

APPENDIX B – DESIGN STANDARDS AND SPECIFICATIONS MANUAL

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Section 1 GENERAL REQUIREMENTS

1.1 Introduction

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

The 5th Edition of the NCTCOG Standard Specifications for Public Works Construction dated November 2017 as modified by the City of Johnson City Special Provisions are supplemental and are made a part of these Design Standards. These documents are to be considered as the minimum requirements of engineering design. The adherence to the requirements of these documents and/or the approval by the City of Johnson City and its agents in no way relieves the developer of the responsibility for adequacy of design, which may require more stringent standards than these, the completeness of plans and specifications or the suitability of the completed facilities. In unusual circumstances, the City of Johnson City may determine that designs other than those of the Standards are necessary and will inform the developer of such requirements before final engineering review.

The developer shall obtain authorization from the City of Johnson City, in writing, for any deviations from the requirements set forth in the Design Standards and Specifications Manual.

1.2 Standards of Design

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

1.3 Standard Specifications for Construction

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

1.4 Standard Details

In an effort to have uniformity and to facilitate maintenance, the City has adopted the North Central Texas Council of Governments (NCTCOG) Standard Drawings as modified by the City of Johnson City Special Provisions for certain facilities such as manholes, street sections, sidewalks, water, wastewater, storm water, curb inlets, barrier free ramps, etc. The City of Johnson City Special Provisions to the NCTCOG Standard Specifications are located in Section 8.B of this document. The NCTCOG Standard Specifications can be obtained from the Capital Area Council of Governments at 616 Six Flags Drive, Suite 200, Arlington, Texas, 76005, (817) 640-3300.

1.5 Materials Testing and Quality Control

Testing of materials and quality control for all development construction shall be performed by a material testing laboratory and payment for such services shall be made by the contractor. It is the contractor's responsibility to show, through test procedures and results, that the work is in conformance with these design standards. All testing shall be completed with an employee or representative of the City of Johnson City present.

1.6 Utilities to be Underground

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

1.7 Submittal to Utility Companies

The developer shall be responsible for submittal of information needed to design private utilities for the development. This information shall be submitted to franchise's and any other appropriate utility.

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

1.8 Requirements of the Final Engineering Drawings

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

1.9 Final Acceptance

After improvements have been constructed, the developer shall be responsible for providing to the City "As Built" or "Record Drawings" mylars and one (1) set of "Black line prints". The City will not accept the subdivision until the mylars and prints are submitted to the City. Mylars and prints shall be sized 24" x 36". The City shall also be furnished pdf images of each sheet named according to the sheet title and sheet number and AutoCAD 2018 or later format drawings on a CD-ROM (No XREFS) of the "As Built" or "Record Drawings" (digital).

1.10 Warranty

As a condition of final acceptance, the contractor shall furnish a two (2) year maintenance bond in the amount of 110% of the public improvements, which shall become effective from the date of acceptance.

Section 2 STREETS

2.1 General

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

2.2 Street Arrangement

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

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

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

2.3 Thoroughfare and Street Geometry

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

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

2.4 Turn Lanes

All left turn storage areas shall be ten (10) feet wide with minimum storage requirements for left-turn lanes as in Figure 2.2. The transition curves used in left-turn lanes shall be two (2), 250-foot radius reverse curves with a total transition length of 100 feet.

TABLE 2.1 GEOMETRIC DESIGN STANDARDS

Design Element	Principal Arterial Divided	Minor Arterial Divided	Major Collector Undivided	Minor Collector Undivided	Local (Residential)
Number Traffic Lanes	6	4	4	2	2
Minimum Lane Width (Feet)	12	12	11	11+ 2 Parking	15
Minimum R.O.W. Width* (Feet)	120	80	80	60	60
Design Speed (M.P.H.)	45	40	40	40	25
Stopping Sight Distance (Feet)	400	325	325	325	325
Median Width ** (Feet)	16	14	—	—	—
Minimum Lateral Clearance (Feet)	6	6	6	6	—
Parking Permitted	NO	NO	NO	Com. Some Res. Yes	Res. Yes
Minimum Horizontal Centerline Curvature (Feet)	1200	850	Com. 700 Res. 600	Com 500 Res. 350	Res. 200 ELBOW – 50'

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

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

***** LOCAL RESIDENTIAL CUL-DE-SACS SHALL HAVE A MINIMUM R.O.W. RADIUS OF FIFTY FEET (50').**

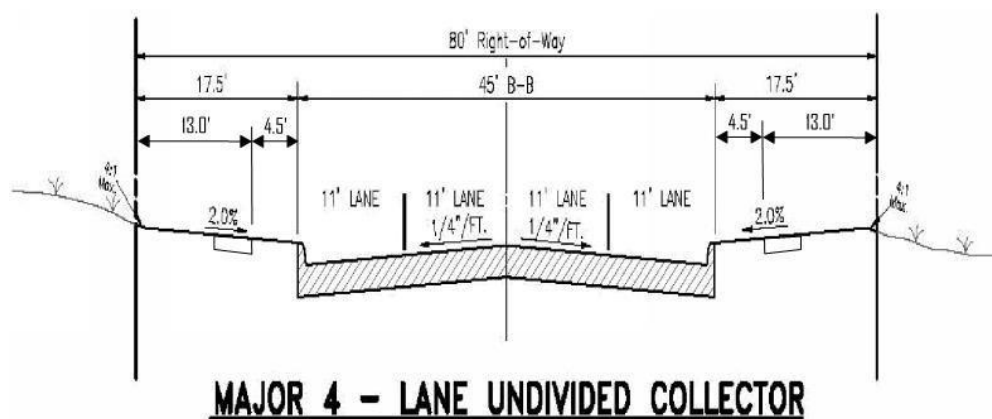
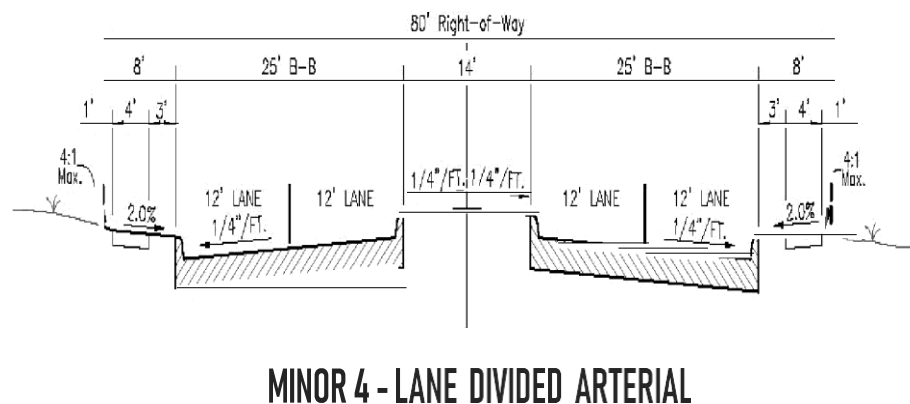
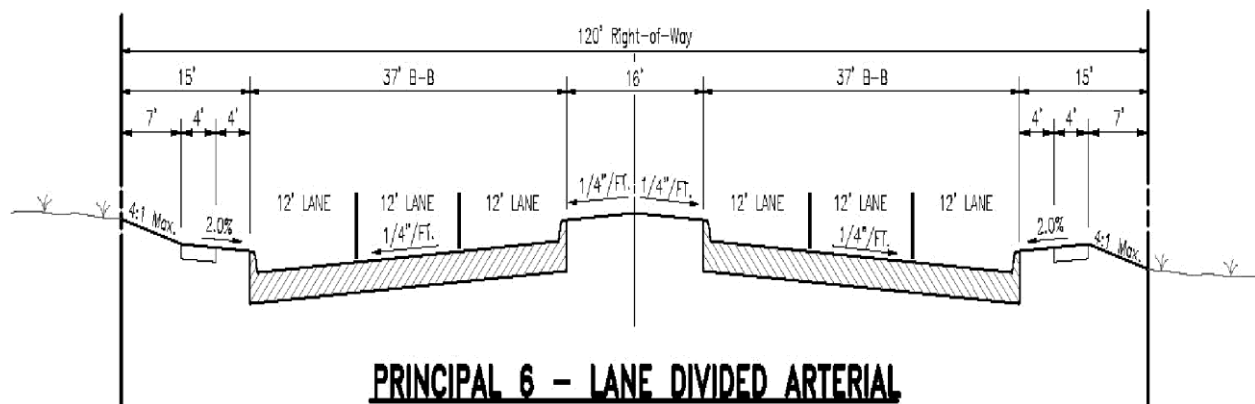


Figure 2.1A

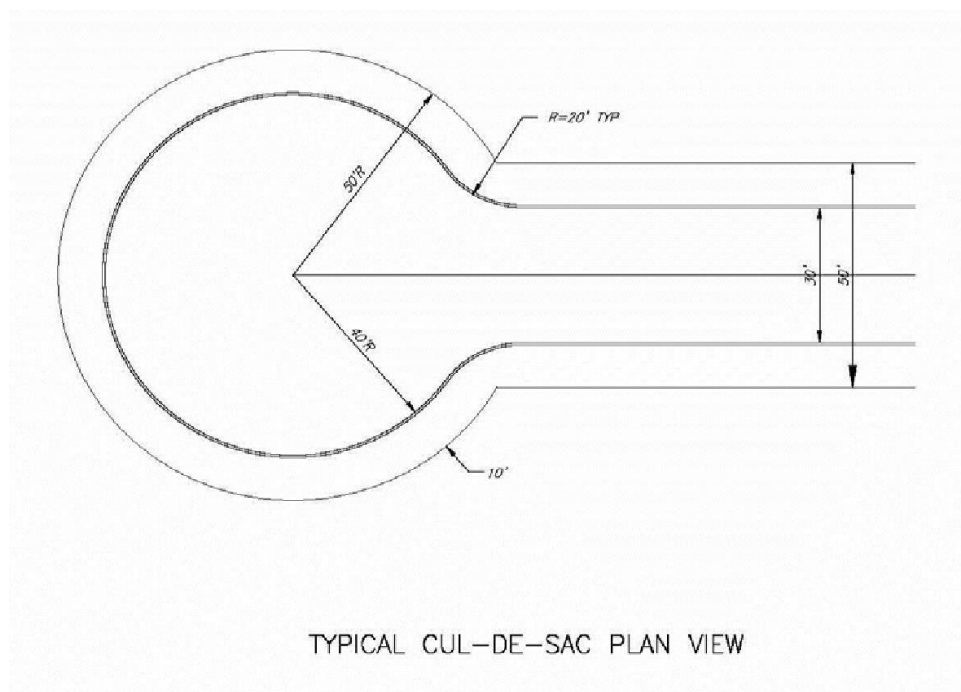
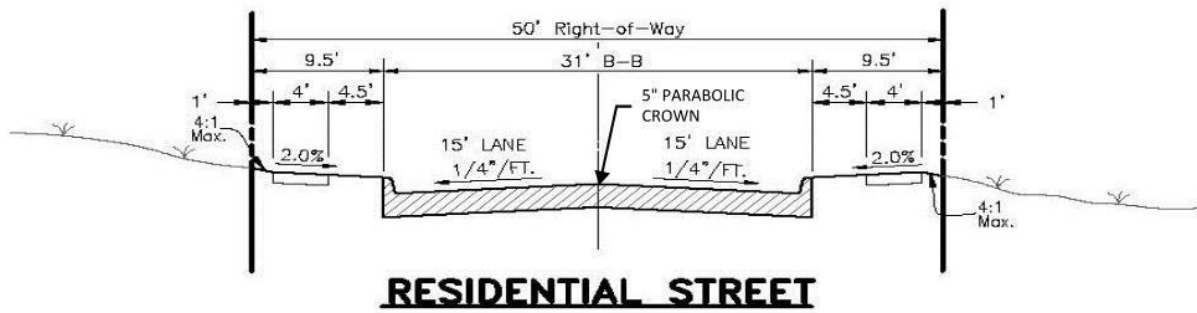
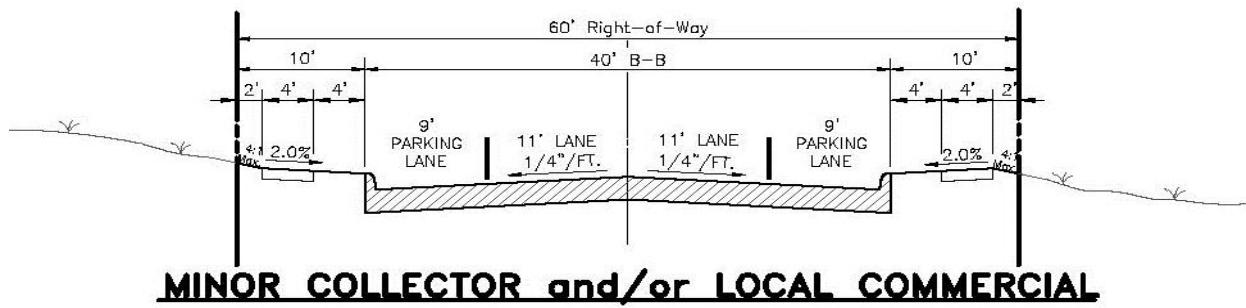
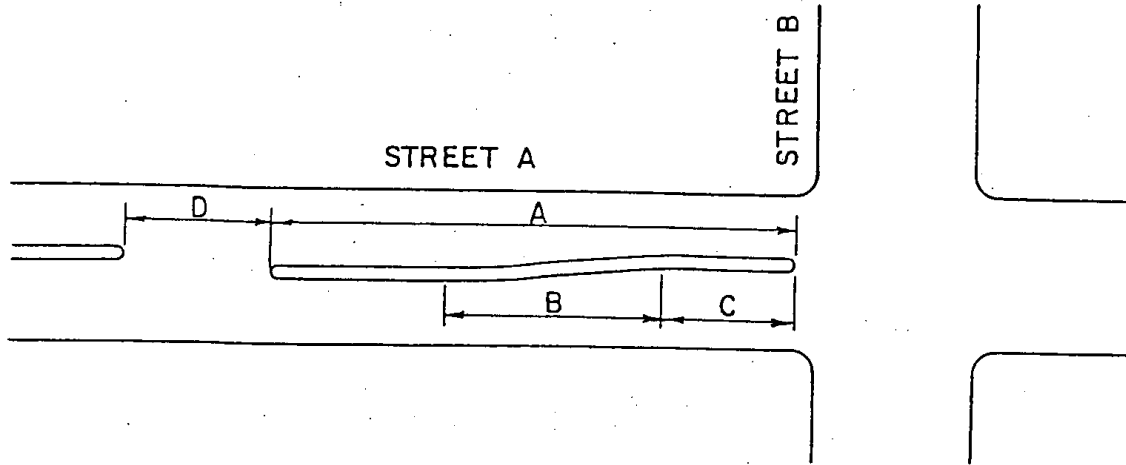


Figure 2.2
MEDIAN DESIGN STANDARDS



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

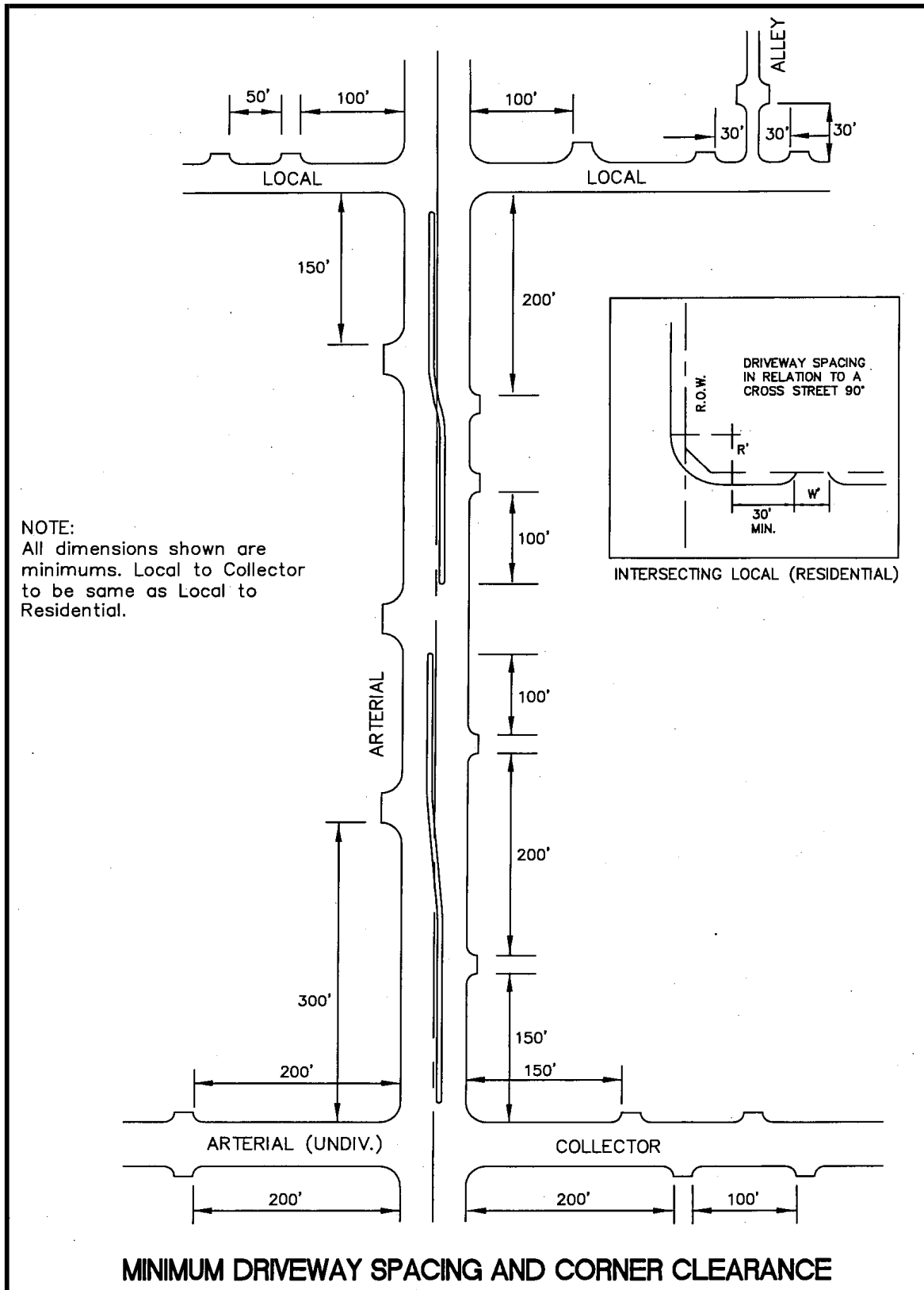
LEFT-TURN STORAGE AREA WIDTH 10' MINIMUM

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

*MINIMUM LENGTH – ACTUAL LENGTH DEPENDENT UPON ANTICIPATED TURN VOLUMN

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

Figure 2.3



2.5 Median Openings, Width, Location and Spacing

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

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

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

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

- A. 310 feet from nose to nose of the median from the intersection of two major thoroughfares to a street or drive (see Figure 2.2);
- B. 260 feet from nose to nose of the median from the intersection of two secondary thoroughfares or a secondary thoroughfare and a major thoroughfare to a residential street or a drive, and;
- C. 220 feet from nose to nose of the median for intersection combinations of drives and/or residential streets.

2.6 Driveway Locations

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

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

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

2.7 Block Lengths

In general, streets shall be provided at such intervals as to serve cross traffic adequately and to intersect with existing streets. Where no existing plats control, the blocks shall be not more than 1,800 feet in length or be less than 500 feet. Block arrangements must provide access to all lots, and in no case, shall a block interfere with traffic circulation.

2.8 Street Intersections

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

Arterial and collector street intersections shall have property line corner clips with a minimum tangent distance of thirty (30) feet. Residential streets shall not normally be

required to have a corner clip at their intersection with other streets or thoroughfares, but a 25-foot by 25-foot sidewalk corner easement will be required.

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

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

2.9 Relation to Adjoining Streets

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

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

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

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

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

2.11 Street Grades

Arterial streets may have a maximum grade of seven and one-half (7½) percent, for a maximum continuous distance of two hundred (200) feet. Collector streets may have a maximum grade of six (6) percent. Residential streets may have a maximum grade of eight (8) percent, unless otherwise approved by the City, where the natural topography is such as to require steeper grades. All streets must have a minimum grade of at least five-tenths (0.5) of one (1) percent. Centerline grade changes with an algebraic difference of more than one (1) percent shall be connected with vertical curves in compliance with the minimum length requirements set forth in Table 2.2.

2.12 Pavement Design

Pavement and pavement subgrades (Roadway and Firelanes) shall be designed based on representative onsite soil sub-surface conditions. Pavement design calculations shall be prepared by Professional Engineer licensed in the State of Texas and be submitted with the preliminary construction plans for review as part of the construction plan review process. The submittal shall include the pavement design traffic loadings and design life.

Pavement and subgrade shall be as follows:

A. Residential and Firelane Pavement:

- 1) Reinforced Concrete Pavement: Reinforced concrete pavement thickness shall be determined by pavement design calculations. Minimum thickness of reinforced concrete pavement shall be no less than six (6) inches reinforced with No. 4 bars at 18-inch centers both ways. Concrete strength shall be NCTCOG Item 303.3.4.2. Class C (4,000 psi Compressive Strength in 28-days), with a cement content of not less than 6 sacks per cubic yard. Subgrade preparation and thickness shall be based on pavement design calculations and shall be lime stabilized no less than six (6) inches in depth. All curbs shall be 6" monolithic barrier curbs.
- 2) Asphalt Pavement: Minimum thickness of Asphalt Pavement shall be no less than seven (7) inches for 36 feet pavement width or less. Asphalt for use in paving shall be a refined asphalt produced from crude petroleum. The base asphalt shall be homogeneous and free from water and residue from distillation of coal, coal tar or paraffin oil and shall not foam when heated to 347 degrees F. Subgrade preparation and thickness shall be based on a soil investigation for subgrade design. Shall be conducted by the Engineer. This design shall be approved by the City Engineer prior to construction.

B. Arterial, Minor Collector, and Major Collector Pavement:

- 1) Reinforced concrete pavement thickness shall be determined by pavement design calculations. Minimum thickness of reinforced concrete pavement shall be no less than eight (8) inches reinforced with No. 4 bars at 18-inch centers both ways. Concrete strength shall be NCTCOG Item 303.3.4.2. Class C (4,000 psi Compressive Strength in 28-days), with a cement content of not less than 6 sacks per cubic yard. Subgrade preparation and thickness shall be based on pavement design calculations and shall be lime stabilized no less than eight (8) inches in depth.
- 2) Asphalt Pavement: Minimum thickness of Asphalt Pavement shall be no less than seven (8) inches for pavements widths above 36 feet. Asphalt for use in paving shall be a refined asphalt produced from crude petroleum. The base asphalt shall be homogeneous and free from water and residue from distillation of coal, coal tar or paraffin oil and shall not foam when heated to 347 degrees F. Subgrade preparation and thickness shall be based on a soil investigation for subgrade design. Shall be conducted by the Engineer. This design shall be approved by the City Engineer prior to construction.

C. Subgrade: Subgrade design shall be based on representative onsite subsurface soil conditions and testing. Testing shall be in accordance with the NCTCOG Standard Specifications for Public Works Construction and be completed by a geotechnical testing lab. The geotechnical investigation shall be submitted to the City as part of the pavement design submittal. In general, the soils testing shall include representative soil borings of the site and the testing of Atterburg limits. Based on

the testing results, the pavement design shall provide the percentage of the subgrade lime stabilization proposed. Stabilization shall span the width of the street, back-of-curb to back-of-curb, plus twelve (12) inches beyond the back of curb on each side and be a minimum of six (6) inches in depth for 6-inch pavement and eight (8) inches in depth for 8-inch pavement, unless greater extents recommended by the geotechnical investigation. Subgrades shall be mechanically compacted to ninety- five (95) percent standard proctor densities at optimum moisture.

There shall be no driveway cuts unless approved by the City. Contractors shall perform a horizontal curb cut for all driveways. Future driveway cuts on existing streets shall have proposed driveway pavement constructed within 48-hours of driveway excavation or a temporary concrete mud mat shall be constructed to protect the existing street subgrade from excessive moisture penetration or moisture evaporation.

TABLE 2.2
CREST VERTICAL CURVES

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

(a) AASHTO; p. 16

TABLE 2.2. Cont'd CREST VERTICAL CURVES

ROUNDED

MINIMUM LENGTH OF VERTICAL CURVE IN FEET

For Speeds and K Values Shown Below (L-KA)

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

TABLE 2.2 Cont'd SAG VERTICAL CURVES

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

(a) AASHTO, p. 316

(b) AASHTO, p. 312

TABLE 2.2 Cont'd SAG VERTICAL CURVES

ROUNDED

MINIMUM LENGTH OF VERTICAL CURVE IN FEET

For Speeds and K Values Shown Below (L-KA)

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

2.13 Parkways, Grades and Sidewalks

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

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

Sidewalks shall be provided for all residential streets in subdivisions zoned for one- or two-family dwellings and on all streets designated on the adopted Master Thoroughfare Plan. Barrier free ramps and sidewalks along screening walls, landscaped areas, trails or in parks, shall be installed by the Developer with street construction and the sidewalks in front of residential lots shall be installed by the home builder. The City may require sidewalks in other locations. Where provided, there shall not be less than four (4) feet in width with the inside edge of the sidewalk to be placed one (1) foot off the property line and located wholly within the dedicated street right-of-way, sidewalk corner easement or road easement in the case of private streets. This requirement may be waived by the City Council.

Sidewalks placed adjacent to the back of the curb must be six (6) feet wide and approved by the City's Engineer.

Sidewalks shall be of concrete having a minimum of 4,000-psi compressive strength in 28 days. The concrete thickness shall be four (4) inches reinforced with No. 3 bars at 18-inch centers both ways. A minimum of 1½ inches of sand must be placed under sidewalk. Subgrade (including sand) shall be mechanically compacted to 95% density.

2.14 Driveways

- A. Residential: Residential driveways to serve two car garages shall be not less than eleven (11) feet nor more than twenty (20) feet in width at the property line. The width of the driveway will be larger at the garage for a three car (width to be twenty- eight (28) feet). Shared driveways and garages larger than three cars shall be a case-by-case basis. Residential driveways shall be separated from one another by a distance of at least ten (10) feet. The radii of all residential driveway returns shall be a minimum of five (5) feet and shall not extend past the adjoining property line. The driveway approaches devoted to one use shall not occupy more than sixty percent (60%) of the frontage abutting the roadway or alley.
- B. Multi-Family and Non-Residential: Driveways providing access to multi-family or non-residential uses shall generally have widths between twenty-four (24) and forty-five (45) feet when measured at their narrowest point near, or at, the property line. The minimum radius for these uses shall be twenty (20) feet. Larger radii are encouraged. Limitations on permissible locations for these driveways are addressed in Section 2.6, Driveway Locations. Driveway radii returns shall not extend across abutting property lines.

2.15 Traffic Information and Control Devices

The developer shall arrange for the installation of all pavement striping, regulatory, warning and guide signs, including posts, as shown on the approved plans. Street name signs shall be installed at each intersection. All traffic control devices shall be designed in accordance with the current addition of the Texas Manual on Uniform Traffic Control Devices (TMUTCD). Examples of regulatory, warning, information and guide signs are as follows:

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

The street signs shall be extruded and engineering grade. Signposts shall be galvanized steel and set in concrete. The developer shall be responsible for the expenses incurred by the City for manufacture and installation of these signs.

2.16 Street Lighting

All developments shall be provided with streetlights. In, general, lights should be located at street intersections and at intervals no greater than four hundred (400) feet apart. Streetlights should be the equivalent of 175-watt mercury vapor fixtures on minor residential streets. All collector and arterial, or commercial streets shall have sodium vapor fixtures with a minimum wattage of 250 or 400 watts as directed, in writing, by the City. In some instances, the City may require greater wattage. For all median lights, as-builts must be provided to the City for final acceptance.

Street lighting shall be required at each residential subdivision intersection. Street name signs and regulatory signs required at the intersection shall be attached to a streetlight. Streetlight and regulatory signage shall be installed in accordance with all TMUTCD requirements. Streetlights between street intersections shall be at the projection of a property line between owners.

2.17 Barrier Free Ramps

Barrier free ramps shall be provided in all commercial areas and in residential areas which have sidewalks. Ramps shall be located to provide access in accordance with the standards set by the Americans with Disabilities Act (A.D.A.) at all pedestrian sidewalks and meet all Texas Accessibility Standards (TAS). Lay down curbs and ramps shall be constructed at all street intersections and driveways whether or not sidewalks are being installed. Lay down curbs and ramps shall be constructed by the developer. The developer shall be responsible for paying for and arranging for all TAS design reviews and post construction inspections. Results of TAS inspections shall be provided to the City.

2.18 Off-Street Parking

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

- A. All parking areas and spaces shall be designed and constructed so as to have free ingress and egress at all times.
- B. No parking space or parking area shall be designed so as to require a vehicle to back into a public street or across a public sidewalk, except in the downtown district, as defined by the City.

C. Minimum Dimensions for Off-Street Parking:

1. Ninety-degree parking (Figures 2.4a and 2.4b) — Each parking space shall not be less than nine (9) feet in width and eighteen (18) feet in length with two (2) feet of overhang between curb and sidewalk or property line (20-foot minimum). Dual head in parking spaces should be a minimum of twenty (20) feet in length; Aisle width shall not be less than twenty-four (24) feet.
2. Sixty-degree angle parking (Figures 2.5a and 2.5b) — Each parking space shall be not less than nine (9) feet wide perpendicular to the parking angle nor less than twenty and one tenth (20.1) feet in length when measured at right angles to the building or parking line. Maneuvering space shall be not less than fourteen and one-half (14½) feet for one-way traffic or twenty-two (22) feet for two-way traffic perpendicular to the building or parking line.
3. Forty-five-degree angle parking (Figures 2.6a and 2.6b) — Each parking space shall not be less than nine (9) feet wide perpendicular to the parking angle nor less than nineteen (19) feet in length when measured at right angles to the building or parking line. Maneuvering space shall be not less than twelve (12) feet for one-way traffic or twenty-one (21) feet for two-way traffic perpendicular to the building or parking line.
4. Parallel Parking — Each parking space shall not be less than nine (9) feet in width and twenty-two (22) feet in length. Maneuvering space will not be less than twenty (20) feet.
5. Handicap Space Parking — Handicap parking spaces are required to meet ADA and TAS regulations.
6. When off-street parking facilities are located adjacent to a public alley, the width of said alley may be utilized as a portion of the maneuvering space requirement, provided the alley is paved.
7. When off-street parking facilities are provided in excess of minimum amounts herein specified, or when off-street parking facilities are provided, but not required by this chapter, said off-street parking facilities shall comply with the minimum requirements for parking and maneuvering space herein specified.

D. Paving Standards:

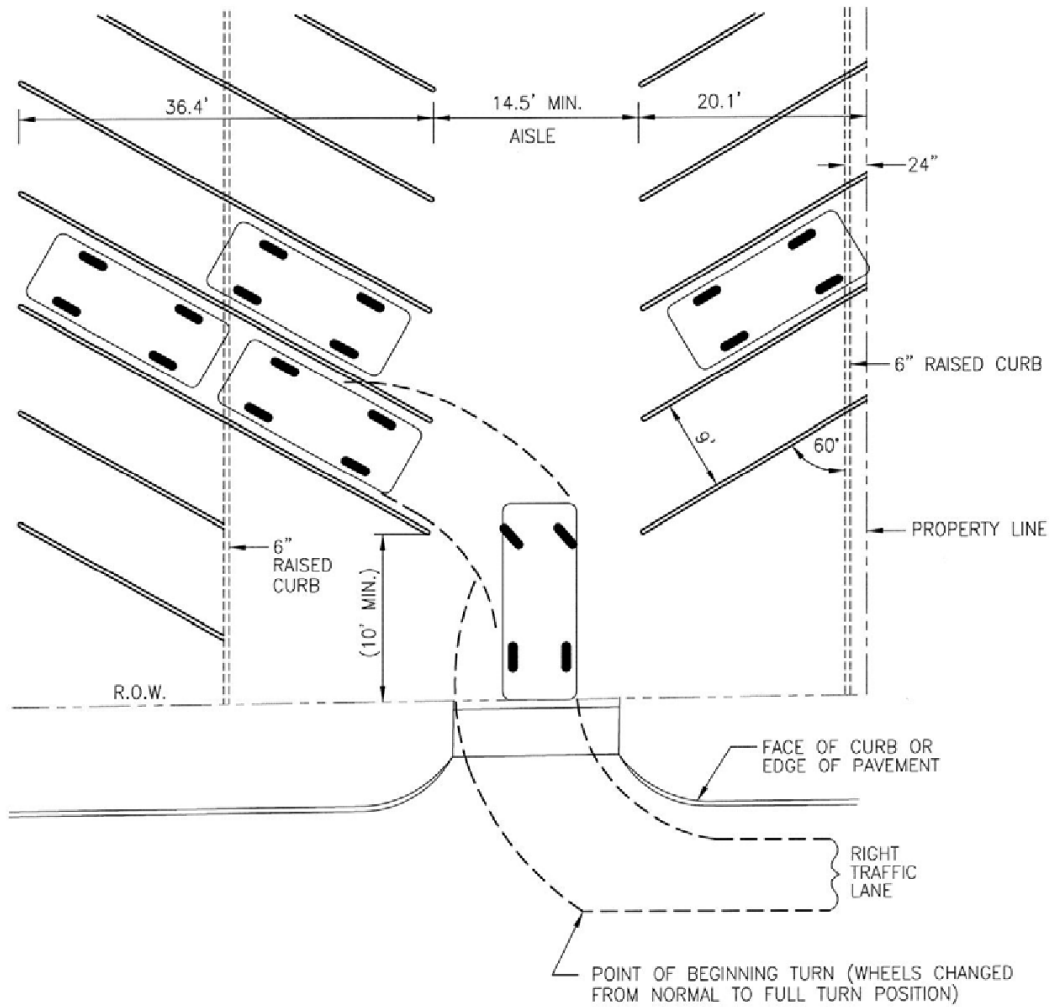
1. Unless otherwise approved by the City Council or as specified in these standards, all parking lots shall be paved with concrete or asphalt and designed according to City standards and specifications. The parking lanes must be clearly marked by approved paint, buttons or other material. All driveway approaches shall be constructed of concrete in the same strength as the adjacent street and shall be curbed per City standards.
2. The pavement within a designated loading area shall be designed and constructed to carry the additional loading of merchandise, goods, sanitation pick-up, etc., in order to prevent any unnecessary failure in the pavement itself. The pavement design shall be included in the engineering construction plans and specifications and submitted to the City's Engineer for review.

3. Fire lane pavement shall be a minimum of six (6) inches with lime stabilized subgrade. Concrete strength shall be NCTCOG Item 303.3.4.2. Class C (4,000 psi in 28-days). Asphalt fire lanes are not permissible, unless approved by the City.
- E. All entrances or exits in a parking lot shall be a minimum of thirty (30) feet from the beginning point of any corner radius.
 - F. All entrances or exits in a parking lot shall be a minimum of twenty-four (24) feet and a maximum of forty-five (45) feet in width, unless One-way, in which case they shall both be a minimum of twelve (12) feet, or as approved by the City Council.
 - G. The driveway approach angle to any parking area shall be a maximum of sixteen (16) degrees; the departure angles a maximum of ten (10) degrees; the ramp angles a maximum of eleven (11) degrees; or otherwise, shall be approved by the City's Engineer.
 - H. No parking areas or parking spaces shall be allowed to pave over or utilize public right-of-way, with the exception of approved entrances and exits, unless the City Council approves a site plan provided by the developer.
 - I. Any lighting used to illuminate any off-street parking area shall be so designed and constructed as to direct the light onto the property and away from any adjoining property or, street.
 - J. All multi-family and commercial parking areas and parking spaces shall be designed and constructed to protect adjacent residences from the direct glare of headlights of vehicles using the parking area.
 - K. All multi-family, retail, commercial and industrial parking lots shall be required to provide a fire lane with a minimum width of twenty-four (24) feet (requires minimum thirty (30) foot inside curve radius).
 - L. No City street curb, alley or street pavement may be cut, or cored for drainage, without a permit from the City.

90° Parking – Double Row



FIGURE 2.5a
60° Parking – Double Row



AISLE WIDTH SHOWN IS THE MINIMUM FOR ONE-WAY TRAFFIC. FOR EASE OF OPERATION AND FOR LONG ROWS OF PARKING, WIDTH SHOULD BE INCREASED APPROXIMATELY 5'

FOR TWO-WAY TRAFFIC THE AISLE WIDTH MUST BE INCREASED TO 22' (CLEAR DISTANCE OF 24.3')

60°

FIGURE 2.5b
60° Parking – Single Row

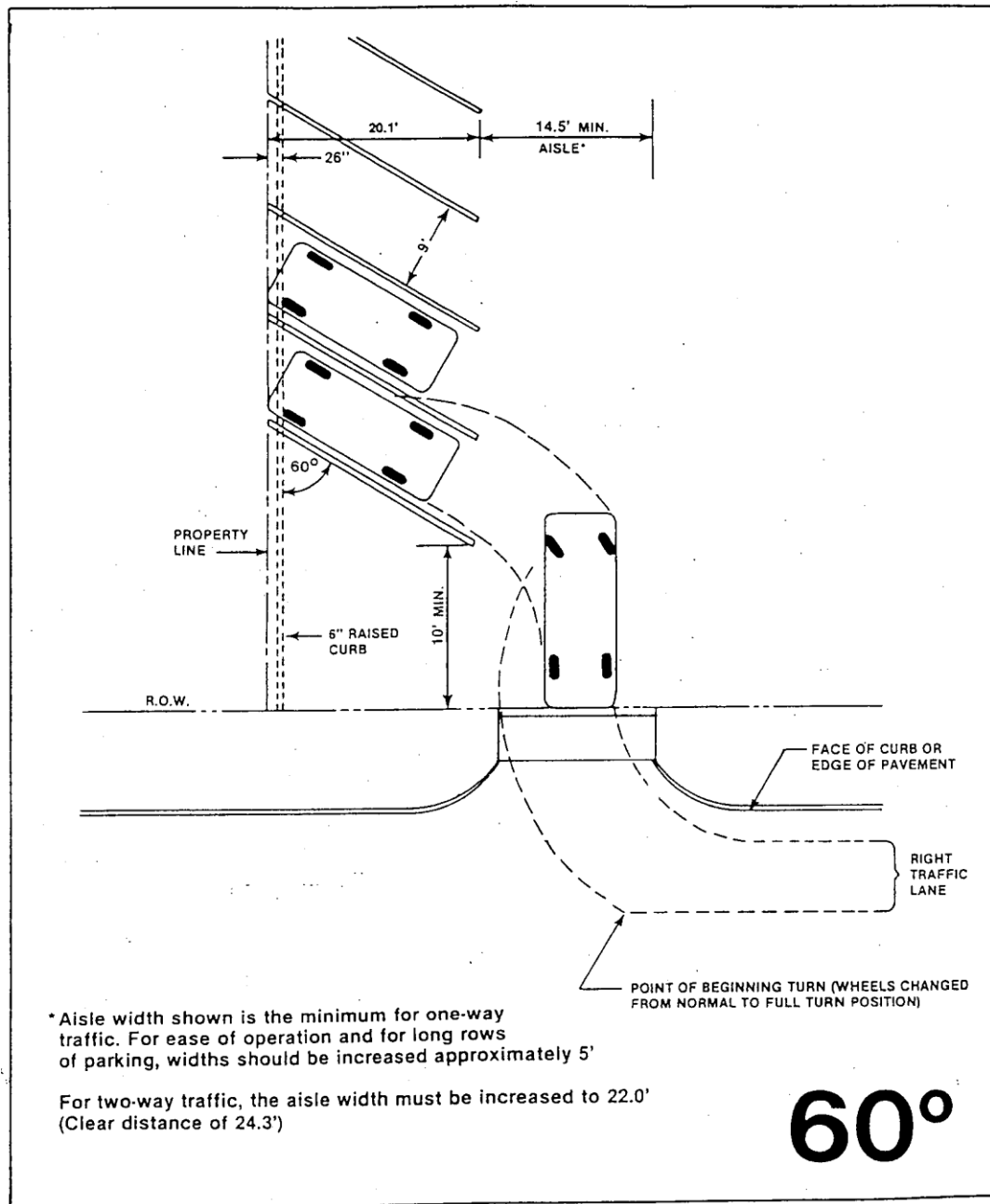
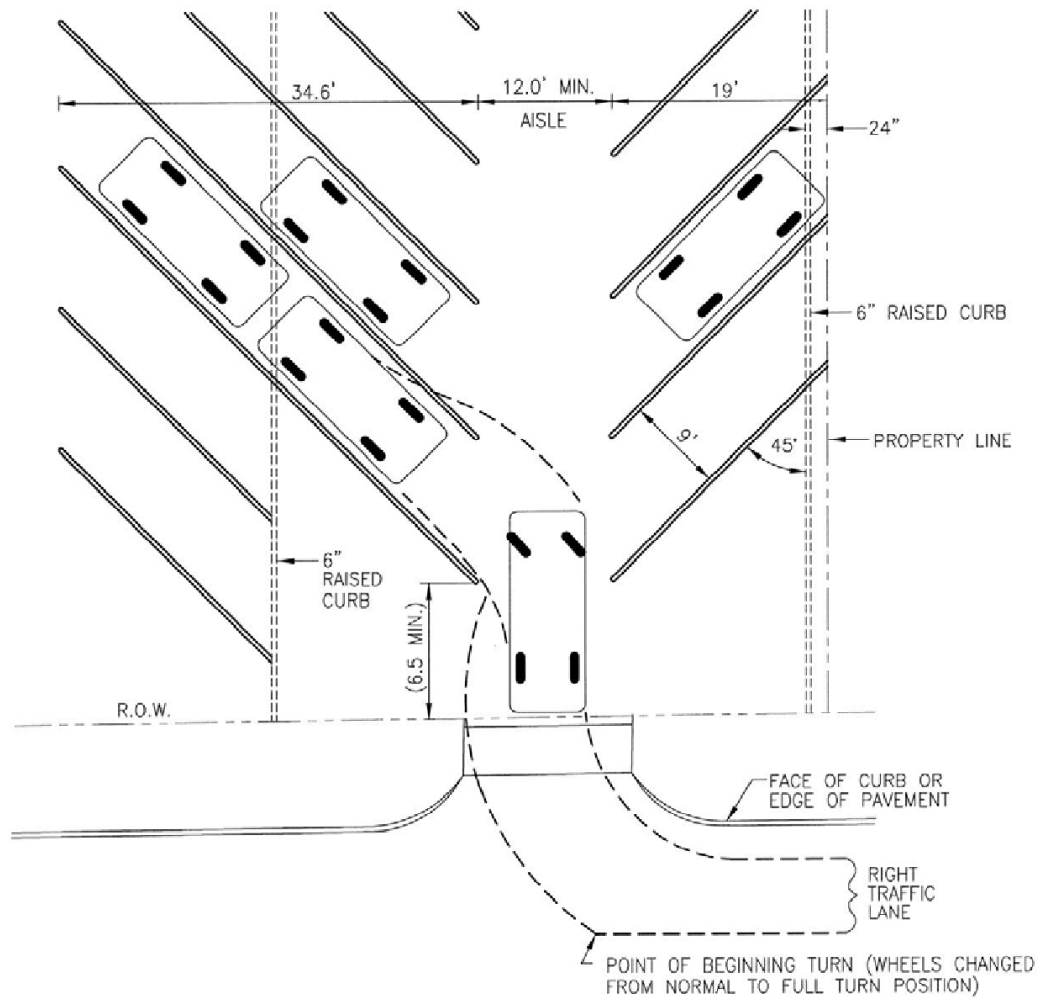


FIGURE 2.6a

45° Parking – Double Row

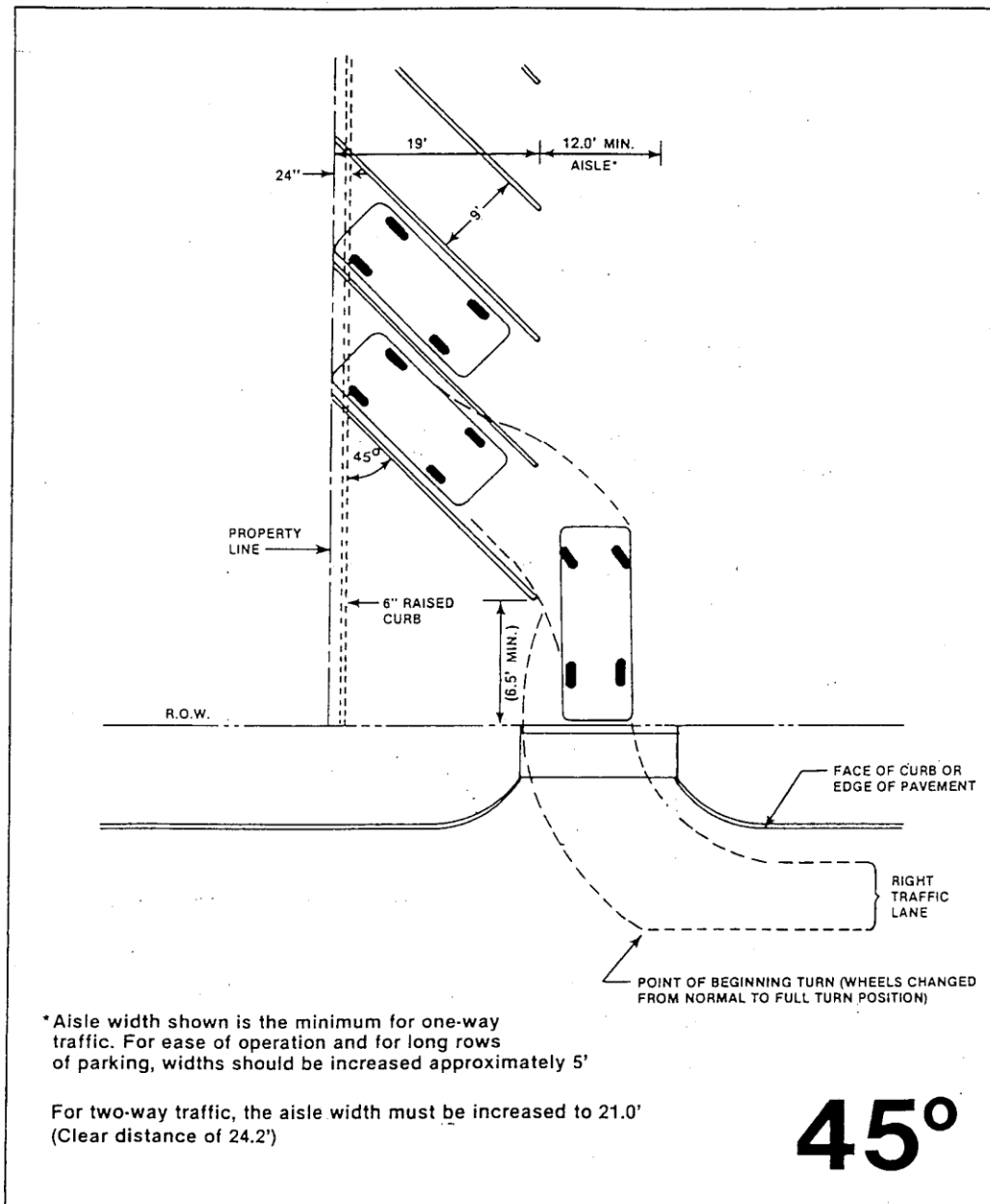


AISLE WIDTH SHOWN IS THE MINIMUM FOR ONE-WAY TRAFFIC. FOR EASE OF OPERATION AND FOR LONG ROWS OF PARKING, WIDTH SHOULD BE INCREASED APPROXIMATELY 5'

FOR TWO-WAY TRAFFIC THE AISLE WIDTH MUST BE INCREASED TO 21' (CLEAR DISTANCE OF 24.2')

45°

FIGURE 2.6b
45° Parking – Single Row



Section 3 STORM DRAINAGE FACILITIES

Introduction

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

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

Storm drainage released from the site will be discharged to a natural water course or storm sewer system of an adequate size to convey the 100-year storm runoff expected after development.

Detention ponds shall be designed for the 2-year and 100-year storm event.

3.1 Storm Drainage Design Criteria

- A. General: Design and analysis of all storm drainage facilities shall be in accordance with these guidelines and the City of Plano's current Storm Drainage Design Manual.. Where conflicts between these guidelines and the City of Plano's current Storm Drainage Design Manual exist, these guidelines shall govern. Where conflicts between the City of Johnson City's Code of Ordinances and the City of Plano's current Storm Drainage Design Manual exist, the City of Johnson City's Code of Ordinances shall govern. Drainage area calculations, storm pipe calculations, and inlet capacity calculations are required with engineering plan submittals, at a minimum. Additional information may be required by the City.
- B. Wet detention / retention ponds are prohibited.
- C. Storm Pipe Size: The minimum size storm sewer line shall be eighteen (18) inches.
- D. Storm Pipe Material: RCP shall be used for all stormwater applications, no plastic pipe will be permitted in the fire lane.
- E. Floodplain: The 100-year existing conditions floodplain limits shall be determined for all water courses with a contributing drainage area of 100-acres or greater within a subdivision in accordance with Section 3.3. In addition to defining the limits of the floodplain, the floodplain study must demonstrate the development will not be detrimental to any other property.
- F. Access: Storm drainage facilities shall include all elements of a drainage system consisting of streets, alleys, storm drains, channels, culverts, bridges, swales and any other facility through which or over which storm water flows, all of which the City must have a right in, either in the form of a dedicated right-of-way, floodway or drainage easements.
- G. Storm Drainage Management Plan: All new subdivisions shall provide as part of the subdivision review process a complete storm drainage management plan. This plan will include, but not be limited to, the following: a complete review of all on- site,

upstream and downstream drainage within the impacted watershed; determine all on-site and downstream drainage facility improvements due to the increased runoff from the proposed development and future upstream and downstream developments; and shall contain calculations necessary to determine compliance with the Standards of Design herein. The plan shall be done, using current zoning conditions or land use prescribed by the **City's Land Use Plan** (whichever creates the greatest storm water runoff), with maximum development considered throughout the watershed. The storm drainage plan shall show all necessary improvements with flow data provided at each point of interception of water. As part of the storm drainage plan, the developer shall show a lot grading plan to direct all water to proper intersection points avoiding cross flow of water from lot to lot. All upstream discharge shall be intercepted and carried through the proper intersection points avoiding cross flow of water from lot to lot. All upstream discharge shall be intercepted and carried through the proposed development in compliance with the Standards of Design herein. All discharge from the proposed development shall be designed in accordance with the Standards of Design herein with all necessary improvements being installed by the developer to protect downstream property from damage. The determination of necessary improvements to existing drainage facilities downstream of a proposed development shall be reviewed by the City's Engineer for compliance and adequacy. Include recessed curb inlets for all streets that are not residential streets.

- H. Storm Water Pollution Prevention Plan: The developer shall provide a Storm Water Pollution Prevention Plan (SWPPP), in compliance with all TCEQ and NPDES regulations, for each project. A copy of the SWPPP and Notice of Intent (NOI) shall be on file at the City prior to the issuance of a building permit.
- I. Exemptions: At the City's discretion, alternative storm sewer design criteria and calculations may be considered for special or unique development cases. The alternative design criteria to be considered by the City, on a case-by-case basis, and storm drainage design criteria shall be approved by City Council.

3.2 Hydrology

A. Hydrograph Method (HEC-HMS)

The hydrograph method is required for all drainage areas in excess of 200-acres, floodplain studies, and final detention sizing.

1) Design Rainfall:

Depth-Duration-Frequency (DDF) data at each project location should be determined from NOAA's Precipitation Frequency Data Server ([PFDS](#)) which reflects the NOAA Atlas 14 data.

Data Description: Data type "Precipitation Depth" with "English" units and "Annual maximum" time series type should be selected at the top of the PFDS prior to selecting point location.

Point Location: Engineers will need to use judgement when selecting an appropriate point to establish depth values. Consideration should be taken when depth values vary across a watershed or project area. The location of the selected depth values and a brief explanation of the selected point should be included in the drainage report. If the majority of the contributing watershed is located within City limits or the City ETJ, the DDF values at the Johnson City (41-4605) station may be used.

2) Frequency Storm:

The 24-hour frequency storm distribution should be used for all hydrograph method analyses in HEC-HMS. Meteorological model parameters should be set as follows:

Annual-Partial Conversion: None

Storm Duration: 1 Day

Intensity Duration: 5 Minutes

Intensity Position: 50 Percent

Area Reduction: None (if area exceeds 10 square miles use areal reduction)

- 3) Control Specifications: Selection of an appropriate time interval is critical to the accuracy and performance of the HEC-HMS model. An appropriate time interval is related to the time of concentration of the watershed as shown in

$$\Delta t = \frac{1}{5}t_c \text{ OR } \Delta t = \frac{1}{6}t_c$$

Where: Δt = time interval
 t_c = time of concentration

3.3 Floodplain Delineation, Studies, and Easement Dedication Requirements

A separate and detailed floodplain study prepared by a licensed professional engineer for all water courses meeting the conditions a floodplain recognized by the City, shall be submitted to provide theoretical verification of the maximum floodwater elevations that may be expected so that the potential effect on subdivision lots may be evaluated.

A. Floodplain Studies:

- 1) Floodplain studies shall be prepared in accordance with the City of Plano Stormwater Design Manual and these guidelines. Where conflicts exist, these guidelines shall govern.
- 2) Hydrology for floodplain studies shall be developed using the United States Army Corps of Engineers (USACE) Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS).
- 3) Hydraulics for floodplain studies shall be developed using the USACE Hydrologic Engineering Center River Analysis System (HEC-RAS).
- 4) Floodplain studies should follow FEMA standards and, at a minimum, include the items in the Floodplain Study Checklist in Attachment XX.

B. Floodplains

- 1) Floodplains shall be delineated for each watercourse with a contributing drainage area of 100-acres or greater. For a watercourse with less than 100-acres of contributing area, a floodplain is not required to be delineated unless the area is already defined as floodplain by FEMA.
- 2) Floodplains shall be delineated assuming “existing” land use conditions in the contributing watershed.

C. FEMA Floodplains

- 1) Special flood hazard areas (SFHZ) defined on the FEMA FIRM's depict floodplain boundaries at the time of study, based on "existing" development conditions within the watershed. Analysis for FEMA submittals will require "existing" land use conditions in the contributing watershed.
- 2) Where a subdivision or development proposes to modify the limits of the FEMA floodplain, the City will require the applicant submit CLOMR and LOMR applications to FEMA. As the local floodplain administrator, the City must review and acknowledge certain CLOMR and LOMR requests.
- 3) The applicant shall bear the cost of engineering services required to develop the application, respond to review comments, and obtain final approval of CLOMRs and LOMRs. The applicant shall bear the cost of any fees associated with review and disposition of LOMCs and CLOMCs that are established by FEMA.
- 4) Where a CLOMR is required, the applicant must provide evidence of CLOMR approval from FEMA prior to issuance of a City Floodplain permit.

D. Floodplain Easements

Floodplain easements shall be defined by the 100-year floodplain or the 100-year floodplain depicted on the FEMA Flood Insurance Rate Map (FIRM), whichever is greater.

Section 4 VEGETATION

4.1 General

All seeding, sodding and fertilizer requirements are to be completed in accordance with the Capital Area Council of Governments (CAPCOG) Standards and Specifications and as modified by the City of Johnson City, herein.

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

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

4.1 Coverage

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

4.2 Planting Season for Seeding

- A. February 1 through May 15 (Permanent Rural Seed Mix) Green Spangle top – 0.3 LB. PLS/Ac.
Bermuda Grass – 1.2 LB. PLS/Ac. Side oats Grama (El Reno) 2.7 LB. PLS/Ac. Little Bluestem (Native) 2.0 LB. PLS/Ac.
Buffalo Grass (Texoka) 1.6 LB. PLS/Ac. Illinois Bundleflower 1.0 LB. PLS/Ac.
- B. February 1 through May 15 (Permanent Urban Seed Mix) Green Spangle top – 0.3 LB. PLS/Ac.
Bermuda Grass – 2.4 LB. PLS/Ac. Side oats Grama (El Reno) 3.6 LB. PLS/Ac.
Buffalo Grass (Texoka) 1.6 LB. PLS/Ac.
- C. September 1 through November 30 (Temporary Cool Season Seeding) Tall Fescue – 4.5 LB./Ac.
Western Wheatgrass – 5.6 LB./Ac. Wheat 34 LB./Ac.
- D. May 1 through August 31 (Temporary Warm Season Seeding) Foxtail Millet – 34 LB./Ac.

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

No Seeding shall occur during the months of December and January. Bermuda grass sod shall be laid during the months of December and January. Developer shall be responsible for establishing a permanent stand of warm season turf.

Section 5 WATER SYSTEM

5.1 General

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

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

The minimum pipeline size to serve residential areas shall be eight (8) inches in diameter, and the minimum pipeline size serving commercial, business, industrial, etc. shall be twelve (12) inches. In general, all lines shall be looped with no dead-ends. Dead-end lines will be considered on a case-by-case basis and shall be furnished with an approved automatic flush valve arrangement. The developer shall provide facilities sufficient for fire flows in accordance with the minimum criteria of the State Board of Insurance or the Fire Code adopted by the City.

The standard water main sizes shall be used are noted in **Table 5.1**.

Table 5.1 – STANDARD WATER LINE SIZES

8 inch	12 inch	16 inch
20 inch	24 inch	30 inch
36 inch	42 inch	54 inch
60 inch	66 inch	72 inch

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

The following values shall be used when calculating the average daily water demands, unless project specific water demand and/or actual flow measurements are provided:

Table 5.2 – AVERAGE DAILY WATER DEMANDS

Land Use	Design	Calculation
Residential	<ul style="list-style-type: none"> 3.5 persons/unit 120 gallons per person per day 	420 gpd/unit
Apartment	<ul style="list-style-type: none"> 2.5 persons/unit 120 gallons per person per day 	300 gpd/unit
Hospital (Beds)	<ul style="list-style-type: none"> 720 gallons per day per bed 	720 gpd/bed
Nursing Home	<ul style="list-style-type: none"> 240 gallons per day per bed 	240 gpd/bed
Restaurant	<ul style="list-style-type: none"> 18 gallons per person per day 	18 gpd/person
Commercial	<ul style="list-style-type: none"> 1 person per parking space, or 1 person per 400 SF of building 	50 gpd/person
School	<ul style="list-style-type: none"> 30 gallons per student/day 	30 gpd/student
Parks	<ul style="list-style-type: none"> 6 gallons per person per day 	6 gpd/person
Mobile Home Park	<ul style="list-style-type: none"> 3 persons per trailer 110 gallons per person per day 	330 gpd/unit

5.2 Connections to Existing Distribution System

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

In a proposed development where City water is not adjacent to the property but is accessible, the developer shall provide, at his expense, an off-site water main of sufficient size to serve his development or as shown on the City's Water Master Plan, whichever is larger. The proposed development will normally require a loop into the existing water distribution system in order to provide adequate water pressure. The loop will be at the developer's expense.

In general, the City will not approve a development which cannot be served by extensions to the City distribution system. Some areas in the City may be served by private water companies. In those cases, the Developer shall contact and make proper arrangements with the private water company. The Developer shall always be responsible to construct water

facilities that meet City requirements and as shown on the City's Water Master Plan. The City will observe the facilities during construction for compliance with these standards. This in no way relieves or reduces the obligations of the developer to comply fully with these requirements. Under certain circumstances, the City may consider approval of a private water system, which will supply an adequate quantity of potable water for all uses, including residential, commercial and firefighting requirements. Such systems must meet the approval of the City, the TCEQ, the State Board of Insurance, and all other appropriate regulatory agencies. In addition, an agreement between the City and the developer shall be executed whereby the City may acquire the system when it can be connected into the City's owned and operated distribution network. In all cases, the engineering drawings shall show the source of water for the development.

5.3 Location of Facilities

- A. Pipelines: Water pipelines shall be located in the parkways between the back of the curb and the street right-of-way. See Standard Drawings for utility locations under pavement. Water lines installed adjacent to a development shall be installed the length of the frontage.
- B. Gate Valves: Gate valves shall be located outside the paved streets and shall be two feet (2') from back of curb of the intersecting street. In general, gate valves shall be located at street intersections (except for fire hydrant leads). Maximum spacing of valves on water lines is 1,000'. All valve boxes shall be encased in a concrete pad that shall be twenty-four inches by twenty-four inches by six inches (24" x 24" x 6") and reinforced with No. 3 steel bars.
- C. Fire Hydrants: In general, fire hydrants shall be located at each street intersection and at intervals on the interior of each block. All fire hydrants shall have isolation valves constructed as described above. No services lines or other connections will be allowed to the fire hydrant leads.
 - 1. Residential and Duplex: Residential and duplex areas shall have a fire hydrant at each street intersection and at five hundred-foot (500') intervals on the interior of each block. In no case, shall there be more than four hundred feet (400') of hose lay from a fire hydrant and fire lane to any main building.
 - 2. Multi-Family: Multi-Family areas shall have a fire hydrant at each street intersection and at three hundred-foot (300') intervals on the interior of each block and along fire lanes. In no case, shall there be more than one hundred and fifty feet (150') of hose lay from a fire lane or two hundred and fifty feet (250') from a fire hydrant to any portion of a building.
 - 3. Commercial, Retail and Industrial: Commercial, retail and industrial areas shall have a fire hydrant at each street intersection and at a maximum of three hundred-foot (300') intervals on the interior of each block and along fire lanes. In no case, shall there be more than one hundred and fifty feet (150') from a fire hydrant and fire lane to any portion of a building in any development.

