

Transmittal No. 22-03
October 14, 2022

Standard Plates

Distribution: Electronic Distribution Recipients**Subject: Standard Plates 1070, 3014, 3021, 4008, 4009, 4010, 4026**

The following standard plates are updated:

- 1070 – Supplemental Pavement Reinforcement
- 3014 – Reinforced Concrete Pipe Arch
- 3021 – 3 x 3 Precast Concrete Box Culvert
- 4008 – Tee Catch Basin - Sectional Concrete Pipe
- 4009 – Manhole or Catch Basin - Integral Tee Section - Sectional Concrete Pipe
- 4010 – Concrete Adjusting Rings
- 4026 – Concrete-Encased Concrete Adjusting Rings

See attached Summary of Changes for details.

Instructions:

1. Record this transmittal letter number, date and subject on the transmittal record sheet located in the front of the manual. The previous Transmittal Letter was 22-02, dated July 20, 2022.
2. Remove from the manual:
 - Numerical Index of Standard Plates
 - Standard Plate 1070M
 - Standard Plate 3014K
 - Standard Plate 4008E
 - Standard Plate 4009H
 - Standard Plate 4010H
 - Standard Plate 4011E (if printed on back of 4010H)
 - Standard Plate 4026A
3. Insert into the manual:
 - Numerical Index of Standard Plates, Sheets 1-4 of 4 (09-30-2022)
 - Standard Plate 1070N (09-30-2022)
 - Standard Plate 3014L (09-30-2022)

- Standard Plate 3021B (09-30-2022)
- Standard Plate 4008F (09-30-2022)
- Standard Plate 4009I (09-30-2022)
- Standard Plate 4010I (09-30-2022)
- Standard Plate 4011E (10-17-1994) (if removed with 4010H)
- Standard Plate 4026B (09-30-2022)

The Standard Plates Manual and associated Transmittal Letters are available online in PDF format at <https://standardplates.dot.state.mn.us/stdplate.aspx>

4. Direct any technical questions regarding this transmittal to Khamsai Yang, State Design Standards Engineer, at (612) 322-5601, or by email to DesignStandards.DOT@state.mn.us



Khamsai Yang, P.E.

State Design Standards Engineer
Office of Project Management and Technical Support

Summary of Changes

Standard Plate 1070N

Supplemental Pavement Reinforcement

General

1. Plate number incremented from 1070M to 1070N.
2. Notes have been updated and added.
3. Bar reinforcement plan details updated
4. Cross-section of culvert or pipe details updated.
5. Text and labeling revisions for clarity.

Construction Notes

1. Updated the notes to remove “shall be” language. This matches how we changed our Standard Specification language (active voice).
2. Removed the different pipe depth requirements for when to use supplemental steel and clarified the language. Supplemental steel only needs to be used in situations when a culvert or pipe cross the pavement in the transverse direction. The depth of the pipe should not dictate when to use supplemental steel. Supplemental steel use used to help prevent cracking due to settlement. Depending on compaction and materials used, settlement may occur in any situation. This is typically how it is designed and is consistent with the current construction methods.
3. Added that supplemental steel is required in the outside shoulders and is not required in the inside shoulders. This was a question that often comes up during construction and is not clarified in the current plate. Inside shoulders are generally too narrow and, in most situations, it would not be constructable. This is also consistent with the current construction methods.
4. Added sixth paragraph: Place the supplemental steel on chairs at a depth of $t/2 \pm 1"$. This is a requirement for placement of supplemental steel that was not defined on this plate originally and should have been.

Bar Reinforcement Plan

1. Changed requirements for using both No. 4 and 5 bars based on thickness to only requiring No.4 bars. We are designing pavements thinner than in the past and the thicker pavements are rarely used. No. 4 bars are more available.
2. Moved the supplemental steel further away from the dowel bar baskets (18"). Less likely that it will interfere with the dowel bar basket if it moves from the push of the concrete. Have had issues with it pushing against the baskets. Currently at 12" away.

3. Moved the supplemental steel to 12" maximum from the edge of the pavement and the centerline. Currently 6" +/-1". Too close to edge if it moves from the push of the concrete and generally not achievable.
4. Changed the wording of the distance at the end of bar to the edge of the pavement from 3" clear to 3" minimum.
5. Adjust the drawing so the first dowel bar is 12" away from the centerline instead of 6". Too close to edge if it moves from the push of the concrete.
6. Added label for max. 3" overlap of longitudinal bars beyond first and last transverse bars.

Cross-Section

1. Changed the name of the drawing to Cross-Section of Culvert or Utility Pipe to be more general with the language.
2. Renamed the area between the transverse joints to "Place Supplemental Steel in all Panels Containing (L)." Needed to better clarify our intent with this definition.
3. Deleted Hf and Hc dimensions and lines since the depth requirement was removed.
4. Added L = Length of Excavation to better define the intent.
5. Added D = Depth of Excavation since the depth requirement was removed.
6. Change H to D to better define the intent.

Summary of Changes

Standard Plate 3014L (1 of 3), (2 of 3), (3 of 3) Reinforced Concrete Pipe Arch Reinforcement

General

1. Plate number was incremented from 3014K to 3014L.
2. Updated laying length notes to match the requirements for round pipe.
3. Updated the amount of circumferential and shear reinforcement required for pipes fabricated with 6,000 psi concrete. Previous editions of this standard used only 4,000 and 5,000 psi strength concrete.

Sheet 1 of 3

At General Notes

1. Removed the first general note: *“Laying lengths: 22” to 122” nominal span (6’ & 8’), 138” nominal span (4’ & 6’), 154” & 169” nominal span (4’ & 5’).”* and changed to *“Laying length is defined as the total pipe section length minus the tongue length J. The minimum laying length is 6’ for spans of 122” or less, except that two 4’ lengths are permitted in a line of pipe to make a required length. The minimum laying length is 4’ for spans greater than 122”. For all spans of pipe, one section of any odd length greater than 4 feet is permitted in each line or reach of pipe to make the required length. Place pipe sections shorter than the nominal length near the middle of the line or as required by the engineer.”*

Sheet 2 of 3

Table of Reinforcement Requirements

1. Changed circled note ④ to ⑤ at the top of the table.
2. Added “Concrete 6000 PSI” row to the table for pipe sizes greater than 115” nominal span.
3. Modified the reinforcement requirements for the inner and outer cages for both the continuous basic reinforcement and the additional reinforcement for all pipe with a nominal span of 115” or greater.
4. Added circled note ④ to the table for arch pipes with a nominal span of 138” or greater.

At Notes

1. Changed circled note ④ to ⑤.
2. Added circled note ④ *“Class IIA pipe 138 inches or more in diameter are special designs in accordance with 3236 and require notification prior to start of production.”*

At Shear Reinforcement Requirements table

1. Removed the column for shear reinforcement requirements for class IIA pipe from the table.
2. Eliminated the shear reinforcement requirements for the top section of all class IIIA pipe.
3. Modified the "X" dimension as follows: for 115" pipe changed from 47" to 48", for 138" pipe changed from 59" to 60", for 154" changed from 65" to 66".
4. Modified the "Z" dimension for 154" pipe from 69" to 70".
5. Modified the amounts of the top and bottom shear reinforcement (A_r) for arch pipes with a nominal span of 155" or larger, based on the use of 6,000 psi concrete.

Summary of Changes

Standard Plate 3021B

3 x 3 Precast Concrete Box Culvert

General

1. Plate number was incremented from 3021A to 3021B
2. This plate was previously titled "*Precast Concrete Cattle Pass (60'') with Steel Fabric Reinforcement*" but was removed from the Standard Plates Manual on 01/01/1967 and was replaced with plate 3020B.
3. Added new title "*3 x 3 Precast Concrete Box Culvert.*" This is a new 2-page standard plate for box culverts for small species crossings and other hydraulic purposes.

Summary of Changes

Standard Plate 4008F

Tee Catch Basin (Sectional Concrete Pipe)

General

1. Plate number incremented from 4008E to 4008F.
2. Changed the title of the plate from “*Catch Basin*” to “*Tee Catch Basin*.”

Sectional View

1. Updated the reinforcement requirements for the mainline pipe tee section and the riser pipe.
2. Flipped the tongue and groove ends of the riser pipe and made allowance for optional bell joints.
3. Allow the top of the riser pipe to be flat at fabricators option.
4. Now limit total height of the riser to 8 feet.

Notes

1. Eliminated the existing notes.
2. Added new circled note ① “*When fabricated as a single unit, place 4 equally spaced no. 3 x 24" bars or welded wire reinforcement (WWR) of equivalent area in the location shown. When not fabricated as a single unit, cut, bend, overlap and fasten the existing WWR in the trunk line pipe to the WWR of the branch connection prior to mortaring the pieces together.*”
3. Added new circled note ② “*Replace cut circumferential reinforcement in mainline pipe, half each side of opening.*”
4. Added new circled note ③ “*Optional bell and gasket joint in accordance with standard plate 3006.*”

Summary of Changes

Standard Plate 4009I

Manhole or Catch Basin – Integral Tee Section (Sectional Concrete Pipe)

General

1. Plate number incremented from 4009H to 4009I.
2. Changed the title from “Manhole or Catch Basin” to “Manhole or Catch Basin – Integral Tee Section.”
3. Updated the reinforcement requirements for the mainline pipe tee section and the riser pipe.
4. Added circled notes ⑥ and ⑦.
5. Limited the size of holes in the cone to 7" or less.
6. Allow the top of the riser pipe to be flat at fabricators option.
7. Restricted the burial depth to the same limitations as the mainline pipe.

Summary of Changes

Standard Plate 4010I

Concrete Adjusting Rings

General

1. Plate number incremented from 4010H to 4010I.
2. Changed the title from "Concrete Short Cone and Adjusting Ring" to "Concrete Adjusting Rings".
3. Eliminated the "Short Cones" on the top portion of the plate.
4. Added a new Section B-B for 30" inside diameter ring.

