

# SECTION I - BARRIER

SHEET NO.	NAME
B-L (2001)	– BARRIER LEGEND .....
B-1	– GUARDRAIL APPLICATIONS .....
	(2002) - 1 PLANS - (TYPE 1, TYPE 2, AND TYPE 3) .....
	(2004) - 2 ELEVATIONS AND SPLICE DETAIL .....
	(2002) - 3 SECTION VIEWS .....
	(2006) - 4 GRADING FOR GUARDRAIL END TREATMENT, TYPE 1 .....
	(2002) - 5 GRADING FOR GUARDRAIL END TREATMENT, TYPE 2 .....
	(2002) - 6 GRADING FOR GUARDRAIL END TREATMENT, TYPE 3 .....
B-2 (2002)	– GUARDRAIL OVER CULVERTS, TYPE 1 .....
B-3 (2002)	– GUARDRAIL OVER CULVERTS, TYPE 2 .....
B-4 (2001)	– CURVED GUARDRAIL SECTION .....
B-5 (2002)	– END ANCHORAGE .....
B-6	– BURIED END SECTION .....
	(2002) - 1 BURIED END SECTION .....
	(2002) - 2 BURIED END SECTION .....
	(2002) - 3 POST, CONCRETE BLOCK, & RUBRAIL ANCHOR DETAILS .....
B-7	– GUARDRAIL TO BARRIER CONNECTION, APPROACH TYPE 1 .....
	(2005) - 1 PLAN, ELEVATION, AND SECTIONS .....
	(2001) - 2 WOOD BLOCKOUT, RUB RAIL WOOD BLOCKS, BEARING PLATE, RUB RAIL TO BARRIER CONNECTION DETAILS .....
	(2001) - 3 BENT PLATE RUB RAIL DETAILS .....
B-8	– GUARDRAIL TO BARRIER CONNECTION, APPROACH TYPE 2 .....
	(2005) - 1 PLAN, ELEVATION, AND SECTIONS .....
	(2001) - 2 NOTES, BENT RAIL DETAILS, BLOCK SCHEDULE .....
B-9 (2002)	– GUARDRAIL TO BARRIER CONNECTION, EXIT TYPE .....
B-10 (2002)	– BRIDGE RAIL RETROFIT, TYPE 1 .....
B-11	– BRIDGE RAIL RETROFIT, TYPE 2 .....
	(2002) - 1 PLAN, SECTION A-A, BASE PLATE DETAIL .....
	(2001) - 2 BASE PLATE DETAIL AND STEEL GUARDRAIL POST .....
B-12 (2001)	– BRIDGE RAIL RETROFIT, TYPE 3 .....
B-13	– HARDWARE .....
	(2004) - 1 W-BEAM DETAILS .....
	(2004) - 2 W-BEAM STEEL POST AND OFFSET BLOCK .....
	(2004) - 3 W-BEAM TERMINAL CONNECTOR .....
	(2004) - 4 THRIE BEAM DETAILS .....
	(2004) - 5 THRIE BEAM STEEL POST AND OFFSET BLOCK .....
	(2004) - 6 W-THRIE BEAM TRANSITION SECTION .....
	(2004) - 7 WOOD BLOCK, SOIL PLATE, SHORT WOOD BREAKAWAY POST, STEEL TUBE, LONG WOOD BREAKAWAY POST .....
	(2004) - 8 SWAGED CABLE AND RELATED HARDWARE ASSEMBLY .....
	(2004) - 9 REFLECTORIZED WASHER AND BEARING PLATE DETAIL .....
	(2004) - 10 GUARDRAIL BOLT & RECESSED NUT .....
	(2004) - 11 5/8" (16) HEX BOLT, HEX NUT, & STEEL WASHER, HIGH-STRENGTH STRUCTURAL HEX BOLT & HEX NUT .....
	(2004) - 12 15/16" (24) HEX NUT & STEEL WASHER, 5/8" (16) CARRIAGE BOLT, HEX NUT, & STEEL WASHER .....
	(2005) - 13 GUARDRAIL MOUNTED RAIL •DETAIL ON HOLD• .....
B-14	– CONCRETE SAFETY BARRIER (F SHAPE) .....
	(2001) - 1 TYPICAL CAST IN PLACE OR SLIP FORM CONSTRUCTION .....
	(2001) - 2 TYPICAL PRE-CAST CONSTRUCTION .....
	(2001) - 3 SLOTTED PLATE CONNECTION DETAILS .....



## SECTION I - BARRIER (CONT'D)

SHEET NO.	NAME
B-15	— PORTABLE CONCRETE SAFETY BARRIER (F SHAPE)
(2001) - 1	PLAN, ELEVATION, AND SECTION VIEW •DETAIL DELETED - SEE SPECIFICATIONS•
(2001) - 2	CURVE SECTION •DETAIL DELETED - SEE SPECIFICATIONS•
(2001) - 3	TAPERED END SECTION •DETAIL DELETED - SEE SPECIFICATIONS•
(2001) - 4	TYPICAL REINFORCEMENT DETAILS •DETAIL DELETED - SEE SPECIFICATIONS•
(2001) - 4	JOINT CONNECTION DETAILS •DETAIL DELETED - SEE SPECIFICATIONS•

## SECTION II - CURB & GUTTER

SHEET NO.	NAME
C-1 (2005)	— P.C.C. CURB, P.C.C. CURB & GUTTER, AND HOT-MIX CURB
C-2	— CURB RAMPS
(2006) - 1	TYPE 1
(2006) - 2	TYPES 2, 3, & 4
(2006) - 3	SECTIONS FOR TYPES 2, 3, & 4
(2006) - 4	TYPE 5
C-3 (2005)	— ENTRANCES
C-4	— CURB OPENINGS
(2001) - 1	TYPES A, B, & C
(2001) - 2	TYPES D & E
(2001) - 3	TYPES F & G

## SECTION III - DRAINAGE

SHEET NO.	NAME
D-1	— 6:1 SAFETY END STRUCTURE
(2001) - 1	DETAIL VIEWS
(2001) - 2	SCHEDULES
D-2	— 10:1 SAFETY END STRUCTURE
(2001) - 1	DETAIL VIEWS
(2001) - 2	SCHEDULES
D-3	— SAFETY GRATES
(2005) - 1	SAFETY END STRUCTURE GRATE & ASSEMBLY DETAIL
(2005) - 2	PERSONNEL SAFETY GRATE FOR PIPE INLET DETAIL
D-4 (2006)	— INLET BOX DETAILS
D-5	— DRAINAGE INLET DETAILS
(2002) - 1	DRAINAGE INLET ASSEMBLY
(2006) - 2	DRAINAGE INLET FRAME AND GRATES
(2004) - 3	DRAINAGE INLET TOP UNITS
(2006) - 4	DRAINAGE INLET COVER SLAB DETAILS
(2006) - 5	DOUBLE INLET COVER SLAB DETAILS
(2004) - 6	DRAINAGE INLET 34" (865) x 24" (610) DETAILS
(2002) - 7	DRAINAGE INLET 34" (865) x 18" (455) DETAILS
(2002) - 8	LAWN INLET DETAIL



## SECTION III - DRAINAGE (CONT'D)

SHEET NO.	NAME
D-6	— MANHOLE DETAILS
	(2001) - 1 BOX MANHOLE ASSEMBLY
	(2001) - 2 ROUND MANHOLE ASSEMBLY
	(2001) - 3 MANHOLE FRAME AND COVER
	(2002) - 4 BOX MANHOLE COVER SLAB
D-7	— JUNCTION BOX DETAILS
	(2002) - 1 JUNCTION BOX ASSEMBLY
	(2002) - 2 JUNCTION BOX COVER SLAB
D-8 (2001)	— PIPE BEDDING
D-9 (2006)	— PERFORATED PIPE UNDERDRAIN

## SECTION IV - EROSION

SHEET NO.	NAME
E-1 (2001)	— INCREMENTAL STABILIZATION
E-2 (2006)	— SILT FENCE
E-3 (2005)	— DRAINAGE INLET SEDIMENT CONTROL
E-4 (2001)	— CURB INLET SEDIMENT CONTROL
E-5 (2006)	— STONE CHECK DAM
E-6 (2005)	— SEDIMENT TRAP
E-7 (2005)	— SEDIMENT TRAP, USING DRAINAGE INLET AS OUTLET
E-8	— RISER PIPE ASSEMBLY FOR SEDIMENT TRAP
	(2006) - 1 ELEVATION
	(2006) - 2 TRASH HOOD DETAILS
E-9 (2005)	— EROSION CONTROL BLANKET APPLICATIONS
E-10 (2005)	— RIPRAP DITCH
E-11 (2005)	— TEMPORARY SWALE
E-12 (2005)	— PERIMETER DIKE/SWALE
E-13 (2005)	— EARTH DIKE
E-14 (2005)	— TEMPORARY SLOPE DRAIN
E-15 (2005)	— STILLING WELL
E-16 (2005)	— SUMP PIT, TYPE 1 & 2
E-17 (2005)	— DEWATERING BASIN
E-18 (2005)	— GEOTEXTILE-LINED CHANNEL DIVERSION
E-19 (2005)	— SANDBAG DIVERSION
E-20 (2005)	— SANDBAG DIKE
E-21 (2005)	— STABILIZED CONSTRUCTION ENTRANCE
E-22 (2006)	— SKIMMER DEWATERING DEVICE
E-23	— TURBIDITY CURTAIN
	(2005) - 1 FLOATING TURBIDITY CURTAIN
	(2005) - 2 STAKED TURBIDITY CURTAIN
E-24 (2005)	— PORTABLE SEDIMENT TANK
E-25 (2005)	— TURF REINFORCEMENT MAT APPLICATIONS
E-26 (2006)	— RIPRAP ENERGY DISSIPATOR DETAIL



## SECTION V - LANDSCAPING

SHEET NO.	NAME
L-1	— PLANTING DETAILS .....
(2006) - 1	ROADSIDE SHRUB PLANTING DETAIL .....
(2006) - 2	TREE PLANTING DETAILS .....
(2006) - 3	PERENNIAL/GROUND COVER PLANTING DETAIL .....

## SECTION VI - MISCELLANEOUS

SHEET NO.	NAME
M-1 (2001)	— RIGHT-OF-WAY FENCE .....
M-2 (2001)	— CONCRETE MONUMENT .....
M-3 (2005)	— REMOVABLE BOLLARD .....
M-4 (2004)	— BIKE RACK .....
M-5 (2004)	— WOOD RAIL FENCE .....
M-6 (2004)	— PATTERNED HOT-MIX OR CONCRETE & BRICK PAVER .....
M-7 (2006)	— CHAIN LINK FENCE DETAILS .....

## SECTION VII - PAVEMENT

SHEET NO.	NAME
P-1	— P.C.C. PAVEMENT .....
(2001) - 1	SLAB PLAN (WITH DOWEL AND TIE LOCATIONS) .....
(2004) - 2	JOINT AND SEALANT DETAILS .....
(2001) - 3	W BOLT, HOOK BOLT, DOWEL & TIE BAR .....
(2001) - 4	DOWEL SUPPORT BASKET .....
(2001) - 5	DOWEL & TIE BAR PLACEMENT TOLERANCES .....
P-2	— P.C.C. PAVEMENT PATCHING .....
(2001) - 1	FULL DEPTH PATCH, PLAN VIEW .....
(2004) - 2	FULL DEPTH PATCH, SECTION VIEWS .....
(2004) - 3	FULL DEPTH PATCH, SEALANT DETAILS, GROUT RETENTION DISK, AND DOWEL BAR .....
(2001) - 4	FULL DEPTH PATCH, DOWEL BAR PLACEMENT TOLERANCES .....
(2001) - 5	PARTIAL DEPTH PATCH, PLAN AND SECTION VIEWS .....



## SECTION VIII - TRAFFIC

SHEET NO.	NAME
T-1 (2005)	— CONDUIT JUNCTION WELL, TYPES 1,2, AND 3 .....
T-2 (2005)	— CONDUIT JUNCTION WELL, TYPE 4 .....
T-3 (2005)	— CONDUIT JUNCTION WELL, TYPE 5 .....
T-4 (2005)	— CABINET BASES (TYPES "M" AND "P") .....
T-5	— POLE BASES .....
	(2005) - 1 ROUND BASE, SQUARE BASE .....
	(2005) - 2 TYPICAL SECTION (BASES 1, 2, 2A, 2B, 3, 3A, 3B, AND 7), TYPICAL SECTION (BASE 4), TYPICAL INSTALLATION (BASES 1, 2, 2A, 2B, 3, 3A, 3B, 4, AND 7) .....
	(2005) - 3 TYPICAL SECTION (BASES 5 AND 6), ANCHOR BOLT DATA CHART AND DETAILS .....
T-6 (2005)	— SPECIAL POLE BASE .....
T-7 (2005)	— SIGN FOUNDATION .....
T-8 (2005)	— LOOP DETECTOR TO CONDUIT JUNCTION WELL CONNECTION .....
T-9 (2005)	— TYPE #1 LOOP DETECTOR .....
T-10 (2005)	— TYPE #2 LOOP DETECTOR .....
T-11	— MESSENGER WIRE ATTACHMENT .....
	(2005) - 1 INTERMEDIATE MESSENGER WIRE ATTACHMENT ON WOOD POLES .....
	(2005) - 2 ANGULAR INTERMEDIATE MESSENGER WIRE ATTACHMENT .....
T-12	— MESSENGER WIRE ATTACHMENT .....
	(2005) - 1 SPAN WIRE ATTACHMENT BETWEEN POLES .....
	(2005) - 2 DEAD END MESSENGER WIRE ATTACHMENT .....
T-13	— CONDUIT JUNCTION WELLS .....
	(2005) - 1 TYPE 4 .....
	(2006) - 2 TYPE 7 .....
	(2006) - 3 TYPES 8 & 10 .....
T-14	— EMERGENCY PREEMPTION RECEIVER .....
	(2006) - 1 UPRIGHT MOUNT .....
	(2005) - 2 INVERTED MOUNT .....



BARRIER LEGEND	
ITEM NO.	DESCRIPTION
①	W-BEAM
②	W6 X 9 (W150 X 13.5) STEEL POST
③	WOOD OFFSET BLOCK
④	SPLICE - REQUIRES EIGHT(8) 5/8" (16) GUARDRAIL BOLTS (L=1/4" (35)) WITH RECESS NUTS, AND ONE(1) 5/8" (16) GUARDRAIL BOLT (L=10" (255)) WITH RECESS NUT.
⑤	W-BEAM TERMINAL CONNECTOR
⑥	5/8" (16) GUARDRAIL BOLT (L=1/4" (35)) AND RECESS NUT
⑦	5/8" (16) GUARDRAIL BOLT (L=10" (255)) AND RECESS NUT
⑧	5/8" (16) GUARDRAIL BOLT (L=10" (255)), STEEL WASHER, AND RECESS NUT
⑨	7/8" (22) HIGH STRENGTH STRUCTURAL HEX BOLT (L=VARIES) AND HEX NUT
⑩	5/8" (16) CARRIAGE BOLT (L=VARIES), STEEL WASHER, AND HEX NUT
⑪	BEARING PLATE



DELAWARE  
DEPARTMENT OF TRANSPORTATION

BARRIER LEGEND

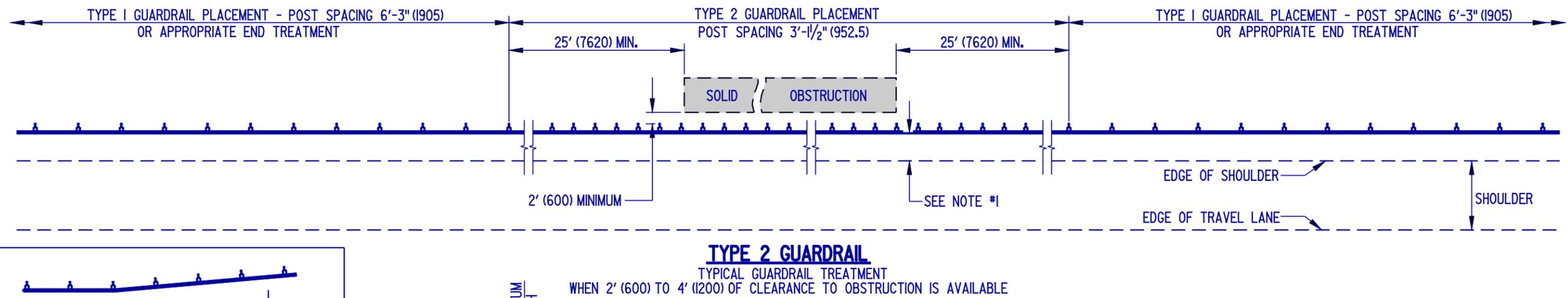
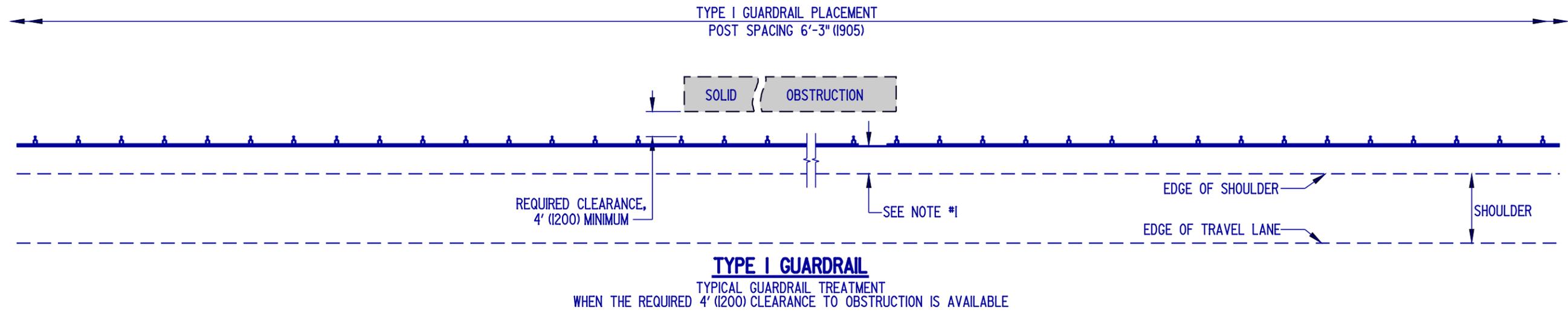
STANDARD NO. B-L (2001) SHT. 1 OF 1

APPROVED

*Ryan M. Harkins*  
CHIEF ENGINEER DATE 6/18/01

RECOMMENDED

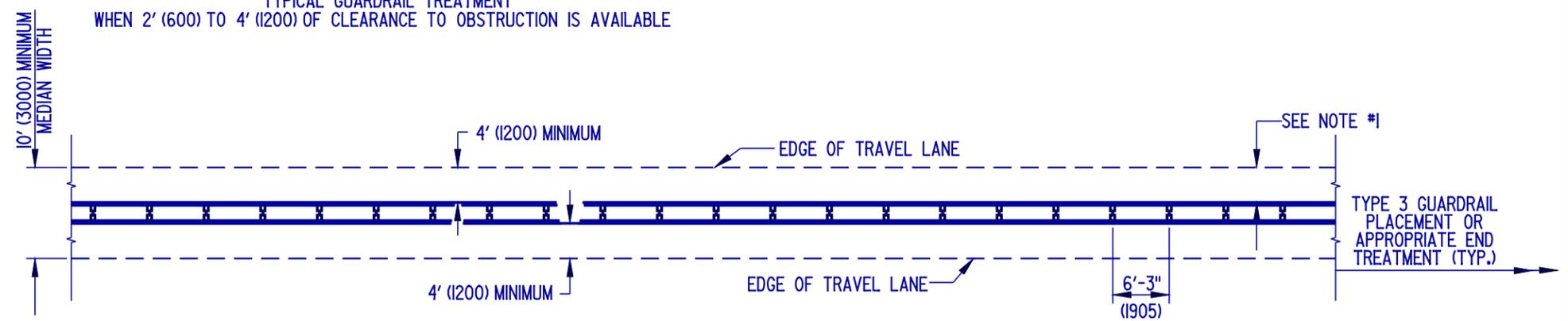
*Mehal Akhavan*  
DESIGN ENGINEER DATE 6/15/01



**GUARDRAIL FLARE RATE**

EDGE OF TRAVEL LANE

FLARE RATES	
DESIGN SPEED	FLARE RATE
70 MPH (110 km/h)	15:1
60 MPH (100 km/h)	14:1
55 MPH (90 km/h)	12:1
50 MPH (80 km/h)	11:1
45 MPH (70 km/h)	10:1
40 MPH (60 km/h)	9:1
30 MPH (50 km/h)	7:1



NOTES : 1). THE DISTANCE FROM THE EDGE OF THE TRAVEL LANE OR SHOULDER TO THE FACE OF GUARDRAIL SHOULD BE MAXIMIZED. THIS AREA SHALL BE GRADED 10:1 OR FLATTER.  
2). PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.



**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

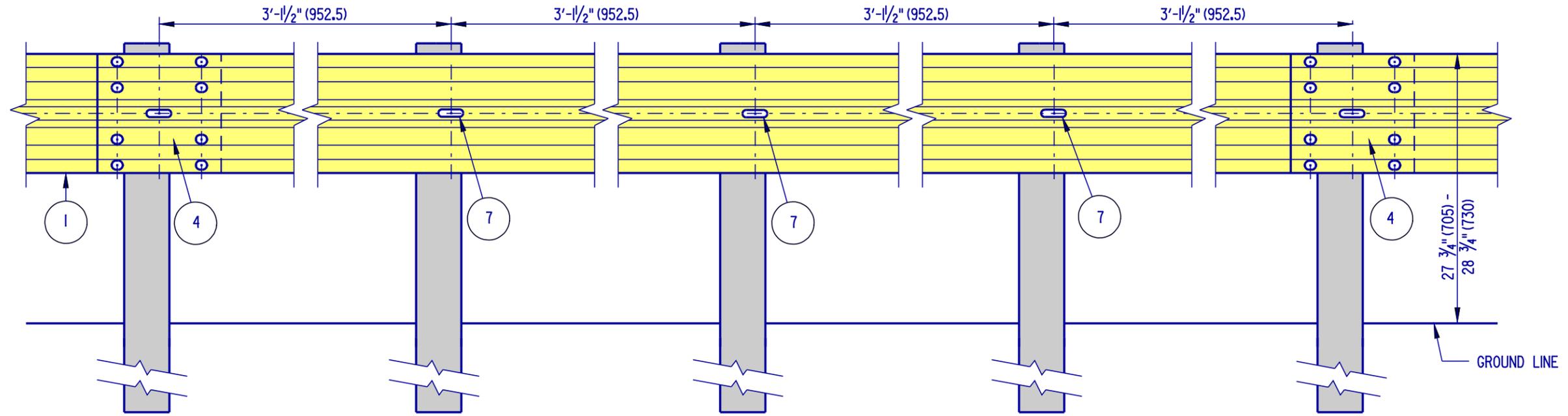
**GUARDRAIL APPLICATIONS**

STANDARD NO. **B-1 (2004)** SHT. **1** OF **6**

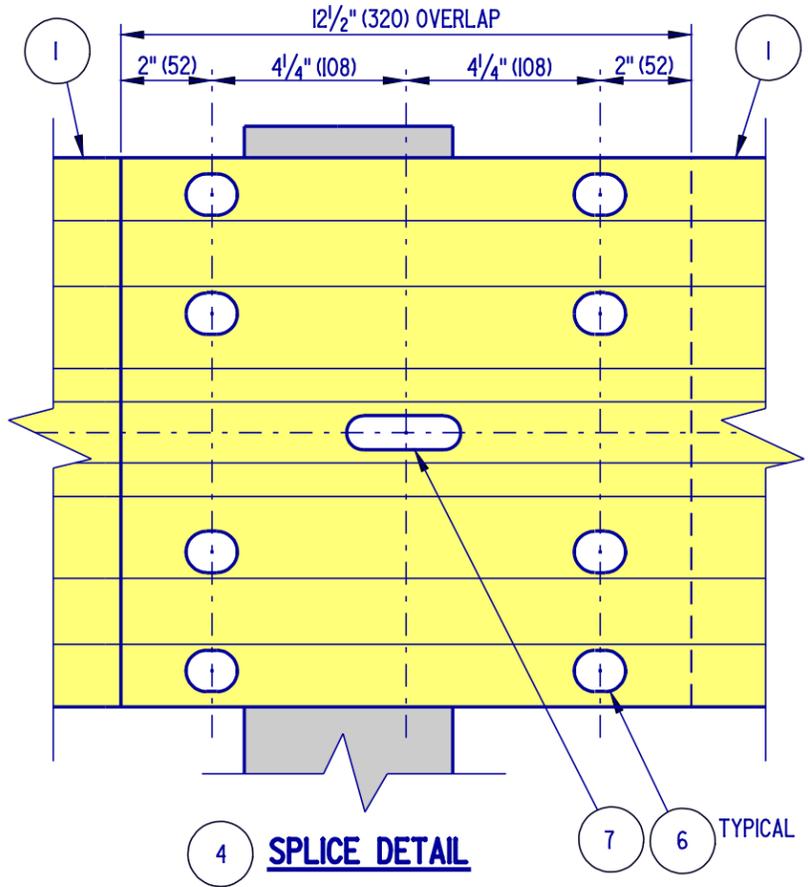
APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

RECOMMENDED *Dennis M. O'Flaherty* 1/3/05  
DESIGN ENGINEER DATE

SCALE : N.T.S.

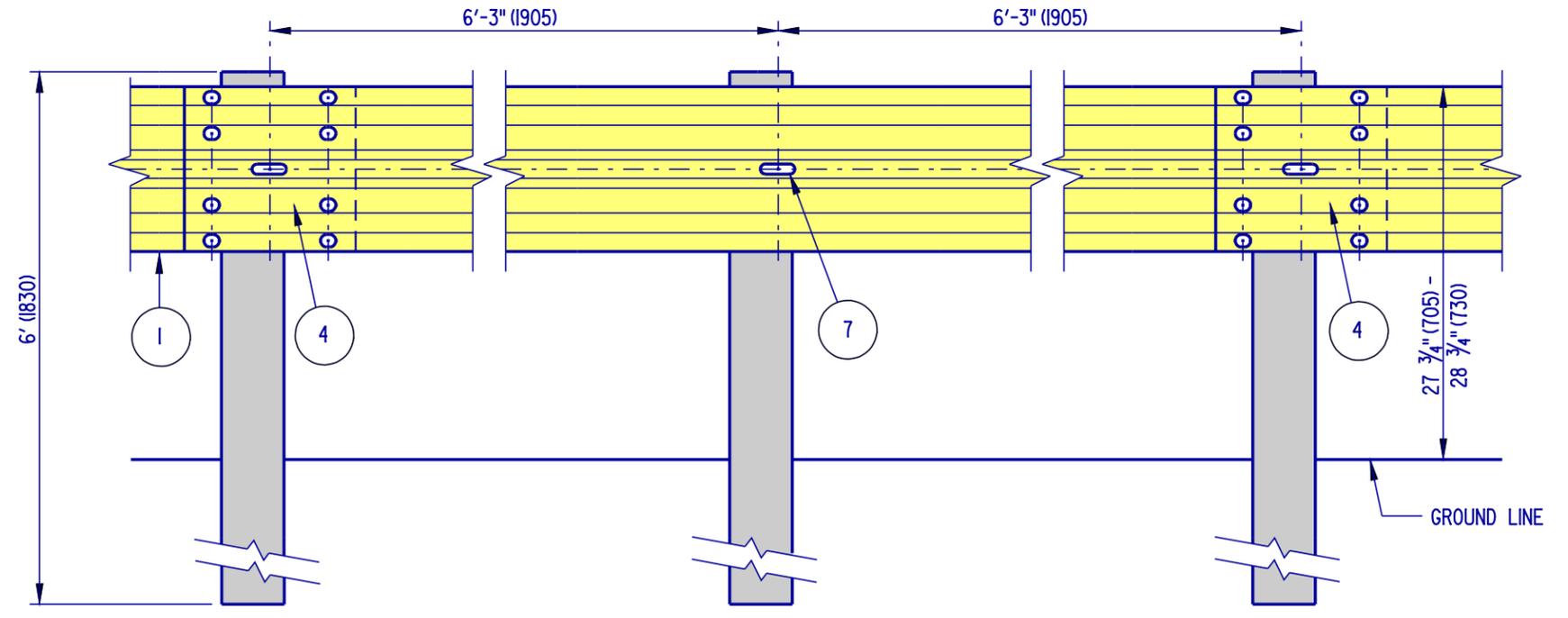


**TYPE 2**



**4 SPLICE DETAIL**

7 6 TYPICAL



**TYPE 10R 3**

NOTE : OVERLAP W-BEAMS IN DIRECTION OF TRAVEL.

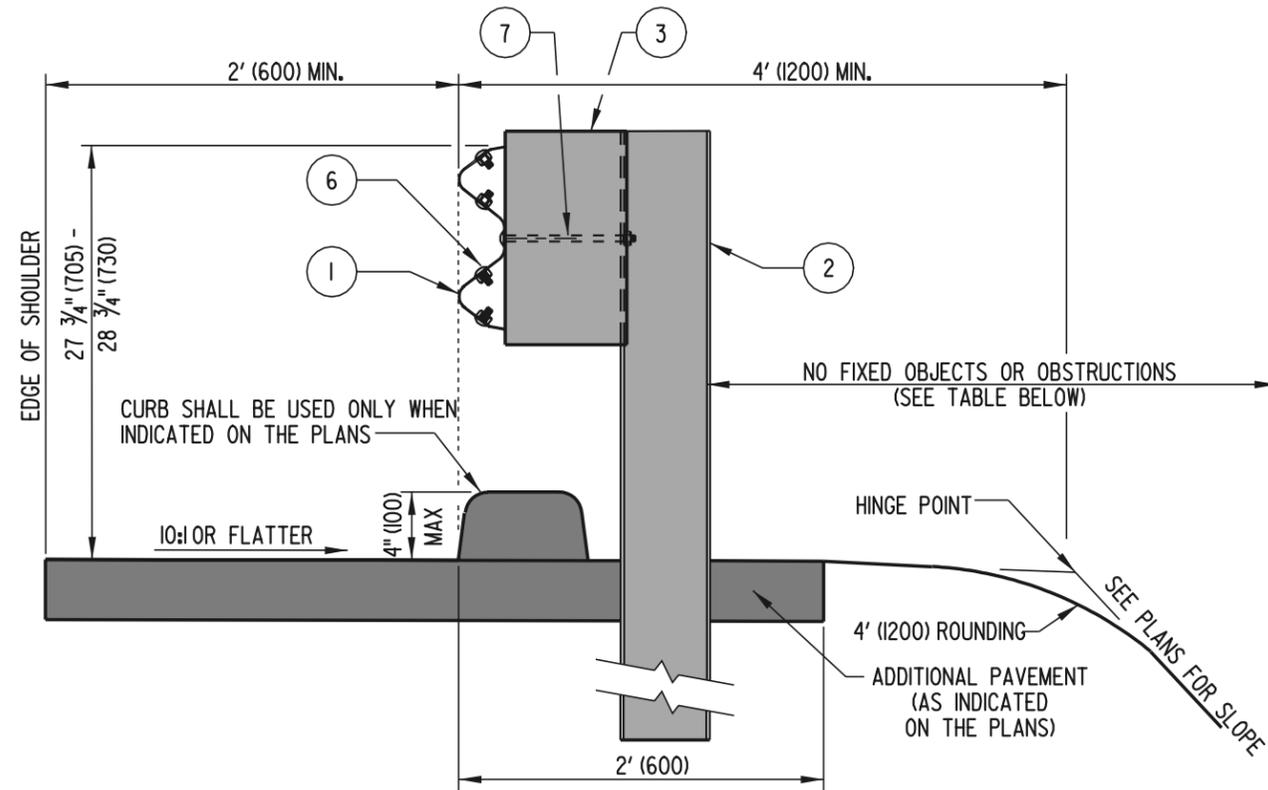


DELAWARE  
DEPARTMENT OF TRANSPORTATION

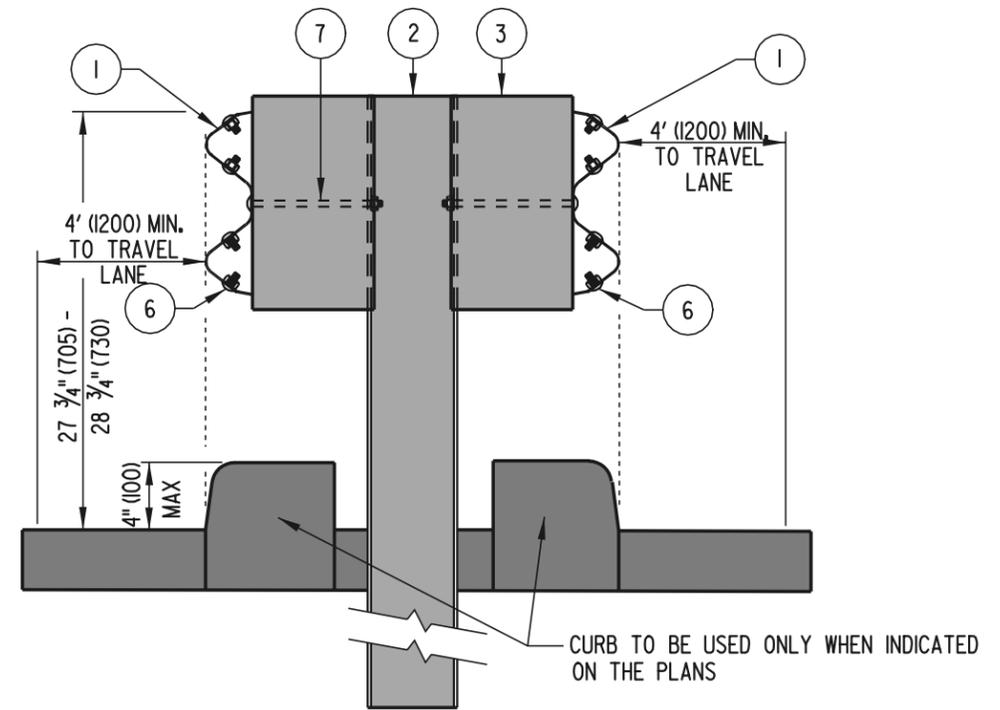
GUARDRAIL APPLICATIONS

STANDARD NO. B-1 (2004) SHT. 2 OF 6

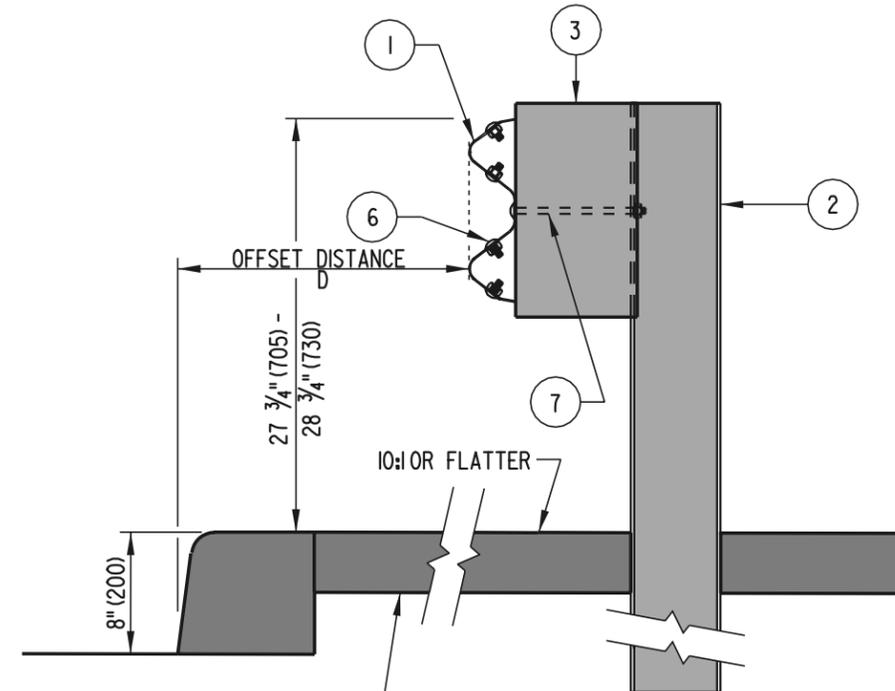
APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE  
RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



**GUARDRAIL SECTION**  
(RURAL SHOULDER APPLICATION)



**GUARDRAIL SECTION**  
(MEDIAN APPLICATION)



**GUARDRAIL SECTION**  
(URBAN SHOULDER APPLICATION)

TYPE	POST SPACING	CLEAR AREA BEHIND POST
1	6' 3" (1905)	4' (1200) MIN
2	3' 1 1/2" (952.5)	2' (600) MIN

DESIGN SPEED	D
< 50 MPH (80 km/h)	6' (1800)
≥ 50 MPH (80 km/h)	10' (3000)



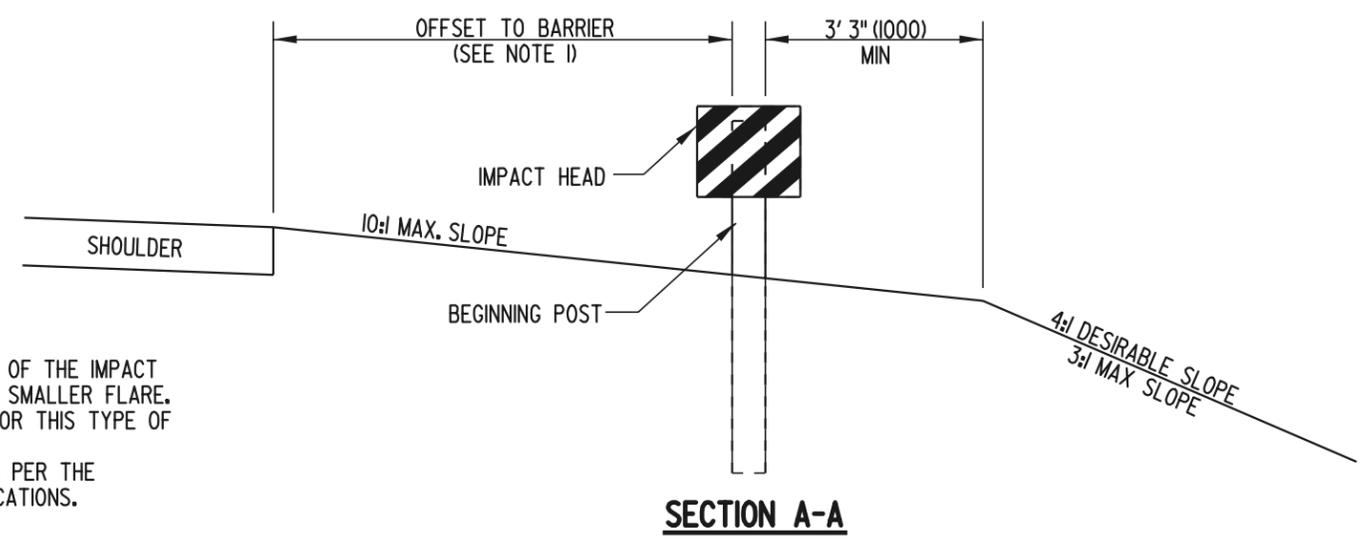
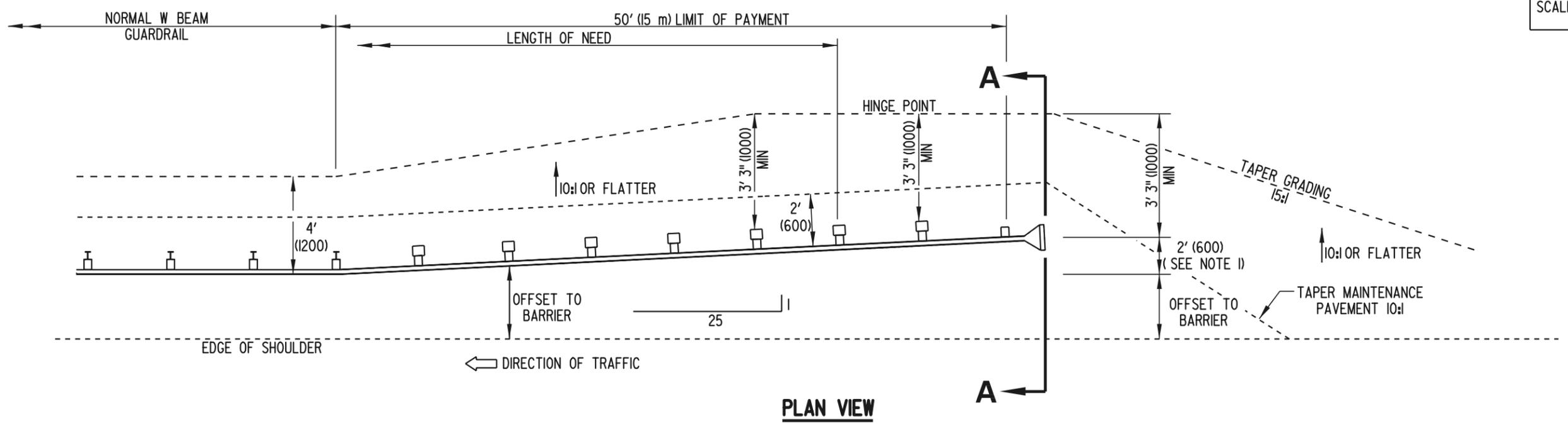
DELAWARE  
DEPARTMENT OF TRANSPORTATION

GUARDRAIL APPLICATIONS

STANDARD NO. B-1 (2002) SHT. 3 OF 6

APPROVED *Caution Wicks* 9/6/02  
CHIEF ENGINEER DATE  
RECOMMENDED *Therese Delph* 8/19/02  
DESIGN ENGINEER DATE

SCALE :



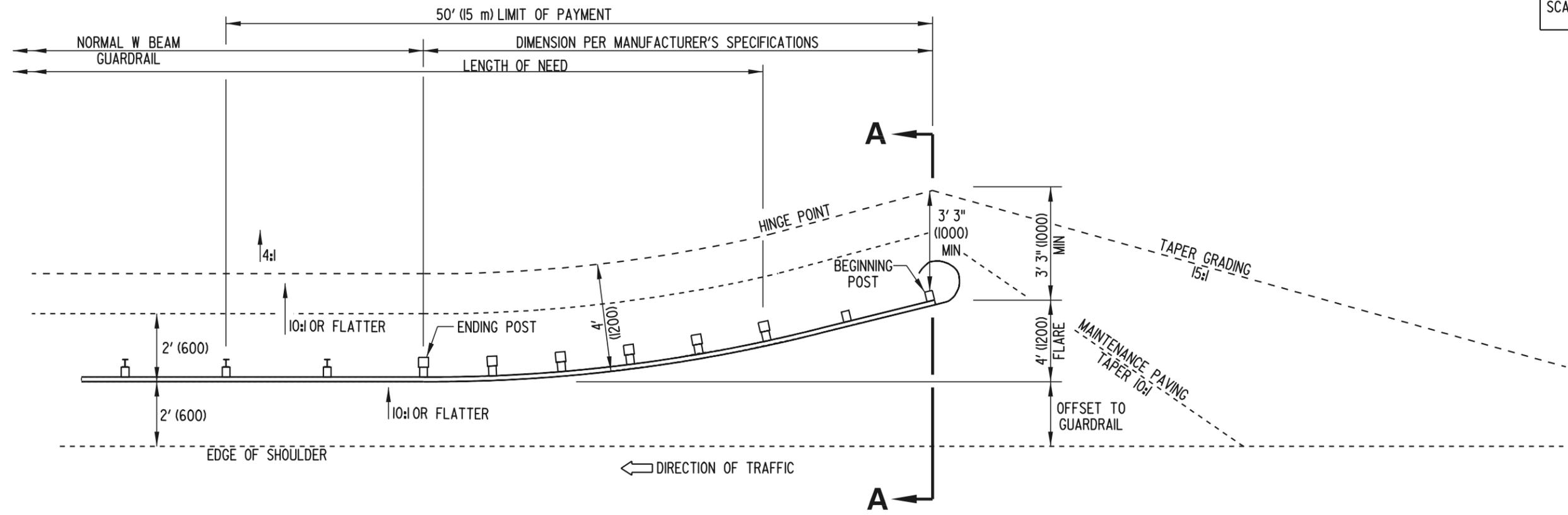
**NOTES:**

1. FLARE THE END TREATMENT AT 25:1 BEGINNING 50' (15 m) FROM THE END OF THE IMPACT HEAD, UNLESS THE CONSTRUCTION PLANS OR SPECIFICATIONS SPECIFY A SMALLER FLARE.
2. THIS DETAIL WAS SOLELY CREATED TO SHOW THE GRADING REQUIRED FOR THIS TYPE OF ATTENUATOR.
3. THE GUARDRAIL END TREATMENT ATTENUATOR SHALL BE INSTALLED AS PER THE MANUFACTURER'S AND THE DEPARTMENT OF TRANSPORTATION'S SPECIFICATIONS.

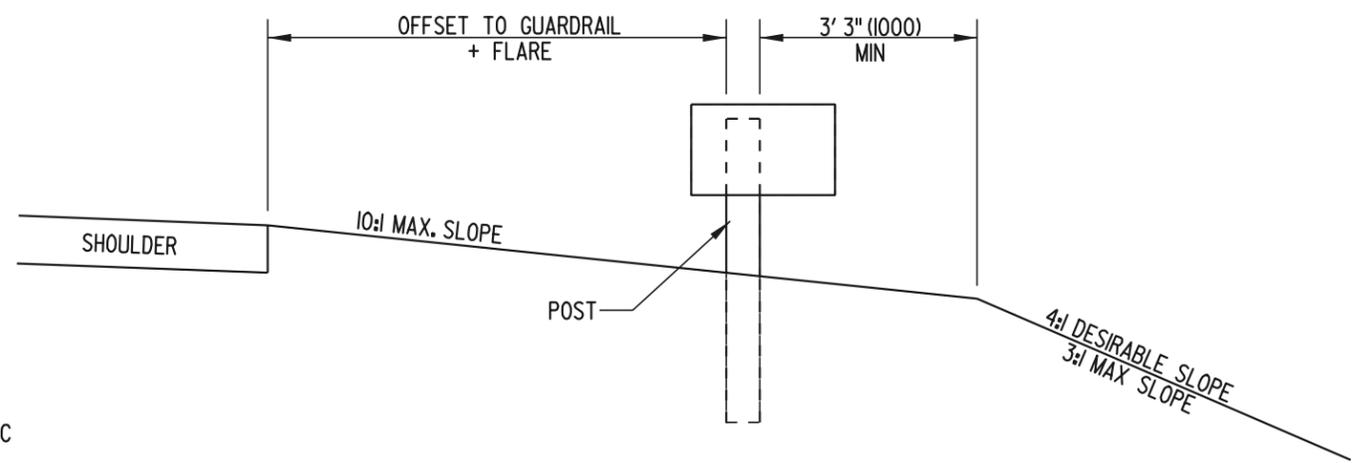
**GRADING FOR GUARDRAIL END TREATMENT ATTENUATOR, TYPE I**

 <b>DELAWARE</b> <b>DEPARTMENT OF TRANSPORTATION</b>	<b>GUARDRAIL APPLICATIONS</b>			<b>APPROVED</b> <i>Caution Wicks</i> <b>9/6/02</b> <small>CHIEF ENGINEER DATE</small>
	<b>STANDARD NO. B-1 (2002)</b>	<b>SHT. 4 OF 6</b>		<b>RECOMMENDED</b> <i>Theresa Roberts</i> <b>8/19/02</b> <small>DESIGN ENGINEER DATE</small>

SCALE :



**PLAN VIEW**



**SECTION A-A**

**GRADING FOR GUARDRAIL END TREATMENT ATTENUATOR, TYPE 2**

**NOTES:**

1. FLARE SHALL BE 4' (1200) UNLESS THE CONSTRUCTION PLANS OR SPECIFICATIONS SPECIFY A SMALLER FLARE. FLARE MAY BE PARABOLIC OR STRAIGHT BASED ON MANUFACTURE'S SPECIFICATIONS.
2. THIS DETAIL WAS SOLELY CREATED TO SHOW THE GRADING REQUIRED FOR THIS TYPE OF ATTENUATOR. THE GUARDRAIL END TREATMENT ATTENUATOR SHALL BE INSTALLED AS PER THE MANUFACTURER'S AND THE DEPARTMENT OF TRANSPORTATION'S SPECIFICATIONS.

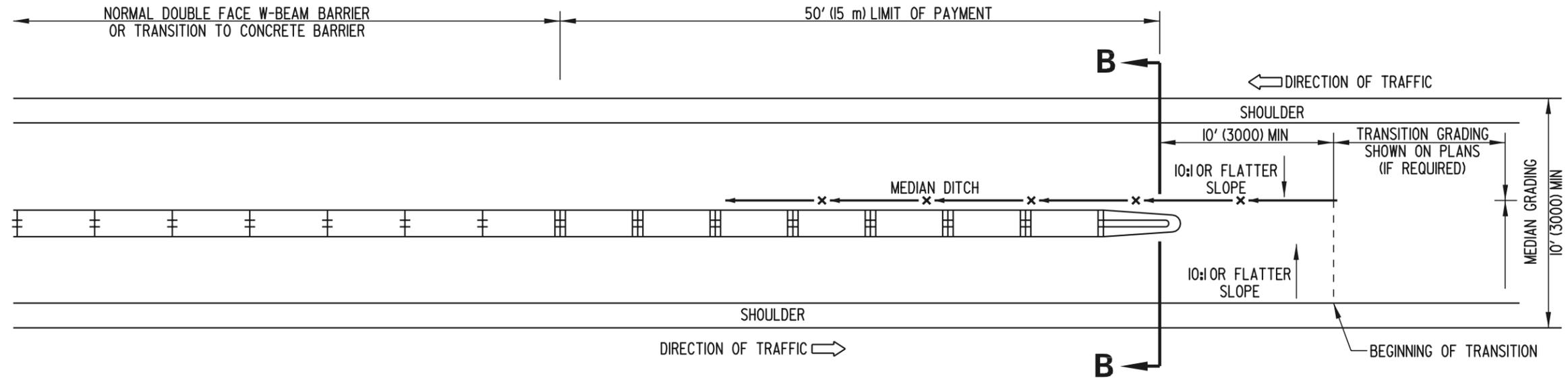


<b>GUARDRAIL APPLICATIONS</b>			
STANDARD NO.	B-1 (2002)	SHT. 5	OF 6

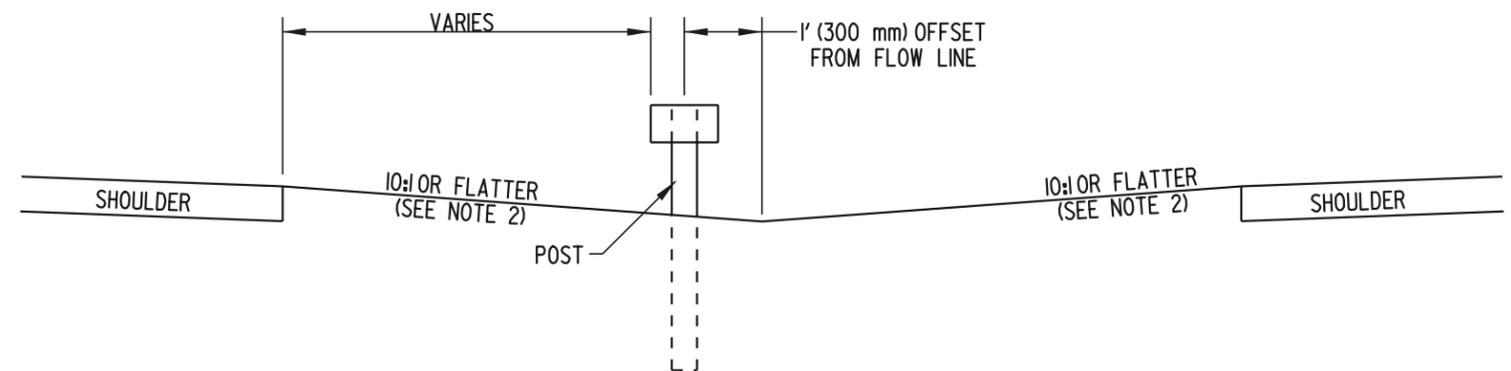
APPROVED *Caution Wicks* 9/6/02  
CHIEF ENGINEER DATE

RECOMMENDED *Therese Delph* 8/19/02  
DESIGN ENGINEER DATE

SCALE :



**PLAN VIEW**



**SECTION B-B**

**GRADING FOR END TREATMENT ATTENUATOR, TYPE 3**

**NOTES:**

1. THIS DETAIL WAS SOLELY CREATED TO SHOW THE GRADING REQUIRED FOR THIS TYPE OF ATTENUATOR.
2. 6:1 OR FLATTER GRADING IS ALLOWABLE WHEN THE BARRIER IS LOCATED 12' (3650 mm) OR MORE FROM THE OUTSIDE EDGE OF THE SHOULDER.
3. THIS END TREATMENT CAN ALSO BE USED IN RAMP GOES OR OTHER AREAS WHERE 2 RAILS OF W-BEAM COME TOGETHER AND TERMINATE WITH ONE END TREATMENT.
4. WHEN OPPOSING ROADWAYS HAVE EQUAL ELEVATIONS THE TRAFFIC BARRIER SYSTEM SHOULD BE PLACED ON THE OPPOSITE SIDE OF THE DITCH LINE FROM APPROACHING TRAFFIC.
5. THE GUARDRAIL END TREATMENT ATTENUATOR SHALL BE INSTALLED AS PER THE MANUFACTURER'S AND THE DEPARTMENT OF TRANSPORTATION'S SPECIFICATIONS.



DELAWARE  
DEPARTMENT OF TRANSPORTATION

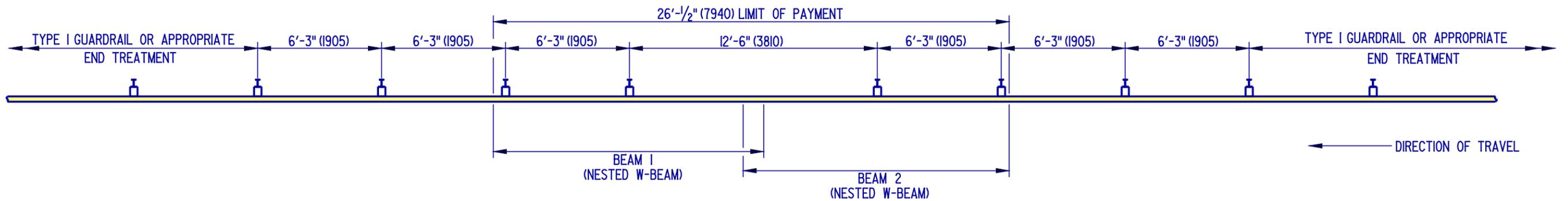
**GUARDRAIL APPLICATIONS**

STANDARD NO. **B-1 (2002)** SHT. **6** OF **6**

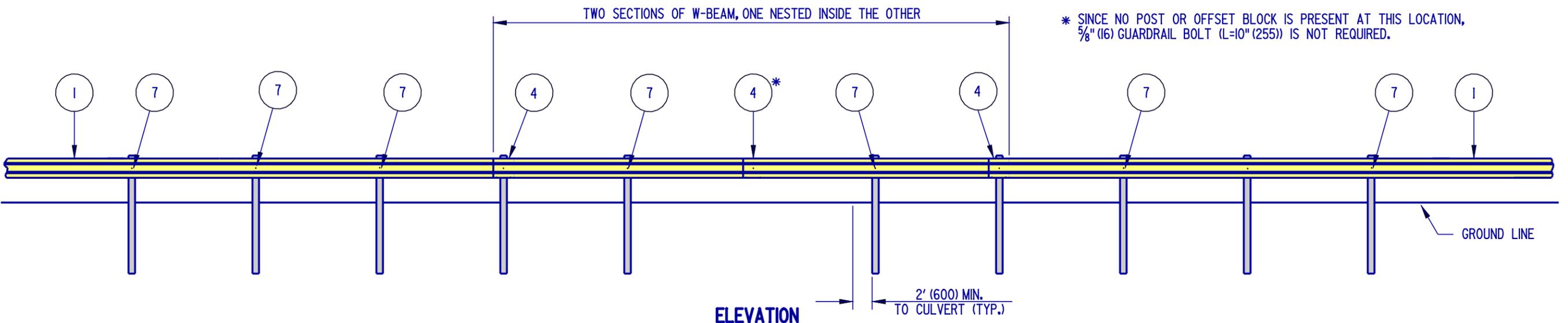
APPROVED *Caroleen Wicks* 9/6/02  
CHIEF ENGINEER DATE

RECOMMENDED *Theresa Delgado* 8/19/02  
DESIGN ENGINEER DATE

SCALE : N.T.S.



**PLAN**



NOTES :1). ALL W-BEAMS ARE 13'-6 1/2" (4130) IN LENGTH.  
 2). PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.



DELAWARE  
 DEPARTMENT OF TRANSPORTATION

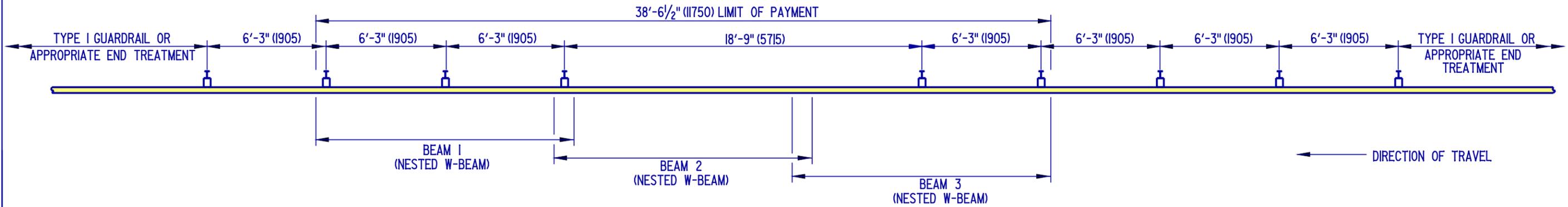
GUARDRAIL OVER CULVERTS, TYPE 1

STANDARD NO. B-2 (2004) SHT. 1 OF 1

APPROVED *Carolann Wick* 1/10/05  
 CHIEF ENGINEER DATE

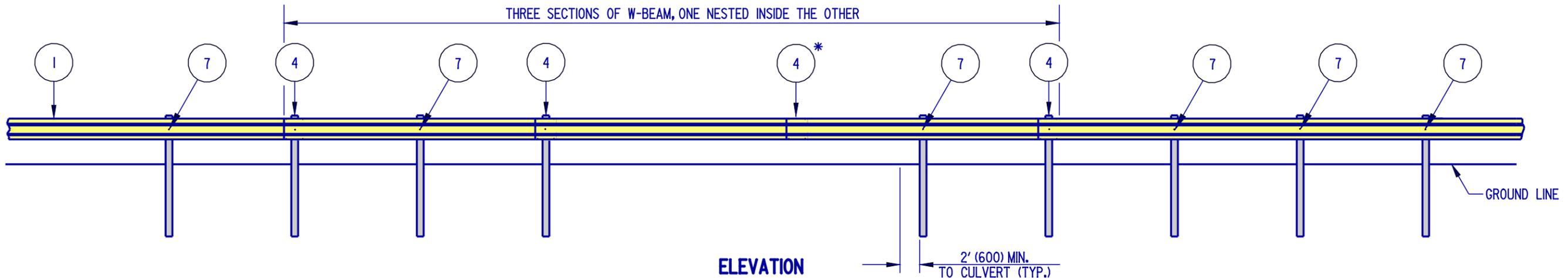
RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
 DESIGN ENGINEER DATE

SCALE : N.T.S.



**PLAN**

\* SINCE NO POST OR OFFSET BLOCK IS PRESENT AT THIS LOCATION, 5/8" (16) GUARDRAIL BOLT (L=10" (255)) IS NOT REQUIRED.



**ELEVATION**

NOTES : 1). ALL W-BEAMS ARE 13'-6 1/2" (4130) IN LENGTH.  
2). PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.



DELAWARE  
DEPARTMENT OF TRANSPORTATION

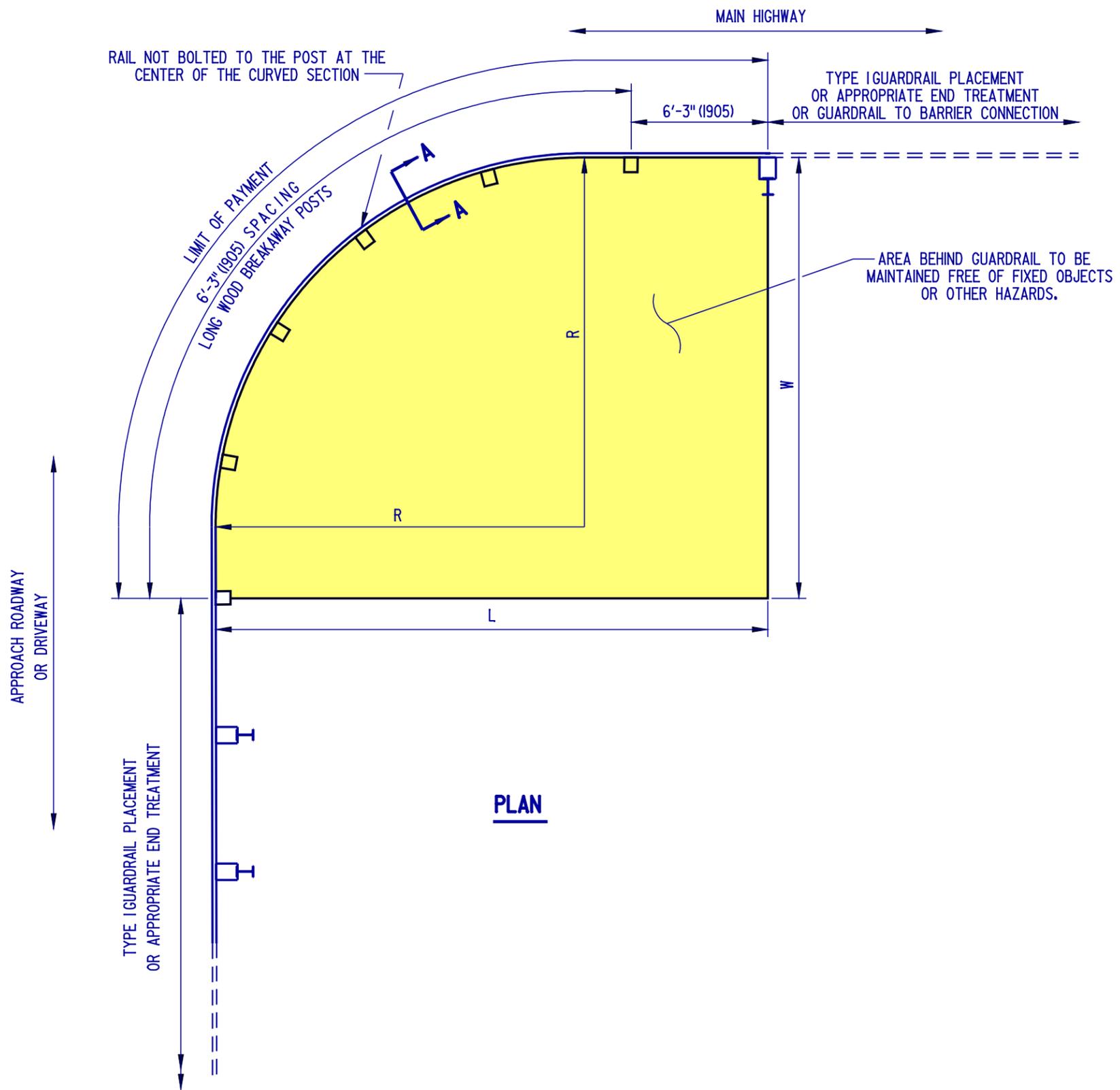
GUARDRAIL OVER CULVERTS, TYPE 2

STANDARD NO. B-3 (2004) SHT. 1 OF 1

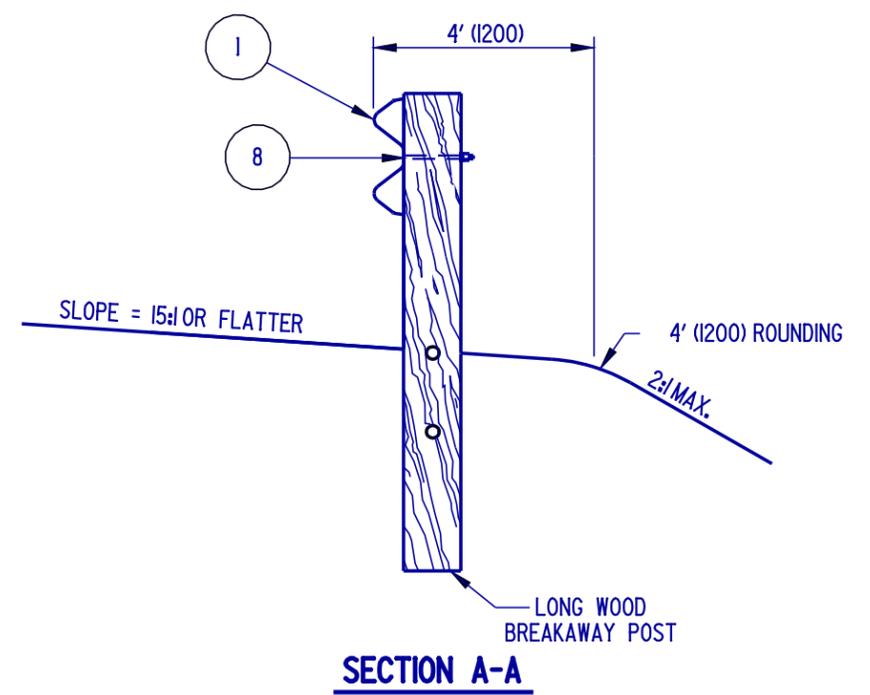
APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE  
RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE

SCALE : N.T.S.

RADIUS	MIN. REQUIRED AREA FREE OF FIXED OBJECTS
	L x W
8'-6" (2600)	25' x 15' (7600 x 4500)
17'-0" (5200)	30' x 15' (9144 x 4500)
25'-6" (7800)	40' x 20' (1200 x 6000)
35'-0" (10700)	50' x 20' (15200 x 6000)



**PLAN**



**SECTION A-A**

- NOTES:
- 1). NO WASHERS ARE USED ON THE RAIL SIDE OF THE LONG WOOD BREAKAWAY POSTS.
  - 2). THE CURVED GUARDRAIL SECTION SHALL BE SHOP BENT.
  - 3). PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.

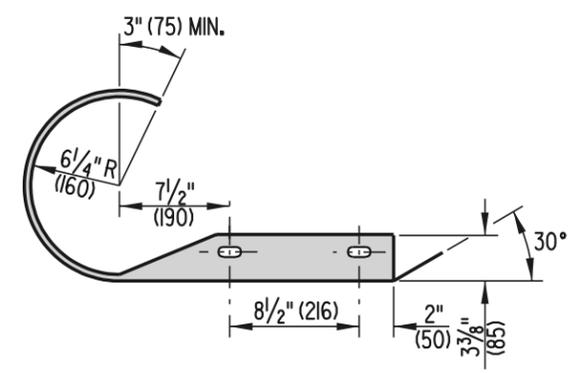


**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

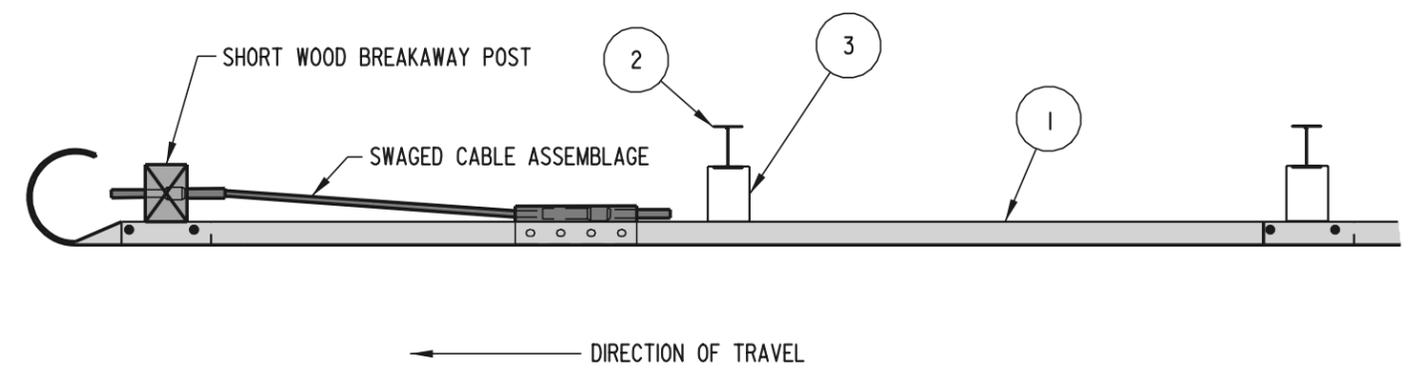
**CURVED GUARDRAIL SECTION**

STANDARD NO. **B-4 (2004)** SHT. **1** OF **1**

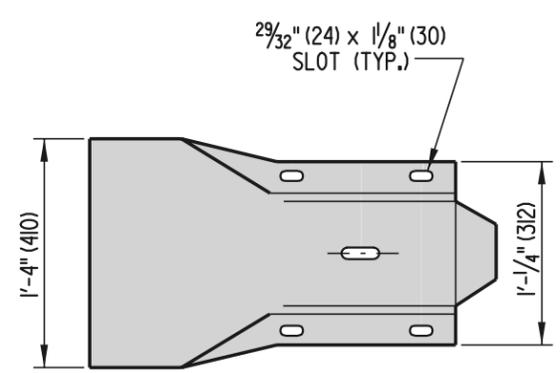
APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE  
RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



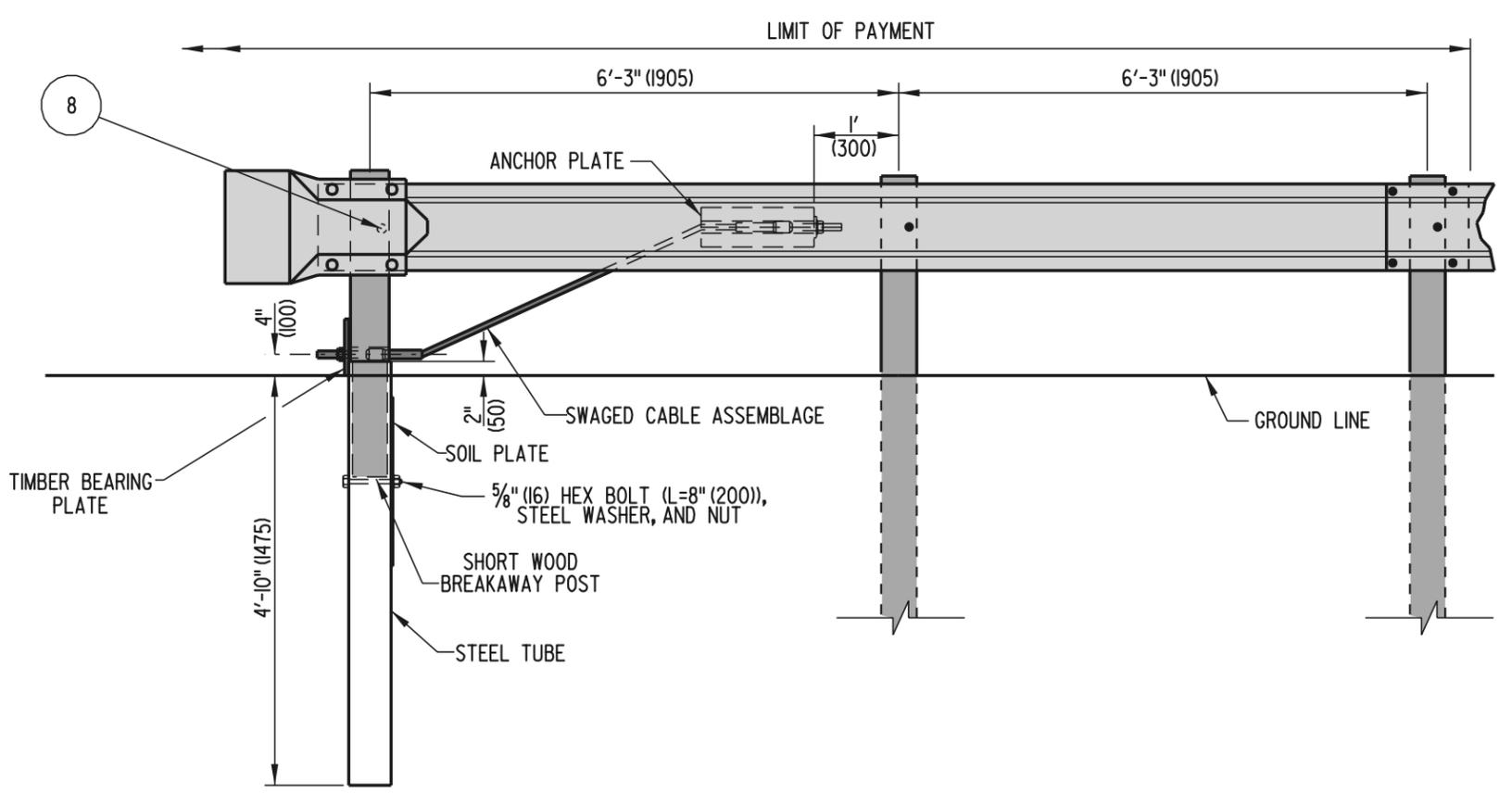
**END SECTION PLAN**



**PLAN**



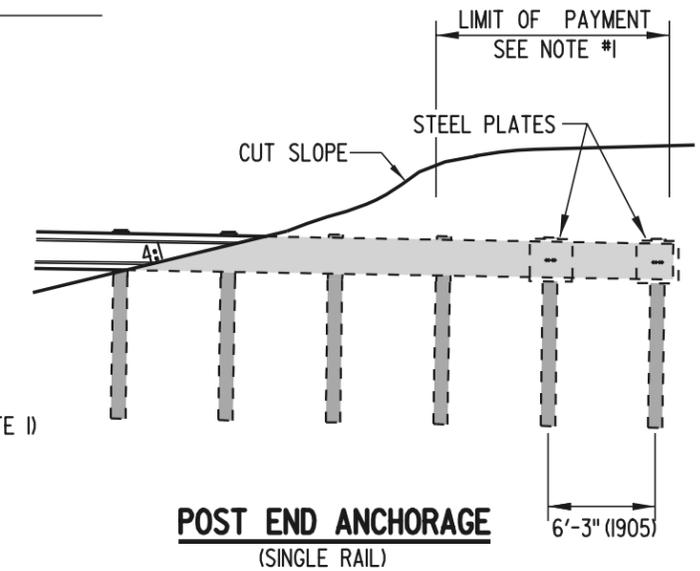
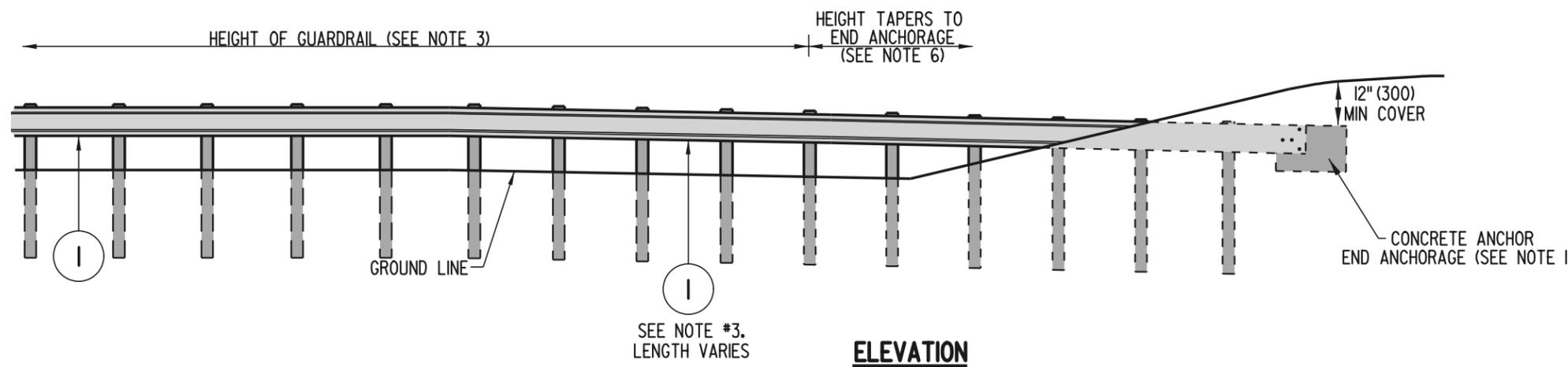
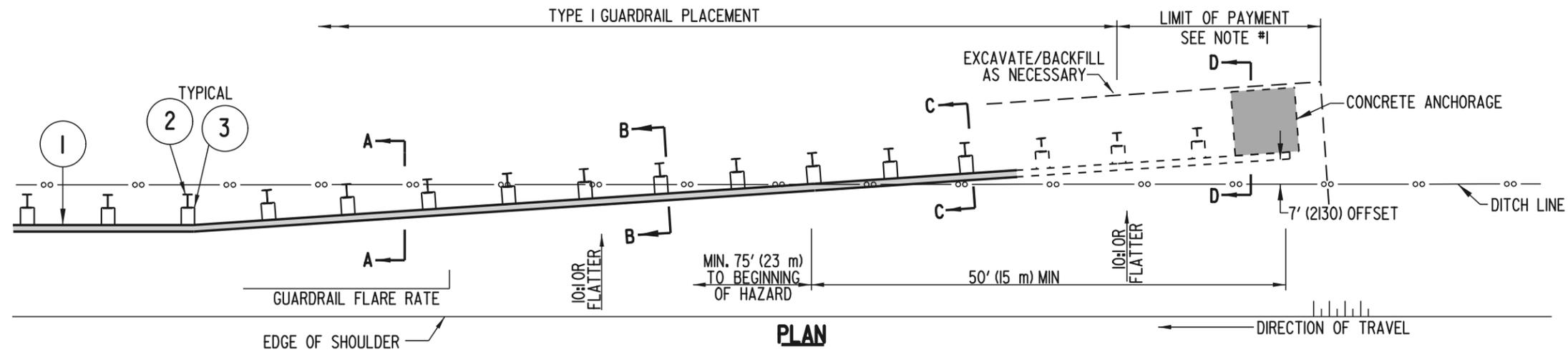
**END SECTION ELEVATION**



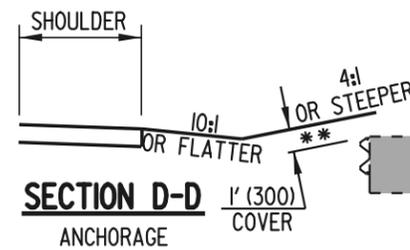
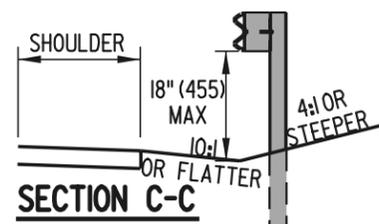
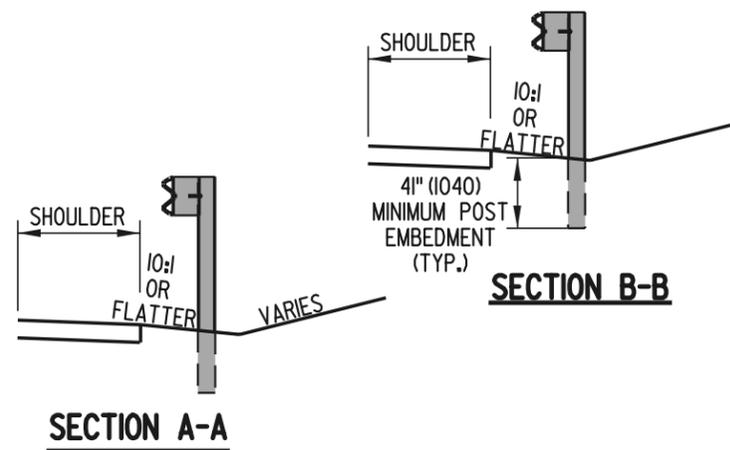
**ELEVATION**

- NOTES:**
1. ADDITIONAL HOLES FOR ANCHOR PLATE SHALL BE DRILLED PRIOR TO GALVANIZING. (SEE STANDARD HARDWARE SHEET FOR HOLE SPACING INFORMATION).
  2. CONTRACTOR HAS THE OPTION OF USING A 6' (1830) STEEL TUBE WITHOUT A SOIL PLATE OR A 5' (1525) STEEL TUBE WITH A SOIL PLATE.

 <b>DELAWARE</b> <b>DEPARTMENT OF TRANSPORTATION</b>	<b>END ANCHORAGE</b>			<b>APPROVED</b> <i>Caudam Wicks</i> <b>9/6/02</b> <small>CHIEF ENGINEER DATE</small>
	<b>STANDARD NO.</b> <b>B-5 (2002)</b>	<b>SHT.</b> <b>1</b>	<b>OF</b> <b>1</b>	<b>RECOMMENDED</b> <i>Thurston Phelps</i> <b>8/19/02</b> <small>DESIGN ENGINEER DATE</small>



FLARE RATES	
DESIGN SPEED	FLARE RATE
70 MPH (110 km/h)	15:1
60 MPH (100 km/h)	14:1
55 MPH (90 km/h)	12:1
50 MPH (80 km/h)	11:1
45 MPH (70 km/h)	10:1
40 MPH (60 km/h)	9:1
30 MPH (50 km/h)	7:1



\*\* 1' (300) BURIAL IS NOT REQUIRED WHEN ANCHORING IN ROCK.

NOTES:

- 1). BURIED END SECTION PAYMENT INCLUDES THE CONCRETE OR POST ANCHORAGE, EXCAVATION, BACKFILL, AND ALL APPLICABLE ITEMS INCLUDING LABOR NECESSARY TO COMPLETE END ANCHORAGE.
- 2). THE CONTRACTOR HAS THE OPTION OF USING EITHER A CONCRETE BLOCK ANCHOR OR A POST ANCHOR TO TERMINATE THE BURIED END SECTION.
- 3). WHEN PLACING GUARDRAIL ON A 10:1 OR FLATTER SLOPE, THE HEIGHT OF THE GUARDRAIL SHALL BE HELD CONSTANT RELATIVE TO THE GROUND DIRECTLY UNDER THE FACE OF THE GUARDRAIL.
- 4). ALL POSTS SHALL BE 6' (1800) FOR SINGLE RAIL INSTALLATION.
- 5). WHEN USING THE BURIED END SECTION, THE DESIGN MUST PROVIDE A MINIMUM OF 75' (23 m) FROM WHERE THE GUARDRAIL CROSSES THE DITCH LINE TO THE BEGINNING OF THE HAZARD.
- 6). MAINTAIN THE FLARE OF THE GUARDRAIL UNTIL THE 12" (300) COVER HAS BEEN ATTAINED. IF THE 12" (300) COVER CANNOT BE ATTAINED BEFORE THE RAIL IS 7' (2100) BEHIND THE BOTTOM OF THE DITCH, THEN SLOPE THE GUARDRAIL FROM THE POINT WHERE IT CROSSES THE DITCH TO WHERE IT IS 7' (2100) BEHIND THE DITCH, SO THAT IT HAS 12" (300) OF COVER.



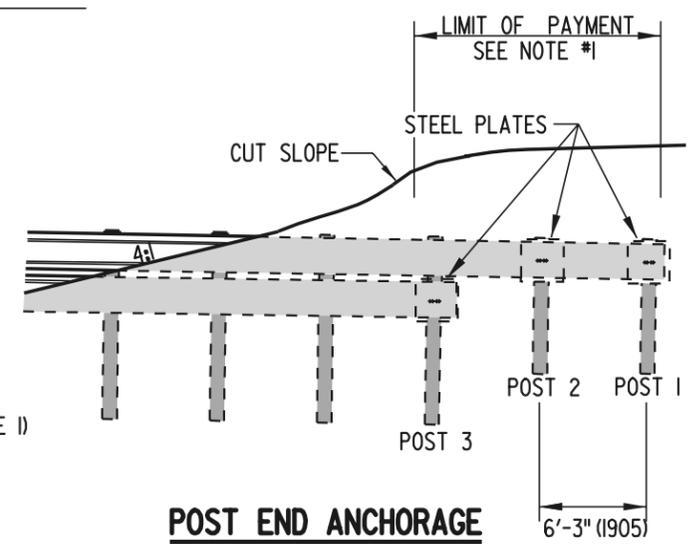
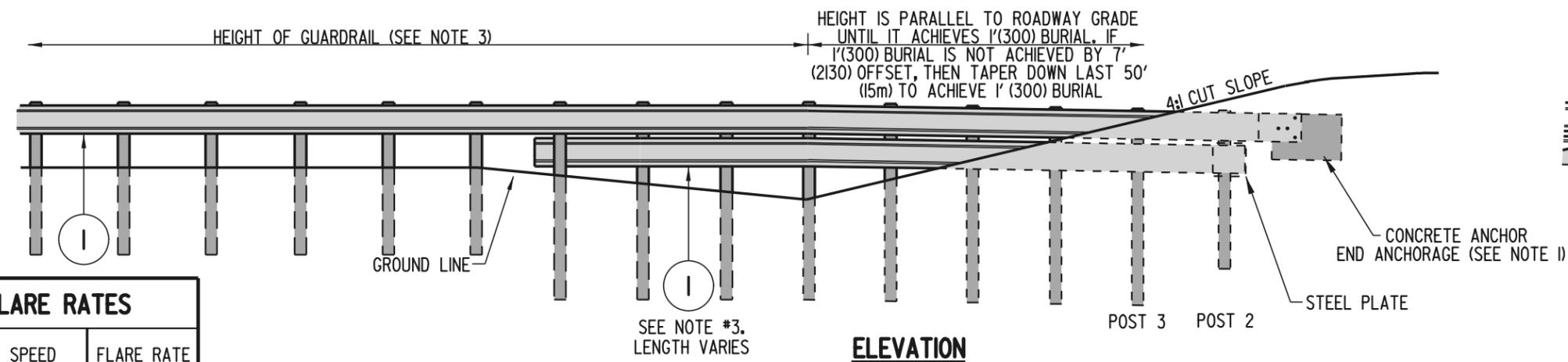
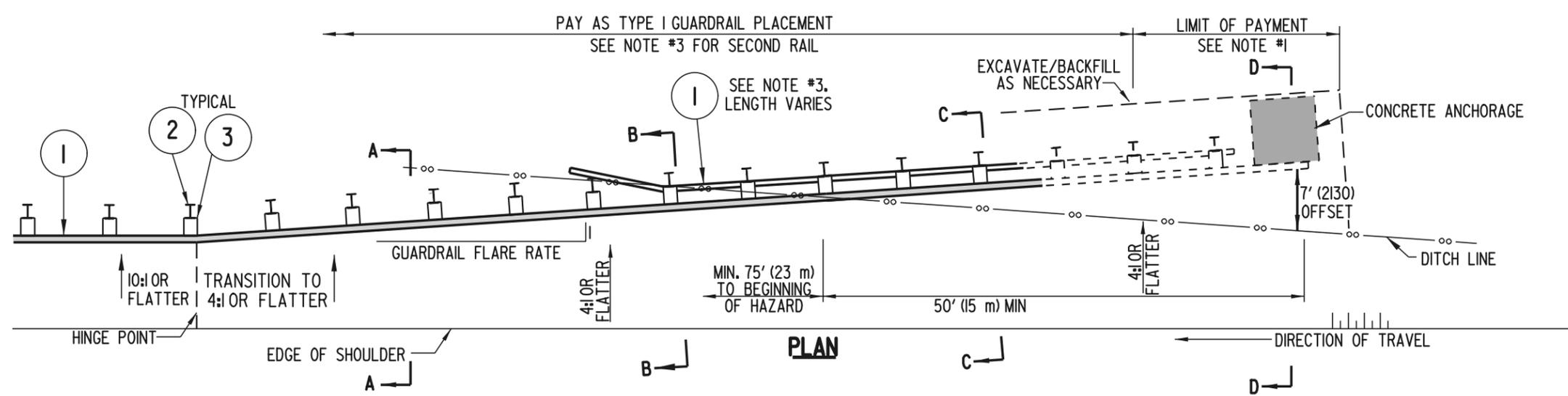
DELAWARE  
DEPARTMENT OF TRANSPORTATION

BURIED END SECTION

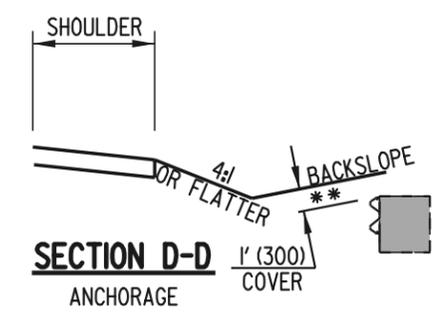
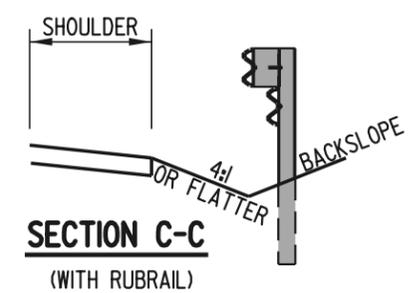
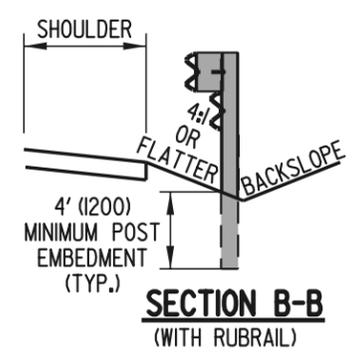
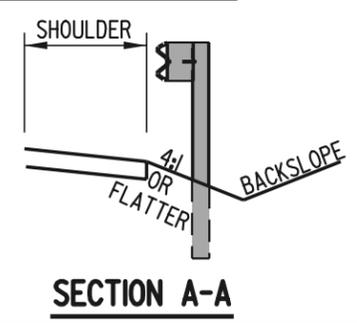
STANDARD NO. B-6 (2002) SHT. 1 OF 3

APPROVED *Cadman Wicks* 9/6/02  
CHIEF ENGINEER DATE

RECOMMENDED *Theresa Delgado* 9/19/02  
DESIGN ENGINEER DATE



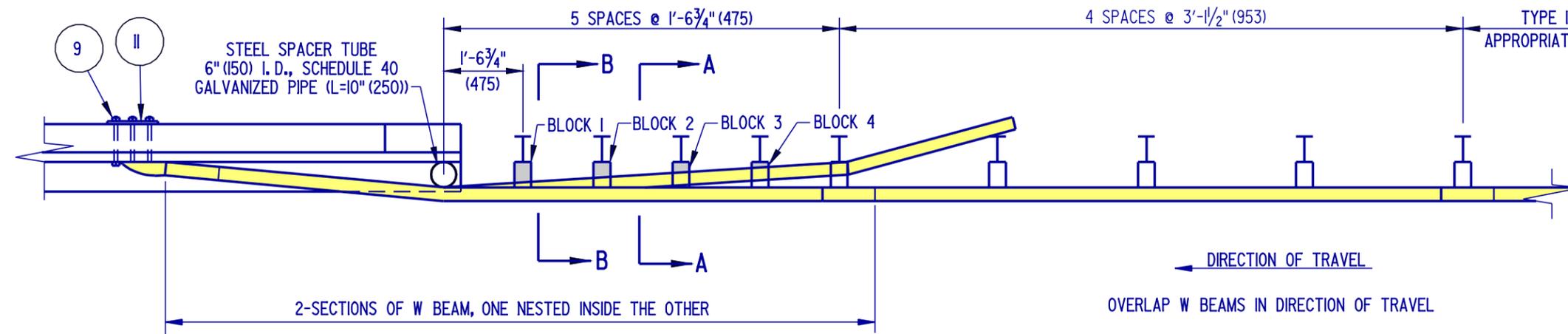
FLARE RATES	
DESIGN SPEED	FLARE RATE
70 MPH (110 km/h)	15:1
60 MPH (100 km/h)	14:1
55 MPH (90 km/h)	12:1
50 MPH (80 km/h)	11:1
45 MPH (70 km/h)	10:1
40 MPH (60 km/h)	9:1
30 MPH (50 km/h)	7:1



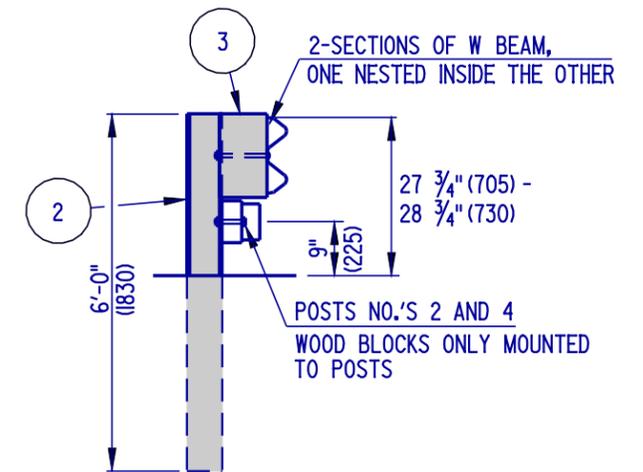
\*\* 1' (300) BURIAL IS NOT REQUIRED WHEN ANCHORING IN ROCK.

- NOTES:**
- 1). BURIED END SECTION PAYMENT INCLUDES THE CONCRETE OR POST ANCHORAGE, EXCAVATION, BACKFILL, AND ALL APPLICABLE ITEMS, INCLUDING LABOR NECESSARY TO COMPLETE END ANCHORAGE.
  - 2). THE CONTRACTOR HAS THE OPTION OF USING EITHER A CONCRETE BLOCK ANCHOR OR A POST ANCHOR TO TERMINATE THE BURIED END SECTION.
  - 3). THE TOP OF THE W-BEAM SHALL BE HELD CONSTANT RELATIVE TO THE ROADWAY PROFILE GRADE UNTIL IT CROSSES THE DITCH FLOW LINE. A SECOND W-BEAM RAIL IS REQUIRED WHEN THE DISTANCE BETWEEN THE GROUND AND THE BOTTOM OF THE TOP RAIL EXCEEDS 18" (450). THE MAXIMUM HEIGHT OF THE DOUBLE RAIL SYSTEM IS 45" (1150). IF NECESSARY, TAPER BOTH RAILS DOWN TO MAINTAIN MAXIMUM HEIGHT. SECOND RAIL SHALL BE PAID FOR AS ADDITIONAL LINEAR FEET (LINEAR METERS) OF TYPE I GUARDRAIL.
  - 4). WHEN USING A SECOND RAIL, 8' (2400) LONG POSTS ARE REQUIRED. BEHIND THE DITCHLINE, POSTS MUST PROVIDE 4' (1200) MINIMUM EMBEDMENT (20" (510) WHEN ROCK IS ENCOUNTERED). POSTS FOR THE POST ANCHOR SHALL BE 6' (1800) LONG.
  - 5). WHEN USING THE BURIED END SECTION, THE DESIGN MUST PROVIDE A MINIMUM OF 75' (23 m) FROM WHERE THE GUARDRAIL CROSSES THE DITCH LINE TO THE BEGINNING OF THE HAZARD.
  - 6). MAINTAIN THE FLARE OF THE GUARDRAIL UNTIL THE 12" (300) COVER HAS BEEN ATTAINED. IF THE 12" (300) COVER CANNOT BE ATTAINED BEFORE THE RAIL IS 7' (2100) BEHIND THE BOTTOM OF THE DITCH, THEN SLOPE THE GUARDRAIL FROM THE POINT WHERE IT CROSSES THE DITCH TO WHERE IT IS 7' (2100) BEHIND THE DITCH, SO THAT IT HAS 12" (300) OF COVER.

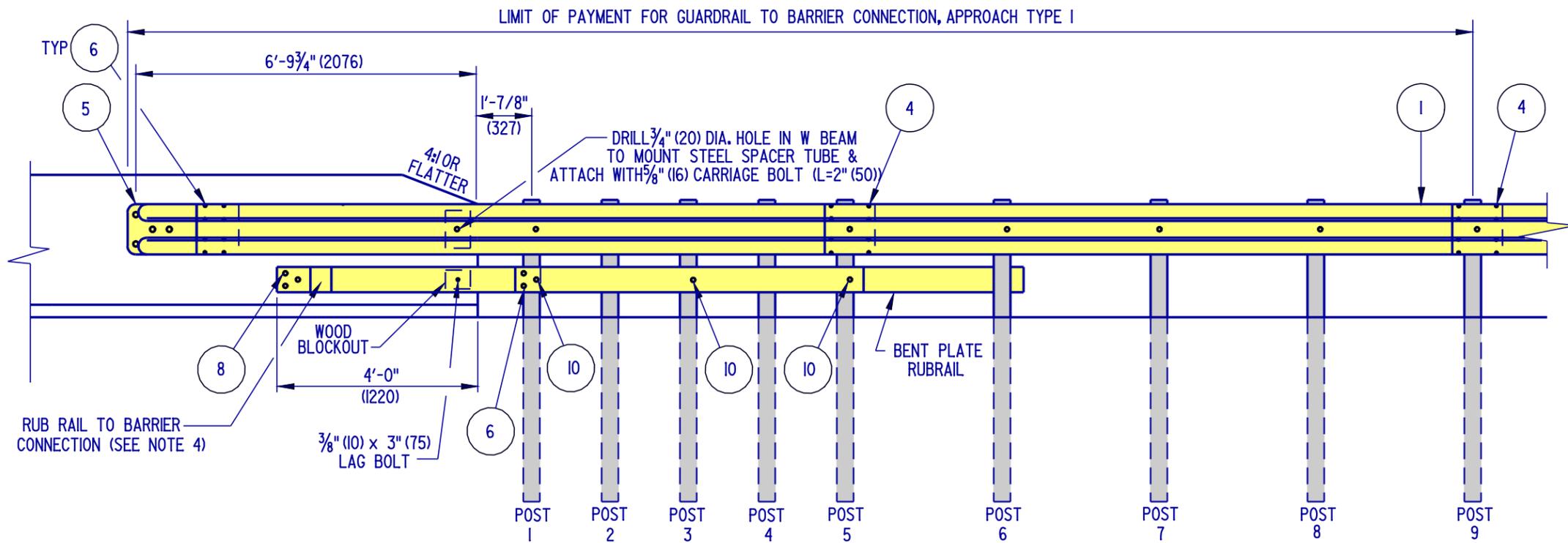




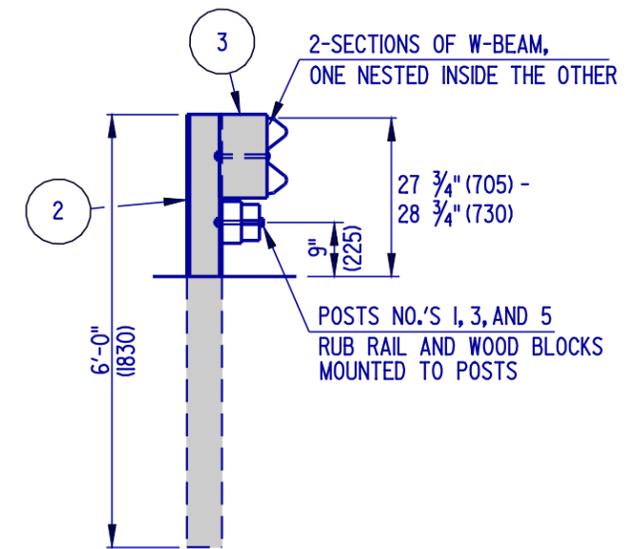
**PLAN**



**SECTION A-A**



**ELEVATION**



**SECTION B-B**

- NOTES: 1). W BEAM IS NOT BOLTED TO POSTS AT POSTS 2 THROUGH 4.  
 2). RUB RAIL IS NOT BOLTED AT POSTS 2 AND 4.  
 3). POSTS 1 THROUGH 6 REQUIRE AN ADDITIONAL HOLE TO ATTACH LOWER WOOD BLOCKS AND/OR RUBRAIL AND WOOD BLOCK.  
 4). USE APPROPRIATE EPOXY BOLT ANCHORS TO REDUCE THE CHANCE OF SPLITTING THE CONCRETE. PLACE STEEL WASHERS (FOR 5/8" (16) BOLT) BETWEEN BOLT HEADS AND RUB RAIL.  
 5). ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.  
 6). PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.  
 7). APPROVED CONCRETE INSERTS MAY BE USED IN NEW CONSTRUCTION TO ATTACH TERMINAL CONNECTOR TO PARAPET.



**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

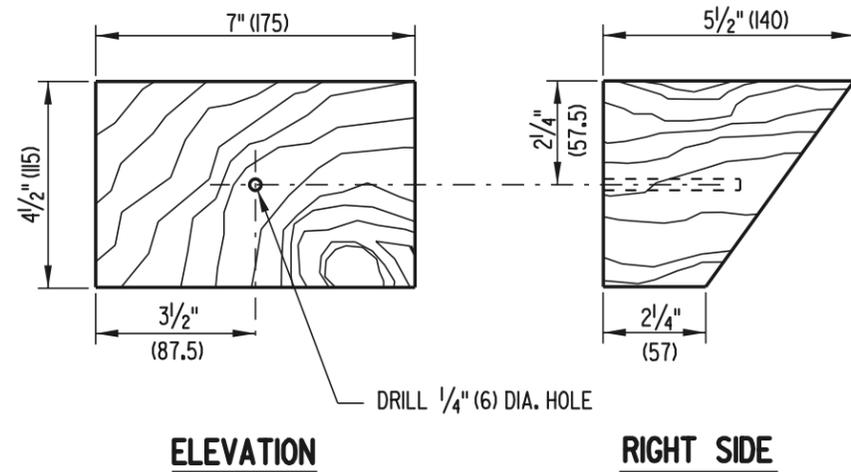
**GUARDRAIL TO BARRIER CONNECTION, APPROACH TYPE 1**

STANDARD NO. **B-7 (2004)**

SHT. **1** OF **3**

APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

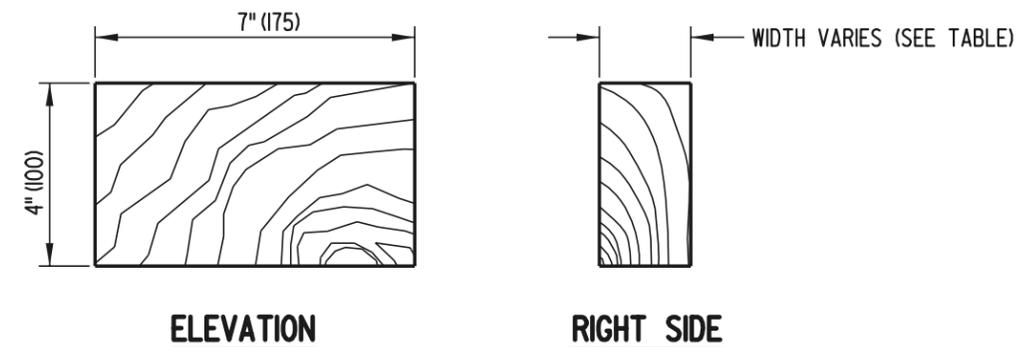
RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



**ELEVATION**

**RIGHT SIDE**

**WOOD BLOCKOUT DETAIL**

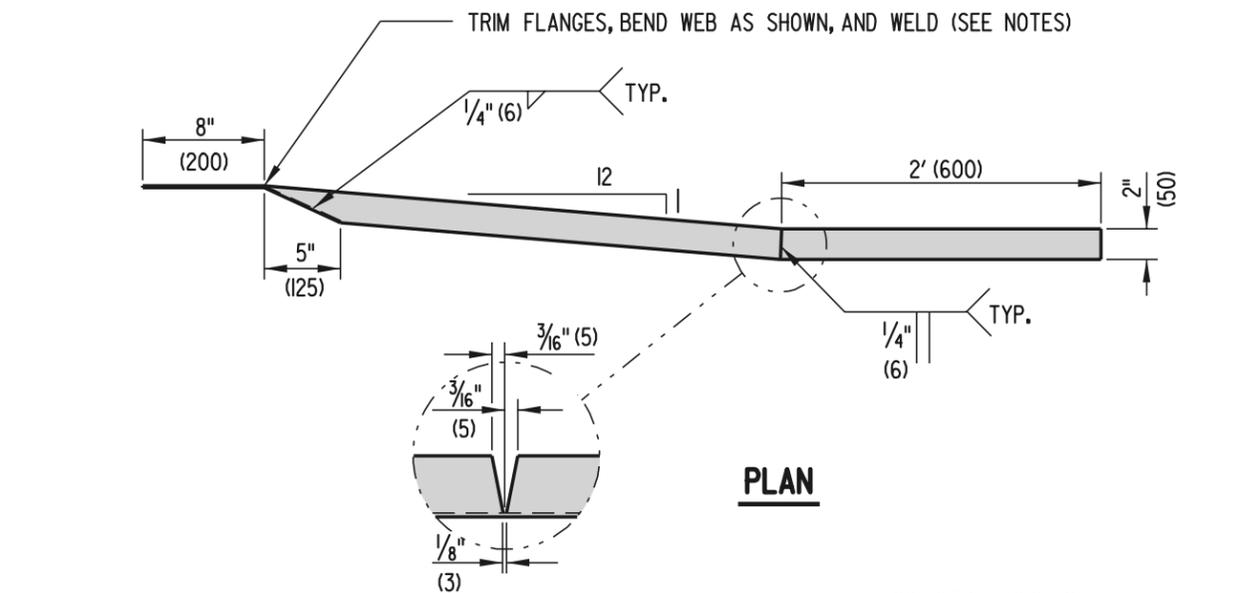


**ELEVATION**

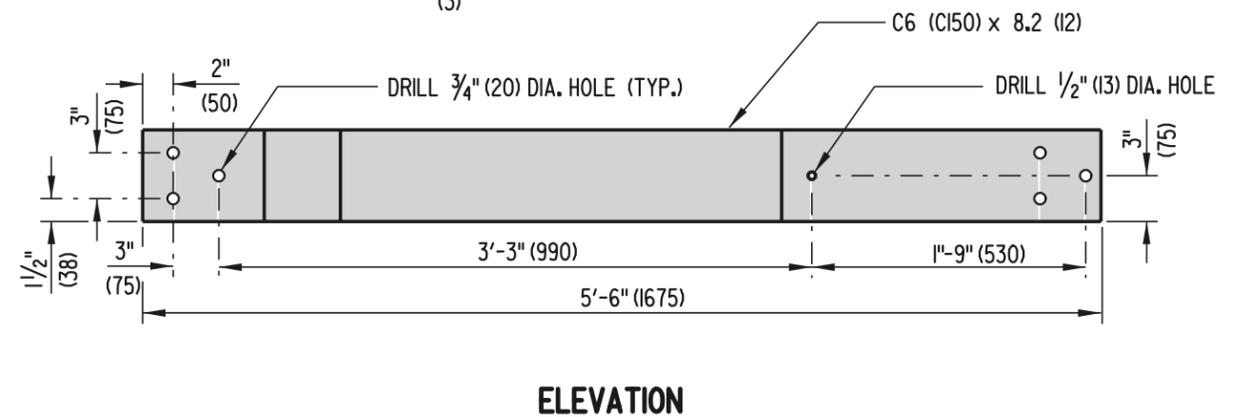
**RIGHT SIDE**

**RUB RAIL WOOD BLOCKS**

RUB RAIL WOOD BLOCKS (7" (175) x 4" (100))		
POST NO.	WIDTH	BOLT LENGTH
1	4 1/4" (108)	6" (150)
2	3 1/4" (83)	4" (100)
3	2" (50)	4" (100)
4	1" (25)	2" (50)



**PLAN**



**ELEVATION**

**RUB RAIL TO BARRIER CONNECTION**

- NOTES:**
- 1). THE RUB RAIL TO BARRIER CONNECTION END MUST BE ATTACHED FLUSH WITH THE SLOPED TOE OF THE SAFETY BARRIER. INSTALLATION CAN BE SIMPLIFIED BY FABRICATING OR SHOP TWISTING THE RUB RAIL END TO BE CONSISTENT WITH THE SLOPE OF THE BARRIER, HOWEVER, FIELD BENDING USING HEAT IS PERMITTED.
  - 2). STEEL SPACER TUBE IS SCHEDULE 40 GALVANIZED PIPE, 6" (152) (I.D.) x 9" (229)



**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

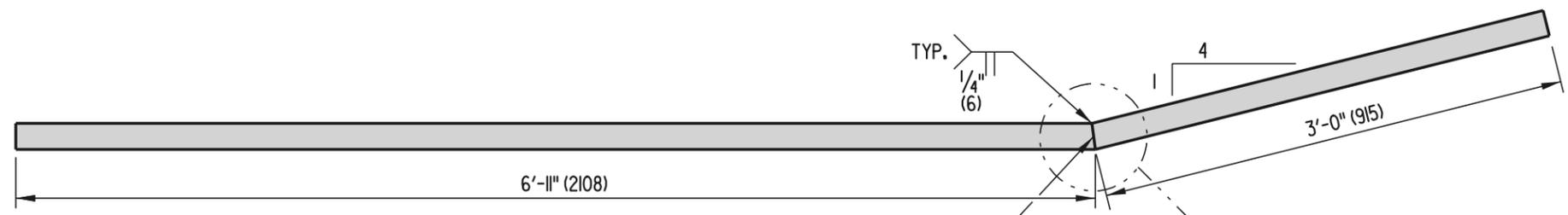
**GUARDRAIL TO BARRIER CONNECTION, APPROACH TYPE 1**

**STANDARD NO. B-7 (2001)**

**SHT. 2 OF 3**

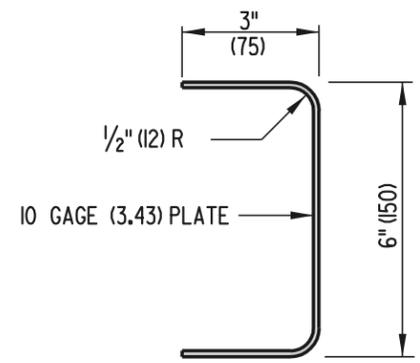
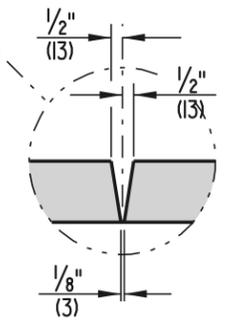
**APPROVED** *Ryan M. Hershberg* **6/18/01**  
CHIEF ENGINEER DATE

**RECOMMENDED** *Mehal Alghob* **6/18/01**  
DESIGN ENGINEER DATE



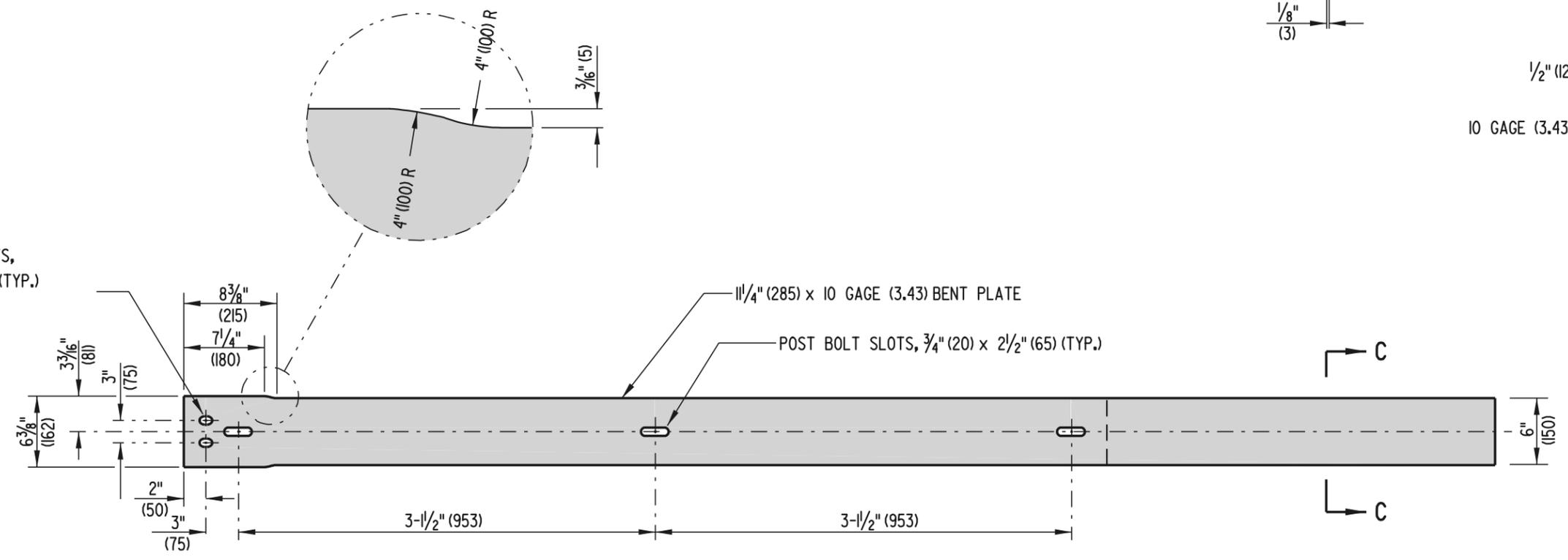
CUT FLANGE, BEND AND WELD

**PLAN**



**SECTION C-C**

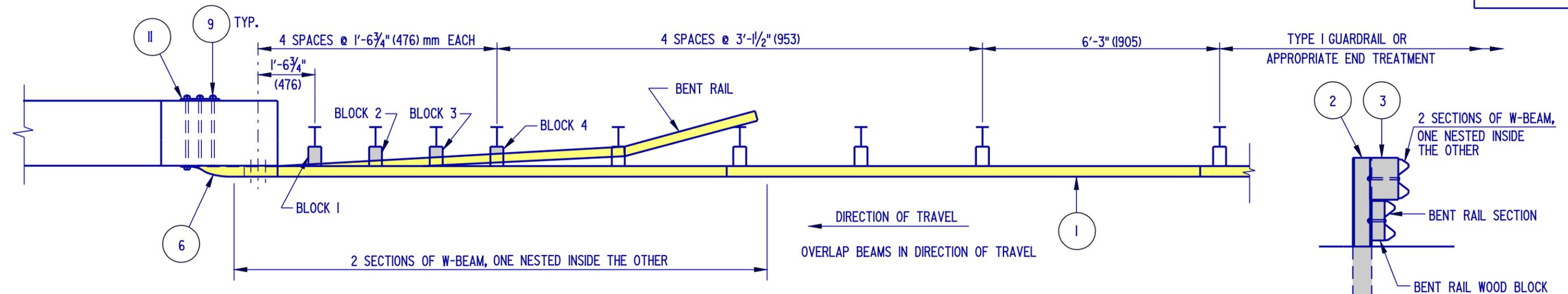
SPLICE BOLT SLOTS,  
3/4" (20) x 1/8" (30) (TYP.)



