ENGINEERING DESIGN MANUAL

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TOWN OF ANNETTA

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ENGINEERING DESIGN MANUAL

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ENGINEERING DESIGN MANUAL

PART I – GENERAL

TOWN OF ANNETTA

ENGINEERING DESIGN MANUAL

PART I - GENERAL

1.01 PURPOSE

The purpose of the Engineering Design Manual is to provide a set of guidelines for designing streets and arterials, drainage facilities, water lines, wastewater lines, other public improvements and for preparing construction plans for such facilities which are to be owned, operated and/or maintained by the Town of Annetta, Texas. These guidelines shall be used by the Town, Consulting Engineers employed by the Town for the above described improvement projects, and Engineers for private developments in the Town of Annetta and its extra-territorial jurisdiction (ETJ) as well as for plat approval, issuance of building permits, issuance of earthwork permits, approval of construction plans by the Town, site plan approval, and for other construction within public rights-of-way and easements subject to Section 245 of the Texas Local Government Code. All projects shall meet state and federal requirements.

1.02 SCOPE

The scope of this section of the Design Manual includes the various design elements, criteria, standards and instructions required for the design of streets and arterials, drainage facilities, water lines, wastewater lines, and other public improvements.

1.03 STANDARD CONSTRUCTION DETAILS

In addition to the guidelines contained in this manual, the Town maintains drawings entitled "Standard Construction Details", which are to be used in conjunction with the Design Manual in the preparation of engineering plans. Please see Appendix D for the Standard Construction Details.

1.04 CORRELATION OF MANUAL AND STANDARD CONSTRUCTION DETAILS

The Engineering Design Manual and Standard Construction Details are complementary and what is called for by one shall be binding as if called for by both.

In case of conflict between the Engineering Design Manual and Standard Construction Details, the Town reserves the right to make the interpretation that is in the best interest of the Town.

1.05 UTILITY ASSIGNMENTS

Utilities are to be located in public rights-of-way in the location shown in Appendix "A". The Town shall determine the location of utilities where special circumstances prevent the standard utility assignments from being used.

1.06 GENERAL NOTES

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

1.07 CORRELATION OF MANUAL AND SUBDIVISION REGULATIONS

The Engineering Design Manual (EDM) and Subdivision Regulations are complementary and what is called for by one shall be binding as if called for by both.

In case of conflict between the EDM and the Subdivision Regulations the more stringent criteria shall take precedence.

1.08 VARIANCE PROCEDURE

The Town of Annetta Mayor or Mayor's designated agent will consider variance requests on an individual basis when, due to geographic or topographic limitations of the site on which the facilities are to be constructed, there are circumstances which warrant an individual design. In considering whether or not a variance should be granted, the Town Mayor or Mayor's designated agent shall consider the following factors:

a. The extent to which the proposed design meets other specific standards of this Ordinance; and
b. The extent to which the proposed design meets the spirit and intent of this Ordinance through the use of materials, design criteria and engineering which will protect the health, safety and general welfare of the public; and
c. The positive or negative impact of the proposed design on surrounding property uses and property values, in comparison to the expected impact of the facilities if same were built in strict conformity with the standards of this Ordinance; and
d. The extent to which the proposed design accomplishes the purposes of the Town's Engineering Design Manual and Standard Construction Details.

A variance shall not be granted to serve as a convenience to the applicant or for reasons related to economic hardship.

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PART II – PAVING

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PART II - PAVING

I. STREET AND ARTERIAL CLASSIFICATIONS

1.01 GENERAL

Town streets and arterials are classified into types according to their use and locations as indicated in Table II-1. The basic types include the residential streets which provide direct access and frontage to adjacent properties, collectors which serve as the distributor-collector routes and provide direct access to adjacent properties, and minor and major arterials which carry high volumes of traffic. Each roadway is made up of elements which are related to the use of that particular facility. These elements include right-of-way, pavement width, median width if required, arrangement of traffic lanes, curb radii at intersections and other characteristics.

The Town of Annetta intends to maintain the rural character of the Town as shown on the Comprehensive Plan. Toward that end, rural roadway standards will be permitted in rural residential areas. Rural standards employ paved shoulders in lieu of curb and use bar ditches for drainage.

II. STREET AND ARTERIAL DIMENSIONS

2.01 GENERAL

Geometrics of streets and arterials may be defined as the geometry of the curbs or pavement areas which governs the movement of traffic within the confines of the right-of-way. Included in the geometrics are the pavement widths, degree of curvature, width of traffic lanes, shoulders, turning lanes, median width separating opposing traffic lanes, median nose radii, curb radii at street intersections, crown height, cross fall, geometric shapes of islands separating traffic movements and other features.

TABLE II-1

STREET AND ARTERIAL CLASSIFICATIONS
AND DIMENSIONS

STREET TYPE	DESCRIPTION	PVMT. WIDTH	MIN. ROW WIDTH	LANES	SHOULDER WIDTH	MIN. PARKWAY WIDTH	MEDIAN WIDTH	MIN. PVMT. THICKNESS	DESIGN SPEED (MPH)
Alley		10'	16'	1-10'	N.A.	2.5'	N.A.	7"	10
Urban Standards									
L2U-U	Local Residential	31'	50'	2-15'	N.A.	9.5'	N.A.	6"	30
C2U-U	Local Collector	37'	60'	2-18'	N.A.	11.5'	N.A.	7"	35
M2U-U	Minor Arterial (undivided)	41'	80'	2-20'	N.A.	9.5'	N.A.	6"	40
M4U-U	Minor Arterial (undivided)	65'	80'	2-15' & 2-12'	N.A.	12.5'	N.A.	8"	40
M4D-U	Minor Arterial (divided)	2-28'	100'	2-15' & 2-12'	N.A.	11.5'	21'	8"	45
P6D-U	Primary Arterial (divided)	2-40'	120'	2-15' & 4-12'	N.A.	9.5'	21'	8"	45
Rural Standards									
L2U-R	Local Residential	24'	60'	2-11'	2-1'	18'	N.A.	6"	30
C2U-R	Local Collector	36'	70'	2-12'	2-6'	17'	N.A.	7"	35
M4U-R	Minor Arterial (undivided)	64'	100'	4-12'	2-8'	16'	N.A.	8"	40
M4D-R	Minor Arterial (divided)	2-32.5'	120'	4-12'	2-8'	17'	21'	8"	45
P6D-R	Primary Arterial (divided)	2-44.5'	140'	6-12'	2-8'	16'	21'	8"	45

Note: All pavement and median width dimensions are to back of curb or edge of pavement.

2.02 DESIGN VEHICLES

The geometrics of Town streets and arterial intersections vary with the classification of intersecting streets. Criteria for the geometric design of intersections must be based on certain vehicle operating characteristics, and vehicle dimensions. The American Association of State Highway and Transportation Officials (AASHTO) has standardized vehicle criteria into three general designs which is published in the AASHTO Publication, "A Policy on Geometric Design of Highways and Streets", dated 2001. In the design of street and thoroughfare intersections for the Town, these vehicle designs are adopted for use. Table II-2, Intersection Design Standards, shall be used for intersection design.

TABLE II-2

INTERSECTION DESIGN STANDARDS
(All dimensions are minimums)

	A_1*	A_1+	A_1#	A_2*	A_3	B	C	D	E	F	R_1	R_2	Corner Clip
P6D-U & R6D-R	275'	150'	100'	150'	150'	160'	10'	330'	600'	60'	50'	50'	25 X 25
M4D-U & M4D-R	200'	150'	100'	150'	150'	150'	10'	330'	600'	60'	50'	50'	25 X 25
M4U-U & M4U-R	200'	150'	100'	150'	150'	150'	N/A	330'	N/A	N/A	40'	40'	20 X 20
M2U-U	150'	150'	100'	150'	150'	150'	N/A	300'	N/A	N/A	40'	40'	20 X 20
C2U-U & C2U-R	100'	150'	100'	100'	150'	150'	N/A	270'	N/A	N/A	30'	30'	15 X 15
L2U-U & L2U-R	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30'	30'	10 X 10

* When intersecting street is a principal or minor arterial.
+ When intersecting street is a collector or a rural road.
# When intersecting street is a local street.
** For dual left-turn standards, consult the Town
A_1 and A_2 may be increased to allow for stacking truck traffic.
Corner clip based on 90 degree intersection, may be adjusted for angled intersection.
Radius and corner clip are based on highest classification street at intersection.

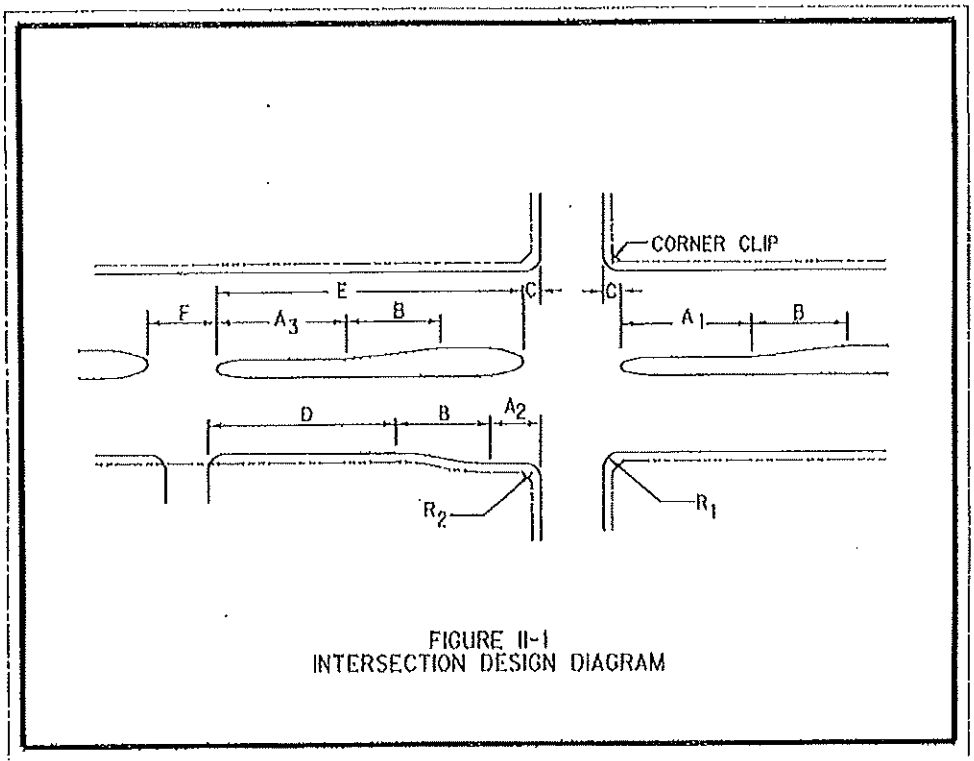


FIGURE II-1
INTERSECTION DESIGN DIAGRAM

2.03 DESIGN SPEED

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

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

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

2.04 HORIZONTAL GEOMETRICS

a. General

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

b. Horizontal Curves and Superelevation

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

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

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

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

where:

e = rate of roadway superelevation, foot per foot

f = Side friction factor (See Table II-3)

V = vehicle design speed, mph

R = radius of curve in feet

TABLE II-3

MINIMUM CENTERLINE RADIUS
FOR ROADWAYS

Rate of Superelevation (In./Ft.)	Residential	Collector/Minor Arterial		Principal Arterial
	DESIGN SPEED (MPH)			
	30 mph	35 mph	40 mph	45 mph
-1/2	500 ft	710 ft	930 ft	1290 ft
-3/8	465 ft	655 ft	855 ft	1175 ft
-1/4	430 ft	605 ft	790 ft	1080 ft
-1/8	400 ft	565 ft	740 ft	1000 ft
0	375 ft	530 ft	690 ft	935 ft
+1/8	355 ft	495 ft	650 ft	875 ft
+1/4	335 ft	470 ft	610 ft	820 ft
+3/8	320 ft	445 ft	580 ft	775 ft
+1/2	300 ft	420 ft	550 ft	730 ft

Street Classification	Side Friction Factor (f)
Residential Streets	0.160
Collector Streets	0.155
Arterials	0.145

c. Turning Lanes

Turning lanes are provided at intersections to accommodate left-turning and right-turning vehicles. The primary purpose of these turning lanes is to provide storage for the turning

vehicles. The secondary purpose is to provide space to decelerate from normal speed to a stopped position in advance of the intersection or to a safe speed for the turn in case a stop is unnecessary. Left turn lanes at intersections are 11-12 feet in width. When turning traffic is too heavy for a single lane and the cross street is wide enough to receive the traffic, two turning lanes may be provided.

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

Minimum length of left turn lanes for major thoroughfares shall be as specified in Table II-2.

The actual length shall be approved by the Town based upon projected left turn volume as determined by a Traffic Impact Analysis, if required, or a capacity analysis.

d. Street Intersections

The intersection at grade of arterials, collector streets, and residential streets shall be at ninety (90) degree angles. Intersections which are not a ninety (90) degree angle may be approved by the Town. Lanes shall be aligned for safe passage through the intersection.

e. Sidewalks

The purpose of the public sidewalks is to provide a safe area for pedestrians. The Town may require, at the discretion of Planning and Zoning, sidewalks to be constructed with the paving of streets, when building construction occurs, in urban residential areas and wherever pedestrian traffic may be generated. Determination for the requirement of sidewalks will be made at the discretion of the Town. All sidewalks shall conform to state laws for barrier free construction.

The standard concrete sidewalk is 5 feet in width for residential areas and commercial areas. Special sidewalk designs to include a 6-foot sidewalk located adjacent to the street will be considered for approval where warranted. For rural paving section sidewalks shall be located in sidewalk easements adjacent to right-of-way lines. Sidewalks shall not be located in ditches. One foot of width shall be added to all sidewalks abutting retaining walls.

Sidewalk alignments may be varied to avoid the removal of trees or the creation of excessive slopes when approved by the Town Engineer. A waiver for deletion of the requirement for sidewalk shall be submitted in writing and will become effective only upon Town Council approval.

2.05 VERTICAL ALIGNMENT

a. Street Grades

The vertical alignment of Town streets and arterials should be designed to insure the safe operation of vehicles and should allow easy access to adjacent property. A safe travelway for vehicles is dependent on criteria which considers operating speeds, maximum grades, vertical curves and sight distance. In addition to these considerations,

other factors related to vertical alignment include storm drainage, crown and cross slope and the grade and right-of-way elevation relationship.

1. Minimum Grades

Minimum longitudinal grades for streets and arterials are required to insure proper flow of surface drainage toward inlets and to provide minimum ditch grades. Minimum grades are five tenths percent (0.5%) for all urban roadways. Valleys across intersections shall be a minimum of five tenths percent.

2. Maximum Grades

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

Arterials must move large volumes of traffic at faster speeds and flatter grades will better accommodate these characteristics. Truck and bus traffic on these type facilities often controls traffic movement, particularly if steep grades prevent normal speeds. The normal maximum street grades allowed are shown in Table II-4. Steeper grades may be permitted for short lengths where topographical features or restricted alignment require.

TABLE II-4

MAXIMUM STREET GRADES

Street Types	Normal Maximum Grade In Percent
Residential	8%
Collector	6%
Arterial	6%

b. Vertical Curves

When two longitudinal street grades intersect at a point of vertical intersection (PVI) and the algebraic difference in the grades is greater than one percent (1%) for design speed less than 45 mph or one-half (0.5%) for design speeds greater than 45 mph, a vertical curve is required. Vertical curves are utilized in roadway design to effect a gradual change between tangent grades and should result in a design which is safe, comfortable in operation, pleasing in appearance and adequate for drainage. The vertical curve shall be formed by a simple parabola and may be a crest vertical curve or a sag vertical curve.

c. Stopping Sight Distance

1. Crest Vertical Curve

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

height of 3.50 feet above the pavement and traveling at design speed to stop before reaching an object in his path that is 0.5-foot in height.

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

The minimum safe stopping sight distance and design speeds are shown in Table II-5. These sight distances are based on each design speed shown and based on a wet pavement. The length of crest vertical curve required for the safe stopping sight distance of each street type may be calculated using the formula L = KA and the values of K for a crest vertical curve shown in Table II-5.

2. Sag Vertical Curve

When a sag vertical curve is required, the vertical curve shall be of sufficient length to provide a safe stopping sight distance based on headlight sight distance. The minimum length of sag vertical curve required to provide a safe stopping sight distance may be calculated using the formula L = KA and values of K for a sag vertical curve are shown on Table II-5.

TABLE II-5

MINIMUM LENGTH OF VERTICAL CURVE

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

Street Type	Design Speed	Safe Stopping Sight Distance	Normal Crest Vertical Curve K	Normal Sag Vertical Curve K	Minimum Length of Curve
Local Residential	30	200	19	37	60
Local Collector	35	250	29	49	100
Minor Arterial	40	305	44	64	100
Primary Arterial	45	360	61	79	120

d. Intersection Grades

The grade of an intersecting street with the principal street gutter should not generally be more than two percent (2%) either up or down within the first 20 feet beyond the curb line of the principal street. Grade changes greater than one percent (1%) will require vertical curves.

The grade of street or arterial, particularly at its intersections with another street, is of prime importance in providing a safe, comfortable riding surface. The intersection design of two arterials shall include grades which will result in a plane surface or at least a surface which approximates a plane surface. Grades in excess of 3% should be avoided. A maximum grade of 2% is desirable. A vehicle traveling on either thoroughfare should be able to traverse the intersection at the design speed without discomfort. For intersections involving streets of different classifications, the profile of street with the lesser classification shall be adjusted to meet the profile of the street with the higher classification. No valleys across major thoroughfares or collectors will be allowed. To accomplish a smooth transition, crossfall toward the median of one lane of each thoroughfare may be required. The use of storm drainage inlets in the median shall be avoided if possible.

In drawing the grades of intersecting thoroughfares in the profile view of plan/profile sheets, profiles of all four profiles shall be shown as a continuous line through the intersection. All intersections where any street is classified as a collector or arterial shall be contour graded with minimum contour intervals of 0.2 feet.

e. Street Cross Section

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

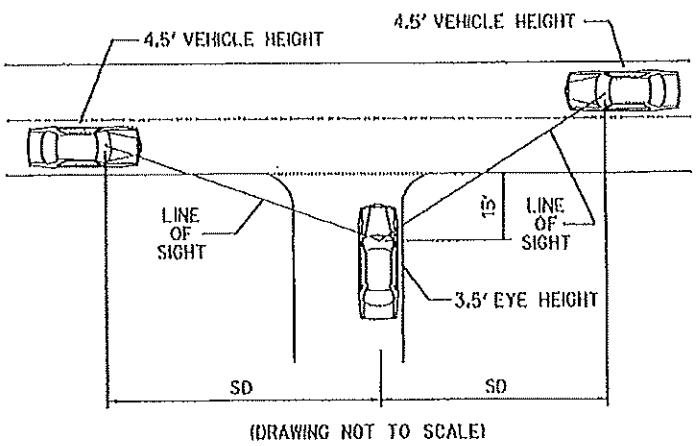
2.06 SIGHT DISTANCE AT INTERSECTIONS

An important consideration in the design of Town streets and arterials is the vehicle attempting to cross the street or thoroughfare from the side street or drive. The operator of the vehicle attempting to cross should have an unobstructed view of the whole intersection and a length of the thoroughfare to be crossed sufficient to permit control of the vehicle to avoid collisions. The minimum sight distance considered safe under various assumptions of physical conditions and driver behavior is related directly to vehicle speeds and to the resultant distance traversed during perception and reaction time and during braking. This sight distance, which is termed intersection sight distance, can be calculated for different street or thoroughfare widths and for various grades upwards and downwards. Intersection sight by AASHTO publication "A Policy on Geometric Design of Highways and Streets", 2001. Sight distance requirements are defined by Table II-6 and Figure II-2. As a minimum visibility triangles shall be provided as shown in Figure II-3.

TABLE II-6

SIGHT DISTANCE REQUIREMENTS

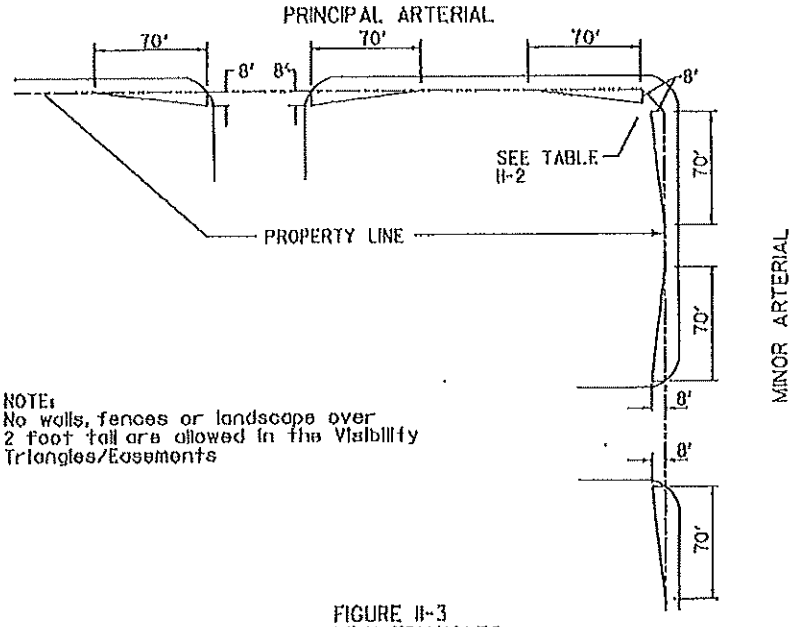
Design Speed (mph)	Stopping Sight Distance (feet)	Intersection Sight Distance for passenger Cars (feet)
30	200	335
35	250	390
40	305	445
45	360	500
55	495	610



(DRAWING NOT TO SCALE)

SD = Sight Distance

FIGURE II-2
SIGHT DISTANCE REQUIREMENTS



NOTE:
No walls, fences or landscape over 2 foot tall are allowed in the Visibility Triangles/Easements

FIGURE II-3
VISIBILITY TRIANGLES

2.07 MEDIAN OPENINGS

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

Major Streets

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

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

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

b. The median opening is not less than 600 feet from another median opening.

2.08 CUL-DE-SACS

The maximum length of any cul-de-sac shall be 500 feet measured from curb line of the intersecting street to the radius point of turn around. The right-of-way radius shall be 60 feet and the curb radius 40 feet within the cul-de-sac turn around. All cul-de-sac turnarounds shall be visible from the intersecting street.

III. DRIVEWAY STANDARDS

3.01 DRIVEWAY REQUIREMENTS

Driveways shall be governed by Tables II-7 and II-9. Refer to Figures II-1 and II-4.

TABLE II-7

DRIVEWAY REQUIREMENTS

	Residential (Min) (Max)	Industrial (Min) (Max)	Commercial (Min) (Max)
A - Driveway Throat Width			
Local	15 – 28 ft	40 ft	30 – 40 ft
Collector	15 – 28 ft	40 – 60 ft *	30 – 40 ft
Minor Arterial	N/A	40 – 60 ft *	30 – 60 ft
Principal Arterial	N/A	40 – 60 ft *	30 – 60 ft
Driveway Curb Radius			
Local	5 ft	30 ft	20 ft
Collector	5 ft	40 ft	25 ft
Minor Arterial	N/A	40 ft	30 ft
Principal Arterial	N/A	50 ft	35 ft
B - Minimum Centerline Driveway Spacing Along			
Local	15 ft	110 ft	70 ft
Collector	25 ft	110 ft	120 ft
Minor Arterial	N/A	160 ft	170 ft
Principal Arterial	N/A	250 ft **	230 ft
Driveway Angle	90°	90°	90°
C - Minimum Distance from Driveway to Intersection			
Local	50 ft	100 ft	100 ft
Collector	50 ft	100 ft	120 ft
Minor Arterial	N/A	175 ft	150 ft
Principal Arterial	N/A	175 ft	150 ft
Maximum Approach Grade			
Local / Collectors	10%	6%	6%
All Others	10%	6%	6%
Right Turn Requirement	10%	6%	6%

* Can be wider based on site requirements.
** Driveways should be used jointly at median openings.
Based on 40 mph.
Driveway width plus radius must be contained within the property frontage, between the extended property lines.
State Standards, if more restrictive, shall apply to State maintained roadways.

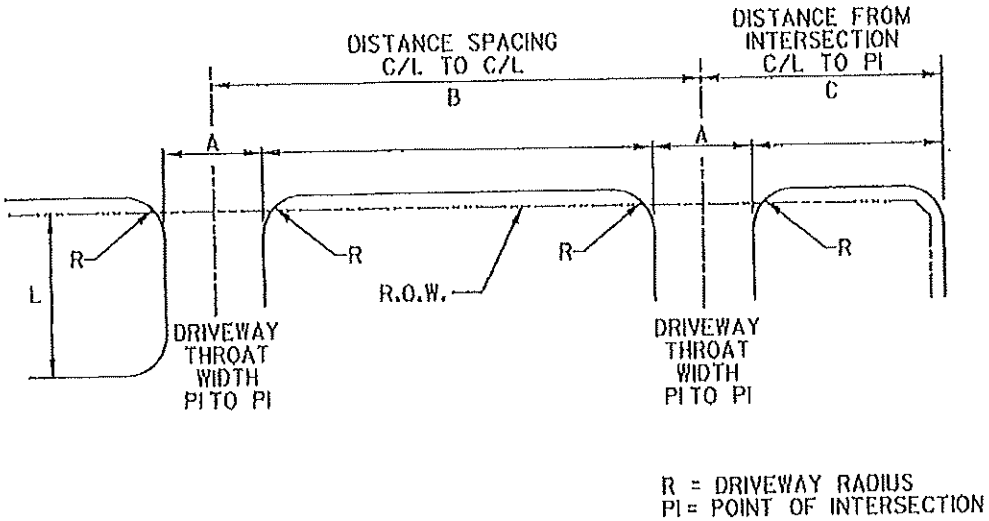


FIGURE II-4
DRIVEWAY REQUIREMENTS

TABLE II-8

MINIMUM DRIVEWAY STORAGE LENGTH (L)
(See Figure II-4)

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

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

IV. TRAFFIC IMPACT ANALYSIS GUIDELINES

4.01 DEFINITIONS – THE FOLLOWING TERMS ARE USED IN THIS SECTION.

a. Projected traffic volumes – The number of vehicles that are expected/calculated to exist on streets after completion of the project.

b. Study area – The boundaries in which the study is conducted.

c. TIA (Traffic Impact Analysis) – An in-depth analysis of traffic.

d. Traffic queuing – A line of waiting vehicles.

e. Trip distribution – Estimates of percentage distribution of trips by turning movements from the proposed development.

f. Trip generation summary – A table summarizing the trip generation characteristics of the development for the entire day including AM and PM peak periods, rates and units used to calculate the number of trips.

g. Non-site traffic – Traffic not created or associated with the traffic generated by the project.

4.02 PURPOSE

The purpose of a Traffic Impact Analysis (TIA) is to assess the effects of specific development activity on the existing and planned roadway system. It is the intent of this ordinance to make traffic access planning an integral part of the development process.

4.03 APPLICABILITY

a. A Traffic Impact Analysis (TIA) will be required at the time of platting for land developments that are expected to meet a threshold level of change as described in Section 4.04 below, "When Traffic Impact Analysis (TIA) is Required". The Town reserves the right to require a TIA for land developments that do not meet the threshold requirements, but may impact a sensitive area with traffic issues or may be a known public concern.

b. A Traffic Impact Analysis (TIA) will be required when there is a request to amend the Thoroughfare Plan.

4.04 WHEN TRAFFIC IMPACT ANALYSIS (TIA) IS REQUIRED

a. A TIA will be required of the property owner (or designated agent) when an activity or change to the property occurs and any of the following occur:

1. More than 500 Peak Hour Trip (PHT) generation
2. More than 5,000 vehicle trips per day generation
3. More than 100 acres of property is involved
4. Any changes or alterations to the Town Thoroughfare Plan

b. The property owner (or designated agent) shall perform and submit to the Town of Annetta a TIA performed at a minimum as established in Section 4.06, "Traffic Impact Analysis Requirements". The TIA must be signed and sealed by a professional engineer, registered

to practice in Texas, with experience in Transportation Engineering sufficient to assess traffic impacts.

c. The engineer conducting the study must be approved by the Town prior to performing the study. The Town of Annetta Public Works Department must approve all TIA's before final acceptance. After acceptance of the TIA, the review process will determine further actions.

4.05 ROLES OF APPLICANT AND TOWN

A TIA that is required of the applicant by the Town of Annetta is part of the development review and approval process. The primary responsibility for assessing the traffic impacts associated with a proposed development rest with the applicant. The Town serves in a review capacity for this process.

4.06 TRAFFIC IMPACT ANALYSIS (TIA) REQUIREMENTS

a. The Traffic Impact Analysis (TIA) must be prepared and evaluated by a consultant who meets the qualifications described in Section 4.04 (b) to perform such studies.

b. The analysis is required to contain at a minimum, the following:

1. Traffic Analysis Map

(a) Land Use, Site and Study Area Boundaries, as defined (provide map).

(b) Existing and Proposed Site Uses.

(c) For TIA's where land use is the basis for estimating projected traffic volumes and existing and Proposed Land Uses on both sides of boundary streets for all parcels within the study area (provide map).

(d) Existing and Proposed Roadways and Intersections of boundary streets within the study area of the subject property, including traffic conditions (provide map).

(e) All major driveways and intersecting streets adjacent to the property will be illustrated in sufficient detail to serve the purposes of illustrating traffic function. This may include showing lane widths, traffic islands, medians, sidewalks, curbs, traffic control devices (traffic signs, signals, and pavement markings), and a general description of the existing pavement condition.

(f) Photographs of adjacent streets of the development and an aerial photograph showing the study area.

2. Trip Generation and Design Hour Volumes (provide table).

(a) A trip generation summary table listing each type of land use, the building size assumed, average trip generation rates used (total daily traffic and a.m./p.m. peaks), and total trips generated shall be provided.

(b) Vehicular trip generation may be discounted in recognition of other reasonable and applicable modes, e.g., transit, pedestrian or bicycles. Trip generation estimates may also be discounted through the recognition of

passby trips and internal site trip satisfaction. All such estimates shall be subject to the approval of the Town.

(c) Proposed trip generation calculations for single-story commercial properties shall be based on a Floor-to-Area (building size to parcel size) ratio of 0.25 or more.

3. Trip Distribution (provide figure by Site Exit/Entrance). The estimates for percentage distribution of trips by turning movements to/from the proposed development.

4. Trip Assignment (provide figure by site entrance and boundary street). The direction of approach of site-attracted traffic via the area's street system.

5. Existing and Projected Traffic Volumes (provide figure for each item). Existing traffic volumes are the numbers of vehicles on the streets of interest during the time periods listed below, immediately prior to the beginning of construction of the land development project. Projected traffic volumes are the number of vehicles, excluding the site-generated traffic, on the streets of interest during the time periods listed below, in the build-out year.

(a) A.M. Peak Hour site traffic (including turning movements) if significant impact.

(b) P.M. Peak Hour site traffic (including turning movements).

(c) Weekend Peak Hour site traffic (including turning movements).

(d) A.M. Peak Hour total traffic including site-generated traffic and Projected Traffic (including turning movements).

(e) P.M. Peak Hour total traffic including site-generated traffic and Projected Traffic (including turning movements).

(f) Weekend Peak Hour total traffic including site-generated traffic and Projected Traffic (including turning movements).

(g) For special situations where peak traffic typically occurs at non-traditional times, e.g., major sporting venues, entertainment venues, large specialty Christmas stores, etc., any other Peak hour necessary for complete analysis (including turning movements).

(h) Total daily existing traffic for street system in study area.

(i) Total daily existing traffic for street system in study area and new site traffic.

(j) Total daily existing traffic for street system in study area plus new site traffic and projected traffic from build-out of study area land uses.

6. Capacity Analysis (provide Analysis Sheets in Appendices).

(a) A capacity analysis shall be conducted for all public streets, intersections and junctions of major driveways with public streets, which are significantly

impacted (as designated by the Town), by the proposed development within the previously defined study boundary.

(b) Capacity analysis will follow the principles established in the latest edition of the Transportation Research Board's *Highway Capacity Manual* (HCM), unless otherwise directed by the Transportation Services Director. Capacity will be reported in quantitative terms as expressed in the HCM and in terms of traffic Level of Service.

(c) Capacity analysis will include traffic queuing estimates for all critical applications where the length of queues is a design parameter, e.g., auxillary turn lanes and at traffic gates.

7. Conclusions and Requirements.

(a) Roadways and intersections, within the Study Area, that are expected to operate at Level of Service D, E, or F, under traffic conditions including projected traffic plus site-generated traffic must be identified and viable recommendations made for raising the traffic conditions to Level of Service C or better (Level of Service A or B).

(b) Level of Service "C" is the design objective for all movements and under no circumstances will less than Level of Service "D" be deemed acceptable for site and non-site traffic including existing traffic at build-out of the study area. The Town must approve a Level of Service "D".

(c) For phased construction projects, implementation of traffic improvements must be accomplished prior to the completion of the project phase for which the capacity analyses show that they are required. Plats for project phases subsequent to a phase for which a traffic improvement is required may be approved only if the traffic improvements are completed or bonded.

(d) Voluntary efforts, beyond those herein required, to mitigate traffic impacts are encouraged as a means of providing enhanced traffic handling capabilities to users of the land development site as well as others.

(e) Traffic mitigation tools include, but are not limited to, pavement widening, turn lanes, median islands, access controls, curbs, sidewalks, traffic signalization, traffic signing, pavement markings, etc.

(f) The applicant will provide five (5) copies of the Draft Report for review and nine (9) copies of the Final Report for submittal.

8. Other Items

(a) The Town may require other items be included in the TIA above those listed above.

V. PAVEMENT DESIGN

5.01 STANDARD STREET AND ARTERIAL PAVEMENT DESIGN

All new roadways within the Town of Annetta shall be constructed of reinforced concrete with the exception of rural residential streets (LTU-R). High quality asphalt pavement may be permitted in certain cases by variance if deemed acceptable and appropriate by the Town. Asphalt pavements may also be used for temporary construction, if approved by the Town. Table II-9 shows the required pavement thickness for rigid pavement and the subgrade requirements for certain soil conditions for various street and thoroughfare types within the Town. The procedure for using this table requires that a soils investigation be made including obtaining soil auger borings, classifying the soils encountered and determining the strength and physical properties of the underlying and supporting soils system in moisture content, and unit dry weight (see 5.02 – Geotechnical Investigation Required). For each soil classification encountered, the plasticity index shall be calculated and depending whether the P.I. is less or more than the critical percentage shown, the subgrade design shall consist of a 6-inch compacted subgrade or a lime or cement treated subgrade as shown in Table II-9. Table II-9 also presents the recommended pavement thickness of portland cement concrete or asphalt pavement for the various street and arterial types.

5.02 GEOTECHNICAL INVESTIGATION REQUIRED

A geotechnical investigation must be performed for all new developments within the Town of Annetta. As a minimum, the study must address the following:

- general soil and groundwater conditions
- earthwork recommendations
- recommendations for pavement subgrade type, depth, and concentration
- guidelines for concrete or asphalt pavement design

The investigation must be based on samples obtained from drilling or from excavations on the site. Samples must be tested in a laboratory. Tests must include as a minimum:

- moisture content and soil identification
- liquid and plastic limit determination
- unit weight determination
- Eades and Grim lime series tests
- soluble sulfate tests

The geotechnical investigation must be performed by a qualified geotechnical firm. A report with findings and recommendations must be prepared. The report shall bear the seal of a licensed engineer in the State of Texas.

5.03 GUIDELINES FOR STABILIZATION OF SUBGRADE SOILS CONTAINING SULFATES

Lime induced heaving has been a cause of pavement failures in the North Texas area. There are four components which are the culprits in sulfate induced stress in stabilized soils: calcium, aluminum, water, and sulfates. Together, and in the proper combination, these components will produce calcium-aluminate-sulfate-hydrate minerals with an expansion potential as large as 250%.

The best approach when dealing with lime stabilization of clay with significant soluble sulfate content is to force the formation of the deleterious minerals prior to compaction. If these minerals form during the mellowing period before placement and compaction, no damage will be done to

the pavement. This can be done by providing adequate mellowing time (time delay between application of stabilizer and compaction of the stabilized soil) and with addition of adequate water.

Generally if the total level of soluble sulfates is below 2,000 ppm, by weight of soil, then lime stabilization is not of significant concern.

Sulfate levels of moderate to high risk are those between 2,000 ppm and 10,000 ppm. These soils should be treated by the double lime application method. In this method one-half of the lime is mixed with the soil and excess water. Mixing water should be applied to bring the soil to at least 3% to 5% above optimum for compaction and maintained at that level through the mellowing period. The mellowing period should be at least 72 hours. After that time, the second half of the required lime is mixed followed by compaction. Double treatment does not require twice the required lime, but rather the required lime placed in two separate treatments.

Sulfate levels of high risk, between 8,000 ppm and 10,000 ppm, should be treated with a double application of lime as required for moderate to high risk soils, but the mellowing period should be extended to a minimum of 7 days.

Soils with a sulfate level higher than 10,000 ppm are not suitable for lime stabilization. Other strategies for dealing with these soils may include removal and replacement or blending with other soils to reduce the concentration of sulfates. The geotechnical report must recommend alternative strategies for subgrades with high levels of sulfates. Alternative strategies are subject to approval by the Town Engineer.

The above guidelines were obtained from a paper and sponsored by the Lime Association of Texas, dated August 2000, and titled "Guidelines for Stabilization of Soils Containing Sulfates".

5.04 ALTERNATE PAVEMENT DESIGN

The Town Engineer will consider an alternate pavement design in lieu of selecting a design from Table II-9, particularly when there are circumstances which warrant an individual design. Recommendations for an alternate pavement design must be signed and sealed by a Geotechnical Engineer for consideration.

TABLE II-9

STANDARD STREET AND THOROUGHFARE PAVEMENT DESIGN

Facility Type	P.I. less Than 15 (1)	P.I. = 15 or Greater (2)	Concrete Pvmt. (3)	Flex Base (4)	Type "B" Asphalt (5)	Type "D" Asphalt (6)
Fire Lane and Driveways	6" Cement	6" Lime	6"	N/A	N/A	N/A
Alleys	6" Cement	6" Lime	7"	N/A	N/A	N/A
Residential						
L2U-U and R	6" Cement	6" Lime	6"	N/A	N/A	N/A
L2U-R (Asphalt Alternative)	N/A	N/A	N/A	8"	4"	2"
Collector						
C2U-U and R	6" Cement	6" Lime	7"	N/A	N/A	N/A
Minor Arterial						
M4U-U and R	6" Cement	6" Lime	8"	N/A	N/A	N/A
M4D-U and R	6" Cement	6" Lime	8"	N/A	N/A	N/A
Principal Arterial						
P6D-U and R	6" Cement	8" Lime	8"	N/A	N/A	N/A

NOTE: 1) Minimum 5% by dry unit weight of Portland cement.
2) Minimum 6% by dry unit weight of hydrated lime.
3) Twenty-eight day concrete compressive strength shall not be less than 3,600 psi.
4) Crushed limestone compacted to 95% standard proctor density at optimum moisture.
5) Asphaltic concrete base meeting N.C.T.C.O.G. specification Item 302.
6) Asphaltic concrete surface course meeting N.C.T.C.O.G. specification Item 302.

VI. PERMANENT LANE MARKINGS

6.01 PAVEMENT MARKINGS PLAN

Permanent lane markers shall be installed in accordance with the pavement markings plan and Pavement Marking Standard Details.

VII. LANDSCAPING IN PUBLIC RIGHT-OF-WAY

7.01 GENERAL

All unpaved public medians and parkways shall be landscaped with a minimum of four inches of topsoil, sodded or seeded in accordance with seeding requirements in the standard details and irrigated with a properly designed and installed system.

7.02 METERING

All water usage shall be metered and paid for by the developer until landscaping is accepted by the Town. Developers shall pay administrative fees, meter costs, and meter deposits, but shall be exempt from impact fees for meters installed on Town right-of-way. Within medians, no plantings or irrigation facilities shall be permitted within areas five feet or less in width or in

median noses. Those areas shall be covered with brick pavers in accordance with the Standard Details.

7.03 OTHER REQUIREMENTS

a. Minimum landscape requirements will be established by the Town.

b. Trees or upright plantings must not be planted within 30 feet of intersections or utility poles. The Town may require greater setback for safety based on line of sight issues.

c. An 8-inch wide concrete mow strip shall be installed between all planting beds and grassed areas.

d. Seeded or sodded areas of medians shall be bermed a minimum of 6 inches.

e. Only trees with a mature height less than 30 feet may be planted closer than 20' either side of an overhead line. No trees shall be directly under utility lines.

f. Trees to be planted within the medians of divided roadways that are ultimately planned for widening by constructing additional lanes in the median shall not be planted within the path of future lanes. Trees shall not be planted within five (5) feet of existing or proposed curbs. Future lane widening shall be shown on the landscape plans.

g. Trees shall not be planted within five feet of existing or proposed water lines.

h. Irrigation systems shall be designed to meet all other Town Ordinances.

7.04 PLAN SUBMITTAL REQUIREMENTS

Landscape and irrigation construction plans shall be submitted as part of the overall construction plans associated with the related project. Plans shall bear license seal of the designer. The plans shall include the following:

a. A scale drawing (1" = 40' or 1" = 20'), prepared on 22" by 34" sheets clearly indicating the location, type, size and description of all proposed landscape materials and existing utilities.

b. The name of the project, name and address of the Developer, north arrow, scale, and legend.

c. The configuration, location, type and size of all irrigation, piping heads and controllers.

d. All details necessary to provide a constructible installation.

7.05 OWNERSHIP AND MAINTENANCE

a. Upon final acceptance, all landscape and irrigation materials within medians and rights of way shall become the property of the Town.

b. Landscape areas shall be maintained by the Developer or owner for a minimum of one year. Within one year the Town will assume responsibility if 80% grass cover is obtained and all plantings are in a healthy condition. Developer maintenance will continue until adequate coverage is obtained.

VIII. STREET LIGHT REQUIREMENTS

8.01 GENERAL

Street lights shall be installed in all new subdivisions. The Developer shall pay the costs for all street lighting. Street light luminaries shall be high pressure sodium (HPS) or metal halide (MH). Street light materials and design shall be approved by the Town.

8.02 STREET LIGHT REQUIREMENTS BY STREET CLASSIFICATION

Street light installations will vary according to the classification of street. In general installations will be as follows:

a. Residential Streets: For residential streets, street lights shall be installed at each intersection, at major curves, at ends of cul-de-sacs, and at intervals of between 200 and 400 feet. Luminaires shall be either 100 Watt HPS or 175 Watt MH and mounted on poles at least 11 feet high as shown on standard details for street lights.

b. Collector Streets: For collector streets, street lights shall be installed at each intersection, at major curves, and at intervals of between 200 and 400 feet. Luminaires shall be either 100 Watt HPS or 175 Watt MH and mounted on poles at least 11 feet high with pole type to be approved by the Town.

c. Major Arterials: For major arterial streets, street lights shall be installed at each intersection, at major curves, and at intervals of between 200 and 300 feet. Luminaires shall be either 250 Watt HPS or 250 Watt MH and mounted on poles at least 30 feet high with pole type to be approved by the Town. Where a major arterial traverses a single-family neighborhood light fixtures shall be either 100 Watt HPS or 175 Watt MH and mounted on poles at least 11 feet high with pole type to be approved by the Town.

d. External lighting for parking lots must conform to the following standards:

(a) All light fixtures serving parking lots must be cut-off fixtures as defined by the Illuminating Engineering Society of North America (IESNA).
(b) Mounting height for light fixtures must not exceed fifteen (15) feet.
(c) Lighting intensity must not exceed 0.6 foot-candles when measured at grade at the property line.
(d) Areas around pump islands and under canopies must be illuminated so that the minimum horizontal illuminance at grade level is no more than twenty-five (25) foot-candles and the maximum horizontal illuminance at grade level is no more than thirty-five (35) foot-candles.
(e) Light fixtures mounted on canopies must be recessed so that the lens cover is recessed or flush with the bottom surface (ceiling) of the canopy and/or shielded by the fixture or the edge of the canopy so that light is restrained to no more than eighty-five (85) degrees from vertical.
(f) As an alternative to recessed ceiling lights, indirect lighting may be used where light is beamed upward and then reflected down from the underside of the canopy. In this case light fixtures must be shielded so that direct illumination is focused exclusively on the underside of the canopy.
(g) Light may not be mounted on the top of sides (fascias) of the canopy, and the sides of the canopy may not be illuminated.
(h) Measuring of lighting levels shall be in accordance with the following:

(i) Metering equipment. Lighting levels shall be measured in foot-candles with a direct reading, portable light meter.

(ii) Method of measurement. The meter sensor shall not be more than six (6) inches above ground level in horizontal position. The reading shall be taken only after the cell has been exposed long enough to provide a constant reading.

i) A photometric plan describing compliance will the provisions of this section shall be submitted to the Town prior to plan approval.

8.03 STREET LIGHT LOCATIONS

Street lights shall be installed in the public right-of-way, in a location at least three (3) feet behind the face of curb. Where there is no curb, street lights shall be installed at least eight (8) feet from the edge of pavement. Street lights on major arterials shall be installed in the median, where a median exists. In conjunction with the development of any subdivision, street light location and installation shall be coordinated with Tri-County, Oncor, and the Town. Installations in state right-of-way shall be coordinated with TxDOT and the Town.

8.04 PLAN SUBMITTAL REQUIREMENTS

Street light plans shall be submitted as part of the overall construction plans associated with the related project. The plans shall include the following:

a. A layout of the entire subdivision showing the location of each street light.

b. A plan for the location of underground conduits. All street lights shall be served by underground electric unless approved in writing by the Town. All wiring shall be placed in minimum two (2) inch schedule 40 PVC conduit.

c. Street light details.

8.05 COSTS

The developer shall be responsible for all engineering and plan preparation costs required for installation of street lights or external lighting.

ENGINEERING DESIGN MANUAL

PART III – DRAINAGE

TOWN OF ANNETTA

ENGINEERING DESIGN MANUAL

PART III - DRAINAGE

Incorporating the

TOWN OF ANNETTA LOCAL CRITERIA SECTION

and the

NCTCOG – *Integrated* Storm Water Management (*iSWM*™)
Design Manual for Site Development
(2006 Edition)

This document consists of the regional *i*SWM™ Manual prepared by the North Central Texas Council of Governments and the Town of Annetta Local Criteria Section. The Local Criteria Section adopts by reference the applicable *i*SWM™ sections that are required by the Town's storm water management program and includes additional design criteria that are not included in the *i*SWM™ Manual. The remaining *i*SWM™ sections and criteria are available for technical reference, utilization by developers for enhancement of land development projects, and potential future adoption by the Town, as needed.

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Engineering Design Manual

Part III – Drainage

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INTRODUCTION

Why a Town of Annetta Storm Water Management Design Manual is necessary

This design manual is needed to create policies and criteria for storm water facilities within the Town of Annetta and its extraterritorial jurisdiction. The primary motivation for this manual is to guide the community in drainage policy and criteria so that new development does not increase flooding, erosion, and/or water quality problems.

This manual is intended to provide a guideline for the most commonly encountered storm water or flood control designs in the Town of Annetta. It can also be used as a guide for watershed master plans and for design of remedial measures for existing facilities. This manual was developed for users with knowledge and experience in the applications of standard engineering principles and practices of storm water design and management. There will be situations not completely addressed or covered by this manual. Any variations from the practices established in this manual must have the approval of the Town. Close coordination with the staff of the Town is recommended and encouraged during the planning, design and construction of all storm water facilities. This Storm Water Management Design Manual is adopted and becomes effective on March 17, 2016.

PE Standard of Care Statement:
The Contractor shall have an appropriately trained Design Engineer that will endeavor to perform in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances for all parts of the proposed development including any hydrology and hydraulics study. All reports, designs, studies, testing, and results shall be completed with good professional judgment in performing such engineering tasks with deliverables appropriately signed and sealed.

Relationship of Town of Annetta Manual to Regional *Integrated* Storm Water Management (*ISWM™*) Manual

The Town of Annetta hereby adopts and incorporates herein the regional *ISWM™* Manual (2006 Edition), developed by the North Central Texas Council of Governments (NCTCOG), the same as if same is set forth fully herein, with such clarifications and modifications as are indicated in this "Local Criteria Section". The *ISWM™* manual was prepared for the 16-county region and includes sections that are not being adopted or are being modified by the Town of Annetta. The digital version of both manuals are included on the Town of Annetta website (http://www.annettatx.gov/). Copies of these documents can be downloaded from the websites or ordered from the respective agencies for the cost of reproduction.

Precedence of Town of Annetta Local Criteria

The requirements contained within this Town of Annetta Local Criteria section shall take precedence over conflicting provisions that may be contained in the *Integrated* Storm Water Management Manual approved by the North Central Council of Governments. Please note that the *ISWM™* Manual's requirements for Streambank Protection and Water Quality Protection are encouraged by the Town but not currently required.

Notes and Abbreviations

Notes and abbreviations used in the Local Criteria Section:

1. Town-Town of Annetta
2. References are made to the Regional *ISWM™* Manual for Site Development, 2006

Contact Information

Contacts for the Town of Annetta Storm Water Management Design Manual can be reached at the Annetta Town Offices at: 817-441-6770 or at the website: http://www.annettatx.gov.

References

Integrated Storm Water Management Design Manual for Site Development, 2006 Edition. NCTCOG, Arlington, TX.

Integrated Storm Water Management Design Manual for Construction, December, 2003. NCTCOG, Arlington, TX.

Note: Additional references are included in individual chapters or appendices.

GOALS AND OBJECTIVES OF THE TOWN OF ANNETTA STORM WATER MANAGEMENT PROGRAM

1. Establish and implement drainage policy and criteria so that new development does not create or increase flooding problems, cause erosion or pollute downstream water bodies.

2. Facilitate the continuation of comprehensive watershed planning that promotes orderly growth and results in an integrated system of public and private storm water infrastructure.

3. Minimize flood risks to citizens and properties and stabilize or decrease streambank and channel erosion on creeks, channels, and streams.

4. Improve storm water quality in creeks, rivers, and other water bodies, remove pollutants, enhance the environment and mimic the natural drainage system to the extent practicable in conformance with the Texas Pollutant Discharge Elimination System (TPDES) permit requirements per www.tceq.texas.gov.

5. Support multi-use functions of storm water facilities for trails, green space, parks, greenways or corridors, storm water quality treatment, and other recreational and natural features, provided they are compatible with the primary functions of the storm water facility.

6. Encourage a more standardized, integrated land development process by bringing storm water planning into the conceptual stages of land development.

TOWN OF ANNETTA STORM WATER POLICY STATEMENTS

1. All development within the Town of Annetta Town Limits or Extra-territorial Jurisdiction (ETJ) shall include planning, design, and construction of storm drainage systems in accordance with this Storm Water Management Design Manual as well as Planning Commission Rules and Regulations.

2. Conceptual, Preliminary and Final Drainage Studies and Plans may be required for proposed developments within the Annetta Town Limits or its ETJ, in conformance with this Storm Water Management Design Manual. Specific submittal requirements depend on the complexity of the project and requirements of the Subdivision Regulations. Drainage Studies are required only as a part of a "Concept Plan" as defined by the Subdivision Regulations. The checklists for each stage of this three-tier process are included in the ISWM™ Manual.

3. All drainage related plans and studies shall be prepared and sealed by a Licensed Professional Engineer with a valid license from the State of Texas. The Engineer shall attest that the design was conducted in accordance with this Storm Water Management Design Manual.

4. For currently developed areas within the Town of Annetta with planned re-development, storm water discharges and velocities from the project should not exceed discharges established by procedures presented in this manual but also shall not exceed discharges and velocities from current (existing) developed conditions, unless the downstream storm drainage system is designed (or adequate) to convey the future (increased) discharges and velocities.

5. All drainage studies and design plans shall be formulated and based upon ultimate, fully developed watershed or drainage area runoff conditions. In certain circumstances where regional detention is in place or a master plan has been adopted, a development may plan to receive less than ultimate developed flow from upstream areas with the approval of the Town. The rainfall frequency criteria for storm water facilities, as enumerated within this Storm Water Management Design Manual shall be utilized for all drainage studies and design plans.

6. Proposed storm water discharge rates and velocities from a development shall not exceed the runoff from existing, pre-development conditions, unless a detailed study is prepared that demonstrates that no unacceptable adverse impacts will be created. Adverse impacts include: new or increased flooding of existing structures, significant increases in flood elevations over existing roadways, unacceptable rises in base flood elevations or velocities, and new or increased stream bank erosion or increased occurrence of nuisance flows.

7. If a proposed development drains into an improved channel or storm water drainage system designed under a previous Town of Annetta drainage policy, then the hydraulic capacities of downstream facilities must be checked to verify that increased flows, caused by the new development, will not exceed the capacity of the existing system or cause increased downstream structure flooding. If there is not sufficient capacity to prevent increased downstream flooding, then detention or other acceptable measures must be adopted to accommodate the increase in runoff due to the proposed development.

8. Storm water runoff may be stored in detention and retention basins to mitigate potential downstream problems caused by a proposed development. Proposed detention or retention basins shall be analyzed both individually and as a part of the watershed system, to assure compatibility with one another and with the Town's storm water management master plans for that watershed (if available). Storage of storm water runoff, near points of rainfall occurrence, such as the use of parking lots, ball fields, property line swales, parks, road embankments, borrow pits and on-site ponds is desirable and encouraged.

9. Alternatives to detention or retention for mitigation of potential downstream problems caused by proposed development include: acquisition of expanded drainage easements, ROW, or property owner agreements; downstream channel and/or roadway bridge/culvert improvements or stream bank erosion protection; and financial contributions to the Town Storm Water Program for future improvements. These alternatives will be considered by the Town on a case-by-case basis.

10. All proposed developments within the Annetta Town Limits or its ETJ shall comply with all local, county, state and federal regulations. All required permits or approvals shall be obtained by the developer.

11. The policy of the Town is to avoid substantial or significant transfer of storm water runoff from one basin to another and to maintain historical drainage paths whenever possible. However, the transfer of storm water from basin to basin may be necessary in certain instances and will be reviewed and a variance can be made by the Town in accordance with established variance procedures. TCEQ approval may be required for significant transfer of storm water.

12. Town Maintenance - The Town will provide for perpetual maintenance, in accordance with adopted Town maintenance standards, of all public drainage facilities (those facilities located within dedicated easements, rights of way and constructed to Town standards). Access shall be provided and dedicated by the developer to all public storm water facilities in developments for maintenance and inspection by the Town.

13. Private Maintenance- Private drainage facilities (those facilities entirely on private property) include those drainage improvements which are located on private property and which handle only private water. Private drainage facilities may also include detention or retention ponds, dams, and other storm water controls which collect public water, as well as drainage ways not constructed to Town standards but which convey public water. Such facilities must be designed in accordance with sound engineering practices and reviewed and inspected by the Town. An agreement for perpetual maintenance of private drainage facilities serving public water shall be executed with the Town prior to acceptance of the final plat. This agreement shall run with the land and can be tied to commercial property or to an owner's association, but not to individual residential lots. Access shall be provided by the developer/owner to all private drainage facilities where there may be a public safety concern for inspection by the Town.

CHAPTER 1 – STORM WATER MANAGEMENT SYSTEM PLANNING AND DESIGN

Chapter 1 of the *i*SWM™ Manual provides a foundation for *integrated* Storm Water Management in terms of basic philosophy, principles, definitions, and land development site planning and design practices. It should therefore be utilized for general guidance throughout the development process. Water Quality and Streambank Protection Volume controls are not adopted by Town of Annetta at this time. Other exceptions are summarized below. All references to *i*SWM™ site plans are modified to refer to Town of Annetta storm water management plans.

Section 1.1 – Storm Water Site Planning
ADOPTED WITH MODIFICATIONS AND IN COMPLIANCE WITH TCEQ REGULATIONS

Depending on the complexity of the project or submittal requirements as dictated in the Subdivision Regulations, storm water management plans may be prepared and submitted to the Town of Annetta in the progressive planning stages of a land development project with the Conceptual Site Plan and Preliminary and Final Plats. The Conceptual Site Plan is an important consideration in that it allows the developer and their design engineer to propose a potential site layout and gives Town staff the opportunity to comment on a storm water management plan concept prior to significant planning and design effort on the part of the design engineer.

Section 1.1.2 – *Integrated* Storm Water Management (*i*SWM™) Site Plans
ADOPTED WITH MODIFICATIONS

The Town of Annetta does not currently require water quality (Section 1.2.3 of *i*SWM™) or streambank protection volume mitigation (Option4 of Section 1.2.4 of *i*SWM™).

Section 1.1.2.2 – Applicability
ADOPTED WITH MODIFICATIONS

Storm Water Management plans are required for all new Town of Annetta subdivisions. At this time the Town of Annetta does not require Storm Water Management plans for land disturbing activities or increases in impervious areas.

Section 1.1.3 – Developer Steps to Prepare an *i*SWM™ Site Plan
ADOPTED WITH MODIFICATIONS

See Local Criteria Section 1.1 for a description of Town of Annetta requirements.

Conceptual Storm Water Management Plan (*i*SWM™ 1.1.3.5)

In general, the engineer and planner will follow the conceptual storm water management plan guidelines as presented in Section 1.1.3.5 of the *i*SWM™ Manual, as applicable to Annetta. Water quality and streambank protection requirements and credits are not currently part of the Town of Annetta criteria.

Preliminary Storm Water Management Plan (*i*SWM™ 1.1.3.6)

A preliminary drainage study and storm water management plan will accompany a preliminary plat submitted for development review, and shall generally include the information listed in Section 1.1.3.6 of the *i*SWM™ manual as applicable to Annetta. The study will include a downstream assessment of properties that could be impacted by the development. These studies will include adequate hydrologic analysis to determine the existing, proposed, and fully-developed runoff for the drainage area that is affected by the proposed development and will include hydraulic studies that define the "adequate

outfall" (as defined in *i*SWM™ Section 2.1.9.2). The development storm water management plan shall address existing downstream, off-site drainage conveyance system(s); and shall define the discharge path from the outlet of the on-site storm water facilities to the off-site drainage system(s) and/or appropriate receiving waters. See Section 2.1.9 of the *i*SWM™ Manual ("Downstream Hydrologic Assessment") for guidance on the details of this downstream assessment. As a minimum, the Town of Annetta requires assessment of the 2-, 10-, 25- and 100- year 24- hour events. This preliminary drainage study and storm water management plan will include:

1. A topographical map of the entire watershed (not just the area of the proposed development) generally not smaller than 1"=200' (or other such scale approved by the Town), delineating the watershed boundary(s) and runoff design point(s), existing and proposed land use and zoning, and the size and description of the outfall drainage facilities and receiving streams.
2. Computation tables showing drainage areas, runoff coefficients, time of concentration, rainfall intensities and peak discharge for the required design storms for both existing and proposed (ultimate development) conditions and at all design points for each component of the storm water system (streets, pipes, channels, detention ponds, etc.).
3. Any proposed changes to watershed boundaries (i.e. by re-grading, where permissible by Texas Water Code). If significant changes to watershed boundary are made, more extensive analyses of downstream impact and mitigating detention will be required and a variance obtained from the Town.
4. FEMA Flood Hazard Areas, if applicable.
5. In addition any required Corps of Engineer's Section 404 permits, Conditional Letters of Map Revision (CLOMR), Letters of Map Revision (LOMR) or other permits relating to lakes and streams required by any federal, state or local authorities. These must be documented in the Drainage Study.
6. Detailed off-site outfall information. This shall include the presence of existing or proposed drainage structures, bridges or systems; documentation of existing versus proposed developed site as well as ultimate runoff, identification of downstream properties which might be impacted by increased runoff, and proposed detention or other means of mitigation. Downstream impacts shall generally be delineated to a point where the drainage from the proposed development has no impact on the receiving stream or on any downstream drainage systems within the "zone of influence"(as defined in *i*SWM™ Section 2.1.9.2).
7. Report with technical documentation.

Final Storm Water Management Plan (*i*SWM™ 1.1.3.7)

A Final Drainage Study and Storm Water Management Plan for development of all or a portion (i.e. phase one or phase two, etc.) of the overall development shall be prepared and submitted to the Town of Annetta. This submittal shall generally include the information listed in Section 1.1.3.7 of the *i*SWM™ manual as applicable to Annetta, including:

1. Conformance with the Preliminary Storm Water Management Plan and Study.
2. Submission of detailed drainage calculations and detailed design plans.
3. The submission of a cover sheet signed by the Town indicating the approval of the detailed construction drawings for the proposed development is sufficient to clear a plat drainage study comment.
4. Final drainage studies shall be approved based on the submission of a signed cover sheet and drainage map with calculations from the approved engineering construction drawings. Where Town approval of construction plans is not required, the above information required for preliminary drainage studies, as well as construction plans for any drainage improvements, prepared according to criteria in the current Town of Annetta plan review checklists, shall be submitted.

5. Note that unless specifically approved in a Floodplain Development Permit issued through the Town, no work may be performed in the FEMA regulatory floodway without a FEMA-approved Conditional Letter of Map Revision (CLOMR). No development activities may occur in the FEMA regulatory floodplain without an approved Floodplain Development Permit.

Section 1.1.4 – Local Community Plan Review Responsibilities

FOR GUIDANCE

Section 1.1.5 – Local Government Responsibilities during Construction and Operation

ADOPTED WITH MODIFICATIONS

The Town of Annetta Process includes:

Construction Phase

1. Pre-construction Meeting - Where possible, a pre-construction meeting shall occur before any clearing or grading is initiated on the site. This step ensures that the owner-developer, contractor, engineer, inspector, and plan reviewer can be sure that each party understands how the plan will be implemented on the site.
2. Periodic Inspections - Periodic inspections during construction by Town of Annetta representatives. Inspection frequency may vary with regard to site size and location; however, monthly inspections are a minimum target.
3. Final Inspection - A final inspection is needed to ensure that the construction conforms to the intent of the approved design. Prior to accepting the infrastructure components, issuing an occupancy permit, and releasing any applicable bonds, the Town of Annetta will ensure that: (a) temporary erosion control measures have been removed; (b) storm water controls are unobstructed and in good working order; (c) permanent vegetative cover has been established in exposed areas; (d) any damage to natural feature protection and conservation areas have been mitigated; (e) conservation areas and buffers have been adequately marked or signed; and (f) any other applicable conditions have been met.
4. Record Drawings - Record drawings of the structural storm water controls, drainage facilities, and other infrastructure components will be provided to the Town of Annetta by the developer.

Maintenance

1. Maintenance Plan - If private maintenance is planned, a maintenance plan, prepared by the developer, will outline the scope of activities, schedule, costs, funding source, and responsible parties. Vegetation, sediment management, access, and safety issues will be addressed.
2. Ongoing Maintenance – It will be clearly detailed in the Final Storm Water Management Plan which entity has responsibility for operation and maintenance of all structural storm water controls and drainage facilities (see Town of Annetta Policy Statements regarding maintenance).
3. Annual Inspections - Annual inspections of private storm water management facilities will be conducted by the owner and the results will be provided to the Town of Annetta.

