVE COUVERS & LIDS
 - ⑪ ANCHORING RODS
 - ⑫ WALL SLEEVE - FLG. & M.J.



- METER VAULT & BY-PASS SPECIFICATIONS**
1. NOTIFY THE UTILITY OPERATIONS DEPARTMENT PRIOR TO CONSTRUCTION OF METER VAULT OR BY-PASS ASSEMBLY.
 2. THE METER VAULT CAN BE EITHER POURED IN PLACE OR PRE-CAST. ALL WALLS, EITHER POURED IN PLACE OR PRE-CAST, SHALL BE MONOLITHIC POUR. NO SEAMS OR EXTENSIONS WILL BE ALLOWED. CONCRETE SHALL BE 6" THICK-3,000 P.S.I., REINFORCED WITH #5 STEEL BARS ON 12" CENTERS EACH WAY, ON POURED IN PLACE VAULTS. PRE-CAST VAULTS SHALL BE 4" THICK-4,500 P.S.I. CONCRETE, REINFORCED WITH #5 STEEL BARS ON 8" CENTERS BOTH WAYS. THESE ARE MINIMUM SPECIFICATIONS.
 3. THE BOTTOM OF THE VAULT SHALL BE 6" THICK-3,000 P.S.I. CONCRETE, REINFORCED WITH #5 STEEL BARS ON 12" CENTERS BOTH WAYS. A 4" DEEP x 12" DIAMETER SUMP SHALL BE INSTALLED TO ONE SIDE AND IN EITHER CORNER OF THE BOTTOM OF THE SLAB. A 4" CUSHION OF SAND SHALL BE INSTALLED UNDER THE SLAB. IF A PRE-FABRICATED VAULT IS TO BE USED, A LAYER OF RAM-NEX SHALL BE INSTALLED BETWEEN THE WALLS AND BOTTOM SLAB.
 4. THE VAULT SHALL NOT BE INSTALLED IN ANY DRIVE OF PARKING AREA AND MUST BE LOCATED IN A UTILITY EASEMENT DEDICATED TO THE CITY. ALL PIPING INSIDE THE VAULT AND THE VAULT ITSELF MUST BE INSPECTED AND APPROVED BY THE UTILITY OPERATIONS DEPARTMENT.
 5. THE VAULT LID SHALL BE BILCO TYPE Q-4AL LEAF DESIGN LID. ANGLE FRAME IS 1/4" STEEL WITH STRAP ANCHORS BOLTED TO THE EXTERIOR. THE LEAF IS 1/4" STEEL DIAMOND PATTERN PLATE, PIVOTING ON TORSION BARS FOR EASY OPERATIONS. THE MINIMUM LIVE LOAD CAPACITY IS 150 LBS. PER SQUARE FOOT. THE LID SIZE SHALL BE 3'x3'. THE LID SHALL BE PAINTED WITH 43-38 TNEC DIFFUSED ALUMINUM PAINT OR APPROVED EQUAL.
 6. ALL PIPING INSIDE THE VAULT SHALL BE DUCTILE IRON PIPE (AWWA C151) WITH FLANGED FITTINGS. THE OUTSIDE DIMENSION OF THE PIPING SHALL BE WITHIN THE FOLLOWING RANGES: 3" PIPE - 3.74" TO 3.86"; 4" PIPE - 4.74" TO 4.90"; 6" PIPE - 6.81" TO 6.96"; 8" PIPE - 8.98" TO 9.20"; 10" PIPE - 11.04" TO 11.61". VARIATION FROM THESE DIMENSIONS WILL RESULT IN THE VAULT BEING REJECTED.
 7. THE STRAINER, METER AND FLANGED ADAPTER COUPLING INSTALLED BY THE CONTRACTOR AND APPROVED BY CITY.
 8. THE STRAINER, METER AND FLANGED ADAPTER COUPLING WILL NOT BE INSTALLED UNTIL THE METER VAULT AND TAPS ARE ACCEPTED BY THE CITY UTILITY OPERATIONS DEPARTMENT. ALL UTILITIES MUST ALSO HAVE BEEN ACCEPTED AND RELEASED BY THE CITY ENGINEERING OFFICE PRIOR TO METER INSTALLATION.
 9. THE MAIN LINE GATE VALVES SHALL BE RESILIENT WEDGE DESIGN, NON-RISING STEM VALVES, WHICH HAVE RECEIVED FORMAL APPROVAL FROM THE CITY. ALL VALVES SHALL BE FLANGED BOTH ENDS AND HAVE HAND WHEELS.
 10. CONTRACTOR SHALL HAVE A CHOICE OF EITHER HAVING A LINK SEAL WALL SLEEVE MODEL WS-6-28-S-6 FOR 3" PIPE; MODEL WS-8-32-S-8 FOR 4" PIPE; MODEL WS-10-36-S-6 FOR 6" PIPE; MODEL WS-12-37-S-6 FOR 8" PIPE; MODEL WS-14-37-S-6 FOR 10" PIPE, CAST IN THE WALL VAULT. THE ABOVE MENTIONED WALL SLEEVES SHALL USE THE FOLLOWING LINK SEALS: FOR 3" PIPE - 5#LS325-C; FOR 4" PIPE - 5 - #LS400-C; FOR 6" PIPE 7 - #LS400-C; FOR 8" PIPE - 9 - #LS-400C; FOR 10" PIPE - 12 - #LS325-C. THE CONTRACTOR MAY HAVE THE VAULT WALL CORED BEFORE INSTALLATION OF VAULT AND PIPING. IF THE WALL IS CORED THE FOLLOWING SPECIFICATIONS SHALL BE USED: FOR 3" PIPE CORE SIZE SHALL BE 6" AND USE 5 - #LS325-C LINK SEALS; FOR 4" PIPE CORE SIZE SHALL BE 8" AND USE 5 - #LS400-C LINK SEALS; FOR 6" PIPE CORE SIZE SHALL BE 10" AND USE 7 - #LS400-C LINK SEALS; FOR 8" PIPE CORE SIZE SHALL BE 12" AND USE 9 - #LS400-C LINK SEALS; FOR 10" PIPE CORE SIZE SHALL BE 14" AND USE 11 - LS425-C LINK SEALS. BREAKING OF THE WALL WITH A JACKHAMMER OR USING PRE-CAST KNOCKOUT PANELS IN NOT PERMITTED.
 11. THERE WILL BE A SOLID REINFORCED CONCRETE SUPPORT BLOCK UNDER EACH GATE VALVE.
 12. MINIMUM DEPTH OF ANY VAULT SHALL BE 4'-6".
 13. IF ELEVATION ADJUSTMENTS ARE NEEDED ON THE ACCESS LID, CONTRACTOR SHALL CONTRACT UTILITY OPERATIONS DEPARTMENT FOR APPROVAL PRIOR TO IMPLEMENTATION OF ADJUSTMENTS.



METER VAULT & BY-PASS SPECIFICATIONS

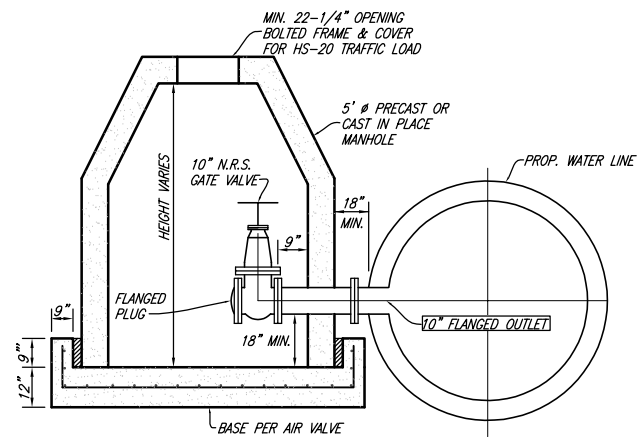
ELEVATION

METER VAULT

(METER_VAULT2)

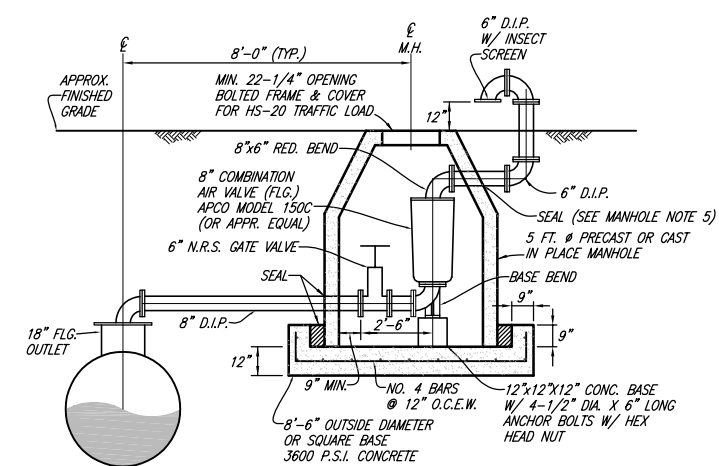
METER VAULT											
DOMESTIC						IRRIGATION					
METER SIZE	U	V	W	Y	Z	METER SIZE	U	V	W	Y	Z
3"	25"	8"	11-1/2"	-	6'-10"	3"	25"	8"	16-1/2"	9"	6'-10"
4"	22"	9"	13-1/2"	-	7'-7"	4"	22"	9"	19-1/2"	10"	7'-7"
6"	26"	10-1/2"	13-1/2"	-	8'-2"	6"	26"	10-1/2"	19-1/2"	13"	8'-2"
						8"	31"	11-1/2"	25-1/2"	17"	9'-1"
						10"	37"	13"	29-1/2"	21"	10'-7"

1. NOTIFY THE UTILITY OPERATIONS DEPARTMENT PRIOR TO CONSTRUCTION OF METER VAULT OR BY-PASS ASSEMBLY.
2. THE METER VAULT CAN BE EITHER POURED IN PLACE OR PRE-FABRICATED. ALL WALLS, EITHER POURED IN PLACE OR PRE-FABRICATED, SHALL BE MONOLITHIC POUR. NO SEAMS OR EXTENSIONS WILL BE ALLOWED. CONCRETE SHALL BE 6" THICK-3,000 P.S.I., REINFORCED WITH #4 STEEL BARS ON 12" CENTERS EACH WAY, ON POURED IN PLACE VAULTS. PRE-FABRICATED VAULTS SHALL BE 4" THICK-4,500 P.S.I. CONCRETE, REINFORCED WITH #4 STEEL BARS ON 8" CENTERS BOTH WAYS. THESE ARE MINIMUM SPECIFICATIONS.
3. THE BOTTOM OF THE VAULT SHALL BE 6" THICK-3,000 P.S.I. CONCRETE, REINFORCED WITH #4 STEEL BARS ON 12" CENTERS BOTH WAYS. A 4" DEEP X 12" DIAMETER SUMP SHALL BE INSTALLED TO ONE SIDE AND IN EITHER CORNER OF THE BOTTOM OF THE SLAB. A 4" CUSHION OF SAND SHALL BE INSTALLED UNDER THE SLAB. IF A PRE-FABRICATED VAULT IS TO BE USED, A LAYER OF RAM-NEX SHALL BE INSTALLED BETWEEN THE WALLS AND BOTTOM SLAB.
4. THE VAULT SHALL NOT BE INSTALLED IN ANY DRIVE OF PARKING AREA AND MUST BE LOCATED IN A UTILITY EASEMENT DEDICATED TO THE CITY. ALL PIPING INSIDE THE VAULT AND THE VAULT ITSELF MUST BE INSPECTED AND APPROVED BY THE UTILITY OPERATIONS DEPARTMENT.
5. THE VAULT LID SHALL BE BILCO TYPE 0-4 LEAF DESIGN LID. ANGLE FRAME IS 1/4" STEEL WITH STRAP ANCHORS BOLTED TO THE EXTERIOR. THE LEAF IS 1/4" STEEL DIAMOND PATTERN PLATE, PIVOTING ON TORSION BARS FOR EASY OPERATIONS. THE MINIMUM LIVE LOAD CAPACITY IS 150 LBS. PER SQUARE FOOT. THE LID SIZE SHALL BE 3'x3'. THE LID SHALL BE PAINTED WITH 43-38 TNEDEC DISFUSED ALUMINUM PAINT OR APPROVED EQUAL.
6. ALL PIPING INSIDE THE VAULT SHALL BE DUCTILE IRON PIPE WITH FLANGED FITTINGS. THE OUTSIDE DIMENSION OF THE PIPING SHALL BE WITHIN THE FOLLOWING RANGES: 3" PIPE - 3.74" TO 3.86"; 4" PIPE - 4.74" TO 4.90"; 6" PIPE - 6.81" TO 6.96"; 8" PIPE - 8.98" TO 9.20"; 10" PIPE - 11.04" TO 11.61". VARIATION FROM THESE DIMENSIONS WILL RESULT IN THE VAULT BEING REJECTED.
7. THE STRAINER, METER AND FLANGED ADAPTER COUPLING WILL BE PROVIDED AND INSTALLED BY THE CITY AT THE CONTRACTORS EXPENSE.
8. THE STRAINER, METER AND FLANGED ADAPTER COUPLING WILL NOT BE INSTALLED UNTIL THE METER VAULT AND TAPS ARE ACCEPTED BY THE CITY UTILITY OPERATIONS DEPARTMENT. ALL UTILITIES MUST ALSO HAVE BEEN ACCEPTED AND RELEASED BY THE CITY ENGINEERING OFFICE PRIOR TO METER INSTALLATION.
9. THE CONTRACTOR SHALL MAKE THE BY-PASS AND METER TEST TAP INSIDE THE VAULT. IF THE SERVICE IS TO BE USED STRICTLY AS A DOMESTIC OR DOMESTIC / IRRIGATION COMBINATION, TAP A ON THIS DRAWING IS NOT NECESSARY. IF THE SERVICE IS USED STRICTLY FOR IRRIGATION TAP A IS REQUIRED. TAP A MUST BE AT LEAST TWO PIPE DIAMETERS DOWN-STREAM OF THE METER. TAPS B & C MUST BE MADE AT AN APPROXIMATE 45% ANGLE ON EACH END OF THE PIPE AND CENTERED 10 INCHES AWAY FROM THE WALL. ALL TAPS SHALL BE 2" AND THE CONTRACTOR SHALL INSTALL APPROVED SERVICE SADDLES WITH BRASS NIPPLES AND NO. 7550 OHIO BRASS OR APPROVED EQUAL GATE VALVES.
10. THE MAIN LINE GATE VALVES SHALL BE RESILIENT WEDGE DESIGN, NON-RISING STEM VALVES, WHICH HAVE RECEIVED FORMAL APPROVAL FROM THE CITY. ALL VALVES SHALL BE FLANGED BOTH ENDS AND HAVE HAND WHEELS.
11. CONTRACTOR SHALL HAVE A CHOICE OF EITHER HAVING A LINK SEAL WALL SLEEVE MODEL WS-6-28-S-6 FOR 3" PIPE; MODEL WS-8-32-S-8 FOR 4" PIPE; MODEL WS-10-36-S-6 FOR 6" PIPE; MODEL WS-12-37-S-6 FOR 8" PIPE; MODEL WS-14-37-S-6 FOR 10" PIPE, CAST IN THE WALL VAULT. THE ABOVE MENTIONED WALL SLEEVES SHALL USE THE FOLLOWING LINK SEALS: FOR 3" PIPE - 5#LS325-C; FOR 4" PIPE - 5 - #LS400-C; FOR 6" PIPE - 7 - #LS400-C; FOR 8" PIPE - 9 - #LS400-C; FOR 10" PIPE - 12 - #LS325-C. THE CONTRACTOR MAY HAVE THE VAULT WALL CORED BEFORE INSTALLATION OF VAULT AND PIPING. IF THE WALL IS CORED THE FOLLOWING SPECIFICATIONS SHALL BE USED: FOR 3" PIPE SIZE SHALL BE 6" AND USE 5 - #LS325-C LINK SEALS; FOR 4" PIPE SIZE SHALL BE 8" AND USE 5 - #LS400-C LINK SEALS; FOR 6" PIPE SIZE SHALL BE 10" AND USE 7 - #LS400-C LINK SEALS; FOR 8" PIPE SIZE SHALL BE 12" AND USE 9 - #LS400-C LINK SEALS; FOR 10" PIPE SIZE SHALL BE 14" AND USE 11 - #LS425-C LINK SEALS. BREAKING OF THE WALL WITH A JACKHAMMER OR USING PRE-CAST KNOCKOUT PANELS IS NOT PERMITTED.
12. THERE WILL BE A CONCRETE SUPPORT UNDER EACH GATE VALVE.
13. MINIMUM DEPTH OF ANY VAULT SHALL BE 4'-6".
14. IF ELEVATION ADJUSTMENTS ARE NEEDED ON THE ACCESS LID, CONTRACTOR SHALL CONTRACT UTILITY OPERATIONS DEPARTMENT FOR APPROVAL PRIOR TO IMPLEMENTATION OF ADJUSTMENTS.



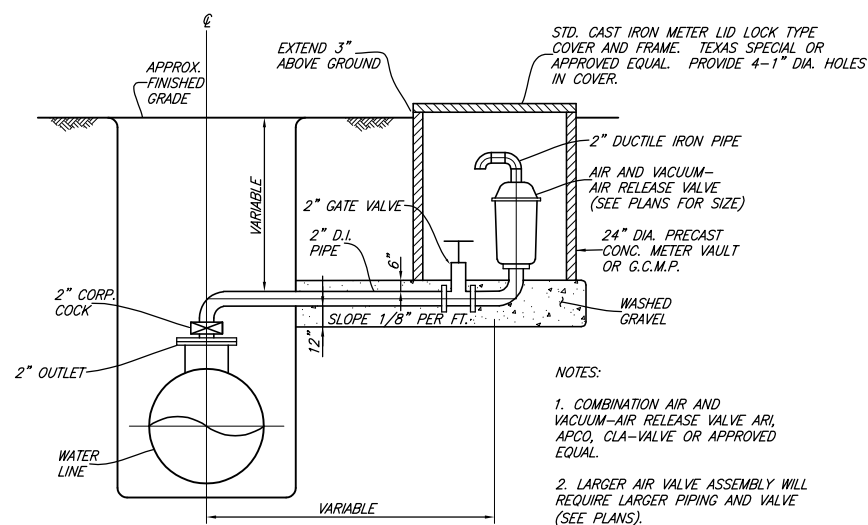
BLOW-OFF VALVE W/MANHOLE

NO SCALE
(BOVALVE)



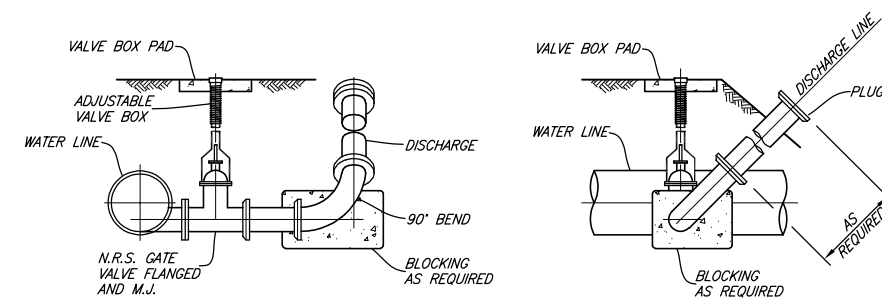
AIR RELEASE VALVE W/MANHOLE

NO SCALE
(AIRVALVE)



AIR AND VACUUM - AIR RELEASE VALVE INSTALLATION

(AIR_VALVE)



BLOW OFF VALVE

(BLOWOFF_VLV)

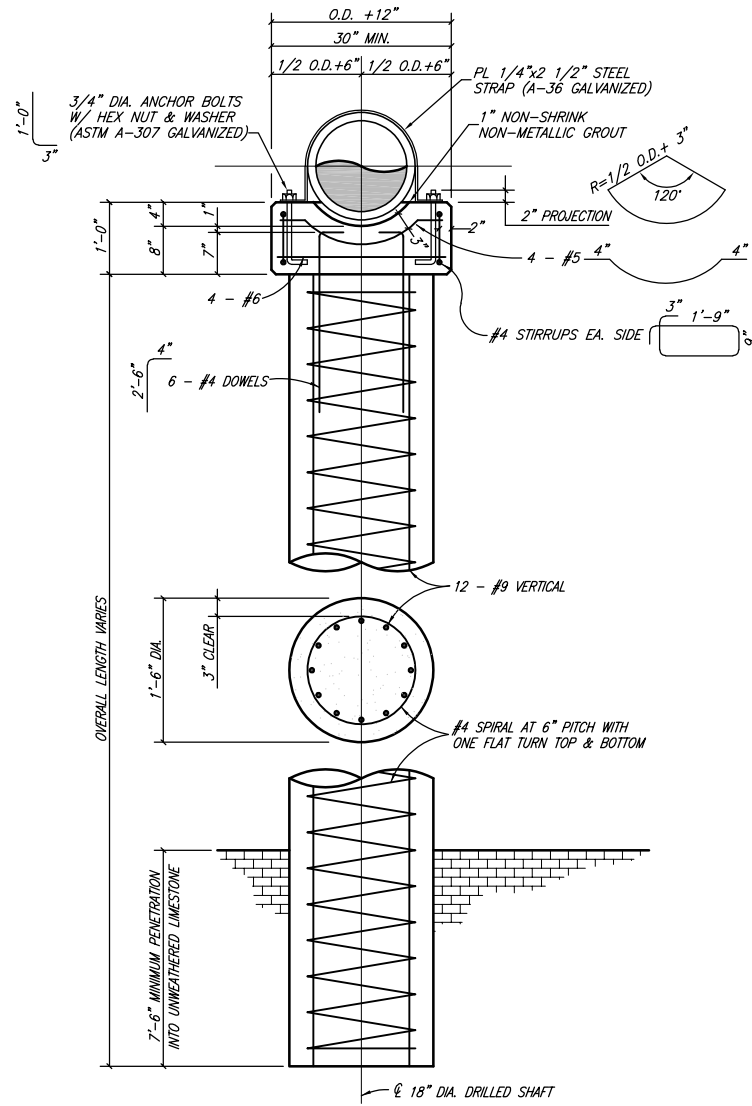


CITY OF AUBREY, TEXAS
STANDARD CONSTRUCTION DETAILS
WATER

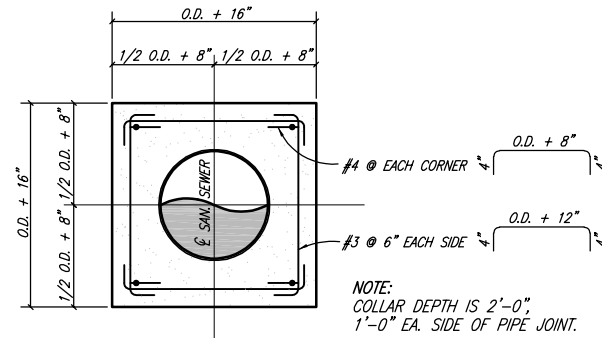
JULY, 2024

SHEET NO.