At Notes

1. Changed the maximum height of rings on new construction from 6" maximum to now allow a total thickness of 9" including mortar, using no more than 2 rings.
2. Added a new note for reconstructing in place structures to allow a maximum thickness of rings of 12" including mortar, using no more than 3 rings.
3. Added new note *"Concrete Adjusting rings are recommended but not required on all structures."*
4. Added new note *"Min. specified conc. strength = 5000 psi at time of shipment."*
5. Changed circled note ① from *"A single hoop of 8 gage steel wire."* to *"A single hoop of minimum diameter 0.192" deformed wire meeting the requirements of ASTM A1064. Place wire within the middle 1/3 of the ring (horizontally and vertically) with a 1/8" tolerance, except provide minimum clear cover of 7/8" vertically for 2" thick rings."*
6. Added new circled note ③.

Summary of Changes

Standard Plate 4026B

Concrete Encased Concrete Adjusting Rings

General

1. Plate number incremented from 4026A to 4026B.
2. Added a note requiring spec. 3107 masonry mortar.
3. Changed the mortar mix for the collar from spec. 2506.2 to spec. 3107.
4. Added a note stating that the maximum height of adjustment includes the adjusting rings and the mortar.

Added Notes

1. Added note "See plate 4010 for maximum number and height of adjusting rings."
2. Added note "Use adjusting rings for vertical adjustments only."

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STANDARD PLATES

BLANK.....	0000 SERIES
PAVEMENT	1000 SERIES
BLANK.....	2000 SERIES
CULVERTS AND APPURTENANCES	3000 SERIES
SEWER APPURTENANCES.....	4000 SERIES
EROSION CONTROL STRUCTURES	5000 SERIES
BLANK.....	6000 SERIES
CURB, CURB AND GUTTER, SIDEWALK	7000 SERIES
BARRICADES, SIGNALS, MARKERS, ETC.....	8000 SERIES
MISCELLANEOUS	9000 SERIES

PLATE NO.

0000 SERIES—BLANK

1000 SERIES—PAVEMENT

- 1070N Supplemental Pavement Reinforcement
- 1103L Typical Dowel Bar Assembly (2 Sheets)
- 1210G Concrete Pavement Adjacent to Railway Crossing

2000 SERIES—BLANK

3000 SERIES—CULVERTS AND APPURTENANCES

- 3000M Reinforced Concrete Pipe (6 Sheets)
- 3001B Reinforced Concrete Reducer Pipe
- 3002B Reinforced Concrete Increaser Pipe
- 3006H Gasket Joint for R.C. Pipe (2 Sheets)
- 3007F Shear Reinforcement for Precast Drainage Structures
- 3014L Reinforced Concrete Pipe Arch (3 Sheets)
- 3020H Reinforced Precast Concrete Cattle Pass (60" & 72")
- 3021B 3 x 3 Precast Concrete Box Culvert (2 Sheets)
- 3022C Precast Concrete Safety Apron (3 Sheets)
- 3040F Corrugated Metal Pipe Culvert (Standard 2-2/3" x 1/2" Corrugation)
- 3041E Corrugated Metal Pipe (3" x 1" Corrugation)
- 3050B Design Data Structural Plate Structures (18" Corner Radius)
- 3051B Design Data Structural Plate Structures (31" Corner Radius)
- 3065C Connection between Existing Culv. & New "C" Culv. Barrel (2 Sheets)
- 3066A C.M. Extension for Box Culvert
- 3100G Concrete Apron for Reinforced Concrete Pipe
- 3110G Concrete Apron for Reinforced Concrete Pipe-Arch
- 3114H Sectional Concrete Apron for Reinforced Concrete Pipe-Arch
- 3122K Metal Apron for C.M. Pipe-Arch Culvert
- 3123J Metal Apron for C.S. Pipe
- 3124B Metal Apron Connection
- 3125A Inlet Protection for Metal Culverts (90" dia. to 96" dia.)
- 3126B Inlet Protection for Structural Plate Pipe (60" thru 96" dia. or span)
- 3127A Inlet Protection for Structural Plate Pipe (102" thru 180" dia. or span)
- 3128H Metal Safety Apron & Grate (2 Sheets)
- 3129A Metal Apron for Corrugated Polyethylene Pipe (Use at Entrances and Driveways)
- 3131C Precast Concrete Headwall for Subsurface Drains
- 3132A Grate for 1:4 Precast Concrete Aprons

PLATE NO.

3133D	Riprap at RCP Outlets
3134D	Riprap at CSP Outlets
3135A	Hand-Placed Riprap at Precast Concrete Cattle Pass
3136B	Slotted Vane Drain for P.V.C. Pipe
3137B	Slotted Drain for 12" thru 30" Dia. C.M. Pipe (Stackable)
3138B	Slotted Drain for 12" thru 30" Dia. C.M. Pipe (Not Stackable)
3139B	Riprap at Precast Concrete End Sections
3142A	Outlet Screen for C.M. & S.C. Pipes
3143C	Inspection Tees
3145G	Concrete Pipe or Precast Culvert Ties
3146C	Anti-Seepage Diaphragm (For CMP and CMP-A)
3148A	Safety Slope Metal End Section for Circular & Arched Pipes (2 Sheets)
3221D	Corrugated Steel Pipe Coupling Band (3 Sheets)

4000 SERIES—SEWER APPURTENANCES

Drainage Structure and Castings (4 Sheets)

- Structure and Casting Combinations
- Standard Casting Assemblies
- List of Castings
- List of Drainage Structures

4000J	Manhole or Catch Basin (Masonry, Field Constructed) - Design A
4002F	Manhole or Catch Basin (Masonry, Field Construction) - Design C
4003B	30" Precast Catch Basin – Design N
4005M	Manhole or Catch Basin Type A & B Cone Sections Precast - Design F
4006L	Manhole or Catch Basin Precast - Designs G and H
4007C	Precast Mechanical Joint Sewer Manhole
4008F	Catch Basin (Sectional Concrete Pipe) - Design I
4009I	Manhole or Catch Basin (Sectional Concrete Pipe) - Design J
4010I	Concrete Adjusting Rings
4011E	Precast Concrete Base
4017C	Catch Basin (Concrete Pipe and Metal Pipe) - Designs PC and PM
4018B	Manhole or Catch Basin (Reducer Cone Section Precast) Design D
4020J	Manhole or Catch Basin (For Use With or Without Traffic Loads) (2 sheets)
4021F	Precast Curb Opening Catch Basin
4022A	Manhole or Catch Basin Cover (3 ft. X 2 ft. Opening)
4024A	48" Dia. Precast Shallow Depth Catch Basin - Design SD
4025B	Drop Inlets or Catch Basins - Design DI (Concrete & Metal)
4026B	Concrete Encased Concrete Adjusting Rings
4101D	Ring Casting For Manhole or Catch Basin
4108F	Adjusting Rings for Catch Basins and Manholes
4110F	Cover Casting for Manhole (For Use in all Traffic Areas) – Casting No. 715 and 716
4125D	Catch Basin Frame Casting (For Square Grate) – Casting No. 806
4126F	Catch Basin Frame Casting – Casting No. 801
4129G	Catch Basin Frame Casting (For Square Grate) - Casting No. 802A
4132G	Catch Basin Frame Casting (For Square Grate) – Casting No. 805
4133A	Curb Box Casting for Catch Basin - Casting No. 824
4134A	Curb Box Casting for Catch Basin (For Design B Curbs) - Casting No. 825
4140D	Special Grate Castings for Catch Basin (Convex and Concave) - Casting No. 720 and 721
4143E	Stool Grate & Concrete Frame (Median Drains) - Casting No. 731
4149C	Grate Casting for Catch Basin - Casting No. 810
4150C	Grate Casting for All Pipe Drainage Structures
4151B	Grate Casting for Catch Basin (Square Type) - Casting No. 811
4152C	Catch Basin Grate Casting - Casting No. 814A

PLATE NO.

- 4153A Catch Basin Grate Casting - Casting No. 815
- 4154B Catch Basin Grate Casting - Casting No. 816
- 4155A ADA Grate Inlet Casting – Casting No. 817
- 4160D Curb Box Casting for Catch Basin - Casting No. 823A and 833A
- 4161F Curb Box Casting for Catch Basin - Casting No. 821B, 822 and 831A
- 4180J Manhole or Catch Basin Step

5000 SERIES—EROSION CONTROL STRUCTURES

- 5010A Reinforced Concrete Pipe Energy Dissipator

6000 SERIES—BLANK

7000 SERIES—CURB, CURB AND GUTTER, SIDEWALK

- 7000E Integrant Curbs (Design B, Design V and Design D)
- 7020K Concrete Curb (Design B, Design V, Design S, Design DR and Design BR) (2 Sheets)
- 7038A Detectable Warning Surface Truncated Domes
- 7065C Bituminous Curb
- 7100H Concrete Curb and Gutter (Design B and Design V)
- 7102K Concrete Curb and Gutter (Design D, Design S, and Design R)
- 7105C Concrete Median (Mountable Type)
- 7107I Entrance Nose (Urban Design)
- 7108G Exit Nose (Urban Design)
- 7109C Median Nose and Island (Undivided to Divided Roadway)
- 7111J Installation of Catch Basin Castings (Concrete Curb and Gutter)
- 7112C Installation & Reinforcement of Catch Basin & Manhole Castings (Concrete Integrant Curbs)
- 7113A Concrete Approach Nose Detail

