

Standard Details Drawings

December 2018

Prepared by:



2100 Trimmier Road, Suite 102 Killeen, Texas 76541 254.690.1478

Table of Contents

1. Erosion and Sedimentation Details

1010	Temporary Erosion and Sedimentation Guidelines
1020	Temporary Erosion and Sedimentation Guidelines
1030	Silt Fence Detail
1040	Rock Berm Detail
1050	Triangular Filter Dike
1060	Stabilized Construction Entrance Detail

2. Paving Details

2170	Standard Curb and Gutter
2190	Integral Curb
2200	Ribbon Curb
2240	Sidewalk Detail
2250	Sidewalk Adjacent to Curb and Gutter
2280	Curb and Gutter in Existing Pavement

3. Trench Details

3020B	Surface Replacement Details – Class “B”
3020C	Surface Replacement Details – Class “C”
3020D	Surface Replacement Details – Class “D”
3040	Concrete Encasement Detail
3070	Dry Utility Conduit Backfill Detail
3080	Common Dry Utility Trench Detail at Street Crossing
3090	Dry Utility Sleeve Locator Detail

4. Water Details

4010	Fire Hydrant Assembly
4020	Concrete Thrust Blocking Detail for MJ Pipe Fittings
4030	Resilient Wedge Gate Valve and Box Detail (12” and Smaller)
4040	Vertical Bend Restrained Joint Detail
4060	Blow Off Valve Assembly
4080	Tapping Sleeve and Valve
4090	1” Water Service & Meter Box Installation
4100	Bullhead (2-1”) Water Service & Meter Box Installation
4110	2” Water Service & Meter Box Installation
4120	Water and Sanitary Sewer Crossing
4130A	Combination Air Vacuum Release Valve
4130B	Combination Air Vacuum Release Valve

5. Wastewater Details

5010	Manhole Ring and Cover
5020	Watertight-Airtight Manhole Ring and Cover

5040	Precast Concrete Manhole
5050	Wastewater Manhole Drop Fixture
5080	Wastewater Manhole Backfill Detail
5101	4" Residential Wastewater Service Connection
5131	Manhole with Doghouse Openings

6. TYPICAL STREET SECTIONS

10000	Typical Street Sections
-------	-------------------------

7. TXDOT DRAINAGE DETAILS

CH-FW-0	Concrete Headwalls with Flared Wings
PCO	Precast Curb Inlet Outside Roadway
PCO	Precast Curb Inlet Outside Roadway
PJB	Precast Junction Box
PB	Precast Base
SETB-CD	Safety End Treatment Type "I" ~ Cross Drainage
SETB-CD	Safety End Treatment Type "I" ~ Cross Drainage
SETB-PD	Safety End Treatment Type "I" ~ Parallel Drainage
SETB-PD	Safety End Treatment Type "I" ~ Parallel Drainage
PSET-SP	Precast Safety End Treatment Type "II" ~ Parallel Drainage
PSET-SC	Precast Safety End Treatment Type "II" ~ Cross Drainage

GUIDELINES FOR DESIGN AND INSTALLATION OF
TEMPORARY EROSION AND SEDIMENTATION CONTROLS

TYPE OF STRUCTURE	REACH LENGTH	MAXIMUM DRAINAGE AREA	SLOPE
SILT FENCE	N/A	2 ACRES	0 – 10%
	200 FEET	2 ACRES	10 – 20%
	100 FEET	1 ACRE	20 – 30%
	50 FEET	1/2 ACRE	> 30%
TRIANGLE FILTER DIKE	100 FEET	1/2 ACRE	< 30% SLOPE
	50 FEET	1/4 ACRE	> 30% SLOPE
ROCK BERM *, **	500 FEET	< 5 ACRES	0 – 10%

* FOR ROCK BERM DESIGN WHERE PARAMETERS ARE OTHER THAN STATED, DRAINAGE AREA CALCULATIONS AND ROCK BERM DESIGN MUST BE SUBMITTED FOR REVIEW.

** HIGH SERVICE ROCK BERMS MAY BE REQUIRED IN AREAS OF ENVIRONMENTAL SIGNIFICANCE AS DETERMINED BY THE ENGINEER.



TEMPORARY EROSION AND SEDIMENTATION GUIDELINES

DETAIL NO.: 1010

SCALE: N.T.S.

NOTE:

THIS SECTION IS INTENDED TO ASSIST THOSE PERSONS PREPARING WATER POLLUTION ABATEMENT PLANS (WPAP) OR STORM WATER POLLUTION PREVENTION PLANS (SW3P) THAT COMPLY WITH FEDERAL, STATE AND/OR LOCAL STORM WATER REGULATIONS.

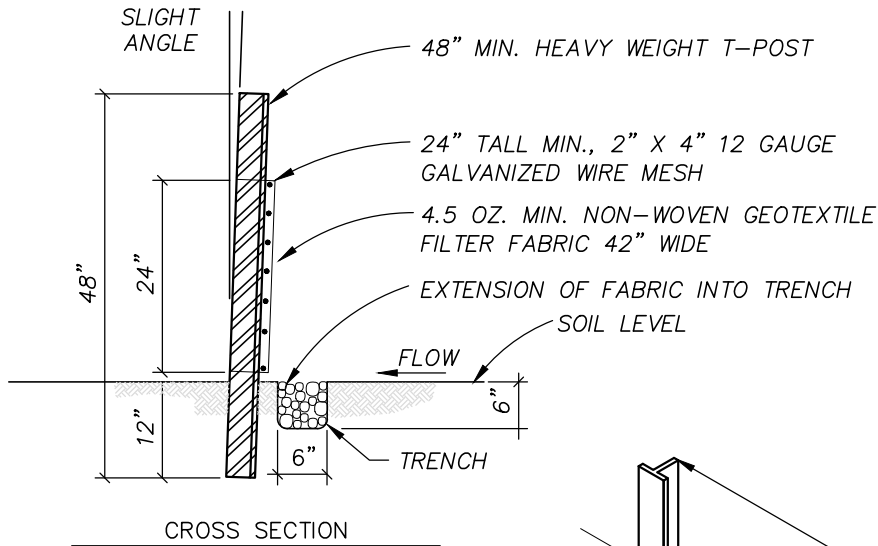
1. THE CONTRACTOR TO INSTALL AND MAINTAIN EROSION/SEDIMENTATION CONTROLS AND TREE/NATURAL AREA PROTECTIVE FENCING PRIOR TO ANY SITE PREPARATION WORK (CLEARING, GRUBBING, GRADING, OR EXCAVATION). CONTRACTOR TO REMOVE EROSION/SEDIMENTATION CONTROLS AT THE COMPLETION OF PROJECT AND GRASS RESTORATION.
2. ALL PROJECTS WITHIN THE RECHARGE ZONE OF THE EDWARD'S AQUIFER SHALL SUBMIT A BEST MANAGEMENT PRACTICES AND WATER POLLUTION AND ABATEMENT PLAN TO THE TNRCC FOR APPROVAL PRIOR TO ANY CONSTRUCTION.
3. THE PLACEMENT OF EROSION/SEDIMENTATION CONTROLS TO BE IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENTATION CONTROL PLAN AND WATER POLLUTION ABATEMENT PLAN. DEVIATIONS FROM THE APPROVED PLAN MUST BE SUBMITTED TO AND APPROVED BY THE OWNER'S REPRESENTATIVE.
4. ALL PLANTING SHALL BE DONE BETWEEN MAY 1 AND SEPTEMBER 15 EXCEPT AS SPECIFICALLY AUTHORIZED IN WRITING. IF PLANTING IS AUTHORIZED TO BE DONE OUTSIDE THE DATES SPECIFIED, THE SEED SHALL BE PLANTED WITH THE ADDITION OF WINTER FESCUE (KENTUCKY 31) AT A RATE OF 100lb/ACRE. GRASS SHALL BE COMMON BERMUDA GRASS, HULLED, MINIMUM 82% PURE LIVE SEED. ALL GRASS SEED SHALL BE FREE FROM NOXIOUS WEED, GRADE "A" RECENT CROP, RECLEANED AND TREATED WITH APPROPRIATE FUNGICIDE AT TIME OF MIXING. SEED SHALL BE FURNISHED IN SEALED, STANDARD CONTAINERS WITH DEALER'S GUARANTEED ANALYSIS.
5. ALL DISTURBED AREAS TO BE RESTORED AS NOTED IN THE WATER POLLUTION ABATEMENT PLAN.
6. THE PLANTED AREA TO BE IRRIGATED OR SPRINKLED IN A MANNER THAT WILL NOT ERODE THE TOPSOIL, BUT WILL SUFFICIENTLY SOAK THE SOIL TO A DEPTH OF FOUR (4) INCHES. THE IRRIGATION TO OCCUR AT 10-DAY INTERVALS DURING THE FIRST TWO MONTHS TO INSURE GERMINATION AND ESTABLISHMENT OF THE GRASS. RAINFALL OCCURRENCES OF 1/2 INCH OR GREATER TO POSTPONE THE WATERING SCHEDULE ONE WEEK.
7. RESTORATION TO BE ACCEPTABLE WHEN THE GRASS HAS GROWN AT LEAST 1-1/2 INCHES HIGH WITH 95% COVERAGE, PROVIDED NO BARE SPOTS LARGER THAN 25 SQUARE FEET EXIST.
8. A MINIMUM OF FOUR (4) INCHES OF TOPSOIL TO BE PLACED IN ALL AREAS DISTURBED BY CONSTRUCTION.
9. THE CONTRACTOR TO HYDROMULCH OR SOD (AS SHOWN ON PLANS) ALL EXPOSED CUTS AND FILLS UPON COMPLETION OF CONSTRUCTION.
10. EROSION AND SEDIMENTATION CONTROLS TO BE INSTALLED OR MAINTAINED IN A MANNER WHICH DOES NOT RESULT IN SOIL BUILDUP WITHIN TREE DRIPLINE.
11. TO AVOID SOIL COMPACTION, CONTRACTOR SHALL NOT ALLOW VEHICULAR TRAFFIC, PARKING, OR STORAGE OF EQUIPMENT OR MATERIALS IN THE TREE DRIPLINE AREAS.
12. WHERE A FENCE IS CLOSER THAN FOUR (4) FEET TO A TREE TRUNK, PROTECT THE TRUNK WITH STRAPPED-ON PLANKING TO A HEIGHT OF EIGHT (8) FEET (OR TO THE LIMITS OF LOWER BRANCHING) IN ADDITION TO THE FENCING.
13. TREES TO BE REMOVED IN A MANNER WHICH DOES NOT IMPACT TREES TO BE PRESERVED.
14. ANY ROOT EXPOSED BY CONSTRUCTION ACTIVITY TO BE PRUNED FLUSH WITH THE SOIL. BACKFILL ROOT AREAS WITH GOOD QUALITY TOPSOIL AS SOON AS POSSIBLE. IF EXPOSED ROOT AREAS ARE NOT BACKFILLED WITHIN TWO DAYS, COVER THEM WITH ORGANIC MATERIAL IN A MANNER WHICH REDUCES SOIL TEMPERATURE AND MINIMIZES WATER LOSS DUE TO EVAPORATION.
15. CONTRACTOR TO PRUNE VEGETATION TO PROVIDE CLEARANCE FOR STRUCTURES, VEHICULAR TRAFFIC, AND EQUIPMENT BEFORE DAMAGE OCCURS (RIPPING OF BRANCHES, ETC.). ALL FINISHED PRUNING TO BE DONE ACCORDING TO RECOGNIZED, APPROVED STANDARDS OF THE INDUSTRY (REFERENCE THE "NATIONAL ARBORIST ASSOCIATION PRUNING STANDARDS FOR SHADE TREES").
16. THE CONTRACTOR IS TO INSPECT THE CONTROLS AT WEEKLY INTERVALS AND AFTER EVERY RAINFALL EXCEEDING 1/4 INCH TO VERIFY THAT THEY HAVE NOT BEEN SIGNIFICANTLY DISTURBED. ANY ACCUMULATED SEDIMENT AFTER A SIGNIFICANT RAINFALL TO BE REMOVED AND PLACED IN THE OWNER DESIGNATED SPOIL DISPOSAL SITE. THE CONTRACTOR TO CONDUCT PERIODIC INSPECTIONS OF ALL EROSION/SEDIMENTATION CONTROLS AND TO MAKE ANY REPAIRS OR MODIFICATIONS NECESSARY TO ASSURE CONTINUED EFFECTIVE OPERATION OF EACH DEVICE.
17. WHERE THERE IS TO BE AN APPROVED GRADE CHANGE, IMPERMEABLE PAVING SURFACE, TREE WELL, OR OTHER SUCH SITE DEVELOPMENT IMMEDIATELY ADJACENT TO A PROTECTED TREE, ERECT THE FENCE APPROXIMATELY TWO TO FOUR FEET (2'-4') BEHIND THE AREA IN QUESTION.
18. NO ABOVE AND/OR BELOW GROUND TEMPORARY FUEL STORAGE FACILITIES TO BE STORED ON THE PROJECT SITE.
19. IF EROSION AND SEDIMENTATION CONTROL SYSTEMS ARE EXISTING FROM PRIOR CONTRACTS, OWNER'S REPRESENTATIVE AND THE CONTRACTOR TO EXAMINE THE EXISTING EROSION AND SEDIMENTATION CONTROL SYSTEMS FOR DAMAGE PRIOR TO CONSTRUCTION. ANY DAMAGE TO PREEXISTING EROSION AND SEDIMENTATION CONTROLS NOTED TO BE REPAIRED AT OWNER'S EXPENSE.
20. INTENTIONAL RELEASE OF VEHICLE OR EQUIPMENT FLUIDS ONTO THE GROUND IS NOT ALLOWED. CONTAMINATED SOIL RESULTING FROM ACCIDENTAL SPILL TO BE REMOVED AND DISPOSED OF PROPERLY.



TEMPORARY EROSION AND SEDIMENTATION GUIDELINES

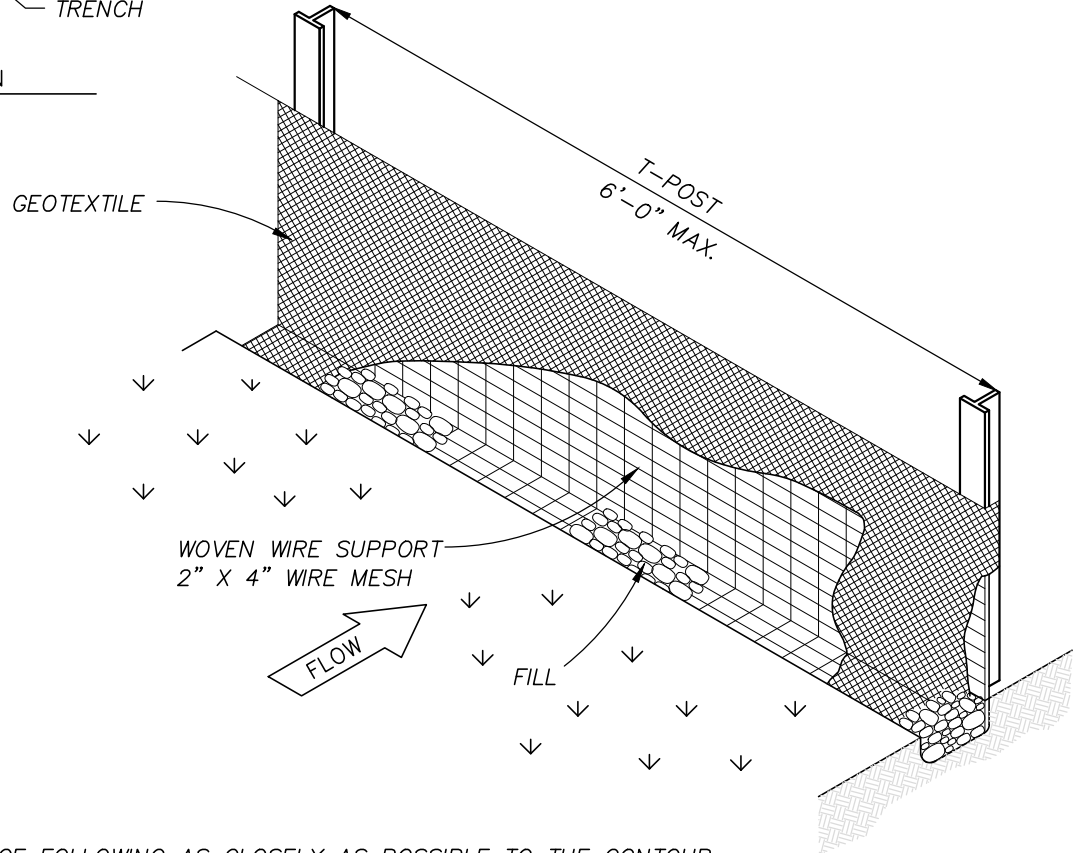
DETAIL NO.: 1020

SCALE: N.T.S.



INSPECTION AND MAINTENANCE GUIDELINES:

- INSPECT ALL FENCING WEEKLY, AND AFTER ANY RAINFALL EVENT.
- REMOVE SEDIMENT WHEN BUILDUP REACHES 6 INCHES.
- REPLACE ANY TORN FABRIC.
- REPLACE OR REPAIR ANY SECTIONS CRUSHED OR COLLAPSED IN THE COURSE OF CONSTRUCTION ACTIVITY.



INSTALLATION:

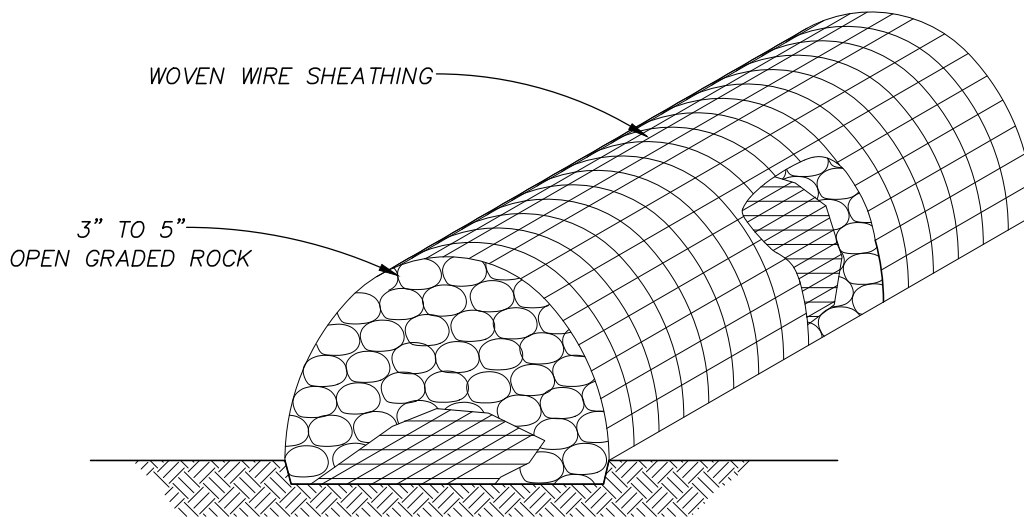
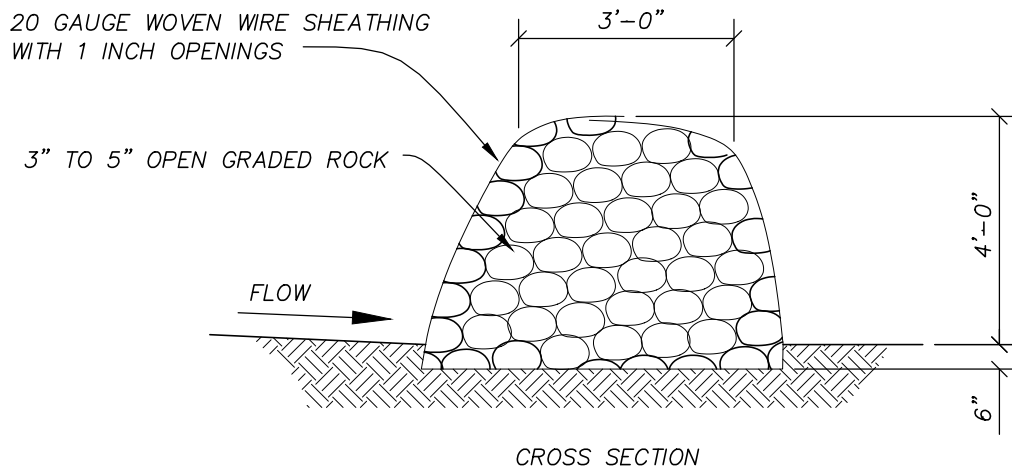
- LAYOUT THE SILT FENCE FOLLOWING AS CLOSELY AS POSSIBLE TO THE CONTOUR.
- CLEAR THE GROUND OF DEBRIS, ROCKS, PLANTS (INCLUDING GRASSES TALLER THAN 2") TO PROVIDE A SMOOTH FLOW APPROACH SURFACE. EXCAVATE 6" DEEP X 6" WIDE TRENCH ON UPSTREAM SIDE OF FACE PER PLANS.
- DRIVE THE HEAVY DUTY T-POST AT LEAST 12 INCHES INTO THE GROUND AND AT A SLIGHT ANGLE TOWARDS THE FLOW.
- ATTACH THE 2" X 4" 12 GAUGE WELDED WIRE MESH TO THE T-POST WITH 11 1/2 GAUGE GALVANIZED T-POST CLIPS. THE TOP OF THE WIRE TO BE 24" ABOVE GROUND LEVEL. THE WELDED WIRE MESH TO BE OVERLAPPED 6" AND TIED AT LEAST 6 TIMES WITH HOG RINGS.
- THE SILT FENCE TO BE INSTALLED WITH A SKIRT A MINIMUM OF 6" WIDE PLACED ON THE UPHILL SIDE OF THE FENCE INSIDE EXCAVATED TRENCH. THE FABRIC TO OVERLAP THE TOP OF THE WIRE BY 1".
- ANCHOR THE SILT FENCE BY BACKFILLING WITH EXCAVATED DIRT AND ROCKS (NOT LARGER THAN 2").
- GEOTEXTILE SPLICES SHOULD BE A MINIMUM OF 18" WIDE ATTACHED IN AT LEAST 6 PLACES. SPLICES IN CONCENTRATED FLOW AREAS WILL NOT BE ACCEPTED.
- SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.



SILT FENCE DETAIL

DETAIL NO.: 1030

SCALE: N.T.S.

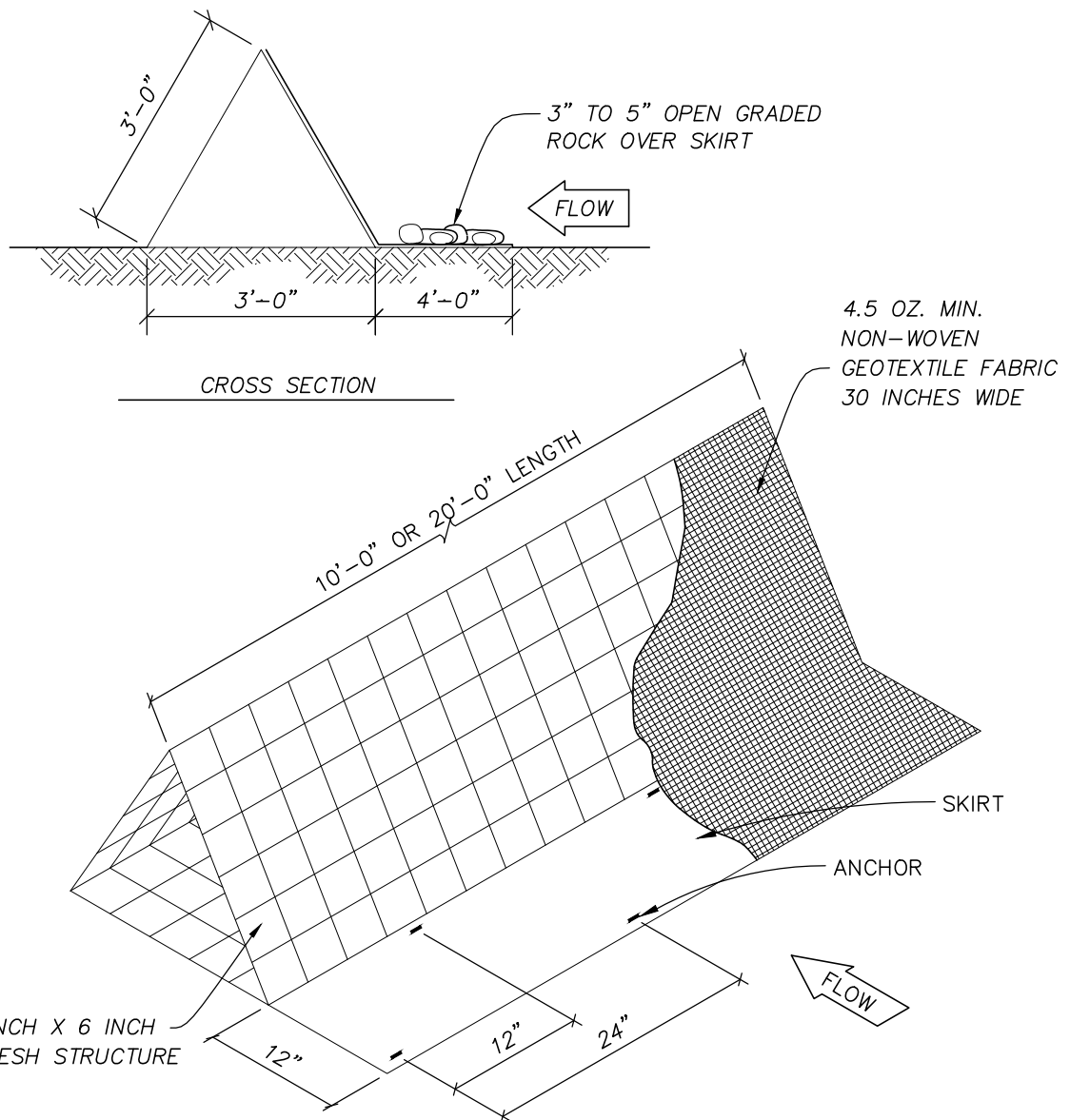


INSTALLATION:

- LAYOUT THE ROCK BERM FOLLOWING AS CLOSELY AS POSSIBLE TO THE CONTOUR.
- CLEAR THE GROUND OF DEBRIS, ROCKS OR PLANTS THAT WILL INTERFERE WITH INSTALLATION.
- PLACE WOVEN WIRE FABRIC ON THE GROUND ALONG THE PROPOSED INSTALLATION WITH ENOUGH OVERLAP TO COMPLETELY ENCIRCLE THE FINISHED SIZE OF THE BERM.
- PLACE THE ROCK ALONG THE CENTER OF THE WIRE TO THE DESIGNATED HEIGHT.
- WRAP THE STRUCTURE WITH THE PREVIOUSLY PLACED WIRE MESH SECURE ENOUGH SO THAT WHEN WALKED ACROSS THE STRUCTURE RETAINS ITS SHAPE.
- SECURE WITH TIE WIRE.
- THE ENDS OF THE BERM SHOULD BE TIED INTO EXISTING UPSLOPE GRADE AND THE BERM SHOULD BE BURIED IN A TRENCH APPROX. 4 INCHES DEEP TO PREVENT FAILURE OF THE CONTROL.
- THE ROCK BERM SHOULD BE LEFT IN PLACE UNTIL ALL UPSTREAM AREAS ARE STABILIZED AND ACCUMULATED SILT REMOVED.

INSPECTION AND MAINTENANCE GUIDELINES:

- INSPECTION SHOULD BE MADE WEEKLY AND AFTER EACH RAINFALL EVENT BY THE RESPONSIBLE PARTY. FOR INSTALLATIONS IN STREAMBEDS, ADDITIONAL DAILY INSPECTIONS SHOULD BE MADE.
- REMOVE SEDIMENT AND OTHER DEBRIS WHEN BUILDUP REACHES 6 INCHES AND DISPOSE OF THE ACCUMULATED SILT IN AN APPROVED MANNER.
- REPAIR ANY LOOSE WIRE SHEATHING.
- THE BERM SHOULD BE RESHAPED AS NEEDED DURING INSPECTION.
- THE BERM SHOULD BE REPLACED WHEN THE STRUCTURE CEASES TO FUNCTION AS INTENDED DUE TO SILT ACCUMULATION AMONG THE ROCKS, WASHOUT, CONSTRUCTION TRAFFIC DAMAGE, ETC.

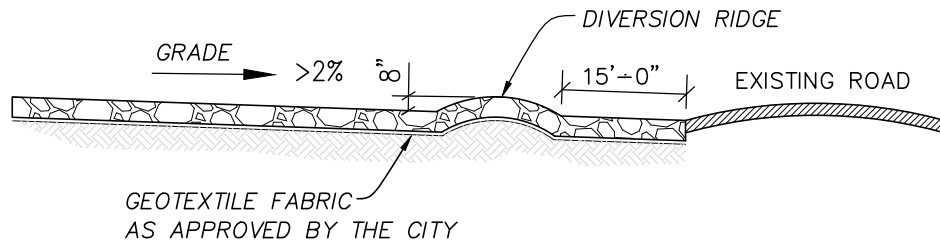
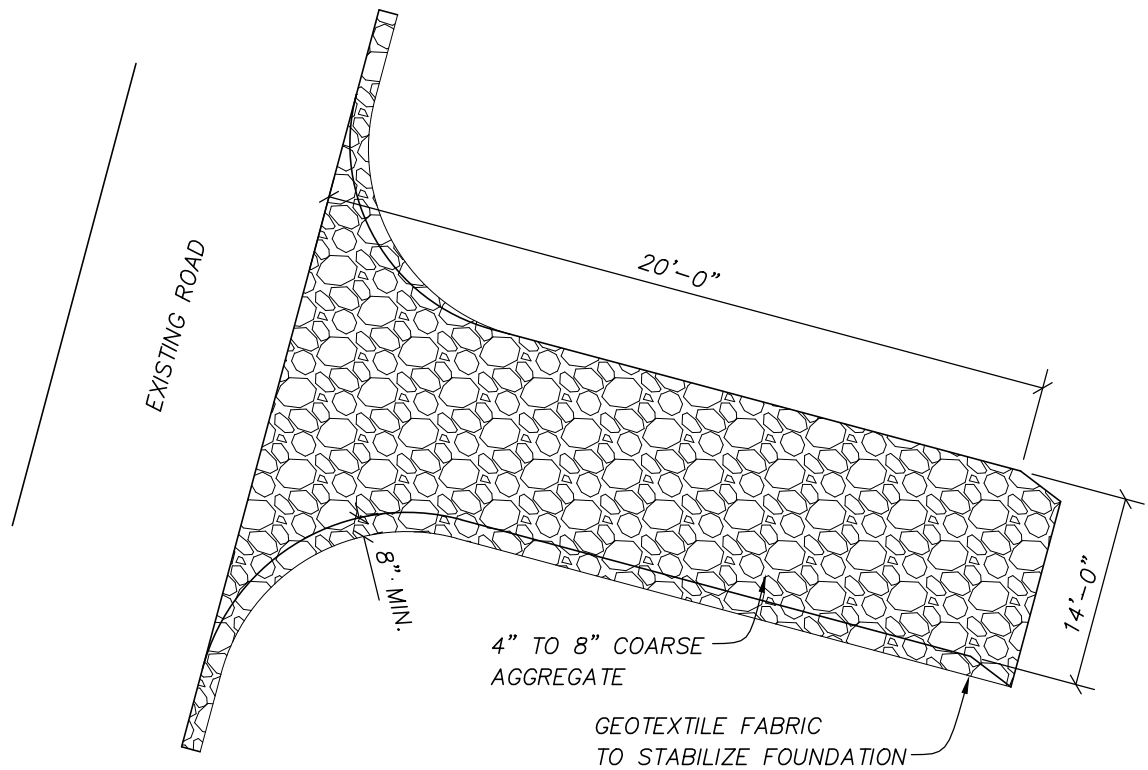


INSTALLATION:

- LAYOUT THE FILTER DIKE FOLLOWING AS CLOSELY AS POSSIBLE TO THE CONTOUR.
- CLEAR THE GROUND OF DEBRIS, ROCKS OR PLANTS THAT WILL INTERFERE WITH INSTALLATION.
- PLACE THE FILTER DIKE SECTIONS ONE AT A TIME, WITH THE SKIRT ON THE UPHILL SIDE TOWARDS THE DIRECTION OF FLOW, ANCHORING EACH SECTION TO THE GROUND BEFORE THE NEXT SECTION IS PLACED.
- ANCHORS SHOULD BE PLACED ON 2'-0" CENTERS ALTERNATING FROM FRONT TO BACK SO THAT THERE IS ACTUALLY ONLY 1'-0" IN BETWEEN ANCHORS.
- SECURELY FASTEN THE SKIRT FROM ONE SECTION OF FILTER DIKE TO THE NEXT.
- FILTER DIKES MUST MAINTAIN CONTINUOUS CONTACT WITH THE GROUND.
- AFTER THE SITE IS COMPLETELY STABILIZED, THE DIKES AND ANY REMAINING SILT SHOULD BE REMOVED. SILT SHOULD BE DISPOSED OF IN A MANNER THAT WILL NOT CONTRIBUTE TO ADDITIONAL SILTATION.

INSPECTION AND MAINTENANCE GUIDELINES:

- INSPECTION SHOULD BE MADE WEEKLY OR AFTER EACH RAINFALL EVENT AND REPAIR OR REPLACEMENT SHOULD BE MADE PROMPTLY AS NEEDED BY THE CONTRACTOR.
- INSPECT AND REALIGN BERMS AS NEEDED TO PREVENT GAPS BETWEEN THE SECTIONS.
- ACCUMULATED SILT SHOULD BE REMOVED AFTER EACH RAINFALL EVENT, AND DISPOSED OF IN A MANNER WHICH WILL NOT CAUSE ADDITIONAL SILTATION.



INSTALLATION:

- CLEAR THE AREA OF DEBRIS, ROCKS OR PLANTS THAT WILL INTERFERE WITH INSTALLATION.
- GRADE THE AREA FOR THE ENTRANCE TO FLOW BACK ON TO THE CONSTRUCTION SITE. RUNOFF FROM THE STABILIZED CONSTRUCTION.
- PLACE GEOTEXTILE FABRIC AS APPROVED BY THE ENGINEER.
- PLACE ROCK AS APPROVED BY THE ENGINEER.

INSPECTIONS AND MAINTENANCE GUIDELINES:

- THE ENTRANCE SHOULD BE MAINTAINED IN A CONDITION, WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
- ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ON TO PUBLIC RIGHTS-OF-WAY SHOULD BE REMOVED IMMEDIATELY BY CONTRACTOR.
- WHEN NECESSARY, WHEELS SHOULD BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHTS-OF-WAY.
- WHEN WASHING IS REQUIRED, IT SHOULD BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.
- ALL SEDIMENT SHOULD BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH OR WATER COURSE BY USING APPROVED METHODS.



STABILIZED CONSTRUCTION ENTRANCE DETAIL

DETAIL NO.: 1060

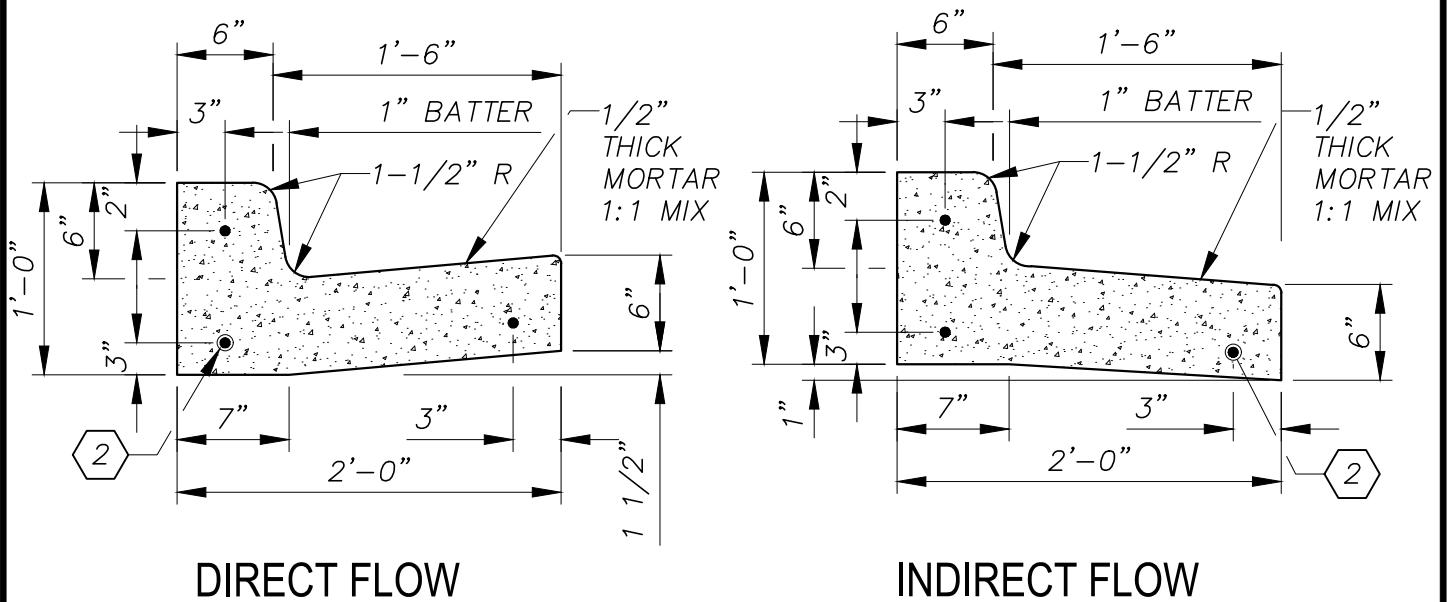
SCALE: N.T.S.