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

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

The spacing of fire hydrants shall be measured along the street frontage or fire lanes. The City Fire Marshall and City's Engineer shall review all fire hydrant spacing. When a special

condition exists due to land use, the Fire Marshall or City's Engineer may require additional hydrants for fire protection.

5.4 Water Service Connections

A water service pipeline shall be laid to each lot with fittings and a meter box in accordance with the Standard Drawings. All service pipelines, which supply water to each single-family lot, shall be constructed of SDR-9 (Polytube) having a minimum size of one inch (1").

All water services under pavement shall be encased in a minimum 2" diameter SDR 21 PVC encasement pipe or approved equivalent, with no couplings being installed under the roadway. The ends of the encasement pipe shall be sealed with silicone.

All residential services shall be tapped to the PVC water main using double strap brass saddle. Tapping tees are required for all services larger than 4-inches.

Meter box tops shall be set one-half inch to one and one-half inch ($\frac{1}{2}$ " to $1\frac{1}{2}$ ") above the curb, and an angle meter stop shall be set six inches (6") below the meter box top. Meter boxes shall have a one-inch (1") wide slot from five inches (5") below the top of the box to the bottom of the box on the side facing the lot for service connection. All meter boxes shall be set at least six inches (6") behind the curb, with a "I" etched into the curb adjacent to the meter box.

- A. Installation of Meter Boxes: Installation of meter boxes with, with reader window within the lid, for single-family, multi-family, condominium, and townhouse developments may be installed only at approved locations. Each single-family and duplex residence shall have individual meters taps and boxes. Condominium, townhouse, or multi-family developments may use alternate installations, approved on a case-by-case basis.

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

Greater than 250 water connections shall require a coliform sampling station.

5.5 Materials and Installation

- A. Before construction of a new water line, contractor shall send a flush plan for review with sample point locations.
- B. Pipe: In general, the water pipelines shall be installed with a minimum of four feet (4') of cover from proposed final grade, unless otherwise approved by the City. The following table summarizes recommended pipe materials for water pipelines:

Table 5.3 – PIPE MATERIALS FOR WATER MAINS

Internal Diameter Pipe Size	Pipe Material
6-inch through 12-inch	PVC, AWWA C900, minimum DR 18
16 inch through 24-inch	PVC, AWWA C900, minimum DR 18 Bar Wrapped Concrete Steel Cylinder, AWWA C303, minimum Class 150
24 inch and larger	Bar Wrapped Concrete Steel Cylinder, AWWA C303, minimum Class 150

- C. All water mains under pavement shall be encased as follows:
1. 8-inch through 12-inch – encase in DR 25 PVC or approved equal
 2. 12-inch and larger – encase in steel pipe, size and thickness (1/4" min.) to be approved by the City's Engineer.
 3. Encasement pipe shall extend 3 feet outside of the pavement.
- D. All pipes not under pavement shall be installed in embedment material as shown on the Standard Drawings.
- E. All water pipe shall be installed with a "tracer tape" blue in color over the top of the pipe. Locator marker pads shall be installed at 250 feet along water lines.
- F. All Bar Wrapped Concrete Cylinder will require a Corrosion Protection System (CPS). The CPS must be designed by a NACE certified Professional Engineer with considerable experience in corrosion engineering.
1. A detailed corrosion survey shall be conducted along the alignment to identify potential corrosion problems and recommend a corrosion protection system.
 2. Based on the corrosion survey, a CPS shall be designed to include a Galvanic Protection System. The CPS shall be submitted for review and approval by the Director of Engineering. The final anode bed and test station locations need to be shown on the plans and record drawings.
 3. Dissimilar metals shall be isolated using insulating kits or other means to prevent galvanic corrosion.
- G. Gate Valves: All gate valves shall conform to AWWA C-509 standards with resilient seat only and shall conform to and shall be installed according to the Design Standards and Specifications Manual.
- H. Fire Hydrants: All fire hydrants shall be installed with a six-inch (6") gate valve on the hydrant lead and located 3-feet off the back of curb. Fire hydrants, or an approved flush valve arrangement, shall be installed at the end of each dead-end line. Minimum main size for a fire hydrant for residential and non-residential uses shall be eight inches (8").
- Fire hydrants shall be three-way breakaway type and conform to AWWA C-502 specifications.

Fire hydrants shall be painted with two coats of TNEMEC Series 530 Omnithane paint or approved equal, and two coats of primer. Bonnet to flange and nozzle caps

of fire hydrants shall painted with two coats of TNEMEC Safety Paint Series 2H "Hi- Build".

Fire hydrant color shall be dependent on the amount of flow. The contractor/developer shall pay for a flow test to be performed by approved flow testing company of City choice.

Hydrants are classified according to AWWA C503 Appendix B as follows:

Class AA: Hydrants that on an individual test usually have a flow capacity of 1,500 gpm or greater.

Class A: Hydrants that on an individual test usually have a flow capacity of 1,000 to 1,499 gpm.

Class B: Hydrants that on an individual test usually have a flow capacity of 500 to 999 gpm.

Class C: Hydrants that on an individual test usually have a flow capacity of less than 500 gpm.

Barrels are to be painted chrome. The tops and outlet-nozzle caps of hydrants are to be painted as follows: light blue for Class AA, green for Class A, orange for Class B, and red for Class C. These colors shall be as designated in Federal Standard 595C.

- I. Water Service Connections: Service pipelines shall be in accordance with the designs shown on the Standard Drawings. The materials shall be installed in accordance with the Standard Specifications for Construction. All connections shall be compression type or approved equal.
- J. Bends: Joint restraint shall be installed at horizontal change in directions 45° or greater and at all vertical change in directions that require a bend. The restraints shall be placed at the bend and at the next pipe joint in each direction from the bend.
- K. All irrigation meters shall have a testable double check backflow preventer.
- L. All iron fittings shall be covered and secured with plastic wrap prior to backfill being placed.

Section 6 WASTEWATER SYSTEM

6.1 General

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

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

The standard wastewater main sizes shall be used are noted in **Table 6.1**.

Table 6.1 – STANDARD WASTEWATER MAIN SIZES

8 inch	10 inch	12 inch
15 inch	18 inch	21 inch
24 inch	27 inch	30 inch
33 inch	36 inch	39 inch
42 inch	48 inch	54 inch
60 inch		

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

Table 6.2 shall be used to calculate the average daily wastewater flow, unless project specific wastewater demand and/or actual flow measurements are provided. The collection system shall be designed based on the peak flow calculations.

Table 6.2 – WASTEWATER DESIGN FLOW

Land Use	Design	Calculation
Residential	3.5 persons/unit 100 gallons per person per day	350 gpd/unit
Apartment	2.5 persons/unit 100 gallons per person per day	255 gpd/unit
Hospital (Beds)	200 gallons per day per bed	200 gpd/bed
Nursing Home	100 gallons per day per bed	100 gpd/bed
Restaurant	10 gallons per person per day	10 gpd/person
Commercial	1 person per parking space, or 1 person per 400 SF of building	20 gpd/person
School	20 gallons per student/day	20 gpd/student
Parks	5 gallons per person per day	5 gpd/person
Mobile Home Park	3 persons per trailer 60 gallons per person per day	180 gpd/unit

A peaking factor of 4.0 shall be used in design of wastewater mains.

Pipe capacity shall be calculated using Manning's equation. A roughness coefficient of 0.013 shall be used.

6.2 Connections to Existing Wastewater Collection System

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

In general, the City will not approve a development which cannot be served by extensions to the City's wastewater collection system. Lots with a minimum area of 1 acre may be

considered, on a case-by-case basis, for a septic system, and will require City Council approval. Lots with approved septic system shall be designed in the case that the City's wastewater collection system is extended to the lot, the septic system can be readily connected to the City's wastewater collection system.

6.3 Location of Facilities

- A. Wastewater Pipelines: Reference the Standard Drawings for location of wastewater pipelines under pavement. No wastewater services can be connected to wastewater mains at depths greater than seventeen feet (17'). If a service connection is required to a line that is greater than seventeen feet (17') deep a parallel main must be installed at a shallower depth, and the service must be connected to the shallower line. Wastewater mains installed adjacent to a development shall be extended the length of the development frontage.

All force mains shall have tracer wires with pits every 200 feet and at every bend. Off site sanitary sewer shall have tracer wire with locator pits being poured into the manhole pad.

- B. Wastewater Service Pipelines: Wastewater service pipelines shall be laid to each lot. The service pipelines shall be PVC pipe having a minimum diameter of four (4) inches and shall extend to the property corner. Wastewater service pipelines shall be located at the center of each lot and as approved on the final construction plans by the City. In general, a service pipeline shall serve one lot. Special wastewater service sizing will require City Wastewater Superintendent review and approval prior to construction. No sewer line shall be located nearer than five (5) feet from any tree or structure, nor any closer than ten (10) feet from any water service or main. Sewer services shall be encased under paved surfaces.

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

The service shall be stubbed out a minimum of ten (10) feet from the right-of-way line and at a depth no greater than five (5) feet. The stub-out shall be capped with a proper fitting and shall have a single sweep cleanout installed at the right-of-way line and which extends to at least two (2) feet above the finished lot grade. The cleanout stack shall be set to grade during construction of the structure to be served and before a certificate of occupancy will be issued. After the street paving is complete, the letters "II" shall be cut into the concrete curb to locate the service.

- C. Manholes: In general, manholes shall be located at all intersections of wastewater pipelines, changes in grade, changes in alignment and at distances not to exceed five hundred (500) feet. For sewer line flowlines connecting eighteen (18) inches or greater above invert, an internal drop manhole shall be constructed. Five (5) foot diameter manholes are required for internal drop manholes. Manholes shall be designed for loading conditions, and rims be flush with surface, when placed under pavement. Manhole rims located in a landscaped area shall be six (6) inches above grade. Manholes located in floodplains, or areas with increased risk of flooding, shall have bolt down lids. Manhole size shall be per Table 6.3. Construct manholes at both ends of lines that are installed by other than open cut and at each end of aerial crossing lines. When manholes are installed adjacent or within a roadway, the letters "MH" shall be etched into the curb line.

TABLE 6.3 – MINIMUM MANHOLE SIZES

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

- D. Manholes shall be installed at the ends of all lines.

6.4 Flows in Wastewaters and Their Appurtenances

- A. Minimum Grades: Wastewater lines should operate with velocities of flow sufficient to prevent excessive deposits of solid materials, otherwise objectionable clogging may result. The controlling velocity with regard to sediment deposition is near the bottom of the conduit and considerably less than the mean velocity flowing full of 2.5 feet per second (fps). TABLE 6.4 indicates the minimum grades for wastewater pipe with a Manning's "n" = 0.013 and flowing at 2.5 fps.
- B. Maximum Velocities: The slope of a wastewater should also be such that excessive velocities will not damage the pipeline. The maximum desirable velocities of wastewaters shall be based upon the pipe manufacturer recommendations not to exceed 10 feet per second (fps).

TABLE 6.4 – MINIMUM GRADES FOR WASTEWATER PIPELINES

Pipe Size (Inches)	Slope in Foot/Foot (n = 0.013)
8	0.0033
10	0.0025
12	0.0023
15	0.0023
18	0.0018
21	0.0015
24	0.0013
27	0.0011
30	0.0009

33	0.0008
36	0.0007
39	0.0006
42	0.0006
45	0.0005
48	0.0005
54	0.0004
60	0.0004
66	0.0004
72	0.0003
78	0.0003
84	0.0003
96	0.0002

6.5 Materials and Installation

- A. Pipe: Pipe used for wastewater collection systems shall have a minimum earth cover of four (4) feet. For depths of ten (10) feet or greater, the wastewater pipeline shall be a minimum SDR 26.

The following table summarizes recommended pipe materials for wastewater mains:

Table 6.5 – PIPE MATERIALS FOR WASTEWATER MAINS

Internal Diameter Pipe Size	Pipe Material
6-inch through 15-inch	<ul style="list-style-type: none"> PVC ASTM 3034 (SDR 35) For water and wastewater separation deficiencies – PVC ASTM 2241 (SDR 26) or Green PVC AWWA C900 (DR25)
18-inch and Larger	<ul style="list-style-type: none"> PVC ASTM F679 (SDR 35) For water and wastewater separation deficiencies – Green PVC AWWA C900 (DR25)

All pipes shall be installed in embedment material as shown on the Standard Drawings. All pipelines shall be tested.

- B. Curved Sewers: No vertical or horizontal curves will be allowed.

- C. Manholes: Manholes shall be of pre-cast concrete or cast in place and shall conform to Standard Drawings.

All manholes shall include concrete corrosion protection admixture per approved materials list.

6.6 Testing

All wastewater lines shall be tested for infiltration in accordance with the procedures set forth in the NCTCOG Standard Specifications for Construction. A television survey and air test shall be performed at the end of the construction period and will again be performed as part of the final testing in the twenty second (22) month of the maintenance period. The television survey shall include having water introduced into the wastewater line during the survey. Deficiencies noted shall be promptly corrected by the developer. All manholes will be hydrostatically or vacuum tested. The City's representative shall be present at all testing and copies of the testing reports shall be provided to the City upon completion. All expenses for this work shall be the developer's responsibility.

TV inspections on wastewater mains and lateral connections shall be performed prior to lime placement and after final walk-through. . All testing required for wastewater lines shall be completed prior to lime placement and after final walk-through.

6.7 Wastewater Lift Stations and Force Mains

- A. General: The design engineer shall prepare an engineering design report signed and sealed by a licensed Engineer in the State of Texas for approval prior to design plans being submitted for review.

Engineering design report shall include: vicinity map, design flow calculations (using c-value of 120), system curve calculations, pump and system curves, pump cycle time calculations, and hydraulic grade line.

A geotechnical engineering report shall be included with engineering design report with recommendations for lift station foundation, generator foundation, and valve vault designs. Recommendations shall be made to limit potential vertical movement to 1 inch.

Lift station design shall meet the minimum requirements of TCEQ Chapter 217 design criteria for domestic wastewater systems except where exceeded as follows:

- B. Pumps: Minimum of two submersible pumps sized to convey the Peak Flow unless otherwise specified. Each pump shall be equipped with a seal failure early warning system. One pump in lift station shall be equipped with a cutter pump. Type 304 stainless steel chains shall be attached to each pump and run full length to top of wet well. Chain shall be sized according to recommended manufacturer specifications.
- C. Power Supply: 3-Phase Electric Utility. Single Phase to 3-Phase converters are not allowed. Provide on-site emergency generator with automatic transfer switch large enough to power pumps necessary during peak flow. There shall be a man handle cutoff installed in the panel.
- D. Wet Well: Cast-in-place concrete or pre-cast concrete manhole with concrete corrosion protection admixture per approved materials list, suitable for this environment, or approved equal. Cast-in-place wet well design shall be signed and

sealed by a licensed engineer in the State of Texas. Joints and openings shall be sealed to prevent water Infiltration/exfiltration. Wet well shall be accessed through the tap using aluminum hatches with integral safety grate. All metallic appurtenances located inside the wet well (guide rails, brackets, fasteners, etc.) shall be stainless steel. The lead and lag pump "on" elevations shall be located below invert of the influent line.

There shall only be one influent line connecting to the wet well. All wastewater lines must combine to a single influent line upstream of the lift station wet well.

Guide rails and all hardware shall be Type 304 stainless steel. Mounting hardware shall include lock nuts or lock washers.

Float hanger, all hardware, bolts, nuts, etc. shall be stainless steel.

Wet well shall be vented with minimum four-inch (4") stainless steel pipe. Ell on end of vent shall be screened with stainless steel #8 mesh.

Contractor shall provide odor control for vent pipe capable of handling anticipated loads.

Control floats must be hung away from incoming flow.

Provide level indicating transducer in wet well and connect to City's SCADA system.

Air-Powered Mixer System shall be installed in wet well for grease control. All mounting equipment shall be stainless steel. Reference approved materials list for equipment manufacturer information.

- E. Lift Station Piping: Piping in the wet well shall be stainless steel with flanged connections. All bolts shall be 316 stainless steel. Pipe shall be rated to withstand external loadings and internal working pressure and shall meet or exceed minimum TCEQ requirements.
- F. Valve Vault: The valve vault shall be cast-in-place or pre-cast concrete. Cast-in-place valve vault design shall be signed and sealed by a licensed engineer in the State of Texas. Valve vault shall be accessed through the top using Flygt or Bilco aluminum hatches. Vault shall be designed to allow for all parts to be removed without interference with the concrete walls. Aluminum ladders with Bilco LadderUp safety post shall be provided. A floor drain with p-trap shall be provided in the floor of the valve vault to drain into the wet well. A flap valve shall be provided on the drain pipe where it enters the wet well. All piping in the valve vault shall be ductile iron. Valve vault piping shall include: flange coupling adapter with thrust harness, plug valve, air release/vacuum valve, and check valve.

Dry well shall be vented with minimum four-inch (4") stainless steel pipe. Ell on end of pipe shall be screened with stainless #8 mesh.

All hardware, bolts, nuts, etc. shall be stainless steel.
- G. Check Valves: Provide swing check valve in discharge piping valve vault.
- H. Plug Valves: Provide plug valve in discharge piping valve vault. Plug valves internal coating shall be Tnemec Series 431 Permashield PL applied at a thickness of 40 mils DFT or Protecto 401 applied at a thickness of 40 mils DFT.
- I. Couplings: Provide coupling in discharge piping valve vault. Coating shall be fusion bonded epoxy powder coating. Thrust harness and thrust rods shall be installed for all CQUplings.
- J. Air Release and Vacuum valves: Air release valves of a type suitable for wastewater service shall be installed along the force main where the force main would be prone to trapped air.

The engineer shall determine the valve type and location. The calculations for valve type and valve sizing shall be provided to the City.

Provide air release and vacuum valve in discharge piping valve vault.

All internal parts shall be a non-corroding material such as stainless steel. The valve body shall be constructed of stainless steel and equipped with intake and discharge flanges.

- K. Electromagnetic Meter: Provide electromagnetic meter in a manhole that is connected to the SCADA system. The sensor shall be rated for NEMA6_IP68 service and shall allow for permanent submergence up to 10 ft of head pressure. Engineer shall ensure adequate upstream and downstream pipe length to ensure accurate flow measurement. Install non-clog submersible sump pump with float switch in flow meter vault.
- L. Jib Crane: Provide a freestanding jib crane capable of lifting equipment out of the wet well and valve vault.
- M. Control Panel Electrical: Control panel shall be Type 304 stainless steel with hinged door and lockable latch installed minimum 13-foot (3") above ground. A Type 304 stainless steel sub-panel with hinged door and lockable latch shall be installed outside of wet well for motor lead connections. Subpanel to be minimum twelve-inch (12") tall by twelve-inch (12") wide by eight-inch (8") deep and shall be minimum twelve (12") inches above ground elevation. Both shall be watertight and Type 4X.

The control panel shall contain all the electrical components required for complete functionality of the lift station and SCADA system.

All breakers and motor starters shall be Square D brand, all relays shall be pin and socket, control power shall be 120 volts, phase and primary voltage to be determined. Provide shelter over control panel to protect from lightning and weather. Approved shelter manufacturer: Shelter shall be designed to withstand wind loads. Shelter shall be designed by licensed engineer in the state of Texas.

Integrate lift station control with City's SCADA System. Approved SCADA integrator shall be determined by the City of Johnson City.

- N. Automatic Controls:

LS 100 Transducer with Float Backup.

Weighted Floats: On, Off, Lag Pump On, High Water Alarm, Low Level Alarm.

- O. Conduit: Schedule 80 PVC electrical conduit shall be used for all wiring. Underground conduit shall be buried minimum 18".

Conduit shall be minimum three-inch (3") I.D.

All conduit ends shall be sealed to prevent gases from entering.

- P. Site: Fenced area shall be minimum 30' x 30', area shall be accessible from a street or access easement with concrete hammerhead driveway.

Fence shall be 8' solid masonry.

Gate shall be 8' high welded steel 16' sliding gate.

The area within the fence shall consist of minimum six-inch (6") compacted flex base with a two-inch (2") crushed stone topping. Stone shall be one-inch (1") nominal in size. Geotextile fabric shall be put down before any stone is put in place.

The access road shall be minimum fifteen feet (15') wide consisting of six-inch (6") reinforced concrete and shall have a concrete drive approach at street connection. Access to be constructed per City of Johnson City Standard Construction Drawings.

Culverts and or trench drains shall be installed as needed for drainage. Provide LED site lighting.

- Q. Site Selection and Requirements: Site Selection — The following are the minimum criteria that shall be met for a lift station site:

The station should be located as remotely as possible from populated areas. The lift station site shall not be located within 150 feet of an existing or proposed residential dwelling and 100 feet from a residential lot.

The station site and its access shall be dedicated to the City fee simple. The fencing setback shall be 20 feet from the easement line to allow for a landscape and drainage buffer.

The station site shall be located so it may serve as much of the entire sewer drainage basin as possible.

Provide a 1-inch potable freeze-proof water service with a 1-inch angle stop and double check valve shall be installed in an appropriately sized meter box.

Provide a fire hydrant at lift station site. Install bollards around fire hydrant.

Lift station piping shall be designed with an additional emergency bypass pump connection, allowing the station to be operated with the primary pump(s) out of service for an extended period.

The force main must be designed to abate any anticipated odor. Reliner by Duran Inc. drop bowl with force line hood shall be installed at force main discharge.

- R. Force Main Piping: Force main piping to be green in color. Pipe type shall be DR-14 AWWA 0-900 for pipe sizes up to 8".

Force main piping shall be fused HDPE or Ductile Iron Pipe with Protecto 401 lining for force main sizes over 8" with minimum 200 psi pressure rating. Owner shall approve pressure rating of proposed piping prior to installation.

Force main line shall have a tracer wire with a locator pit every 200 feet.

Force main shall be hydrostatically tested to 150 psi for a minimum of four (4) hours to ensure there is less than 1 psi of pressure loss.

Force main pipe shall be designed to meet the working pressure requirements of the particular application. Design calculations and pipe selection shall be submitted to the City for approval prior to installation.

- S. Odor Control: Contractor shall provide odor control capable of handling anticipated loads.

- T. Acceptance Testing: Both pumps shall be pulled and reinstalled to check for proper alignment of guide rails and access cover

Both pumps shall be run to check for proper rotation and operation and to make sure both are properly seated after reinstallation.

All electrical components shall be tested for proper operation.

Pump supplier shall issue a Certificate of Operation verifying all components have been tested and passed along with performance curves. Two (2) copies of O&M manuals shall be submitted to the City of Johnson City.

Provide a minimum two (2) year warranty of all equipment.

Section 7 MISCELLANEOUS REQUIREMENTS

7.1 Grading

All grading shall be completed before the start of utility and paving operations. A sheep-foot roller shall be utilized for compaction of all fill material. There shall be no material larger than six (6) inches used in the trench.

7.2 Grading Permit

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

7.3 Private Utility Construction

A. Trench Backfill — City Right-of-Way

1. No concrete streets shall be open cut by utility companies without City approval, by permit. Utilities crossing concrete streets shall be tunneled or bored. Tunneling or boring methods shall be approved by the City prior to installation.
2. Asphalt streets may be open cut, by permit. Backfill above utilities shall be concrete stabilized sand or cement. The asphalt pavement shall be repaired per City detail.
3. All trench backfill is to be mechanically compacted to 95% Standard Proctor Density within City rights-of-way. The compaction may be obtained by mechanical tamping, rolling, etc. No water jetting is allowed. In the parkway, the backfill material may be from the excavated trench, except no rocks larger than six inches (6") shall be used. Material from rock or shale excavation shall not be used. The contractor for the utility company or the utility company shall furnish density reports from a materials testing company verifying the densities. Densities shall be taken at each twelve-inch (12") lift at a maximum spacing of 300 feet.

B. Parkway Cleanup:

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

CITY OF ANNA
FILL MATERIAL REQUEST FORM

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

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

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

Areas or Locations of Fill Material Placement:

Signature of Property Owner(s):

Phone: _____

Name of Project Where Material Originated:

Name of Contact/Representative:

Phone: _____

Signature of Project Contractor/Representative:

Signature of City of Anna Representative:

City Engineer Comments:

(SEE BACK FOR INSTRUCTIONS)

EXHIBIT 7.1

INSTRUCTIONS FOR
CITY OF ANNA FILL REQUEST

I. Permanent Placement

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

2. Temporary Stockpiling

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

3. Signatures

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

4. Miscellaneous

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

CATMIS102 Fill Request
CAT/em

EXHIBIT 7.1 Cont'd.

7.4 Additional Permits or Approvals

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

7.5 Retaining Walls

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

Section 8. A STANDARD SPECIFICATIONS (see Section 8.B. for modifications to these specifications).

MATERIALS AND CONSTRUCTION METHODS

STANDARDS:

All work shall be performed in accordance with the Standard Specifications for Public Works Construction - North Central Texas, 5th Edition, dated 2017, except where noted otherwise in the City of Johnson City's supplemental "Special Provisions", the Special Conditions, and the Special Specifications included herein.

Section 8. B MODIFICATIONS TO STANDARD SPECIFICATIONS

CITY OF JOHNSON CITY, TEXAS

**SPECIAL PROVISIONS TO THE NORTH CENTRAL TEXAS STANDARD SPECIFICATIONS
FOR PUBLIC WORKS CONSTRUCTION**

MATERIALS AND CONSTRUCTION METHODS

The North Central Texas Standard Specifications, 5th Edition dated November 2017, as referenced or set forth in Section 8.A. shall be modified and clarified by the addition of the following requirements to the various items. Except when specifically stated, none of the requirements shall be deleted.

DIVISION 200 – SITE PROTECTION AND PREPARATION

ITEM 204.7 MULCHING

Slope and drainage channel seeding shall be in conformance with Item 204.7. Hydromulch Seeding mixture and rate shall be as required under Item 204.6.

ITEM 204.2 TOPSOIL

204.2.3. Construction Methods

Add the following: A minimum of four (4) inches of topsoil shall be provided on all major thoroughfare medians and rights-of-way and on all earthen channel slopes. This will be material imported from off site. The City will approve material prior to placement.

ITEM 204.6 SEEDING TURF-GRASS

Delete the mixture, rate, and planting dates and substitute:

- Type I: Unhulled Perennial Bermuda: Reserve and Spangle Top Grass Seeds (September – March)
- Type II: Perennial Bermuda Grass – Unhulled: (April – August)

A mix of seed shall be used in overlapping seasons.

204.6.4 Construction Methods

Add as follows: All seeding operations shall be performed by either “Drilling” or “Cultipacker” process or approved equivalent. Seed shall be covered by + ¼” Topsoil.

204.6.4.1 General

Add the following: The Contractor shall maintain the seeded areas including watering until a “Stand of Grass” is obtained. A “Stand of Grass” shall consist of **80%** coverage, a minimum of one (1) inch in height. Re-seeding will be required in washed areas.

ITEM 203.1 GENERAL SITE PREPARATION

203.1.2 Construction Methods

Add the following: Unless otherwise approved in writing by the City of Johnson City, where excavation to grade established in the field by the Owner terminates in loose or solid rock, the Contractor shall excavate 6-inches below the required subgrade elevations for the entire roadbed width and shall backfill with suitable selected materials as indicated on the plans. Suitable selected material shall include lime treated subgrade or a base material having a plasticity, index not greater than 12. Payment for such work will be made under the items of unclassified street excavation, lime treated subgrade and hydrated lime. The 6-inch lime treated subgrade or base shall be compacted to 95% density.

ITEM 203.5 EMBANKMENT

203.5.2 Construction Methods

Add the following paragraph: Excavated material from the channel which is used as embankment to complete the established alignment, grade and cross-section of the channel shall be compacted to 95% density.

203.5.3 Density

Add: Embankment in the City of Johnson City shall be compacted to not less than 95% of the maximum density.

DIVISION 300 – ROADWAY CONSTRUCTION

ITEM 301 SUBGRADE, SUB-BASE & BASE PREPARATION

301.1 General

Construction Methods:

Add the following: Prior to final compaction of subgrade, samples of the subgrade material shall be collected by a testing laboratory approved by the City, and laboratory tests made to determine the amount of lime required.

The application rate for hydrated lime shall be selected to obtain at least the optimum lime percentage indicated by test method ASTM C977-83a, Appendix XI; however, not less than 27 lbs. per S.Y. shall be applied. A Geotechnical Engineer's report reflecting the recommended application rate and including supporting test data shall be submitted in writing to the City, for approval prior to beginning any lime treatment. Laboratory test may be waived provided a minimum of 36 lbs. per S.Y. is applied.

ITEM 301.2 LIME TREATMENT

Add the following: The lime treated subgrade shall be moist cured until covered by other base or pavement up to fourteen (14) days after final compaction. After 14 days without covering an application of 0.10 to 0.20 gallons per square yard emulsified asphalt shall be applied at the Contractor's expense. Reapplication of emulsified asphalt may be required if lime treated subgrade is not covered shortly after first application. Lime treated subgrade may be covered by other base or Pavement when density of 95% of maximum at optimum moisture content is obtained.

301.2.1.2 Quicklime (dry) shall not be used in the construction of roadway work in the City.

ITEM 301.3 PORTLAND CEMENT TREATMENT

Add the following: Portland cement modification of subgrade soils is not permitted unless approved by the City of Johnson City Public Works director. Subgrade soils means natural ground or embankment encountered in the construction.

ITEM 301.5 FLEXIBLE SUB-BASE OR BASE (CRUSHED STONE / CONCRETE)

General:

Add the sentence: No local limestone material shall be used as flexible base (crushed limestone) on Johnson City paving projects, unless otherwise shown on the plans.

ITEM 302 ASPHALT PAVEMENT

ITEM 302.2 AGGREGATES FOR HOT-MIX ASPHALT PAVEMENT

Central Mixing Plant

Add the following: When a fly ash admixture is used with Type I cement in the production of Portland cement concrete, separate silos shall be provided for fly ash and cement and provisions shall be made for individual measurements.

Finishing

Add the following: The finished concrete pavement construction under these specifications is expected to meet certain quality standards for surface of the concrete including the durability, texture, riding surface and appearance. The surface must be durable, firm, dense and well bonded to the aggregate to maintain an appearance and texture which is satisfactory to the Owner. Concrete pavement having a poor surface which has spalled (exposed aggregate) due to poor quality paste, high water-cement ratio, over-vibration, improper curing, extreme weather or any other reason, or does not have a satisfactory riding surface shall be removed and replaced at the Contractor's expense. It is extremely important that the Pavement have a good rideable surface, free from undulations and rough joints. The City Engineer shall determine the acceptability of the Pavement.

- Machine Finishing

Machine finishing of pavement shall include the use of power-driven spreaders, reciprocating type power-driven vibrators, power-driven transverse strike-off, and screed.

The concrete pavement shall be consolidated by a reciprocating type mechanical vibrator. As soon as the concrete has been spread between the forms, the mechanical vibrator shall be operated to consolidate the concrete and remove all voids. Hand manipulated vibrators shall be used for areas not covered by the mechanical vibratory unit.

The transverse finishing machine shall first be operated to compact and finish the pavement to the required section and grade, without surface voids. The machine shall be operated over each area as many times and at such intervals as directed. At least two trips will be required and the last trip over a given area shall be a continuous run of not less than 40 feet. After completion of finishing with the transverse finishing machine a transverse drag float may be used.

After the floating has been completed and the excess water removed, but while the concrete is still plastic, the surface of the concrete shall be tested for trueness with an approved 10-foot steel straightedge furnished by the Contractor. The straightedge shall be operated from the side of the pavement, placed parallel to the pavement centerline and passed across the slab to reveal any high spots or depressions. The straightedge shall be advanced along the pavement in successive stages of not more than one-half its length. Practically perfect contact of the straightedge with surface will be required, and the pavement shall be leveled to this condition, in order to insure conformity with the surface test required below after the pavement has fully hardened and to insure a smooth rideable surface. Any correction of the surface required shall be accomplished by adding concrete if required and by operating the longitudinal float over the area. The surface test with the straightedge shall then be repeated.

After completion of the straightedge testing and surface correction the surface of the pavement shall be finished by an approved method. Methods available for pavement surface finish including a burlap drag finish, a broom finish or a belt finish. Unless otherwise shown on the plans, the pavement surface shall be finished with the burlap drag.

a. Burlap Drag Finish

If the surface texture is to be a drag finish, a drag shall be used; it shall consist of a seamless strip of damp burlap or cotton fabric, and it shall produce a uniform surface of gritty texture after dragging it longitudinally along the full width of pavement. For pavement 16 feet or more in width, the drag shall be mounted on a bridge which travels on the forms. The diameter of the drag shall be such that a strip of burlap or fabric at least 3 feet wide is in contact with the full width of pavement surface while the drag is used. The drag shall consist of not less than two layers of burlap with the bottom layer approximately 6 inches wider than the upper layer. The drag shall be maintained in such a condition that the resultant surface is of uniform appearance and reasonably free from gravels over 1/16-inch in depth. Drags shall be maintained clean and free from encrusted mortar. Drags that cannot be cleaned shall be discarded and new drags substituted.

b. Broom Finish

If the surface texture is to be broom finished, it shall be applied when the water sheen has practically disappeared. The broom shall be drawn from the center to the edge of the pavement with adjacent strokes slightly overlapping. The

broom operation shall be so executed that the corrugation produced in the surface shall be uniform in appearance and not more than 1/16-inch in depth. Brooming shall be completed before the concrete is in such condition that the surface will be torn or unduly roughened by the operation. The surface thus finished shall be free from rough and porous areas, irregularities, and depressions resulting from improper handling of the broom. Brooms shall be of the quality, size, and construction and shall be operated to produce a surface finish meeting the approval of the Owner. Subject to the approval of the Owner, the Contractor may be permitted to substitute mechanical brooming in lieu of the manual brooming as herein described.

c. Belt Finish

If the surface texture is to be belt finish, when straightedging is completed and after sheen has practically disappeared and just before the concrete becomes non-plastic, the surface shall be belted with a 2-ply canvas belt not less than 8 inches wide and at least 3 feet longer than the pavement width. Hand belts shall have suitable handles to permit controlled, uniform manipulation. The belt shall be operated with short strokes transverse to the centerline and with a rapid advance parallel to the centerline.

- Hand Finishing

Hand finishing of concrete pavement will be permitted in areas where it is not practical or possible to construct with finishing machines. These areas include, but are not limited to, intersections, left turn, lanes, crossovers, transition areas and where the pavement width is not uniform. In all hand finished areas, one-half (½) extra sack of cement per cubic yard of concrete shall be used in the mix. In hand finished areas, the concrete shall be struck off with an approved strike-off screed to such elevation that when consolidated and finished the surface of the pavement shall conform to the required section and grade. The strike template shall be moved forward with a combined transverse and longitudinal motion in the direction the work is progressing, maintaining a slight excess of material in front of the cutting edge. The concrete shall then be tamped with an approved tamping template to compact the concrete thoroughly and eliminate surface voids and the surface screeded to required section. After completion of a strike-off, consolidation and transverse screeding, a hand-operated longitudinal float shall be operated to test and level the surface to the required grade.

Workmen shall operate the float from approved bridges riding on the forms and spanning the pavement. The longitudinal float shall be held in contact with the surface and parallel to the centerline and operated with short longitudinal strokes while being passed from one side of the pavement to the other. If contact with the pavement is not made at all points, additional concrete shall be placed, if required, and screeded, and the float shall be used to produce a satisfactory

surface. Care shall be exercised to keep the ends of the float from digging into the surface of the pavement. After a section has been smoothed so that the float maintains contact with the surface at all points in being passed from one side to the other, the bridges may be moved forward half the length of the float and the operation repeated. Other operations and surfaces tests shall be as required for machine finishing.

- Edging at Forms and Joints

After the final finish, but before the concrete has taken its initial set, the edges of the pavement along each side of each slab, and on each side of transverse expansion joints, formed joints, transverse construction joints, and emergency construction joints shall be worked with an approved tool and rounded to the radius required by the plans. A well-defined and continuous radius shall be produced, and a smooth, dense mortar finish obtained. The surface of the slab shall not be unduly disturbed by tilting of the tool during use.

At all joints, any tool marks appearing on the slab adjacent to the joints shall be eliminated by brooming the surface. In doing this, the rounding of the edge shall not be disturbed. All concrete on top of the joint filler shall be completely removed.

All joint shall be tested with a straightedge before the concrete has set, and correction shall be made if one side of the joint is higher than the other or if they are higher or lower than the adjacent slabs.

ITEM 303 PORTLAND CEMENT CONCRETE PAVEMENT

ITEM 303.8 PAVEMENT TESTING AND EVALUATION

303.8.2 Pavement Thickness Test

Delete in its entirety and substitute therefore the following:

Upon completion of the work and before final acceptance and final payment shall be made, pavement thickness tests shall be made by the Contractor. Tests shall be made at 400-foot spacings along the length of the pavement. In the event a deficiency in the thickness of pavement is revealed, two (2) subsequent sets necessary to isolate the deficiency shall be made - one at a jointed section prior to the deficient station and one at a jointed section following the deficient station. Additional tests shall be obtained as necessary, at jointed section intervals to isolate the deficient area. Removal and replacement of concrete shall extend to joint boundaries, the full width of pavement section. If the average thickness of pavement in a particular section is less than called for on the plans, the pavement section shall be removed and replaced with the correct thickness, extending to joint boundaries, the full width of the pavement section, at the Contractor's entire expense. No additional payment over the contract unit price shall be made for any pavement of a thickness exceeding that required on the plans.

303.8.3 Pavement Strength Test

Revise the first paragraph to read: During the progress of the work, the Inspector or a commercial laboratory shall cast test cylinders or beams to maintain a check on the strengths of the concrete being placed.

Add to the 5th paragraph: Test cores shall be obtained within five (5) working days after the 28-day test results have been provided by the commercial laboratory. All test cores shall be obtained by a commercial laboratory, at the Contractors expense. One (1) core shall be obtained in the immediate area of the deficiency and two (2) additional cores shall be obtained - one at a jointed section prior to the deficient station and one at a jointed section following the deficient station. Additional cores shall be obtained as necessary, at jointed section intervals to isolate the deficient area. Removal and replacement of concrete shall extend to joint boundaries, the full width of pavement section.

Amend the 2nd paragraph on Page 303-25 to read "Pavement not meeting the minimum specified 28-day strength after cores have been tested shall be removed and replaced at the Contractor's expense."

ITEM 305 MISCELLANEOUS ROADWAY CONSTRUCTION

ITEM 305.1 CONCRETE CURB AND GUTTER

305.1.3.2 Reinforcing Steel

All bars at splices shall be lapped a minimum of 30 diameters of the bar or 12-inches, whichever is greater.

ITEM 305.2 CONCRETE SIDEWALKS, DRIVEWAY APPROACHES, & BARRIER FREE RAMPS

305.2.2.2 Reinforcement

Revise the first sentence to read: Driveway approaches and walk reinforcing shall be No. 3 bars on 18-inch centers.

305.2.3 Construction Methods

General:

Add to end of first paragraph: The drive approach shall have a minimum thickness equal to the thickness of the adjacent street or 6 inches, whichever is greater.

305.2.3.7 Joints

Revise second sentence to read: Expansion joints shall be placed in the sidewalk at 40-foot intervals or as otherwise specified by the Owner.

DIVISION 500 – UNDERGROUND CONSTRUCTION & APPURTENANCES

ITEM 501 UNDERGROUND CONDUIT MATERIALS

ITEM 501.4 CONCRETE PRESSURE PIPE AND FITTINGS

C302 Reinforced Concrete Pressure Pipe, Non Cylinder Type, for Water and Other Liquids, and C300 Reinforced Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids are not approved for use in the City, unless otherwise shown in the plans or approved in writing. Reinforced concrete cylinder pipe in sizes 16 inches through 21 inches shall be Pretensioned Pipe Type C303. For pipe 42 inches in diameter and above the pipe shall be Prestressed Pipe Type C301. Between 24 inches and 36 inches the pipe furnished may be either type. All pipe shall be designed to withstand the working pressure and external load as shown in the plans.

ITEM 501.5 REINFORCED CONCRETE WASTEWATER PIPE WITH RUBBER GASKET JOINTS

ASTM Designation C76 and shall be of the Thick Wall Pipe design with aggregates consisting of limestone aggregate in the proportion of at least 75 percent by weight of the total aggregates, unless otherwise provided in the Special Conditions to the Specifications.

ITEM 501.7 DUCTILE-IRON PRESSURE PIPE AND FITTINGS

Add the Following: Minimum design thickness for all Ductile-Iron Pipe installed shall be Class 50 on sizes 12 inches and smaller, and Class 51 on sizes 14 inches and larger.

ITEM 501.9 STEEL PIPE AND FITTINGS

501.9.2 Applicable Standard Specifications

Add the following: Contractor shall, submit a written certification that the pipe has been manufactured and tested in accordance with the applicable standards.

The pipe shall be manufactured, fabricated, coated and lined by a single manufacture being a certified member in good standing of the Steel Plate Fabricators Association (SPFA).

501.9.3 Pipe and Fitting Requirements

Substitute the following for the sentence following (2) Wall Thickness: All steel pipe to be furnished for this project shall be designed in accordance with AWWA MI 1 for the most critical application of internal pressures and external loads. The following design conditions shall apply:

Internal Pressure (Design to account for working and surge together)

1. Working Pressure of 200 psi
2. Surge allowance of 250 psi

External Loading for Buried Pipe

1. External loads shall be comprised of the weight of the backfill together with live and' impact loads. Earth loads shall be calculated based on ditch and positive projecting conduit. The earth load for the pipe design shall be the greater of the above two conditions.
2. External live loads shall be at least equivalent to AASHTO HS-20 loading.
3. Modulus of soil reaction (E') < 1000 psi
4. Unit weight of fill (w) > 120 pcf
5. Deflection lag factor (DI) (1.0)
6. Bedding constant (K) = 0.100
7. $hw = h$ = depth of cover above top of pipe
8. Maximum deflection in percent of pipe diameter 'shall be ad determined by AWWA MI 1, latest edition, as calculated using moment of inertia of steel cross section of pipe wall. Moment of inertia of cement mortar shall not be included in calculation of maximum deflection.

Available Deflections

Mortar-lined and coated = 2 percent of pipe diameter

Maximum Working Stress

The maximum combined stress based on working pressure shall be no greater than 50 percent of the minimum yield strength or 18,000 psi, whichever is less.

The maximum combined stress based on test pressure shall be no greater than 75 percent of the minimum yield strength or 24,000 psi, whichever is less.

501.9.4 Joints:

Add the following: In general, pipe joints shall be as follows, as indicated on the Drawings or as specified.

- A. Flanged joints shall be provided as a minimum at all flanged valves, meters and other equipment.

1. Flanges: Unless otherwise noted, flanges shall conform to the requirements of AWWA C207, Table D, E or F as required.
 2. Flange Bolts and Nuts: Shall be furnished in size and numbers stipulated in AWWA C207. Unless otherwise indicated, bolts shall be carbon steel to meet the requirements of ASTM Designation A307, Grade B for regular joints.
- B. Restrained Lap-Welded slip joints (expanded bell) with a single fillet weld.
- C. Carnegie-Shape Rubber Gasket Joint: Bell and spigot rubber gasket joint will be furnished with the bell end of the pipe mechanically expanded to the required internal diameter and the spigot end furnished as a sized Carnegie shape welded to the opposite end of the pipe. The expanded bell and Carnegie spigot shall be designed such that when the pipe is laid and jointed, it will be self-centered, and the O-ring rubber gasket will be enclosed tightly on all four sides and confined under compression adequate to ensure watertightness.

Gaskets to be full-face for use with flat face flanges and ring type for use with raised face flanges. Gasket material for water service pipe shall be cloth inserted rubber sheet, 1/8-inch thick or red rubber, ASTM D1330, Grade 1. Gasket material for air piping shall be as above, but of EPDM.

- D. Mechanical Couplings: Mechanical couplings designed to provide a stress relieving flexible joint shall consist of a cylindrical sleeve, two gaskets, two follower rings and a set of bolts and nuts.
1. Sleeves: Manufactured of ASTM A53 steel, for sizes 10-inches and smaller. ASTM A36 steel for sizes 12-inches and larger. Minimum sleeve length shall be five inches for pipe 12-inches and smaller, 7-inches for pipe 14-inches through 24-inches, and 10-inches for pipe larger than 24-inches.
 2. Follower Rings: Ductile Iron ASTM A536 or AISI C1020 Steel.
 3. Bolts and Nuts: High strength low alloy steel with heavy semi-finished hexagon nuts.
 4. Gaskets: Shall be of synthetic rubber suitable for operating conditions.
 5. Shop Finish: Manufacturer's standard unless otherwise noted.

6. Manufacturer: 'Baker 200, Dresser Style 39, Rockwell Series 411 or approved equal.

ITEM 502.3 FIRE HYDRANTS

502.3.1 Materials

All fire hydrants furnished shall conform strictly with the latest specification C-502 of the American Water Works Association Standards for dry barrel fire hydrants and must comply with the following supplementary details and changes or addition. All fire hydrants shall include integral quick connect per approved materials list.

- A. Inlet Connection: Unless otherwise specified, the inlet connection shall be a six (6) inch standard mechanical joint complete with all joint accessories. The inlet shoe shall be cast of the same or stronger metal than the lower barrel to prevent impact damage of the shoe. The interior of the shoe, including the lower valve plate and/or cap nut shall have a protective epoxy coating of at least 4 mils applied in the shop. If a cap nut is utilized, it must be locked in place with a stainless-steel lock washer or similar non-corrosive device and all machined surfaces must be protected from water intrusion to prevent corrosion and assure ease of field teardown or maintenance.
- B. Main Valve: The main valve shall be reversible compression type, closing with the pressure and shall be not less than 5-1/4" in diameter. Composition of the main valve shall be molded rubber or neoprene having a durometer hardness of 90 + 5 and shall be not less than 1" thick to protect against hydrant chatter and give long term durability.
- C. Outlet Nozzles: All hydrants shall be "three way", equipped with two hose nozzles and one pumper nozzle.
- D. Diameter Outlet Nozzles: The hydrant shall have two hose nozzles, two and one-half (2-1/2") inches nominal I.D., and one pumper nozzle four and one-half (4-1/2") inches nominal I.D. with Natural Standard Hose Threads.
- E. Nozzle Attachment: All nozzles shall be mechanically connected into the barrel and have "O" Ring pressure seals to provide a positive seal between nozzles and hydrant barrel. A suitable nozzle lock shall be provided and shall be stainless steel or bronze. Nozzles shall not be caulked in.

Nozzle caps shall be furnished with pentagon nut the same size as the operating nut. They shall be furnished with interior rubber gaskets that will seat against bronze nozzles. All caps shall be secured to hydrant barrel by heavy duty non-kinking chains with a chain loop on each cap that permits free turning of the cap, for speed and ease of removal by fire fighters.

- F. Operating Nut: The operating nut shall be non-rising, pentagonal shape, measuring 1-1/8" at the top and 1-1/4" at the base from point to flat. Pentagon shall have a depth of at least one and one-quarter inch (1-1/4"). The hydrant shall be constructed in such a manner that the operating nut, "O" Rings and washers can be removed and replaced without removing the bonnet. All bearing surfaces of the operating nut shall be bronze.
- G. Holddown Nut: Holddown nut must have integral weather seal. Resilient seal between holddown nut and operating nut shall prevent debris entry to protect operating nut from damage.
- H. Lubrication Reservoir: The hydrant shall have a completely "O" Ring sealed oil reservoir with a minimum of two (2) "O" Ring pressure seals to prevent contamination of the oil around the operating parts of the hydrant. The oil reservoir shall be cast in such a manner that all operating parts shall be repairable without removal of the bonnet to facilitate repairs and shall be of a design that all bearing surfaces and threaded parts will be automatically lubricated upon each operation of the hydrant. If bearing surfaces are not lubricated, the design shall keep operating friction to a minimum. A high wear resistant thermoset plastic anti-friction washer shall be in place above the thrust collar to minimize operation torque and facilitate long term ease of operation~ The operating threads must be sealed against contact with water to all times regardless of open or closed position of main valve. The hydrant shall have the capability of field personnel to visually check oil level and add additional oil if needed. Filler and inspection plug shall be recessed or flush type.
- I. Traffic Feature: Hydrants shall be "traffic model" having upper and lower barrel joined approximately two inches (2") above the groundline by a breakable "swivel" flange providing 360-degree rotation of the upper barrel for nozzle positioning and must be capable of rotating barrel with line pressure on. The groundline shall not be less than eighteen inches (18") below the centerline of the lowest nozzle and shall be clearly marked in a permanent manner on the lower barrel. A breakable stainless-steel stem coupling shall join the two-piece stem adjacent to the ground line flange. Screws, clevis pins, fasteners or bolts used in the coupling shall be Series 300 stainless steel. The weakened portion of the stem coupling shall be located to divert pressure from the stem coupling directly to the upper and lower stems when torque is applied in seat ring removal.

Design of the coupling shall be such that when the coupling is broken, no part of the coupling will shatter or come loose and fall into hydrant and the break will not occur through the pins or bolts holding the coupling to the stem.

- J. Drain Valve Assembly: Hydrants shall be equipped with two drain valves which drain the barrel when the hydrant is closed, and seal shut when the hydrant is in the open position. The upper valve plate, seat ring and drain ring (shoe bushing) must be bronze and work in conjunction to form an all bronze drainway. Upper valve plate if not bronze, must be epoxy coated.

The bronze seat ring shall be a minimum 5-1/4" inside diameter and shall thread into a bronze drain ring forming an all bronze drainway with two (2) drain outlets for double protection against drain clogging and corrosive damage. All bronze components shall have less than 16% zinc alloy, Grade A to give high corrosion resistance as recommended in Section 2.1, Table I of American Water Works Association Standard C-502. Seat ring seals shall be "O" Rings. Hydrant shall be designed so that during opening and closing operation(s), water pressure force flushes the drain valve and drain openings to prevent clogging, thus allowing barrel drainage:

- K. Repair: All internal operating parts shall be removable from above ground level with a lightweight stem wrench.
- L. Provisions for Extension: All hydrants shall be capable of being extended to accommodate future grade changes without excavation. Extension of the hydrant shall be made by adding at the groundline flange a new coupling and stem section equal to the length of the extension. This must facilitate easy field grade adjustment.

Stem extensions made by adding new section of stem to the threaded section of the stem at the top of the hydrant will not be accepted.

Extension kits must be available from manufacturer in six-inch (6") increments.

- M. Pressure Loss and Working Pressure: Pressure loss through one (1) four and one-half inch (4-1/2") nozzle at 1000 GPM shall not be more than 5.0 psi.

ITEM 502.6 VALVES

502.6.2 Resilient-Seated Gate Valves for Ordinary Water Works Service

Unless otherwise approved in writing, all Gate Valves for direct buried service in the City's distribution system, 6 inches through 12 inches in diameter, shall be Resilient Seated Gate Valves that conform strictly with the latest specification C-509 of the American Water Works Association Standards and must comply with the following supplementary details, changes or additions.

- A. Body: Gate valves shall be iron body designed for a working pressure of 250 psi. All valves shall be hydrostatically tested

at 200 psi and shell tested at 500 psi. Any leakage during testing shall be cause for rejection. For ease of repair the body, bonnet and stuffing box shall be flanged together with ASTM Grade B bolts and nuts. Each valve shall have the maker's initials, pressure rating, and year in which manufactured cast in the body.

- B. Stems: Stems shall be machined from manganese bronze rod with an integral forged thrust collar machined to size. The stems shall be non- rising and equipped for nut operation, which shall be opened by turning to the left.
- C. Stem Seals: The seals shall consist of two "O" rings above and one "O" ring below the thrust collar. An anti-friction washer shall be located above and below the thrust collar for operating torque.
- D. Stem Nut: The stem nut shall be ASTM'B-62 bronze.
- E. Resilient Wedge: The wedge shall be cast iron, fully encapsulated in molded rubber complying with ASTM D2000. Wedge must have molded wedge guides preventing the disc from tilting downstream during operation. Protective guide cap bearings made of polymer bearing material to provide a bearing interface between the wedge guide and valve interior.
- F. Paint and Protective Coatings: All valves furnished under these specifications shall be painted on the exterior as specified in AWWA C509 with asphalt varnish. All ferrous metal surfaces in the internal part of the valve shall be protected with a fusion epoxy coating 'to a nominal thickness of 10 mils for corrosion protection and shall be of a color that is easily identified as an epoxy coating. The proguard fusion epoxy coating shall fully comply with AWWA C550 .and certified NSF 61. The coating shall be 'non-toxic and shall not impart taste to water. The coating must be formulated from materials deemed acceptable per the Food & Drug Administration Document Title 21 of the Federal Regulations of Food Additives, Section 121.2514 entitled Resins and Polymeric Coatings. The coating shall 'have a satin finish and shall be suitable for field overcoating and touchup with the same coating' material without sanding or special surface preparation, or application of heat in excess of room temperature.
- G. Experience and Certification: Valves, furnished under these specifications, shall be manufactured by a firm that has been producing valves of this general type continuously for. the past 'five (5) years. Each company or. manufacturer supplying valves under these specifications shall have on file, with the City of Johnson City, approved records of experience and detailed drawings of the proposed valves. Drawings

shall cover the specific valve to be furnished for installation and shall show all dimensions including metal thickness, construction details and materials used in all parts of the valve together with ASTM Designation and Structural properties of these materials.

The manufacturer shall furnish to the City of Johnson City, a Certification that the valve complies with the specifications without any exceptions. This certification shall apply to specific valves being installed within the City water distribution system. The certification shall state (1) the number of valves covered by the certifications, (2) the Addition where valves are being installed or the Project Name, and (3) name of Contractor installing valves.

The City may require the Manufacturer, Supplier or Contractor to dismantle valves at any time to determine compliance with these specifications. Location of any valve within the City system, installed after adoption of these specifications, that does not meet the specifications completely shall be cause for prohibiting the future use of any valves from the same manufacturer.

- H. Tapping Sleeves: The materials for tapping sleeve bodies shall be cast-iron or ductile-iron in accordance with AWWA Standard CI 10 (ANSI 21.10), in two sections, or halves to be bolted together with high-strength, corrosion resistant, low alloy steel bolts conforming to AWWA Standard C111 (ANSI 21.11).

Cast iron and ductile-iron sleeve shall be mechanical joint, or as specified, or dimensions to secure, proper fit on the type and class of pipe on which they are to be used. Each sleeve shall be furnished with a 3/8-inch test opening so that tests can be made prior to tapping. Opening shall be provided with a 3/8-inch bronze plug.

502.6.5 Butterfly Valves

Add the following: All Butterfly Valves for installation underground in the City's distribution system 16 inches through 48 inches shall be in accordance with this specification.

All butterfly valves furnished shall conform strictly with the latest specification C-504 of the American Water Works Association Standard for rubber-seated butterfly valves and must comply with the following supplementary details and changes or addition.

- A. Body: The body shall be cast-iron ASTM A126, Class B and shall have face to face dimensions in accordance with AWWA Standards for short body, Class 150-B. All butterfly valves shall have a floating body seat ring to compensate for change in direction of flow to assure bottle-tight seal in either direction.

- B. Shaft: Valve shafts shall be an 18-8, Type 304 stainless steel. Valve disc and shaft shall be standard self-adjusting Chevron "V" type packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft.
- C. Disc and Seat: The valve disc shall be cast iron ASTM A126, Class B. The valve seat shall be Buna-N located on the valve body. Valves 20" and smaller shall have a bonded seat that meets test procedures in ASTM D429, Method B. Valves 24" and larger shall be retained in the valve body' by mechanical means without the use of metal retainers or other devices located in the flow stream.
- D. Operator: Butterfly valve operators shall be of the traveling nut design. All operators shall have adjustable mechanical stop limiting devices to prevent over travel of the disc. The operator shall have a mechanical stop which will withstand an input torque of 450 Ft. lbs. against the stop. The traveling nut shall engage alignment grooves in the housing.
- E. Operation: Unless otherwise shown in the plans, all valves shall open counter clockwise.
- F. Valve Ends: Valve ends shall be Mechanical Joint End, or Flanged Ends. Mechanical joint valves shall come complete with bolts, nuts, gaskets and glands. It shall be the responsibility of the Contractor to coordinate the ends of the adjoining pipe with the type valve end he proposes to use.
- G. Testing: All valves seats shall be tested at 150 psi as described in AWWA C-504 and in addition shall have a shell test of 300 psi. Any leakage shall be cause for rejection.
- H. Paint and Protective Coatings: All butterfly 'valves furnished under these specifications shall be painted on exterior as specified in AWWA C-504, with asphalt varnish.

All ferrous metal surfaces in the internal part of the valve shall be protected with a two-part thermoset epoxy coating to a nominal thickness of 4 mils for corrosion protection and shall be of a color that is easily identified as an epoxy coating. This shall be applied in shop.

The thermoset epoxy coating shall be a two-part epoxy and shall function as a physical, chemical and electrical barrier between the base metal to which it is applied and the surroundings. The coating shall be non-toxic and shall not impart taste to water. The coating must be formulated from materials deemed acceptable per the Food & Drug Administration Document Title 21 of the Federal Regulations of Food Additives, Section 121 .2514 entitled Resins & Polymeric Coatings. The coating shall have a satin finish and' shall be suitable for field overcoating and touchup with the same coating material without sanding or special

surface preparation, or application of heat in excess of room temperatures.

- I. Experience and Certification: Butterfly valves, furnished under these specifications, shall be manufactured by a firm that has been producing valves of this general type continuously for the past five (5) years. Each company or manufacturer supplying valves under these specifications shall have on file, at the City of Johnson City, approved records of experience and detailed drawings of the proposed valves. Drawings shall cover the specific valve to be furnished for installation in the City of Johnson City and shall show all dimensions including metal thickness, construction details and materials used in all parts of the valve together with ASTM Designation and structural properties of these materials. The manufacturer shall furnish to the City, a Certification that the valve complies with the specifications without any exceptions. This certification shall apply to specific valve being installed with the City water distribution system. The certification shall state (1) the number of valves covered by the certification, (2) the Addition where valves are being installed or the Project Name and (3) name of Contractor installing valves.
- J. The City may require 'the Manufacturer, Supplier or Contractor to dismantle valves at any time to determine compliance with these specifications. Location of any valve with the City system, installed after adoption of these specifications, that does not meet the specifications completely shall be cause for prohibiting the future use of any valves from the same manufacturer.

ITEM 504 OPEN CUT - BACKFILL

ITEM 504.2 MATERIALS

504.2.2.1 Add the following sentence: All stone used for pipe embedment shall be standard crushed rock- aggregate, Grade 4, unless otherwise approved in writing.

ITEM 504.3 EXCAVATION AND FOUNDATION

Prior to start of excavation the Contractor shall remove and stockpile the Topsoil and protect the Topsoil from contamination during construction.

After the trench has been refilled, topsoil shall be replaced to the extent that rock, excavated from the trench, will be completely covered and the area is returned to its original condition, except that in cultivated areas a minimum of 12 inches of top soil shall be replaced.

ITEM 504.4 BACKFILL – GENERAL REQUIREMENTS

The material used in the backfill shall be pulverized to the extent necessary to produce, a free-flowing material free of clay balls larger than 6-inch diameter.

ITEM 504.5 EMBEDMENT

Add the Following: Rock Cuttings or Sand will not be permitted in the pipe bedding for sanitary sewer. Rock Cuttings will not be permitted in the pipe bedding for water lines in the City of Johnson City.

504.5.2.15 Class "H" Embedment:

The embedment consists of a completely encased pipe with Standard Crushed Stone, Grade 4. Class "H" Embedment shall be used on the P.V.C. Sanitary Sewer Pipe installed within the City of Johnson City.

After the trench has been cut to a depth below the barrel of the pipe a distance of 1/8 Bc (3 inches minimum and 6 inches maximum), the bedding layer shall be brought to a point slightly above grade with compacted crushed stone. Bell holes shall be formed and the pipe laid and joined as specified. The stone shall be brought up in uniform layers of six inches to a point six inches over the top of the pipe when compacted. On PVC Pipe 18 inches through 27 inches in diameter the crushed stone shall be brought up in uniform layers to a point twelve (12) inches over the top of the pipe when compacted.

ITEM 506 OPEN CUT – WATER CONDUIT INSTALLATION

ITEM 506.3 LAYING WATER CONDUIT

Valves for installation in the City's distribution system shall be installed by direct burial as shown on the standard detail sheets and shall be provided with valve boxes for operation of the valve. After the water samples are passed, all valves shall be accessible during all phases of construction.

ITEM 506.5 HYDROSTATIC TEST

All hydrostatic tests shall be maintained over a period of not less than four hours. "Before being accepted, all ductile iron, C-900 PVC or concrete cylinder water mains shall be tested with a hydraulic test pressure of not less than four hours. Concrete pressure pipe shall be tested with a hydraulic test pressure of 120 percent of the design pressure. Steel pressure pipe shall be tested with a hydraulic test pressure not to exceed 150 percent and not less than 120 percent of the designed working pressure. The rate of leakage of all pipe tested shall not exceed the amounts shown in the tables titled "Hydrostatic Test-C-900 PVC, Steel or Ductile Iron Water Mains" or "Hydrostatic Test-Concrete Cylinder Water Mains". Water lines of material in combination shall be tested for the type of pipe (material) with the least stringent hydraulic test pressure and maintained over a period of not less than four hours."