8000 SERIES—BARRICADES, SIGNALS, MARKERS, ETC.

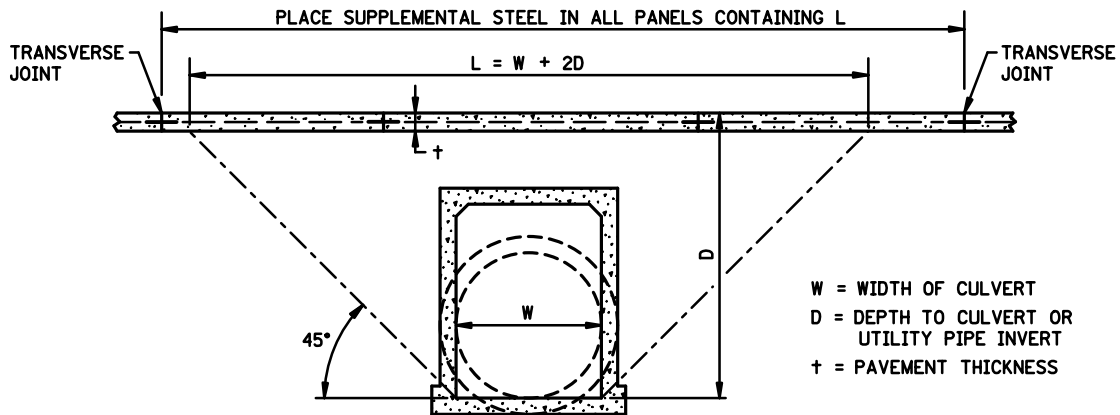
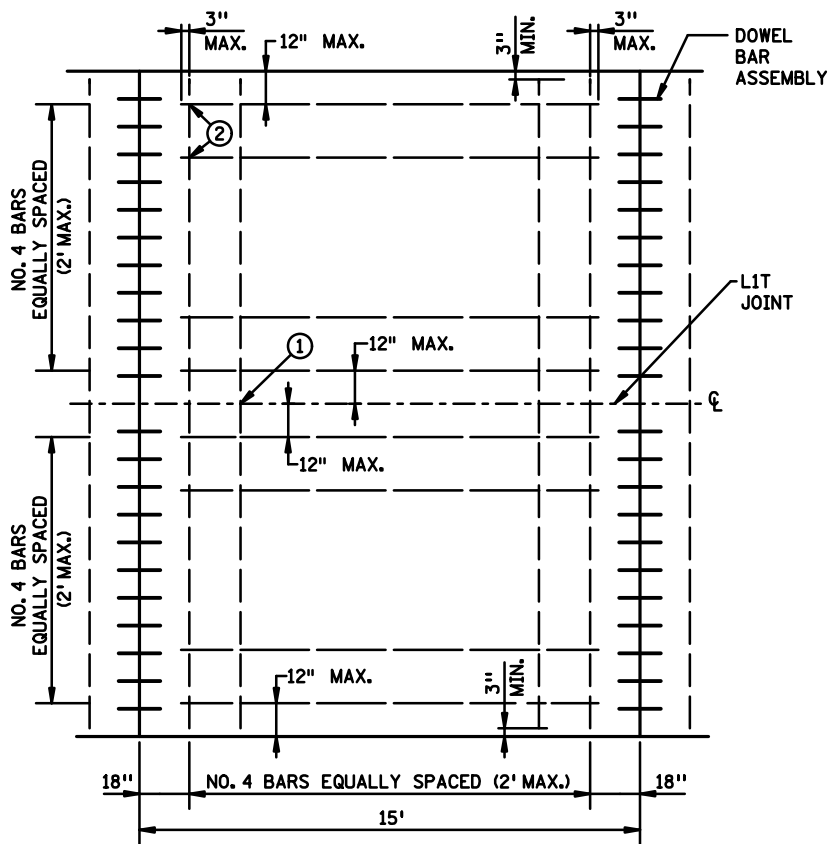
- 8000K Temporary Channelizers (3 Sheets)
- 8106D Equipment Pad B
- 8107A RLF Equipment Pad Foundation Layout
- 8110E Traffic Signal Bracketing (Pole Mounted)
- 8111E Traffic Signal Bracketing (Pedestal Mounted) (3 Sheets)
- 8112I Pedestal Foundation (Traffic Control Signals)
- 8117G Precast Concrete Handhole With Vehicle Load
- 8118D Service Equipment & Pole Traffic Control Signals
- 8119C Ground Mounted Cabinet Foundation
- 8120Q Pole Foundation (PA85)
- 8121H Transformer Base and Pole Base Plate (PA85, PA90 and PA100) (2 Sheets)
- 8122F Pedestal and Pedestal Base (For Traffic Control Signals Support) (2 Sheets)
- 8123G Pole and Mast Arm Luminaires and Traffic Lights Assembly (For All Pole Types) (2 Sheets)
- 8126L Pole Foundation (PA90 and PA100)
- 8127E Light Foundation - Design E, Precast/Cast-In-Place, 40 ft. Pole or Less (2 Sheets)
- 8128E Light Foundation - Design H, Precast/Cast-In-Place, 49 ft. Pole (2 Sheets)
- 8129A Shim and Washer (Traffic Control Signals and Roadway Lighting)
- 8130E Saw Cut Loop Detectors (3 Sheets)
- 8132B Preformed Rigid PVC Conduit Loop Detector (3 Sheets)
- 8133A Pole and Mast Arm - Type BA (9 Sheets)
- 8134C Pole Foundation - Type BA (4 Sheets)
- 8135A Anchor Rod Assembly for Light Tower Foundation

PLATE NO.

8150C	Installation of Culvert Markers
8307S	W-Beam Guardrail & End Anchorages (Installation with Wood Posts) (4 Sheets)
8308C	Reinforced Concrete Median Barrier Type F (Non-Glare Screen Type) (4 Sheets)
8309C	Reinforced Concrete Median Barrier Type F & Glare Screen (4 Sheets)
8316C	Post Seat for Anchorage on Footing or Box Culverts
8318C	Guardrail Anchorage Plate for Bridges and BCT'S
8326D	Flexible Plastic Glare Screen
8330G	3-Cable Guardrail (With Wood Posts) (Assembly Details) (2 Sheets)
8331B	3-Cable Guardrail (With Steel Posts) (3 Sheets)
8332E	Anchor Rod Assembly for Light Foundation - Barrier
8333B	3-Cable Guardrail Anchor (Anchor Details) (4 Sheets)
8337D	Temporary Portable Precast Concrete Barrier - Type F (3 Sheets)
8338D	W-Beam Guardrail & End Anchorages (Installation with Steel Posts) (4 Sheets)
8339A	3-Cable (Steel Posts) to W Beam (Wood Posts) Guardrail Transition
8340A	3-Cable (Steel Posts) to W Beam (Steel Posts) Guardrail Transition
8342B	High-Tension Cable Barrier Line Post Foundation (Concrete Design)
8343A	High-Tension Cable Barrier Line Post Foundation (Steel Design)
8347B	Portable Precast Concrete Barrier Anchors
8350A	Thrie Beam Anchorage Plate
8352C	Thrie Beam Wedge Plate for F-Shape and J-Shape Barrier (2 Sheets)
8355A	W-Beam Guardrail
8356A	W-Beam to Thrie-Beam Transition Guardrail
8357A	Thrie Beam Guardrail
8358A	Thrie-Beam Slotted Rail for Bullnose (2 Sheets)
8360B	Guardrail Post Length Marking
8361B	Guardrail Steel Post (3 Sheets)
8362A	Universal Breakaway Steel Post (UBSP) (2 Sheets)
8365A	BCT Timber Post
8366A	BCT Foundation Tube
8368A	CRT Wood Post
8369A	Guardrail Blockout (2 Sheets)
8370A	BCT Cable and Components (2 Sheets)
8371A	Nose Cable – Bullnose Guardrail
8400F	Pipe Railing

9000 SERIES—MISCELLANEOUS

9000E	Approaches and Entrances - Recommended Standards
9101B	Shaping and Sodding of Slopes at Box Culvert Ends
9303B	Geodetic Survey Disks (Aluminum) (2 Sheets)
9304A	Geodetic Survey Disks (Removable Type Disk)
9308A	Survey Monument Cap (2 Sheets)
9309G	PLS (Public Land Survey) Monument (2 Sheets)
9320G	Woven Wire Fence (Wood Post)
9321F	Woven Wire Fence (Steel Post) (2 Sheets)
9322K	Chain Link Fence (2 Sheets)
9323D	Barbed Wire Fence (Wood Post)
9324C	Barbed Wire Fence (Steel Post)
9350B	Mailbox Support - Swing-Away Type



NOTE: SEE PLANS FOR LOCATIONS WHERE REINFORCEMENT OR EXTRA REINFORCEMENT IS REQUIRED.

NOTES:

CONCRETE PANELS DO NOT NEED SUPPLEMENTAL REINFORCEMENT OVER EXISTING (UNDISTURBED) CULVERTS OR UTILITY PIPES. THIS INCLUDES CONCRETE OVERLAYS UNLESS THE INPLACE PAVEMENT EXHIBITS DIFFERENTIAL SETTLEMENT ISSUES, THEN REINFORCE THE NEW CONCRETE PAVEMENT.

DURING CONSTRUCTION, IF THE ENGINEER DETERMINES AN INCREASED POTENTIAL FOR DIFFERENTIAL SETTLEMENT, THEN REINFORCE THE NEW CONCRETE PAVEMENT.

SUPPLEMENTAL REINFORCEMENT IS REQUIRED IN THE MAINLINE AND OUTSIDE SHOULDER PANELS OVER NEW CULVERTS OR UTILITY PIPES CROSSING THE PAVEMENT IN THE TRANSVERSE DIRECTION AS SHOWN IN THE CROSS SECTION ABOVE. SUPPLEMENTAL REINFORCEMENT IS NOT REQUIRED IN THE INSIDE SHOULDER PANELS.

CONTACT THE MnDOT CONCRETE ENGINEERING UNIT FOR USE IN ANY OTHER SITUATIONS.

PROVIDE EPOXY-COATED REINFORCEMENT BARS COMPLYING WITH SPEC. 3301.

PLACE THE SUPPLEMENTAL STEEL ON CHAIRS AT A DEPTH OF $+/2 \pm 1"$.

- ① TIE BARS (FOR LIT JOINT) NOT REQUIRED IF TRANSVERSE BARS ARE CONTINUOUS THROUGH LONGITUDINAL JOINT.
- ② TIE ALL PERIPHERAL INTERSECTIONS AND A SUFFICIENT NUMBER OF INTERMEDIATE INTERSECTIONS TO PREVENT SHIFTING.