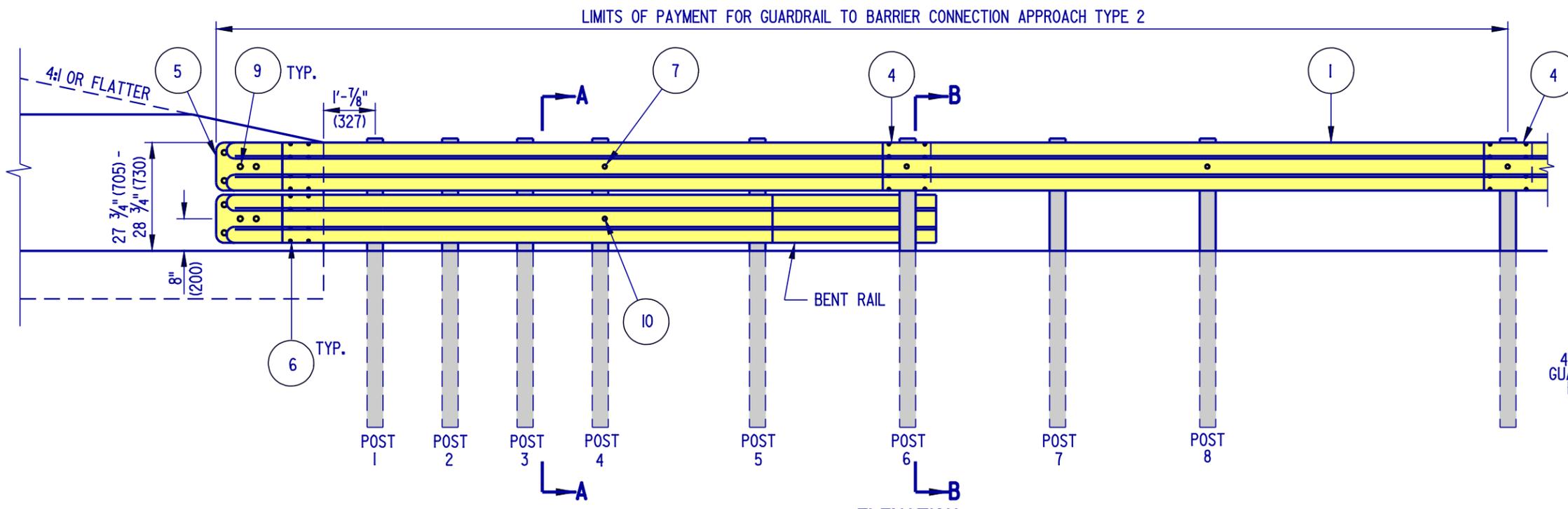
**ELEVATION**

**BENT PLATE RUB RAIL**

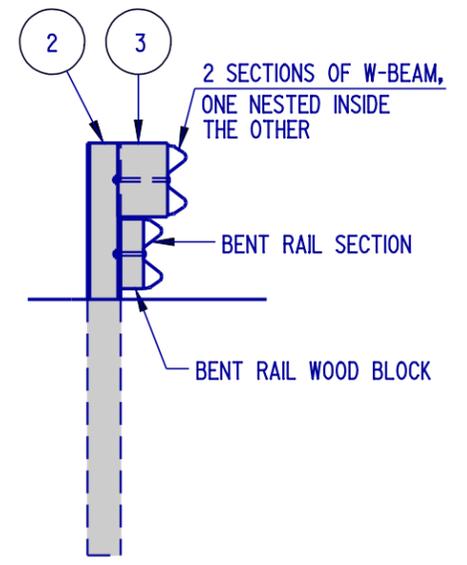
 <b>DELAWARE</b> DEPARTMENT OF TRANSPORTATION	GUARDRAIL TO BARRIER CONNECTION, APPROACH TYPE 1		APPROVED <i>Ryan M. Harshbarger</i> 6/18/01 <small>CHIEF ENGINEER DATE</small>
	STANDARD NO. B-7 (2001)	SHT. 3 OF 3	RECOMMENDED <i>Mehal Akhavan</i> 6/18/01 <small>DESIGN ENGINEER DATE</small>



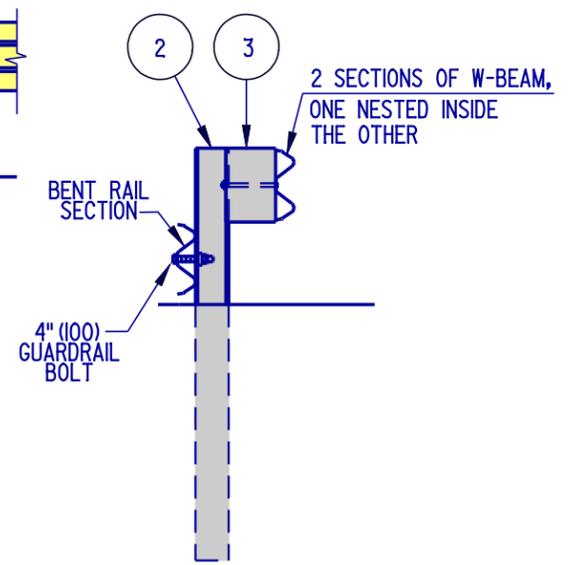
**PLAN**



**ELEVATION**



**SECTION A-A**



**SECTION B-B**

- NOTES :
- 1). CURB SHALL NOT BE USED AT THE FACE OF RAIL WITHIN THE LIMITS OF THIS INSTALLATION.
  - 2). POSTS 1, 2, 3, 4, AND 6 REQUIRE AN ADDITIONAL HOLE TO ATTACH WOOD BLOCKS AND/OR BENT RAIL.
  - 3). DO NOT ATTACH RAILS TO POSTS 1, 2, 3, 5, OR 7.
  - 4). CURB SHALL NOT BE USED AT THE FACE OF RAIL WITHIN THE LIMITS OF THIS INSTALLATION.
  - 5). ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.
  - 6). BENT RAIL MAY BE SHOP BENT TO FACILITATE INSTALLATION OR MAY BE FIELD BENT USING HEAT.
  - 7). APPROVED CONCRETE INSERTS MAY BE USED IN NEW CONSTRUCTION TO ATTACH TERMINAL CONNECTORS TO PARAPET.
  - 8). PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.
  - 9). WHEN PLACED OVER CURB (MIN 8" (200) HIGH), BOTTOM RAIL CAN BE ELIMINATED.

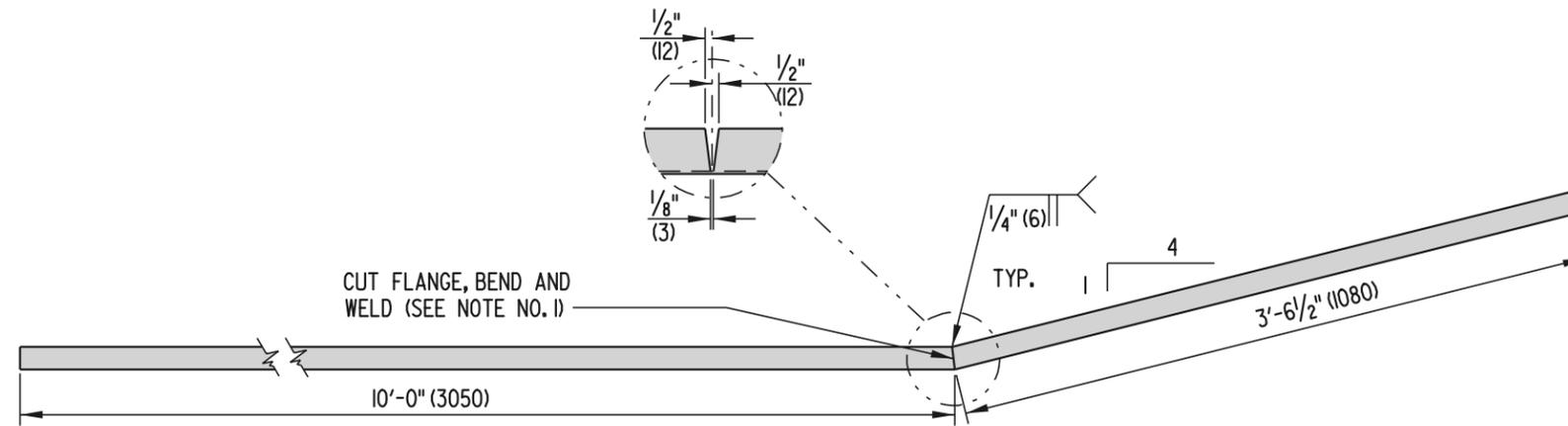


**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

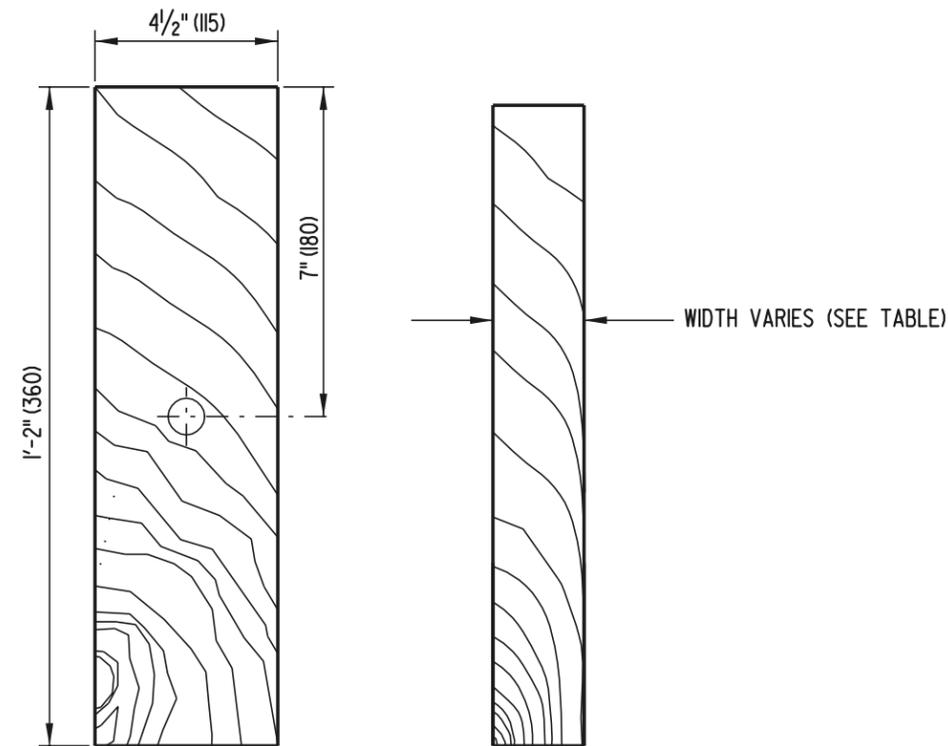
<b>GUARDRAIL TO BARRER CONNECTION, APPROACH TYPE 2</b>			
STANDARD NO.	B-8 (2004)	SHT.	1 OF 2

APPROVED *Carolann Wick* 1/10/05  
CHIEF ENGINEER DATE

RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



**BENT RAIL**



**ELEVATION**

**RIGHT SIDE**

**BENT RAIL WOOD BLOCKS**

BENT RAIL WOOD BLOCKS 1'-2" (360) x 4 1/2" (115)		
BLOCK	WIDTH	BOLT LENGTH
1	5" (125)	8" (200)
2	4" (100)	6" (150)
3	3" (75)	6" (150)
4	2" (50)	4" (100)

**NOTE:** BOTTOM WOOD BLOCKS LOCATED ON POSTS 1-4 ARE OFFSET DRILLED TO SIT SQUARELY ON THE POST FLANGE AND SECURED WITH 5/8" (16) CARRIAGE BOLTS (L VARIES), SEE BENT RAIL WOOD BLOCKS TABLE.



DELAWARE  
DEPARTMENT OF TRANSPORTATION

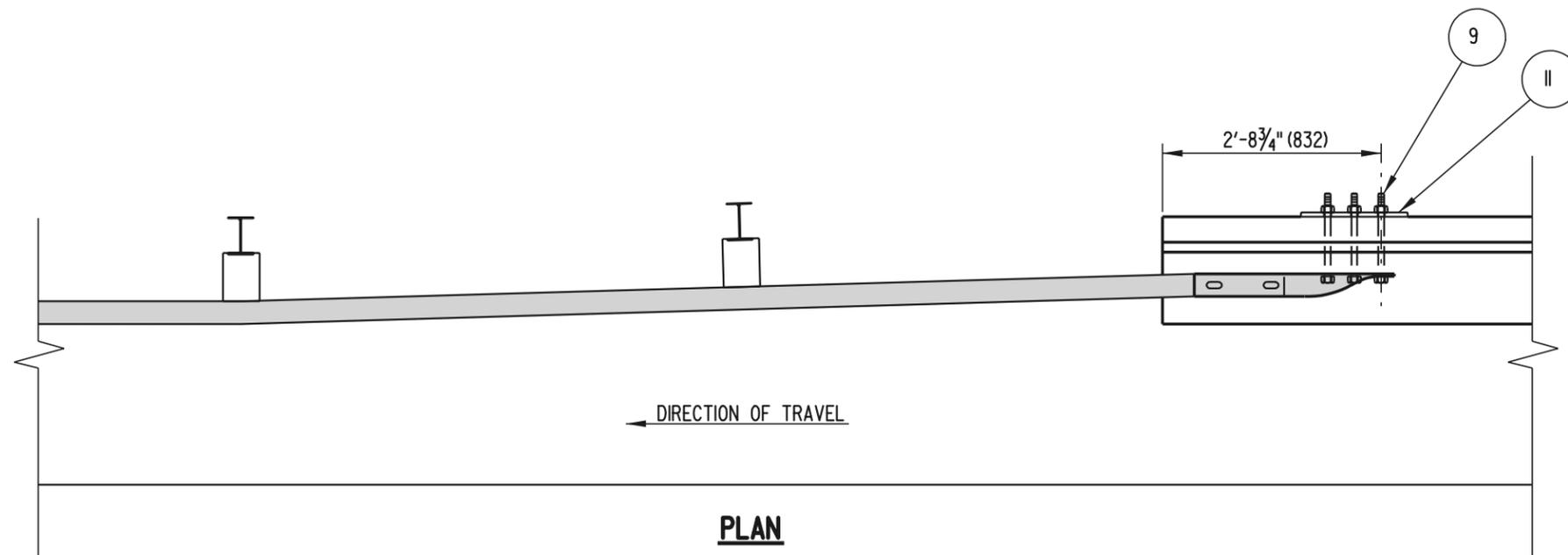
GUARDRAIL TO BARRIER CONNECTION, APPROACH TYPE 2

STANDARD NO. B-8 (2001)

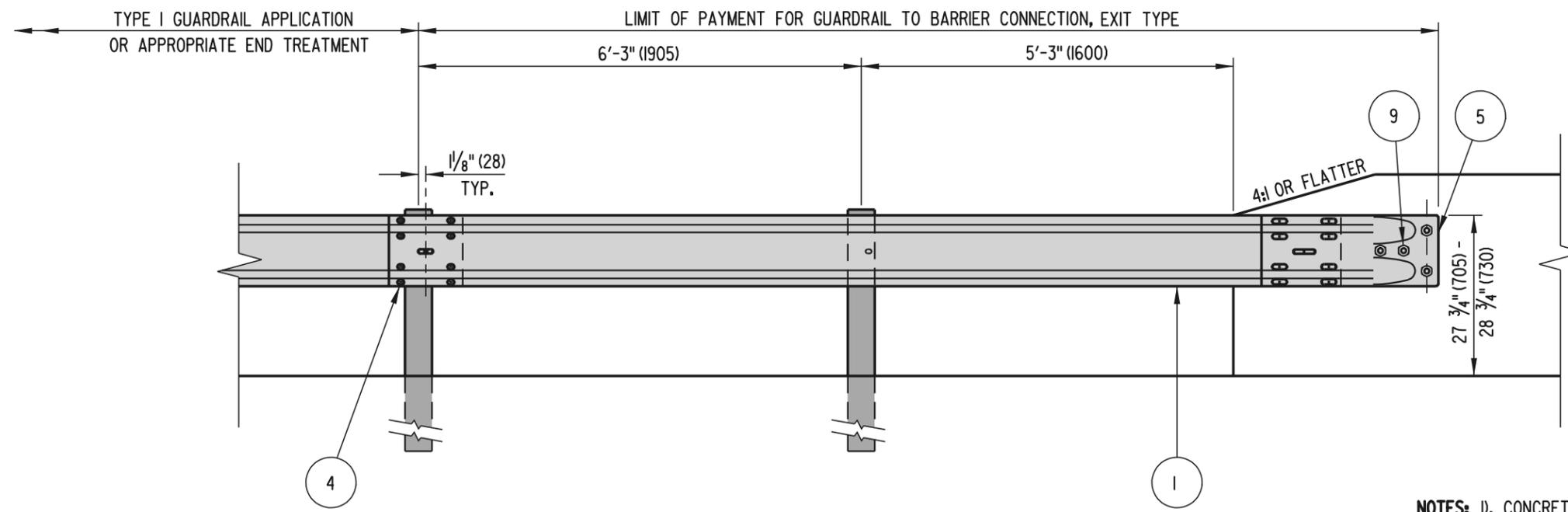
SHT. 2 OF 2

APPROVED *Ryan M. Harshbarger* 6/18/01  
CHIEF ENGINEER DATE

RECOMMENDED *Michael R. [Signature]* 6/18/01  
DESIGN ENGINEER DATE



**PLAN**



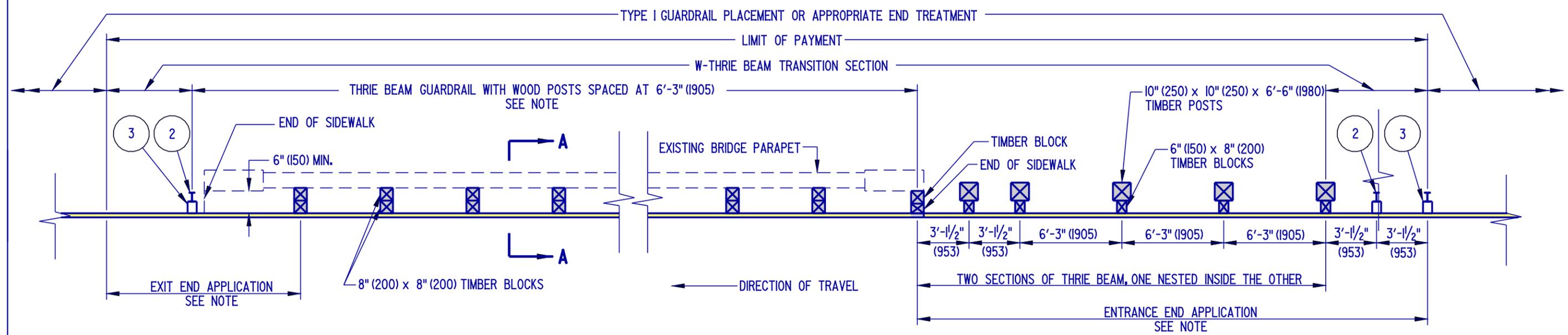
**ELEVATION**

- NOTES:**
- 1). CONCRETE INSERTS MAY BE USED IN NEW CONSTRUCTION TO ATTACH TERMINAL CONNECTOR TO PARAPET,
  - 2). GUARDRAIL SECTION AND TERMINAL CONNECTORS SHALL BE OVERLAPPED IN THE DIRECTION OF TRAVEL.
  - 3). INSTALLATION SHOWN ABOVE WITH AN 'F-TYPE' BARRIER FACE. GUARDRAIL SECTION OF BARRIER CONNECTION SHALL BE ADJUSTED HORIZONTALLY IN ORDER TO MEET FLUSH AGAINST VARIOUS TYPES OF WALLS AND BARRIERS.

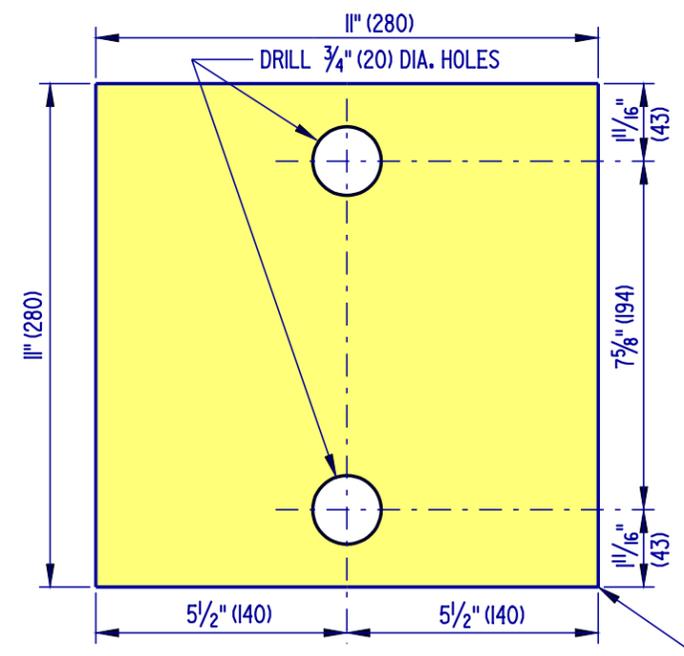


<b>GUARDRAIL TO BARRIER CONNECTION, EXIT TYPE</b>			
STANDARD NO.	B-9 (2002)	SHT. 1	OF 1

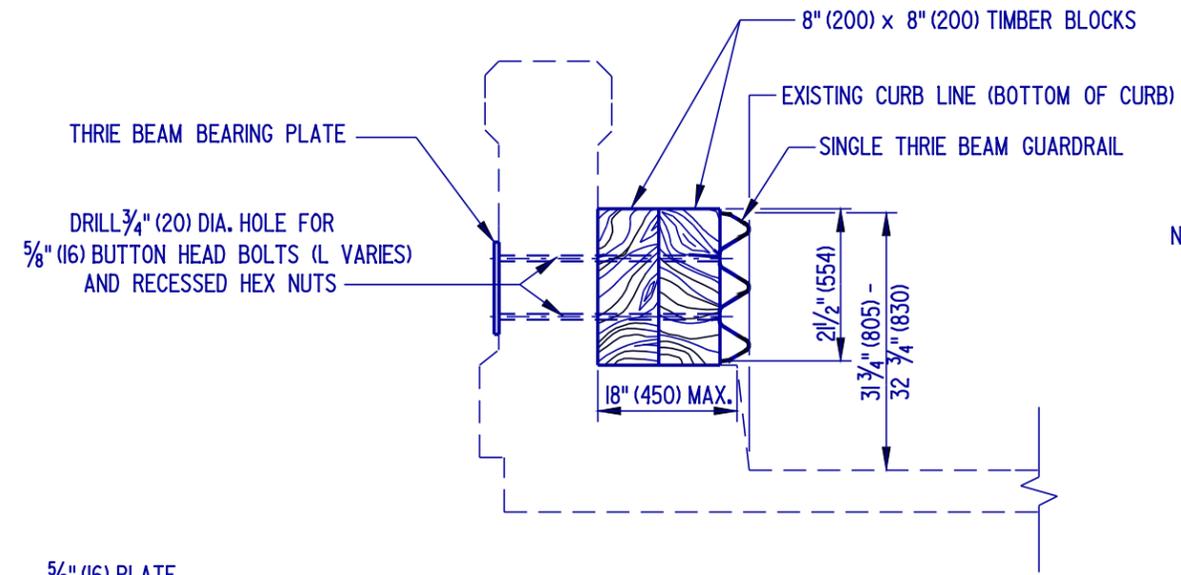
APPROVED	<i>Caudan Wicks</i> CHIEF ENGINEER	9/6/02 DATE
RECOMMENDED	<i>Theresa Roberts</i> DESIGN ENGINEER	8/19/02 DATE



**PLAN**



**THRIE BEAM BEARING PLATE DETAIL**



**SECTION A-A**

- NOTES:
- 1). THIS INSTALLATION SHALL BE USED WHEN THE EXISTING SIDEWALK IS 18" (450) OR LESS.
  - 2). USE A THRIE BEAM EXPANSION SECTION AT BRIDGE EXPANSION JOINTS.
  - 3). PLACE GUARDRAIL REFLECTOR IN THE UPPER VALLEY OF THE THRIE BEAM EVERY FIFTH POST.
  - 4). TIMBER BLOCK THICKNESS SHALL BE ADJUSTED TO ALLOW FACE OF THE THRIE BEAM TO BE FLUSH WITH BOTTOM OF CURB (MINIMUM THICKNESS SHALL BE 4" (100)).
  - 5). THE EXIT END APPLICATION SHALL BE USED ONLY ON DIVIDED HIGHWAYS. FOR ALL OTHER SITUATIONS, THE ENTRANCE END APPLICATION SHALL BE USED ON BOTH ENDS OF THE BRIDGE PARAPET.
  - 6). SPACING OF WOOD POSTS MAY NEED TO BE REDUCED TO ACCOMMODATE LINING UP POSTS AT THE END OF THE PARAPET.

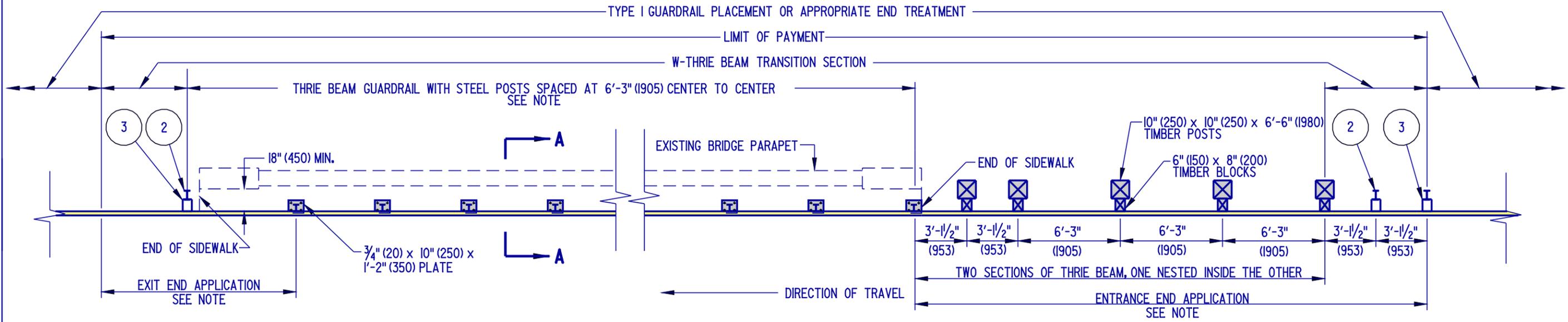


**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

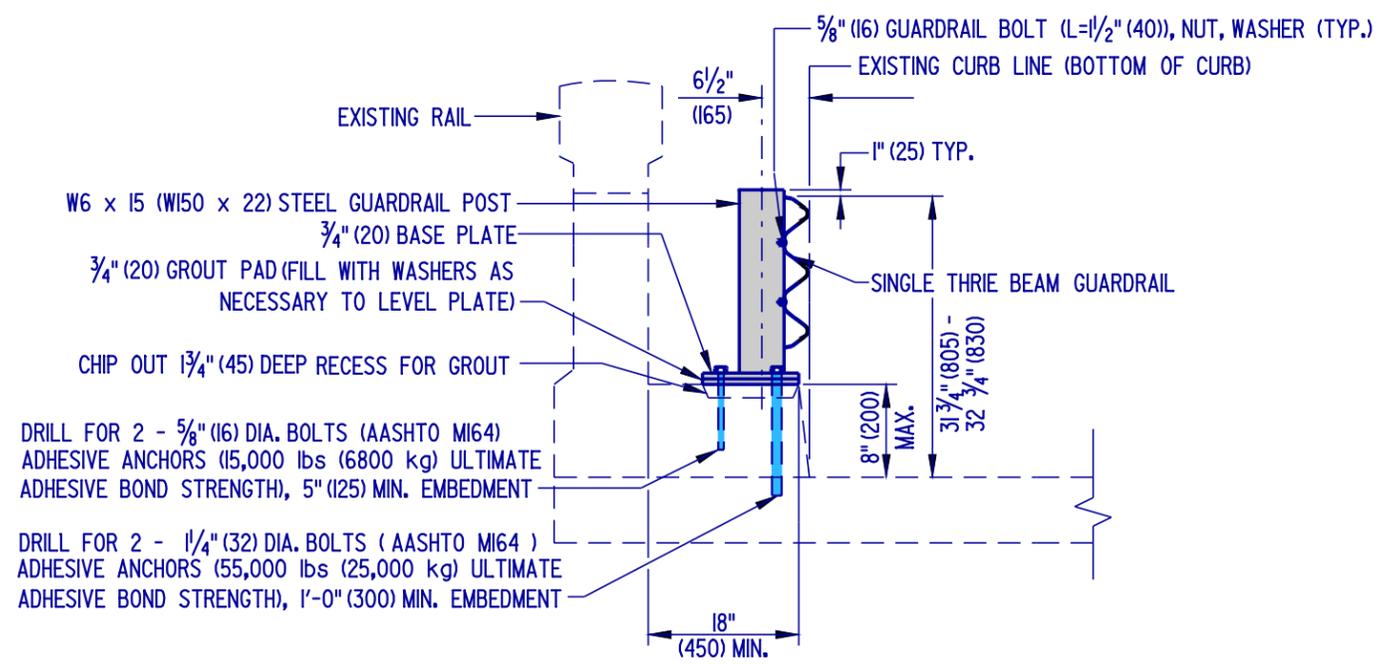
<b>BRIDGE RAIL RETROFIT, TYPE 1</b>			
STANDARD NO.	B-10 (2004)	SHT. 1	OF 1

APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

RECOMMENDED *Dennis M. O'Flaherty* 1/3/05  
DESIGN ENGINEER DATE



**PLAN**



**SECTION A-A**

- NOTES: 1). THIS INSTALLATION SHALL BE USED WHEN THE EXISTING SIDEWALK IS 18" (450) OR WIDER, AND DEAD LOAD CONSIDERATIONS ARE A CONCERN WHEN USING BRIDGE RAIL RETROFIT, TYPE 3.  
 2). ADHESIVE ANCHORS SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS AND SHALL BE GALVANIZED.  
 3). USE A THRIE BEAM EXPANSION SECTION AT BRIDGE EXPANSION JOINTS.  
 4). PLACE GUARDRAIL REFLECTOR IN THE UPPER VALLEY OF THE THRIE BEAM EVERY FIFTH POST.  
 5). THE EXIT END APPLICATION SHALL BE USED ONLY ON DIVIDED HIGHWAYS. FOR ALL OTHER SITUATIONS, THE ENTRANCE END APPLICATION SHALL BE USED ON BOTH ENDS OF THE BRIDGE PARAPET.  
 6). SPACING OF STEEL POSTS MAY NEED TO BE REDUCED TO ACCOMMODATE LINING UP POSTS AT THE END OF THE PARAPET.



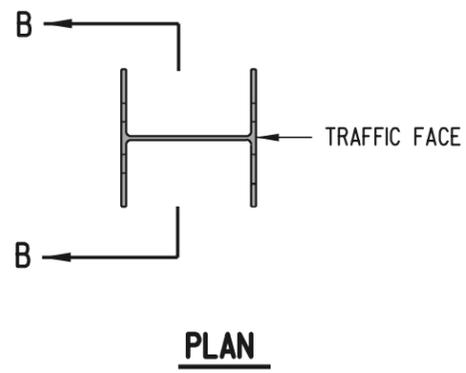
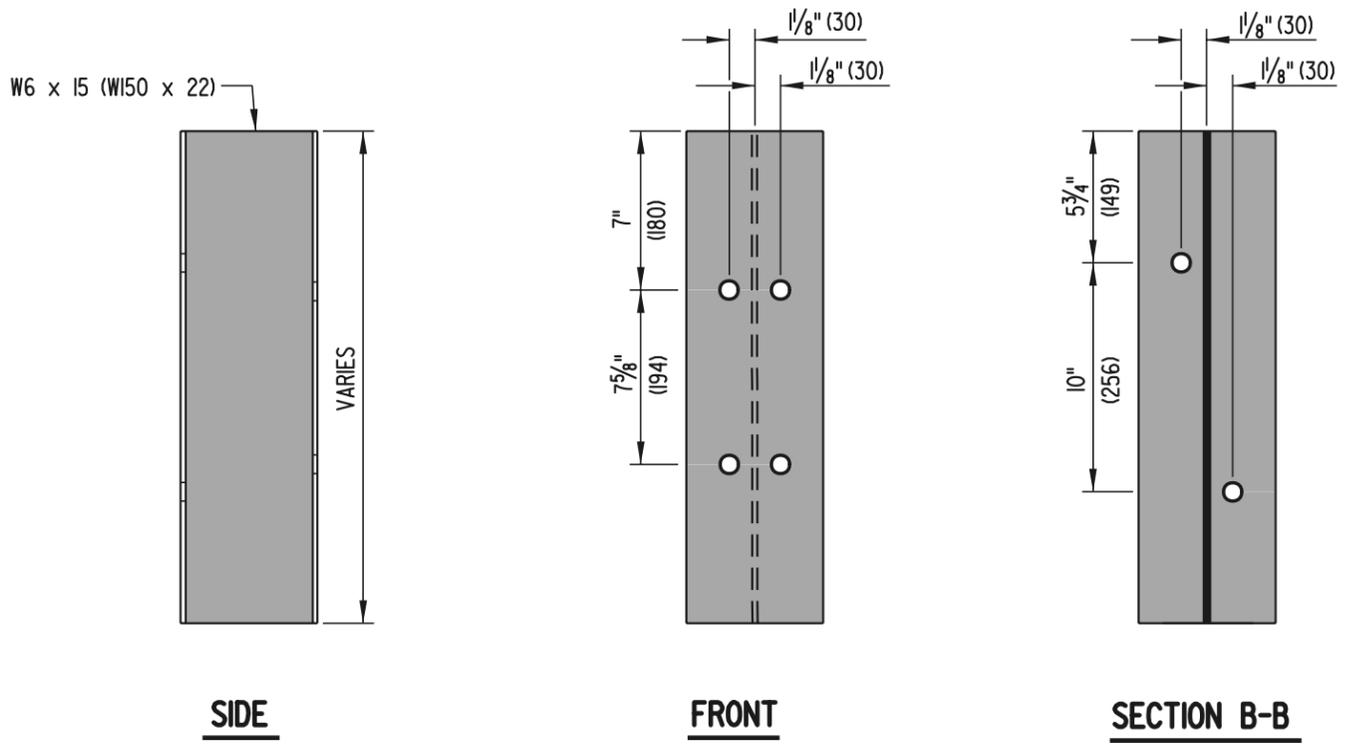
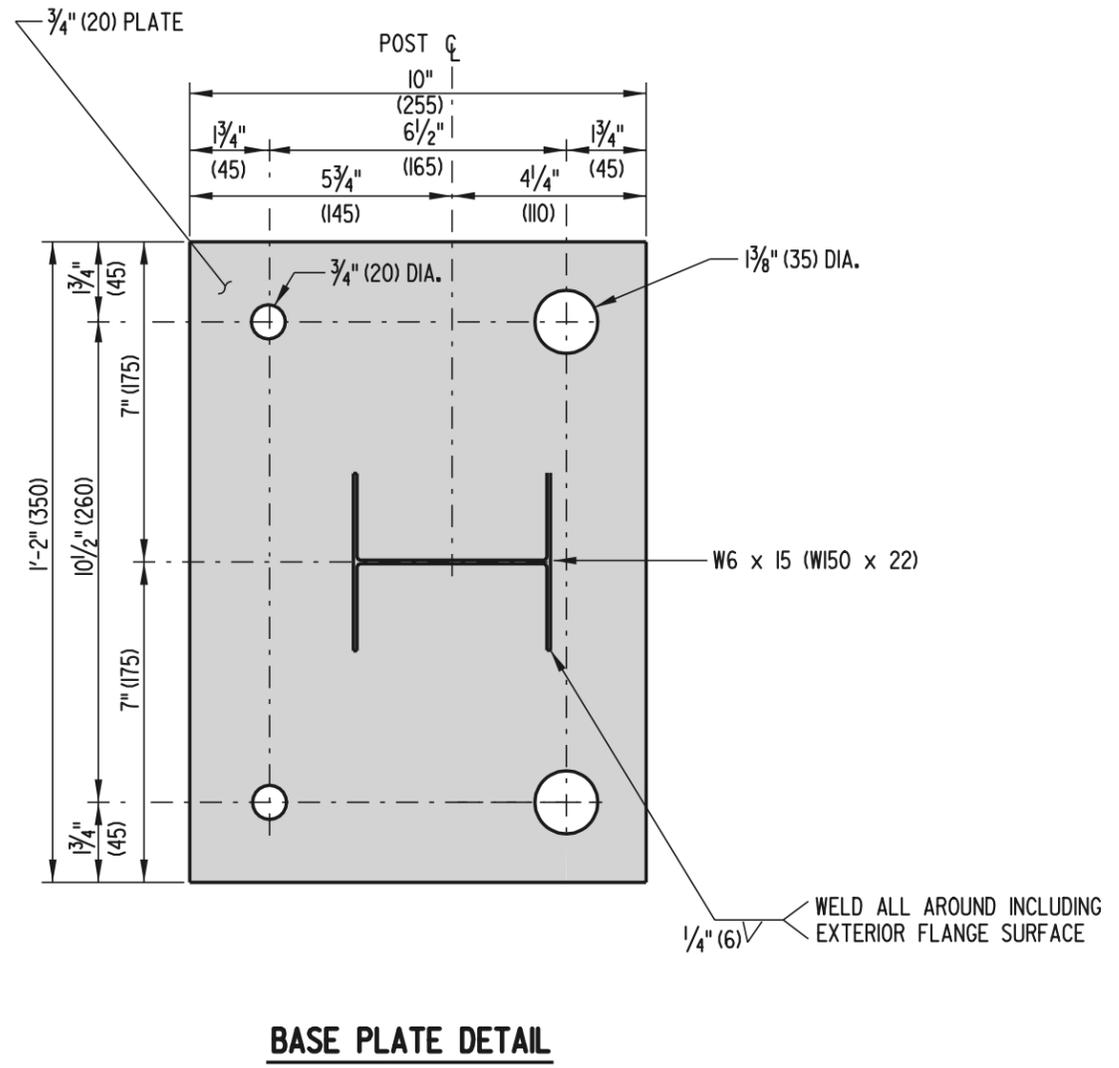
**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

**BRIDGE RAIL RETROFIT, TYPE 2**

STANDARD NO.	B-11 (2004)	SHT.	1	OF	4
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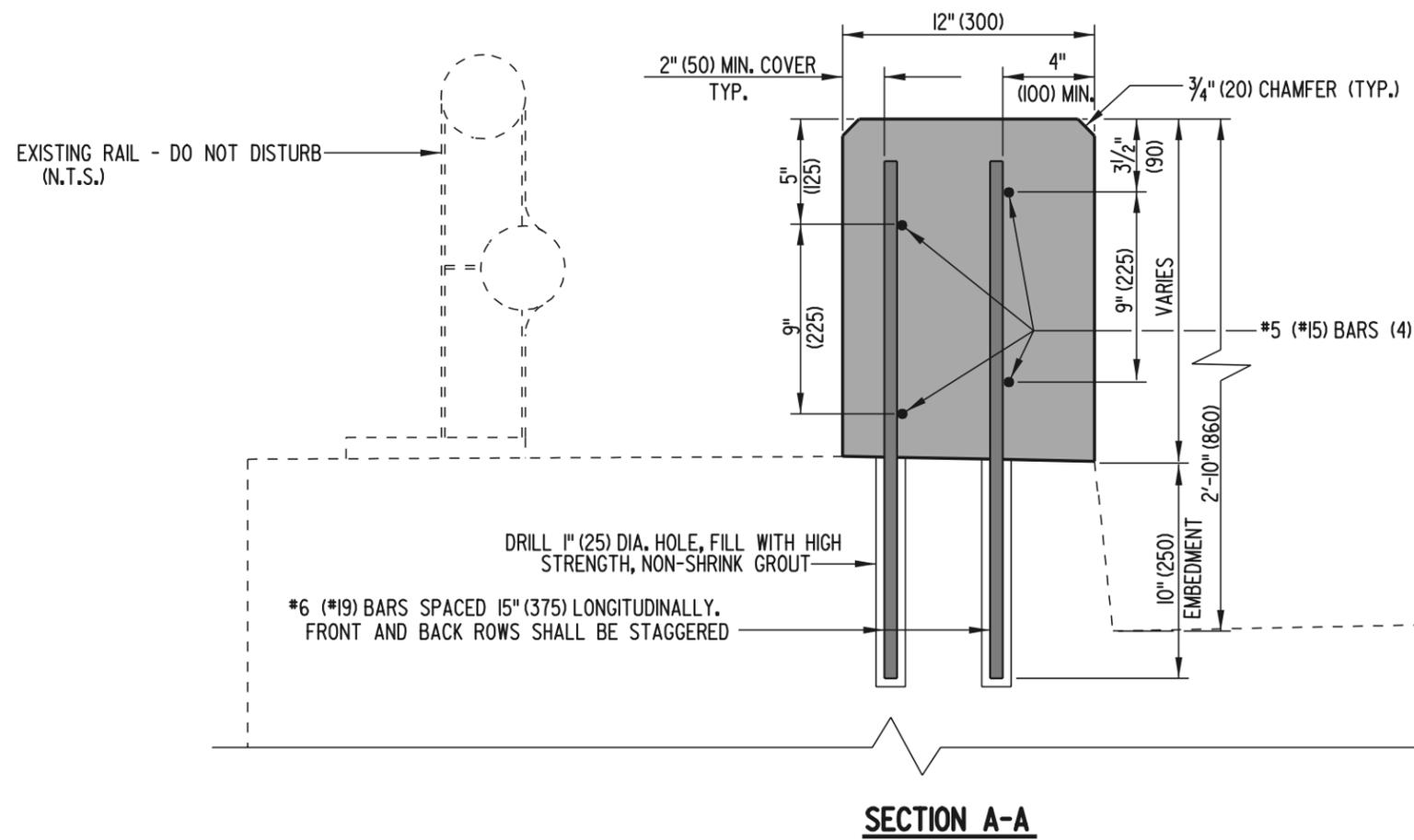
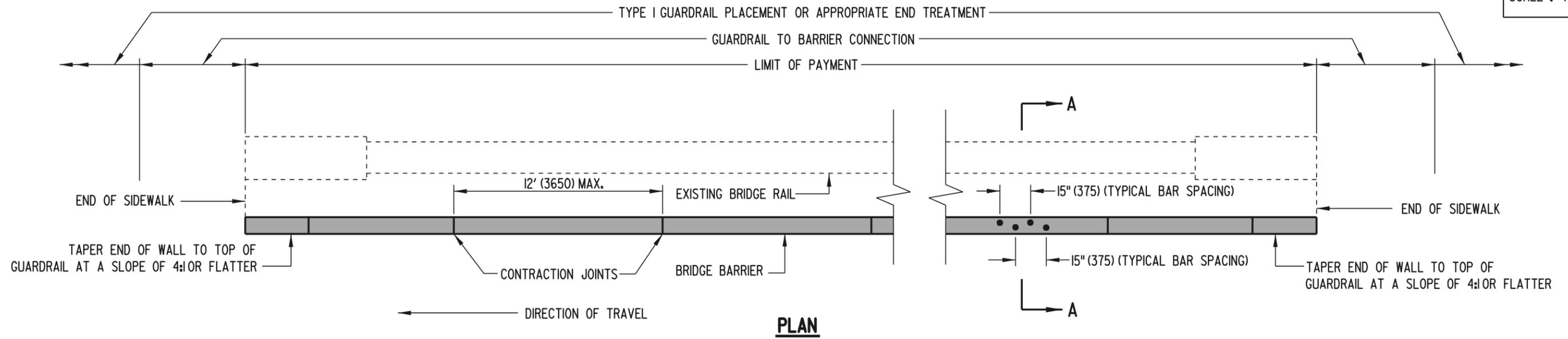
**APPROVED** *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

**RECOMMENDED** *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



**W6 x 15 (W150 x 22) STEEL GUARDRAIL POST**

<p><b>DELAWARE</b> <b>DEPARTMENT OF TRANSPORTATION</b></p>	<b>BRIDGE RAIL RETROFIT, TYPE 2</b>			<p>APPROVED <i>Ryan M. Harshbarger</i> <u>6/18/01</u>  <small>CHIEF ENGINEER DATE</small></p>
	<p>STANDARD NO. <b>B-11 (2001)</b></p>	<p>SHT. <b>2</b> OF <b>2</b></p>	<p>RECOMMENDED <i>Mehal Alghob</i> <u>6/18/01</u>  <small>DESIGN ENGINEER DATE</small></p>	



**NOTE:** STANDARD GUARDRAIL TO BARRIER CONNECTIONS SHALL BE CONNECTED TO THE ENDS OF THE NEW BRIDGE BARRIER AND TRANSITIONED TO THE EXISTING GUARDRAIL.

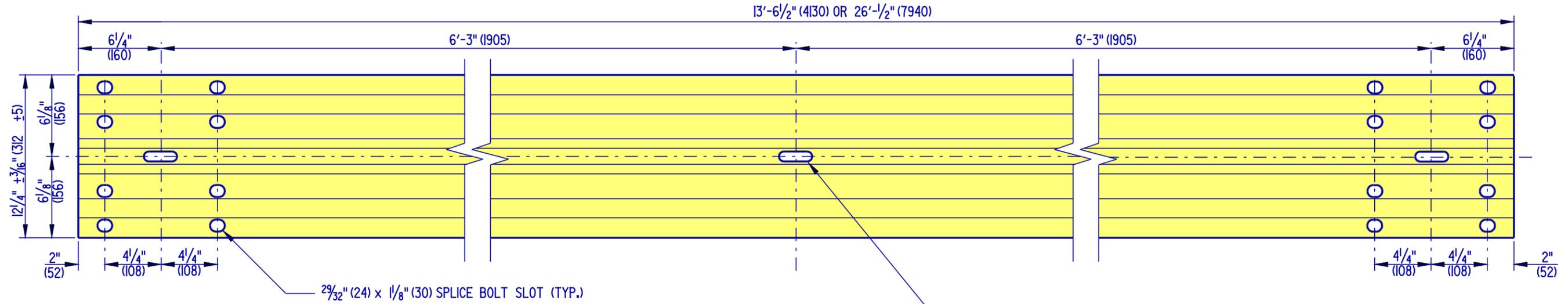


**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

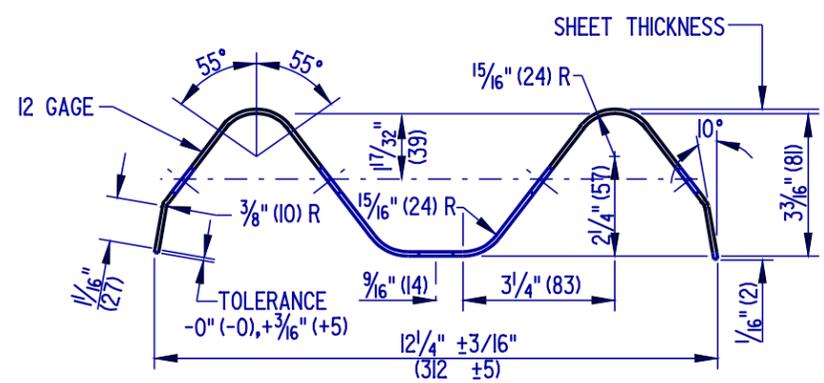
**BRIDGE RAIL RETROFIT, TYPE 3**

STANDARD NO. **B-12 (2001)** SHT. **1** OF **1**

APPROVED *Ryan M. Harkness* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Akhavan* 6/18/01  
DESIGN ENGINEER DATE



**W-BEAM ELEVATION**



**W-BEAM SECTION**

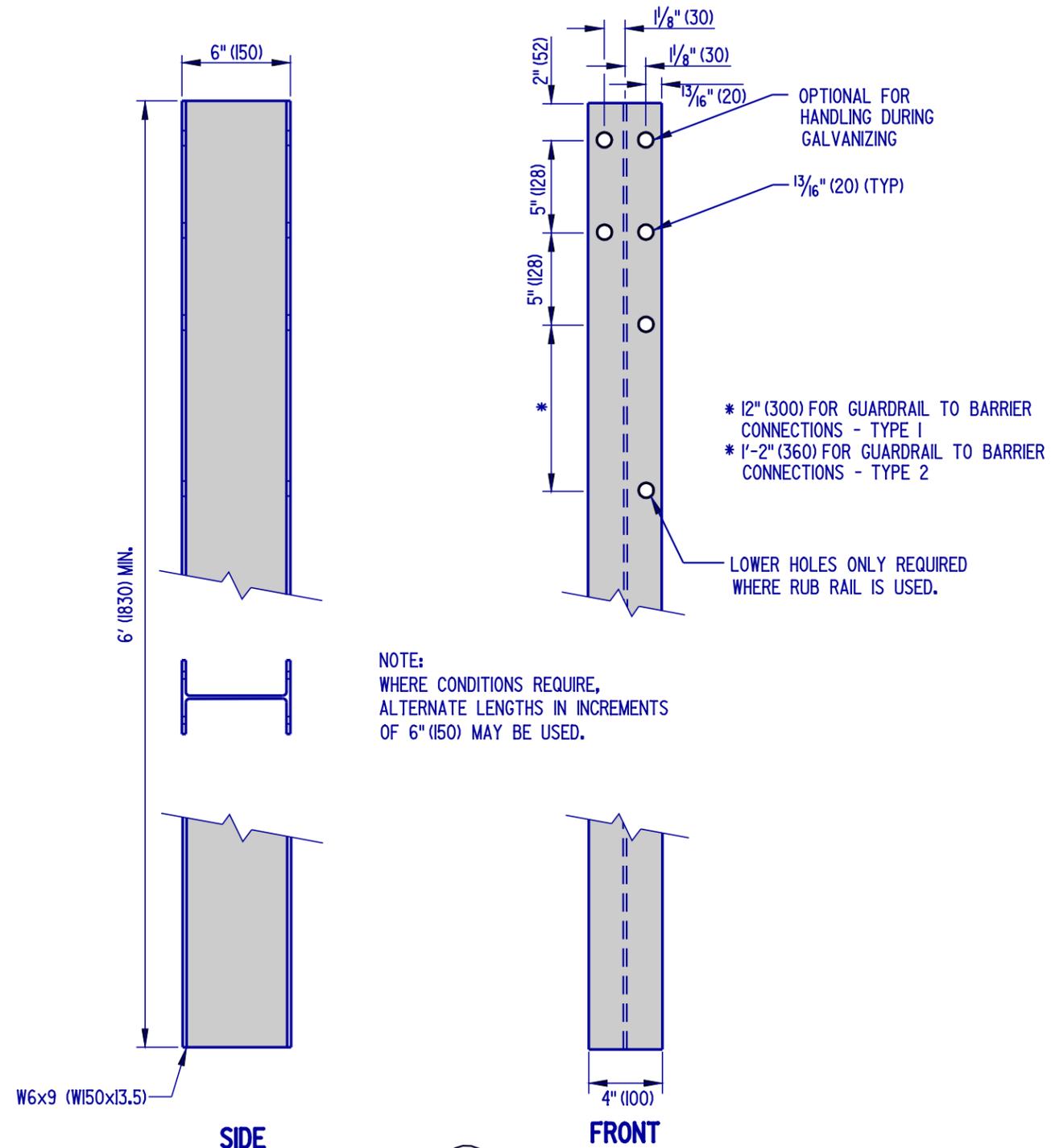
NOTES: 1). TWO ADDITIONAL 3/4" (20) x 2 1/2" (65) SLOTS SHALL BE PROVIDED AT 6'-3" (1905) SPACING FOR BEAM LENGTH OF 26'-1/2" (7940).



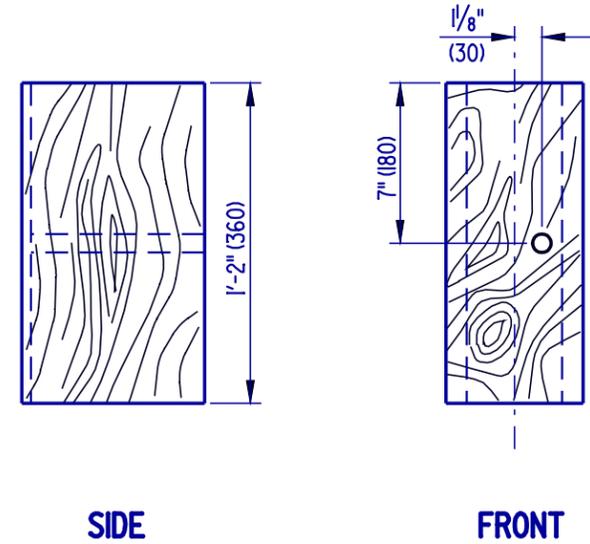
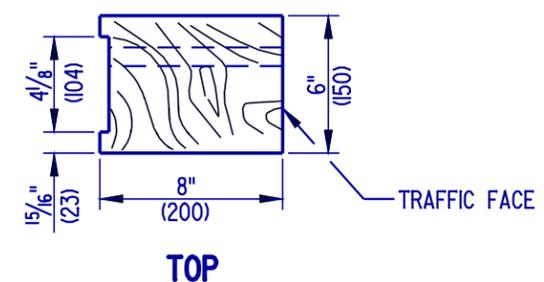
DELAWARE  
DEPARTMENT OF TRANSPORTATION

STANDARD NO. B-13 (2004)		HARDWARE		APPROVED	
SHT. 1	OF 13	1/10/05		1/10/05	
		RECOMMENDED		1/13/05	

CHIEF ENGINEER  
DESIGN ENGINEER



NOTE:  
WHERE CONDITIONS REQUIRE,  
ALTERNATE LENGTHS IN INCREMENTS  
OF 6" (150) MAY BE USED.



**OFFSET BLOCK** (3)

NOTE : ALL HOLES SHALL BE 13/16" (20) DIA. BOLT HOLE PATTERN IS SYMMETRICAL WITH RESPECT TO THE VERTICAL AXIS OF THE POST.

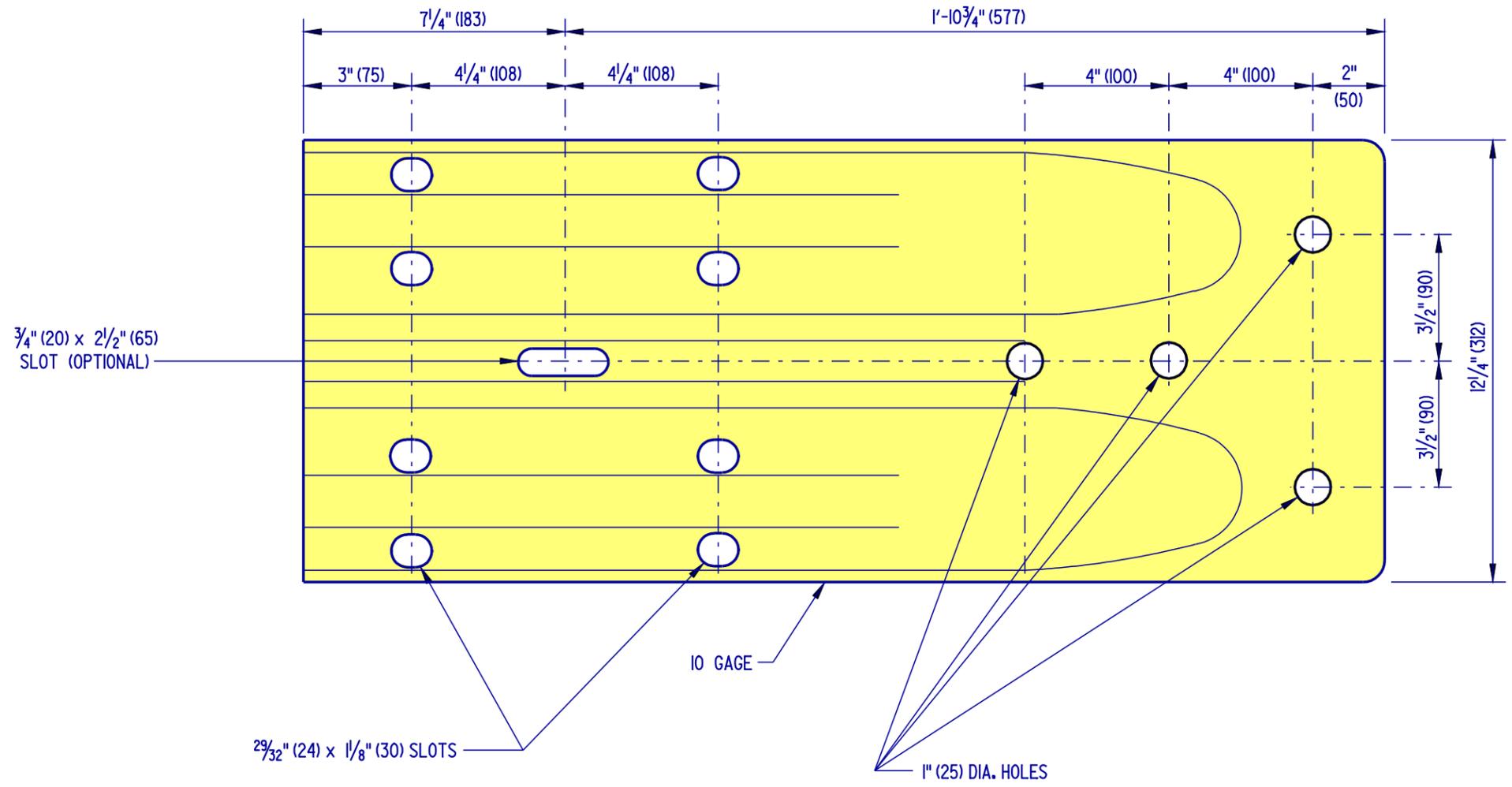
**POST** (2)

**W-BEAM STEEL POST AND WOOD OFFSET BLOCK**

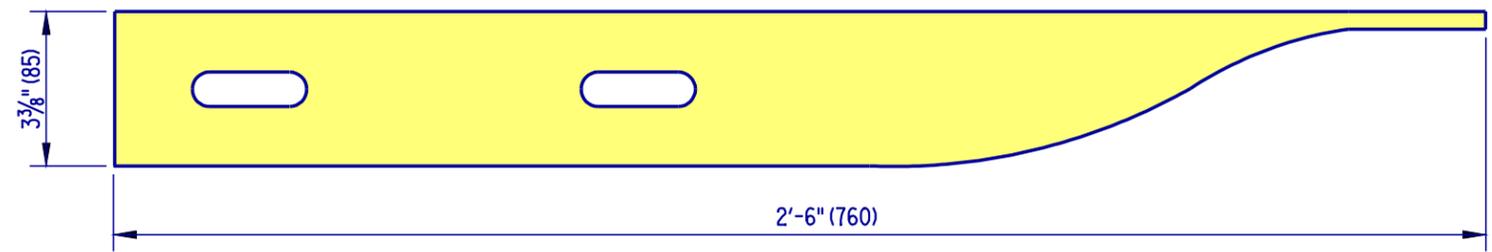


DELAWARE  
DEPARTMENT OF TRANSPORTATION

STANDARD NO. B-13 (2004)		HARDWARE		APPROVED <i>Carolann Wicks</i> 1/10/05 CHIEF ENGINEER DATE	
SHT. 2	OF 13	RECOMMENDED <i>Dennis M. O'Flaherty</i> 1/13/05 DESIGN ENGINEER DATE			



**ELEVATION**



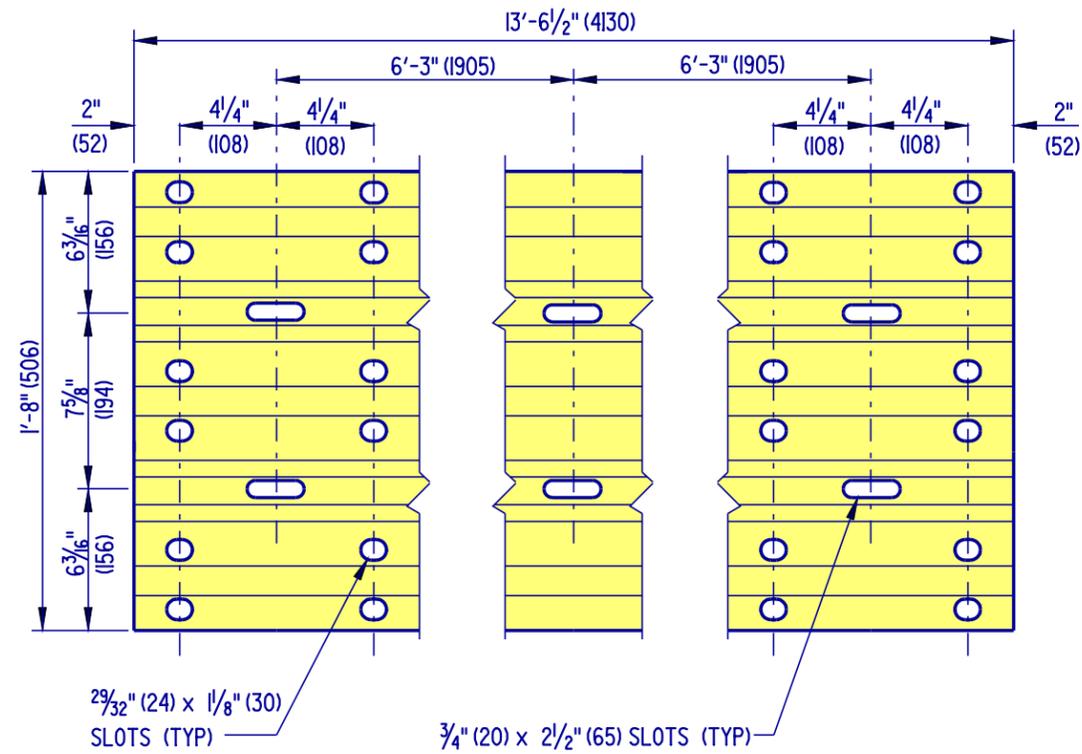
**PLAN**

**W-BEAM TERMINAL CONNECTOR** 5

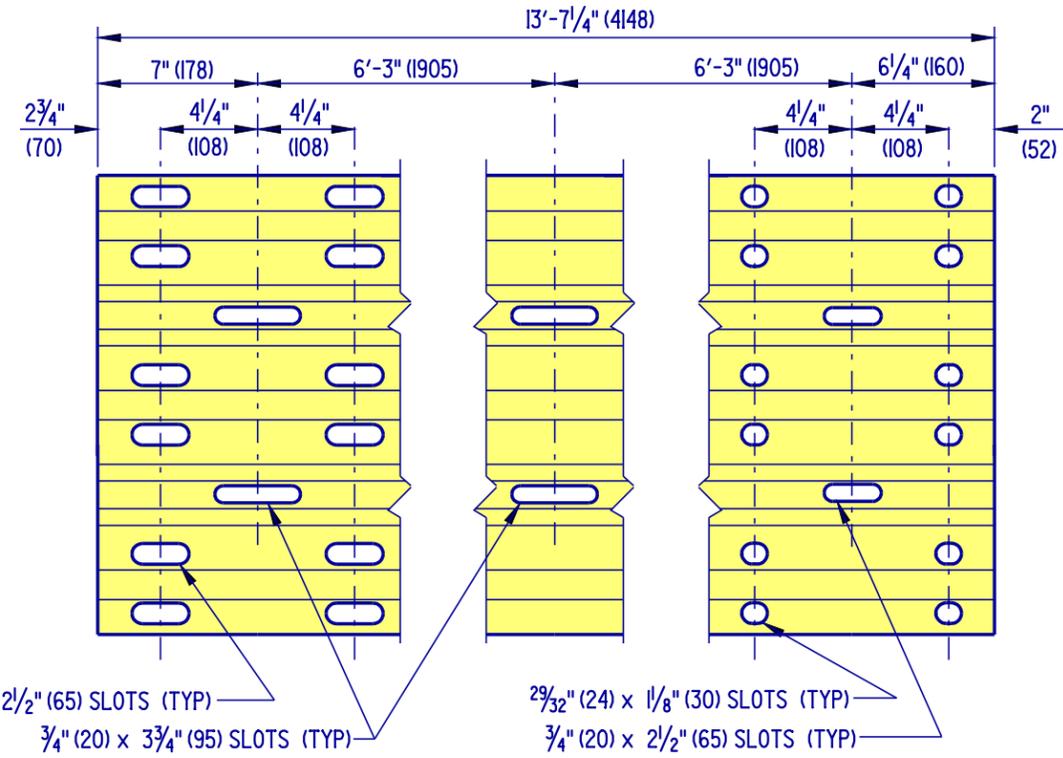


DELAWARE  
DEPARTMENT OF TRANSPORTATION

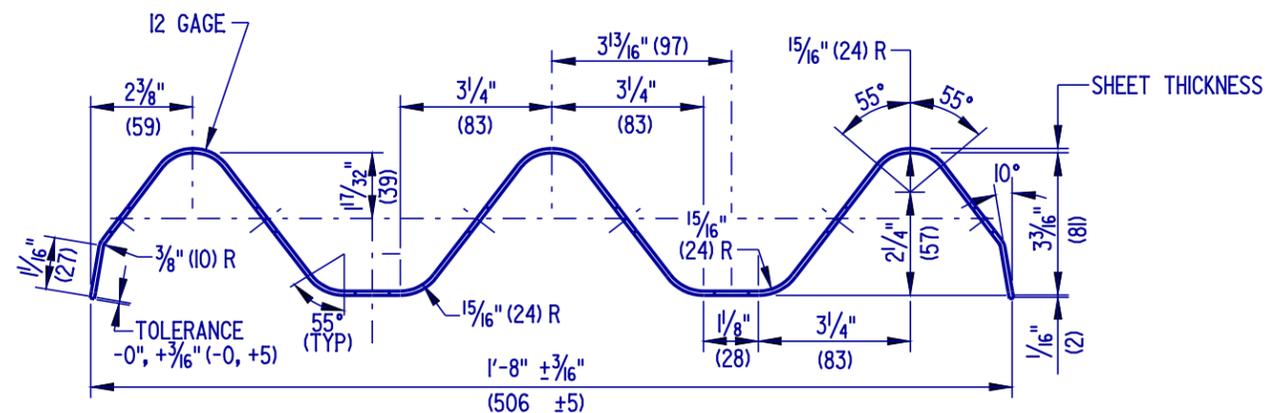
HARDWARE		APPROVED <i>Carolann Wicks</i> 1/10/05 CHIEF ENGINEER DATE	
STANDARD NO. B-13 (2004)	SHT. 3 OF 13	RECOMMENDED <i>Dennis M. O'Flaherty</i> 1/13/05 DESIGN ENGINEER DATE	



**THRIE BEAM ELEVATION**



**THRIE BEAM EXPANSION ELEMENT**



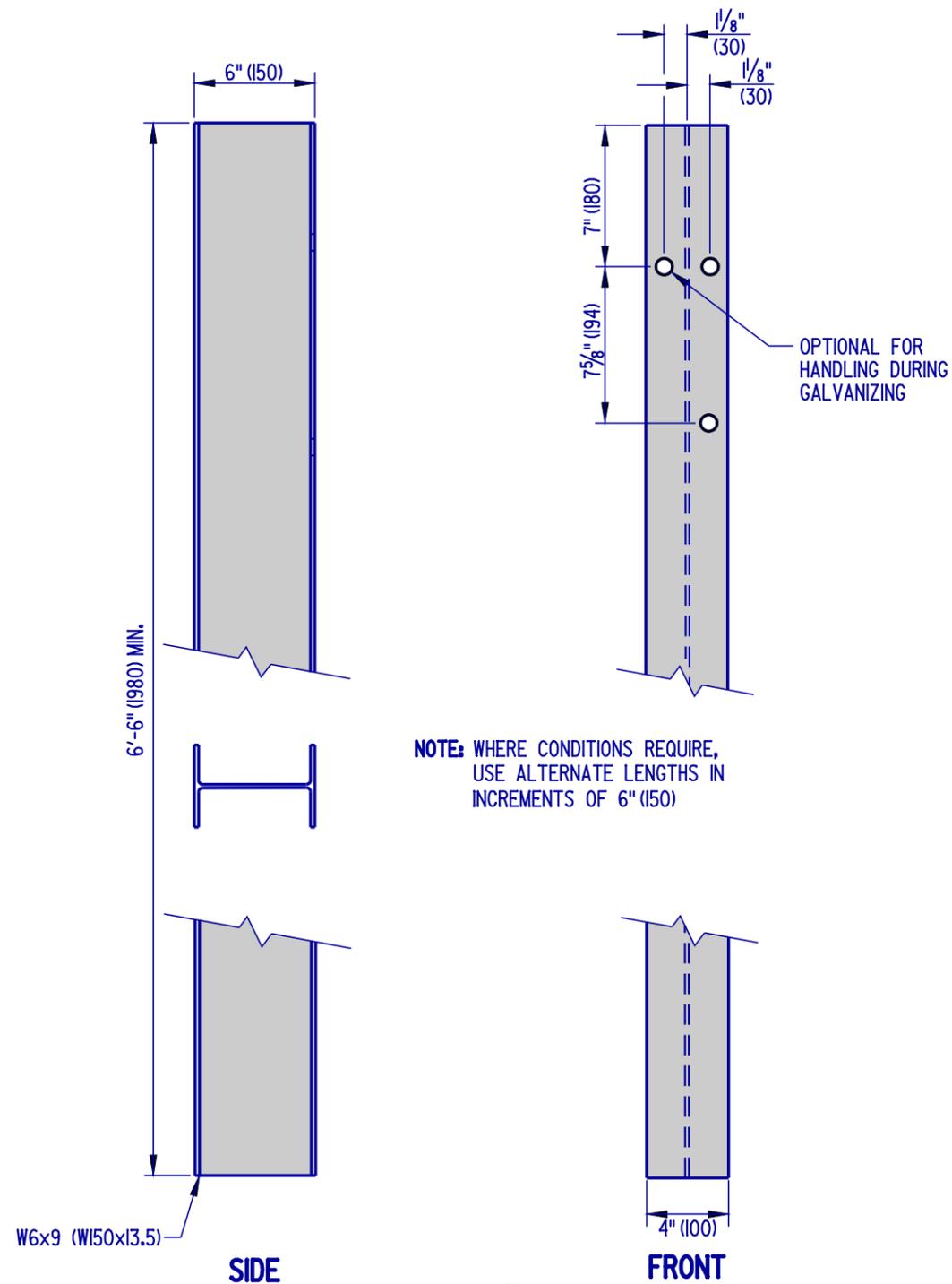
**THRIE BEAM SECTION**



DELAWARE  
DEPARTMENT OF TRANSPORTATION

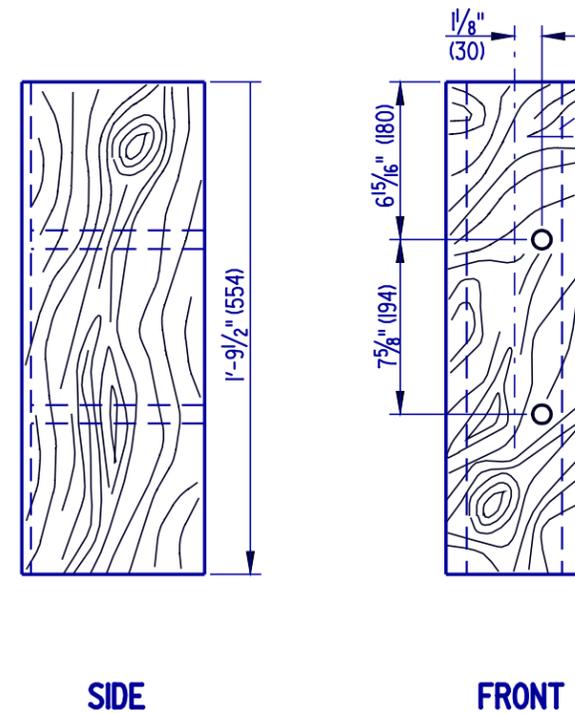
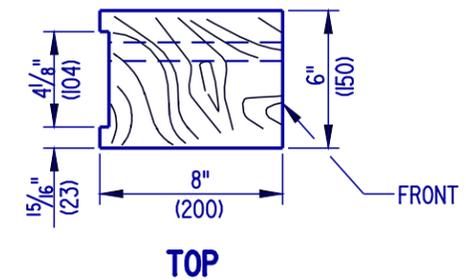
STANDARD NO. B-13 (2004)		HARDWARE		APPROVED	
SHT. 4	OF 13	RECOMMENDED		DATE	

APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE  
 RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



NOTE: WHERE CONDITIONS REQUIRE, USE ALTERNATE LENGTHS IN INCREMENTS OF 6" (150)

POST 2



OFFSET BLOCK

3

NOTE : ALL HOLES SHALL BE 1 3/16" (20) DIA. BOLT HOLE PATTERN IS SYMMETRICAL WITH RESPECT TO THE VERTICAL AXIS OF THE POST.

**THRIE BEAM STEEL POST AND WOOD OFFSET BLOCK**

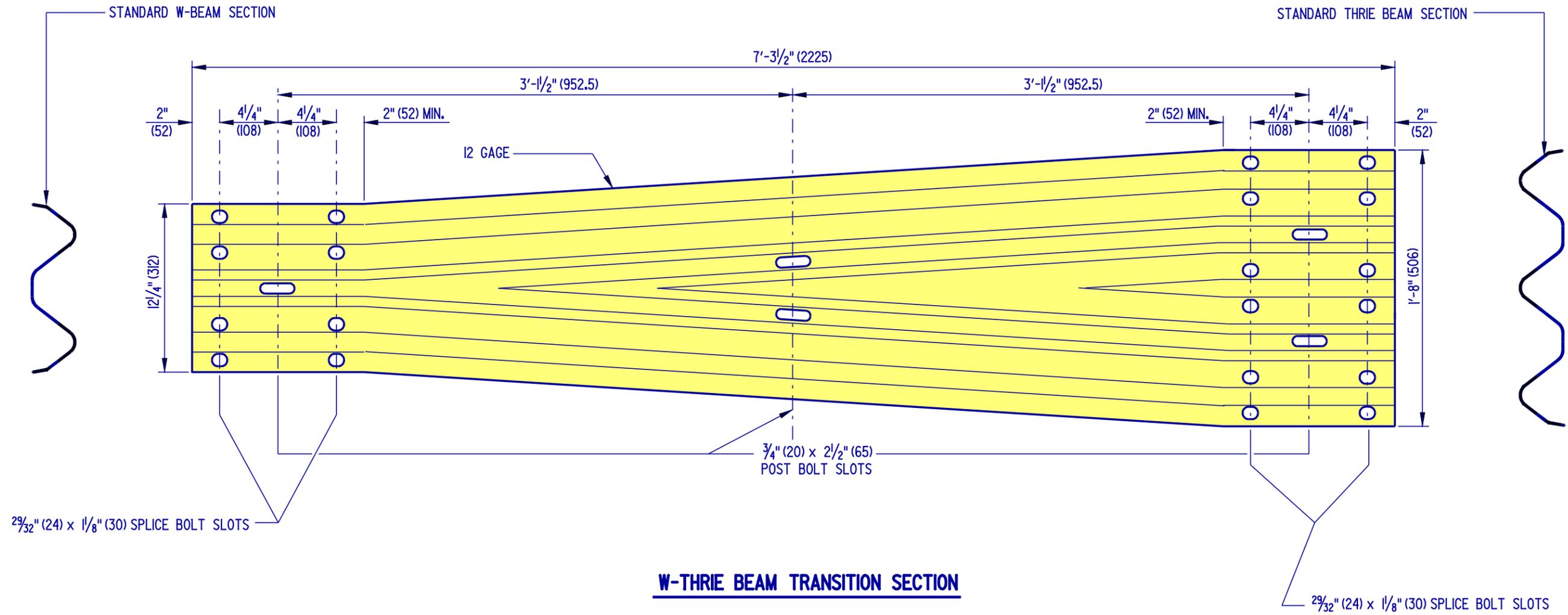


DELAWARE  
DEPARTMENT OF TRANSPORTATION

STANDARD NO. B-13 (2004)		HARDWARE		SHT. 5 OF 13	
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APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



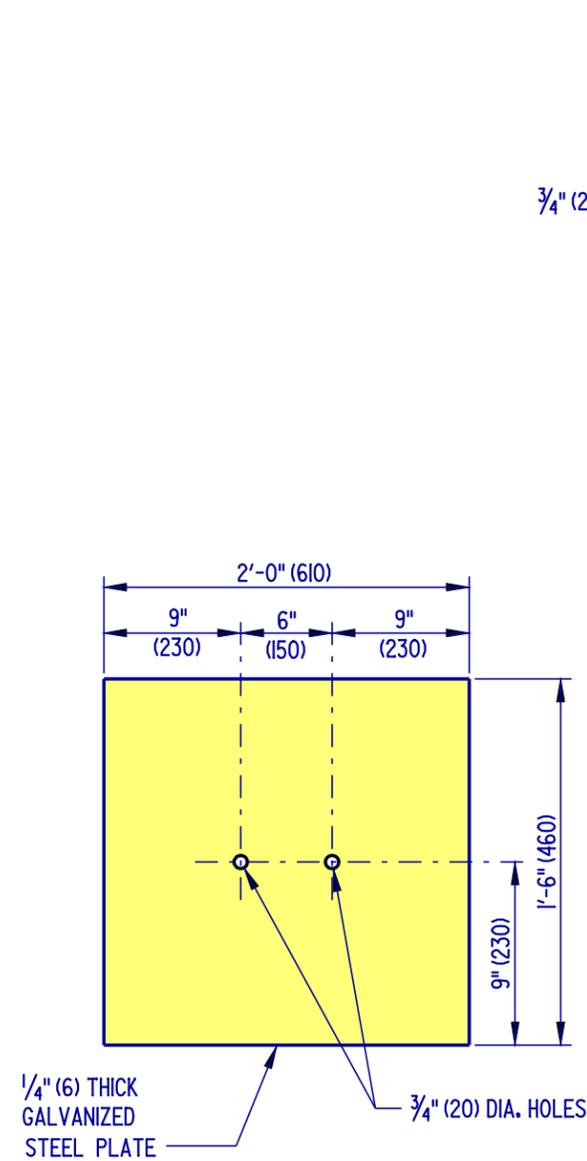
DELAWARE  
DEPARTMENT OF TRANSPORTATION

STANDARD NO. B-13 (2004)		HARDWARE	
SHT. 6	OF 13		

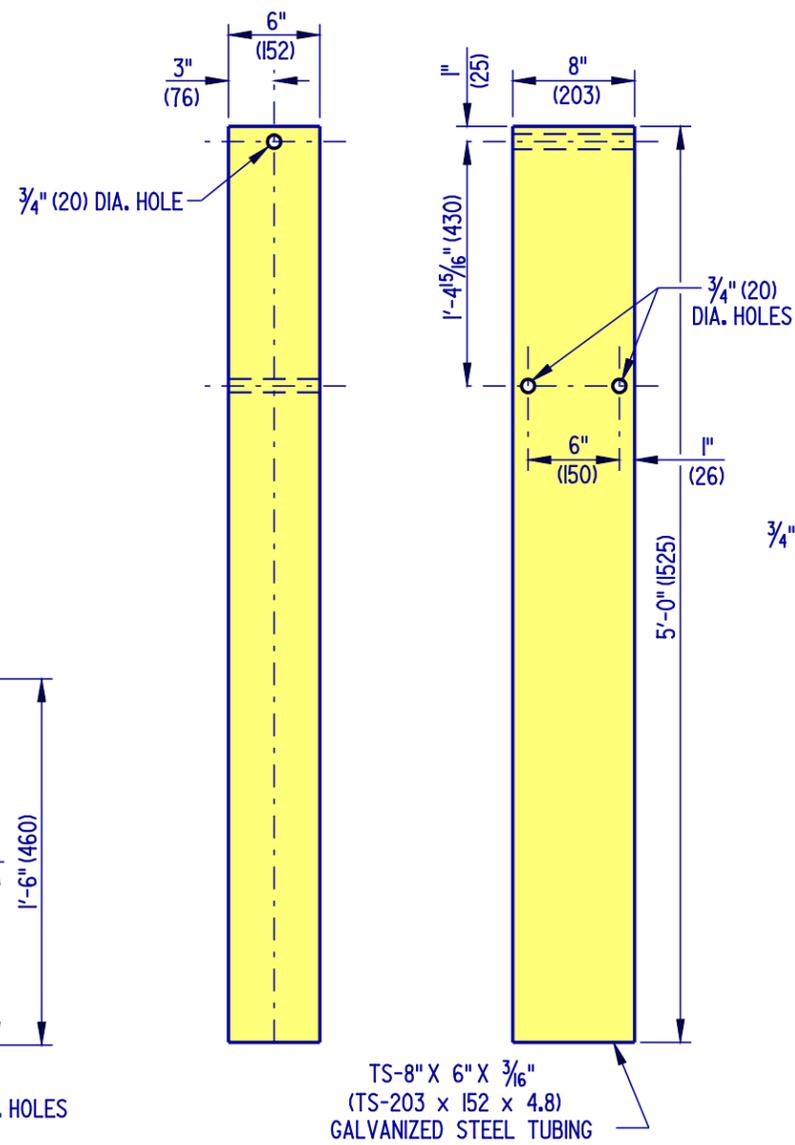
APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

RECOMMENDED *Dennis M. O'Flaherty* 1/3/05  
DESIGN ENGINEER DATE

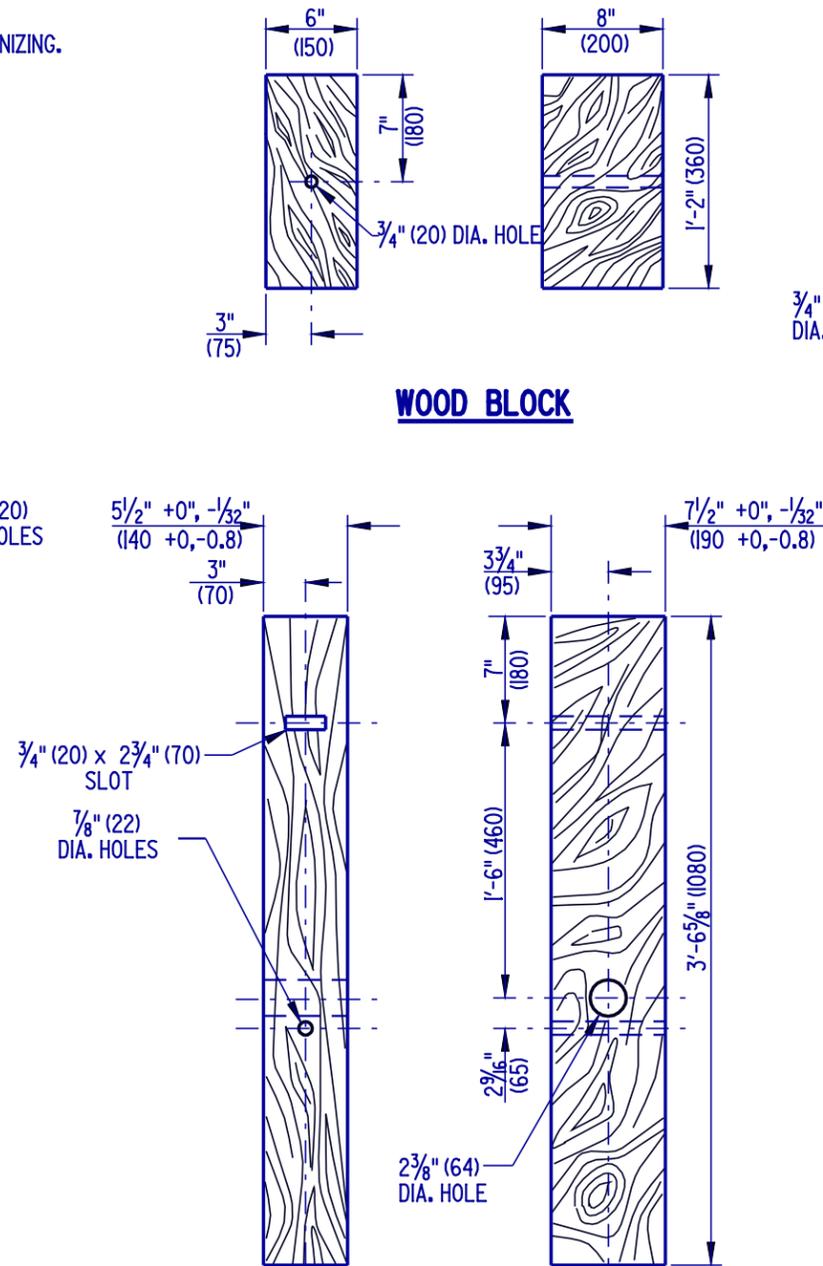
**NOTES :** 1). ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.  
 2). ALL WOOD SIZES ARE NOMINAL DIMENSIONS.



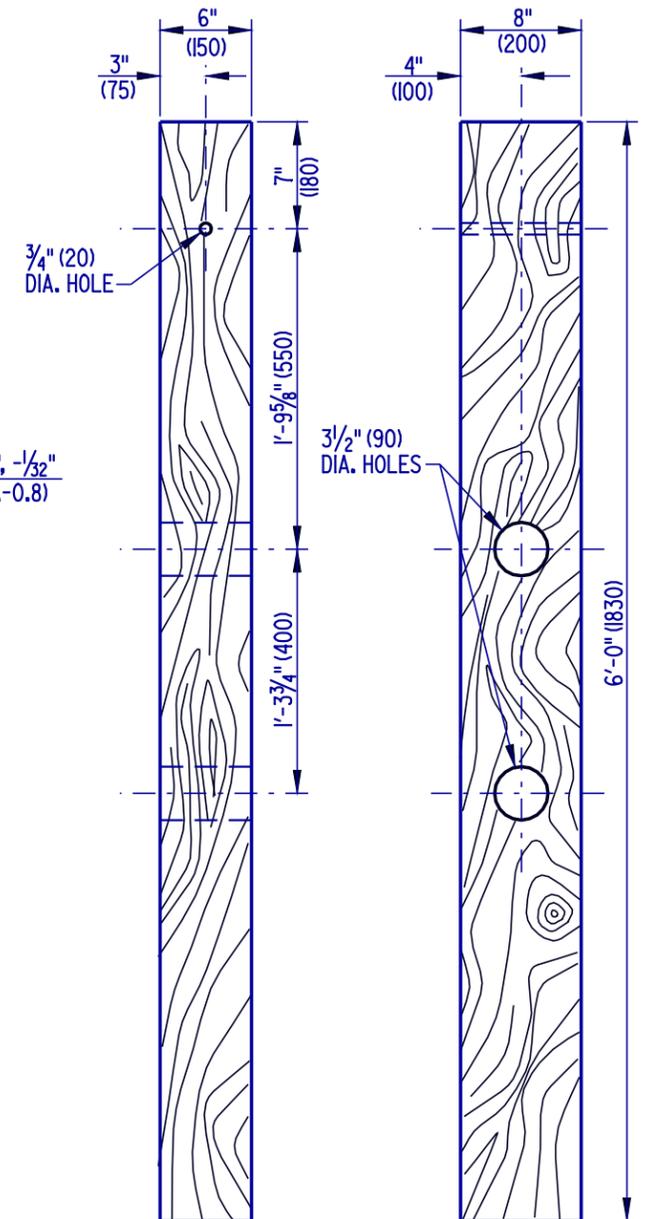
**SOIL PLATE**



**STEEL TUBE**



**SHORT WOOD BREAKAWAY POST**



**LONG WOOD BREAKAWAY POST**



DELAWARE  
 DEPARTMENT OF TRANSPORTATION

STANDARD NO. B-13 (2004)

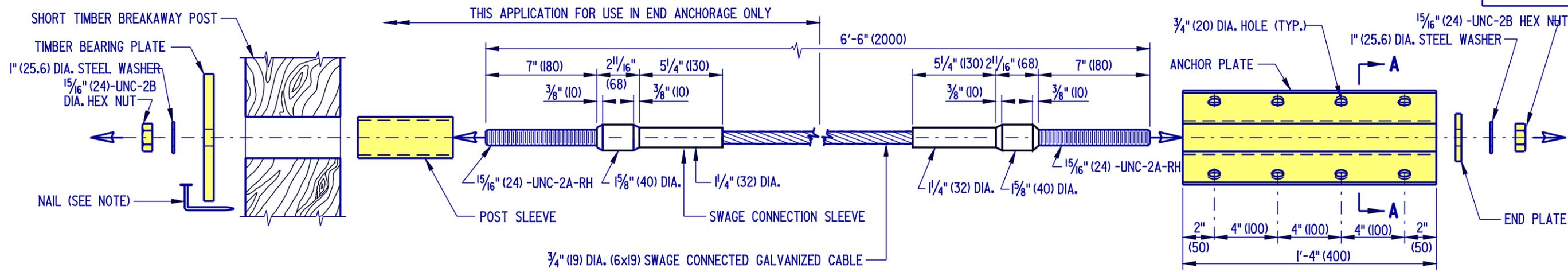
HARDWARE

SHT. 7 OF 13

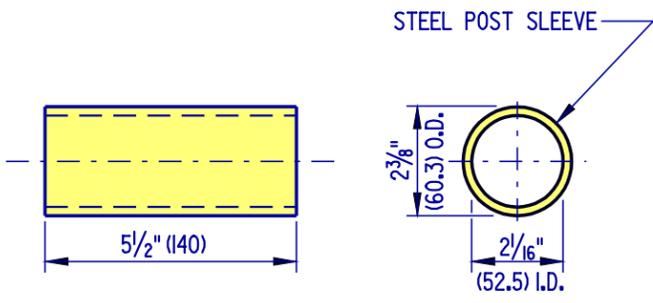
APPROVED *Carolann Wicks* 1/10/05  
 CHIEF ENGINEER DATE

RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
 DESIGN ENGINEER DATE

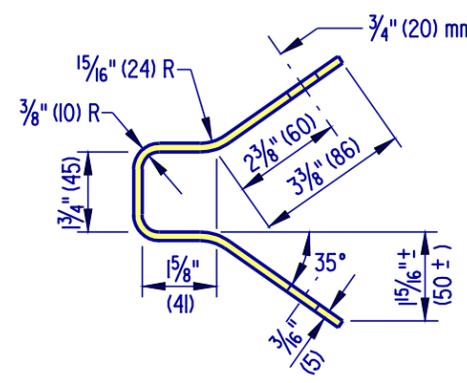
SCALE : N.T.S.



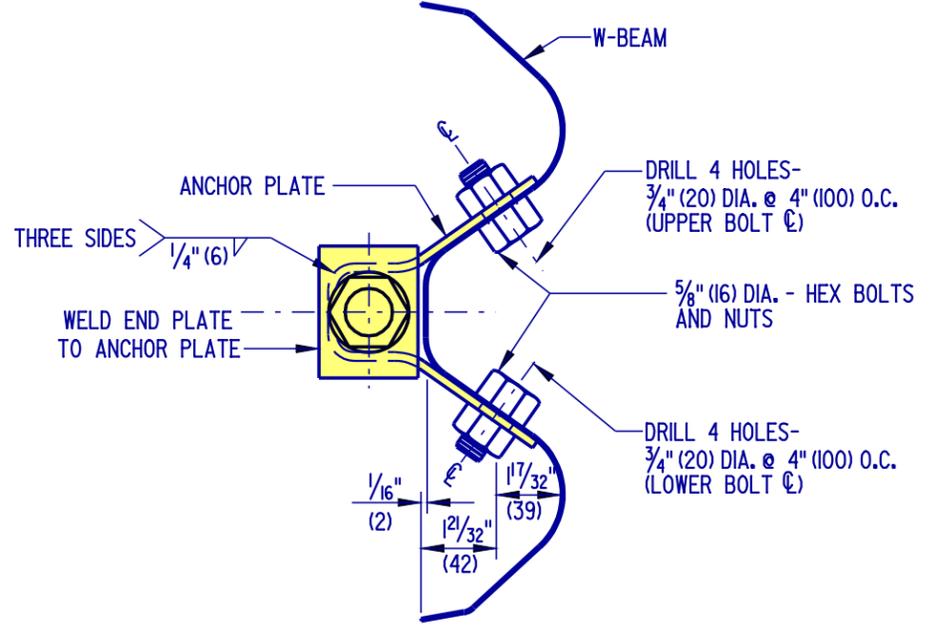
**SWAGED CABLE ASSEMBLY AND RELATED HARDWARE ASSEMBLY**



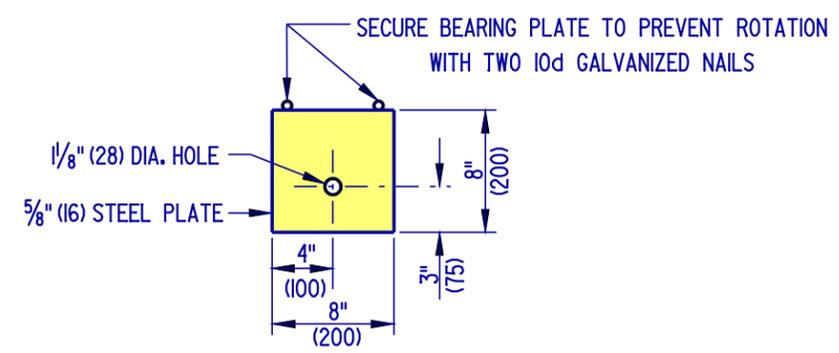
**POST SLEEVE**



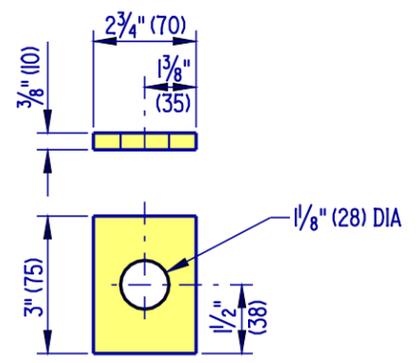
**SECTION A-A**



**ANCHOR PLATE TO W-BEAM CONNECTION DETAIL**



**TIMBER BEARING PLATE**



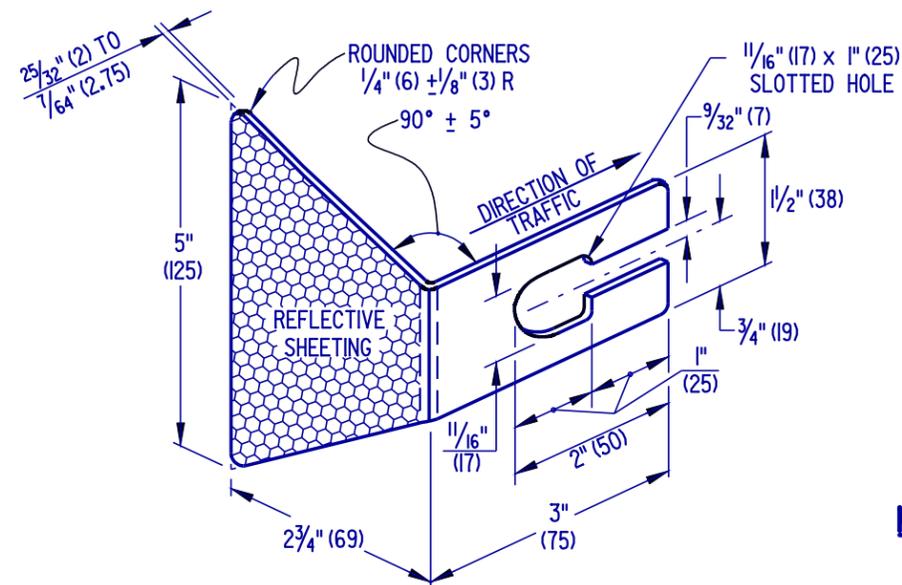
**END PLATE**

- NOTES:**
- 1). TO ENSURE THAT THE TIMBER BEARING PLATE REMAINS IN POSITION, 2 - 10d GALVANIZED STEEL NAILS SHALL BE DRIVEN IN THE SHORT TIMBER BREAKAWAY POST, AND BENT OVER BEARING PLATE.
  - 2). TIGHTEN ASSEMBLY UNTIL CABLE IS TAUGHT.
  - 3). ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.

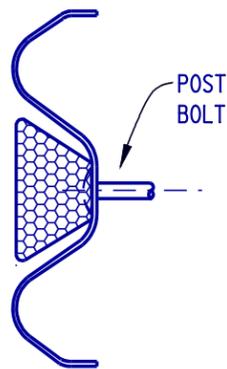


**DELAWARE DEPARTMENT OF TRANSPORTATION**

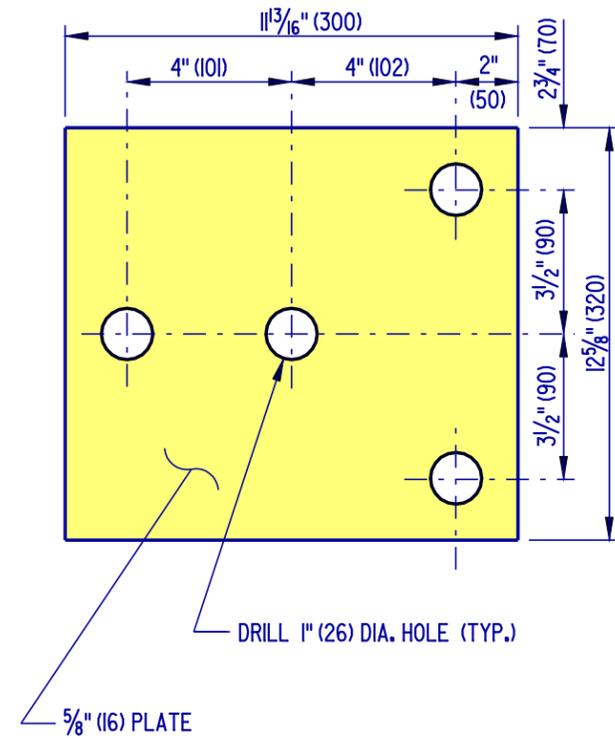
<b>HARDWARE</b>		<b>APPROVED</b>	
STANDARD NO. <b>B-13 (2004)</b>	SHT. <b>8</b> OF <b>13</b>	<i>Carolann Wicks</i> CHIEF ENGINEER	<i>1/10/05</i> DATE
		<i>Dennis M. O'Flaherty</i> DESIGN ENGINEER	<i>1/13/05</i> DATE



**GUARDRAIL REFLECTOR**



**MOUNTING POSITION**



**BEARING PLATE DETAIL** II



DELAWARE  
DEPARTMENT OF TRANSPORTATION

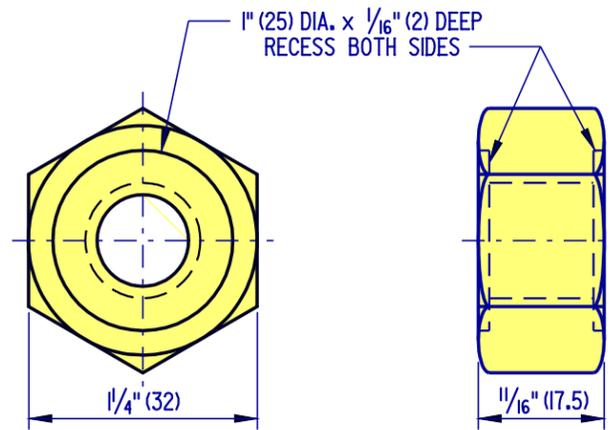
**HARDWARE**

STANDARD NO. B-13 (2004)

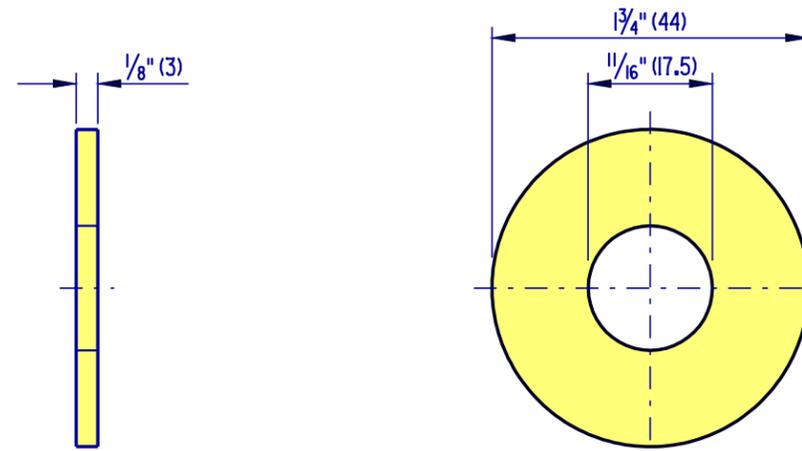
SHT. 9 OF 13

APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE

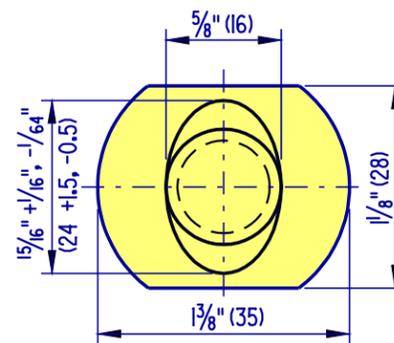
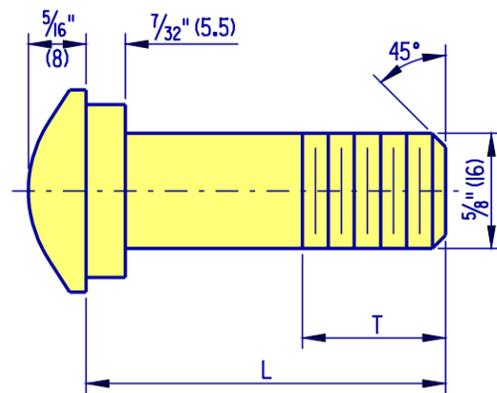


**RECESSED NUT  
(FOR 5/8" (16) GUARDRAIL BOLT)**



**STEEL WASHER (FOR 5/8" (16) GUARDRAIL BOLT)**

NOTE: DIMENSION FOR WASHER THICKNESS IS APPROXIMATE BASED ON METAL THICKNESS.



**GUARDRAIL BOLT**

L	T (MIN.)
1/4" (35)	FULL THREAD LENGTH
2" (50)	FULL THREAD LENGTH
4" (100)	FULL THREAD LENGTH
10" (255)	4" (100) THREAD LENGTH
18" (460)	4" (100) THREAD LENGTH

NOTES : 1. ALL FILLETS SHALL HAVE A MINIMUM RADIUS OF 1/16" (2).  
2. IF THE BOLT EXTENDS MORE THAN 1/2" (12) BEYOND THE NUT, THE BOLT SHALL BE TRIMMED BACK AS PER THE DEPARTMENT'S SPECIFICATIONS.



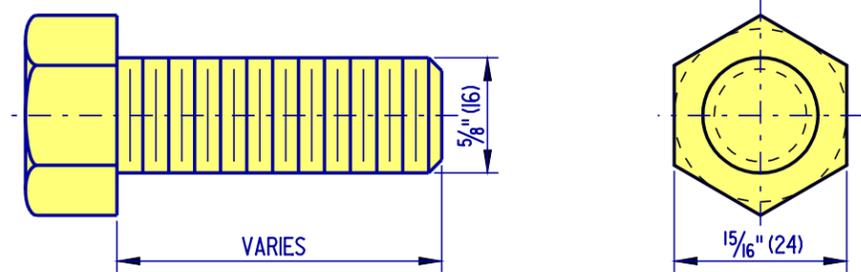
DELAWARE  
DEPARTMENT OF TRANSPORTATION

**HARDWARE**

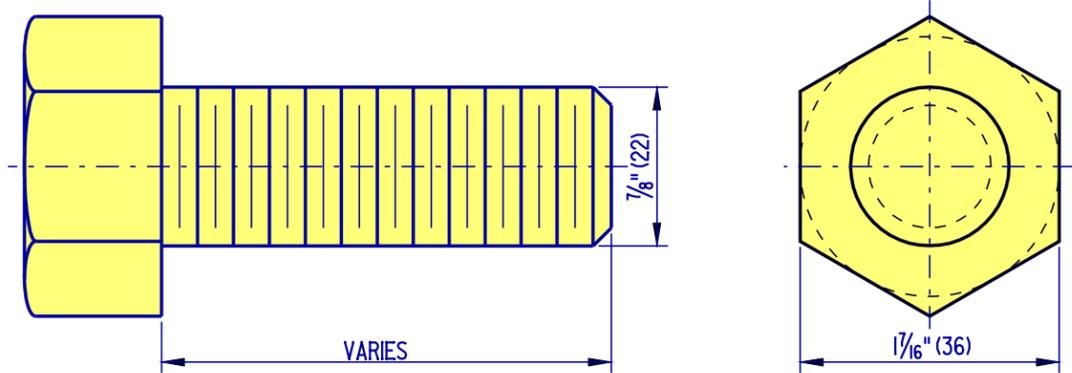
STANDARD NO. B-13 (2004) SHT. 10 OF 13

APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



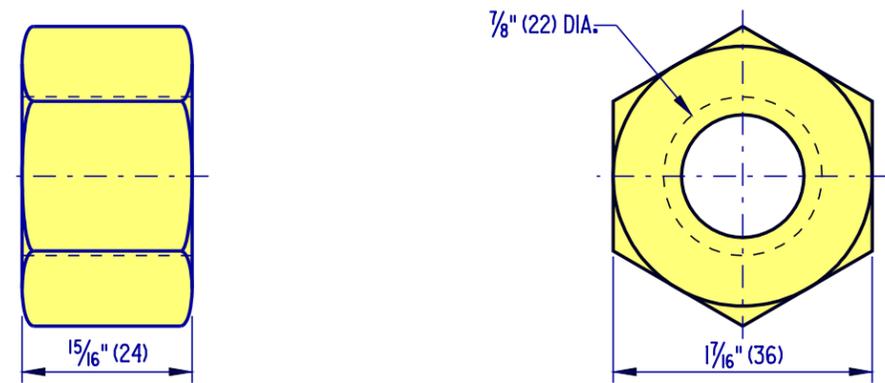
**5/8" (16) HEX BOLT**



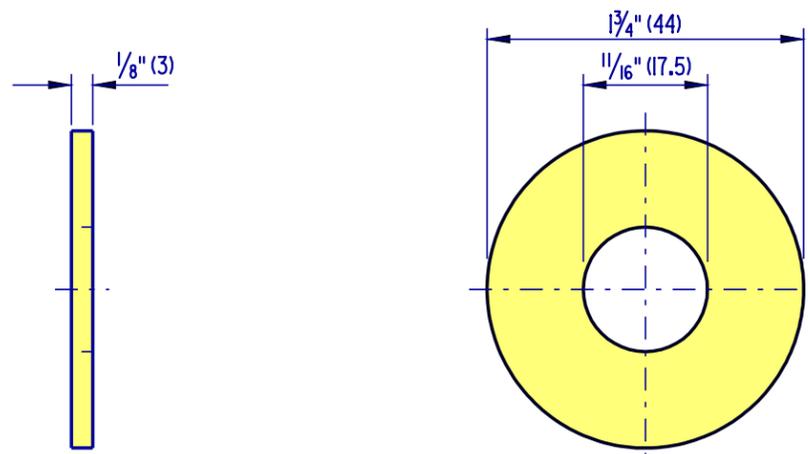
**HIGH-STRENGTH STRUCTURAL HEX BOLT**



**5/8" (16) HEX NUT**



**HIGH-STRENGTH STRUCTURAL HEX NUT**



**5/8" (16) STEEL WASHER**

NOTE : DIMENSION FOR WASHER THICKNESS IS APPROXIMATE BASE METAL THICKNESS.