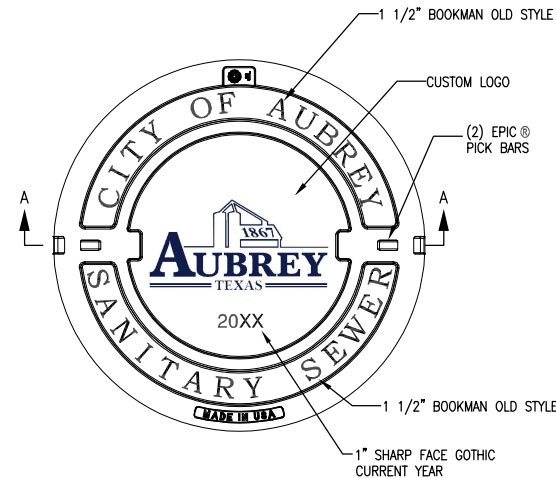
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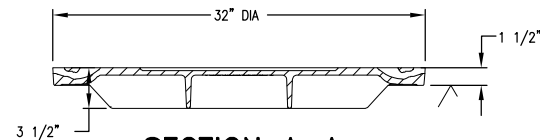
AERIAL CROSSING PIER & PIER CAP
(PIER)



AERIAL CROSSING CONCRETE COLLAR
(COLLAR)



PLAN OF COVER

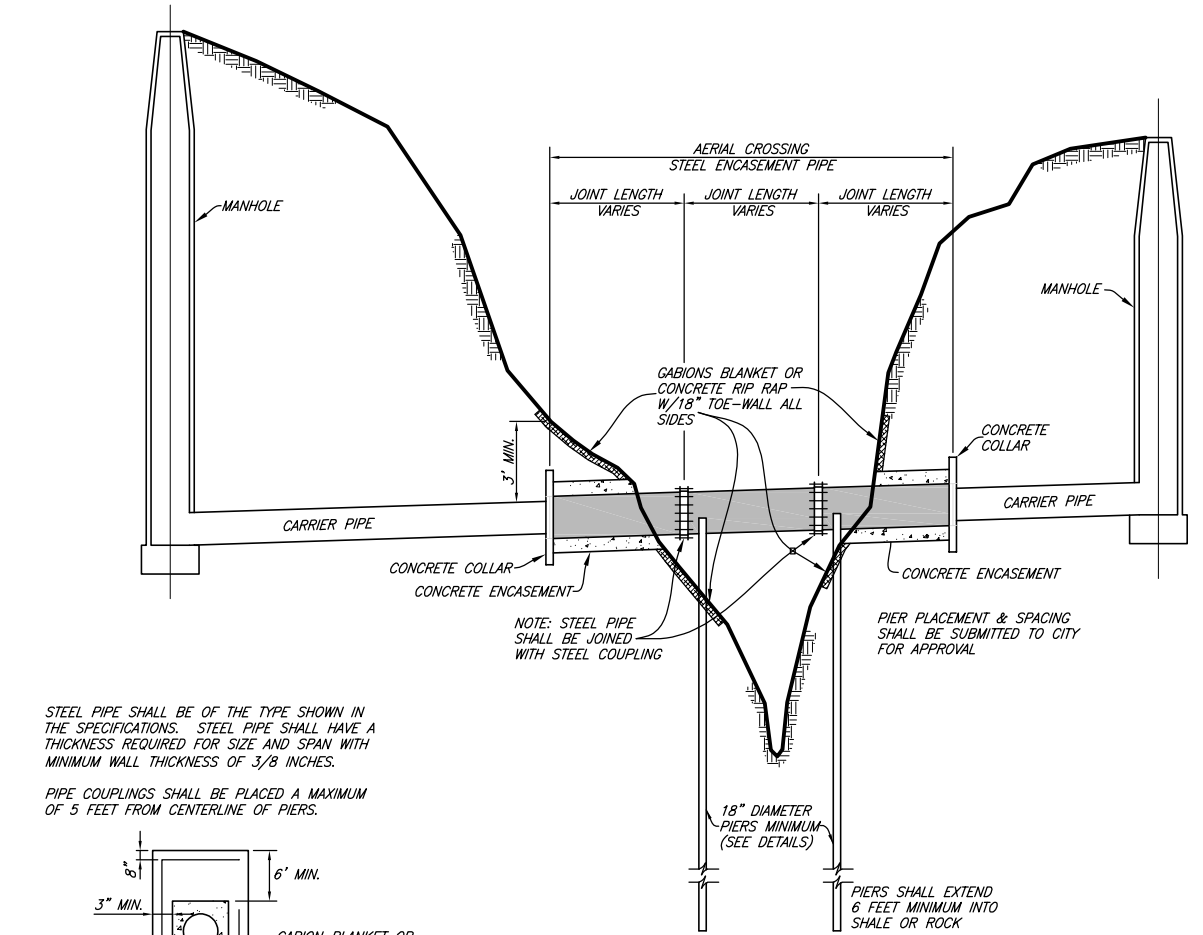


SECTION A-A

SANITARY SEWER COVER

BASS & HAYS COVER, PART# VRM30-LID97
FRAME, PART# VRM30 RING

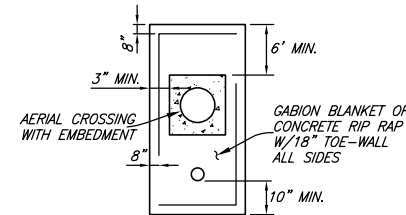
(MH-COV6)



AERIAL CROSSING
(AERIAL-X)

STEEL PIPE SHALL BE OF THE TYPE SHOWN IN THE SPECIFICATIONS. STEEL PIPE SHALL HAVE A THICKNESS REQUIRED FOR SIZE AND SPAN WITH MINIMUM WALL THICKNESS OF 3/8 INCHES.

PIPE COUPLINGS SHALL BE PLACED A MAXIMUM OF 5 FEET FROM CENTERLINE OF PIERS.



BANK PROTECTION (TYP.)

NOTE:
ENGINEERING DESIGN SHALL BE SUBMITTED TO CITY FOR APPROVAL FOR USE FOR EACH CROSSING. PIERS SHALL BE PLACED AT MAXIMUM SPAN DISTANCE AS DICTATED BY ENGINEER'S DESIGN.

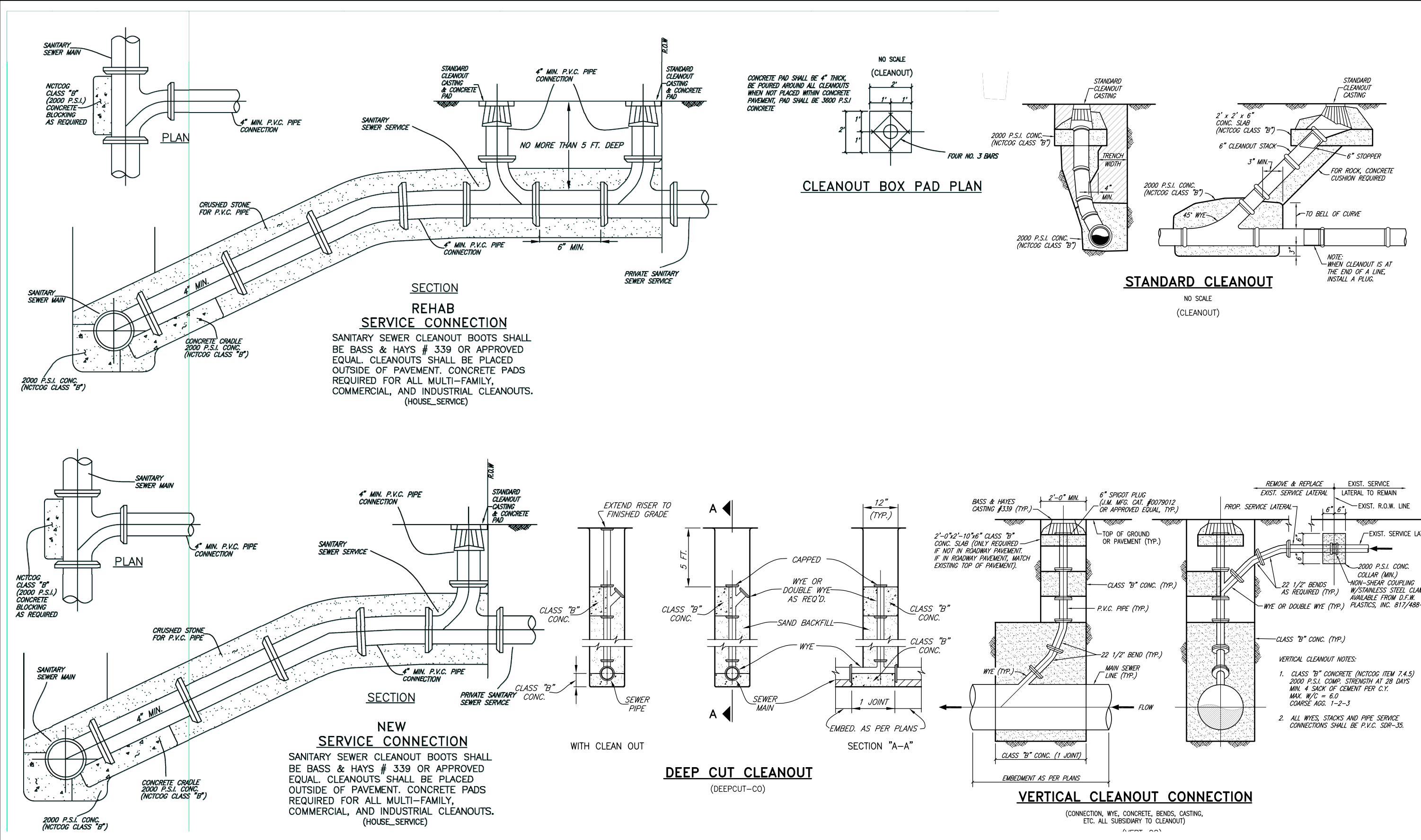


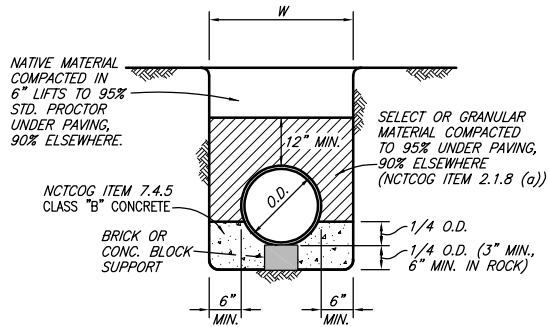
CITY OF AUBREY, TEXAS
STANDARD CONSTRUCTION DETAILS
SANITARY SEWER

JULY, 2024

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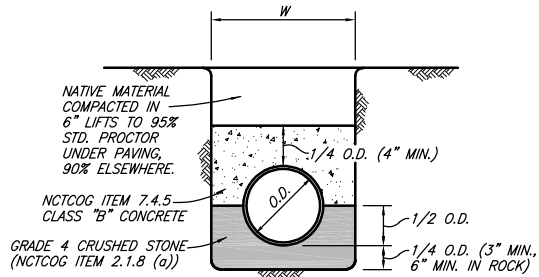
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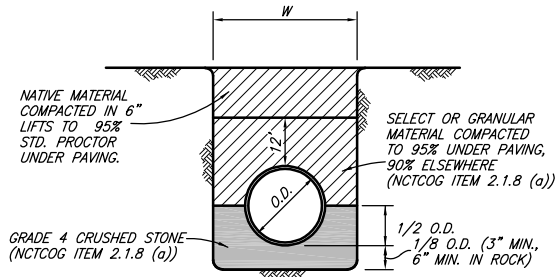
CLASS A EMBEDMENT

CONCRETE CRADLE
(CLASSA)



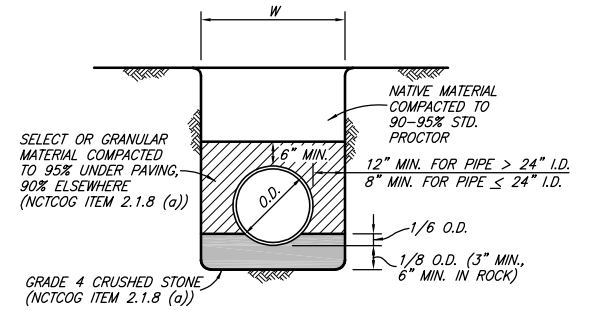
CLASS A-1 EMBEDMENT

CONCRETE CAP
(CLASSA1)



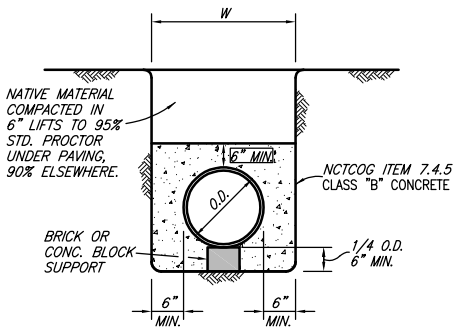
CLASS B+ EMBEDMENT

STD PVC WATER
(CLASSBP)



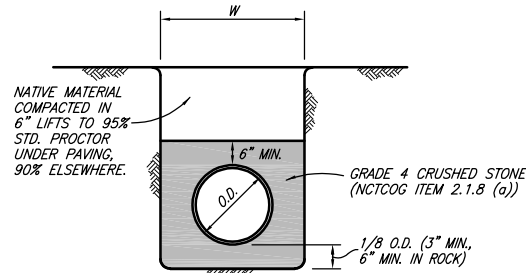
CLASS C EMBEDMENT

STD. DUCTILE IRON WATER OR SEWER
STD. R.C.C.P. WATER
STD. STORM SEWER
(CLASSC)



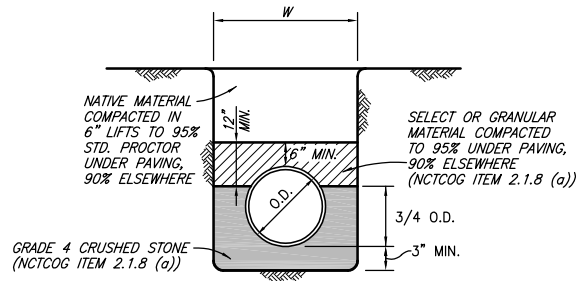
CLASS G EMBEDMENT

CONCRETE ENCASEMENT
(CLASSG)



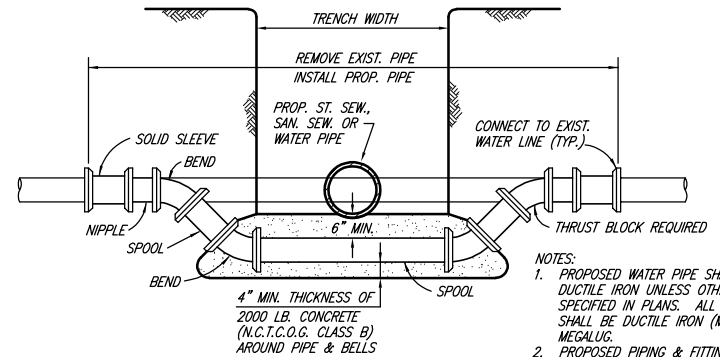
CLASS H EMBEDMENT

P.V.C. PIPE ONLY
STD. P.V.C. SEWER
(CLASSH)



CLASS B-1 EMBEDMENT

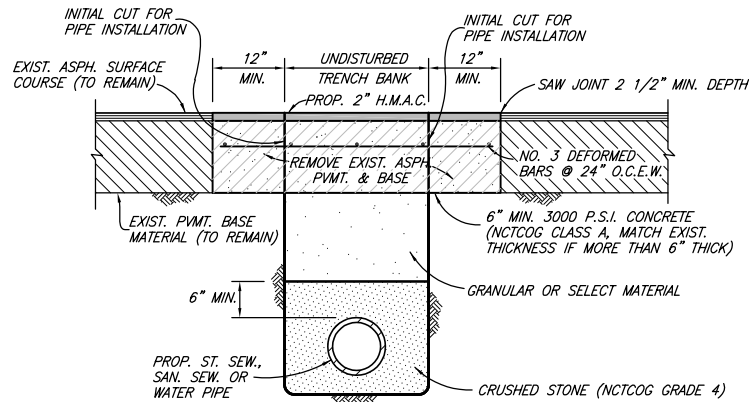
P.V.C. PIPE ONLY
STD. P.V.C. WATER
(CLASSB1)



- NOTES:
1. PROPOSED WATER PIPE SHALL BE DUCTILE IRON UNLESS OTHERWISE SPECIFIED IN PLANS. ALL FITTINGS SHALL BE DUCTILE IRON (M.J.-P.E.) MEGALUG.
 2. PROPOSED PIPING & FITTINGS ARE SYMMETRIC ABOUT CENTER OF PROP. SAN. SEW. OR ST. SEW. PIPE AND SHALL RETAIN TEST PRESSURES.
 3. ALL THRUST BLOCKING SHALL BE SUBSIDIARY TO UNIT PRICE.
 4. CROSSING OF SANITARY SEWER SHALL BE IN ACCORDANCE WITH T.N.R.C.C. REQUIREMENTS.

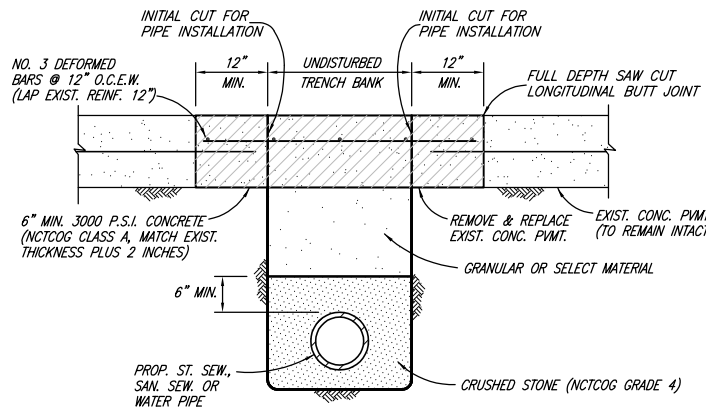
WATER MAIN LOWERING

(WMLOW)



ASPHALT STREET OR DRIVEWAY REPAIR

(ASHPVMT)



CONCRETE STREET OR DRIVEWAY REPAIR

(CONCPVMT)

GRADE 4 CRUSHED STONE GRADATION

SIEVE SIZE	% RETAINED
1-1/2 INCH	0
1 INCH	0-5
1/2 INCH	40-75
NO. 4	90-100
NO. 8	95-100

(CRU-STN)



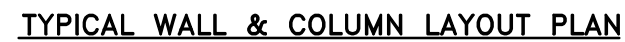
CITY OF AUBREY, TEXAS

STANDARD CONSTRUCTION DETAILS
TYPICAL EMBEDMENT

JULY, 2024

SHEET NO.

25



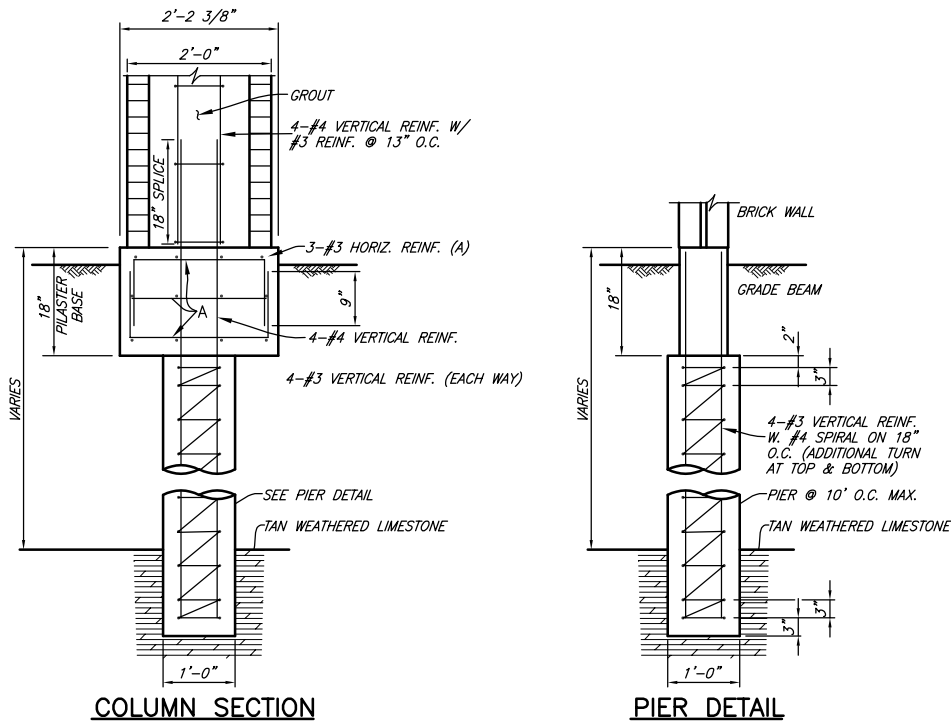
NOTES:

1. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 P.S.I. AT 28 DAYS.
2. REINFORCING STEEL SHALL BE NEW BILLET STEEL CONFORMING TO THE REQUIREMENTS OF ASTM A-615-GR.60.
3. CONCRETE FOR DRILLED PIERS SHALL BE PLACED WITHIN 8 HOURS OF DRILLING PIER HOLES.
4. BRICK MASONRY SHALL BE AS SPECIFIED IN ITEM 2.3.6 OF THE SPECIAL PREVISIONS.
5. MORTAR SHALL BE TYPE "S".
6. CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE "RECOMMENDED PRACTICE FOR ENGINEERED BRICK MASONRY"— BRICK INSTITUTE OF AMERICA.
7. USE #9 GAUGE 1-3/4" WIDE GALVANIZED LADDER WIRE TO EXTEND HORIZONTAL IN WALL PANEL DURAWALL CORP. EVERY COURSE.
8. #9 GAUGE WIRE FABRICATED AS SHOWN BETWEEN EACH COURSE OF COLUMN BRICK.
9. THE WALL SHALL BE A MINIMUM OF SIX FEET IN HEIGHT AS MEASURED FROM THE NEAREST ALLEY EDGE OR SIDEWALK GRADE, WHICHEVER IS HIGHER. THE COLOR OF THE WALL SHALL BE SELECTED BY THE CITY.

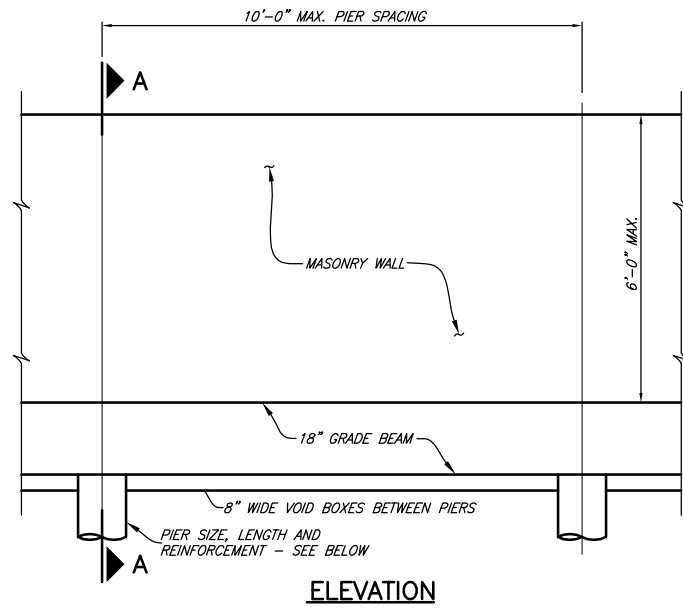
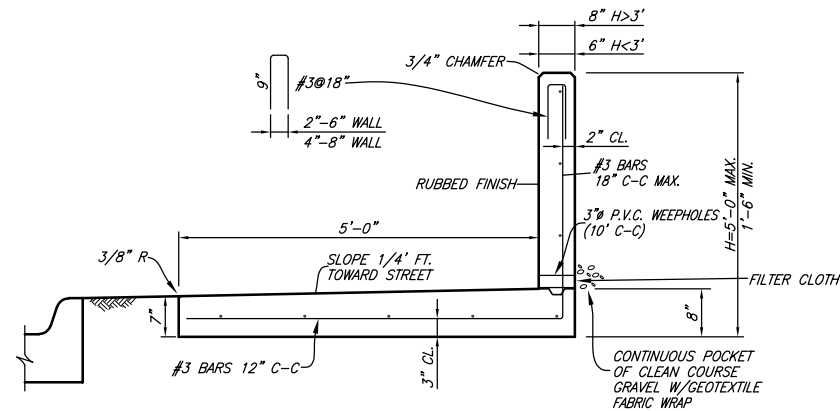


(WALLPIER)

1. CONCRETE COMP. STRENGTH-4000 P.S.I.
2. REINFORCEMENT STEEL - ASTM A615 - GR. 60.
3. CLEAN BOTTOM OF HOLE PRIOR TO PLACEMENT OF CONCRETE.
4. CONCRETE SHALL BE PLACED WITHIN 8 HOURS OF DRILLING.
5. DESIGN WIND PRESSURE - 20 PSF.
6. MAXIMUM PILASTER SPACING - 10'-0"
7. MAXIMUM HEIGHT OF WALL - 6'-0".
8. EXTEND REBAR 48" INTO PILASTER AND COLUMN.



- ### SCREENING WALL
- GENERAL NOTES:**
1. CONCRETE – MINIMUM COMPRESSIVE STRENGTH OF 3000 P.S.I. AT 28 DAYS.
 2. REINFORCEMENT – ASTM A 36
 3. MASONRY – COMPRESSIVE STRENGTH SHALL BE AS PRESCRIBED IN ITEM 2.3.6 SPECIAL PROVISIONS.
 4. WIND LOAD – 20 P.S.F.
 5. PIER BEARING STRESSES – SEE BRICK SCREENING WALL NOTES.
 6. MORTAR – TYPE "S"
 7. PROVIDE CONTROL JOINTS AT 50 FT.
 8. PROVIDE EXPANSION JOINTS AT 200 FT. CENTER MAXIMUM.
 9. PROVIDE MIN. 9' FT. W/ 24" DIA. BELL IN CLAY OR OTHER MATERIAL EXCEPT BLUE SHALE, 6' MIN. WITH 3' MIN. INTO BLUE SHALE.
 10. ALL EXPOSED CONCRETE SHALL BE RUBBED FINISHED SURFACE.
 11. SIDEWALKS ADJACENT TO WALLS MUST BE 5'-0" MIN. WIDTH FROM ALL PORTIONS OF THE WALL (INCLUDING PILASTERS, COLUMNS, ETC.).
 12. MAX. PILASTER SPACING 40 FT.
 13. WALLS SHALL NOT BE PLACED IN THE VISIBILITY EASEMENT OR STREET R.O.W.
 14. THE WALL SHALL BE A MINIMUM OF SIX FEET IN HEIGHT AS MEASURED FROM THE NEAREST ALLEY EDGE OR SIDEWALK GRADE, WHICHEVER IS THE HIGHER. THE COLOR OF THE WALL SHALL BE LIMITED TO EARTH-TONE COLORS, EXCLUDING GRAY, GREEN AND WHITE. THE COLOR OF THE WALL SHALL BE UNIFORM ON EACH SIDE OF A THOROUGHFARE FOR THE ENTIRE LENGTH BETWEEN INTERSECTING THOROUGHFARES, UNLESS OTHERWISE APPROVED BY THE ENGINEERING DEPARTMENT. THE FINISH OF THE WALL SHALL BE CONSISTENT ON ALL SURFACES.
 15. IF WROUGHT IRON FENCING IS TO BE UTILIZED ON REQUIRED SCREENING, ALL WROUGHT IRON MUST BE SOLID STOCK, NO TUBULAR STEEL WILL BE ALLOWED.

