CITY OF FARGO SPECIFICATIONS
STORM SEWERS

PART 1
DESCRIPTION OF WORK

The work to be done under this section of the Specifications and the accompanying plans consists of the furnishing of all labor, material, accessories and equipment necessary to construct storm sewers in the City of Fargo. The work includes excavation, removal and replacement of paving where encountered; furnishing, laying and jointing pipe; making connections to existing storm sewers and manholes and inlets as necessary; constructing new manholes and inlets; protecting existing utilities and public and private property; backfilling trenches and other work as may be necessary in order that the work may be completed in accordance with these Specifications and the plans accompanying them.

PART 2
MATERIAL

2.1. REINFORCED CONCRETE PIPE (RCP)

2.1.1. MATERIAL

Material, manufacture and testing of RCP shall comply with ASTM C76 latest edition. RCP joints shall have rubber gaskets conforming to ASTM C 443.

2.1.2. MANUFACTURE

Pipe shall be furnished in four to eight foot lengths. Unless otherwise stated in the plans or special instructions, pipe 12" to 18" in diameter shall be Class V, 21" to 36" in diameter shall be Class III, 42" and larger diameter shall be Class II. All pipes shall be marked with the date of manufacture and class of pipe, and no pipe shall be laid before it is at least five days old. Special coatings or lining, if required, shall be as specified in the Special Instructions on the particular project.

2.1.3. JOINTS

Joints shall be of the tongue and groove type and shall be designed to be self-centering. Joints shall be furnished with an all weather butyl rubber gasket in flexible rope form meeting or exceeding the requirements of Federal Specification SS-S-210 A and AASHTO M-198. Where conditions warrant, an approved primer shall be used to obtain a sufficient seal, as directed by the Engineer. All lift holes shall be plugged with a nonshrink concrete plug and a mortar mix or asphaltic sealer to fill voids.

2.2. SOLID WALL POLYVINYLCHLORIDE (PVC) SEWER PIPE

2.2.1. MATERIAL

The material shall conform to "Standard Specifications for Rigid Polyvinyl chloride Compounds", ASTM D-1784, Class 12454-B or 12454-C or 12364-C. The pipe shall be produced using a continuous extrusion process employing a prime grade of unplasticized polyvinyl chloride.

2.2.2. PIPE MANUFACTURE

The PVC sewer pipe and fittings 15 inches in diameter or smaller shall meet the requirements of ASTM D 3034 SDR 35 minimum; pipe and fittings larger than 15 inches in diameter shall meet the requirements of ASTM F 679, wall thickness T-1, pipe stiffness of 46 psi.

2.2.3. JOINTING

The joint system shall be an integral bell gasketed joint, which forms a watertight seal.

2.3. POLY VINYL CHLORIDE (PVC) RIBBED SEWER PIPE

2.3.1. MATERIAL

The material shall conform to "Standard Specifications for Rigid Polyvinyl chloride Compounds", ASTM D-1784, Class 12454-B or 12454-C or 12364-C. The pipe shall be produced using a continuous extrusion process employing a prime grade of unplasticized polyvinyl chloride.

2.3.2. PIPE MANUFACTURE

The PVC ribbed sewer pipe and fittings 30 inches in diameter or smaller shall be seamless profile wall and meet the requirements of ASTM F794 Standard Specification for PVC Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter. The pipe interior shall be smooth walled and shall have a minimum pipe stiffness of 60 psi for pipe diameters 12 inches or less and a minimum pipe stiffness of 46 psi for 15-30"diameter pipe. Pipe shall meet requirements of ASTM D2444 for impact resistance. Exterior ribs shall be perpendicular to the axis of the pipe to allow placement of sealing gaskets without additional cutting or machining.

2.3.3. JOINTING

The joint system shall be an integral bell gasketed joint, which forms a watertight seal and meets the requirements of ASTM D3212 and F477.

2.3.4. MARKING

Each length of pipe shall be marked with the following information: Size, Company name or logo, PVC Sewer Pipe, ASTM F794 Manufacturers code, Cell Classification.

2.3.5. APPROVED MANUFACTURER

PWEAGLE ULTRA-RIB is an approved product.

2.4. CLOSED PROFILE POLYVINYL CHLORIDE (PVC) SEWER PIPE

2.4.1. MATERIAL

The pipe and fittings be made of PVC plastic meeting the requirements of ASTM D-1784 having a minimum cell classification of 12364 -A.

2.4.2. MANUFACTURE

The PVC profile wall pipe and fittings shall meet the requirements of ASTM F 794 latest edition and have a minimum pipe stiffness of 46 psi. Closed cell PVC pipe will only be allowed in 21-inch diameter or larger.

2.4.3. JOINTING

The joint system shall be of the bell and spigot type with a gasket that meets the requirement of ASTM D3212 & F477 to form a watertight seal. Gaskets shall be factory installed and chemically bonded to the bell end of the pipe. Field cuts and field installed gaskets shall be done in accordance with the manufacturer's instructions and his recommended equipment and materials.

2.4.4. APPROVED MANUFACTURERS

Vylon High Capacity and Diamond Plastics Pro-21 closed profile PVC pipe are approved products.

2.5. POLYPROPYLENE (PP) PIPE

2.5.1. MATERIAL

Polypropylene compound for pipe and fittings production shall be impact modified copolymer meeting the material requirements of ASTM F2736, Section 4, ASTM F2881, Section 5 and AASHTO MP-21-11, Section 6.1 for the respective diameters. Pipes shall have a min. stiffness of 46 psi – ASTM D2412.

2.5.2. MANUFACTURE

Under 30 inch diameter pipe shall be dual-wall pipe, and shall have a smooth interior and annular exterior corrugations and meet or exceed ASTM F2736 and AASHTO MP-21-11.

30 to 60 inch diameter pipe shall be triple-wall pipe and shall have a smooth interior and exterior walls and meet of exceed ASTM F2881 and AASHTO MP-21-11.

2.5.3. JOINTING

Pipe shall be joined with a gasketed integral bell & spigot joint meeting the requirements of ASTM F2736 & F2881, for the respective diameters.

All pipe joints shall be watertight according to the requirements of ASTM D3212. Spigots shall have gaskets meeting the requirements of ASTM F477. Gasket shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant, available from the manufacturer, shall be used on the gasket and bell during assembly.

Pipes shall have a reinforced bell with a polymer composite band installed by the manufacturer.

2.6. MANHOLES

2.6.1. MATERIAL

Precast manholes shall meet the requirements of ASTM C478. Precast segmental blocks shall be manufactured in accordance with ASTM C-139. The blocks shall form an 8" wall thickness. Brick shall be clay or concrete, uniform in size and texture and meeting ASTM Specifications for sewer brick. Brick manholes shall have prior approval from the Engineer.

Either monolithic manhole style boot connectors factory installed at the proper elevation and direction or concrete to PVC pipe adapters shall be used to connect PVC pipe to the manhole. PVC manhole adapter shall be GPK Products or approved equal.

2.6.2. MANUFACTURE

The manholes shall be constructed in accordance with ASTM C478 and the detail drawings included as part of this section of the Specifications. The main sewer shall be carried through manholes by split pipe whenever practicable. The concrete manhole shelves shall slope from the top edges of the invert at a rate of 2" per foot. When split pipe is not possible due to breaks in grade or elevation, the sewer invert shall be made of concrete. The shape of the invert shall conform exactly to the lower 1/2 of the pipe it connects and be left smooth and clean. Side branch inverts shall be constructed with as large radius of curvature as possible.

Mortar for concrete block manholes shall be mixed in the proportions of one part by volume of Portland Cement and two parts by volume of sand. Cement and sand shall be thoroughly mixed dry and only enough water added to form a mortar of proper consistency for block laying. All mortar shall be used within 40 minutes of mixing, and all mortar that has begun to take on its initial set shall be discarded and shall not be mixed with additional cement or new mortar. When connecting pipe to manholes, regular concrete (not grout) shall be used to mortar around the pipes on both the inside and outside of the manhole or inlet.

2.6.3. JOINTS

Joints shall be of the tongue and groove type and shall be designed to be self-centering. Joints shall meet the requirements of ASTM C990 unless otherwise specified in the Special Instructions. Joints shall be an all weather butyl rubber gasket in flexible rope form, meeting or exceeding the requirements of federal specification 55.5-210A and AASHTO M-198. Where conditions warrant, an approved primer shall be used to obtain a sufficient seal as directed by the Engineer.

2.6.4. MANHOLE AND INLET ADJUSTING RINGS

Manhole and inlet adjusting rings shall be composed of engineered polymer; either injection molded High Density Polyethylene (HDPE) as manufactured by Ladtech, Inc., or IPEX, Inc, or Expanded Polypropylene (EPP) as manufactured by JSP, or approved equal. Fine adjustments shall be made with thin and/or tapered adjustment rings (no steel shims allowed). All rings shall meet or exceed AASHTO HS-20 loading and be properly installed and sealed in accordance with the manufacturer's recommendations. HDPE materials shall conform to ASTM D-4976 using 100% recycled material.

Precast reinforced concrete adjusting rings will only be allowed upon the Division Engineer's approval where the size required is not manufactured in engineered polymer.

2.6.5. LIFT HOLES

Lift holes shall be manufactured to provide a watertight seal.

2.7. INLETS

The inlets shall be constructed in accordance with the detailed drawings included as part of these Specifications. Concrete and reinforcing used in the construction of these inlets shall also meet the requirements of ASTM C-478.

Concrete to PVC pipe adapters shall be used to connect PVC pipe to the inlet. PVC manhole adapter shall be GPK Products or approved equal.

All gutter-line inlets shall be installed complete with holes, either precast or core-drilled, and boots for watertight edge drain connections. Boots shall be flexible synthetic rubber, certified to ASTM C-923, with no plastic parts, welds, nor rivets. Any/all fastening components shall be stainless steel.

2.8. CASTINGS

2.8.1. MANHOLE CASTINGS

Manhole casting shall be Neenah R-1733, EJ1205Z, or approved equal with a vented lid with the word "STORM" (or the words "STORM SEWER") cast into the center of the lid in letters at least 1 inch high.

2.8.2. INLET CASTINGS

RDI - Round Inlet DBI - Double Box Inlet MHI - Manhole Inlet
SPI - Special Inlet SBI - Single Box Inlet

CHART 1 - INLET CASTINGS, GRATES, ETC.

Curb Type	Inlet Location	Inlet Type	Frame Type		Grate Type		Curb Box		Fargo Designation
			Neenah Foundry	EJ	Neenah Foundry	EJ	Neenah Foundry	EJ	
Standard (Type 2)	Low Point	DBI	R-3295-2	7031	V	M4	3290-0040	T5	**DBI-V2**
	Low Point	SBI	R-3067-VB	7030	VB	M11	3290-0040	T5	**SBI-VB2**
	Not LPT	SBI	R-3067-V	7030	V	M4	3290-0040	T5	**SBI-V2**
	Any	RDI or SPI	R-3404	5113	L	M1	none	none	**RDI-L2 or SPI-L2**
Mountable (Type 1)	Any	SBI	R-3067-C	7030Z2	L	M6	none	none	**SBI-L1**
	Any	RDI or SPI	R-3404	5113	L	M1	none	none	**RDI-L1 or SPI-L1**
Flat	ADA Ramp	SBI	R-3067-C	7030Z2	Q	M10	none	none	**SBI-Q**
none	Non-Street	RDI, SPI, or MHI	none		R-4342	6489	N/A		**RDI, SPI, or MHI**

Note: Gutter line MHI frame, grate, and curb box designations shall be as shown on the plans.

2.8.3. BEEHIVE CASTING (WHERE SPECIFIED)

Beehive casting (6” high) shall be Neenah R-2561-A, EJ 1205Z/M2 or approved equal.

2.8.4. FLOATING CASTINGS (WHERE REQUIRED)

Floating casting shall be per section 2100 of these Specifications.

PART 3
CONSTRUCTION

3.1. GENERAL

Excavation, trenching and backfilling shall be done in accordance with Section 1000 of these Specifications. Pipe shall be handled and laid in accordance with the Manufacturer's or Industry standards, ASTM C1479. Pipe and manholes shall be laid in the location shown on the plans, the exact location being designated by the Engineer. With PVC and/or PP pipe, both ends shall be wiped clean and sufficient lubrication placed on the gasket and spigot end before the pipe is fully pushed into the bell. Field cut spigot ends shall be beveled prior to being pushed into the bell. With RCP, both ends shall be cleaned and the asphaltic joint sealer applied in sufficient quantity to be extruded from the joint as the pipe is pushed home. If butyl rubber gaskets are used, they shall be installed as per the manufacturer's recommendations. Every part of the pipe shall be bedded uniformly throughout its length. Pipe shall be laid upgrade with the spigot end pointing in the direction of flow. All sewers must be kept thoroughly clean. When the trench is left at night or the pipe laying stopped, the upper end of the pipe must be closed with an end board or cap to prevent dirt and sand from entering the pipe.

Pipe shall not be trimmed except for closures, and pipe not making a good fit shall be plainly marked and removed from the site. Permissible defects (minor chips or broken sockets with a depth of fracture less than 1" deep as measured from the end of the socket (RCP only)) shall be placed in the top of the line.

PVC and/or PP pipe used as storm sewer will only be allowed on backyard inlet lead runs where the pipe is located outside the future street section unless approved by the Engineer. Material change can only be made at a structure.

All 60" or larger RCP shall be laid on a bed of 6-inches of 1 1/4" crushed rock. The six inches of crushed rock shall be incidental to the pipe bid price. Additional rock shall be used as directed by the Engineer to backfill unstable bedding areas. The cost of excavating and placing the additional (more than 6-inches) shall be paid for per cubic yard of 1 1/4" crushed rock.

3.2. ALIGNMENT

The Engineer will provide line and grade for all storm sewer pipes. Grade and alignment shall be maintained by the use of a line parallel to the grade and line of the sewer, this line to be supported above the ground on batter boards spaced 50 feet or less apart and rigidly anchored to and supported by steel post driven into the ground.

Not less than 3 batter boards shall be maintained at all times. The Engineer shall be immediately notified of any misalignment of the batter boards set in accordance with the grade and alignment of the tacked offset stakes provided.

Electronic grade control is allowed, however the Contractor will be required to periodically check the alignment and grade from the offset stakes provided. In no instance will the Contractor be allowed to change the alignment or grade without the permission of the Engineer.