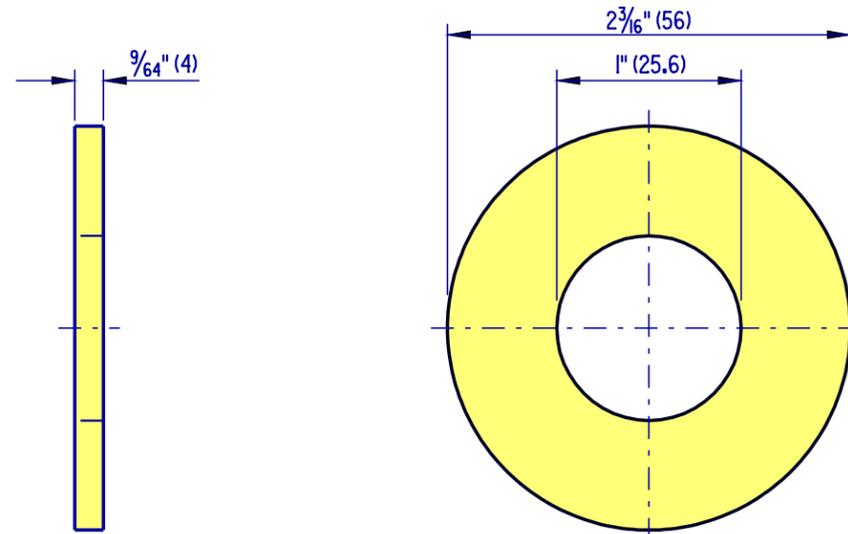


**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

<b>HARDWARE</b>					
STANDARD NO.	B-13 (2004)	SHT.	11	OF	13

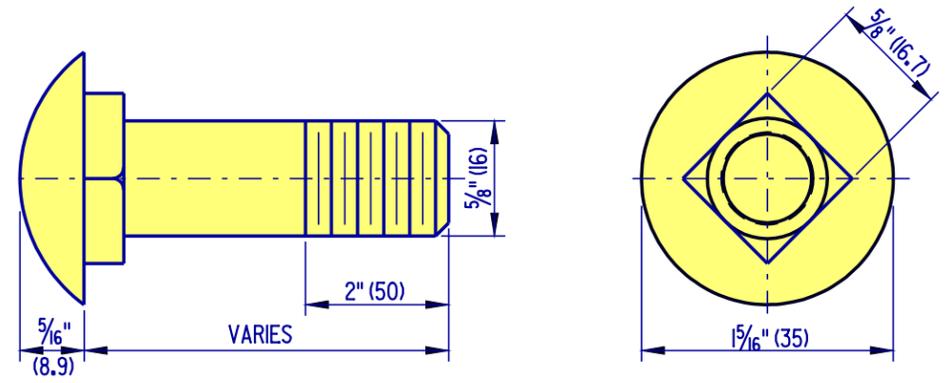
APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE

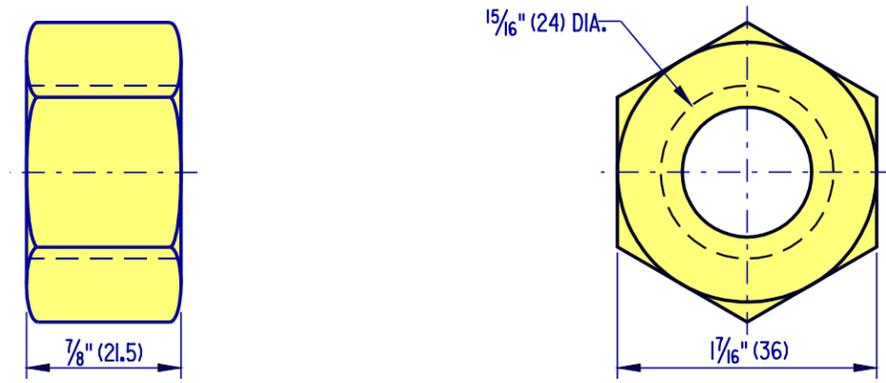


**STEEL WASHER**

NOTES : 1. FOR USE WITH SWAGED CABLE ASSEMBLAGE.  
2. DIMENSION FOR WASHER THICKNESS IS APPROXIMATE BASE METAL THICKNESS.



**5/8\" (16) CARRIAGE BOLT**



**1 5/16\" (24) HEX NUT**

NOTE : FOR USE WITH SWAGED CABLE ASSEMBLAGE.

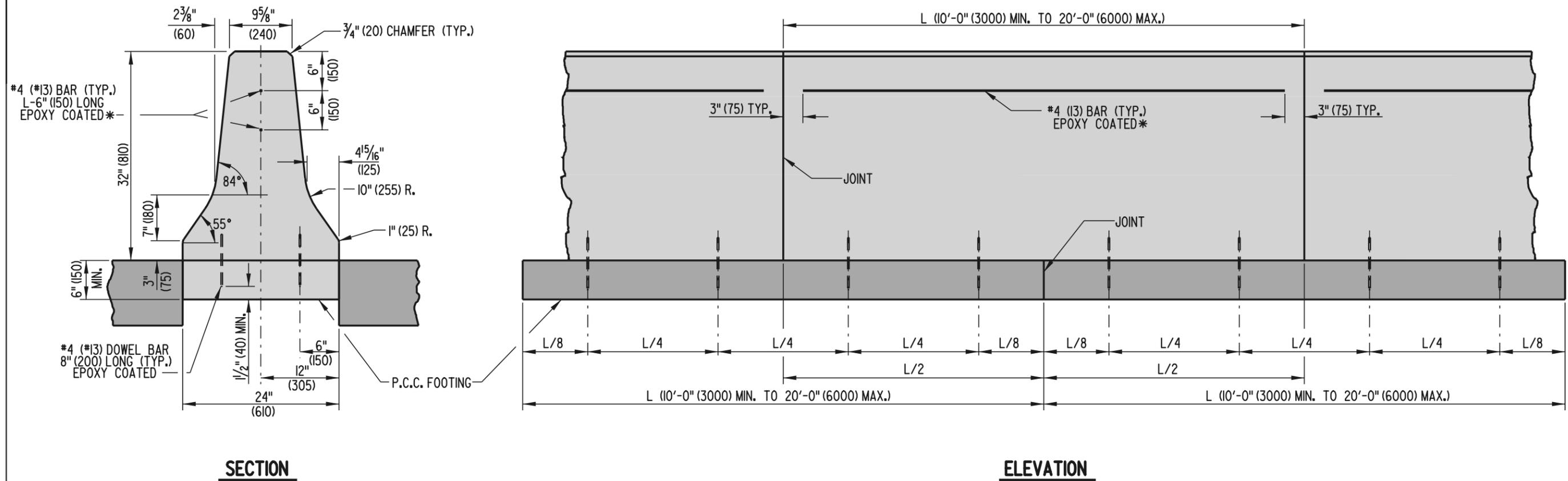


DELAWARE  
DEPARTMENT OF TRANSPORTATION

HARDWARE

STANDARD NO. B-13 (2004) SHT. 12 OF 13

APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE  
RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



**TYPICAL CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION**

\* BAR SHALL BE CUT AT EVERY JOINT IF MADE CONTINUOUS FOR SLIP-FORM CONSTRUCTION



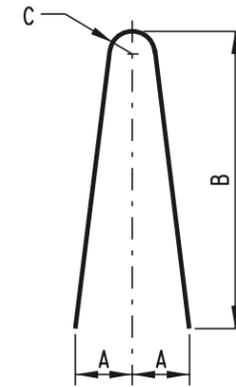
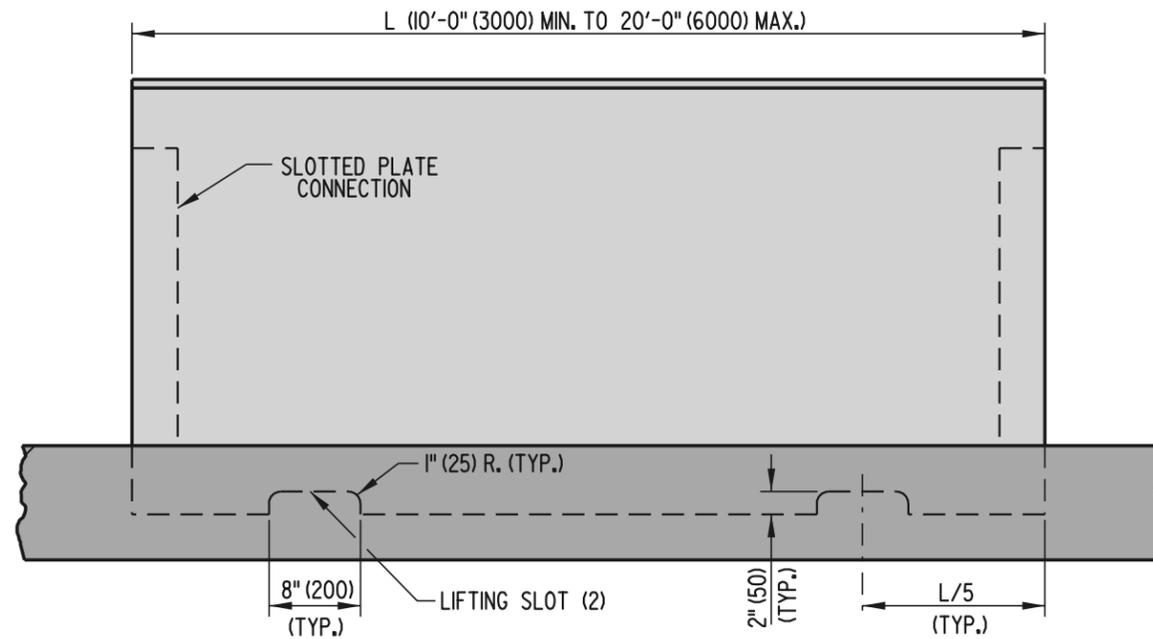
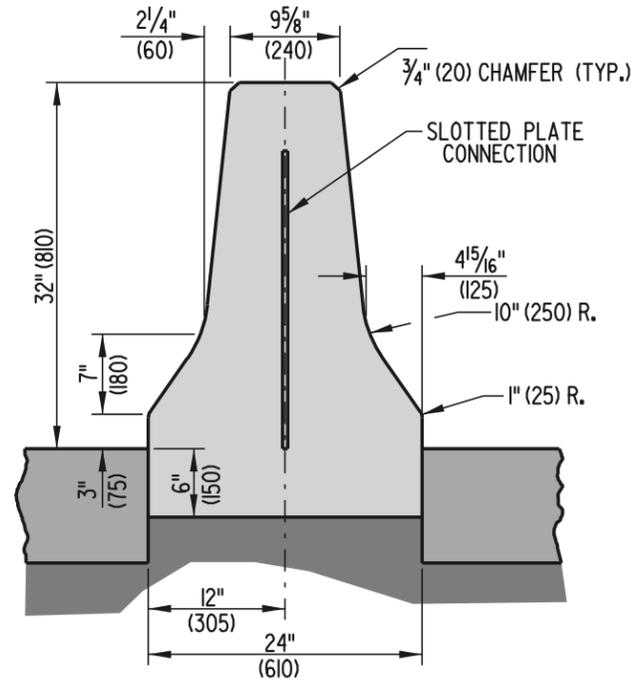
**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**CONCRETE SAFETY BARRIER (F SHAPE)**

STANDARD NO. **B-14 (2001)**

SHT. **1** OF **3**

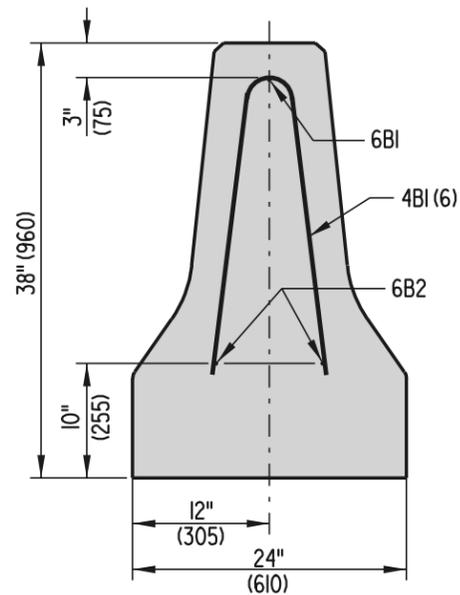
APPROVED *Ryan M. Harkness* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Akhavan* 6/18/01  
DESIGN ENGINEER DATE



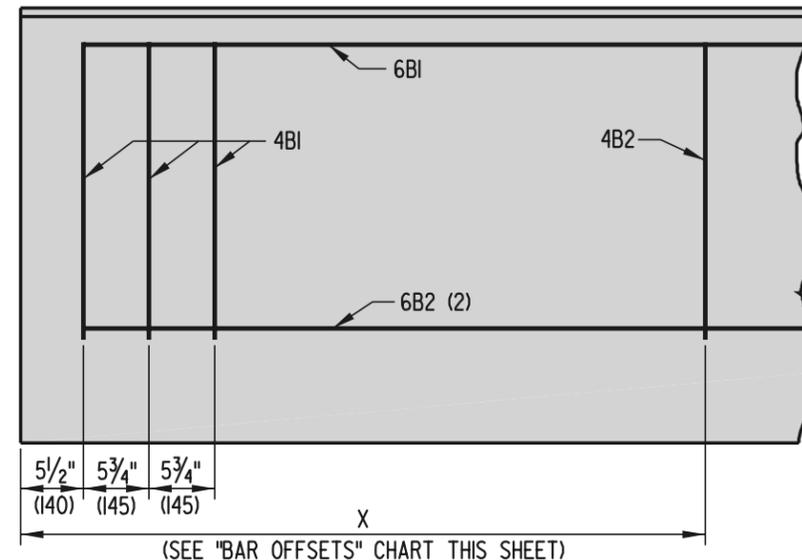
**TYPE 'I' BAR**

**TYPICAL PRE-CAST CONSTRUCTION**

BAR OFFSETS		
NOMINAL LENGTH OF BARRIER UNIT	"X"	NO. REQ'D FOR EACH BARRIER UNIT
20' (6000)	6' - 11" (2100)	2
18' (5500)	6' - 5" (1950)	2
16' (5000)	5' - 11" (1800)	2
14' (4500)	7' - 0" (2250)	1
12' (4000)	6' - 0" (2000)	1
10' (3000)	5' - 0" (1500)	1



**'F' SHAPE BARRIER SECTION**



**ELEVATION**

**TYPICAL PRE-CAST REINFORCEMENT DETAILS**

BAR LIST							
MARK	SIZE	NUMBER IN EACH SECTION	LENGTH	TYPE	A	B	C
4B1	4 (I3)	6	4'-7" (1400)	I	5" (125)	26" (660)	2" (50)
4B2	4 (I3)	**	4'-7" (1400)	I	5" (125)	26" (660)	2" (50)
6B1	6 (I9)	1	*	STR.			
6B2	6 (I9)	2	*	STR.			

\* THE LENGTH OF BARS 6B1 AND 6B2 SHALL BE 11" (280) SHORTER IN LENGTH THAN THE NOMINAL SIZE OF THE BARRIER IN WHICH IT IS USED.  
\*\* SEE "BAR OFFSETS" CHART ON THIS SHEET FOR MORE INFORMATION.

NOTES: 1). CONCRETE CLEAR COVER FOR REINFORCING BARS SHALL BE 1/2" (40) MIN..

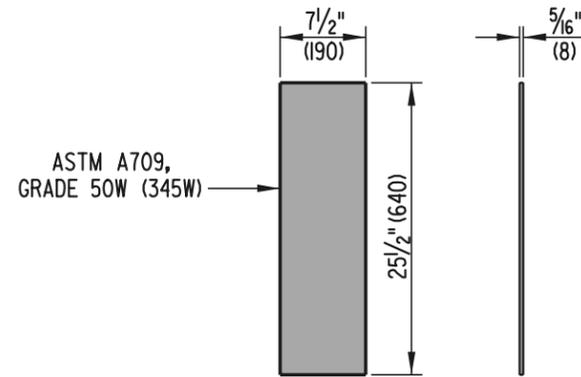


DELAWARE  
DEPARTMENT OF TRANSPORTATION

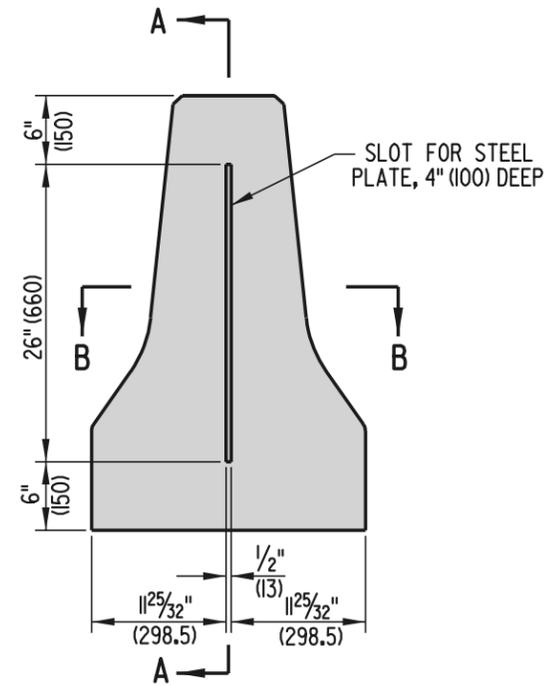
CONCRETE SAFETY BARRIER (F SHAPE)

STANDARD NO. B-14 (2001) SHT. 2 OF 3

APPROVED *Ryan M. Harshbarger* 6/18/01  
CHIEF ENGINEER DATE  
RECOMMENDED *Mehmet Aksoy* 6/18/01  
DESIGN ENGINEER DATE

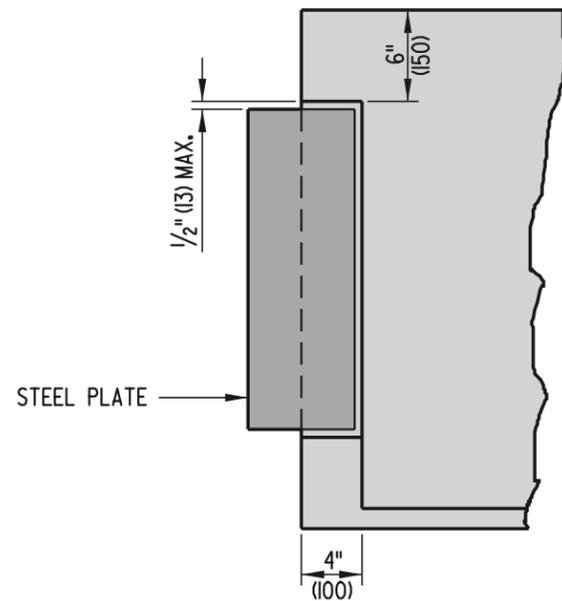


**STEEL CONNECTOR PLATE**

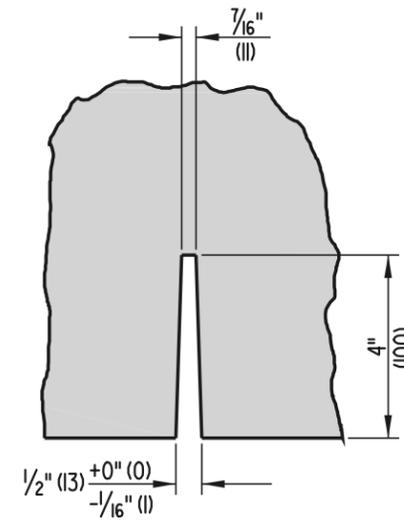


**SLOT DIMENSIONS**

CONCRETE SAFETY BARRIER, PRECAST CONSTRUCTION  
'F' SHAPE BARRIER SECTION



**SECTION A-A**



**SECTION B-B**



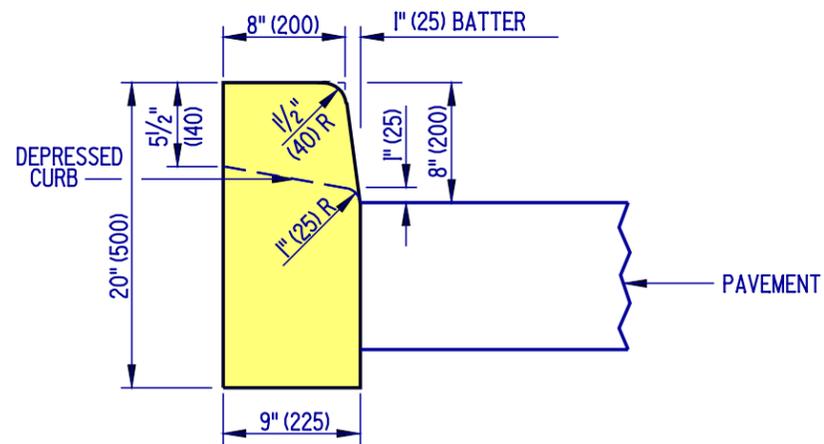
DELAWARE  
DEPARTMENT OF TRANSPORTATION

**SLOTTED PLATE CONNECTION DETAILS**

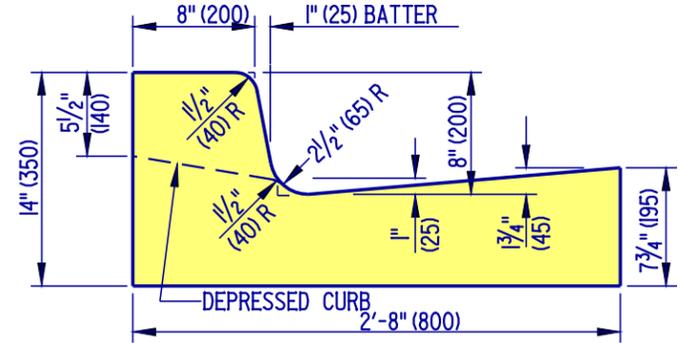
STANDARD NO. B-14 (2001)

SHT. 3 OF 3

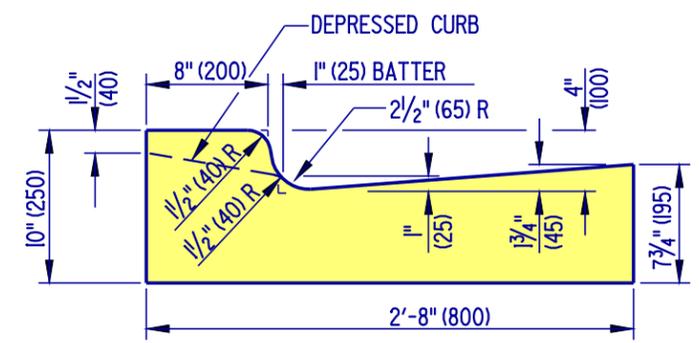
APPROVED *Ryan M. Harkins* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Aljeda* 6/18/01  
DESIGN ENGINEER DATE



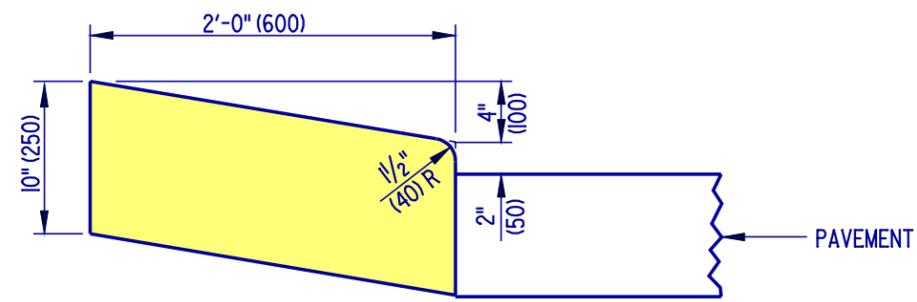
**P.C.C. CURB**  
TYPE 1



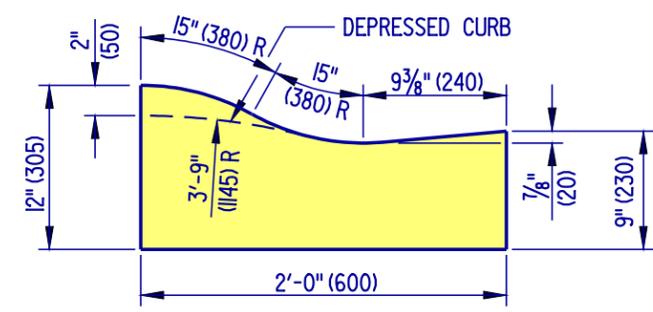
**INTEGRAL P.C.C. CURB AND GUTTER**  
TYPE 1



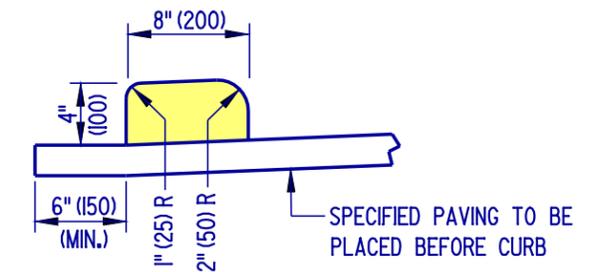
**INTEGRAL P.C.C. CURB AND GUTTER**  
TYPE 4



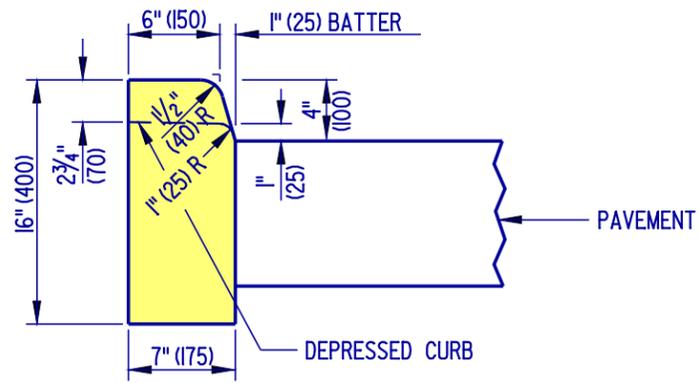
**P.C.C. CURB**  
TYPE 2



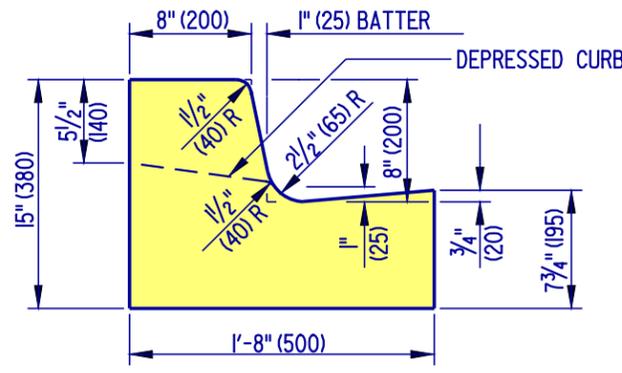
**INTEGRAL P.C.C. CURB AND GUTTER**  
TYPE 2



**HOT-MIX, HOT LAID BITUMINOUS CONCRETE CURB**



**P.C.C. CURB**  
TYPE 3



**INTEGRAL P.C.C. CURB AND GUTTER**  
TYPE 3

- NOTES:
1. WHEN INTEGRAL P.C.C. CURB AND GUTTER IS PLACED ADJACENT TO PORTLAND CEMENT CONCRETE PAVEMENT, CONSTRUCT THE JOINT AS PER THE LONGITUDINAL JOINT SEALANT DETAIL ON STANDARD P-2, SHEET 3 OF 5. USE APPROVED JOINT FILLER TO SEAL. WORK TO BE PAID UNDER RESPECTIVE CURB AND GUTTER ITEM.
  2. DEPRESS CURB AT DRIVEWAYS AS DETAILED.
  3. DEPRESS CURB FLUSH WITH PAVEMENT AT CURB RAMPS. MAXIMUM SLOPE OF DEPRESSED CURB IS 1:2.

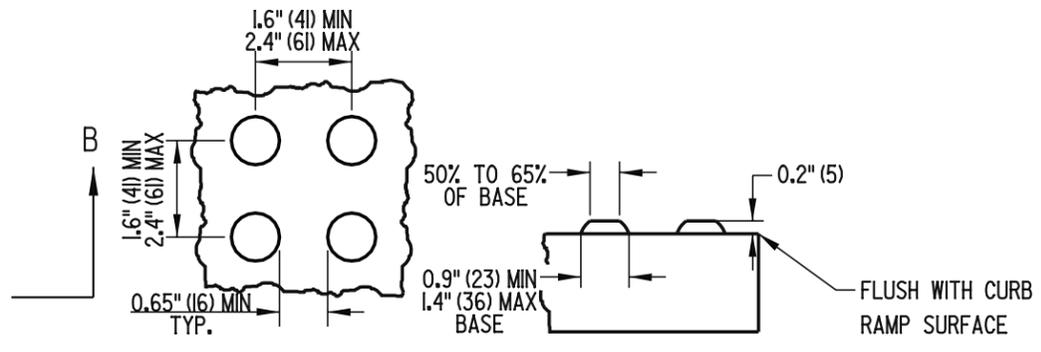
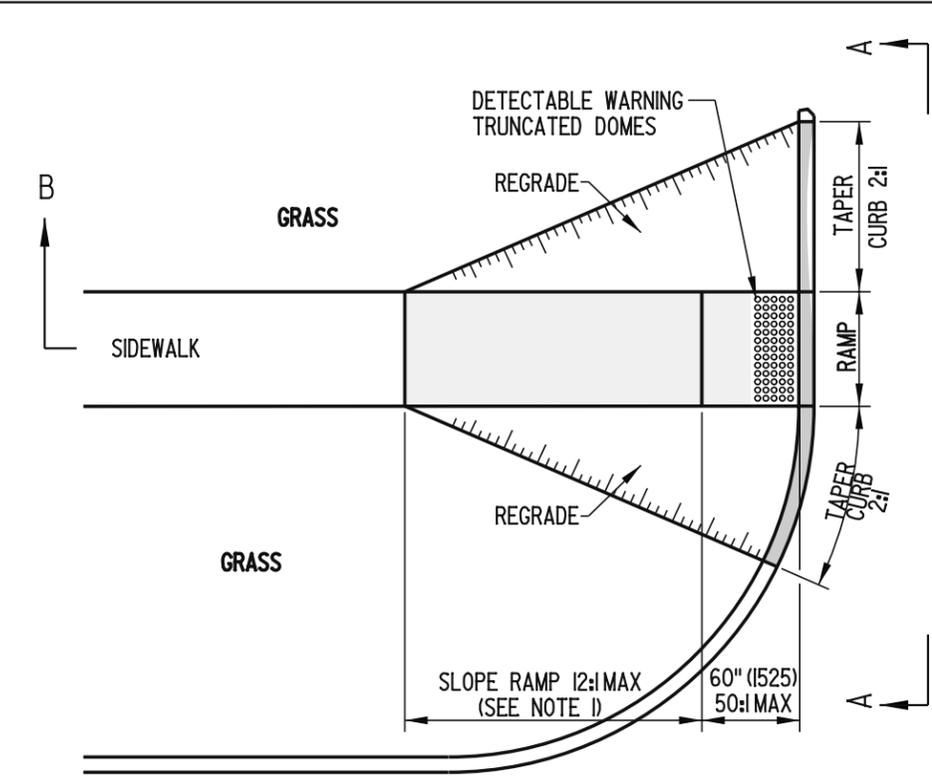


DELAWARE  
DEPARTMENT OF TRANSPORTATION

P.C.C. CURB, P.C.C. CURB & GUTTER, AND HOT-MIX CURB  
STANDARD NO. C-1 (2004) SHT. 1 OF 1

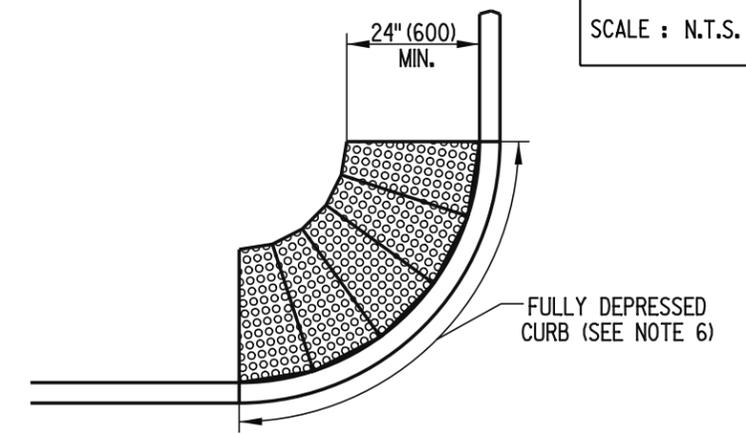
APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE  
RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE

SCALE : N.T.S.

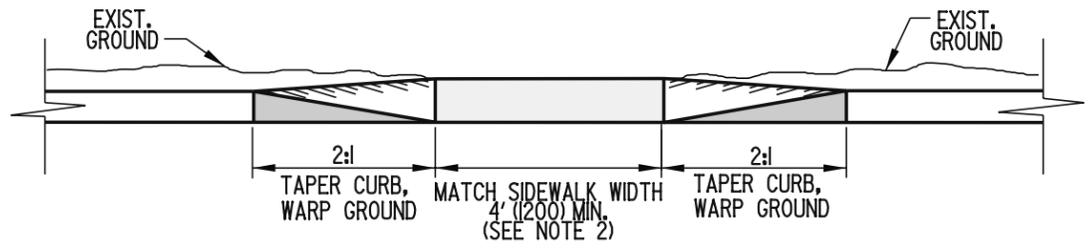


**DETECTABLE WARNING TRUNCATED DOME DETAILS**

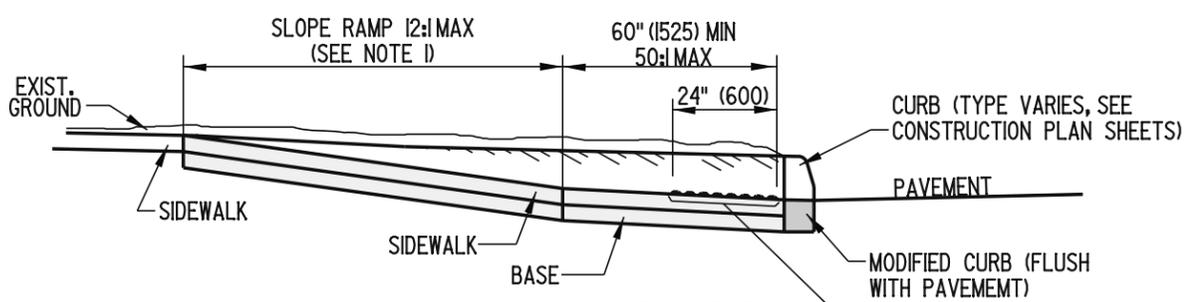
- NOTES:**  
 A). THE AREA OF DETECTABLE WARNING TRUNCATED DOMES SHALL BE 24" (600) LONG AND THE FULL WIDTH OF THE RAMP OR DEPRESSED CURB.  
 B). SEE SPECIFICATION FOR ADDITIONAL INFORMATION.



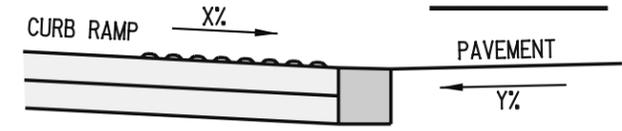
**SAMPLE LAYOUT OF DETECTABLE WARNING TRUNCATED DOMES ALONG A CURB RADIUS**



**ELEVATION A-A**



**SECTION B-B**

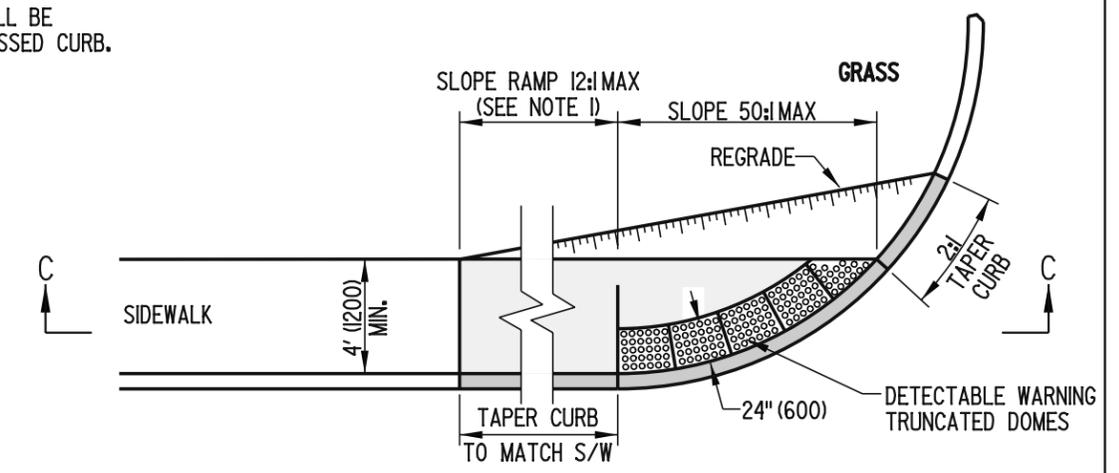


**MAXIMUM DIFFERENCE IN GRADE**

FOR EXAMPLE, IF THE CURB RAMP AND DEPRESSED CURB SLOPE (X) IS 8.1% AND THE PAVEMENT SLOPE (Y) IS 4.0%, THEN TO DETERMINE THE DIFFERENCE IN GRADE, ADD X + Y TO GET 12.1%. WHICH IS GREATER THAN THE 14% PREFERRED BUT LESS THAN THE 13% MAXIMUM.

**CURB RAMP, TYPE 1**

PERPENDICULAR CURB RAMP



**SECTION C-C**

**NOTES:**

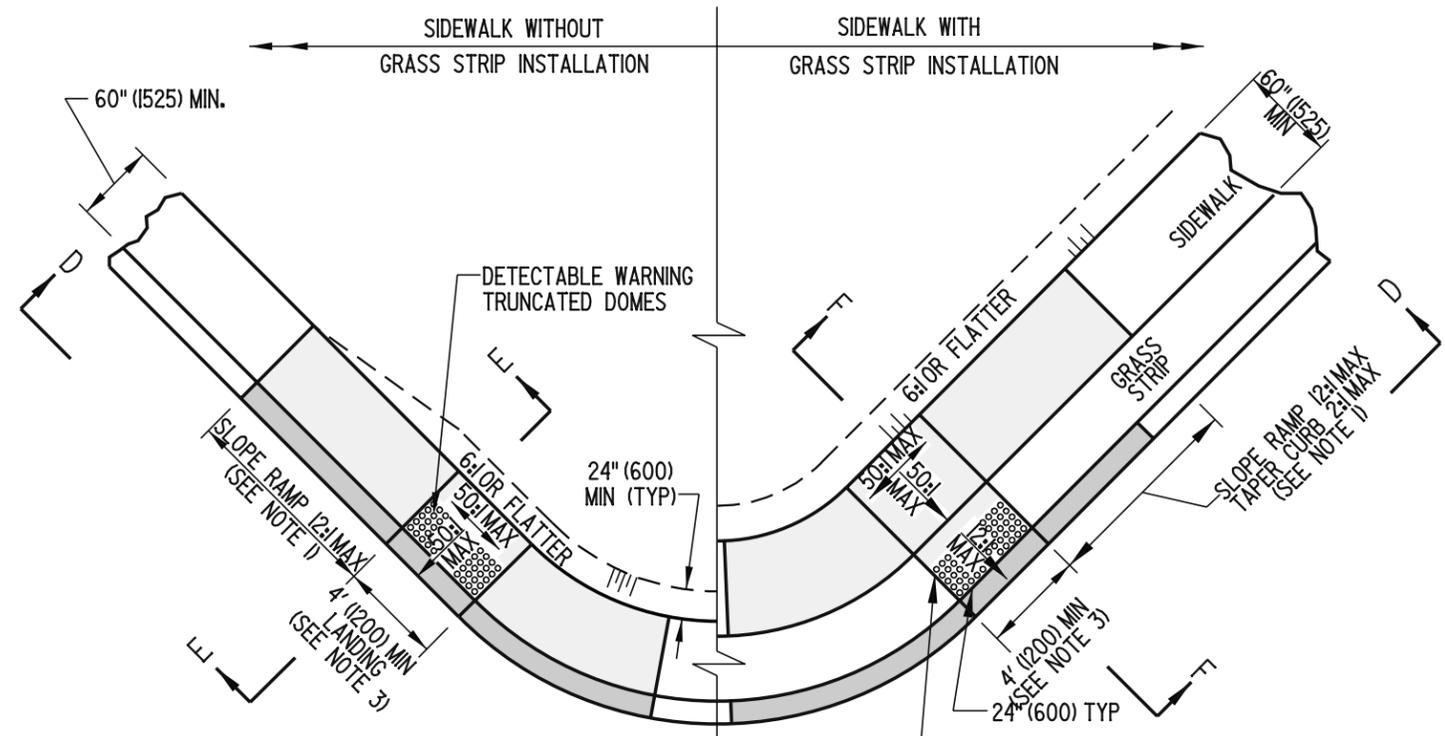
- 1). WHERE A 12:1 MAXIMUM SLOPE RAMP WILL NOT MEET THE SIDEWALK GRADE WITHIN A LENGTH OF 15' (4570) DUE TO STEEP ADJACENT ROADWAY, THE RAMP LENGTH MAY BE LIMITED TO 15' (4570), AND ALLOWED TO EXCEED 12:1.
- 2). RAMP WIDTH SHALL BE 4' (1200) MINIMUM, HOWEVER, 5' (1525) IS PREFERRED.
- 3). RAMP AND SIDEWALK CROSS SLOPE SHALL BE 50:1 (2%) MAXIMUM.
- 4). IF GRADING WILL BE STEEPER THAN 6:1, THEN A TYPE I CURB OR RETAINING WALL SHOULD BE USED TO ELIMINATE THE NEED FOR THE STEEP SLOPE.
- 5). THE MAXIMUM DIFFERENCE IN GRADE BETWEEN THE CURB RAMP OR MODIFIED CURB AND THE PAVEMENT SHALL BE 13%, HOWEVER 11% IS PREFERRED.
- 6). IF THE WIDTH OF THE FULLY DEPRESSED CURB AT THE STREET IS 5' (1525) OR LESS, THEN A RECTANGULAR PIECE OF DETECTABLE WARNING TRUNCATED DOMES MAY BE USED.

**DELAWARE DEPARTMENT OF TRANSPORTATION**

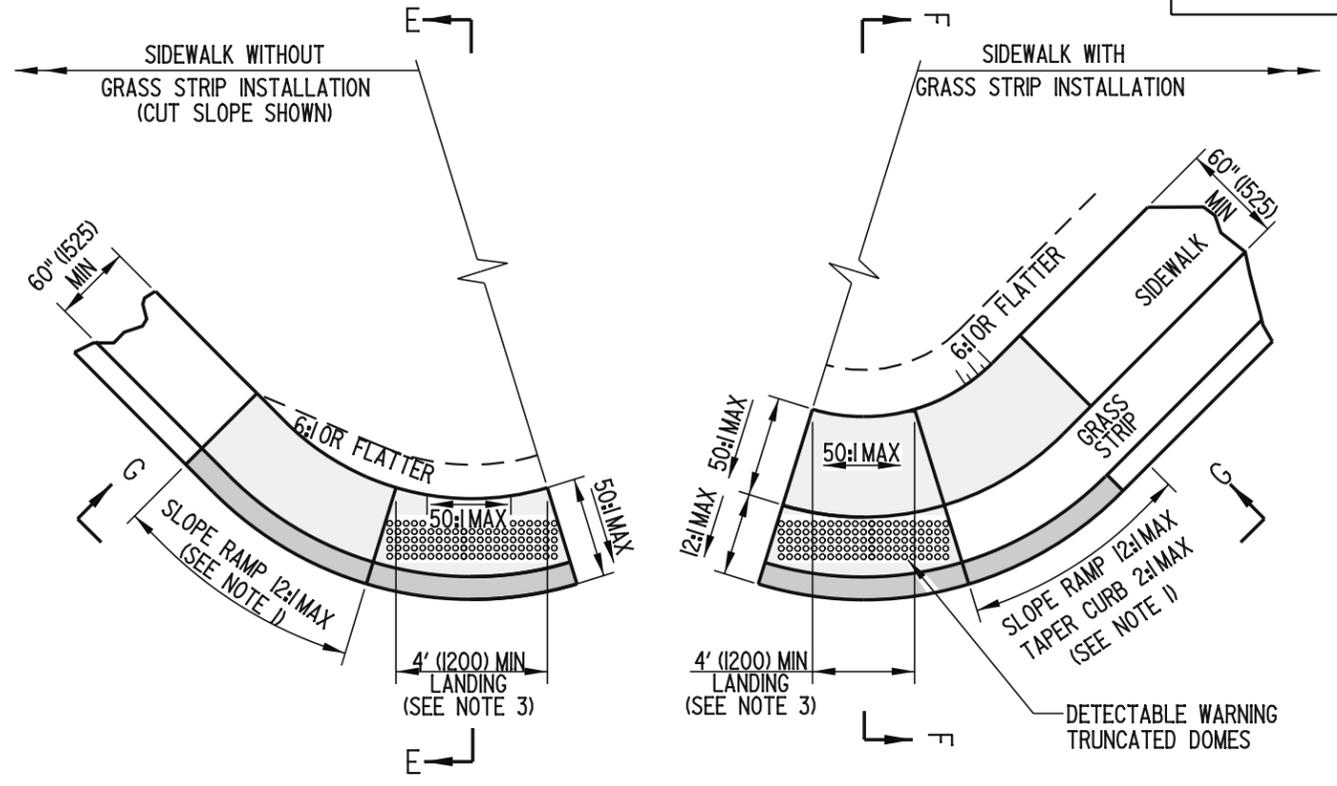
<b>CURB RAMP, TYPE 1 AND SECTIONS</b>			
STANDARD NO.	C-2 (2006)	SHT.	1 OF 4

**APPROVED** *[Signature]* 10/10/06  
CHIEF ENGINEER DATE

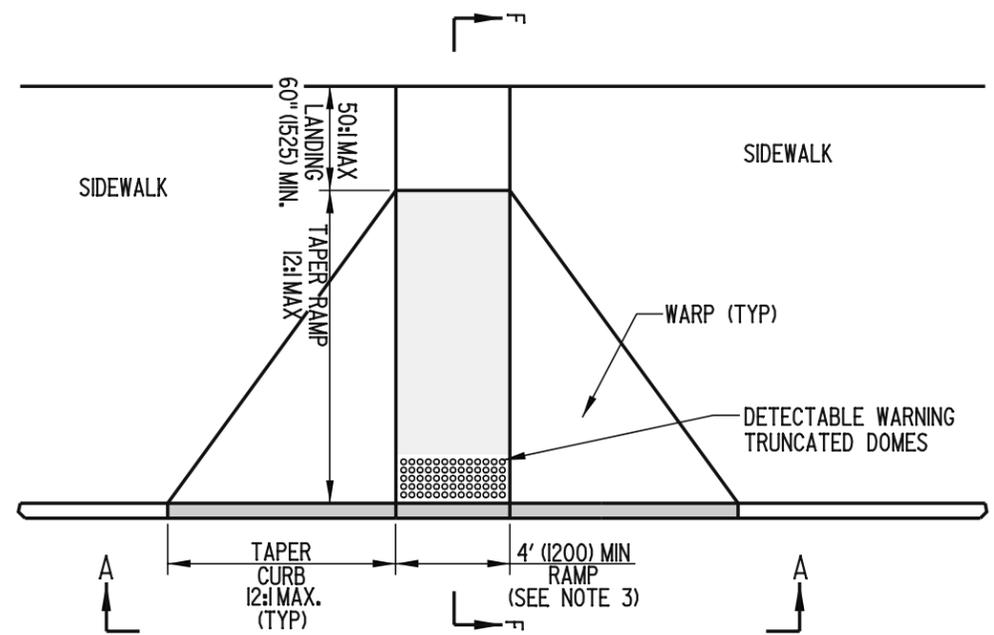
**RECOMMENDED** *[Signature]* 10/19/06  
DESIGN ENGINEER DATE



**CURB RAMP, TYPE 2**



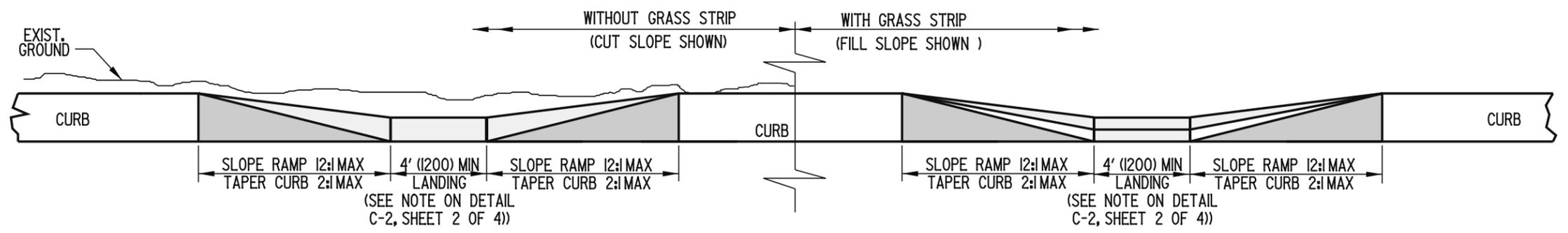
**CURB RAMP, TYPE 3**  
DIAGONAL CURB RAMP



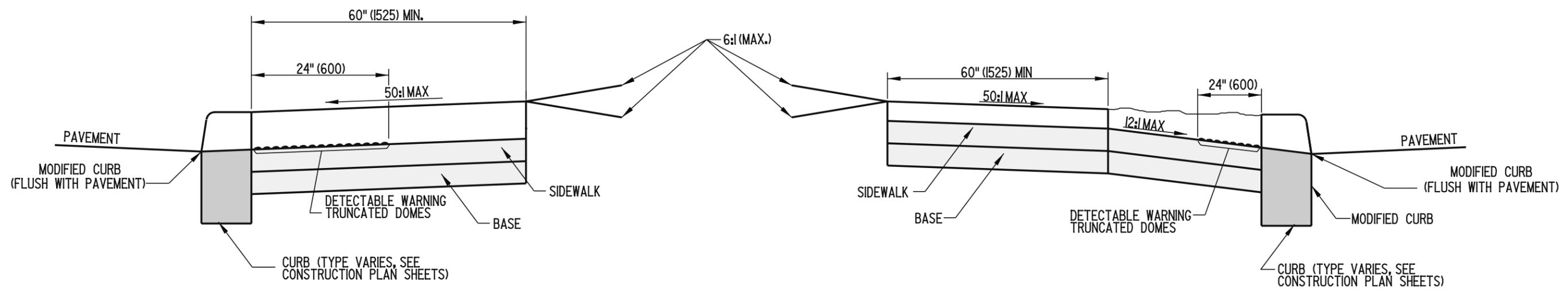
**CURB RAMP, TYPE 4**  
PERPENDICULAR CURB RAMP

**NOTES:**

- 1). WHERE A 12:1 MAXIMUM SLOPE RAMP WILL NOT MEET THE SIDEWALK GRADE WITHIN A LENGTH OF 15' (4570) DUE TO STEEP ADJACENT ROADWAY, THE RAMP LENGTH MAY BE LIMITED TO 15' (4570), AND THE RAMP SLOPE ALLOWED TO EXCEED 12:1.
- 2). TRANSITION TO EXISTING SIDEWALK WIDTH OVER THE LENGTH OF THE RAMP.
- 3). RAMP OR LANDING WIDTH SHALL BE 4' (1200) MINIMUM, HOWEVER, 5' (1525) IS PREFERRED.
- 4). RAMP AND SIDEWALK CROSS SLOPE SHALL BE 50:1 (2%) MAXIMUM.
- 5). IF GRADING WILL BE STEEPER THAN 6:1 ADJACENT TO THE CURB RAMP OR SIDEWALK, THEN A TYPE 1 CURB OR RETAINING WALL SHOULD BE USED TO ELIMINATE THE NEED FOR THE STEEP SLOPE.
- 6). FOR THE CURB RAMP, TYPE 3, IF THE WIDTH OF THE FULLY DEPRESSED CURB AT THE STREET IS MORE THAN 5' (1525), THE DETECTABLE WARNING TRUNCATED DOMES SHALL FOLLOW THE RADIUS OF THE CURB CONTINUOUSLY WITHOUT GAPS FOR THE ENTIRE LENGTH OF DEPRESSED CURB. SEE STANDARD NO. C-2, SHEET 1 OF 4.
- 7). THE MAXIMUM DIFFERENCE IN GRADE BETWEEN THE SIDEWALK OR CURB AND THE PAVEMENT SHALL BE 13:1, HOWEVER 11:1 IS PREFERRED. SEE STANDARD NO. C-2, SHEET 1 OF 4.

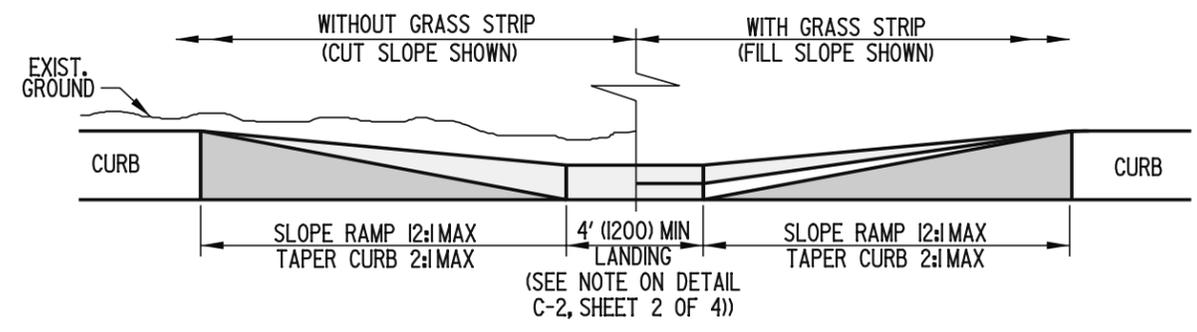


**ELEVATION D-D**

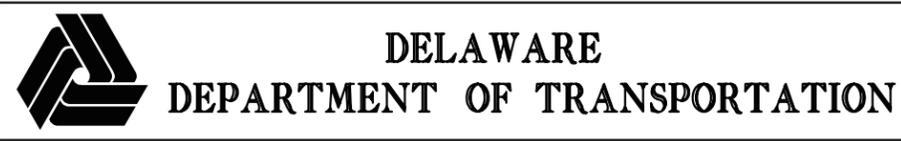


**SECTION E-E**

**SECTION F-F**



**ELEVATION G-G**

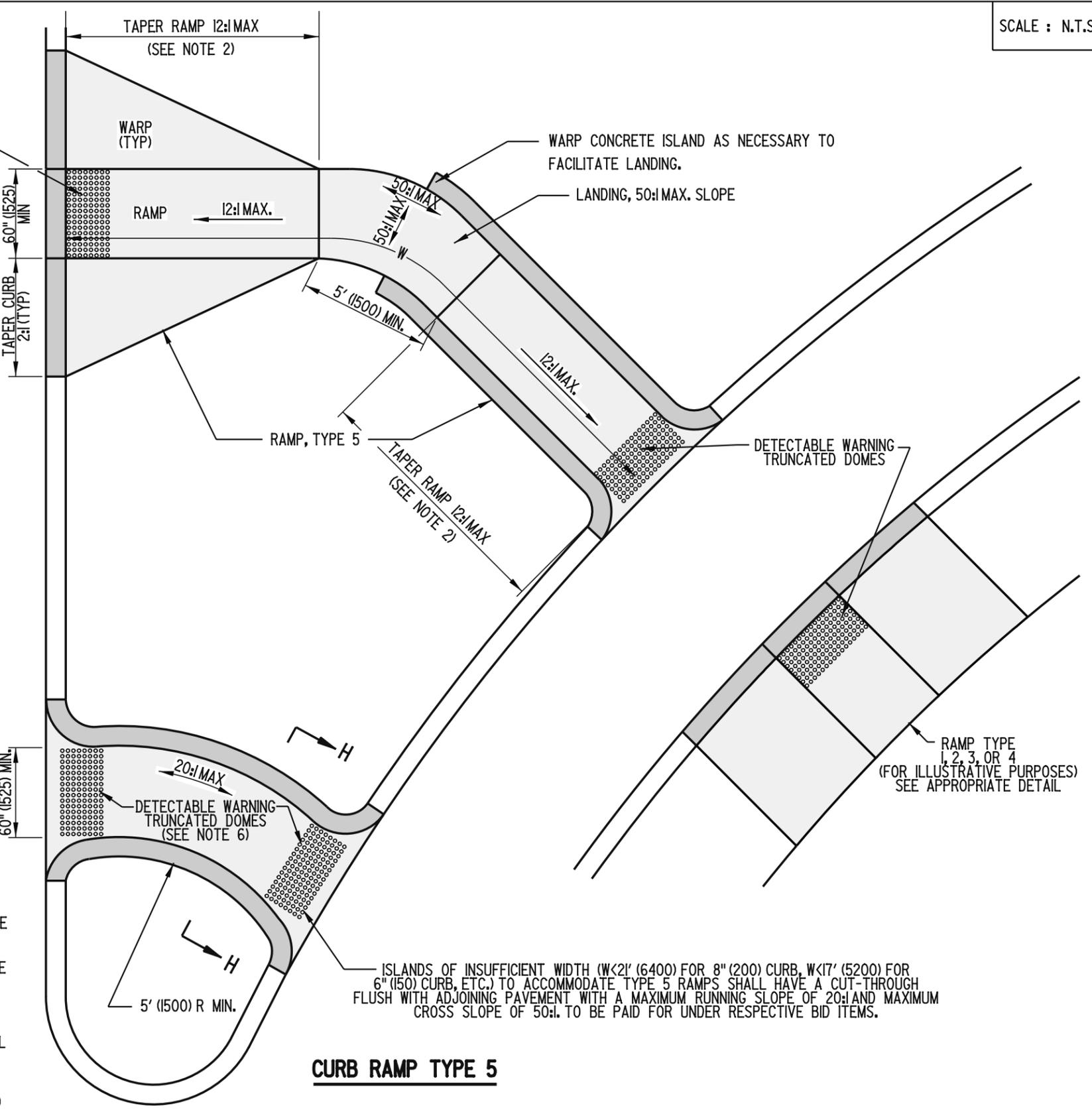
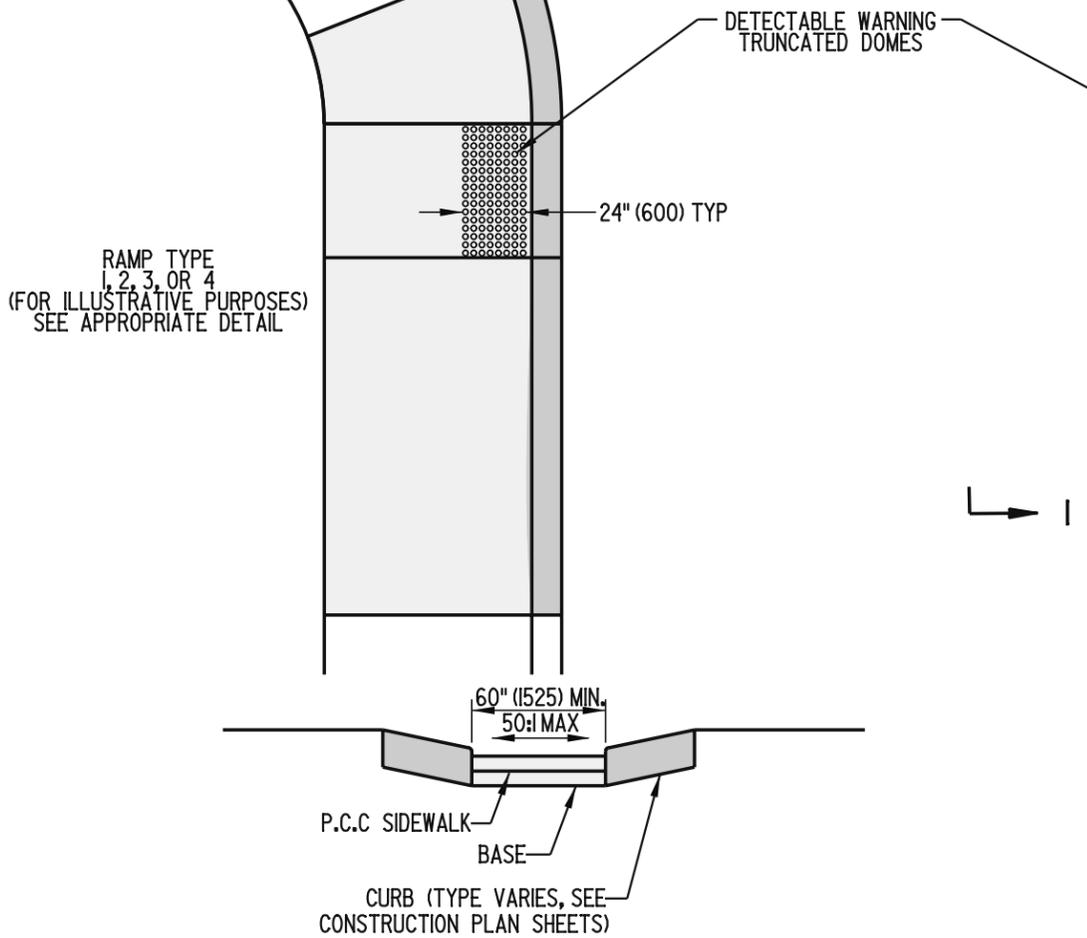


**CURB RAMP SECTIONS FOR TYPES 2 & 3**

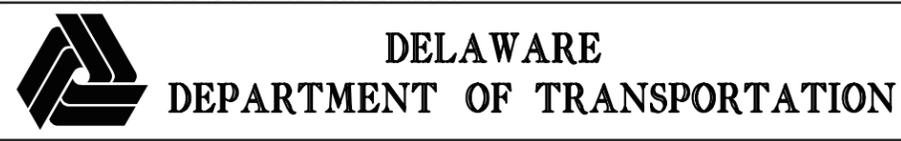
STANDARD NO. C-2 (2006)      SHT. 3 OF 4

APPROVED *Frank Taylor* 10/10/06  
CHIEF ENGINEER DATE

RECOMMENDED *Dennis Smith* 10/19/06  
DESIGN ENGINEER DATE

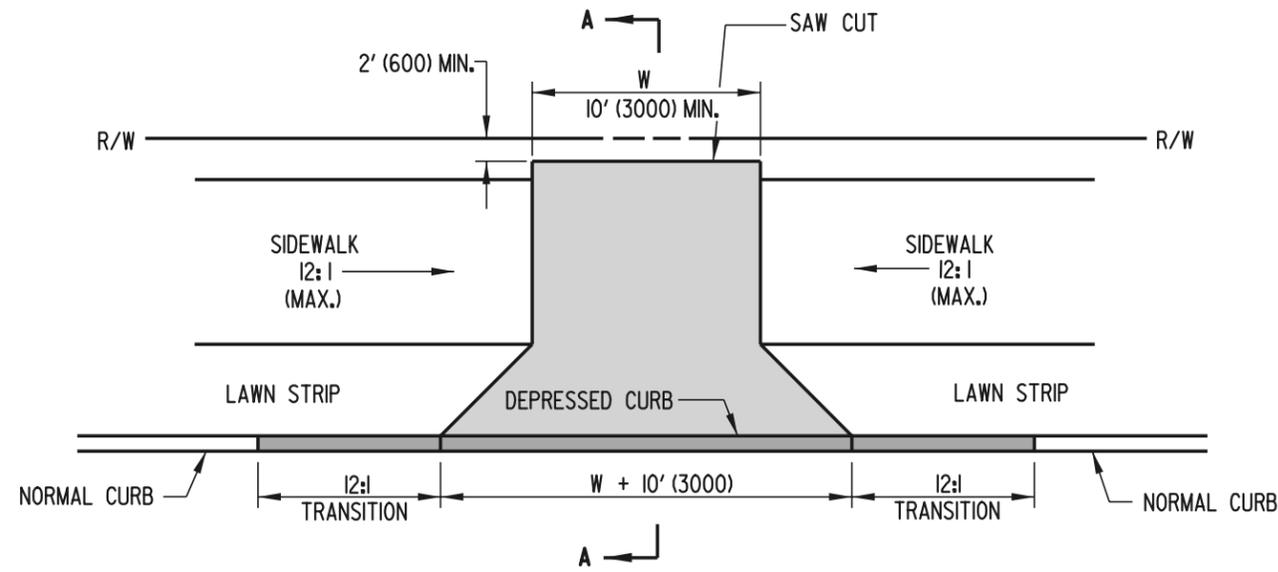


- NOTES:**
- 1). A CUT-THROUGH LEVEL WITH THE STREET IS THE PREFERRED TREATMENT FOR ISLANDS, ALTHOUGH, RAMPS CAN BE USED WHERE THE ISLAND WIDTH IS SUFFICIENT TO ACCOMMODATE THEM. POSITIVE SURFACE DRAINAGE MUST BE PROVIDED FOR EITHER TREATMENT. EITHER TREATMENT IS ACCEPTABLE.
  - 2). WHERE A 12:1 MAXIMUM SLOPE RAMP WILL NOT MEET THE SIDEWALK GRADE WITHIN A LENGTH OF 15' (4570) DUE TO STEEP ADJACENT ROADWAY, THE RAMP LENGTH MAY BE LIMITED TO 15' (4570), AND THE RAMP SLOPE ALLOWED TO EXCEED 12:1.
  - 3). A CONTINUOUS PATH MUST BE PROVIDED BETWEEN ADJACENT CURB RAMPS IN ISLANDS AND MEDIANS, WITH A MAXIMUM RUNNING SLOPE OF 20:1.
  - 4). RAMP AND SIDEWALK CROSS SLOPE SHALL BE 50:1 (2%) MAXIMUM.
  - 5). WHERE THERE IS NO DEPRESSED CURB AT A CUT-THROUGH OR CURB RAMP, THE DETECTABLE WARNING SHALL BE INSTALLED 3" (75) FROM THE ROADWAY PAVEMENT.
  - 6). IF THE MINIMUM CLEAR SPACE BETWEEN DETECTABLE WARNINGS IS LESS THAN 2' (600), THEN THE ENTIRE MEDIAN CURB RAMP AREA SHALL BE COVERED WITH DETECTABLE WARNINGS.
  - 7). PEDESTRIAN SIGNALS SHALL BE ACCESSIBLE WITH A LEVEL LANDING, WHOSE EDGE IS NO MORE THAN 10" (250) FROM ALL PEDESTRIAN PUSH BUTTONS.



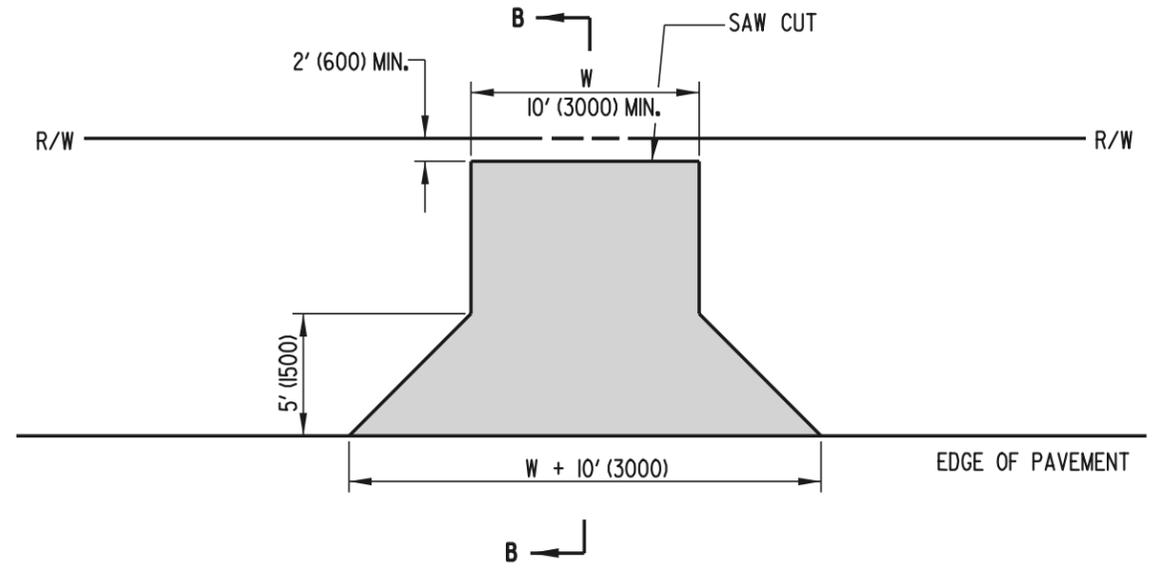
<b>CURB RAMP TYPE 5 &amp; SECTIONS</b>			
STANDARD NO.	C-2 (2006)	SHT.	4 OF 4

APPROVED	<i>[Signature]</i> CHIEF ENGINEER	10/10/06 DATE
RECOMMENDED	<i>[Signature]</i> DESIGN ENGINEER	10/19/06 DATE



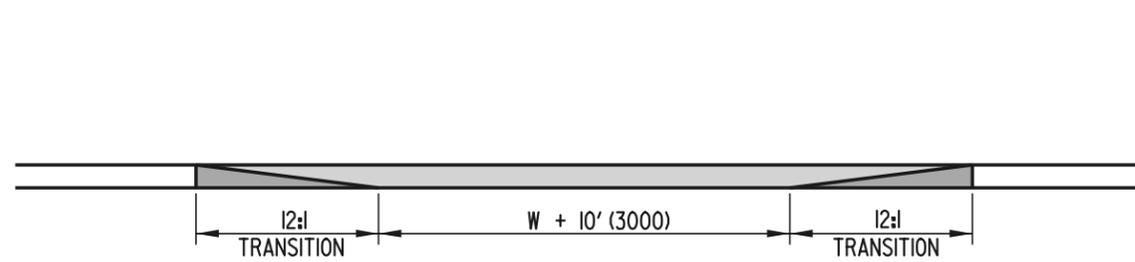
**PLAN**

**URBAN APPLICATION**

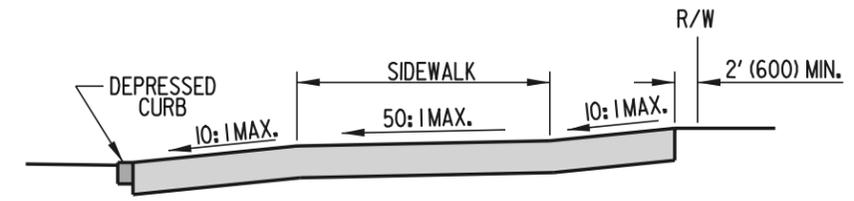


**PLAN**

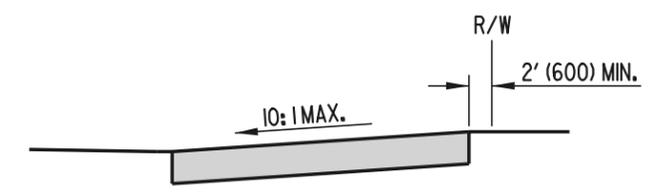
**RURAL APPLICATION**



**ELEVATION**



**SECTION A-A**



**SECTION B-B**



DELAWARE  
DEPARTMENT OF TRANSPORTATION

ENTRANCES

STANDARD NO. C-3 (2001)

SHT. 1 OF 1

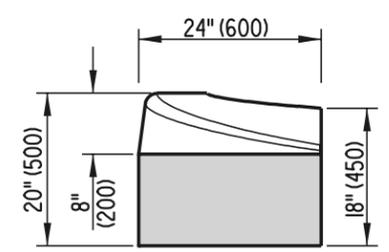
APPROVED

*Ryan M. Harshbarger*  
CHIEF ENGINEER DATE 6/18/01

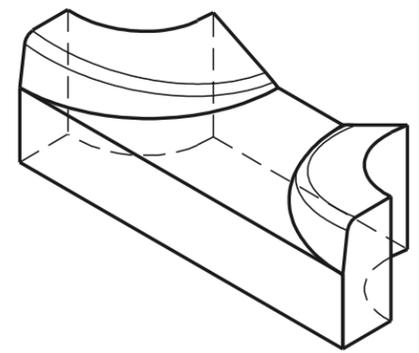
RECOMMENDED

*Michael R. [Signature]*  
DESIGN ENGINEER DATE 6/18/01

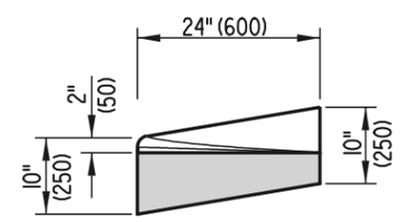
SCALE : N.T.S.



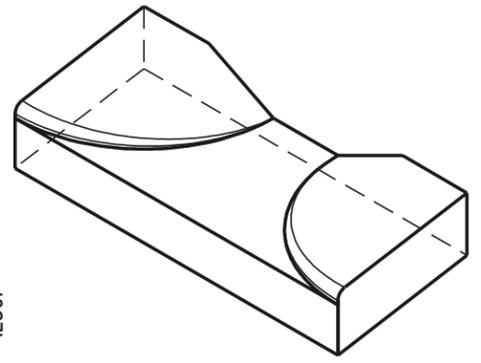
**SECTION A-A**



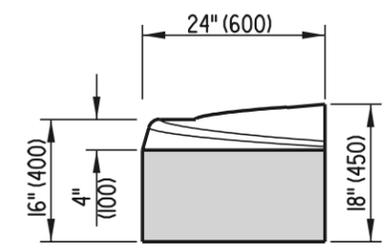
**ISOMETRIC VIEW**



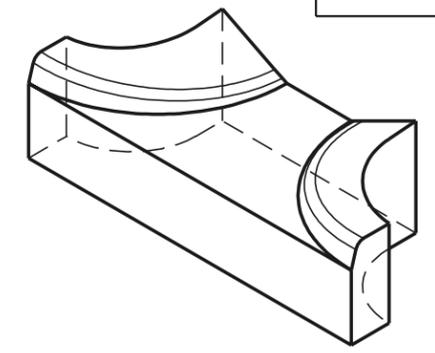
**SECTION B-B**



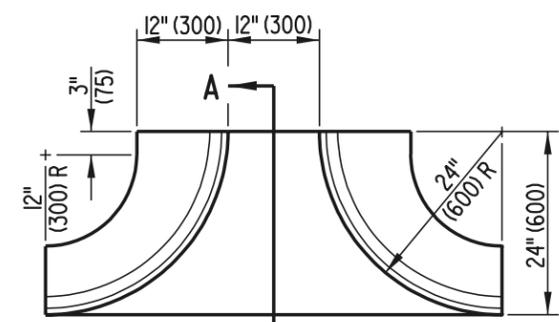
**ISOMETRIC VIEW**



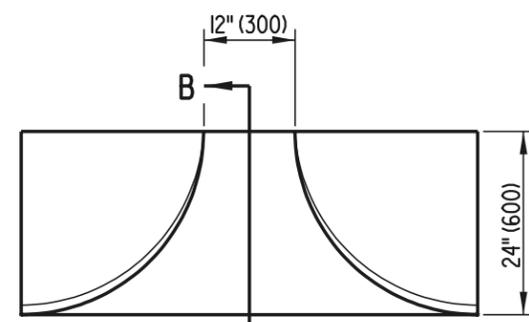
**SECTION C-C**



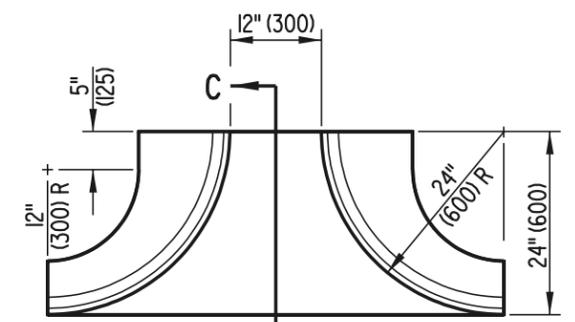
**ISOMETRIC VIEW**



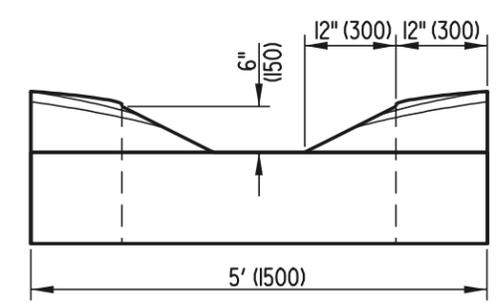
**TOP VIEW**



**TOP VIEW**

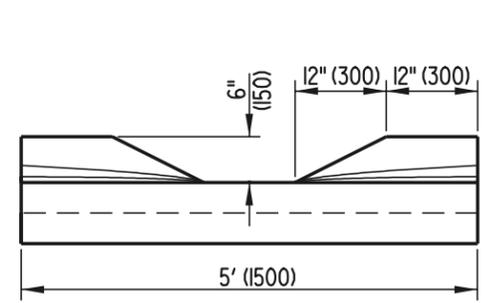


**TOP VIEW**



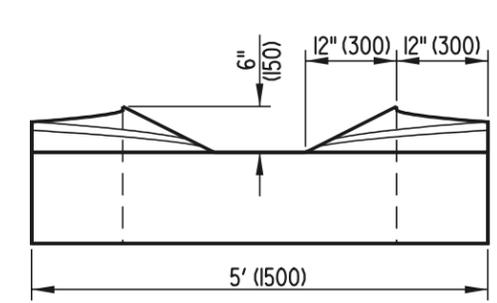
**FRONT VIEW**

**TYPE A**  
P.C.C. CURB, TYPE 1



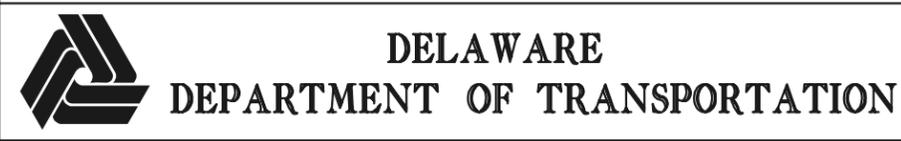
**FRONT VIEW**

**TYPE B**  
P.C.C. CURB, TYPE 2



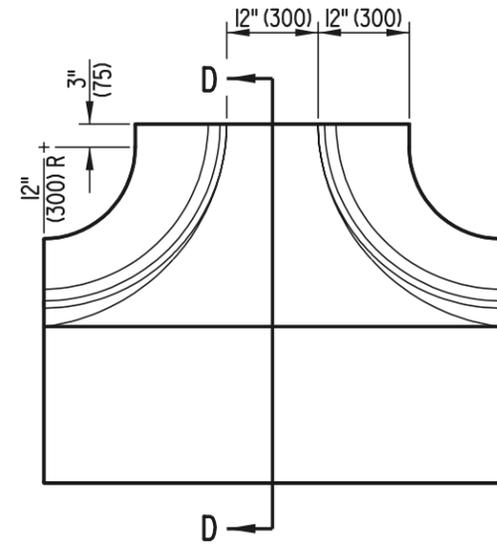
**FRONT VIEW**

**TYPE C**  
P.C.C. CURB, TYPE 3

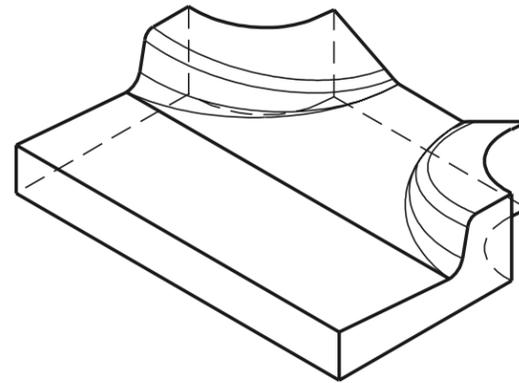


<b>CURB OPENINGS</b>			
STANDARD NO.	C-4 (2001)	SHT.	1 OF 3

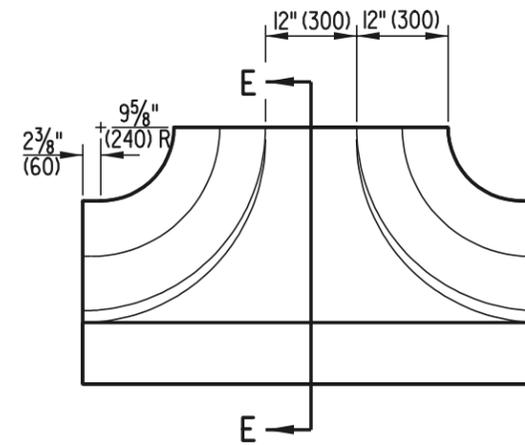
APPROVED	<i>Ryan M. Harshbarger</i>	DATE	6/18/01
RECOMMENDED	<i>Mehal Alghobari</i>	DATE	6/18/01



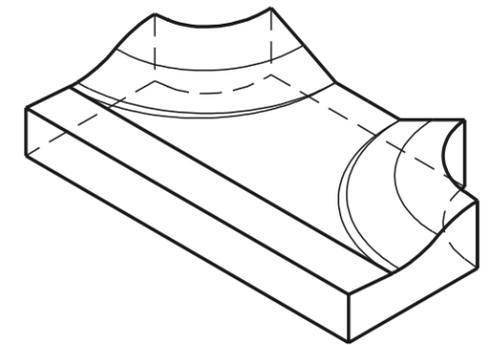
TOP VIEW



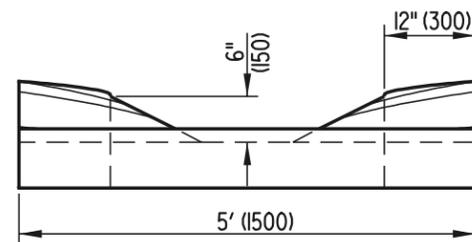
ISOMETRIC VIEW



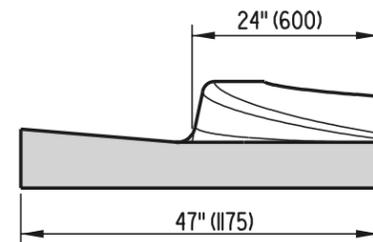
TOP VIEW



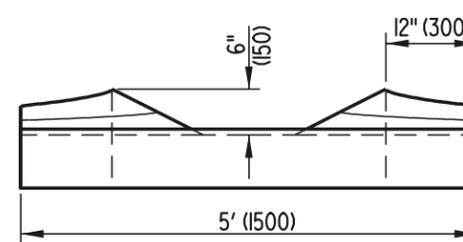
ISOMETRIC VIEW



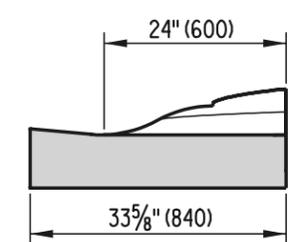
FRONT VIEW



SECTION D-D



FRONT VIEW



SECTION E-E

**TYPE D**  
INTEGRAL P.C.C. CURB AND GUTTER, TYPE 1

**TYPE E**  
INTEGRAL P.C.C. CURB AND GUTTER, TYPE 2

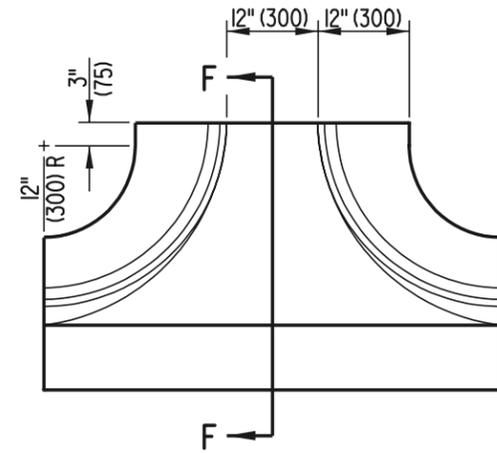


DELAWARE  
DEPARTMENT OF TRANSPORTATION

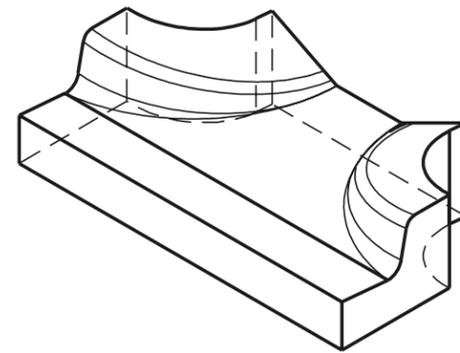
CURB OPENINGS

STANDARD NO. C-4 (2001) SHT. 2 OF 3

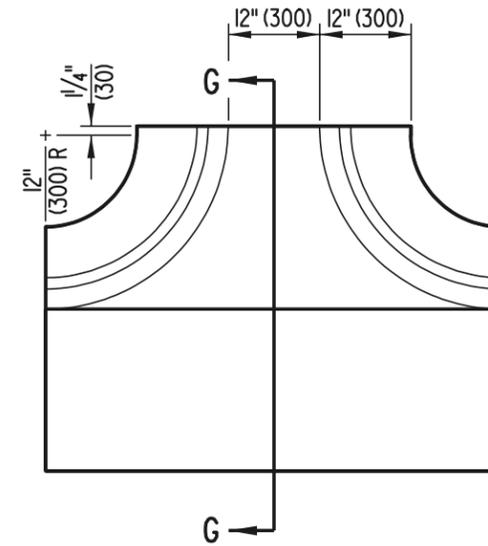
APPROVED *Ryan M. Harshbarger* 6/18/01  
CHIEF ENGINEER DATE  
RECOMMENDED *Mehal Alghobari* 6/18/01  
DESIGN ENGINEER DATE



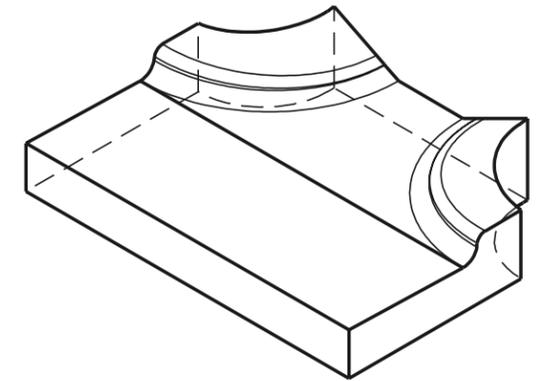
TOP VIEW



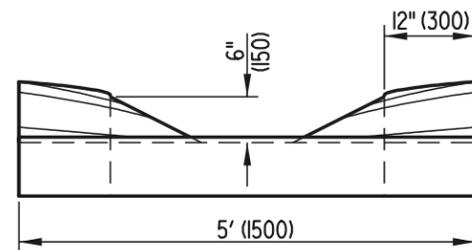
ISOMETRIC VIEW



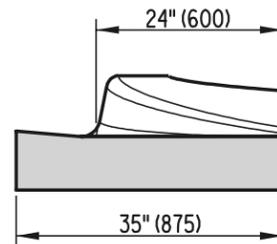
TOP VIEW



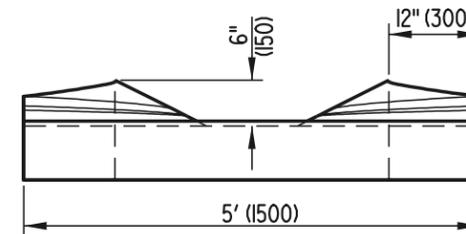
ISOMETRIC VIEW



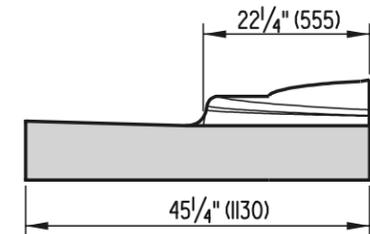
FRONT VIEW



SECTION F-F



FRONT VIEW



SECTION G-G

**TYPE F**  
INTEGRAL P.C.C. CURB AND GUTTER, TYPE 3

**TYPE G**  
INTEGRAL P.C.C. CURB AND GUTTER, TYPE 4

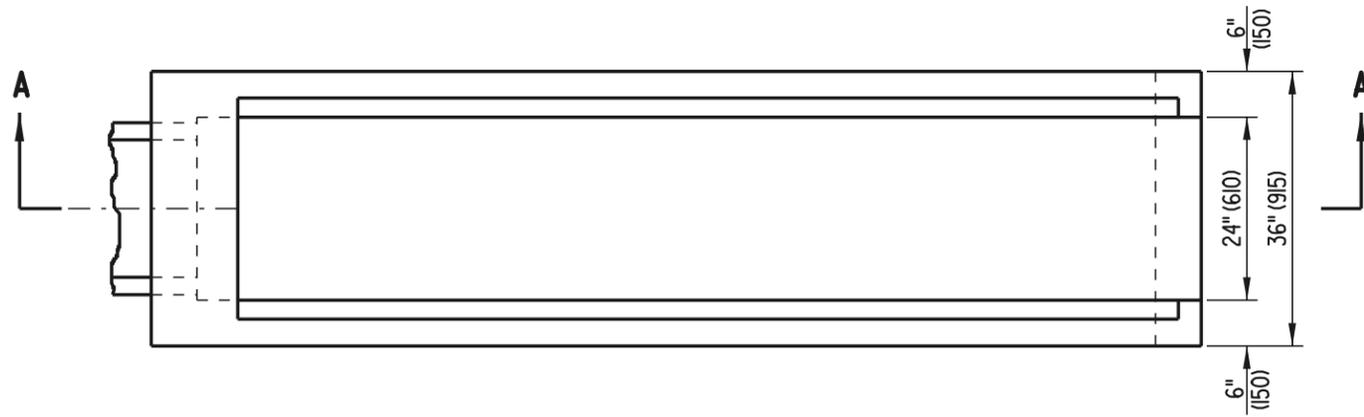


**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

**CURB OPENINGS**

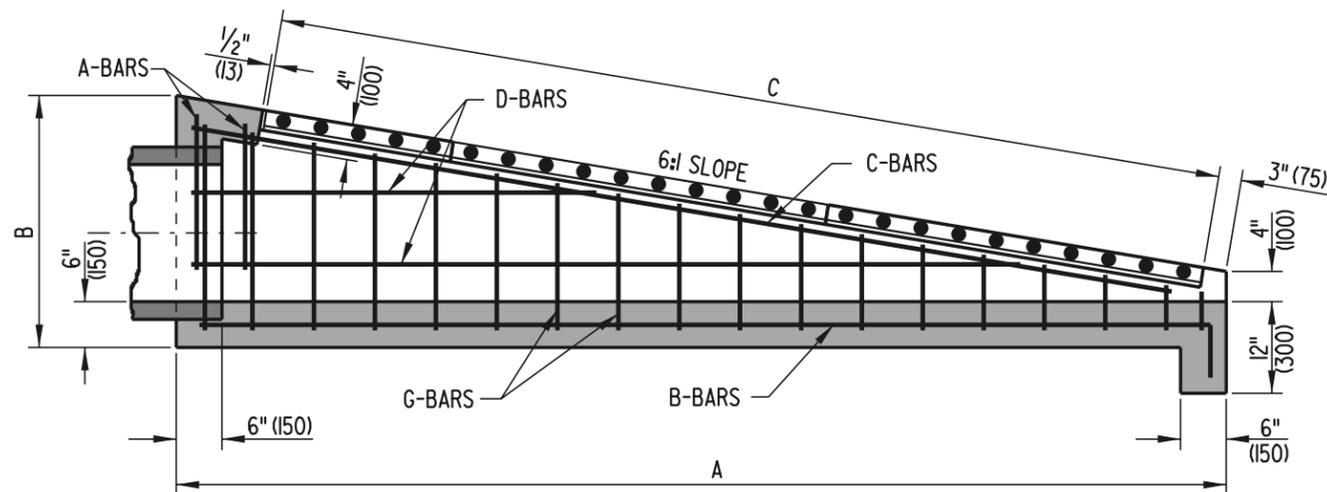
STANDARD NO. C-4 (2001) SHT. 3 OF 3

APPROVED *Ryan M. Harshbarger* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Aljeda* 6/18/01  
DESIGN ENGINEER DATE

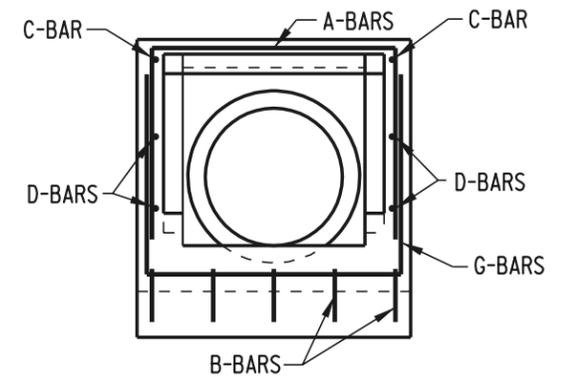


**PLAN VIEW**  
SHOWN WITHOUT GRATE

NOTE: 6:1 SAFETY END STRUCTURE TO BE PRECAST



**SECTION A-A**



**FRONT VIEW**



DELAWARE  
DEPARTMENT OF TRANSPORTATION

6:1 SAFETY END STRUCTURE

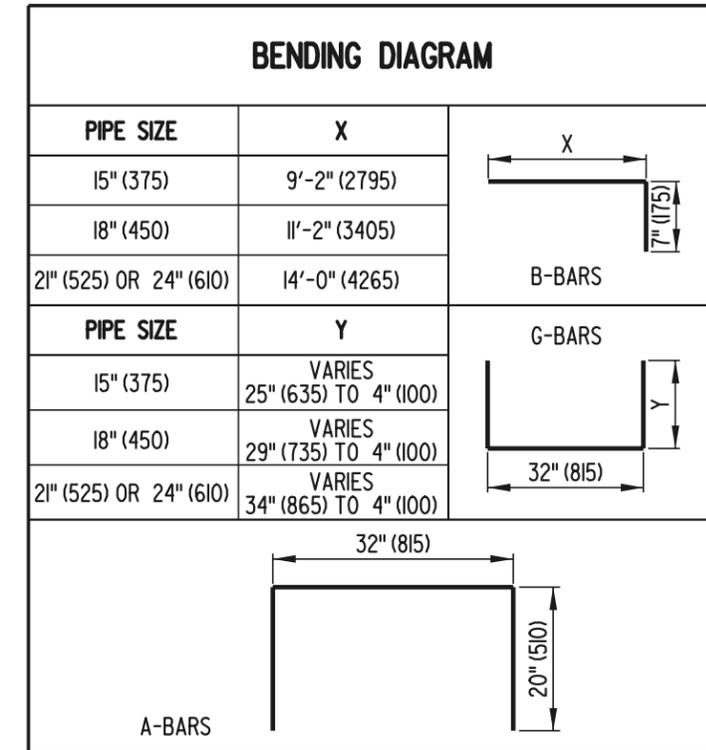
STANDARD NO. D-1 (2001)

SHT. 1 OF 2

APPROVED *Ryan M. Harshbarger* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Rajda* 6/18/01  
DESIGN ENGINEER DATE

DIMENSIONS			
PIPE SIZE	A	B	C
15" (375)	9'-6" (2895)	2'-5" (735)	8'-4" (2540)
18" (450)	11'-6" (3505)	2'-9" (840)	10'-5" (3175)
21" (525) OR 24" (600)	14'-4" (4370)	3'-2 <sup>5</sup> / <sub>8</sub> " (980)	12'-6" (3810)

APPROXIMATE QUANTITIES							
PIPE SIZE	CONCRETE FT <sup>3</sup> (m <sup>3</sup> )		REINF. STEEL LBS. (kg)	NO. OF GRATES	LENGTH TO BE CUT FROM 1 GRATE	WEIGHT OF FULL SIZE GRATE LBS. (kg)	WEIGHT OF CUT GRATE LBS. (kg)
	CONC. PIPE	C.M. PIPE					
15" (375)	25 (0.708)	25.43 (0.720)	121.12 (54.94)	2	--	270.92 (122.89)	--
18" (450)	31.5 (0.892)	32.07 (0.908)	156.7 (71.08)	3	2'-1" (635)	270.92 (122.89)	135.47 (61.45)
21" (525) OR 24" (600)	40.75 (1.154)	39.87 (1.129)	194.0 (88.00)	3	--	270.92 (122.89)	--



SCHEDULE OF REINFORCING STEEL																				
PIPE SIZE	A-BARS				B-BARS				C-BARS				D-BARS				G-BARS			
	SIZE	NO.	SPA.	LENGTH	SIZE	NO.	SPA.	LENGTH	SIZE	NO.	SPA.	LENGTH	SIZE	NO.	SPA.	LENGTH	SIZE	NO.	SPA.	LENGTH
15" (375)	#4 (#13)	2	8" (200)	72" (1830)	#4 (#13)	5	8" (200)	9'-9" (2970)	#4 (#13)	2	-	9'-3" (2820)	#4 (#13)	4	8" (200)	VARIES 50" (1270) TO 100" (2540)	#4 (#13)	15	8" (200)	VARIES 40" (1015) TO 82" (2085)
18" (450)	#4 (#13)	2	8" (200)	72" (1830)	#4 (#13)	5	8" (200)	11'-9" (3580)	#4 (#13)	2	-	11'-5" (3480)	#4 (#13)	6	8" (200)	VARIES 43 <sup>1</sup> / <sub>2</sub> " (1105) TO 130 <sup>1</sup> / <sub>2</sub> " (3315)	#4 (#13)	18	8" (200)	VARIES 40" (1015) TO 90" (2285)
21" (525) OR 24" (600)	#4 (#13)	2	8" (200)	72" (1830)	#4 (#13)	5	8" (200)	14'-7" (4445)	#4 (#13)	2	-	14'-3" (4345)	#4 (#13)	6	8" (200)	VARIES 51" (1295) TO 153" (3885)	#4 (#13)	22	8" (200)	VARIES 40" (1015) TO 100" (2540)



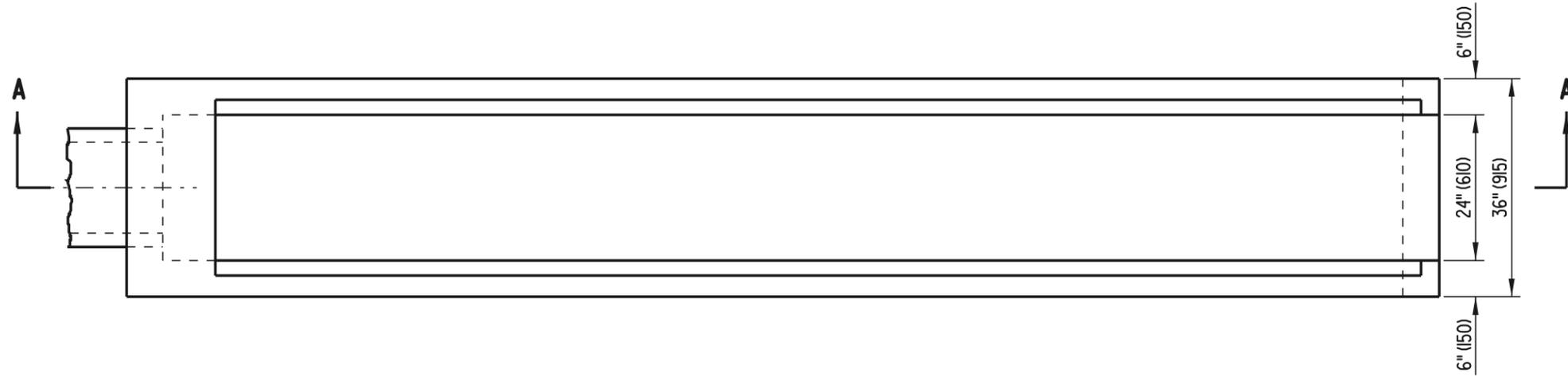
DELAWARE  
DEPARTMENT OF TRANSPORTATION

6:1 SAFETY END STRUCTURE

STANDARD NO. D-1 (2001)

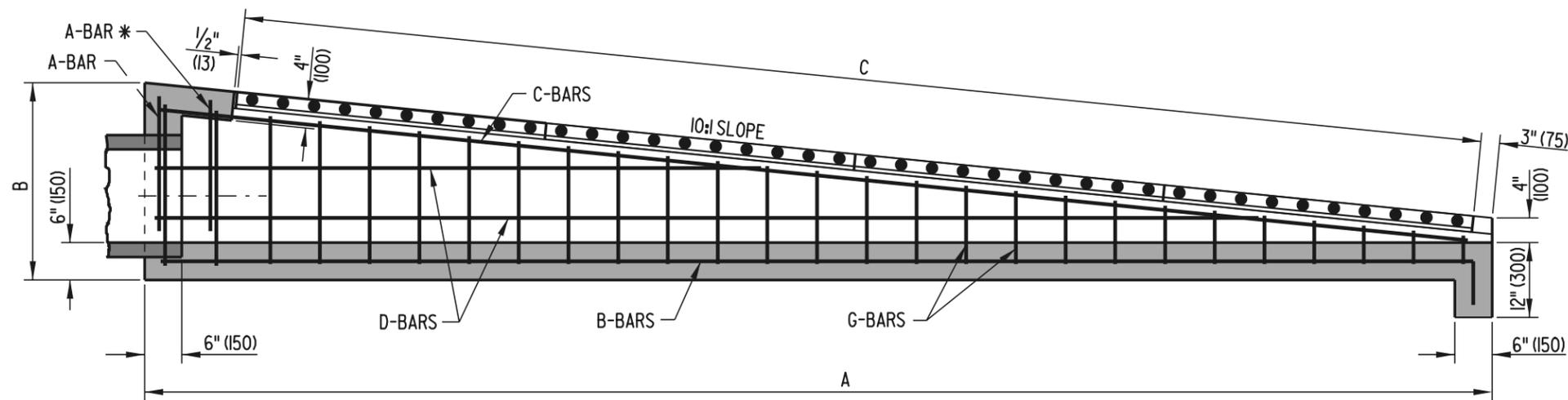
SHT. 2 OF 2

APPROVED *Ryan M. Hershman* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Rajda* 6/18/01  
DESIGN ENGINEER DATE



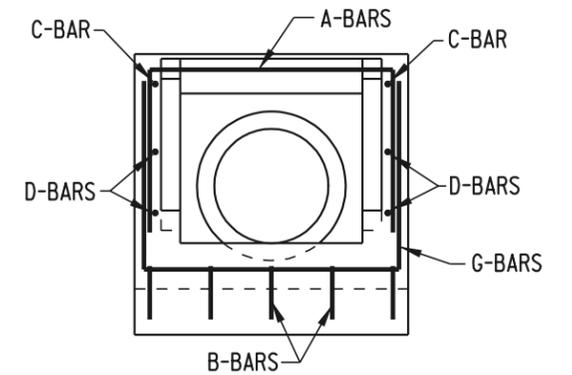
**PLAN VIEW**  
SHOWN WITHOUT GRATE

NOTE: 10:1 SAFETY END STRUCTURE TO BE PRECAST



**SECTION A-A**

\* REQUIRED ONLY FOR PIPE SIZE OF 21" (525) OR 24" (600)



**FRONT VIEW**



DELAWARE  
DEPARTMENT OF TRANSPORTATION

10:1 SAFETY END STRUCTURE

STANDARD NO. D-2 (2001)

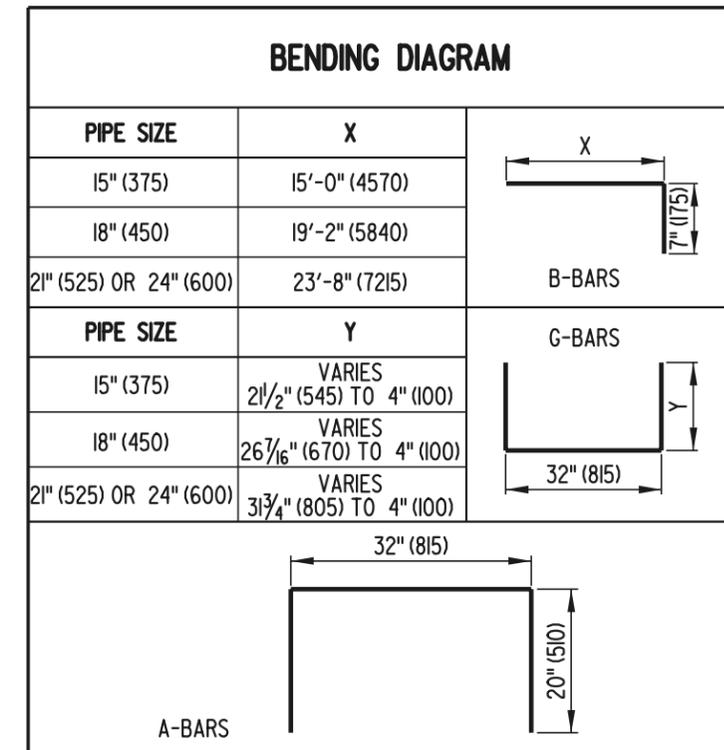
SHT. 1 OF 2

APPROVED *Ryan M. Harshbarger* 6/18/01  
CHIEF ENGINEER DATE

RECOMMENDED *Mehal Akhavan* 6/18/01  
DESIGN ENGINEER DATE

DIMENSIONS			
PIPE SIZE	A	B	C
15" (375)	15'-4" (4675)	2'-4 <sup>3</sup> / <sub>8</sub> " (720)	14'-7" (4445)
18" (450)	19'-6" (5945)	2'-9 <sup>3</sup> / <sub>8</sub> " (850)	18'-9" (5715)
21" (525) OR 24" (600)	24'-0" (7315)	3'-2 <sup>13</sup> / <sub>16</sub> " (985)	22'-11" (6985)

APPROXIMATE QUANTITIES							
PIPE SIZE	CONCRETE FT <sup>3</sup> (m <sup>3</sup> )		REINF. STEEL LBS. (kg)	NO. OF GRATES	LENGTH TO BE CUT FROM 1 GRATE	WEIGHT OF FULL SIZE GRATE LBS. (kg)	WEIGHT OF CUT GRATE LBS. (kg)
	CONC. PIPE	C.M. PIPE					
15" (375)	41.35 (1.171)	41.78 (1.183)	175.0 (79.38)	4	2'-1" (635)	270.92 (122.89)	135.47 (61.45)
18" (450)	50.11 (1.419)	50.68 (1.435)	227.0 (102.98)	5	2'-1" (635)	270.92 (122.89)	135.47 (61.45)
21" (525) OR 24" (600)	69.43 (1.966)	70.31 (1.991)	310.4 (140.79)	6	2'-1" (635)	270.92 (122.89)	135.47 (61.45)



SCHEDULE OF REINFORCING STEEL																				
PIPE SIZE	A-BARS				B-BARS				C-BARS				D-BARS				G-BARS			
	SIZE	NO.	SPA.	LENGTH	SIZE	NO.	SPA.	LENGTH	SIZE	NO.	SPA.	LENGTH	SIZE	NO.	SPA.	LENGTH	SIZE	NO.	SPA.	LENGTH
15" (375)	*4 (#13)	1	-	72" (1830)	*4 (#13)	5	8" (200)	15'-7" (4750)	*4 (#13)	2	-	15'-1 1/16" (4600)	*4 (#13)	4	8" (200)	VARIES 72 13/16" (1850) TO 145 5/8" (3700)	*4 (#13)	24	8" (200)	VARIES 40" (1015) TO 75 11/16" (1920)
18" (450)	*4 (#13)	1	-	72" (1830)	*4 (#13)	5	8" (200)	19'-9" (6020)	*4 (#13)	2	-	19'-3 3/8" (5875)	*4 (#13)	4	8" (200)	VARIES 89 5/8" (2275) TO 179 3/16" (4550)	*4 (#13)	30	8" (200)	VARIES 40" (1015) TO 85 3/4" (2180)
21" (525) OR 24" (600)	*4 (#13)	2	-	72" (1830)	*4 (#13)	5	8" (200)	24'-3" (7390)	*4 (#13)	2	-	23'-9 5/8" (7255)	*4 (#13)	6	8" (200)	VARIES 80 3/4" (2050) TO 242 1/8" (6150)	*4 (#13)	37	8" (200)	VARIES 40" (1015) TO 96 9/16" (2455)



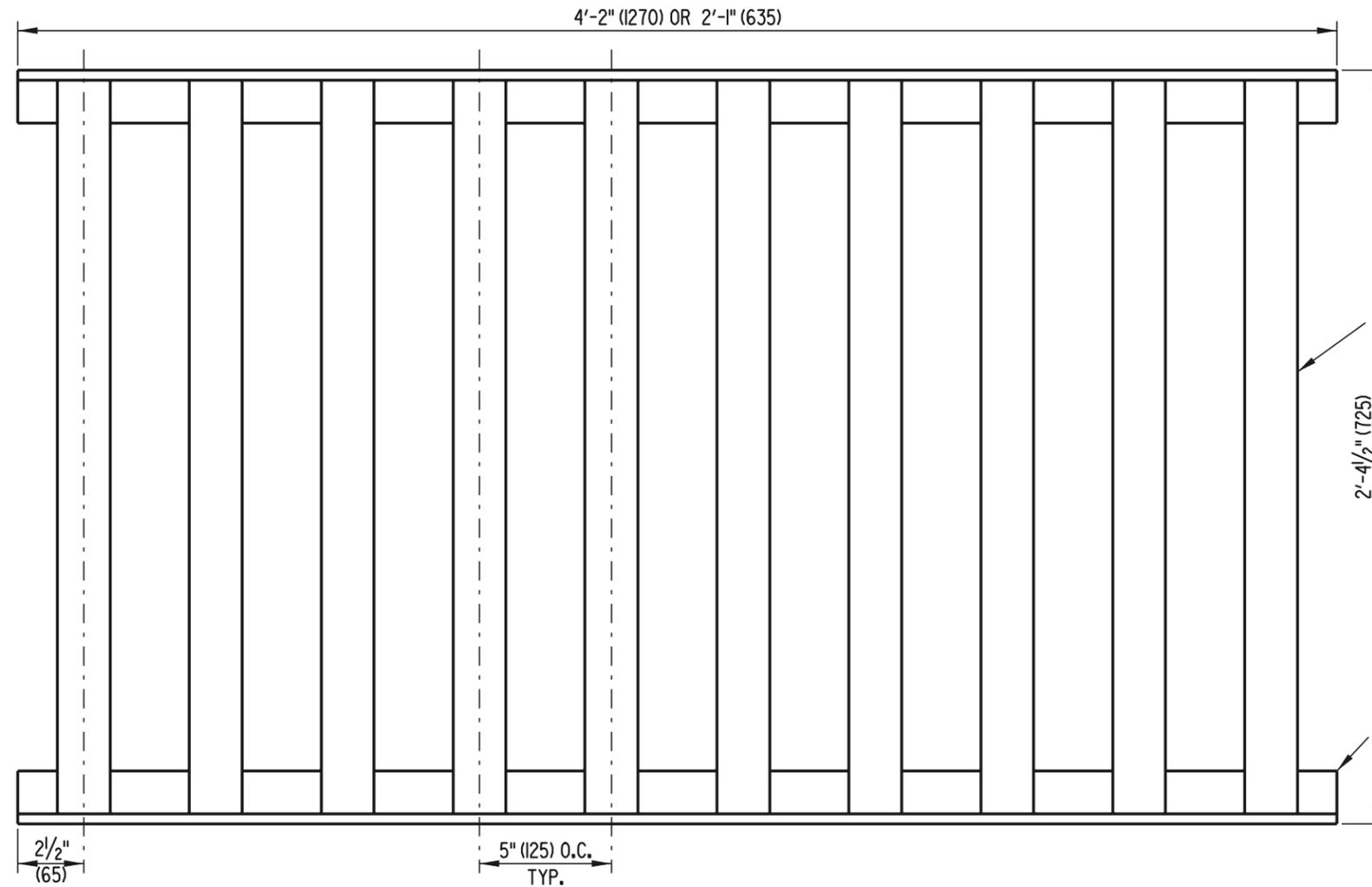
DELAWARE  
DEPARTMENT OF TRANSPORTATION

10:1 SAFETY END STRUCTURE

STANDARD NO. D-2 (2001)

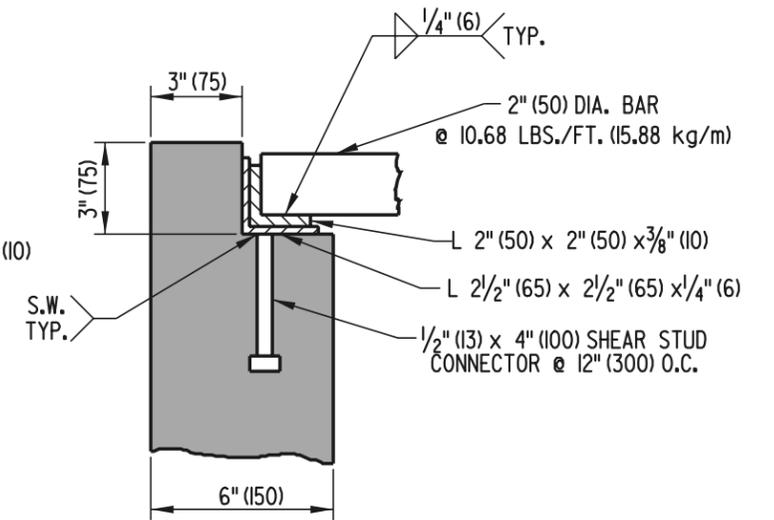
SHT. 2 OF 2

APPROVED *Ryan M. Hershberg* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Akhavan* 6/18/01  
DESIGN ENGINEER DATE



**GRATE DETAIL**

2" (50) DIA. BAR @ 10.68 LBS./FT. (15.88 kg/m)



**FRAME & GRATE ASSEMBLY DETAIL**



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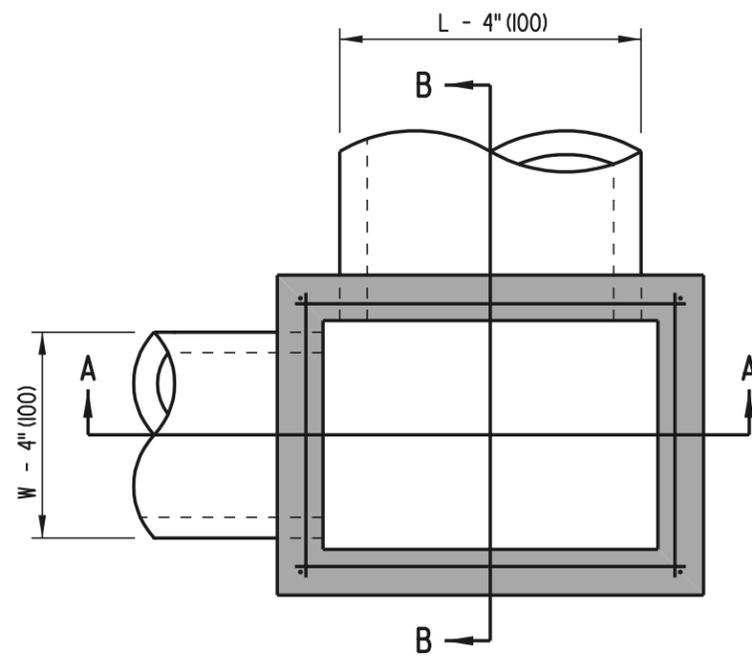
**SAFETY END STRUCTURE GRATE**

STANDARD NO. D-3 (2001)

SHT. 1 OF 1

APPROVED *Ryan M. Harshbarger* 6/18/01  
CHIEF ENGINEER DATE

RECOMMENDED *Mehal Raju* 6/18/01  
DESIGN ENGINEER DATE



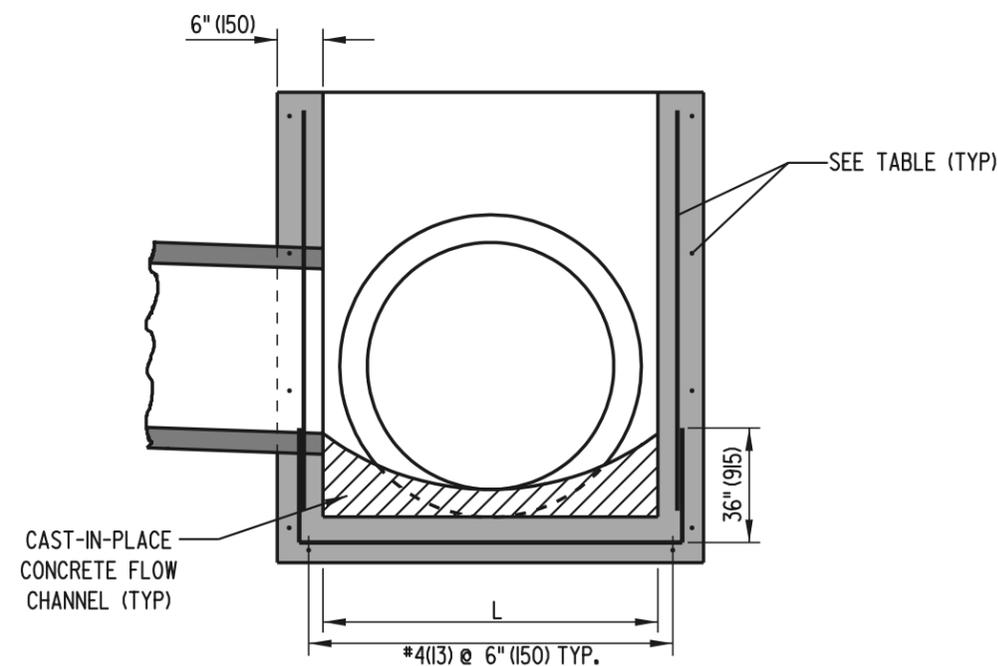
**TOP VIEW**

WALL REINFORCEMENT SCHEDULE		
INTERIOR WALL DIMENSION	AREA OF HORIZONTAL REINFORCEMENT PER FOOT (mm <sup>2</sup> )	AREA OF VERTICAL REINFORCEMENT PER FOOT (mm <sup>2</sup> )
	IN <sup>2</sup> (mm <sup>2</sup> )	IN <sup>2</sup> (mm <sup>2</sup> )
LESS THAN 4' (1220)	0.132 (85)	0.132 (85)
4' (1220) TO 4.5' (1370)	0.163 (105)	0.132 (85)
4.5' (1370) TO 5' (1525)	0.198 (128)	0.132 (85)
5' (1525) TO 5.5' (1675)	0.239 (154)	0.132 (85)
5.5' (1675) TO 6' (1830)	0.284 (183)	0.132 (85)

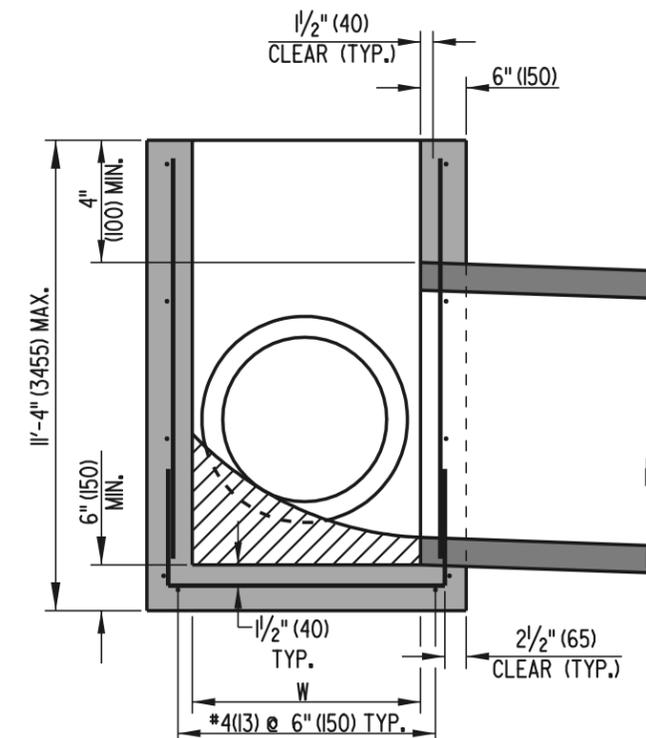
INLET BOX SCHEDULE			
L	W	L MAX	W MAX
34" (865)	18" (455)	34" (865)	18" (455)
34" (865)	24" (610)	34" (865)	24" (610)
48" (1220)	30" (760)	54" (1370)	36" (915)
48" (1220)	48" (1220)	54" (1370)	54" (1370)
66" (1675)	30" (760)	72" (1830)	36" (915)
66" (1675)	48" (1220)	72" (1830)	54" (1370)
66" (1675)	66" (1675)	72" (1830)	72" (1830)
72" (1830)	24" (610)	72" (1830)	30" (760)
72" (1830)	48" (1220)	72" (1830)	54" (1370)
72" (1830)	72" (1830)	72" (1830)	72" (1830)

**NOTES:**

1. INLET BOXES SHALL BE PRE-CAST OR CAST-IN-PLACE.
2. OUTSIDE OF PIPE MUST FIT INTO THE INTERIOR OF THE BOX.
3. STEPS ARE TO BE INSTALLED IN BACK WALL AS PER SPECIFICATIONS.
4. NO PIPES WITH AN OUTSIDE DIAMETER LARGER THAN 11" (275) WILL BE PERMITTED TO ENTER THE BACK WALL OF A DRAINAGE INLET OR MANHOLE TO ACCOMMODATE STEPS IF REQUIRED. A LARGER BOX MAY BE USED IN ORDER TO FIT THE STEPS AND A LARGER PIPE IN THE BACK WALL, IF NECESSARY.



