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CITY OF PLAINVIEW
TECHNICAL DESIGN & CONSTRUCTION STANDARDS
Plainview, Texas

November | 2023

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TECHNICAL DESIGN & CONSTRUCTION STANDARDS

GENERAL

****Any deviation from the Design Standards must be submitted to the City for review and approval.****

1.0 SCOPE OF PROJECT

1.1 GENERAL

The Work to be accomplished under these Specifications consists of the furnishing of all materials, machinery, labor, equipment, and services necessary for the construction of underground utility additions more particularly described elsewhere in the Specifications and shown on the Plans. The Contractor shall perform all necessary clearing, staking, excavating, backfilling, grading, clean-up, restoration of damage to property, testing, etc., for the proper and complete installation of the system and restoration of the surface to its original condition.

The term “Engineer” used in these Specifications shall refer to the City Engineer or a City Representative designated by the City to administer these Specifications and associated Plans.

Any references to these Specifications, ASTM, AASHTO, TxDOT, or other designated tests, procedures, quality standards, or requirements which are included in these Specifications, or any associated Plans shall be the latest edition and revision thereof. When information indicated on Plan sheets is in conflict with these Specifications, the information on the Plans shall govern.

1.2 ADA NOTES

In accordance with Texas Government Code, Chapter 469.105, and TDLR Administrative Rule 68.52, the owner of a building or facility subject to compliance with Chapter 469.101 shall obtain an inspection to verify compliance with the Texas Accessibility Standards (TAS) not later than the first anniversary of the completion of construction.

The request for an inspection must be made by completing this form and submitting it to a Registered Accessibility Specialist (RAS) not later than 30 calendar days after the completion of construction.

The completed Request for Inspection form must be received prior to proceeding with the inspection.

2.0 PRELIMINARY WORK

2.1 WORK ON HIGHWAY RIGHT-OF-WAY

The Contractor shall be responsible for complying with the requirements of the appropriate Highway Department. In the event a surety bond is required, such bond will be provided by the Contractor.

2.2 WORK ON RAILROAD RIGHT-OF-WAY

Should it be necessary to do any excavating or trenching on railroad rights-of-ways, the Contractor shall notify the railroad and shall conform to their requirements when performing Work on their rights-of-way.

2.3 TEXAS COMMISSION OF ENVIRONMENTAL QUALITY

No construction shall commence until plans are approved by the Texas Commission of Environment Quality, if applicable, and said approved plans are on Site. In addition, no construction shall commence until a Notice to Proceed has been received.

2.4 COORDINATION WITH OTHER UTILITIES

The Contractor shall cooperate with other utilities and shall take every reasonable precaution to avoid conflicts. In instances where the proposed waterlines will be located near existing or proposed utility lines, the Contractor shall take the necessary steps to avoid damage to the utility lines and shall notify the City of any potentially hazardous situations.

2.5 LOCATION AND PROTECTION OF UNDERGROUND UTILITIES

Prior to trenching, the Contractor shall determine, as far as possible, the actual location of all underground utilities in the vicinity of his operations and shall have the respective utilities clearly mark their location so that they may be avoided by equipment operators. As per Texas State Law, a minimum of 48 hours before excavation is to begin, the Contractor shall call Dig Tess (811) to have member utilities mark their utilities. Please note that non-member utilities will have to be contacted individually and must also be given 48 hours. Where such utility lines or services appear to lie in the path of construction, they shall be uncovered in advance to determine the exact location and depth and to avoid damage due to trenching and boring operations. Existing facilities shall be protected during construction or removed and replaced in equal or better condition, as necessary. Should any existing utility line or service be damaged during or as a result of the Contractor's operations, the Contractor shall take such emergency measures as may be necessary to minimize damage and shall immediately notify the respective utility Owner. The Contractor shall then repair the damage to the satisfaction of the utility Owner or shall pay the utility Owner for making the repairs. In all cases, the restoration and/or repair shall be such that the damaged structure will be in as good or better condition as before the damage.

The Contractor's attention is called to the special conditions indicated on the plans and described in this Section of the Specifications. Special conditions include construction on highway or railroad right-of-way, construction in the vicinity of existing utilities, and special surface restoration.

2.6 TEXAS ACCESSIBILITY STANDARDS (TAS)

All Plans and Specifications for the construction or alteration of public buildings and facilities, privately owned buildings and facilities leased or occupied by state agencies, places of public accommodation, pedestrian facilities within public right-of-way, and commercial facilities must be in compliance with the Texas Accessibility Standards (TAS) for individuals with disabilities and must conform to the standards required by regulations issued by the Texas Department of Licensing and Regulation (TDLR).

2.7 SURVEYING AND STAKING

The Plans show the desired location of the proposed utilities, and it shall be the responsibility of the Contractor to provide the necessary stakes and lines to ensure that the utilities will be accurately installed in the location shown and at proper alignment. Graphic symbols are used to indicate valve and hydrant general locations but ARE NOT drawn to scale. Minor changes in pipeline location to avoid obstructions or provide better coordination with topographic conditions may be determined in the field between representatives of the Contractor and the City of Plainview, and must be updated on as-built drawings. In general, such field changes shall be limited to occasional deflections to avoid side drains, culverts, ditches, or other obstructions or lateral shifts which would result in an improved laying condition or a decrease in inconvenience to property Owners or motorists. It is intended that the utilities be held a reasonable uniform distance from rights-of way, edge of pavement, or other boundary and indiscriminate wandering over the available area solely for the purpose of selecting the easiest trenching conditions will not be tolerated. Any changes in design or alignment will require as-built drawings to reflect updates.

2.8 REMOVAL OF OBSTRUCTIONS

The Contractor shall be responsible for the removal, safeguarding, and replacement of fences, walls, structures, culverts, street signs, billboards, shrubs, mailboxes, or other obstruction, which must be moved to facilitate construction. Such obstructions must be restored to at least their original condition.

2.9 CLEARING AND GRUBBING

The Contractor shall be responsible for cutting, removing, and disposing of all trees, brush, stumps, roots, and weeds within the construction area, unless otherwise noted. Disposal shall be by means of chippers, landfills, or other approved method not in conflict with State or local ordinances. Care shall be taken to avoid unnecessary cutting or damage to trees not in the construction area. The Contractor will be responsible for loss or damage to trees outside the permanent easement or rights-of-ways.

2.10 TRAFFIC CONTROL PLAN (TCP)

When required, the Contractor is responsible for submitting a Traffic Control Plan (TCP) for approval. The Plan shall be based upon applicable City and State requirements and established standards. In the event a TCP has been included with the Contract Documents, the Contractor shall comply with the TCP. The Contractor is responsible for monitoring the Plan as the Work progresses and submit modifications for approval as needed. The Contractor is also responsible to provide the inspector a copy of the signed TCP prior to beginning Work.

The requirements for the TCP are as follows:

- Must conform with current Texas Manual on Uniform Traffic Control Devices (MUTCD) standards.
- Must clearly depict each construction stage.
- Must be compiled by Licensed or Certified Personnel. To be considered “Certified Personnel,” a staff member must complete yearly training on TXDOT TCP and have received their certification.

2.11 TRENCH SAFETY PLAN

When required by the Work, the Contractor shall submit a Trench Safety Plan for review. The Plan must conform to OSHA subpart P guidelines. The plan shall include the recommended safety protection measures with the appropriate loading requirements. The Contractor shall ensure that all protective measures located on site and all procedures on the Project are in compliance with all aspects of the plan. The Contractor shall comply with all applicable rules and regulations. All related documentation will be made available to the inspector on a daily basis. The Contractor shall provide copies of all related documentation to the Owner upon request.

2.12 CONFINED SPACE PLAN

When required by the Work, the Contractor shall submit a Confined Space Plan for review. The Contractor shall ensure that all procedures employed on the Project are in compliance with all aspects of the plan. The Contractor shall comply with all applicable rules and regulations. All related documentation will be made available to the inspector on a daily basis. The Contractor shall provide copies of all related documentation to the Owner upon request. Monitoring and ventilation equipment conforming to OSHA standards must be used when H2S concentrations may be present.

2.13 PROTECTION OF PIPE

Whenever pipe laying operations are suspended for any reason, including lunch hour or temporary interruptions, a test plug shall be inserted in the open ends of the pipe. The installed pipe shall be adequately protected at all times against the entrance of dirt, animals, mud, sewage, or other foreign material. Pipe shall not be laid in a ditch containing standing water.

3.0 MATERIALS

3.1 GENERAL

All materials to be incorporated in the Project shall be first quality, new and undamaged material conforming to all applicable portions of these Specifications. All materials must be furnished by the Contractor, and with all applicable taxes paid by the Contractor, and must conform to applicable portions of these Specifications.

3.2 CEMENT

Cement shall be Portland cement of an approved brand and shall conform to "Standard Specifications for Portland Cement," Type 1 or Type 2, ASTM Designation C150, latest revision. Cement shall be furnished in undamaged sacks and shall show no evidence of lumping. All cement shall come from the same manufacturer unless otherwise approved.

3.3 CONCRETE FINE AGGREGATE

Fine aggregate shall be clean, hard, uncoated, natural sand conforming to ASTM Designation C33, latest revision, "Standard Specifications for Concrete Aggregate."

3.4 CONCRETE COARSE AGGREGATE

Coarse aggregate shall consist of clean, hard, dense particles of stone or gravel conforming to ASTM Designation C33, latest revision, "Standard Specifications for Concrete Aggregate." Aggregate shall be well graded between 1-1/2 inches and #4 sieve sizes.

3.5 WATER

Water used in mixing concrete shall be clean and free from organic matter, pollutants, and other foreign materials.

Meters, Valves and Fittings

The Contractor shall:

- Not draw water from any fire hydrant without obtaining permission from the City Public Works Department.
- Provide their own water tank trucks. The City does not provide water free of charge.
- Obtain a permit and place a deposit with the Utility Billing Department if City water usage is necessary. The City Public Works Department will issue a meter that will become the responsibility of the Contractor. Only CITY OF PLAINVIEW issued meters will be acceptable for use.
- Exercise proper use of the meter and follow cross contamination rules set forth by TCEQ.
- Forfeit the deposit and will be billed if repairs and/or replacement is required due to misuse, freezing, vandalism, loss, theft, other damage, or if lost or stolen.

Fire Hydrants

The Contractor shall:

- Exercise proper care and precaution in the use of a fire hydrant.
- Only use a standard fire hydrant wrench on a fire hydrant.
- Always have the fire hydrant completely open.
- Use a valve to adjust the flow of water.
- Not leave the valve, hose, pipe, or any other connections on the fire hydrant except when an employee is in the vicinity.
- Use the proper tools for the removal of such valve, hose, pipe, or other connections in case of an emergency.
- Lock the fire hydrant and use a chain to connect the water meter to the hydrant when not present to avoid theft of the water meter.
- Report a faulty hydrant to the City Public Works Department immediately.
- Forfeit the deposit if observed taking water from a fire hydrant without the use of a City-issued meter. City-issued equipment will be confiscated and any amount due will be billed to the Contractor. ***Theft of water will result in a $500.00 fee.***

Should a violation concerning the use of the fire hydrant be observed, the Contractor will be notified and expected to resolve the violation immediately. Should the violation continue, the City of Plainview will terminate the permit, the deposit will be forfeited without further notice, and any amount due will be billed to the Contractor. Should the fire hydrant be damaged through use by a Contractor, the Contractor shall repair or pay the City for repairs required to restore equipment to a condition equal to that prior to its use and to the satisfaction of the City Director of Public Works. Should pavement in the vicinity of a fire hydrant be damaged during the use of the fire hydrant or if it fails due to excessive leakage during use, the Contractor shall replace the damaged pavement to the satisfaction of the City Street Department.

3.6 READY-MIX CONCRETE

Ready-mix concrete shall conform to ASTM Designation C94, latest revision, "Specifications for Ready-Mix Concrete." Before any concrete is delivered on the jobsite, the supplier must furnish a statement of the proportions of cement, fine aggregate, and course aggregate to be used for each mix ordered, and must receive approval of such proportions. A copy of every manifest ticket of each load of concrete must be available for review by the City or Representative and must conform to the Specifications required for that Project.

3.7 CLASS "A" CONCRETE

Class "A" concrete shall have a minimum compressive strength of 3,000 pounds-per-square-inch after 7 days and 4,000 pounds-per-square-inch in 28 days. Class "A" concrete shall contain not less than six sacks of cement per cubic yard.

3.8 CLASS "B" CONCRETE

Class "B" concrete shall have a minimum compressive strength of 2,200 pounds-per-square-inch after 7 days and 3,000 pounds per square inch in 28 days. Class "B" concrete shall contain not less than 4-1/2 sacks of cement per cubic yard.

3.9 METAL REINFORCING

Reinforcing bars shall be Grade 60 steel conforming to ASTM Designation A615, latest revision, "Standard Specifications for Billet Steel Bars for Concrete Reinforcement". Bars shall be deformed with a cross sectional area at all points equal to that of plain bars of equal nominal size. Wire will not be acceptable reinforcing material in any City project.

3.10 CRUSHED STONE

Crushed stone for bedding or backfill shall be TxDOT Standard Size and shall meet State Highway Department Standards for road surfacing.

3.11 PEA GRAVEL

Pea gravel for shaping cradle bedding shall be #4 to 1/2-inch size or approved local gravel of similar character.

3.12 FLOWABLE FILL

All flowable mortar shall be in accordance with the Standard Specifications. Furnish and place flowable backfill for trench, hole, or other void.

- Furnish cement conforming to DMS-4600, “Hydraulic Cement.”
- Furnish fly ash conforming to DMS-4610, “Fly Ash.”
- Furnish chemical admixtures conforming to DMS-4640, “Chemical Admixtures for Concrete.”
- Provide fine aggregate that will stay in suspension in the mortar to the extent required for proper flow and that meets the gradation requirements.

Aggregate Gradation Chart

Sieve size	Percent passing
3/8-inch	28.2
No. 200	0-3

Test fine aggregate gradation in accordance with TEX-401-A.

Plasticity Index (PI) must exceed 5 when tested in accordance with TEX-106-A. Once the PI reaches 20, the City Engineer will review a change in material or the addition of lime.

- Use mixing water conforming to the requirements of Item 3.5.
- Design the mix to be placed without consolidation and to fill all intended voids. Fill an open-ended, 3-inch-diameter-by-6-inch-high cylinder to the top to test the consistency. Immediately pull the cylinder straight up. The correct consistency of the mix must produce a minimum 8-inch-diameter circular spread with no segregation. Mix the flowable fill using a central-mixed concrete plant, ready-mix concrete truck, pug mill, or other approved method.

3.13 ACCEPTABLE BACKFILL MATERIAL

Where crushed stone backfill is required, the crushed stone shall be as designated by TxDOT Specifications and shall meet all requirements of the TXDOT Specifications for crushed stone used in road surfacing. Where crushed stone is not required, but the excavated material is unsuitable for use in the backfill, the Contractor may use fine dry selected earth or clay as backfill material. Material containing excessive organic matter, stumps, roots, refuse or foreign matter, or hard clay lumps that cannot readily be compacted will not be acceptable for use as backfill.

3.14 CASING PIPE

Casing pipe is intended to be installed by bore and jack. Installation may be made by open cut only if authorized in writing by the City of Plainview, and generally only after an attempted bore is unsuccessful. In no event will construction method be contradictory of instruction of the Railroad or Highway Department. In the event of any unsuccessful bore attempts, the bore hole will be refilled according to instructions of the Railroad or Highway Department or outside their jurisdiction by leaving jacked casing in place and sealing end with brick and mortar.

Casing pipe shall be black steel pipe with minimum wall thickness as follows:

Casing Pipe Diameter Wall Thickness

Pipe Diameter (in)	Wall Thickness (in)
6	0.250
8	0.250
10	0.250
12	0.250
16+	0.375

Tunneling, jacking, and boring are methods used for sewer line placement under restrictive conditions when open cut construction is not allowed.

- Only straight pipe alignments for both horizontal and vertical alignment are allowed.
- Casing shall extend full width of right-of-way or as directed by the Engineer or City.
- Casing pipe shall be a minimum of two standard sizes larger than encased pipe.
- Casing pipe thickness shall be as indicated in table above.
- Manufactured centralizers or spacers shall be required at minimum 6-foot intervals or as recommended by the manufacturer.
- Only purpose-built centralizers may be used.
- Coal tar coating for casing pipe shall conform to AWWA C203.
- For bores in excess of 100 feet, purpose-built fused or restrained joint pipe shall be used.
- Slick boring or directional drilling without encasement shall be considered on a case-by-case basis by the Engineer/City.
- Annular space between casing or uncased pipe and bored hole shall be injection grouted.

4.0 EXCAVATION AND BACKFILL

4.1 GENERAL

The Contractor shall perform all required excavation and backfilling incidental to the installation of water mains, force mains, sewers, manholes, and other appurtenances under this Contract. Excavation shall be carried to the depths indicated on the Drawings or as necessary to permit the installation of pipe, bedding, and structures of appurtenances. Care shall be taken to provide a firm, undisturbed, uniform surface in the bottoms of trenches and excavations for structures. Where the excavation exceeds the required depth, the CONTRACTOR shall bring the excavation to proper grade through the use of an approved incompressible backfill material (generally crushed stone or fill concrete, depending upon the nature of the facility to be placed thereon). In the event unstable soil conditions are encountered at the bottom of the excavation, the Engineer may direct the Contractor to continue the excavation to firm soil or to provide pilings or other suitable special foundations. The Contractor shall take such precautions as may be necessary to avoid endangering personnel, pavement, adjacent utilities or structures through cave-ins, slides, settlement, or other soil disturbance resulting from his operations. Backfilling shall be carried out as expeditiously as possible. The Contractor must carry out all backfilling operations with due regard for: the protection of pipes, structures, and appurtenances; the use of prescribed backfill materials; and procedures to obtain the desired degree of compaction. The Contractor shall be responsible for storage of excavated material, disposal of surplus excavated material, trench dewatering and other operations incidental to excavation and backfilling operations.

4.2 TRENCH EXCAVATION

A Trench Safety Plan must conform to OSHA guidelines. Trenches shall be neatly excavated to the alignment and depth required for the proper installation of pipe, bedding material, and appurtenances. Trenches shall be opened up far enough ahead of pipe laying to reveal obstructions, but in general shall not include more than 300 feet of continuous open trench at any time. The Contractor will be required to follow up trenching operations promptly with pipe laying, backfill, and cleanup, and in the event of failure to do so, may be prohibited from excavating additional trenches until such Work is completed. The Contractor shall plan his operations so as to cause a minimum of inconvenience to property owners and to traffic. No road, street, or alley may be closed unless absolutely necessary, and then only if the following conditions are met:

- Permit is secured from appropriate State, County, or Municipal authorities having jurisdiction.
- Fire and Police Departments are notified before road is closed.
- Suitable detours are provided and are clearly marked.

No driveways shall be cut or blocked without first notifying the occupant of the property. Every effort shall be made to schedule the blocking of drives to suit the occupants convenience, and except in case of emergency, drives shall not be blocked for a period of more than 8 hours. The Contractor shall furnish and maintain barricades, signs, flashing lights, and other warning devices as necessary for the protection of public safety. Flagmen shall be provided as required on heavily traveled streets to avoid traffic jams or accidents. Trench width shall be held to a minimum consistent with proper working space for assembly of pipe. Maximum trench width shall be limited to the outside pipe diameter plus 18 inches. Boulders, large stone, shale, and rock shall be removed to provide clearance of 6 inches below and on each side of the pipe. Trench walls shall be kept as nearly vertical as possible with due consideration to soil conditions encountered and when necessary, sheeting, or bracing shall be provided to protect life and property. Where unstable soil conditions are encountered at the trench bottom, the Contractor shall remove such additional material as may be directed by the inspector and replace the excavated material with crushed stone. The Contractor shall excavate by hand wherever necessary to protect existing structures or utilities from damage or to prevent over-depth excavation in the trench subgrade. Excavated material shall be stored safely away from the edge of trench (min. 24 inches) and in such a way as to avoid encroachment on private property. The trench shall be excavated to sufficient depth to permit a minimum cover as indicated on Drawings. The bottom of the trenches must be shaped by hand and bell holes must be dug so that the full length of pipe is resting on trench bottom. Blocking shall not be used and neither shall the pipe be laid on a trench bottom that has not been leveled to provide support throughout the full length of the pipe.

The Contractor’s attention is called to the fact that the 48-inch depth of cover is a minimum and may be exceeded in instances where obstructions are encountered in trenching operations. The Contractor will be permitted to lay the pipe above the obstruction only if the minimum cover required can be obtained while providing a cushion at least 6 inches thick between the bottom of the pipe and the top of the obstruction. Where this minimum cover and the required clearance cannot be obtained, the Contractor will be required to lay the pipe under the obstruction and will receive no additional compensation for the additional depth of trench required for constructing the line in this manner. The Contractor will also be required to gradually increase the depth of trench when approaching cuts, creek banks, or other changes in grade in order to avoid the use of fittings, wherever it is practical to do so. Trenches for sewers shall be carefully excavated to maintain the desired grade and alignment. Depth of finished trench shall be adequate to accommodate the bedding.

4.3 BACKFILL FOR TRENCHES

Backfilling of trenches will proceed as pipe laying progresses so that the trench will be filled in as rapidly as possible after the pipe has been assembled and inspected. The Contractor shall, however, afford the inspector ample opportunity for observing the assembled pipeline before placing the backfill and, if requested by the inspector shall delay the backfilling operation when the inspector is not present at the Site. It is intended that the Contractor will backfill trenches and place base on the same day that the trench is excavated. All streets and walks shall be broomed to remove all earth and loose rock and shall be watered as necessary to prevent a dust problem. Within 14 days of excavation, all excess material shall be removed and effected area shall be maintained in an acceptable condition.

In highways, streets, driveways, all areas subject to traffic, and certain areas as designated on the Drawings, the backfill shall only consist of Engineer-approved material and shall be placed in layers or lifts not exceeding 12 inches in thickness and shall then be carefully compacted to 95 percent D698 ±2 percent optimum moisture or minimum volume. The backfill around the pipe and up to a depth of 12 inches above the top of the pipe shall be placed by hand to avoid damage to or misalignment of the sewer. After the backfill has been placed to a depth of at least 12 inches above the top of the pipe, the additional backfill may be placed by means of front-end loaders, bulldozers, or other suitable mechanical equipment subject to the 12 inches limitation on maximum thickness of layers placed before compaction.

4.4 EXCAVATION FOR STRUCTURES

Excavation for structures shall be only as large as may be required for the structure and for working room around the structure. In earth, excavation shall generally extend to the outer limits of the structure at the bottom, and shall slope outward at such angle as may be required for stability of excavated face. In rock, excavation shall be carried to a point 6 inches outside the structure so that no rock is left within 6 inches of the finished structure. Care shall be taken as the excavation approaches the desired grade to avoid over-depth excavation and provide a firm and undisturbed soil surface on which footings, slabs, or foundations are to be placed. Should the Contractor excavate below the desired grade level, the excavation shall be brought to grade by the use of concrete or compacted crushed stone at the expense of the Concractor. The use of tamped earth backfill under foundations, footings, or slabs will not be acceptable. Where the Contractor is permitted to place concrete directly on the rock, all dirt and weathered rock shall be removed and any seams or crevices shall be cleaned and filled with grout or mortar prior to placement of the structural concrete. Should the material found at the desired subgrade appear to be unstable or otherwise unsuitable for support of the structure, such condition shall be immediately called to the attention of the City. The City may direct that such unsuitable material be removed and replaced with compacted crushed stone.

4.5 STORAGE AND EXCAVATED MATERIAL

Excavated material shall be deposited in such a manner as to avoid danger to workmen, utility line, or traffic, and to cause minimum inconvenience through blocking of drives, sidewalks, natural drains, etc. Where indicated on the Drawings, or necessitated by conditions prevailing, the Contractor shall haul away and stockpile excavated material.

4.6 DISPOSAL OF SURPLUS EXCAVATED MATERIAL

Excavated material that is unsuitable or unnecessary for backfilling shall be removed from the jobsite and disposed of at the Contractor’s expense. The Contractor must not sell or give away surplus excavated material suitable for backfilling or surfacing until the excavation has been refilled and surfaced. Contractor shall have the approval of each property owner and the City prior to the removal of excess material. The Contractor shall make his own arrangements for disposal.

5.0 PAVEMENT REPLACEMENT

5.1 GENERAL

The Contractor shall be responsible for replacement of pavement removed or damaged by his operations. Pavement replacement shall be in accordance with this Section of the Specifications and in every case shall be equal to or better than the quality of pavement damaged or removed. The Contractor shall also be responsible for subsequent pavement failures during the warranty period, where such failures occur over or adjacent to trenches or other excavations by the Contractor and result from insufficient compaction of the backfill.

5.2 PAVEMENT REMOVAL

Where existing paved streets, roads, parking lots, drives, or sidewalks must be disturbed during construction of the Project, the Contractor shall take the necessary steps to minimize damage. Permanent type pavement shall be cut or sawed in a straight line before removal and care shall be taken during excavation to avoid damage to adjacent pavement. Where trucks or other heavy equipment must cross curbs or sidewalks, such areas shall be suitably protected.

5.3 PAVEMENT REPLACEMENT

As soon as the pipe has been installed, the trench shall be backfilled as specified in Section 4.3 and a temporary pavement patch shall be provided in paved areas. The temporary pavement shall consist of a single or double surface treatment, which will protect the base, prevent "pot holes" or "chuck holes," and provide a reasonable smooth pavement surface until the permanent patch is made. The permanent pavement patch shall not be made until the job is nearing completion. The permanent pavement patch shall be installed to required Specifications or installed by the City's Public Works Department at a pre-negotiated price. All permanent areas must observe water runoff flow directions and be constructed accordingly.

6.0 SPECIAL CONDITIONS

6.1 GENERAL

The Contractor's attention is called to the special conditions indicated on the Plans and described in this Section of the Specifications. Special conditions include construction on highway or railroad right-of-way, construction in the vicinity of existing utilities, and special surface restoration. Service connections to existing system will require City issued permit. Service connection to a manhole will not be allowed.

6.2 CLEANING

Upon completion of cleaning of any line or manhole, the Engineer shall make a visual inspection to verify the quality of workmanship. Any defects such as grease or roots shall be removed by means of further cleaning operations until the line or manhole is in a condition satisfactory to the Engineer.

6.3 SEEDING

In all areas damaged or disturbed by Contractor's operations where established ground cover was present before beginning of construction, Contractor shall be responsible for restoring this ground cover after completion of construction (unless noted otherwise on Drawings). In areas of established lawns, Contractor will be required to separate and preserve best of excavated material or, if no acceptable material has been excavated, haul in an acceptable material for use in making top 6 inches of finished grade. No rock will be permitted in this top 6 inches of finished grade for established lawns. All areas seeded shall be graded smooth prior to seeding and Contractor shall be responsible for maintenance of this smooth finished grade until grass growth is established. After designated areas have been carefully hand graded, soil shall be prepared for seeding.

Where necessary, Contractor will sod slopes and embankments, and remaining areas may be seeded. A well-made lawn is desired, and Contractor will be responsible for any necessary regrading or reseeding required to produce an acceptable grass as cover. The seed is to be of the same type of grass existing before construction. The soil shall be fertilized with a commercial fertilizer of a grade and at a rate recommended by vendor of seed. All seeded areas shall be covered with clean straw uniformly distributed to approved density.

6.4 SLOPE PROTECTION AND EROSION CONTROL

This Section shall consist of temporary control measures as shown in the Plans. Control erosion and water pollution through the use of berms, dikes, dams, sediment basins, fiber mats, netting, mulches, grasses, slope drains, temporary silt fences, and other control devices. The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control features to assure economical, effective, and continuous erosion control throughout the construction and post-construction period.

6.5 TEXAS CONSTRUCTION GENERAL PERMIT (CGP) – PERMANENT CONTROLS

Construction activities that discharge stormwater runoff into or adjacent to any surface water of the state are regulated by the state of Texas under the Construction General Permit (CGP) (TXR150000). The governing agency is the Texas Commission on Environmental Quality (TCEQ). Construction activities are regulated according to the area of land disturbed.

Large Construction Activities

For sites that disturb 5 or more acres, or are part of a larger common plan of development that will disturb 5 or more acres, and meet the definition of an operator, the following applies:

- Prepare and implement a Stormwater Pollution Prevention Plan (SWPPP)
- Post a Site Notice
- Submit a copy of the Site Notice to the MS4 Operator

For sites that disturb 5 or more acres, and meet the definition of a primary operator, the following applies:

- Prepare and implement a SWPPP
- Submit a Notice of Intent (NOI) to TCEQ
- Post the NOI and Site Notice
- Submit a copy of the NOI to MS4 Operator

Small Construction Activities

For sites that disturb at least 1, but less than 5 acres, or are part of a larger common plan of development that will disturb at least 1, but less than 5 acres and meet the definition of an operator, the following applies:

- Prepare and implement a SWPPP
- Post a Site Notice
- Submit a copy of the Site Notice to the MS4 Operator

Sites that disturb less than 1 acre and that are not part of a larger common plan of development that would disturb one or more acres, are not required to have coverage under the general permit. Refer to the General Permit definitions for Operator and Primary Operator. Additional information on the Texas Construction General Permit can be found at the following link: http://www.tceq.texas.gov/permitting/stormwater/

6.6 STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

One of the requirements of the Construction General Permit is to develop an SWPPP in accordance with CGP and the SWPPP Guidance Policy for the City. The purpose of the SWPPP is to provide guidelines for minimizing sediment and other pollutants that may originate on the Site, from flowing into municipal storm systems, or jurisdictional waters during construction. The plan must also address the principal activities known to disturb significant amounts of ground surface during construction.

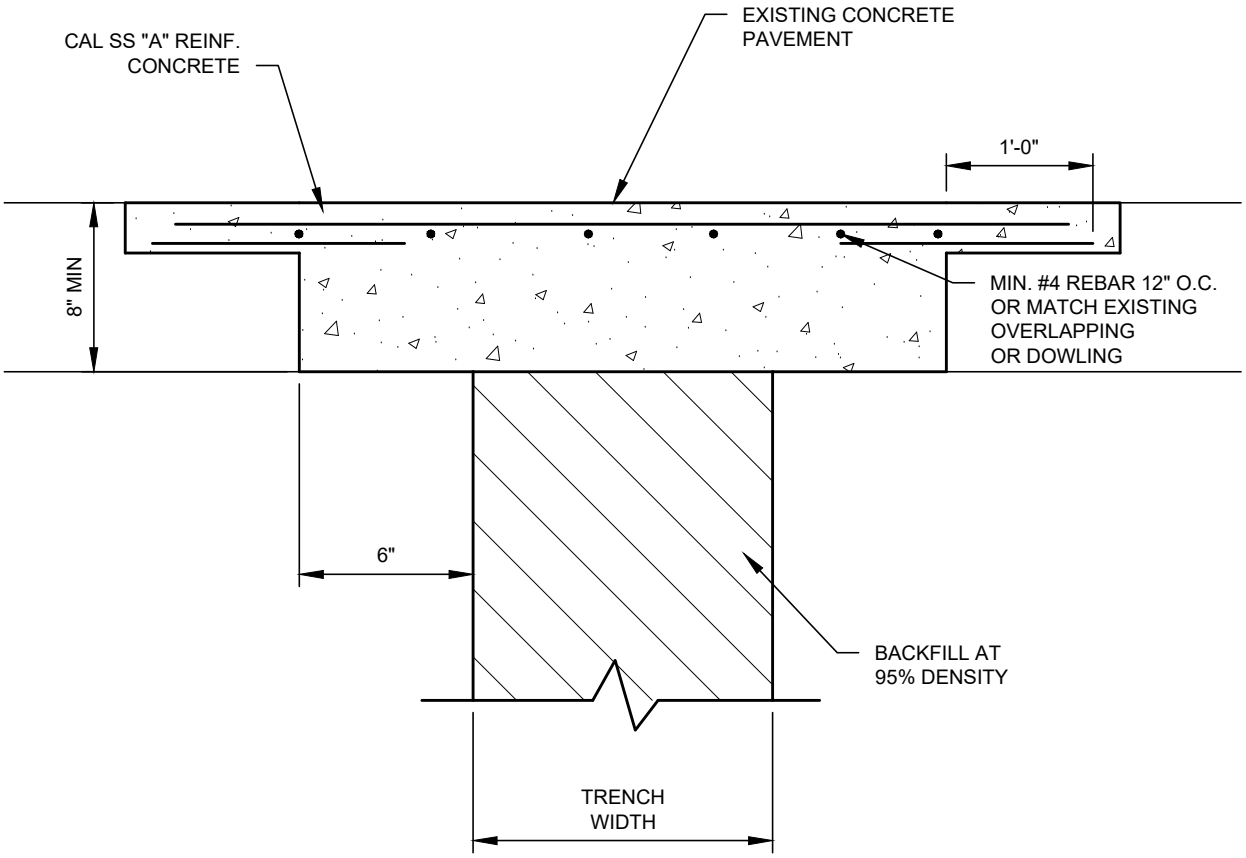
The stormwater management controls included in the SWPPP should focus on providing control of pollutant discharges with practical approaches that use readily available techniques, expertise, materials, and equipment. The SWPPP must be implemented prior to the start of construction activity.

