City of St. Francis

PRIVATE DEVELOPMENT STANDARDS

April 27, 2023

Forward

In order to protect the public health, safety and welfare, it is necessary to establish standards for engineering in the City of St. Francis.

This manual outlines specific requirements, materials and standards that will be incorporated into the preparation of plans and specifications for sanitary sewer, storm sewer, watermain, trails, street construction and other improvements within the City of St. Francis. The following definitions shall be used for this manual:

Owner: Owner shall mean the person(s), company, corporation, etc. that enter into a "Developers Agreement" with the City of St. Francis for the purpose of construction of public improvements on lands under the ownership and control of said persons(s), company, corporation, etc.

Engineer: Engineer shall mean the Owner's Engineer.

City Engineer: City Engineer shall mean the Licensed Professional Engineer(s) under contract to the City to serve in that capacity.

Approved Plans: Shall mean all Plans and Specifications and information required to be shown thereon per the City of St. Francis Ordinances, along with these Standard Specifications.

Sanitary sewer facilities and water work shall be designed to conform to the “10 State Standards” and shall be constructed in accordance with City Engineers Association of Minnesota Standard Specifications except as modified by specific City of St. Francis requirements. Street and road surface improvements shall be designed to the standards of the Minnesota Department of Transportation design manuals and shall be constructed in accordance with the Minnesota Department of Transportation Standard Specifications except as modified by specific City of St. Francis requirements.

Development plans and public facilities construction plans shall conform to City of St. Francis Ordinances and Comprehensive Plans. Related to engineering, comprehensive plans include the sanitary sewer system with associated trunk facilities for area service, the water distribution system with watermain oversizing, the surface water runoff control plan and the city transportation plan with designated collector streets. The City of St. Francis has the authority to construct improvements as necessary conforming with City Comprehensive Planning with the costs of improvements allocated or assessed to properties for benefit.

Once the plat, plans and specifications and associated documents have been reviewed, approved and signed, the City will allow the Developers, as defined in the Development Agreement, to proceed with the construction.

These standards are established as policy and as such may be subject to change by action of the City Council. The City of St. Francis Private Development Standards manual was approved by the City Council on _____ .

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GLOSSARY OF TERMS

AASHTO	American Association of State Highway and Transportation Office
ANSI	American National Standards Institute
ASTM	American Society of Testing and Materials
AWWA	American Water Works Association
CEAM	City Engineer’s Association of Minnesota
CMP	Corrugated Metal Pipe
HDPE	High Density Polyethylene
MnDOT	Minnesota Department of Transportation
MnPCA	Minnesota Pollution Control Agency
PID	Property Identification Number
PVC	Polyvinyl chloride
RCP	Reinforced Concrete Pipe
SDR	Strength to Diameter Ratio

ENGINEERING MANUAL

I. Engineering Requirements

As set forth in various sections of the City ordinances, Developers of property within the City of St. Francis are required to submit certain plans and specifications for review and approval by the City. These include such items as grading plans, drainage plans, topographic surveys, plats, street and utility plans and specifications. These plans and specifications shall be prepared by competent professionals.

The professional services required of the Developer may include one or more of the following professionals: architect, land surveyor, planner, soils and civil engineer and testing service. The engineering services include not only preparation of plans and specifications, but field staking in order to assure the City that the completed project is in conformance with the approved plans and specifications. The City will provide construction observation of the installation of the facilities at the Developer's expense.

The following procedures shall be followed:

1. The Developer shall submit plans, specifications and copies of all design calculations to the City for review and approval. These plans are to be prepared by a licensed professional civil engineer and shall be in accordance with City standards as outlined herein. The City comprehensive sanitary sewer, water, storm drainage and thoroughfare plans shall be adhered to in design considerations. All sanitary sewer and watermain testing shall be completed and copies of service ties submitted to the City prior to issuance of any service connection permits.

2. The Developer shall submit erosion and sediment control plans to the City for review and approval. No work is to begin until all erosion and sediment control methods are in place and approved by the City.

3. The Developer shall furnish a separate Development Plan showing housepad with elevations on front & back of pad and garage floor slab, lot corners, drainage arrows, and street grade in front of driveway.

4. The Developer will be responsible for not only plans and specifications preparation, but also for providing construction staking. Resident construction observation of said improvements to assure compliance with the approved plans shall be completed by the City.

5. Copies of all bids, change orders, etc. relating to the improvements shall be forwarded to the City Engineer.

6. The Developer shall furnish to the City the list of selected contractors and subcontractors being considered for retention by the Developer for any of the public improvements work in the development. The City has the right to reject any contractor or subcontractor deemed unacceptable to the City.

7. Any changes to the approved plans and specifications shall be approved by the City Engineer in writing before work is started. If the change affects the project letter of credit by increasing the cost, the letter of credit shall be increased before the work can begin.

8. The Developer will hold a preconstruction meeting at the City Hall prior to start of any work on the development. The City staff and City Engineer along with the contractor and subcontractors, Developer's engineer, utility companies and other interested parties must be invited to the meeting. The Developer will be responsible for drafting pre-construction meeting minutes. The said minutes shall be submitted to the City Engineer for review, and then distributed by the Developer to all parties whom were in attendance at the meeting.

9. The Developer shall retain an independent testing service to perform the required tests of materials. Copies of tests will be directed to the City Engineer or his designated representative. The cost of this service will be the responsibility of the Developer.

   The City shall be notified 24 hours in advance of all scheduled tests so its representatives can be present at the time tests are made. The required tests include sanitary sewer, watermain, storm sewer, street subgrade, base course, wear course, and curb and gutter.

10. Upon completion of all the work required, the City Engineer or his/her designated representative, a representative of the contractor and a representative of the Developer will make the required final inspections of all work. This includes a final inspection of all site grading and approval by the City Engineer before any building permits will be issued. Before the improvements are considered for acceptance by the City, the City Engineer shall be satisfied that all work is satisfactorily completed in accordance with the approved plans and specifications, and the Developer's engineer shall submit a written statement attesting to same. Acceptance of the completed work shall be made by motion of the City Council upon the recommendation of the City Engineer.

11. An as-built survey signed by a Professional Land Surveyor for each individual lot will be required to verify lot corner elevations, swales, emergency overflow elevations, and house low floor and lowest opening elevations. Said survey shall be submitted to the City Building

Department for review and approved by the City Engineer prior to the Certificate of Occupancy being issued.

12. Warranty Period – If within the time prescribed by law, by the contract documents and/or the Developer's Agreement any of the work is found to be unacceptable, the Developer shall correct it promptly unless the City Council has previously accepted the work. The Developer shall give prompt notice after discovery of any unacceptable conditions to the contractor responsible for the project work.

    Unless otherwise noted in the contract documents, the following requirements shall apply:

    a. The contractor shall guarantee all work relating to street construction including concrete curb and gutter, utilities, appurtenances, material and equipment furnished by him/her for a period of two years from the date of written acceptance by the City Council of the work or project.

    b. The Developer shall provide letter of credit(s) as defined in the Developers Agreement. The amount of the letter of credit(s) will be determined by the City Engineer and the City Attorney.

13. After all public improvements have been completed, properly inspected as specified above, and after an acceptable maintenance guarantee has been provided the public improvements will be scheduled for acceptance by the City Council subject to the following:

    a. The Developer or the Developer's engineer must submit written certification to the City Engineer stating that all public improvements have been completed in accordance with the approved plans and specifications.

    b. The Developer's engineer shall provide the City with a complete set of "as-builts" for the City records as outlined in this manual. These as-builts shall be submitted prior to release of building permits.

II. Erosion Control Policy

1. Required Erosion Control Plan. Prior to commencing any earth disturbing activity in a subdivision, the Developer shall prepare and submit to the City Engineer a Stormwater Pollution Prevention Plan (SWPPP).

2. The SWPPP shall conform to the MnPCA's "Application for General Storm-water Permit for Construction Activity (MN R100001) and as specified herein:

a. The plan shall be suited to the topography and soils so as to create the least erosion potential.

b. The land shall be developed in increments of workable size on which adequate controls of erosion and siltation can be provided and maintained during the construction period. Grading operations and other land disturbing operations shall be staged so that the area being developed is not exposed for long periods of time without stabilization.

c. Temporary vegetation and/or mulching shall be used to protect the areas exposed during the development. No area shall be left denuded for a period longer than five (5) days after initial site grading and other land disturbing operations on slopes of 3:1 and greater. These areas shall be mulched and stabilized with an erosion control netting or hydraulic erosion control matrix acceptable to the City Engineer.

d. Permanent vegetation and erosion control measures shall be installed within time period as prescribed in the approved SWPPP. If grading is not completed until after the planting season has expired, temporary erosion control measures, including dormant seeding and mulching, shall be implemented.

e. Sediment basins (debris basins, desilting basins, or silt traps) shall be installed and maintained to remove sediment from runoff waters from the land undergoing development. Storm sewer inlets shall be provided with debris guards and microsilt basins to trap sediment and avoid possible damage from blockage. The silt shall be removed when necessary. If sediment/siltation measures taken are not adequate and result in downstream sediment, the Developer shall be responsible for cleaning out or dredging downstream storm sewers, ponds, and/or natural features as necessary.

f. Before grading is commenced, all control measures as shown on the approved plan shall be installed.

g. Immediately after curb and gutter has been placed, cured, and backfilled, approved erosion control measures shall be installed directly behind the curb.

h. Erosion control practices shall comply with the Minnesota Pollution Control Agency Best Management Practices.

i. The Developer shall be responsible for cleaning and maintenance of the storm sewer system (including ponds, pipes, catch basins, culverts, and swales) within the subdivision and the adjacent off-site storm sewer system that receives storm water from the subdivision. The Developer shall follow all instructions it receives from the City concerning the cleaning and maintenance of the storm sewer system. The Developer's obligations under this paragraph shall end as defined in the Developers Agreement.

j. The Developer shall be responsible for cleaning all streets in the subdivision and adjacent to the subdivision from sediment and debris from the subdivision for a period of two (2) year beginning when the streets have been completed and accepted by the City.

3. Financial Guarantee

a. A portion of the Developer's letter of credit required by the Developer's agreement shall include a guarantee of compliance with erosion control measures, and shall be furnished upon approval of the Developer's Agreement before work is commenced. The financial guarantee shall remain in place until all the Developer's obligations under the erosion control plan have been satisfied.

b. If the City draws upon the financial guarantee, the Developer shall within ten (10) days of the draw, deposit with the City additional security in the same amount that the City has drawn. No further inspections will be conducted, no new building permits will be issued, and all work must stop within the development until the cash deposit for erosion control is restored to the predraw balance.

4. Street Sweeping. The Developer shall provide street sweeping within the plat before the final acceptance is approved. If the construction operation within or out of the plat causes debris on the existing streets, the City Engineer may require street sweeping done by the Developer.

5. Enforcement.

   a. The City may issue a stop work order halting all development work and building construction for noncompliance with the erosion control plan.

   b. The City may draw down the posted financial guarantee and perform any work necessary to achieve compliance with the erosion control plan. The City will endeavor to give the Developer advance notice of such action.

III. City Standard Plans

In order for the City to have standardized construction and as-built plans, the guidelines listed below shall be followed:

General Requirements:

1. The Developers must consider the requirements for plans found in the subdivision ordinance and street construction standards attached herein.

2. Incorporated in the set of plans shall be a sheet indicating the entire project, with corresponding sheet numbers on each separate sheet and index.

3. All sheets shall be 22” x 34”, reduceable to 11” x 17” at correct scaling.

4. Scale Horizontal Scale 1” = 50’
   Vertical Scale 1” = 5’
   (unless otherwise approved by the City engineer)

5. General Details

   a. North arrow
   b. Scale with bargraph
   c. Date of preparation
   d. Proposed name of the subdivision in which the roadway and utilities are to be constructed.
   e. Proposed name of all streets
   f. Name of the plan preparer, Engineer, Surveyor and Owner
   g. Seal or signature of the preparer and Licensed Engineer
   h. Street, sanitary sewer, watermain and storm sewer plan and profile shall be drawn at a scale of 1” = 50’ horizontal and 1” = 5’ vertical.
   i. Street cross-sections shall be drawn at a scale of 1” = 10’ horizontal and 1” = 5’ vertical.

j. Location map which shows all existing streets within 2500 feet of the proposed plat.

6. All utilities shall be shown in the following approximate locations:

a.	Sanitary Sewer	-	on centerline of street right-of-way
b.	Watermain	-	ten feet north and east of centerline
c.	Storm Sewer	-	ten feet south and west of centerline

7. All detail drawings shall be on a separate sheet and referenced to the proper sheet.

8. The profile shall be directly below the plan with the stationing aligned as closely as practical. Stationing shall be shown on the plan view as well as the profile.

9. All parcels shall be properly labeled with lot and block numbers and plat name, or P.I.D. in unplatted areas. Developed parcels shall have their address shown on the plan. Bearings and distances for all existing roadway centerlines and right-of-ways described above shall be shown.

10. All match line breaks shall be clean with reference points clearly marked. All plans which are broken by a matchline shall be on the same or consecutive sheets.

11. Existing utilities shall be shown in both plan and profile, stationed and labeled as existing.

12. Approximate locations of gas, electric, telephone and cable lines shall be shown.

13. Right of way and pavement or curb and gutter alignment data shall be shown. Right of way shall be rounded at intersections to allow for utility installation.

14. Bench marks shall be placed on all sheets.

Specific Requirements:

1. Stationing of sanitary sewer wyes shall be indicated “S” in front of the stationing.

2. All sanitary sewer services shall be drawn on the plan to the constructed length. If other than open cut trench methods are employed, the method needs to be indicated on the plans.

3. If the sanitary sewer wye only is constructed, it shall be noted as “Wye Only” after stationing.

4. The invert elevation of all sanitary sewer services shall be shown on the plans. If risers are installed, the height of each shall be indicated on the plans and also drawn on the profile, along with the height of each riser.

5. All manholes shall be numbered on both plan and profile.

6. All hydrants, gate valves and tees shall be stationed on the bottom of the profile.

7. All water corporation stops shall be indicated by a “W” in front of its stationing.

8. All water services shall be drawn to constructed length. If other than open cut service installation methods are employed, the method needs to be indicated on the plans.

9. The size and type of materials of all sanitary sewer and water services shall be noted on the plans.

10. On combination sewer and water projects, services may be placed in the same trench with sanitary sewer services three feet downstream from water services. Locations will be noted on the plans with an “S & W” in front of the stationing.

11. All sewer and watermain shall be shown in the profile with the appropriate information such as size, material, grades, invert elevations, etc.

As-Built Requirements:

1. All as-built plans shall be submitted electronically in .pdf and .dwg format.

2. As-built plans on all ponding areas are required. Plans shall indicate as-built spot elevations overlaid on the proposed contours, normal water elevation, high water elevation, and the acre feet of storage for each ponding area along with the final storm sewer plans.

3. All “as-built” plans shall be certified by the design engineer and land surveyor responsible for the field work.

4. All water valves shall be located with at least two permanent field ties, using the following priority:

    a. Fire hydrants

b. Manholes
c. Catch basins, if curb and gutter is in
d. Buildings or other permanent structures
e. Power poles, trees, other semipermanent items
f. Stationing from hydrants, manholes, catch basins, if over 100'
g. Back of curb only when used with station in (f.) above

5. All services shall be tied with at least two ties, using the following priority:

   a. The served structure with address noted
   b. Neighboring structures with address noted
   c. Fire hydrants
   d. Manholes, catch basins, if curb and gutter is in
   e. Other permanent structures (bridges, telephone boxes, electrical boxes, etc.)
   f. Power poles, trees, and other semipermanent items
   g. Stationing from hydrant, manhole, catch basins – these may be used with back of curb distance only as last possible means.

6. Show contractor's name on the as-builts.

7. Show where fabric has been placed or correction to pavement section has been made in the streets on the plan portion of the as-builts.

8. Benchmarks shall be referenced on each sheet.

9. All hydrants are to be at required height after lawns, boulevards, etc. are finished (sod, seed, etc.) <u>This will be the Developer's responsibility.</u>

10. The Developer shall provide the City with linework and feature locations as necessary for updating the City's G.I.S. mapping. The Developer shall pay the costs for updating the G.I.S. mapping to include the new infrastructure.

IV. <u>City Standard Materials</u>

In order to standardize certain construction materials and assure quality construction, we have adopted the following:

1. Sanitary Sewer pipe and service line materials:

   a. Plastic pipe shall be smooth wall polyvinyl chloride (PVC) and shall conform with ASTM D 3034 for the size and strength requirements shown on the plans. Minimum pipe strength shall be SDR 35 for depths 20 feet and less. For sewer depths greater than 20 feet, the pipe shall be SDR 26. In general, sanitary sewer shall not exceed

26 feet in depth unless approved by the City. All joints shall be elastomeric gasketed.

b. Ductile iron sewer pipe shall be Class 50 and shall meet ANSI specifications A-21.51.

c. All connections between existing and new sanitary sewer or service pipe shall be made with factory manufactured flexible couplings, Fernco or equivalent, specially designed and sized for sanitary sewer connections.

d. All PVC sanitary sewer service pipe and fittings shall be SDR 26 minimum pipe strength. All service pipe connections shall be solvent welded. Gasketed connections will not be allowed.

e. Maximum distance between sanitary sewer manholes shall be 400 feet. All sanitary sewer manholes shall be located on the street centerline unless otherwise approved by the City.

f. Green tracer wire is required along all sanitary sewer main and service pipe in accordance with the specification as contained herein.

2. Storm Sewer and Drainage Pipe

a. All storm sewer pipe within any street right-of-way shall be reinforced concrete pipe of the class as shown on the plans. Pipe shall meet Mn/DOT 3236 Specification. Pipe joint sealer materials shall be preformed rubber, Type A, in accordance with Mn/DOT Specification Section, 3726.

b. High density polyethylene (HDPE) is not allowed.

c. Riprap shall be required for all sizes to prevent erosion. Fabric blanket conforming with MnDOT 3733 Type IV shall be required under the rip-rap. Erosion control blanket is required at all inlets per Mn/DOT Standard Plat No. 9102D.

d. All flared end sections for pipe culverts 18” and larger shall be fitted with trash guards and all flared end sections on pipe storm sewer systems shall be fitted with trash guards.

3. Metal Sewer Castings

a. Castings for sanitary sewer manhole shall be Neenah R1733 or approved equal with a concealed pickhole and a neoprene gasket

and groove for watertight application. The words “Sanitary Sewer” shall be imprinted on the cover. Waterproof castings where required shall be Neenah R 1755 or approved equal.

b. Castings for storm manholes and catchbasin shall be in accordance with the standard plates and schedule of structures. Unless otherwise specified, castings shall be equivalent to Neenah R-1733 for manholes and R-3067 with V or VB grates for catch basins.

c. Off-street catchbasin manhole and catchbasin inlets shall be constructed per MnDOT Standard Plate 4143E – Stool Grate & Concrete Frame and shall utilize a R-4342 or equivalent grate.

4. Manhole and Catchbasin Structure

a. Manhole and catchbasin structure shall be in accordance with applicable MnDOT standard plates or City standard plates and Mn/DOT Standard Specification Section 2506. All manholes and covers shall be reinforced for traffic loadings.

b. Manholes identified on the plans as box structures shall be constructed from precast reinforced concrete box sections conforming to ASTM C-789 placed on end. Wall thickness and reinforcement shall be in accordance with ASTM C-789 Table 1 for box section under earth dead load and HS-20 live load conditions. Base and cover slabs shall have thickness and reinforcement to meet MnDOT HS-20 traffic loadings.

c. All manhole and catchbasin structures with builds greater than 5.0 feet from casting to invert shall have steps. Maximum distance from top of casting to first step is 2 feet.

d. Sanitary sewer adjusting rings shall be Ladtech HDPE or approved equal. Storm sewer adjusting rings shall be concrete with approved Chimney Seal or Infi-Shield External Seal or Flex-Seal Utility Seal.

5. Chimney Seal or Infi- Shield External Seal or Flex-Seal Utility Seal

Any one of the three following ring seals is allowed. (Contractor choice)

a. CHIMNEY SEAL

1. Chimney seals shall consist of a flexible internal rubber sleeve, interlocking extensions and stainless steel expansion bands. (See standard plate No. 308)

2. The seal shall remain flexible throughout a 25 year design life, allowing repeated vertical movement of the frame of not less than 2 inches and/or repeated horizontal movement of not less than ½ inch. The sleeve portion of the seal shall be either double or triple pleated with a minimum unexpanded vertical height of either 8 inches or 10 inches respectively. The sleeve and extension shall have a minimum thickness of 3/16 inches and shall be made from a high quality rubber compound conforming to the applicable requirements of ASTM C-923, with a minimum 1500 psi tensile strength, a maximum 18% compression set and a hardness (durometer) of 48±5. The bands shall be integrally formed from 16 gauge stainless steel conforming to ASTM A-240, Type 304, with no welded attachments, shall have a minimum adjustment range of 2 diameter inches and a positive locking mechanism. Any screws, bolts or nuts used for this mechanism shall be stainless steel conforming to ASTM F-593 and 594, Type 304.

b. FLEX-SEAL UTILITY SEALANT

1. Manhole seal shall be designed to prevent leakage of water into the manhole through the frame joint area and the area above the manhole cone including all extensions to the chimney area. Extensions shall include but is not limited to lifting rings, brick and/or block material that may have been used to achieve grade. The seal shall remain flexible allowing for the repeated vertical or horizontal movements of the frame due to frost lift, ground movement or the thermal movement of pavements. The final liner material shall be made no less than 200 mils. of corrosion resistant aromatic flexible urethane resin coating to be applied to the inside wall of the entire chimney area as described above. The product shall have a minimum elongation of 800% and a hardness (Durometer) of 75. Final liner shall have a minimum tensile and adhesion strengths of 1150 psi and 175 lb. l/in. respectively. The manhole sealing system shall conform to the physical requirements of ASTM D-412, with a minimum of 200 mils. thickness for durability and resistance elongation and tearing. The lining product shall have an aromatic urethane primer resin on the complete surface. The sealing system shall line the interior of the adjustment area from the cone/top of the manhole and onto the inside of the casting. (See standard plate No. 309)

2. All lose and protruding mortar and brick that would interfere with the seal's performance shall be removed. Any lips for gravel pan supports shall be cut off flush with casting. All excessive voids shall be sealed. Patching cement, shall conform to the manufactures requirements. Any patching cement work will require the contractor to contact the sealant manufacture to determine in writing the proper time required for the cement to completely cure prior to installing this item. Preparation of surface shall include water blasting machine that delivers the water with a sandblaster attachment in a steady stream at a minimum of 3500 psi. Surface preparation shall also include wire brushing of surface to ensure a clean surface as required by manufacture. Active leaks (infiltration) should be corrected by a method approved by the City Engineer prior to installing an Internal Manhole Seal. After water sandblasting, pressure wash the entire area to remove any loose sand that may have been deposited. The substrate surface must be free of sand, loose debris, latencies, dust, oil, grease or chemical contamination. A blower may be required to completely dry the substrate surface or as recommended by manufacture. Ensure casting and structure surfaces are clean and dry where the primer is intended to adhere. Flex-Seal Utility Sealant or approved equal may require the proper mixing of agents, as recommended by the manufacture's instructions. After allowing for proper drying of primer to occur, sealant may be applied by brush as evenly as possible over the entire chimney area, that includes the frame joint area and the area above the manhole cone including all extensions to the chimney area. The contractor is to furnish the City Engineer two (2) mirrors with extension handles that can be used to inspect sealant application to areas underneath frame without entry of manhole. These items will become the property of the owner upon completion and at no additional cost of this item. Cost for these items shall be included in the bid items for internal manhole sealing work.

3. The manufacture must in writing certify that each of the contractor's representatives are approved to install item. The proof or certification of training shall be included in the bid items for internal manhole seals.

c. INFI-SHIELD

1. The casting shall be sealed to the structure with an external sealing system. The seal shall be continuous bands, made

of high quality EPDM (Ethylene Propylene Diene Monomer) rubber with a minimum thickness of 60 mils. Each unit shall have a 2” wide mastic strip on the top and bottom of the band. The mastic shall be non-hardening butyl rubber sealant, with a minimum thickness of 3/16”, and shall seal to the cone/top of the manhole section and over the flange of the casting. (See standard plate No. 310)

2. The external sealing system shall be installed according to the manufacturers recommendations. The external seal shall extend onto the casting and the cone section a minimum of 2”.

6. Watermain and Appurtenances

Materials shall conform to the Standard Specifications and to the following:

a. Watermain shall be polyvinyl chloride (PVC) pressure pipe. PVC watermain shall conform to AWWA C 900 for pipe sizes 4” to 12” and AWWA C 905 for pipe sizes 14” to 24”. All pipe shall have a minimum dimension ratio (DR) of 18 corresponding to a working pressure of 150 psi for PVC type 1120 pipe.

The bell of the joint shall consist of an integral wall section with a factory installed, solid cross section elastometric ring, which meets the requirements of ASTM F 477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C 900 for sizes 4” to 12” and AWWA C 905 for sizes 14” to 24”. The pipe shall be manufactured to ductile iron outside dimensions in accordance with AWWA C 900.

Restraints for C 900 and C 905 PVC pipe shall be Ebba Iron Series 2001PV, Uniflange Series 1300C, and 1390C or approved equal. Fittings for the PVC watermain shall be ductile iron.

Blue tracer wire shall be laid with all PVC watermain in accordance with the specifications included herein.

Granular bedding material shall be furnished and installed with the PVC watermain and associated services, as necessary.

b. Bends shall be 45 degrees or less. Any deflection greater than 45 degrees shall be made with multiple bend sections.

c. Valves 12” and larger shall be butterfly valves, AWWA C504, Mueller Line Seal or approved equal. Valves smaller than 12” in size shall be resilient wedge valves, Mueller A 2360 Series, American-Darling Series 2500 or approved equal conforming to AWWA C509 standards. All valves shall be installed on-line with accompanying valve boxes. All valves shall close in a clockwise direction. All valves shall be epoxy coated as per AWWA C550.

Valve boxes shall be three piece adjustable screw type boxes, nominal 60” to 90” extension, with a 5 ¼” shaft diameter. Valve boxes shall be provided with extension suitable for the design location and a minimum 6-inch available adjustment after final setting. The word “Water” shall be imprinted on each lid.

All valves shall be fitted with extension rods to within one foot of the finished ground surface.

d. All fire hydrants shall be Clow Medalliaon ® F2545 with 16” break off section. The hydrant lead shall contain a 6” gate valve. Color and threads shall match City of St. Francis Standards. A Hydrafinder® red and white stripe shall be included. 8’6” bury depth typical. All hydrants shall be purchased from licensed distributors of Clow hydrants. All hydrant bolts shall be stainless steel.

e. All water service will be minimum 1-inch. All copper service pipe shall be Type K or Polyethylene Grade PE-3408 or PE-4710, or High Density Polyethylene SDR 11 and shall be rated for 200 PSI working pressure.

f. The component parts of a tap service installation shall include a corporation stop coupling complete with watermain tap and saddle; a curb stop coupling complete with curb box; and copper service piping extending from the corporation stop to the curb stop coupling. Corporation stops for 1” through 2” services shall be Mueller 300 Ball Type or Ford FB-600-4-NL Series Ballcorp. All services shall be wet tapped**.** Service saddles shall be all Type 304 stainless steel Smith-Blair 372 TaperSeal service saddles, or approved equal. Curb stops for 1” through 2” service shall be Ford Ball Valve B22-444M-NL Series or Mueller Oriseal and shall be a Minneapolis pattern valve with thread top. Curb box shall be Minneapolis base, sized to fit the curb stop. Boxes shall have a one and one-quarter (1 ¼) inch upper section and shall be furnished with a stationary rod 66” in length. All curb boxes shall utilize a BoaBox with tracer wire and ground wire securely connected to the BoaBox terminals. All curb boxes located beneath

driveways, shall have Ford Series A lid covers placed over the riser. (See Standard Plate 207)

g. Water services 2-inches and larger shall be constructed with pipe, fittings, valves and boxes as specified for PVC pipe installation.

h. Water meter shall be obtained from the City with payment of established fee, and installed in accordance with directions.

7. Street Material

All materials shall be in conformance with Minnesota Department of Transportation Standard Specifications for Construction, latest edition and all subsequent revisions (MnDOT) or as modified herein in Appendix C.

V. Testing Requirements

Materials shall be sampled and tested in accordance to the MnDOT schedule of material control, except for as modified below. Utility systems shall be tested in accordance with the standard specifications for watermain, service lines, sanitary sewer and storm sewer as published by the City Engineer Association of Minnesota. The City Engineer shall be notified 24 hours in advance of the specific test.

1. Pipe Trench Compaction:

a. Standard Proctor Density (ASTM D-698-78): Proctor samples will be obtained within the utility trenches for each type of soil encountered in construction.

b. Density Test Nuclear (ASTM D-2922): 1 test per lift of backfill, 1 test every 500 feet of pipe installed, minimum 1 test daily when backfilling.

c. Sand-Cone Method (ASTM D-1556): The City Engineer may at his or her discretion, order density tests by the sand cone method.

2. Embankment Compaction:

   a. Standard Proctor Density (ASTM D-698-78): 1 test per source of material.

   b. Density Test Nuclear (ASTM D-2922): 1 test per lift of embankment, 1 test every 500 feet of roadway fill, 1 test daily when constructing embankment.

   c. Density Test Sand-Cone Method (ASTM D-1556): The City Engineer may, at his or her discretion, order density tests by the sand cone method.

3. Select Granular Borrow

   a. Standard Proctor Density (ASTM D-698-78): 1 test per source of material.

   b. Gradation Test: 1 test per source of material.

   c. Density Test Nuclear (ASTM D-2922): 1 test per lift of embankment, 1 test every 500 feet of roadway fill, 1 test daily when constructing embankment.

   d. Density Test Sand-Cone method (ASTM D-1556): The City Engineer may, at his or her discretion, order density tests by the sand cone method.

4. Concrete Tests

   a. General: When molding cylinders for strength tests, three cylinders are to be made according to ASTM C-31.

   b. Compressive Strength (ASTM C-39): 1 set of 3 for every 1000 l.f. of curb and gutter constructed or 1 set of 3 for every 100 cubic yards of concrete placed or a minimum 1 set of 3 daily when pouring concrete.

   c. Percent Air Test (ASTM C-231): 1 test for every 1000 l.f. of curb and gutter constructed or 1 test for every 100 cubic yards of concrete placed or a minimum 1 test daily when pouring concrete.

   d. Slump Test (ASTM C-143): 1 test for every 1000 l.f. of curb and gutter constructed or 1 test for every 100 cubic yards of concrete placed or a minimum 1 test daily when pouring concrete.

5. Televising

The Developer shall televise all sewer pipe, pipe joints, and service connections. One copy of the televising report and tape shall be submitted to the City for review.

VI. Construction Requirements

1. Sanitary Sewer, Watermain, and Storm Sewer

a. Applicable Specifications

Work shall conform to the Standard Utility Specifications as published by the City Engineers Association of Minnesota, latest edition.

2. Storm Sewer

Pipe sewers shall be installed in accordance with CEAM 2621 and MnDOT 2501 and 2503, except as modified by these specifications.

3. Casting Adjustments

All utility castings shall be adjusted as follows:

a. Sewer Manhole:

All sanitary and storm sewer manhole castings shall be in place during the laying of the wear course. The castings shall be adjusted before the mat is laid and shall be not less than one-eight inch (1/8”) nor more than three-eighths inch (3/8”) below finished grade.

b. Storm Sewer:

Storm sewer inlet castings shall be adjusted to be 0.1 feet below finished gutter line.

c. Water Valve Boxes:

All water valve boxes shall be adjusted prior to wear course paving and shall be not less than one-eight (1/8”) nor more than three-eights inch (3/8”) below finished grade. Only screw-type adjustments are allowed.

d. Grouting Adjusting Rings:

Whenever adjustment rings are provided, the contractor shall grout rings, place the castings and remove all excess grout on the inside and outside of the manhole by wiping smooth with a gloved hand or similar instrument.

4. Streets

The street shall be constructed in accordance with typical sections shown on City Standard Plates and specifications as approved by the City Engineer. The final wear course shall not be constructed until at least one construction season after the base construction is completed.

VII. Storm Water Treatment Basins

1. Storm water conveyance, storage and treatment basins shall be designed in accordance with the City of St. Francis's policy on stormwater drainage in Appendix B. Typical basin construction and outlet structures are shown on the City Standard Plates in Appendix A.

VIII. Miscellaneous

1. Proper notification of improvements shall be given by the Developer or his/her engineer to the responsible governmental agencies, watershed districts, etc. affected by said construction. All necessary permits shall be obtained prior to commencing any work. All special requirements of the responsible agencies shall be complied with.

2. The Developer's contractor shall furnish, erect and maintain signs and barricades as provided in MnDOT 1710 "Barricades and Signs" under the General Conditions to protect the public. The City Engineer shall be notified 48 hours prior to the proposed partial blockage or closure of any street or public right-of-way. No street or public right-of-way shall be closed without the proper approval of the City Engineer.

3. It is the responsibility of the Developer's contractor to protect and leave undisturbed those markers or monuments set for the subdivision of land.

4. The Developer and/or his/her contractor shall immediately repair or replace at his/her own expense any defective workmanship or material of which he/she is notified during the construction period, or within the warranty period, regardless of the approval and acceptance of the work.

5. A plan for the routing of construction traffic shall be submitted to the City Engineer for his/her approval. City streets that are utilized for access or egress to the construction site shall be kept free of dirt and other debris resulting from said construction. Adequate control of dust shall be maintained by the Developer or contractor.

6. The City will require the contractor or Developer to submit a list of materials and respective suppliers as well as all tests of materials.

7. If any material or labor supplied by the contractor or Developer is rejected by the City Engineer or his/her designated representative as defective or unsuitable, then such rejected material shall be promptly removed, disposed of off the job site, and replaced with approved material.

8. All street right-of-ways shall be cleared and grubbed to full width except as specifically directed.

9. The standard ten (10) foot utility and drainage easement adjacent to the street right-of-way shall be cleared and grubbed for the placement of utilities except as specifically directed.

10. Work shall not commence before 7:00 a.m. nor extend beyond 7:00 p.m. Monday through Friday. On Saturdays, the hours will be from 8:00 a.m. to 6:00 p.m. No work is to be done on Sundays. Hours and days of work may be modified based on need.

APPENDIX A

APPENDIX A

SERIES 1 PAVEMENT

100 Local Residential Urban Street Section – 9 Ton
101 Through Local Residential Urban Street Section – 9 Ton
102 MSA Collector Urban Street Section – 10 Ton
103 Rural Residential Street – 9 Ton
104 Residential Cul-De-Sac Urban Section
105 Residential Cul-De-Sac Rural Section
106 Temporary Cul-De-Sac Urban Section
107 Bituminous Patch Section
108 Minimum Public Street Standards (Table)
109 Rural Driveway Standards
110 Local Residential Private Street Section - Ending in Cul-De-Sac
111 Local Residential Private Street Section - Thru

SERIES 2 WATER SYSTEM AND APPURTENANCES

200 Water Service Detail (2” and Less)
201 Water Service Detail (Greater than 2”)
202 Water Service Detail Boulevard
203 Thrust Block Detail
204 Watermain Concrete Blocking Quantities
205 Clow Medallion Hydrant
206 Hydrant & Valve Installation
207 Typical Resilient Wedge Valve & Box Installation – 10” & under Watermain
208 Typical Butterfly Valve & Box Installation – 12” & Over Watermain
209 Curb Stop Cover for Driveway Installation
210 Hydrant Tracer Wire Detail
213 PVC C900 Watermain Trench
214 Watermain Offset
215 Gate Valve Alignment Device
216 Gate Valve Extension Stem
217 Tracer Wire Sample Water Plan

SERIES 3 SANITARY SEWER AND APPURTENANCES

300 Sanitary Sewer Standard Manhole
301 Water Tight Seals
302 Shallow Sanitary Main Service Connection
303 Deep Sanitary Main Service Connection
304 Insulation for Water & Sanitary Sewer Pipe & Services
305 Standard Drop Manhole
306 Pipe Jacking Detail
307 Sanitary Sewer Manhole Frame and Casting
308 Internal Chimney Seal
309 Manhole Adjusting Rings
310 External Chimney Seal
312 Forcemain Air/Vacuum Valve

313 Forcemain Cleanout
314 Manhole Joint Seal
315 Tracer Wire Plan (Sewer)
316 Tracer Wire Service Detail
317 Tracer Wire Sewer Manhole Detail

SERIES 4 STORM SEWER APPURTENANCES

400 Slab-Top Manhole – Storm Sewer
401 Storm Sewer Manhole Deeper than 15’
402 Skimmer Structure
403 Skimmer Structures with Weir
404 Typical Treatment Basin
405 48 Inch Diameter Shallow Catch Basin
406 Standard Storm Manhole Catch Basin
407 Plate Style Grate for 48” Dia Outlet Structure
408 Standard Storm Manhole – Yard Inlet
409 27” Precast Catch Basin Yard Inlet
410 2’ x 3’ Catch Basin
411 Transverse Permeable Aggregate Base (PAB) Drain
412 Longitudinal Permeable Aggregate Base (PAB) Drain
414 Storm Manhole Adjustment Rings
MnDOT4143E Stool Grate & Concrete Frame
MnDOT 4180J Manhole or Catch Basin Step

SERIES 5 EROSION CONTROL AND LAND APPURTENANCES

500 Articulated Concrete Block at RCP Outlets
501 Articulated Concrete Block Mat Layout
502 Rip Rap at RCP Outlet
503 Silt Fence Installation
504 Erosion Control Blanket Installation on Cut Slope
505 Rock Construction Entrance
506 Drop Inlet Protection
507 Culvert Control End
508 Silt Sock
509 Silt Sock

SERIES 6 WALLS OR MISCELLANEOUS STRUCTURES

SERIES 7 CURB AND GUTTER AND SIDEWALK

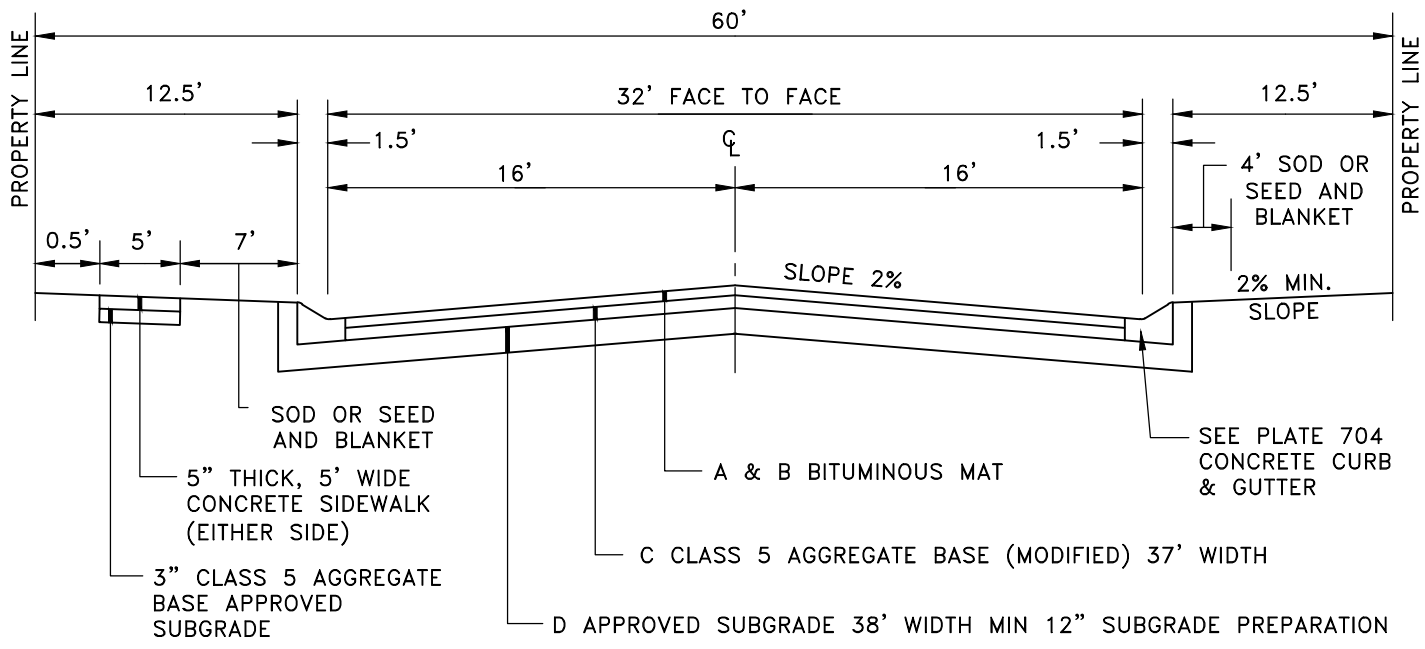
702 Concrete Cross Gutter
703 Curb and Gutter Construction at Catch Basins (B624)
704 Surmountable Concrete Curb & Gutter
705 Curb and Gutter Construction at Catch Basins (B618)
706 Typical Drop Curb – Bike Trail
707 Typical Section – Bike Trail
708 Concrete Approach Nose Detail
MnDOT 7035L Concrete Walk & Curb Returns at Entrances
MnDOT 7100 Concrete Curb & Gutter Design B & V

SERIES 8 BARRICADES, SIGNALS, MARKERS, ETC.

800 Lateral Offset and Vertical Clearance Type C & D Signs
801 Type C and D Sign Post
802A A-Frame and Stringer Bracing
802B A-Frame and Stringer Bracing
803 Marker Post Detail
805 Stop Sign and Street Name Sign Detail
806 Sign Post Detail
807 Temporary Cul-De-Sac Sign
808 Wetland Buffer Sign Installation
MnDOT 8002 Permanent Barricade

SERIES 9 MISCELLANEOUS

900 Location of Public Utilities
901 Mail Box Support



LEGEND					
AASHTO	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2360***	NON-WEAR 2360***	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
A-3	(R-70 ≤ 90,000)	** 1 1/2"	** 2"	** 8"	–
A-4	(R-20 ≤ 90,000)	1 1/2"	2"	8"	–
A-6	(R-15 ≤ 90,000)	1 1/2"	2"	8"	12"
A-7	(R-10 ≤ 90,000)	1 1/2"	2"	8"	18"
	(R-5 ≤ 90,000)	1 1/2"	2"	8"	24"

* SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER

** MINIMUM ALLOWABLE DESIGN THICKNESS

*** NEW CONSTRUCTION ASPHALT BINDER GRADE = B

NOTES:
R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD.

SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

LOCAL RESIDENTIAL
URBAN STREET SECTION – 9 TON

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 100
REVISED		

Dec 19, 2022 - 3:02pm
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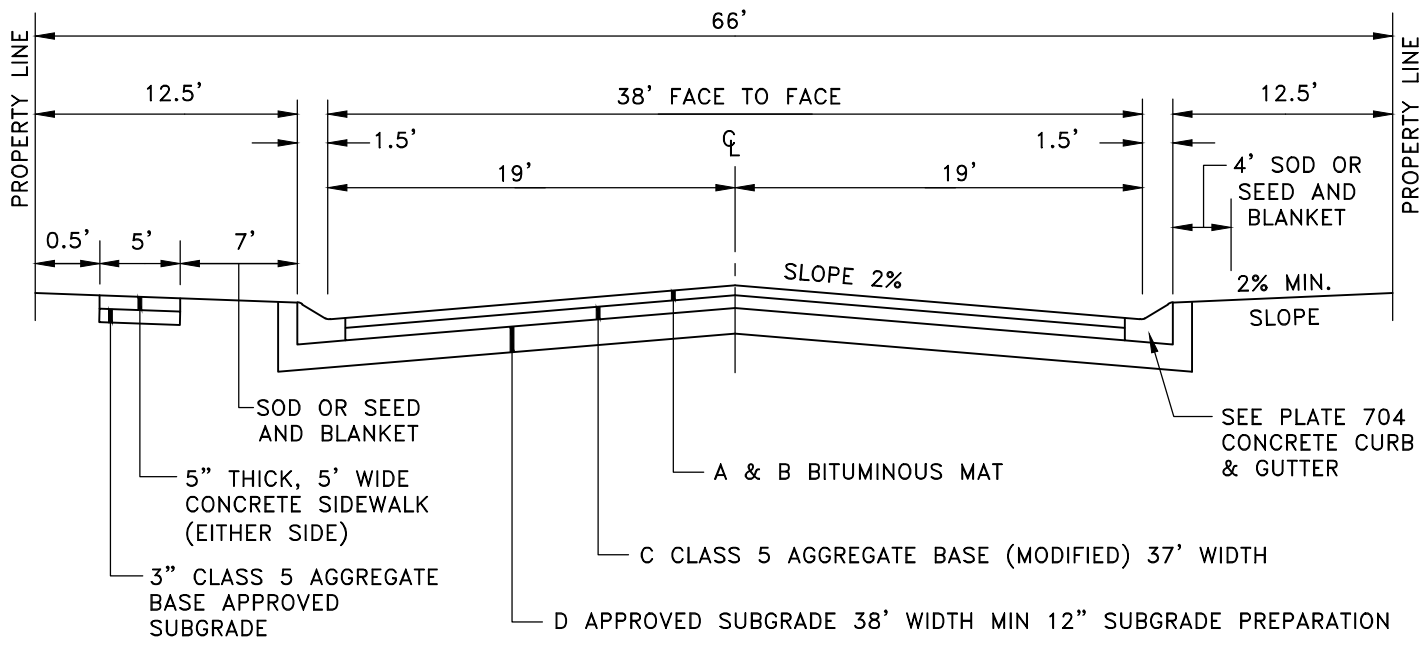

LEGEND					
AASHTO	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2360***	NON-WEAR 2360***	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
A-3	(R-70 ≤ 90,000)	** 1 1/2"	** 2"	** 8"	–
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* SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER

** MINIMUM ALLOWABLE DESIGN THICKNESS

*** NEW CONSTRUCTION ASPHALT BINDER GRADE = B

NOTES:
R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD

SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

THROUGH LOCAL RESIDENTIAL URBAN STREET SECTION – 9 TON

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 101
REVISED		

Dec 19, 2022 - 3:03pm
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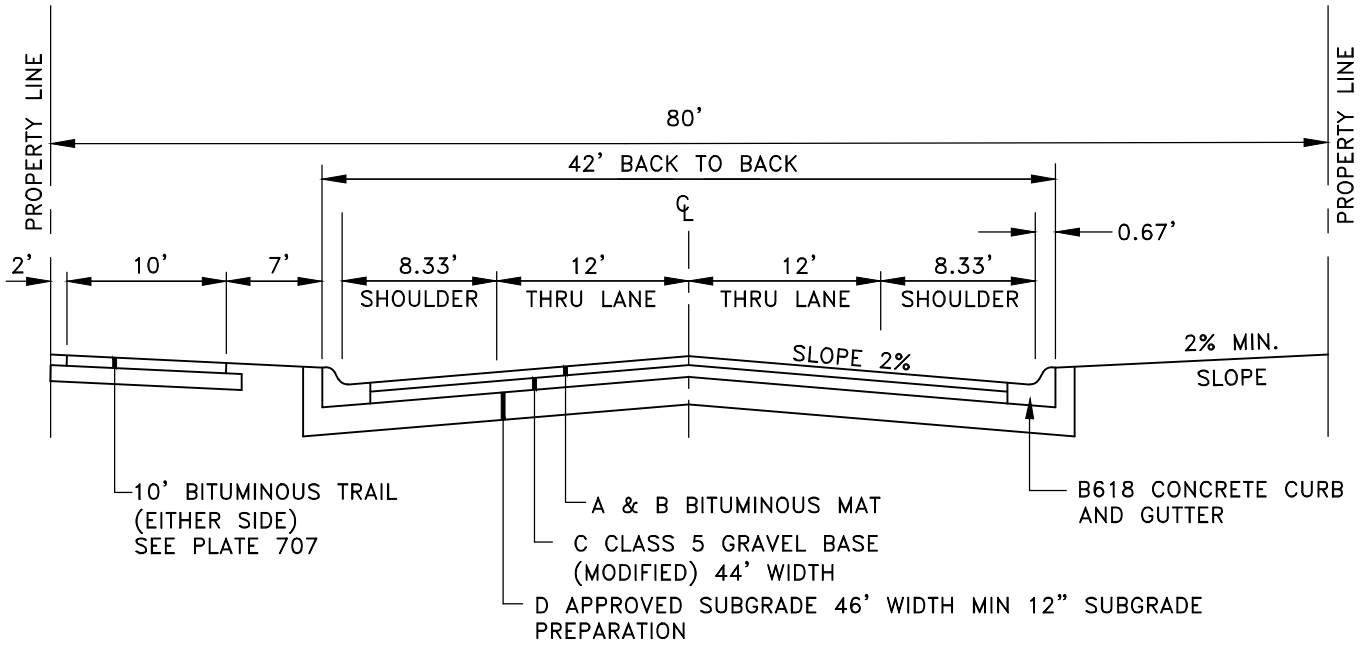

LEGEND					
AASHTO	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2360***	NON-WEAR 2360***	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
A-3	(R-70 ≤ 90,000)	** 2"	** 2 1/2"	** 8"	–
A-4	(R-20 ≤ 90,000)	2"	2 1/2"	8"	–
A-6	(R-15 ≤ 90,000)	2"	2 1/2"	8"	12"
A-7	(R-10 ≤ 90,000)	2"	2 1/2"	8"	18"
	(R-5 ≤ 90,000)	2"	2 1/2"	8"	24"

* SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER

** MINIMUM ALLOWABLE DESIGN THICKNESS

*** BASE COURSE ASPHALT BINDER GRADE = B
WEAR COURSE ASPHALT BINDER GRADE = C

NOTES:
R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD

SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

MSA COLLECTOR
URBAN STREET SECTION – 10 TON

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 102
REVISED		

Dec 19, 2022 – 3:03pm
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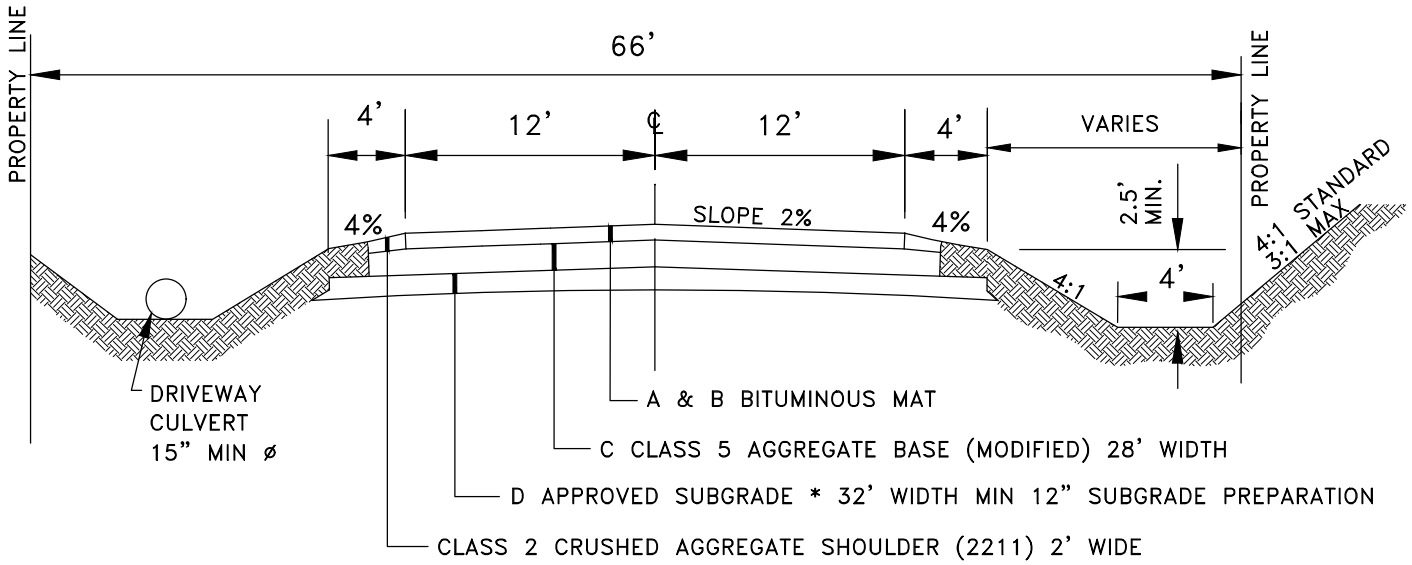

LEGEND					
AASHTO	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2360***	NON-WEAR 2360***	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
A-3	(R-70 ≤ 90,000)	** 1 1/2"	** 2"	** 8"	–
A-4	(R-20 ≤ 90,000)	1 1/2"	2"	8"	–
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* SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER

** MINIMUM ALLOWABLE DESIGN THICKNESS

*** NEW CONSTRUCTION ASPHALT BINDER GRADE = B

NOTES:
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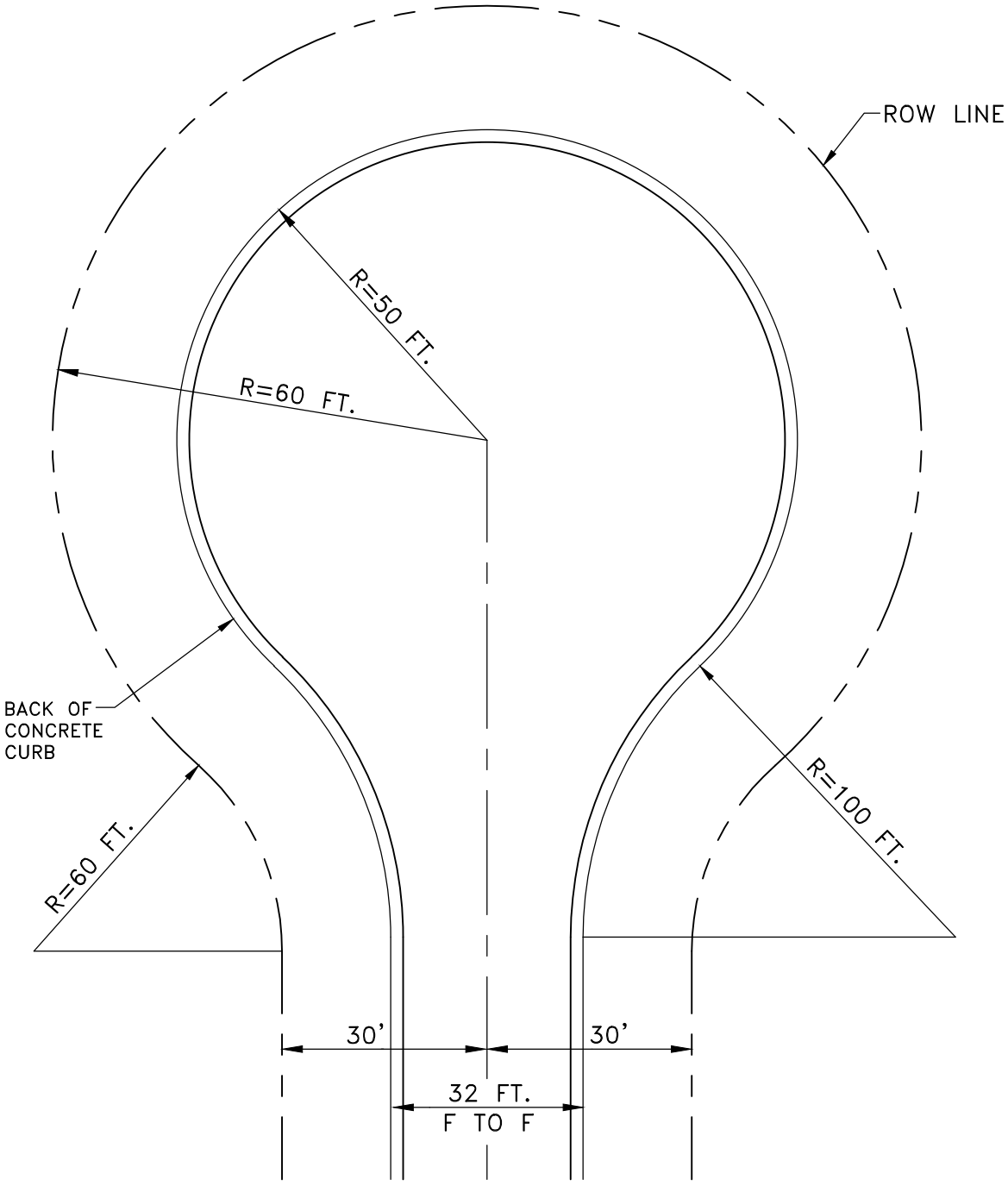
SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