**SECTION A-A**



**SECTION B-B**

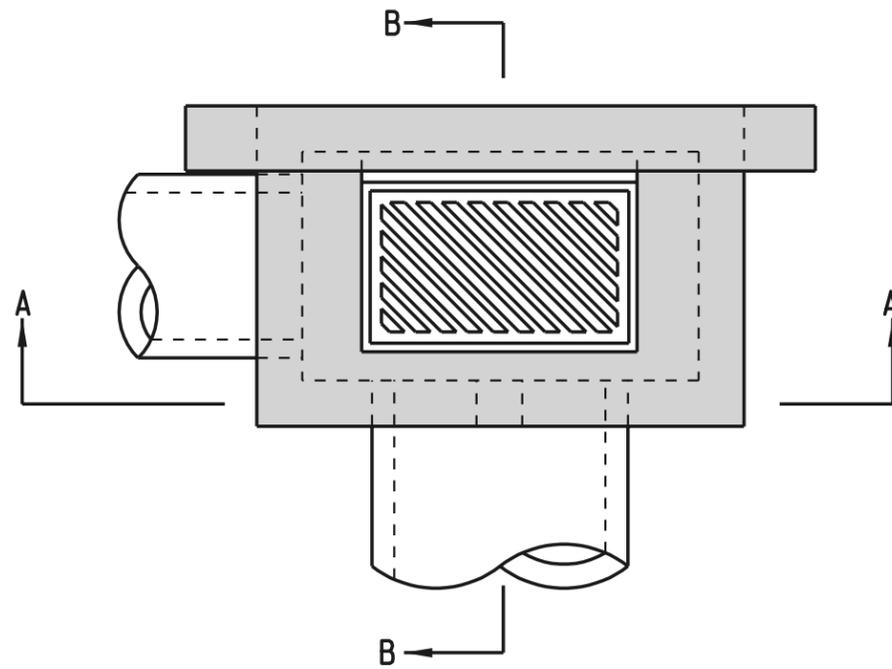


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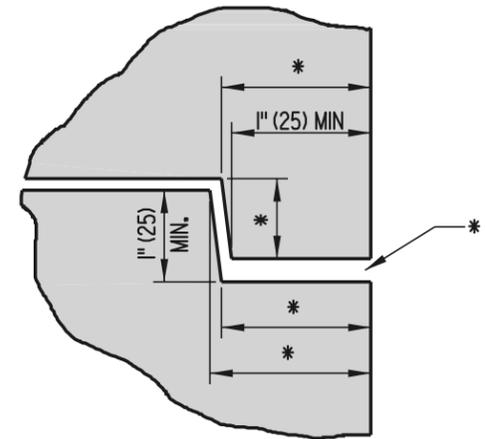
**INLET BOX DETAILS**

STANDARD NO. D-4 (2002) SHT. 1 OF 1

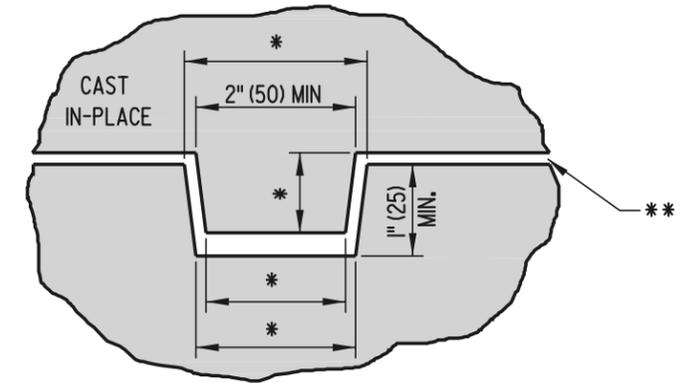
APPROVED *Caution Wicks* 9/6/02  
CHIEF ENGINEER DATE  
RECOMMENDED *Therese Delpho* 8/19/02  
DESIGN ENGINEER DATE



**PLAN**

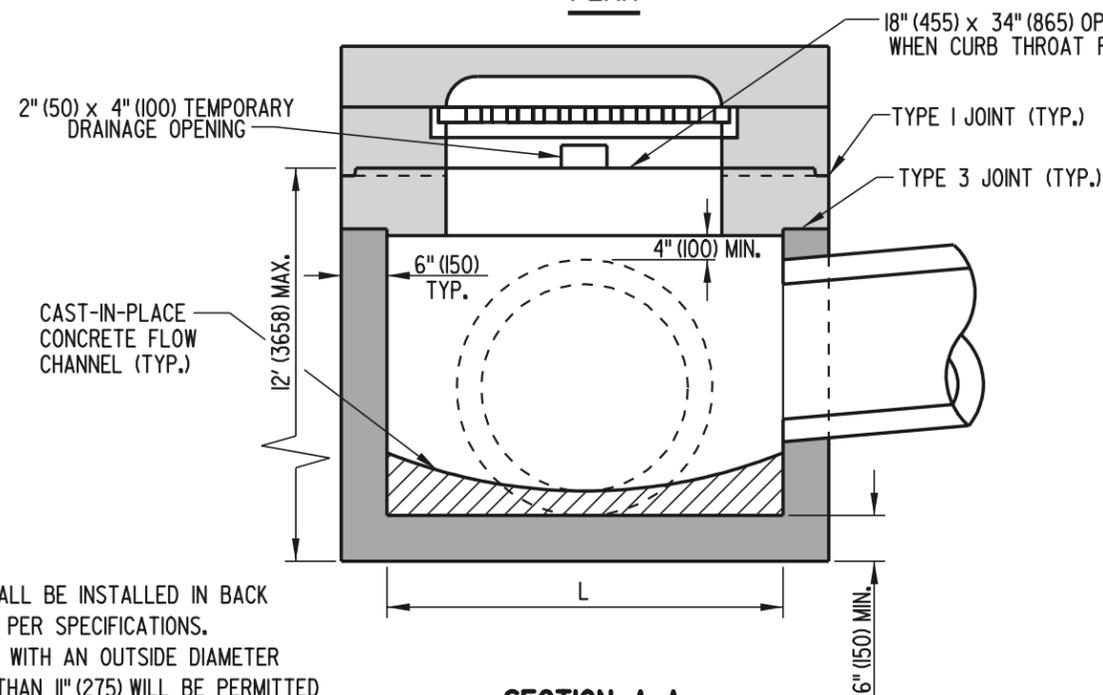


**TYPE 1 JOINT DETAIL**



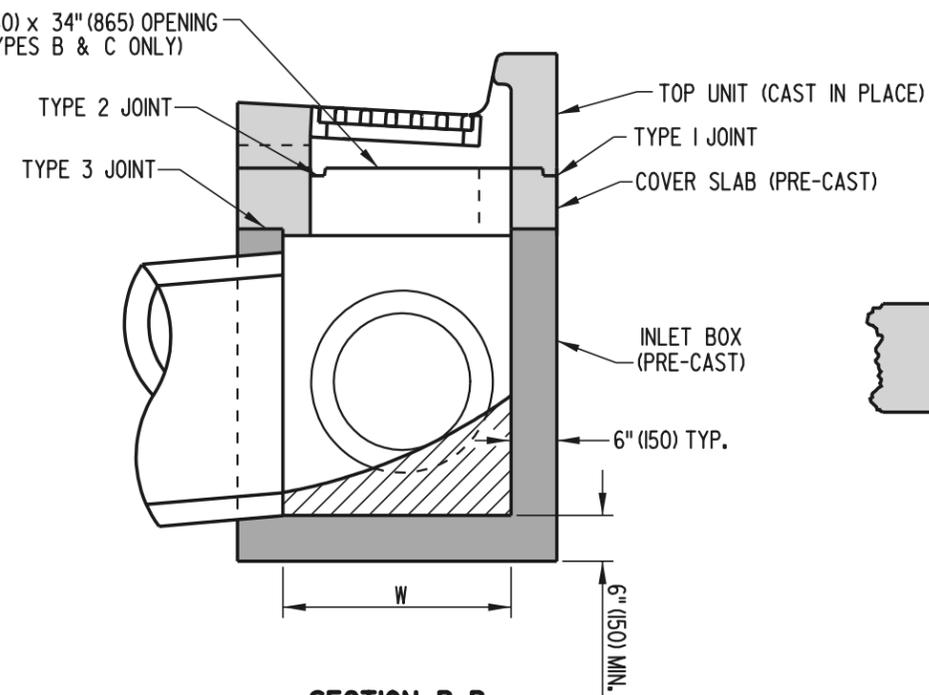
**TYPE 2 JOINT DETAIL**

\* DIMENSIONS WILL VARY  
 \*\* JOINT SEALANT AS PER SPECIFICATIONS

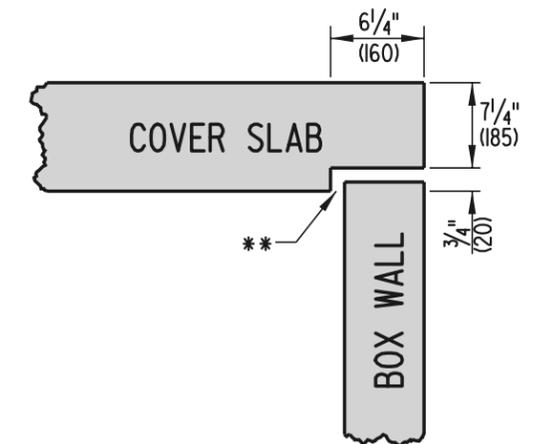


**SECTION A-A**

**DRAINAGE INLET ASSEMBLY**



**SECTION B-B**



**TYPE 3 JOINT DETAIL**

- NOTES:**
- 1.) STEPS SHALL BE INSTALLED IN BACK WALL AS PER SPECIFICATIONS.
  - 2.) NO PIPES WITH AN OUTSIDE DIAMETER LARGER THAN 11" (275) WILL BE PERMITTED TO ENTER THE BACK WALL OF A DRAINAGE INLET, IF IT IMPEDES THE INSTALLATION OF STEPS IN THE BACK WALL.
  - 3.) IF NECESSARY, A LARGER BOX MAY BE USED IN ORDER TO FIT THE STEPS AND A LARGER PIPE IN THE BACK WALL.

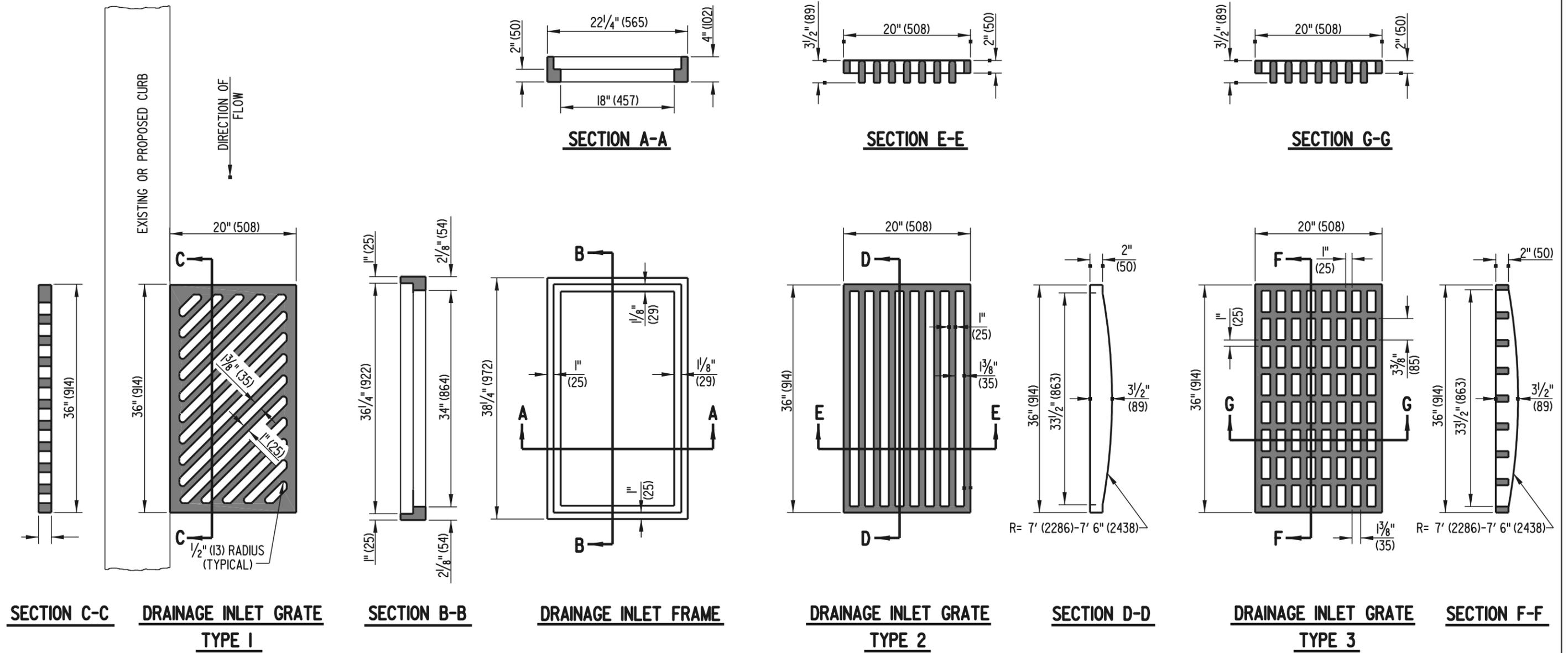


**DELAWARE  
 DEPARTMENT OF TRANSPORTATION**

**DRAINAGE INLET DETAILS**

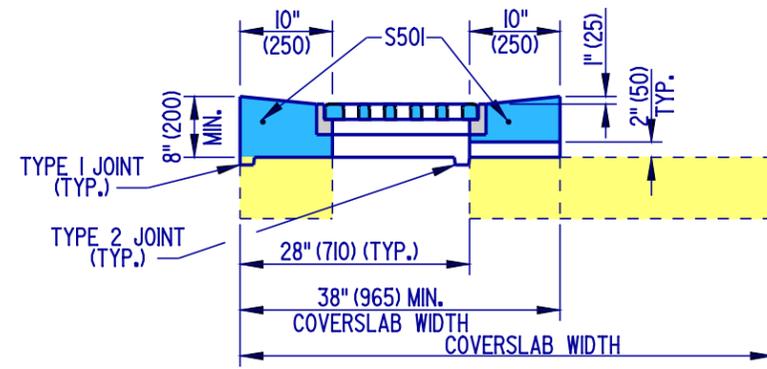
STANDARD NO. **D-5 (2002)** SHT. **1** OF **8**

APPROVED *Caution Wicks* 9/6/02  
CHIEF ENGINEER DATE  
 RECOMMENDED *Therese Delpho* 8/19/02  
DESIGN ENGINEER DATE

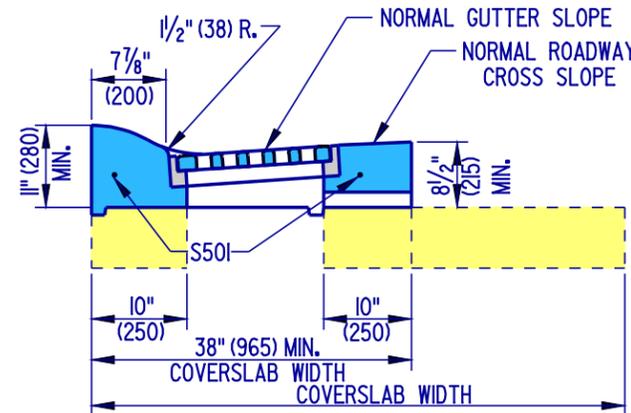


**DRAINAGE INLET FRAME AND GRATES**

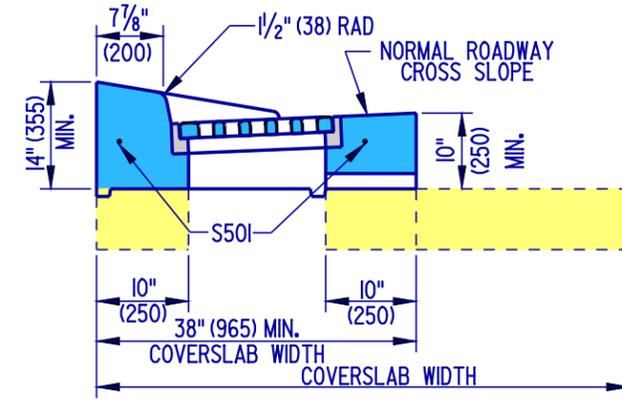
- NOTE: 1. BOTTOM OF TYPE 1 GRATE TO BE FLAT AND TRUE.  
 2. TYPE 2 GRATE SHALL NOT BE INSTALLED WHERE BICYCLE TRAFFIC MAY BE PRESENT.



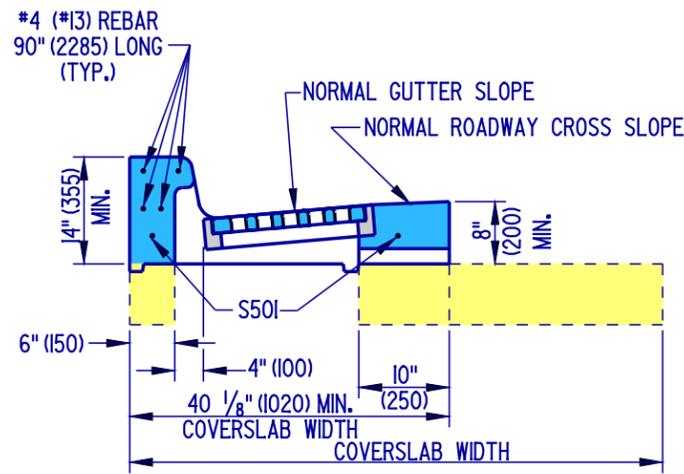
**TYPE A**



**TYPE D**

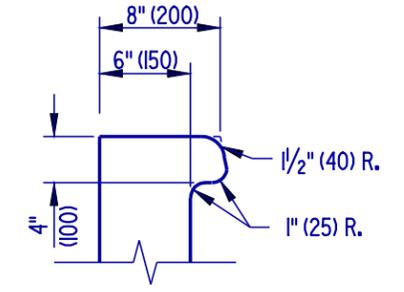


**TYPE E**

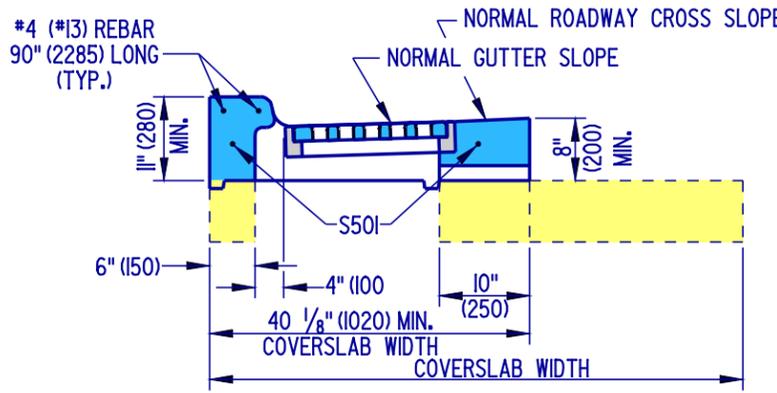


**TYPE B**

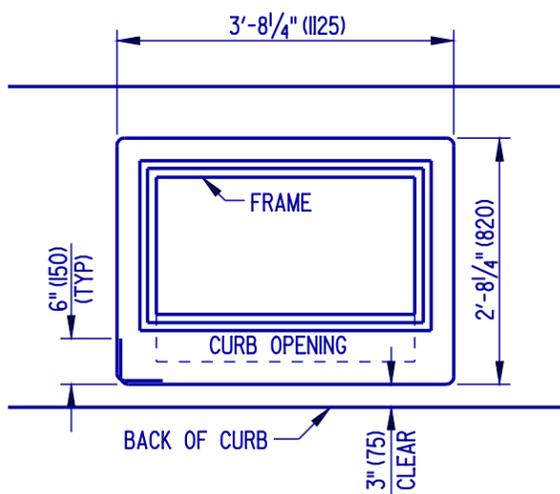
INLET TOP UNIT APPLICATIONS	
TOP UNIT	CURB
TYPE A	USE IN DRAINAGE SWALE
TYPE B	INTEGRAL PCC CURB & GUTTER, TYPE 1 & 3, PCC CURB TYPE 1
TYPE C	INTEGRAL PCC CURB & GUTTER, TYPE 4, PCC CURB TYPE 3
TYPE D	INTEGRAL PCC CURB & GUTTER, TYPE 2
TYPE E	PCC CURB TYPE 2



**CURB OPENING DETAIL**



**TYPE C**

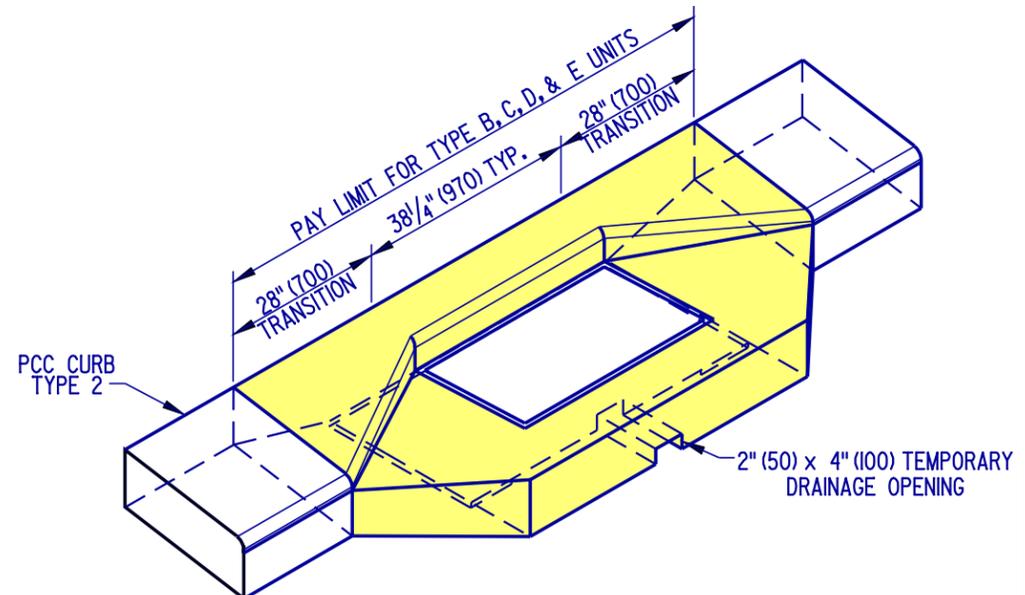


**S501 BENDING DIAGRAM**

S501 IS NOT REQUIRED TO BE ONE CONTINUOUS BAR. IF MORE THAN ONE BAR IS USED, THERE MUST BE A 12" (300) OVERLAP BETWEEN BARS.

**DRAINAGE INLET TOP UNITS**

NOTE: TOP UNIT IS TO BE CAST-IN-PLACE TO GRADE AS SPECIFIED ON PLAN SHEETS OR AS DIRECTED BY ENGINEER.



**ISOMETRIC VIEW**

TYPE E UNIT SHOWN



**DELAWARE DEPARTMENT OF TRANSPORTATION**

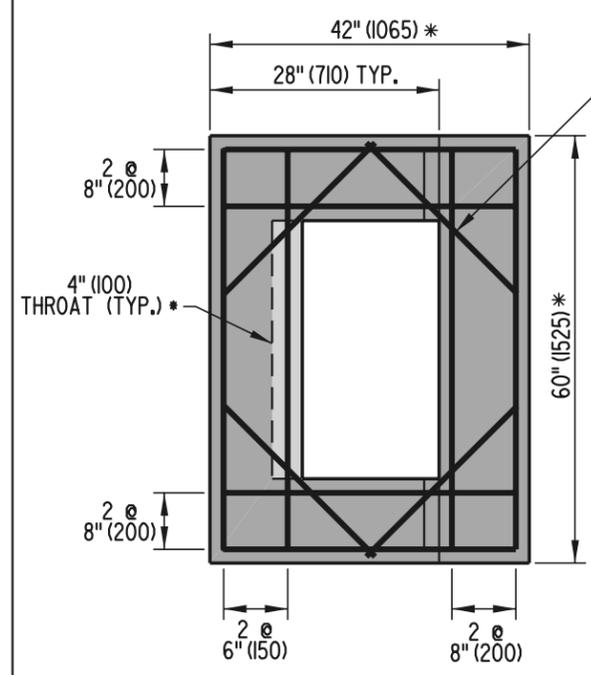
**DRAINAGE INLET DETAILS**  
 STANDARD NO. **D-5 (2004)** SHT. **3** OF **8**

APPROVED *Carolann Wicks* 1/10/05  
 CHIEF ENGINEER DATE  
 RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
 DESIGN ENGINEER DATE

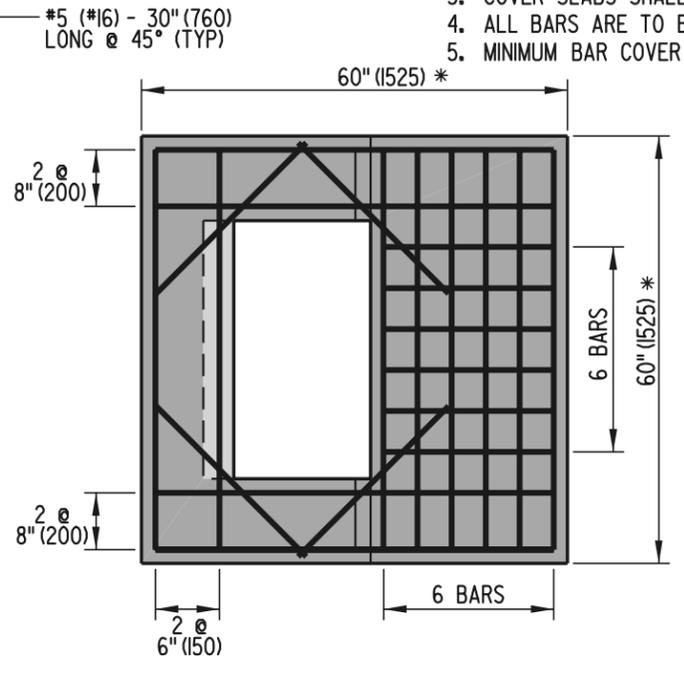
SCALE : N.T.S.

- NOTE :**
- 4" (100) THROAT IS FOR TYPES B AND C TOP UNITS ONLY.
  - RELOCATE ENCROACHING REINFORCING BARS WHEN USING TYPES B & C TOP UNITS.
  - COVER SLABS SHALL BE PRE-CAST AND MUST BE SIZED TO FIT INLET BOX DIMENSIONS.
  - ALL BARS ARE TO BE #5 (#16) SPACED @ 6" (150) ± UNLESS NOTED OTHERWISE.
  - MINIMUM BAR COVER = 1 1/2" (38).

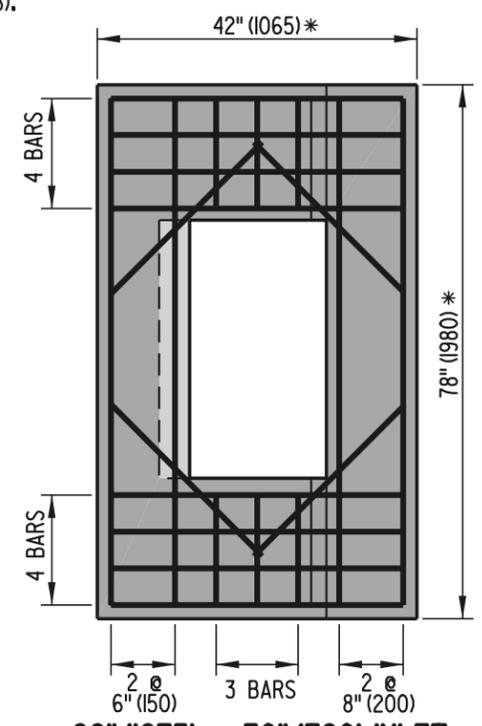
\* - DIMENSIONS TO MATCH OUTSIDE TO OUTSIDE DIMENSIONS OF BOX



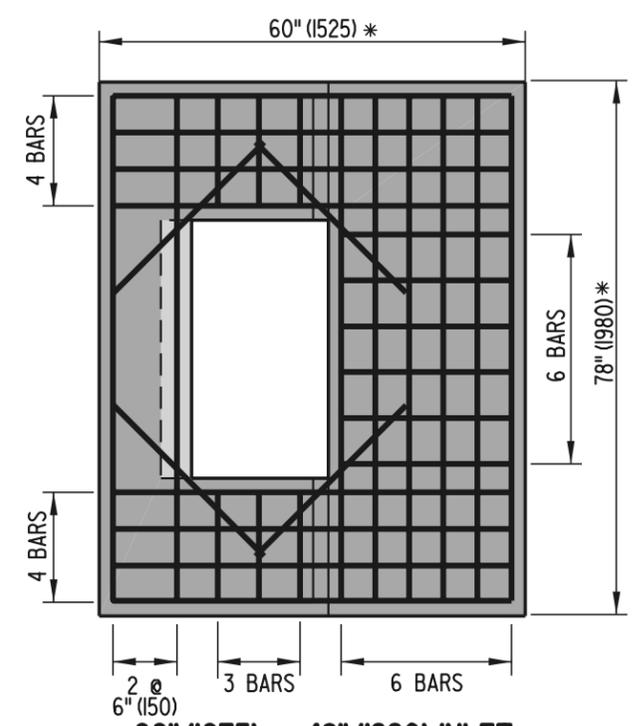
**48" (1220) x 30" (760) INLET**



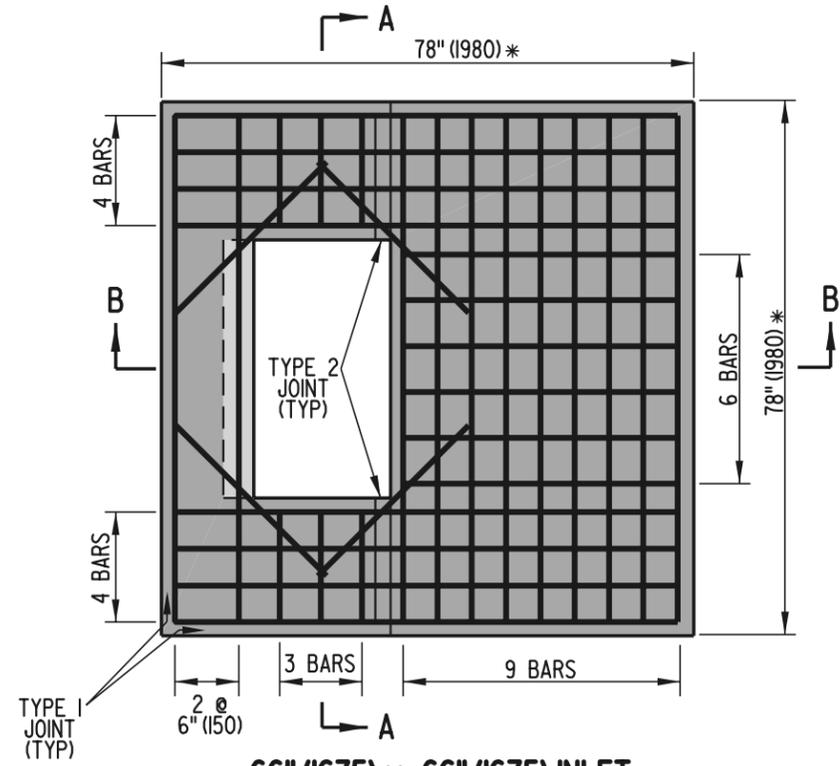
**48" (1220) x 48" (1220) INLET**



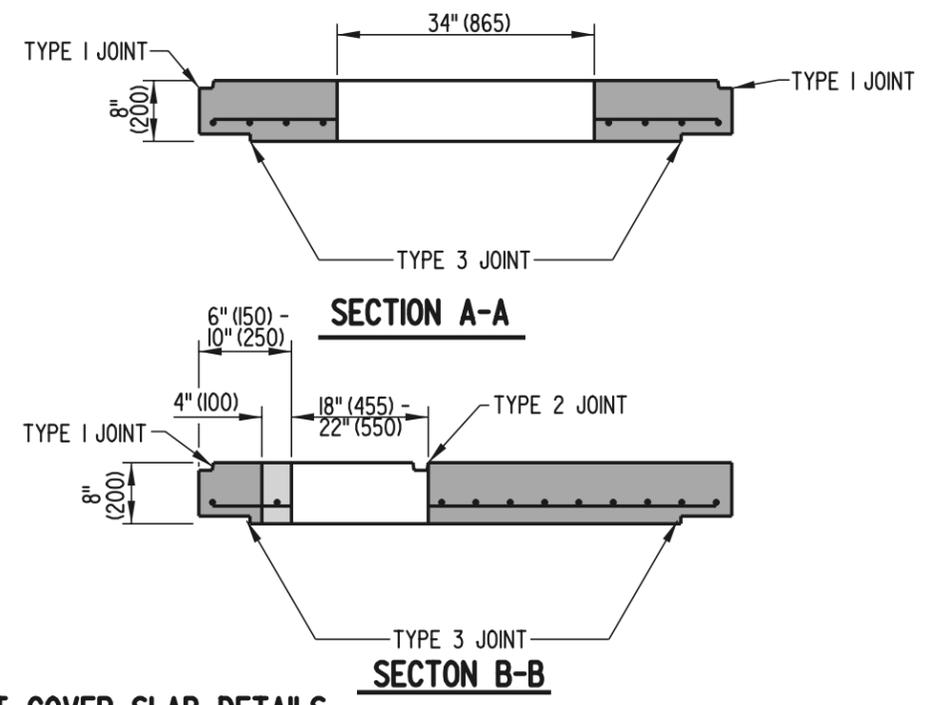
**66" (1675) x 30" (760) INLET**



**66" (1675) x 48" (1220) INLET**



**66" (1675) x 66" (1675) INLET**



**DRAINAGE INLET COVER SLAB DETAILS**

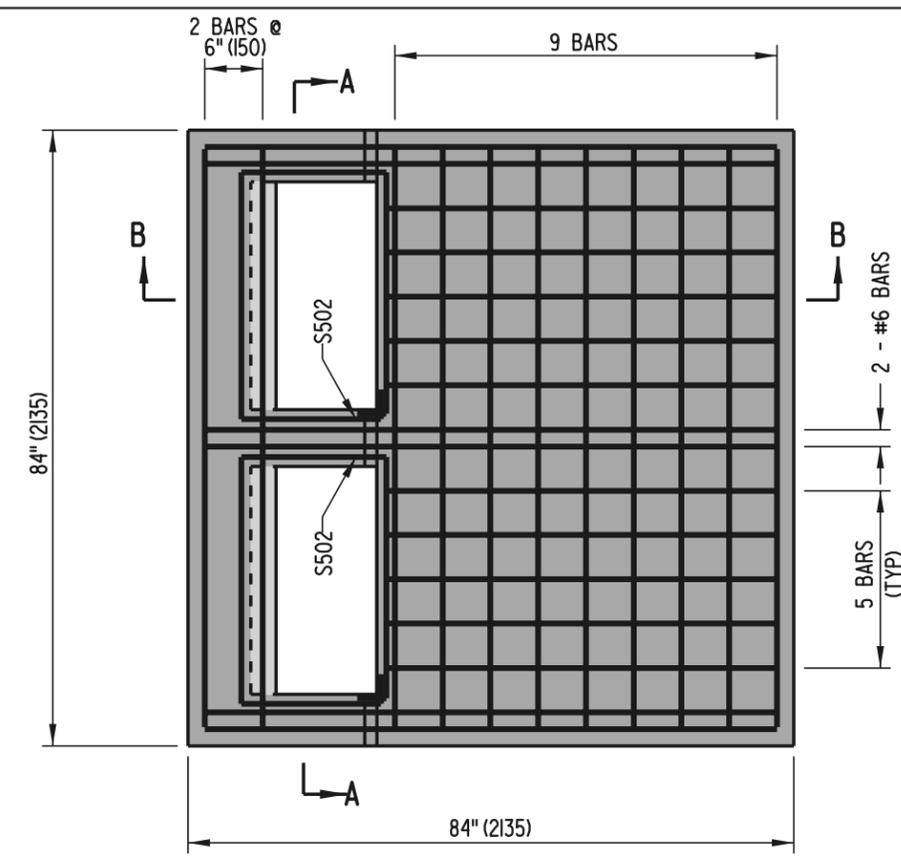
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DEPARTMENT OF TRANSPORTATION

DRAINAGE INLET DETAILS			
STANDARD NO.	D-5 (2002)	SHT.	4 OF 8

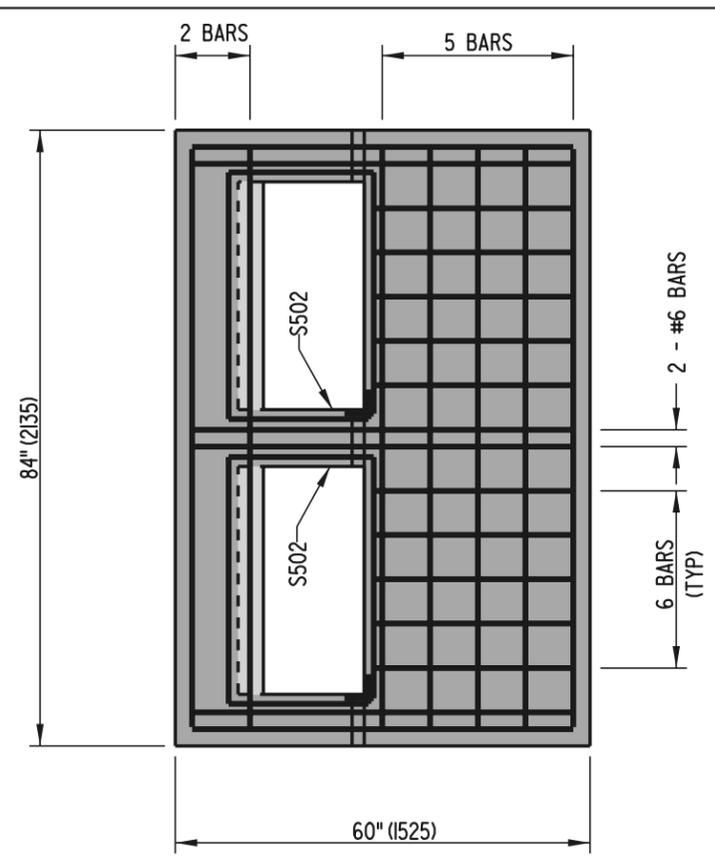
APPROVED *Caution Wicks* 9/6/02  
CHIEF ENGINEER DATE

RECOMMENDED *Therese Delph* 8/19/02  
DESIGN ENGINEER DATE

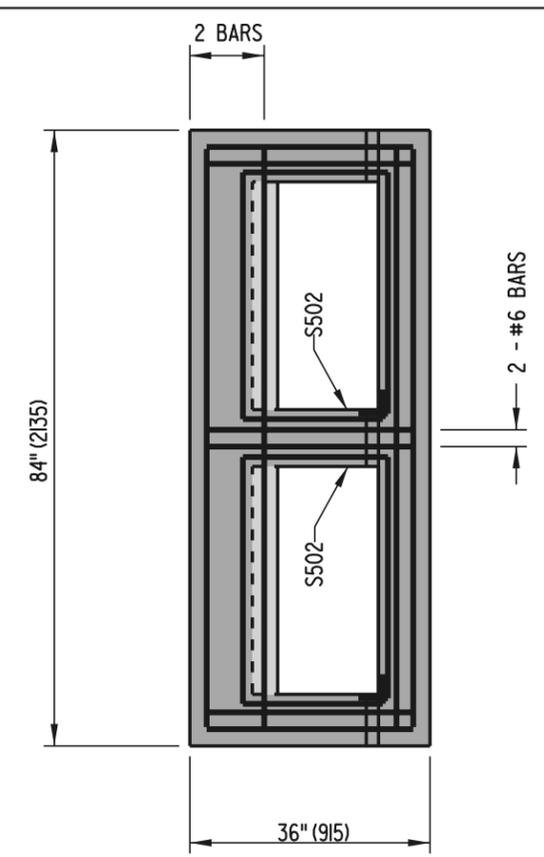
SCALE : N.T.S.



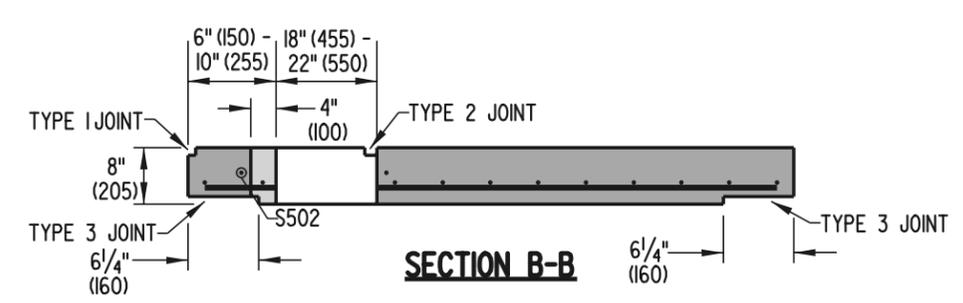
**72" (1830) x 72" (1830) INLET**



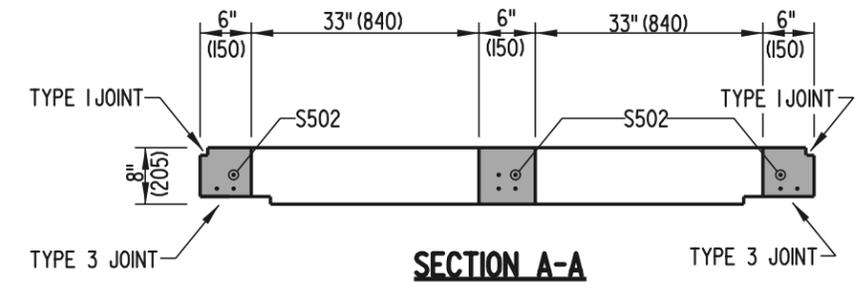
**72" (1830) x 48" (1220) INLET**



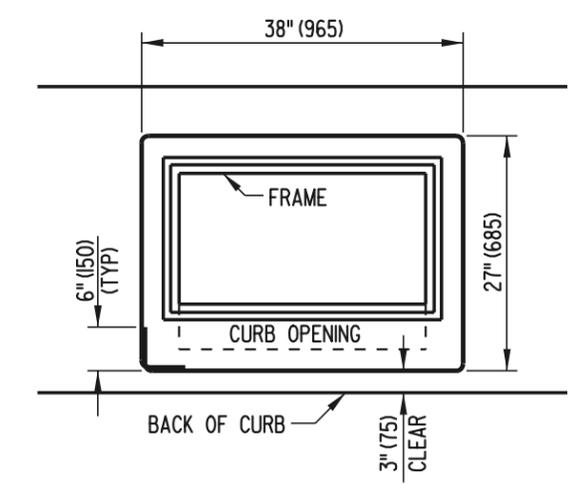
**72" (1830) x 24" (610) INLET**



**SECTION B-B**



**SECTION A-A**



**S502 BENDING DIAGRAM**

S502 IS NOT REQUIRED TO BE ONE CONTINUOUS BAR. IF MORE THAN ONE BAR IS USED, THERE MUST BE A 12" (300) OVERLAP BETWEEN BARS.

- NOTE :**
1. 4" (100) THROAT IS FOR TYPES B AND C TOP UNITS ONLY.
  2. RELOCATE ENCROACHING REINFORCING BARS WHEN USING TYPES B & C TOP UNITS.
  3. COVER SLABS ARE TO BE PRE-CAST AND MUST BE SIZED TO FIT INLET BOX DIMENSIONS.
  4. ALL BARS ARE TO BE #5 (#16) SPACED @ 6" (150) ± UNLESS NOTED OTHERWISE.
  5. MINIMUM BAR COVER = 1/2" (38).



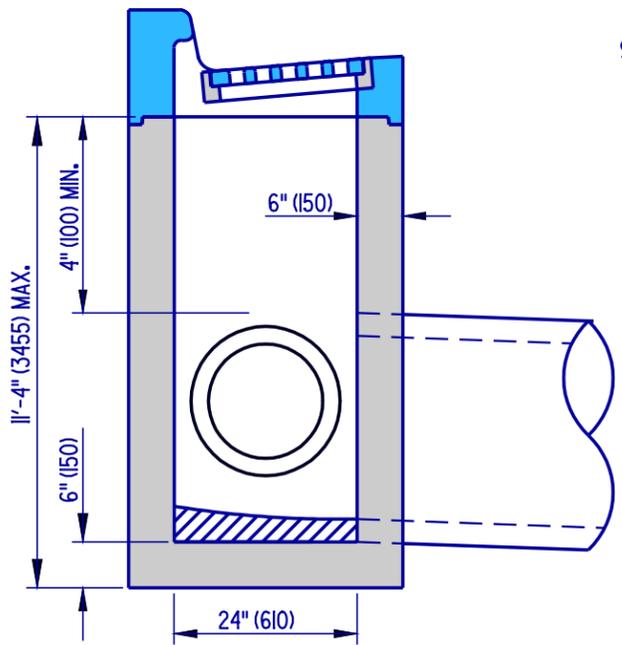
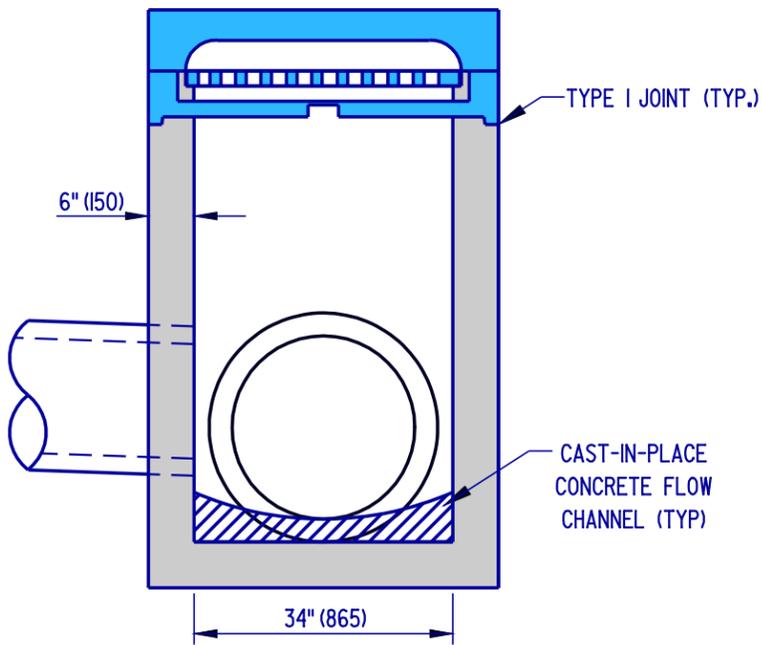
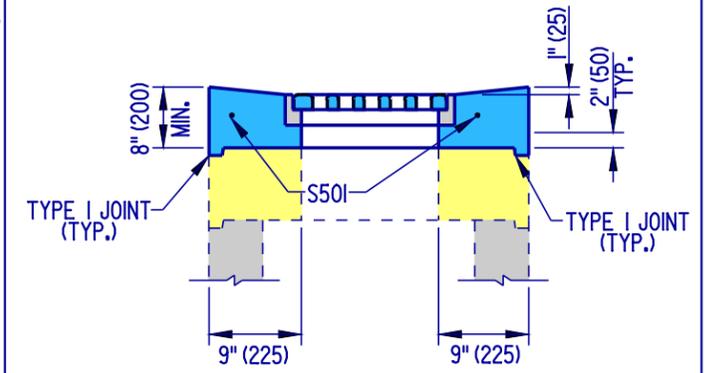
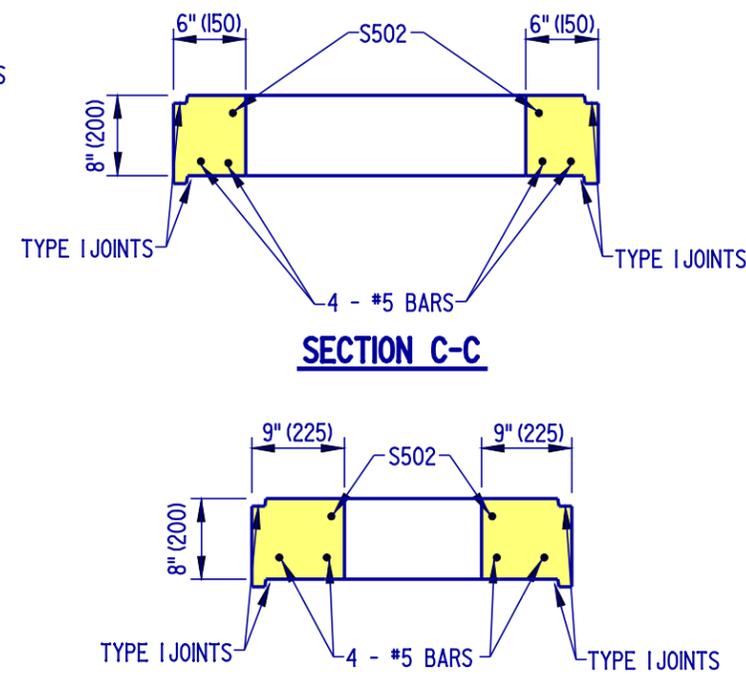
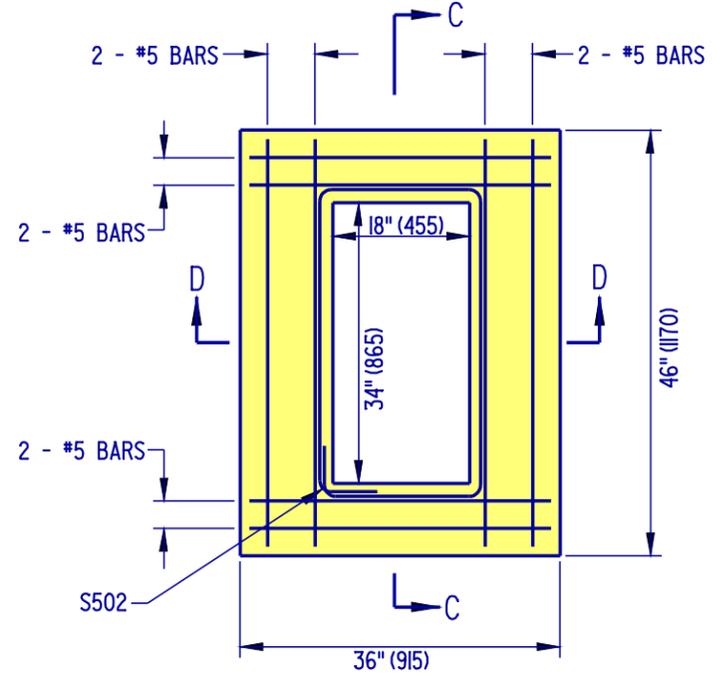
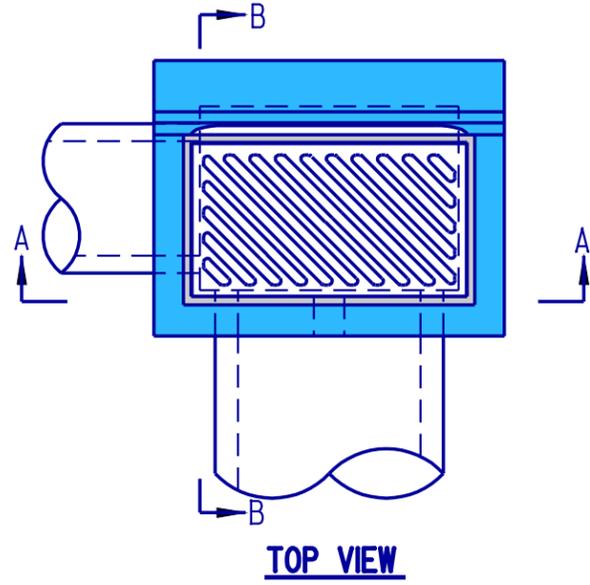
**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**DOUBLE INLET COVER SLAB DETAILS**

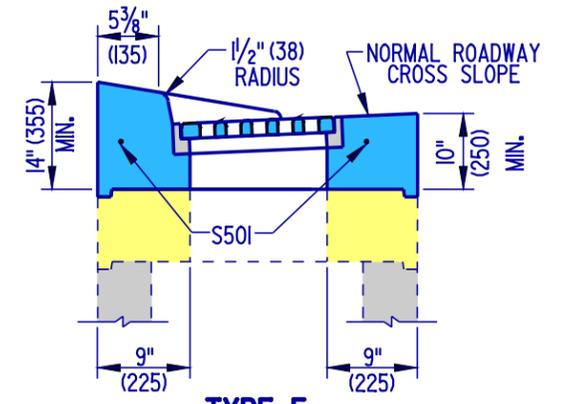
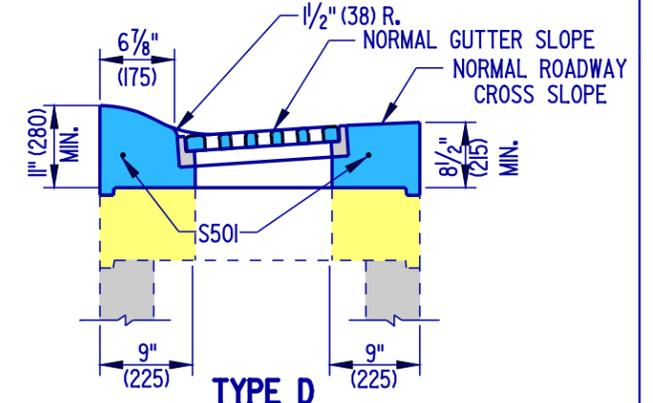
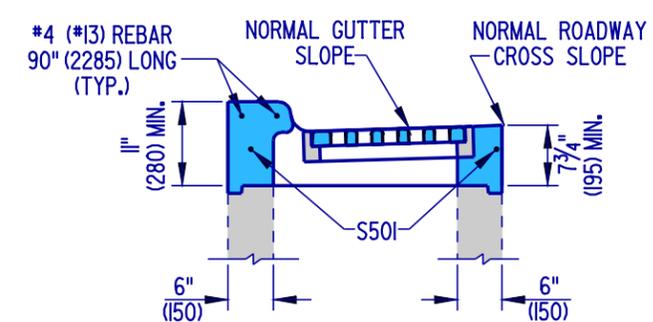
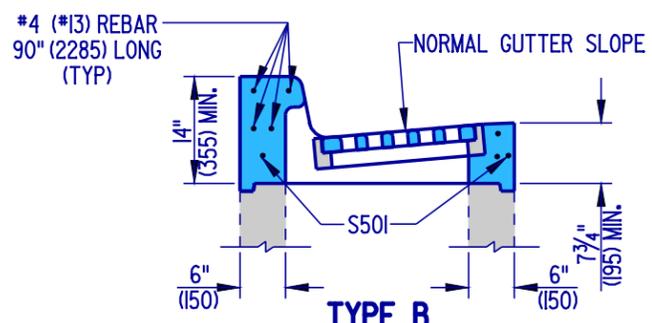
STANDARD NO. **D-5 (2002)** SHT. **5** OF **8**

APPROVED *Carston Wicks* 9/6/02  
CHIEF ENGINEER DATE  
 RECOMMENDED *Thurston Adams* 8/19/02  
DESIGN ENGINEER DATE

SCALE : N.T.S.



**34" (865) x 24" (610) DRAINAGE INLET DETAILS**  
NOTE: REFER TO PREVIOUS SHEETS FOR REINFORCING REQUIREMENTS



**TOP UNIT DETAILS**



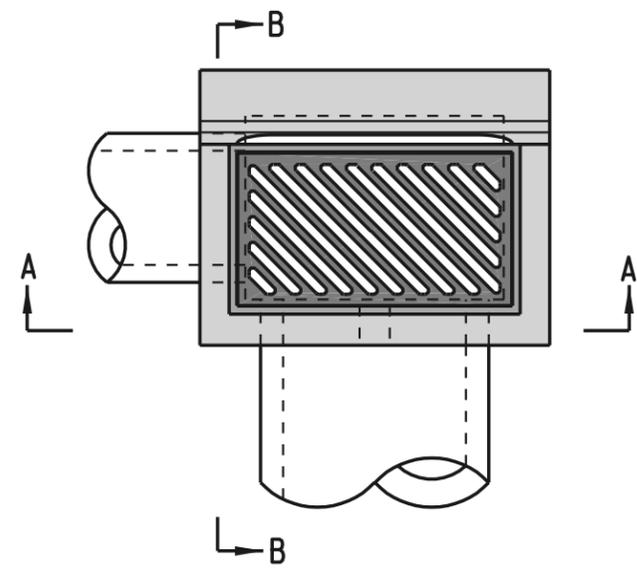
**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

**DRAINAGE INLET DETAILS**

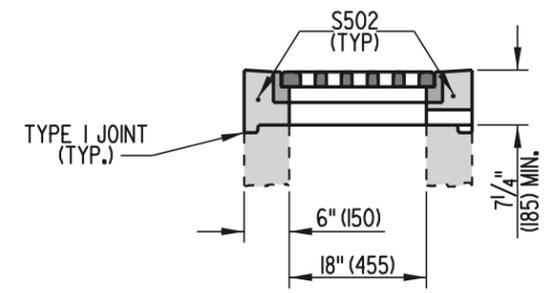
STANDARD NO. **D-5 (2004)** SHT. **6** OF **8**

APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

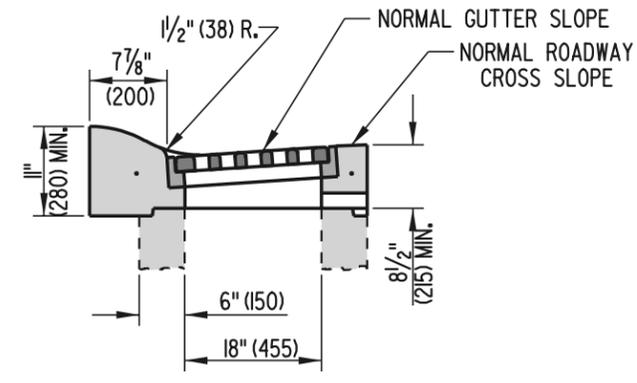
RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



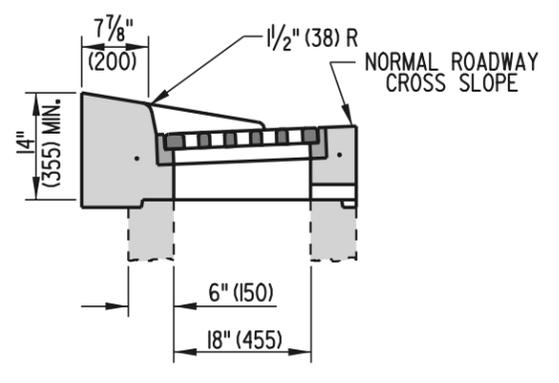
**TOP VIEW**



**TYPE A**

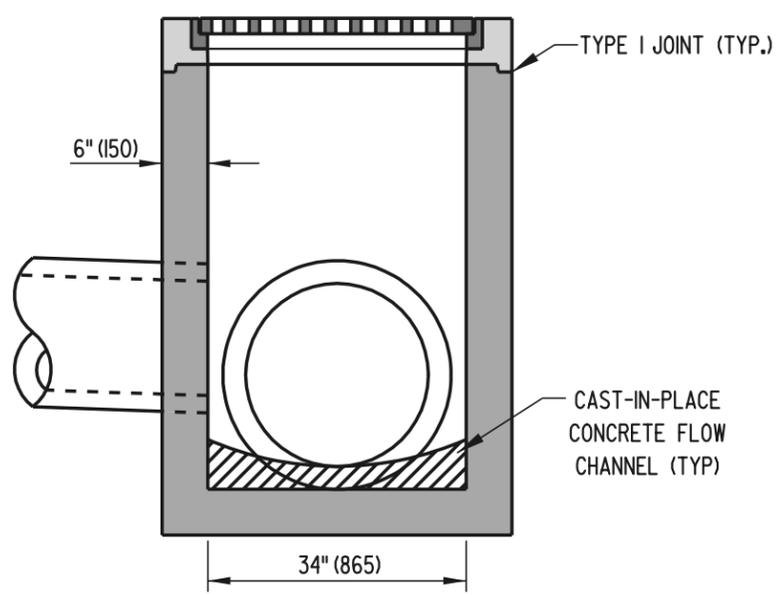


**TYPE D**

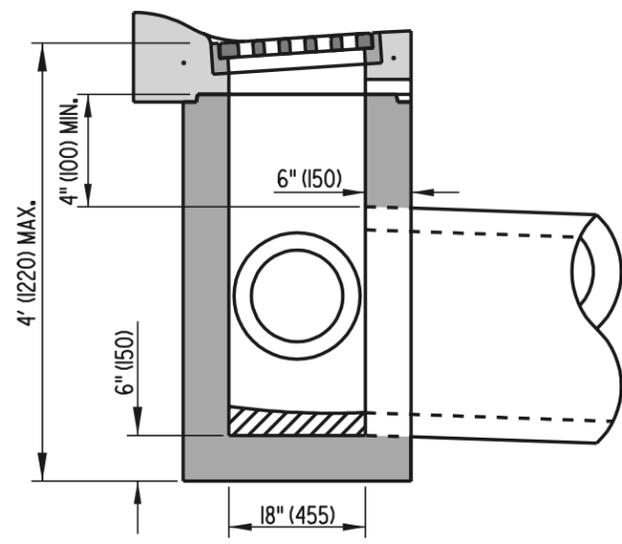


**TYPE E**

**TOP UNIT DETAILS**



**SECTION A-A**

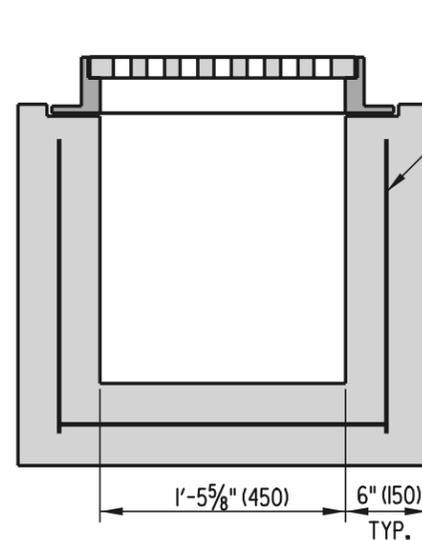
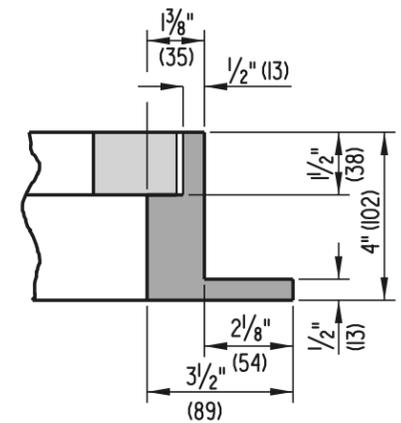
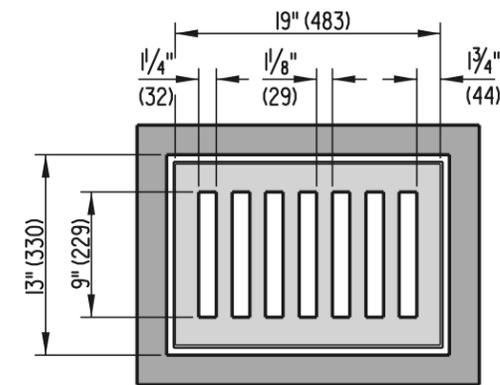
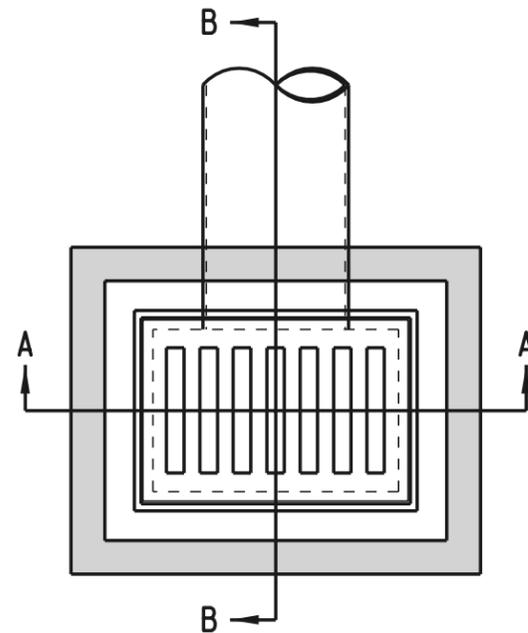


**SECTION B-B**

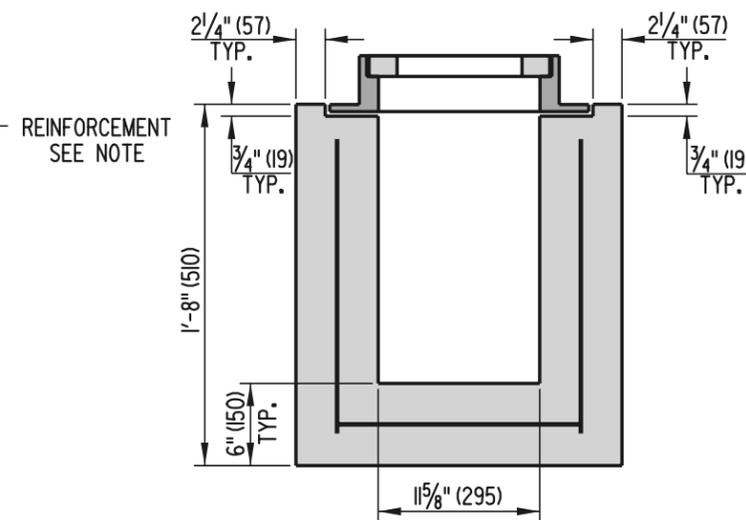
**34" (865) x 18" (455) DRAINAGE INLET DETAILS**

- NOTES:  
 1.) REFER TO PREVIOUS SHEETS FOR REINFORCEMENT REQUIREMENTS  
 2.) THE HEIGHT OF THIS INLET IS LIMITED TO 4' (1220) MAXIMUM, THEREFORE STEPS WILL NOT BE REQUIRED AND SHOULD NOT BE INSTALLED ON THIS INLET.

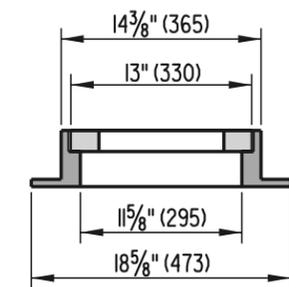
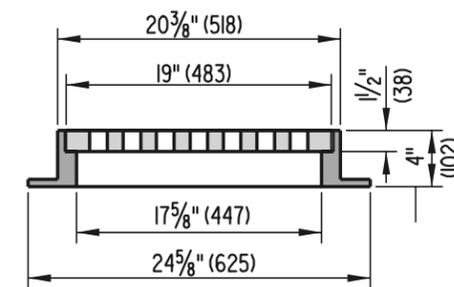
**NOTE:** 1. REINFORCEMENT SHALL BE 4" (102) X 4" (102) W4 X W4 (W26 X W26)  
 2. INLET BOXES ARE TO BE PRE-CAST OR CAST-IN-PLACE.



SECTION A-A



SECTION B-B



DELAWARE  
 DEPARTMENT OF TRANSPORTATION

LAWN INLET

STANDARD NO.

D-5 (2002)

SHT. 8

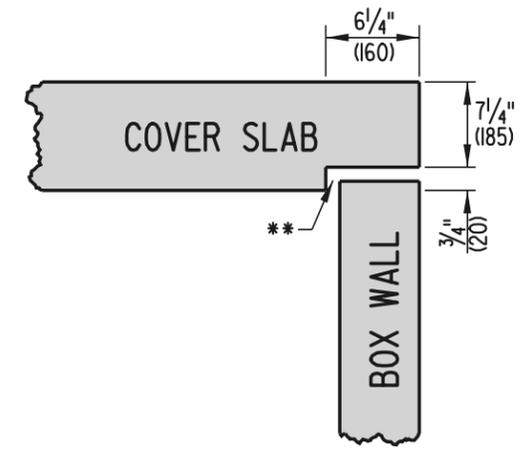
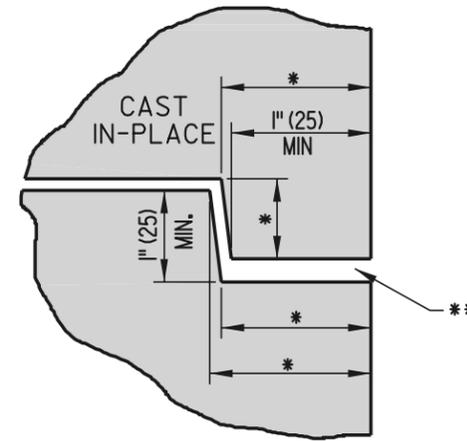
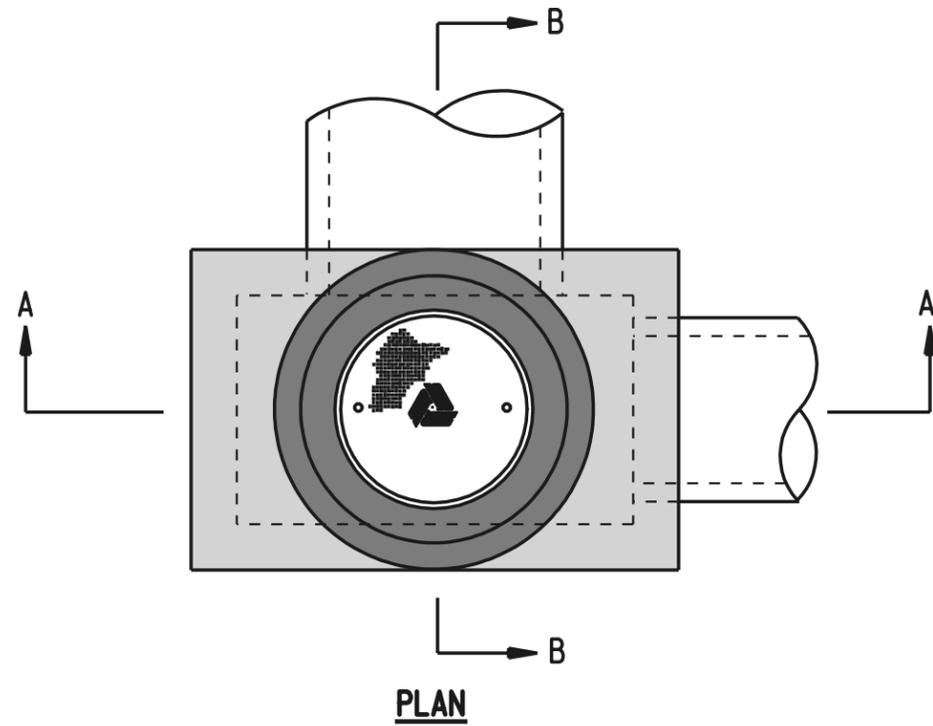
OF 8

APPROVED

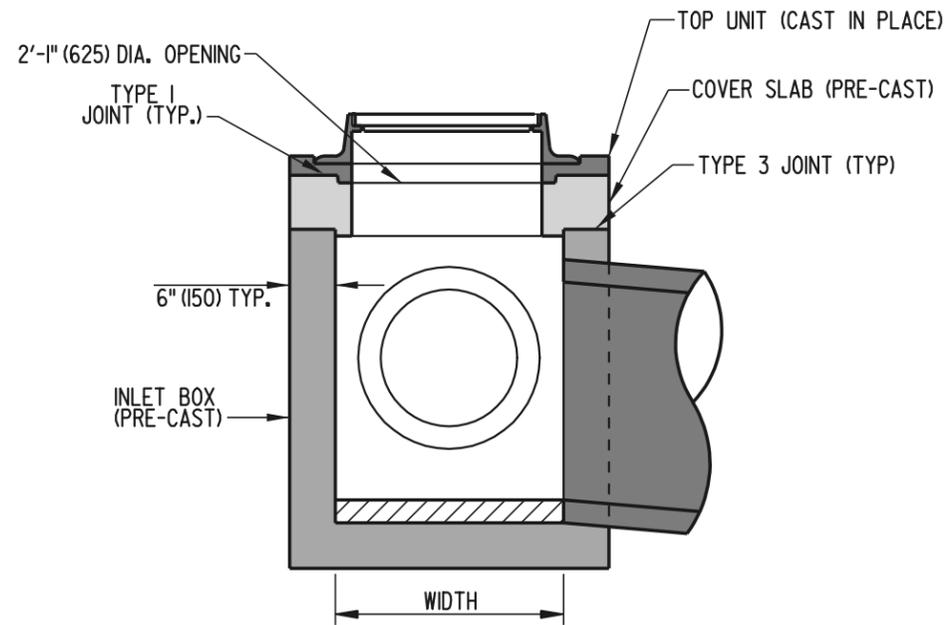
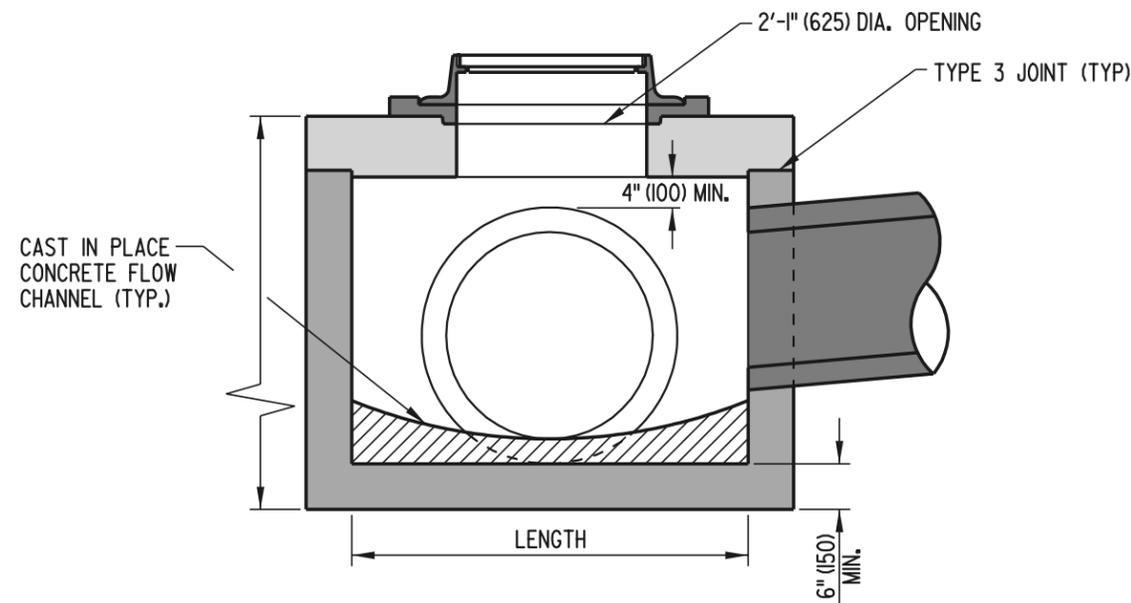
*Caution Wicks*  
 CHIEF ENGINEER DATE 9/6/02

RECOMMENDED

*Theresa Delgado*  
 DESIGN ENGINEER DATE 8/19/02



\* DIMENSIONS WILL VARY  
 \*\* JOINT SEALANT



**BOX MANHOLE ASSEMBLY**

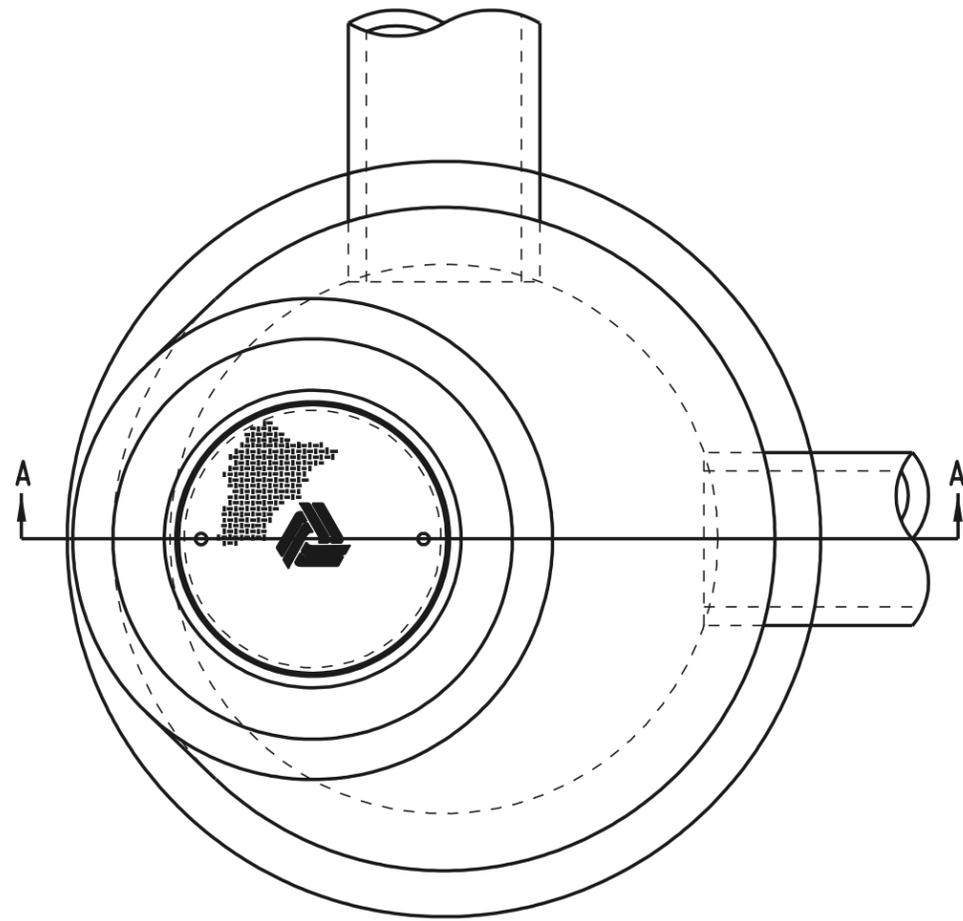


**DELAWARE  
 DEPARTMENT OF TRANSPORTATION**

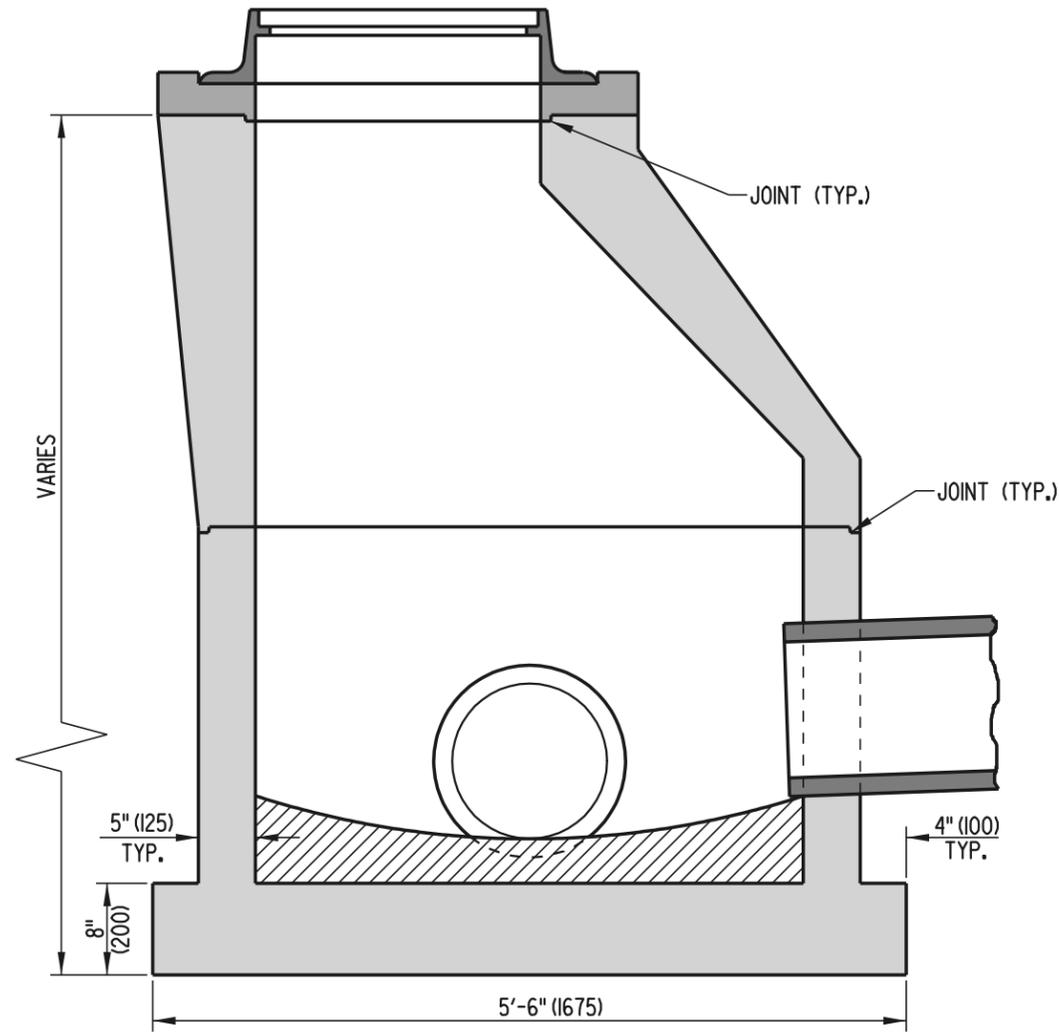
**MANHOLE DETAILS**

STANDARD NO. **D-6 (2001)** SHT. **1** OF **4**

APPROVED *Ryan M. Harshbarger* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Michael R. [Signature]* 6/18/01  
DESIGN ENGINEER DATE



PLAN



SECTION A-A

ROUND MANHOLE ASSEMBLY

NOTE: ROUND MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M 199.



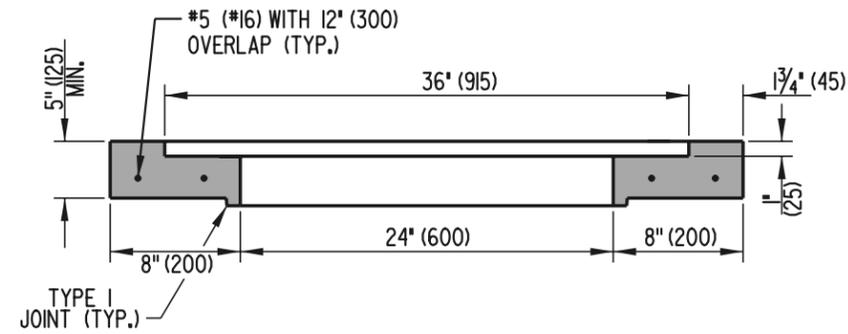
DELAWARE  
DEPARTMENT OF TRANSPORTATION

MANHOLE DETAILS

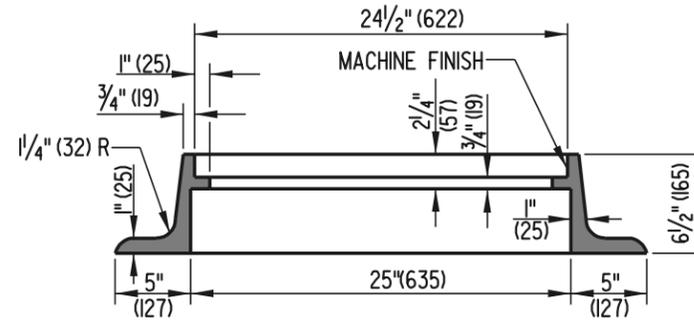
STANDARD NO. D-6 (2001) SHT. 2 OF 4

APPROVED *Ryan M. Harkness* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Michael R. Gotsch* 6/18/01  
DESIGN ENGINEER DATE

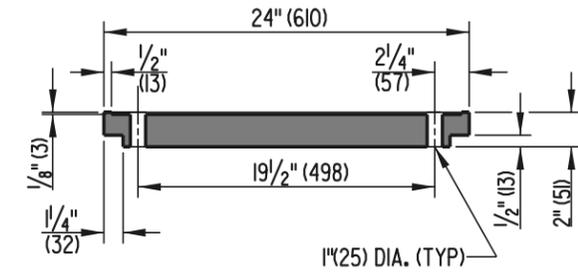
NOTE: TOP UNIT IS TO BE CAST IN PLACE TO GRADE AS SPECIFIED ON PLAN SHEETS OR AS DIRECTED BY ENGINEER.



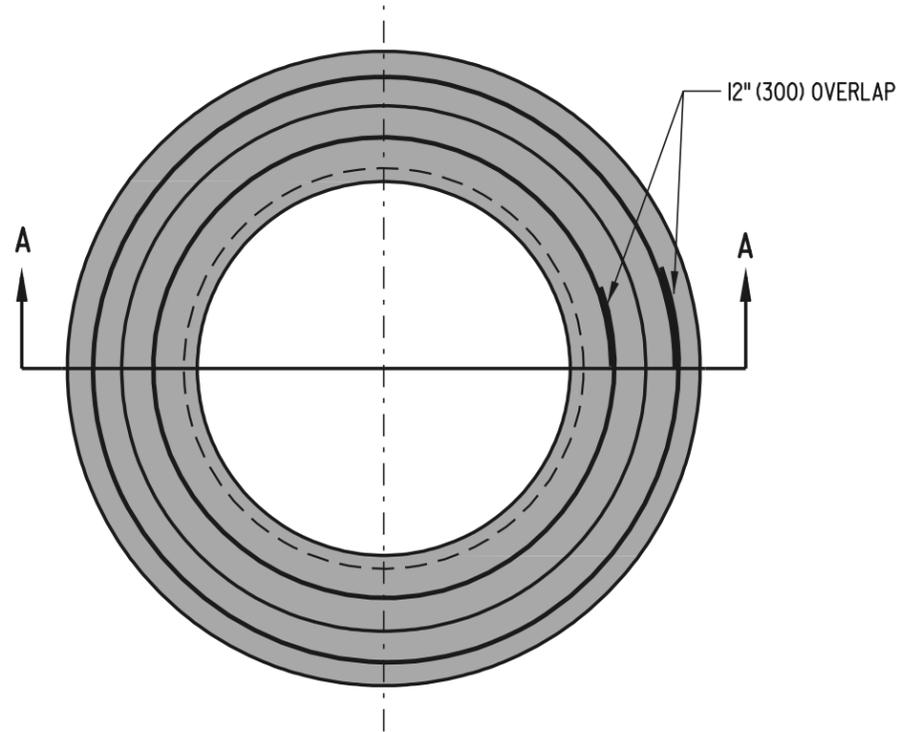
**SECTION A-A**



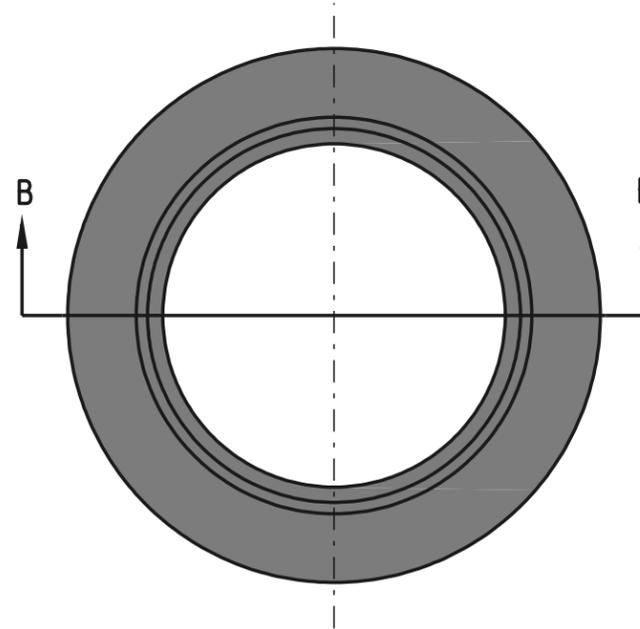
**SECTION B-B**



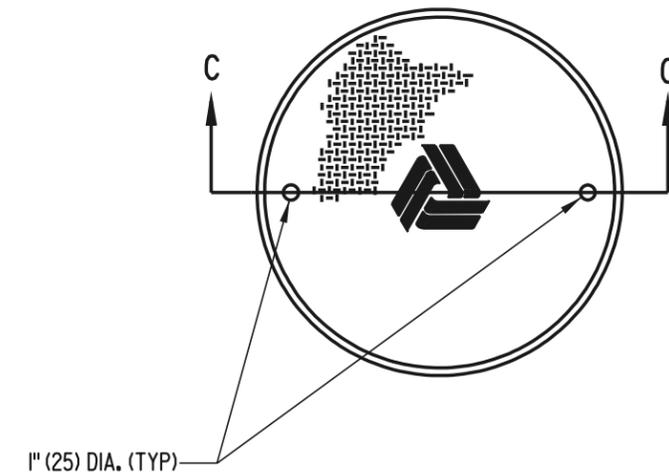
**SECTION C-C**



**TOP UNIT**



**FRAME**



**COVER**



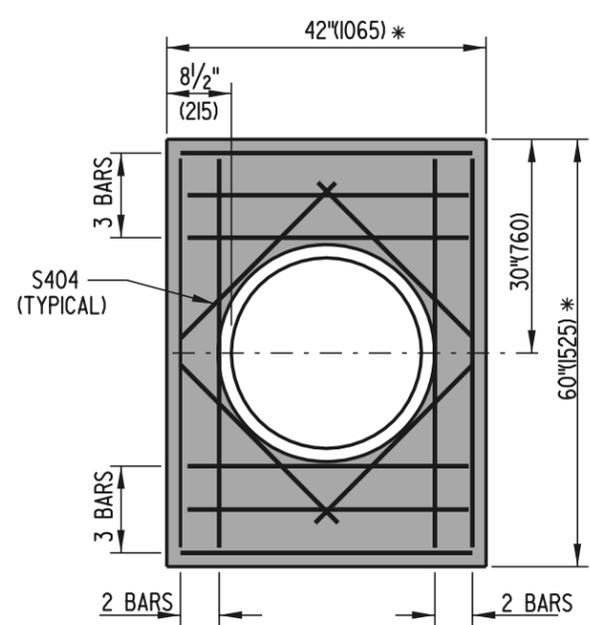
DELAWARE  
DEPARTMENT OF TRANSPORTATION

MANHOLE DETAILS

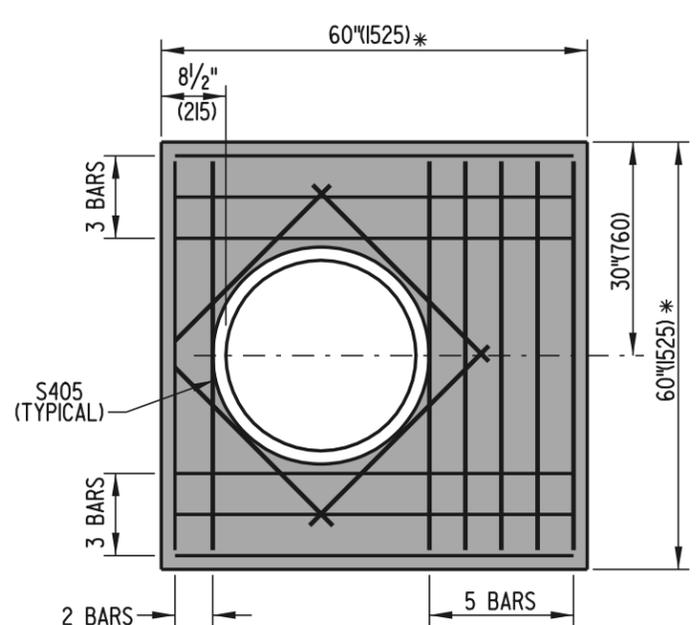
STANDARD NO. D-6 (2001) SHT. 3 OF 4

APPROVED *Ryan M. Harkins* 6/18/01  
CHIEF ENGINEER DATE

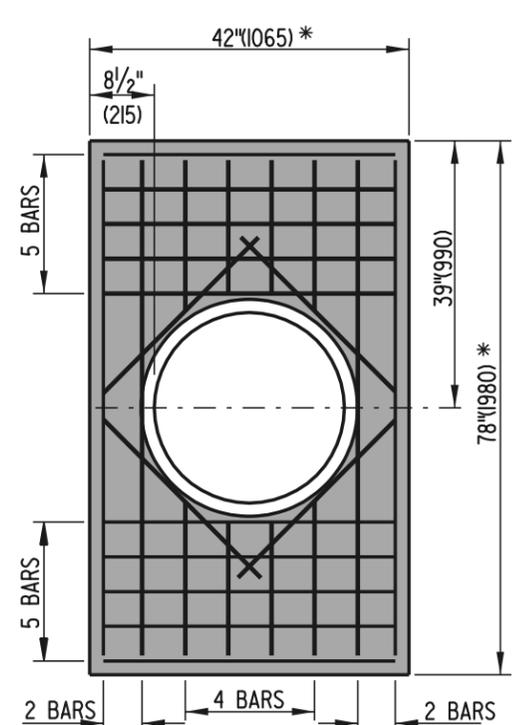
RECOMMENDED *Mehal Akhavan* 6/18/01  
DESIGN ENGINEER DATE



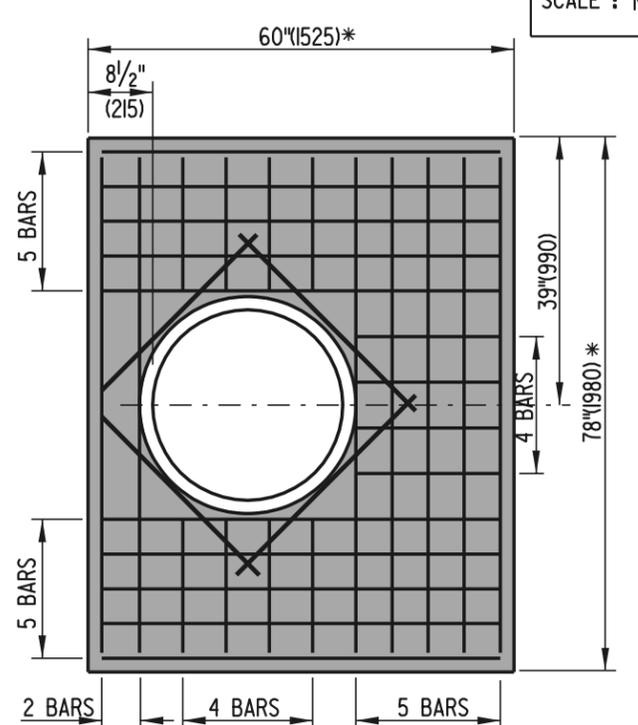
**48" (1220) X 30" (760) MANHOLE**



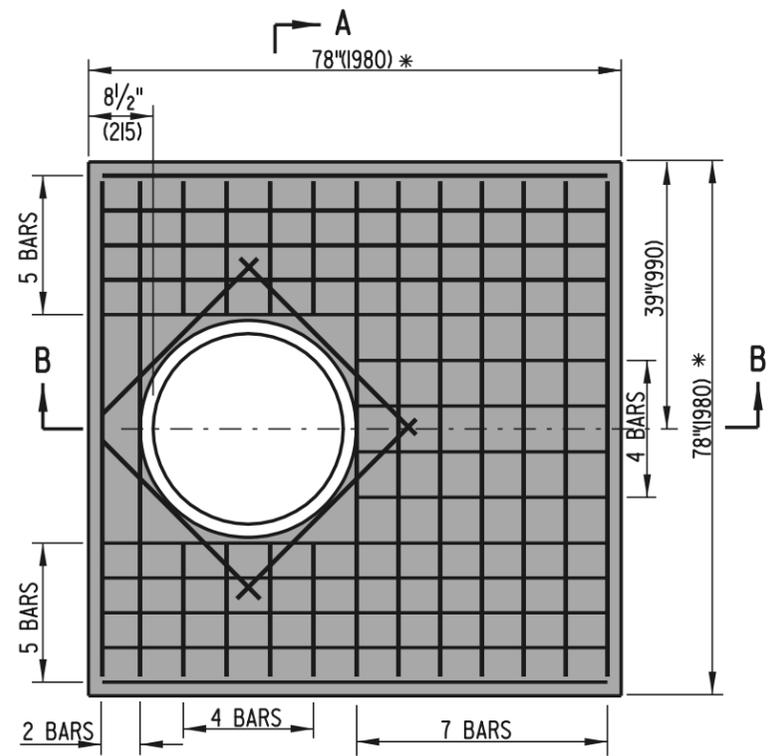
**48" (1220) X 48" (1220) MANHOLE**



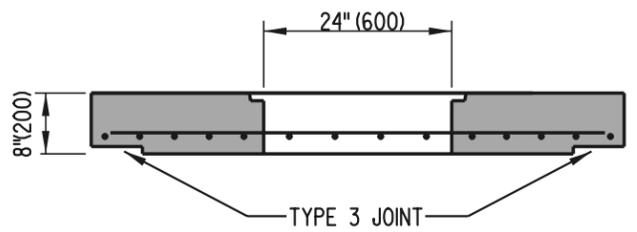
**66" (1675) X 30" (760) MANHOLE**



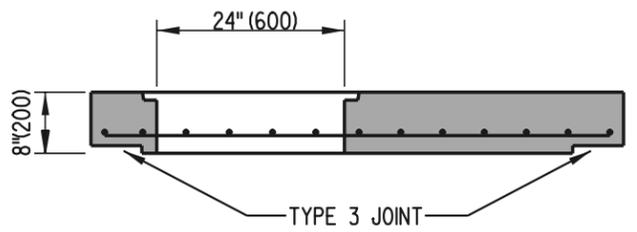
**66" (1675) X 48" (1220) MANHOLE**



**66" (1675) X 66" (1675) MANHOLE**



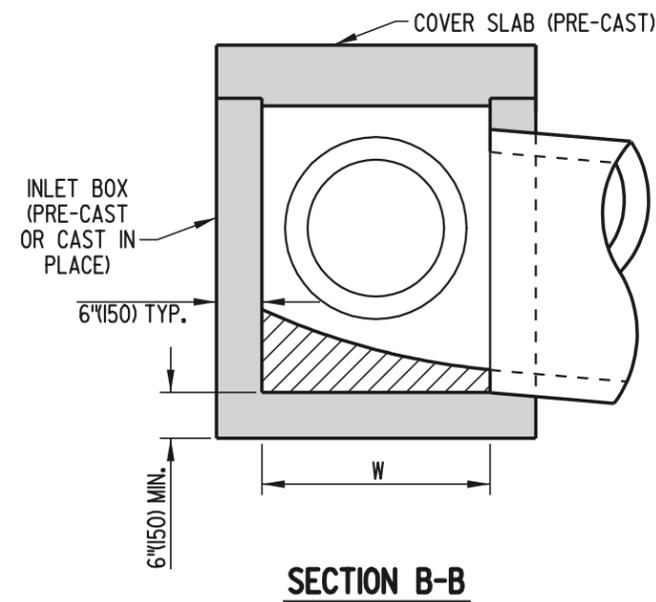
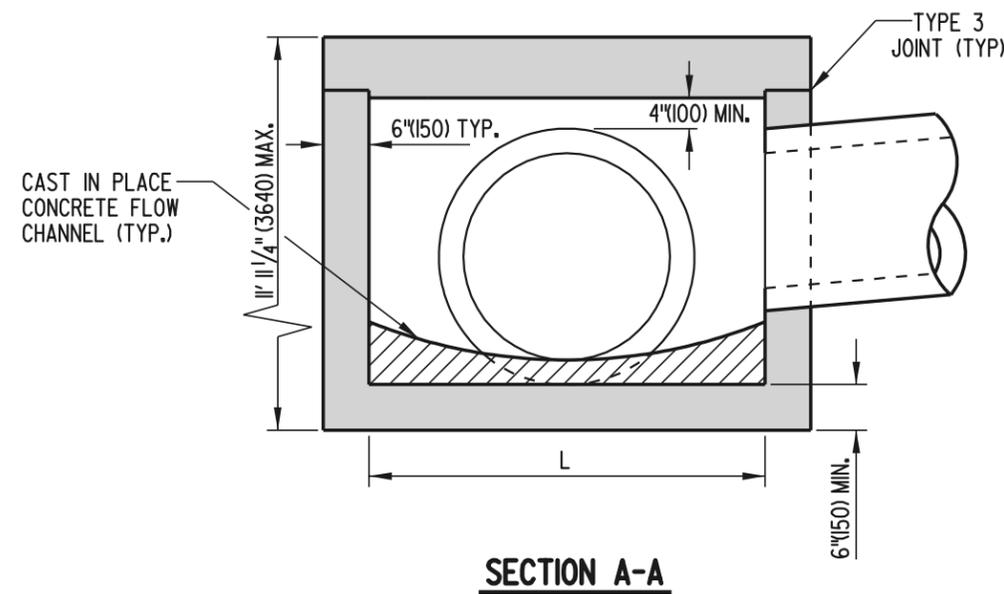
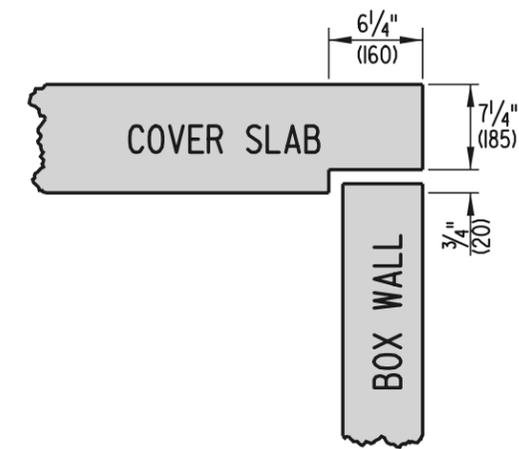
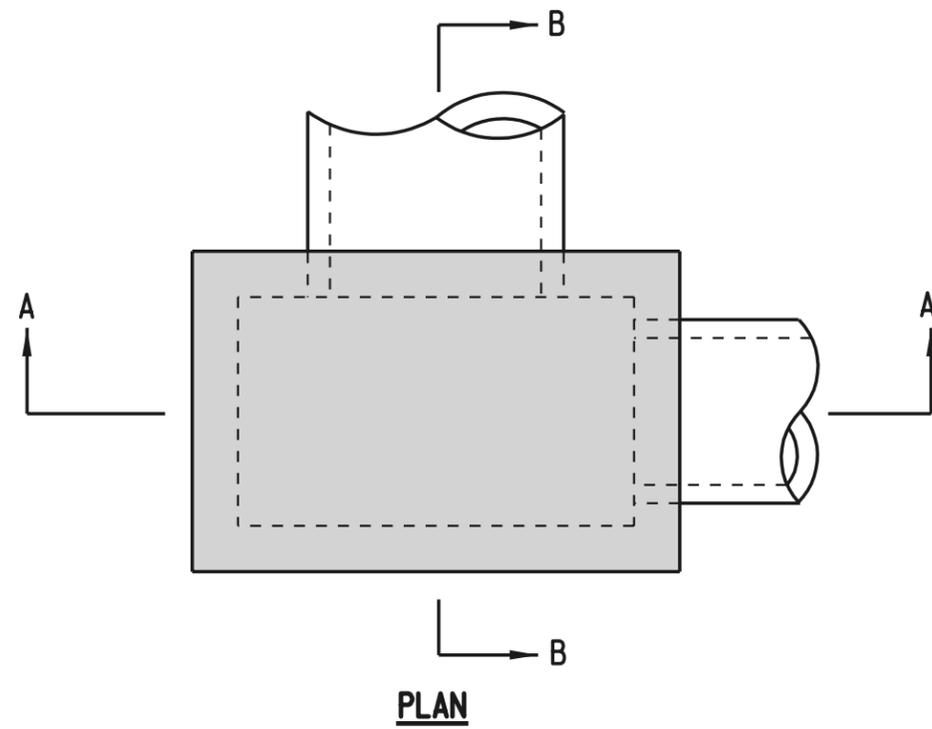
**SECTION A-A**



**SECTION B-B**

**BOX MANHOLE COVER SLAB DETAILS**

- NOTES:**
- COVER SLABS SHALL BE PRE-CAST.
  - ALL BARS SHALL BE #5 (\*16) SPACED AT 6" (150) ± UNLESS NOTED OTHERWISE.
  - MINIMUM BAR COVER = 1/2" (38).
- \* - DIMENSIONS TO MATCH OUTSIDE TO OUTSIDE DIMENSIONS OF BOX.



**JUNCTION BOX ASSEMBLY**



DELAWARE  
DEPARTMENT OF TRANSPORTATION

JUNCTION BOX DETAILS

STANDARD NO.