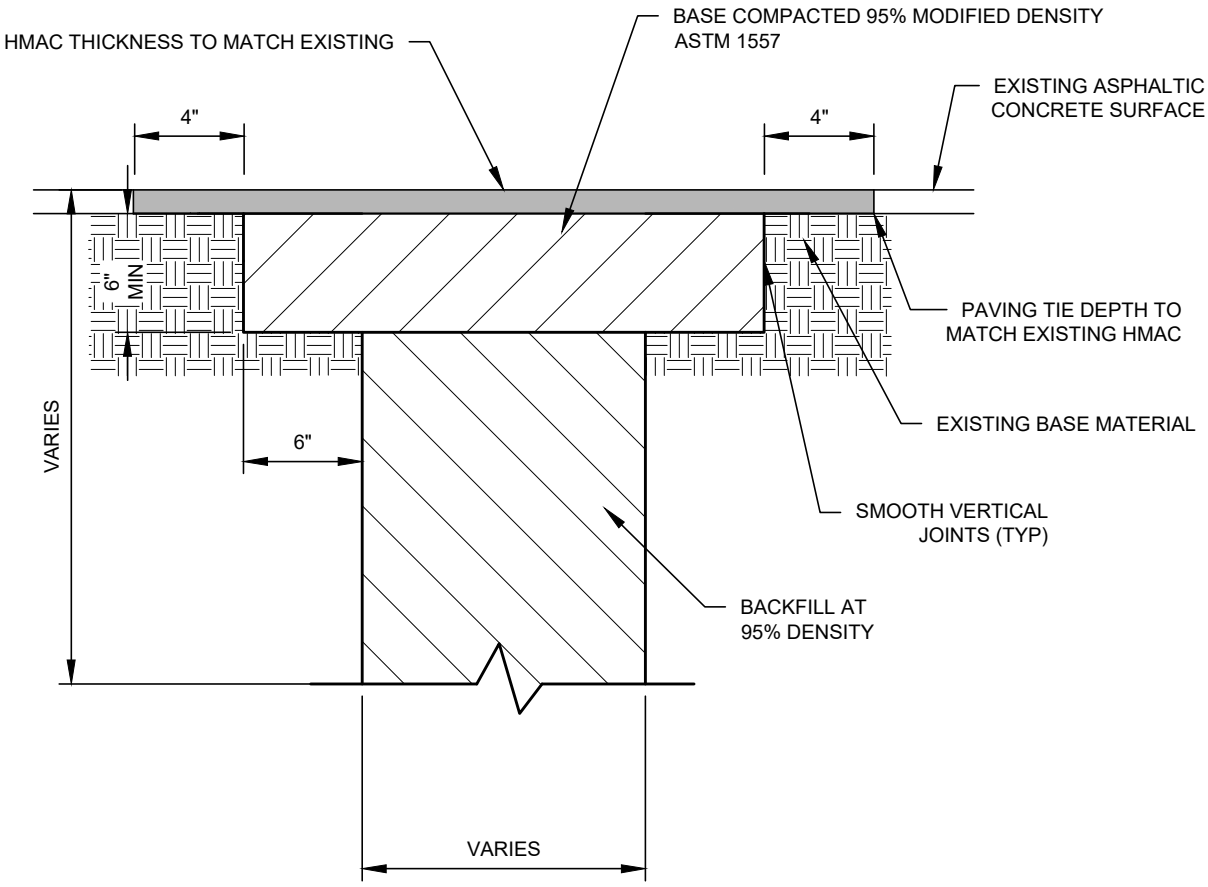
6.7 SEPARATION OF WATER MAINS AND SEWER

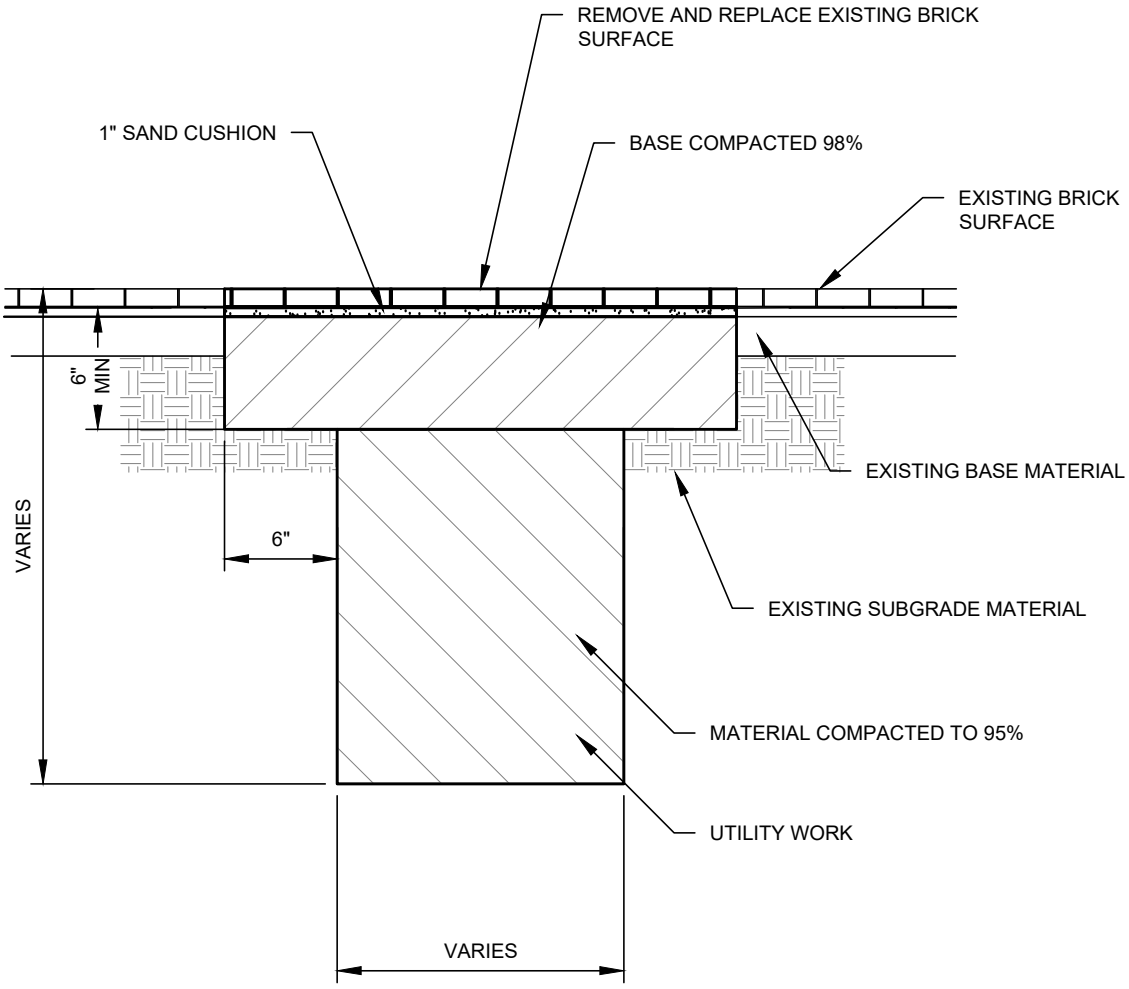
Must be in accordance to TCEQ RG-195 290.44 (e) §290.44(e) Location of waterlines. The following rules apply to installations of waterlines, wastewater mains or laterals, and other conveyances/appurtenances identified as potential sources of contamination. Furthermore, all ratings specified shall be defined by ASTM or AWWA standards unless stated otherwise. New mains, service lines, or laterals are those that are installed where no main, service line, or lateral previously existed, or where existing mains, service lines, or laterals are replaced with pipes of different size or material. When new potable water distribution lines are constructed, they shall be installed no closer than 9 feet in all directions to wastewater collection facilities. All separation distances shall be measured from the outside surface of each of the respective pieces. Potable water distribution lines and wastewater mains or laterals that form parallel utility lines shall be installed in separate trenches. No physical connection shall be made between a drinking water supply and a sewer line. Any appurtenance shall be designed and constructed so as to prevent any possibility of sewage entering the drinking water system.

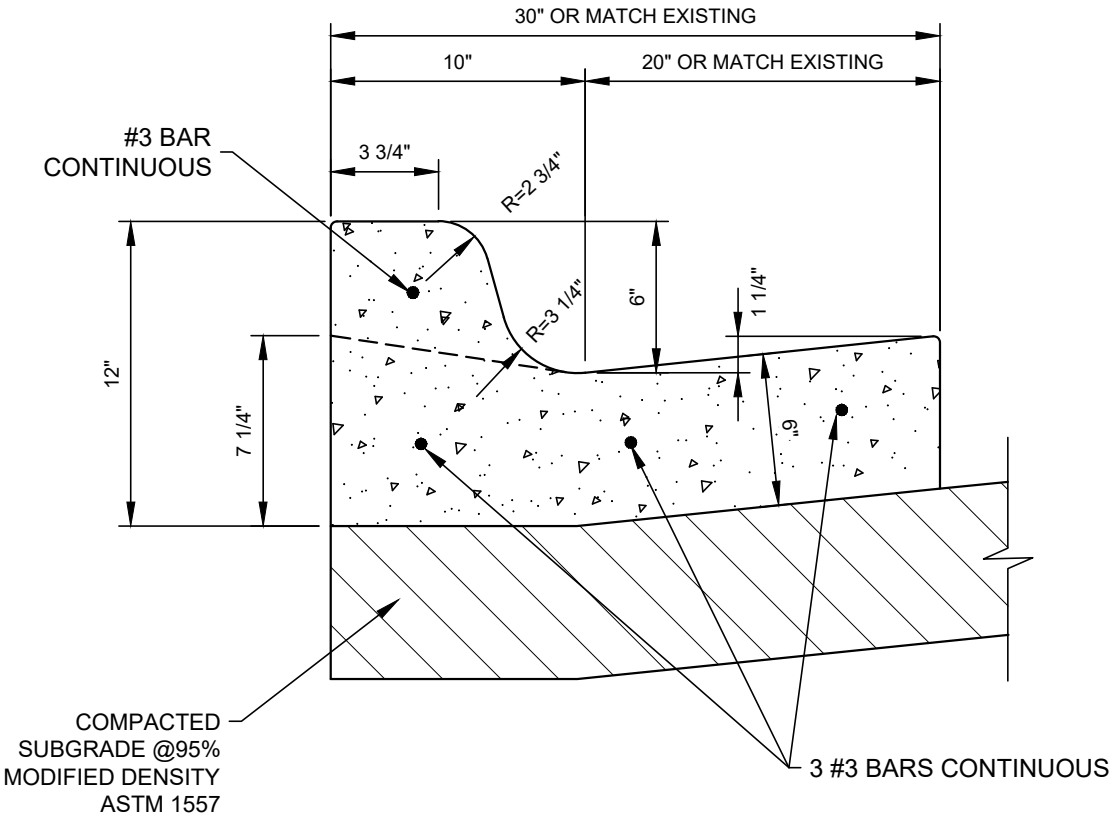
6.8 COMMERCIAL DRIVEWAY

Commercial driveways will be constructed in accordance with the City's Standard Details and Standard Specifications. Driveways on streets with existing curb, or with new curb being constructed as part of the same project, will include pedestrian ramps on both sides of the driveway approach. Ramps are required regardless of whether sidewalk is existing or planned in order to accommodate future sidewalk construction. Driveways on streets with no existing curb, and no curb planned as part of the same project, may omit the pedestrian ramps and will include flares instead. Driveways on streets with mountable (or roll-over) curb do not typically need to include flares or pedestrian ramps. However, all other design and spacing standards still apply.

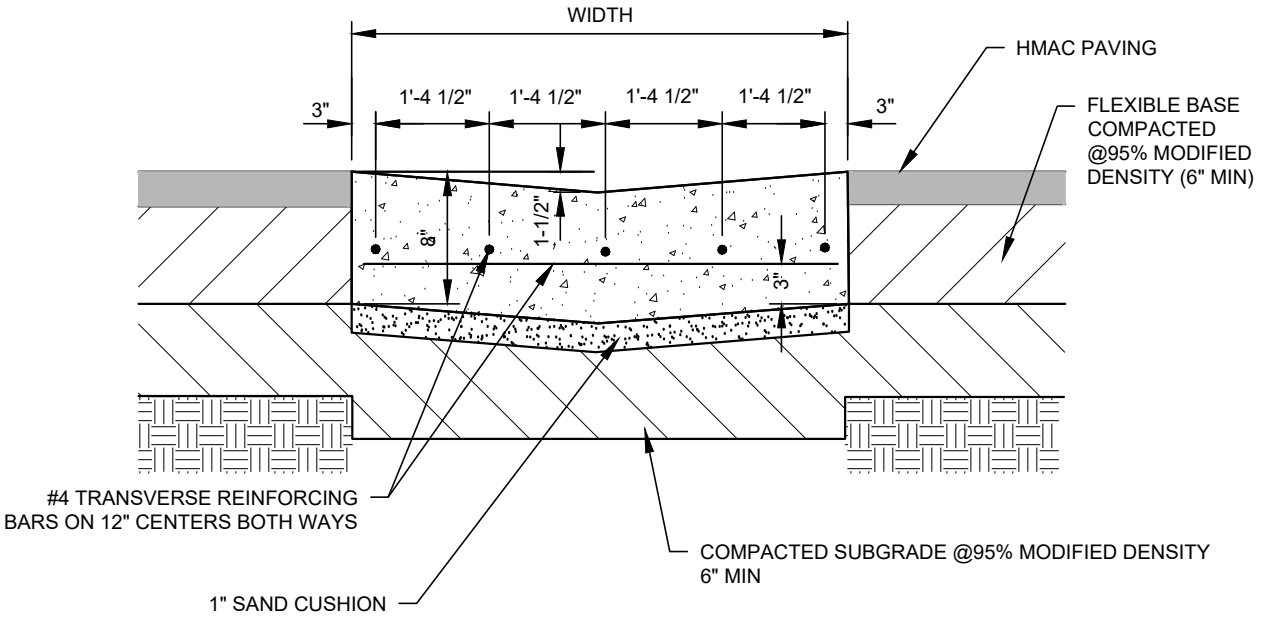

CAL SS "A" REINF.
CONCRETE
EXISTING CONCRETE
PAVEMENT
1'-0"
8" MIN
MIN. #4 REBAR 12" O.C.
OR MATCH EXISTING
OVERLAPPING
OR DOWLING
6"
BACKFILL AT
95% DENSITY
TRENCH
WIDTH


HMAC THICKNESS TO MATCH EXISTING
BASE COMPACTED 95% MODIFIED DENSITY
ASTM 1557
EXISTING ASPHALTIC
CONCRETE SURFACE
4"
4"
6" MIN
PAVING TIE DEPTH TO
MATCH EXISTING HMAC
EXISTING BASE MATERIAL
VARIES
6"
SMOOTH VERTICAL
JOINTS (TYP)
BACKFILL AT
95% DENSITY
VARIES

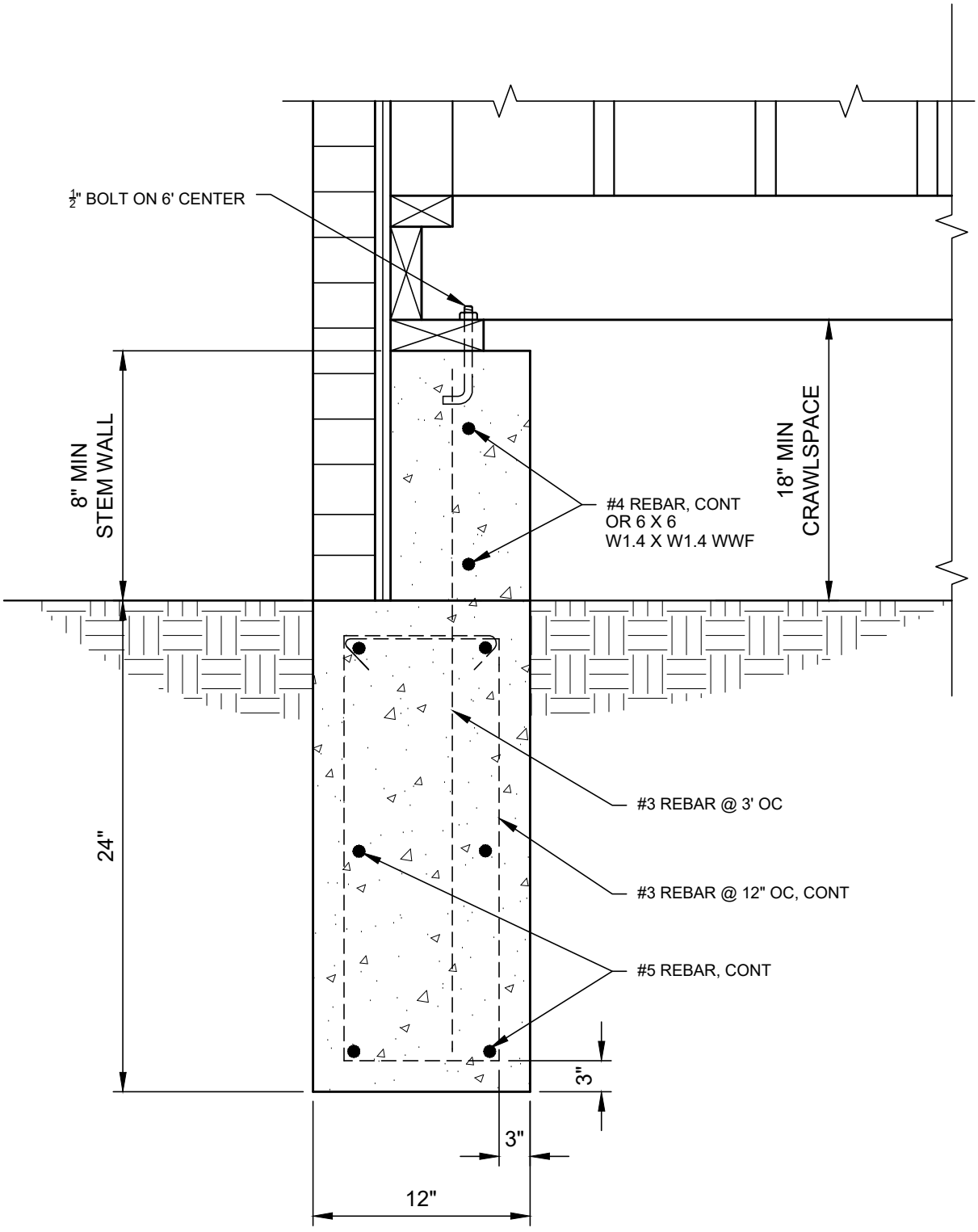

REMOVE AND REPLACE EXISTING BRICK SURFACE
1" SAND CUSHION
BASE COMPACTED 98%
EXISTING BRICK SURFACE
6" MIN
EXISTING BASE MATERIAL
VARIES
6"
EXISTING SUBGRADE MATERIAL
MATERIAL COMPACTED TO 95%
UTILITY WORK
VARIES



NOTE: DOWEL INTO EXISTING REBAR



VALLEY GUTTER WIDTH	
STREET CLASSIFICATION	WIDTH
RESIDENTIAL	6'
COLLECTOR	10'
ARTERIAL	20'



CONCRETE FOOTING
W/BRICK

PLAINVIEW, TX
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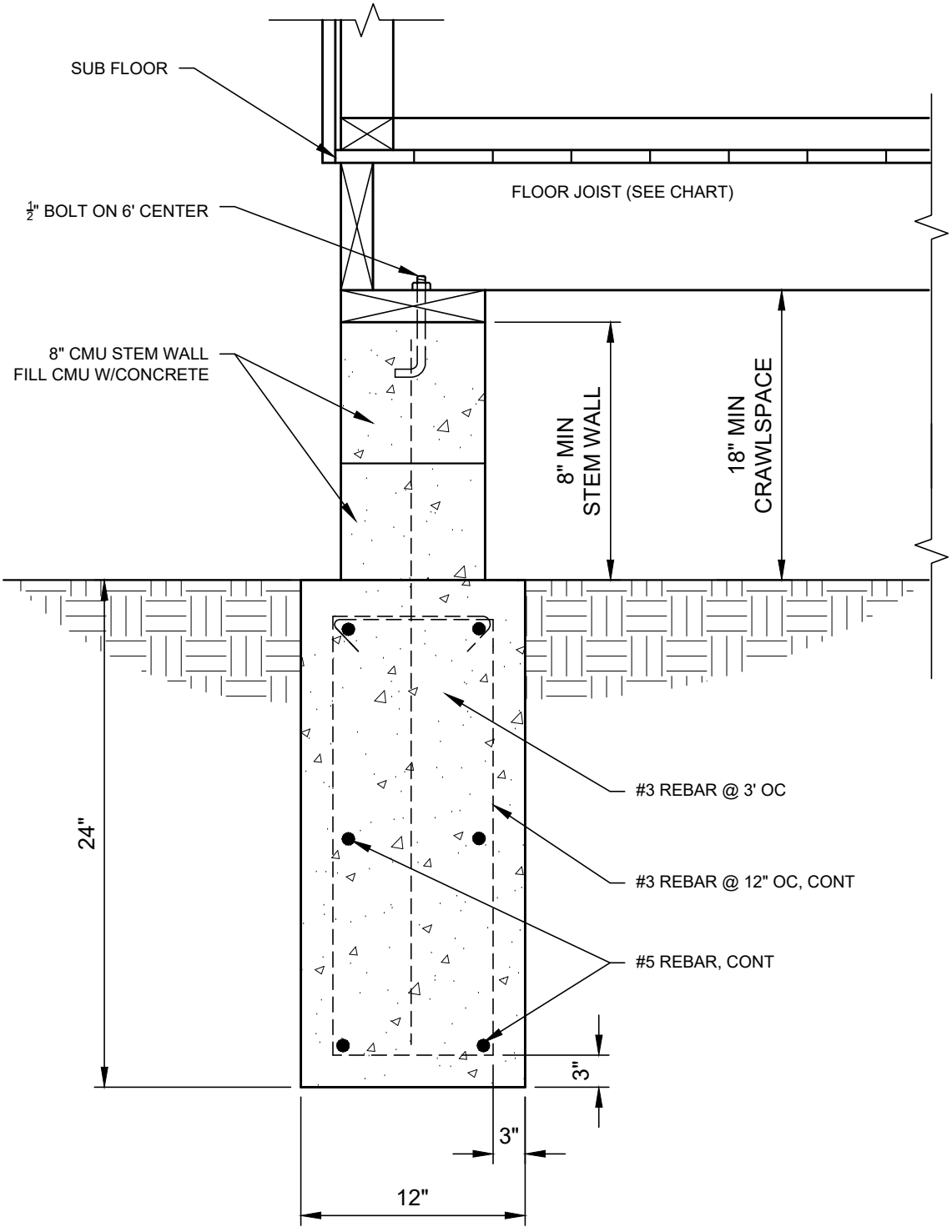
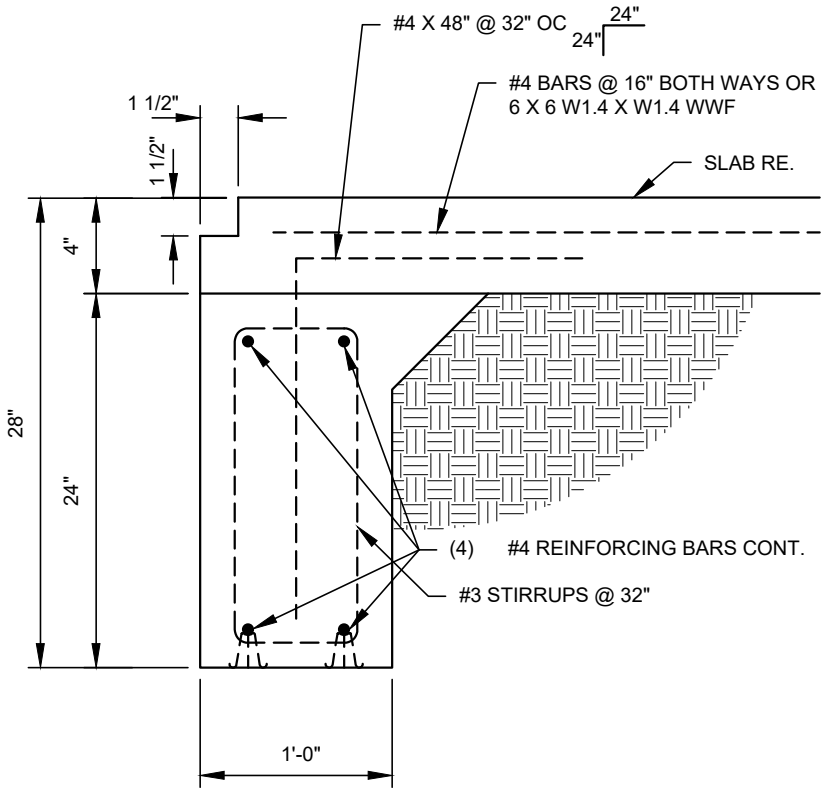
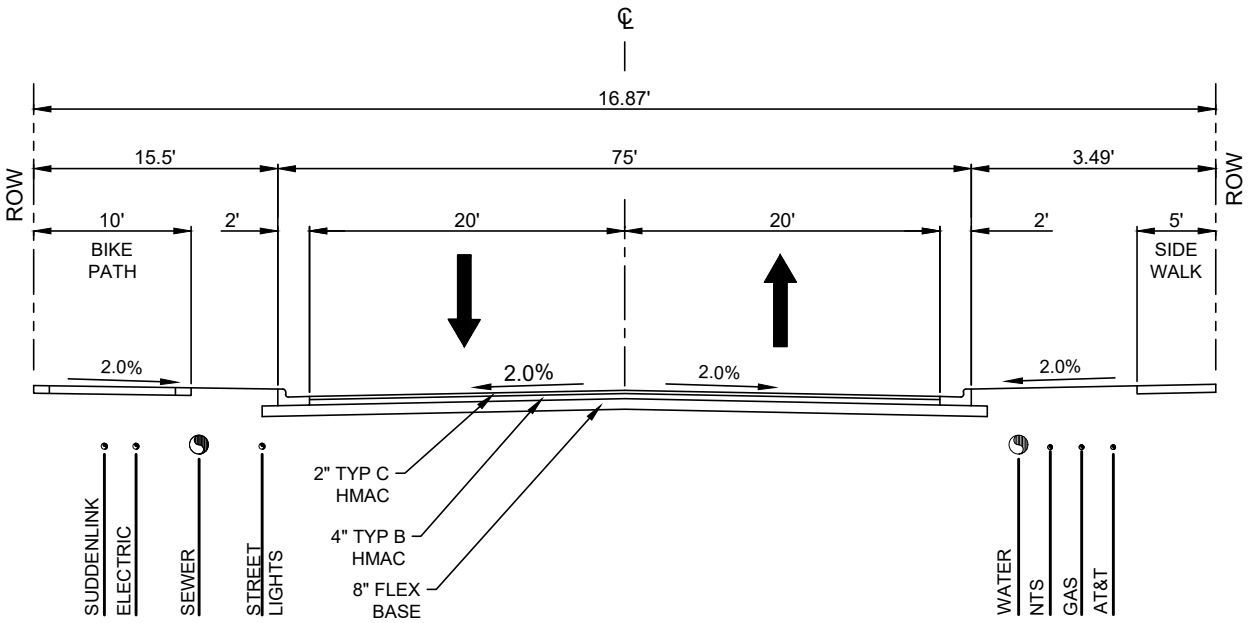
JANUARY 2024


SUB FLOOR
½" BOLT ON 6' CENTER
FLOOR JOIST (SEE CHART)
8" CMU STEM WALL
FILL CMU W/CONCRETE
8" MIN
STEM WALL
18" MIN
CRAWLSPACE
#3 REBAR @ 3' OC
#3 REBAR @ 12" OC, CONT
#5 REBAR, CONT
24"
3"
3"
12"

6 x 6 W1.4 x W1.4 W.W.F.




℄
16.87'
15.5'
75'
3.49'
ROW
ROW
10'
BIKE
PATH
2'
20'
20'
2'
5'
SIDE
WALK
2.0%
2.0%
2.0%
2.0%
SUDDENLINK
ELECTRIC
SEWER
STREET
LIGHTS
2" TYP C
HMAC
4" TYP B
HMAC
8" FLEX
BASE
WATER
NTS
GAS
AT&T

PLAINVIEW, TX

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TECHNICAL DESIGN & CONSTRUCTION STANDARDS

WATER

****Any deviation from the Design Standards must be submitted to the City for review and approval.****

1.0 SCOPE OF PROJECT

1.1 PLASTIC WATER PIPE & FITTINGS

All plastic water pipe shall be made from clean, virgin, NSF-approved, Type I, Grade I polyvinyl chloride (PVC), conforming to ASTM resin Specification D1784. All pipe shall meet or exceed minimum requirements of the AWWA C-900 standard Specification for polyvinyl chloride water distribution pipe. Pipe length shall not exceed 20 feet unless approved. Provision must be made for proper transporting, handling, and storage of pipe. Pipe and fittings are to be assembled with non-toxic lubricant as recommended by manufacturer. Pipe joints shall be the coupling or bell and spigot type utilizing rubber ring compression gasket(s) (ASTM D1869). Provision shall be made for thermal expansion and contraction to be taken up at the joint. Pipe joint shall conform to ASTM D3139 latest revision.

1.2 DUCTILE IRON FITTINGS

All fittings shall be ductile iron manufactured in accordance with ANSI/AWWA 153/A21.53-94. Fittings shall be furnished with mechanical joints conforming to ANSI/AWWA C111/A21.11. All fittings shall be furnished for 250 psi pressure rating.

1.3 GATE VALVES

All gate valves shall be resilient seated, manufactured to meet or exceed the requirement of AWWA C509 latest revision. All internal and external exposed surfaces shall be fusion-bonded epoxy coated with an approved epoxy coating to a minimum thickness of 6 mils, complying fully with AWWA 550 and certified to NSF61. Valves shall be furnished with mechanical joint ends in accordance with ANSI A21.11, unless otherwise shown or directed, and have an O-ring seal. Valves shall be suitable for installation in an approximate vertical position in buried pipelines. All valves shall open to the left (counterclockwise) with non-rising stems and shall be provided with a 2-inch square operating nut. Valves shall be complete when shipped and the manufacturer shall use due and customary care in preparing them for shipment so as to avoid damage in handling or in transit.

1.4 TAPPING SLEEVES AND VALVES

Tapping sleeves shall consist of a heavy gauge stainless-steel body with removable bolts, full gasket design giving 360 degree pipe coverage and stainless-steel flange to accept standard tapping valve. Tapping valve shall conform to all applicable Specifications for gate valves and shall be manufactured as tapping valves with line up grooves.

1.5 VALVE BOXES

Valve boxes for the water distribution system shall be made of cast iron of the heavy roadway type. Base section shall be enlarged to enclose and protect valve-operating nut without being in contact with the valve or the pipe at any point. Top section shall be adjustable for elevation. Backfill around valves and box shall be tamped to maintain proper alignment of the box. Valve boxes that are not plumb or not properly centered will not be accepted. All valve boxes shall be provided with covers on which the word “water” is cast in raised letters. Boxes shall be suitable for installation on mains laid at depths specified. Additional compensation will not be provided for deeper valve boxes made necessary by installation of mains at depths greater than minimum depths specified. Valve boxes shall have an inside opening of not less than 11 inches by 13 inches.

1.6 FIRE HYDRANTS

Fire hydrants shall be iron bodied fully bronze mounted hydrants manufactured to meet or exceed AWWA standard C502-54. Hydrants shall be suitable for 150 psi working pressure and shall be subjected to a test pressure of 250 psi. Inlet connection shall be 6-inch mechanical joint. Main hydrant valve shall be compression type, closing with the pressure, with 5 1/4-inch valve opening. The hydrant shall have a 7.5-inch i.d. barrel. The bronze seat shall be threaded into mating threads of bronze for easy field removal. All hydrants shall be equipped with two 2-1/2-inch hose nozzles, one 5 1/4-inch pumper nozzle, breakable safety flange, and stem coupling. Bronze nozzles shall be securely locked to prevent them from blowing off. Hose and pumper nozzles shall be field replaceable. Hose threads shall be national standard. Nozzle caps shall be equipped with non-kink chains. Hydrants shall be of the "dry barrel" type with an oil or grease reservoir and provision for automatic lubrication of stem threads and bearing surfaces each time the hydrant is operated. Double o-ring seals shall be provided to keep water out of the hydrant top. Operating nut style shall be 1-1/2-inch pentagon with direction of opening to the left and shall be equipped with a weather cap. The operating nut, main stem, coupling, and main valve assembly shall be capable of withstanding input torque of 200 ft/lbs., in opening or closing directions. Hydrants shall be provided with multi-port drain ports. It should not be necessary to excavate to repair or inspect internal parts. It should be removable without disturbing line joint or nozzle section of hydrant. Fire hydrants shall be supplied with a bituminous coating for buried portion of hydrant and an enamel finish for above ground portions of the hydrant.

1.7 SERVICE INSTALLATIONS

Pipe fittings and fixtures must comply with the S.3874 Reduction of Lead in Drinking Water Act SEC.2 (d) (1) (A) not containing more than 0.2 percent lead when used with respect to solder and flux and, (B) not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.

Meter Boxes shall be plastic, 18-inch minimum depth, round plastic box with round cast-iron lid. If meter box is located in an alley or an area exposed to vehicular traffic, then a H20 rated meter box and lid shall be required.

Meters shall be furnished by the City.

Service saddles for installation shall have two saddle rings.

Service pipe shall be polyethylene with stiffeners at each connection or type K copper.