KEY NOTES

- 1 INSTALL 1/2" PREMOLDED EXPANSION JOINT MATERIAL AT 50' INTERVALS & AT BEGINNING & END OF ALL CURB RETURNS & DRIVE APPROACHES.
- 2 #3 REBAR, CONTINUOUS. INSTALL 3 EA. 5/8" ϕ X 2' LONG, SMOOTH DOWEL BARS AT ALL EXPANSION JOINTS & AT BEGINNING & END OF ALL CURB RETURNS. EXTEND BARS 12" INTO EACH SIDE OF JOINT & WRAP ONE END W/ 15# FELT, 15" LONG.
- 3 DUMMY JOINTS WILL BE CUT ON 10' SPACING. JOINTS WILL BE CUT AT LEAST 1/2 WAY THRU THE FACE, TOP, AND GUTTER TO INSURE CRACKS WILL OCCUR @ JOINT.

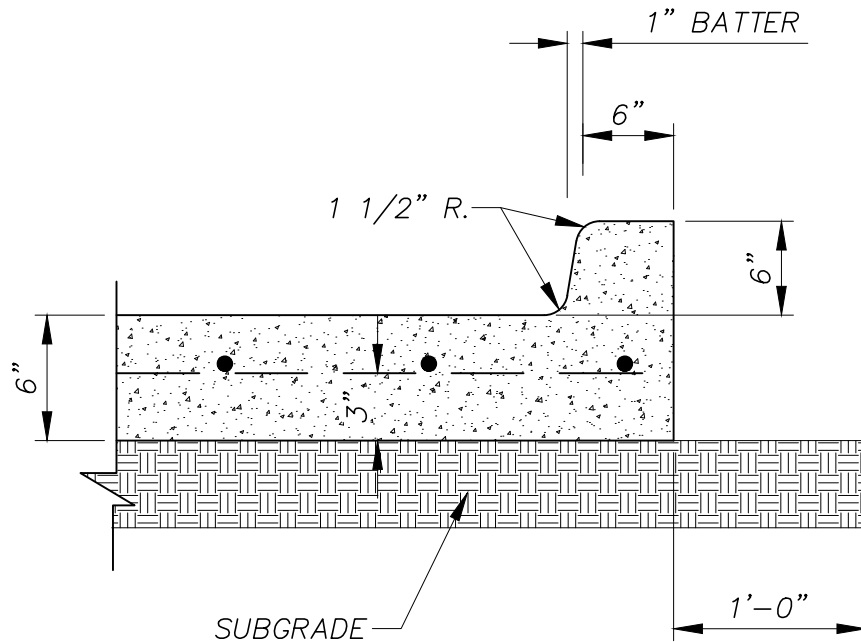
NOTES

1. ALL REINFORCED CONCRETE PAVING SHALL BE TXDOT CLASS "A", 3000 PSI CONCRETE.
2. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A615 GRADE 60, DEFORMED REINFORCING BARS. ALL REINFORCEMENT SHALL BE OF DOMESTIC MANUFACTURE.
3. EXPANSION JOINTS SHALL BE SPACED AT 50' C-C (MAXIMUM) AND AT ALL STRUCTURES, INTERSECTIONS, P.C.'S & P.T.'S
4. LONGITUDINAL CONTRACTION JOINT OR CONSTRUCTION JOINT SHALL BE THE WIDTH OF EACH LANE, BUT SHALL NOT EXCEED 15' C-C



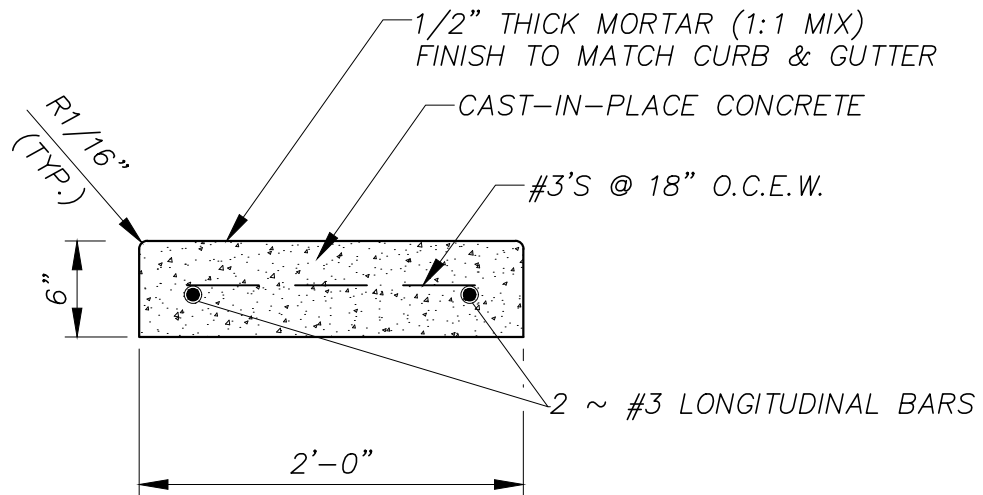
NOTES

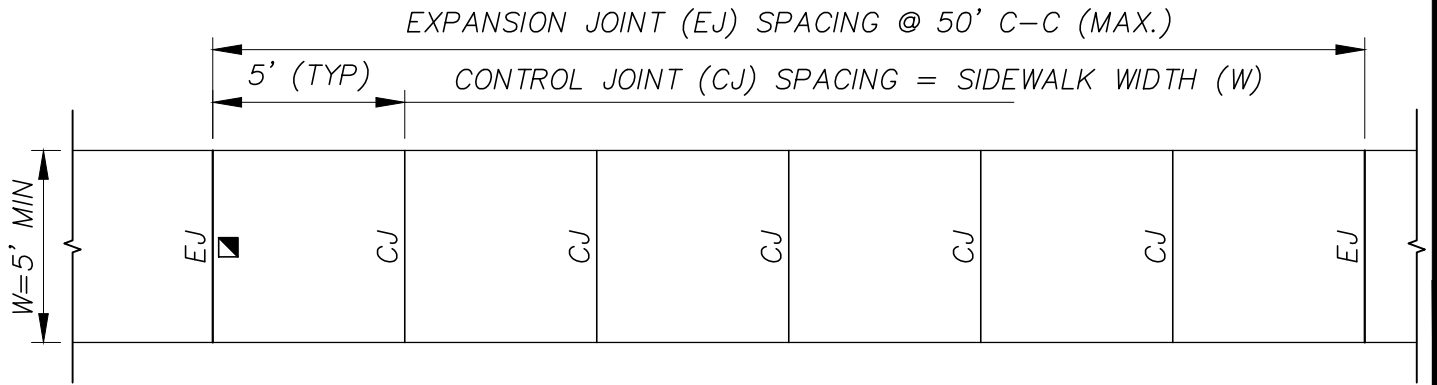
1. ALL REINFORCED CONCRETE PAVING SHALL BE TXDOT CLASS "P", 3600 PSI CONCRETE.
2. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A615 GRADE 60, DEFORMED REINFORCING BARS. ALL REINFORCEMENT SHALL BE OF DOMESTIC MANUFACTURE.
3. ALL REINFORCING SIZING AND SPACING SHALL BE INDICATED ON THE "TYPICAL SECTION."
4. INTEGRAL CONCRETE CURB AND/OR CONCRETE CURB AND GUTTER SHALL BE THE SAME MIX DESIGN AND COMPRESSIVE STRENGTH AS THE CONCRETE PAVING
5. EXPANSION JOINTS SHALL BE SPACED AT 60' C-C (MAXIMUM) AND AT ALL STRUCTURES, INTERSECTIONS, P.C.'S & P.T.'S
6. LONGITUDINAL CONTRACTION JOINT OR CONSTRUCTION JOINT SHALL BE THE WIDTH OF EACH LANE, BUT SHALL NOT EXCEED 15' C-C



NOTES

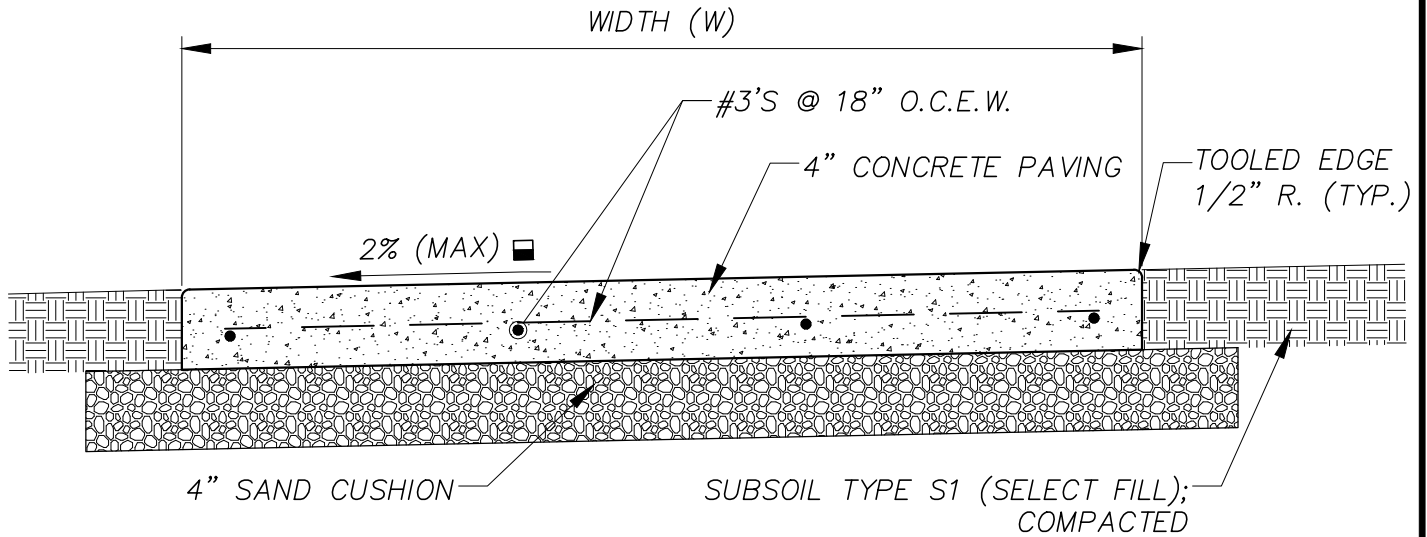
1. ALL REINFORCED CONCRETE PAVING SHALL BE TXDOT CLASS "A", 3000 PSI CONCRETE.
2. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A615 GRADE 60, DEFORMED REINFORCING BARS. ALL REINFORCEMENT SHALL BE OF DOMESTIC MANUFACTURE.
3. EXPANSION JOINTS SHALL BE SPACED AT 50' C-C (MAXIMUM) AND AT ALL STRUCTURES, INTERSECTIONS, P.C.'S & P.T.'S.
4. LONGITUDINAL CONTRACTION JOINT OR CONSTRUCTION JOINT SHALL BE THE WIDTH OF EACH LANE, BUT SHALL NOT EXCEED 15' C-C.





■ RE: JOINT DETAILS

PLAN



■ RE: DRAWINGS FOR SLOPE DIRECTION.
ALL SIDEWALK SHALL MEET CURRENT
TEXAS ACCESSIBILITY STANDARDS (TAS)

SECTION

NOTES

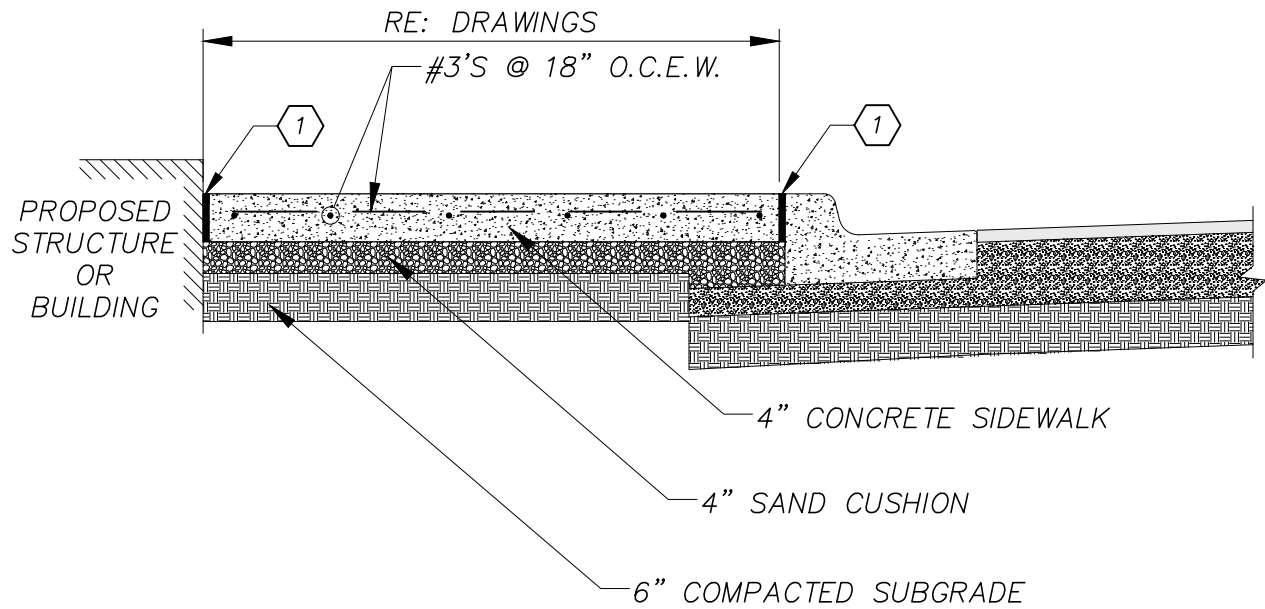
1. ALL REINFORCED CONCRETE PAVING SHALL BE TXDOT CLASS "A", 3000 PSI CONCRETE.
2. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A615 GRADE 60, DEFORMED REINFORCING BARS. ALL REINFORCEMENT SHALL BE OF DOMESTIC MANUFACTURE.



SIDEWALK DETAIL

DETAIL NO.: 2240

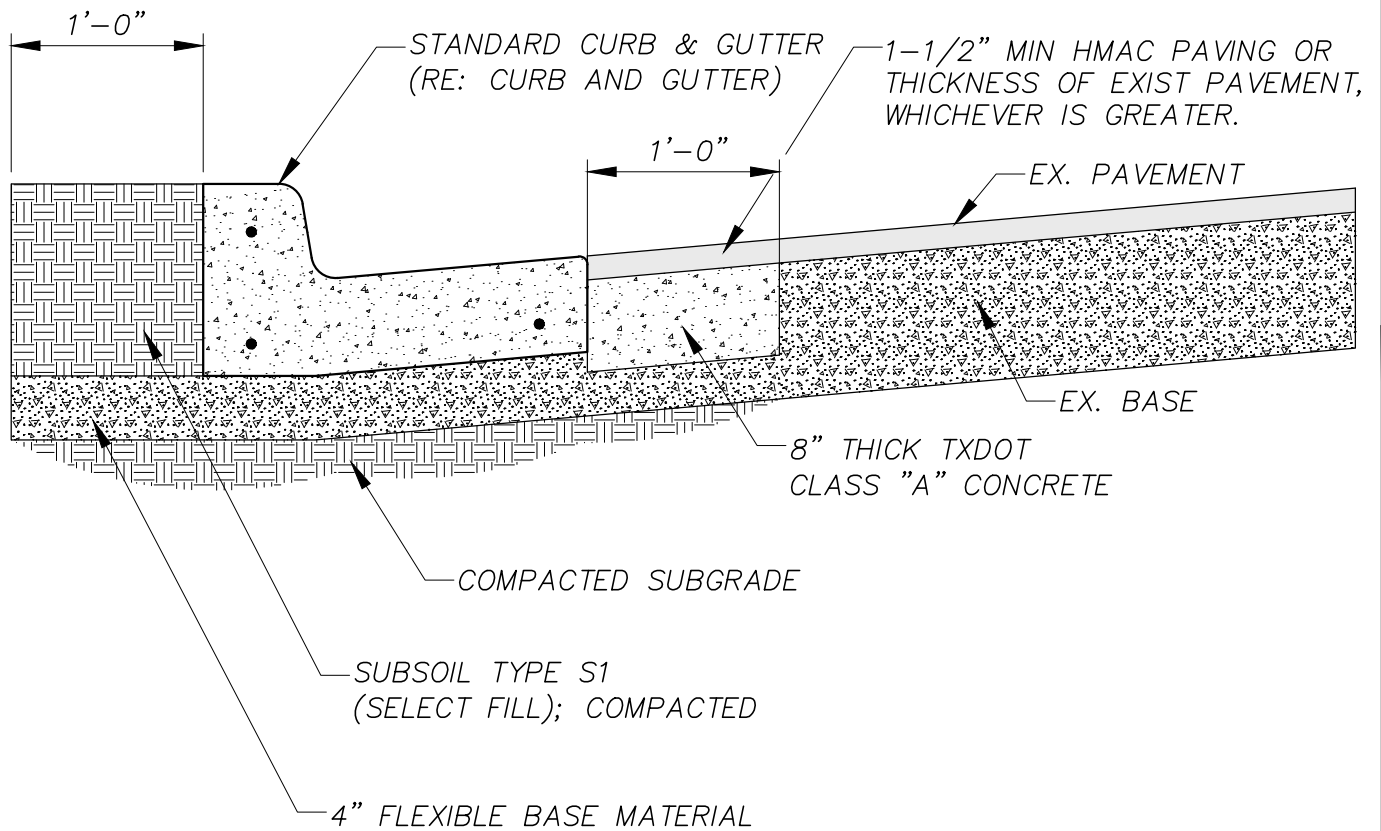
SCALE: N.T.S.



① 3/4" ISOLATION JOINT

NOTES

1. ALL REINFORCED CONCRETE PAVING SHALL BE TXDOT CLASS "A", 3000 PSI CONCRETE.
2. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A615 GRADE 60, DEFORMED REINFORCING BARS. ALL REINFORCEMENT SHALL BE OF DOMESTIC MANUFACTURE.
3. CONTRACTION JOINTS SHALL BE SPACED TO MATCH JOINTS IN CURB AND GUTTER.
4. EXPANSION JOINTS SHALL BE SPACED @ 50' O.C. AND SHALL MATCH EXPANSION JOINTS IN CURB AND GUTTER.



NOTES

1. ALL REINFORCED CONCRETE PAVING SHALL BE TXDOT CLASS "A", 3000 PSI CONCRETE.
2. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A615 GRADE 60, DEFORMED REINFORCING BARS. ALL REINFORCEMENT SHALL BE OF DOMESTIC MANUFACTURE.
3. ALL FLEXIBLE BASE MATERIAL SHALL BE TXDOT ITEM 247, TYPE A, GRADE 1 OR 2. COMPACTED TO 95% MODIFIED PROCTOR DENSITY $\pm 2\%$.

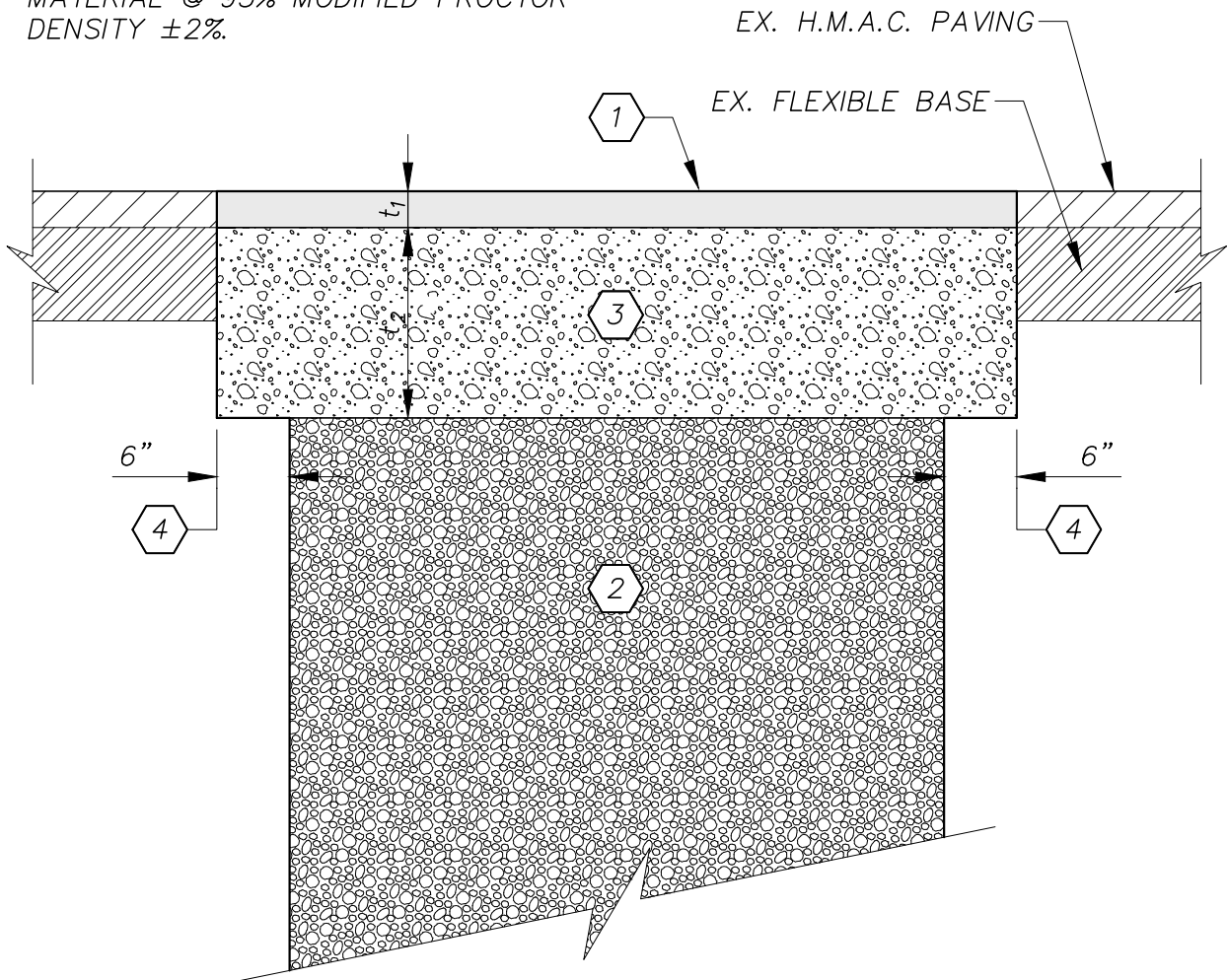
MATERIAL REQUIREMENTS

1 HOT MIXED ASPHALTIC CONCRETE (H.M.A.C.) PAVEMENT. MINIMUM THICKNESS (t_1) SHALL BE 2", OR MATCH EXISTING H.M.A.C. SURFACE, WHICHEVER IS GREATER.

3 FLEXIBLE BASE MATERIAL COMPACTED @ 95% MODIFIED PROCTOR DENSITY $\pm 2\%$. MINIMUM THICKNESS (t_2) FOR THE BASE SHALL BE 12", OR MATCH THE EXISTING BASE THICKNESS, WHICHEVER IS GREATER.

2 BACKFILL MATERIAL IN AREAS SUBJECT TO OR INFLUENCED BY VEHICULAR TRAFFIC (WITHIN 5' OF BACK OF CURB OR ASPHALT), SHALL BE BACKFILLED AND COMPACTED WITH FLEXIBLE BASE MATERIAL @ 95% MODIFIED PROCTOR DENSITY $\pm 2\%$.

4 SAWCUT EX. PVMT. TO SMOOTH, NEAT LINES.



CLASS "B"

SURFACE REPLACEMENT FOR
H.M.A.C. SURFACE WITH FLEXIBLE BASE

MATERIAL REQUIREMENTS

1 BACKFILL MATERIAL IN AREAS SUBJECT TO OR INFLUENCED BY VEHICULAR TRAFFIC (WITHIN 5' OF BACK OF CURB OR ASPHALT), SHALL BE BACKFILLED AND COMPACTED WITH FLEXIBLE BASE MATERIAL @ 95% MODIFIED PROCTOR DENSITY $\pm 2\%$.

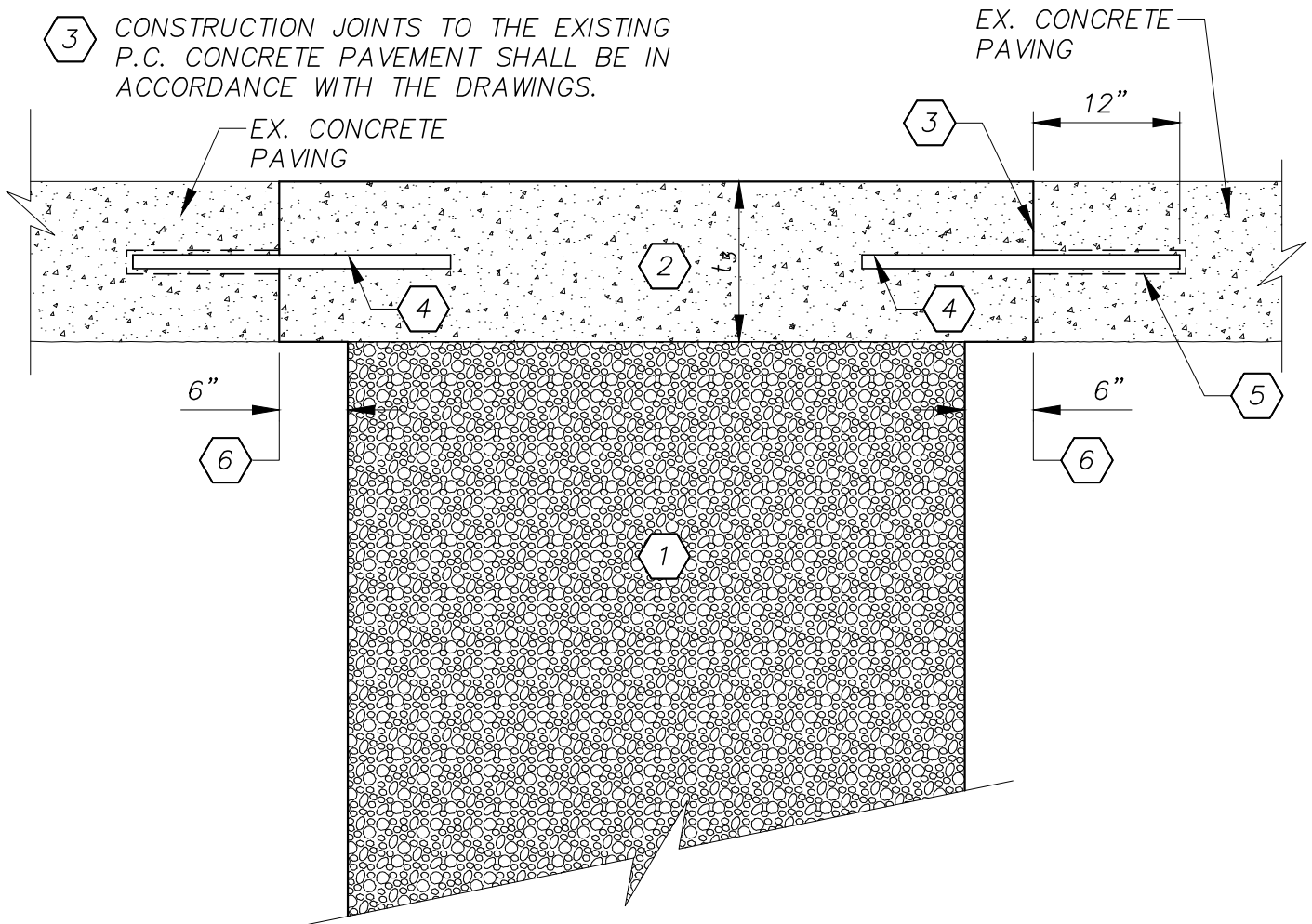
2 P.C. CONCRETE PAVEMENT (REINFORCED) SHALL BE TXDOT ITEM 360 CLASS "P", 3600 PSI CONCRETE. MINIMUM THICKNESS (t_3) FOR THE CONCRETE PAVING SHALL BE 8 INCHES, OR MATCH THE EXISTING CONCRETE PAVING THICKNESS, WHICHEVER IS GREATER.

3 CONSTRUCTION JOINTS TO THE EXISTING P.C. CONCRETE PAVEMENT SHALL BE IN ACCORDANCE WITH THE DRAWINGS.

4 #5'S x 24" DEFORMED DOWELS @ 12" O.C.

5 3/4" DRILLED HOLES BLOWN CLEAN. COAT DOWELS WITH EPOXY RESIN, FILL HOLES WITH EPOXY RESIN, & SUPPORT DOWELS IN CENTER OF HOLE UNTIL EPOXY HAS CURED.

6 SAWCUT EX. PVMT. TO SMOOTH, NEAT LINES.



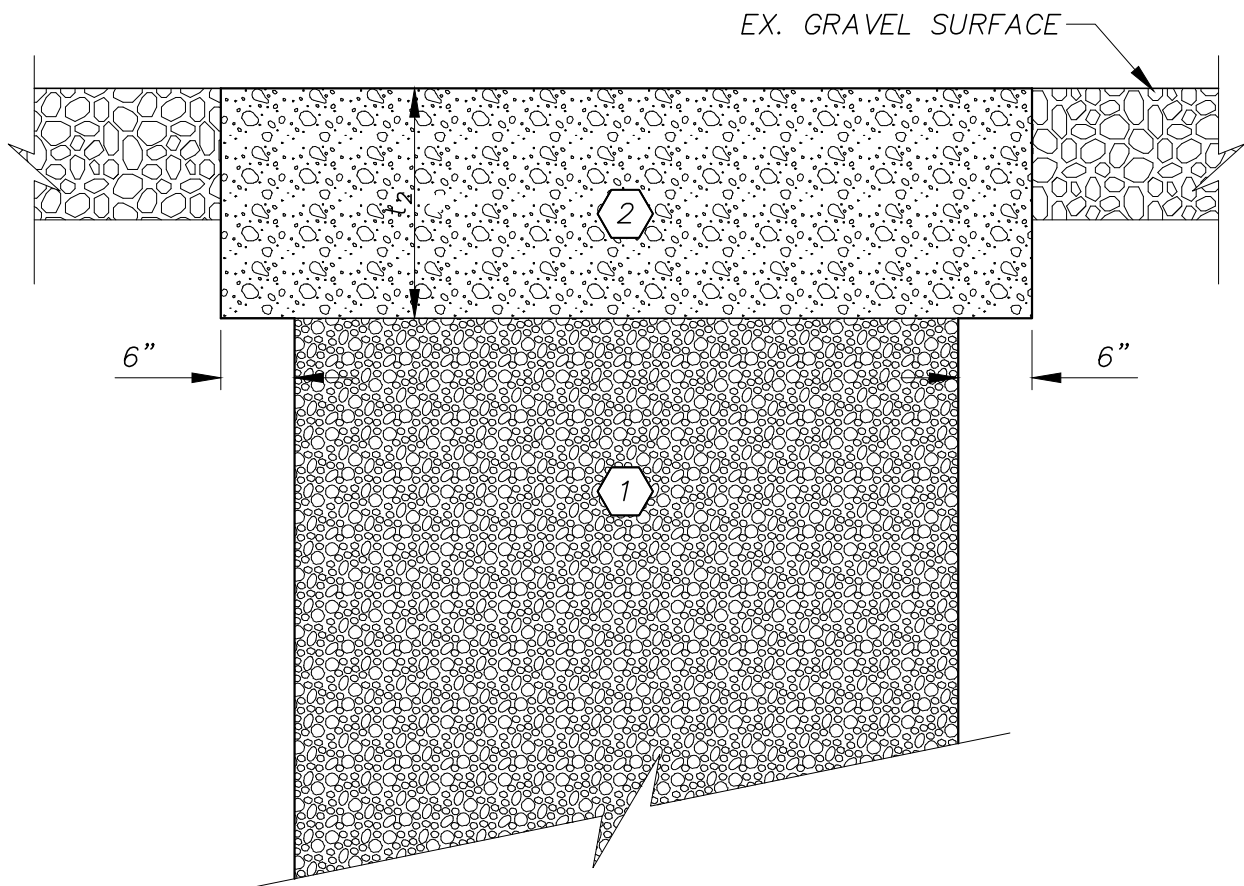
CLASS "C"

SURFACE REPLACEMENT FOR
CONCRETE PAVING

MATERIAL REQUIREMENTS

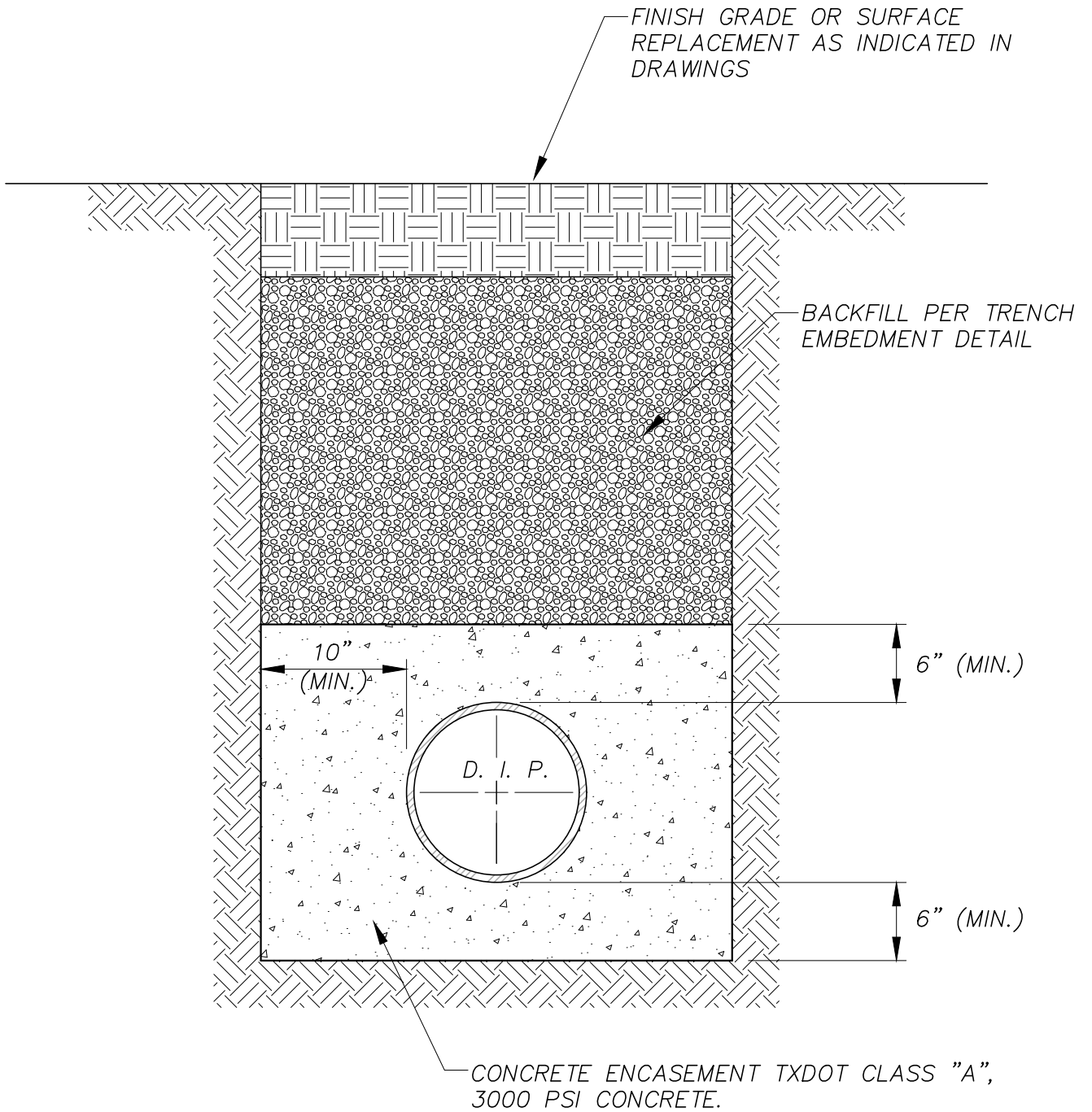
① BACKFILL MATERIAL IN AREAS SUBJECT TO OR INFLUENCED BY VEHICULAR TRAFFIC (WITHIN 5' OF BACK OF CURB OR ASPHALT), SHALL BE BACKFILLED AND COMPACTED WITH FLEXIBLE BASE MATERIAL @ 95% MODIFIED PROCTOR DENSITY ± 2 .