3.3. MANHOLES/INLETS

The manhole/inlet bases shall be set at the proper grade and alignment to provide a smooth transition from the incoming pipe(s) to the outgoing pipe. Manhole/inlet bases shall be set on four inches of bedding sand in a dry trench condition. In wet or unstable trench conditions the manhole/inlet base shall be bedded in 6" of 1 1/4" crushed rock. The area that is over-excavated adjacent to the manhole/inlet base and under the pipe shall be filled with concrete to prevent settlement and provide for support for the pipe from the manhole/inlet edge to the regular trench excavation. Care shall be taken that the connection between the manhole/inlet and the pipe is watertight and the invert is smooth and continuous as it enters and exits the manhole/inlet. Mortar around the pipe connection shall be regular concrete (not grout) conforming to the requirements for sidewalks outlined in Section 2300. The concrete shall be placed on both the inside and outside of the manhole/inlet concurrently. The concrete below the spring line of the pipe at both the exterior and interior of the manhole/inlet shall be vibrated. The interior shall have a wood trowel finish. When non-RCP is used, a manhole connection adapter will be required to be installed to achieve a watertight condition - installation shall be per the pipe manufacturer recommendations. Contractor shall protect manhole/inlet from washouts by plugging holes for edge drain. If edge drain is not part of the contract, plugs shall remain in place at completion of project.

3.4. CASTING TO GRADE (BOULEVARD)

This item applies to inlets located outside the paving section and for manholes/inlets that will not be adjusted with a planned future project, and shall include all labor, materials and equipment necessary to

adjust the various manhole/inlet castings to the proper line and grade. Changes in grade shall be made as follows:

All adjustments, including fine adjustments, shall be made with engineered polymer adjustment rings as specified herein (no steel shims allowed). All adjustment rings shall be properly sealed or wrapped with nonwoven geotextile fabric in accordance with the manufacturer's recommendations.

Where casting adjustment requirements cannot be met by the use of engineered polymer adjustment rings and upon the Division Engineer's approval, the Contractor shall provide precast reinforced concrete adjusting rings. For fine adjustments of less than two (2) inches, steel shims shall be used to temporarily support the casting. The castings and rings shall be laid in a full bed of mortar. The rings and structure section shall be cleaned to assure a flat seating surface and the rings shall be installed in alignment with no noticeable offsets. After smoothing the protruding grout around the interior and exterior of the rings, nonwoven geotextile fabric shall be placed and secured around the outside of the rings from three (3) inches below the top of the manhole/inlet structure to the top of the rings, overlapping the frame casting.

Care shall be taken to adjust the casting to the elevation determined by the Engineer. Any castings not satisfying these requirements shall be redone to the satisfaction of the Engineer.

3.5. TELEVISING

All gravity sewers shall be televised by the City of Fargo Street Department. Any abnormalities such as, but not limited to, deviations of grade, misaligned joints, cracked/defected pipe, rolled gaskets shall be repaired by the Contractor at his expense. Sections requiring repair shall be re-televised to verify conditions of repair. It is the Contractor's responsibility to provide drivable access to each manhole for the City of Fargo camera truck. Televising requires a 7-day advance notice and shall be scheduled through the inspectors on site, and will be completed during normal City of Fargo Street Department hours. If the camera operator deems the pipe unsuitable for televising, the Contractor shall clean the sewer by means of jetting. All costs to accommodate televising shall be included in other bid items.

3.6. DEFLECTION TESTING

All flexible conduit pipe used in urban storm sewers shall be tested for deflection in accordance with Section 1200 of these Specifications.

PART 4
GUARANTEE, MEASUREMENT & PAYMENT

4.1. GUARANTEE

The guarantee shall be per the contract.

4.2. MEASUREMENT AND PAYMENT

4.2.1. GENERAL

The cost of excavating and trenching shall be included as part of this specification.

4.2.2. STORM SEWER PIPE

Pipe will be measured by customary and conventional methods and paid for on a unit price basis for the actual length installed. Measurement will be from center of manhole to center of manhole or from end of existing pipe to center of manhole or end of pipe stubout. No additional payment will be made for the manhole connections or cutting of pipe for closures. Where bid items are provided, plugs will be paid on a per each basis, otherwise they shall be incidental to the work.

4.2.3. STORM SEWER MANHOLES & INLETS

The cost of furnishing and installing the manholes and inlets will be paid for on a lump sum bid per each manhole or inlet installed. Costs shall include all excavation, bedding, backfilling, constructing, furnishing and installing the casting in place, connections to the sewer, installing inverts and sealing the manhole or inlet connections, joints, and lift holes, and plugging the holes for edge drain.

4.2.4. CASTING TO GRADE (BOULEVARD)

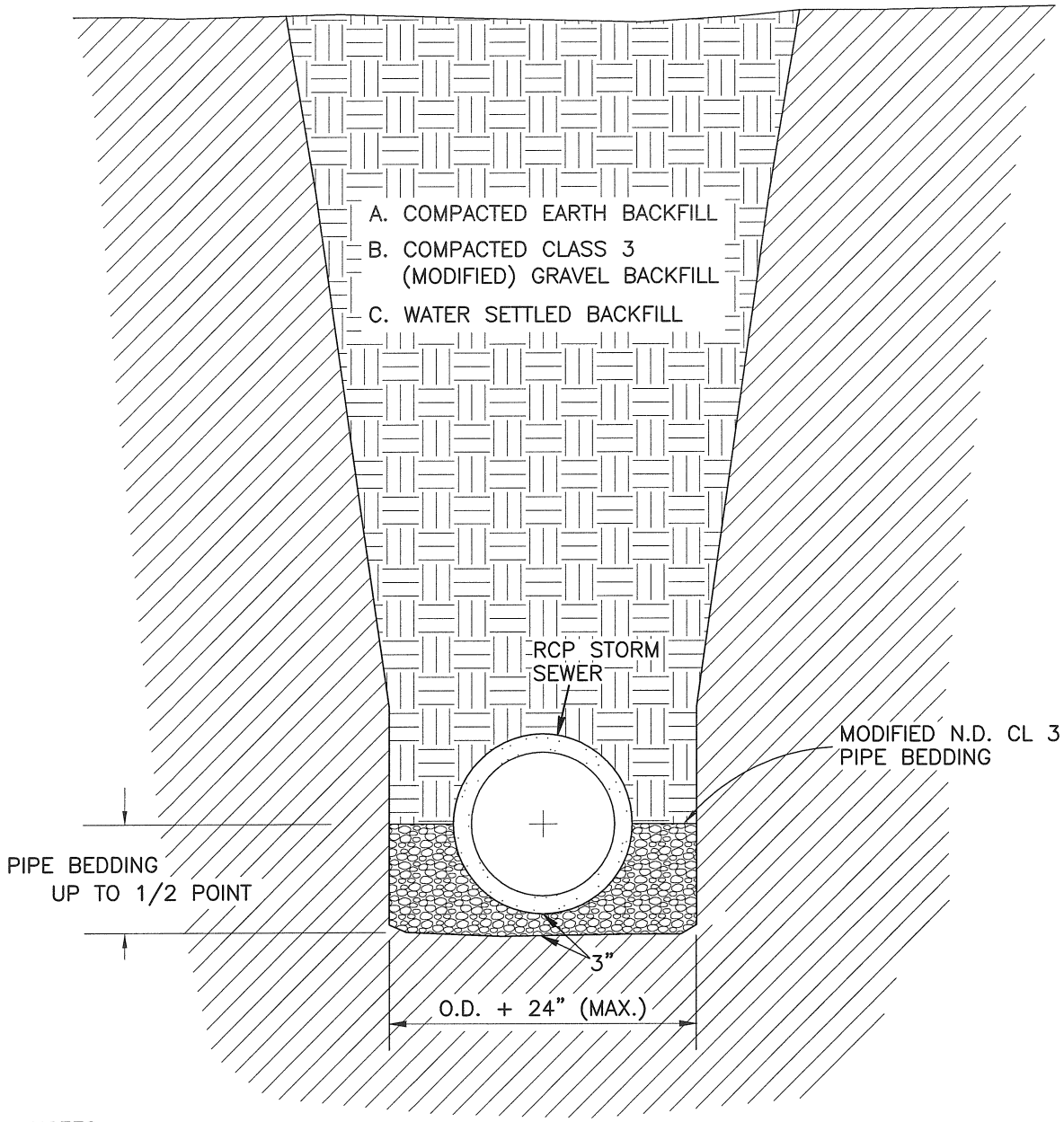
This bid item shall be paid for at the contract unit price per each, and shall include adjusting the castings with up to 4 adjusting rings, including all sealant, wrap, or chimney seals as specified herein.

4.2.5. FLARED-END SECTION (FES)

The length of a Flared End Section (FES) shall not be included in the measurement of the associated storm sewer size. A FES shall be paid on a per each basis. Trash racks shall be incidental to the FES bid item.

4.2.6. OTHER COSTS

All other costs for work necessary to properly complete the work specified herein shall not be bid items; the costs shall be charged to other items unless a bid item is specifically included on the bid sheet.



NOTES:

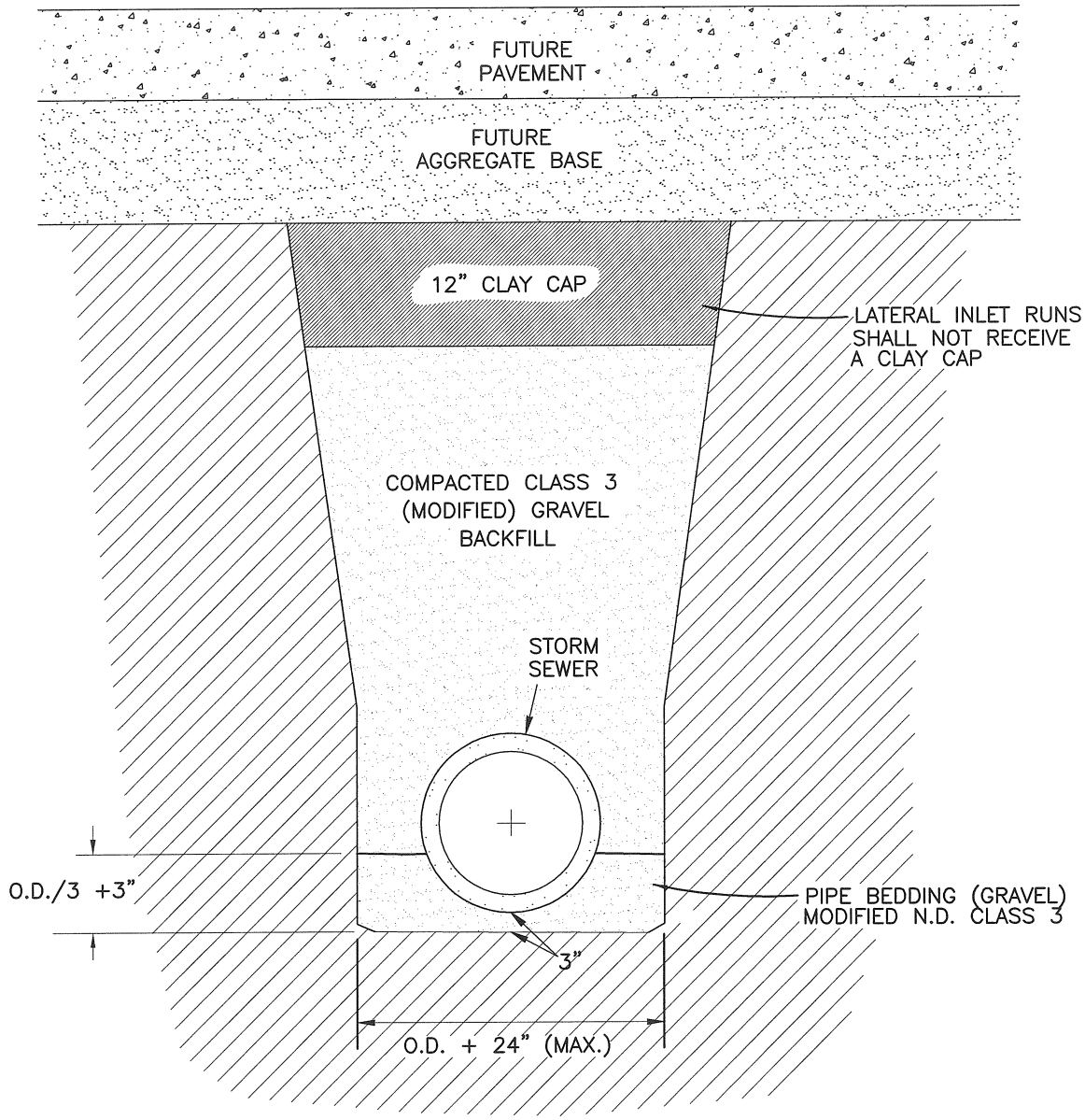
1. MAXIMUM TRENCH WIDTH FOR 60", 66" & 72" RCP NOT TO EXCEED OUTSIDE DIAMETER OF PIPE + 12" FROM BOTTOM OF TRENCH TO A POINT 2' ABOVE PIPE.
2. ALL LIFTING HOLES TO BE PLUGGED & MORTARED.
3. PVC PIPE – GRAVEL BEDDING/ENCASEMENT REQUIRED TO 3" ABOVE PIPE.
4. OTHER PIPE – GRAVEL BEDDING/ENCASEMENT PER DIRECTION OF ENGINEER.

SECTION NO. 1500	DRAWING NO. 5.1
REV,D. 2012	

STORM SEWER TRENCH BACKFILL

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED BED	DATE 2-21-2012



NOTES:

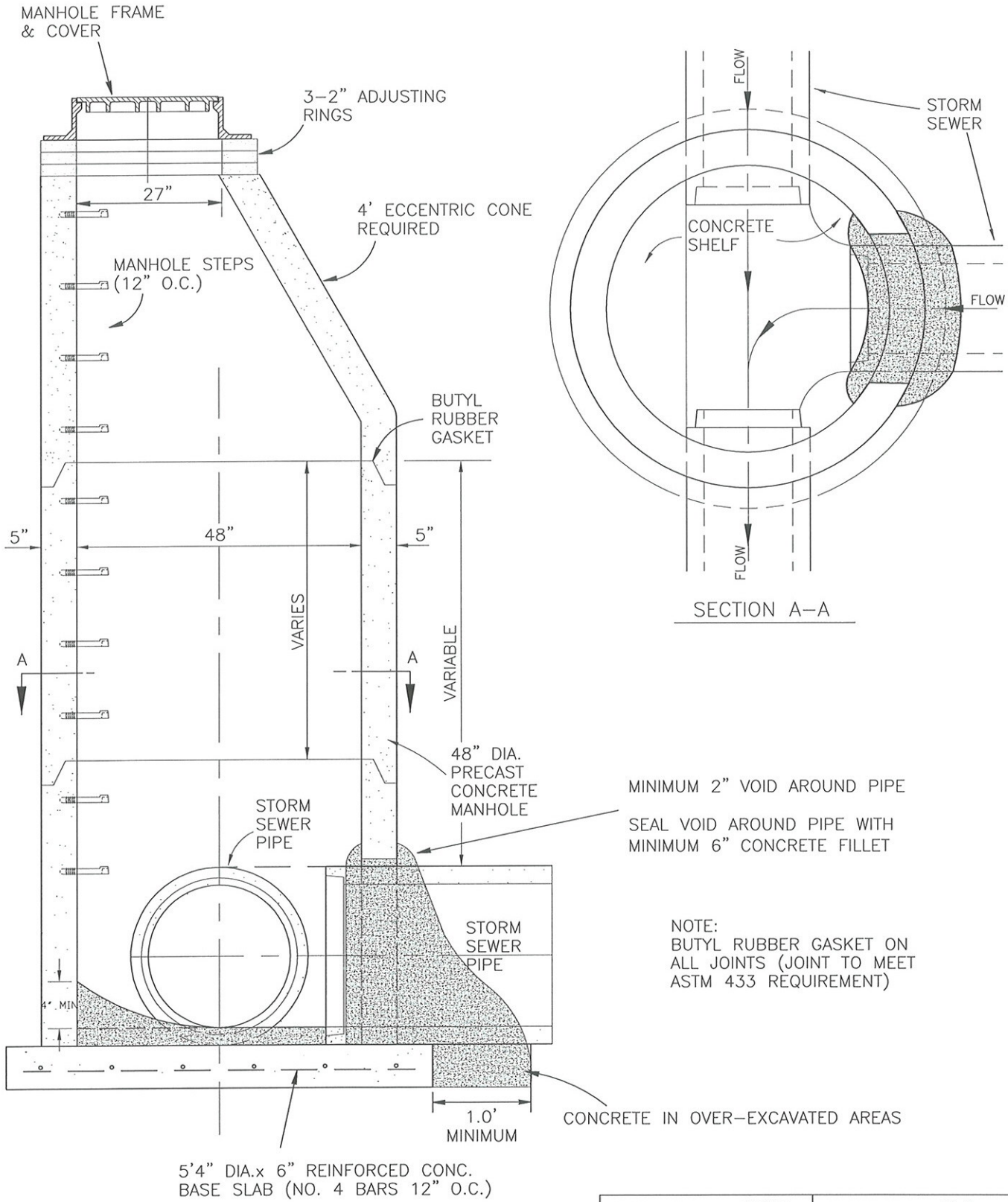
1. MAXIMUM TRENCH WIDTH FOR 60", 66" & 72" RCP NOT TO EXCEED OUTSIDE DIAMETER OF PIPE + 12" FROM BOTTOM OF TRENCH TO A POINT 2' ABOVE PIPE.
2. ALL LIFTING HOLES SHALL BE PLUGGED & MORTARED.
3. THIS DETAIL APPLIES WHERE STORM SEWER IS INSTALLED UNDER FUTURE PAVING WITH EDGE DRAIN.