2.0 INSTALLATION OF WATER PIPE AND ACCESSORIES

2.1 GENERAL

Water pipe shall be furnished and installed in accordance with details shown on the Drawings. The Work shall be done by experienced workmen employed by a General Contractor licensed in the State of Texas with the appropriate classification. Pipe, fittings, valves, and accessories shall be installed in strict accordance with these Specifications and the recommendations of the manufacturer. Gaskets, bolts, lubricant, and other accessories shall be furnished by or as recommended by the manufacturer. The Contractor shall use top quality materials throughout and shall exercise care in the storage, handling, and installation of the pipe and accessories. Trench bottoms shall include bedding and must be carefully graded by hand to provide continuous support for the pipe except at bells where bell holes must be dug.

2.2 HANDLING PIPE AND ACCESSORIES

All water pipe, fittings, valves, and other appurtenances shall be stored in a protected location where they will not be subject to physical damage or contamination. Pipe may be delivered to the trench site only if it is unloaded with suitable mechanical equipment and left in an area where it will not be a hazard or obstruction and will not be subject to flooding. Pipe, fittings, valves, and hydrants shall not be rolled or dropped from trucks or trailers and shall not be left in roadside ditches. Pipe clamps, slings, hooks, hoists, booms, or other equipment as required for safe and efficient handling of pipe and accessories shall be provided at the trench site whenever pipe laying is in progress. A suitable swab or brush shall be provided by the Contractor and shall be run through each and every joint of pipe to insure the removal of dirt and foreign objects. The pipe shall be inspected for defects immediately before being lowered into the ditch.

2.3 INSTALLATION OF POLYVINYL CHLORIDE (PVC) PIPE

PVC pipe, fittings, and valves shall be installed in strict accordance with manufacturer's recommendations.

2.4 INSTALLING FIRE HYDRANTS

Fire hydrants shall be located as shown on the Plans and as directed by the City of Plainview. In residential areas, a fire hydrant shall be located no more than 500 feet apart. In all other areas, fire hydrants shall be located no more than 250 feet apart. The hydrant shall be set in a vertical position with the pumper nozzle facing the street. The hydrant shall be set on a poured in place concrete pad, which shall also serve as a kicker against the undisturbed trench face. The concrete shall have horizontal and vertical bearing areas of at least 3 square feet against the undisturbed trench bottom and side, respectively, but shall not cover the flanges or drain ports. At least 7 cu. ft. of crushed stone shall be provided around the hydrant for drainage unless located on finished impervious surface. Hydrants shall be set so that the finished ground level will be just below the breakable flange or at the bury level indicated on the hydrant. The lower barrel of the hydrant shall be of sufficient length to enable the hydrant head to be installed horizontally even though the hydrant may be located in an embankment. Installed hydrants shall have an undamaged enamel coating and oil reservoirs shall be filled.

2.5 THRUST BLOCKS OR RESTRAINTS

Poured in place concrete thrust blocks must be provided where fittings are installed and at all points of unbalanced pressure where the pipeline could pull apart. Thrust blocks shall conform to details and minimum bearing areas as shown on the Drawings and shall bear against the undisturbed trench face. Contractors may elect to use an approved type of locked flexible joint extending on each side of bend.

2.6 VALVE BOX INSTALLATIONS

Valve boxes shall be centered over the valve-operating nut and installed in a vertical position. Box shall be of the proper length to extend to the ground surface and allow the adjustable upper section to be positioned approximately midway between upper and lower limits. Backfill shall be carefully tamped around valve box and suitable support shall be provided under and around the upper section to prevent future settlement.

2.7 CONNECTIONS TO EXISTING MAINS

All taps shall be done by the City unless approval is granted by the Public Works Director or Designee.

3.0 TESTING AND DISINFECTION

3.1 GENERAL

Upon completion of the construction Work under this Contract, all waterlines shall be disinfected to AWWA Standards and subjected to the necessary pressure and leakage tests. In the event pressure or leakage test is unsatisfactory, or bacteriological tests indicate that disinfection is incomplete, corrective measures shall be taken and the tests repeated until satisfactory results are obtained.

3.2 PRESSURE AND LEAKAGE TESTS

All waterlines shall be subjected to a hydrostatic pressure of 1.25 times the system working pressure or a minimum of 150 psi, whichever is greater, for a period of two hours and any defective Work revealed by the test shall be repaired or replaced by the Contractor. The amount of leakage under the stated pressure shall not exceed the amount allowed by formulas in AWWA C-605, shown below:

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

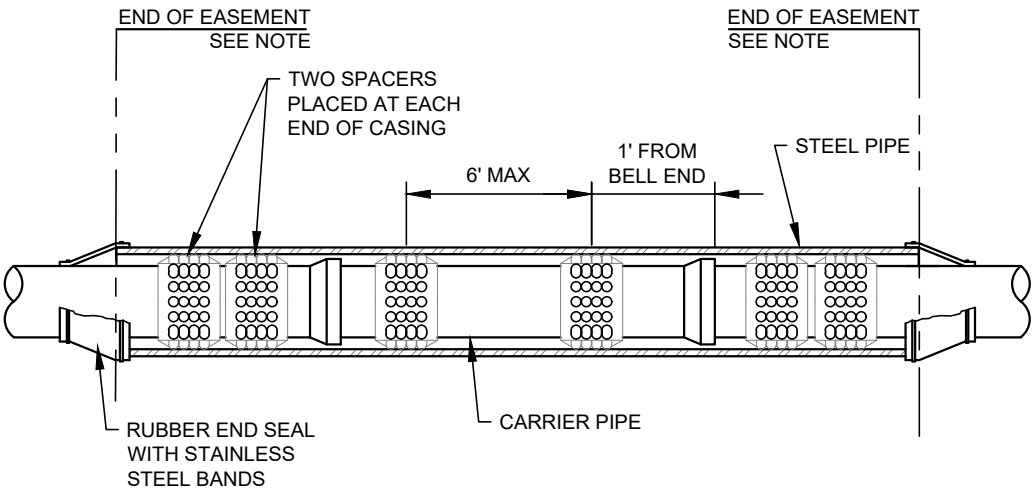
Where:

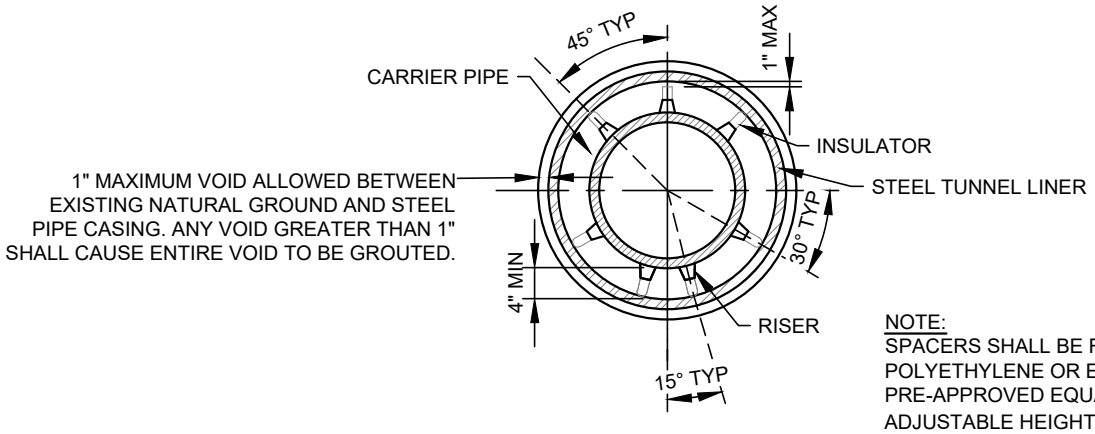
- Q = the quantity of makeup water in gallons per hour,
- L = the length of the pipe section being tested, in feet,
- D = the nominal diameter of the pipe in inches, and
- P = the average test pressure during the hydrostatic test in pounds per square inch (psi).

Should the amount of leakage exceed the above limit, the Contractor shall locate and repair the defective joints until the leakage is within the specified limits. In no event shall the leakage exceed the allowable leakage for mechanical or push on joints as shown in Table 6 of the AWWA C600-87 Standard. The Contractor shall provide all labor, tools, equipment, and materials for making the tests. Contractor should note that 200 psi test pressure is required although some large butterfly valves are bottle tight only to 150 psi across the valve. Attention should be given that at least 50 psi system pressure be on the low side or that valve be installed such that direction of pressure is on that face of the valve closure that provides the highest bottle tight pressure.

3.3 DISINFECTION

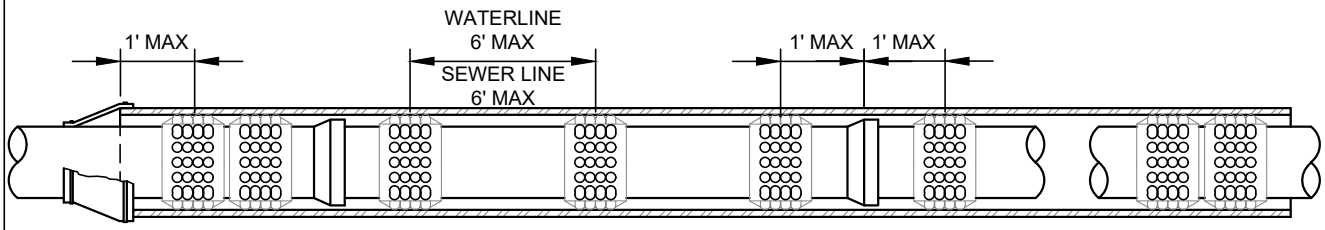
All waterlines, including pipe, valves, meters, etc., shall be disinfected prior to being placed in service in accordance with AWWA C651-92, after the system has been flushed to remove dirt or foreign objects which may have been accidentally introduced into the line. For this Work, the Contractor shall furnish suitable plugs or caps for the pipe, injection pumps, pipe connections, chlorine, and other equipment with all labor required. While the disinfectant is being applied to any section of the system, the water shall be allowed to escape all extremities of this section. The method of chlorine residual testing shall be the DPD color comparator method. The disinfectant shall be allowed to remain in the pipe for 24 hours, after which the lines shall be thoroughly flushed until only the residual chlorine found in tap water is present. Samples shall be taken for every 1,000’ of main and be delivered to an approved lab. In the event any of the bacteriological samples show the presence of coliform organisms or an excessive total count, the disinfection procedure shall be repeated until samples of satisfactory quality can be obtained.





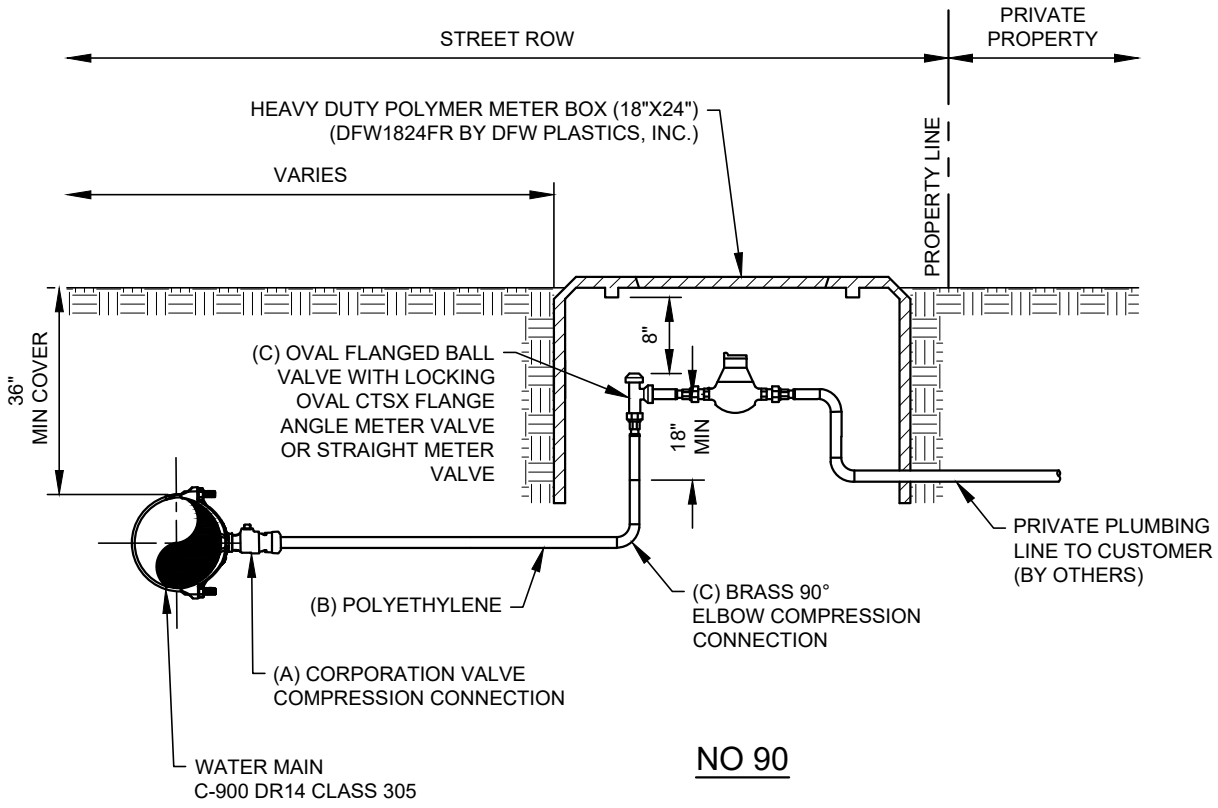
SECTION

NOTE:
SPACERS SHALL BE RACI HIGH DENSITY POLYETHYLENE OR ENGINEER PRE-APPROVED EQUAL.
ADJUSTABLE HEIGHT SPACERS REQUIRED FOR GRAVITY LINES.



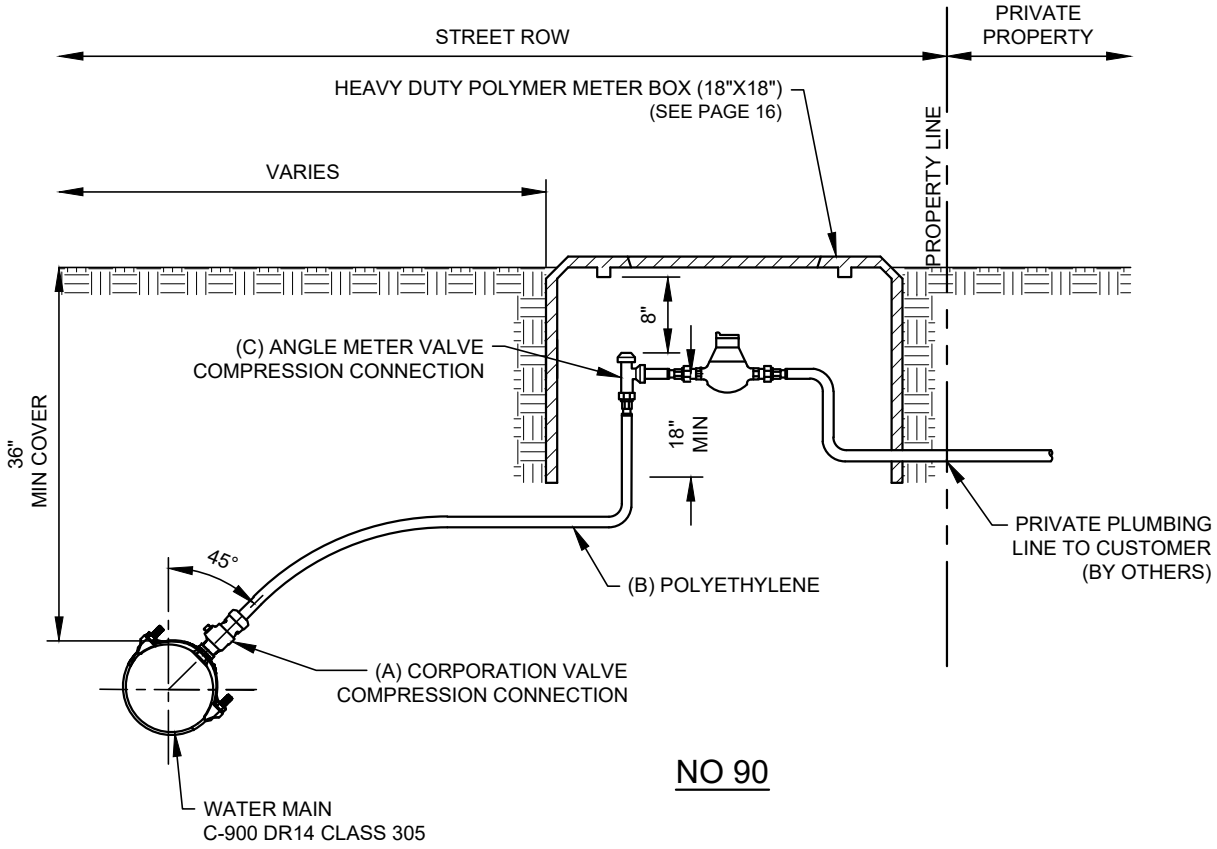
SPACER DETAIL

NOTE:
SPACER SHALL BE LOCATED A MINIMUM OF ONE FOOT FROM EACH SIDE OF PIPE JOINT, END OF CASING, AND ON MAXIMUM SIX FOOT CENTERS.



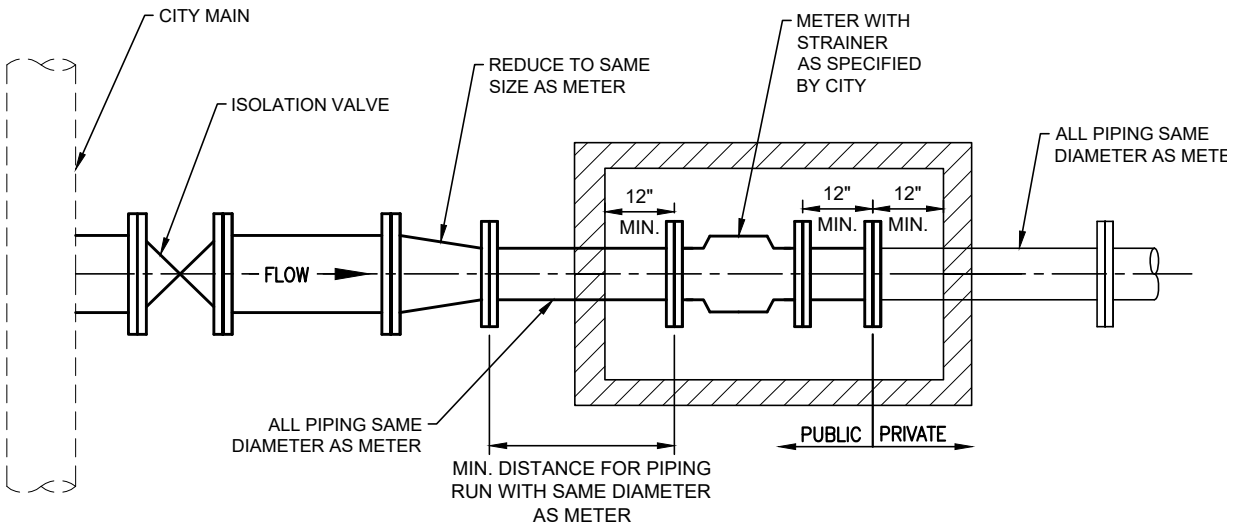
TYPICAL SINGLE WATER SERVICE INSTALLATION
TYPICAL 1-1/2" AND 2"

DESCRIPTION			
TAP SIZE	(A)	(B)	(C)
1-1/2"	1-1/2"	1-1/2"	1-1/2"
2"	2"	2"	2"



TYPICAL SINGLE WATER SERVICE INSTALLATION
TYPICAL 3/4" AND 1"

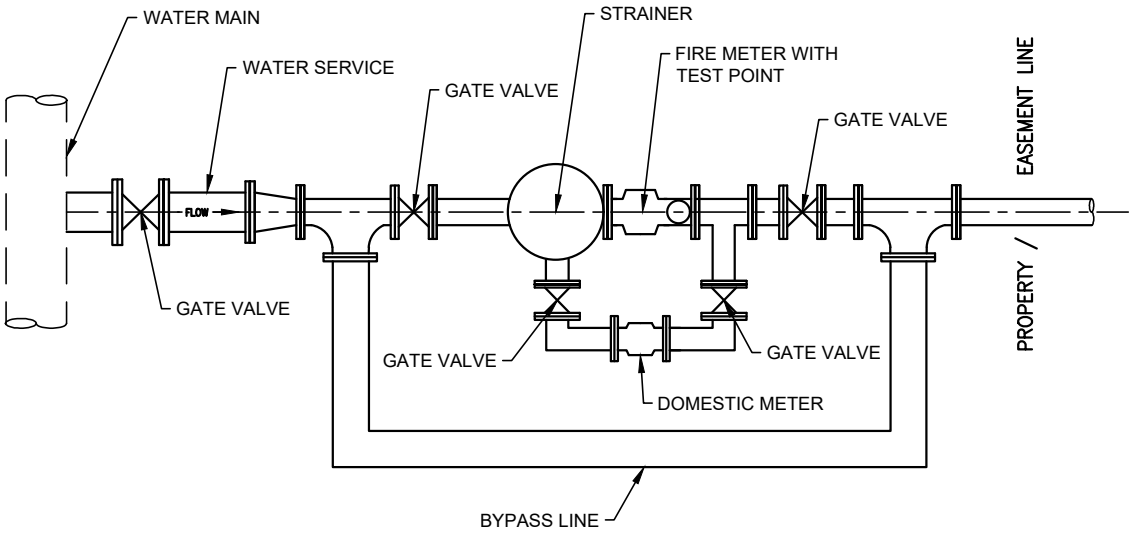
DESCRIPTION			
TAP SIZE	(A)	(B)	(C)
3/4"	3/4"	3/4"	3/4"
1"	1"	1"	1"



NOTE:

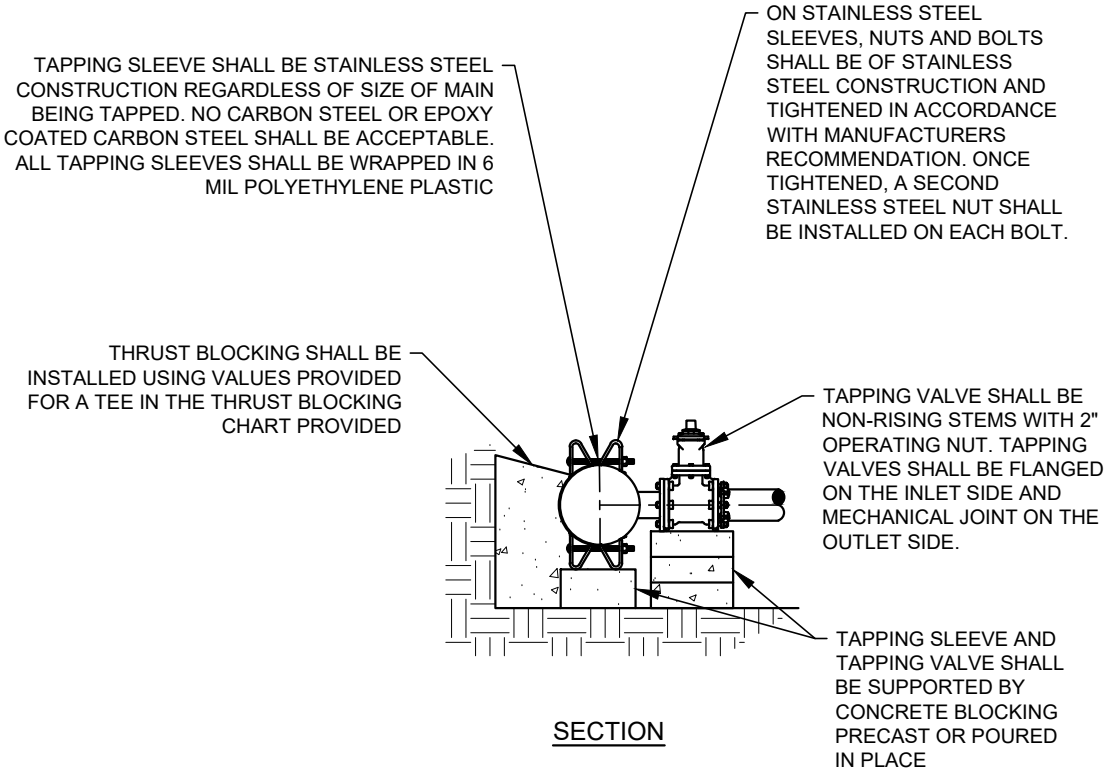
A. METER VAULT DETAIL ENGINEERED FOR THE APPLICATION WITH ADEQUATE ROOM FOR INSPECTION, NO CONSTRUCTION WITH CMU OR BRICK.

B. BACKFLOW VAULT DETAIL ENGINEERED FOR THE APPLICATION WITH ADEQUATE ROOM FOR INSPECTION, NO CONSTRUCTION WITH CMU OR BRICK.

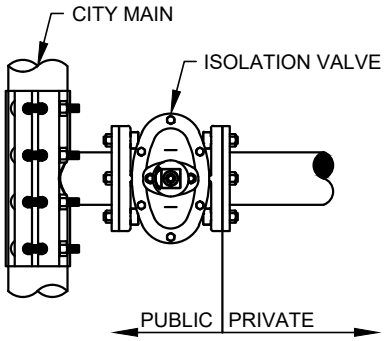


NOTES:

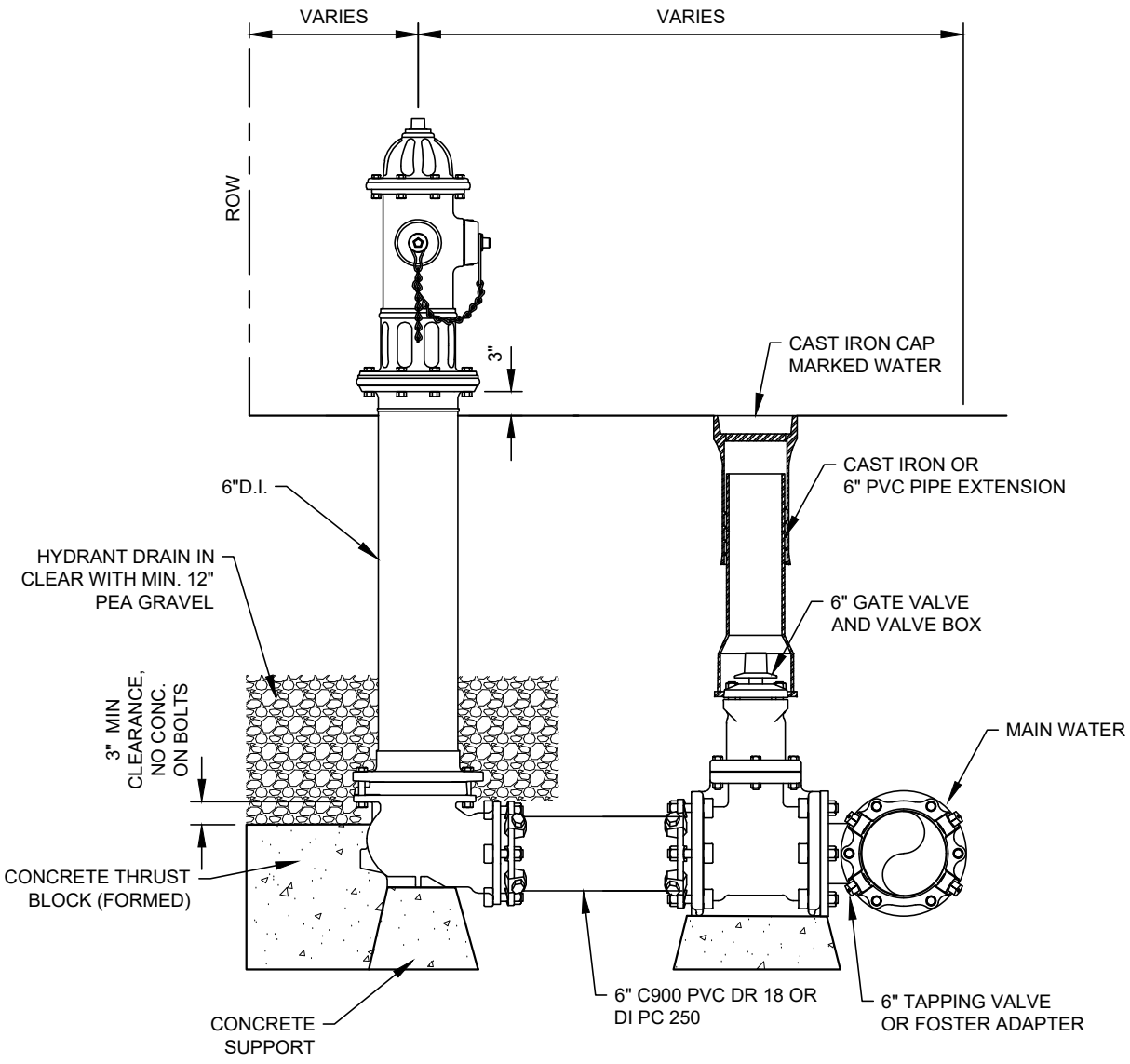
1. IF UNINTERRUPTED SERVICE REQUIRED, BYPASS MUST BE IN VALVE BOX.
2. RESIDENTIAL ONLY

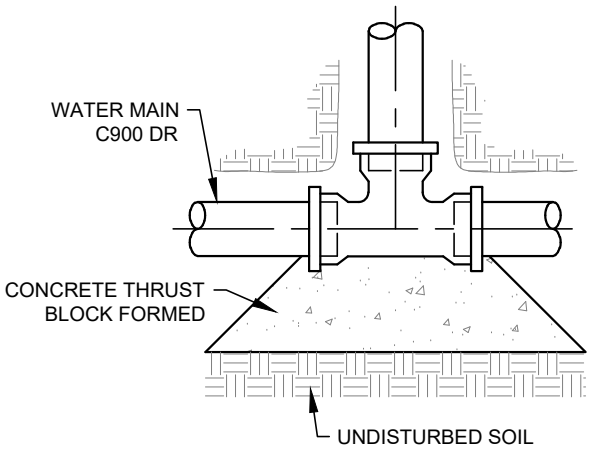


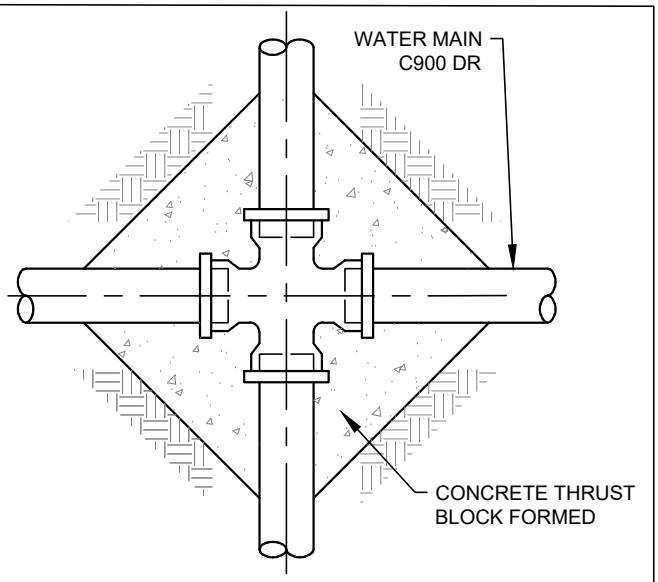
SECTION

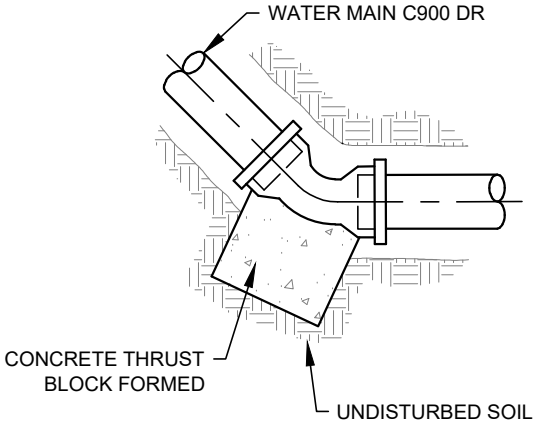


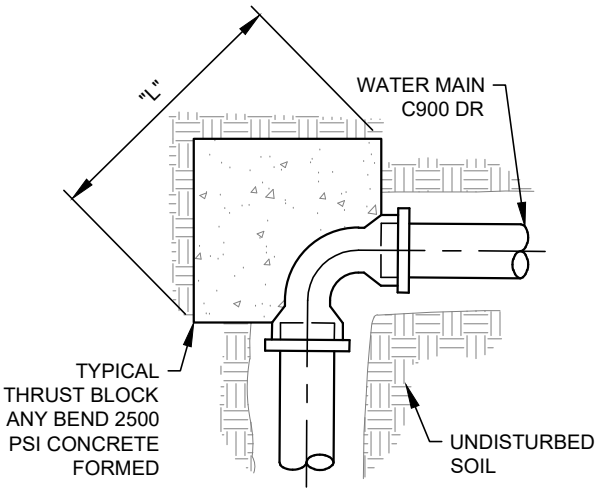
PLAN


VARIES
VARIES
ROW
3"
CAST IRON CAP
MARKED WATER
CAST IRON OR
6" PVC PIPE EXTENSION
6"D.I.
HYDRANT DRAIN IN
CLEAR WITH MIN. 12"
PEA GRAVEL
6" GATE VALVE
AND VALVE BOX
3" MIN
CLEARANCE,
NO CONC.
ON BOLTS
MAIN WATER
CONCRETE THRUST
BLOCK (FORMED)
6" C900 PVC DR 18 OR
DI PC 250
6" TAPPING VALVE
OR FOSTER ADAPTER
CONCRETE
SUPPORT