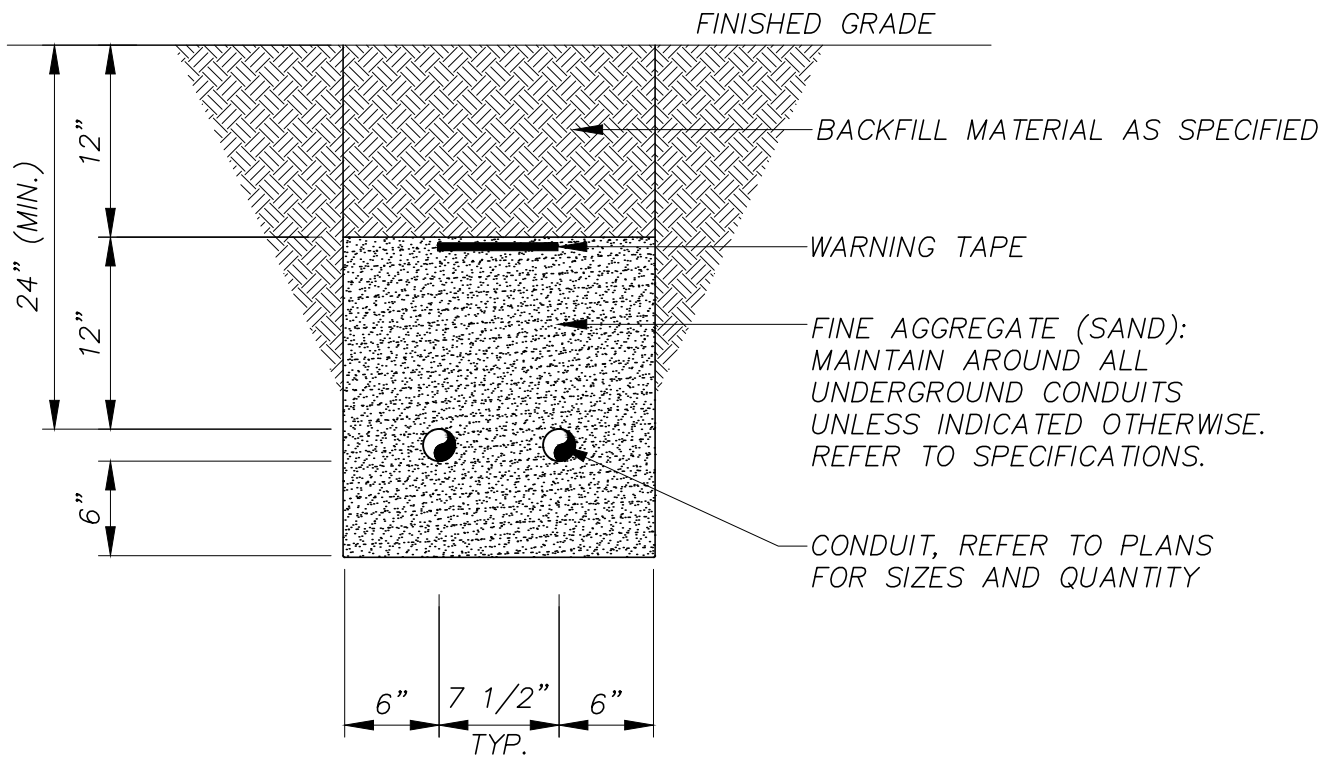
② FLEXIBLE BASE MATERIAL COMPACTED @ 95% MODIFIED PROCTOR DENSITY ± 2 . MINIMUM THICKNESS (t_2) FOR THE BASE SHALL BE 12", OR MATCH THE EXISTING BASE THICKNESS, WHICHEVER IS GREATER.

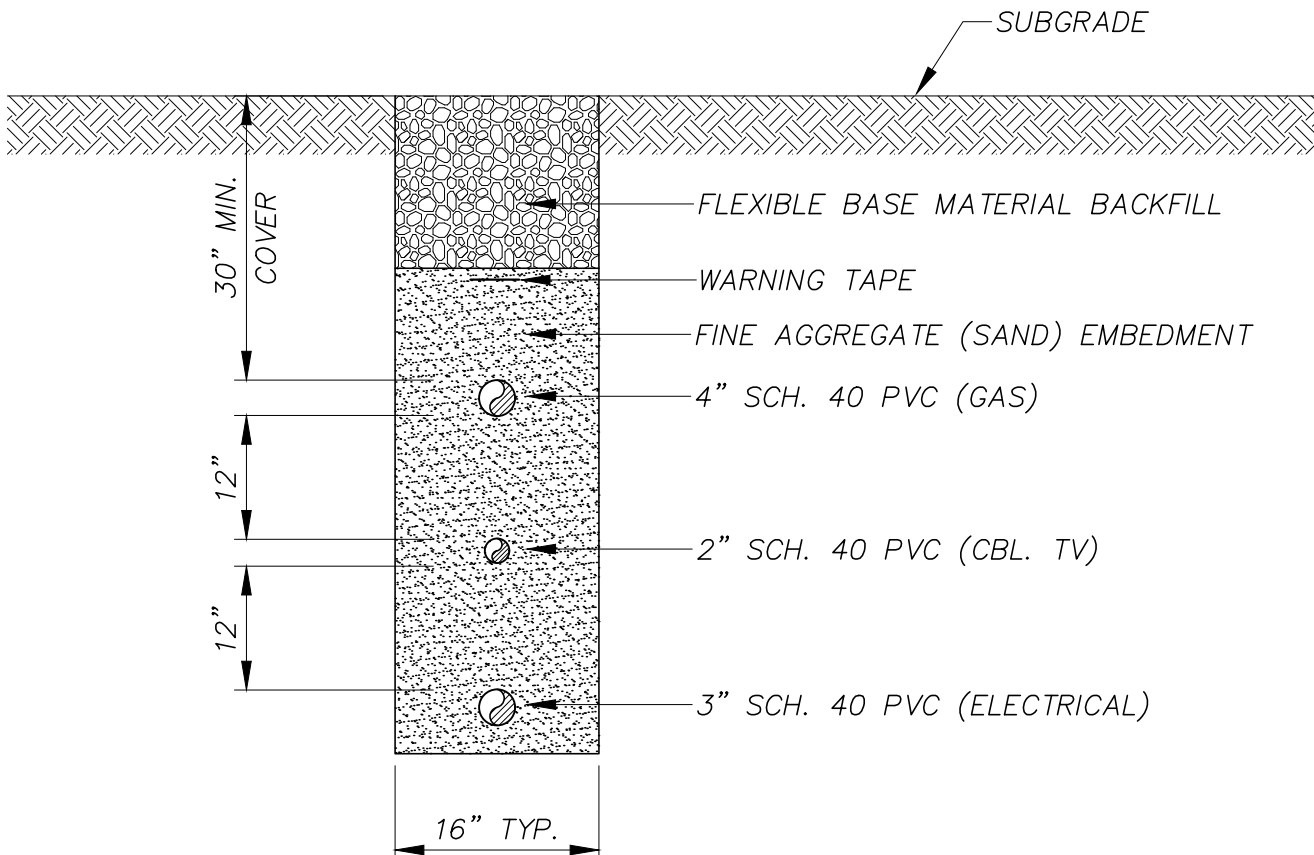


CLASS "D"

SURFACE REPLACEMENT FOR
GRAVEL SURFACE



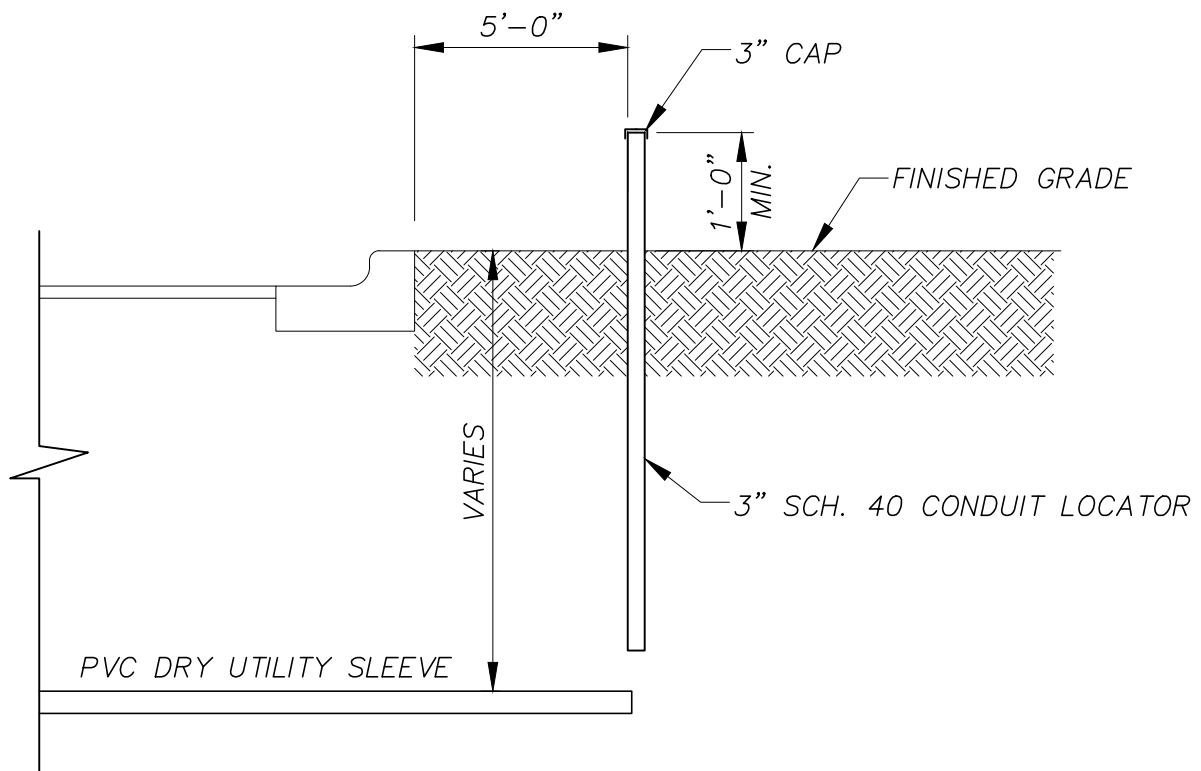




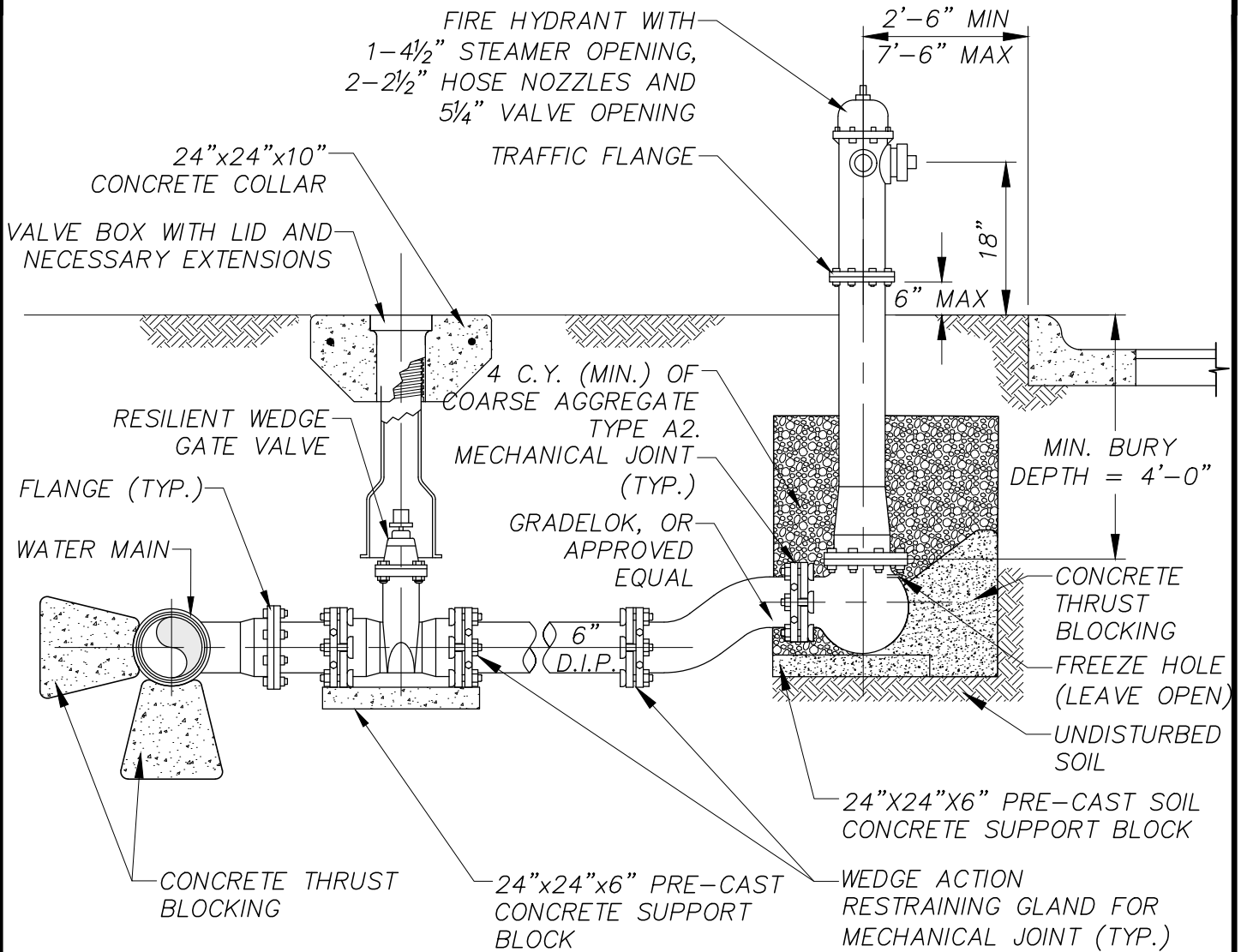
COMMON DRY UTILITY TRENCH DETAIL AT STREET CROSSING

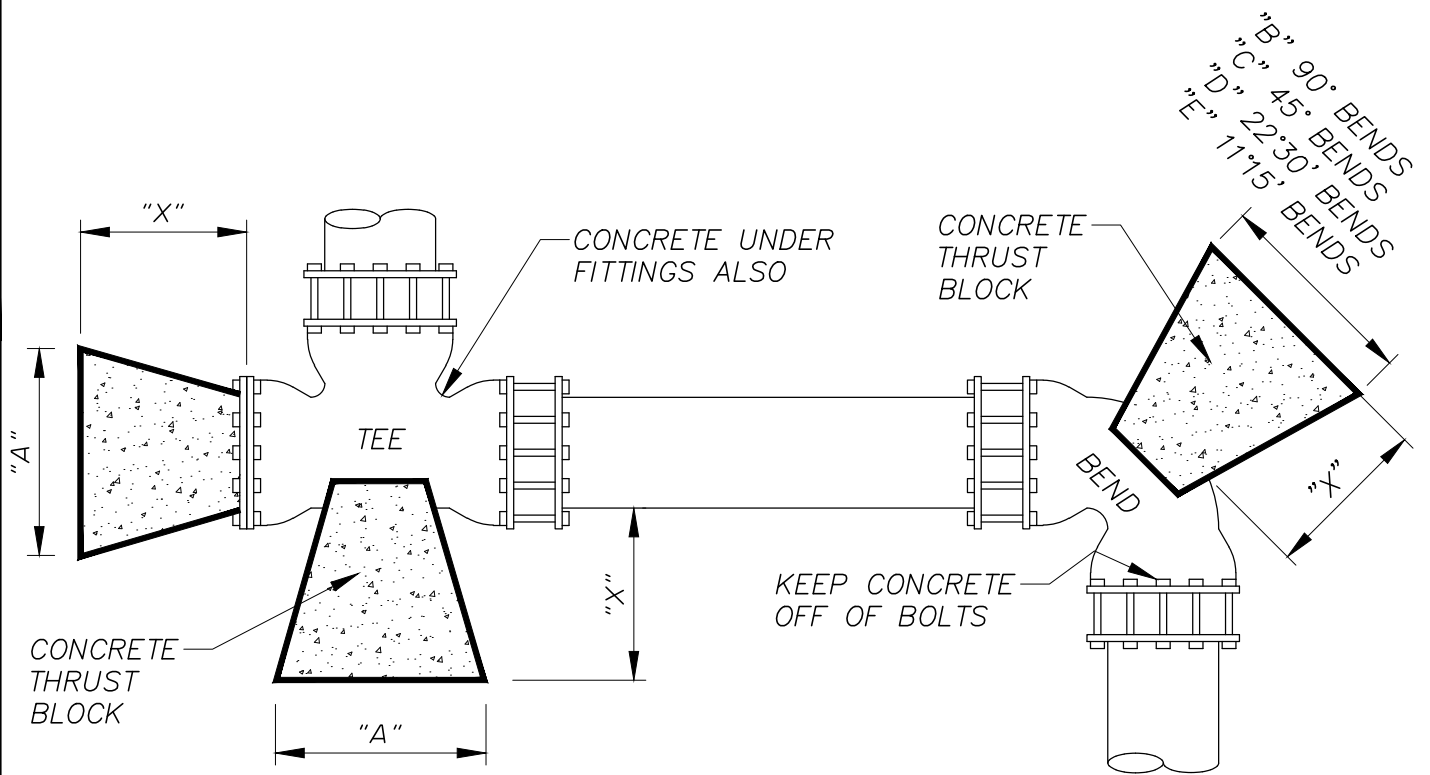
DETAIL NO.: 3080

SCALE: N.T.S.



DRY UTILITY SLEEVE LOCATOR DETAIL





DIM "X" TO BE A MIN. OF ONE FT. (1') BUT IS TO BE INCREASED WHERE NECESSARY TO PROVIDE BEARING AGAINST UNDISTURBED TRENCH WALL.

HORIZONTAL BLOCKING TABLE																
PIPE SIZE	"X" DIM.	PLUGS & TEES			90° BENDS			45° BENDS			22°30' BENDS			11°15' BENDS		
		"A"	MIN. AREA	MIN. VOL.	"B"	MIN. AREA	MIN. VOL.	"C"	MIN. AREA	MIN. VOL.	"D"	MIN. AREA	MIN. VOL.	"E"	MIN. AREA	MIN. VOL.
4"	1'-0"	1'-0"	0.83	0.05	1'-0"	0.83	0.05	1'-0"	0.83	0.05	1'-0"	0.83	0.05	1'-0"	0.83	0.05
6"	1'-6"	1'-0"	1.06	0.06	1'-2"	1.05	0.09	1'-0"	0.83	0.05	1'-0"	0.83	0.05	1'-0"	0.83	0.05
8"	1'-6"	1'-3"	1.89	0.11	1'-6"	2.66	0.15	1'-3"	1.44	0.08	1'-0"	0.83	0.05	1'-0"	0.83	0.05
10"	1'-6"	1'-9"	2.95	0.17	2'-0"	4.17	0.24	1'-6"	2.26	0.13	1'-3"	1.15	0.07	1'-0"	0.83	0.05
12"	1'-6"	2'-0"	4.25	0.24	2'-3"	6.00	0.34	1'-9"	3.25	0.18	1'-3"	1.65	0.10	1'-0"	0.83	0.05
16"	2'-0"	2'-7"	7.54	0.56	3'-0"	10.65	0.79	2'-3"	5.76	0.43	1'-8"	2.94	0.22	1'-2"	1.48	0.11
18"	2'-0"	2'-11"	7.70	0.57	3'-5"	10.89	0.82	2'-6"	5.89	0.44	1'-10"	3.01	0.22	1'-5"	1.51	0.11
20"	2'-0"	3'-3"	7.86	0.59	3'-9"	11.12	0.84	2'-9"	6.01	0.45	2'-0"	3.07	0.23	1'-7"	1.54	0.12
24"	2'-0"	3'-8"	11.33	0.84	4'-3"	16.00	1.20	3'-2"	8.65	0.65	2'-6"	4.42	0.33	1'-10"	2.22	0.17

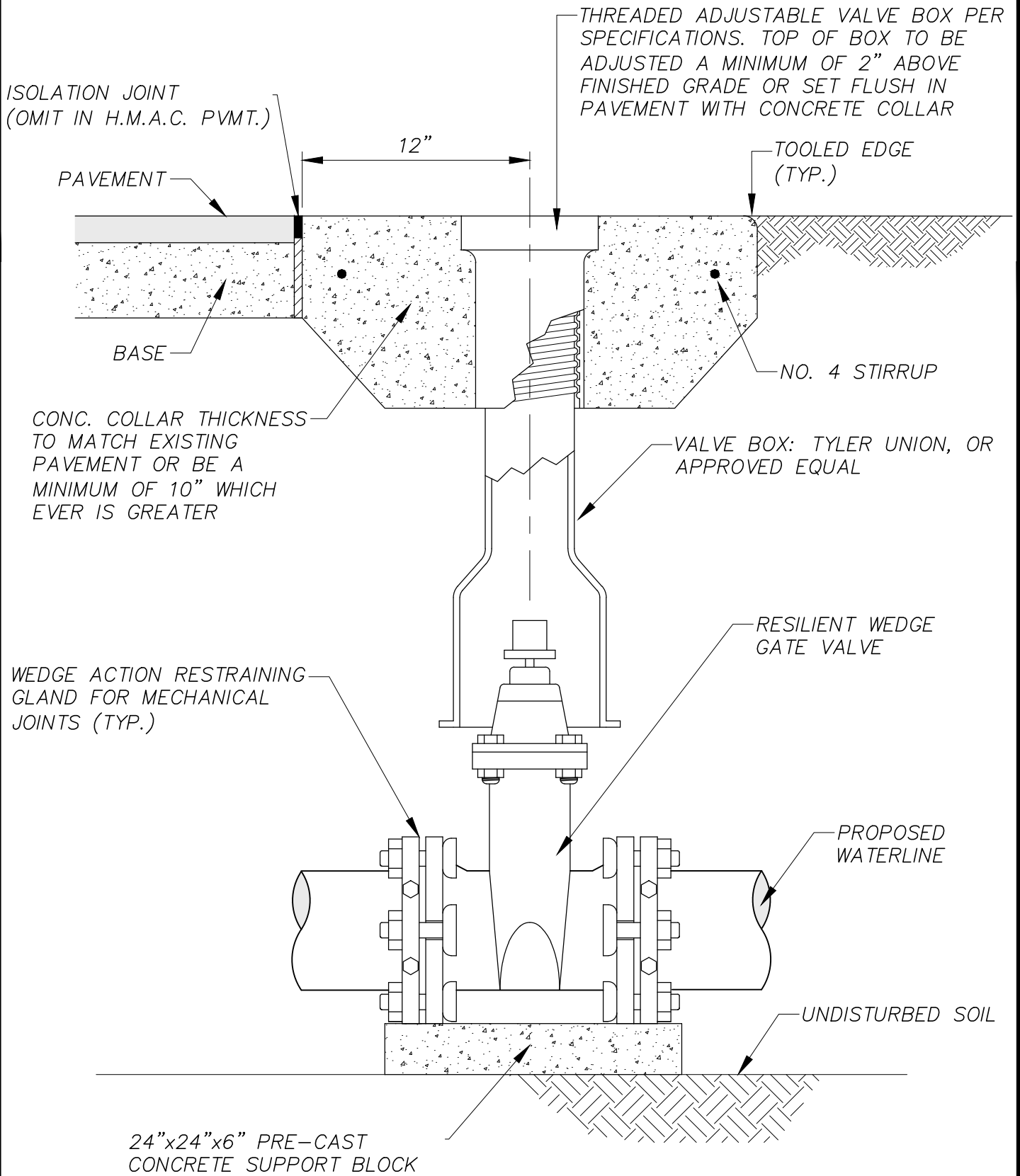
NOTE: CALCULATIONS IN MIN. AREA COLUMN ARE IN SQUARE FEET. CALCULATIONS IN THE MIN. VOLUME COLUMN ARE IN CUBIC YARDS.

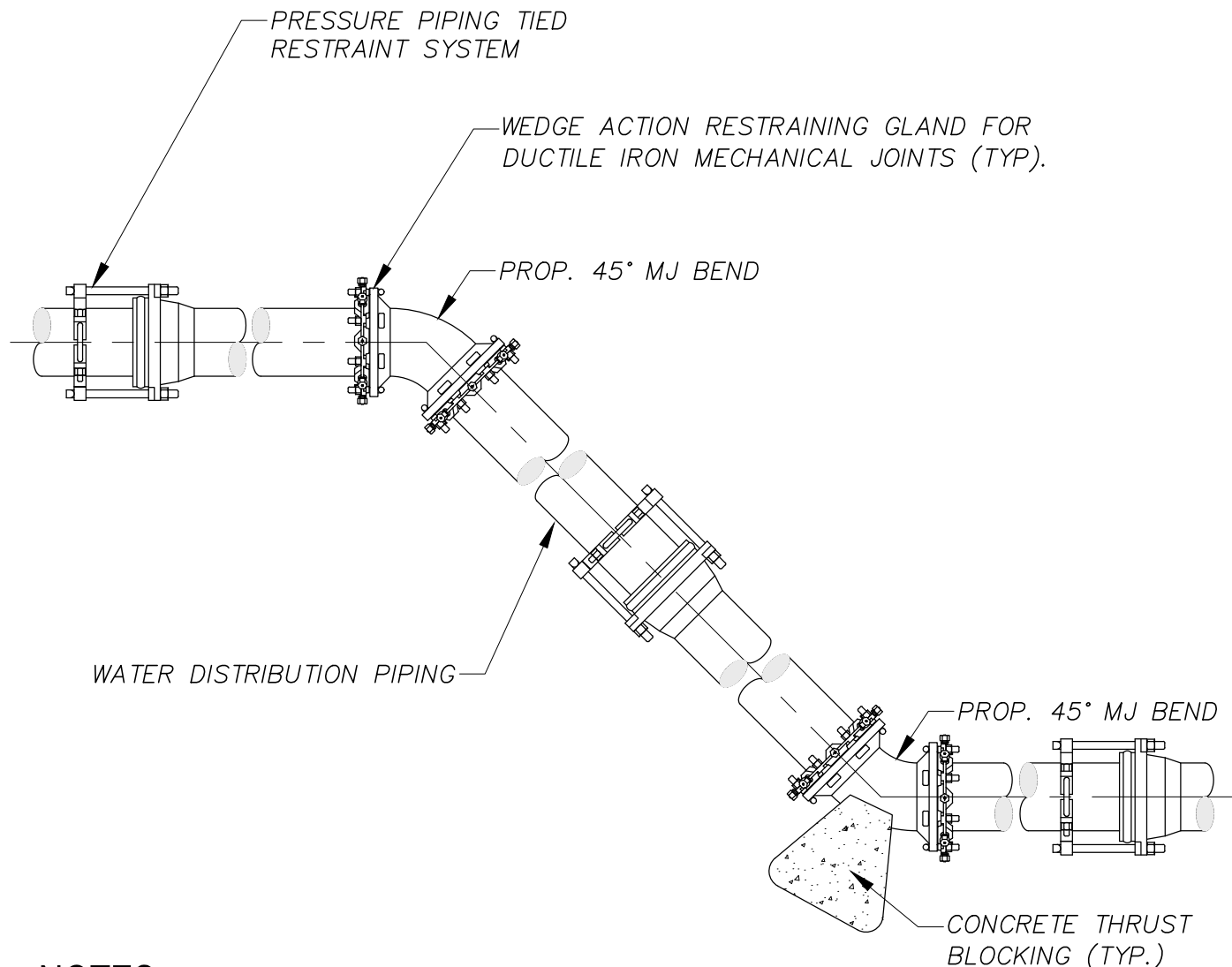


CONCRETE THRUST BLOCKING DETAIL FOR MJ PIPE FITTINGS

DETAIL NO.: 4020

SCALE: N.T.S.





NOTES:

1. PIPES CONNECTED TO THE UPPER BEND RESTRAINTS SHALL BE EBAA IRON SERIES 1500 (OR EQUAL) FOR C-900 PIPE AND SERIES 2800 (OR EQUAL) FOR C-905 PIPE FOR LENGTHS INDICATED IN THE DRAWINGS (RULING), OR ON THE TABLE BELOW (DEFAULT).
2. PIPES CONNECTED TO THE LOWER BEND SHALL BE EBAA IRON SERIES 1500 (OR EQUAL) FOR C-900 PIPE AND SERIES 2800 (OR EQUAL) FOR C-905 PIPE FOR LENGTHS INDICATED IN THE DRAWINGS (RULING) OR ON THE TABLE BELOW (DEFAULT).

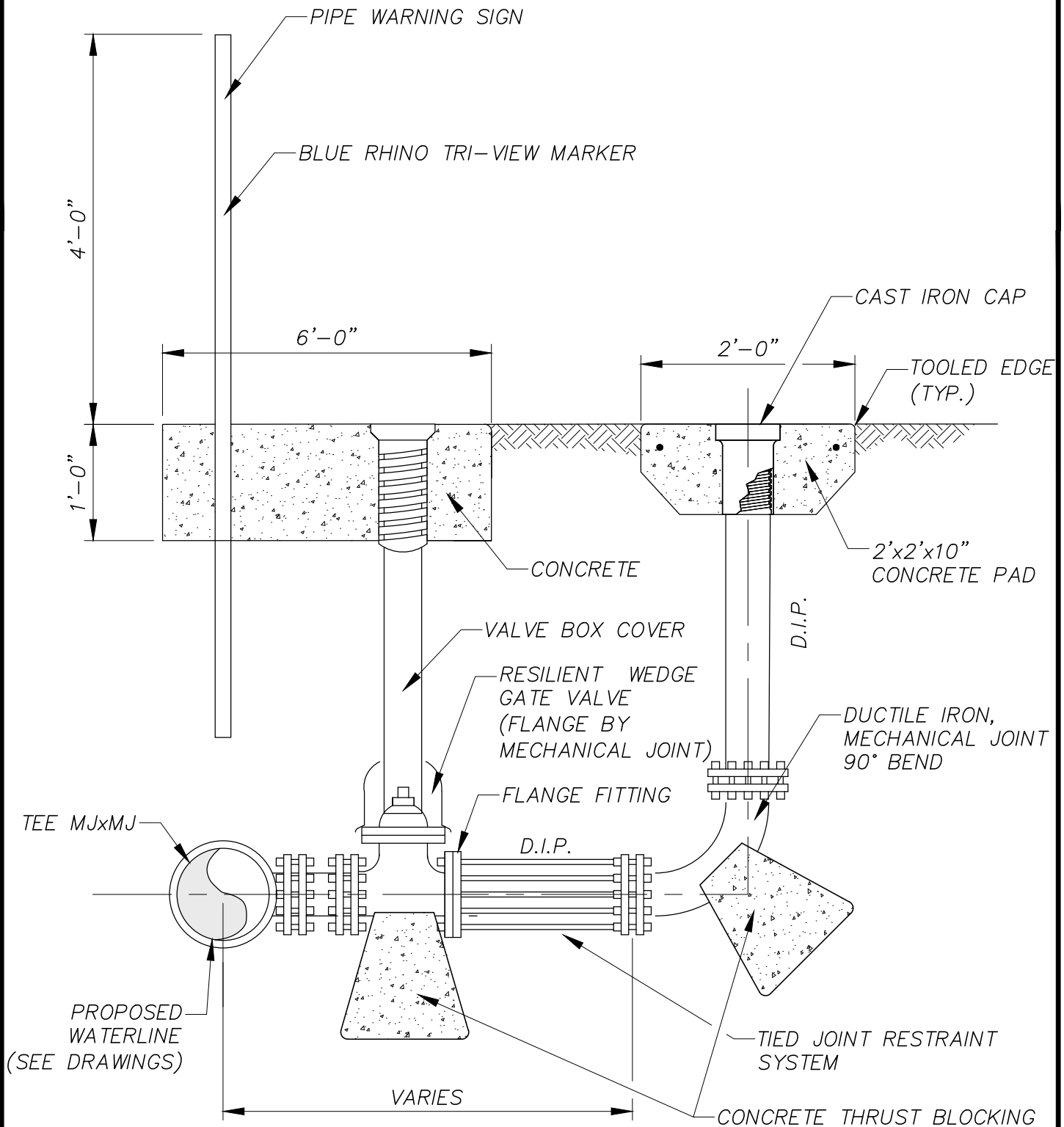
PIPE SIZE	6"	8"	10"	12"	14"	16"	18"	20"	> 20"
UPPER RESTRAINED LENGTH FT.	23'	30'	36'	43'	49'	55'	61'	67'	REFERENCE DRAWINGS
LOWER RESTRAINED LENGTH FT.	6'	8'	10'	12'	13'	15'	16'	18'	REFERENCE DRAWINGS



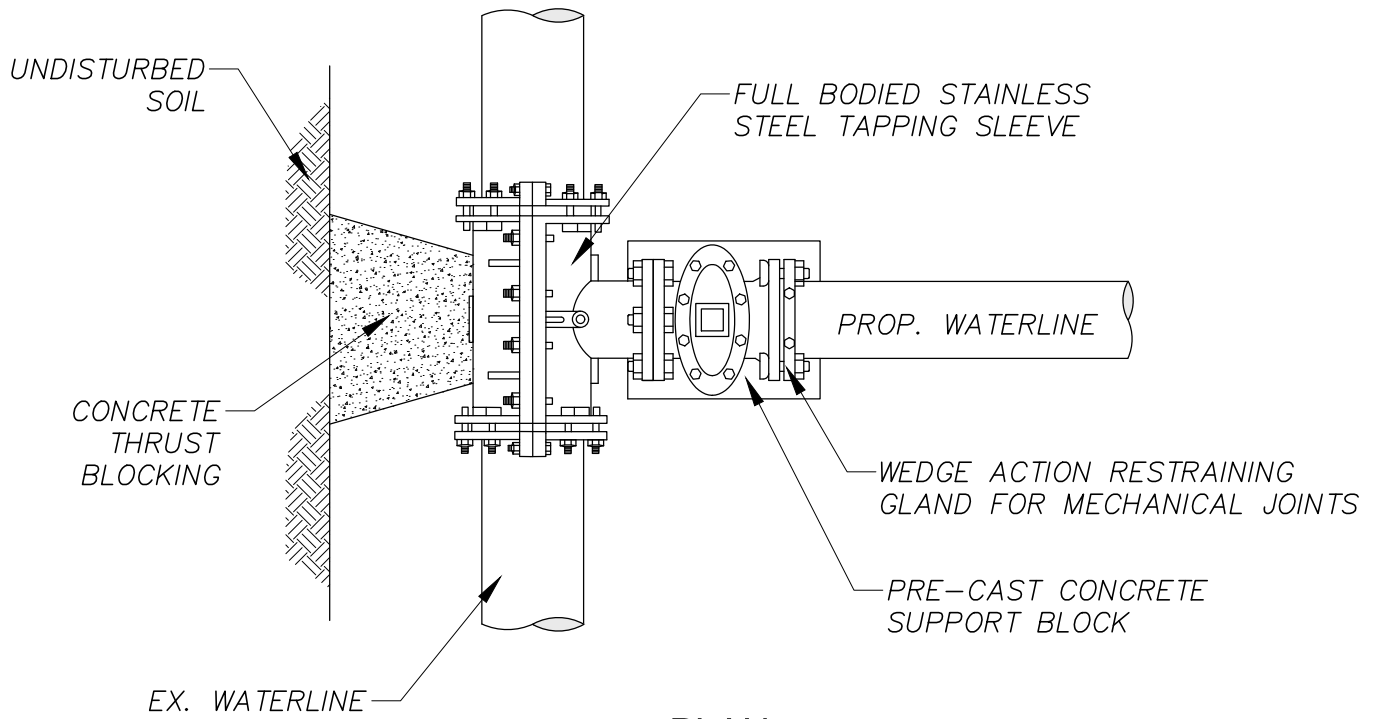
VERTICAL BEND RESTRAINED JOINT DETAIL

DETAIL NO.: 4040

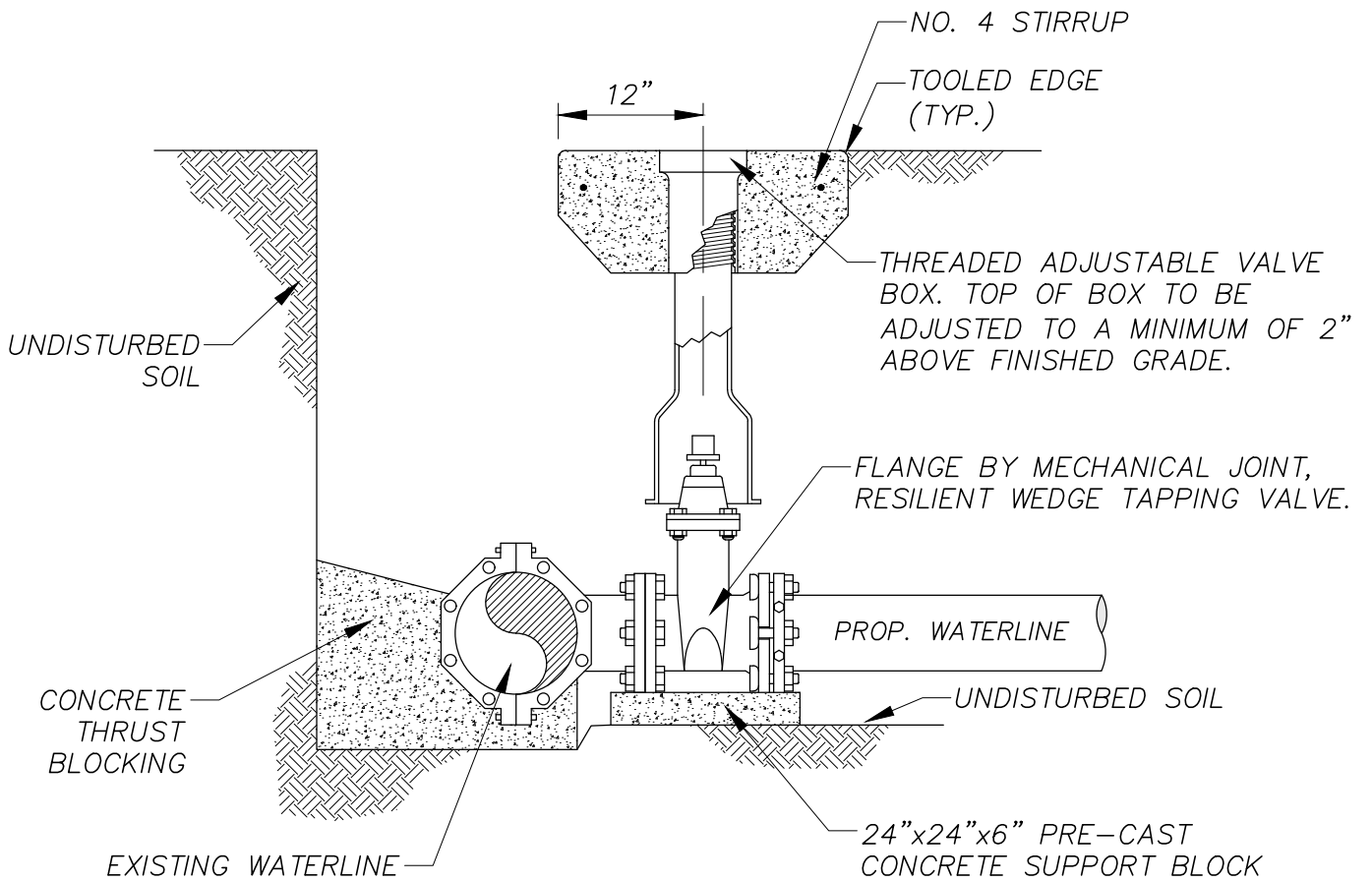
SCALE: N.T.S.