RURAL RESIDENTIAL STREET

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 103
REVISED		



RESIDENTIAL CUL DE SAC
URBAN SECTION

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 104
REVISED		

Nov 15, 2022 - 11:16am
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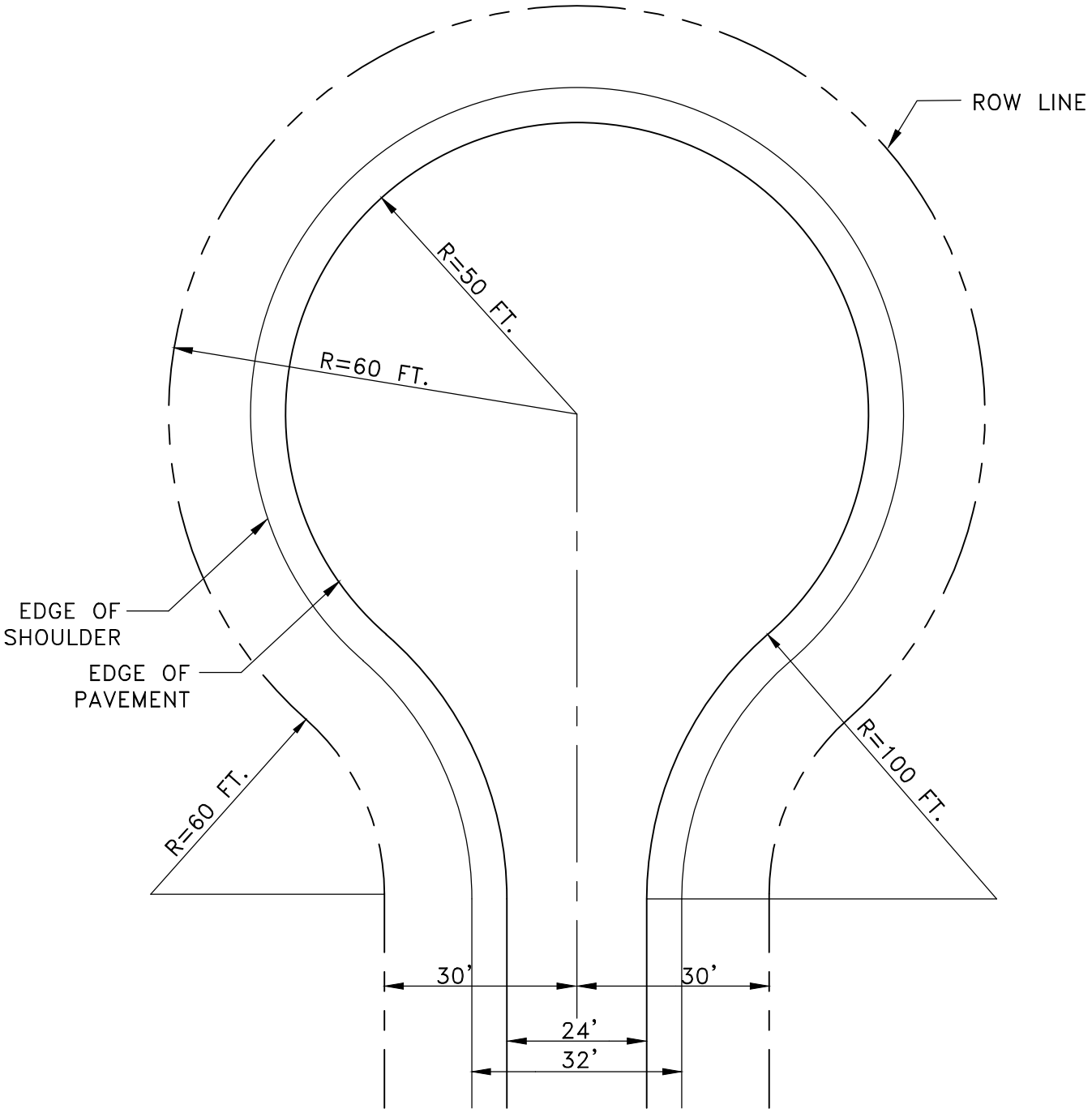

RESIDENTIAL CUL DE SAC
RURAL SECTION

NO SCALE

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REVISED		

Nov 15, 2022 - 11:17am
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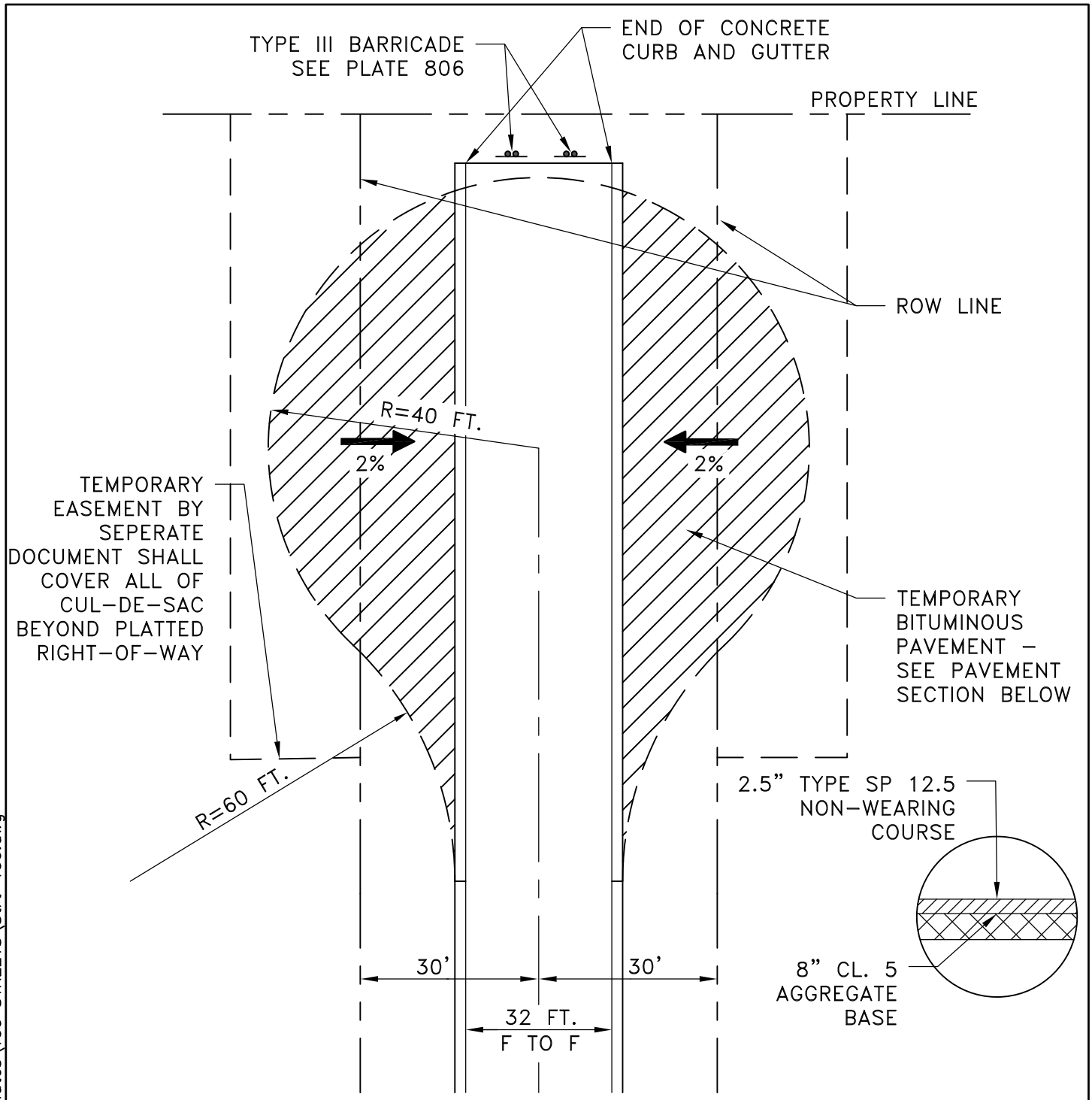

TEMPORARY CUL DE SAC
URBAN SECTION

NO SCALE

Dec 19, 2022 - 3:05pm
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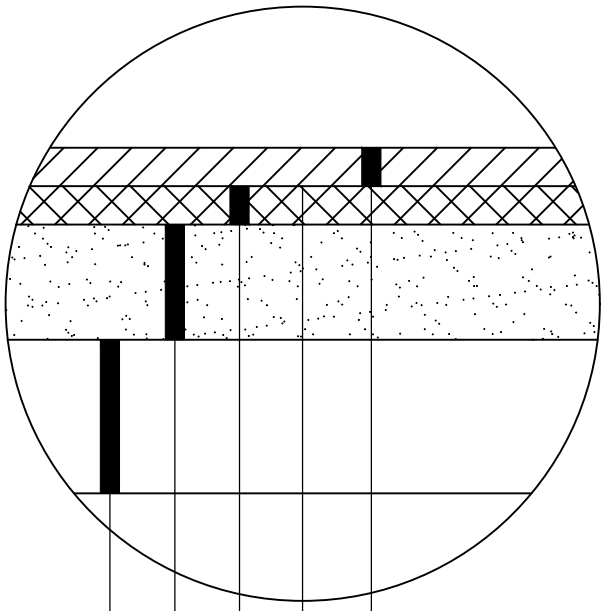
APPROVED	City of St. Francis	STANDARD PLATE NO. 106
REVISED		



2" TYPE SP 12.5 WEARING COURSE (SPWEB240B) (2360)

BITUMINOUS TACK COAT (2357)

2" TYPE SP 12.5 NON-WEARING COURSE (SPNWB230B) (2360)

8" AGGREGATE BASE CLASS 5 (2211)

12" SUBGRADE PREPARATION (2112) (INCIDENTAL)

BITUMINOUS PATCH SECTION

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 107
REVISED		

Nov 17, 2022 - 2:59pm
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APPROVED

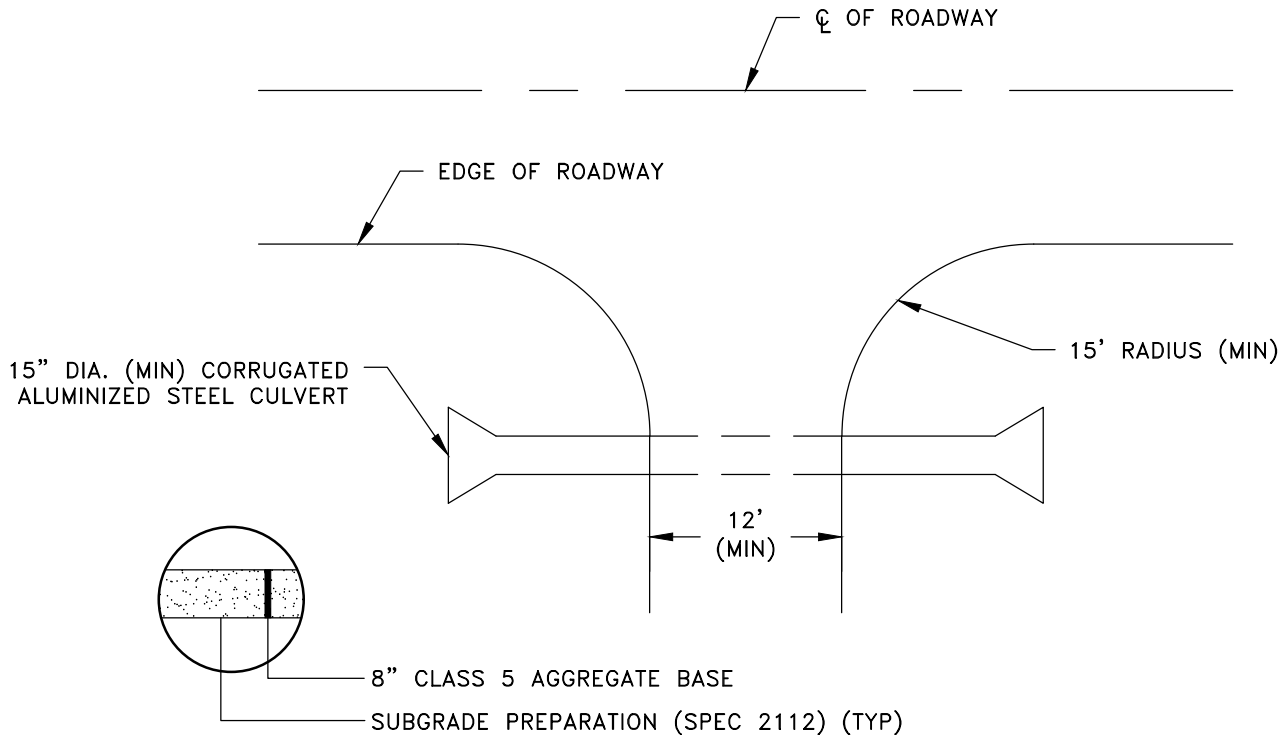
REVISED

City of St. Francis

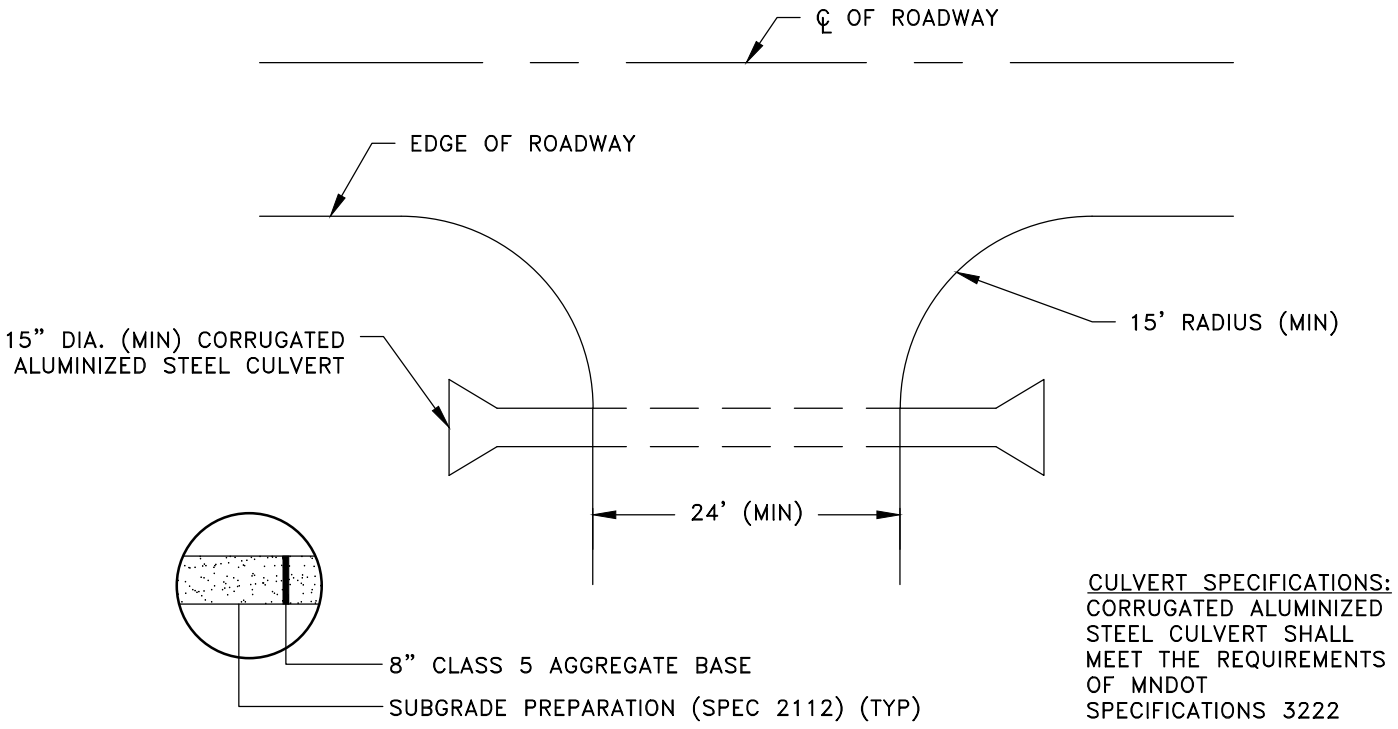
FUNCTIONAL CLASSIFICATION	F–F WIDTH (FT)	ROW WIDTH	PARKING LANES	MINIMUM ROADWAY SECTION
MINIMUM RESIDENTIAL	28’	50’	0	1.5” SPWEB240B 2.0” SPNWB230B 8.0” CLASS 5 AGGREGATE BASE 12.0” SUBGRADE PREPARATION
RESIDENTIAL STREET	32’	60’	1	1.5” SPWEB240B 2.0” SPNWB230B 8.0” CLASS 5 AGGREGATE BASE 12.0” SUBGRADE PREPARATION
THROUGH RESIDENTIAL STREET	38’	66’	2	1.5” SPWEB240B 2.0” SPNWB230B 8.0”/10.0” CLASS 5 AGGREGATE BASE 12.0” SUBGRADE PREPARATION
MINOR COLLECTOR	40’–44’ +	80’ +	2	1.5” SPWEB240C 3.5” SPNWB230B 8.0”/10.0” CLASS 5 AGGREGATE BASE 12.0” SUBGRADE PREPARATION
MAJOR COLLECTOR	VARIES	100’ +	2	4.0” SPWEB240C / SPWEB340C 2.0” SPNWB230F / SPNWB330B 10.0” CLASS 5 AGGREGATE BASE 12.0” SUBGRADE PREPARATION
HIGH DENSITY ARTERIAL	VARIES	100’ +	–	4.0” SPWEB340F 2.0” SPNWB330B 12.0” CLASS 5 AGGREGATE BASE 12.0” SUBGRADE PREPARATION

MINIMUM PUBLIC STREET STANDARDS

STANDARD PLATE NO. 108



RURAL DRIVEWAY UNDER 600' IN LENGTH



CULVERT SPECIFICATIONS:
CORRUGATED ALUMINIZED STEEL CULVERT SHALL MEET THE REQUIREMENTS OF MNDOT SPECIFICATIONS 3222

RURAL DRIVEWAY OVER 600' IN LENGTH

RURAL DRIVEWAY STANDARDS

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 109
REVISED		

Dec 19, 2022 - 3:06pm
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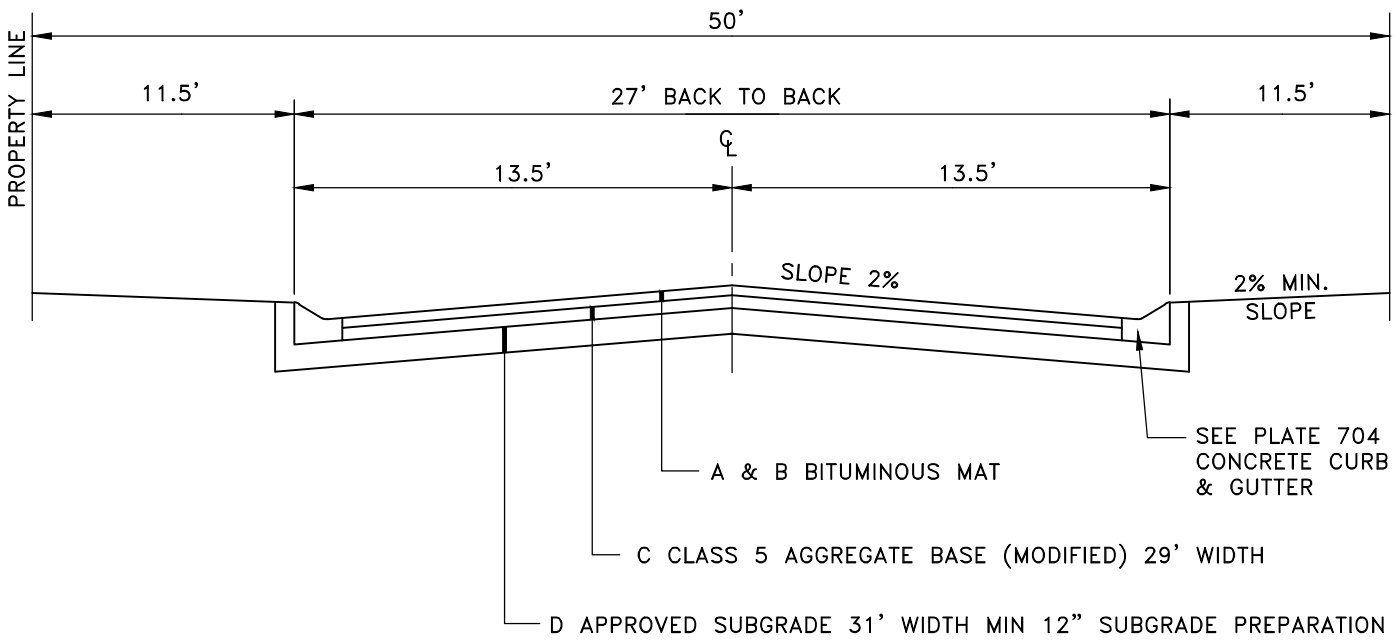

LEGEND					
AASHTO	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2360***	NON-WEAR 2360***	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
A-3	(R-70 ≤ 90,000)	** 1 1/2"	** 2"	** 8"	–
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A-7	(R-10 ≤ 90,000)	1 1/2"	2"	8"	18"
	(R-5 ≤ 90,000)	1 1/2"	2"	8"	24"

* SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER

** MINIMUM ALLOWABLE DESIGN THICKNESS

*** NEW CONSTRUCTION ASPHALT BINDER GRADE = B

NOTES:
R VALUE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD.

SIGMA N18 VALUE IS THE CUMULATIVE DAMAGE EFFECT OF VEHICLES DURING THE DESIGN LIFE OF A FLEXIBLE PAVEMENT.

LOCAL RESIDENTIAL
PRIVATE STREET SECTION – ENDING IN CUL-DE-SAC

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 110
REVISED		

Apr 27, 2023 – 11:45am
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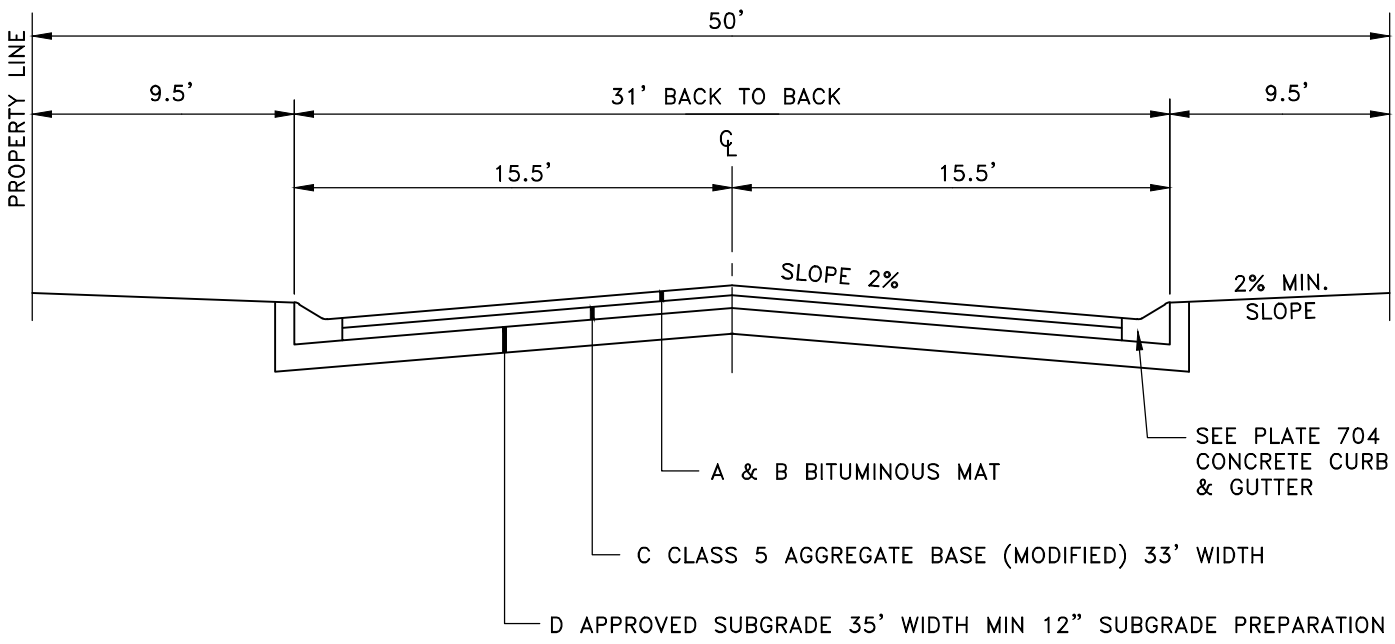

LEGEND					
AASHTO	R VALUE SIGMA N18	BITUMINOUS SURFACE		AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2360***	NON-WEAR 2360***	CLASS 5 OR 6 3138 C*	CLASS 3 OR 4 3138 D*
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LOCAL RESIDENTIAL
PRIVATE STREET SECTION – THRU

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 111
REVISED		

Apr 27, 2023 – 11:46am
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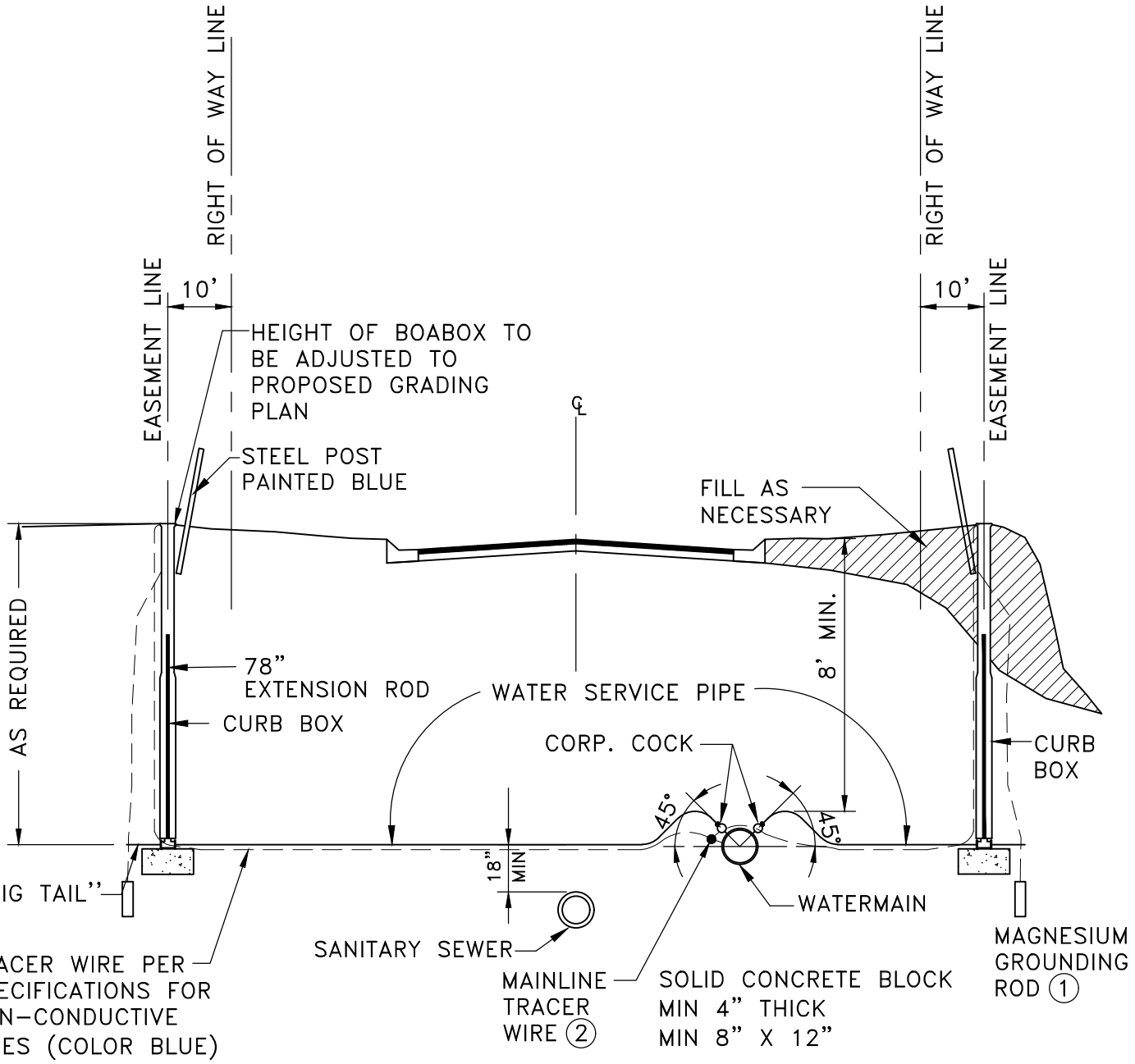


REFERENCE NOTES:

(1) GROUNDING ROD SHALL HAVE RED WIRE CONNECTED THAT TERMINATES IN BOABOX.

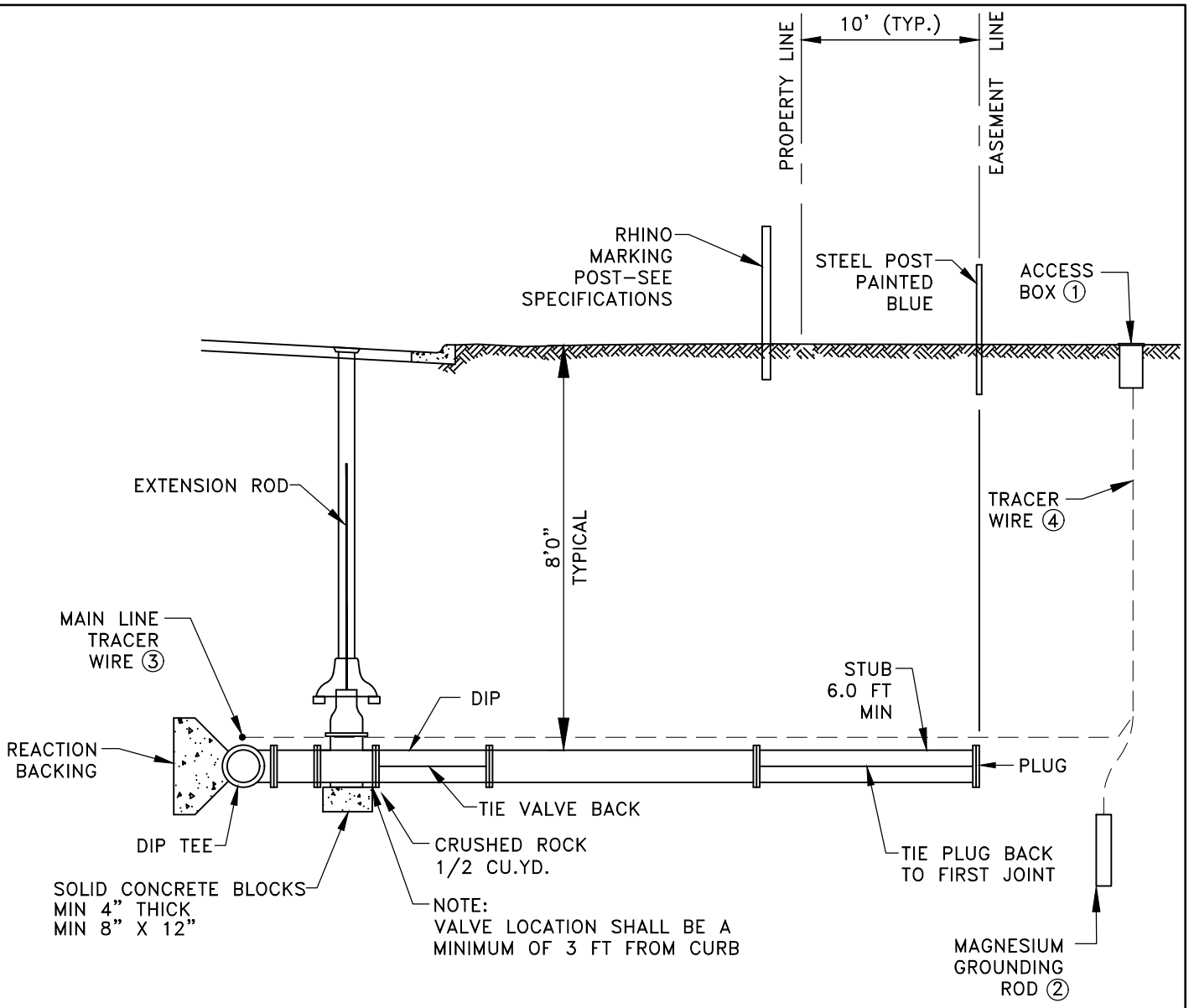
(2) CONNECT TO MAIN LONE TRACER WIRE WITH A THREE-WAY LUG CONNECTIONS.

WATER SERVICE DETAIL

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 200
REVISED		

Dec 19, 2022 - 3:07pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\200 WATER\W-200.dwg



REFERENCE NOTES:

① ACCESS BOX SHALL BE A COPPERHEAD INDUSTRIES 36 INCHES LONG WITH 2–3/4 INCHES ID ABS SHAFT, CAST IRON PENTAGONAL LOCKING LID, ENCAPSULATED MAGNETIC BEACON, INTERNAL SWIVEL TRACER WIRE CONNECTION LUG, AND ARCHED BASE TO RESIST PULL–OUT OR OTHER WHICH MEETS THE REQUIREMENTS OF THIS SPECIFICATION. ACCESS BOX LIDS SHALL BE COLOR CODED BLUE FOR WATERMAIN AND LOCATION SHALL BE DEPICTED ON THE UTILITY PLAN

② GROUNDING ROD SHALL HAVE RED WIRE THAT TERMINATES IN ACCESS BOX. PROVIDE 18" OF SLACK IN ACCESS BOX.

③ CONNECT TO THE MAIN LINE TRACER WIRE WITH A THREE–WAY LUG CONNECTOR.

④ PROVIDE 12 INCHES OF SLACK IN ACCESS BOX. STRIP 1 INCH OF WIRE AND ATTACH TO TERMINAL CONNECTORS.

GREATER THAN 2" SERVICES

WATER SERVICE DETAIL STREET

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 201

Dec 19, 2022 – 3:07pm
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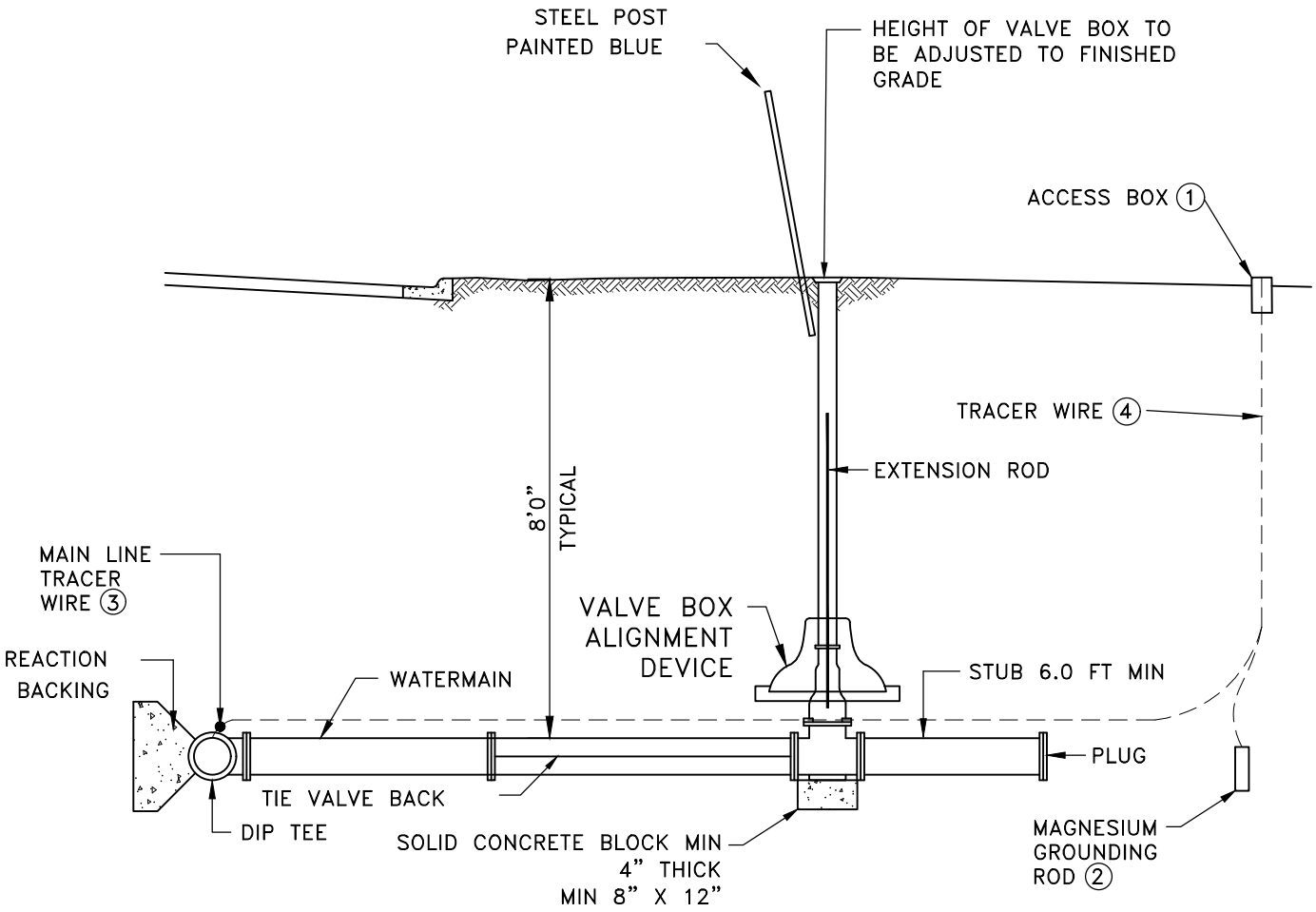

REFERENCE NOTES:

① ACCESS BOX SHALL BE A COPPERHEAD INDUSTRIES 36 INCHES LONG WITH 2-3/4 INCHES ID ABS SHAFT, CAST IRON PENTAGONAL LOCKING LID, ENCAPSULATED MAGNETIC BEACON, INTERNAL SWIVEL TRACER WIRE CONNECTION LUG, AND ARCHED BASE TO RESIST PULL-OUT OR OTHER WHICH MEETS THE REQUIREMENTS OF THIS SPECIFICATION. ACCESS BOX LIDS SHALL BE COLOR CODED BLUE FOR WATERMAIN AND LOCATION SHALL BE DEPICTED ON THE UTILITY PLAN.

② GROUNDING ROD SHALL HAVE RED WIRE THAT TERMINATES IN ACCESS BOX. PROVIDE 18" OF SLACK IN ACCESS BOX.

③ CONNECT TO THE MAIN LINE TRACER WIRE WITH A THREE-WAY LUG CONNECTOR.

④ PROVIDE 12 INCHES OF SLACK IN ACCESS BOX. STRIP 1 INCH OF WIRE AND ATTACH TO TERMINAL CONNECTORS.

GREATER THAN 2" SERVICES

WATER SERVICE DETAIL BOULEVARD

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 202

Dec 19, 2022 - 3:07pm
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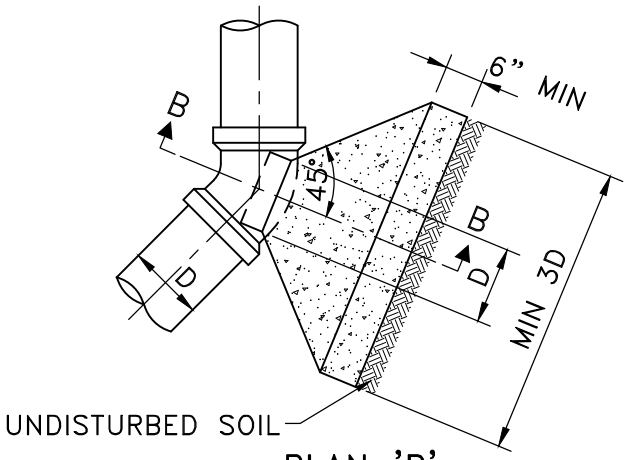
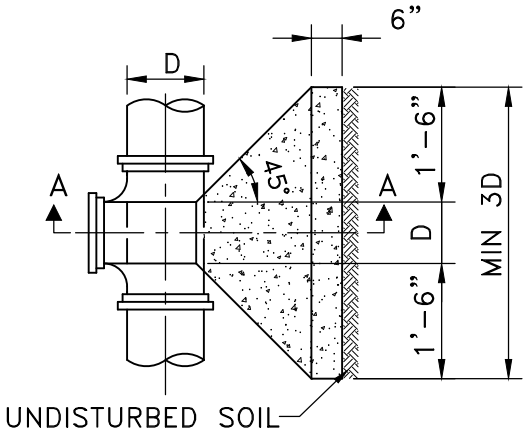
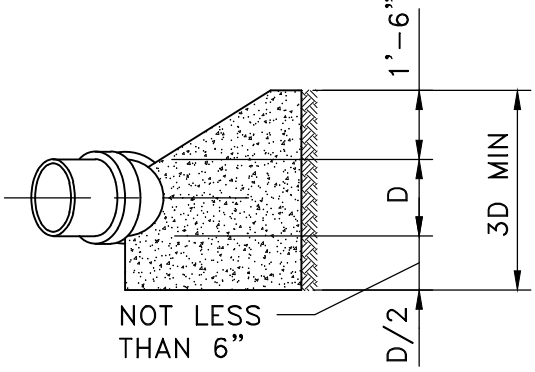


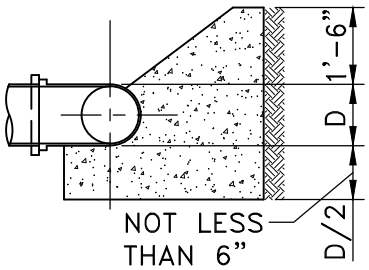
PLAN 'B'
AT BEND



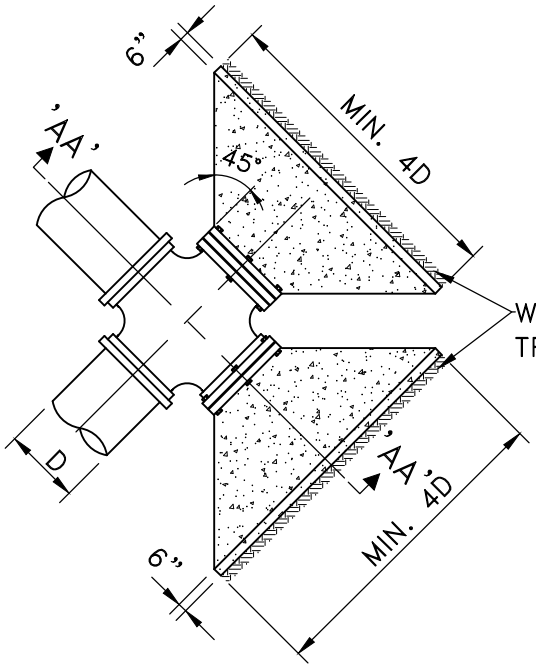
PLAN 'A'



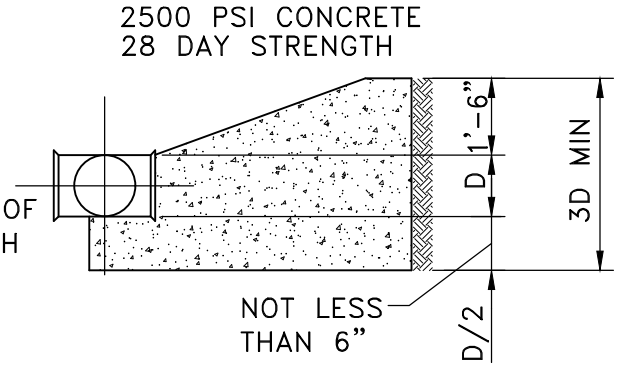
SECTION 'B'
AT BEND



SECTION 'A'



PLAN 'AA'



SECTION 'AA'

COVER FITTING ENCASED IN CONCRETE WITH POLYETHYLENE OR BUILDING PAPER PRIOR TO POURING

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 203

PIPE SIZE	TEE or PLUG	CROSS W/ 2 PLUGS (i.e. 90° BEND)	1/8 BEND (45° BEND) AND 1/16 BEND (22.5°)
6”	0.22 CuYds	0.15 CuYds	0.05 CuYds
8”	0.27 CuYds	0.29 CuYds	0.08 CuYds
10”	0.32 CuYds	0.48 CuYds	0.14 CuYds
12”	0.37 CuYds	0.73 CuYds	0.21 CuYds
16”	0.53 CuYds	1.73 CuYds	0.49 CuYds
20”	0.82 CuYds	3.36 CuYds	0.95 CuYds
24”	1.34 CuYds	5.77 CuYds	1.63 CuYds

NOTE:

1. COVER FITTINGS ENCASED IN CONCRETE WITH POLYETHYLENE OR BUILDING PAPER PRIOR TO POURING.
2. CONCRETE BLOCKING SHALL BE POURED AGAINST FIRM, UNDISTURBED GROUND.
3. CONCRETE SHALL MEET THE REQUIREMENTS FOR GRADE B CONCRETE IN CONFORMANCE WITH Mn/DOT 2461.
4. ALL METAL PARTS OF TIE ROD OR STRAP TYPE RESTRAINTS SHALL BE GALVANIZED OR COATED WITH ASPHALTIC TYPE RUSTPROOFING.

WATERMAIN CONCRETE BLOCKING QUANITIES

Nov 11, 2022 - 10:17am
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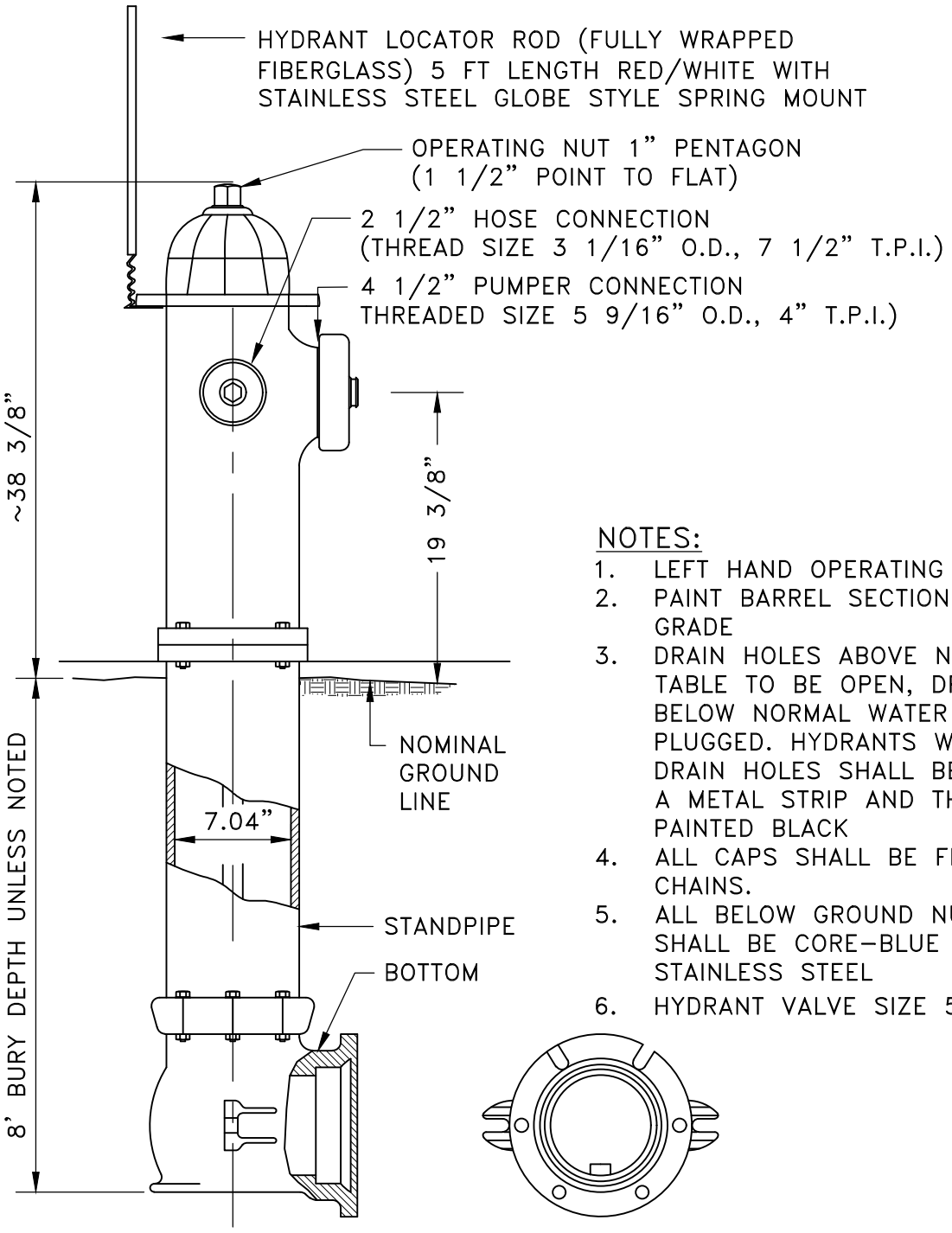
APPROVED	City of St. Francis	STANDARD PLATE NO. 204
REVISED		



NOTES:

1. LEFT HAND OPERATING NUT
2. PAINT BARREL SECTION RED TO GRADE
3. DRAIN HOLES ABOVE NORMAL WATER TABLE TO BE OPEN, DRAIN HOLES BELOW NORMAL WATER TABLE TO BE PLUGGED. HYDRANTS WITH PLUGGED DRAIN HOLES SHALL BE TAGGED WITH A METAL STRIP AND THE NOZZLE PAINTED BLACK
4. ALL CAPS SHALL BE FITTED WITH CHAINS.
5. ALL BELOW GROUND NUTS AND BOLTS SHALL BE CORE-BLUE OR 316 STAINLESS STEEL
6. HYDRANT VALVE SIZE $5\frac{1}{4}$"

CLOW MEDALLION HYDRANT

(OR APPROVED EQUAL)
NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 205
REVISED		

Dec 19, 2022 - 3:08pm
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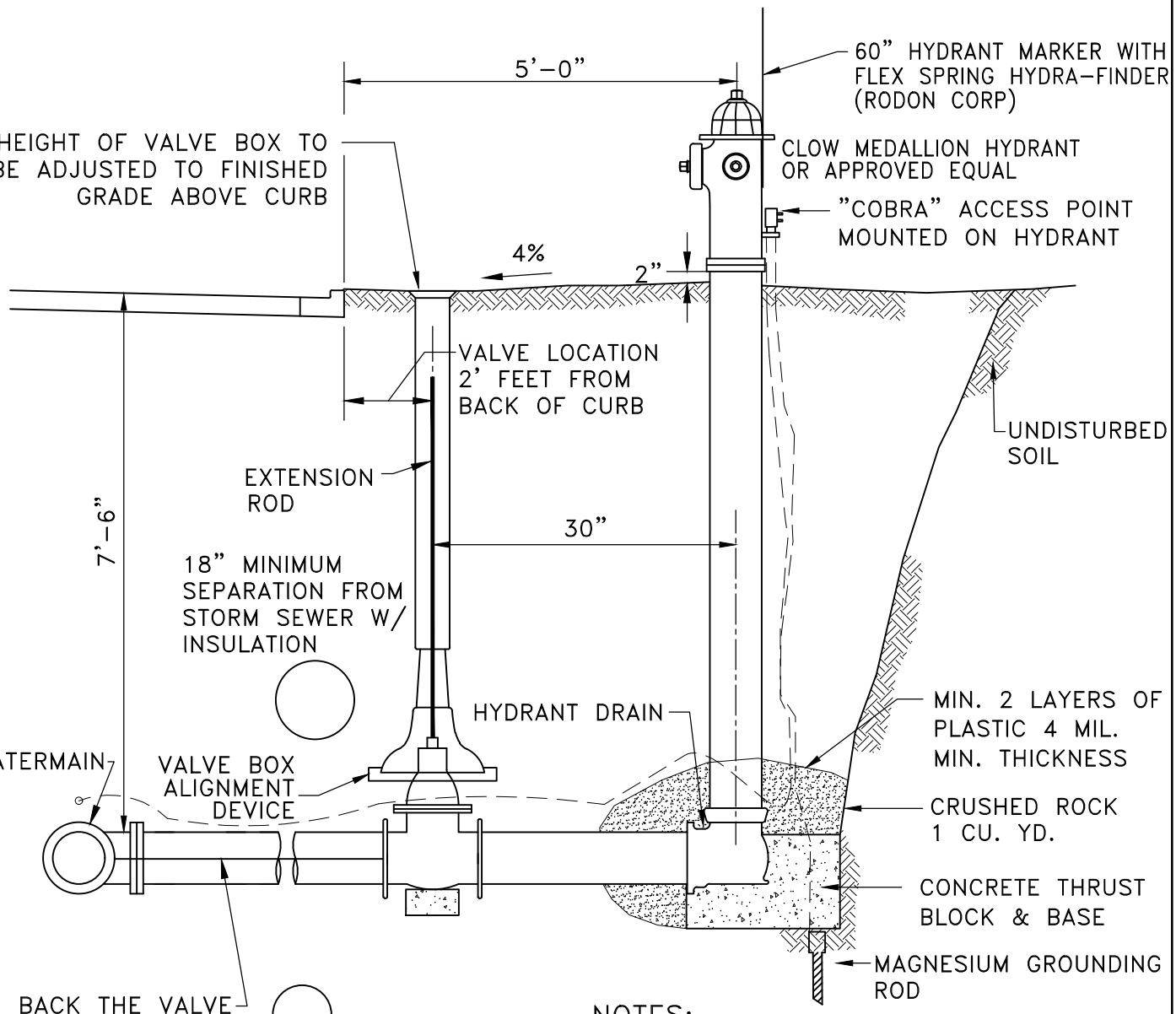

NOTES:

1. HYDRANT DRAINS BELOW WATER TABLE TO BE PLUGGED AND THE HYDRANT TAGGED WITH METAL STRIP AND THE NOZZLE PAINTED BLACK.
2. ALL BELOW GROUND NUTS, BOLTS, AND RODDING SHALL BE CORE-BLUE OR 316 STAINLESS STEEL.