Section 1.1.6 – iSWM™ Site Plan Design Tools

FOR GUIDANCE

Section 1.2 – *Integrated* Planning and Design Approach

ADOPTED WITH MODIFICATIONS

In general, the Town of Annetta currently follows the flood control and streambank protection components of the *Integrated* planning and design approach. Streambank protection is a requirement in Annetta, but there is not a standard requirement to provide extended release detention for the streambank protection volume. Post construction water quality protection is not currently a standard requirement in Annetta. However, the Town encourages land developers to consider the use of post construction water quality measures.

Section 1.2.1 – Introduction

ADOPTED

Section 1.2.2 – Downstream Assessment

ADOPTED WITH MODIFICATIONS

The downstream assessment described in Section 2.1.9 of the *iSWM*™ Manual will include the necessary hydrologic and hydraulic analyses to clearly demonstrate that the limits of the Zone of Influence (Refer to *iSWM*™ Section 2.1.9.2) have been identified, and that along the drainage route to that location, these parameters are met:

- No new or increased flooding of existing insurable (FEMA) structures (habitable buildings).
- No significant (0.1') increases in flood elevations over existing roadways for the 2-, 10-, 25- and 100-year floods.
- No significant rise (0.1') in 100-year flood elevations, unless contained in existing channel, roadway, drainage easement and/or R.O.W.
- No significant increases (maximum 5%) in channel velocities for the 2-, 10-, 25- and 100-year floods. Post-development channel velocities cannot be increased above pre-development velocities, if they exceed the applicable maximum permissible velocity shown in *iSWM*™ Table 4.4-2. Exceptions to these criteria will require certified geotechnical/geomorphologic studies that provide documentation those higher velocities will not create additional erosion. If existing channel velocities exceed six (6) feet per second, no additional increase in velocities will be allowed.
- No increases in downstream discharges caused by the proposed development that, in combination with existing discharges, exceeds the existing capacity of the downstream storm drainage system.
- For watersheds of 100 acres or less at any proposed outfall, the downstream assessment may use the ten percent rule of thumb (as delineated in section 2.1.9.2 of the *iSWM*™ Manual) or a detailed study in order to determine the Zone of Influence.
- For all other watersheds, the Zone of Influence will be defined by a detailed hydrologic and hydraulic analysis.

Section 1.2.3 – Water Quality Protection

FOR GUIDANCE

Post construction water quality protection is not currently a standard requirement in Annetta. However, the Town encourages land developers to consider the use of post construction water quality measures.

Section 1.2.4 – Stream Bank Protection
ADOPTED WITH MODIFICATIONS

Streambank protection is a requirement in Annetta, but there is not a standard requirement to provide extended release detention for the streambank protection volume.

Section 1.2.5 – Flood Control
ADOPTED

Section 1.2.6 – *Integrated* Watershed Planning
FOR GUIDANCE

Section 1.3 – *Integrated* Site Design Practices
ADOPTED WITH MODIFICATIONS

This section provides general guidance for potentially reducing costs of storm water infrastructure construction and the negative impacts of development on flooding, stream stability and water quality. Numerous examples of *Integrated* site design practices are included. Town of Annetta exceptions to this guidance are summarized below:

Section 1.3.4 – *Integrated* Site Design Credits
FOR GUIDANCE

Section 1.4 – *Integrated* Storm Water Controls
FOR GUIDANCE

Section 1.4 and Chapter 5 of the *i*SWM™ Manual contain summaries, discussions and examples of storm water controls that can be implemented in land development to meet the goals of protecting water quality, minimizing streambank erosion, and reducing flood volumes. Although primarily oriented toward water quality issues, these storm water controls bring additional and valuable benefits for flood control and streambank protection. Many of the listed storm water control features and techniques enhance the aesthetics and value of land developments, as well as providing a drainage function, and are recommended for use in Annetta, when applicable.

Special storm water controls are not required for water quality treatment by the Town of Annetta at this time unless downstream conditions dictate. Although not mandated, the use of these storm water controls are recognized as inherently valuable for application in overall storm water management. The Town of Annetta encourages developers to use water quality storm water controls and will evaluate any proposed controls based on this section.

CHAPTER 2 – HYDROLOGIC ANALYSIS

The Town of Annetta requires a professional judgement of design flow, modeling, results, construction, testing, etc. to be completed by a competent Registered Professional Engineer with due standards of care in the State of Texas. All reports, studies, and plans will be appropriately signed and sealed.

Section 2.1 – Estimating Runoff

Section 2.1.1 – Introduction to Hydrologic Methods

ADOPTED WITH MODIFICATIONS

Water quality volume and stream bank protection volume applications are encouraged by the Town but not specifically required at this time. USGS and TxDOT equations are only allowed with the approval of the Town.

Table 2.1.1-1 – Only hydrograph methods may be used to compute design discharges for design of bridges with over 100 acres in contributing drainage area.

Table 2.1.1-2 – See modified version of Table 2.1.1-2 below (differences from *iSWM*™ Manual are in bold type).

Table 2.1.1-2 Constraints on Using Recommended Hydrologic Methods

Method	Size Limitations[1]	Comments
Rational	0 – 200 acres	Method can be used for estimating peak flows and the design of small site or subdivision storm sewer systems.
Modified Rational[2]	0 –200 acres	Method can be used for estimating runoff volumes for detention planning and conceptual design. However, basin sizes larger than 25 acres must utilize a hydrograph routing method for final design.
Unit Hydrograph (SCS)[3]	Any Size	Method can be used for estimating peak flows and hydrographs for all design applications.
Unit Hydrograph (Snyder's)[4]	> 100 acres	Method can be used for estimating peak flows and hydrographs for all design applications.
TXDOT Regression Equations[5]	10 to 100 mi²	Method can be used for estimating peak flows for rural design applications for comparison purposes only.
USGS Regression Equations[5]	3 – 40 mi²	Method can be used for estimating peak flows for urban design applications for comparison purposes only.
iSWM™ Water Quality Protection Volume Calculation[6]	Limits set for each Structural Control	Method used for calculating the Water Quality Protection Volume (WQv)

[1]Size limitations refer to the drainage basin for the storm water management facility (e.g., culvert, inlet). These do not necessarily apply to master drainage plans.
[2]Where the Modified Rational Method is used for conceptual sizing the engineer is cautioned that the method could underestimate the storage volume.
[3]This refers to SCS routing methodology included in many readily available programs (such as HEC-HMS or HEC-1) that utilize this methodology.
[4]This refers to the Snyder's routing methodology included in many readily available programs (such as HEC-HMS or HEC-1) that utilize this methodology.
[5]Use only with approval of TOWN.
[6]Not currently required by TOWN OF ANNETTA.

Section 2.1.2 – Symbols and Definitions

ADOPTED

Section 2.1.3 – Rainfall Estimation

ADOPTED WITH MODIFICATIONS

The rainfall intensities listed in the *i*SWM™ Manual for Parker County will be used throughout Annetta and its ETJ.

Section 2.1.4 – Rational Method
ADOPTED

Section 2.1.4.3 – Equations
ADOPTED

Section 2.1.4.4 – Time of Concentration
ADOPTED

Section 2.1.4.6 – Runoff Coefficient (C)
ADOPTED

Section 2.1.5 – SCS Hydrologic Method
ADOPTED

Section 2.1.5.2 – Application
ADOPTED WITH MODIFICATIONS

Town of Annetta allows the hydrograph routing method for subdrainage areas of any size but will not allow the Simplified Method, except as approved by TOWN. Figure 2.1.6-1 presents a sample computation sheet for presentation of unit hydrograph method results. This form should be completed even if the computations are performed on acceptable computer programs HEC-1 or HEC-HMS.

BY:	LOSS RATE METHOD	COMPUTATION SHEET								SHEET 1 OF 1 SUBWATERSHED
DATE:		HYDROLOGY BY UNIT HYDROGRAPH METHOD								MAJOR WATERSHED
CK'D:	STREAM ROUTING									JOB/FILE NO.:
DATE:		UNIT HYDROGRAPH COEFFICIENTS				PEAK DISCHARGES (CFS)				
ANALYSIS POINT	SUBWATER-SHED AREA (AC)	WATERSHED AREA (AC)	SCS METHOD		SNYDER'S METHOD					COMMENTS
			C_U	Lag (HR)	C_p	T_p (HR)	Q2	Q10	Q25	Q100	
1	2	3	4	5	6	7	8	9	10	11	12
REMARKS, SKETCHES AND COMPUTATIONS											

Figure 2.1.6-1 Computation Sheet – Hydrology by Unit Hydrograph Method

Section 2.1.5.7 – Simplified SCS Peak Runoff Rate Estimation
ADOPTED WITH MODIFICATIONS

Town of Annetta will not allow the simplified SCS method except as approved by the Town.

Section 2.1.5.8 – Example Problem 1
ADOPTED WITH MODIFICATIONS

Town of Annetta will not allow the simplified SCS method except as approved by the Town.

Section 2.1.6 – Snyder's Unit Hydrograph Method
ADOPTED

Section 2.1.6.2 – Application
ADOPTED WITH MODIFICATIONS

Figure 2.1.6-1 presents a sample computation sheet for presentation of unit hydrograph method results. This form should be completed even if the computations are performed on acceptable computer programs HEC-1 or HEC-HMS.

Section 2.1.6.3 – Urbanization Curves
ADOPTED WITH MODIFICATIONS

An alternative method to determine Snyder's Lag is to determine the time of concentration (travel time) by the methodology described in Section 2.1.5.6 and multiply this time of concentration by 0.6.

Section 2.1.7 – Modified Rational Method
ADOPTED

Section 2.1.7.2 – Design Equations
ADOPTED WITH MODIFICATIONS

An exception to the *ISWM*™ Method is that only "C" coefficients presented in *ISWM*™ Table 2.1.4-2 are allowed for use in the Modified Rational Method. The remaining methodology is allowed.

Section 2.1.8 – USGS and TxDOT Regression Methods
ADOPTED WITH MODIFICATIONS

The regression methods used in this Section will only be used for comparison of the reasonableness of other approved determinations, not for final results or design unless specifically approved by the Town.

Section 2.1.9 – Downstream Hydrologic Assessment
ADOPTED

Section 2.1.10 – Water Quality Protection Volume and Peak Flow
ADOPTED

Section 2.1.11 – Streambank Protection Volume Estimation
ADOPTED

Section 2.1.12 – Water Balance Calculations

ADOPTED

References

ADOPTED

CHAPTER 3 – HYDRAULIC DESIGN OF STREETS AND CLOSED CONDUITS

Section 3.1 – Storm Water Street and Closed Conduit Design Overview

Section 3.1.1 – Storm Water System Design

ADOPTED

Section 3.1.2 – Key Issues in Storm Water System Design

ADOPTED

Section 3.1.2.3 – Street and Roadway Gutter

FOR GUIDANCE

Section 3.1.2.4 – Inlets and Drains

FOR GUIDANCE

Section 3.1.2.5 – Closed Conduit Systems (Storm Drains/Sewers)

FOR GUIDANCE

Section 3.1.3 – Design Storm Recommendations

ADOPTED WITH MODIFICATIONS

The design storms presented in *i*SWM™ are replaced by the design storms required by Town of Annetta as follows:

Storm Sewer System

The design storm is a minimum 25-year for the closed conduit systems in residential and commercial areas and for thoroughfares. The 100-year storm is the design storm for the combination of the closed conduit and surface drainage system.

Runoff from the design closed conduit storm must be contained within the permissible spread of water in the gutter. The 100-year storm flow must be contained within the ROW. Adequate inlet capacity shall be provided to intercept surface flows before the street ROW capacity is exceeded. Note: The capacity of the underground system may be required to exceed the 25-year design closed conduit storm in order to satisfy the 100-year storm criteria.

Enclosed drainage systems for all street types shall be designed to contain the 25-year storm. The 25-year flow must not exceed curb depth. 100-year flows shall be contained within drainage easement and/or ROW. Safe overflow routing with supporting calculations shall be provided and indicated on plans. Grading plans must accommodate the necessary capacities to contain the 100-year flow within the street right-of-way or drainage easements.

The closed conduit HGL must be equal to or below the gutter line for pipe systems and one (1) foot or more below top of curb at inlets. For situations where no ROW exists, the 100 year HGL must be below finished ground. The 100-year HGL will be tracked carefully throughout the system and described in the hydraulic calculation tables (Fig. 3.2.4-4) in the construction drawings.

Roadway ditches shall be designed to convey the 100-year storm within the limits of the 4:1 ditch and within the ROW or easement.

Driveway culverts shall be installed at all driveways to allow the storm drainage to pass underneath the driveway. The Driveway culvert shall be designed to convey the 100-year storm.

Storm systems must meet or exceed Texas Department of Transportation standards when applicable.

Sump Inlets

In sag or sump conditions, the storm drain and sump inlets should be sized to intercept and convey the 25-year storm, provided that a positive overflow is provided for the remainder of the 100-year storm. When the overflow route is between residential lots or otherwise constricted, the positive overflow structure must be concrete or other acceptable non-earthen structure with a minimum bottom width of 6 feet extending from the sump inlet to the storm sewer outfall. If the upstream pipe already conveys more than 25-year peak discharge, then the downstream pipe must have at least the same capacity from sump to outfall, and an inlet must still be installed at sump to allow for emergency overflow. In the event that a structural overflow is not practical, then the underground system must be sized to convey the 100-year storm.

Section 3.2 – On-Site Flood Control System Design

Section 3.2.1 – Overview

ADOPTED WITH MODIFICATIONS

The portion of Section 3.2.3 dealing with Flow Spread Limits is an exception to the *i*SWM™ requirements. Portions of Sections 3.2.5, 3.2.6 and 3.2.7 are specific Town of Annetta requirements rather than the *i*SWM™ requirements. The forms presented herein will be used to document all closed conduit calculations even if calculations are actually performed on an acceptable computer program unless otherwise approved by the Town.

Section 3.2.1.2 – General Criteria

ADOPTED WITH MODIFICATIONS

Flow Spread Limits

The requirements for the Town of Annetta's typical urban street sections are presented in Table 3.1.3-1 below. Rural street sections are not shown because those street sections are non curbed and drainage is taken to roadway ditches.

Table 3.1.3-1 Typical Street Sections and Storm Sewer Criteria

Street Type	Back to Back Width (ft)	Section Type	Closed Conduit Design Storm	Inlet Type	
				Recessed or Non-Recessed	Depressed or Non-Depressed
Local Residential (L2U-U)	31	Parabolic	25 yr	Non-Recessed	Depressed
Local Collector (C2U-U)	37	Parabolic	25 yr	Non-Recessed	Depressed
Minor Arterial – Undivided (M2U-U)	41	Parabolic	25 yr	Recessed	Depressed
Minor Arterial – Undivided (M4U-U)	51	Parabolic	25 yr	Recessed	Depressed
Minor Arterial – Divided (M4D-U)	28/28*	Straight Crown	25 yr	Recessed	Depressed
Principal Arterial - Divided (P6D-U)	40/40*	Straight Crown	25 yr	Recessed	Depressed

* Each Side

Must use roadway sections as approved by Town of Annetta. See the Engineering Design Manual and the "Standard Construction Details" for drawings of these sections. Permissible spread of water for a 10-year frequency event will be limited to the following:

Local Residential – Six inch (6") depth of flow at curb or no lanes completely clear.
Collector – One traffic lane to remain clear down the center of the pavement.
Minor Arterial – One traffic lane in each direction to remain clear.
Principal Arterial – One traffic lane in each direction to remain clear.

Section 3.2.2 – Symbols and Definitions
ADOPTED

Section 3.2.3 – Street and Roadway Gutters
ADOPTED

Section 3.2.4 – Storm Water Inlets
ADOPTED

Section 3.2.5- Grate Inlet Design
ADOPTED WITH MODIFICATIONS

Grate inlets on grade are not permitted by the Town of Annetta.

Section 3.2.6 – Curb Inlet Design
ADOPTED WITH MODIFICATIONS

Curb inlets on grade without depression are not permitted by the Town of Annetta.

Section 3.2.6.2 – Curb Inlets in Sumps
ADOPTED WITH MODIFICATIONS

In order to accommodate the standard curb inlet configuration presented in Annetta's "Standard Construction Details", the following supplement to Section 3.2.4.1 of *i*SWM™ from Hydraulic Engineering Circular 22 by FHA (August, 2001) is presented.

The weir for a depressed curb-opening inlet is at the edge of the gutter and the effective weir length is dependent on the width of the depressed gutter and the length of the curb opening. The weir location for a curb-opening inlet that is not depressed is at the lip of the curb opening and its length is equal to that of the inlet.

The equation for the interception capacity of a depressed curb-opening inlet operating as a weir is:

$$Q_I = C_W (L + 1.8\ W)\ d^{1.5} \qquad (4\text{-}28)$$

where:

C_W = 1.25 (2.3 in English Units)
L = length of curb opening, m (ft)
W = lateral width of depression m (ft)
d = depth at curb measured from the normal cross slope, m (ft), i.e., $d = T\ S_x$

The weir equation is applicable to depths at the curb approximately equal to the height of the opening plus the depth of the depression. Thus, the limitation on the use of equation 4-28 for a depressed curb-opening inlet is:

$$d \leq h + a/(1000) \qquad (d \leq h + a/12, \text{ in English units}) \qquad (4\text{-}29)$$

where:

h = height of curb-opening inlet, m (ft)
a = depth of depression, mm (in)

Section 3.2.7 – Combination Inlets

ADOPTED WITH MODIFICATIONS

Combination inlets on grade are permitted only by Town approval.

Section 3.2.8 – Closed Conduit Systems

ADOPTED WITH MODIFICATIONS

Materials

Only reinforced concrete pipe is allowed within public rights of way in the Town of Annetta.

HDPE/CPVC pipe is permitted for use in private developments only.

In selecting roughness coefficients for concrete pipe, consideration will be given to the average conditions at the site during the useful life of the structure. The 'n' value of 0.015 for concrete pipe shall be used primarily in analyzing old sewers where alignment is poor and joints have become rough. If, for example, concrete pipe is being designed at a location where it is considered suitable, and there is reason to believe that the roughness would increase through erosion or corrosion of the interior surface, slight displacement of joints or entrance of foreign materials. A roughness coefficient will be selected which in the judgment of the designer, will represent the average condition. Any selection of 'n' values below the minimum or above the maximum, either for monolithic concrete structures, concrete pipe or HDPE, will have to have written approval of the Town.

The following recommended coefficients of roughness are listed in Table 3.2.8-3 and are for use in the nomographs contained herein, or by direct solution of Manning's Equation.

Table 3.2.8-3 Manning's Coefficients for Storm Drain Conduits*	
Type of Storm Drain	Manning's n
Concrete Pipe (Design n = 0.013)	0.012-0.015
Concrete Boxes (Design n = 0.015)	0.012-0.015
*NOTE: Actual field values for conduits may vary depending on the effect of abrasion, corrosion, deflection, and joint conditions.	

Full or Part Full Flow in Storm Drains

All storm drains shall be designed by the application of the Continuity Equation and Manning Equation either through the appropriate charts or nomographs or by direct solutions of the equations as follows:

$Q = A V$, and

$Q = \frac{1.486}{n} A r^{2/3} S_f^{1/2}$, where

Q = Runoff in cubic feet per second.

A = Cross-sectional area of pipe or channel.

V = Velocity of flow.

n = Coefficient of roughness of pipe or channel.

r = Hydraulic radius = $\frac{A}{P}$

S_f = friction slope in feet per foot in pipe or channel.

p = Wetted perimeter.

The size of pipe required to transport a known-quantity of storm runoff is obtained by substituting known values in the formula. In practice, the formula is best utilized in the preparation of a pipe flow chart which interrelates values of runoff, velocity, slope and pipe geometry. With two of these variables known or assumed. The other two are quickly obtained from the chart. A pipe flow nomograph for circular conduits flowing full graphs is shown in *iSWM™* Figure 3.2.16. Nomographs for flow in conduits of other cross-sections are available in TxDOT Hydraulic Design Manual, dated March 2004, Chapter 6, Section 2. For circular conduits flowing partially full, graphs are presented in *iSWM™* Figure 3.2-18a.

Hydraulic Gradient and Profile of Storm Drain

In storm drain systems flowing full (or partially full as discussed above) all losses of energy through resistance with flow in pipes, by changes of momentum or by interference with flow patterns at junctions, must be accounted for by accumulative head losses along the system from its initial upstream inlet to its outlet. The purpose of accurate determinations of head losses at junctions is to include these values in a progressive calculation of the hydraulic gradient along the storm drain system. In this way, it is possible to determine the water surface elevation which will exist at each structure. The rate of loss of energy through the storm drain system shall be represented by the hydraulic grade line. Since the hydraulic grade line measures the pressure head available at any given point within the system.

The hydraulic grade (HG) line shall be established for all storm drainage design in which the system operates under a head. In open channels, the water surface itself is the hydraulic grade line. The

hydraulic grade line is often controlled by the conditions of the sewer outfall; therefore, the elevation of the tailwater pool must be known. The hydraulic gradient is constructed upstream from the downstream end, taking into account all of the head losses that may occur along the line. *iSWM™* Section 3.2.8.10 provides a table of coincident design frequencies to assist with tailwater determination. The hydraulic gradient shall begin at the higher of the tailwater pool or depth of flow in the pipe at the downstream end.

All head losses shall be calculated as if the storm drain system is in a sub critical flow regime whether the system is flowing partially full or surcharged. Hydraulic calculations shall reflect partially full pipe where appropriate. Supercritical flow is allowed in main lines only with the approval of the Town. If the system is in supercritical regime the section should be marked "SUPERCRITICAL FLOW." The presence of supercritical regime should be confirmed by analyzing from downstream as well as upstream.

The friction head loss shall be determined by direct application of Manning's Equation or by appropriate nomographs or charts as discussed in the first paragraph of this subsection. Minor losses due to turbulence at structures shall be determined by the procedure described in Section 3.2.8.11 of the *iSWM™* manual. All HG calculations will be carried upstream to the inlet.

The hydraulic grade line shall in no case be above the surface of the ground or street gutter for the design storm. Allowance of head must also be provided for future extensions of the storm drainage system. In all cases the maximum HGL must be 12" below top of curb at any inlet.

Section 3.3 – General Design and Construction Standards

LOCAL CRITERIA SECTION ONLY

Utilities

In the design of a storm drainage system, the engineer is frequently confronted with the problem of crossings between the proposed storm drain and existing or proposed utilities such as water, gas and sanitary sewer lines. The Town of Annetta prefers a minimum of 2 feet of clearance with all conflicting utilities. All utilities in the vicinity of a proposed storm drain shall be clearly indicated on both plan and profile sheets.

Single Family Lot Grading

All single family lots shall be graded such that the lots are higher than the street. Lots shall be graded to allow all drainage towards public rights of way or drainage easements. Lots shall be graded to avoid lot to lot drainage.

Headwalls, Culverts, and Other Structures

For headwalls, culverts and other structures, Standard Construction Details adopted by the Town of Annetta shall be used. The appropriate detail sheets for non-standard structures should be included in any construction plans. All headwalls and culverts should be extended to or beyond the street right-of-way. Sloped headwalls shall be used to the greatest extent possible.

Roadway Ditch Design & Driveway culverts

In the rural typical sections, ditches along the sides of the road will convey storm drainage.

Driveway culverts shall be installed at all driveways to allow the storm drainage to pass underneath the driveway. Minimum pipe size for the driveway culvert shall be 18" and shall be reinforced concrete pipe.

Unless otherwise approved by the Town, all headwalls on all driveway culverts shall be sloped headwalls per the standard sloped headwall.

Roadway ditches shall utilize the Manning's n values as shown in *ISWM*™ adopted table 4.4-2. Values shall be in the "Minor Natural Streams" range from 0.030 to 0.050.

Roadway ditches shall be analyzed for capacity with the rougher of two Manning's n values and analyzed for velocity with the smoother of the two Manning's n values.

Minimum Pipe Sizes and Depths

Minimum pipe sizes are 24" diameter for mains and 18" diameter for inlet leads. Minimum pipe size for lead lines to sag inlets shall be 24". Minimum depth of storm sewer from outside top of conduit to top of curb/pavement is 24 inches.

Pipe Connections and Curved Alignment

Prefabricated wye (45-degree or 60-degree) connections supplied by the pipe manufacturer are required. Manholes are required at Tee intersections. Pipes with beveled joints or "radius" shall be used when pulled joints exceed manufacturer limits. However, designers should use bends or large radius curves where practical. When field connections or field radii must be used, all joints and gaps must be fully grouted with a collar to prevent voids and cave-ins caused by material washout into the storm drain.

Inlets

Curb inlets shall be 5, 10, 15 or 20 feet in length and shall have depressed openings. Recessed inlets shall be provided on minor arterials and principal arterials as described in Table 3.1.3-1. Proposed inlet lengths greater than 20 feet must be approved by the Town. Care should be taken in laying out inlets to allow for adequate driveway access between the inlet and the far property line.

Due to excessive clogging, grate inlets are not allowed on public storm drain except as specifically approved by the Town.

Streets

To minimize standing water, the minimum street grade shall be 0.50%. Along a curve, this grade shall be measured along the outer gutter line. The minimum grade along a cul-de-sac or eyebrow gutter shall be 0.50%. Alternatively, elbows may be designed with a valley gutter along the normal outer gutter line, with two percent cross slope from curb to the valley gutter. The minimum grade for any valley gutter shall be 0.50%. Where a crest or sag is designed on a residential street, a PVI shall be used instead of a vertical curve where the total gradient change is no more than one percent ($\Delta \leq 1.0\%$).

Flow in Driveways and Intersections

At any intersection, only one street shall be crossed with surface drainage and this street shall be the lower classified street. Where an alley or street intersects a street, inlets shall be placed in the intersecting alley or street whenever the combination of flow down the alley or intersecting street would cause the capacity of the downstream street to be exceeded. Inlets shall be placed upstream from an intersection whenever possible. Surface drainage from a 25-year event may not cross any street classified as a thoroughfare or collector. Not more than 5.0 cfs in a 25-year event may be discharged per driveway at a business, commercial, industrial, manufacturing, or school site. Also, not more than 5.0 cfs may be discharged in a 25-year event from a street intersection with a major collector or arterial. In all cases, the downstream storm drainage system shall be adequate to collect and convey the flow and inlets shall be provided as required.

The cumulative flows from existing driveways shall be considered and inlets provided as necessary where the flow exceeds the specified design capacity of the street.

Storm Drain Outfall Considerations

In the design of outfalls, the engineer should consider discharge flow conditions, conduit size and shape, existing and future site conditions, soil characteristics, and flow conditions of the receiving stream.

The outfall flowline should match the flowline of the receiving stream. Because of height restrictions, it is sometimes necessary to terminate the conduit at the floodplain fringe and have a channel extend to the stream flowline. Outfall velocities should not exceed the following:

Channel Material	Mean channel Velocity (fps)
Fine Sand	2.0
Course Sand	4.0
Fine Gravel	6.0
Clay	6.0
Grass-lined channel (Slope < 5%)	6.0
Concrete	15.0

Velocities which exceed this amount shall be treated with erosion control to a point where the velocity slows to the above values. In addition, outfalls with velocities of 9 to 15 fps shall have engineered energy dissipaters. Outfall velocities exceeding 15 fps shall not be permitted.

Storm Drain Access Points

Manholes shall be located at vertical changes in grade and no greater than 500' apart in storm drain lines less than 6' in diameter or height and no greater than 1,000' apart in larger conduits.

Storm Drain Profiles

All storm drain lines shall be profiled.

Storm Drain Velocity

Storm drain velocities shall not be less than 2.0 fps (assuming uniform open channel flow), nor greater than 15.0 fps under pressure flow.

Section 3.4 – Easements for Closed Conduit Systems

LOCAL CRITERIA SECTION ONLY

Minimum easement requirements for storm sewer pipe shall be as follows:

Table 3.4-1 Closed Conduit Easements

Pipe Size	Minimum Easement Width Required
36" and under	15 Feet
42" through 54"	20 Feet
60" through 66"	25 Feet
72" through 102"	30 Feet

The outside face of the proposed storm drain line shall be placed at least five (5) feet off either edge of the storm drain easement. The proposed centerline of overflow swales shall normally coincide with the centerline of the easement.

Box culverts shall have an easement width equal to the width of the box plus twenty (20) additional feet. The edge of the box should be located at least five (5) feet from either edge of the easement.

Drainage easements will generally extend beyond an outfall headwall to provide for velocity dissipation devices and an area for maintenance operations. Drainage easements along a required outfall channel or ditch shall be provided until the flowline reaches an acceptable outfall.

References

ADOPTED WITH MODIFICATIONS

Texas Department of Transportation, March 2004, Hydraulic Design Manual, Austin, Texas.

CHAPTER 4 – HYDRAULIC DESIGN OF CULVERTS, BRIDGES, OPEN CHANNELS, AND DETENTION STRUCTURES

Section 4.1 – Storm Water Open Channels, Culverts, Bridges, and Detention Structure Design Overview

Section 4.1.1 – Storm Water System Design

ADOPTED

Section 4.1.2 – Key Issues In Storm Water System Design

ADOPTED

Section 4.1.3 – Design Storm Recommendations

ADOPTED WITH MODIFICATIONS

Roadway Culvert Design

100-year storm for fully developed watershed conditions.

Bridge Design

100-year storm for fully developed watershed conditions.

Open Channel Design

100-year storm for fully developed watershed conditions

Energy Dissipation Design

100-year design for fully developed watershed conditions.

Storage (Detention Basin Design)

2-year, 10-year, 25-year and 100-year storm for the critical storm duration (i.e. 3 hour, 6 hour or 24 hour duration) that results in the maximum (or near maximum) peak flow. Analysis should consider both existing watershed plus developed site conditions and fully developed watershed conditions.

Section 4.2 – Culvert Design

Section 4.2.1 – Overview

ADOPTED

Section 4.2.2 – Symbols and Definitions

ADOPTED

Section 4.2.3 – Design Criteria

ADOPTED WITH MODIFICATIONS

Town of Annetta requires a 100-year design storm for fully developed watershed with headwater (HW – upstream WSEL) 1' below the adjacent curb. Only reinforced concrete culvert structures are acceptable.

Section 4.2.4 – Design Procedures

ADOPTED

Section 4.2.4.4 – Nomographs
ADOPTED WITH MODIFICATIONS

Nomographs are not allowed by the Town of Annetta for final sizing of culverts with drainage areas greater than 10 acres. The use of nomographs for culverts with drainage areas greater than 10 acres requires approval of the Town. The reference for nomographs is FHWA HDS-5. A backwater analysis using HEC-RAS is required for culverts with areas greater than 10 acres.

Section 4.2.5 – Culvert Design Example
ADOPTED WITH MODIFICATIONS

This procedure is acceptable for preliminary sizing of all culverts and final sizing of culverts with drainage areas of 10 acres or less unless approved by the Town.

Section 4.2.6 – Design Procedures for Beveled-Edged Inlets
ADOPTED WITH MODIFICATIONS

This procedure is acceptable for preliminary sizing only.

Section 4.2.7 – Flood Routing and Culvert Design
FOR GUIDANCE

Section 4.3 – Bridge Design

Section 4.3.1 – Overview
ADOPTED

Section 4.3.2 – Symbols and Definitions
ADOPTED

Section 4.3.3 – Design Criteria
ADOPTED

Section 4.3.3.2 – Freeboard
ADOPTED WITH MODIFICATIONS

In all cases the minimum allowable freeboard between the low cord on a bridge and the fully developed 100-year water surface elevation is 2'.

Section 4.3.4 – Design Procedures
ADOPTED WITH MODIFICATIONS

Backwater analysis will be required using HEC-RAS for any proposed bridge to determine accurate tailwater elevations, velocities, headlosses, headwater elevations, profiles and floodplains affected by the proposed structure. If the current effective FEMA model is a HEC-2 model, the engineer has the option to either use that model, or convert to HEC-RAS for analysis of proposed conditions.

Section 4.4 – Open Channel Design
ADOPTED WITH MODIFICATIONS

Normal Depth (Uniform Flow) vs. Backwater Profile Depths:

For uniform flow calculations, the theoretical channel dimensions, computed by the slope-area methods outlined in the *ISWM*™ manual, are generally to be used only for an initial dimension in the design of an

improved channel. Exceptions will be for small outfall channels (with the approval of the Town) meeting the following criteria:

1. Drainage area 10 acres or less.
2. Completely contained on the development site ;
3. No nearby downstream restrictions (no significant backwater effects).
4. Flow conditions consistent with uniform flow assumption.

The Town of Annetta requires a HEC-RAS backwater/frontwater analysis on any proposed open channel with a drainage area greater than 10 acres to determine the actual tailwater elevations, channel capacity and freeboard, and impacts on adjacent floodplains. If the current effective FEMA model for the stream is a HEC-2 model, the engineer has the option to either use that model, or convert to HEC-RAS for analysis of proposed conditions.

Supercritical Flow Regime

Supercritical flow will not be allowed except under unusual circumstances, with special approval of the Town. However, for lined channels the analysis should include a mixed-flow regime analysis, to make sure no supercritical flow occurs. Town of Annetta requires that the computed flow depths in designed channels be outside of the range of instability, i.e. depth of flow should be at least 1.1 times critical depth.

Channel Transitions or Energy Dissipation Structures or Small Dams

A HEC-RAS model is a standard requirement for design of channel transitions (upstream and downstream), energy dissipation structures, and small dams. A backwater analysis will be required by the Town, to determine accurate tailwater elevation, headlosses, headwater elevations and floodplains affected by the proposed transition into and out of an improved channel, any on-stream energy dissipating structures, and small dams (less than 6 feet). If the current effective FEMA model for the stream is a HEC-2 model, the engineer has the option to either use that model, or convert to HEC-RAS for analysis of proposed conditions. For larger dams, a hydrologic routing will be required, as well as hydraulic analysis, to determine impacts of the proposed structure on existing floodplains and adjacent properties.

Section 4.4.1 – Overview

ADOPTED

Section 4.4.2 – Symbols and Definitions

ADOPTED

Section 4.4.3 – Design Criteria

ADOPTED

Section 4.4.3.1 – General Criteria

ADOPTED WITH MODIFICATIONS

Earthen Channels

The Town of Annetta encourages the preservation of natural drainageways or use of constructed vegetated or permeable channels designed to create a more natural environment.

1. An earthen channel shall have a trapezoidal shape with side slopes not steeper than a 4:1 ratio and a channel bottom at least six (6) feet in width. Roadway ditches in rural paving sections are allowed to have a "V" ditch".
2. One (1) foot of freeboard must be provided, within drainage easements, above the 100-year fully developed water surface elevation at all locations along channels.

3. The side slopes and bottom of an earthen channel shall be smooth, free of rocks, and contain a minimum of six (6) inches of topsoil. The side slopes and channel bottom shall be re-vegetated with grass or other acceptable vegetative material. No channel shall be accepted by the Town until a uniform (e.g., evenly distributed, without large bare areas) vegetative cover at least 2" in height with a density of 70% has been established.
4. Each reach of a channel requiring vehicular access for maintenance must have a ramp. In general, reaches with maintenance access ramps should be located between bridges or culverts but individual situations may vary. Ramps shall be at least ten (10) feet wide and have 15% maximum grade. Twelve-foot (12') width is required if the ramp is bound by vertical walls.
5. Minimum channel slope is 0.0020 ft/ft unless approved by the Town. Minimum slope for roadway ditches is 0.0050 ft/ft.
6. Erosion protection to be provided at upper limits of improvements and outfall to the receiving stream.
7. All improved earthen channels shall include either "Composite Low Flow" channel or "Trickle" channel. Criteria for each of these channels is as follows:
   a. Low Flow Composite Channels-
      1) Drainage area greater than 300 acres.
      2) Minimum design discharge - 2% of fully developed 100 year peak discharge.
      3) Maximum depth - 5 feet. Maximum side slope 4:1 (H:V).
      4) Minimum bottom width- 8 feet unless approved by the Town.
      5) Lined with riprap or gabions if design velocity exceeds 5 feet/second (also see /SWM™ sections 4.4.3 and 4.4.4).
      6) Some meanders in alignment acceptable as long as width of shelf between top of bank of low flow channel and toe of slope of main channel is not less than 10 feet. Minimum lateral slope of shelf is 1%.
   b. Trickle Channels-
      1) Drainage area less than or equal to 300 acres.
      2) Design discharge - 2% of fully developed 100 year peak discharge.
      3) Concrete or permeable armor such as gabions, mat or interlocking block-lined.
      4) Minimum bottom width- 8 feet unless approved by the Town.
      5) Maximum depth -5 feet. Maximum side slope dependent on type of lining.
8. The following guidelines shall be considered for buffer areas or zones along natural or constructed earthen channels:
   a. A minimum erosion control setback on each side of natural channels based on a 4:1 (H:V) slope from the bottom of the bank to the natural ground adjacent to the bank plus an additional 15 feet. See Figure 4.4.3-1.
   b. Include adjacent delineated wetlands or critical habitats.
   c. Other buffer widths will be considered if supported by specific engineering and environmental studies.
9. Landscaping shall be installed to allow earthen channels to evolve into a more natural environment. Tree or shrub plantings will be required to enhance habitat of channels by providing shade once mature plant growth has been reached. Mature plantings must be considered in setting design Manning's "n" values.

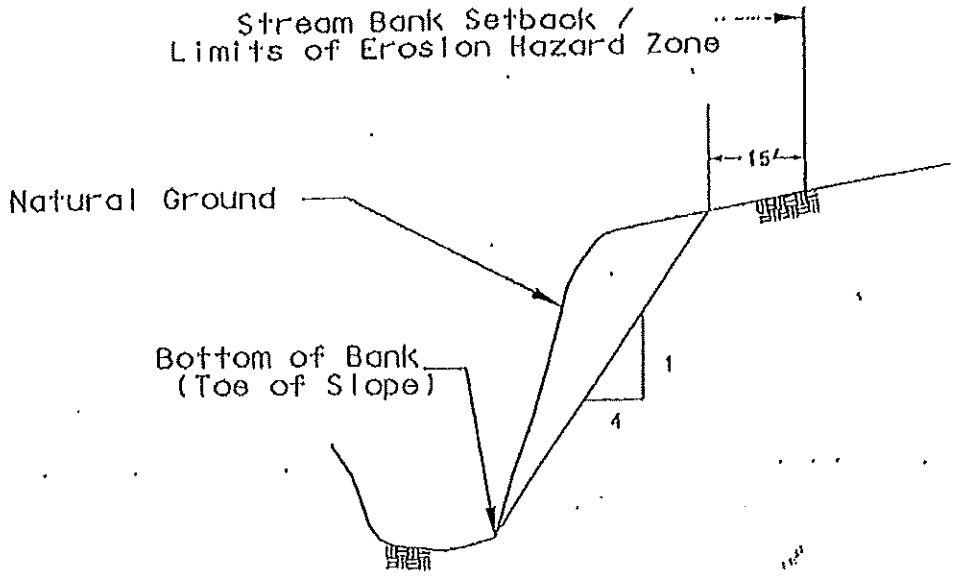


Figure 4.4.3-1 Minimum Erosion Control Setback

Lined Channels

In general, lined channels are discouraged and must have approval of the Town.

1. Channels shall be trapezoidal in shape and lined with reinforced concrete (or flexible lining material as approved by the Town). Side slopes shall generally be no steeper than 2:1 unless approved by the Town as appropriate for the lining material. The lining shall extend to and include the water surface elevation of the 100 year fully developed storm plus one foot freeboard.
2. The channel bottom must be a minimum of 8' in width. (A minimum bottom width of 6 feet for overflow structures of storm sewer system sumps or where access is not a concern).
3. The maximum water flow velocity in a lined channel shall be fifteen (15) feet per second except that the water flow shall not be supercritical in an area from 100' upstream from a bridge to 25' downstream from a bridge. Hydraulic jumps shall not be allowed from the face of a culvert to 50' upstream from that culvert. In general channels having supercritical flow conditions are discouraged (See Section 4.4).
4. Whenever flow changes from supercritical to subcritical channel protection shall be provided to protect from the hydraulic jump that is anticipated (see comment in Item 3).
5. The design of the channel lining shall take into account the super elevation of the water surface around curves and other changes in direction.
6. A chain link fence six (6) feet in height or other fence as approved by the Town may be required on each side of a lined channel.
7. The Town may require a geotechnical study and /or an underground drainage system design option prior to approval of concrete lined channels.

Soil Retention Blankets

Soil Retention Blankets will be required on all earthen side slopes and bottoms, with the exception of bar ditches.
Excellent guidance is provided by the Texas Department of Transportation (TxDOT) concerning synthetic blankets and mats for use as slope protection and flexible channel liners. Annually, these products are tested and a list of acceptable products is published. It is recommended that applications in the project area be limited to those products on TxDOT's approved list. The current list is available at www.dot.state.tx.us/services/maintenance/erosion_control.htm. Most of these systems are proprietary and should be installed per the manufacturer's recommendations.

A soil retention blanket (SRB) is used for short and/or long-term protection of seeded and sodded slopes, ditches, and channels. SRB's can be manufactured out of wood, straw or coconut fiber mat, synthetic mat, paper mat, jute mesh or other material. The SRB shall be one of the following classes and types:

- Class 1. "Slope Protection"
  - Type A. Slopes 4(h):1(v) or flatter – Clay soils
  - Type B. Slopes 4(h):1(v) or flatter – Sandy soils
  - Type C. Slopes steeper than 4(h):1(v) – Clay soils
  - Type D. Slopes steeper than 4(h):1(v) – Sandy soils

- Class 1. "Flexible Channel Liner"
  - Type E. Shear Stress < 2 lbs./sf
  - Type F. Shear Stress < 4 lbs./sf
  - Type G. Shear Stress < 6 lbs./sf
  - Type H. Shear Stress < 8 lbs./sf
  - Type I. Shear Stress < 10 lbs./sf
  - Type J. Shear Stress < 12 lbs./sf

- Mulches 6:1 or flatter slopes
  - Clay or Tight Soils
  - Sandy or Loose Soils

Section 4.4.3.2 – Velocity Limitation

ADOPTED WITH MODIFICATIONS

Channel Velocities

Maximum allowable:

Lined Channels – Maximum velocities = 15 fps. (Exceptions can be granted by the Town, with justifiable, technical reasons)

Grass Lined Channels – Maximum velocities = 6 fps. Higher values can be justified by a sealed geotechnical study/analysis of soil type and conditions.

Section 4.4.4 – Manning's n Values

ADOPTED

Section 4.4.5 – Uniform Flow Calculations

ADOPTED

Section 4.4.6 – Critical Flow Calculations
ADOPTED

Section 4.4.7 –Vegetative Design
ADOPTED

Section 4.4.8 – Stone Riprap Design
ADOPTED

Section 4.4.8.1 – Introduction
ADOPTED WITH MODIFICATIONS

The "Method # 2" procedure in *i*SWM™ for stone riprap design is adopted by the Town of Annetta. Please note that Equation 4.4.16 in the *i*SWM™ Manual is INCORRECT and should be expressed as $T_0' = T_0*(1- (Sin^2\phi/Sin^2\theta))^{1/2}$. □ A properly designed geotextile is required under the bedding layer. Regardless of computed thickness the minimum allowable riprap thickness is 12 inches.

The Town of Annetta may allow grouted stone riprap as an erosion control feature. However, the design thickness of the stone lining will not be reduced by the use of grout. See the U.S. Army Corps of Engineers design manual ETL 1110-2-334 on design and construction of grouted riprap.

Section 4.4.8.2 – Method # 1: Maynard & Reese
FOR GUIDANCE

Section 4.4.8.3 – Method # 2: Gregory
ADOPTED

Section 4.4.8.4 – Culvert Outfall Protection
ADOPTED

Section 4.4.9 – Gabion Design
ADOPTED

Section 4.4.10 – Uniform Flow - Example Problems
ADOPTED

Section 4.4.11 – Gradually Varied Flow
ADOPTED

Section 4.4.12 – Rectangular, Triangular and Trapezoidal Open Channel Design
ADOPTED

Section 4.5 – Storage Design
ADOPTED WITH MODIFICATIONS

Storm water detention is not a standard requirement in Annetta, but shall be provided to mitigate increased peak flows in Annetta waterways in specific circumstances. The purpose of the mitigation is to minimize downstream flooding impacts or streambank erosion from upstream development. In some instances, detention may be shown to exacerbate potential flooding conditions downstream. Therefore,

the "Zone of Influence" criteria (Reference Section 2.1.9.2 of ISWM™) shall be applied in addition to these criteria.

The Owner of any property upon which a Detention Facility is required to be developed, constructed, or used in order to satisfy the Town of Annetta's requirements for drainage, shall be required to indemnify, defend and hold harmless the Town of Annetta, its officers, employees, and agents from any direct or indirect loss, damage, liability, or expense and attorneys' fees for any negligence whatsoever, arising out of the design, construction, operation, maintenance, condition, or use of the "Detention Facility," including any non-performance of the foregoing, in form and substance as required by the Uniform Development Code.

"Dry" Detention Basins

1. Detention Basins shall be required when downstream facilities within the "Zone of Influence" are not adequately sized to convey a design storm based on current Town criteria for hydraulic capacity. Detention basins may not be required if downstream improvements that will result in sufficient hydraulic capacity are proposed by the Town within a relatively short period of time.
2. Calculated proposed storm water discharge from a site shall not exceed the calculated discharges from existing conditions, unless sufficient downstream capacity above existing discharge conditions is available.
3. The Modified Rational Method is allowed for planning and conceptual design for watersheds of 200 acres and less. For final design purposes the Modified Rational Method is allowed only for watersheds of 25 acres and less (see Table 2.1.1-2).
4. Detention Basins draining watersheds over 25 acres shall be designed using a detailed unit hydrograph method acceptable to the Town of Annetta. These include Snyder's Unit Hydrograph (>100 acres) and SCS Dimensionless Unit Hydrograph (any size). The SCS method is also allowed for basins with watersheds less than 25 acres (see Table 2.1.1-2).
5. Detention Basins shall be designed for the 2-year, 10-year, 25-year and 100-year storm for the critical storm duration (i.e. 3-hour, 6-hour, or 24-hour storm duration) that results in the maximum (or near maximum) peak flow.
6. Detention Basins shall be designed with access for tracked earthwork equipment with a 10-foot crown width on any embankment.
7. Earthen (grassed) embankment slopes shall NOT exceed 4:1. Concrete lined or structural embankment can be steeper with the approval of the Town.
8. A calculation summary shall be provided on construction plans. For detailed calculations of unit hydrograph studies, a separate report shall be provided to the Town for review and referenced on the construction plans. Stage-storage-discharge values shall be tabulated and flow calculations for discharge structures shall be shown on the construction plans.
9. An emergency spillway shall be provided at the 100-year maximum storage elevation with sufficient capacity to convey the fully urbanized 100-year storm assuming blockage of the closed conduit portion outlet works with six inches of freeboard. Spillway requirements must also meet all appropriate state and Federal criteria.
10. Design calculations will be provided for all spillways.
11. All detention basins shall be stabilized against significant erosion and include a maintenance plan.
12. State rules and regulations regarding impoundments shall be observed including 30 TAC Chapter 299, Dams and Reservoirs (TCEQ).
13. In accordance with Texas Water Code §11, all surface impoundments not used for domestic or livestock purposes must obtain a water rights permit from the TCEQ. A completed permit for the proposed use, or written documentation stating that a permit is not required, must be obtained. All detention facility designs shall include a landscaping plan.
14. Detention ponds shall maintain a minimum slope of 0.5% on the bottom to avoid silt build up.

"Wet" Detention Basins and Amenity Ponds

Wet detention basins maintain a permanent pool with additional storage capacity to detain storm water. Amenity ponds may or may not include this additional storage. The depth of a wet or amenity pond is generally seven (7) to ten (10) feet to prevent algal growth, although lesser depths are possible with artificial mixing. The objective is to avoid thermal stratification that could result in odor problems or recycling of nutrients. Gentle artificial mixing may be needed in small ponds because they are effectively sheltered from the wind. If properly designed, constructed, and maintained, wet ponds will not only reduce peak storm water flows, but also improve water quality and can be an attractive feature of a development.

Below are guidelines for wet detention basins in addition to those presented under "Dry" Detention Basins.

1. Must be appropriately aerated according to normal pool size unless specifically approved by the Town.
2. Provisions shall be made to ensure that normal water surface elevation is maintained through the use of ground wells or the Town water supply unless surface water supply can be justified based on drainage area to pond. (general requirement is 12 acres of drainage area for every acre-foot of normal pool storage).
3. Ten-foot (10') wide maintenance access shall be provided with a slope of 6:1 or flatter.
4. A debris filter must be provided for all outlet structures.
5. Design shall provide adequate capacity for trapped sediment for five (5) years.
6. To minimize short-circuiting, the inlet and outlet should be placed at opposite ends of the pond or baffling shall be installed to direct the water to the opposite end before returning to the outlet. Dead space should be avoided.
7. To limit water loss by infiltration through the bottom of the pond either an artificial liner or a clay liner may be used. Natural material may be used if a geotechnical report is provided to assure it will not leach out the bottom or sides of the pond.
8. Reference *ISWM™* Section 5.2.21 "Storm Water Ponds" for additional guidance on the design of Wet Ponds. The water quality and streambank protection criteria described in this *ISWM™* section are not currently required by the Town.
9. Detention ponds shall maintain a minimum slope of 0.5% on the bottom to avoid silt build up.

Section 4.5.1 – General Storage Concepts
ADOPTED

Section 4.5.2 – Symbols and Definitions
ADOPTED

Section 4.5.3 – General Storage Design Procedures
ADOPTED

Section 4.5.4 – Preliminary Detention Calculations
ADOPTED

Section 4.6 – Outlet Structures
ADOPTED

Section 4.7 – Energy Dissipation

Section 4.7.1 – Overview
ADOPTED WITH MODIFICATIONS

Channel Transitions, Energy Dissipation Structures, or Small Dams

A backwater analysis is required by the Town of Annetta, using HEC-RAS, to determine accurate tailwater elevation and velocities, headlosses, headwater elevations, velocities and floodplains affected by the proposed transition into and out of 1) An improved channel, 2) Any on-stream energy dissipating structures, and 3) Small dams (less than 6 feet). If the current effective FEMA model for the stream is a HEC-2 model, the engineer has the option to either use that model, or convert to HEC-RAS for analysis of proposed conditions. For larger dams, a hydrologic routing will be required, as well as hydraulic analysis, to determine impacts of the proposed structure on existing floodplains and adjacent properties.

Exceptions may be granted for small outfall channels (with the approval of the Town) with drainage areas of 10 acres or less and no nearby downstream restrictions.

Examples of Open Channel Transition Structures

Details and Specifications and application guidance for Harris County Flood Control District Straight Drop Structure and Bureau of Reclamation Baffled Chute (Basin IX) can be found in the Harris County Flood Control District Policy Criteria & Procedure Manual (See references section for description). A computer program associated with FHWA Hydraulic Engineering Circular No. 14 is "HY8Energy" dated May 2000. This program provides guidance in the selection and sizing of a broad range of energy dissipaters including some of those listed in Chapter 4 of the *i*SWM™ manual.

Section 4.7.2 – Symbols and Definitions
ADOPTED

Section 4.7.3 – Design Guidelines
ADOPTED

Section 4.7.4 – Riprap Aprons
ADOPTED

Section 4.7.5 – Riprap Basins
ADOPTED

Section 4.7.6 – Baffled Outlets
ADOPTED

Section 4.7.7 – Grade Control Structures
ADOPTED

Section 4.8 – Easements for Open Channels and Detention Ponds
LOCAL CRITERIA SECTION ONLY

Drainage Easement Criteria:

1. Drainage easements are required for both on-site and off-site public storm drain channels and ponds. Results of a backwater hydraulic analysis (plus freeboard) will determine easement requirements.

Buffer zones must also be provided for access and to guard against nuisances created from natural erosion processes. Also see Item 6 below.

2. Floodway/Drainage easements shall be provided on-site along FEMA streams with delineated floodways. Floodway easements shall encompass the entire area of the floodway shown on the Effective FEMA Flood Insurance Rate Map.
3. Drainage easements shall include a minimum of ten-foot (10') margin on both sides beyond actual top of bank for improved earthen channels. Retaining walls are not permitted within or adjacent to a drainage easement in order to reduce the easement width.
4. Natural creeks shall have a dedicated drainage easement encompassing the 100-year fully developed floodplain plus ten (10) feet on each side of this floodplain. The minimum finished floor elevation for lots impacted by natural creeks shall be a minimum of two (2) feet above the fully developed 100 year water surface elevation.
5. Concrete Lined Channels and Gabion Lined Channels shall have drainage easements dedicated to meet the requirements of the width of the channel, the one-foot freeboard above the 100 year fully developed water surface elevation, and any access routes. The minimum finished floor elevation for lots adjacent to Concrete Lined and Gabion Lined Channels shall be a minimum of two (2) feet above the fully developed 100 year water surface.
6. All detention and retention structures shall be located within drainage easements. Maintenance shall be provided by the developer/land owner. The Town of Annetta provides maintenance only on regional detention facilities. The limit of the easement shall include all freeboard as stated in Section 4.5 plus any access route around the perimeter of the facility.
7. The entire reach or each section of any drainage facility must be readily accessible to maintenance equipment. Additional easement(s) shall be required at the access point(s) and the access points shall be appropriately designed to restrict access by the public.

References

ADOPTED WITH MODIFICATIONS

Harris County Flood Control District, October 2004, Policy, Criteria and Procedure Manual for Approval and Acceptance of Infrastructure, Houston, Texas.

U.S. Army Corps of Engineers, August, 1992, Design and Construction of Grouted Riprap, ETL 1110-2-334.

U.S. Army Corps of Engineers, July 1991/June 1994, Hydraulic Design of Flood Control Channels, EM 1110-2-1601.

U.S. Department of the Interior Bureau of Reclamation , Hydraulic Design of Stilling Basins and Energy Dissipaters, January 1978, Engineering Monograph No. 25.

CHAPTER 5 - STORM WATER CONTROLS
FOR GUIDANCE ONLY

Chapter 5 of the *i*SWM™ Manual contains an exhaustive discussion and detailed examples of storm water controls that can be implemented in land development to meet the goals of protecting water quality, minimizing streambank erosion, and reducing flood volumes. It is an excellent planning and design resource document and has valuable design examples that the Town of Annetta encourages local developers to consider in their site planning. Although it is primarily oriented toward water quality issues, these storm water controls bring additional and valuable benefits for flood control and streambank protection. Many of the listed storm water control features and techniques enhance the aesthetics and value of land developments, as well as providing a drainage function.

Since the Town of Annetta is currently emphasizing the streambank protection and flood control components of the *integrated* storm water management approach, Chapter 5 of the *i*SWM™ Manual is being adopted for design guidance, technical reference, and applicable features that can be implemented in local developments and redevelopments. The Town of Annetta does not mandate the use of any of these storm water controls, but recognizes the inherent values of their application in overall storm water management.

Therefore the Town of Annetta adopts for design guidance and technical reference ONLY all sections of Chapter 5.

/SWM™ APPENDICES

Appendix A — Rainfall Tables for North Central Texas
Adopted

Appendix B — Hydrologic Soils Data
Adopted

Appendix C — Federal, State and Regional Regulations and Programs
Adopted

Appendix D — Dams and Reservoirs in Texas
Adopted

Appendix E — /SWM™ Worksheets and Checklists
Adopted

Appendix F — Landscaping and Aesthetics Guidance
Adopted

Appendix G — Storm Water Computer Models
Adopted with Modifications

In addition to Storm Water Computer Models listed in Appendix G of the /SWM™ Manual, the Town of Annetta accepts appropriately applied versions of the following computer models.

1. STORMCAD by Haestad Methods and GeoPac by Bentley for analysis and design of storm sewer.
2. Gabion Design Programs by Maccaferri:
   a. Macra 1 for Channel Design
   b. GawacWIN for Retaining Wall Design
3. SWFHYD (formerly NUDALLAS) by Fort Worth District, U.S. Army Corps of Engineers for hydrologic routing studies (use only where model currently exists).
4. AdICPR (Advanced Interconnected Pond Routing) by Streamline Technologies, Inc. for complex hydrograph routing particularly detention ponds in series.
5. InfoWorks by Wallingford for complex dynamic hydrologic and hydraulic modeling.

Appendix H — Storm Water Control Design Examples
Adopted

ENGINEERING DESIGN MANUAL

PART IV – WATER & WASTEWATER LINES

All submittals to any regulatory agency regarding the Town of Annetta public water or wastewater system or any potential connection to the Town of Annetta water or wastewater connection requires **PRIOR** review and written approval for submission.

PART IV - WATER AND WASTEWATER

I WATER MAINS

1.01 GENERAL

Water mains shall be placed on the north and east sides of a street, in accordance with the utility assignments in Appendix A. Where applicable, line sizes shall comply with the Town's Water Master Plan or subsequent revisions.

a. Water lines in the Town of Annetta are categorized as:

   1. Distribution Lines – sizes 6-inch and less. No distribution line shall be less than 4".

   2. Transmission Mains – sizes shall be 8 inches or greater.

b. Mains shall be minimum 8-inch diameter pipe. For mains in commercial and manufacturing districts, a minimum of 12-inch diameter pipe will be required if the main is over 600 feet in length. Pipe sizes may be changed as a result of system modeling responses.

c. Dead end lines are not allowed. Only with written approval, may a fire hydrant or flush station be installed.

d. Fire hydrant lead lines shall be 6-inch diameter pipe, no greater than 50 feet in length. Any fire hydrant lead line over 20 feet shall be 8-inch diameter pipe.

e. Water lines 12-inches and greater shall be profiled. P.I.s shall be stationed and elevations to 0.01 feet provided for all water lines.

1.02 WATER LINE MATERIAL

a. Water mains 24-in diameter and smaller shall be AWWA C900 most recent version Class 235 (SDR 18) PVC, mechanical joint, or a bell and spigot joint. A recession in the bell shall have a single rubber gasket. Ductile iron fittings with polywrap shall be used.

b. Water mains greater than 24 inches in diameter and larger shall be one of the following:

   1. Reinforced Concrete, Pretensioned Cylinder Pipe (RCCP), complying with AWWA C303 (Pressure Class 150 or greater). RCCP pipe shall be provided with Cathodic protection. The Cathodic Protection System shall be designed by a Texas licensed professional engineer.

   2. Ductile Iron Pipe, (DIP) complying with AWWA C151, with bituminous coating outside and mortar-lining inside in accordance with AWWA C104. Mechanical or push-on joints shall be used and shall conform to ASTM C111. The minimum Pressure Class shall be 150 psi. All pipe and fittings shall be encased in polyethylene in conformance with ASTM C105.

c. Water lines shall be minimum pressure Class 150.

d. All water mains outside utility easements which supply fire sprinkler systems shall be minimum 200 PSI working pressure and U.L. listed.

e. Water mains shall be standard sizes that are readily available, such as 8-inch, 12-inch, 16-inch, 18-inch, 20-inch, 24-inch, 30-inch, and 36-inch.

1.03 LOCATION

Water mains shall be constructed with extensions to the development boundary to allow for direct connection by future developments. Water mains shall be located in accordance with Utility Location Requirements for the Town of Annetta. See Appendix "A".

1.04 WATER VALVES

Valves 16-inches and smaller shall be placed on or near street property lines and shall be spaced at a maximum of 800 feet apart in residential and 500 feet in all other districts. Valves shall be placed in such a manner as to require two valves to shut down each Town block, or as may be required to prevent shutting off more than one fire hydrant. On cross-feed mains without services, a maximum of four valves shall be used to shut down each block. Also, valves shall be placed at or near the ends of mains in such manner that a shut-down can be made for a future main extension without causing loss of service on the existing main. If valves cannot be located for a shut-down, restrained joints shall be used. The location of valves larger than 16-inches will be as approved by the Town Engineer. Valves 16-inches and under shall be Resilient Seat Gate Valves (RSGV). All valves will be gate valves. Valves are to be placed within the same corner of intersection, as applicable.

1.05 FIRE HYDRANTS

a. Number and Locations

A sufficient number of fire hydrants shall be installed to provide hose stream protection for every point on the exterior wall of the building. There shall be sufficient hydrants to concentrate the required fire flow, as recommended by the publication "GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOW" published by the Insurance Service Office, around any building with an adequate flow available from the water system to meet this required flow. Fire hydrant markers shall be provided at each hydrant. In addition, the following guidelines shall be met or exceeded:

1. SINGLE FAMILY AND DUPLEX RESIDENTIAL - As the property is developed, fire hydrants shall be located at all intersecting streets and at intermediate locations between intersections at a maximum spacing of 500 feet between fire hydrants as measured along the route that fire hose is laid by a fire vehicle. All buildings shall be within a 500-foot radius of a fire hydrant.

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

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

4. PROTECTED PROPERTIES - Fire hydrants required providing a supplemental water supply for automatic fire protection systems shall be within 100 feet of the fire department connection for such system.

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

   (a) Non-Residential Property or Use

      (1). within 150 feet of the main entrance.

      (2). within 100 feet of any fire department connection.

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

   (b) Apartment, Townhouse, or Cluster Residential Property or Use

      (1). within 100 feet of any fire department connection.

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

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

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

8. Along divided arteries fire hydrants shall be installed on both sides of the roadway so as to preclude the need for laying hose across the roadway.

b. Restrictions

1. All required fire hydrants shall be as required by the North Central Texas Council of Governments Specifications, Fourth Edition and Addenda and shall be placed on water mains of no less than six (6") inches in size. Fire hydrants shall be manufactured by one of the following companies, American Darling, Mueller Company, M&H, or approved equal.

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

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

4. Fire hydrants shall be located a minimum of two (2') feet and a maximum of six (6') feet behind the curb line, depending on the location of the sidewalk. The fire hydrant shall not be in the sidewalk.

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

6. All required fire hydrants shall be installed so that the steamer connection will face the fire lane or street, or as directed by the Town.

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

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

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

10. Fire hydrant bonnet shall be painted red according to Standard Details.

1.06 FIRE LINE METERING

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

1.07 MINIMUM COVER

The minimum cover to the top of the pipe must vary with the valve stem. In general, the minimum cover below the street grade should be as follows: 12-inch and smaller, 3.0 feet. Lines larger than 12-inches shall have 5.0 to 6.0 feet of cover. Water lines with more than 6.0 feet of cover shall be approved by the Town. For water lines to be constructed along county-type roads, which are commonly built with a high crown about the surrounding property, increase the cover as required to allow for future paving grade changes.

Plumbing of any yard piping and transmission lines that cross under concrete, paving, asphalt, etc. shall be sleeved in at least 4" larger schedule 40 pipe or greater and extend at least 2' outside curb line.

1.08 DISINFECTION

The contractor shall disinfect the new water mains in accordance with the most recent AWWA Standard C-651 and then flush and sample the lines before being placed into service. Samples shall be collected for microbiological analysis to check the effectiveness of the disinfection procedure which shall be repeated if contamination persists. A minimum of one sample for each 1,000 feet of completed water line will be required or at the next available sampling point beyond 1,000 feet as designated by the design engineer, in accordance with 30 TAC §290.44(f)(3). Water system extensions shall be sampled every 500ft, if over 500ft then another sample will be required.

1.09 TCEQ REGULATIONS FOR WATER LINES

This water distribution system must be constructed in accordance with the current Texas Commission on Environmental Quality (TCEQ) Rules and Regulations for Public Water Systems 30 Texas Administrative Code (TAC) Chapter 290 Subchapter D. When conflicts are noted with local standards, the more stringent requirement shall be applied. Construction for public water systems must always, at a minimum, meet TCEQ's "Rules and Regulations for Public Water Systems.