ASSEMBLY INCLUDES:
 TEE, VALVE, PIPE, BENDS, BLOCKING,
 RISER, CAP, PAD, SIGN, AND CONCRETE.

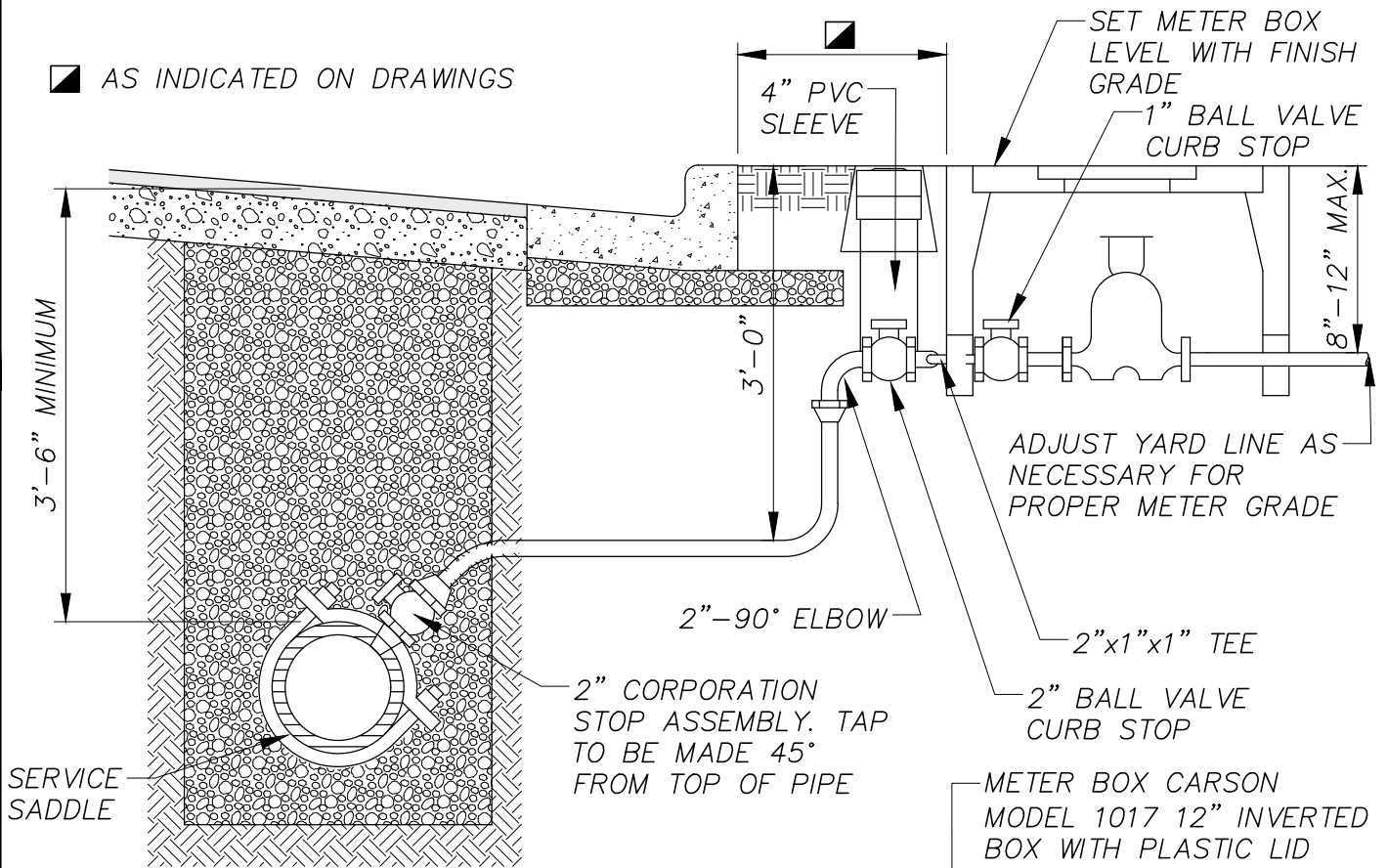


PLAN

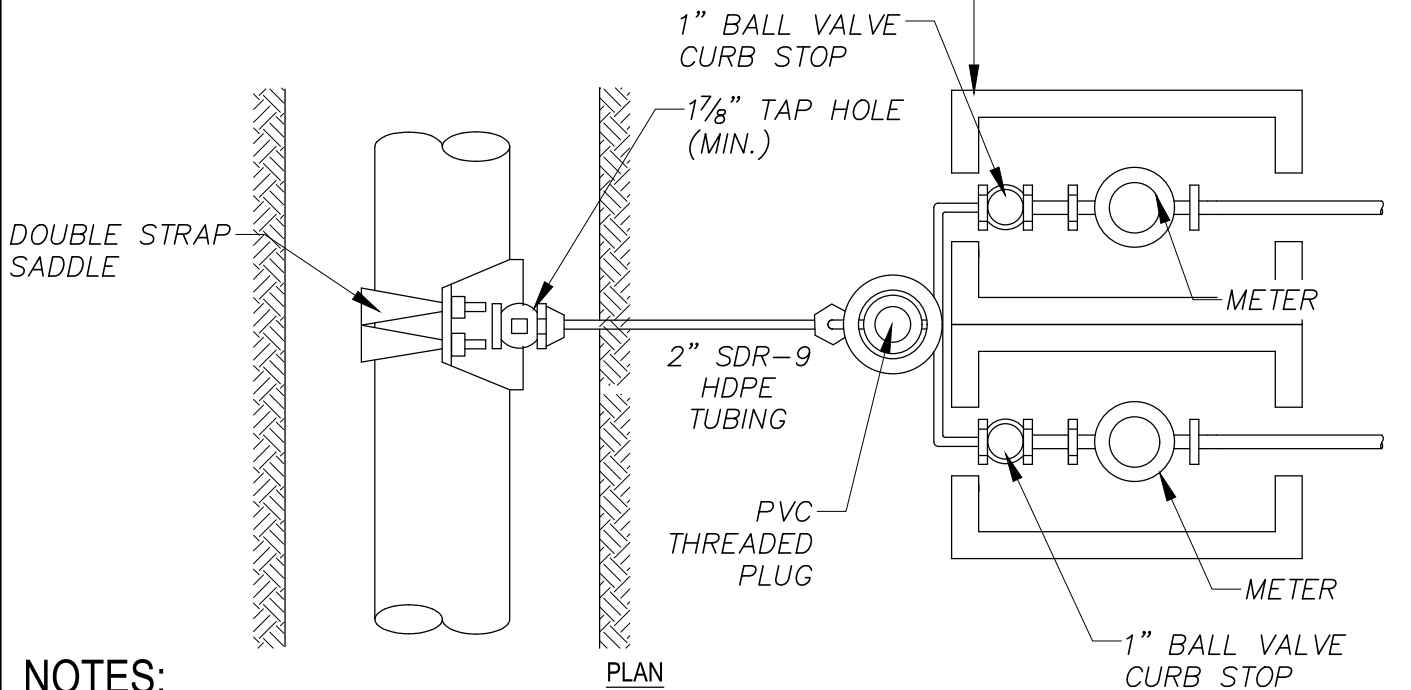


SECTION

AS INDICATED ON DRAWINGS



SECTION



NOTES:

1. WHERE METER BOX IS EXPOSED TO TRAFFIC OR IN SIDEWALK, USE CONCRETE BOX WITH CAST IRON TRAFFIC COVER AND CAST IRON READER LID.

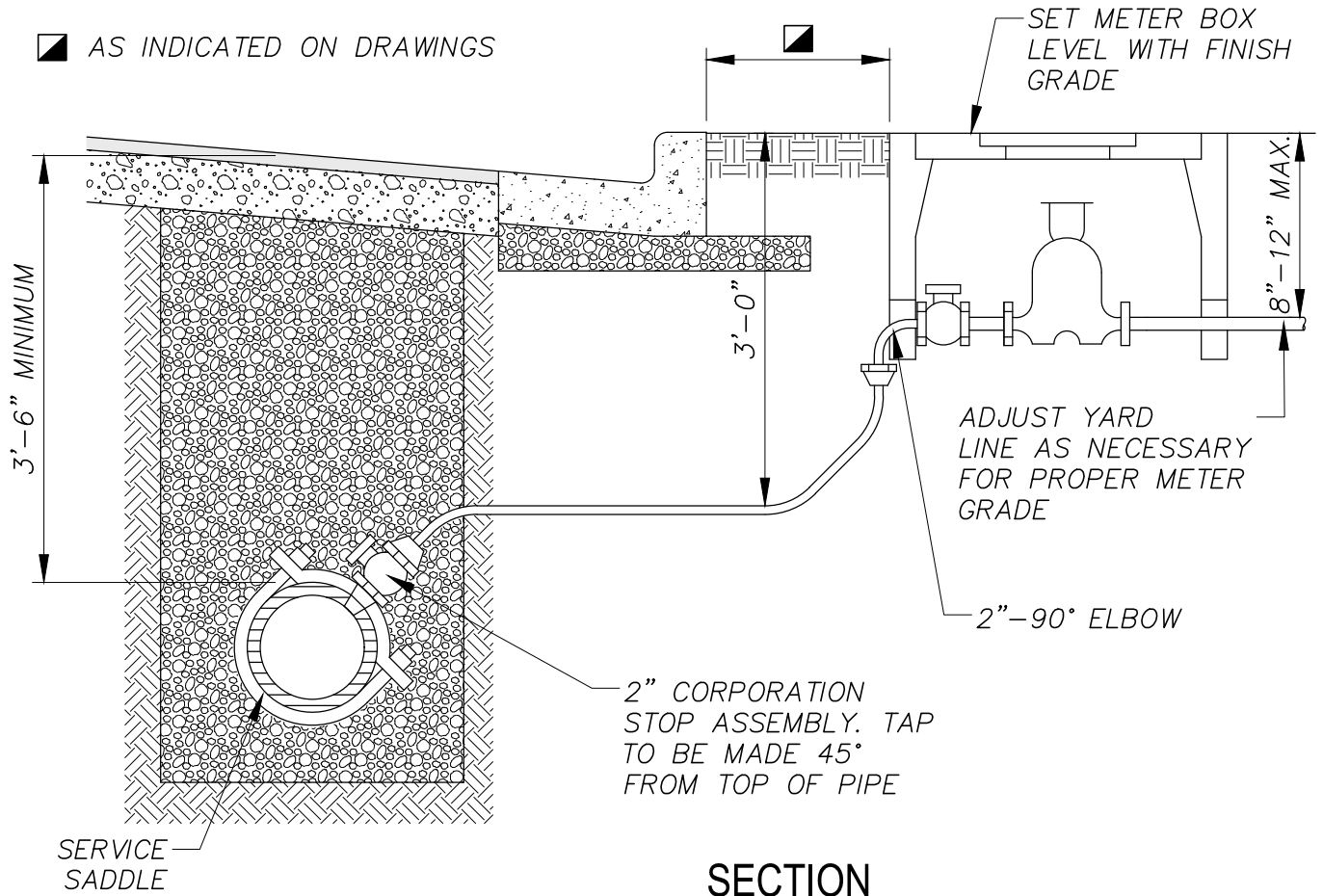


BULLHEAD (2-1IN) WATER SERVICE & METER BOX INSTALLATION

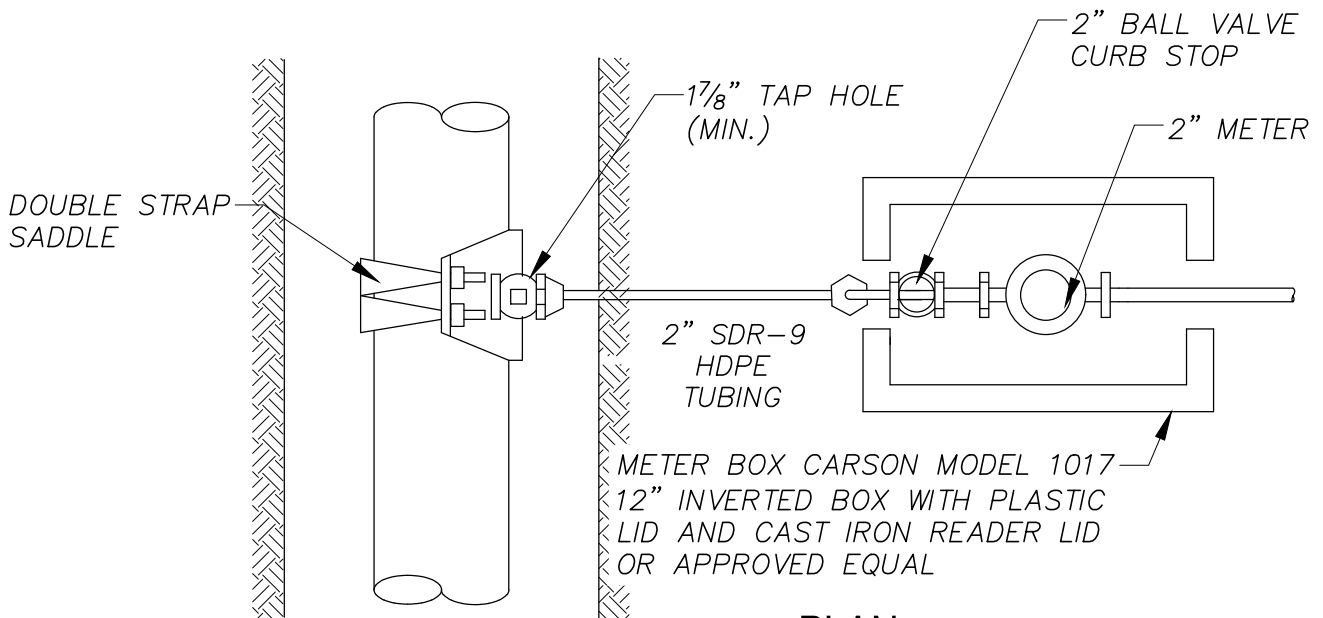
DETAIL NO.: 4100

SCALE: N.T.S.

AS INDICATED ON DRAWINGS



SECTION



PLAN

NOTES:

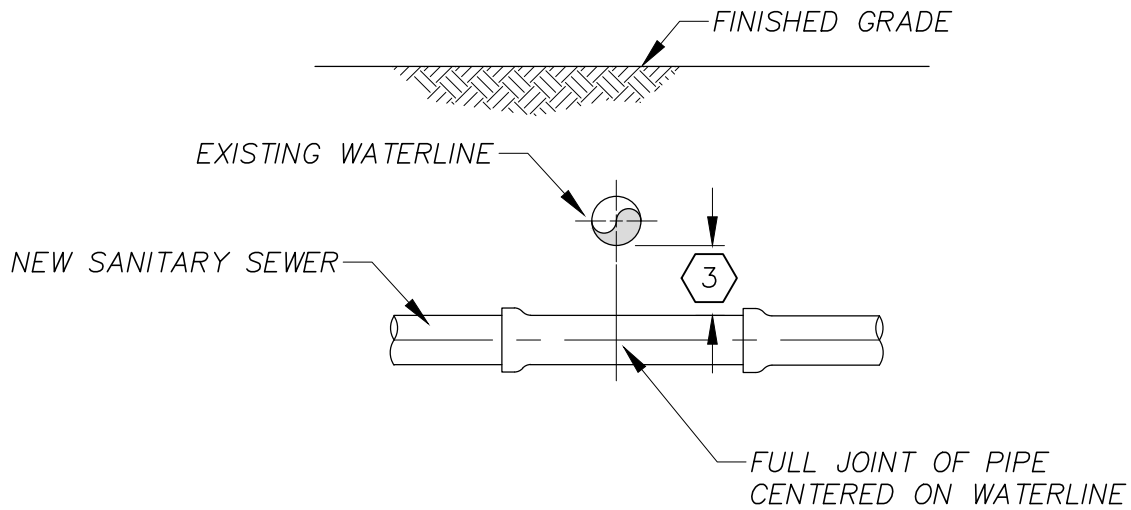
- WHERE METER BOX IS EXPOSED TO TRAFFIC OR IN SIDEWALK, USE CONCRETE BOX WITH CAST IRON TRAFFIC COVER AND CAST IRON READER LID.



2IN WATER SERVICE & METER BOX INSTALLATION

DETAIL NO.: 4110

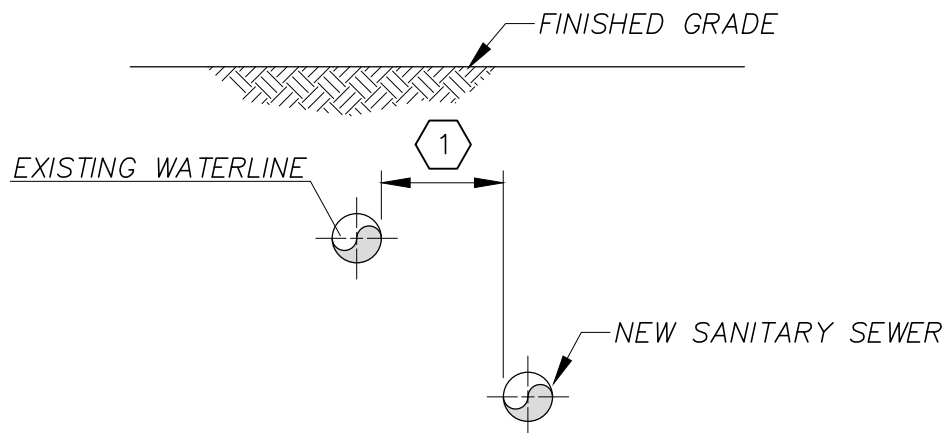
SCALE: N.T.S.



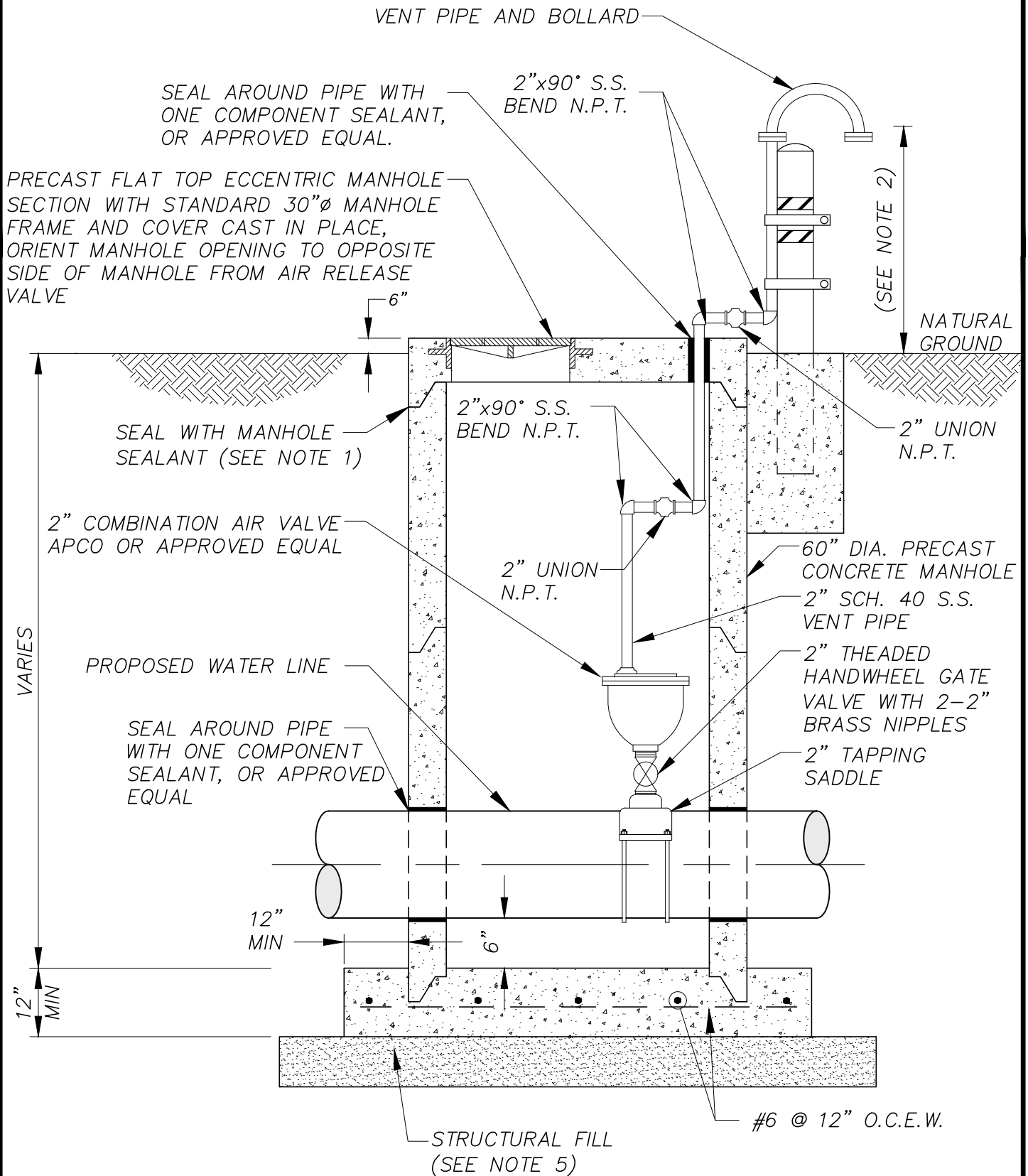
NEW SANITARY SEWER CROSSING EXISTING WATERLINE

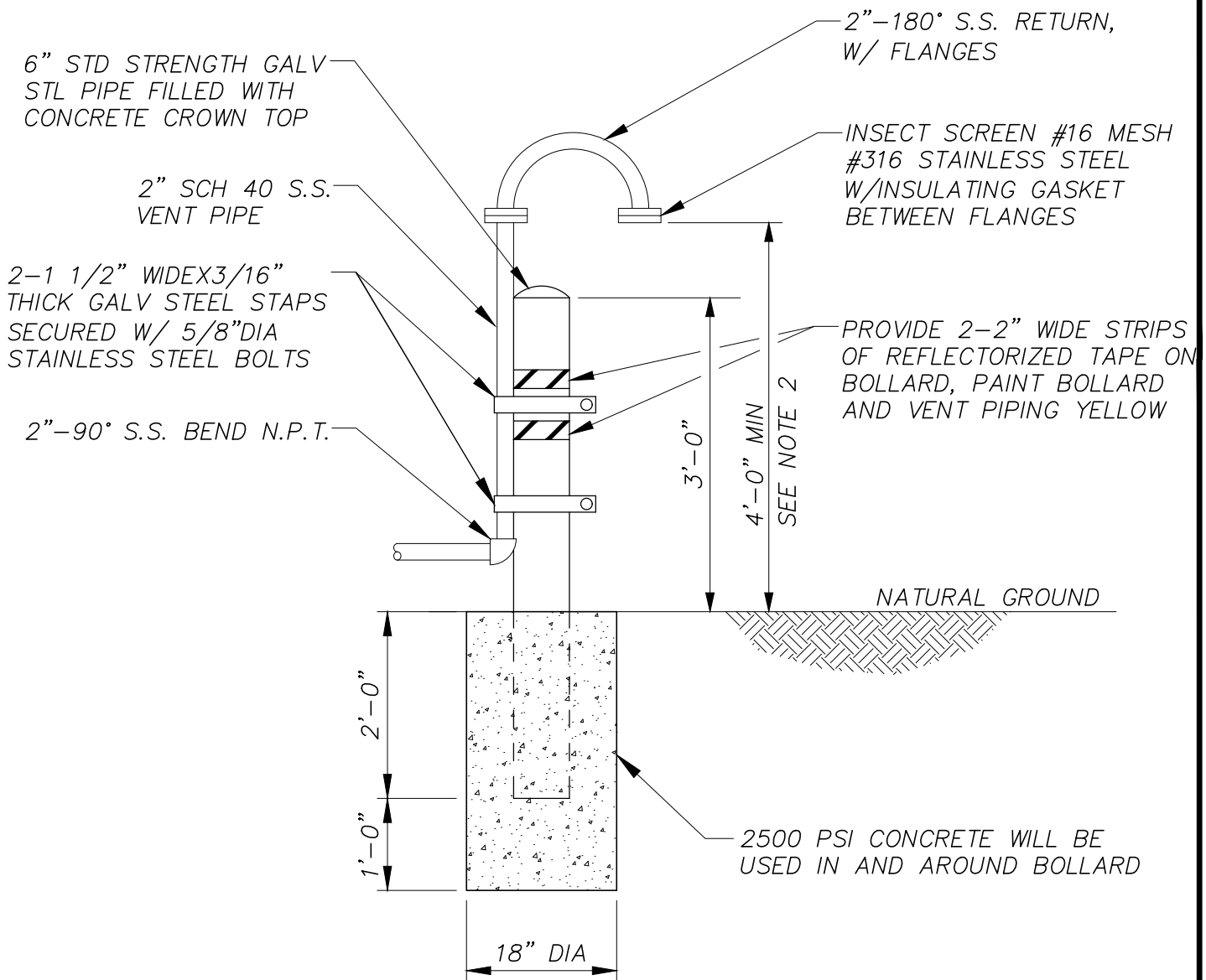
KEY NOTES:

- ① ALL WATER AND SEWER LINE CONSTRUCTION RUNNING PARALLEL WITH EACH OTHER SHALL MAINTAIN A 9' HORIZONTAL SEPARATION, PIPE WALL TO PIPE WALL.
- ② SEPARATION REQUIREMENTS SHOWN HERE DO NOT APPLY TO SERVICE CONNECTIONS – REFER TO INTERNATIONAL PLUMBING CODE FOR APPLICABLE REQUIREMENTS.
- ③ ALL SEWER AND WATERLINE CROSSINGS SHALL COMPLY WITH THE TCEQ CHAPTER 290, PUBLIC DRINKING WATER SECTION 290.44 WATER DISTRIBUTION, SUB SECTION B, NEW WATERLINE INSTALLATION–CROSSING LINES, PARAGRAPHS (1) THROUGH (I) AND ALL SUB PARAGRAPHS THEREIN.



NEW SANITARY SEWER PARALLEL TO EXISTING WATERLINE





NOTES:

VENT PIPE WITH BOLLARD

1. PROVIDE RAM-NEK JOINT SEAL, OR APPROVED EQUAL, BETWEEN PRECAST SEGMENTS OF THE MANHOLE.
2. VERIFY THAT LOCATION OF SCREEN IS 1 FOOT ABOVE 100-YEAR FLOOD PLAIN ELEVATION OR 4 FEET ABOVE NATURAL GROUND WHICHEVER IS HIGHER.
3. REFER TO DRAWINGS FOR LOCATIONS OF AIR RELEASE VALVE AND MANHOLES.
4. MANHOLE BASE SHALL BE A PRECAST SECTION WITH PROPER SIZED KNOCK OUTS FOR PROPOSED WATER LINE. SEAL AROUND WATER LINE AND MANHOLE AS INDICATED.
5. STRUCTURAL FILL: 1" WASHED ROCK.



COMBINATION AIR VACUUM RELEASE VALVE

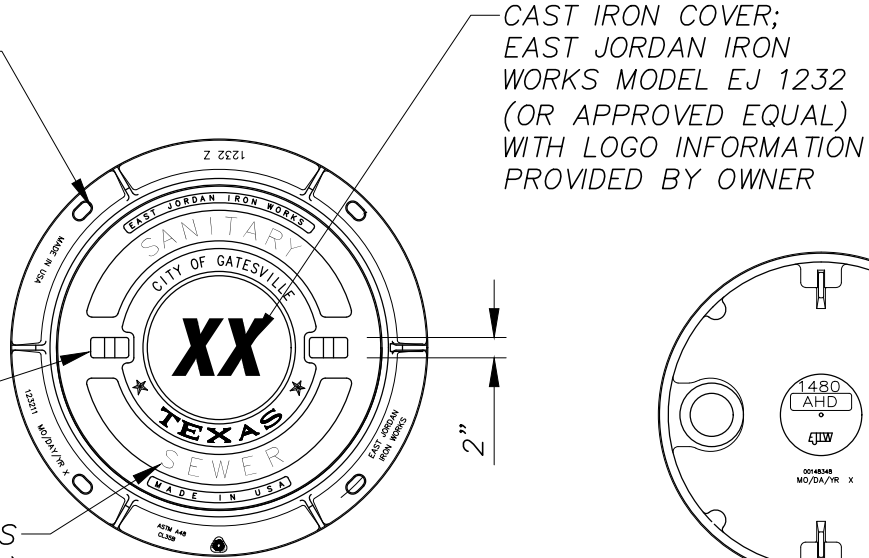
DETAIL NO.: 4130B

SCALE: N.T.S.

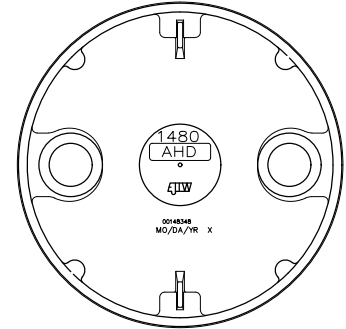
(4) 2"x1 1/8"x
SLOTTED HOLES
ON A 38" DIA. B.C.

PACK BARS
(2 TYP.)

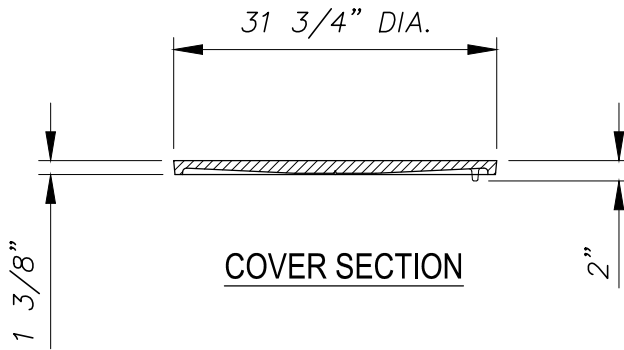
1 1/2" LETTERS
(RECESSED FLUSH)



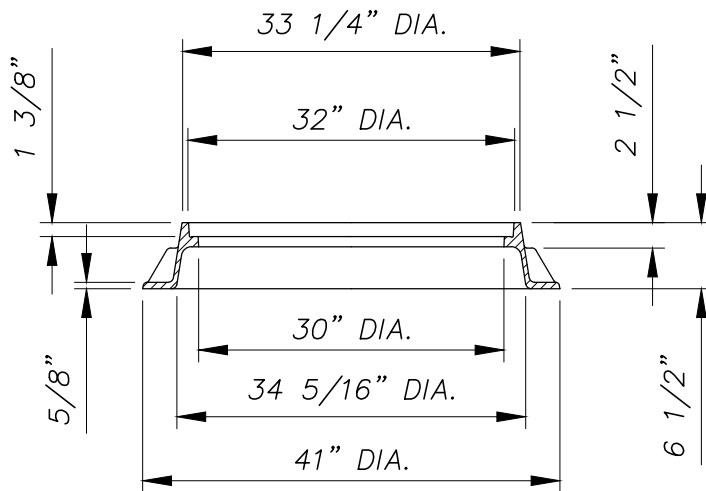
SPECIAL MACHINE OD & HEIGHT



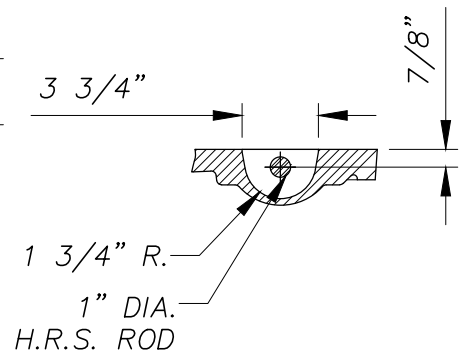
COVER BACK



COVER SECTION



FRAME SECTION



PICK BAR DETAIL



MANHOLE RING AND COVER

DETAIL NO.: 5010

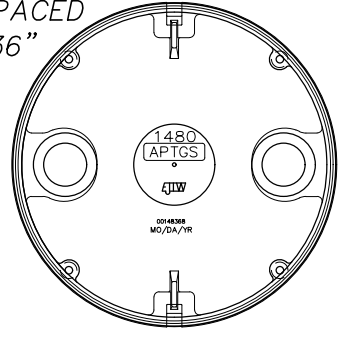
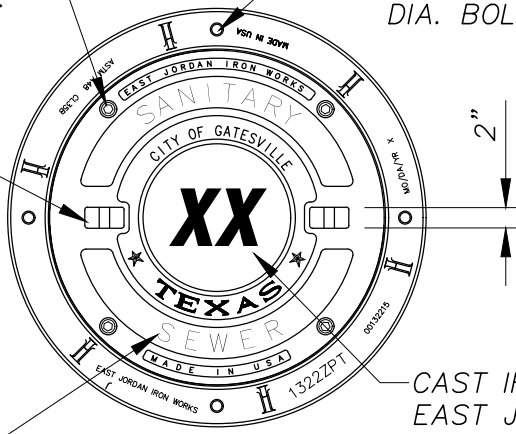
SCALE: N.T.S.

(4) 1/2"-13x2" LG. HEX HEAD S.S. BOLTS WITH WASHERS ON A 29 3/8" B.C.

(4) 1" DIA. BOLT HOLES EQUALLY SPACED 90° APART ON A 36" DIA. BOLT CIRCLE

PACK BARS (2 TYP.)