HYDROSTATIC TEST
C-900 OR 905 PVC, STEEL OR DUCTILE-IRON WATER MAINS

GALLONS ALLOWED									
L.F Pipe	Pipe Diameter								
	4"	6"	8"	10"	12"	14"	16"	18"	20"
5	0.016	0.024	0.032	0.039	0.047	0.055	0.063	0.071	0.079
10	0.032	0.047	0.063	0.078	0.094	0.110	0.126	0.142	0.158
20	0.063	0.095	0.126	0.158	0.189	0.221	0.253	0.284	0.316
30	0.095	0.142	0.189	0.236	0.284	0.331	0.379	0.426	0.473
40	0.126	0.189	0.253	0.316	0.379	0.442	0.505	0.568	0.631
50	0.158	0.239	0.316	0.395	0.473	0.552	0.631	0.710	0.789
60	0.189	0.284	0.379	0.473	0.568	0.663	0.758	0.852	0.947
70	0.221	0.331	0.442	0.552	0.663	0.773	0.884	0.994	1.105
80	0.253	0.379	0.505	0.631	0.758	0.884	1.010	1.136	1.263
90	0.284	0.426	0.568	0.710	0.852	0.994	1.136	1.278	1.420
100	0.316	0.473	0.631	0.789	0.947	1.105	1.263	1.420	1.578
200	0.631	0.947	1.263	1.578	1.894	2.210	2.525	2.841	3.157
300	0.947	1.420	1.894	2.367	2.841	3.314	3.788	4.261	4.735
400	1.263	1.894	2.525	3.157	3.788	4.420	5.051	5.682	6.313
500	1.578	2.367	3.157	3.947	4.735	5.525	6.313	7.102	7.891
600	1.894	2.841	3.788	4.735	5.682	6.629	7.576	8.523	9.470
700	2.210	3.314	4.420	5.525	6.629	7.734	8.838	9.943	11.048
800	2.525	3.788	5.051	6.313	7.578	8.839	10.101	11.364	12.626
900	2.841	4.261	5.682	7.102	8.523	9.944	11.364	12.784	14.205
1000	3.157	4.735	6.313	7.891	9.470	11.048	12.626	14.205	15.783

Maximum allowable water loss in 4 hours at 180 pounds per square inch of pressure for a rate of 25 gallons per inch diameter of pipe per mile over a 24-hour period

EQUATION THE ABOVE CHART IS BASED ON:

$$G = 25 \times D \times L \times \frac{L^3}{5280} \times \frac{1}{24}$$

HYDROSTATIC TEST

HYDROSTATIC TEST **CONCRETE CYLINDER WATER MAINS**

GALLONS ALLOWED									
L.F Pipe	Pipe Diameter								
	4"	6"	8"	10"	12"	14"	16"	18"	20"
5	0.031	0.047	0.063	0.078	0.095	0.110	0.126	0.142	0.158
10	0.063	0.095	0.126	0.158	0.189	0.221	0.253	0.284	0.315
20	0.126	0.189	0.253	0.316	0.379	0.442	0.505	0.568	0.631
30	0.188	0.284	0.379	0.473	0.568	0.663	0.758	0.852	0.947
40	0.253	0.379	0.505	0.631	0.758	0.884	1.010	1.136	1.263
50	0.316	0.473	0.631	0.789	0.947	1.105	1.263	1.420	1.578
60	0.379	0.568	0.758	0.947	1.136	1.326	1.515	1.704	1.894
70	0.442	0.663	0.884	1.105	1.326	1.547	1.768	1.989	2.210
80	0.505	0.758	1.010	1.263	1.515	1.768	2.020	2.273	2.525
90	0.568	0.852	1.136	1.420	1.704	1.989	2.273	2.557	2.841
100	0.631	0.947	1.263	1.578	1.894	2.209	2.525	2.841	3.156
200	1.263	1.894	2.525	3.156	3.788	4.419	5.050	5.682	6.313
300	1.894	2.841	3.788	4.735	5.682	6.628	7.575	8.522	9.470
400	2.525	3.788	5.050	6.313	7.575	8.838	10.100	11.363	12.626
500	3.156	4.735	6.313	7.891	9.470	11.047	12.626	14.204	15.782
600	3.788	5.682	7.575	9.469	11.363	13.257	15.151	17.045	18.938
700	4.419	6.628	8.838	11.047	13.257	15.468	17.676	19.885	22.095
800	5.050	7.575	10.100	12.626	15.152	17.676	20.201	22.726	25.251
900	5.682	8.522	11.363	14.204	17.044	19.886	22.726	25.567	28.405
1000	6.313	9.469	12.626	15.782	18.939	22.096	25.253	28.408	31.564

Maximum allowable water loss in 4 hours at 180 pounds per square inch of pressure for a rate of 50 gallons per inch diameter of pipe per mile over a 24-hour period

EQUATION THE ABOVE CHART IS BASED ON:

$$\text{GALLONS} = 50 \times \text{L.F.} \times \text{D}^2 \times \frac{1}{5280} \times \frac{1}{24}$$

HYDROSTATIC TEST

ITEM 506.7 PURGING AND DISINFECTION OF WATER

Add the following: On all waterlines installed in the City of Johnson City the Contractor shall be responsible for Purging, Testing and Sterilization of the completed lines.

DIVISION 800 – MISCELLANEOUS CONSTRUCTION & MATERIALS

ITEM 801.3 RAILING

Reflectorized marking for guard rail and other traffic control used shall meet the requirements of 3M Scotchlite Brand Reflective Sheeting Grade, Series 2800, 3800 or 5800, or equal. The marking shall conform to U.S. Department of Transportation, Federal Highway Administration, STANDARD SPECIFICATIONS FOR CONSTRUCTION OF ROADS AND BRIDGES ON FEDERAL HIGHWAY PROJECTS, 1979 FP-79, Type III A, Sections 633.36 and 718.01 and Federal Supply Service, General Services Administration, LS-300 C, SHEETING AND TAPE REFLECTIVE NON-EXPOSED LENS, Reflectivity 2, Class 4.

ITEM 801.5 WIRE FENCE

801.5.2.1 Wire Fencing Fabric: All chain link fencing shall be No. 9 gage copper bearing open-hearth steel wire.

801.5.2.2 Posts

801.5.2.2.1 Metal: All posts shall be heavily galvanized by the hot-dip process after fabrication and shall be fitted with watertight malleable iron caps. All posts shall be of the following size and shape:

Line Posts: "H" Section hot rolled weighing not less than 4.10 pounds per linear foot or 3-1/2-inch O.D. pipe weighing not less than 3.65 pounds per linear foot.

Terminal Posts: Three-inch (3") steel pipe weighing not less than 5.79 pounds per linear foot.

Gate Posts: Four-inch (4") O.D. steel pipe weighing not less than 9.11 pounds per linear foot.

801.5.2.3 Rails. Gates. Braces and Fittings: Shall be 1-5/8-inch steel pipe weighing not less than 2.27 pounds per linear foot.

ITEM 803.2 GABION STRUCTURES

803.2.2 Materials

Add the sentence: All wire used, including tie and connecting wire, shall be certified by Mill Test Reports showing compliance with specification requirements.

803.2.2.2 Stone

Add the following: Facing stone shall be hand selected, large stone and shall be selected for best appearance. Facing stone shall be an off-white color and prior to laying the stone, samples shall be delivered to the site and shall be approved by the Engineer for gradation and appearance.

ITEM 805 ELECTRICAL COMPONENTS AND CONDUIT

ITEM 805.3 MATERIAL

Add the following: Pull Box. All pull boxes shall be Quazite precast polymer concrete or approved equal. Boxes shall be approximately 17" x 30" x 30" and shall be furnished with a concrete cover.

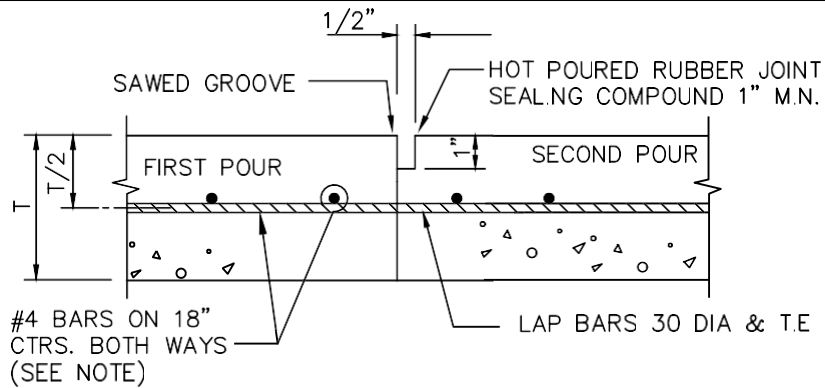
Each change of direction in the conduit run requires a pull box. Max spacing of pull boxes shall be one hundred feet (100').

Section 8. C STANDARD DRAWINGS

STANDARD DRAWINGS (Note: In the event of any conflicts, the standard drawings that follow in this Section 8.C. shall govern.)

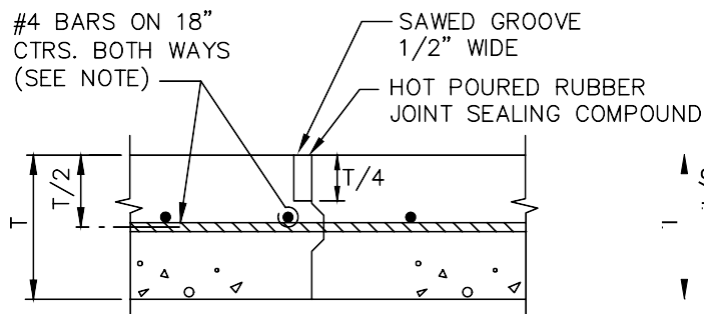
DRAWING NO.	DRAWING TITLE
PAV-01	REINFORCED CONCRETE PAVEMENT - JOINTS
PAV-02	REINFORCED CONCRETE PAVEMENT - TRANSVERSE JOINT SPACING
PAV-03	REINFORCED CONCRETE PAVEMENT - STREET HEADERS
PAV-04	CONCRETE CURBS & CURB WITH GUTTER - INTEGRAL, SEPARATE & DOWELED
PAV-05	MEDIAN ISLAND PAVEMENT - NOSE & LEFT TURN LANE
PAV-06	MEDIAN ISLAND PAVEMENT - MONOLITHIC CONCRETE NOSE
PAV-07	CONCRETE DRIVEWAY APPROACH - RADIUS RETURN
PAV-08	CONCRETE DRIVEWAY APPROACH - RESIDENTIAL
PAV-09	REINFORCED CONCRETE SIDEWALK - JOINTS & SPACING
PAV-10	MID BLOCK BARRIER FREE RAMP - TYPE 'A'
PAV-11	BARRIER FREE RAMP - TYPE 'B' (1 OF 2)
PAV-11A	BARRIER FREE RAMP - TYPE 'B' (2 OF 2)
PAV-12	BARRIER FREE RAMP - TYPE 'C'
PAV-13	TYPICAL UTILITY LOCATION - IN PAVEMENT
PAV-14	HOT MIX ASPHALT PAVEMENT
WAT-01	GATE VALVE 4" TO 12" - BOX & EXTENSION STEM
WAT-02	VAULT CONSTRUCTION PLAN - HORIZONTAL GATE VALVE $\geq 16"$
WAT-03	VAULT CONSTRUCTION PROFILE - HORIZONTAL GATE VALVE $\geq 16"$
WAT-04	VAULT CONSTRUCTION DIMENSIONS - VERTICAL GATE VALVE $\geq 16"$
WAT-05	VAULT CONSTRUCTION SECTION - VERTICAL GATE VALVE $\geq 16"$
WAT-06	VAULT CONSTRUCTION PLAN - BUTTERFLY VALVE $\geq 16"$
WAT-07	VAULT CONSTRUCTION PROFILE - BUTTERFLY VALVE $\geq 16"$
WAT-08	COMBINATION AIR VACUUM VALVE - TYPE "1"
WAT-09	COMBINATION AIR VACUUM VALVE - TYPE "2" SECTION
WAT-10	AIR RELEASE VALVE AIR VENT - TYPE "2"
WAT-11	FLUSH POINT INSTALLATION - TYPE "1"
WAT-12	FIRE HYDRANT - INSTALLATION
WAT-12A	FIRE HYDRANT - REBAR & PLACEMENT
WAT-13	WATER SERVICE INSTALLATION - 1" LINE
WAT-14	WATER SERVICE INSTALLATION - 1-1/2" OR 2" LINE
WAT-15	4" COMBINATION WATER SERVICE - WITH 4" METER
WAT-16	ENCASEMENT PIPE - WATER LINE BY BORE
WAT-17	BLOW OFF VALVE - INSTALLATION
WAT-18	AUTOMATIC FLUSH VALVE
WAT-19	WATER METER LID - METERS UP TO 1"
WAT-19A	WATER METER LID - METERS FROM 1.5" TO 2"
WAT-20	HORIZONTAL THRUST BLOCK - AT PIPE BEND (1 OF 3)

WAT-20A	HORIZONTAL THRUST BLOCK - AT PIPE BEND (2 OF 3)
WAT-20B	HORIZONTAL THRUST BLOCK - AT PIPE BEND (3 OF 3)
WAT-21	HORIZONTAL THRUST BLOCK - AT TEES & PLUGS
WAT-22	VERTICAL THRUST BLOCK - AT PIPE BEND
WAT-23	THRUST BLOCK - GENERAL NOTES
SS-01	WASTEWATER MAIN TIE-IN - AT CLEANOUT OR MANHOLE STUBOUT
SS-02	WASTEWATER MANHOLE - PRECAST
SS-03	WASTEWATER MANHOLE - CAST-IN-PLACE
SS-04	WASTEWATER MANHOLE - PRESSURE MANHOLE
SS-05	WASTEWATER MANHOLE - INTERNAL DROP CONNECTION
SS-06	WASTEWATER MANHOLE - VENTED TYPE 'S'
SS-06A	WASTEWATER MANHOLE - VENTED FLAT TOP
SS-07	WASTEWATER MANHOLE - LINE INTERSECTION
SS-08	WASTEWATER MAIN - CLEANOUT
SS-09	WASTEWATER SERVICES - LATERAL CONNECTION
SS-10	WASTEWATER SERVICES - CLEANOUT FRAME & COVER
SS-11	WASTEWATER SERVICES - DEEP LATERAL CONNECTION
SS-12	RESIDENTIAL LATERAL - WITH CLEANOUT AT PROPERTY LINE
SS-13	ENCASEMENT PIPE - WASTEWATER LINE BY BORE
SS-14	WASTEWATER MANHOLE - STANDARD COVER
SS-14A	WASTEWATER MANHOLE - BOLTED COVER
SS-15	WASTEWATER MANHOLE - FALSE MANHOLE BOTTOM
SS-16	I&I BARRIER & GATOR WRAP - 6" GATOR WRAP
SS-17	MANHOLE & VALVE VAULT - MOW STRIP
EMB-01	EMBEDMENT - CLASS "B+" & CLASS "G"
EMB-02	EMBEDMENT - CLASS "H" & STORM SEWER
EMB-03	PAVEMENT CUT & REPAIR - CONCRETE & PARKWAY
EMB-04	PAVEMENT CUT & REPAIR - ASPHALT
EMB-05	INFILTRATION PROTECTION - CONDUIT UNDER CHANNEL
STM-01	STORMWATER CURB INLET - STANDARD (1 OF 2)
STM-01A	STORMWATER CURB INLET - STANDARD (2 OF 2)
STM-02	STORMWATER CURB INLET - REINFORCING STEEL
STM-03	STORM SEWER - STANDARD INLET COVER
STM-03A	STORM SEWER - BOLTED INLET COVER
STM-04	STORMWATER HEADWALL - TYPE "C"
STM-05	JUNCTION BOX - 4', 5', OR 6' SQUARE (1 OF 2)
STM-05A	JUNCTION BOX - 4', 5', OR 6' SQUARE (2 OF 2)
L-01	TREE PROTECTION - PLAN DETAIL



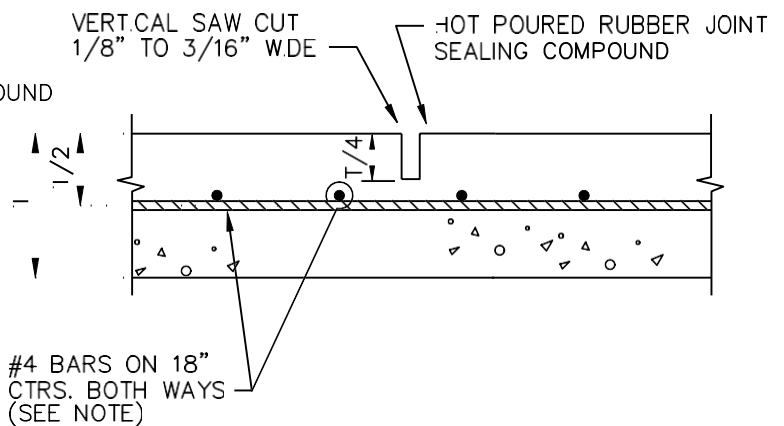
CONSTRUCTION JOINT

N.T.S.



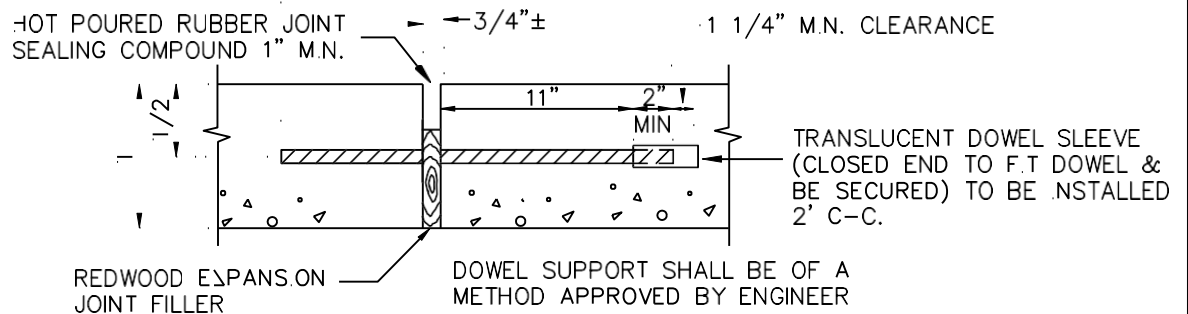
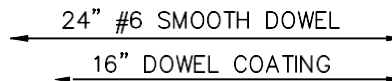
KEYWAY JOINT

(FOR PAVEMENT THICKNESS > 6")
N.T.S.



SAWED CONTRACTION JOINT

N.T.S.



EXPANSION JOINT

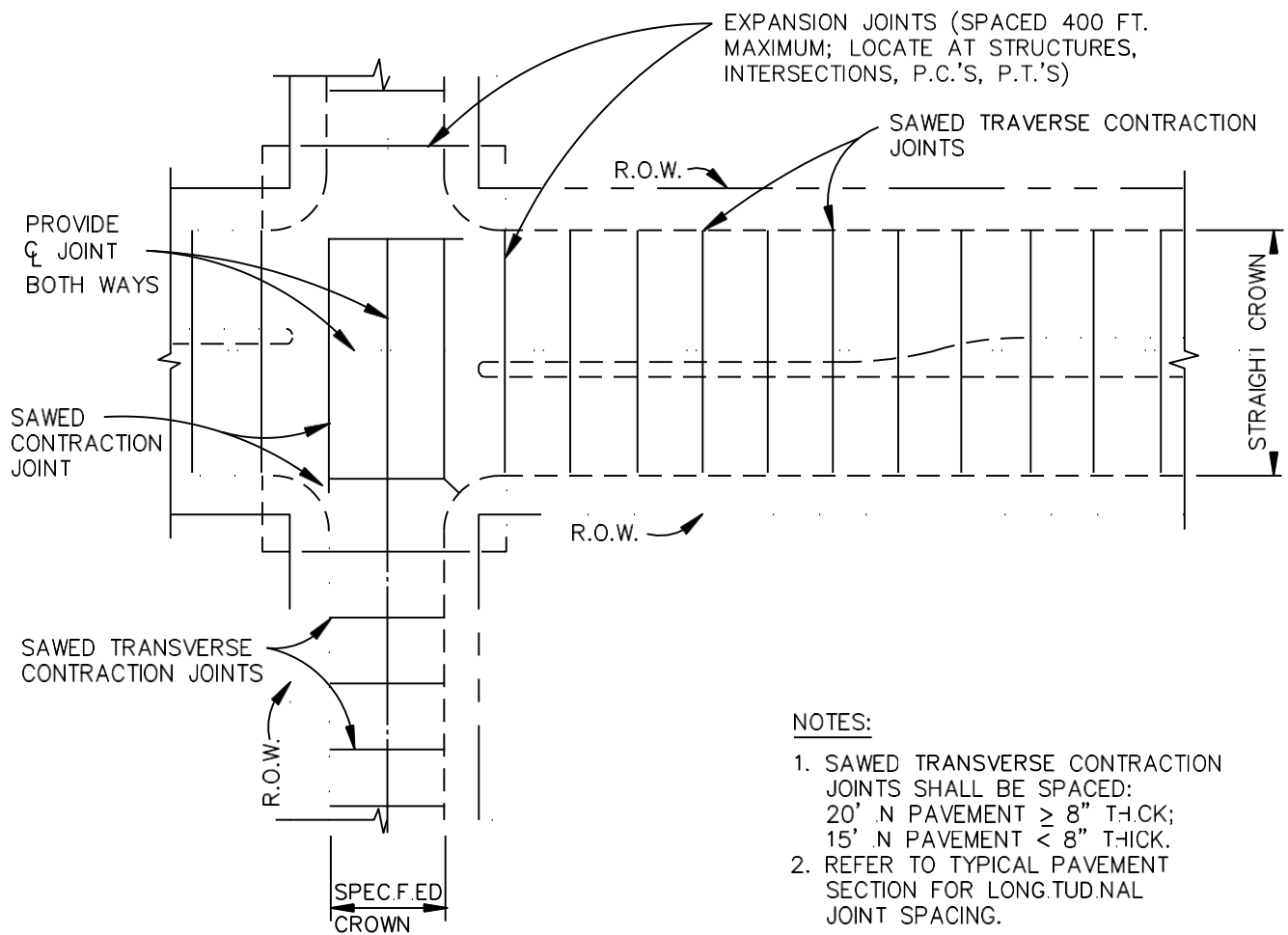
(SPACED 400 FT. MAXIMUM; LOCATE AT
STRUCTURES AND AT INTERSECTION P.C.'S & P.T.'S)
N.T.S.

REINFORCED CONCRETE PAVEMENT

JOINTS

STANDARD DRAWING NO.

PAV-01



SPACING DIAGRAM FOR TRANSVERSE JOINTS

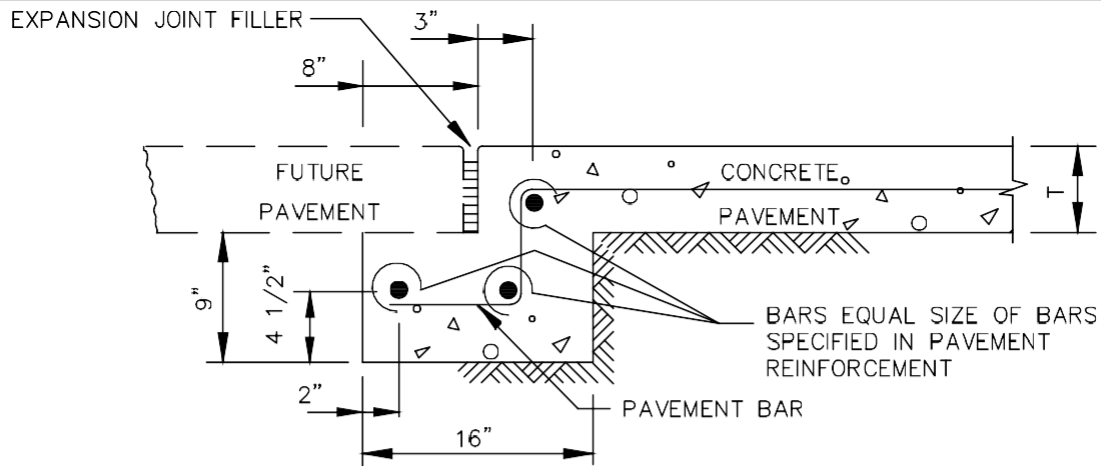
N.T.S.

REINFORCED CONCRETE PAVEMENT

TRANSVERSE JOINT SPACING

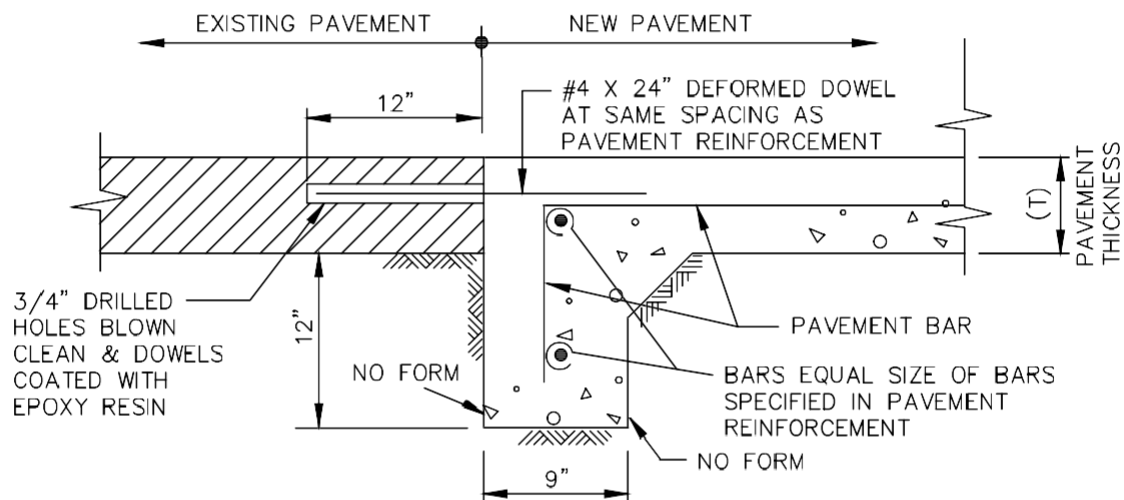
STANDARD DRAWING NO.

PAV-02



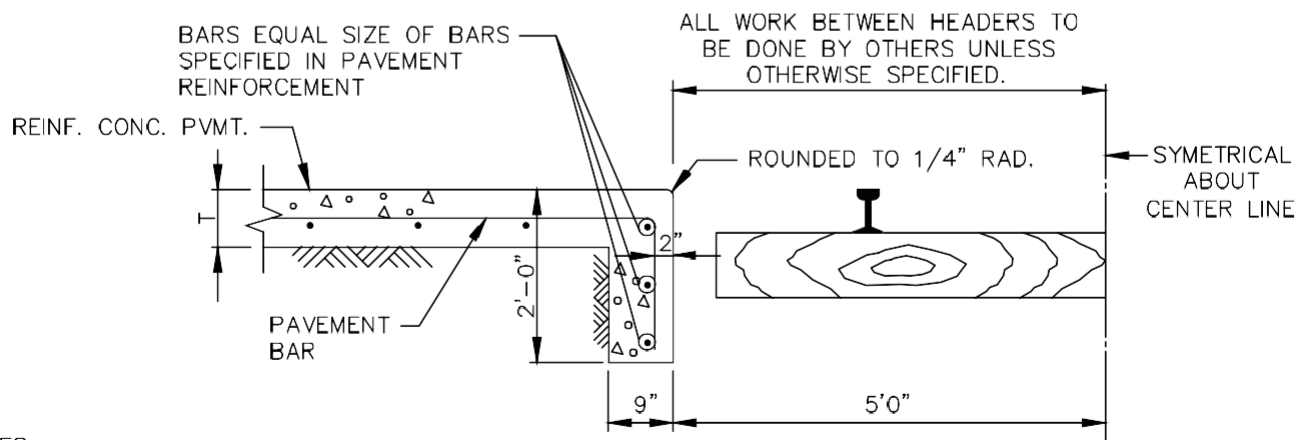
STREET HEADER FOR FUTURE PAVEMENT

N.T.S.



STREET HEADER AT EXISTING PAVEMENT

N.T.S.



NOTES:

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

STREET HEADER AT RAILROAD

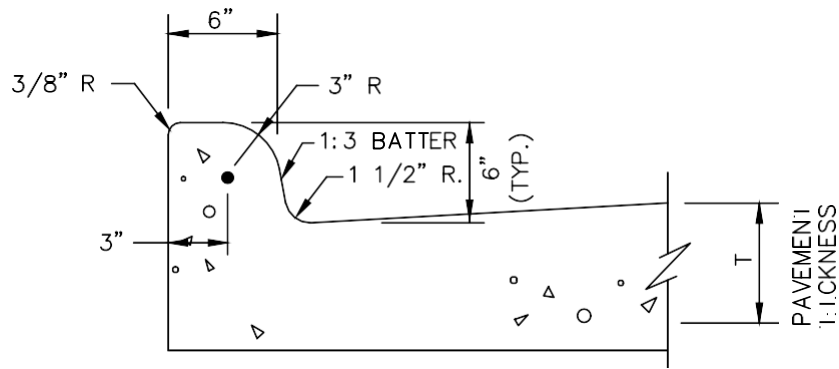
N.T.S.

REINFORCED CONCRETE PAVEMENT

STREET HEADERS

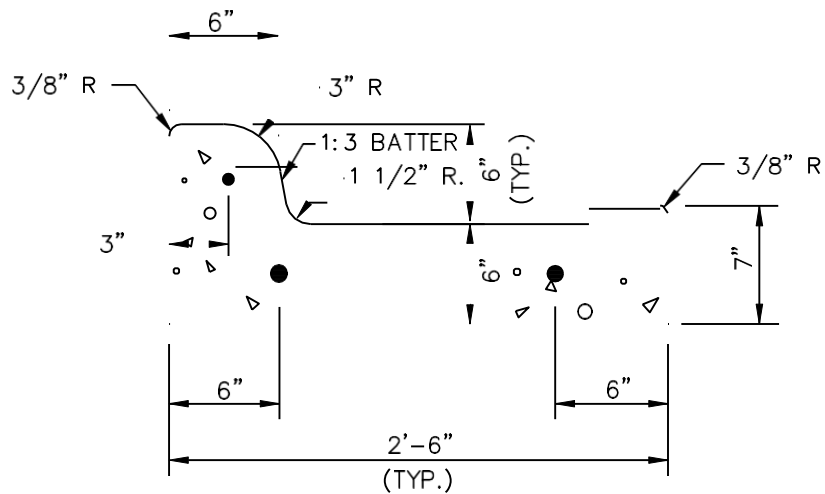
STANDARD DRAWING NO.

PAV-03



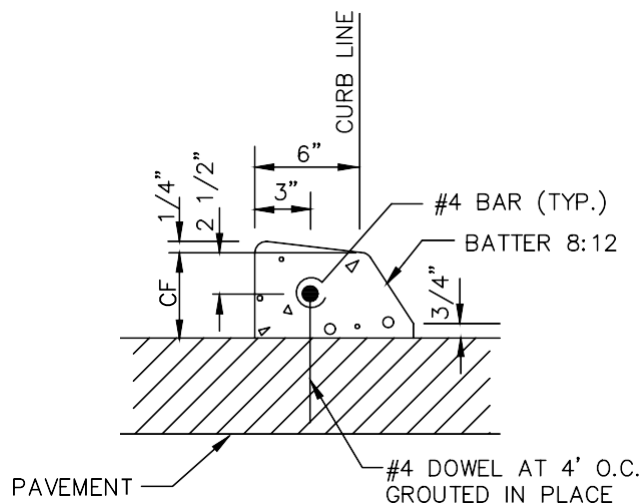
INTEGRAL CURB & GUTTER

N.T.S.



SEPARATE CURB & GUTTER

N.T.S.



DOWELED CURB

N.T.S.

NOTES:

1. REINFORCEMENT SHALL BE NO. 4 BARS.
2. CONCRETE SHALL BE CLASS "C".
3. "CF" IS 6" UNLESS OTHERWISE SPECIFIED.
4. ALL CURBS ARE CONSTRUCTED OF PORTLAND CEMENT CONCRETE UNLESS OTHERWISE SHOWN.
5. GRADE SHALL BE MEASURED AT BACK OF CURB.

CONCRETE CURBS & CURB WITH GUTTER

INTEGRAL, SEPARATE & DOWELED

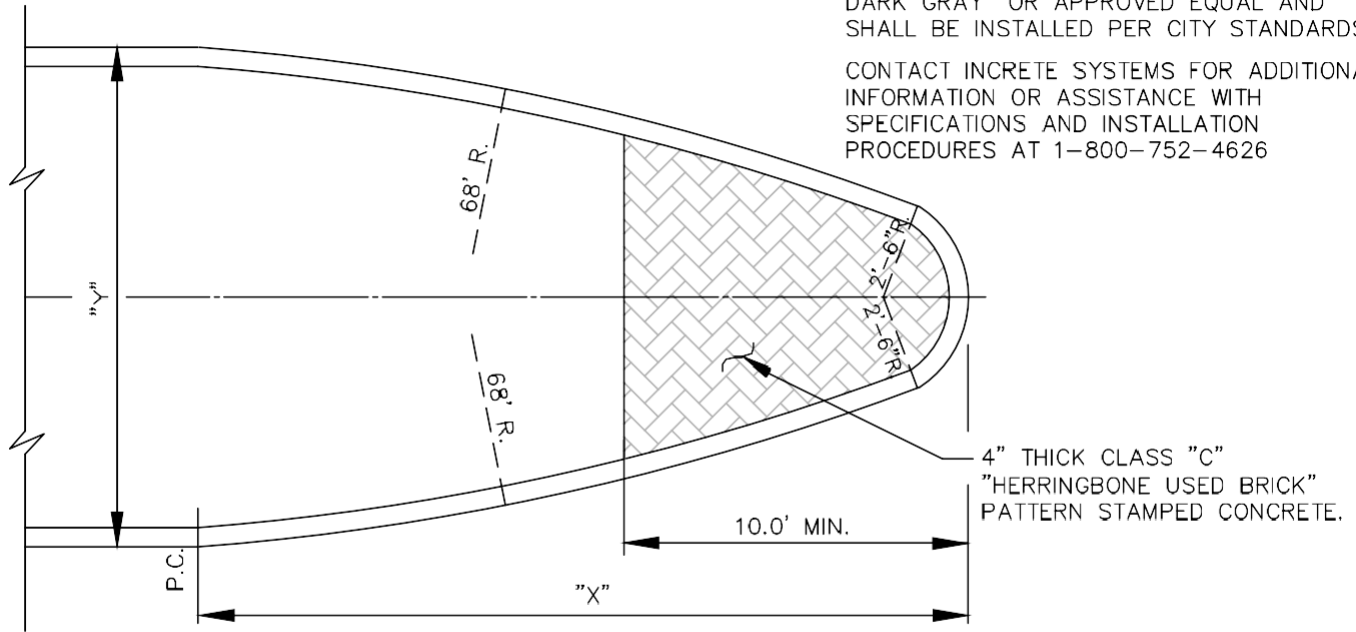
STANDARD DRAWING NO.

PAV-04

NOTE:

STAMPED CONCRETE SHALL BE INTEGRAL STAINED INCRETE COLOR "REDWOOD W/ DARK GRAY" OR APPROVED EQUAL AND SHALL BE INSTALLED PER CITY STANDARDS.

CONTACT INCRETE SYSTEMS FOR ADDITIONAL INFORMATION OR ASSISTANCE WITH SPECIFICATIONS AND INSTALLATION PROCEDURES AT 1-800-752-4626



DIMENSIONS OF MEDIAN NOSE

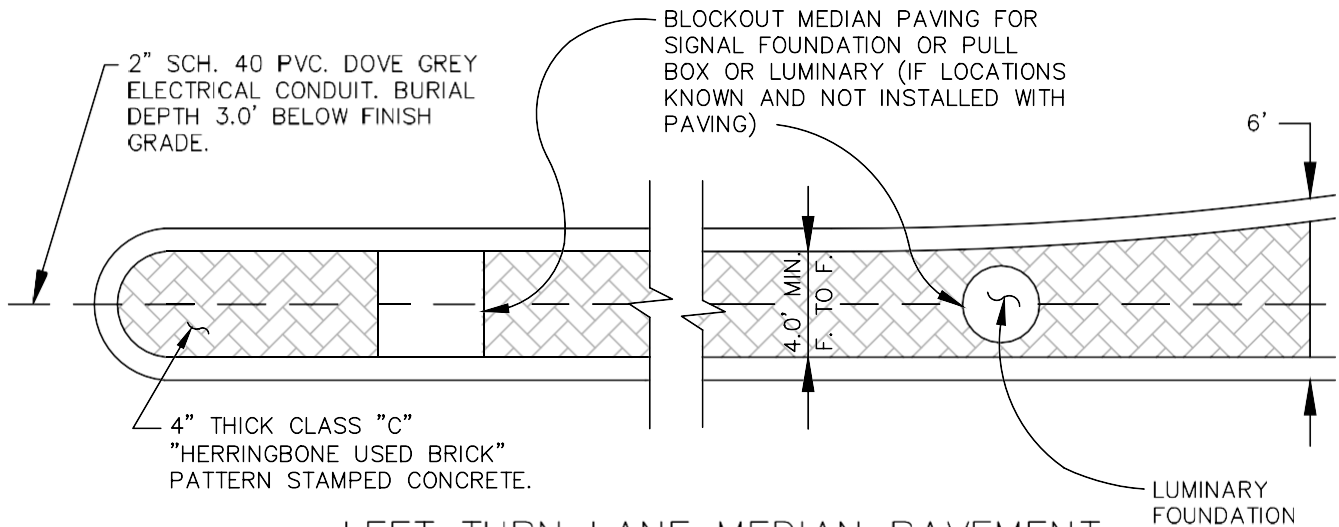
Y = 15'	X = 27.6'
Y = 16'	X = 28.8'
Y = 17'	X = 29.9'
Y = 18'	X = 30.9'

CONCRETE NOSE FOR MEDIAN ISLAND

N.T.S.

NOTE:

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



LEFT TURN LANE MEDIAN PAVEMENT

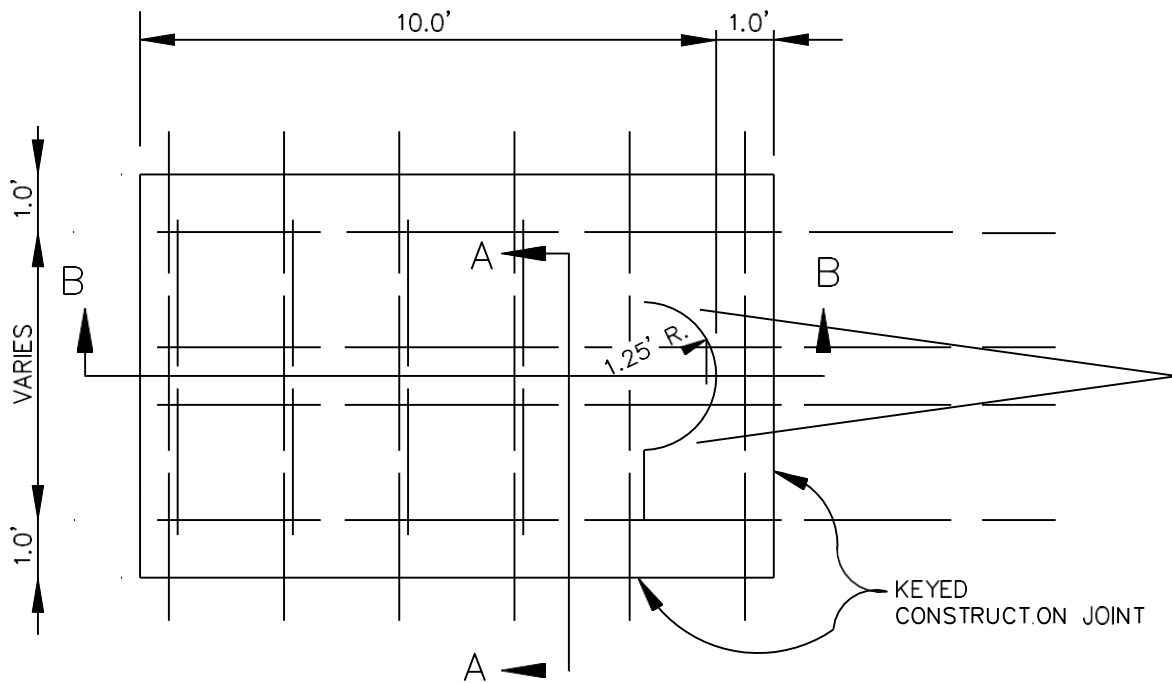
N.T.S.

MEDIAN ISLAND PAVEMENT

NOSE & LEFT TURN LANE

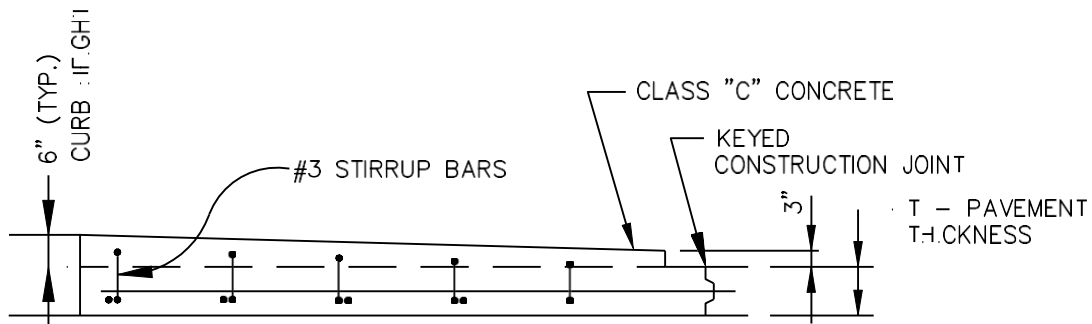
STANDARD DRAWING NO.

PAV-05



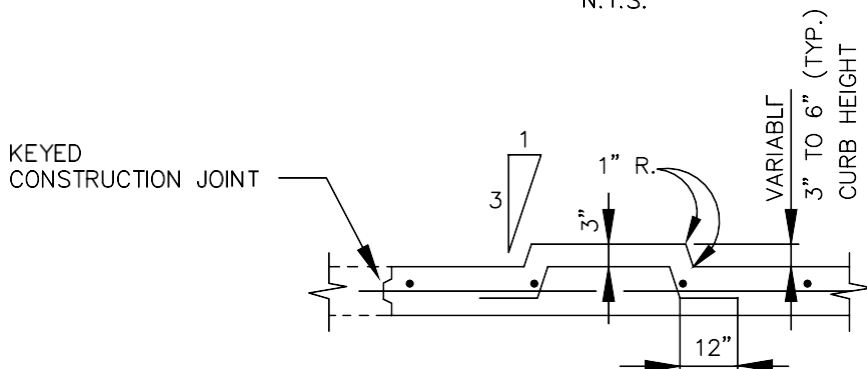
MONOLITHIC CONCRETE MEDIAN NOSE

N.T.S.



SECTION B-B

N.T.S.



SECTION A-A

N.T.S.

NOTE:

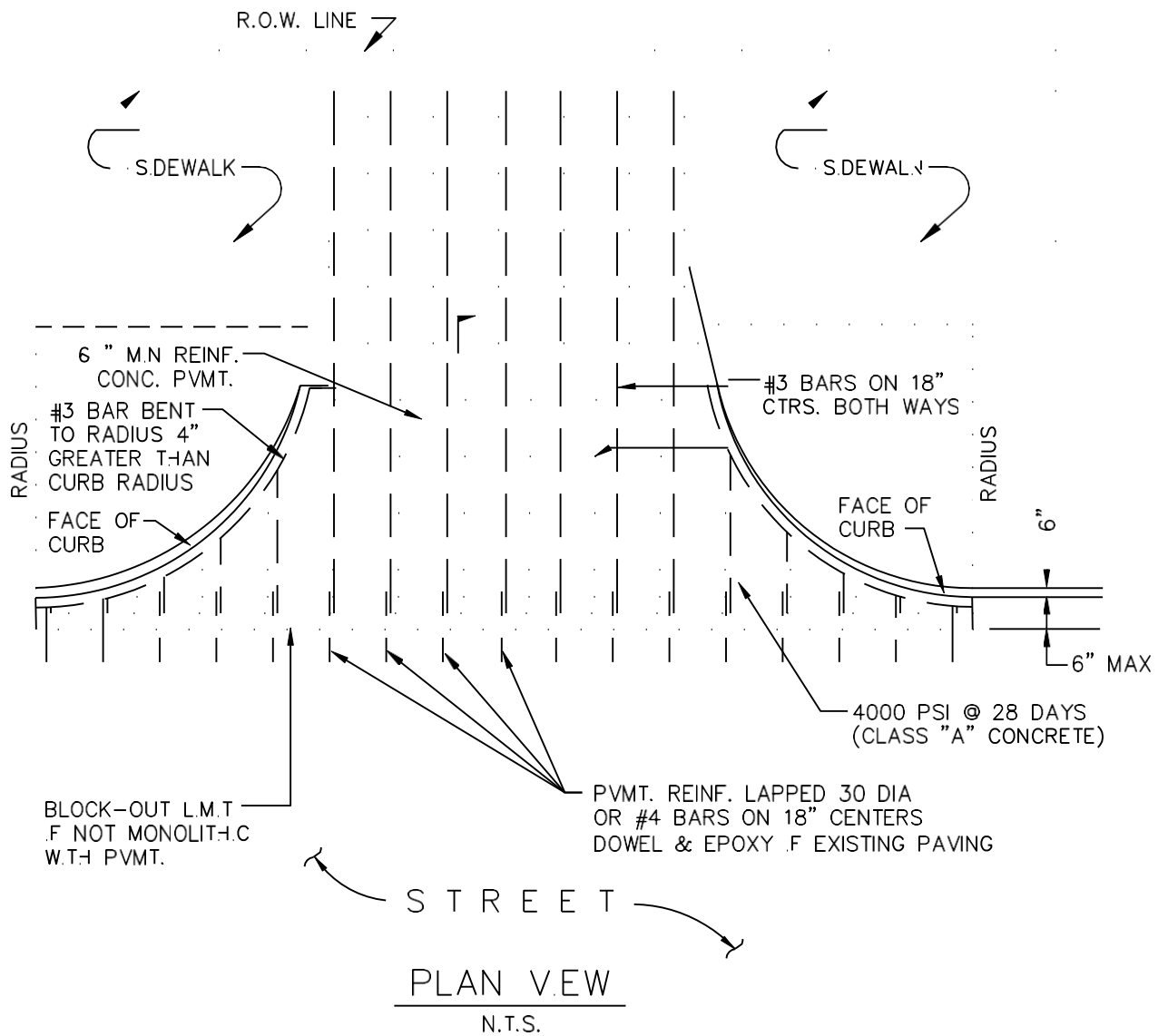
REINFORCEMENT BARS SHALL MATCH THOSE IN PAVEMENT.

MEDIAN ISLAND PAVEMENT

MONOLITHIC CONCRETE NOSE

STANDARD DRAWING NO.

PAV-06



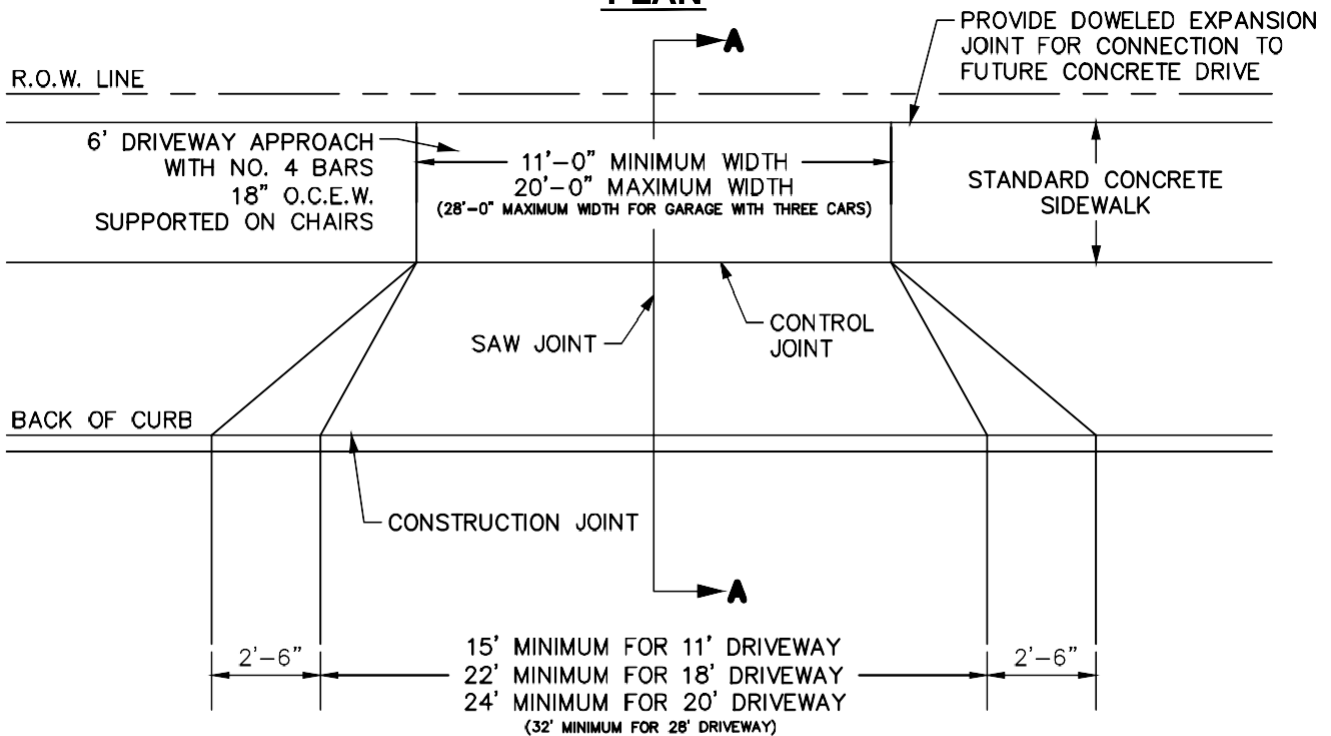
CONCRETE DRIVEWAY APPROACH

RADIUS RETURN

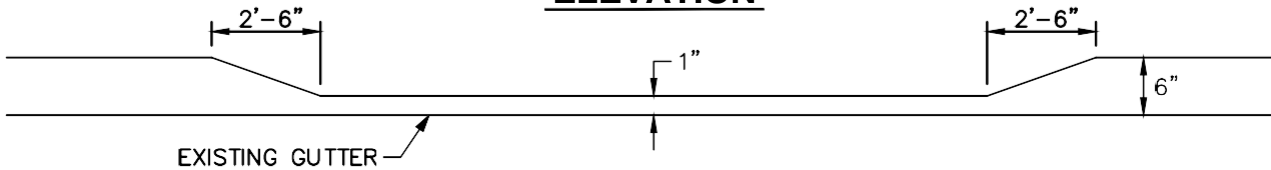
STANDARD DRAWING NO.

PAV-07

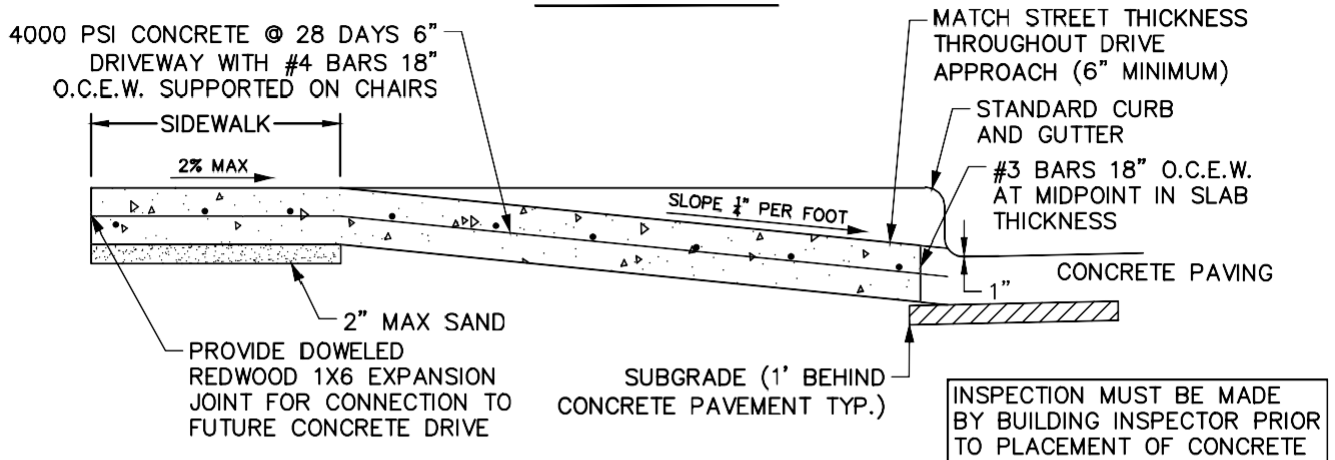
PLAN



ELEVATION



SECTION A-A



NOTES:

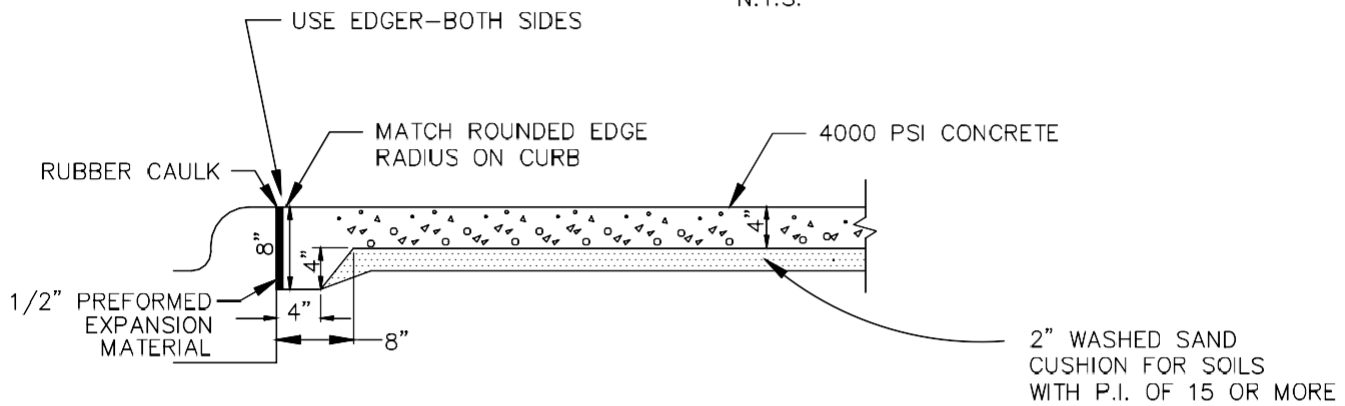
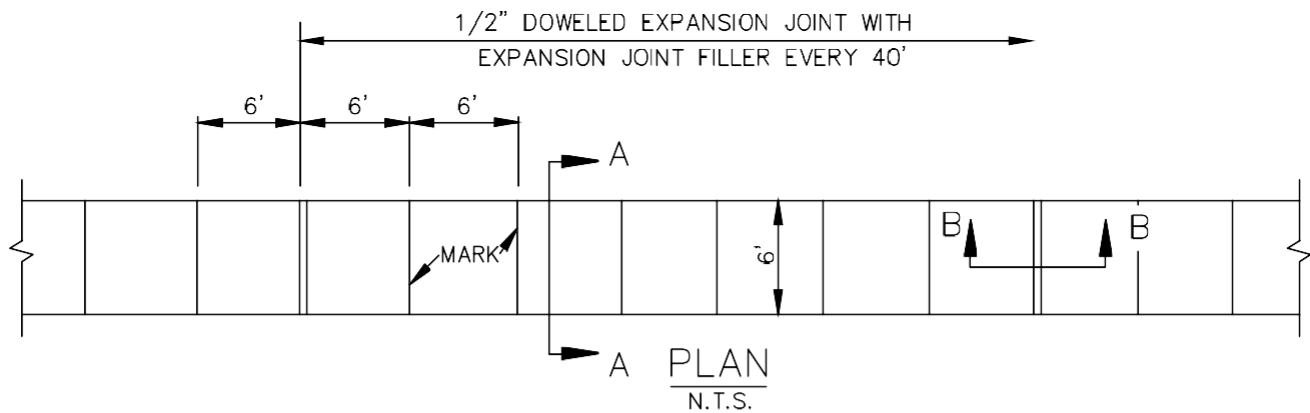
1. EXISTING CURB AND GUTTER, IF ANY MUST BE SAWED AS DIRECTED BY THE CITY ENGINEER, HORIZONTAL CURB CUT SHALL BE AT AN ELEVATION OF 1" ABOVE THE EXISTING GUTTER WITH A MINIMUM LENGTH AS SHOWN. THE TRADITIONAL SAW CUT SHALL HAVE A RUN OF 2'-6" AND SHALL RISE TO MEET THE EXISTING TOP OF CURB. ALL EXPOSED EDGES SHALL BE GROUND TO A 1/4" RADIUS. SAW CUTTING SHALL BE PERFORMED WITH A RIDE-ON SAW EQUIPPED WITH A DIAMOND BLADE.
2. SIDEWALK SECTION THRU DRIVEWAY SHALL BE POURED SAME THICKNESS AS DRIVEWAY APPROACH. (EXISTING SIDEWALK, IF ANY, SHALL BE REMOVED AND REPLACED.)
3. THIS WORK SHALL NOT DISRUPT THE DESIGN FLOWLINE OF THE EXISTING GUTTER.

CONCRETE DRIVEWAY APPROACH

RESIDENTIAL

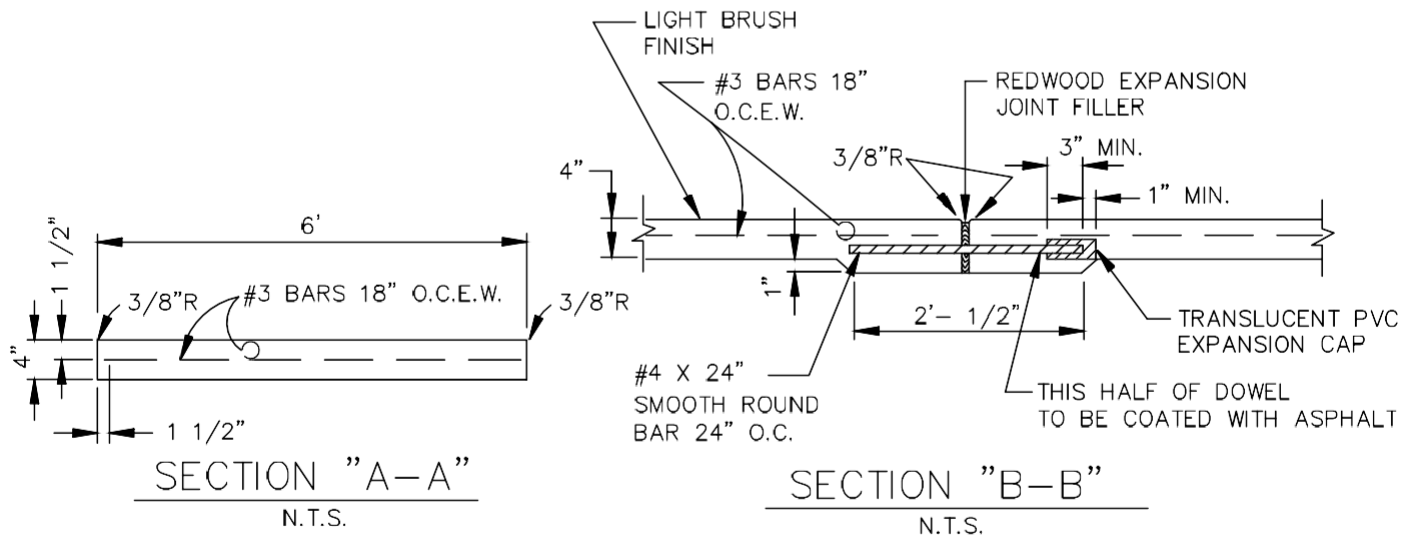
STANDARD DRAWING NO.

PAV-08



JOINT LUG DETAIL FOR MEDIAN PAVEMENT OR SIDEWALK ADJACENT TO CURB

N.T.S.



NOTE:

1. REFER TO STANDARD SPECIFICATION ITEM 8.3. FOR ALTERNATE REINFORCEMENT.
2. CROSS SLOPE OF SIDEWALK SHALL BE $\pm 1/4"$ PER FT. MIN. TO $\pm 3/8"$ PER FT. MAX.
3. OTHER THAN 6'-0" SIDEWALK WIDTH MAY BE SPECIFIED BY OWNER.
4. ALL HONEYCOMB IN BACK OF CURB TO BE TROWEL-PLASTERED BEFORE POURING SIDEWALK.
5. LUG MAY BE FORMED BY SHAPING SUBGRADE TO APPROXIMATE DIMENSIONS SHOWN.