All newly installed pipes and related products must conform to American National Standards Institute (ANSI)/NSF International Standard 61 and must be certified by an organization accredited by ANSI, as required by 30 TAC §290.44(a)(1).

Plastic pipe for use in public water systems must bear the NSF International Seal of Approval (NSF-pw) and have an ASTM design pressure rating of at least 150 psi or a standard dimension ratio of 26 or less, as required by 30 TAC §290.44(a)(2).

Pursuant to 30 TAC §290.44(a)(5), the hydrostatic leakage rate shall not exceed the amount allowed or recommended by the most current AWWA formulas for PVC pipe, cast iron and ductile iron pipe. Include the formulas in the notes on the plans.

The hydrostatic leakage rate for polyvinyl chloride (PVC) pipe and appurtenances shall not exceed the amount allowed or recommended by formulas in America Water Works Association (AWWA) C-605 as required in 30 TAC §290.44(a)(5). Please ensure that the formula for this calculation is correct and most current formula is in use.

$$Q=LD\sqrt{P}148{,}000$$

Where:
Q = the quantity of makeup water in gallons per hour,
L = the length of the pipe section being tested, in feet,
D = the nominal diameter of the pipe in inches, and P = the average test pressure during the hydrostatic test in pounds per square inch (psi).

The hydrostatic leakage rate for ductile iron (DI) pipe and appurtenances shall not exceed the amount allowed or recommended by formulas in America Water Works Association (AWWA) C-600 as required in 30 TAC §290.44(a)(5). Please ensure that the formula for this calculation is correct and most current formula is in use.

$$L=SD\sqrt{P}148{,}000$$

Where:
L = the quantity of makeup water in gallons per hour,
S = the length of the pipe section being tested, in feet,
D = the nominal diameter of the pipe in inches, and
P = the average test pressure during the hydrostatic test in pounds per square inch (psi).

The maximum allowable lead content of pipes, pipe fittings, plumbing fittings, and fixtures to 0.25 percent.

1.10 CLEARANCES BETWEEN WATER AND WASTEWATER LINES:

The contractor shall maintain a minimum separation distance in all directions of nine feet between the proposed waterline and wastewater collection facilities including manholes and septic tank drain fields. If this distance cannot be maintained, the contractor must immediately notify the project engineer for further direction. Separation distances, installation methods, and materials utilized must meet 30 TAC §290.44(e)(1-4) of the current rules.

Pursuant to 30 TAC §290.44(e)(5), the separation distance from a potable waterline to a wastewater main or lateral manhole or cleanout shall be a minimum of nine feet. Where the nine-foot separation distance cannot be achieved, the potable waterline shall be encased in a joint of at least 150 psi pressure class pipe at least 18 feet long and two nominal sizes larger than the new conveyance. The space around the carrier pipe shall be supported at five-foot intervals with spacers or be filled to the springline with washed sand. The encasement pipe shall be centered on the crossing and both ends sealed with cement grout or manufactured sealant.

1.11 METER, METER BOX AND SERVICE

A service with a meter box is constructed from the main to a point just behind the curb line, usually in advance of paving. The location of the meter box is as shown on the Utility Assignments detail sheets and as shown on the Town of Annetta Details. On multiple apartments and business properties, the desired size and location is usually specified by the owners.

The Town utilizes Zenner meters equipped for automated meter reading (AMR). Necessary appurtenances may be required such as automated metering infrastructure (AMI) relay units and telemetry services to fully incorporate any new meter (S) into the AMI.

Minimum requirements for water service sizes are:

a. Either 5/8 x 3/4" or one-inch single water services are required to serve all single-family residential lots. Combination meters with service connections to two residences are not allowed.
b. Residential service connections shall be 3/4-in OR 1-in Poly service connections. No copper lines are to be used for residential service.
c. Top of meter box shall be 3-4" above final grade to account for new sod, grass and accessibility.
d. Meter box size and Orientation: Please see Appendix D for meter drawings, depths and orientations.
e. A customer cut-off valve is required on the customer's side and adjacent to the water meter vault.
f. If a PRV is required or desired, the PRV shall be placed on the customer's side of the meter and shall be the full responsibility of the homeowner for care, maintenance, testing, etc.

1.12 SERVICE CONNECTIONS

a. Service connections shall not be allowed to fire hydrant leads.

b. Service connections shall not be allowed to transmission mains.

c. Service connections shall be PVC. See Appendix D, Page W-6, Water Standard Details.

II. WASTEWATER

2.01 MINIMUM SIZE

The minimum size of wastewater mains in the Town of Annetta shall be 8-inch. 6-inch lines may be used to connect to existing 6-inch mains only when approved by the Town. Line sizes shall convey peak flows as shown on the Town's Wastewater Master Plan or subsequent revisions. All wastewater lines shall be one of the following standard sizes such as 8-inch, 10-inch, 12-inch, 15-inch, 18-inch, 21-inch, 24-inch, 30-inch, and 36-inch.

2.02 LOCATION

Wastewater mains shall be placed on the south and west sides of a street, in accordance with the utility assignments in Appendix A. Where applicable, line sizes shall comply with the Town's Wastewater Master Plan or subsequent revisions.

For Planned Developments, ALL necessary sanitary sewer services must be constructed up to the right-of-way. In areas outside of Planned Developments, sanitary sewer stub outs must be provided to allow future developments to connect their services.

2.03 MINIMUM COVER

Minimum cover over all wastewater mains shall be 4.0 feet unless approved by the Town. Approved mains with less than 3.5 feet of cover shall be capped as per the "Cap Detail" on the Wastewater Standard Details. See Town Standard Details.

2.04 WASTEWATER FLOWS, SIZE AND GRADES

Wastewater lines shall be designed to convey flows from all upstream areas based on ultimate development of the sewershed. Wastewater main sizes shall be obtained from the Town's Wastewater Master Plan. Subbasin flow shall be computed in accordance with the following formula:

$$Q = \frac{C^{0.89}}{295}$$

Where:

Q = Peak wastewater flow (million gallons per day)
C = Equivalent single-family connections

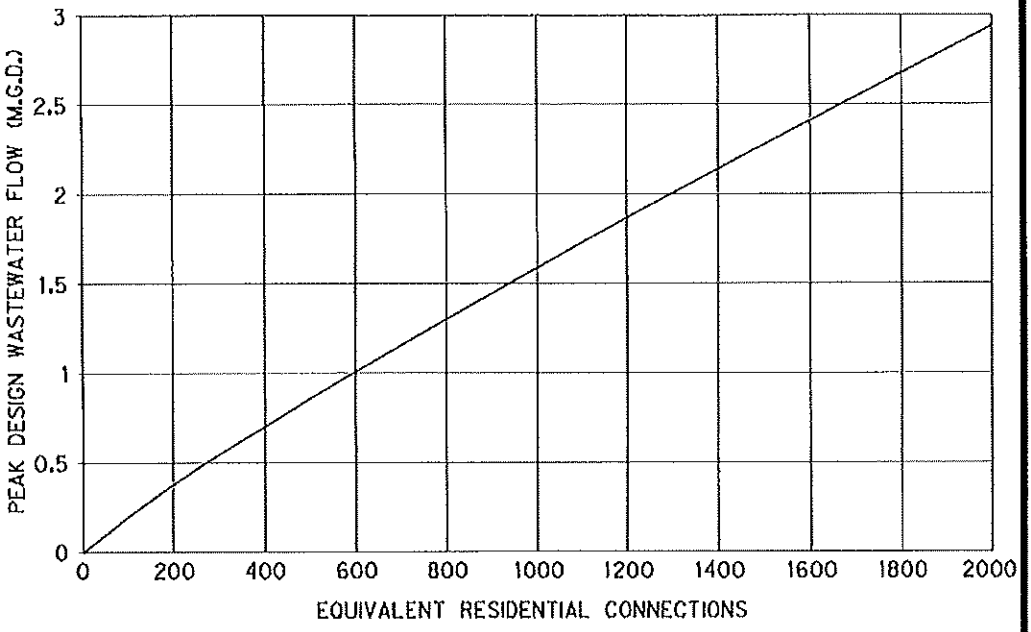
This equation is graphically displayed in Figure IV-1. Equivalent single-family connections are based on a density of 3.1 persons per dwelling unit. Densities for other residential uses shall be determined by the Town. Wastewater flow for non-residential uses shall be evaluated by the design engineer and submitted to the Town for approval.

Pipes should be placed on such a grade that the velocity when flowing full is not less than two feet or more than ten feet per second. Minimum grades shall be as follows:

6" - 0.50%	8" - 0.33%	10" - 0.25%	12 - 0.20%
15" - 0.14%	18" - 0.12%		

All grades shall be shown to the nearest 0.01 foot with point of intersection, stationing. A manhole is required at all pipe slope changes. No vertical curves will be allowed in wastewater lines. Horizontal curves (meeting pipe manufacturer recommendations) to match changes in street direction will be allowed as approved by the Town.

FIGURE IV-1
PEAK WASTEWATER FLOW RATES



2.05 MANHOLES

a. The sizes shall be as designated on the Wastewater Standard Details. In general, manholes shall be placed at all four-way connections and three-way connections. The diameter of a manhole constructed over the center of a sewer should vary with the size of the wastewater line. In floodplains, curbed (collared) and sealed manhole covers shall be used. Drop manholes shall be required when the inflow elevation exceeds the outflow elevation by more than 24 inches. All manholes shall have a minimum 30-inch rim opening.

Table IV-1 Minimum Manhole Sizes
MINIMUM MANHOLE SIZES

Largest Main Size	Manhole Diameter
8"	4' 0"
12" – 24"	5' 0"
Greater than 24"	6' 0"

Manholes more than 8 feet deep shall be a minimum of 5-foot diameter.

Manholes shall be provided at all points of directional change (vertical and horizontal), "tees", and change in pipe size. Maximum spacing between manholes 21" and under shall be 500 feet. Maximum spacing for manholes larger than 21" shall be 800 feet.

Manholes and cover shall be end 4-5" above grade.

b. Lift station is required when slopes and fall within manhole does not allow for minimum slope and/or fall. Design standards for lift stations shall include SCADA.

2.06 LATERALS

For single family dwellings, the lateral size shall be 4" minimum; for multiple units, apartments, local retail and commercial - 6" minimum; for manufacturing and industrial, the size should be determined by the Engineer. House laterals shall be located 10 feet downstream from the center of the lot and shall have a 10-foot lateral separation from the water service. Manholes will be required on 6-inch and larger laterals where they connect to the main line. Laterals will not be connected to sewer mains that are deeper than 12 feet. A minimum of one lateral per building shall be required. Also, a minimum of one lateral per residential lot shall be required. Duplexes shall have a lateral to each unit.

A cleanout shall be installed in each lateral and located at the right-of-way or easement line. Sewer cleanouts shall be 4-5" above final grade.

2.07 WASTEWATER LINE MATERIALS

a. All wastewater lines up to 15-inch diameter shall be PVC SDR 35 for depths less than 14 feet and SDR 26 for deeper installation. Allowable pipe types for larger mains shall be as shown on the Wastewater Details.

b. For wastewater lines crossing creeks with a minimum cover of 5 feet or less to the creek flowline, wastewater lines shall be PVC with concrete encasement per the Wastewater Details.

III. UTILITY EASEMENTS

3.01 Requirements

All public utilities shall be in a utility easement (UE). UEs shall be granted on plats or by separate instrument if the property is not platted.

No building, wall, or pool shall be located or constructed within a UE. Only the following facilities may be allowed in a UE with written approval of the Town.

a. A fence (removable, rolling type approved in writing by Town) may be placed in a UE;

b. Facilities transverse to the easement such as roads, streets and private utilities; and/or

c. Parking lots and driveways subject to written approval of the Town.

UEs shall be shown, labeled and described by metes and bounds on the plat or when provided by separate instrument.

UEs shall have the following minimum widths unless approved in writing by the Town Public Works Director.

a. No UE shall be less than 15' width.

b. UEs with a water and wastewater lines shall have a minimum width of 25'.

c. When there are more than two utility lines or a line is greater than 12" diameter, then the width of the UE will be determined by the Town. Typical easement width with a single line are: 16" to 20" diameter 20' easement; 24" to 27" 25' easement; and 30" and greater 30' easement.

3.02 LANDSCAPING IN UTILITY EASEMENTS

Landscaping in utility easements shall be limited to grass. Trees are not permitted in utility easements.

The Town of Annetta will not repair any damages from necessary utility maintenance and repair due to unauthorized utility easement landscaping, fencing, or other facilities.

IV. WATER TREATMENT PLANT

All submittals to any regulatory agency regarding the Town of Annetta public water or wastewater system or any potential connection to the Town of Annetta water or wastewater connection requires PRIOR review and written approval for submission.

The water plant shall not be located within a 100-year flood plain. Site topography shall direct all incoming and on-site rainfall runoff away from the water treatment plant as a whole. Appropriate use of drainage swales, sidewalks and driveways, culverts, storm sewers, or a combination thereof for internal site drainage are required. All unsurfaced areas on the site and access strip shall be seeded and fertilized or hydro mulched.

Plumbing of any yard piping and transmission lines that cross under concrete, paving, asphalt, etc. shall be sleeved in at least 4" larger schedule 40 pipe or greater and extend at least 2' outside curb line.

4.01 GROUNDWATER WELL MINIMUM DESIGN REQUIREMENTS

The Town of Annetta requires all procedures, materials, methods utilized and final well completion to conform to AWWA A100-97 for Water Wells, and shall comply with 30 TAC § 290.38-290.49, *Rules and Regulations for Public Water Supply Systems,* and 30 TAC § 338, *Water Well Drillers,* and Chapter 33 of the Texas Water Code, *Water Well Pump Installers.*

All water well drillers for the Town of Annetta or any of its developments shall be licensed in the State of Texas under 30 TAC § 340. The well driller shall have completed at least five successful sand free potable water supply wells of similar type, depth, and capacity as the well proposed.

All Town of Annetta groundwater production wells for potable use and proposed for connection to the Town of Annetta public water system shall be carbon steel, and shall meet one or more of the following standards: AWWA C200, ASTM A53, ASTM A139, API Specification 5L, API Specification 5CT, API Specification 5B, ASTM A120, ASTM A211, ASTM A714, ASTM D1784, ASTM D2837, ASTM F480, NSF14, or NSF61. Mill certificates for all steel pipe used in the production well shall be furnished and be available at the drill site for inspection prior to running such materials. All slotted pipe shall be new stainless steel pipe of the same dimensions and specifications as the casing. The pipe shall be rod based wire wrapped. Welding of the steel well casing shall be done in accordance with the American Welding Society Specifications and the American Petroleum Institute Specifications. Welding stainless steel casing to mild steel casing will not be permitted.

The well casing shall be pressure-cemented in place from bottom to top in accordance with 30 TAC Chapter 290.41(c)(3)(C). The driller shall utilize a pressure cementation method in accordance with the AWWA Standard for Water Wells (A100 06), Appendix C: Section C.2 (Positive Displacement Exterior Method); Section C.3 (Interior Method Without Plug); Section C.4 (Positive Placement, Interior Method, Drillable Plug); and Section C.5 (Placement Through Float Shoe Attached to Bottom of Casing) involving pumping grout, through a tremie pipe set inside the annulus, from the top of the bentonite plug up the outside of the casing to the surface, or an approved similar positive-displacement method. The cement used shall be Portland Class A cement with no more than 6 percent, by weight, bentonite and not more than 2 percent, by weight, calcium chloride added, or approved equal. The cement and bentonite shall be mixed with no more than 6.0 gallons of water per 94 pound sack of cement and have a slurry weight of approximately 14.7 lb/gal (110 lb/ft^3). The volume of cement stocked on location shall be enough to fill the annular space, plus at least 25 percent in excess.

Each well shall include a pump, motor, and associated equipment, following all instructions and directions supplied by the equipment manufacturers and in accordance with requirements of the Texas Water Well Driller's Board. Each well shall have a stainless steel safety cable of suitable

strength to the pump in order to provide ease of pump removal for the entire length of the well, if necessary.

In addition to the requirements above, a water well that is granted a variance from the Town's spacing requirements must meet the following requirements:

(a) The well shall be completed with a casing of PVCASTM F480 or Carbon Steel and must be designed based on a potential for hydraulic collapse considering external and internal pressures. The casing pipe, screens, discharge piping, pump, and all appurtenances that will be in contact with water shall be NSF-61 certified. The PVC shall comply with ANSI/NSF Standard 14, and the steel casing shall comply with either New ASTM A-53 Grade A or better or have a minimum weight and thickness of American National Standards Institute (ANSI) Schedule 10 to prevent caving of the formations penetrated and also to ensure protection of the liquid from contamination. The well shall be cased from the bottom of the drilled hole to twenty-four (24) inches above the finish grade or more if required to keep surface contamination from entering the casing. The well casing shall be cemented in place and sealed to protect the underground water formation from potential contamination resulting from surface or subsurface sources of potential contamination. The annular space shall be three (3) inches larger than the outside diameter of the casing and shall be tremie pressure sealed with concrete or grout from the ground surface to the top of the groundwater producing formation;

(b) For stability, the casing shall be covered at the ground with a concrete slab no less than 48"x48"x4". The top of the slab shall protrude six (6) inches above finish grade and shall be sloped away from the casing. The top of the casing shall be provided with a suitable well seal to prevent contamination of the well. If a vent is provided on the casing, it shall be equipped with an elbow turned downward and screened with a 16-mesh screen;

(c) Install a 0.75 inch outside diameter (O.D.) measuring or sounding tube to allow for access of an electric water-level measuring device. The sounding tube shall consist of PVC pipe, and shall be set alongside the pump column. The bottom of the tube shall be left open. The tube shall be set from approximately 10 feet above the pump to the top of the well casing and shall be accessible through the discharge head. The sounding tube shall be affixed to the pump column pipe with 10 mil tape or other non-corrosive straps and clamps."

Additional Requirements for Public Water Wells

Each well shall have a gooseneck style casing vent with a 16-mesh screen at the inlet and pressure tubing and gauge to determine water levels within the well's operating areas.

Each well shall have a stainless-steel submersible pump manufactured by Grundfos® Pump Company or approved equal. The pump shall be appropriately sized to operate at the selected optimum capacity capable with at least 75 percent efficiency. The motor shall be submersible and shall operate 3-phase as manufactured by Franklin Electric, or an approved equal.

Each well shall have a concrete sealing block extending at least three feet from the well casing in all directions, with a minimum thickness of one-half (½) foot, and sloped away from the well casing a minimum of one-quarter (¼) inch per foot.

Each well shall have an AMI ready master meter conforming to the most recent AWWA C-702.

Each well shall have a geophysical log (including, but not limited to spontaneous potential, gamma-ray, short normal resistivity, and lateral resistivity) of the pilot hole. The log shall be run for the entire pilot hole to total depth.

Each well shall have a wellhead assembly that shall be heavy duty cast iron or fabricated steel, for supporting the pump, motor, and column pipe. The wellhead shall be properly sealed by a

gasket or sealing compound and properly vented to prevent the possibility of contaminating the well water. Vents open to the atmosphere shall be equipped with turned-down screen vents with openings located at least 12 inches above the top of the well casing, and covered with 16-mesh or finer, corrosion-resistant screening material or an acceptable equivalent. The discharge head shall rest on the top of the casing, at least 18 inches above the sealing slab and at least two feet higher than the 100-year floodplain elevation. The discharge elbow shall have a class 150 ANSI raised face flange of the same diameter as the column pipe and a ¼-inch NPT connection with a pressure gauge. The pressure gauge shall be seated with a suitable gauge guard or gauge diaphragm. In addition, the discharge head shall have threaded connections for an electrical terminal box and an airline assembly, and a threaded opening for the measuring tube specified in Item No. 4. A sample cock shall be provided.

4.02 GROUND STORAGE TANK MINIMUM DESIGN REQUIREMENTS

Contractor shall install an AWWA D-103 (most recent) new standard bolted steel tank with a height of approximately ___ feet.
Design Requirements:

a. Tank Inlets: Minimum inlet size to be 4". One located interior to the tank along the side wall of the tank and at least 45 degrees from a tank outlet. Direct flow with a 45-degree bend away from the nearest outlet with a flared internal end. Inlet needs to be internally plumbed so that an air gap separates the highest water level from the inlet flared end.

b. Tank Outlets: Outlet to be sized to a minimum of 8 in One per tank located at least 45 degrees from a tank inlet. The outlet for booster pump suction shall be fitted with an internal 90-degree fitting turned downward with flared end. Diameter shall be equal to or larger than the suction line. Outlets shall have a minimum 12-inch clearance from the tank bottom.

c. Overflow: Provide an external overflow pipe, minimum of 6". The overflow assembly shall be sized to handle the maximum tank influent rate. The overflow pipe discharge shall terminate above ground, not be subject to submergence, and be fitted with a weighted hinged flap valve. There shall be no more than a 1/16-inch gap between the pipe and flap. Top of overflow weir shall be a minimum of one foot below bottom of any roof rafter with a 90-degree flare. Provide a concrete splash block. Can be combined with the tanks drain valve.

d. Liquid level indicator: The indicator shall be a float or moving target, an ultrasonic level indicator or a pressure gauge calibrated in feet of water. Pressure gauges must be no less than 3 inches in diameter and calibrated at not more than two-foot intervals.

e. Tank Drain: Minimum of 6" with gate valve, located a minimum practical distance above the tank floor to flow line of drain. The drain may be connected to the overflow discharge pipe outside the tank with a concrete splash block.

f. Roof Vents: At least one vent located at or near the center of the roof at the highest point possible. Size vents for maximum influent and effluent rates. Vents are to be double gooseneck type or a mushroom type with a 3" overlap with openings protected by 316 stainless steel, 16-mesh.

g. Roof Hatch: Primary roof hatch shall have a minimum size of 30-inch diameter with 4-inch curb and shall have a cover with a 2-inch downward overlap and provisions for locking. Primary location shall be offset from the exterior tank ladder centerline and located over the interior ladder.

h. Tank Roof: Slope tank roof 0.75 inches per foot. Provide 3 access ports for SCADA control equipment and other controls.

i. Ladders: Provide an exterior steel ladder extending the full height of the tank that meets OSHA requirements. Provide exterior ladders with a halo type safety cage. Interior ladders shall be provided and offset from external ladder by at least 2 feet.

j. Roof Guard Rails: Provide guard rails along the roof edge for a distance of 10 feet either side of the exterior ladder and 5 feet either side of any perimeter tank appurtenance.

k. Manholes: Provide two flush type clean outs. The primary access manway in the lower ring of the tank shall not be less than 30 inches in diameter. A second manhole shall have

a minimum of 24 inches wide by 48 inches high and located approximately 180 degrees apart. A gasket shall be used to make a positive seal when the access manway is closed.

l. Sample Cock: Provide one sample cock. Sample cock and pressure gauge assembly shall have a ball valve (AWWA/NSF certified- and be lead free brass or stainless, no galvanized iron materials to be used) and calibrated in feet of water located 3 feet above tank bottom also to match the tanks capacity height. The valve should be located between the tanks flanged connection and the sample/gauge assembly.

m. Foundation: The foundation shall be scarified and compacted to minimum 95% density (Proctor test required and be submitted to TOA staff prior to any further construction of tank foundation). At a minimum, the foundation shall include support concrete ring wall of minimum 12-inches wide. the top of the foundation shall be at least 12-inches above finished grade and minimum two (2) feet below grade. A geotechnical assessment may be required given specific site conditions and tank size. Larger tanks may require a full concrete foundation. Concrete shall be minimum 4,000 psi. The tank bottom shall rest on a minimum 6-inches clean sand, free from clay, lumps, shale, loam, organic matter, and other deleterious materials. Slope the tank bottom at least 1 inch in 10 feet from the tank center to the outside edge.

n. Coatings: All tank accessories that are not galvanized shall be coated in conformance with the most recent ANSI/NSF 61-G. The tank and all appurtenances shall be tan in color to the match Town of Annetta water system.

o. Locate ground storage tanks a minimum of 20 feet from any site boundary, public street right-of-way, utility easement, or power company aerial easement. Locate ground storage tanks a minimum of 20 feet from plant structures and equipment. Provide at least 10 feet of clearance between ground storage tanks and centerline of plant piping, except where segments of piping are routed directly to the tank. The tank may not be located within 500 feet of sewerage treatment plant or disposal area.

p. Disinfect the tank in strict accordance AWWA Standard C652 most recent.

q. Dechlorination of disinfecting water shall be in strict accordance with current AWWA Standard C655 most recent. Discharge of heavily chlorinated water is prohibited.

4.03 SPECIFICATIONS FOR HYDROPNEUMATIC TANK

Contractor shall install a hydropneumatic tank. The tank shall ride on the system; main flow to the distribution system should not pass through the tank. The tank shall be new and not used for any other prior use. No more than three hydropneumatic tanks shall be installed on any one site.

Design Requirements:

a. The tank shall be designed as a minimum of over 20 gallons per connection.

b. Foundation: The foundation shall be scarified and compacted to minimum 95% density (Proctor test required). The PT pad shall be a full concrete foundation with concrete piers designed for PT saddle width. Concrete shall be minimum 4,000 psi. The pad bottom shall rest on a minimum 6-inches clean sand, free from clay, lumps, shale, loam, organic matter, and other deleterious materials.

c. Locate tank wholly above grade. Tank shall be constructed of steel with welded seams in accordance with the most recent American Society of Mechanical Engineers (ASME) Section VIII, Division 1 Codes and Construction Regulations. Tank shall be ASME stamped and approved.

d. The hydropneumatic tank shall be mounted on welded steel saddles bolted to concrete piers with the bottom of the tank being a minimum of 12 inches above ground. Both saddles shall be welded to the tank. The tank shall be sloped toward the tank drain.

e. Metal thickness shall be sufficient to provide at least a minimum 1/8-inch corrosion allowance and to withstand the highest expected working pressures with a four to one factor of safety.

f. Protective paint or coating applied to the inside and outside portions of the tank shall conform to current TCEQ standards and ANSI/NSF Standard 61. No temporary coating,

wax, grease coating or coating materials containing lead will be allowed. No other coating will be allowed which are not approved for use (as a contact surface with potable water by the United Sates Environmental Protection Agency (EPA), NSF International, The United States Food and Drug Administration (FDA). All newly installed coatings must conform to ANSI/NSF International Standard 61 and must be certified by an organization accredited by ANSI. The tank and all appurtenances shall be tan in color to the match Town of Annetta water system.

g. Associated appurtenances including valves pipes and fittings connected to pressure tank must conform to ANSI/NSF International Standard 61 and shall be thoroughly tight against leakage. The maximum allowable lead content of pipes, pipe fittings, plumbing fittings, and fixtures is 0.25 percent.

h. Provide appropriate valving to isolate each hydropneumatic tank from other portions of the system. Valves shall be slow closing to eliminate water hammer and reduce the chance of tank failure.

i. Provide automatically functioning facilities for maintaining the air-water volume at the design water level and working pressure.

j. Air injection lines must be equipped with filters or other devices to prevent compressor lubricant and other contaminants from entering the pressure tank.

k. Provide a pressure release device and an easily readable pressure gauge for each tank.

l. Provide a separate auxiliary access port.

m. Provide an access port for periodic inspections.

n. Provide a sight gauge for reading water level in each tank with added ball type valves for maintenance and draining the sight glass.

o. Provide tank with a means for completely draining the tank.

p. Air compressors shall be sized for a minimum of 0.25 cfm per 1,000-gallon tank capacity at 150 psi and shall have a filter/s on air injection lines to remove all contaminates and oils from the compressor.

q. Hydropneumatic tank shall be rated for at least 10 psi above the maximum booster pump operating pressure and shall be equipped with a pressure relief valve that will open at 5 psi above the maximum plant operating pressure.

r. Disinfection of the Hydropneumatic tank shall be in strict accordance with current AWWA Standard C652-11 or most recent.

s. Dechlorination of disinfecting water shall be in strict accordance with current AWWA Standard C655-09 or most recent.

4.04 SPECIFICATIONS FOR FENCING

Installation of intruder-resistant fence—Commercial six feet tall chain link fence (9 gauge 1.2 oz.) (can be black poly lined) with three strands of 12.5 gauge 4-point commercial grade barbed wire extending outward from the top of the fence at a 45-degree angle with the smooth side of the fence on the outside wall close enough to surface grade to prevent intruder passage. Barbed wire is to be tight. Installation of double gates for 12'-20' (depending on lot and plant layout design) opening with locks to exclude possible contamination or damage to the facilities by trespassers. Commercial eight-foot fencing can be installed in lieu of 6' with barbed wire. The same conditions apply for materials and installation.

The gates shall be trussed and braced- 2 3/8" schedule 40 lines posts to be set in a concrete footing 10" diameter 36" deep. 4" schedule 40 corner, end, and gate posts to be set in concrete footing 12" diameter 36" deep. Site gates shall not be anchored to a corner post. All perimeter fencing shall be a minimum of 10' from any above ground facilities.

Concrete used for fencing shall be minimum 3,000 psi.

4.05 SPECIFICATIONS FOR CHLORINATION FACILITIES

Chlorination Facilities: Do not put chlorination equipment or store chlorine bottles in the same room as pumps, motors, and electrical equipment. Provide a separate room specifically for chlorination.

Design Requirements

a. Provide a chlorination system for groundwater plants to disinfect the water supply.
b. The source of chlorine shall be gas chlorine.
c. The Town of Annetta currently utilizes Regal Manufactured gas chlorination systems (REGAL Model 210) for 10 pounds per day.
d. The system shall be complete with all components, equipment, and appurtenances.
e. All materials and components shall be new and unused of first quality by well-known manufacturers. Inferior materials or components shall not be allowed.
f. The system shall convey the gas under vacuum from the wall-mounted vacuum regulators to the ejector assembly.
g. The chlorination system shall automatically switch the gas supply from an empty chlorine manifold to a full one if a double/twin bottle design is required.
h. Connections shall be provided for tubing vented gas away from the pressure relief (vent) port of the vacuum regulator to atmosphere outside the building. The outside end of the vent tubing shall be equipped with an insect screen.
i. The regulator shall be equipped with an inlet filter to remove particulate matter from the gas before it enters the inlet safety valve.
j. This gas flow meter shall be equipped with a control valve for manual feed rate adjustment.
k. Ejectors shall provide the operating vacuum for the chlorination system.
l. Ejector check valve shall automatically close upon the loss of vacuum in the Ejector.
m. Install chlorine injection location and vault to the aboveground well collection pipe downstream of the well flow meter, prior to entering the ground storage tank.
n. The chlorinator room shall be a separate room or structure separated from other plant facilities. The structure shall be masonry and shall include a ceiling-level inlet fan or fans designed with at least one complete air exchange every 3 minutes, a floor-level back draft damper, a heater, and outside light and fan switches. The structure shall be designed to accommodate container delivery truck loading and unloading.
o. Required accessories include an appropriate SCBA unit with at least a 30-minute supply of air, gas mask, diffuser assembly, and chlorine leak detector. Town of Annetta currently utilizes MSA brand of SCBA's.
p. A chlorine leak detector (May be required depending on water plant design) shall be located in each room (or structure) containing chlorination equipment. The chlorine leak detector shall activate an alarm circuit which includes as a minimum a red rotating beacon which can be seen by the plant operator upon entering the plant site. Locate the breathing apparatus close to but outside of rooms or structures containing chlorination equipment. Gas mask and cases shall either be mounted on side wall just outside of CL^2 door or mounted inside the pump house near the door.

4.06 SPECIFICATIONS FOR SERVICE PUMPS

Service Pumps: Contractor shall install at a minimum two service pumps with a minimum 150 gpm capacity equipped with pressure switches for controls. Including low GST level lock float type switch to deter complete tank drain out and a non-SCADA well control float type switch. Both set to maximize GST efficiency.

a. The booster pump station is designed to meet the maximum day demand for the system.
b. Booster pumps shall be non-overloading through the full operating range and shall be equipped with premium efficiency motors. All pumps in excess of 5 HP shall be 3-phase. Pumps shall be mounted on concrete pedestals or welded and painted steel. The pump suction piping shall be arranged to prevent cavitation. Each pump discharge will be equipped with a check valve for pipe sizes 3-inch and smaller, or with a pump control valve (Cla-Valve or equal) for pipe sizes 4-inch and larger. The check valve or pump control valve shall be equipped with opening and closing speed controls to prevent noise and water hammer due to starting or stopping the pump. A gate valve shall be located on each pump

suction, and on each pump discharge immediately downstream of the check valve or pump control valve. A sample cock shall be installed on each pump, located before the check valve on the pumps discharge plumbing.

c. A third stub out is required for future use.

4.07 SPECIFICATIONS FOR PUMP HOUSE

Design Requirements:
Minimum interior size of 14' X 14' masonry or other approved building with composition shingles (minimum 30-year life). The structure shall be masonry and shall include a ceiling-level inlet fan or fans, a floor-level back draft damper, a heater, and outside light and fan switches. The structure shall be designed to accommodate container delivery truck loading and unloading.

a. Locate controls and electrical equipment in a room separate from piping, pumps, and motors. The floor of the electrical control room shall be raised above the pump room floor level or all electrical and control equipment shall be installed on raised housekeeping pads.

b. Locate buildings a minimum of 20 feet from plant site property lines to help eliminate vandalism and to facilitate access for maintenance and repair.

c. Buildings shall conform to applicable local, state, and federal building codes and requirements, including OSHA requirements.

d. Concrete work shall conform to the latest revision of ACI 318, ACI 301, and other applicable ACI specifications.

e. Pump buildings shall be constructed of fire-proof reinforced concrete or reinforced mason) construction; do not use metal buildings. Building and roof shall have a minimum design life of 30 years.

f. Lightning rod per codes L.P.I. 175 and NFPA 78.

g. Wiring shall conform to the most current revision of the National Electric Code requirements for commercial or industrial wiring. Materials and equipment shall be approved and listed by Underwriters Laboratory. See Chapter 6, Electrical, Monitoring and Control Systems, for electrical and control requirements.

h. Building interior spaces shall be sufficiently lighted to allow for safe and convenient operation and maintenance of equipment including pumps, motors, motor control centers, and auto sensory equipment. Provide exterior lighting at exterior doors, walkways, driveways, and work areas around the buildings. Follow lighting requirements contained in OSHA standards.

i. Building shall be insulated with a minimum 4" batt insulation and attic vents.

j. Provide roof vent in pump house. No roof vent is required in the CL2 room. Ceiling/roof should be sealed from the pump house to keep all chlorine gas from penetrating the walls or leaking over into the pump house.

k. Provide bird screening over fan openings. Screening shall be 316 stainless steel, 16 mesh.

l. Provide sleeves for piping passing through walls. Line sleeves with expansion joint material to allow for minor movements of piping and buildings. Do not use building walls to support piping.

m. Foundation: The foundation shall be scarified and compacted to minimum 95% density (Proctor test required). Provide a minimum 6-inch-thick reinforced concrete with #3 rebar floor with an appropriate placed drain that drains outside the building at a slope to direct any flow from the building footprint. The exterior opening of the drainpipe shall have a 316 Stainless, 16-mesh cover. The pump house foundation shall rest on a minimum 6-inches clean sand, free from clay, lumps, shale, loam, organic matter, and other deleterious materials. Coat the floor with non-skid, chemical resistant material. ½" anchor bolts per 6' of perimeter wall.

n. Provide a minimum 2' concrete toe with a minimum 4 #5 rebars and 12" in width over an appropriately prepared foundation of cushion sand over compacted fill over a minimum of 6" undisturbed soil.

o. Provide sloped concrete ramp for chlorine room with a minimum size of 30"x30". Ramp shall meet floor level of CL2 room and sloped downward to meet ground level outside of room.

p. Doors shall be solid commercial metal.

q. Building shall be painted with a prime and finished coat TNEMEC or equal. The Town of Annetta currently utilizes tan on all painted buildings.

r. Each water plant shall include an all-weather access road over properly scarified and compacted subbase (Proctor test required for submittal and approval).

4.08 SCADA

Each water or wastewater facility, including any storage, production, or treatment facilities and lift stations, shall be equipped with a Supervisory Control and Data Acquisition system (SCADA). The Town requires the SCADA system to include all related power supplies (including a minimum 15 minutes of uninterruptable backup power), lightning and surge protection, terminals, fuses, wire, etc. for the remote telemetry unit(s), as well as radio, cellular modem, and antenna towers as required for communication to the Town's remote monitoring SCADA system.

The location of new water or wastewater treatment facilities will determine if the facilities require radio telemetry or cellular network service, or both as needed to integrate the new facility with the existing Town SCADA infrastructure. All radio communications shall operate on one of the primary frequency bands designated as unlicensed bands by the US Federal Communications Commission (FCC). The Town Engineer must approve the cellular service provider(s) for any cellular modems.

The water and wastewater facility control systems shall provide primary Programmable Logic Control (PLC) integrated with the Town's current SCADA platform, including continuous level and pressure measurement, remote set-point adjustment, alarming, and alarm notification. The Town currently utilizes Principal Technology, Inc. (PTI) for full SCADA support. Alternate suppliers shall require a compatibility review for the Town's current SCADA system.

An initial ten-year software license term (or payment in lieu of) with the required data inputs for integration into the Town of Annetta's current Cloud-hosted SCADA monitoring system is required.

a. Water Plant SCADA Controls: In addition to primary PLC-based automated control herein defined, the Town requires all Water Plant facilities, including water wells, ground storage tanks, hydropneumatic tanks, and water supply pumps, to incorporate secondary or backup operation utilizing relay-based "on-off" control using locally adjustable or fixed set-point level and pressure switches. The primary and secondary operating mode selection shall be made via a two-position selection switch located in the SCADA control system enclosure.

    1. SCADA-Auto (Primary Control): SCADA-Auto is the intended normal operating mode for all facilities. This mode of operation shall provide unattended remote control of the facility, including the following:

        (a) Ground Storage Tank (GST) and Well Pump(s) Control

            (1) The Well Pump(s) operation shall be triggered from the continuous level transmitter on the Ground Storage Tank(s).

            (2) The following set-points shall be adjustable by the Water Plant operator using the SCADA interface portal.

                i. Low Low Level Alarm
                ii. Low Level Pump On Set-Point
                iii. High Level Pump Off Set-Point
                iv. High High Level Alarm

The Well Pump(s) supplying the GST shall be operated from a full voltage non-reversing starter or combination starter and shall include a local Hand / Off / Remote (Auto) control switch and power and run indication pilot lights installed in the starter enclosure. The motor starter shall be capable of receiving a potential free/dry-contact Remote Run command signal from the facility Control Panel. Additionally, the motor starter shall provide a potential free/dry-contact Pump Running feedback signal to the SCADA Panel. The Pump Running Feedback signal shall function in all modes of operation, including Hand, Auto, Primary SCADA-Auto Control, and Secondary Local-Auto Relay Control.

(b) Water Supply Pumps and Hydrostatic Pressure Tank Control

(1) The Water Supply Pump(s) operation shall be triggered from the continuous pressure transmitter on the Pressure Tank.

(2) The following set-points shall be adjustable by the Water Plant operator SCADA interface portal.

i. Low Low Pressure Alarm
ii. Low Pressure 2 Pump #2 On Set-Point
iii. Low Pressure 1 Pump #1 On Set-Point
iv. High Pressure Pump Off Set-Point
v. High High Pressure Alarm

Pumps #1 and #2 shall be cycled in Lead and Lag mode to provide a balanced cumulative run time for each pump. (Additional logic will apply for three pump systems based on water demand.)

The Water Supply Pumps shall be operated from a full voltage non reversing starter or combination starter and shall include a local Hand / Off / Remote (Auto) control switch and power and run indication pilot lights installed in the starter enclosure for each pump. The motor starter shall be capable of receiving a potential free/dry-contact Remote Run command signal from the facility Control Panel. Additionally, the motor starter shall provide a potential free/dry-contact Pump Running feedback signal to the SCADA Control Panel. The Pump Running Feedback signal shall function in all modes of operation, including Hand, Auto, Primary SCADA-Auto Control, and Secondary Local-Auto Relay Control.

2. Local-Auto (Secondary / Back-up Control): The Local-Auto operating mode is required to provide a minimum level of emergency backup operation for the Water Plant in the event the SCADA System PLC malfunctions (e.g., processor fault, program loss, or unspecified loss of control).

While in Local-Auto, the system shall provide a basic level of pressure and level switch control through relay-based controls wired in independently and in parallel with the SCADA Control System PLC.

(a) Ground Storage Tank and Well Pump Control

(1) The Well Pump(s) operation shall be triggered from the fixed level switches in the Ground Storage Tanks. The level switch shall have the following four individual trip-points

i. Low Low Level Alarm
ii. Low Level Pump On Trip-Point
iii. High Level Pump Off Trip-Point
iv. High High Level Alarm

(b) Water Supply Pumps and Hydrostatic Pressure Tank Control

(1) The Water Supply Pump operation shall be triggered from the fixed pressure switches installed on the Pressure Tank. Two pressure switches are required, one for each supply pump. The pressure switches shall have the following trip points.

i. Low Pressure Pump On Trip-Point

ii. High Pressure Pump Off Trip-Point

The On Trip-Point for each pressure switch shall be staggered such that one pump comes on first to meet the water demand. If the first pump is incapable of keeping up with demand and the supply pressure continues to fall, the second pump will turn on to provide additional capacity. Additional pressure switches will be required for Water Plants with more than two pumps.

Because of the simplified operating requirements of the Secondary / Backup Control mode, well pump run limit timers and pump Lead-Lag selection are not required in the Local-Auto operating mode.

3. Hydrostatic Pressure Tank / Air Compressor Control: The Air-Compressor operation shall be triggered from a local contactor (power relay) containing a three-position *Hand / Off / Auto* switch. This switch and contactor/power relay may be installed in the SCADA Control System panel or in a separate contactor panel located near the Air-Compressor.

(a) Hand Position – The Air-Compressor shall run continuously until the switch is moved to the Off or Remote (Auto) position.

(b) Off Position – The Air-Compressor shall not operate.

(c) Auto – The Air-Compressor shall operate based on a High-Low Level Switch installed in the Hydrostatic Pressure Tank. The compressor shall turn On when the water level reaches the High Limit Switch, and the compressor should turn Off once the water level falls below the Low Level Switch trip point.

The control logic for the Air-Compressor control may be accomplished in either the PLC or via local interposing relays in the Air-Compressor contactor panel. With either option, a "running" feedback signal from the Air-Compressor contactor is required to provide a remote run status indication via SCADA.

A pressure reducing regulator with internal relief is required between the Air-Compressor discharge and the Hydrostatic Pressure Tank. This regulator is in addition to the primary regulator included on the Air-Compressor equipment package. Each regulator shall be set above the Water Supply Pump maximum discharge pressure and below the maximum permitted water supply pressure to prevent excessive air-compressor cycling and run time. The system and/or tank pressure relief valve(s) shall be sized to accommodate the full Air-Compressor discharge flow rate.

4. Chlorination System Control: The Chlorination system control is wholly separate from the SCADA System; refer to section 4.05.

5. Water Plant SCADA Control System Hardware Requirements: The SCADA System must include the following hardware components and instrumentation. Substitutions or alternate designs require a design review by the Town Engineer.

(a) Electrical Motor Starters and Contactor Panels for all Water Well and Water Supply Pump Motors shall include:
- (1) Combination Power Disconnect with Fuse or Breaker Circuit Protection
- (2) Full Voltage Non-Reversing 3-Phase Contactor
- (3) Hand-Off-Auto Selector Switch
- (4) Power and Running Pilot Lights
- (5) 120 VAC Control Power Transformer
- (6) Remote Run Command Input from SCADA Control Panel (Dry-Contact)
- (7) Aux (Dry) Contacts Providing Run Status
- (8) Stainless Steel Enclosure with a Minimum Environmental Rating of NEMA 12 for Indoor Installations or NEMA 4 for Outdoor Installations

(b) Air-Compressor Contactor Panel shall include:
- (1) Power Disconnect and Circuit Protection (May be installed in a separate enclosure.)
- (2) Hand-Off-Remote Selector Switch
- (3) Full Voltage Contactor or Power Relay Suitable for Compressor Load
- (4) Auxiliary Contact or Spare Electrically Isolated Normally Open (NO) Contact Block for Run Status Feedback

(c) Ground Storage Tank Instruments
- (1) Hydrostatic Level Transmitter (Minimum One Required)
  - i. Loop-Powered, 4-20 mA Output
  - ii. Fixed Scale of No Less than 120% and No More than 250% Tank Wall Height
  - iii. Alternate Programmable "Smart" Transmitters are acceptable but must be compatible with the HART communication protocol.
  - iv. NSF/ANSI 61 Certified
- (2) Float Level Switch (Minimum One Required)
  - i. Minimum Four (4) Actuation Points with Isolated Contacts
  - ii. Dry-Contact, a Minimum Rating of 0.5 Amp @ 120 VAC and 0.1 Amp at 30 VDC
  - iii. Alternate Contact Ratings, if Required, May be Provided via Interposing Relays
  - iv. NSF/ANSI 61 Certified

(d) Hydrostatic Pressure Tank Instruments
- (1) Float Level Switch (Minimum One Required)
  - i. Minimum Four (4) Actuation Points with Isolated Contacts
  - ii. Dry-Contact, a Minimum Rating of 0.5 Amp at 120 VAC and 0.1 Amp at 30 VDC
  - iii. Alternate Contact Ratings, if Required, May be Provided via Interposing Relays
  - iv. NSF/ANSI 61 Certified or Documented Compliance *(e.g., Approved Material Test Reports for Wetted Components)*

(e) Supply Piping System Instruments (Minimum One Required)
- (1) Pressure Transmitter
  - i. Loop-Powered, 4-20 mA Output

ii. Fixed Scale of No Less than 100 PSIG and No More than 150 PSIG
iii. Alternate Programmable "Smart" Transmitters are acceptable but must be compatible with the HART communication protocol.
iv. NSF/ANSI 61 Certified

(2) Pressure Switch (One Required per Pump)
i. Minimum One (1) Actuation Point with Isolated Contacts
ii. Adjustable Actuation Point with Adjustable Deadband.
iii. Minimum Deadband Adjustment Shall be 20 PSIG or Smaller
iv. Dry-Contact, a Minimum Rating of 0.5 Amp at 120 VAC and 0.1 Amp at 30 VDC
v. Alternate Contact Ratings, if Required, May be Provided via Interposing Relays
vi. NSF/ANSI 61 Certified

(f) SCADA Control Panel
(1) General Construction
i. Enclosure construction shall be stainless steel with a minimum of NEMA 12 or NEMA 4 Environmental Rating.
ii. Power Supply 120 VAC, Single Phase, with Whole Panel Surge Protection
iii. Uninterruptable backup power supply sufficient to detect and provide alarm notification for loss of power.
iv. Door Mounted Selector Switches
- Two-Position SCADA-Auto / Local-Auto
- Three-Position Air-Compressor Hand/Off/Auto *(Not Required on Systems with Separate Compressor Contactor Panel with an integral HOA selector switch)*

(2) PLC Hardware with Operator Interface Terminal
i. Allen Bradley, CompactLogix Processor Family with No Less Than 750 KB of On-Board Memory
ii. Allen Bradley, PanelView (current series) 7" Color Touch Screen. Suitable pushbuttons and pilot lights indicating critical control functions may be provided in lieu of the Color Touch Screen with Town Engineer approval.
iii. Analog Input Module, 4-20 mA, 8-Channel
iv. Digital Input Module, 120 VAC, 16 Channel
v. Digital Output Module, Relay Output, 8 Channel (Minimum)
vi. Digital Output Isolation Relays, Qty 8 (Minimum)

b. Waste Water Treatment Plant SCADA Controls: The SCADA and control interface for all Waste Water Treatment (WWTP) facilities require an engineering design review by the Town Engineer. WWTP control functions shall be provided to meet the Original Equipment Manufacturers design requirements and shall be suitable for unattended operation.

The SCADA panel located within the WWTP facility shall include:

1. SCADA Control Panel

(a) General Construction
(1) Enclosure construction shall be stainless steel with a minimum of NEMA 4x Environmental Rating.

(2) Power Supply 120 VAC, Single Phase, with Whole Panel Surge Protection

(3) Uninterruptable backup power supply sufficient to detect and provide alarm notification for loss of power.

(b) PLC Hardware with Operator Interface Terminal

(1) Allen Bradley, CompactLogix Processor Family with No Less Than 750 KB of On-Board Memory

(2) Allen Bradley, PanelView (current series) 7" Color Touch Screen. Suitable pushbuttons and pilot lights indicating critical control functions may be provided in lieu of the Color Touch Screen with the Town Engineer's approval.

(3) Analog Input Module, 4-20 mA, 8-Channel

(4) Digital Input Module, 120 VAC, 16 Channel

(5) Digital Output Module, Relay Output, 8 Channel (Minimum)

(6) Digital Output Isolation Relays, Qty 8 (Minimum)

2. Minimum required WWTP SCADA Alarms

(a) Critical condition alarms indicating shutdown or loss of control shall be hardwired to the SCADA PLC

(b) Secondary or non-critical condition alarms, pump and blower run status, and other available performance status conditions may be communicated to the SCADA panel via any convenient means, including hardwired signal inputs or approved serial or Ethernet network communications.

c. Lift Station SCADA Controls: The SCADA monitoring and control interface for all Lift Stations shall include:

1. Electrical Motor Starters and Contactor Panels for all Water Well and Water Supply Pump Motors shall include:

(a) Combination Power Disconnect with Fuse or Breaker Circuit Protection

(b) Full Voltage Non-Reversing 3-Phase Contactor

(c) Hand-Off-Auto Selector Switch

(d) Power and Running Pilot Lights

(e) 120 VAC Control Power Transformer

(f) Aux (Dry) Contacts Providing Run Status

(g) Stainless Steel Enclosure with a Minimum Environmental Rating of NEMA 4x

2. SCADA Control Panel

(a) General Construction

(1) Enclosure construction shall be stainless steel with a minimum of NEMA 4x Environmental Rating.

(2) Power Supply 120 VAC, Single Phase, with Whole Panel Surge Protection

(3) Uninterruptable backup power supply sufficient to detect and provide alarm notification for loss of power.

(b) Logic Control Hardware and Status Indication
With the approval of the Town Engineer, Lift Stations are not required to have programable logic controllers provided reliable, unattended operation is accomplished using common relays, level switches, or level transmitters. Minimum status indication pilot lights shall include:
(1) Power On Status
(2) Pump Run Status
(3) Alarm / Fault Condition

3. Minimum required Lift Station SCADA Alarms shall include hardwired critical condition alarms indicating shutdown or loss of control and shall include the following:

(a) Loss of Power

(b) Run Status (All Pumps)

(c) Pump Hand / Auto Mode Selection (All Pumps)

(d) Wet Well Level

d. Common SCADA Display and Alarm Requirements: The SCADA Control System must include the following common alarm conditions where applicable. Additional, facility-specific display and alarm conditions shall be included where required for the safe and reliable operation of the system.

1. Local Control Panel Indication via panel enclosure mounted pilot lights

(a) System Power On

(b) Run Status (All motors, blowers, pumps, air-compressors)

(c) Critical Alarm Condition active if not included on Operator Interface Terminal

2. Local Control Panel Operator Interface Terminal and SCADA Control Screens

(a) Storage Tank Level(s)

(b) Water Supply Pressure

(c) Pump(s) and Blower(s) Cumulative Run Time

(d) Control Set-Points (e.g., "On/Off" Pressure settings, lead, lag, and shutoff pressures)

(e) On-Screen HOA Switches for All Pumps Controllable via SCADA.

3. The system will provide the following alarm indications on the local Operator Terminal and via the SCADA portal:
(a) Failure To Start (All Pumps, Blowers, and Motors)

(b) Low Level Alarm (All Tanks)

(c) High Level Alarm (All Tanks)

(d) Low Pressure Alarm

(e) High Pressure Alarm

(f) Loss Of Power

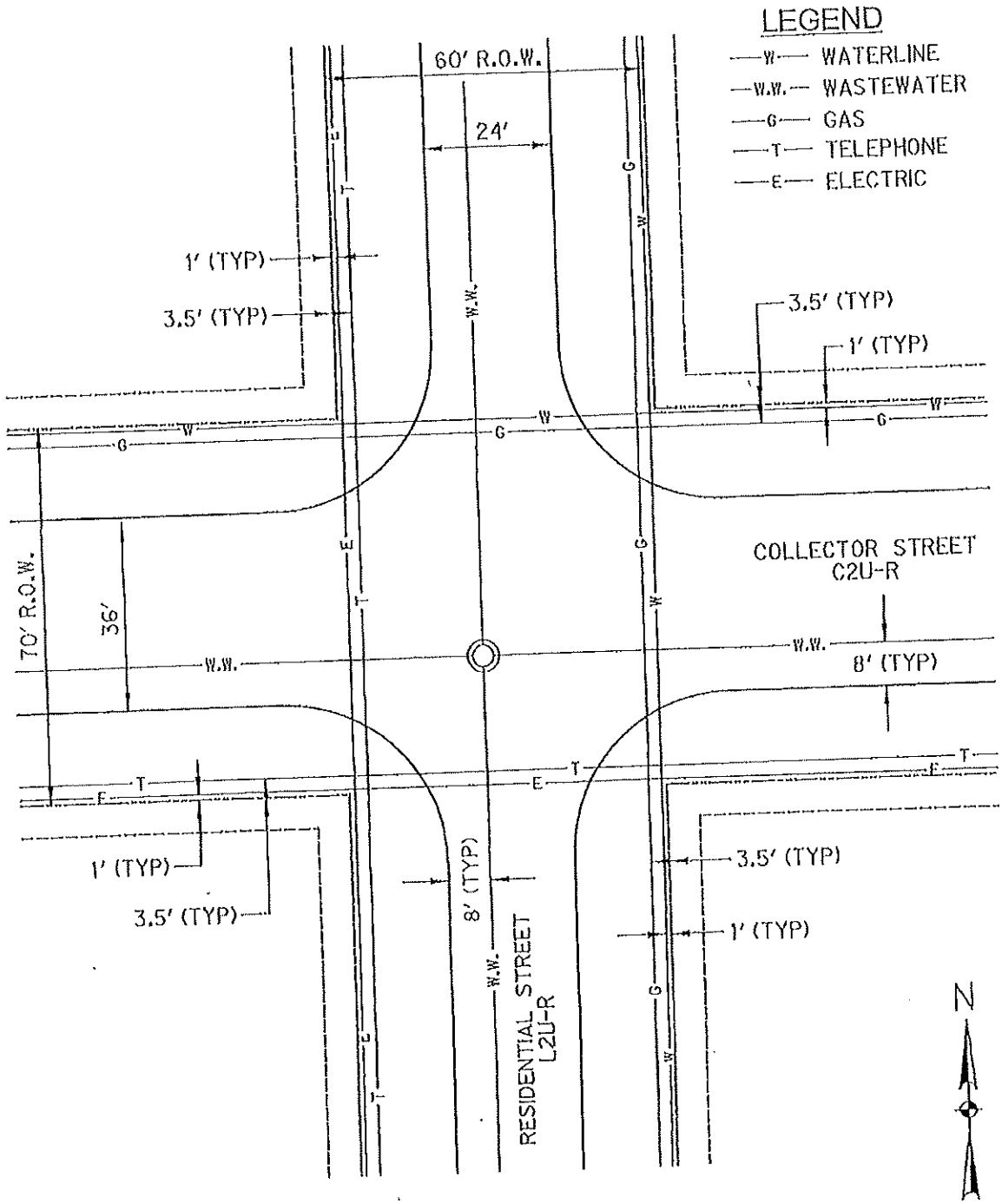
4. Additional display and alarm conditions shall be included where required by good engineering practice for similar systems.

e. Unauthorized Access and Intrusion Detection: All building access doors located at Water and Wastewater Facilities shall include a potential free/dry-contact door closure switch wired to the SCADA panel. Any motor or SCADA control enclosures not located inside a building with monitored access doors shall include a lockable enclosure door and be provided with a potential free/dry-contact enclosure door switch wired to the SCADA panel.