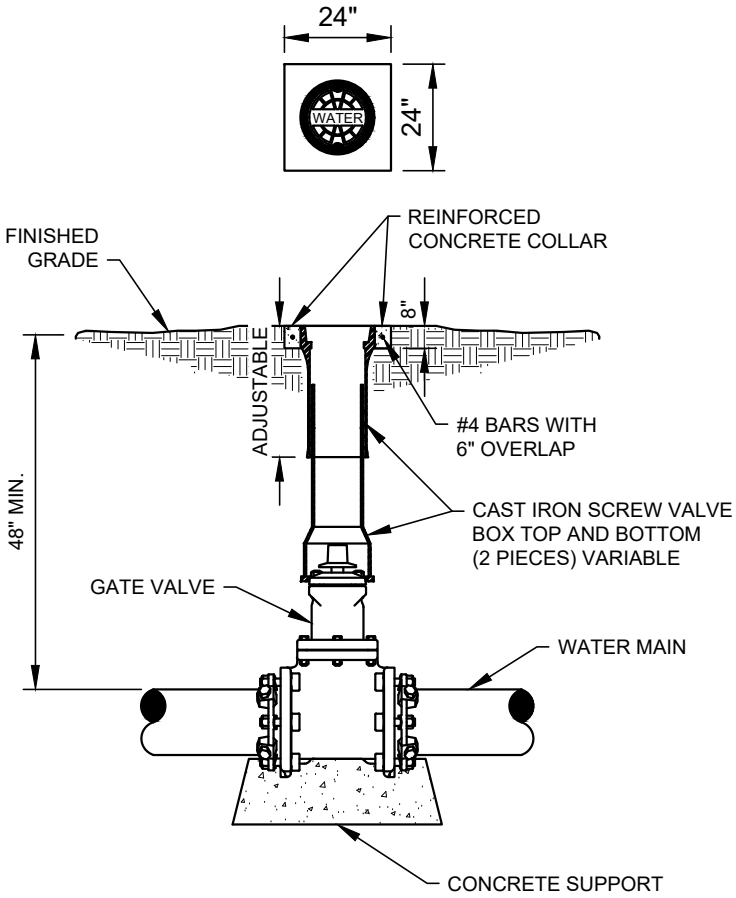


BASED ON 2000 LBS/SQFT MIN. SOIL BEARING CAPACITY

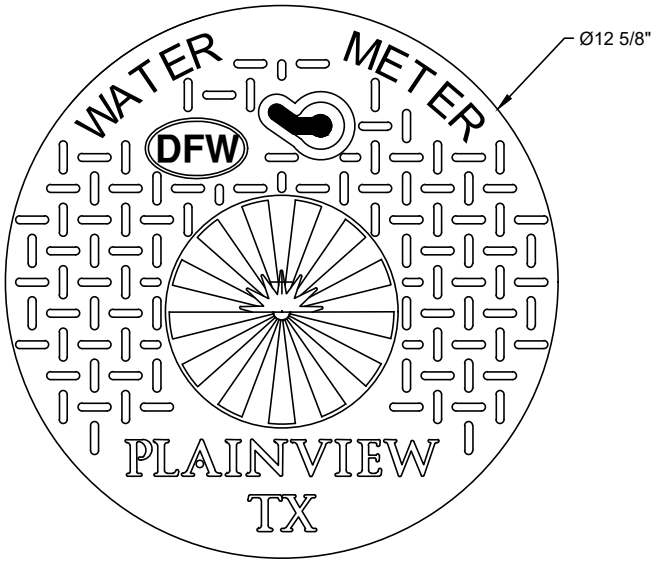
THRUST BLOCK DIMENSIONS 150 PSI TEST PRESSURE						
PIPE SIZE	L LENGTH REQUIRED IN INCHES (SEE DETAIL)					
	T VERTICAL SOIL BEARING THICKNESS IN INCHES					
	TEE *	CAP	BEND			
			90°	45°	22 1/2°	11 1/4°
8"	43/12	43/12	43/12	23/12	12/12	12/12
12"	48/24	48/24	48/24	35/18	26/12	16/12

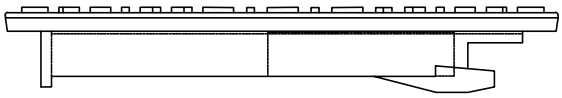
RESTRAINT LENGTH IN FEET 150 PSI TEST PRESSURE SAFETY FACTOR = 2.0, SOIL TYPE = CL, 4' PIPE COVER						
PIPE SIZE	TEE *	CAP	HORIZONTAL BENDS			
			90°	45°	22 1/2°	11 1/4°
8"	25'	68'	25'	10'	5'	3'
12"	5' (12X8) 55' (12X12)	97'				

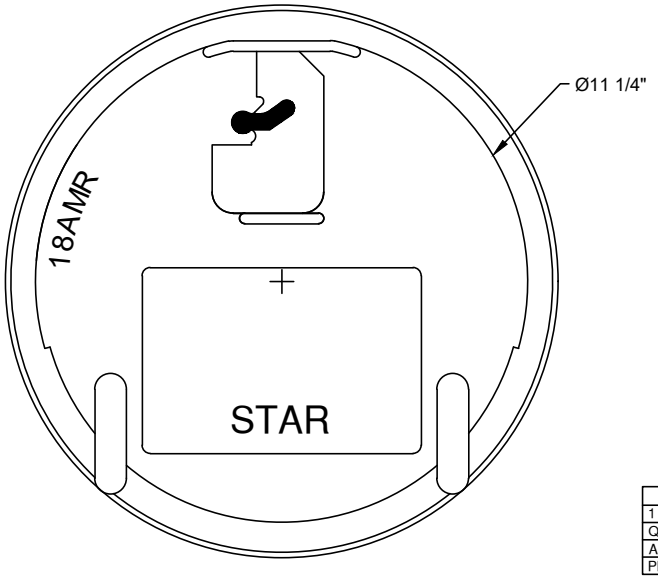
* RESTRAINT LENGTH ALONG THE BRANCH ASSUMING A MINIMUM PIPE LENGTH OF 5FT ON EACH SIDE OF THE TEE RUN WITHOUT FITTINGS.



NOTE:
CAST IRON VALVE EXTENSION OR 6" PVC PIPE TO BE USED FOR DEEPER GATE VALVES.







LID KEY	
1	BLACK COLOR
Q	KEYHOLE ONLY, NO LOCK
A STAR	ACLARA MOUNT RECESS
PLNVEW	PLAINVIEW TEXAS

DFW
DFW PLASTICS, INC.
PO Box 648, Bedford, TX 76095
817.439.3600
www.dfwplasticsinc.com

WATER METER COVER
DFW18AMR-1QA STAR PLNVW-LID
BY DFW PLASTICS, INC.

PLAINVIEW, TX
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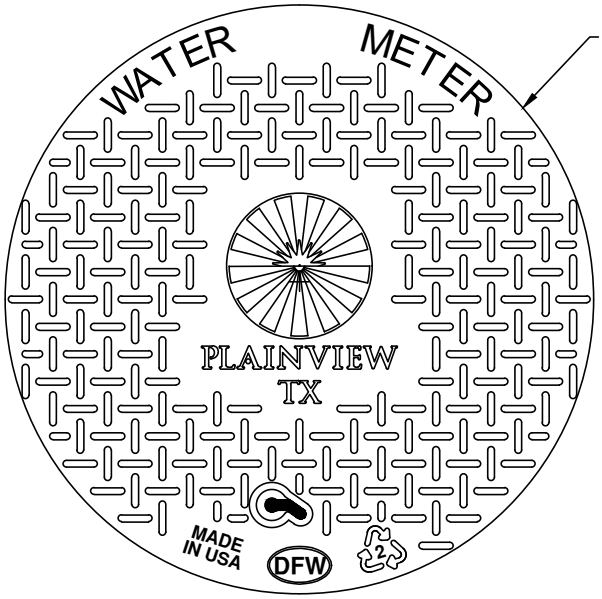

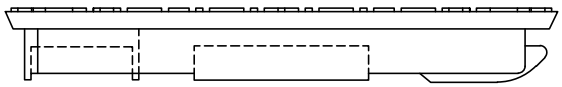

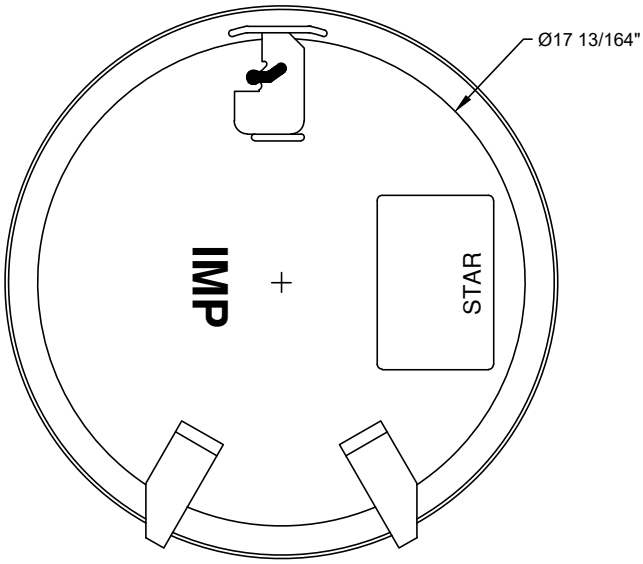

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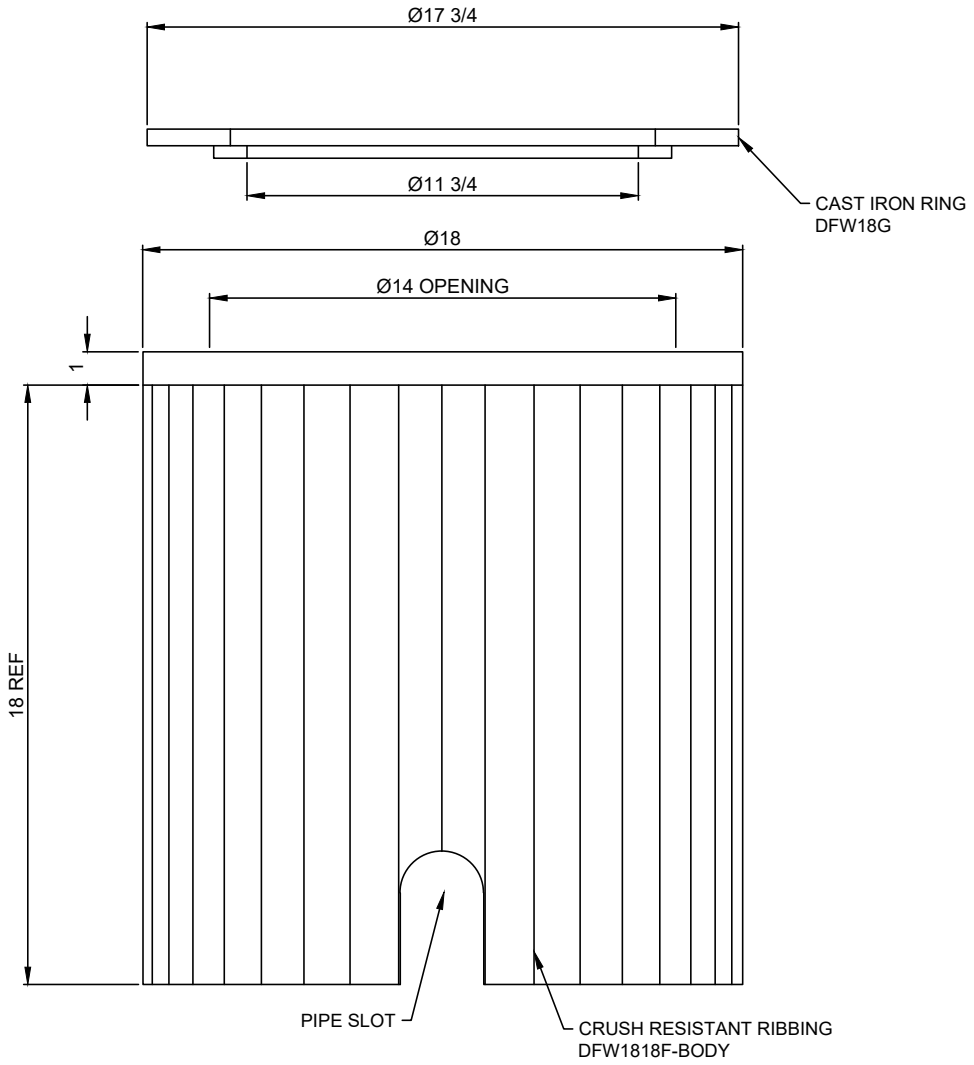

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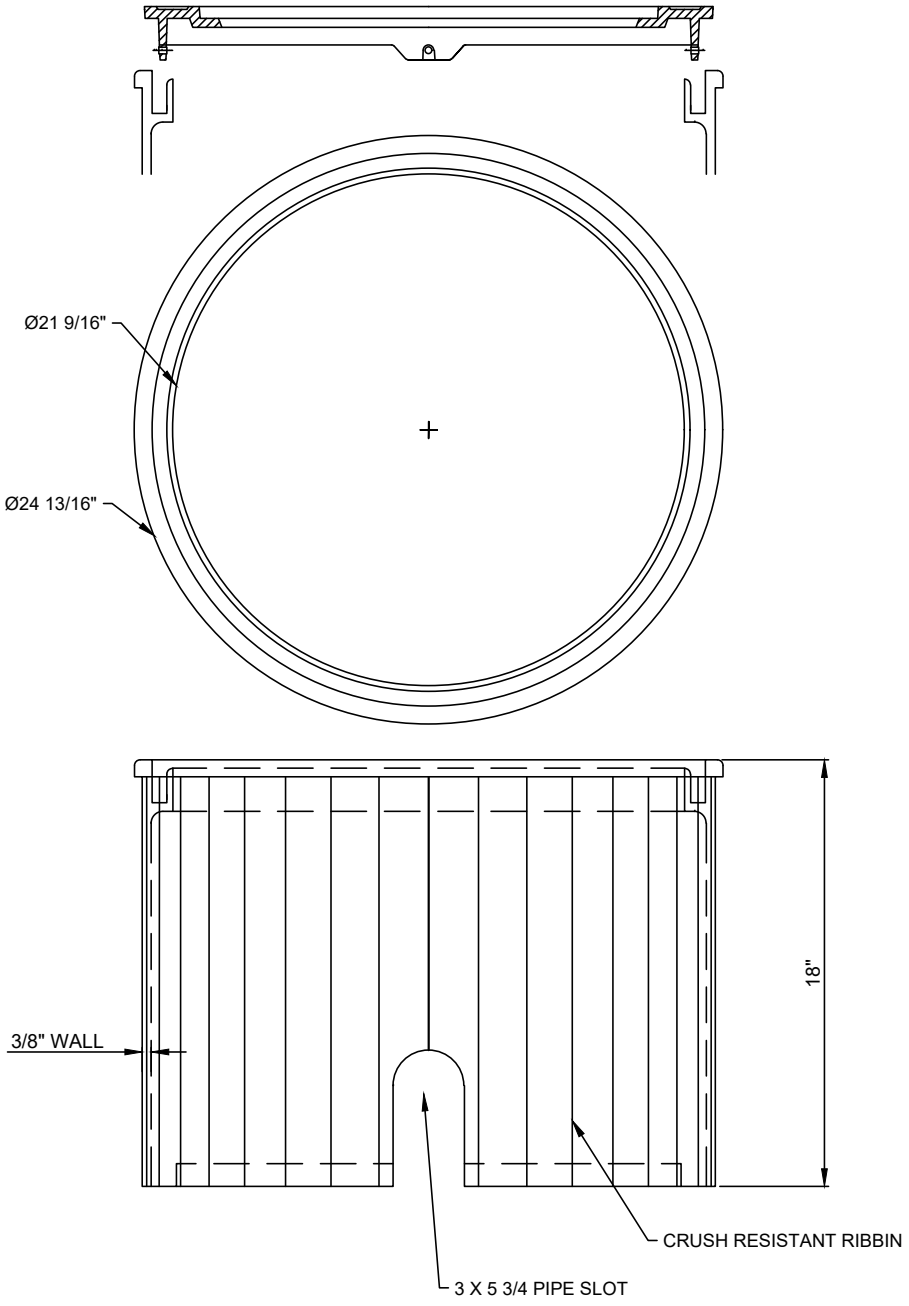

DFW
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PO Box 648, Bedford, TX 76095
817.439.3600
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WATER METER BOX
DFW2418FR
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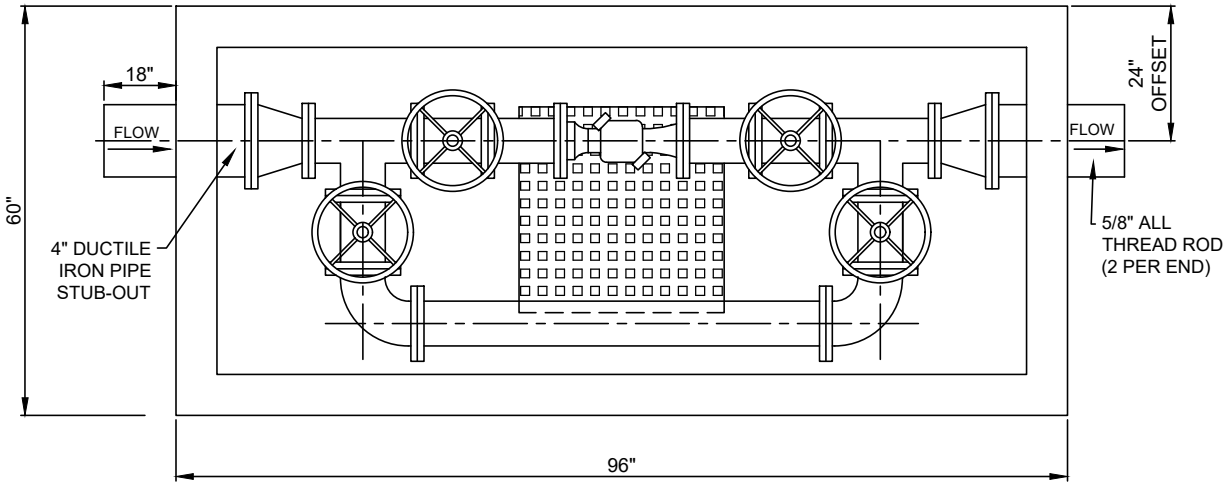
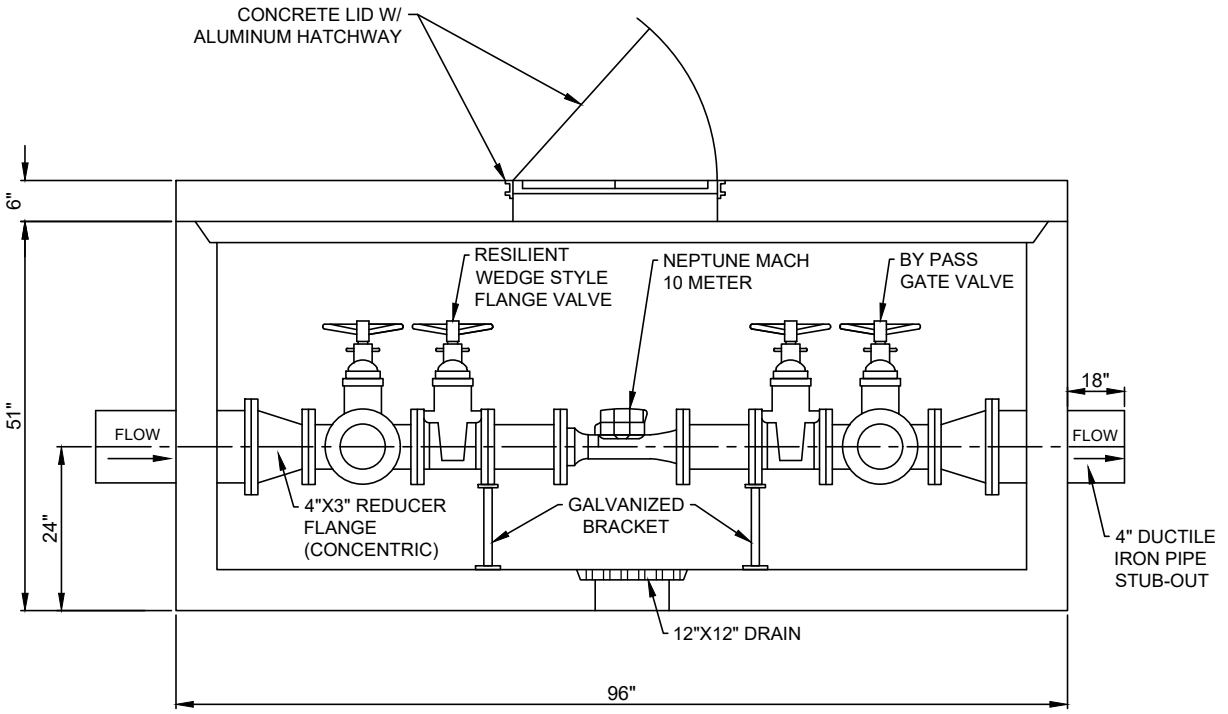
JANUARY 2024





GENERAL NOTES

A. CONCRETE, 5000 PSI @ 28 DAYS.
B. REBARS, #4 @ 12" OCEW.
C. METER MODEL, 4" TO 3" NEPTUNE MACH 10 METER AMS-3FSM/ VAULT 3/ PERMANENT BY PASS OPTION.
D. FACTORY ASSEMBLED AND TESTED. SITE PREPARATION, EXCAVATION, BASE, AND BACKFILL TO BE COMPLETED BY CONTRACTOR.

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TECHNICAL DESIGN & CONSTRUCTION STANDARDS

SEWER

****Any deviation from the Design Standards must be submitted to the City for review and approval.****

1.0 SCOPE OF PROJECT

1.1 SEWAGE BYPASSING

Where sewage flow exceeds the maximum allowance in performance of the various Work items, the Contractor shall provide pumps and bypass pipelines as required to divert any excess flow around the Work area. All sewage must remain in the system. Under no circumstances will the Contractor be allowed to discharge sewage into natural streams, drainage ditches, or other locations that could endanger the public health, violate laws and regulations, or cause a public nuisance.

2.0 MATERIALS

2.1 MANHOLES

All manholes shall be fiberglass unless otherwise approved by the City or specific to Engineering Plans. The Contractor shall submit details of the proposed manholes together with the name of the supplier to the City for approval. All invert channels shall be smooth and accurately shaped to a semi-circular bottom conforming to the inside of the adjacent sewer section. Inverts shall extend up at least half of the diameter of the pipe. Changes in the direction of the sewer and entering branches shall have a true curve of as large a radius as the size of the manhole will permit.

2.2 MANHOLE FRAMES & COVERS

Standard Manhole Frames & Covers

The standard frame and cover shall be traffic type of gray cast iron ASTM Designation A 48-64 with a 30-inch diameter opening weighing not less than 400 pounds as shown on the Plans. The covers shall be the solid self-sealing type with no holes except watertight pick notches or a heavy lifting ring. The surface between the cover and frame shall fit smoothly without rocking and shall be thoroughly cleaned. Special attention shall be given to ensure the proper installation of the rubber gasket in the self-sealing cover. The gasket shall have at least 1/4-inch diameter cross-section. The frame shall be attached to the manhole barrel by means of four 5/8-inch anchor bolts and shall be set in a bed of mastic so as to constitute a watertight seal between the barrel and the frame.

Watertight Manholes Frames & Covers

The manhole frames shall be set in the same manner prescribed for standard frames except special attention shall be paid to securing a watertight connection to the manhole barrel. The watertight manhole frame and cover shall be a traffic type of gray cast iron ASTM designation a 48-64 with a 30-inch diameter minimum clear opening weighing not less than 450 pounds and shall be of the two-cover design as shown on the Plans. The surface cover shall be the solid type with no holes except watertight pick notches or a heavy lifting ring. The surface between this cover and frame shall fit without rocking. The inner cover shall be of the solid type with no holes, shall have not less than two lifting handles and shall have a neoprene sealing gasket at least 7/16-inch diameter cross-section with a hollow center. The inner cover shall be mechanically sealed by means of a removable metal bar located over the inner cover with a centrally located bronze or stainless-steel tightening bolt. This bolt shall have a tee-handle or bent handle for turning. The bolt shall have appropriate reinforcing ribs to prevent cracking or distortion when tightened. The inner cover shall have sufficient clearance to allow easy removal from the frame. The frame shall be attached to the manhole barrel by means of four 5/8-inch anchor bolts and shall be set in a bed of mastic so as to constitute a watertight seal between the barrel and frame. Watertight manholes shall be vented at 1,000-foot intervals.

2.3 FIBERGLASS MANHOLES

Fiberglass reinforced plastic manholes shall be in accordance with ASTM D3753 “Glass Fiber-Reinforced Polyester Manholes” and the requirements of this Specification. The inside diameter of the manhole barrel shall be either 48 inches or as indicated in the Plans. A concentric reducer over the barrel shall have an inside diameter of 30 inches. The minimum wall thickness for all manholes regardless of depth shall be 1/2-inch (0.480-inch). The Contractor shall furnish the manufacturer’s certificate that the material meets the standards. All fiberglass manhole Sections shall be identified with the manufacturer’s name, identification number, and manhole length. Manhole frames and covers shall be gray cast iron conforming to ASTM A48 Class 20, unless shown otherwise below, and shall be first quality castings free from blow-holes, shrinkage, distortion, or other defects. After cleaning, casting shall be painted with a bituminous coating, giving tough, smooth surface not tacky or having tendency to scale or "alligator.” Frames and covers shall be as shown on Detail Drawings. Unless shown otherwise on Plans, covers to be solid with words "SANITARY SEWER" cast in cover, with pick hole cast in cover. Frames and covers for traffic conditions shall have machined contact surfaces to prevent rocking.

2.4 MORTAR MATERIALS

Mortar for manholes shall consist of one part of Portland cement to two parts of sand. Sand shall be a clean, natural river sand. When dry, 100 percent of the sand shall pass a #8 sieve and not more than 35 percent shall pass a #50 sieve.

2.5 SERVICE CONNECTIONS

Sewer service lines shall be provided as shown on the Plans or as directed by the Engineers. Service connections shall consist of tees or wyes with branch connection, curves, and service pipe. Pipe and fitting joints shall be compression type as used on the main sewer. Service pipe and fittings shall be of the same material as used for the main sewer. Service pipe shall be laid on a slope of at least 1/8-inch-per-foot. Sewer service lines shall conform to details as shown on the Drawings and shall terminate at the property line. Services to be installed across state highways, railroads, and other designated areas shall be installed by boring and jacking and 6-inch PVC pipe shall be used where pipe is installed by boring and jacking. In the event that it should be necessary to install a service connection where a tee has not been provided, saddles must be such a way as to effect a permanent water tight joint as recommended by the pipe manufacturer. Excavation, laying, and backfilling for service lines shall conform to the applicable Specifications for main sewers. 90 degree bends will be prohibited without approval from Engineer or City. The Contractor shall make connections to the existing sewers in accordance with details shown on the Drawings and as described herein. No taps into manholes will be allowed.

2.6 CONNECTIONS TO EXISTING SEWERS

New manholes shall be constructed over the existing sewer at points where the proposed sewer will connect, and the top of the pipe shall be cut out to provide for flow channels for both existing and proposed sewers. The Contractor shall make the necessary provisions to keep the existing sewer in operation without bypassing to the ditch or creek or ground surface. All taps shall be done by the City unless approval is granted by the Public Works Director or Designee.

3.0 TESTING AND ACCEPTANCE

3.1 GENERAL

Testing and acceptance of Work shall be conducted as Work proceeds and upon completion of the various Work operations. Acceptance of the Project shall involve a visual inspection and/or a leakage test. The procedures shall be as outlined hereinafter. The Work will not be accepted until the visual inspection and/or the leakage test results are satisfactory.

3.2 MANHOLES

As a basis of acceptance, the manufacturer shall provide an independent certification which consists of a copy of the manufacturer's test report and accompanied by a copy of the test results that the manhole has been sampled, tested, and inspected in accordance with the provisions of the Specification of ASTM D 3753 or latest version and meets all requirements. Once all manholes have been constructed or repaired and proper curing time for materials has elapsed, a vacuum test shall be conducted on the manholes. The test shall be conducted by the Contractor in coordination with the Engineer as specified hereinafter. To perform a vacuum test, the Contractor shall plug all lift holes and exterior joints with a non-shrink grout and plug all pipes entering a manhole. Grout may not be placed in horizontal joints before testing. Stub-outs, manhole boots, and pipe plugs must be secured to prevent movement while a vacuum is drawn. Contractor shall use a minimum 60-inch-per-pound torque wrench to tighten the external clamps that secure a test cover to the top of a manhole. A test head must be placed at the top of a cone section, and the seal must be inflated in accordance with the manufacturer's recommendations. There must be a vacuum of 10 inches of mercury inside a manhole to perform a valid test. A test does not begin until after the vacuum pump is off. A manhole passes the test if after two minutes and with all valves closed, the vacuum is at least nine inches of mercury. Any manhole which fails the vacuum test shall be repaired, reworked, or replaced as applicable at the Contractor's expense until the manhole passes the required test. Manhole vacuum tests shall only be preformed in the presence of the Owner's Representative or Engineer.

3.3 GRAVITY SEWER LINES & SEWER LINE REPLACEMENT

Upon completion of construction, the Contractor shall remove all sand, dirt, brick, and other foreign materials from the sewers and shall conduct his own inspection to locate any defects, and determine when the sewers are ready for final inspection, testing, and acceptance by the Engineer. After all apparent defects have been corrected, the Contractor shall notify the Engineer and request a final inspection. No final inspection will be scheduled by the Engineer until the Contractor advises he has conducted his own inspection and believes the Project to be ready for such final inspection. Should the Engineer begin a final inspection at the request of the Contractor and find the sewers have not been cleaned or defects have not been corrected, the inspection will be terminated and will not be rescheduled until the Contractor again advises the Project is ready for inspection. Acceptance of the Project shall involve visual inspection leakage test and a deflection test. The procedures shall be as outlined hereinafter. The Work will not be accepted until the visual inspection, leakage test, and deflection test results are satisfactory. A deflection test will be provided for PVC sewer lines running a full manhole to manhole length. Deflection test shall be by pulling a 9-arm mandrel sized at 95% of the internal diameter through the sewer. Test shall be performed after the sewer has been backfilled for at least 24 hours. PVC sewer lines failing mandrel test must be relayed.

After completion of sewer construction, and following the visual inspection, a low pressure air test shall be performed on all sewers to determine leakage. The Contractor will furnish all equipment, facilities, and personnel for conducting the test. The test shall be observed by a Representative of the Engineer. The air test will be made after all services have been installed and backfilling has been completed and compacted. All ties and end of sewer services shall be plugged with flexible joint plugs or caps securely fastened to withstand the internal test pressures. Such plug or cap shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension. Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches 3.5 pounds per square inch greater than the average back pressure of any ground water that may submerge the pipe. After the above internal pressure is obtained, allow at least two minutes for temperature to stabilize adding only the amount of air required to maintain pressure. The requirements of this Specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 2.5 pounds per square inch is not less than what is shown on the "Allowable Time Table," listed below. If the pipe installation fails to meet these requirements, the Contractor shall determine at his own expense the source of leakage, and he shall repair or replace all defective materials or workmanship.

MINIMUM TESTING TIME FOR LOW-PRESSURE AIR TEST

Pipe Diameter *(inches)*	Minimum Time *(seconds)*	Maximum Length for Minimum Time *(feet)*	Time for Longer Length *(seconds/foot)*
6	340	398	0.855
8	454	298	1.520
10	567	239	2.374
12	680	199	3.419
15	850	159	5.342
18	1020	133	7.693
21	1190	114	10.471
24	1360	100	13.676
27	1530	88	17.309
30	1700	80	21.369
33	1870	72	25.856

Plugs used to close the sewer pipe for the air test must be securely braced to prevent the unintentional release of a plug that can become a high-velocity projectile. Gauges, air piping manifolds, and valves shall be located at the top of the ground. No one shall be permitted to enter a manhole where a plugged pipe is under pressure. Four pounds (4#)[guage] air pressure develops a force against the plug in a 12-inch diameter pipe of approximately 450 pounds (450#). A safety release device set to release at ten pounds (10#) per square inch is to be provided between the air supply and the sewer under test. In addition to the leakage tests above, an infiltration leakage test will be made to ensure compliance with the infiltration limitations. Infiltration shall not exceed 25 gallons per day (GPD) per inch diameter per mile of sewer and in no case shall it exceed 750 GPD per mile of sewer. The infiltration test shall be made a maximum ground water table. The Contractor shall furnish all labor, tools, equipment, and materials for the test. The test must be scheduled at a time acceptable to the Engineer and shall be witnessed by his Representative.