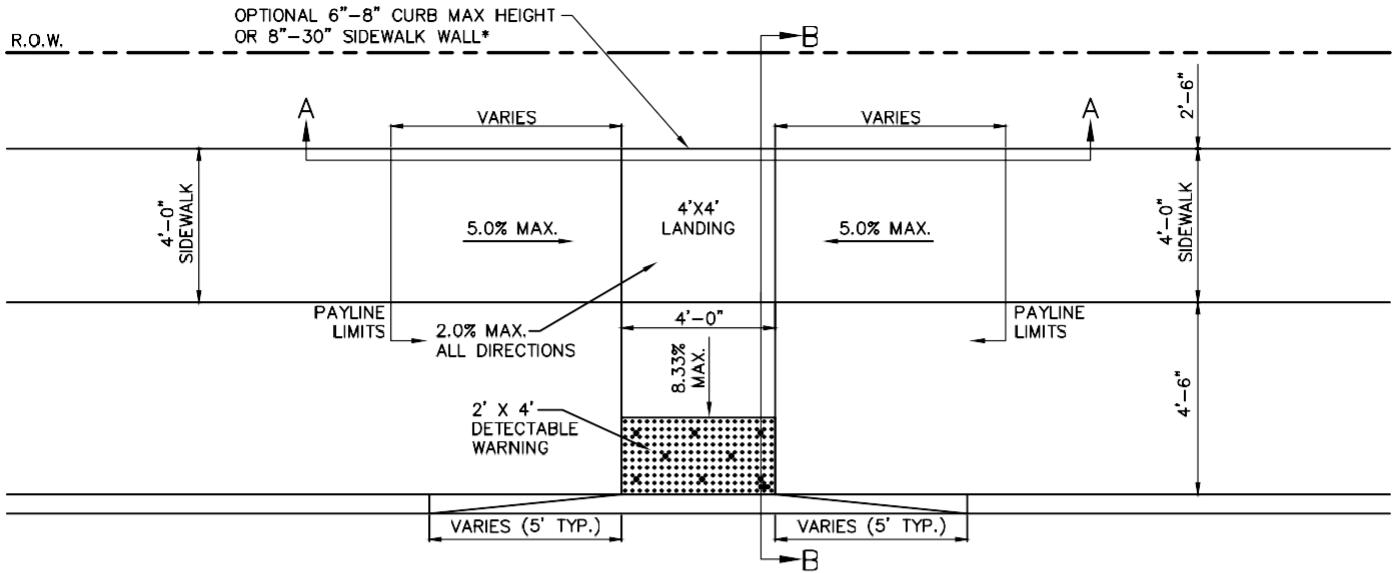
REINFORCED CONCRETE SIDEWALK

JOINTS & SPACING

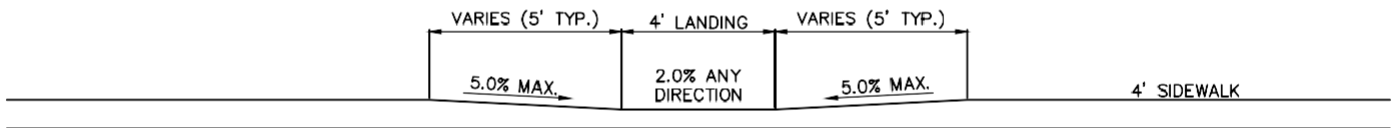
STANDARD DRAWING NO.

PAV-09

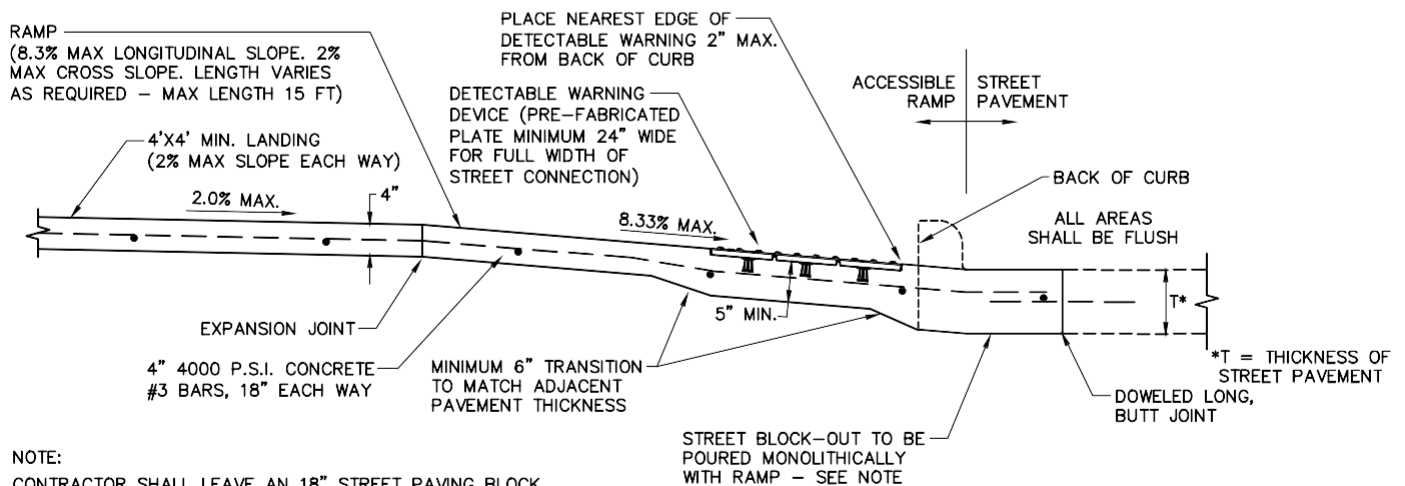
*SIDEWALK MUST BE 5' WIDE AT LANDING IF 6" CURB OR SIDEWALK WALL IS REQUIRED



MID-BLOCK CURB RAMP



SECTION A-A



NOTE:
CONTRACTOR SHALL LEAVE AN 18" STREET PAVING BLOCK OUT, MEASURED FROM BACK OF CURB, ADJACENT TO CURB RAMPS. BLOCK OUT SHALL BE POURED MONOLITHICALLY WITH CURB RAMP, DOWELED INTO STREET PAVEMENT (18" SMOOTH #3 DOWELS PLACED 18" O.C.)

SECTION B-B

MID-BLOCK BARRIER FREE RAMP

OPPOSITE "T" INTERSECTION

STANDARD DRAWING NO.

PAV-10

PEDESIRIAN ACCESSIBILITY (WITHIN PUBLIC R.O.W.)

ALL NEWLY CONSTRUCTED SIDEWALKS, CURB RAMPS AND CROSSWALKS INSTALLED WITHIN CITY PUBLIC RIGHTS-OF-WAY SHALL BE CONSIDERED A PEDESIRIAN ACCESS ROUTE AND SHALL CONFORM TO THE MOST CURRENT "DRAFT" GUIDELINES FOR PUBLIC RIGHTS-OF-WAY CREATED BY THE UNITED STATES ACCESS BOARD.

CURB RAMPS

- ALL SLOPES SHOWN ARE MAXIMUM ALLOWABLE. LESSER SLOPES THAT WILL STILL DRAIN PROPERLY SHOULD BE USED. ADJUST CURB RAMP LENGTH OR GRADE OF APPROACH SIDEWALKS AS DIRECTED.
- LANDINGS SHALL BE 5' X 5' MINIMUM WITH A MAXIMUM 2" SLOPE IN EACH DIRECTION.
- CLEAR SPACE AT THE BOTTOM OF CURB RAMPS SHALL BE A MINIMUM OF 4' X 4' WHOLLY CONTAINED WITHIN THE CROSSWALK AND WHOLLY OUTSIDE THE PARALLEL VEHICULAR TRAVEL PATH.
- MAXIMUM ALLOWABLE CROSS SLOPE ON SIDEWALK AND CURB RAMP SURFACES IS 2%.
- ADDITIONAL INFORMATION ON CURB RAMP LOCATION, DESIGN, LIGHT REFLECTIVE VALUE AND TEXTURE MAY BE FOUND IN THE MOST CURRENT EDITION OF THE TEXAS ACCESSIBILITY STANDARDS (TAS) AND 16 TAC 68.102. FEDERAL GUIDELINES SHALL SUPERSEDE ANY CONFLICTS.
- CROSSWALK DIMENSIONS, CROSSWALK MARKINGS AND STOP BAR LOCATIONS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS. AT INTERSECTIONS WHERE CROSSWALK MARKINGS ARE NOT REQUIRED, CURB RAMPS AND ACCESSIBLE ROUTES SHALL ALIGN WITH THEORETICAL CROSSWALKS UNLESS OTHERWISE DIRECTED.
- HANDRAILS ARE NOT REQUIRED ON CURB RAMPS.
- PROVIDE A FLUSH TRANSITION WHERE THE CURB RAMPS CONNECT TO THE STREET.
- ACCESSIBLE ROUTES ARE CONSIDERED "RAMPS" WHEN LONGITUDINAL SLOPES ARE BETWEEN 5" AND 8.3" (MAXIMUM ALLOWABLE). SIDEWALKS UNDER 5" LONGITUDINAL SLOPE ARE DEEMED ACCESSIBLE ROUTES AND MUST FOLLOW ALL APPLICABLE GUIDELINES.

EJ - EXPANSION JOINT

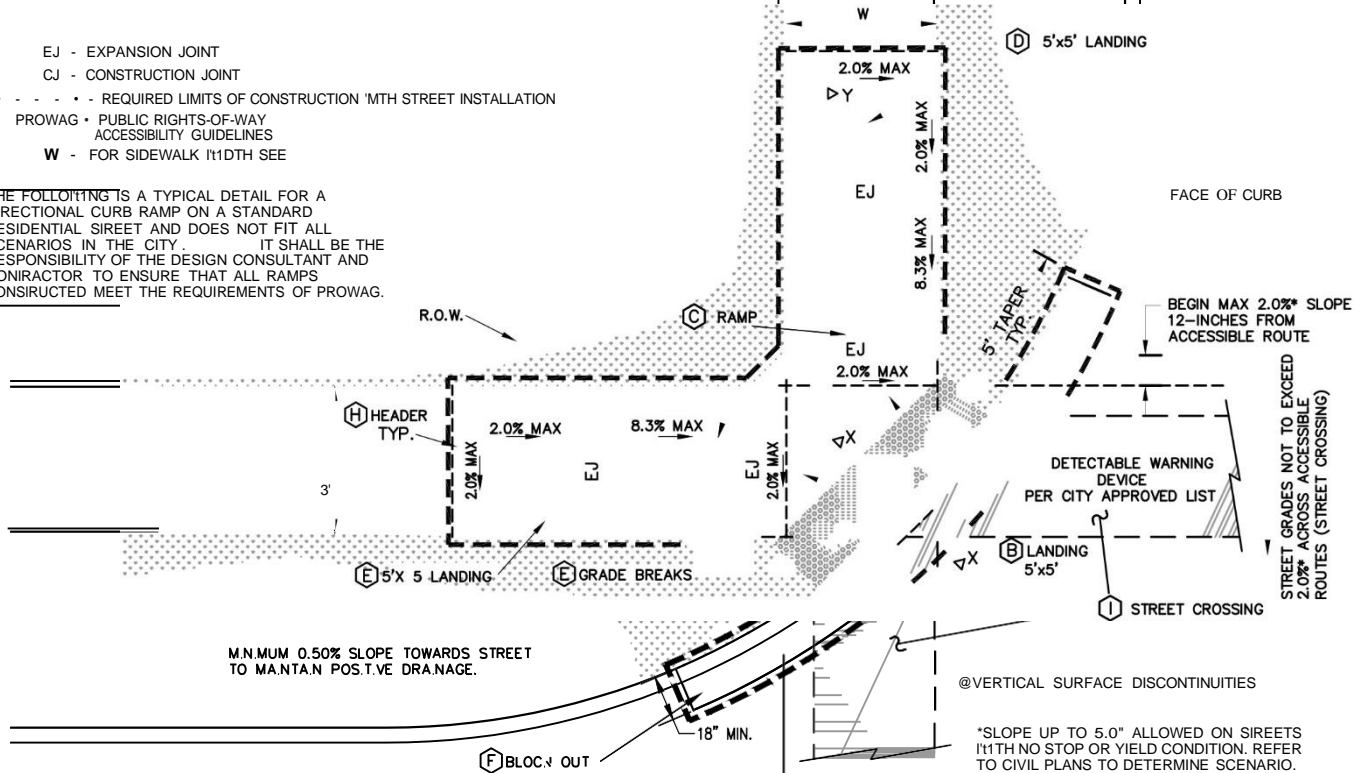
CJ - CONSTRUCTION JOINT

- - - - - REQUIRED LIMITS OF CONSTRUCTION WITH STREET INSTALLATION

PROWAG - PUBLIC RIGHTS-OF-WAY ACCESSIBILITY GUIDELINES

W - FOR SIDEWALK WITHIN SEE

THE FOLLOWING IS A TYPICAL DETAIL FOR A DIRECTIONAL CURB RAMP ON A STANDARD RESIDENTIAL STREET AND DOES NOT FIT ALL SCENARIOS IN THE CITY. IT SHALL BE THE RESPONSIBILITY OF THE DESIGN CONSULTANT AND CONTRACTOR TO ENSURE THAT ALL RAMPS CONSTRUCTED MEET THE REQUIREMENTS OF PROWAG.

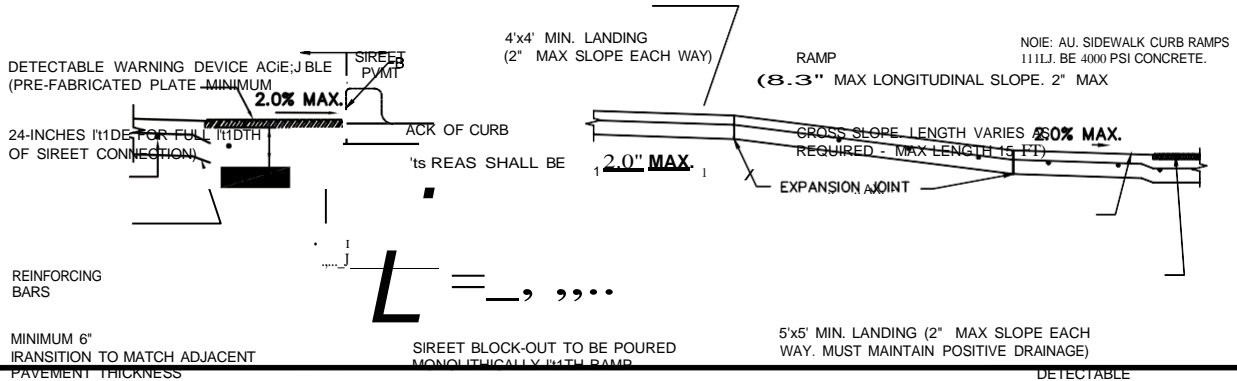


MINIMUM 0.50% SLOPE TOWARDS STREET TO MAINTAIN POSITIVE DRAINAGE.

@ VERTICAL SURFACE DISCONTINUITIES

*SLOPE UP TO 5.0" ALLOWED ON STREETS WITH NO STOP OR YIELD CONDITION. REFER TO CIVIL PLANS TO DETERMINE SCENARIO.

STREET GRADES NOT TO EXCEED 2.0% ACROSS ACCESSIBLE ROUTES (STREET CROSSING)



REINFORCING BARS

MINIMUM 6\"/>

STREET BLOCK-OUT TO BE POURED MONOLITHICALLY WITH RAMP

5'x5' MIN. LANDING (2\"/>

DETECTABLE

T - THICKNESS OF STREET PAVEMENT

SECTION X-X
N.T.S.

KEYWAY JOINT FOR NEW CONSTRUCTION. STREET CONNECTION SHALL BE LONGITUDINAL BUTT JOINT FOR CONNECTIONS TO EXISTING ROADWAYS.

SECTION Y-Y
N.T.S.

WARNING DEVICE

BARRIER FREE RAMP

STANDARD DRAWING NO.

TYPE 'B' (1 OF 2)

PAV-11

(A) DETECTABLE WARNING DEVICES (DWD) SHALL BE PRE-MANUFACTURED CAST-IN-PLACE PLATES FROM THE CITY OF ANNA APPROVED VENDOR LIST INSTALLED TO THE MANUFACTURER'S SPECIFICATIONS, AND SHALL MEET ALL ADA REQUIREMENTS. NO BRICK PAVERS ALLOWED. COLOR TO BE BRICK RED OR SIMILAR. DWD SHALL BE 24 INCHES IN LENGTH FOR THE FULL WIDTH OF THE STREET CONNECTION STARTING AT THE BACK OF CURB. A MAXIMUM 2-INCH BORDER SHALL BE ALLOWED ON THE SIDES OF THE DWD FOR PROPER INSTALLATION.

(R) ALSO KNOWN AS "CLEAR SPACE" PER ADA PROWAG, THE CITY REQUIRES A MINIMUM LANDING SPACE OF 4-FOOT BY 4-FOOT AT THE BOTTOM OF EVERY RAMP. THIS LANDING SPACE SHALL HAVE A CROSS SLOPE IN BOTH DIRECTIONS THAT DOES NOT EXCEED 2.0%. AND SHALL BE WHOLLY OUTSIDE THE PARALLEL VEHICULAR TRAVEL PATH.

(C) THE RAMP COMPONENT OF THE DIRECTIONAL CURB RAMP SHALL HAVE A CONTINUOUS LONGITUDINAL SLOPE MORE THAN 5% AND LESS THAN 8.3%. THE RAMP SHALL ALSO HAVE A CROSS SLOPE OF NO MORE THAN 2.0%. LENGTH OF RAMP CAN VARY, BUT SHALL NOT EXCEED 15 FEET TO ACHIEVE DESIRED ELEVATION CHANGE.

(R-I) ALSO KNOWN AS "TURNING SPACE" PER ADA PROWAG, A MINIMUM LANDING SPACE OF 4-FOOT BY 4-FOOT SHALL BE AT THE TOP OF EVERY RAMP. THIS LANDING (TURNING) SPACE SHALL HAVE A CROSS SLOPE IN BOTH DIRECTIONS THAT DOES NOT EXCEED 2.0%. LANDING MUST MATCH WIDTH OF SIDEWALK AND LENGTH SHALL BE THE SAME DISTANCE ("SQUARED" LANDING).

(C) ALL CURB RAMPS SHALL HAVE GRADE BREAKS AT THE TOP AND BOTTOM THAT ARE PERPENDICULAR TO THE DIRECTION OF THE RAMP RUN. WHERE THE ENDS OF THE BOTTOM GRADE BREAK ARE LESS THAN OR EQUAL TO 5 FEET, THE DWD SHALL BE PLACED WITHIN THE RAMP AT THE BOTTOM GRADE BREAK. WHERE EITHER END OF THE BOTTOM GRADE BREAK IS GREATER THAN 5 FEET, THE DWD SHALL BE PLACED BEHIND THE BACK OF THE CURB.

(R) PAVING CONTRACTOR SHALL LEAVE BLOCK OUT WITH A KEYWAY JOINT INSTALLED, MINIMUM OF 18 INCHES MEASURED FROM BACK OF CURB. BLOCK OUT SHALL BE POURED MONOLITHICALLY WITH CURB RAMP. CONCRETE SHALL TIE TO STREET PAVING WITH A KEYWAY JOINT PER CITY DETAIL 2050M. NO CURB SHALL BE CONSTRUCTED WHERE A DWD IS PROVIDED. THE CURB ON EITHER SIDE SHALL HAVE A TYPICAL 5 FOOT TAPER TO TRANSITION FROM THE STANDARD 6-INCH CURB HEIGHT TO BE FLUSH WITH RAMP.

ALL WORK ASSOCIATED WITH ACCESSIBLE ROUTES SHALL BE INSTALLED FLUSH WITH ALL FEATURES TO MINIMIZE VERTICAL SURFACE DISCONTINUITIES. EACH SEGMENT ALONG ACCESSIBLE ROUTE SHALL BE FLUSH WITH NO MORE (ZERO TOLERANCE) THAN A 1/4-INCH GRADE SEPARATION (ELEVATION DIFFERENCE), OR 1/2-INCH GRADE SEPARATION IF BEVELED (BEVEL SLOPE SHALL NOT BE STEEPER THAN 50%).

(R) A SIDEWALK HEADER SHALL BE CONSTRUCTED AT ENDS OF ALL WORK PERFORMED.

ii) STREET CROSSINGS SHALL ADHERE TO SAME GUIDELINES AS OTHER ACCESSIBLE ROUTES WITHIN PUBLIC RIGHT-OF-WAY, AND SHALL BE FOR THE FULL WIDTH OF THE IN-LINE ACCESSIBLE ROUTE. CROSS SLOPE SHALL NOT EXCEED 2%. NEW STREET CONSTRUCTION SHALL INCORPORATE ALL ADA DESIGN REQUIREMENTS. IT SHALL BE THE RESPONSIBILITY OF THE DESIGN PROFESSIONAL AND CONTRACTOR TO ENSURE ALL STREET CROSSINGS MEET THE REQUIREMENTS OF PROWAG. STREET ALTERATIONS ON EXISTING STREETS TO BRING TO COMPLIANCE SHALL BE AT THE CITY ENGINEER'S DISCRETION.

0 ALL CURBS CONSTRUCTED AS PART OF AN ADA RAMP SHALL MATCH CITY CURB STANDARDS.

* SEE PROWAG SPECIAL DESIGN CONSIDERATIONS WHEN STREET CROSSING HAS NO STOP OR YIELD CONDITION.

DETECTABLE WARNING DEVICE

1. CURB RAMPS MUST CONTAIN A DETECTABLE WARNING SURFACE THAT CONSISTS OF RAISED TRUNCATED DOMES COMPLYING WITH SECTION 705 OF THE TAS. THE SURFACE MUST CONTRAST VISUALLY WITH ADJOINING SURFACES. FURNISH AND INSTALL AN APPROVED CAST-IN-PLACE DARK RED DETECTABLE WARNING SURFACE MATERIAL ADJACENT TO UNCOLORED CONCRETE, UNLESS SPECIFIED ELSEWHERE IN THE PLANS.
2. DETECTABLE WARNING MATERIALS MUST MEET CITY OF ANNA MATERIAL SPECIFICATION (REFER TO TXDOT APPROVED VENDOR LIST) AND BE LISTED ON THE MATERIAL PRODUCER LIST. INSTALL PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
3. DETECTABLE WARNING SURFACES MUST BE SLIP RESISTANT AND NOT ALLOW WATER TO ACCUMULATE.
4. DETECTABLE WARNING SURFACES SHALL BE A MINIMUM OF 24" IN DEPTH IN THE DIRECTION OF PEDESTRIAN TRAVEL, AND EXTEND THE FULL WIDTH OF THE CURB RAMP OR LANDING WHERE THE PEDESTRIAN ACCESS ROUTE ENTERS THE STREET.
5. DETECTABLE WARNING SURFACES SHALL BE LOCATED SO THAT THE EDGE NEAREST THE CURB LINE IS AT THE BACK OF CURB. WHEN PLACED ON THE RAMP, ALIGN THE ROWS OF DOMES TO BE PERPENDICULAR TO THE GRADE BREAK BETWEEN THE RAMP RUN AND THE STREET. WHERE DETECTABLE WARNING SURFACES ARE PROVIDED ON A SURFACE WITH A SLOPE THAT IS LESS THAN 5 PERCENT, DOME ORIENTATION IS LESS CRITICAL. DETECTABLE WARNING SURFACES MAY BE CURVED ALONG THE CORNER RADIUS.

SIDEWALKS

6. PROVIDE CLEAR GROUND SPACE AT OPERABLE PARTS, INCLUDING PEDESTRIAN PUSH BUTTONS. OPERABLE PARTS SHALL BE PLACED WITHIN ONE OR MORE REACH RANGES SPECIFIED IN TAS 308.
7. PLACE TRAFFIC SIGNAL OR ILLUMINATION POLES, GROUND BOXES, CONTROLLER BOXES, SIGNS, DRAINAGE FACILITIES AND OTHER ITEMS SO AS NOT TO OBSTRUCT THE PEDESTRIAN ACCESS ROUTE OR CLEAR GROUND SPACE.
8. STREET GRADES AND CROSS SLOPES SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
9. CHANGES IN LEVEL GREATER THAN 1/4 INCH ARE NOT PERMITTED (1/2 INCH WITH BEVEL).
10. WHERE A 4' SIDEWALK IS PROVIDED, A 5'X 5' PASSING AREAS ARE REQUIRED AT INTERVALS NOT TO EXCEED 200'.
11. THE LEAST POSSIBLE GRADE SHOULD BE USED TO MAXIMIZE ACCESSIBILITY. THE RUNNING SLOPE OF SIDEWALKS AND CROSSWALKS WITHIN THE PUBLIC RIGHT OF WAY MAY FOLLOW THE GRADE OF THE PARALLEL ROADWAY. WHERE A CONTINUOUS GRADE GREATER THAN 5% MUST BE PROVIDED, HANDRAILS MAY BE DESIRABLE TO IMPROVE ACCESSIBILITY. HANDRAILS MAY ALSO BE NEEDED TO PROTECT PEDESTRIANS FROM POTENTIALLY HAZARDOUS CONDITIONS. IF PROVIDED, HANDRAILS SHALL COMPLY WITH TAS 505.
12. HANDRAIL EXTENSIONS SHALL NOT PROTRUDE INTO THE USABLE LANDING AREA OR INTO INTERSECTING PEDESTRIAN ROUTES.

BARRIER FREE RAMP

TYPE 'B' (2 OF 2)

STANDARD DRAWING NO.

PAV-11A

INSTALL 18" #3 SMOOTH -
DOWEL BARS AT 18" O.C. -
DRILL 9" INTO EX. SIDEWALK

3:
ci
a:

EXISTING
SIDEWALK

4'-0"
SIDEWALK

BRICK RED DETECTABLE WARNING SURFACE
SHALL BE PROVIDED AS SHOWN BY INSTALLING
WET SET ADA REPLACEABLE TACTILE WARNING
SURFACE UNIT ADA REP MANUFACTURED BY
ADA SOLUTIONS, INC OR APPROVED EQUAL.
INSTALL ACCORDING TO MANUFACTURER
RECOMMENDATIONS. USE ONLY MANUFACTURED
STANDARD SIZES.

PAY LIMIT FOR
RAMP

2.0% MAX
2.0% MAX

FACE OF CURB

LANDING

CURB

6" TRANSITION

BEGIN MAX 2.0%
SLOPE 12" FROM
ACCESSIBLE ROUTE

*STREET GRADE NOT TO
EXCEED 2.0% ACROSS
ACCESSIBLE ROUTES
(STREET CROSSING)

R.O.W.
PAY LIMIT
FOR RAMP

BOTTOM LANDING
(4'X4' MIN)

8.3% MAX

-2.0% MAX-

2.0% MAX
1.2% MIN

2.0% MAX
1.2% MIN

RAMP

4'X4' LANDING

PLACE NEAREST EDGE OF
DETECTABLE WARNING 2" FROM
BACK OF CURB

2'X4'
DETECTAB
WARNING

LE

BLOCK OUT

18" MIN.

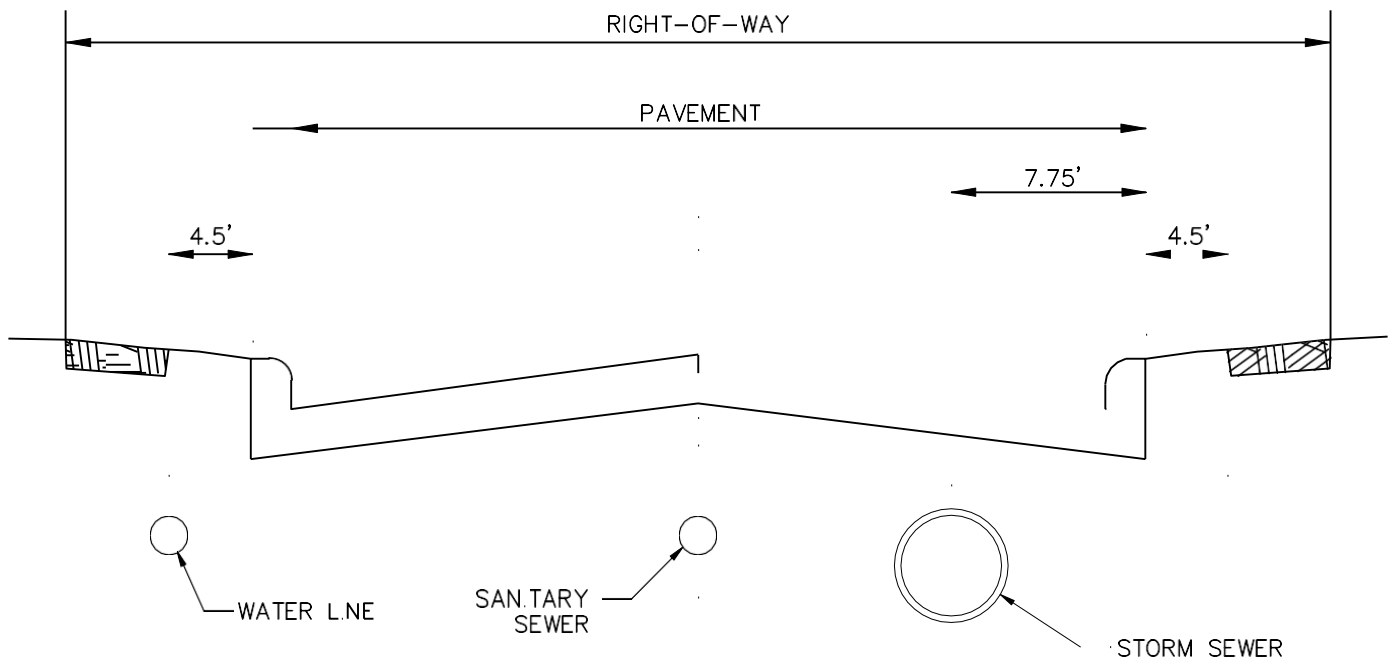
*FOR STREET CROSSINGS WITH
STOP OR YIELD CONTROL.

BARRIER FREE RAMP

STANDARD DRAWING NO.

TYPE 'C'

PAV-12

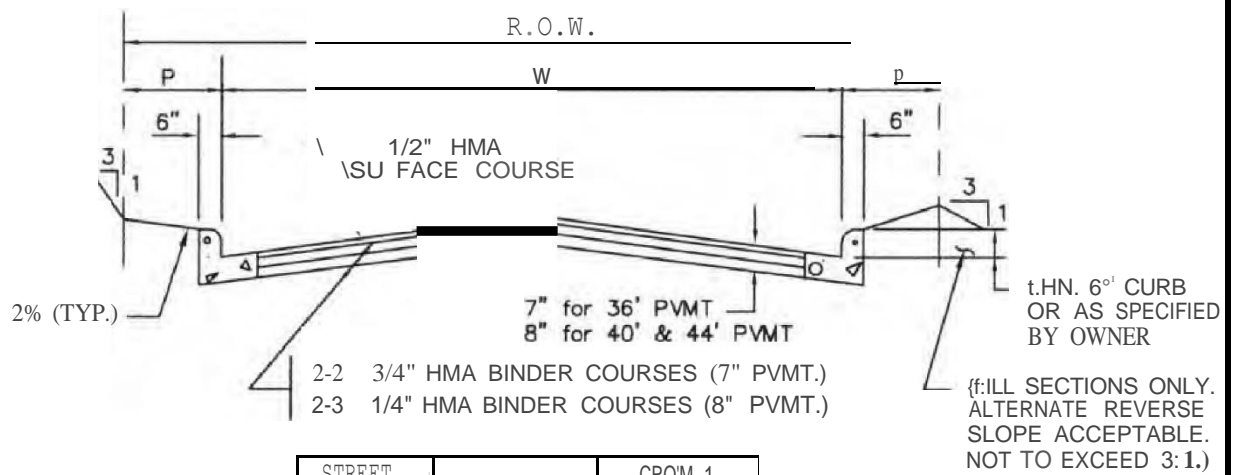


TYPICAL UTILITY LOCATION

IN PAVEMENT

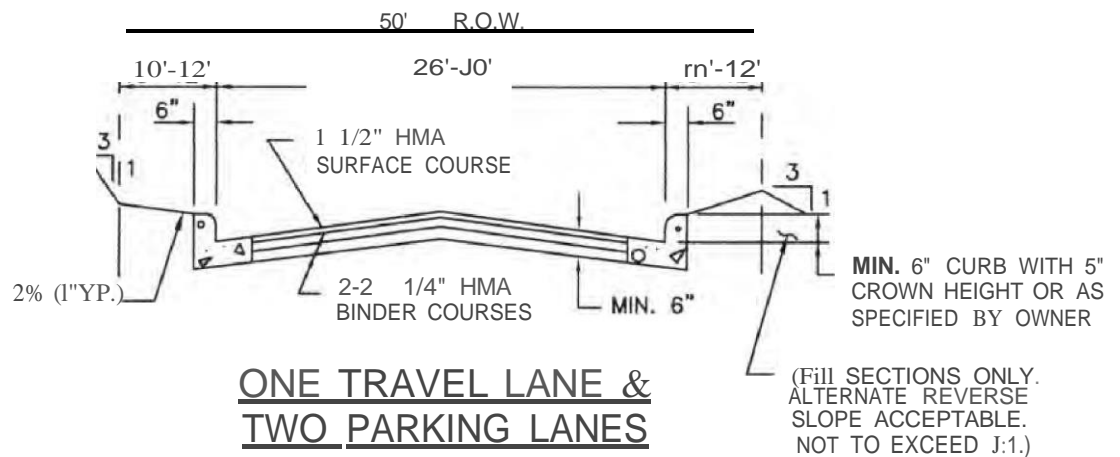
STANDARD DRAWING NO.

PAV-13



FOUR TRAVEL LANES OR TWO TRAVEL LANES & TWO PARKING LANES

N.T.S.



ONE TRAVEL LANE & TWO PARKING LANES

N.T.S.

NOTES:

1. A SOIL INVESTIGATION FOR SUBGRADE DESIGN SHALL BE CONDUCTED BY THE ENGINEER THIS DESIGN SHALL BE APPROVED BY THE OWNER PRIOR TO CONSTRUCTION.
2. WHERE FULL-DEPTH ASPHALT PAVEMENTS ARE BEING CONSIDERED FOR USE, THE ASPHALT PAVEMENT THICKNESS SHALL BE BASED UPON NECESSARY SUBGRADE ANALYSES AND PAVEMENT THICKNESS DESIGN DETERMINATIONS AS APPROVED BY THE OWNER. THICKNESSES SHOWN ARE TYPICAL
3. TACK COAT BETWEEN COURSES AS REQUIRED.

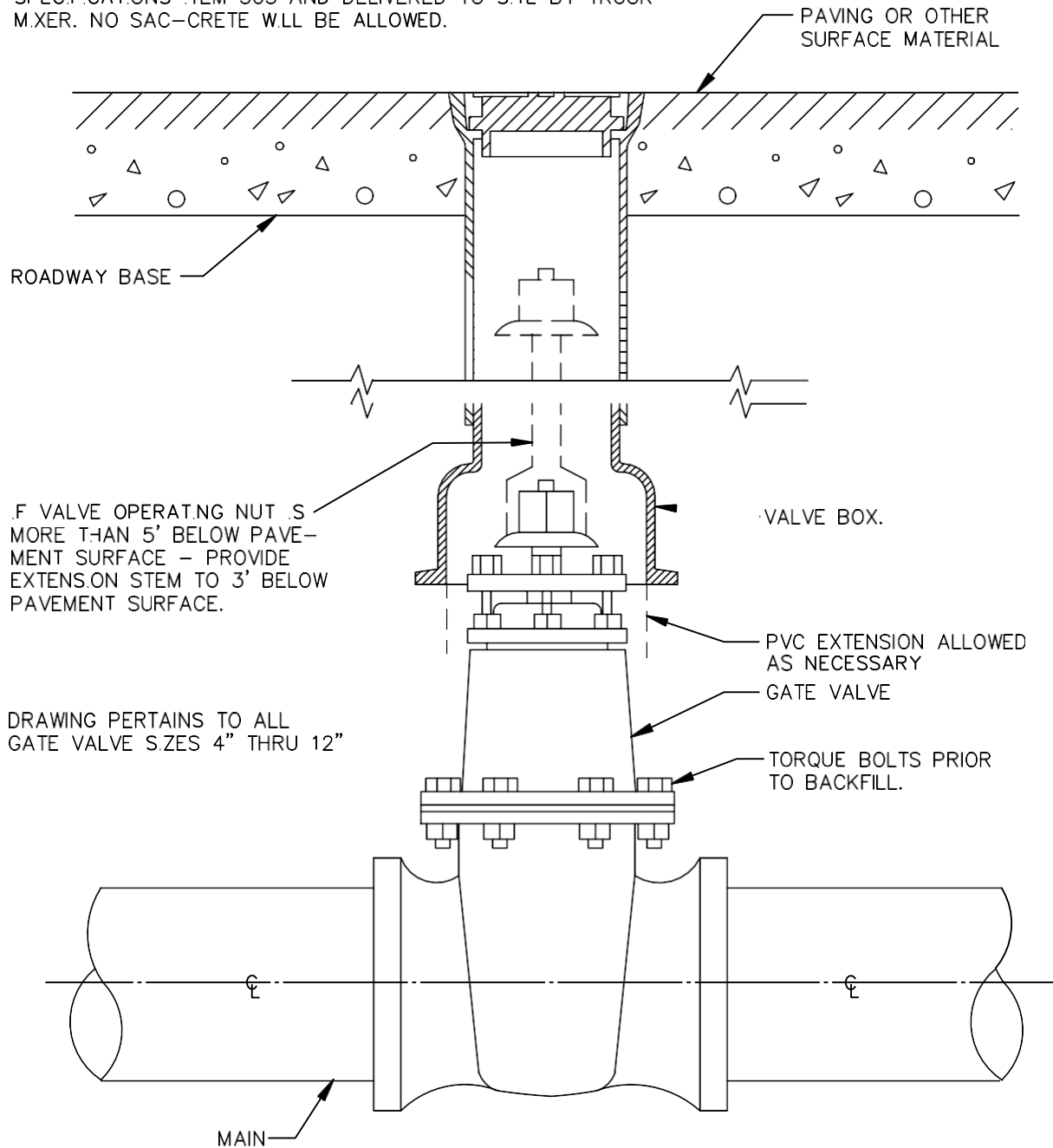
HOT MIX ASPHALT PAVEMENT

2- & 4-LANE UNDIVIDED THOROUGHFARE

PAV-14

NOTE:

IN UNPAVED AREAS, INSTALL 2' x 2' x 6" CONCRETE VALVE PAD FLUSH WITH THE TOP OF VALVE BOX. REINFORCE WITH #3 BARS ON 6" CENTERS BOTH WAYS. CONCRETE SHALL BE IN ACCORDANCE WITH 5TH EDITION NCTCOG STANDARD SPECIFICATIONS ITEM 303 AND DELIVERED TO SITE BY TRUCK MIXER. NO SAC-CRETE WILL BE ALLOWED.



**GATE VALVE BOX AND
EXTENSION STEM**

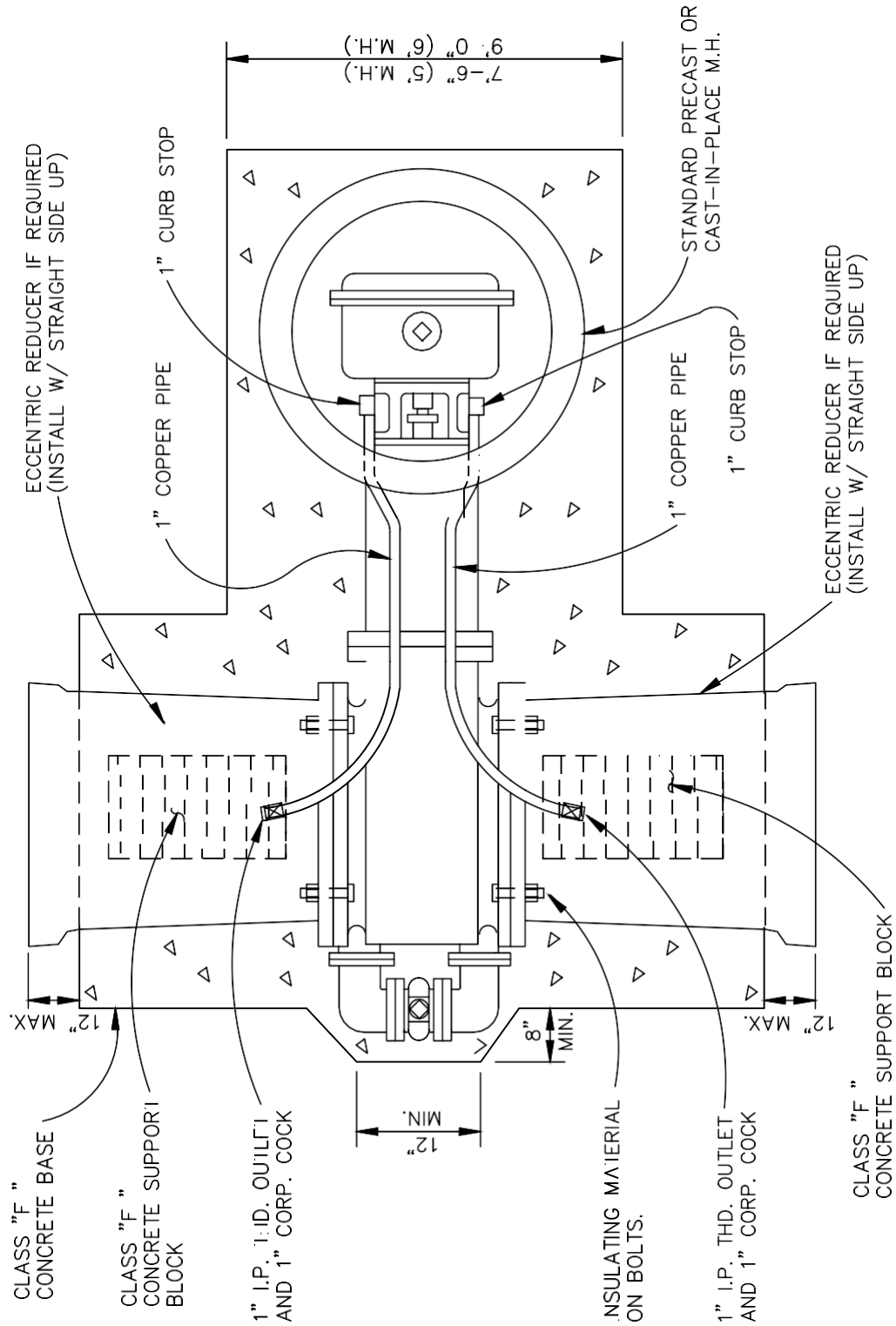
N.T.S.

GATE VALVE 4" TO 12"

BOX & EXTENSION STEM

STANDARD DRAWING NO.

WAT-01

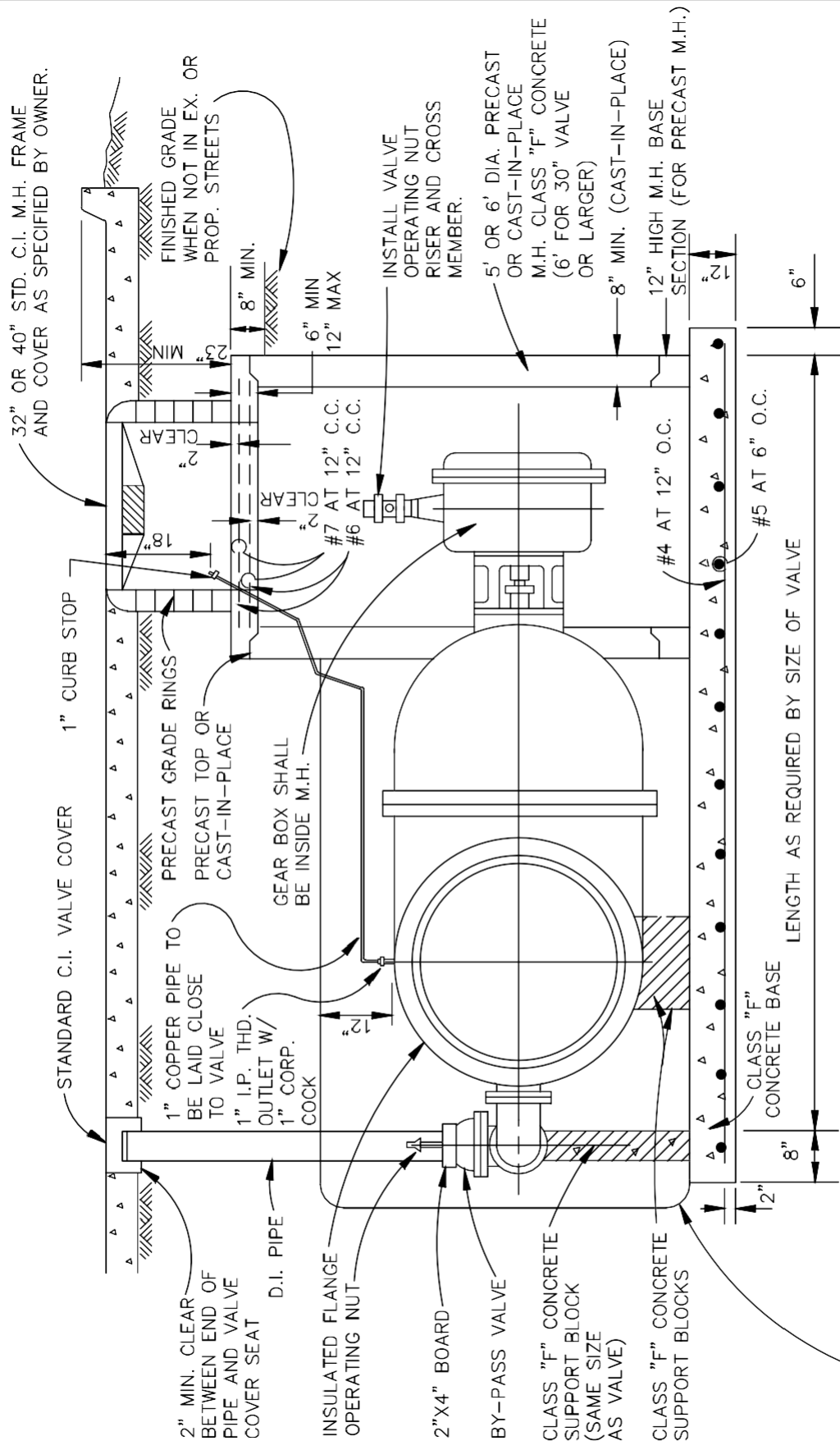


VAULT CONSTRUCTION PLAN

HORIZONTAL GATE VALVE $\geq 16"$

STANDARD DRAWING NO.

WAT-02



BACKFILL 12" AROUND VALVE BODY W/
PORTLAND CEMENT STABILIZED SAND
2 SACKS PER CUBIC YARD.

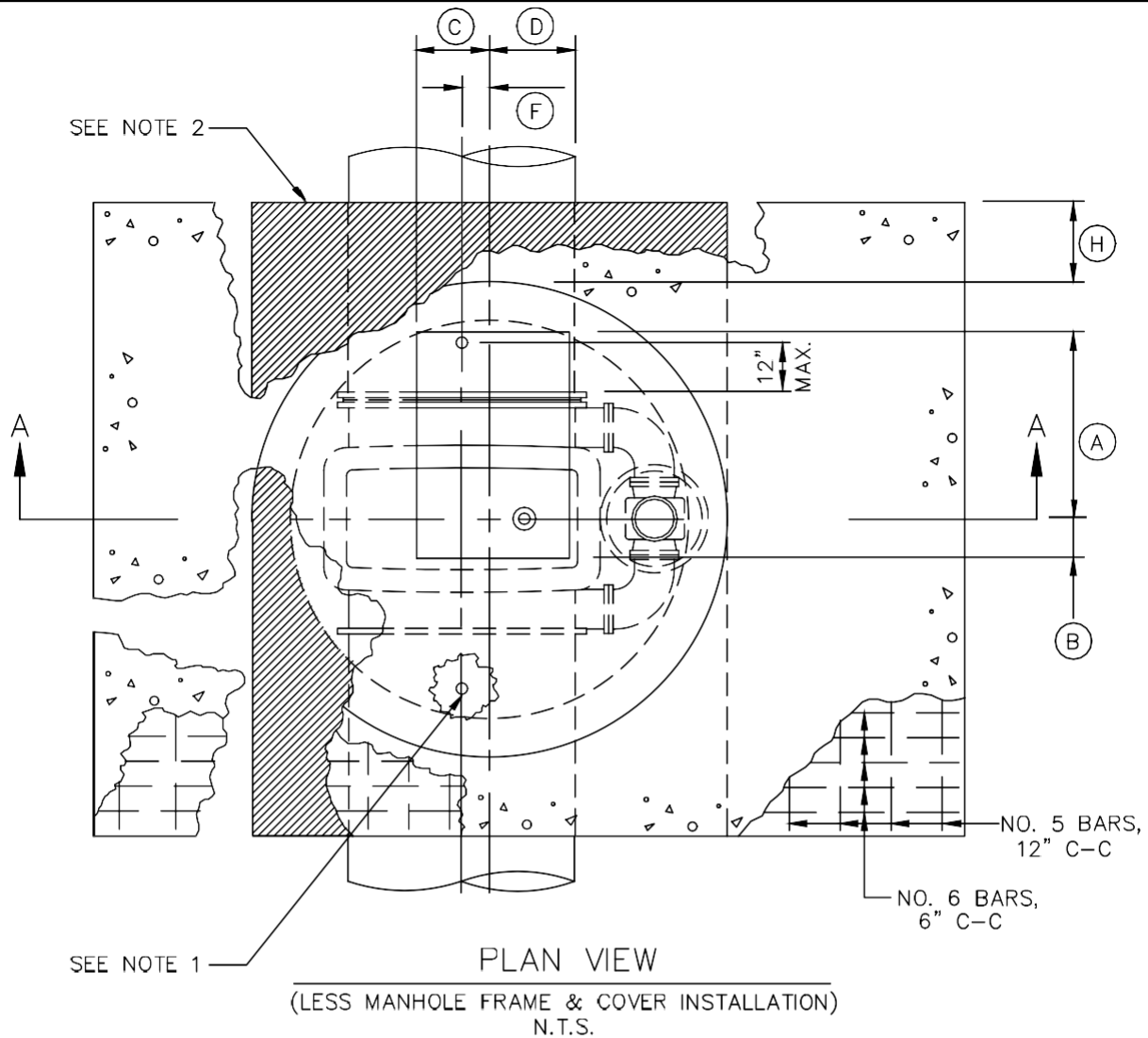
PROFILE
N.T.S.

VAULT CONSTRUCTION PROFILE

HORIZONTAL GATE VALVE $\geq 16"$

STANDARD DRAWING NO.

WAT-03



GATE VALVE SIZE	DIMENSION TABLE											
	A	B	C	D	E	F	G	H	J	K	L	M
16"	20"	20"	12"	12"	44 1/2"	1"	48"	12"	10"	24"	12"	16"
18"	20"	20"	12"	12"	51 3/8"	2"	48"	12"	12"	24"	12"	18"
20"	22"	18"	12"	12"	56 5/8"	1"	54"	12"	12"	24"	16"	20"
24"	26"	14"	12"	12"	64 3/8"	1"	60"	18"	14"	30"	18"	24"
30"	28"	12"	12"	12"	80 5/8"	3"	66"	18"	18"	30"	20"	30"
36"	32"	8"	12"	12"	90 1/16"	4"	72"	18"	18"	36"	24"	36"
42"	34"	6"	15"	9"	107 3/4"	5"	78"	24"	20"	36"	30"	42"
48"	36"	4"	14"	10"	121 5/8"	4"	90"	24"	26"	42"	36"	48"
54"	36"	4"	9"	15"	142 1/2"	3"	102"	24"	32"	46"	40"	54"

NOTES:

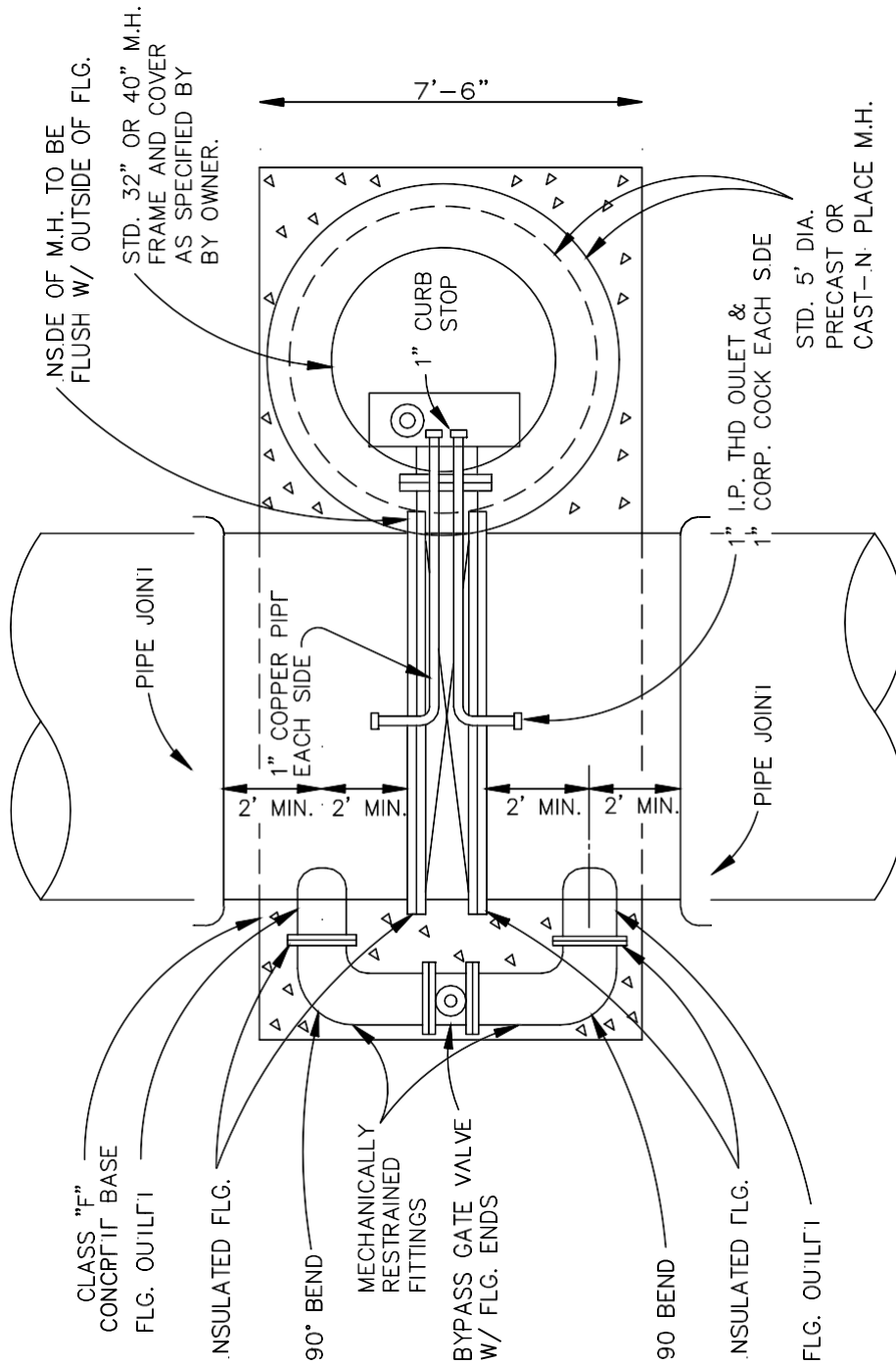
1. PROVIDE CORPORATION AND CURB STOPS A MAXIMUM OF 12" FROM EACH END OF GATE VALVE, AS SHOWN. CORPORATION AND CURB STOP SIZES SHALL BE 1" FOR 16", 20", AND 24" NOMINAL PIPE DIAMETERS; 2" FOR 30" AND LARGER DIAMETERS. 2" TAPS SHALL BE MADE AS A 2" FLANGED OUTLET WITH INSULATED ADAPTOR KIT. COPPER RISERS SHALL BE PROVIDED BETWEEN THE CORPORATION AND CURB STOPS. CURB STOPS SHALL BE INSTALLED AT AN ELEVATION 12" ABOVE THE TOP SURFACE OF VAULT BOTTOM SLAB.
2. POLYURETHANE CUSHION PAD.

VAULT CONSTRUCTION DIMENSIONS

VERTICAL GATE VALVE $\geq 16"$

STANDARD DRAWING NO.

WAT-04

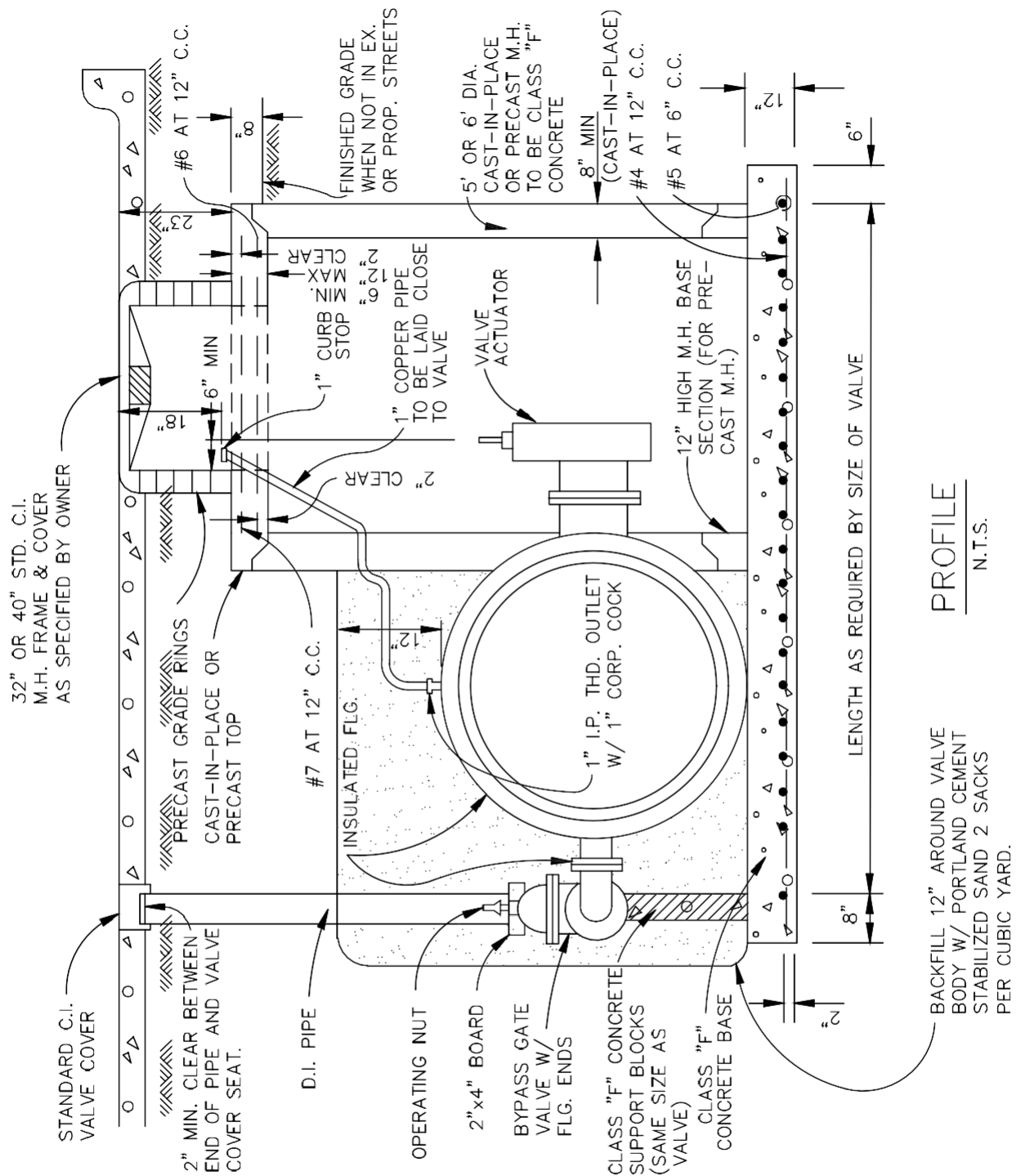


VAULT CONSTRUCTION PLAN

BUTTERFLY VALVE ≥ 16"

STANDARD DRAWING NO.