APPENDIX "A"

UTILITY ASSIGNMENTS

UTILITIES LOCATION PLAN WITHIN STREET R.O.W.
(TOWN OF ANNETTA)

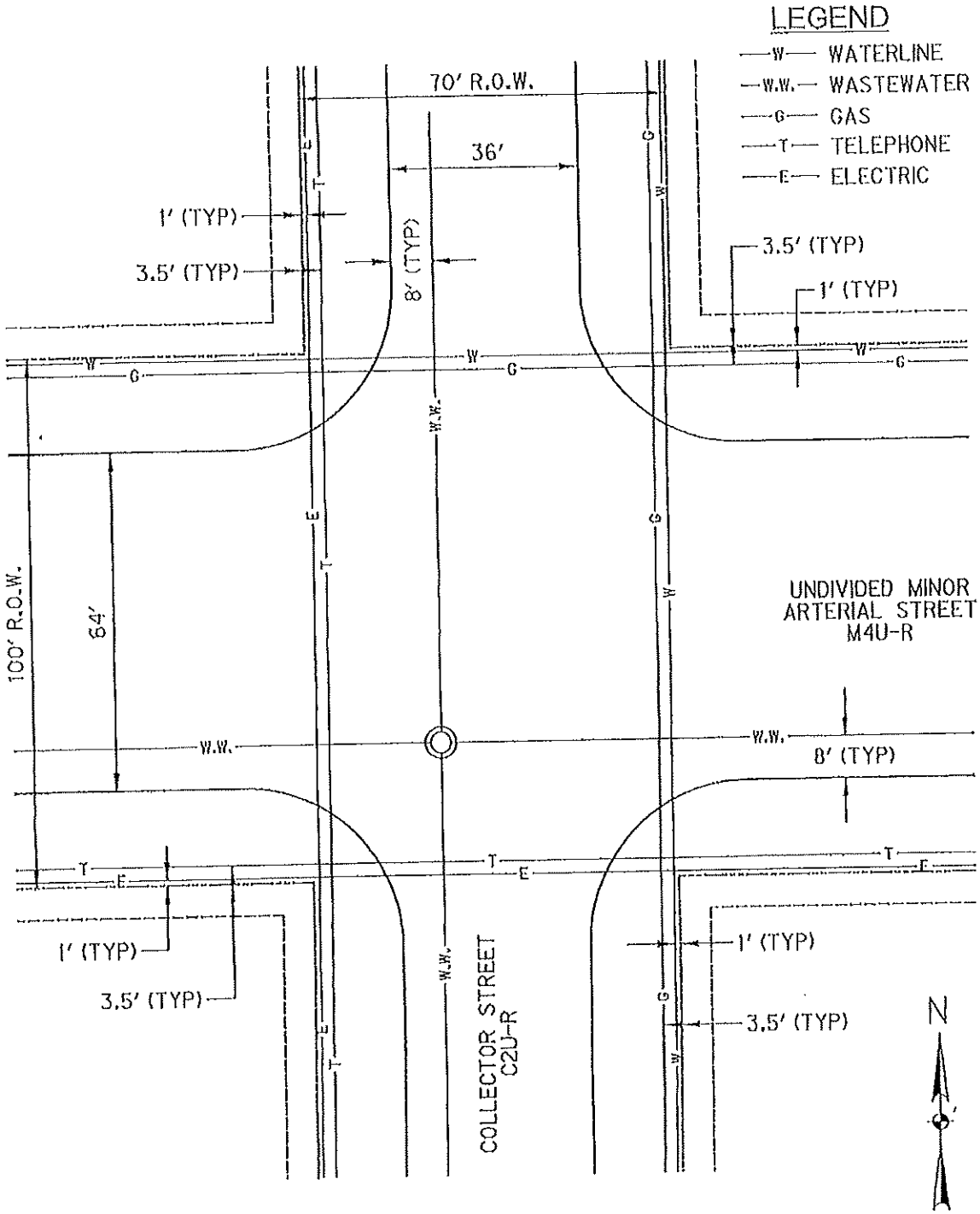


NOT TO SCALE

APPENDIX A
SHEET 1 OF 6

RESIDENTIAL - COLLECTOR STREET INTERSECTION

UTILITIES LOCATION PLAN WITHIN STREET R.O.W.
(TOWN OF ANNETTA)

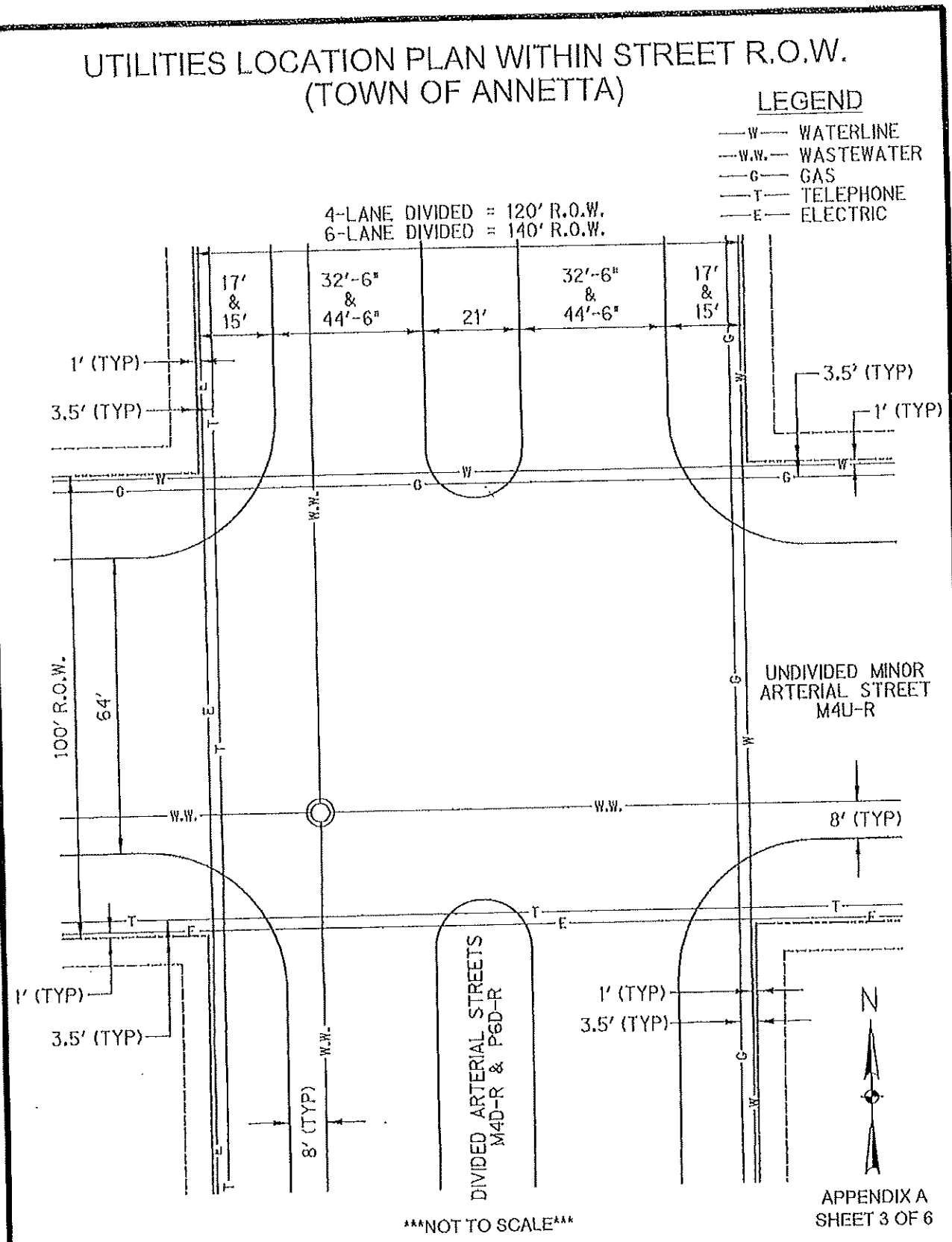


NOT TO SCALE

APPENDIX A
SHEET 2 OF 6

COLLECTOR STREET - UNDIVIDED MINOR ARTERIAL INTERSECTION

UTILITIES LOCATION PLAN WITHIN STREET R.O.W.
(TOWN OF ANNETTA)

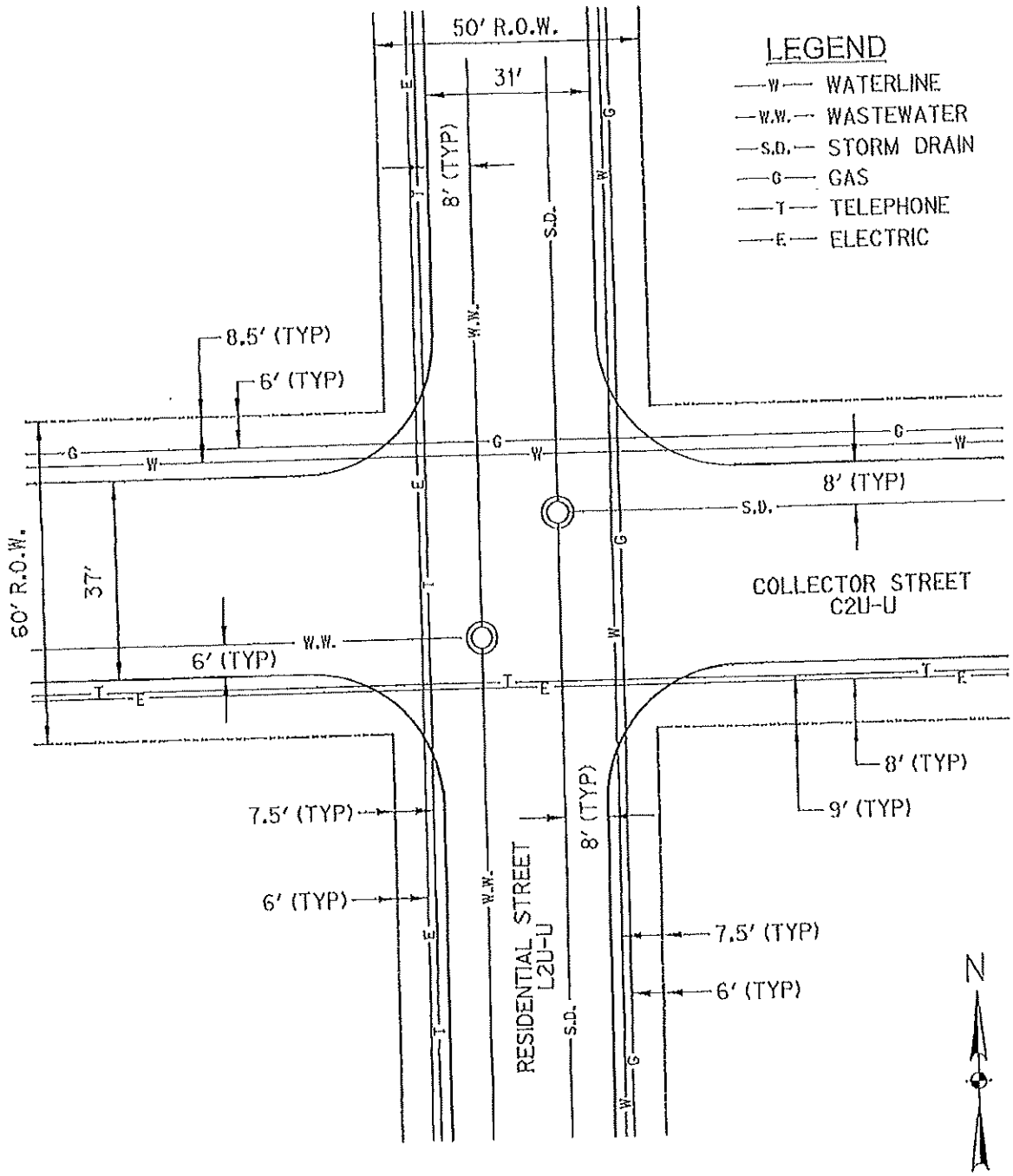


NOT TO SCALE

APPENDIX A
SHEET 3 OF 6

UNDIVIDED MINOR ARTERIAL - DIVIDED ARTERIAL INTERSECTION

UTILITIES LOCATION PLAN WITHIN STREET R.O.W.
(TOWN OF ANNETTA)

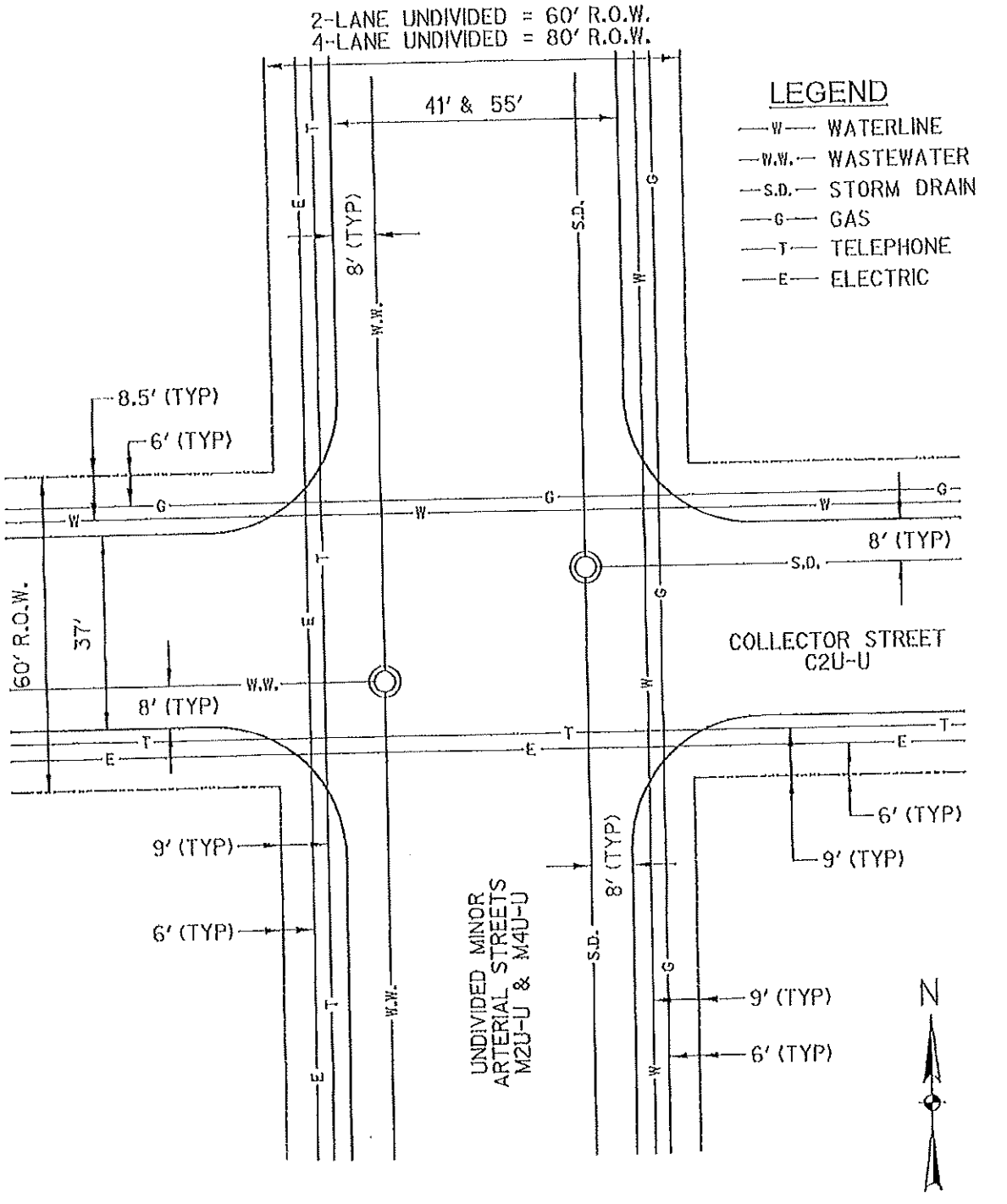


NOT TO SCALE

APPENDIX A
SHEET 4 OF 6

COLLECTOR STREET - RESIDENTIAL STREET INTERSECTION

UTILITIES LOCATION PLAN WITHIN STREET R.O.W.
(TOWN OF ANNETTA)

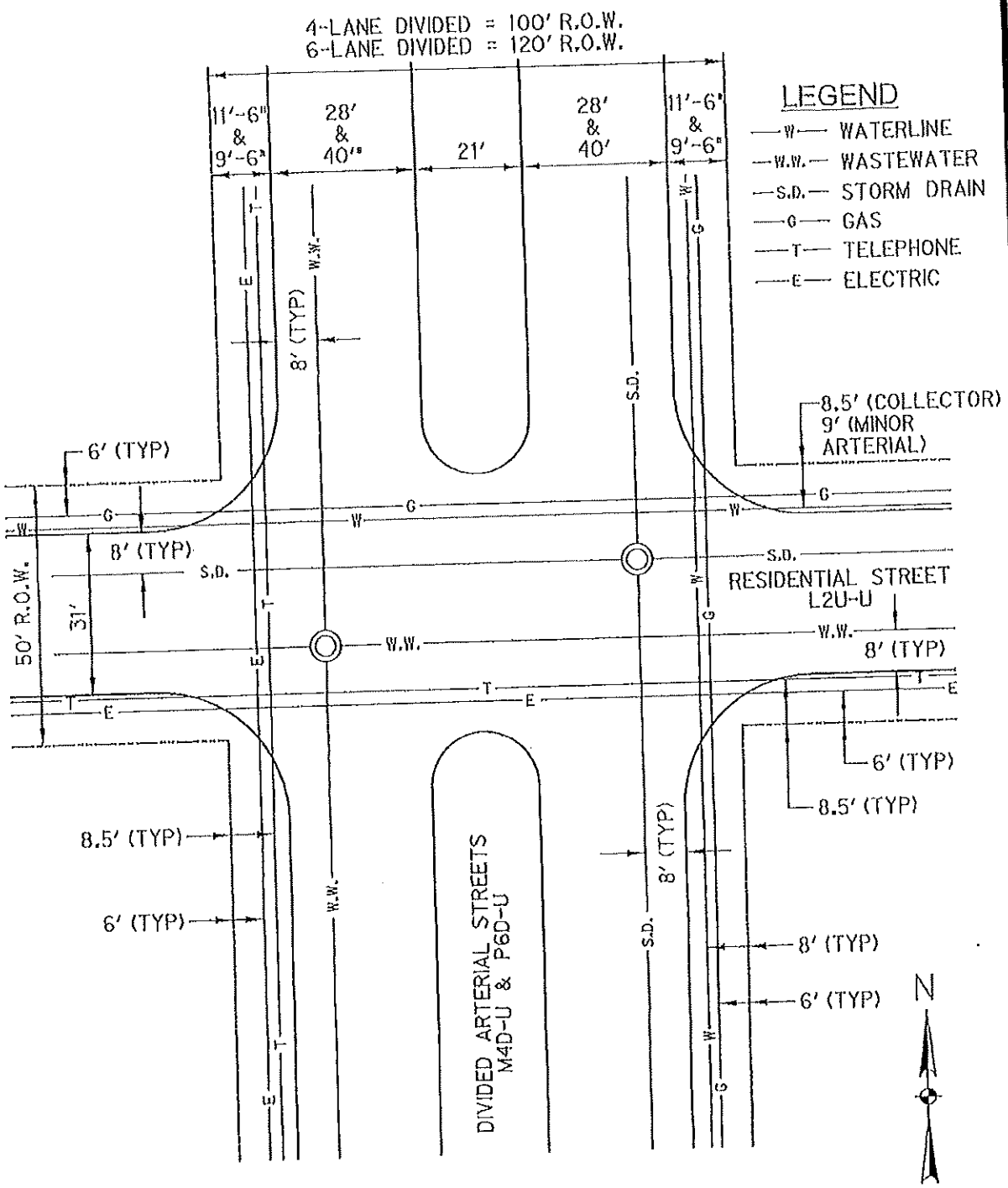


NOT TO SCALE

APPENDIX A
SHEET 5 OF 6

COLLECTOR STREET - UNDIVIDED MINOR ARTERIAL STREET INTERSECTION

UTILITIES LOCATION PLAN WITHIN STREET R.O.W.
(TOWN OF ANNETTA)



NOT TO SCALE

APPENDIX A
SHEET 6 OF 6

RESIDENTIAL STREET - DIVIDED ARTERIAL STREET INTERSECTION

TOWN OF ANNETTA

ENGINEERING DESIGN MANUAL

APPENDIX "B"

PRIVATE DEVELOPMENT GENERAL NOTES

1. All work shall be done in accordance with the Town of Annetta standard details and specifications which has adopted the North Central Texas Council of Governments (N.C.T.C.O.G.) "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION", Fourth Edition and Addenda. Copies may be obtained from the "NORTH CENTRAL COUNCIL OF GOVERNMENTS", PO Drawer 6888, Arlington, Texas, 76005-5888, Phone (817) 640-3300; also available at www.publicworks.dfwinfo.com A copy of the contract documents, plans and specifications shall be available on-site at all times by the Contractor.

2. The location and depth of all utilities shown on the plans are approximate and there may be other unknown existing utilities not shown on the plans. All existing utilities shall be field verified and protected by the Contractor prior to the start of construction. Also see General Note No. 3(D). The contractor shall contact the following utility companies 72 hours prior to doing any work in the area:

Utility	Contact – Job Title	Phone Number
Tri-County Electric		(817) 444-3201
Oncor Electric		(877) 898-8471
DPC Midstream		(888) 204-1781
AT&T		(800) 222-0300
Town of Annetta		(817) 441-5770

3. It shall be the responsibility of the Contractor to perform the following:

   a. Prevent any property damage to property owner's poles, fences, shrubs, mailboxes, etc.
   b. Provide access to all drives during construction.
   c. Protect all underground and overhead utilities and repair any damages. Also see General Note No. 2.
   d. Notify all Utility Companies and verify location of all utilities prior to the start of construction.
   e. Cooperate with the Utility Companies where utilities are required or specified to be relocated.
   f. Work in close proximity to and protect existing Utility Mains, traffic lights and poles.
   g. Any item not specifically called out to be removed shall be brought to the attention of the Engineer prior to removing that item or it shall be replaced at the Contractor's own expense.
   h. Any tree, shrub, or grassed areas damaged by the Contractor's work shall be repaired at the Contractor's expense.

4. In the preparation of the plans and specifications, the Engineer has endeavored to indicate the location of existing underground utilities. It is not guaranteed that all lines or structures have been shown on the plans.

5. The Contractor shall verify, locate, and protect existing water, sanitary sewer, storm sewer, gas, electric, telephone mains and services and restore service in case of any damage.

6. The Contractor shall provide proper barricades and maintain traffic flow as per Manual on Uniform Traffic Control Devices (MUTCD) at all times.

7. The location for the disposal of construction material shall be approved by the Town of Annetta prior to the start of construction.

8. All phases of construction must be coordinated with the Engineer. Also, the Contractor is required to coordinate with the property owners in order to minimize conflicts.

9. Field adjustments may be necessary and will be carried out as directed by the Engineer.

10. The Contractor shall contact the Town of Annetta prior to any sign removal. Please See General Note No. 3. Sign removal and reinstallation/relocation shall be in good condition equal to or better than existing condition, and as per the Engineer's specifications.

11. All fences, signs, and property corner monuments removed for, or damaged during construction shall be replaced with new material as per the Engineer's specifications.

12. The Contractor shall relocate existing mailboxes in conflict with the proposed improvements and as specified on the plans, in good condition equal to or better than existing condition, complete in place. The mailboxes shall be accessible at all times for mail delivery.

13. The Contractor shall be responsible for taking all precautions to protect existing trees outside the scope of this Project.

14. The Contractor shall be responsible for repairing any damage caused by the Contractor outside of the designated work area with new quality material at the Contractor's expense.

15. The Contractor shall locate, verify working condition and protect all existing sprinkler systems lines and heads (if any). Remove, adjust and reinstall in good condition equal to or better than existing condition; replace, if in direct conflict, with the same or better quality material and appurtenances.

16. All existing grades shown on the plans are approximate and shown based on the best information available.

17. All backfill for ditch lines are to be mechanically tamped to 95% STD Proctor density (ASTM D698), at a moisture content near optimum (-1% to +3%).

18. Contractor to fill all voids under existing pavement when installing new line. Also all ditch lines must be filled at the end of each day's work.

19. All pipe shall be kept free of trash and dirt at all time. At the end of each day, the pipe shall be temporarily connected/sealed.

20. The Contractor shall keep the existing fire hydrants in service at all times.

21. The Contractor shall maintain the existing water mains in service during all phases of construction. Leaks caused by the Contractor shall be repaired immediately at the Contractor's expense. Leaks along the existing water main close to the working area, caused by vibration, etc. (during working hours) shall be repaired by the Contractor with the Town only providing the required parts. The Town will repair all leaks if the Contractor is not on the job-site (primarily after

working hours); if the leak is directly caused by the Contractor and not repaired, all charges incurred shall be billed to the Contractor.

22. All cutting and plugging of the existing water main where specified on the plans, shall include all labor, fittings and appurtenances required to perform this work. The cost for this work is incidental to the project.

23. The Contractor shall maintain the existing sanitary sewer mains and services in operation when installing the proposed sanitary sewer main. This shall include any temporary connections, if required.

24. Clearances on water and wastewater lines shall meet Texas Commission on Environmental Quality (TCEQ) requirements. Minimum clearances for water and wastewater lines crossing each other storm drains shall be two (2) feet or one-half (0.5) feet when the water or wastewater line is concrete encased. When running in parallel, water and wastewater lines shall be no closer than 9' from the outside edge of each pipe.

25. Street closing requests shall be submitted to the Town of Annetta in writing, a minimum of two weeks in advance of any street closing for notifications to Police, Fire, Mail, Garbage and School. There are no guarantees that street closings will be approved by the Town.

26. Seed/sod shall be furnished to establish ground cover over all disturbed areas as an erosion control measure. The Contractor shall not wait until the completion of the entire project before doing this work. The project shall not be accepted by the Town prior to the establishment of ground cover.

27. Sheeting, shoring, and bracing: The contractor will abide by all applicable federal, state, and local laws governing excavation, Trench's side slopes shall meet Occupational Safety and Health Administration (OSHA) standards that are in effect at the time of construction. Sheeting shoring and bracing shall be required if side slope standards are not met. A pull box, meeting OSHA standards, will be acceptable. The Contractor will submit detailed plans and specifications for trench safety systems that meet OSHA standards that are in effect at the time of development of project when trench excavation will exceed a depth of five (5) feet. These plans will be sealed by an Engineer registered by the State of Texas and submitted to the Town before obtaining a construction permit.

28. Contractor shall conform activities to the SWPPP as specified, including installing, maintaining, and removing pollution controls, conducting and documenting inspections of pollution controls, sprinkling for dust control, maintaining spill response equipment on-site, and "good housekeeping". Pollution controls include silt fences (or straw bales), stabilized construction entrance, establishing grass, sprinkling for dust control. The Contractor shall also be responsible for submitting Notice of Intent (NOI) and Notice of Termination (NOT) to the Texas Commission on Environmental Quality (TCEQ).

29. The Contractor shall maintain the existing water mains and services in operation when installing the proposed water main. This shall include any temporary connections, if required in areas of conflict.

30. Contractor must notify each property owner 24 hours prior to shutting off water for connection to new main.

31. The Contractor shall contact the Town at (817) 441-5770 for the operation of all water valves.

32. The cost of replacing all pavement markers, traffic buttons, striping, etc., disturbed during the construction shall be Contractor's responsibility to maintain, repair or replace.

33. The Contractor shall maintain the flow of traffic at all times and provide access to all drives.

34. The maximum deflection of pipe joints shall not exceed that recommended by the pipe manufacturer. If it is necessary to deflect the pipe (greater that the recommended amount) the Contractor shall provide fittings or specials.

35. The Contractor shall notify the Town for inspection 48 hours in advance for all water or wastewater locates or turnoffs of water.

36. Prior to the start of construction, Inspection, Water/Wastewater and the Contractor shall make a dry run to the system to insure, to the extent possible, that the utility can be found and secured.

37. Work may not be backfilled until it has been inspected by the Town.

38. Development Fees:

a. Public Facilities Plan Review:	$500 plus 1% of estimated construction costs
b. Public Facilities Inspection:	4% of actual construction costs
c. Administrative Processing Fee:	1% of actual construction costs

Refer to the Town's Official Fee Schedule for further details.

Fees are subject to change.

TOWN OF ANNETTA

ENGINEERING DESIGN MANUAL

APPENDIX "C"

ENGINEERING DOCUMENT PLANS REVIEW CHECKLIST

Please make sure the plans you are submitting are in accordance with this checklist. The following checklist will be used during the Plan Review.

PRELIMINARY PLAT CHECKLIST:

1. Preliminary plats shall be placed on maximum 22" x 34" sheets and drawn to a scale of 1" = 100' or 1" = 50' unless approved in advance by the Town. Yes ____ No ____ N/A ____
2. Title or name of the subdivision preceded by the words: "Preliminary Plat" Yes ____ No ____ N/A ____
3. Name, address and telephone number of the owner, applicant, survey, and/or engineer. Yes ____ No ____ N/A ____
4. Volume and page, or deed record number of the ownership deed from Parker County Deed Records. Yes ____ No ____ N/A ____
5. Vicinity map and key map, if multiple sheets are needed. Yes ____ No ____ N/A ____
6. Date of preparation, written and graphic scale, and north arrow. Yes ____ No ____ N/A ____
7. Boundary line of the proposed subdivision drawn with a heavy line. Yes ____ No ____ N/A ____
8. Computed gross acreage of the subdivision Yes ____ No ____ N/A ____
9. Metes and bounds description of the proposed subdivision. Yes ____ No ____ N/A ____
10. Location of the subdivision with respect to a corner of the survey or tract or an original corner of the survey of which it is a part. Yes ____ No ____ N/A ____
11. Names of adjoining subdivisions with lots and blocks shown with dashed lines and/or property owners of record for all contiguous unplatted properties. Yes ____ No ____ N/A ____
12. Town limits (if applicable). Yes ____ No ____ N/A ____

13. Location, dimension, and description and recording information for all existing rights-of-way, railroad rights-of-way, easements or other public ways on or adjacent to the property being developed. Yes ____ No ____ N/A ____

14. Show permanent structures or uses that will remain. Yes ____ No ____ N/A ____

15. Sizes and flowlines of existing drainage structures, 100-year floodplain and floodway as defined by FEMA. Yes ____ No ____ N/A ____

16. Location, size and type of all existing utilities within or adjacent lot the site. Yes ____ No ____ N/A ____

17. Existing two (2) foot interval contours referenced to NAD. Yes ____ No ____ N/A ____

18. Proposed streets, alleys, drainageways, parks, open spaces, easements, other public areas and other rights-of-way within the subdivision. Dimensions of all easements and rights-of-way. Yes ____ No ____ N/A ____

19. Number each proposed lot and block. Provide the proposed number of lots. Yes ____ No ____ N/A ____

20. Dimensions for all lots. Gross acreage for all non-residential lots. Approximate acreage for areas in residential use. Approximate acreage of streets, parks, and other non-residential uses. Yes ____ No ____ N/A ____

21. Front building setback lines and side building setback lines abutting streets. Yes ____ No ____ N/A ____

22. Preliminary drainage study meeting the requirements of the Engineering Design Manual shall be submitted with the Preliminary Plat. Yes ____ No ____ N/A ____

23. Preliminary Plat approval block as described by the Subdivision Regulations. Yes ____ No ____ N/A ____

24. Where the Preliminary Plat is part of a larger area owned by the Applicant that will be subsequently subdivided, provide a layout of the larger area showing the tentative layout of streets, blocks, drainage, water, sewerage, and other improvements for the larger area. Yes ____ No ____ N/A ____

FINAL PLAT CHECKLIST

1. Final plats shall be placed on maximum 22" x 34" sheets and drawn to a scale of 1" = 100' or 1" = 50' unless approved in advance by the Town. Yes ____ No ____ N/A ____

2. Title or name of the subdivision preceded by the words "Final Plat" Yes ____ No ____ N/A ____

3. Name address and telephone number of the owner, applicant, survey, and/or engineer. Yes ____ No ____ N/A ____

4. Vicinity map and key map if multiple sheets are needed. Yes ____ No ____ N/A ____

5. Date, written and graphic scale, and north arrow. Yes ____ No ____ N/A ____

6. Boundary line of subdivision drawn with a heavy line and with bearings, dimensions and curve data. Yes ____ No ____ N/A ____

7. Names of adjoining subdivisions with lots and blocks shown with dashed lines and/or property owners of record for all contiguous unplatted properties. Yes ____ No ____ N/A ____

8. Town limits, if applicable. Yes ____ No ____ N/A ____

9. Proposed streets, alleys, drainageways, parks, open spaces, easements, other public areas and other rights-of-way within the subdivision including dimensions, bearings and curve data. Yes ____ No ____ N/A ____

10. Location, dimension, description and recording information for all existing rights-of-way, railroad rights-of-way, easements or other public ways on or adjacent to the property being platted. Yes ____ No ____ N/A ____

11. Location and description of all permanent monuments and control points Yes ____ No ____ N/A ____

12. Floodways / Floodplains (FEMA):

    a. Show the ultimate 100-year water surface elevation. Yes ____ No ____ N/A ____

    b. Show floodplain and floodway boundaries. Yes ____ No ____ N/A ____

    c. Drainage Floodway easement limits Yes ____ No ____ N/A ____

    d. Minimum fill and floor elevations specified. Yes ____ No ____ N/A ____

13. Minimum building setback lines. Yes ____ No ____ N/A ____

14. Lot and block numbers. Yes ____ No ____ N/A ____

15. Approval block in the form prescribed by the SUBDIVISION REGULATIONS. Yes ____ No ____ N/A ____

16. Abutting property owner names and recording information. Yes ____ No ____ N/A ____

17. Gross acreage of the land being subdivided Yes ____ No ____ N/A ____

18. Owner's certificate of dead or dedication in the form prescribed by the SUBDIVISION REGULATIONS with the following:

    a. Metes and bounds description. Yes ____ No ____ N/A ____

    b. Representation that dedicators own the property. Yes ____ No ____ N/A ____

    c. Dedication statement. Yes ____ No ____ N/A ____

    d. Reference and identification or name of final plat. Yes ____ No ____ N/A ____

    e. Surveyor certification in the form prescribed by the SUBDIVISION REGULATIONS. Yes ____ No ____ N/A ____

19. Certificate showing all taxes have been paid. Yes ____ No ____ N/A ____

20. A letter fully outlining and alterations from the approved Preliminary Plat. Yes ____ No ____ N/A ____

SITE PLAN – Each site plan shall include:

1. Site plans shall be placed on maximum 22" x 34" sheets and drawn to a scale of 1" = 100' or 1" = 50' unless approved in advance by the Town. Yes ____ No ____ N/A ____

2. Title block in lower right hand corner including:

    a. Subdivision name with lot and block number. Yes ____ No ____ N/A ____

    b. Area in acres. Yes ____ No ____ N/A ____

    c. Metes and bounds description including survey name and abstract number. Yes ____ No ____ N/A ____

    d. Town and County. Yes ____ No ____ N/A ____

    e. Preparation Date. Yes ____ No ____ N/A ____

3. Name, address and telephone number of the Yes ____ No ____ N/A ____

owner, applicant, and surveyor/engineer.

4. Vicinity map and key map, if multiple sheets are needed. Yes ____ No ____ N/A ____

5. Written scale, graphic scale and north arrow. Yes ____ No ____ N/A ____

6. Approximate distance to the nearest street. Yes ____ No ____ N/A ____

7. Site boundaries, dimensions, lot lines and lot areas. Yes ____ No ____ N/A ____

8. Legend. Yes ____ No ____ N/A ____

9. Site data summary table including:

   a. Zoning. Yes ____ No ____ N/A ____

   b. Proposed use. Yes ____ No ____ N/A ____

   c. Building area (gross square footage). Yes ____ No ____ N/A ____

   d. Building height (feet and inches). Yes ____ No ____ N/A ____

   e. Area of impervious surface. Yes ____ No ____ N/A ____

   f. Total Parking: Required and provided. Yes ____ No ____ N/A ____

   g. Number of handicap parking spaces. Yes ____ No ____ N/A ____

   h. Number of dwelling units and number of bedrooms (multifamily). Yes ____ No ____ N/A ____

10. Existing improvements within 75' of the subject property. Yes ____ No ____ N/A ____

11. Land use, zoning, subdivision name, recording information and adjacent owners. Yes ____ No ____ N/A ____

12. Building locations, sizes, and dimensions. Yes ____ No ____ N/A ____

13. Distance between buildings on the same lot. Yes ____ No ____ N/A ____

14. Building lines and setbacks. Yes ____ No ____ N/A ____

15. Dimensions of all drive lanes and traffic flow arrows. Yes ____ No ____ N/A ____

16. FEMA floodplains with elevations, and minimum finished floor elevations (include the floodplain note shown on the final plat). Yes ____ No ____ N/A ____

17. Public streets, private drives, and fire lanes with pavement widths and including rights-of-way, median openings, turn lanes, existing driveways, adjacent existing driveways with dimensions, radii, and surface. Yes ____ No ____ N/A ____

18. Distances between existing and proposed driveways. Yes ____ No ____ N/A ____

19. Loading and unloading areas. Yes ____ No ____ N/A ____

20. Ramps, crosswalks, sidewalks and barrier-free ramps with dimensions. Yes ____ No ____ N/A ____

21. Locations of dumpsters and trash compactors with height and material of screening. Yes ____ No ____ N/A ____

22. Size, location, dimensions and details of all signs and exterior lighting of signs, including type of standards, locations and radius of light and intensity of foot-candles. All signage are subject to approval by the Building Inspections Department. Yes ____ No ____ N/A ____

23. Location and sizes of existing and proposed water and sewer mains. Yes ____ No ____ N/A ____

24. Location of fire hydrants. Yes ____ No ____ N/A ____

25. Location and sizes of storm drains, culverts, inlets and other drainage features on or adjacent to the site. Yes ____ No ____ N/A ____

26. Locations, widths, and types of existing and proposed easements. Yes ____ No ____ N/A ____

27. Provide an elevation of all four sides of the building including materials, colors and dimensions at an architectural scale of 1"=20'. Yes ____ No ____ N/A ____

28. Landscape plan provided on separate sheet to show the following: Yes ____ No ____ N/A ____

    a. Natural features including tree masses and anticipated tree loss. Yes ____ No ____ N/A ____

    b. Floodplains, drainageways and creeks. Yes ____ No ____ N/A ____

    c. Screening walls and fences, retaining walls, headlight screens, and service area screens Yes ____ No ____ N/A ____

including height and type of construction.

d. Existing and preserved trees including location, size, and species. Yes ____ No ____ N/A ____

e. Landscaping materials including location and size. Yes ____ No ____ N/A ____

f. Proposed plant materials. Yes ____ No ____ N/A ____

g. Note to indicate type and placement of irrigation system. Yes ____ No ____ N/A ____

29. 2" x 3" blank box in lower right corner for Town use. Yes ____ No ____ N/A ____

30. Additional information as requested to clarify the proposed development. Yes ____ No ____ N/A ____

GENERAL

1. North arrow clearly shown on each plan sheet. Yes ____ No ____ N/A ____

2. Bench marks shown on each sheet; located on permanent structure outside of construction limits and conveniently spaced (500' +). Yes ____ No ____ N/A ____

3. Title blocks, title, sheet number and scales shown. Yes ____ No ____ N/A ____

4. Each sheet must bear the seal of a Licensed Professional Engineer, signature, and date. Yes ____ No ____ N/A ____

5. Street names on each sheet. Yes ____ No ____ N/A ____

6. Property owners and property lines shown. Yes ____ No ____ N/A ____

7. Submit four (4) sets of plans for review on 22" x 34" sheets. Yes ____ No ____ N/A ____

8. Prepare plans on 22" x 34" sheets allowing for half size reduction to 11" x 17". Yes ____ No ____ N/A ____

9. Text shall be legible on the half size 11" x17" plans. Yes ____ No ____ N/A ____

10. Place standard general notes on plans. Yes ____ No ____ N/A ____

11. Existing, proposed and future facilities must clearly be defined. Yes ____ No ____ N/A ____

12. Project name on right end of plan sheets. Yes ____ No ____ N/A ____

COVER SHEET * - The cover sheet shall include:

1. Project title and type of project. Yes ____ No ____ N/A ____
2. Location map. Yes ____ No ____ N/A ____
3. Disposal site for excess excavation. Yes ____ No ____ N/A ____
4. Index of Sheets (if not included on its own sheet). Yes ____ No ____ N/A ____
5. Approval blocks for Town including Town Engineer and Director of Public Works. Yes ____ No ____ N/A ____
6. Professional Engineer's seal, signature and date. Yes ____ No ____ N/A ____
7. "Release for Construction" note. Yes ____ No ____ N/A ____

* NOTE: If the Cover Sheet is not furnished, information should appear on other sheets.

GRADING * – Each grading plan shall include:

1. Horizontal scale for grading plans shall be at 1" = 20' on full size drawings. Yes ____ No ____ N/A ____
2. Existing one-foot contours based on an on-the-ground survey or controlled aerial topographic map (dashed lines and labeled) to extend 20 feet from property line onto adjacent property. Yes ____ No ____ N/A ____
3. Proposed one-foot contours – solid lines and labeled. Yes ____ No ____ N/A ____
4. Show top of curb elevation every 50 feet on streets, alleys, existing and proposed parking lots. Yes ____ No ____ N/A ____
5. Slope:
   a. Back of street curb to property line: ¼" per foot. Yes ____ No ____ N/A ____
   b. Parking lot top of curb to property line: Maximum 4 (horizontal) to 1 (vertical). Yes ____ No ____ N/A ____
   c. Any unpaved area to property line: Maximum slope of 4:1. Yes ____ No ____ N/A ____
   d. Show driveways with ¼" per foot + 6" from street gutter up to property line. Yes ____ No ____ N/A ____
6. Letter of approval if grading is proposed on adjacent property. Yes ____ No ____ N/A ____

7. Utility easement from abutting property owners. Yes ____ No ____ N/A ____

8. Proposed inlets, label and size. Yes ____ No ____ N/A ____

9. Proposed pipes, label and size. Yes ____ No ____ N/A ____

10. Existing inlets and pipes. Yes ____ No ____ N/A ____

* NOTE: Add statement that grading only is being submitted with these plans.

DRAINAGE – Design of Drainage Systems shall include:

1. Runoff calculations for all areas showing:

   a. Acreage. Yes ____ No ____ N/A ____

   b. Runoff Coefficient. Yes ____ No ____ N/A ____

   c. Inlet Time. Yes ____ No ____ N/A ____

   d. 25-year and 100-year intensities. Yes ____ No ____ N/A ____

2. Rational Method calculation for area less than 200 acres. Yes ____ No ____ N/A ____

3. Unit Hydrograph Method for areas greater than 200 acres. Yes ____ No ____ N/A ____

4. Statement that drainage from the abutting property will not be impaired by the proposed grading. Yes ____ No ____ N/A ____

5. Emergency overflow for 100-year storm at low points or design for 100-year storm. Yes ____ No ____ N/A ____

6. No diversion of drainage. Yes ____ No ____ N/A ____

7. Drainage Area Map:

   a. 1" = 200' or less with match lines between any two or more maps. Yes ____ No ____ N/A ____

   b. Show existing and proposed storm drains and inlets. Yes ____ No ____ N/A ____

   c. Calculate sub areas for each inlet and point of analysis. Yes ____ No ____ N/A ____

   d. Provide existing and proposed two foot contours on map for on and offsite. Yes ____ No ____ N/A ____

e. Indicate zoning on drainage area. Yes ____ No ____ N/A ____

f. Calculate discharge at all inlets, dead-end streets and alleys or to adjacent additions or acreage. Yes ____ No ____ N/A ____

g. Calculations of:

1) Spread of water. Yes ____ No ____ N/A ____

2) Inlets. Yes ____ No ____ N/A ____

3) Street capacity. Yes ____ No ____ N/A ____

4) ROW capacity. Yes ____ No ____ N/A ____

5) Hydraulic grade line for conduits. Yes ____ No ____ N/A ____

h. For cumulative runoff, show calculations. Yes ____ No ____ N/A ____

i. Define all crests, sags and streets and alley intersections with flow arrows. Yes ____ No ____ N/A ____

8. Curbs for alleys where capacity is exceeded. Yes ____ No ____ N/A ____

9. Storm water from streets does not flow into alleys or drives. Yes ____ No ____ N/A ____

10. Offsite drainage or discharge to downstream property will require a letter of permission and/or easements. Yes ____ No ____ N/A ____

11. Discharge does not adversely affect downstream property. Yes ____ No ____ N/A ____

PAVING PLAN – Each Paving Plan shall include:

1. Horizontal scale for paving plans shall be at 1" = 20' on full size drawings. Yes ____ No ____ N/A ____

2. Right-of-way, street, alley, drives and sidewalks dimensioned. Yes ____ No ____ N/A ____

3. Centerline stations shown. Yes ____ No ____ N/A ____

4. Limits of work defined. Yes ____ No ____ N/A ____

5. Barrier free ramps at all intersections. Yes ____ No ____ N/A ____

6. Pavement transitions. Yes ____ No ____ N/A ____

7. Traffic control items; striping, traffic buttons, sign. Yes ____ No ____ N/A ____

8. Street lighting. Yes ____ No ____ N/A ____

9. Concrete pavement thickness. Yes ____ No ____ N/A ____

10. 3,600 psi in 28 days concrete compressive strength. Yes ____ No ____ N/A ____

11. 6" curbs. Yes ____ No ____ N/A ____

12. Reinforcement with No. 4 bars 24" o.c. both ways. Yes ____ No ____ N/A ____

13. Sidewalks to be 4" thick, 3,600 psi in 28 days, reinforced with No. 3 bars 14" O.C.E.W. Yes ____ No ____ N/A ____

14. Expansion joints at intersection and at minimum 600 foot intervals for pavement. Yes ____ No ____ N/A ____

15. Saw cut at 15-, 17.5- and 20-foot intervals for 6-inch, 7-inch and 8-inch pavements respectively. Yes ____ No ____ N/A ____

16. Radius at corners conform to Table II-2. Yes ____ No ____ N/A ____

17. Gutter flow arrows. Yes ____ No ____ N/A ____

18. Roadways comply with thoroughfare plan. Yes ____ No ____ N/A ____

19. Geometrics meet design speed criteria. Yes ____ No ____ N/A ____

20. Is Superelevation required? Yes ____ No ____ N/A ____

21. Retaining Walls:

    a. Type, beginning and ending locations and wall elevations. Yes ____ No ____ N/A ____

    b. Provide design if non-standard or modified. Yes ____ No ____ N/A ____

    c. Drainage behind walls shown. Yes ____ No ____ N/A ____

22. Driveway grades shown. Yes ____ No ____ N/A ____

23. Prepare plans and necessary forms for TDLR plans review and field inspection. Yes ____ No ____ N/A ____

24. Developer to pay for all review and inspection fees. Yes ____ No ____ N/A ____

PAVING PROFILES AND GRADES – Plans shall include:

1. Vertical scale for paving profiles shall be at 1" = 4' on full size drawings. Yes ____ No ____ N/A ____
2. Profiles plotted showing ground at proposed property line. Yes ____ No ____ N/A ____
3. Top of curb profiles must meet minimum and maximum grade requirements. Yes ____ No ____ N/A ____
4. Driveway profile grades. Yes ____ No ____ N/A ____
5. Vertical curves must be designed in accordance with Table II-5. Yes ____ No ____ N/A ____
6. Contour grading plans for major intersections. Yes ____ No ____ N/A ____
7. Spot top of curb elevations in plan view on proposed left turn lanes. Yes ____ No ____ N/A ____
8. Check carefully for any place water might pond. Are inlets located at sag points or vertical curves? Yes ____ No ____ N/A ____
9. Are grades, crossfall, slopes, etc., consistent with information shown on typical section? Yes ____ No ____ N/A ____
10. Check ends of project for drainage. If gutters drain to ditches or field type inlets, are grades and profiles shown? Yes ____ No ____ N/A ____
11. Minimum grades maintained to assure complete drainage. Yes ____ No ____ N/A ____

CLOSED CONDUIT STORM DRAINS – All storm drain plans shall include:

1. Horizontal scale for storm drain profiles shall be at 1" = 20' on full size drawings. Yes ____ No ____ N/A ____
2. Vertical scale for storm drain profiles shall be at 1" = 4' on full size drawings. Yes ____ No ____ N/A ____
3. Plan and profile of all proposed storm drains. Yes ____ No ____ N/A ____
4. Station of laterals on trunk profile. Yes ____ No ____ N/A ____
5. Plan view of each area showing
   a. Size of inlet. Yes ____ No ____ N/A ____
   b. Lateral size. Yes ____ No ____ N/A ____

c. Flow line. Yes ____ No ____ N/A ____

d. Paving station. Yes ____ No ____ N/A ____

e. Top of curb elevation. Yes ____ No ____ N/A ____

6. Details of all non-standard items. Yes ____ No ____ N/A ____

7. Curve data for storm drains. Yes ____ No ____ N/A ____

8. Property lines and easements with dimensions. Yes ____ No ____ N/A ____

9. Class III RCP required for all storm drain in public rights of way. Yes ____ No ____ N/A ____

10. Concrete cushion. Yes ____ No ____ N/A ____

11. Plot hydraulic grade line (HGL). Yes ____ No ____ N/A ____

12. Storm drain discharge at flow line of creek or channel and use rip-rap. Show coincident water surface of outfall. Yes ____ No ____ N/A ____

13. Headwalls and erosion control at outfall of storm drains. Yes ____ No ____ N/A ____

14. Laterals connected at 45 or 60 degree angle. Yes ____ No ____ N/A ____

15. Matching pipe centerline at connection. Yes ____ No ____ N/A ____

16. 3600 psi in 28 days for structural concrete strength. Yes ____ No ____ N/A ____

17. Existing and proposed utilities in plan and profile. Yes ____ No ____ N/A ____

18. On profile indicate:

a. Grade. Yes ____ No ____ N/A ____

b. Flow line elevations every station. Yes ____ No ____ N/A ____

c. Existing and proposed ground line. Yes ____ No ____ N/A ____

d. Hydraulic grade line and data. Yes ____ No ____ N/A ____

19. Show sizes in plan and profile. Yes ____ No ____ N/A ____

20. Show computations for existing system when connecting to existing storm drain. Yes ____ No ____ N/A ____

21. Velocities and hydraulic gradients conform to Design Manual. Yes ____ No ____ N/A ____

22. Inlets and conduits properly sized. Yes ____ No ____ N/A ____

23. Storm drain inlet and outlet velocity calculations. Yes ____ No ____ N/A ____

CREEKS AND CHANNELS – Plans of creeks and channels shall include:

1. Horizontal scale for plan views shall be at 1" = 20' on full size drawings. Yes ____ No ____ N/A ____

2. Vertical scale for profile views shall be at 1" = 4' on full size drawings. Yes ____ No ____ N/A ____

3. Stationing in plan and profile. Yes ____ No ____ N/A ____

4. Profiles indicating:

   a. Existing flow line. Yes ____ No ____ N/A ____

   b. High banks. Yes ____ No ____ N/A ____

   c. Hydraulic profile and data. Yes ____ No ____ N/A ____

   d. Rock line. Yes ____ No ____ N/A ____

5. Hydraulic Computations.

   a. 100-year discharge Yes ____ No ____ N/A ____

   b. Velocity Yes ____ No ____ N/A ____

   c. Critical depth Yes ____ No ____ N/A ____

   d. Manning's "n" Yes ____ No ____ N/A ____

   e. Design grade for improved channels Yes ____ No ____ N/A ____

6. Cross sections as relative to property line. Yes ____ No ____ N/A ____

7. Erosion control. Yes ____ No ____ N/A ____

8. Compacted fill where fill required. Yes ____ No ____ N/A ____

9. Design velocities not greater than original stream velocities or greater than stated in Design Manual. Yes ____ No ____ N/A ____

10. Maximum side slope on earthen channels not greater than 4:1. Yes ____ No ____ N/A ____

BRIDGES – Plans of bridges shall include:

1. Lowest member of bridge 2 feet above design water surface elevation. Yes ____ No ____ N/A ____
2. Soil Borings on plans. Yes ____ No ____ N/A ____
3. Soils report. Yes ____ No ____ N/A ____
4. Channel sections upstream and downstream. Yes ____ No ____ N/A ____
5. Structural details and calculations with dead load deflection diagram. Yes ____ No ____ N/A ____
6. Vertical and horizontal alignment. Yes ____ No ____ N/A ____
7. Bridge cross section. Yes ____ No ____ N/A ____
8. Hydraulic calculations on all sections. Yes ____ No ____ N/A ____

WATER – All water distribution and transmission facilities shall include:

1. Horizontal scale for plan views shall be at 1" = 20' on full size drawings. Yes ____ No ____ N/A ____
2. Vertical scale for profile views shall be at 1" = 4' on full size drawings. Yes ____ No ____ N/A ____
3. Minimum 8" for main lines. Yes ____ No ____ N/A ____
4. DR 18 Class 150 PVC all water mains less than or equal to 24-inch diameter. Yes ____ No ____ N/A ____
5. Loop water mains. Yes ____ No ____ N/A ____
6. Valves on fire hydrant leads. Yes ____ No ____ N/A ____
7. Valves on main lines between each fire hydrant. Yes ____ No ____ N/A ____
8. Maximum distance between each fire hydrant.
   a. Residential – 500' c-c on street. Yes ____ No ____ N/A ____
   b. Multifamily – 400' c-c on street. Yes ____ No ____ N/A ____
   c. Office, retail, commercial, industrial 300' c-c on street. Yes ____ No ____ N/A ____
9. All portions of building within 300' radius of a fire hydrant in commercial. Yes ____ No ____ N/A ____

10. All portions of building within 400' radius of a fire hydrant in multifamily. Yes ____ No ____ N/A ____

11. All portions of buildings within 500' radius of a fire hydrant in single family and duplex residential. Yes ____ No ____ N/A ____

12. Maximum length non-looped line serving a fire hydrant is 150 feet. Yes ____ No ____ N/A ____

13. Lateral service (min. 1" copper) from main line to two feet from back of curb at center of lot in residential subdivisions. Yes ____ No ____ N/A ____

14. Water main extended to opposite property line or tied to existing main. Yes ____ No ____ N/A ____

15. Profile mains 12" and larger. Yes ____ No ____ N/A ____

16. Show other utility lines crossing wastewater lines. Yes ____ No ____ N/A ____

17. Show location of water meters:

    a. Domestic. Yes ____ No ____ N/A ____

    b. Irrigation. Yes ____ No ____ N/A ____

    c. Fire line. Yes ____ No ____ N/A ____

18. Show size of water meters. Yes ____ No ____ N/A ____

19. Note minimum pipe covers (attach water and standard details and general notes). Yes ____ No ____ N/A ____

20. Dedicate water line easements up to and including fire hydrants and water meters for lines off ROW. Yes ____ No ____ N/A ____

WASTEWATER – All wastewater plans shall include:

1. Horizontal scale for plan views shall be at 1" = 20' on full size drawings. Yes ____ No ____ N/A ____

2. Vertical scale for profile views shall be at 1" = 4' on full size drawings. Yes ____ No ____ N/A ____

3. 8" minimum, PVC SDR-35 (unless 6-inch approved by Town). Yes ____ No ____ N/A ____

4. Manhole at end of all lines. Yes ____ No ____ N/A ____

5. Manholes at change of pipe size, tees and bends. Yes ____ No ____ N/A ____

6. 500' maximum distance between manholes on lines 21" and smaller. 800' maximum distance between manholes on lines 24" and larger. Yes ____ No ____ N/A ____

7. Minimum slopes:

   a. 6" – 0.50% (Pipe size as approved by Town). Yes ____ No ____ N/A ____

   b. 8" – 0.33%. Yes ____ No ____ N/A ____

   c. 10" – 0.25%. Yes ____ No ____ N/A ____

   d. 12" – 0.20%. Yes ____ No ____ N/A ____

   e. 15" – 0.14%. Yes ____ No ____ N/A ____

   f. 18" – 0.12%. Yes ____ No ____ N/A ____

8. Maximum slope such that velocity is less than 10 fps. Yes ____ No ____ N/A ____

9. Sewer laterals 10' downstream from water service or to center of lot. Yes ____ No ____ N/A ____

10. Minimum lateral size:

    a. Residential, 4". Yes ____ No ____ N/A ____

    b. Apartment, retail or commercial – 6". Yes ____ No ____ N/A ____

    c. Manufacturing or industrial – 8". Yes ____ No ____ N/A ____

11. Profile all sewer lines except laterals. Yes ____ No ____ N/A ____

12. Show other utility lines crossing wastewater lines. Yes ____ No ____ N/A ____

13. Label lines to correspond to profile. Yes ____ No ____ N/A ____

14. Concrete encasement at creek crossing. Yes ____ No ____ N/A ____

15. Provide stub outs to adjacent property. Add services for Planned Development Communities. Yes ____ No ____ N/A ____

16. Note benchmark on all sheets. Yes ____ No ____ N/A ____

17. 10' utility easement provided for lines not in ROW. Yes ____ No ____ N/A ____

UTILITIES – All plans shall show the following:

1. Existing and proposed facilities shown in plan and profiles views. Yes ____ No ____ N/A ____

2. Underground facilities close to or in conflict with proposed construction located by actual ties and elevations. Yes ____ No ____ N/A ____

3. Caution notes shown when construction operations come close to existing utilities. Telephone number of utility contact shall be shown. Yes ____ No ____ N/A ____

EROSION CONTROL – All plans shall show the following:

1. The scale for Erosion Control Plans may vary however shall be prepared on sheets no smaller than 1" = 100' on full size drawings. Yes ____ No ____ N/A ____

2. Existing and Proposed Grading. Yes ____ No ____ N/A ____

3. Existing and Proposed Drainage Features. Yes ____ No ____ N/A ____

4. Erosion features including temporary construction entrance, silt fence, inlet protection, rock berms, seeding, etc. Yes ____ No ____ N/A ____

5. Erosion control standard details. Yes ____ No ____ N/A ____

PAVEMENT MARKINGS AND SIGNAGE

1. The scale for Pavement Marking Plans may vary however shall be prepared on sheets no smaller than 1" = 100' on full size drawings. Yes ____ No ____ N/A ____

2. Pavement Markings and Signage Plan in accordance with MUTCD. Yes ____ No ____ N/A ____

3. Pavement Markings Standard Details. Yes ____ No ____ N/A ____

TRAFFIC CONTROL PLAN

1. The scale for Traffic Control Plans may vary however shall be prepared on sheets no smaller than 1" = 200' on full size drawings. Yes ____ No ____ N/A ____

2. Traffic Control Plan in accordance with MUTCD. Yes ____ No ____ N/A ____

3. Traffic Control Standard Details. Yes ____ No ____ N/A ____

4. Traffic Control Phasing as necessary. Yes ____ No ____ N/A ____

LANDSCAPE AND IRRIGATION PLANS

1. The scale for Landscape and Irrigation Plans may vary however shall be prepared on sheets no smaller than 1" = 100' on full size drawings. Yes ____ No ____ N/A ____

2. Landscape Plan showing rights-of-way and proposed back of curbs, sidewalk, existing; and proposed utilities and other features pertinent to the plan. Yes ____ No ____ N/A ____

3. Planting details. Yes ____ No ____ N/A ____

4. Irrigation Plans including metering, back flow prevention, and provision for electrical service and controllers. Yes ____ No ____ N/A ____

5. Irrigation details. Yes ____ No ____ N/A ____

STREET LIGHTING

1. The scale for Street Lighting Plans may vary however shall be prepared on sheets no smaller than 1" = 100' on full size drawings. Yes ____ No ____ N/A ____

1. Lighting and Conduit Layout Plan. Yes ____ No ____ N/A ____

2. Lighting Standard Details. Yes ____ No ____ N/A ____

APPENDIX "D"

STANDARD CONSTRUCTION

DETAILS REVISION DATE:

SEPTEMBER 2017

November 2020

SILT FENCE GENERAL NOTES

(1) STEEL POSTS WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED ON A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. POST MUST BE EMBEDDED A MINIMUM OF ONE FOOT, AND HAVE SAFETY CAPS INSTALLED.

(2) THE TOE OF THE SILT FENCE SHALL BE TRENCHED IN WITH A SPADE OR MECHANICAL TRENCHER, SO THAT THE DOWNSLOPE FACE OF THE TRENCH IS FLAT AND PERPENDICULAR TO THE LINE OF FLOW. WHERE FENCE CANNOT BE TRENCHED IN (e.g. PAVEMENT), WEIGHT FABRIC FLAP WITH ROCK ON UPHILL SIDE TO PREVENT FLOW FROM SEEPING UNDER FENCE.

(3) THE TRENCH MUST BE A MINIMUM OF 6 INCHES DEEP AND 6 INCHES WIDE TO ALLOW FOR THE SILT FENCE FABRIC TO BE LAID IN THE GROUND AND BACKFILLED WITH COMPACTED MATERIAL.

(4) SILT FENCE SHOULD BE SECURELY FASTENED TO EACH STEEL SUPPORT POST OR TO WOVEN WIRE, WHICH IN TURN IS ATTACHED TO THE STEEL FENCE POST. THERE SHALL BE A 3 FOOT OVERLAP, SECURELY FASTENED WHERE ENDS OF FABRIC MEET.

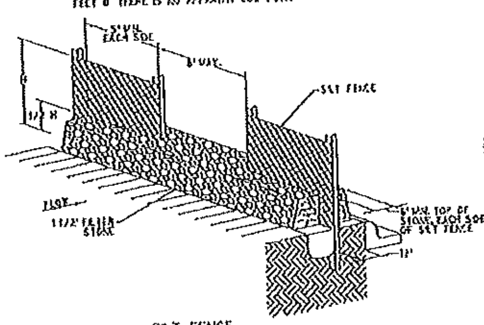
(5) INSPECTION SHALL BE MADE EVERY TWO WEEKS AND AFTER EACH RAINFALL. REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.

(6) SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED, PER NOTE 1 ON THE EROSION CONTROL DETAILS (SHEET 2 OF 2), SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

(7) ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF HALF THE HEIGHT OF THE FENCE. THE SILT SHALL BE DISPOSED OF AT AN APPROVED SITE AND IN SUCH A MANNER AS TO NOT CONTRIBUTE TO ADDITIONAL SILTATION.

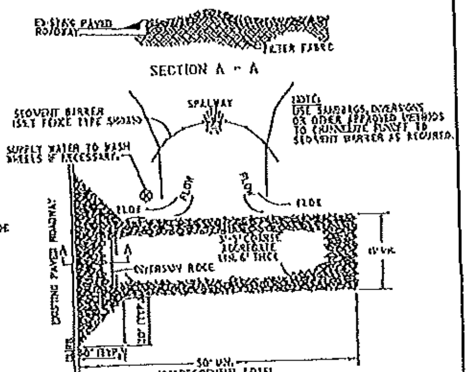
(8) CONTRACTOR IS FULLY RESPONSIBLE FOR ALL SWPPP, PERMITTING, APPROVAL, INSPECTIONS, MAINTENANCE, AND REMOVAL.

NOTE:
STONE OVERFLOW STRUCTURES OR OTHER OUTLET CONTROL DEVICES SHALL BE INSTALLED AT ALL LOW POINTS ALONG THE FENCE OR EVERY 300 FEET IF THERE IS NO APPARENT LOW POINT.

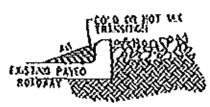


SILT FENCE
STONE OVERFLOW STRUCTURE
N.T.S.

DIVERSION RIDGE REQUIRED WHERE GRADE EXCEEDS 2%

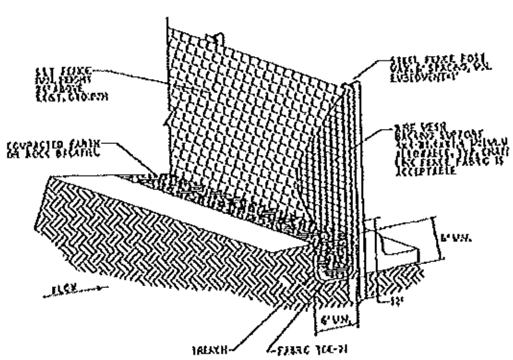


NOTE:
WHEN SEDIMENT HAS SUBSTANTIALLY CLOGGED THE VOID AREA BETWEEN THE ROCKS, THE AGGREGATE MAT MUST BE WASHED DOWN OR REPLACED. PERIODIC RE-GRADING AND TOP DRESSING WITH ADDITIONAL STONE MUST BE DONE TO KEEP THE EFFICIENCY OF THE ENTRANCE FROM DIMINISHING.



TRANSITION

TEMPORARY STONE CONSTRUCTION
ENTRANCE/EXIT
N.T.S.



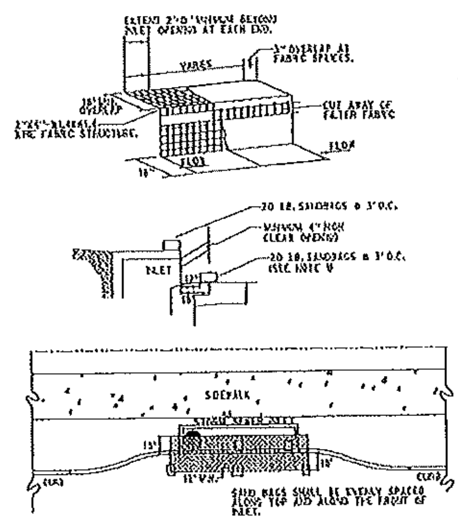
ISOMETRIC PLAN VIEW
N.T.S.

[EC-1]

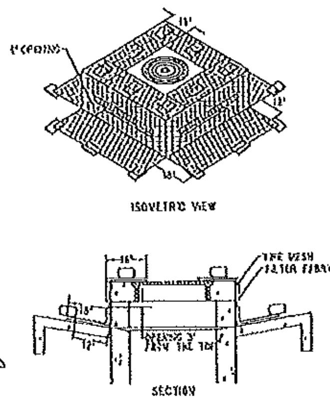
CERTIFICATION:
THIS TOWN OF ANTHONY STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT ACCEPTED FROM THE TOWN OF ANTHONY.

PAVEMENT MARKING STANDARD DETAILS
EROSION CONTROL DETAILS
(SHEET 1 OF 2)

THE TOWN OF ANTHONY
TEXAS



CURB INLET PROTECTION DETAIL
N.T.S.



FILTER FABRIC AREA INLET PROTECTION
N.T.S.

ESTABLISHMENT OF GROUND COVER

(1) Eighty percent (80%) evenly distributed ground cover, without large bare areas, shall be established after the designated areas have been completed to the lines, grades and cross sections shown on the plans and prior to final acceptance by the Town.

(2) Ground cover, for Seeding Turf Grass, shall be in accordance with the standard specifications of the Town of Annetta which has also adopted the Fourth Edition of the "Standard Specifications for Public Works Construction - North Central Texas" herein referred to as "COG" specifications. Copies may be obtained from the North Central Texas Council of Governments, 616 Six Flags Drive, Suite 200, Arlington, Texas 76005-5888, (817) 640-3300. A copy of the contract documents, plans and specifications shall be available on-site at all times by the Contractor.

(3) Refer to COG Item 202.6 specifications.

(4) Prior to planting, contractor shall provide the Town with the State of Texas Certificate stating analysis of purity and germination of seed.

(5) Planting season and application rates. All planting shall be done between the dates specified in Table 1, for each grass type except when specifically authorized in writing. The seeds planted per acre shall be of a type specified with the mixture, rate and planting dates as shown in the Table 1, or as specified by the Engineer.

Table 1. Seeding Turf Grass		
TYPE	PLANTING SEASON	SEED AND RATE
TYPE 1	MARCH THROUGH SEPTEMBER	BERMUDA GRASS, HULLED 50-LB (22.7-KG) PLS PER ACRE
TYPE 4	OCTOBER THROUGH FEBRUARY	RYE GRASS, 100-LB (45.4-KG) PLS PER ACRE COMBINED WITH BERMUDA GRASS, HULLED 20-LB (9.1-KG) PLS PER ACRE.
OTHER	AS SPECIFIED ON PLANS	AS SPECIFIED ON PLANS

(PLS = Pure Live Seed is determined by multiplying the gross weight times purity times the germination (for example, a 100-lb bag with 85% purity and 80% germination: PLS = pounds in bag x purity x germination = 100 x 0.85 x 0.8 = 68.0 lbs of pure live seed)

(6) Seeded areas shall be maintained, including watering and mowing, at such time and in a manner and quality to establish a minimum 80% evenly distributed ground cover, without large bare areas, until completion and final acceptance of the project by the Town.

NOTES:

(1) A SECTION OF FILTER FABRIC SHALL BE REMOVED AS SHOWN ON THIS DETAIL TO PROVIDE A 4-INCH MINIMUM CLEAR OPENING. FABRIC MUST BE SECURED TO WIRE BACKING WITH CLIPS OR HOG RINGS AT THIS LOCATION.

(2) INSPECTION SHALL BE MADE BY THE CONTRACTOR AND SILT ACCUMULATION MUST BE REMOVED WHEN DEPTH REACHES 2 INCHES.

(3) CONTRACTOR SHALL MONITOR THE PERFORMANCE OF INLET PROTECTION DURING EACH RAINFALL EVENT AND IMMEDIATELY REMOVE THE INLET PROTECTIONS IF THE STORM-WATER BEGINS TO OVERTOP THE CURB.

(4) INLET PROTECTIONS SHALL BE REMOVED AS SOON AS THE SOURCE OF SEDIMENT IS STABILIZED.

INLET OPENING	MINIMUM NUMBER OF SAND BAGS	
	TOP	FRONT
5'	2	3
10'	2	3
15'	3	4
20'	4	5

CERTIFICATION:
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EC-2

PAVEMENT MARKING STANDARD DETAILS

EROSION CONTROL DETAILS
(SHEET 2 OF 2)

THE TOWN OF ANNETTA
TEXAS

DESIGN	DRAWN	CHECK	DATE	SCALE	FILE	NO.
[illegible]	[illegible]	[illegible]	[illegible]	N.T.S.	EC-2	—

GENERAL CONSTRUCTION NOTES:

PRE-CONSTRUCTION
1. Contractor shall notify Public Works Director ([illegible]) [illegible] days minimum before beginning work on this project.
2. Contractor shall attend a pre-construction meeting before beginning work on this project.
3. Developer shall [illegible] the type of Street Light pole or poles to be installed for the proposed project site.