HYDRANT AND VALVE INSTALLATION

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE No. 206
REVISED		

Dec 19, 2022 - 3:08pm
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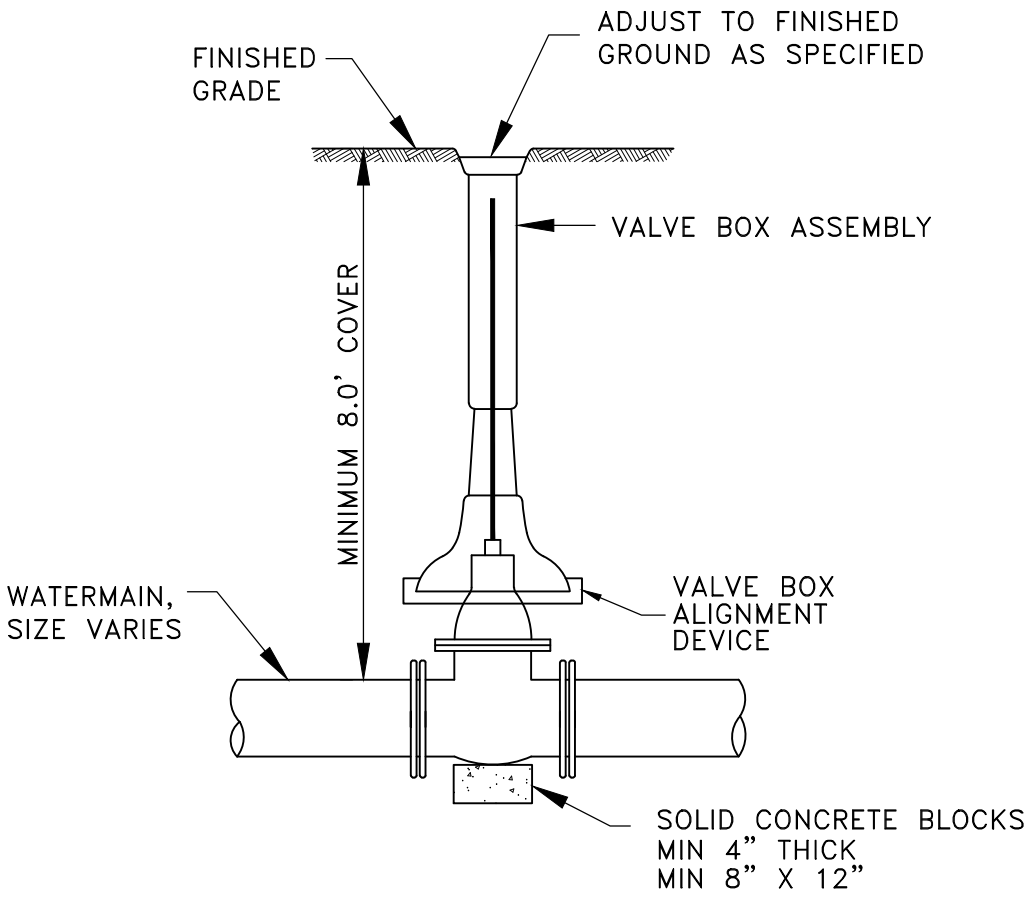


NOTES:

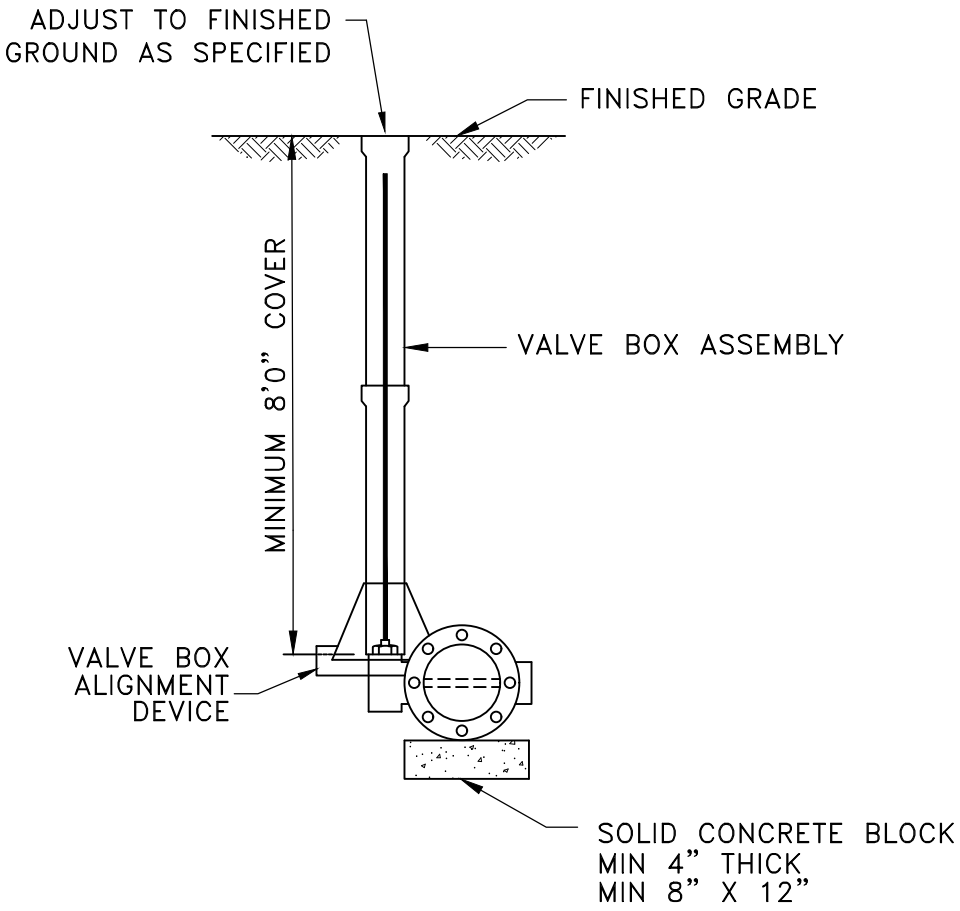
1. ALL VALVES SHALL BE FITTED WITH EXTENSION STEMS. TO BRING THE OPERATING NUT TO BE 12" FROM THE SURFACE.
2. ALL BELOW GROUND NUTS, BOLTS, AND RODDING SHALL BE CORE-BLUE OR 316 STAINLESS STEEL.

TYPICAL RESILIENT WEDGE VALVE & BOX INSTALLATION 10" & UNDER WATERMAIN

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 207
REVISED		

Nov 11, 2022 - 10:27am
K:\cad_eng\Details\ST FRANCIS\Standard plates\200 WATER\W-207.dwg



NOTES:

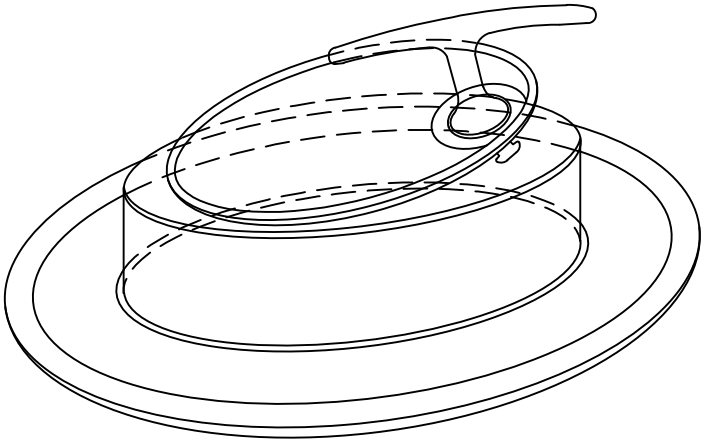
1. ALL VALVES SHALL BE FITTED WITH EXTENSION STEMS TO BRING THE OPERATING NUT TO BE 12" FROM THE SURFACE.
2. ALL BELOW GROUND NUTS, BOLTS, AND RODDING SHALL BE CORE-BLUE OR 316 STAINLESS STEEL

TYPICAL BUTTERFLY VALVE & BOX INSTALLATION 12" & OVER WATERMAIN

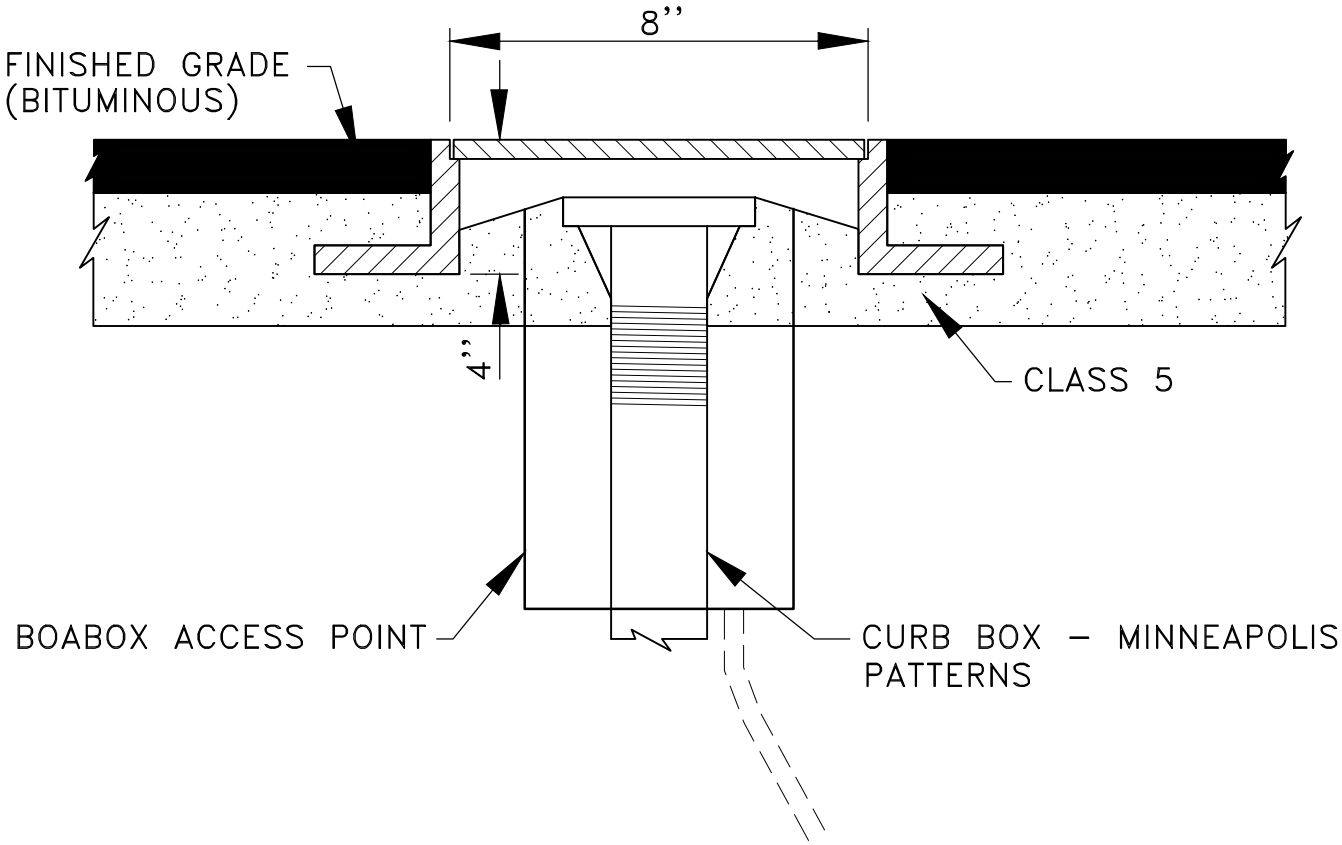
NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 208
REVISED		

Nov 11, 2022 - 10:28am
K:\cad_eng\Details\ST FRANCIS\Standard plates\200 WATER\W-208.dwg



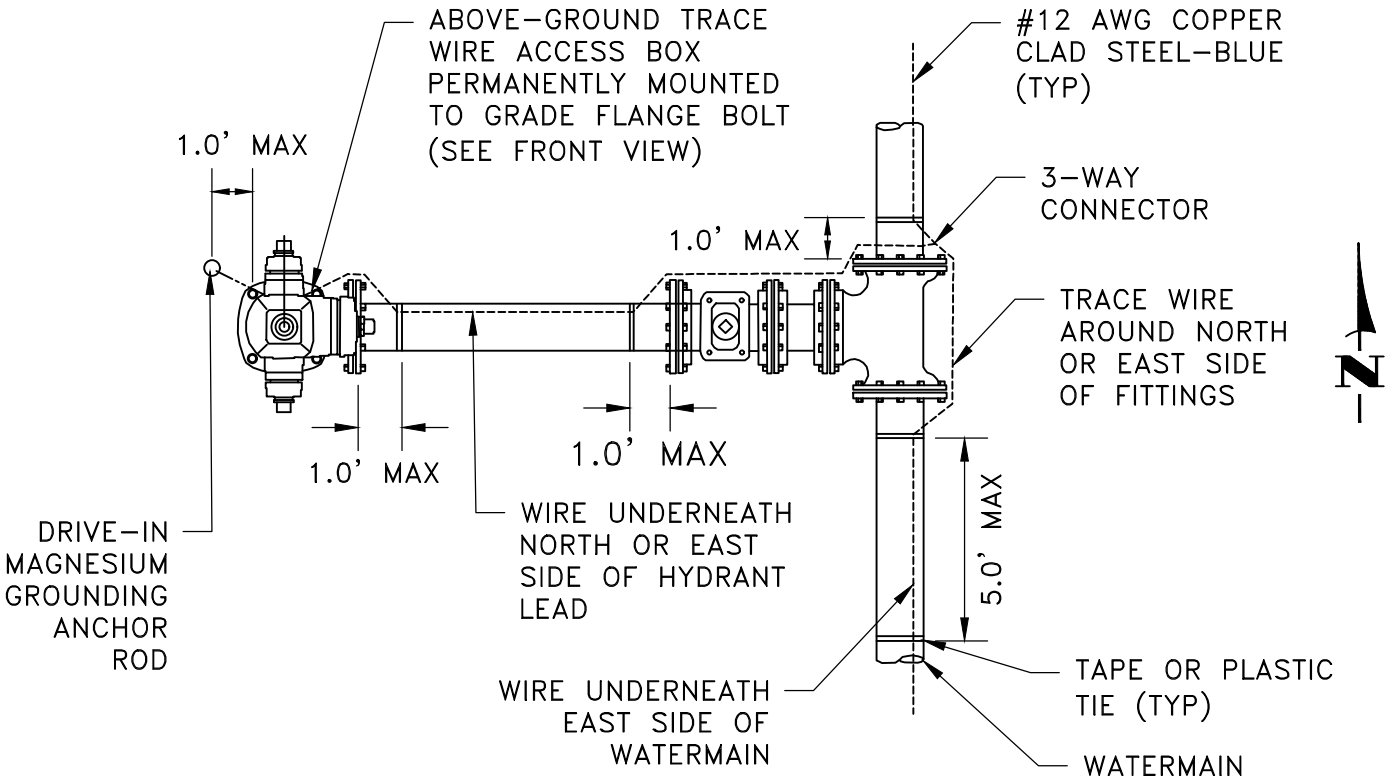
FORD SERIES A LID COVER



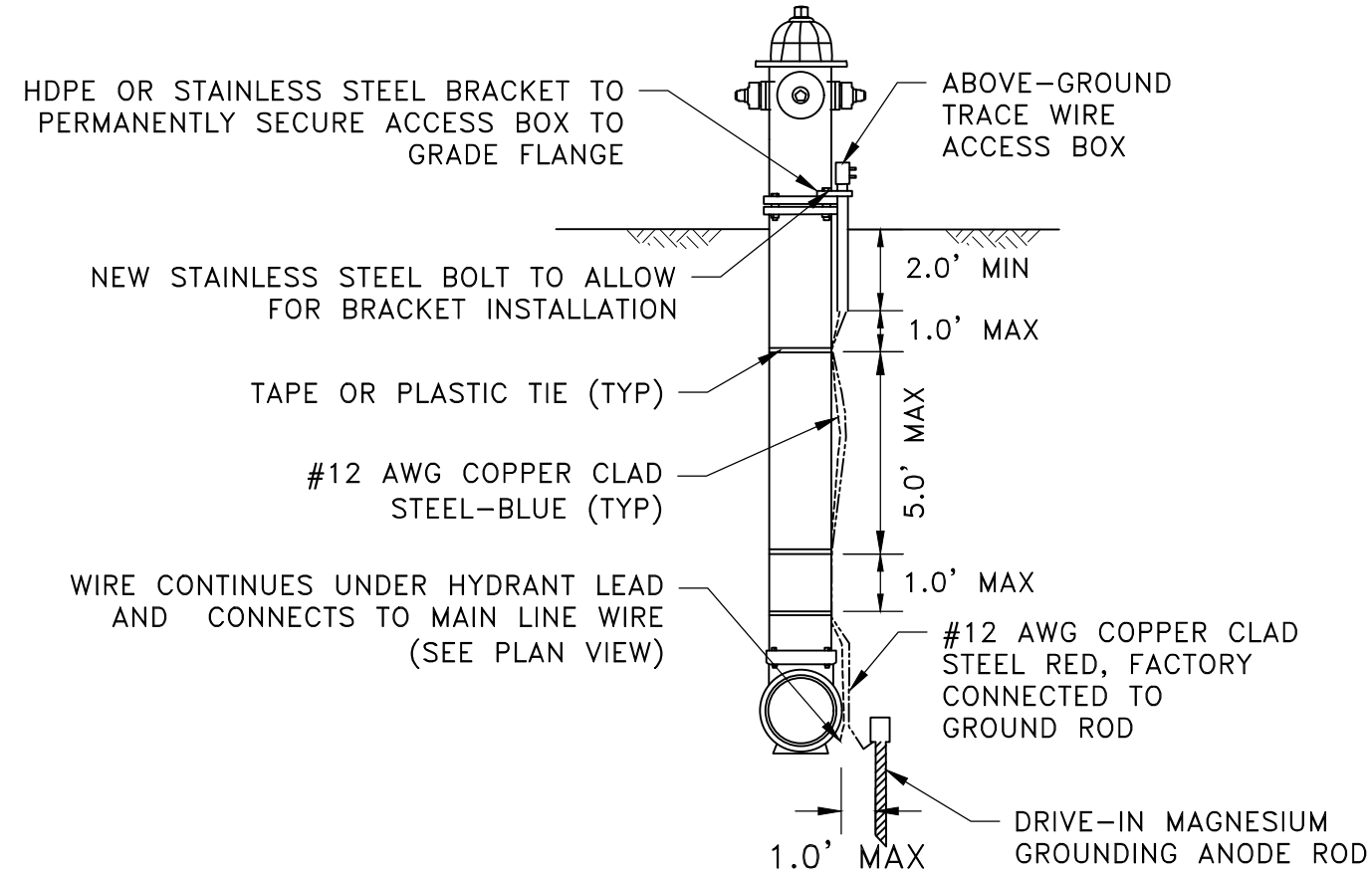
CURB STOP COVER FOR DRIVEWAY INSTALLATION

NO SCALE

APPROVED		STANDARD PLATE NO. 209
REVISED	City of St. Francis	



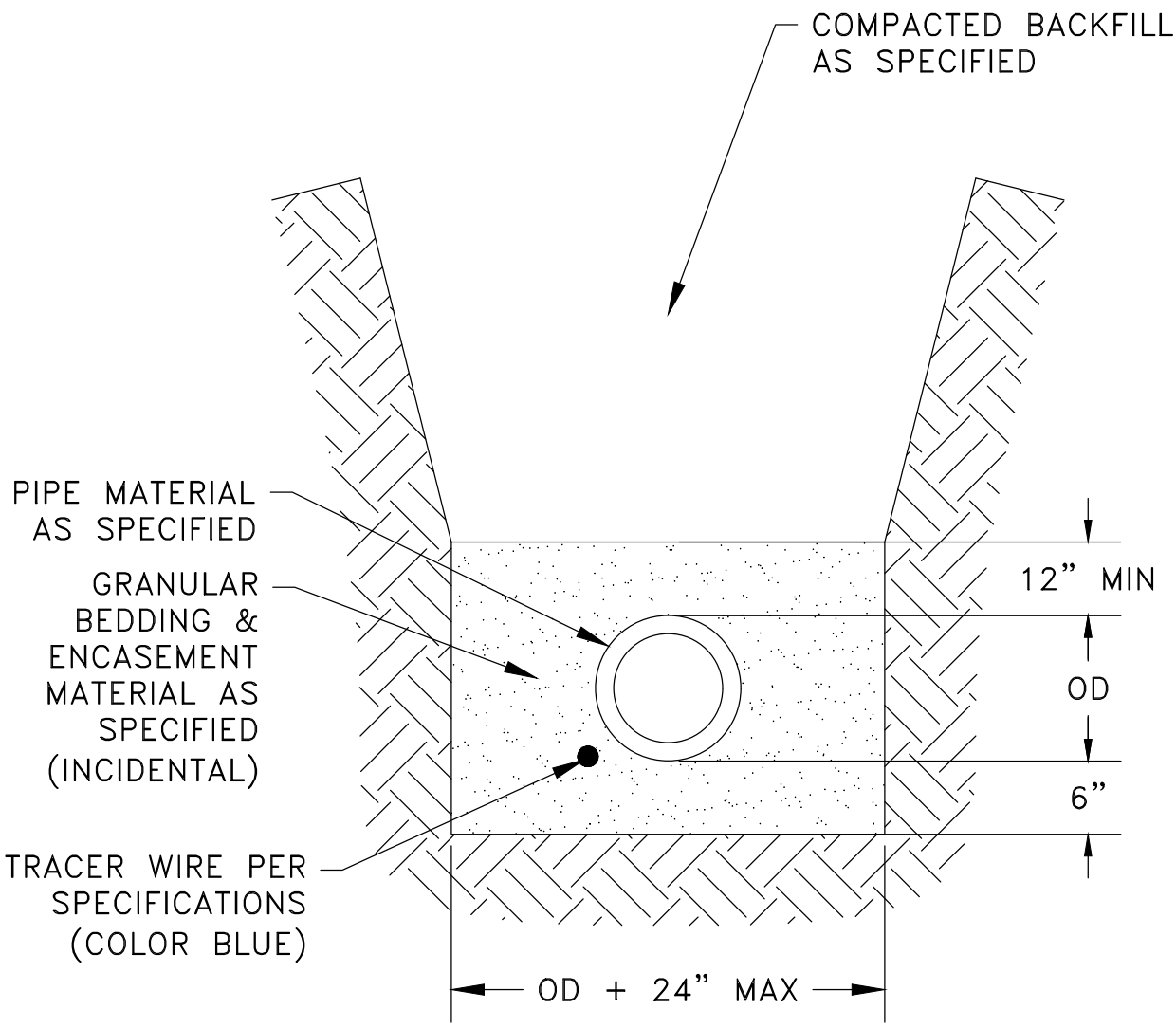
HYDRANT – PLAN VIEW



TRACER WIRE DETAIL
NO SCALE

HYDRANT – SECTION VIEW

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 210



PVC C-900 WATERMAIN TRENCH

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 213

Nov 17, 2022 - 3:00pm
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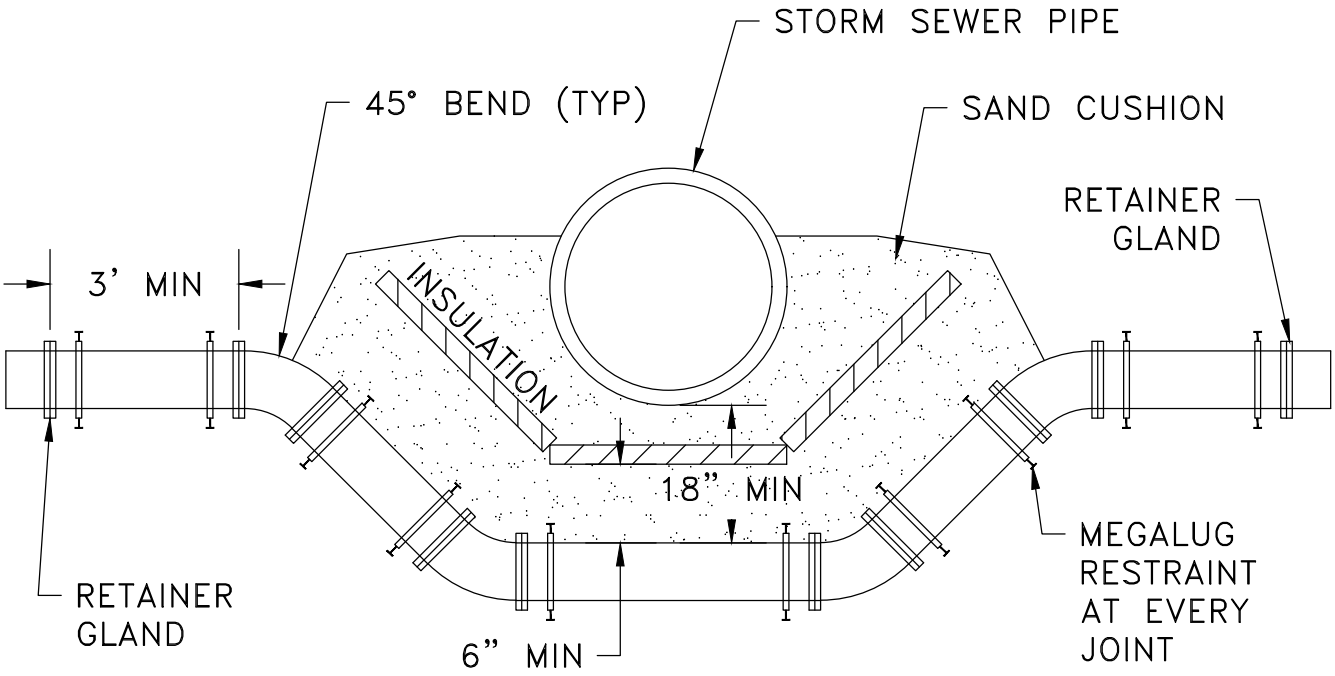


NOTES:

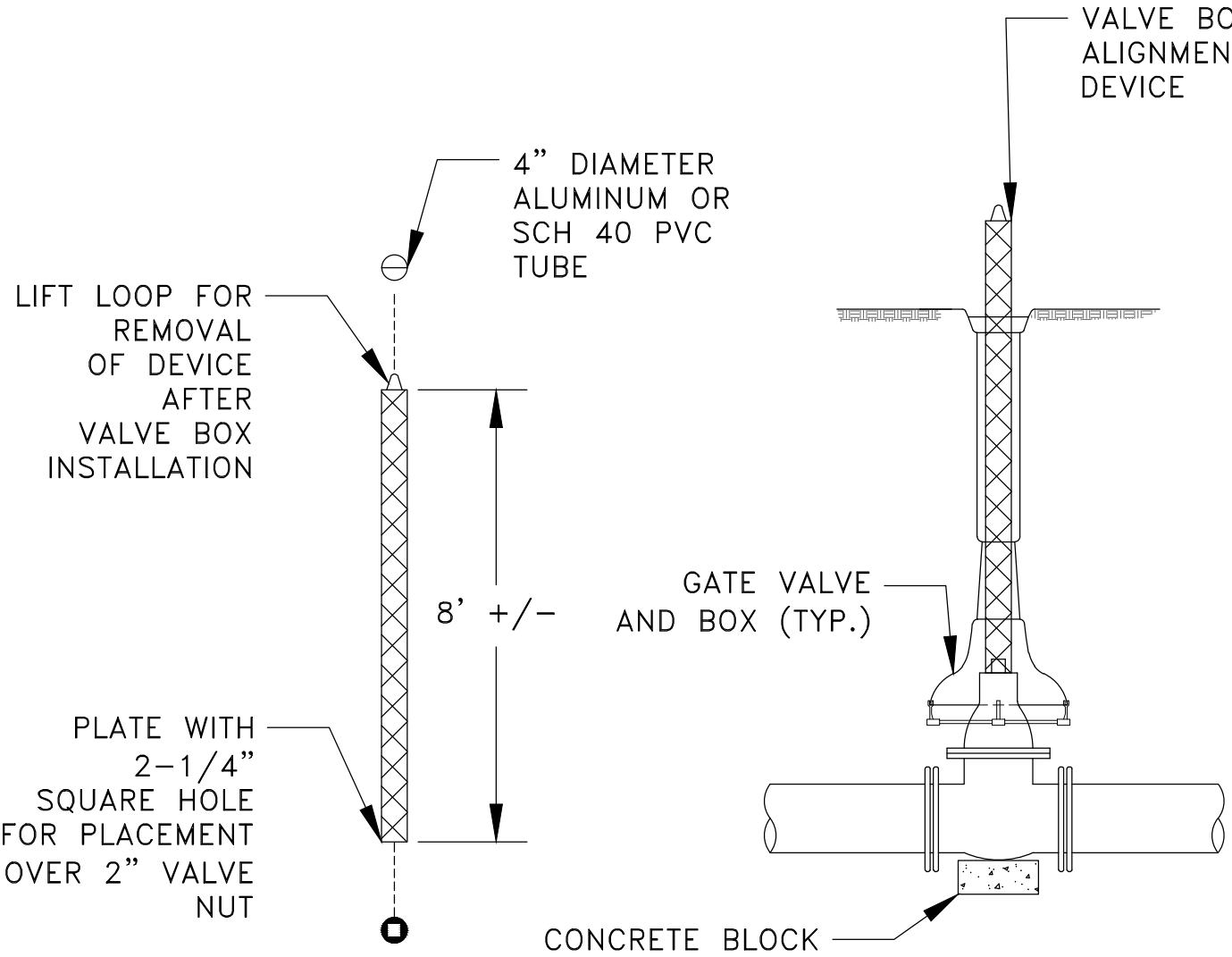
1. PROVIDE MEGALUG RESTRAINT AT JOINTS ON BENDS AND AS SHOWN ON DETAIL.
2. COAT ALL ANCHORAGE AS PER SPECIFICATIONS.
3. PROVIDE SAND CUSHION BETWEEN TOP OF WATERMAIN AND BOTTOM OF SEWER PIPE, MINIMUM DIMENSIONS AS SHOWN ON DETAIL (INCIDENTAL).
4. INSULATION TO BE 4" THICK POLYSTYRENE.
5. IN AREAS OF GREATER LONGITUDINAL SPACE, THE WATERMAIN SHALL BE GRADUALLY LOWERED AND RAISED, USING NO BENDS, OVER A DISTANCE OF 200 FEET.

WATERMAIN OFFSET

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 214
REVISED		

Dec 27, 2022 - 7:58pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\200 WATER\W-214.dwg



NOTE:
1. ALIGNMENT DEVICE TO BE LEFT IN PLACE UNTIL BACKFILL OPERATIONS ARE COMPLETE.

GATE VALVE ALIGNMENT DEVICE

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 215
REVISED		

Dec 27, 2022 - 7:59pm
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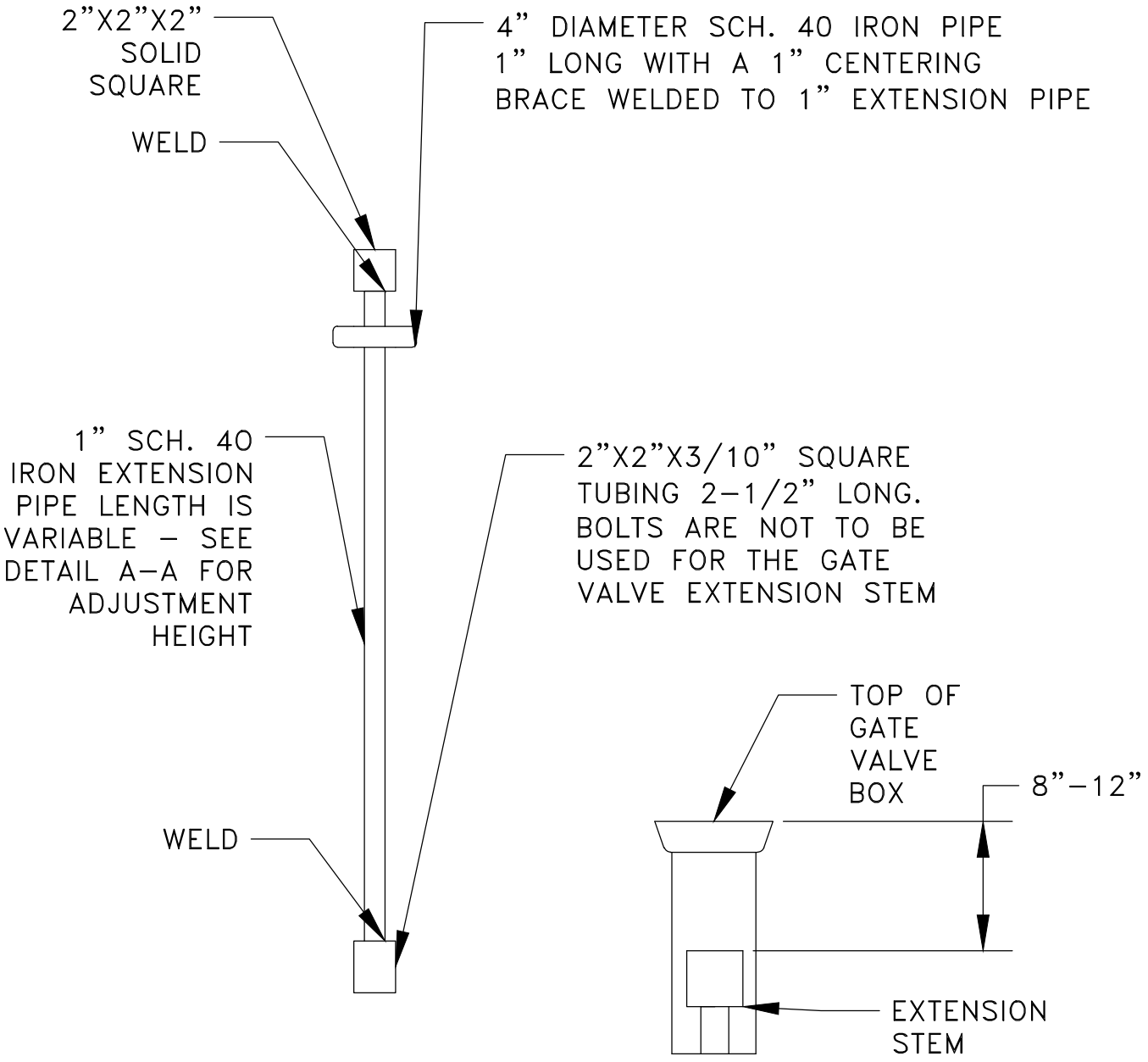

DETAIL A–A

NOTE:

1. AFTER FABRICATION, THE ENTIRE GATE VALVE EXTENSION STEM SHALL BE PAINTED WITH A SHOP APPLIED PRIMER AND EXTERIOR EPOXY PAINT.

GATE VALVE EXTENSION STEM

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 216
REVISED		

Dec 27, 2022 – 8:00pm
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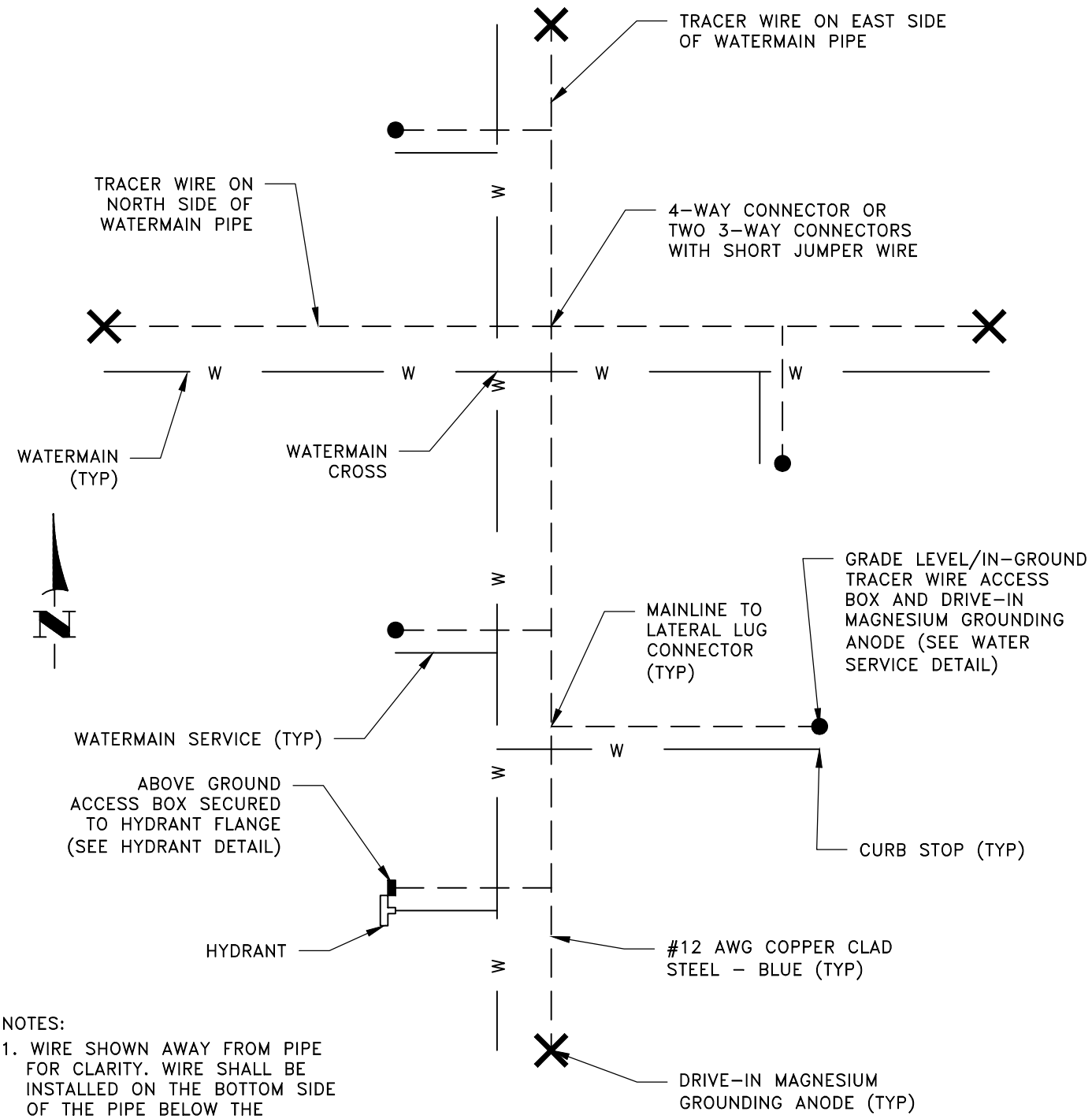

NOTES:

1. WIRE SHOWN AWAY FROM PIPE FOR CLARITY. WIRE SHALL BE INSTALLED ON THE BOTTOM SIDE OF THE PIPE BELOW THE SPRING LINE. THE WIRE SHALL BE FASTENED TO THE PIPE WITH TAPE OR PLASTIC TIES AT 5' INTERVALS

TRACER WIRE SAMPLE WATER PLAN

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 217
REVISED		

Dec 27, 2022 - 8:01pm
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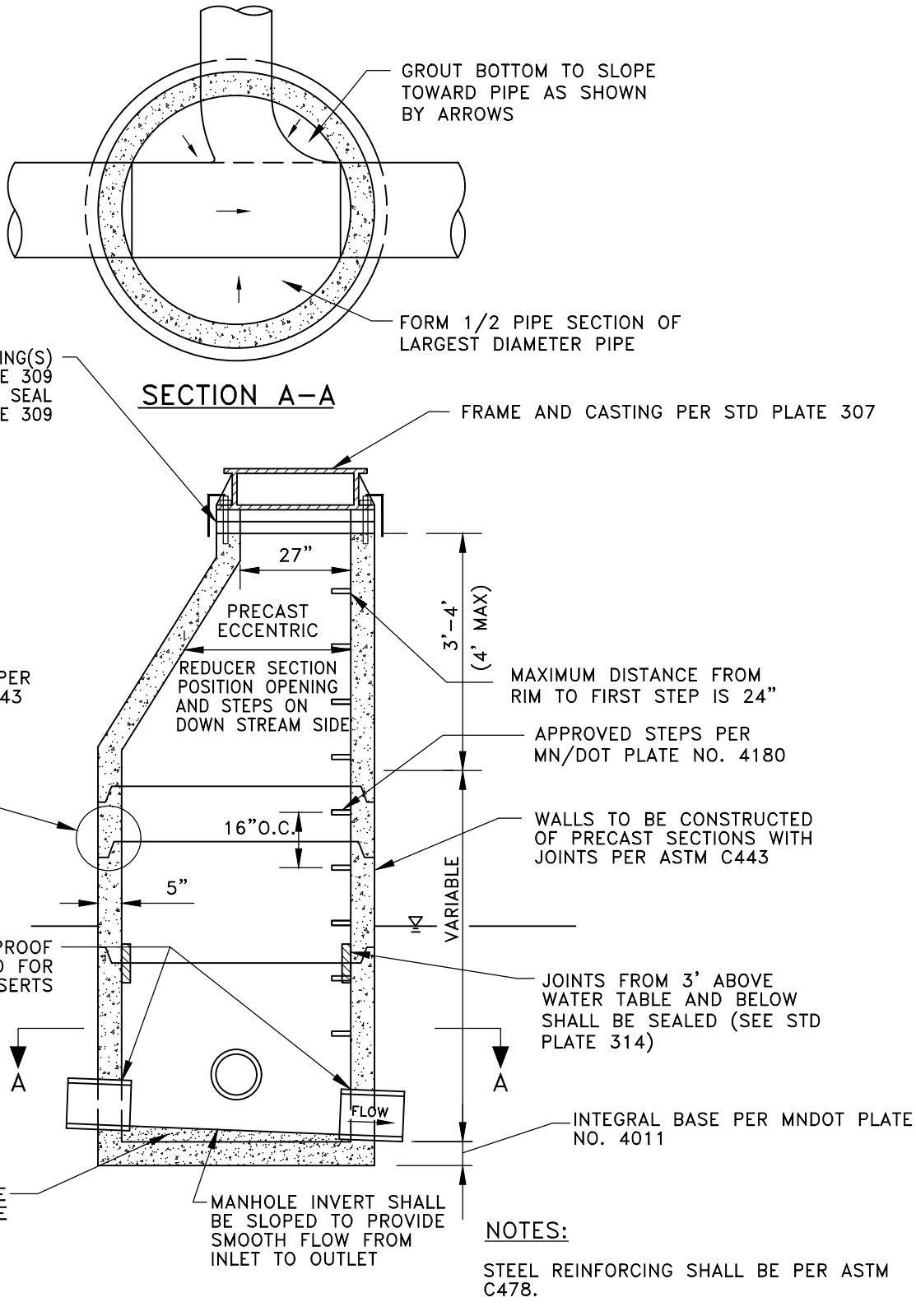

SANITARY SEWER STANDARD MANHOLE

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 300

Dec 27, 2022 - 8:03pm
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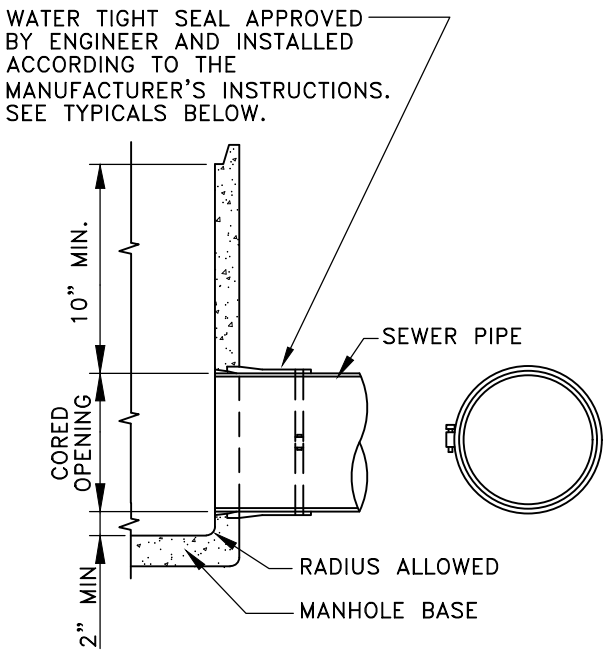
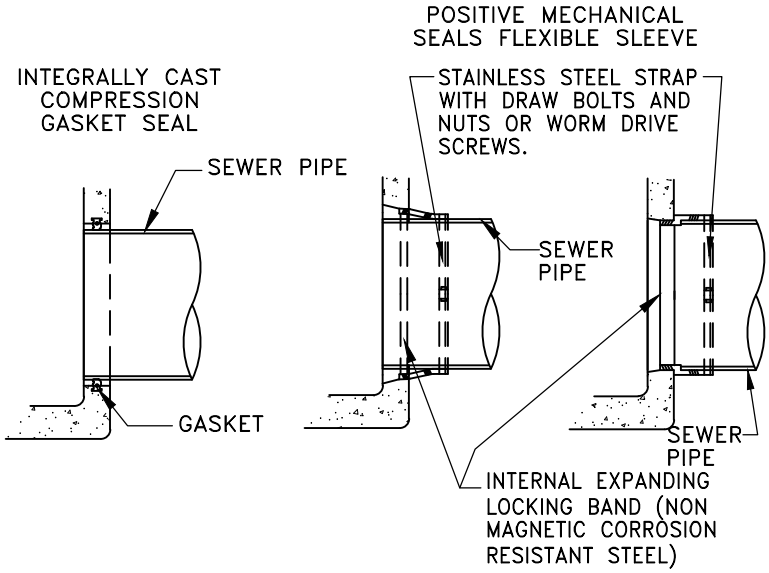




SLEEVE NOTES:

FLEXIBLE SLEEVE SHALL BE NEOPRENE MATERIAL MEETING THE REQUIREMENTS OF ASTM C-443 OR AS APPROVED

FLEXIBLE SLEEVE DIMENSIONS SHALL CONFORM TO PRODUCERS STANDARDS.

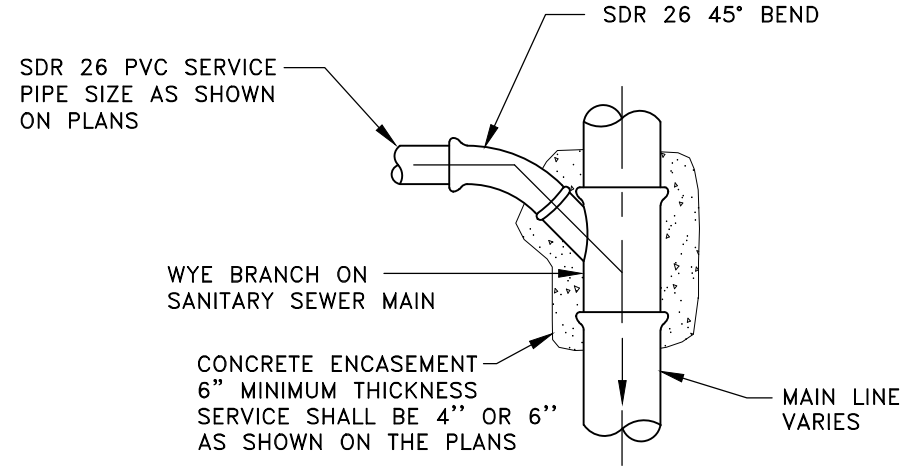
TYPICAL WATER TIGHT SEALS

NO SCALE

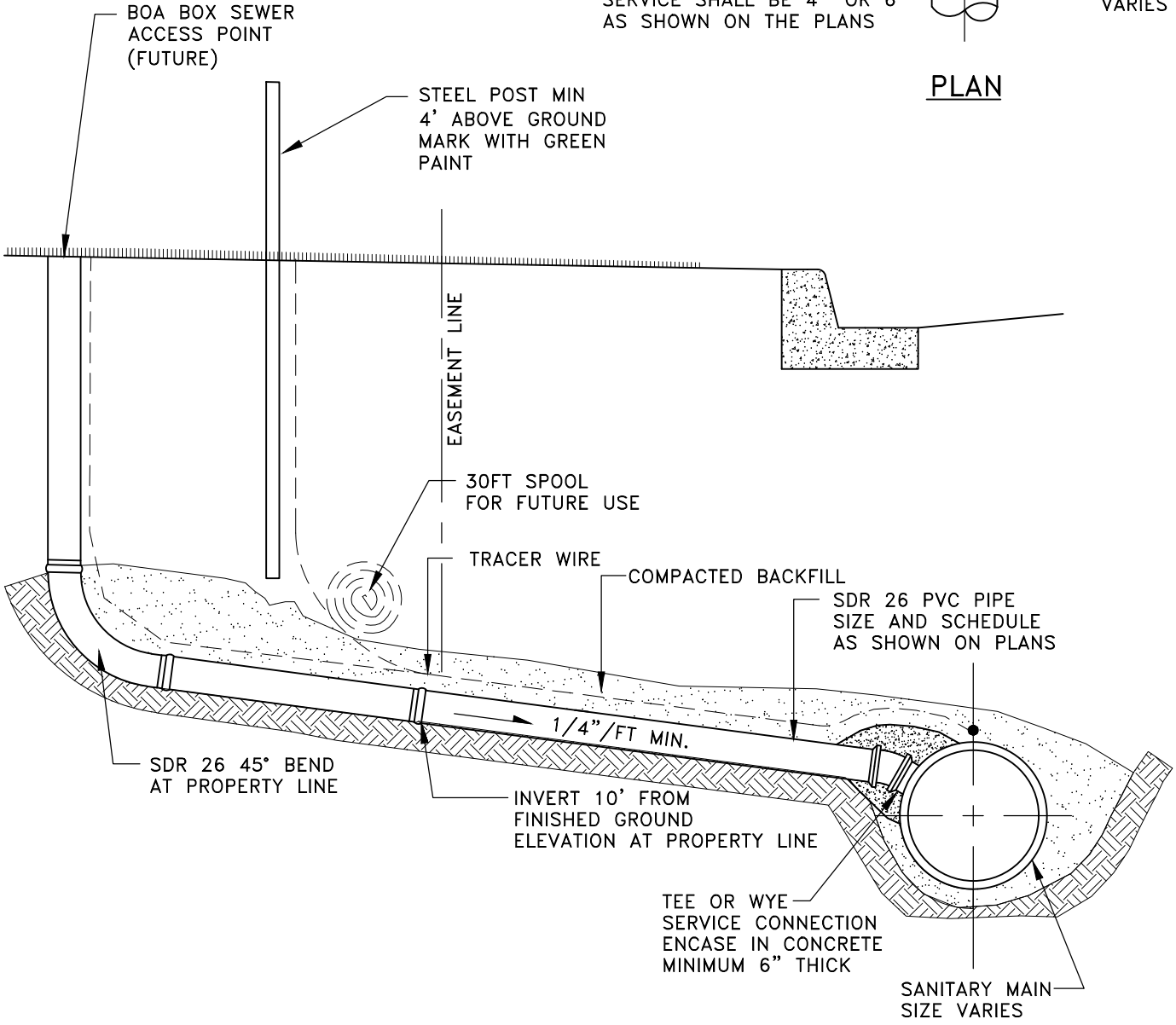
APPROVED	City of St. Francis	STANDARD PLATE NO. 301
REVISED		

NOTE:

1. PLUGS/CAPS SHALL BE PUSH ON/IN FITTINGS WITH SNUG FIT ELASTOMERIC JOINTS.
2. TEMPORARY PLUGS/CAPS SHALL BE OF SAME MATERIAL AS THE PIPE WITH WATER TIGHT SEALS.



PLAN



SHALLOW SANITARY MAIN SERVICE CONNECTION

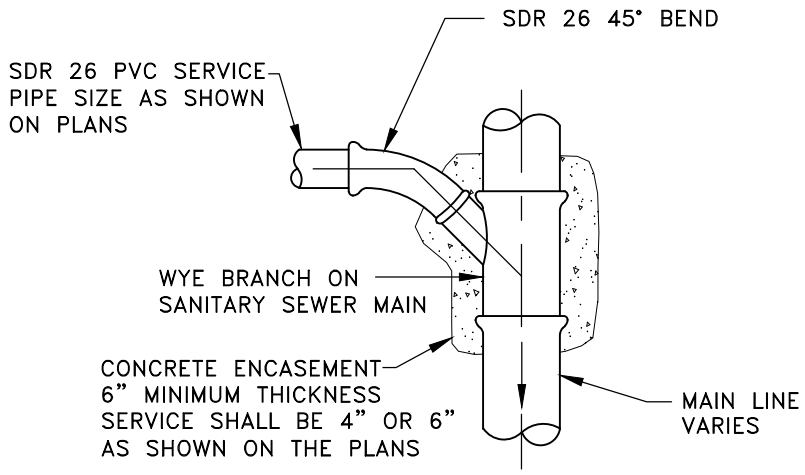
NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 302
REVISED		

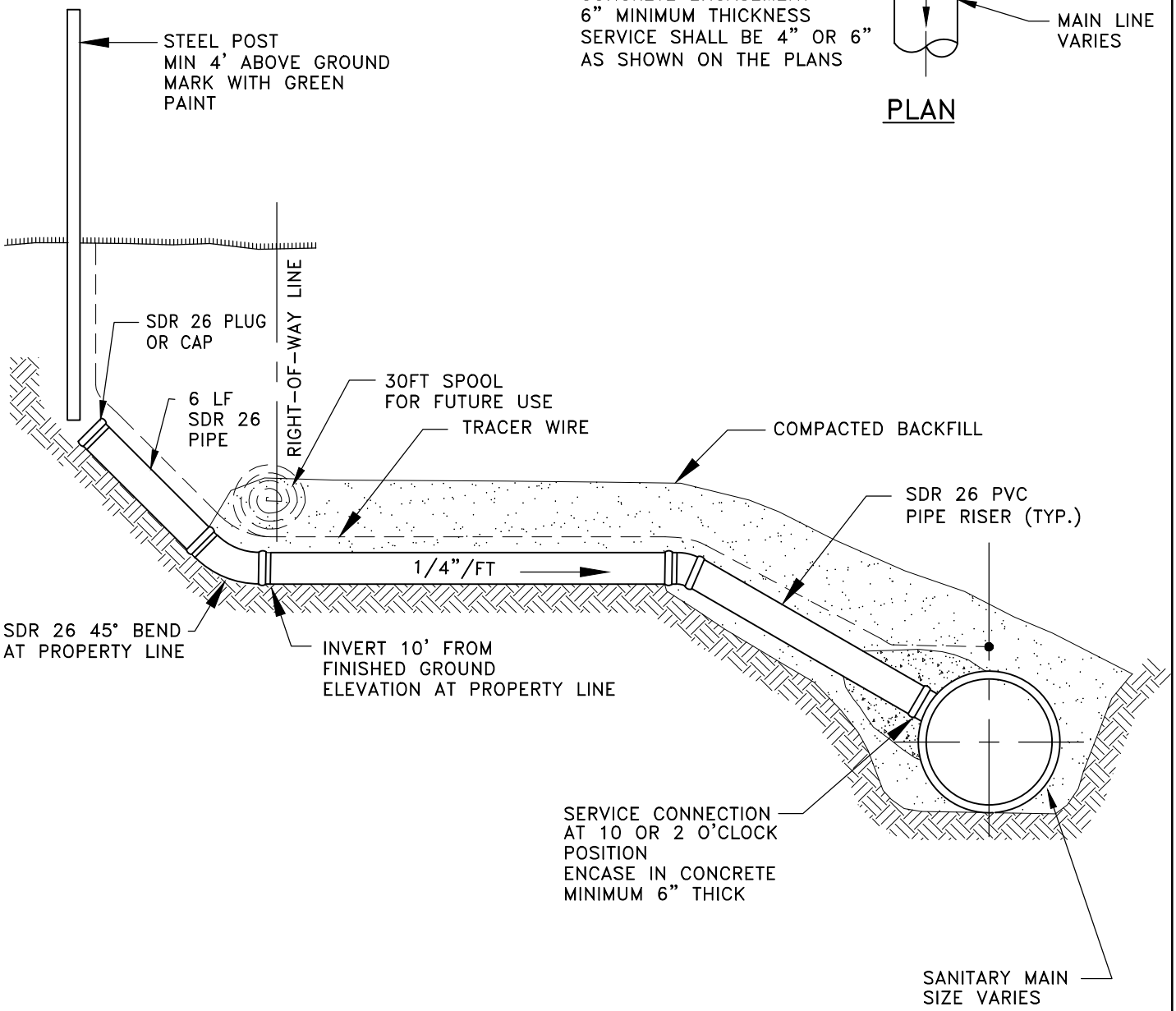
Dec 27, 2022 - 8:06pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\300 SANITARY\Sat-302.dwg

NOTE:

1. PLUGS/CAPS SHALL BE PUSH ON/IN FITTINGS WITH SNUG FIT ELASTOMERIC JOINTS.
2. TEMPORARY PLUGS/CAPS SHALL BE OF SAME MATERIAL AS THE PIPE WITH WATER TIGHT SEALS.