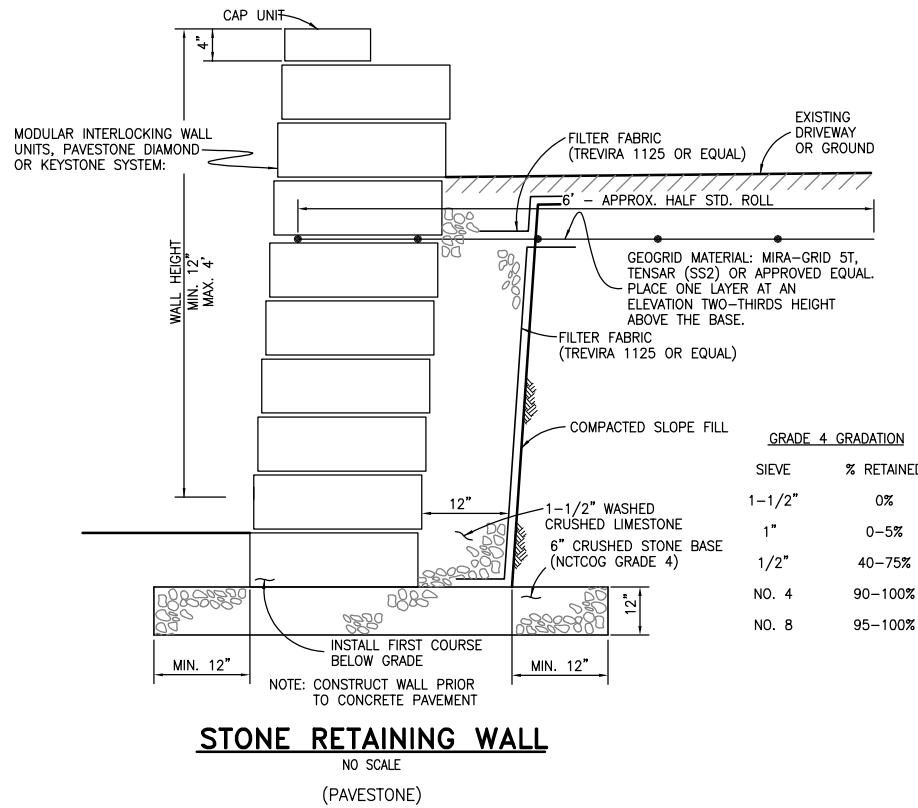
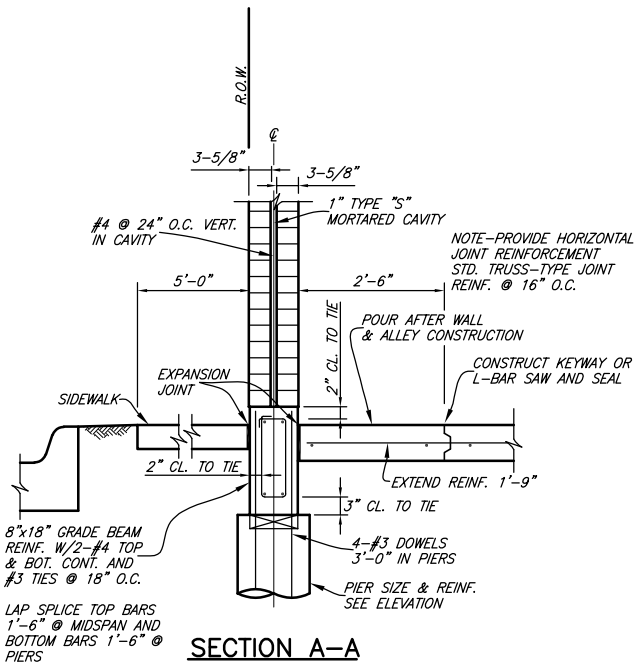


DRILLED PIERS 12" DIA. REINF. W/ 4-#5 VERT. & #4 REINF. @ 18" O.C. MINIMUM LENGTH OF PIER IS 6'-0". *PIER BOTTOM MAY BE EITHER OF THE TWO ALTERNATES:

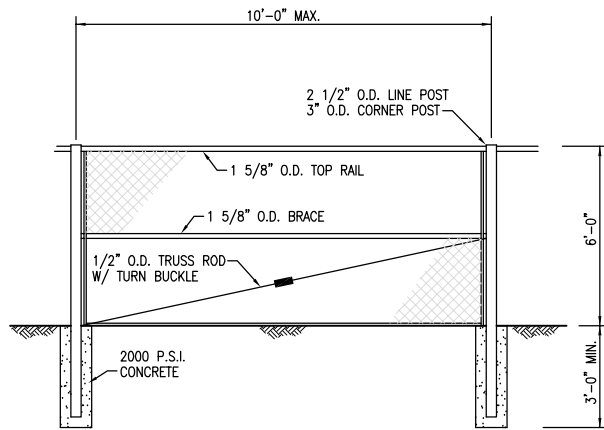
1. 12" DIA. SHAFT EMBEDDED MINIMUM 3'-0" INTO BLUE SHALE RESULTING BEARING STRESS IS 8.0 KIPS PER SQUARE FOOT.
2. 12" DIA. SHAFT W/ 24" DIA. BELL IN CLAY. RESULTING BEARING STRESS IN 2.0 KIPS PER SQUARE FOOT.

* SEE GENERAL NO. 9

BRICK SCREENING WALL

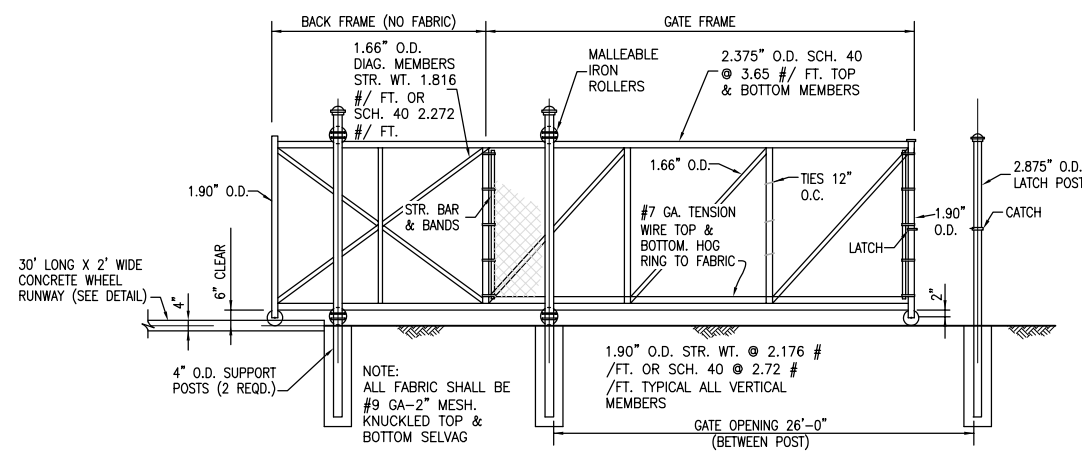


GRADE 4 GRADATION	
SIEVE	% RETAINED
1-1/2"	0%
1"	0-5%
1/2"	40-75%
NO. 4	90-100%
NO. 8	95-100%



FENCE DETAIL

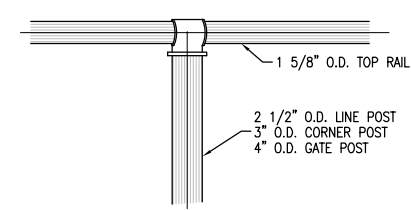
NO SCALE



SLIDE GATE DETAIL

NO SCALE

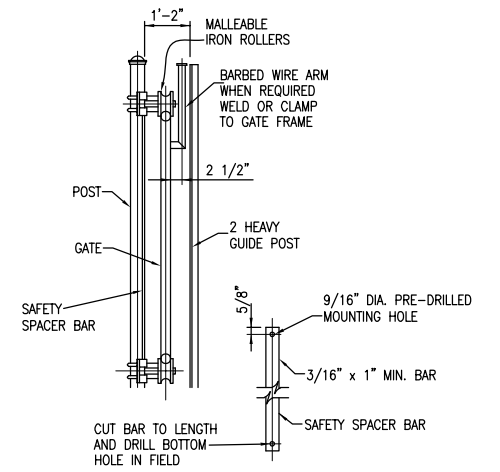
(FENCEDTL)



FENCE TOP

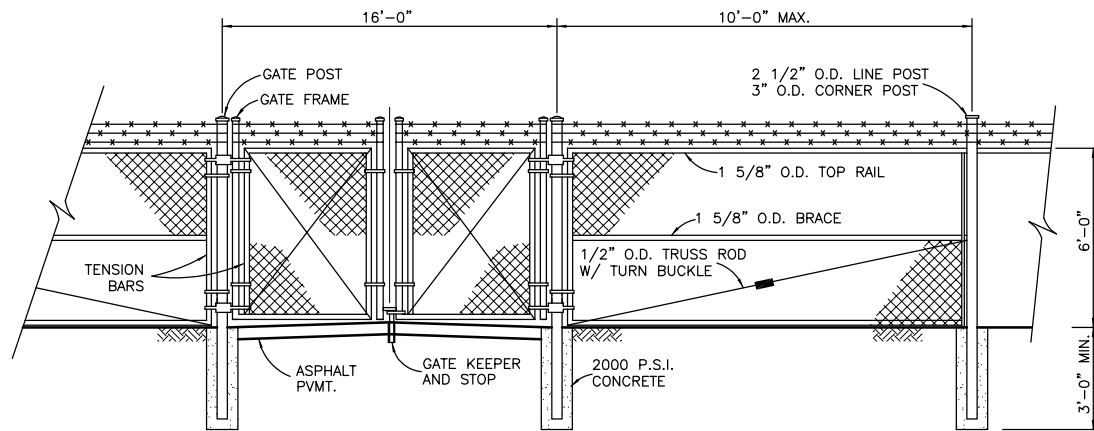
NO SCALE

- NOTES:
1. GATE TO BE CYCLONE STANDARD CANTILEVER SLIDE GATE OR APPROVED EQUAL.
 2. ALL FENCE FABRIC SHALL HAVE A BLACK P.V.C. COATING.
 3. CONTRACTOR SHALL FURNISH AND INSTALL AN AUTOMATIC GATE OPERATOR (STANLEY MODEL 580 GEAR HEAD, A STANLEY 320-0720 DIGITAL KEYLESS ENTRY, A STANLEY 320-0716 INTERCOM, A STANLEY 420-0888 MAGNETIC VEHICLE DETECTOR (FOR OUTGOING VEHICLES), A STANLEY 420-0555 AND 420-0779 TIME DELAY SYSTEM. ALL EXTERIOR MOUNTING OF EQUIPMENT SHALL BE IN WEATHERPROOF ENCLOSURES.



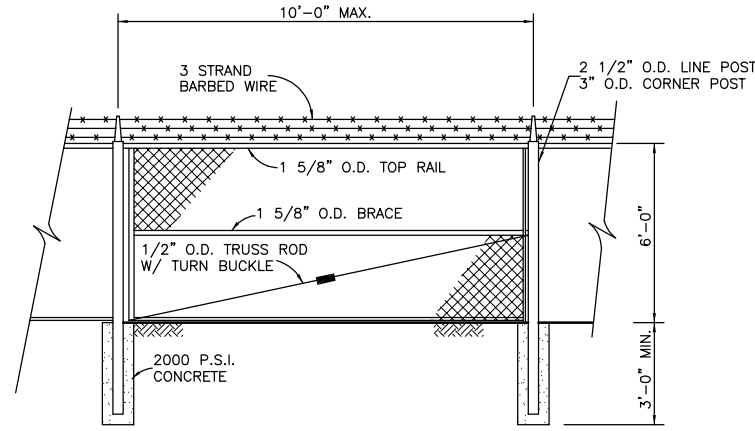
ROLLER DETAIL

NO SCALE



GATE DETAIL

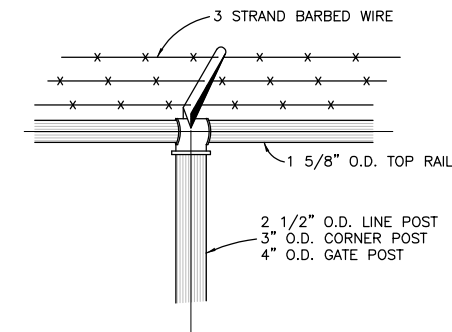
N.T.S.



FENCE DETAIL

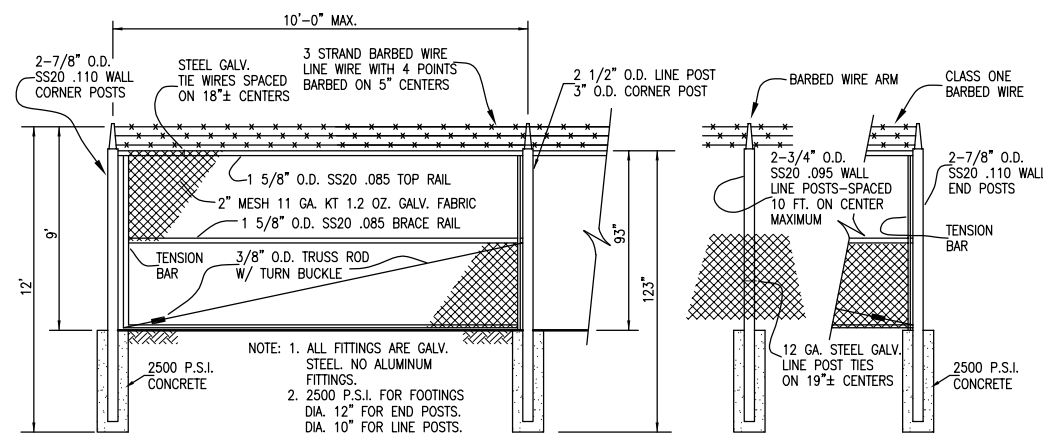
N.T.S.

(FENCEDT2)



FENCE TOP

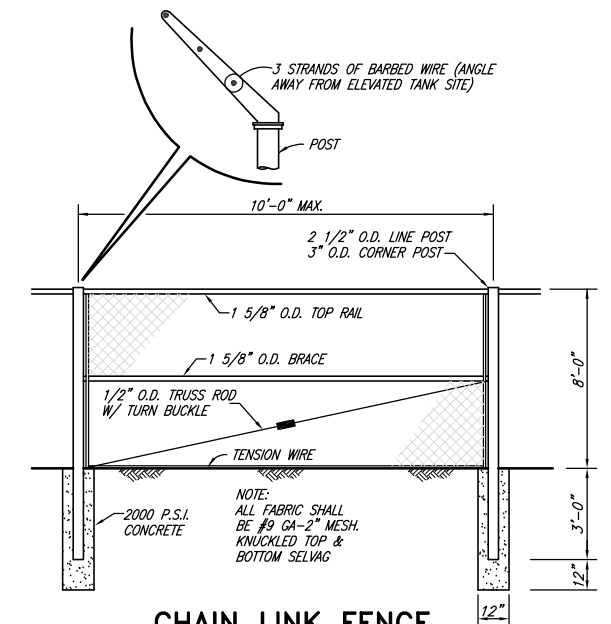
N.T.S.



8 FOOT CHAIN LINK FENCE DETAIL

N.T.S.

(FENCE-8FT)



CHAIN LINK FENCE

NO SCALE

(CLFENCE)



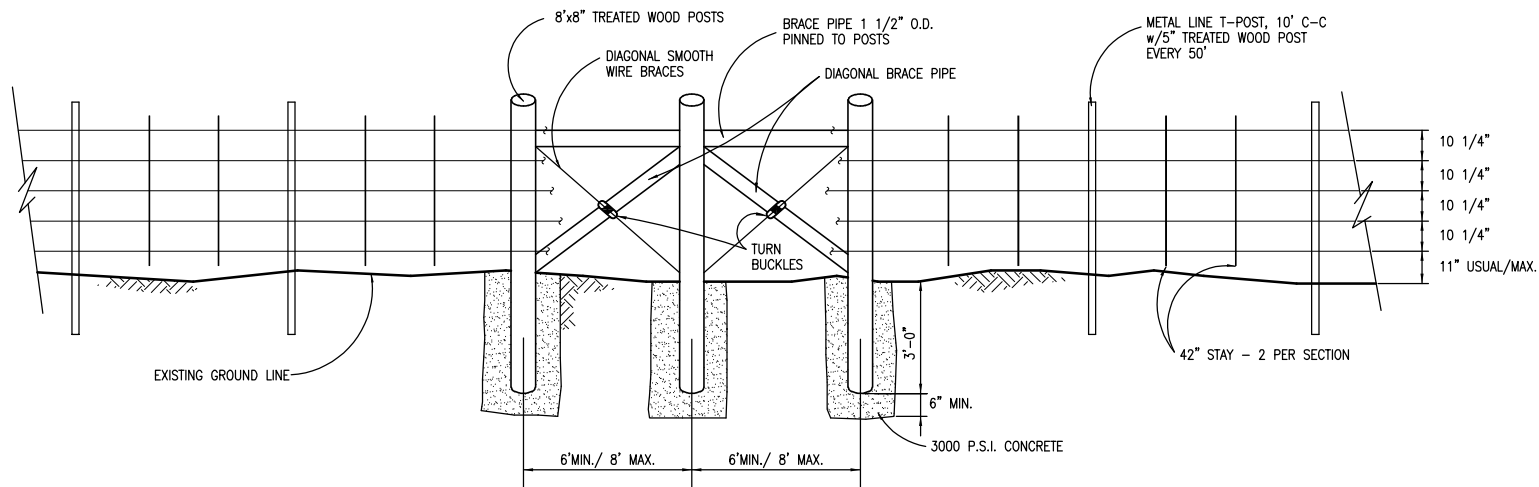
CITY OF AUBREY, TEXAS

**STANDARD CONSTRUCTION DETAILS
FENCING**

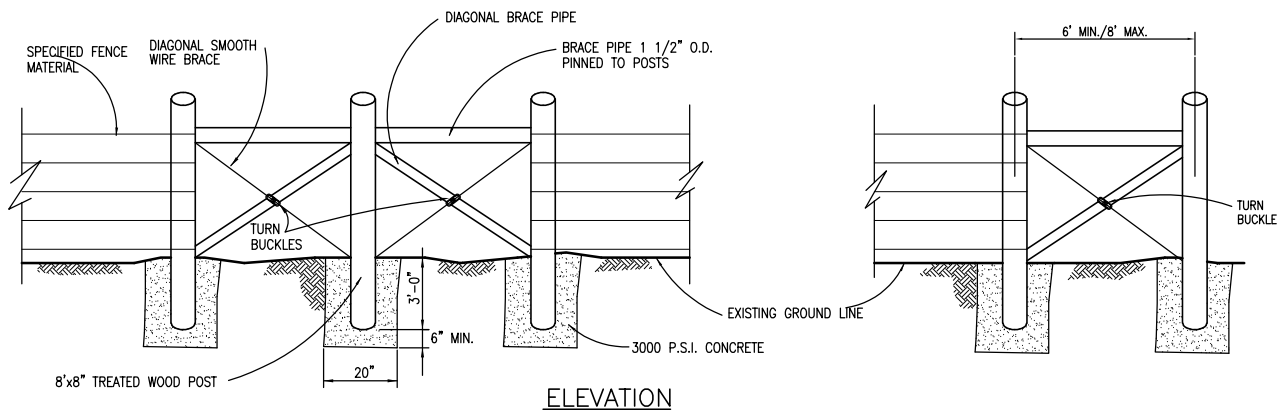
JULY, 2024

SHEET NO.

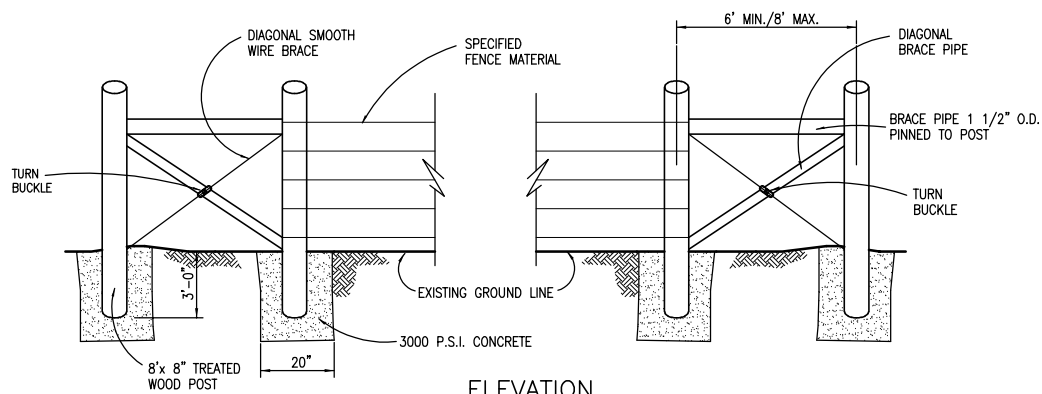
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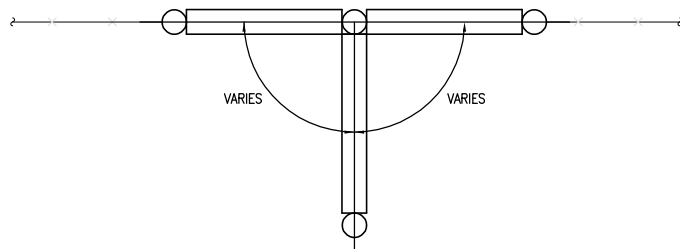
**TYPE "B" FARM FENCE WITH
PULL POST UNIT**
N.T.S.



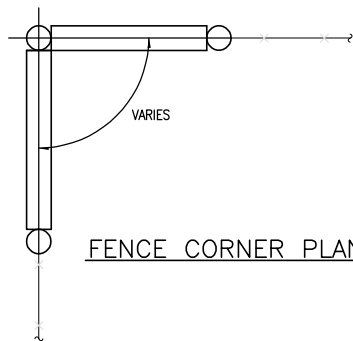
FENCE JUNCTION DETAIL
N.T.S.



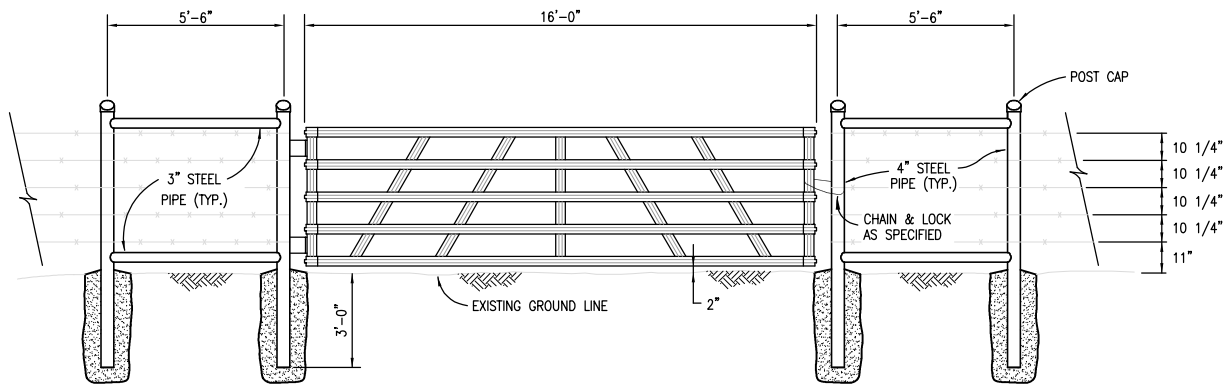
FENCE CORNER DETAIL
N.T.S.