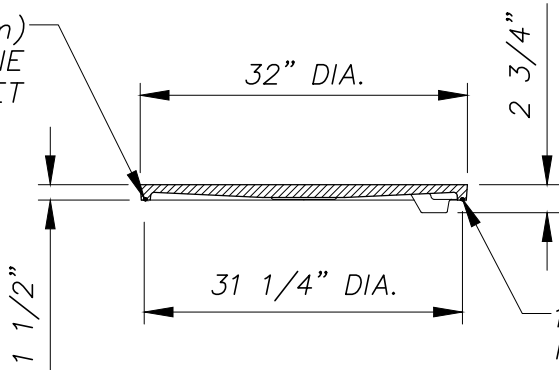
1 1/2" LETTERS (RECESSED FLUSH)



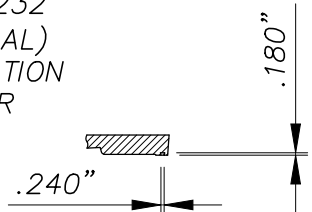
COVER BACK

CAST IRON COVER; EAST JORDAN IRON WORKS MODEL EJ 1232 (OR APPROVED EQUAL) WITH LOGO INFORMATION PROVIDED BY OWNER

1/4" (6mm) NEOPRENE GASKET

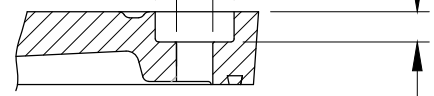


GASKET GROOVE DETAIL



1 5/8" DIA.

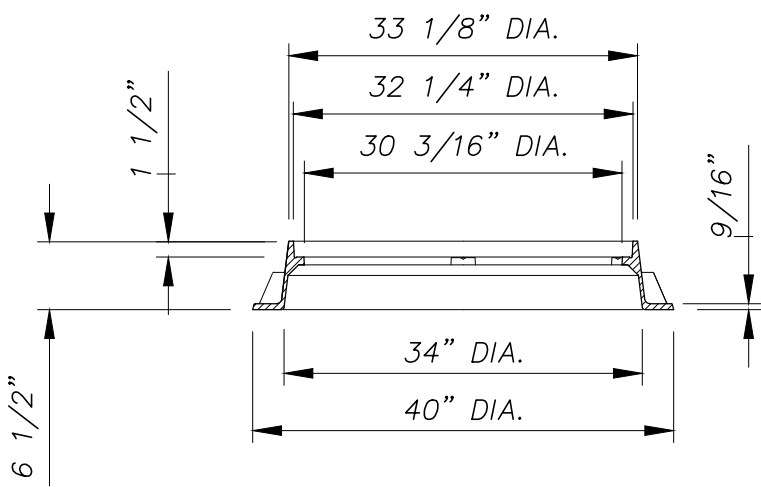
3/4" DIA.



BOLT HOLE DETAIL

5/8"

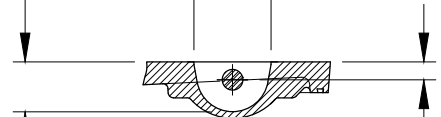
(OUTSIDE GROOVE)



SECTION VIEW

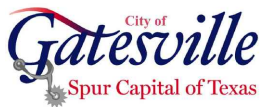
2 7/16"

3 3/4"



BOLT HOLE DETAIL

7/8"



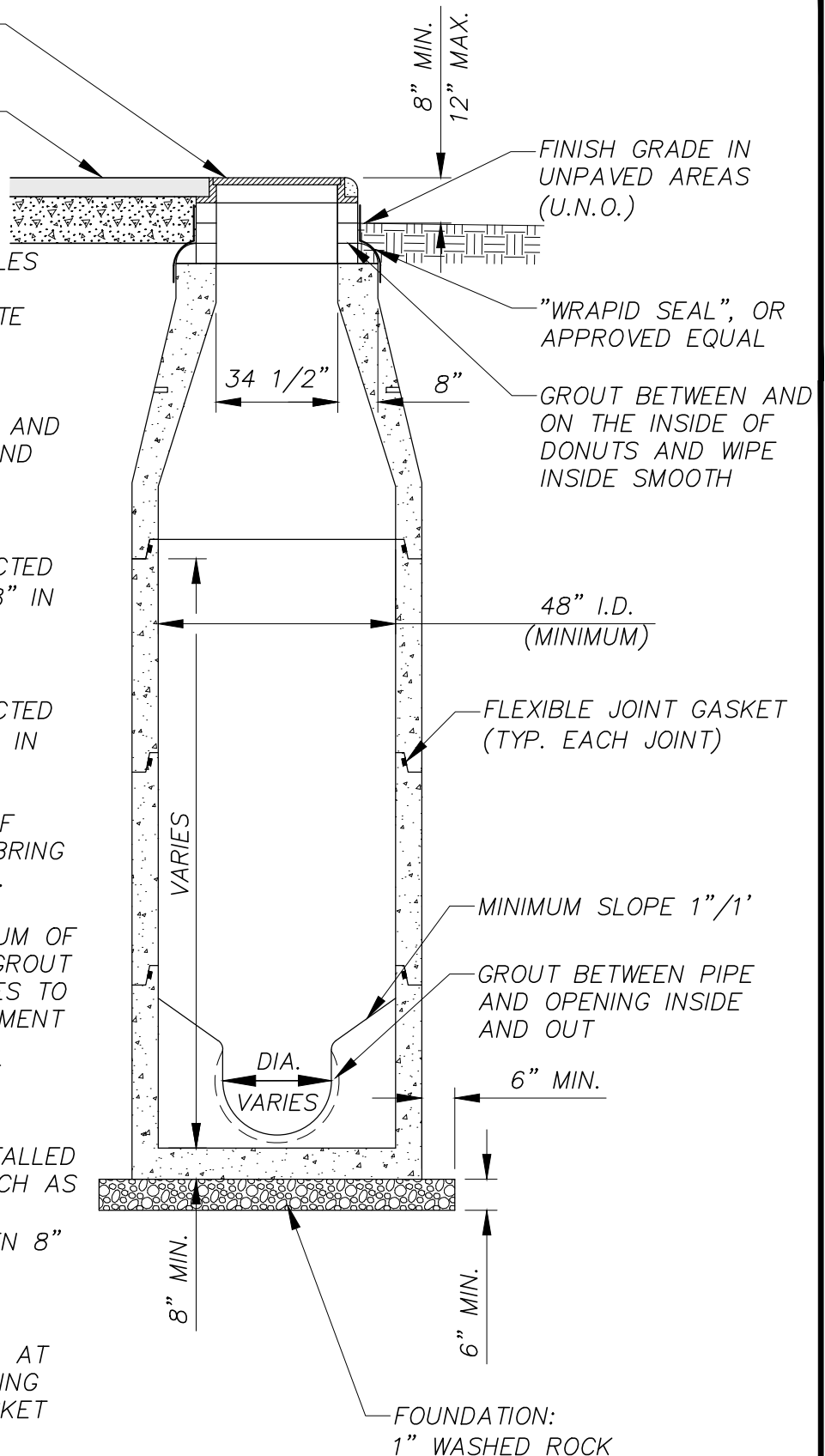
WATERTIGHT-AIRTIGHT MANHOLE RING AND COVER

DETAIL NO.: 5020

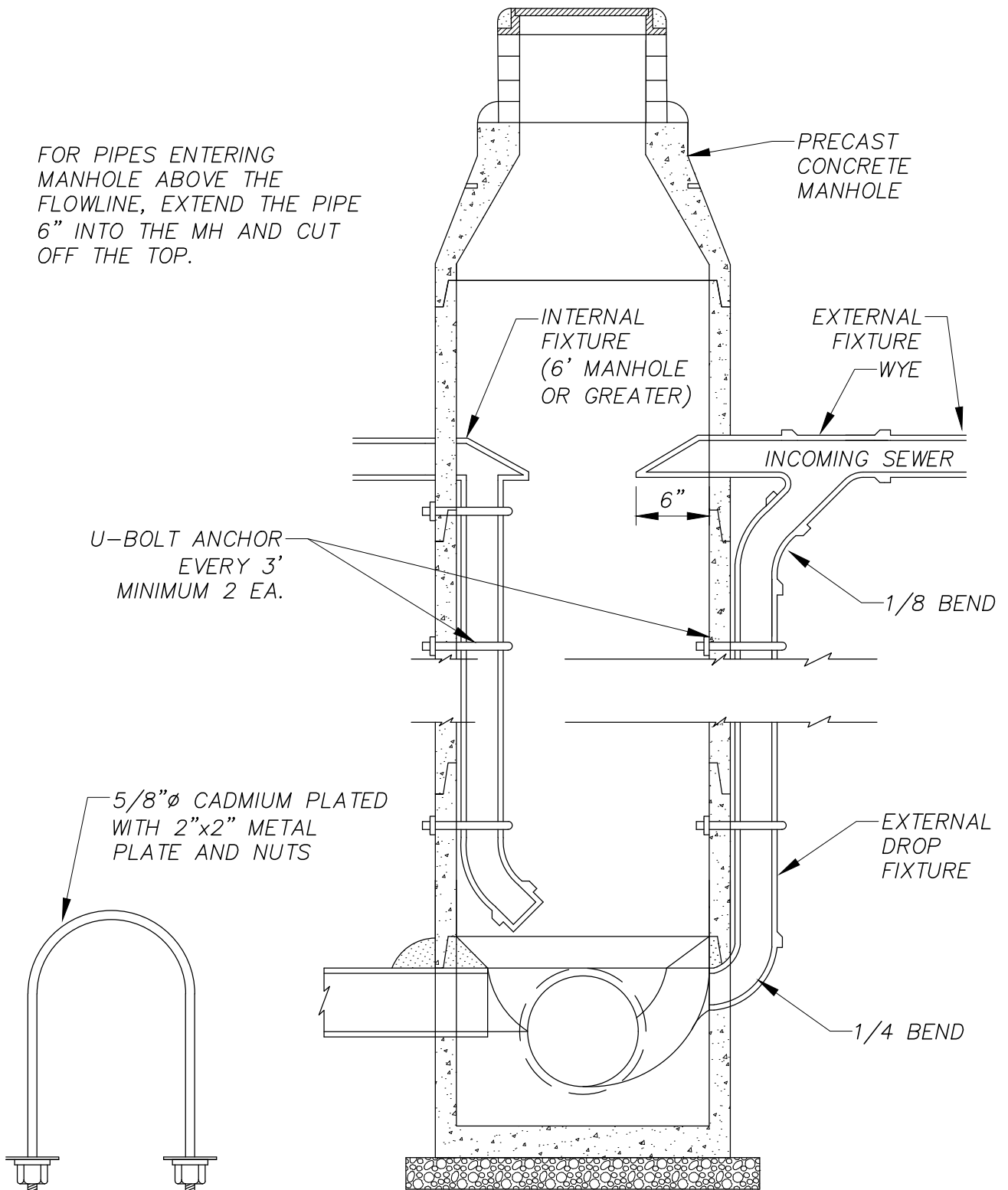
SCALE: N.T.S.

MANHOLE NOTES:

1. PRECAST CONCRETE MANHOLES SHALL BE REINFORCED AND CONCRETE SHALL BE SULFATE RESISTANT WITH AN ANTI-MICROBIAL AGENT.
2. INVERTS SHALL BE SHAPED AND FINISHED BY HAND FLOAT AND TROWEL.
3. STANDARD 4'-0" DIAMETER MANHOLES TO BE CONSTRUCTED ON PIPES SMALLER THAN 18" IN DIAMETER.
4. STANDARD 6'-0" DIAMETER MANHOLES TO BE CONSTRUCTED ON PIPES 18" THROUGH 36" IN DIAMETER.
5. A MAXIMUM OF 2 INCHES OF MORTAR MAY BE USED TO BRING RING AND COVER TO GRADE.
6. A MINIMUM OF 4" & MAXIMUM OF 12 OF THROAT RINGS AND GROUT TO BE APPLIED TO MANHOLES TO ALLOW FOR FUTURE ADJUSTMENT DONUTS, RINGS, AND COVER SHALL BE SET IN A BED OF GROUT.
7. WHERE MANHOLES ARE INSTALLED IN UNDEVELOPED AREAS SUCH AS FIELDS, THE TOP OF THE MANHOLE SHALL BE BETWEEN 8" AND 12" ABOVE NATURAL GROUND.
8. GASKETS SHALL BE PLACED AT EACH JOINT PRIOR TO PLACING NEXT SECTION, ENSURE GASKET MATERIAL IS EXTRUDED.

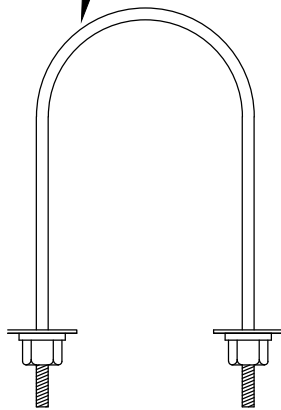


FOR PIPES ENTERING MANHOLE ABOVE THE FLOWLINE, EXTEND THE PIPE 6" INTO THE MH AND CUT OFF THE TOP.



U-BOLT ANCHOR
EVERY 3'
MINIMUM 2 EA.

5/8"Ø CADMIUM PLATED
WITH 2"x2" METAL
PLATE AND NUTS



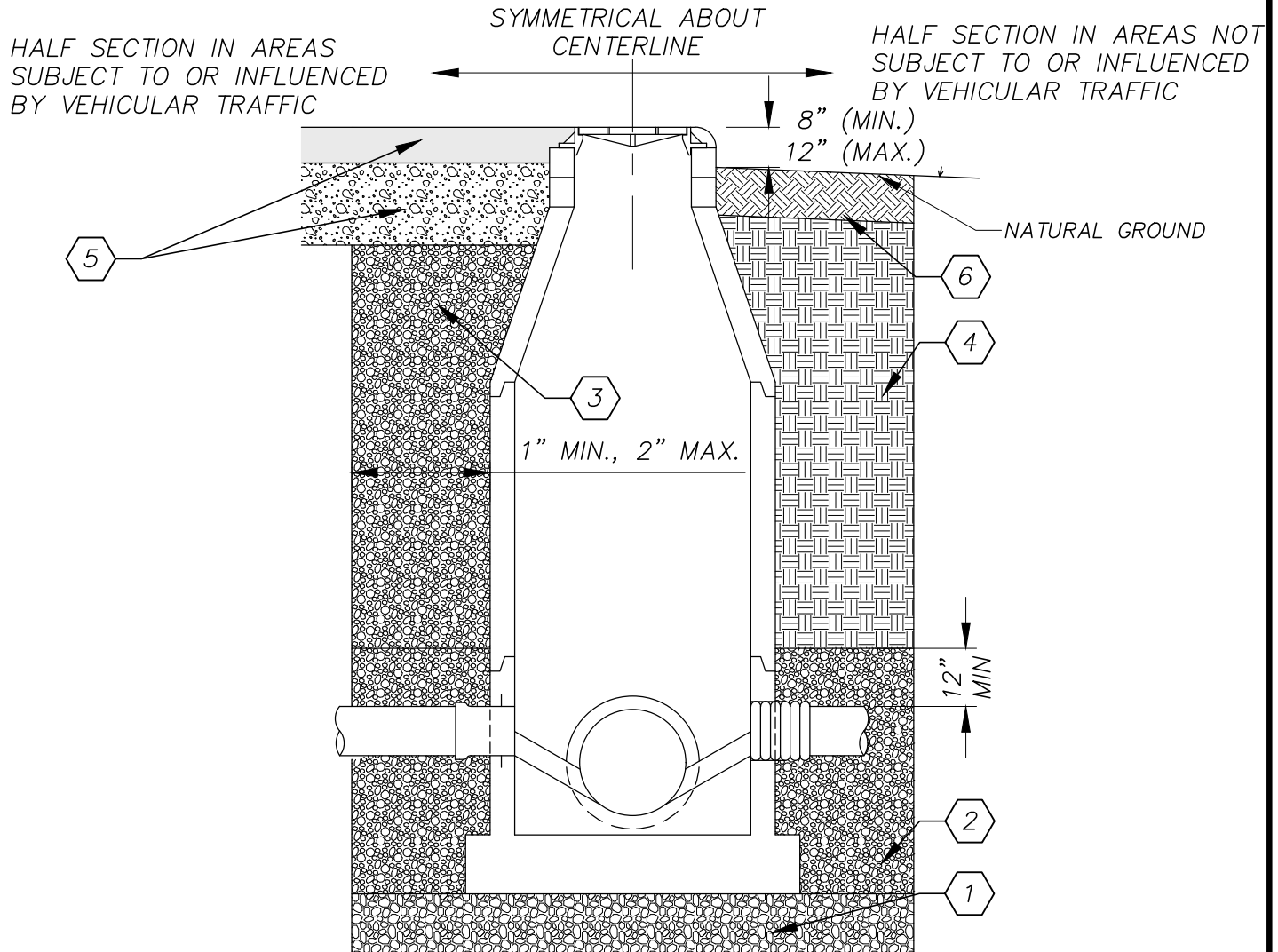
U-BOLT ANCHOR DETAIL

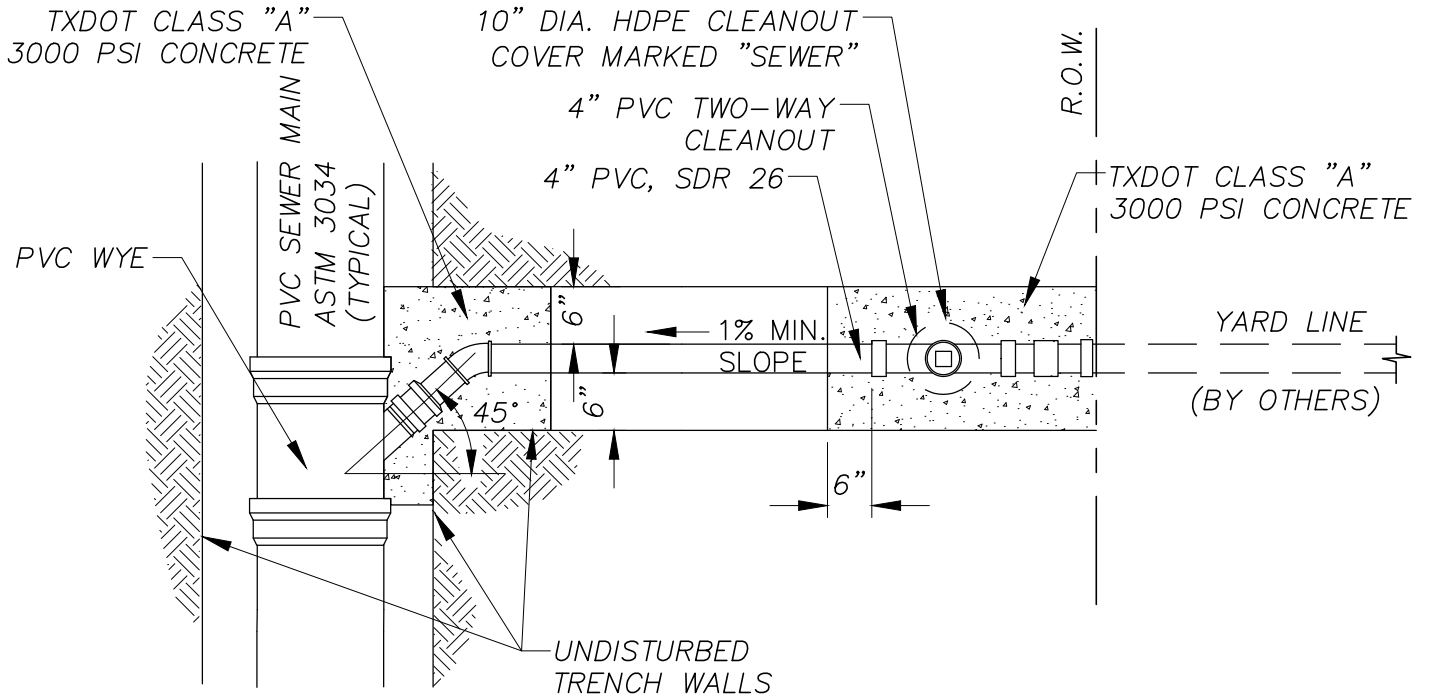
NOTE:

- INTERNAL AND EXTERNAL DROP FIXTURE SHALL BE THE SAME PIPE MATERIAL AS THE SANITARY SEWER.

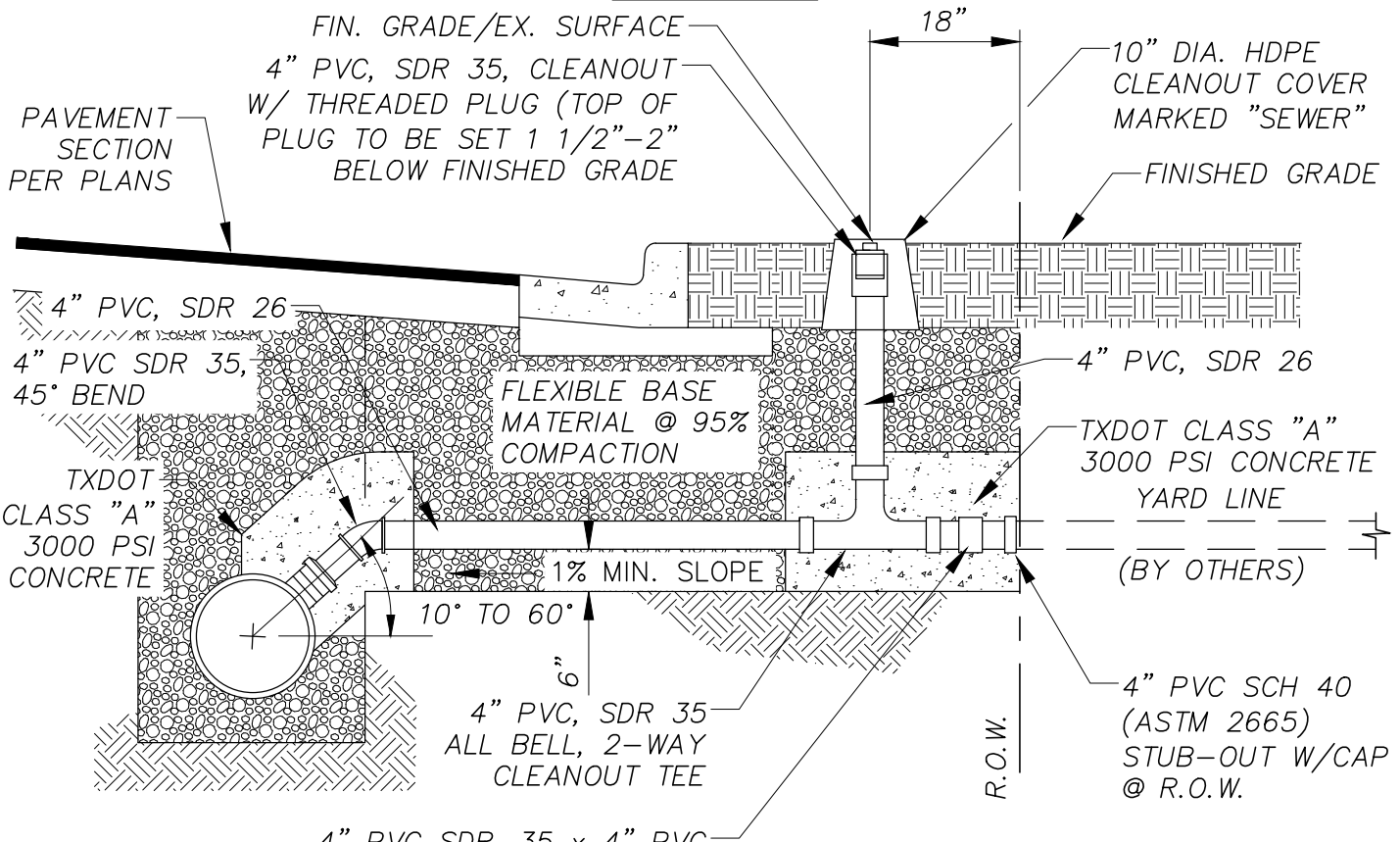
MATERIAL SCHEDULE

- 1 FOUNDATION: 1" WASHED ROCK
- 2 EMBEDMENT MATERIAL: 1" WASHED ROCK
- 3 TRENCH BACKFILL IN PAVEMENT AND WITHIN 5' OF BACK OF CURB SHALL BE FLEXIBLE BASE MATERIAL TYPE "A" GRADE 1 OR 2. BASE TO BE COMPACTED TO 95% MODIFIED PROCTOR DENSITY $\pm 2\%$.
- 4 TRENCH BACKFILL OUTSIDE OF PAVEMENT SHALL BE NATIVE MATERIAL. MATERIAL TO BE COMPACTED TO 85% STANDARD PROCTOR DENSITY $\pm 2\%$.
- 5 NEW PAVEMENT, BASE (AND SUBGRADE) AS PER THE DRAWINGS AND SPECIFICATIONS. -OR- REFERENCE "SURFACE REPLACEMENT DETAIL" WHEN TRENCHING IN EXISTING PAVEMENT.
- 6 TOPSOIL, 12 INCHES THICK, EXCAVATED, SALVAGED, AND STOCKPILED FROM ORIGINAL GROUND SURFACE OF THE TRENCH (AND OR UTILITY EASEMENT) AND REPLACED AFTER INSTALLATION OR PIPELINE.





PLAN VIEW



NOTE:

4" PVC SDR-35 x 4" PVC
SCH. 40 HUB ADAPTOR
STACK SHALL BE REASONABLY PLUMB.

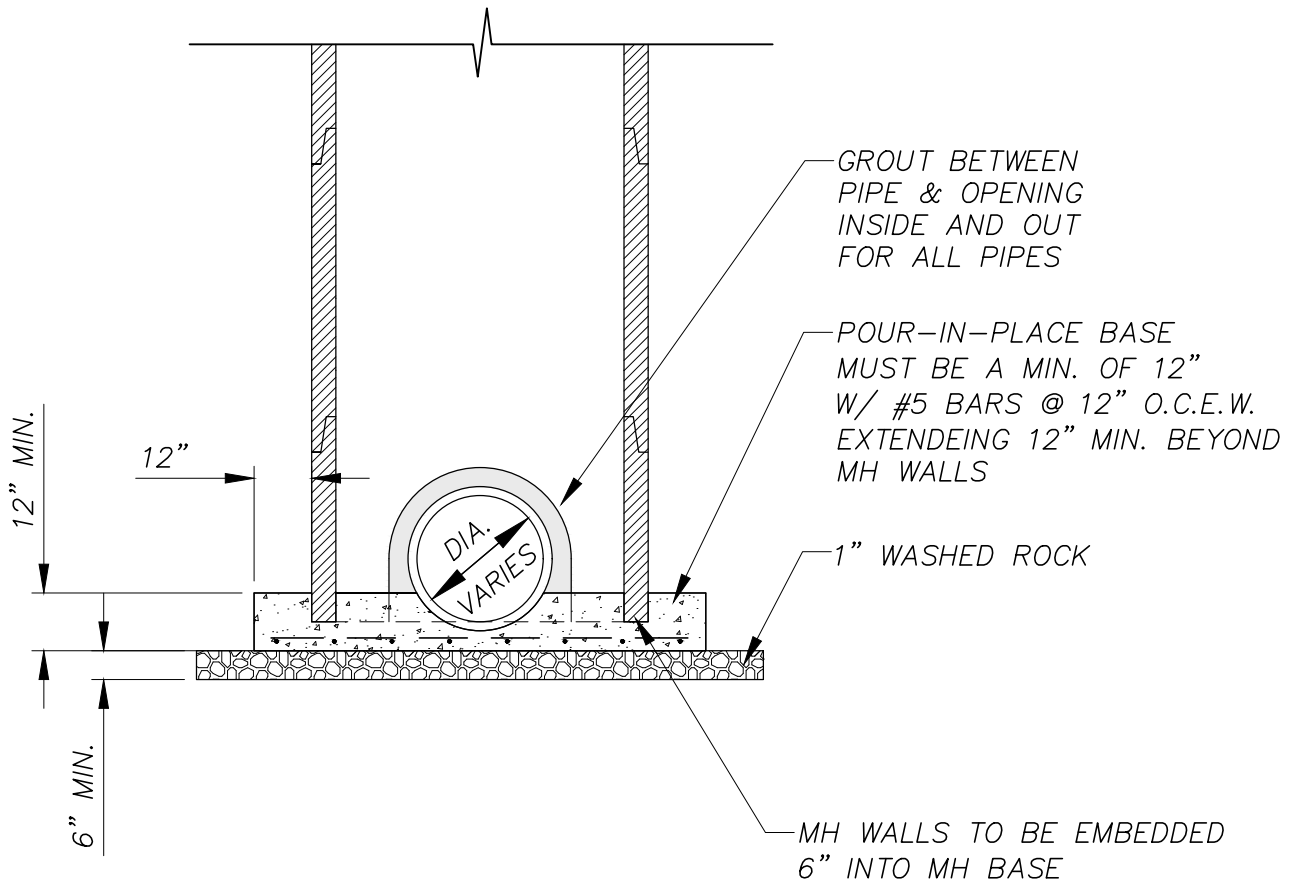
PROFILE VIEW



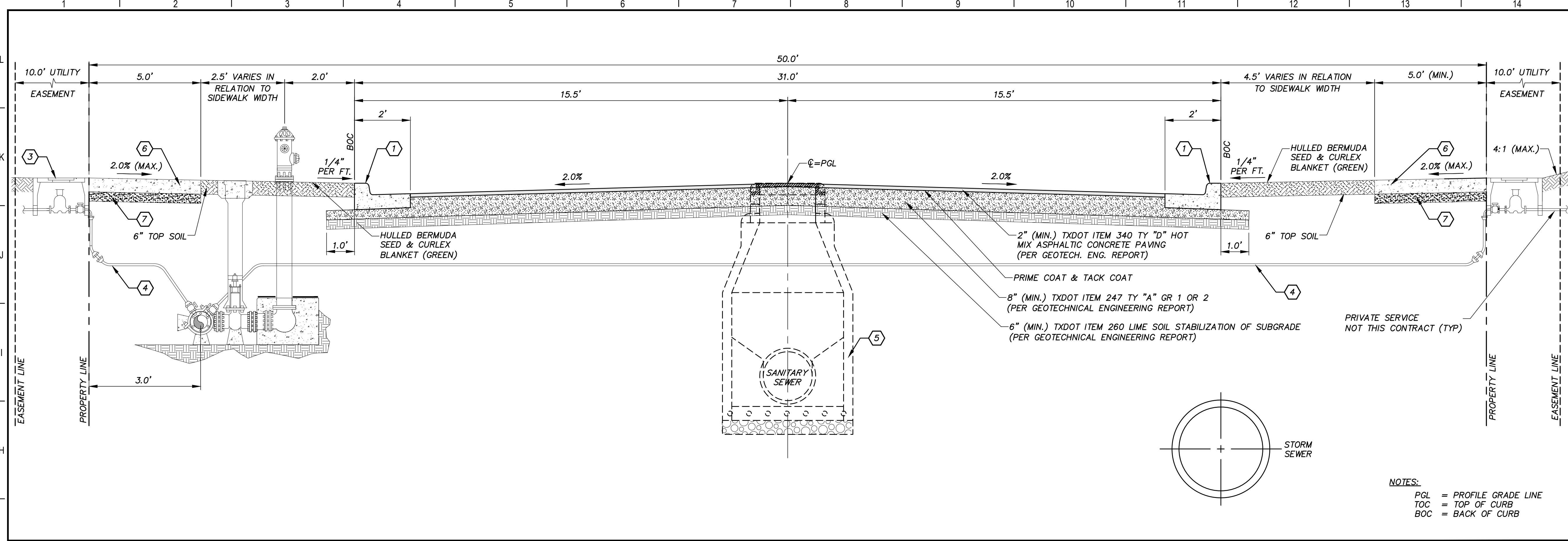
4IN RESIDENTIAL WASTEWATER SERVICE CONNECTION

DETAIL NO.: 5101

SCALE: N.T.S.



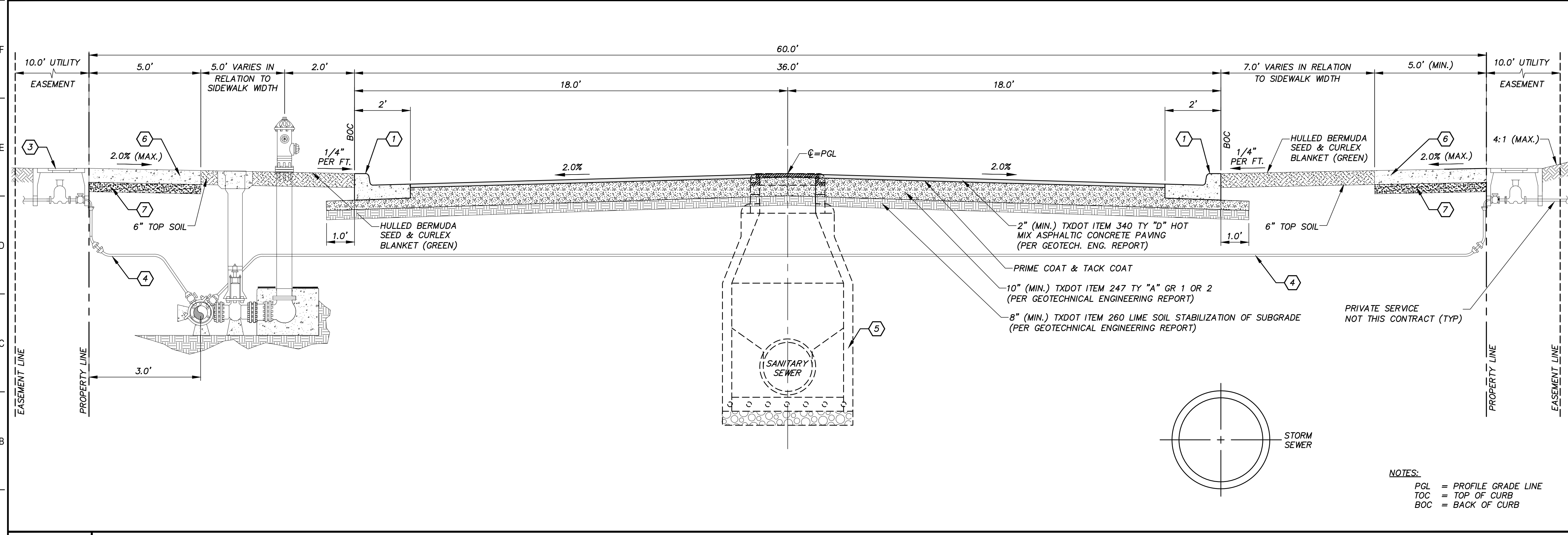
G:\PROJECTS\2-0156512 DESIGN\2.0 CAD\DIVISION 10000 - STREET SECTIONS.DWG, TYPICAL STREET SECTIONS, 12/11/2018 9:57:43 AM, kszanislav



KEY NOTES	
1	STANDARD CURB & GUTTER
2	FIRE HYDRANT
3	VALVE BOX & EXTENSION INSTALLATION
4	RESIDENTIAL WATER SERVICE CONNECTION
5	PRECAST CONCRETE WASTEWATER MANHOLE
6	REINFORCED CONCRETE SIDEWALK
7	4" SAND CUSHION

NOTES:
PGL = PROFILE GRADE LINE
TOC = TOP OF CURB
BOC = BACK OF CURB

G1 TYPICAL RESIDENTIAL STREET SECTION (31' BOC - BOC)
N.T.S.



REV.	DESCRIPTION	DATE

City of
Gatesville
Spur Capital of Texas

CITY OF GATESVILLE

COMPREHENSIVE PLAN

TYPICAL STREET SECTIONS

DESIGNED	OEK
DRAFTED	NLK
CHECKED	KAM,KAS
PROJECT NO.	NLK
DRAWING NO.	2-01565

10000

NOTES:
PGL = PROFILE GRADE LINE
TOC = TOP OF CURB
BOC = BACK OF CURB

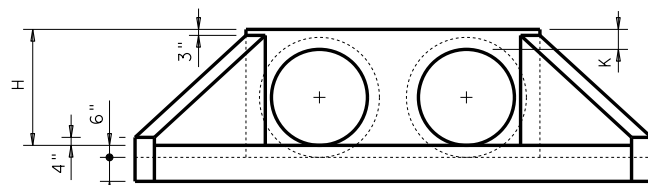
A1 TYPICAL RESIDENTIAL COLLECTOR STREET SECTION (36' BOC - BOC)
N.T.S.