FOUNDATIONS
1. Dimensions shown on plans for locations of street light foundations, conduit and other lines may be varied to meet field conditions; subject to approval of Town Engineer.
2. Contractor shall contact the Town for inspections prior to pouring street light foundations and excavating for conduit runs.
3. No street light poles shall be placed on foundations prior to seven days following placement of concrete.
4. Contractor shall clean up and remove all waste material resulting from construction operations.
5. Street light pole foundations shall be ([illegible]) [illegible] P.S.I.) concrete.
6. All foundations shall be 24 inches in diameter unless shown otherwise.
7. Foundation piers shall be drilled plus the top of foundation poured level, the top 3 inches of the exposed pier out[illegible] above finished grade shall have the [illegible] removed.
8. Top of foundation shall be 3 inches above the finished grade unless shown different on plans.
9. Anchor bolts [illegible] extend above the top of the foundation concrete as shown on Anchor Bolt Detail.
10. Anchor bolts, ground rod, all reinforcing and conduit shall be in place before pouring concrete in pier foundations.
11. Pier foundations shall have one continuous concrete pour.
12. Street light foundations shall have a chamfered edge [illegible] at the top, see foundation details on sheet [illegible].

FOUNDATION PLACEMENT
1. Foundations in medians shall be placed in the center of the median.
2. Foundations shall not be placed within 3 feet of a water line or Fire Hydrant.
3. In residential areas foundations shall be placed in the street right of way [illegible] in line with the property line between lots and at the back of the curb point of the street curb at street intersections.
4. Foundations shall not be placed in [illegible] for location of future [illegible] or [illegible] ramps.

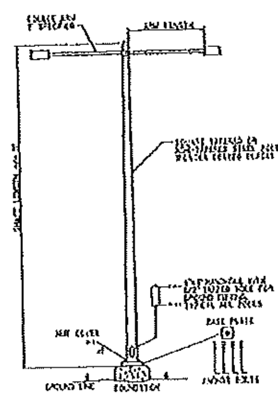
CONCRETE POURS
Contractor shall notify the Public Works Director ([illegible]) or his designated inspector in advance ([illegible]) of all concrete pours. Inspector must be present when concrete is placed on the project site.

EXISTING UTILITIES
1. Approximate location of known underground utilities has been shown on the plan sheets for the project. The Engineer assumes no responsibility for the accuracy of the utility locations shown on the plans.
2. It is Contractor's responsibility to make arrangements with the owners of underground facilities prior to working in the area to confirm their exact location and to determine whether any additional facilities other than those shown on the plans may be present. The Contractor shall preserve and protect all underground facilities.
3. Contractor shall be responsible for the following at no additional cost to the Town:
   3.1 Preventing any property damage to property owner's [illegible], fences, shrubs, mailboxes, etc. Any damaged property will be restored as directed by Director of Public Works.
   3.2 Landscaping and Sprinkler System - the contractor shall adjust and repair any existing landscaping and the sprinkler systems as directed by the Director of Public Works to allow for the placement of all street light equipment. This shall be done in a manner equal to or better than the areas adjacent to the disturbed areas.
   3.3 Providing access to all driveways during construction.
   3.4 Protection of underground and overhead utilities and repair any damages.
4. No additional payment will be made for relocation of any foundations or conduit due to location of existing utilities.
5. Texas State Law, Article [illegible], makes unlawful the operation of equipment or machines within 10 feet of any overhead electrical line unless danger against contact with high voltage overhead lines has been effectively guarded against pursuant to the provisions of the article. When construction operations require working near an overhead electrical line, the contractor shall contact the owner/operator of the overhead electrical line to make adequate arrangements and to take necessary safety precautions to ensure that all laws, electrical line owner/operator requirements and standard industry safety practices are met.
6. If any item of [illegible] water or sewer utility is in the vicinity of a proposed pole foundation (within 3.0 feet), then the Contractor will [illegible] to uncover the line and verify that the proposed pole foundation location is satisfactory. The Contractor shall be liable for all damages and restoration to utilities as a result of his/her operations.

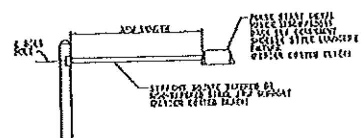
DRAINAGE
Any obstruction to existing drainage due to Contractor's operations shall be corrected by the contractor as required by the Public Works Director at the Contractor's expense.

PERMITS
Contractor shall obtain and pay for all permits as required to work in Town right-of-way.

ELECTRICAL
1. All conduit under ground shall be 2 inch schedule 40 PVC and placed 24 inches to 36 inches deep.
2. Conduit above ground shall be 2 inch rigid galvanized metal.
3. Conduit shall be installed in a trench free of rocks that would damage the conduit and first 2 inches of backfill shall be free of rocks.
4. All conduit shall start or end in a ground box, foundation or at a transformer pad along with a 1/4 inch poly line (pull string) with a break strength of 500 pounds or more.
5. Each change of direction in the conduit run requires a ground box [illegible].
6. The unit of measure for conduit placement is the straight line distance between ground boxes, foundations or transformer pads.
7. Conduit shall be placed [illegible] on easement or street right-of-way as shown on the plans. When placed in easements, the location of conduit shall be [illegible] inches off [illegible] to avoid being damaged by fence post placement.
8. All electrical conduit, wiring, electrical connections, etc. shall be installed according to the National Electric Code.



SINGLE PIECE STEEL POLE SHAFT



STREET CLASSIFICATION	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

LUMINAIRE SUPPORT ARM

L-1

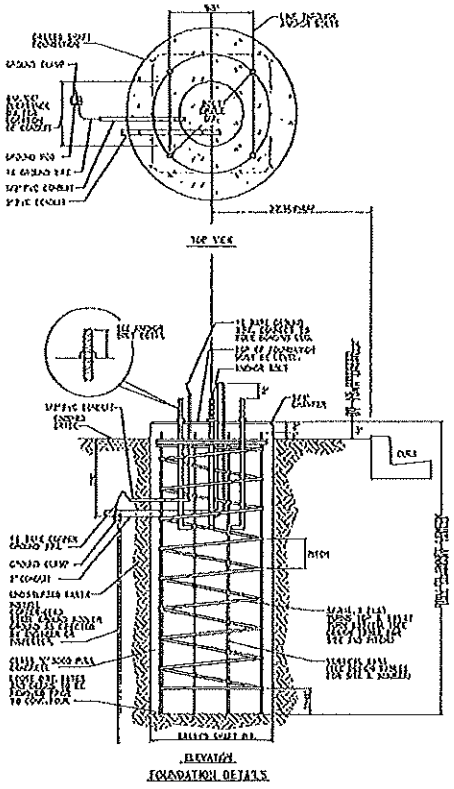
CERTIFICATION:
THE TOWN OF [illegible] STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THE ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF [illegible].

STREET LUMINAIRE

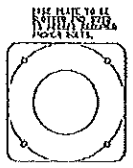
POLE DETAILS & GENERAL NOTES

THE TOWN OF [illegible]
TEXAS

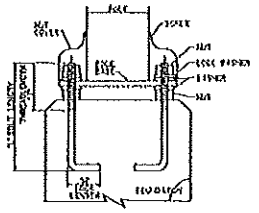
[illegible]	[illegible]	[illegible]	[illegible]	SCALE	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	N.T.S.		—



ELEVATION
FOUNDATION DETAILS



POLE BASE PLATE



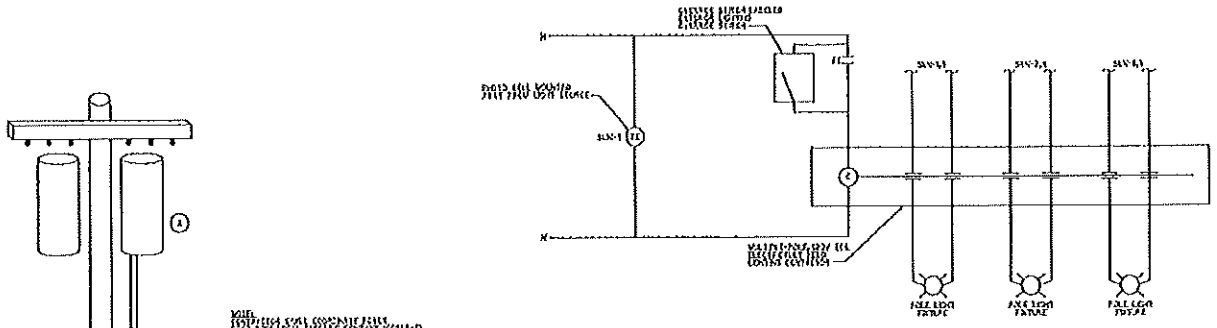
ANCHOR BOLT DETAIL

STREET LUMINAIRE

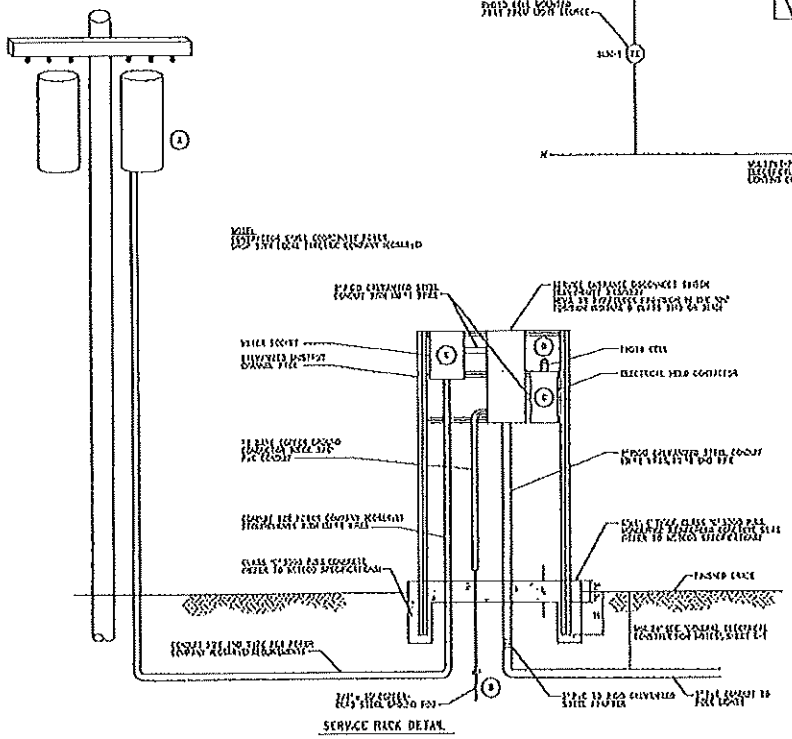
POLE FOUNDATION DETAILS

THE TOWN OF ANNETTA
TEXAS

E-2



OUTDOOR LIGHTING CONTROL SCHEMATIC



SERVICE RACK DETAIL

(A) [illegible]

(B) [illegible]

(C) [illegible]

(D) [illegible]

(E) [illegible]

L-3

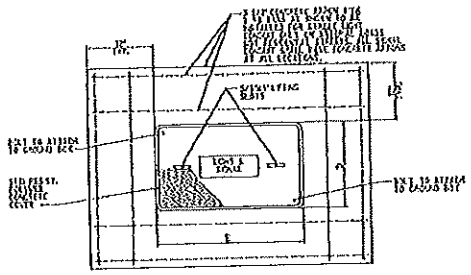
CERTIFICATION:
THIS SEAL OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ANNETTA PUBLIC WORKS DEPARTMENT. ALL ITEMS ON THIS SHEET, THIS ENGINEER IS ALSO CONFIRMING THAT THE CONTENT OF THE DETAILS AND NOTES OF THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

STREET LUMINAIRE

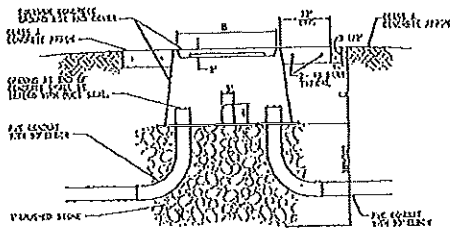
ELECTRICAL CONNECTION DETAILS

THE TOWN OF ANNETTA
TEXAS

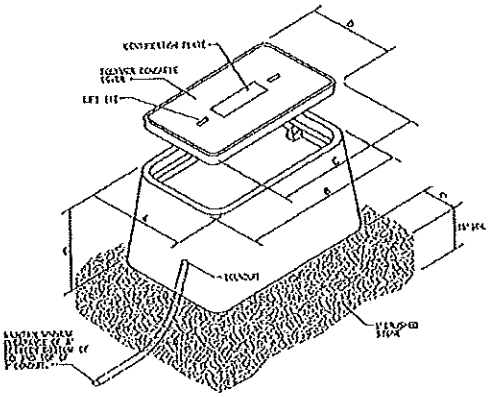
DESIGN	DRAWN	CHECKED	DATE	SCALE	FILE	NO.
[illegible]	[illegible]	[illegible]	[illegible]	N.T.S.		

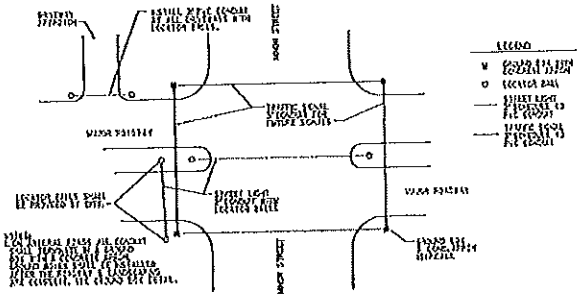


COVER



DIMENSIONS OF BOX AND
ACCOMPANYING FIELD INSTALLATION





TYPICAL CONDUIT PLACEMENT
AT NEW ROAD CONSTRUCTION

L-1

GROUND BOX DETAIL
(FULL SIZE)

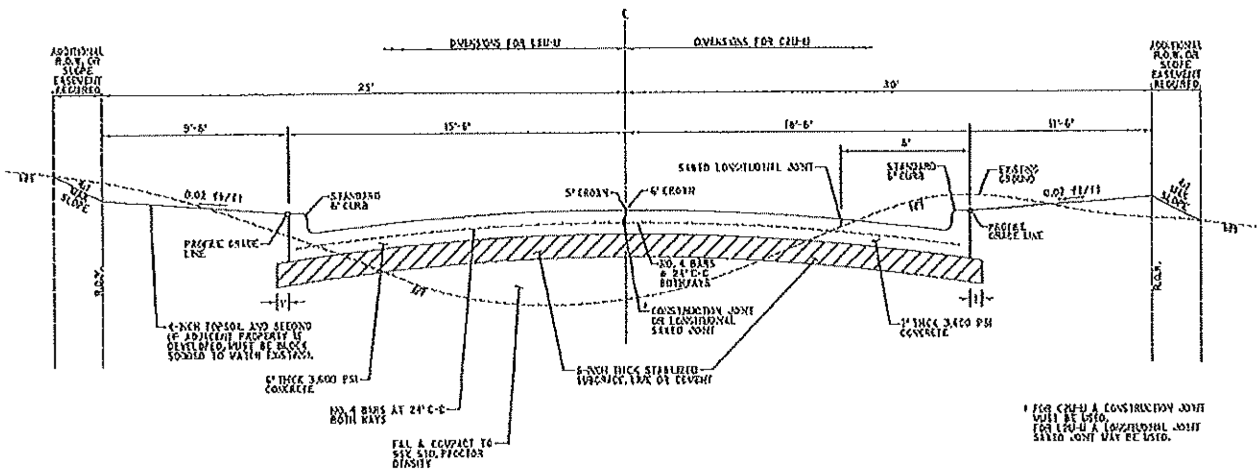
CERTIFICATION

THIS SEAL OF ANNETTA
STANDARD DETAIL SHEET
IS INDICATED FOR USE
IN THIS PROJECT BY THE
ENGINEER WHOSE SEAL
APPEARS ON THIS SHEET.
THIS ENGINEER IS ALSO
CERTIFYING THAT THE
CONTENT OF THE DETAILS
AND NOTES ON THIS SHEET
HAVE NOT BEEN ALTERED
FROM THAT RECEIVED FROM
THE TOWN OF ANNETTA.

STREET LUMINAIRE

CONDUIT & GROUND BOX DETAILS

THE TOWN OF ANNETTA
TEXAS



REINFORCED CONCRETE PAVING STANDARDS
LOCAL RESIDENTIAL & COLLECTOR STREETS - URBAN
L2U-U & C2U-U

N.T.S.

P-1

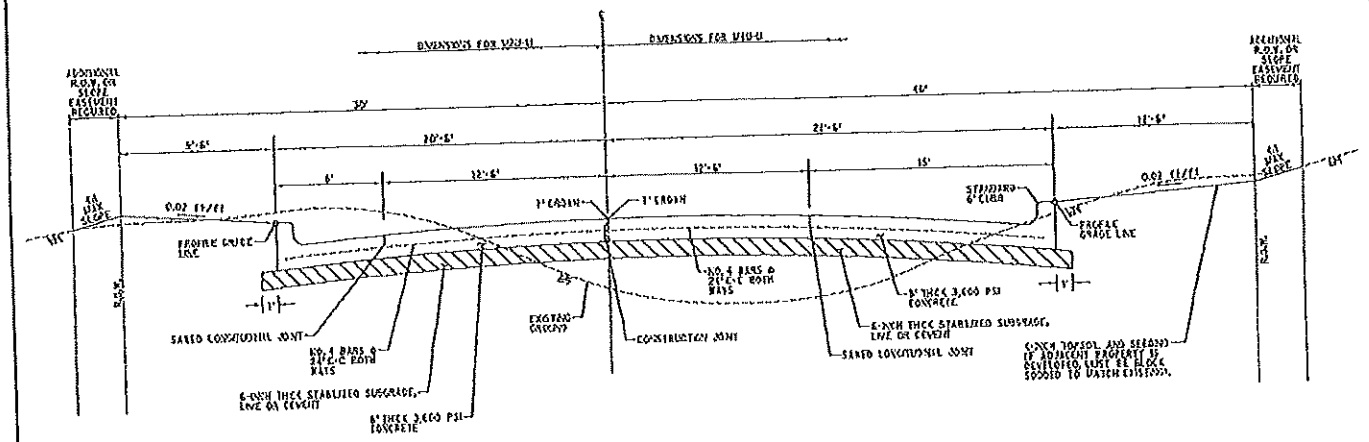
NOTES:
1. L2U-U IS SHOWN ON LEFT SIDE OF DRAWING AND C2U-U IS SHOWN ON RIGHT SIDE OF DRAWING.
2. ALL DIMENSIONS TO CURB ARE SHOWN TO THE BACK OF CURB.
3. SEE SIDEWALK DETAILS FOR SIDEWALK LOCATIONS.

CERTIFICATION.
THIS TOWN OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

PAVEMENT DETAILS

LOCAL RESIDENTIAL & COLLECTOR STREETS - URBAN

THE TOWN OF ANNETTA
TEXAS



REINFORCED CONCRETE PAVING STANDARDS
UNDIVIDED MINOR ARTERIALS - M2U-U & M4U-U

N.T.S.

P-2

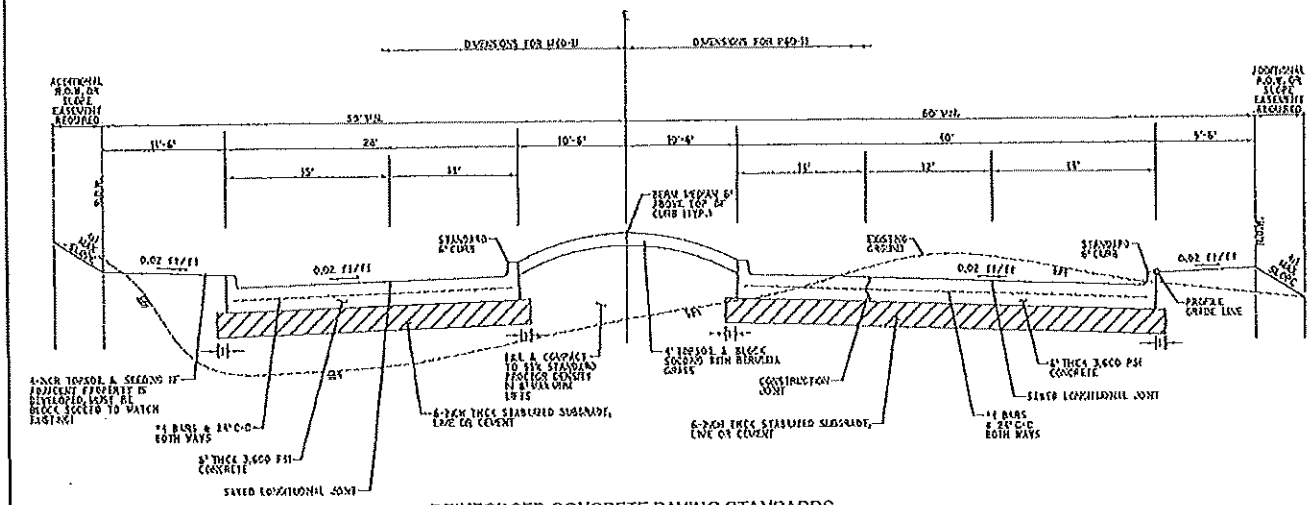
NOTES:
1. M2U-U IS SHOWN ON LEFT SIDE OF DRAWING AND M4U-U IS SHOWN ON RIGHT SIDE OF DRAWING.
2. ALL DIMENSIONS TO CURB ARE SHOWN TO THE BACK OF CURB.
3. SEE SIDEWALK DETAILS FOR SIDEWALK LOCATIONS.

CERTIFICATION:
THIS TOWN OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE UNDERSIGNED DULY SEAL APPEARS ON THIS SHEET. THE ENGINEER IS ALSO CERTIFYING THAT THE CONTENTS OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECORDED WITH THE TOWN OF ANNETTA.

PAVEMENT DETAILS
UNDIVIDED MINOR ARTERIALS - URBAN

THE TOWN OF ANNETTA
TEXAS

DESIGN	DRAWN	CHECK	DATE	SCALE	JOB	NO.
[illegible]	[illegible]	[illegible]	[illegible]	N.T.S.	P-2	—



REINFORCED CONCRETE PAVING STANDARDS
DIVIDED ARTERIALS - M4D-U & P6D-U

N.T.S.

P3

NOTES:
1. M6D-U IS SHOWN ON LEFT SIDE OF DRAWING AND P6D-U IS SHOWN ON RIGHT SIDE OF DRAWING.
2. ALL DIMENSIONS TO CURB ARE SHOWN TO THE FACE OF CURB.
3. SEE SIDEWALK DETAILS FOR SIDEWALK LOCATIONS.

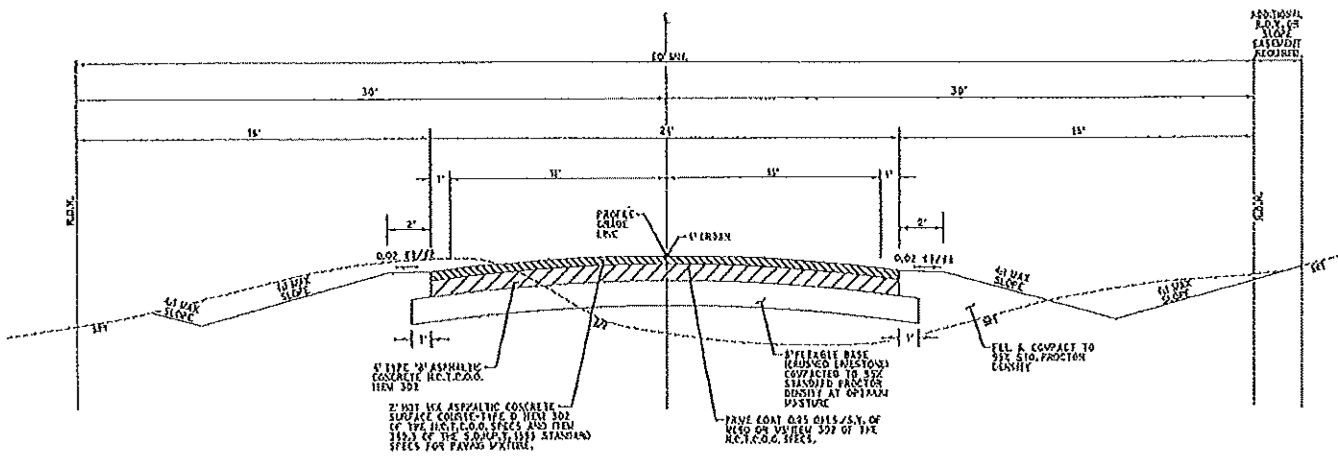
CERTIFICATION:
THIS TOWN OF ANNETTA STANDARD DETAIL SHEET IS APPROVED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECORDED FOR THE TOWN OF ANNETTA.

PAVEMENT DETAILS

DIVIDED ARTERIALS - URBAN

THE TOWN OF ANNETTA
TEXAS

DESIGN	DRAWN	CHECK	DATE	SCALE	FILE	JOB
XXXX	XXXX	XXXX	MAY XX	N.T.S.	P-3	



L2U-R LOCAL RESIDENTIAL - RURAL ASPHALT PAVEMENT OPTION

N.T.S.

NOTES:
1. ALL UTILITIES AND SIDEWALKS ARE TO BE PLACED IN A MINIMUM 10' SIDEWALK & UTILITY EASEMENT OUTSIDE OF RIGHT-OF-WAY.

2. SEE SIDEWALK DETAILS FOR SIDEWALK LOCATIONS

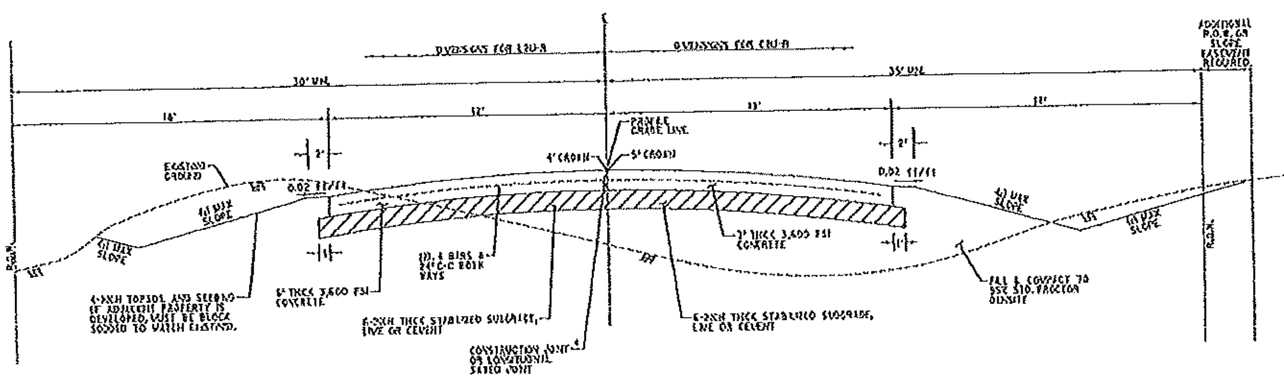
P-1

CERTIFICATION
THIS TOWN OF ANNETTA STANDARD DETAIL SHEET IS APPROVED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THE ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

PAVEMENT DETAILS

RESIDENTIAL STREET - RURAL ASPHALT PAVEMENT OPTION

THE TOWN OF ANNETTA
TEXAS



* FOR C2U A CONSTRUCTION JOINT MUST BE USED.
FOR A L2U A LONGITUDINAL JOINT SAWED JOINT MAY BE USED.

REINFORCED CONCRETE PAVING STANDARDS
LOCAL RESIDENTIAL & COLLECTOR STREETS - RURAL
L2U-R & C2U-R

N.T.S.

NOTES:
1. L2U-R IS SHOWN ON LEFT SIDE OF DRAWING AND C2U-R IS SHOWN ON RIGHT SIDE OF DRAWING.
2. ALL UTILITIES AND SIDEWALKS ARE TO BE PLACED IN A MINIMUM 10' SIDEWALK & UTILITY EASEMENT OUTSIDE OF RIGHT-OF-WAY.
3. SEE SIDEWALK DETAILS FOR SIDEWALK LOCATIONS

CERTIFICATION.
THIS TOWN OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

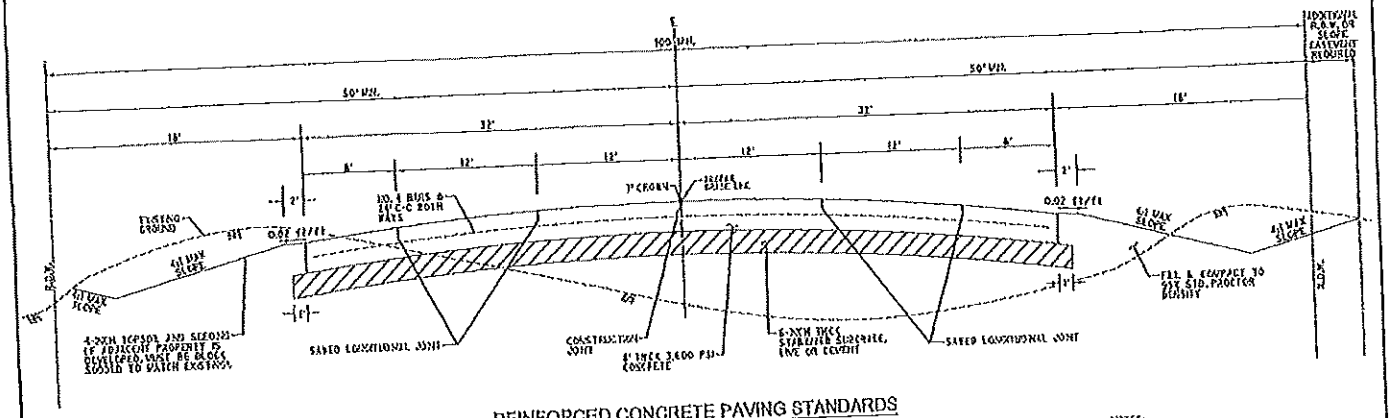
P-5

PAVEMENT DETAILS

LOCAL RESIDENTIAL & COLLECTOR STREETS - RURAL

THE TOWN OF ANNETTA
TEXAS

SCALE: N.T.S.



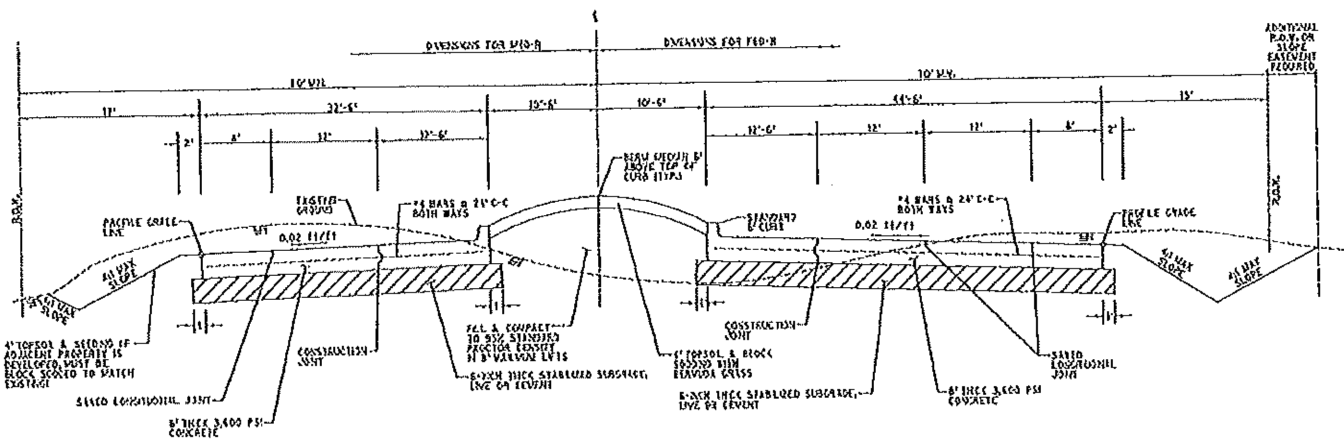
REINFORCED CONCRETE PAVING STANDARDS
UNDIVIDED MINOR ARTERIAL - MAU-R

NOTES:
1. ALL UTILITIES AND SIDEWALKS ARE TO BE PLACED IN A UNIFORM 10' SIDEWALK & UTILITY EASEMENT OUTSIDE OF RIGHT-OF-WAY.
2. SEE SIDEWALL DETAILS FOR SIDEWALK LOCATIONS

P-6

PAVEMENT DETAILS
UNDIVIDED MINOR ARTERIAL - RURAL

THE TOWN OF ANNETTA
TEXAS



REINFORCED CONCRETE PAVING STANDARDS
DIVIDED ARTERIALS - M4D-R & P6D-R

N.T.S.

NOTES:
1. M4D-R IS SHOWN ON LEFT SIDE OF DRAWING AND P6D-R IS SHOWN ON RIGHT SIDE OF DRAWING.
2. ALL DIMENSIONS TO CURB ARE SHOWN TO THE BACK OF CURB.
3. ALL UTILITIES AND SIDEWALKS ARE TO BE PLACED IN A UNIVERSAL 10' SIDEWALK & UTILITY EASEMENT OUTSIDE OF RIGHT-OF-WAY.
4. SEE SIDEWALK DETAILS FOR SIDEWALK LOCATIONS.

CERTIFICATION:
THIS TOWN OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

P-7

PAVEMENT DETAILS

DIVIDED ARTERIALS - RURAL

THE TOWN OF ANNETTA
TEXAS

N.T.S.

PAVING GENERAL NOTES

[illegible]

h. Subgrade Testing

[illegible]

i. Concrete Testing for Pavements, Curbs, Sidewalks and Driveways

[illegible]

j. Hot-Mix Asphalt Concrete Pavement Testing

[illegible]

CERTIFICATION:
THE TOWN OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

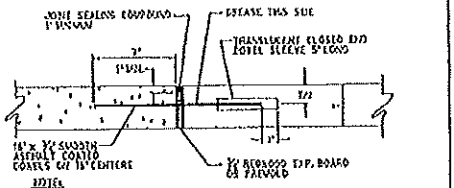
P-8

PAVEMENT DETAILS

PAVING GENERAL NOTES

THE TOWN OF ANNETTA
TEXAS

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	N.T.S.	P-8	

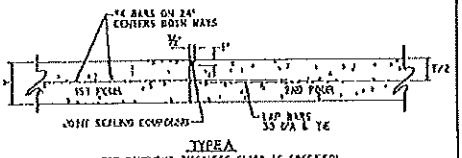


NOTES:

SLEEVES FOR DOWELS SHALL HAVE AN INSIDE DIAMETER OF 1/8" GREATER THAN THE DIAMETER OF THE DOWELS AND SHALL BE APPROVED BY THE ENGINEER PRIOR TO USE. EXPANSION JOINTS TO BE CONSTRUCTED A MINIMUM OF 300' APART ON STRAIGHT PAVING, AND AT ALL P.C.s, P.T.s, END OF RETURN OR OTHERWISE SPECIFIED.

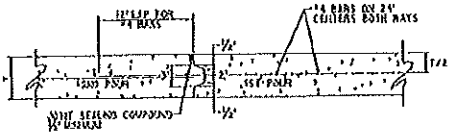
EXPANSION JOINT

NOT TO SCALE



TYPE A

FOR PAVEMENT THICKNESS GIVEN AS SPECIFIED

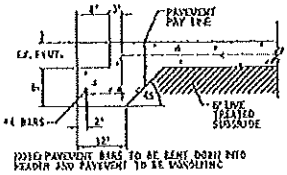


TYPE B

FOR PAVEMENT THICKNESS GREATER THAN GIVEN AS SPECIFIED

CONSTRUCTION JOINT

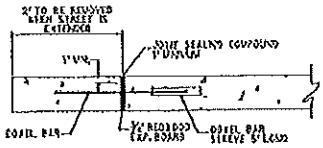
NOT TO SCALE



NOTE: EXISTING PAVEMENT BARS TO BE BENT DOWN INTO HEADER AND PAVEMENT TO BE REMOVED

TYPE-A CONCRETE HEADER

NOT TO SCALE



NOTE: TYPE-A HEADER TO BE USED FOR FUTURE STREET EXTENSION UNLESS SPECIFIED ON PLANS TO BE USED.

TYPE-B CONCRETE HEADER

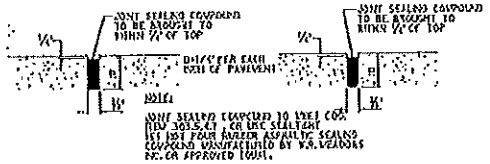
NOT TO SCALE

NOTES:

UNLESS TYPE "A" OR "B" HEADERS ARE SPECIFIED WHEN CONSTRUCTING NEW PAVEMENT, THE CONTRACTOR MUST:

A) EXPOSE THE REINFORCING STEEL FROM THE EXISTING PAVEMENT AND TIE IT TO THE PROPOSED STEEL MAT, OR

B) DRILL #3 REINFORCED STEEL BARS INTO THE EXISTING PAVEMENT A MINIMUM OF 15 DIA. DEPTH AT 24" CENTERS AND HAVE A MINIMUM OF 15" LAP.



SAWED DUMMY JOINT

NOT TO SCALE

STATEMENT:

THIS TOWN OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

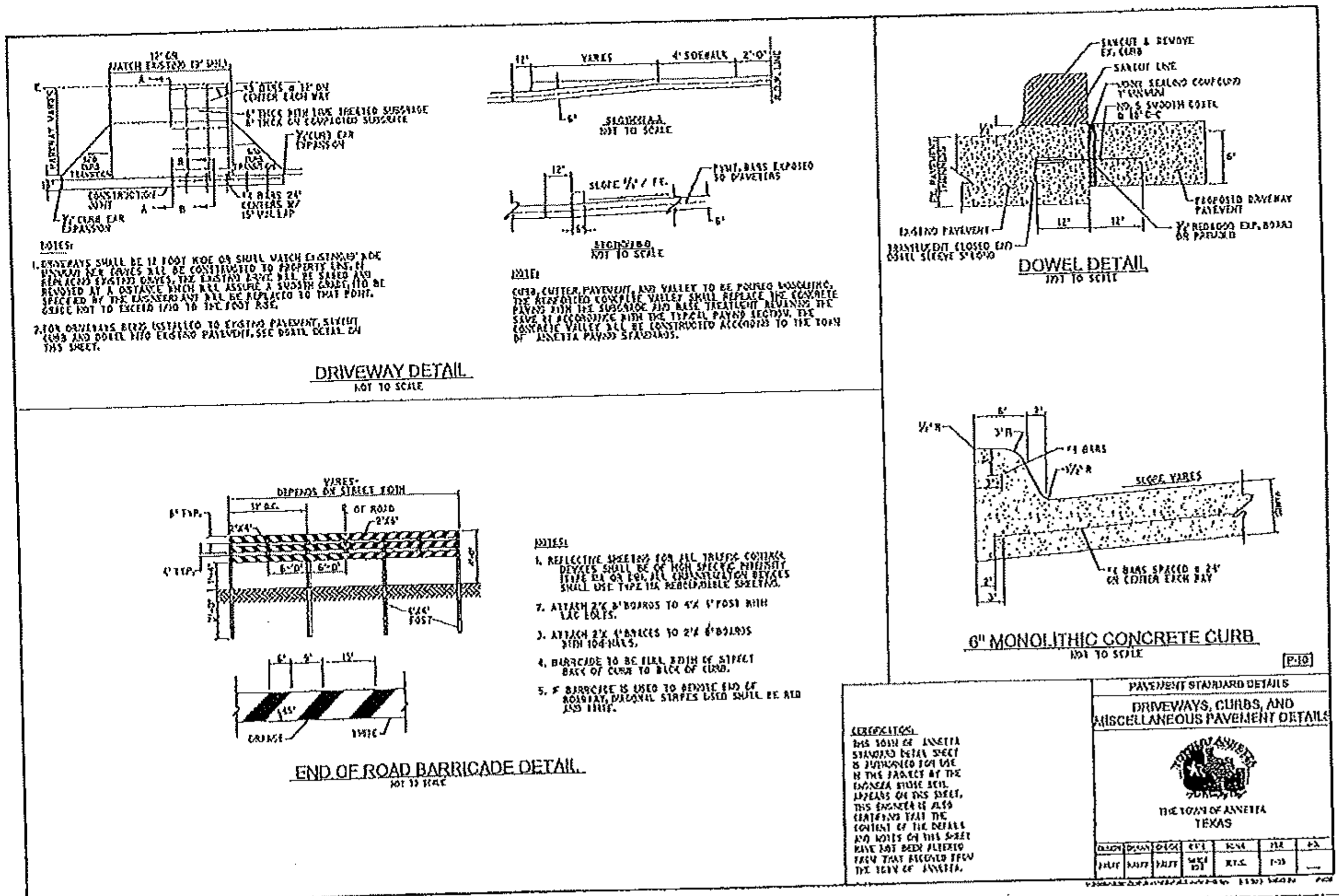
P-9

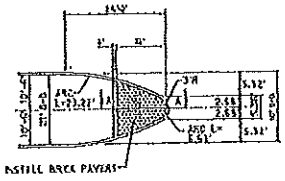
PAVEMENT STANDARD DETAILS

CONSTRUCTION JOINT DETAILS

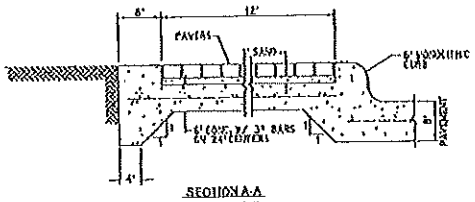
THE TOWN OF ANNETTA
TEXAS

DESIGN	DRAWN	CHECKED	DATE	SCALE	FILE	NO.
DATE	DATE	DATE	MAY '01	N.T.S.	P-9	—

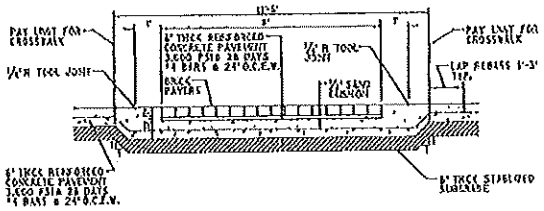

DRIVEWAY DETAIL
NOT TO SCALE
DOWEL DETAIL
NOT TO SCALE
END OF ROAD BARRICADE DETAIL
6" MONOLITHIC CONCRETE CURB
NOT TO SCALE
P-10
PAVEMENT STANDARD DETAILS
DRIVEWAYS, CURBS, AND
MISCELLANEOUS PAVEMENT DETAILS
THE TOWN OF ANNETTA
TEXAS



MEDIAN NOSE DETAIL
NOT TO SCALE



SECTION A-A
NOT TO SCALE



BRICK PAVER CROSS WALK
NOT TO SCALE

P-11

CERTIFICATES

THIS SHEET OF ANNETTA STANDARD DETAIL SHEET IS APPROVED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THE ENGINEER IS ALSO CERTIFIED THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

PAVEMENT STANDARD DETAILS

BRICK PAVERS FOR MEDIAN NOSE AND CROSS WALKS

THE TOWN OF ANNETTA
TEXAS

SIDEWALK AND HANDICAP / CURB RAMP NOTES:

GENERAL REQUIREMENTS:
REQUIREMENTS AND SPECIFICATIONS OF THE TEXAS ACCESSIBILITY STANDARDS AND THE AMERICANS [illegible] DISABILITIES ACT.

ALL SLOPES ARE MAXIMUM ALLOWABLE. THE LEAST POSSIBLE SLOPE THAT WILL DRAIN PROPERLY SHOULD BE USED. ADJUST CURB RAMP LENGTH OR GRADE OF APPROACH SIDEWALKS AS DIRECTED.

SIDEWALK WIDTH:
THE MINIMUM WIDTH OF ALL SIDEWALKS SHALL BE 5 FEET, ALONG FRONTAGE WITH RESIDENTIAL PROPERTIES AND 6 FEET ALONG COMMERCIAL FRONTAGE, AND TO BE CONSTRUCTED AS PER FIGURE 1: "SIDEWALK LOCATION DETAIL" ON THIS SHEET & SHEET 2 OF 3.

MINIMUM 6-FOOT SIDEWALK IS REQUIRED ADJACENT TO THE CURB, WITH THE APPROVAL OF THE TRAFFIC ENGINEER.

CURB RAMP LOCATIONS:
CURB RAMPS UNDER THESE PROVISIONS, SHALL BE WHEREVER AN ACCESSIBLE ROUTE CROSSES A CURB.

SLOPE:
MAXIMUM ALLOWABLE CROSS SLOPE ON SIDEWALK AND CURB RAMP SURFACES IS 2%.

SLOPES ON CURB RAMPS SHALL BE AS FOLLOWS:

A. THE SLOPE SHALL BE MEASURED AS SHOWN IN FIGURE 3.
B. TRANSITIONS FROM RAMPS TO WALKS, GUTTERS, OR STREETS SHALL BE FLUSH AND FREE OF ABRUPT CHANGES.
C. MAXIMUM SLOPES OF ADJOINING GUTTERS, ROAD SURFACE IMMEDIATELY ADJACENT TO THE CURB RAMP, OR ACCESSIBLE ROUTE SHALL NOT EXCEED 1:20
D. THE LEAST POSSIBLE SLOPE SHALL BE USED FOR ANY RAMP. THE MAXIMUM SLOPE OF A RAMP IN NEW CONSTRUCTION SHALL BE 1:12. THE MAXIMUM RISE FOR ANY RUN SHALL BE 30-INCHES. ANY RAMP LONGER THAT 6' AT 1:12 WILL REQUIRE RAILING. CURB RAMPS AND RAMPS TO BE CONSTRUCTED ON EXISTING SITES OR IN EXISTING BUILDINGS OR FACILITIES MAY HAVE SLOPES AND RISES IF SPACE LIMITATIONS PROHIBIT THE USE OF A 1:12 SLOPE OR LESS, AS FOLLOWS:
   1.) A SLOPE BETWEEN 1:10 AND 1:12 IS ALLOWED FOR A MAXIMUM RISE OF 6-INCHES.
   2.) A SLOPE BETWEEN 1:8 AND 1:10 IS ALLOWED FOR A MAXIMUM OF 3-INCHES. A SLOPE STEEPER THAN 1:8 IS NOT ALLOWED.
E. LANDINGS SHALL BE 5'X 5' MINIMUM WITH A MAXIMUM 2% SLOPE IN ANY DIRECTION
F. MANEUVERING SPACE AT THE BOTTOM OF CURB RAMPS SHALL BE MINIMUM OF 4'X4' WHOLLY CONTAINED WITHIN THE CROSSWALK AND WHOLLY OUTSIDE THE PARALLEL VEHICULAR TRAVEL PATH.

RAMP WIDTH:
THE MINIMUM WIDTH OF A CURB RAMP SHALL BE 36 INCHES EXCLUSIVE OF FLARED SIDES.

SURFACE:
SURFACES OF CURB RAMPS, ALONG ACCESSIBLE ROUTES AND IN ACCESSIBLE ROOMS AND SPACES INCLUDING FLOORS, WALKS, RAMPS, STAIRS, AND CURB RAMPS, SHALL BE STABLE, FIRM, AND SLIP RESISTANT.

SIDES OF CURB RAMPS:
IF A CURB RAMP IS LOCATED WHERE PEDESTRIANS MUST WALK ACROSS THE RAMP, OR WHERE IT IS NOT PROTECTED BY HANDRAILS OR GUARDRAILS, IT SHALL HAVE FLARED SIDES.

THE MAXIMUM SLOPE OF THE FLARE SHALL BE 1:10 (SEE FIGURE 4 (A)) CURB RAMPS WITH RETURNED CURBS MAY BE USED WHERE PEDESTRIANS WOULD NOT WALK ACROSS THE RAMP (SEE FIGURE 4 (B)) PROVIDE 1/8-INCH TOOLED 1/4-INCH TO 3/4-INCH WIDE GROOVES AT 2-INCH CENTERS.

BUILT-UP RAMPS:
BUILT-UP CURB RAMPS SHALL BE LOCATED SO THEY DO NOT PROJECT INTO VEHICULAR TRAFFIC LANES.
PROVIDE 1/8-INCH TOOLED 1/4-INCH TO 3/4-INCH WIDE GROOVES AT 2-INCH CENTERS.

OBSTRUCTIONS:
CURB RAMPS SHALL BE LOCATED OR PROTECTED TO PREVENT THEIR OBSTRUCTION BY PARKED VEHICLES.

LOCATION AT MARKED CROSSINGS:
CURB RAMPS AT MARKED CROSSINGS SHALL BE WHOLLY CONTAINED WITHIN THE MARKINGS, EXCLUDING ANY FLARED SIDES (SEE FIGURE 2).

DIAGONAL CURB RAMPS:
IF DIAGONAL (OR CORNER TYPE) CURB RAMPS HAVE RETURNED CURBS OR OTHER WELL DEFINED EDGES, SUCH EDGES SHALL BE PARALLEL TO THE DIRECTION OF PEDESTRIAN FLOW. THE BOTTOM OF THE DIAGONAL CURB RAMPS SHALL HAVE 48-INCHES MINIMUM. IF DIAGONAL CURB RAMPS ARE PROVIDED AT MARKED CROSSINGS, THE 48-INCH CLEAR SPACE SHALL BE WITHIN THE MARKINGS (SEE FIGURE 2 (C) AND (D)). IF DIAGONAL CURB RAMPS HAVE FLARED SIDES, THEY SHALL ALSO HAVE AT LEAST A 24-INCH LONG SEGMENT OF STRAIGHT CURB LOCATED ON EACH SIDE OF THE CURB RAMPS AND WITHIN THE MARKED CROSSING (SEE FIGURE 2 [illegible]).

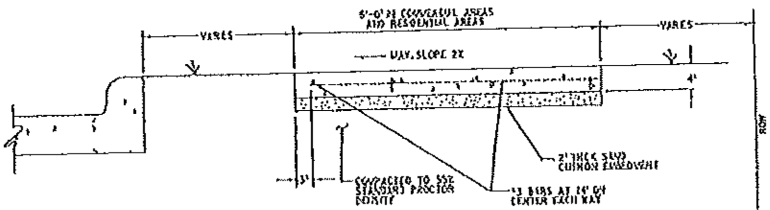
ANY RAISED ISLANDS IN CROSSINGS SHALL BE CUT THROUGH LEVEL WITH THE STREET OR HAVE CURB RAMPS AT BOTH SIDES AND A LEVEL AREA AT LEAST 48-INCHES LONG BETWEEN THE CURB RAMPS IN THE PART OF THE ISLAND INTERSECTED BY THE CROSSINGS (SEE FIGURE 2 (A) AND (B)).

JOINTING:
SEPARATE CURB RAMP AND LANDINGS FROM ADJACENT SIDEWALK AND ANY OTHER ELEMENTS WITH PREMOLDED OR BOARD JOINT OF 3/4" UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

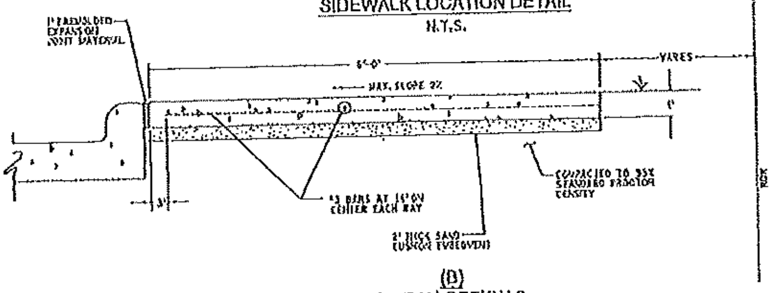
CONSTRUCTION:

A. THE CONTRACTOR SHALL SAWCUT, REMOVE AND DISPOSE OFF-SITE THE REQUIRED EXISTING CONCRETE SIDEWALK, AND CURB AND GUTTER, TO CONSTRUCT THE PROPOSED RAMPS.
B. CONCRETE SIDEWALKS AND RAMPS SHALL BE MINIMUM 4-INCH THICK, 3,000 PSI, 5 SACK CONCRETE, REINFORCED WITH #3 BARS AT 18-INCH CENTERS BOTHWAYS, PLACED OVER A 2-INCH THICK SAND CUSHION EMBEDMENT.
C. THE CONTRACTOR SHALL USE 1-INCH PREMOLDED EXPANSION JOINT MATERIAL BETWEEN THE PROPOSED SIDEWALKS AND RAMPS AT THE BACK OF CURBS, AND AT JOINTS AT NO EXTRA PAY.
D. DUMMY JOINT REQUIRED EVERY 4-FEET IN 4-FOOT WIDE SIDEWALKS AND EVERY 5-FEET IN 5-FOOT WIDE SIDEWALK.

PAYMENT:
CURB RAMPS AND LANDINGS SHALL BE CONSTRUCTED AND PAID FOR IN ACCORDANCE WITH NCTCOG ITEM 305.2.



(A)
URBAN OPTION 1
SIDEWALK LOCATION DETAIL
N.T.S.



(B)
URBAN OPTION 2
SIDEWALK LOCATION DETAIL
N.T.S.

FIGURE 1

P-12

CERTIFICATION:
THIS TOWN OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

PAVEMENT STANDARD DETAILS

SIDEWALK DETAILS
(SHEET 1 OF 3)

THE TOWN OF ANNETTA
TEXAS

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	N.T.S.	P-12	—

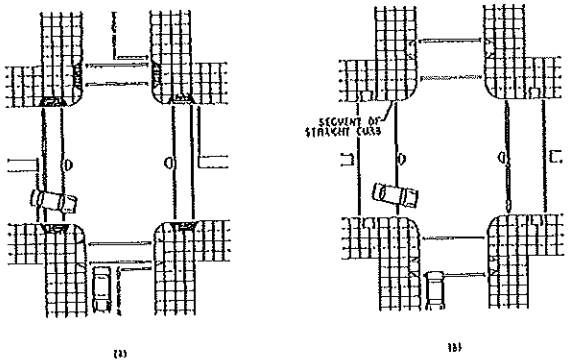
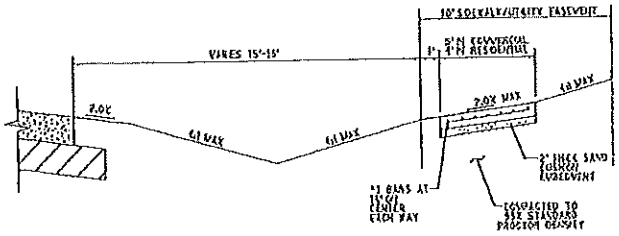


FIGURE 2
CURB RAMPS AT MARKED CROSSINGS
N.T.S.



(C)
RURAL CONDITIONS
SIDEWALK LOCATION DETAIL
N.T.S.

FIGURE 1

CERTIFICATION:
THE TOWN OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

PAVEMENT STANDARD DETAILS
SIDEWALK DETAILS
(SHEET 2 OF 3)

THE TOWN OF ANNETTA
TEXAS

V:H = VERTICAL : HORIZONTAL

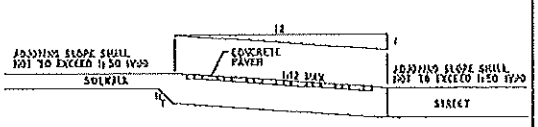
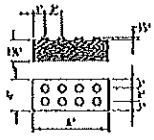


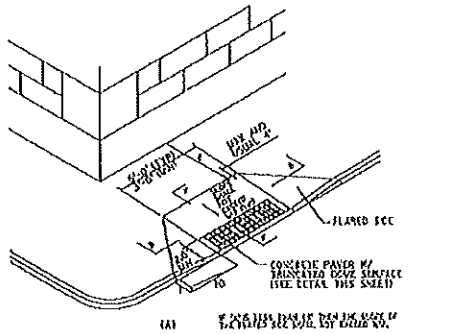
FIGURE 3
MEASUREMENT OF CURB RAMP SLOPES
N.T.S.



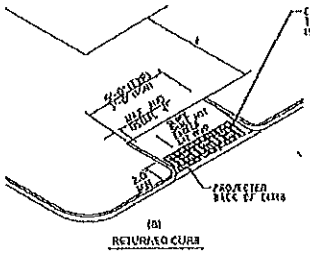
CONCRETE PAVER WITH TRUNCATED DOME SURFACE DETAIL
N.T.S.

CONCRETE PAVER NOTES

1. Concrete paver units shall meet all requirements of ASTM C-936, C-33, and shall be laid in a two by two unit basket weave pattern, unless shown otherwise in the plans.
2. Domes shall be aligned in the direction of pedestrian travel.
3. Concrete paver units shall have a truncated dome top surface for detectable warning to pedestrians.
4. Concrete paver unit color for the ramp shall be a contrasting color (red) that provides a light reflective value that significantly contrasts with the adjacent surfaces. Use red pigment in concrete at ramp. The red pigment shall be Patterned Concrete Industries, Inc. A-121 dark red, all pigment used on the project must be the same for the entire project.
5. Concrete paver units shall be saw cut only and any cut unit shall not be less than 25 percent of a full unit.
6. Other acceptance of truncated domes may be accepted for use as approved by Town of Annetta.
7. Landings shall be provided at top and bottom of each curb ramp. Landings shall be 5'-0" min. with a max. 2% cross slope in any direction.

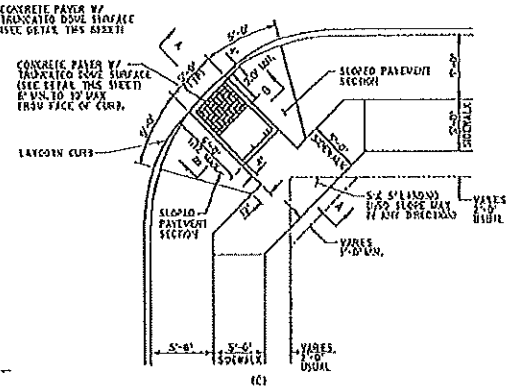


(A)
FLARED SIDES

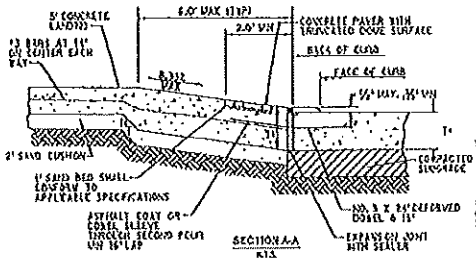


(B)
RETURNED CURB

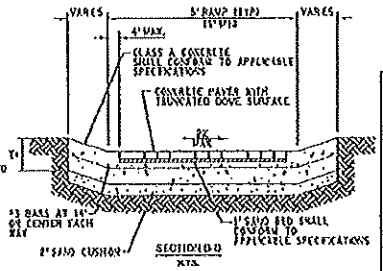
FIGURE 4
SIDES OF CURB RAMP



(C)
AT INTERSECTION WITH FLOW LINE



SECTION A-A
N.T.S.



SECTION B-B
N.T.S.