APPROVED 09-30-2022

 STATE DESIGN ENGINEER

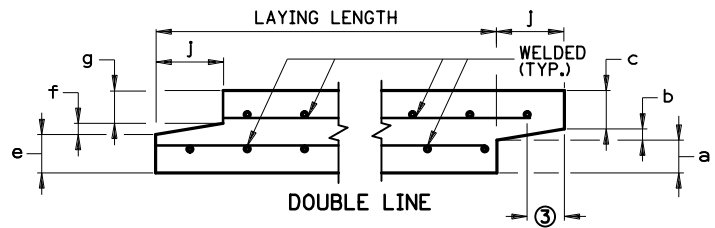
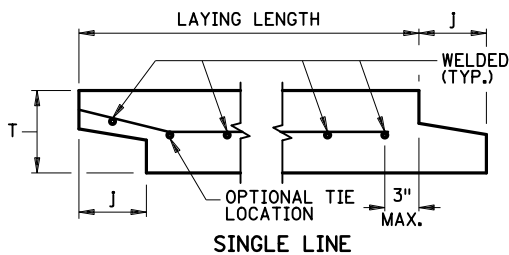
STATE OF MINNESOTA
 DEPARTMENT OF TRANSPORTATION
**SUPPLEMENTAL PAVEMENT
 REINFORCEMENT**

SPECIFICATION
 REFERENCE
 2301

STANDARD
 PLATE
 NO.
1070N

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TABLE OF DIMENSIONS															
NOMINAL SPAN	EQUIVALENT DIAMETER ①	WATER AREA	RISE	SPAN	MIN. WALL THICKNESS (T)	DIMENSION REQUIREMENTS IN INCHES									APPROX. WT./FT.
						a	b	c	j	e	f	g	E ②	LB.	
22	18	1.7	13½	22	2½	1⅜	⅜	¾	2	1⅛	⅜	1	6	170	
28	24	2.8	18	28½	3½	1⅝	½	1⅜	3	1⅜	½	1⅝	5⅝	315	
36	30	4.4	22½	36¼	4	1⅝	⅝	1⅞	3½	1⅞	⅝	1⅝	7⅞	445	
44	36	6.4	26⅝	43¾	4½	2	¾	1¾	4	1¾	¾	2	8⅞	595	
51	42	8.8	31⅝	51⅞	4½	2	¾	1¾	4	1¾	¾	2	10⅞	685	
58	48	11.4	36	58½	5	2¼	¾	2	5	2	¾	2¼	11⅝	875	
65	54	14.0	40	65	5½	2½	¾	2¼	5	2¼	¾	2½	13	1065	
73	60	17.7	45	73	6	3⅝	¾	1⅝	5	2¾	¾	2½	14⅞	1305	
88	72	25.6	54	88	7	3⅝	1	2⅝	6	3¼	1	2¾	17	1820	
102	84	34.6	62	102	8	4⅞	1	2⅞	6	3½	1	3½	18⅞	2410	
115	90	44.5	72	115½	8½	4¼	1	3¼	7	3¾	1	3¾	22⅞	2915	
122	96	51.7	77½	122⅝	9	4½	1	3½	7	4	1	4	23⅞	3290	
138	108	66.0	87⅞	138½	10	5	1	4	7	4½	1	4½	25⅞	4125	
154	120	81.8	96⅞	154	11	5½	1	4½	7	5	1	5	29¼	5055	
169	132	99.1	106½	168¾	10	5	1	4	7	4½	1	4½	32⅝	4975	



LONGITUDINAL SECTION

NOTES:

- ① EQUIVALENT DIAMETER EQUALS DIAMETER OF CIRCULAR PIPE WITH APPROXIMATELY EQUIVALENT CROSS-SECTION AREA.
- ② SPRINGLINE DIMENSION, SEE SHEET 2 OF 3.
- ③ MAXIMUM END COVER ON LAST CIRCUMFERENTIAL REINFORCEMENT WIRE IS LESSER OF HALF THE LENGTH OF THE JOINT OR 3". MINIMUM END COVER TO THE LAST CIRCUMFERENTIAL REINFORCEMENT WIRE IS ½" IN THE GROOVE END AND ¼" IN THE TONGUE END.

LAYING LENGTH IS DEFINED AS THE TOTAL PIPE SECTION LENGTH MINUS THE TONGUE LENGTH J. THE MINIMUM LAYING LENGTH IS 6' FOR SPANS OF 122" OR LESS, EXCEPT THAT TWO 4' LENGTHS ARE PERMITTED IN A LINE OF PIPE TO MAKE A REQUIRED LENGTH. THE MINIMUM LAYING LENGTH IS 4' FOR SPANS GREATER THAN 122". FOR ALL SPANS OF PIPE, ONE SECTION OF ANY ODD LENGTH GREATER THAN 4' IS PERMITTED IN EACH LINE OR REACH OF PIPE TO MAKE THE REQUIRED LENGTH. PLACE PIPE SECTIONS SHORTER THAN THE NOMINAL LENGTH NEAR THE MIDDLE OF THE LINE OR AS REQUIRED BY THE ENGINEER.

SEE MnDOT DRAINAGE MANUAL FOR ALLOWABLE FILL HEIGHTS.
 SEE STANDARD PLATE 3014 SHEET 2 OF 3 FOR CROSS SECTION SKETCH.
 SEE STANDARD PLATE 3007 FOR ADDITIONAL DETAILS.

BASIS OF DESIGN:

CONCRETE STRENGTHS AND REINFORCEMENT REQUIREMENTS ARE IN ACCORDANCE WITH AASHTO M 206. FOR PIPE SIZES AND CLASSES THAT ARE NOT INCLUDED IN M 206, A CUSTOM DESIGN WAS PERFORMED IN ACCORDANCE WITH THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 8TH EDITION, SECTION 12.10.4.2, WITH HL-93 LIVE LOAD EXCLUDING LANE LOAD. ASSUMED SOIL UNIT WEIGHT OF 120 PCF.

APPROVED 09-30-2022

 STATE DESIGN ENGINEER

STATE OF MINNESOTA
 DEPARTMENT OF TRANSPORTATION
REINFORCED CONCRETE PIPE ARCH
 GENERAL NOTES AND DIMENSIONS

SPECIFICATION REFERENCE
 2501, 2503

STANDARD PLATE NO.
3014L
 1 OF 3

TABLE OF REINFORCEMENT REQUIREMENTS																				
NOMINAL SPAN	EQUIVALENT DIAMETER ①	CONCRETE 4000 PSI ⑤																		
		As, CONTINUOUS BASIC REINFORCEMENT						As, ADDITIONAL REINFORCEMENT									SINGLE LINE REINFORCEMENT			
		INNER CAGE			OUTER CAGE			U - INNER CAGE			V - OUTER CAGE						IIA	IIIA	IVA	
		IIA	IIIA	IVA	IIA	IIIA	IVA	DIMENSION	IIA	IIIA	IVA	DIMENSION	IIA	IIIA	IVA					
IN.	IN.																			
22	18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.11	0.14	0.26
28	24	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.16	0.21	0.32
36	30	0.09	0.12	0.18	0.07	0.09	0.14	13"	0.09	0.12	0.18	29"	0.07	0.09	0.13	0.18	0.24	0.36		
44	36	0.11	0.15	0.22	0.09	0.12	0.17	15"	0.11	0.15	0.22	34"	0.09	0.12	0.16	0.21	0.30	0.44		
51	42	0.13	0.18	0.27	0.10	0.14	0.21	17"	0.13	0.18	0.27	39"	0.10	0.14	0.22	0.26	0.36	0.54		
58	48	0.15	0.22	②	0.12	0.17	②	22"	0.15	0.21	②	48"	0.12	0.17	②	0.30	0.44	②		
65	54	0.18	0.24	②	0.14	0.19	②	24"	0.18	0.24	②	54"	0.14	0.19	②	0.36	0.48	②		
CONCRETE 5000 PSI																				
73	60	0.21	0.28	②	0.17	0.21	②	28"	0.21	0.27	②	60"	0.17	0.21	②	0.42	0.56	②		
88	72	0.26	0.36	0.57③	0.20	0.27	0.43③	33"	0.26	0.36	0.57③	72"	0.20	0.27	0.43③	0.52	0.72	—		
102	84	0.32	0.44	0.67③	0.24	0.34	0.50③	39"	0.32	0.44	0.67③	84"	0.24	0.34	0.50③	0.64	0.88	—		
CONCRETE 6000 PSI																				
115	90	0.39	0.52③	0.82③	0.30	0.39③	0.62③	43"	0.39	0.52③	0.82③	96"	0.30	0.39③	0.62③	—	—	—		
122	96	0.42	0.55③	0.88③	0.32	0.41③	0.66③	46"	0.42	0.55③	0.88③	102"	0.32	0.41③	0.66③	—	—	—		
138	108	0.49④	0.64③	②	0.37④	0.48③	②	52"	0.49④	0.64③	②	114"	0.37④	0.48③	②	—	—	②		
154	120	0.55④	0.74③	②	0.41④	0.55③	②	58"	0.55④	0.74③	②	126"	0.41④	0.55③	②	—	②	②		
169	132	0.79④	②	②	0.59④	②	②	62"	0.79④	②	②	132"	0.59④	②	②	—	②	②		

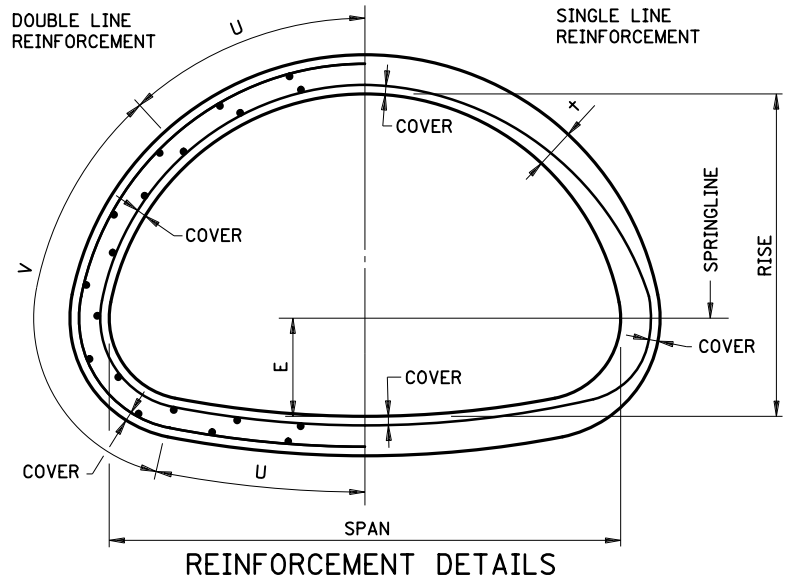
As = CIRCUMFERENTIAL REINFORCEMENT AREA IN SQUARE INCHES PER LINEAR FOOT OF PIPE BARREL IN EACH CONTINUOUS BASIC CAGE AND SUPPLEMENTAL REINFORCEMENT DESIGNATED "U" AND "V".