D-7 (2002)

SHT. 1

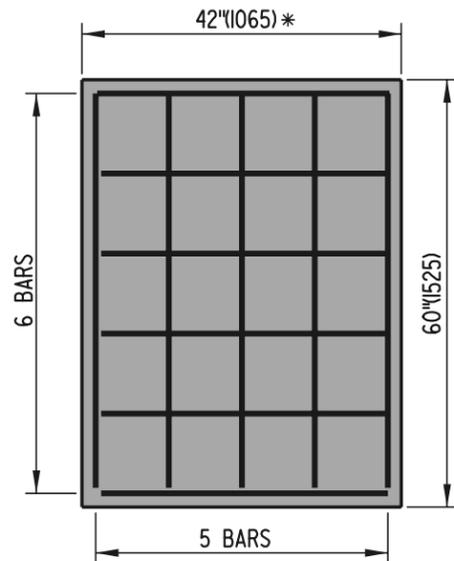
OF 2

APPROVED

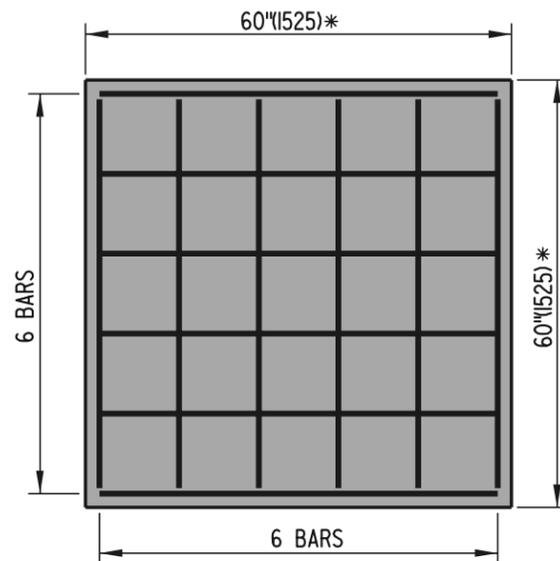
*Caution Wicks*  
CHIEF ENGINEER DATE 9/6/02

RECOMMENDED

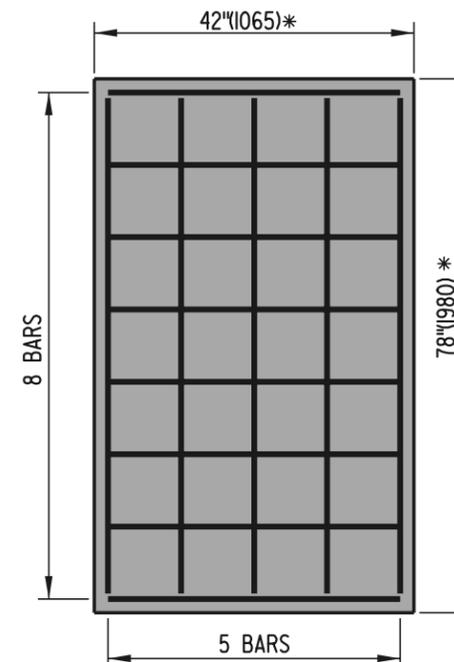
*Theresa Delgado*  
DESIGN ENGINEER DATE 8/19/02



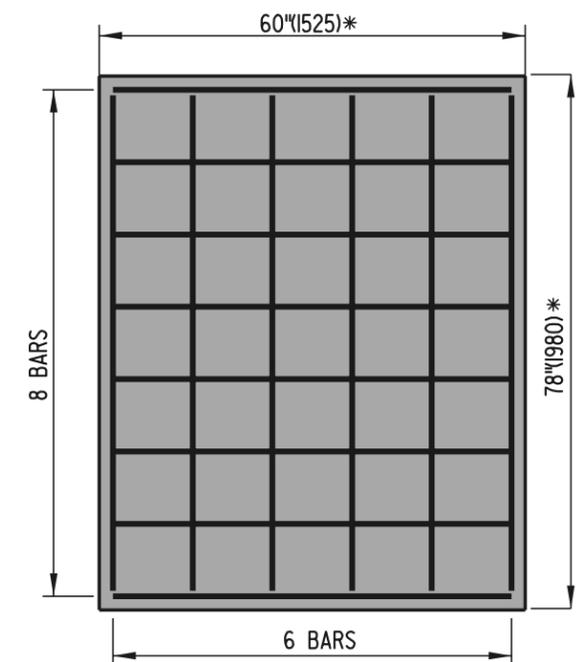
**48" (1220) x 30" (760)  
JUNCTION BOX**



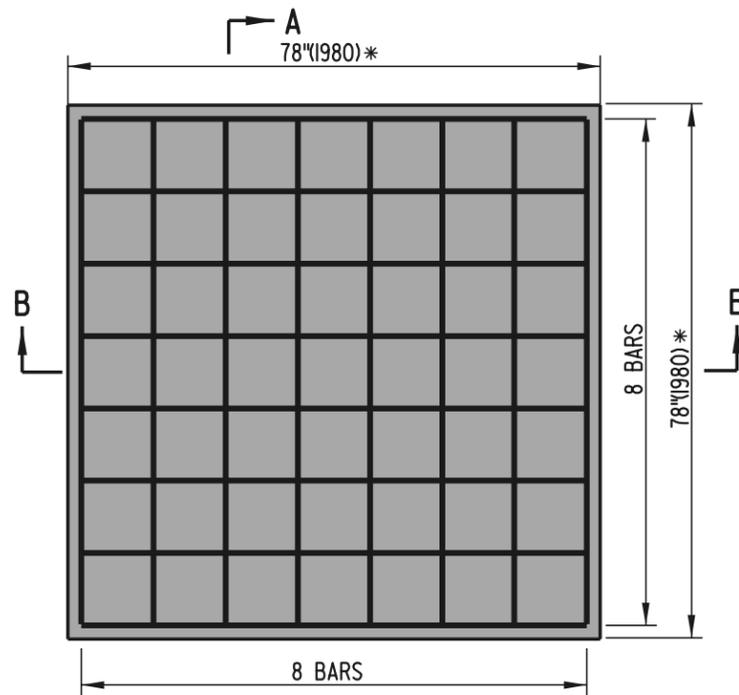
**48" (1220) x 48" (1220)  
JUNCTION BOX**



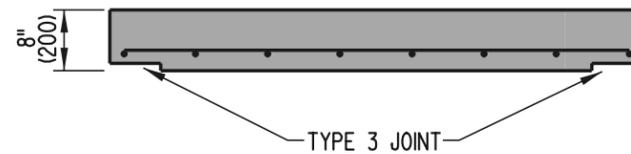
**66" (1675) x 30" (760)  
JUNCTION BOX**



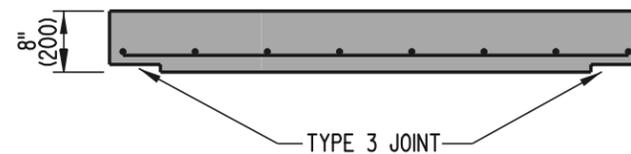
**66" (1675) x 48" (1220)  
JUNCTION BOX**



**66" (1675) x 66" (1675)  
JUNCTION BOX**



**SECTION A-A**



**SECTION B-B**

**JUNCTION BOX COVER SLAB DETAILS**

**NOTES :**

1. COVER SLABS ARE TO BE PRE-CAST.
  2. ALL BARS ARE TO BE #5 (\*16) SPACED @ 12" (305) ± UNLESS NOTED OTHERWISE.
  3. MINIMUM BAR COVER = 1/2" (38).
- \* - DIMENSIONS TO MATCH OUTSIDE TO OUTSIDE DIMENSIONS OF BOX

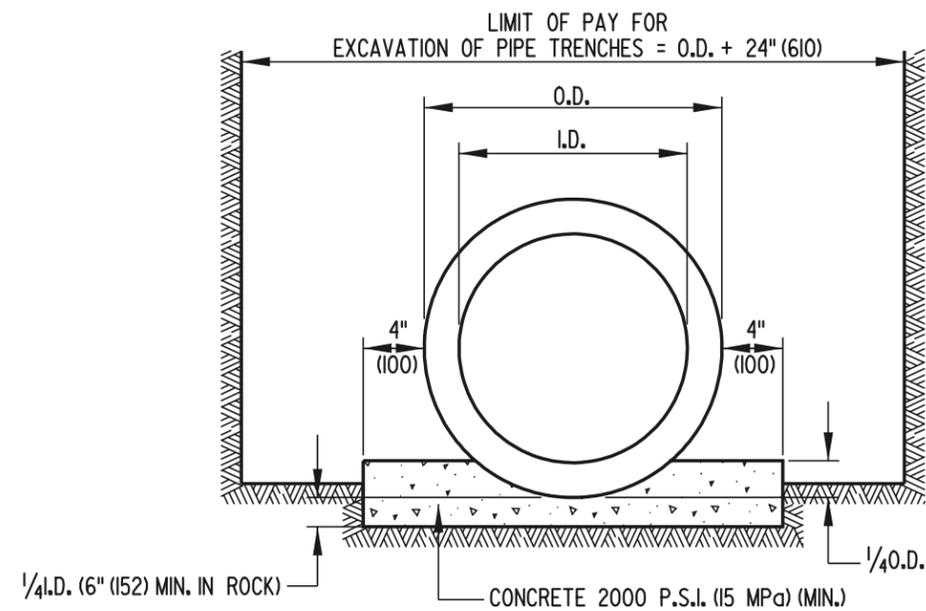


DELAWARE  
DEPARTMENT OF TRANSPORTATION

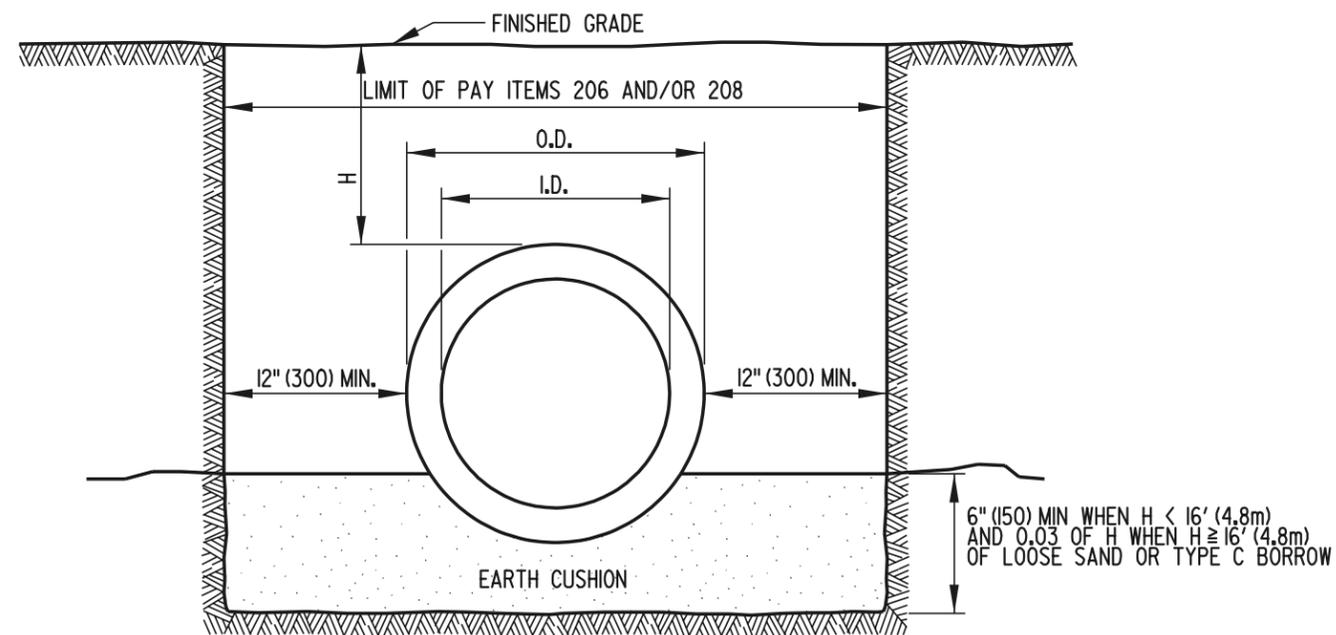
JUNCTION BOX DETAILS

STANDARD NO. D-7 (2002) SHT. 2 OF 2

APPROVED *Caution Wicks* 9/6/02  
CHIEF ENGINEER DATE  
RECOMMENDED *Therese Delgado* 8/19/02  
DESIGN ENGINEER DATE



**CLASS A BEDDING**



**CLASS C BEDDING**

NOTE: USE CLASS C BEDDING UNLESS OTHERWISE INDICATED



DELAWARE  
DEPARTMENT OF TRANSPORTATION

PIPE BEDDING

STANDARD NO.

D-8 (2001)

SHT. 1

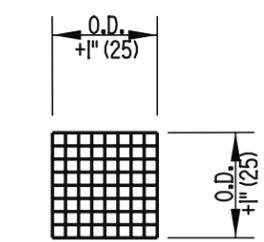
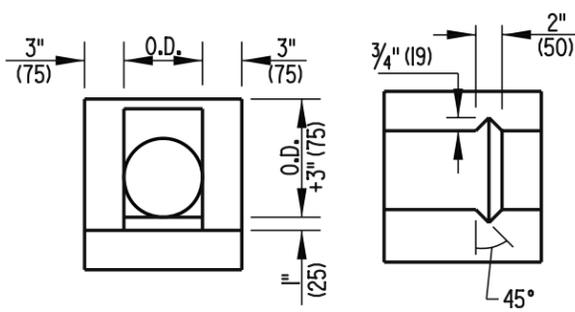
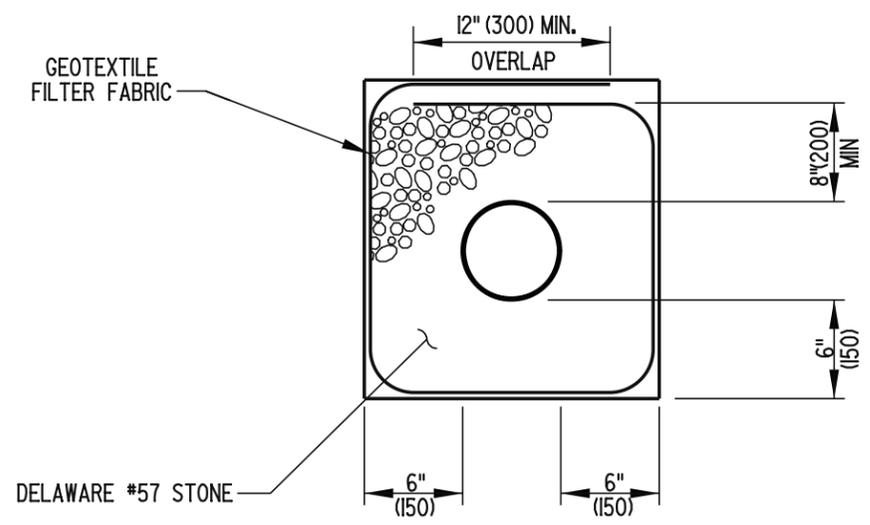
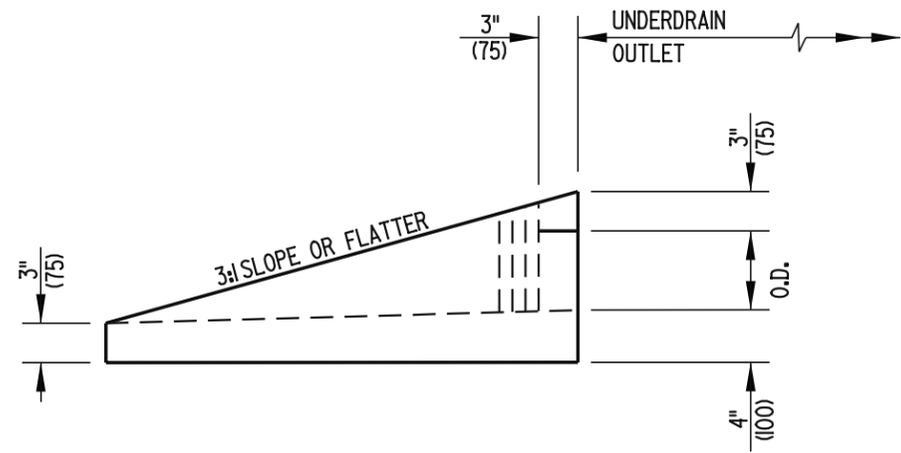
OF 1

APPROVED

*Ryan M. Harshbarger*  
CHIEF ENGINEER DATE 6/18/01

RECOMMENDED

*Michael R. [Signature]*  
DESIGN ENGINEER DATE 6/18/01

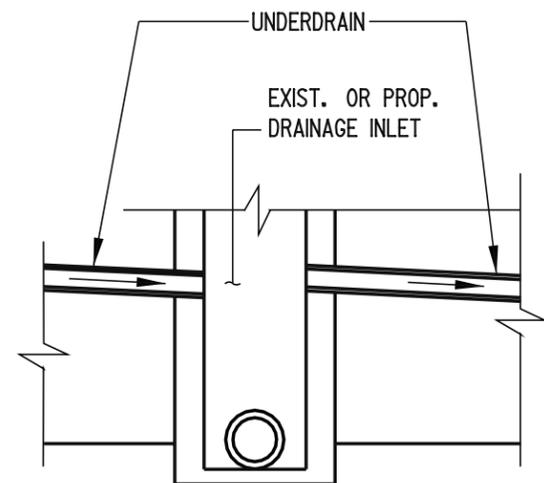


**FRONT VIEW**  
**TOP VIEW**  
**SLOTTED HEADWALL DETAIL**

**FRONT VIEW**  
**RODENT SCREEN**

**DOWNSPOUT SPLASH APRON FOR UNDERDRAIN OUTLET**

NOT TO SCALE

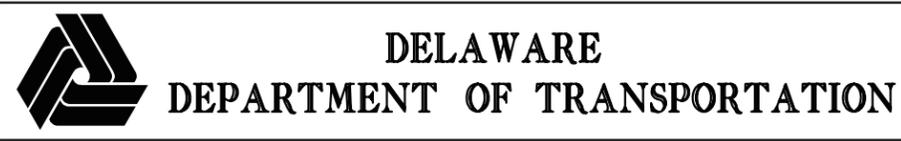


**ELEVATION**

**PERFORATED PIPE UNDERDRAIN**

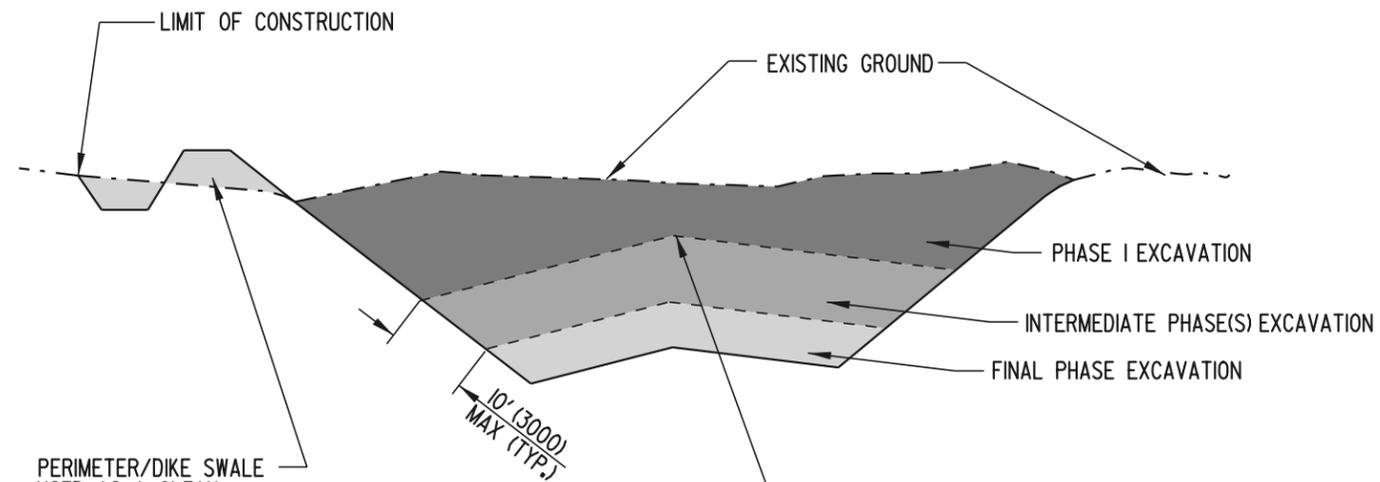
NOT TO SCALE

- NOTES:**
- 1). THE PERFORATED PIPE UNDERDRAIN SHALL BE LOCATED AS SHOWN ON THE TYPICAL SECTIONS OF THE CONSTRUCTION PLANS.
  - 2). GEOTEXTILE FILTER FABRIC SHALL BE PLACED ENTIRELY OVER THE TOP OF UNDERDRAIN TRENCH AND LAPPED AS SHOWN.
  - 3). SLOPE OF UNDERDRAINS SHALL MATCH ROADWAY GRADE, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
  - 4). OUTLET PIPE CONFIGURATIONS SHALL USE 45 DEGREE ELBOWS OR SHALL USE STRAIGHT PIPE WITH A MINIMUM RADIUS OF 3' (900) TO DIRECT UNDERDRAIN PIPE INTO SIDE OF DRAINAGE INLET OR TO POSITIVE GRADE. PIPE SHALL ALSO BE NON-PERFORATED AND HAVE A SMOOTH INTERIOR.
  - 5). RODENT SCREEN SHALL SNUGLY FIT THE PROVIDED SLOT WITH THE SCREEN LIP FITTING TIGHT TO THE BOTTOM FLOW LINE.
  - 6). A 4' (1200) FLEXIBLE DELINEATOR SHALL BE FURNISHED AND INSTALLED AT THE DIRECTION OF THE ENGINEER TO MARK THE LOCATION OF THE CONCRETE HEADWALL. COST INCIDENTAL TO DOWNSPOUT SPLASH APRONS ITEM.
  - 7). WHEN TWO LINES OF PIPE UNDERDRAIN DRAIN TO A LOW POINT, EACH PIPE MUST HAVE ITS OWN OUTLET.
  - 8). PERFORATED PIPE UNDERDRAIN SHALL NOT BE PLACED UNDER GUARDRAIL IN ORDER TO AVOID PUNCTURING.



<b>PERFORATED PIPE UNDERDRAIN DETAIL</b>			
STANDARD NO.	D-9 (2006)	SHT. 1	OF 1

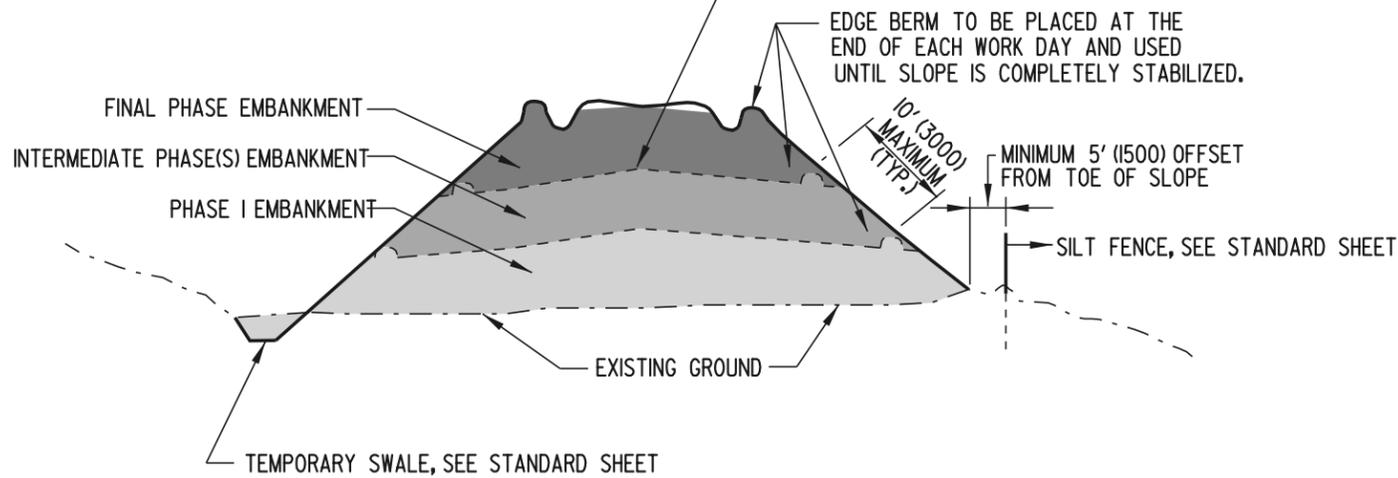
APPROVED *[Signature]* 10/10/06  
CHIEF ENGINEER  
 RECOMMENDED *[Signature]* 10/19/06  
DESIGN ENGINEER



**CUT SECTION**

PERIMETER/DIKE SWALE USED AS A CLEAN WATER DIVERSION, SEE STANDARD SHEET

BREAK IN CROSS SLOPE MAY BE ELIMINATED TO DIRECT SURFACE FLOW LEFT OR RIGHT OR AS DIRECTED BY THE ENGINEER.



**FILL SECTION**

- NOTES:**
- 1.) EDGE BERMS AND TEMPORARY SLOPE DRAINS SHALL BE CONSTRUCTED ALONG THE TOP OF ALL SLOPES TO INTERCEPT RUNOFF AND CONVEY IT DOWN THE SLOPE FACES WITHOUT CREATING GULLIES OR WASHOUTS.
  - 2.) SLOPE FACES SHALL BE TRACKED WITH CLEATED EQUIPMENT SUCH THAT THE CLEAT MARKS ARE ORIENTED HORIZONTALLY.
  - 3.) ALL CUT AND FILL SLOPES OF THE HIGHWAY EMBANKMENT SHALL BE PERMANENTLY STABILIZED AS THE WORK PROGRESSES IN INCREMENTS NOT TO EXCEED 10' (3000) MEASURED ALONG THE SLOPE.
  - 4.) CROSS SLOPES SHALL BE 2% MINIMUM, 6% MAXIMUM.

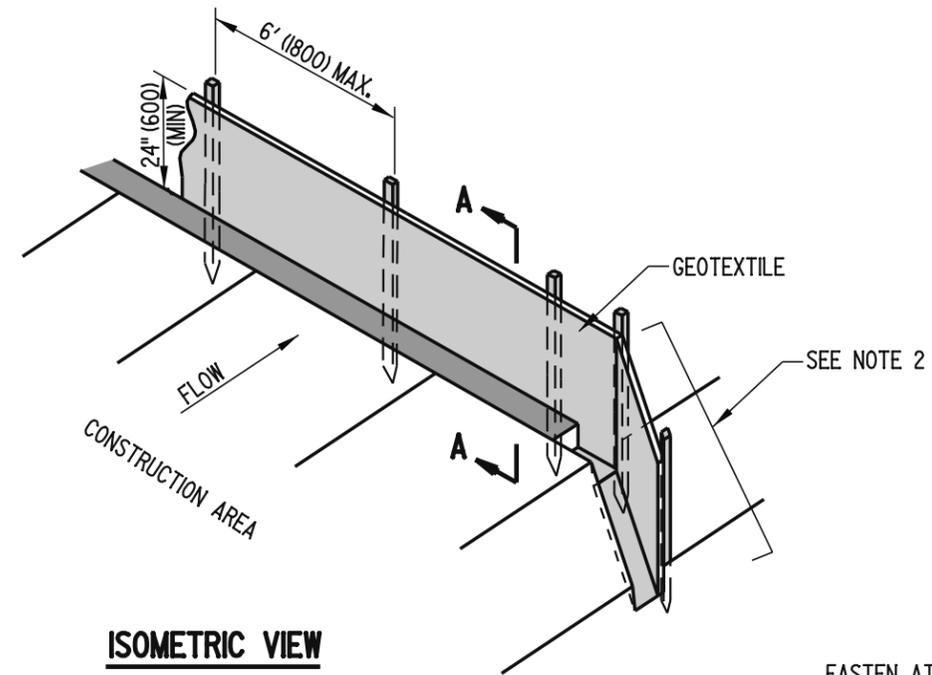


**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

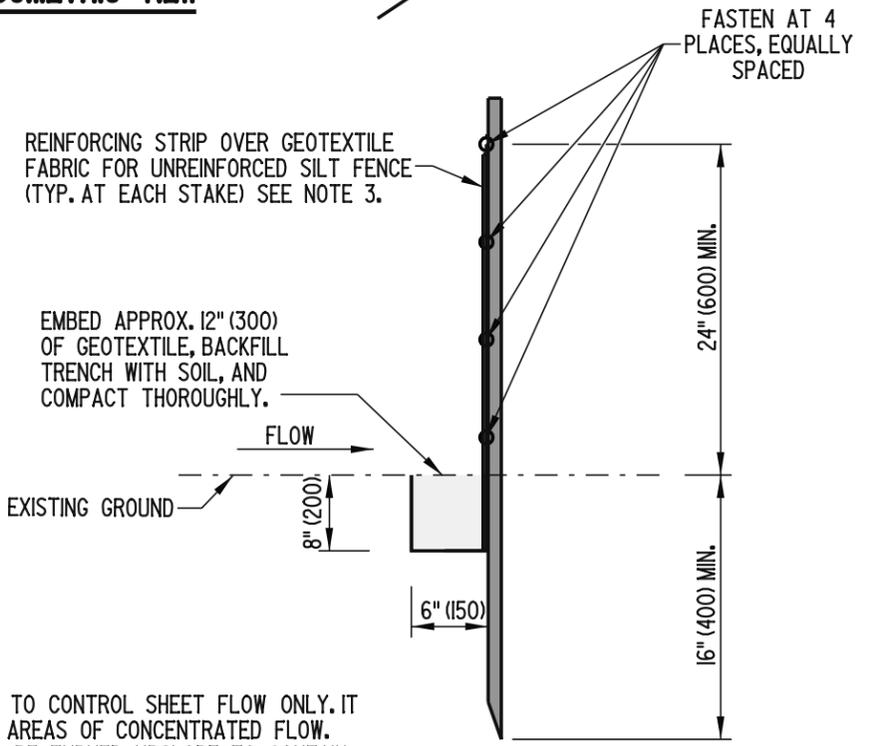
**INCREMENTAL STABILIZATION**

STANDARD NO. **E-1 (2001)** SHT. **1** OF **1**

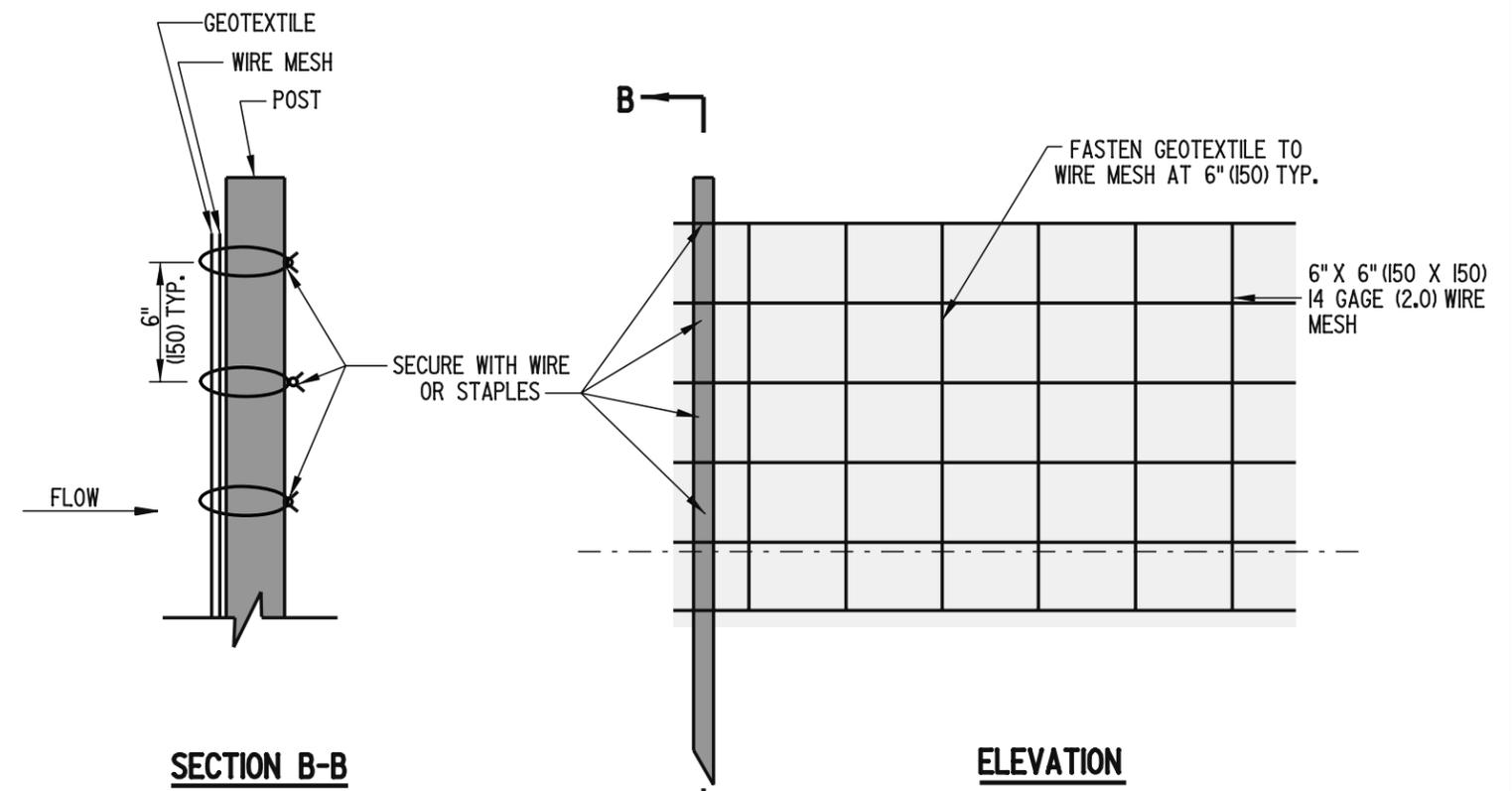
APPROVED *Ryan M. Harkins* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Michael R. Gotsch* 6/18/01  
DESIGN ENGINEER DATE



**ISOMETRIC VIEW**



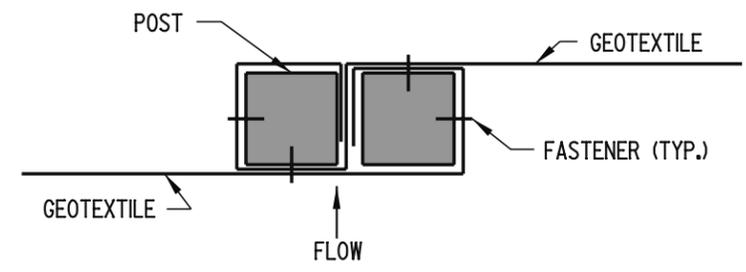
**SECTION A-A**



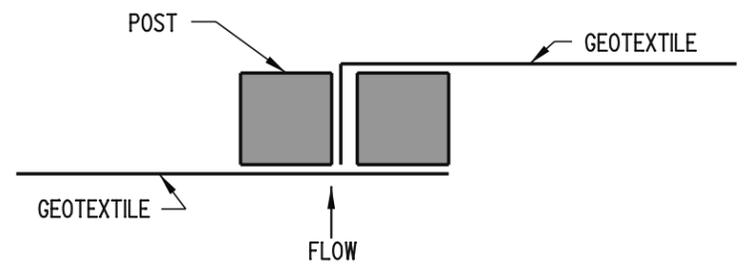
**SECTION B-B**

**ELEVATION**

**WIRE MESH DETAIL  
(REINFORCED SILT FENCE ONLY)**

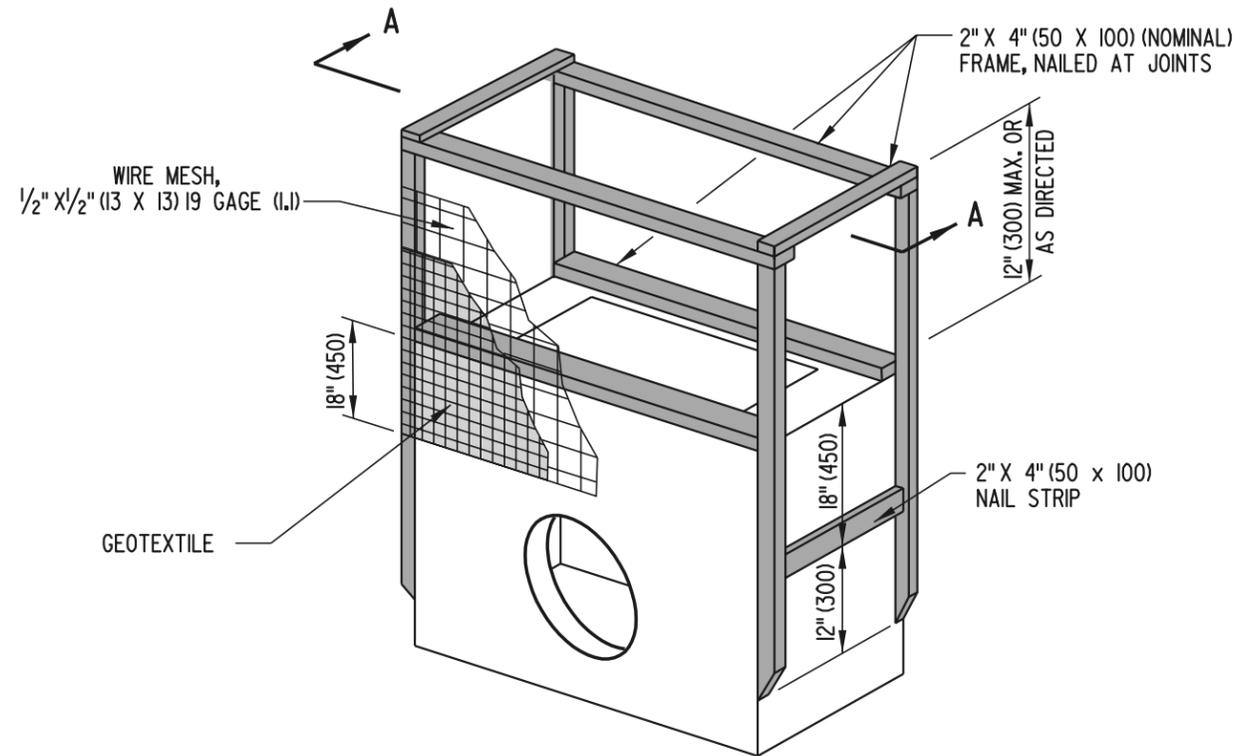


**UNREINFORCED SILT FENCE  
CONNECTON DETAIL**

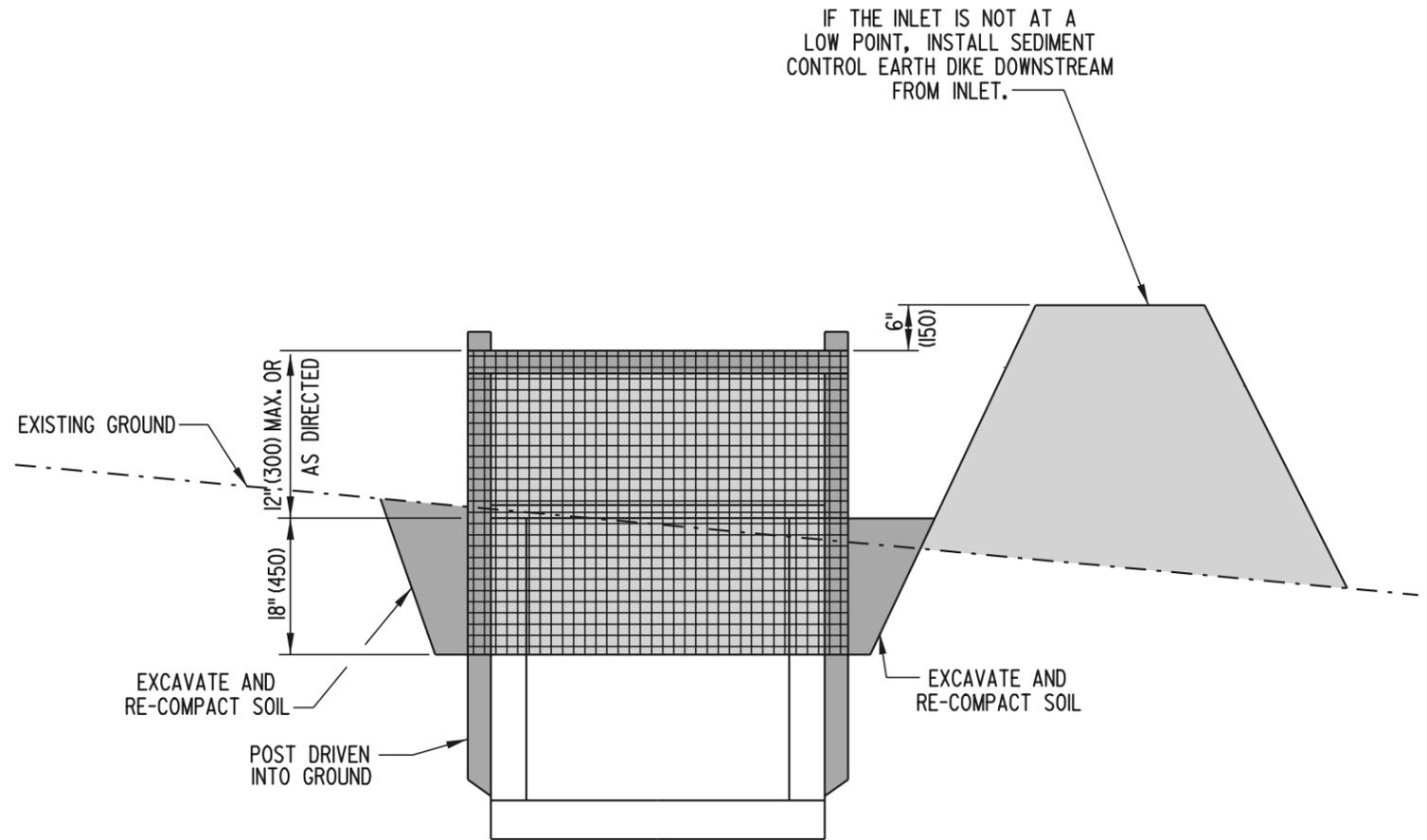


**REINFORCED SILT FENCE  
CONNECTON DETAIL**

- NOTES:**
- 1). THIS DEVICE IS INTENDED TO CONTROL SHEET FLOW ONLY. IT SHALL NOT BE USED IN AREAS OF CONCENTRATED FLOW.
  - 2). SILT FENCE ENDS SHALL BE TURNED UPSLOPE TO CONTAIN RUNOFF.
  - 3). REINFORCING STRIP IS TO BE ONE COMPLETE STRIP COVERING ALL GEOTEXTILE FABRIC AT POST.



**ISOMETRIC VIEW**



**SECTION A-A**

**NOTE:** IF THE INLET IS NOT IN A LOW POINT, CONSTRUCT A SEDIMENT CONTROL EARTH DIKE IN THE DITCHLINE DOWNSTREAM FROM IT. SEE STANDARD SHEET FOR ADDITIONAL INFORMATION.

**PLAN SYMBOL**

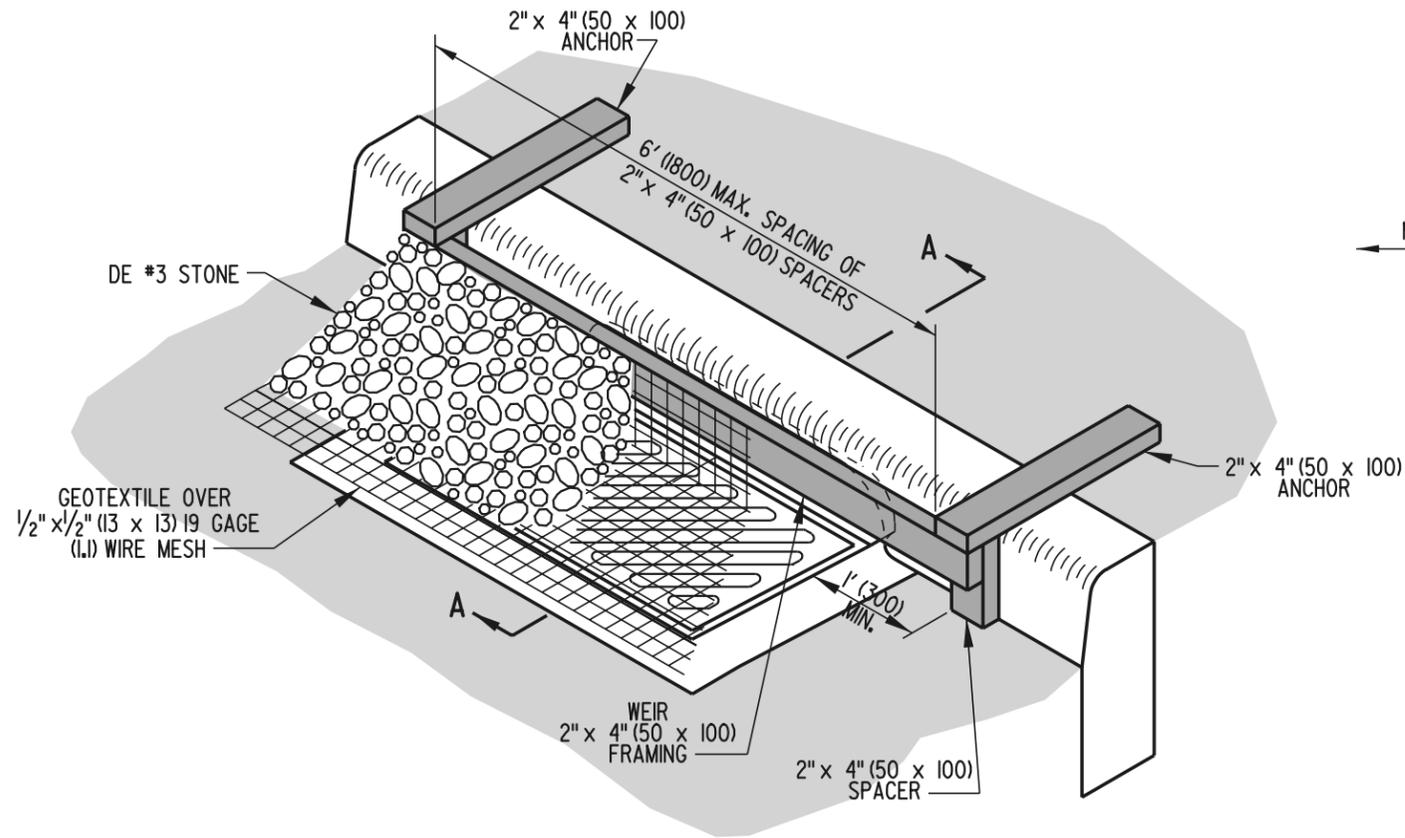


**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

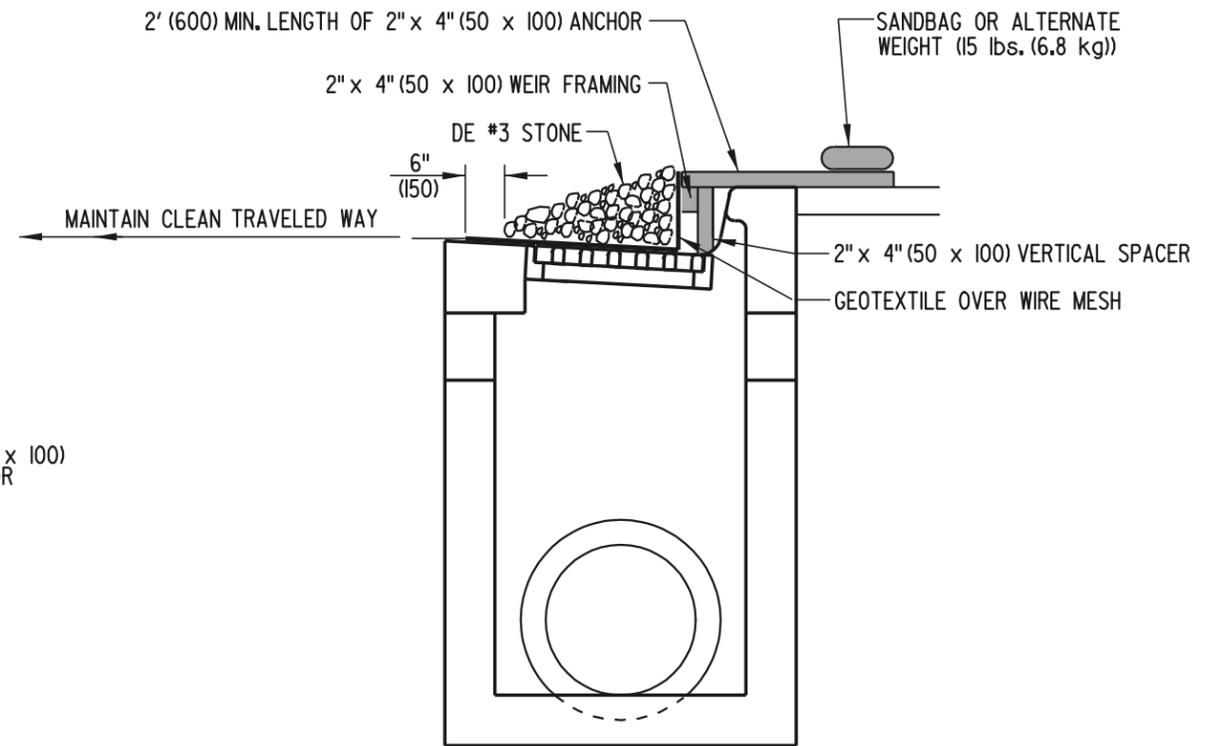
**DRAINAGE INLET SEDIMENT CONTROL**

STANDARD NO. **E-3 (2001)** SHT. **1** OF **1**

APPROVED *Ryan M. Harkness* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Michael R. [Signature]* 6/18/01  
DESIGN ENGINEER DATE



**ISOMETRIC VIEW**



**SECTION A-A**

**PLAN SYMBOL**

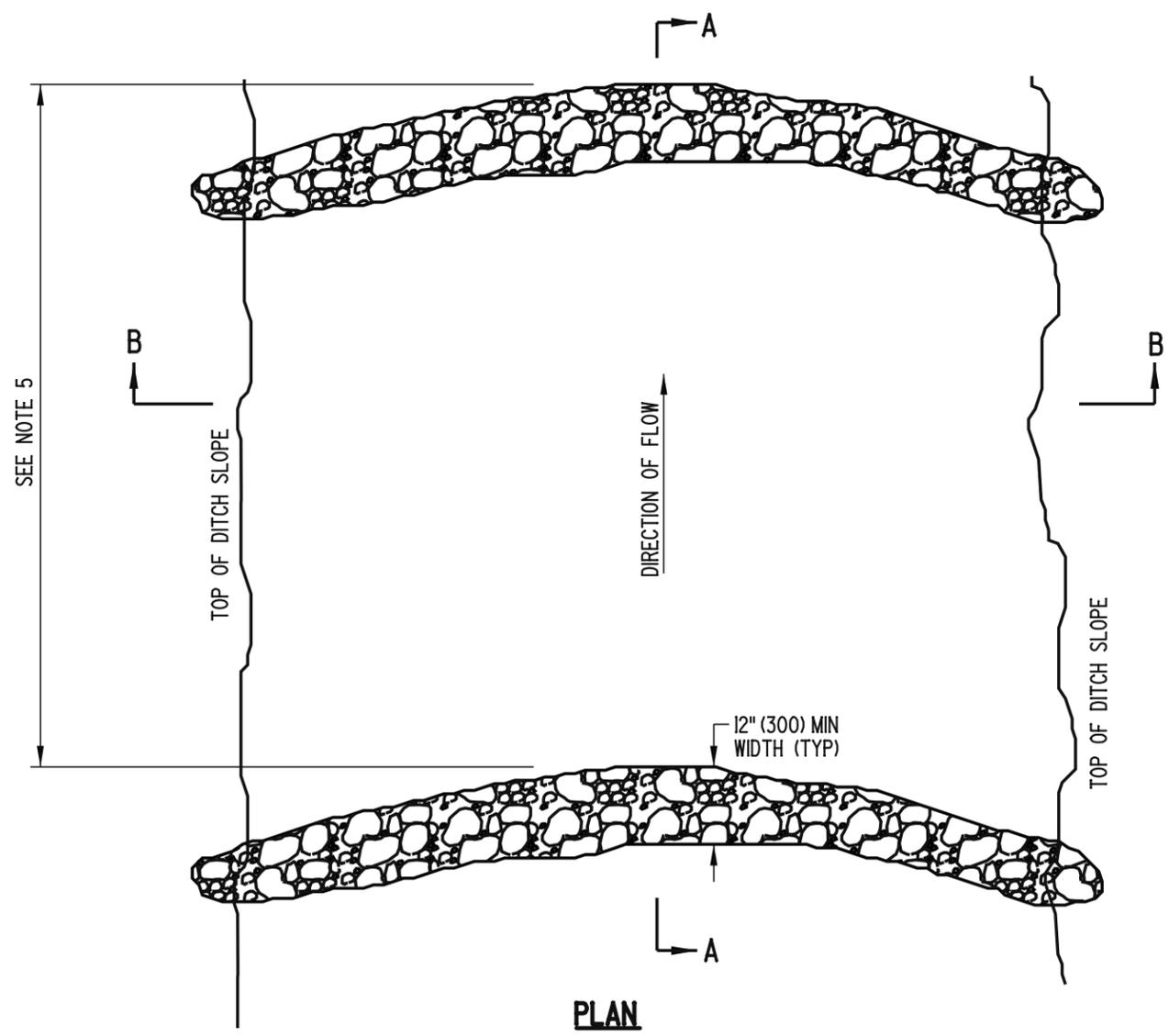
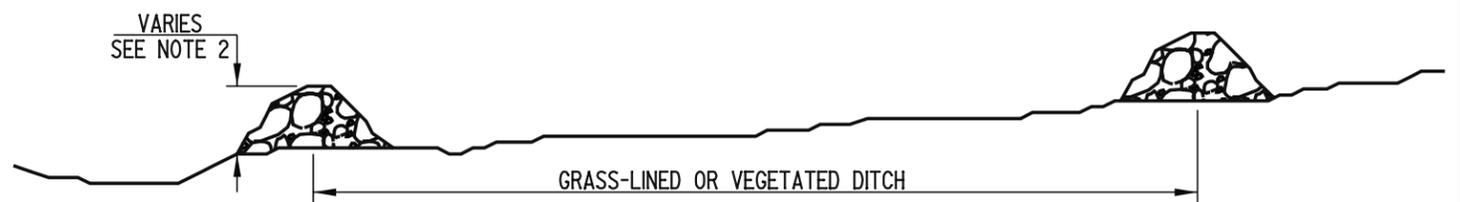
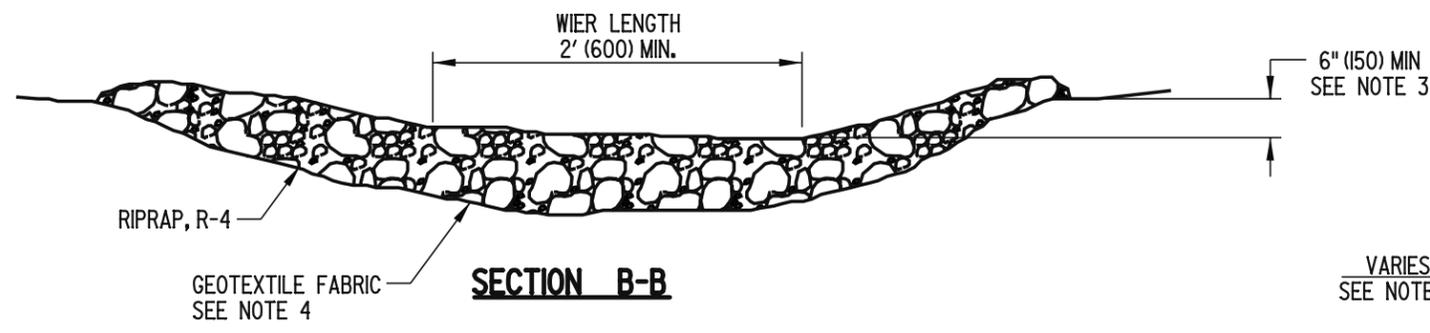


**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**CURB INLET SEDIMENT CONTROL**

STANDARD NO. **E-4 (2001)** SHT. **1** OF **1**

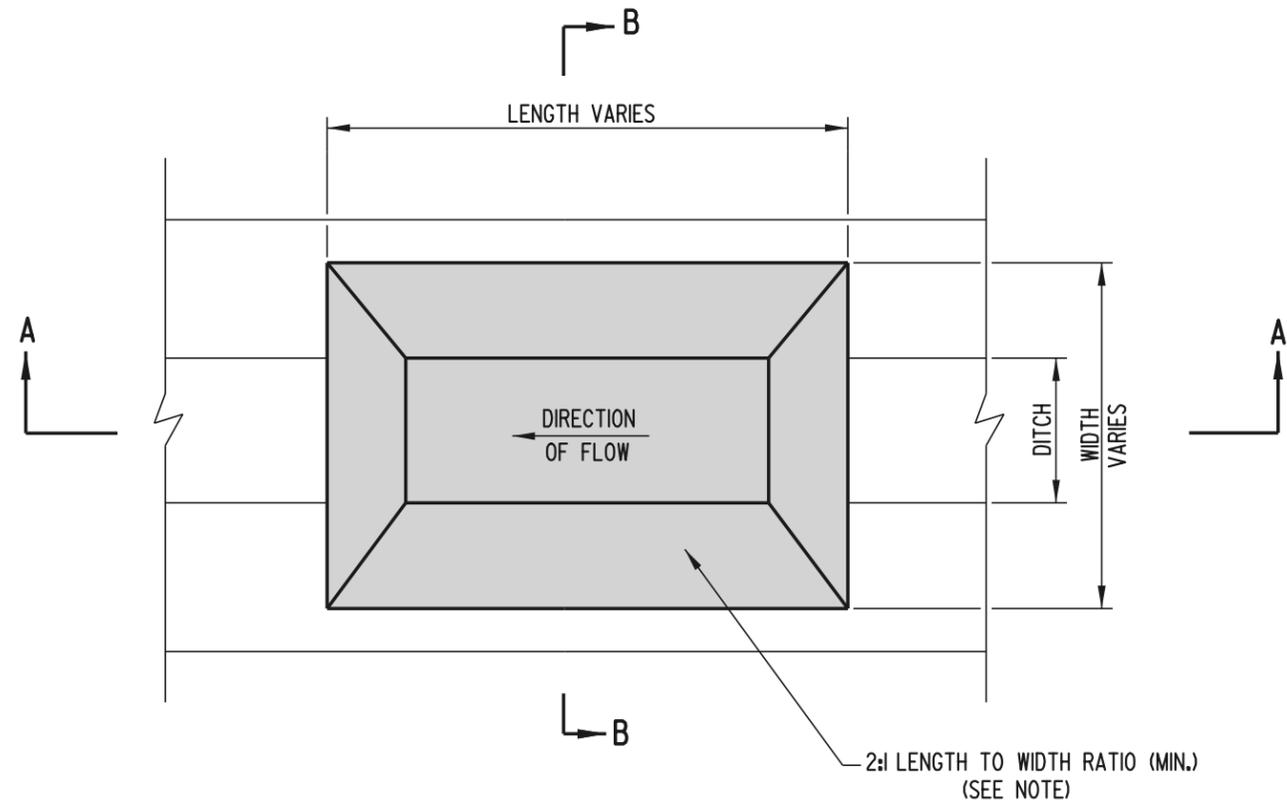
APPROVED *Ryan M. Harshbarger* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Alghob* 6/18/01  
DESIGN ENGINEER DATE



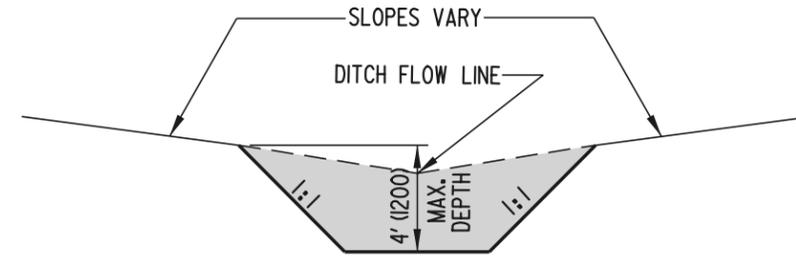
**SECTION A-A**

**NOTES:**

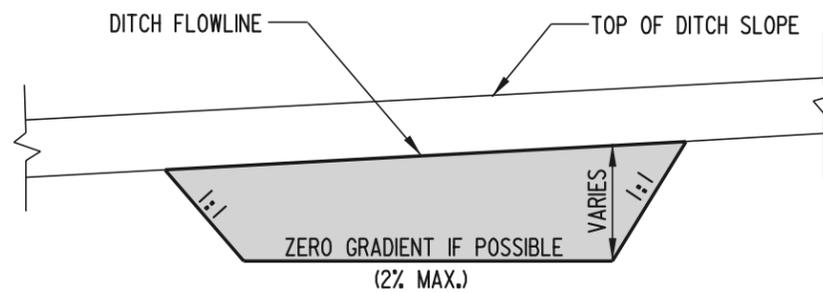
- 1). FOR DITCHES LESS THAN 30" (750) IN DEPTH, PLACE DAM AS DIRECTED BY THE ENGINEER.
- 2). THE CHECK DAM HEIGHT MUST NOT EXCEED 2' (600) AT THE CENTER OF THE WEIR.
- 3). THE CHECK DAM IS TO BE CONSTRUCTED SO THAT THE CENTER IS 6" (150) MIN. LOWER THAN THE OUTER EDGES, FORMING A WEIR THAT WATER CAN FLOW ACROSS.
- 4). GEOTEXTILE FABRIC IS TO BE INSTALLED UNDERNEATH RIPRAP ON PERMANENT CHECK DAMS ONLY.
- 5). THE MAXIMUM SPACING BETWEEN DAMS SHALL BE THE DISTANCE IN THE DITCH WHERE THE TOE OF THE UPSTREAM DAM IS AT THE SAME ELEVATION AS THE TOP OF THE DOWNSTREAM DAM AT THE CENTER OF THE WEIR.



**PLAN**



**SECTION B-B**



**SECTION A-A**

- NOTES:**
- 1). SEDIMENT TRAPS ARE INTENDED FOR USE IN EXISTING, PROPOSED, AND TEMPORARY DITCHES OF ALL TYPES WITH A MAXIMUM DRAINAGE AREA OF 15 ACRES (6 HECTARES), AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER.
  - 2). SIDE SLOPES SHALL BE STABILIZED WITH "TEMPORARY GRASS SEEDING, DRY GROUND" AND STRAW MULCH.
  - 3). AN OUTLET STRUCTURE IS REQUIRED. STONE CHECK DAMS, PERFORATED RISER PIPES, SKIMMER DEWATERING DEVICES, OR DRAINAGE INLETS MAY BE USED. SEE APPROPRIATE STANDARD SHEET FOR ADDITIONAL INFORMATION.
  - 4). FOR SIZE, LOCATION, ETC. OF SEDIMENT TRAP, SEE CONSTRUCTION PHASING, M.O.T., AND EROSION CONTROL PLANS.
  - 5). ALL FILL SLOPES SHALL BE 2:1.
  - 6). A 2:1 LENGTH TO WIDTH RATIO SHOULD BE ACHIEVED WHERE POSSIBLE. IF THIS IS NOT POSSIBLE, THE USE OF BAFFLES OR OTHER SPECIAL DESIGNS SHOULD BE INCORPORATED TO INCREASE FLOW TIME.

**PLAN SYMBOL**

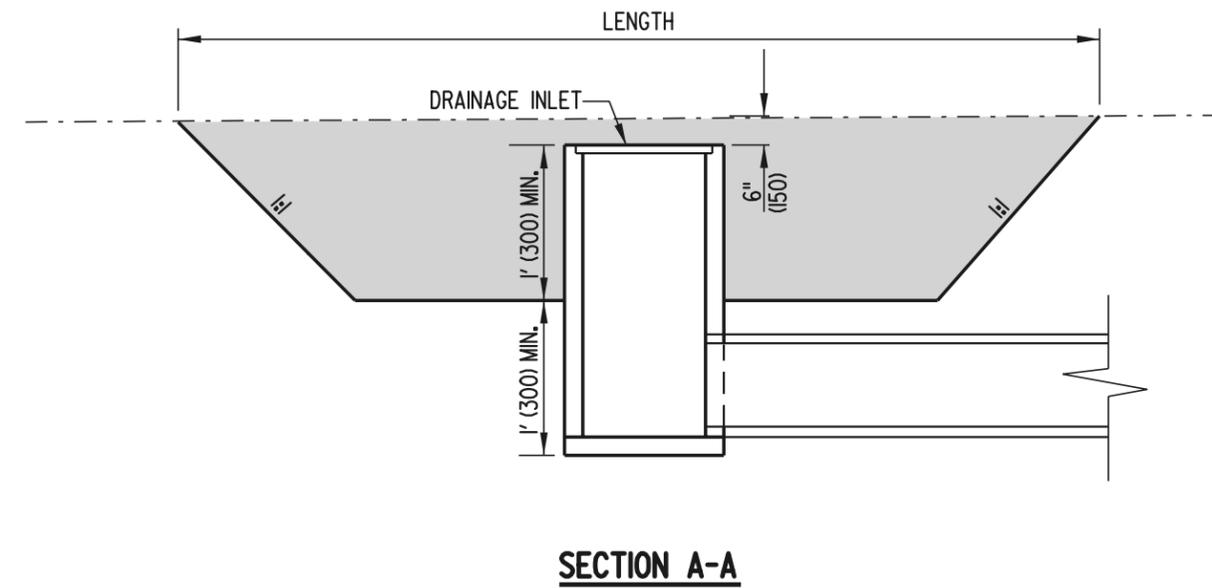
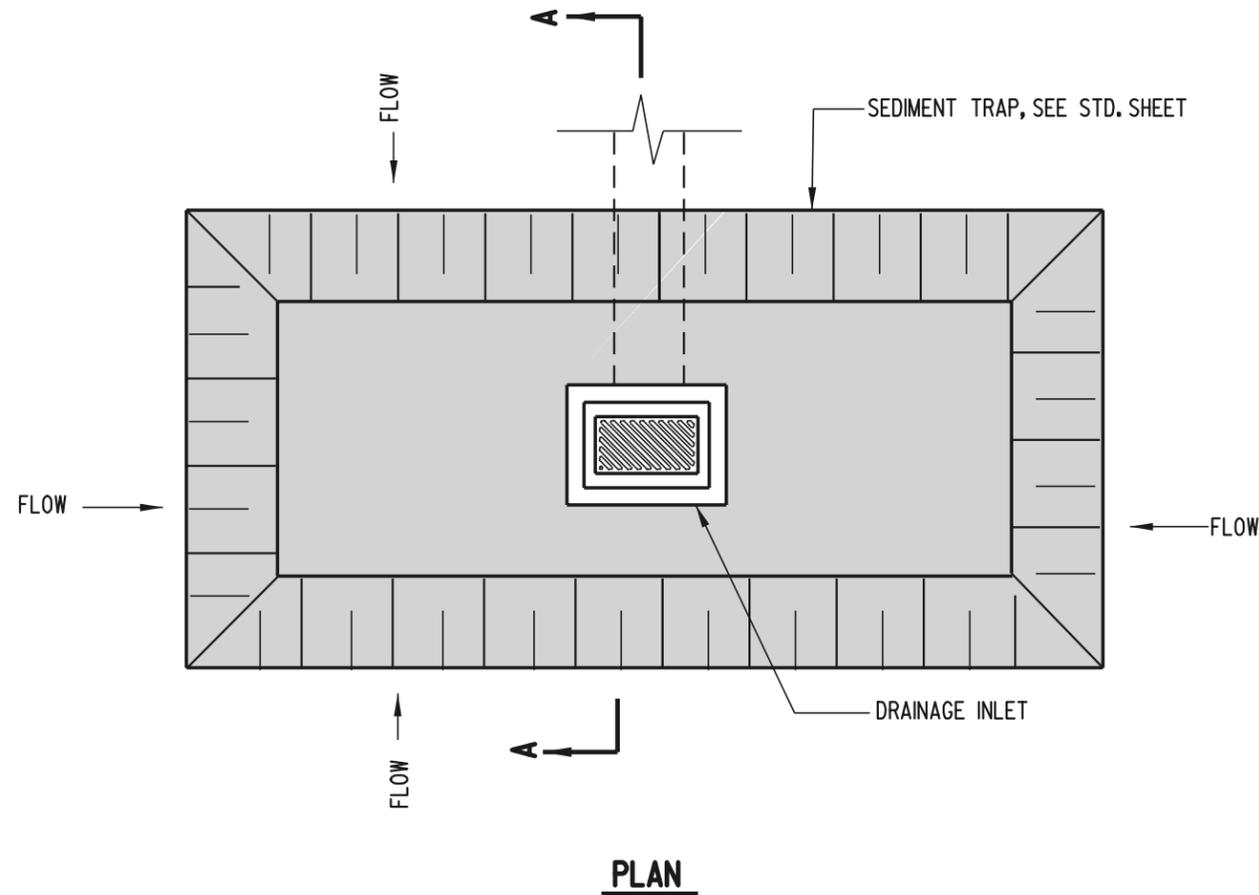


**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**SEDIMENT TRAP**

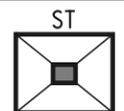
STANDARD NO. **E-6 (2001)** SHT. **1** OF **1**

APPROVED *Ryan M. Harshbarger* **6/18/01**  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal P. G. [Signature]* **6/18/01**  
DESIGN ENGINEER DATE



- NOTES:**
- 1). THE WORK SHALL CONSIST OF THE CONSTRUCTION OF A SEDIMENT TRAP AROUND A DRAINAGE INLET TO ALLOW SEDIMENTATION TO OCCUR BEFORE RUNOFF ENTERS THE DRAINAGE INLET.
  - 2). DRAINAGE INLET SEDIMENT TRAPS SHALL BE LIMITED TO A THREE (3) ACRE (1.2 HECTARE) MAXIMUM DRAINAGE AREA.
  - 3). THE DIMENSIONS OF THE DRAINAGE INLET SEDIMENT TRAP ARE TO BE AS INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

**PLAN SYMBOL**



**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

**SEDIMENT TRAP, USING DRAINAGE INLET AS OUTLET**

STANDARD NO. **E-7 (2001)**

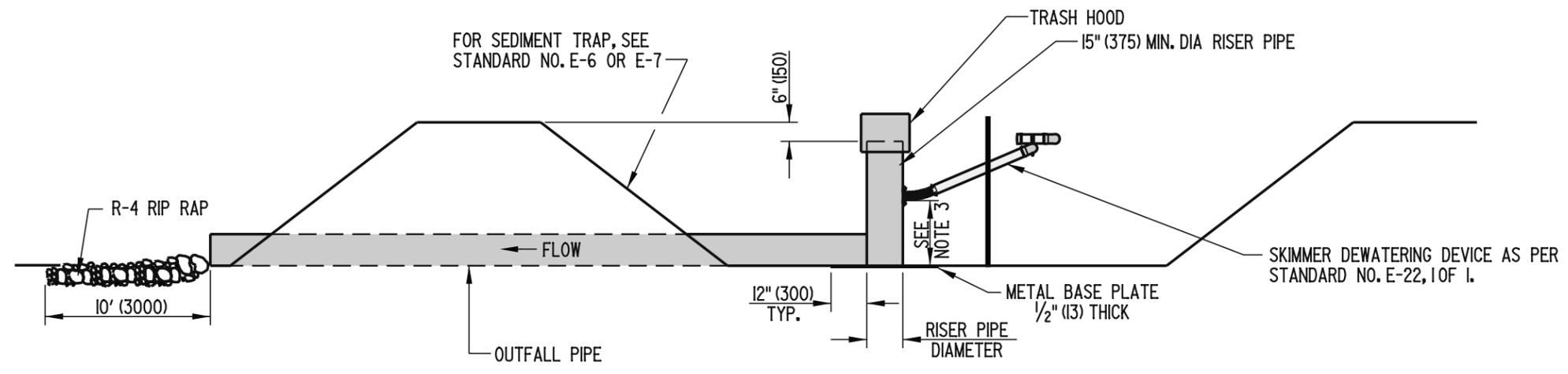
SHT. **1** OF **1**

**APPROVED** *Ryan M. Harshbarger* **6/18/01**  
CHIEF ENGINEER DATE

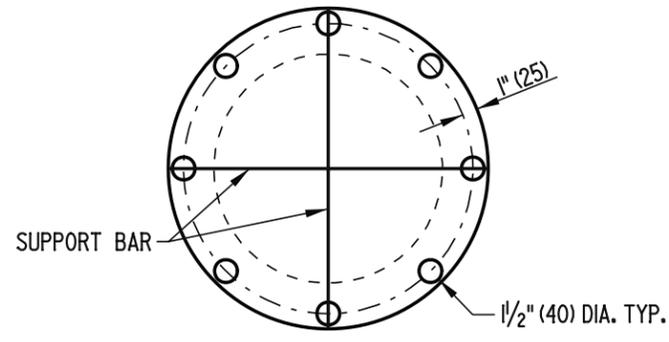
**RECOMMENDED** *Mehal Alghobari* **6/18/01**  
DESIGN ENGINEER DATE

MIN. * OUTFALL PIPE DIA.	MIN. RISER DIA.	MAX. DRAINAGE AREA ACRES (ha)
12" (300)	15" (375)	1 (0.4)
15" (375)	18" (450)	2 (0.8)
18" (450)	21" (525)	3 (1.2)
21" (525)	24" (600)	4 (1.6)
24" (600)	27" (675)	5 (2.0)

\* OUTFALL PIPE DIAMETER MAY BE SAME SIZE AS RISER DIAMETER.

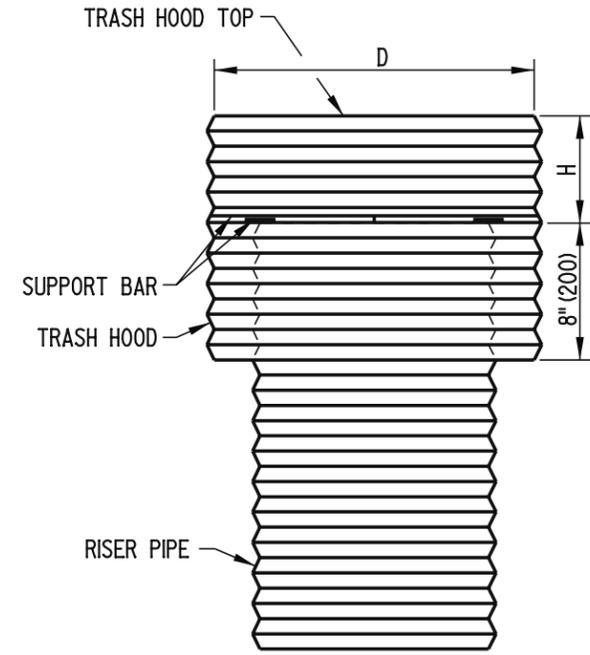


- NOTES:**
- 1). THIS DEVICE IS INTENDED TO BE USED AS AN OUTLET FOR SEDIMENT TRAPS.
  - 2). THE PIPE OUTLET SHOWN SHALL ONLY BE USED WITH SEDIMENT TRAPS WITH DRAINAGE AREAS OF 5 ACRES (2.0 HECTARES) OR LESS. LARGER DRAINAGE AREAS REQUIRE AN ENGINEERED DESIGN.
  - 3). THE HEIGHT OF THE SKIMMER DEWATERING DEVICE SHALL BE SPECIFIED BY THE ENGINEER IN THE FIELD.

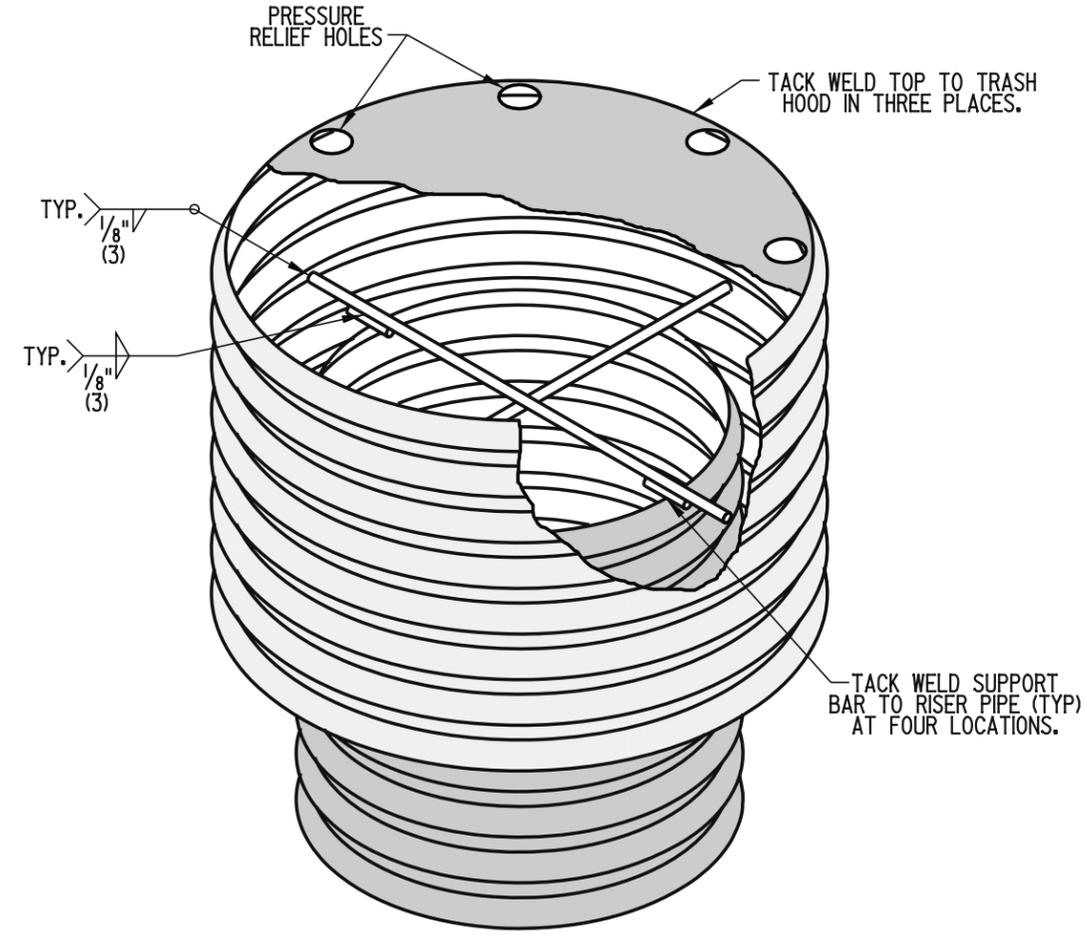


**PLAN**

TRASH HOOD CHART					
RISER PIPE DIAMETER	D	H	TRASH HOOD THICK. (GAGE)	MINIMUM SIZE SUPPORT BAR	MINIMUM TOP THICK. (GAGE)
15" (375)	21" (525)	7" (175)	16 (1.6)	*6 (#19) REBAR	16 (1.6)
18" (450)	27" (675)	8" (200)	16 (1.6)	*6 (#19) REBAR	16 (1.6)
21" (525)	30" (750)	11" (275)	16 (1.6)	*6 (#19) REBAR	16 (1.6)
24" (600)	36" (900)	13" (330)	16 (1.6)	*6 (#19) REBAR	14 (2.0)
27" (675)	42" (1050)	15" (380)	16 (1.6)	*6 (#19) REBAR	14 (2.0)
36" (900)	54" (1350)	17" (430)	14 (2.0)	*8 (#25) REBAR	12 (2.7)

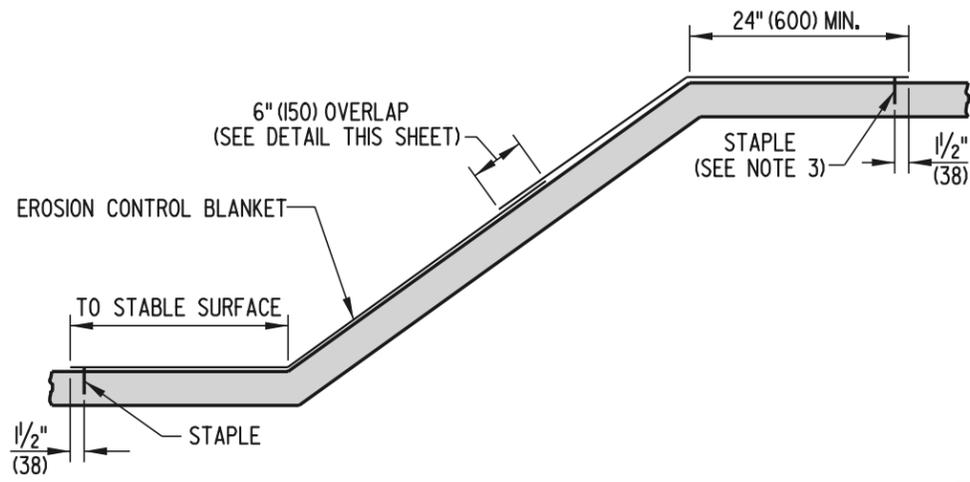


**FRONT**



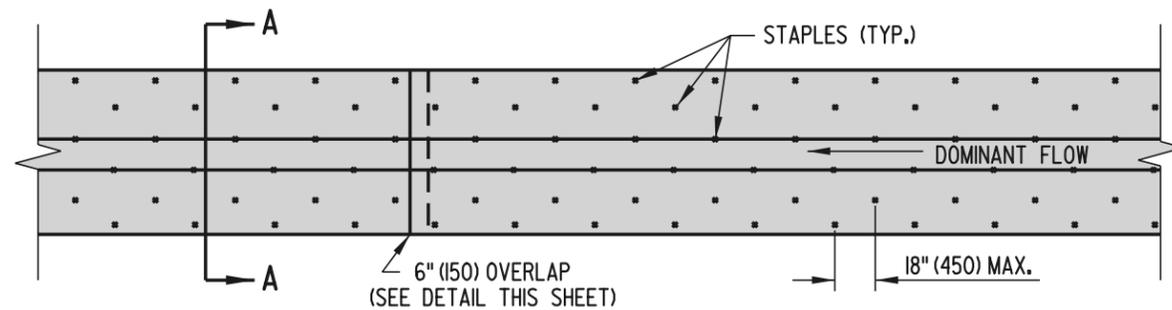
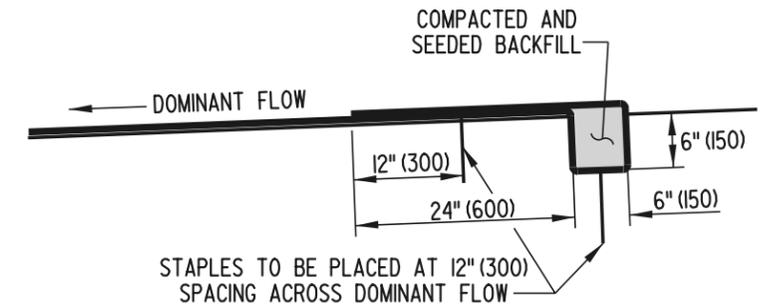
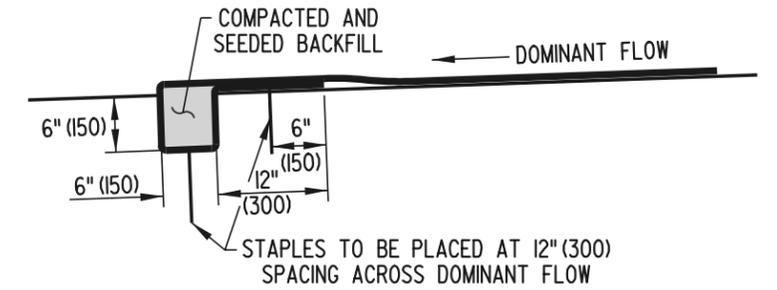
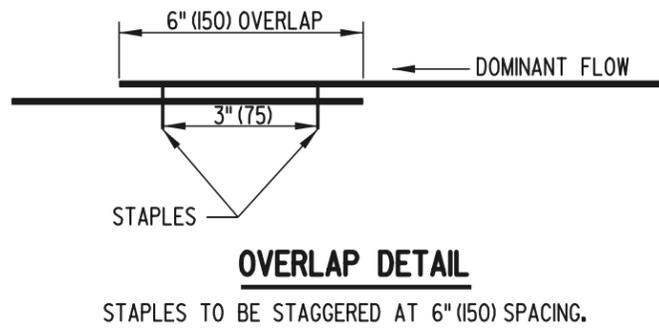
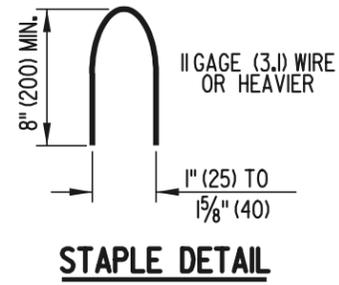
**ISOMETRIC VIEW**

**TRASH HOOD DETAILS**



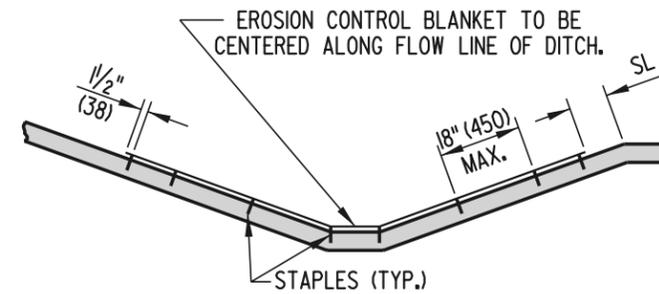
**STABILIZATION OF EMBANKMENTS**

- NOTES:**
1. STAPLES TO BE STAGGERED AT 18" (450) SPACING.
  2. TOPSOIL UNDER EROSION CONTROL BLANKET IS TO BE TRACKED AND SEEDED.
  3. WHEN OFFSITE RUNOFF OCCURS, ADDITIONAL MEASURES AS DIRECTED BY THE ENGINEER SHALL BE USED TO ENSURE STABILITY OF EMBANKMENT.



**STABILIZATION OF DITCHES PLAN**

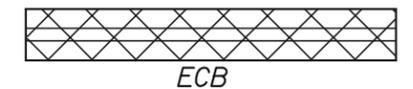
- NOTES:**
1. ADDITIONAL STAPLES NOT SHOWN ARE REQUIRED AT OVERLAPS. SEE OVERLAP DETAIL FOR STAPLE PLACEMENT.
  2. STAPLES ARE TO BE STAGGERED.
  3. TOPSOIL UNDER EROSION CONTROL BLANKET IS TO BE TRACKED AND SEEDED.



**STABILIZATION OF DITCHES SECTION A-A**

STAPLES ALONG LONGITUDINAL EDGES SHALL BE SPACED AS FOLLOWS:  
 18" (450) WHEN SL ≤ 20' (6000)  
 9" (225) WHEN SL > 20' (6000)

**PLAN SYMBOL**

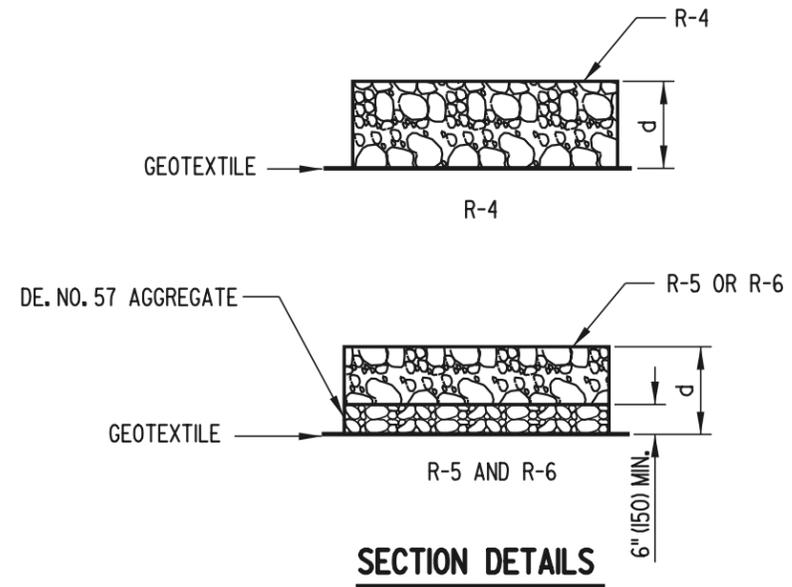
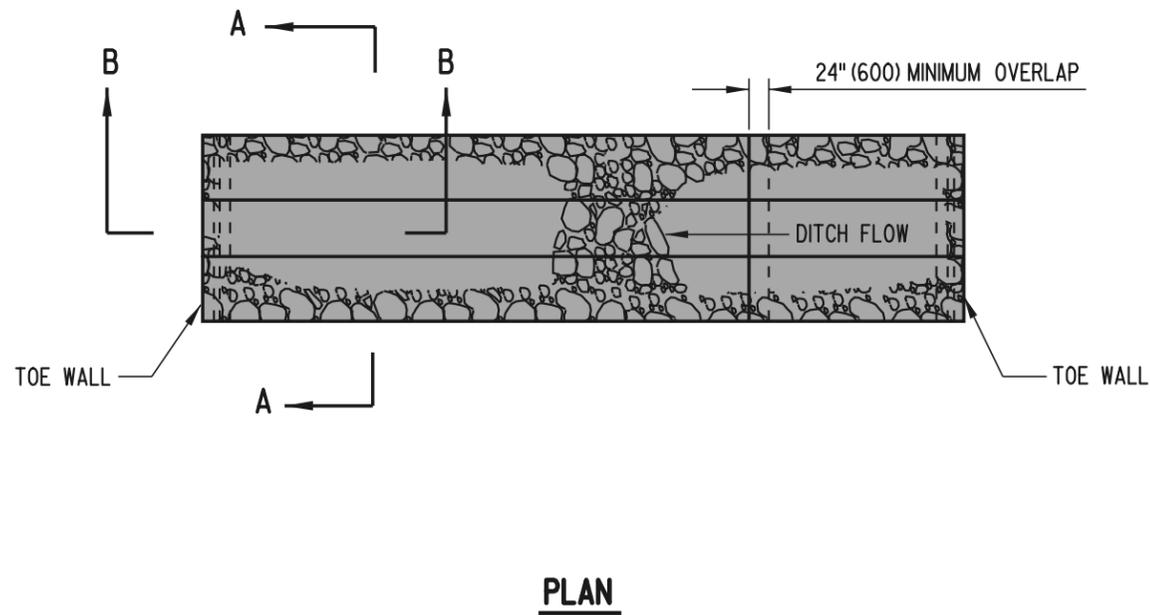
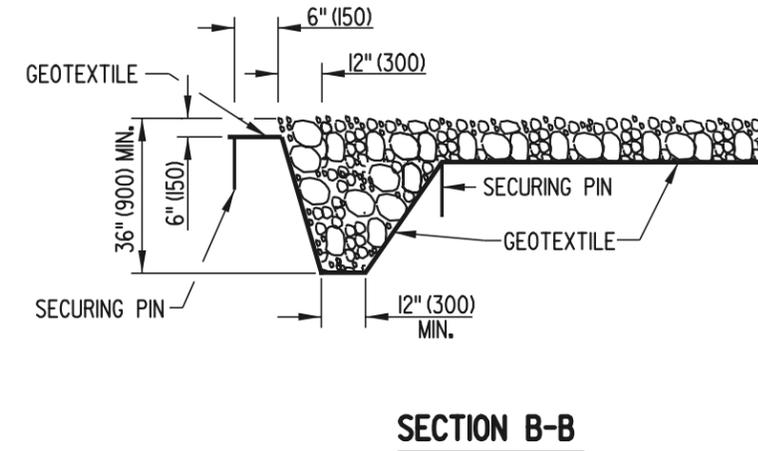
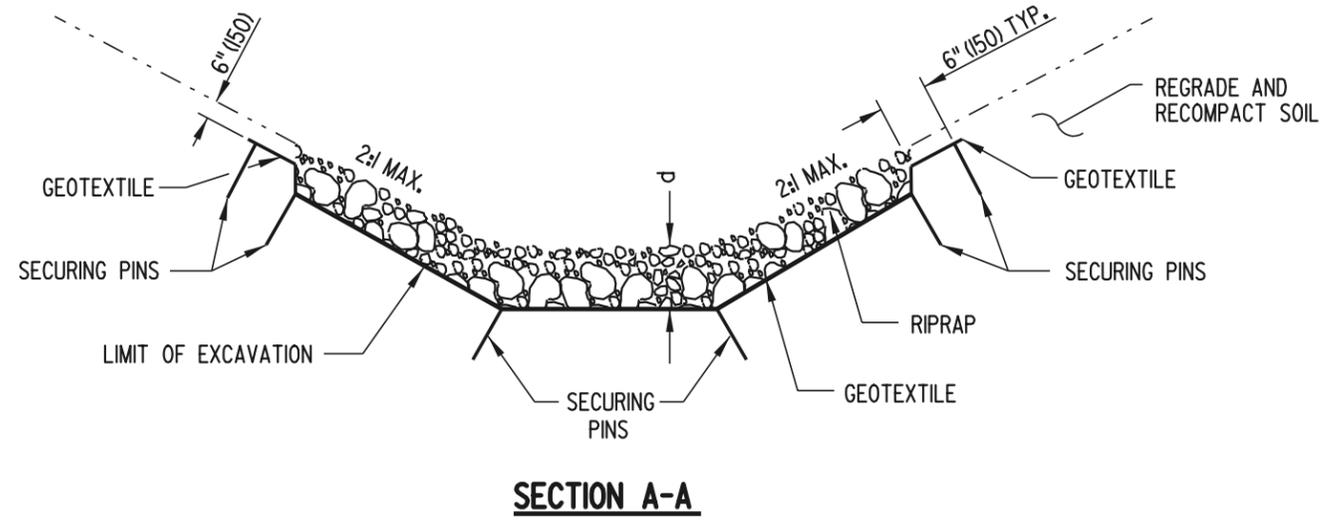


**DELAWARE DEPARTMENT OF TRANSPORTATION**

**EROSION CONTROL BLANKET APPLICATIONS**

STANDARD NO. E-9 (2001) SHT. 1 OF 1

APPROVED *Ryan M. Harshbarger* 6/18/01  
 CHIEF ENGINEER DATE  
 RECOMMENDED *Michael R. [Signature]* 6/18/01  
 DESIGN ENGINEER DATE



**CLASS RIPRAP**  
 R-4 d = 14" (350) MIN.  
 R-5 d = 26" (650) MIN.  
 R-6 d = 34" (850) MIN.

- NOTES:**
- 1). SECURING PINS ARE TO BE PLACED AT LOCATIONS SHOWN AND AT 24" (600) LONGITUDINAL AND LATERAL SPACING.
  - 2). SEE PLANS FOR LOCATION, DIMENSIONS, GRADES, ETC.
  - 3). USE OF R-7 RIPRAP WILL REQUIRE A SEPARATE PROFESSIONAL ENGINEERING DESIGN FOR SIGHT SPECIFIC CONDITIONS.

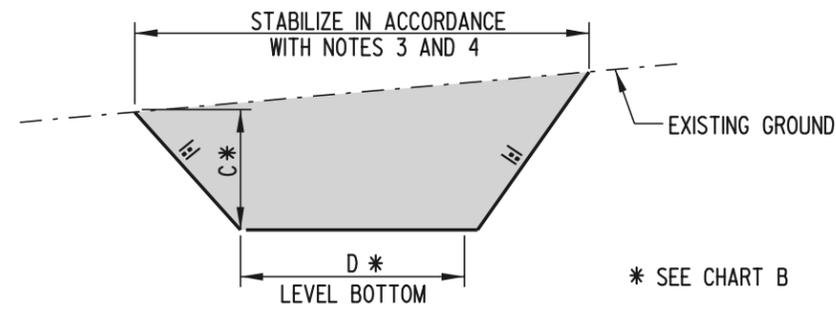
**PLAN SYMBOL**



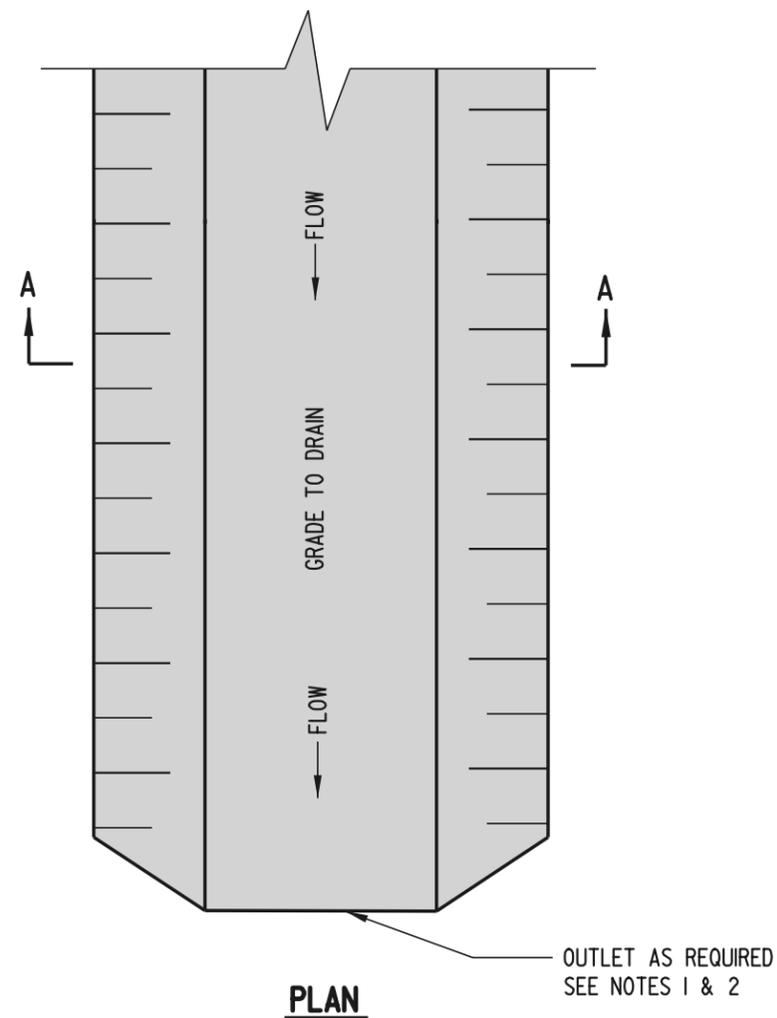
**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

**RIPRAP DITCH**  
 STANDARD NO. **E-10 (2001)** SHT. **1** OF **1**

**APPROVED** *Ryan M. Harkins* 6/18/01  
CHIEF ENGINEER DATE  
**RECOMMENDED** *Mehal P. G. G.* 6/18/01  
DESIGN ENGINEER DATE



**SECTION A-A**



**PLAN**

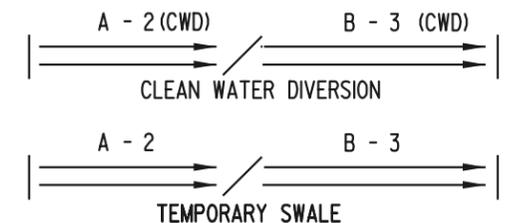
CHART A - STABILIZATION			
SYMBOL	SWALE GRADE	TYPE OF TREATMENT	
		DRAINAGE AREA A (5 AC (2 ha) OR LESS)	DRAINAGE AREA B (5 AC - 10 AC (2 ha - 4 ha))
1	0.5-2.0%	SEED USED WITH EROSION CONTROL BLANKET	SEED USED WITH EROSION CONTROL BL.
2	2.1-8.0%	R-4 RIRRAP	R-4 RIRRAP
3	8.1-20%	ENGINEERED DESIGN	ENGINEERED DESIGN

CHART B - SWALE DIMENSIONS		
SYMBOL	SWALE A	SWALE B
C	1' (300) MIN.	1' (300) MIN.
D	4' (1200) MIN.	6' (1800) MIN.

SEE SECTION A - A

- NOTES:**
- DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
  - DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL OUTLET DIRECTLY INTO AN UNDISTURBED STABILIZED AREA AT NON-EROSIVE VELOCITY.
  - IF TEMPORARY SWALES OR CLEAN WATER DIVERSIONS ARE TO BE OPERATIONAL FOR MORE THAN 14 DAYS, THEY SHALL BE STABILIZED IN ACCORDANCE WITH CHART A PRIOR TO BECOMING OPERATIONAL.
  - IF TEMPORARY SWALES OR CLEAN WATER DIVERSIONS ARE TO BE OPERATIONAL FOR LESS THAN 14 DAYS, THEY SHALL BE STABILIZED WITH GEOTEXTILE IN ACCORDANCE WITH THE STANDARD DETAIL, "GEOTEXTILE-LINED CHANNEL DIVERSION".

**PLAN SYMBOL**



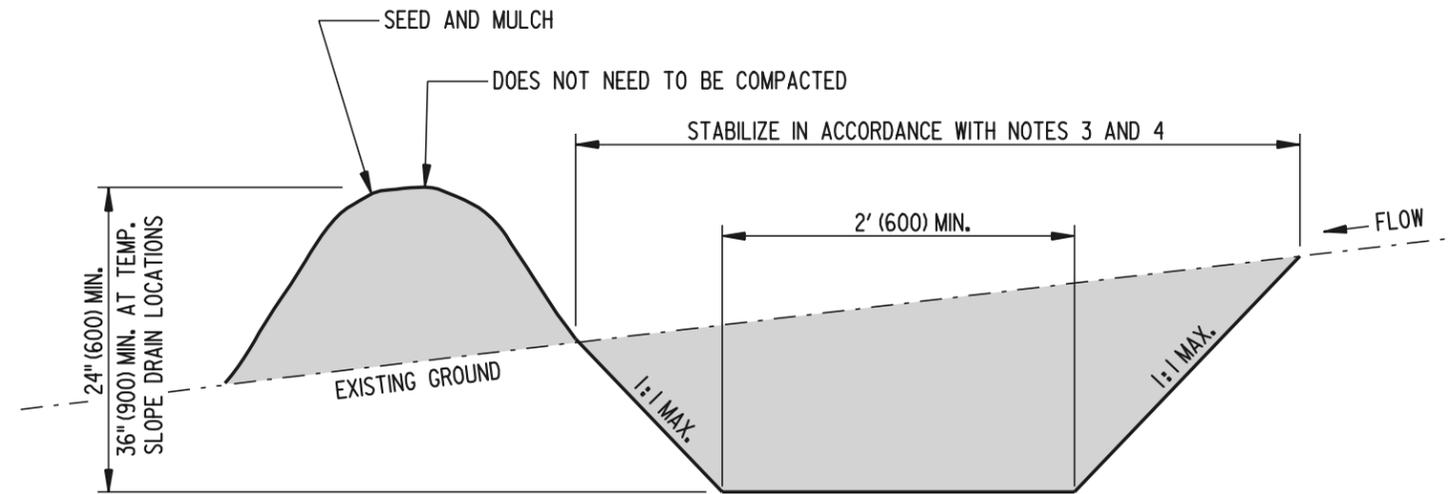
**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**TEMPORARY SWALE**

STANDARD NO. **E-11 (2001)** SHT. **1** OF **1**

APPROVED *Ryan M. Harshbarger* **6/18/01**  
CHIEF ENGINEER DATE

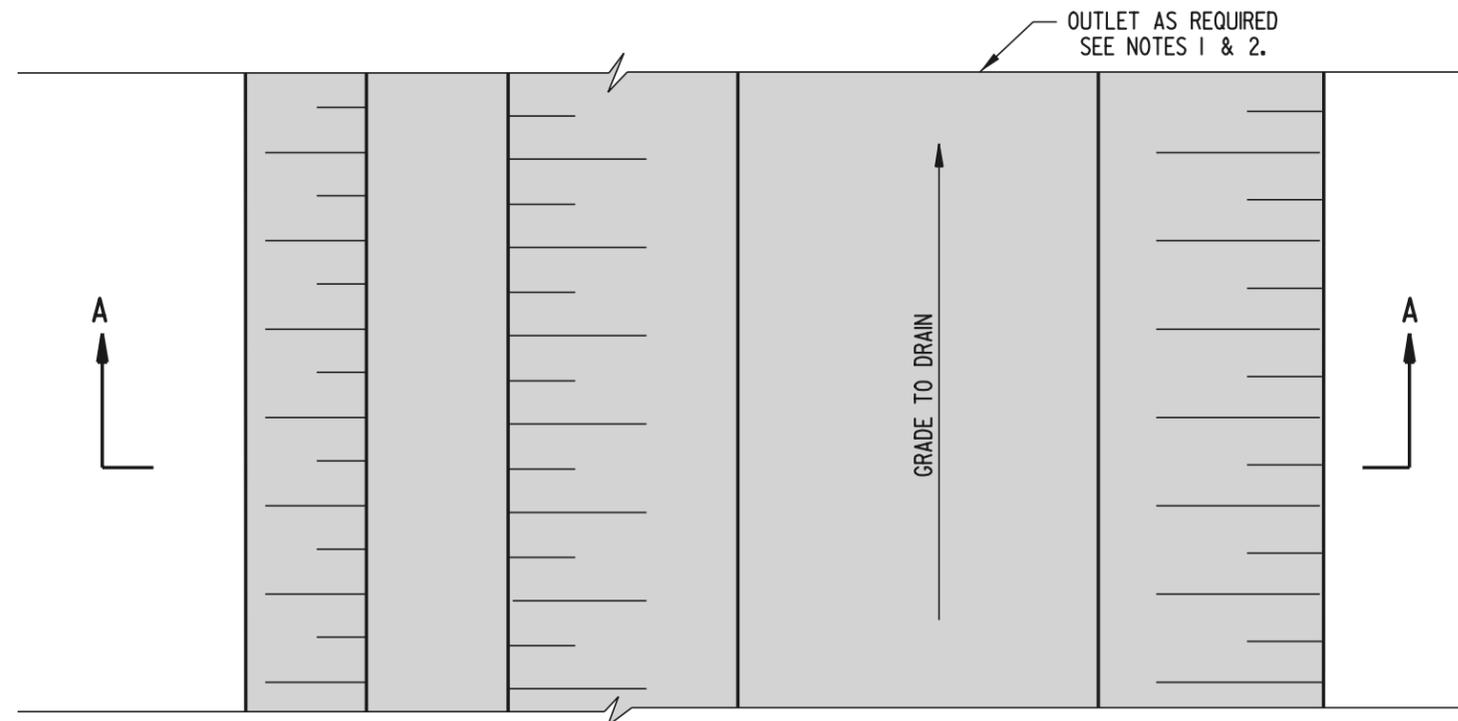
RECOMMENDED *Mehal Akhavan* **6/18/01**  
DESIGN ENGINEER DATE



**SECTION A-A**

CHART A - SWALE STABILIZATION		
SYMBOL	SWALE GRADE	TYPE OF TREATMENT
A-1	0.5-2.0%	SEED AND EROSION CONTROL BLANKET
A-2	2.1-8.0%	LINED R-4 RIPRAP
A-3	8.1-20%	ENGINEERED DESIGN

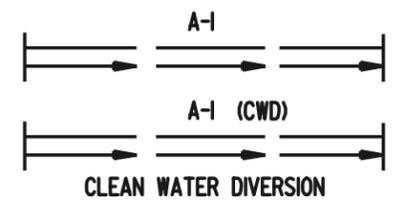
MAXIMUM DRAINAGE AREA: 2 ACRES (0.8 ha)



**PLAN**

- NOTES:**
- 1). DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
  - 2). DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL OUTLET INTO AN UNDISTURBED STABILIZED AREA AT NON-EROSIVE VELOCITY.
  - 3). IF PERIMETER DIKE SWALES ARE TO BE OPERATIONAL FOR MORE THAN 14 DAYS, THEY SHALL BE STABILIZED IN ACCORDANCE WITH CHART A PRIOR TO BECOMING OPERATIONAL.
  - 4). IF TEMPORARY SWALES OR CLEAN WATER DIVERSIONS ARE TO BE OPERATIONAL FOR LESS THAN 14 DAYS, THEY SHALL BE STABILIZED WITH GEOTEXTILE IN ACCORDANCE WITH THE STANDARD DETAIL, "GEOTEXTILE-LINED CHANNEL DIVERSION".

**PLAN SYMBOL**

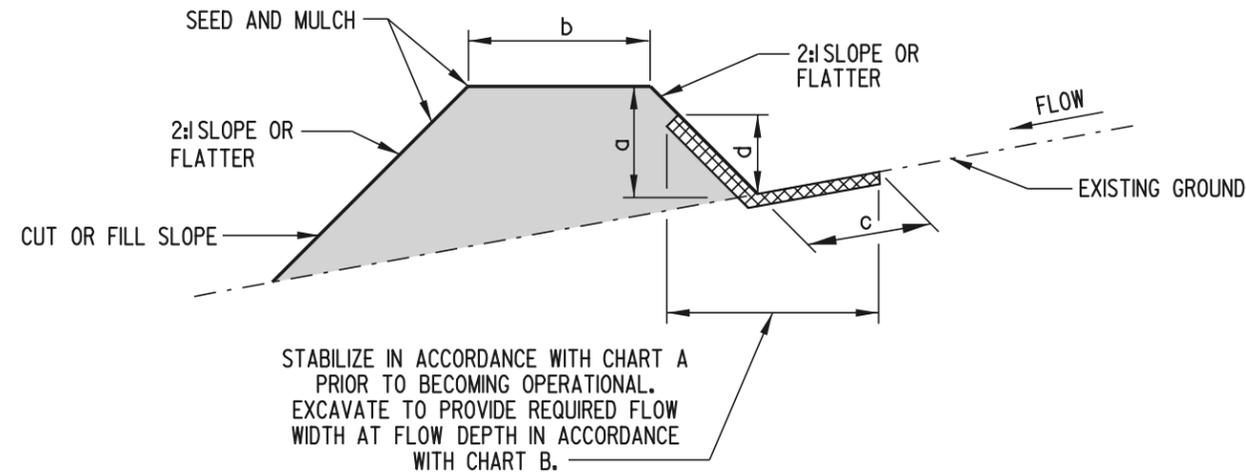


**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**PERIMETER DIKE / SWALE**

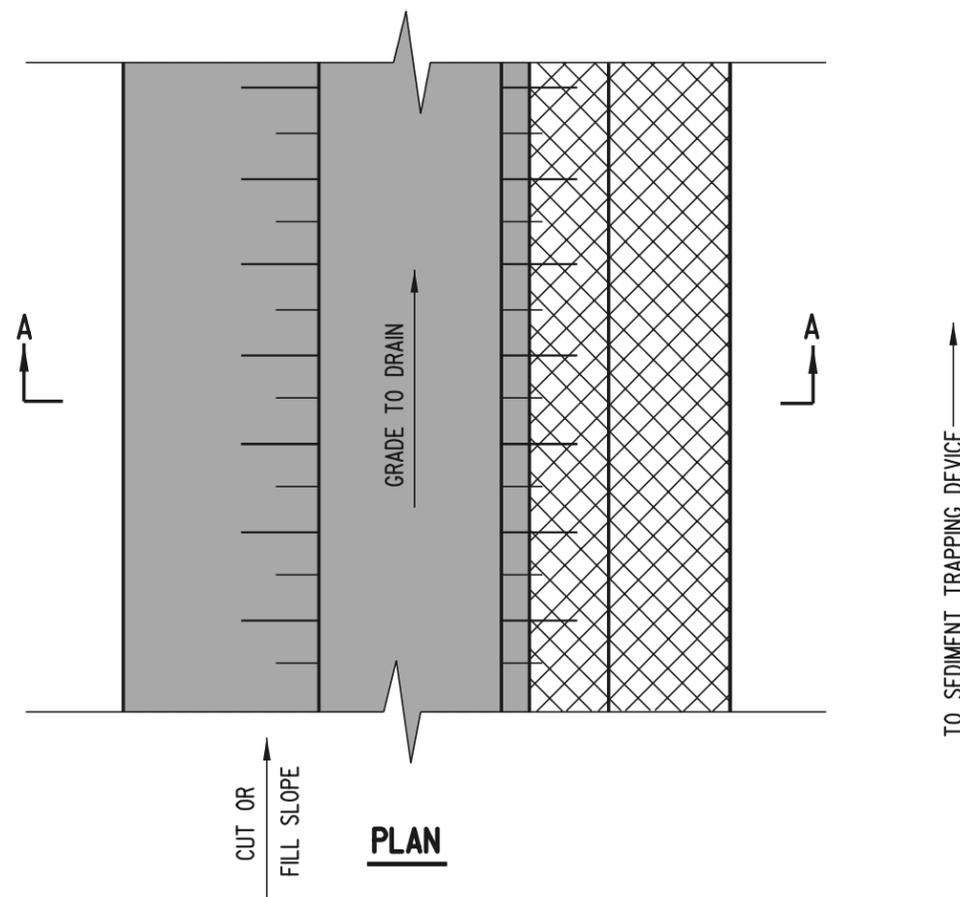
STANDARD NO. **E-12 (2001)** SHT. **1** OF **1**

APPROVED *Ryan M. Harshbarger* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Rajda* 6/18/01  
DESIGN ENGINEER DATE



TYPE	CHANNEL GRADE	TYPE OF TREATMENT
1	0.5-2.0%	SEED AND EROSION CONTROL BLANKET
2	2.1-8.0%	R-4 RIPRAP
3	8.1-20%	ENGINEERED DESIGN

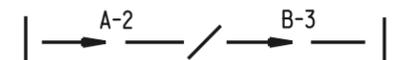
**SECTION A-A**



SYMBOL	DIKE A (5 ac (2 ha) or less)	DIKE B (5-10ac(2-4 ha))
a-DIKE HEIGHT	12" (300)	18" (450)
b-DIKE WIDTH	12" (300)	24" (600)
c-FLOW WIDTH	48" (1200)	72" (1800)
d-FLOW DEPTH	14" (350)	27" (680)

- NOTES:**
- 1). IF DESIRED, TOP WIDTH MAY BE WIDER AND SIDE SLOPES MAY BE FLATTER TO FACILITATE CROSSING BY CONSTRUCTION TRAFFIC.
  - 2). FIELD LOCATION SHOULD BE ADJUSTED AS NEEDED TO INSURE A STABILIZED OUTFALL.