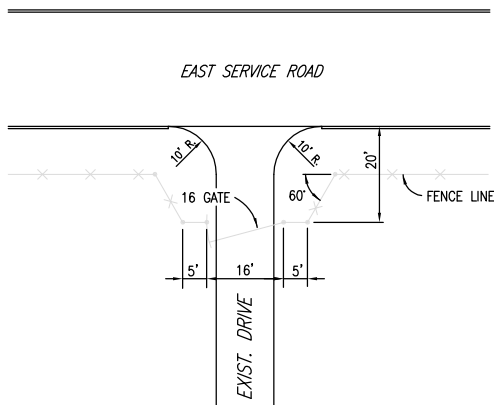
FENCE JUNCTION PLAN



FENCE CORNER PLAN



16' STEEL GATE DETAIL
N.T.S.



20' SET BACK FENCE DETAIL
N.T.S.

GENERAL NOTES:

1. BARBED WIRE SHALL BE TWO STRAND TWISTED NO. 12-1/2 AWS GAUGE GALVANIZED STEEL WIRE WITH TWO-POINT BARBS OF NO. 14 AWS GAUGE STEEL WIRE AND CONFORMING TO ZINC-COATED(GALVANIZED)STEEL BARBED WIRE, ASTM DESIGNATION A 121, CLASS 1.
2. WOVEN WIRE FENCE FABRIC(HOG WIRE)SHALL BE OF A GOOD COMMERCIAL QUALITY OF STEEL MEETING THE REQUIREMENTS OF ZINC-COATED(GALVANIZED) STEEL WOVEN WIRE FENCE FABRIC, ASTM DESIGNATION A 116. THE TOP AND BOTTOM WIRES SHALL BE A MINIMUM NO. 10 AWS GAUGE AND THE INTERMEDIATE WIRES AND VERTICAL STAYS SHALL BE NO. 12-1/2 AWS GAUGE.
3. METAL POSTS, RAILS, GATES, BRACES AND FITTINGS MAY BE ROLLED, FORMED OR TUBULAR IN CROSS SECTION AND SHALL BE IN ACCORDANCE WITH STRENGTH REQUIREMENTS OF METAL POSTS AND RAILS FOR INDUSTRIAL CHAIN LINK FENCE, ASTM DESIGNATION F669. ALL POSTS, RAILS, GATES AND BRACES NOT GALVANIZED SHALL BE PAINTED WITH AN APPROVED ANTI-CORROSIVE PAINT. POST CAPS SHALL BE INSTALLED ON THE OPEN END OF PIPE POSTS TO PREVENT CORROSION. FITTINGS SHALL BE IN ACCORDANCE WITH FENCE FITTINGS, ASTM DESIGNATION F626.
4. WOOD POSTS SHALL BE SOUND AND STRAIGHT AND FREE OF EXCESSIVE KNOTS. UNTREATED POSTS MAY BR CEDAR, REDWOOD, CYPRESS OR LIVE OAK. TREATED POSTS MAY BE PINE, SPRUCE OR FIR AND SHALL HAVE A CREOSOTE OIL OR PENTACHLOROPHENOL TREATMENT OF NOT LESS THAN SIX POUNDS PER CUBIC FOOT(128 Kg. per cubic meter).
5. PULL POST UNITS FOR FARM FENCE SHALL BE LOCATED AT 300 FEET CENTER TO CENTER MAXIMUM. METAL T-POSTS SHALL BE SPACED AT 10 FEET C-C. AT CONNECTIONS TO EXISTING FENCE, A PULL POST UNIT, CORNER UNIT OR JUNCTION UNIT SHALL BE CONSTRUCTED.
6. GATE MANUFACTURER SHALL FURNISH HINGES, BOLTS AND A SLIDING LATCH FOR EACH GATE.
7. CONCRETE SHALL HAVE A COMPRESSIVE STRENGTH OF 3000 p.s.i. IN 28 DAYS.
8. LINE BRACE ASSEMBLY SHALL BE PLACED ON APEX OF ALL CURVES.
9. METAL T-POSTS(6-1/2' MIN.) TO BE GREEN WITH REFLECTIVE TOPS.
10. FENCE REPLACEMENT SHALL BE "IN KIND".

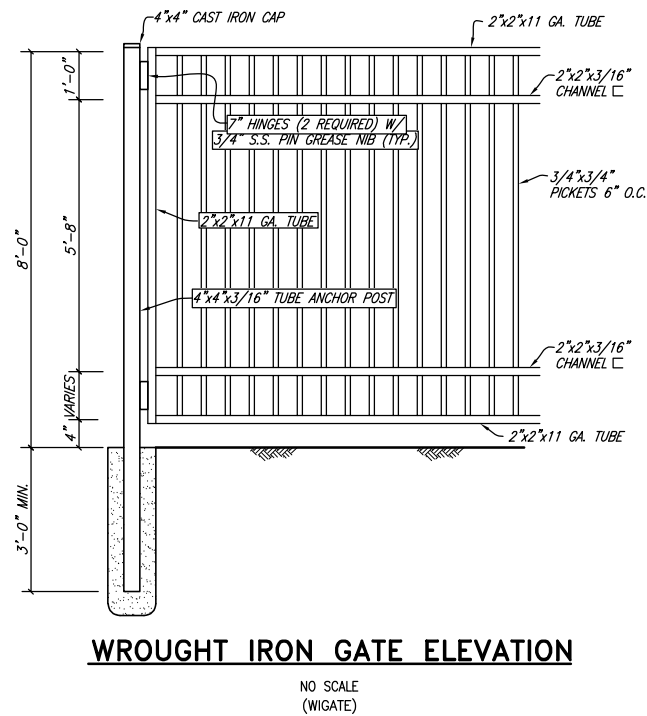
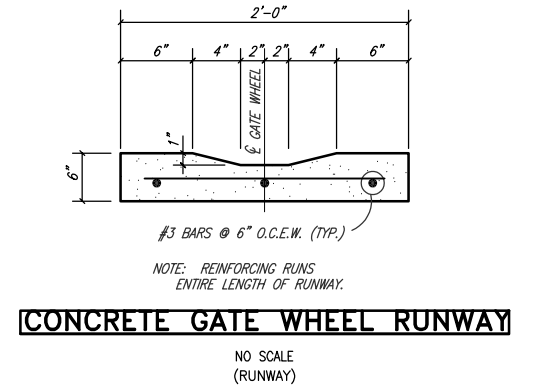
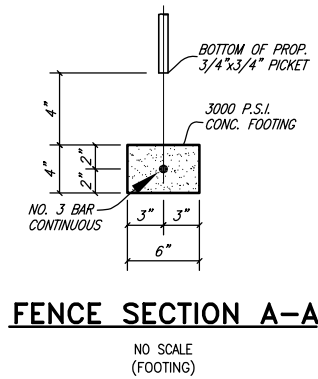
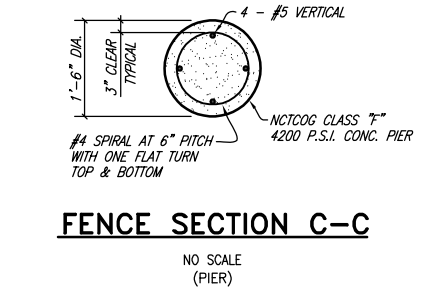
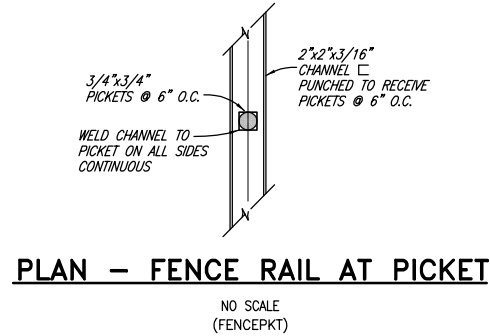
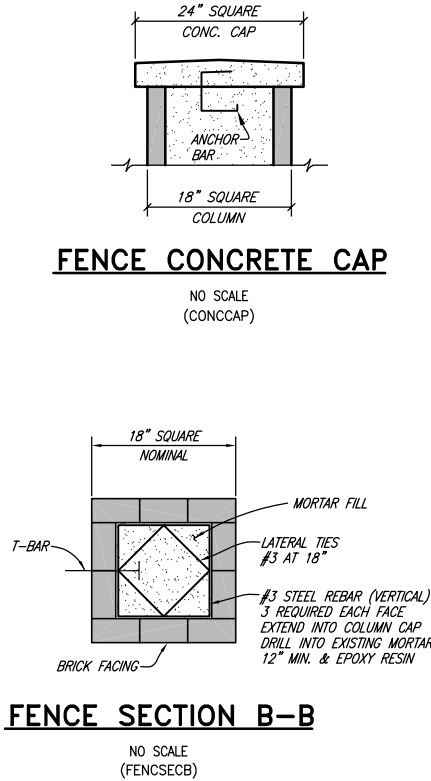
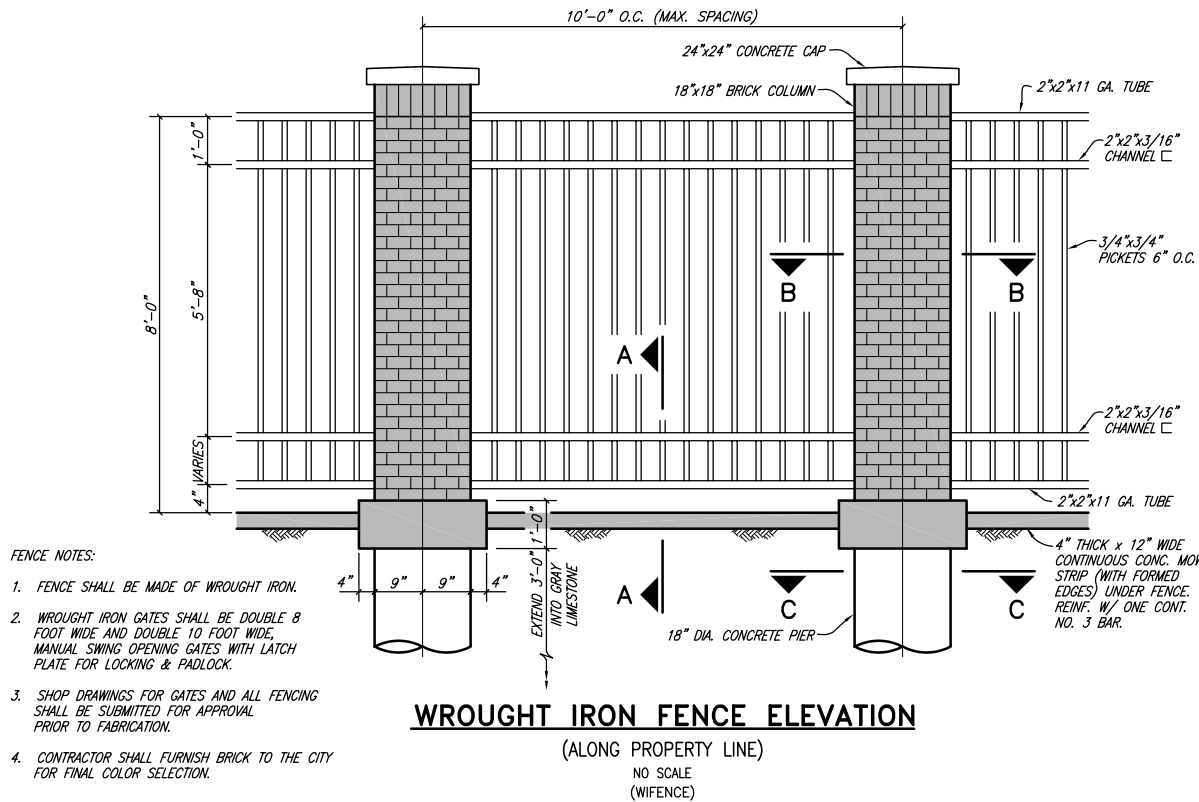


CITY OF AUBREY, TEXAS
STANDARD CONSTRUCTION DETAILS
FENCING

JULY, 2024

SHEET NO.

29



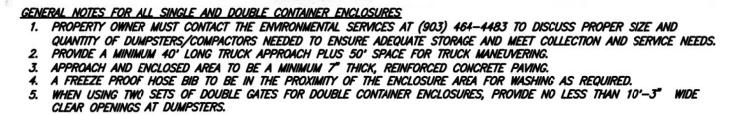
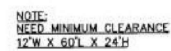
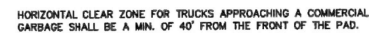
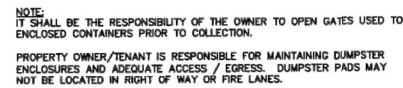
CITY OF AUBREY, TEXAS
STANDARD CONSTRUCTION DETAILS
FENCING

JULY, 2024

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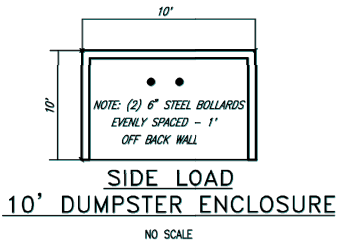
30

1. GARBAGE CONTAINERS ARE REQUIRED TO BE SCREENED ON ALL SIDES, AND CONSTRUCTED SO AS TO BE ACCESSIBLE TO GARBAGE TRUCKS. APPLICANTS SUBMITTING SITE PLANS WHICH INCLUDE THE SITING OF A GARBAGE DUMPSTER AND CONSTRUCTION OF THE REQUIRED ENCLOSURE SHOULD BE FAMILIAR WITH THE REQUIREMENTS OF THE ZONING ORDINANCE AND THE MINIMUM STANDARDS ADOPTED BY THE CITY.
2. APPLICANTS SHOULD CONSULT SECTION 146-132 AND THE ATTACHED DRAWINGS FOR THE REQUIREMENTS OF DUMPSTER ENCLOSURES.
3. THE MINIMUM HEIGHT OF THE SCREENING DEVICE FOR GARBAGE, TRASH OR REFUSE CONTAINERS IS 7 FEET AND THE MAXIMUM HEIGHT IS 8' - 4", EXCEPT FOR "ML", "MH" AND INDUSTRIAL "PD" DISTRICTS WHERE THE MAXIMUM HEIGHT OF A SCREENING DEVICE IS 10 feet.
4. WHEN SITTING A DUMPSTER ENCLOSURE ON A PROPERTY, APPLICANTS SHOULD CONSIDER HOW EASILY A 32 FOOT LONG TRUCK CAN ENTER THE SITE, MANEUVER TO THE DUMPSTER, ACCESS IT (INCLUDING AT LEAST 40 FEET STRAIGHT FROM THE SCREENING GATES FOR BACKING), AND EITHER EXIT THE SITE OR MANEUVER TO THE NEXT DUMPSTER. FIRELANES PROVIDE ADEQUATE MANEUVERING LANES, BUT NOTE THAT ENCLOSURES CAN NOT BE LOCATED WITHIN FIRELANES. LOCATIONS THAT REQUIRE A TRUCK TO PERFORM EXCESSIVE BACKING (> 80 FEET) ARE DISCOURAGED.
5. SCREENING GATES ARE REQUIRED TO BE SOLID METAL AND SCREEN THE DUMPSTER FROM VIEW WHEN CLOSED. GATES SHOULD SWING OUT TO AN ANGLE GREATER THAN 180~ AND CREATE AN OPENING AT LEAST 12 FEET WIDE FOR THE TRUCK TO ENTER THE ENCLOSURE. PINS SHOULD HOLD THE GATES OPEN WHILE THE DUMPSTER IS BEING ACCESSED. GATES SHOULD ALSO SWING CLEAR OF ALL FIRELANES.
6. BUFFERING (LANDSCAPING) IS REQUIRED AROUND SCREENING WALLS WHEREVER THEY ABUT A NON-PAVED SURFACE OR A REQUIRED LANDSCAPE AREA. ACCEPTABLE BUFFERING INCLUDES A ROW OF HOLLIES (NELLIE R. STEVENS, BURFORD, ETC.) ALONG THE SCREENING WALLS.
7. FOR MORE INFORMATION ABOUT THE MINIMUM STANDARDS FOR DUMPSTER ENCLOSURES, CONTACT THE PLANNING DEPARTMENT OR THE ENVIRONMENTAL WASTE DEPARTMENT.



SOLID WASTE VEHICLE OPERATION SCHEMATIC TYPICAL ROUTE CONDITIONS AND TRUCK MANEUVERING SPACE CLEARANCES REQUIREMENTS

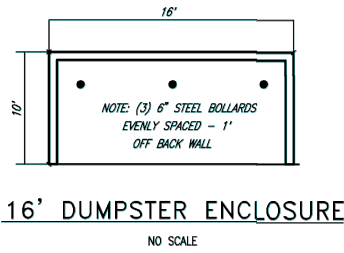
- GENERAL NOTES:
- ALL CURBS ARE TO BE ALIGNED ON THE OUTSIDE OF ENCLOSURE WALLS. THE CURBS SHALL NOT INTERFERE WITH THE ROUTE OF THE SOLID WASTE COLLECTION VEHICLE.
 - ALL SOLID WASTE COLLECTION ROUTES SHALL MEET ENGINEERING DESIGN CRITERIA (WIDTHS, TURNING RADI, ETC.). SITE SHALL BE DESIGNED TO PROVIDE SOLID WASTE COLLECTION VEHICLES WITH SAFE APPROACH TO DUMPSTER ENCLOSURES AND LIFT EACH CONTAINER WITHOUT GROUND LEVEL OR AERIAL OBSTRUCTIONS AS REQUIRED.
 - FOR THE SAFETY OF OTHERS, ROUTE LAYOUT AND OPERATION CLEARANCES SHALL BE SUCH THAT SOLID WASTE VEHICLES WILL NOT NEED TO BACK UP MORE THAN 50 FEET TO EXIT THE SITE AFTER SERVICING A DUMPSTER.
 - NO AWNING OR BUILDING PROJECTIONS ARE TO ENCROACH THE SOLID WASTE COLLECTION VEHICLE'S OPERATION AREA AND/OR SPACE. MINIMUM OVERHEAD CLEARANCE OF 14 FEET IS REQUIRED IN DRIVE AND 25 FEET OVER AND ABOUT THE DUMPSTER ENCLOSURE AREA FROM STEEL SAFETY BOLLARDS BACK 50 FEET.
 - ROUTES SHALL BE CLEAR OF ALL OBSTRUCTIONS (CURBS, WALLS, OVERHEAD WIRES, AWNINGS, ROOF PROJECTIONS, ETC.) TO PREVENT DAMAGE FROM THE COLLECTION VEHICLE.
 - IDEALLY, THE MOST DESIRED SITE PLANNING SHALL BE WHENEVER IS POSSIBLE TO SELECT A ROUTE FOR THE COLLECTION VEHICLE TO TRAVEL THE SITE WITHOUT BACKTRACKING. MULTIPLE FACILITIES SHOULD BE LOCATED IN SEQUENCE TO ALLOW CONSECUTIVE SERVICING ON ONE-WAY TRUCK ROUTE AS MUCH AS POSSIBLE (TYPICAL, UNLESS OTHERWISE APPROVED BY ENVIRONMENTAL SERVICES.)
 - ALL DUMPSTER ENCLOSURES MUST BE ORIENTED TO FACE 90 FEET LONG OF OPEN SPACE. THE ONLY EXCEPTION IS FOR DUMPSTER ENCLOSURES PLACED ALONG A STRAIGHT COLLECTION VEHICLE ROUTE WHERE THE ENCLOSURES NEED TO BE ANGLED WITH NOT MORE THAN 30 DEGREES DEVIATION FROM THE ROUTE DIRECTION LINE AND PLACED DEEP ENOUGH TO ALLOW THE TYPICAL 50 FEET BACK UP FOR THE VEHICLE TO RESUME IT'S ROUTE.
 - DUMPSTER ENCLOSURES SHALL BE LOCATED AWAY FROM ENTRANCES AND EXITS SO SOLID WASTE COLLECTION VEHICLES DO NOT CREATE A SAFETY HAZARD BY BLOCKING IN-COMING OR OUT-GOING TRAFFIC.
 - FOR WHERE SINGLE, DOUBLE OR TRIPLE-WIDE DUMPSTER ENCLOSURES ARE REQUIRED, SEE CITY ORDINANCE # 01--02--14. ALL DESIGNS MUST BE APPROVED BY THE ENVIRONMENTAL SERVICES DEPARTMENT (972-292-5915).
 - FOR GENERAL INFORMATION AND TYPICAL REQUIREMENTS ON DUMPSTER ENCLOSURE DESIGN LAYOUT SEE AVAILABLE CITY STANDARD CRITERIA DETAILS.



CAPACITY:
1 EA. 3 YD. DUMPSTER
OR
1 EA. 8 YD. DUMPSTER

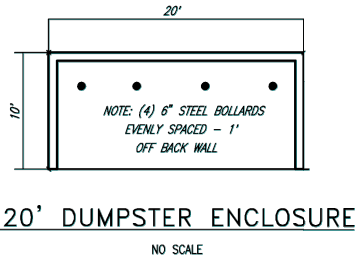
OPTIONS:
FRONT GATES MUST OPEN 180 DEGREES
FRONT GATES MUST OPEN 90 DEGREES

MUST MEET ALL FRONT LOAD REQUIREMENTS WITH SCREENING WALLS, CONCRETE, ETC.