PLAN



DEEP SANITARY MAIN SERVICE CONNECTION

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 303

Dec 27, 2022 - 8:07pm
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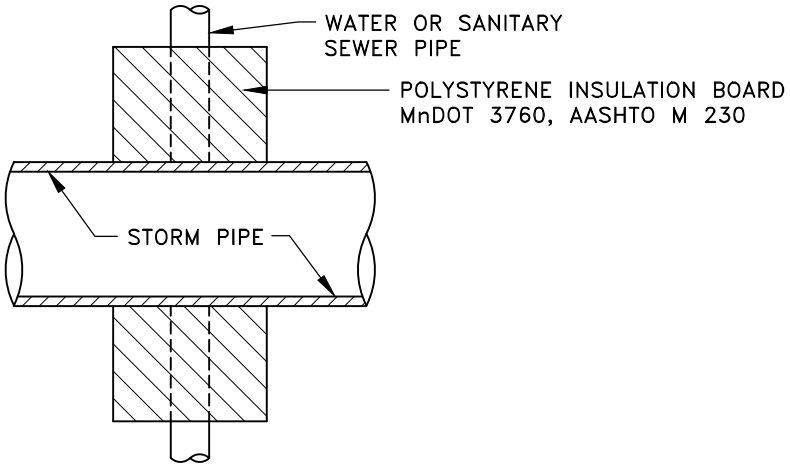
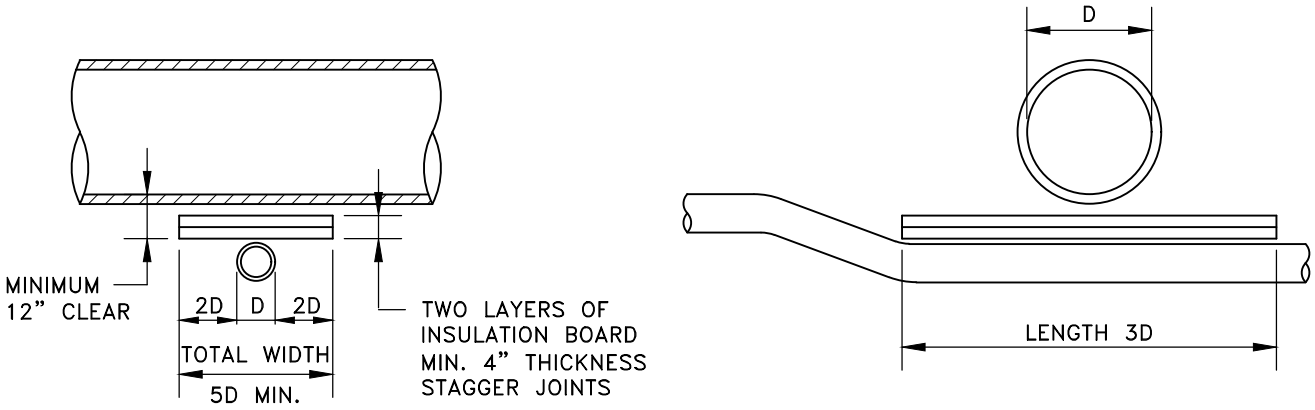
NOTE:
INSULATE ALL WATER OR SANITARY SEWER PIPE CROSSINGS WITHIN 2' OF STORM SEWER PIPE



PLAN



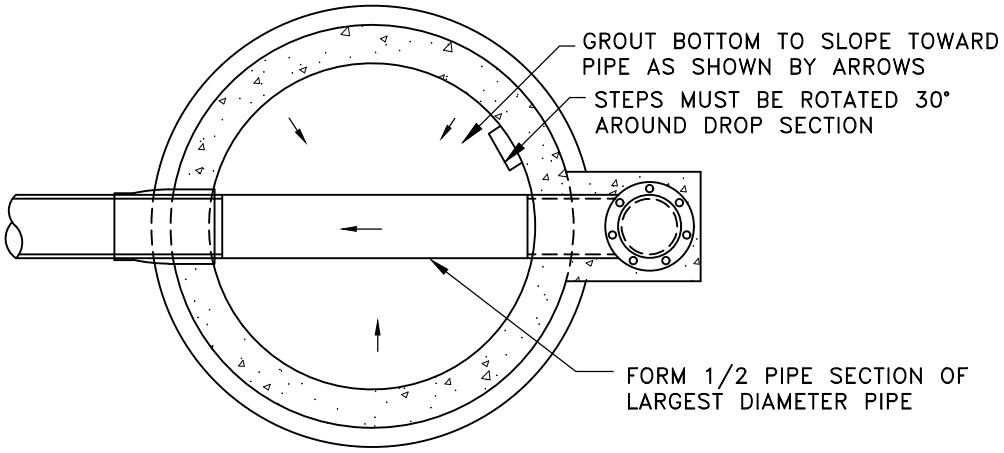
PROFILE

INSULATION FOR WATER & SANITARY SEWER PIPE & SERVICES

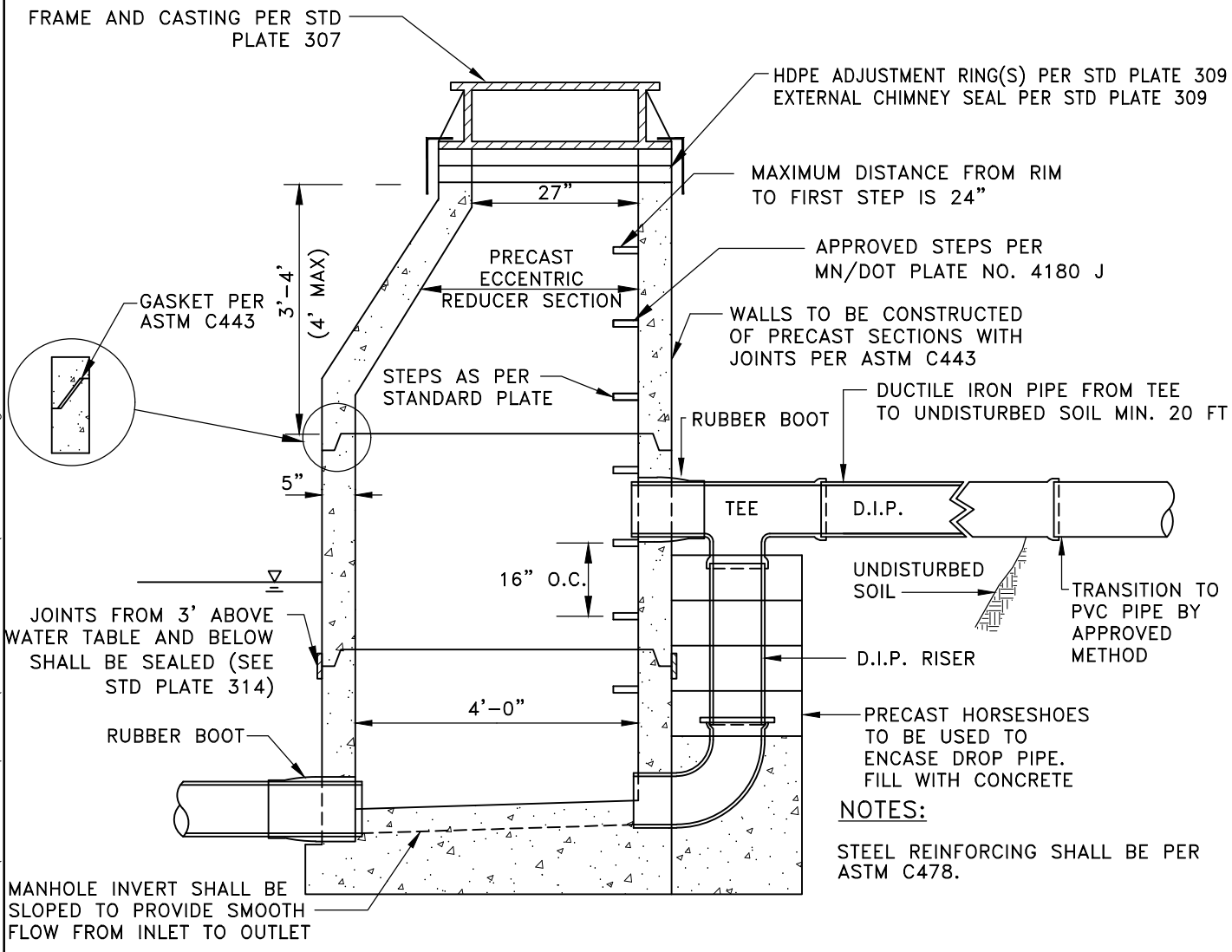
NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 304
REVISED		

Nov 11, 2022 - 10:49am
K:\cad_eng\Details\ST FRANCIS\Standard plates\300 SANITARY\Sat-304.dwg



PLAN VIEW



NOTES:

STEEL REINFORCING SHALL BE PER ASTM C478.

STANDARD MONOLITHIC DROP MANHOLE

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 305
REVISED		

Dec 27, 2022 - 8:08pm
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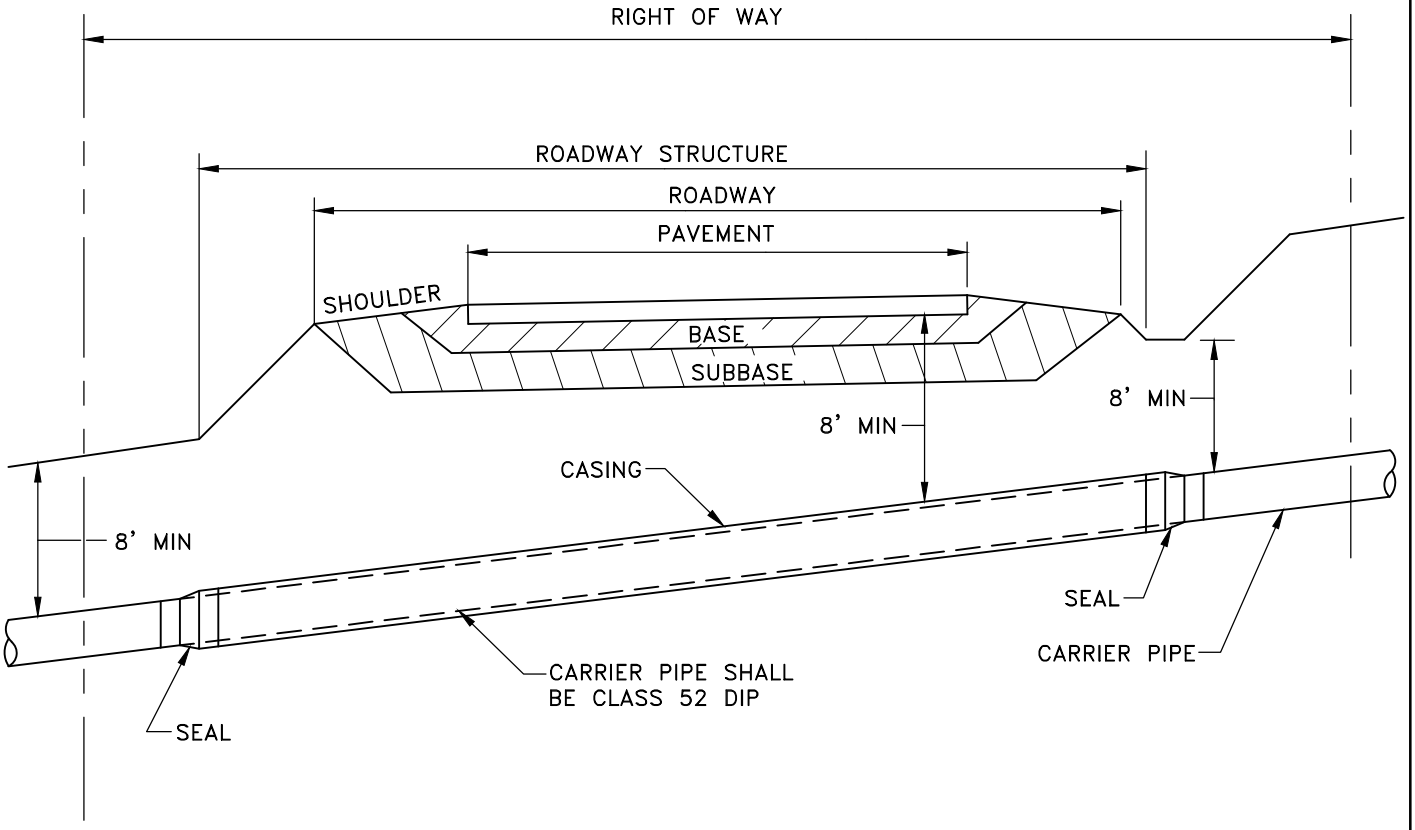
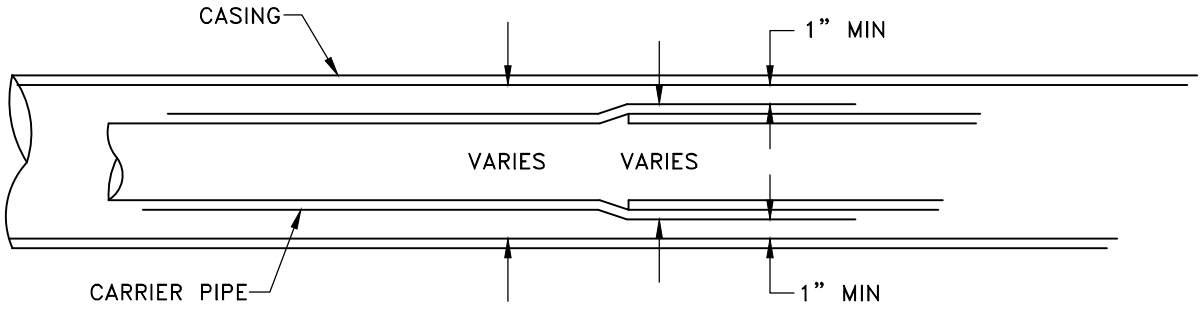


CASING PIPE SHALL BE WELDED STEEL PIPE, NEW MATERIAL, WITH A MINIMUM YIELD STRENGTH OF 35,000 PSIG (POUNDS PER SQUARE INCH GAUGE). THE FOLLOWING MINIMUM WALL THICKNESS SHALL BE USED:



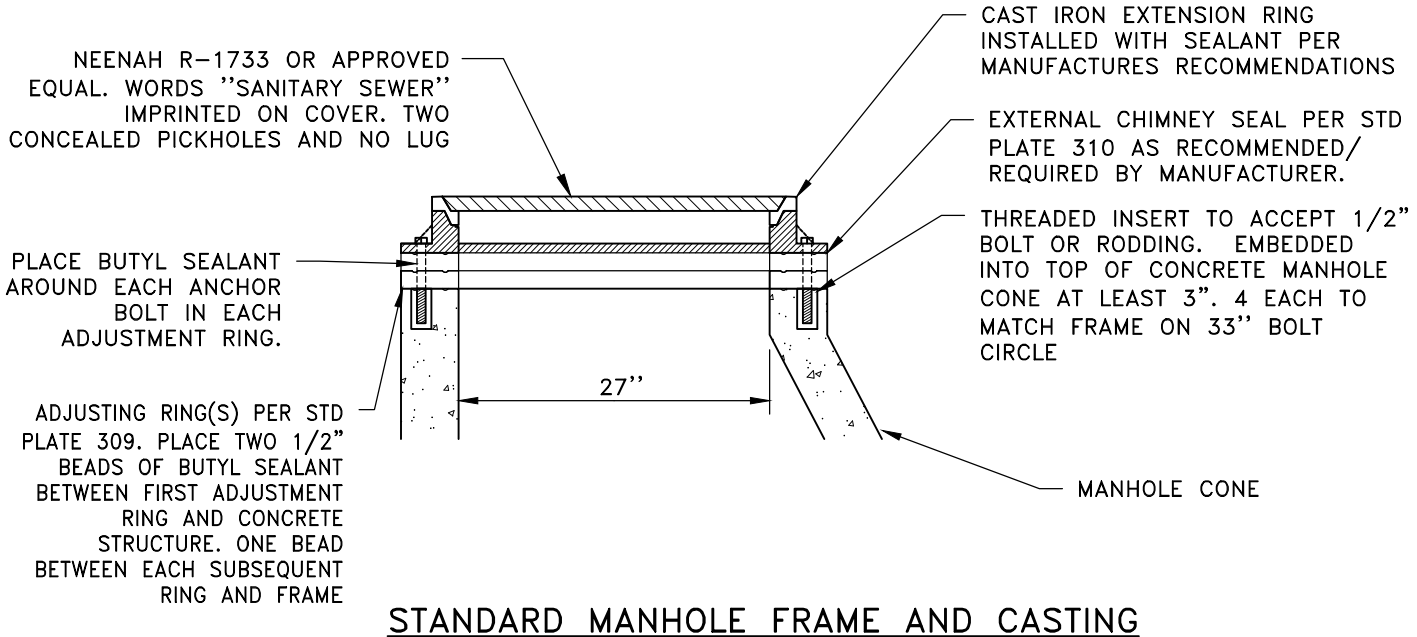
INSIDE DIAMETER OF CASING MIN 2" GREATER THEN OUTSIDE DIAMETER OF CARRIER.

PIPE JACKING DETAIL

NO SCALE

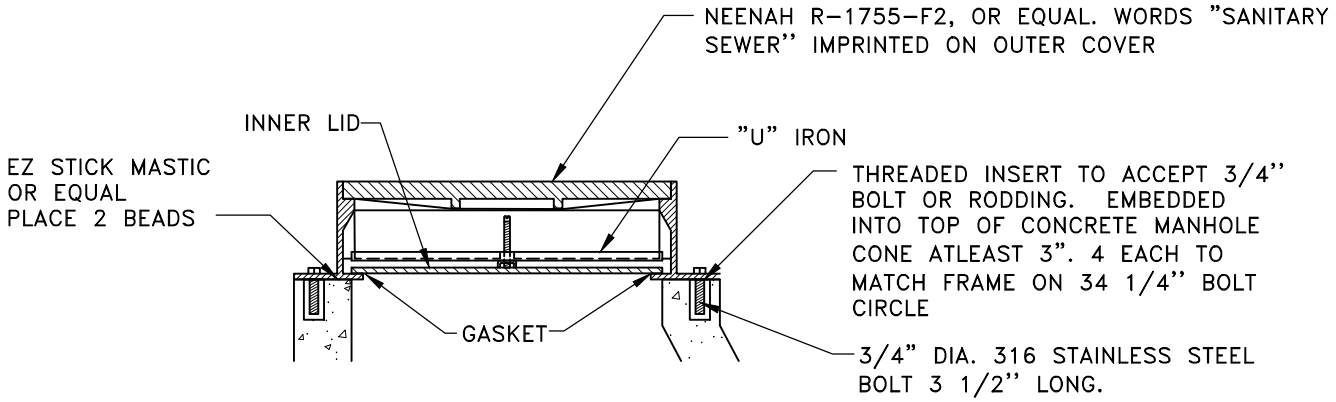
APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 306

Nov 11, 2022 - 10:53am
K:\cad_eng\Details\ST FRANCIS\Standard plates\300 SANITARY\Sat-306.dwg



STANDARD MANHOLE FRAME AND CASTING

(ALL MANHOLES EXCEPT WHERE WATERPROOF FRAMES AND CASTINGS ARE REQUIRED)



WATERPROOF FRAME AND CASTING

(ALL FORCEMAIN MANHOLES, OR ANY MANHOLE WITHIN GREEN SPACES OR WITHIN THE 100 YR HWL AREA)

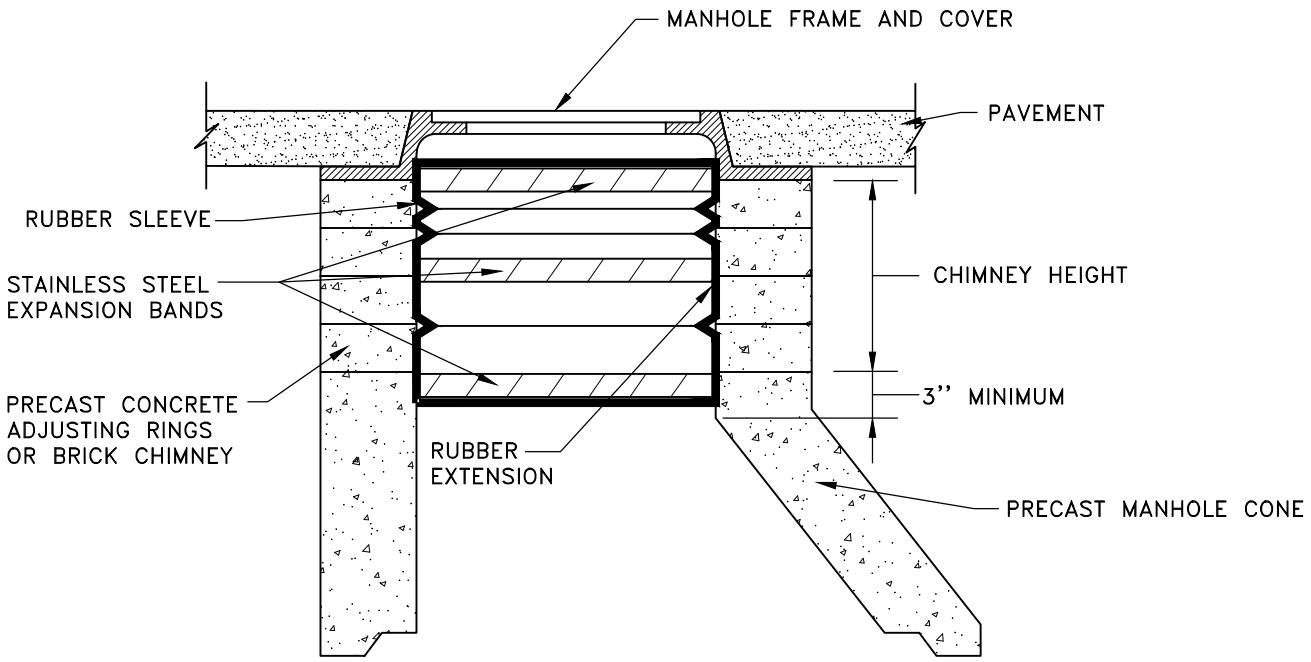
NOTE:

1. ALL NUTS, BOLTS, THREADED INSERTS, AND RODDING SHALL BE 316 STAINLESS STEEL.
2. CLEAN ALL SURFACES TO REMOVE SCALE OR LOOSE IMPEDIMENTS BEFORE PLACING ANY MASTIC, SEALANT, OR INSTALLATION OF FRAME AND CASTING SYSTEM.
3. NEENAH R-1642 SYSTEM SHALL CONSIST OF CAST IRON FRAME, SOLID CAST IRON LID, CAST IRON EXTENSION RING AND HDPE "PLASTIC" ADJUSTMENT RINGS.
4. NEENAH R-1755-F2 SYSTEM SHALL CONSIST OF CAST IRON FRAME, SOLID CAST IRON LID, & INNER LID. THOUGH NOT TYPICAL IF NECESSARY HDPE "PLASTIC" ADJUSTMENT RINGS SHALL BE USED. THE INSERT EXTENSION RINGS ARE NOT ALLOWED FOR FINAL CASTING ADJUSTMENTS WITH THESE FRAMES AND CASTINGS.

SANITARY MANHOLE FRAME AND CASTING

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 307
REVISED		



NOTES:

1. THE ADJUSTMENT RINGS AND FRAME SHALL BE SEALED WITH AN 8.5'' WIDE DOUBLE PLEATED, OR WIDE, A 10'' WIDE TRIPLE PLEATED, INTERNAL CHIMNEY SEAL AS MANUFACTURED BY CRETEX SPECIALTY PRODUCTS. THE SAME EXPANSION BANDS AND EXTENTIONS ARE USED ON BOTH.

2. SEE CHIMNEY HEIGHT TABLE FOR SEAL AND EXTENSION COMBINATIONS NEEDED TO SPAN FROM THE FRAME TO THE TOP OF THE CONE ON MANHOLES WITH VARIOUS CHIMNEY HEIGHTS. FRAME OFFSETS OR DIAMETER DIFFERENTIALS WILL REDUCE THESE SPAN HEIGHTS.

3. THE TOP OF THE CONE MUST HAVE A MINIMUM 3'' HIGH VERTICAL SURFACE THAT IS SMOOTH AND FREE OF ANY FORM OFFSETS OR EXCESSIVE HONEYCOMB. IF A 3'' HIGH VERTICAL SURFACE IS NOT AVAILABLE DUE TO THE EXISTING CONFIGURATION OF THE EXISTING MANHOLE CONE, ONE MAY BE CREATED USING A CONE DISK FORM AND A NON SHRINK PATCHING MORTAR. PLANS FOR A FORM DISK CONE ARE AVAILABLE FROM CRETEX SPECIALTY PRODUCTS.

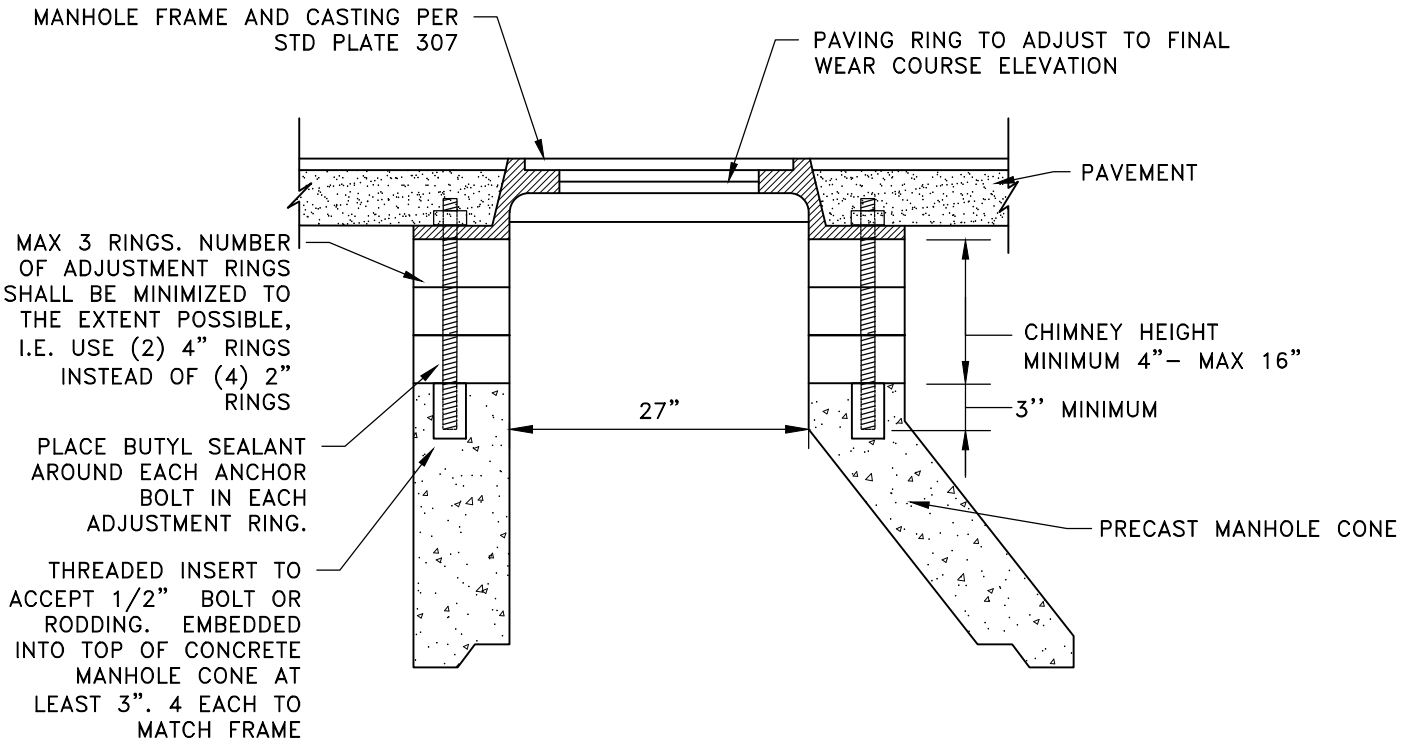
SEAL SELECTION TABLE

COMBINATIONS OF SEALS AND EXTENSIONS	TO SPAN CHIMNEY HEIGHT OF		
	W / STANDARD SEAL	W / WIDE SEAL	W /EXTRA WIDE SEAL
SEAL ONLY	0''–4.5''	2''–7.5''	OVER 6"–12"
SEAL + 7'' EXTENSION	OVER 4.5''–10.5''	OVER 7.5''–13.5''	OVER 12"–18''
SEAL + 10'' EXTENSION	OVER 10.5''–13''	OVER 13.5''–16''	OVER 18''–20.5'
SEAL + MULT. EXTENSION	OVER 13''	OVER 16''	OVER 20.5''
ADD 6'' OF COVERAGE FOR EACH ADDITIONAL 7'' EXTENSION ADD 8.5'' OF COVERAGE FOR EACH ADDITIONAL 10'' EXTENSION DIAMETER DIFFERENTIALS AND OFFSETS WILL REDUCE THESE COVERAGES			

INTERNAL CHIMNEY SEAL

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 308
REVISED		



NOTES:

1. ALL NUTS, BOLTS, THREADED INSERTS, AND RODDING SHALL BE 316 STAINLESS STEEL.
2. ADJUSTMENT RINGS SHALL BE HIGH DENSITY POLYETHYLENE RINGS AS MANUFACTURED BY LADTECH, INC OR APPROVED EQUAL.
3. ALL RINGS SHALL MEET OR EXCEED MnDOT HS–20 TRAFFIC LOADING.
4. AS DETERMINED BY THE CITY ENGINEER, PRECAST CONCRETE ADJUSTING RINGS OR BRICK CHIMNEY WILL BE ALLOWED FOR ADJUSTING EXISTING MANHOLES.
5. CLEAN ALL SURFACES TO REMOVE SCALE OR LOOSE IMPEDIMENTS BEFORE PLACING ANY MASTIC, SEALANT, OR INSTALLATION OF FRAME AND CASTING SYSTEM.
6. PLACE TWO 1/2" BEADS OF BUTYL SEALANT BETWEEN FIRST ADJUSTMENT RING AND CONCRETE STRUCTURE. ONE BEAD BETWEEN EACH SUBSEQUENT RING AND FRAME.

MANHOLE ADJUSTMENT RINGS

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 309

Nov 11, 2022 – 10:56am
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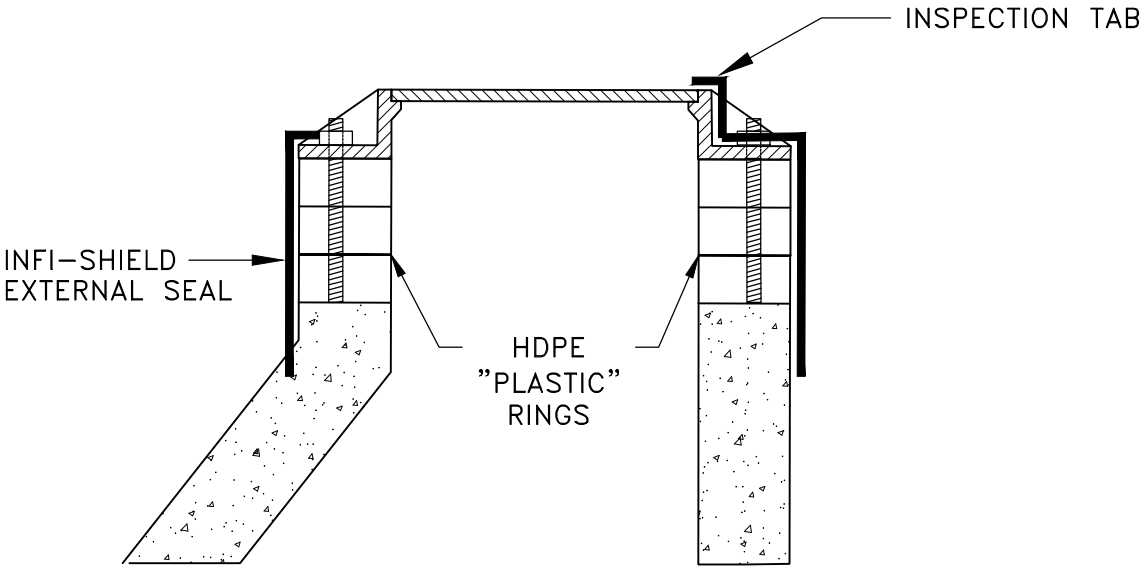


NOTES:

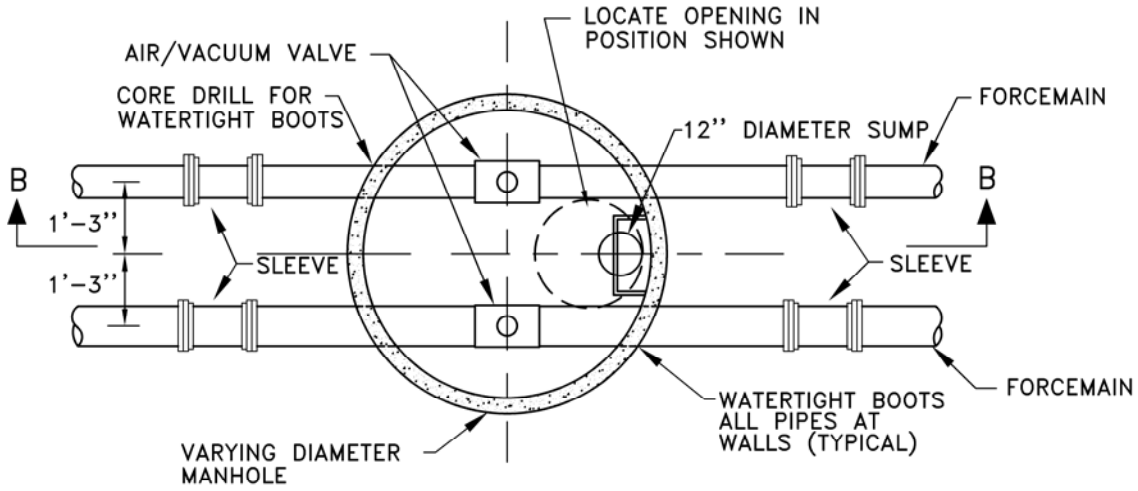
1. THE ADJUSTMENT RINGS AND FRAME SHALL BE SEALED WITH AN EXTERNAL RUBBER SEALING SLEEVE, "INFI-SHIELD" AS MANUFACTURED BY SEALING SYSTEM, INC. OR APPROVED EQUAL.

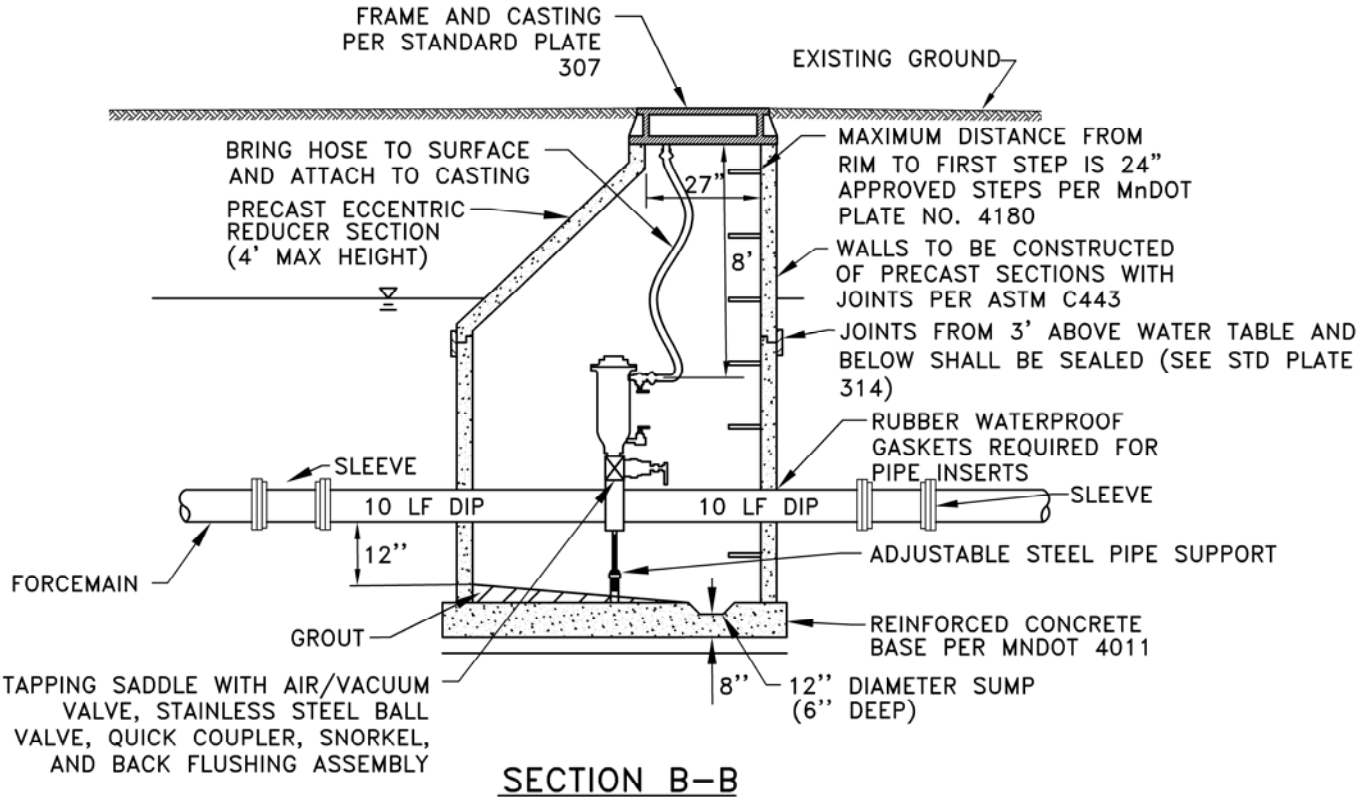
2. THE SEAL SHALL BE MADE OF EPDM RUBBER WITH A MINIMUM THICKNESS OF 60 MILS AND SEALED WITH A NON-HARDENING BUTYL RUBBER MASTIC.

EXTERNAL CHIMNEY SEAL

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 310
REVISED		





SECTION B-B

NOTES:

ARRANGE PIPE JOINTS TO BE AT LEAST SIX FEET FROM CENTER OF MANHOLE.

ALL SANITARY MANHOLES; MOISTURE PROOF (EXTERIOR ONLY) CONSEAL CS-55 (GRAY) OR APPROVED EQUAL. DO NOT COAT RUBBER GASKETS OR BOOTS

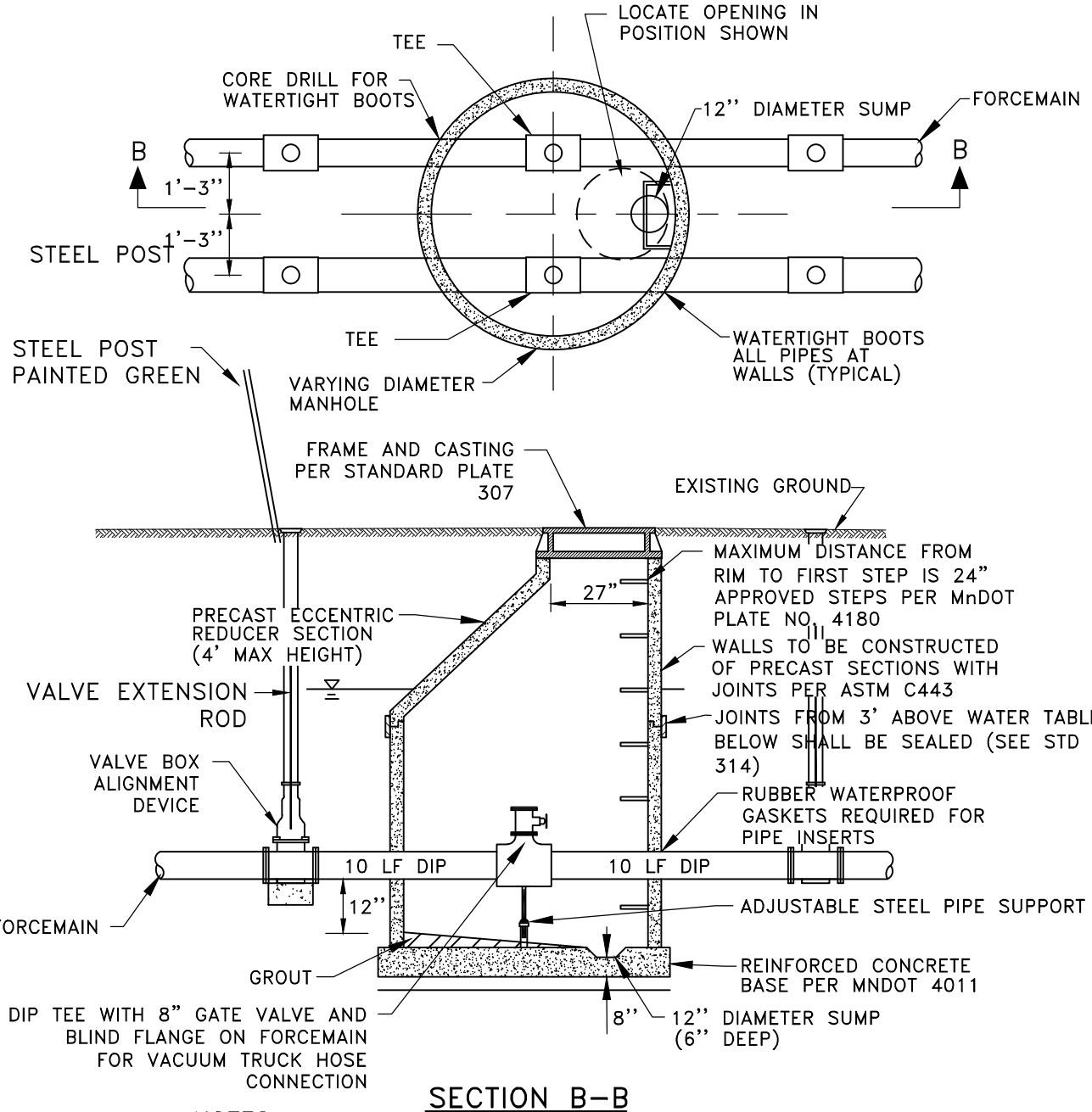
STEEL REINFORCING SHALL BE PER ASTM C478.

AIR/VAVUUM VALVE SHALL BE VAL MATIC MODEL 802A AS MANUFACTURED BY VAL MATIC VALVE AND MANUFACTURING CORP., OR APPROVED EQUAL

FORCEMAIN AIR/VACUUM VALVE

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 312
REVISED		



SECTION B–B

NOTES:

ARRANGE PIPE JOINTS TO BE AT LEAST SIX FEET FROM CENTER OF MANHOLE.

CLEAN OUTS ARE TYPICALLY LOCATED AT LOW POINTS IN FORCE MAIN AND WITH GAVE VALVES ON BOTH SIDES OF MANHOLE.

ALL SANITARY MANHOLES; MOISTURE PROOF (EXTERIOR ONLY) CONSEAL CS–55 (GRAY) OR APPROVED EQUAL. DO NOT COAT RUBBER GASKETS OR BOOTS

STEEL REINFORCING SHALL BE PER ASTM C478.

FORCEMAIN CLEANOUT

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 313
REVISED		

Nov 11, 2022 – 10:59am
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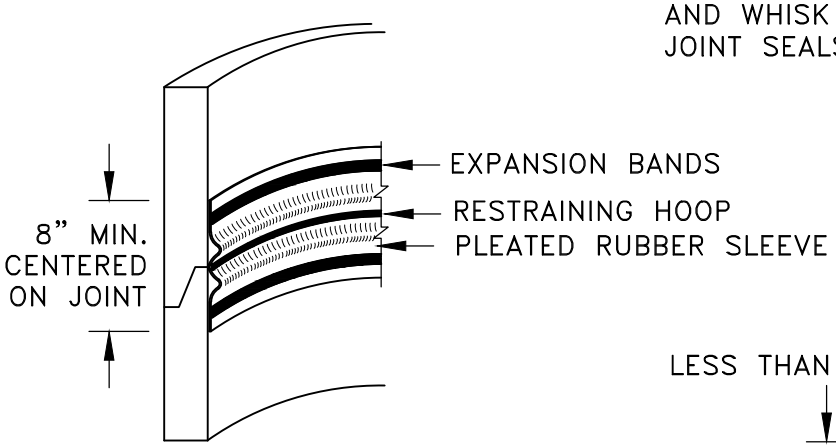
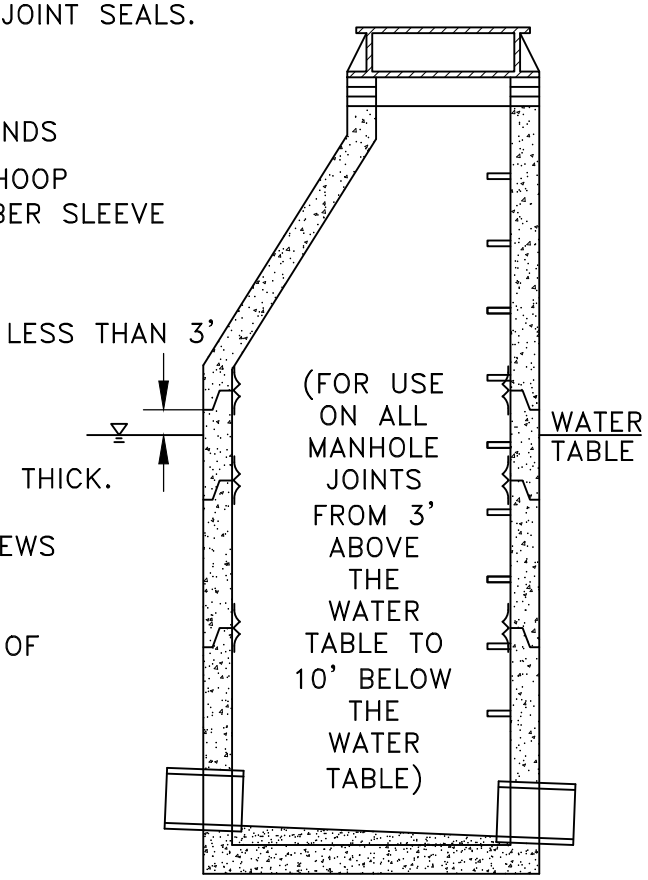
INTERNAL MANHOLE JOINT SEAL

ALL SEALS SHALL BE INSTALLED PER MANUFACTURES SPECIFICATIONS. CLEAN AREA AROUND JOINTS WITH WIRE BRUSH AND WHISK BROOM PRIOR TO PLACING JOINT SEALS.

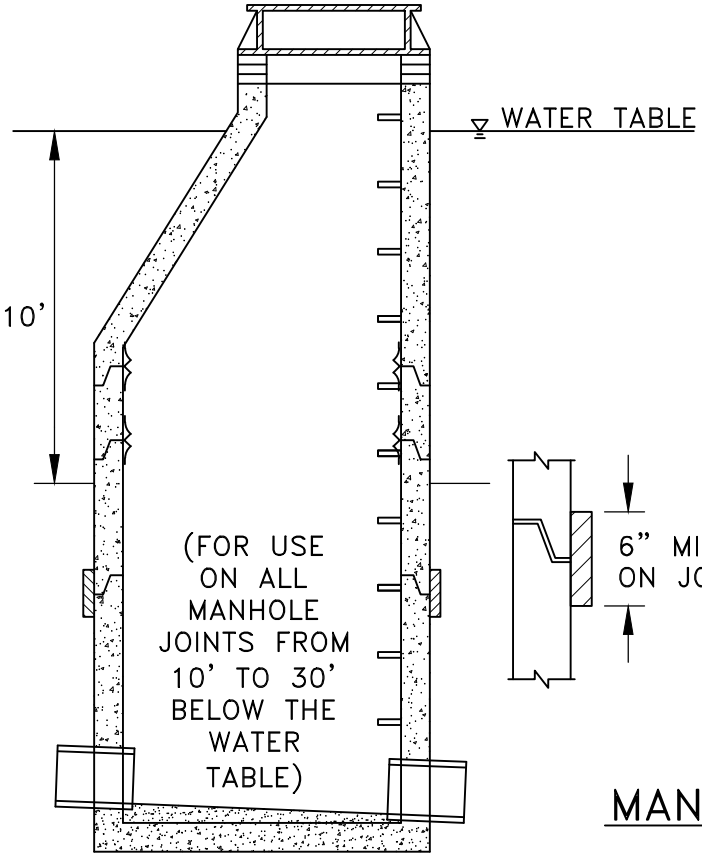




NOTES

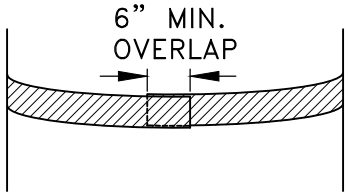
1. RUBBER SLEEVE SHALL BE A MIN. OF 3/16" THICK.
2. 1 3/4" WIDE EXPANSION BANDS, 16 GAUGE STAINLESS STEEL. ALL NUTS, BOLTS OR SCREWS SHALL BE STAINLESS STEEL.
3. RESTRAINING HOOP SHALL BE 5/16" DIA. STAINLESS STEEL, PLACED BETWEEN PLEATS OF RUBBER SLEEVE.

INFI-SHIELD EXTERNAL GATOR WRAP



NOTES

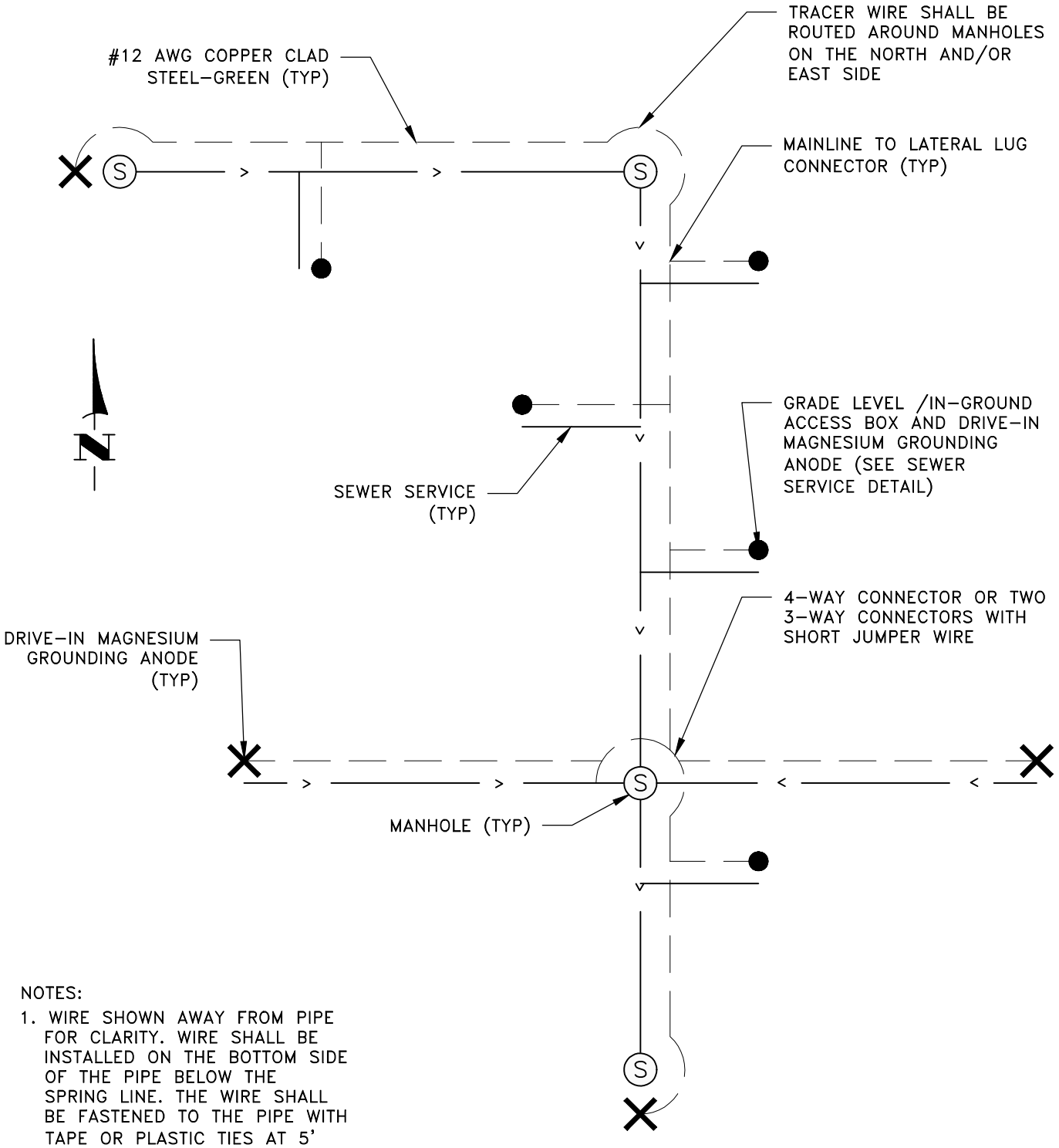
1. EPDM FLEXIBLE RUBBER SLEEVE – 30 MILS THICK
2. NON-HARDENING BUTYL MASTIC ADHESIVE – 30 MILS THICK



MANHOLE JOINT SEAL

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 314
REVISED		



NOTES:

1. WIRE SHOWN AWAY FROM PIPE FOR CLARITY. WIRE SHALL BE INSTALLED ON THE BOTTOM SIDE OF THE PIPE BELOW THE SPRING LINE. THE WIRE SHALL BE FASTENED TO THE PIPE WITH TAPE OR PLASTIC TIES AT 5' INTERVALS

TRACER WIRE PLAN (SEWER)

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 315
REVISED		

Dec 27, 2022 - 8:09pm
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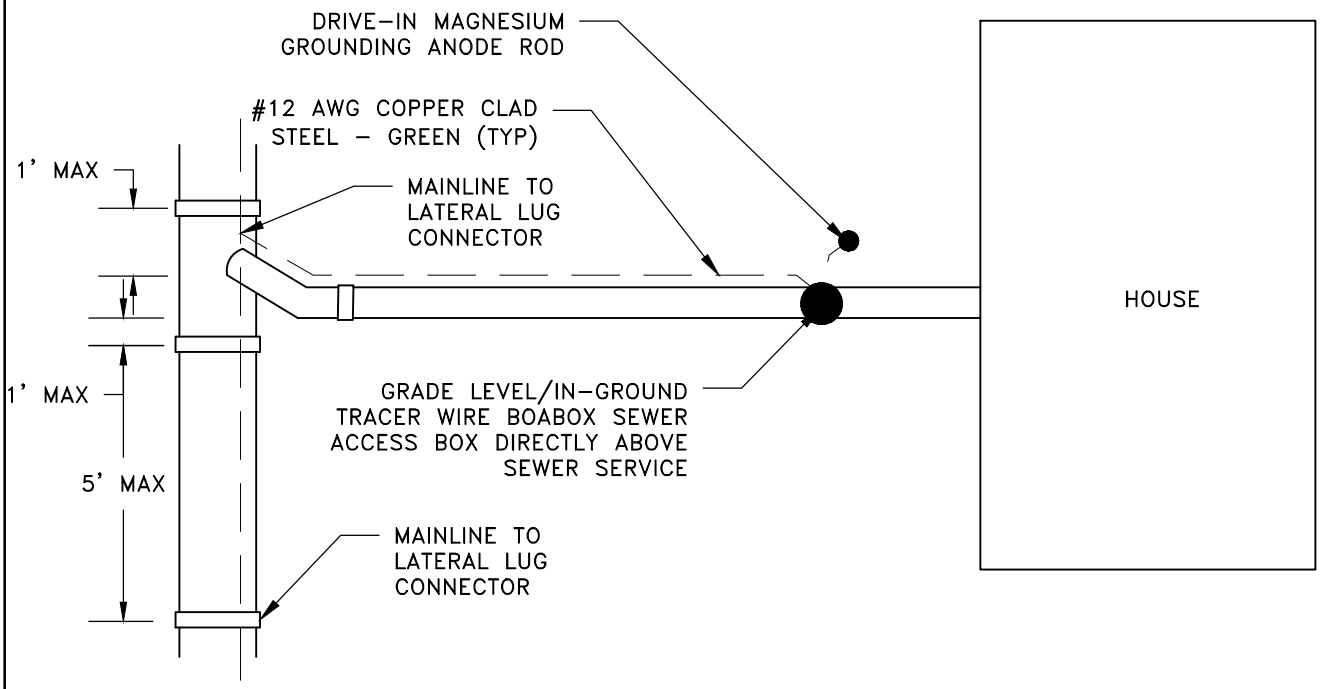
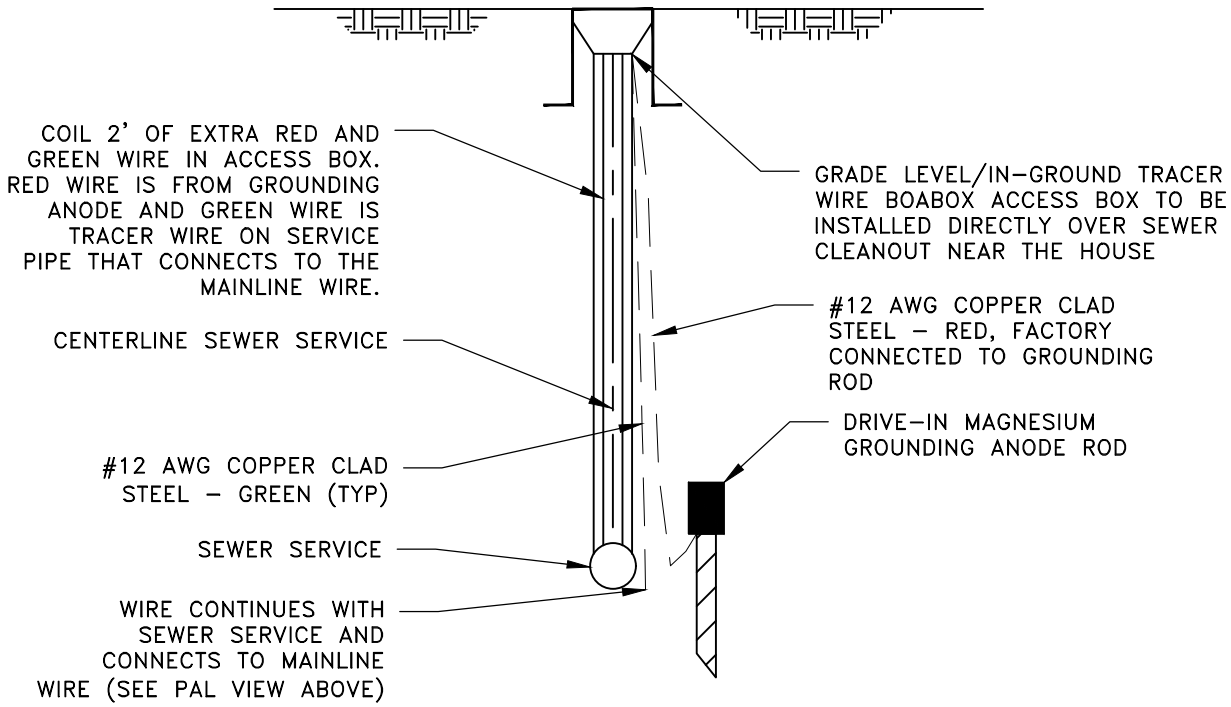