U = HALF BAR OR WELDED WIRE REINFORCEMENT LENGTH MEASURED ALONG CENTERLINE OF PIPE WALL FROM VERTICAL CENTERLINE OF PIPE.

V = FULL BAR OR WELDED WIRE REINFORCEMENT LENGTH MEASURED ALONG CENTERLINE OF PIPE WALL AND POSITIONED EQUIDISTANT WITH RESPECT TO ENDS OF "U" REINFORCEMENT.

D-LOADS FOR THREE-EDGE-BEARING TEST		
CLASS	0.01-IN CRACK	ULTIMATE
IIA	1000	1500
IIIA	1350	2000
IVA	2000	3000

NOTE: TEST LOAD IN POUNDS PER LINEAR FOOT EQUALS D-LOAD x INSIDE SPAN IN FEET. REFER TO SPEC. 3236 FOR ADDITIONAL LOAD BEARING TEST REQUIREMENTS.



NOTES:

IF REINFORCEMENT BARS ARE USED IN LIEU OF WELDED WIRE REINFORCEMENT, USE REINFORCEMENT BARS IN CONFORMANCE WITH SPEC. 3301, fy = 60 KSI, AND INCREASE THE REQUIRED REINFORCEMENT BY 8%.

THE MINIMUM COVER FOR REINFORCEMENT IS 3/4" AND THE MAXIMUM IS 1" + 10% OF THE WALL THICKNESS, OR 1/2", WHICHEVER IS GREATER.

DO NOT EXCEED A SPACING OF 4 INCHES FOR THE CENTER-TO-CENTER SPACING OF ADJACENT RINGS OF CIRCUMFERENTIAL REINFORCEMENT FOR 30" EQUIVALENT DIAMETER AND SMALLER PIPE; DO NOT EXCEED THE WALL THICKNESS OR 6 INCHES, WHICHEVER IS LESS, FOR LARGER PIPE. DO NOT DESTROY THE CONTINUITY OF THE CIRCUMFERENTIAL REINFORCEMENT DURING THE MANUFACTURE OF THE PIPE.

REFER TO AASHTO M 206 FOR ADDITIONAL PIPE DIMENSIONS AND GEOMETRY.

① EQUIVALENT DIAMETER = DIAMETER OF CIRCULAR PIPE WITH APPROXIMATELY EQUIVALENT CROSS-SECTION AREA.

② NOT AVAILABLE IN THIS SIZE/CLASS COMBINATION.

③ NOMINAL SPANS OF 115 INCHES OR GREATER FOR CLASS IIIA PIPE AND 88 INCHES OR GREATER FOR CLASS IVA PIPE ARE SPECIAL DESIGNS IN ACCORDANCE WITH SPEC. 3236 AND REQUIRE SHEAR REINFORCEMENT. SEE SHEET 3 OF 3.

④ NOMINAL SPANS OF 138 INCHES OR GREATER FOR CLASS IIA PIPE ARE SPECIAL DESIGNS IN ACCORDANCE WITH SPEC. 3236. NOTIFY THE ENGINEER PRIOR TO THE START OF PRODUCTION.

⑤ THE REQUIRED STRENGTH INCREASES FOR LARGER SIZE PIPE, SEE BELOW.

APPROVED 09-30-2022

Rom S. J.
STATE DESIGN ENGINEER

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

**REINFORCED CONCRETE PIPE ARCH
REINFORCEMENT**

SPECIFICATION
REFERENCE

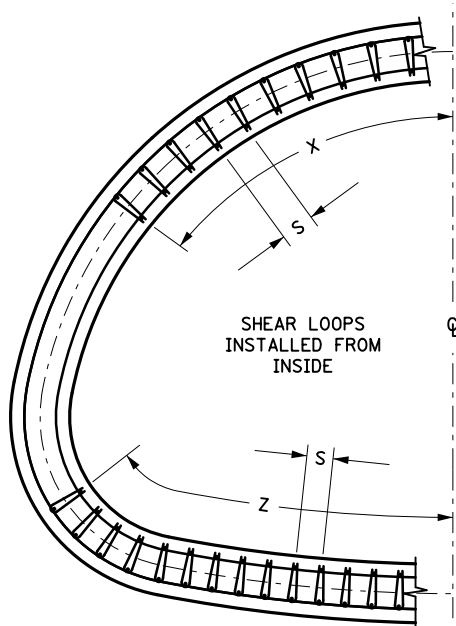
2501
2503

STANDARD
PLATE
NO.

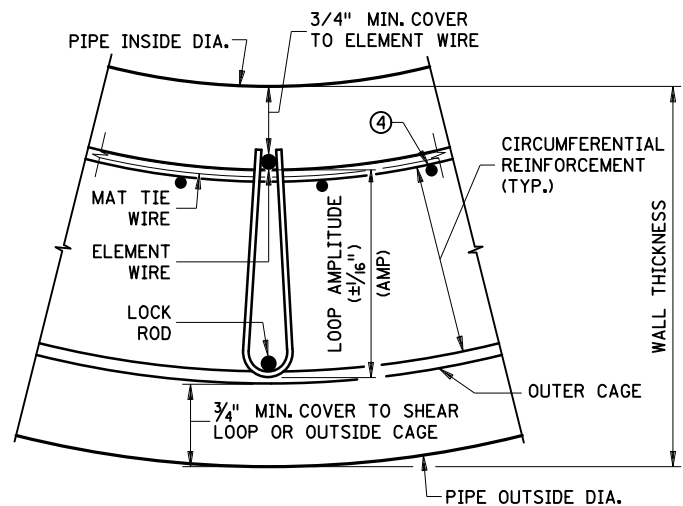
3014L

2 OF 3

SHEAR REINFORCEMENT REQUIREMENTS ③												
NOMINAL SPAN	EQUIVALENT DIAMETER ①	WALL THICKNESS	AMPLITUDE (AMP)	TOP				BOTTOM				
				S	X	A _r		S	Z	A _r		
						IIIA	IVA			IIIA	IVA	
IN.	IN. ①	IN.	IN.	IN.	IN.			IN.	IN.			
88	72	7"	5"	3.5	36	—	0.39	3.5	42	—	0.27	
102	84	8"	6"	4.5	42	—	0.39	4.5	49	—	0.26	
115	90	8½"	6½"	4.5	48	—	0.40	4.5	54	0.09	0.27	
122	96	9"	7"	5	52	—	0.39	5	55	0.09	0.26	
138	108	10"	8"	5.5	60	—	②	5.5	62	0.10	②	
154	120	11"	9"	6	66	—	②	6	70	0.10	②	
169	132	10"	8"	5.5	71	②	②	5.5	74	②	②	



SHEAR LOCK MAT
(INSTALLED FROM INSIDE)



SHEAR LOCK MAT DETAIL
(PINNED ON INSIDE)

NOTES:

SHEAR LOCK MATS MUST BE INSTALLED FROM INSIDE OF PIPE AS SHOWN ON THIS SHEET.

AMP = SHEAR LOOP AMPLITUDE MEASURED FROM FACE OF ELEMENT WIRE TO TIP OF LOOP WIRE (INCHES)

A_r = MINIMUM RADIAL REINFORCEMENT REQUIRED IN SQUARE INCHES PER SQUARE FOOT OF PIPE MEASURED AT THE INNER CAGE OVER MINIMUM ARC LENGTHS X AND Z AT THE TOP AND BOTTOM OF THE PIPE, RESPECTIVELY.

X & Z = MINIMUM LENGTH OF STIRRUPS MEASURED AT INNER CAGE (INCHES).

S = MAXIMUM SPACING OF ROWS OR RADIAL REINFORCEMENT AT INNER CAGE (INCHES).

S IS BASED ON ARTICLE 12.10.4.2.6 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 8TH EDITION, WHERE S SHALL NOT EXCEED $0.75 \times d \times \phi_v$, WHERE ϕ_v IS 0.9 AS SPECIFIED IN AASHTO ARTICLE 12.5.5. THE MAXIMUM SPACING HAS BEEN ROUNDED UP FROM THE CALCULATED VALUE TO THE NEAREST ½ INCH.

PIN ALL SHEAR REINFORCEMENT. PROVIDE ELEMENT BAR WITH A MINIMUM DIAMETER OF 0.19" AND A LOCK ROD OF THE SAME DIAMETER.

SECURE LOCK RODS PLACED ON THE INSIDE OF THE OUTER CAGE NO MORE THAN 6" FROM END OF EACH LOCK ROD, AT 12" MAXIMUM SPACING.

SET INSIDE CIRCUMFERENTIAL REINFORCEMENT COVER BY USING A 1" CHAIR FOR THE CIRCUMFERENTIAL REINFORCEMENT.

① EQUIVALENT DIAMETER EQUALS DIAMETER OF CIRCULAR PIPE WITH APPROXIMATELY EQUIVALENT CROSS-SECTION AREA.

② NOT AVAILABLE IN THIS SIZE/CLASS COMBINATION.

③ SEE STANDARD PLATE 3007 FOR SHEAR REINFORCEMENT OPTIONS AND ADDITIONAL DETAILS AND INFORMATION.

④ WHEN SHEAR LOCK MAT ALTERNATE IS USED, LOCATE THE LONGITUDINAL REINFORCEMENT ON THE INNER CAGE AS SHOWN.