CAPACITY:
2EA. 3 YD. DUMPSTERS
OR
1EA. 8 YD. DUMPSTER

OPTIONS:
FRONT GATES MUST OPEN 180 DEGREES
FRONT GATES MUST OPEN 90 DEGREES

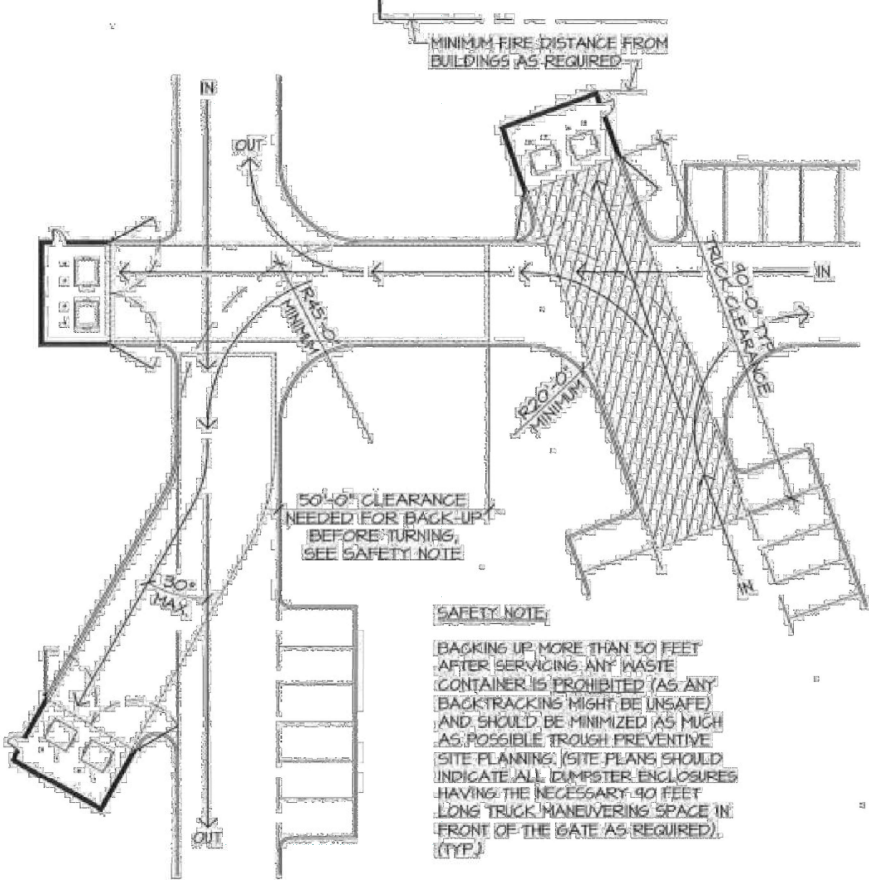


CAPACITY:
2EA. 8 YD. DUMPSTERS

OPTIONS:
FRONT GATES MUST OPEN 90 DEGREES

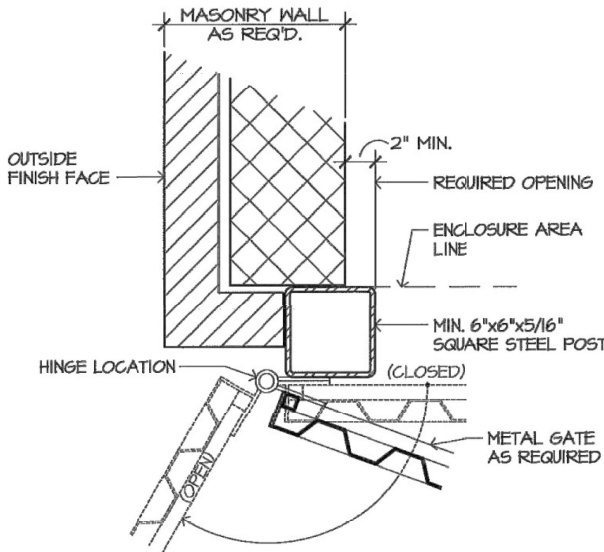
SOLID WASTE VEHICLE OPERATION SCHEMATIC TYPICAL ROUTE CONDITIONS AND TRUCK MANEUVERING SPACE CLEARANCES REQUIREMENTS

FRONT LOAD



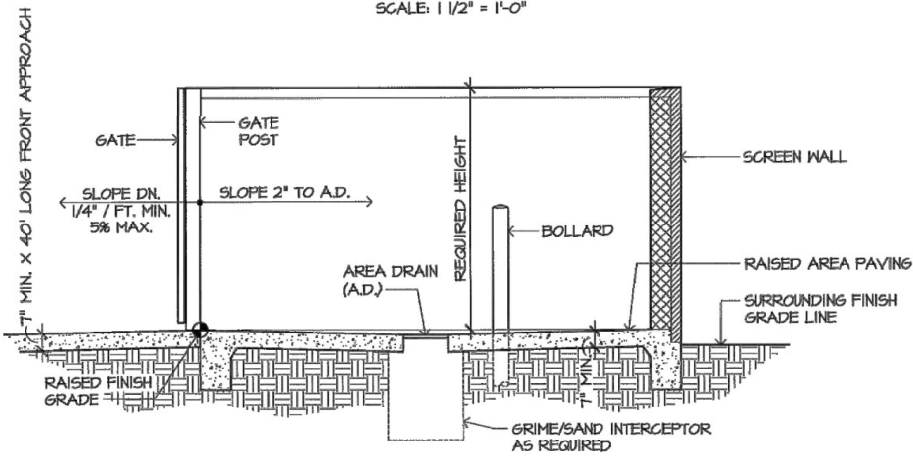
SCHEMATIC SITE PLAN

SCALE: 1" = 30'-0"



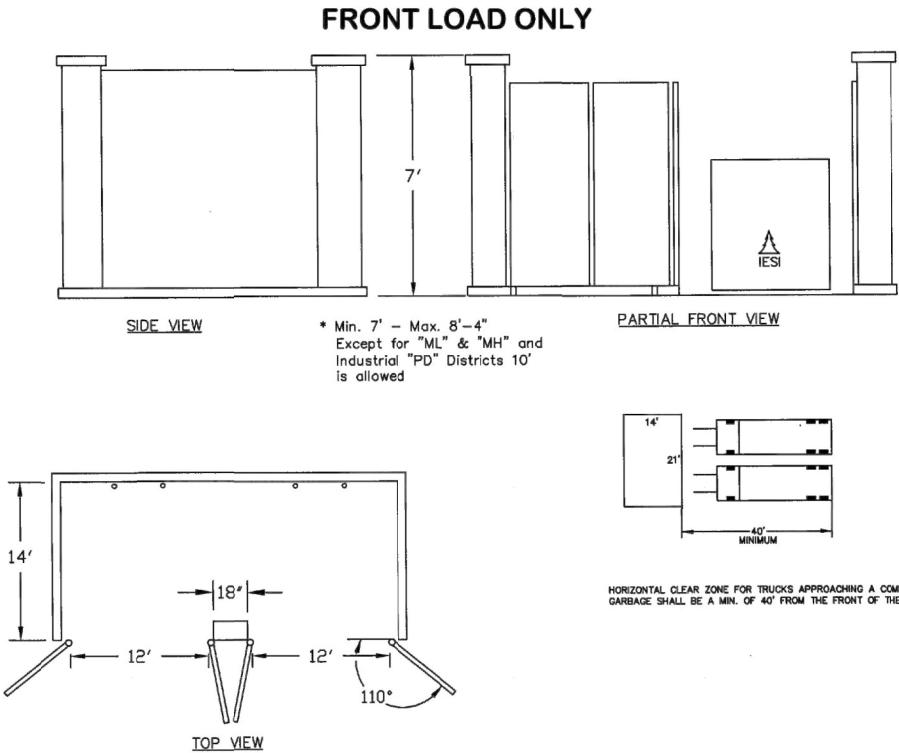
GATE POST PLAN DETAIL

SCALE: 1/2" = 1'-0"



ENCLOSED AREA CROSS SECTION

SCALE: 1/4" = 1'-0"



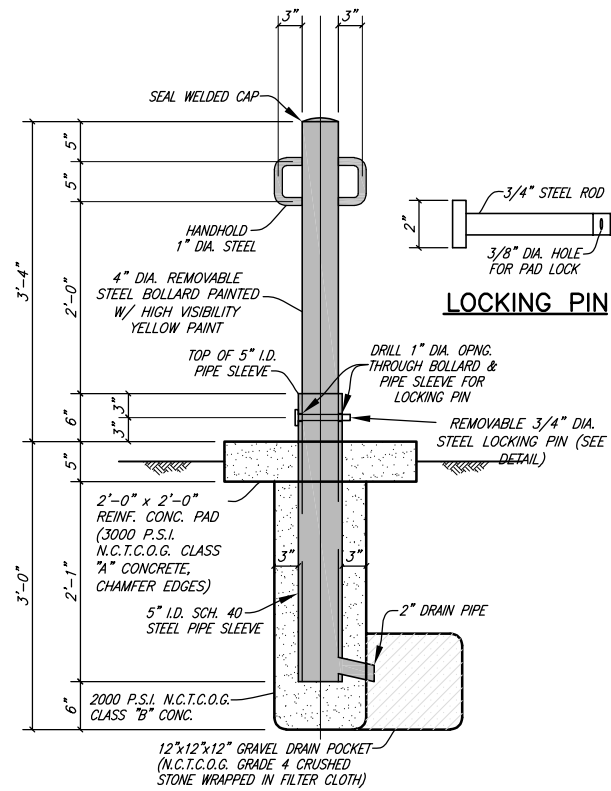
CITY OF AUBREY, TEXAS

STANDARD CONSTRUCTION DETAILS
DUMPSTER DETAILS

JULY, 2024

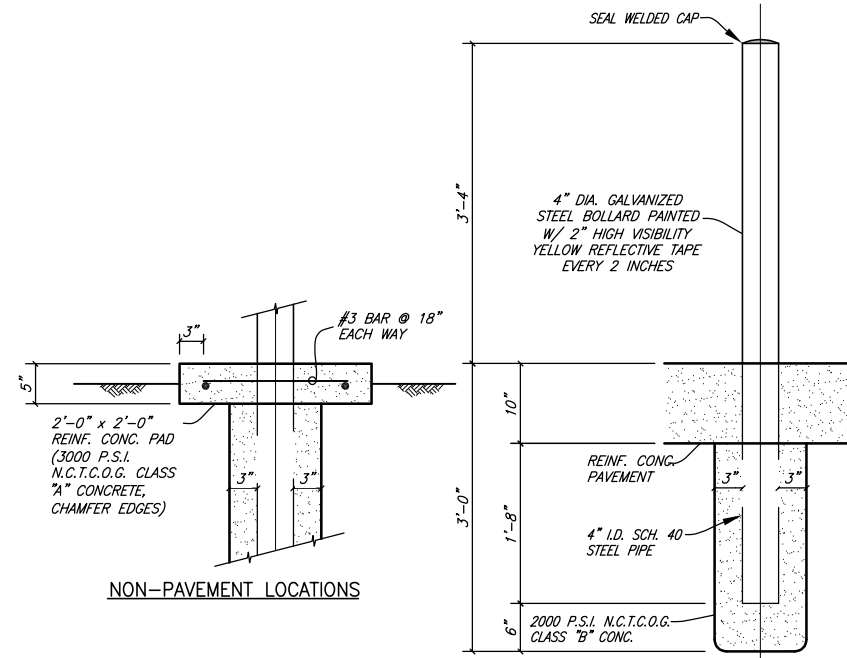
SHEET NO.

32



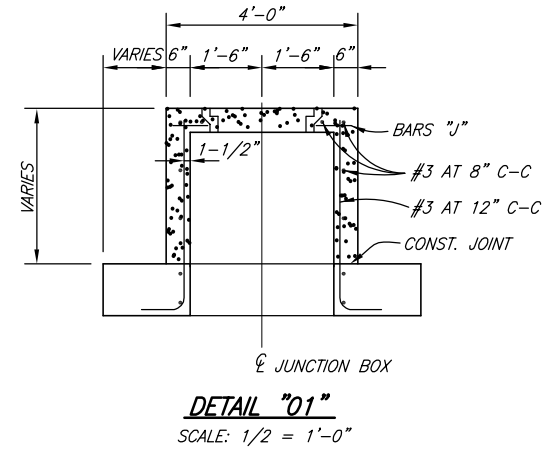
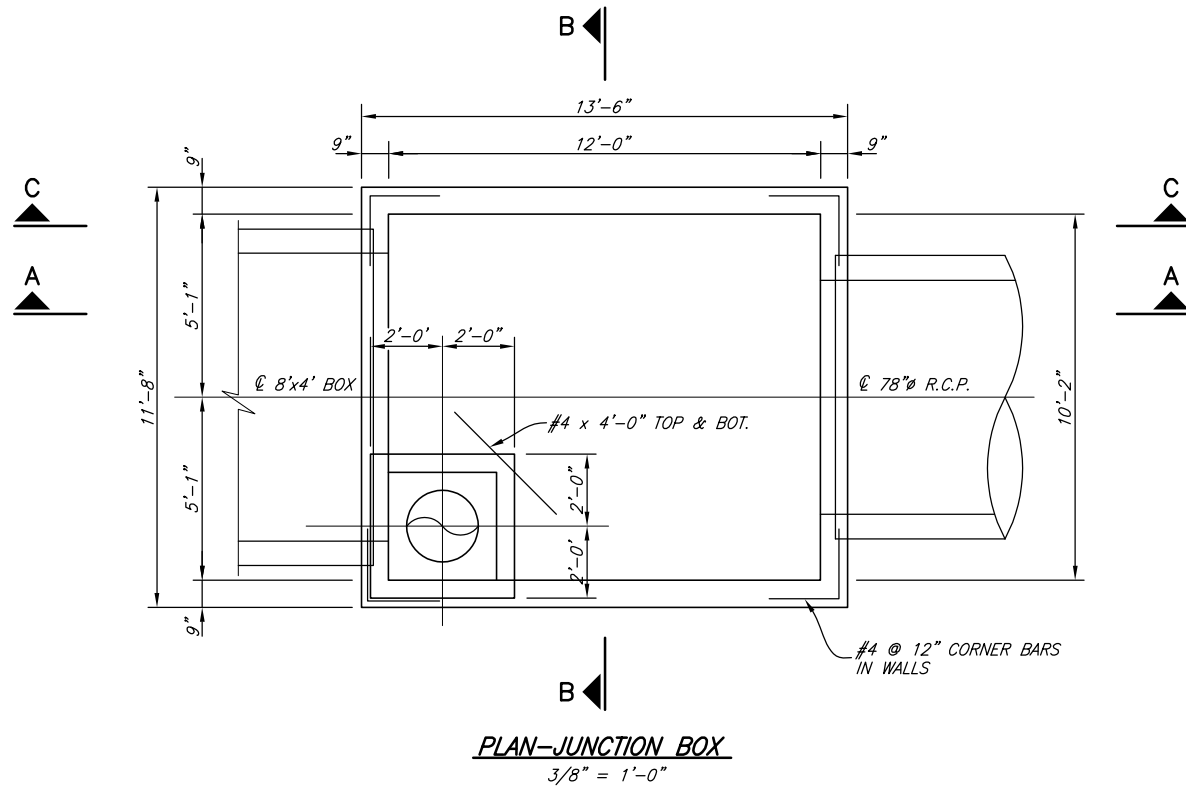
REMOVABLE PIPE BOLLARD
NO SCALE
(BOLLARD)

- NOTES:
1. BOLLARDS SHALL BE LOCATED IN THE FIELD 4'-0" O.C. AS SHOWN IN THE ELECTRICAL SITE PLAN.
2. ALL STEEL SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.



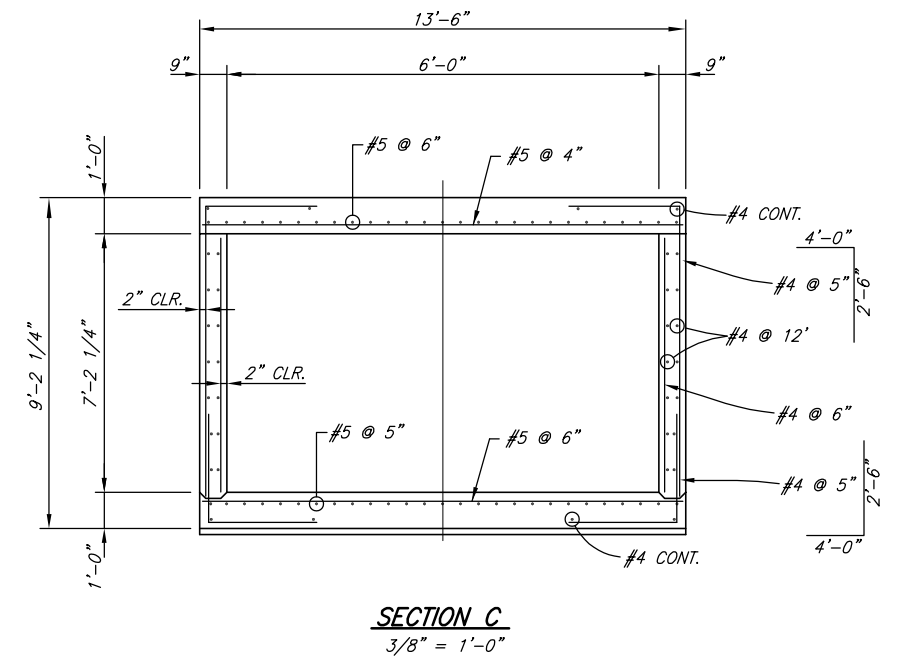
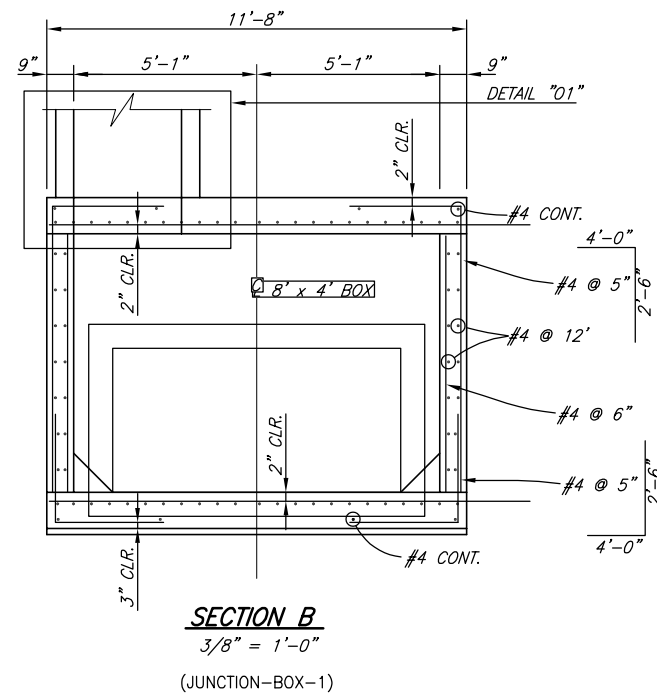
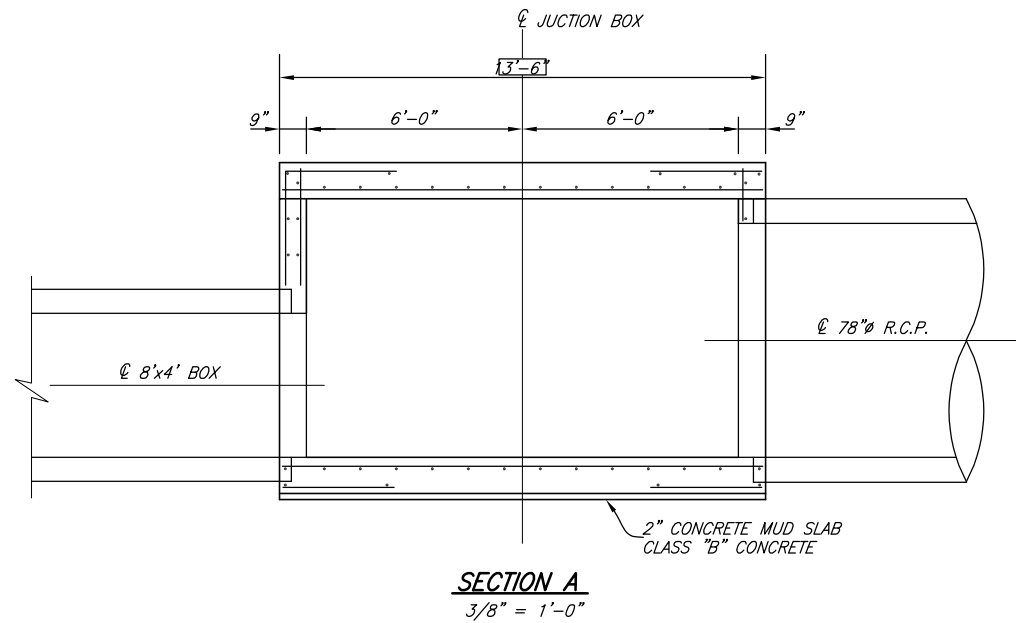
PIPE BOLLARD
NO SCALE
(BOLLARDS)

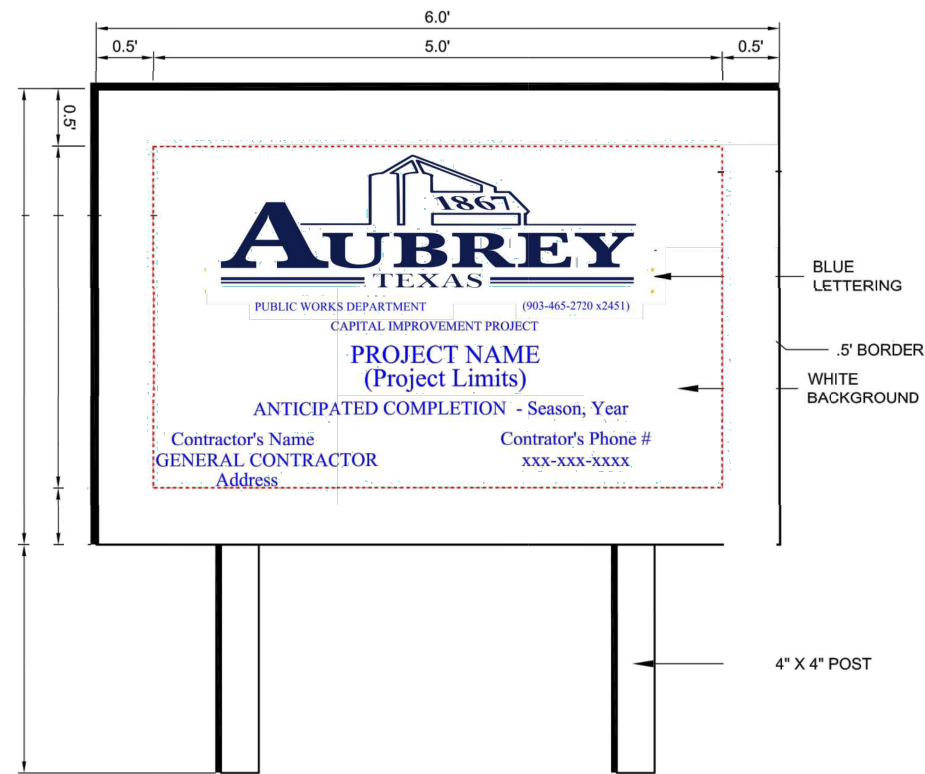
NOTE:
ALL STEEL SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.



NOTE:

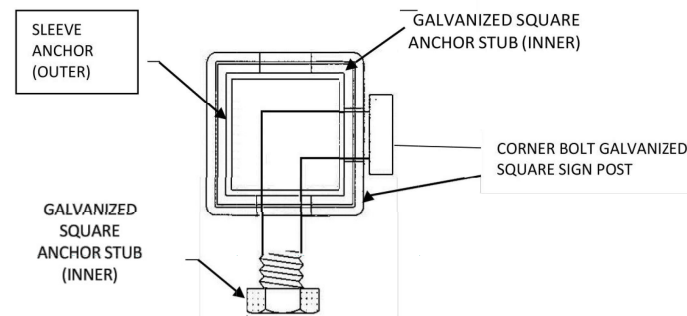
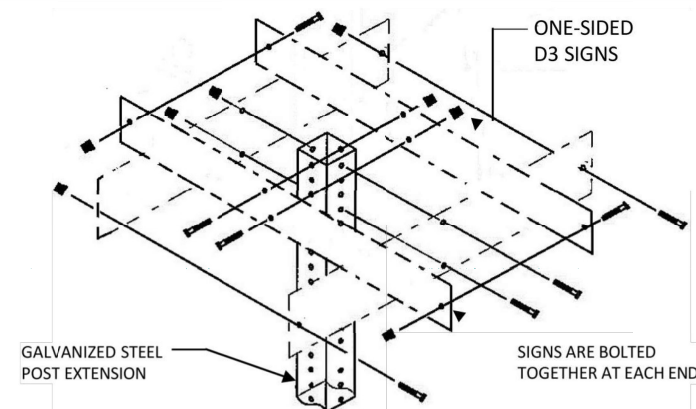
1. CONSTRUCTION SHALL CONFORM TO THE REQUIREMENTS OF NCTCOG'S STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION.
2. CONCRETE SHALL BE CLASS "C" -3,600 P.S.I..
3. REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF ASTM A615, GRADE 60.
4. FIELD CUT REINFORCING STEEL TO CLEAR PRECAST BOX AND R.C.P. BY 2".



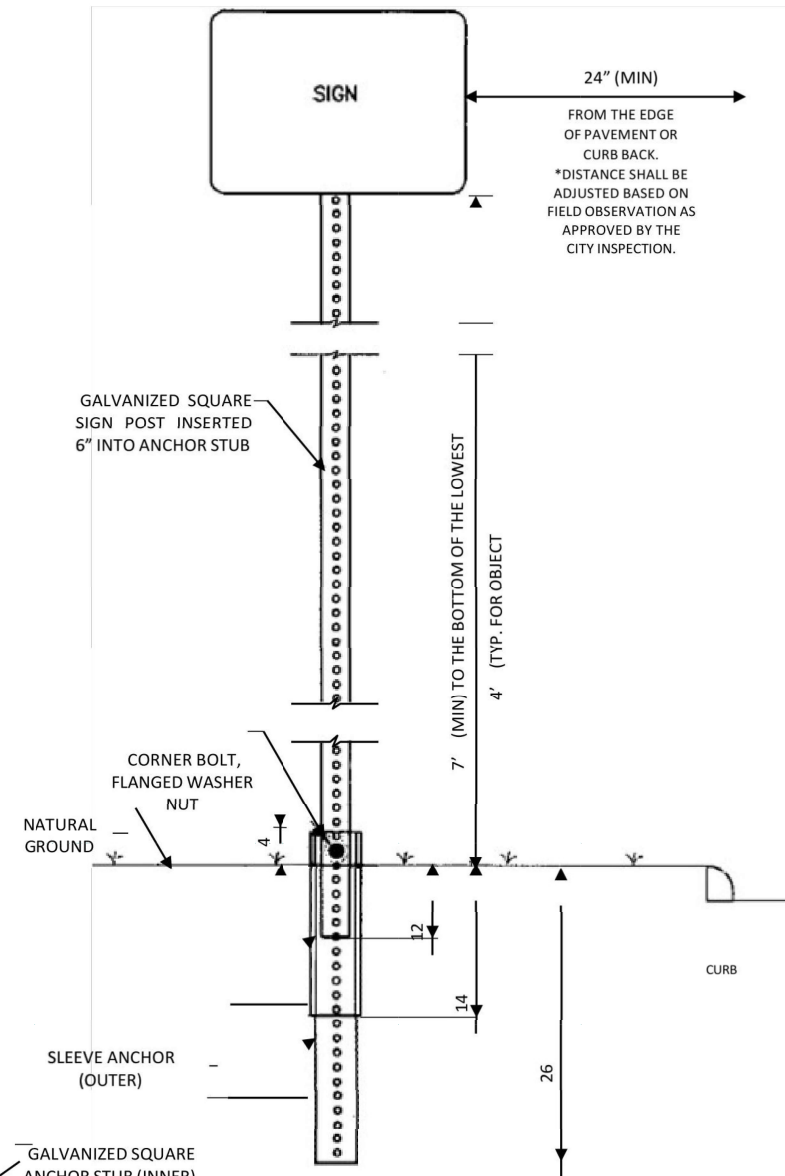


PROJECT SIGN DETAIL
SCALE N.T.S.