SEWER SERVICE – PLAN VIEW



SEWER SERVICE – SECTION VIEW

TRACER WIRE SEWER SERVICE DETAIL

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 316

Dec 27, 2022 – 8:10pm
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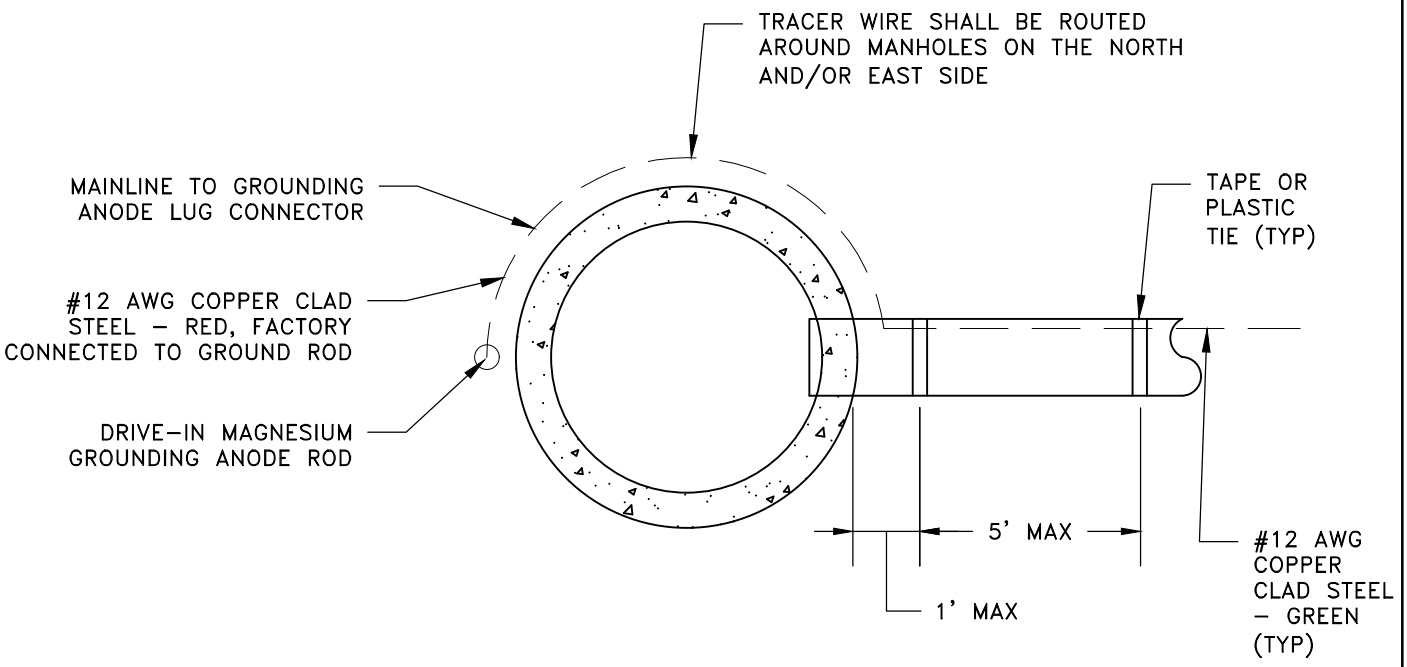
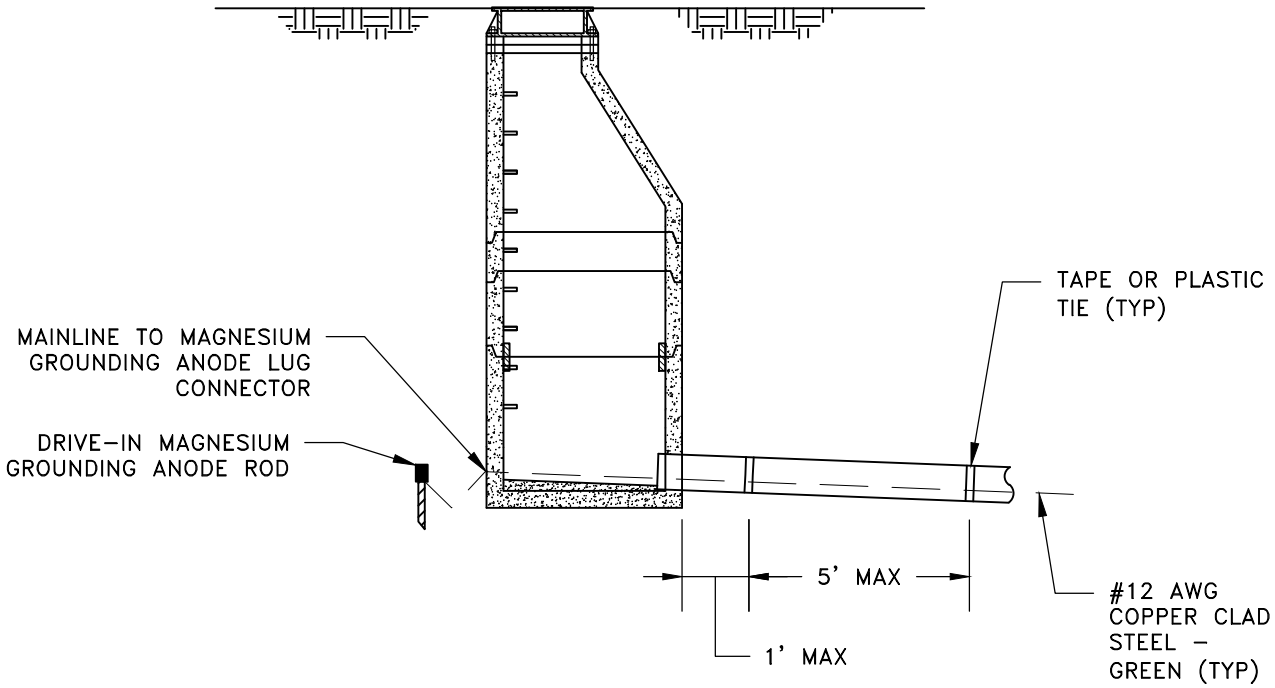


SEWER MANHOLE – PLAN VIEW



SEWER MANHOLE – SECTION VIEW

TRACER WIRE SEWER MANHOLE DETAIL

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 317

Dec 27, 2022 – 8:12pm
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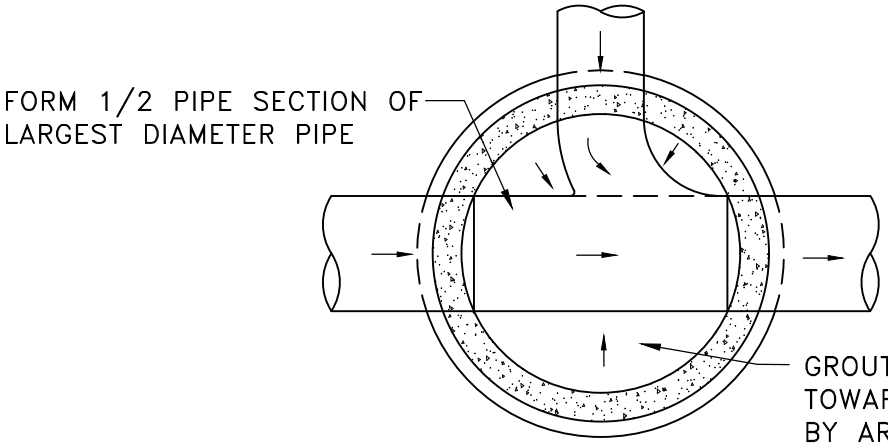
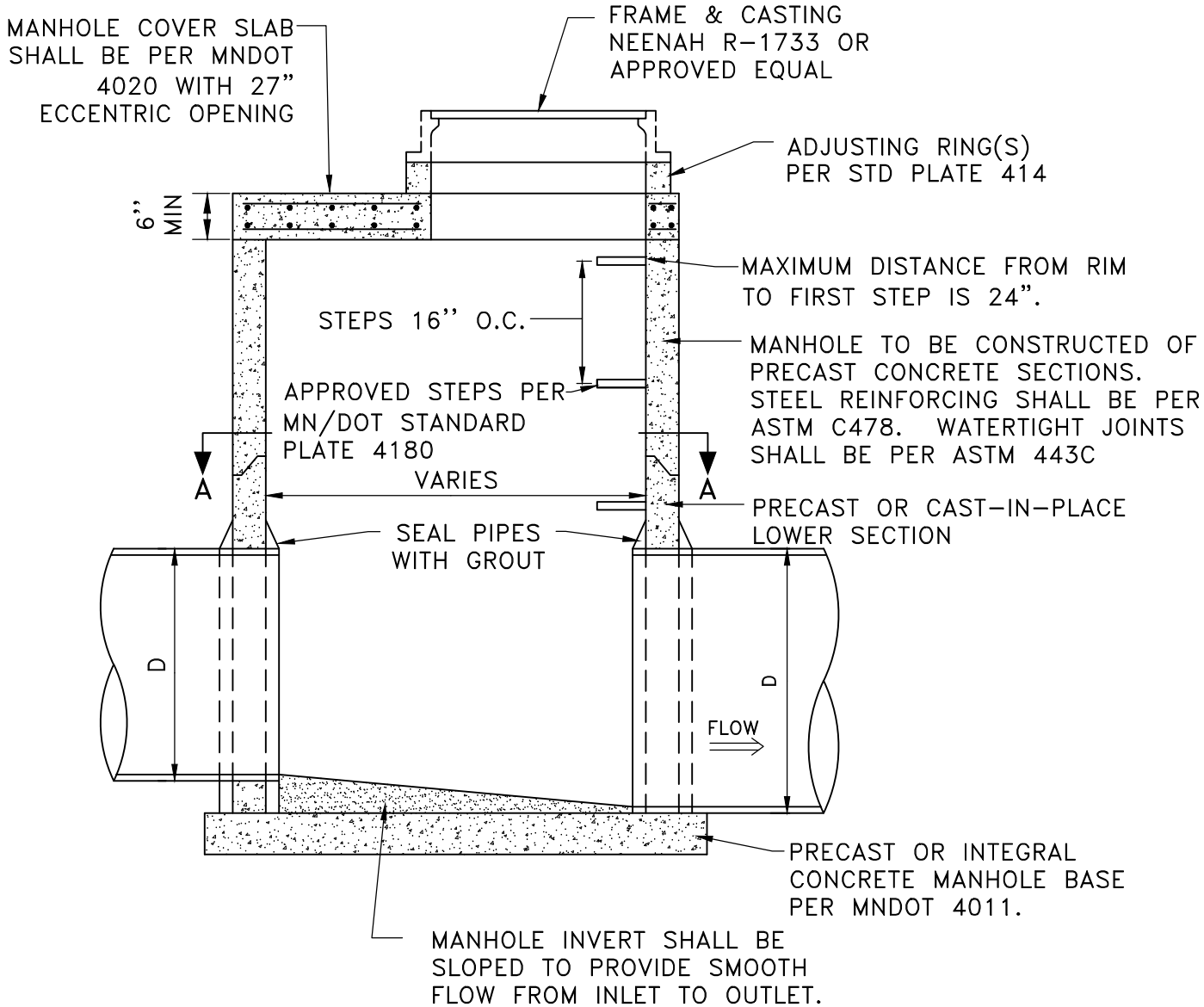


SECTION A–A



MAXIMUM FILL HEIGHT 15 FT.

SLAB–TOP MANHOLE

(STORM SEWER)
NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 400
REVISED		

Dec 27, 2022 - 8:13pm
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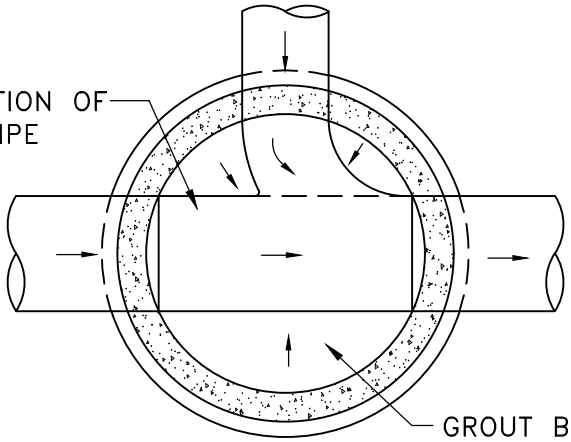
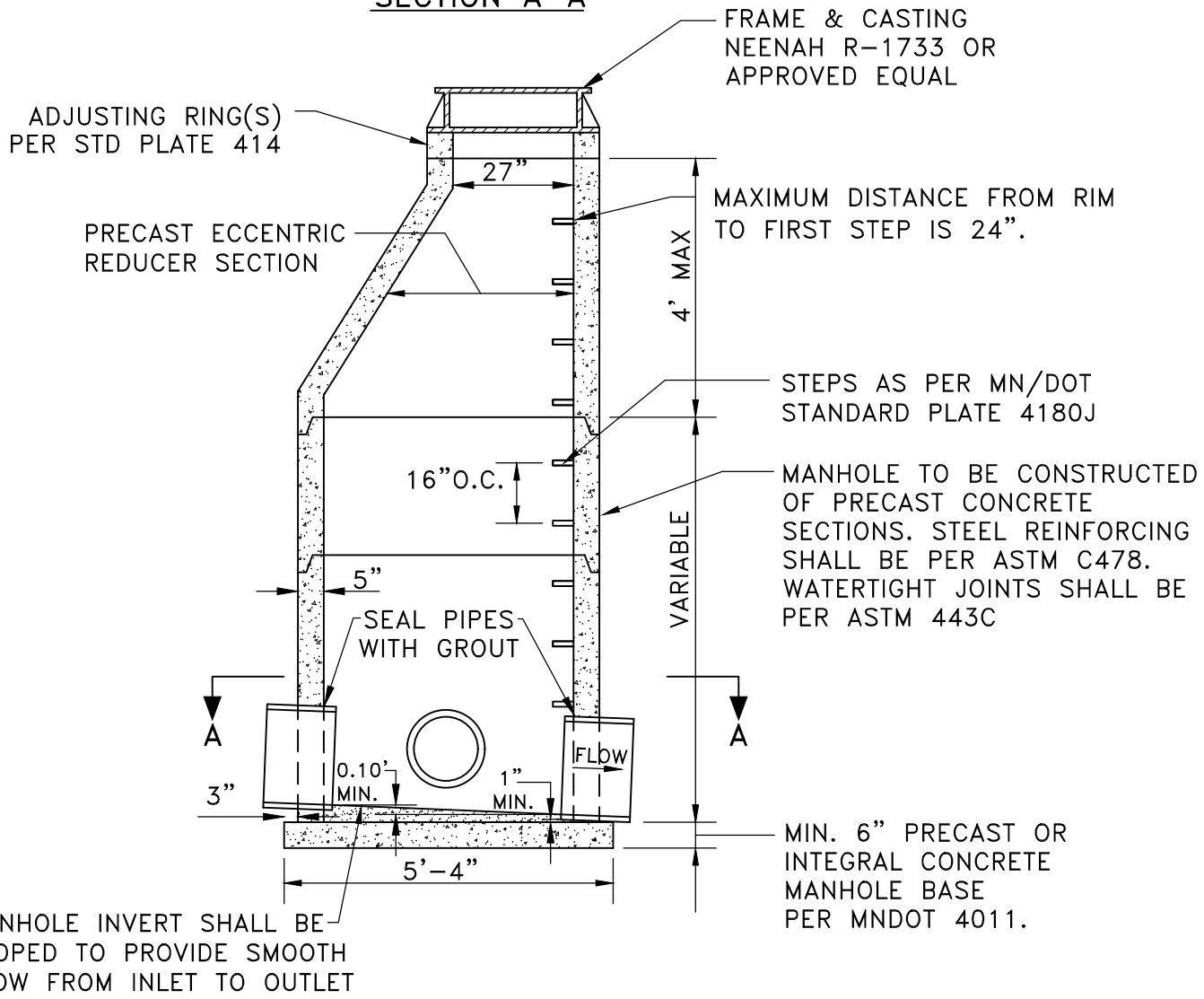


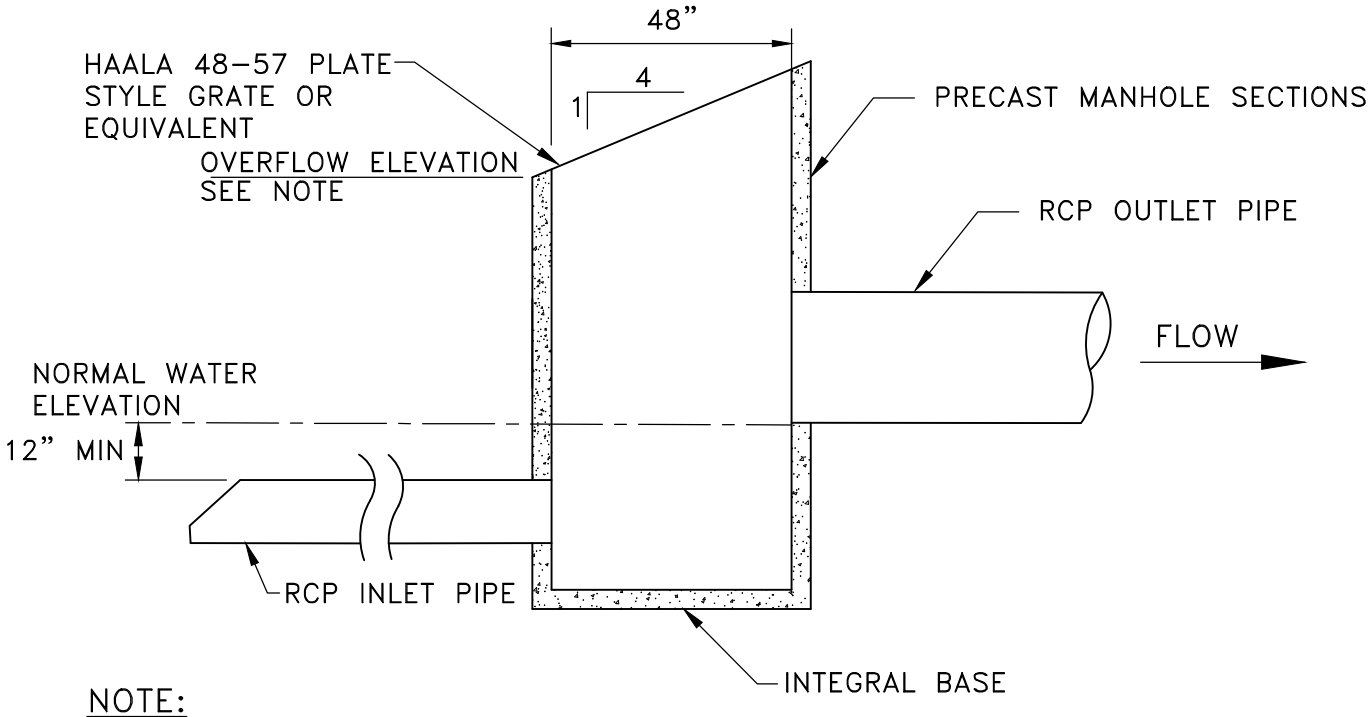
SECTION A–A



STORM SEWER STANDARD MANHOLE DEEPER THAN 15'

NO SCALE

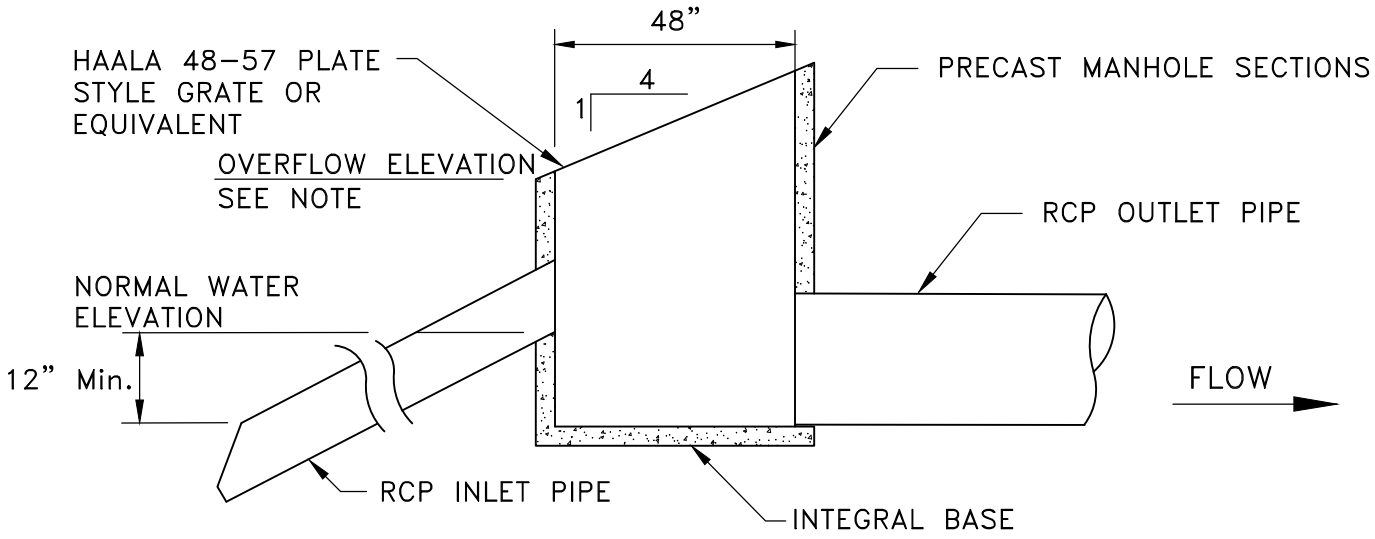
APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 401



NOTE:
THE OVERFLOW ELEVATION SHALL BE AT OR ABOVE THE PEAK 2–YEAR STORM EVENT ELEVATION

SKIMMER STRUCTURE

NO SCALE

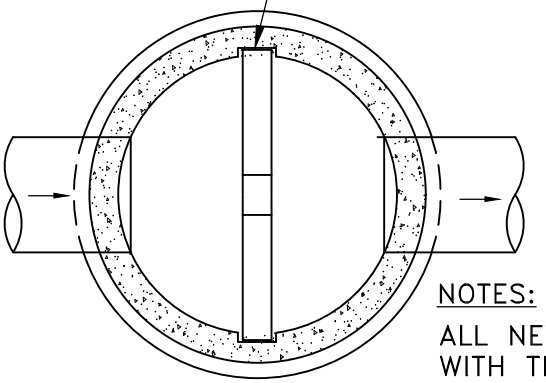


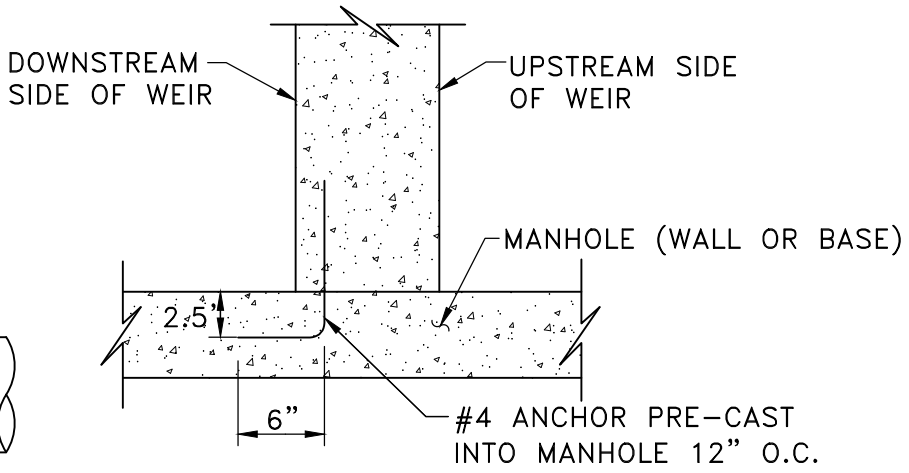
NOTE:
THE OVERFLOW ELEVATION SHALL BE AT OR ABOVE THE PEAK 2–YEAR STORM EVENT ELEVATION, BUT NO HIGHER THAN THE 100–YEAR ELEVATION

SKIMMER STRUCTURE

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 402
REVISED		





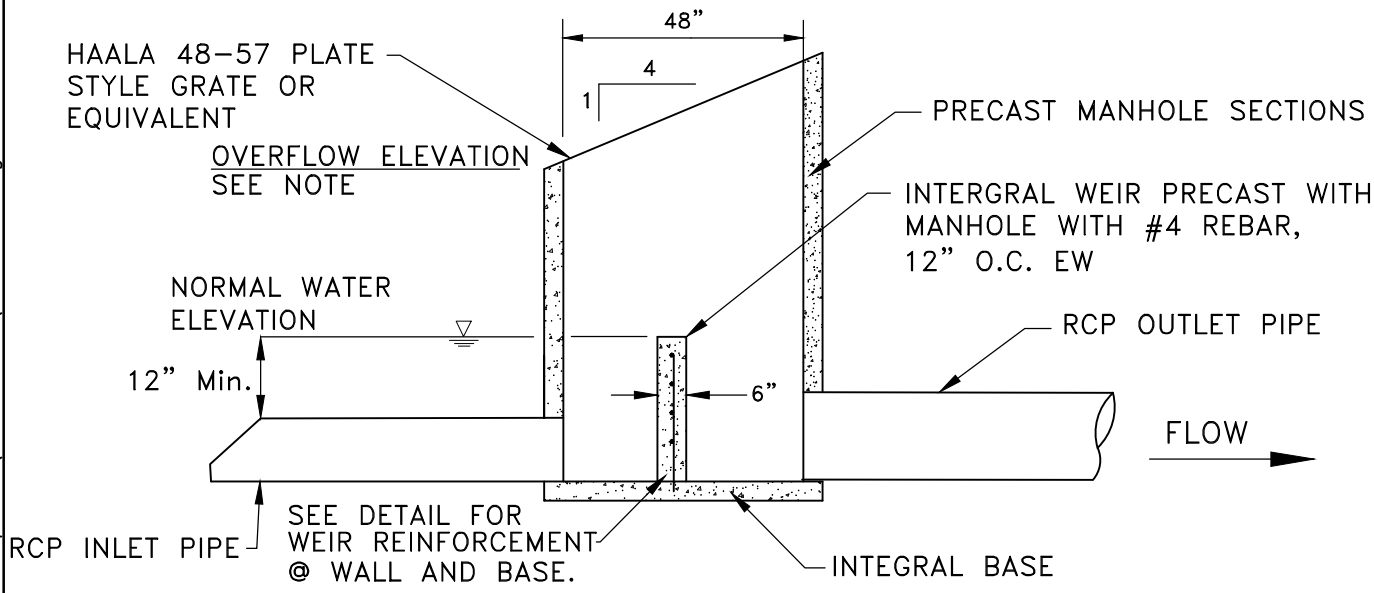
NOTES:

ALL NEW MANHOLES SHALL HAVE AN INTEGRAL WEIR PRECAST WITH THE MANHOLE.

*IF NECESSARY, AS AN ALTERNATIVE TO THE PRECAST WEIR AND ANCHORS: HVA ADHESIVE ANCHOR SYSTEM, WITH HVA ADHESIVE CAPSULES AND #5 REBAR, AS MANUFACTURED BY HILTI CORP OR APPROVED EQUAL MAY BE USED.

REINFORCEMENT BARS IN WEIR NOT SHOWN.

WEIR REINFORCEMENT @ WALL AND BASE



NOTE:
THE OVERFLOW ELEVATION SHALL BE AT OR ABOVE THE PEAK 2-YEAR STORM EVENT ELEVATION, BUT NO HIGHER THAN THE 100 YEAR ELEVATION

SKIMMER STRUCTURE WITH WEIR

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 403
REVISED		

Nov 11, 2022 - 11:33am
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Nov 11, 2022 – 11:34am
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APPROVED

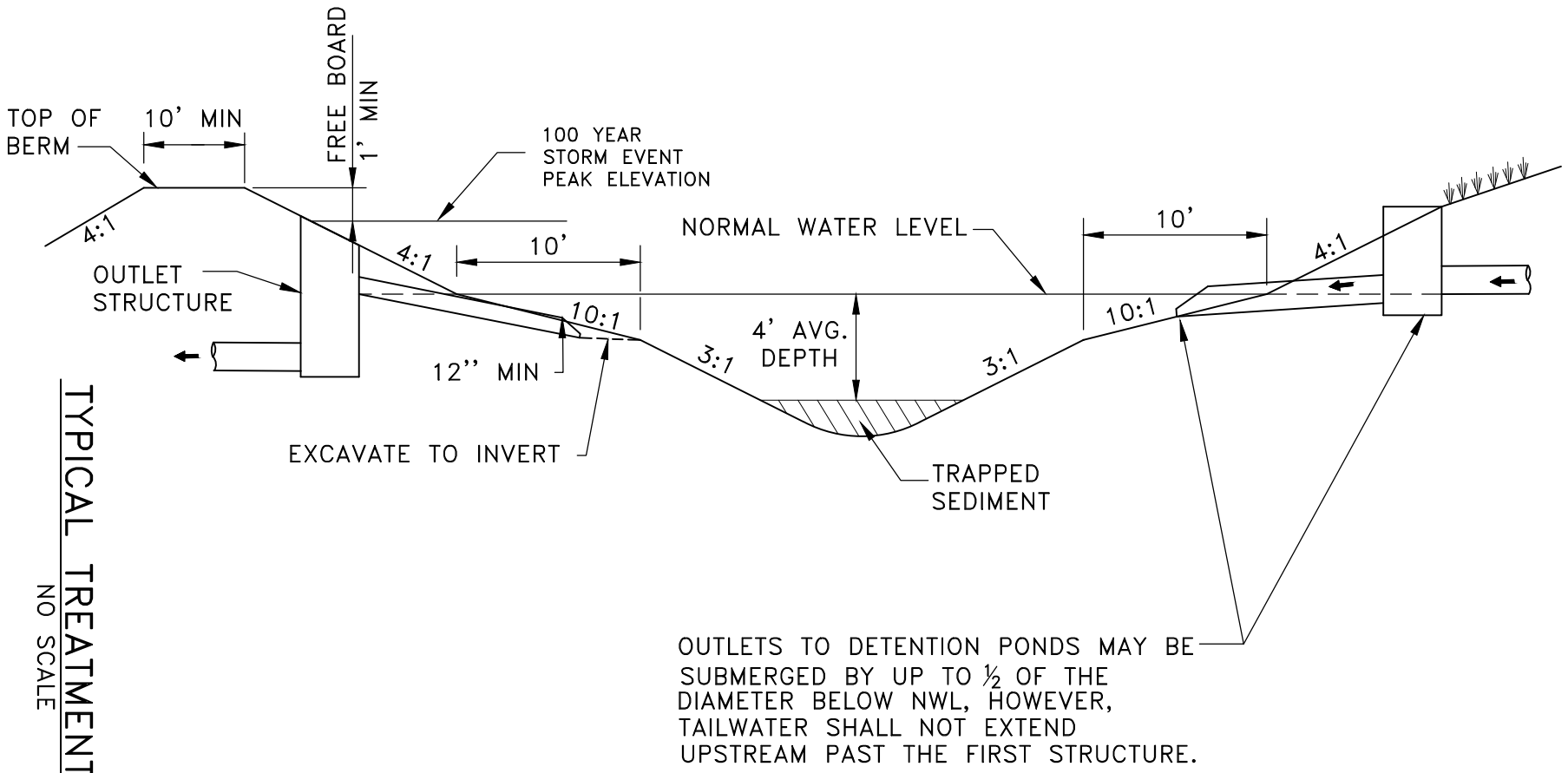
REVISED

City of St. Francis

STANDARD PLATE NO. 404

TYPICAL TREATMENT BASIN

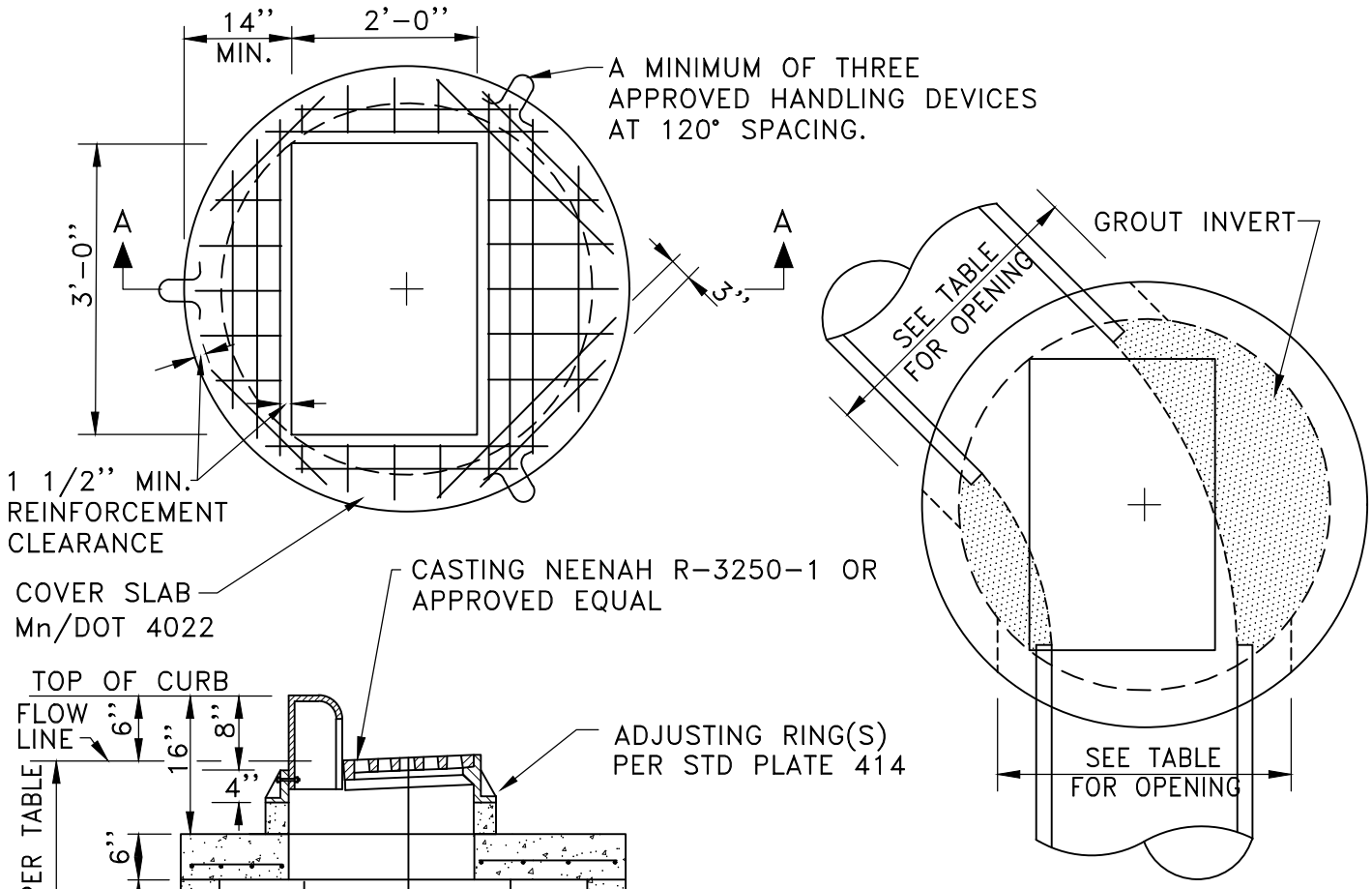
NO SCALE



OUTLETS TO DETENTION PONDS MAY BE SUBMERGED BY UP TO ½ OF THE DIAMETER BELOW NWL, HOWEVER, TAILWATER SHALL NOT EXTEND UPSTREAM PAST THE FIRST STRUCTURE.

NOTE:

1. SLOPES SHALL BE NO STEEPER THAN THOSE SHOWN.
2. AN STABILIZED EMERGENCY OVERFLOW SHALL BE PROVIDED.
3. 10' WIDE ACCESS ROUTE TO BE PROVIDED TO SKIMMER STRUCTURE/RIPIRAP OVERFLOW



SECTION A-A

STANDARD OPENINGS	
PIPE DIA. (IN.)	OPENING SIZE (IN.)
15	24
18	26
21	30
24	34

MINIMUM C.B. DEPTH - FLOW LINE TO INVERT		
PIPE DIA.	MIN. DEPTH	MINIMUM DEPTH WITH 2 RINGS
15	41 IN.	41 IN.
18	45 IN.	45 IN.
21	48 IN.	48 IN.
24	51 IN.	51 IN.

48 INCH DIAMETER SHALLOW DEPTH CATCH BASIN

MAXIMUM 24 INCH DIAMETER PIPE SIZE

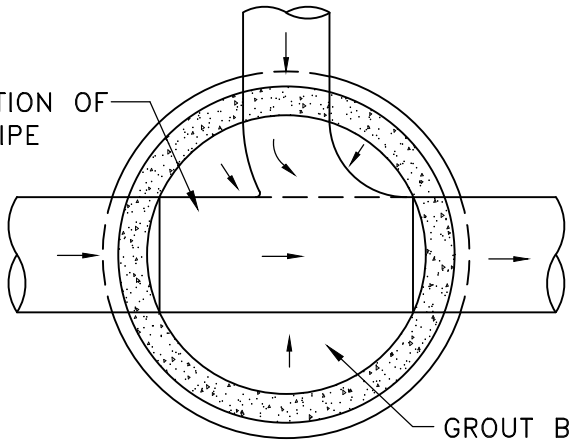
NO SCALE

APPROVED

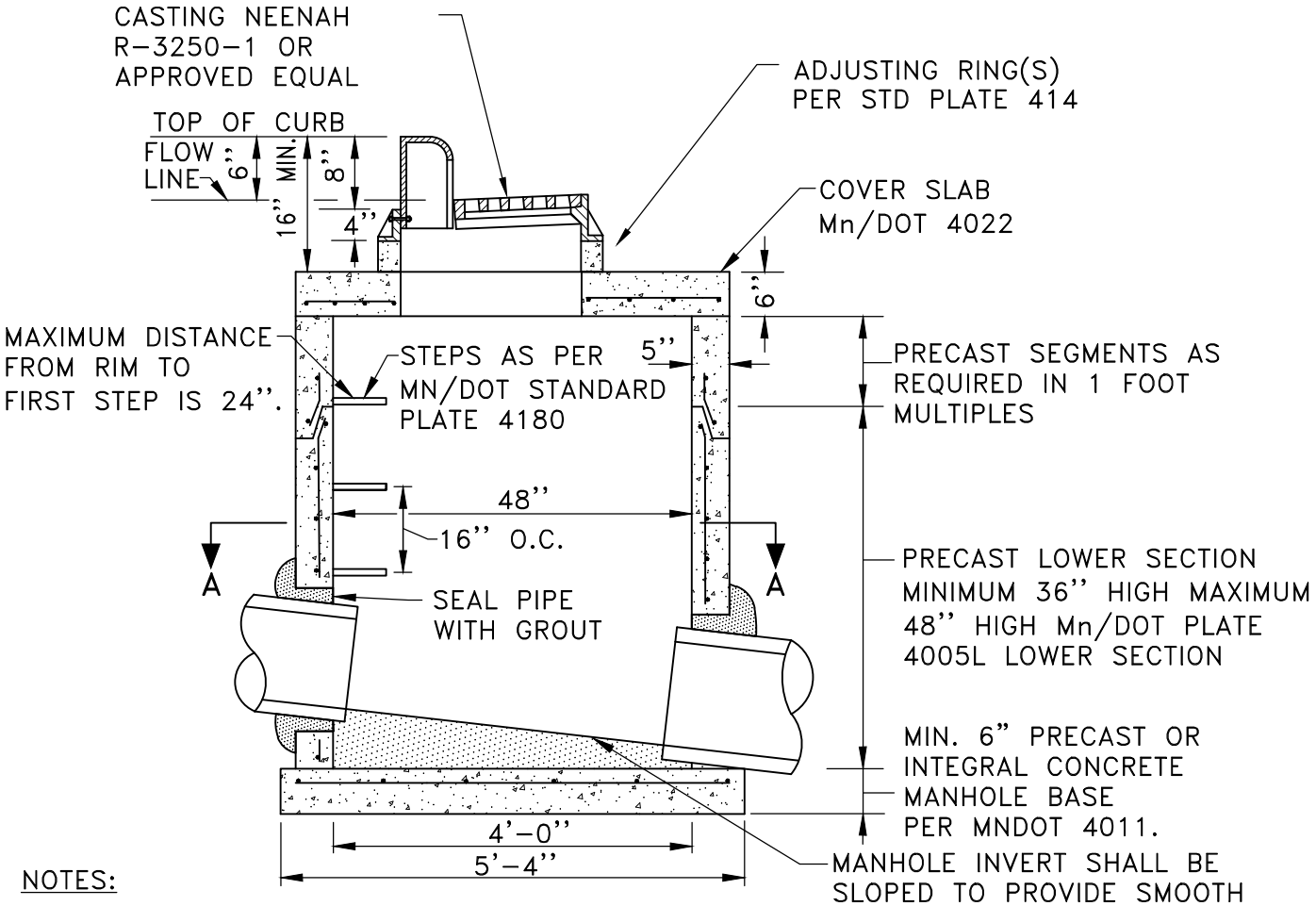
REVISED

City of St. Francis

STANDARD PLATE NO. 405



SECTION A–A



NOTES:

MANHOLE STEEL REINFORCING SHALL BE PER ASTM C478.

STANDARD STORM MANHOLE – CATCH BASIN

MINIMUM COVER FLOW LINE – TO TOP OF PIPE = 2 FEET

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 406
REVISED		

Dec 27, 2022 - 8:15pm
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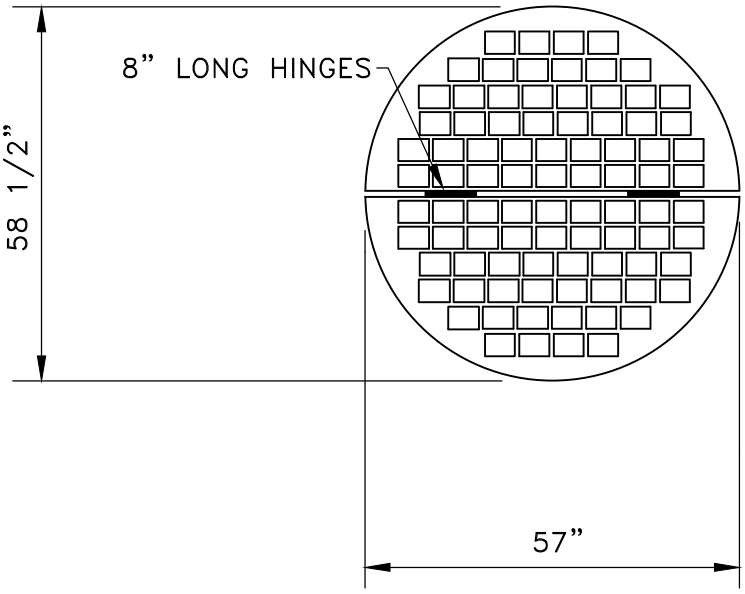
GALVANIZED GRATE



TOP VIEW

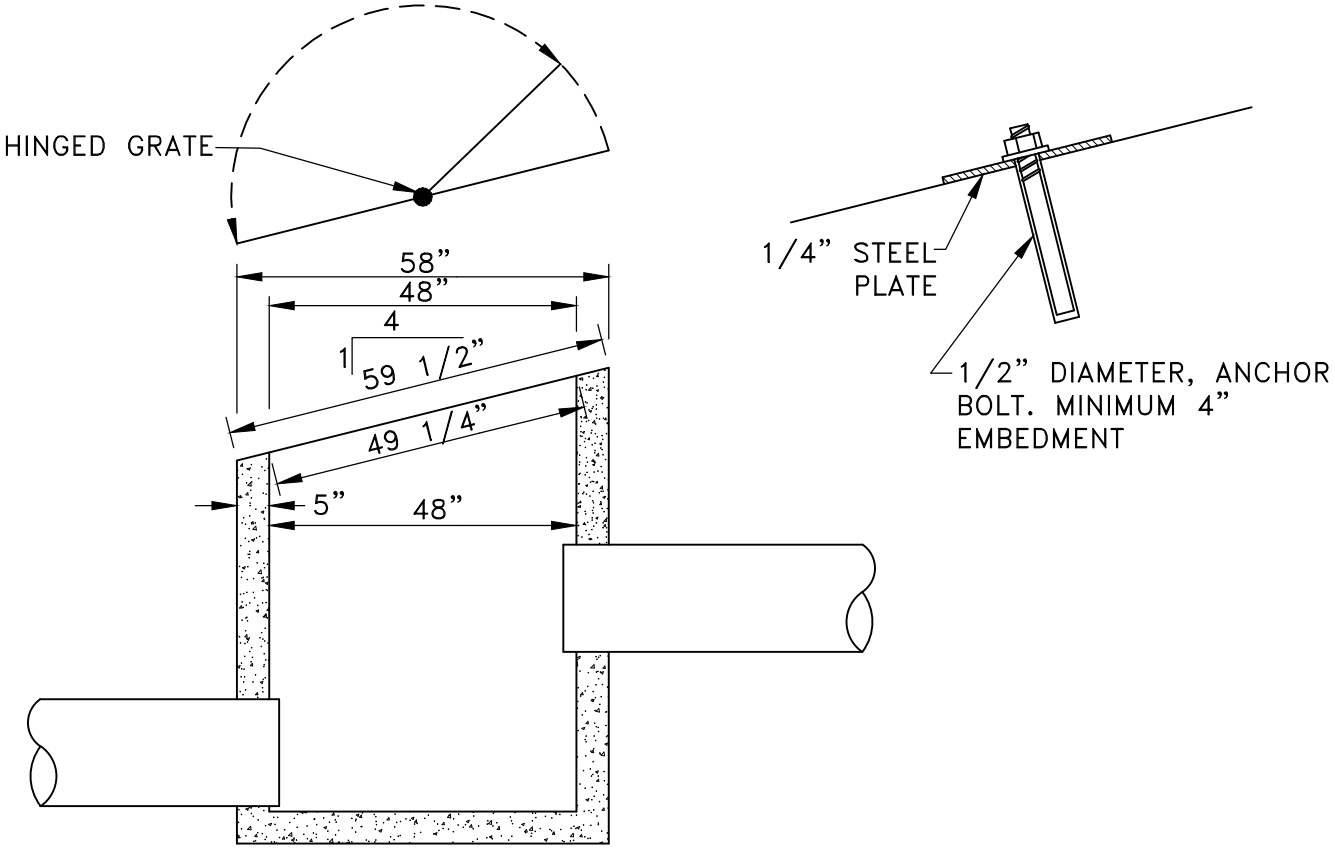
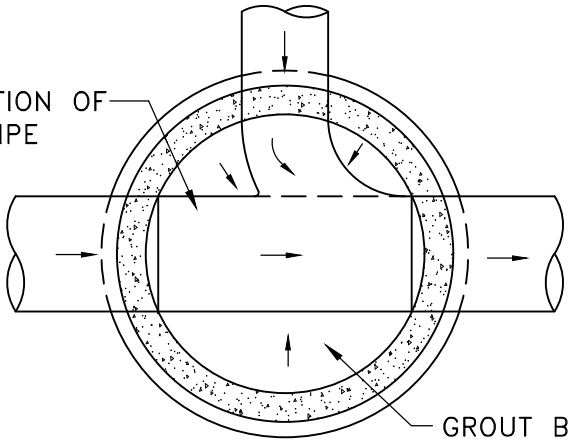


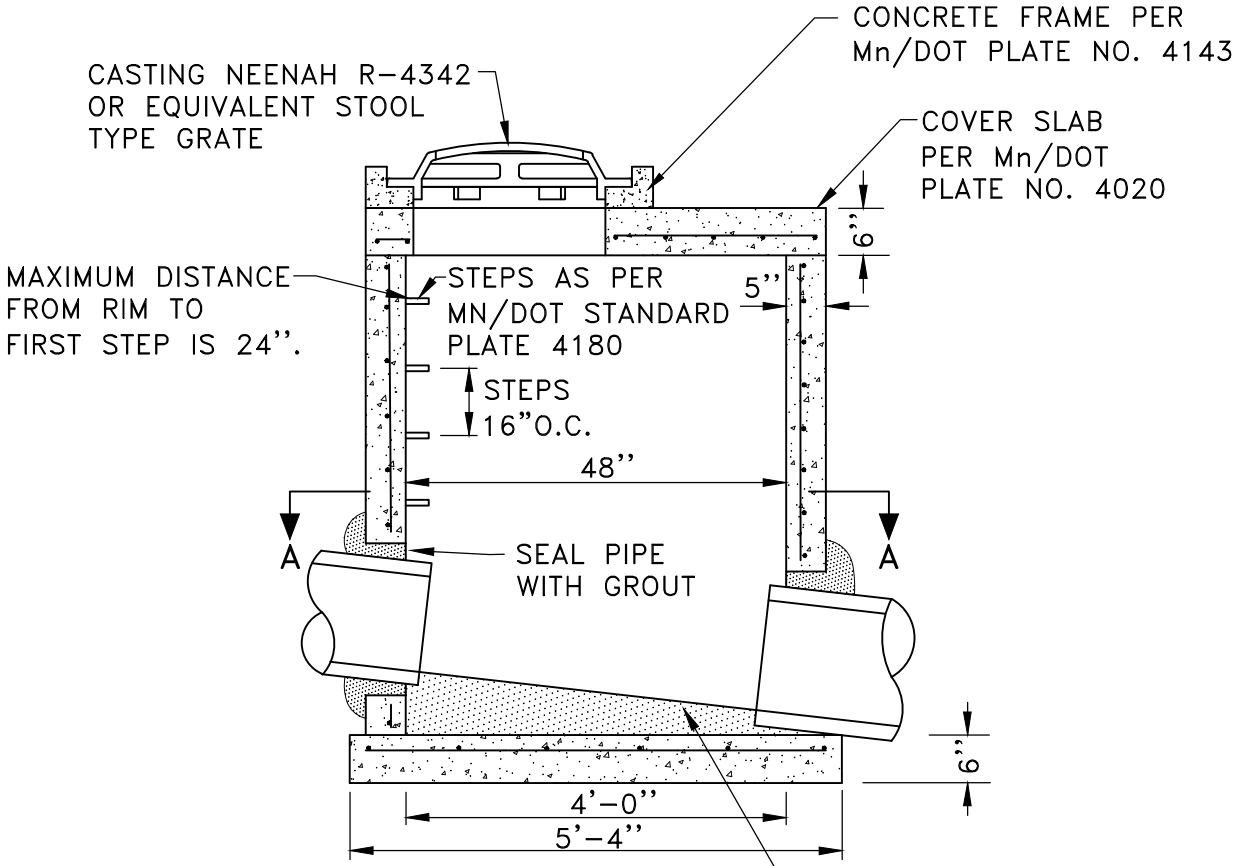
PLATE STYLE GRATE FOR 48" DIA. OUTLET STRUCTURE

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 407



SECTION A–A



NOTES:

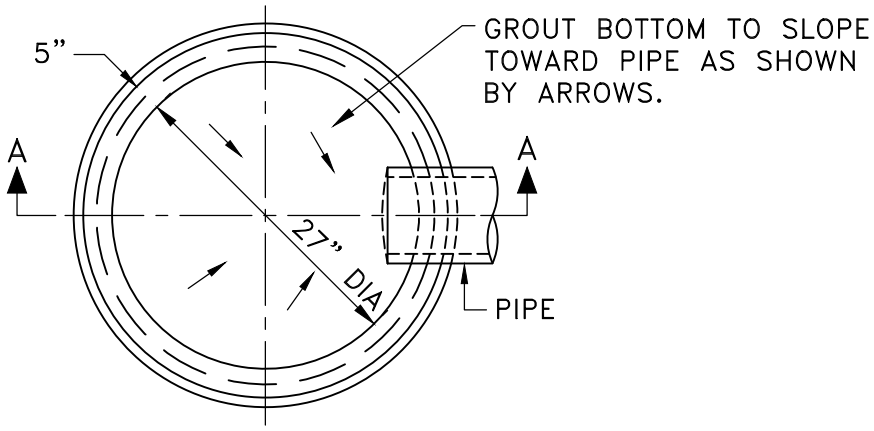
MANHOLE STEEL REINFORCING SHALL BE PER ASTM C478.

STANDARD STORM MANHOLE–YARD INLET

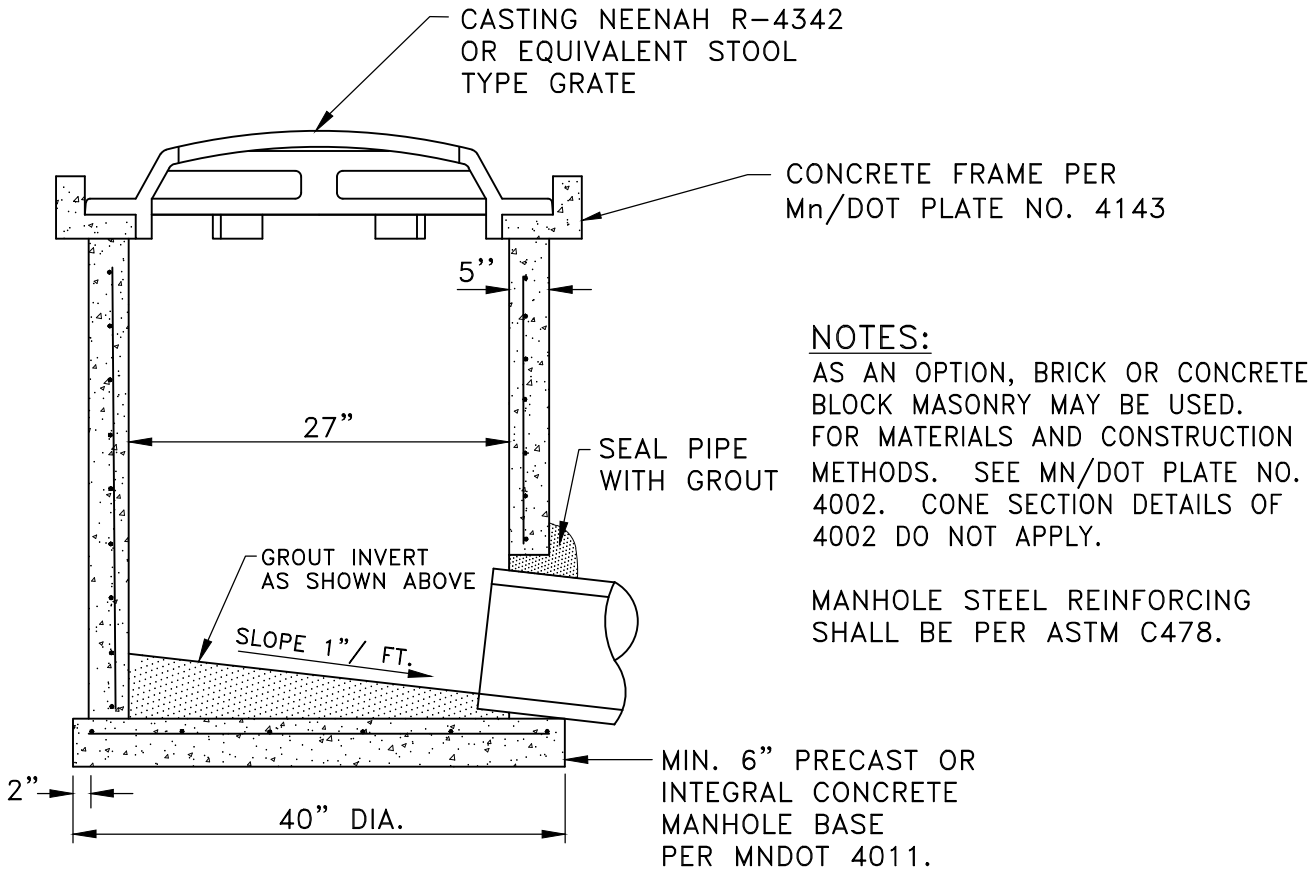
NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 408

Nov 11, 2022 – 11:39am
K:\cad_eng\Details\ST FRANCIS\Standard plates\400 STORM\Stm–408.dwg



TOP VIEW



SECTION A-A

NOTES:

AS AN OPTION, BRICK OR CONCRETE BLOCK MASONRY MAY BE USED. FOR MATERIALS AND CONSTRUCTION METHODS. SEE MN/DOT PLATE NO. 4002. CONE SECTION DETAILS OF 4002 DO NOT APPLY.