SECTION NO. 1500	DRAWING NO. 5.2
REV,D.	

STORM SEWER TRENCH UNDER NEW PAVEMENT

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED BED	DATE 2-21-2012



SECTION A–A

NOTE:
BUTYL RUBBER GASKET ON ALL JOINTS (JOINT TO MEET ASTM 433 REQUIREMENT)

NOTES:
1. CASTING FRAME AND COVER SHALL BE DETERMINED BY THE ENGINEER.

2. MAXIMUM RCP DIA.–27" STRAIGHT THRU. MAXIMUM RCP DIA–18" AT RIGHT ANGLES.

3. ALL JOINTS AND LIFTING HOLES SHALL BE MORTARED.

SECTION NO. 1500	DRAWING NO. 5.3
REV,D. 2013	

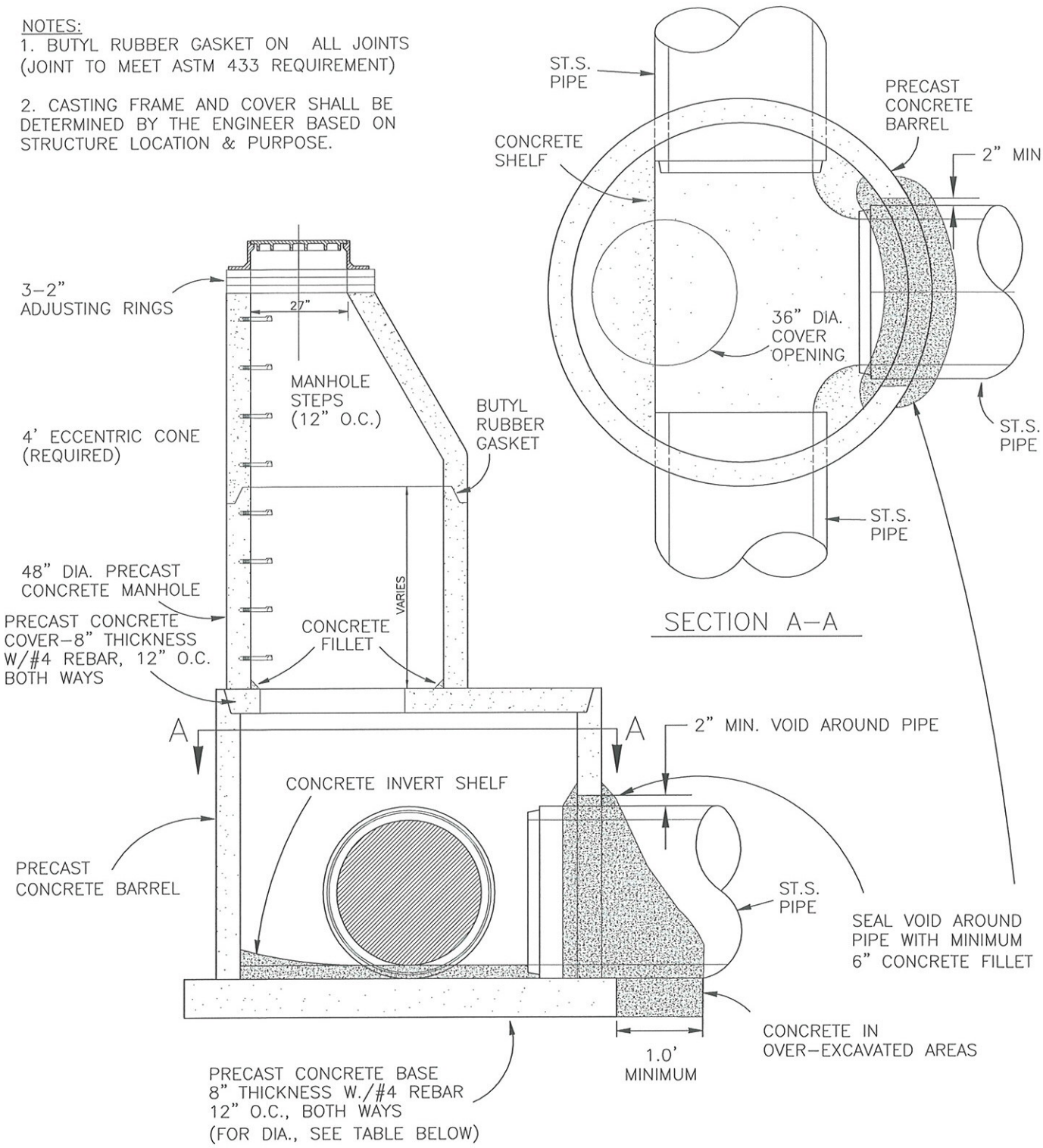
STORM SEWER STANDARD MANHOLE

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED JME	DATE 1-2-13

NOTES:
1. BUTYL RUBBER GASKET ON ALL JOINTS (JOINT TO MEET ASTM 433 REQUIREMENT)

2. CASTING FRAME AND COVER SHALL BE DETERMINED BY THE ENGINEER BASED ON STRUCTURE LOCATION & PURPOSE.



MANHOLE TYPE	(A) MANHOLE INSIDE DIA.	(B) MANHOLE OUTSIDE DIA.	MAXIMUM PIPE SIZES		
			0° ∢	90° ∢	135° ∢
A	60"	7'–0"	36"	24"	36"
B	72"	8'–0"	42"	33"	42"
C	84"	9'–4"	48"	36"	48"
D	96"	10'–6"	60"	42"	60"

SECTION NO. 1500	DRAWING NO. 5.4
REV,D. 2013	

STORM SEWER MANHOLE TYPE "A – D"

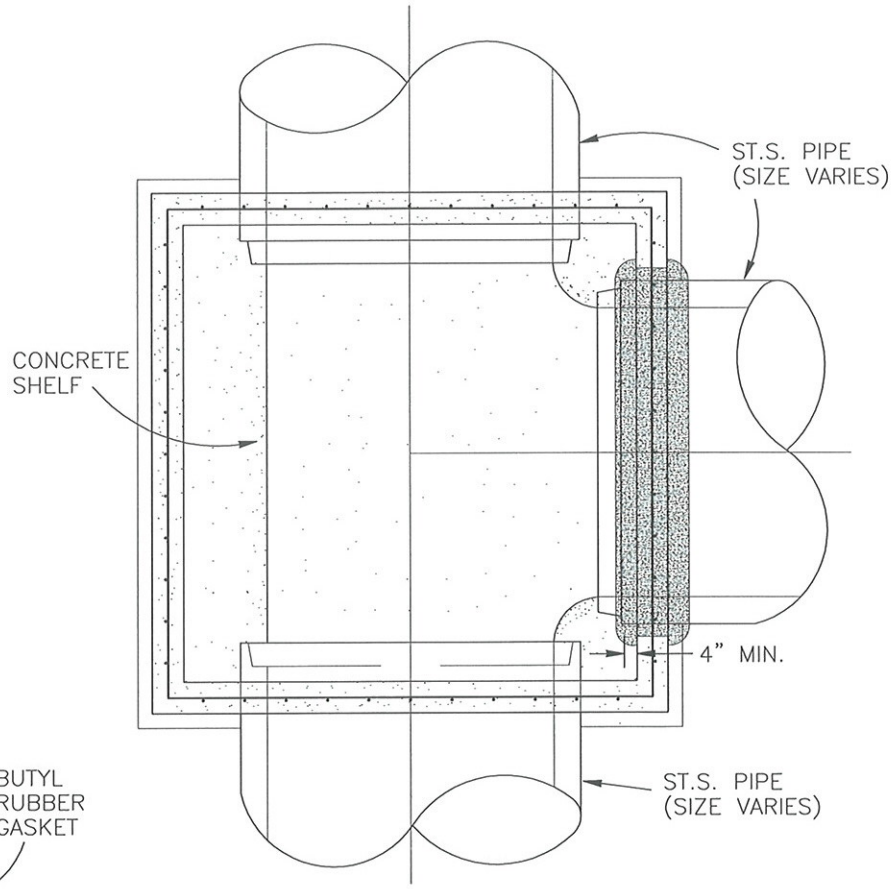
CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED BME	DATE 1-2-13

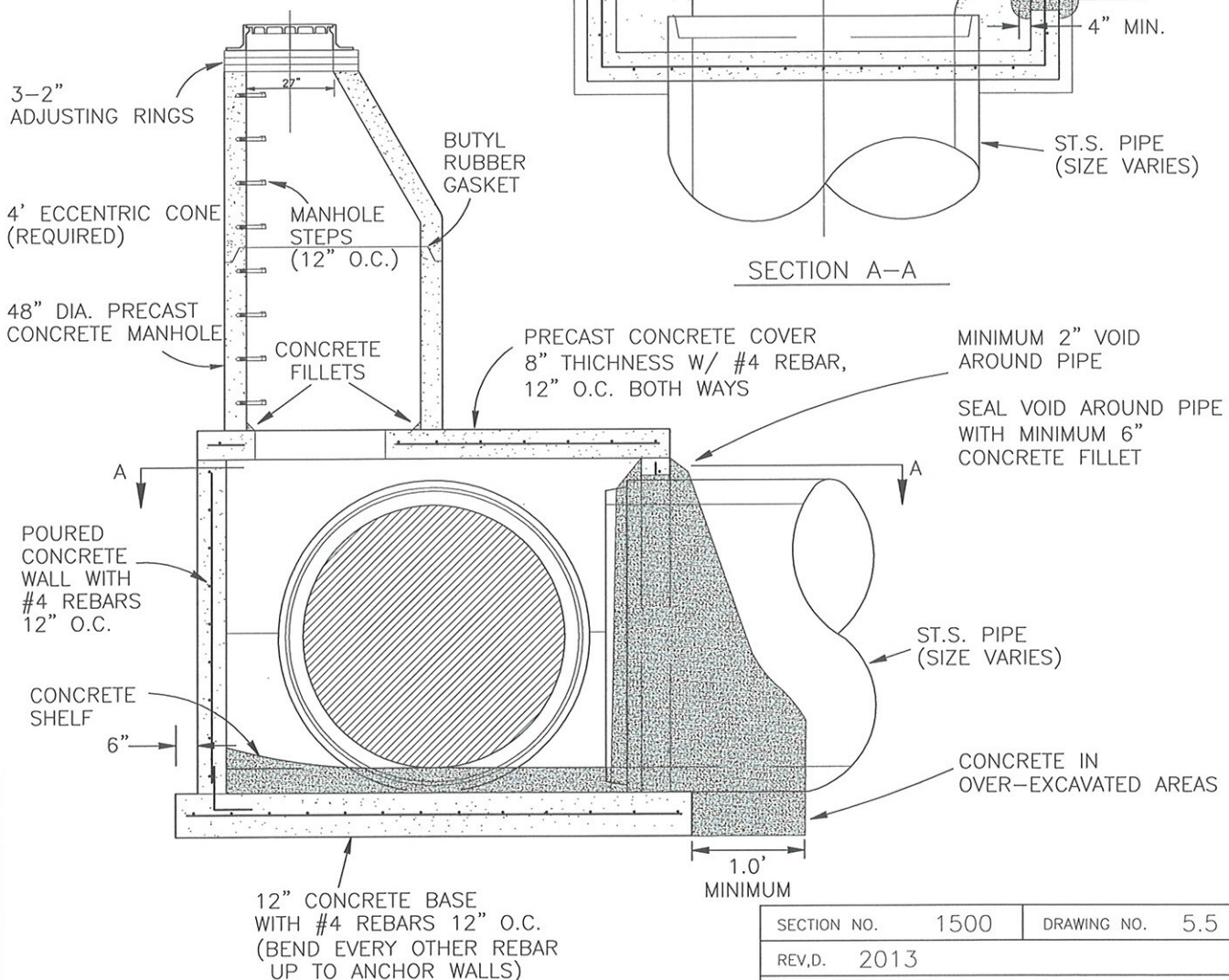
NOTES:
1. CASTING FRAME AND COVER SHALL BE DETERMINED BY THE ENGINEER BASED ON STRUCTURE LOCATION & PURPOSE.

2. BUTYL RUBBER GASKET ON ALL JOINTS (JOINTS TO MEET ASTM 433 REQUIREMENT).

3. TYPE "E" MANHOLE SHALL BE BUILT TO THE DIMENSIONS SHOWN ON THE PLANS. THE WALLS SHALL BE REINFORCED WITH #4 REBAR 12" O.C.