3.4 FORCE MAINS

Force mains shall be installed in accordance with AWWA standards and inspected by an Engineer. Upon completion of the construction Work under this Contract, all force mains shall be subjected to the necessary pressure and leakage tests. In the event the pressure or leakage test is unsatisfactory, corrective measures shall be taken and the tests repeated until satisfactory results are obtained. Force mains shall be tested and accepted only in accordance with AWWA C-600 and these Specifications.

All lines shall be subjected to a hydrostatic pressure of 200 psi for a period of one hour, and any defective Work revealed by the test shall be repaired or replaced by the Contractor.

The amount of leakage under the stated pressure shall not exceed the following formula:

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

Where:

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

Should the amount of leakage exceed the above limit, the Contractor shall locate and repair the defective joints until the leakage is within the specified limits.

3.5 REPAIR OF MANHOLES

The Contractor shall take precautions in ensuring that all defects are repaired when the manholes are first scheduled for Work. Should the manhole be found to be leaking anytime during the warranty period from a leak type repaired by the Contractor, the manhole will be repaired at no additional cost to the Owner.

3.6 ABANDON MANHOLE

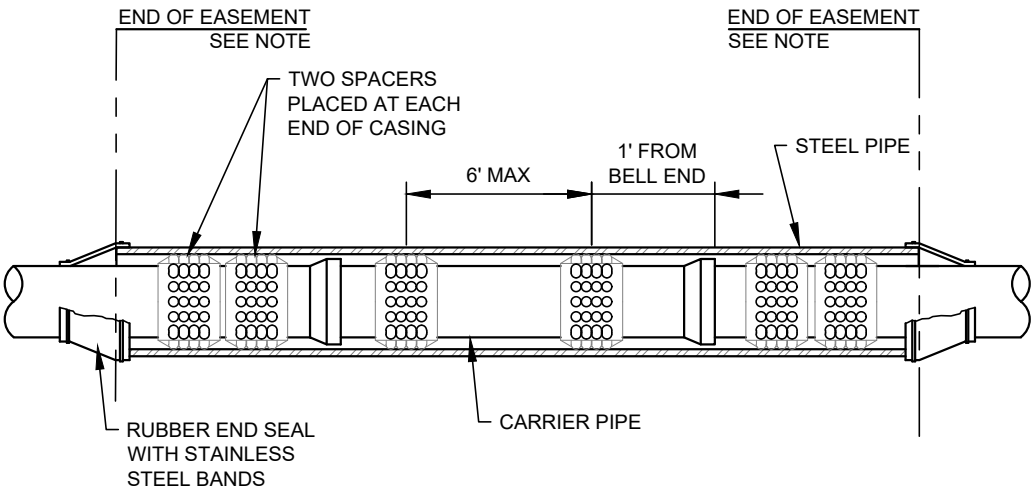
Wherever shown, the Contractor shall remove existing casting and deliver such to City's inventory. In areas subject to traffic, manhole shall be filled with flowable fill, and repair pavement. In yards and fields, Contractor shall remove top 4 feet of manhole, fill manhole with approved material, compacted to 95 percent ASTM D698, and seed disturbed area. Contractor to be responsible for settlement. Inlet and outlet lines to be plugged with concrete as directed by Engineer.

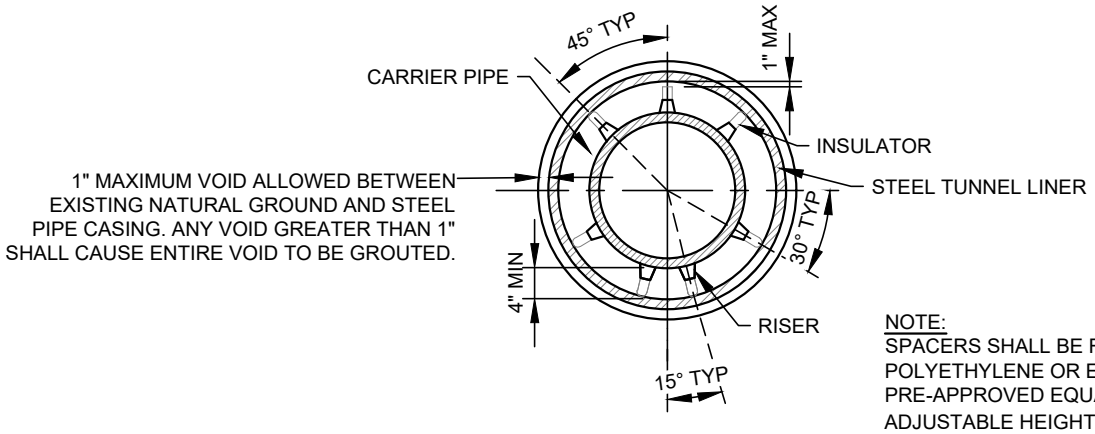
3.7 MANHOLE CONNECTIONS

Contractor shall construct all manhole connections as shown on detail sheet of these Specifications. The Contractor shall make connections to existing manholes as shown on Plans, reroute, reform, and rebuild inverts, plug and seal existing lines as directed, repair all defects within manhole, and plug and seal all leaks.

3.8 RECONDITION MANHOLES

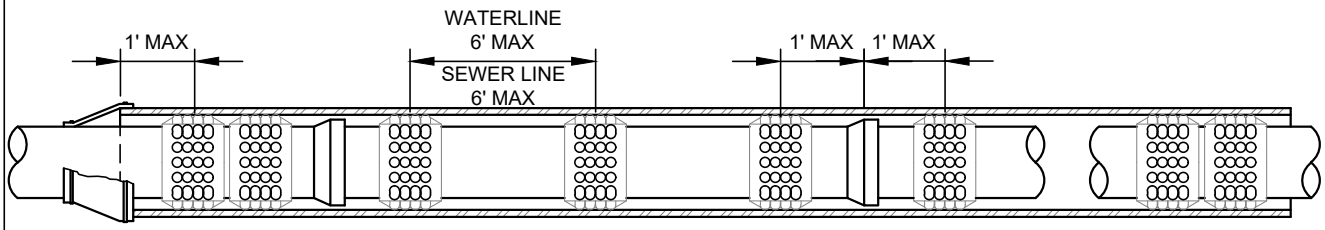
Contractor shall plug and seal existing lines as shown on Plans, reconstruct or recondition invert as required, repair all defects, plug and seal all leaks, and plaster manhole in accordance with approved system.





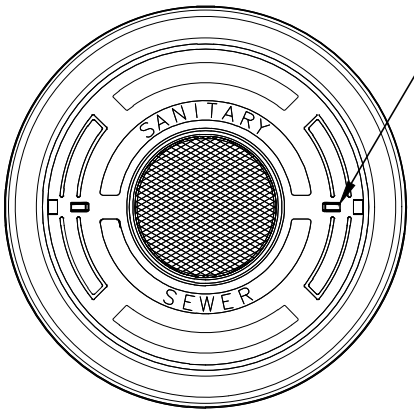
SECTION

NOTE:
SPACERS SHALL BE RACI HIGH DENSITY POLYETHYLENE OR ENGINEER PRE-APPROVED EQUAL.
ADJUSTABLE HEIGHT SPACERS REQUIRED FOR GRAVITY LINES.

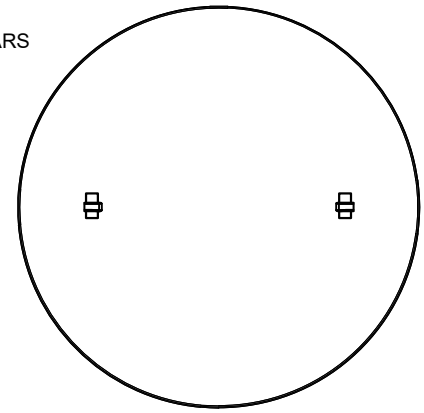


SPACER DETAIL

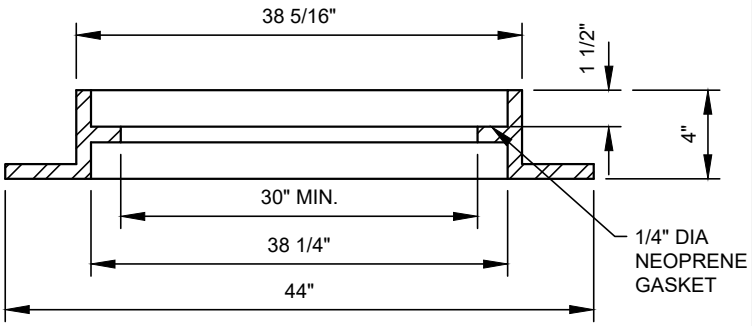
NOTE:
SPACER SHALL BE LOCATED A MINIMUM OF ONE FOOT FROM EACH SIDE OF PIPE JOINT, END OF CASING, AND ON MAXIMUM SIX FOOT CENTERS.



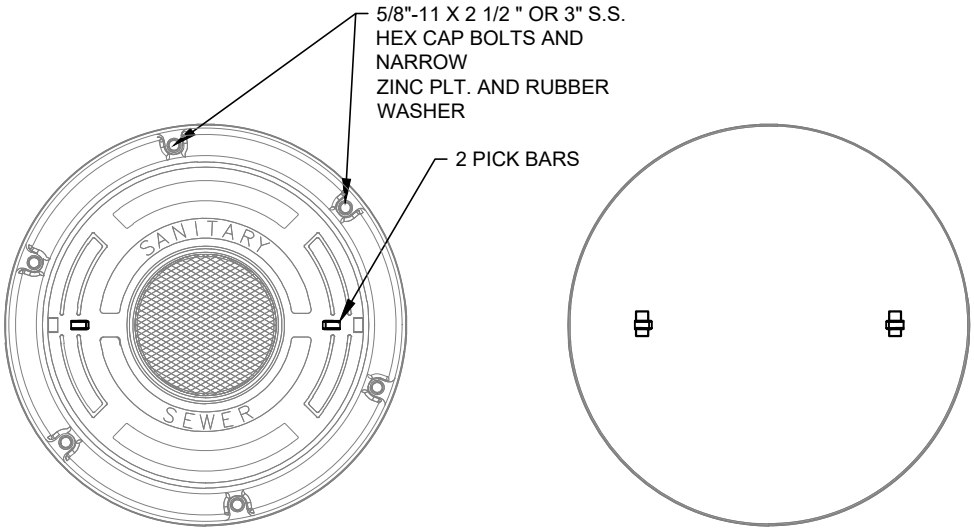
TOP VIEW OF COVER



BOTTOM VIEW OF COVER

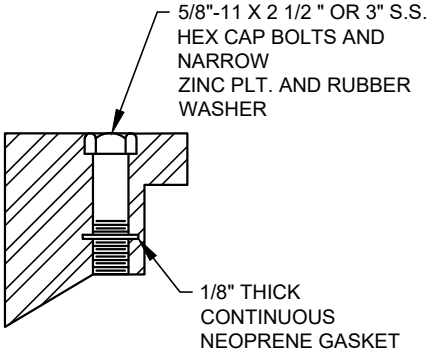


FRAME SECTION

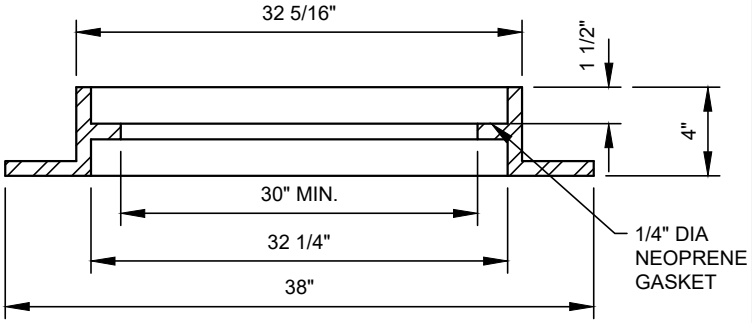


TOP VIEW OF COVER

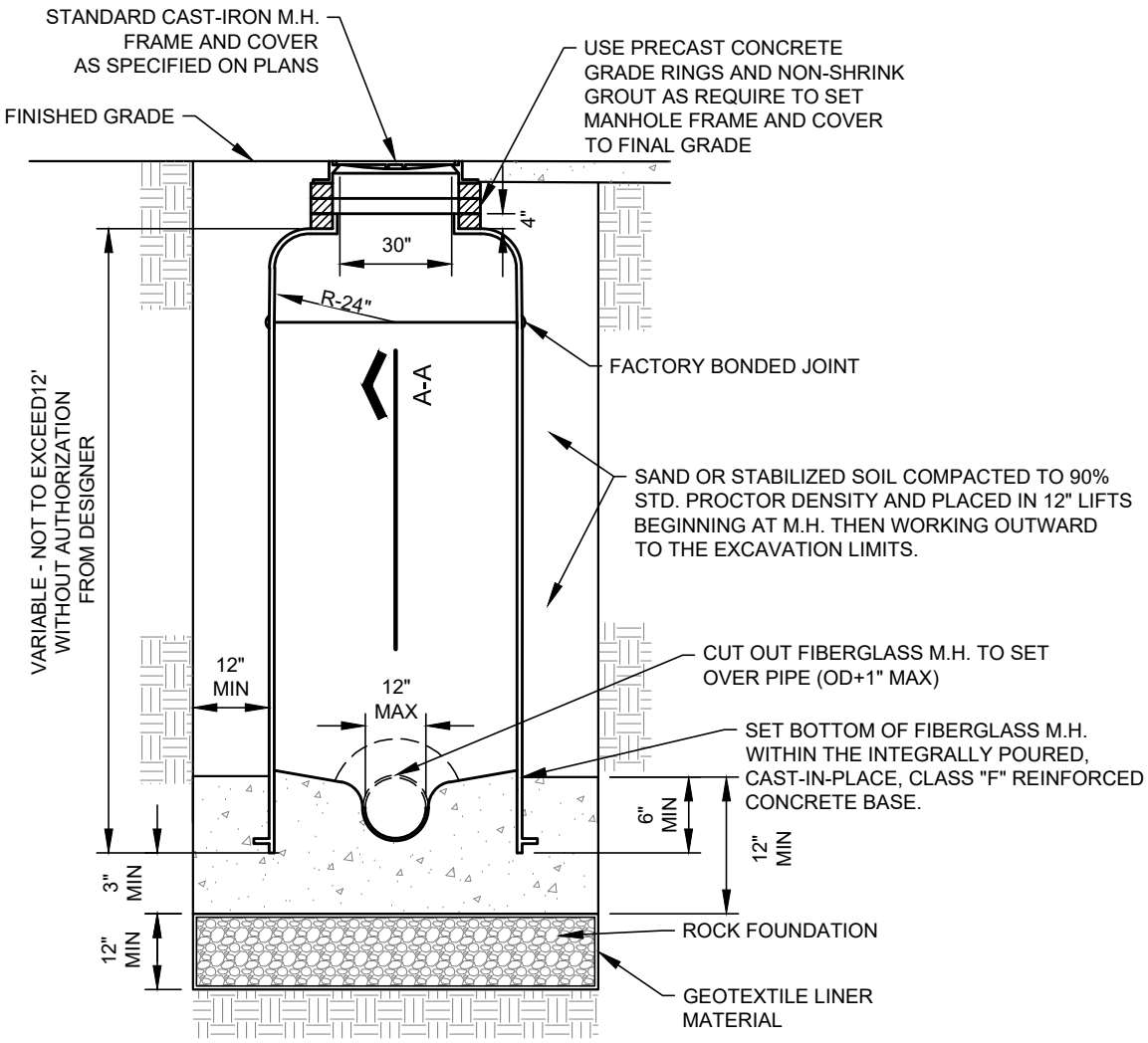
BOTTOM VIEW OF COVER



BOLT DETAIL

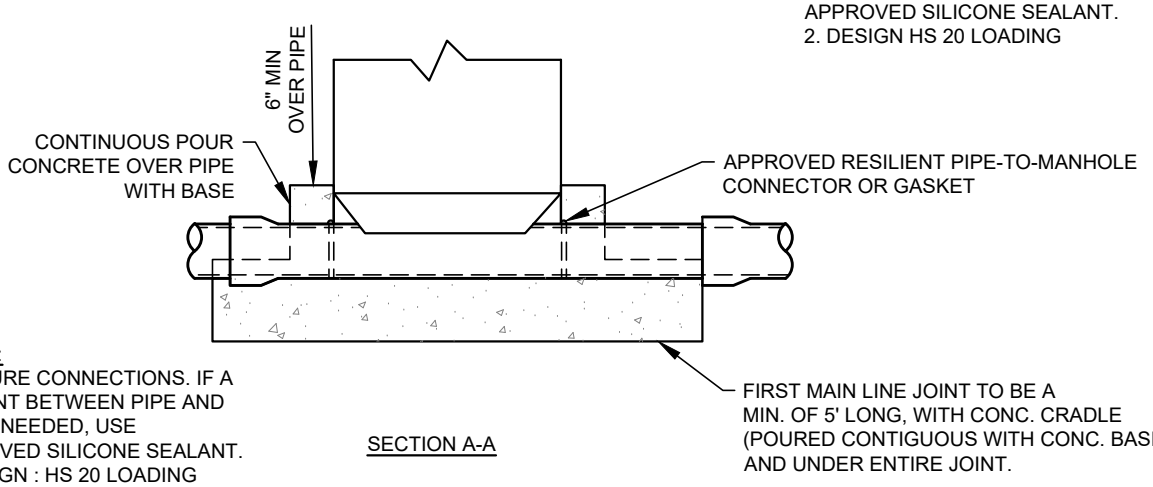


FRAME SECTION



ELEVATION

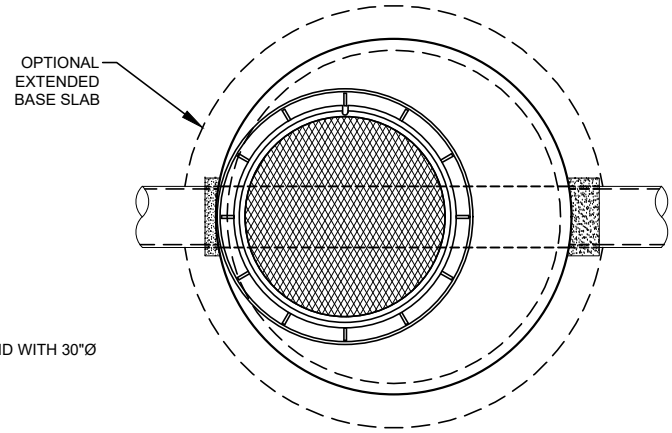
NOTES:
1. FUTURE CONNECTIONS. IF A SEALANT BETWEEN PIPE AND M.H. IS NEEDED, USED APPROVED SILICONE SEALANT.
2. DESIGN HS 20 LOADING



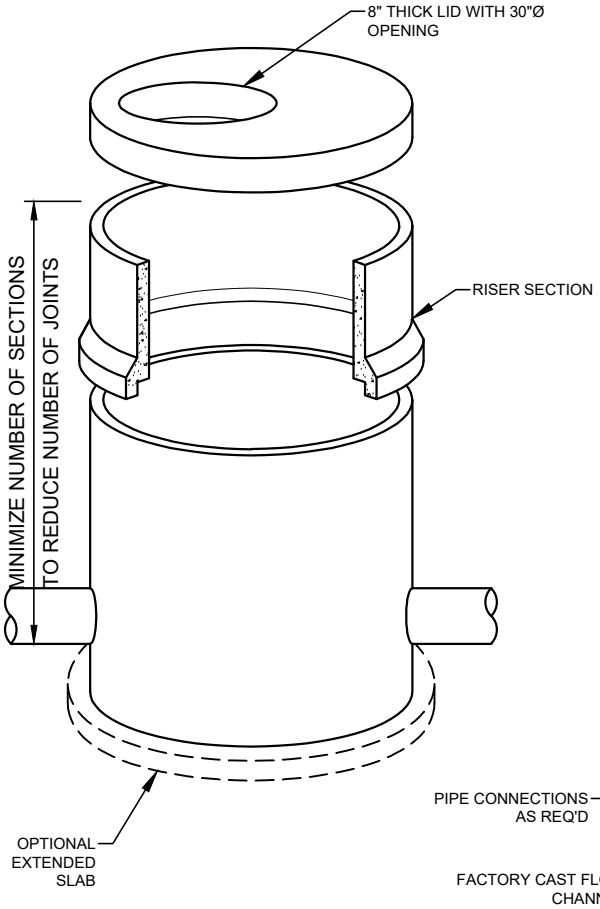
NOTES:
1. FUTURE CONNECTIONS. IF A SEALANT BETWEEN PIPE AND M.H. IS NEEDED, USE APPROVED SILICONE SEALANT.
2. DESIGN : HS 20 LOADING

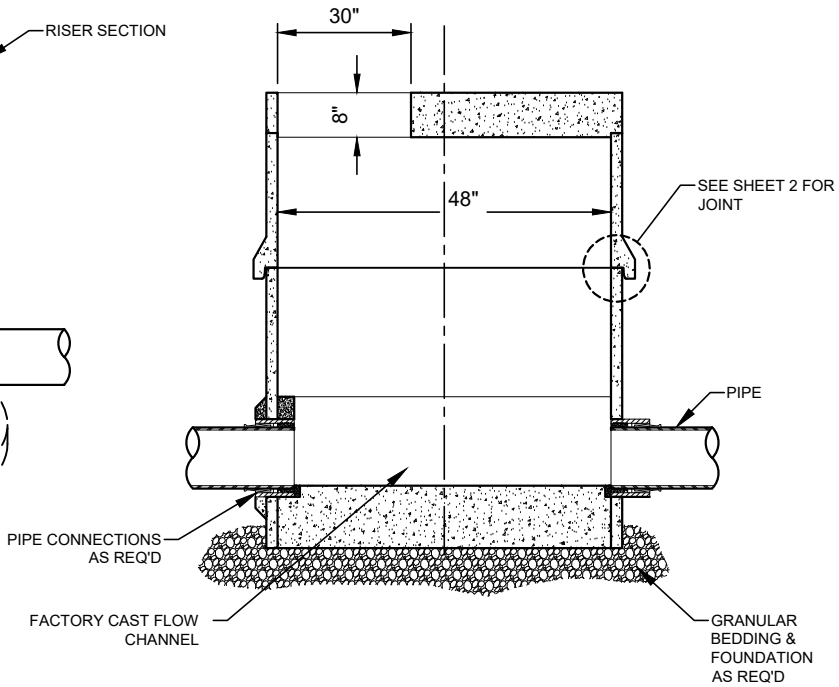
SECTION A-A

HS-20/HL-93 LOADING



PLAN VIEW

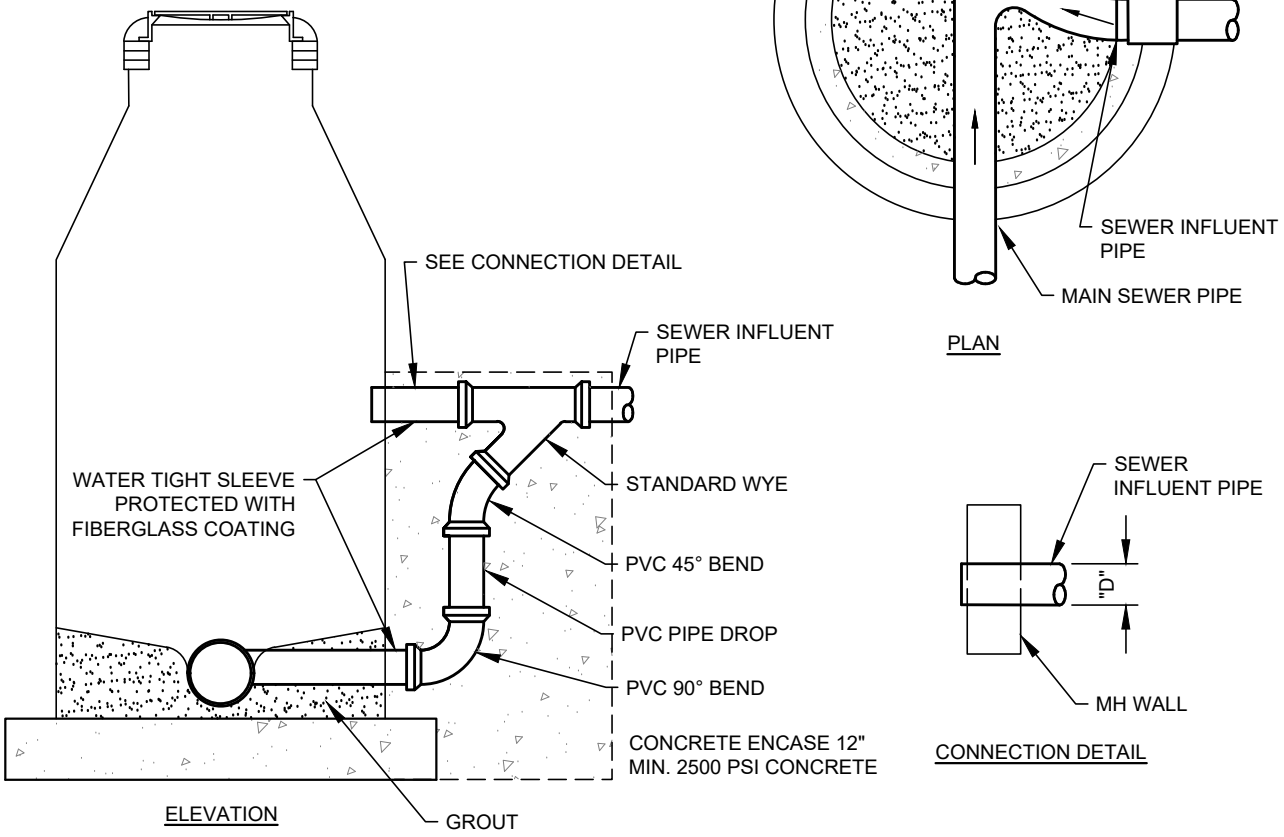




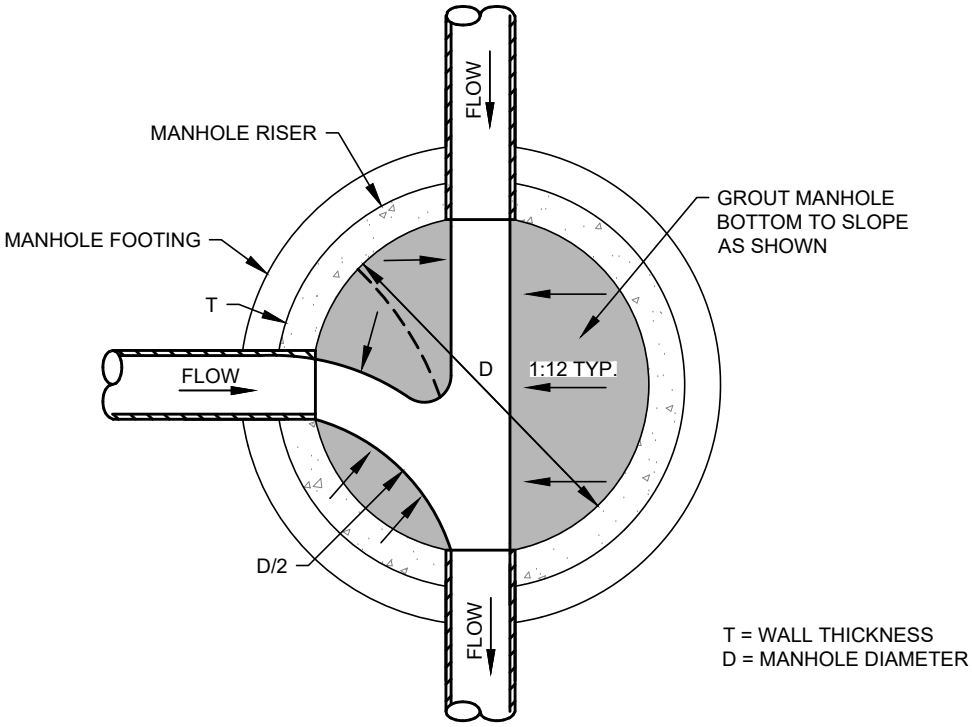
48" POLYMER MANHOLE SPECIFICATIONS				
WALL THICKNESS	AVAILABLE BASE HEIGHTS	AVAILABLE RISER HEIGHTS	WALL WEIGHT/FT	APPROX. WEIGHT 3' BASE
2"	3', 4'	1', 2', 3', 4', 5', 6'	300 LBS/FT	3,655 LBS

NOTES:
ADD 200 LBS TO EACH RISER FOR THE WEIGHT OF THE BELL.

POLYMER MANHOLE SPECIFICATIONS				
WALL THICKNESS	AVAILABLE BASE HEIGHTS	AVAILABLE RISER HEIGHTS	WALL WEIGHT/FT	BASE WEIGHT
2"	3', 4'	1', 2', 3', 4', 5', 6'	300 lb/ft	



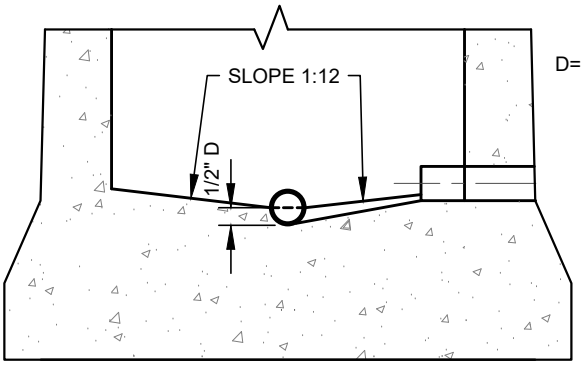
NOTES:
1. DROP PIPE SHALL BE ONE SIZE LARGER THAN SEWER INFLUENT PIPE.
2. ALL STANDARD MANHOLE DETAILS APPLY TO DROP MANHOLE CONSTRUCTION.
3. ALL DROP MANHOLES SHALL BE 60" DIAMETER.
4. NO DROP PIPING SHALL BE REQUIRED IF SEWER INFLUENT PIPE FLOWLINE IS 24" OR LESS ABOVE MAIN SEWER PIPE FLOWLINES OR IF MAIN SEWER PIPE BENCH IS HIGHER THAN SEWER INFLUENT FLOWLINE.
5. USE INSIDE DROP IF INFLUENT PIPE IS 8" IN DIAMETER OR SMALLER.



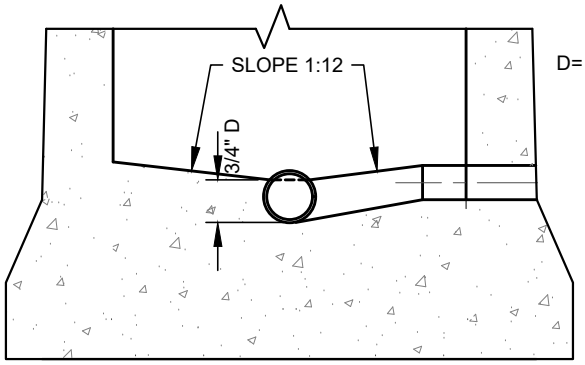
NOTE:

1. MANHOLE WITH PIPES OF DIFFERENT SIZED MUST HAVE TOPS OF THE PIPES AT THE SAME ELEVATION AND FLOW CHANNELS IN THE INVERT SLOPED ON AN EVEN SLOPE FROM PIPE TO PIPE PER TCEQ 217.55.

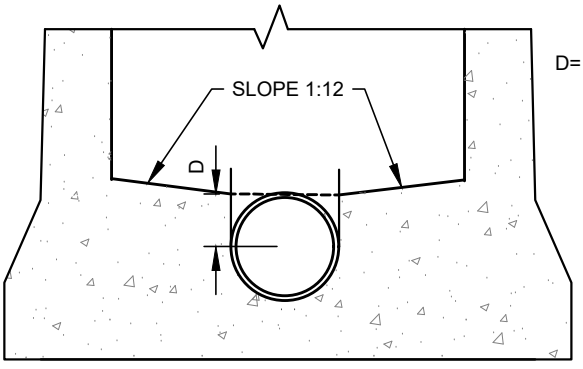
2. SET INFLOW MAIN ELEVATIONS AND GROUT BOTTOM IN MANNER TO PREVENT FREE FALL OF FLUID INTO MANHOLE FROM INFLOW MAINS.