WAT-06



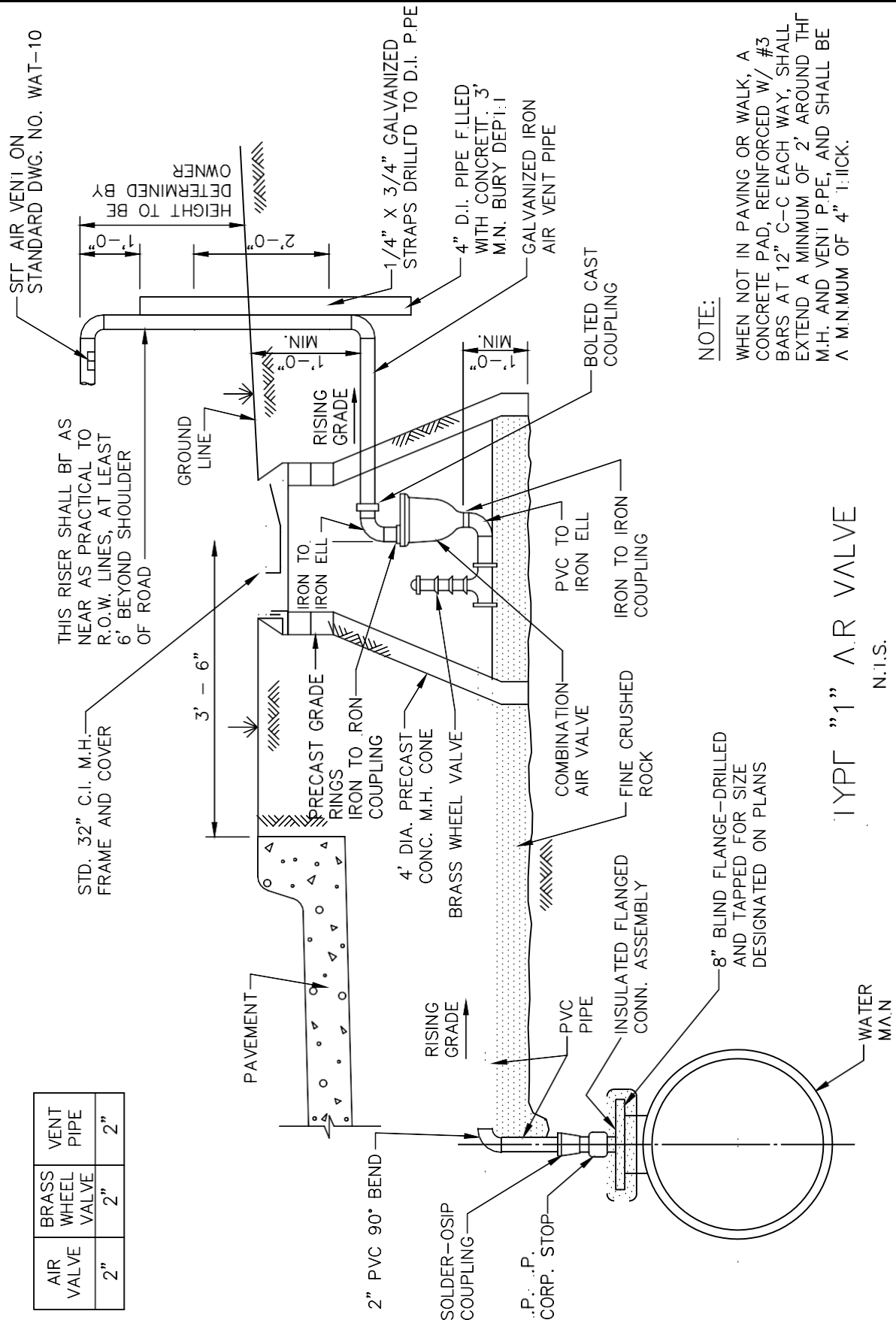
PROFILE
N.T.S.

VAULT CONSTRUCTION PROFILE

BUTTERFLY VALVE $\geq 16"$

STANDARD DRAWING NO.

WAT-07

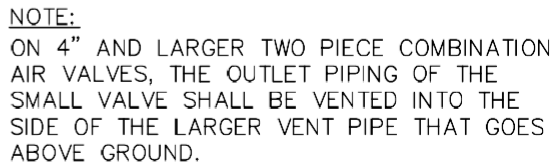
STANDARD DRAWING NO.WAT-08

NOTE:

WHEN NOT IN PAVING OR WALK, A
CONCRETE PAD, REINFORCED W/ #3
BARS AT 12" C-C EACH WAY, SHALL
EXTEND A MINIMUM OF 2' AROUND THE
M.H. AND VENT P.I.P.E. AND SHALL BE
A MINIMUM OF 4" THICK.

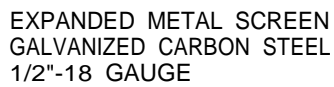
TYPE "1" A.R. VALVE
N.I.S.

WHEN NOT IN PAVING OR WALK, A CONCRETE PAD REINFORCED W/ #3 BARS AT 12" C-C EACH WAY, SHALL EXTEND A MINIMUM OF 2' AROUND THE M.H. AND VENT PIPE, AND SHALL BE A MINIMUM OF 4" THICK.



N.T.S.

	COMBINATION AIR VACUUM VALVE	STANDARD DRAWING NO.
	TYPE "2" SECTION	WAT-09



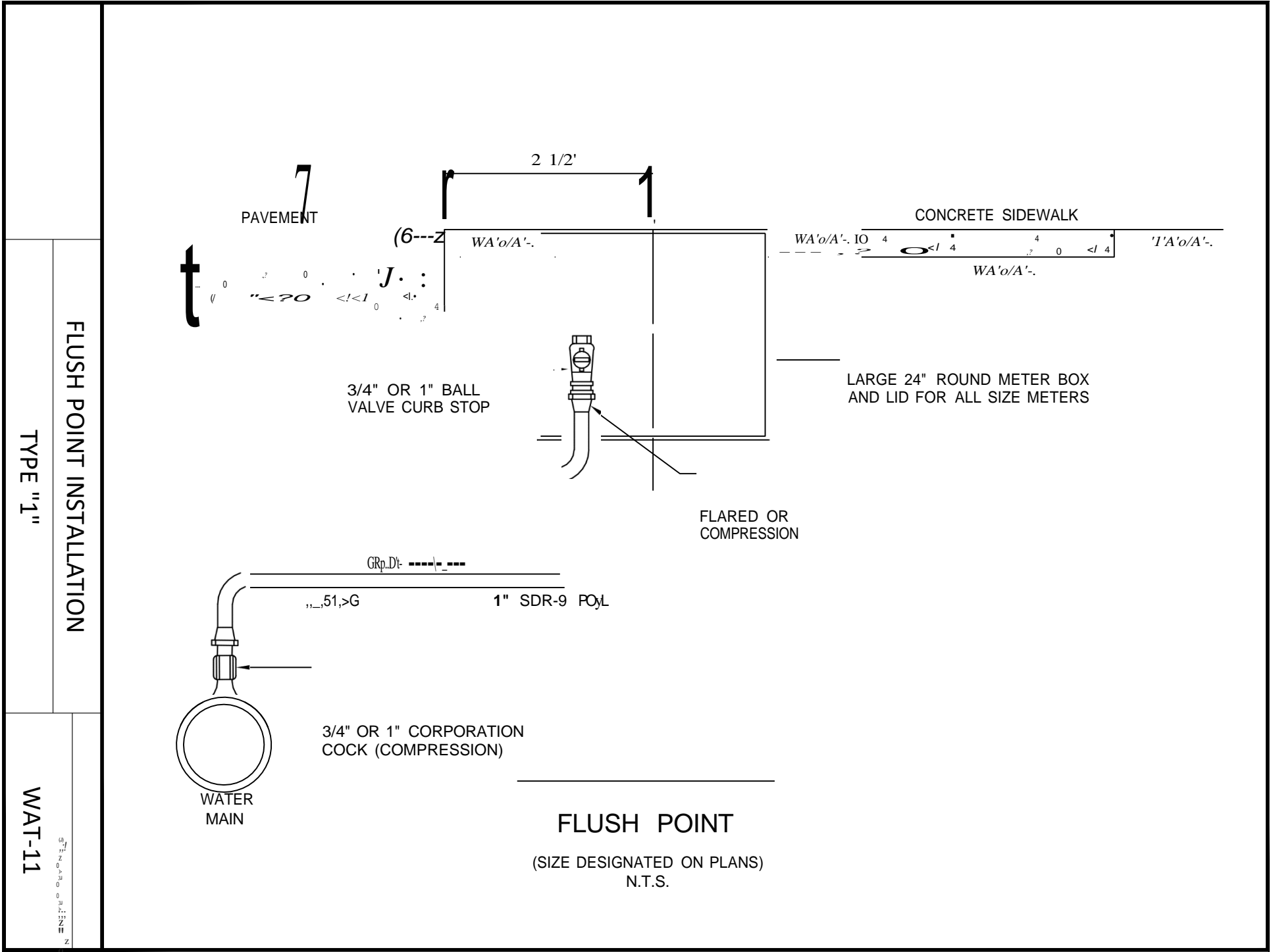
N.T.S.

AIR VALVE	GATE VALVE	FLG. OUTLET	MIN. FITTING HEIGHT	VENT PIPE D	M.H. DIA.
2"	2"	8"	26"	2"	5'
3"	3"	18"	31"	3"	5'
4"	4"	18"	38"	4"	5'
6"	6"	18"	46"	6"	5'
8"	8"	18"	53"	8"	6'
10"	10"	20"	62"	10"	6'
12"	12"	24"	72"	12"	6'

N.T.S.

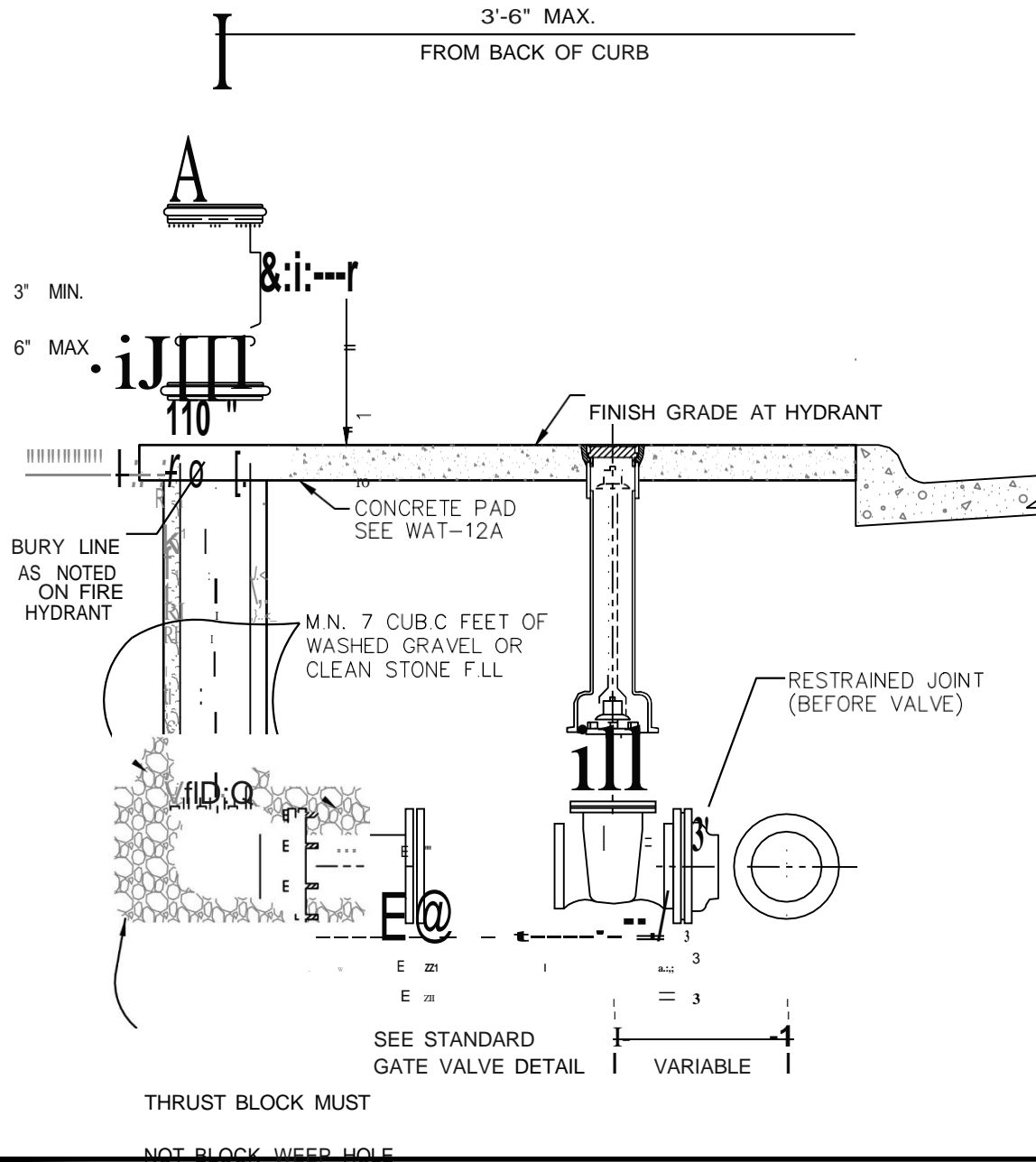
TYPE "2"

STANDARD DRAWING NO.
WAT-10



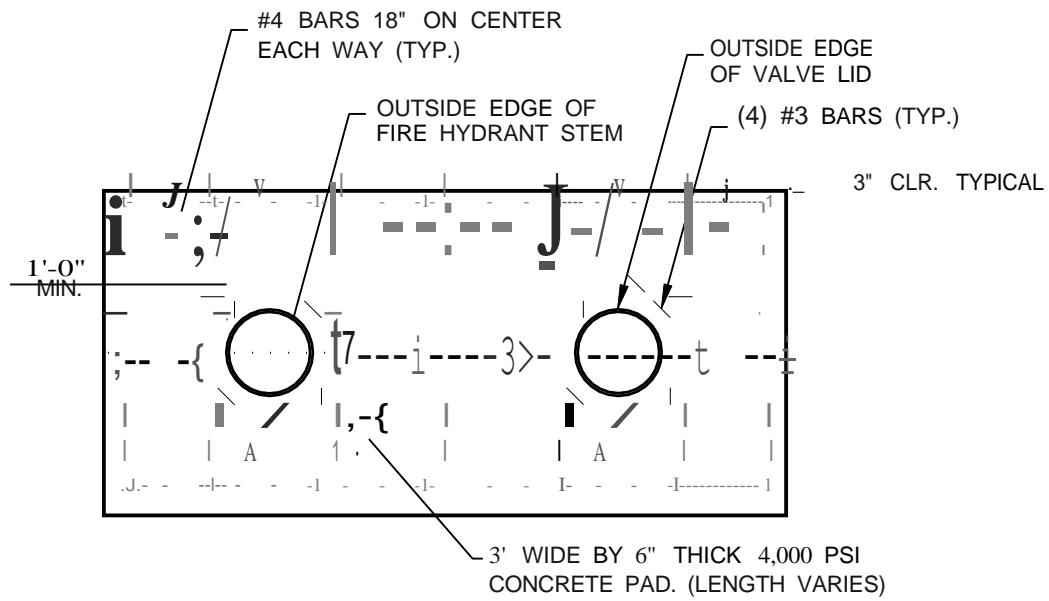
FIRE HYDRANT INSTALLATION

WAT-12

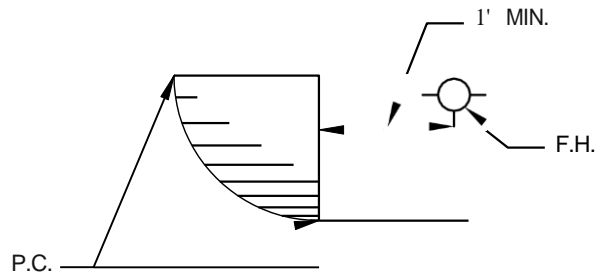


NOTES:

1. IN GENERAL, ALL FIRE HYDRANTS SHALL CONFORM TO AWWA STANDARD SPECIFICATIONS FOR FIRE HYDRANTS FOR ORDINARY WATER WORKS SERVICE, C-502. FIRE HYDRANTS SHALL HAVE A 5 1/4" MIN. VALVE OPENING AND A BARREL APPROXIMATELY 7" INSIDE DIAMETER. ALL HYDRANTS SHALL BE EQUIPPED WITH A BREAKAWAY FLANGE.
2. ALL JOINTS SHALL BE MECHANICAL JOINTS.
3. TYPICAL VALVE: ACTUAL VALVE LOCATION WILL DEPEND ON LOCATION OF WATER MAIN.
4. F.H. NO CLOSER THAN 18" TO EXISTING OR PROPOSED SIDEWALKS. (USUAL)
5. STANDARD BURY DEPTH 5' FEET.
6. SET FIRE HYDRANT ON THE LOT LINE EXTENDED WHEN POSSIBLE.
7. F.H. SHALL BE LOCATED MINIMUM 1 FT. OUTSIDE OF THE AREA BETWEEN THE P.C.'S OF THE CORNER TURNING RADII AT INTERSECTIONS. (SEE PLAN VIEW ON WAT-12A)
8. NO MORE THAN 2 EXTENSIONS SHALL BE PERMITTED.



PLAN VIEW REBAR
N.T.S.



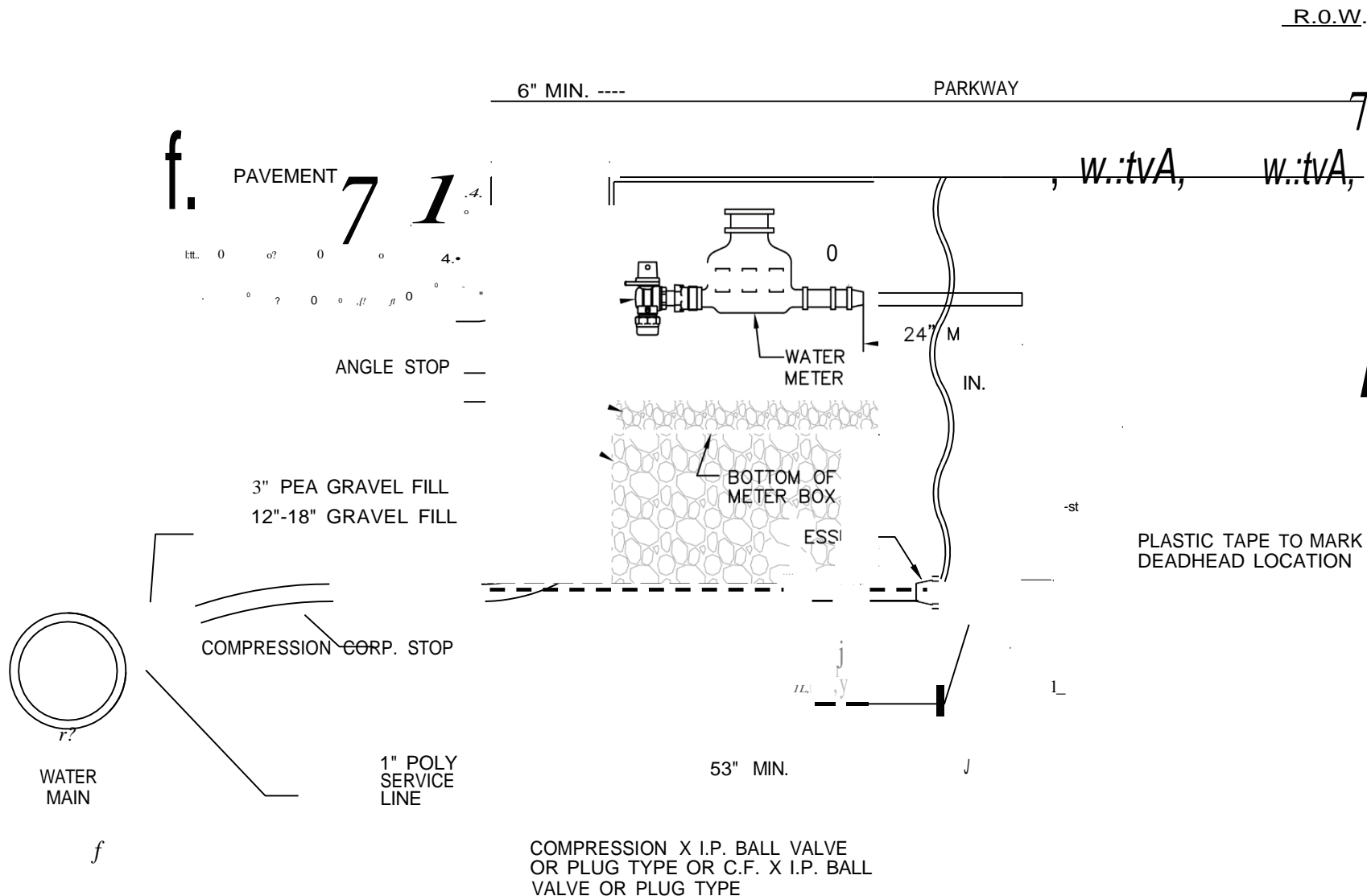
PLAN EW - PLACEMENT
N.T.S.

	FIRE HYDRANT		STANDARD DRAWING NO.
	REBAR & PLACEMENT		WAT-12A

WATER SERVICE INSTALLATION

1" LINE

WAT-13

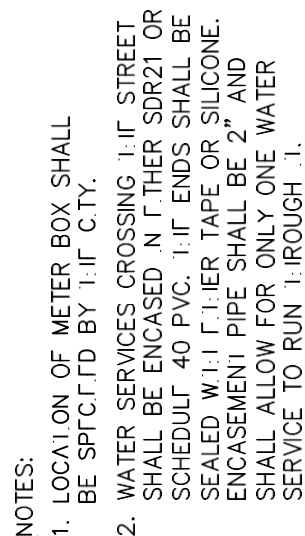


LOCATION OF TAPS TO BE AT 45°. TAPS SHALL BE MADE WITH TAPERED THREADS.

NOTES:

1. LOCATION OF METER BOX SHALL BE SPECIFIED BY THE CITY.
2. WATER SERVICES CROSSING THE STREET SHALL BE ENCASED IN EITHER SDR21 OR SCHEDULE 40 PVC. THE ENDS SHALL BE SEALED WITH EITHER TAPE OR SILICONE.

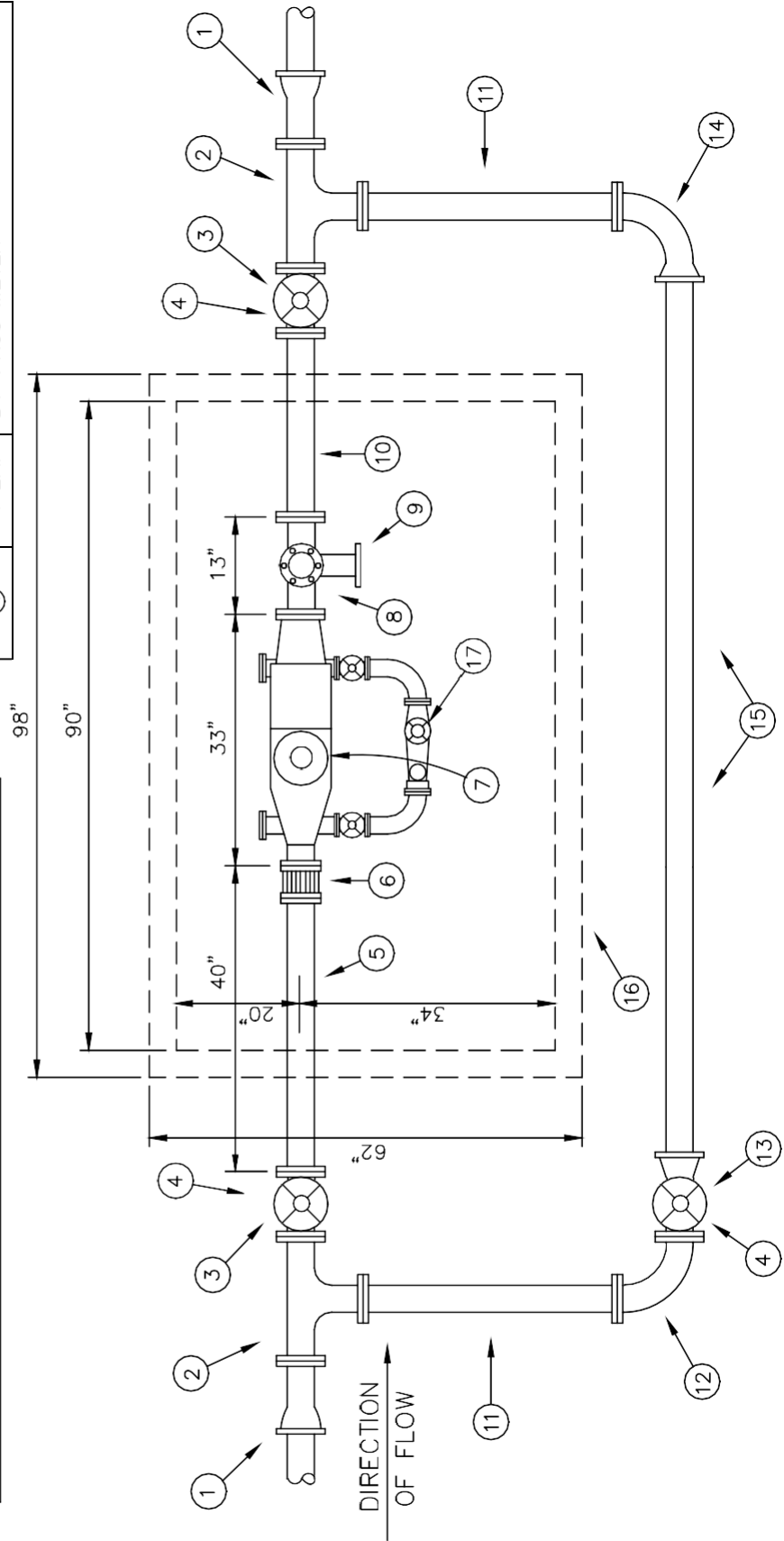
ENCASEMENT PIPE SHALL BE 2" AND SHALL ALLOW FOR ONLY ONE
WATER SERVICE TO RUN THROUGH IT.



WAT-14

MATERIALS LIST	
PART NO.	DESCRIPTION
①	4" X 12" D.I. NIPPLE M.J. X F.
②	4" X 4" D.I. TEE F. X F.
③	4" GATE VALVE F. X F.
④	VALVE STACK RISER COVER & LID
⑤	4" X 40" D.I. NIPPLE F. X SLEEVE
⑥	4" FLANGED COUPLING ADAPTER
⑦	4" METER AS SPECIFIED (TYPE F.M. SHOWN)
⑧	4" X 4" D.I. TEE F. X F. (TEST POINT)
⑨	4" BLIND FLG.

MATERIALS LIST	
PART NO.	DESCRIPTION
⑩	4" X 24" D.I. NIPPLE F. X F.
⑪	4" X 36" D.I. NIPPLE F. X F.
⑫	4" D.I. 90° BEND F. X F.
⑬	4" GATE VALVE F. X M.J.
⑭	4" D.I. 90° BEND M.J. X F.
⑮	4" D.I. PIPE, CLASS 52, APPROX. 10'
⑯	PRECAST METER VAULT
⑰	VAULT FLOOR (NOT SHOWN)
⑱	ACCESS HATCH (NOT SHOWN)
⑲	BY-PASS METER



4" COMBINATION WATER SERVICE

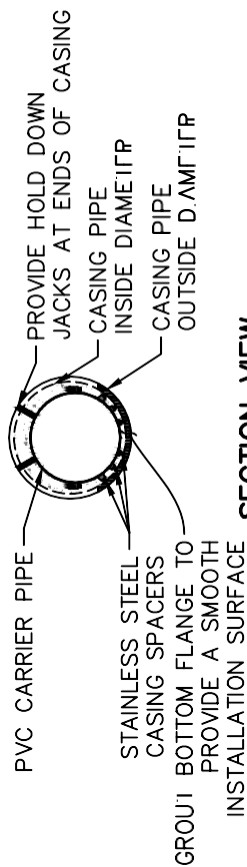
WITH 4" METER

STANDARD DRAWING NO.

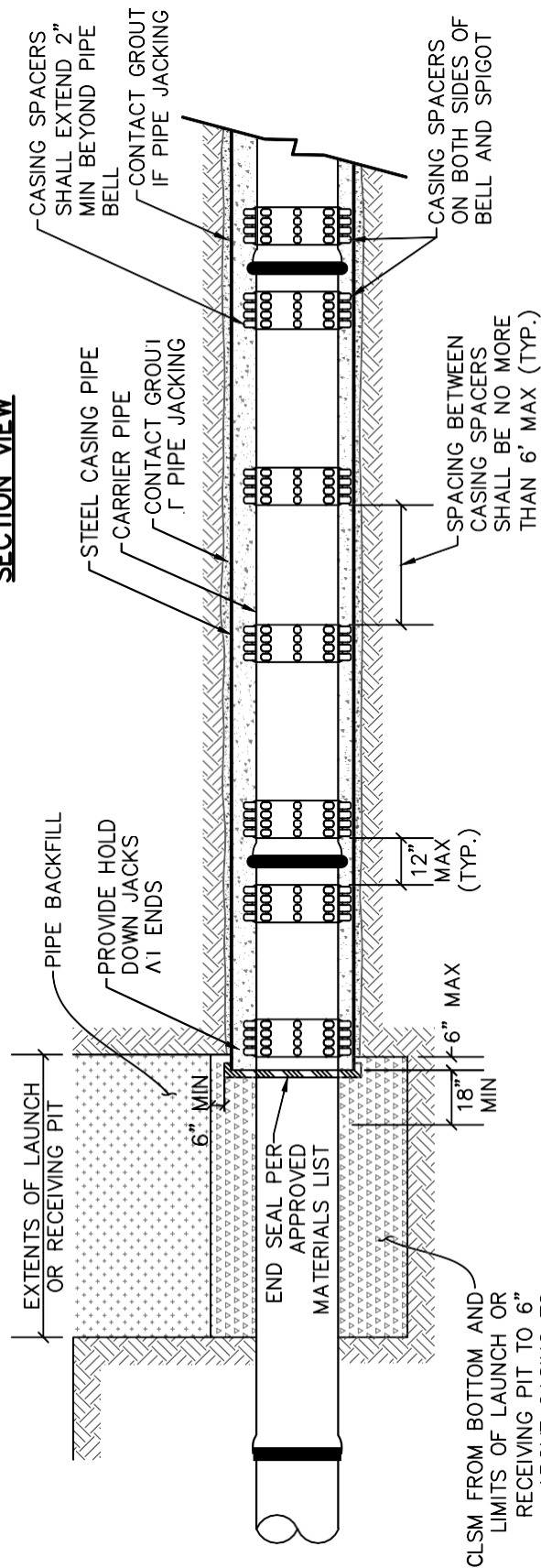
WAT-15

NOTE:

PROVIDE THREE (3) CASING SPACERS PER JOINT OF PIPE



SECTION VIEW



NOTES:

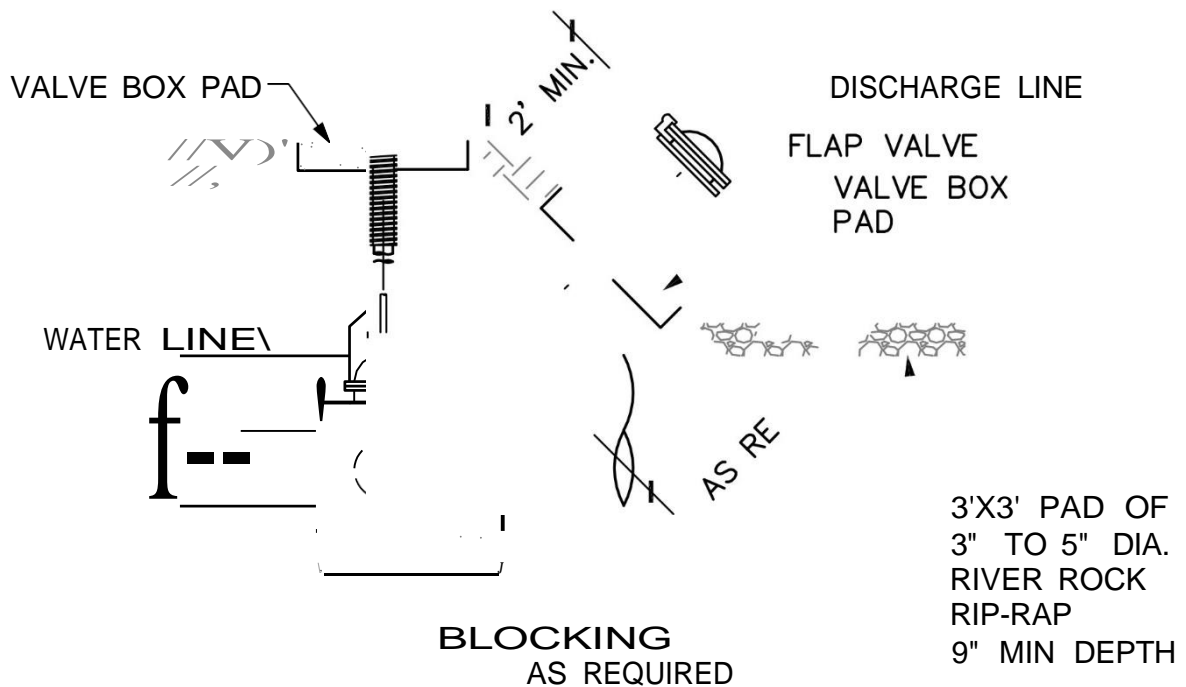
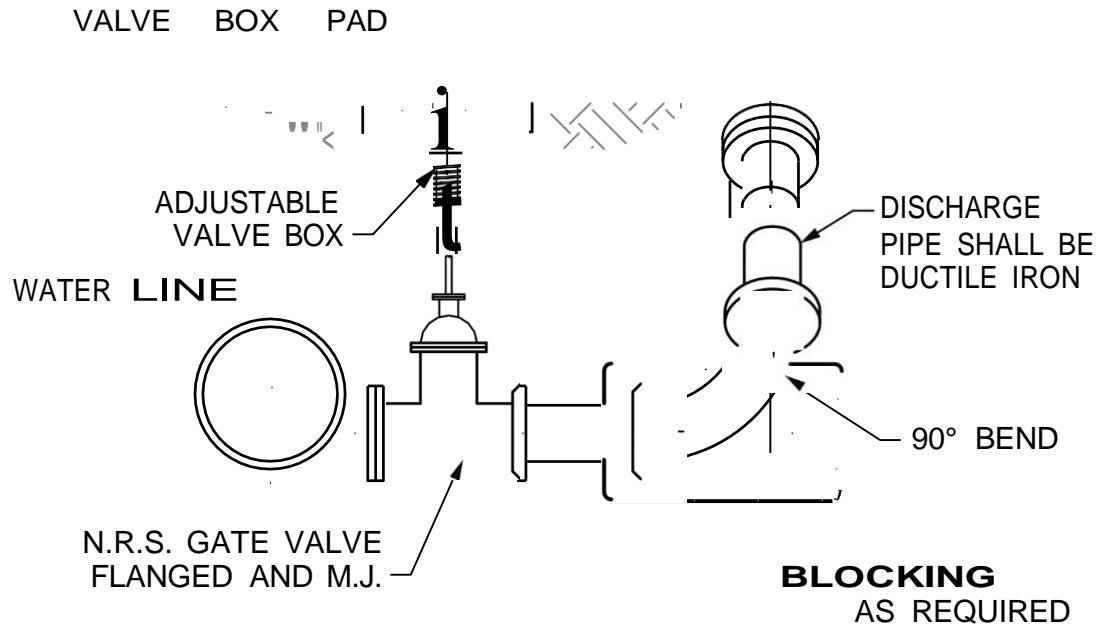
1. PIPE SHALL HAVE UNIFORM ALGNMENT AND BEARING WHEN INSTALLED AS A CARRIER PIPE IN CASING PIPE. TO PROVIDE STRAIGHT ALIGNMENT AND GRADE, CONCRETE PAVING MAY BE REQUIRED.
2. PRESSURE GROUT SPACE OUTSIDE OF CASING PIPE AFTER TUNNELS INSTALLED.
3. WHERE A BORE PIPE EXCEEDS 5 FEET IN DEPTH, THE CONTRACTOR SHALL INSTALL SHORING OF 1:1 P.I. WALLS AS REQUIRED BY OSHA.
4. FOR BELL AND SPIGOT PIPE, REMOVE ALL SLACK IN LINE PRIOR TO BACKFILL AND PRESSURE TESTING.
5. CASING SPACERS SHALL BE TIGHT SNUG OVER THE CARRIER PIPE AND POSITION THE CARRIER PIPE APPROXIMATELY IN THE CENTER OF THE CASING PIPE TO PROVIDE ADEQUATE CLEARANCE BETWEEN THE CARRIER PIPE BELL AND THE CASING PIPE. CASING SPACERS SHALL BE STAINLESS STEEL FOR WATER PIPE.
6. CASING PIPE SHALL BE 1.5 TIMES LARGER THAN THE CARRIER PIPE.

ENCASEMENT PIPE

WATER LINE BY BORE

STANDARD DRAWING NO.

WAT-16



NOTE:

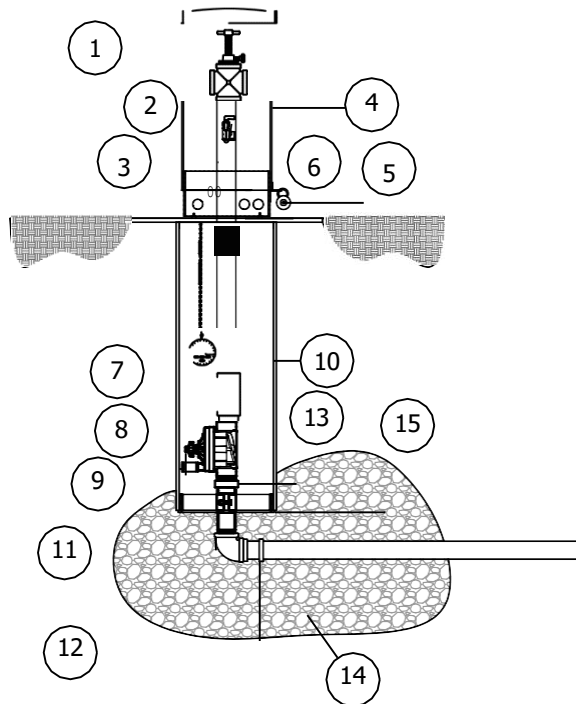
1. MUST BE DISCHARGED INTO STORM SEWER, BRIDGE OR CULVERT.

BLOW OFF VALVE

STANDARD DRAWING NO.

INSTALLATION

WAT-17



ITEM	ITEM / DESCRIPTION	OPTIONAL	BY OTHERS
1	2" WATER FLD'G RESTRICTDR		
2	SAMPLING POINT		
3	2" PVC PIPE		
4	UV RESISTANT LOCKABLE DOME ENCLOSURE		
5	LOCKING POINT		
6	REMOVABLE ACCESS PLATE		
7	CONTROLLER		
8	AUTDMATIC DRAIN		
9	2" AUTDMATIC VALVE		
10	SDR 35 SE'WER PIPE		
11	2" SS MIP INLET	X	X
12	2" MIP x COMPRESSION ADAPTER		X
13	O-RING CONNECTOR		
14	1" CLEAN ROCK		X
15	DEBRIS PLATE		

NOTES:

1. AUTOMATIC FLUSHING DEVICE SHALL HAVE A 2" STAINLESS STEEL MIP INLET, THAT WILL LEAD VERTICALLY TO THE BOTTOM INTO A 2" AUTOMATIC FLUSHING VALVE.
2. THE FLUSHING VALVE SHALL CONTROL THE FLOW OF WATER THROUGH THE HYDRANT AND ITS DIAPHRAGM WITH THE EXTENSION AND RETRACTION OF A DC LATCHING SOLENOID AND HAVE A 220 PSI RATING.
3. EACH UNIT SHALL BE FURNISHED WITH A STAND-ALONE VALVE CONTROLLER. VALVE CONTROLLER WILL NOT REQUIRE A SECOND HAND-HELD DEVICE FOR PROGRAMMING. CONTROLLER MUST HAVE MINIMUM OF 12 POSSIBLE FLUSHING CYCLES PER DAY.
4. SHALL BE SUBMERSIBLE TO 12 FEET, OPERATE WITH A 9 VOLT BATTERY AND HAVE RESIN-SEATED ELECTRICAL COMPONENTS.
5. SOLENOID SHALL HAVE NO LOOSE PARTS WHEN REMOVED FROM VALVE. REMOVAL OF 2" SOLENOID VALVE SHALL BE POSSIBLE VIA AN O-RING CONNECTOR LOCATED UNDER THE VALVE AFTER REMOVAL OF STAINLESS STEEL ACCESS PLATE.
6. VALVE ASSEMBLY SHALL BE CONTAINED WITHIN A UV-RESISTANT LOCKING COVER.
7. UNIT MODEL # SHALL BE 9400 AS MANUFACTURED BY KUPFERLE FOUNDRY COMPANY. MODEL #9400 ST. LOUIS, MO. 1-800-231-3990, OR APPROVED EQUAL.
8. FLUSH WATER LINES FREE OF DEBRIS BEFORE INSTALLATION

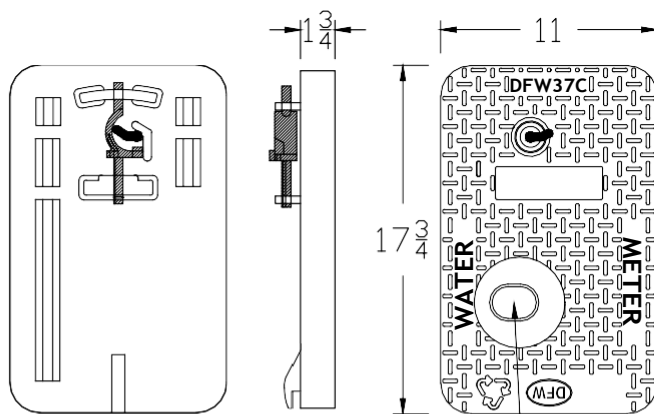
AUTOMATIC FLUSHING DEVICE

N.T.S.

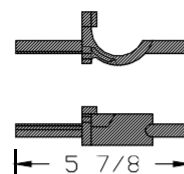
AUTOMATIC FLUSH VALVE

STANDARD DRAWING NO.

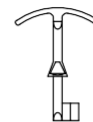
WAT-18



Ø 4 3/8" x 1/2" DEEP RECESS
W/ Ø 1.88 x 2.50
KNOCKOUT FOR ENDPOINT



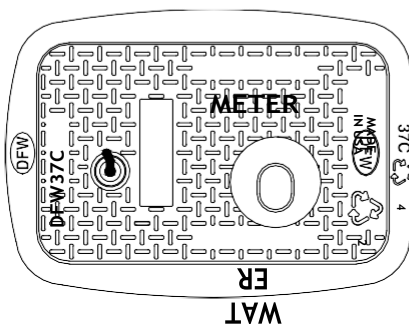
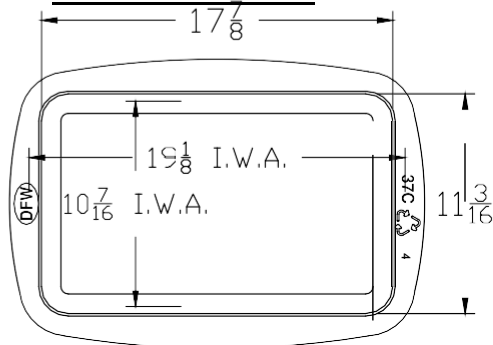
DFW-PLOCK



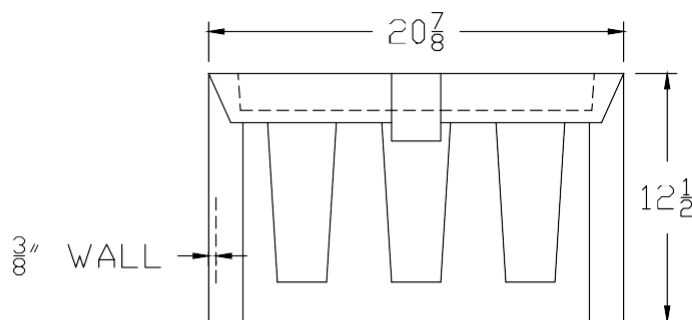
DFW-KEY

1	BLACK COLOR
K	PLASTIC LOCK
F	KNOCKOUT
DEEP	DEEP RECESS

DFW37C-1KFDEEP -LID



DFW37C-12-1KFDEEP



DFW37C-12-BODY

NOTES

- 1) DIM'S ± 1/8" U.N.O.
- 2) LID MATERIAL: HDPE
- 3) BODY MATERIAL: LLDPE
- 4) WALL THICKNESS: 3/8" MINIMUM
- 5) I.W.A. = INSIDE WORK AREA

DFW PLASTICS, INC. ENGAGES IN ONGOING RESEARCH AND DEVELOPMENT TO IMPROVE AND ENHANCE ITS PRODUCTS. THEREFORE, DFW PLASTICS, INC. RESERVES THE RIGHT TO CHANGE PRODUCT OR SYSTEM SPECIFICATIONS WITHOUT NOTICE.



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(817) 439-3700 (f)
www.dfwplasticsinc.com

DFW37C-12-1KFDEEP

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ACCEPTED:

DRAWN BY:

PLOT SCALE:

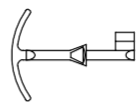
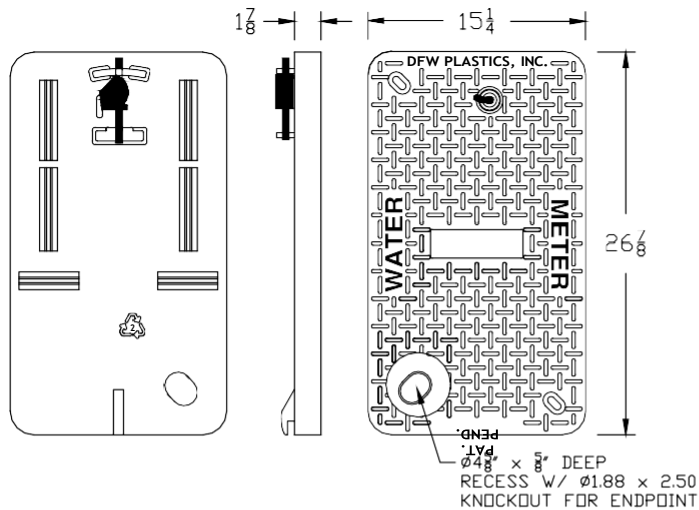
NTS

WATER METER LID

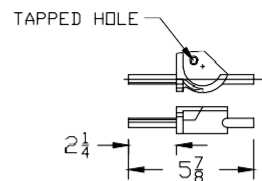
STANDARD DRAWING NO.

METERS UP TO 1"

WAT-19



DFW-KEY



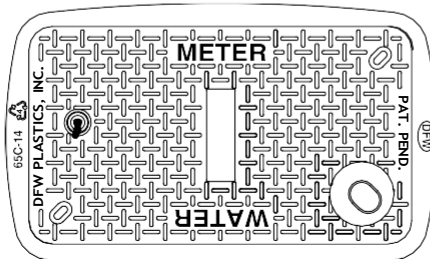
DFW-SBLOCK-XL

LID KEY	
1	BLACK COLOR
S	SECURITY BRASS LOCK
F	KNOCKOUT
DEEP	DEEP RECESS

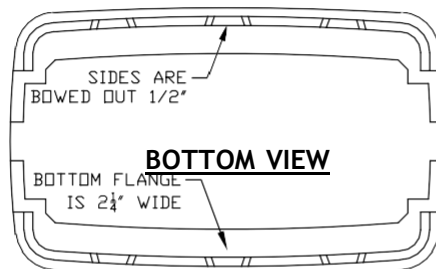
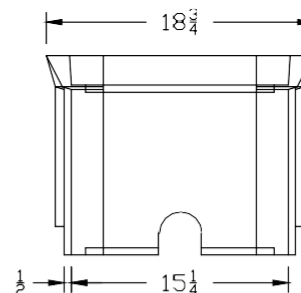
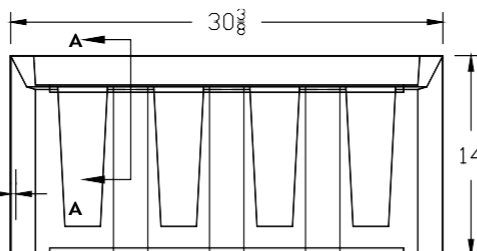
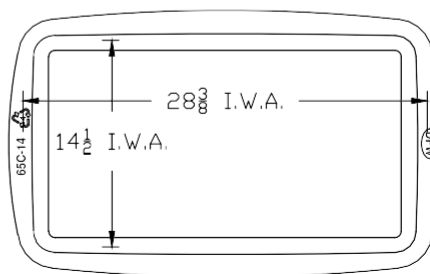
DFW65C-1SFDEEP Johnson City-LID



**KISS OFF DETAIL
SECTION A-A**



DFW65C-14-1SFDEEP



DFW65C-14-BODY

- NOTES**
- 1) DIM'S $\pm 1/8$ " U.N.O.
 - 2) LID MATERIAL: HDPE
 - 3) BODY MATERIAL: LLDPE
 - 4) WALL THICKNESS: $3/8$ " MINIMUM
 - 5) I.W.A. = INSIDE WORK AREA

DFW PLASTICS, INC. ENGAGES IN ONGOING RESEARCH AND DEVELOPMENT TO IMPROVE AND ENHANCE ITS PRODUCTS. THEREFORE, DFW PLASTICS, INC. RESERVES THE RIGHT TO CHANGE PRODUCT OR SYSTEM SPECIFICATIONS WITHOUT NOTICE.



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DFW65C-14-1SFDEEP

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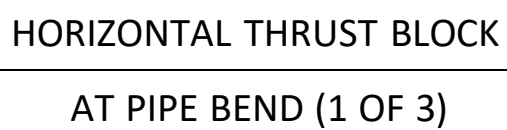
PLOT SCAL

WATER METER LID

METERS FROM 1.5" TO 2"

STANDARD DRAWING NO.

WAT-19A



WAT-20

I.D. (IN.)	T (IN.)	$\Delta = 11.25^\circ$ (FT.)	$\Delta \geq 22.50^\circ$ (FT.)	E (FT.)
4,6,8	0.4	1.5	1.5	0.9
10,12	0.5	1.5	1.5	1.2
16,18	0.6	1.5	1.5	1.6
20	0.7	1.5	1.5	1.8
24	0.9	1.5	1.5	2.1
30	2.9	1.5	1.9	2.6
36	4.5	1.5	2.3	3.3
42	5.0	1.8	2.6	3.8
48	5.5	2.0	3.0	4.3
54	6.0	2.3	3.4	4.8
60	6.5	2.5	3.8	5.3
66	6.8	2.8	4.1	5.7
72	7.5	3.0	4.5	6.3
78	7.5	3.3	4.9	6.7
84	8.0	3.5	5.3	7.2
90	8.5	3.8	5.6	7.7
96	9.0	4.0	6.0	8.2

I.D. (IN.)	Δ = 11.25°								I.D. (IN.)	Δ= 22.50°							
	G (FT.)	THRUST (TONS)	EARTH			ROCK				G (FT.)	THRUST (TONS)	EARTH			ROCK		
			A (FT.)	B (FT.)	VOL. (C.Y.)	A (FT.)	B (FT.)	VOL. (C.Y.)				A (FT.)	B (FT.)	VOL. (C.Y.)	A (FT.)	B (FT.)	VOL. (C.Y.)
4,6,8	0.4	1.0	1.0	1.5	0.1	1.0	1.0	0.1	4,6,8	0.8	2.0	1.5	1.5	0.1	1.0	1.0	0.1
10,12	0.6	2.2	1.5	1.5	0.1	1.0	1.5	0.1	10,12	1.1	4.4	2.0	2.5	0.3	1.5	1.5	0.1
16,18	0.8	5.0	2.0	2.5	0.3	1.5	2.0	0.2	16,18	1.6	9.9	3.0	3.5	0.6	2.0	2.5	0.3
20	0.9	6.2	2.0	3.5	0.4	1.5	3.0	0.3	20	1.8	12.3	3.5	3.5	0.7	2.0	3.0	0.4
24	1.1	8.9	3.0	3.5	0.5	1.5	3.0	0.3	24	2.2	17.7	4.0	4.5	1.0	3.0	3.5	0.5
30	1.4	10.4	3.0	3.5	0.6	2.0	3.5	0.4	30	2.7	20.7	5.0	4.5	1.5	3.0	4.0	0.8
36	1.7	15.0	3.5	4.5	0.9	2.0	4.0	0.5	36	3.3	29.8	5.5	5.5	2.3	4.0	4.0	1.3
42	1.9	20.4	4.5	5.0	1.5	2.5	5.0	0.8	42	3.8	40.5	7.0	6.0	3.9	4.5	5.0	2.1
48	2.2	26.6	4.5	6.0	2.0	2.5	6.0	1.1	48	4.4	52.9	8.0	7.0	5.7	4.5	6.0	2.8
54	2.5	33.7	6.0	6.0	3.0	3.0	6.0	1.4	54	4.9	67.0	9.0	8.0	8.0	6.0	6.0	4.1
60	2.7	41.6	6.0	7.0	3.8	3.0	7.0	1.8	60	5.5	82.7	9.5	9.0	10.6	6.0	7.0	5.3
66	3.0	50.3	6.5	8.0	5.1	3.5	8.0	2.7	66	6.0	100.1	10.5	10.0	14.1	6.5	8.0	7.2
72	3.3	59.9	7.5	8.0	6.3	4.0	8.0	3.3	72	6.6	119.1	11.0	11.0	17.6	7.5	8.0	9.1
78	3.6	70.2	8.0	9.0	8.1	4.0	9.0	3.9	78	7.1	139.8	12.0	12.0	22.5	8.0	9.0	11.7
84	3.8	81.5	8.5	10.0	10.3	4.5	10.0	5.3	84	7.6	162.1	13.0	12.5	27.2	8.5	10.0	14.8
90	4.1	93.5	9.5	10.0	12.2	5.0	10.0	6.3	90	8.2	186.1	14.0	13.5	33.7	9.5	10.0	17.7
96	4.4	106.4	10.0	11.0	15.0	5.0	11.0	7.4	96	8.7	211.7	15.0	14.5	41.2	10.0	11.0	21.8

TABLES OF DIMENSIONS AND QUANTITIES

	HORIZONTAL THRUST BLOCK	STANDARD DRAWING NO.
	AT PIPE BEND (2 OF 3)	WAT-20A

$\Delta = 30^\circ$									$\Delta = 45^\circ$								
I.D. (IN.)	G (FT.)	THRUST (TONS)	EARTH			ROCK			I.D. (IN.)	G (FT.)	THRUST (TONS)	EARTH			ROCK		
			A (FT.)	B (FT.)	VOL. (C.Y.)	A (FT.)	B (FT.)	VOL. (C.Y.)				A (FT.)	B (FT.)	VOL. (C.Y.)	A (FT.)	B (FT.)	VOL. (C.Y.)
4,6,8	1.0	2.6	2.0	1.5	0.2	1.0	1.5	0.1	4,6,8	1.5	3.9	2.0	2.0	0.2	1.5	1.5	0.1
10,12	1.5	5.9	2.5	2.5	0.3	2.0	1.5	0.2	10,12	2.2	8.7	3.5	2.5	0.5	2.0	2.5	0.3
16,18	2.2	13.2	3.5	4.0	0.8	2.5	3.0	0.4	16,18	3.2	19.5	4.5	4.5	1.2	3.0	3.5	0.6
20	2.4	16.3	4.5	4.0	1.0	3.0	3.0	0.5	20	3.6	24.1	5.5	4.5	1.5	3.5	3.5	0.7
24	2.9	23.4	6.0	4.0	1.4	3.5	3.5	0.7	24	4.3	34.6	8.0	4.5	2.3	4.5	4.0	1.1
30	3.6	27.5	6.5	5.0	1.9	3.5	4.0	0.9	30	5.4	40.6	8.5	5.0	3.2	5.5	4.0	1.6
36	4.4	39.5	7.0	6.0	3.4	4.5	4.5	1.6	36	6.5	58.5	10.0	6.0	5.3	6.5	4.5	2.6
42	5.1	53.8	8.0	7.0	5.1	5.5	5.0	2.5	42	7.5	79.6	11.5	7.0	8.1	8.0	5.0	4.2
48	5.8	70.3	9.0	8.0	7.4	6.0	6.0	3.7	48	8.6	104.0	13.0	8.0	11.9	9.0	6.0	6.3
54	6.5	89.0	10.0	9.0	10.3	7.0	6.5	5.3	54	9.7	131.5	15.0	9.0	17.1	10.5	6.5	8.9
60	7.3	110.0	11.0	10.0	13.9	7.5	7.5	7.3	60	10.7	162.4	16.5	10.0	23.1	11.0	7.5	12.0
66	8.0	132.9	12.5	11.0	18.9	8.5	8.0	9.6	66	11.8	196.5	18.0	11.0	30.1	12.0	8.5	16.2
72	8.7	158.2	13.5	12.0	24.0	9.0	9.0	12.3	72	12.9	233.9	19.5	12.0	38.6	14.0	8.5	20.7
78	9.4	185.6	14.5	13.0	30.0	10.0	9.5	15.6	78	13.9	274.5	21.5	13.0	49.8	14.5	9.5	25.9
84	10.1	215.3	15.5	14.0	37.1	10.5	10.5	19.5	84	15.0	318.4	23.0	14.0	61.2	15.5	10.5	32.6
90	10.9	247.1	16.5	15.0	45.0	11.5	11.0	23.9	90	16.1	365.5	24.5	15.0	74.5	17.5	10.5	39.6
96	11.6	281.2	18.0	16.0	55.5	12.5	11.5	28.9	96	17.1	415.6	26.0	16.0	89.5	18.5	11.5	48.5

$\Delta = 67.50^\circ$									$\Delta = 90^\circ$								
I.D. (IN.)	G (FT.)	THRUST (TONS)	EARTH			ROCK			I.D. (IN.)	G (FT.)	THRUST (TONS)	EARTH			ROCK		
			A (FT.)	B (FT.)	VOL. (C.Y.)	A (FT.)	B (FT.)	VOL. (C.Y.)				A (FT.)	B (FT.)	VOL. (C.Y.)	A (FT.)	B (FT.)	VOL. (C.Y.)
4,6,8	2.1	5.6	3.0	2.0	0.3	2.0	1.5	0.2	4,6,8	2.7	7.1	5.0	1.5	0.4	2.0	2.0	0.2
10,12	3.1	12.6	5.5	2.5	0.8	3.5	2.0	0.4	10,12	4.0	16.0	6.5	2.5	1.0	3.5	2.5	0.5
16,18	4.7	28.3	7.5	4.0	1.9	5.5	3.0	0.9	16,18	6.0	36.0	9.0	4.0	2.4	4.5	4.0	1.0
20	5.2	34.9	9.0	4.0	2.3	5.5	3.5	1.2	20	6.6	44.4	10.0	4.5	3.1	6.0	4.0	1.5
24	6.2	50.3	11.5	4.5	3.5	6.5	4.0	1.6	24	7.9	64.0	14.5	4.5	5.0	8.0	4.0	2.1
30	7.8	58.9	12.0	5.0	4.8	7.5	4.0	2.2	30	9.9	75.0	15.0	5.0	6.7	10.0	4.0	3.3
36	9.4	84.9	14.5	6.0	8.2	9.5	4.5	3.8	36	11.9	108.0	18.0	6.0	11.4	12.0	4.5	5.3
42	10.9	115.5	17.0	7.0	12.8	11.0	5.5	6.3	42	13.9	147.0	21.0	7.0	17.8	14.0	5.5	8.7
48	12.5	150.9	19.0	8.0	18.4	13.0	6.0	9.2	48	15.9	192.0	24.0	8.0	26.2	16.0	6.0	12.4
54	14.0	191.0	21.5	9.0	26.0	15.0	6.5	12.9	54	17.9	243.0	27.0	9.0	36.9	18.0	7.0	18.1
60	15.6	235.8	24.0	10.0	35.6	16.0	7.5	17.6	60	19.9	299.8	30.0	10.0	50.3	20.0	7.5	24.0
66	17.1	285.3	26.0	11.0	46.0	18.0	8.0	23.0	66	21.8	362.8	33.0	11.0	66.2	22.0	8.5	32.5
72	18.7	339.5	28.5	12.0	57.8	19.0	9.0	28.4	72	23.8	431.8	36.0	12.0	85.6	24.0	9.0	41.0
78	20.2	398.5	31.0	13.0	75.7	21.0	9.5	37.4	78	25.7	506.7	39.0	13.0	108.2	26.0	10.0	53.2
84	21.8	462.1	33.5	14.0	94.7	22.0	10.5	46.5	84	27.7	587.7	42.0	14.0	134.4	28.0	10.5	64.8
90	23.3	530.5	35.5	15.0	114.4	24.5	11.0	58.2	90	29.0	674.6	45.0	15.0	164.9	30.0	11.5	81.2
96	24.9	603.6	38.0	16.0	138.9	25.5	12.0	70.0	96	31.6	767.5	48.0	16.0	199.0	32.0	12.0	95.1

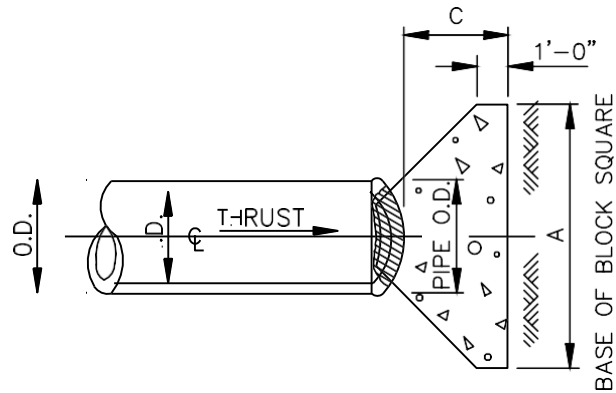
TABLES OF DIMENSIONS AND QUANTITIES

HORIZONTAL THRUST BLOCK

AT PIPE BEND (3 OF 3)

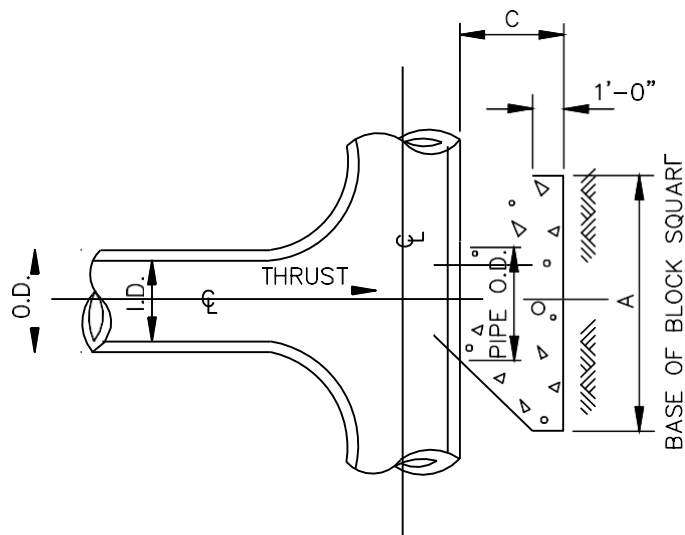
STANDARD DRAWING NO.