SECTION A–A

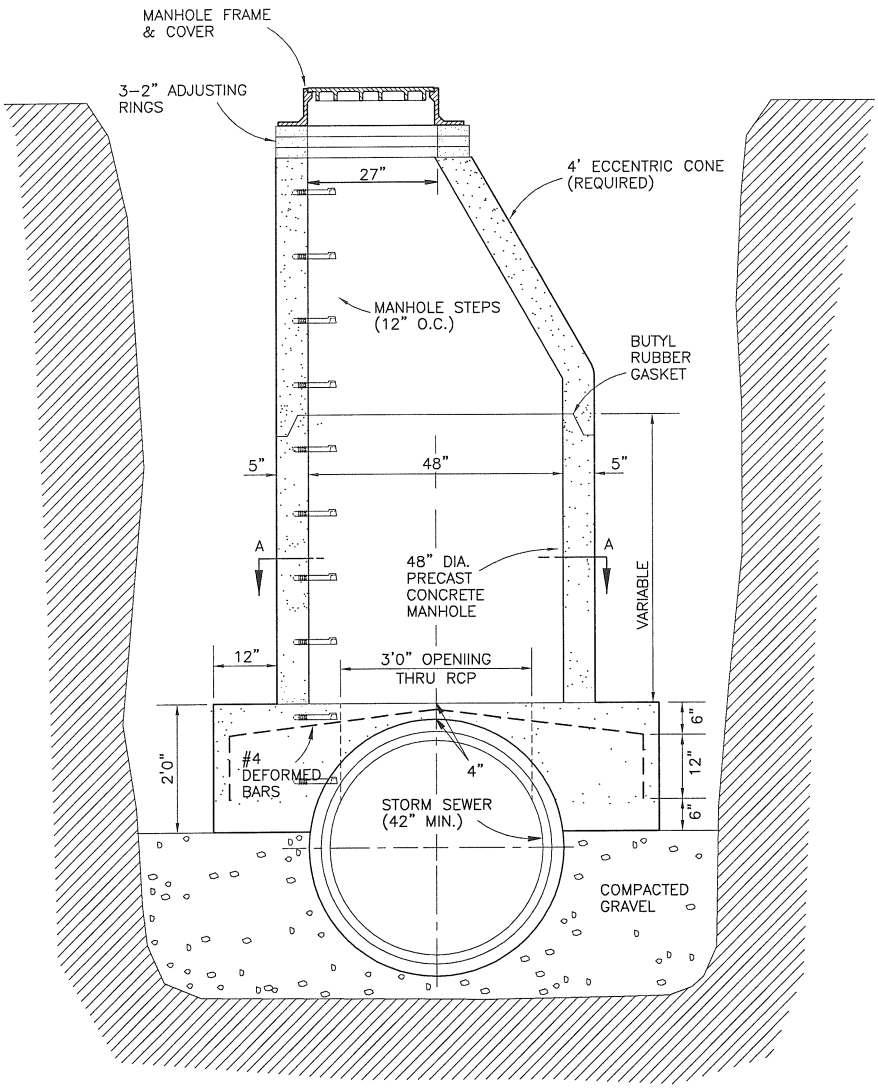


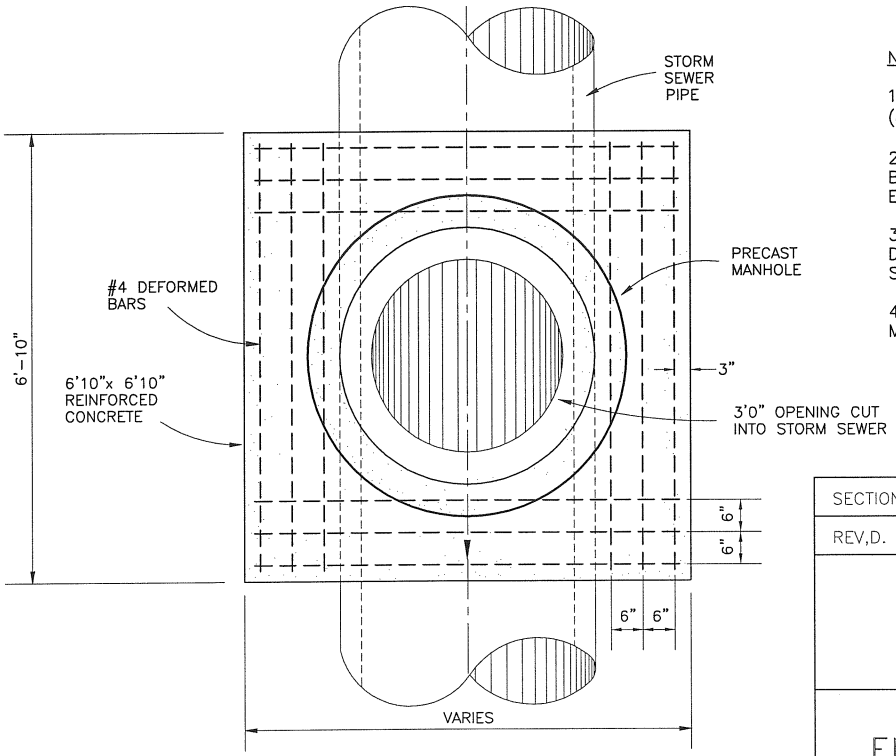
SECTION NO. 1500	DRAWING NO. 5.5
REV,D. 2013	

STORM SEWER MANHOLE TYPE "E"

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED MME	DATE 1-2-13





SECTION A–A

NOTES:

1. BUTYL RUBBER GASKET ON ALL JOINTS (JOINTS TO MEET ASTM 433 REQUIREMENT).

2. 3'0" OPENING THRU TOP OF R.C.P. SHALL BE GIVEN A SMOOTH MORTAR FINISH TO PERMIT ENTRY INTO STORM SEWER.

3. CASTING FRAME AND COVER SHALL DETERMINED BY THE ENGINEER BASED ON STRUCTURE LOCATION AND PURPOSE.

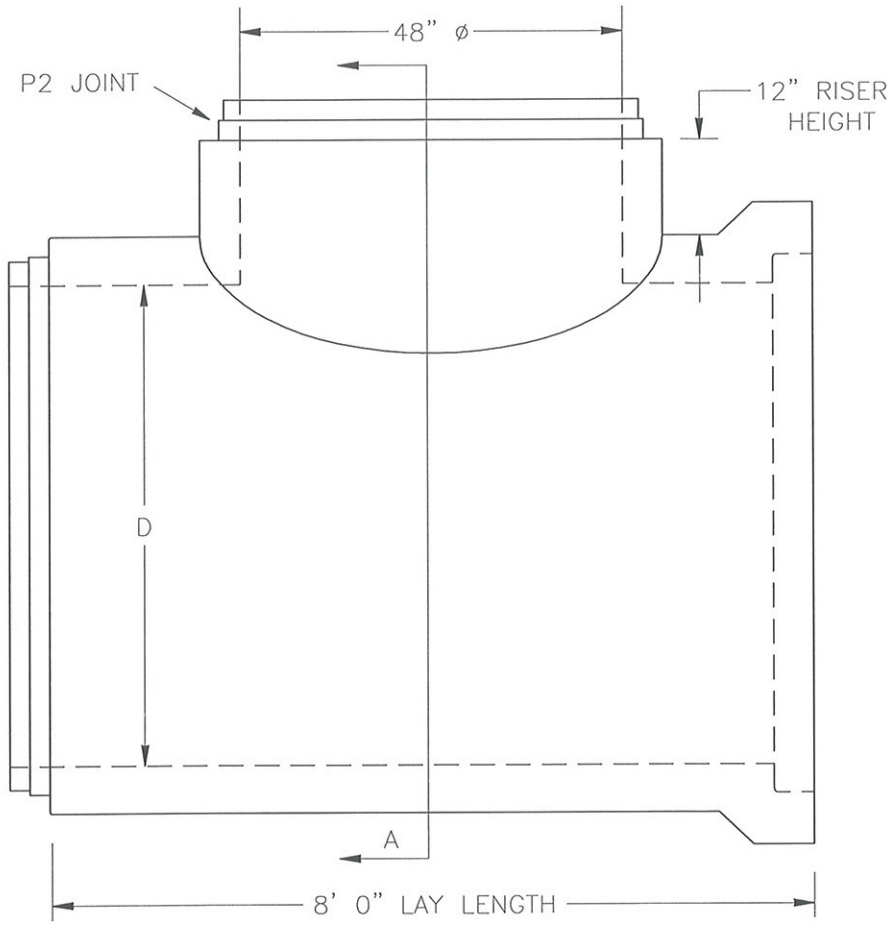
4. ALL JOINTS AND LIFTING HOLES SHALL BE MORTARED.

SECTION NO. 1500	DRAWING NO. 5.6
REV,D. 2012	

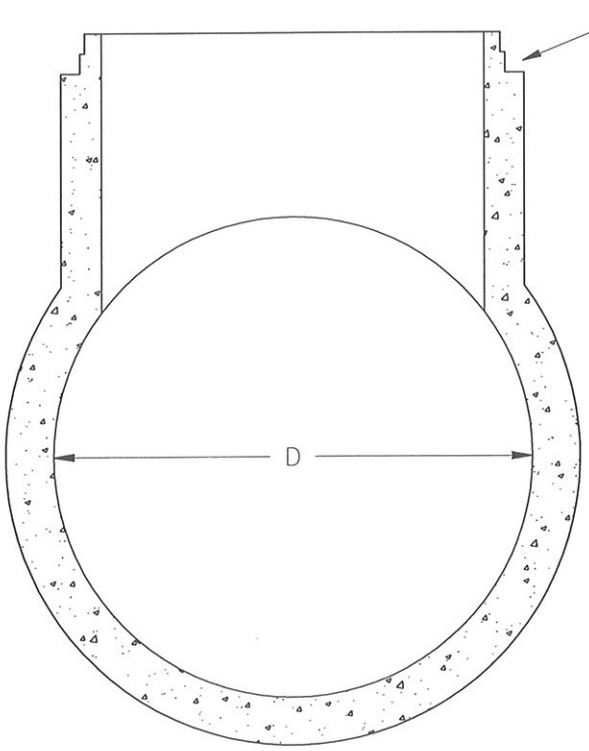
STORM SEWER SADDLE MANHOLE

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED BED	DATE 2-21-2012



SIDE VIEW



SECTION A–A

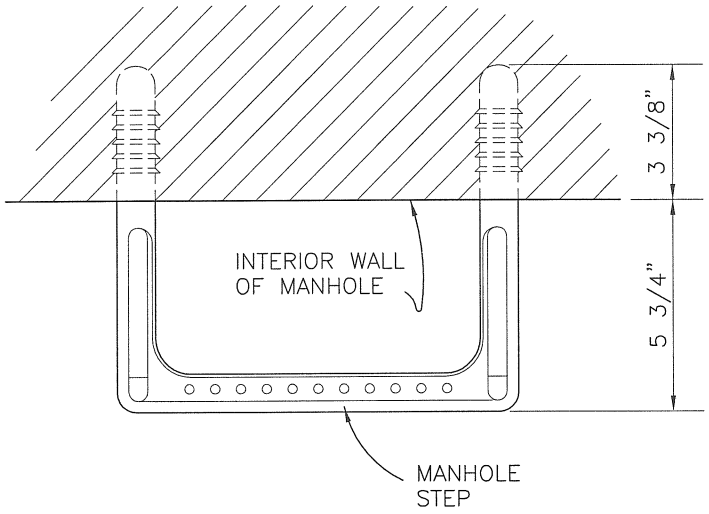
D
PIPE DIAMETER
48"
54"
60"
66"
72"
78"
84"
96"
102"
108"
120"

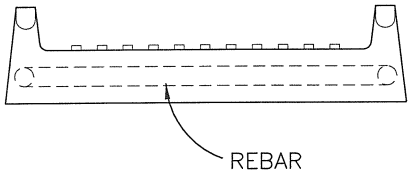
SECTION NO. 1500	DRAWING NO. 5.6B
REV,D.	

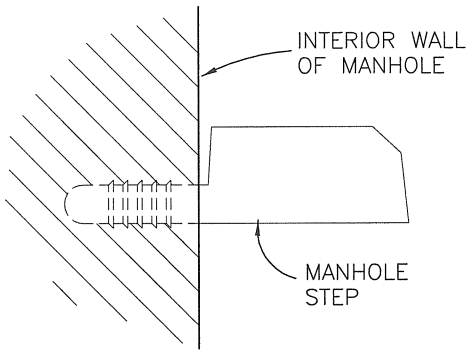
INLINE TEE MANHOLE

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED JME	DATE 1-2-13







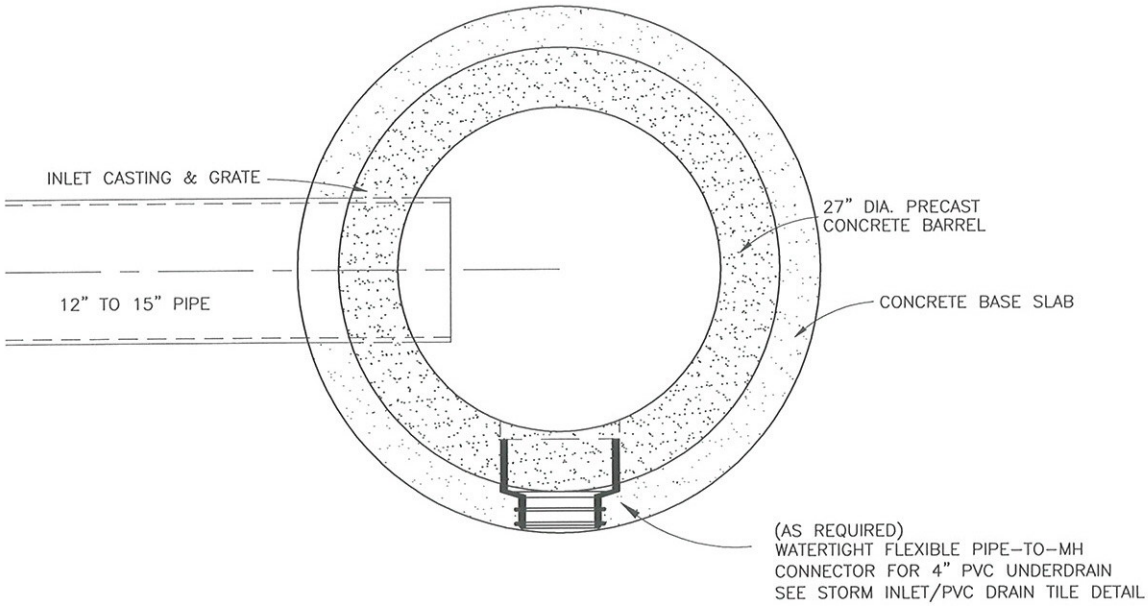
NOTE:
STEP SHALL BE CONSTRUCTED OF 1/2" REINFORCING ROD AND COMPLETELY ENCASED IN A CORROSION RESISTANT RUBBER OR POLYPROPYLENE PLASTIC, WHICH WILL RESIST DETERIORATION FROM HYDROGEN SULFIDE OR OTHER CHEMICALS AND GASES ENCOUNTERED IN MANHOLE APPLICATION.
ALSO, STEP SHALL HAVE A VERTICAL RESISTANCE OF 400 LBS., AND A PULLOUT RESISTANCE OF 1000 LBS. SUCH AS: THE WEDG-LOC STEP BY DELTA PIPE PRODUCTS OR APPROVED EQUAL.