CERTIFICATION:
THIS TOWN OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

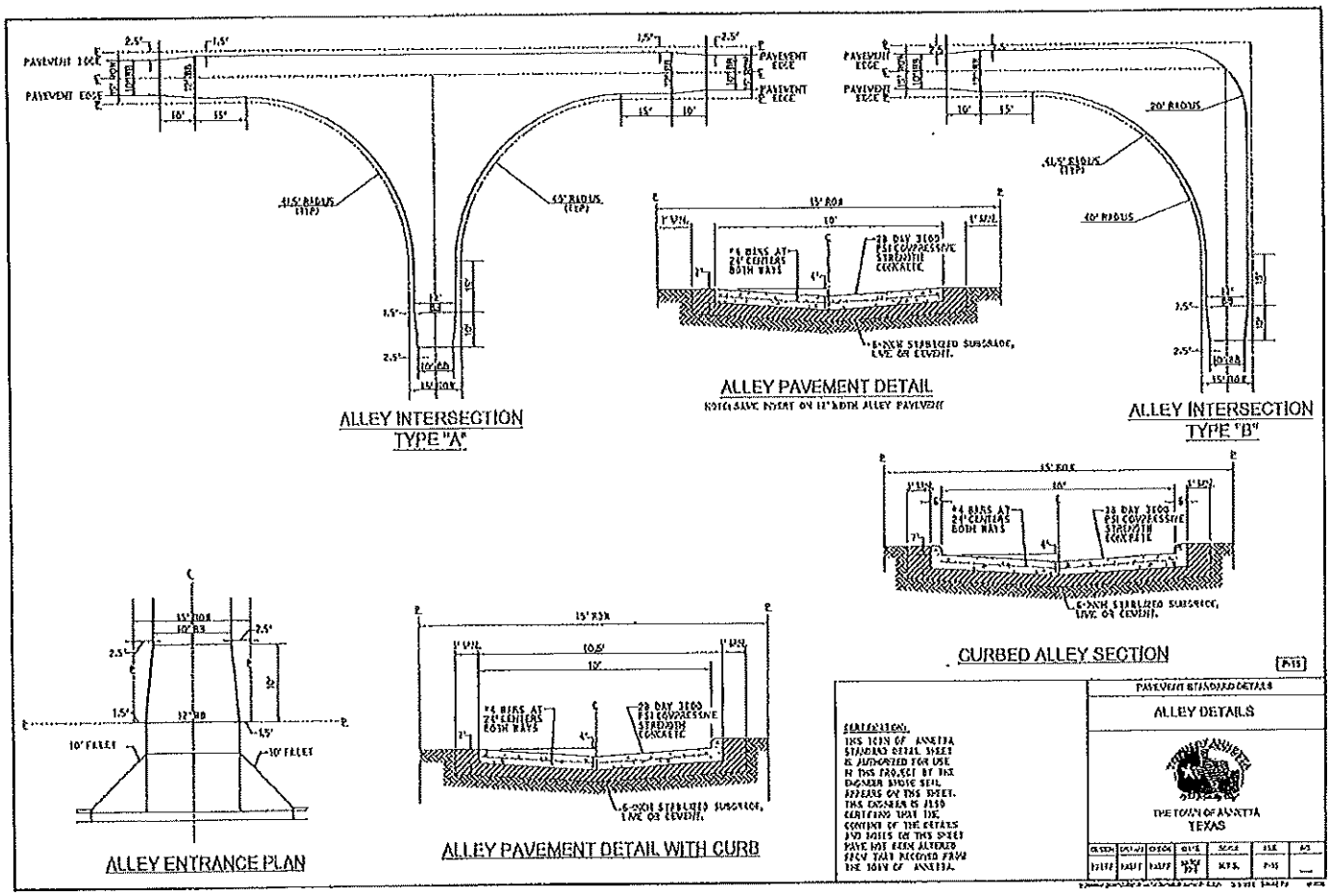
PAVEMENT STANDARD DETAILS

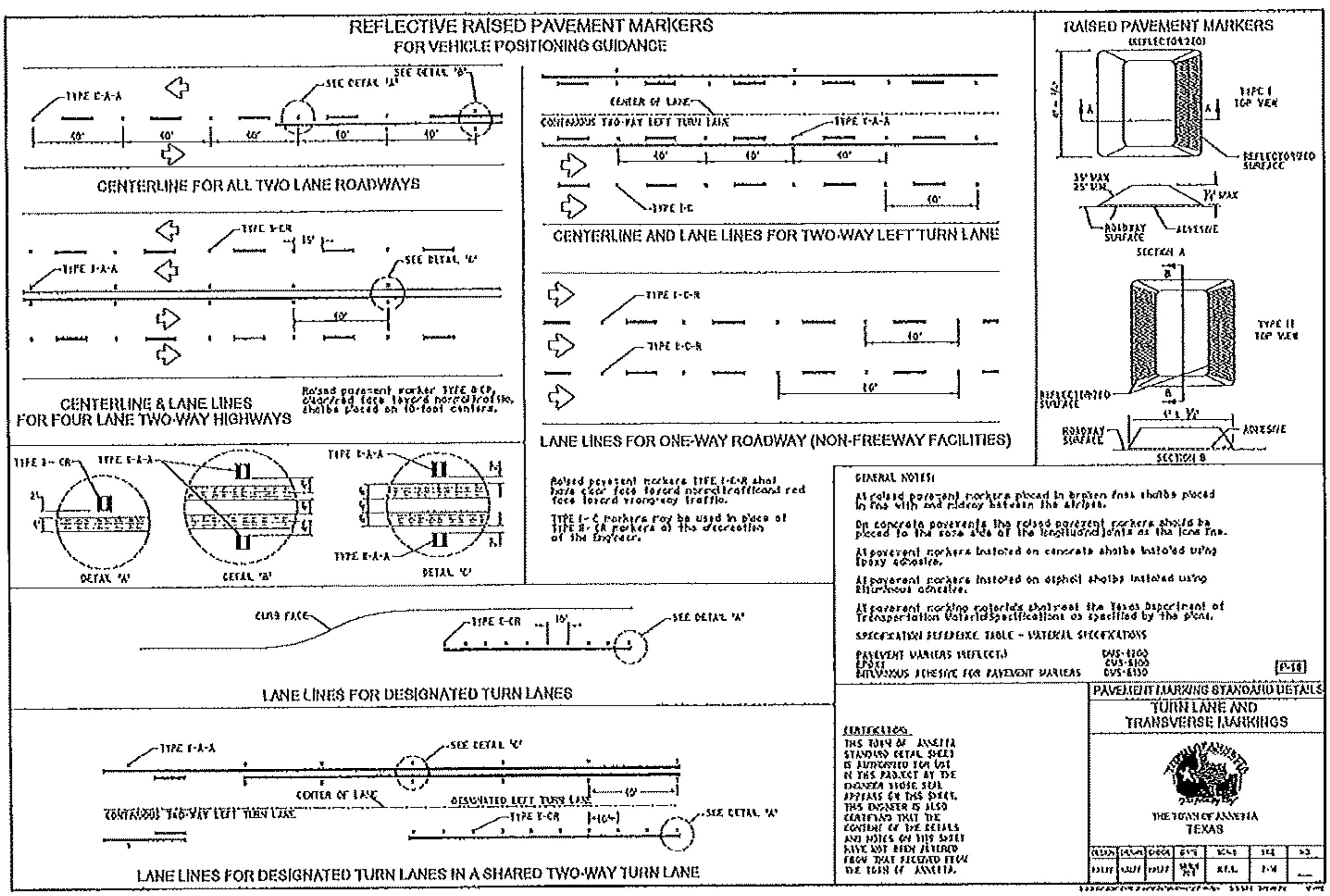
SIDEWALK DETAILS (SHEET 3 OF 3)

THE TOWN OF ANNETTA
TEXAS

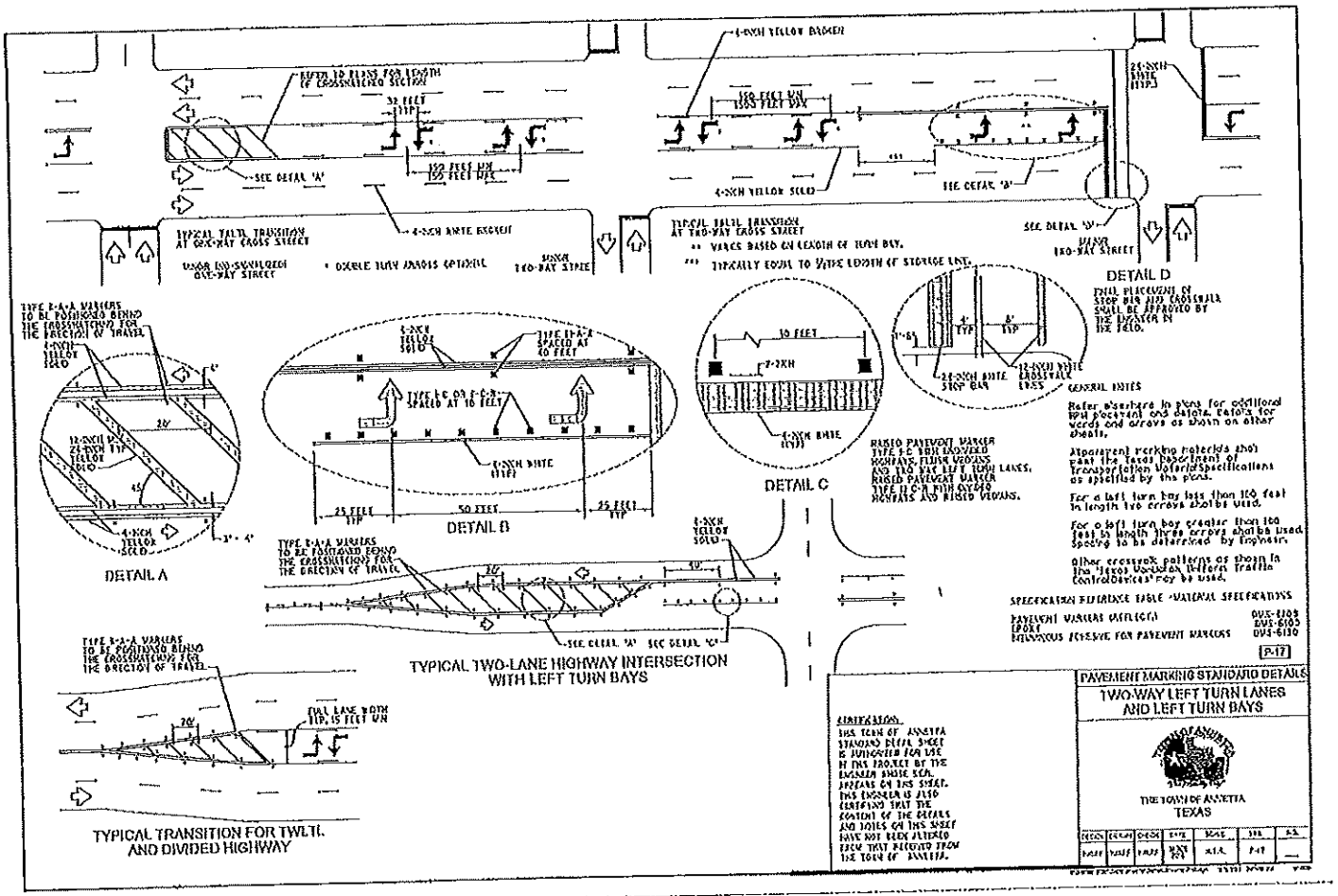
DESIGN	DRAWN	CHECK	DATE	SCALE	FILE	NO.
MATT	MATT	MATT	MAR 2018	N.T.S.	P-11	—

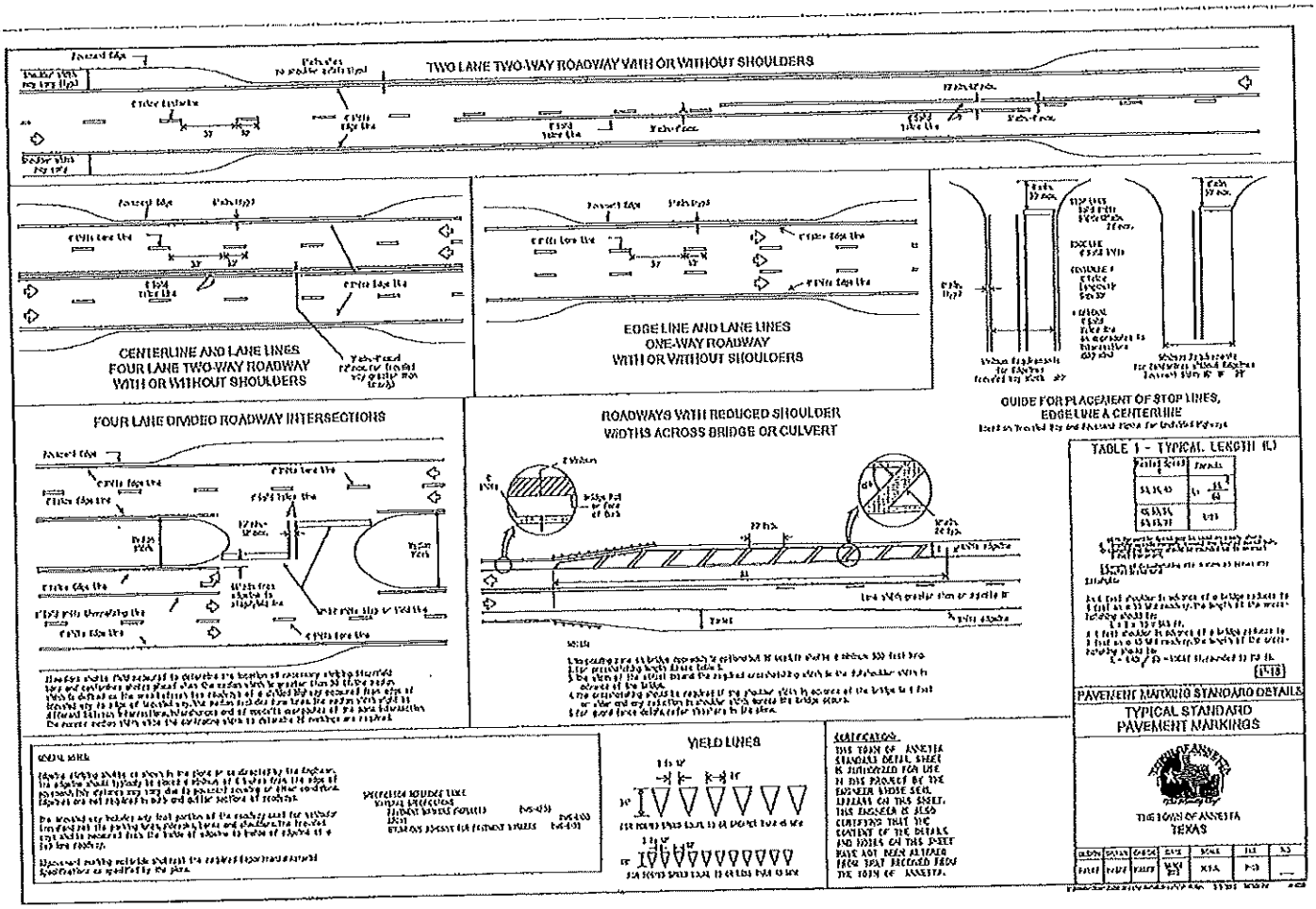
P-11

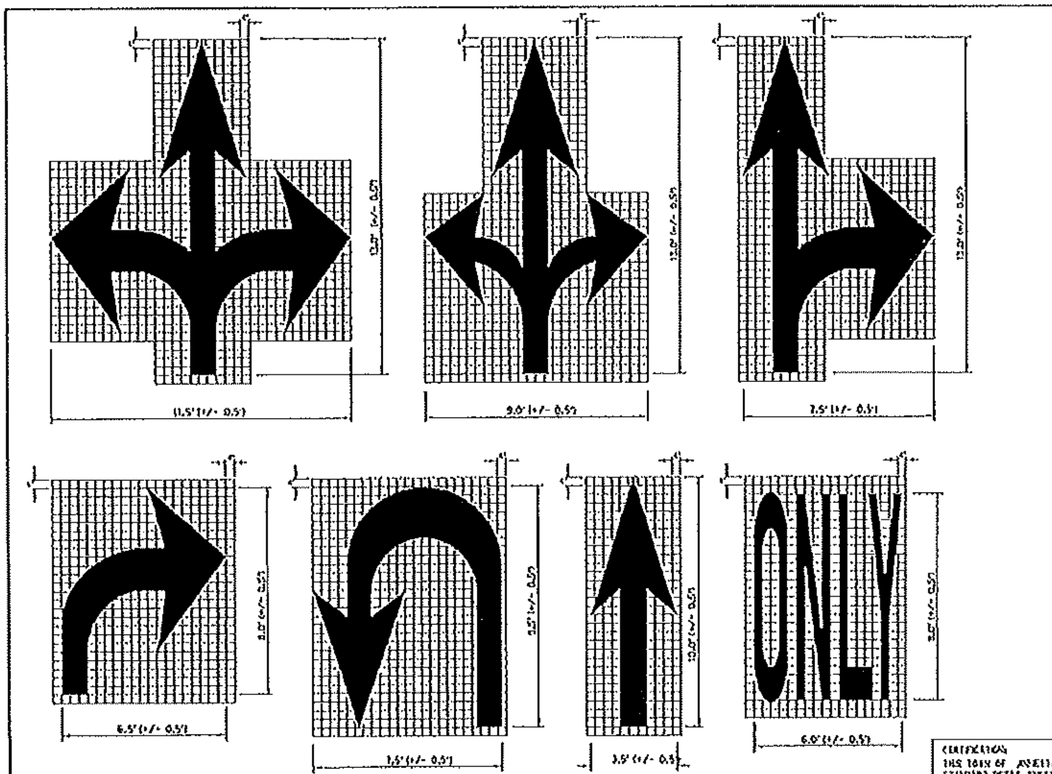

ALLEY INTERSECTION
TYPE "A"
ALLEY PAVEMENT DETAIL
ALLEY INTERSECTION
TYPE "B"
CURBED ALLEY SECTION
ALLEY ENTRANCE PLAN
ALLEY PAVEMENT DETAIL WITH CURB
PAVEMENT STANDARD DETAILS
ALLEY DETAILS
THE TOWN OF ANNETTA
TEXAS



REFLECTIVE RAISED PAVEMENT MARKERS
FOR VEHICLE POSITIONING GUIDANCE
CENTERLINE FOR ALL TWO LANE ROADWAYS
CENTERLINE & LANE LINES
FOR FOUR LANE TWO-WAY HIGHWAYS
CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)
LANE LINES FOR DESIGNATED TURN LANES
LANE LINES FOR DESIGNATED TURN LANES IN A SHARED TWO-WAY TURN LANE
RAISED PAVEMENT MARKERS
SECTION A
SECTION B
GENERAL NOTES:
SPECIFICATION REFERENCE TABLE - MATERIAL SPECIFICATIONS
PAVEMENT MARKING STANDARD DETAILS
TURN LANE AND
TRANSVERSE MARKINGS
TEXAS


DETAIL A
DETAIL B
DETAIL C
DETAIL D
TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY
GENERAL NOTES
SPECIFICATION REFERENCE TABLE - MATERIAL SPECIFICATIONS
PAVEMENT MARKING STANDARD DETAILS
TWO-WAY LEFT TURN LANES AND LEFT TURN BAYS
THE TOWN OF ANNETTA
TEXAS
P-17


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS
CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS
EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS
GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE
FOUR LANE DIVIDED ROADWAY INTERSECTIONS
ROADWAYS WITH REDUCED SHOULDER
WIDTHS ACROSS BRIDGE OR CULVERT
YIELD LINES
TABLE 1 - TYPICAL LENGTH (L)
PAVEMENT MARKING STANDARD DETAILS
TYPICAL STANDARD
PAVEMENT MARKINGS
THE TOWN OF ANNETTA
TEXAS



GENERAL NOTES:

[illegible]

P-19

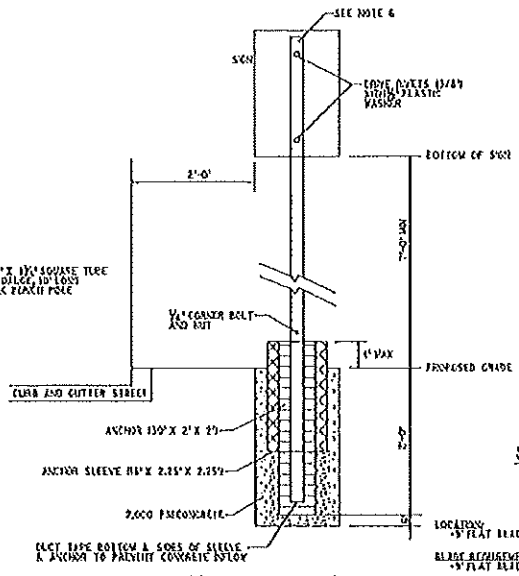
CERTIFICATION

THE TOWN OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

PAVEMENT MARKING STANDARD DETAILS

LEGENDS AND ARROWS

THE TOWN OF ANNETTA
TEXAS



SIGN POST DETAIL

N.T.S.

TYPICAL STREET NAME BLADE DETAIL

N.T.S.

STREET NAME BLADE SPECIFICATIONS

LOCATIONS:
- 9" FLAT BLADE SHALL BE USED AT ALL INTERSECTIONS.

BLADE REQUIREMENTS:
- 9" FLAT BLADE SHALL BE ALUMINUM.

LETTERING ARRANGEMENT:
- TOWN LOGO SHALL APPEAR AT THE LEFT SIDE
- STREET NAME SHALL BE LEFT JUSTIFIED & FLOATED RIGHT TOWN LOGO
- BLOCK LETTERS SHALL BE LOCATED IN UPPER RIGHT HAND CORNER & RIGHT JUSTIFIED.
- ABBREVIATED STREET DESIGNATIONS SHALL BE LOCATED IN THE LOWER RIGHT HAND CORNER AND RIGHT JUSTIFIED.

LETTERING FOR 9" FLAT BLADES:
- FONT SHALL BE CLEARVIEW 2A
- FOR EACH WORD, USE FIRST LETTER SHALL BE UPPERCASE AND ALL FOLLOWING LETTERS SHALL BE LOWERCASE.
- LETTERS IN ABBREVIATED STREET DESIGNATIONS SHALL BE 3" TALL AND SAME AS THE FIRST LETTER UPPERCASE (i.e. Ln, Pkwy, Ct, etc.)
- BLOCK NUMBERS SHALL BE 3" TALL

SIGN SHEETING AND COLORS:
- SHEETING SHALL BE 3M REFLECTIVE COATING.
- BACKGROUND COLOR SHALL BE GREEN.
- ALL LETTERING SHALL BE WHITE.
- EMBLEM SHALL BE ACQUIRED FROM TOWN OF ANNETTA

90 DEGREE STREET:
- FOR A STREET WITH ONLY ONE 90-DEGREE END APPROACH A STANDARD W 16-2a SHALL BE MOUNTED OVER THE STREET NAME BLADE.
- IN THE CASE OF A STREET WITH TWO 90-DEGREE ENDS, A STANDARD W 16-2a SIGN SHALL BE MOUNTED OVER THE STREET NAME BLADE PLACED IN THE APPROPRIATE DIRECTION.

TRAFFIC CONTROL NOTES

1. ALL SIGNAGE, BARRICADES, AND PAVEMENT MARKINGS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AND THE STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS.
2. LOCATIONS SHOWN FOR SIGNAGE AND PAVEMENT MARKINGS ARE APPROXIMATE ONLY. LOCATIONS MAY CHANGE DUE TO POST CONSTRUCTION CONDITIONS AND PRESENCE OF OTHER PHYSICAL FEATURES. FINAL LOCATION OF ALL TRAFFIC CONTROL DEVICES SHALL BE FIELD VERIFIED WITH TOWN OF ANNETTA PRIOR TO INSTALLATION.
3. ALL PAVEMENT MARKINGS OTHER THAN BUTTONS SHALL BE THERMOPLASTIC UNLESS OTHERWISE NOTED.
4. ALL SIGNS SHALL BE DIAMOND GRADE INTENSITY AND TYPE UNLESS SHALL BE STANDARD UNLESS OTHERWISE NOTED.
5. ALL TRAFFIC SIGNS, POSTS, AND MATERIALS SHALL BE INSTALLED PER DETAIL ON THIS SHEET.
6. FOR STOP SIGNS THAT WILL ACCEPT FUTURE STREET SIGNS, EXTEND POST ABOVE STOP SIGN SO THAT 2 HOLES ARE AVAILABLE FOR MOUNTING. IF NOT ALL OTHERS, POST SHALL NOT EXTEND ABOVE STOP SIGN.
7. CHANGES TO TYPICAL SIGN POST LOCATION MADE AT ENGINEER'S DISCRETION.

CERTIFICATION:
THIS SIGN OF ANNETTA STANDARD DETAIL SHEET IS APPROVED FOR USE IN THIS PROJECT BY THE UNDERSIGNED WHOSE SEAL APPEARS ON THIS SHEET. THIS UNDERSIGN IS ALSO CERTIFIED THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

P-29

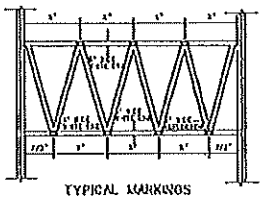
PAVEMENT STANDARD DETAILS

SIGNING DETAILS & TRAFFIC CONTROL NOTES

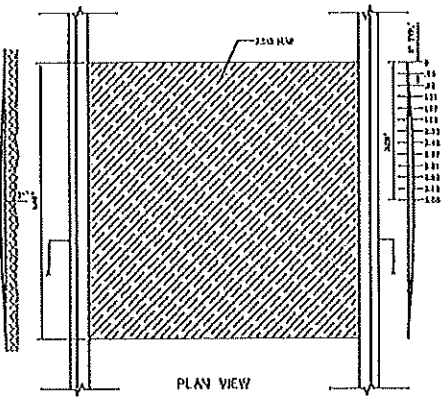
THE TOWN OF ANNETTA
TEXAS

DESIGN	DRAWN	CHECK	DATE	SCALE	FILE	JOB
INITIALS	INITIALS	INITIALS	MONTH DAY	N.T.S.	P-29	—

GENERAL CONDITIONS FOR LOCATION ROAD HUMPS

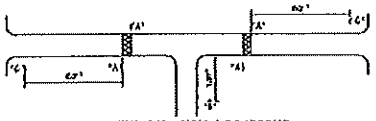


TYPICAL MARKINGS



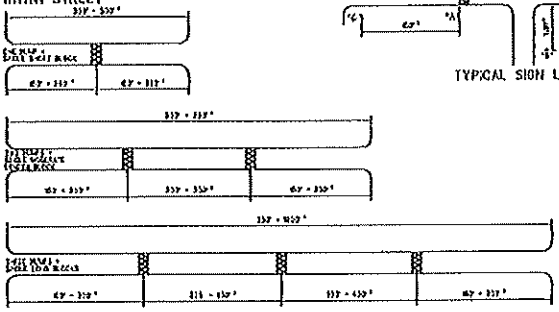
PLAN VIEW

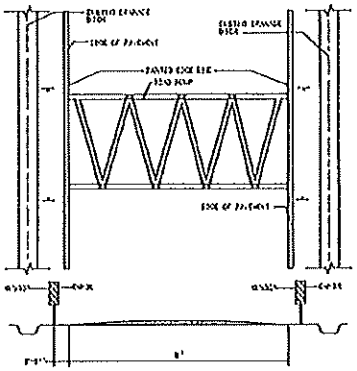
SECTION A-A



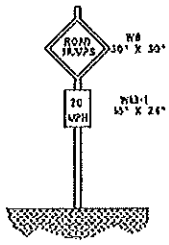
TYPICAL SIGN LOCATIONS

TYPICAL LOCATION WITHIN STREET

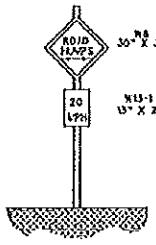




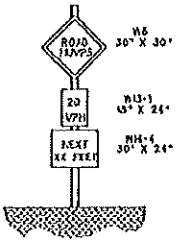
ALTERNATIVE ROAD HUMP INSTALLATION ON STREETS WITHOUT CURBS



SIGN INSTALLATION "A"



SIGN INSTALLATION "B"



SIGN INSTALLATION "C"

CERTIFICATE

THIS TOWN OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

TYPICAL ROAD HUMP DESIGN

SHEET 1 OF 1

THE TOWN OF ANNETTA
TEXAS

DESIGN	DRAWN	CHECK	DATE	SCALE	FILE	NO.
MATT	MATT	MATT	04	N.T.S.		P-21

STORM DRAIN GENERAL NOTES

1. All construction shall be in accordance with the standard specifications of the Town of Annetta and the Fourth Edition of the "Standard Specifications for Public Works Construction - North Central Texas" herein referred to as "COG" specifications. Copies may be obtained from the North Central Texas Council of Governments, 616 Six Flags Drive, Suite 200, Arlington, Texas 76005-5888, (817) 640-3300.
2. Storm drain lines shall be installed per COG Item 501 specifications.
3. Only Reinforced Concrete Pipe (RCP) or Reinforced Concrete Box (RCB) is approved for use in public right-of-way or easements.
4. For pipes, embedment shall be per the Street Backfill & Repair detail on the Backfill / Embedment Standard Detail. For box culverts, embedment shall be per the Box Culvert Embedment detail on the Backfill / Embedment Standard Detail.

   Note that flowable backfill is only required below areas to be paved.
5. The CONTRACTOR shall seal all joints on closed conduits with Ram-Nek joint seals, or equal unless approved otherwise by the Town.
6. All concrete to be used in pre-cast products for reinforced concrete pipes or boxes shall come from plants certified by the National Pre-cast Concrete Association.
7. The CONTRACTOR shall use only pre-fabricated fittings on new construction projects. Field connections shall be made only to existing pipe with Town approval. The connection shall be a smooth connection and concrete wrapped on the outside and inside.
8. Concrete collars shall be constructed per the Concrete Collar Details on the Headwalls & Pipe Collars Standard Detail at all storm drain size and at grade changes or in curves where the joint is being used more than recommended by the manufacturer. Please refer to the details on the Headwalls & Pipe Collars Standard Detail and COG Item 502.3.4.1 specifications.
9. All inlets shall be poured in place. Precast inlets, junction boxes, manholes, and headwalls are not allowed.
10. Bottoms, tops, and variable height curb to be separate pours as poured for curb inlets.
11. Curb inlet bottoms shall be poured prior to any paving.
12. Ring and cover on curb inlets to be located directly over the outlet pipe.
13. Concrete shall be made with a minimum of 5 sacks of cement and have a minimum compressive strength of 3,600 PSI at 28 days.
14. All reinforcing steel shall be new, neat, billet-steel per ASTM designation A-615, Grade 60, and shall be detailed and placed per ACI Manuals SP-66 and 318, latest additions. All reinforcing steel shall have minimum 15 inch lap splices, unless noted otherwise on the plans.
15. The CONTRACTOR shall use a liquid membrane-forming curing compound per COG Item 303.2.13.1.
16. All exposed surfaces shall have 3/4-inch chamfer.
17. All closed conduits shall be television inspected.
18. The CONTRACTOR shall be responsible for notifying the Town Inspector at least 24 hours prior to any required testing.
    a. Soil and material testing technicians shall provide written proof of having minimum of two (2) years of related field experience.
    b. The CONTRACTOR shall coordinate all testing activities with the Town Inspector and shall facilitate required testing throughout the construction period. The Inspector shall be present during all testing.
    c. The Town shall make final decision as to the validity of all testing results.
    d. The CONTRACTOR shall be responsible for ensuring that materials to be tested are in compliance with all plans and specifications prior to testing. All materials found not to be in compliance with the plans and specifications before and after testing shall be removed and replaced at the CONTRACTOR'S expense.
    e. All costs associated with the retesting of work that fails to meet the specifications required in the contract documents shall be borne by the CONTRACTOR. For Town projects, retesting cost shall be withheld from pay requests submitted by the CONTRACTOR. This cost will be based on the Town's cost with no additional mark-up. A letter of acceptance will not be issued until all testing deficiencies are addressed and all related cost paid.
    f. The Town Inspector shall be notified of concrete placement 24 hours in advance for steel and form inspection.
    g. One set of four cylinders (2-7 day, 2-28 day) for cast-in-place concrete shall be made for every day that concrete is placed (ASTM C-31). Air, slump, and temperature tests shall be taken for every set of cylinders made. Concrete with a temperature above 95 degrees will be rejected. Additional cylinders and or tests may be requested at the Inspector or ENGINEER'S discretion. Exterior forms shall not be removed for a minimum of 24 hours unless approved by Inspector or ENGINEER. Sulfate resistant concrete shall be used for all manholes.
    h. Backfill and Density Testing
       1) All trenches shall be backfilled in accordance with standard details and mechanically compacted with approved vibratory methods in accordance with COG Item 504.5.3.2.5 and paragraph 3) below unless otherwise stated on the plans or in the specifications.
       2) Densities shall conform to standard trench details, COG Item 504.5.3.2.5, and Paragraph 3) below unless otherwise stated on the plans or in the specifications. Proctor samples shall be taken for all classifications of soil on site. Atterberg limits shall be determined on all Proctor samples. No "pothoping" will be allowed. Densities shall be taken on all storm drain laterals within the Right-of-Way and shall conform to Paragraph 3) below and COG Item 504.5.3.2.5, unless otherwise stated on the plans or in the specifications. Backfill adjacent to all structures shall be compacted manually and density tested on every lift.
       3) Mechanical Tamping of Backfill
          a) All ditch lines and bore pits shall be mechanically tamped.
          b) Backfill other than select fill may consist of onsite or offsite inorganic soils and should be placed in loose lifts 6" - 8" in thickness (not to exceed 12") and should be mechanically compacted to 95 percent of the maximum dry density as defined by ASTM D-698 (Standard Proctor) procedures under existing and proposed pavement, and to 90 percent standard Proctor procedures elsewhere. The moisture content of the fill at the time of compaction shall be between minus 1% of optimum to four percentage points above the Proctor optimum value.
          c) All backfill material to be select native material by Geotechnical Engineer, unless directed otherwise on the plans or in the specifications and to be mechanically tamped and density controlled as described in Paragraph 3) above.
          d) Water jetting is not permitted.
          e) Densities shall be taken every one (1) lift at staggered locations not to exceed 200 feet increments. Offset fifty (50) feet every other lift.
          f) Densities may be taken at typical locations as shown below; also, densities will be taken at random locations and at the Geotechnician's discretion.

SD-1

STORM DRAIN STANDARD DETAILS

STORM DRAIN GENERAL NOTES

THE TOWN OF ANNETTA
TEXAS

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

[illegible]

CERTIFICATION:
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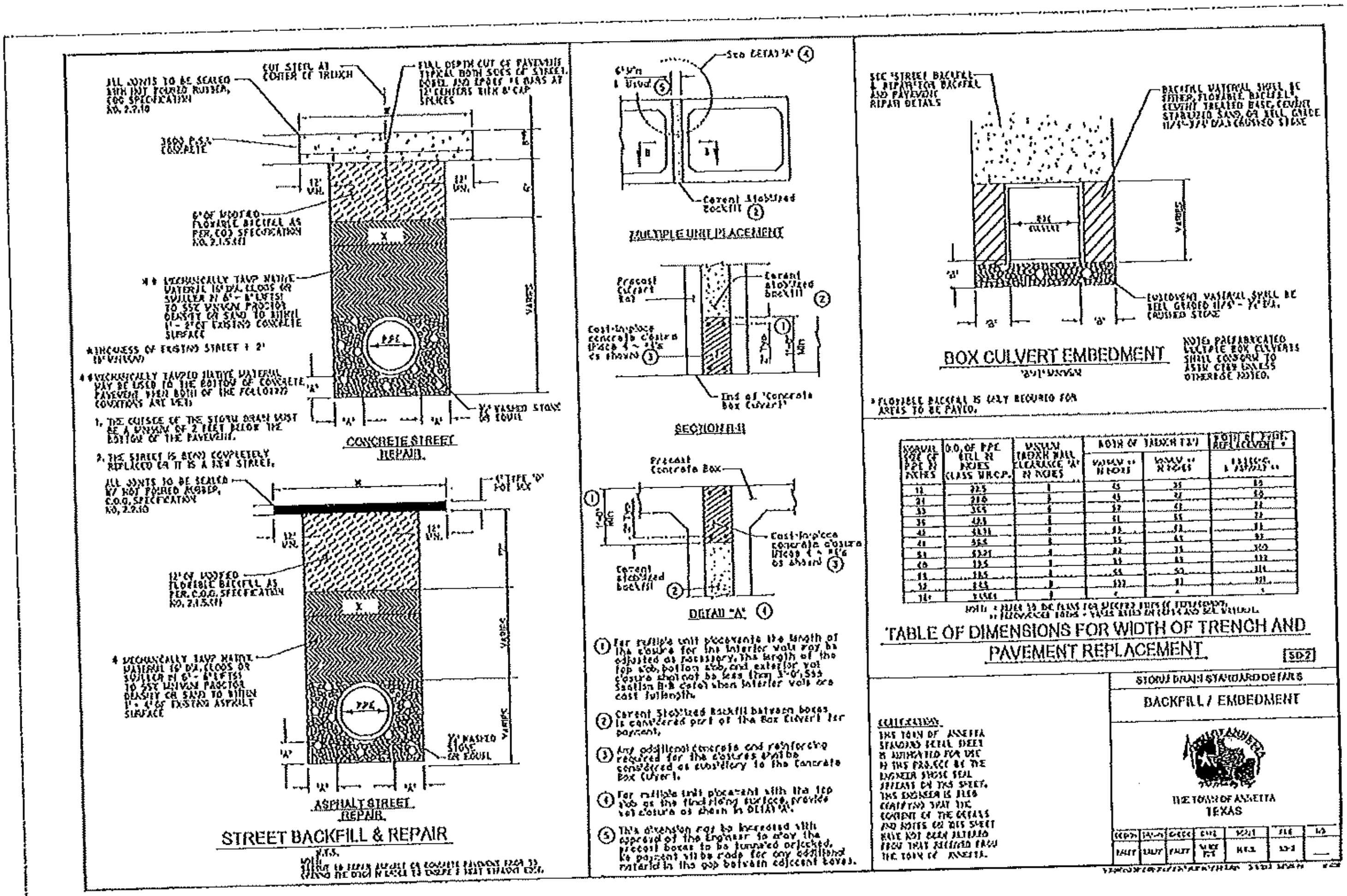
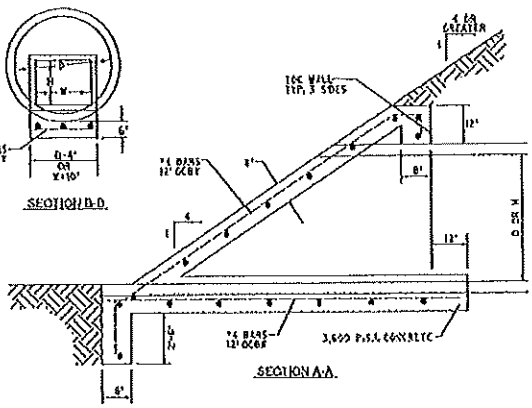
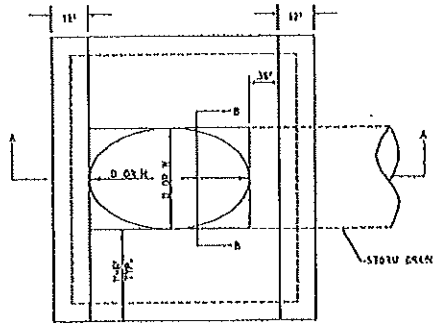
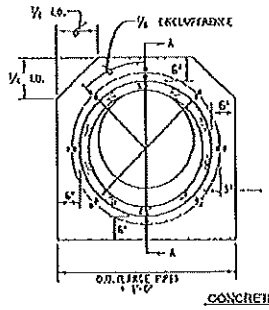

CONCRETE STREET REPAIR
ASPHALT STREET REPAIR
STREET BACKFILL & REPAIR
MULTIPLE UNIT PLACEMENT
SECTION B-B
DETAIL "A"
BOX CULVERT EMBEDMENT
TABLE OF DIMENSIONS FOR WIDTH OF TRENCH AND PAVEMENT REPLACEMENT
SD-2
STORM DRAIN STANDARD DETAILS
BACKFILL / EMBEDMENT
THE TOWN OF ANNETTA
TEXAS

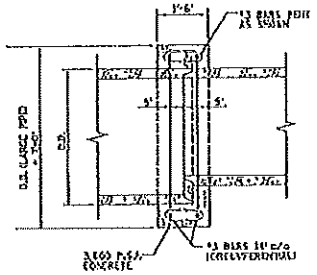




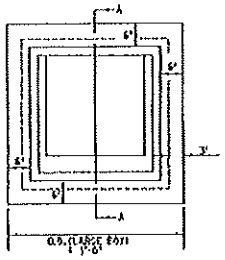
SLOPED HEADWALL

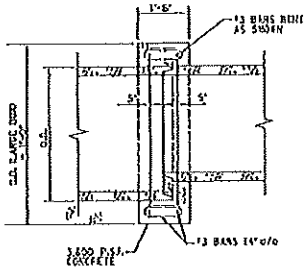
N.T.S.





CONCRETE COLLAR DETAIL (PIPE)





CONCRETE COLLAR DETAIL (BOX)

CONCRETE COLLAR

N.T.S.

(SD-3)

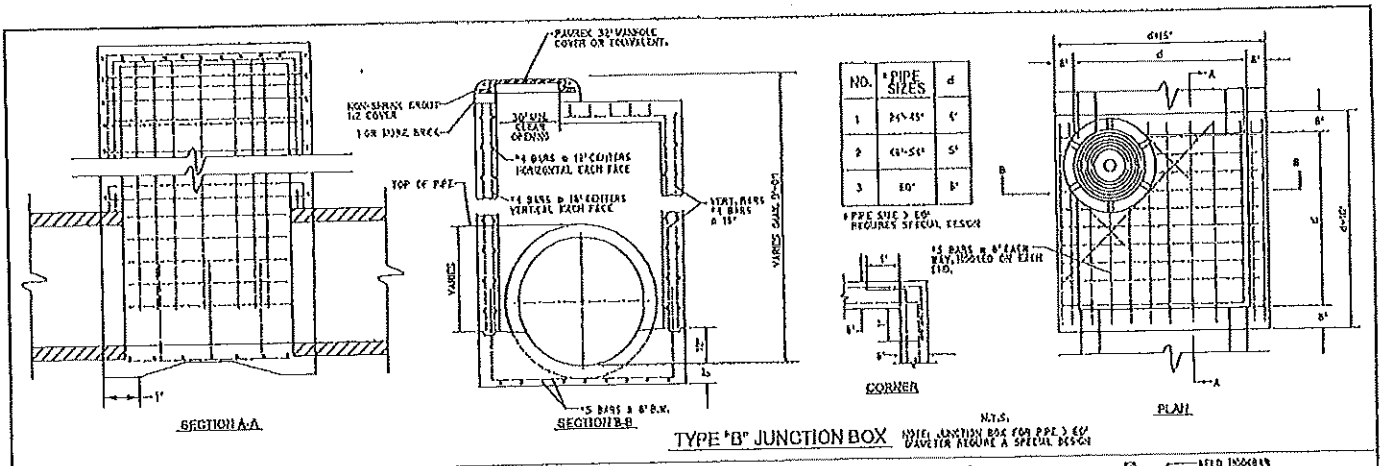
STORM DRAIN STANDARD DETAILS

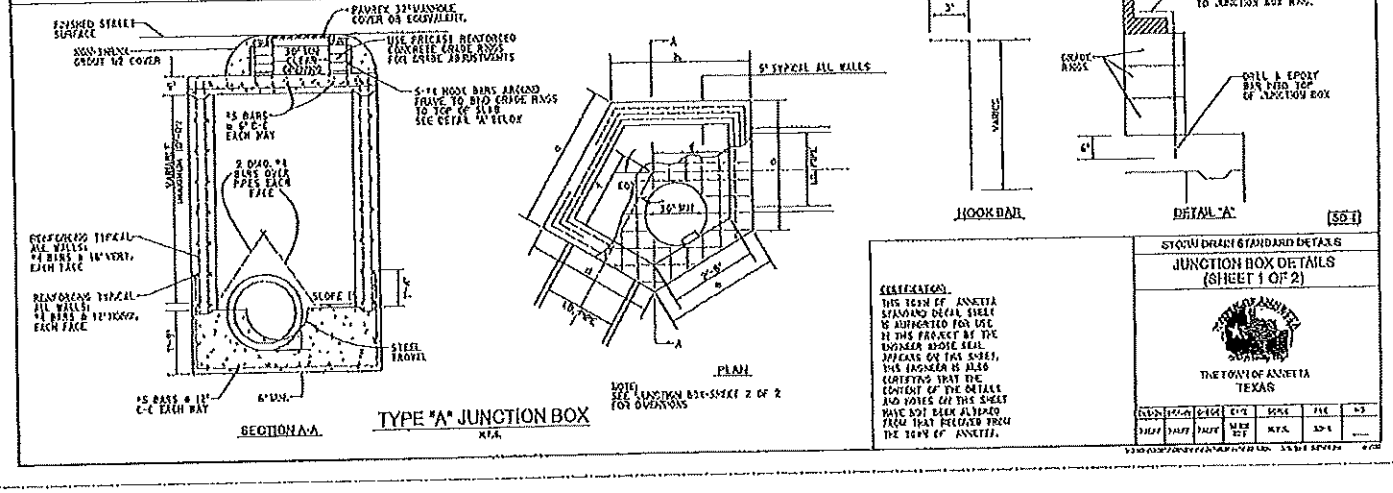
HEADWALLS & PIPE COLLARS

THE TOWN OF ANNETTA
TEXAS

DESIGN	DRAWN	CHECKED	DATE	SCALE	FILE	NO.
MAY	STAFF	ENGR	MAY 2011	N.T.S.	SD-3	—

EXPLANATION:
THE TOWN OF ANNETTA STANDARD DETAIL SHEET IS APPROVED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS NOT RESPONSIBLE FOR ANY CHANGES THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET MAY HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.





CERTIFICATION

THIS SEAL OF ANNETTA STANDARD DETAIL SHEET IS APPROVED FOR USE IN THIS PROJECT AS THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

STORM DRAIN STANDARD DETAILS

JUNCTION BOX DETAILS
(SHEET 1 OF 2)

THE TOWN OF ANNETTA
TEXAS

TYPE "A" JUNCTION BOX DIMENSIONS

NO.	PIPE SIZES	a	b	c	d	e	f
1	18"-24"	4'-5½"	4'-5½"	4'-2"	4'-2"	3'-6½"	2'-5"
2	27"-33"	4'-11½"	4'-11½"	5'-1"	5'-1"	3'-6½"	2'-8"
3	36"-42"	5'-5½"	5'-5½"	5'-11½"	5'-11½"	3'-6½"	2'-11"
4	48"-54"	6'-1½"	6'-1½"	7'-1½"	7'-1½"	3'-6½"	3'-3"
5	60"-66"	6'-9½"	5'-9½"	8'-3½"	8'-3½"	3'-6½"	3'-7"
6	72"-78"	7'-6"	7'-6"	9'-5½"	9'-5½"	3'-6½"	3'-11"
7	84"-90"	8'-6½"	8'-6½"	11'-2½"	11'-2½"	3'-6½"	4'-5½"

GENERAL NOTES:

(1) All construction shall be in accordance with the standard specifications of the Town of Annetta, which has also adopted the Fourth Edition of the "Standard Specifications for Public Works Construction – North Central Texas" herein referred to as "COG" specifications. Copies may be obtained from the North Central Texas Council of Governments, 616 Six Flags Drive, Suite 200, Arlington, Texas 76005-5888, (817) 640-3300.

(2) All manholes shall be poured in place. Precast junction boxes or manholes are not allowed.

(3) Concrete shall be made with a minimum of 5 sacks of cement and have a minimum compressive strength of 3,600 PSI at 28 days.

(4) All reinforcing steel shall be new, billet-steel bar ASTM designation A-615, Grade 60, and shall be detailed and placed per ACI Manuals SP-66 and 318, latest editions. All reinforcing steel shall have minimum 15 inch lap splices, unless noted otherwise on the plans.

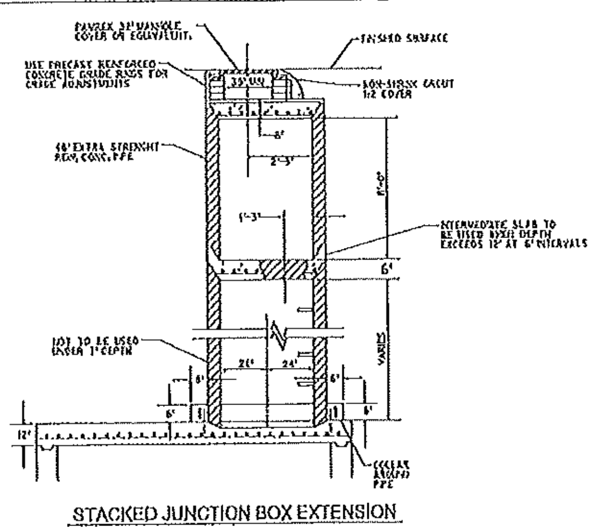
(5) The Contractor shall use a liquid membrane-forming curing compound per COG Item [illegible] specifications.

(6) Light broom finish required on all exposed manhole tops.

(7) Manhole steps, frame and cover shall be installed as per the details on this sheet.

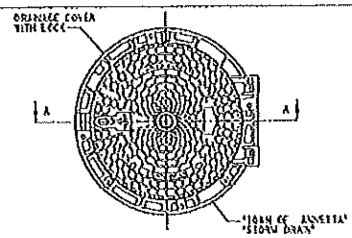
(8) Stacked manhole extension shall be installed, where specified on the plans and as per the details on this sheet.

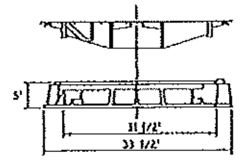
(9) Manholes shall be constructed per details on this sheet and COG Item 502.1.4 specifications.



STACKED JUNCTION BOX EXTENSION

N.T.S.





SECTION A-A

RING & COVER NOTES:

1. THE STD. MANHOLE COVER SHALL BE PAMREX 32" RING AND COVER NO. [illegible] OR EQUAL.
2. APPROXIMATE WEIGHT OF RING-107 LBS. AND COVER-182 LBS.
3. MANHOLE COVER AND NECK SHALL HAVE A MINIMUM CLEAR OPENING OF 30".

STANDARD 32" PAMREX RING & COVER

NOT TO SCALE

SD-5

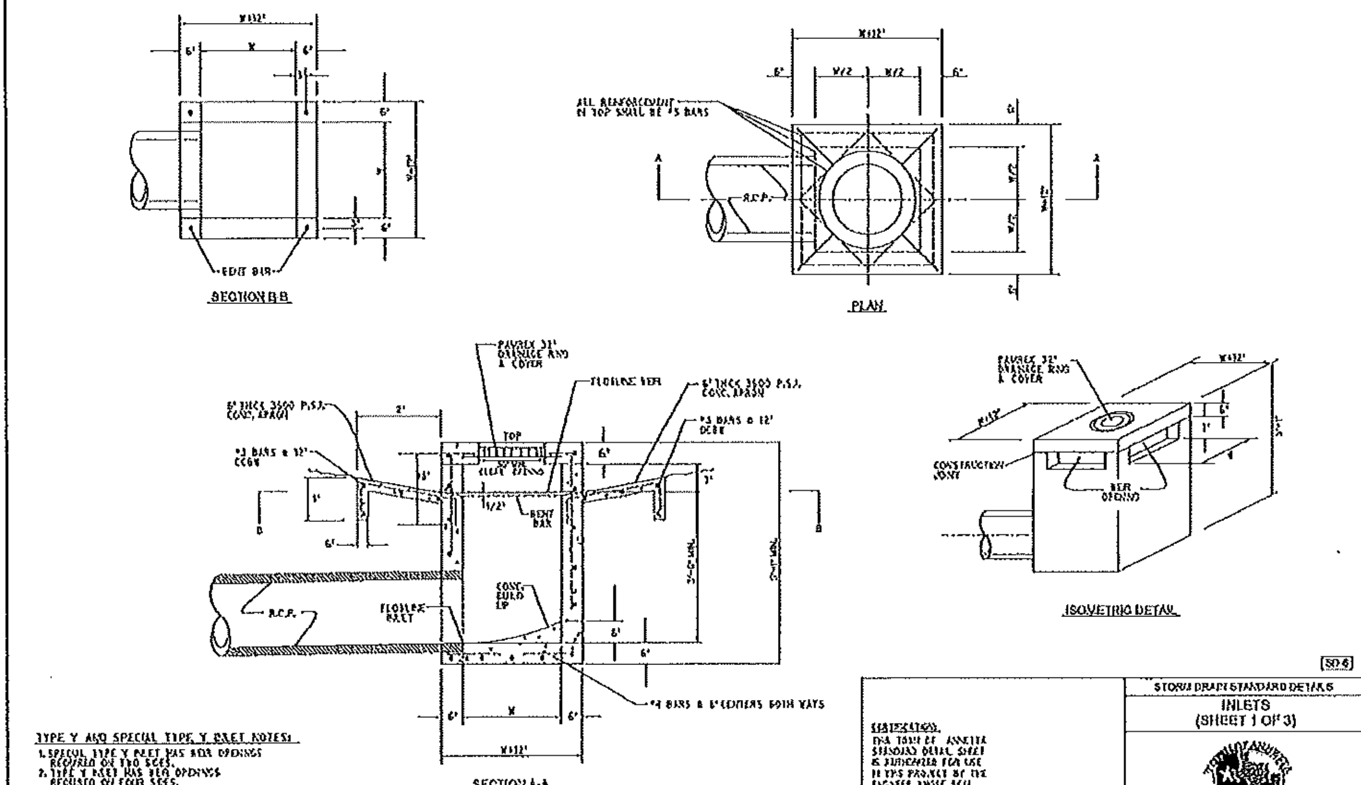
CERTIFICATION:
THE TOWN OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THE ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

STORM DRAIN STANDARD DETAILS

JUNCTION BOX DETAILS
(SHEET 2 OF 2)

THE TOWN OF ANNETTA
TEXAS

[illegible]	[illegible]	[illegible]	[illegible]	SCALE	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	N.T.S.	SD-5	—



TYPE Y AND SPECIAL TYPE Y INLET NOTES:

1. SPECIAL TYPE Y INLET HAS SIDE OPENINGS REQUIRED ON TWO SIDES.
2. TYPE Y INLET HAS SIDE OPENINGS REQUIRED ON FOUR SIDES.
3. THE MAXIMUM OPENINGS FOR TYPE Y AND SPECIAL TYPE Y INLETS IS X=3 FEET
4. ALL REINFORCING SHALL BE WITH #4 BARS @ 12 INCH CENTERS, EXCEPT IN TOP.

TYPE Y & SPECIAL TYPE Y INLET

N.T.S.

NOTE: MAXIMUM DIMENSION FOR "X" = 36 INCHES

CERTIFICATION:
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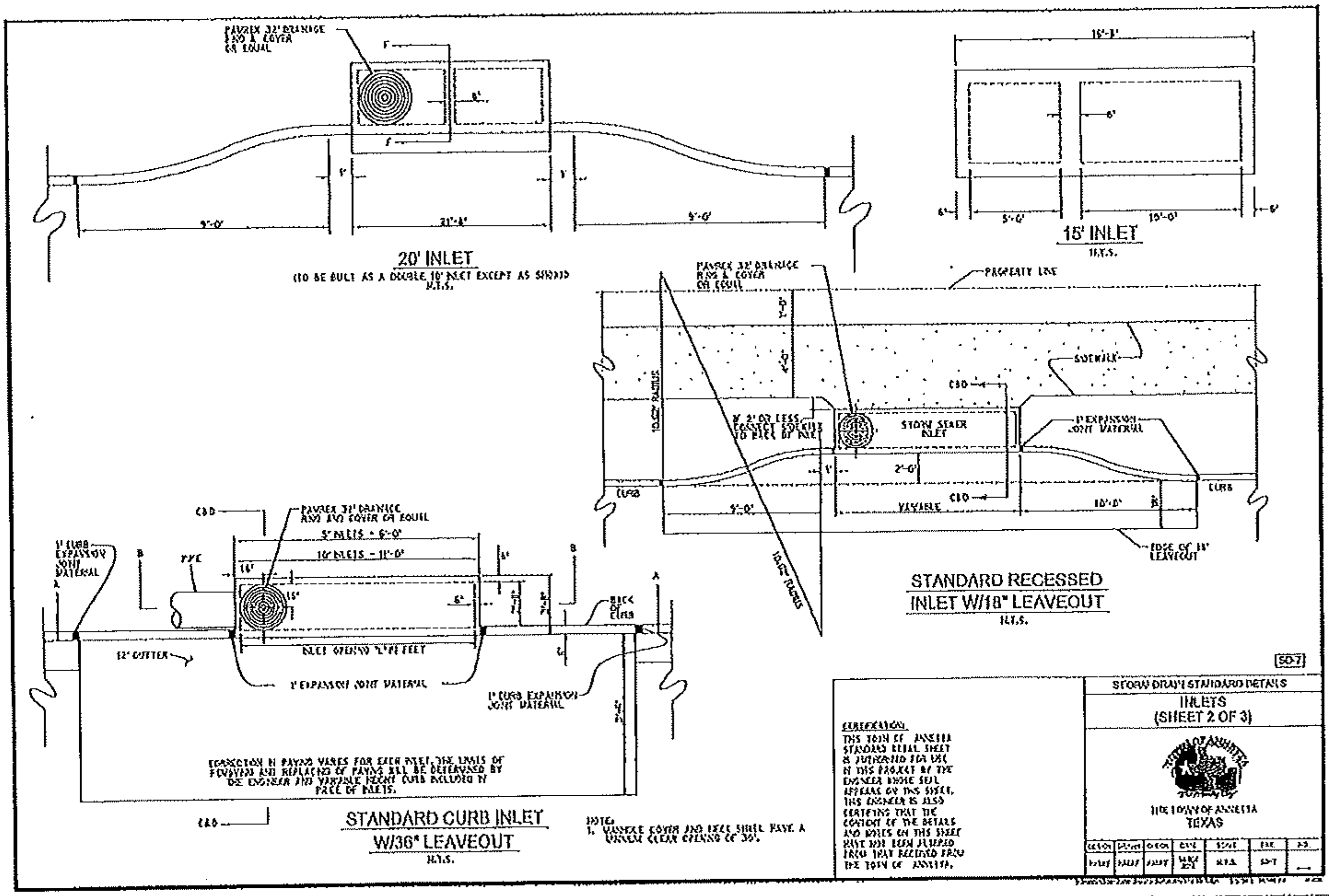
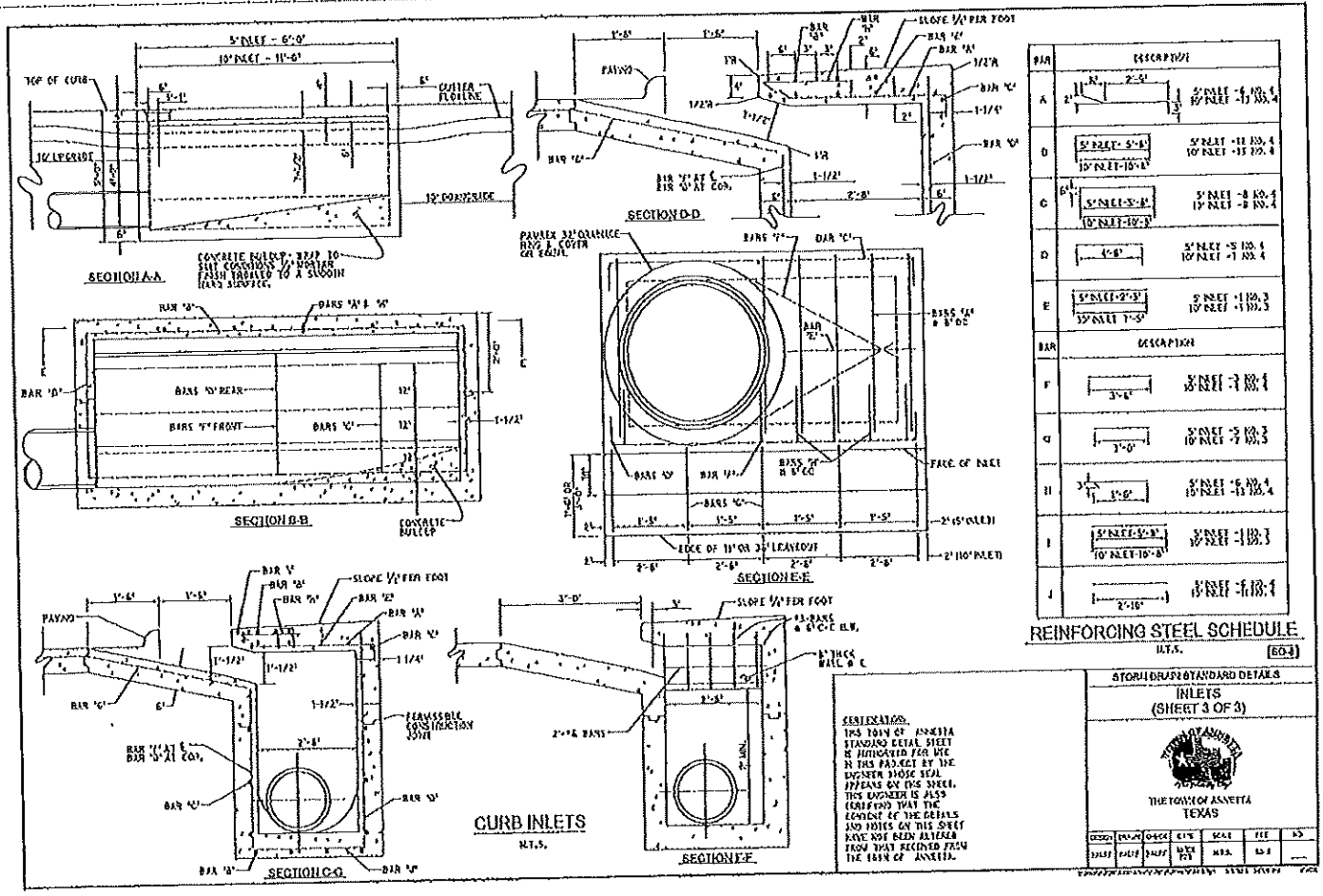
STORM DRAIN STANDARD DETAILS

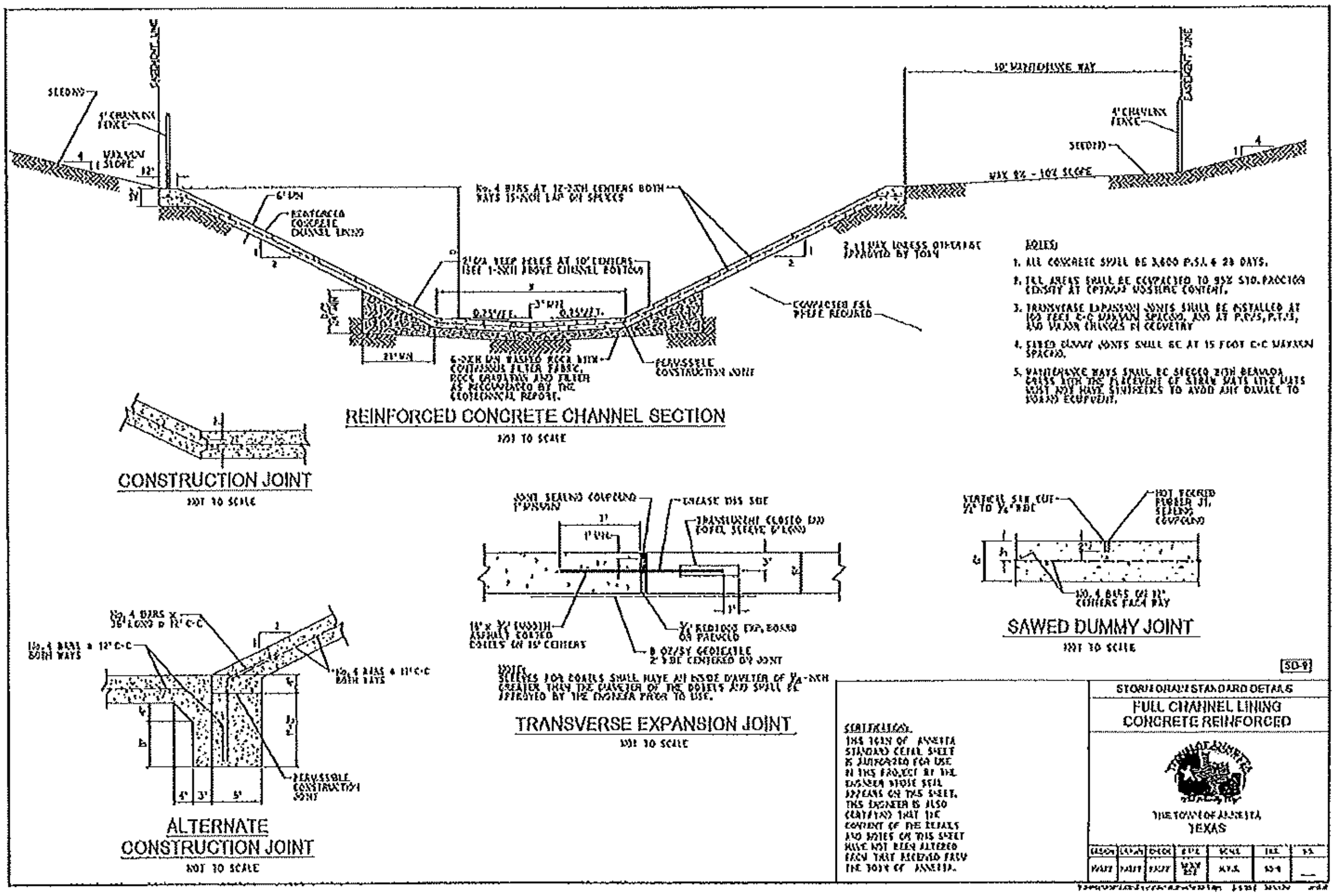
INLETS
(SHEET 1 OF 3)

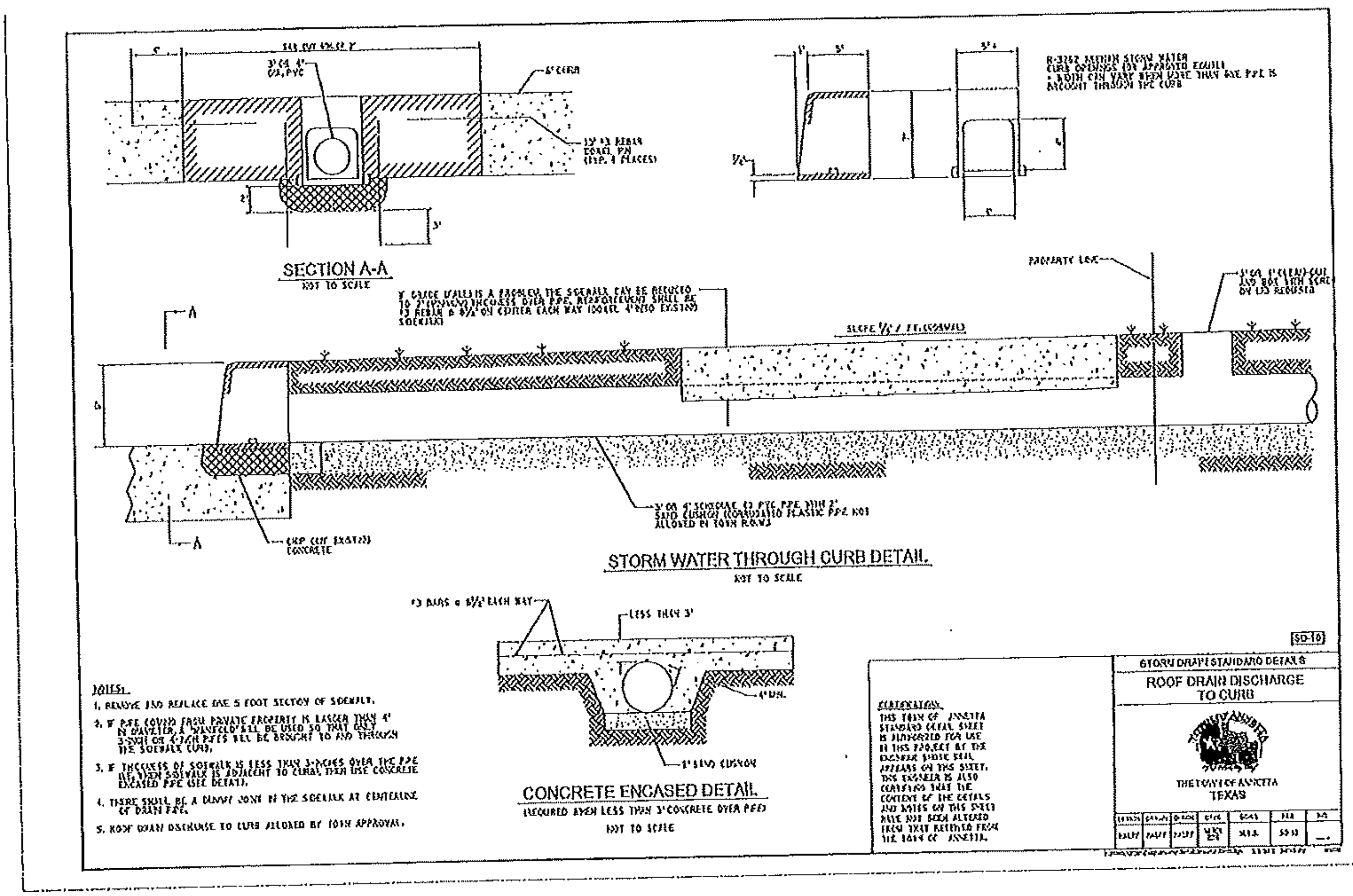
THE TOWN OF ANNETTA
TEXAS

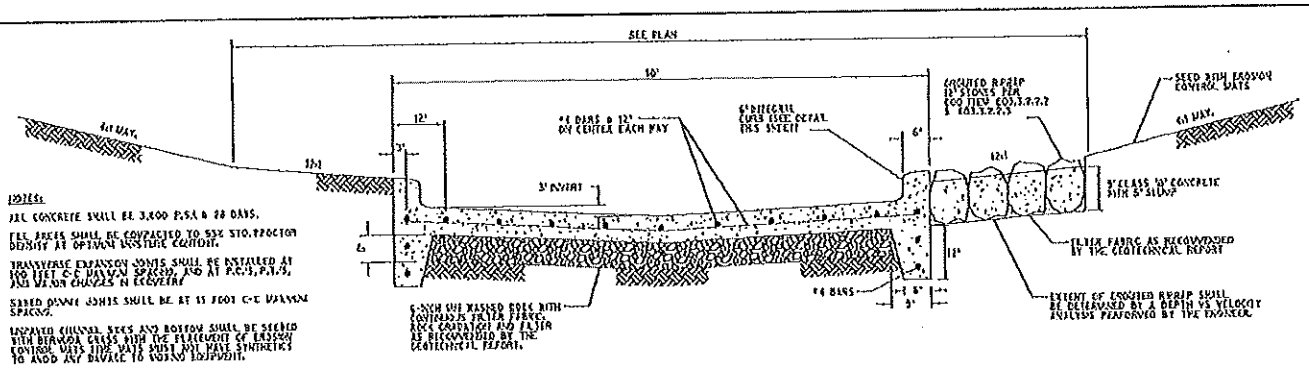
N.T.S.