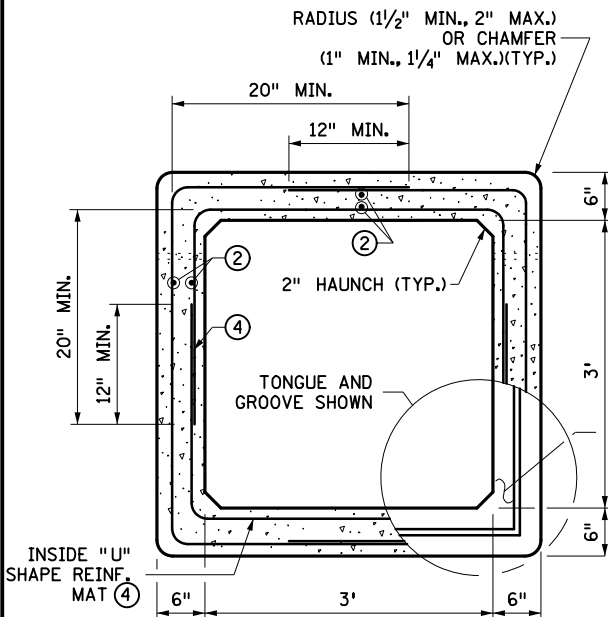
APPROVED 09-30-2022
Rom S
STATE DESIGN ENGINEER

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION
REINFORCED CONCRETE PIPE ARCH
SPECIAL DESIGN - SHEAR REINFORCEMENT
INSTALLED FROM INSIDE

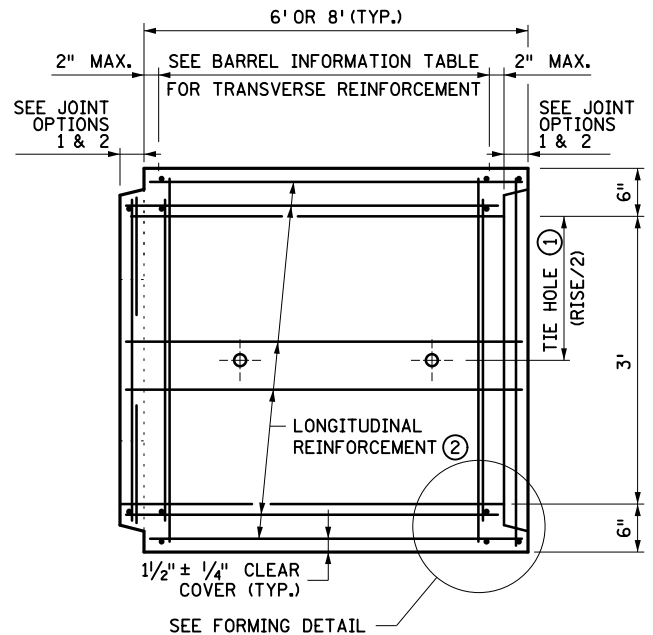
SPECIFICATION
REFERENCE
2501
2503

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PLATE
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3014L
3 OF 3

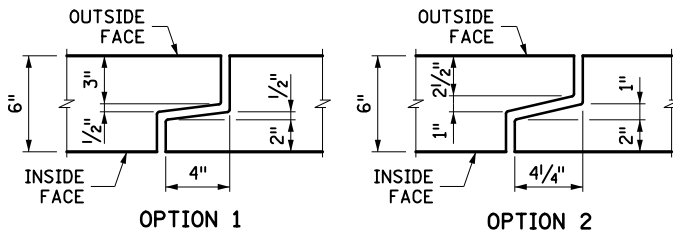
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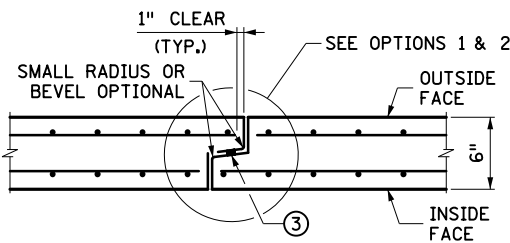
TRANSVERSE BARREL SECTION



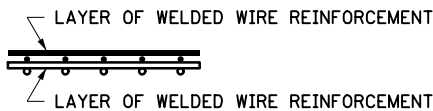
LONGITUDINAL BARREL SECTION



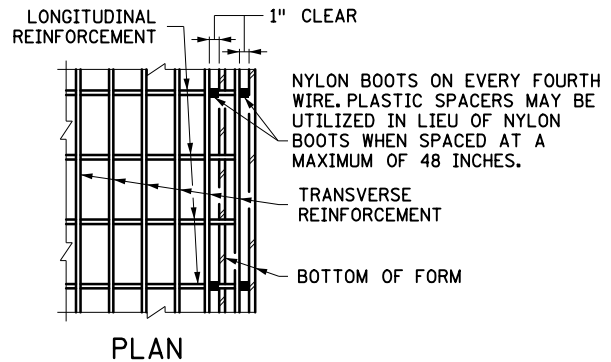
TONGUE AND GROOVE JOINT DETAIL



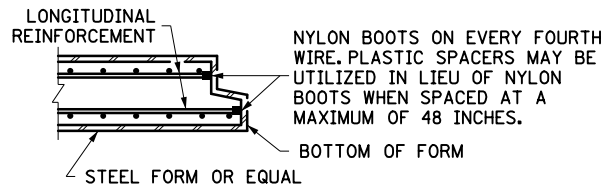
REINFORCEMENT LAYER DETAIL



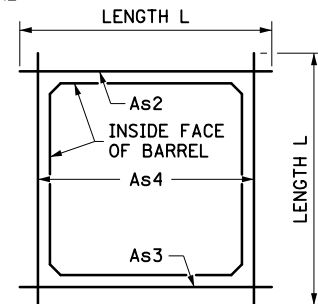
WHEN MORE THAN ONE LAYER OF WELDED WIRE REINFORCEMENT IS USED TO OBTAIN THE REQUIRED REINFORCEMENT AREAS, PLACE THE WIRES OF THE WELDED WIRE REINFORCEMENT AS SHOWN



PLAN



SECTION FORMING DETAIL



ALTERNATIVE INSIDE MAT REINFORCEMENT (4)

(As2 = As3 = As4 = 0.21 SQ. IN/FT)

SEE SHEET 2 OF 2 FOR NUMBERED NOTES.

BARREL AND END SECTION INFORMATION TABLE				
f'c (P.S.I.)	FILL HEIGHT RANGE (FT.)	BARREL WEIGHT (LBS./FT.) (5)	TRANSVERSE REINFORCEMENT (SQ. IN/FT)	
			INSIDE MAT	OUTSIDE MAT
5000	1.5-20	1050	0.21	0.15

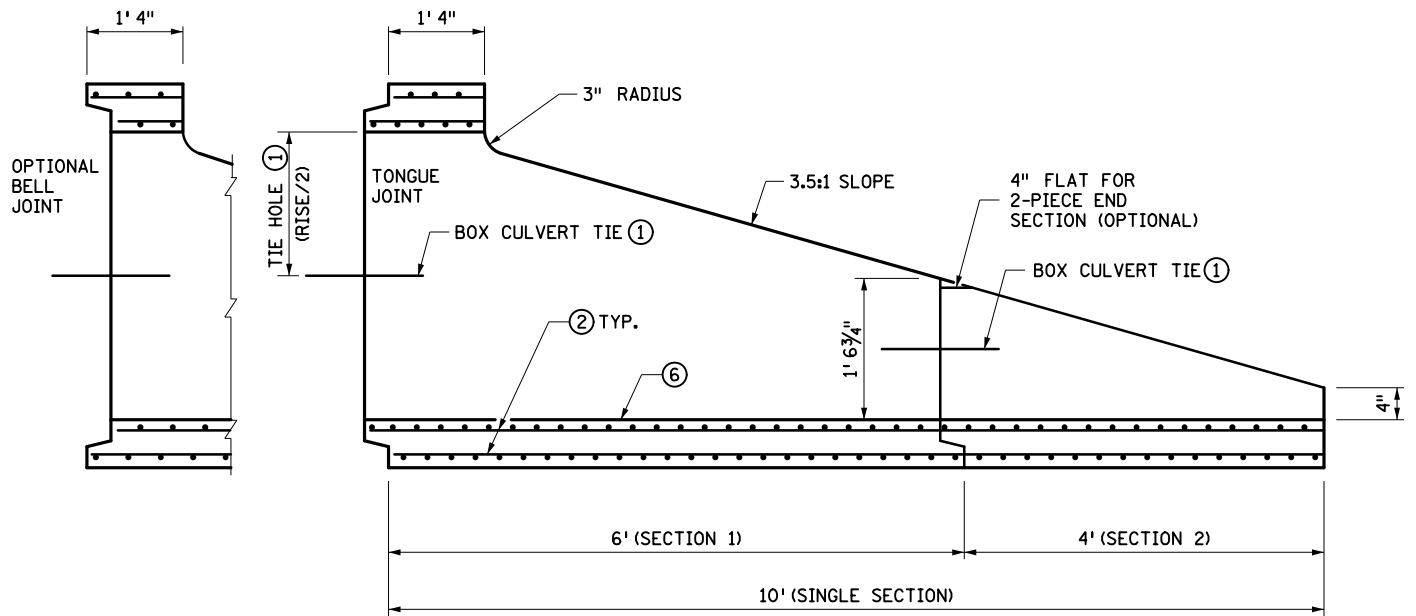
APPROVED 09-30-2022

 STATE DESIGN ENGINEER

STATE OF MINNESOTA
 DEPARTMENT OF TRANSPORTATION
**3 X 3 PRECAST CONCRETE
 BOX CULVERT**

SPECIFICATION
 REFERENCE

STANDARD
 PLATE
 NO.
3021B
 1 OF 2



PRECAST END SECTION (1 OR 2 PIECES)

(REFER TO BARREL AND END SECTION TABLE FOR REINFORCEMENT)

NOTES:

CONSTRUCT CULVERTS IN ACCORDANCE WITH SPEC. 2412 EXCEPT AS NOTED.

PROVIDE WELDED WIRE REINFORCEMENT AND REINFORCEMENT BARS PER THE APPLICABLE REQUIREMENTS OF AASHTO M 259.

MINIMUM WELDED WIRE REINFORCEMENT BEND DIAMETER = 6 WIRE DIAMETERS.

1/2" ± 1/4" CONCRETE COVER ON ALL REINFORCEMENT EXCEPT FOR TONGUE AND GROOVE DETAIL.

ANY OF THE FOLLOWING COMBINATIONS OF STEEL REINFORCEMENT MAY BE USED:

- (a) 1 OR 2 LAYERS OF WELDED WIRE REINFORCEMENT OR
- (b) 1 LAYER OF WELDED WIRE REINFORCEMENT AND 1 LAYER OF REINFORCEMENT BARS OR
- (c) 1 LAYER OF REINFORCEMENT BARS.