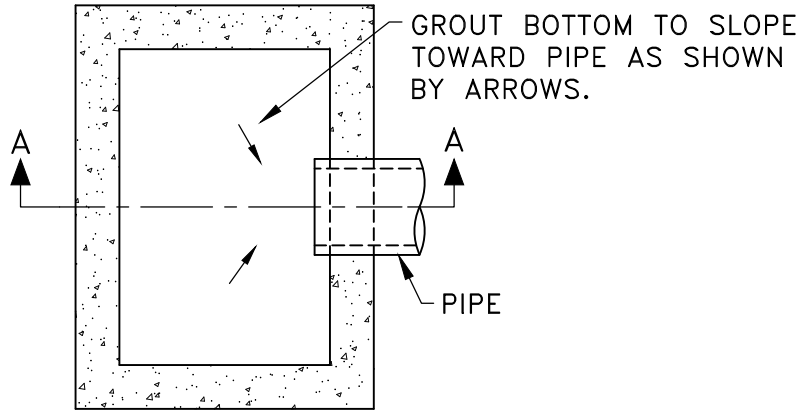
MANHOLE STEEL REINFORCING SHALL BE PER ASTM C478.

27" PRECAST CATCH BASIN YARD INLET

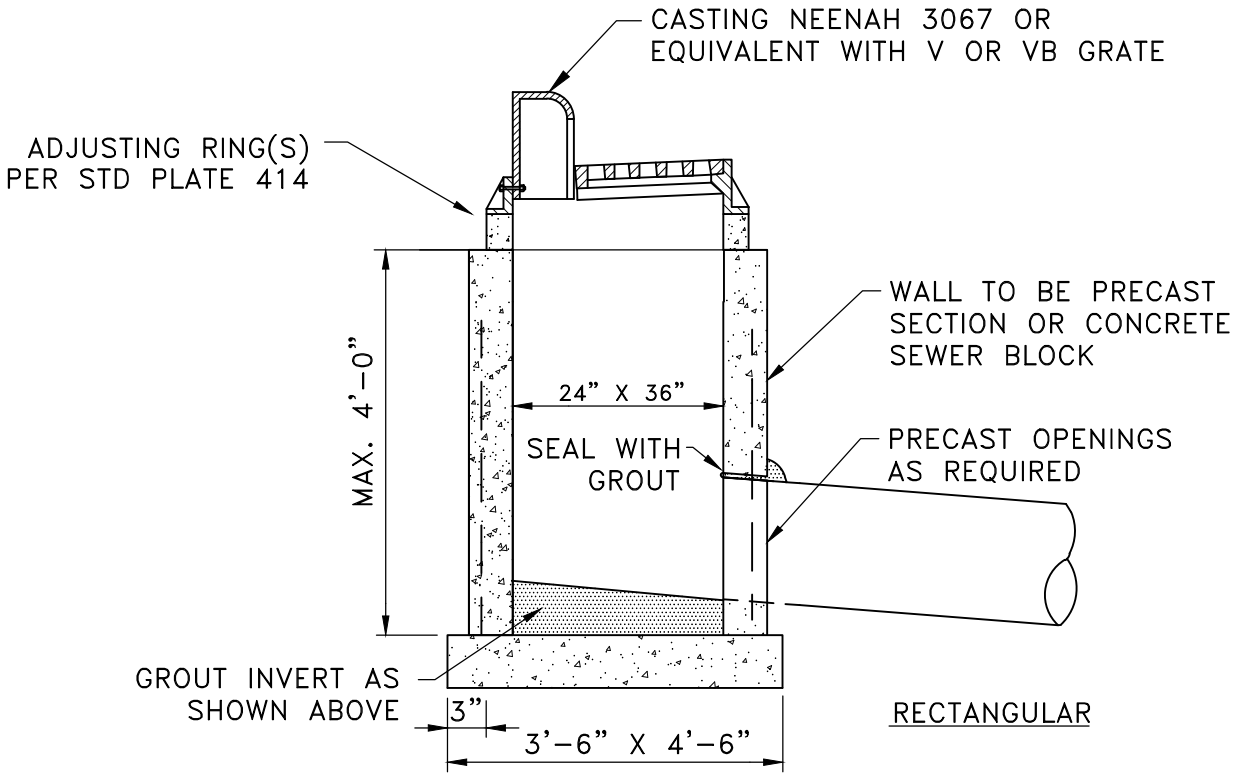
NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 409

Nov 11, 2022 - 11:39am
K:\cad_eng\Details\ST FRANCIS\Standard plates\400 STORM\Stm-409.dwg



TOP VIEW



SECTION A–A

NOTES:

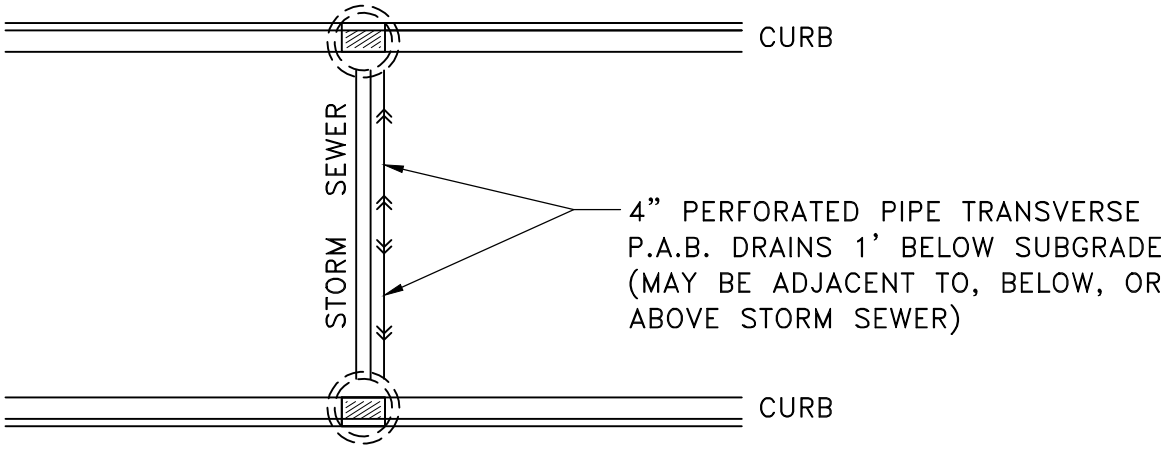
1. CONCRETE BASE SHALL BE 6" POURED IN PLACE OR 5" PRECAST SLAB.
2. MANHOLE STEEL REINFORCING SHALL BE PER ASTM C478.

2' x 3' CATCH BASIN

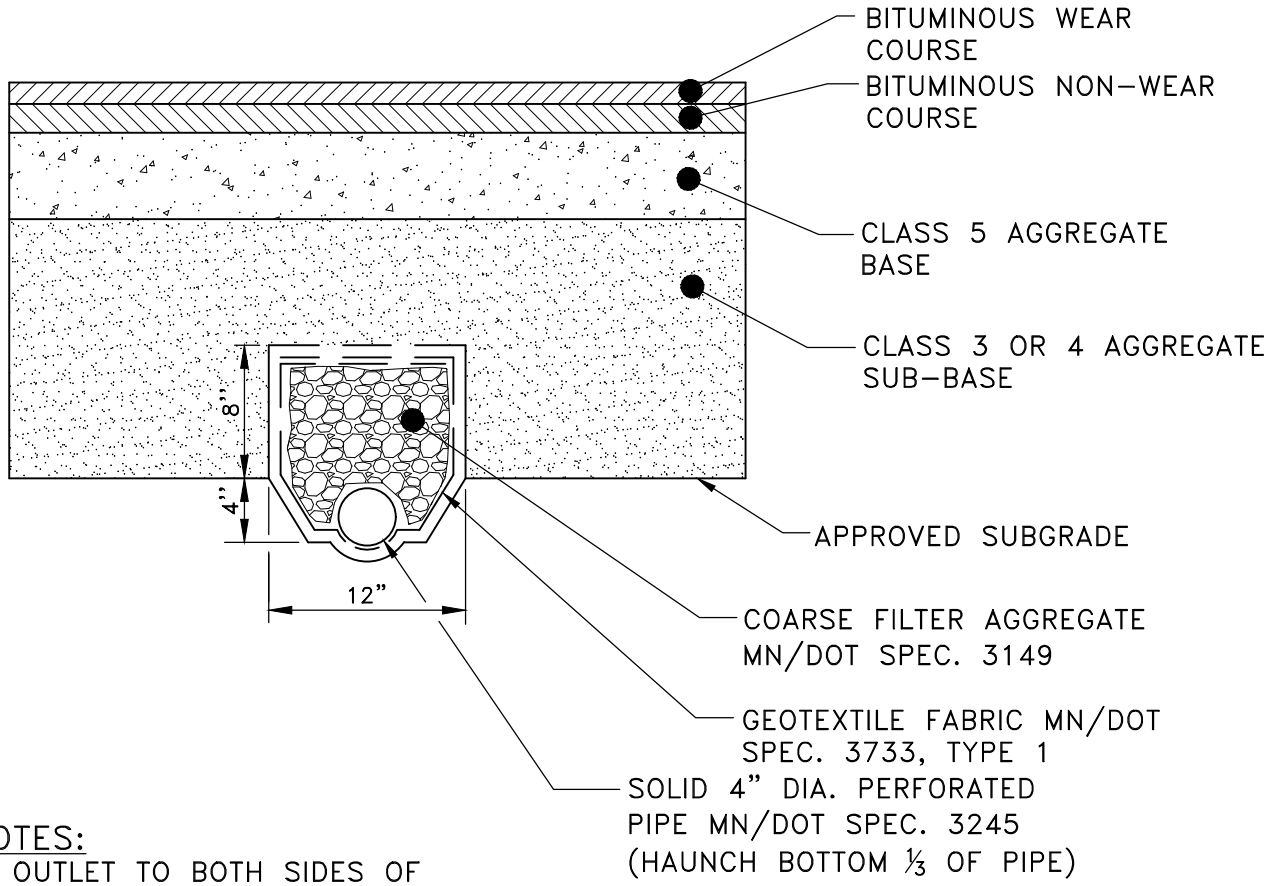
NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 410
REVISED		

Dec 27, 2022 - 8:16pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\400 STORM\Stm-410.dwg



TOP VIEW



NOTES:

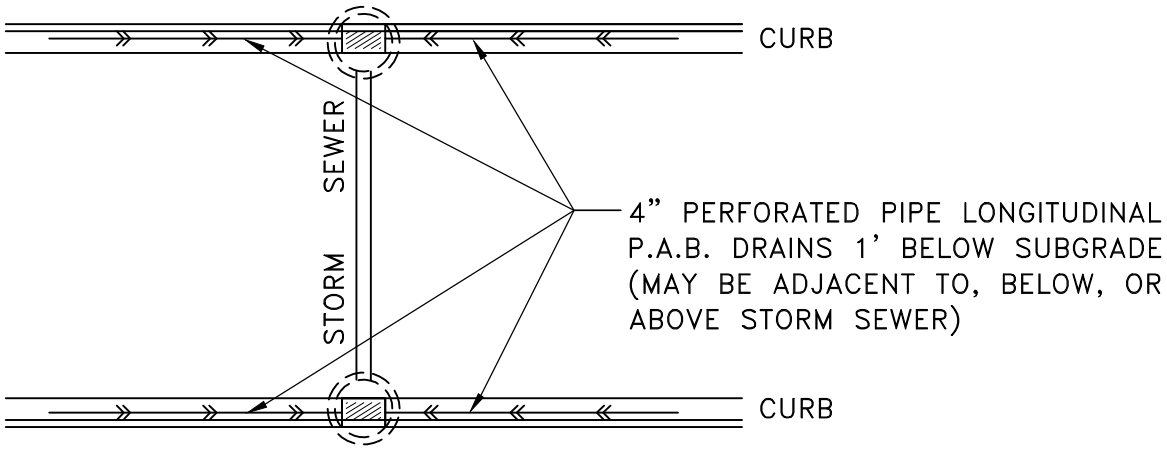
1. OUTLET TO BOTH SIDES OF ROADWAY.
2. MINIMUM TRANSVERSE SLOPE OF PERFORATED PIPE SHALL BE 2%.

TRANSVERSE PERMEABLE AGGREGATE BASE (P.A.B.) DRAIN

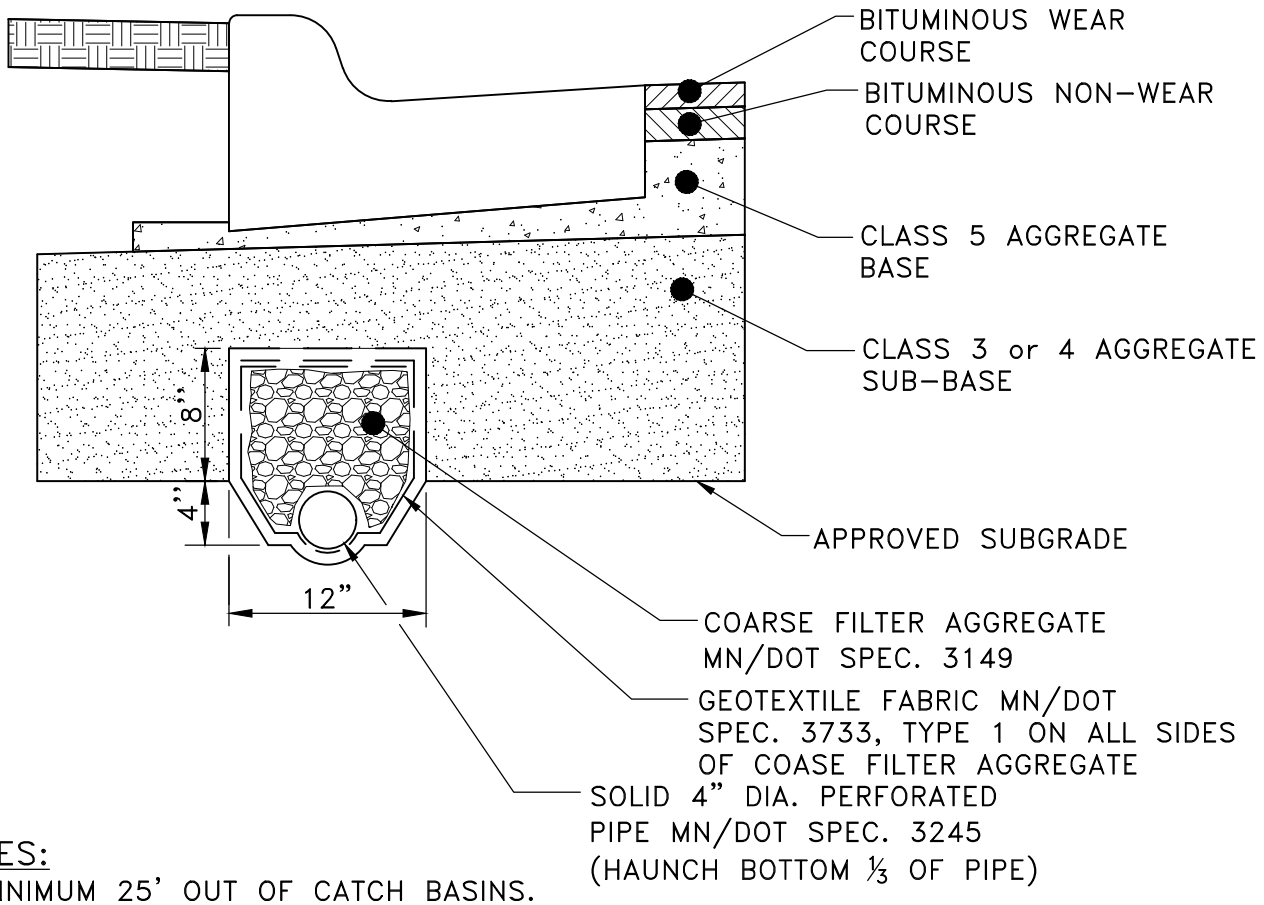
NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 411
REVISED		

Nov 11, 2022 - 11:41am
K:\cad_eng\Details\ST FRANCIS\Standard plates\400 STORM\Stm-411.dwg



TOP VIEW



NOTES:

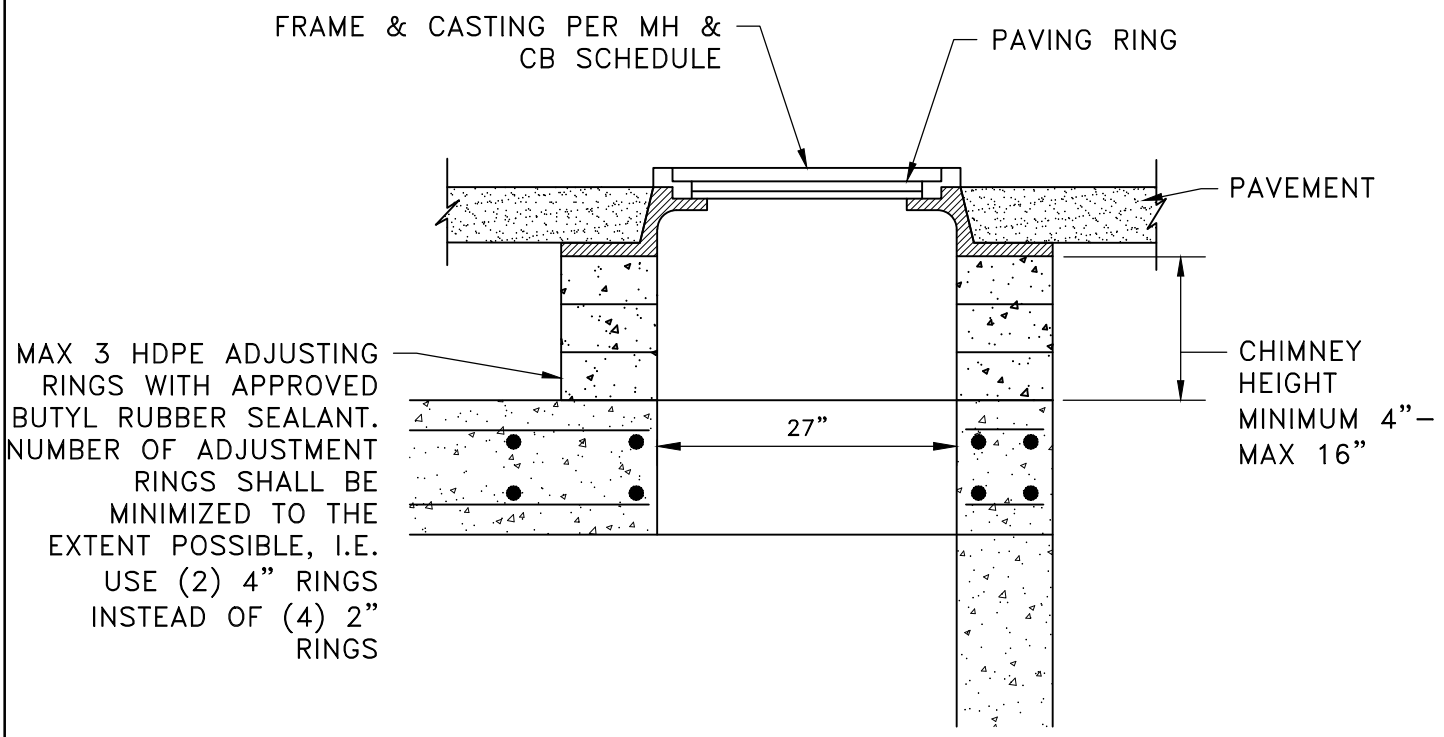
1. MINIMUM 25' OUT OF CATCH BASINS.
2. MINIMUM SLOPE OF PERFORATED PIPE SHALL BE 1%.

LONGITUDINAL PERMEABLE AGGREGATE BASE (P.A.B.) DRAIN

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 412
REVISED		

Nov 11, 2022 - 11:43am
K:\cad_eng\Details\ST FRANCIS\Standard plates\400 STORM\Stm-412.dwg

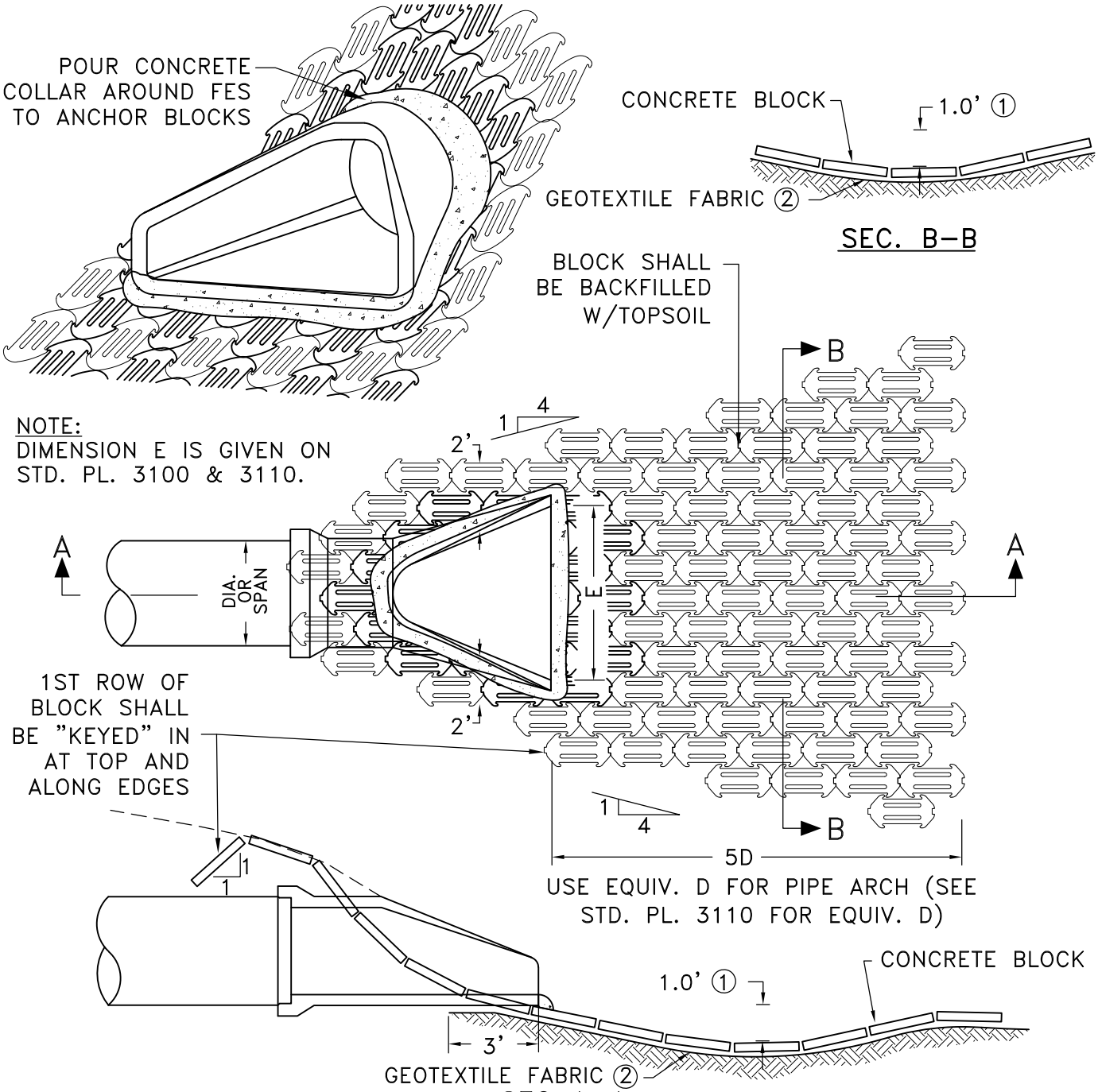


STORM MANHOLE ADJUSTMENT RINGS

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 414

Dec 27, 2022 - 8:17pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\400 STORM\Stm-414.dwg



ARTICULATED CONCRETE BLOCK SHALL BE A HANDPLACED INTERLOCKING CONCRETE BLOCK SYSTEM, CABLE CONNECED CONCRETE BLOCK MAT, OR APPROVED EQUAL.

① FOR PIPES GREATER THAN OR EQUAL TO 48", USE 2.0'

② GEOTEXTILE FABRIC PER Mn/DOT SPEC. 3733. FABRIC SHALL BE OVERSIZED A MINIMM OF 12" AND COVER THE ENTIRE AREA UNDER THE BLOCK MAT AND EXTEND UNDER THE CULVERT APRON 3 FEET.

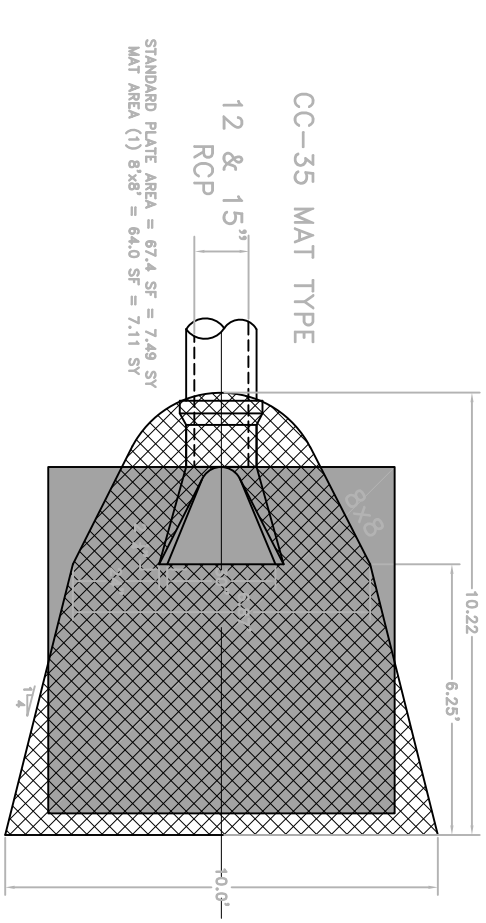
③ IF A CABLE CONCRETE SYSTEM IS USED, MULTIPLE MATS MUST BE TIED TOGETHER PER MANUFACTURERS SPEC. AND ALL CABLES PROTRUDING BEYOND THE FINISHED EDGES SHALL BE CUT FLUSH TO THE BLOCK.

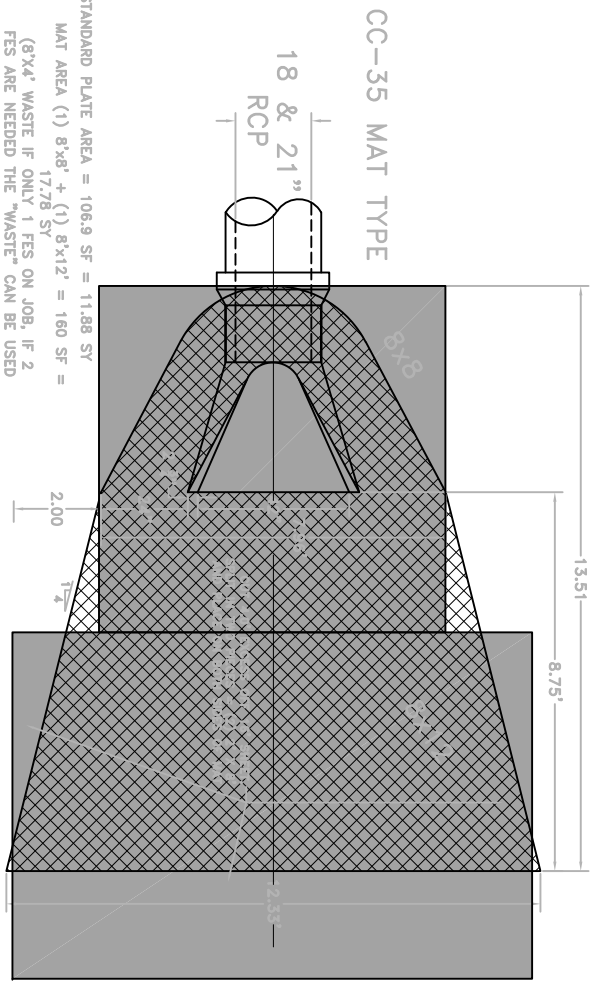
ARTICULATED CONCRETE BLOCK AT R.C.P. OUTLET

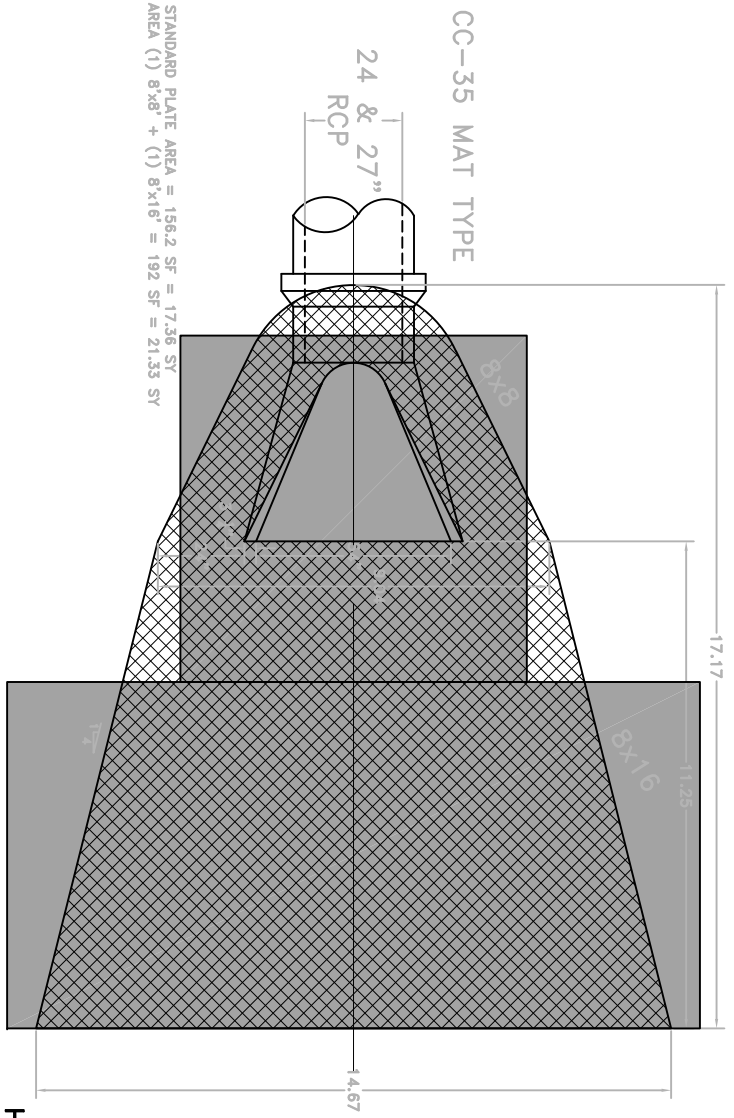
NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 500
REVISED		

Nov 11, 2022 – 11:45am
K:\cad_eng\Details\ST FRANCIS\Standard plates\500 EROSION\Ers-500.dwg



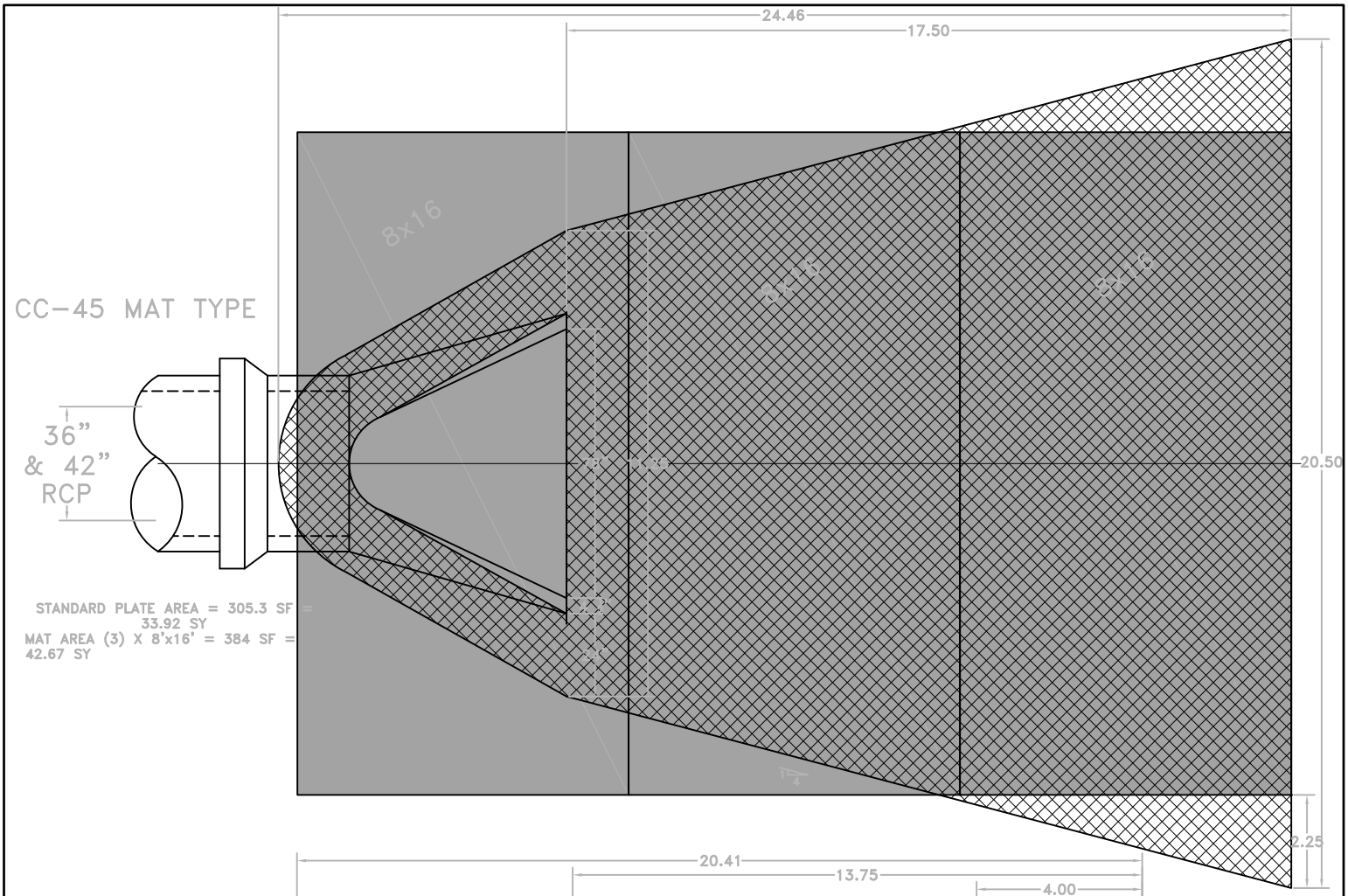


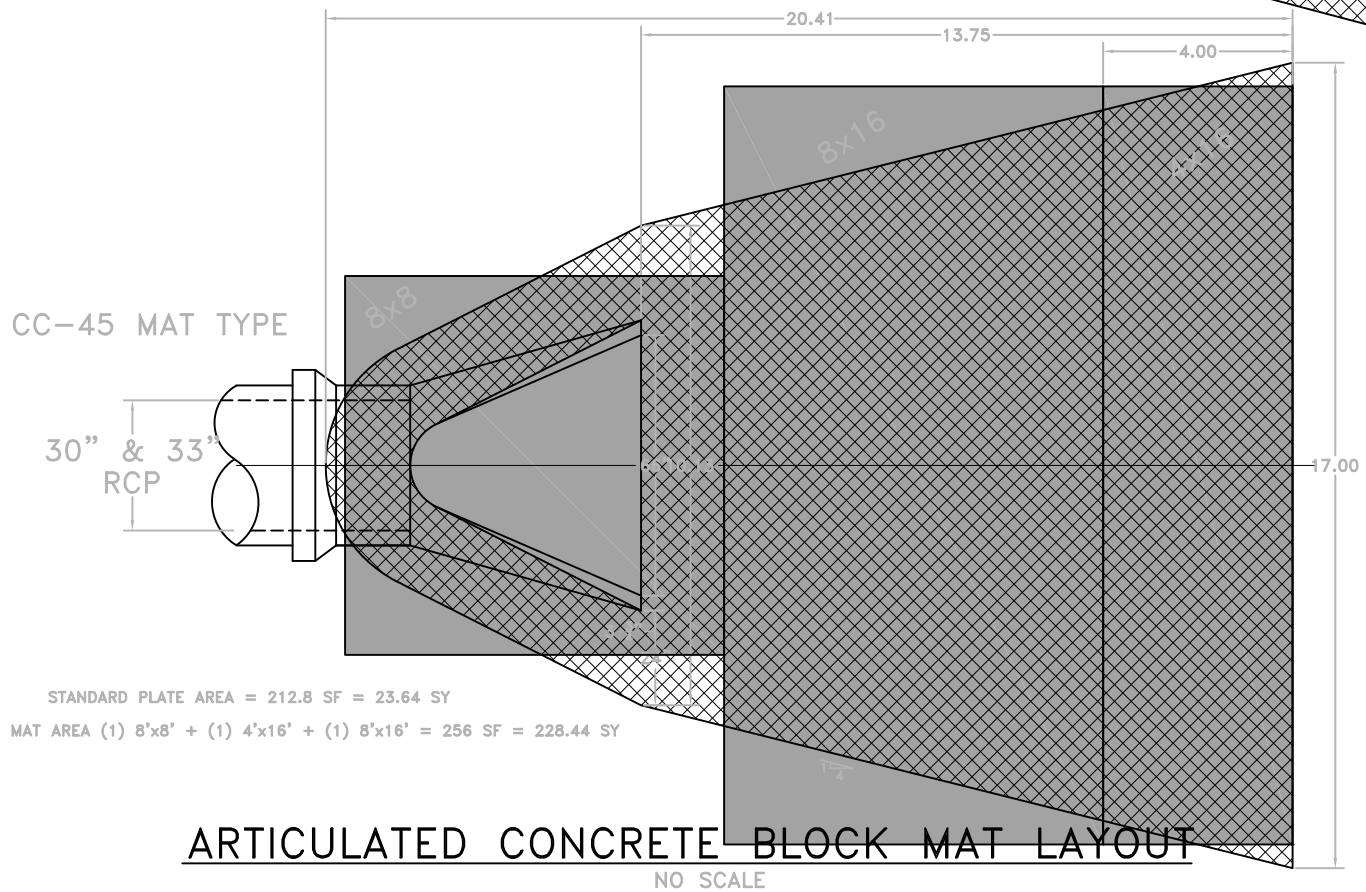


ARTICULATED CONCRETE BLOCK MAT LAYOUT

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 501	SHEET 1 OF 3



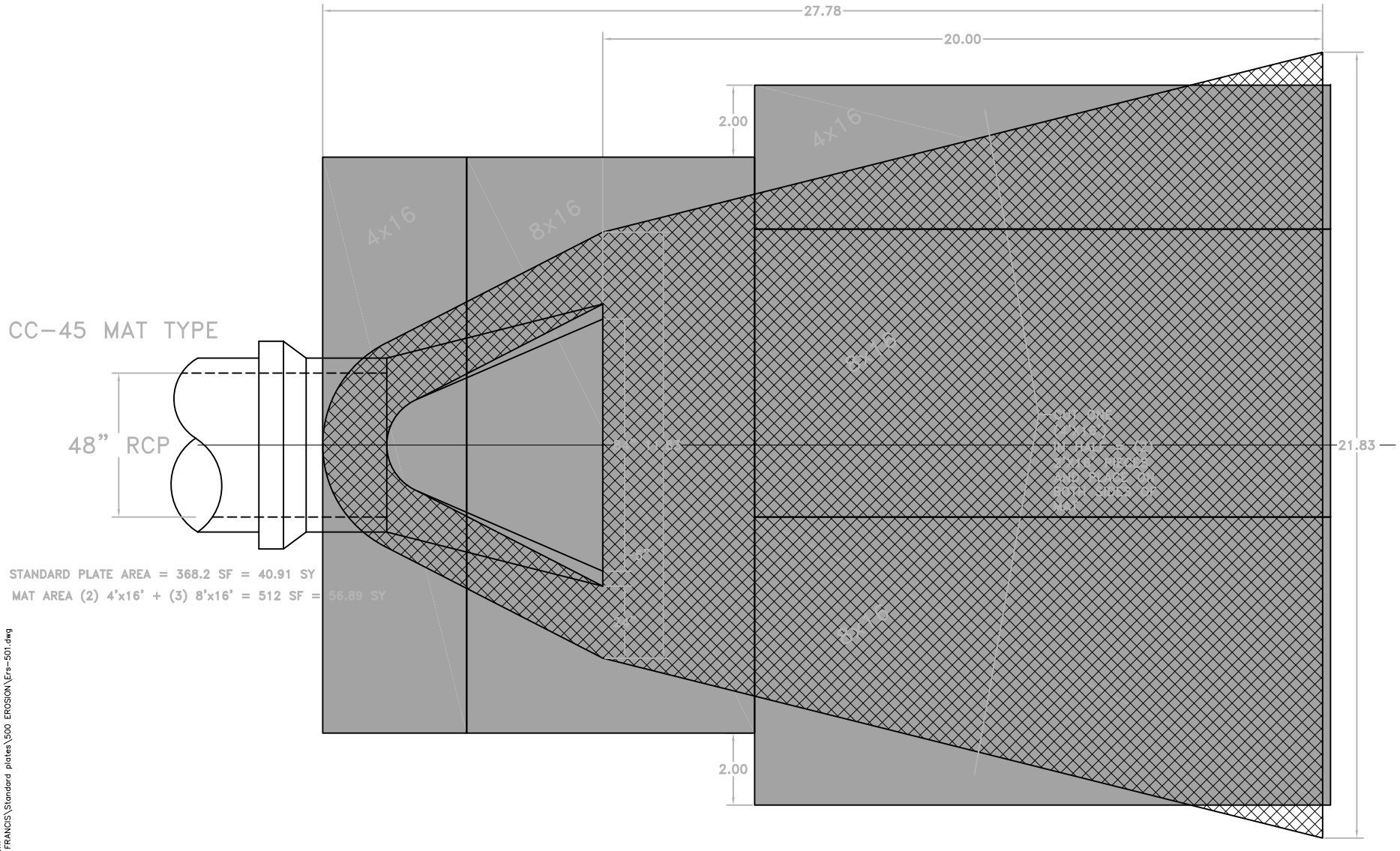


ARTICULATED CONCRETE BLOCK MAT LAYOUT

NO SCALE

Dec. 27, 2022 – 7:47pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\500 EROSION\Er-501.dwg

APPROVED	City of St. Francis	STANDARD PLATE NO. 501
REVISED		SHEET 2 OF 3

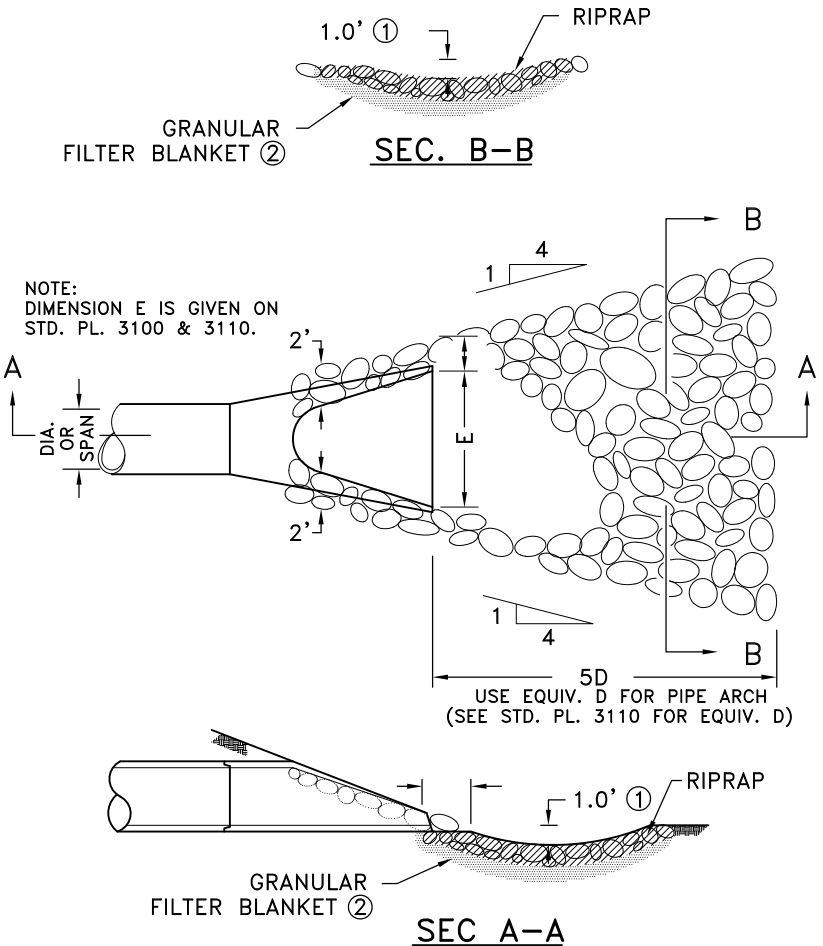


Dec 27, 2022 - 7:53pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\500 EROSION\Fs-501.dwg

ARTICULATED CONCRETE BLOCK MAT LAYOUT

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 501	SHEET 3 OF 3



		CLASS III d50=9"	CLASS IV d50=12"
DIA OF ROUND PIPE (IN)	L (FT)*	18" DEPTH RIPRAP (CU YD)	24" DEPTH RIPRAP (CU YD)
12	8	8	10
15	8	8	10
18	10	10	15
21	10	15	15
24	12	15	20
27	12	15	20
30	14	20	25
36	16	25	30
42	18	30	40
48	20	40	50

*"L" DIMESNTION IS MINIMUM REQUIRED. RIPRAP SHALL EXTEND TO POND BOTTOM

① FOR PIPES GREATER THAN OR EQUAL TO 48'", USE 2.0'

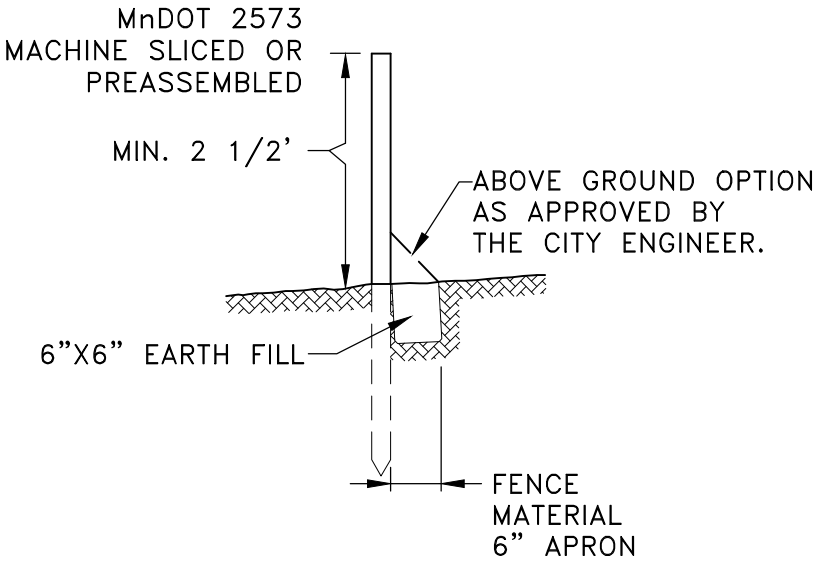
② THE CONTRACTOR MAY SUBSTITUTE A GEOTEXTILE FABRIC, SPEC. 3601 FOR THE GRANULAR FILTER BLANKET UNLESS OTHERWISE SPECIFIED IN THE PLANS. THE FABRIC SHOULD COVER THE AREA OF THE RIPRAP AND EXTEND UNDER THE CULVERT APRON 3 FEET.

RIP–RAP AT R.C.P. OUTLET

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 502
REVISED		

Dec 27, 2022 – 8:18pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\500 EROSION\Ers–502.dwg



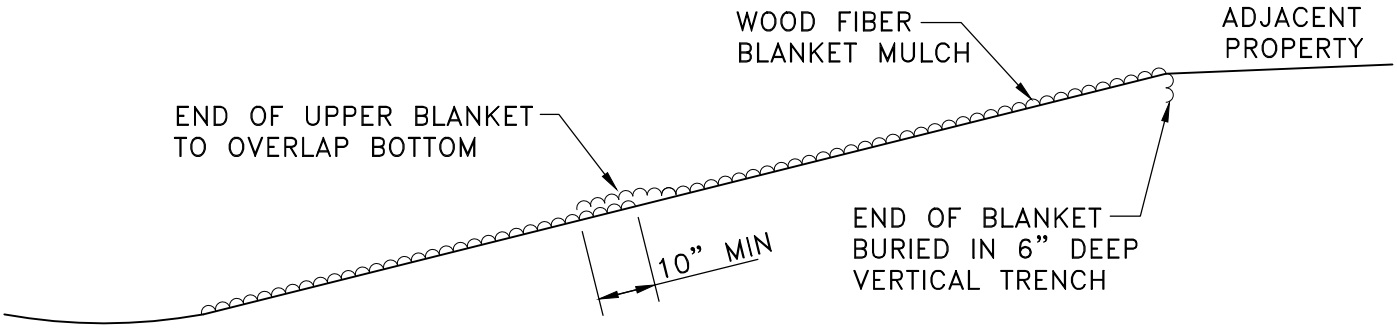
5' POSTS – 8' MAX. ON CENTER
MINIMUM 2' PENETRATION

REF. MnDOT 3886

SILT FENCE

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 503
REVISED		



NOTE:
WOOD FIBER BLANKET SHALL BE PLACED AND STAPLED ACCORDING TO Mn/DOT SPECIFICATION 2575.3K2 WITH THE FOLLOWING EXCEPTIONS. ADJACENT STRIP EDGES SHALL BE OVERLAPPED A MINIMUM OF 6".

PLASTIC OR WOOD BIODEGRADABLE STAKES OR STAPLES SHALL BE USED IN PLACE OF METAL WIRE STAPLES.

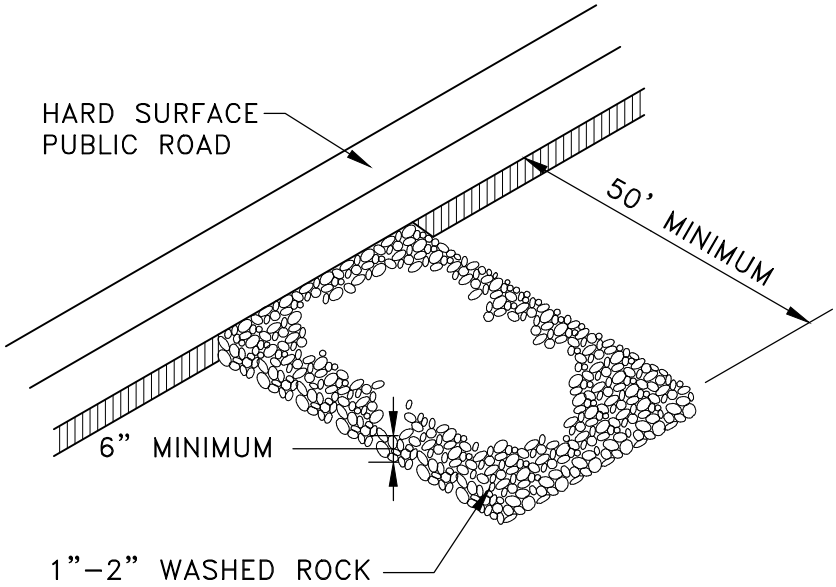
ECOSTAKES AND BIOSTAKES ARE ACCEPTABLE PRODUCTS FOR USE TO FASTEN WOOD FIBER BLANKET.

WOOD FIBER BLANKET INSTALLATION ON A CUT SLOPE

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 504

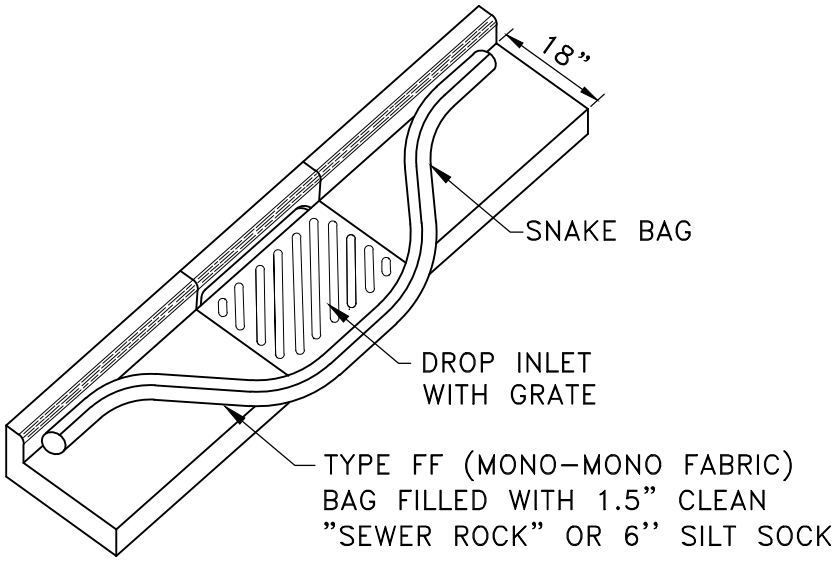
Dec 27, 2022 - 8:20pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\500 EROSION\Ers-504.dwg

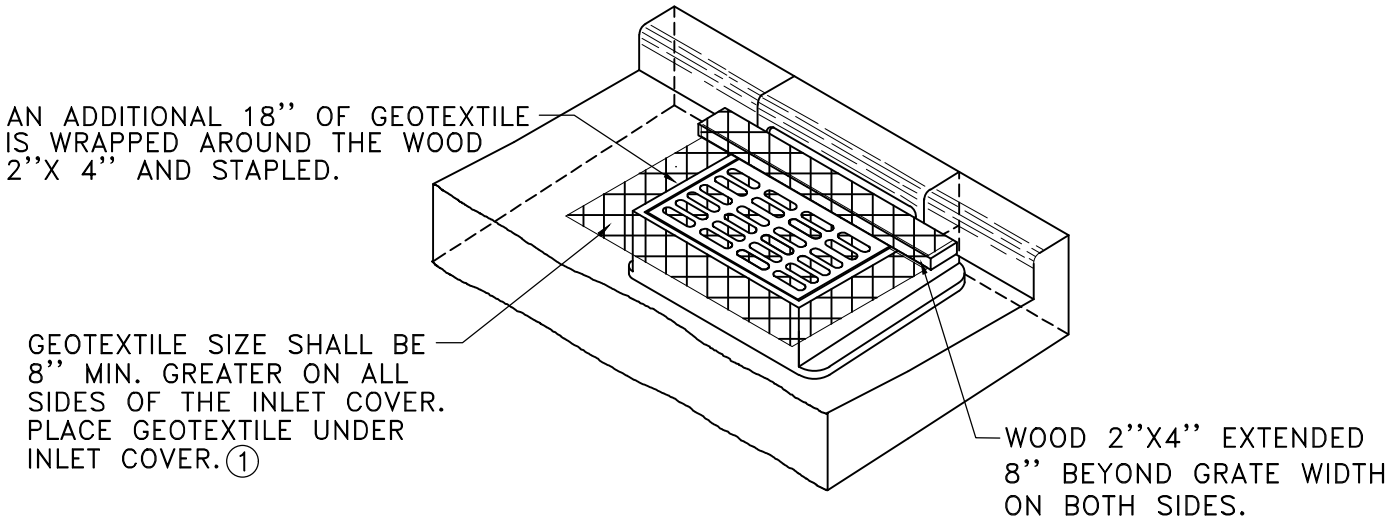


ROCK CONSTRUCTION ENTRANCE

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 505





① ALL GEOTEXTILE USED FOR INLET PROTECTION SHALL BE MONOFILAMENT IN BOTH DIRECTIONS, MEETING SPEC. 3886 FOR MACHINE SLICED.

② WIMCO'S MAY BE USED IN PLACE OF ABOVE.