20' INLET
15' INLET
STANDARD RECESSED INLET W/18" LEAVEOUT
STANDARD CURB INLET W/36" LEAVEOUT
SD-7
STORM DRAIN STANDARD DETAILS
INLETS
(SHEET 2 OF 3)
TEXAS


SECTION A-A
SECTION B-B
SECTION C-C
SECTION D-D
SECTION E-E
SECTION F-F
CURB INLETS
N.T.S.
REINFORCING STEEL SCHEDULE
N.T.S.
STORM DRAIN STANDARD DETAILS
INLETS
(SHEET 3 OF 3)
THE TOWN OF ANNETTA
TEXAS

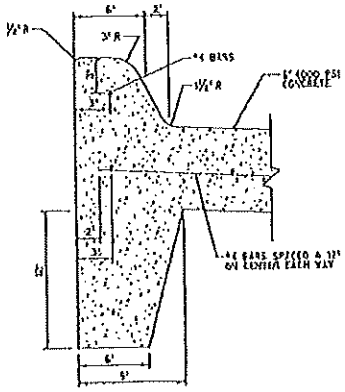

REINFORCED CONCRETE CHANNEL SECTION
CONSTRUCTION JOINT
TRANSVERSE EXPANSION JOINT
SAWED DUMMY JOINT
ALTERNATE
CONSTRUCTION JOINT
SD-9
STORM DRAIN STANDARD DETAILS
FULL CHANNEL LINING
CONCRETE REINFORCED
TEXAS


SECTION A-A
NOT TO SCALE
STORM WATER THROUGH CURB DETAIL.
NOT TO SCALE
CONCRETE ENCASED DETAIL
NOT TO SCALE
SD-10
STORM DRAIN STANDARD DETAILS
ROOF DRAIN DISCHARGE
TO CURB
TEXAS



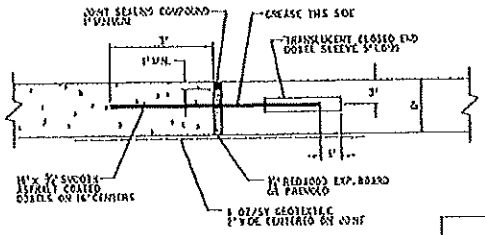
CONCRETE PILOT CHANNEL DETAIL

NOT TO SCALE



6" INTEGRAL CONCRETE CURB

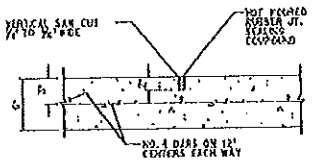
NOT TO SCALE



NOTE:
SLEEVES FOR DOWELS SHALL HAVE AN INSIDE DIAMETER OF ⅛"-INCH GREATER THAN THE DIAMETER OF THE DOWELS AND SHALL BE APPROVED BY THE ENGINEER PRIOR TO USE.

TRANSVERSE EXPANSION JOINT

NOT TO SCALE



SAWED DUMMY JOINT

NOT TO SCALE

SD-11

STORM DRAIN STANDARD DETAILS

TYPICAL PILOT CHANNEL

THE TOWN OF ANNETTA
TEXAS

LEGAL NOTICE:
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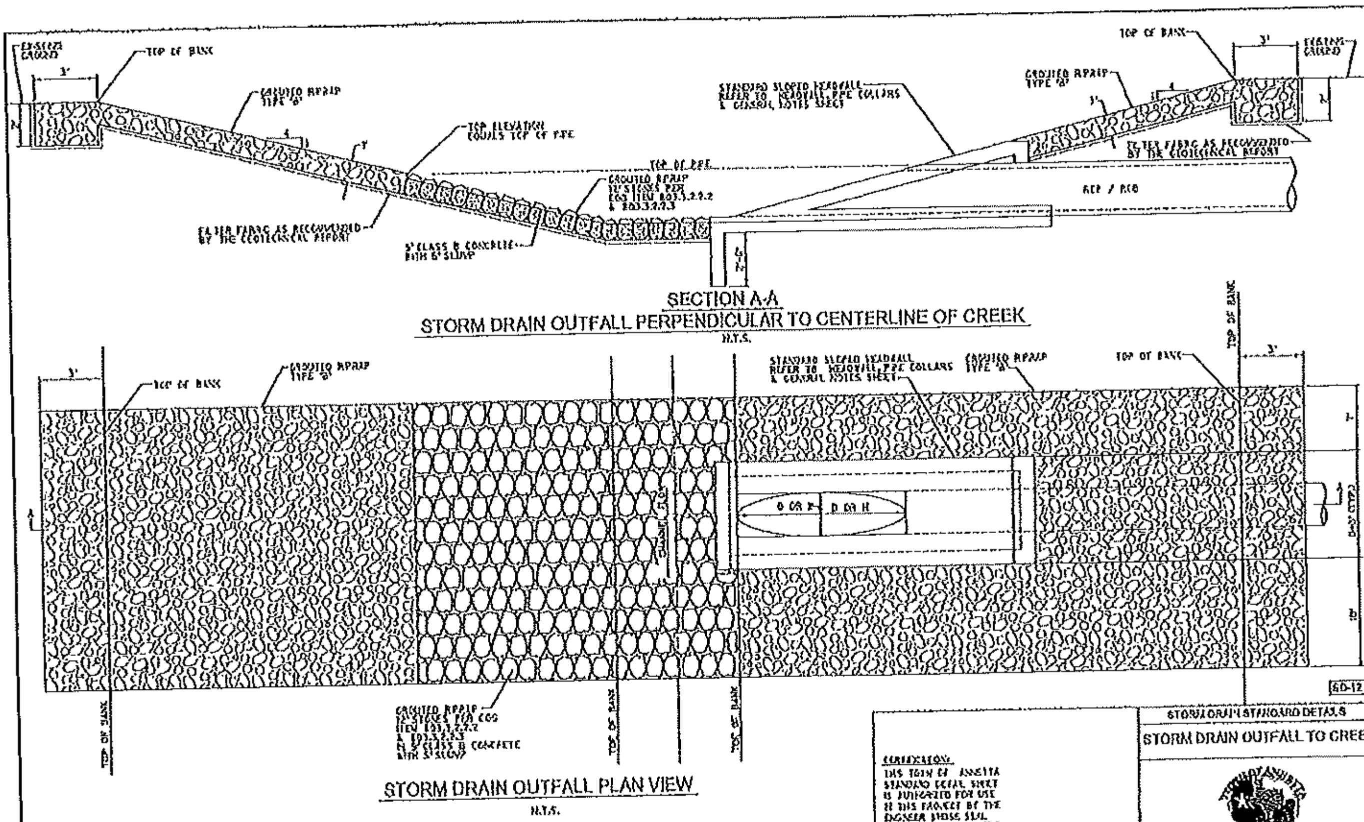
DESIGN	DRAWN	CHECKED	DATE	SCALE	FILE	NO.
TXDOT	TXDOT	TXDOT	MAR 2014	N.T.S.	SD-11	—



STORM DRAIN STANDARD DETAILS

STORM DRAIN OUTFALL TO CREEK

THE TOWN OF ANNETTA
TEXAS

CERTIFICATION:
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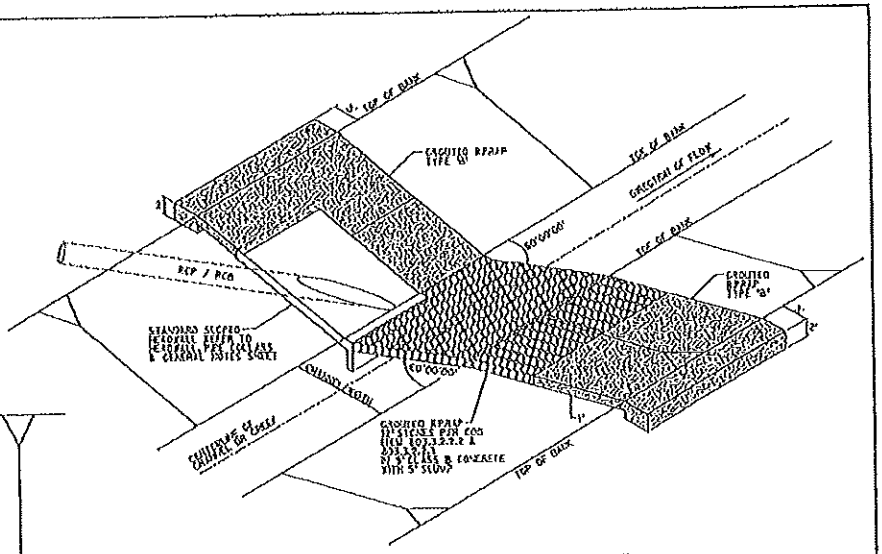

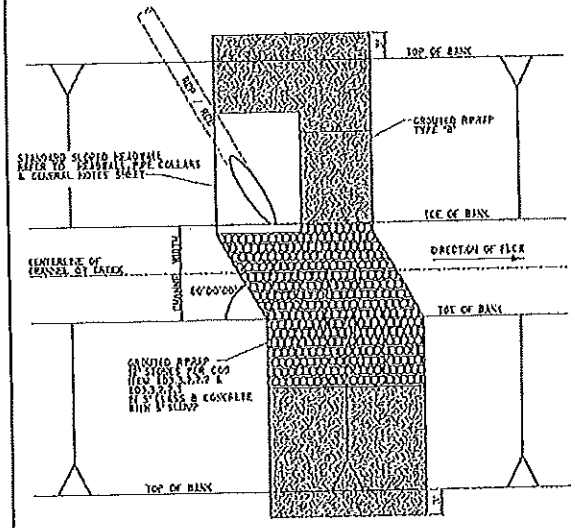

STORM DRAIN OUTFALL PLAN VIEW
N.T.S.

STORM DRAIN OUTFALL - 60 DEGREE ANGLE TO CREEK

[50.13]

CERTIFICATION:
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STORM DRAIN STANDARD DETAILS

STORM DRAIN OUTFALL
60 DEGREE ANGLE TO CREEK

TOWN OF ANNETTA
TEXAS

DESIGN	DRAWN	CHECK	DATE	SCALE	FILE	NO.
JULY	JULY	PATT	MAY 07	N.T.S.	50-13	—

WATER GENERAL NOTES

1. All construction shall be in accordance with the standard specifications and details of the Town of Annetta and the most recent edition of the "Standard Specifications for Public Works Construction – North Central Texas" herein referred to as "COG". Copies may be obtained from the North Central Texas Council of Governments, 616 Six Flags Drive, Suite 200, Arlington, Texas 76005-5888. All installations must meet or exceed TCEQ standards in addition to NCTCOG.

2. For 6-inch to 24-inch sizes, water lines shall be AWWA C900-07 Polyvinyl Chloride Pressure Class 235 (DR18) or greater.

3. Fittings shall be cast iron or ductile iron with 83-mil polywrap per COG Item 501.7.C. All fittings shall be Mega Lug or equivalent unless specified otherwise. Beveled ends of the pipe shall be removed when used with Mega Lug fittings. Fittings shall be blocked as per the Concrete Blocking details.

4. Water pipe shall be blue in color.

5. All pipe joints shall be gasketed, bell and spigot, push-on type.

6. For creek crossings with less than 5 feet of cover to the creek flowline, the pipe shall be PVC with concrete encasement.

7. Embedment and backfill shall be as per the Water Details for pipes up to 12-inch diameter. For pipes larger than 12-inch size, the Engineer shall specify embedment.

8. Minimum cover over water lines shall be as follows:

    a. 36 inches for water lines 12-inches in diameter or less.

    b. 60 inches for water lines larger than 12-inches in diameter.

    c. Cover over 72 inches must be approved by the Town.

9. Trace wire and marking tape shall be installed on all water mains and shall be considered incidental to all construction of water main. Materials, installation and testing shall be as follows:

    a. Trace wire shall be fourteen (14) gauge minimum solid copper with thermoplastic insulation recommended for direct burial. Wire connectors to be 3M DBR, or approved equal, and shall be watertight to provide electrical continuity.

    b. Trace wire access points shall be composed of one CopperHead SnakePit Magnetized Tracer Box, Test and Monitoring Station, or approved equal, and shall be installed in each proposed 24"x24" concrete valve pad.

    c. Trace wire shall be installed in the same trench and inside bored holes and casing with pipe during pipe installation. It shall be secured to the pipe as required to insure that the wire remains adjacent to the pipe. The trace wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity, and it shall be accessible at all trace wire access points.

    d. Trace wire access points shall be spaced at no more than five hundred (500) feet and at every proposed 24"x24" concrete valve pad. Concentrations of multiple proposed valves near pipe intersections, i.e. tees or crosses, may require more than one access point assembly in each concrete valve pad.

    e. Trace wire shall be laid flat and securely affixed to the pipe at 10 feet intervals. The wire shall be protected from damage during the execution of the work. Breaks or cuts in the trace wire or insulation shall be permitted. At water service saddles, the trace wire shall not be allowed to be placed between the saddle and the water main.

    f. Except for approved spliced-in connections, trace wire shall be continuous and without splices from each trace wire access point. Where any approved spliced-in connections occur, 3M DBR watertight connectors, or approved equal, shall be used to provide electrical continuity.

    g. At all water main end caps, a minimum of 6 feet of trace wire shall be extended beyond the end of the pipe, coiled and secured for future connections. The end of the trace wire shall be spliced to the wire of a six pound zinc anode and is to be buried at the same elevation as the water main.

    h. For directional drilling, augering or boring installations, three (3) trace wires shall be installed with the pipe and connected to the trace wire at both ends.

    i. Spliced connections between the main line trace wire and branch connection trace wire shall only be allowed at water main tees, crosses or at iron or copper water services where a portion of the branch connection water main or water service is replaced with a non-iron or non-copper material. The branch connection trace wire shall be a single trace wire properly spliced to the main line trace wire. Where the existing branch connection is neither iron nor copper, then the new branch connection trace wire shall be properly spliced to the existing trace wire on the branch connection.

    j. At all repair locations where there is existing trace wire, the trace wire shall be properly reconnected and spliced as outlined above.

    k. Contractor shall perform a continuity test on all trace wire in the presence of the Inspector or the Town's representative. If the trace wire is found to be not continuous after testing, Contractor shall repair or replace the failed segment of the wire.

10. Clay cut-off walls shall be constructed as per the Water Details.

11. PVC Water pipe is allowed to be stored a maximum of six [illegible] protected from sunlight and is to be protected from other elements.

12. When PVC water pipe is installed in casing, skids must be used to prevent damage to the pipe and bell during installation. PVC pipe should not rest on the bells. Plastic spacers such as RACI or approved equal shall be used.

13. All valves installed on waterlines shall be resilient gate valves with non-rising stems and resilient wedge seat.

14. Plumbing of any yard piping and transmission lines that cross under concrete, paving, asphalt, etc. shall be sleeved in at least 4" [illegible] schedule 40 pipe or greater and extend at least 2' outside curb line.

15. Valves and fire hydrants shall be installed in line with lot and ROW lines, where possible.

16. Valve locations shall be marked with "V" stamped or cut on the curb and painted blue for water mains and silver for fire hydrants.

17. All property corners shall be staked with iron pins prior to the installation of any water services. The locations of the water service shall be staked according to the plans.

10. Unless otherwise stated in the Contract Documents the Contractor is responsible for all testing. All field reports shall be turned in to the Town Inspector within five (5) working days. Failed samples must be reported to the Town Inspector immediately.

19. Water mains shall be standard sizes that are readily available such as 8-inch, 12-inch, 16-inch, 20-inch, 30-inch, and 36-inch.

    a. The CONTRACTOR shall be responsible for notifying the Town Inspector at least 24 hours prior to any required testing.

    b. Soil and material testing technicians shall provide written proof of having minimum of two (2) years of related field experience.

    c. The CONTRACTOR shall coordinate all testing activities with the Town Inspector and shall facilitate required testing throughout the construction period. The Inspector shall be present during all testing.

    d. The Town shall make final decision as to the validity of all testing results.

    e. The CONTRACTOR shall be responsible for ensuring that materials to be tested are in compliance with all plans and specifications prior to testing. All materials found not to be in compliance with the plans and specifications before and after testing shall be removed and replaced at the CONTRACTOR'S expense.

    f. All costs associated with the retesting of work that fails to meet the specifications required in the contract documents shall be borne by the CONTRACTOR. For Town projects, retesting cost shall be withheld from pay requests submitted by the CONTRACTOR. This cost will be based on the Town's cost with no additional mark-up. A letter of acceptance will not be issued until all testing deficiencies are corrected and all retested cost paid.

    g. The Town Inspector shall be notified of concrete placement 24 hours in advance for steel and form inspection.

    h. One set of four cylinders (2-7 day, 2-28 day) for cast-in-place concrete shall be made for every day that concrete is placed (ASTM C-31). Air, slump, and temperature tests shall be taken for every set of cylinders made. Concrete with a temperature above 95 degrees will be rejected. Additional cylinders and or tests may be requested at the Inspector or ENGINEER's discretion. Exterior forms shall not be removed for a minimum of 24 hours unless approved by Inspector or ENGINEER. Sulfate resistant concrete shall be used for all manholes.

    i. Backfill and Density Testing

        1) All trenches shall be backfilled in accordance with standard details and mechanically compacted with approved vibratory methods in accordance with COG Item 501.5.3.7.1 and Paragraph 3) below unless otherwise stated on the plans or in the specifications.

        2) Densities shall conform to standard trench details, COG Item 501.5.3.7.1, and Paragraph 3) below unless otherwise stated on the plans or in the specifications. Proctor samples shall be taken for all classifications of soil on site. Atterberg Limits shall be determined on all Proctor samples. No "reboring" will be allowed. Densities shall be taken on all water services both sides of the street within the Right-of-Way and shall conform to Paragraph 3) below and COG Item 501.5.3.7.1, unless otherwise stated on the plans or in the specifications. Backfill adjacent to all structures shall be compacted manually and density tested on every lift.

        3) Unsaturated Tamping of Backfill

            a) All ditch lines and bore pits shall be mechanically tamped.

            b) Backfill, other than select fill, may consist of onsite or offsite processed soils and should be placed in loose lifts 6" – 8" in thickness (not to exceed 12") and should be mechanically compacted to 95 percent of the maximum dry density as defined by ASTM D-698 (Standard Proctor) procedures under existing and proposed pavement, and to 90 percent standard proctor procedures elsewhere. The moisture content of the fill at the time of compaction shall be between minus 2% of optimum to four percentage points above the proctor optimum value.

            c) All backfill material to be select native material, 6" diameter clods and smaller, unless directed otherwise on the plans or in the specifications and to be mechanically tamped and density controlled as described in Paragraph b) above.

            d) Water jetting is not permitted.

CERTIFICATION
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town of ANNETTA

SHEET 1 OF 2 | NOVEMBER 20[illegible]

WATER STANDARD DETAILS

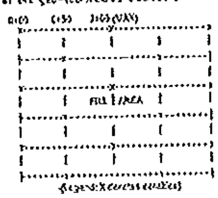
WATER GENERAL NOTES

W-1

WATER GENERAL NOTES, CONT.

e) Densities shall be taken every one (1) lift at staggered locations not to exceed 200 feet increments. Offset fifty (50) feet every other lift.

f) Densities may be taken at typical locations as shown below. Additional densities will be taken at random locations and at the geo-technician's discretion.



g) Purging – All water lines greater than 200 feet in length and 12-inches in diameter or less shall be purged using the "Poly-Pig" method with the "Poly-Pig" to enter and exit at an approved location. Purging shall be in accordance with COD Item 505.7.3.1. Lines larger than 12-inches in diameter shall be purged using the flushing method in accordance with COD Item 505.7.3.2. The Town inspector must be present.

h) Hydrostatic Testing – All water lines shall be tested in accordance with COD Item 505.5. The Town inspector must be present.

i) Disinfection – All water lines shall be disinfected in accordance with COD Item 505.7.5 and as approved by the Town. All bidders shall have corporation stops at the main. One water sample shall be obtained for each street run (no greater than 1,000 feet) or as approved by the Town.

m) Hydrostatic Testing and Disinfection practices must conform to TCEQ rules and regulations.

n) Meters shall be utilized for all Town water usage associated with private development flushing. Each meter shall have a Zenner AMI Ready Meter and MIU unit.

o) Minimum horizontal and vertical clearances for water and wastewater lines established by the Texas Commission on Environmental Quality (TCEQ) must be maintained in all directions. Separation distances, installation practices, and materials utilized must meet 30 TAC §290.44(e)(1-4) of the current rules.

CERTIFICATION

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town of ANNETTA

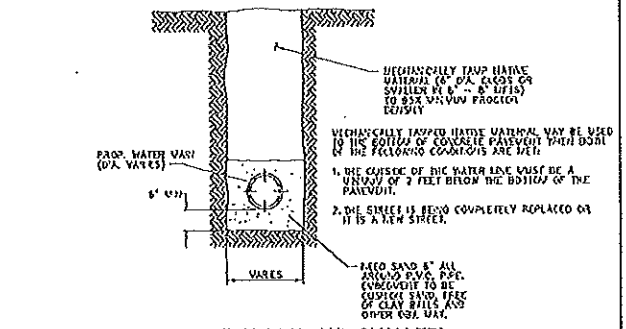
SHEET 2 OF 2

NOVEMBER 2020

WATER STANDARD DETAILS

WATER GENERAL NOTES

W-2

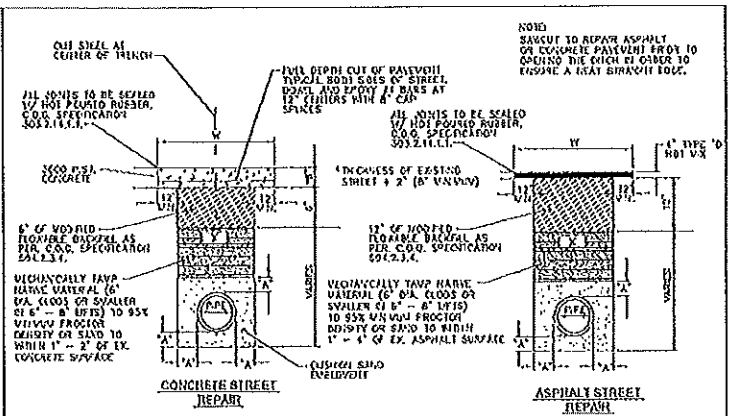


PIPE EMBEDMENT DETAIL (12" DIA. AND SMALLER)

N.T.S.

NOTES:

1. A COMMERCIALLY AVAILABLE MAGNETIC TAPE SHALL BE INSTALLED 12-INCHES ABOVE THE TOP OF ALL PVC WATER PIPE. THE TAPE SHALL BE BLUE IN COLOR AND HAVE THE WORDING "CAUTION WATER LINE BURIED BELOW".
2. TRACE WIRE SHALL BE INSTALLED ON ALL WATER MAINS. SEE GENERAL NOTES FOR REQUIREMENTS.



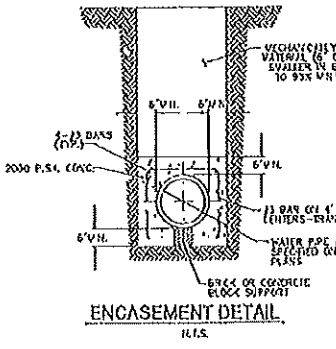
STREET BACKFILL & REPAIR

N.T.S.

TABLE OF DIMENSIONS FOR WIDTH OF TRENCH AND PAVEMENT REPLACEMENT

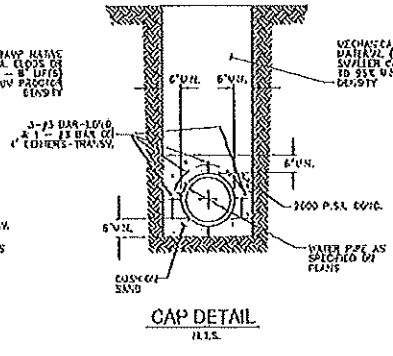
NOMINAL SIZE OF PIPE IN INCHES	O.D. OF PIPE BELL IN INCHES (PVC-DR18)	MINIMUM TRENCH WALL CLEARANCE "A" IN INCHES	WIDTH OF TRENCH ("A")		WIDTH OF PAVEMENT REPLACEMENT
			MINIMUM * IN INCHES	MINIMUM ** IN INCHES	(W) LESS THAN 4" ASPHALT **
6	6.9	6	24	18	48
8	9.0	6	24	19	48
10	11.10	6	24	21	48
12	13.20	6	30	28	60
16+	VARIES	8	*	*	*

NOTE: * REFER TO THE PLANS FOR SPECIFIED WIDTH OF REPLACEMENT.
** RECOMMENDED WIDTHS – VARIES BASED ON DEPTH AND SOIL MATERIAL.



ENCASEMENT DETAIL

N.T.S.



CAP DETAIL

N.T.S.

PIPE EMBEDMENT NOTES:

1. A COMMERCIALLY AVAILABLE MAGNETIC TAPE SHALL BE INSTALLED 12-INCHES ABOVE THE TOP OF ALL PVC WATER PIPE. THE TAPE SHALL BE BLUE IN COLOR AND HAVE THE WORDING "CAUTION WATER LINE BURIED BELOW".
2. TRACE WIRE SHALL BE INSTALLED ON ALL WATER MAINS. SEE GENERAL NOTES FOR REQUIREMENTS.

(CERTIFICATE)

THIS TOWN OF ANNETTA STANDARD DETAIL SHEET IS AUTHORIZED FOR USE ON THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

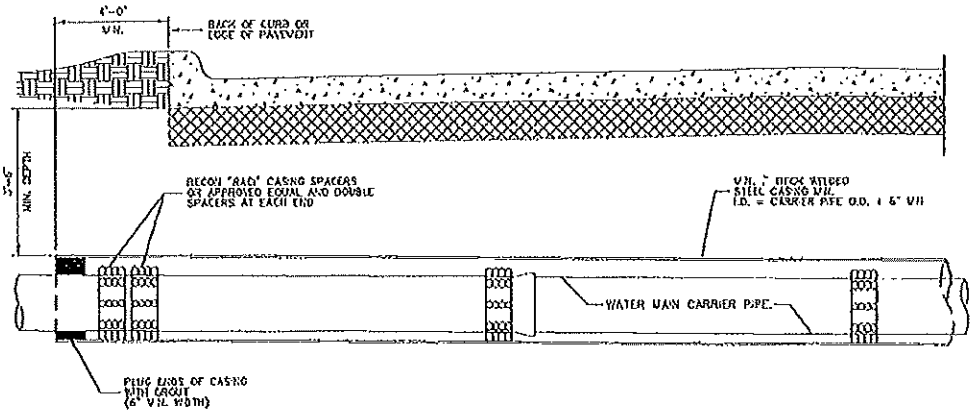
town of ANNETTA

SHEET 1 OF 1 | NOVEMBER 2010

WATER STANDARD DETAILS

BACKFILL /EMBEDMENT

W-3



BORE DETAIL

N.T.S.

NOTES:

1. WHERE A BORE PIT EXCEEDS 5 FEET IN DEPTH THE CONTRACTOR SHALL INSTALL SHORING OF THE PIT WALLS AS REQUIRED BY OSHA.
2. WHERE A BORE IS TO BE PARTIALLY OR COMPLETELY ABANDONED, SAID BORE SHALL BE COMPLETELY FILLED WITH MECHANICALLY PLACED CEMENT GROUT.
3. CASING SHALL BE EXTENDED TO THE RIGHT-OF-WAY LINE FOR STATE HIGHWAY AND RAILROAD CROSSINGS.
4. THE EDGE OF BORE PIT SHALL BE A MINIMUM OF 4' BEHIND THE BACK OF CURB OR EDGE OF PAVEMENT.
5. MINIMUM SCHEDULE CLASS 200 PSI SHALL BE ALLOWED UP TO 6" MAXIMUM. ALL OTHER BORES SHALL BE 1/4" COATED STEEL CASING.
6. 2' SEPARATION BETWEEN ALL OTHER UTILITIES IS REQUIRED. MINIMUM SEPARATION FROM WASTEWATER UTILITIES SHALL BE PER TCEQ.
7. DRY BORES SHALL BE REQUIRED IN ALL ROW AND EASEMENTS.
8. CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL PERMITTING FROM ANY TRANSPORTATION AND ROADWAY AUTHORITY.

CERTIFICATION

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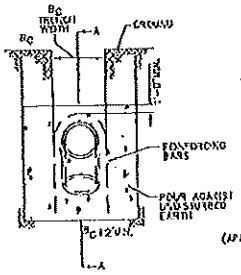
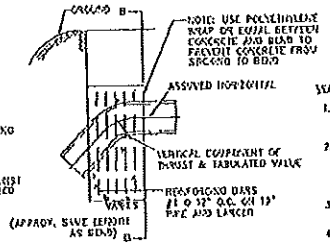
town of ANNETTA

SHEET 1 OF 1	NOVEMBER 2019
WATER STANDARD DETAILS	
BORE DETAIL	W-4



ELEVATION B-B



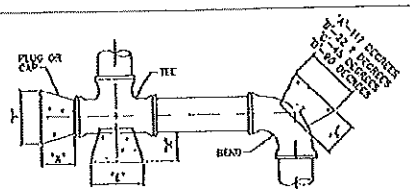
ELEVATION A-A

VERTICAL THRUST BLOCK NOTES:

1. ALL CALCULATIONS ARE BASED ON EXCESSIVE PRESSURE OF 200 P.S.I. FOR 24" I.D. PIPE AND SMALLER AND 150 P.S.I. OF 30" I.D. AND LARGER.
2. VOLUMES OF VERTICAL BEND THRUST BLOCKS ARE NET VOLUMES OF CONCRETE TO BE PROVIDED. THE CORresponding weight of the concrete is equal to or greater than the vertical component of thrust of the vertical bend.
3. WHEN NECESSARY (1) ASSUMED HERE FOR ESTIMATED PURPOSES ONLY.
4. CONCRETE FOR BLOCKING SHALL BE 2000 P.S.I. CONCRETE DIMENSIONS MAY BE VARIED AS REQUIRED BY FIELD CONDITIONS WHERE AND AS DIRECTED BY THE ENGINEER, THE VOLUME OF CONCRETE BLOCKING SHALL NOT BE LESS THAN SHOWN HERE.

Δ	11.25°		22.50°		30°		45°		67.50°		90°		Δ
I.D. (IN.)	THRUST 100'S	VOL. C.Y.	THRUST 100'S	VOL. C.Y.	THRUST 100'S	VOL. C.Y.	THRUST 100'S	VOL. C.Y.	THRUST 100'S	VOL. C.Y.	THRUST 100'S	VOL. C.Y.	I.D. (IN.)
4,6,8	1.0	0.5	2.0	1.0	2.5	1.3	3.6	1.8	4.6	2.3	6.0	2.6	4,6,8
10,12	2.2	1.1	4.3	2.2	5.7	2.8	8.0	4.0	10.5	5.2	11.3	5.7	10,12
16,18	5.0	2.5	9.7	4.9	12.7	6.4	18.0	9.0	23.5	11.8	25.5	12.7	16,18
20	6.1	3.1	12.0	6.0	15.7	7.9	22.2	11.1	29.2	14.5	31.1	15.7	20
24	8.2	4.1	17.3	8.7	22.6	11.3	32.0	16.0	41.8	20.9	45.2	22.6	24
30	10.5	5.2	20.3	10.1	26.5	13.3	37.5	18.8	49.0	24.5	53.1	26.5	30
36	14.9	7.5	29.3	14.6	38.2	19.3	54.0	27.0	70.5	35.3	76.4	38.2	36
42	20.3	10.1	33.8	18.9	52.0	26.0	73.5	36.7	96.0	48.0	104.0	52.0	42
48	26.5	13.2	51.9	26.0	67.9	33.9	95.0	48.0	124.0	61.7	136.0	67.9	48
54	33.5	16.8	65.7	32.9	85.9	42.9	122.0	60.7	159.0	79.4	172.0	85.9	54
60	41.4	20.7	81.2	40.6	106.0	53.0	150.0	75.0	196.0	98.0	212.0	106.0	60
66	50.1	25.0	98.2	49.1	128.0	64.2	182.0	90.7	237.0	119.0	253.0	126.0	66
72	59.6	29.8	117.0	58.4	153.0	76.3	216.0	108.0	282.0	141.0	305.0	153.0	72
78	69.9	35.0	137.0	68.6	179.0	90.0	254.0	127.0	331.0	166.0	358.0	179.0	78
84	81.1	40.5	159.0	79.5	208.0	104.0	296.0	147.0	384.0	192.0	416.0	208.0	84
90	93.1	46.5	183.0	91.3	239.0	119.0	332.0	169.0	441.0	221.0	477.0	239.0	90
96	106.0	53.0	208.0	104.0	272.0	136.0	384.0	192.0	502.0	251.0	543.0	272.0	96

DIMENSIONS OF CONCRETE FOR VERTICAL THRUST BLOCKS AT FITTINGS



P.S.I.	I.D.	11¼ DEGREES		22½ DEGREES		45 DEGREES		90 DEGREES		TEE & PLUG	
		"A"	VERT. AREA	"B"	VERT. AREA	"C"	VERT. AREA	"D"	VERT. AREA	"E"	VERT. AREA
200	4"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	6"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	8"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	10"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	12"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	16"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	18"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	20"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	24"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	30"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	36"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	42"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	48"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	54"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	60"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
150	4"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	6"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	8"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	10"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	12"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	16"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	18"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	20"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	24"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	30"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	36"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	42"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	48"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	54"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	60"	1.5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

HORIZONTAL THRUST BLOCK NOTES:

1. USE MEGA LUGS OR EQUIVALENT FOR ALL BENDS.
2. ALL CALCULATIONS ARE BASED ON A WATER LINE PRESSURE OF 150 P.S.I. AND AN ALLOWABLE SOIL BEARING VALUE OF 2,500 POUNDS PER SQUARE FEET.
3. 3000 P.S.I. CONCRETE SHALL BE USED FOR ALL BLOCKING.
4. THE MINIMUM VERTICAL DIMENSIONS OF ALL BLOCKING SHALL BE 1.5 TIMES THE PIPE DIAMETER WITH AT LEAST 0.75 TIMES THE PIPE DIAMETER EXTENDING BOTH ABOVE AND BELOW THE PIPE CENTERLINE. THIS DIMENSION DETERMINES THE "A" DIMENSION FOR 11 1/4° BENDS.
5. FOR 22-1/2°, 45°, 90°, AND TEE AND PLUGS, THE VERTICAL DIMENSION SHALL BE EQUAL TO THE HORIZONTAL DIMENSION SHOWN TO PRODUCE THE REQUIRED MINIMUM AREA.
6. ALL MINIMUM AREAS ARE IN SQUARE FEET.

DIMENSIONS OF CONCRETE FOR HORIZONTAL THRUST BLOCKING AT FITTINGS

CERTIFICATION:

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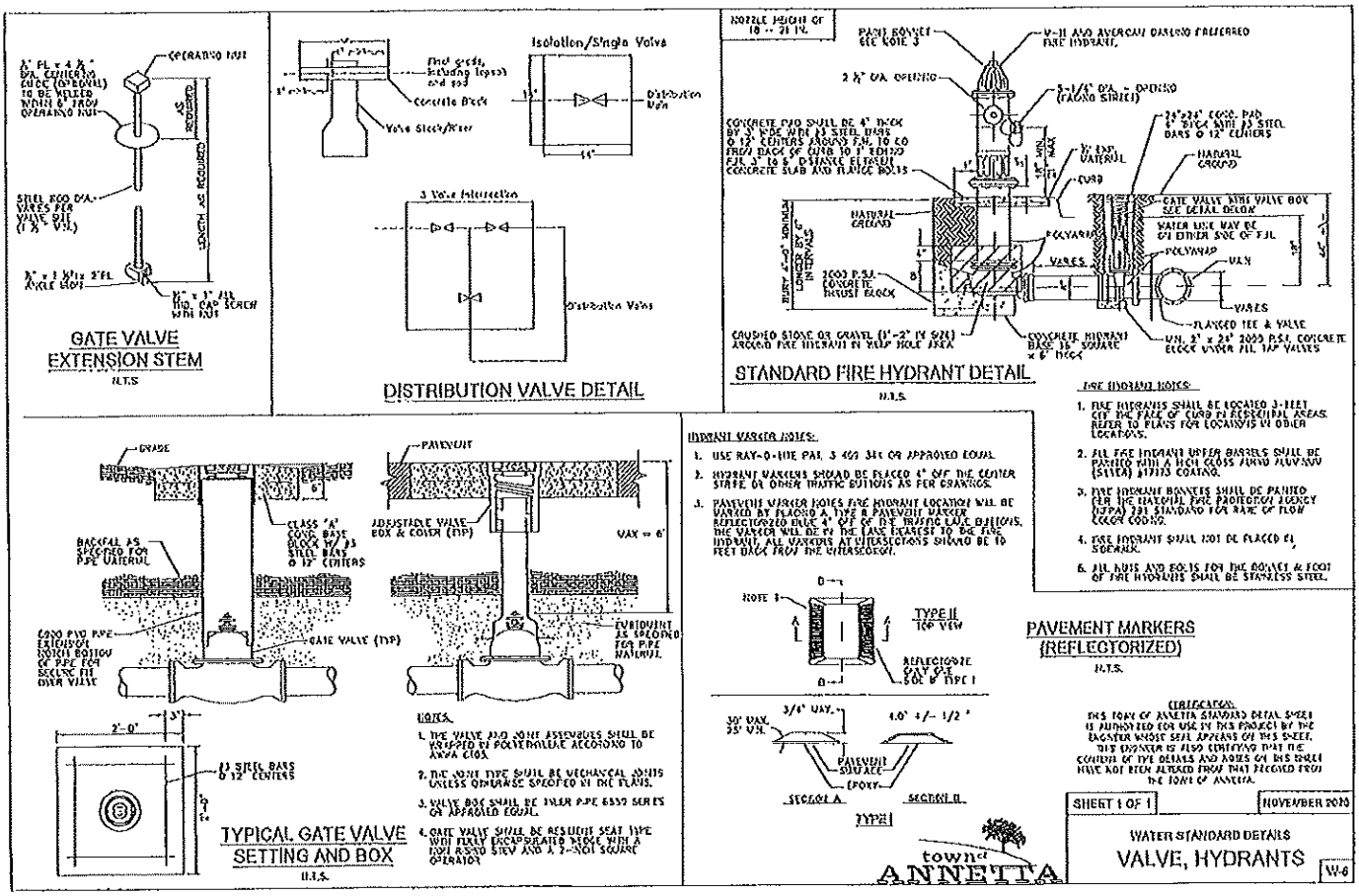
SHEET 1 OF 1 | NOVEMBER 2020

town of ANNETTA

WATER STANDARD DETAILS

CONCRETE BLOCKING

W-5


GATE VALVE EXTENSION STEM
N.T.S.
Isolation/Single Valve
3 Valve Intersection
DISTRIBUTION VALVE DETAIL
STANDARD FIRE HYDRANT DETAIL
N.T.S.
FIRE HYDRANT NOTES:
1. FIRE HYDRANTS SHALL BE LOCATED 3 FEET OFF THE FACE OF CURB IN RESIDENTIAL AREAS. REFER TO PLANS FOR LOCATIONS IN OTHER LOCATIONS.
2. ALL FIRE HYDRANT BARREL SHALL BE PAINTED WITH A HIGH GLOSS ALKYD ALUMINUM (SILVER) PAINT COATING.
3. FIRE HYDRANT BONNETS SHALL BE PAINTED PER THE NATIONAL FIRE PROTECTION AGENCY (NFPA) 291 STANDARD FOR RATE OF FLOW COLOR CODING.
4. FIRE HYDRANT SHALL NOT BE PLACED IN SIDEWALK.
5. ALL NUTS AND BOLTS FOR THE BONNET & BOOT OF FIRE HYDRANTS SHALL BE STAINLESS STEEL.
TYPICAL GATE VALVE SETTING AND BOX
N.T.S.
HYDRANT MARKER NOTES:
1. USE RAY-O-LITE PAR 3 400 SERIES OR APPROVED EQUAL.
2. HYDRANT MARKERS SHOULD BE PLACED 6" OFF THE CENTER STRIPE OR OTHER TRAFFIC BUTTONS AS PER DRAWINGS.
3. PAVEMENT MARKER NOTES FIRE HYDRANT LOCATION WILL BE MARKED BY PLACING A TYPE B PAVEMENT MARKER REFLECTORIZED BLUE 4" OFF OF THE TRAFFIC LANE BUTTONS. THIS MARKER WILL BE ON THE LANE CLOSEST TO THE FIRE HYDRANT. ALL MARKERS AT INTERSECTIONS SHOULD BE 10 FEET BACK FROM THE INTERSECTION.
TYPE II TOP VIEW
REFLECTORIZE GRAY DOT SEE B TYPE I
PAVEMENT MARKERS (REFLECTORIZED)
N.T.S.
3/4" MAX.
30° MAX. 25° MIN.
4.0" +/- 1/2"
PAVEMENT SURFACE
EPOXY
SECTION A
SECTION B
TYPE I
CERTIFICATION:
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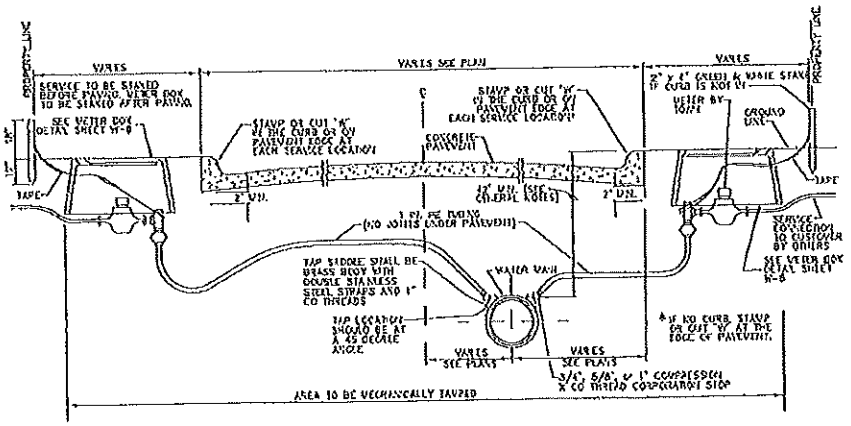
SHEET 1 OF 1
NOVEMBER 2020
WATER STANDARD DETAILS
VALVE, HYDRANTS
W-6
town of ANNETTA

WATER SERVICE NOTES:

1. All property corners shall be staked with iron rods prior to the installation of any water services. Water service locations shall be staked in the field in accordance with Note 4 below.
2. Water services shall not be connected to fire hydrant lead lines.
3. All material shall conform to the standard specifications. See the Town of Annetta EDM or the most recent edition of the "North Central Texas Council of Governments Standard Specifications for Public Works Construction" for a list of approved materials.
4. The Contractor shall set the meter boxes in all cases, the meter box shall be within the right-of-way or a dedicated utility easement. The meter box shall be protected from vehicular traffic.
5. It is the responsibility of the Contractor to furnish and install the corporation, water service pipe, cut-off angle valve, the connector pipe, and meter box, as per the details on this sheet.
6. Direct taps are not allowed, saddles shall be used.
7. Cutter for taps shall be of the double slotted type.
8. Tap saddle shall be brass body with double stainless steel straps and 1" CC threads.
9. All taps larger than 2-inch shall be made using tapping tees.
10. Taps shall be a minimum of 18 inches apart with taps no closer than 1 foot from the end of the pipe.
11. All house services shall be 3/4-inch, 5/8-inch, or 1-inch PVC.
12. No splices of water services shall be permitted under pavement unless approved by the Town.
13. Where splices are approved by the Town, use a 3 part union copper to copper, Mueller restrained union, or equal.
14. Corporations shall be Mueller compression corporation or approved equal.
15. No 90 degree bends may be installed in services, except as shown.
16. All water services to be marked by "W" stamped or cut on the curb.
17. Any brass part of the fitting or valve in contact with potable water shall be made of a "No-Lead Brass".
18. Single services shall be placed on a property line with a 1" line and reduced at the angle stop.



WATER SERVICE DETAIL

N.T.S.

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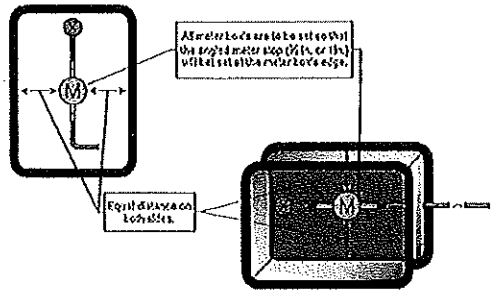
SHEET 1 OF 1 | NOVEMBER 2010

town of ANNETTA

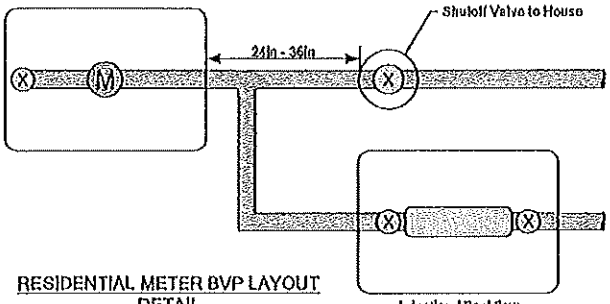
WATER STANDARD DETAILS
SERVICES

W-7



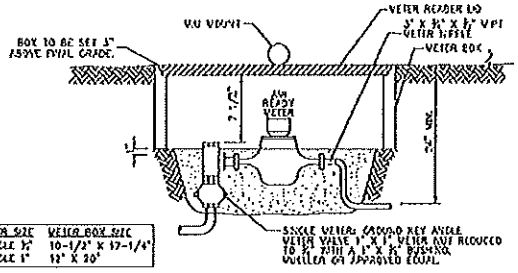
Single ¾ inch or ¾ inch shall use a 1200 series poly meter box (12" x 17" x 12").
Double set meter tops and 1 inch meters shall use a 1500 series poly meter box (15" x 21" x 12").
All meters shall utilize angled meter couplings so plumbing can be set below frost line (18" min.).

METER SPACING DETAIL
N.T.S.



RESIDENTIAL METER BVP LAYOUT DETAIL
N.T.S.

Irrigation / Backflow Prevention Double Check Box



METER SIZE	METER BOX SIZE
SINGLE ¾"	10-1/2" X 17-1/4"
SINGLE 1"	12" X 20"

SINGLE METER: CARBOLOY KEY ANGLE METER VALVE 1" X 1" METER AVE REDUCED TO ¾" WITH A 1" X ¾" BUSHING. MUELLER OR APPROVED EQUAL

METER BOX NOTES

1. METER BOX SHALL BE DFW PLASTICS "C" SERIES BOX(ES) OR APPROVED EQUAL OF THE APPROPRIATE SIZE FOR ALL 1" AND SMALLER.
2. SINGLE SERVICES SHALL BE PLACED ON A PROPERTY LINE WITH A 1" LOOP AND REDUCED AT THE ANGLE STOP.
3. METER SHALL BE CONTAINED IN BOXES. METER BOXES SHALL BE LOCATED OUTSIDE OF ALL DRIVEWAYS, SIDEWALKS, AND APPURTENANCES, EXCEPT WHERE APPROVED BY THE BUILDING OFFICIAL. A WATER METER SERVICE LOCATED IN AN AREA SUBJECT TO VEHICULAR TRAFFIC MUST EMPLOY A TRAFFIC RATED METER BOX AND BE WITH ANY EXPENDITURES.

METER BOX DETAIL
N.T.S.

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SHEET 1 OF 1 | NOVEMBER 2020

town of ANNETTA

WATER STANDARD DETAILS
METER DETAIL
W-8

NOTES:

1. The Town of Annetta requires all vaults to be pre-fabricated and all vaults shall be a monolithic pour with no seams or extensions. All side walls shall be 6 inches thick with 4,500 psi concrete reinforced with #4 re-bar on 8 inch centers both ways. All vaults shall be Brooks, American or approved equal. These are minimum specifications.

2. The bottom of the vault shall be 6 inches thick with 4,500 psi concrete with #4 re-bar on 12 inch centers both ways. A 4 inch deep x 12 inch diameter keyway shall be installed in the center on either side of the bottom slab. A 4 inch cushion of sand shall be installed under the slab.

3. The vault shall not be installed in any drive or parking area and must be located in a utility easement dedicated to the Town of Annetta. All piping inside the vault and the vault itself must be inspected by Public Works before installation.

4. The lid shall be a J-4AL Bilco door (3'x3') for 2 inch – 4 inch meter vaults and J-24L Bilco (4'x6') door for 6 inch – 8 inch meter. The design loads for the lid shall consist of dead, live, typical loads, and in addition loads due to water table and any other loads which may be imposed upon the structure. The loads shall be for H-20 per AASHTO standards specifications for highway bridges. Design wheel load shall be 16 kips. The live load shall be that which produces the maximum stress and bending moments in the structure. The lids shall be equipped with a hold-open mechanism and push locking devices. The access door must have 2 inch holes drilled 6 inches apart in the center of the lid for AMR reading devices. The aluminum must be protected from the concrete during casting.

5. All piping inside the vault must be ductile iron pipe with flanged fittings. Town standards – American National Standard for ductile iron AWWA standard C151 (ANSI A21.51).

6. The contractor shall make the by-pass and meter test tap inside of the vault. The by-pass line must be the same size pipe as the main line. If the service is strictly to be used as irrigation a by-pass will not be necessary. The test tap must be installed at least 2 pipe diameters down-stream from the meter and all test taps shall be 2 inches and the contractor shall install an approved stainless saddle with brass nipple with a Mueller or approved equal brass gate valve. The test tap gate valve must have a threaded end discharge pipe.

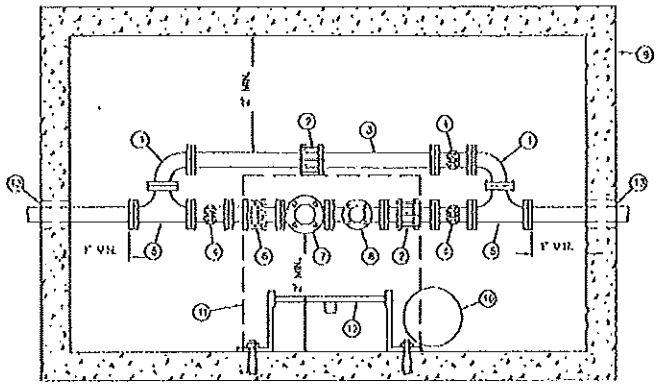
7. The main line and by-pass gate valves shall be resilient wedge. All main line and by-pass valves shall be flanged on both ends and have hand wheels. All gate valves must be Mueller or approved equal.

8. The contractor shall have a choice of having link seal or cast sleeves (model WS-6-33-S-6 for 3 inch pipe; model WS-8-32-S-6 for 4 inch pipe; model WS-10-38-S-6 for 6 inch pipe; model WS-12-37-S-6 for 8 inch pipe). The above mentioned wall sleeves shall use the following Link Seals For 3 inch pipe – 6 AS325-C; for 4 inch pipe – 8 AS400-C; for 6 inch pipe – 7 AS600-C; for 8 inch pipe – 9 AS600-C. Breaking the wall with a jackhammer or using a pre-cast knockout panels is not permitted.

9. Pipe and fittings shall be constructed a minimum of 1 foot above the vault floor and there shall be a minimum of 2 feet from the side walls. The by-pass tees shall be a minimum of 1 foot from the sidewall. There will be a concrete support under each valve.

10. Minimum depth of any vault shall be 4 foot 6 inches.

11. The Town will provide the meter at the contractor expense. All other parts will be supplied by the contractor at the contractor's expense.



2 INCH COMPOUND AND LARGER METER VAULTS

N.T.S.

MATERIALS LIST:	
1	OIL 90° BEND FLG X FLG
2	RESTRAINED COUPLING OR EXPANSION JOINT
3	BY-PASS LINE
4	GATE VALVE – RESILIENT WEDGE FLG X FLG
5	OIL TEE FLG X FLG
6	STRAINER
7	METER
8	TESTING TEE FLG X FLG WITH 2" GATE VALVE
9	PRECAST METER VAULT
10	SUMP
11	ACCESS DOOR
12	GALVANIZED STEEL LADDER WITH BILCO ERGEM UP SAFETY POST
13	WALL SLEEVE

MINIMUM VAULT SIZE	
METER SIZE	VAULT SIZE
2" COMP	6' X 6'
3" COMP	6' X 8'
3" TURBINE	6' X 8'
4" COMP	6' X 8'
4" TURBINE	8' X 8'
6" COMP	8' X 10'
6" TURBINE	8' X 10'
8" COMP	8' X 12'
8" TURBINE	8' X 12'

CERTIFICATION:
THIS TOWN OF ANNETTA STANDARD DETAIL SHEET IS APPROVED FOR USE ON THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT THE CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

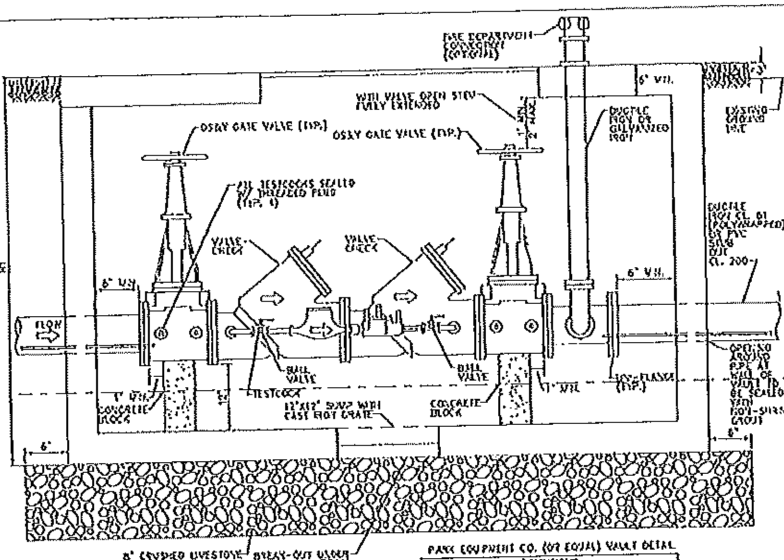
SHEET 1 OF 1	NOVEMBER 2020

town of ANNETTA

WATER STANDARD DETAILS

2" COMPOUND AND LARGER METERS

W-9



ELEVATION

N.T.S

PARK EQUIPMENT CO. (OR EQUAL) VAULT DETAIL

		DIMENSIONS			
MODEL	SIZE	L1	W1	H1	WEIGHT LBS.
DDSP3	3"	6'-0"	3'-6"	4'-0"	7,700
DDSP4	4"	6'-0"	3'-6"	4'-0"	7,900
DDSP6	6"	7'-10"	4'-4"	5'-5"	9,000
DDSP8	8"	8'-8"	5'-0"	5'-6"	15,000
DDSP10	10"	9'-2"	5'-8"	8'-6"	18,000

GENERAL NOTES:

(A) All construction shall be in accordance with the standard specifications of the Town of Annetta, which has also adopted the most recent edition of the "Standard Specifications For Public Works Construction — North Central Texas" herein referred to as "COG" specifications. Copies may be obtained from the North Central Texas Council of Governments, 616 Six Flags Drive, Suite 200, Arlington, Texas 76005-5888. (817) 640-3300.
(B) Refer to COG Items 502.12.2 and 502.6 specifications.
(C) The assembly shall meet the basic requirements of ASSE 1015 for double check valves and meet requirements of AWWA, CSA, UL Classified, FM Approved Assembly shall also be approved by the University of Southern California.
(D) All details and specifications shown on this sheet will govern for the installation of the assembly.

LOCATION:

(A) The vault shall be located on the property owner's property and not within the town right-of-way.
(B) The owner at his option and with the approval of the Town of Annetta may be permitted to install the double check detector backflow preventer assembly inside the building. The installation would be required to be permitted by the Town of Annetta. The Fire Department connection is to be located at the street. The Fire Department connection shall be within 6 feet of curb, unobstructed, and in clear view and Water Utility personnel shall have access during normal business hours.
(C) The Fire Department connection may be installed outside the vault with the approval of the engineering division.

VAULT:

(A) The valve vault may be precast as per details of Dalworth Oldcastle or Brooks Products or an approved equal.
(B) The vault shall be placed on 8-inches crushed limestone and the vault shall have a sump with a minimum of a 12"x12" grate in the bottom of the vault for drain purposes.
(C) Concrete shall be minimum 6.5 sacks, with 4,200 P.S.I. at 28 days.
(D) Unit is to be of monolithic construction of box and first stage of wall with sectional riser to required depth.
(E) Reinforcement shall be Grade 60 steel Rebar conforming to ASTM A-615 or require centers or equal.
(F) Hatchway shall be 1/4-inch Aluminum Diamond Plate Cover all extruded aluminum frame. Hatch to be furnished with 316 stainless steel snap lock and brass hinges.

PERMIT AND INSPECTION:

(A) The installation of the check valves and vault shall be permitted and inspected by the Public Works Department of the Town of Annetta.
(B) The Pipe line from the check valve vault to the building shall be permitted and inspected by the Plumbing Inspection Division of the Town of Annetta.

INSTALLATION:

(A) The double check detector backflow preventer assembly shall consist of a single complete assembly containing two independent acting check valves and four properly placed resilient test cocks for test of the assembly. Assembly shall also include two (2) U.L. Listed resilient seated OS & Y shutoff valves and test cocks.
(B) Unit shall be UL/FM approved with UL/FM approved OS & Y shutoff valves.
(C) OS & Y valve shall be Mueller, American Flow Control, or an approved equal.
(D) The auxiliary line shall consist of an approved backflow preventer (double check assembly completed with test cocks) and a 5/8" X 3/4" water meter.
(E) The bypass auxiliary line shall have a double check assembly, Watts series 007, Ames 2000 SS BY, or FEBCO 805 Y, or an approved equal.
(F) The bypass auxiliary line 5/8" X 3/4" meter shall be Hersey, Neptune, or Badger.
(G) The backflow preventer shall have Epoxy coated cast iron body, Epoxy coated ductile iron body, or stainless steel body with replaceable bronze seats and/or a unitized stainless and plastic check assembly.
(H) The double check detector backflow preventer assembly shall be a Watts series 709 DCDA OSY RW, AMES Model 3000 SS, or FEBCO Model 856, or an approved equal.
(I) 4-inch water check valves shall be Kennedy Model DW, Mueller A 2102, or FEBCO W-500?, or an approved equal.

TESTING:

(A) The Uniform Plumbing Code requires that this assembly must be tested immediately upon installation. Copies of the report must be forwarded to the Environmental Services Department.
(B) Upon installation and approval of fire sprinkler line/Fire Department connection, the owner shall be required to submit a yearly test report from a reputable testing company stating that the check valves are in good working condition. These test reports shall be submitted to the Town of Annetta Environmental Services Department and the Fire Department once a year as required by the TCEQ rules and regulations and Town of Annetta Code of Ordinances. The testing of backflow preventer assemblies which are installed to provide protection against health hazards are to be completed by certified Backflow Testers that are qualified to test and repair backflow preventer assemblies on fire lines only.

MAINTENANCE:

(A) The maintenance of the double check detector backflow assembly shall be by the property owner.