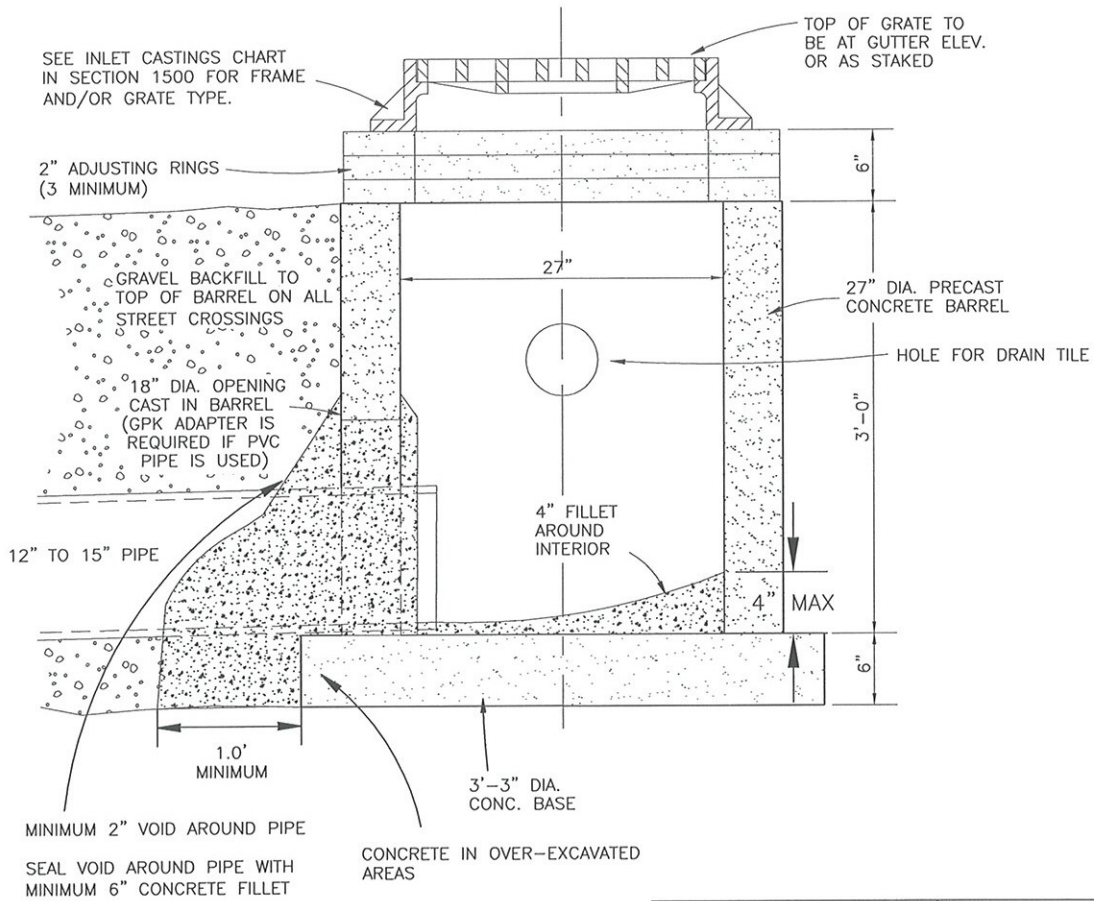
SECTION NO. 1500	DRAWING NO. 5.7
REV,D. March, 2000	

MANHOLE STEP DETAIL

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED BEO	DATE 2-21-2012



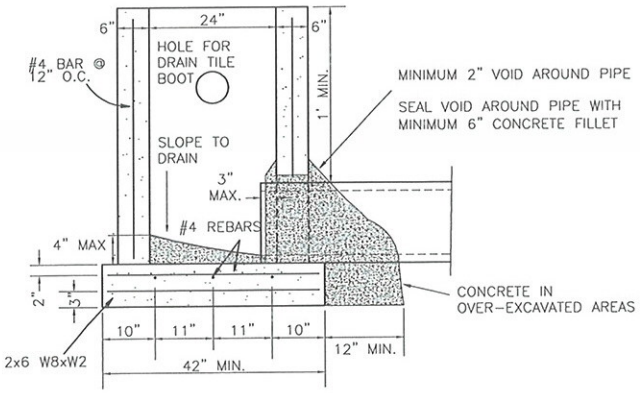


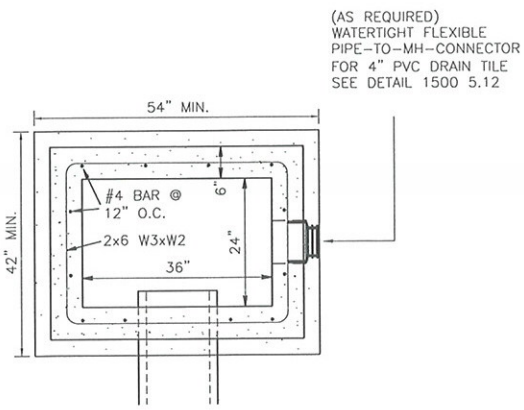
SECTION NO. 1500	DRAWING NO. 5.8
REV,D. 2013	

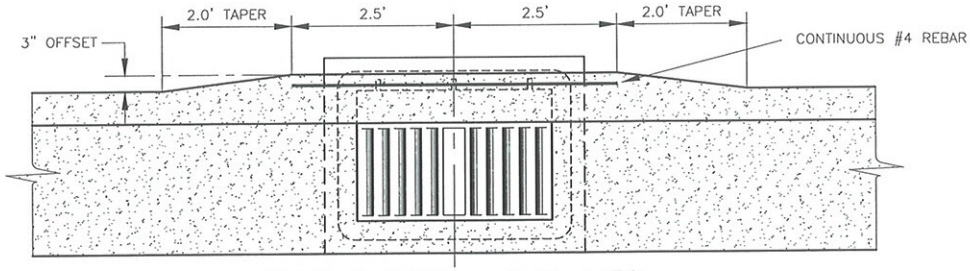
STORM SEWER ROUND INLET (RDI)

CITY OF FARGO
ENGINEERING DEPARTMENT

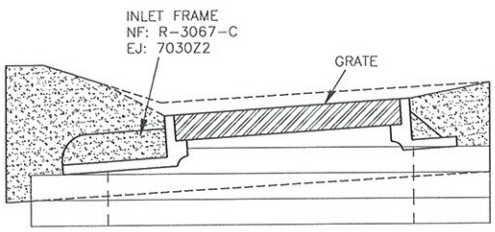
APPROVED ANE	DATE 1-2-13



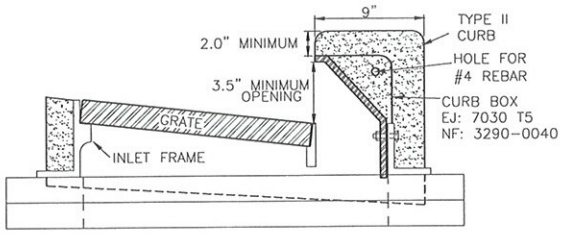




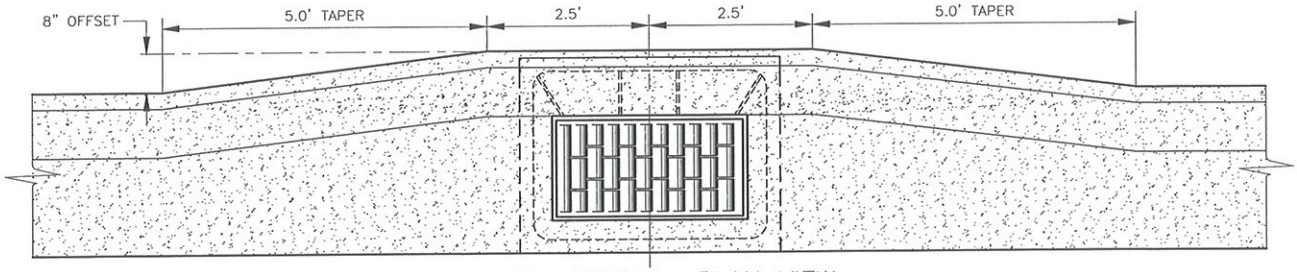
TYPE II CURB – PLAN VIEW



TYPE I CURB



TYPE II CURB



TYPE I CURB – PLAN VIEW

NOTES:

1. VERIFY FRAME, GRATE, & CURB BOX WITH INLET CASTINGS CHART IN SECTION 1500.

2. METAL USED IN THE MANUFACTURE OF CASTINGS SHALL CONFORM TO AAShTO M-105, CLASS 35B.

3. THE CONCTRACTOR SHALL HAVE THE OPTION OF USING PRECAST OR POURED IN PLACE BASES. CLASS OF CONCRETE SHALL BE AE. THE AGGREGATE SIZE SHALL BE APPROVED BY THE ENGINEER IN THE FIELD.

4. PRECAST RISERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M199.

5. ON PROJECTS WITH P.C.C. PAVEMENT ALL INLET RISERS OR BARRELS SHALL BE CONSTRUCTED 4 TO 5 INCHES BELOW FINAL ELEVATION AND ADJUSTED TO FINAL GRADE AFTER THE PAVING. ADJUSTMENT MAY BE DONE WITH ADJUSTMENT RINGS, MASONARY OR CAST-IN-PLACE. ALL COSTS FOR THIS ADJUSTMENT SHALL BE INCLUDED IN THE BID PRICE FOR THE INLET.

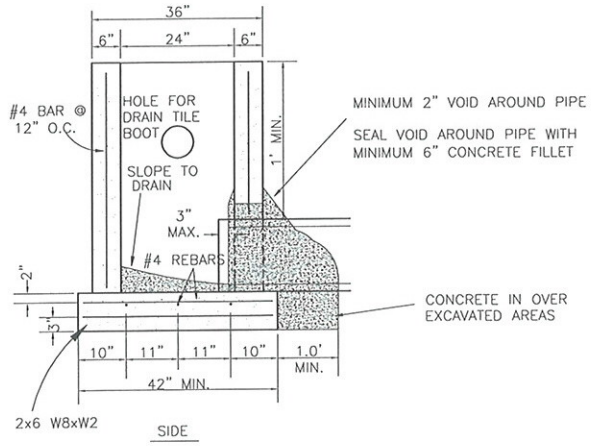
CURB BOX
STANDARD CURB – NEENAH 3290-0040 or EAST JORDAN T5

SECTION NO. 1500	DRAWING NO. 5.9
REV,D. 2013	

SINGLE BOX INLET (SBI) DETAIL

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED GME	DATE 1-2-13



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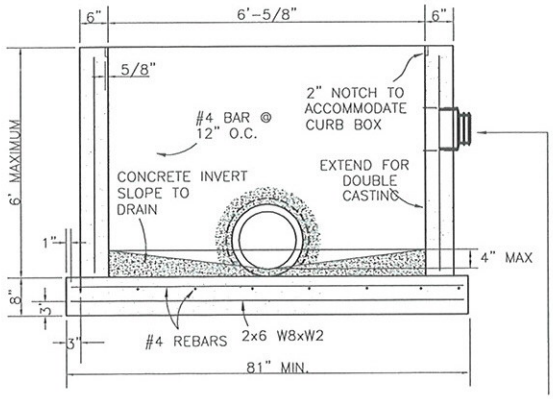
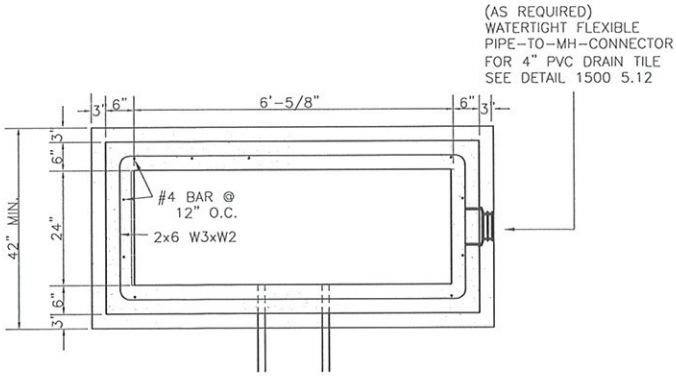
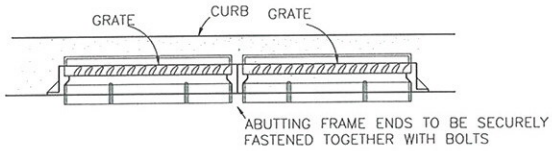
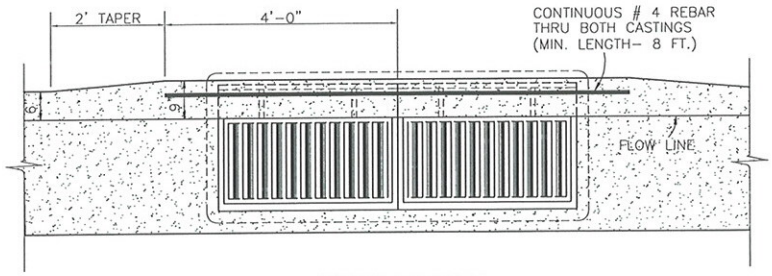




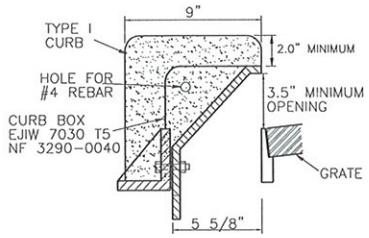


FRONT

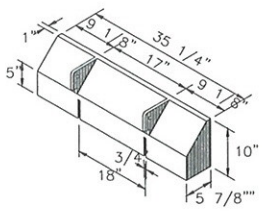
PLAN



DOUBLE INLET PLAN
TYPE II CURB



TYPE II CURB



CURB BOX
STANDARD CURB – NEENAH 3290-0040 or E.J. T5
MOUNTABLE CURB – NEENAH 3067-7009 or E.J. T7
OR APPROVED EQUAL

NOTES:

1. SEE INLET CASTINGS CHART IN SECTION 1500 FOR FRAME AND/OR GRATE TYPE.

2. METAL USED IN THE MANUFACTURE OF CASTINGS SHALL CONFORM TO AASHTO M-105, CLASS 35B.

3. THE CONCTRACTOR SHALL HAVE THE OPTION OF USING PRECAST OR POURED IN PLACE BASES. CLASS OF CONCRETE SHALL BE AE. THE AGGREGATE SIZE SHALL BE APPROVED BY THE ENGINEER IN THE FIELD.