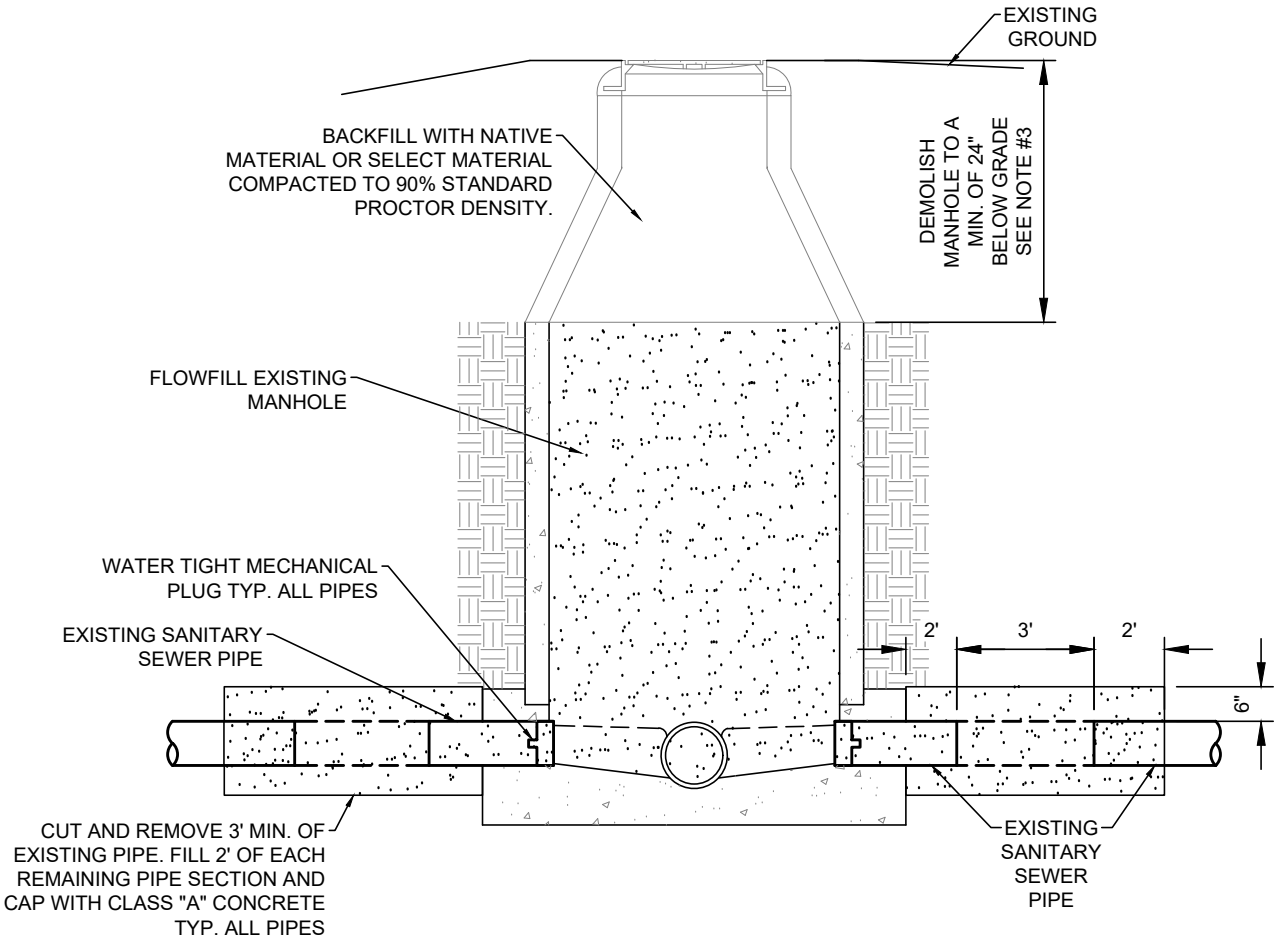
FOR PIPE SMALLER
THAN 15" IN DIAMETER



FOR PIPE FROM
15" TO 24" IN DIAMETER

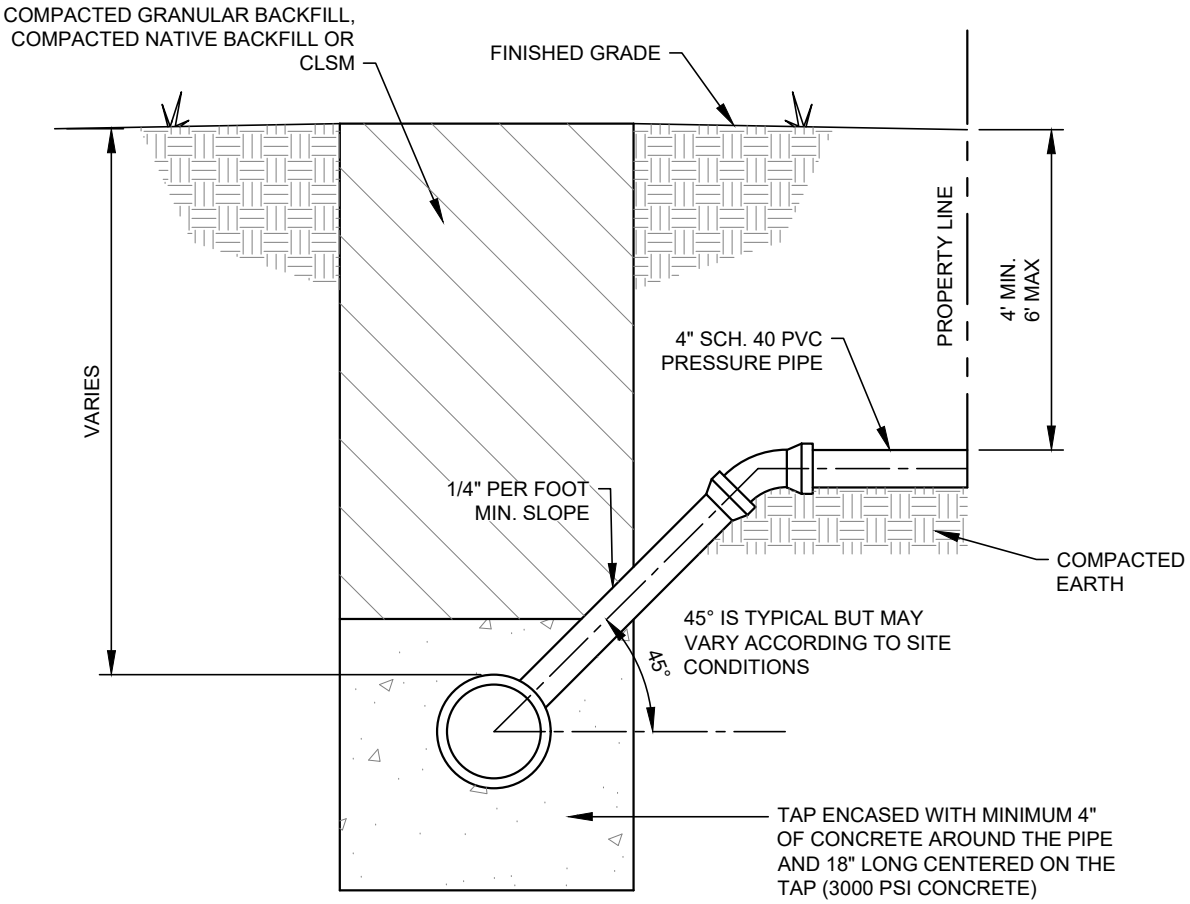


FOR PIPE LARGER
THAN 24" IN DIAMETER

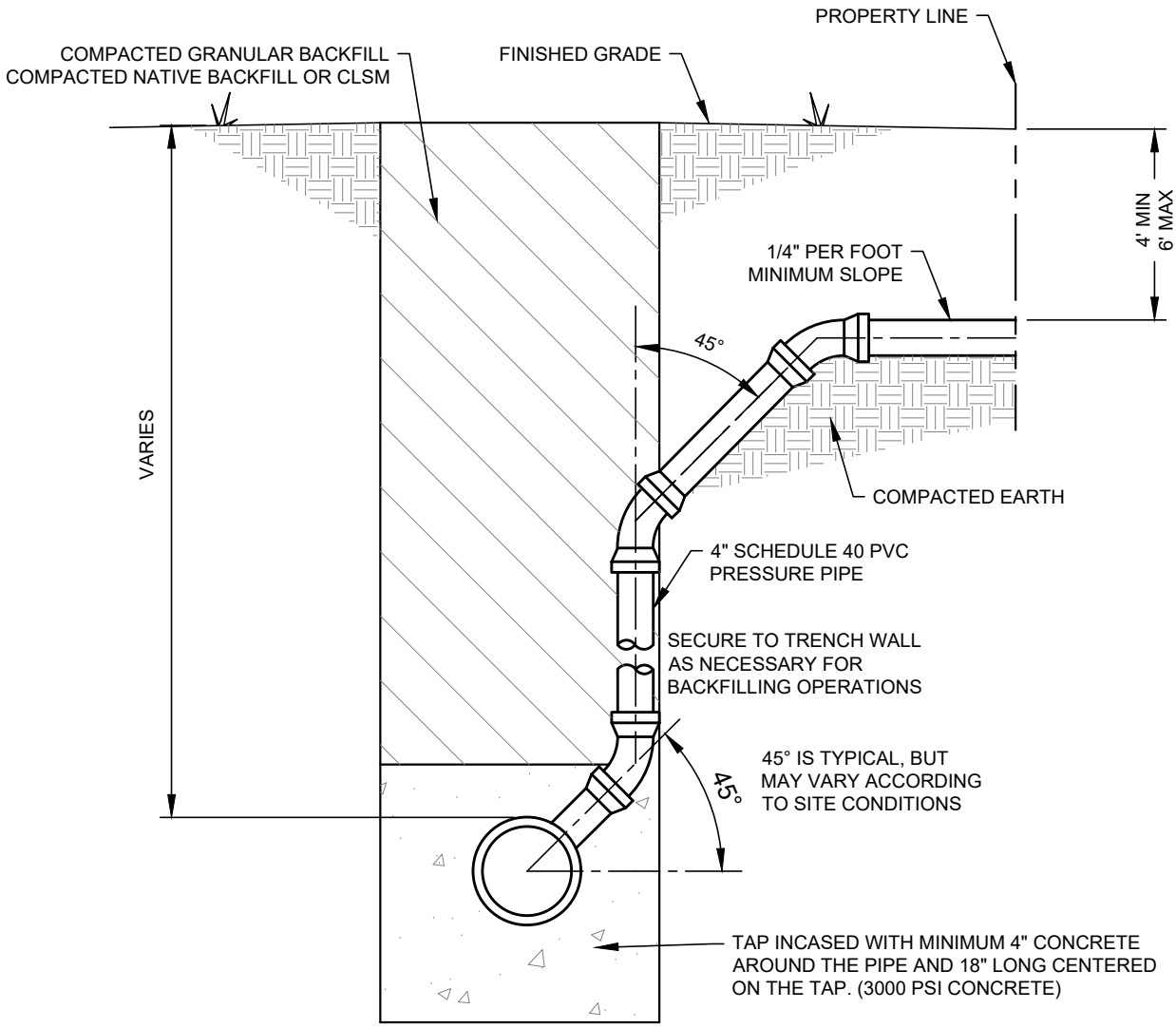


NOTES:

1. MATCH EXISTING SURFACE CONDITIONS WITH PAVEMENT REPAIRS AS NECESSARY, SEE APPLICABLE DETAILS FOR PAVEMENT CUT REPAIR.
2. MANHOLE SHALL HAVE THE INVERTS PLUGGED WITH A WATER TIGHT MECHANICAL PLUG PRIOR TO CONCRETE PLUGS
3. THE CONE SECTION SHALL BE REMOVED AND DISPOSED. THE RING AND COVER SHALL BE REMOVED AND RETURNED TO THE CITY WASTE WATER DEPARTMENT AND THE MANHOLE FILLED IN ACCORDANCE WITH THIS DETAIL.



NOTE:
1. TAPS 8" OR LARGER REQUIRE CONSTRUCTION OF MANHOLE
2. THIS DETAIL SHALL APPLY WHEN DEPTH OF SEWER MAIN IS APPROXIMATELY 10' OR LESS.



NOTES:
1. TAPS 8" OR LARGER REQUIRE CONSTRUCTION OF A MANHOLE.
2. THIS DETAIL SHALL APPLY WHEN DEPTH OF SEWER MAIN EXCEEDS APPROXIMATELY 10'.

PLAINVIEW, TX

explore the opportunities

TECHNICAL DESIGN & CONSTRUCTION STANDARDS

DRAINAGE

****Any deviation from the Design Standards must be submitted to the City for review and approval.****

1.0 PRINCIPLE OF DRAINAGE DESIGN

1.1 GENERAL

This Section contains the minimum storm drainage design criteria to be followed in the design of storm drainage facilities and demonstrates the design procedures to be used on drainage Projects in the City of Plainview.

The design factors, formulas, graphs, and procedures described are intended to serve as guidelines. Responsibility for the actual design remains with the Engineer. Deviation from the requirements of these standards shall be approved by the Director of Public Works or Community Development.

The Engineer shall prepare the Design Plans in accordance with the standard design checklist.

It is the responsibility of the Engineer to provide all necessary calculations and designs described herein. The Engineer shall provide the City the data, calculations, and designs necessary to demonstrate the design complies with these standards as well as state and federal rules, regulations, and requirements.

Plainview has riverine drainage to Running Water Draw and a few tributaries, but most of all the City and surrounding areas drain to playa lakes (low areas with no natural drainage). Drainage criteria for sites that drain to playa lakes differ from those that drain to draws. Some playa lakes can overflow. The overflow may run to another playa lake, creating a chain of playa lakes, or to the Draw.

Every site is unique in drainage characteristics and situation within its watershed. If the Engineer encounters a situation not addressed in these standards, an alternate solution that honors the spirit of these requirements can be presented for consideration.

1.2 AVAILABLE MODELS

FEMA has a Flood Insurance Study for Hale County that includes a hydrologic model of the Running Water Draw watershed from 1989 using NUDALLAS software. HEC-2 models of the draw and some playa chains in the City were developed as well. The City of Plainview does not have copies of these models.

The FIS dated February 18, 2011 and associated maps are based on the models from the 1989 study, converted to NAVD88 vertical datum.

The City of Plainview may have additional flood models developed for local Projects. Engineers are encouraged to request and use these as a starting point for any developments in the same sub watersheds.

1.3 STANDARDS FOR DRAINAGE DESIGN ACCEPTANCE

The City requires fully developed watershed conditions to be assumed for all areas within the City limits and within one mile outside City limits. FEMA's flows shall not be used as the flows are generally based upon existing watershed conditions. Running Water Draw watershed is extremely large, controlled by several dams, and is not expected to fully develop. FEMA flows are appropriate for this draw.

Principles for development in an area that drains to a playa lake differ depending on whether the playa will overflow in a 1% annual chance event, plus other details related to potential flood damage. Playa drainage criteria are stringent because the duration of flooding in a playa can extend to weeks. The table below shows variations that lead to differing playa requirements. Choose the situation that best applies to the site.

Table 1.1 Playa Computation Requirements

Playa Overflows	**Situation**	**Requirements**	**Drainage Report Must Prove:**
Yes	Overflow to another playa	No increase in *overflow volume or peak flow rate* is allowed.	Excavation is provided to offset any fill and also any increased runoff volume. Overflow location is shaped to release less or equal than pre-developed peak.
No	Playa has structures or roadways below the computed water surface	No increase in *water surface elevation* is allowed.	Excavation is provided to offset any fill and also any increased runoff volume.
No	Playa has no structures or roadways below the computed water surface, and a single landowner	Landowner can reshape and increase water surface elevation if desired. No *overflow* is allowed. No roadways or structures can be	Storage equal to or greater than volume of runoff into playa is provided below the overflow elevation and below all existing structures, roads or other critical
No	Playa has no structures or roadways below the computed water surface, and more than one landowner	All landowners can agree to a plan described for single landowner.	Same as previous, plus landowners must provide signed letter of agreement to drainage and grading plans to City.

Playa capacities are to be computed for the 1% annual chance rainfall event. Because playas may hold runoff for weeks after a rainfall, all computations will utilize this initial condition assumption: A volume of water equivalent to 1.4 inches of runoff from the playa subbasin shall be placed into the dry playa. The resulting water surface elevation shall be used as the initial playa condition for the hydrologic analysis. If the playa is drained to an established elevation by a gravity storm drain, or other reliable means, the assumed initial condition is: the outflow invert elevation as the initial playa water surface elevation, with City approval.

Principles for development in watershed that drains to a draw, channel, or other feature with positive drainage differ from those in playas. Downstream assessments are often required in other jurisdictions. Generally, small runoff increases into a large watershed cause no harm. Because Running Water Draw has a large watershed relative to the areas in Plainview that drain into it, no downstream assessment or detention is needed for projects adjacent to the draw. Other sites that do not drain to playas will need consideration of downstream capacity. Runoff and detention calculations must be provided for the 1% and 10% annual chance events.

Table 1.2 Requirements for Sites with Positive Drainage (non-playa)

Runoff to feature:	Size of Development	Detention required	Drainage Report Must Prove:
Directly to Running Water Draw	Any	No, (but see 1.3.E)	Runoff enters the draw without flooding anything on the way.
Channel, street or tributary	Greater than 5 acres, or part of a larger plan of development greater than 5 acres.	Yes	Detention sized to reduce project outflow to existing peak flow.
Channel, street or tributary	Less than 5 acres	No, (but see 1.3.E)	None required.

Flow capacity downstream of the development Site for streets, channels or tributaries MAY be a required consideration for Project approval. The City may require the developer to calculate the capacity the route runoff will take after leaving the Site, whether in an overflow out of a playa or in a street, channel or tributary. If the existing capacity is known or determined to be inadequate, the City may require the developer to construct an alternate route or to increase capacity of the existing conveyance, or to provide detention even if not required in Table 1.2.

The drainage report for downstream capacity analysis, if required, should map the route of flow from the Site to Running Water Draw, and compute capacity of streets, ditches, culverts, etc. encountered along the route. Any known pinch or flooding points should be noted. The peak flow rate for the 1% and 10% annual events should be computed at these locations, with and without the proposed Project.

Upstream inflows must be considered in all drainage reports. The watershed map must show any areas that currently drain into the Site. Runoff from these areas must be conveyed through or around the Project. If the upstream property is undeveloped, the Engineer shall assume fully developed conditions without detention for the off-site area in and within one mile of the City, unless it is shown that the downstream facilities cannot convey the fully developed peak flows. If downstream capacity is inadequate, the drainage report should clearly show that upstream areas have been treated as undeveloped, and detention will be required for them when they develop.

The type of analysis required depends on whether peak runoff flow or runoff volume is needed to prove the development meets the requirements in 1.3. Use of rational method is permitted but not encouraged. The table below lists conditions that may apply and the methods needed to support the required drainage plan elements. All analyses will be performed for pre-project and post-project conditions.

Table 1.3 Computations Needed for Required Analyses

Size of watershed	**Drains to**	**Need to Compute**	**Acceptable methods**
Any	Playa with no overflow	Volume of runoff	NRCS curve number volume equation or hydrograph method
Any	Playa with overflow	Volume of runoff, peak overflow	Hydrograph method with routing through playa
< 200 Acres	Running Water Draw	Peak flow from site	Rational method, NRCS peak flow equation, or hydrograph
>200 Acres	Running Water Draw	Peak flow from site	NRCS equation, or hydrograph
< 200 Acres	Channel, street or tributary	Volume of runoff, peak runoff, detention size and outlet structure	Modified rational method, hydrograph method
>200 Acres	Channel, street or tributary	Volume of runoff, peak runoff, detention size and outlet structure	Hydrograph method with routing through detention

2.0 DETERMINING RUNOFF DISCHARGE AND VOLUME

2.1 RAINFALL

The rainfall intensity (I) and precipitation depth values shall be based on the National Weather Service Partial Duration Rainfall Frequency Data presented in NOAA Atlas 14 Precipitaion-Frequency Atlas of the United States, Volume 11: Texas. The intensity or depth for a particular duration can be obtained from the tables below. If the needed duration differs from the value in the tables, the Engineer shall interpolate between adjacent values.

Table 2.1 Point Precipitation Intensity by Duration for Average Return Interval (years)

	Intensity (inches per hour) for Return Interval (years)							
Duration	**1**	**2**	**5**	**10**	**25**	**50**	**100**	**500**
5-min	3.82	4.79	6.26	7.58	9.50	11.10	12.80	17.30
10-min	3.09	3.87	5.07	6.13	7.68	8.93	10.30	14.00
15-min	2.51	3.15	4.13	5.00	6.27	7.30	8.43	11.40
30-min	1.69	2.13	2.79	3.38	4.24	4.95	5.71	7.73
60-min	1.07	1.34	1.76	2.13	2.66	3.10	3.58	4.84
2-hr	0.641	0.798	1.040	1.260	1.560	1.810	2.080	2.810
3-hr	0.468	0.580	0.756	0.909	1.130	1.300	1.490	2.020
6-hr	0.271	0.334	0.435	0.521	0.643	0.739	0.843	1.140
12-hr	0.153	0.189	0.245	0.294	0.363	0.418	0.478	0.642
24-hr	0.087	0.108	0.140	0.167	0.207	0.239	0.272	0.362
2-day	0.051	0.062	0.081	0.096	0.118	0.135	0.153	0.201
3-day	0.038	0.046	0.059	0.070	0.085	0.097	0.110	0.142
4-day	0.030	0.037	0.047	0.056	0.068	0.077	0.086	0.111
7-day	0.020	0.024	0.030	0.036	0.043	0.048	0.054	0.069
10-day	0.016	0.018	0.023	0.027	0.033	0.036	0.040	0.051

Table 2.2 Point Precipitation Depths by Duration for Average Return Interval (years)

	Depth (inches) for Return Interval (years)							
Duration	**1**	**2**	**5**	**10**	**25**	**50**	**100**	**500**
5-min	0.318	0.399	0.522	0.632	0.792	0.922	1.060	1.440
10-min	0.515	0.645	0.845	1.02	1.28	1.49	1.72	2.33
15-min	0.627	0.788	1.03	1.25	1.57	1.83	2.11	2.86
30-min	0.85	1.06	1.39	1.69	2.12	2.47	2.86	3.86
60-min	1.07	1.34	1.76	2.13	2.66	3.10	3.58	4.84
2-hr	1.28	1.60	2.08	2.51	3.13	3.62	4.16	5.63
3-hr	1.40	1.74	2.27	2.73	3.38	3.90	4.47	6.05
6-hr	1.62	2.00	2.60	3.12	3.85	4.42	5.05	6.83
12-hr	1.84	2.27	2.95	3.54	4.38	5.04	5.75	7.73
24-hr	2.09	2.58	3.35	4.02	4.97	5.72	6.53	8.69
2-day	2.45	3.00	3.88	4.63	5.68	6.50	7.36	9.64
3-day	2.71	3.29	4.25	5.04	6.15	7.00	7.89	10.20
4-day	2.90	3.52	4.52	5.35	6.49	7.36	8.26	10.70
7-day	3.36	4.02	5.11	6.01	7.22	8.11	9.03	11.50
10-day	3.74	4.43	5.60	6.55	7.82	8.74	9.68	12.20

2.2 RUNOFF VOLUME CALCULATION

A NRCS curve number equation can be used to compute runoff volume in calculations for non-overflow playas, where only a runoff volume is needed. NRCS methodology is found in the National Engineering Handbook, Part 630 Hydrology, Chapter 10, among other references. The curve number runoff equation is:

Q = (P-Ia)^2/(P-Ia)+S

where: Q = depth of runoff, in inches

P = depth of rainfall, in inches

Ia = initial abstraction, in inches (Ia is usually assumed to be Ia = 0.2S)

S = maximum potential retention, in inches

S is related to the curve number CN as follows: S = 1000/CN – 10

2.3 RUNOFF CURVE NUMBERS

Selection of a curve number for a drainage area is based on the hydrologic soil group, the percentage of impervious cover, the condition of vegetative cover and the antecedent moisture condition. Curve numbers can be related to land use as follows:

Table 2.3 Curve Numbers and Assumed Imperviousness by Land Use

Zoning	Description	Assumed % Impervious Cover	AMC II Curve Number for Soil Group			
			A	B	C	D
Use the following NRCS TR-55 values for computing weighted average curve numbers:						
	Open Space Lawns and Parks, fair (50-75% cover)		49	69	79	84
	Open Space Lawns and Parks, good (75%+ cover)		39	61	74	80
	Pasture, grassland or range, Fair Condition		49	69	79	84
	Row Crops, Straight Row, Good Condition		74	83	88	90
	Paved or Roofed Areas		98	98	98	98
The following are pre-computed typical values for the use or zoning code:						
	Usually Dry Playa Bottoms	0%	39	61	74	80
	Usually Wet Playa Bottoms	100%	98	98	98	98
	Parks	7%	52	71	80	85
R/A	Rural/Agricultural	0%	74	83	88	90
SR	Suburban Residential	55%	76	85	89	92
MR	Mixed Residential	65%	81	88	91	93
MF	Multifamily Residential	70%	83	89	92	94
MH	Manufactured Housing	55%	76	85	89	92
DT	Downtown	95%	96	97	97	97
NC	Neighborhood Commercial	95%	96	97	97	97
GC	General Commercial	85%	91	94	95	96
LI	Light Industrial	72%	84	90	93	94
HI	Heavy Industrial	72%	84	90	93	94
CU	College & University (also schools)		Compute from equation below			
PD	Planned Development		Compute from equation below			
MU	Mixed Use		Compute from equation below			

Equation used to compute weighted averages:

CN = (Impervious % x CN for Paved, Roofed)+(Pervious % x CN for Open Space, Fair)

Round CN values to even numbers

2.4 TIME OF CONCENTRATION

Time of Concentration (Tc) is required for rational method as well as for hydrograph methods. NRCS methodology shall be used to determine the time of concentration (Tc). This method separates the flow through the drainage area into sheet flow, shallow concentrated flow, and open channel flow. The Tc is the sum of travel times for sheet flow, shallow flow, and open channel flow. The time of concentration flow path and sheet flow path shall be drawn on the submitted drainage area map.

The maximum allowable length for sheet flow is 300' for undeveloped drainage areas and 100' for developed areas. When selecting sheet flow, consider the cover to a height of about 0.1'. This is the only part of the plant cover that will obstruct sheet flow. The Tt in minutes for sheet flow is determined using the following equation:

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} S^{0.4}}$$

T_t = travel time (hr)
n = Manning's roughness coefficient (Table 4.2)
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall, 3.6in
S = slope of hydraulic grade line (land slope, ft/ft)

TABLE 2.4: Manning's Roughness Coefficients

Surface Description	n
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils	
Residue cover less than 20%	0.06
Residue cover greater than 20%	0.17
Grass:	
Short Prairie Grass	0.15
Dense grasses	0.24
Range (natural)	0.13
Woods:	
Light underbrush	0.40
Dense underbrush	0.80

Shallow concentrated flow begins where sheet flow ends. A projected slope should be established along the flow line for the shallow concentrated flow length. The Tt in minutes for shallow concentrated flow is determined by the following equation.

$$T_t = \frac{L}{3600V}$$

T_t = travel time (hr)
L = flow length (ft)
V = velocity (fps)
Unpaved = 16.1345*(S)^0.5
Paved = 20.3282*(S)^0.5

Open Channel Flow is where the runoff is located within a defined channel or in some cases, closed storm systems. The Tt for open channel flow is determined using the following equation:

$$T_t = \frac{L}{3600V}$$

$$V = \frac{1.49 r^{\frac{2}{3}} S^{\frac{1}{2}}}{n}$$

T_t	=	travel time (hr)
V	=	average velocity (ft/s)
r	=	hydraulic radius (ft) A = cross sectional flow (ft^2) P = wetted perimeter (ft)
s	=	slope of the hydraulic grade line (channel slope, ft/ft)
n	=	Manning's roughness coefficient

2.5 HYDROGRAPH ANALYSES

Overflow playas and detention basins must be studied using a hydrograph method with a reservoir routing through the playa or basin. A hydrograph analysis is required for larger (> 200 acres) watersheds that do not include playas. The City may require the use of a hydrograph analysis for smaller but complex drainage plans where peak flow timing might be a factor in the analysis, as well.

NRCS curve number methodology is required for hydrograph analyses. The hydrograph computations can be completed using HEC-HMS or other software capable of implementing the NRCS unit hydrograph methodology and using a frequency storm rainfall distribution. ICPR or FLO-2d software can be used, and is especially helpful where playas are drained or connected with storm drain systems. Other hydrologic models may be used upon approval from the City.

The following criteria should be used:

- Use a 24-hour storm duration and develop the storm hyetograph using the frequency storm process. This is described in the TxDOT Hydraulic Design Manual, section 4.13. Note: The older SCS Type II rainfall distribution is no longer valid after NOAA Atlas 14 was published in 2018. An appropriate rainfall distribution for this region may in future be developed and adopted by TxDOT. It will be acceptable as an alternate hyetograph method once adopted.
- Rainfall values using depths are provided in Table 2.2.
- The NRCS Curve Number (CN) method shall be used to determine the loss rate. CN values shall be taken from table 2.3 above, TR-55, and National Engineering Handbook chapter 9.
- Tc values shall be calculated as shown in Section 2.4. To estimate the peak discharge and establish a runoff hydrograph using the NRCS Method, the concept of a dimensionless unit hydrograph is applied. A peaking factor of 484 will be used for all analyses. The lag time for each watershed is calculated from the time of concentration (Tc), using the following equation:

$$T_{LAG} = 0.6 \times T_c$$

- Muskingum Cunge method shall be used for routing of the Unit Hydrograph through the drainage system. The City may request for other routing methods, such as the Modified Puls Routing Method, to be used in the design if the method is more characteristic of the hydrologic and hydraulic conditions of the watershed.
- Use an Areal Reduction Factor for watershed areas greater that 10 square miles.

2.6 RATIONAL METHOD

Rational method is acceptable for watersheds less than 200 acres. Modified Rational Method is not acceptable for detention basin design. The table below indicates when rational method can be used.

Table 2.5 Rational Method Usage

Is rational method acceptable?		
Peak flow for design of streets, drainage flumes, pipes on a site or subdivision	Yes	
Peak flow for design of offsite conveyance such as channel, culvert or storm drain, where drainage area < 200 ac.	Yes	
Sizing of detention basin and detention outlet structure		No
Analysis of playa volume		No

The Rational Formula for computing peak runoff rates is as follows:

Q = C*I*A

Q = runoff rate (cfs)

C = runoff coefficient (dimensionless)

I = rainfall intensity (in/hr)

A = drainage area (ac)

Runoff Coefficient (C)

- Runoff coefficients shall be based on the future land use plan, which is included in the City's Comprehensive Plan.
- Table 2.6 provides guidelines for runoff coefficients for typical land use within the city; however, a weighted runoff coefficient may be used for the design if it is more representative of the site conditions.

TABLE 2.6: Runoff Coefficients and Inlet Time Guidelines

Land Use	Runoff Coefficient "C"	Inlet Time (Minutes)
Single Family Residential	0.55	15
Two Family, Patio Home, Town Home	0.70	10
Multiple Family	0.80	10
Non-Residential Uses	0.90	10
Park Area	0.35	20
School	0.70	15
Church	0.80	10
Undeveloped	0.30	20
Hospital	0.90	10
Streets	0.90	10

3.0 STANDARDS FOR DRAINAGE INFRASTRUCTURE

3.1 STREET CAPACITY

All street capacities shall be hydraulically designed using Manning's equation:

$$Q = \left(\frac{1.486}{n}\right) A \left(R^{2/3}\right) \left(S^{1/2}\right)$$

Q	=	Gutter flow (cfs)
n	=	Manning's roughness coefficient, (0.0175 for concrete street)
A	=	Cross section flow area (ft^2)
R	=	Hydraulic radius of the conduit in feet, which is the area of the flow divided by the wetted perimeter (R=A/P)
P	=	Wetted perimeter (ft)
S	=	Slope of the hydraulic gradient (ft/ft)

The City allows a maximum street flow depth of 12 inches measured from the gutter for the 100-year event.

For parabolic crown streets, capacities shall be hydraulically designed using Manning's equation. The geometry may be approximated using street elevations at the center and quarter points of the pavement.

3.2 ALLEY CAPACITY

All alley capacities shall be hydraulically designed using Manning's equation.

The 100-year storm event capacity for alleys shall be computed as 8.5 inches depth measured at the center.

3.3 VALLEY GUTTERS

Valley gutters to convey stormwater across a street intersection should conform to the detail in this section.

3.4 STORM DRAIN SYSTEMS

Storm Drain Design

- Curb inlets shall be placed to ensure that the 100-year flow in a street does not exceed the depth requirements for streets. If the flow in the gutter is excessive, the storm sewer shall be extended to a point where the gutter flow can be effectively intercepted by curb inlets.
- Design storm drains using standard engineering practice, using a spreadsheet method or an appropriate computer program. Comptations or program printout must be provided to the City.
- All enclosed systems shall be hydraulically designed, and all required calculations shall be provided on the construction plans. The hydraulic gradient and full-flow velocity shall be calculated using the design flow, appropriate pipe size, and Manning's equation.

Storm Drain Materials

- Publicly maintained storm drains are required to be reinforced concrete.
- Any structure under a fire lane must be designed to withstand applicable loadings, including loading of a fire apparatus.

Curb Inlet Placement

- Placing several curb inlets at a single location is only permitted in areas with steep grades (4% or greater) to prevent flooding and avoid exceeding street capacity in flatter reaches downstream.
- No more than 20’ of inlet shall be constructed at one location along one curb line.
- Curb inlets shall be placed upstream from the right angle turns and street intersections.
- An emergency overflow path shall be provided on the plans for sag locations. An emergency overflow path is a path the stormwater will take if the drainage facility becomes clogged or ceases to function as designed. The emergency overflow path must be located within the public right-of-way or within a drainage easement.
- Curb inlet depth shall not be less than 4.5’ from top of curb for all public improvements.
- Inlets are required at the low point of superelevation to prevent flow across the roadway.
- Multiple sag inlets shall be located no closer than 300’.
- Alignments of proposed storm drain systems shall use existing easements and rights-of-way. If located within an easement, the storm sewer shall be centered within the easement. If located within rights-of-way, the centerline of the storm sewer shall be located under paving 7’ from the back of the curb. No part of the storm sewer is to be designed within the lime-treated subgrade of a proposed pavement.

Manhole Placement

- The following is a list of guidelines governing the placement of storm sewer manholes to ensure adequate accessibility of storm drainage system:
- Storm sewer lines shall have points of access no more than 500’ apart.
- A manhole shall be required where two or more pipes connect into a main at the same joint.
- A manhole shall be located where pipe sizes or slopes change.