CERTIFICATION:

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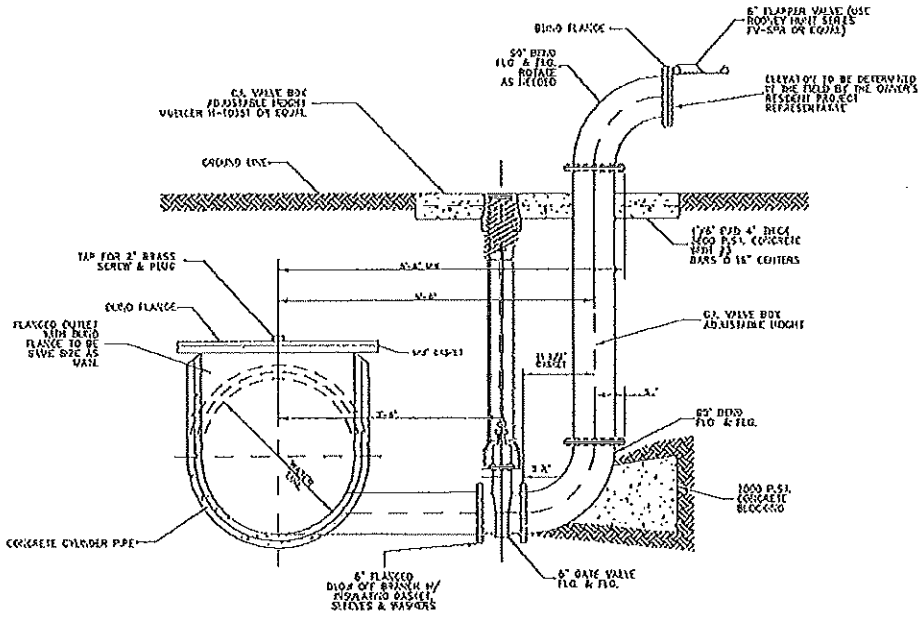
SHEET 1 OF 1 | NOVEMBER 2013

WATER STANDARD DETAILS

WATER DETECTOR CHECK AND VAULT

W-10

town of ANNETTA



WATER BLOW-OFF DETAIL

N.T.S.

GENERAL NOTES:

1. All construction shall be in accordance with the standard specifications of the Town of Annetta, which has also adopted the most recent edition of the "Standard Specifications for Public Works Construction – North Central Texas" herein referred to as "CSS" specifications. Copies may be obtained from the North Central Texas Council of Governments, 616 Six Flags Drive, Suite 200, Arlington, Texas 76005-5888. (817) 640-3300.
2. The ductile iron pipe shall be class 50, and polyencased.
3. Refer to the "Water Standard Details" sheet for valve, blocking, and testing specifications.
4. Refer to the details on this sheet and CSS Item 502.11.2 specifications.
5. Stainless steel bolts shall be used on flanged fittings installed below ground.

CERTIFICATION:

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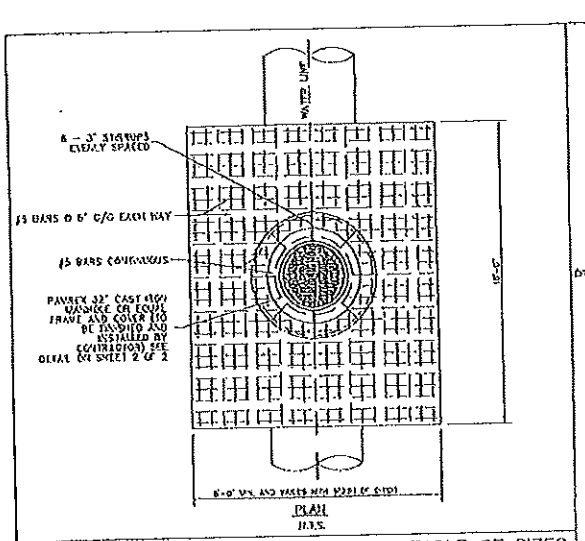
town of ANNETTA

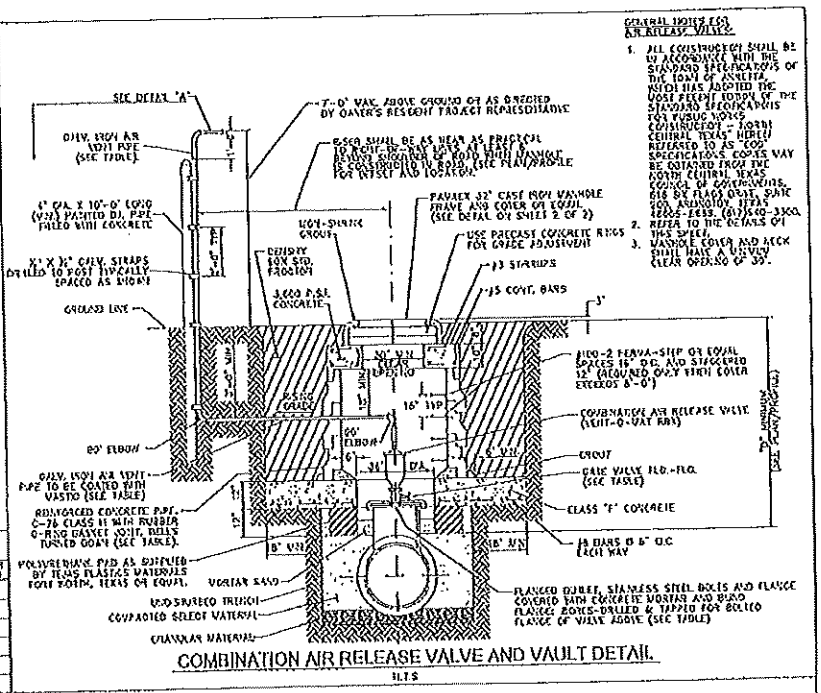
SHEET 1 OF 1 | NOVEMBER 2019

WATER STANDARD DETAILS

WATER BLOW-OFF VALVE

W-11



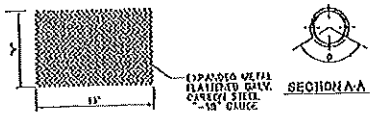


GENERAL NOTES FOR AIR RELEASE VALVES:

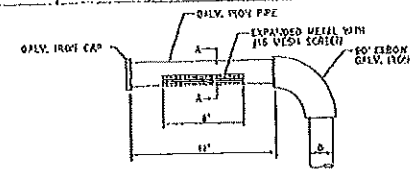
1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS OF THE TOWN OF ANNETTA WHICH HAS ADOPTED THE MOST RECENT EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION - NORTH CENTRAL TEXAS" HEREIN REFERRED TO AS "COG SPECIFICATIONS" COPIES MAY BE OBTAINED FROM THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS, 616 BY FLAGG DRIVE, SUITE 100, ARLINGTON, TEXAS 76005-6888, (817)640-3300.
2. REFER TO THE DETAILS OF THIS SHEET.
3. MANHOLE COVER AND NECK SHALL HAVE A MINIMUM CLEAR OPENING OF 30".

COMBINATION AIR RELEASE VALVE - TABLE OF SIZES

AIR VALVE	VALVE	FLG. OUTLET (A)	VENT PIPE	EXPANDED METAL (B)	MANHOLE DIA	CONCRETE COVER OVER PIPE (C)
1"	1"	8"	1"	3'	N/A	N/A
2"	2"	8"	2"	5'	4'	6.5'
3"	3"	12"	3"	8'	5'	7.0'
4"	4"	16"	4"	10'	5'	7.5'
6"	6"	18"	6"	16'	5'	8.5'
8"	8"	18"	6"	21'	5'	9.0'



DETAIL "A"
NOT TO SCALE



CERTIFICATION:

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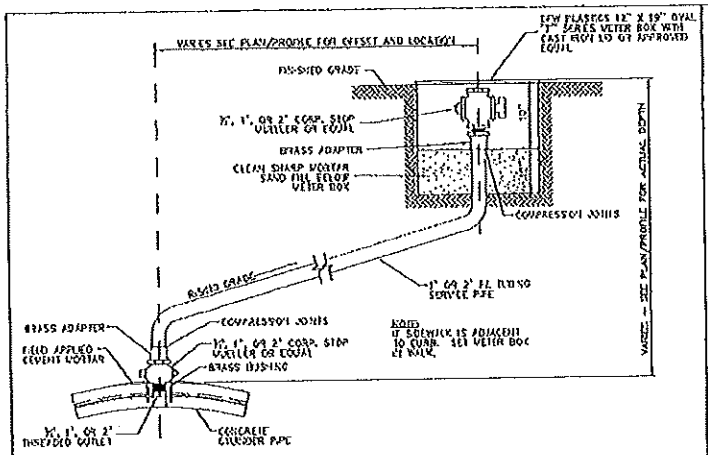
town of ANNETTA

SHEET 1 OF 2 | NOVEMBER 2010

WATER STANDARD DETAILS

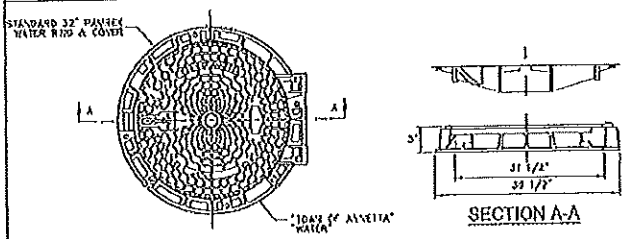
WATER AIR VALVE

W-12



MANUALLY OPERATED AIR VALVE AND FLUSH POINT

(SIZES DESIGNATED ON PLANS)
N.T.S.



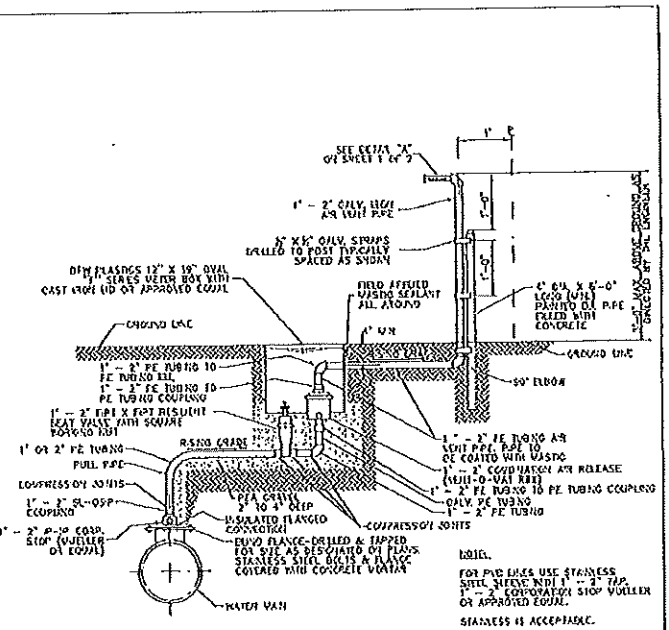
STANDARD 32" PAMREX RING & COVER

N.T.S.

SECTION A-A

RING & COVER NOTES:

1. THE STD. MANHOLE COVER SHALL BE PAMREX 32" RING AND COVER NO. COPAGOOI OR EQUAL
2. APPROXIMATE WEIGHT OF RING=107 LBS. AND COVER=162 LBS.
3. MANHOLE COVER AND RING SHALL HAVE A MINIMUM CLEAR OPENING OF 30".
4. MANHOLE SHALL BE GASKETED AND LOCKABLE.



COMBINATION AIR RELEASE VALVE AND METER BOX DETAIL

N.T.S.

NOTE:
FOR PVC LINES USE STAINLESS STEEL SLEEVE TYP. 1" - 2" TAP 1" - 2" CORPORATION STOP (MUELLER OR APPROVED EQUAL.
STAINLESS IS ACCEPTABLE.

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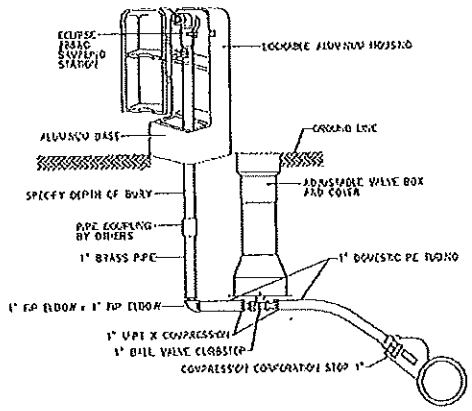
SHEET 2 OF 2 | NOVEMBER 2020

town of ANNETTA

WATER STANDARD DETAILS

WATER AIR VALVE

W-19

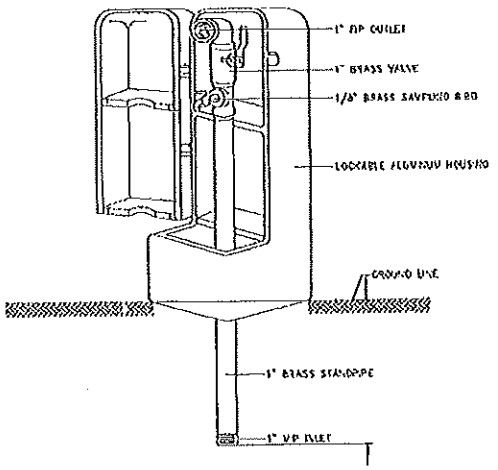


ECLIPSE #88WC SAMPLING STATION

N.T.S.

NOTES:

1. SAMPLING STATIONS SHALL BE 2' BURY, WITH A 1" MIP RISER, AND A 1" FIP DIP DISCHARGE. A 3" SAMPLING BOX SHALL BE LOCATED BEFORE THE DISCHARGE PIPE.
2. ALL STATIONS SHALL BE ENCLOSED IN A LOCKABLE, CONVENTIONAL, ALUMINUM-CAST HOUSING
3. WHEN OPENED, THE STATION SHALL REQUIRE NO KEY FOR OPERATION, AND THE WATER WILL FLOW IN AN ALL BRASS WATERWAY.
4. ALL WORKING PARTS WILL BE OF BRASS AND SERVICEABLE FROM ABOVE GROUND WITH NO DIGGING (OPTIONAL IF DESIRED, A 12" BRASS DRAIN TUBE SHALL BE WITHIN THE LOCKING COVER.)
5. A 1" BALL VALVE WILL CONTROL THE WATER FLOW, AND BE LOCATED BEFORE (OR AFTER) THE SAMPLING BOX, AS MANUFACTURED BY RUPTURE FOUNDRY ST. LOUIS, MO 63102.
6. WITH 1-300 NEW SERVICES 1 SAMPLING STATION SHALL BE INSTALLED AT THE PUBLIC WORKS RECOMMENDED LOCATION.
7. WITH 301-600 NEW SERVICES 2 SAMPLING STATIONS SHALL BE INSTALLED AT THE PUBLIC WORKS RECOMMENDED LOCATION.
8. WITH 601-900 NEW SERVICES 3 SAMPLING STATIONS SHALL BE INSTALLED AT THE PUBLIC WORKS RECOMMENDED LOCATION.



ECLIPSE #88WC SAMPLING STATION DETAIL

N.T.S.

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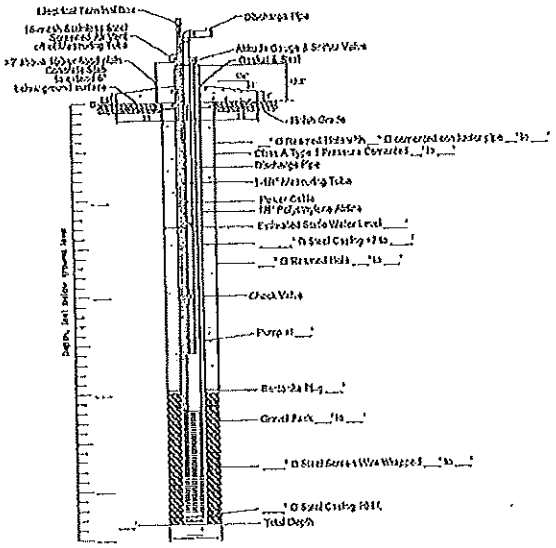
SHEET 1 OF 1 | NOVEMBER 2020

town of ANNETTA

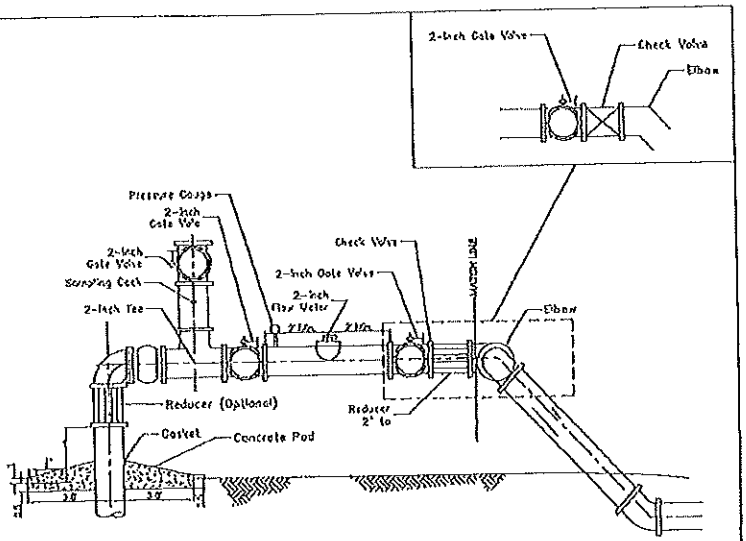
WATER STANDARD DETAILS

WATER SAMPLING STATION

W-14



STANDARD WELL DESIGN DETAIL



STANDARD WELL DESIGN DETAIL

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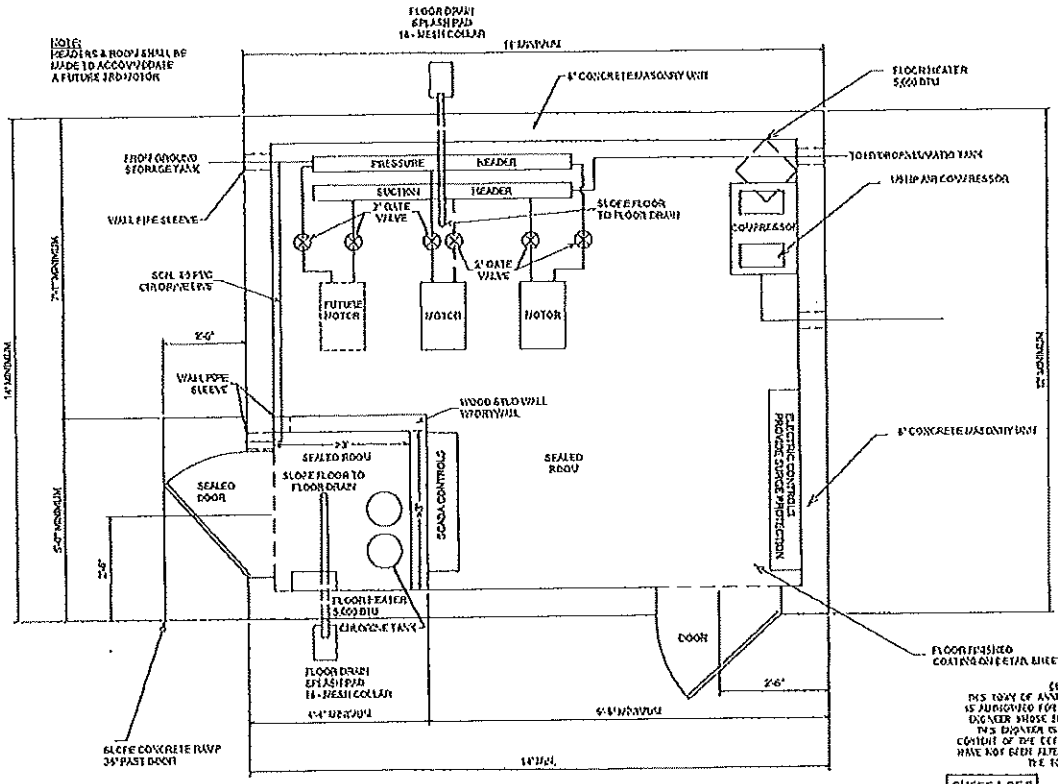
SHEET 1 OF 1 | NOVEMBER 2020

town of ANNETTA

WATER STANDARD DETAILS
WELL DETAIL

W-15



WELL HOUSE

CERTIFICATION:
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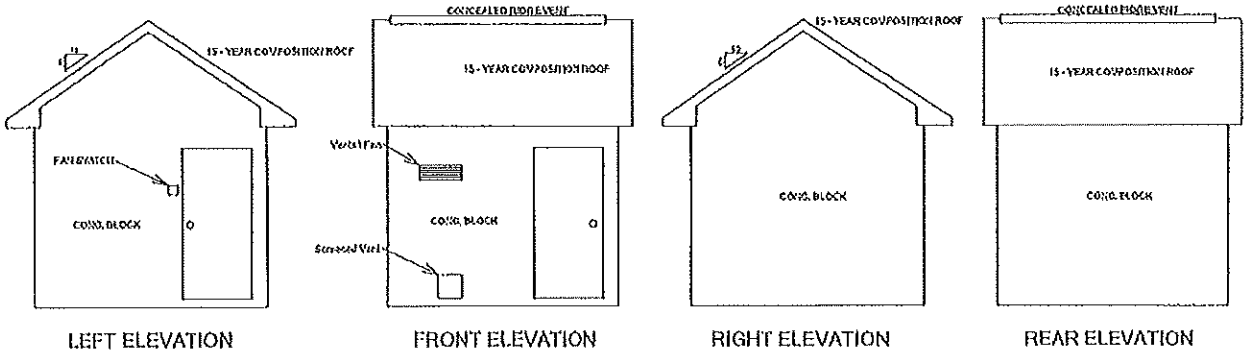
town of ANNETTA

SHEET 1 OF 2 | NOVEMBER 2020

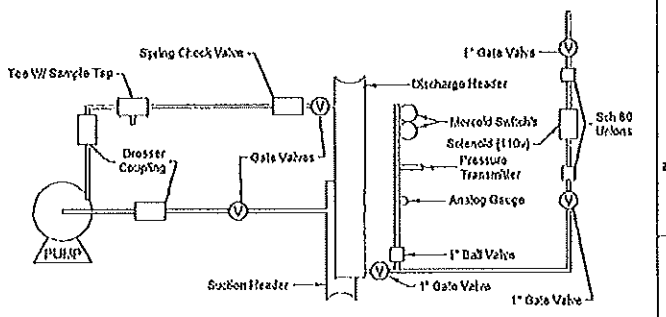
WATER STANDARD DETAILS

PUMP HOUSE

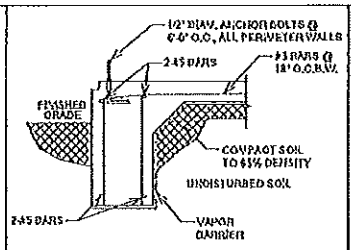
W-16



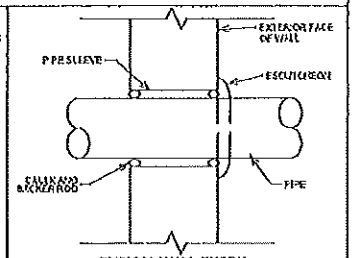
LEFT ELEVATION | FRONT ELEVATION | RIGHT ELEVATION | REAR ELEVATION



PUMP HOUSE HEADER DETAIL
N.T.S.



EXTERIOR BEAM
N.T.S.



TYPICAL WALL ENTRY
N.T.S.

CERTIFICATION:
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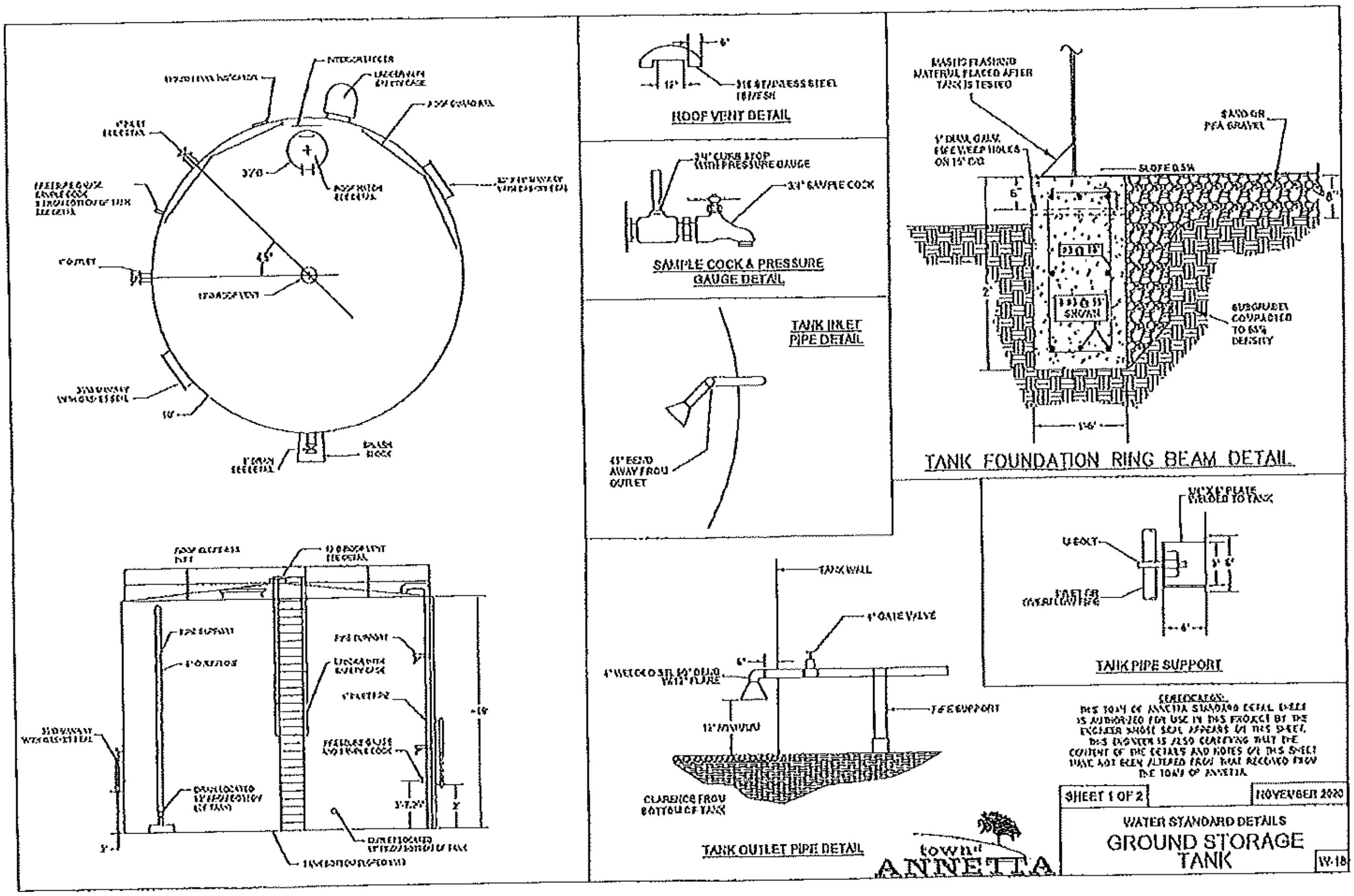
SHEET 2 OF 2 | NOVEMBER 2020

town of ANNETTA

WATER STANDARD DETAILS
PUMP HOUSE
W-17


ROOF VENT DETAIL
3/4" CURB STOP WITH PRESSURE GAUGE
3/4" SAMPLE COCK
SAMPLE COCK & PRESSURE GAUGE DETAIL
TANK INLET PIPE DETAIL
45° BEND AWAY FROM OUTLET
MASTIC FLASHING MATERIAL PLACED AFTER TANK IS TESTED
SAND OR PEA GRAVEL
SUBGRADE COMPACTED TO 95% DENSITY
TANK FOUNDATION RING BEAM DETAIL
U-BOLT
TANK PIPE SUPPORT
TANK WALL
4" GATE VALVE
PIPE SUPPORT
CLARENCE FROM BOTTOM OF TANK
TANK OUTLET PIPE DETAIL
CERTIFICATION:
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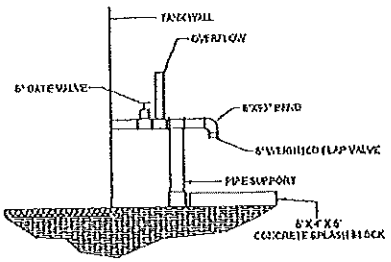
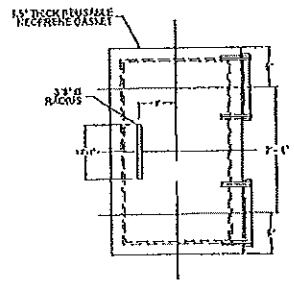
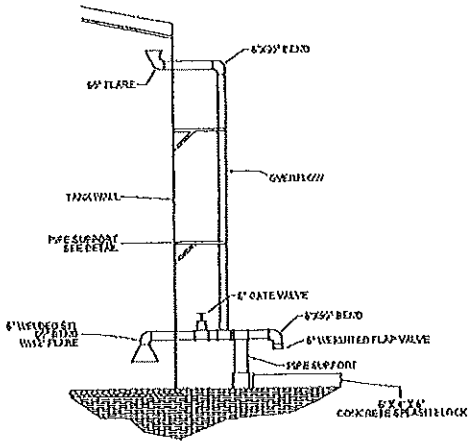
SHEET 1 OF 2
NOVEMBER 2020
town of ANNETTA
WATER STANDARD DETAILS
GROUND STORAGE TANK
W-18



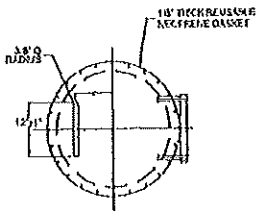
TANK DRAIN DETAIL



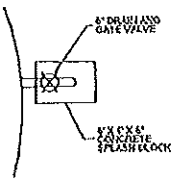
30" X 46" MANWAY



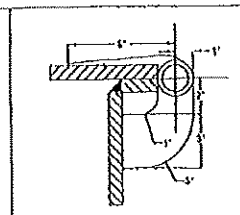
OVERFLOW & DRAIN DETAIL



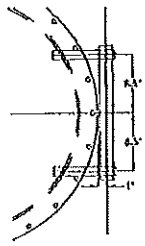
30" Ø MANWAY



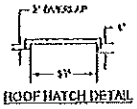
TANK DRAIN DETAIL



HINGE DETAIL SECTION



HINGE DETAIL



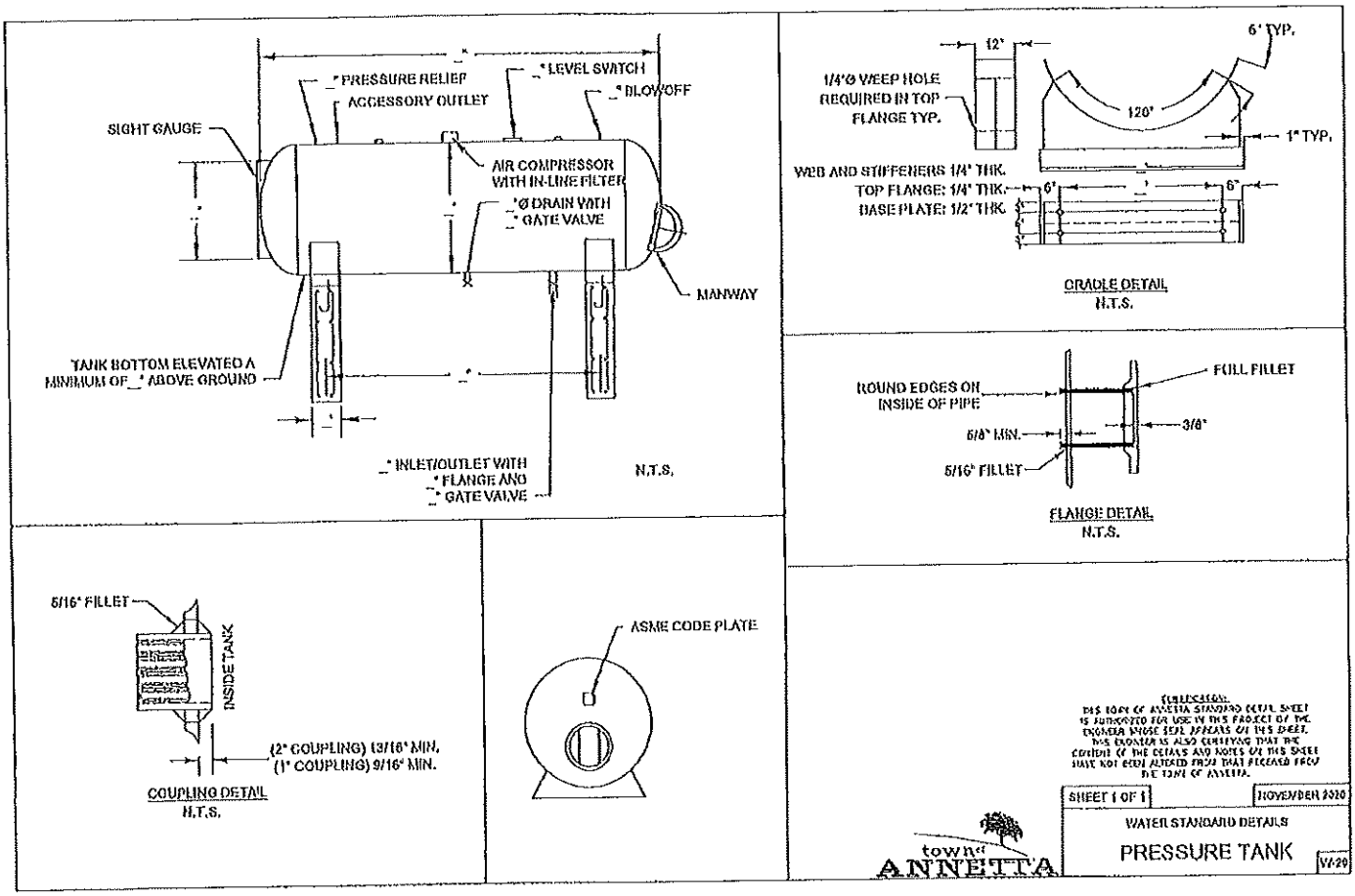
ROOF HATCH DETAIL

CERTIFICATE:
THIS TOWN OF ANNETTA STANDARD DETAIL SHEET IS APPROVED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS ON THIS SHEET. THIS ENGINEER IS ALSO CERTIFYING THAT ALL CONTENT OF THE DETAILS AND NOTES ON THIS SHEET HAVE NOT BEEN ALTERED FROM THAT RECEIVED FROM THE TOWN OF ANNETTA.

SHEET 2 OF 2 | NOVEMBER 2020

town of ANNETTA

WATER STANDARD DETAILS
GROUND STORAGE TANK
W-19


" PRESSURE RELIEF
ACCESSORY OUTLET
" LEVEL SWITCH
" BLOWOFF
SIGHT GAUGE
AIR COMPRESSOR WITH IN-LINE FILTER
" Ø DRAIN WITH " GATE VALVE
MANWAY
TANK BOTTOM ELEVATED A MINIMUM OF " ABOVE GROUND
" INLET/OUTLET WITH " FLANGE AND " GATE VALVE
N.T.S.
12"
6" TYP.
1/4"Ø WEEP HOLE REQUIRED IN TOP FLANGE TYP.
120°
1" TYP.
WEB AND STIFFENERS 1/4" THK.
TOP FLANGE: 1/4" THK.
BASE PLATE: 1/2" THK.
6"
6"
CRADLE DETAIL
N.T.S.
ROUND EDGES ON INSIDE OF PIPE
FULL FILLET
3/8"
6/8" MIN.
5/16" FILLET
FLANGE DETAIL
N.T.S.
5/16" FILLET
INSIDE TANK
(2" COUPLING) 13/16" MIN.
(1" COUPLING) 9/16" MIN.
COUPLING DETAIL
N.T.S.
ASME CODE PLATE
CERTIFICATION:
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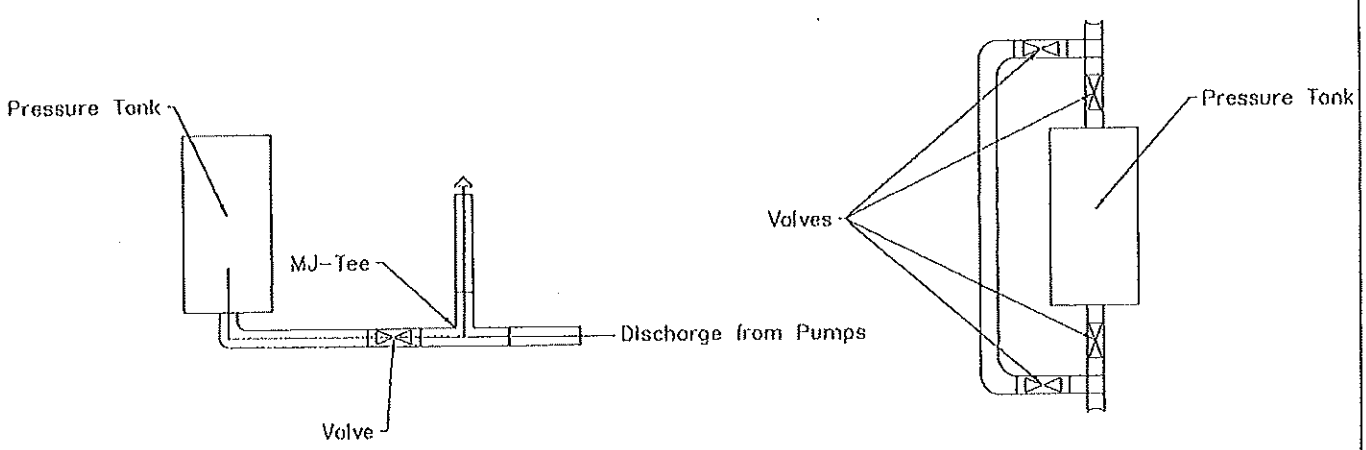
SHEET 1 OF 1
NOVEMBER 2020
WATER STANDARD DETAILS
PRESSURE TANK
W-20
town of ANNETTA



PRESSURE TANK LAYOUT DETAIL

CERTIFICATE:
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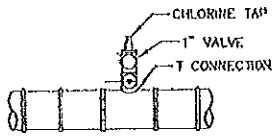
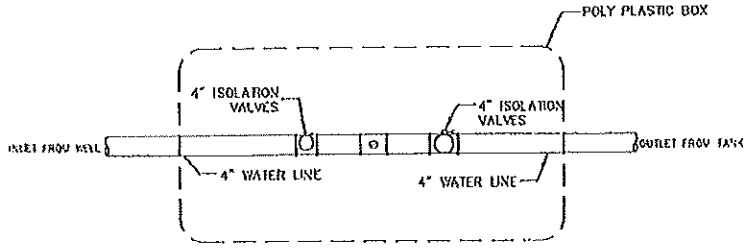
SHEET 1 OF 1 | NOVEMBER 2020

town of ANNETTA

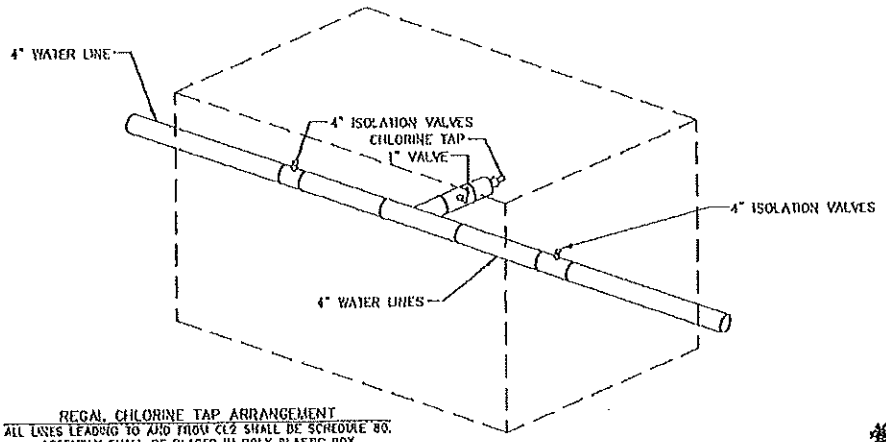
WATER STANDARD DETAILS
PRESSURE TANK LAYOUT
W-21



REGAL CHLORINE TAP ASSEMBLY
TOP VIEW



REGAL CHLORINE TAP ASSEMBLY
SIDE VIEW
ALL LINES LEADING TO AND FROM CL2 SHALL BE SCHEDULE 80.
ASSEMBLY SHALL BE PLACED IN POLY PLASTIC BOX



REGAL CHLORINE TAP ARRANGEMENT
ALL LINES LEADING TO AND FROM CL2 SHALL BE SCHEDULE 80.
ASSEMBLY SHALL BE PLACED IN POLY PLASTIC BOX

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SHEET 1 OF 1 | NOVEMBER 2020

town of ANNETTA

WATER STANDARD DETAILS
CHLORINE TAP ASSEMBLY
W-22

WASTEWATER GENERAL NOTES:

1. All construction shall be in accordance with the standard specifications and details of the Town of Annetta and the most recent edition of the "Standard Specifications for Public Works Construction – North Central Texas" herein referred to as "COG", Copies may be obtained from the North Central Texas Council of Governments, 616 Six Flags Drive, Suite 200, Arlington, Texas 76005-5888.

2. For 6-inch to 15-inch sizes, wastewater lines shall be ASTM D3034 Polyvinyl Chloride (PVC) SDR 35 for depths less than 14 for depths greater than 14 feet, SDR 26 shall be used.

3. For 18-inch to 48-inch size wastewater mains shall be one of the following types:

   a. ASTM F679 PVC, Large-Diameter Poly Vinyl Gravity Sewer Pipe and Fittings.

   b. ASTM F794 PVC, Profile Gravity Sewer Pipe and Fittings based on a Controlled, Inside Diameter.

   c. ASTM F949 PVC, Corrugated Sewer Pipe with a Smooth Interior Lining.

   d. ASTM F1803 PVC, Closed Profile Gravity Sewer Pipe and Fittings based on Controlled, Inside Diameter.

4. All pipe joints shall be gasketed, bell and spigot, push-on type conforming to ASTM D3212 and compatible with the type of pipe to which they are attached.

5. All PVC pipe shall have a minimum pipe stiffness that equals or exceeds 46 psi.

6. For creek crossings with less than 5 feet of cover to the creek bedline, the pipe shall be PVC with concrete encasement.

7. Embedment and backfill shall be as per the Wastewater Details for pipes 6-inch to 15-inch diameter. Larger pipes shall be installed per ASTM D2321 and manufacturers recommendations with embedment and backfill details shown on the plans.

8. The minimum cover over all wastewater mains is 4 feet, unless approved by the Town. Approved mains with less than 3.5 fee of cover shall be capped as per details.

9. Commercially available magnetic tape shall be installed above the top of all PVC wastewater pipes. The tape shall be green in color and have the wording "Caution Sanitary Sewer line buried below.".

10. Clay cut-off walls shall be constructed as per the Wastewater Details

11. PVC wastewater pipe is allowed to be stored a maximum of six months without cover. Thereafter all pipes should be covered or protected from sunlight and to be protected from other elements.

12. When PVC wastewater pipe is installed in casing, skids must be used to prevent damage to the pipe and bell during installation. PVC pipe should not rest on the bells. Plastic spacers such as RACI or approved equal shall be used.

13. All property corners shall be staked with iron pins prior to the installation of any wastewater services. The location of the wastewater service shall be staked according to the plans

14. Wastewater services to be marked with "S" stamped or cut in the curb, or edge of pavement if no curb is present.

15. All new manhole locations shall be marked with "MH" stamped or cut on the curb.

16. All wastewater shall be one of the following standard sizes, 8-inch, 10-inch, 12-inch, 15-inch, 18-inch, 21-inch, 24-inch, 30-inch, or 36-inch.

e. The CONTRACTOR shall be responsible for notifying the Town Inspector at least 24 hours prior to any required testing

b. Soil and material testing technicians shall provide written proof of having a minimum of two (2) years of related field experience.

c. The CONTRACTOR shall coordinate all testing activities with the Town Inspector and shall facilitate required testing throughout the construction period. The Inspector shall be present during all testing

d. The Town shall make final decision as to the validity of all testing results.

e. Minimum backwater and testbed clearances for water and wastewater lines established by the Texas Commission on Environmental Quality (TCEQ) must be maintained in all directions. Separation distances, installation methods, and materials utilized must meet 30 TAC §290.44(e) (1-4) of the current rules.

f. All costs associated with the retesting of work that fails to meet the specifications required in the contract documents shall be borne by the CONTRACTOR. For Town projects, retesting cost shall be adjusted from pay requests submitted by the CONTRACTOR, this cost will be based on the Town's cost with an additional mark-up. A letter of acceptance will not be issued until all testing deficiencies are addressed and related cost paid.

g. The Town Inspector shall be notified of concrete placement 24 hours in advance for steel and form inspection.

h. One set of four cylinders (2-7 day, 2-28 day) for cast-in-place concrete shall be made for every day that concrete is placed (ASTM C-31). Air, slump, and temperature tests shall be taken for every set of cylinders made. Concrete with a temperature above 95 degrees will be rejected. Additional cylinders and or tests may be requested at the Inspector or ENGINEER's discretion. Cylinder forms shall not be removed for a minimum of 24 hours unless approved by Inspector or ENGINEER. Sulfate resistant concrete shall be used for all manholes.

i. Backfill and Density Testing

   1) All trenches shall be backfilled in accordance with standard details and mechanically compacted with approved vibratory methods in accordance with COG Item 504.5.3.2.1 and paragraph 3) below unless otherwise stated on the plans or in the specifications

   2) Densities shall conform to standard trench details, COG Item 504.5.3.2.1, and Paragraph 3) below unless otherwise stated on the plans or in the specifications. Proctor samples shall be taken for all classifications of soil on site. Atterberg Limits shall be determined on all Proctor samples. No "pumping" will be allowed. Densities shall be taken on all sewer services both sides of the street within the Right-of-Way and shall conform to Paragraph 3) below and COG Item 504.5.3.2.1, unless otherwise stated on the plans or in the specifications. Backfill adjacent to all structures shall be compacted manually and density tested on every lift.

   3) Mechanical Tamping of Backfill

j) All ditch ties and bore pits shall be mechanically tamped.

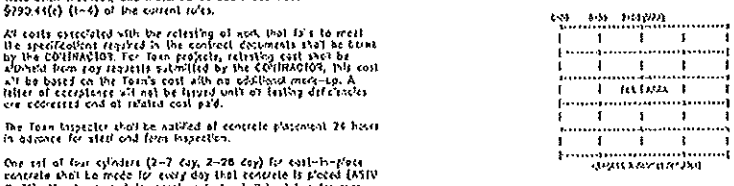
k) Backfill, other than select fill, may consist of onsite or offsite inorganic soils and should be placed in loose lifts 6" – 8" in thickness (not to exceed 12") and should be mechanically compacted to 95 percent of the maximum dry density as defined by ASTM D-698 (Standard Proctor) procedures under existing or proposed pavement, and to 90 percent standard proctor procedures elsewhere. The moisture content of the fill at the time of compaction shall be between minus 2% of optimum to four percentage points above the proctor optimum value.

c) All backfill material to be select native material, 6" diameter clods and smaller, unless directed otherwise on the plans or by the specifications and to be mechanically tamped and density controlled as described in Paragraph b) above.

d) Water jetting is not permitted.

e) Densities shall be taken every one (1) lift at staggered locations not to exceed 200 feet increments. Offset fifty (50') feet every other lift.

f) Densities may be taken at typical locations or upon direction, densities will be taken at random locations and at the geo-technician's discretion.



j) Deflection Testing – All sewer lines shall be tested with a mandrel for 5% deflection (max.) in accordance with COG Item 507.5.1.4.1. The Town Inspector must be present.

k) Air Testing – All sewer lines shall be tested by a low pressure air test according to the COG Item 507.5.1.3 the Town Inspector must be present.

l) Television Inspection – All sewer lines shall be televised in accordance with COG Item 507.5.2 and placed on DVD. A copy of the DVD and stamped report shall be submitted to the Town prior to any paving activities as follows may be identified and repaired accordingly (COG Item 507.5.2). All services shall be "zoomed."

m) Manhole Testing – Vacuum testing of manholes shall be performed in accordance with COG Item 504.1.6.

n) Deflection Testing, Air Testing, and Television Inspection shall not be performed until all utilities are complete in place and backfilled

CERTIFICATION

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SHEET 1 OF 1	NOVEMBER 2010

town of ANNETTA

WASTEWATER STANDARD DETAILS

WASTEWATER GENERAL NOTES

WW-1

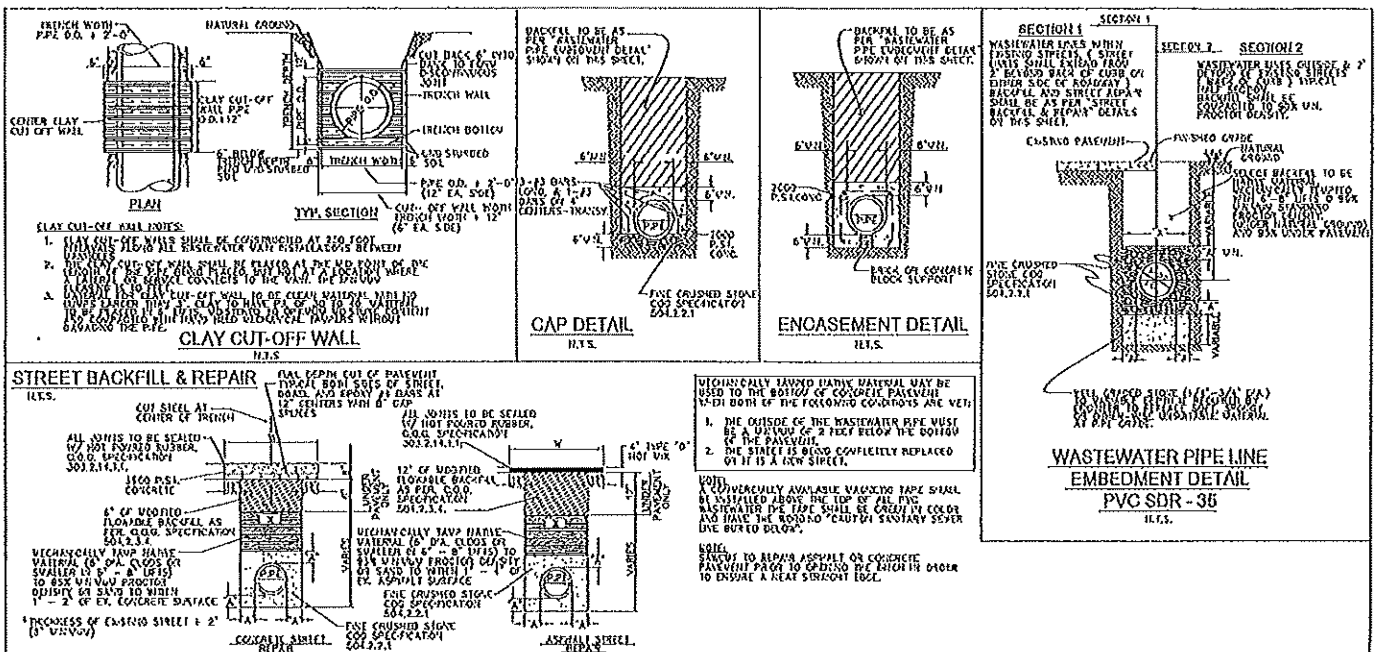


TABLE OF DIMENSIONS FOR WIDTH OF TRENCH AND PAVEMENT REPLACEMENT

NOMINAL SIZE OF PIPE IN INCHES	O.D. OF PIPE BELL IN INCHES (PVC-SDR35)	MINIMUM TRENCH WALL CLEARANCE "A" IN INCHES	WIDTH OF TRENCH ("X")		WIDTH OF PAVT. REPLACEMENT*
			MAXIMUM ** IN INCHES	MINIMUM ** IN INCHES	(W) CONC. & ASPHALT **
4	4.67	6	24	18	47
6	6.14	6	24	19	48
8	8.53	6	24	21	43
10	11.27	6	28	24	48
12	13.27	6	30	26	50
15	16.45	8	37	33	57
18	20.73	8	41	37	61
21	24.42	8	45	41	65
24	27.31	8	48	43	68
27	30.61	8	51	47	71

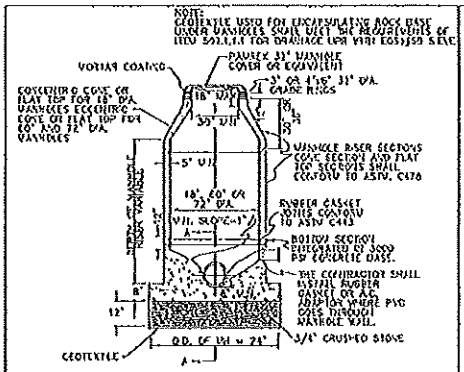
NOTE: * REFER TO THE PLANS FOR SPECIFIED WIDTH OF REPLACEMENT.
** RECOMMENDED WIDTHS – VARIES BASED ON DEPTH, AND SOIL MATERIAL.

town of ANNETTA

SHEET 1 OF 1 | NOVEMBER 2020

WASTEWATER STANDARD DETAILS

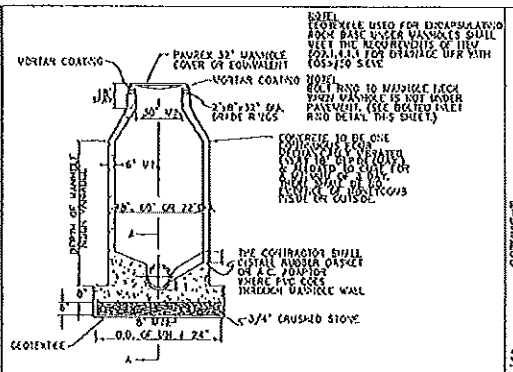
BACKFILL / EMBEDMENT



PRECAST CONCRETE MANHOLE

N.T.S.

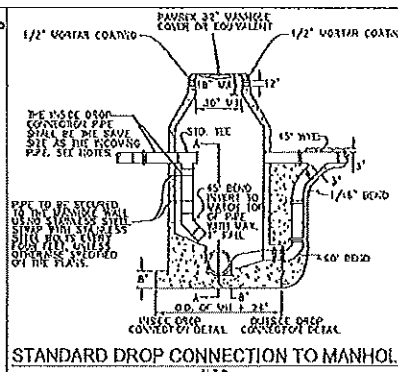
SEE CONCRETE MANHOLE NOTES.



POURED IN PLACE CONCRETE MANHOLE

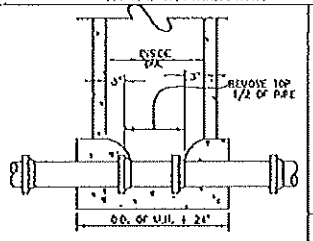
N.T.S.

SEE CONCRETE MANHOLE NOTES.



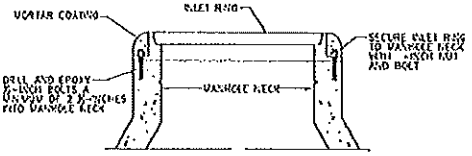
STANDARD DROP CONNECTION TO MANHOLE

N.T.S.



SECTION "A-A"

N.T.S.



BOLTED INLET RING DETAIL

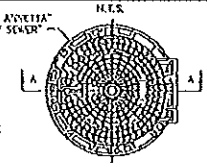
N.T.S.

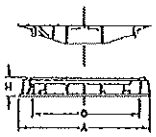
CONCRETE MANHOLE NOTES:

1. CONCRETE FOR ALL PRECAST AND POURED IN PLACE MANHOLES SHALL BE 6.5 SACK, 4500 P.S.I. SULPHATE RESISTANT CONCRETE.
2. THE DIAMETER OF THE CONCRETE BASE SHALL NOT BE LESS THAN THE OUTSIDE DIAMETER OF THE MANHOLE PLUS 2 FEET.
3. STEPS SHALL NOT BE INSTALLED IN MANHOLE.
4. ALL NEW MANHOLES SHALL BE MARKED WITH "WS" STAMPED OR CUT IN THE CURB.
5. USE DROP CONNECTIONS WHEN CONNECTING PIPE EXCEEDS 24" ABOVE THE MANHOLE FLOWLINE.
6. USE OUTSIDE DROP CONNECTIONS ON ALL NEW MANHOLES.
7. INSIDE DROP CONNECTIONS ON MANHOLES ARE ALLOWED ONLY ON EXISTING MANHOLES 5' OR LARGER IN DIAMETER.
8. ALL PRECAST MANHOLES SHALL BE AS MANUFACTURED BY JENSEN, OLMSTEAD, OR EQUIVALENT.
9. MANHOLE COVER AND NECK SHALL HAVE A MINIMUM CLEAR OPENING OF 30".

PAMREX 32 INCH MANHOLE COVER AND FRAME

N.T.S.





SECTION A-A

N.T.S.

NOTES

1. MANHOLE COVER AND FRAME SHALL BE PAMREX OR APPROVED EQUAL. COVER AND FRAME SHALL BE MANUFACTURED FROM DUCTILE IRON.
2. COVERS SHALL BE DUALLY HINGED AND INCORPORATE A 90 DEGREE LOCKING SYSTEM TO PREVENT ACCIDENTAL CLOSURE. COVERS SHALL BE ONE MAN OPERABLE USING STANDARD TOOLS AND SHALL BE CAPABLE OF WITHSTANDING A TEST LOAD OF 60,000 POUNDS.
3. FRAMES SHALL BE CIRCULAR, INCORPORATE A SEATING RING AND A FILLED PLUG IN EACH HINGE HOUSING AND BE AVAILABLE IN A 32 INCH CLEAR OPENING. THE FRAME DEPTH SHALL NOT EXCEED 8 INCHES AND THE FLANGE SHALL INCORPORATE BADGING SLOTS, BOLT HOLES, AND LIFTING EYES.
4. ALL COMPONENTS SHALL BE BLACK COATED.

FRAME WEIGHT: 107 LBS.
COVER WEIGHT: 162 LBS.
TOTAL WEIGHT: 269 LBS.

5. MANHOLES SHALL BE GASKETED AND LOCKABLE

DIMENSIONS (INCHES)			WEIGHT (lbs)		REFERENCE
A	D	H	COVER AND FRAME	COVER ONLY	
31½"	30½"	8"	269	162	PC 32 RB FD

CERTIFICATION:

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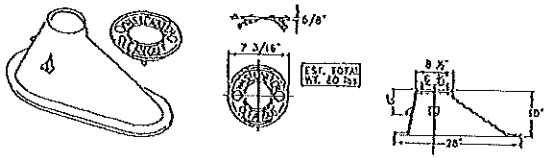
town of ANNETTA

SHEET 1 OF 1	NOVEMBER 1990

WASTEWATER STANDARD DETAILS

MANHOLES

WW-5



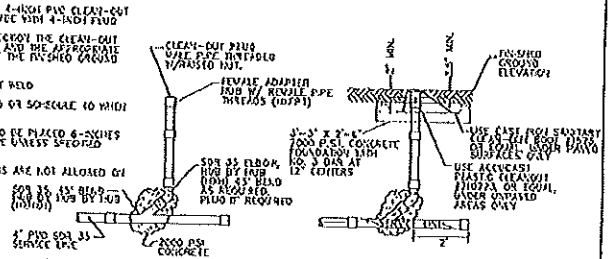
ACCUCAST CAST IRON CLEAN-OUT BOOT

N.T.S.

ACCUCAST #1073 OR EQUAL
(TO BE USED UNDER PAVED SURFACES ONLY)

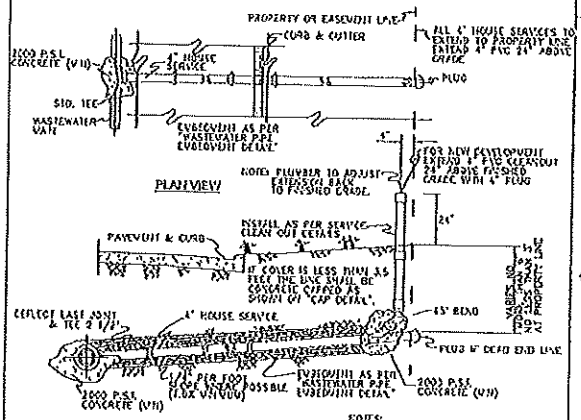
WASTEWATER SERVICE CLEAN-OUT NOTES:

1. FOR NEW INSTALLATIONS EXTEND 4-INCH PVC CLEAN-OUT 24-INCHES ABOVE FINISHED GRADE WITH 4-INCH PLUG
2. AT THE TIME OF SERVICE CONNECTION THE CLEAN-OUT EXTENSION SHALL BE ADJUSTED AND THE APPROPRIATE CLEAN-OUT BOOT INSTALLED AT THE FINISHED GRADE ELEVATION.
3. ALL FITTINGS SHALL BE SOLVENT WELD
4. ALL PIPE SHALL BE PVC SDR 35 OR SCH-40 TO WHICH LESS THAN 14-FEET DEEP
5. CENTER LINE OF CLEAN-OUTS TO BE PLACED 6-INCHES INSIDE TOWN ROW-OF-WAY LINE UNLESS SPECIFIED OTHERWISE.
6. WASTEWATER SERVICE CLEAN-OUTS ARE NOT ALLOWED ON MAIN LINES.



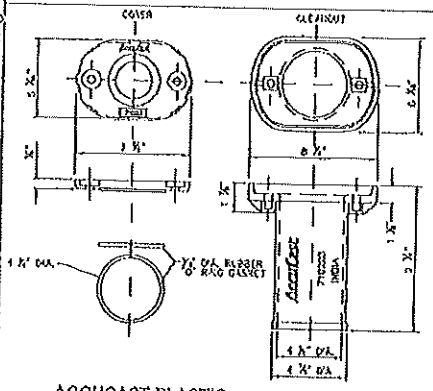
WASTEWATER SERVICE CLEAN-OUT DETAILS

N.T.S.



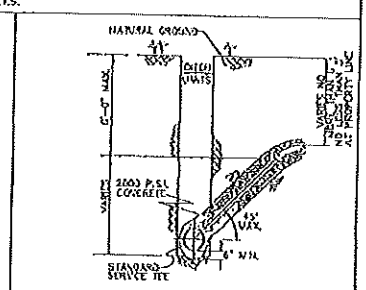
STANDARD WASTEWATER SERVICE CONNECTION

N.T.S.



ACCUCAST PLASTIC SEWER CLEANOUT

ACCUCAST #1010ZZ3 OR EQUAL
(TO BE USED UNDER UNPAVED SURFACES ONLY)
NOT TO SCALE



STANDARD DEEP CUT CONNECTION

N.T.S.

NOTE:
USE EXTENSION TO THE PROPERTY/EASEMENT LINE SHALL BE AS PER THE STANDARD WASTEWATER SERVICE CONNECTION DETAIL.

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SHEET 1 OF 1 | NOVEMBER 2020

town of ANNETTA

WASTEWATER STANDARD DETAILS

SERVICES

WW-1