DEVELOP REINFORCEMENT IN ACCORDANCE WITH AASHTO "LRFD BRIDGE DESIGN SPECIFICATIONS." IF BAR REINFORCEMENT IS SUBSTITUTED FOR WELDED WIRE REINFORCEMENT, INCREASE THE AREA OF REINFORCEMENT BY 8%, AND SUBMIT DESIGN CALCULATIONS VERIFYING COMPLIANCE WITH AASHTO 5.7.3.4. "CONTROL OF CRACKING BY DISTRIBUTION OF REINFORCEMENT."

MAXIMUM SIZE OF REINFORCEMENT BARS IS NO. 6. THE MAXIMUM WELDED WIRE REINFORCEMENT SIZE IS W23 PER LAYER (MAXIMUM OF 2 LAYERS).

SPACE CENTER TO CENTER OF TRANSVERSE WIRES NOT LESS THAN 2" NOR MORE THAN 4". SPACE CENTER TO CENTER OF LONGITUDINAL WIRES NOT MORE THAN 8".

WELDING IS NOT PERMITTED ON REINFORCEMENT BARS OR WELDED WIRE REINFORCEMENT, EXCEPT THAT THE ORIGINAL WELDING REQUIRED TO MANUFACTURE WIRE REINFORCEMENT IS ACCEPTABLE.

WHEN REINFORCEMENT IS CUT, PLACE ADDITIONAL REINFORCEMENT ON BOTH SIDES OF THE CUT MEMBER TO REPLACE OR EXCEED THE CUT STEEL.


USE CONCRETE MIX NO. 3W82 WITH NO CALCIUM CHLORIDE ALLOWED.

SHOP DRAWING APPROVAL IN ACCORDANCE WITH SPEC. 3238.2.A IS NOT REQUIRED UNLESS OPENINGS OR ATTACHMENTS ARE PLACED ON A BARREL SEGMENT.

COMPACT THE FIRST 1.0' (LOOSE) OF FILL ABOVE THE BOX WITH LIGHT COMPACTION EQUIPMENT SUCH AS PLATE COMPACTORS OR WALK BEHIND ROLLERS.

TRANSVERSE REINFORCEMENT IS PARALLEL TO THE CULVERT SPAN. LONGITUDINAL REINFORCEMENT IS PERPENDICULAR TO THE CULVERT SPAN.

- ① USE 3/4" DIAMETER CULVERT TIES. SEE STANDARD PLATE 3145 FOR DETAILS.
- ② PLACE LONGITUDINAL REINFORCEMENT IN ALL SLABS AND WALLS WITH A MINIMUM OF 0.06 SQ. IN./FT.
- ③ REFER TO SPEC, 2412 FOR SEALANT REQUIREMENTS.
- ④ AT FABRICATORS OPTION, SEPARATE MATS As2, As3, As4 MAY BE USED IN LIEU OF "U" SHAPES FOR INSIDE REINFORCING MAT. LENGTH L OF As2 = As3 = As4 = 3' 6".
- ⑤ ESTIMATED WEIGHT OF END SECTION 1 IS 4150 LBS. AND SECTION 2 IS 1800 LBS.
- ⑥ 6" THICK WALLS AND SLABS.

APPROVED 09-30-2022

 STATE DESIGN ENGINEER

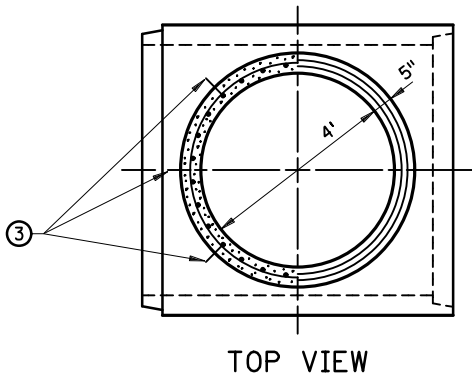
STATE OF MINNESOTA
 DEPARTMENT OF TRANSPORTATION

**3 X 3 PRECAST CONCRETE
 BOX CULVERT**

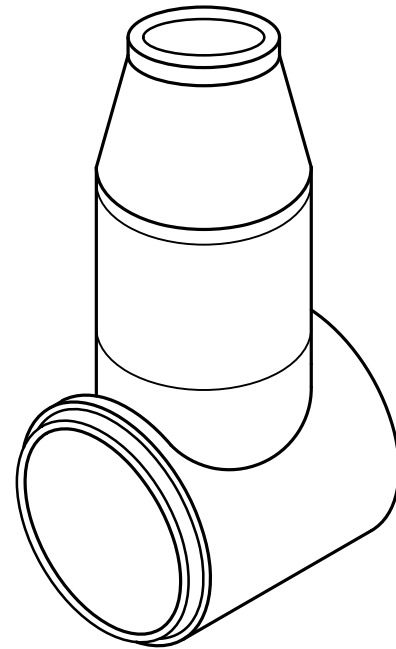
SPECIFICATION
 REFERENCE

STANDARD
 PLATE
 NO.
3021B
 2 OF 2

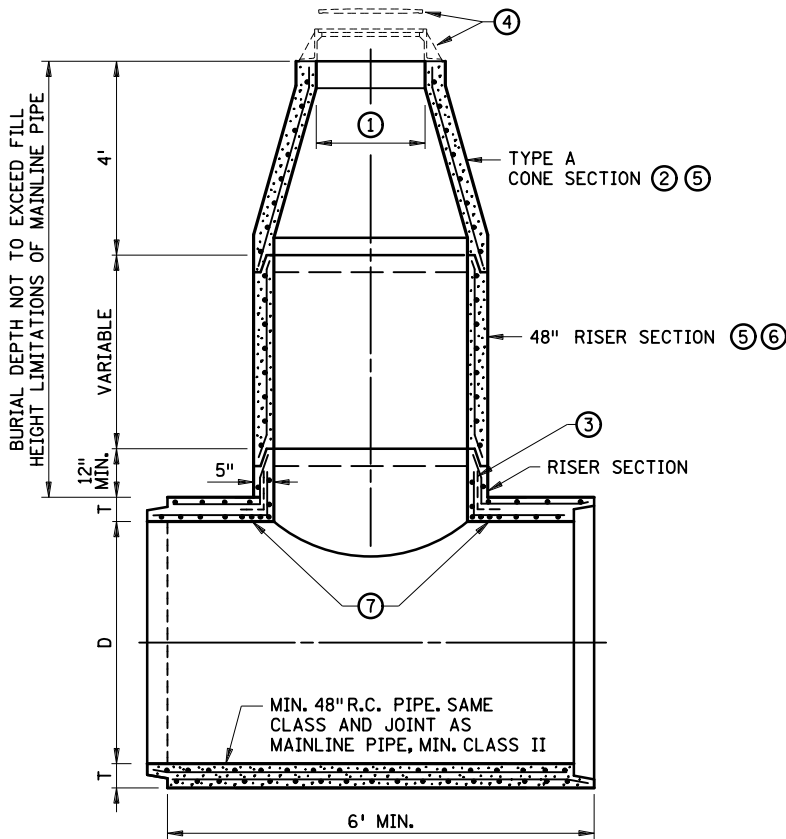
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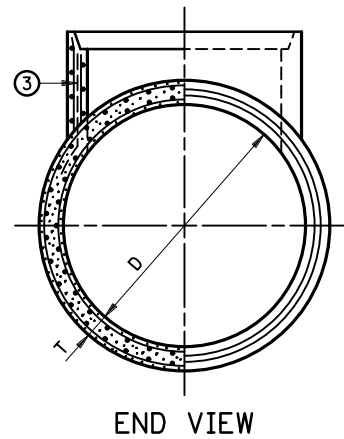
TOP VIEW



PERSPECTIVE VIEW



SECTIONAL VIEW



END VIEW

NOTES:

INLET/OUTLET HOLES LARGER THAN 7" ARE NOT PERMITTED IN THE CONE SECTION. REFER TO STANDARD PLATE 4020 FOR HOLE SIZE RESTRICTIONS IN THE RISER PIPE.

- ① 2' 3" NORMAL OPENING.
- ② USE STANDARD PLATE 4005 TYPE A CONE SECTION UNLESS OTHERWISE INDICATED IN THE PLANS.
- ③ WHEN FABRICATED AS A SINGLE UNIT, PLACE 8 EQUALLY SPACED NO. 3 X 24" BARS OR WELDED WIRE REINFORCEMENT (WWR) OF EQUIVALENT AREA IN THE LOCATION SHOWN. WHEN NOT FABRICATED AS A SINGLE UNIT, CUT, BEND, OVERLAP AND FASTEN THE EXISTING WWR IN THE TRUNK LINE PIPE TO THE WWR OF THE BRANCH CONNECTION PRIOR TO MORTARING THE PIECES TOGETHER.

- ④ REFER TO PLANS FOR CASTINGS REQUIRED. USE ADJUSTING RINGS WHERE NECESSARY, SEE STANDARD PLATES 4010 AND 4026. SET CASTING AND PRECAST CONCRETE ADJUSTING RINGS ON FULL MORTAR BEDS.
- ⑤ REFER TO PLANS FOR ANY STEP REQUIREMENTS.
- ⑥ REINFORCE RISER WITH SINGLE LINE CIRCUMFERENTIAL WELDED WIRE REINFORCEMENT WITH CROSS SECTIONAL AREA NOT LESS THAN 0.18 SQ. IN. PER FOOT OF HEIGHT PER THE TEMPERATURE & SHRINKAGE PROVISIONS OF ACI 350.
- ⑦ REPLACE CUT CIRCUMFERENTIAL REINFORCEMENT IN MAINLINE PIPE, HALF EACH SIDE OF OPENING.