**PLAN SYMBOL**

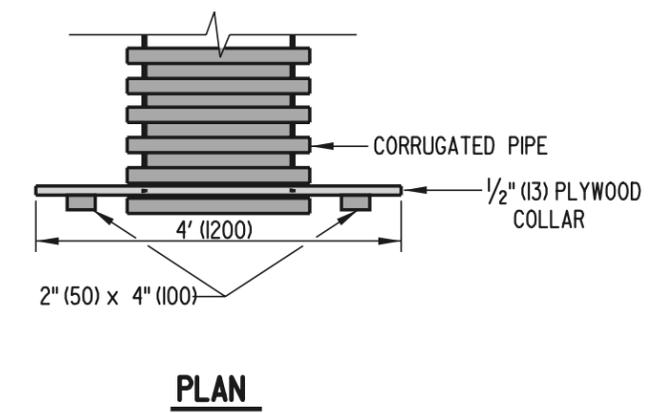
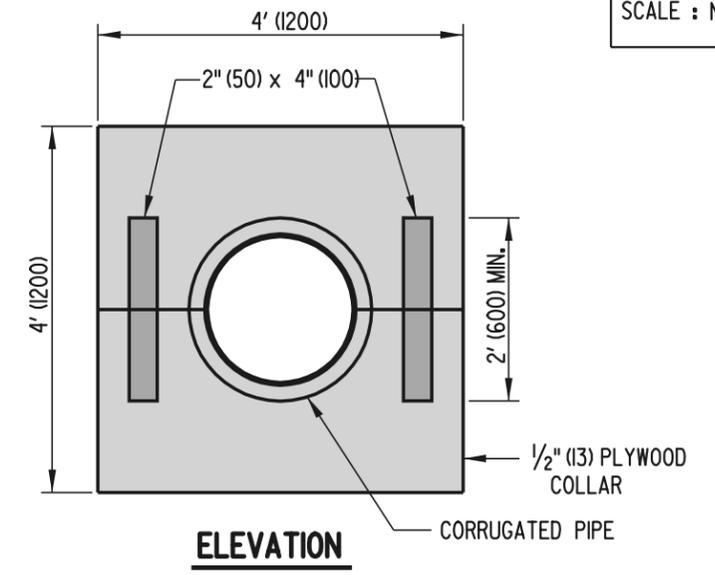
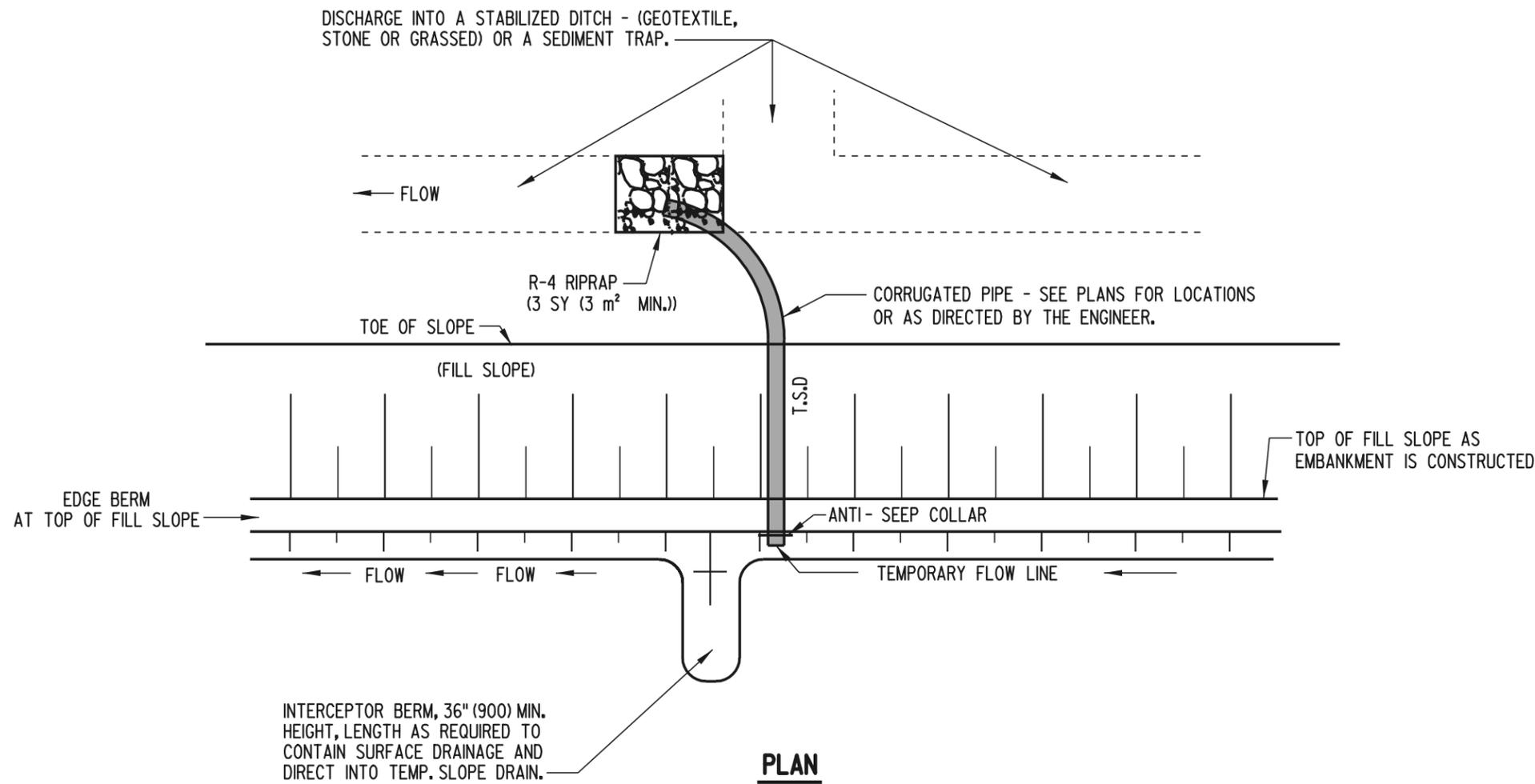


**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

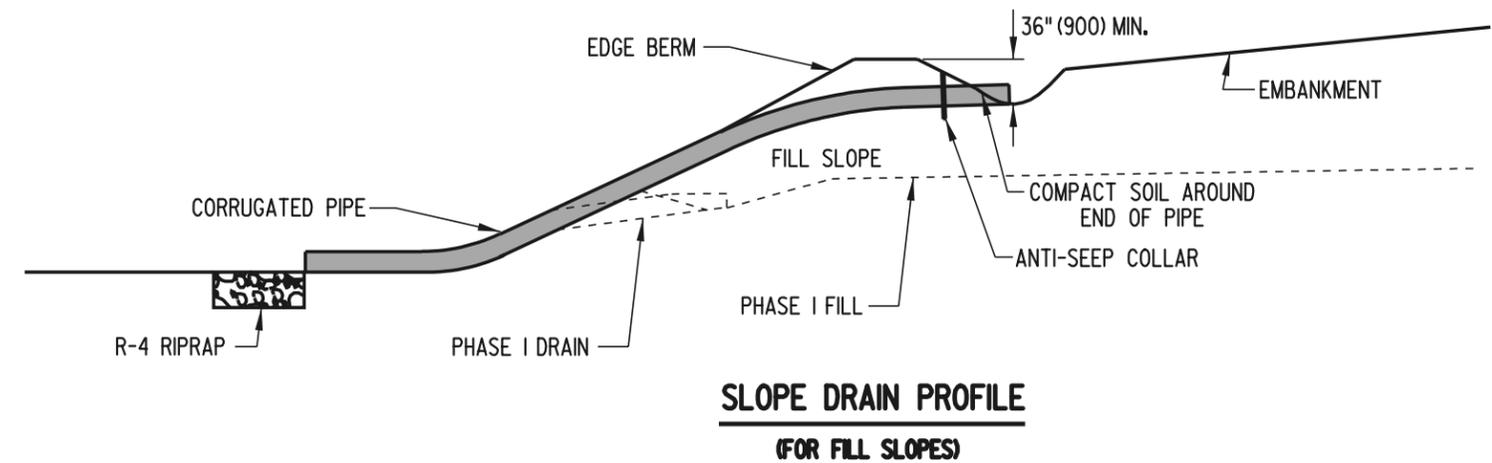
**EARTH DIKE**

STANDARD NO. **E-13 (2001)** SHT. **1** OF **1**

APPROVED *Ryan M. Hershman* **6/18/01**  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Akhavan* **6/18/01**  
DESIGN ENGINEER DATE



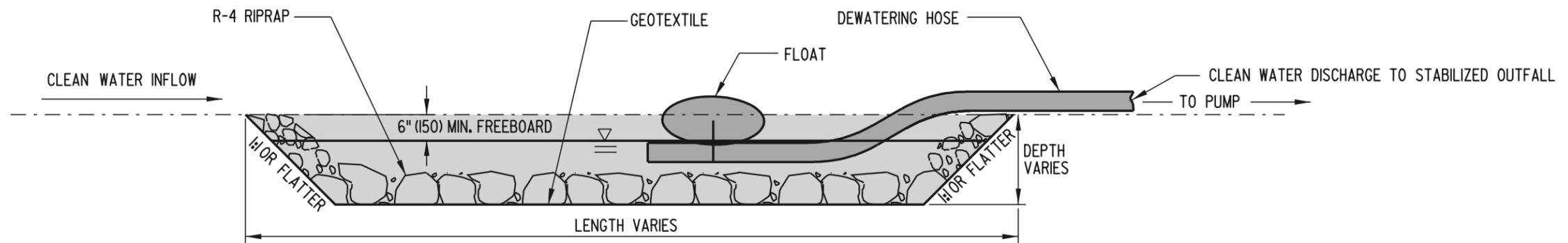
**ANTI-SEEP COLLAR**



- NOTES:**
- 1). ALL TEMPORARY SLOPE DRAINS SHALL DISCHARGE INTO THE BACK OF SEDIMENT TRAPS, INTO SEDIMENT BASINS OR DITCHES DISCHARGING INTO TRAPS OR BASINS.
  - 2). TEMPORARY SLOPE DRAINS SHALL BE USED AT THE TOP OF FILL SLOPES AS EMBANKMENT IS CONSTRUCTED, TO PREVENT EXCESSIVE EROSION UNTIL SHOULDERS ARE CONSTRUCTED AND THE SLOPES ARE SEEDED AND MULCHED.

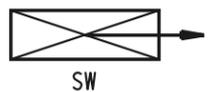
**PLAN SYMBOL**





- NOTES:**
- 1). THE WORK SHALL CONSIST OF CONSTRUCTING A STILLING WELL FOR THE PURPOSE OF PUMPING CLEAN WATER AROUND A DISTURBED CONSTRUCTION AREA TO A STABILIZED OUTFALL.
  - 2). THE DIMENSIONS OF THE STILLING WELL SHALL BE AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

**PLAN SYMBOL**



SW

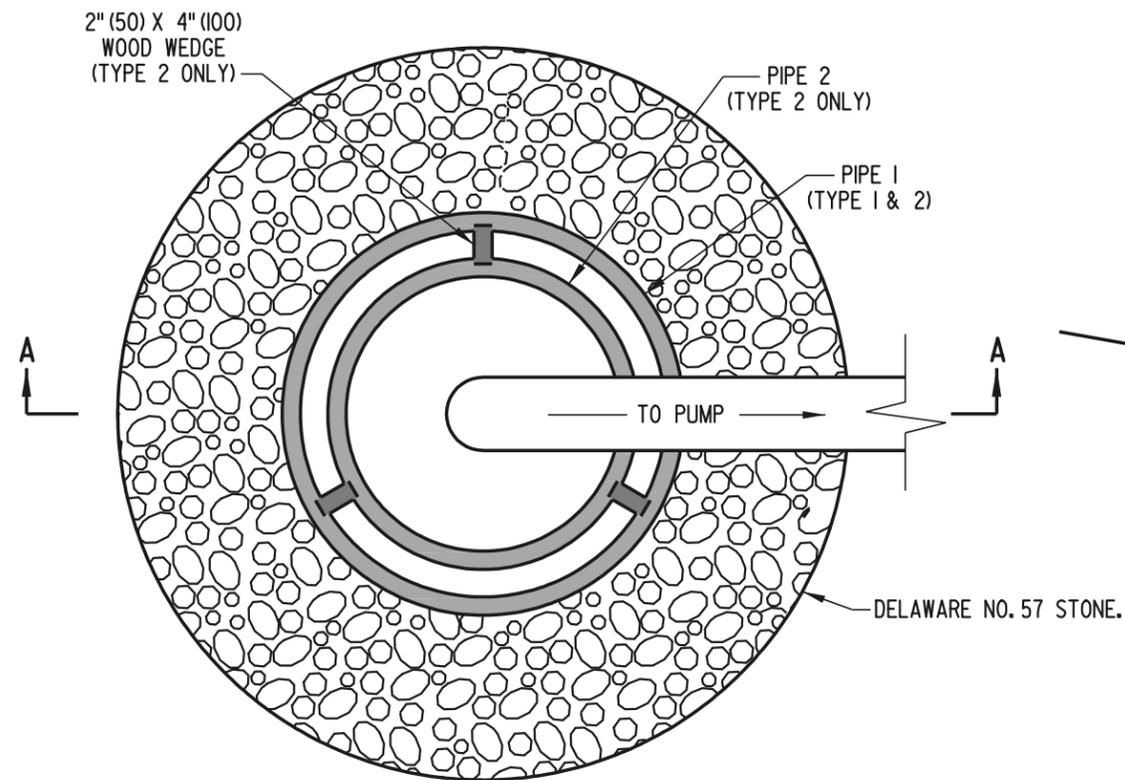


**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

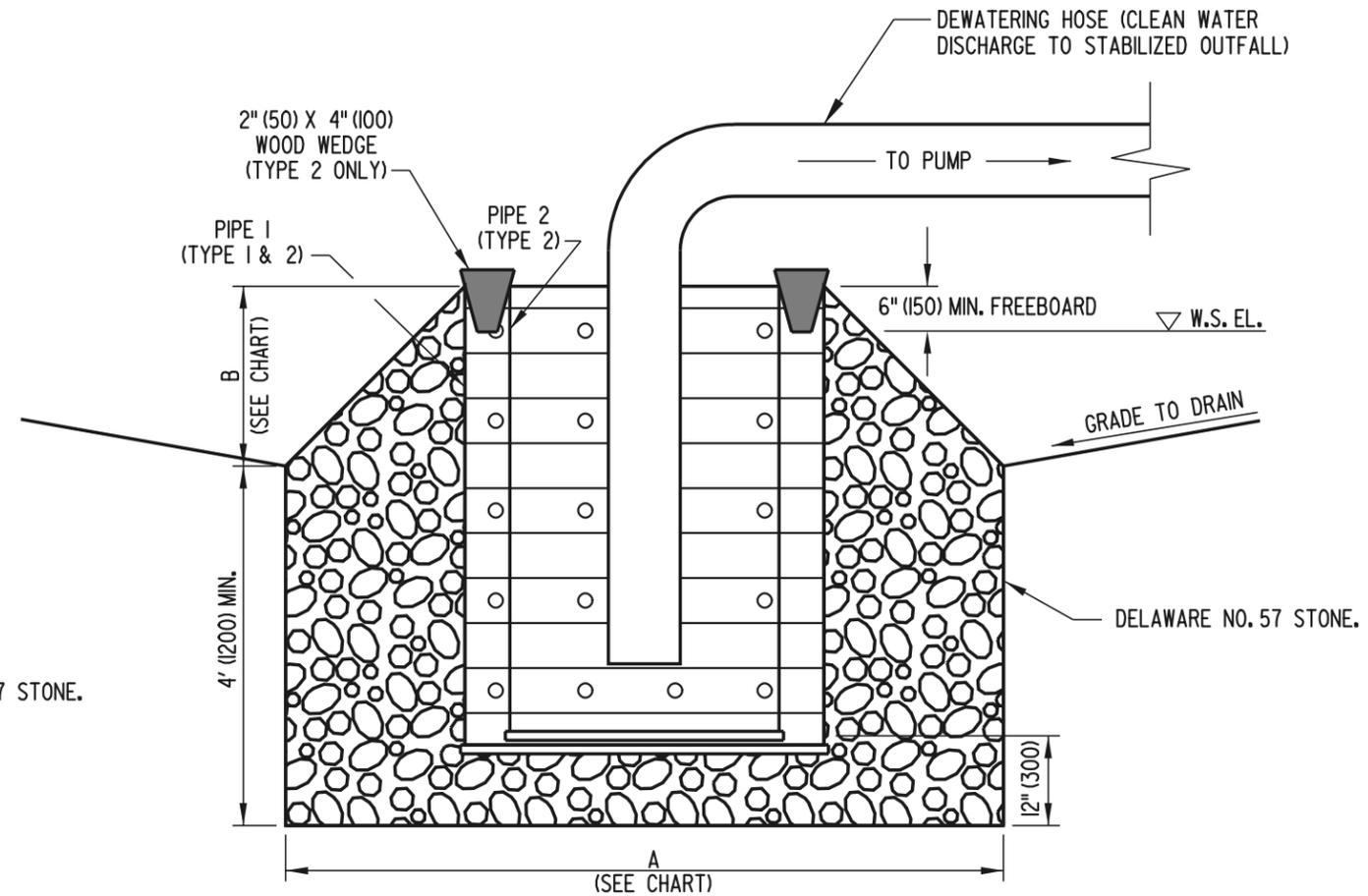
**STILLING WELL**

STANDARD NO. **E-15 (2001)** SHT. **1** OF **1**

APPROVED *Ryan M. Harshbarger* **6/18/01**  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Akhavan* **6/15/01**  
DESIGN ENGINEER DATE



**PLAN**

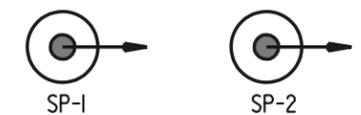


**SECTION A-A**

- NOTES:**
- 1). THE WORK SHALL CONSIST OF CONSTRUCTING A SUMP PIT FOR THE PURPOSE OF FILTERING AND PUMPING WATER TO A STABILIZED OUTFALL.
  - 2). GEOTEXTILE FOR THE 36" (900) CMP SHALL BE REPLACED WHEN CLOGGED WITH SEDIMENT.
  - 3). 1/2" x 1/2" (13 x 13) 19 GAGE (I.I) WIRE MESH SHALL BE PLACED AROUND THE REMOVABLE 36" (900) CMP BEFORE ATTACHING THE GEOTEXTILE TO INCREASE FLOW THROUGH THE GEOTEXTILE.
  - 4). ALL PERFORATIONS SHALL BE 1" (25) IN DIAMETER AND 12" (300) ON CENTER IN ALL DIRECTIONS.
  - 5). TYPE I SUMP PIT SHALL BE USED ONLY WHEN PUMPING IS NEEDED FOR LESS THAN 7 DAYS.

SUMP PIT CHART				
TYPE	PIPE 1	PIPE 2	A	B
1	PERFORATED 24" (600) CMP WITH PERFORATED CAP WELDED ON BOTTOM AND COMPLETELY WRAPPED WITH GEOTEXTILE.	N/A	4' (1200) MIN.	12" (300)
2	PERFORATED 48" (1200) CMP WITH PERFORATED CAP WELDED ON BOTTOM	REMOVABLE PERFORATED 36" (900) CMP WITH PERFORATED CAP WELDED ON BOTTOM AND COMPLETELY WRAPPED WITH GEOTEXTILE.	8' (2400) MIN.	24" (600)

**PLAN SYMBOL**

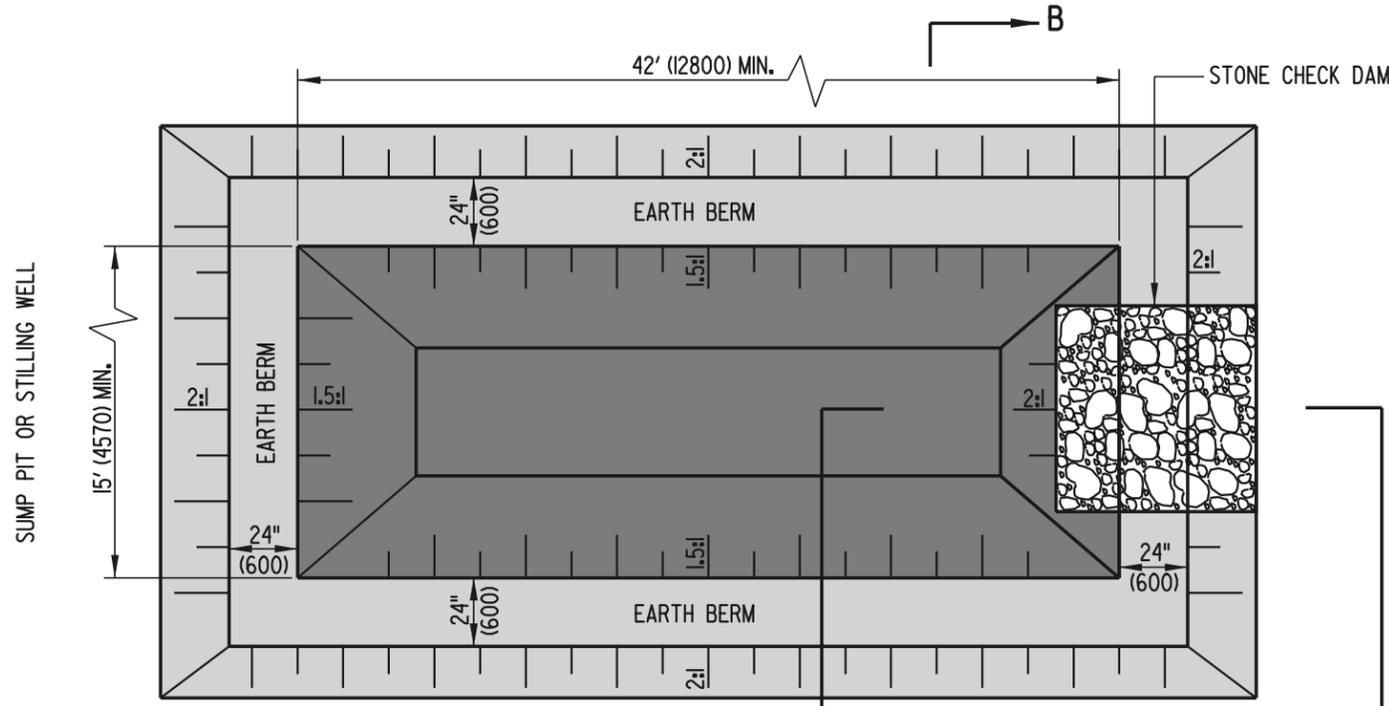


**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

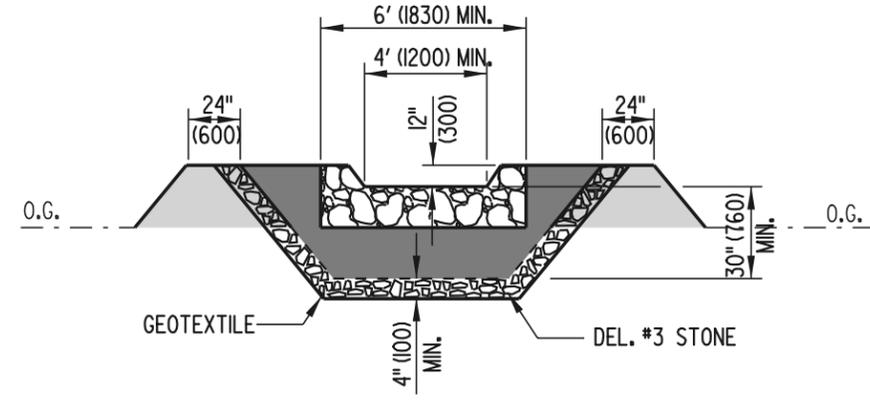
**SUMP PIT, TYPE 1 & 2**

STANDARD NO. **E-16 (2001)** SHT. **1** OF **1**

APPROVED *Ryan M. Harshbarger* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Rajda* 6/18/01  
DESIGN ENGINEER DATE



**PLAN**



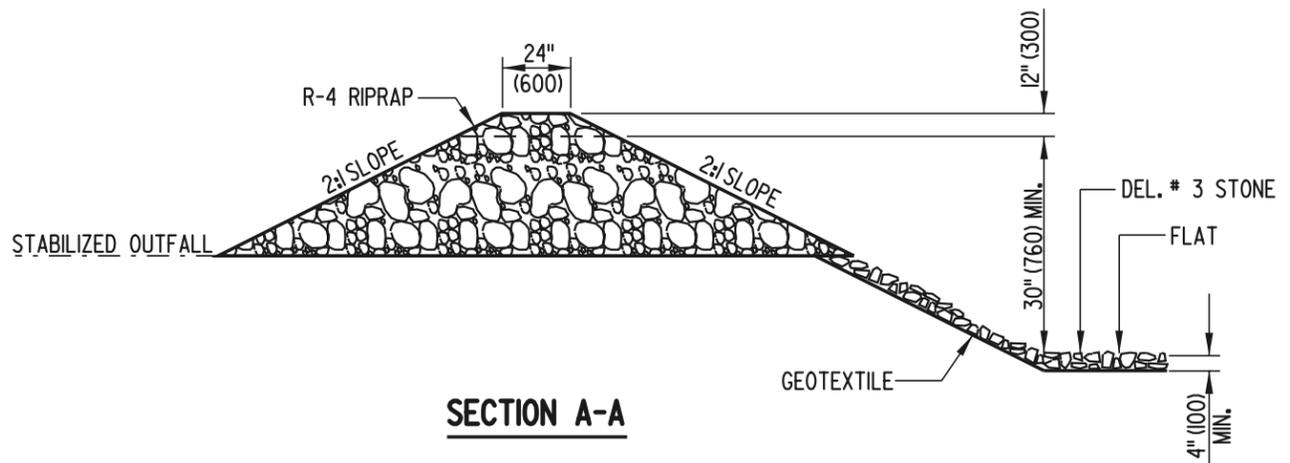
**SECTION B-B**

**NOTES:** 1.) A DEWATERING BASIN (DWB) IS USED TO REMOVE SEDIMENT FROM SEDIMENT-LADEN WATER PUMPED FROM A CONSTRUCTION SITE BEFORE THE WATER RE-ENTERS THE WATERWAY. THE DWB SHALL HAVE A MINIMUM TOP WIDTH OF 15' (4570) AND A MINIMUM DEPTH OF 3.5' (1065). THE MINIMUM TOP LENGTH SHOWN IN THE PLAN IS USED ONLY FOR QUANTITY CALCULATIONS BY THE ENGINEER. THE ACTUAL TOP LENGTH IN THE FIELD SHALL BE CALCULATED BY THE EQUATION:

US CUSTOMARY : TOP LENGTH (FEET) = 26' + .01 x Y  
 METRIC : TOP LENGTH (mm) = 7930 + 48300 x Y

WHERE Y IS THE MAXIMUM CAPACITY IN GALLONS PER MINUTE (CUBIC METERS PER SECOND) OF THE DEWATERING PUMP.

- 2.) THE OUTFALL FROM THE BASIN TO THE RECEIVING WATERS SHALL BE STABILIZED. PUMPING INTO THE DWB SHALL CEASE WHEN THE EFFLUENT FROM THE BASIN BECOMES SEDIMENT-LADEN.
- 3.) A SUMP PIT OR STILLING WELL (SEE STANDARD SHEETS) SHALL BE USED IN CONJUNCTION WITH A DWB. THE BASIN MAY BE BYPASSED INTO THE STABILIZED OUTFALL IF THE WATER BEING PUMPED IS NON-SEDIMENT-LADEN. DIRECT DISCHARGE TO THE RECEIVING WATERS SHALL CEASE AND BE REDIRECTED TO THE DWB WHEN EFFLUENT FROM THE PUMP BECOMES SEDIMENT-LADEN.
- 4.) MAINTENANCE MUST BE PERFORMED IN ORDER FOR THE DWB TO FUNCTION PROPERLY. ACCUMULATED SEDIMENT SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED DISPOSAL AREA WHEN THE BASIN IS FILLED TO WITHIN 12" (300) FROM THE CREST.
- 5.) WHEN USED IN CONJUNCTION WITH A COFFERDAM, DEWATERING SHALL BEGIN NO SOONER THAN 12 HOURS AFTER COFFERDAM INSTALLATION IN ORDER TO ALLOW SEDIMENT PRODUCED DURING INSTALLATION TO SETTLE COMPLETELY.

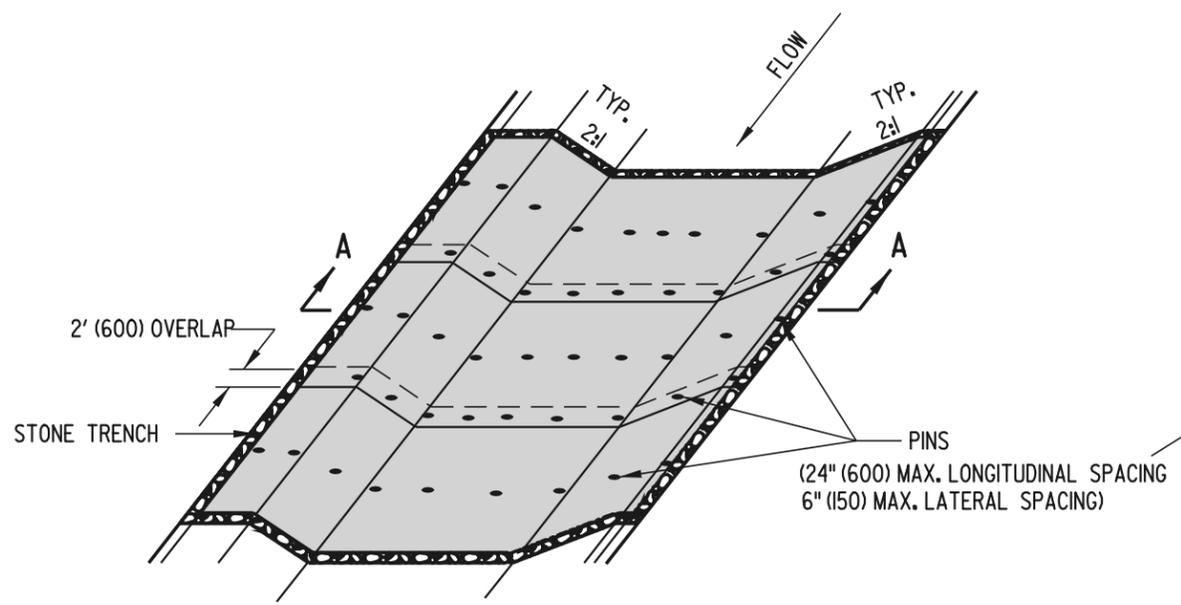


**SECTION A-A**

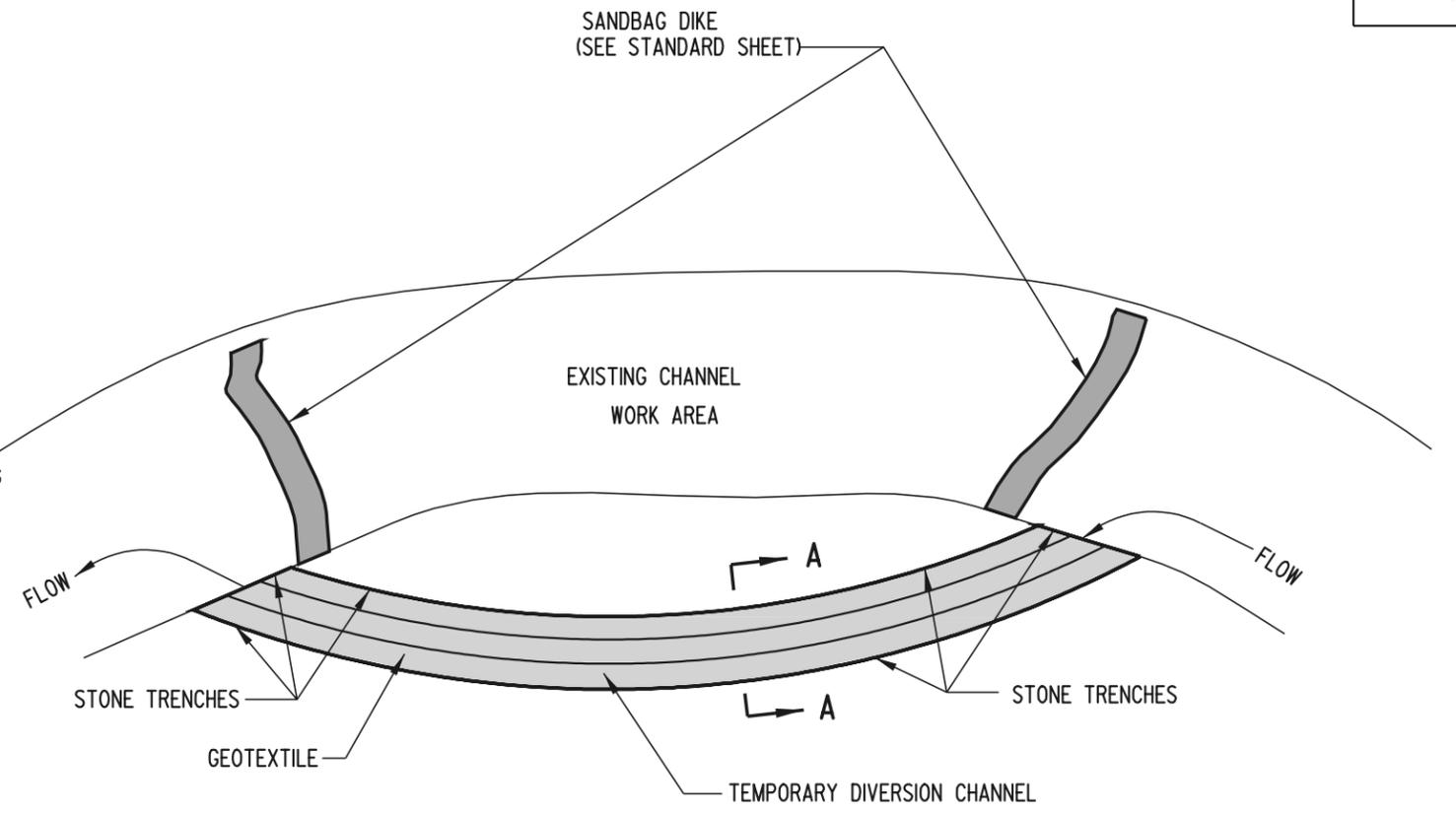
**PLAN SYMBOL**



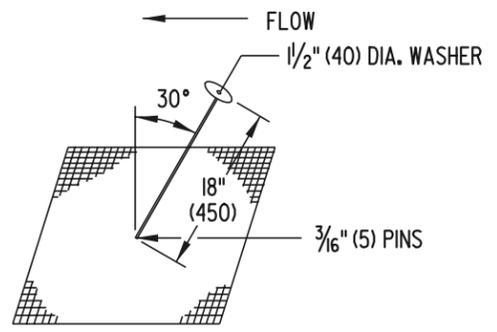
	<b>DEWATERING BASIN</b>				APPROVED <i>Ryan M. Harshbarger</i> 6/18/01 <small>CHIEF ENGINEER DATE</small>
	STANDARD NO. E-17 (2001)	SHT. 1	OF 1		RECOMMENDED <i>Mehal Rajda</i> 6/18/01 <small>DESIGN ENGINEER DATE</small>



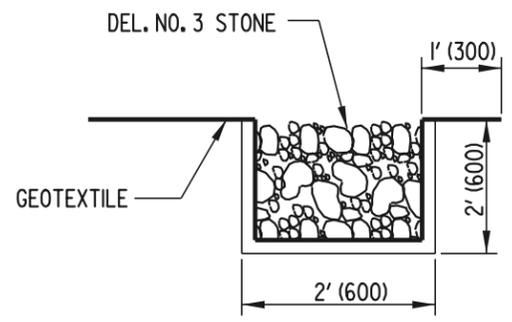
**OBLIQUE VIEW**



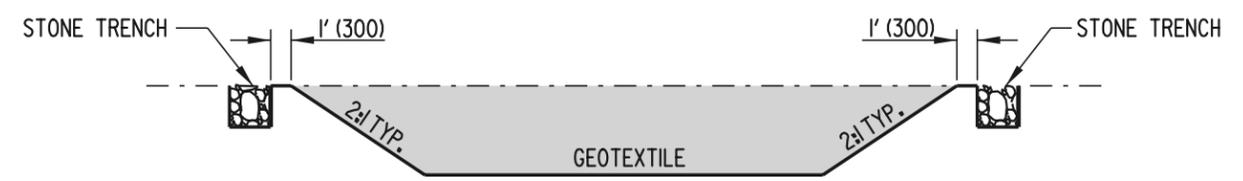
**PLAN**



**FASTENING DETAIL**



**TRENCHING DETAIL**

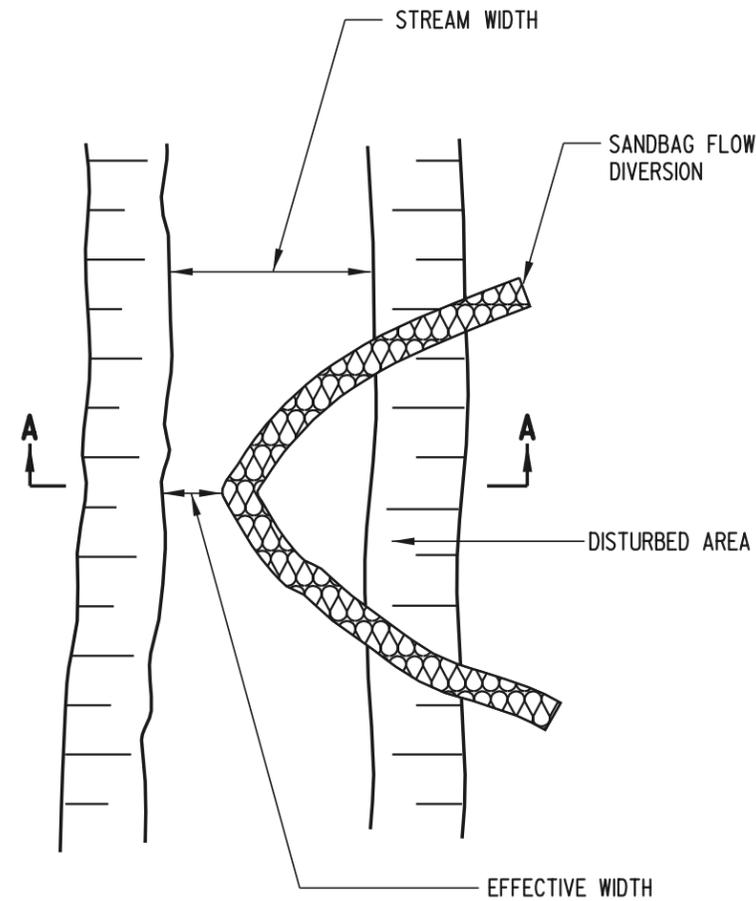


**SECTION A-A**

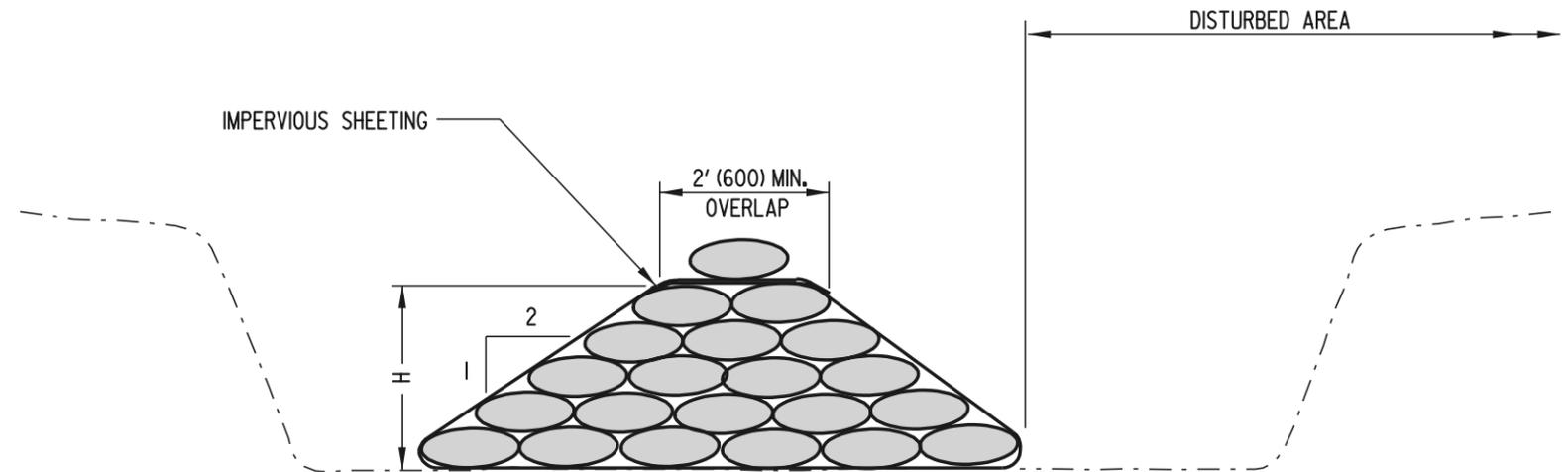
**PLAN SYMBOL**



NOTE: SEE PLANS FOR LOCATION, DIMENSIONS, GRADES, ETC.



**PLAN**



**SECTION A-A**

- NOTES:**
- 1). THE WORK SHALL CONSIST OF INSTALLING FLOW DIVERSIONS FOR THE PURPOSE OF EROSION CONTROL WHEN CONSTRUCTION ACTIVITIES TAKE PLACE WITHIN THE STREAM CHANNEL SUCH AS BANK STABILIZATION OR BRIDGE ABUTMENT CONSTRUCTION.
  - 2). THE DIVERSION STRUCTURE SHALL BE INSTALLED FROM UPSTREAM TO DOWNSTREAM.
  - 3). THE EFFECTIVE CHANNEL WIDTH SHALL BE SIZED TO PASS A ONE YEAR STORM EVENT PEAK FLOW, OR 1/3 OF STREAM WIDTH, WHICHEVER IS GREATER.
  - 4). THE SANDBAG DIVERSION HEIGHT (H) SHALL BE 1' (300) ABOVE THE PEAK ELEVATION OF THE ONE YEAR STORM.

**PLAN SYMBOL**

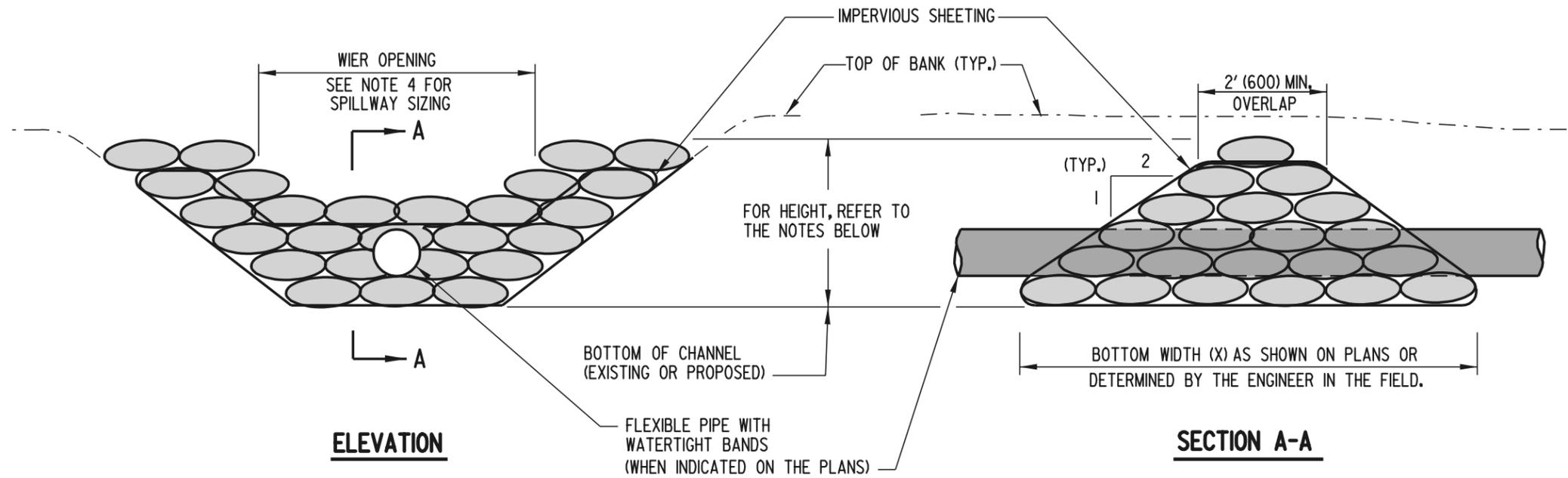


**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**SANDBAG DIVERSION**

STANDARD NO. **E-19 (2001)** SHT. **1** OF **1**

APPROVED *Ryan M. Harshbarger* **6/18/01**  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Akhavan* **6/18/01**  
DESIGN ENGINEER DATE



- NOTES:**
- 1). THE WORK SHALL CONSIST OF INSTALLING A SANDBAG DIKE FOR THE PURPOSE OF EROSION CONTROL WHEN CONSTRUCTION ACTIVITIES TAKE PLACE WITHIN THE STREAM CHANNEL SUCH AS BANK STABILIZATION OR BRIDGE ABUTMENT CONSTRUCTION.
  - 2). THE SANDBAG DIKE SHALL BE INSTALLED AT THE UPSTREAM LOCATION FIRST.
  - 3). THE HEIGHT OF THE SANDBAG DIKE SHALL BE 1' (300) ABOVE THE PEAK ELEVATION OF THE ONE YEAR STORM, OR EQUAL WITH THE TOP OF BANK, WHICHEVER IS LESS. SEE PLANS FOR INFORMATION.
  - 4). THE SPILLWAY SHALL BE SIZED TO PASS A (1) ONE YEAR STORM EVENT PEAK FLOW, SEE PLANS.
  - 5). THE PIPE, WHEN UTILIZED, SHALL BE SIZED TO PASS THE STREAM BASE FLOW.

**PLAN SYMBOL**

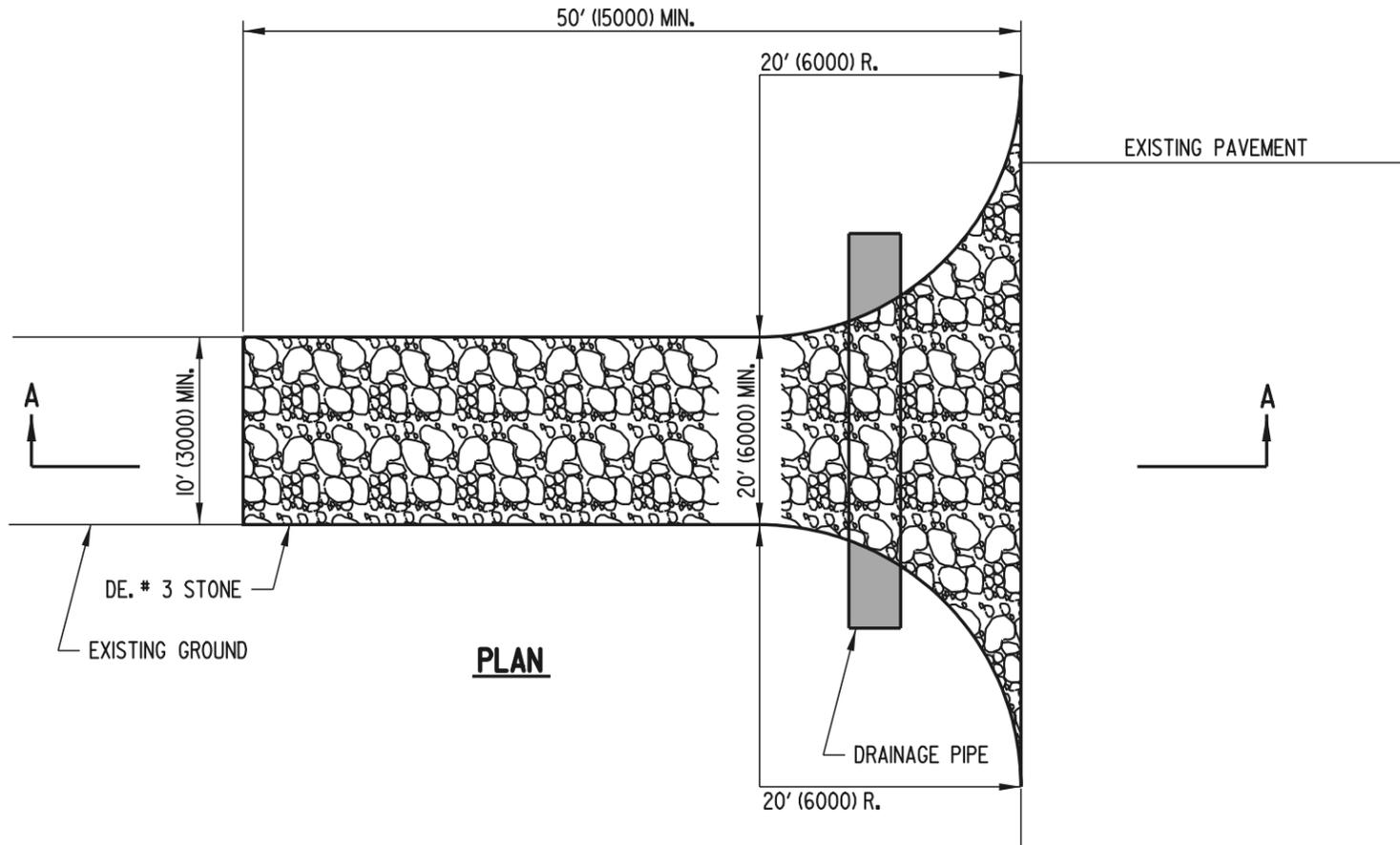


**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**SANDBAG DIKE**

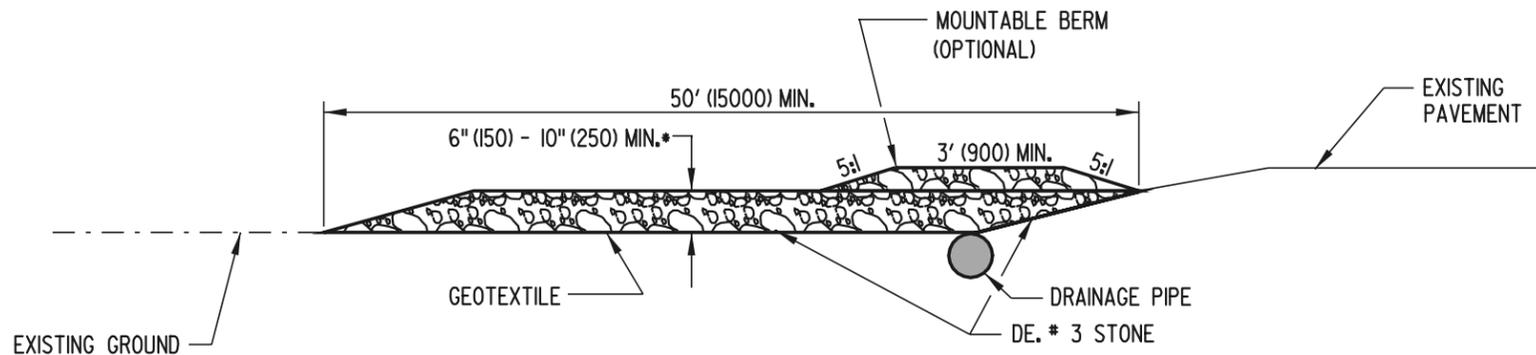
STANDARD NO. **E-20 (2001)** SHT. **1** OF **1**

APPROVED *Ryan M. Harkness* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Alghobari* 6/18/01  
DESIGN ENGINEER DATE



**PLAN**

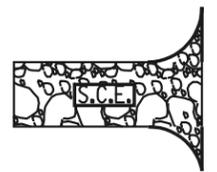
- NOTES:**
- 1). ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED UNDER THE ENTRANCE. IF NECESSARY, A MOUNTABLE BERM WITH 5:1 SLOPES SHALL BE ALLOWED TO FACILITATE PLACEMENT OF PIPES IN SHALLOW CONDITIONS.
  - 2). THE LOCATION AND NUMBER OF STABILIZED CONSTRUCTION ENTRANCES SHALL BE AS INDICATED ON THE PLANS. ANY CHANGE IN LOCATION, ADDITION, OR DELETION OF AN ENTRANCE SHALL BE APPROVED IN ADVANCE BY THE ENGINEER.
  - 3). DRAINAGE PIPE, IF UTILIZED, SHALL BE PAID FOR SEPARATELY UNDER THE APPROPRIATE BID ITEM.
  - 4). THE TOP 2" (50) OF STONE SHALL BE REMOVED AND REPLACED WITH 2" (50) OF CLEAN STONE WHEN VOIDS ARE FILLED OR AS DIRECTED BY THE ENGINEER.



**SECTION A-A**

\* 6" (150) MIN. (< 3 AXLE)  
10" (250) MIN. (> 3 AXLE)

**PLAN SYMBOL**



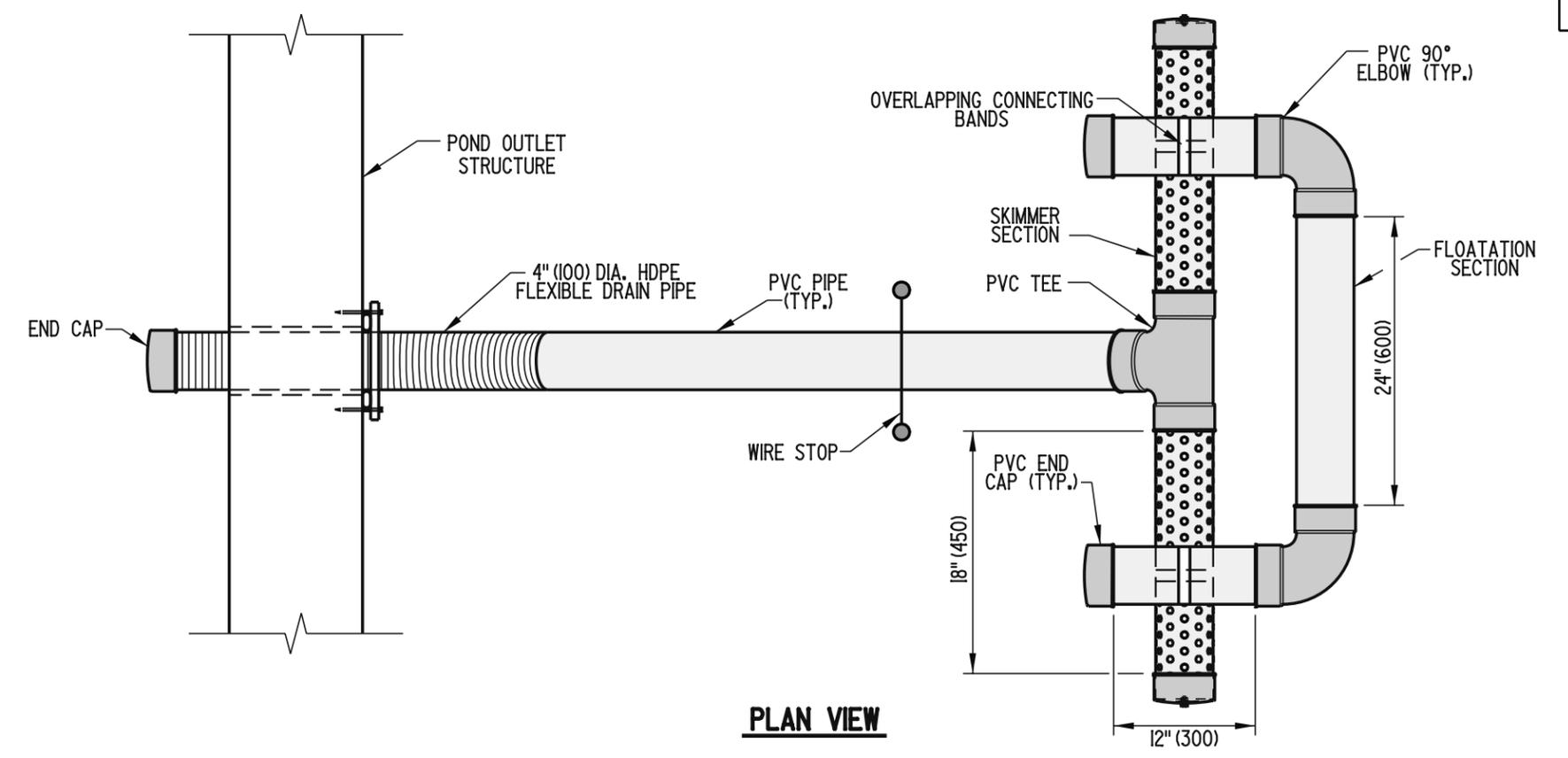
**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**STABILIZED CONSTRUCTION ENTRANCE**

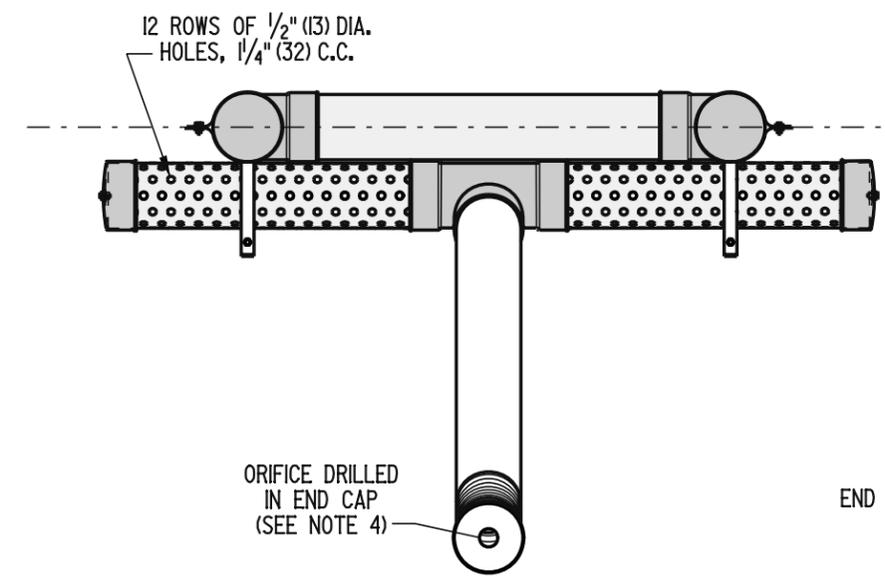
STANDARD NO. **E-21 (2001)** SHT. **1** OF **1**

APPROVED *Ryan M. Harshbarger* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Raju* 6/18/01  
DESIGN ENGINEER DATE

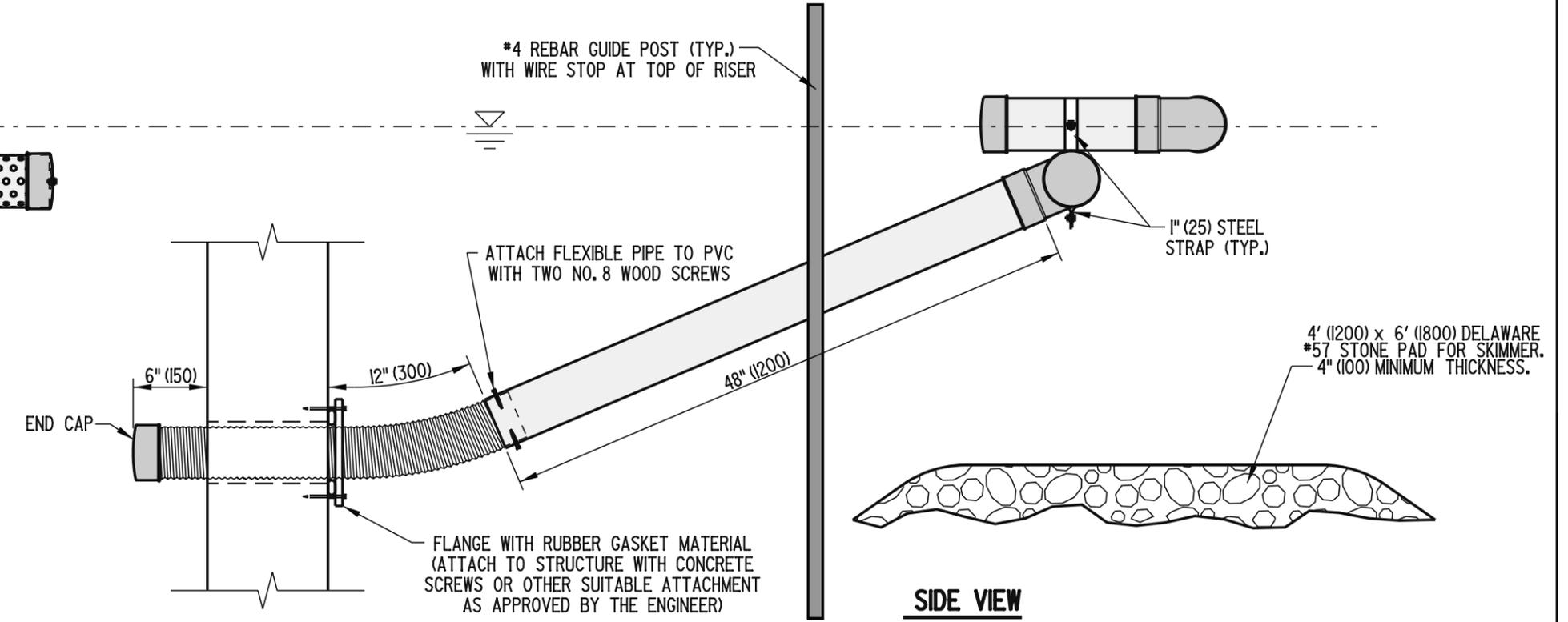
- NOTES:**
- 1). ALL P.V.C. PIPES ARE TO BE 4" (100) I.D., SCHEDULE 40
  - 2). ALL JOINTS OF THE FLOATATION SECTION SHALL BE SOLVENT WELDED. JOINTS OF SKIMMER SECTION NEED NOT BE WATER-TIGHT.
  - 3). 4" (100) HDPE FLEXIBLE DRAIN PIPE IS TO BE ATTACHED TO THE POND OUTLET STRUCTURE WITH WATER-TIGHT CONNECTIONS.
  - 4). ORIFICE IS TO BE SIZED ACCORDING TO STORAGE VOLUME AND TO SLOWLY RELEASE 1" (25) RUNOFF FOR AT LEAST 24-HOURS.



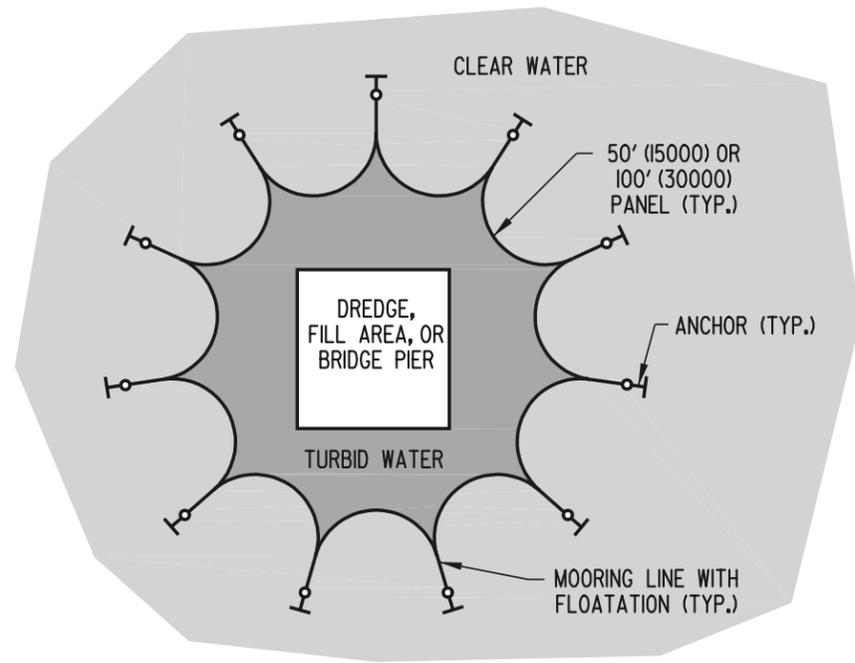
**PLAN VIEW**



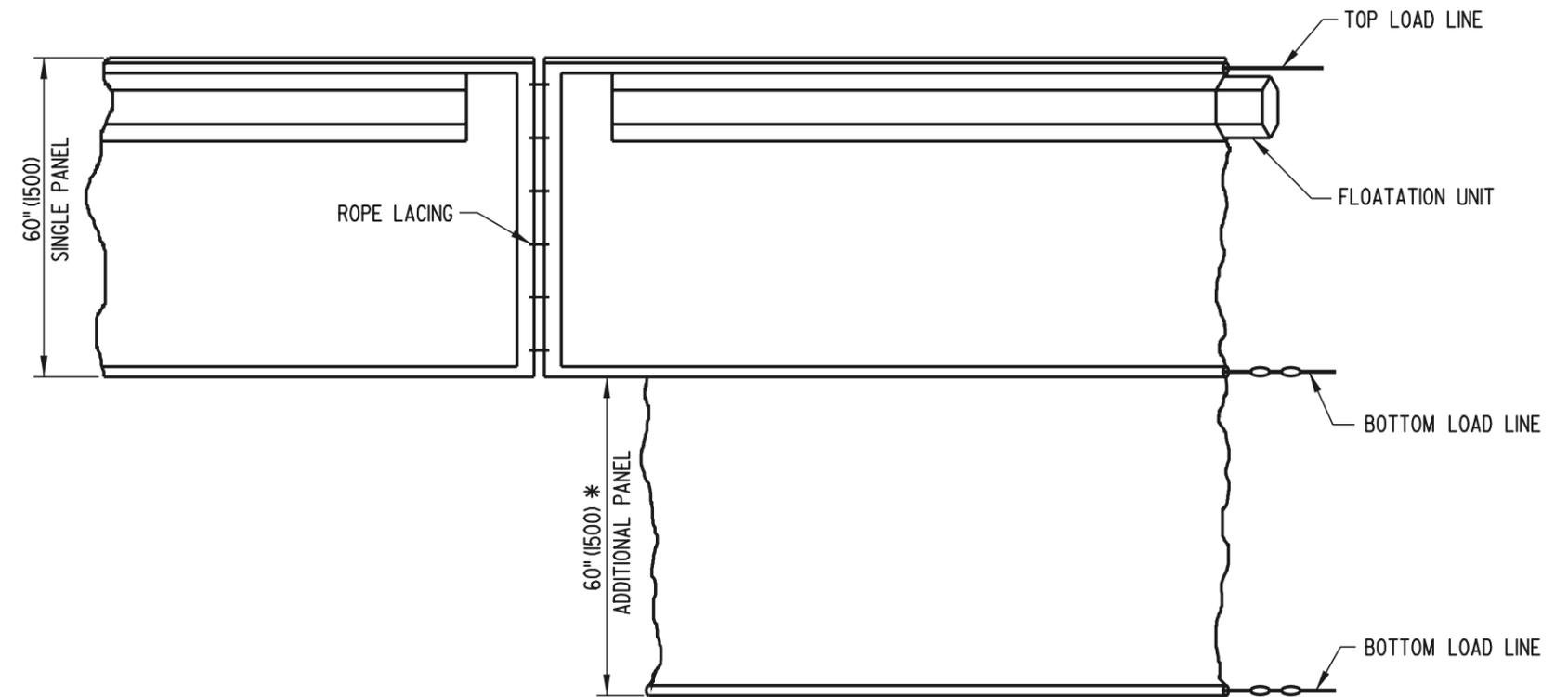
**FRONT VIEW**



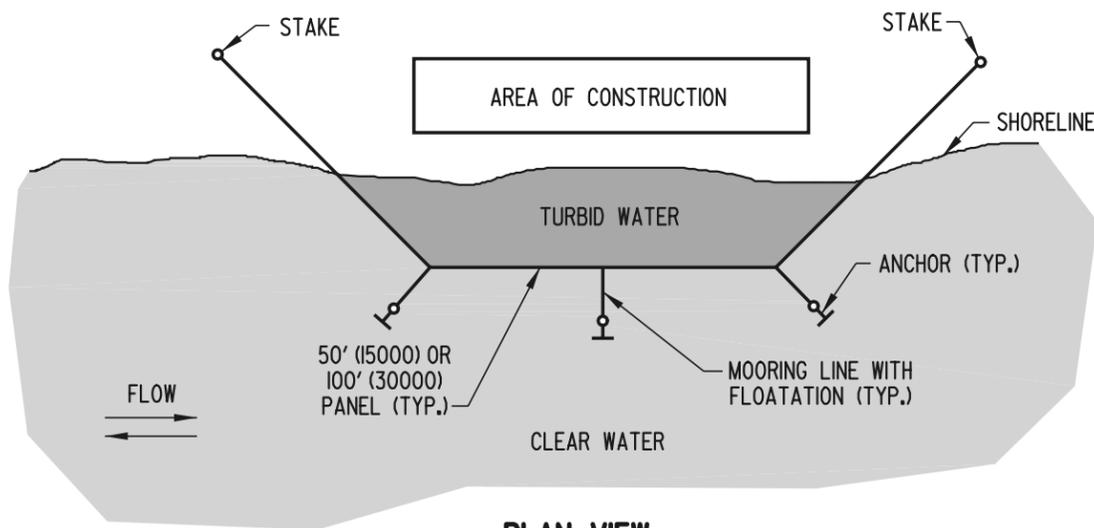
**SIDE VIEW**



**PLAN VIEW**  
OPEN WATER APPLICATION



**ELEVATION**



**PLAN VIEW**  
SHORELINE APPLICATION

**FLOATING TURBIDITY CURTAIN**

- NOTE:** 1.) ADDITIONAL PANEL REQUIRED FOR DEPTHS GREATER THAN 5' (1500).  
2.) FLOATING TURBIDITY CURTAIN SHALL REACH BOTTOM UP TO DEPTHS OF 10' (3000) BY USING TWO PANELS. DEPTHS GREATER THAN 10' (3000) SHALL REQUIRE SPECIAL DEPTH CURTAINS SPECIFICALLY CALLED FOR IN THE PLANS OR AS DIRECTED BY THE ENGINEER.

**PLAN SYMBOL**

— FTC —



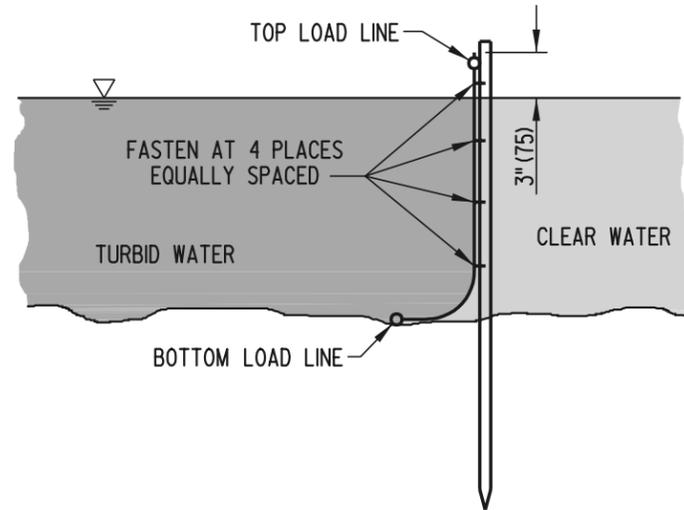
**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

**TURBIDITY CURTAIN**

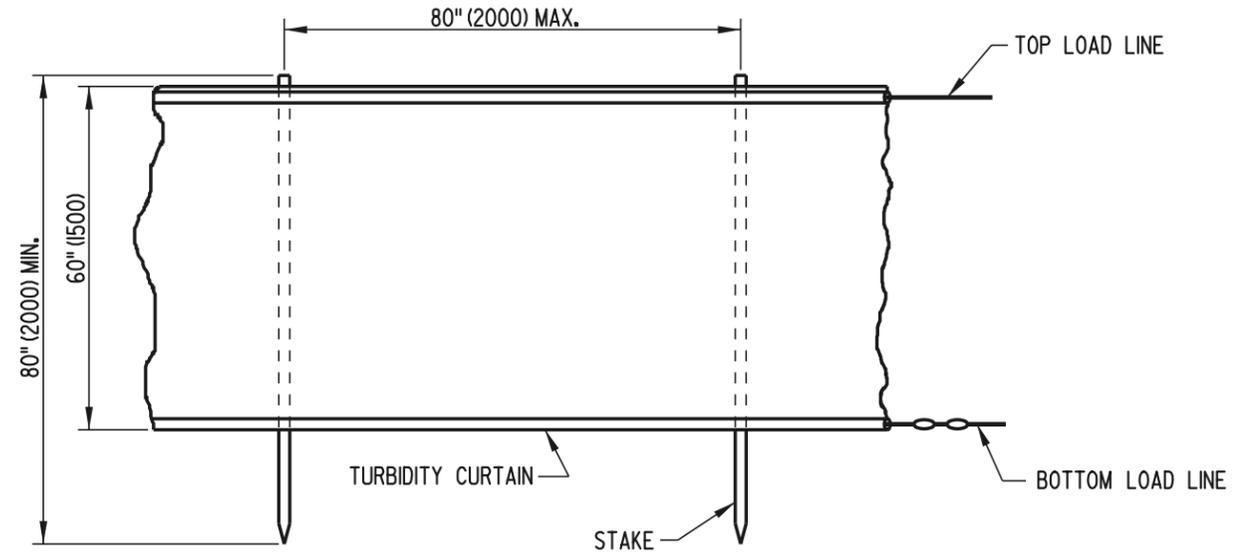
STANDARD NO. **E-23 (2001)**

SHT. **1** OF **2**

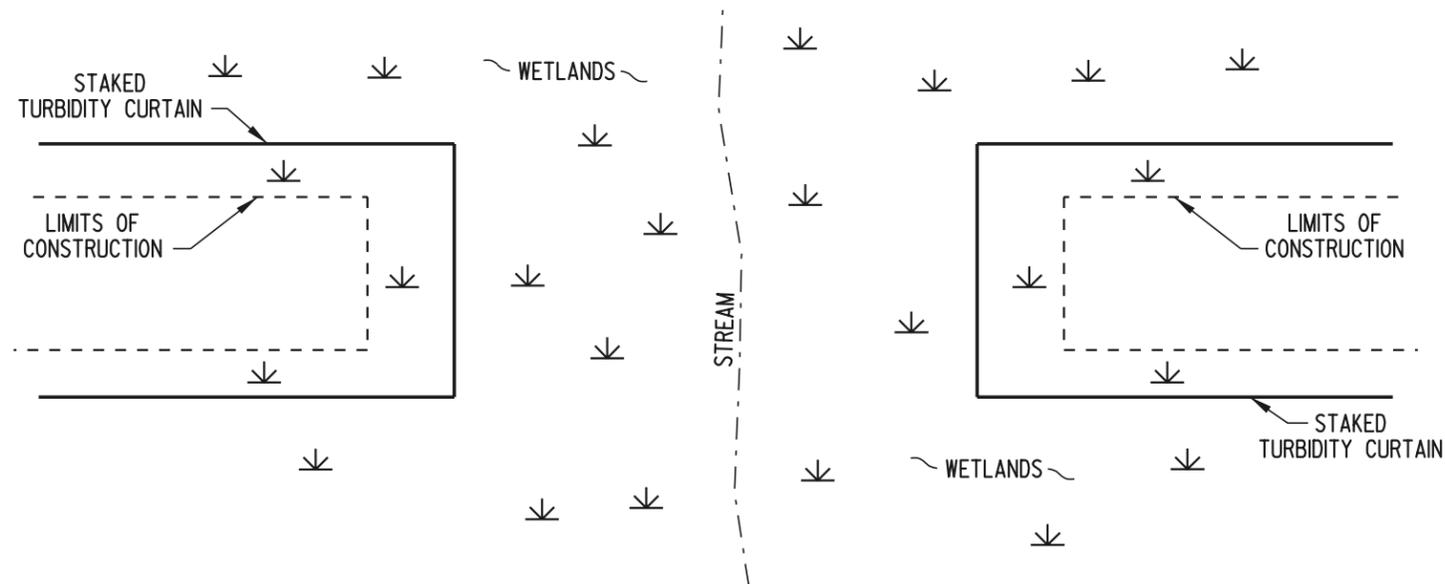
APPROVED *Ryan M. Harshbarger* **6/18/01**  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Aljeda* **6/18/01**  
DESIGN ENGINEER DATE



**SECTION**



**ELEVATION**



**PLAN VIEW**  
SHALLOW WATER/MARSH APPLICATION

**PLAN SYMBOL**

— STC —

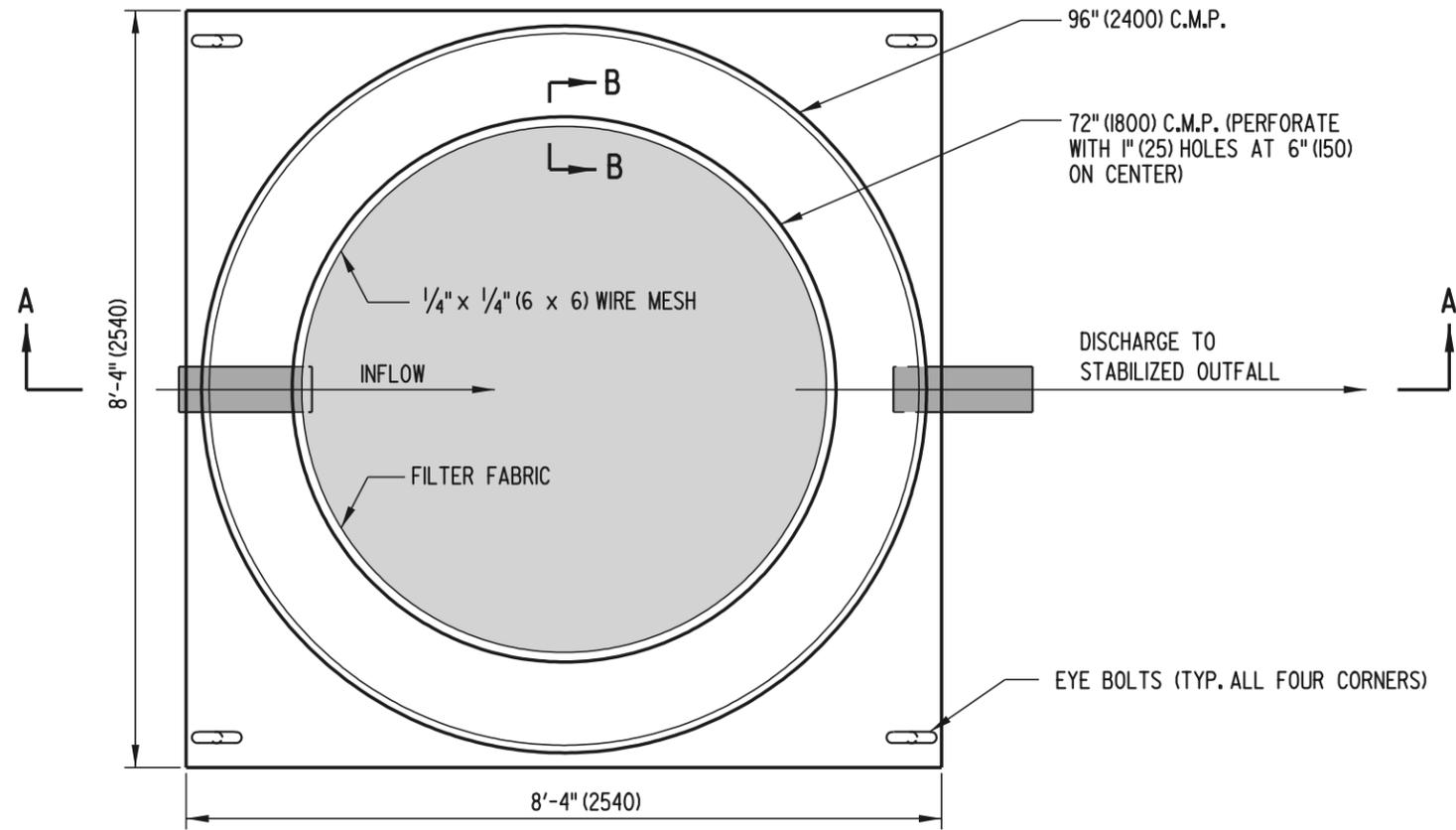
**STAKED TURBIDITY CURTAIN**



**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

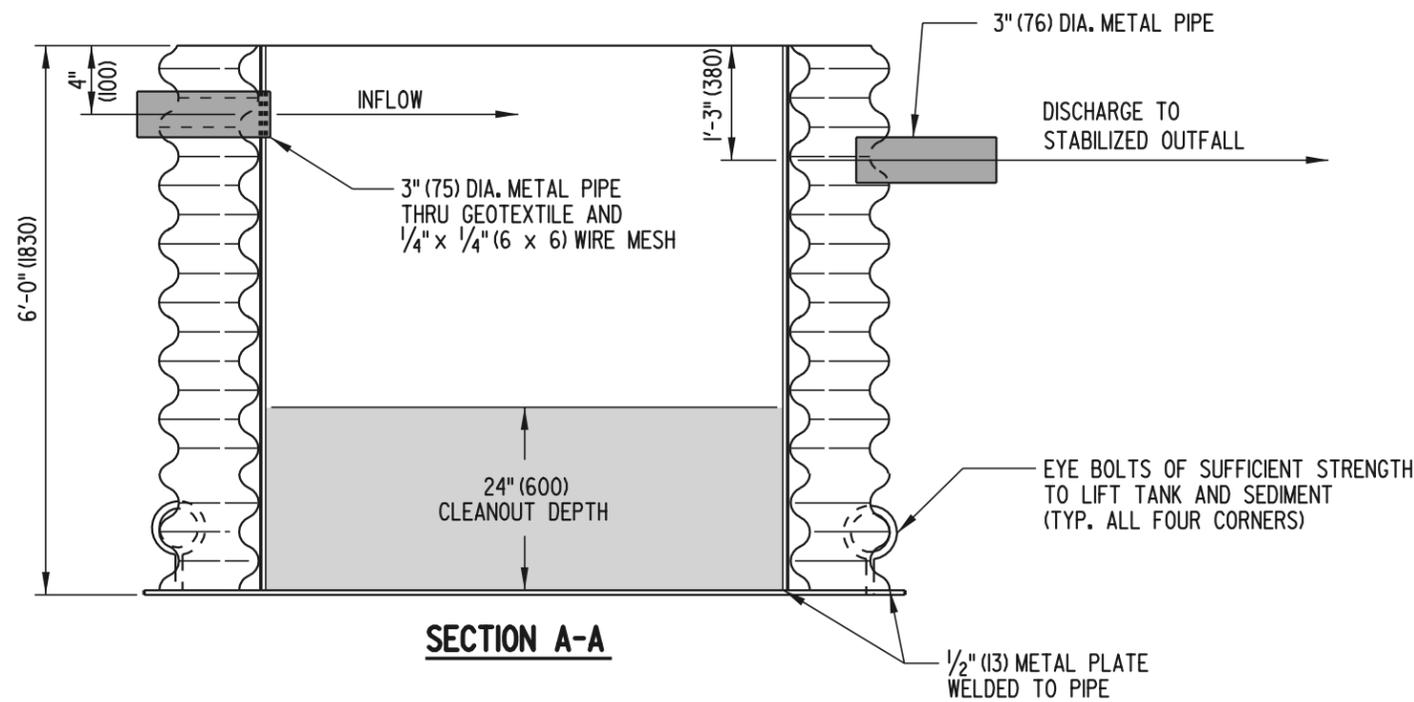
<b>TURBIDITY CURTAIN</b>			
STANDARD NO.	E-23 (2001)	SHT.	2 OF 2

APPROVED	<i>Ryan M. Harshbarger</i>	6/18/01
	CHIEF ENGINEER	DATE
RECOMMENDED	<i>Michael R. [Signature]</i>	6/18/01
	DESIGN ENGINEER	DATE

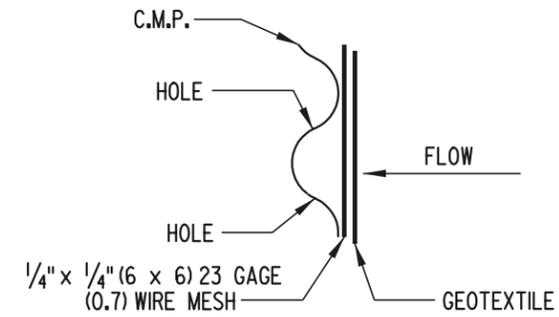


**PLAN**

- NOTES:**
- 1). THE PORTABLE SEDIMENT TANK SHOWN MAY BE USED IN SITES WHERE SPACE IS LIMITED TO CONSTRUCT A DEWATERING BASIN.
  - 2). THE MAXIMUM PUMP DISCHARGE INTO THIS TYPICAL PORTABLE SEDIMENT TANK SHALL BE 425 GALLONS PER MINUTE (26 LITERS PER SECOND). THE FILTER FABRIC SHALL BE REPLACED WHEN THE PORTABLE SEDIMENT TANK CAN NO LONGER ALLOW THIS FLOW RATE, WHEN THERE IS A TEAR, OR WHEN DIRECTED BY THE ENGINEER.
  - 3). SEVERAL UN-CONNECTED OR CONNECTED IN PARALLEL PORTABLE SEDIMENT TANKS MAY BE USED WHEN A HIGHER FLOW RATE IS NEEDED TO DE-WATER THE JOB.
  - 4). OTHER DESIGNS MAY BE USED PROVIDED THE HYDRAULIC DESIGN IS SUBMITTED TO AND APPROVED BY THE STORMWATER ENGINEER.



**SECTION A-A**



**SECTION B-B**

**PLAN SYMBOL**

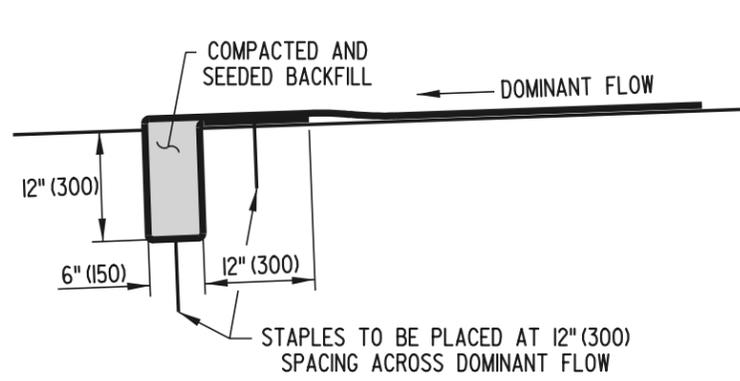


**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

**PORTABLE SEDIMENT TANK**

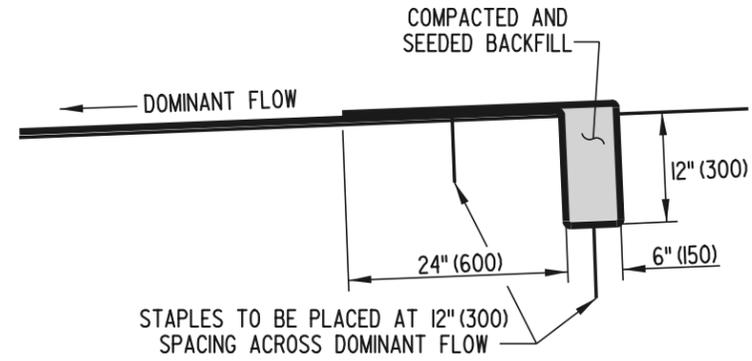
STANDARD NO. **E-24 (2001)** SHT. **1** OF **1**

APPROVED *Ryan M. Harkness* **6/18/01**  
CHIEF ENGINEER DATE  
 RECOMMENDED *Michael R. [Signature]* **6/18/01**  
DESIGN ENGINEER DATE



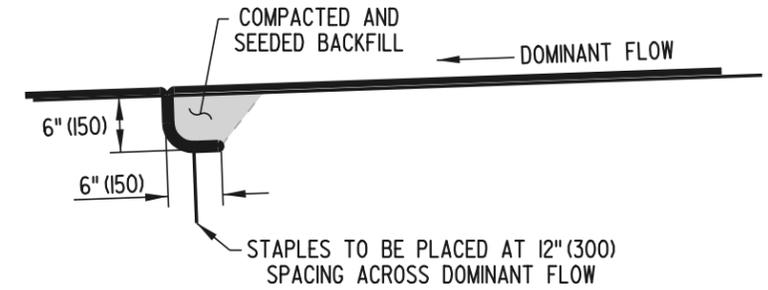
**INITIAL TRENCH ANCHOR DETAIL**

APPLIED AT THE DOWNSTREAM END OF DITCH



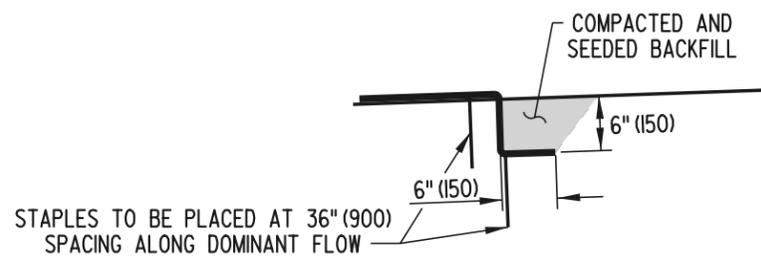
**TERMINAL TRENCH ANCHOR DETAIL**

APPLIED AT THE UPSTREAM END OF DITCH

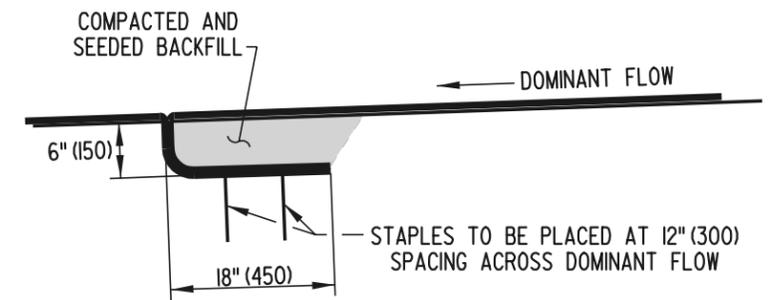


**CHECK SLOT DETAIL**

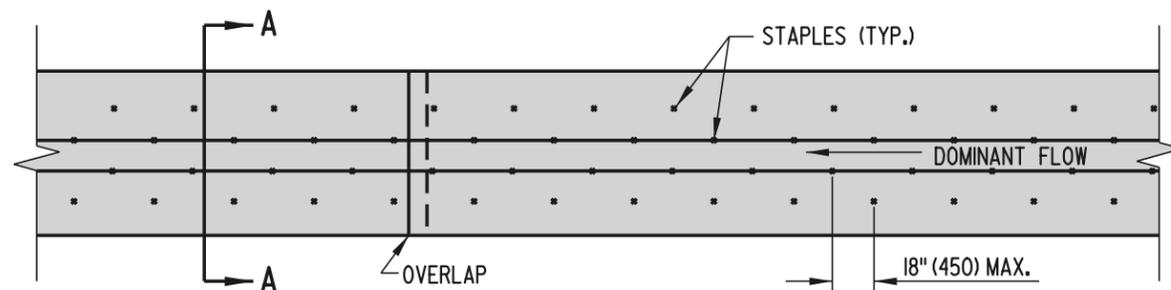
(AS NEEDED PER PLANS)



**LONGITUDINAL TRENCH ANCHOR DETAIL**

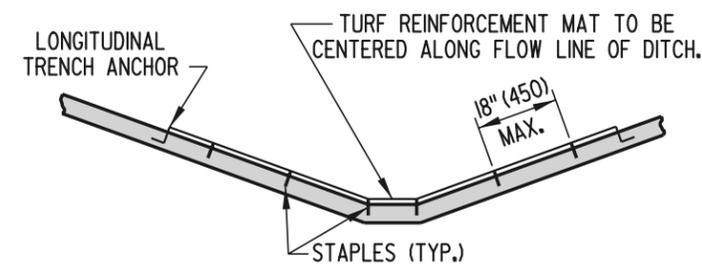


**OVERLAP DETAIL**

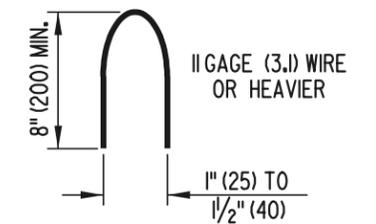


**STABILIZATION OF DITCHES PLAN**

- NOTES: 1. ADDITIONAL STAPLES NOT SHOWN ARE REQUIRED AT OVERLAPS, ENDS, CHECK SLOTS AND EDGES. SEE APPROPRIATE DETAILS FOR STAPLE PLACEMENT.  
 2. STAPLES ARE TO BE STAGGERED.  
 3. TOPSOIL UNDER TURF REINFORCEMENT MAT IS TO BE TRACKED AND SEEDED.

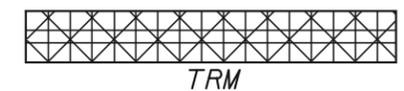


**STABILIZATION OF DITCHES SECTION A-A**



**STAPLE DETAIL**

**PLAN SYMBOL**



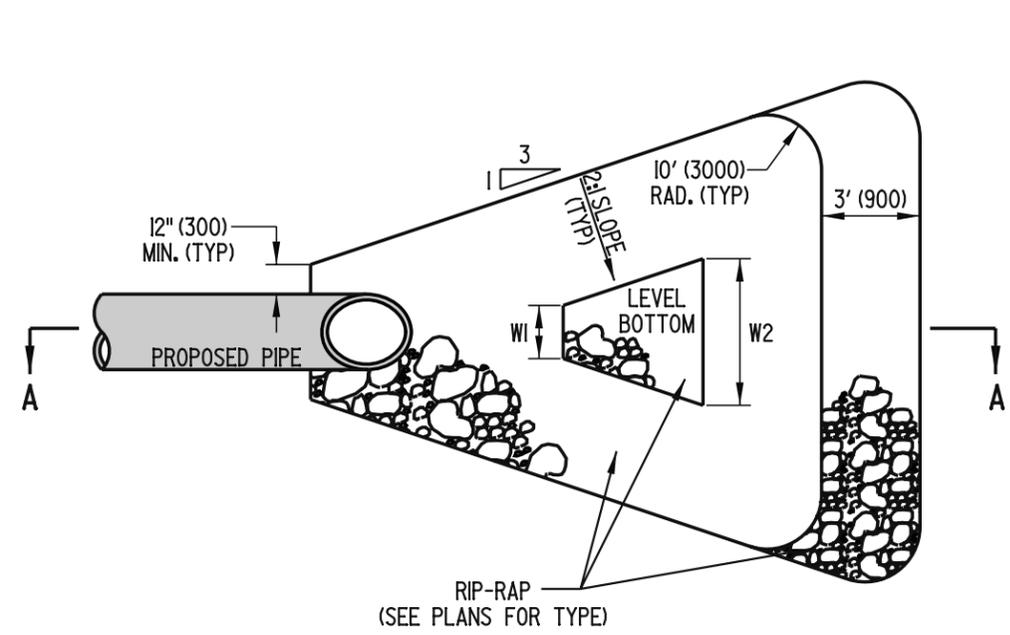
DELAWARE  
DEPARTMENT OF TRANSPORTATION

**TURF REINFORCEMENT MAT APPLICATIONS**

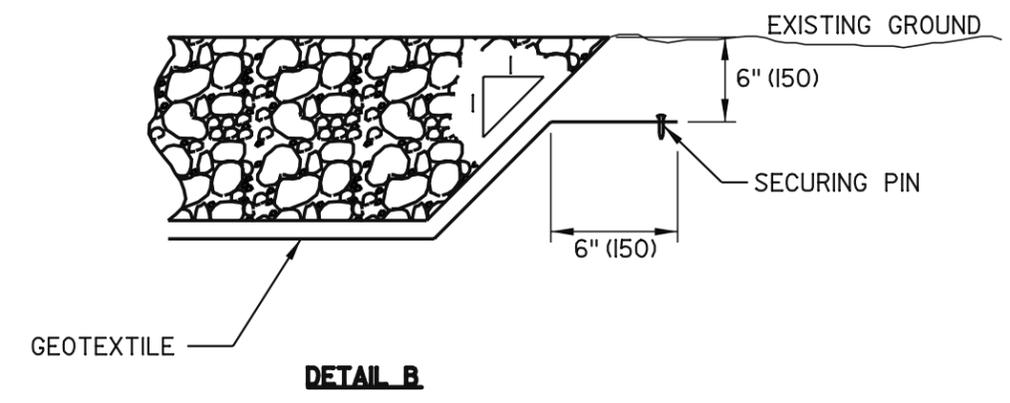
STANDARD NO. E-25 (2001) SHT. 1 OF 1

APPROVED *Ryan M. Hershberg* 6/18/01  
CHIEF ENGINEER DATE

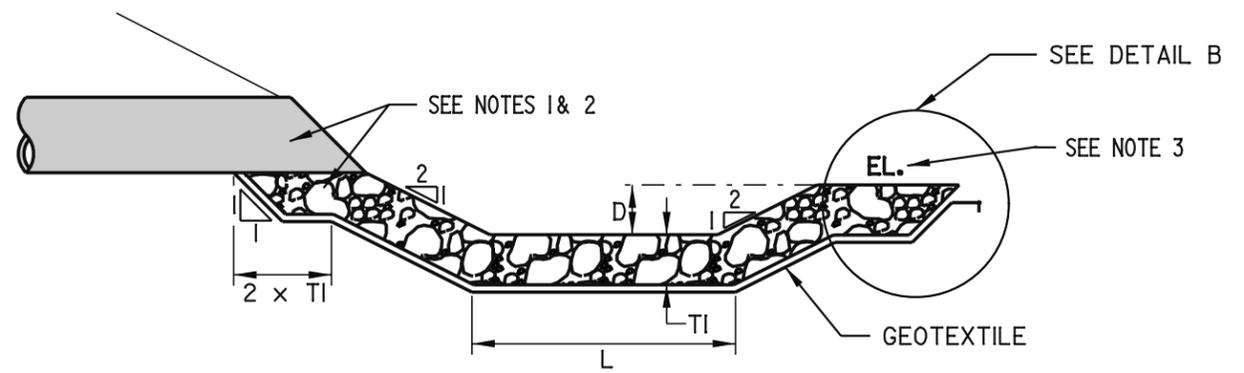
RECOMMENDED *Michael R. Gotsch* 6/18/01  
DESIGN ENGINEER DATE



**PLAN VIEW**

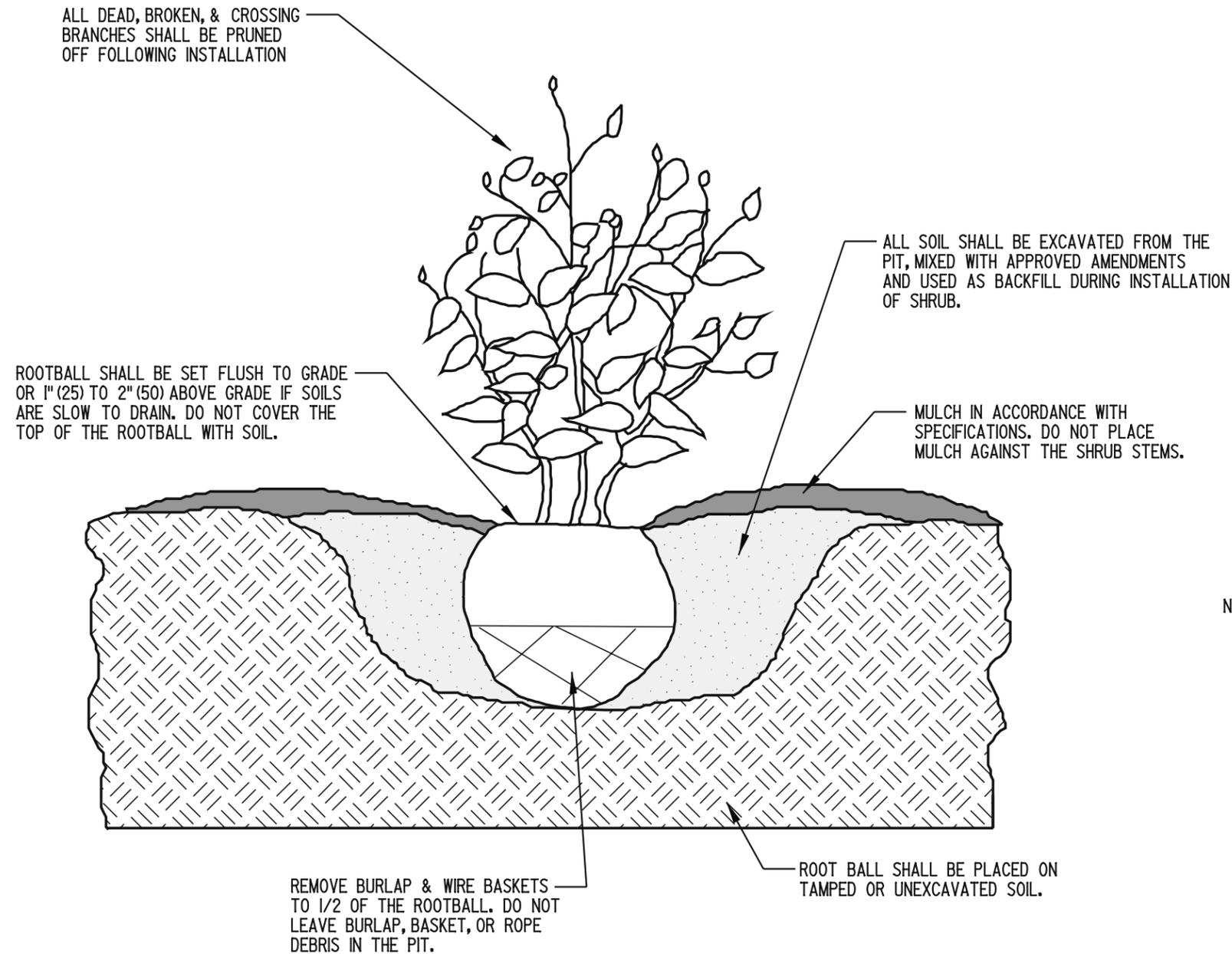


**DETAIL B**



**SECTION A-A**

- NOTES:
1. RIPRAP IS TO BE PLACED PRIOR TO PLACING PIPE.
  2. PLACE DELAWARE NO. 3 STONE UNDER PIPE.
  3. ELEVATION (EL.) SHOULD NOT BE HIGHER THAN PIPE INVERT.
  4. REFER TO THE PIPE ENERGY DISSIPATOR SCHEDULE ON THE CONSTRUCTION PLANS FOR THE VALUE OF DIMENSION VARIABLES.



- NOTES:
- 1). BASE OF PLANTING PIT SHALL BE A MINIMUM WIDTH OF TWICE THE ROOT BALL SIZE AND A MAXIMUM OF THREE TIMES THE ROOT BALL SIZE.
  - 2). SHRUBS SHALL BE INSTALLED IN MASSES OF NO LESS THAN 3 PLANTS. A MINIMUM OF 6' (1800) WIDTH IS REQUIRED FROM THE BACK OF CURB TO THE EDGE OF SIDEWALK FOR INSTALLATION OF SHRUBS.
  - 3). ALL PRUNING SHALL BE DONE BY AN I.S.A. CERTIFIED ARBORIST, CERTIFIED NURSERY PROFESSIONAL, OR UNDER THE DIRECTION THEREOF. DO NOT HEAVILY PRUNE SHRUBS AT PLANTING.
  - 4). AUGERED HOLES SHALL BE HAND DUG TO FINAL WIDTH AND TO ELIMINATE GLAZING.
  - 5). ALL SHRUB MASSES SHALL BE MULCHED AS ONE CONTINUOUS BED.

**ROADSIDE SHRUB PLANTING DETAIL**



**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**PLANTING DETAILS**

STANDARD NO. L-1 (2006) SHT. 1 OF 3

APPROVED

*Frank Taylor*  
CHIEF ENGINEER

10/10/06  
DATE

RECOMMENDED

*D. Smith*  
DESIGN ENGINEER

10/19/06  
DATE

DO NOT PRUNE THE DOMINANT LEADER OR TERMINAL BUDS OF THE CROWN.

**NOTES**

- 1). ALL PRUNING SHALL BE DONE BY OR UNDER THE DIRECTION OF, AN I.S.A. CERTIFIED ARBORIST OR CERTIFIED NURSERY PROFESSIONAL. DO NOT HEAVILY PRUNE TREES AT PLANTING.
- 2). ALL DEAD, BROKEN, & CROSSING BRANCHES SHALL BE PRUNED OFF FOLLOWING INSTALLATION.
- 3). BASE OF PLANTING PIT SIZE SHALL BE A MINIMUM WIDTH OF TWICE THE ROOT BALL SIZE AND A MAXIMUM OF THREE TIMES THE ROOT BALL SIZE.
- 4). WHEN PLANTING TREES ALONG STREETS, THERE MUST BE A MINIMUM OF 6' (1800) BETWEEN THE BACK OF CURB AND THE EDGE OF SIDEWALK AND SHALL BE CENTERED BETWEEN THE BACK OF CURB AND THE EDGE OF SIDEWALK.
- 5). WHEN PLANTING TREES ALONG SIDEWALKS, THE TREE SHALL BE LIMBED TO 7' (2100) FOR PEDESTRIAN CLEARANCE.

STAKE & GUY TREES. GUY WIRE, STAKES, & RUBBER HOSE SHALL BE AS SPECIFIED IN SECTION 737.

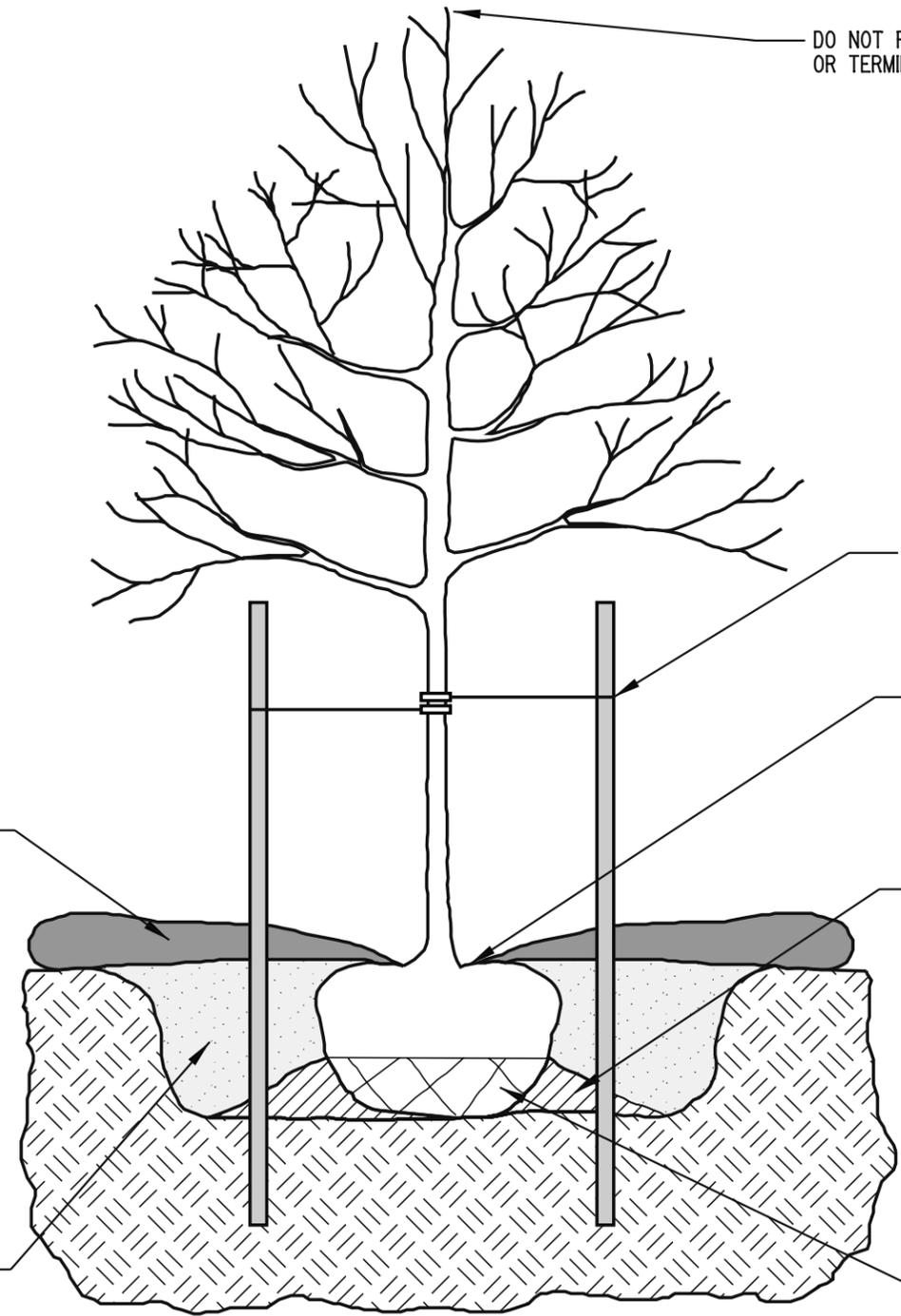
SET ROOT BALL FLUSH TO GRADE OR 1" (25) TO 2" (50) ABOVE GRADE IF SOILS ARE SLOW TO DRAIN. PLANT TREES SUCH THAT THE TRUNK FLARE IS VISIBLE. ANY TREE WHERE TRUNK FLARE IS NOT VISIBLE SHALL BE REJECTED. DO NOT COVER THE TOP OF THE ROOT BALL WITH SOIL.

TAMP SOIL AROUND THE ROOT BALL BASE WITH FOOT PRESSURE SO ROOT BALL DOES NOT SHIFT.

MULCH IN ACCORDANCE WITH SPECIFICATIONS. DO NOT PLACE MULCH AGAINST THE TRUNK.