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (4)

SLOPE DIA OF PIPE, D	Values for one Pipe					Values to be added for each add'l Pipe			
	W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	X and W	Reinf (Lbs)	Conc (CY) (1)
12"	4'-7 1/2"	2'-6"	2'-10"	3'-3 1/4"	84	0.6	1'-9"	20	0.2
15"	5'-5 3/4"	2'-9 1/2"	3'-4"	3'-10 1/4"	99	0.7	2'-2"	24	0.3
18"	6'-4 1/4"	3'-1"	3'-10"	4'-5"	120	0.9	2'-8"	32	0.3
21"	7'-2 3/4"	3'-4 1/2"	4'-4"	5'-0"	137	1.1	3'-1"	43	0.4
24"	8'-2 1/2"	3'-9 1/2"	4'-10"	5'-7"	158	1.3	3'-7"	50	0.5
27"	9'-1"	4'-1"	5'-4"	6'-2"	173	1.5	3'-11"	56	0.6
30"	9'-11 1/2"	4'-4 1/2"	5'-10"	6'-8 3/4"	197	1.7	4'-4"	65	0.8
33"	10'-10"	4'-8"	6'-4"	7'-3 3/4"	216	2.0	4'-8"	71	0.9
36"	11'-8 1/4"	4'-11 1/2"	6'-10"	7'-10 3/4"	241	2.2	5'-1"	81	1.0
42"	13'-5 1/4"	5'-6 1/2"	7'-10"	9'-0 1/2"	290	2.8	5'-10"	97	1.3
48"	15'-9"	6'-1 1/2"	9'-4"	10'-9 1/4"	350	3.8	6'-7"	117	1.7
54"	17'-5 3/4"	6'-8 1/2"	10'-4"	11'-11 1/4"	415	4.5	7'-6"	151	2.1
60"	19'-2 3/4"	7'-3 1/2"	11'-4"	13'-1"	469	5.3	8'-3"	174	2.5
66"	20'-11 1/2"	7'-10 1/2"	12'-4"	14'-3"	530	6.2	8'-9"	194	2.9
72"	22'-8 1/2"	8'-5 1/2"	13'-4"	15'-4 3/4"	587	7.1	9'-4"	213	3.3
12"	6'-3"	2'-6"	4'-3"	4'-11"	114	0.8	1'-9"	22	0.2
15"	7'-5"	2'-9 1/2"	5'-0"	5'-9 1/4"	133	1.1	2'-2"	28	0.3
18"	8'-6 3/4"	3'-1"	5'-9"	6'-7 3/4"	166	1.3	2'-8"	37	0.5
21"	9'-8 3/4"	3'-4 1/2"	6'-6"	7'-6"	189	1.6	3'-1"	48	0.6
24"	11'-0"	3'-9 1/2"	7'-3"	8'-4 1/2"	221	2.0	3'-7"	58	0.7
27"	12'-2"	4'-1"	8'-0"	9'-2 3/4"	245	2.3	3'-11"	67	0.8
30"	13'-4"	4'-4 1/2"	8'-9"	10'-1 1/4"	287	2.7	4'-4"	77	1.0
33"	14'-5 3/4"	4'-8"	9'-6"	10'-11 3/4"	310	3.1	4'-8"	84	1.2
36"	15'-7 3/4"	4'-11 1/2"	10'-3"	11'-10"	343	3.5	5'-1"	96	1.4
42"	17'-11 1/2"	5'-6 1/2"	11'-9"	13'-6 3/4"	424	4.5	5'-10"	119	1.7
48"	21'-1 3/4"	6'-1 1/2"	14'-0"	16'-2"	527	6.1	6'-7"	146	2.3
54"	23'-5 1/2"	6'-8 1/2"	15'-6"	17'-10 3/4"	618	7.3	7'-6"	186	2.9
60"	25'-9 1/4"	7'-3 1/2"	17'-0"	19'-7 1/2"	707	8.7	8'-3"	219	3.4
66"	28'-1"	7'-10 1/2"	18'-6"	21'-4 1/4"	797	10.1	8'-9"	242	3.9
72"	30'-4 3/4"	8'-5 1/2"	20'-0"	23'-1 1/4"	910	11.7	9'-4"	272	4.4
12"	7'-10 3/4"	2'-6"	5'-8"	6'-6 1/2"	144	1.1	1'-9"	24	0.3
15"	9'-4"	2'-9 1/2"	6'-8"	7'-8 1/2"	177	1.5	2'-2"	32	0.4
18"	10'-9 1/2"	3'-1"	7'-8"	8'-10 1/4"	217	1.9	2'-8"	42	0.5
21"	12'-2 3/4"	3'-4 1/2"	8'-8"	10'-0"	254	2.3	3'-1"	57	0.7
24"	13'-9 1/2"	3'-9 1/2"	9'-8"	11'-2"	295	2.8	3'-7"	67	0.9
27"	15'-3"	4'-1"	10'-8"	12'-3 3/4"	328	3.3	3'-11"	77	1.0
30"	16'-8 1/4"	4'-4 1/2"	11'-8"	13'-5 3/4"	379	3.8	4'-4"	89	1.3
33"	18'-1 3/4"	4'-8"	12'-8"	14'-7 1/2"	417	4.5	4'-8"	101	1.4
36"	19'-7"	4'-11 1/2"	13'-8"	15'-9 1/4"	464	5.1	5'-1"	115	1.7
42"	22'-5 3/4"	5'-6 1/2"	15'-8"	18'-1"	575	6.5	5'-10"	141	2.1
48"	26'-6 1/4"	6'-1 1/2"	18'-8"	21'-6 3/4"	720	8.9	6'-7"	175	2.8
54"	29'-5"	6'-8 1/2"	20'-8"	23'-10 1/4"	863	10.7	7'-6"	226	3.6
60"	32'-3 3/4"	7'-3 1/2"	22'-8"	26'-2"	984	12.7	8'-3"	264	4.3
66"	35'-2 1/2"	7'-10 1/2"	24'-8"	28'-5 3/4"	1126	14.9	8'-9"	300	4.9
72"	38'-1 1/4"	8'-5 1/2"	26'-8"	30'-9 1/2"	1283	17.3	9'-4"	334	5.6
12"	11'-2"	2'-6"	8'-6"	9'-9 3/4"	220	1.9	1'-9"	28	0.4
15"	13'-2 1/4"	2'-9 1/2"	10'-0"	11'-6 1/2"	264	2.5	2'-2"	37	0.5
18"	15'-2 1/2"	3'-1"	11'-6"	13'-3 1/4"	326	3.2	2'-8"	50	0.7
21"	17'-2 3/4"	3'-4 1/2"	13'-0"	15'-0 1/4"	381	3.9	3'-1"	69	0.9
24"	19'-4 1/2"	3'-9 1/2"	14'-6"	16'-9"	447	4.8	3'-7"	80	1.2
27"	21'-4 3/4"	4'-1"	16'-0"	18'-5 3/4"	506	5.7	3'-11"	96	1.4
30"	23'-5 1/4"	4'-4 1/2"	17'-6"	20'-2 1/2"	587	6.7	4'-4"	110	1.7
33"	25'-5 1/2"	4'-8"	19'-0"	21'-11 1/4"	667	7.8	4'-8"	127	2.0
36"	27'-5 3/4"	4'-11 1/2"	20'-6"	23'-8"	727	9.0	5'-1"	144	2.3
42"	31'-6 1/4"	5'-6 1/2"	23'-6"	27'-1 1/2"	914	11.5	5'-10"	179	3.0
48"	37'-3 1/2"	6'-1 1/2"	28'-0"	32'-4"	1181	15.9	6'-7"	231	4.0
54"	41'-4 1/4"	6'-8 1/2"	31'-0"	35'-9 1/2"	1412	19.2	7'-6"	300	5.0
60"	45'-4 3/4"	7'-3 1/2"	34'-0"	39'-3"	1619	22.9	8'-3"	353	6.0

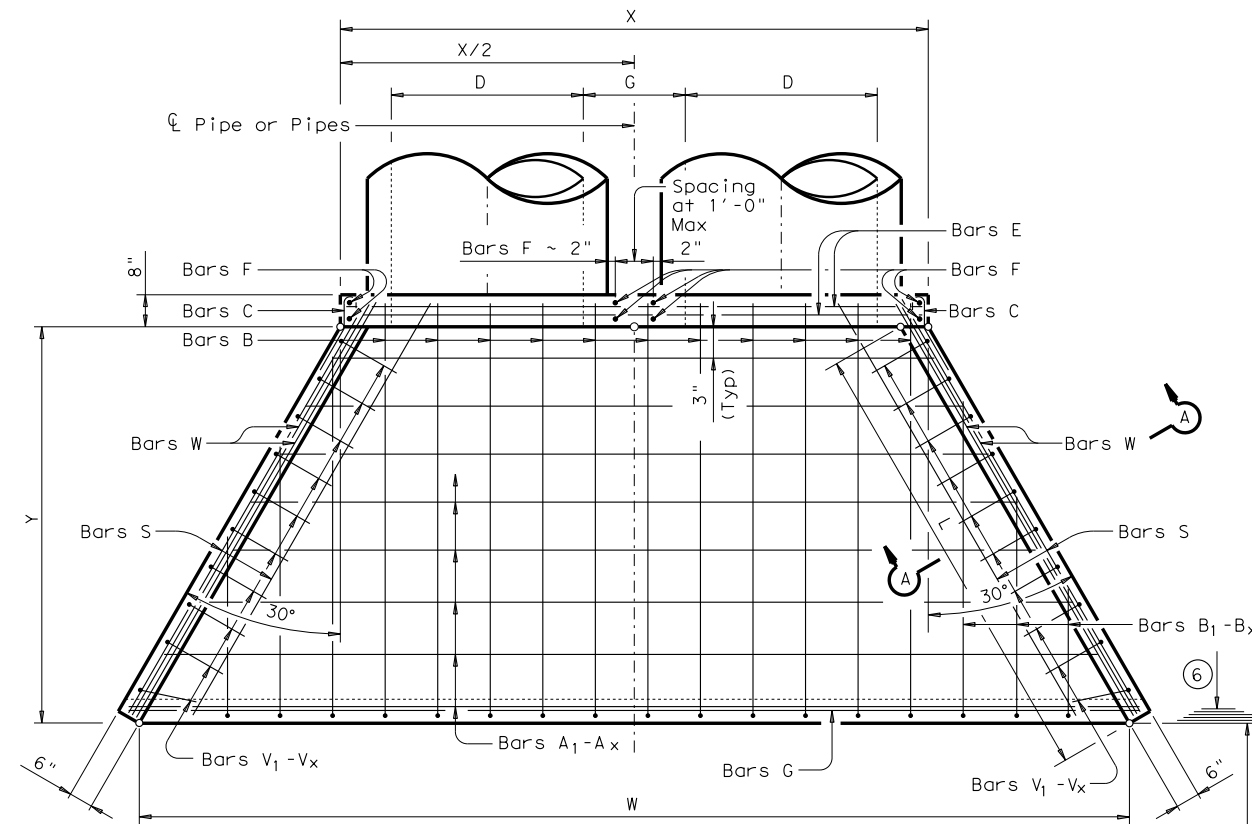
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: FILE:

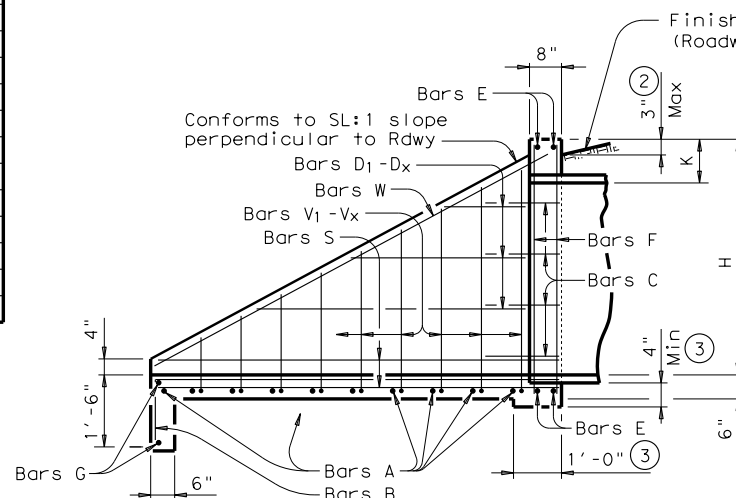


ELEVATION
Showing dimensions

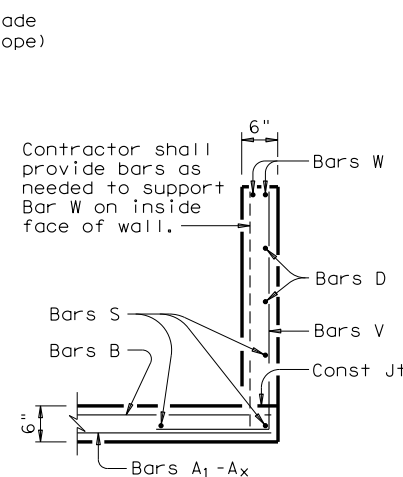
- Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.
- For vehicle safety, curbs shall project no more than 3" above finished grade. Curb heights shall be reduced, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- Provide a 1'-0" footing as shown where required to maintain 4" Min cover for pipes.
- Quantities shown are for one structure end only (one headwall).
- Min Length = $6" + 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right)$
Max Length = $12 \times H - 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right) - 1"$
- Lengths of wings based on SL:1 Slope along this line.



PLAN



TYPICAL WING ELEVATION



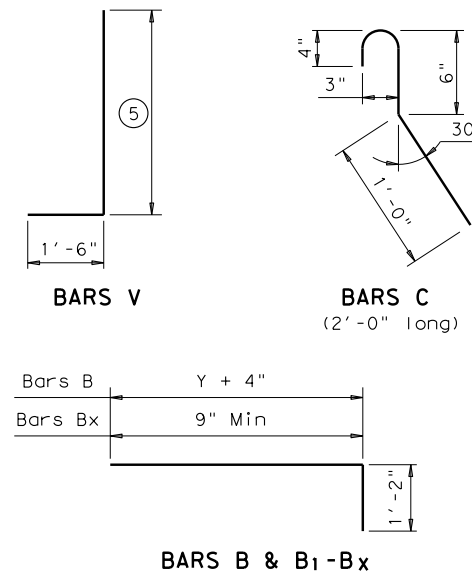
SECTION A-A

TABLE OF REINFORCING STEEL (4)

Bar	Size	Spa	No.
A	# 4	1'-0"	~
B	# 3	1'-6"	~
C	# 4	1'-0"	~
D	# 3	1'-0"	~
E	# 5	~	4
F	# 5	~	~
G	# 3	~	2
S	# 4	~	6
V	# 4	1'-0"	~
W	# 5	~	4

TABLE OF CONSTANT DIMENSIONS

DIA OF PIPE, D	G	K	H
12"	9"	1'-0"	2'-0"
15"	11"	1'-0"	2'-3"
18"	1'-2"	1'-0"	2'-6"
21"	1'-4"	1'-0"	2'-9"
24"	1'-7"	1'-0"	3'-0"
27"	1'-8"	1'-0"	3'-3"
30"	1'-10"	1'-0"	3'-6"
33"	1'-11"	1'-0"	3'-9"
36"	2'-1"	1'-0"	4'-0"
42"	2'-4"	1'-0"	4'-6"
48"	2'-7"	1'-3"	5'-3"
54"	3'-0"	1'-3"	5'-9"
60"	3'-3"	1'-3"	6'-3"
66"	3'-3"	1'-3"	6'-9"
72"	3'-4"	1'-3"	7'-3"

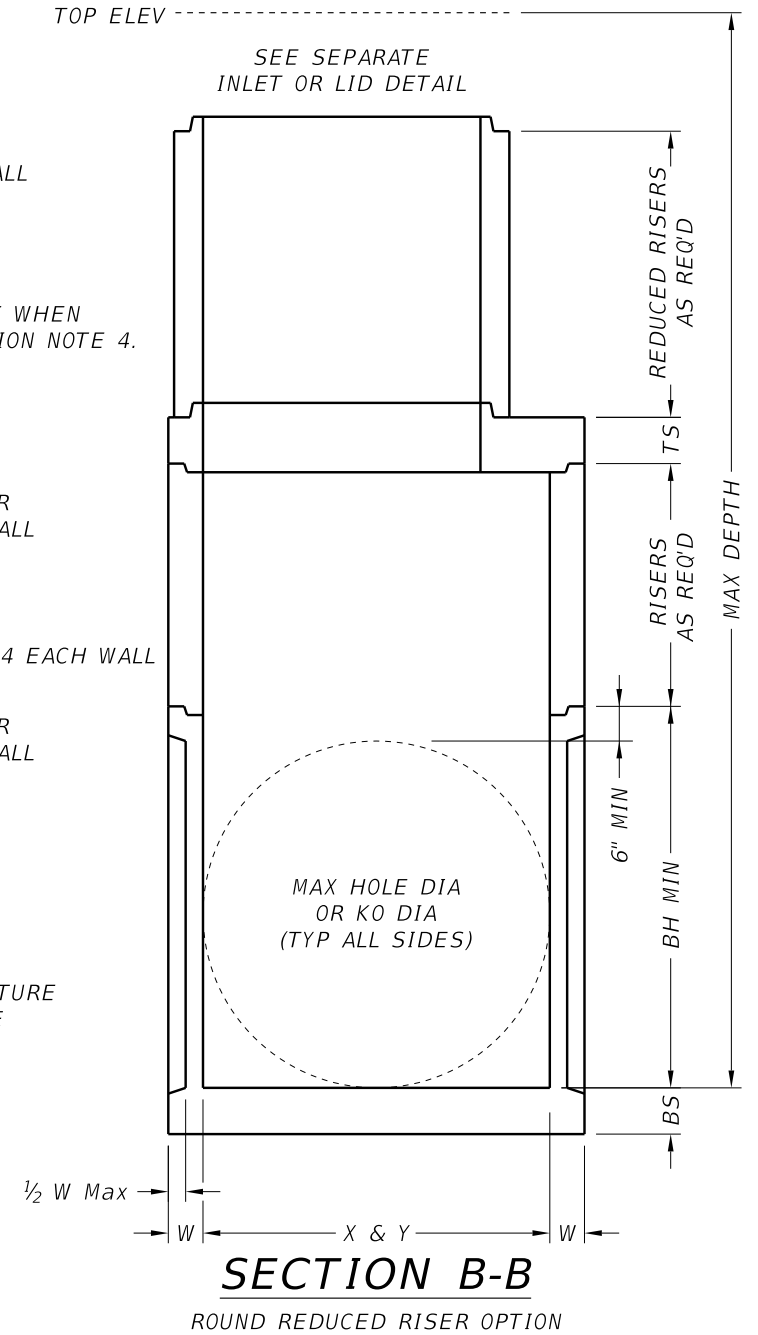
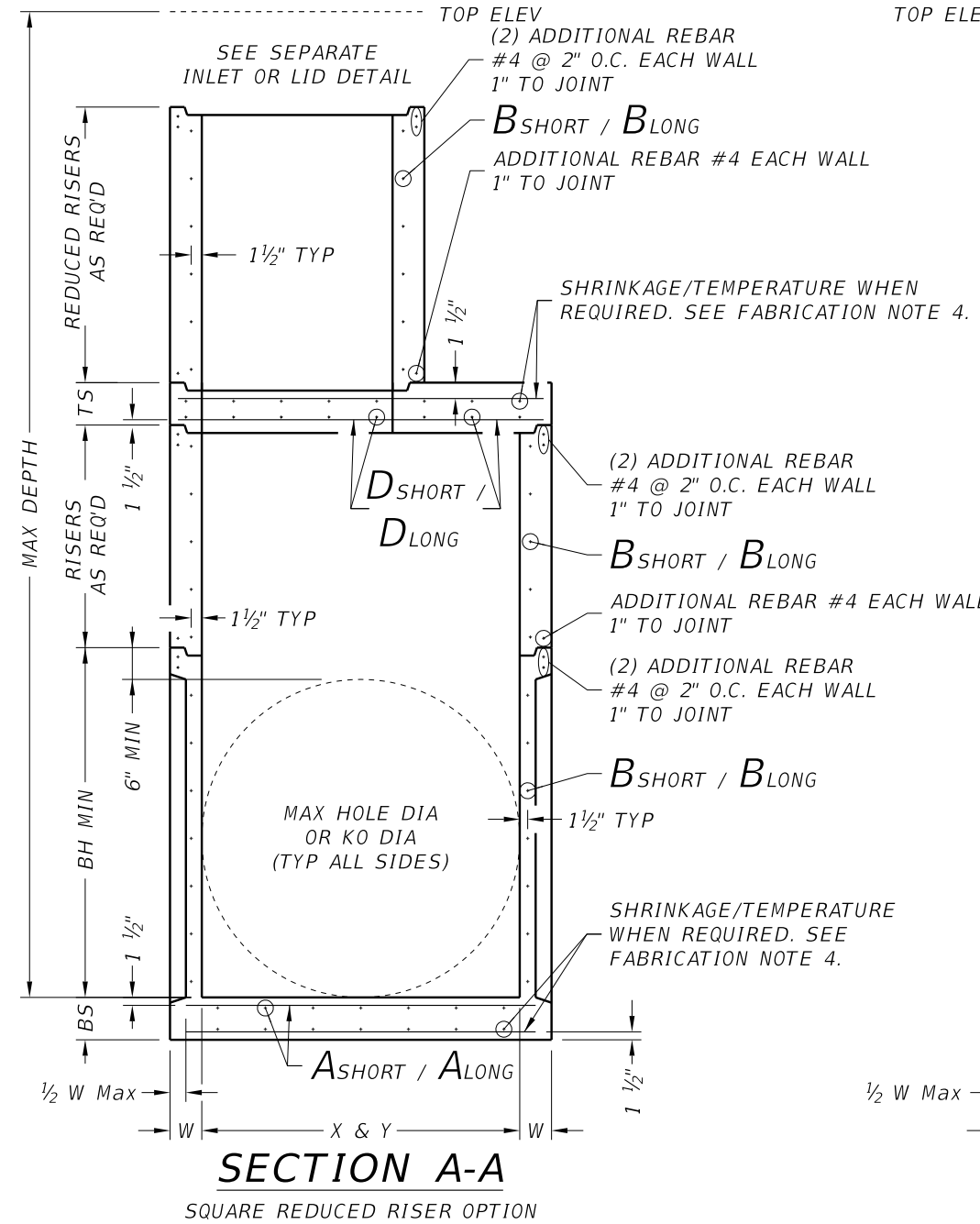
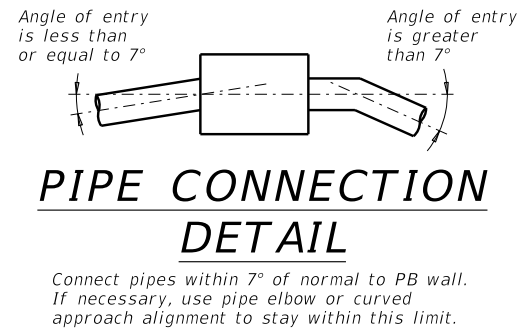
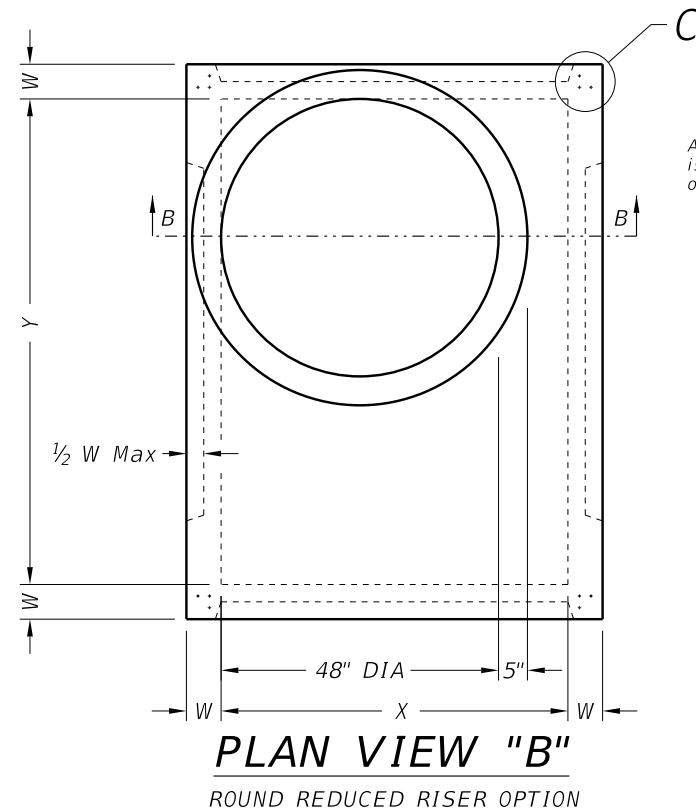
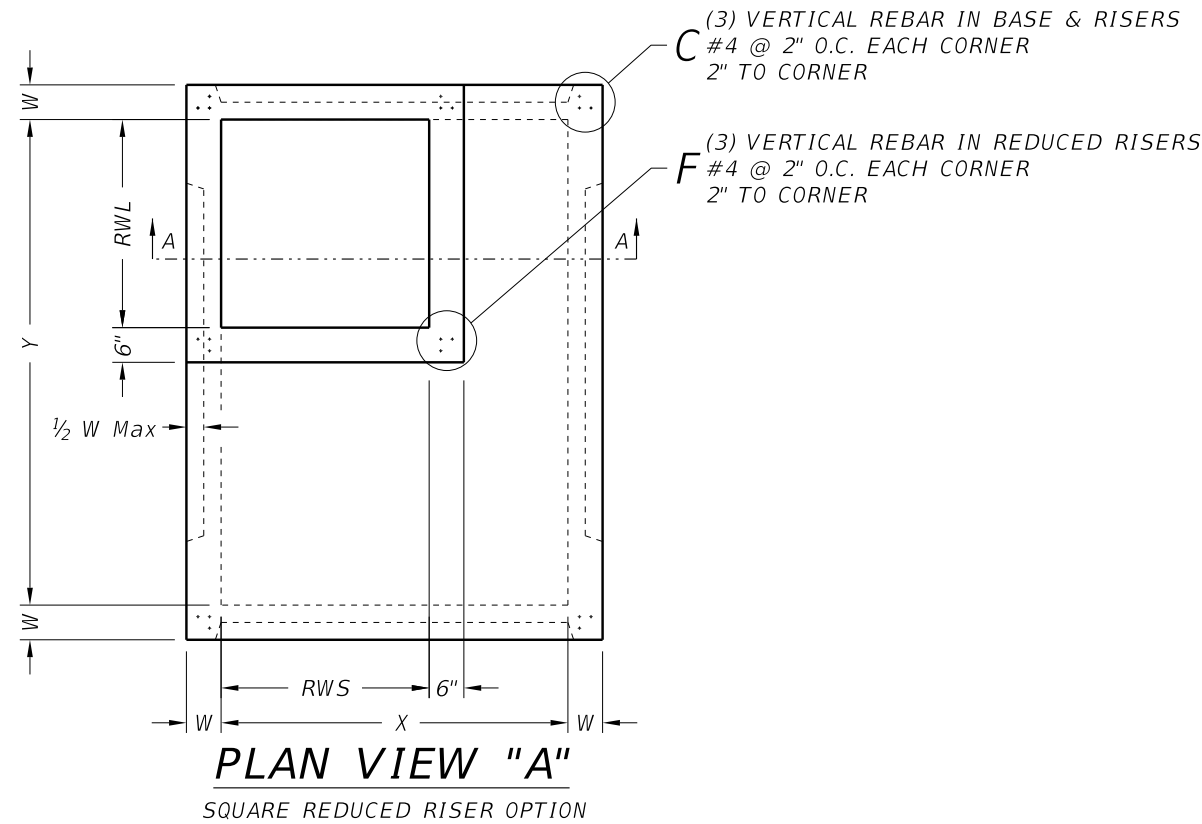


GENERAL NOTES:
 Designed according to AASHTO LRFD Specifications.
 Reinforcing steel shall be placed with the center of the outside layer of bars 2" from the surface of the concrete.
 All reinforcing steel shall be Grade 60.
 All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.
 No bridge rails of any type may be mounted directly to these culvert headwalls.

Texas Department of Transportation
CONCRETE HEADWALLS WITH FLARED WINGS FOR 0° SKEW PIPE CULVERTS
CH-FW-0

FILE: chfw00se.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST		COUNTY	SHEET NO.

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 1/2" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in²/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is 3/4".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.

INSTALLATION NOTES:

1. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to specified inlet or manhole.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or 1/2 the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

GENERAL NOTES:

1. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for precast base is subsidiary to the specified inlet, per Item 465, "Junction Boxes, Manholes, and Inlets."

Cover dimensions are clear dimensions, unless noted otherwise.

DATE:
FILE:

HL93 LOADING



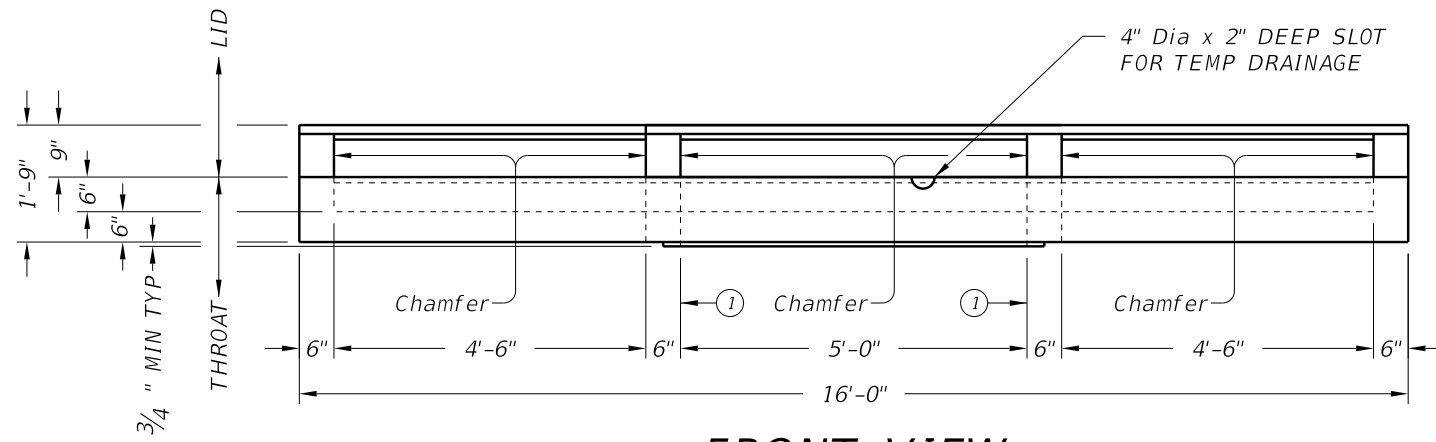
PRECAST BASE

PB

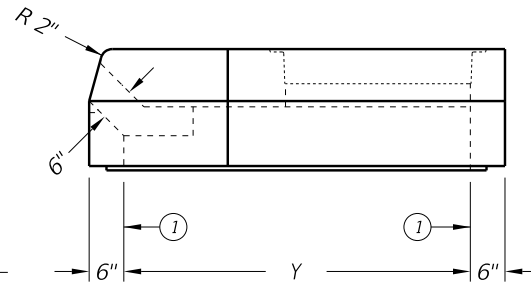
FILE: prest01.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				
DIST	COUNTY			SHEET NO.

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

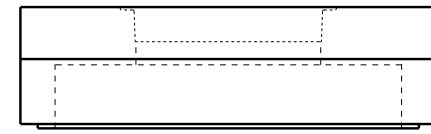
DATE:
FILE:



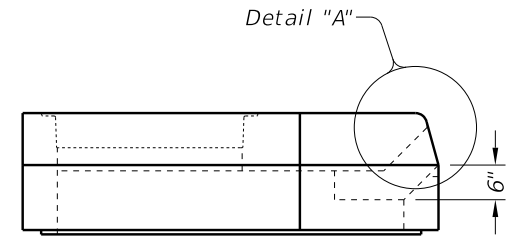
FRONT VIEW
(SHOWING LEFT AND RIGHT EXTENSIONS)



RIGHT VIEW

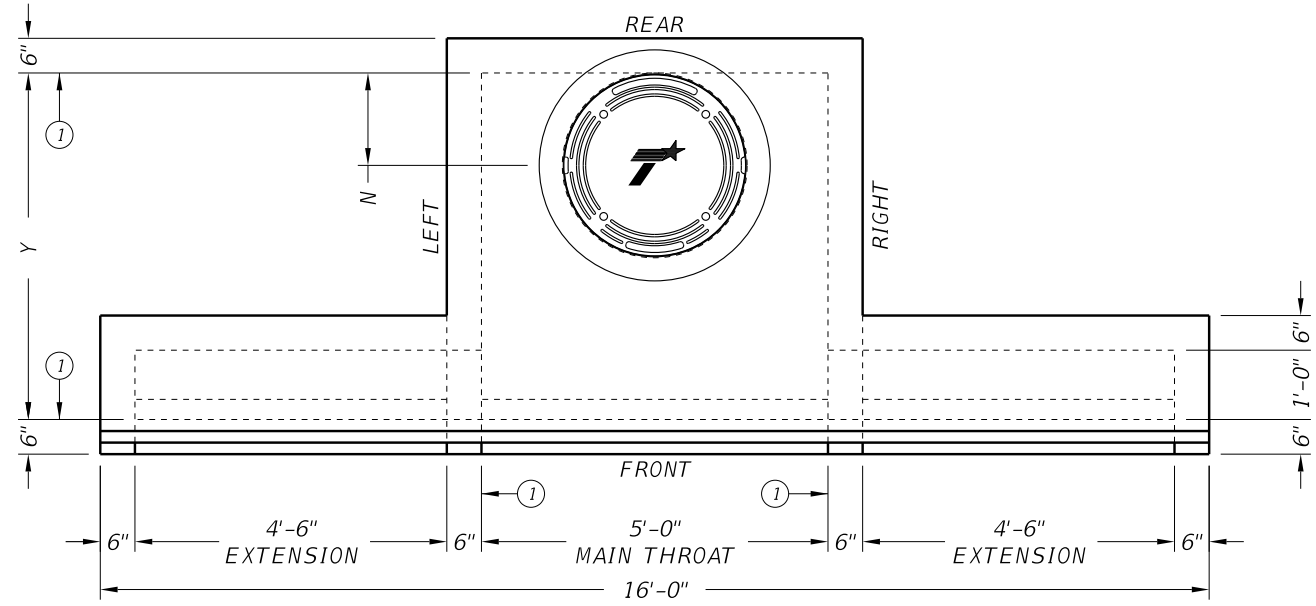


REAR VIEW
(EXTENSIONS NOT SHOWN)

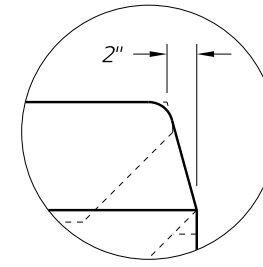


LEFT VIEW

① Matches inside face of wall of precast base or riser below inlet.



PLAN VIEW
(SHOWING LEFT AND RIGHT EXTENSIONS)



DETAIL "A"

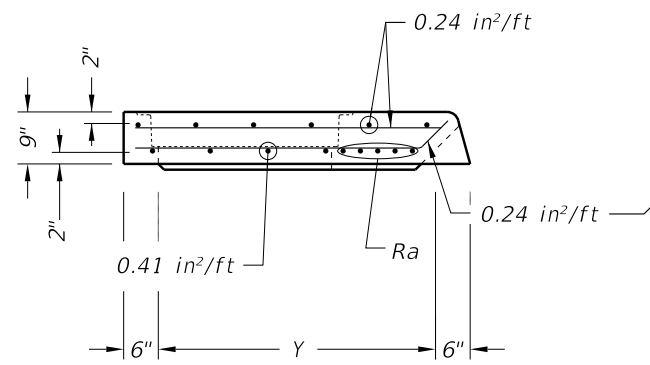


**PRECAST CURB INLET
OUTSIDE ROADWAY**

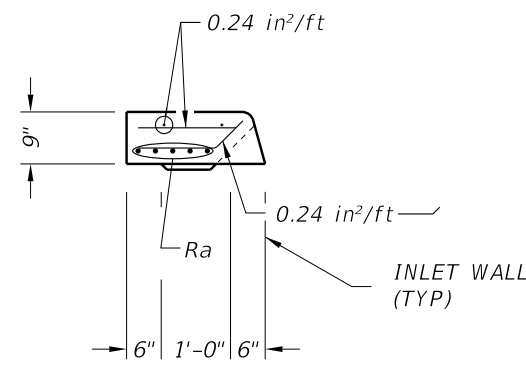
PCO

FILE: prest03.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.