Hydraulic Design

- The City requires that all hydraulic gradient calculations begin at the outfall of the system. The starting HGL at an outfall into a creek or channel shall be the 100-year fully developed water surface unless an approved flood hydrograph is available to provide a coincident flow elevation for the system's peak.
- The hydraulic grade line (HGL) must be calculated for all storm drain mains and laterals using appropriate head loss equations. In all cases, the storm drain HGL must remain at least 1’ below the top of the curb at each inlet.
- A minimum full flow velocity of 2.5 fps and a minimum slope of 0.2% shall be maintained in the pipe.
- Only standard sizes shall be used. The minimum allowable pipe size is 18”. Pipe sizes shall not be decreased in the downstream direction unless otherwise approved by the City.
- Laterals shall intersect the storm drain at standard angles.
- In situations where only the lower portion of an enclosed storm sewer system is being built, stub-outs for future connections must be included.
- The required storm drain capacity to meet existing and future needs, if applicable, shall be provided.
- The Engineer shall demonstrate the drainage from the site is conveyed to an adequate outfall. An adequate outfall is a structure or location that is adequately designed to not cause adverse flooding conditions, erosion, or any other adverse impacts. An adequate outfall shall also have the capacity to convey the increased runoff.

3.5 DETENTION/RETENTION FACILITY DESIGN

Detention facilities shall be designed based upon the following minimum criteria:

- Detention shall be provided for the 1% and 10% design storms. Post-project peak flows for these frequencies will be reduced to pre-project peak flows.
- Pilot channels may be required for detention facilities for maintenance purposes if the bottom slope is less than 0.5%. The Engineer shall provide a maintenance plan for the detention facility as part of the design. The maintenance plan shall indicate the ingress and egress locations to enter and maintain the pond, maintenance roles and responsibilities, contact information for the party responsible for the maintenance, and a maintenance schedule.
- Criteria established by the State of Texas for dam safety (TAC Title 30, Part 1, Chapter 299) and impoundment of state waters (Texas Water Code Chapter 11) shall apply where required by the state, and where, in the Engineer's judgment, the potential hazard requires these more stringent criteria.

All detention/retention facilities shall demonstrate and provide an adequate outfall and/or spillway in accordance with City Requirements. Retention facilities are defined as basins with no gravity outfall.

Pond and Spillway Geometry

- Detention basins constructed without a berm shall have a minimum of 1' of freeboard above the 100-year water surface elevation.
- Where embankments are used to increase detention storage, the effective crest of the embankment will be a minimum of 2' above the 100-year water surface elevation.
- The steepest side slope permitted for a vegetated embankment is 6.5:1.
- Detention facilities shall be designed with an emergency spillway in case the primary outfall ceases to function as designed. The spillway shall be designed to pass a minimum of the 100- year flood event. Retention facilities shall be designed with a spillway following the same criteria. Spillways for retention facilities shall be constructed in with concrete to prevent erosion.
- The detention facility bottom must be designed to provide positive drainage with a minimum bottom slope of 0.5%.
- Access shall be provided to the banks and bottom of a detention facility for maintenance.
  - The Engineer shall provide an operations and maintenance plan that will detail access. Access may be from a street, alley, or drainage easement. If in the drainage easement, the minimum width of the access strip will be fifteen feet.
- It is the responsibility of the Engineer to consider pedestrian and vehicular safety in the design of detention facilities. Perimeter rails or fencing may be required.
- Underground detention facilities shall be designed with reinforced concrete if located under fire lane or within city right of way.

Any detention facility that is classified as a dam by the Texas Commission on Environmental Quality (TCEQ) must comply with all TCEQ requirements.

3.6 OPEN CHANNEL DESIGN

Excavated open channels may be used to convey storm waters. Open channels shall be designed to convey the full 100-year design discharge. The allowable excavated channel cross-section is shown in the detail in this section.

Unlined unvegetated excavated channels are not allowed. Construction of excavated channels will not be considered complete until the channel banks are stabilized. Vegetation selected for channel cover can be selected from the local regional grass mix from TxDOT current Specifications, or a turf grass in areas that will be irrigated and landscaped.

Supercritical flow shall not be allowed in channels except at drop structures and other energy dissipators. The maximum design velocity for a grass lined channel is 6 feet per second. Channel armoring for erosion control shall be provided where velocities exceed the maximum.

Access to the channel is required along at least one side for the full length of the channel. This access can be a street, alley or drainage easement. Minimum width of the access easement (in addition to the channel easement) is fifteen feet. If the channel cannot be maintained from the top of the bank, a maintenance access ramp shall be provided and included within the drainage easement.

Minimum channel bottom widths are recommended to be equal to twice the depth of the channel. Any permanent open channel shall have a minimum bottom width of 5'. The center line curvature shall have a minimum radius of three times the top width of the channel.

All open channels require a minimum freeboard of 1' freeboard.

The minimum slope for an excavated improved channel is 0.5% unless a pilot channel is constructed, or otherwise approved by the City.

3.7 HYDRAULIC DESIGN OF CULVERTS

All taps shall be done by the City unless approval is granted by the Public Works Director or Designee.

All culverts, headwalls, wing walls, and aprons shall be designed in conformance with the City (or TXDOT) Standard Details. The Engineer is responsible for selecting the applicable detail.

Culvert calculations shall be provided to the City for review. Calculations may include but are not limited to, headwall, tailwater, and flowline elevations, lowest adjacent grade and structure elevations, inlet and outlet control calculations and velocity calculations.

Culverts should always be aligned to follow the natural or constructed stream channel. The Engineer shall provide sufficient information to analyze the upstream and downstream impacts of the culvert and illustrate the interaction of the channel and culvert alignment.

The Engineer shall be responsible for the headwall and wing wall designs. Headwalls and end walls refer to the entrances and exits of structures, respectively, and are usually formed of cast-in-place concrete and located at either end of the drainage system. Wing walls are vertical walls, which project out from the sides of a headwall or end wall.

Concrete culvert headwalls and wing walls shall use form-liner surface finish unless otherwise approved,

Hydraulic calculations will be performed using standard engineering best practices. A program such as the Federal Highway Administration HY-8 or other similar computational method is acceptable.

3.8 ENERGY DISSIPATORS

The Engineer shall be responsible for all energy dissipation designs and shall utilize standard engineering best practices.

All energy dissipation designs shall include supporting calculations showing the design is adequate. The City may require the Engineer to provide a hydraulic model as supporting documentation.

All energy dissipators should be designed to facilitate future maintenance. The design of outlet structures in or near parks or residential areas shall give special consideration to appearance.

Flumes to convey surface runoff into playas and channels are required. The flume must extend to the bottom of the channel or playa. A detail for these flumes is included in this section.

4.0 TESTING AND DISINFECTION – WATER MAIN

4.1 FINISHED FLOOR AND LOT GRADING REQUIREMENTS

Finished floor elevations are shown in the table below. These apply to residences and commercial buildings on lots of typical size. Very large lots may have buildings situated a long distance from the streets and alleys and have interior graded swales that direct flow around the building. In these instances, with approval of the City, a lower finished floor can be selected. In all cases the building must be one foot above the edge of the highest drainage feature nearest to the building. Where buildings are affected by more than one of the criteria in Table 4.1 below, use the highest.

Table 4.1 Minimum Finished Floor Requirements

Building Next To	**Minimum Finished Floor**
Playa with BFE on FIS map	BFE + 1’
Playa with no BFE on FIS map	Playa overflow elevation + 1’ (or computed 100-yr water surface +1’ if provided by Engineer)
Draw with BFE on FIS map	BFE+ 1’
Channel	Computed 100-yr water surface + 2’
Street	Gutter elevation + 18” (use highest curb adjacent to structure)
Alley	Edge of alley + 1’

Lot to lot surface drainage is prohibited. A lot grading detail is provided within for reference when performing lot grading designs. Refer to the International Residential Building Code (IRC) currently adopted by the City for additional requirements.

4.2 FLOODPLAIN ALTERATIONS

Playa alterations are typically mapped as special flood hazard areas. Compliance with Section 1.3 will exceed FEMA’s regulations for protection of the floodplain areas.

No grading of playas shall be made without a grading permit issued after review of a drainage plan showing the Work will comply with Section 1.3.

Alterations of riverine floodplains, including playa overflow routes:

- Alterations shall be in compliance with FEMA guidelines. Where alterations of a mapped floodway are proposed, the City will require approval by FEMA of a Conditional Letter of Map Revision prior to construction of the improvements.
- Any alteration of floodplain areas shall not cause any additional expense in any current or projected public improvements, including maintenance.
- A permit may be issued for a structure in the flooplain of streams that have a mapped floodway without submitting a hydraulic floodplain analysis.

- Riverine floodplains with no floodway mapped are subject to a higher standard for permitting fill, structures, or other alterations. Prior to issuing a permit that includes alteration of a riverine floodplain, a flood study shall be submitted that include flows generated for existing conditions and fully-developed conditions for the 10 and 100- year storm events.

In general, the information needed for the application shall be performing by running a backwater model, such as HEC-2 or HEC-RAS, and a flood routing model, such as TR-20, HEC-1, or HEC-HMS. The backwater information shall be used to determine that upstream water surface elevations and erosive velocities have not increased. Flood routing information shall be used to insure that the cumulative effects of the reduction in floodplain storage of floodwater will not cause downstream increases in water surface elevations and erosive velocities.

The Engineer is responsible for providing documentation of the relevant USACE approved permits prior to beginning modification to the floodplain, or for providing a signed and sealed statement detailing why such permits are unnecessary.

All floodplain models used to modify the official Flood Insurance Rate Maps will be provided to the City.

Verification of Floodplain Alterations:

- Prior to final acceptance by the City, a certified statement shall be prepared by a Licensed Professional Engineer showing that all lot elevations, as developed within the subject project, meet the required minimum finished floor elevations shown on the construction plans.

4.3 DRAINAGE EASEMENTS

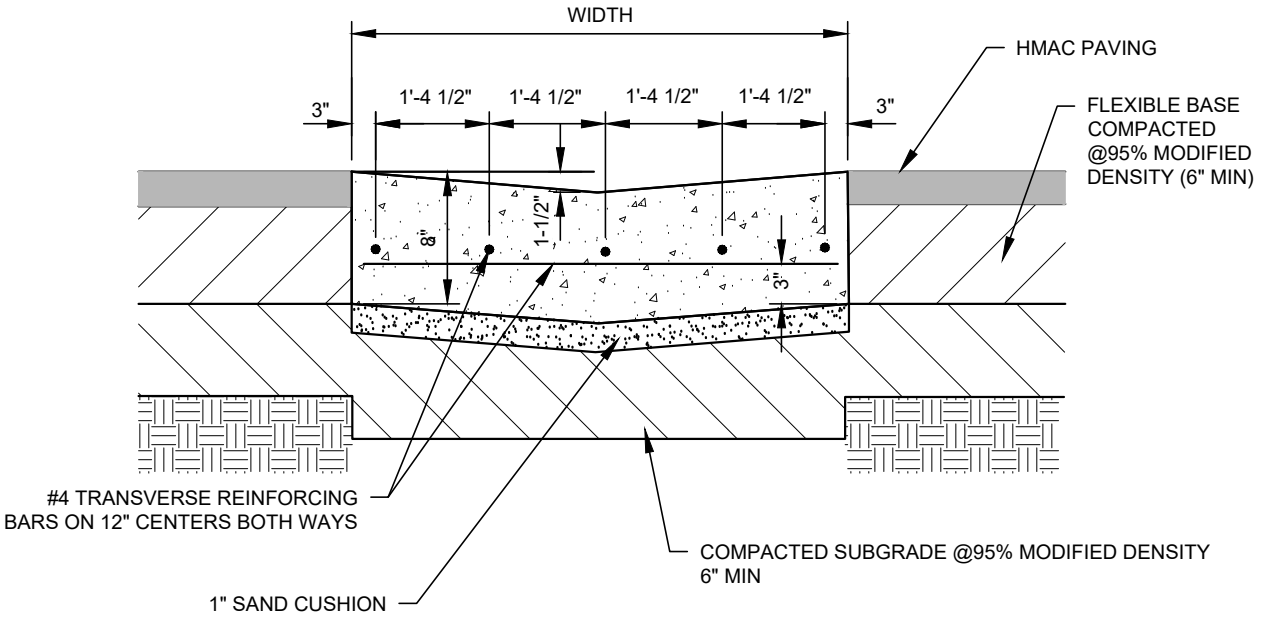
The following minimum width exclusive drainage easements are required when facilities are not located within public rights-of-way or easements:

- Storm sewers are to be located within the center of a 15’ drainage easement or 1.5 times the depth plus the width of the structure rounded up to the nearest 5’, whichever is greater.
- Overflow flumes are to be located with the edge being a minimum of 1’ off the property line within a 10’ drainage easement.
- Channel easements are described in Section 3.6.

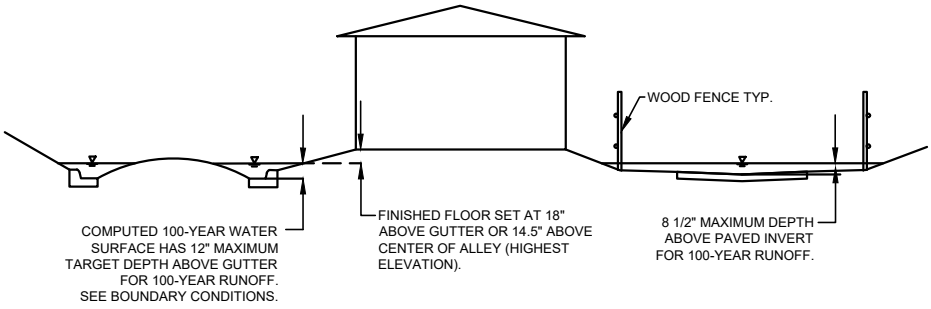
Storm drain lines are considered public if they cross property lines and collect runoff from adjacent properties. Drainage easements shall be dedicated to the City for public maintenance when a drainage system crosses a property line. For single- family residential developments, storm drain lines shall not cross residential lots unless approved.

Drainage Easements shall be dedicated for all floodplains.

Drainage Easements shall be dedicated for all detention and retention facilities. These easements will include maintenance access.

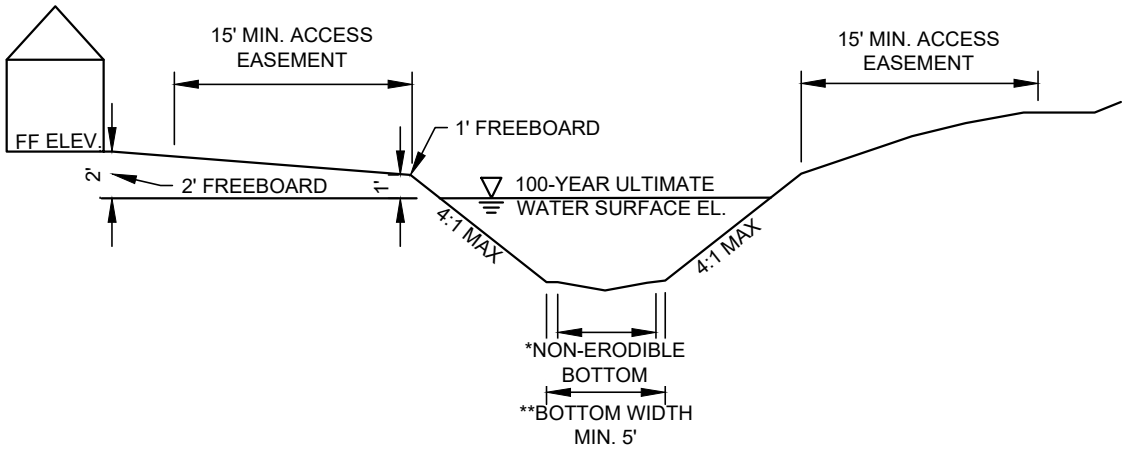


VALLEY GUTTER WIDTH	
STREET CLASSIFICATION	WIDTH
RESIDENTIAL	6'
COLLECTOR	10'
ARTERIAL	20'

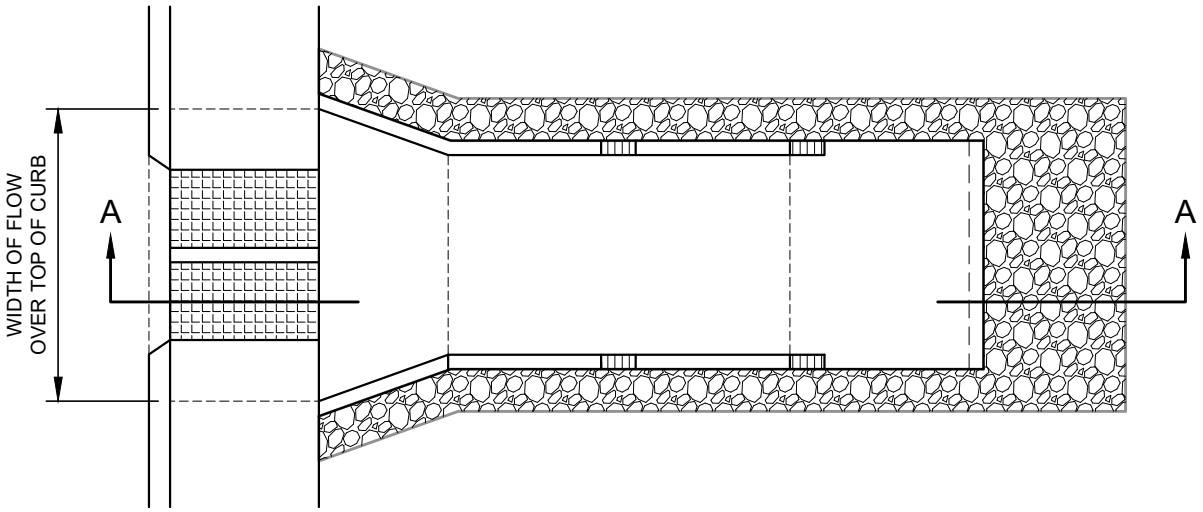


MAXIMUM ALLOWABLE STREET
AND ALLEY WATER SURFACE

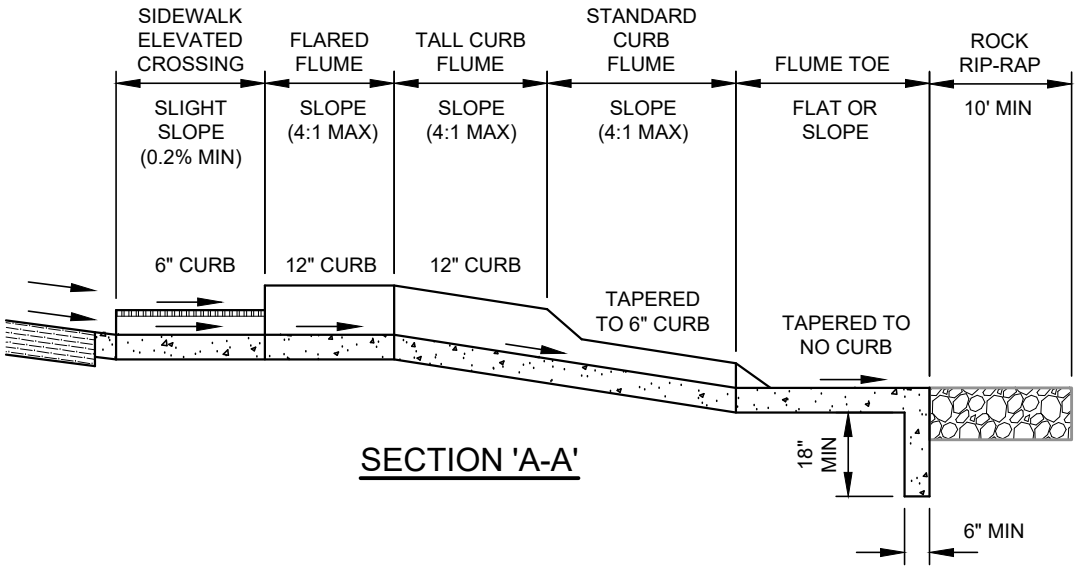
NOTE:
NO WATER TO DRAIN
TO ADJACENT LOTS.



NOTE:
* NON-ERODIBLE BOTTOM SHALL BE DESIGNED BY THE ENGINEER AND DOCUMENTATION AND CALCULATIONS SHALL BE PROVIDED TO CITY STAFF FOR REVIEW. GRADE SHALL ENSURE POSITIVE DRAINAGE THROUGHOUT THE CHANNEL.
** MINIMUM BOTTOM WIDTH SHALL BE BASED UPON PROJECT SPECIFIC CHANNEL MAINTENANCE NEEDS. BOTTOM WIDTHS SMALLER THAN WHAT IS SHOWN SHALL BE APPROVED BY THE CITY. THE CITY MAY REQUIRE HYDRAULIC MODELING OF THE CONSTRUCTED CHANNEL.
***ACCESS EASEMENT REQUIRED FULL LENGTH OF CHANNEL ON ONE SIDE, WHERE IT IS NOT ADJACENT TO ALLEY OR STREET.



SECTION 'A-A'



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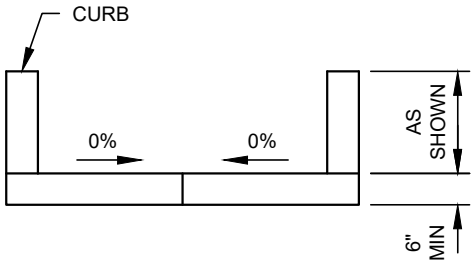


SECTION THROUGH FLUME

PLAINVIEW, TX

explore the opportunities

TECHNICAL DESIGN & CONSTRUCTION STANDARDS

STREETS

****Any deviation from the Design Standards must be submitted to the City for review and approval.****

1.0 CONSTRUCTION

1.1 GENERAL

All construction, testing, and materials, including concrete reinforcement, jointing, subgrade preparation, and treatment shall be in accordance with the City of Plainview's (City) current standards, details, and Specifications.

- Any construction or materials failing to meet the requirements of these Specifications, or the Plan sheets shall be removed and replaced at the Contractor's own expense.
- No consideration will be given to requests for reduced payments for construction or materials not in conformance with these Specifications and the plan sheets.
- The Engineer may require certificates from manufacturers certifying that materials or equipment to be incorporated into the Work meet these Specifications.
- Safety Data Sheets (SDS) shall be required on all materials.
- All materials or equipment shall be subject to approval by the City or Engineer before being incorporated into any Project.
- After approval, the source and/or character of materials shall not be changed without written authorization by the City or Engineer.

Testing and inspection of materials shall be performed by a commercial testing laboratory approved by the City. Contractor shall furnish materials or specimens for testing and shall furnish suitable evidence that the materials proposed to be incorporated into the Work are in accordance with the Specifications.

Contractor shall notify the City at least 48 hours prior to beginning construction. Traffic Control Plan shall be submitted to City prior to the start of construction.

Contractor is responsible for obtaining all necessary permits and approvals prior to beginning any construction. Contact Inspection Division of Community Development at 806.296.1121 for a permit to work within City Right-of-Way (ROW).

Contractor must keep available onsite, at all times, approved Construction Plans and copies of any required permits along with the appropriate versions of the following references: City of Plainview Engineering Standards, NCTCOG Specifications, TxDOT Specifications, TxDOT Standard Drawings.

All Shop Drawings, Working Drawings, or other documents which require review by the City, shall be submitted by the Contractor sufficiently in advance of scheduled construction to allow no less than 14 calendar days for review and response by the City.

Contractor shall be responsible for all required construction surveying and staking and shall notify the City of any discrepancies prior to proceeding with any Work.

Contractor shall be responsible for protecting all survey markers including iron rods, property corners, or survey monuments within the limits of construction and outside ROW during construction. Any survey markers disturbed during construction shall be replaced by the Contractor at no cost to the City.

Contractor shall provide a construction schedule and weekly progress reports.

Contractor is responsible for keeping streets and driveways adjacent to the Project free of mud and debris at all times. Contractor shall clean up and remove all loose material resulting from construction operations. The Contractor shall take all available precautions to control dust. Contractor shall be responsible for any damage to existing facilities or adjacent properties during construction. Any removal or damage to existing facilities shall be replaced or repaired to equal or better condition by the Contractor.

Contractor shall not store materials, equipment, or other construction items on adjacent properties or right-of-way without the prior written consent of the property Owner and the City. Temporary fencing shall be installed prior to the removal of existing fencing. Temporary fencing shall be removed after proposed fencing is approved by the City. All temporary and proposed fencing locations shall be subject to field revisions as directed by the City.

Unusable excavated material, or construction debris shall be removed and disposed of offsite at an approved disposal facility by the Contractor at their own expense.

It is the Contractor's responsibility to maintain a neat and accurate record of construction for the City's records.

No earthwork, lime application, or other preparation of the subgrade for paving of streets, alleys, or fire lanes shall be initiated without authorization from the City. The City will authorize the subgrade Work in preparation for paving after utility trench backfill testing has been completed and verified to meet the City requirements.

Streets to be constructed in a location where the traffic is expected to consist of an unusual number of trucks or other heavy vehicles shall have an approved pavement structure design specific to that loading condition.

2.0 ROADWAY DESIGN REQUIREMENTS

2.1 GENERAL

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

All throughfare designs shall meet the guidelines in AASHTO's current "*A Policy on Geometric Design of Highways and Streets."*

Roadway Design Standard

Street Type	Traffic Lanes	Street Width & Type (Minimum)	ROW (Min)	Design Speed m.p.h.	Grade (Min)	Grade (Max)	Centerline Radius for Horizontal Curves
Alley (Residential)	NA	concrete or Asphalt	20 ft.	NA	0.5	14%	NA
Alley (Commercial)	NA	concrete or Asphalt	25 ft	NA	0.5	14%	NA
Local Street	2	36 ft.	60 ft.	25	0.5	10%	350 ft.
Collector Street	2	40 ft.	64 ft.	30	0.5	8%	590 ft.
Arterial Street (Undivided)	4	46 ft.	76 ft.	40	0.5	7%	750 ft.
Arterial Street (Divided)	4	46 ft.	78 ft.	45	0.5	7%	940 ft.

2.2 TRAFFIC LIGHT INSTALLATION

All traffic light installation shall be in accordance with current TXDOT Standards.

2.3 STREET LIGHT INSTALLATION

All street light installations shall be in accordance with current XCEL Energy Standards.

3.0 PAVEMENT AND SUBGRADE DESIGN REQUIREMENTS

3.1 GENERAL

The following specifies minimum standards required for the pavement and subgrade design for roadways and alleys within the City. These minimum standards are not intended to replace the professional judgment of the Geotechnical Engineer for any specific project. The standards may need to be expanded or modified on a case-by-case basis as determined necessary and appropriate by the Geotechnical Engineer, and as approved by the Director of Public Works.

All roadways and alleys shall have a geotechnical investigation pavement and subgrade design performed. Results of the geotechnical investigations, engineering analyses, and recommendations shall be presented in a Geotechnical Report for Roadways. The Report and any subsequent re-evaluations or supplemental reports shall be signed and sealed by a Licensed Professional Engineer in the State of Texas trained and qualified to provide geotechnical engineering analysis and design recommendations.

The information and recommendations contained in the Report and any subsequent re-evaluation and/or supplement reports shall be accepted by the Director of Public Works or Project Engineer, in writing, prior to Release of Construction.

Fire lane paving shall be designed in accordance with the Standard Details or Letter of Recommendation from the Owner.

Refer to the Standard Details and Technical Specifications for additional specific requirements related to pavement and subgrade.

3.2 SUBGRADE DESIGN

Subgrade material for concrete or asphalt construction shall consist of suitable native soil or off-site soil, free from vegetation or other objectionable matter.

All unstable or objectionable material shall be removed from the subgrade and replaced with approved material.

Subgrade material shall be suitable for forming a stable embankment and shall meet the following requirements: PI must be 5 to 15. For soils with a PI greater than 15, submit alternate materials or amendments for the City Engineer to review.

Table 3.1 Material Requirements

Material Property	Value
Liquid Limit	Max 45
Plasticity Index	Min 5; Max 15
Linear Shrinkage	Min 2; Max 10

- Subgrade material which does not meet the above requirements may be conditioned by blending with lime, sand, or caliche screenings. The conditioning shall produce a uniform subgrade material which meets all of these specified subgrade requirements.
- Subgrade will be prepared in conformance with the lines and grades shown on the Plans, or as directed by the Engineer, by scarifying and compacting to a minimum of 95 percent or Modified Proctor Density at optimum moisture content, plus or minus 2 percent.
- Subgrade shall be constructed in maximum of 6-inch lifts, and each 6-inch lift tested for moisture and density.

Maximum Aggregate Size: 3.0 inches.

Percent Retained on No. 4 Sieve: 25 to 50 percent.

Percent Retained on No. 40 Sieve: 50 to 85 percent.

Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum Moisture content at time of compaction.

Bedding Course: Naturally- or artificially-graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, ASTM D2940, except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

Sand: ASTM C33, fine aggregate.

3.3 FLEXIBLE BASE (CALICHE)

Material for flexible base shall consist of crushed caliche, limestone, and calcareous clay particles produced from oversize quarried aggregate, sized by crushing, and produced from a naturally occurring single source.

Screen all acceptable material, crush, and return oversized material to screened material so a uniform material is produced. Processed caliche base material, when properly slaked and tested by TxDOT standard laboratory methods, shall meet the following requirements:

Passing 1 3/4-inch Sieve: 100 percent.

Passing 7/8-inch Sieve: 65 to 90 percent.

Passing 3/8-inch Sieve: 50 to 70 percent.

Passing No 4. Sieve: 30 to 60 percent.

Passing No. 40 Sieve: 15 to 35 percent.

Triaxial Classification (Minimum): 3.0.

Material passing No. 40 sieve, including blended filler, shall be soil binder with a liquid limit not more than 35 and PI not more than 10 when tested per Test Method TEX-101 E.

Recycled material (Recycled Asphalt Pavement (RAP), etc.) not permitted unless specifically shown otherwise on Plans.

Compaction Test: One field density test required for each 500 square yards of caliche base material laid. Compact material to 98 percent maximum density, at optimum moisture, as determined by ASTM D1557.

3.4 ASPHALT STABILIZED BASE (ASB)

Asphalt stabilized base shall consist of a uniform mixture of mineral aggregate and asphalt cement mixed hot in a mixing plant in accordance with these Specifications.

Caliche is not an acceptable aggregate for ASB.

ASB shall be compacted thoroughly and uniformly with approved rollers to a density between 93 percent and 98 percent of the maximum theoretical gravity, with a lab molded target of 96.5 percent using the Texas Gyratory Compaction method.

All results will be calculated using the maximum theoretical Rice gravity.

Compaction less than 93 percent or greater than 98 percent will be considered deficient. All deficient pavement shall be removed and replaced as determined by the Engineer at the Contractor's expense.

ASB shall meet all compaction requirements at the time of inspection. Re-rolling is not an approved method for achieving compaction requirements.

Contractor shall set rolling patterns using a thin lift nuclear gauge in order to ensure maximum compaction.

All roller marks shall be removed, and compaction completed prior to the ASB mixture cooling defective joints until the leakage is within the specified limits.

3.5 CONCRETE PAVEMENT DESIGN

All concrete pavements shall be in accordance with Technical Specification unless otherwise approved by the Director of Public Works.

Shop Drawings for reinforcement detailing, fabricating, bending, and placing concrete reinforcement shall comply with ACI 315 “Manual of Standard Practice for Detailing Reinforced Concrete Structures,” showing bar schedules, stirrup spacing, bent bar diagrams, materials, steel grades, and arrangement of concrete reinforcement and methods of support.

Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment must be certified per National Ready Mix Concrete Association's Plant Certification Program.

ACI Publications shall comply with ACI 301 “Specification for Structural Concrete.”

3.6 CONCRETE MATERIALS

Portland Cement: ASTM C 150, Types I, II, or III.

Aggregate: ASTM C 33, uniformly graded, from a single source, as:

- Class: 4M.
- Maximum Aggregate Size: 1-1/2 inches nominal.
- Coarse aggregate for Class C or D concrete shall be crushed limestone.
- Gradation for aggregate shall meet these requirements by weight.

Testing Agency: Contractor shall sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control include those specified herein.