ALL SOIL SHALL BE EXCAVATED FROM THE PIT, MIXED WITH APPROVED AMENDMENTS AS PER SPECIFICATIONS AND USED AS BACKFILL DURING INSTALLATION OF TREES. PLACE ROOT BALL ON TAMPED OR UNEXCAVATED SOIL.

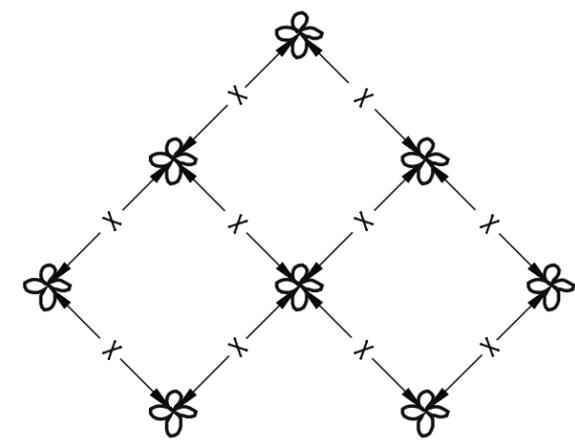
REMOVE BURLAP AND BASKETS TO 1/2 OF THE ROOT BALL. DO NOT BURY EXCESS BURLAP, ROPE OR REMNANTS OF BASKET IN THE PLANTING PIT.



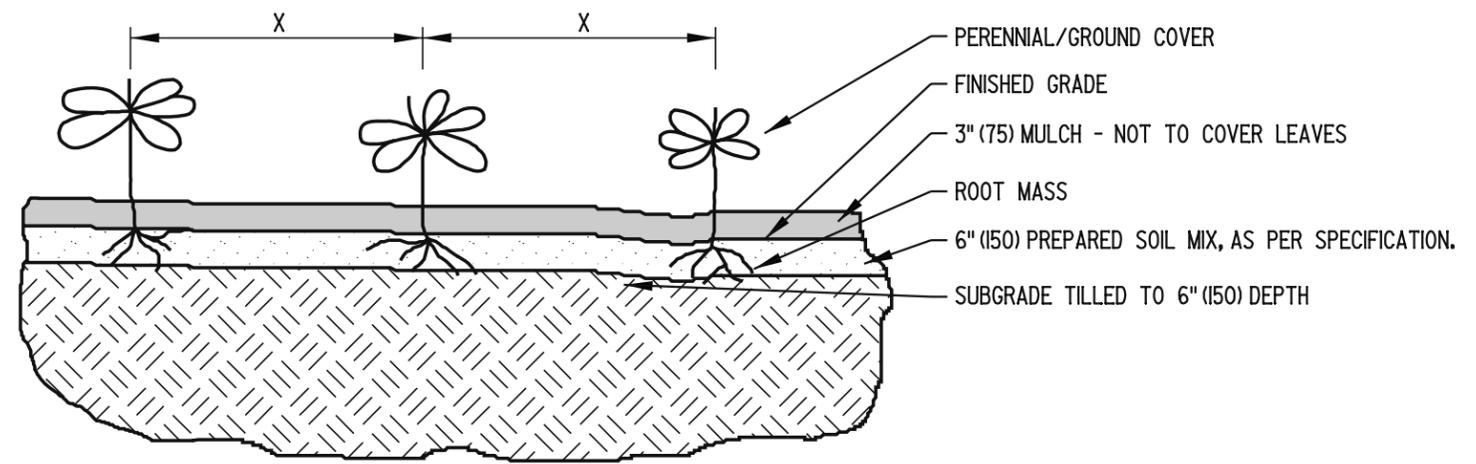
**TREE PLANTING DETAIL**

 <b>DELAWARE</b> <b>DEPARTMENT OF TRANSPORTATION</b>	<b>PLANTING DETAILS</b>			<b>APPROVED</b>  <u>10/10/06</u> <small>CHIEF ENGINEER DATE</small>
	<b>STANDARD NO.</b> L-1 (2006)	<b>SHT.</b> 2	<b>OF</b> 3	<b>RECOMMENDED</b>  <u>10/19/06</u> <small>DESIGN ENGINEER DATE</small>

**NOTE:**  
1). SEE PLANT LIST FOR SPACING (X).



**PLAN VIEW**



**SECTION VIEW**

**PERENNIAL/GROUNDCOVER PLANTING DETAIL**



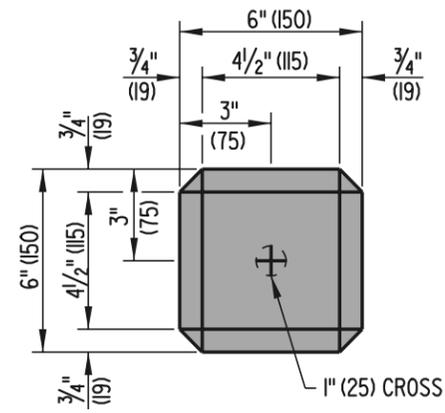
**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

<b>PLANTING DETAILS</b>			
STANDARD NO.	L-1 (2006)	SHT. 3	OF 3

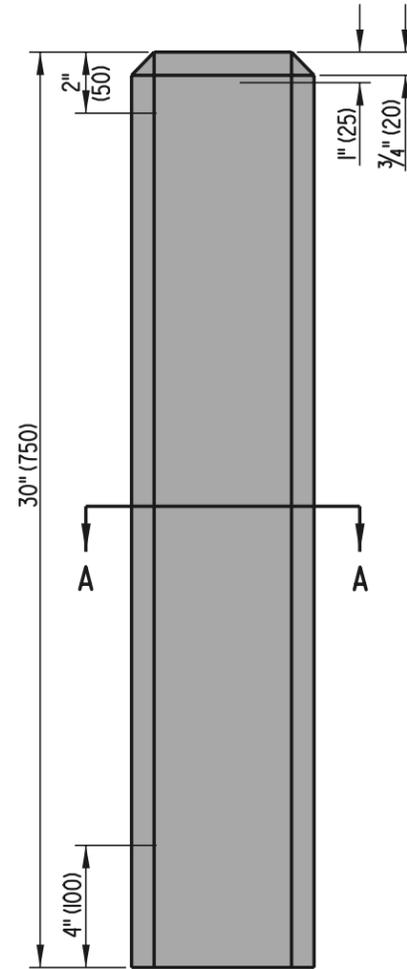
**APPROVED** *[Signature]* 10/10/06  
CHIEF ENGINEER DATE

**RECOMMENDED** *[Signature]* 10/19/06  
DESIGN ENGINEER DATE

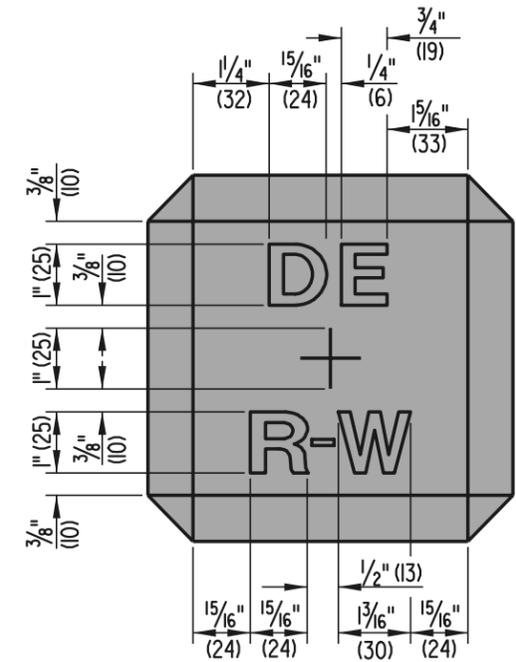




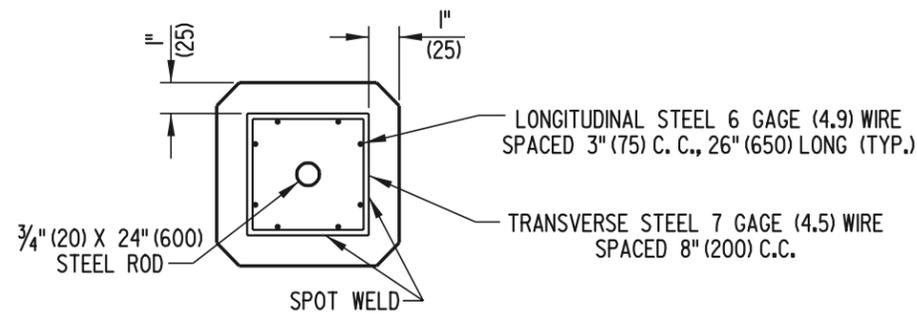
**TOP**



**ELEVATION**



**TOP DETAIL**



**SECTION A-A**

- NOTES :**
- LONGITUDINAL STEEL SHALL BE HELD IN PLACE BY CRADLES.
  - LETTERS AND CROSS TO BE COUNTERSUNK IN TOP OF MARKER 1/4" (6).

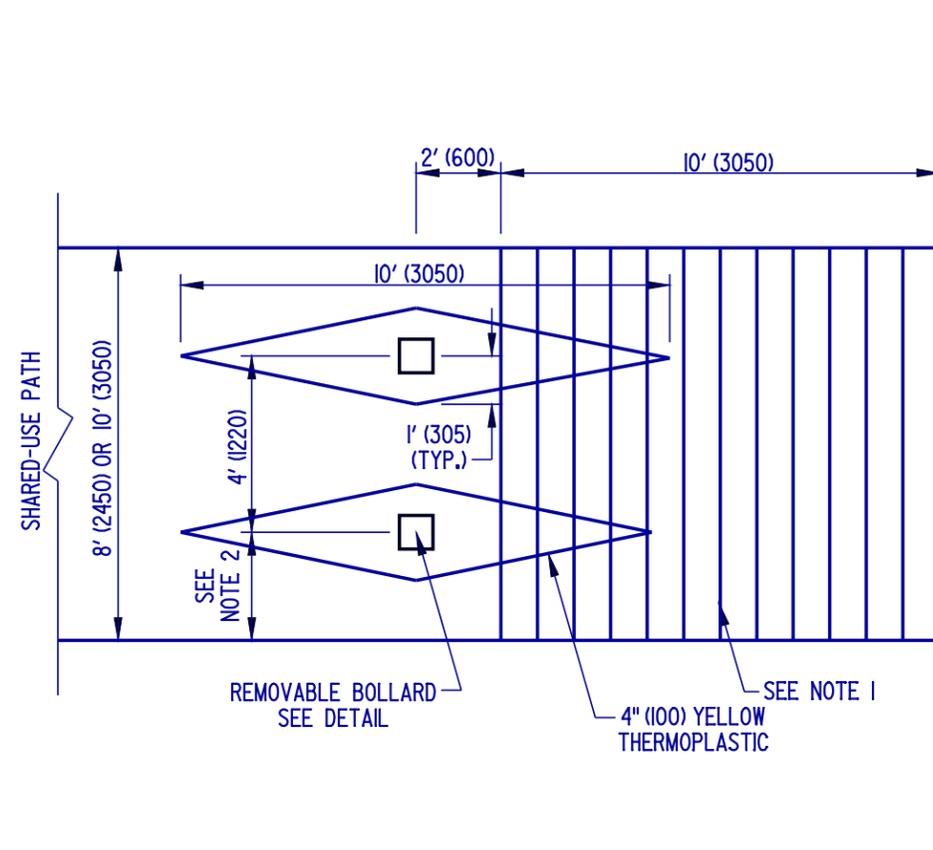


**DELAWARE**  
**DEPARTMENT OF TRANSPORTATION**

**CONCRETE MONUMENT**

STANDARD NO. **M-2 (2001)** SHT. **1** OF **1**

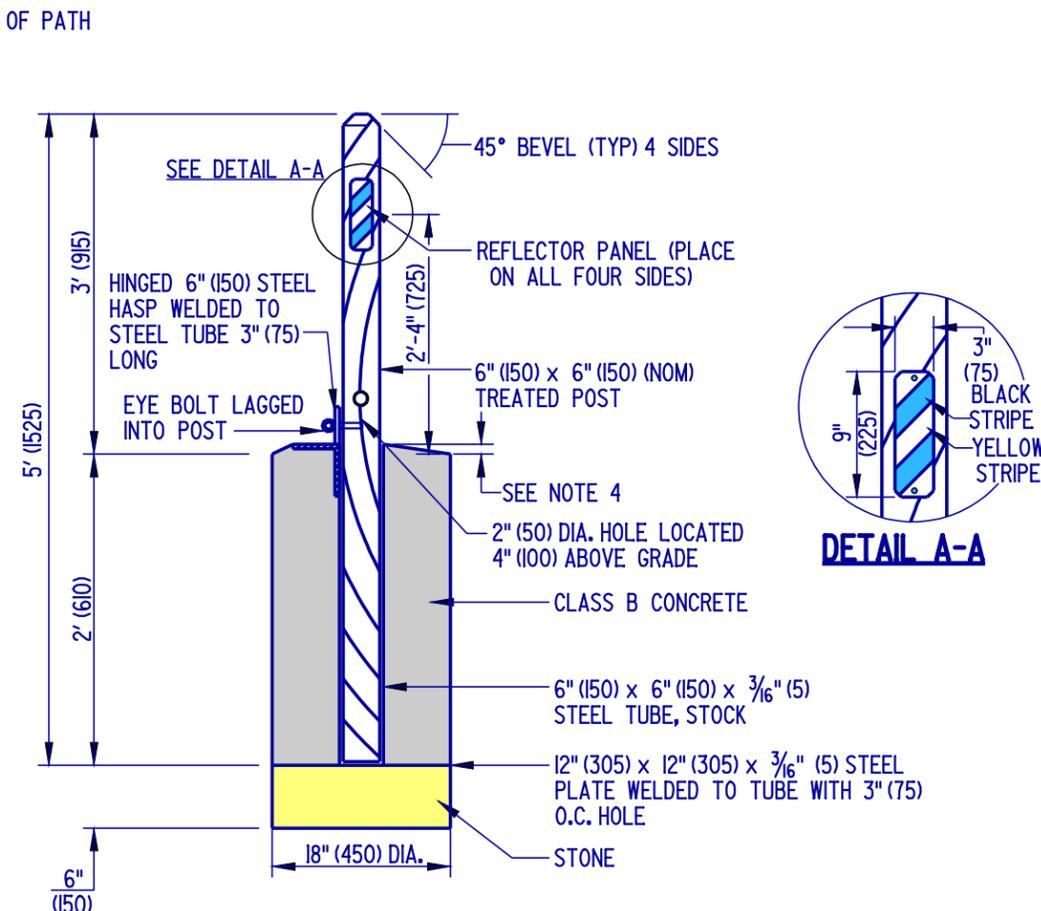
APPROVED *Ryan M. Harshbarger* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Mehal Rajda* 6/18/01  
DESIGN ENGINEER DATE



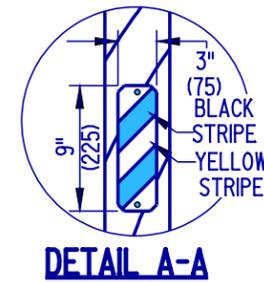
**SHARED USE PATH INTERSECTION**

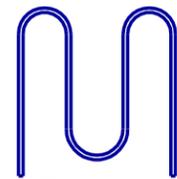
**NOTES:**

1. THE 4" (100) CONCRETE SHARED-USE PATH SHALL BE FINISHED TO INCLUDE A TEXTURED WARNING SURFACE BY USING A JOINT STRIKE TO PRODUCE A 1/2" (12) DEEP V-JOINT AT 6" (150) O.C. PAYMENT FOR INSTALLING THE GROOVED FINISH SHALL BE INCIDENTAL TO THE SIDEWALK CONSTRUCTION.
2. FOR 8' (2450) AND 10' (3050) PATH WIDTH, THE OUTSIDE DIMENSION FROM CENTER OF BOLLARD TO EDGE OF PATH SHALL BE 2' (610) AND 3' (915) RESPECTIVELY.
3. IF THE SHARED USE PATH ENDS AT A ROADWAY, THEN DETECTABLE WARNING TRUNCATED DOMES 24" (600) LONG AND THE FULL WIDTH OF THE PATH SHALL BE INSTALLED. SEE SHEET C-2.
4. STEEL TUBE TO EXTEND 1/2" (13) ABOVE GROUND WITH CONCRETE TO SLOPE AWAY FROM TUBE TO KEEP WATER AND SEDIMENT FROM DRAINING INTO TUBE.

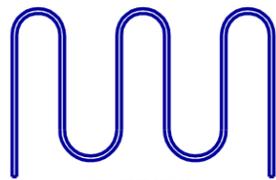


**REMOVABLE BOLLARD**

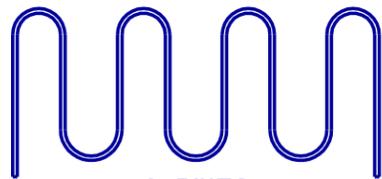




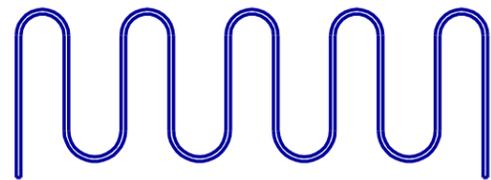
**5 BIKES**  
W = 38" (965)



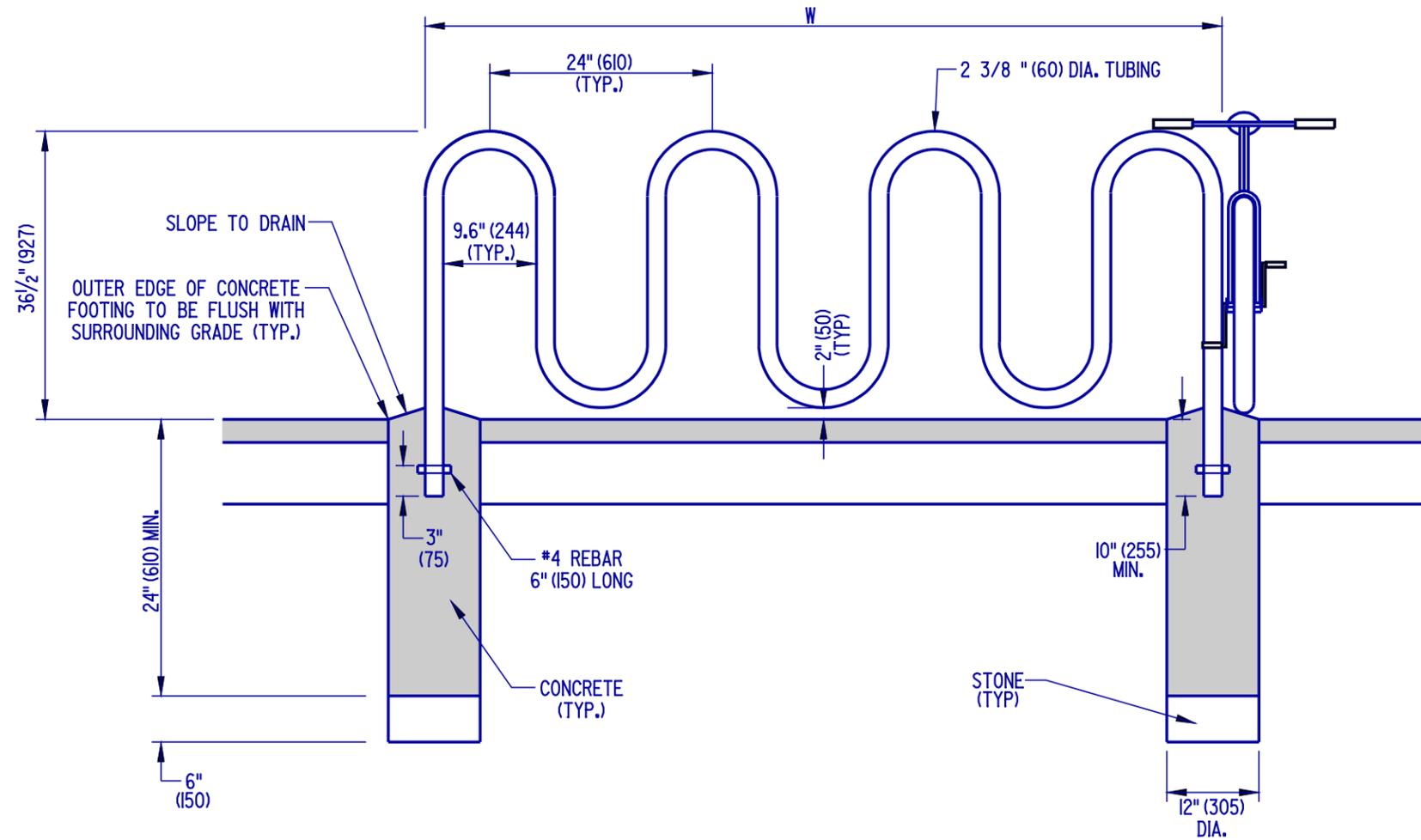
**7 BIKES**  
W = 63" (1600)



**9 BIKES**  
W = 87" (2210)



**11 BIKES**  
W = 111" (2819)



**BICYCLE RACK**  
N.T.S.



DELAWARE  
DEPARTMENT OF TRANSPORTATION

BIKE RACK DETAILS

STANDARD NO.

M-4 (2004)

SHT. 1

OF 1

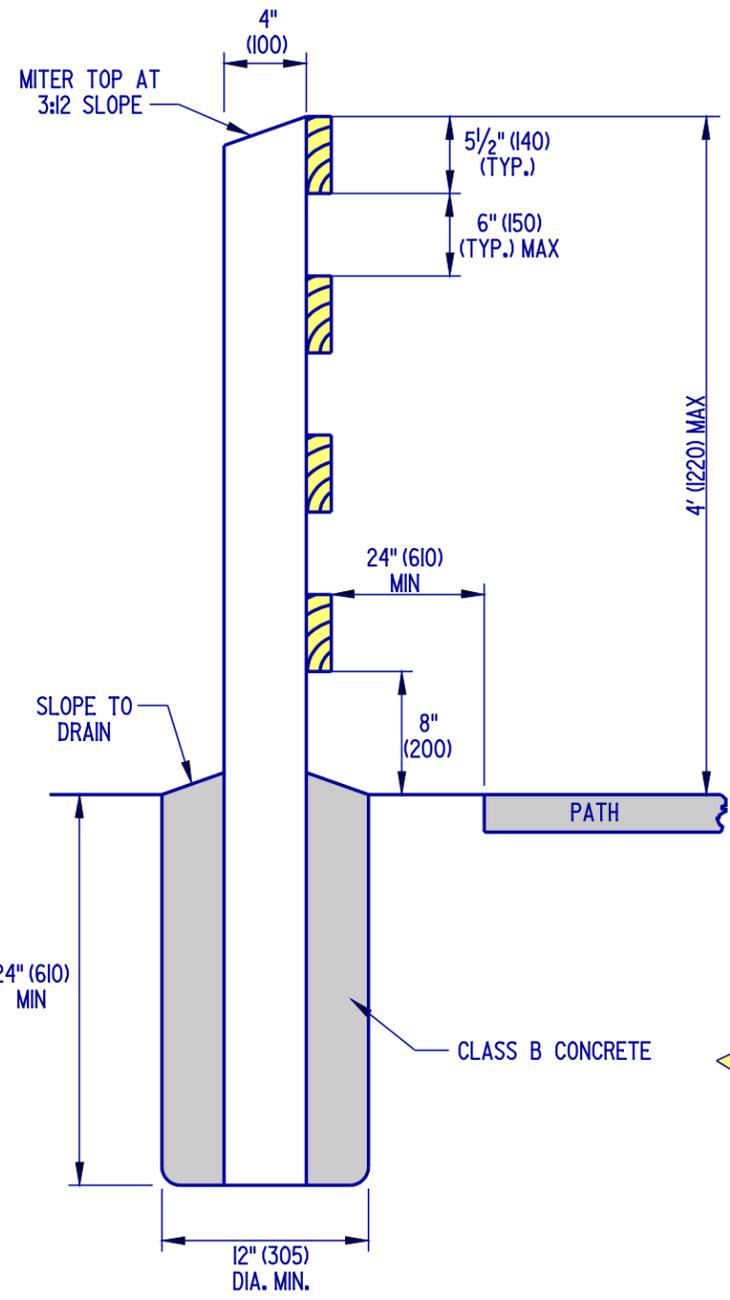
APPROVED

*Carolann Wicks*  
CHIEF ENGINEER 1/10/05  
DATE

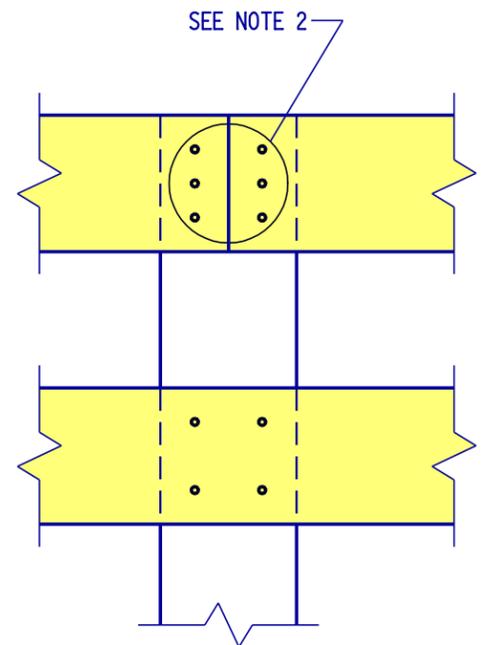
RECOMMENDED

*Dennis M. O'Flaherty*  
DESIGN ENGINEER 1/13/05  
DATE

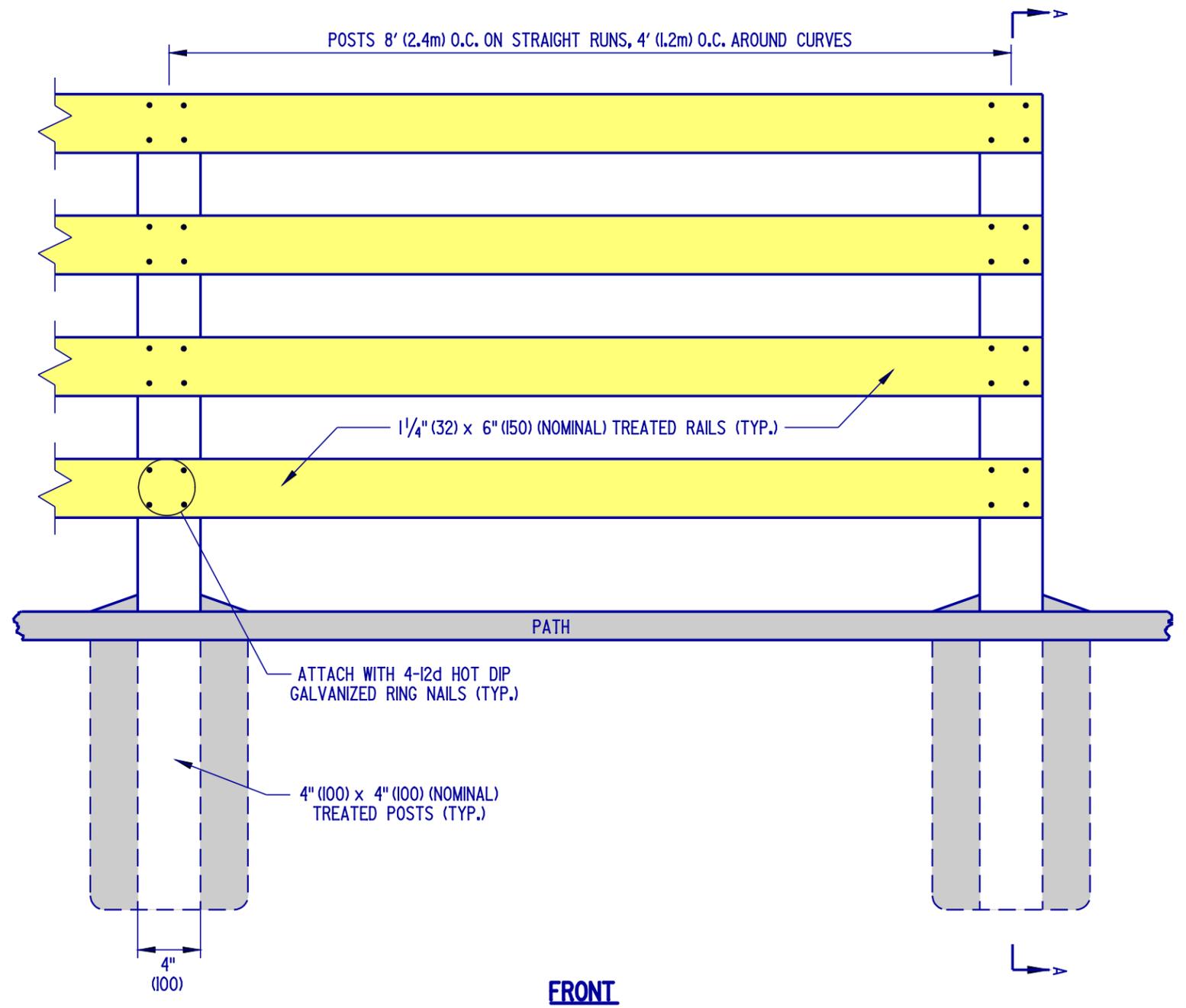
SCALE : N.T.S.



**SECTION A-A**



**TYPICAL JOINT DETAIL**



**FRONT**

- NOTES:**
1. ALL RAIL JOINTS SHALL BE CENTERED AT THE POSTS.
  2. ALL JOINTS SHALL BE ATTACHED WITH 3 - 12d NAILS AND TWO ADJACENT RAILS SHALL NOT END ON THE SAME POST.
  3. RAILS SHALL BE FLUSH TO THE POSTS AT THE END POSTS.

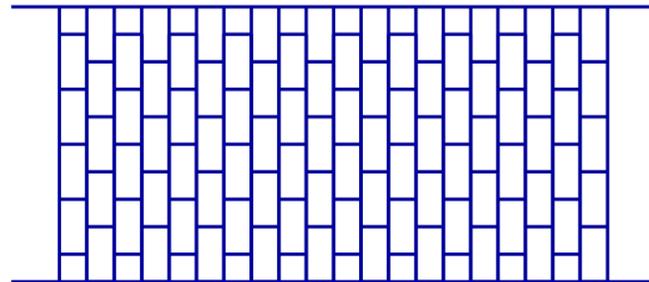


**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

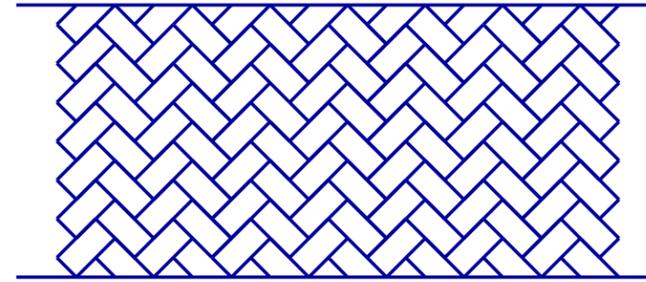
**WOOD RAIL FENCE DETAILS**

STANDARD NO. **M-5 (2004)** SHT. **1** OF **1**

APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE  
RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



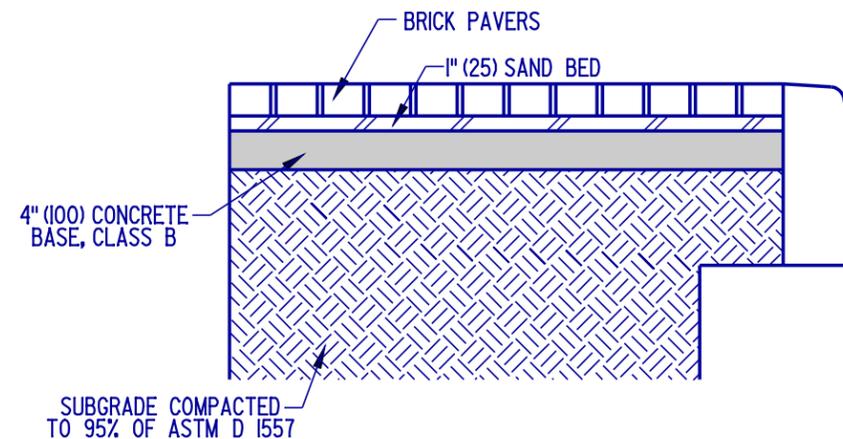
**4" (100) x 8" (200) RUNNING BOND PATTERN**



**4" (100) x 8" (200) HERRINGBONE PATTERN**

**NOTES:**

1. ACTUAL PATTERN TO BE USED SHALL BE SPECIFIED ON THE PLANS. COLOR IS TO BE "BRICK RED" UNLESS OTHERWISE NOTED ON THE PLANS.
2. MATERIALS AND PAVEMENT BOX VARY DEPENDING ON PLANS.
3. FOR CROSSWALK APPLICATIONS, 8" (200) WHITE LINES SHOULD BE PLACED ON BOTH SIDES.
4. THE PATTERNS ABOVE ARE THE PREFERRED PATTERNS AVAILABLE FOR SIDEWALK OR CROSSWALK APPLICATIONS.



**BRICK PAVER SIDEWALK DETAIL**

**NOTES:**

1. ALL PAVERS ARE TO BE "BRICK RED" UNLESS OTHERWISE SPECIFIED ON THE PLANS. THE PATTERN SHALL BE SPECIFIED ON THE PLANS.
2. EXPANSION JOINT MAY BE NEEDED ON NON-CURB SIDE OF BRICK PAVER SIDEWALK IF THAT SIDE IS AGAINST BUILDING OR OTHER CONFINING FEATURE.



**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**PATTERNED HOT-MIX OR CONCRETE & BRICK PAVER DETAILS**

STANDARD NO. **M-6 (2004)**

SHT. **1** OF **1**

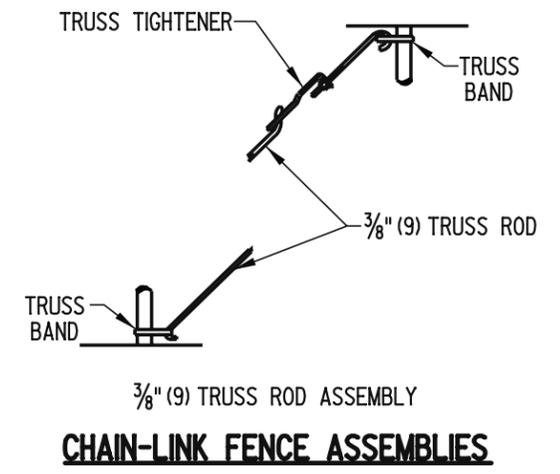
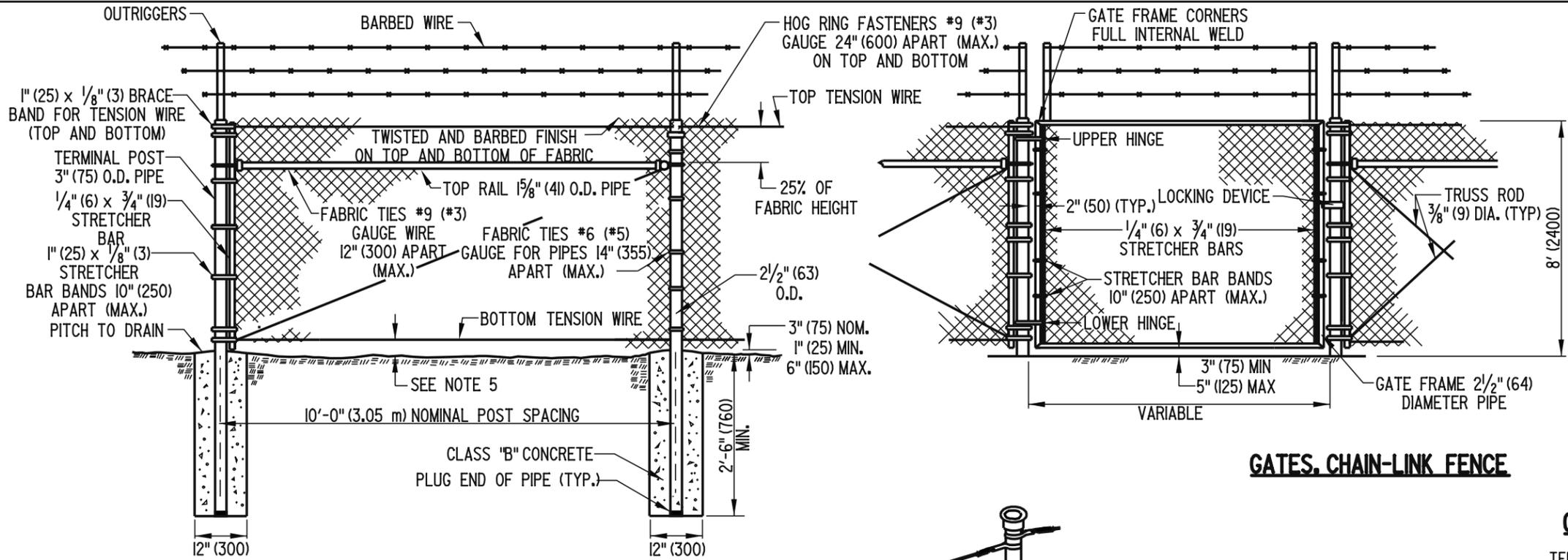
APPROVED

*Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

RECOMMENDED

*Dennis M. O'Flaherty* 1/3/05  
DESIGN ENGINEER DATE

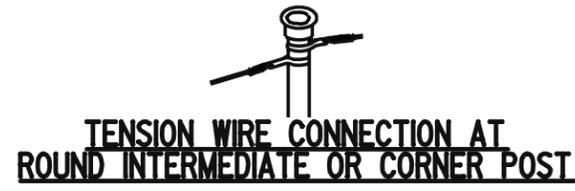
SCALE : N.T.S.



**CHAIN-LINK FENCE**

**GATES, CHAIN-LINK FENCE**

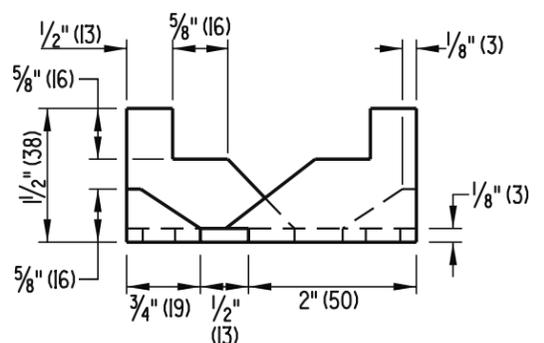
**CHAIN-LINK FENCE ASSEMBLIES**



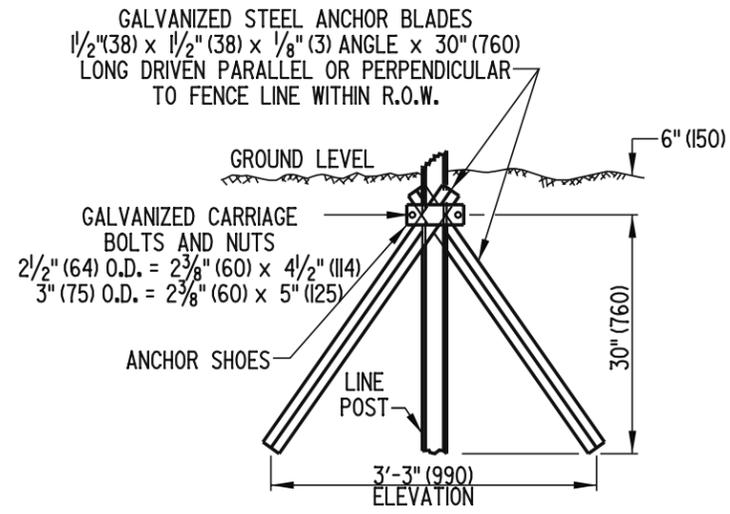
**TENSION WIRE CONNECTION AT ROUND INTERMEDIATE OR CORNER POST**

**GENERAL NOTES**

- | 1. POSTS                | TERMINAL, CORNER AND GATE POSTS              | LINE POSTS                                   | TOP OR BRACE RAIL                              |
|-------------------------|--|--|--|
|                         | 3" (75) O.D. PIPE                            | 2 1/2" (64) O.D. PIPE                        | 1 5/8" (41) O.D. PIPE                          |
| AASHTO TYPE             | 10R II                                       | 10R II                                       | 10R II   |
| AASHTO GRADE            | 10R 2  | 10R 2  | 10R 2  |
| MINIMUM LENGTH OF POST: | 10'-8" (3250)                                | 10'-8" (3250)                                | N/A  |
| ACTUAL OUTSIDE DIAMETER | 2 7/8" (73)                                  | 2 3/8" (60)                                  | 1.660" (42)                                    |
| WALL THICKNESS          | GRADE 1 = .203" (5.2)<br>GRADE 2 = .160" (4) | GRADE 1 = .154" (3.9)<br>GRADE 2 = .120" (3) | GRADE 1 = .140" (3.5)<br>GRADE 2 = .111" (2.8) |
- THE DEPTH OF CONCRETE FOOTERS IN SOLID ROCK MAY BE REDUCED TO 12" (300) BELOW THE TOP OF ROCK AND THE DIAMETER OF THE HOLE IN ROCK MAY BE REDUCED TO 6" (150).
  - BRACE BANDS AND STRETCHER BAR BANDS SHALL BE FURNISHED WITH 5/16" (8) DIA. CARRIAGE BOLTS AND ELASTIC STOP NUTS.
  - DRIVE ANCHOR SHOE ASSEMBLY ONLY TO BE USED IN WET AREAS AND WITH PRIOR APPROVAL OF THE ENGINEER.
  - THE BOTTOM OF THE FENCE SHALL BE 2" (50) MAX ABOVE HARD GROUND OR PAVEMENT. WHERE THERE IS SOFT GROUND, THE BOTTOM OF THE FENCE SHALL EXTEND INTO THE GROUND IN ORDER TO BE FIRM DUE TO SHIFTING SOIL OR SAND.
  - NUTS AND BOLTS SHALL BE TACK WELDED OR BURRED TO PREVENT REMOVAL.
  - IF THERE ARE ANY OPENINGS IN THE FENCE LARGER THAN 96 SQ. IN. (620 sq. cm) DUE TO UTILITIES OR GRADED TERRAIN, THE OPENINGS SHALL BE SECURED WITH A METAL GRILL THAT IS LOCKED OR PERMANENTLY WELDED.
  - VEGETATION AND PERMANENT STRUCTURES (SUCH AS BUILDINGS, LIGHT POLES, AND UTILITY POLES) SHALL BE AT LEAST 14' (4.2 m) FROM THE FENCE. ANY EXCEPTIONS SHALL REQUIRE THE CONSTRUCTION OF TOP GUARDS.

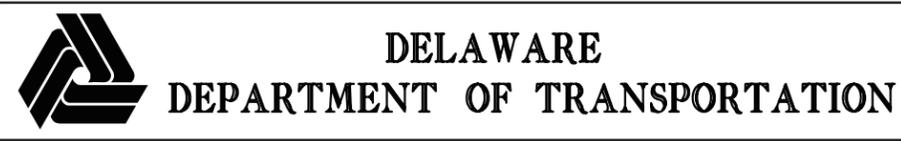


**ANCHOR SHOE**



**DRIVE ANCHOR SHOE ASSEMBLY**

(SEE NOTE 4)

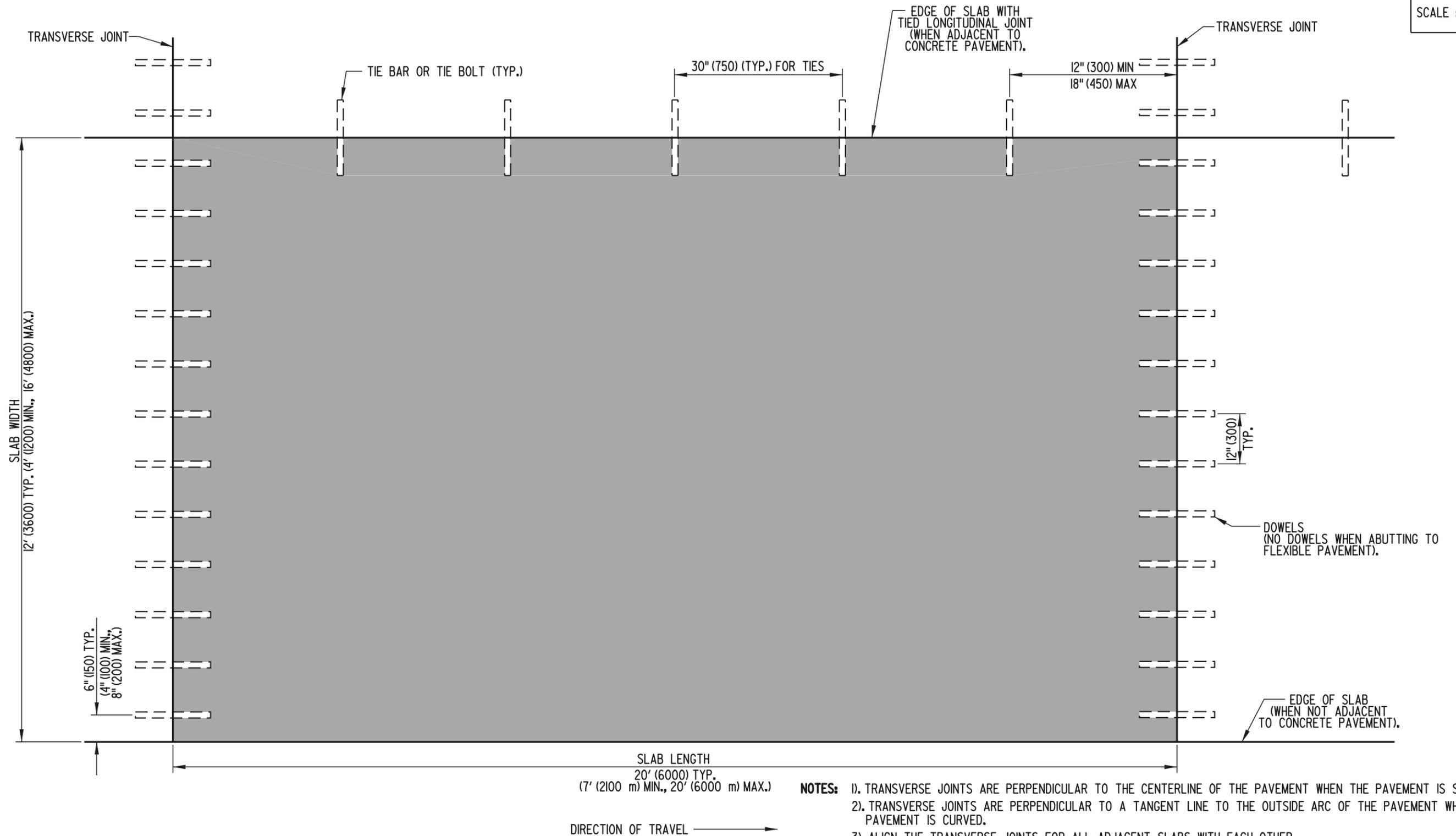


**DELAWARE DEPARTMENT OF TRANSPORTATION**

<b>CHAIN LINK FENCE DETAILS</b>			
STANDARD NO.	M-7 (2006)	SHT.	1 OF 1

APPROVED *[Signature]* 10/10/06  
 RECOMMENDED *[Signature]* 10/19/06

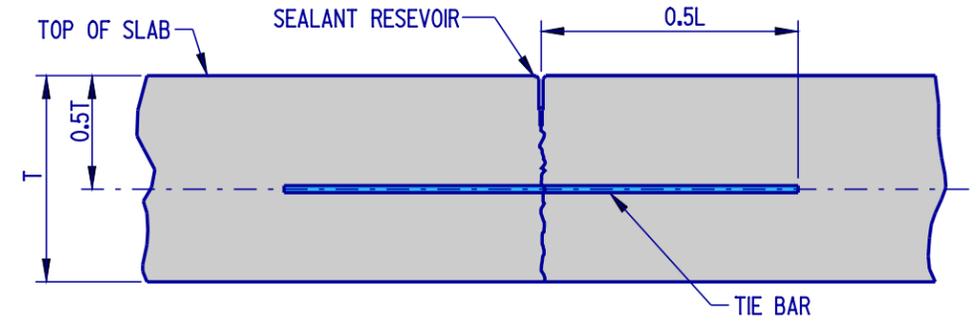
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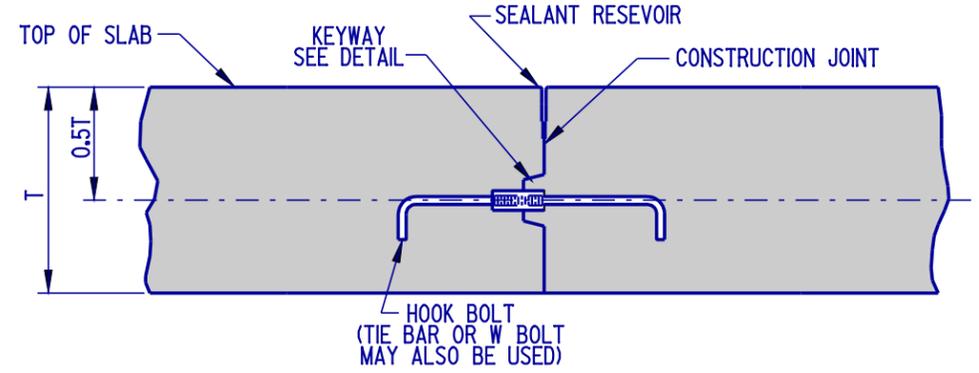
- NOTES:**
- 1). TRANSVERSE JOINTS ARE PERPENDICULAR TO THE CENTERLINE OF THE PAVEMENT WHEN THE PAVEMENT IS STRAIGHT.
  - 2). TRANSVERSE JOINTS ARE PERPENDICULAR TO A TANGENT LINE TO THE OUTSIDE ARC OF THE PAVEMENT WHEN THE PAVEMENT IS CURVED.
  - 3). ALIGN THE TRANSVERSE JOINTS FOR ALL ADJACENT SLABS WITH EACH OTHER.
  - 4). ABRUPT CHANGES IN PAVEMENT WIDTH MAY OCCUR ONLY AT THE TRANSVERSE JOINT LINE; LONGITUDINAL JOINTS SHALL BE CONTINUOUS WHENEVER POSSIBLE.
  - 5). LONGITUDINAL JOINTS SHOULD NOT BE LOCATED WITHIN PROPOSED WHEEL PATHS. THE WHEEL PATH IS GENERALLY LOCATED 2' (600) INSIDE OF THE LANE EDGELINE OR CENTERLINE.

**SLAB PLAN (WITH DOWEL AND TIE LOCATIONS)**

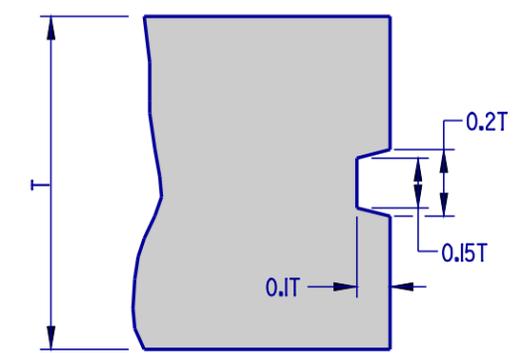
 <b>DELAWARE</b> <b>DEPARTMENT OF TRANSPORTATION</b>	<b>P.C.C. PAVEMENT</b>			<b>APPROVED</b> <i>Ryan M. Harshbarger</i> <b>6/18/01</b> <small>CHIEF ENGINEER DATE</small>
	STANDARD NO. <b>P-1 (2001)</b>	SHT. <b>1</b>	OF <b>5</b>	<b>RECOMMENDED</b> <i>Mehal Aljeda</i> <b>6/18/01</b> <small>DESIGN ENGINEER DATE</small>



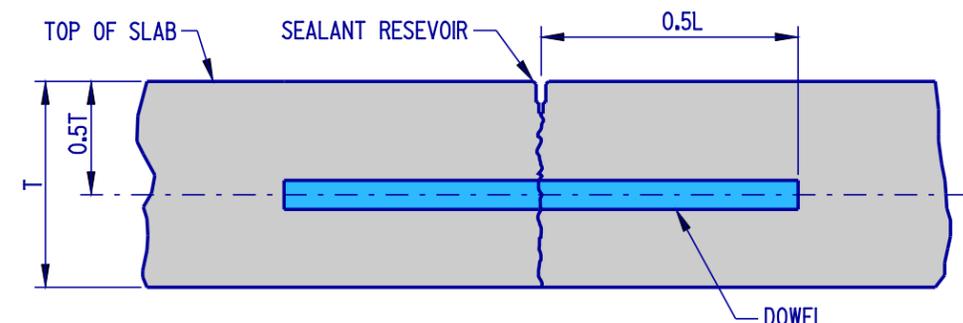
**LONGITUDINAL SAW-CUT JOINT DETAIL**



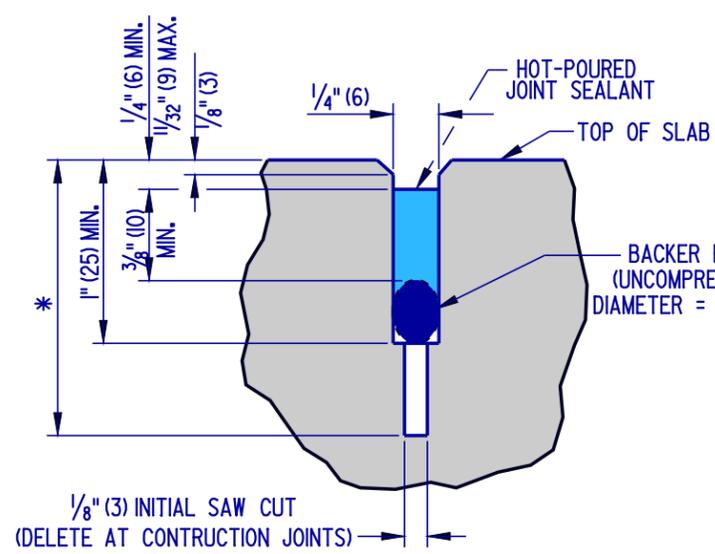
**LONGITUDINAL CONSTRUCTION JOINT DETAIL**



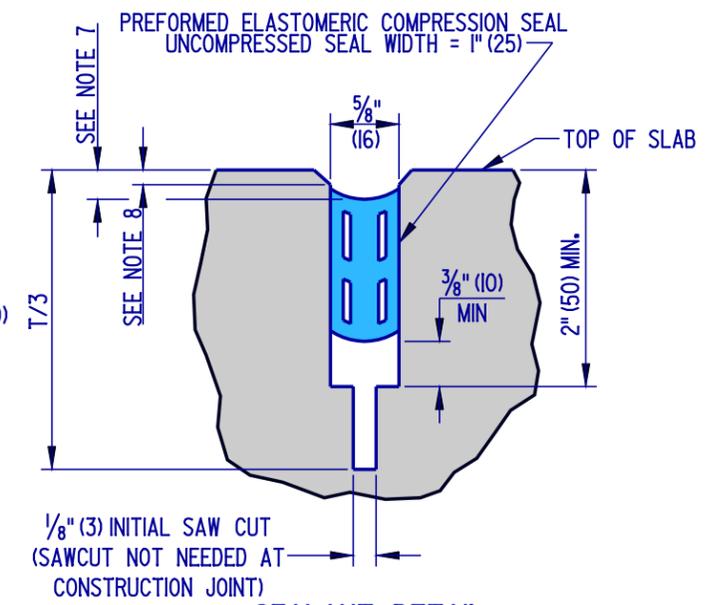
**KEYWAY DETAIL**



**TRANSVERSE SAW-CUT JOINT DETAIL**



**SEALANT DETAIL-LONGITUDINAL JOINT**



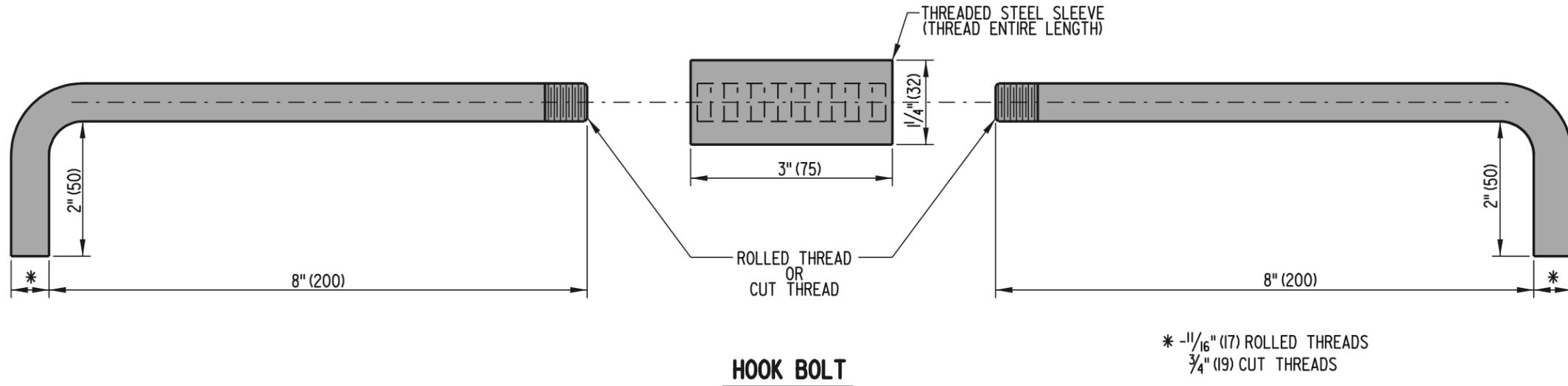
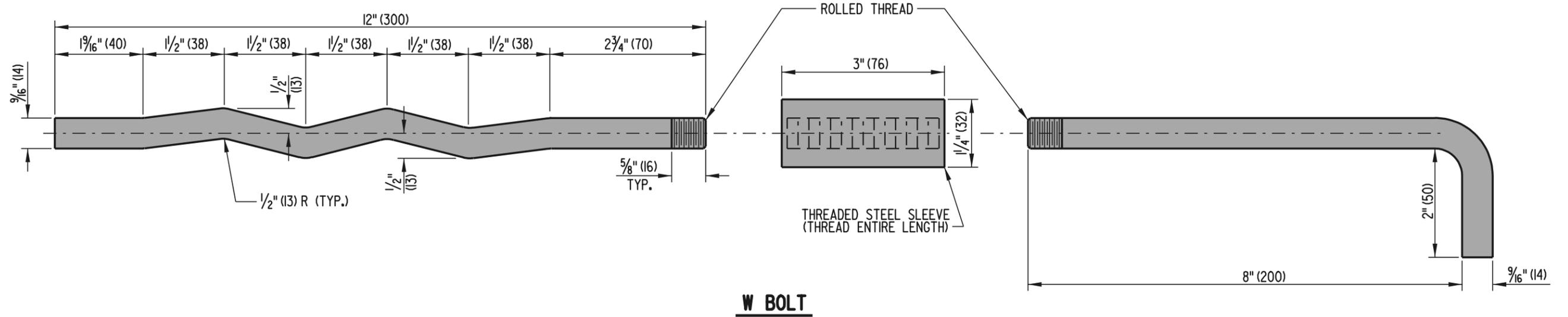
**SEALANT DETAIL-TRANSVERSE JOINT**

\* - 0.3T (10" (250) P.C.C. PAVEMENT)  
0.4T (12" (300) P.C.C. PAVEMENT)

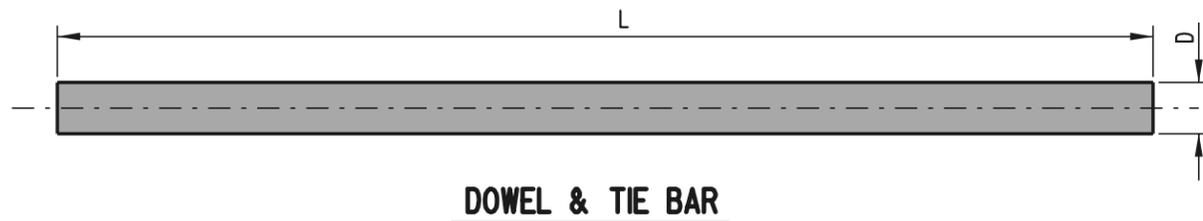
- NOTES:
- 1). AS DIMENSIONED, THE WIDTH OF THE TRANSVERSE SEALANT RESERVOIR IS APPLICABLE WHEN THE TEMPERATURE OF THE PAVEMENT SURFACE IS BETWEEN 60°F (16°C) AND 80°F (27°C). WHEN THE TEMPERATURE IS BELOW 60°F (16°C), THE SEALANT RESERVOIR SHALL BE CUT 1/16" (2) WIDER. WHEN THE TEMPERATURE IS ABOVE 80°F (27°C), THE SEALANT RESERVOIR SHALL BE CUT 1/16" (2) NARROWER.
  - 2). "T" REFERS TO THE ACTUAL CONSTRUCTED SLAB THICKNESS.
  - 3). TOLERANCE ON ALL JOINT SEALANT DETAIL DIMENSIONS SHOWN WITHOUT RANGES SHALL BE PLUS 1/16" (2), MINUS 0" (0).
  - 4). THE TOP EDGES OF THE CONTACT SURFACES OF THE SEALANT MATERIAL ON BOTH SIDES OF THE JOINT RESERVOIR SHALL BE AT THE SAME ELEVATION.
  - 5). TRANSVERSE JOINT MATERIAL SHALL BE PLACED BEFORE LONGITUDINAL JOINT MATERIAL; THE TRANSVERSE JOINT MATERIAL SHALL BE CONTINUOUS FOR THE FULL WIDTH OF ALL ADJACENT P.C.C. PAVEMENT SLABS.
  - 6). LONGITUDINAL JOINT MATERIAL SHALL BE PLACED WITHOUT GAPS WHENEVER INTERRUPTED BY THE TRANSVERSE JOINT MATERIAL.
  - 7). TRANSVERSE JOINT SEAL TO BE RECESSED 3/16" (5) TO 5/16" (8) BELOW THE TOP OF THE SLAB.
  - 8). A 45° CHAMFER SHALL BE CUT 1/8" (3) TO 1/4" (6) DEEP AT THE TOP OF THE SLAB ALONG BOTH SIDES OF THE TRANSVERSE SEALANT RESERVOIR.
  - 9). THE TOP EDGES OF THE COMPRESSION SEAL SHALL BE IN FULL CONTACT WITH THE SLAB SIDES.

**JOINT AND SEALANT DETAILS**

 <b>DELAWARE</b> DEPARTMENT OF TRANSPORTATION	<b>P.C.C. PAVEMENT</b>				<b>APPROVED</b> <i>Carolann Wicks</i> 1/10/05 CHIEF ENGINEER DATE
	STANDARD NO. P-1 (2004)	SHT. 2	OF 5		<b>RECOMMENDED</b> <i>Dennis M. O'Flaherty</i> 1/3/05 DESIGN ENGINEER DATE



\* -11/16" (17) ROLLED THREADS  
3/4" (19) CUT THREADS



SLAB THICKNESS	DOWEL		TIE BAR	
	D	L	D	L
10" (250)	1/4" (32)	18" (450)	5/8" (16)	30" (750)
12" (300)	1/2" (38)	20" (500)	5/8" (16)	30" (750)



DELAWARE  
DEPARTMENT OF TRANSPORTATION

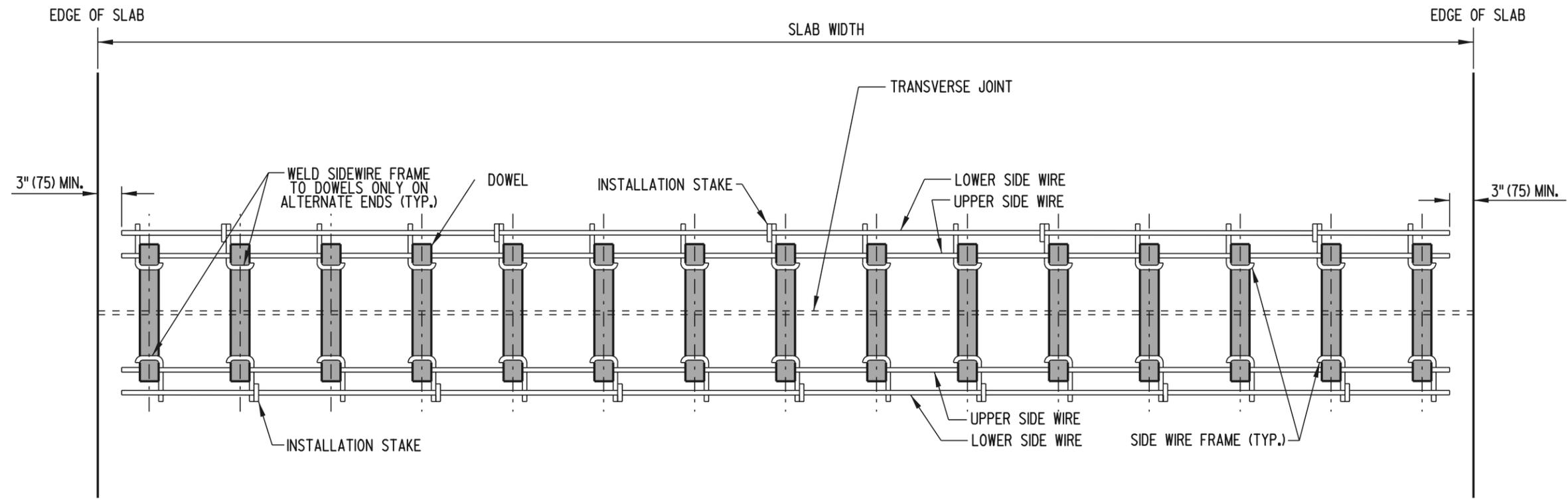
P.C.C. PAVEMENT

STANDARD NO. P-1 (2001)

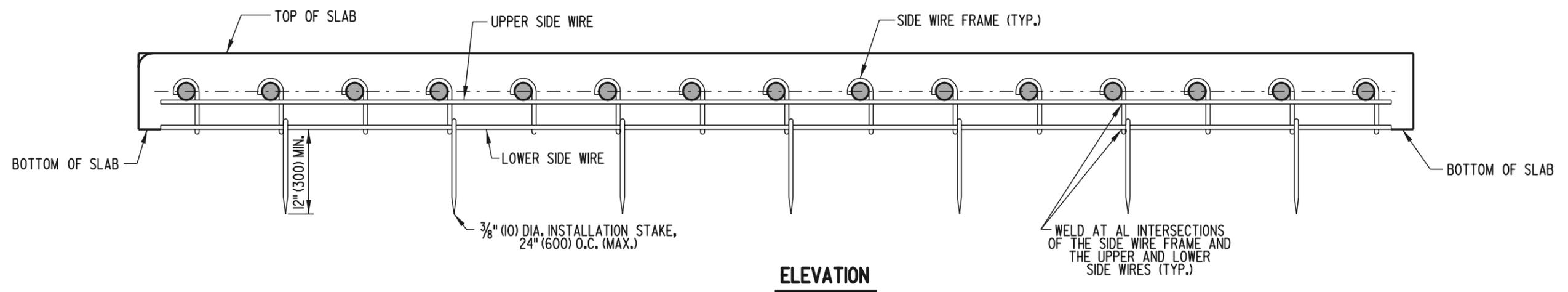
SHT. 3 OF 5

APPROVED *Ryan M. Harkins* 6/18/01  
CHIEF ENGINEER DATE  
 RECOMMENDED *Michael R. Gotsch* 6/18/01  
DESIGN ENGINEER DATE

SCALE : N.T.S.



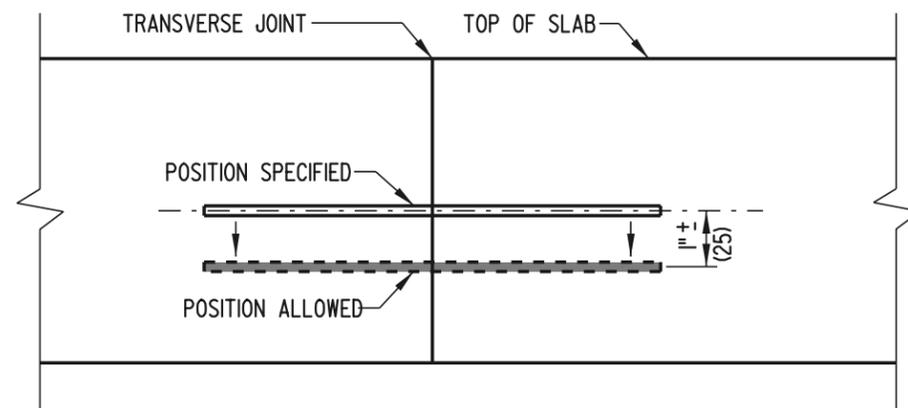
**PLAN**



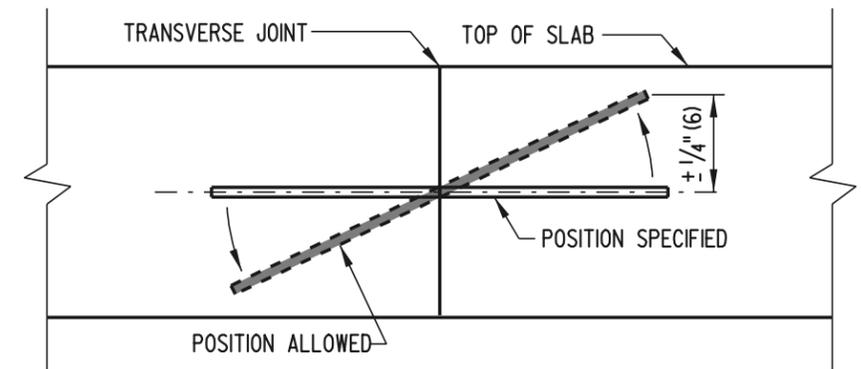
**ELEVATION**

**DOWEL SUPPORT BASKET**

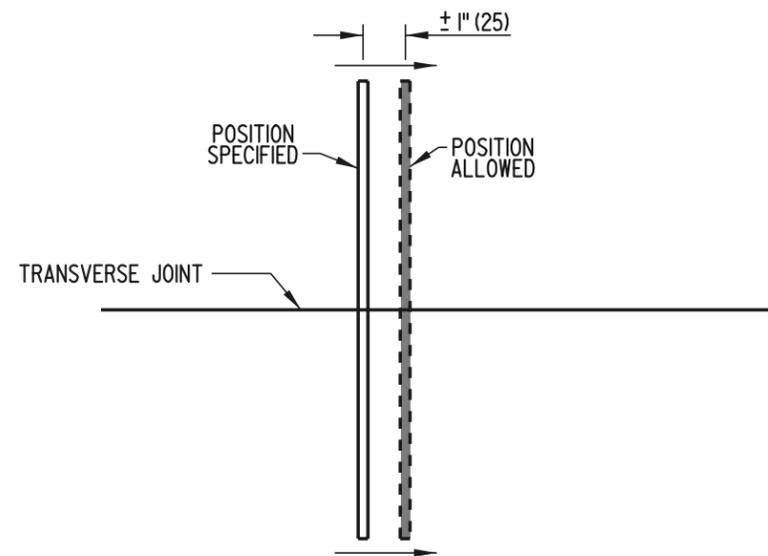
 <b>DELAWARE</b> <b>DEPARTMENT OF TRANSPORTATION</b>	<b>P.C.C. PAVEMENT</b>			<b>APPROVED</b> <i>Ryan M. Harshbarger</i> <b>6/18/01</b> <small>CHIEF ENGINEER DATE</small>
	<b>STANDARD NO. P-1 (2001)</b>	<b>SHT. 4 OF 5</b>		<b>RECOMMENDED</b> <i>Mehal Alghob</i> <b>6/18/01</b> <small>DESIGN ENGINEER DATE</small>



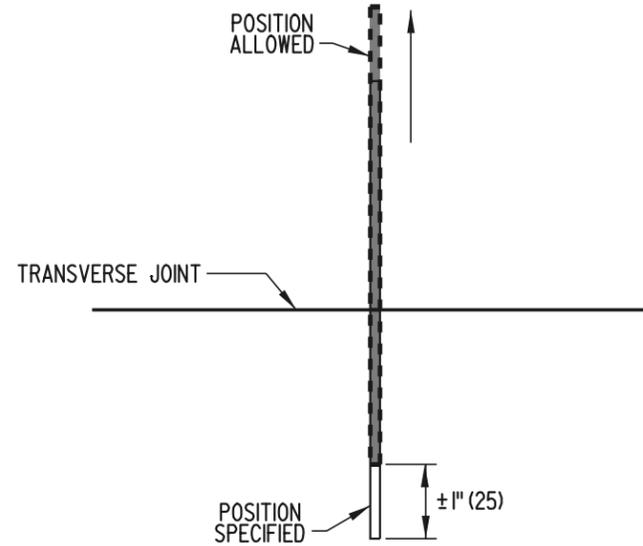
VERTICAL TRANSLATION



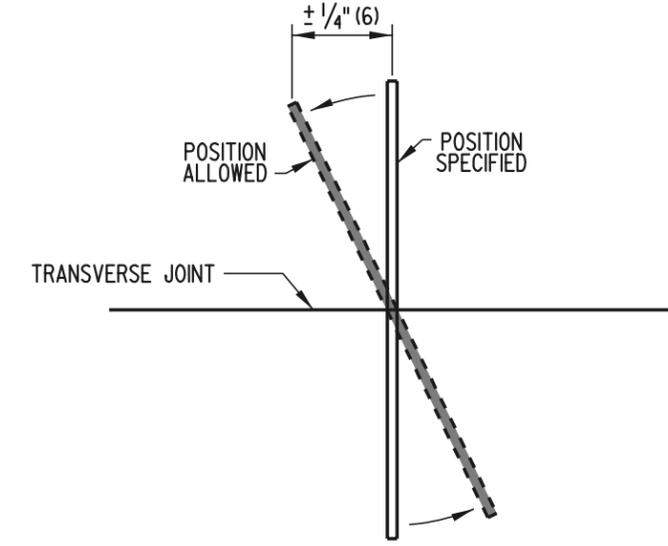
VERTICAL ROTATION



HORIZONTAL TRANSLATION



LONGITUDINAL TRANSLATION



HORIZONTAL ROTATION

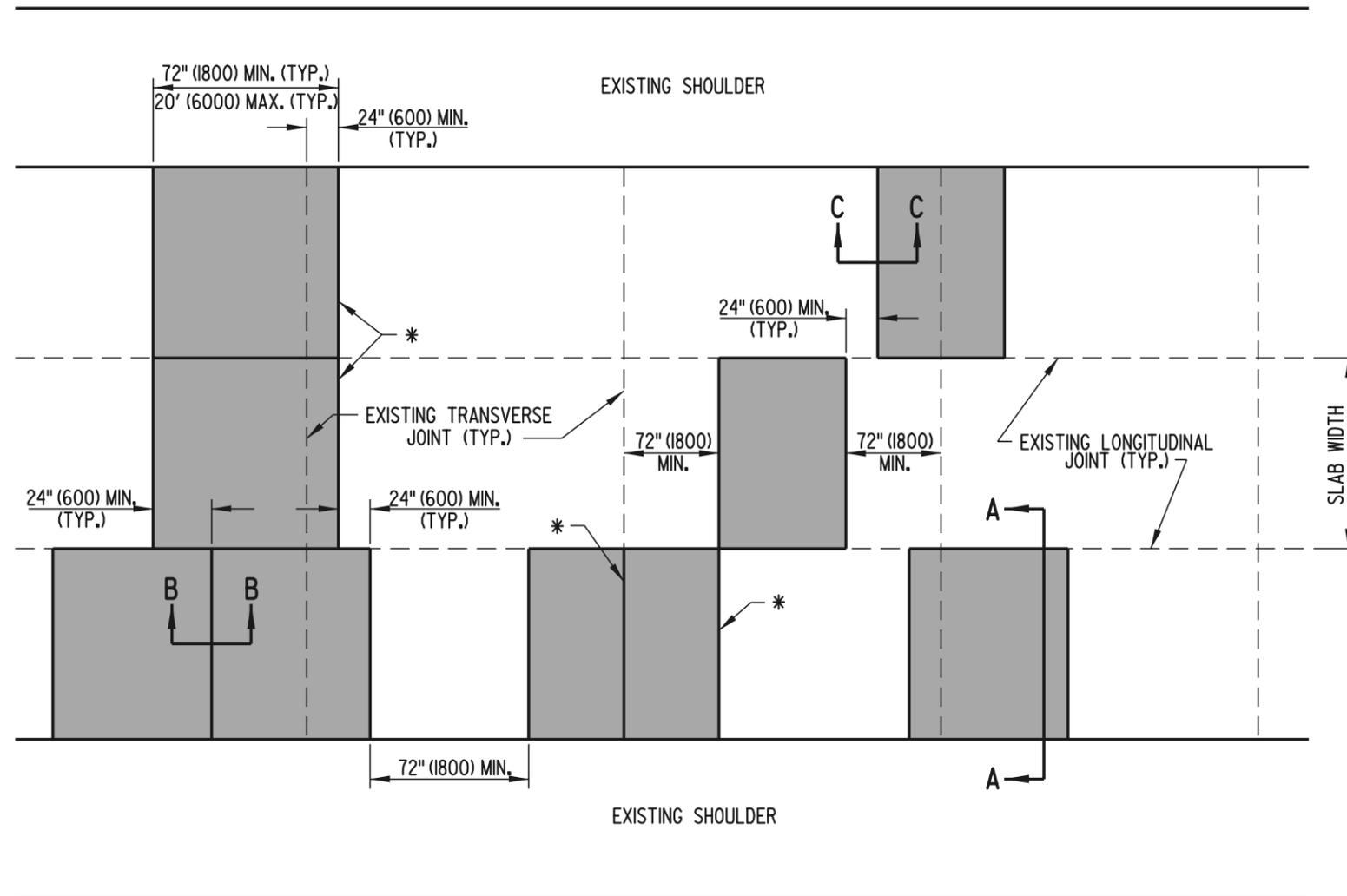
DOWEL & TIE BAR PLACEMENT TOLERANCES



DELAWARE  
DEPARTMENT OF TRANSPORTATION

P.C.C. PAVEMENT			
STANDARD NO.	P-1 (2001)	SHT.	5 OF 5

APPROVED	<i>Ryan M. Harshbarger</i>	6/18/01
	CHIEF ENGINEER	DATE
RECOMMENDED	<i>Mehal Akhavan</i>	6/18/01
	DESIGN ENGINEER	DATE



**PLAN**

\*- PROPOSED LOCATIONS FOR TRANSVERSE JOINTS SHALL EXACTLY MATCH THE ALIGNMENT OF THE FINAL (EXISTING OR RELOCATED) TRANSVERSE JOINTS IN ALL IMMEDIATELY ADJACENT LANES.

- NOTES:**
- 1). WHEN REPAIRING EXISTING TRANSVERSE JOINTS, THE PATCH SHALL EXTEND A MINIMUM OF 24" (600) THROUGH THE EXISTING JOINT, WHICH WILL RELOCATE THE JOINT.
  - 2). PROPOSED LOCATIONS FOR TRANSVERSE JOINTS, WHEN NOT ALIGNED WITH THE FINAL EXPECTED TRANSVERSE JOINT LOCATIONS IN THE IMMEDIATELY ADJACENT LANES, SHALL BE OFFSET A MINIMUM OF 24" (600) FROM THE AFOREMENTIONED JOINTS.
  - 3). THE LONGITUDINAL JOINT ALIGNMENT SHALL BE STRAIGHT AND CONTINUOUS THROUGH THE REPAIRED AREA.

**FULL DEPTH PATCH**



**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**P.C.C. PAVEMENT PATCHING**

STANDARD NO.

**P-2 (2001)**

SHT. **1**

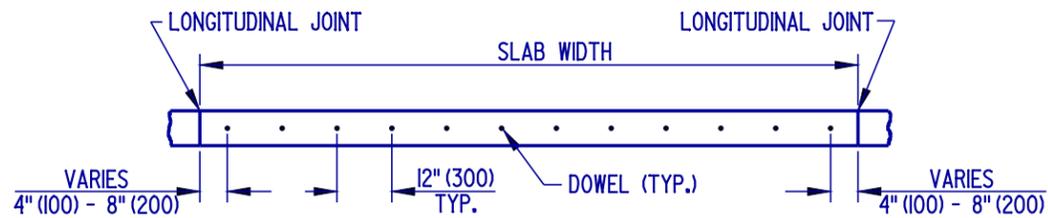
OF **5**

APPROVED

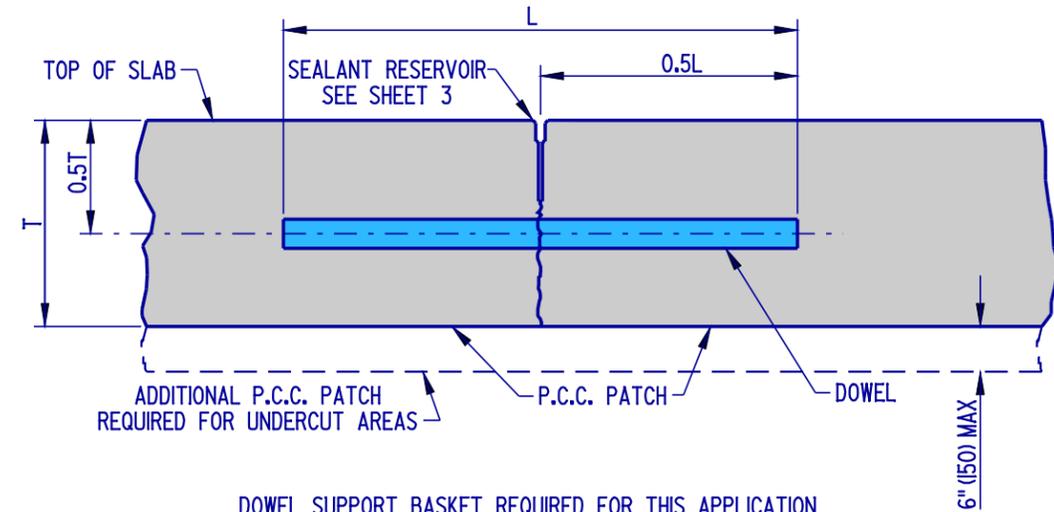
*Ryan M. Harkness*  
CHIEF ENGINEER DATE **6/18/01**

RECOMMENDED

*Michael R. [Signature]*  
DESIGN ENGINEER DATE **6/18/01**



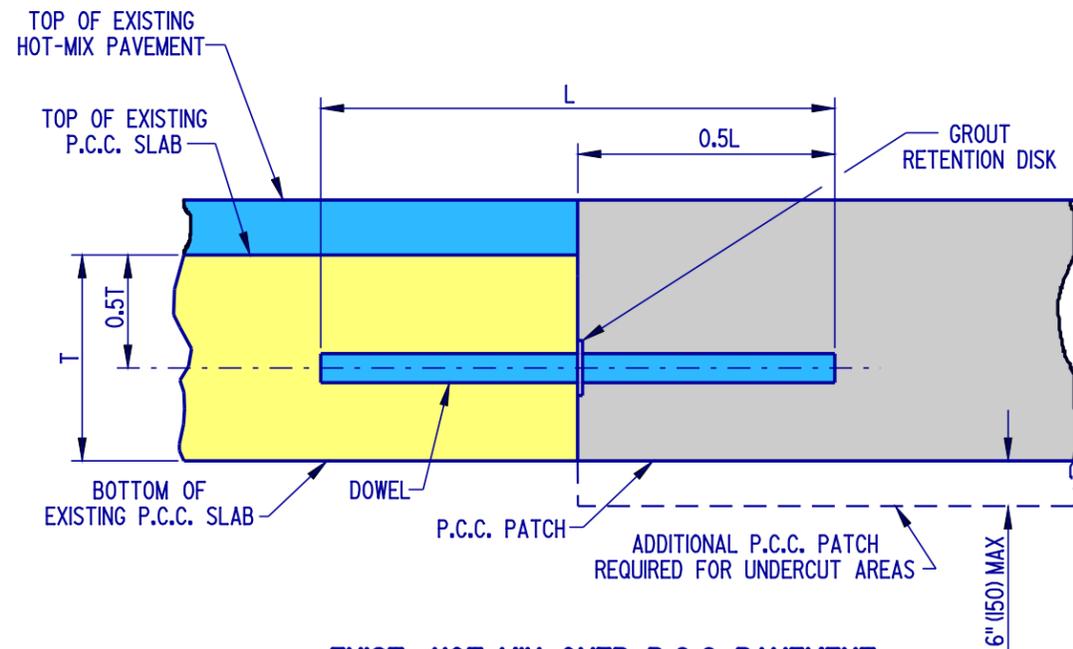
**SECTION A-A**



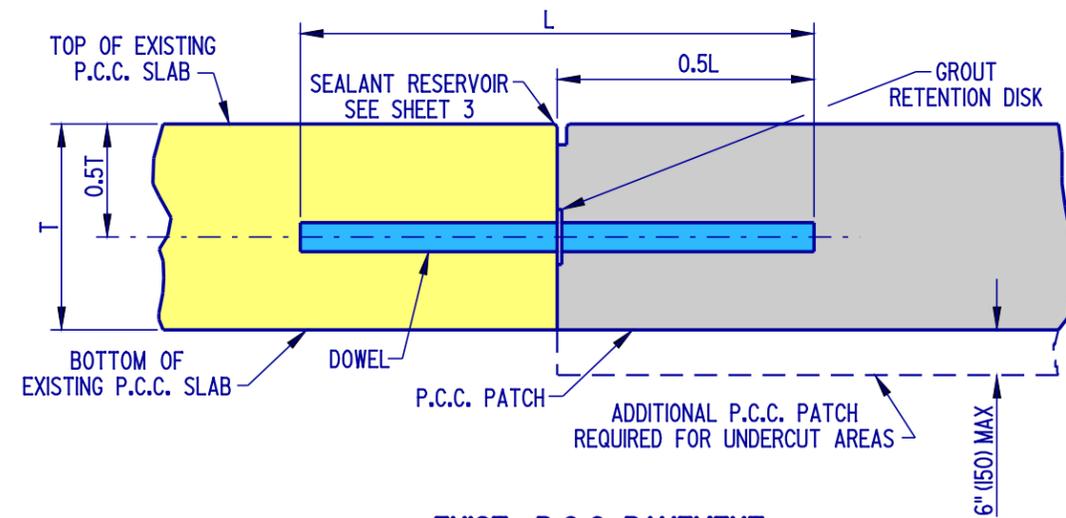
DOWEL SUPPORT BASKET REQUIRED FOR THIS APPLICATION  
(REFER TO STANDARD CONSTRUCTION DETAIL FOR P.C.C. PAVEMENT.)

**SECTION B-B**

TRANSVERSE SAW-CUT USED FOR JOINTS LOCATED WITHIN THE PATCH



**EXIST. HOT-MIX OVER P.C.C. PAVEMENT**



**EXIST. P.C.C. PAVEMENT**

**SECTION C-C**

TRANSVERSE CONSTRUCTION JOINT USED ON JOINTS BETWEEN EXISTING PAVEMENT AND PATCH

**FULL DEPTH PATCH**



DELAWARE  
DEPARTMENT OF TRANSPORTATION

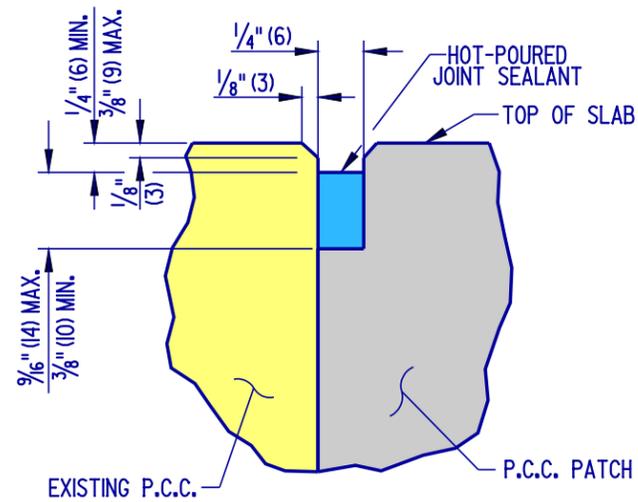
P.C.C. PAVEMENT PATCHING

STANDARD NO. P-2 (2004)

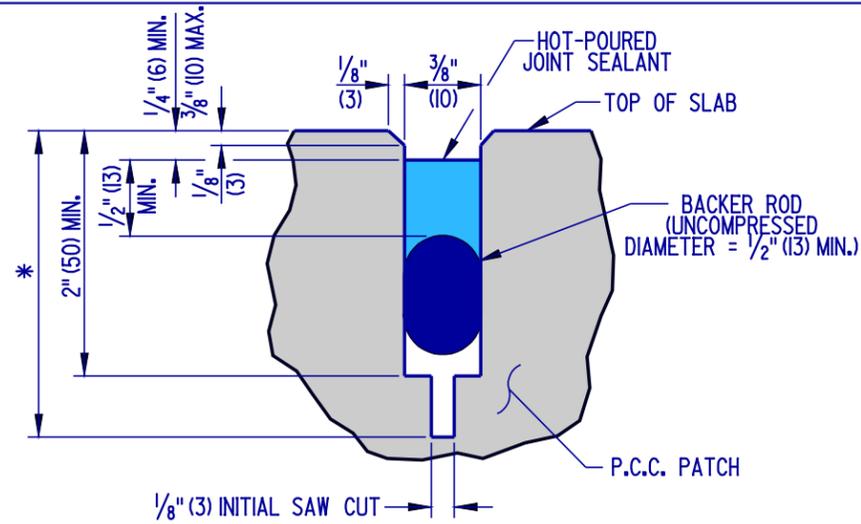
SHT. 2 OF 5

APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

RECOMMENDED *Dennis M. O'Flaherty* 1/3/05  
DESIGN ENGINEER DATE

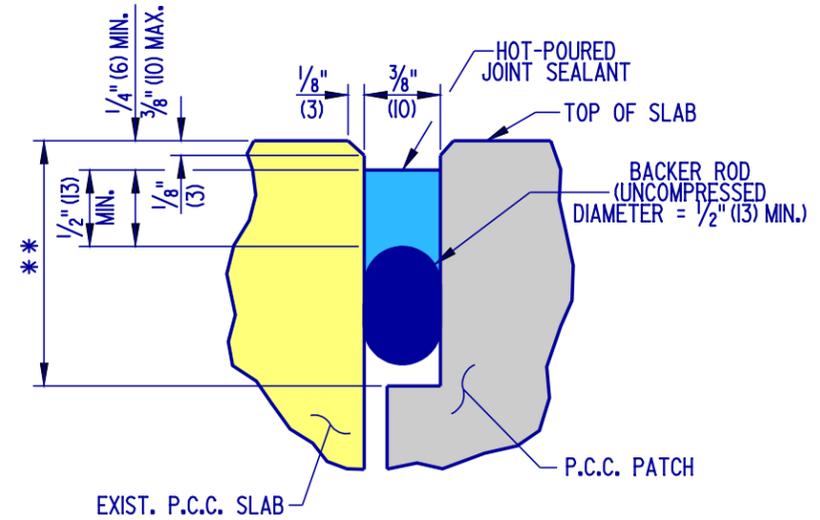


**SEALANT DETAIL - LONGITUDINAL JOINT**



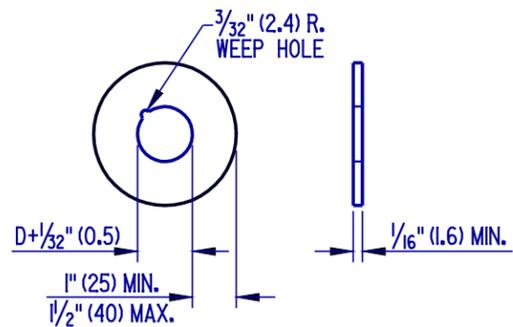
\* - 0.3T (T < 10" (250) P.C.C. PAVEMENT)  
0.4T (T > 10" (250) P.C.C. PAVEMENT)

**SEALANT DETAIL - TRANSVERSE SAW-CUT JOINT**



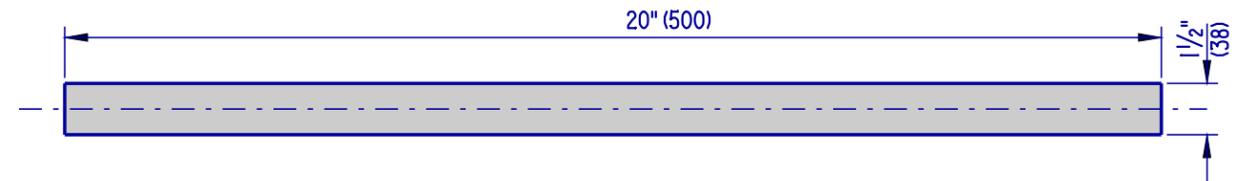
\*\* - 2" (50) MIN. WITH BACKER ROD  
5/8" (16) MIN. WITH BOND BREAKER TAPE

**SEALANT DETAIL - TRANSVERSE CONSTRUCTION JOINT**



D - DOWEL DIAMETER (INCLUDING PROTECTING COATINGS, IF ANY.)

**GROUT RETENTION DISK**



**DOWEL BAR**

**NOTES:**

- 1). AS DIMENSIONED, THE WIDTH OF THE TRANSVERSE SEALANT RESERVOIR IS APPLICABLE WHEN THE TEMPERATURE OF THE PAVEMENT SURFACE IS BETWEEN 60°F (16°C) AND 80°F (27°C). WHEN THE TEMPERATURE IS BELOW 60°F (16°C), THE SEALANT RESERVOIR SHALL BE CUT 1/16" (2) WIDER. WHEN THE TEMPERATURE IS ABOVE 80°F (27°C), THE SEALANT RESERVOIR SHALL BE CUT 1/16" (2) NARROWER.
- 2). "T" REFERS TO THE EXISTING "AS-BUILT" SLAB THICKNESS.
- 3). TOLERANCE ON ALL JOINT SEALANT DETAIL DIMENSIONS SHOWN WITHOUT RANGES SHALL BE PLUS 1/16" (2), MINUS 0" (0).
- 4). THE TOP EDGES OF THE CONTACT SURFACES OF THE SEALANT MATERIAL ON BOTH SIDES OF THE JOINT RESERVOIR SHALL BE AT THE SAME ELEVATION.

**FULL DEPTH PATCH**



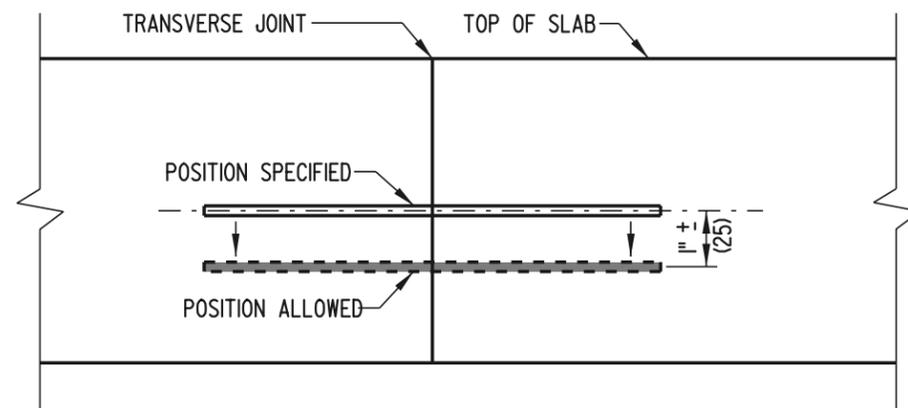
**DELAWARE DEPARTMENT OF TRANSPORTATION**

**P.C.C. PAVEMENT PATCHING**

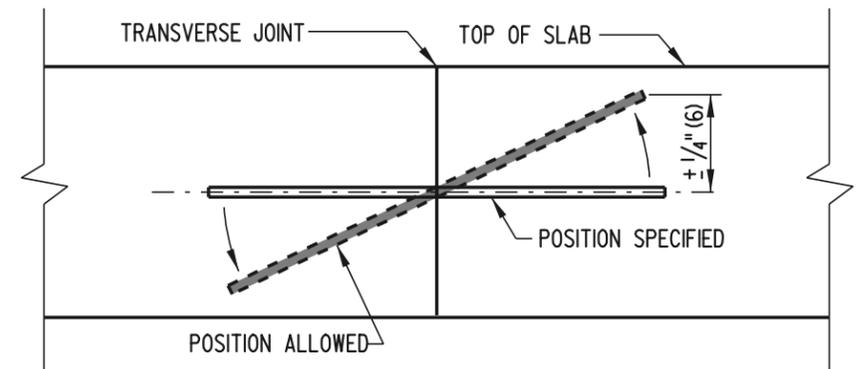
STANDARD NO. P-2 (2004) SHT. 3 OF 5

APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

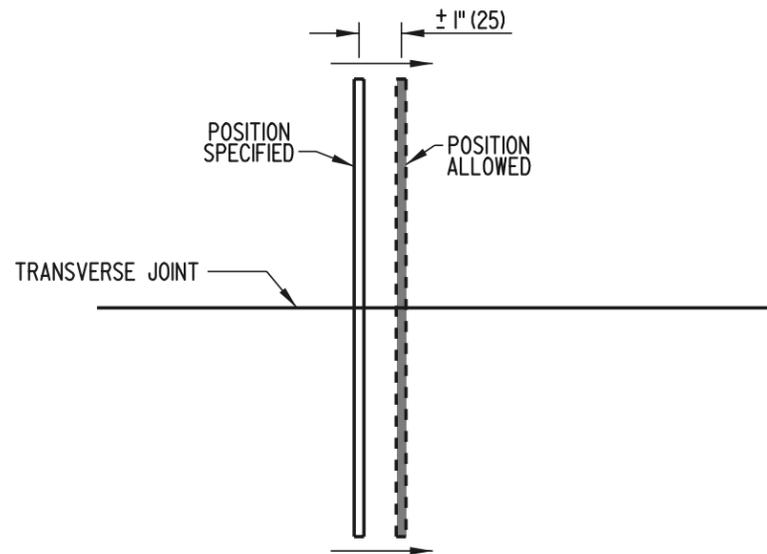
RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



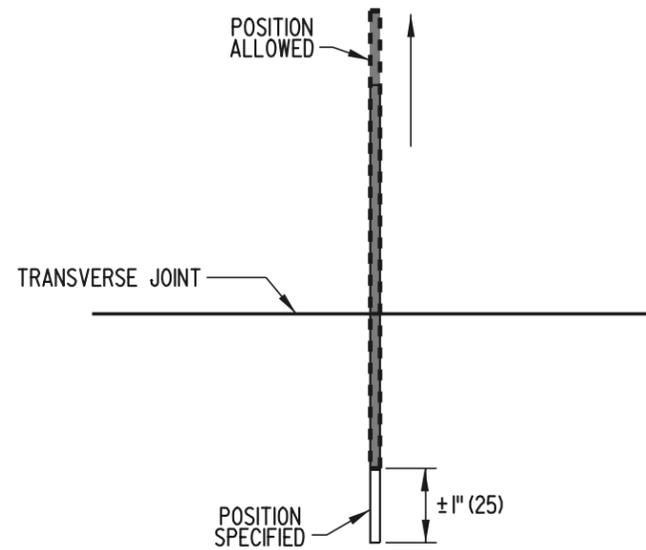
**VERTICAL TRANSLATION**



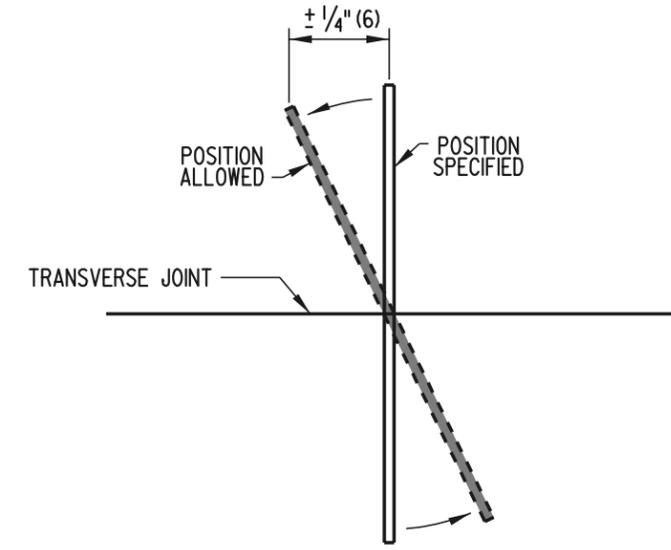
**VERTICAL ROTATION**



**HORIZONTAL TRANSLATION**



**LONGITUDINAL TRANSLATION**



**HORIZONTAL ROTATION**

**DOWEL & TIE BAR PLACEMENT TOLERANCES**

**FULL DEPTH PATCH**



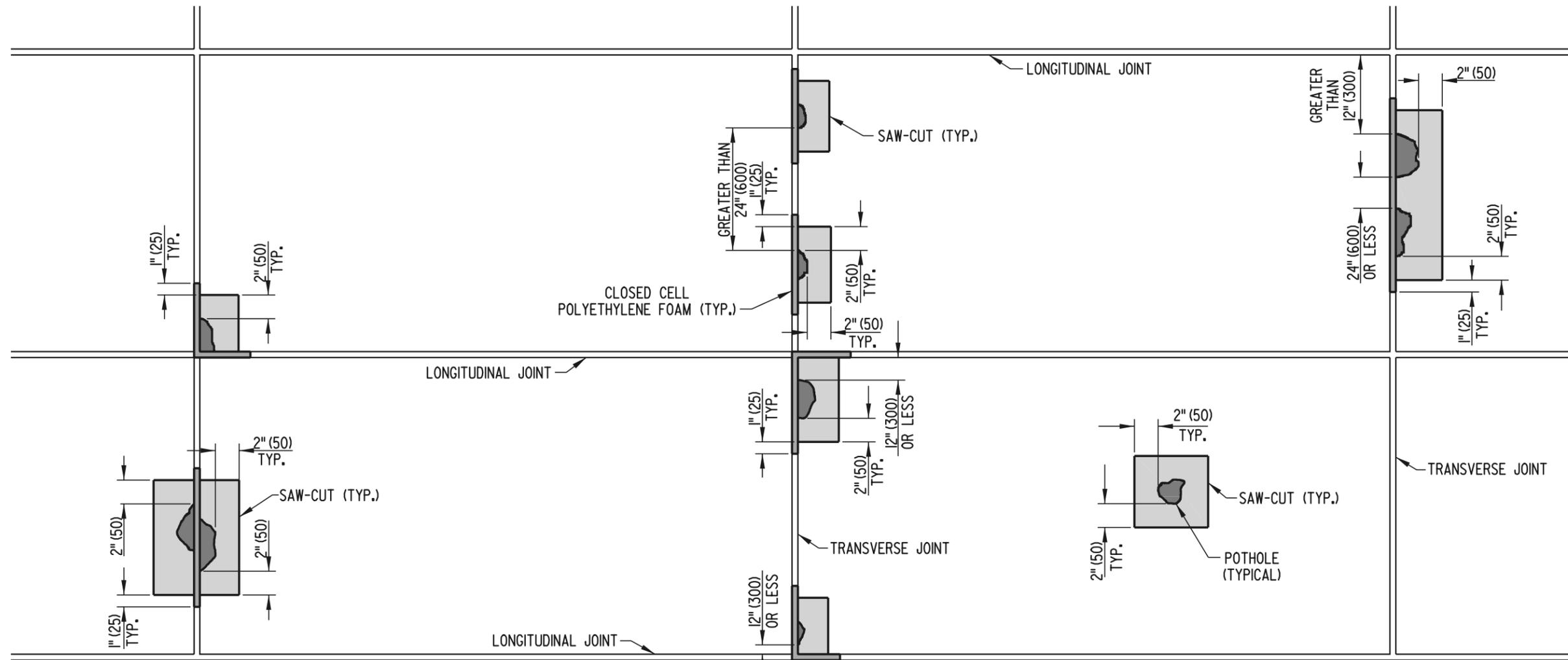
**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**P.C.C. PAVEMENT PATCHING**

**STANDARD NO. P-2 (2001)**

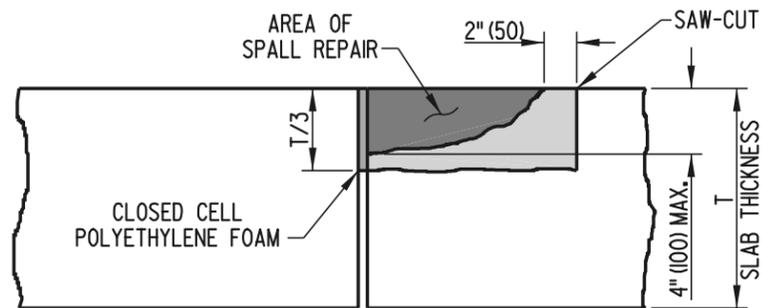
**SHT. 4 OF 5**

**APPROVED** *Ryan M. Harshbarger* **6/18/01**  
CHIEF ENGINEER DATE  
**RECOMMENDED** *Michael R. [Signature]* **6/18/01**  
DESIGN ENGINEER DATE

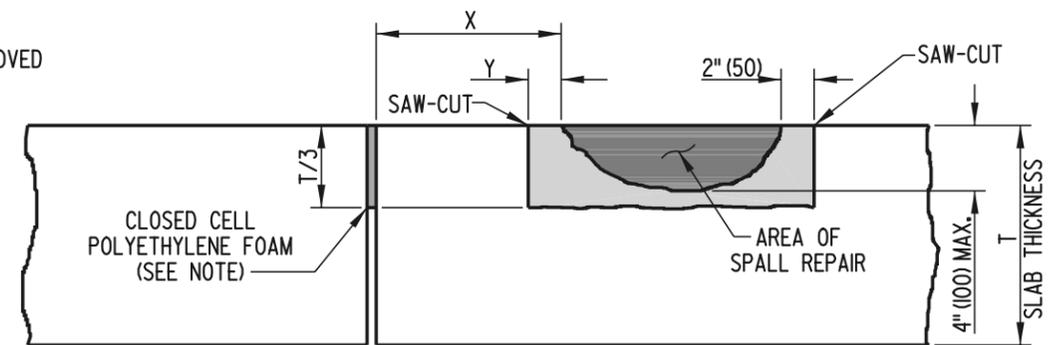


**PLAN**

**NOTE:** CLOSED CELL POLYETHYLENE FOAM SHALL BE THE SAME WIDTH AS THE JOINT AND 5" (125) IN DEPTH. AFTER THE CONCRETE IN THE REPAIR AREA HAS ACHIEVED THE SPECIFIED STRENGTH, THE FOAM SHALL BE REMOVED AND REPLACED WITH BACKER ROD AND HOT-POUR SEALANT MEETING ALL APPLICABLE STANDARD DETAILS AND SPECIFICATIONS.



**SECTION WITH SPALL ADJACENT TO JOINT**



**SECTION WITH SPALL NOT ADJACENT TO JOINT**

**NOTE:** WHEN  $X > 12" (300)$ , THEN  $Y=1" (25)$  AND POLYETHYLENE FOAM IS NOT USED. WHEN  $X \leq 12" (300)$ , THEN  $Y=X$  AND POLYETHYLENE FOAM IS USED.

**PARTIAL DEPTH PATCH**



**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**P.C.C. PAVEMENT PATCHING**

STANDARD NO.

P-2 (2001)

SHT. 5

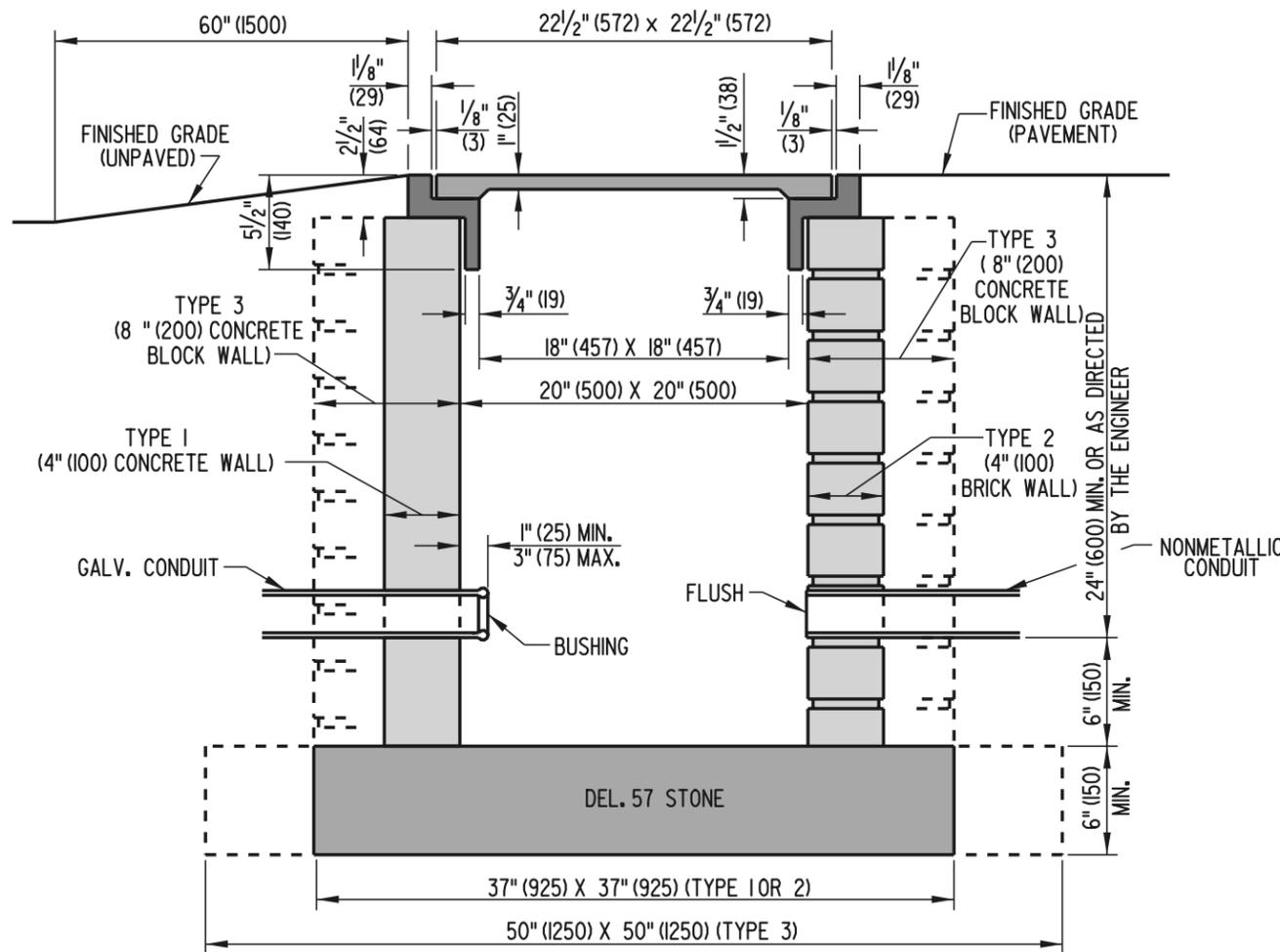
OF 5

APPROVED

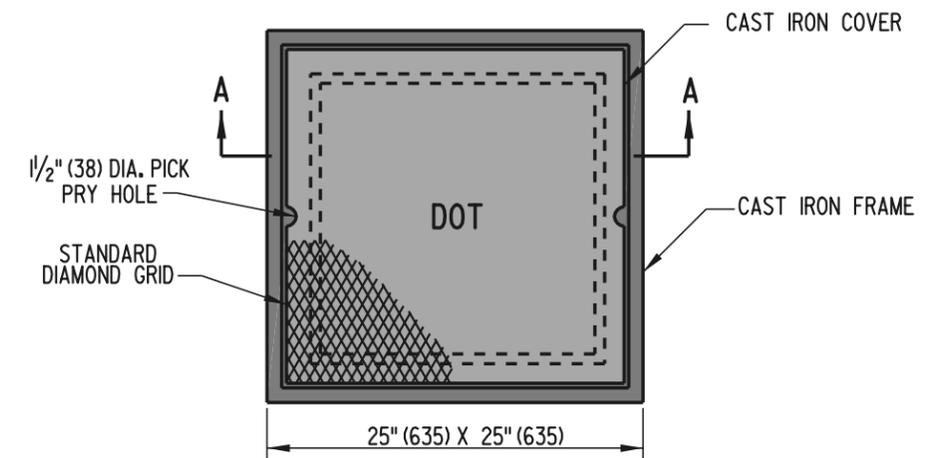
*Ryan M. Harshbarger*  
CHIEF ENGINEER DATE 6/18/01

RECOMMENDED

*Michael R. [Signature]*  
DESIGN ENGINEER DATE 6/18/01



**SECTION A-A**



**PLAN VIEW**

- NOTES:**
- 1). TYPE 1 CONDUIT JUNCTION WELL SHALL BE PRECAST CONCRETE. AT LEAST ONE HOLE IN PRECAST WELLS WILL BE OF A 5" (125) DIAMETER COMPLETELY THROUGH THE WALL. UNUSED HOLES SHALL BE PLUGGED.
  - 2). TYPE 2 AND TYPE 3 CONDUIT JUNCTION WELLS SHALL BE BRICK AND WILL CONFORM TO STANDARD SPECIFICATIONS FOR BRICK MASONRY. JOINTS SHALL BE CONCAVE TYPE. TYPE 2 WALLS WILL BE A NOMINAL 4" (100) THICK. TYPE 3 WALL WILL BE A NOMINAL 8" (200) THICK.
  - 3). TYPE 2 AND TYPE 3 CONDUIT JUNCTION WELLS SHALL NOT BE PLACED UNDER ANY TYPE OF PAVEMENT.
  - 4). ALL CONDUIT JUNCTION WELLS CONSTRUCTED WITHIN PAVEMENT, SIDEWALKS, ETC. WILL BE CONSTRUCTED FLUSH WITH THE SURFACE OF THE SAME. INSTALLATION IN UNPAVED AREAS WILL BE CONSTRUCTED ABOVE GRADE AND GRADED TO DRAIN AWAY FROM CONDUIT JUNCTION WELL.