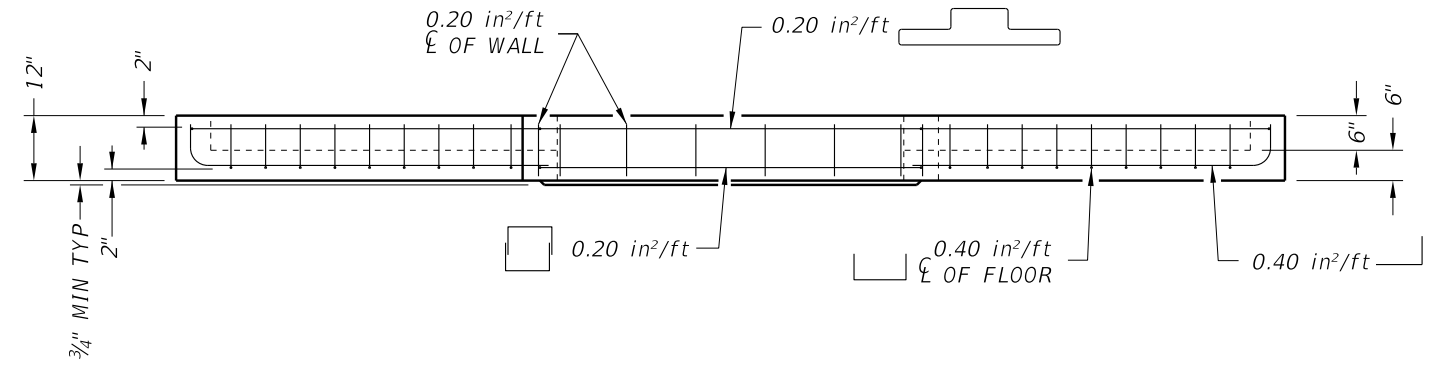
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



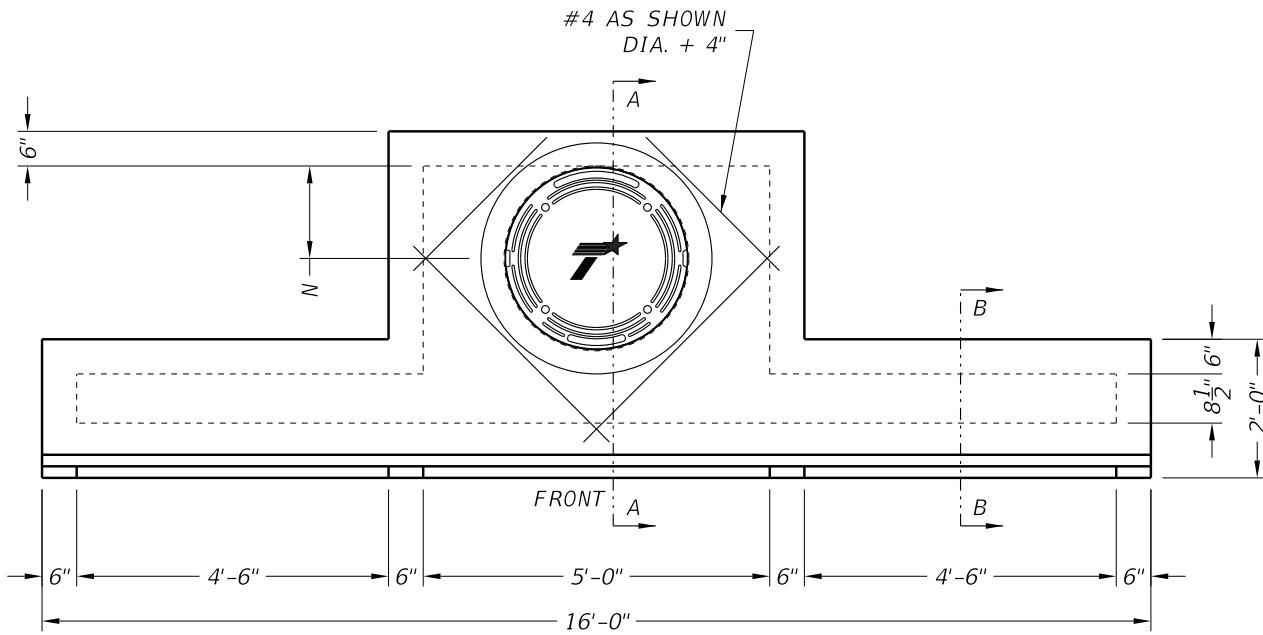
LID SECTION A-A



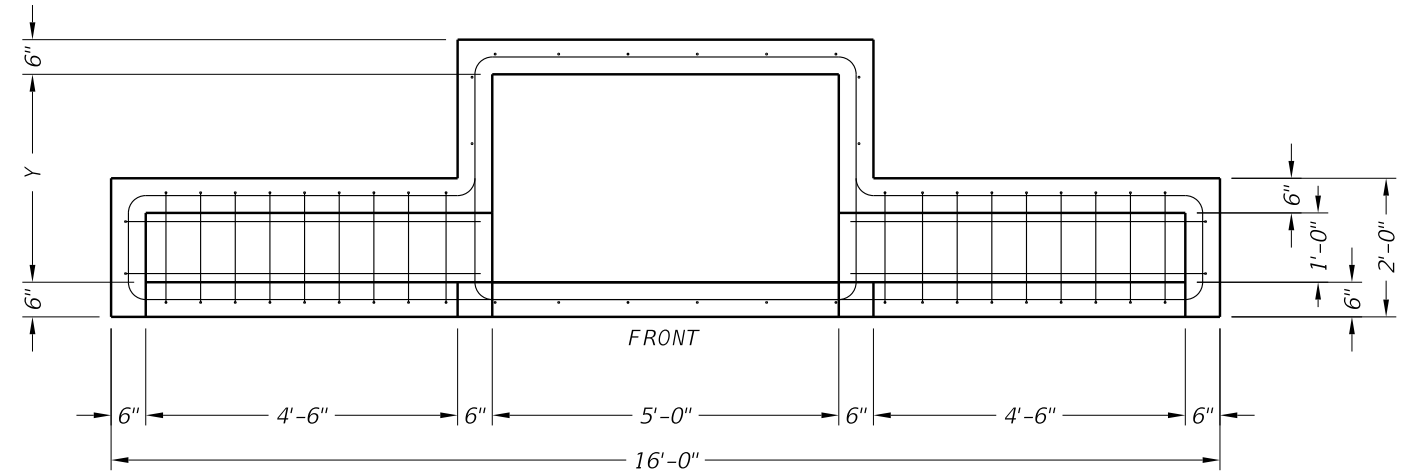
LID SECTION B-B



THROAT ELEVATION VIEW
(SHOWING LEFT AND RIGHT EXTENSIONS)



LID PLAN VIEW
(SHOWING LEFT AND RIGHT EXTENSIONS)



THROAT PLAN VIEW
(SHOWING LEFT AND RIGHT EXTENSIONS)

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Extensions may be right, left, both or none. Provide extensions as specified elsewhere in the plans.
4. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is 3/4". Lid may employ a butt joint with dowels at the Contractor's option.
5. Provide lifting devices in conformance with Manufacturer's recommendations.
6. Provide cast iron solid cover, unless noted otherwise elsewhere in the plans.
7. Chamfer vertical edges of inlet lid 3/4" as shown in Front View, sheet 1.

INSTALLATION NOTES:

1. Inlet throat and lid are not intended for direct traffic. Do not place in roadway.
2. Seal tongue and groove joints and butt joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or 1/2 the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.

GENERAL NOTES:

1. Designed according to ASTM C913.
2. Open area of main throat = 360 sq in. Open area of one extension throat = 324 sq in.
3. Payment for inlet is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, size, and extension placement. Extensions are subsidiary to inlet.

Cover dimensions are clear dimensions, unless noted otherwise.

SIZE (Y)	N	MH DIA*	Ra
3'	9"	18"	(4) #5 Additional
4'	16"	32"	(4) #5 Additional
5'	16"	32"	(4) #5 Additional
6'	16"	32"	(4) #5 Additional

*Nominal ring and cover size.

HS20 LOADING SHEET 2 OF 2



**PRECAST CURB INLET
OUTSIDE ROADWAY**

PCO

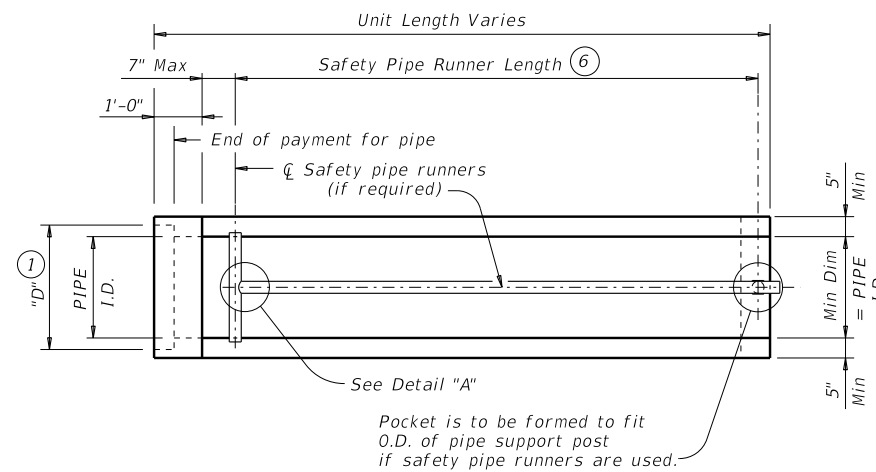
FILE: prest03.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO.	

DATE:
FILE:

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

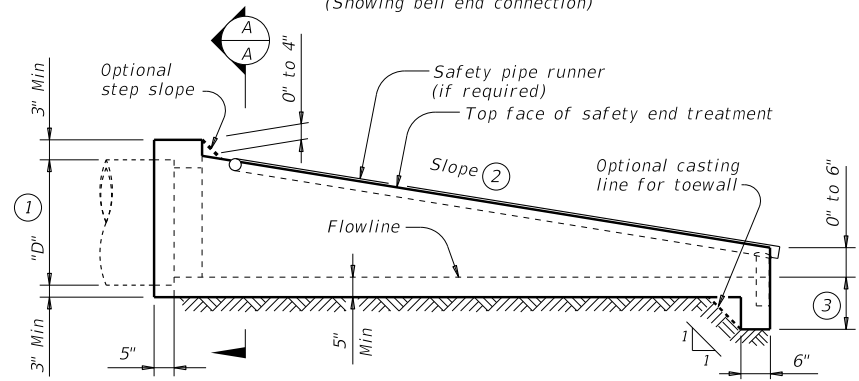
DATE: FILE:

PIPE I.D.	RCP WALL "B" THICKNESS	TP WALL THICKNESS (8)	"D" (1)	SLOPE	MINIMUM LENGTH OF UNIT	SINGLE PIPE		MULTIPLE PIPE	
						SKEW	PIPE RUNNERS REQUIRED	SKEW	PIPE RUNNERS REQUIRED
12"	2"	1.15"	17"	3:1	2'-11"	<=45 deg	No	<=45 deg	No
				4:1	3'-6"				
				6:1	4'-9"				
15"	2.25"	1.30"	20.50"	3:1	3'-8"	<=45 deg	No	<=45 deg	No
				4:1	4'-7"				
				6:1	6'-5"				
18"	2.50"	1.60"	24"	3:1	4'-6"	<=45 deg	No	<=45 deg	No
				4:1	5'-8"				
				6:1	8'-0"				
24"	3"	1.95"	31"	3:1	6'-2"	<=45 deg	No	<=30 deg	No
				4:1	7'-10"			>30 deg	Yes
				6:1	11'-3"				
30"	3.50"	2.65"	38.50"	3:1	7'-10"	<=15 deg	No	<=15 deg	No
				4:1	10'-1"			>15 deg	Yes
				6:1	14'-8"				
36"	4"	2.75"	45.50"	3:1	9'-5"	=0 deg	No	=>0 deg	Yes
				4:1	12'-3"			>0 deg	Yes
				6:1	17'-11"				
42"	4.50"	N/A	52.50"	3:1	11'-1"	=>0 deg	Yes	=>0 deg	Yes
				4:1	14'-5"				
				6:1	21'-2"				



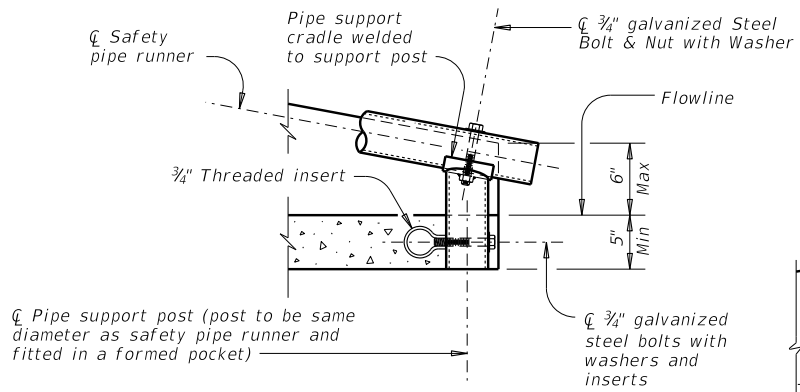
PLAN

(Showing bell end connection)



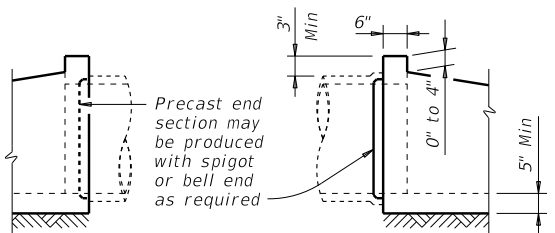
LONGITUDINAL ELEVATION

(Showing bell end connection)



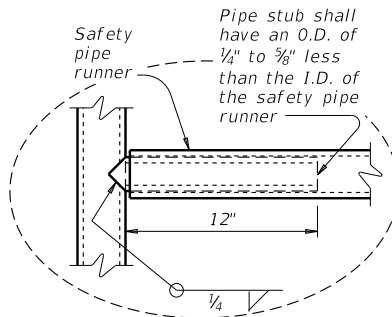
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

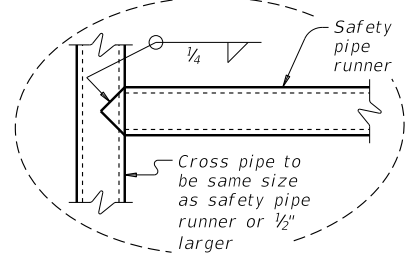


OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



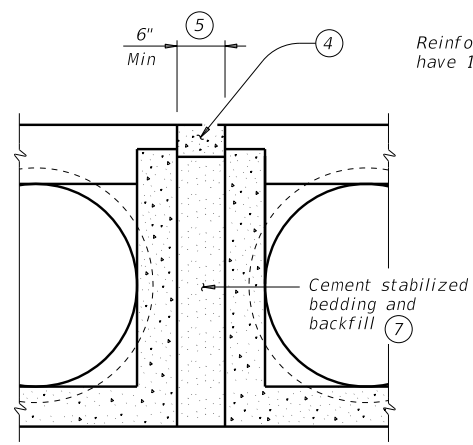
OPTION A



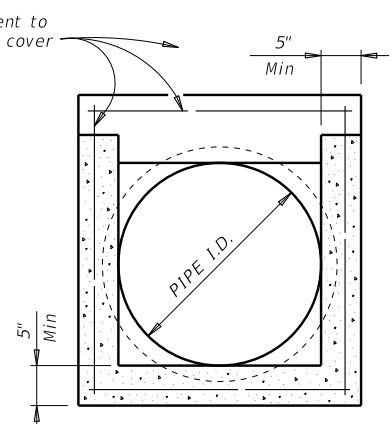
OPTION B

DETAIL A

(If required)

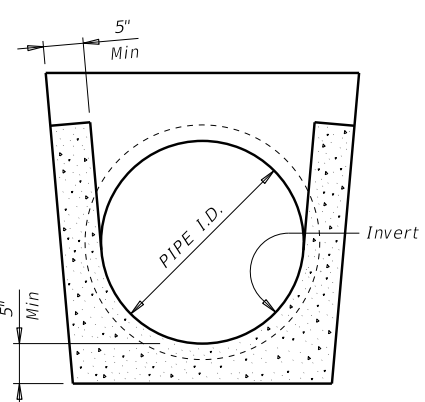


MULTIPLE PIPE INSTALLATION

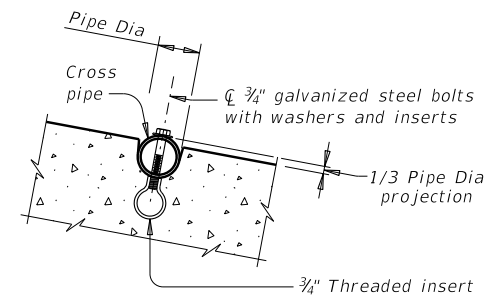


OPTION WITH SQUARE BOTTOM

SECTION A-A



OPTION WITH INVERT BOTTOM



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

Maximum Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11'- 2"	3" STD	3.500"	3.068"
15'- 6"	3 1/2" STD	4.000"	3.548"
20'-10"	4" STD	4.500"	4.026"
35'- 4"	5" STD	5.563"	5.047"

- Dimension "D" is based on Reinforced Concrete Pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For Thermoplastic Pipe (TP) take into account the annular space requirements for grouted connections.
- Slope as shown elsewhere in plans. Slope of 3:1 or flatter is required for vehicle safety.
- Toewall to be used only when dimension is shown elsewhere in the plans.
- Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item "Safety End Treatment".
- Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.
- Measured along slope.
- Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.
- Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item "Safety End Treatment" except as noted below:

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor the next larger size of safety end treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

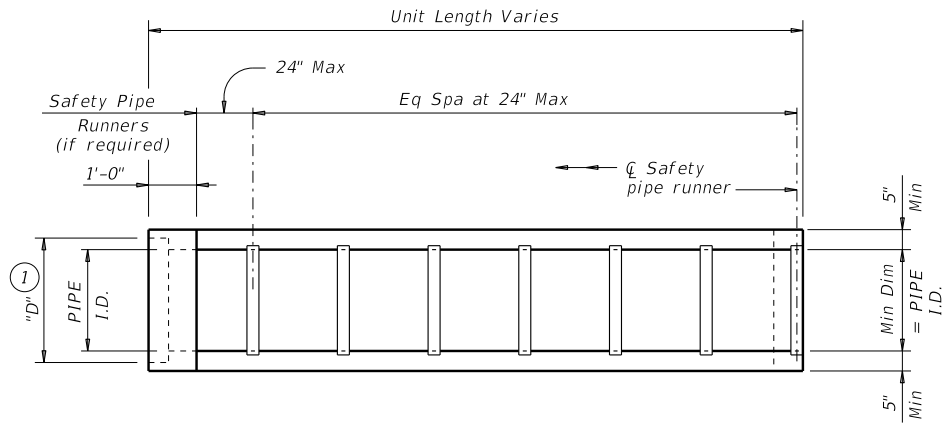
Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe". Connect TP by grouting. See PBGC standard for grouted connections with TP and precast safety end treatment.

<p>PRECAST SAFETY END TREATMENT</p> <p>TYPE II ~ CROSS DRAINAGE</p> <p>PSET-SC</p>			
FILE: psetscss-18.dgn	DN: RLW	CK: KLR	DW: JTR
©TxDOT February 2010	CONTRACT	SECTION	JOB
REVISIONS			HIGHWAY
11-10: Add note for synthetic fibers.			
09-18: Added Thermoplastic Pipe in table.	DIST	COUNTY	SHEET NO.

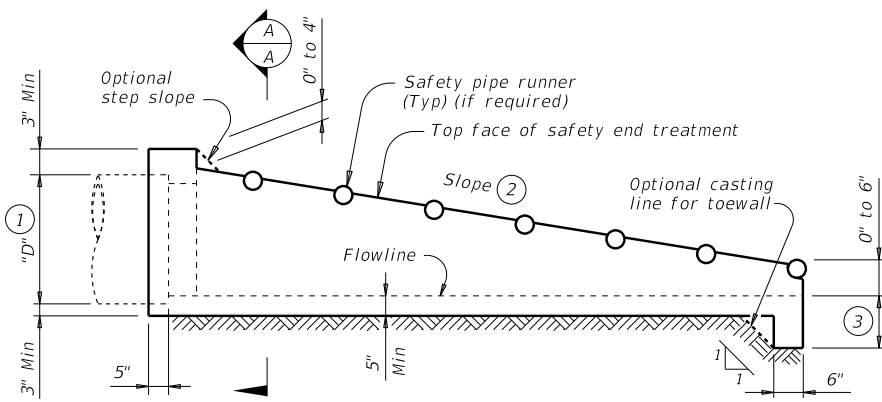
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: FILE:



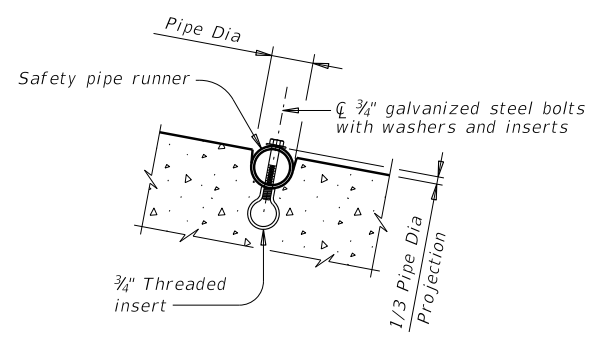
PLAN

(Showing bell end connection)



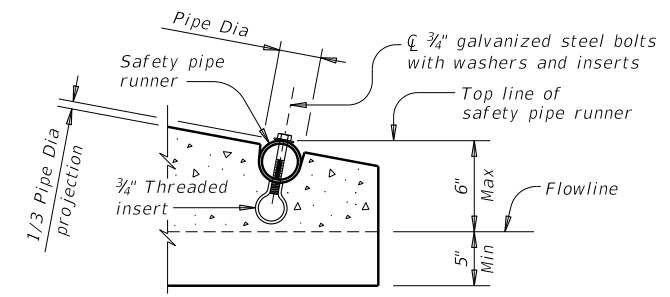
LONGITUDINAL ELEVATION

(Showing bell end connection)

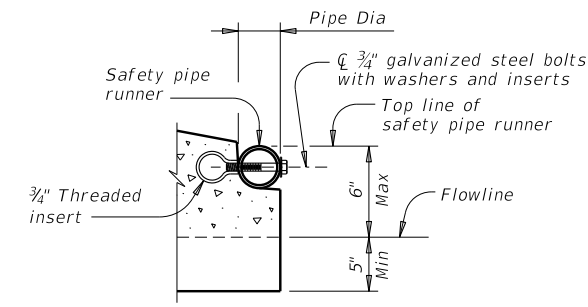


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



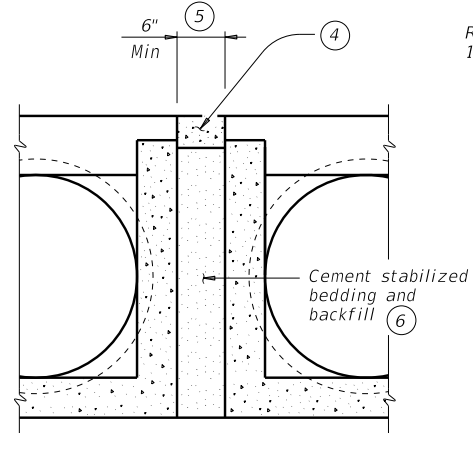
OPTION A



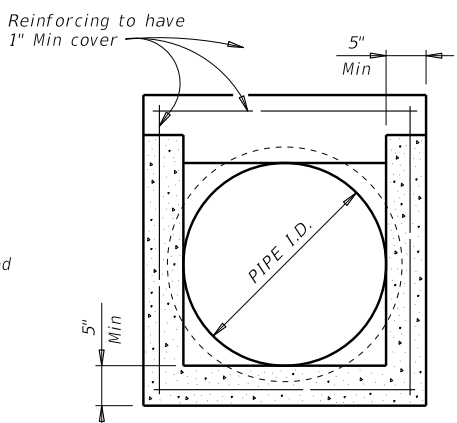
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

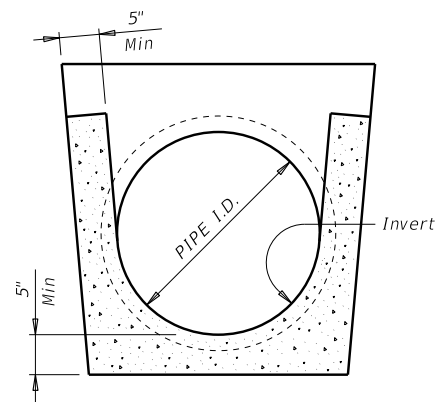


MULTIPLE PIPE INSTALLATION

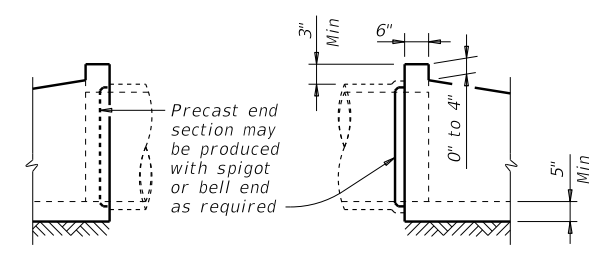


OPTION WITH SQUARE BOTTOM

SECTION A-A



OPTION WITH INVERT BOTTOM



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)

PIPE I.D.	RCP WALL "B" THICKNESS	TP WALL THICKNESS	"D"	MAXIMUM SLOPE	MINIMUM LENGTH OF UNIT	PIPE RUNNERS REQUIRED		REQUIRED PIPE RUNNER SIZES		
						SINGLE PIPE	MULTIPLE PIPE	NOMINAL DIA.	O.D.	I.D.
12"	2"	1.15"	17"	6:1	4'-9"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
15"	2.25"	1.30"	20.50"	6:1	6'-5"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
18"	2.50"	1.60"	24"	6:1	8'-0"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
24"	3"	1.95"	31"	6:1	11'-3"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
30"	3.50"	2.65"	38.50"	6:1	14'-8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	2.75"	45.50"	6:1	17'-11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4.50"	N/A	52.50"	6:1	21'-2"	Yes	Yes	4" STD	4.500"	4.026"

- Dimension "D" is based on Reinforced Concrete Pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For Thermoplastic Pipe (TP) take into account the annular space requirements for grouted connections.
- Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.
- Toewall to be used only when dimension is shown elsewhere in the plans.
- Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item "Safety End Treatment".
- Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.
- Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.
- Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item "Safety End Treatment" except as noted below:

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor the next larger size of safety end treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe". Connect TP by grouting. See PBGC standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation
 Bridge Division Standard

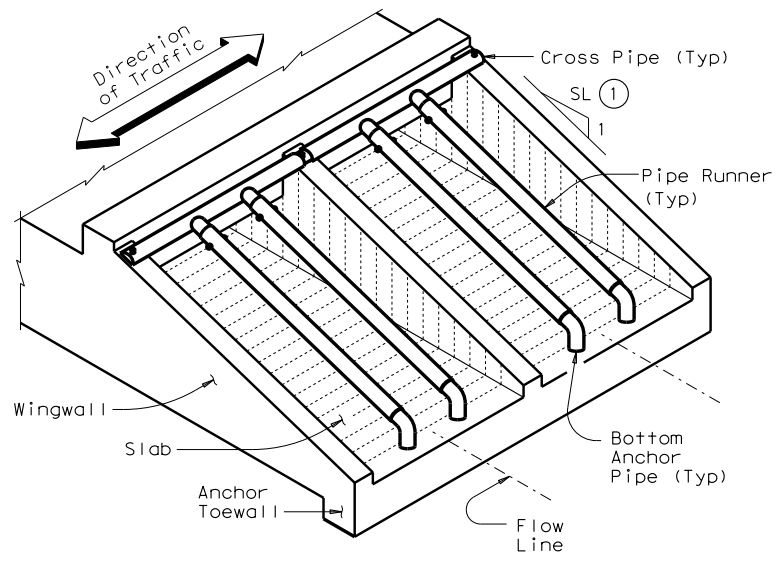
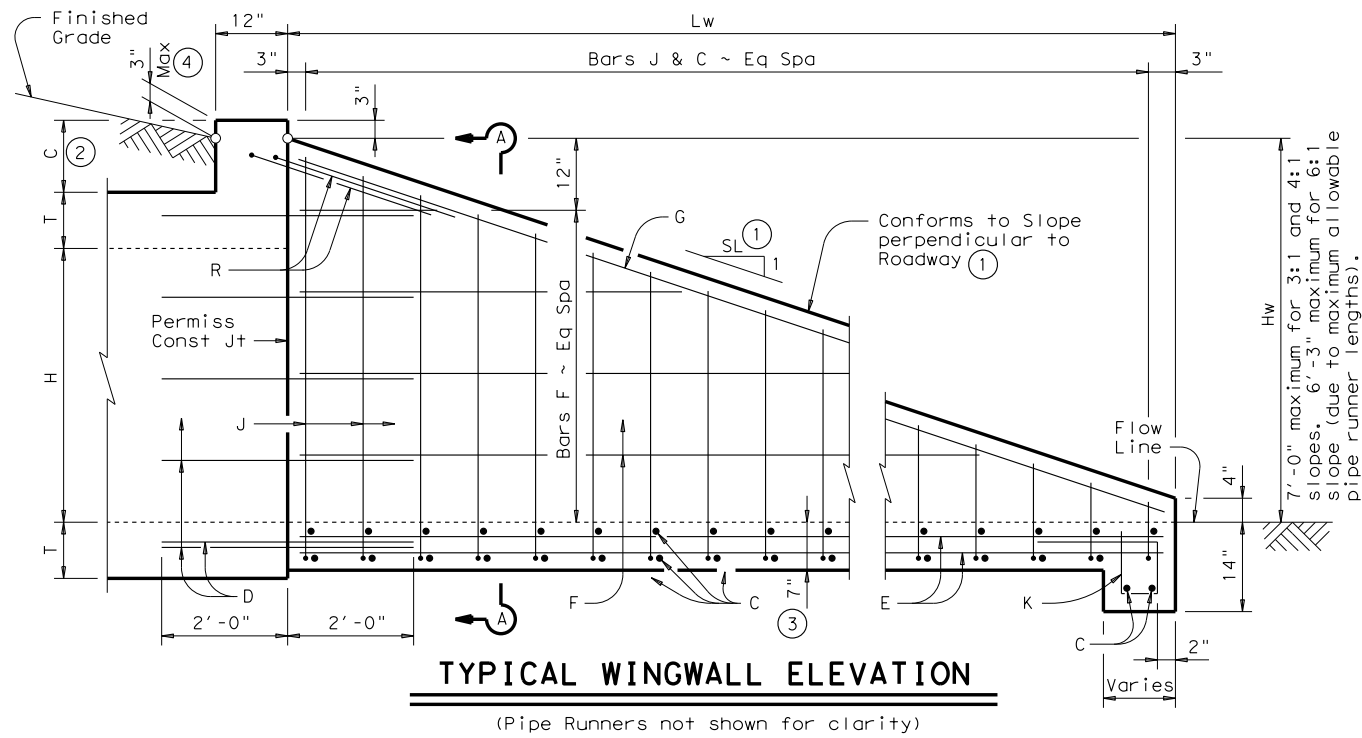
PRECAST SAFETY END TREATMENT TYPE II ~ PARALLEL DRAINAGE

PSET-SP

FILE: psetspss-18.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
11-10: Add note for synthetic fibers.				
09-18: Added Thermoplastic Pipe in table.	DIST	COUNTY		SHEET NO.

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: FILE:



ISOMETRIC VIEW OF TYPICAL INSTALLATION

Formulas: (All values are in Feet)
 $Hw = H + T + C - 0.250'$
 $Lw = (Hw - 0.333') (SL)$

For Cast-in-place culverts:
 $Atw = (N) (S) + (N+1) (U)$

For Precast culverts:
 $Atw = (N) (2U+S) + (N-1) (0.500')$

Total Wingwall Area (S.F.)
 $= (0.5) (Hw + 0.333') (Lw) (N+1)$

Total Concrete Volume (C.Y.)
 $= [(Wingwall Area) (0.583') + (Lw) (Atw) (0.583') + (Atw) (1.167') (1.167' - 0.583')] \div (27)$

Pipe Runner Length
 $= (Lw) (K1) - (1.917')$

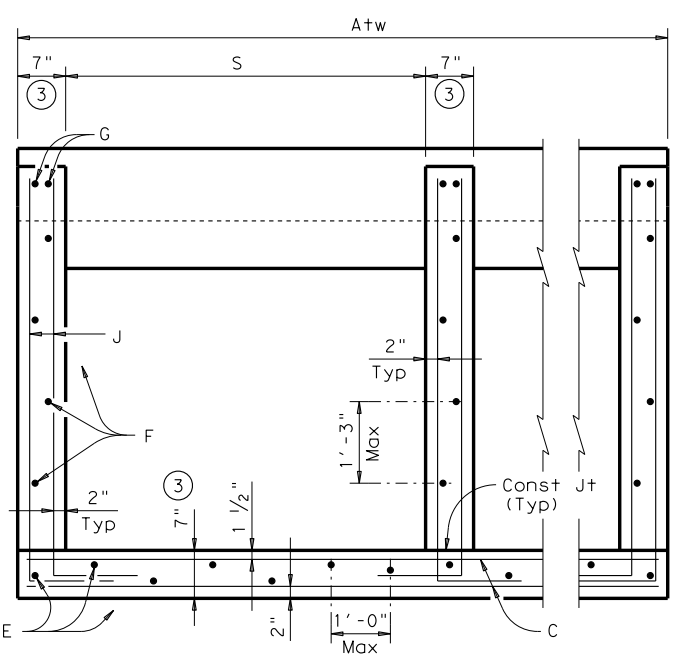
Total Reinforcing (Lbs)
 $= (1.55) (Lw) (Atw) + (4.43) (Atw) + (K2) (Hw) (N+1) (\sqrt{Lw})$

C = Height of Curb above top of Top Slab
Hw = Height of Wingwall
K = Constant Value for use in formulas
Slope SL:1 K1 K2
3:1 ~ 1.054 ~ 7.45
4:1 ~ 1.031 ~ 8.49
6:1 ~ 1.014 ~ 10.30

Atw = Anchor Toewall Length
Lw = Length of Wingwall
N = Number of Culvert Barrels
SL:1 = Side Slope Ratio (Horizontal : 1 Vertical)

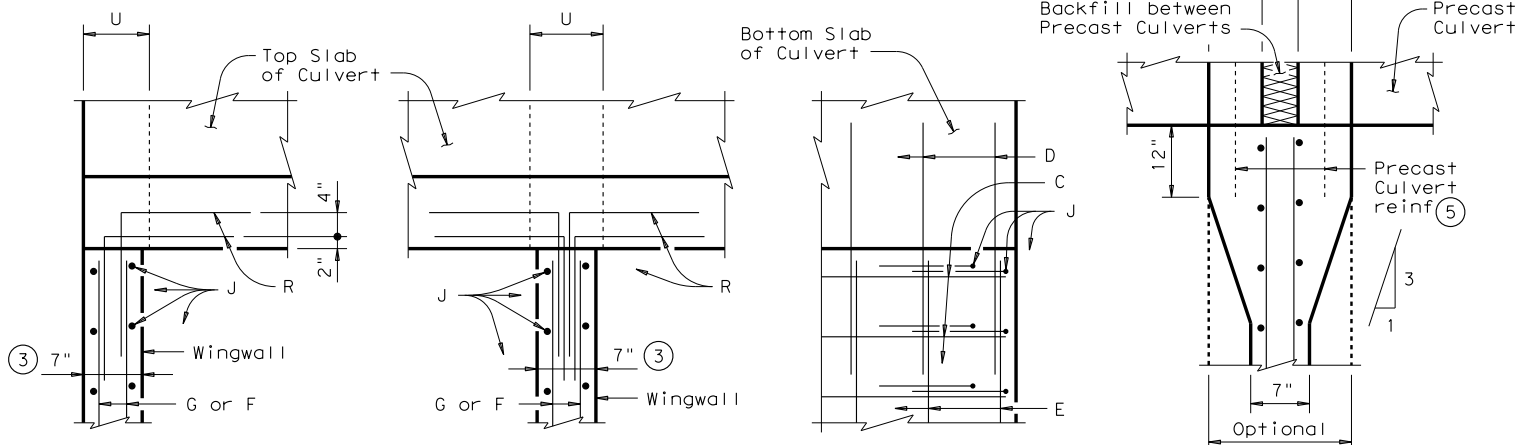
See applicable box culvert standard for H, S, T, and U values.

GENERAL NOTES:
Designed according to AASHTO LRFD Specifications.
The Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Pipe Runners.
Pipe Runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
All reinforcing steel shall be Grade 60. All reinforcing shall be adjusted as necessary to provide a minimum clear cover of 1 1/4".
All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.
The quantities for Pipe Runners, reinforcing steel, and concrete, resulting from the formulas given herein are for Contractor's information only.
Pipe Runners, Cross Pipes, and Anchor Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.
Bolts and nuts shall conform to ASTM A307.
All steel components, except the concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.
See BCS standard sheet for additional dimensions and information.
Alternate design drawings bearing the seal of a professional engineer will be acceptable for precast construction of the Safety End Treatments.