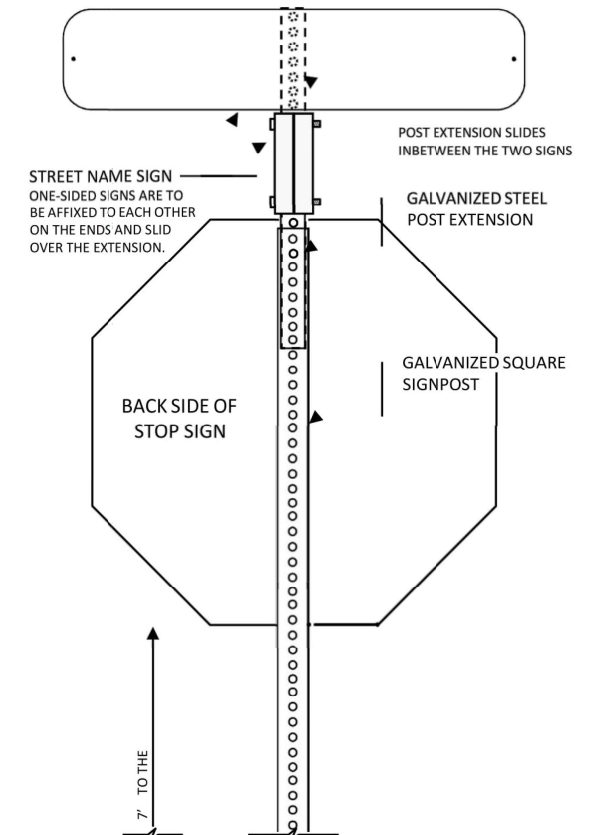
COLOR PALETTE



TYPICAL GROUND SIGN INSTALLATION
PERFORATED SQUARE METAL TUBING



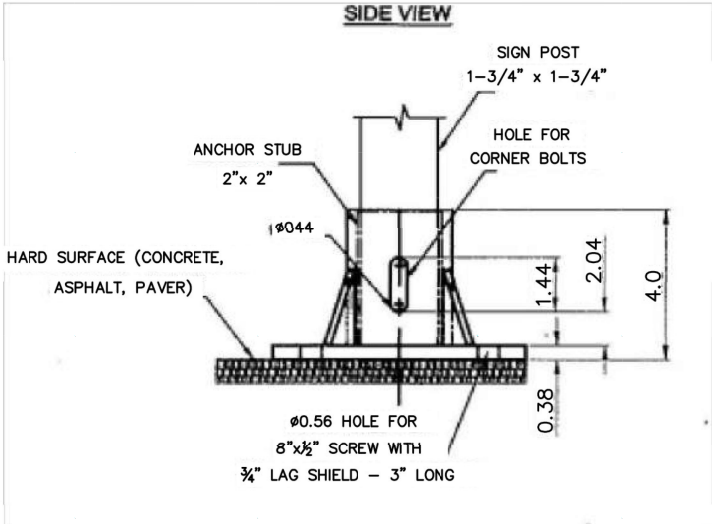
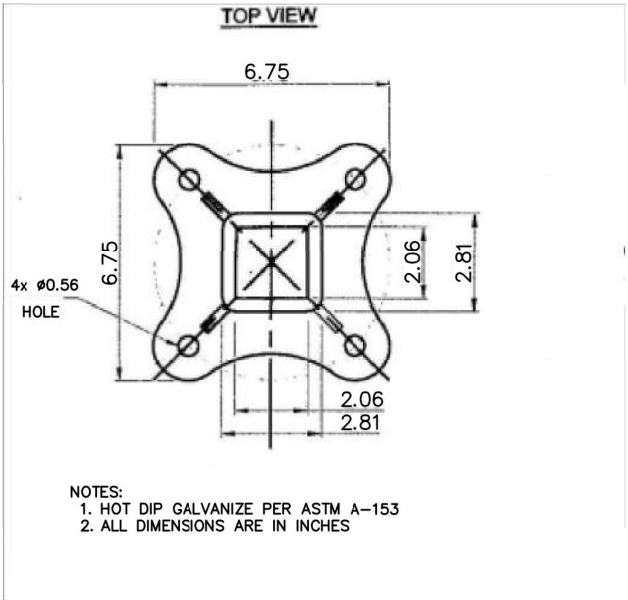
TYPICAL STOP SIGN AND
STREET NAME SIGN INSTALLATION



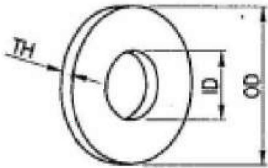
SLEEVE DETAILS

GALVANIZED SQUARE SIGN POST EXTENSION (PERFORATED)	1-1/2" x 1-1/2" (14 GAUGE)
GALVANIZED SQUARE SIGN POST (PERFORATED)	1-3/4" x 1-3/4" (14 GAUGE)
GALVANIZED SQUARE SIGN POST (PERFORATED) (INNER)	2" x 2" x 30" (14 GAUGE)
GALVANIZED SQUARE SIGN POST (PERFORATED) (OUTER)	2 1/4" x 2 1/4" x 18" (14 GAUGE)

TYPICAL HARD SURFACE INSTALLATION GALVANIZED SIGN BASE
(USED ONLY WHEN UNDERGROUND CONDITIONS PROHIBIT USE OF STANDARD ANCHOR SLEEVE
– APPROVAL FROM PUBLIC WORKS DIRECTOR OR DESIGNEE NEEDED PRIOR TO USE)



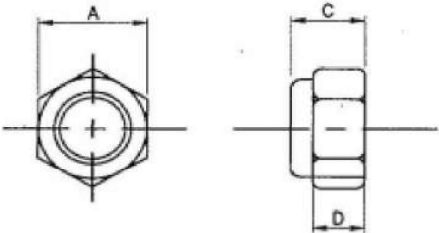
1/2" FLAT WASHERS, LOW CARBON, SAE, ZINC PLATED



SAE FLAT WASHERS								
SIZE	ID			OD			THICKNESS--TH	
	BASIC	TOLERANCE		BASIC	TOLERANCE		BASIC	PLUS MINUS
		PLUS	MINUS		PLUS	MINUS		
1/2	0.515	0.015	0.005	1.062	0.030	0.007	0.095	0.121 0.074

DIMENSIONS: ASME B18.21.1, TYPE A PLAIN WASHERS
MATERIAL: CARBON STEEL
FINISH: Fe/Zn 3AT PER ASTM F1941

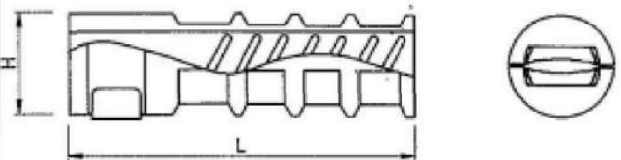
HEX NYLON INSERT LOCKNUTS (NE), GRADE 8, YELLOW ZINC PLATED



SIZE	C		A		D
	THICKNESS		WIDTH ACROSS FLATS		HEX HEIGHT
	MAX.	MIN.	MAX.	MIN.	MIN.
5/16"	0.359	0.329	0.502	0.489	0.25

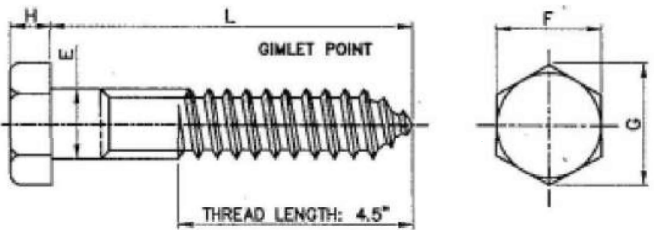
DIMENSIONS: ASME B18.16.6
MATERIAL: CARBON STEEL GRADE 8 PER ASME B18.16.6, NYLON %
THREAD REQUIREMENTS: ASME B1.1 UNC& UNG CLASS 2B

ANCHOR LAG SHIELD - ZINC ALLOY



TH	L		H
LAG THREAD SIZE	LENGTH		DRILLED HOLE SIZE
	NOMINAL		
1/2"	2"	3"	3/4"

8" HEX LAG SCREWS, HOT DIPPED GALVANIZED



DIAMETER	E		F		G		H		L
	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	8
1/2"	0.515	0.482	0.75	0.725	0.866	0.826	0.75	0.725	

MATERIAL: PER A307 GRADE A
COATING: HOT DIP ZINC PER ASTM F2329 OR IN ACCORDANCE WITH CLASS C OF ASTM AND CLASS D FOR 3/8" DIAMETER OR LESS



CITY OF AUBREY, TEXAS

STANDARD CONSTRUCTION DETAILS
TYPICAL HARD SURFACE INSTALLATION SIGN BASE DETAILS

JULY, 2024

SHEET NO.

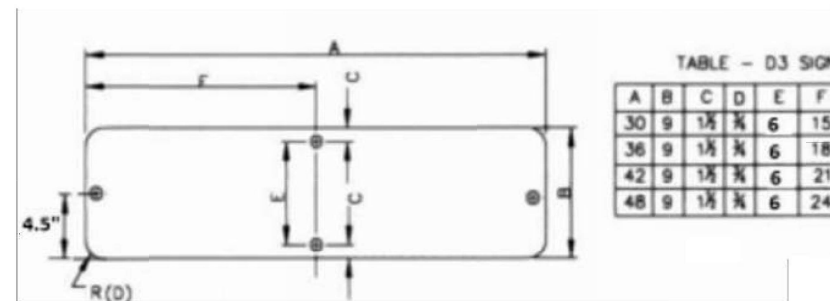
36

D3-1 STREET NAME SIGN EXAMPLES (DIMENSIONS SHOWN ARE TYPICAL)

D3-1 STREET NAME SIGN

HEIGHT	9" SIGN BLANK (9.30" DESIGNED WITH FULL BLEED)
LENGTH	30", 36" 42" OR 48"
THICKNESS	0.080"
SUBSTRATE	ALUMINUM ALLOY, 5052-H38 (ASTM B-209)
SIGN FACE MATERIAL	GREEN FILM OVER ASTM-4956 TYPE XI FULL CUBE PRISMATIC GRADE RETROREFLECTIVE SHEETING OR EQUIVALENT
SIGN FONT	CLEARVIEW HWY 3W
COLOR	LETTERS - WHITE REFLECTIVE BACKGROUND – GREEN FILM

D3-1 STREET NAME SIGN DIMENSIONS

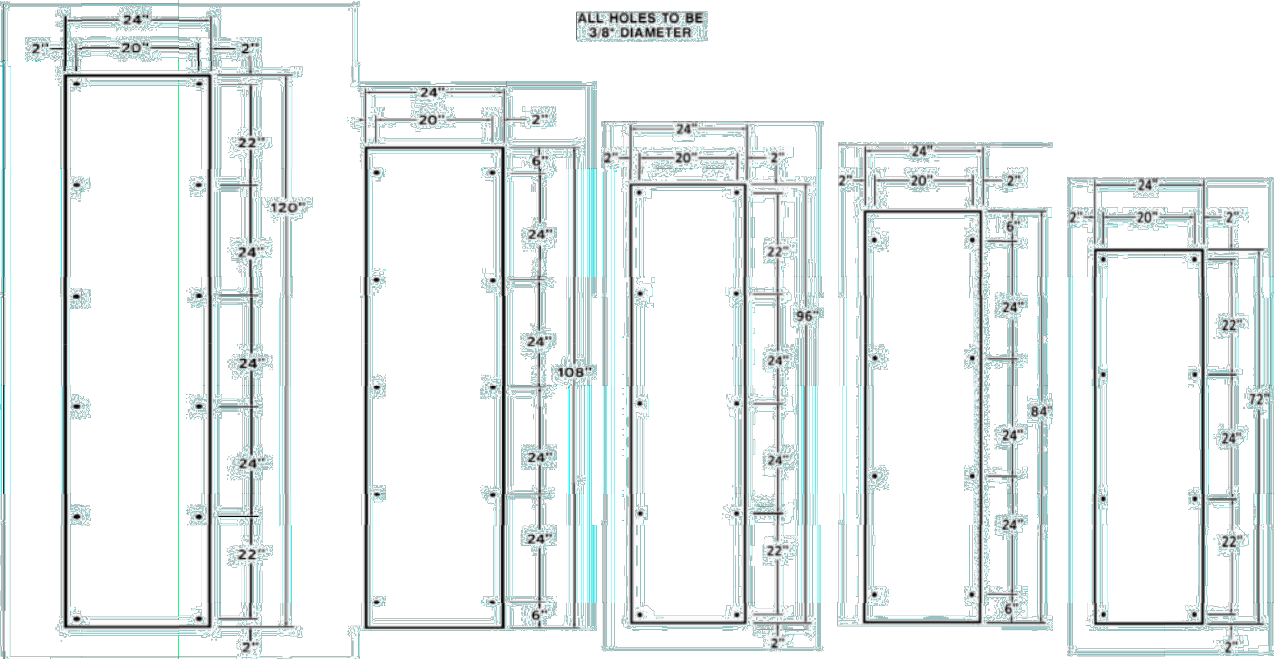


NOTES:

1. TEXT SHALL START 2" FROM THE EDGE OF THE LOGO
2. STREETNAME SHALL BE CENTERED AND 6" FONT SIZE
3. 1" MIN. SPACE BETWEEN STREET NAME LETTERS
4. SUFFIX AND BLOCK NUMBER MUST BE LOCATED 2" FROM STREET NAME AND 2" FROM THE RIGHT EDGE, SUFFIX AT TOP AND BLOCK NUMBER AT BOTTOM, 3" SPACE BETWEEN THEM.
5. LETTERS AND/OR NUMBERS SPACES IN THE SUFFIX AND BLOCK NUMBER MUST BE 1.5" MIN
6. BLOCK NUMBER MUST HAVE 1" SPACE FROM THE BLADE EDGE
7. ALL DIMENSIONS ARE IN INCHES.
8. SIGN LENGTH WILL BE DICTATED BY THE NUMBER OF LETTERS IN THE NAME
9. ALL STREETNAME SIGNS SHALL HAVE 1/4" DIAMETER HOLES DRILLED ON EACH END AND AFFIXED TOGETHER.

[illegible]

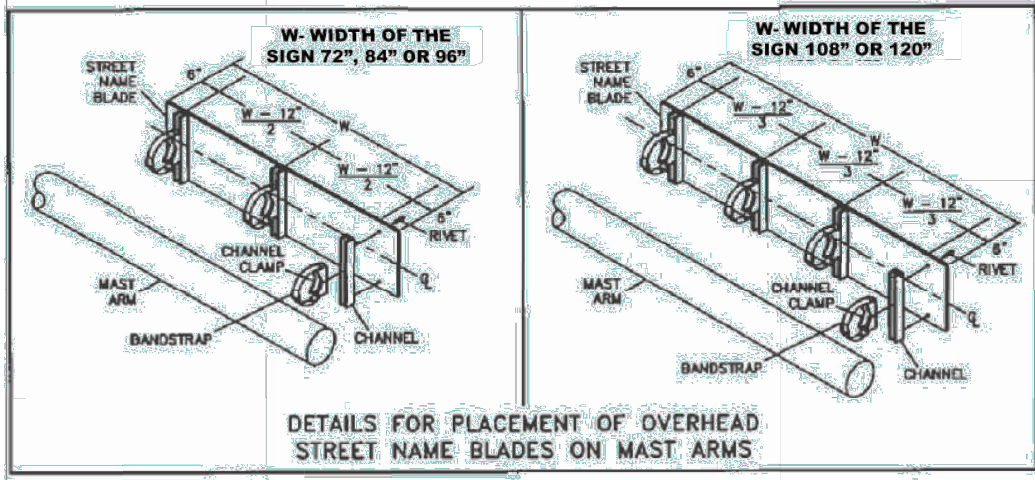
D3-1 OVERHEAD SIGN PANEL DIMENSIONS



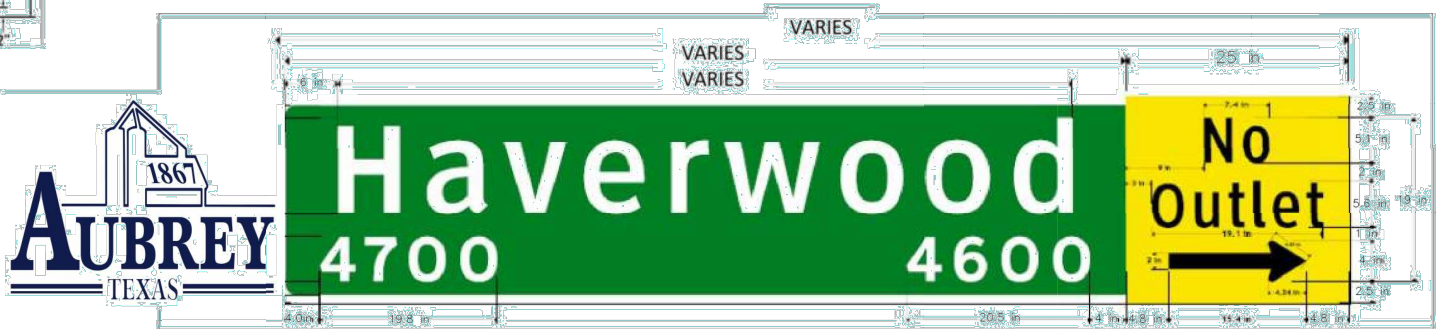
ALL HOLES TO BE
3/8" DIAMETER

HEIGHT	24"
LENGTH	72", 84", 96", 108", or 120"
THICKNESS	0.100"
SUBSTRATE	ALUMINUM ALLOY, 5052-H38 (ASTM B-209)
SIGN FACE MATERIAL	GREEN FILM OVER ASTM-4956 TYPE XI FULL CUBE PRISMATIC GRADE RETROREFLECTIVE SHEETING OR EQUIVALENT
SIGN FONT	CLEARVIEW HWY 5W
COLOR	LETTERS - WHITE REFLECTIVE BACKGROUND - GREEN FILM

DETAILS FOR MOUNTING TRAFFIC SIGNS
ON SIGNAL MAST ARMS AND POLES



D3-1 OVERHEAD STREET NAME SIGN
EXAMPLES
(DIMENSIONS SHOWN ARE TYPICAL)



Complete Sign Unit

made from the following parts:

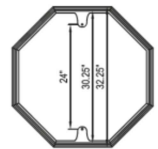
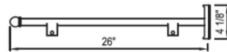
POLE:
SP4X14 - 4" x 14' FLUTED POLE
EXTRUDED ALUMINUM ALLOY 6005-T5
WALL THICKNESS .125"

FINIAL:
FIN-A4 - ACORN FINIAL FOR 4" OD ROUND POLE
HEIGHT: 8"
WIDTH: 4.75"
CAST ALUMINUM ALLOY #356

TRIMS:
SSA-01 - STREET SIGN HOLDER
LENGTH: 26"
BACKPLATE LENGTH: 4 1/8"
CAST ALUMINUM ALLOY #356

DT-01 - DECORATIVE FLOWER VINE SCROLL
LENGTH: 17.25"
HEIGHT: 9.75"

TSTOP30N - TRIM FOR 30" STOP SIGN
CAST ALUMINUM ALLOY #356

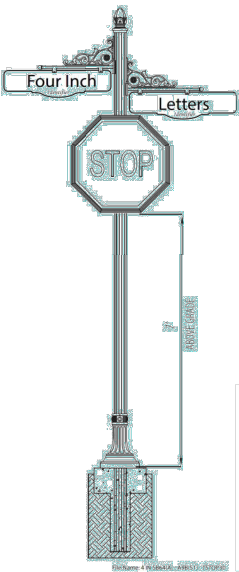


SIGN:
0936DS-B - DOUBLE-SIDED 9" x 36" REFLECTIVE
CUSTOM STYLE B STREET SIGN w/4" LETTERS & 2"
IDENTIFIER LETTERS
SPECIFY VINYL TYPE
SPECIFY VINYL COLOR

R1-1/30 - REFLECTIVE 30" STOP SIGN
SPECIFY VINYL TYPE

BASE:
SB-64 - SLIP-OVER BASE FOR 4" OD POST
HEIGHT: 18"
WIDTH: 13"
CAST ALUMINUM ALLOY #356

NOTES:
COMPLETE UNIT SHOWN WITH 2" BELOW GRADE BURIAL.
DRAWING FOR INFORMATION ONLY, NOT INTENDED FOR CONSTRUCTION PURPOSES.



NOTE: SIGN LENGTH WILL BE DICTATED BY THE NUMBER OF LETTERS IN THE NAME.
THE HEIGHT SHALL BE 24"