WAT-20B



PLAN OF PLUG THRUST BLOCK.

N.T.S.



PLAN OF TEE THRUST BLOCK.

N.T.S.

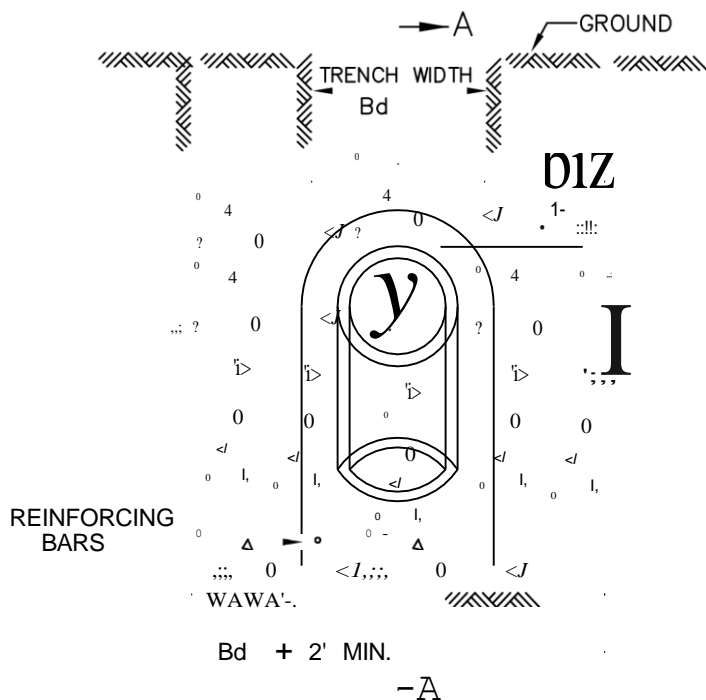
I.D. (IN.)	THRUST (TONS)	C (FT.)	EARTH		ROCK	
			A (FT.)	VOL. (C.Y.)	A (FT.)	VOL. (C.Y.)
4,6,8	5.1	1.5	2.5	0.3	2.0	0.2
10,12	11.3	1.5	3.5	0.6	2.5	0.3
16,18	25.5	2.0	5.5	1.6	4.0	0.9
20	31.5	2.0	6.0	1.9	4.0	0.9
24	45.2	2.5	7.0	3.1	5.0	1.7
30	53.0	3.0	7.5	4.1	5.5	2.4
36	76.3	4.0	9.0	7.3	6.5	4.2
42	104.0	4.5	10.5	11.0	7.5	6.2
48	136.0	5.0	12.0	15.6	8.5	8.7
54	172.0	5.5	13.5	21.4	9.5	11.9
60	212.0	6.0	15.0	28.4	10.5	15.7
66	257.0	6.5	16.5	36.8	11.5	20.5
72	305.0	7.5	17.5	47.2	12.5	27.2
78	358.0	8.0	19.0	58.9	13.5	33.7
84	416.0	8.5	20.5	72.3	14.5	41.2
90	477.0	9.0	22.0	87.7	15.5	49.7
96	543.0	9.5	23.5	104.8	16.5	61.0

HORIZONTAL THRUST BLOCK

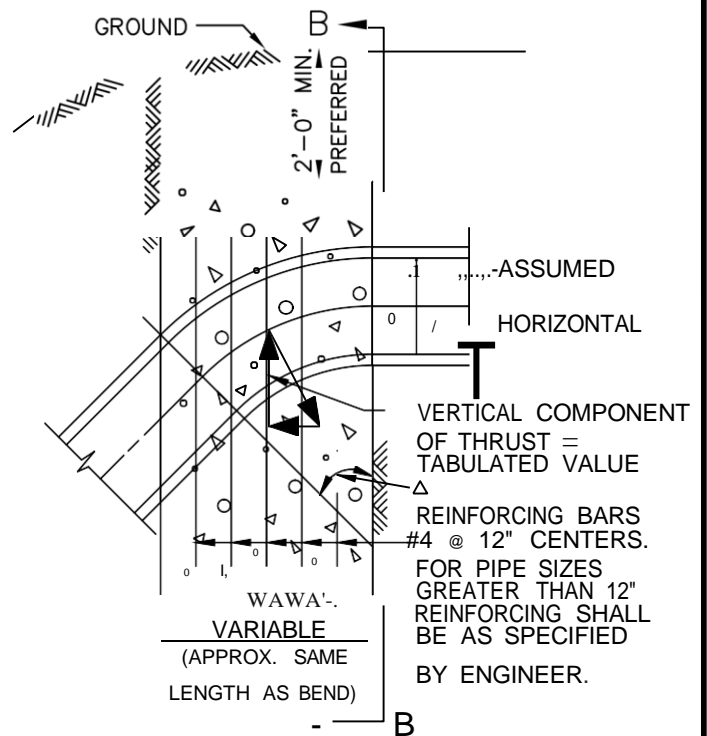
AT TEES & PLUGS

STANDARD DRAWING NO.

WAT-21



ELEVATION "B-B"
N.T.S.



SECTION "A-A"
N.T.S.

11 ----	11.25		22.50"		30		45		67.50"		90		---- /1
I.D. (IN.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	I.D. (IN.)
4,6,8	1.0	0.5	2.0	1.0	2.5	1.3	3.6	1.8	4.6	2.3	5.0	2.5	4,6,8
10,12	2.2	1.1	4.3	2.2	5.7	2.8	8.0	4.0	10.5	5.2	11.3	5.7	10,12
16,18	5.0	2.5	9.7	4.9	12.7	6.4	18.0	9.0	23.5	11.8	25.5	12.7	16,18
20	6.1	3.1	12.0	6.0	15.7	7.9	22.2	11.1	29.2	14.5	31.4	15.7	20
24	8.2	4.4	17.3	8.7	22.6	11.3	32.0	16.0	41.8	20.9	45.2	22.6	24
30	10.5	5.2	20.3	10.1	26.5	13.3	37.5	18.8	49.0	24.5	53.1	26.5	30
36	14.9	7.5	29.2	14.6	38.2	19.1	54.0	27.0	70.5	35.3	76.4	38.2	36
42	20.3	10.1	39.8	19.9	52.0	26.0	73.5	36.7	96.0	48.0	104.0	52.0	42
48	26.5	13.2	51.9	26.0	67.9	33.9	96.0	48.0	126.0	62.7	136.0	67.9	48
54	33.5	16.8	65.7	32.9	85.9	42.9	122.0	60.7	159.0	79.4	172.0	85.9	54
60	41.4	20.7	81.2	40.6	106.0	53.0	150.0	75.0	196.0	98.0	212.0	106.0	60
66	50.1	25.0	98.2	49.1	128.0	64.2	182.0	90.7	237.0	119.0	257.0	128.0	66
72	59.6	29.8	117.0	58.4	153.0	76.3	216.0	108.0	282.0	141.0	305.0	153.0	72
78	69.9	35.0	137.0	68.6	179.0	90.0	254.0	127.0	331.0	166.0	358.0	179.0	78
84	81.1	40.5	159.0	79.5	208.0	104.0	294.0	147.0	384.0	192.0	416.0	208.0	84
90	93.1	46.5	183.0	91.3	239.0	119.0	337.0	169.0	441.0	221.0	477.0	239.0	90
96	106.0	53.0	208.0	104.0	272.0	136.0	384.0	192.0	502.0	251.0	543.0	272.0	96

VERTICAL THRUST BLOCK

AT PIPE BEND

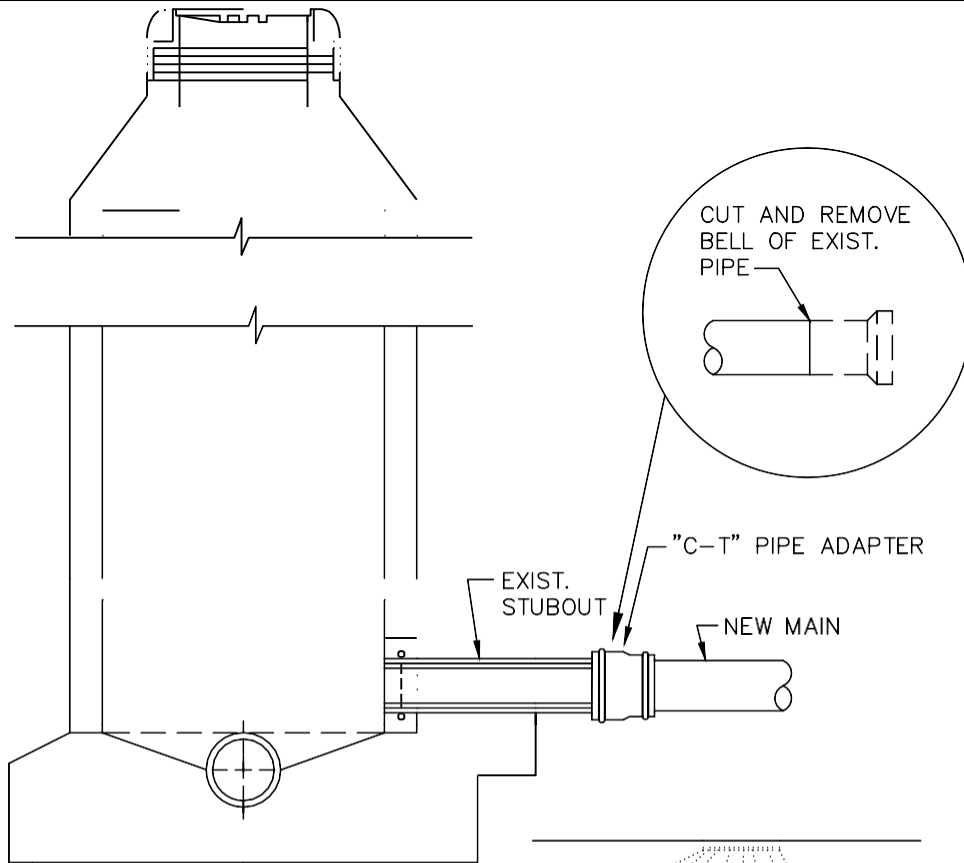
STANDARD DRAWING NO.

WAT-22

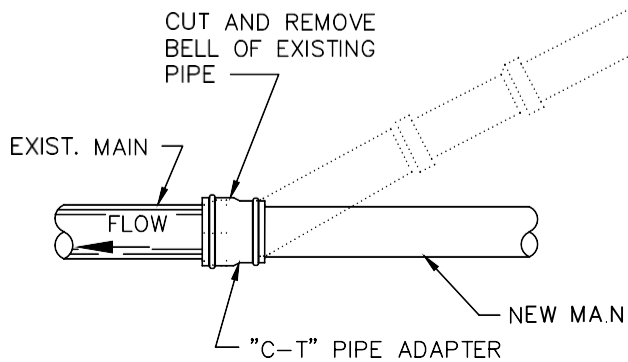
GENERAL NOTES FOR ALL THRUST BLOCKS:

1. CONCRETE FOR BLOCKING SHALL BE CLASS "B".
2. ALL CALCULATIONS ARE BASED ON INTERNAL PRESSURE OF 200 PSI FOR DUCTILE IRON, P.V.C., AND 150 PSI FOR CONCRETE PIPE.
3. VOLUMES OF THRUST BLOCKS ARE NET VOLUMES OF CONCRETE TO BE FURNISHED. THE CORRESPONDING WEIGHT OF THE CONCRETE (CLASS "B") IS EQUAL TO OR GREATER THAN THE VERTICAL COMPONENT OF THE THRUST ON THE VERTICAL BEND.
4. WALL THICKNESS (T) ASSUMED HERE FOR ESTIMATING PURPOSES ONLY.
5. POUR CONCRETE FOR BLOCK AGAINST UNDISTURBED EARTH.
6. DIMENSIONS MAY BE VARIED AS REQUIRED BY FIELD CONDITIONS WHERE AND AS DIRECTED BY THE ENGINEER. THE VOLUME OF CONCRETE BLOCKING SHALL NOT BE LESS THAN SHOWN HERE.
7. THE SOIL BEARING PRESSURES ARE BASED ON 1000 LBS./S.F. IN SOIL AND 2000 LBS./S.F. IN ROCK.
8. USE POLYETHYLENE WRAP OR EQUAL BETWEEN CONCRETE AND BEND, TEE, OR PLUG TO PREVENT THE CONCRETE FROM STICKING TO IT.
9. CONCRETE SHALL NOT EXTEND BEYOND JOINTS.

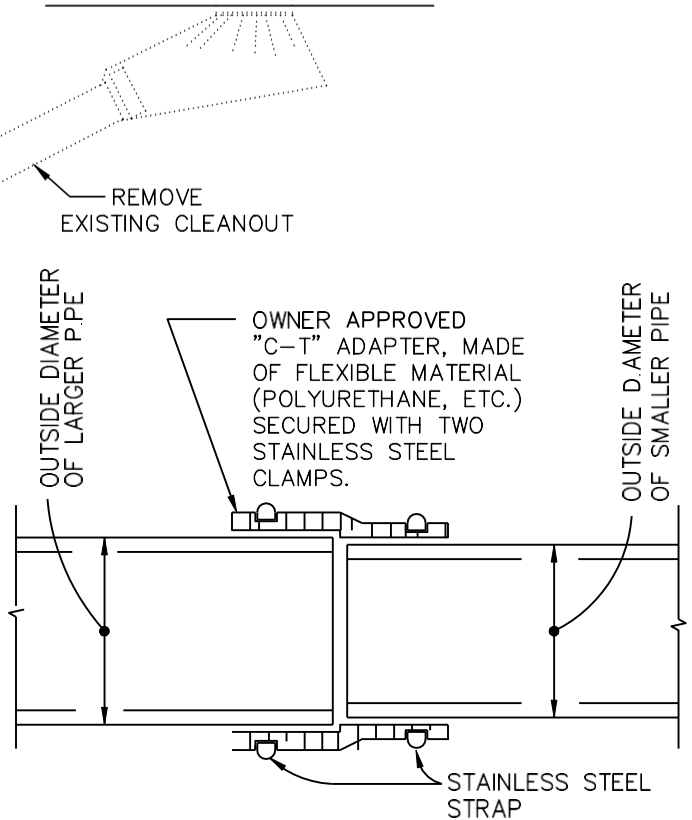
	THRUST BLOCK	
	GENERAL NOTES	STANDARD DRAWING NO. WAT-23



AT STUBOUT
N.T.S.



AT CLEANOUT
N.T.S.



"C-T" PIPE ADAPTER
N.T.S.

NOTE:

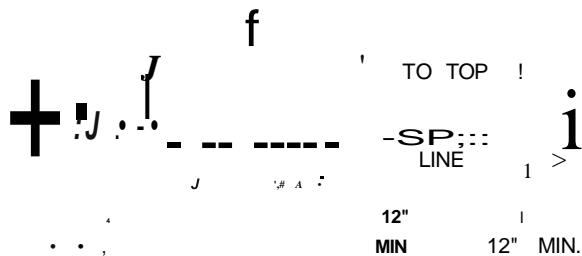
T.H.S. DETAIL FOR USE ONLY WHEN NEW MAIN WILL NOT MATE WITH EXISTING MAIN JOINT DUE TO DIFFERENT DIMENSIONS OR MATERIALS AND A MANHOLE IS NOT REQUIRED.

WASTEWATER MAIN TIE-IN

AT CLEANOUT OR MANHOLE STUBOUT

STANDARD DRAWING NO.

SS-01



PROP. TOP OF CURB)

"12" MIN.

PROP. PVMT.\

PRECAST BASE

I&I BARRIER SEE SS-16

N.T.S.

-ROCK
FOUNDATION

GEOTEXTILE -
MATERIAL

STD. CAS⁺T IRON

F. NON SHRINK GROUT
COATING, WHEN NOT

STUBOUTS TO BE MIN.
3' LONG SUPPORTED BY

MANHOLE FRAME &
COVER AS SPECIFIED

IN PAVING

EMBEDMENT SPECIFIED

BY OWNER.

30"

IN PLANS. STUBOUTS
TO BE GROUTED AT
M.H. WITH NON SHRINK
GROUT. STUBOUTS
SHALL ALSO BE FITTED
WITH WATER TIGHT
STOPPER OR CAP

USE PRECAST CONC.
GRADE RINGS & NON SHRINK
GROUT AS REQUIRED
TO RAISE TO GRADE
MAX. 3 GRADE RINGS
(MAX. 18")

6" GATOR WRAP
SEE SS-16

USE O-RING RUBBER
GASKET (TYP.)
INTERMEDIATE RISER "

NOTES:

1. FIRST MAIN LINE JOINT TO BE A MIN. OF 5'
LONG WITH CONC. CRADLE (FROM SAME POUR
AS BASE) UNDER THE ENTIRE LENGTH.
2. IF FALSE M.H. BOTTOMS ARE REQUIRED, THEY SHALL
BE CONSTRUCTED, INSTALLED AND REMOVED PER
STD. DWG. SS-15
3. WHERE M.H.'S ARE OUTSIDE OF PAVEMENT, FRAME
& COVER SHALL BE CENTERED IN A 5'X5' CONCRETE
PAD CLASS "A" CONCRETE, 4" THICK

4', 5', OR 6'
AS SPECIFIED
BY OWNER

BASE RISER WITH "BUTT END" INTEGRATED
INTO THE CLASS "F" CONC. BASE

6" MIN.

SPRING LINE

STUBOUTS TO BE FITTED
WITH A WATER TIGHT

STOPPER OR CAP
STUBOUTS TO BE A MIN. OF 5'

LONG WITH CONC. CRADLE (FROM
SAME POUR AS BASE) UNDER

THE ENTIRE ;ETXH LE MATERIAL

CLASS "F" CONCRETE

OF
ROCK FOUNDATION
APPROVED RESILIENT PIPE-TO-
MANHOLE CONNECTOR OR

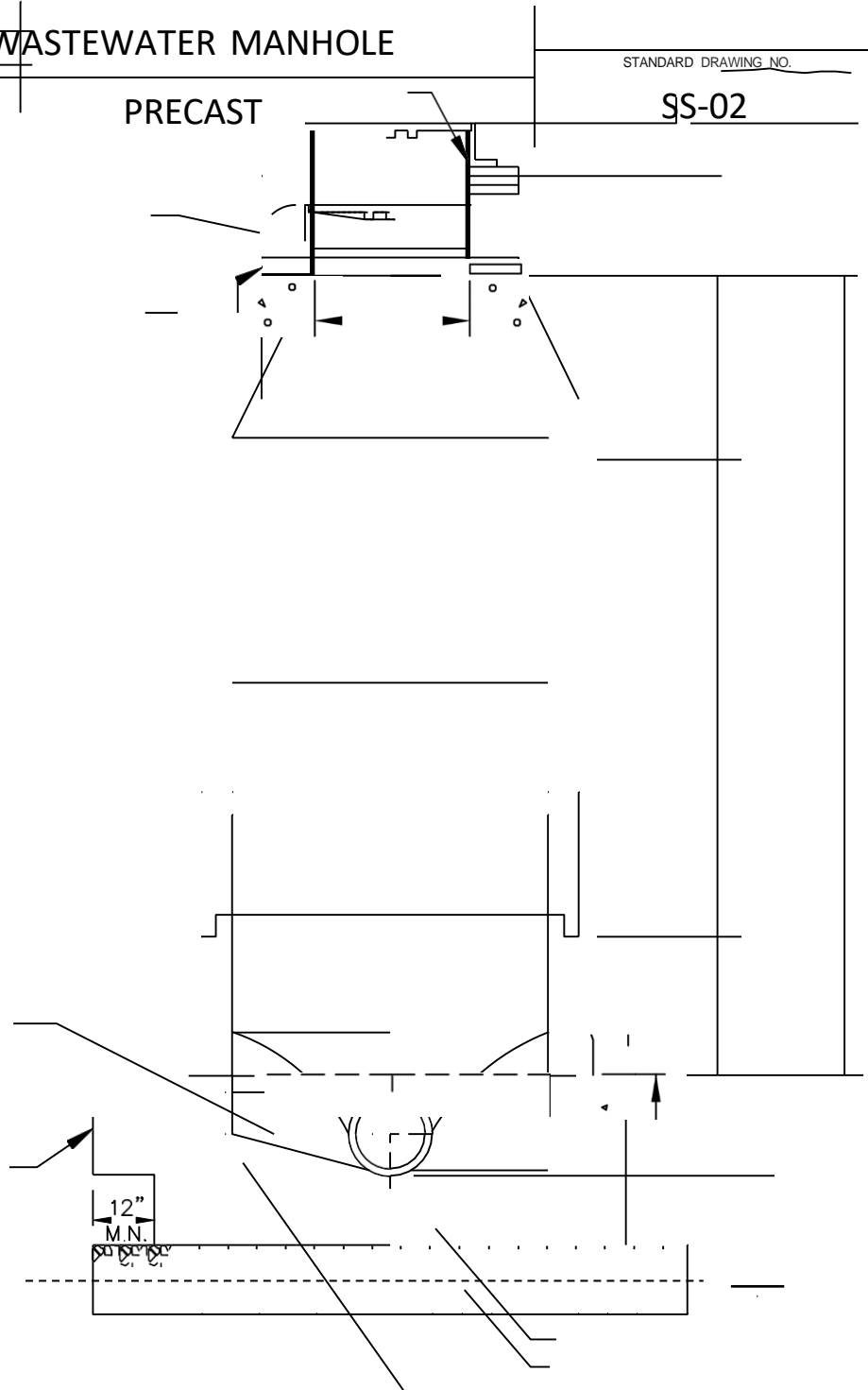
GASKET REQ'D. FOR PIPE OTHER THAN
CLAY OR CONCRETE.

WASTEWATER MANHOLE

STANDARD DRAWING NO.

PRECAST

SS-02



ADJUSTABLE FRAME

ROOF OPTIONS
N.T.S.

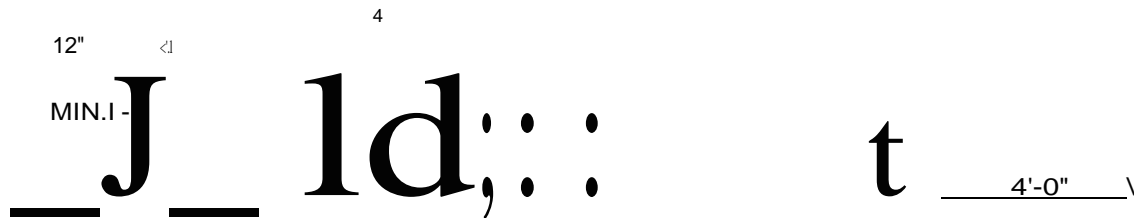
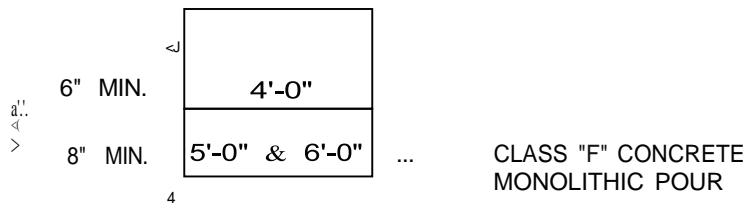
FRAME CAST IN CONC.

1/2" NON SHRINK
GROUT COATING

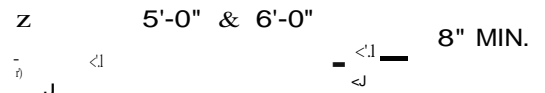
STD. M.H. FRAME & COVER
AS SPECIFIED BY OWNER

FOR 5' & 6' DIA. M.H.'S
SEE TRANSITION DETAIL

USE PRECAST CONCRETE
GRADE RINGS & NON
SHRINK GROUT AS
REQUIRED TO RAISE
TO GRADE.
(MAX. 3 COURSES)



GEOTEXTILE "Y" ROCK FOUNDATION
MATERIAL



NOTES

1. WHERE M.H.'S ARE IN "PROPOSED" PAVING, FRAME & COVER SHALL BE SET 23" BELOW THE PROPOSED PAVEMENT GRADE.
2. IF FALSE M.H. BOTTOMS ARE REQUIRED THEY SHALL BE CONSTRUCTED, INSTALLED AND REMOVED. PER STD. DWG. SS-15
3. WHERE M.H.'S ARE OUTSIDE OF PAVEMENT, FRAME & COVER SHALL BE CENTERED IN A 5'X5' CONCRETE PAD CLASS "A" CONCRETE, 4" THICK

FIRST MAIN LINE JOINT TO BE A MIN. OF 5' LONG WITH CONC. CRADLE (FROM SAME POUR AS BASE) UNDER ENTIRE LENGTH.

TRANSITION DETAIL FOR
5' & 6' DIA. M.H.'S
N.T.S.

APPROVED RESILIENT PIPE-TO-MANHOLE CONNECTOR OR GASKET REQUIRED FOR PIPE OTHER THAN CLAY OR CONCRETE.

STUBOUT TO BE FITTED WITH WATERTIGHT STOPPER OR CAP STUBOUTS TO BE A MIN. OF 5' LONG WITH CONC. CRADLE (FROM SAME POUR) UNDER ENTIRE LENGTH

STUBOUT CONNECTION

STD. SM.H. FRAME & COVER
AS SPECIFIED BY OWNER

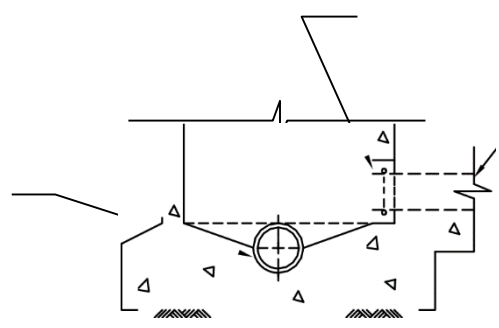
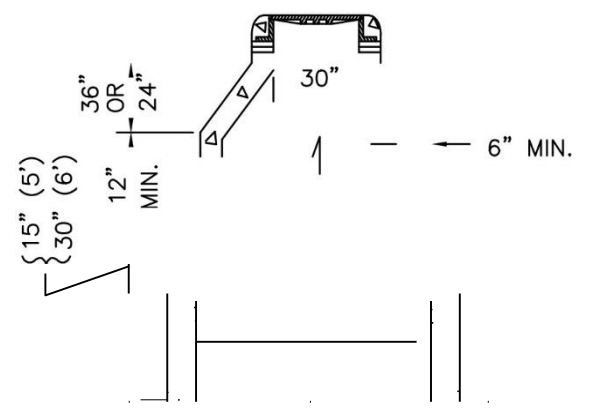
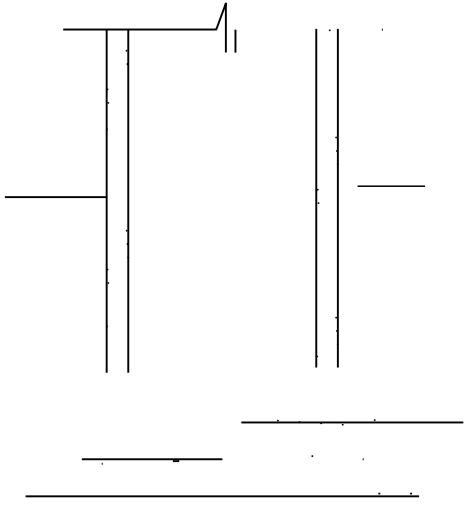
24"
OR
36"

WASTEWATER MANHOLE

CAST-IN-PLACE

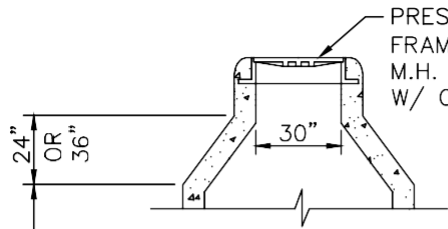
STANDARD DRAWING NO.

SS-03



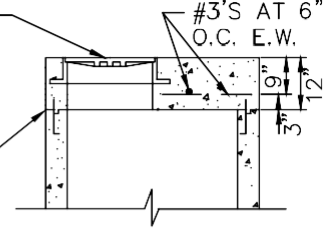
CONCRETE CONE ← ROOF OPTIONS → REINFORCED CONCRETE SLAB

N.T.S.

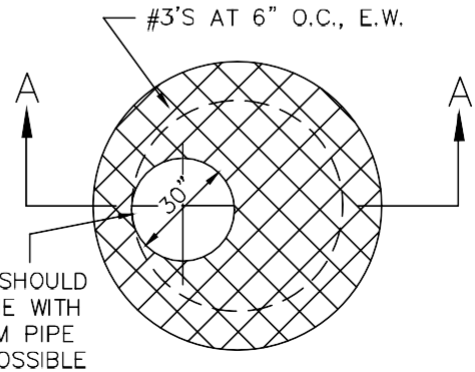
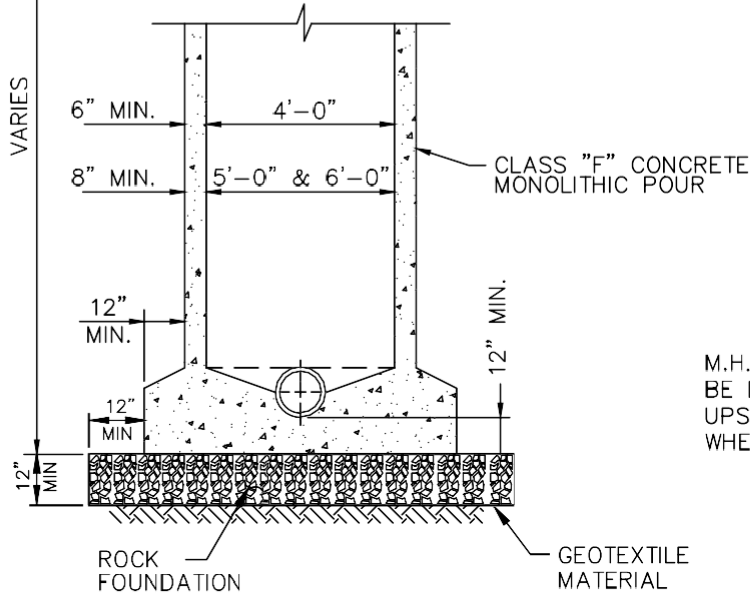


FOR 5' & 6' DIA. M.H.'S
SEE TRANSITION DETAIL

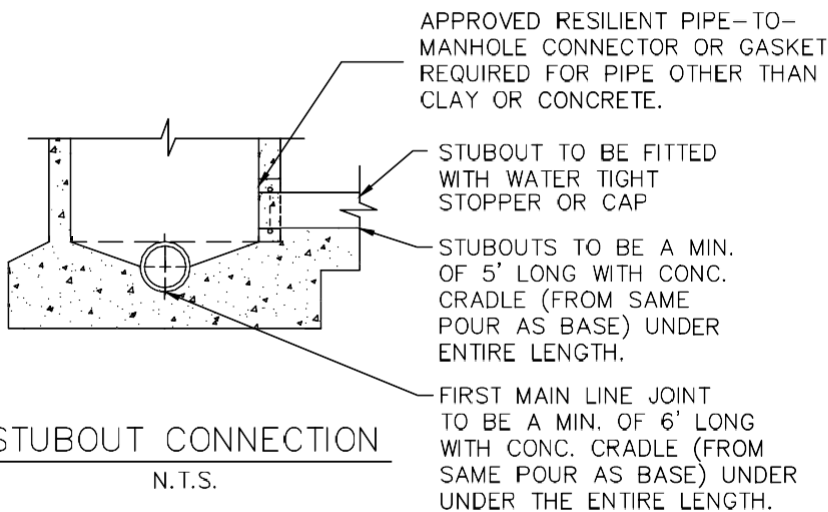
CONSTRUCTION JOINT WITH
KEY WAY WATERSTOP, AND
#3'S AT 12" O.C. EXTENDING
9" INTO WALL (NOT REQ'D
FOR CONTINUOUS POUR)



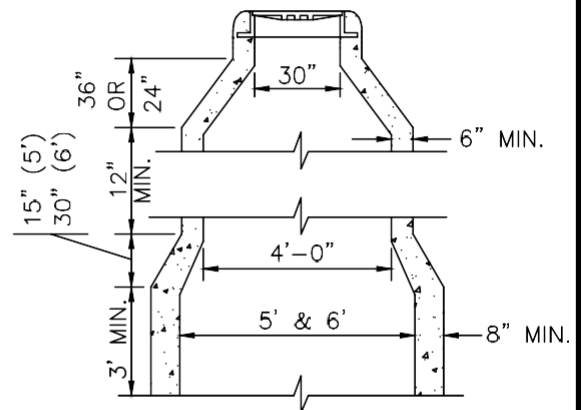
SECTION A - A
N.T.S.



ROOF STEEL LAYOUT
N.T.S.



STUBOUT CONNECTION
N.T.S.



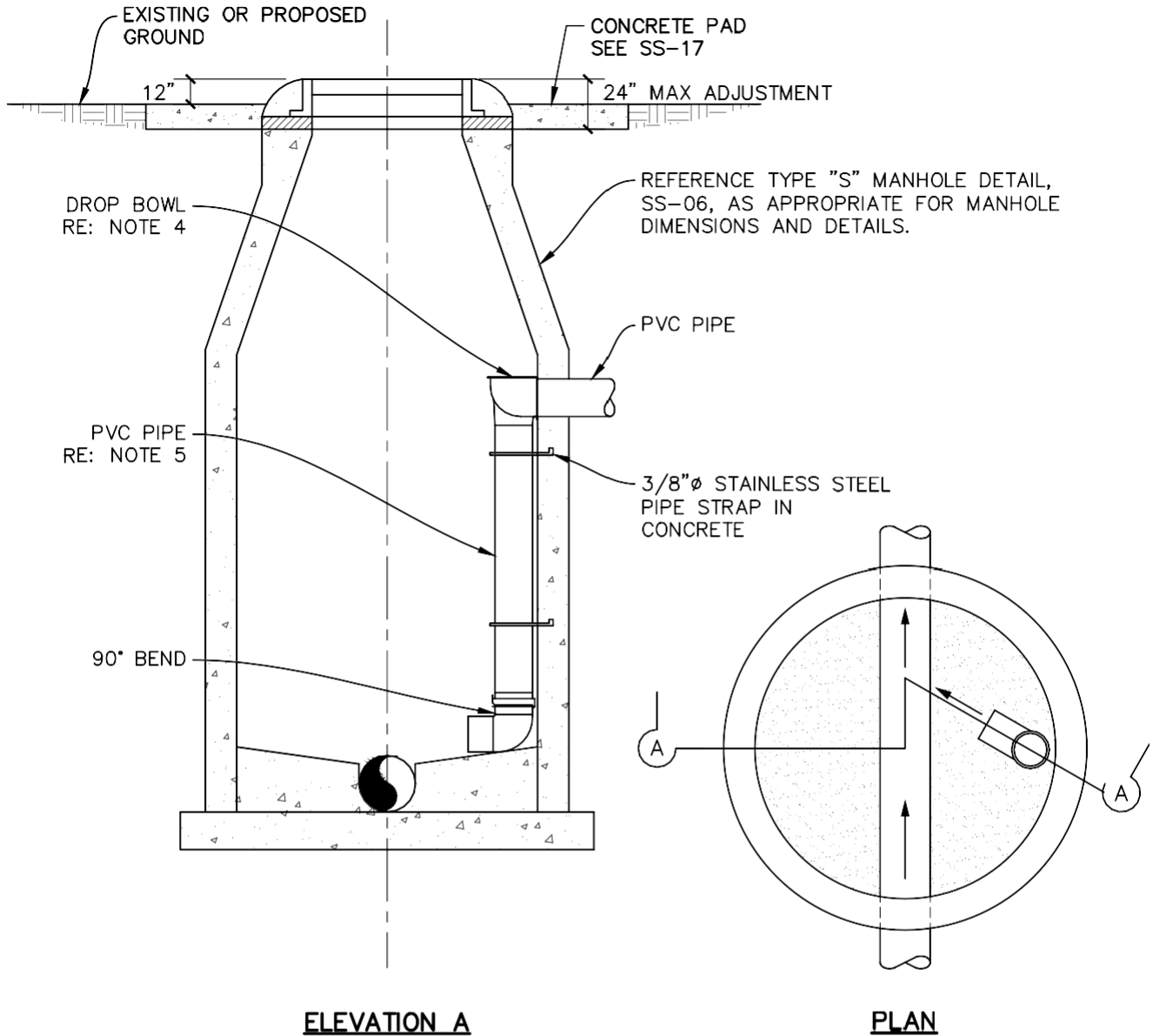
TRANSITION DETAIL FOR
5' & 6' DIA. M.H.'S
N.T.S.

WASTEWATER MANHOLE

PRESSURE MANHOLE

STANDARD DRAWING NO.

SS-04



NOTES:

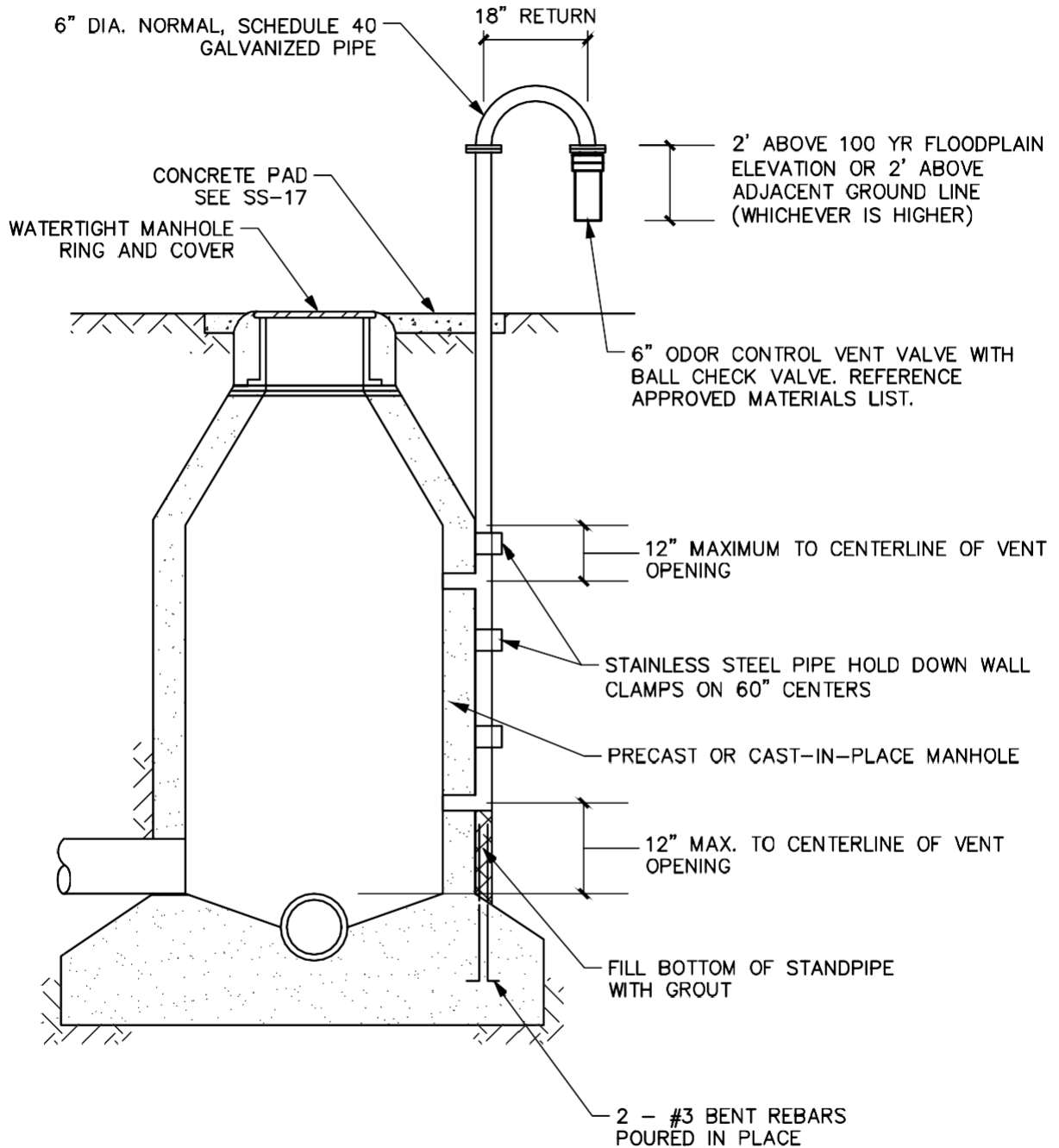
1. PVC PIPE WITHIN MANHOLE SHALL BE SDR-35 FOR DEPTHS LESS THAN 10 FEET.
2. PVC PIPE WITHIN MANHOLE SHALL BE SDR-26 FOR DEPTHS 10 FEET AND GREATER.
3. INSIDE PIPE SHALL NOT BE PLACED IN CONE AREA.
4. DROP BOWL SHALL BE RELINER PRODUCT AS MANUFACTURED BY DURAN INC., OR APPROVED EQUAL.
5. DROP PIPE SIZE SHALL MATCH INCOMING SEWER LINE SIZE.

WASTEWATER MANHOLE

INTERNAL DROP CONNECTION

STANDARD DRAWING NO.

SS-05



WASTEWATER MANHOLE

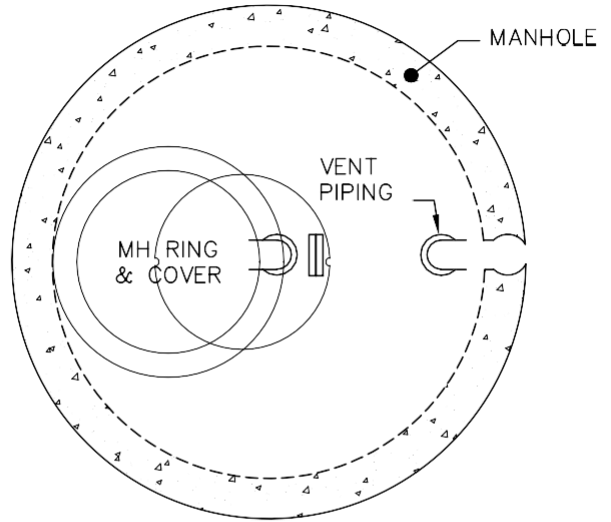
VENTED TYPE 'S'

STANDARD DRAWING NO.

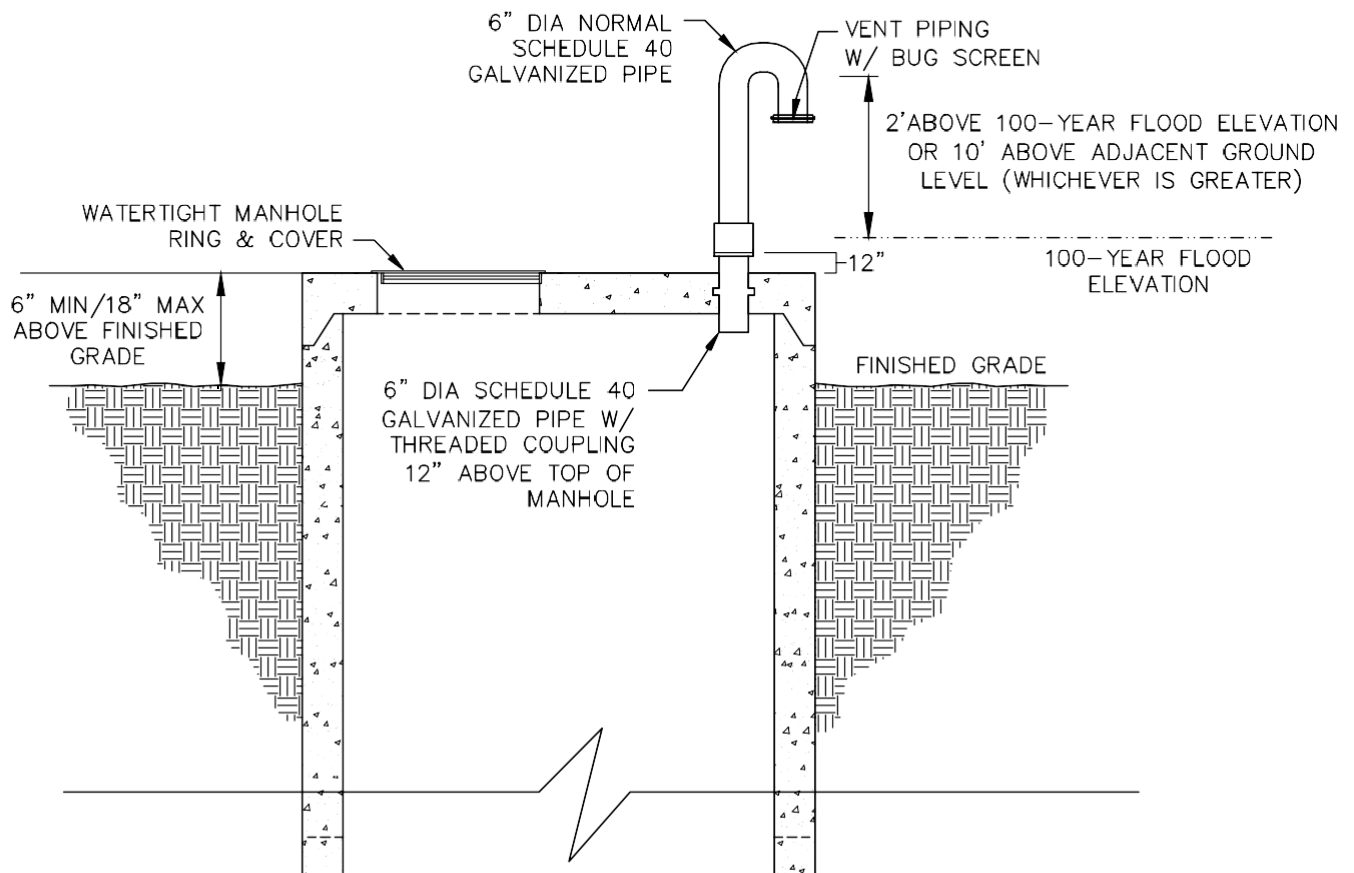
SS-06

NOTES:

1. VENT PIPE OPENING IN PRECAST POLYMER CONCRETE MANHOLE WALL SHALL BE PRECAST BY MANHOLE MANUFACTURER.
2. LOCATION OF VENT PIPE SHALL BE OPPOSITE THE MANHOLE OPENING WITH WATERTIGHT RING AND COVER VENT TOP TO BE ELEVATED AT LEAST 24 INCHES ABOVE THE 100 YEAR FLOOD PLAIN ELEVATION OR 10' ABOVE ADJACENT GROUND LEVEL (WHICHEVER IS GREATER).



PLAN VIEW



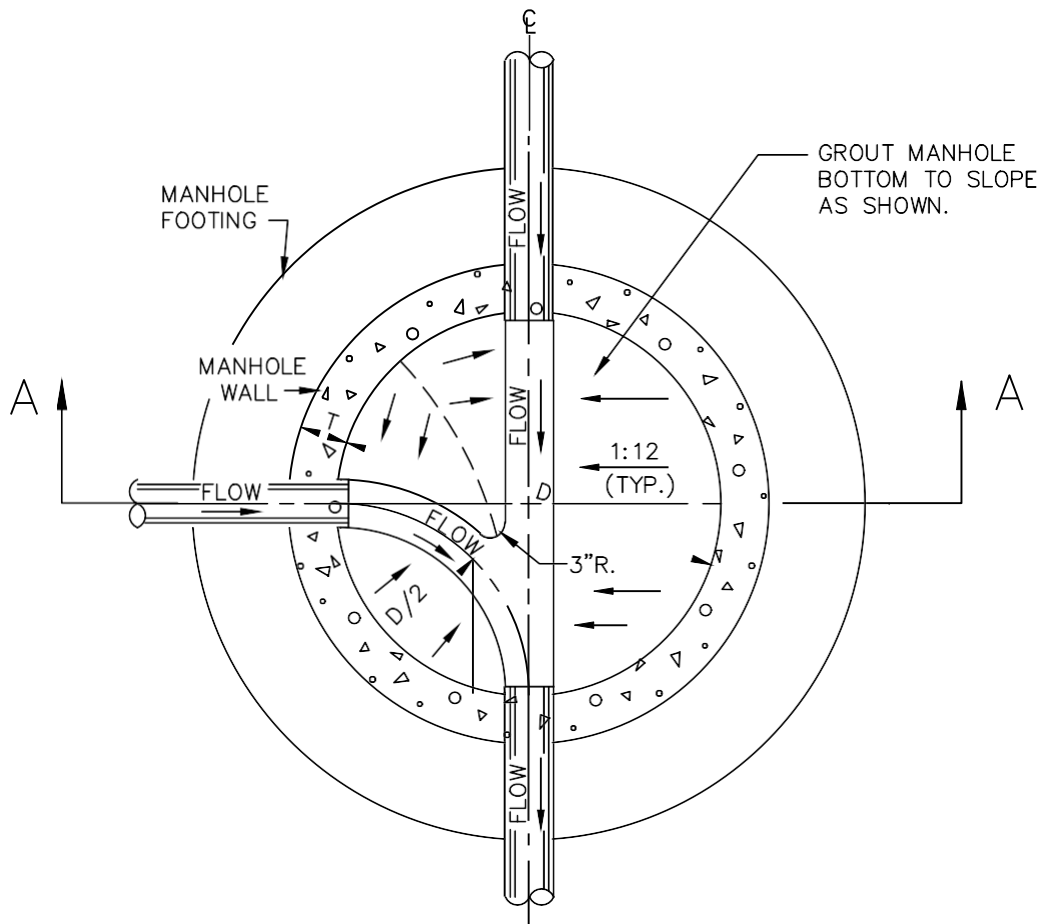
ELEVATION VIEW

WASTEWATER MANHOLE

VENTED FLAT TOP

STANDARD DRAWING NO.

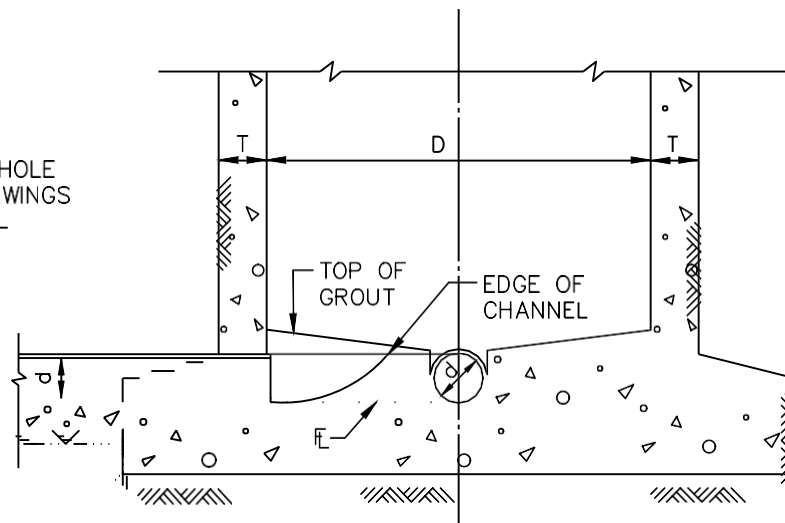
SS-06A



PLAN
N.T.S.

T = WALL THICKNESS
D = MANHOLE DIAMETER
d = PIPE DIAMETER

NOTE:
REFER TO MANHOLE
STANDARD DRAWINGS
FOR ADDITIONAL
DETAIL OF M.H.



SECTION A-A
N.T.S.

WASTEWATER MANHOLE

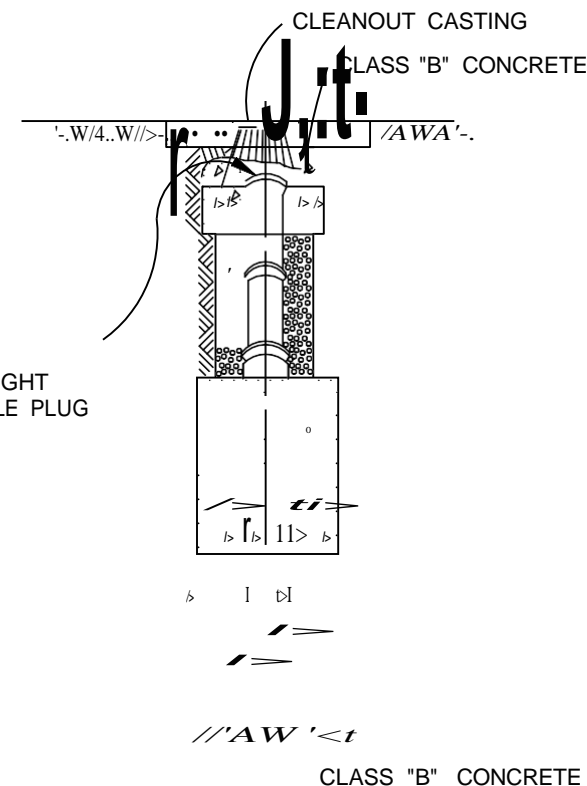
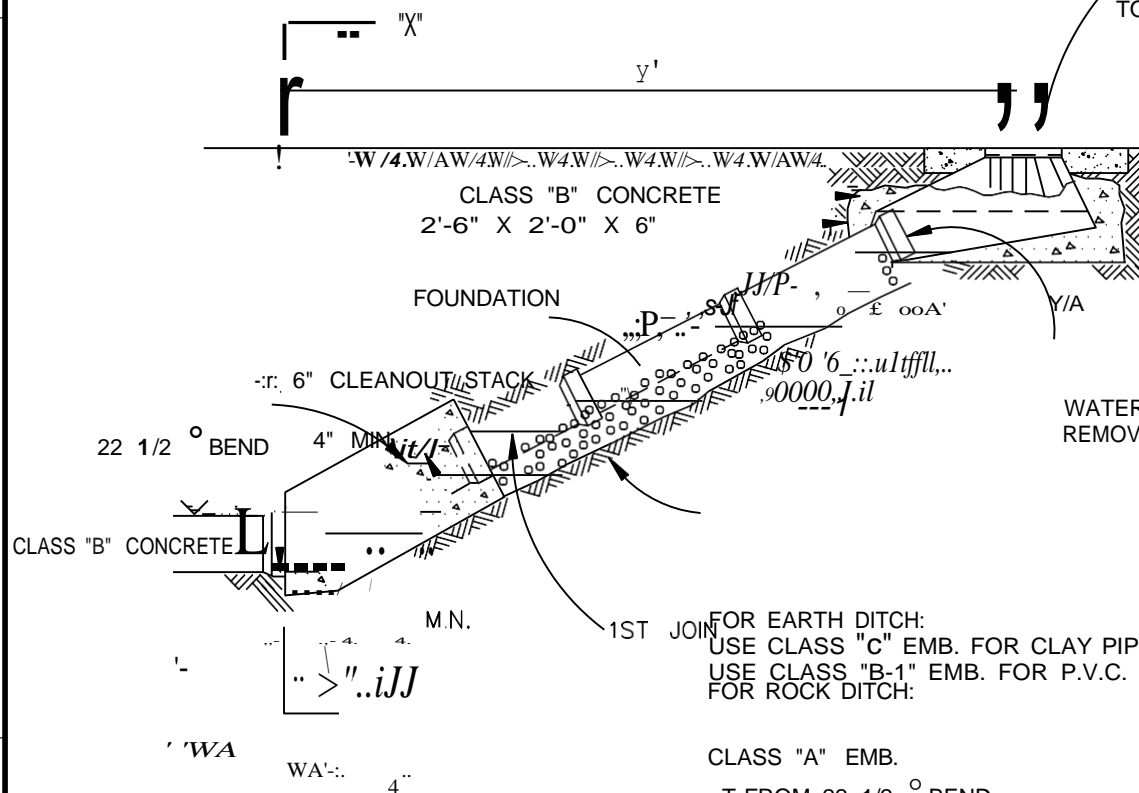
LINE INTERSECTION

STANDARD DRAWING NO.

SS-07

H'	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	H'
y'	10	12	14	17	19	22	24	27	29	31	34	36	39	41	43	46	48	y'

CLEANOUT CASTING OPENING TO BE INSTALLED CENTERED OVER THE CENTERLINE OF THE CLEANOUT STACK EXTENDED TO GROUND LEVEL. CLEANOUT OUTSIDE OF PAVEMENT TO BE INSTALLED IN 24"X24"X4" PAD.



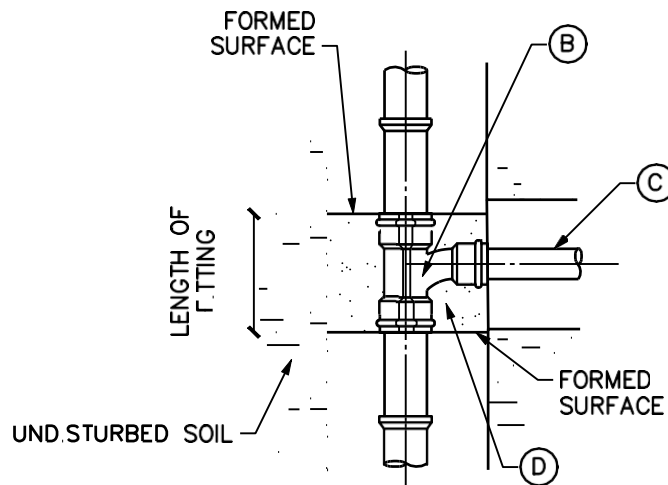
PROFILE VIEW
N.T.S.

SECTION "X - X"
N.T.S.

WASTEWATER MAIN

CLEANOUT

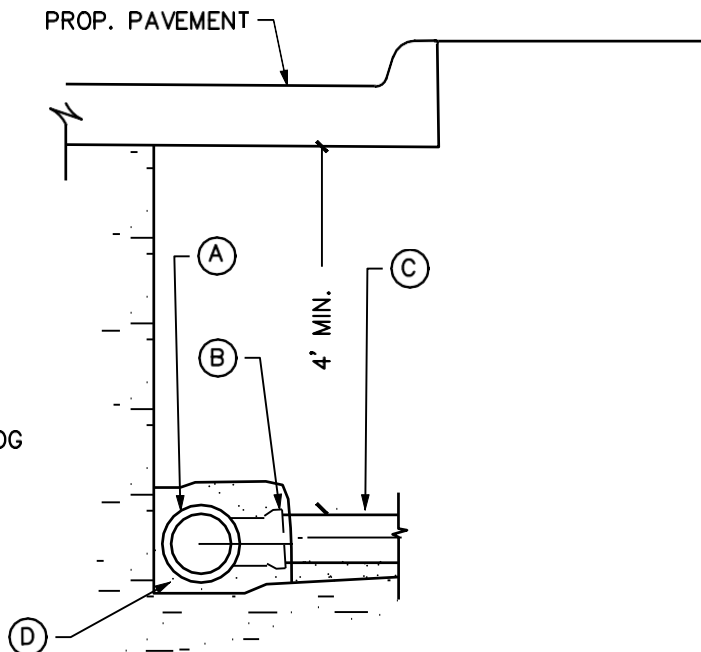
SS-08



PLAN VIEW

KEY:

- (A) WASTEWATER MAIN
- (B) 4" WYE
- (C) 4" WASTEWATER LAT.
(LENGTH VARIES)
- (D) CLASS B CONCRETE
2,000 PSI CONCRETE PER NCTCOG
702.2.4.2



SECTION VIEW

NOTES:

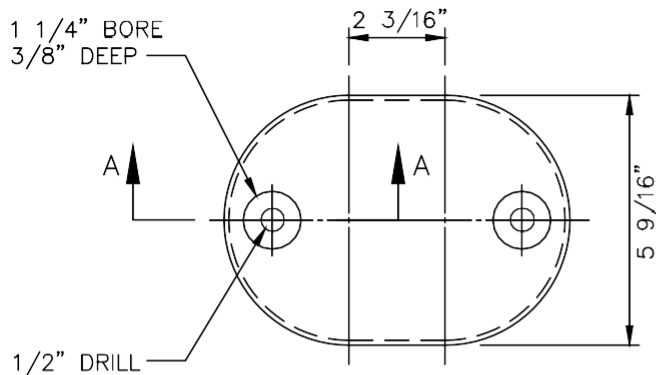
1. THE CLEANOUT MAY BE PLACED IN THE PARKWAY OR SIDEWALK, IF NECESSARY.
2. REFERENCE TECHNICAL SPECIFICATION 333109.