SECTION A-A

(Showing typical Wingwall and Wing Slab reinforcing)
(Pipe Runners not shown for clarity)



PLAN VIEWS OF CORNER DETAILS

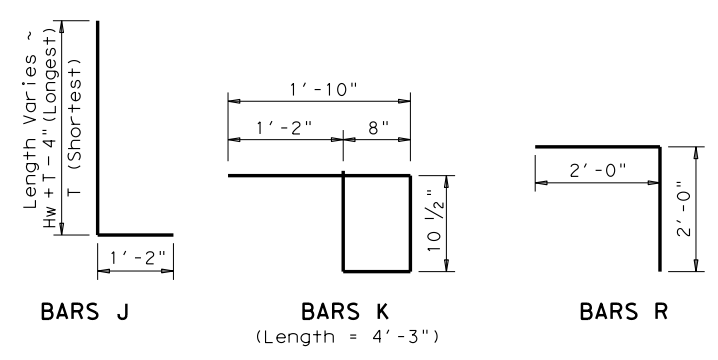


TABLE OF REINFORCING BAR SIZES & SPACING		
Bar	Size	Spacing
C	#4	10" Max
D	#4	match F & E
E	#4	1' - 0" Max
F	#4	1' - 3" Max
G	#6	Shown
J	#4	10" Max
K	#4	1' - 0" Max
R	#4	Shown

- Recommended values of slope are: 3:1, 4:1, & 6:1. Slope shall be 3:1 or flatter.
- 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to ECD standard.
- Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" Minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.
- For vehicle safety, curbs shall project no more than 3" above finished grade. Curb heights shall be reduced, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- For Culverts with C = 0", the precast culvert reinforcing may extend 1'-0" minimum into Wingwall. Wingwall Bars D and R may be omitted. Otherwise, refer to the "Wingwall Connection Detail" on the SCP-MD standard.

Texas Department of Transportation Bridge Division Standard

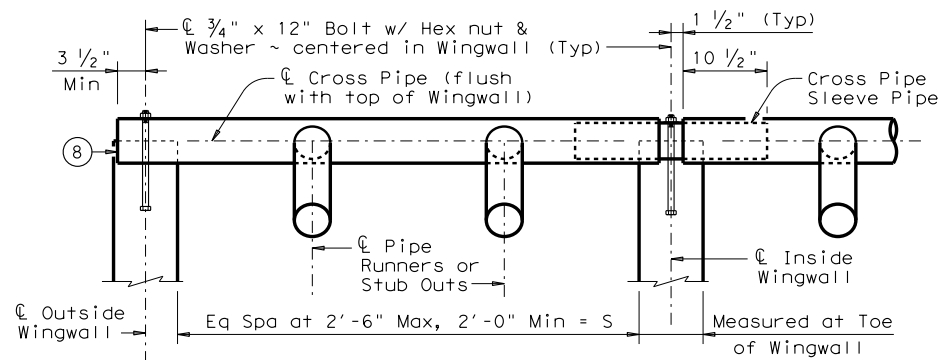
SAFETY END TREATMENT FOR 0° SKEW BOX CULVERTS (MAXIMUM Hw = 7'-0") TYPE I ~ CROSS DRAINAGE

SETB-CD

FILE: setbcdse.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO.	

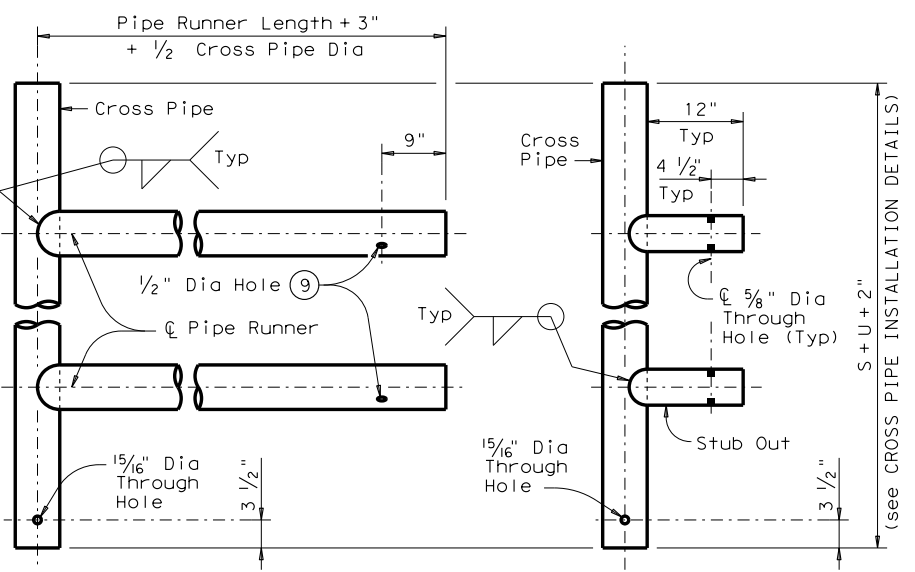
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: FILE:

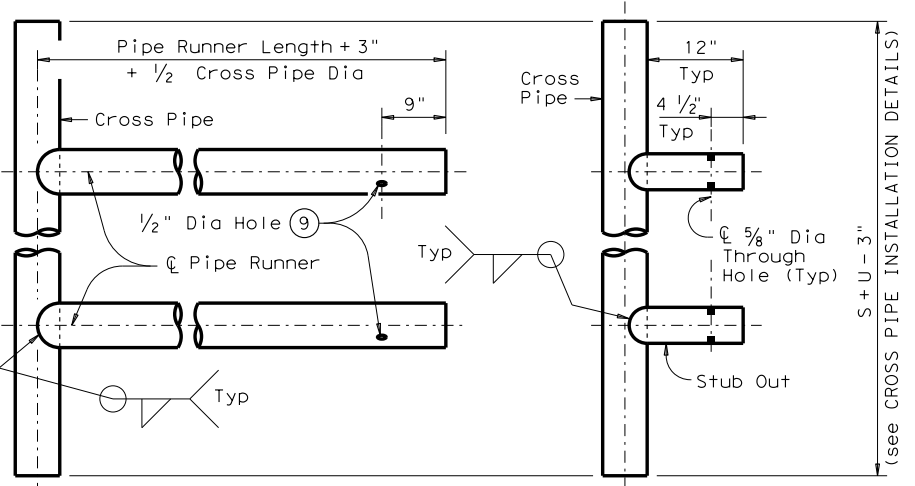


NOTE: At Contractor's option, the Cross Pipe may be made continuous across the Inside Wingwalls. If such option is selected, the Sleeve Pipe shall be omitted and a 1 5/16 inch diameter through hole be made in the Cross Pipe to accept the anchor bolt at the centerline of each Inside Wingwall.

CROSS PIPE INSTALLATION DETAILS

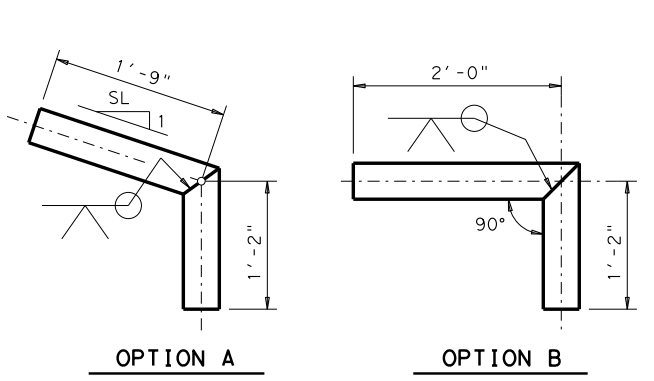


OPTION A2 FOR USE IN OUTSIDE CULVERT BAY



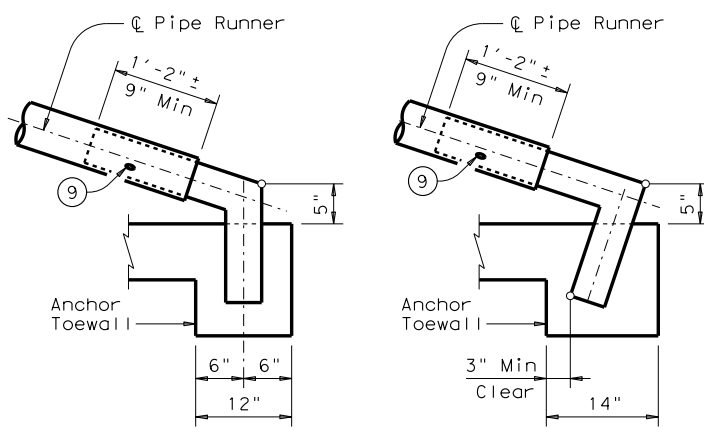
OPTION A2 FOR USE IN INSIDE CULVERT BAY

CROSS PIPE AND CONNECTIONS DETAILS



OPTION A OPTION B

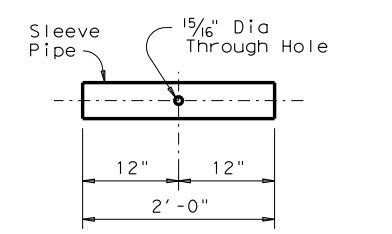
BOTTOM ANCHOR PIPE DETAILS ⑩



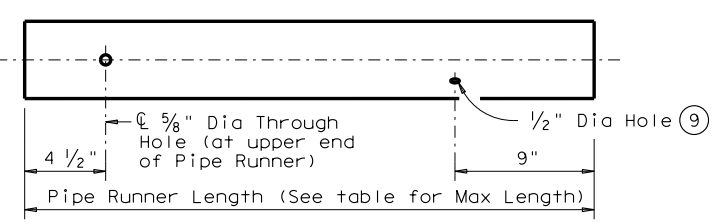
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Wingwall not shown for clarity)



CROSS PIPE SLEEVE PIPE DETAILS

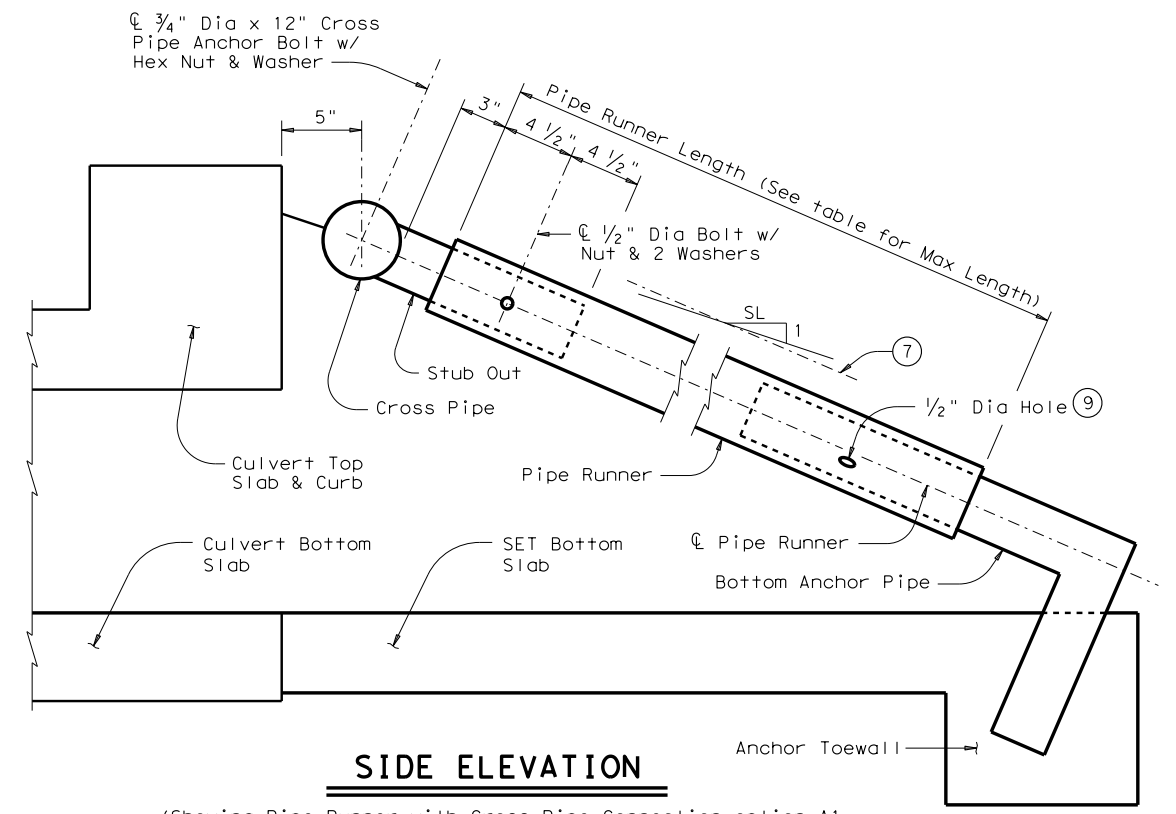


NOTE: The separate Pipe Runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

- ⑥ Cross Pipe shall be the same size as the Pipe Runner. Cross Pipe Stub Out shall be the same size as the Anchor Pipe.
- ⑦ Note that actual slope of Safety Pipe Runner may vary slightly from Side Slope.
- ⑧ Care shall be taken to ensure that Riprap concrete does not flow into the Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access.
- ⑨ After installation, the 1/2 inch hole shall be inspected to ensure that the lap of the Safety Pipe Runner with the Bottom Anchor Pipe is adequate.
- ⑩ At fabricator's option, a heat bend to a smooth 5 inch radius or a manufactured elbow (of the same material as the Runner) may be substituted for the mitered and welded joint in the Bottom Anchor Pipe.

Maximum Pipe Runner Length	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
10' - 0"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19' - 8"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
34' - 2"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"



SIDE ELEVATION

(Showing Pipe Runner with Cross Pipe Connection option A1 and anchor Pipe option B2. Wingwall not shown for clarity)

SHEET 2 OF 2

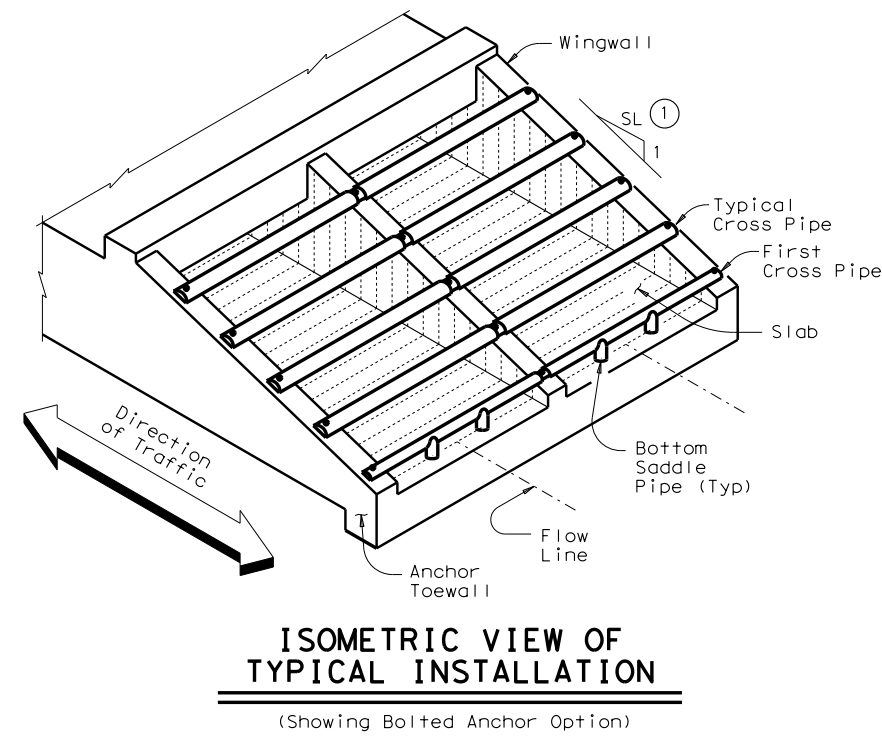
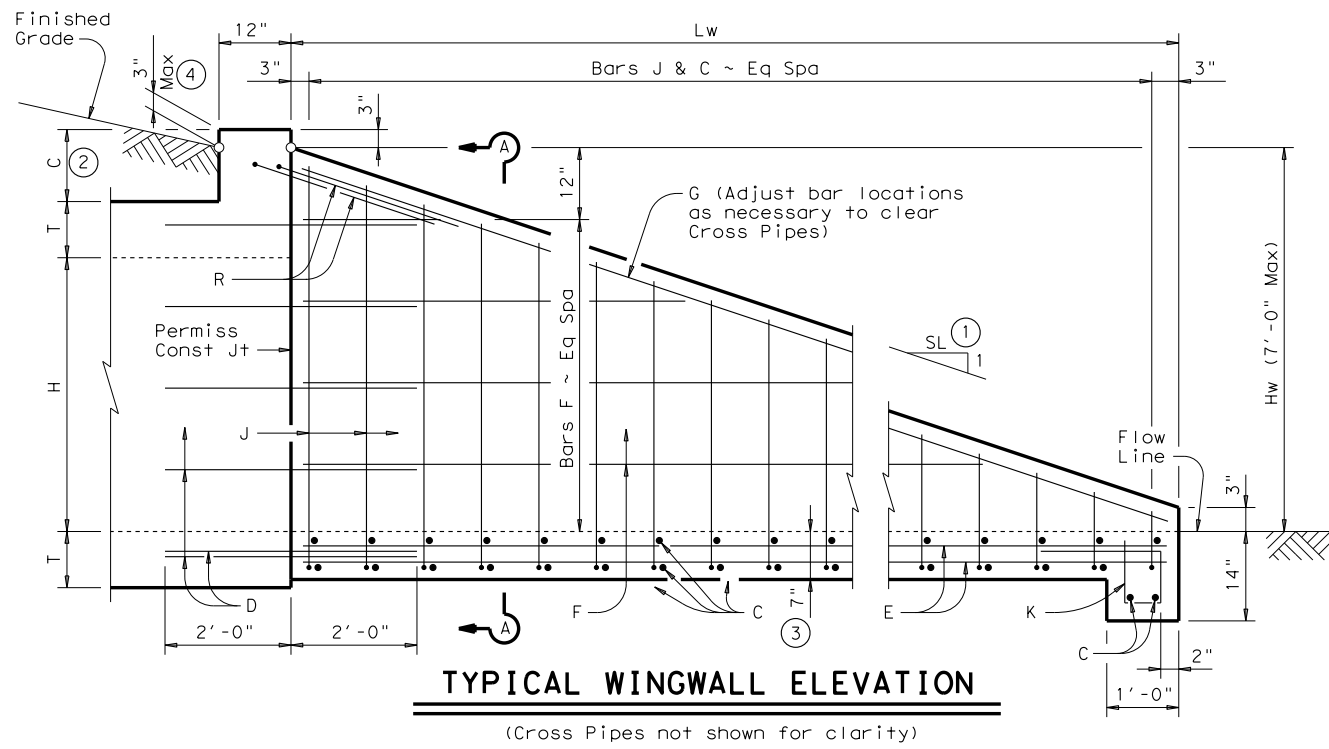
Bridge Division Standard

SAFETY END TREATMENT
 FOR 0° SKEW BOX CULVERTS
 (MAXIMUM Hw = 7'-0")
 TYPE I ~ CROSS DRAINAGE

SETB-CD

FILE: setbcdse.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



Formulas: (All values are in Feet)
 $Hw = H + T + C - 0.250'$
 $Lw = (Hw - 0.250') (SL)$

For Cast-in-place culverts:
 $Atw = (N) (S) + (N+1) (U)$

For Precast culverts:
 $Atw = (N) (2U+S) + (N-1) (0.500')$

Total Wingwall Area (S.F.)
 $= (0.5) (Hw + 0.250') (Lw) (N+1)$

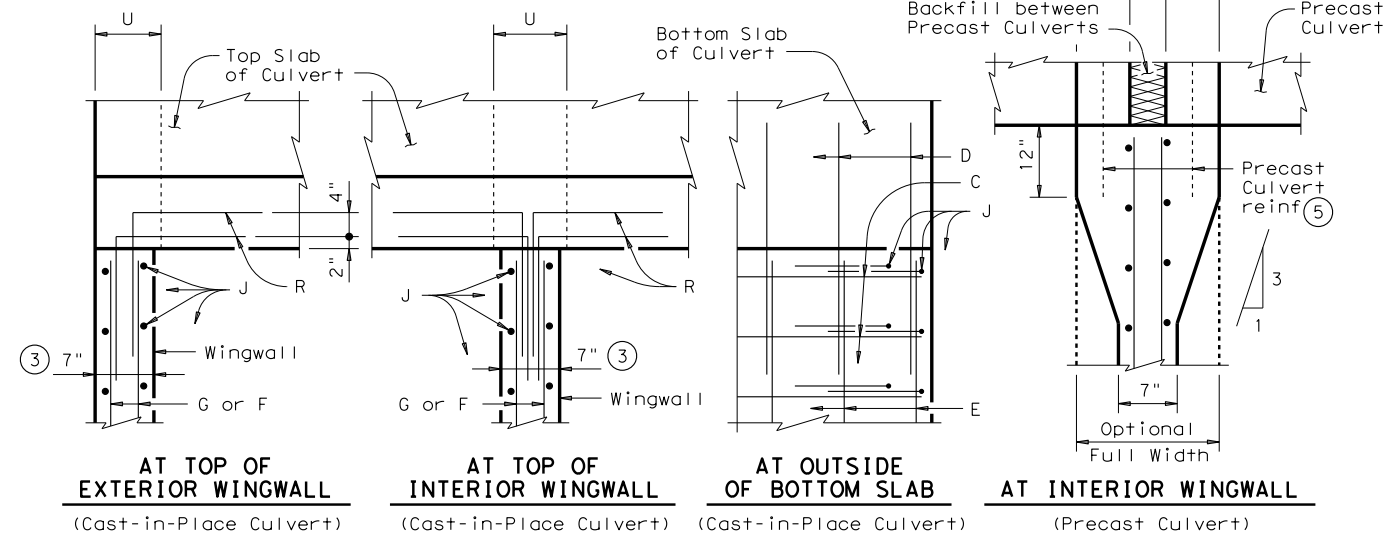
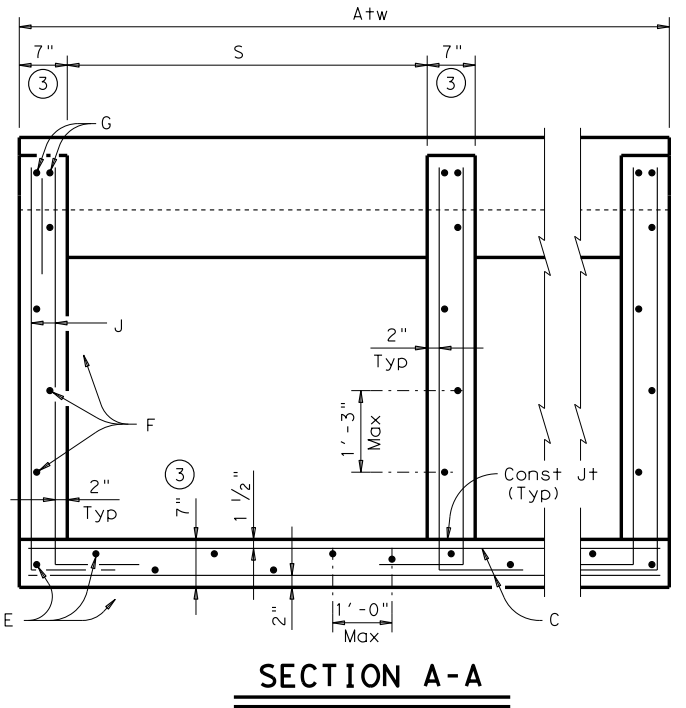
Total Concrete Volume (C.Y.)
 $= [(Wingwall Area) (0.583') + (Lw) (Atw) (0.583') + (Atw) (1.000') (1.167' - 0.583')] \div (27)$

Total Reinforcing (Lbs)
 $= (1.55) (Lw) (Atw) + (4.43) (Atw) + (K) (Hw) (N+1) (\sqrt{Lw})$

C = Height of Curb above top of Top Slab
Hw = Height of Wingwall
K = Constant Value for use in formulas
Slope SL:1 = $\frac{K}{6:1} \sim 10.41$
Atw = Anchor Toewall Length
Lw = Length of Wingwall
N = Number of Culvert Barrels
S = Clear Span of each Barrel
SL:1 = Side Slope Ratio (Horizontal : 1 Vertical)

See applicable box culvert standard for H, S, T, and U values.

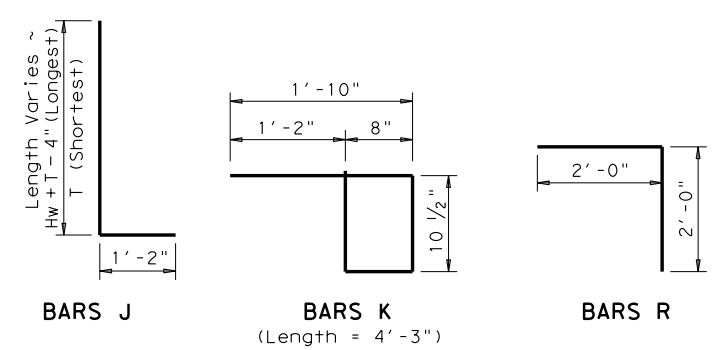
GENERAL NOTES:
Designed according to AASHTO LRFD Specifications.
The Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Cross Pipes.
Cross Pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.
All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.
All reinforcing steel shall be Grade 60. All reinforcing shall be adjusted as necessary to provide a minimum clear cover of 1 1/4".
The quantities for concrete, reinforcing steel, and Cross Pipes resulting from the formulas given herein are for Contractor's information only.
Cross Pipes, Sleeve Pipes, and Saddle Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.
Bolts and nuts shall conform to ASTM A307. All steel components, except the concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.
See BCS standard sheet for additional dimensions and information.
Alternate design drawings bearing the seal of a professional engineer will be acceptable for precast construction of the Safety End Treatments.



PLAN VIEWS OF CORNER DETAILS

- ① Slope will be 6:1 or flatter.
- ② 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to ECD standard.
- ③ Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" Minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.
- ④ For vehicle safety, curbs shall project no more than 3" above finished grade. Curb heights shall be reduced, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ⑤ For Culverts with C = 0", the precast culvert reinforcing may extend 1'-0" minimum into Wingwall. Wingwall Bars D and R may be omitted. Otherwise, refer to the "Wingwall Connection Detail" on the SCP-MD standard.

TABLE OF REINFORCING BAR SIZES & SPACING		
Bar	Size	Spacing
C	#4	10" Max
D	#4	match F & E
E	#4	1'-0" Max
F	#4	1'-3" Max
G	#6	Shown
J	#4	10" Max
K	#4	1'-0" Max
R	#4	Shown



Texas Department of Transportation

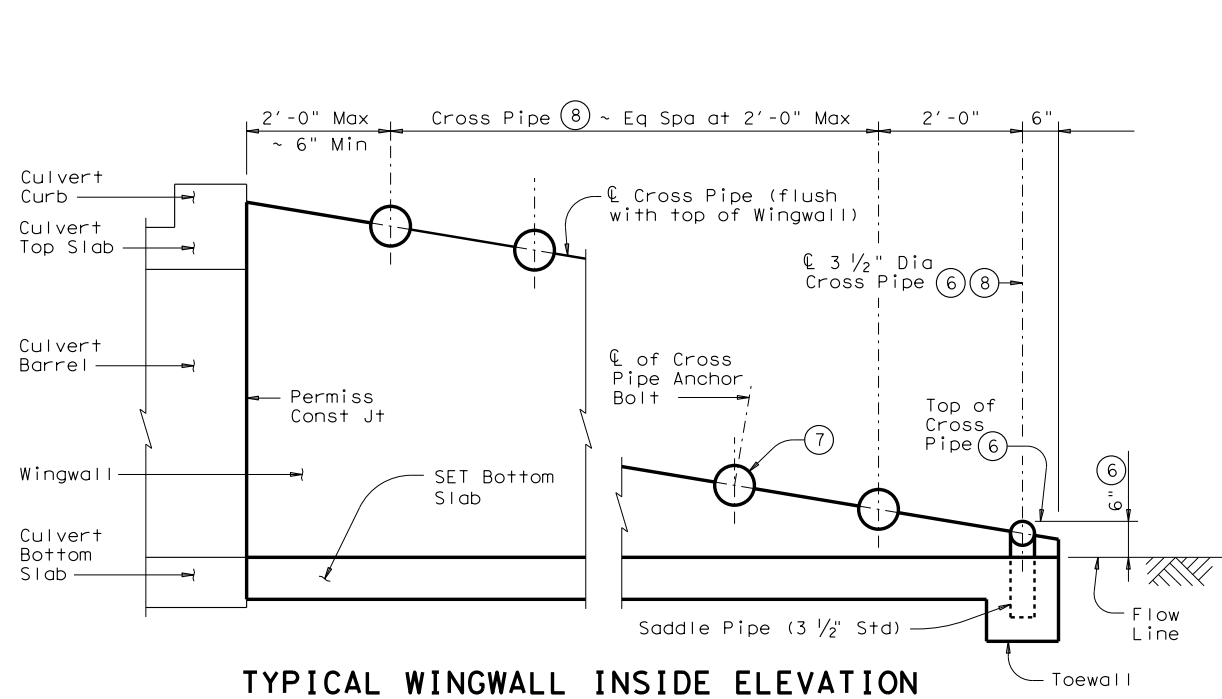
SAFETY END TREATMENT FOR BOX CULVERTS (MAXIMUM Hw = 7'-0") TYPE I ~ PARALLEL DRAINAGE

SETB-PD

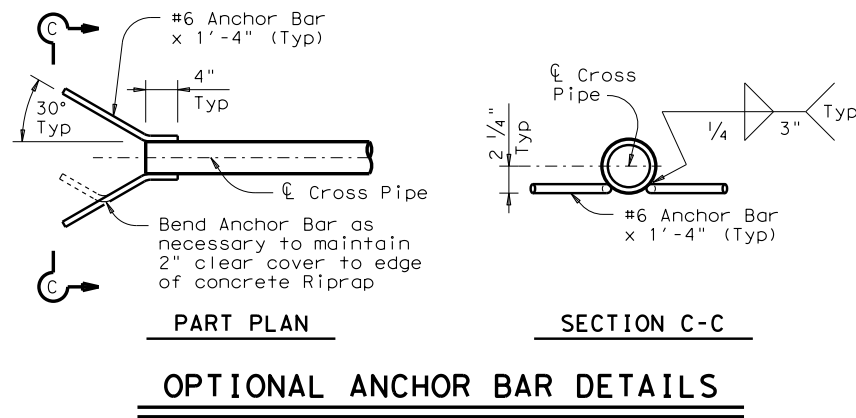
FILE: setbpdse.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY	SHEET NO.	

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

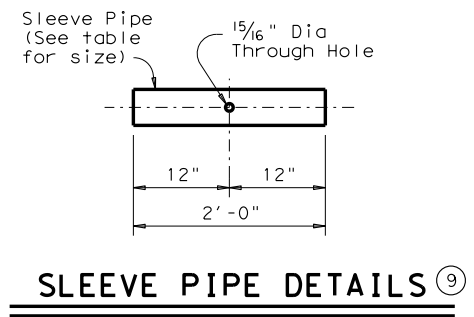
DATE: FILE:



TYPICAL WINGWALL INSIDE ELEVATION
(Showing installation of Cross Pipes)



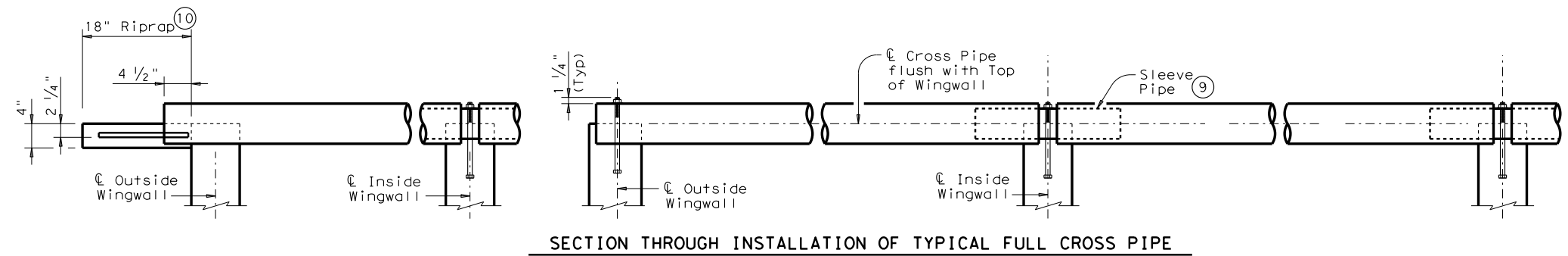
OPTIONAL ANCHOR BAR DETAILS



SLEEVE PIPE DETAILS

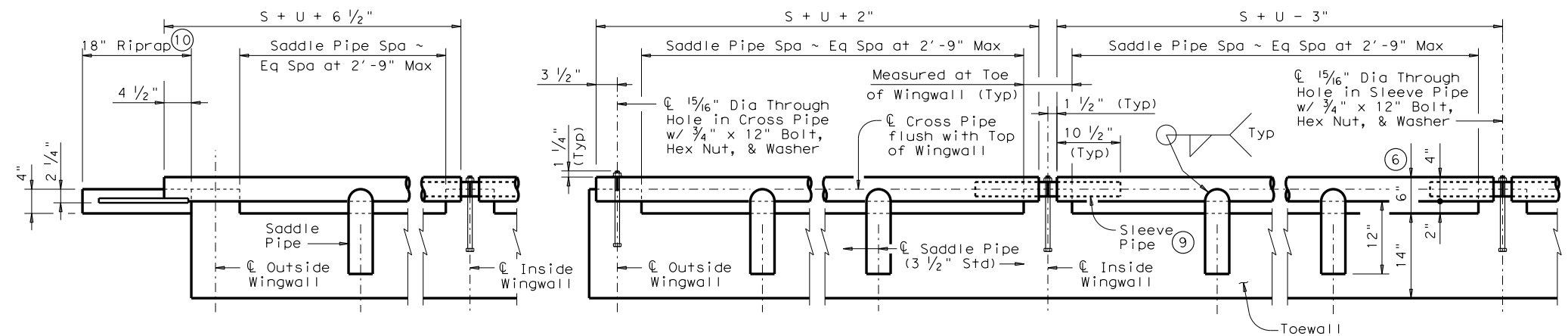
REQUIRED PIPE SIZES ^⑧			STANDARD PIPE SIZES		
Culvert Span Sizes	Cross Pipe Size	Sleeve Pipe Size ^⑨	Pipe Size	Pipe O.D.	Pipe I.D.
First Pipe	3 1/2" STD	2 1/2" STD	2 1/2" STD	2.875"	2.469"
30" to 42"	4" STD	3" STD	3" STD	3.500"	3.068"
48" to 72"	5" STD	4" STD	3 1/2" STD	4.000"	3.548"
78" to 120"	6" STD	5" STD	4" STD	4.500"	4.026"
			5" STD	5.563"	5.047"
			6" STD	6.625"	6.065"

- ⑥ The proper installation of the first Cross Pipe is critical for vehicle safety. The top of the first Cross Pipe must be placed at no more than 6" above the flow line.
- ⑦ The third Cross Pipe from the bottom of the Culvert shall always be installed using a bolted connection. Care shall be taken to ensure that concrete does not flow into this Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access.
- ⑧ Cross Pipes and Sleeve Pipes (if required) shall be as shown in the REQUIRED PIPE SIZES table. Saddle Pipes for the 3 1/2" first Cross Pipe shall also be 3 1/2".
- ⑨ At Contractor's option, the Cross Pipe may be continuous across the Inside Wingwalls. If such option is selected the Sleeve Pipe shall be omitted and a 15/16" diameter through hole made in the Cross Pipe to accept the anchor bolt at the centerline of each Interior Wingwall.
- ⑩ Riprap will be required when using the optional Anchor Bar details and shall be included in the Price Bid for Safety End Treatment. Such Riprap shall be concrete Riprap in accordance with Item 432, "Riprap".



SECTION THROUGH INSTALLATION OF TYPICAL FULL CROSS PIPE

(Anchor details and dimensions are similar to those shown below in SECTION THROUGH INSTALLATION OF 3 1/2" FIRST CROSS PIPE detail.)



SECTION THROUGH INSTALLATION OF 3 1/2" FIRST CROSS PIPE

OUTSIDE CULVERT BARREL WITH OPTIONAL ANCHOR BARS & RIPRAP **OUTSIDE CULVERT BARREL WITH BOLTED ANCHOR** **INSIDE CULVERT BARREL**

CROSS PIPE INSTALLATION DETAILS

SHEET 2 OF 2

Texas Department of Transportation Bridge Division Standard

SAFETY END TREATMENT FOR BOX CULVERTS (MAXIMUM Hw = 7'-0") TYPE I ~ PARALLEL DRAINAGE

SETB-PD

FILE: setbpdse.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.