4. PRECAST RISERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M199.

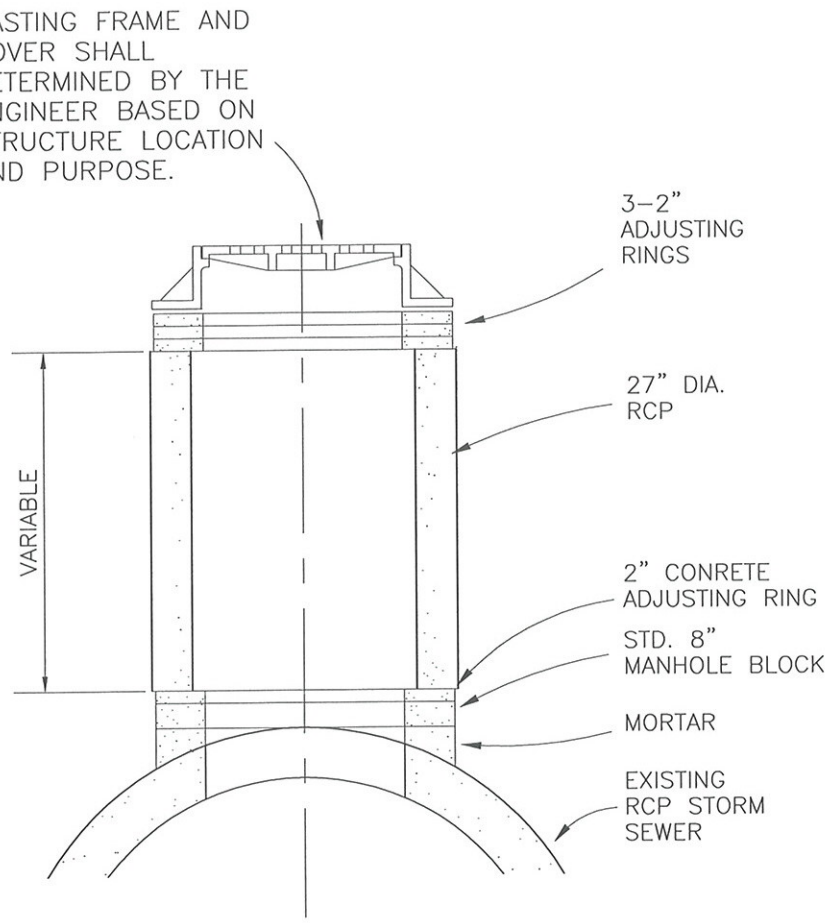
5. ON PROJECTS WITH P.C.C. PAVEMENT ALL INLET RISERS OR BARRELS SHALL BE CONSTRUCTED 4 TO 5 INCHES BELOW FINAL ELEVATION AND ADJUSTED TO FINAL GRADE AFTER THE PAVING. ADJUSTMENT MAY BE DONE WITH ADJUSTMENT RINGS, MASONARY OR CAST-IN-PLACE. ALL COSTS FOR THIS ADJUSTMENT SHALL BE INCLUDED IN THE BID PRICE FOR THE INLET.

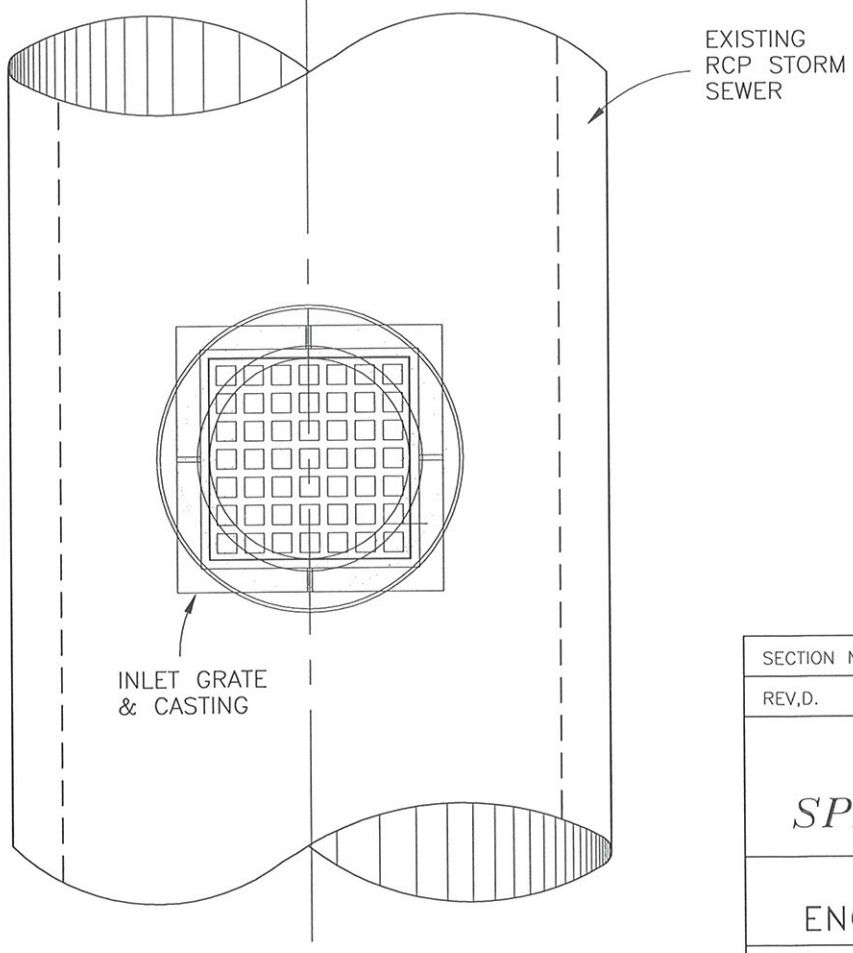
SECTION NO. 1500	DRAWING NO. 5.10
REV,D. 2013	

DOUBLE BOX INLET (DBI) DETAIL

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED CME	DATE 1-2-13





NOTES:

1. BUTYL RUBBER GASKET ON ALL JOINTS (JOINTS TO MEET ASTM 433 REQUIREMENT).

2. TOP OF INLET GRATE TO BE AT GUTTER ELEATION OR 1.5' BELOW NATURAL GROUND IN NEW ADDITIONS.

3. 27" RCP BARREL TO BE A.S.T.M. DESIG. C76.

4. 27" OPENING THRU TOP OF R.C.P. SHALL BE GIVEN A SMOOTH MORTAR FINISH TO PERMIT SAFE ENTRY INTO STORM SEWER.

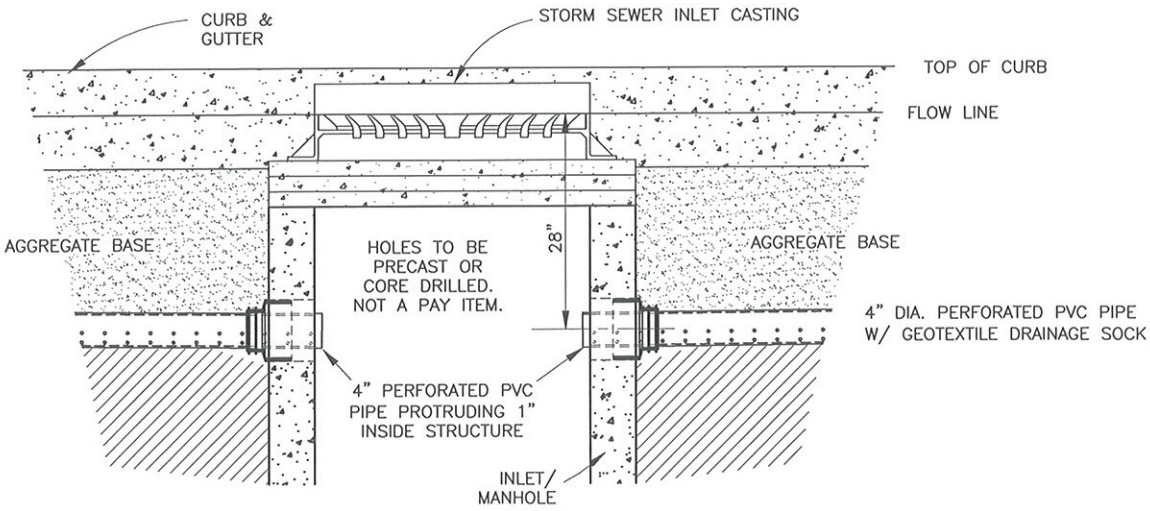
5. SPECIAL INLETS MAY ONLY BE INSTALLED ON 36" DIA. RCP OR LARGER PIPE.

SECTION NO. 1500	DRAWING NO. 5.11
REV,D. 2013	

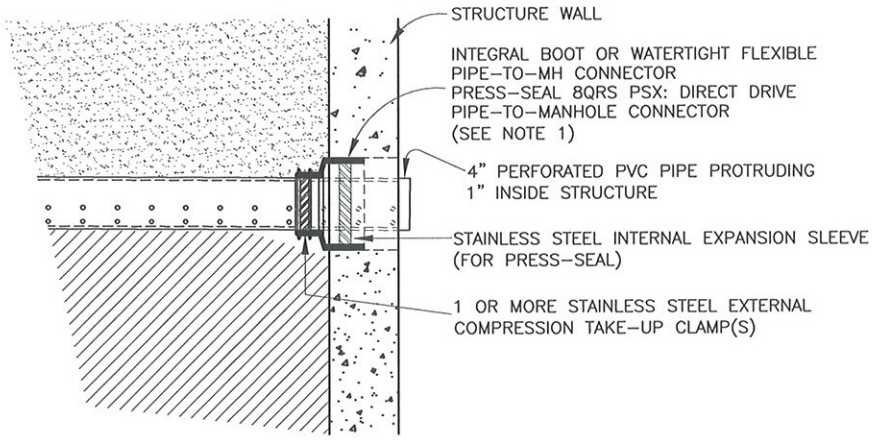
STORM SEWER SPECIAL INLET (SPI)

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED ame	DATE 1-2-13



INLET/MANHOLE CONNECTION



CONNECTION DETAIL

NOTES:
1. INSERTA TEE, LINK–SEAL, OR OTHER APPROVED EQUAL MAY BE UTILIZED WITH ENGINEER APPROVAL.

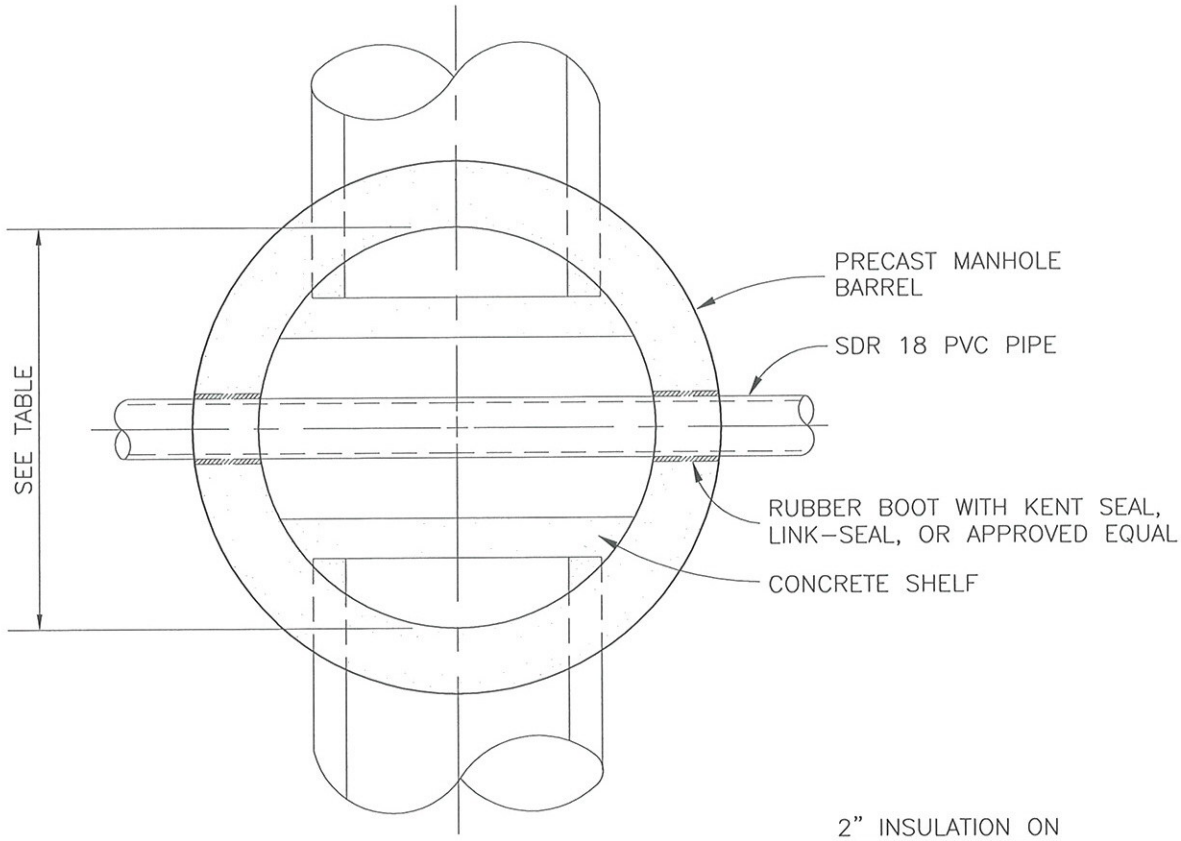
2. SEE 4" PVC EDGE DRAIN DETAIL IN SECTION 2100 FOR ADDITIONAL DETAILS.