DESIGN J

APPROVED 09-30-2022

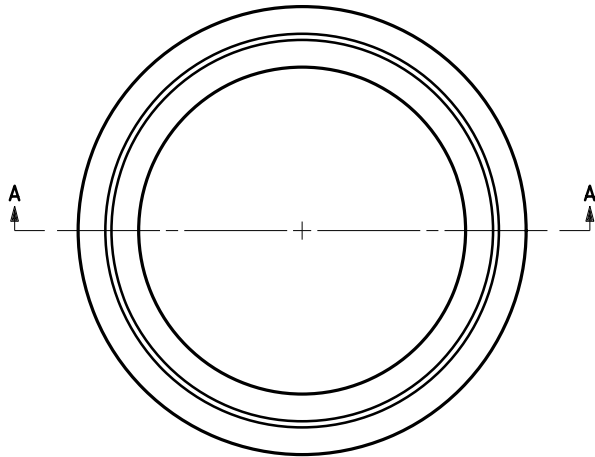
Rom S. Smith
STATE DESIGN ENGINEER

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION
**MANHOLE OR CATCH BASIN - INTEGRAL
TEE SECTION**
SECTIONAL CONCRETE PIPE

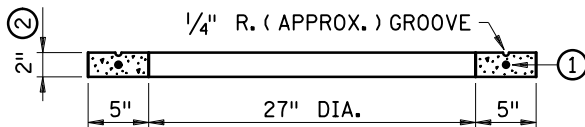
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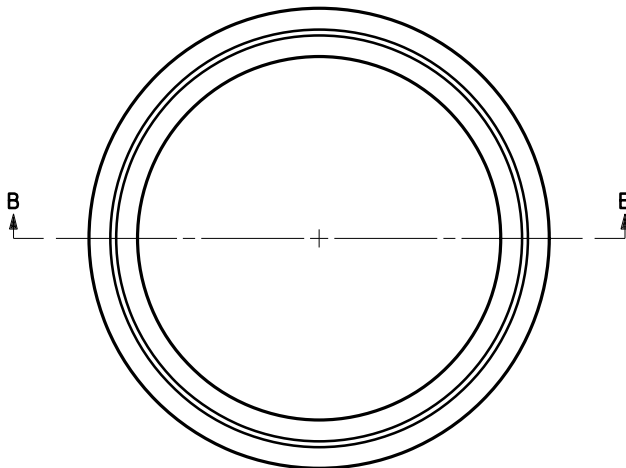
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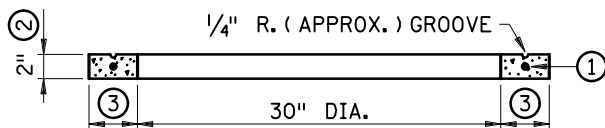
TOP VIEW



SECTION A-A



TOP VIEW



SECTION B-B

NOTES:

ON CONSTRUCTION OF NEW DRAINAGE STRUCTURES, LIMIT THE NUMBER OF CONCRETE ADJUSTING RINGS USED PER MANHOLE OR CATCH BASIN TO TWO RINGS WITH A TOTAL MAXIMUM THICKNESS OF 9" INCLUDING MORTAR.


UP TO THREE RINGS WITH A MAXIMUM TOTAL THICKNESS OF 12" INCLUDING MORTAR ARE ALLOWED WHEN RECONSTRUCTING INPLACE STRUCTURES WITH A GRADE CHANGE.

CONCRETE ADJUSTING RINGS ARE RECOMMENDED BUT NOT REQUIRED ON ALL STRUCTURES.

CONCRETE ADJUSTING RINGS MUST BE ENCASED IN MORTAR, SEE STANDARD PLATE 4026.

MINIMUM SPECIFIED CONCRETE STRENGTH = 5000 PSI AT TIME OF SHIPMENT.

- ① REINFORCING:
A SINGLE HOOP OF MINIMUM DIAMETER 0.192" DEFORMED WIRE MEETING THE REQUIREMENTS OF ASTM A1064. PLACE WIRE WITHIN THE MIDDLE THIRD OF THE RING (HORIZONTALLY AND VERTICALLY) WITH A 1/8" TOLERANCE, EXCEPT PROVIDE MINIMUM CLEAR COVER OF 7/8" VERTICALLY FOR 2" THICK RINGS.
- ② VARIABLE THICKNESS, 2" MINIMUM TO 6" MAXIMUM.
- ③ VARIABLE WIDTH, 4" MINIMUM TO 5" MAXIMUM.

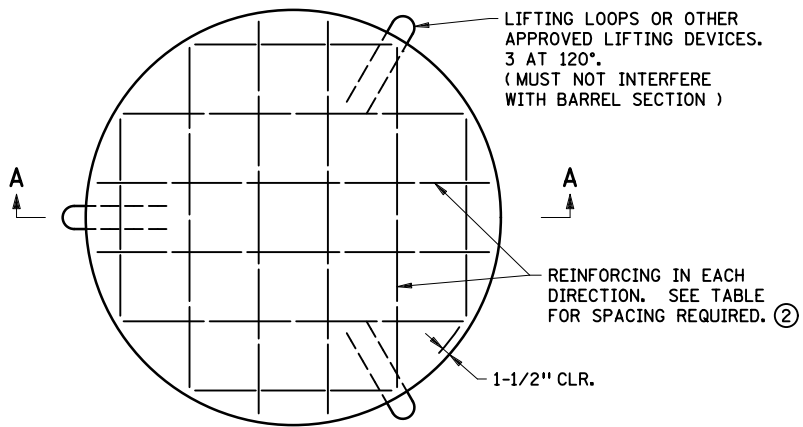
APPROVED 09-30-2022

 STATE DESIGN ENGINEER

STATE OF MINNESOTA
 DEPARTMENT OF TRANSPORTATION
CONCRETE ADJUSTING RINGS

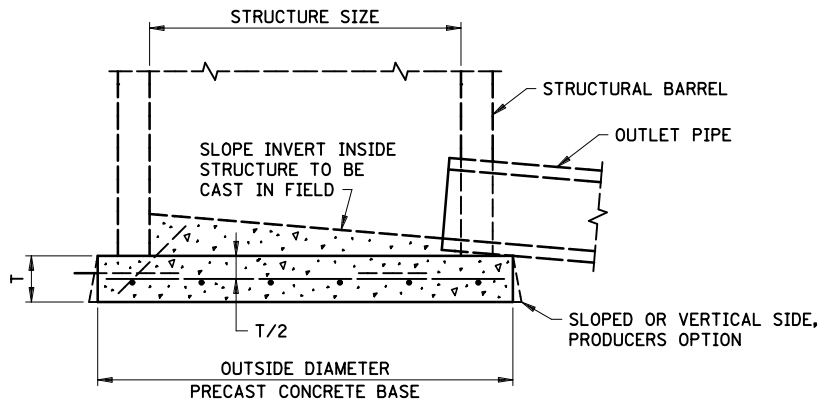
SPECIFICATION
 REFERENCE
 2506

STANDARD
 PLATE
 NO.
4010I

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TOP VIEW



SECTION A-A

STRUCTURE SIZE (INCHES)	PRECAST CONCRETE BASE				APPROX. WEIGHT (POUNDS)
	OUTSIDE DIAMETER (INCHES)	T (INCHES)	MINIMUM REINF. ②		
			BAR NUMBER	SPACING (INCHES)	
30	44	6	4	12	790
48	64	6	4	12	1,680
54	72	8	4	12	2,830
60	78	8	4	12	3,320
66	85	8	4	12	3,940
72	92	8	4	12	4,620
78	100	8	4	12	5,460
84	106	8	4	8	6,130
90	114	8	4	8	7,090
96	120	8	4	8	7,850
102	127	8	4	8	8,800
108	132	9	4	8	10,690
120	146	12	4	8	17,440
132	160	12	4	8	20,940
144	174	12	4	6	24,770

NOTES:

- ① ALTERNATE T = 10" WITH NO. 4 BAR SPACED AT 10".
- ② EQUIVALENT WIRE MESH MAY BE USED.

APPROVED OCTOBER 17, 1994

Gerald J. Rodbrack
STATE DESIGN ENGINEER

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

PRECAST CONCRETE BASE

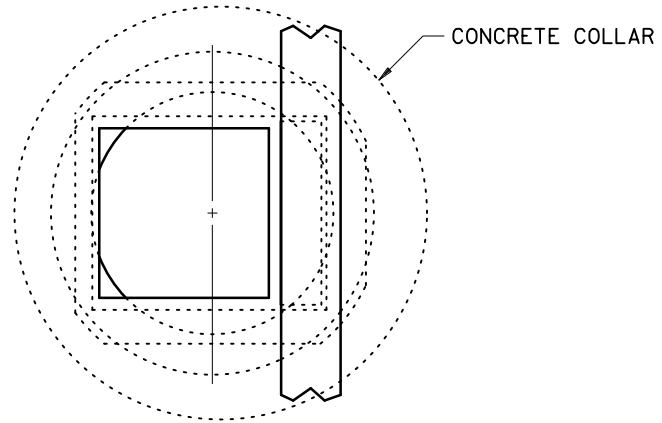
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REVISED
3-22-2013 M.J.E.

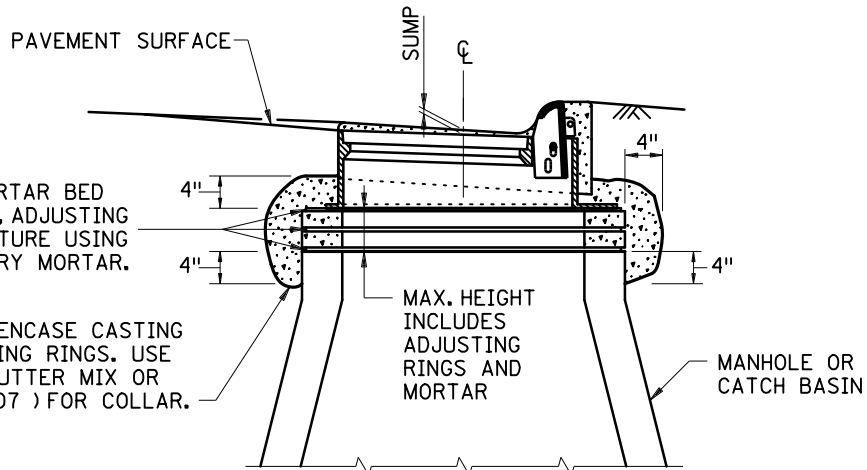
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PLAN




SECTION

NOTES:

SEE PLATE 4010 FOR MAXIMUM NUMBER AND HEIGHT OF ADJUSTING RINGS.

USE ADJUSTING RINGS FOR VERTICAL ADJUSTMENTS ONLY.

APPROVED 09-30-2022

 STATE DESIGN ENGINEER

STATE OF MINNESOTA
 DEPARTMENT OF TRANSPORTATION
**CONCRETE-ENCASED
 CONCRETE ADJUSTING RINGS**

SPECIFICATION
 REFERENCE
 2506

STANDARD
 PLATE
 NO.
4026B

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