WASTEWATER SERVICES

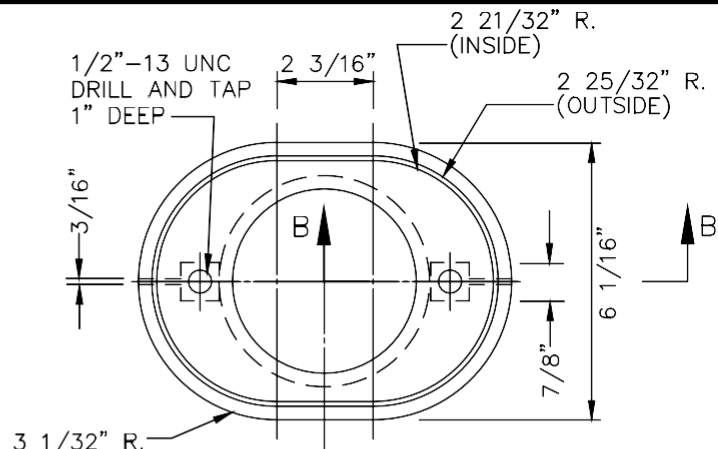
LATERAL CONNECTION

STANDARD DRAWING NO.

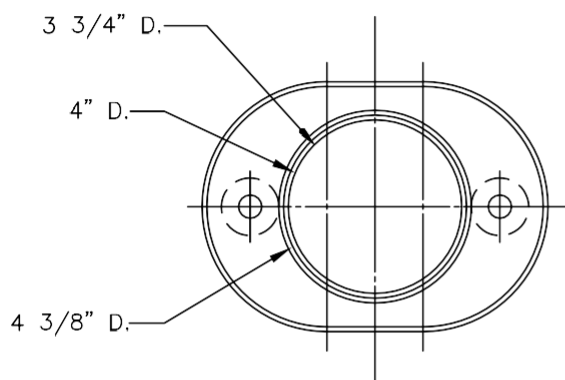
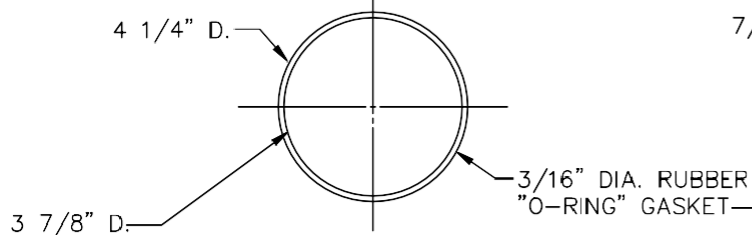
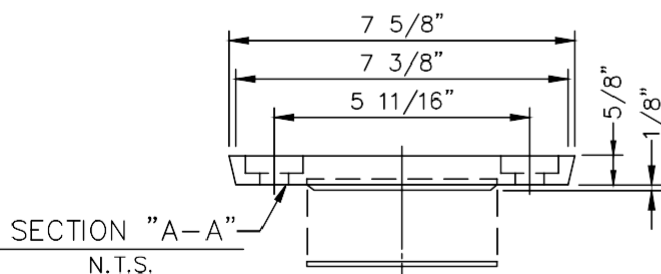
SS-09



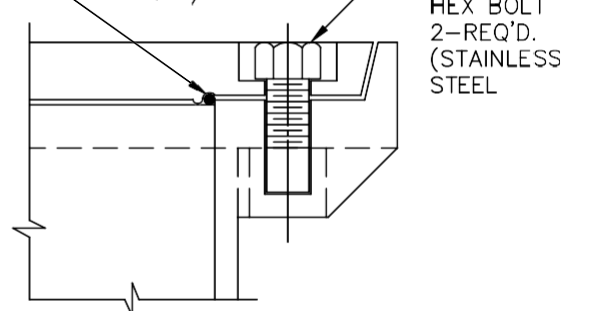
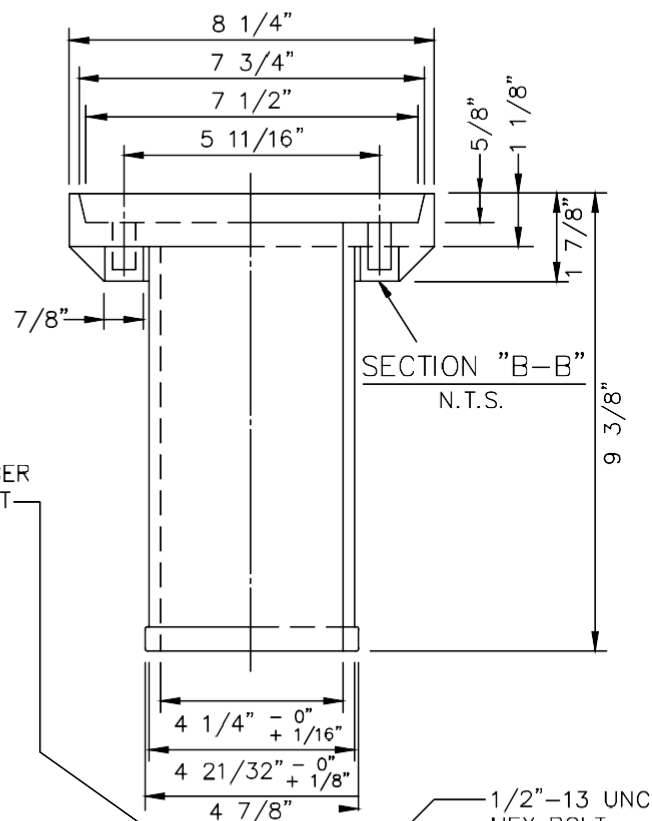
COVER
N.T.S.



CLEANOUT FRAME TOP
N.T.S.



CLEANOUT FRAME BOTTOM
N.T.S.



ASSEMBLY VIEW
N.T.S.

NOTES:

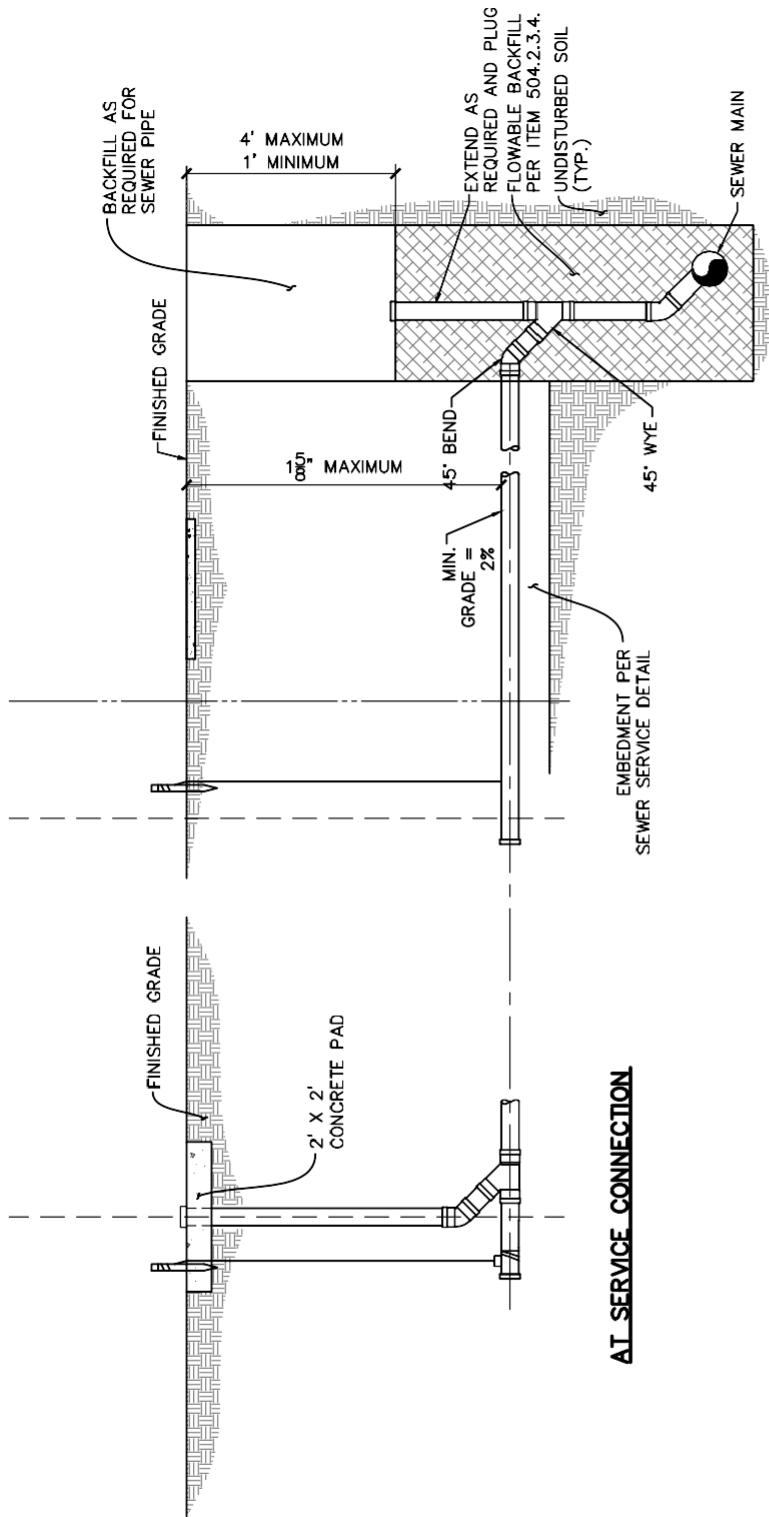
1. THE WORDS "WASTEWATER LATERAL CLEANOUT" SHALL BE CAST INTO TOP OF COVER.
2. MATERIALS TO BE CAST IRON, P.V.C. OR ABS PLASTIC.

WASTEWATER SERVICES

CLEANOUT FRAME & COVER

STANDARD DRAWING NO.

SS-10

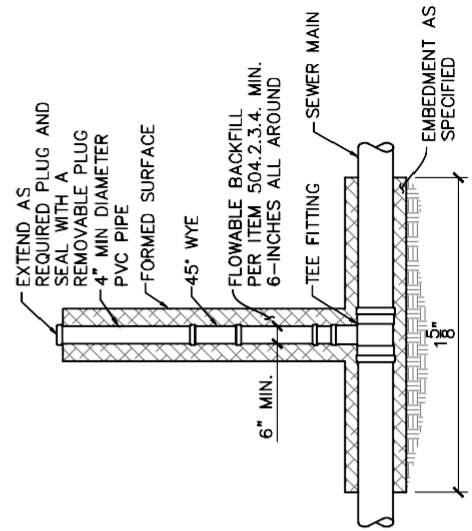


AT SERVICE CONNECTION

NOTES:

1. FOR SEWER MAINS DEEPER THAN 9 FEET, A DEEP SEWER SERVICE SHALL BE USED.
2. SERVICE LINE SHALL BE 4-INCH WHEN SEWER MAIN IS DEEPER THAN 12 FEET.
3. SANITARY SEWER SERVICE SHALL BE INSTALLED IN ACCORDANCE WITH THE STANDARD SANITARY SEWER EMBEDMENT AND BACKFILL DETAIL.
4. WHERE THE CLEAN-OUT HOUSING IS LOCATED INSIDE THE SIDEWALK, THE HOUSING SHALL BE LOCATED FLUSH WITH THE FINISHED SURFACE.
5. WHERE THE CLEAN-OUT HOUSING IS LOCATED OUTSIDE OF THE SIDEWALK, THE HOUSING SHALL BE AT FINISHED GRADE.
6. AT SUBDIVISION FINAL, THE SEWER SERVICE SHALL BE EXTENDED TO THE OUTSIDE OF THE UTILITY EASEMENT, IF ONE EXISTS ADJACENT TO THE RIGHT-OF-WAY; IF NOT TO THE OUTSIDE OF THE RIGHT-OF-WAY, AND A LINE AND STAKE LOCATOR INSTALLED AS SHOWN.
7. THE RESIDENTIAL BUILDING CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING THE CLEAN-OUT AT THE EASEMENT LINE, OR RIGHT-OF-WAY LINE IF NO EASEMENT EXISTS, WHEN EXTENDING THE SERVICE TO THE STRUCTURE, AND SETTING CLEAN-OUT AT FINAL GRADE, INSTALLING 2' X 2' PAD WITH CAST IRON CLEAN OUT BOX AND RUBBER GEM CAP ON STAND PIPE.

AT SUBDIVISION FINAL

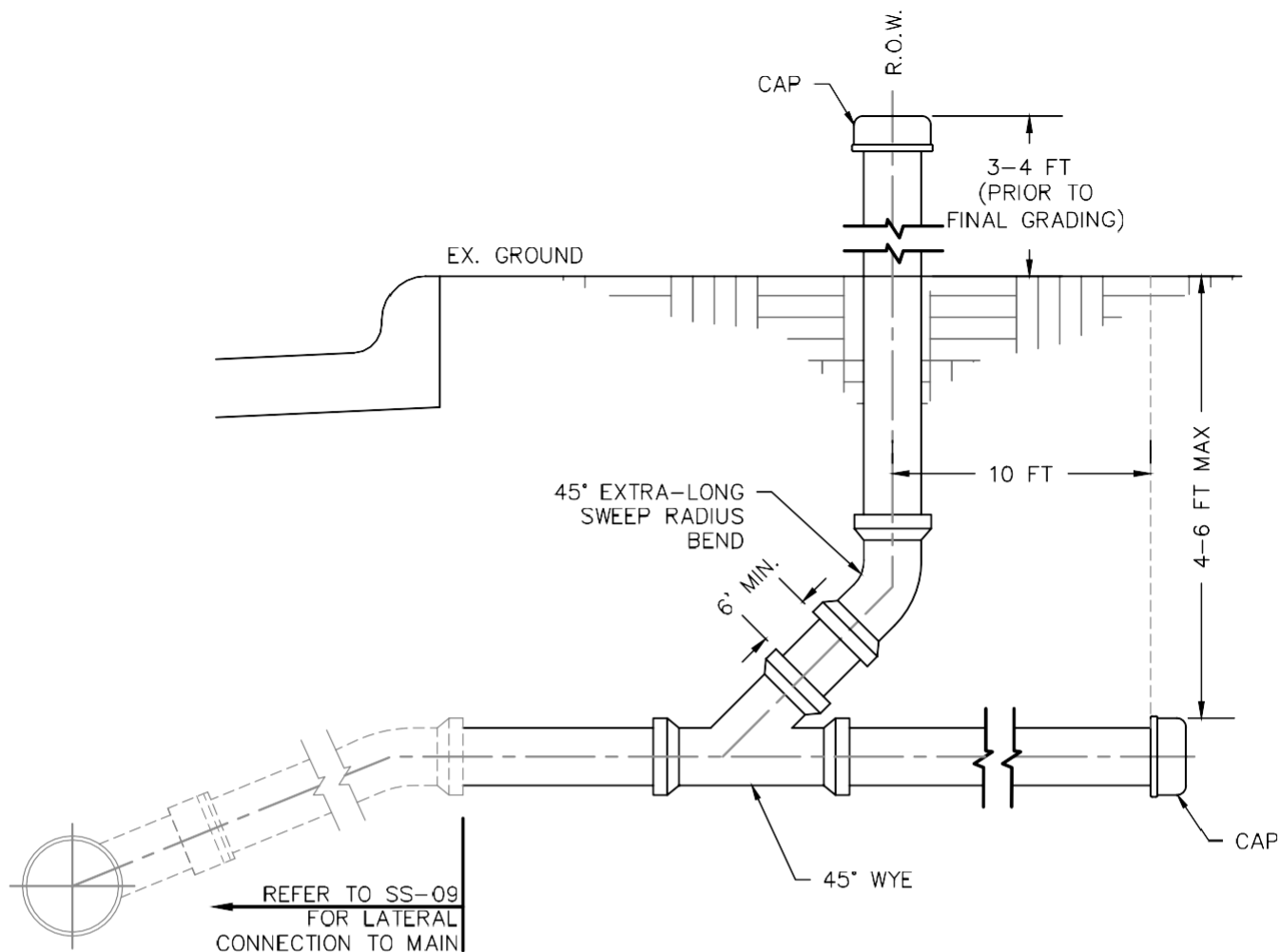


WASTEWATER SERVICES

DEEP LATERAL CONNECTION

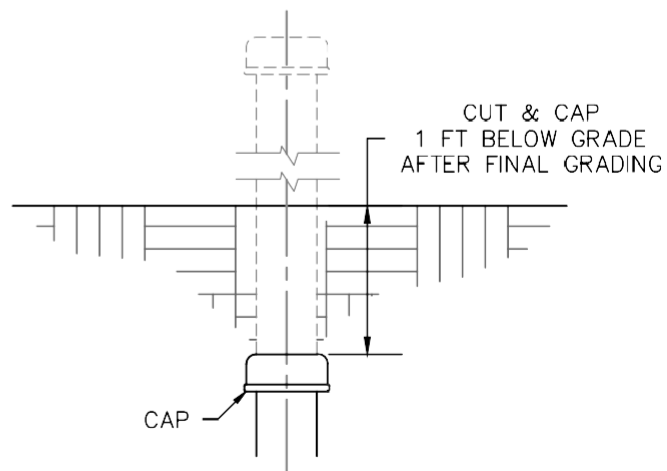
STANDARD DRAWING NO.

SS-11



NOTES:

1. RESIDENTIAL SEWER LATERAL SHALL BE MINIMUM 4" PVC SDR 35 AT A 2% MINIMUM GRADE.
2. SEWER LATERALS SHALL EXTEND TO A POINT 10 FT BEYOND RIGHT-OF-WAY LINE AND SHALL BE A MAXIMUM OF 5 FT DEEP.
3. SEWER LATERALS SHALL BE PLACED AT THE CENTERLINE OF EACH LOT.
4. DURING INITIAL LATERAL INSTALLATION, A 4" CLEANOUT SHALL BE BROUGHT 3-4 FT ABOVE GRADE AT THE R.O.W. LINE.
5. PRIOR TO FINAL GRADING, LATERAL LOCATION SHALL BE MARKED ON CURB AND CLEANOUT TO BE CUT 1 FOOT BELOW GRADE.
6. CONNECTION TO THE MAIN SHALL BE MADE WITH A COMBO WYE & EXTRA-LONG SWEEP $\frac{1}{8}$ BEND.

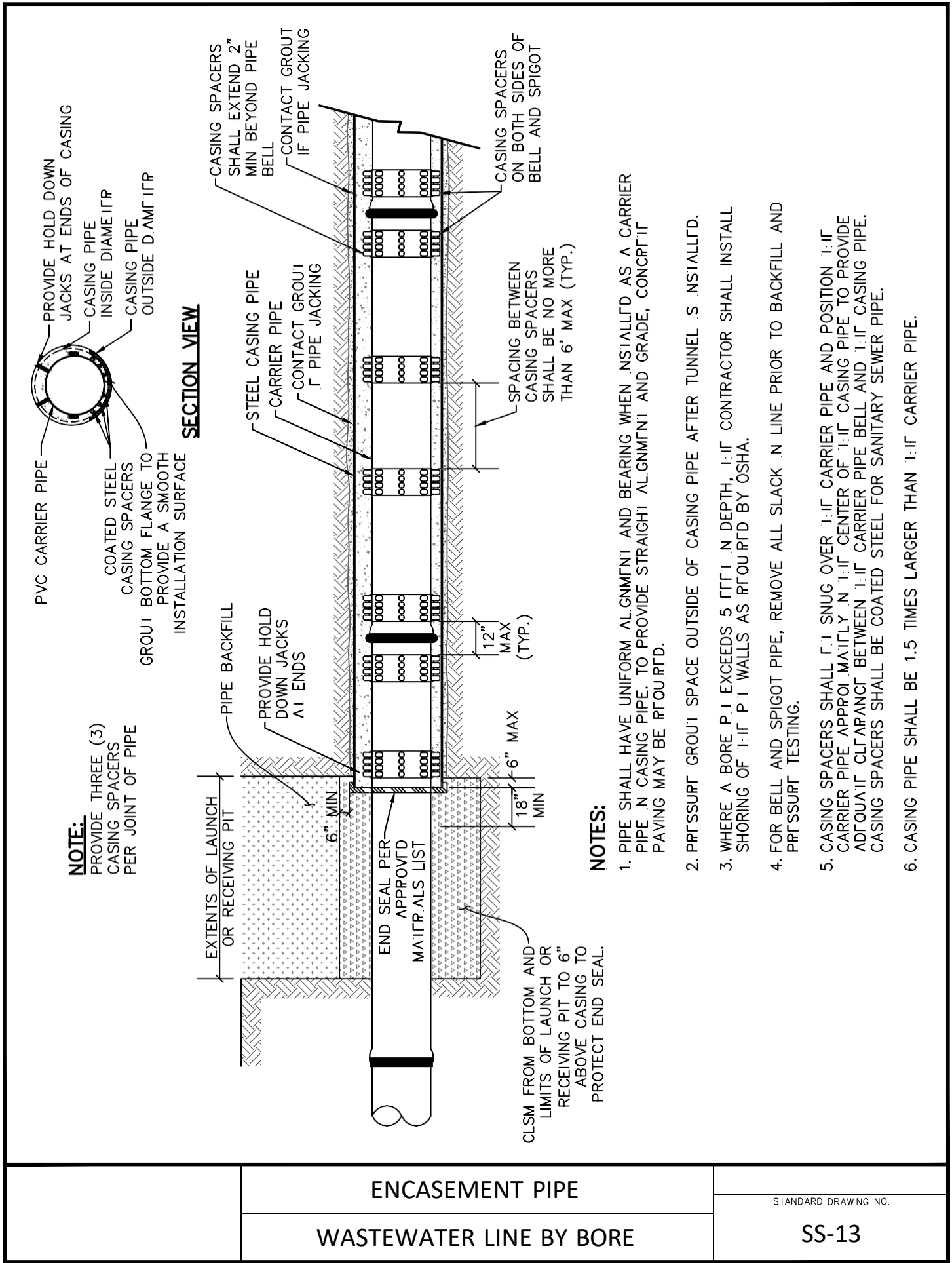


RESIDENTIAL LATERAL

WITH CLEANOUT AT PROPERTY LINE

STANDARD DRAWING NO.

SS-12



NOTE:

PROVIDE THREE (3) CASING SPACERS PER JOINT OF PIPE

SECTION VIEW

NOTES:

1. PIPE SHALL HAVE UNIFORM ALGNUMFN1 AND BEARING WHEN INSTALLED AS A CARRIER PIPE IN CASING PIPE. TO PROVIDE STRAIGHT ALIGNMENT AND GRADE, CONCRETE PAVING MAY BE REQUIRED.
2. PRESSURE GROUT SPACE OUTSIDE OF CASING PIPE AFTER TUNNELS INSTALLED.
3. WHERE A BORE PIPE EXCEEDS 5 FT IN DEPTH, THE CONTRACTOR SHALL INSTALL SHORING OF 1:1 P.I. WALLS AS REQUIRED BY OSHA.
4. FOR BELL AND SPIGOT PIPE, REMOVE ALL SLACK IN LINE PRIOR TO BACKFILL AND PRESSURE TESTING.
5. CASING SPACERS SHALL BE SNUG OVER THE CARRIER PIPE AND POSITION THE CARRIER PIPE APPROXIMATELY IN THE CENTER OF THE CASING PIPE TO PROVIDE ADEQUATE CLEARANCE BETWEEN THE CARRIER PIPE BELL AND THE CASING PIPE. CASING SPACERS SHALL BE COATED STEEL FOR SANITARY SEWER PIPE.
6. CASING PIPE SHALL BE 1.5 TIMES LARGER THAN THE CARRIER PIPE.

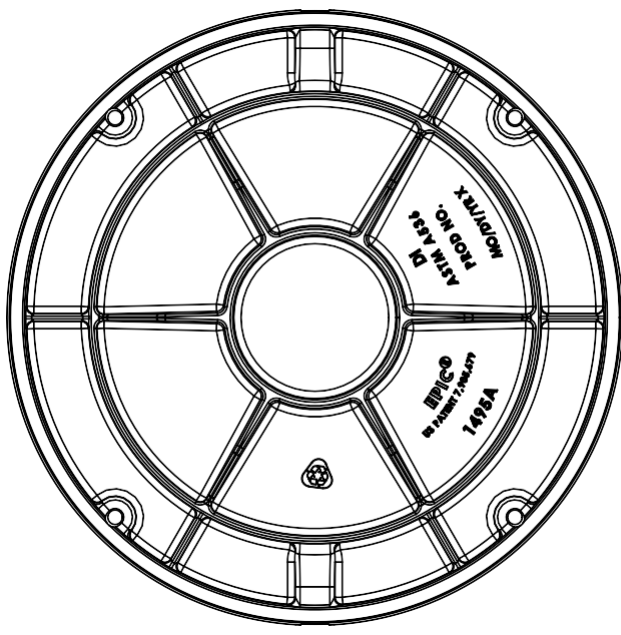
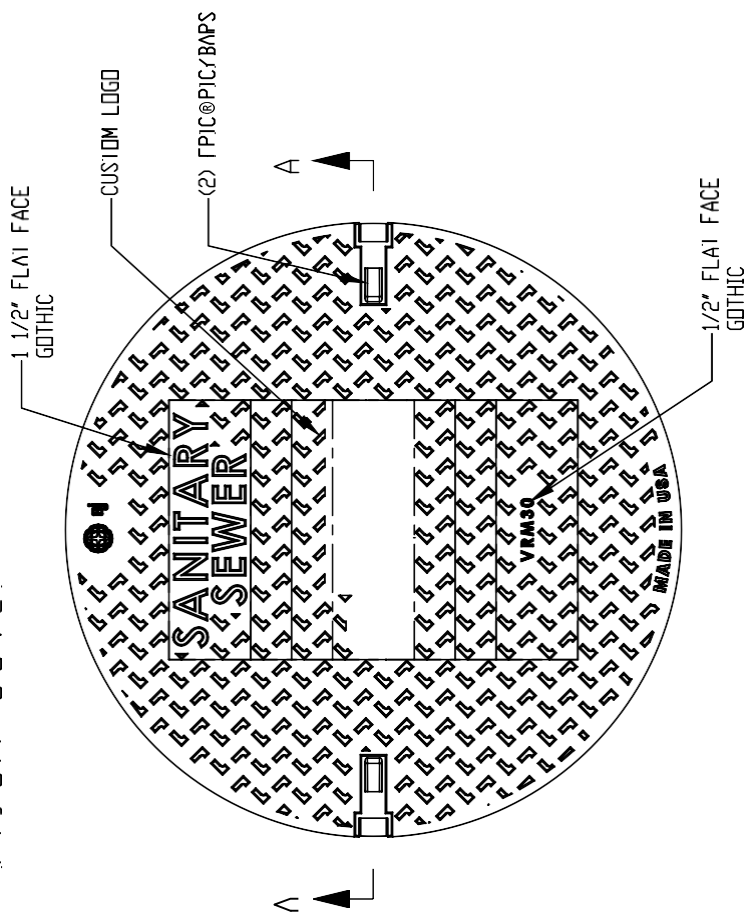
ENCASEMENT PIPE

WASTEWATER LINE BY BORE

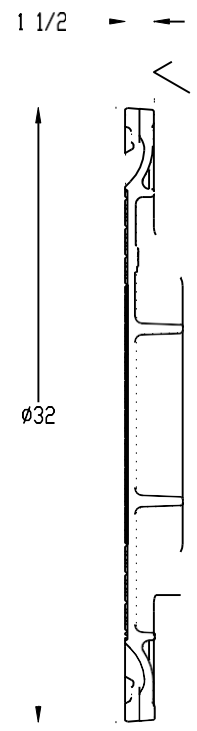
STANDARD DRAWING NO.

SS-13

1495A Cover



BOTTOM VIEW



SECTION A-A

Product Number
001495024

Design Features
-Materials
Ductile Iron (70-50-05)
-Design Load
Heavy Duty
-Open Area
n/a
-Coating
Unlipped
-✓ Designates Machined Surface

Certification
-ASTM A536
-Country of Origin: USA

Disclaimer
Weights (lbs/kg), dimensions (inches/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

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800 626 4633
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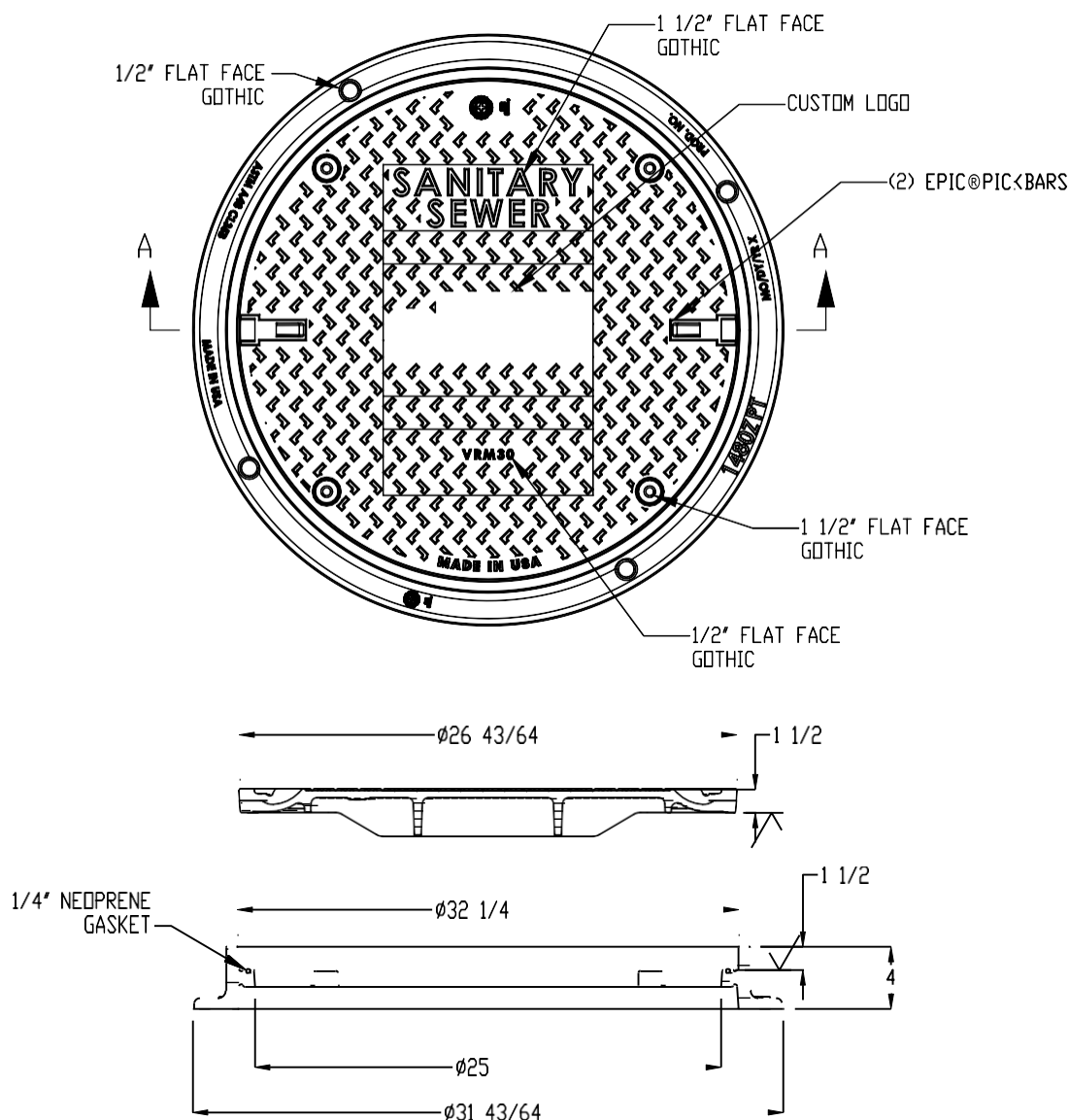
WASTEWATER MANHOLE

STANDARD COVER

STANDARD DRAWING NO.

SS-14

1480ZPT 1495APT Assembly



Product Number
001495023W01

Design Features

- Materials
- Frame
Gray Iron (CL35B)
- Cover
Ductile Iron (70-50-05)
- Design Load
Heavy Duty
- Open Area
n/a
- Coating
Undipped
- ✓ Designates Machined Surface

Major Components
00148019
001495023

Certification
-ASTM A536
-Country of Origin: USA

Disclaimer
Weights (lbs/kg), dimensions (inches/mm)
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WASTEWATER MANHOLE

BOLTED COVER

STANDARD DRAWING NO.

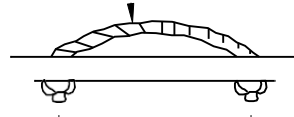
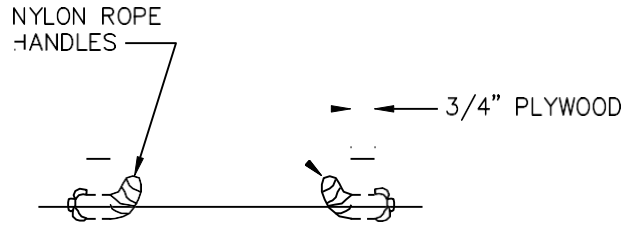
SS-14A

INSTALLATION

FALSE MANHOLE BOTTOM SHALL BE FURNISHED AND INSTALLED IN ALL MANHOLES CONSTRUCTED IN ADVANCE OF PAVING. THESE FALSE MANHOLE BOTTOMS WILL BE INSTALLED AT A TIME DIRECTED BY THE ENGINEER BUT WILL USUALLY BE AFTER ALL WORK IS COMPLETED ON THE WASTEWATER SYSTEM INCLUDING THE A/R TEST, BUT PRIOR TO THE FINAL INSPECTION.

REMOVAL

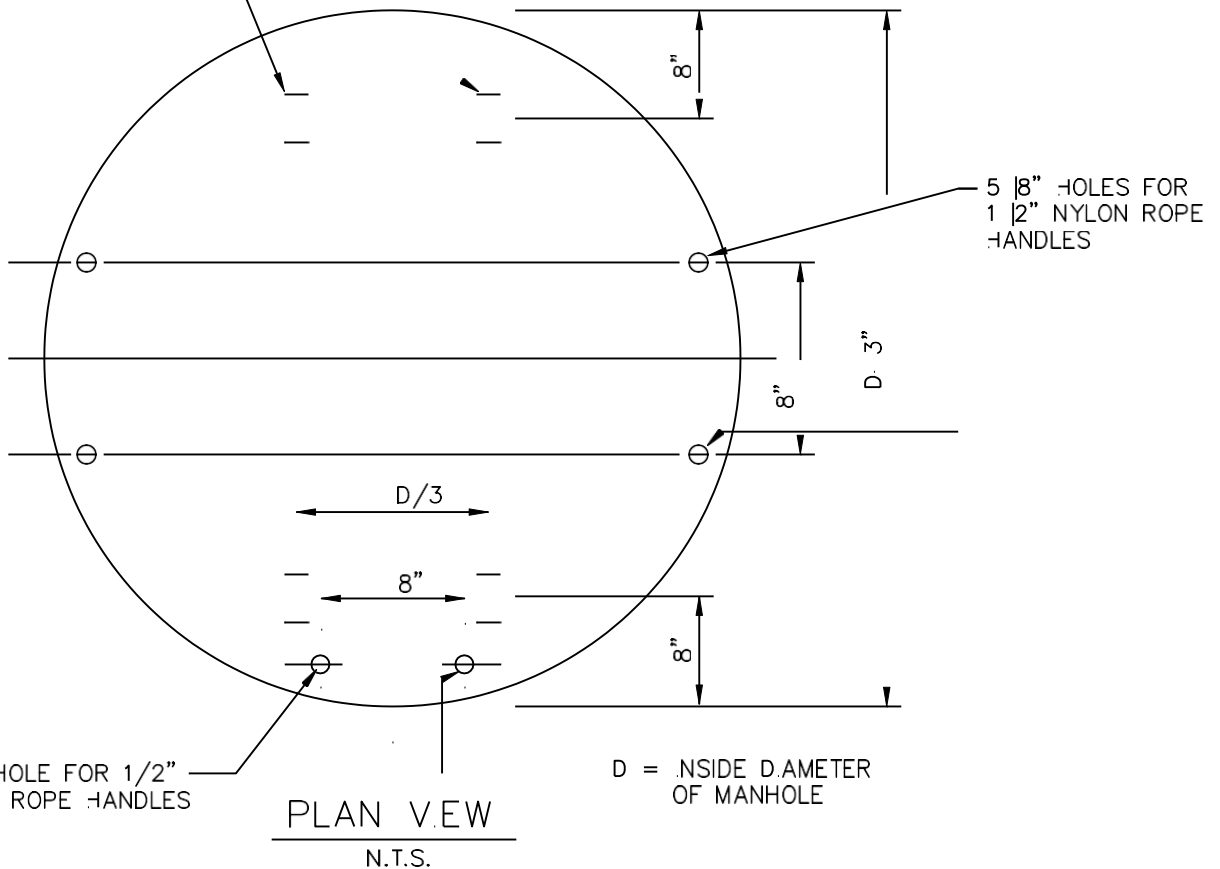
FALSE MANHOLE BOTTOM SHALL BE REMOVED AFTER THE FINAL APPURTENANCE ADJUSTMENT INSPECTION. THE PAVING CONTRACTOR AND OWNER'S REPRESENTATIVE WILL COORDINATE THE REMOVAL OF THE FALSE MANHOLE BOTTOMS.



INSTALLATION AND REMOVAL POSITION

N.T.S.

METAL STRAP HINGES
(M.N. 3" LONG) W/BOLTS



	WASTEWATER MANHOLE	STANDARD DRAWING NO.
	FALSE MANHOLE BOTTOM	SS-15

INFI-SHIELD
6" GATOR WRAP SPECIFICATION

Each manhole, catch basin or pipe joint shall be sealed with external rubber sleeve similar to the Infi-Shield Gator Wrap as manufactured by Sealing Systems, Inc. (763-478-2057). The seal shall be made of a Stretchable, Self-Shrinking, Intra-Curing Halogenated Based Rubber with a minimum thickness of 30 mils. The back side of each until shall be coated with a cross-linked re-enforced butyl adhesive. The butyl adhesive shall be non-hardening sealant, with a minimum thickness of 30 mils. The seal shall be designed to stretch around the substrate then overlapped creating a cross-link and fused bond between the rubber and butyl adhesive. The application shall form a continuous rubber seal that applies inward pressure on the protected area for the life of application. The butyl adhesive and the inward pressure exerted on the substrate will prevent the intrusion of water and soil through the joint sections of a manhole, catch basin or concrete pipe.

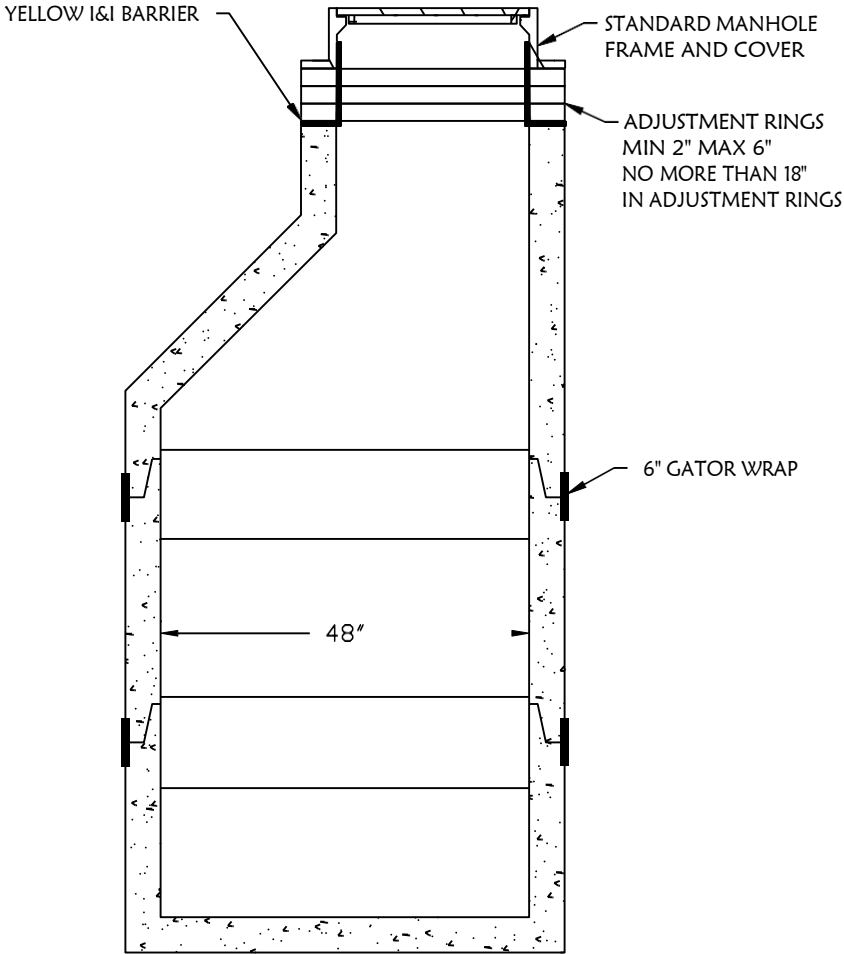
Gator Wrap 6"

Height	6 inches
Length	16 or 50 foot rolls
Thickness	60 mils
Height tolerance	6 inches +/- .188"
Length tolerance	+/- 3"
Rubber Thickness tolerance	30 mils
Butyl Adhesive Thickness	30 mils

I&I BARRIER

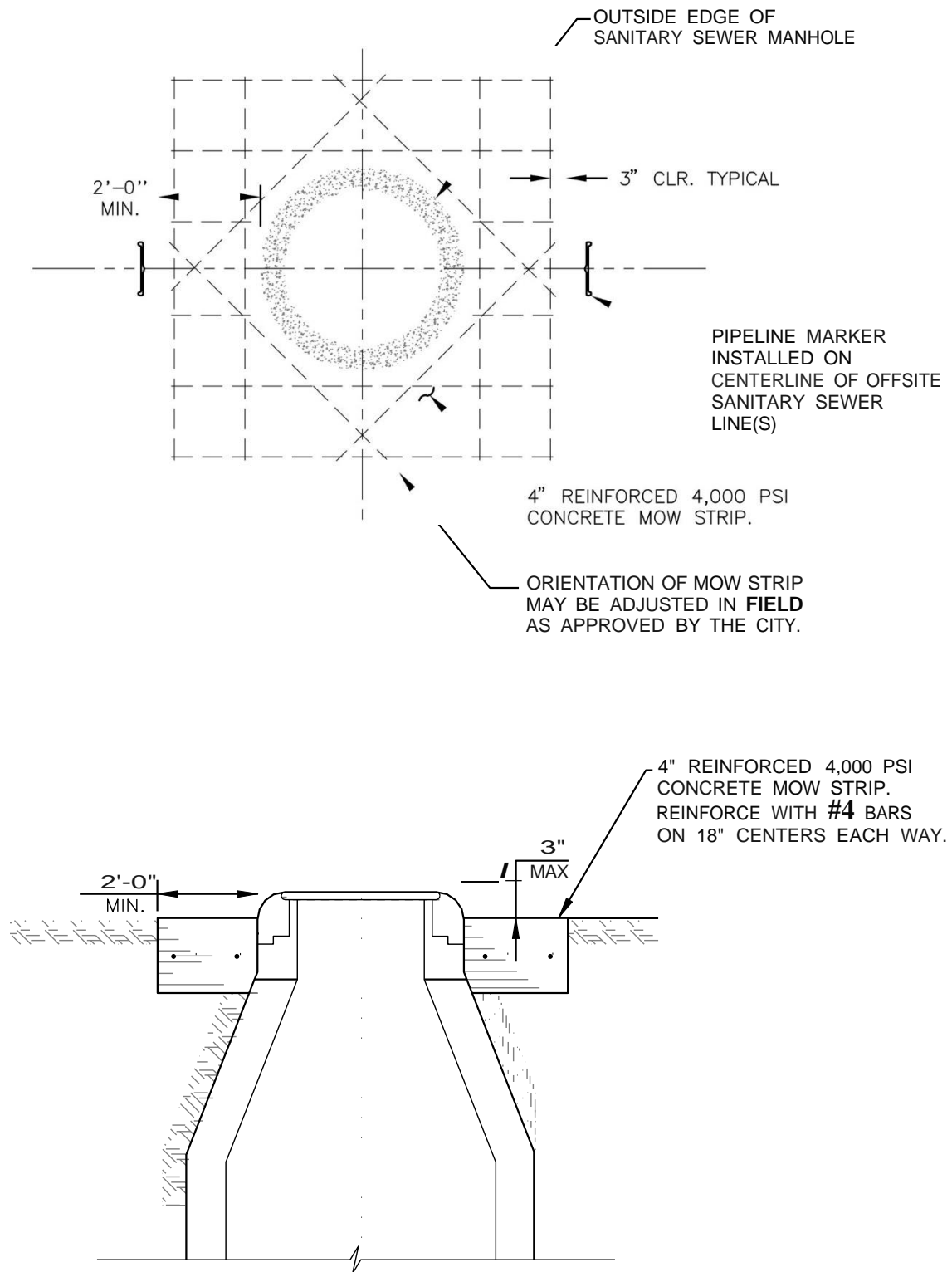
SPECIFICATION
Patent Pending

The bottom surface of the I/I BARRIER flange shall be sealed to the manhole cone top surface using a butyl sealant as specified by the manufacture of the I/I BARRIER. The sealant shall be applied to the top surface of the manhole cone section only. Sufficient sealant must be used to accommodate flaws in the cone surface and "out-of-flat" conditions. The amount of sealant and its placement will be determined by the condition of the cone. This determination will be the responsibility of the contractor installing the I/I BARRIER. The I/I BARRIER is then centrally seated on the cone against the sealant. The bottom adjustment ring is then centrally placed on the top surface of the I/I BARRIER flange using no sealant. If plastic adjustment rings with a vertical tongue are being used, the tongue must be cut off to allow the bottom ring to set flush on the I/I BARRIER flange. This removal should be done per instructions from the adjustment ring manufacturer. The chimney section is then completed based on the type of adjustment rings being utilized.



I&I BARRIER & GATOR WRAP
6" GATOR WRAP

SS-16
STANDARD DRAWING NO.



MANHOLE & VALVE VAULT

MOW STRIP

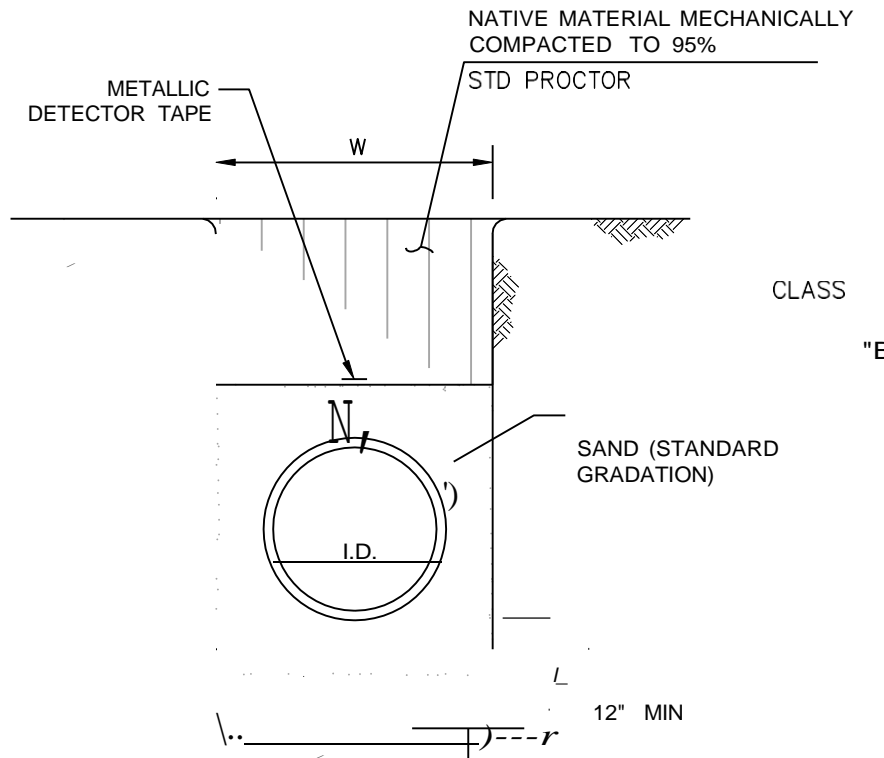
SIANDARD DRAWING NO.

SS-17

CLASS "B+" & CLASS "G"

EMBEDMENT

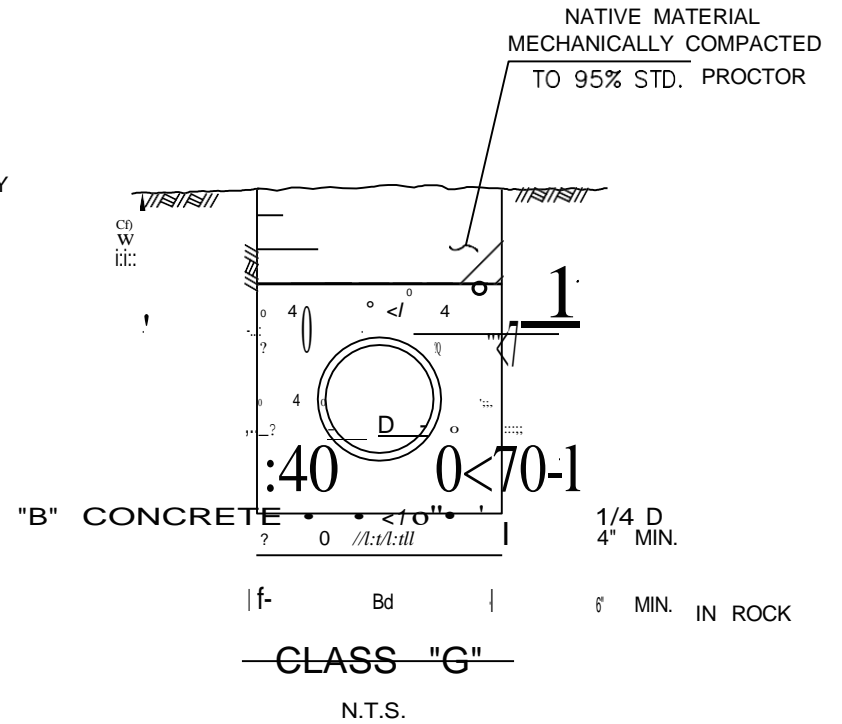
EMB-01



12"MIN. FOR PIPE > 24" I.D.
8" MIN. FOR PIPE :5: 24" I.D.

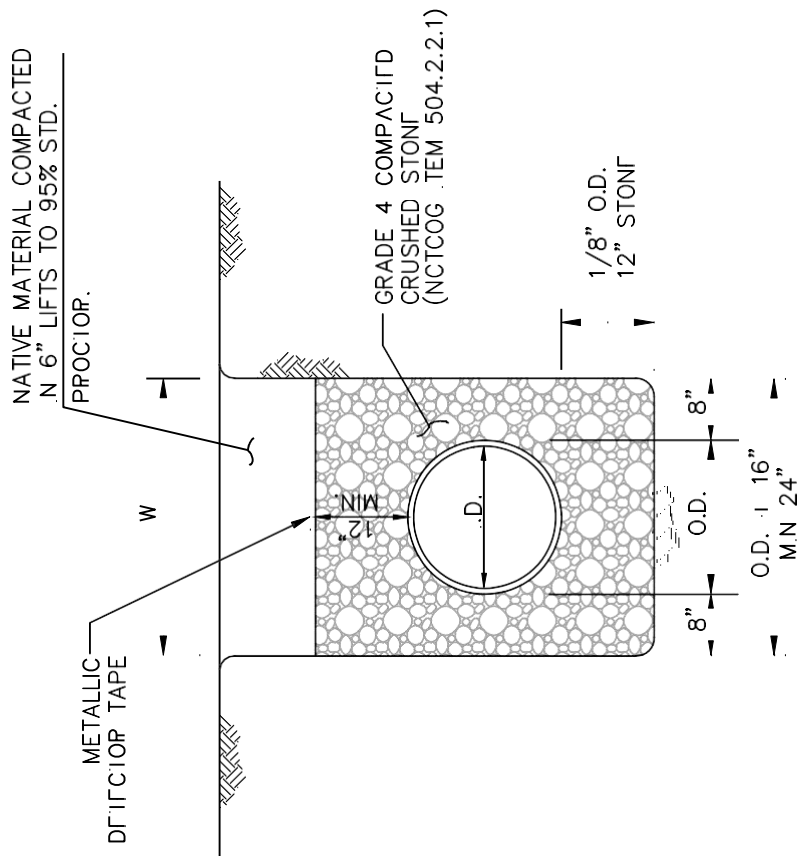
WATER LINE EMBEDMENT

NO SCALE



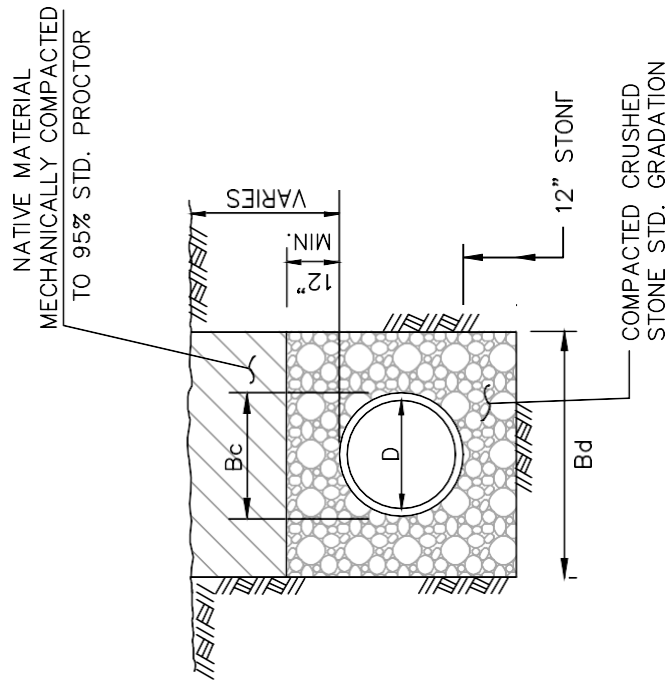
NOTES:

1. D = INSIDE DIAMETER OF PIPE
2. Bd = TRENCH WIDTH



CLASS I EMBE DMENT
P.V.C. PIPE ONLY
STD. P.V.C. SEWER

- NOTES:
1. UTILIZE CLASS "H" EMBEDMENT FOR PVC (SDR 35) WASTEWATER LINE.
 2. BEDDING DEPTH MEASURED FROM OUTSIDE OF PIPE BELL.



STORM SEWER
EMB EMENT
N.T.S.

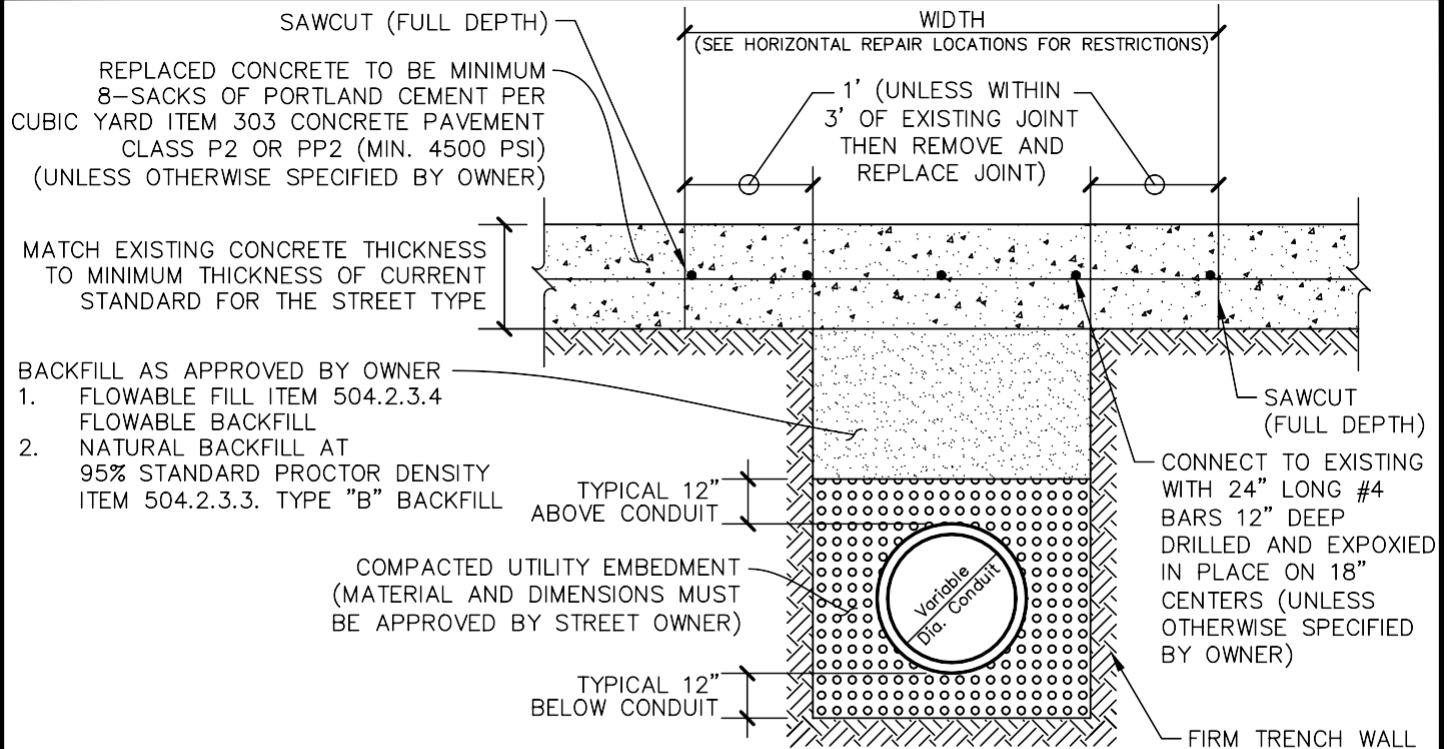
- NOTES:
1. D : INSIDE DIAMETER OF PIPE
 2. Bd : TRENCH WIDTH
 3. Bc : OUTSIDE DIAMETER OF PIPE

EMBEDMENT

CLASS "H" & STORM SEWER

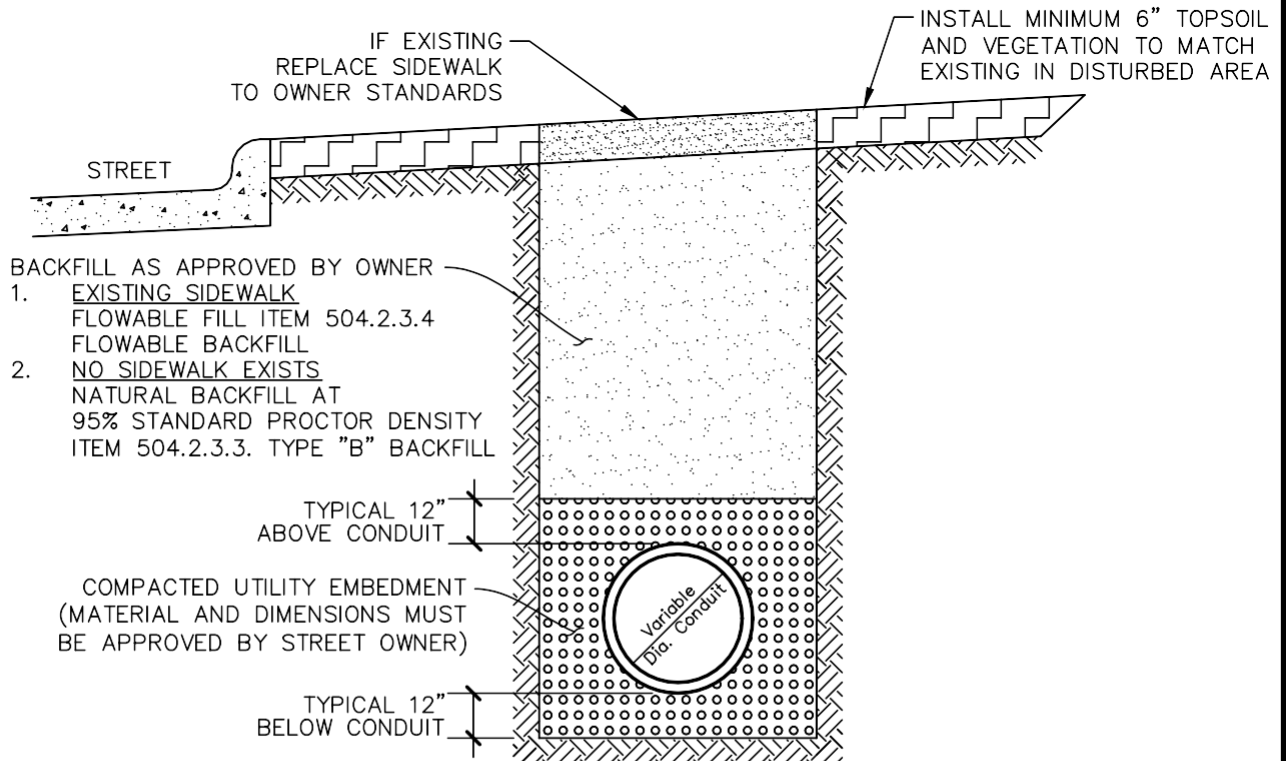
STANDARD DRAWING NO.