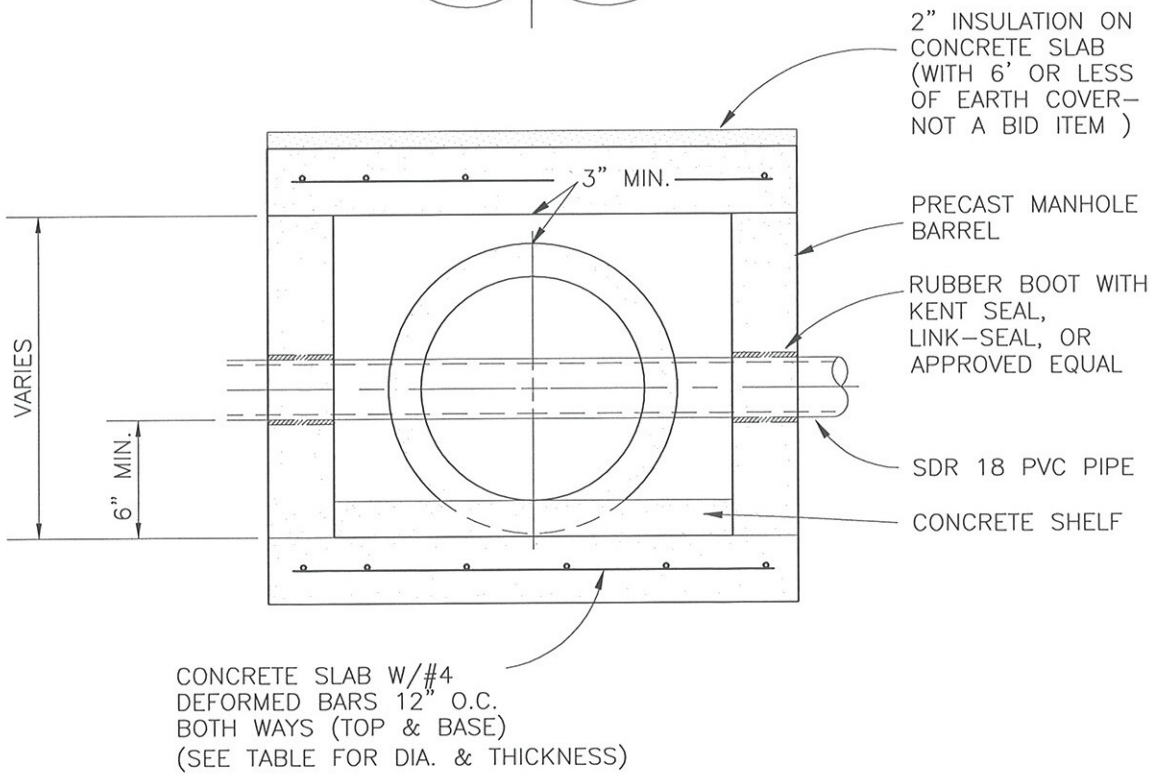
SECTION NO. 1500	DRAWING NO. 5.12
REV,D. 2013	

STORM INLET/PVC DRAIN PIPE DETAIL

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED CME	DATE 1-2-13





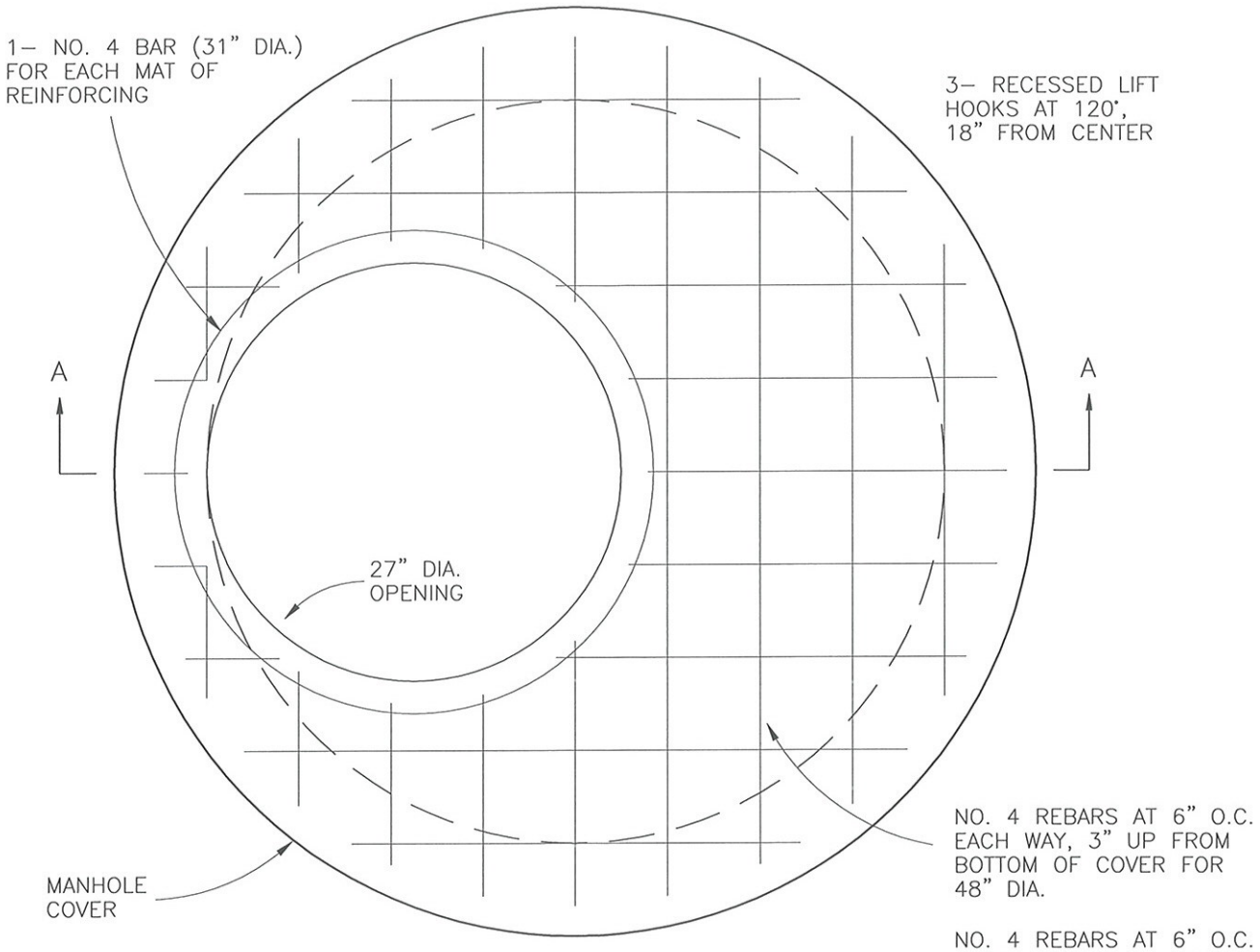
RCP DIAMETER (MAXIMUM)	BASE (INSIDE DIA.)	BASE (THICKNESS)
15"	2'–0"	6"
27"	4'–0"	8"
54"	6'–0"	8"

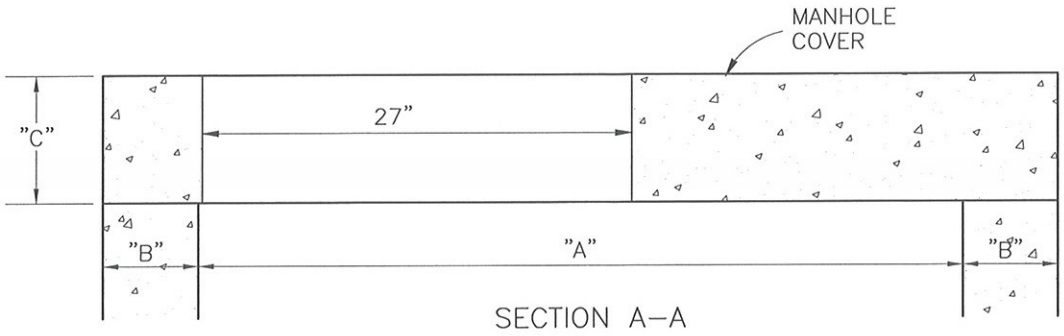
SECTION NO. 1500	DRAWING NO. 5.13
REV,D. 2013	

UTILITY CROSSING CHAMBER

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED CME	DATE 1-2-13





SECTION A–A

DIMENSION TABLE

A	B	C
48"	5"	6"
60"	6"	7"
72"	7"	8"
84"	8"	9"
96"	9"	9"

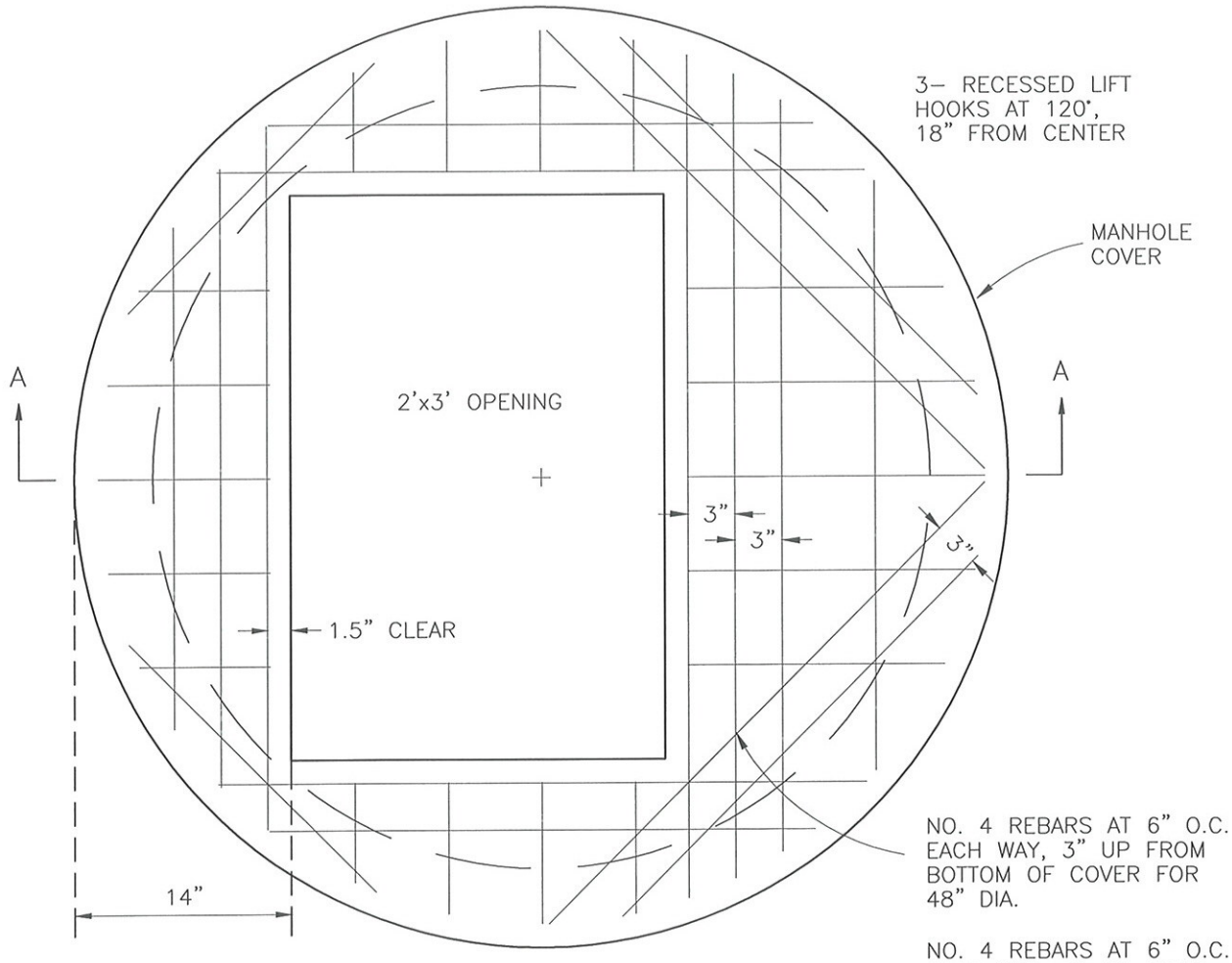
TO BE USED WHEN STRUCTURE IS LOCATED OUTSIDE GUTTER LINE

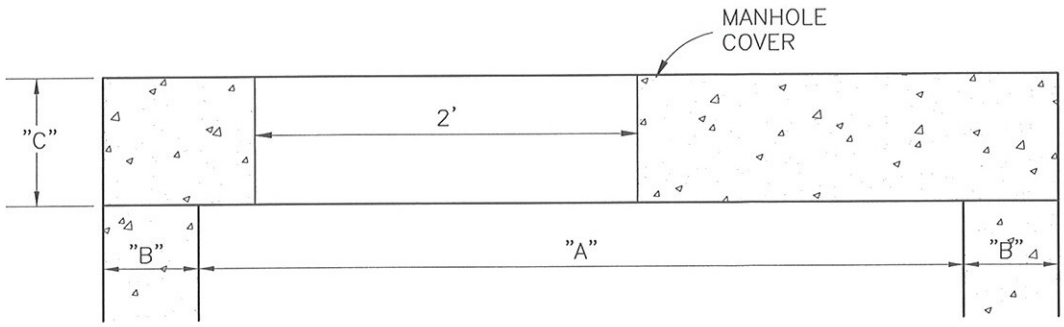
SECTION NO. 1500	DRAWING NO. 5.14
REV,D. January 2013	

MANHOLE COVER DETAIL

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED CME	DATE 1-2-13





SECTION A–A

DIMENSION TABLE

A	B	C
48"	5"	6"
60"	6"	7"
72"	7"	8"
84"	8"	9"
96"	9"	9"

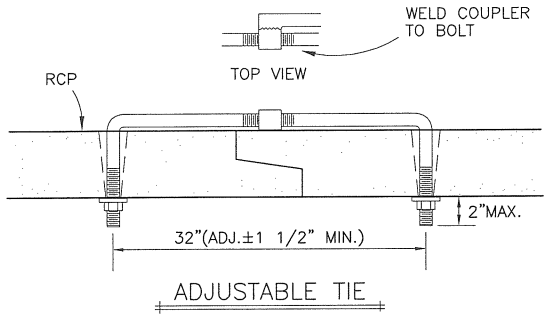
TO BE USED WHEN STRUCTURE IS LOCATED IN GUTTER LINE

SECTION NO. 1500	DRAWING NO. 5.14B
REV,D.	

MANHOLE COVER DETAIL (GUTTER)

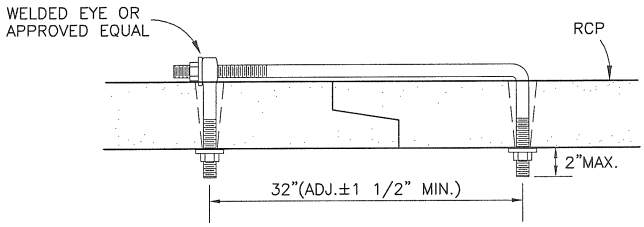
CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED CME	DATE 1-2-13



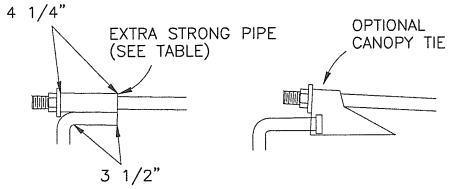
ADJUSTABLE TIE

REQUIRED SIZE OF TIE BOLTS					
PIPE SIZE (INCHES)	THREAD DIA.	PIPE SIZE (INCHES)	THREAD DIA.	PIPE SIZE (INCHES)	THREAD DIA.
12 15 18 21 24 27	5/8" SEE NOTE TWO	30 33 36 42 48 54 60 66	3/4"	72 78 84 90 96 102 108 120 132	1"

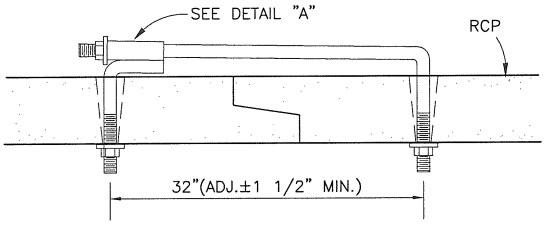


EYE BOLT TIE

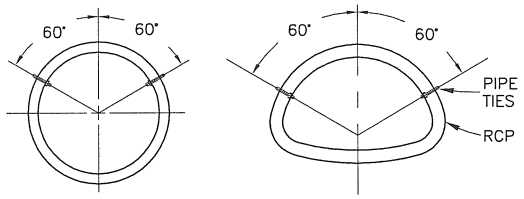
THREAD DIA.	E.S. PIPE DIA
5/8"	3/4"
3/4"	1"
1"	1 1/4"