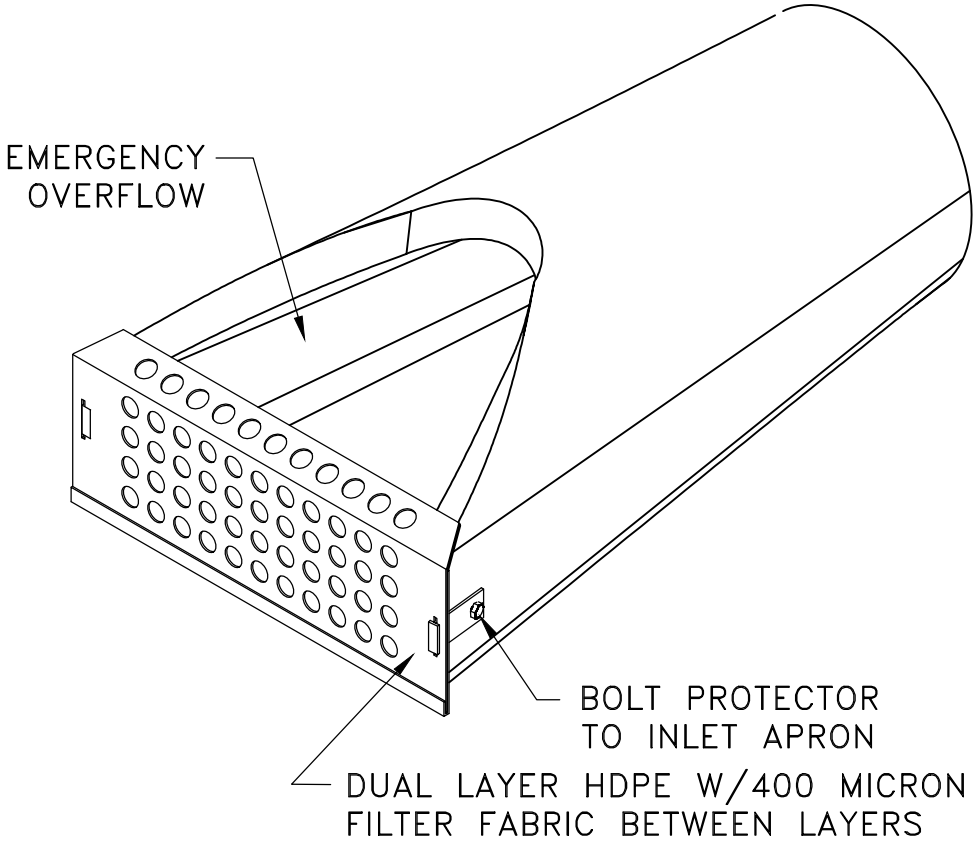
③ ALL DROP INLET PROTECTION SHALL BE REMOVED PRIOR TO WINTER FREEZE.

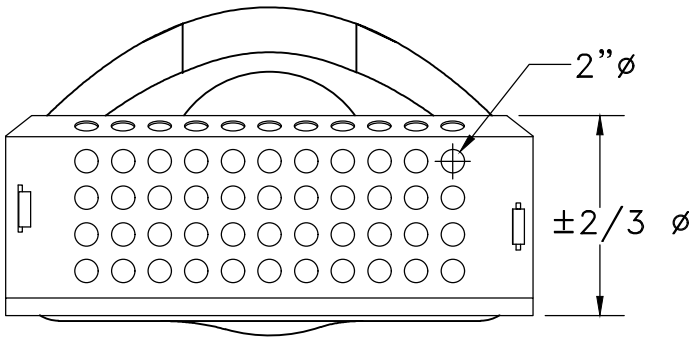
DROP INLET PROTECTION

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 506
REVISED		

Dec 27, 2022 - 8:21pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\500 EROSION\Ers-506.dwg

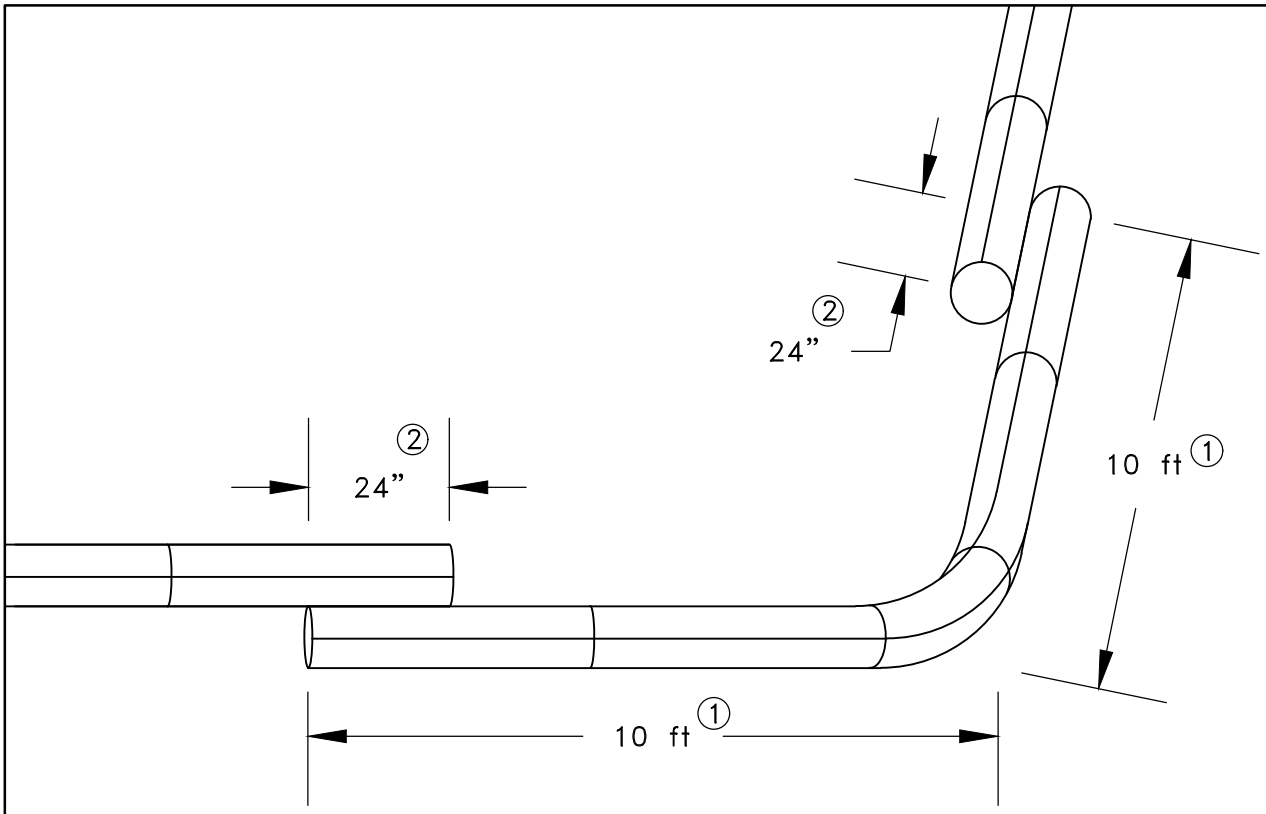


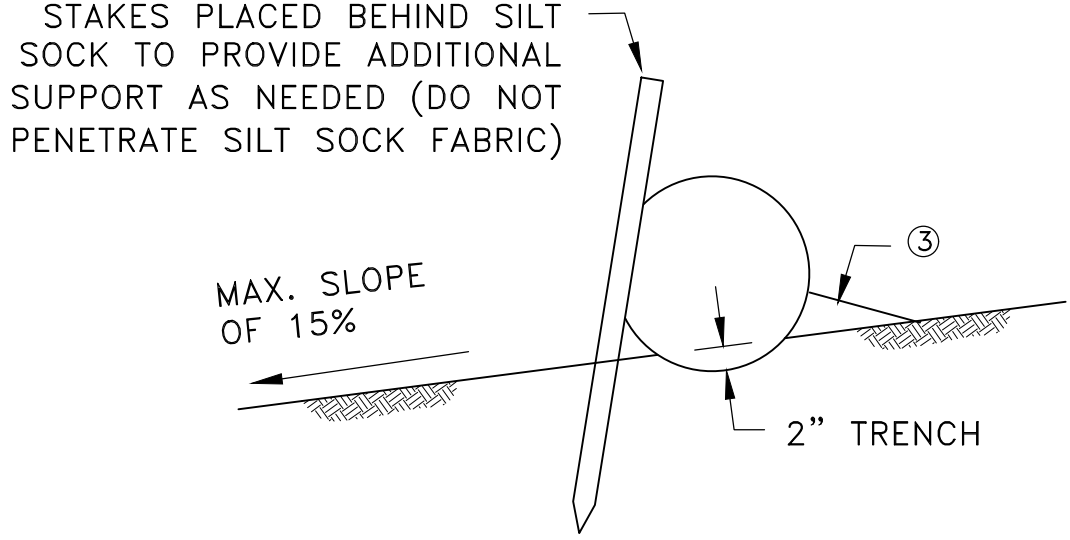


CULVERT CONTROL END

NO SCALE

APPROVED		STANDARD PLATE NO. 507
REVISED	City of St. Francis	





① BREAKS IN SILT SOCK SHALL BE LOCATED A MINIMUM OF 10 FEET FROM ANY SHARP BEND OR CHANGE IN SOCK DIRECTION.

② SOCK'S SHALL BE OVERLAPPED A MINIMUM OF 24" WITH THE UPSLOPE SIDE INFRONT.

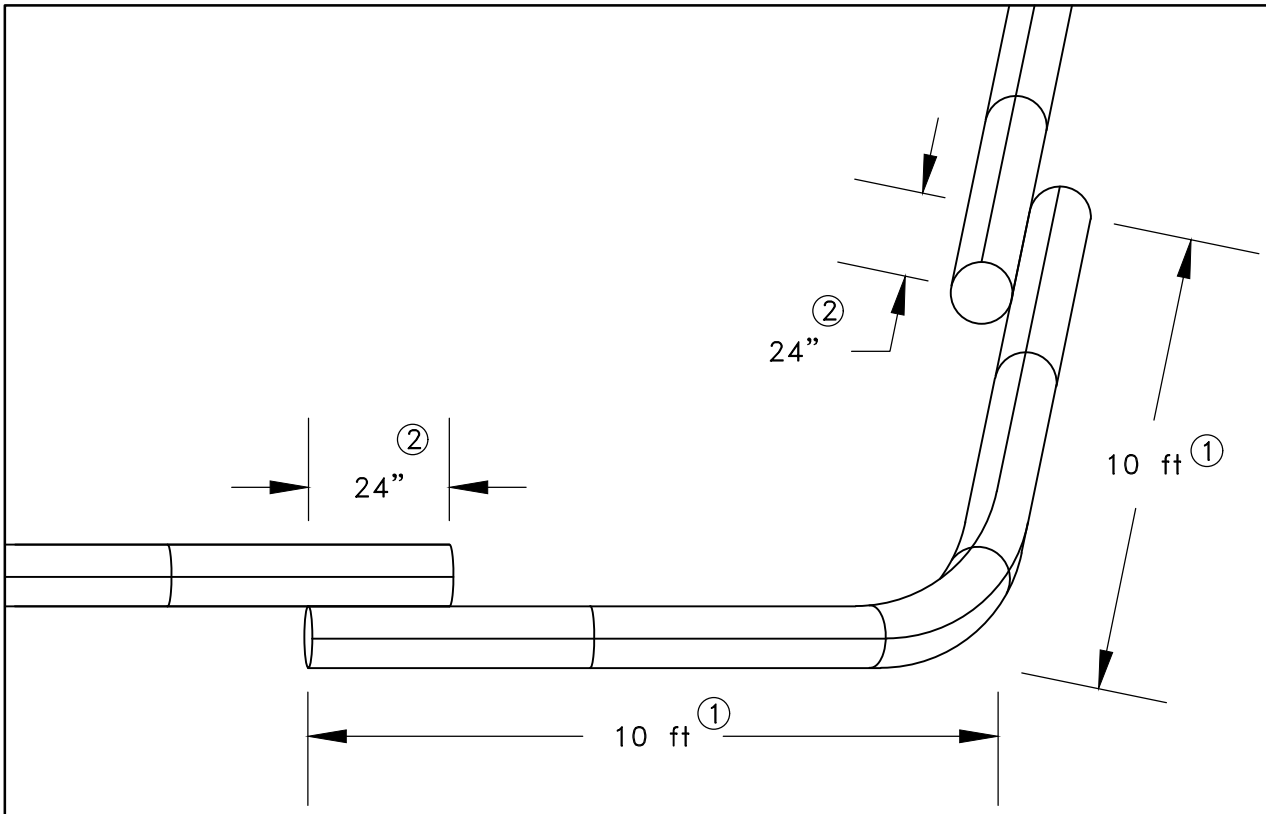
③ SEDIMENT ACCUMULATION OF 1/2 THE SOCK HEIGHT MUST BE REMOVED.

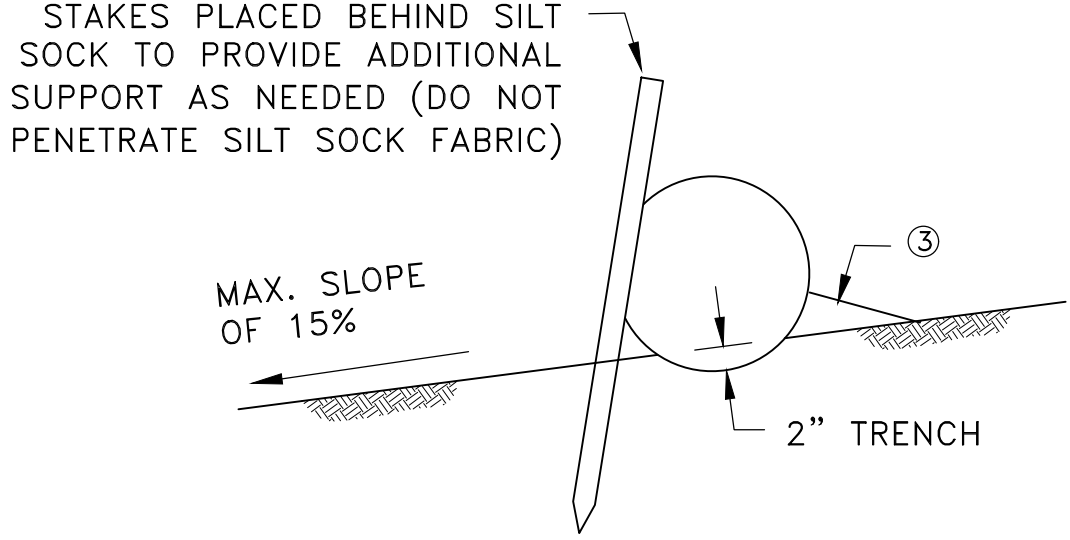
SILT SOCK

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 508
REVISED		

Nov 11, 2022 - 11:51am
K:\cad_eng\Details\ST FRANCIS\Standard plates\500 EROSION\Ers-508.dwg





① BREAKS IN SILT SOCK SHALL BE LOCATED A MINIMUM OF 10 FEET FROM ANY SHARP BEND OR CHANGE IN SOCK DIRECTION.

② SOCK'S SHALL BE OVERLAPPED A MINIMUM OF 24" WITH THE UPSLOPE SIDE INFRONT.

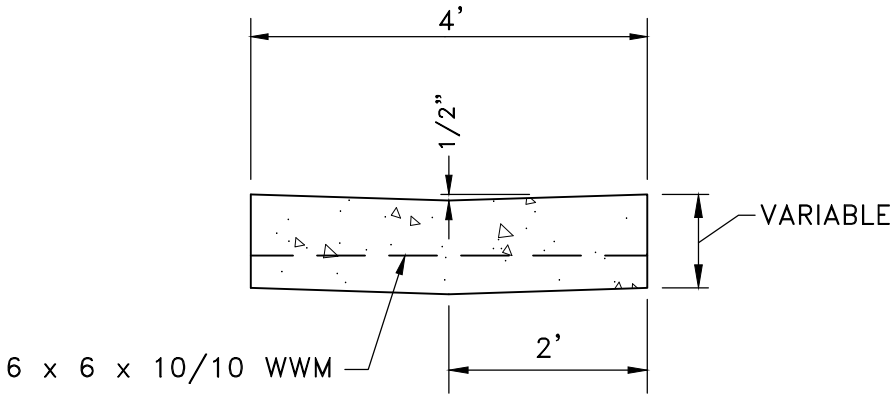
③ SEDIMENT ACCUMULATION OF 1/2 THE SOCK HEIGHT MUST BE REMOVED.

SILT SOCK

NO SCALE

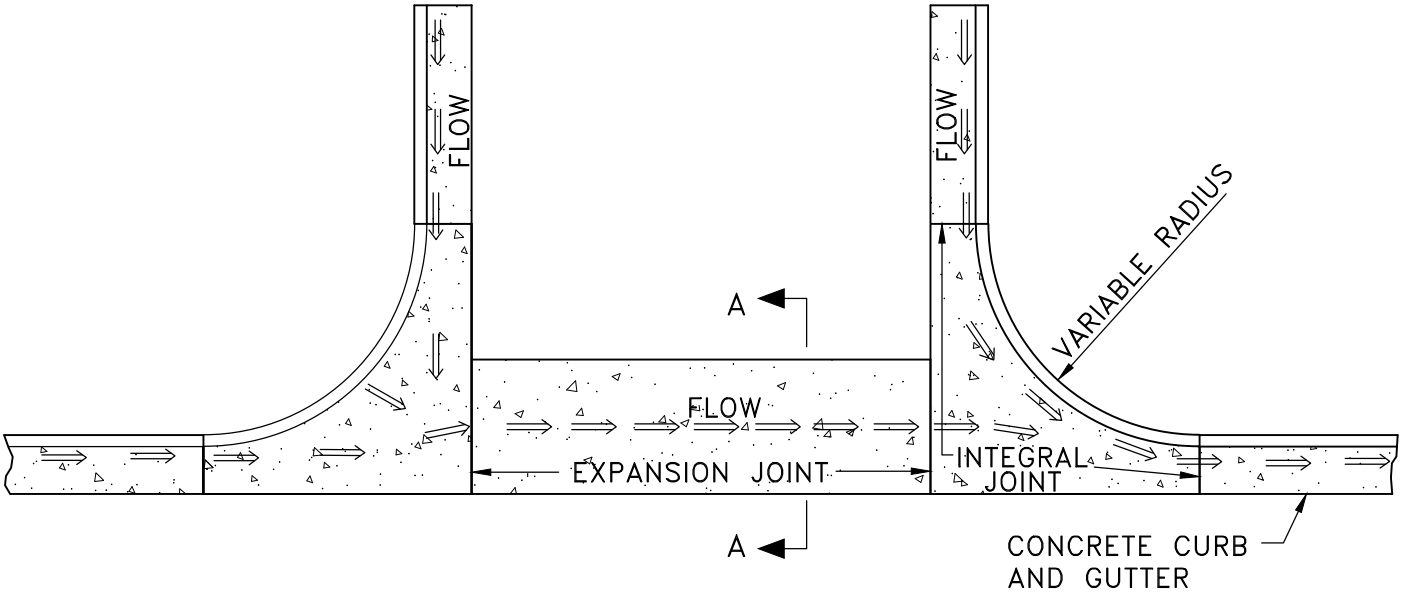
APPROVED	City of St. Francis	STANDARD PLATE NO. 509
REVISED		

Dec 27, 2022 - 8:23pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\500 EROSION\Ers-509.dwg



NOTE:
DEPTH OF CONCRETE SHALL BE DETERMINED BY TYPE OF CURB AND GUTTER

SECTION AA

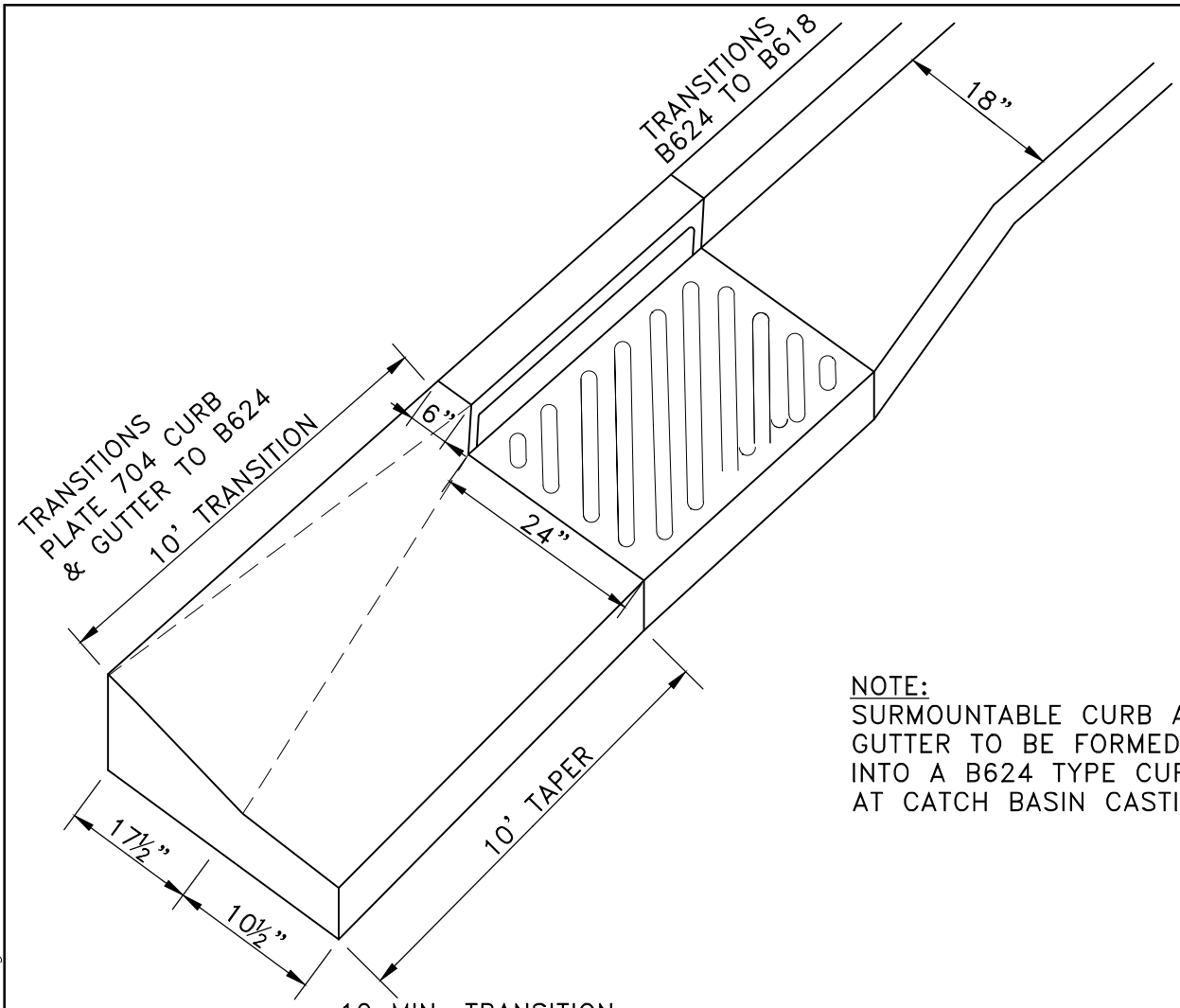


TYPICAL CROSS GUTTER

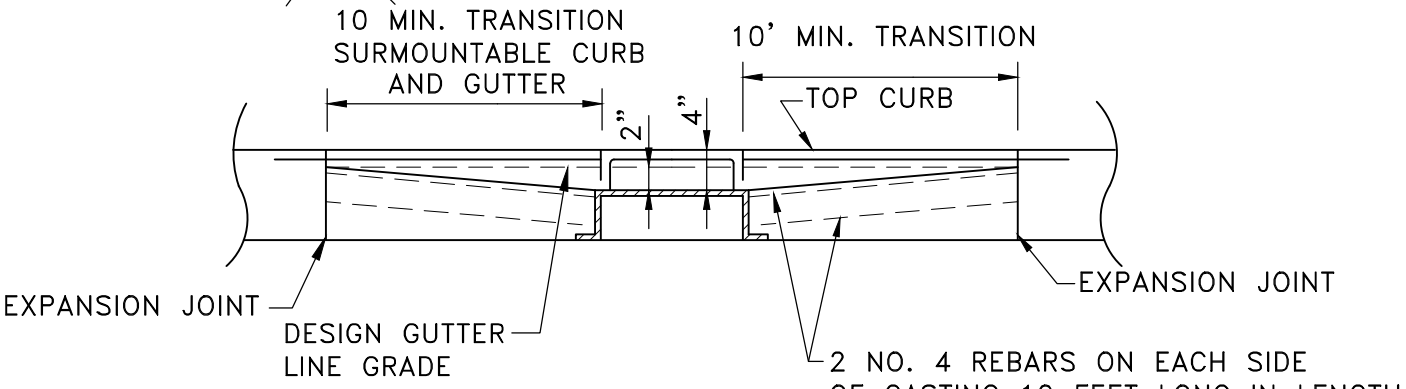
NO SCALE

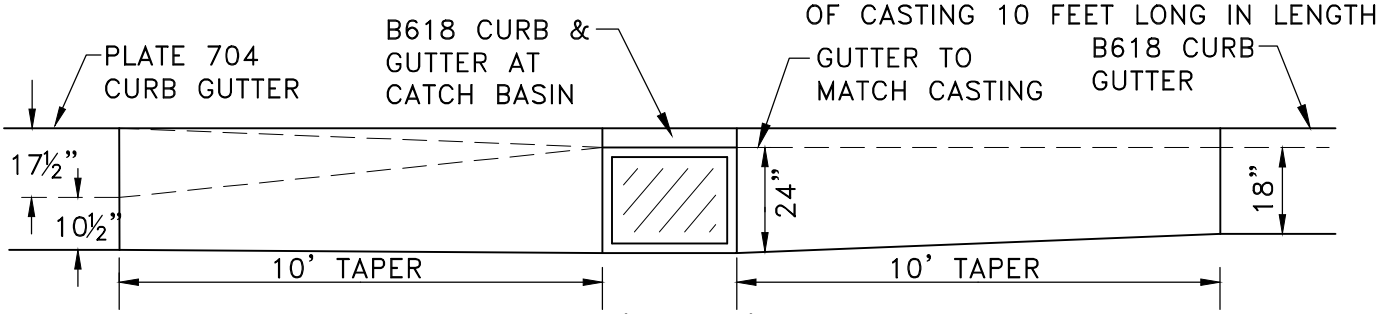
APPROVED	City of St. Francis	STANDARD PLATE NO. 702
REVISED		

Dec 27, 2022 - 8:24pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\700 CURB GUTTER\Curb-702.dwg



NOTE:
SURMOUNTABLE CURB AND GUTTER TO BE FORMED INTO A B624 TYPE CURB AT CATCH BASIN CASTING.



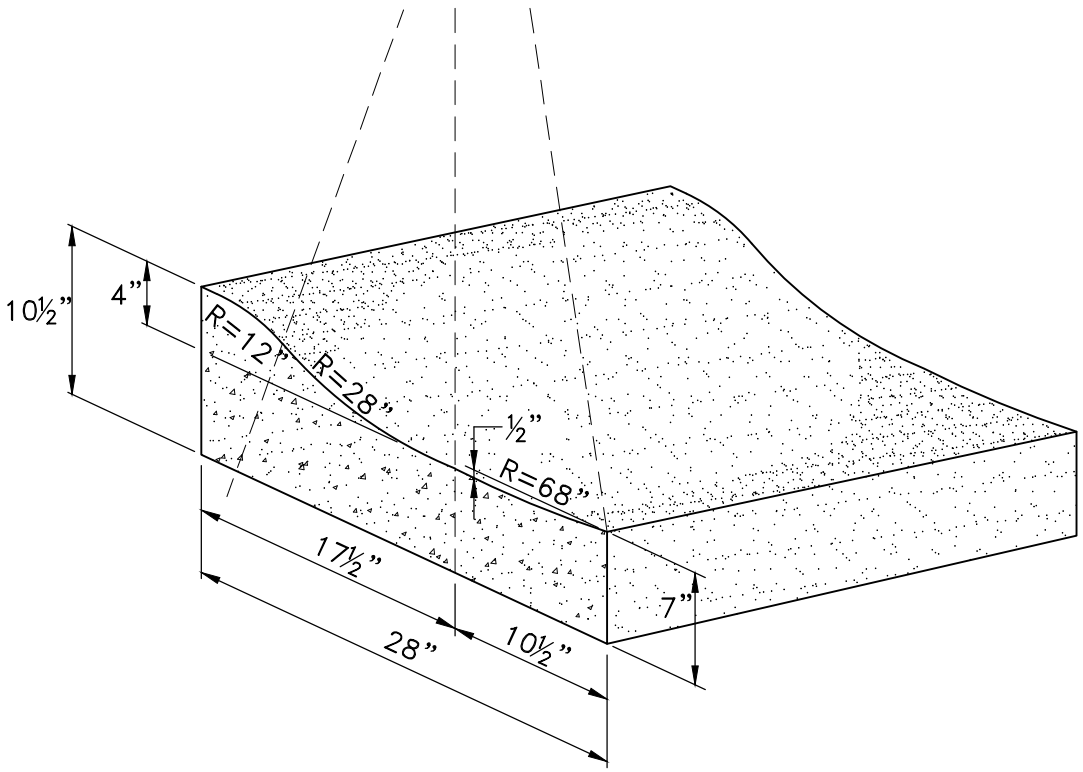


CURB TRANSITION (B624) AT CATCH BASIN

NOT TO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 703
REVISED		

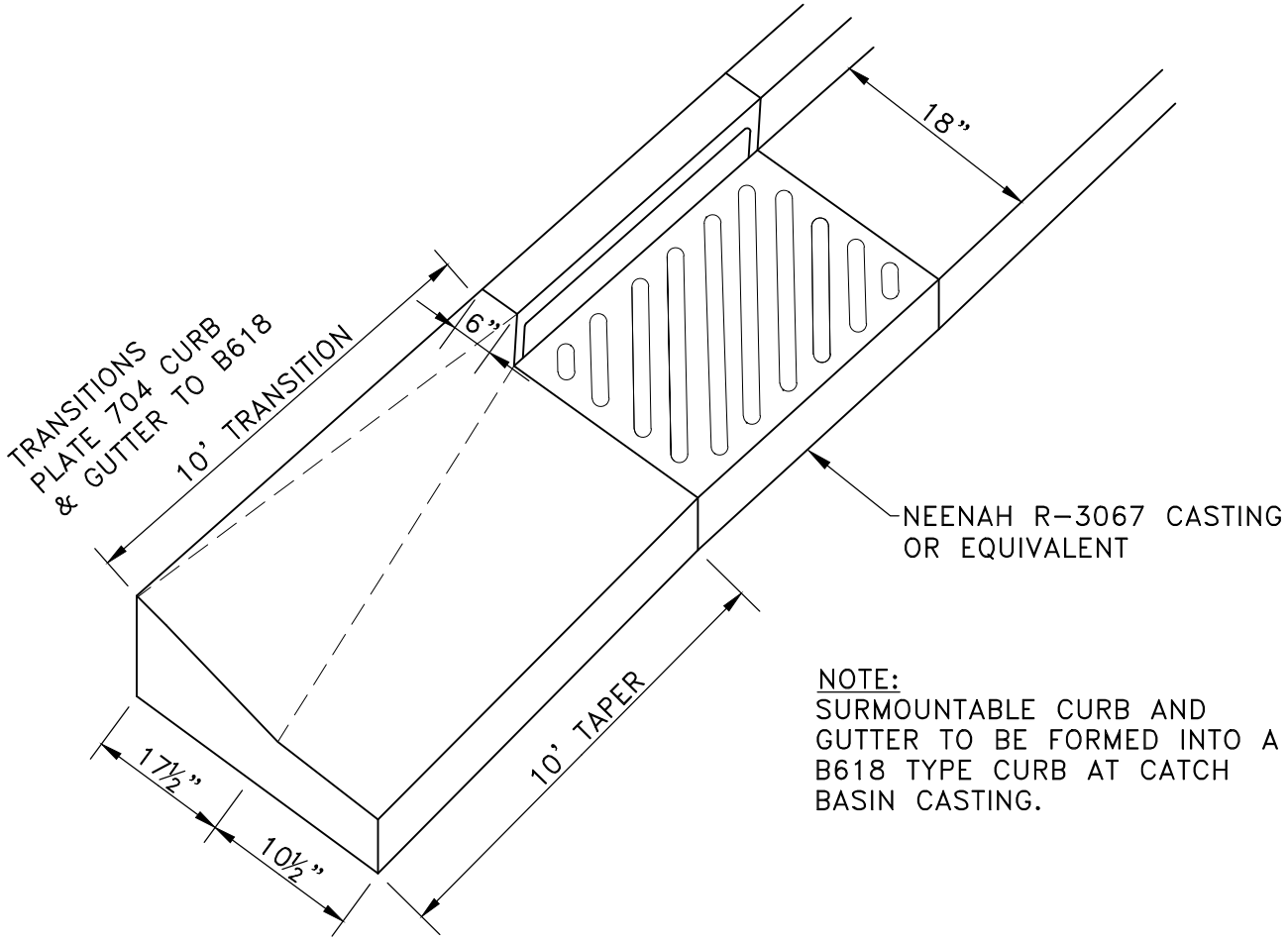
Nov 11, 2022 – 11:54am
K:\cad_eng\Details\ST FRANCIS\Standard plates\700 CURB GUTTER\Curb-703.dwg



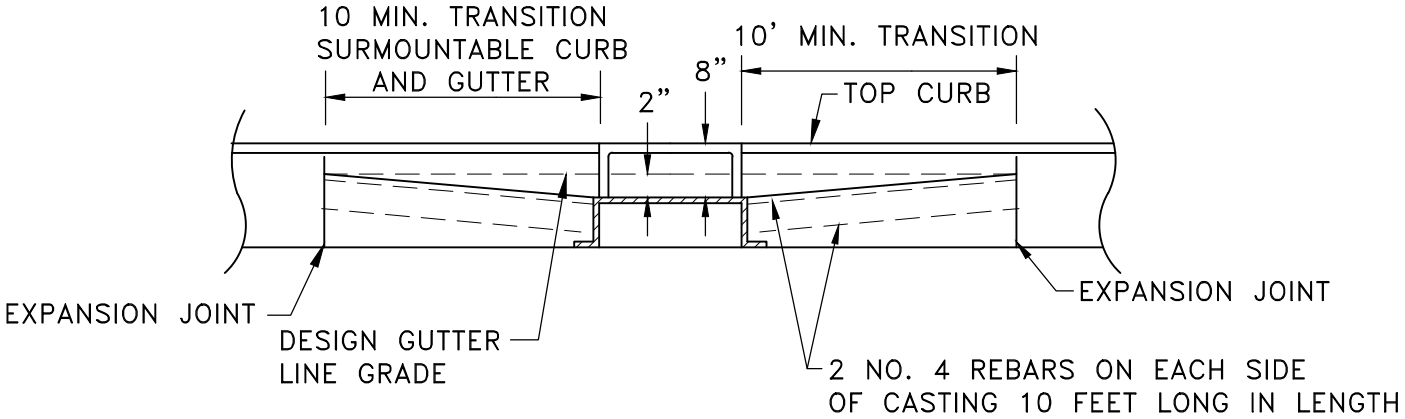
SURMOUNTABLE CONCRETE CURB AND GUTTER

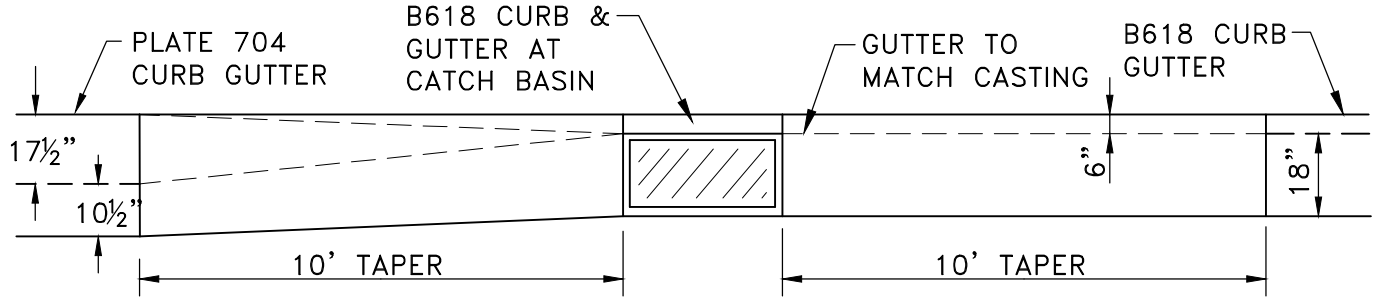
NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 704
REVISED		



NOTE:
SURMOUNTABLE CURB AND GUTTER TO BE FORMED INTO A B618 TYPE CURB AT CATCH BASIN CASTING.

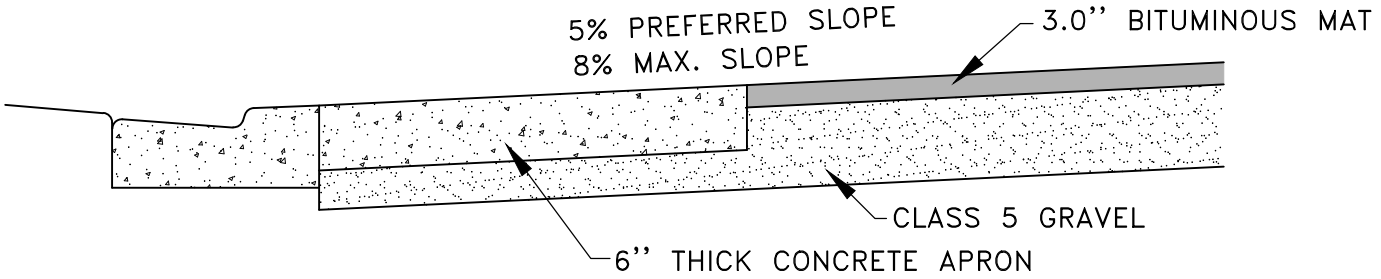




CURB TRANSITION (B618) AT CATCH BASIN

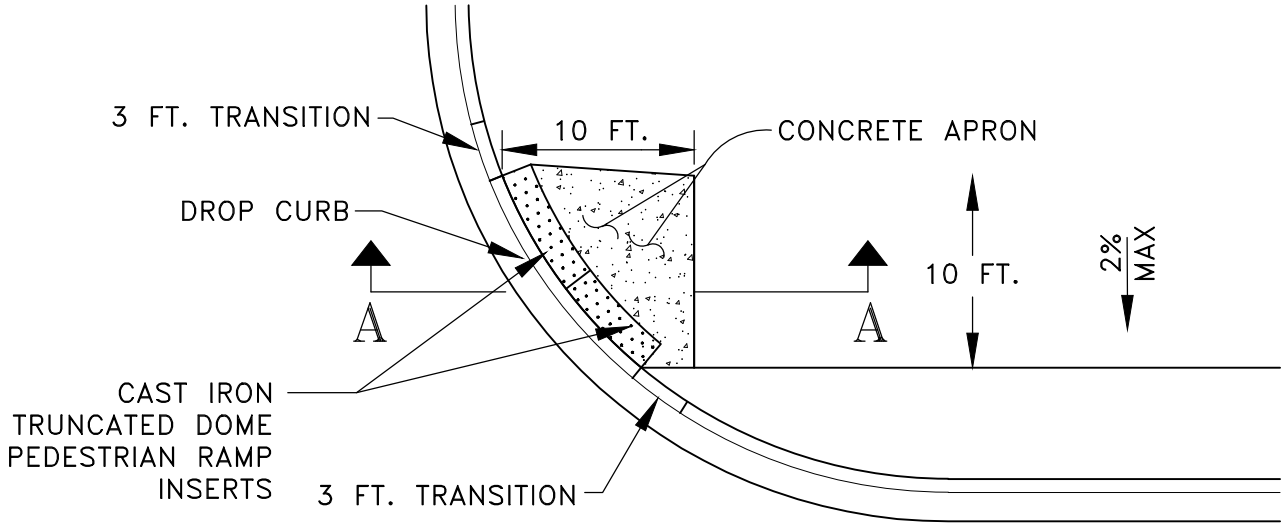
NOT TO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 705
REVISED		



SECTION A–A

NO SCALE

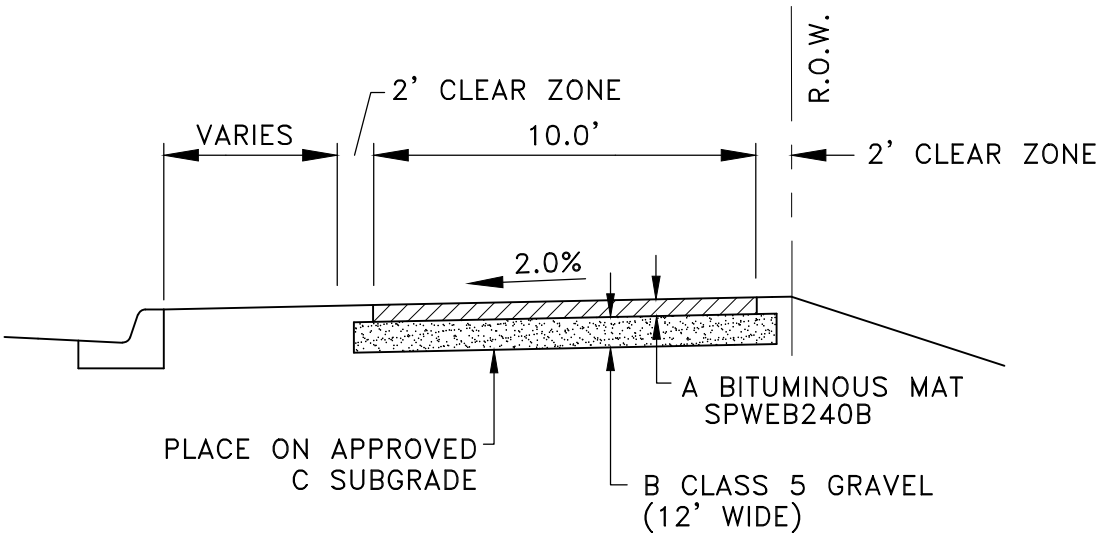


TYPICAL DROP CURB – BIKE TRAIL

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 706

Nov 11, 2022 – 11:57am
K:\cad_eng\Details\ST FRANCIS\Standard plates\700 CURB GUTTER\Curb-706.dwg



TYPICAL SECTION – BIKE TRAIL

NO SCALE

LEGEND				
AASHTO	R VALUE	BITUMINOUS SURFACE	AGGREGATE BASE	
SUBGRADE SOIL CLASS		WEAR 2360*** A	CLASS 5 3138 B*	CLASS 3 OR 4 3138 C*
A–3 A–4 A–6 A–7	R–70 R–20 R–15 R–10 R–5	** 3" 3" 3" 3" 3"	** 6" 6" 6" 8" 6"	– – – – 12"

* SUBJECT TO REVIEW BY QUALIFIED SOILS ENGINEER

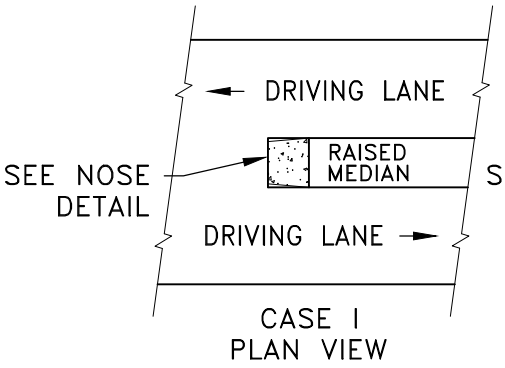
** MINIMUM ALLOWABLE DESIGN THICKNESS

*** ASPHALT BINDER GRADE = B

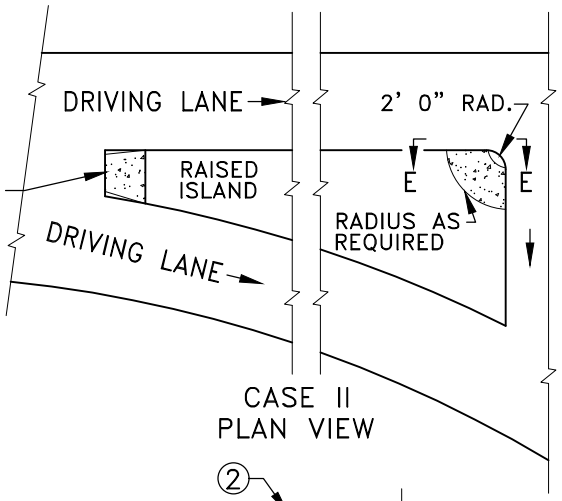
NOTES: R VALVE IS A MEASURE OF EMBANKMENT SOIL RESISTANCE STRENGTH AS DETERMINED BY THE HVEEM STABILOMETER METHOD.

APPROVED	City of St. Francis	STANDARD PLATE NO. 707
REVISED		

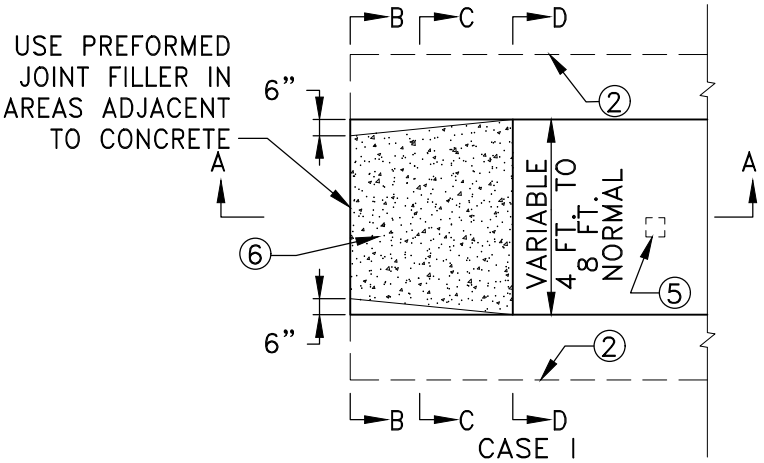
Dec 27, 2022 – 8:24pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\700 CURB GUTTER\TRAIL–707.dwg



CASE I
PLAN VIEW

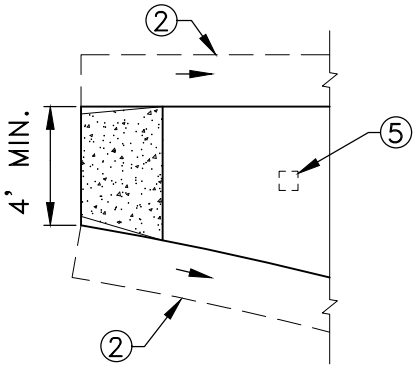


CASE II
PLAN VIEW

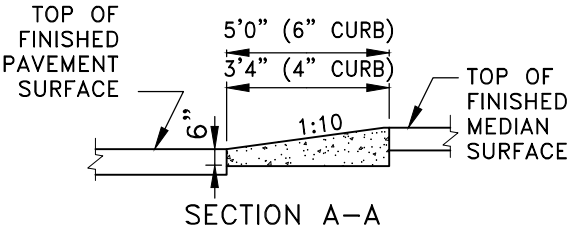


CASE I
NOSE DETAIL

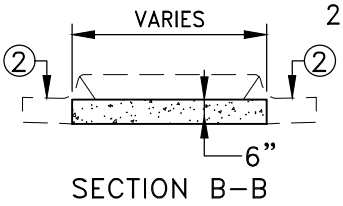
PLAN VIEW



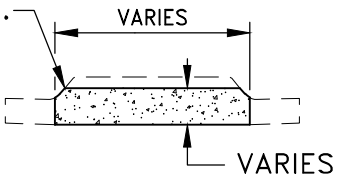
CASE I
NOSE DETAIL
SEE CASE I FOR DIMENSIONS



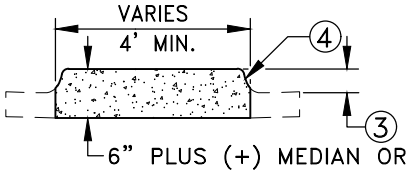
SECTION A–A



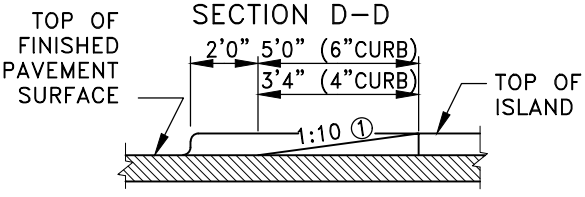
SECTION B–B



SECTION C–C



SECTION D–D



SECTION E–E

NOTES:

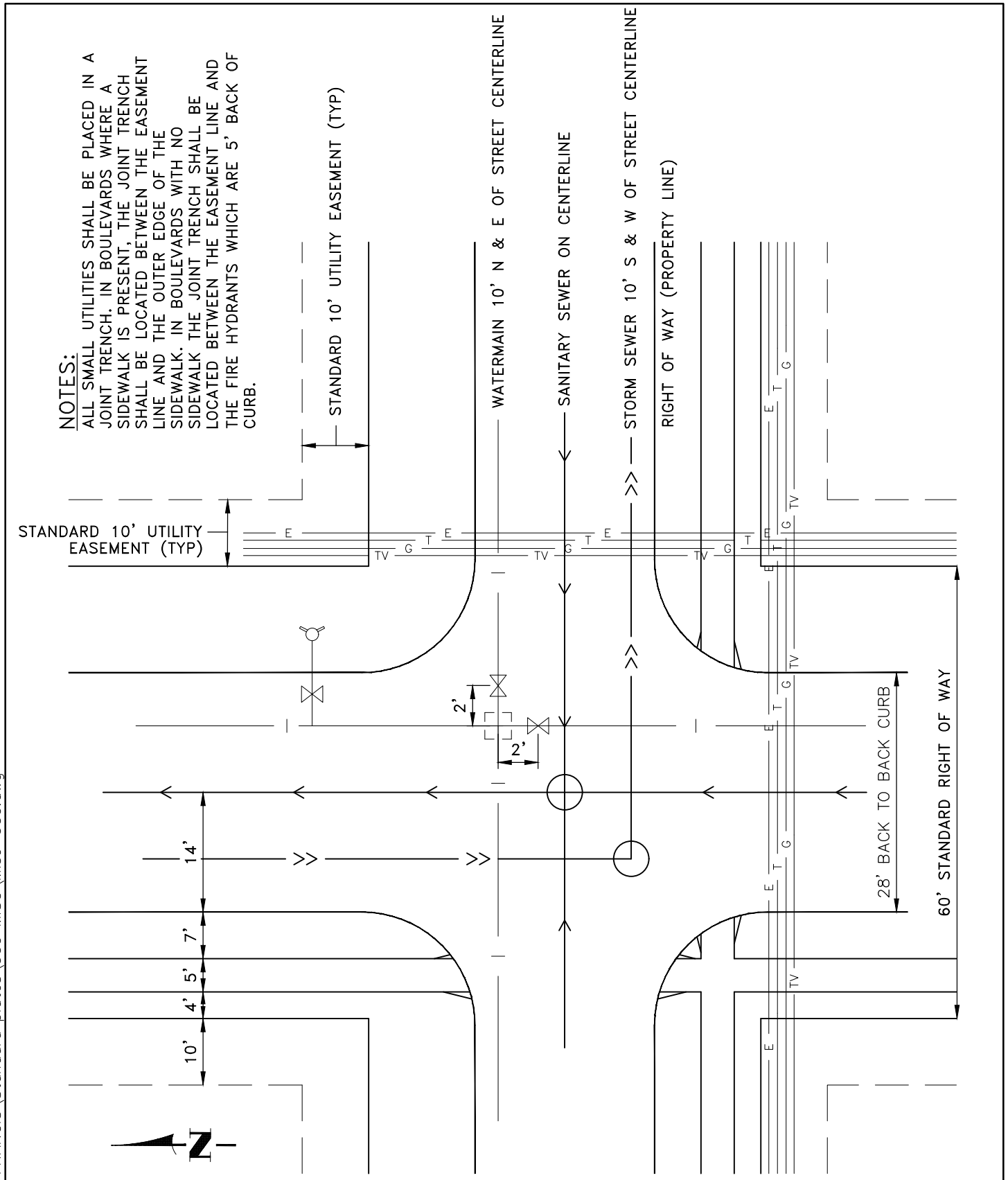
① TYPICAL SLOPE ALONG GUTTER LINE EACH DIRECTION
② GUTTER, IF REQUIRED
③ VARIABLE MEDIAN OR CURB HEIGHT
④ SHAPE SAME AS MEDIAN OR CURB
⑤ PROVIDE ONE 6" X 6" OPENING IN MEDIAN FOR SIGNING IF REQUIRED.
⑥ PAID FOR AS CONCRETE WALK, INCLUDES GUTTER IF REQUIRED

CONCRETE APPROACH NOSE DETAIL

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 708
REVISED		

Nov 11, 2022 – 11:58am
K:\cad_eng\Details\ST FRANCIS\Standard plates\700 CURB GUTTER\CURB-708.dwg

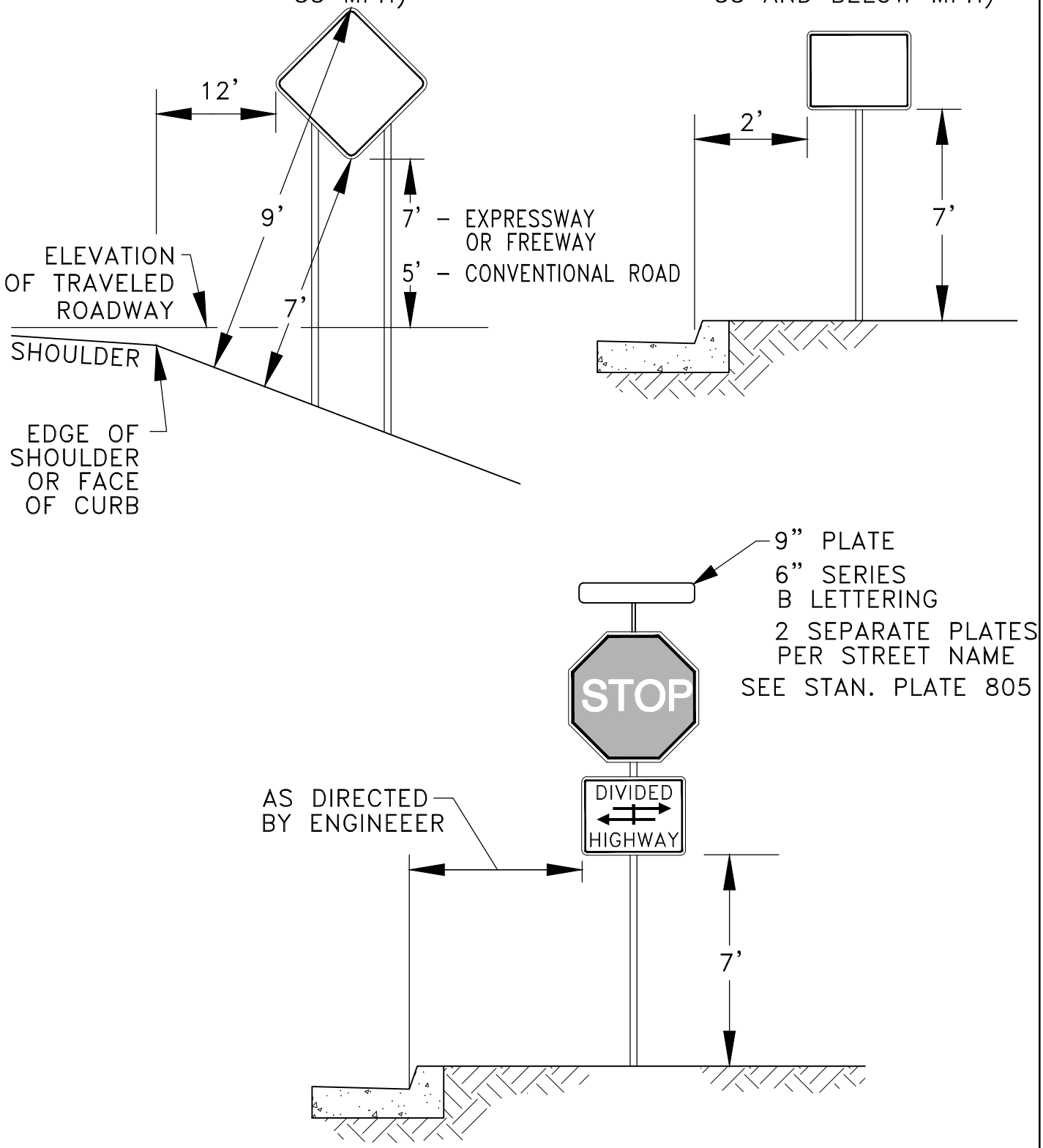


LOCATION OF PUBLIC UTILITIES

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 900

Nov 11, 2022 – 12:06pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\900 MISC\Misc-900.dwg

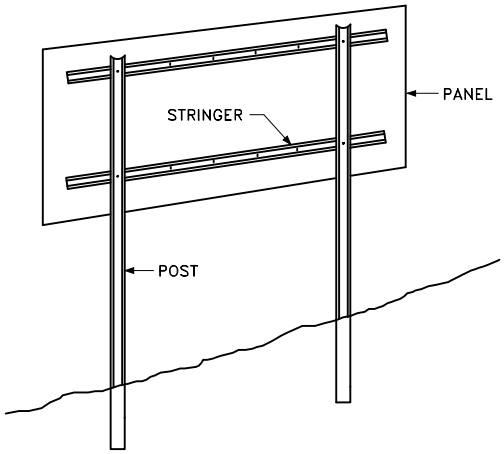


LATERAL OFFSET AND VERTICAL CLEARANCE REQUIREMENTS FOR TYPE C & D SIGNS

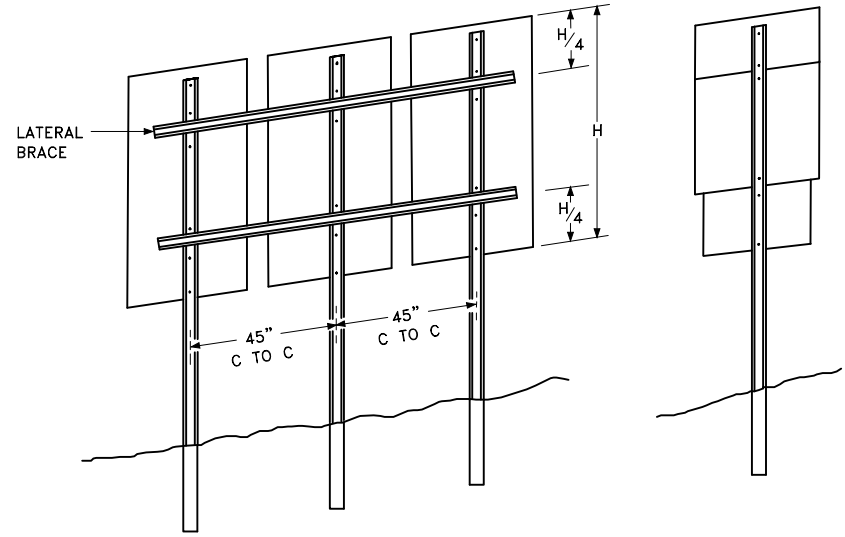
NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 800
REVISED		

Nov 11, 2022 – 11:59am
K:\cad_eng\Details\ST FRANCIS\Standard plates\800 SIGNAGE & LIGHTING\SIGN 800.dwg

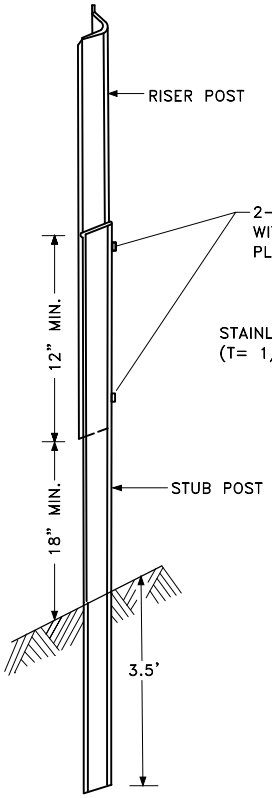


TYPICAL TYPE "D" INSTALLATION

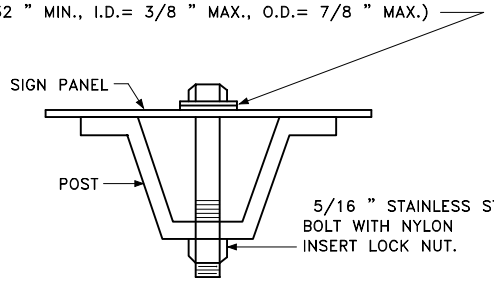


TYPICAL TYPE "C" INSTALLATIONS

TYPE "C" & "D" POST



"U POST"SPLICE



"U POST" MOUNTING
TYPE "C" SIGNS

NOTES:

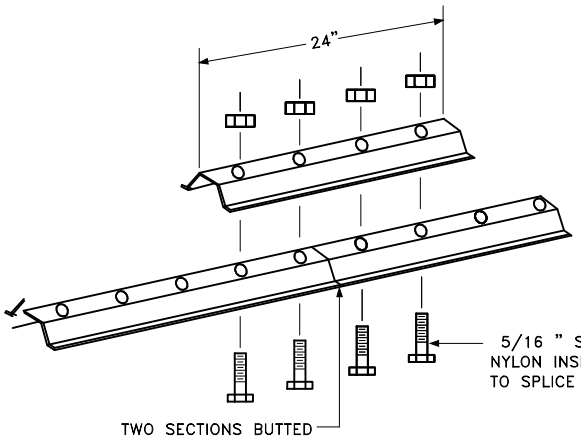
1. USE 3# STUB POSTS, RISER POSTS, STRINGERS, KNEE BRACES, LATERAL BRACES AND KNEE BRACE STUB POSTS. ALL SHALL CONFORM TO MN/DOT 3401.
2. FOR TYPE "D" SIGN POSTS LENGTHS AND SPACINGS, SEE SIGN DATA SHEET.
3. TYPE "D" SIGN PANELS SHALL BE BOLTED TO STRINGERS AT 24" MAXIMUM INTERVALS IN ACCORDANCE WITH TYPE "D" STRINGER AND PANEL–JOINT DETAIL (SEE STANDARD SIGNS MANUAL).
4. MOUNTING (PUNCHING CODE) FOR TYPE "C" SIGN PANELS SHALL BE AS INDICATED IN THE STANDARD SIGNS MANUAL UNLESS OTHERWISE SPECIFIED.
5. ALL RISER (VERTICAL) "U POSTS" SHALL BE SPLICED. DRIVEN STUB POSTS SHALL BE AT LEAST 7' LONG.
6. USE STAINLESS STEEL 5/16" BOLTS, WASHERS, AND NYLON INSERT LOCK NUTS AS SHOWN FOR ALL GROUND MOUNTED AND OVERHEAD MOUNTED SIGNS.
7. STAINLESS STEEL WASHER WITH SAME DIMENSIONS SHALL BE PROVIDED BETWEEN ALL NYLON WASHERS AND BOLT HEADS.
8. BRACING STUBS SHALL BE NO MORE THAN 4" ABOVE GROUND AND EMBEDDED AT LEAST 3 1/2 '.
9. A–FRAME BRACKET SHALL BE STEEL CONFORMING TO MN/DOT 3306 AND GALVANIZED IN ACCORDANCE WITH MN/DOT 3394.
10. COLLARS SHALL BE USED TO SHIM OVERLAYS AND DEMOUNTABLE LEGEND AWAY FROM PANEL WHERE INTERFERENCE WITH BOLT HEADS IS ENCOUNTERED. MN/DOT 3352.2A7.
11. 2 AND 3 POST TYPE "C" SIGNS SHALL BE REINFORCED WITH AT LEAST ONE LATERAL BRACE. INSTALLATIONS WHERE THE TOTAL PANEL HEIGHT IS 60" OR MORE SHALL HAVE TWO LATERAL BRACES LOCATED APPROXIMATELY AT THE QUARTER POINTS.
12. WHERE 2 OR MORE SINGLE POST SIGNS (TYPE "C") ARE MOUNTED SIDE BY SIDE, THEY SHALL BE REINFORCED LATERALLY BY AT LEAST 2 POST SECTIONS, BOLTED AT EACH POST AND LOCATED APPROXIMATELY AT THE QUARTER POINTS AS SHOWN IN SKETCH.