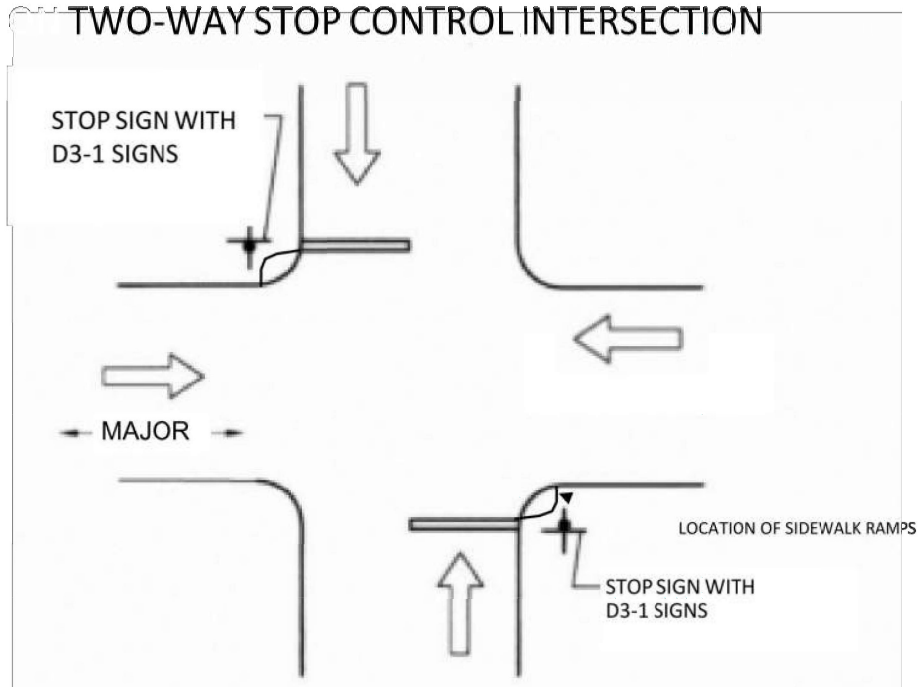
CITY OF AUBREY, TEXAS

STANDARD CONSTRUCTION DETAILS
OVERHEAD STREET NAME BLADE (D3-1) DETAILS

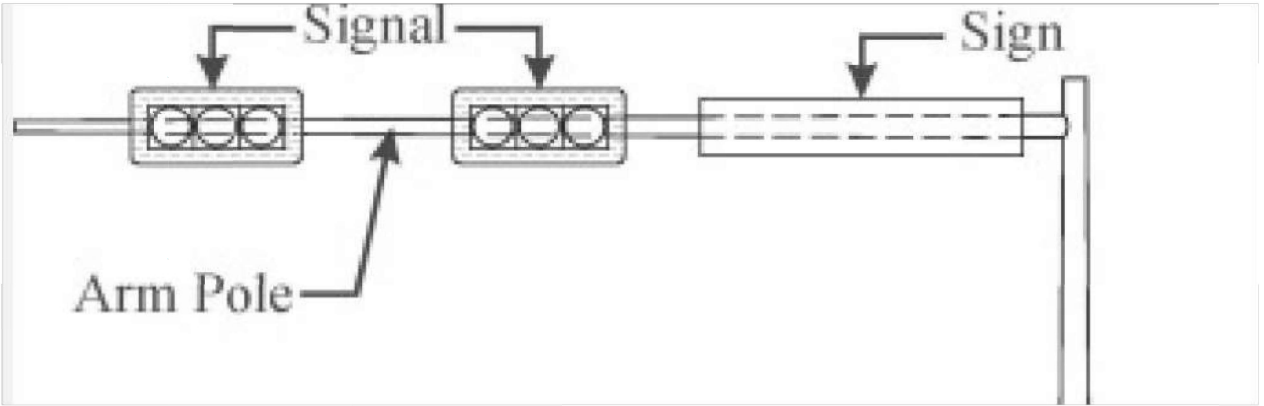
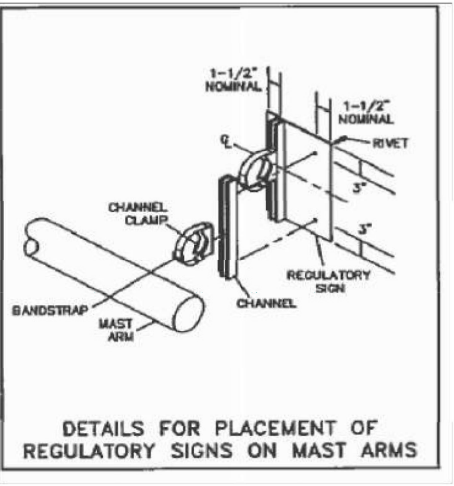
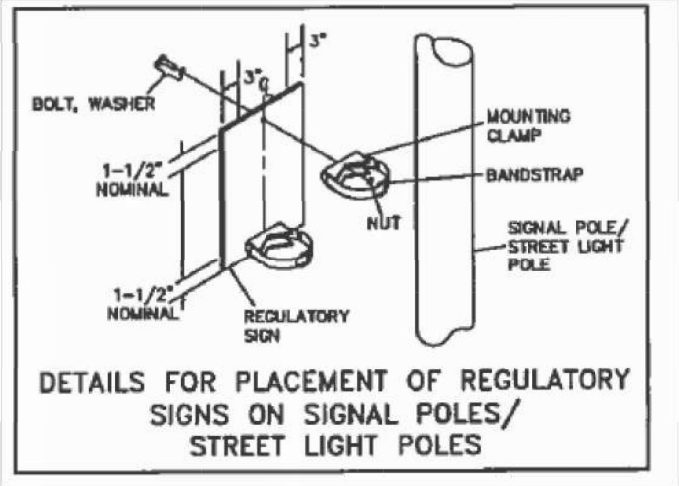
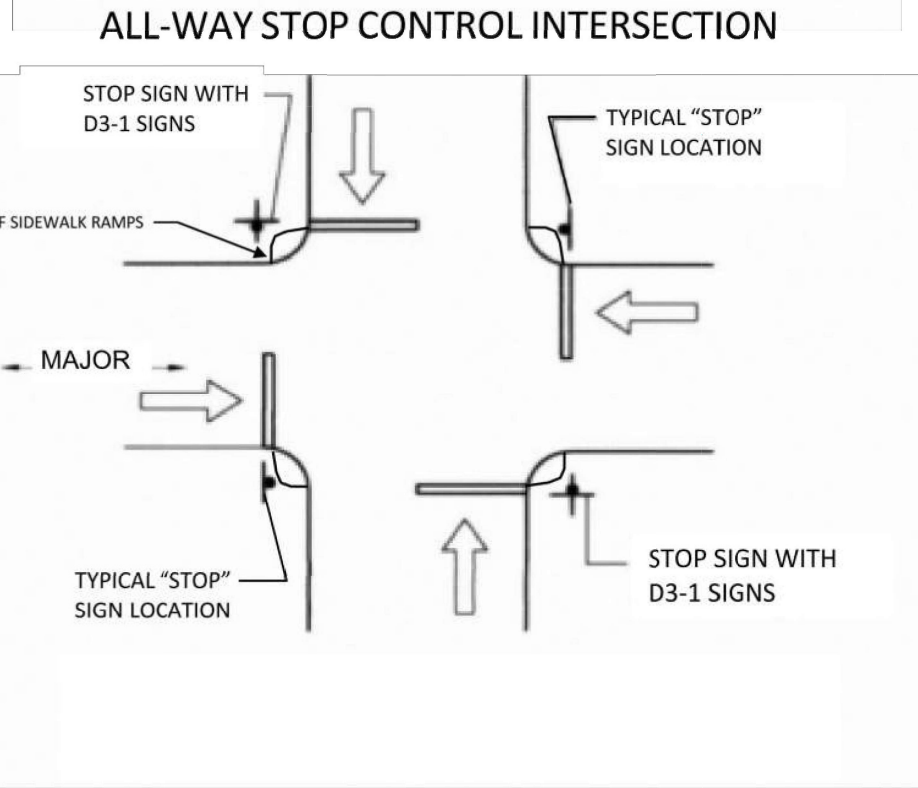
JULY, 2024

SHEET NO.

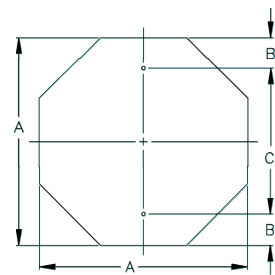
38



**STOP SIGNS ARE TO BE INSTALLED IN ADVANCE OF CROSSWALK AND RAMP

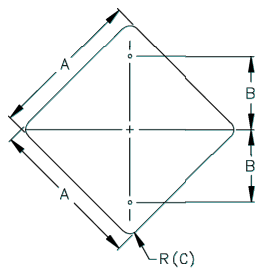


TYPICAL SIGN PLACEMENTS ON SIGNAL MAST ARMS



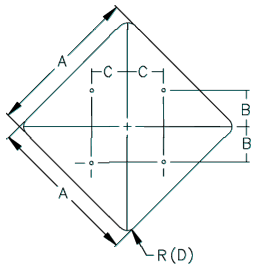
OCTAGONAL

A	B	C	T
24	3	18	0.080
30	3	24	0.080
36	3	30	0.100



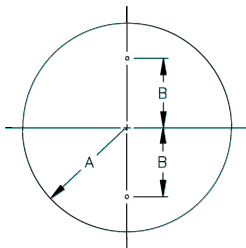
DIAMOND (A)

A	B	C	T
18	9	1	0.080
24	12	1	0.080
30	15	1	0.080
36	18	1	0.100



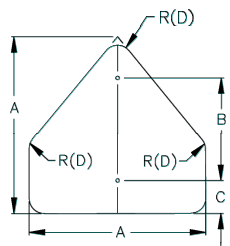
DIAMOND (B)

A	B	C	D	T
48	15	15	3	0.100



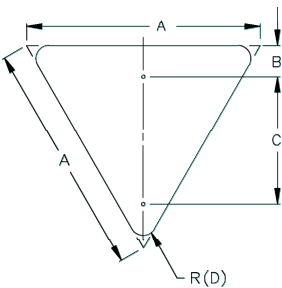
CIRCLE

A	B	T
18	15	0.100



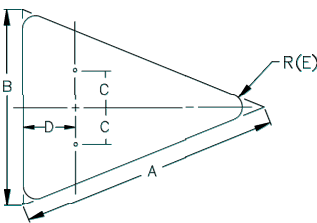
PENTAGON (SCHOOL)

A	B	C	D	T
36	24	32	1	0.100



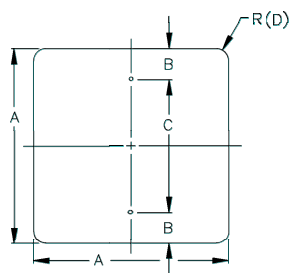
EQUILATERAL TRIANGLE

A	B	C	D	T
36	2	24	2	0.100



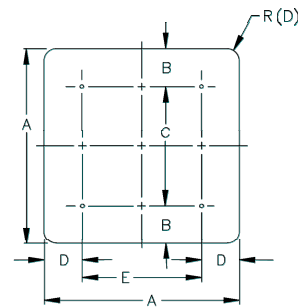
ISOSCELES TRIANGLE

A	B	C	D	E	T
40	30	1	12	7	0.100
48	36	9	15	1	0.100



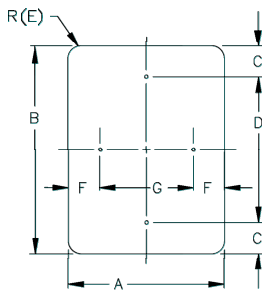
SQUARE (A)

A	B	C	D	T
18	1	12	1	0.080
24	3	18	1	0.080
30	3	24	7	0.080



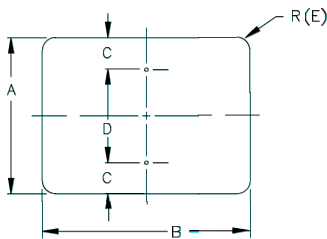
SQUARE (B)

A	B	C	D	E	F	T
48	6	36	9	30	3	0.100



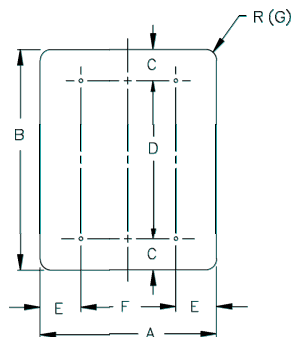
VERTICAL / HORIZONTAL RECTANGLE

A	B	C	D	E	F	G	T
12	18	1	25	1	2	2	0.080
12	36	3	30	1	2	2	0.080
18	24	1	21	1	2	25	0.080
24	30	3	24	1	2	3	0.080
24	36	3	30	1	2	3	0.080
24	48	6	36	7	6	3	0.080
30	36	3	30	7	8	24	0.080



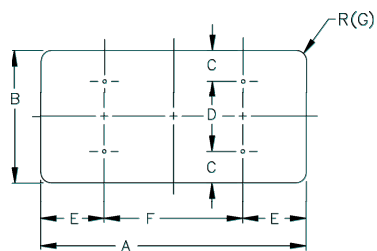
HORIZONTAL RECTANGLE

A	B	C	D	E	T
6	12	1	4	1	0.080
6	18	1	4	1	0.080
20	36	1	12	1	0.080



VERTICAL RECTANGLE

A	B	C	D	E	F	G	T
5	3	14	6	3	14	24	1
48	60	6	48	9	30	3	0.100



HORIZONTAL RECTANGLE

A	B	C	D	E	F	G	T
48	24	2	20	2	44	7	0.100
48	36	3	30	3	42	1	0.100
60	24	2	20	2	58	1	0.100
60	36	3	30	3	54	1	0.100
48	30	3	24	3	42	7	0.100
60	30	3	24	3	54	7	0.100



CITY OF AUBREY, TEXAS

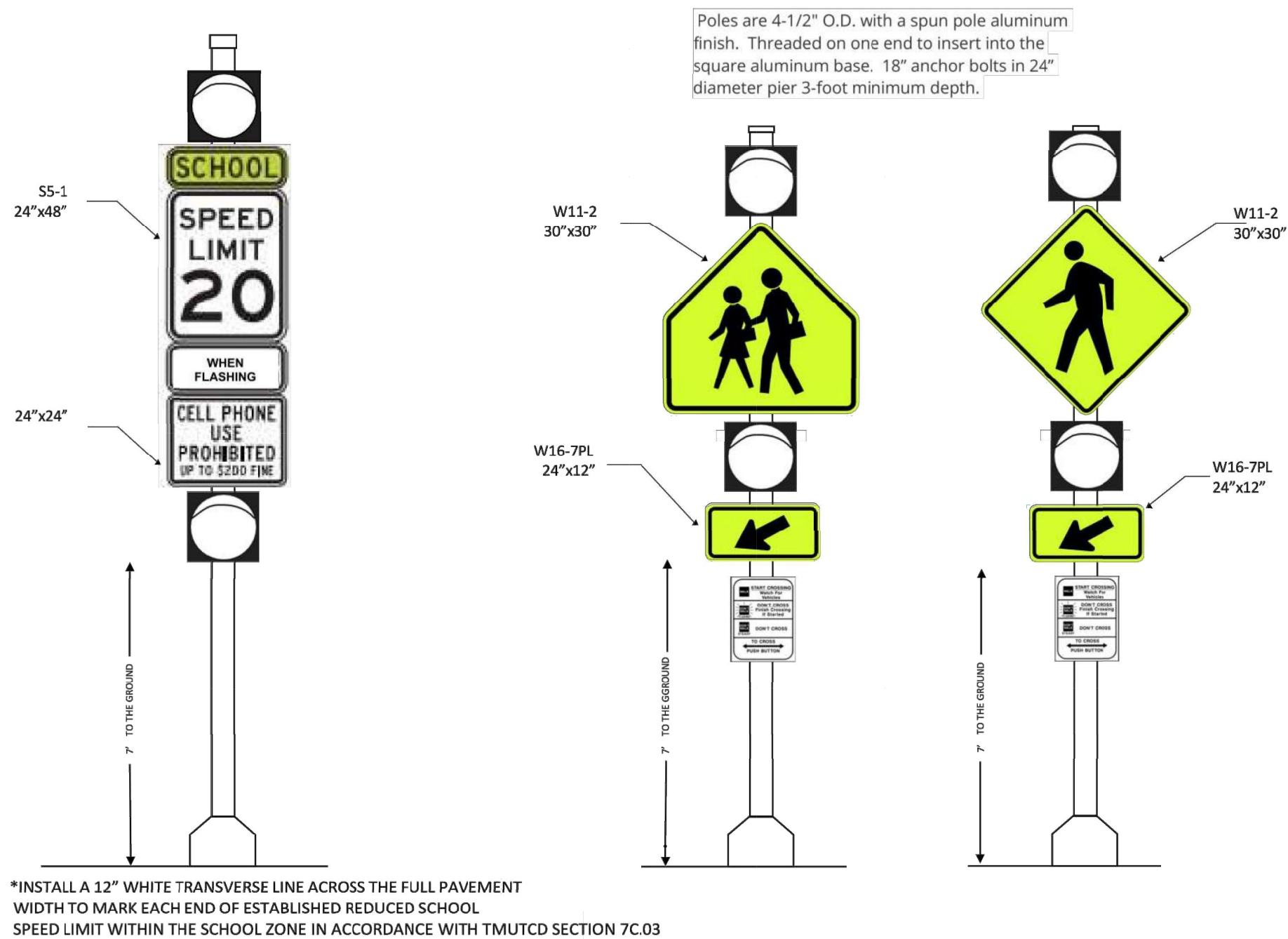
STANDARD CONSTRUCTION DETAILS
TRAFFIC SIGN BLANK DIMENSION

JULY, 2024

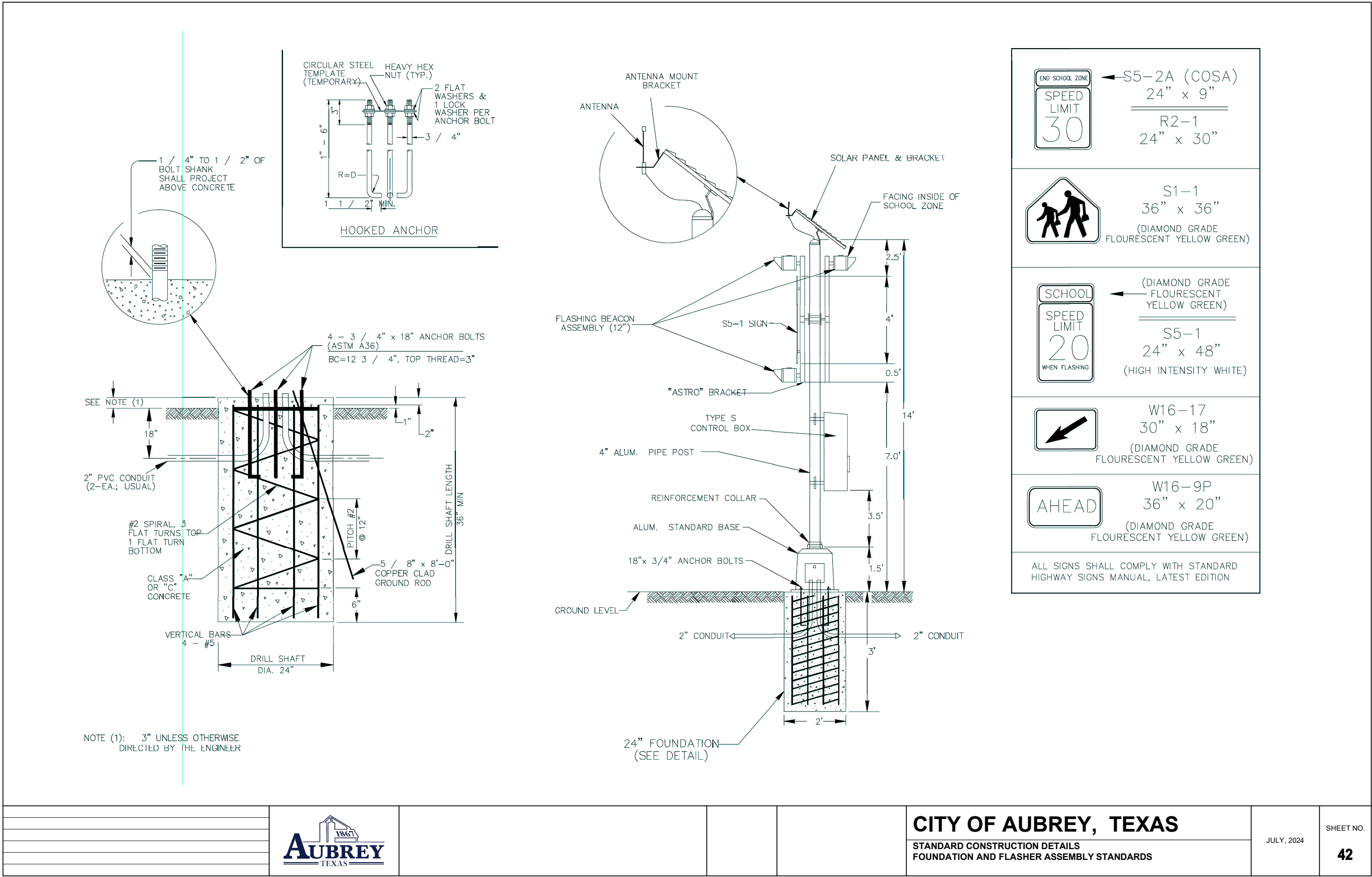
SHEET NO.

40

SCHOOL FLASHERS - FLASHING BEACONS



					CITY OF AUBREY, TEXAS		JULY, 2024	SHEET NO. 41
AUBREY TEXAS					STANDARD CONSTRUCTION DETAILS TYPICAL SCHOOL ZONE FLASHER ASSEMBLY			



Street Light Options
Post Top

Town And Country	
20' Round Fiberglass Pole	
Embedded Base	
LED	0-55W
HPS	100W



Town and Country

Washington	
15' Fluted Fiberglass Pole	
Embedded w/ Town Lake Base	
LED	0-55W
HPS	100W



Washington

Street Light Options
Historical Specifications

Pole	Mounting Height	Color Available	Material	Base
American	11' or 14'	Black	Cast Aluminium	24" Diameter w/ 15" Bolt Circle
Central Park	12'	Black	Cast Iron	24" Diameter w/ 15" Bolt Circle
European	12' or 14'	Black	Cast Iron	24" Diameter w/ 15" Bolt Circle
Texan	11' or 14'	Black	Cast Iron	24" Diameter w/ 15" Bolt Circle
Philadelphia*	16'	Black	Cast Aluminium	18" Diameter w/ 10.5" Bolt Circle

Luminaire	Light Source Options	Luminaire Size
Acorn	LED 0-55W, HPS 100W	41" Tall x 16" Wide
Lantern	LED 0-55W, HPS 100W	43.25" Tall x 16.125" Wide
Decorative	LED 0-55W	38" Tall x 16" Wide
Pendant*	LED 0-55W, HPS 100W	16" Tall x 16" Wide

*The Pendant Luminaire and bracket arm can only be used with the Philadelphia style pole.



Cobra Head Luminaire
Embedded Base

See Section 113 for Conductor Tensioning

23'

18" Min.

6" Min.

60"

#6 Copper Ground Coil

18" Max.

Street Light Options
Historical Luminaire

Historical luminaires are the high-end street light options offered by Oncor. These luminaires are available in three different styles that can be mounted on any of the four available styles of Historical Poles.



Lantern



Acorn



Decorative

Street Light Options
Historical Pole



American



Central Park



European



Texan

All Historical Poles are installed on Oncor approved precast foundations.

Street Light Options
Historical Pendant



Philadelphia with Single Pendant



Philadelphia with Double Pendant

The Historical Pendant luminaire will be mounted 2 feet from the center of the pole and 17.5 inches above the height of the pole stated in the "Historical Specifications" table.



CITY OF AUBREY, TEXAS

STANDARD CONSTRUCTION DETAILS
STREET LIGHT DETAILS

JULY, 2024

43

SHEET NO.

REVISED: 4/26/24 — NPandey

H:\Projects\Aubrey\4000\360-Standard Construction Details\Standard Details 2.0\Aubrey-43.dwg

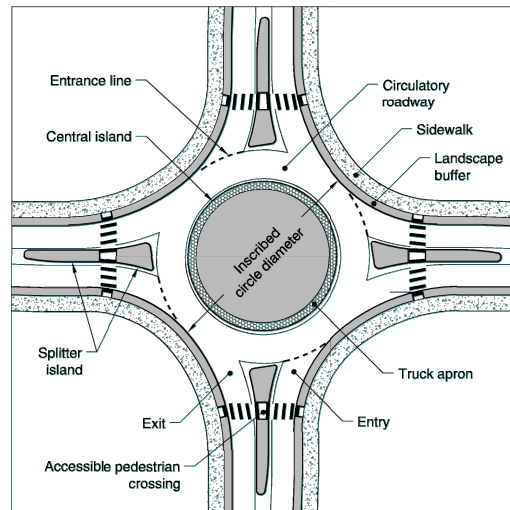
PLOT SCALE: 1:2

PLOT STYLE: 11x17.ctb

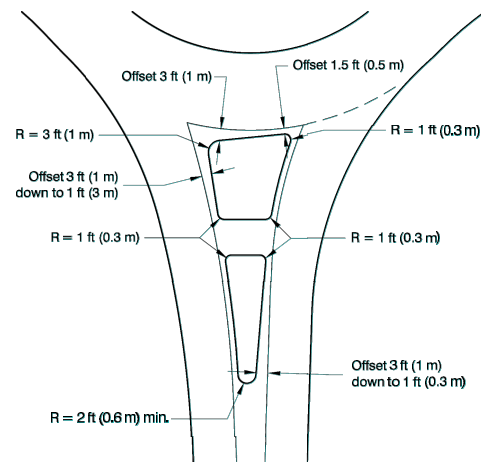
PLOTTED BY: Nabin Pandey ON 7/16/2024

Page 173 of 186

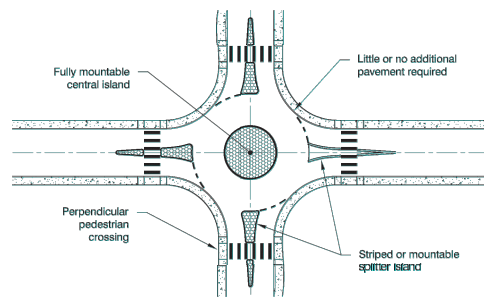
Roundabouts



Basic Geometric Elements of a Roundabout
Source: NCHRP Report 672 - Exhibit 6-2

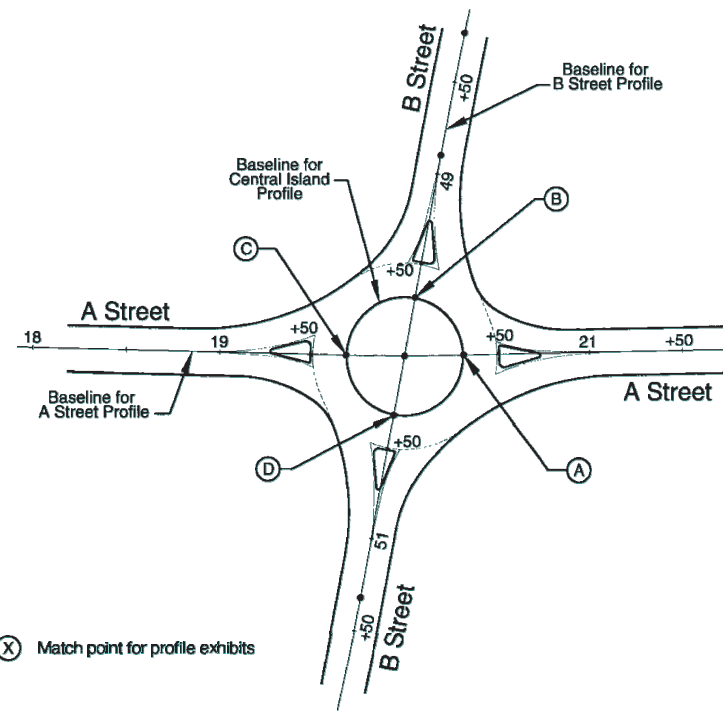


Typical Minimum Splitter Island Nose Radii and Offset
Source: NCHRP Report 672 - Exhibit 6-13

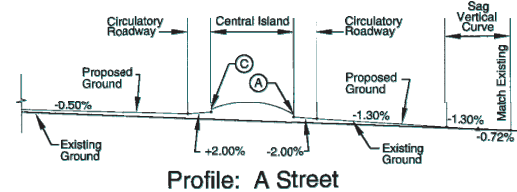


Features of Typical Mini-Roundabout
Source: NCHRP Report 672 - Exhibit 1-10

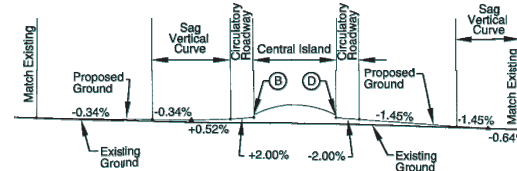
NOTE:
1. DEVELOPER SHALL DESIGN ROUNDABOUTS WITH GENERAL GUIDELINE INFORMATION PROVIDED BY THE NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP) REPORT 672, OR THEIR LATEST EDITION FOR INFORMATION AND GUIDANCE IN ALL ASPECTS OF ROUNDABOUTS, ON THE FEDERAL HIGHWAY ADMINISTRATION FOR ROUNDABOUT GEOMETRIC DESIGN GUIDE.