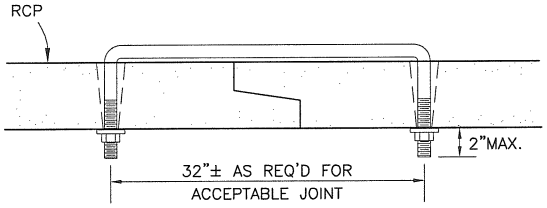


DETAIL "A"

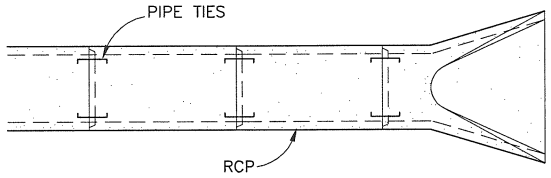


WELDED PIPE TIE





U BOLT TIE



TIE LOCATIONS

NOTES

1. PIPE SIZE LISTED IS INSIDE DIAMETER OF ROUND PIPE OR EQUIVALENT DIAMETER OF PIPE ARCH.
2. NUTS AND WASHERS ARE NOT REQUIRED ON INSIDE OF 21" DIAMETER PIPE OR LESS.
3. TIES TO BE USED ONLY TO HOLD PIPE SECTIONS TOGETHER, NOT FOR PULLING SECTIONS TIGHT.
4. TIE BOLTS SHALL BE PAINTED AFTER FABRICATION WITH ONE COAT OF ZINC CHROMATE IRON OXIDE PAINT. THREADED PORTIION OF RODS DO NOT HAVE TO BE PAINTED.
5. HOLES IN PIPE TO ACCOMMODATE THE TIE BOLTS CAN BE PRECAST OR DRILLED. TAPERED HOLES WILL BE PERMITTED WHEN PRECAST. WHEN EXISTING PIPE ARE EXTENDED OR SALVAGED AND RELAYED, THE CONTRACTOR WILL BE REQUIRED TO DRILL THE NECESSARY HOLES.
6. THE CONTRACTOR HAS THE OPTION OF SELECTING THE TYPE OF TIE BOLT TO BE USED. THE TYPE SELECTED SHALL BE APPPROVED BY THE ENGINEER.
7. THE COST OF PRECASTING OR DRILLING THE REQUIRED HOLES AND FURNISHING AND INSTALLING THE TIE BOLTS SHALL BE INCLUDED IN THE PRICE BID FOR REINFORCED CONCRETE PIPE CULVERTS.
8. TIE BOLTS ARE NOT REQUIRED ON STORM SEWER PIPE UNLESS SPECIFICALLY NOTED IN THE PLANS.
9. TIE BOLTS ARE REQUIRED ON END SECTIONS (4 SECTIONS) FOR ALL R.C.P. CULVERTS. ON CULVERTS WITHOUT FLARED END SECTIONS, THE THREE END SECTIONS OF THE CULVERT SHALL BE TIED TOGETHER IN THE SAME MANNER FOR EACH END.

SECTION NO. 1500	DRAWING NO. 5.15
REV,D. March, 1999	

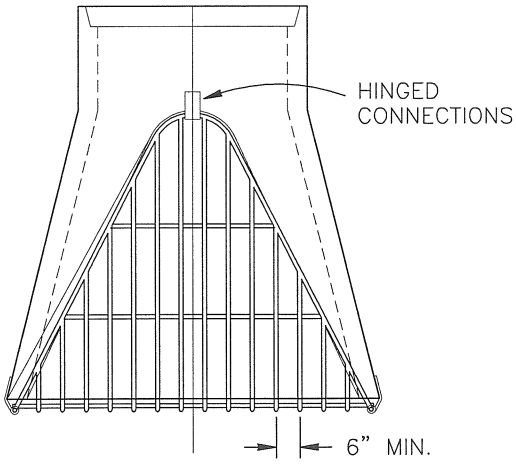
CONCRETE PIPE TIES DETAILS

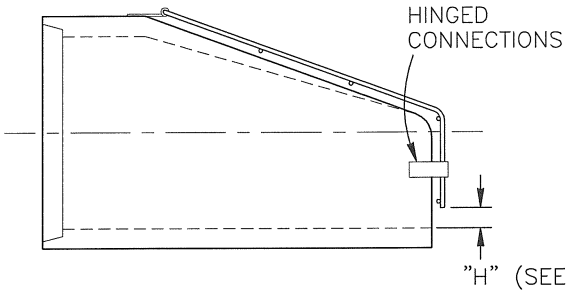
CITY OF FARGO
ENGINEERING DEPARTMENT

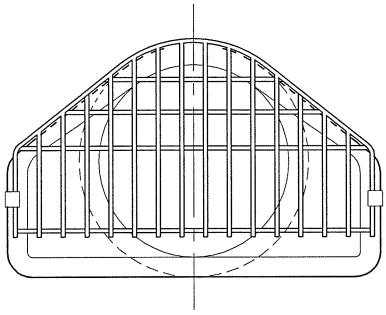
APPROVED BED	DATE 2-21-2012

ALL TRASH GUARDS TO HAVE (1) CROSS BAR 60" DIA. & UP TO HAVE (2) BARS EQUALLY SPACED

HOT DIP GALVANIZED PER MN/DOT 3392 OR ASTM–A153







BAR SIZES									
STANDARD DESIGN					HEAVY DESIGN				
	PIPE SIZE	HOLE DIA. REQ'D	BOLT DIA.	BAR SIZE		PIPE SIZE	HOLE DIA. REQ'D	BOLT DIA.	BAR SIZE
ROUND	12"–24"	3/4"	5/8"	5/8"	ROUND	12"–18"	3/4"	5/8"	3/4"
	27"–48"	7/8"	3/4"	3/4"		21"–42"	7/8"	3/4"	1"
	54"–90"	1 1/8"	1"	1"		48"–90"	1 1/8"	1"	1 1/4"
ARCH	22"–29"	3/4"	5/8"	5/8"	ARCH	22"	3/4"	5/8"	3/4"
	36"–59"	7/8"	3/4"	3/4"		29"–51"	7/8"	3/4"	1"
	65"–88"	1 1/8"	1"	1"		59"–88"	1 1/8"	1"	1 1/4"
BOLT LG. = PIPEWALL THICKNESS + 2 1/2"									

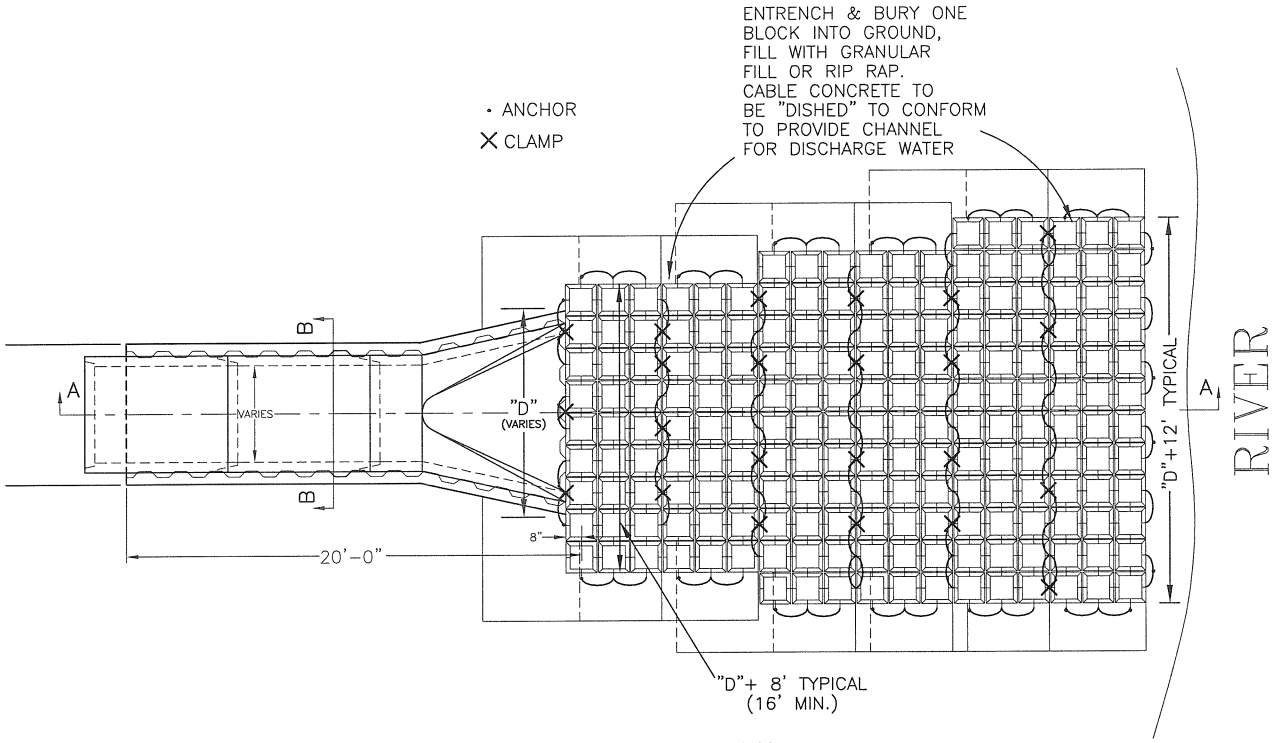
VALUES FOR "H"			
ROUND PIPE		ARCH PIPE	
PIPE SIZE	H	PIPE SIZE	H
12"	2 1/2"	22"–29"	4"
15"	3"	36"–44"	5"
18"–24"	4"	51"–55"	6"
27"–36"	5"	73"–88"	7"
42"–54"	6"		
60"–72"	7"		
78"–90"	8"		

SECTION NO. 1500	DRAWING NO. 5.16
REV,D. March, 1999	

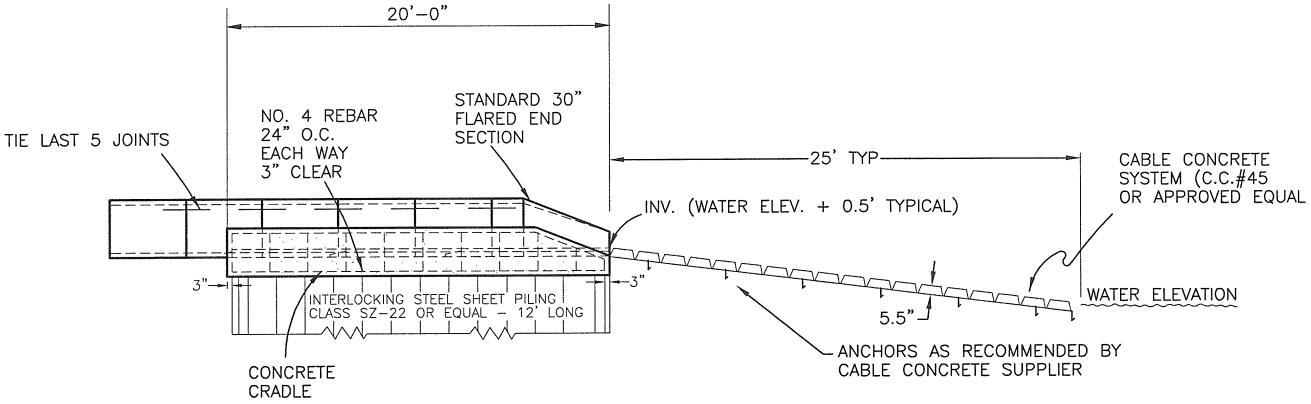
TRASH GUARD FOR FLARED END SECTIONS

CITY OF FARGO
ENGINEERING DEPARTMENT

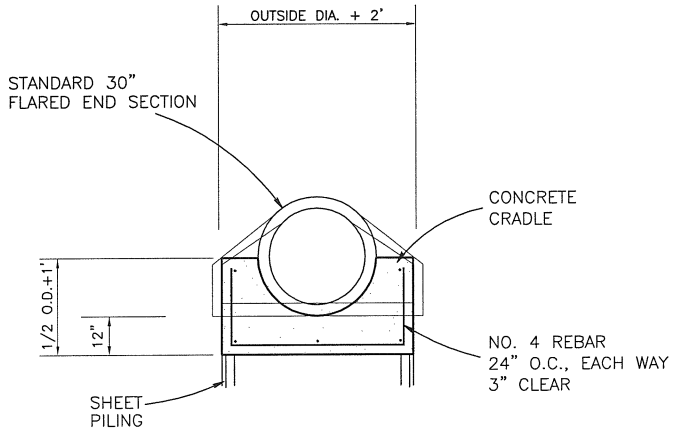
APPROVED BEO	DATE 2-21-2012



OUTFALL DETAIL



SECTION A–A



SECTION B–B

SECTION NO. 1500	DRAWING NO. 5.17
REV,D. MARCH, 2007	

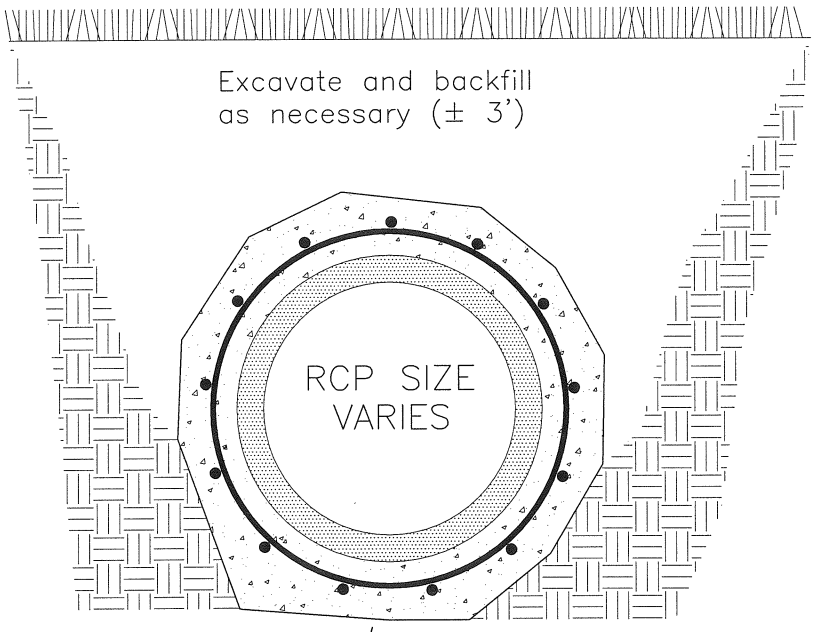
OUTFALL DETAIL

CITY OF FARGO
ENGINEERING DEPARTMENT

APPROVED BED	DATE 2-21-2012

Reinforcing:

5 – No. 4 Deformed Bars (Circumferential)
No. 4 Deformed Bars 12" O.C. (Transverse across joint)



SECTION NO. 1500	DRAWING NO. 5.18
REV,D. 2012	
PIPE JOINT REPAIR BAND DETAIL	
CITY OF FARGO ENGINEERING DEPARTMENT	
APPROVED BED	DATE 2-21-2012