TYPE "C" AND "D" SIGN POST INSTALLATION DETAIL

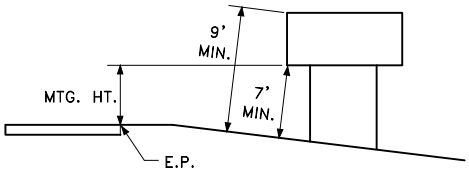
NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 801
REVISED		

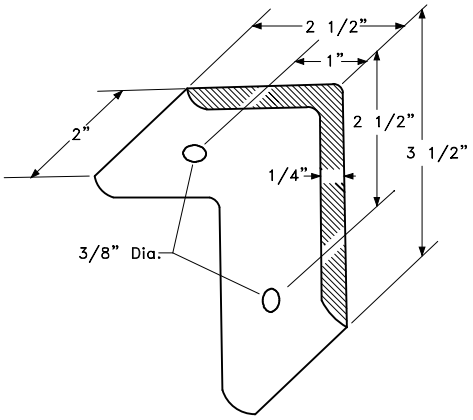
Nov 11, 2022 – 12:00pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\800 SIGNAGE & LIGHTING\SIGN 801.dwg



LATERAL BRACE OR STRINGER SPLICE DETAIL (EXPLODED VIEW)

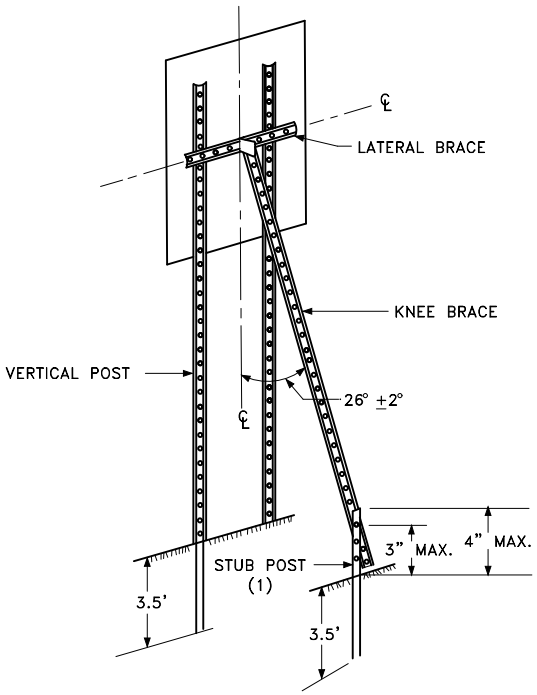


TYPICAL MOUNTING

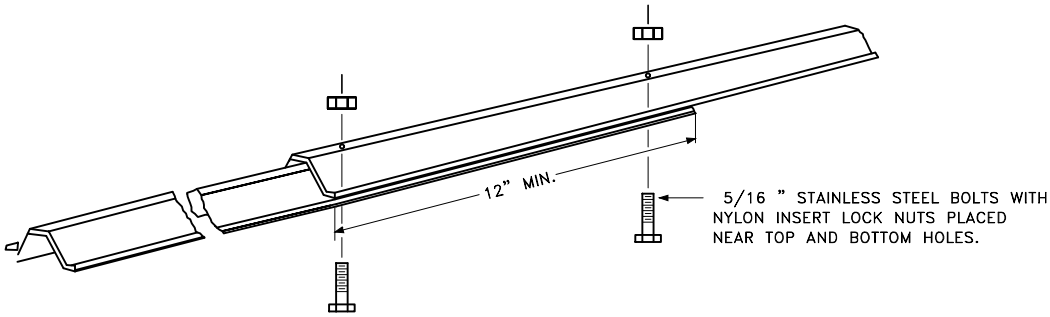


A–FRAME BRACKET

(STEEL MN/DOT 3306 GALVANIZED PER MN/DOT 3394)



TYPICAL "A–FRAME" INSTALLATION TYPE "C" SIGNS



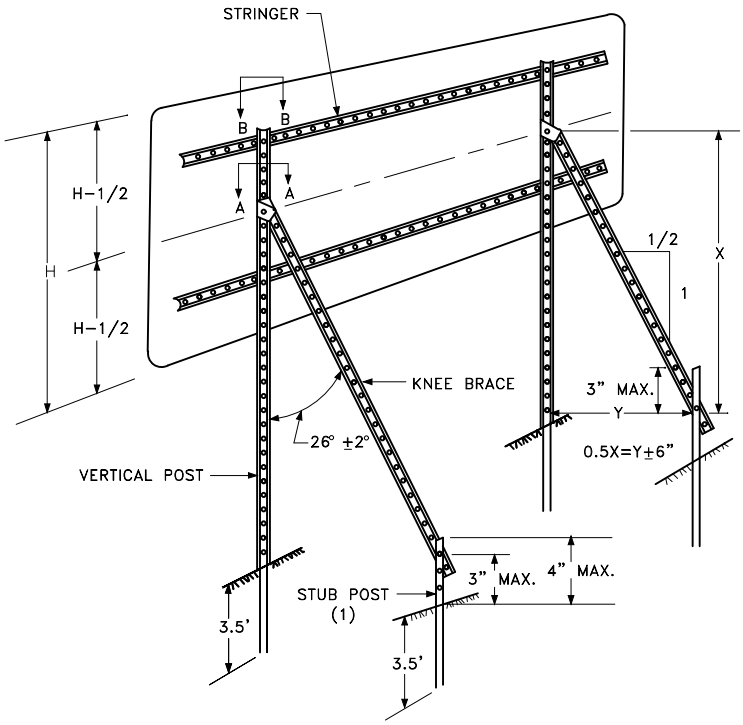
KNEE BRACE SPLICE

A–FRAME AND STRINGER BRACING DETAIL

NO SCALE

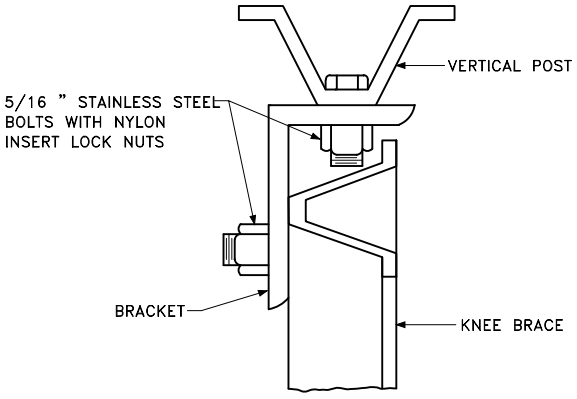
APPROVED	City of St. Francis	STANDARD PLATE NO. 802A
REVISED		

Nov 11, 2022 – 12:01pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\800 SIGNAGE & LIGHTING\SIGN 802A&B.dwg

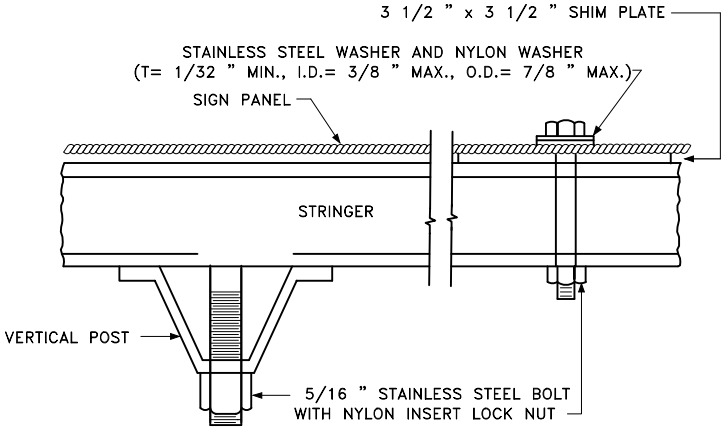


TYPICAL "A-FRAME" INSTALLATION
TYPE "D" SIGNS

(1) OFFSET STUB POST 1' TOWARD ROADWAY RELATIVE TO VERTICAL POST.



SECTION A-A

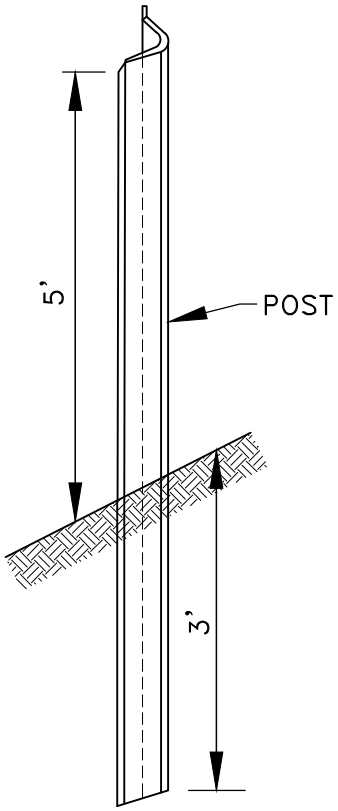


SECTION B-B

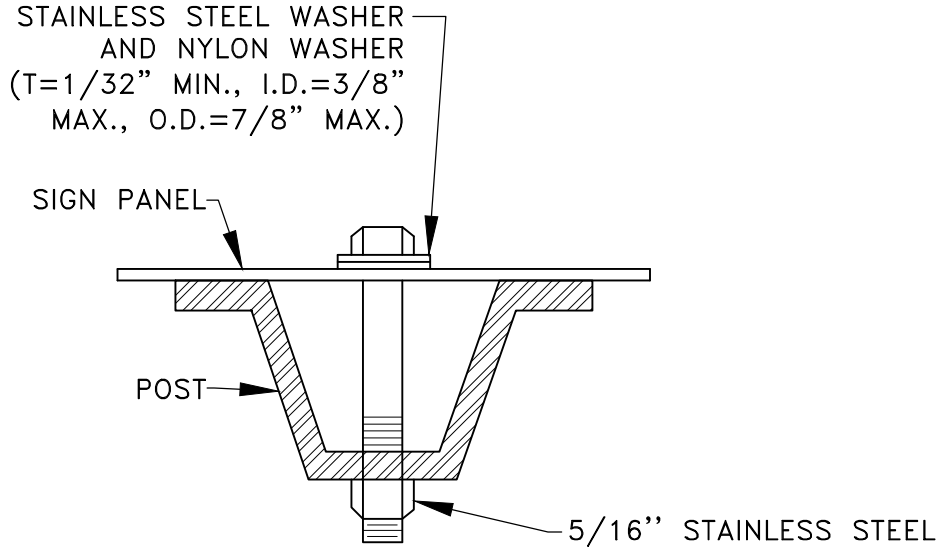
A-FRAME AND STRINGER BRACING DETAIL

NO SCALE

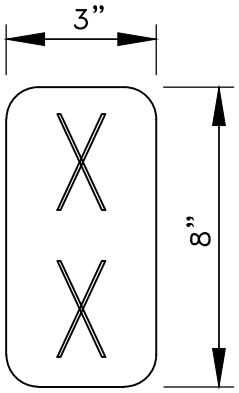
APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 802B



U POST



"U POST" MOUNTING



SIGN

NOTE:
POST SHALL CONFORM TO SPEC. 3401 AND HAVE A NOMINAL WEIGHT OF 2 LBS PER FT. AND SHALL BE PAINTED GREEN.

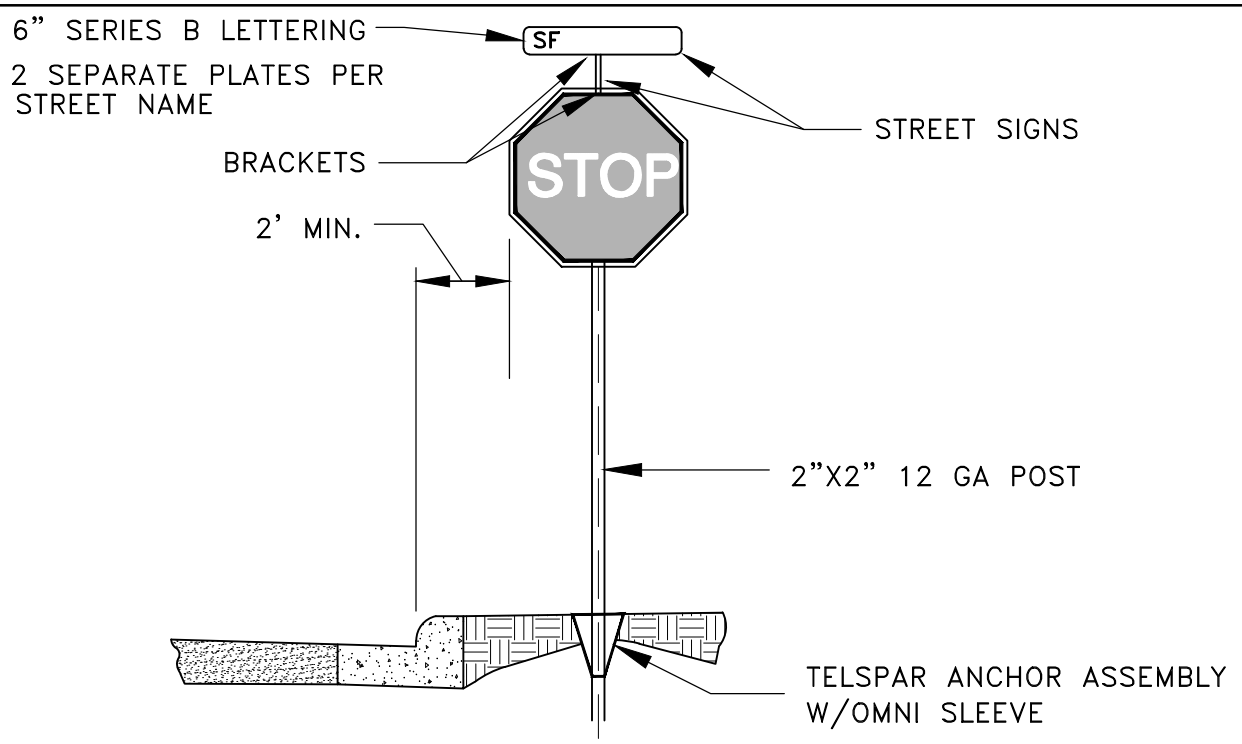
MARKING POSTS SHALL BE OFFSET 2' FROM VALVE BOXES TO ALLOW ROOM FOR OPERATING THE VALVE.

LEGEND
MH = SAN MANHOLE (WHITE ON GREEN)
GV = GATE VALVE (WHITE ON BLUE)
ST = STORM SEWER (WHITE ON BLACK)

MARKER POST INSTALLATION

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 803
REVISED		



FURNISH AND INSTALL NEW SIGNS

SIGN NUMBER	SIGN	COLOR	SIZE	COMMENTS
R1-1	STOP	WHITE ON RED	30"x 30"	
	SF STREET NAME	WHITE ON GREEN	9" PLATES	ALL INTERSECTIONS

NOTES:

POSTS SHALL BE CYLINDRICAL TUBE STEEL POSTS, THE POST SHALL BE 12' LONG, WITH 2-3/8" OD, 12 GAUGE COLD ROLLED GALVANIZE STEEL MEETING ASTM A-446 GRADE A.

SIGN BASE MATERIAL SHALL BE ALUMINUM. THICKNESS OF THE PLATE SHALL BE 0.08".

THE STREET NAME SIGNS SHALL BE NOTCHED AND MOUNTED IN AN E450 BRACKET AND PLACED ABOVE THE STOP SIGN.

STREET NAME SIGNS SHALL HAVE HIGH INTENSITY PRISMATIC RETROREFLECTIVE SHEETING (ASTM TYPE IV).

STOP SIGNS SHALL HAVE DIAMOND GRADE VIP RETROREFLECTIVE SHEETING (ASTM TYPE IX).

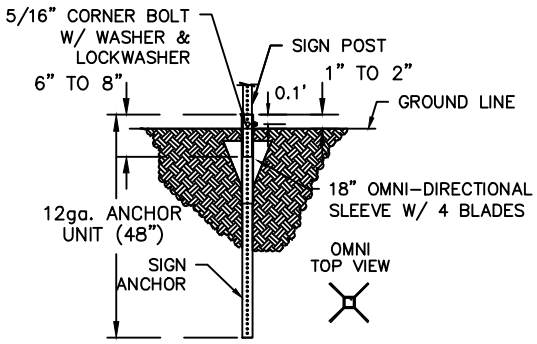
SIGNS AND INSTALLATION OF SIGNS SHALL BE IN ACCORDANCE WITH THE "MINNESOTA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES"

STOP SIGN AND STREET NAME SIGN DETAIL

NO SCALE

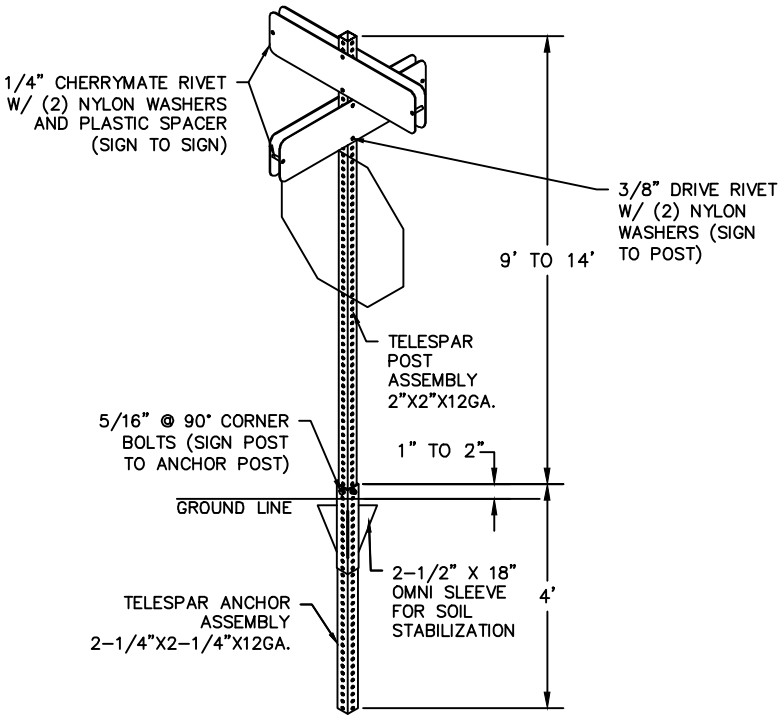
APPROVED	City of St. Francis	STANDARD PLATE NO. 805
REVISED		

Dec 27, 2022 - 8:26pm
K:\cad_eng\Details\ST FRANCIS\Standard plates\800 SIGNAGE & LIGHTING\SIGN 805.dwg



TELESPAR ANCHOR DETAIL

NOT TO SCALE



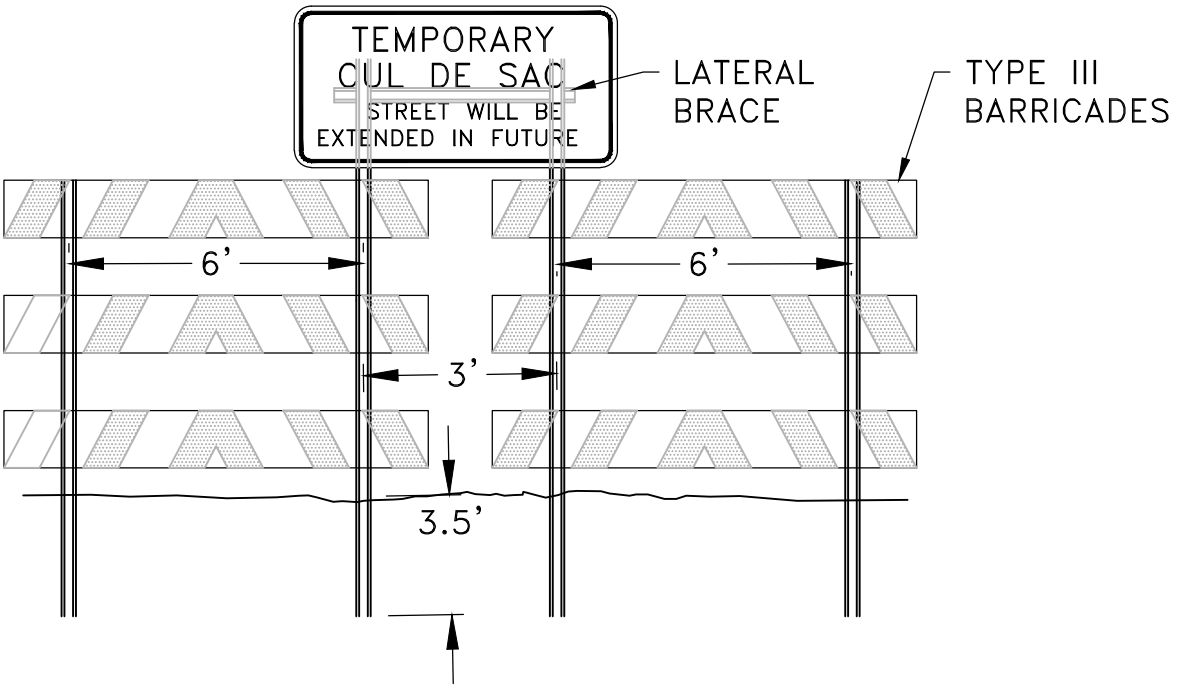
SIGN POST DETAIL

NOT TO SCALE

SIGN POST DETAIL

NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 806
REVISED		



NOTES:

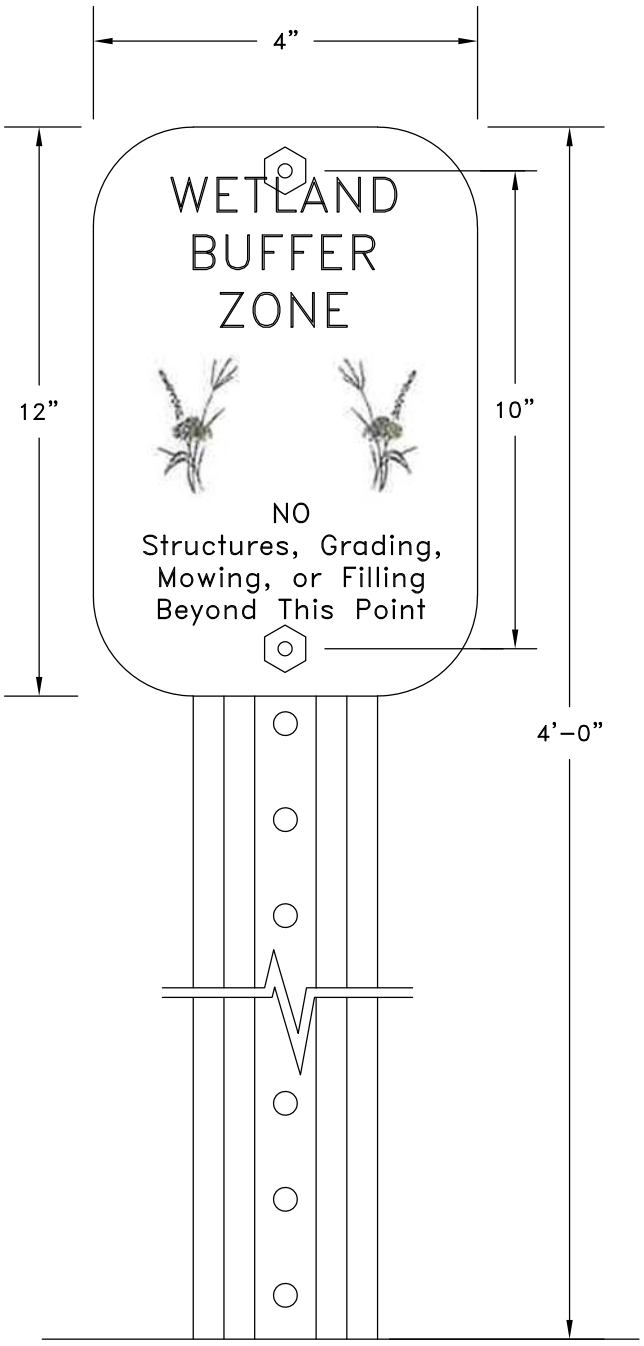
TYPE E WHITE LETTERING ON GREEN BACKGROUND

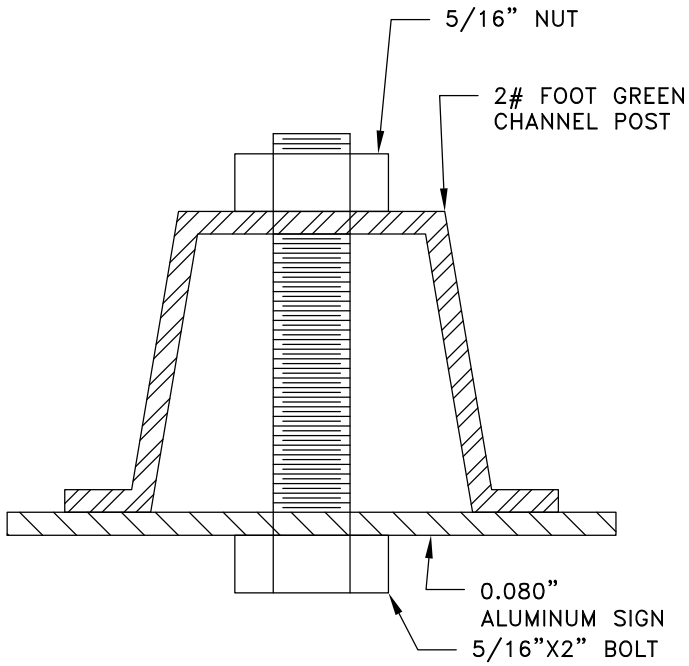
THIS SIGN SHALL BE PLACED AT THE END OF DEAD END STREET OR TEMPORARY CUL-DE-SAC.

TEMPORARY CUL-DE-SAC SIGN

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 807





TYPICAL SECTION

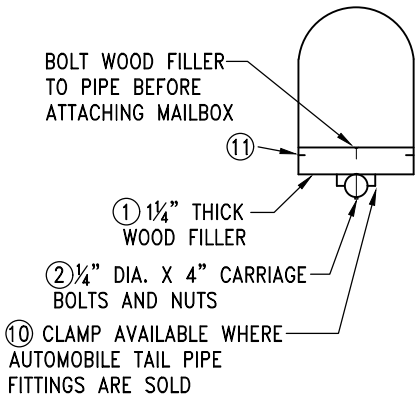
NOTES:

1. MATERIALS TO BE SUPPLIED BY THE DEVELOPER/CONTRACTOR INCLUDE THE FOLLOWING:
   - (2) 4"X12"X0.080" ALUMINUM WETLAND BUFFER SIGNS
   - (2) 5/16"X2" CAD PLATED BOLTS
   - (4) 5/16" CAD PLATED NUTS
   - (1) 7' (2#/FOOT) GREEN CHANNEL POST
2. EACH BUFFER MARKER SHALL HAVE ONE SIGN FACING PRIVATE PROPERTY.
3. SIGNS TO BE INSTALLED BY THE DEVELOPER PER THE DRAWING SHOWN AT THE LEFT.
4. AS A GENERAL RULE, WETLAND BUFFER SIGNS SHOULD BE PLACED AT EVERY OTHER LOT CORNER. HOWEVER, AT NO TIME SHOULD THERE BE MORE THAN 200' BETWEEN SIGNS IN UNFORESTED AREAS AND 150' IN FORESTED AREAS.
5. SIGN PANELS SHALL CONSIST OF GREEN BACKGROUND WITH WHITE LETTERING, TYPE IX, 3M DIAMOND GRADE VIP SETTINGS.

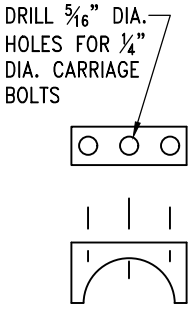
WETLAND BUFFER ZONE SIGN INSTALLATION

NO SCALE

APPROVED REVISED	City of St. Francis	STANDARD PLATE NO. 808



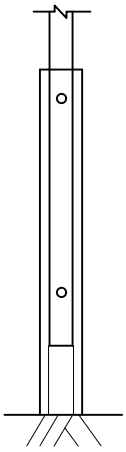
SECTION A–A



DETAIL

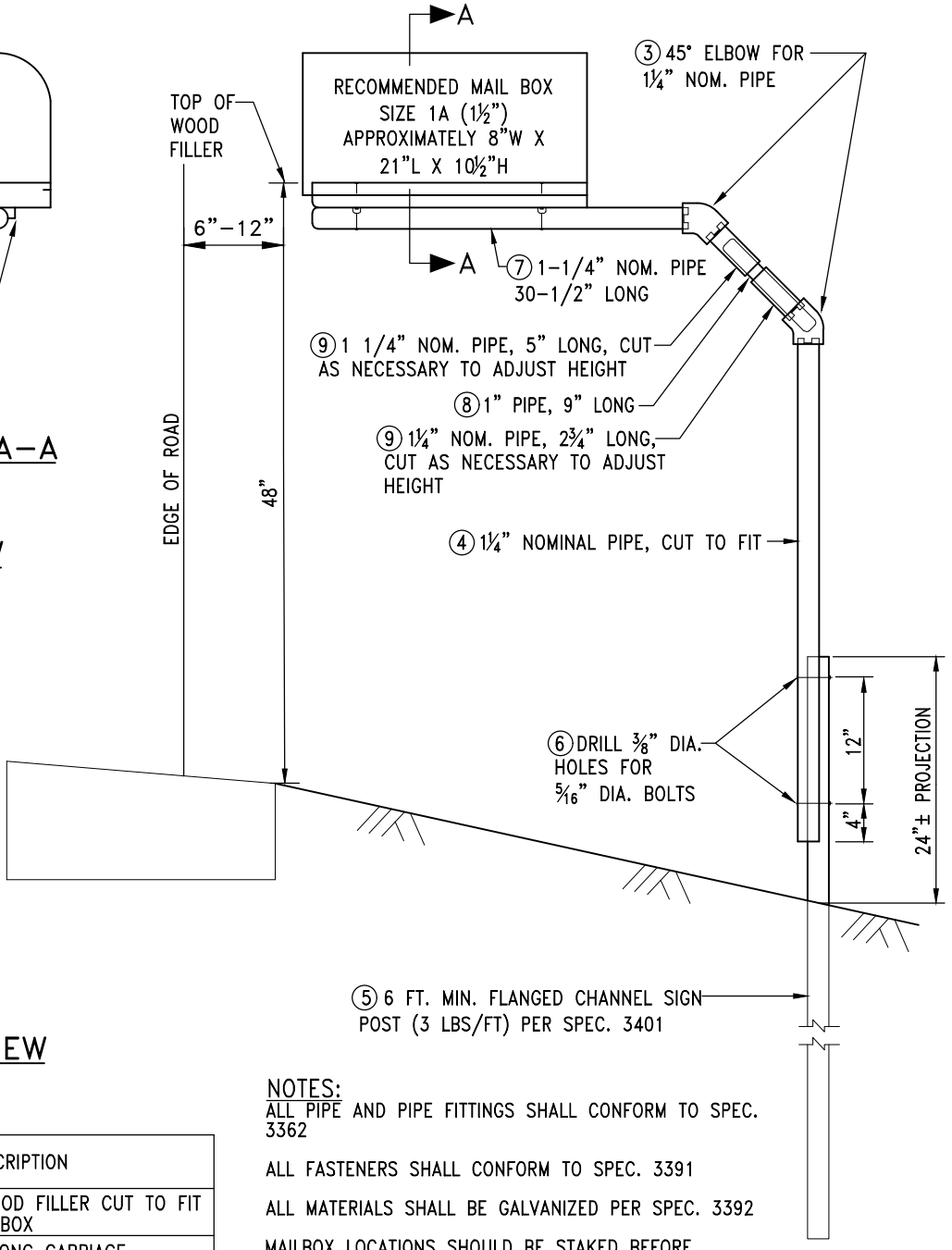
TAIL PIPE CLAMP

TOP VIEW



ROADWAY VIEW

PIPE/POST CONNECTION



ITEM NO.	NUMBER REQUIRED	DESCRIPTION
1	1	1-1/2" THICK WOOD FILLER CUT TO FIT SNUG UNDER MAILBOX
2	2	1/4" DIA. X 4" LONG CARRIAGE BOLTS AND NUTS
3	2	45° ELBOW FOR 1-1/4" NOMINAL PIPE
4	1	1-1/4" NOMINAL PIPE, CUT TO FIT
5	1	6 FT. MIN. SIGN POST (3LBS_/FT.)
6	2	5/16" DIA. BOLT, NUT & LOCKWASHER
7	1	1-1/4" NOMINAL PIPE, 30-1/2" LONG
8	1	1" PIPE, 9" LONG
9	1	1-1/4" NOMINAL PIPE, 5" LONG 1-1/4" NOMINAL PIPE, 2-3/4" LONG
10	2	1-1/2" TAIL PIPE CLAMP
11	9	NO. 10 X 1" SHEET METAL SCREWS

NOTES:

ALL PIPE AND PIPE FITTINGS SHALL CONFORM TO SPEC. 3362

ALL FASTENERS SHALL CONFORM TO SPEC. 3391

ALL MATERIALS SHALL BE GALVANIZED PER SPEC. 3392

MAILBOX LOCATIONS SHOULD BE STAKED BEFORE INSTALLATION FOR PROPER HEIGHT AND DISTANCE FROM THE ROADWAY. ONCE STAKED, THE INSTALLER MUST NOTIFY THE ENGINEER. THE ENGINEER WILL BE ALLOWED 48 HOURS TO REVIEW AND MODIFY THE STAKED LOCATIONS PRIOR TO FINAL INSTALLATION.

OTHER MN/DOT APPROVED MAILBOX SUPPORTS MAY ALSO BE USED.

A MINIMUM 30" CLEARANCE FROM THE GROUND MUST BE MAINTAINED FOR SNOW REMOVAL. CITY WILL NOT REPLACE DAMAGES CAUSED BY SNOW REMOVAL IF 30" OF CLEARANCE IS NOT PROVIDED.

MAILBOX SUPPORT

STEEL PIPE WITH FITTINGS AND STEEL FENCE POST
(SINGLE SUPPORT)
NO SCALE

APPROVED	City of St. Francis	STANDARD PLATE NO. 901
REVISED		

APPENDIX B

POLICY ON STORMWATER DRAINAGE SUBMITTAL REQUIREMENTS FOR DEVELOPERS

CITY OF ST. FRANCIS

TABLE OF CONTENTS

POLICY ON STORMWATER DRAINAGE
SUBMITTAL REQUIREMENTS
FOR DEVELOPERS

CITY OF ST. FRANCIS

1.0 Purpose and Intent

This policy is intended to provide Developer's Engineers with a standardized format for submittal of drainage plans and calculations to the City for review. A standardized format will provide the following:

- Reduce preparation time for submittals by providing direct guidelines for Developer's Engineers to follow

- Reduce review time required by the City's Engineer by insuring a complete and comprehensive drainage plan and calculations are submitted

- Insure that the City will receive the best possible protection of its resources, which could be adversely affected by inadequate stormwater management planning.

2.0 Incorporation by Reference

Protecting Water Quality in Urban Areas (Best Management Practices for Minnesota) prepared by the Minnesota Pollution Control Agency, Division of Water Quality, latest edition, shall be incorporated by reference into this policy.

The Minnesota Stormwater Manual as published online and available here: Minnesota Stormwater Manual (state.mn.us) shall be incorporated by reference.

Recommendations set forth in the above referenced manual shall be implemented by the Developer's Engineer. All recommendations set forth within the above referenced manual shall be termed "required" when applicable unless otherwise amended by this policy.

3.0 State and Federal Requirements

State and Federal Ordinances, Codes, Regulations, and Requirements shall be adhered to by the Developer.

4.0 Calculations and Considerations

A. General Hydrology

Hydrologic analysis of storm water runoff for the planning and design of flows in storm sewers, ditches, streams and channels to lakes, detention basins, and wetlands shall be made using generally accepted hydrograph methods.

Determination of total runoff volume should follow the USDA-SCS curve number method which incorporates land use and hydrologic soil groups. Specific step-by-step process can be found in the Soil Conservation Service (SCS) publication National Engineering Handbook: Chapter 4, SCS Hydrology (1972), and Hydrology Guide for Minnesota (1992). Peak runoff rates should be determined through the use of the SCS method incorporating "time of concentration" for both pre and post development conditions.

Then the storm water should be routed through the drainage area, that is, mathematically the peaks and volumes are followed as they move in a wave progressively downstream.

"Design Storms" or storm volumes for hydrologic analyses shall be based upon Hershfield, D.M., 1961, Rainfall Frequency Atlas of the United States for Durations of 30 minutes to 24 hours and Return Periods from 1 to 100 years, Technical Publication Number 40 (TP-40) along with the supplementary documents entitled: Oberts, G. L., 1984, Surface Water Management: Precipitation Frequency Analysis for the Twin Cities Metropolitan Area, Metropolitan Council, Publication Number 10-84-007 and Fredrick, R.H., 1977, Five-to-Six-Minute Precipitation Frequency for the Eastern united States, NOAA Technical Memorandum NWS HYDRO-35, Office of Hydrology, Silver Spring, Maryland.

The rational method may be used to determine peak runoff rates for primary systems. Construction of a hydrograph should be undertaken which characterizes the movement of surface water as a function of time and precipitation. Rainfall intensity shall be determined by using the IDF curves in the Mn/DOT Drainage Manual dated August 30, 2000.

Minimum time of concentration shall be 10 minutes for drainage areas with tributary areas, 7 minutes without tributary areas. When a portion of the drainage area is highly impervious, the drainage area shall be evaluated both with and without tributary area to verify that just the highly impervious area does not result in greater peak discharge than the area evaluated as a whole.

B. Rainfall

Usually the standard 24-hour SCS rainfall distribution will be used to calculate the peak discharge rates and levels. The following rainfall values shall be used in calculations for the City of St. Francis:

Event	Rainfall (inches)

1 year, 24 hour	2.44
2 year, 24 hour	2.85
10 year, 24 hour	4.22
25 year, 24 hour	5.21
50 year, 24 hour	6.04
100 year, 24 hour	6.94

C. Curve Numbers

Table 1 lists the minimum allowable Curve Numbers (CN) which shall be used for design. Hydrologic soil groups shall be determined based upon the Soil Survey for Anoka County, Minnesota as published by the United States Department of Agriculture Soil Conservation Service in Cooperation with Minnesota Agricultural Experiment Station.

D. Flood Protection

Consistent with state and federal regulations, the City of St. Francis requires that the level of flood protection along all ditches, detention basins, lakes, streams and wetlands be established based upon the 1 percent (100-year frequency) flood. Land use within floodplains shall be regulated in accordance with state floodplain zoning regulations.

The following freeboard values are required for the City of St. Francis:

• Landlocked Basins (no outlet)	3 feet	(Established high water, see 4.E.8.)
• Non-landlocked basins	1.5 feet	(100-year frequency)

E. On-Site Detention Basins

It is the policy of the City of St. Francis to require developments to control storm water quantity and quality through a management approach of detention basins. Detention basins, whether on-site or regional in nature, shall be designed to incorporate the following:

1. A permanent pool ("dead storage") volume below the normal elevation which shall be greater than or equal to the runoff from a 2.5-inch rainstorm over the entire contributing drainage area assuming full development. This modified NURP criteria includes a 25 percent increase in basin storage to permit routine sediment accumulation over a 20-year design period, assuming the drainage area is protected with proper erosion and sedimentation control practices. The runoff volume shall consider the entire area contributing to the pond, however, the minimum permanent pool volume must be greater than or equal to the volume produced from

0.5 inches of runoff from all impervious area in the contributing watershed.

2. A permanent pool average depth (basin volume/basin area) which shall be greater than 4 feet with a maximum depth of less than 10 feet.

3. An emergency spillway (emergency outlet) adequate to control the one percent frequency/duration rainfall event (usually 100-year, 24-hour).

4. Basin side slopes above the normal water level should be no steeper than 4:1, and preferably flatter. A basin shelf with a minimum width of 10 feet and a slope of 10:1 starting at the normal water level.

5. To prevent short-circuiting, the distance between major inlets and the normal outlet shall be maximized. The ratio of maximum length to maximum width of the permanent pool should be at least 3:1.

6. To protect downstream channels and structures, the following flood control criteria are required for basin design:

    a. A flood pool ("live storage") volume above the normal elevation shall be adequate so that the peak discharge rates from the 2-year and 100-year frequency, critical duration storms (usually the 24-hour) are no greater than predevelopment basin watershed conditions.

    b. Storage volumes and discharge rates have been established for the 100-year event for certain portions of the city. In these areas the established storage volumes and discharge rates shall be used for post development design.

    c. Dead storage volume may not be utilized as live storage.

7. Skimming structures shall be utilized for each basin. The skimming structure shall be in accordance with the City Standard Plates. Skimming structures shall be shown on the plans.

8. Where discharge from the basin is not possible, the permanent basin must be sized for two 100 year events back-to-back. In this situation the free board above the established high water level shall be a minimum of three (3) feet. The high water level shall be established as follows:

    a. Assume the water surface is at the normal water surface elevation of the basin.

b. Above the assumed water surface elevation store the volume of runoff equal to two 100-year, 24-hour storm events over the entire drainage area to the landlocked basin.

c. The established high water level is the elevation the water would rise to from the above steps a and b.

9. Discharge must be made to a receiving stream, ditch, or another pond or an approved discharge route as shown in the Storm Water Management Plan.

F. Infiltration / Filtration Basins

1. All infiltration/filtration basins shall be designed and constructed in accordance with the Minnesota Pollution Control Agency's standards and City of St. Francis ordinance requirements.

2. Pre-treatment shall be provided prior to stormwater entering the infiltration/filtration basins.

a. For publicly maintained infiltration/filtration basins, the pre-treatment shall consist of a sediment forebay designed in accordance with the MN Stormwater manual recommendations.

3. On-site soil testing (i.e. soil borings and/or double ring infiltrometer tests) shall be preformed within each infiltration/filtration basin.

G. Storm Sewer

1. Storm sewer sizing shall be based upon the 10 year storm event. Inlet capacities and roadway spread at each inlet shall be determined. The maximum allowable roadway spread at any inlet shall be one-half of the traveled lane.

Storm sewer inlets shall be spaced to insure that not more than ½ of the traveled lane is inundated during the 10 year storm event. Manning's equation shall be utilized to determine the flow in the street at each catchbasin for verification of actual spread. A manning's n of 0.016 shall be utilized for asphalt pavement. Additionally, grate inlet capacities shall be verified at the maximum allowable depth of flow to verify that the proposed grates will pass the 10 year flows. When appropriate, by-pass flows shall be considered in calculations.

2. Storm sewer systems shall also meet the following requirements:

a. Maintain a minimum velocity of 3 fps for 10-year storm event.

b. Maintain a minimum cover of 2 feet from top of pipe to top of casting or flow line elevation.

c. Maintain a minimum of 3 feet of final cover over corrugated high density polyethylene (HDPE) pipe. See engineering guidelines to determine when HDPE is allowed.

d. Maintain a minimum of 1.5 feet of final cover over RCP in areas not used for vehicle traffic.

e. Storm sewers inverts, which outlet to detention basins, shall be placed at the normal water elevation of the basin. Storm sewers may be submerged a maximum of 1/2 the pipe diameter below the basin normal water elevation.

5.0 General Requirements - Grading, Drainage, and Erosion Control Plan

Grading, Drainage, and Erosion Control Plans shall be provided by the Developer in accordance with this manual. Several items critical to the review of the drainage system must be adequately depicted on the plan by the Developer's Engineer. The following key elements must be depicted on the plan:

A. Existing and proposed contours at a minimum of 2-foot intervals. A 1-foot contour interval or proposed spot elevations shall be used where conditions dictate. The determination of contour interval shall be made based upon clarity and readability of the plans.

B. Basin locations as depicted by the proposed contours. Normal level and 2 year, 10 year and 100 year flood water levels shall be depicted on the plan for each basin. Detention basins are required at each ditch and storm sewer outfall point from the proposed plat. Perimeter berm elevation and width shall be clearly labeled on plan sheets.

Permanent detention basins may be utilized as construction detention basins, provided they are cleaned after permanent erosion control measures are established. Design features of the detention ponds shall be as described in the BMP Manual.

C. Locations of silt fence, bale checks, erosion control blanket, rock construction entrances, storm drain inlet protection, outlet projection, rip rap, temporary seeding, permanent seeding, sod, mulch, or other erosion control features proposed to be implemented for the project.

D. Storm sewer facilities, when utilized, shall be adequately depicted on the drawings. As a minimum, the following must be shown on the plan:

1. Storm sewer pipe length, grade, type of material, and size between each catch basin and manhole.

2. Catchbasin and manhole structural data including size or diameter, and depth. A typical section depicting each different type of catchbasin or manhole used shall be shown on the drawing. Type of casting utilized shall be referenced for each catchbasin or manhole. Elevations for the top of inlet and each invert shall be referenced on the drawing.

3. A typical curb section for urban design streets shall be shown on the drawing.

4. If ditch sections are used, a typical section shall be shown on the drawing depicting bottom width and side slopes of the ditch.

5. Details of skimming structures utilized.

E. Individual lot grading shall insure positive drainage. Lot grading shall clearly depict a minimum design slope of 2%. Slopes of 1% to 2% may be allowed on a case by case basis with approval from the City Engineer. Under no circumstances will slopes less than 1% be allowed.

6.0 Storm Drainage System Submittal Requirements

A. The stormwater drainage report shall be comprised of the following sections to provide the City Engineer with adequate base information for which to review the report. The following data must be included in the report:

1. Title Page. The title page shall list the project name, project location, date prepared, and preparer's name, title, and company.

2. Signature Page. The report shall be signed by a licensed professional engineer.

3. Table of Contents. The table of contents must provide a description of the major categories of the report and also list each hydrograph and reservoir report presented in the report.

4. Stormwater Summary. The summary must provide descriptions of items critical to the review of the entire report. Assumptions and results of the calculations shall be included in the summary. As a minimum, the following items must be discussed in the summary:

    a. Pre–development site conditions (Existing)
        i. Total site area
        ii. Delineation of sub-drainage areas, as appropriate.
        iii. For each drainage area, or sub–drainage area, provide the following information:
            1. Area in acres

2. Curve number (with justification)
3. Time of Concentration (with justification)
4. Runoff rate and runoff volume

b. Post Development Site Conditions (Proposed)
   i. Total site area
   ii. Delineation of sub-drainage areas, as appropriate.
   iii. For each drainage area, or sub–drainage area, provide the following information:
      1. Area in acres
      2. Curve number (with justification)
      3. Time of Concentration (with justification)
      4. Runoff rate and runoff volume

b. Comparison of pre-development to post-development runoff rates and volumes.

c. Comparison of infiltration volume required to infiltration volume provided.

d. Discussion of temporary and permanent erosion control measures utilized.

e. A discussion of the storm sewer system, if applicable, to include a summary of flows to each catchbasin and the depth of water over each catchbasin during the ten year event.

5. Drainage maps depicting pre-development and post-development conditions. The maps may be 22"x34" plans, but shall also be provided on 11"x17" reductions. The plans shall delineate drainage area and sub-drainage area boundaries. All areas shall be labeled and referenced to those presented in the report.

6. Computer printouts of all hydrograph and reservoir files shall be included at the back of the report for reference.

7.0 Glossary

Critical Storm

Critical Storm means that rainfall event whose distribution and duration results in a runoff volume and rate establishing the appropriate level of protection.

Freeboard

Is the vertical difference between the lowest floor of proposed buildings and the critical 100-year storm event elevation or established high water level.

Level of Protection

The amount of secondary storm water runoff capacity required to avoid flood damage and provide for public safety.

Level of Service

The amount of primary storm water runoff capacity required to avoid unusual hardship or significant interference with normal public activities (transportation, sanitary, or utilities).

Normal Level

For basins, that water elevation maintained by a natural or man-made outlet.

NURP

Nationwide Urban Runoff Program (USEPA, 1983).

100-Year Storms

Rainstorms of varying duration (e.g. 2-, 6-, 24- or 48-hour) and intensities expected to recur on the average of once every one hundred years (1% frequency probability).

On-Site Detention

A method of temporarily storing storm water runoff at a development site in the form of wet basins.

Primary Capacity

The volume and/or rate of storm water runoff defined as that level of service provided by the primary system.

Primary System

The primary system conveys runoff from the more frequent events such as the 2 to 10-year events. In general, the system is composed of swales, ditches, gutters, and storm sewers.

Secondary Capacity

The volume and/or rate of storm water runoff in excess of the primary capacity and defined as that level of protection provided by the secondary system.

Secondary System

The system is composed of all the pathways that runoff takes when the capacity of the primary system is exceeded and in general is composed of streets, swales, ditches, stormsewers, detention basins, creeks, streams and rivers.

Storm Water Runoff

The flow on the surface of the ground, resulting from precipitation in the form of rainfall or snowmelt.

Table 1
City of St. Francis Minimum Runoff Curve Numbers

Cover Description	Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	**A**	**B**	**C**	**D**
Fully developed urban areas (vegetation established)				
Open space (lawns, parks, golf courses, cemeteries, etc.				
Grass Cover > 75%	39	61	74	80
Grass Cover < 75%	49	65	77	82
Impervious areas:				
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	98	98	98	98
Streets and roads:				
Paved; curbs and storm sewers (excluding right-of-way)	98	98	98	98
Paved; open ditches (including right-of-way)	83	89	92	93
Gravel (including right-of-way)	76	85	89	91
Dirt (including right-of-way)	72	82	87	89
Water Surface:	100	100	100	100
Urban Districts:				
Commercial and business	NA[1]	92	94	95
Industrial	NA[1]	88	91	93
Residential districts by average lot size:				
1/8 acre of less (town houses)	NA[1]	85	90	92
1/4 acre	NA[1]	75	83	87
1/3 acre	NA[1]	72	81	86
1/2 acre	NA[1]	70	80	85
1 acre	59	68	79	84
2 acres and greater	55	65	77	82
Developing Urban Areas				
Newly graded areas (pervious areas only, no vegetation)	77	86	91	94
Undeveloped areas				
Agricultural land (all current uses)	55	65	77	82
Pasture, grassland, or range – continuous forage for grazing	49	65	77	82
Meadow – continuous grass, protected from grazing and generally mowed for hay	30	58	71	78
Brush – brush-weed-grass mixture with brush the major element	35	56	70	77
Woods – grass combination (orchard or tree farm)	43	65	76	82
Woods	36	60	73	79

[1]Use of Type A soil is not allowed for this hydrologic condition