EMB-02



CONCRETE PAVEMENT

N.T.S.



STREET PARKWAY

N.T.S.

PAVEMENT CUT & REPAIR

CONCRETE & PARKWAY

STANDARD DRAWING NO.

EMB-03

REPLACED CONCRETE TO BE MINIMUM
8-SACKS OF PORTLAND CEMENT PER
CUBIC YARD ITEM 303 CONCRETE PAVEMENT
CLASS P2 OR PP2 (MIN. 4500 PSI)
REINFORCING STEEL 24" O.C.E.W.
(UNLESS OTHERWISE SPECIFIED BY OWNER)
MATCH EXISTING ASPHALT THICKNESS
TO MINIMUM THICKNESS OF CURRENT
STANDARD FOR THE STREET TYPE

WIDTH
(SEE HORIZONTAL REPAIR LOCATIONS FOR RESTRICTIONS)

-1' (UNLESS WITHIN -
3' OF EXISTING JOINT
THEN REMOVE AND
REPLACE JOINT)

CRACK SEAL NEW
JOINT (MATERIAL
AS APPROVED
BY OWNER)

MATCH EXISTING CONCRETE THICKNESS
TO MINIMUM THICKNESS OF CURRENT

STANDARD FOR THE STREET TYPE

SAWCUT (FULL DEPTH)
BACKFILL AS APPROVED BY OWNER

1. FLOWABLE FILL ITEM 504.2.3.4
FLOWABLE BACKFILL
2. NATURAL BACKFILL AT
95% STANDARD PROCTOR DENSITY

ITEM 504.2.3.3. TYPE "B" BACKFILL TYPICAL 12"

ABOVE CONDUIT
COMPACTED UTILITY EMBEDMENT
(MATERIAL AND DIMENSIONS MUST
BE APPROVED BY STREET OWNER)

TYPICAL 12" - U

BELOW CONDUIT

CONCRETE PAVEMENT WITH ASPHALT OVERLAY

N.T.S.

MATCH EXISTING ASPHALT THICKNESS
SURFACE COURSE
TO MINIMUM THICKNESS OF CURRENT
STANDARD FOR THE STREET TYPE

WIDTH
(SEE HORIZONTAL REPAIR LOCATIONS FOR RESTRICTIONS)

-1' (UNLESS WITHIN -
3' OF EXISTING JOINT
THEN REMOVE AND
REPLACE JOINT)

CRACK SEAL NEW
JOINT (MATERIAL
AS APPROVED
BY OWNER)

REPLACED BASE COURSE ASPHALT
TO MATCH EXISTING ASPHALT
TO MINIMUM THICKNESS OF CURRENT
STANDARD FOR THE STREET TYPE

SAWCUT (FULL DEPTH)

BACKFILL AS APPROVED BY OWNER
1. FLOWABLE FILL ITEM 504.2.3.4
FLOWABLE BACKFILL

2. NATURAL BACKFILL AT
95% STANDARD PROCTOR DENSITY
ITEM 504.2.3.3. TYPE "B" BACKFILL

TYPICAL

12" 1] -> t

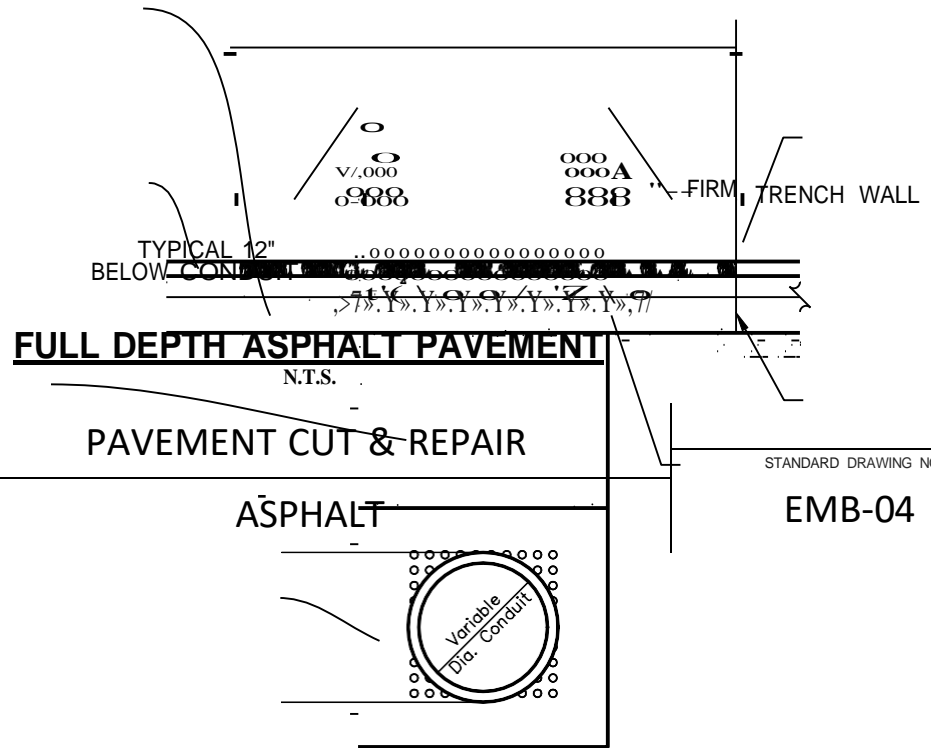
ABOVE CONDUIT

COMPACTED UTILITY EMBEDMENT
(MATERIAL AND DIMENSIONS MUST

BE APPROVED
BY STREET

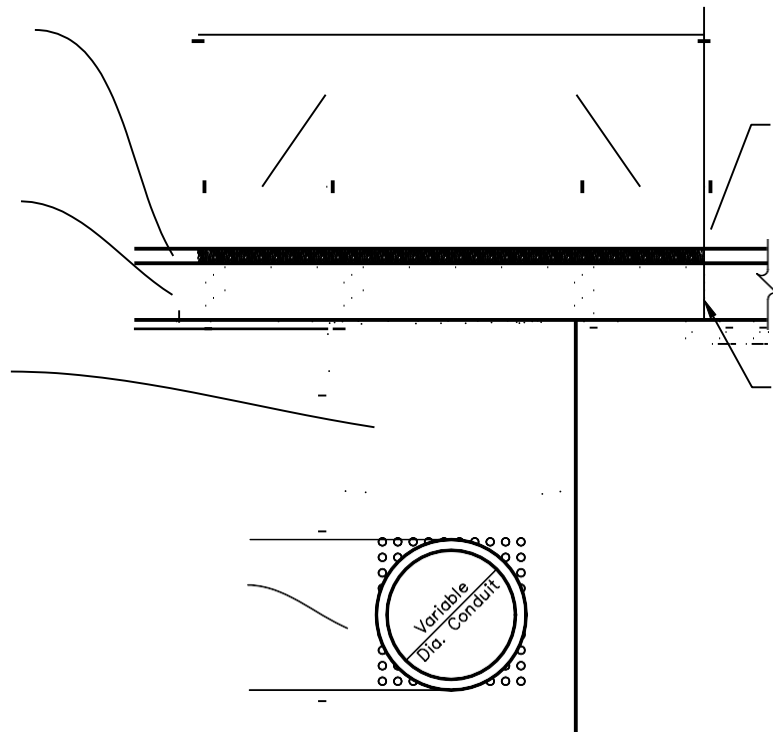
O
W

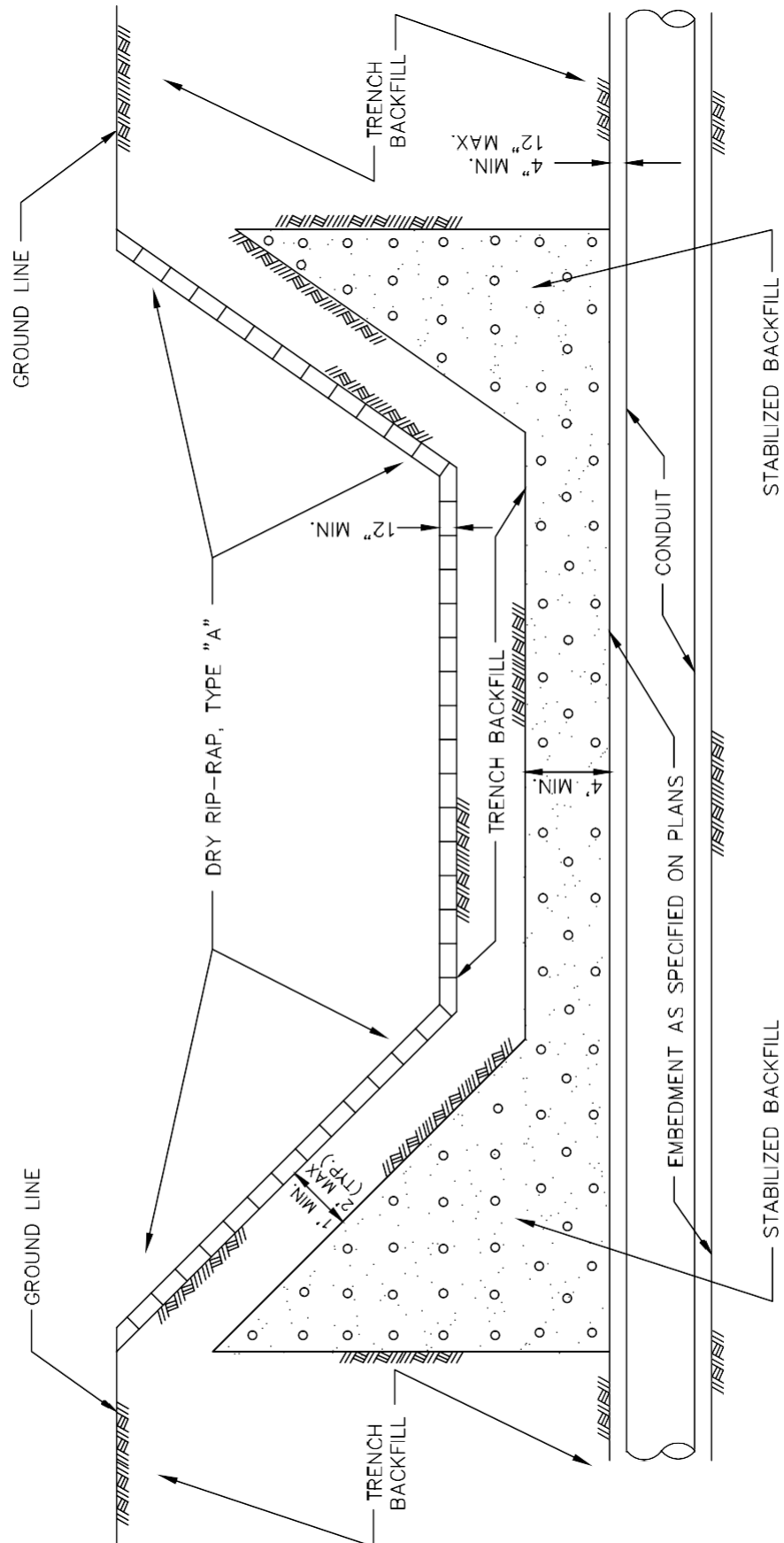
NER)



STANDARD DRAWING NO.

EMB-04



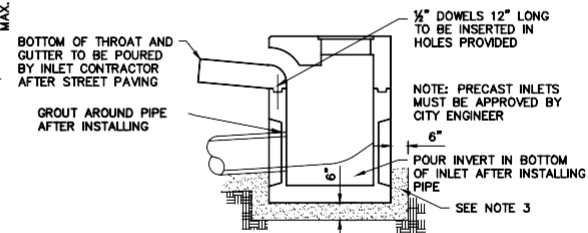
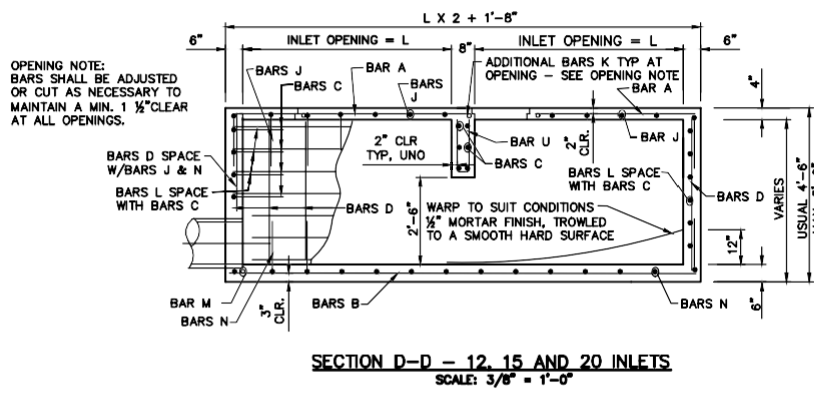
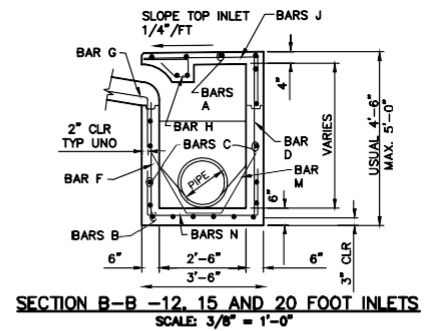
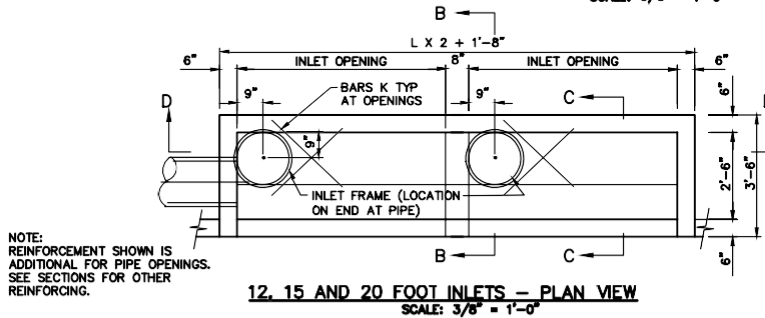
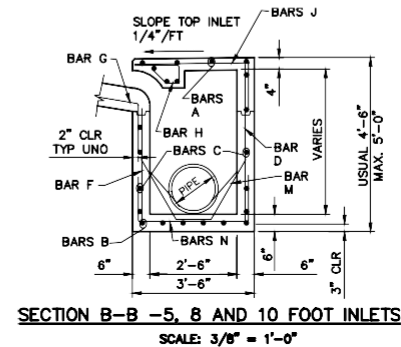
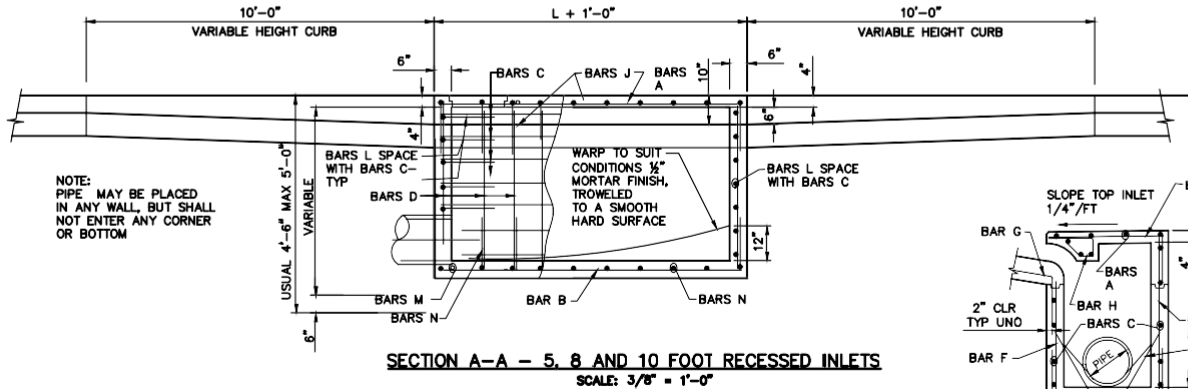
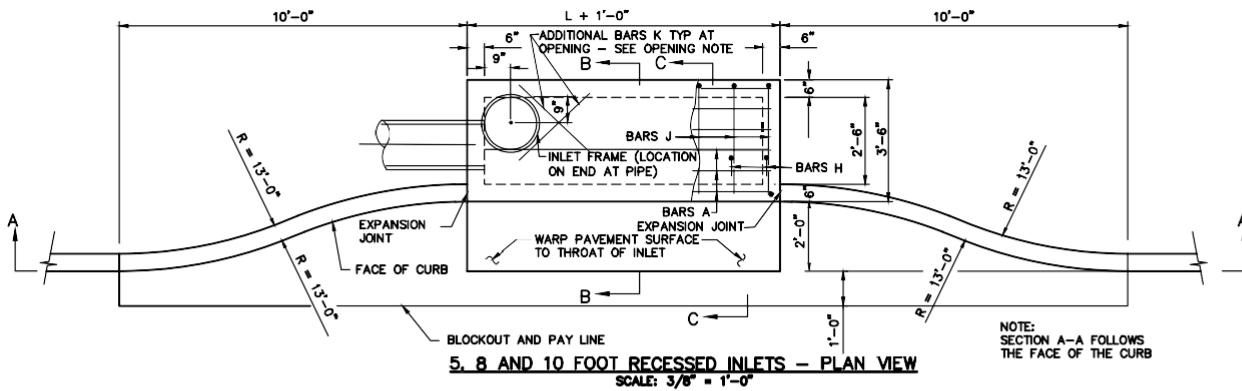


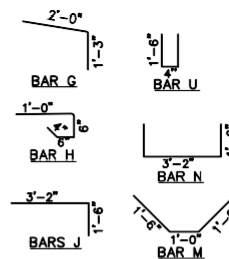
INFILTRATION PROTECTION

CONDUIT UNDER CHANNEL

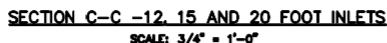
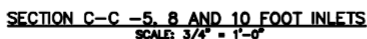
STANDARD DRAWING NO.

EMB-05





PLAN - STANDARD INLET
SCALE: 3/8" = 1'-0"



REINFORCING STEEL SCHEDULE					REINFORCING STEEL SCHEDULE				
DOUBLE INLETS									
INLET OPENING L ₁	BAR	BAR SIZE	NO. REQ'D	BAR* LENGTH	INLET OPENING L ₂	BAR	BAR SIZE	NO. REQ'D	BAR* LENGTH
6'-0"	A	#4	11	13'-4"	5'-0"	A	#4	9	5'-0"
	B	#4	6	13'-4"		B	#4	6	5'-0"
	C	#4	18	13'-4"		C	#4	12	5'-0"
	D	#5	1	5'-0"		D	#5	7	4'-0"
	E	#5	1	5'-3'-4"		E	#5	7	3'-3"
	F	#4	15	3'-6"		F	#4	7	3'-6"
	G	#4	15	2'-6"		G	#4	9	2'-6"
	H	#5	15	4'-8"		H	#5	7	4'-8"
	K**	#4	4	3'-0"		K**	#4	4	3'-0"
	L	#4	24	3'-0"		L	#4	24	3'-0"
	M**	#4	2	4'-0"		M**	#4	2	4'-0"
	N	#5	15	6'-2"		N	#5	7	6'-2"
	U	#4	4	3'-4"					
7'-6"	A	#4	11	16'-4"	8'-0"	A	#4	9	7'-0"
	B	#4	6	16'-4"		B	#4	6	7'-0"
	C	#4	18	16'-4"		C	#4	12	7'-0"
	D	#5	18	4'-0"		D	#5	10	4'-0"
	E	#5	18	3'-3"		E	#5	10	3'-3"
	F	#4	18	3'-6"		F	#4	10	3'-6"
	G	#4	18	2'-6"		G	#4	14	2'-6"
	H	#4	18	4'-8"		H	#4	10	4'-8"
	J	#4	4	3'-0"		J	#4	4	3'-0"
	K**	#4	4	3'-0"		K**	#4	4	3'-0"
	L	#4	24	3'-0"		L	#4	24	3'-0"
	M**	#4	2	4'-0"		M**	#4	2	4'-0"
	N	#5	18	6'-2"		N	#5	10	6'-2"
U	#4	4	3'-4"						
10'-0"	A	#4	11	21'-4"	10'-0"	A	#4	9	9'-0"
	B	#4	6	21'-4"		B	#4	6	9'-0"
	C	#4	18	21'-4"		C	#4	12	9'-0"
	D	#5	23	4'-0"		D	#5	12	4'-0"
	E	#5	23	3'-3"		E	#5	12	3'-3"
	F	#4	23	3'-6"		F	#4	12	3'-6"
	G	#4	23	2'-6"		G	#4	12	3'-6"
	H	#4	23	2'-6"		H	#4	17	2'-6"
	J	#5	23	4'-8"		J	#5	12	4'-8"
	K**	#4	4	3'-0"		K**	#4	4	3'-0"
	L	#4	24	3'-0"		L	#4	24	3'-0"
	M**	#4	2	4'-0"		L	#4	2	4'-0"
	N	#5	23	6'-2"		N	#5	12	6'-2"
U	#4	4	3'-4"						

* BAR QUANTITIES AND LENGTHS SHOWN ARE FOR MAX HEIGHT INLETS. VALUES SHALL BE ADJUSTED FOR USUAL HEIGHT INLETS

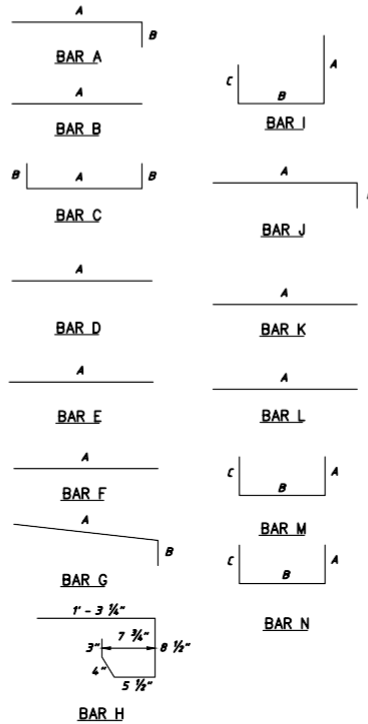
** NUMBER AND DIMENSIONS SHOWN FOR TOP SLAB OPENINGS AS SHOWN IN THE DETAILS. ADDITIONAL BARS SHALL BE PROVIDED AT ALL PIPE OPENINGS AS SHOWN IN THE DETAILS. NUMBER AND DIMENSIONS TO BE MODIFIED AS NEEDED.

1. PRECAST INLETS MUST BE APPROVED BY ENGINEER.
2. THE FLOOR OF THE EXCAVATION MUST PROVIDE A FIRM, LEVEL BED FOR THE BASE SECTION TO REST UPON.
3. A MINIMUM OF 6 INCHES OF 1" DIAMETER (MAXIMUM ROCK OR GRAVEL SHALL BE USED TO PREPARE THE BEDDING TO FINAL GRADE OR IN LIEU OF THIS, AT LEAST 6 INCHES OF 2-SACK CEMENT STABILIZED SAND SHALL BE USED TO PREPARE THE BEDDING TO GRADE. CEMENT STABILIZED-SAND SHALL BE ALLOWED TO SET BY PROVIDING A 1/2" HOLE PIERING THROUGH THE SAND.
4. AFTER CASTING HAS BEEN INSTALLED ON THE PROPER BEDDING, THE BACKFILL MATERIAL, WHICH IS FREE FLOWING AND CLEAR OF ROCKS, IN EXCESS OF 4" DIAMETER AND OTHER LUMPS WHICH WOULD PROHIBITED PROPER COMPACTION, SHALL BE COMMENCED IN LIFTS OF NO MORE THAN 18". THE MATERIAL USED FOR BACKFILL SHOULD BE OF TYPE A SUITABLE TO OBTAIN THE DENSITY REQUIREMENTS FOR THE SPECIFIC JOB.
5. CONCRETE TO BE USED SHALL BE PERMANENTLY SET.
6. LOCKING DEVICE IS REQUIRED ON ALL STORM SEWER LIDS.
7. "NO DUMPING" WARNING PLAQUE TO BE INSTALLED ON ALL STANDARD AND RECESSED INLETS.

DIMENSIONS SHOWN ARE FOR MAXIMUM SIZE INLETS

INLET LENGTH	BAR TYPE	BAR DIA. (# IN.)	NO. REQ'D	BAR DIMENSIONS		
				A	B	C
4	A	3	6	3'-2"	0'-3"	-
	B	3	1	2'-10"	-	-
	C	4	15	4'-8"	0'-6"	-
	D	4	5	4'-8"	-	-
	F	4	1	3'-2"	-	-
	G	3	5	2'-0"	1'-3"	-
	H	3	3	*	*	*
	N	3	3	3'-2"	3'-2"	3'-2"
6	A	3	9	3'-2"	0'-3"	-
	B	3	1	4'-10"	-	-
	C	4	15	6'-8"	0'-6"	-
	D	4	5	4'-8"	-	-
	F	4	1	3'-2"	-	-
	G	3	5	2'-0"	1'-3"	-
	H	3	3	*	*	*
	N	3	3	3'-2"	3'-2"	3'-2"
8	A	3	12	3'-2"	0'-3"	-
	B	3	1	6'-10"	-	-
	C	4	15	8'-8"	0'-6"	-
	D	4	5	4'-8"	-	-
	F	4	1	3'-2"	-	-
	G	3	5	2'-0"	1'-3"	-
	H	3	4	*	*	*
	N	3	3	3'-2"	3'-2"	3'-2"
10	A	3	10	3'-2"	0'-3"	-
	B	3	2	8'-10"	-	-
	C	4	16	10'-8"	0'-6"	-
	D	4	4	4'-8"	-	-
	E	5	6	10'-8"	-	-
	G	3	5	2'-0"	1'-3"	-
	H	3	15	*	*	*
	I	4	8	4'-8"	3'-2"	3'-2"
	L	4	5	4'-3"	-	-
12	A	3	12	3'-2"	0'-3"	-
	B	3	2	10'-10"	-	-
	C	4	16	12'-8"	0'-6"	-
	D	4	4	4'-8"	-	-
	E	5	6	12'-8"	-	-
	G	3	5	2'-0"	1'-3"	-
	H	3	18	*	*	*
	I	4	10	4'-8"	3'-2"	3'-2"
	J	5	9	3'-2"	1'-3"	-
	K	4	5	2'-3"	-	-
	L	4	5	4'-3"	-	-
	M	5	9	4'-3"	3'-2"	3'-9"
14	A	3	14	3'-2"	0'-3"	-
	B	3	2	10'-10"	-	-
	C	4	16	14'-8"	0'-6"	-
	D	4	4	4'-8"	-	-
	E	5	6	14'-8"	-	-
	G	3	5	2'-0"	1'-3"	-
	H	3	21	*	*	*
	I	4	12	4'-8"	3'-2"	3'-2"
	J	5	9	3'-2"	1'-3"	-
	K	4	5	2'-3"	-	-
	L	4	5	4'-3"	-	-
	M	5	9	4'-3"	3'-2"	3'-9"

*SEE DIAGRAM FOR DIMENSIONS. 4', 6', 8', 12' AND 14' INLETS.



BAR DIAGRAMS

REINFORCING STEEL SCHEDULE

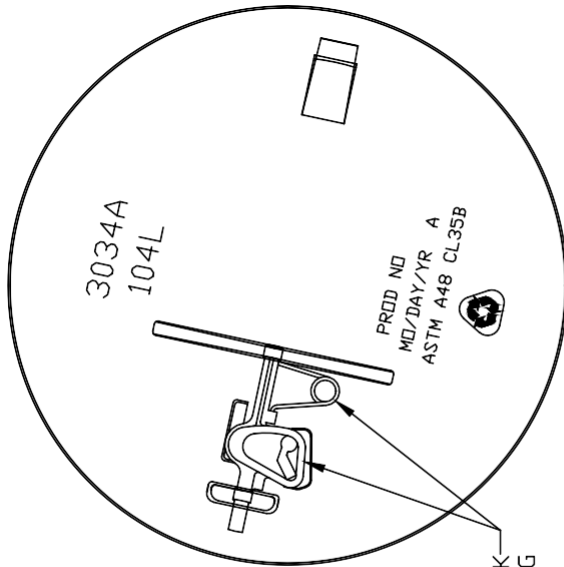
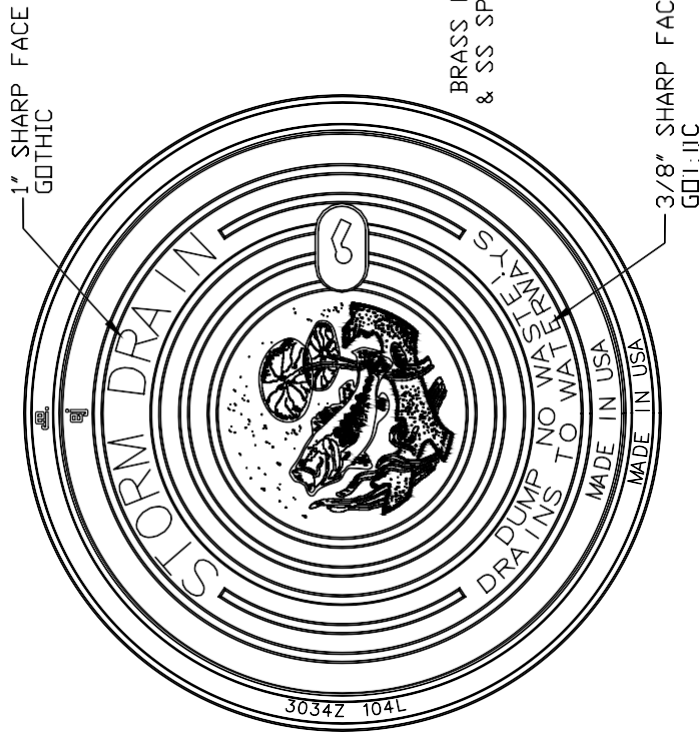
STORMWATER CURB INLET

REINFORCING STEEL

STANDARD DRAWING NO.

STM-02

3034Z 3034A Assembly



BOTTOM VIEW

Product Number
00303461

Design Features

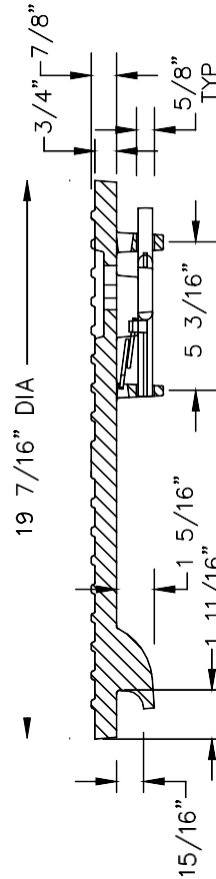
-Materials
Frame
Gray Iron (CL35B)
Cover
Gray Iron (CL35B)
-Design Load
Light Duty
-Coating
Dipped

✓ Designates Machined Surface

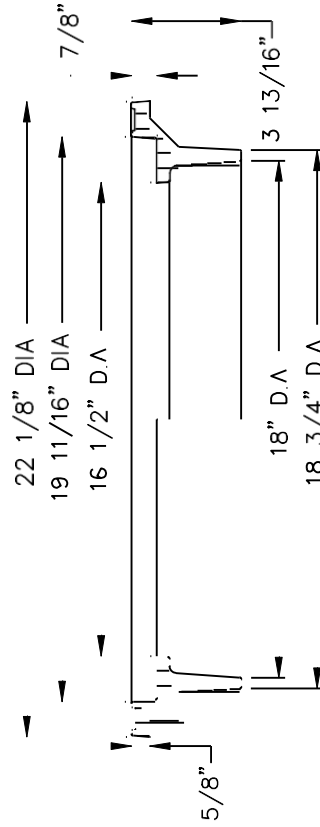
Certification
ASTM A48

-Country of Origin: USA

Major Components
00303410
00303427



COVER SECTION



FRAME SECTION

Disclaimer

Weights (lbs./kg) dimensions (inches/mm) and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

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Drawing Revision
01/19/2007 Designer: HEV
12/22/2014 Revised By: JVD
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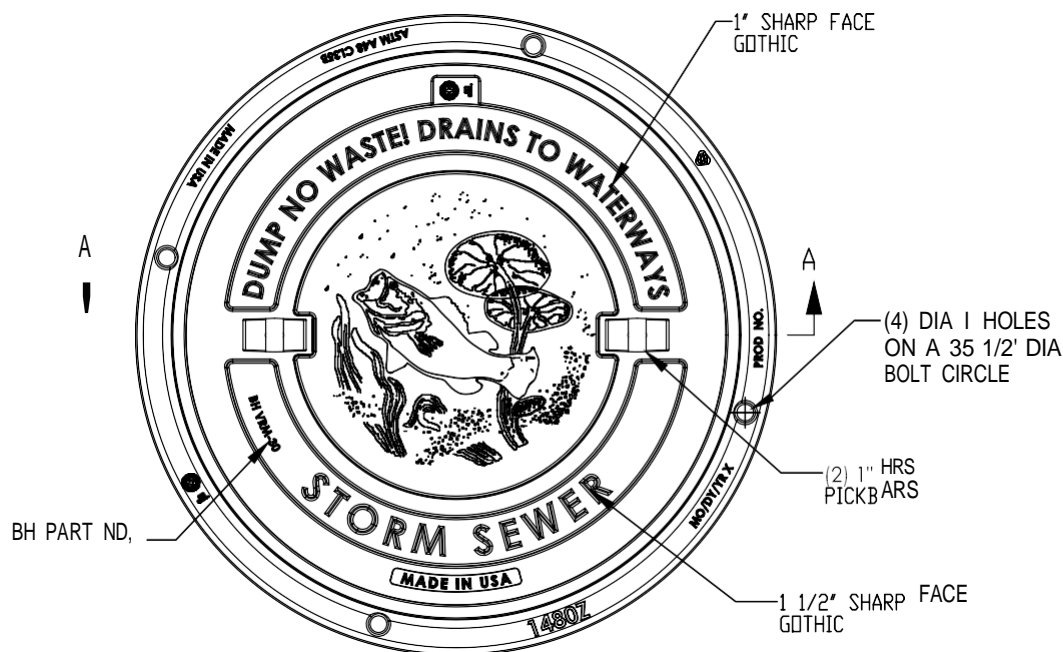
STORM SEWER

STANDARD INLET COVER

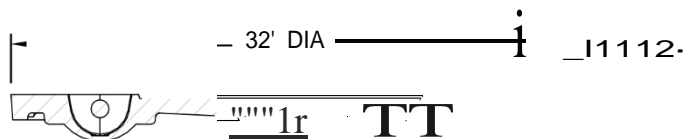
STANDARD DRAWING NO.

STM-03

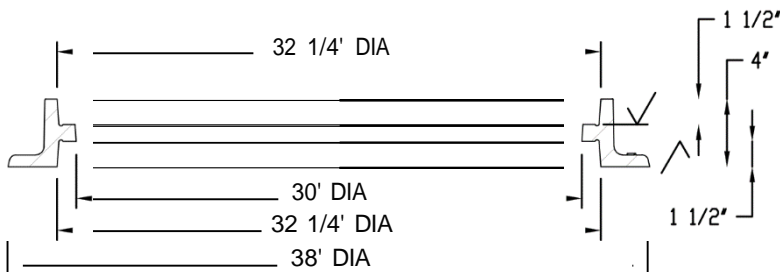
1480A 1480Z AsseMbly



PLAN VIEW



COVER SECTION



SECTION A-A

Product Number
00147987A01
Design Features
-Material
Cover
Gro.y Iron <CL35BI
Frame
Gro.y Iron (CL35BI
-Design Load
Heavy Duty
-Open Area
n/a
-Coating
Undipped
Design Notes: Machine Surfaces

Certification
-ASTM MB
-Country of Origin: USA

Major Components
00147987
00148015

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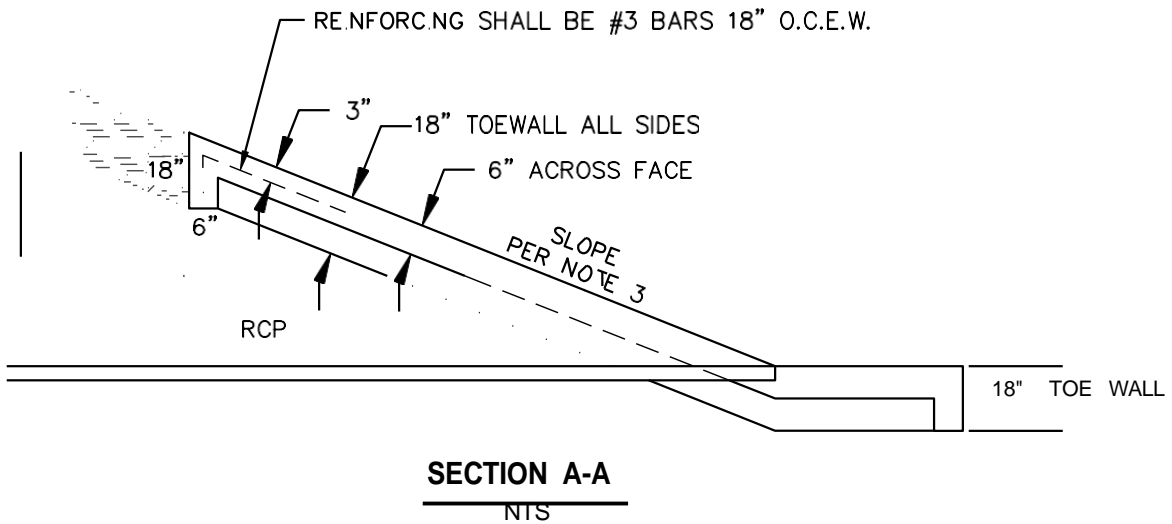
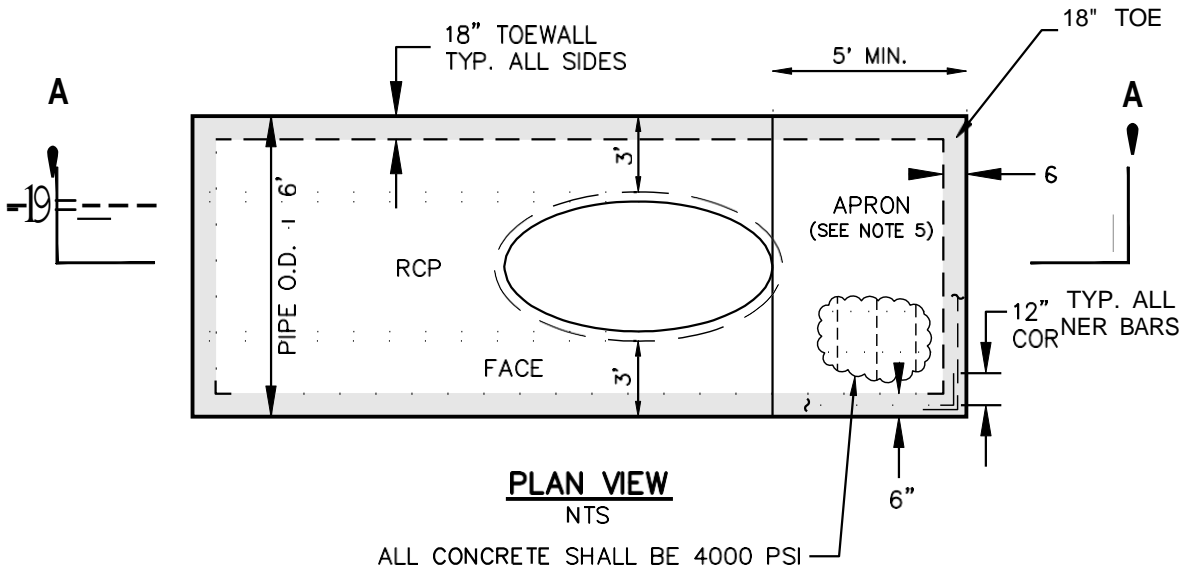
Contact
800 626 4653
e.jco.co.,

STORM SEWER

BOLTED INLET COVER

STANDARD DRAWING NO.

STM-03A



NOTES:

1. ROCK RIPRAP PROVIDED BEYOND APRON SHALL BE AS SPECIFIED IN PLANS BY DESIGN ENGINEER.
2. POSITIVE DRAINAGE MUST BE PROVIDED BEYOND CONCRETE APRON.
3. HEADWALL SLOPE SHALL BE SPECIFIED IN PLANS BY DESIGN ENGINEER (MAX. 3: 1)
4. CONCRETE SHALL BE 4000 PSI.
5. CONCRETE APRON OR APPROVED EQUAL.

STORMWATER HEADWALL

TYPE "C"

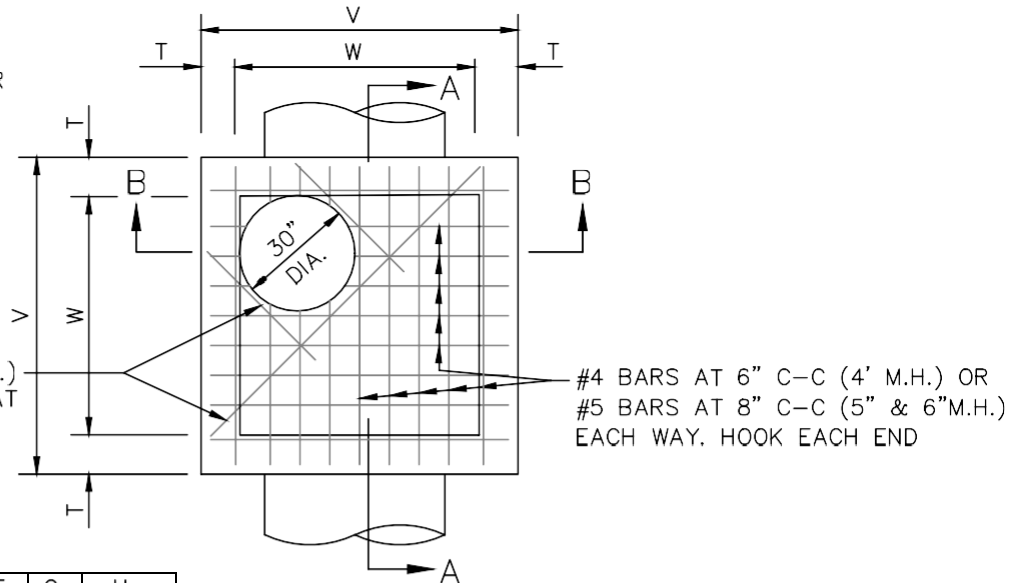
STANDARD DRAWING NO.

STM-04

NOTE:

PROVIDE AN ALUMINUM LADDER
FOR JUNCTION STRUCTURES
DEEPER THAN 7'

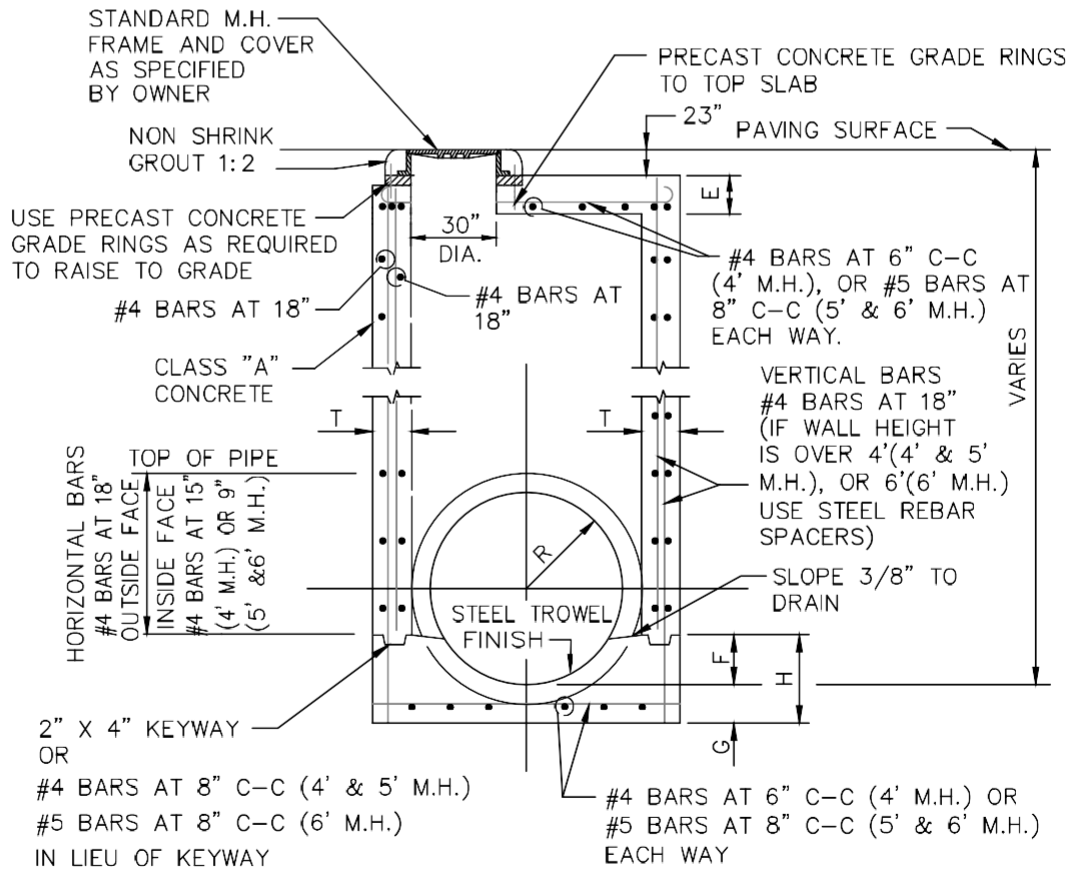
3-#4 BARS (4' & 5' M.H.)
OR #5 BARS (6' M.H.) AT
OPENING AS SHOWN.



M.H. SIZE(W)	V	T	E	F	G	H
4'	5'-4"	8"	6"	9"	6"	1'-3"
5'	6'-4"	8"	6"	12"	8"	1'-8"
6'	7'-6"	9"	9"	16"	10"	2'-2"

TABLE OF DIMENSIONS

N.T.S.



JUNCTION BOX

4', 5', OR 6' SQUARE (1 OF 2)

STANDARD DRAWING NO.

STM-05

#4 BARS AT 6" C-C (4' M.H.), OR
 #5 BARS AT 8" C-C (5' & 6' M.H.)
 EACH WAY HOOKED
 EACH END

#4 BARS
 AT 18"
 OUTSIDE FACE

#4 BARS
 AT 18" INSIDE FACE

#4 BARS
 AT 18"
 OUTSIDE FACE

#4 BARS AT 15"
 (4' M.H.) OR 9" (5'
 & 6' M.H.) INSIDE FACE.

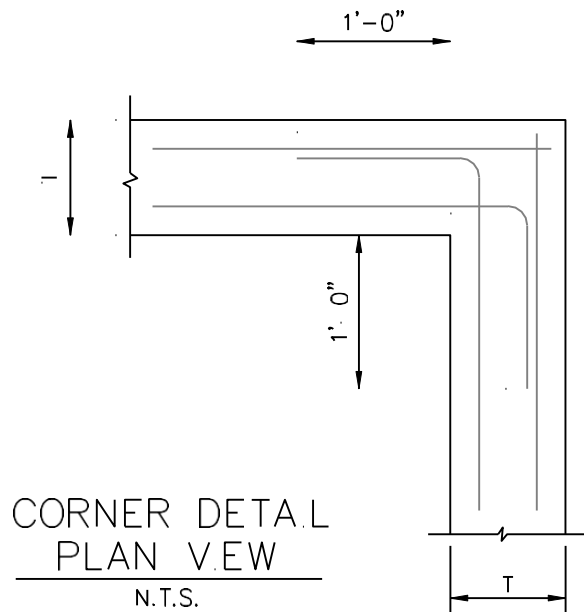
#4 DOWELS AT 18"
 ALL AROUND EXCEPT
 IN WAY OF PIPE

#4 BARS AT 6" C-C
 (4' M.H.), OR #5 BARS AT
 8" C-C (5' & 6' M.H.)
 EACH WAY

5" M.N.

SECTION A-A

N.T.S.



NOTES:

1. SLOPE INVERT OF MANHOLE AS INDICATED ON PLAN-PROFILE SHEET.
2. LAYERS OF REINFORCING STEEL NEAREST THE INTERIOR AND EXTERIOR SURFACE SHALL HAVE A COVER OF 2" TO THE CENTER OF BARS, UNLESS OTHERWISE NOTED.
3. CONCRETE SHALL BE CLASS "A".

JUNCTION BOX

4', 5', OR 6' SQUARE (2 OF 2)

STANDARD DRAWING NO.

STM-05A

LEGEND:

EXISTING TREE(S) TO
REMAIN

Ⓡ DRIP LINE OF EXISTING
TREE (TYP.)

CONTINUOUS NYLON TIE
STRING TIED TO STAKE
TOPS W/ 2' TUNDRA
WEIGHT ORANGE

STREAMERS AT 3' O.C.

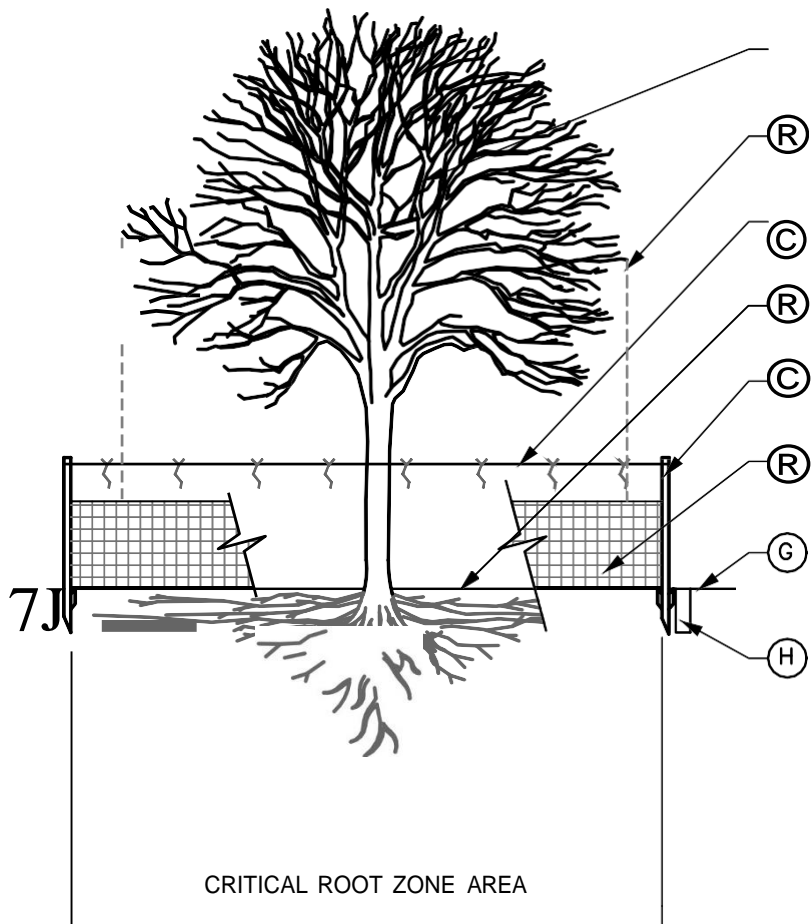
Ⓡ EXISTING GRADE TO
REMAIN

Ⓒ 2"x2"x8' STEEL POST
T-STAKES, 8' O.C. **MIN.**,
DRIVEN 2' INTO GROUND
AT (OR OUTSIDE) TREE
DRIP LINE

4' MIN HEIGHT ORANGE
PLASTIC FENCING
INSTALLED PER
CITY-APPROVED
MANUFACTURER'S
SPECIFICATIONS

EXISTING GRADE TO BE
DISTURBED

Ⓡ ROOT PRUNING TRENCH
12" OUTSIDE FENCE



NOTES:

1. PERFORM ROOT PRUNING ON ALL EXISTING TREES TO REMAIN WHERE CONSTRUCTION ACTIVITY FALLS WITHIN DRIP LINE OF EXISTING TREES.
2. NO GRADING, PARKING, STORAGE OR ANY OTHER CONSTRUCTION ACTIVITY WITHIN FENCED AREA.
3. REFER TO TECHNICAL SPECIFICATION 329600.
4. TREE PRUNING BY CERTIFIED TREE TRIMMER OR ARBORIST.

	TREE PROTECTION	
	PLAN DETAIL	STANDARD DRAWING NO. L-01

Section 9. GENERAL CONSTRUCTION NOTES

(See following page)

Section 10. APPROVED MATERIALS LIST

(See following page)

WATER

Overview Category	Basic Product Category	Use/Specifications	Manufacturer	Model, Type, or Approved Style
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Service Connections

Angle Meter Valve	1"		
Angle Meter Valve	1"	Mueller	
Angle Meter Valve	1" to 2"		
Angle Meter Valve	1" to 2"	Mueller	
Corporation Stop	1" to 1 1/2"		
Corporation Stop	1" to 1 1/2"	Mueller	
Curb Stop	1" to 2"		
Curb Stop	1" to 2"	Mueller	
Service Saddle	1" to 1.5"		Bronze Double Strap
Service Saddle	1" to 1.5"	Mueller	Bronze Double Strap
Service Saddle	1" to 1.5"	A.Y. McDonald	Bronze Double Strap
Service Line	1" to 2"	Various Manufacturers	Poly Tubing
Casing for Service Lines	2" to 4" Schudel 40 or SDR 21	Various Manufacturers	PVC Piping for service lines
Inserts	1" to 2"	Various Manufacturers	Insert stiffeners for poly tubing
Water Meters	1" to 2"	Master Meter	Harmony AMI 4G
Water Meters	Larger than 2"	Master Meter	Octave AMI 4G
Meter Box and Lid	Up to 1"	DFW Plastics	37A
Meter Box and Lid	1 1/2" to 2"	DFW Plastics	65A
Meter Box and Lid	Larger than 2" meters will require vault		

Distribution System

Tapping Sleeve	2" and larger	Smith-Blair	Stainless Steel
Tapping Sleeve	2" and larger	Mueller	Stainless Steel
Tapping Sleeve	2" and larger	U.S. Pipe	Stainless Steel
Valve, Resilient Wedge Gate	2" and larger	Clow	Resilient Wedge Gate Valve
Valve, Resilient Wedge Gate	2" and larger	Mueller	Resilient Wedge Gate Valve
Valve, Resilient Wedge Gate	2" and larger	American Flow Control	Resilient Wedge Gate Valve
Valve, Resilient Wedge Gate	2" and larger	East Jordan EJ Valve	Resilient Wedge Gate Valve
Valve, Resilient Wedge Gate	2" and larger	M&H Valve	Resilient Wedge Gate Valve
Valve, Butterfly	16" and larger	Clow	Butterfly Valve
Valve, Butterfly	16" and larger	Mueller	Butterfly Valve
Valve, Butterfly	16" and larger	M&H Valve	Butterfly Valve
Valve, Butterfly	16" and larger	American Flow Control	Butterfly Valve
Valve, Butterfly	16" and larger	ValMatic	Butterfly Valve
Valve, Butterfly	16" and larger	Pratt	Butterfly Valve
Valve, Butterfly	16" and larger	DeZurik	Butterfly Valve
Valve, Check	2" and larger	ValMatic	Check Valve
Valve, Air/Vacuum	2" and larger	Vent-O-Mat	RBX Series
Valve, Air/Vacuum	2" and larger	A.R.I.	D-060
Valve, Flap	Blow-Off Valve	Waterman	
Valve Box & Lid		East Jordan	Adjustable
Valve Box & Lid		Tyler Union	Adjustable
Valve Box & Lid		Bass & Hays	Adjustable
Fire Hydrants		East Jordan	WaterMaster 5CD250
Flush Hydrant		The Kupferle Foundry	Mainguard #77
Fire Hydrant Reflector	Blue Reflector	Centerline Supply	3M Raised
Fire Hydrant Reflector	Blue Reflector	Econosigns	3M Raised
Fire Hydrant	Integral Quick Connect	Mueller	Integral Storz Connection
Automatic Flush Valve		Kupferle	Eclipse 9400
Automatic Flush Valve		Kupferle	Eclipse 9800
Casing Spacers		Raci	
Casing Spacers		Power Seal	
Casing Spacers		Pipeline Seal and Insulator	
End Seal	Casing Pipe, Bore	LinkSeal	
Coupling, Adapter		Ford	
Coupling, Adapter		Power Seal	
Coupling, Adapter		Hymax	
Coupling, Adapter		JCM	
Coupling, Adapter		Romac	
Coupling, Adapter		Smith-Blair	
Ductile Iron Fittings	Domestic	Tyler Union	AWWA C110/C153
Ductile Iron Fittings	Domestic	Star	AWWA C110/C153
Mechanical Restraints		EBAA	Megalug
Water Meter Vault		Park	Precast Concrete
Fire line valve box		Park	Precast Concrete
Pipeline Marker	Blue	Rhino	Triview 400 66"

Other

Bolts			Stainless Steel
Paint		Tnemec	
Paint		Sherwin Williams	
Polywrap	All DI Pipe and Fittings		

WASTEWATER

Overview Category

Basic Product Category

Use Specifications

Manufacturer

Model, Type, or Approved Style

Collection System

Cleanout Castings & Lids		Bass & Hays	
Cleanout Castings & Lids		East Jordan	
Cleanout Castings & Lids		Tyler Union	
Corrosion Protection	Concrete Admixture	ConShield Technologies	
Polymer Concrete Manhole		Armorock	
Chimney Seal		Strike Products	
Chimney Seal		CreteX	
Rain Pans		CreteX	
Manholes	Precast Manhole	Forterra	
Manholes	Precast Manhole	Old Castle	
Manhole Frame and Cover	Standard	EJ	NPR19-002876011628
Manhole Frame and Cover	Bolted	EJ	NPR19-002876-11629
Manholes	Pipe Connectors	A-Lok	
Manholes	Pipe Connectors	Kor-N-Seal	
Manholes	Pipe Connectors	Fernco	
Manholes	Pipe Connectors	PSX	
Manholes	I&I Barrier	Strike Products	
End Seal	Casing Pipe, Bore	LinkSeal	
Combination Air Valves	Force Main ARV's	Vent-O-Mat	Series RGX, Stainless Steel
Combination Air Valves	Force Main ARV's	ARI	Stainless Steel
Valve, Plug	2" and larger	Pratt	Plug Valve Internalcoating to be lined with Tnemec Series 431 Permashield PL applied at a thickness of 40 mils DFT
Valve, Plug	2" and larger	Dezurik	Plug Valve Internalcoating to be lined with Tnemec Series 431 Permashield PL applied at a thickness of 40 mils DFT
Pipeline Marker	Green Sewer Main Marker	Rhino	TriView 400
Service Taps		Fernco	

Lift Station

Pump	Submersible Pump	Flygt	At least one Cutter Pump in Lift Station
Pump	Submersible Pump	KSB	At least one Cutter Pump in Lift Station
Air-Powered Mixer	Grease Control	Medora / GridBee	GridBee AP500 Mixer
Pressure Transducer		Wika	
Pressure Transducer		KPSI	
Wet Well Piping			Stainless Steel
Guide Rails			Stainless Steel
Electromagnetic Meter	Force Main Flow Meter	Badger	
Electromagnetic Meter	Force Main Flow Meter	Endress Hauser	
Level Transmitter		Echo	Echo Plus 6R30

Other

Bolts			Stainless Steel
Paint		Tnemec	
Paint		Sherwin Williams	
Ductile Iron Pipe & Fittings		Lined with Protecto 401	
Polywrap	All DI Pipe and Fittings		
Odor Control	Odor Control Vent Check Valve	Wager	Model 1850
Odor Control		Purafil	
Sump Pump		Hydromatic	

STORM

Overview Category	Basic Product Category	Use Specifications	Manufacturer	Model, Type, or Approved Style
Curb inlet	Inlet filters		Forterra	Bio Clean
	Grate inlet filters		Forterra	Bio Clean
	Inlet access lid		East Jordan Ironworks	
	Inlet access lid		Bass & Hays Foundry	
Manholes	Manhole frame and cover	Standard	EJ	303461
	Manhole frame and cover	Bolted	EJ	00147987A01
Pipe	Concrete Pipe		Forterra	RCP
	Concrete Box		Forterra	RCB