Table 3.2 Aggregate Gradiation

FINE AGGREGATE		COARSE AGGREGATE	
Sieve	**Percent Passing**	**Sieve**	**Percent Passing**
3/8-Inch	95-100	1-3/4-Inch	100
No. 4	80-100	1-1/2-Inch	95-100
No. 16	50-85	3/4-Inch	35-70
No. 30	25-60	3/8-Inch	10-30
No. 50	5-30	No. 4	0-5
No. 100	0-10		

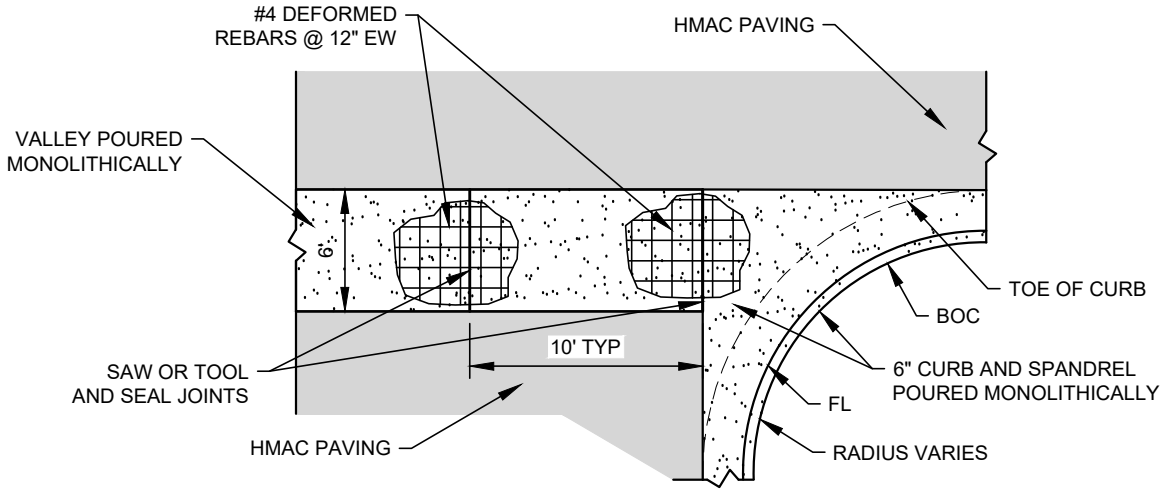
Testing Services shall be performed per the following requirements:

- Sampling Fresh Concrete: Obtain representative samples of fresh concrete per ASTM C172, except modified for slump to comply with ASTM C94.
- Slump: ASTM C143; 1 test at point of placement for each compressive-strength specimen, but not less than 1 test for each day's pour of each type of concrete. Additional tests required when concrete consistency changes.
- Air Content: ASTM C231, pressure method; 1 test for each compressive-strength specimen, but not less than one test for each day's pour of each type of air-entrained concrete.
- Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 degrees F and below and 80 degrees F and above, and 1 test for each set of compressive-strength specimens.
- Compression Test Specimens: ASTM C 31/C31M; 1 set of 4 standard cylinders for each compressive-strength test, unless otherwise indicated. Mold and store cylinders for laboratory-cured test specimens unless field-cured test specimens required.
- Compressive-Strength Tests: ASTM C 39; 1 set for each day's pour of each concrete class exceeding 5 but less than 25 cubic yards, plus 1 set for each additional 50 cubic yards. Test one specimen at 7 days and two at 28 days. Retain 1 specimen in reserve for later testing if required.

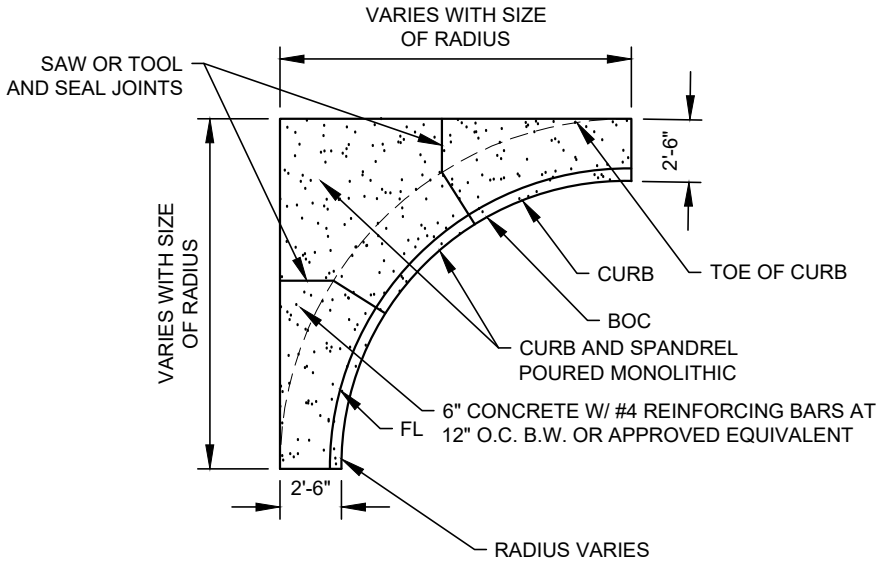
When frequency of testing will provide fewer than 5 compressive-strength tests for a given class of concrete, test from at least 5 randomly-selected batches or each batch if fewer than 5 are used.

3.7 HOT MIX ASPHALT CONCRETE SURFACE (HMAC)

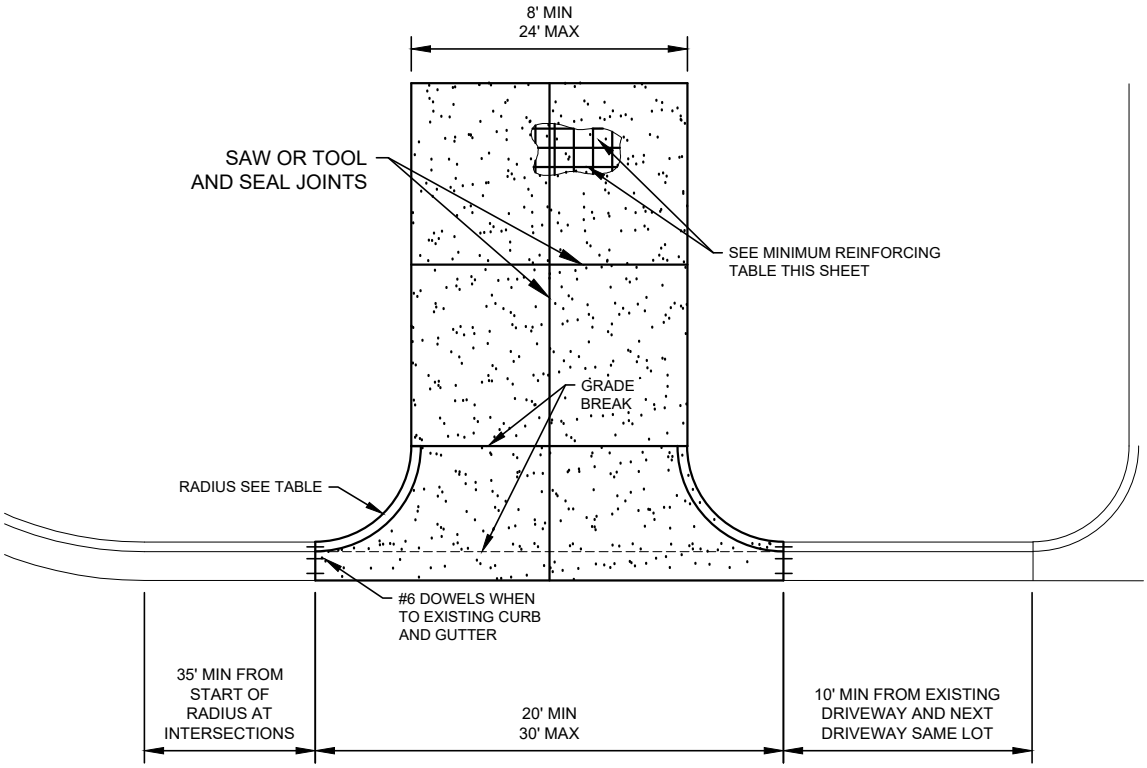
Hot mix asphalt concrete surface shall consist of a uniform mixture of mineral aggregate (coarse aggregate, fine aggregate, mineral filler) and asphalt cement mixed hot in a mixing plant in accordance with these Specifications. The Contractor's methods, plant, and equipment are subject to approval by the Engineer, and shall be appropriate and in suitable condition to produce the HMAC surface material consistently in compliance with these Specifications.



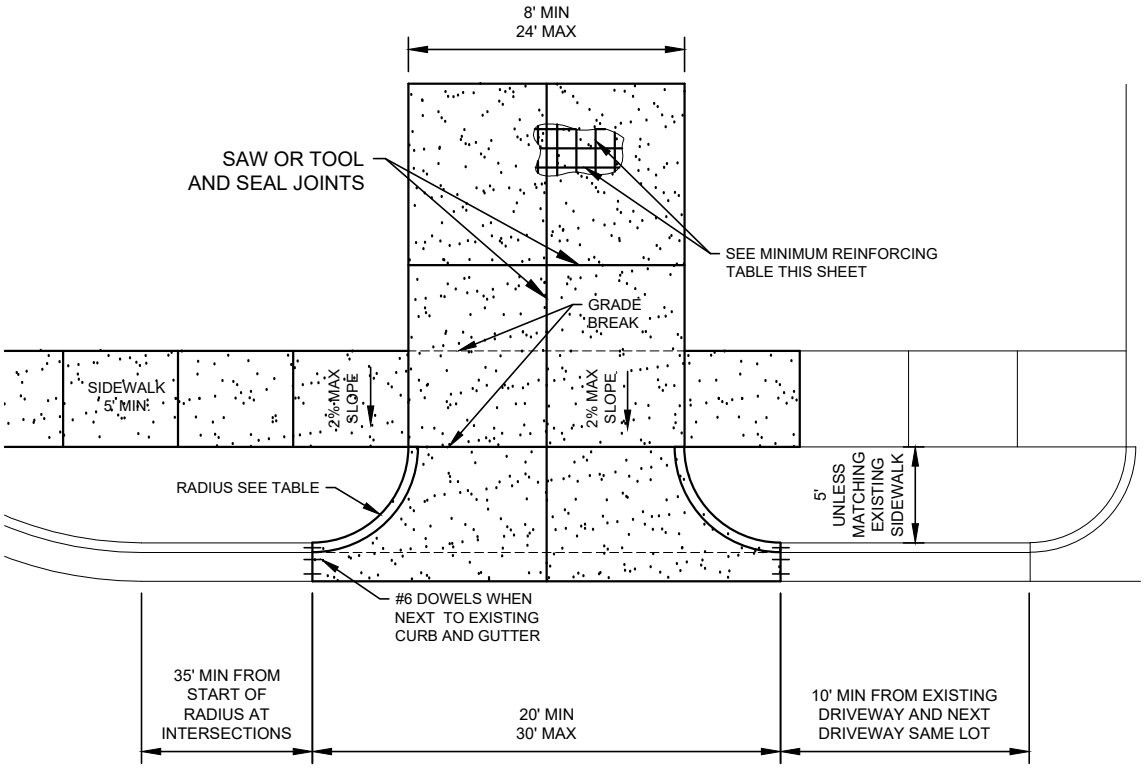
PLAN



SPANDREL, CURB AND GUTTER



DRIVEWAY	REINFORCEMENT	RADIUS	MATERIAL
RESIDENTIAL	6"X6"WELDED WIRE FABRIC	5' MIN	3,500 PSI CONCRETE @ 6" THICK
COMMERCIAL	COMMERCIAL	15' MIN	4,000 PSI CONCRETE @ 6" THICK



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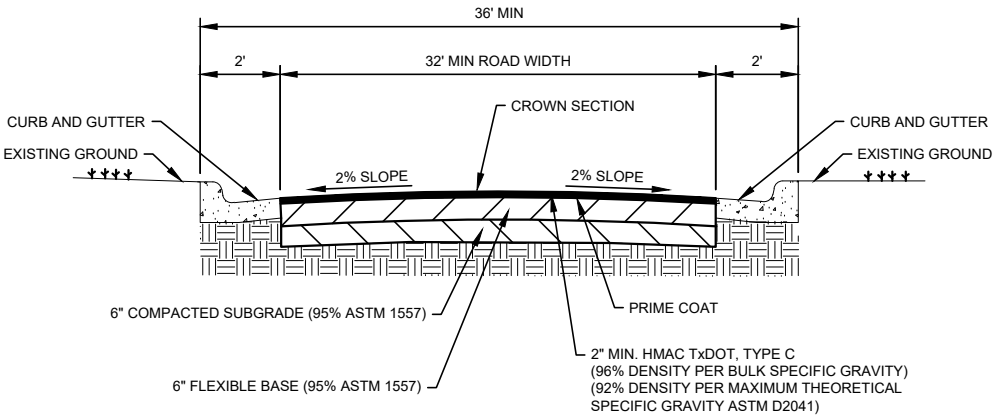
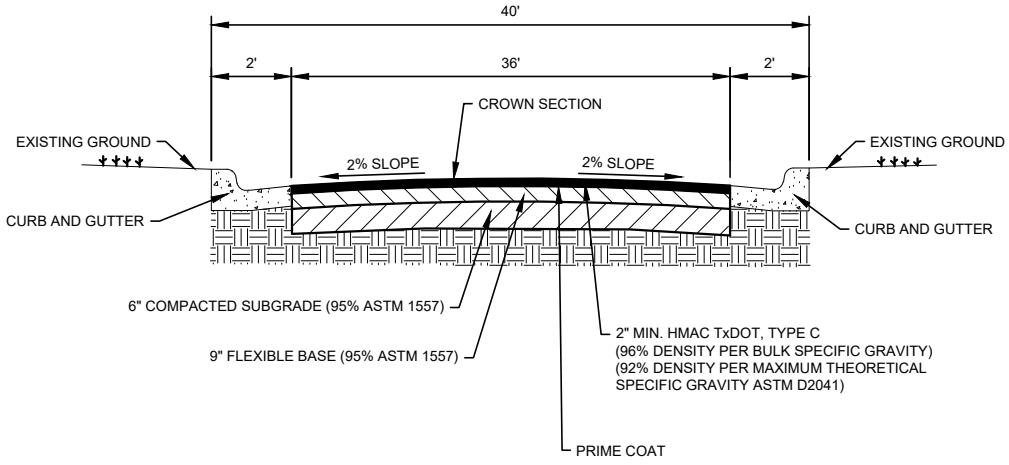


LOCAL STREET SECTION

NOTES:

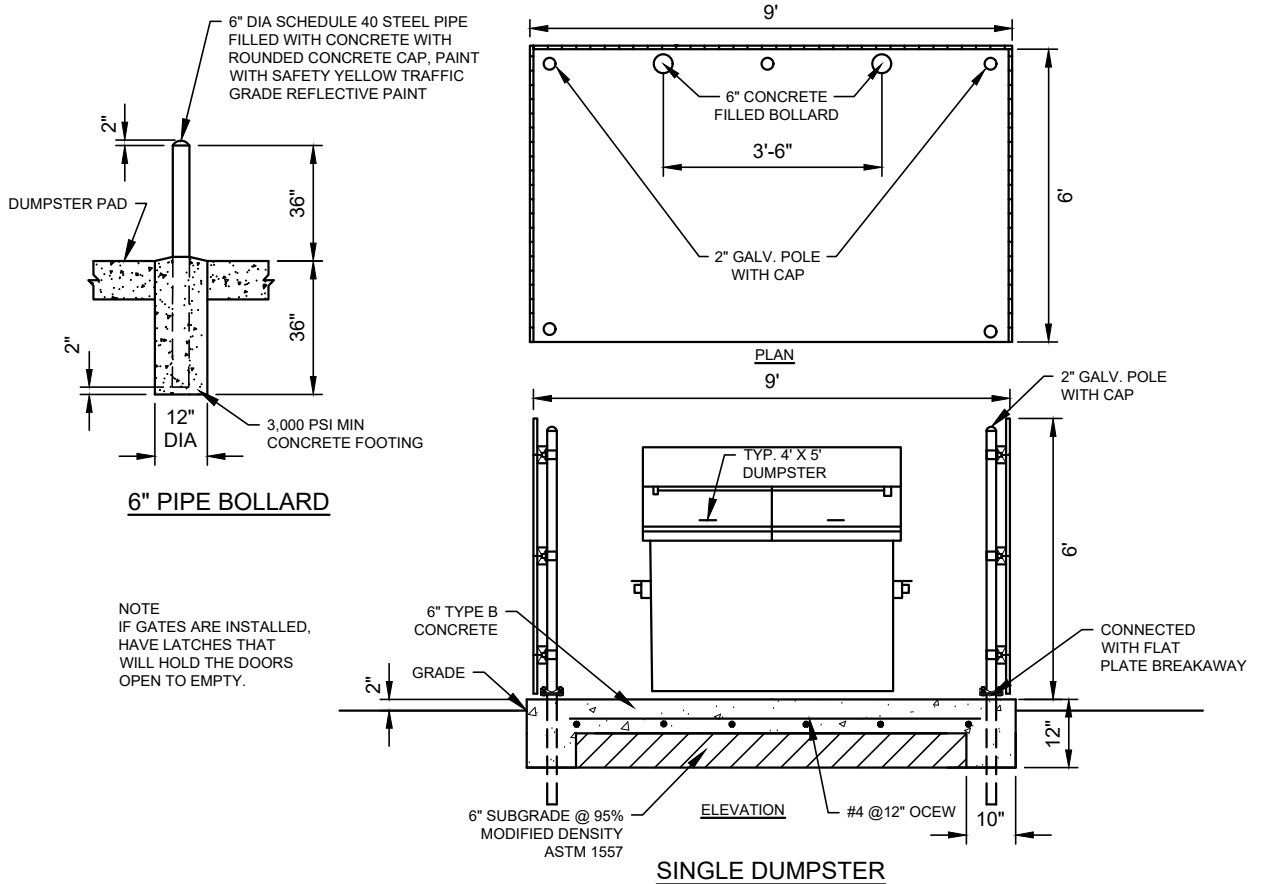
A. SUBGRADE MATERIAL SHALL BE SUITABLE FOR FORMING STABLE EMBANKMENT AND SHALL MEET THE FOLLOWING REQUIRMEN: PI MUST BE 5 TO 15. FOR SOILS WITH A PI GREATER THAN 15, SUBMIT ALTERNATE MATERIALS OR AMENDMENTS FOR THE CITY REVIEW.
B. CONTRACTOR SHALL SUBMIT PAVEMENT DESIGN FOR CITY APPROVAL ON ALL ARTERIAL STREETS.



COLLECTOR STREET SECTION

NOTES:

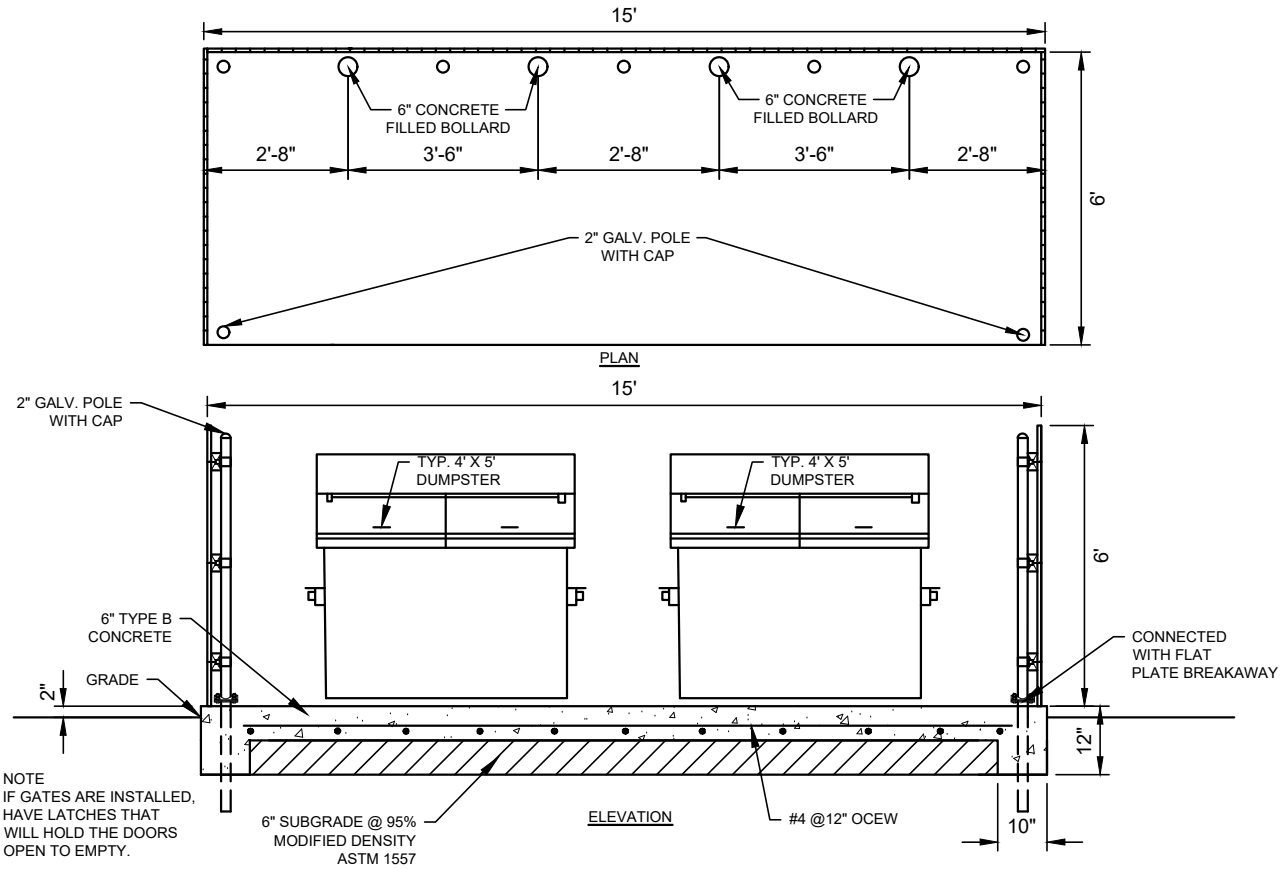
A. SUBGRADE MATERIAL SHALL BE SUITABLE FOR FORMING STABLE EMBANKMENT AND SHALL MEET THE FOLLOWING REQUIRMEN: PI MUST BE 5 TO 15. FOR SOILS WITH A PI GREATER THAN 15, SUBMIT ALTERNATE MATERIALS OR AMENDMENTS FOR THE CITY REVIEW.
B. CONTRACTOR SHALL SUBMIT PAVEMENT DESIGN FOR CITY APPROVAL ON ALL ARTERIAL STREETS.



6" PIPE BOLLARD

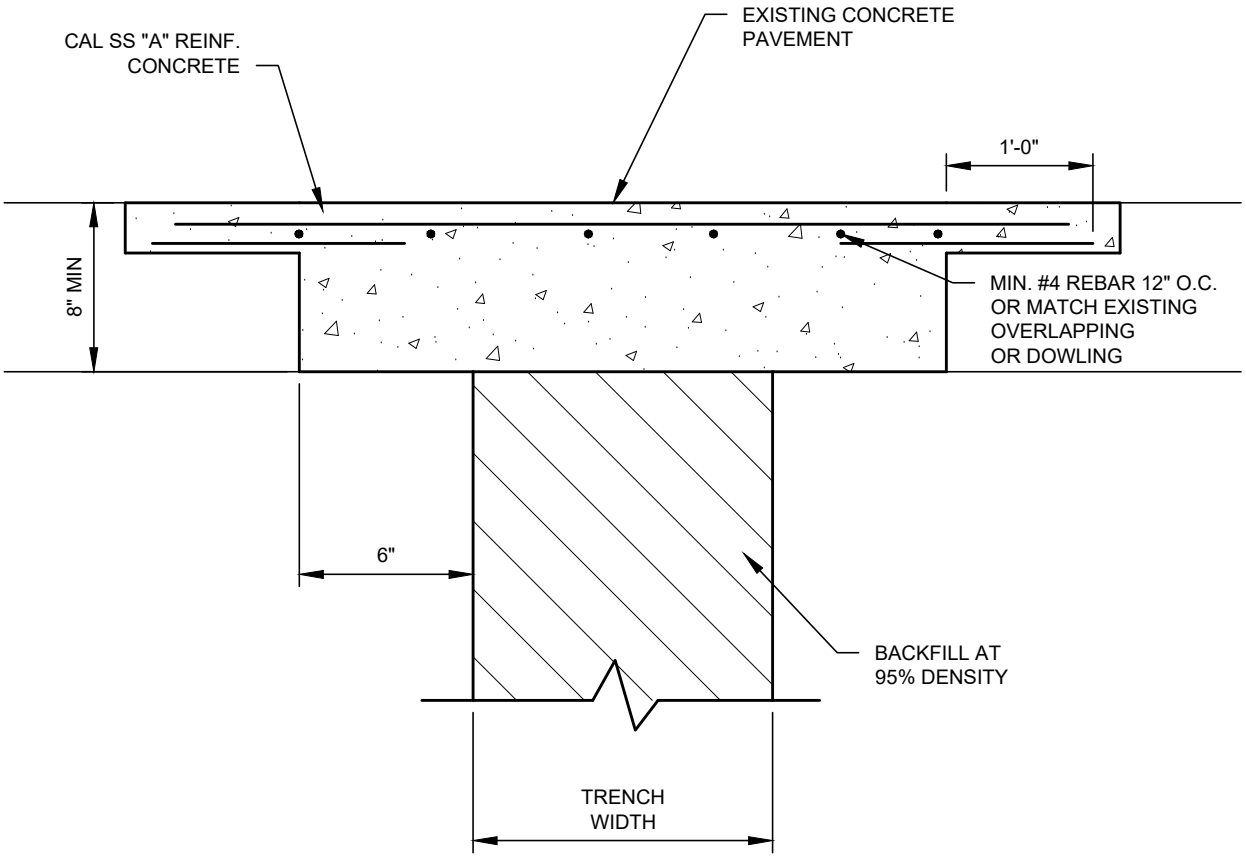
NOTE
IF GATES ARE INSTALLED, HAVE LATCHES THAT WILL HOLD THE DOORS OPEN TO EMPTY.

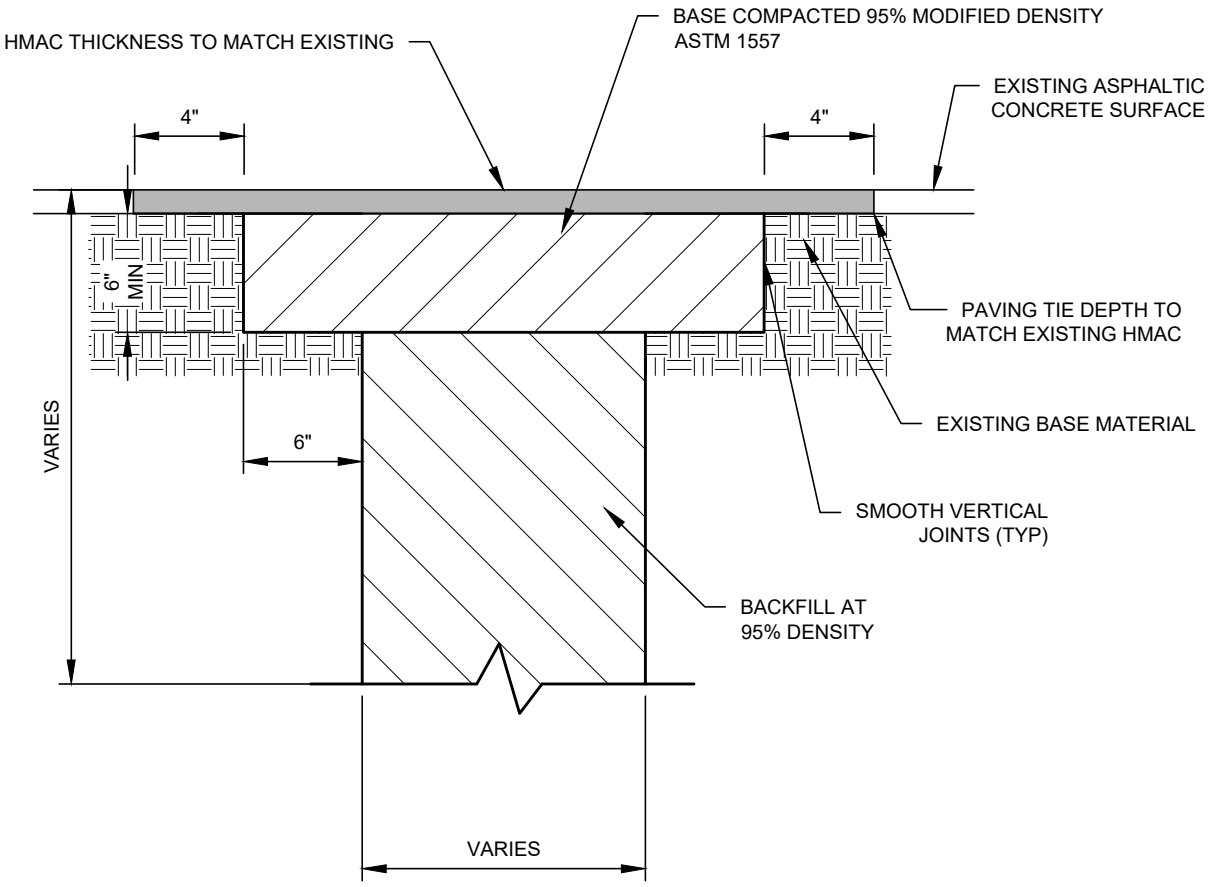
SINGLE DUMPSTER

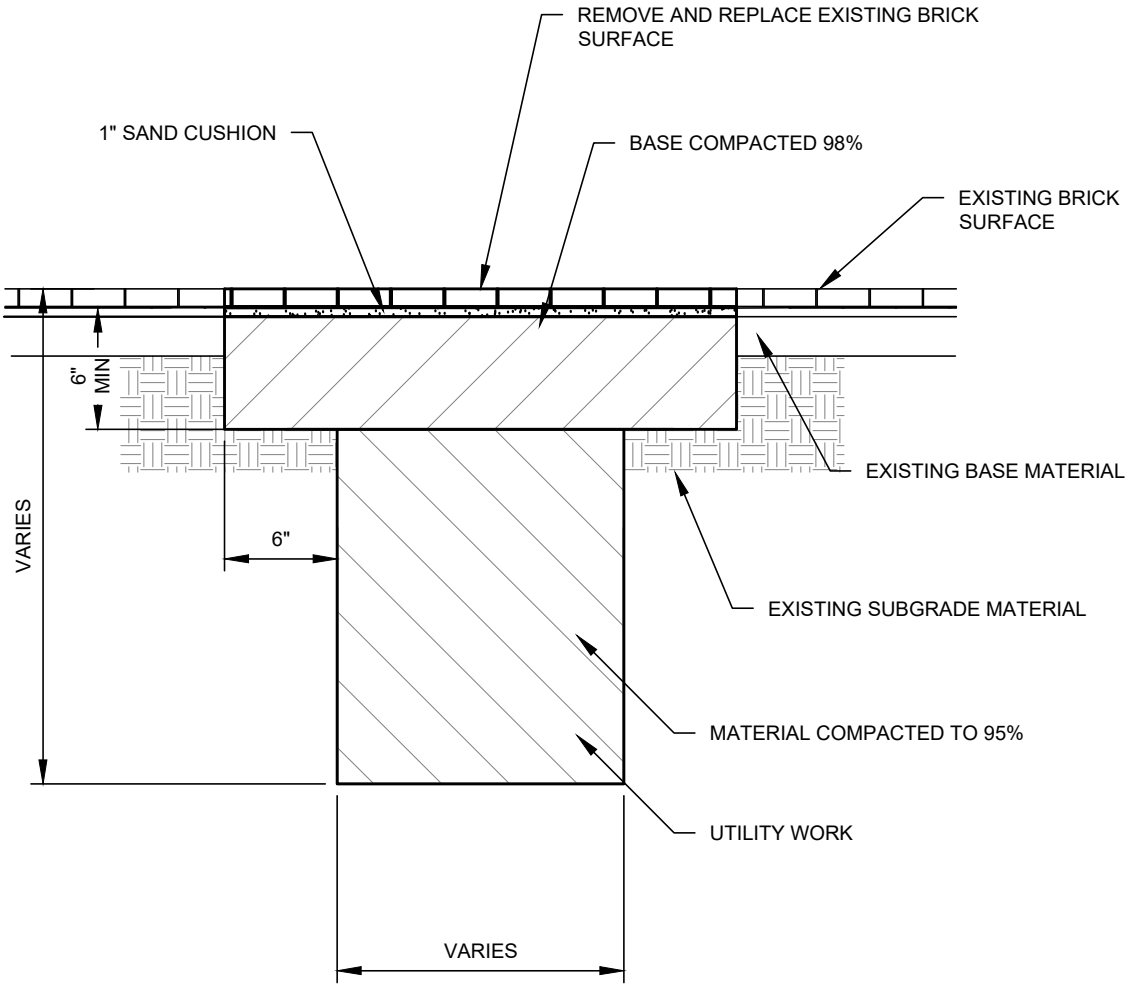


NOTE
IF GATES ARE INSTALLED, HAVE LATCHES THAT WILL HOLD THE DOORS OPEN TO EMPTY.

DOUBLE DUMPSTER


CAL SS "A" REINF.
CONCRETE
EXISTING CONCRETE
PAVEMENT
1'-0"
8" MIN
MIN. #4 REBAR 12" O.C.
OR MATCH EXISTING
OVERLAPPING
OR DOWLING
6"
BACKFILL AT
95% DENSITY
TRENCH
WIDTH


HMAC THICKNESS TO MATCH EXISTING
BASE COMPACTED 95% MODIFIED DENSITY
ASTM 1557
EXISTING ASPHALTIC
CONCRETE SURFACE
4"
4"
6" MIN
PAVING TIE DEPTH TO
MATCH EXISTING HMAC
EXISTING BASE MATERIAL
VARIES
6"
SMOOTH VERTICAL
JOINTS (TYP)
BACKFILL AT
95% DENSITY
VARIES


REMOVE AND REPLACE EXISTING BRICK SURFACE
1" SAND CUSHION
BASE COMPACTED 98%
EXISTING BRICK SURFACE
6" MIN
EXISTING BASE MATERIAL
VARIES
6"
EXISTING SUBGRADE MATERIAL
MATERIAL COMPACTED TO 95%
UTILITY WORK
VARIES