ⓧ Match point for profile exhibits

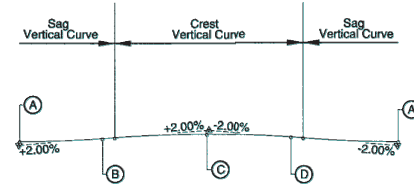


Profile: A Street



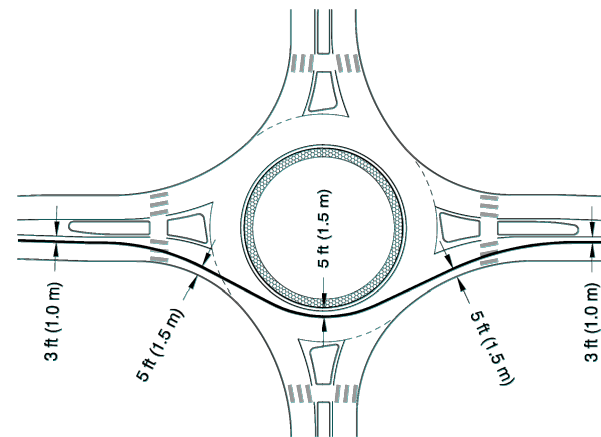
Profile: B Street

(X) See plan view for match point locations

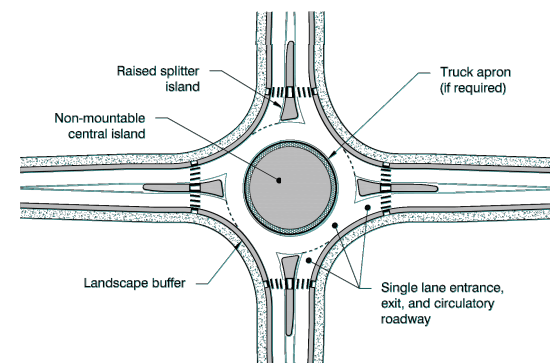


Profile: Central Island

Sample Central Island Plan and Profile
Source: NCHRP Report 672 - Exhibit 6-75



Fastest Vehicle Path through Single-Lane Roundabout
Source: NCHRP Report 672 - Exhibit 6-48

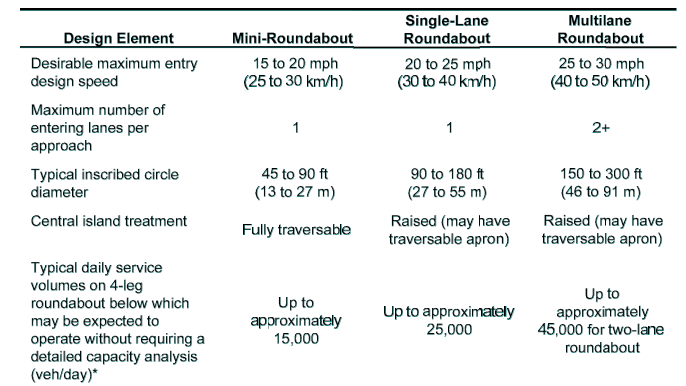


Features of Typical Single-Lane Roundabout
Source: NCHRP Report 672 - Exhibit 1-12

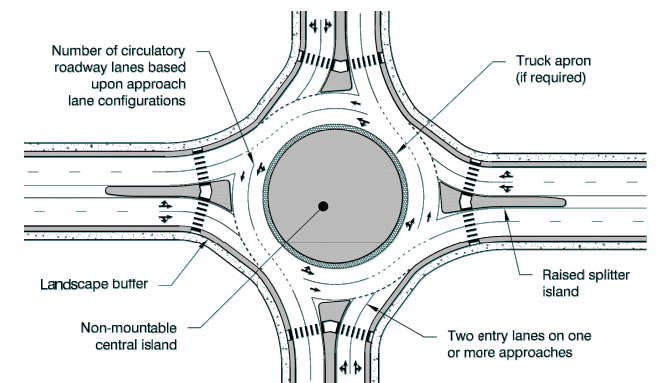
Roundabout Configuration	Typical Design Vehicle	Common Inscribed Circle Diameter Range*	
Mini-Roundabout	SU-30 (SU-9)	45 to 90 ft	(14 to 27 m)
Single-Lane Roundabout	B-40 (B-12)	90 to 150 ft	(27 to 46 m)
	WB-50 (WB-15)	105 to 150 ft	(32 to 46 m)
	WB-67 (WB-20)	130 to 180 ft	(40 to 55 m)
Multilane Roundabout (2 lanes)	WB-50 (WB-15)	150 to 220 ft	(46 to 67 m)
	WB-67 (WB-20)	165 to 220 ft	(50 to 67 m)
Multilane Roundabout (3 lanes)	WB-50 (WB-15)	200 to 250 ft	(61 to 76 m)
	WB-67 (WB-20)	220 to 300 ft	(67 to 91 m)

* Assumes 90° angles between entries and no more than four legs. List of possible design vehicles is not all-inclusive.

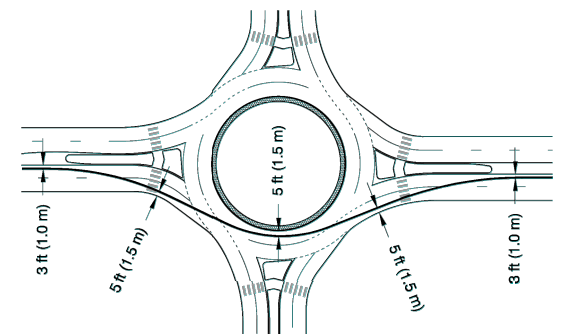
Typical Inscribed Circles Diameter Ranges
Source: NCHRP Report 672 - Exhibit 6-9



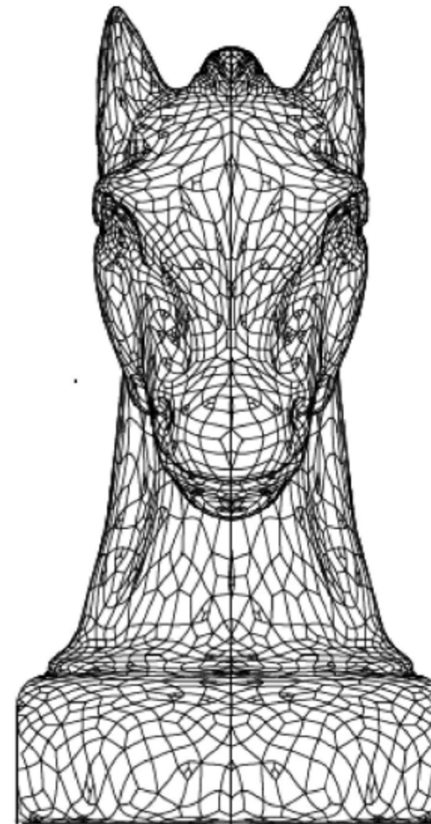
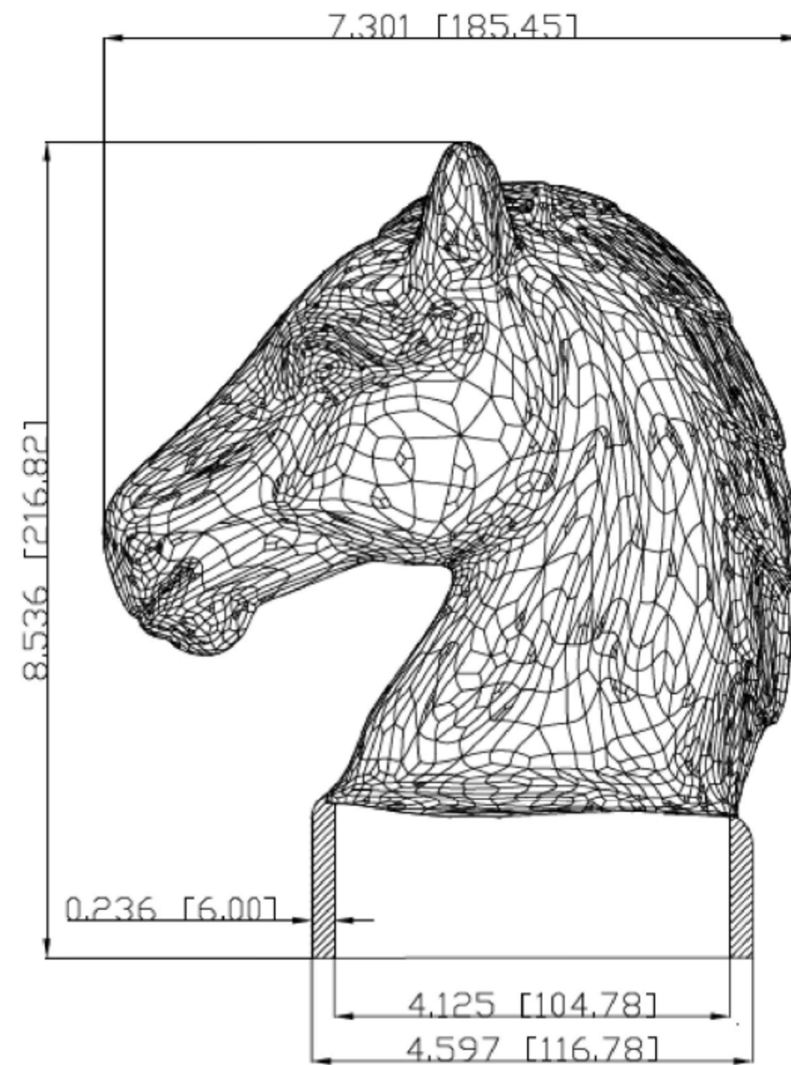
Roundabout Category Comparison
Source: NCHRP Report 672 - Exhibit 1-9



Features of Typical Two-Lane Roundabout
Source: NCHRP Report 672 - Exhibit 1-14



Fastest Vehicle Path through Multilane Roundabout
Source: NCHRP Report 672 - Exhibit 6-49



					CITY OF AUBREY, TEXAS STANDARD CONSTRUCTION DETAILS DESIGN DETAILS	JULY, 2024	SHEET NO. 45
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**CITY OF AUBREY, TEXAS
RESOLUTION NO. 980-24**

**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF AUBREY,
TEXAS URGING THE TEXAS LEGISLATURE TO REPEAL OR AMEND
SENATE BILL 2038 DUE TO ITS DETRIMENTAL IMPACT ON SMALLER
MUNICIPALITIES.**

WHEREAS, Senate Bill 2038 poses significant challenges for the City of Aubrey and similar municipalities across Texas; and

WHEREAS, the City of Aubrey has invested considerable time and financial resources in developing comprehensive plans, including our Master Development District (MDD) strategic plan, water and wastewater infrastructure plans, and thoroughfare plans; and

WHEREAS, the ability for property owners within our Extraterritorial Jurisdiction (ETJ) to petition for de-annexation under SB 2038 creates substantial disruptions, leading to "donut holes" within our carefully constructed plans; and

WHEREAS, such disruptions would force the City to revise and update these plans at significant additional expense, undermining the efficient growth and development of our community; and

WHEREAS, the City of Aubrey has established boundary agreements with neighboring cities, which sometimes involve financial transactions to realign ETJ boundaries for the mutual benefit of all parties involved; and

WHEREAS, allowing property owners to petition for de-annexation after such agreements have been made raises the question of whether the property owner should reimburse the City for the costs associated with the ETJ release; and

WHEREAS, the City of Aubrey has consistently denied requests for de-annexation at formal City Council meetings in order to protect the integrity of our long-term planning and agreements; and

WHEREAS, while SB 2038 may have been designed with larger cities like Austin or Houston in mind, it fails to consider the detrimental impact on smaller cities and their taxpayers, effectively prioritizing developers' interests over those of the community; and

WHEREAS, SB 2038 could enable developers facing resistance to force de-annexation, thereby bypassing municipal oversight and potentially jeopardizing the health, safety, and welfare of our residents, while still requiring emergency services from the City; and

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF AUBREY, TEXAS that the City of Aubrey respectfully urges the Texas Legislature to either repeal Senate Bill 2038 in its entirety or, at a minimum, limit its application to cities

with populations of 250,000 or more, or trigger its provisions only in cases of multiple forced annexation attempts by a city.

PASSED AND APPROVED on this the 28th day of August, 2024.

APPROVED:

Chris Rich, Mayor

ATTEST:

Jenny Hicks, City Secretary

OFFICIAL BALLOT

Texas Municipal League Intergovernmental Risk Pool Board of Trustees Election

This is the official ballot for the election of Places 11 – 14 of the Board of Trustees for the Texas Municipal League Intergovernmental Risk Pool. Each Member of the Pool is entitled to vote for Board of Trustee members. Please record your organization's choices by placing an "X" in the square beside the candidate's name or writing in the name of an eligible person in the space provided. You can only vote for one candidate for each place.

The officials listed on this ballot have been nominated to serve a six-year term on the TML Intergovernmental Risk Pool (Workers' Compensation, Property and Liability) Board of Trustees. The names of the candidates for each Place on the Board of Trustees are listed in alphabetical order on this ballot.

Ballots must reach the office of David Reagan, Secretary of the Board, no later than September 30, 2024. Ballots received after September 30, 2024, cannot be counted. **The ballot must be properly signed, and all pages of the ballot must be mailed to: Trustee Election, David Reagan, Secretary of the Board, P.O. Box 149194, Austin, Texas 78714-9194. If the ballot is not signed, it will not be counted.**

PLACE 11

- ☐ **Randy Criswell.** (Incumbent) Randy Criswell is currently the City Manager of Wolfforth (Region 3), a position he's held since 2022. He has served on the TML Risk Pool Board of Trustees since 2015 and as Chair of the Board from 2020 to 2022. He has been in public service since 1994, having served the City of Canyon in three administrative roles including City Manager, the City of Mineral Wells as City Manager, and his current position. Mr. Criswell has a Bachelor of Science Degree from Texas Tech University in Engineering Technology and is a Certified Public Manager. He is a member of TCMA and a past member of the TCMA Board of Directors. He and his wife Janie have three grown children, and he enjoys golf, his Harley Davidson motorcycle, and spending time with Janie.
- ☐ **Robert S. Davis.** Robert Davis serves as the City Attorney for the City of Bullard (Region 15). He is a Senior Partner at Flowers Davis PLLC in Tyler and oversees the Business and Commercial Litigation, Insurance Defense, Defense of Governmental Entities, Employment Law, and Medical Liability Sections of the law firm. Mr. Davis has extensive experience in representing governmental entities and government officials in all types of litigation. He also has extensive experience in litigation for major insurance carriers and drafting coverage opinions for insurance carriers. Through the years, he has written many papers for and made numerous presentations to Texas Sheriff's Association, Texas Association of Counties, Texas Jail Association, and Texas Chief Deputies' Association.

WRITE IN CANDIDATE:

PLACE 12

- ☐ **Cedric Davis, Sr.** Cedric Davis is the City Manager of the City of Mathis (Region 11). He joined the city's administration team on January 3, 2024, and has more than three decades of experience as a public servant. He served as the City Manager of Mathis for over four years, and is a former Chief of Police and Public Educator. He is a graduate of Law Enforcement Management Institute of Texas and the Advanced Military Academy of Texas. He has a Bachelor of Science degree in Criminal Justice Administration from Sam Houston State University. He is a licensed Master Peace Officer, Police Instructor, Investigator, and holds certifications in Public Management, Smart City Practitioner, and Public Finance Investment Officer. In 2008 he served as Mayor of Balch Springs.
- ☐ **Rocky Hawkins.** Rocky Hawkins is a Councilmember for the City of Gladewater (Region 15), and served as such for four years. He has also served on the Gladewater Lake Board for 10 years, as a Chamber of Commerce Volunteer, as a member of the "Friends of the Library" at the Lee-Bardwell Public Library in Gladewater, and on various boards and committees at First Baptist Church for 30 years. Mr. Hawkins began his career with a brief stint as a Parole Officer for Gregg County; later spent almost 15 years in the Hospitality/Restaurant Business; and finished his career with 30 years at Eastman Chemical Co. He holds an associate's degree in business management from Kilgore College and a B.S. degree in Criminal Justice from Sam Houston State University.
- ☐ **Allison Heyward.** (Incumbent) Allison Heyward has served as Councilmember for the City of Schertz (Region 7) since 2018. She also serves on the TML Board of Directors and is currently the TML President Elect. She previously served in 2022 on the TMLIRP Board as the TML Board representative. In January 2023, she was appointed to Place 12 on the TMLIRP Board to fill a vacancy. She holds a Bachelor's Degree in Accounting from Texas Southern University, and is a 2020 graduate of the Chamber Leadership Core Program. Mrs. Heyward is also a TML Leadership Fellow and a Certified Municipal Officer (CMO), having received the TMLI CMO (Certified Municipal Official Designation) Award of Excellence for maintaining the designation for 5 continuous years. She has also been recognized with the President's Award for being one of the top 2 highest earners of Continuing Education Units.
- ☐ **Rudy Zepeda.** Rudy Zepeda has served as the Finance Director for the City of Santa Fe (Region 14) since 2021. Before joining Santa Fe, Mr. Zepeda served eight years in Dayton, Texas, as Assistant City Manager and Finance Director. He holds a degree in Classics from the University of Arizona and certification in Certified Public Management from Stephen F. Austin University. While Finance Director in Santa Fe, the city earned the Government Finance Officers Association (GFOA) Budget Presentation Award and the Excellence in Financial Reporting award. This year, the city was recognized by the State Comptroller's Office with its Traditional Finances Star Award. Mr. Zepeda's career spans 30 years, with significant experience in both public and private sectors, including 14 years in local government.

WRITE IN CANDIDATE:

PLACE 13

- ☐ **Harlan Jefferson.** (Incumbent) Deputy City Manager for the City of Burleson (Region 13). Mr. Jefferson has been in public service for 41 years, serving as a Risk Manager for the City of Denton early in his career and serving as Town Manager for Flower Mound and Prosper, Texas. Mr. Jefferson is an active member of the Texas City Management Association (TCMA), having served on its Board of Directors and is a Past President of the North Texas City Manager Association. He holds a Bachelor of Arts in Political Science and a Master of Public Administration from the University of North Texas. Additionally, he is an Adjunct Faculty member in the Master of Public Administration Program at the University of North Texas.
- ☐ **James Quin.** City Administrator for the City of Hutchins (Region 13) since March 2022. He served as City Administrator of Haslet for 8 years and City Manager for Richland Hills for 16 years. Mr. Quin earned a Bachelor of Science Education degree and a Master of Public Administration degree from Missouri State University. He is a member of the International City/County Management Association (ICMA) and maintains the ICMA Credentialed Manager (CM) designation. In April 2022, he was awarded the High Performance Leadership Academy Certificate issued by ICMA Professional Development Academy. Also, he is a full member of TCMA, and previously served on the HCA Medical City Alliance Hospital Board for 6 years.

WRITE IN CANDIDATE:

PLACE 14

- ☐ **Mike Land** (Incumbent) City Manager for the City of Coppell (Region 13) since 2017, and Deputy City Manager from 2012-2017. Previously, he was Town Manager for Prosper, City Manager for Gainesville, and Executive Director for the Southwestern Diabetic Foundation. Mr. Land serves on the International City/County Management (ICMA) Board of Directors and is the 2024-25 ICMA President-Elect. Additionally, he serves on the Texas Women's Leadership Institute Advisory Board, the Texas A&M University's Development Industry Advisory Council, and the UTA MPA Advisory Board. He has also served as School Board Trustee for Gainesville Independent School District and as President of TCMA.

WRITE IN CANDIDATE:

Certificate

I certify that the vote cast above has been cast in accordance with the will of the majority of the governing body of the public entity named below.

Witness my hand, this _____ day of _____, 2024.

Signature of Authorized Official

Title

Printed Name of Authorized Official

Printed Name of Political Entity



OFFICIAL BALLOT

Texas Municipal League (TML) Region 8 Director Election

This is the official ballot for the election of the Region 8 director of the TML Board of Directors. You received this ballot because you are the city's primary contact person with TML. Each TML member city is entitled to one vote, which vote must be cast by a majority vote of the city's governing body. Please record your city's choice by placing an "X" in the square beside the candidate's name or writing in the name of an eligible person in the space provided. You can only vote for one candidate.

The officials listed on this ballot have been nominated to serve a two-year term on the TML Board of Directors. A brief biography for each candidate is included after the ballot.

Ballots must reach the TML office by 5:00 p.m. Central Time on October 3, 2024. Ballots received after this date cannot be counted. **The ballot must be properly signed and mailed to: Rachael Pitts, Texas Municipal League, 1821 Rutherford Lane, Suite 400, Austin, TX 78754, or scanned and emailed to rpitts@tml.org. If the ballot is not signed, it will not be counted.**

Region 8 Director (select one)

☐

Troy Dunn, Councilmember, Haltom City

☐

Kim Greaves, Mayor, Westlake

☐

Jon McKenzie, Councilmember, Hurst (Incumbent)

☐

Mary Sarver, Mayor Pro Tem, Grandview

Certificate

I certify that the vote cast above has been cast in accordance with the will of the majority of the governing body of the city named below.

Witness my hand, this _____ day of _____, 2024.

Signature of Authorized Official

Title

Printed Name of Authorized Official

Printed Name of City

Region 8 Director Candidate Biographies (printed on both sides of the page)



Troy Dunn, Councilmember, Haltom City

Troy Dunn and his wife own Troy Dunn Insurance Agency, which is very active in the community. Dunn is a member of the Birdville Education Foundation Board of Directors, served on the 2022 Birdville ISD Bond Committee, and has been offering a Troy Dunn Insurance Scholarship for Haltom High seniors for six years. He is very active in his community and is the Northeast Tarrant Chamber incoming chair and a Haltom City Council councilmember. He previously served on the Haltom City Economic Development Corporation for three years, the Zoning Board of Adjustments for three years, and the Parks Board for five years. Dunn is a community partner with Haltom Senior Center Bingo each month and has been a luncheon sponsor at the Center for the past four years. He is also on the North Richland Lions Club Board of Directors. Dunn is a community partner first

and foremost in his personal and business life.



Kim Greaves, Mayor, Westlake

Kim Greaves was a financial services executive with a breadth of success across numerous organizations from start-ups to enhancing mature organizations. As a collaborative leader, he has demonstrated successes by directing cross-functional teams to plan effectively, develop strategically, and execute tactically to exceed business, delivery, and financial expectations. Over the course of his career, Kim managed over 7,000 employees and managed billions in mortgage servicing portfolios. Kim developed a reputation for improving every organization he managed while successfully driving unprecedented growth for companies such as JPMorgan Chase, Citibank, Nationstar Mortgage, and Citizens Bank. Kim retired in 2021 and has dedicated his time to serving his community. After getting involved with Westlake Academy athletics, Kim started attending town council/schoolboard

meetings and was frustrated with issues and unanswered questions. He decided to run for the Westlake Town Council/School Board and was elected in 2022. After serving his first term as a councilmember, Kim decided to run for mayor and bring respect and ethics back to the mayor's office. He was elected with 82% of the vote. (Note: The Town of Westlake runs a municipality and a charter school, nationally ranked Westlake Academy. Town councilmembers are also school board members.) Kim attended high school at New Mexico Military Institute, holds a BBA in Finance from the University of North Texas and an MBA from the University of Notre Dame. In addition to town responsibilities, Kim currently serves as the vice chairman of the New Mexico Military Institute Foundation and is active in the Metroport Chamber of Commerce.



**City Council Special Meeting
Staff Report
August 28, 2024**

Agenda Item

Consideration and action on an Ordinance approving the fiscal year 2024-2025 Aubrey Municipal Development District Budget.

Staff Contact

Mike English, Finance Director
menglish@aubreytx.gov
940-440-9343

Summary

The attached MDD FY25 budget update reflects MDD board input given to Exec Director at board meeting on Tuesday, August 13, 2024. Changes made to salaries, TMRS and Medicare tax and travel and training.

Financial Summary

Staff Recommended Motion

Conditions

N/A