**PLAN SYMBOL**

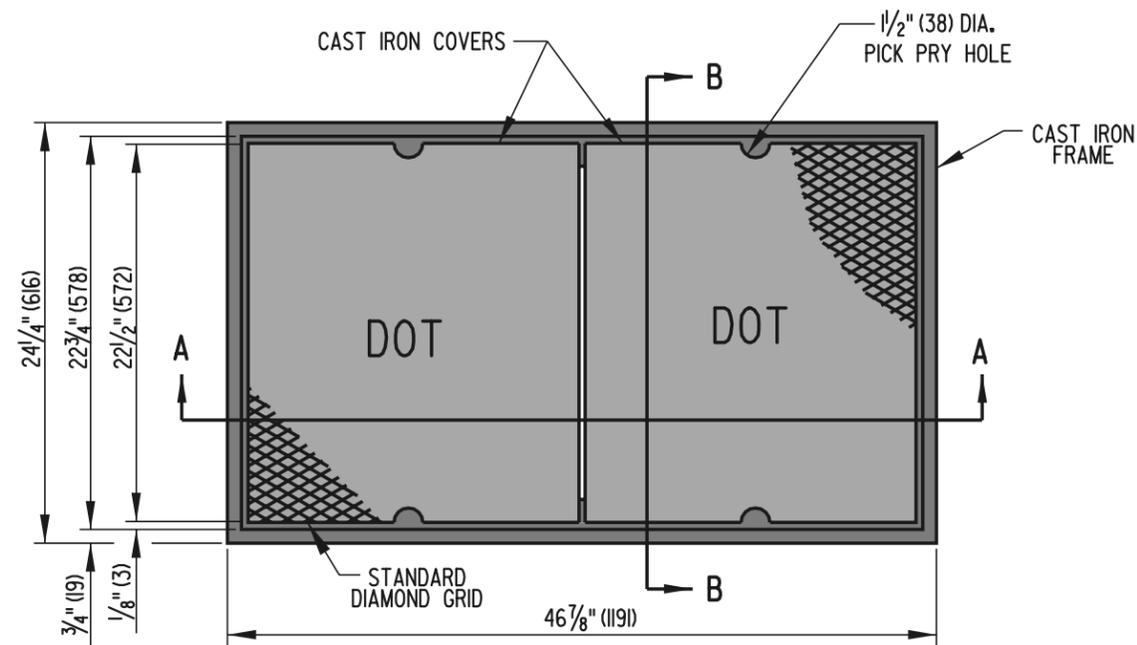


**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

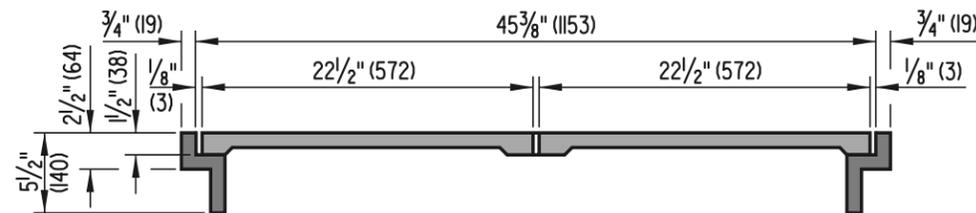
**CONDUIT JUNCTION WELL, TYPES 1, 2, AND 3**

STANDARD NO. **T-1 (2002)** SHT. **1** OF **1**

APPROVED *Caution Wicks* 9/6/02  
CHIEF ENGINEER DATE  
 RECOMMENDED *Therese Delph* 8/19/02  
DESIGN ENGINEER DATE

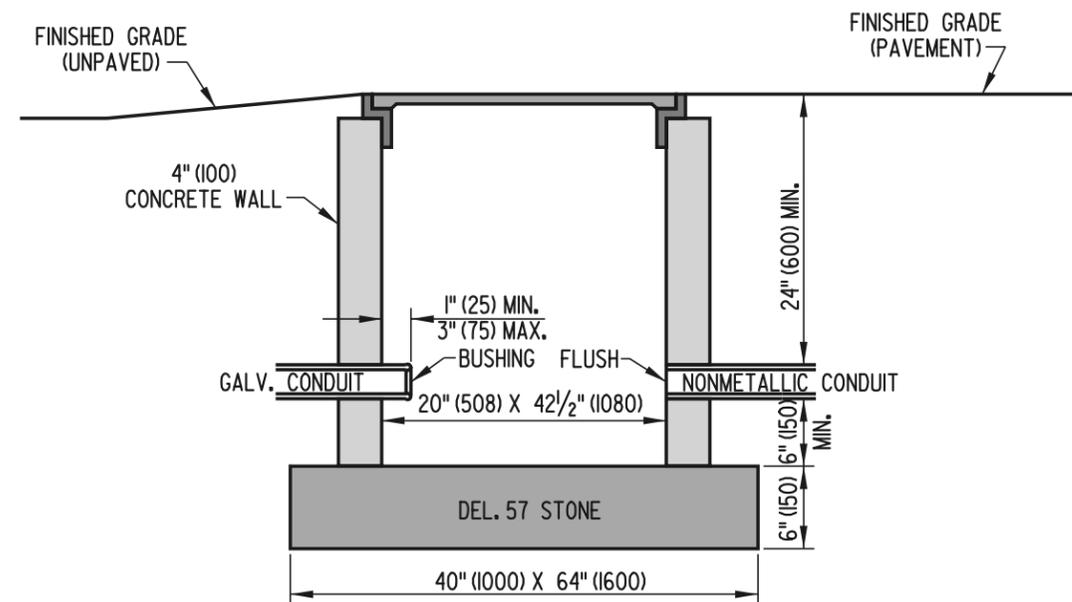


**PLAN VIEW**



**SECTION A-A**

- NOTES:**
- 1). TYPE 4 CONDUIT JUNCTION WELL SHALL BE PRECAST CONCRETE. AT LEAST ONE HOLE IN PRECAST WALLS WILL BE OF A 5" (125) DIAMETER COMPLETELY THROUGH THE WALL. UNUSED HOLES SHALL BE PLUGGED.
  - 2). ALL CONDUIT JUNCTION WELLS CONSTRUCTED WITHIN PAVEMENT, SIDEWALKS, ETC. WILL BE CONSTRUCTED FLUSH WITH THE SURFACE OF THE SAME. INSTALLATION IN UNPAVED AREAS WILL BE CONSTRUCTED ABOVE GRADE AND GRADED TO DRAIN AWAY FROM CONDUIT JUNCTION WELL.



**SECTION B-B**

**PLAN SYMBOL**



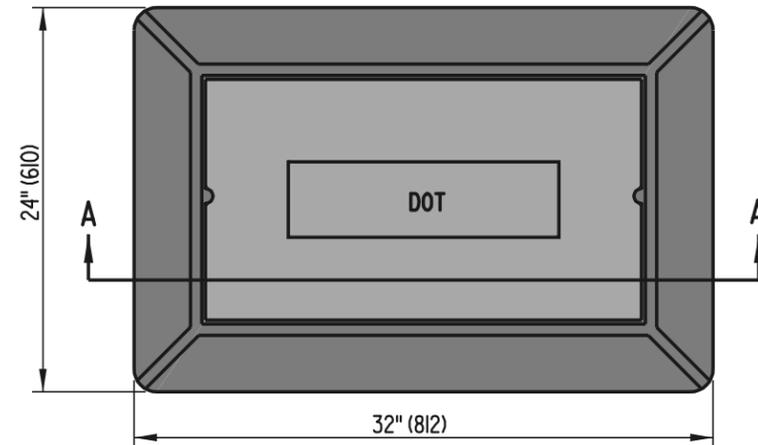
**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**CONDUIT JUNCTION WELL, TYPE 4**

STANDARD NO. **T-2 (2002)** SHT. **1** OF **1**

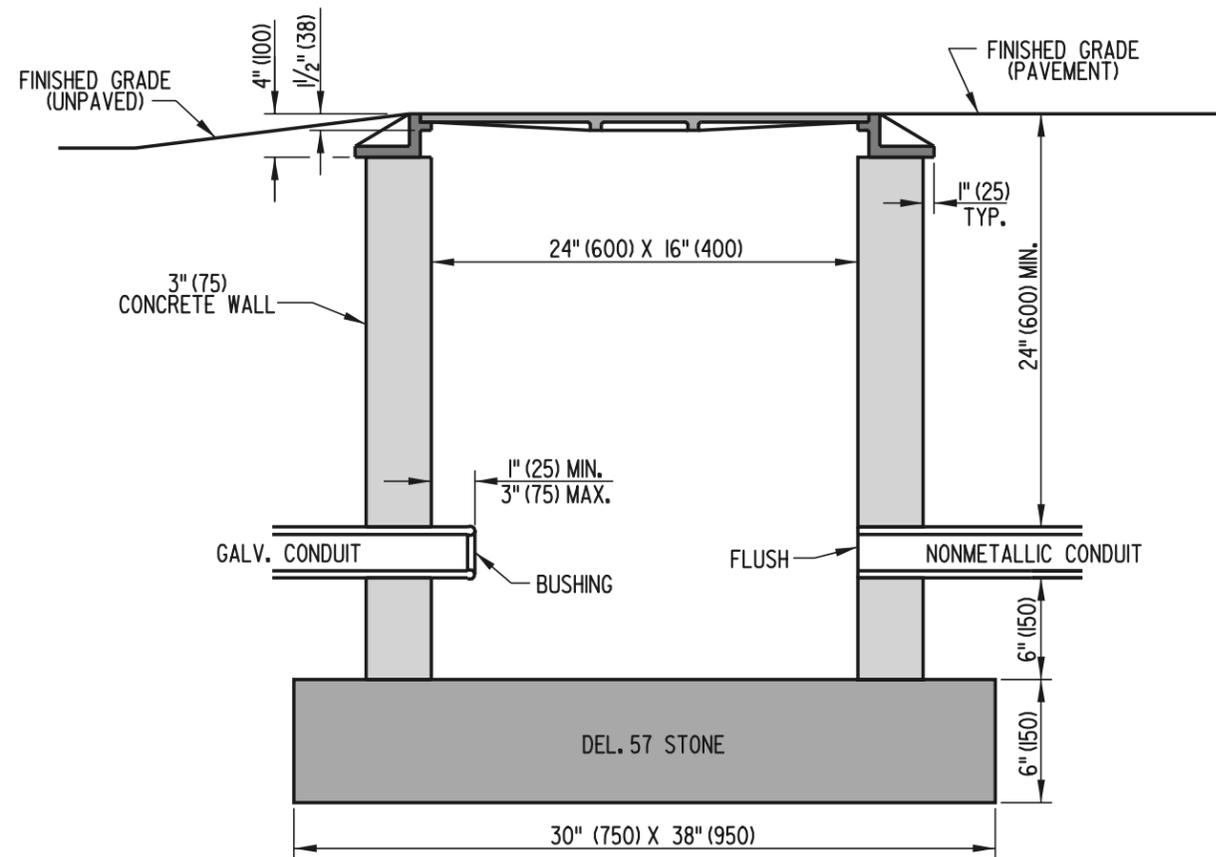
APPROVED *Caudam Wicks* 9/6/02  
CHIEF ENGINEER DATE

RECOMMENDED *Thurston Phelps* 8/19/02  
DESIGN ENGINEER DATE



**PLAN VIEW**

- NOTES:**
1. TYPE 5 CONDUIT JUNCTION WELL SHALL BE PRECAST CONCRETE. AT LEAST ONE HOLE IN PRECAST WELLS WILL BE OF A 5" (125) DIAMETER COMPLETELY THROUGH THE WALL. UNUSED HOLES SHALL BE PLUGGED.
  2. ALL CONDUIT JUNCTION WELLS CONSTRUCTED WITHIN PAVEMENT, SIDEWALKS, ETC. WILL BE CONSTRUCTED FLUSH WITH THE SURFACE OF THE SAME. INSTALLATION IN UNPAVED AREAS WILL BE CONSTRUCTED ABOVE GRADE AND GRADED TO DRAIN AWAY FROM CONDUIT JUNCTION WELL.



**SECTION A-A**

**PLAN SYMBOL**

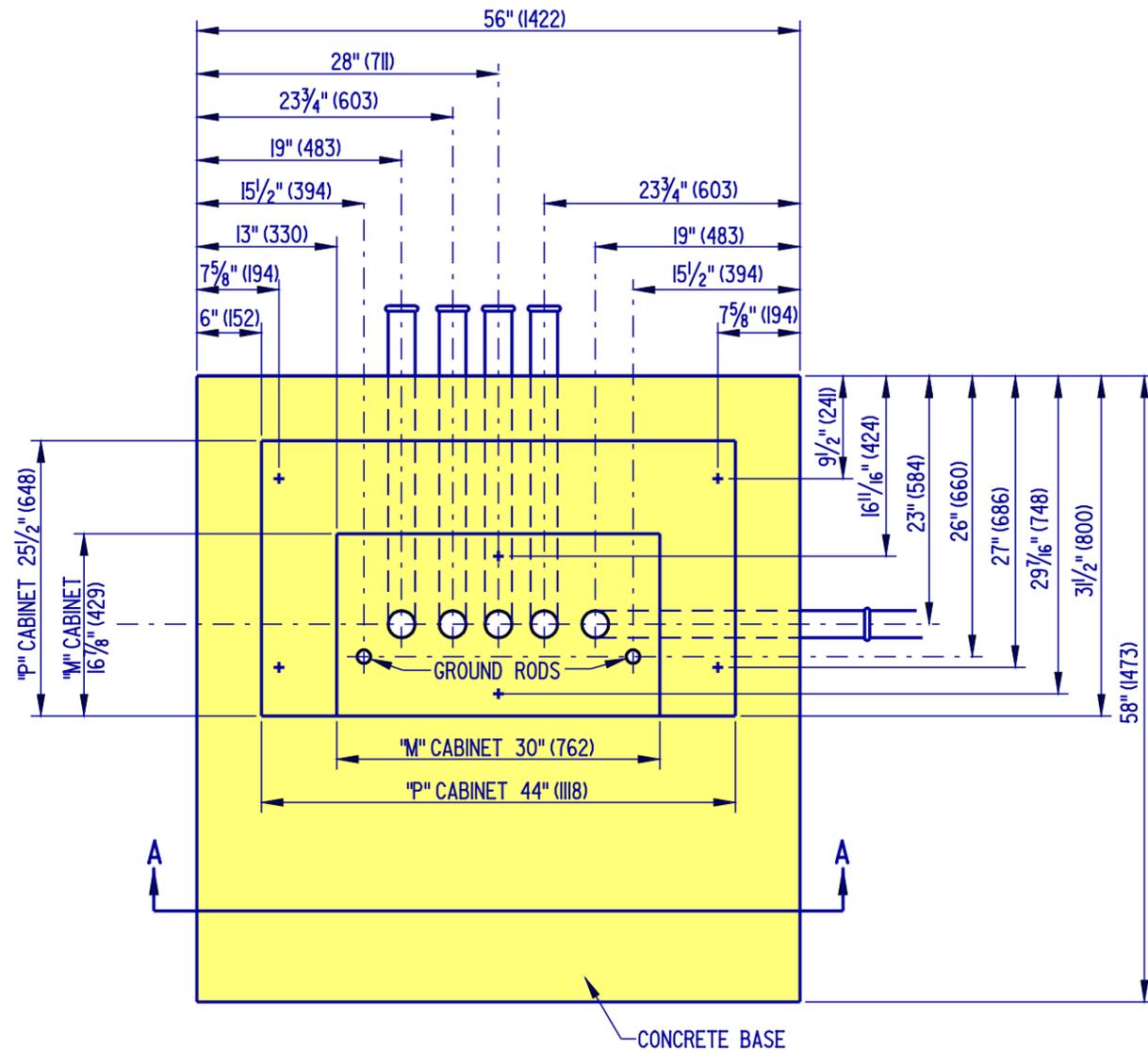


**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

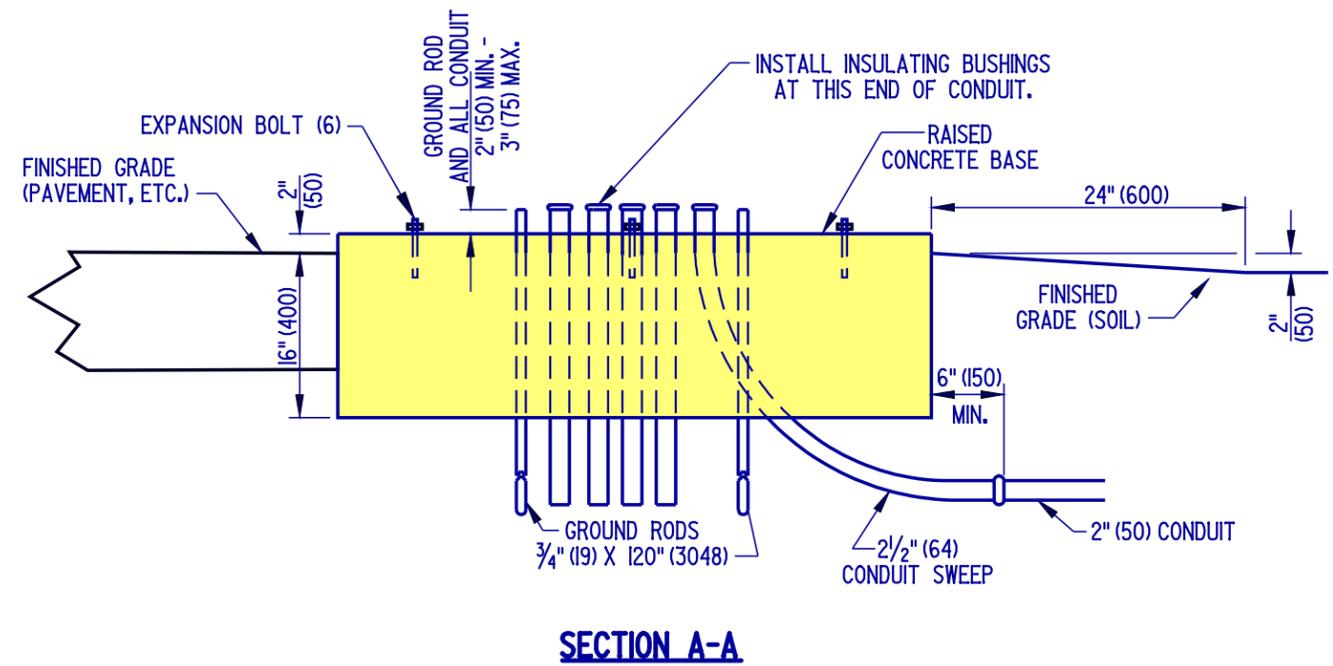
**CONDUIT JUNCTION WELL, TYPE 5**

**STANDARD NO. T-3 (2002) SHT. 1 OF 1**

**APPROVED** *Caution Wicks* 9/6/02  
CHIEF ENGINEER DATE  
**RECOMMENDED** *Theresa Roberts* 8/19/02  
DESIGN ENGINEER DATE



**PLAN VIEW**



**SECTION A-A**

**CONCRETE CABINET BASE**

**PLAN SYMBOL**



**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**CABINET BASES (TYPES 'M' & 'P')**

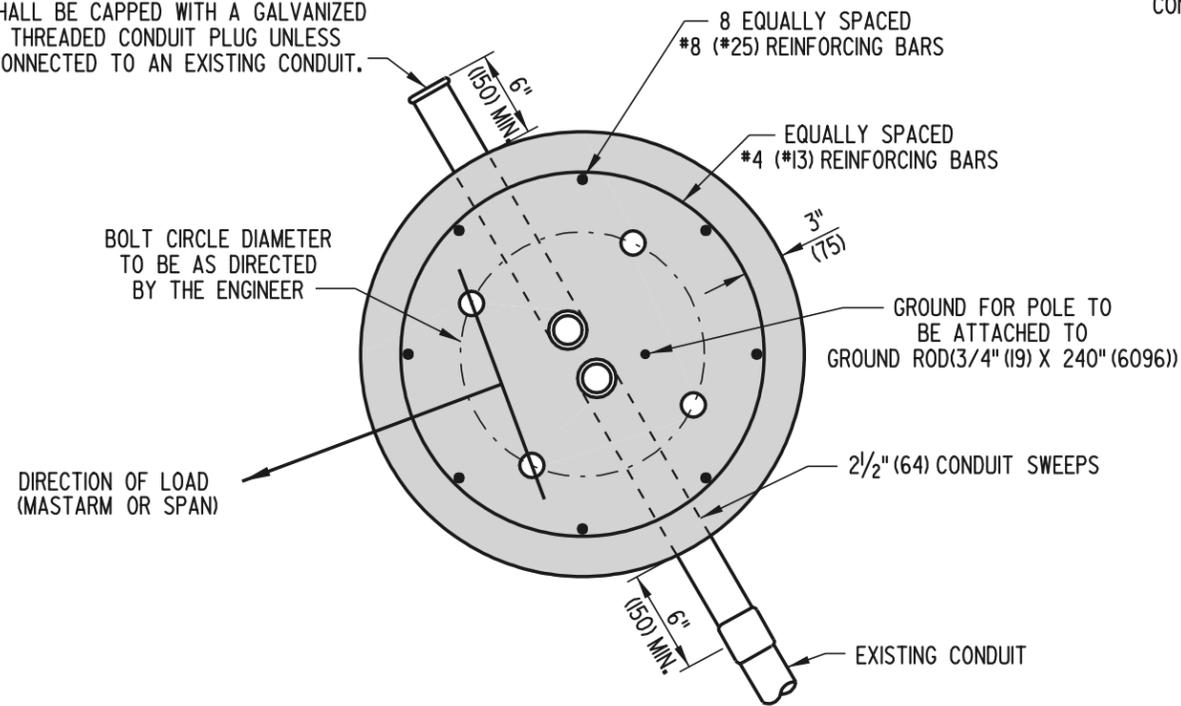
STANDARD NO. T-4 (2004)

SHT. 1 OF 1

APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE

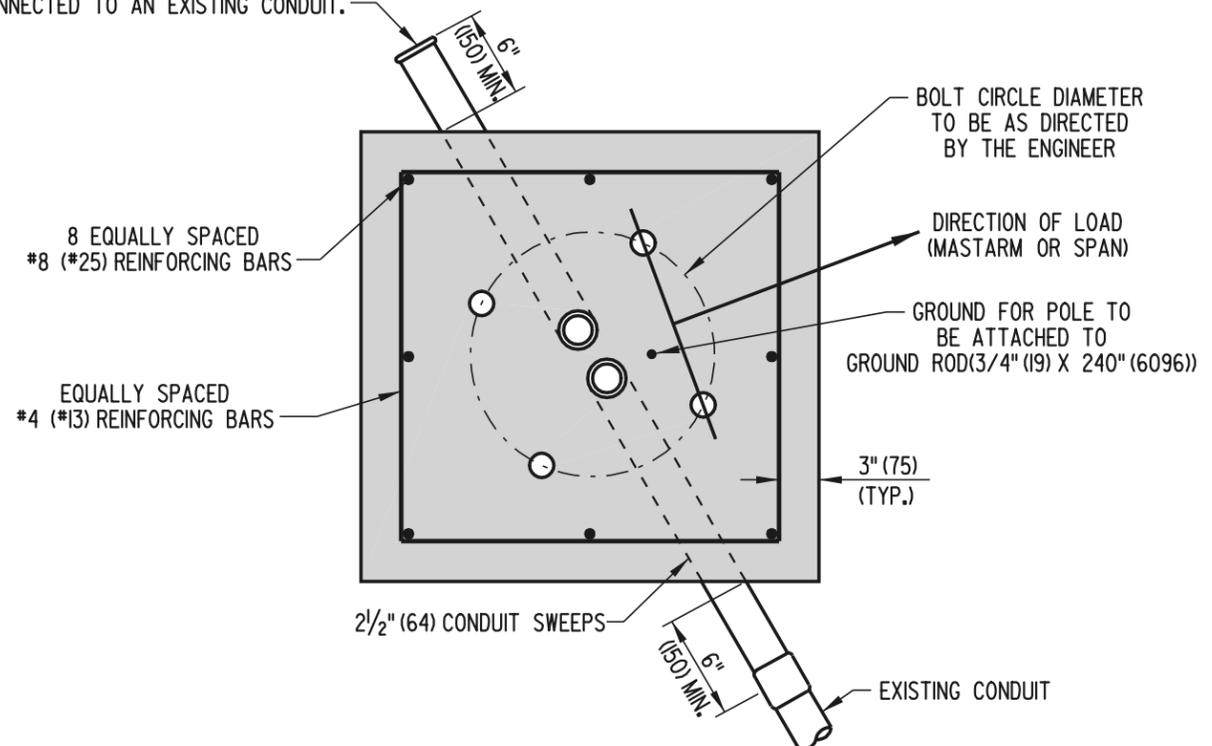
RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE

UNDERGROUND CONDUIT ENDS SHALL BE CAPPED WITH A GALVANIZED THREADED CONDUIT PLUG UNLESS CONNECTED TO AN EXISTING CONDUIT.



**ROUND BASE**

UNDERGROUND CONDUIT ENDS SHALL BE CAPPED WITH A GALVANIZED THREADED CONDUIT PLUG UNLESS CONNECTED TO AN EXISTING CONDUIT.



**SQUARE BASE**

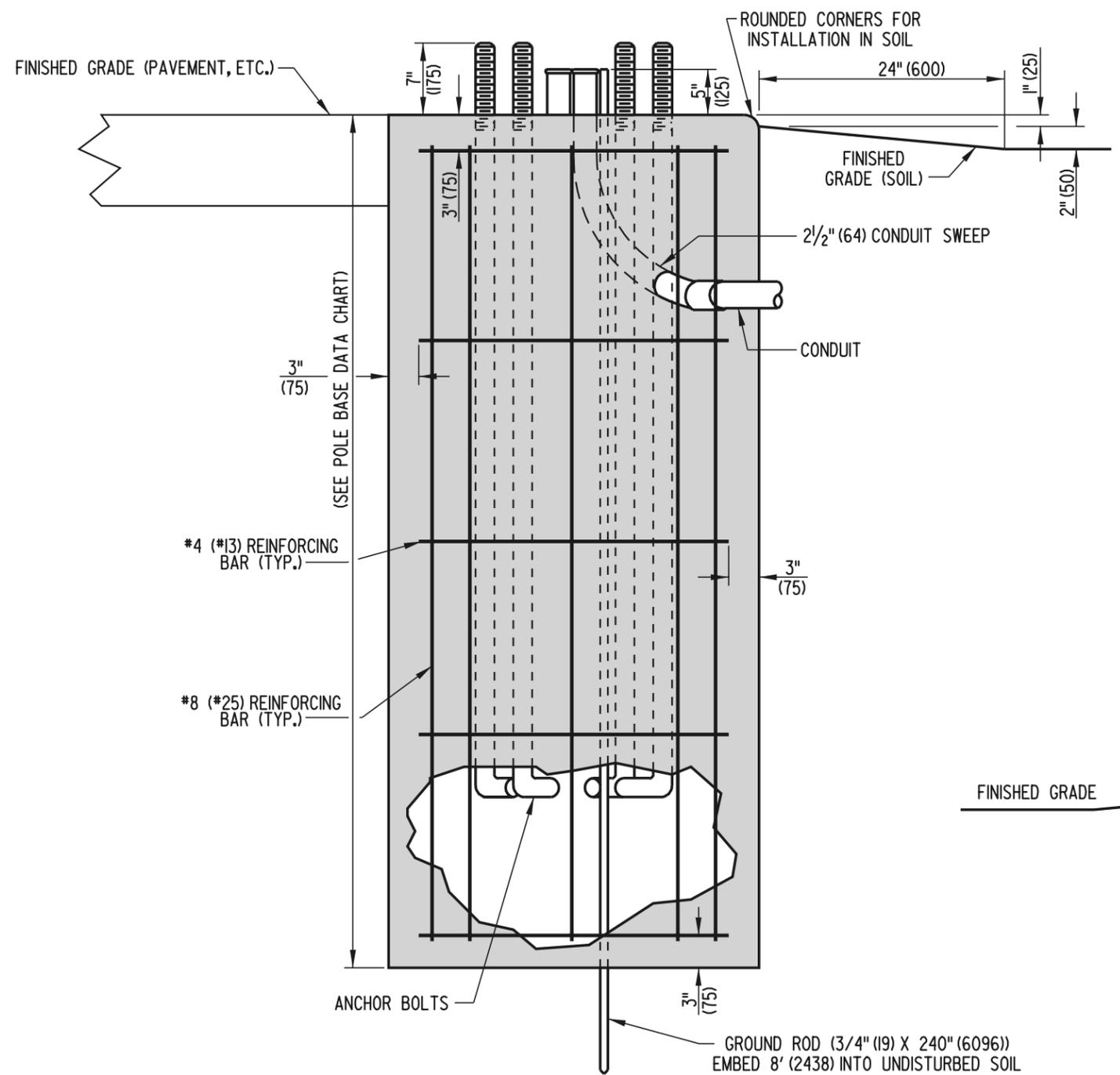
NOTE: BASE DEPENDENT ON POLE AND EQUIPMENT TO BE ATTACHED.

**PLAN SYMBOL**

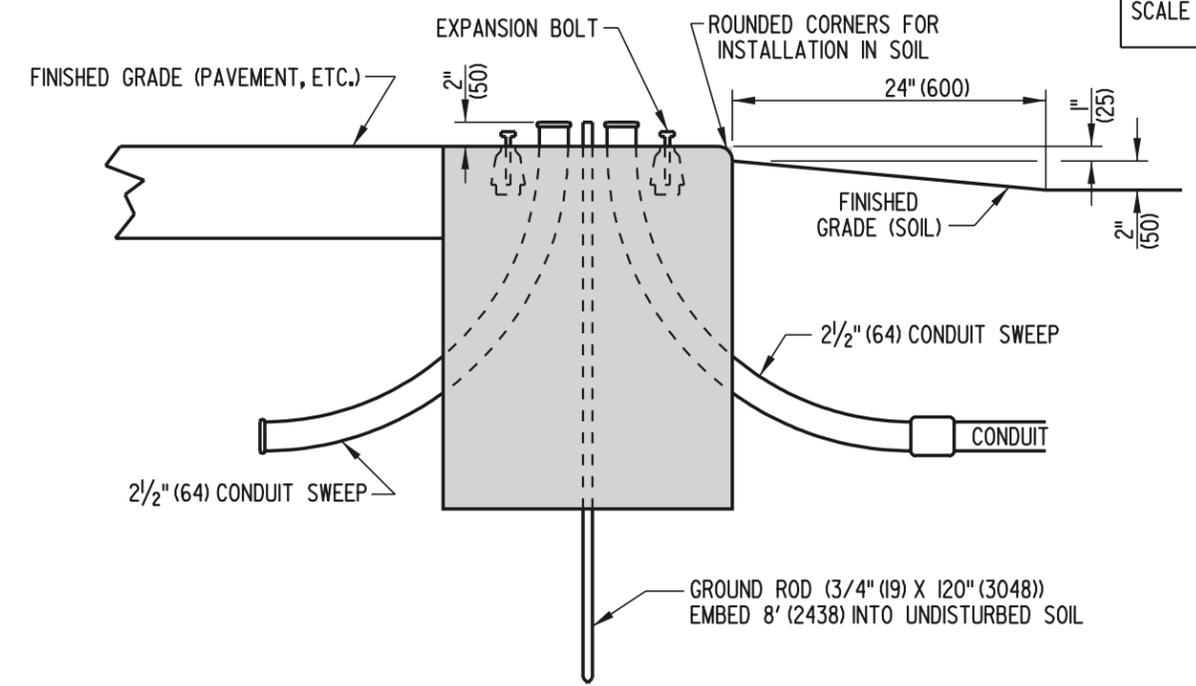


 <b>DELAWARE</b> <b>DEPARTMENT OF TRANSPORTATION</b>	<b>POLE BASES</b>			<b>APPROVED</b> <i>Caution Wicks</i> <b>9/6/02</b> <small>CHIEF ENGINEER DATE</small>
	<b>STANDARD NO. T-5 (2002)</b>	<b>SHT. 1</b>	<b>OF 3</b>	<b>RECOMMENDED</b> <i>Therese Roberts</i> <b>8/19/02</b> <small>DESIGN ENGINEER DATE</small>

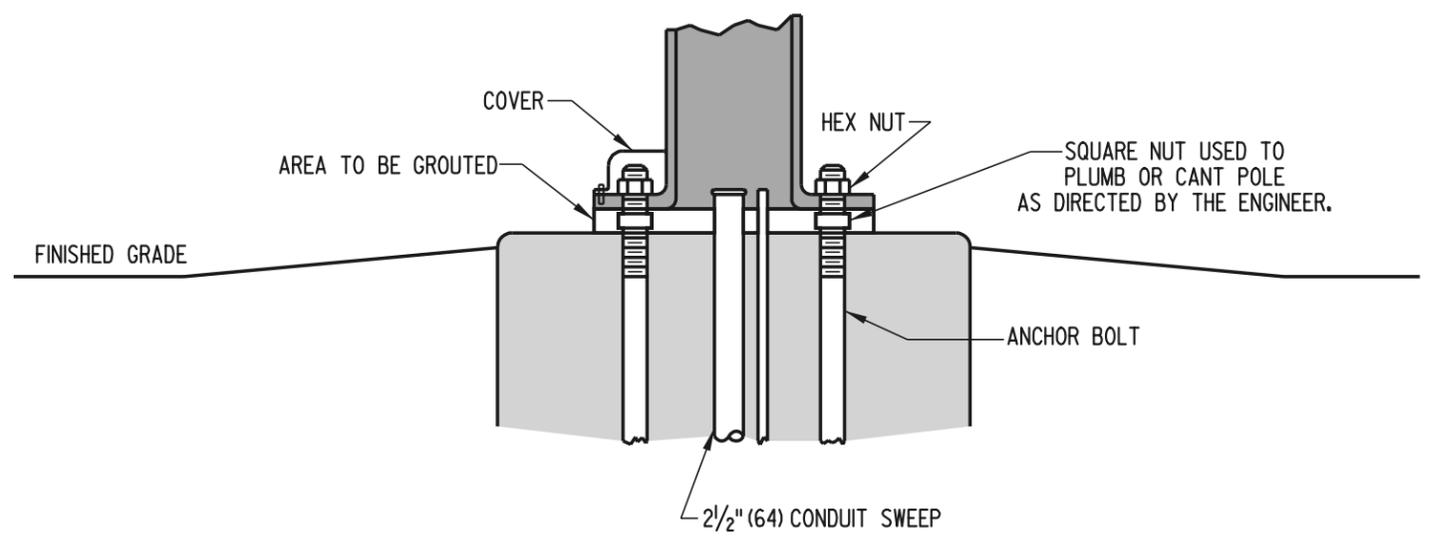
SCALE : N.T.S.



**TYPICAL SECTION (BASES 1,2,2A,2B,3,3A,3B, AND 7)**



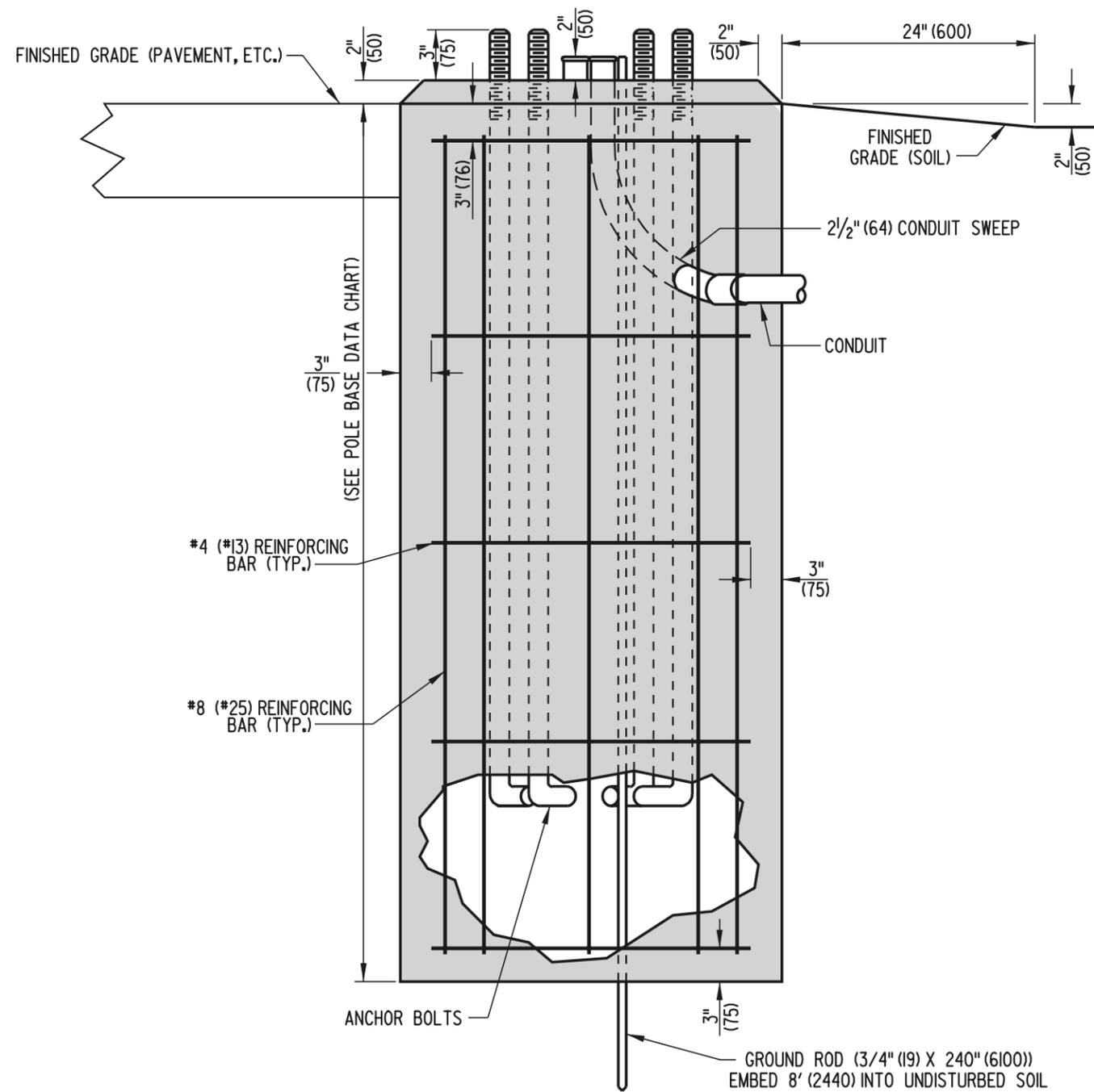
**TYPICAL SECTION (BASE 4)**



**TYPICAL INSTALLATION (BASES 1,2,2A,2B,3,3A,3B,4, AND 7)**

- NOTES:**
- 1.) PLACE 2 EACH 6" (150) LONG x 1/2" (13) DIA. P.V.C., SCHEDULE 40 (TYP) VENTS IN THE GROUT AS DIRECTED IN THE FIELD BY ENGINEER.
  - 2.) SEE POLE BASE DATA CHART FOR POLE BASE DIMENSIONS.

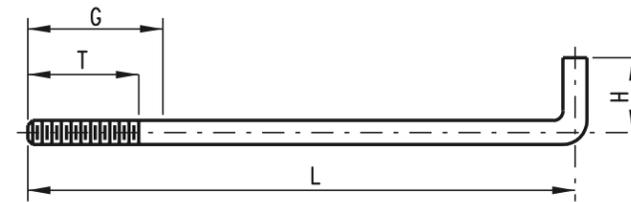
**PLAN SYMBOL**



**TYPICAL SECTION (BASES 5 AND 6)**

POLE BASE DATA CHART				
POLE BASE TYPE *	DIAMETER	DEPTH *	#4 (#13) HORIZONTAL REINFORCING BARS	#8 (#25) VERTICAL REINFORCING BARS
1	36" (915)	7' (2150)	5	8
2	36" (915)	10' (3050)	6	8
2A	48" (1220)	8' (2450)	5	8
2B	60" (1525)	7' (2150)	5	8
3	48" (1220)	10' (3050)	6	8
3A	60" (1525)	9' (2750)	6	8
3B	72" (1830)	7' (2150)	5	8
4	24" (610)	2'-4" (725)	NONE	NONE
5	36" (915)	4' (1225)	NONE	NONE
6	24" (610)	6' (1850)	4	8
7	48" (1220)	13'-4" (4000)	7	8

\* - ADDITIONAL DEPTH FOR POLE BASE EXTENSION, IF REQUIRED, TO BE DETERMINED BY TRAFFIC ENGINEERING AND MANAGEMENT (TEAM) FIELD REPRESENTATIVE.



G = GALVANIZED PORTION  
 T = THREAD LENGTH  
 L = LENGTH OF ROD  
 H = HEIGHT OF ROD

NOMINAL BOLT SIZE	L	H	T	G
1" (25) X 40" (1025)	36" (925)	4" (100)	6" (150)	8" (200)
1 1/4" (32) X 48" (1225)	42" (1075)	6" (150)	8" (200)	10" (250)
1 1/2" (38) X 60" (1525)	54" (1375)	6" (150)	10" (250)	12" (305)
1 3/4" (45) X 90" (2285)	84" (2135)	6" (150)	10" (250)	20" (500)
2" (51) X 90" (2285)	82" (2085)	8" (200)	8" (200)	18" (455)

**ANCHOR BOLT DATA CHART AND DETAILS**

NOTE: ANCHOR BOLTS FOR POLE BASE TYPE 7 SHALL CONFORM TO THE CCTV POLE MANUFACTURER'S SPECIFICATIONS.

**PLAN SYMBOL**



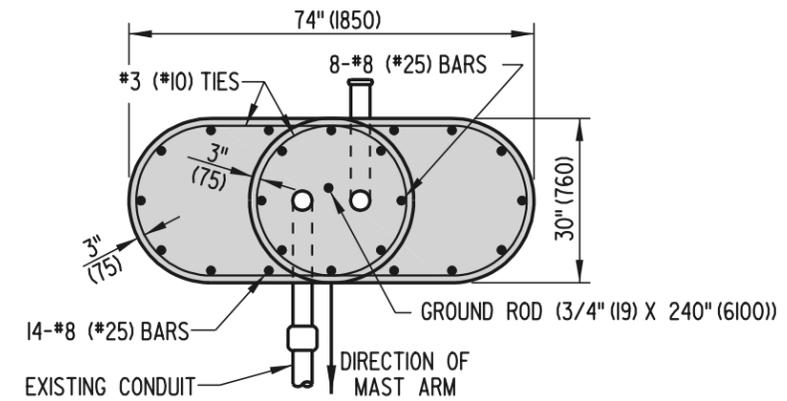
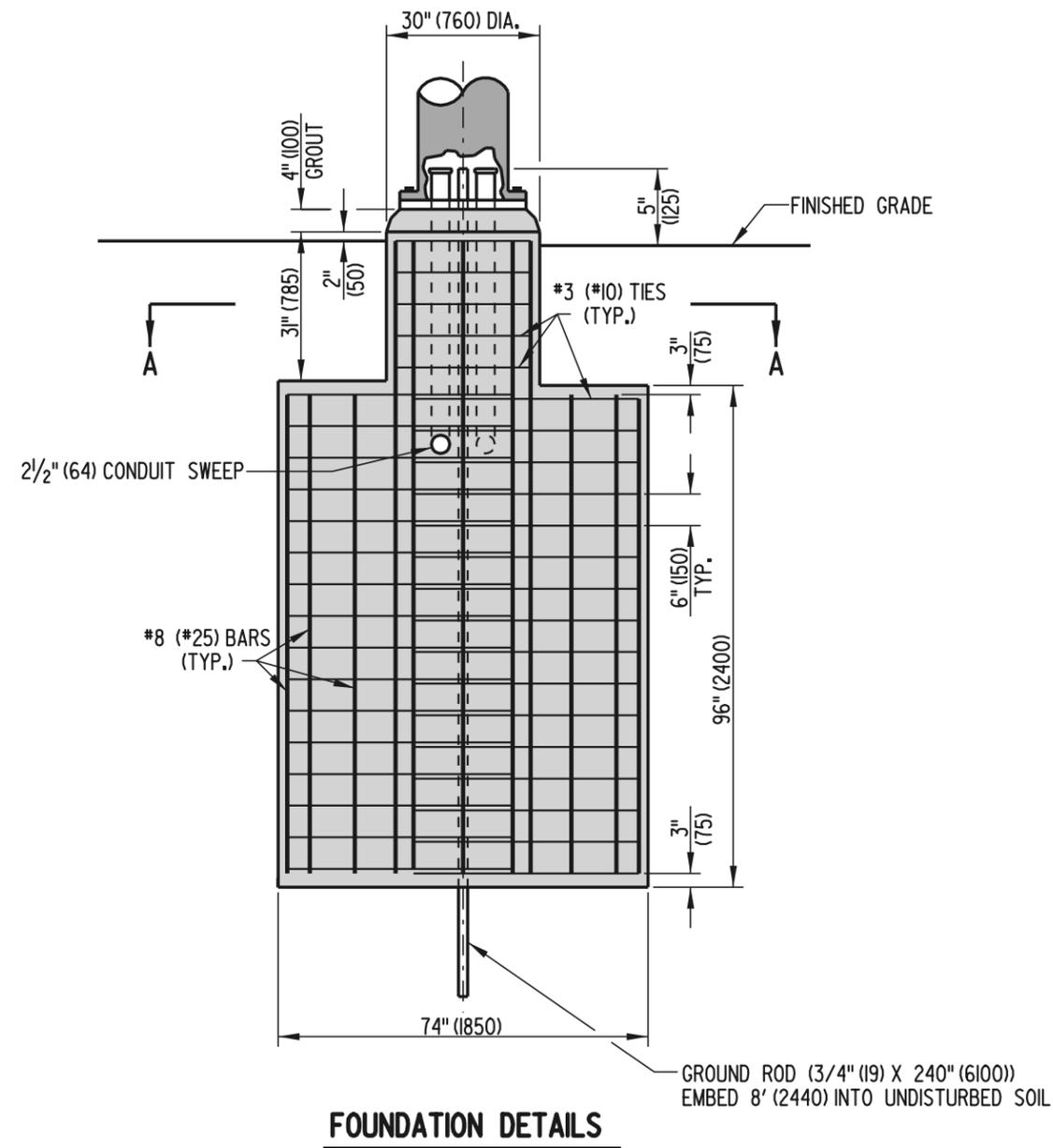
DELAWARE  
 DEPARTMENT OF TRANSPORTATION

POLE BASES

STANDARD NO. T-5 (2002)

SHT. 3 OF 3

APPROVED *Caution Wicks* 9/6/02  
CHIEF ENGINEER DATE  
 RECOMMENDED *Theresa Delgado* 8/19/02  
DESIGN ENGINEER DATE



**SECTION A-A**

**NOTES:**

1. UNDERGROUND CONDUIT ENDS SHALL BE CAPPED WITH A GALVANIZED THREADED CONDUIT PLUG UNLESS CONNECTED TO AN EXISTING CONDUIT.
2. PLACE 2 EACH 6" (150) x 1/2" (13) P.V.C., SCHEDULE 40 (TYP) VENTS IN THE GROUT AS DIRECTED IN THE FIELD BY THE ENGINEER.

**PLAN SYMBOL**

○  
(SAME AS NORMAL POLE BASE)

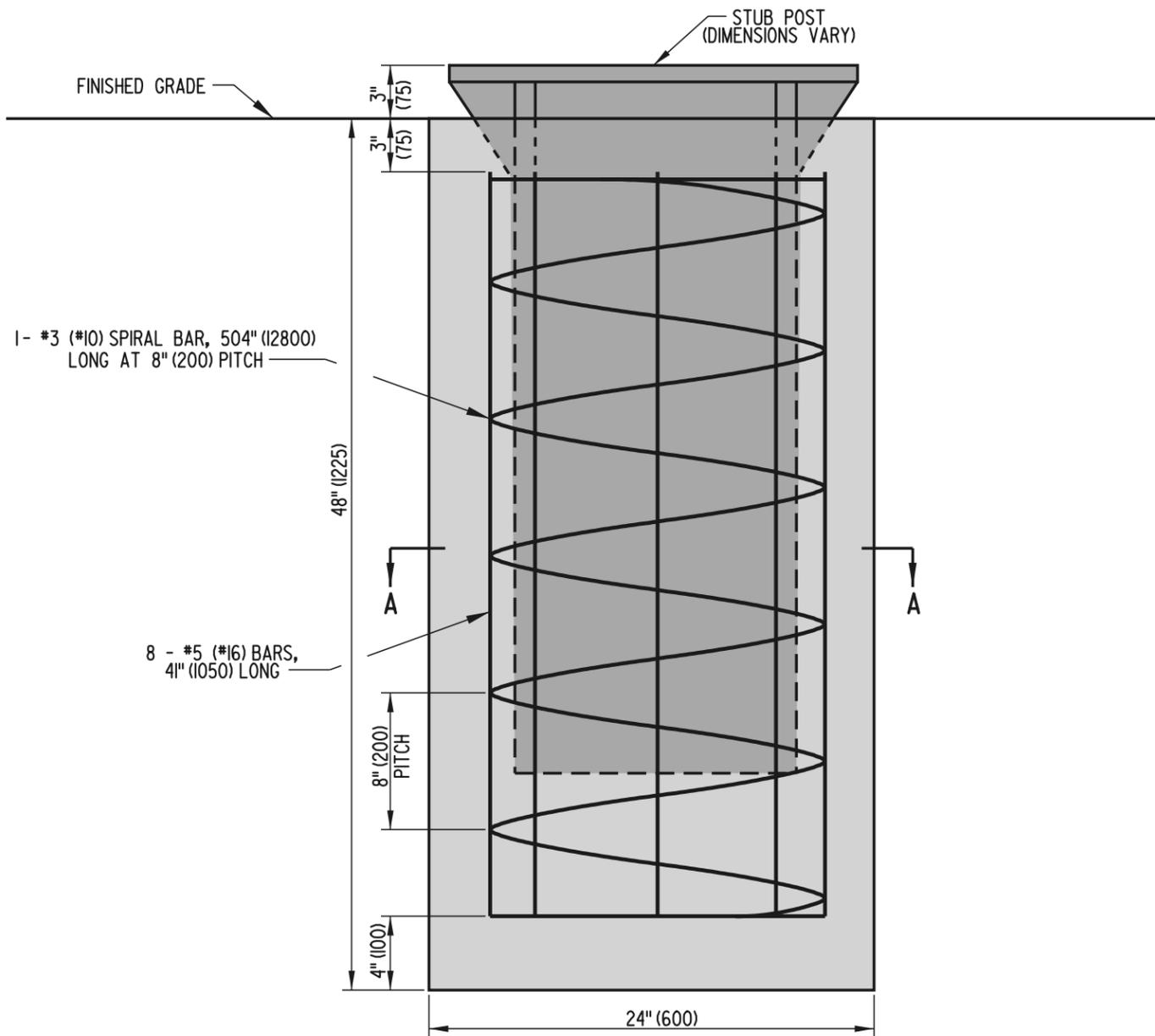


DELAWARE  
DEPARTMENT OF TRANSPORTATION

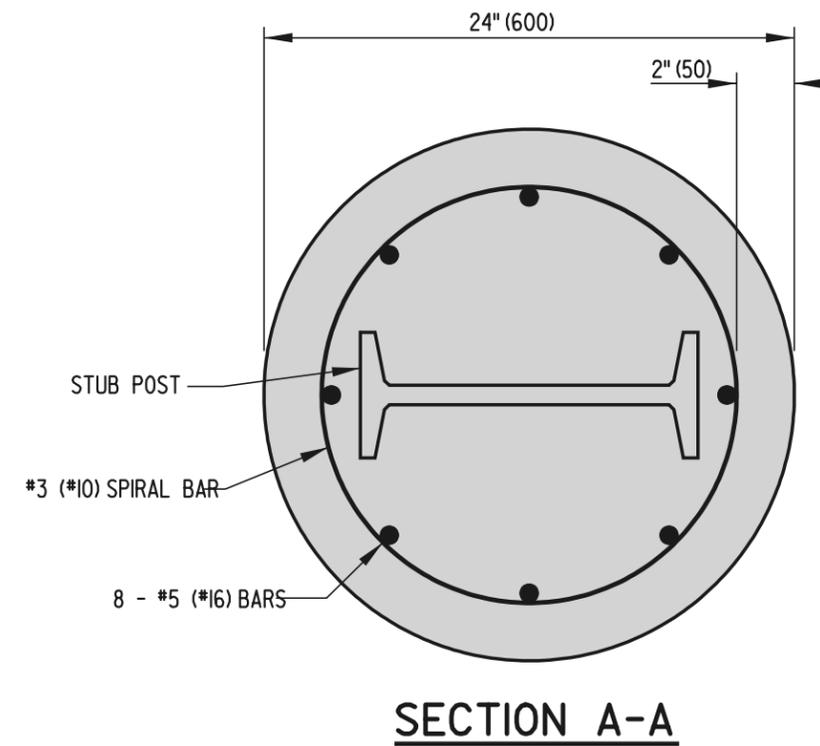
**SPECIAL POLE BASE**

STANDARD NO. T-6 (2002) SHT. 1 OF 1

APPROVED *Caroleen Wicks* 9/6/02  
CHIEF ENGINEER DATE  
RECOMMENDED *Theresa Roberts* 8/19/02  
DESIGN ENGINEER DATE



NOTES: 1). STUB POST TO BE SUPPLIED BY THE DEPARTMENTS TRAFFIC, ENGINEERING, AND MANAGEMENT SECTION.



PLAN SYMBOL



DELAWARE  
DEPARTMENT OF TRANSPORTATION

SIGN FOUNDATION

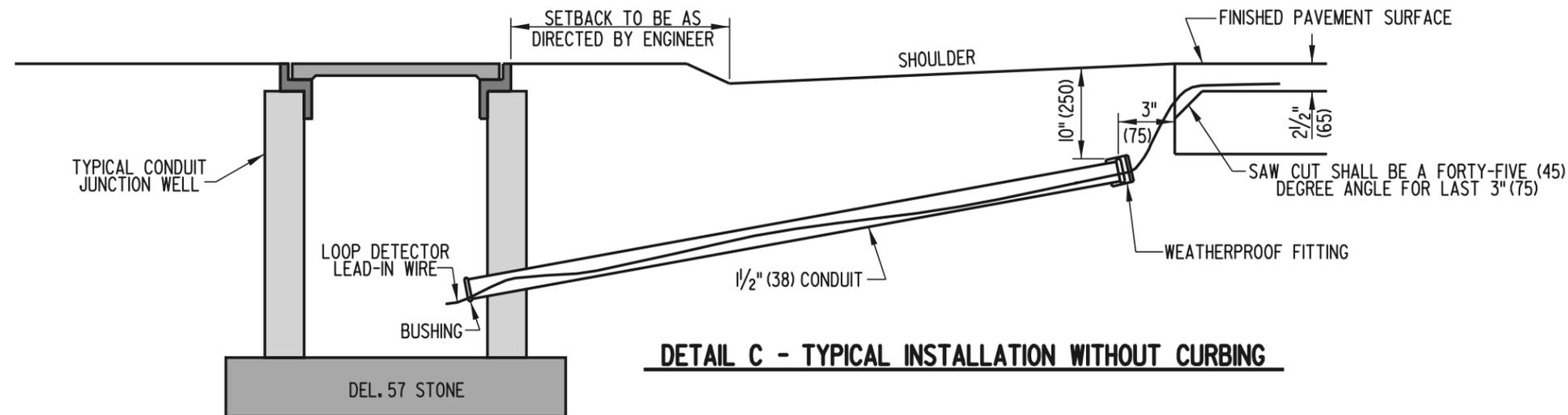
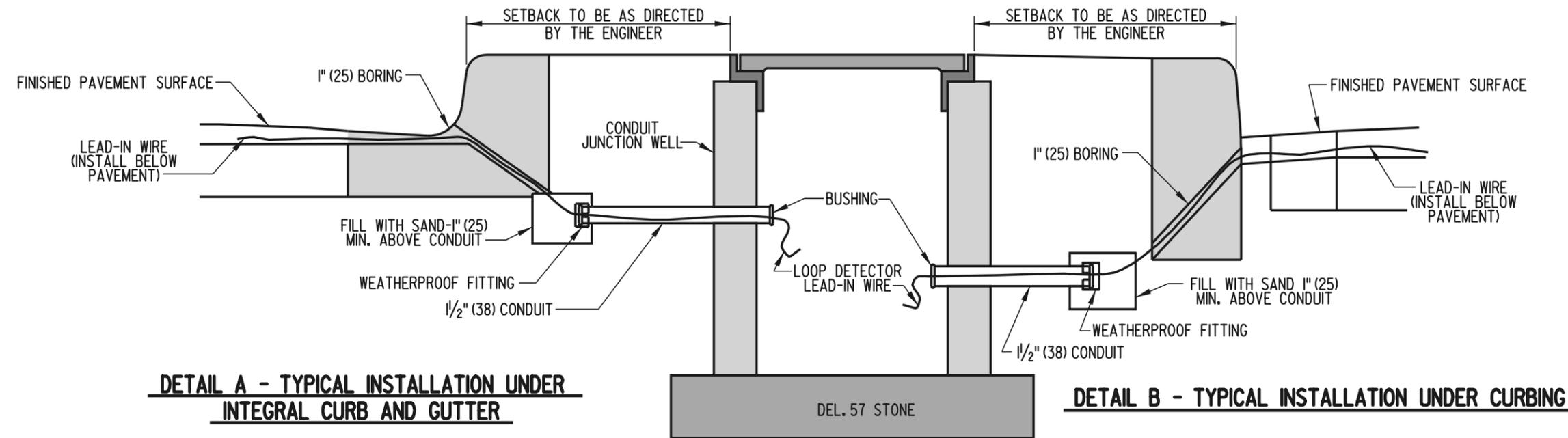
STANDARD NO. T-7 (2002)

SHT. 1 OF 1

APPROVED *Caution Wicks* 9/6/02  
CHIEF ENGINEER DATE

RECOMMENDED *Therese Roberts* 8/19/02  
DESIGN ENGINEER DATE

- NOTES:**
1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING THE CONDUIT AGAINST ANY POSSIBLE DAMAGE IN PAVING OPERATIONS.
  2. THE WEATHERPROOF FITTING SHALL CONSIST OF A GALVANIZED 1/2" (38) COUPLING CONTAINING A STEEL THREADED REDUCING BUSHING (1/2" (38) TO 3/4" (19)) AND A 3/4" (19) WATERTIGHT CONNECTOR FOR SERVICE ENTRANCE CABLE.
  3. THE LEAD-IN WIRE SHALL BE RUN THROUGH THE RUBBER OF THE WEATHERPROOF FITTING.



**PLAN SYMBOL**



**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

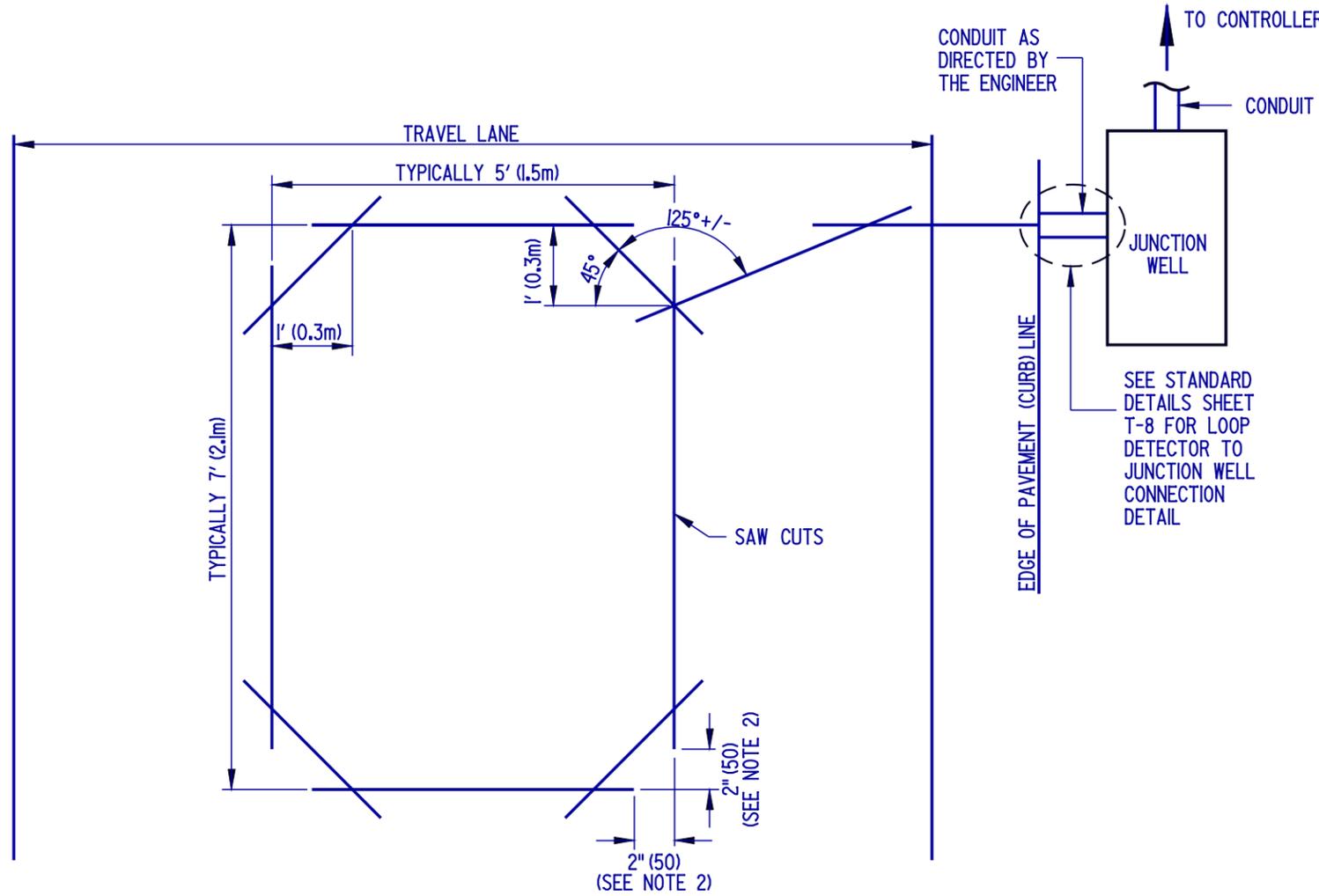
**LOOP DETECTOR TO CONDUIT JUNCTION WELL CONNECTION**

STANDARD NO. **T-8 (2002)** SHT. **1** OF **1**

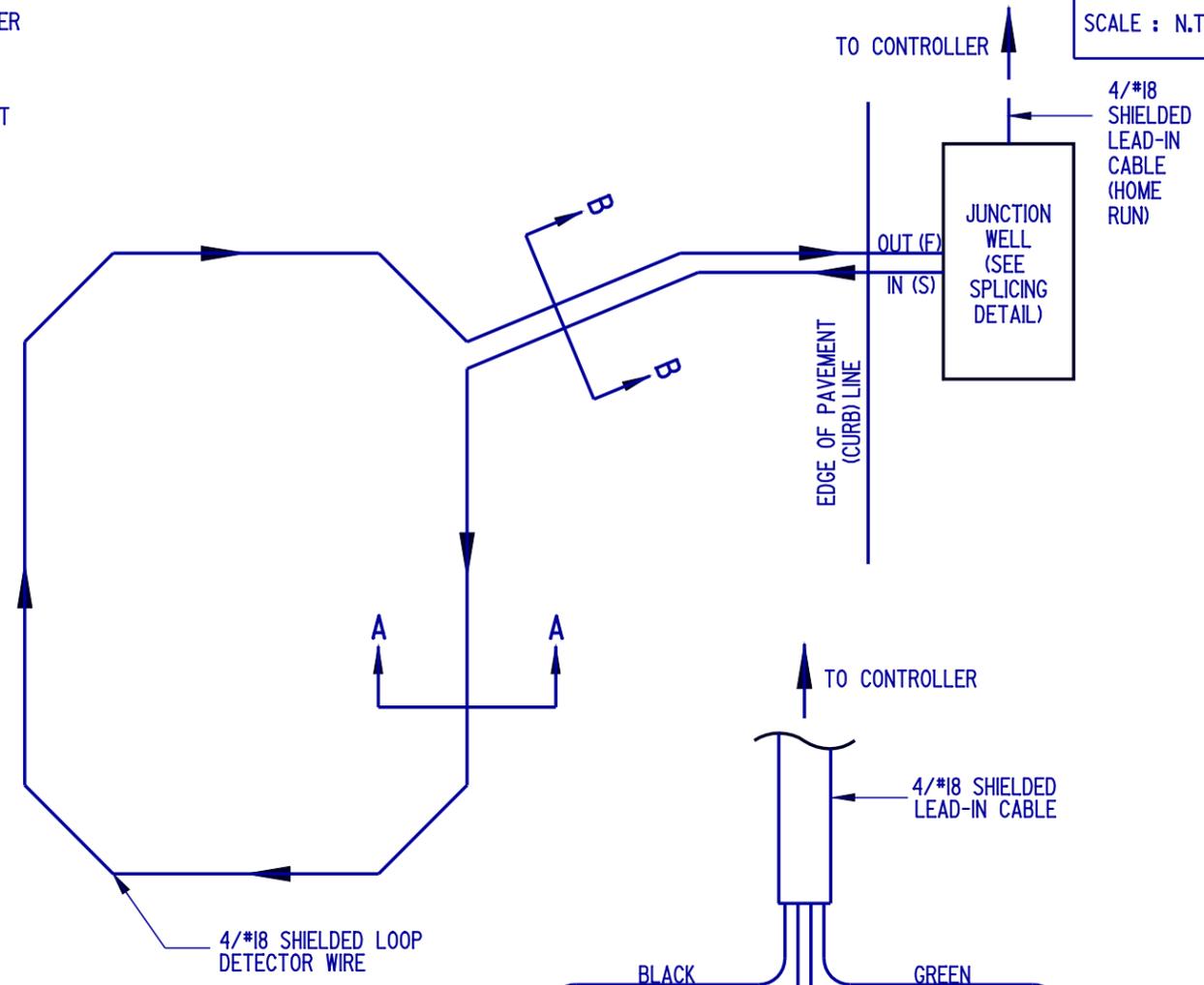
APPROVED *Caution Wicks* **9/6/02**  
CHIEF ENGINEER DATE

RECOMMENDED *Therese Delpho* **8/19/02**  
DESIGN ENGINEER DATE

SCALE : N.T.S.



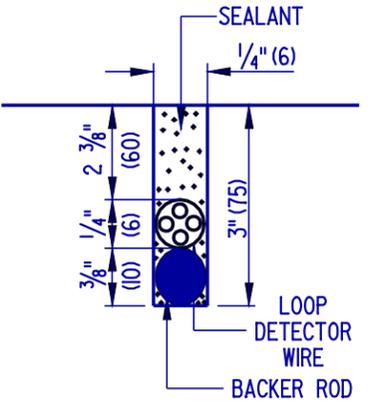
**WIRE SLOT CONSTRUCTION**



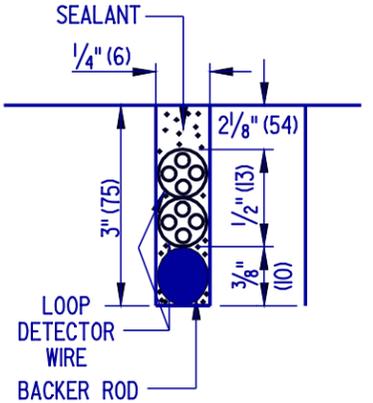
**DETAILS FOR INSTALLING LOOP DETECTOR WIRE (SINGLE WRAP)**

**NOTES:**

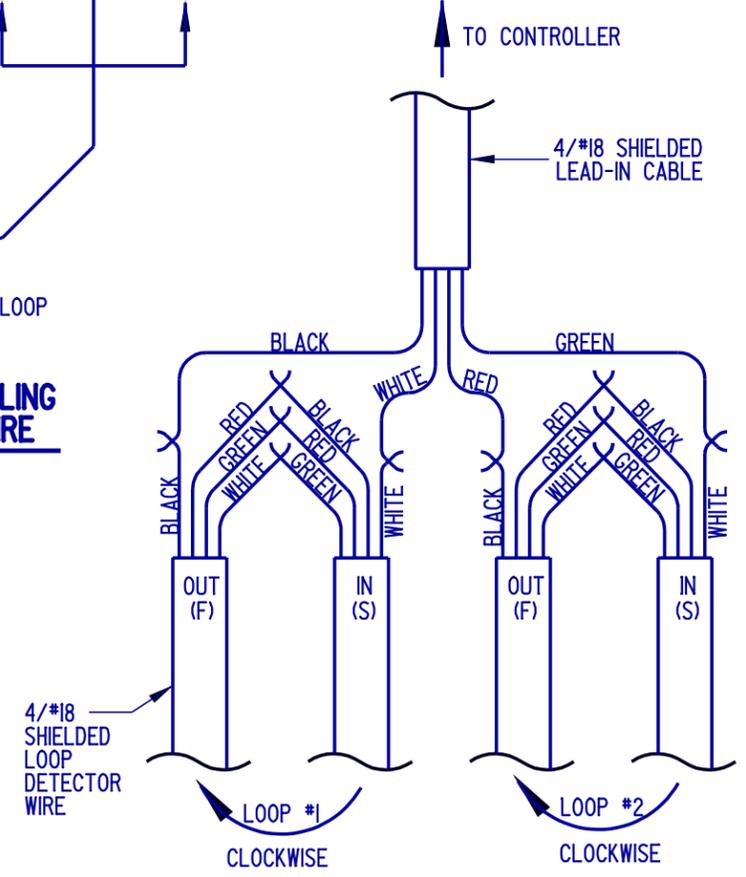
- 1). SAW CUTS FOR WIRE SLOT CONSTRUCTION SHALL BE EXTENDED BEYOND THE CORNERS SO THAT THE SLOT IS FULL DEPTH AT TURN POINTS. A FORTY-FIVE (45) DEGREE ANGLE SHALL BE CUT 12" (300) BACK FROM THE POINT OF THE EXTENDED CORNER.
- 2). THE DIAGONAL CUT SHALL BE STOPPED APPROXIMATELY 2" (50) FROM THE CORNER TO PREVENT THE TRIANGULAR PORTION OF THE PAVEMENT FROM BREAKING.
- 3). A MAXIMUM OF TWO LOOP DETECTORS CAN BE SPLICED TO ONE LEAD-IN CABLE, THE DETAIL ILLUSTRATES THE METHOD OF SPLICING TWO LOOP DETECTORS (LOOP #1 AND LOOP #2) TO A LEAD-IN CABLE.
- 4). LOOP DETECTOR SHALL BE CENTERED IN TRAVEL LANE.



**SECTION A - A**



**SECTION B - B**



**SPlicing DETAIL (SEE NOTE 3)**

**PLAN SYMBOL**

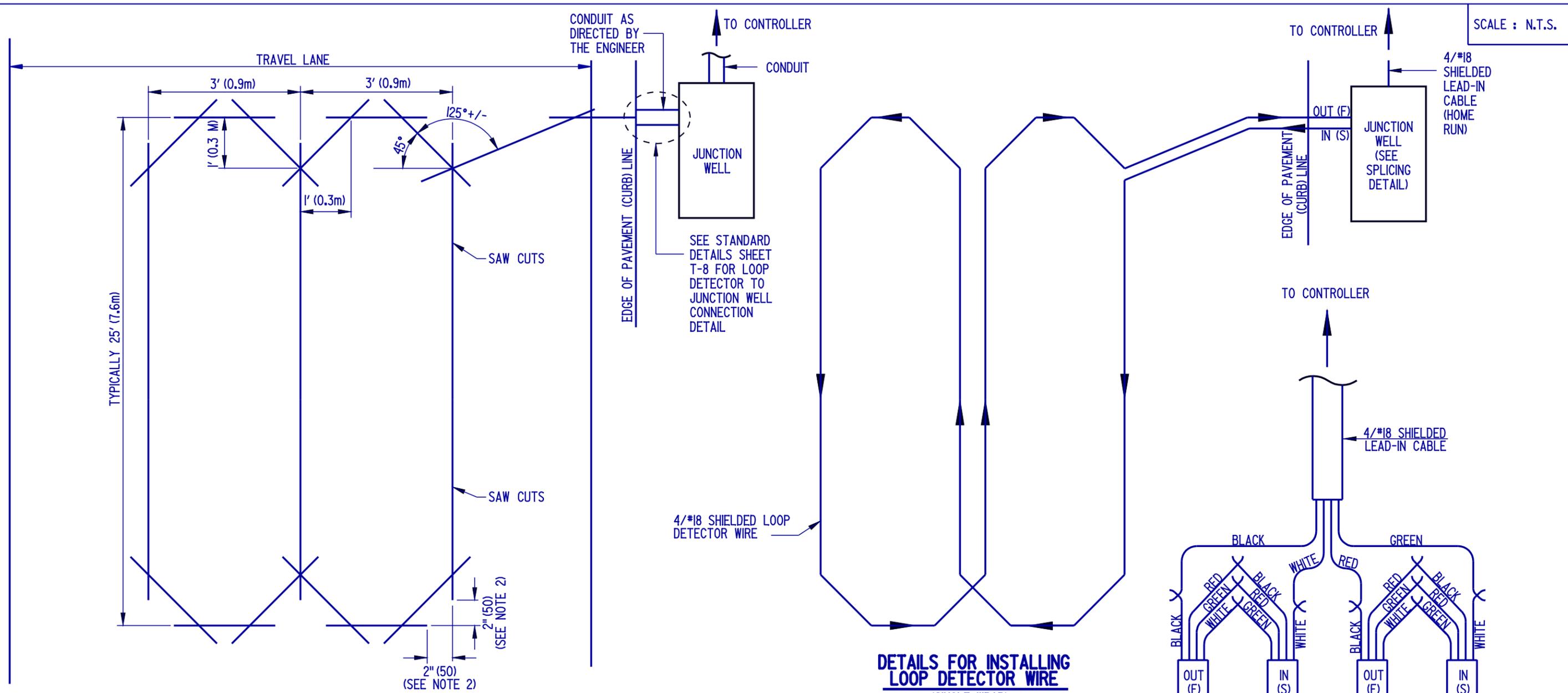


**DELAWARE DEPARTMENT OF TRANSPORTATION**

**TYPE #1 LOOP DETECTOR**  
 STANDARD NO. T-9 (2004) SHT. 1 OF 1

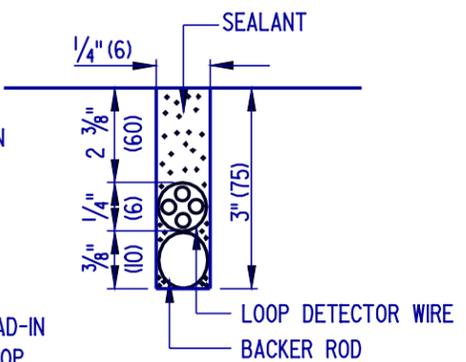
APPROVED *Carolann Wick* 1/10/05  
 CHIEF ENGINEER DATE  
 RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
 DESIGN ENGINEER DATE

SCALE : N.T.S.

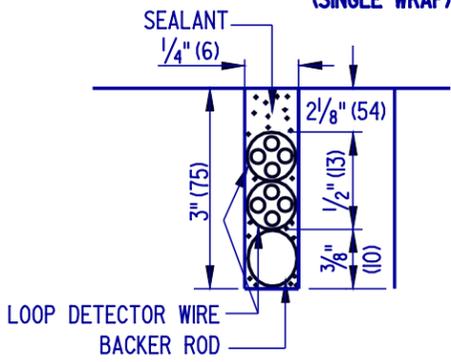


**WIRE SLOT CONSTRUCTION**

- NOTES:**
- 1). SAW CUTS FOR WIRE SLOT CONSTRUCTION SHALL BE EXTENDED BEYOND THE CORNERS SO THAT THE SLOT IS FULL DEPTH AT TURN POINTS. A FORTY-FIVE (45) DEGREE ANGLE SHALL BE CUT 1' (0.3m) BACK FROM THE POINT OF THE EXTENDED CORNER.
  - 2). THE DIAGONAL CUT SHALL BE STOPPED APPROXIMATELY 2" (50) FROM THE CORNER TO PREVENT THE TRIANGULAR PORTION OF THE PAVEMENT FROM BREAKING.
  - 3). A MAXIMUM OF TWO LOOP DETECTORS CAN BE SPLICED TO ONE LEAD-IN CABLE. THE DETAIL ILLUSTRATES THE METHOD OF SPLICING TWO LOOP DETECTORS (LOOP #1 AND LOOP #2) TO A LEAD-IN CABLE.
  - 4). LOOP DETECTOR SHALL BE CENTERED IN TRAVEL LANE.

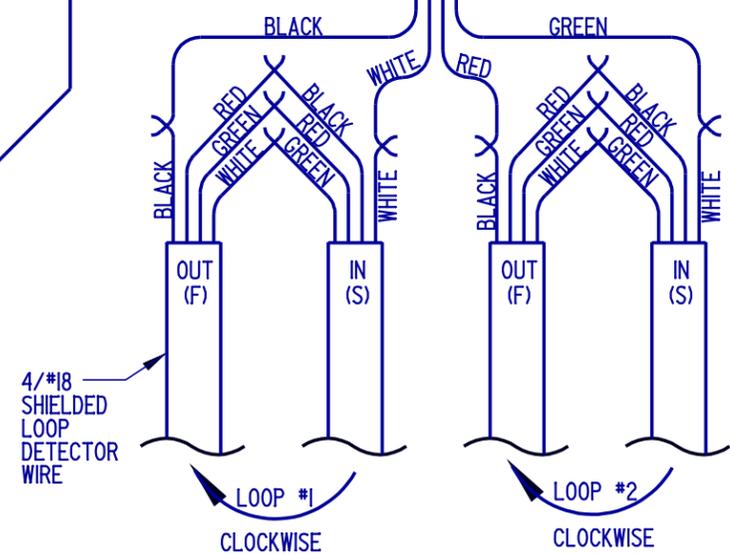


**SECTION A - A**



**SECTION B - B**

**DETAILS FOR INSTALLING LOOP DETECTOR WIRE (SINGLE WRAP)**



**SPlicing DETAIL (SEE NOTE 3)**

**PLAN SYMBOL**

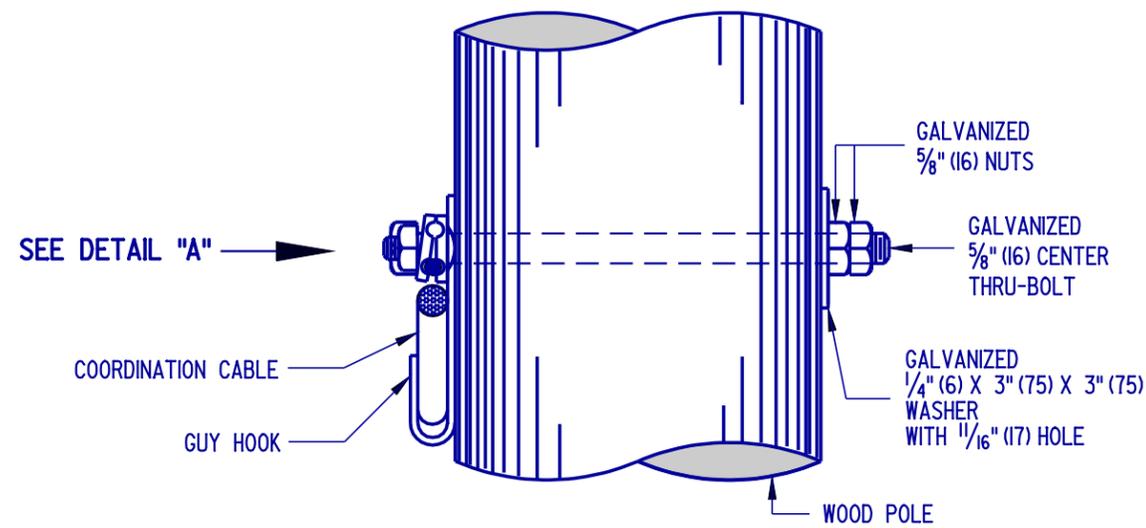


**DELAWARE DEPARTMENT OF TRANSPORTATION**

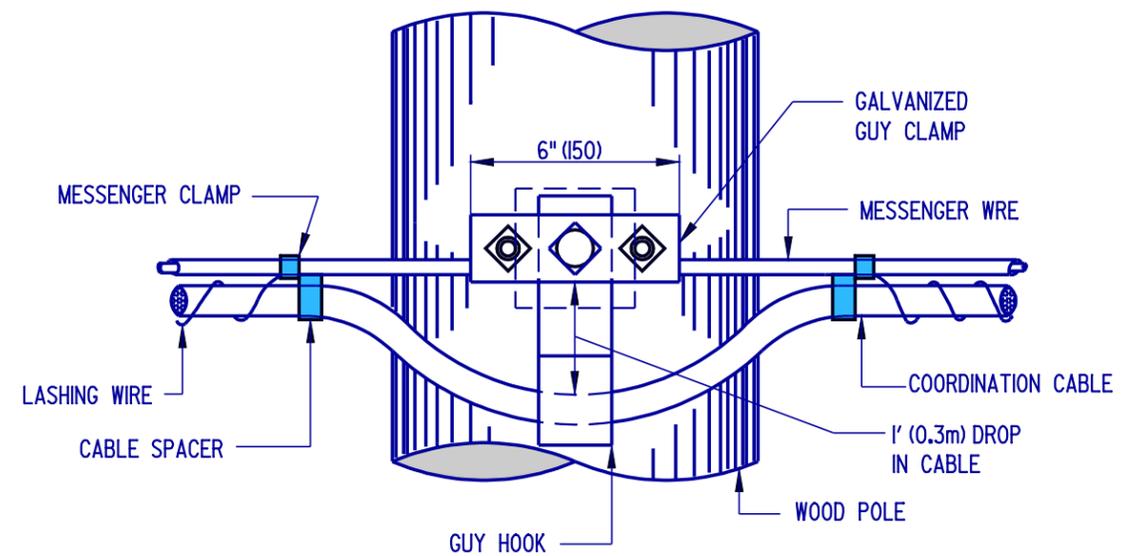
**TYPE #2 LOOP DETECTOR**  
 STANDARD NO. T-10 (2004) SHT. 1 OF 1

APPROVED *Carolann Wicks* 1/10/05  
 CHIEF ENGINEER DATE  
 RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
 DESIGN ENGINEER DATE

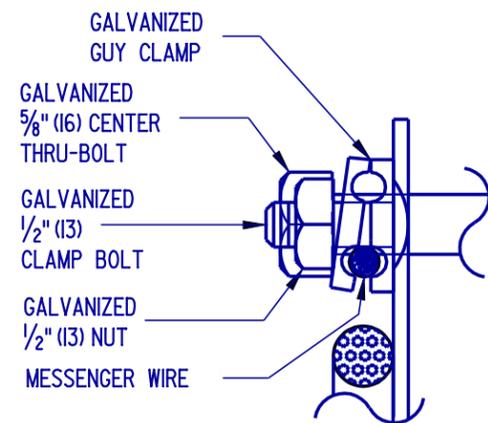
**INTERMEDIATE**



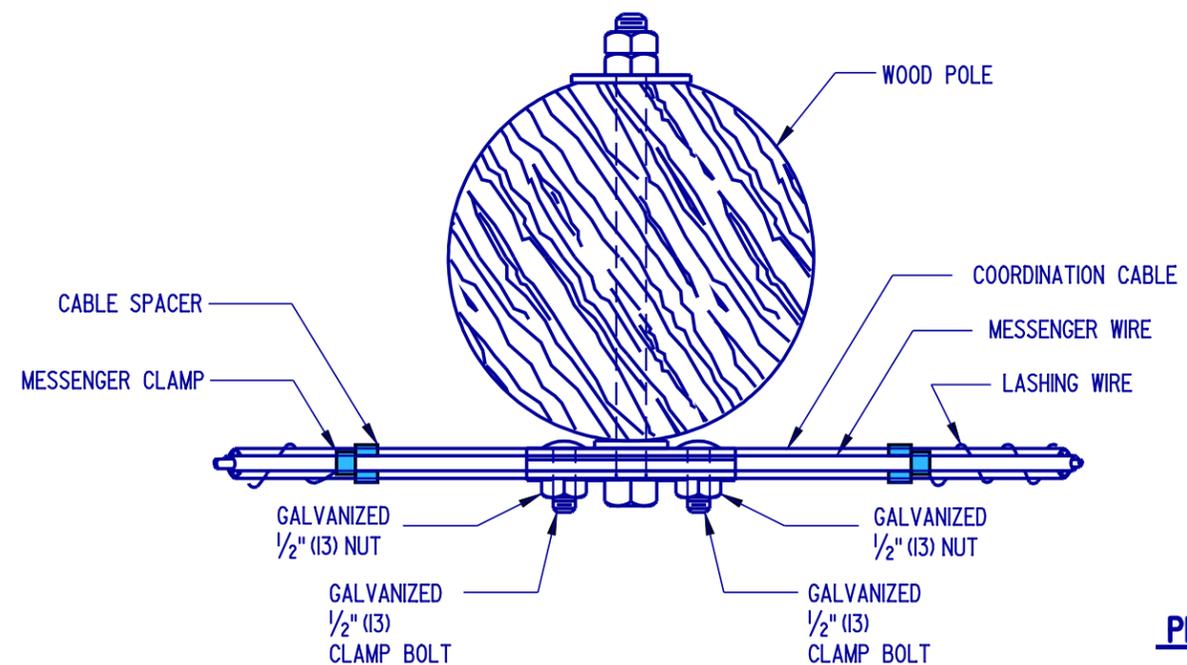
**SIDE VIEW**



**FRONT VIEW**



**DETAIL "A"**



**TOP VIEW**

**PLAN SYMBOL**



**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**INTERMEDIATE MESSENGER WIRE ATTACHMENT ON WOOD POLES**

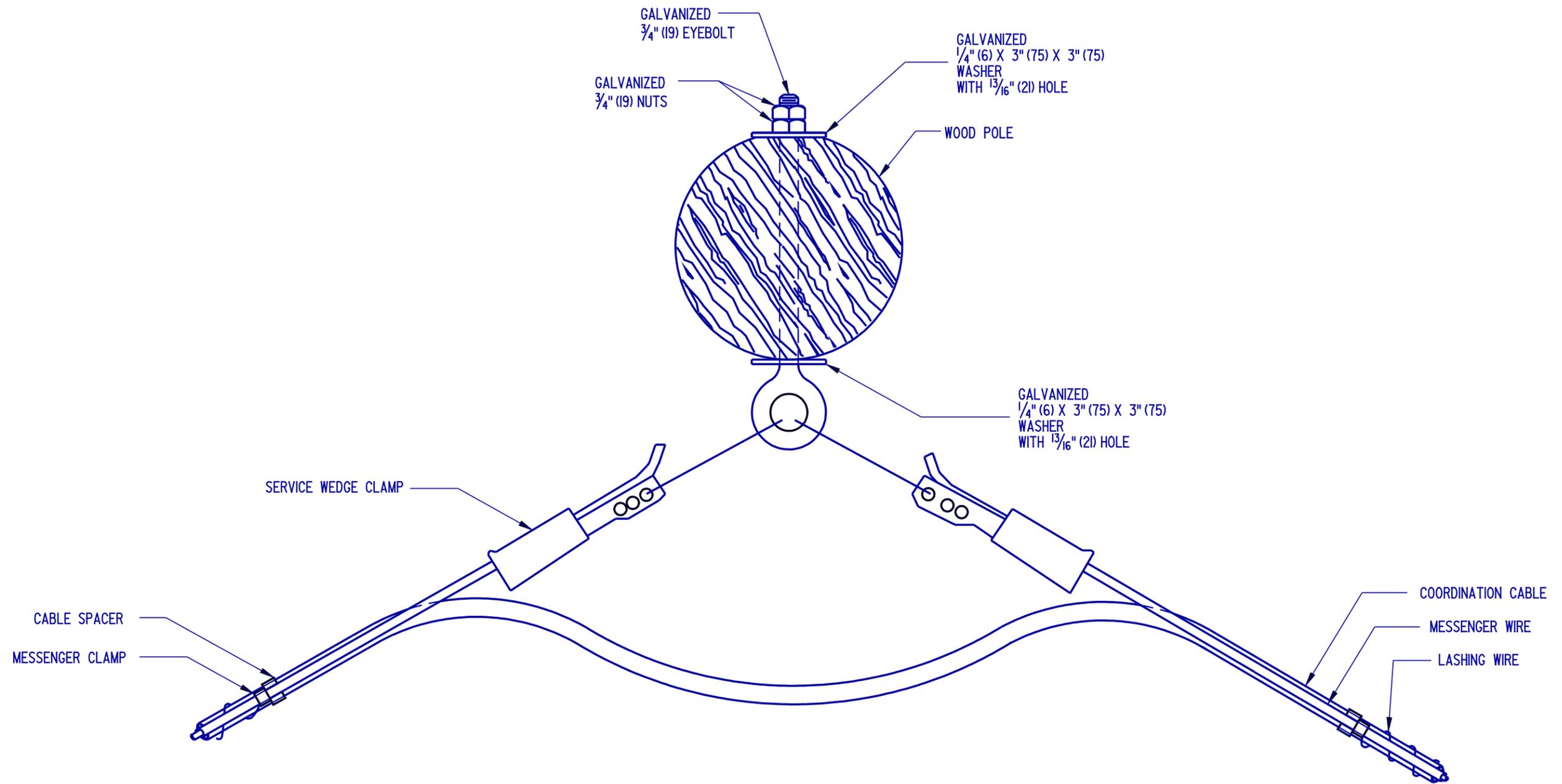
**STANDARD NO. T-11 (2004)**

**SHT. 1 OF 2**

**APPROVED** *Carolann Wick* 1/10/05  
CHIEF ENGINEER DATE

**RECOMMENDED** *Dennis M. O'Flaherty* 1/3/05  
DESIGN ENGINEER DATE

SCALE : N.T.S.

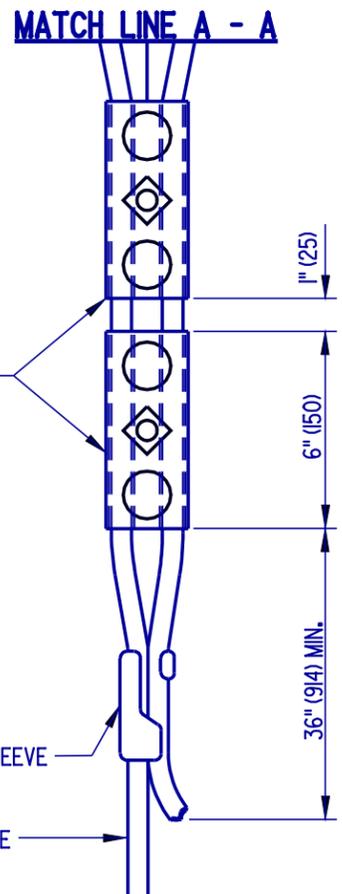
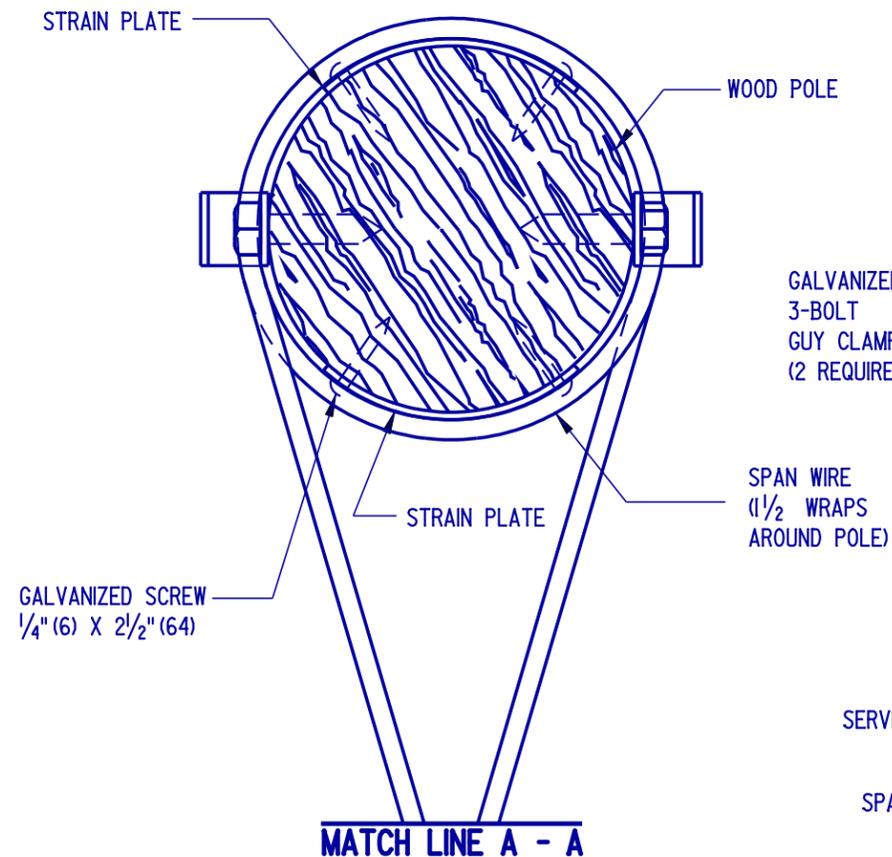
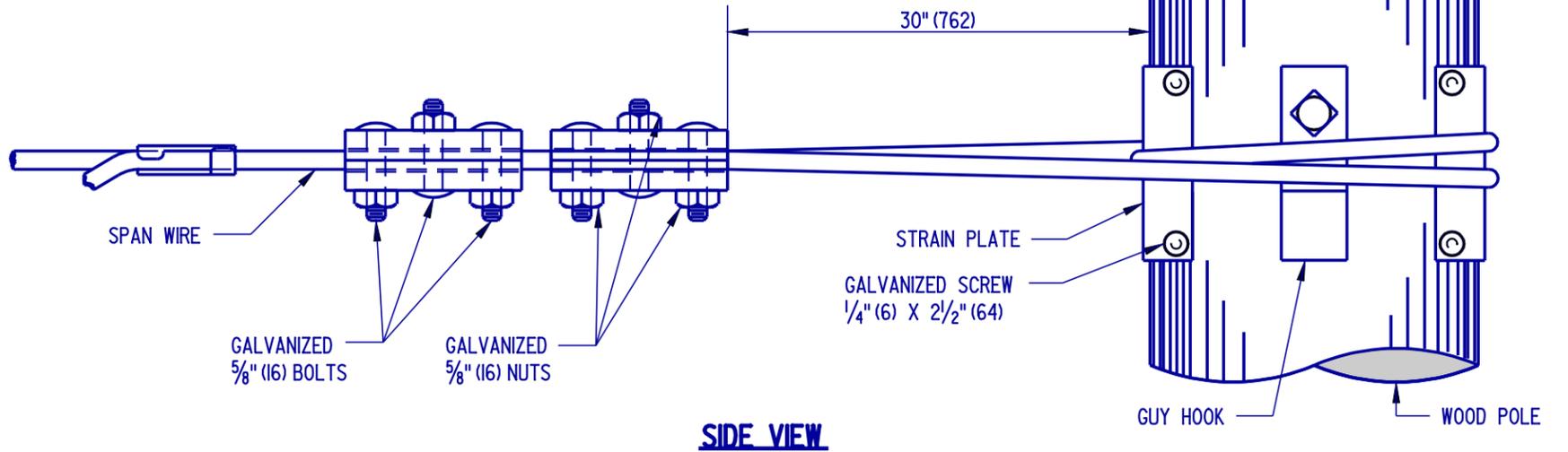
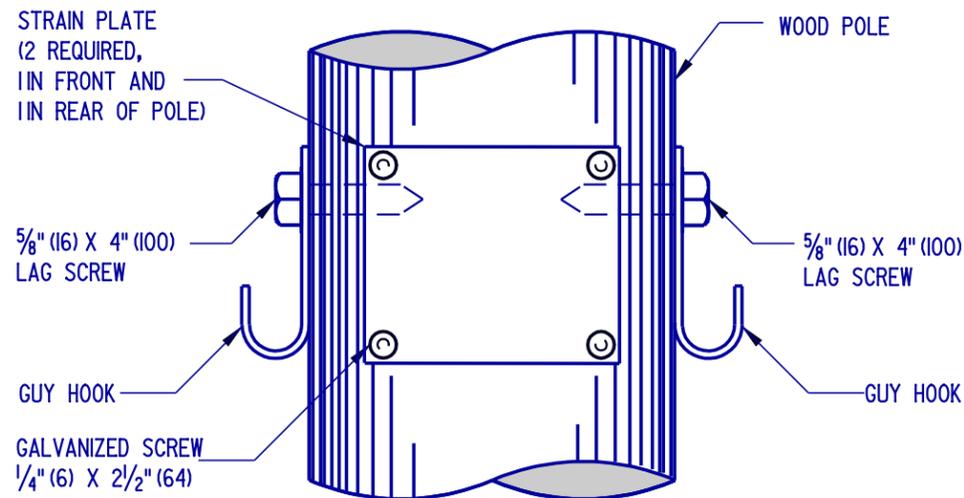


**TOP VIEW**

**PLAN SYMBOL**

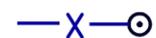


SCALE : N.T.S.



**NOTE:** SPAN WIRE ATTACHMENT BETWEEN METAL POLES IS THE SAME AS SHOWN FOR WOOD POLES EXCEPT THAT THE STRAIN PLATES AND GUY HOOKS ARE NOT USED. FOR DETAIL SEE T-14 SHEET 2 - "DEAD END MESSENGER WIRE ATTACHMENT, METAL POLES".

**PLAN SYMBOL**



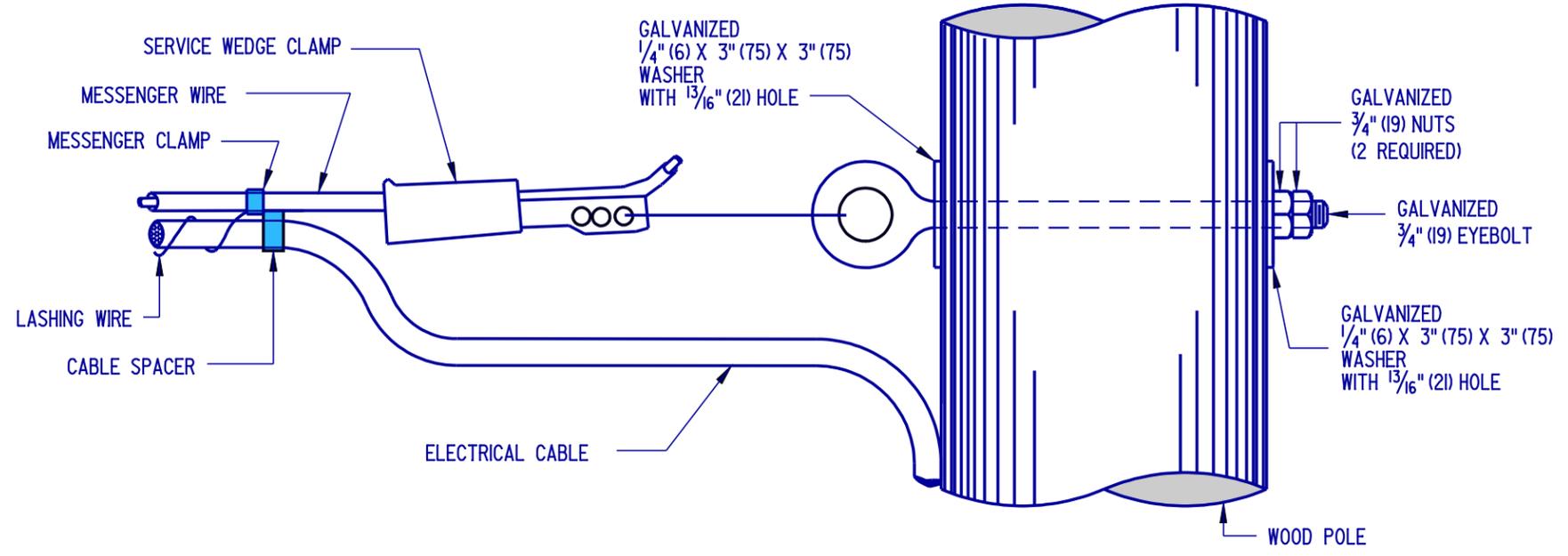
DELAWARE  
DEPARTMENT OF TRANSPORTATION

SPAN WIRE ATTACHMENT BETWEEN POLES

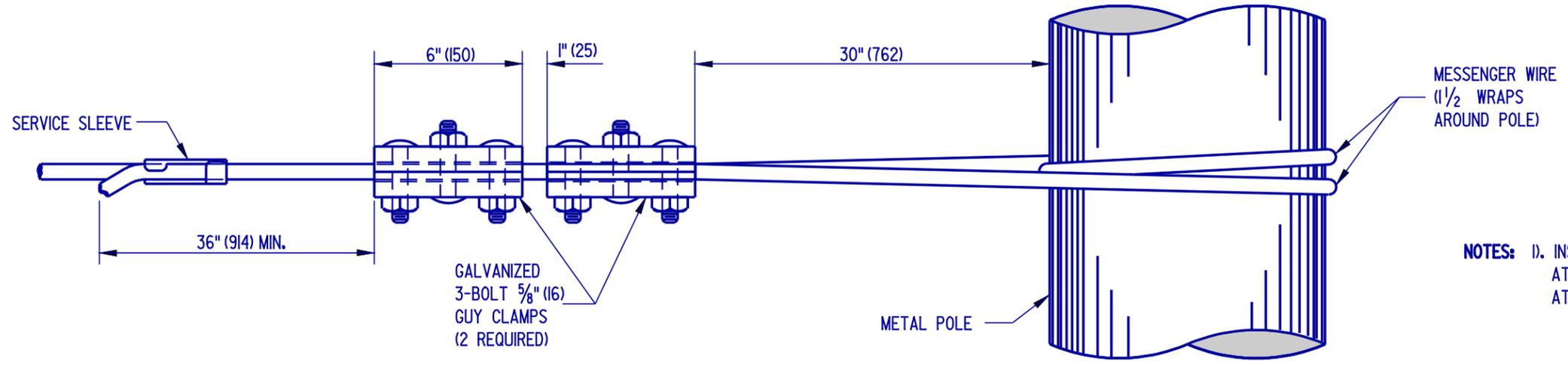
STANDARD NO. T-12 (2004) SHT. 1 OF 2

APPROVED *Carolann Wick* 1/10/05  
CHIEF ENGINEER DATE

RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



**WOOD POLES**



**NOTES:** 1). INSTALLATION METHOD SHOWN FOR DEAD END MESSENGER WIRE ATTACHMENT TO METAL POLES SHALL BE USED FOR SPAN WIRE ATTACHMENT BETWEEN METAL POLES.

**PLAN SYMBOL**



**METAL POLES**

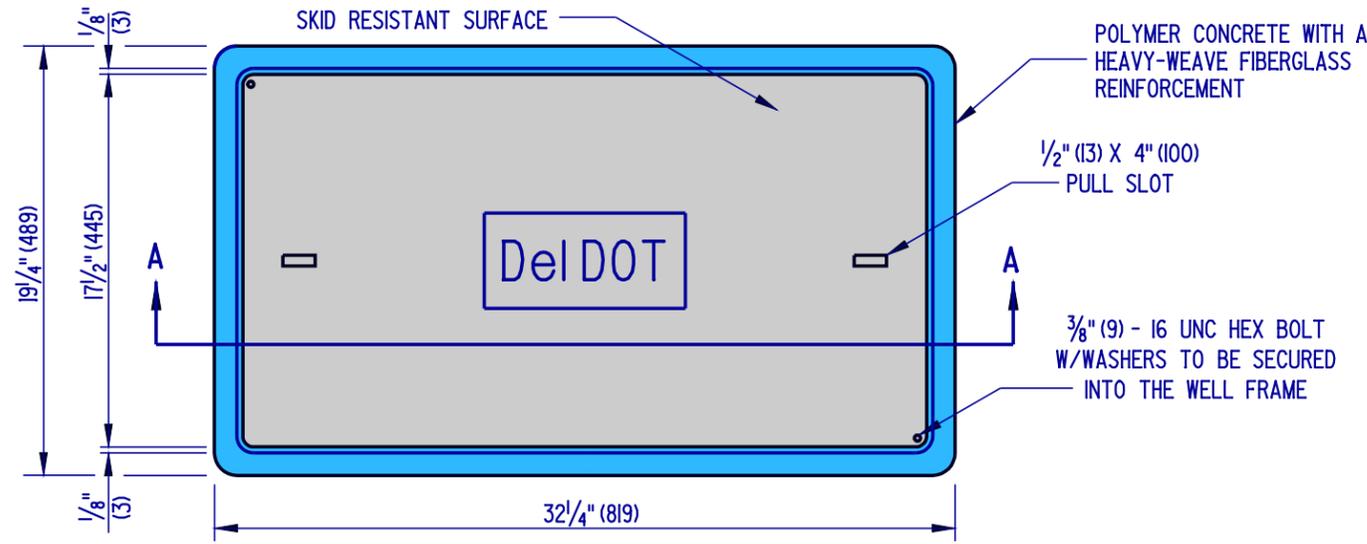


**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

<b>DEAD END MESSENGER WIRE ATTACHMENT</b>					
STANDARD NO.	T-12 (2004)	SHT.	2	OF	2

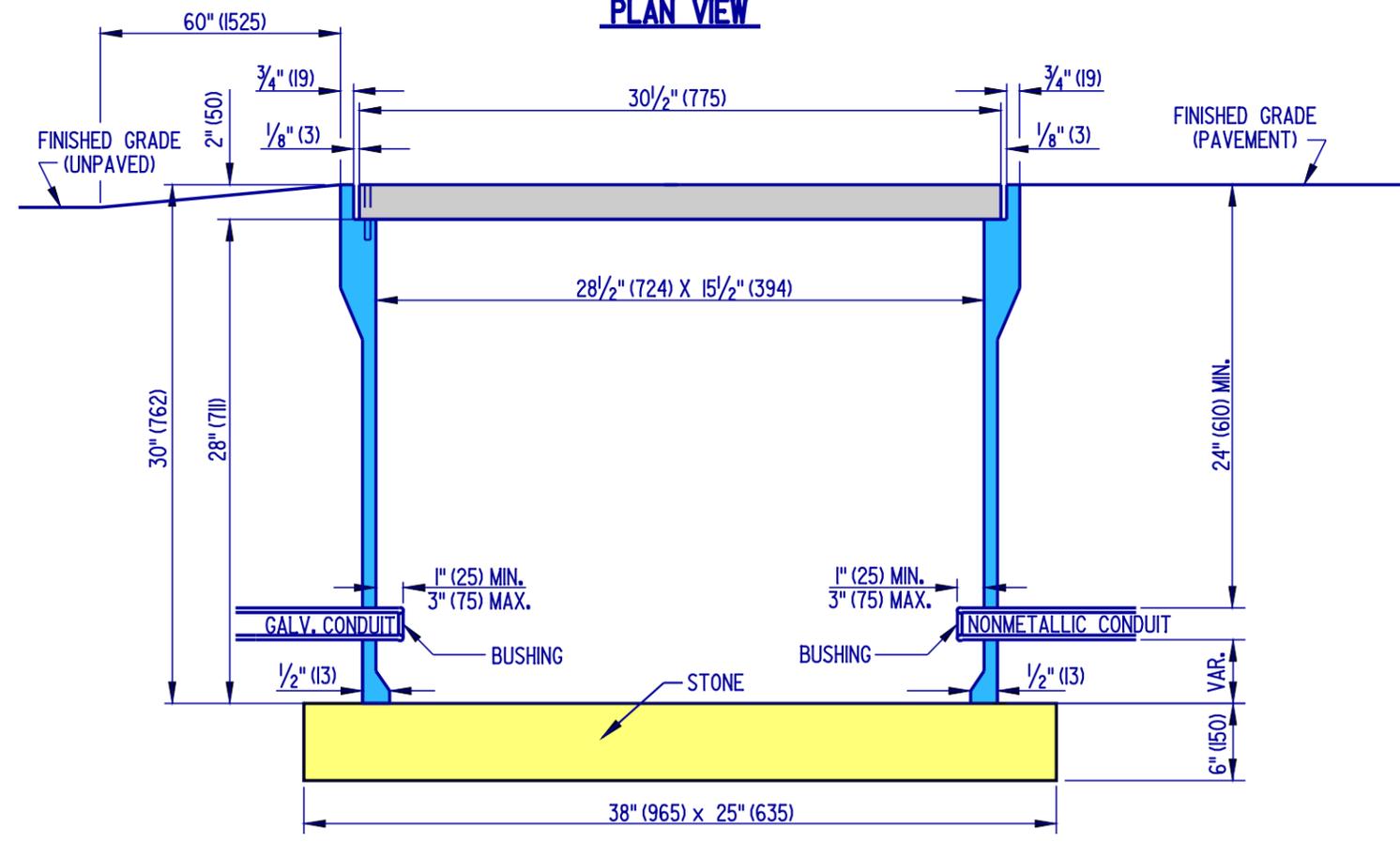
**APPROVED** *Carolann Wick* 1/10/05  
CHIEF ENGINEER DATE

**RECOMMENDED** *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



- NOTES:**
1. TYPE 6 CONDUIT JUNCTION WELL SHALL BE PRECAST POLYMER CONCRETE.
  2. ALL CONDUIT JUNCTION WELLS CONSTRUCTED WITHIN PAVEMENT, SIDEWALKS, ETC. WILL BE CONSTRUCTED FLUSH WITH THE SURFACE OF THE SAME. INSTALLATION IN UNPAVED AREAS WILL BE CONSTRUCTED ABOVE GRADE AND GRADED TO DRAIN AWAY FROM THE CONDUIT JUNCTION WELL.
  3. POLYMER CONCRETE COVERS SHALL BE THE HEAVY-DUTY TYPE WITH A DESIGN LOAD OF 15,000 LBS (6800 kg) OVER A 10" (255) SQUARE.

**PLAN VIEW**



**SECTION A-A**

**PLAN SYMBOL**

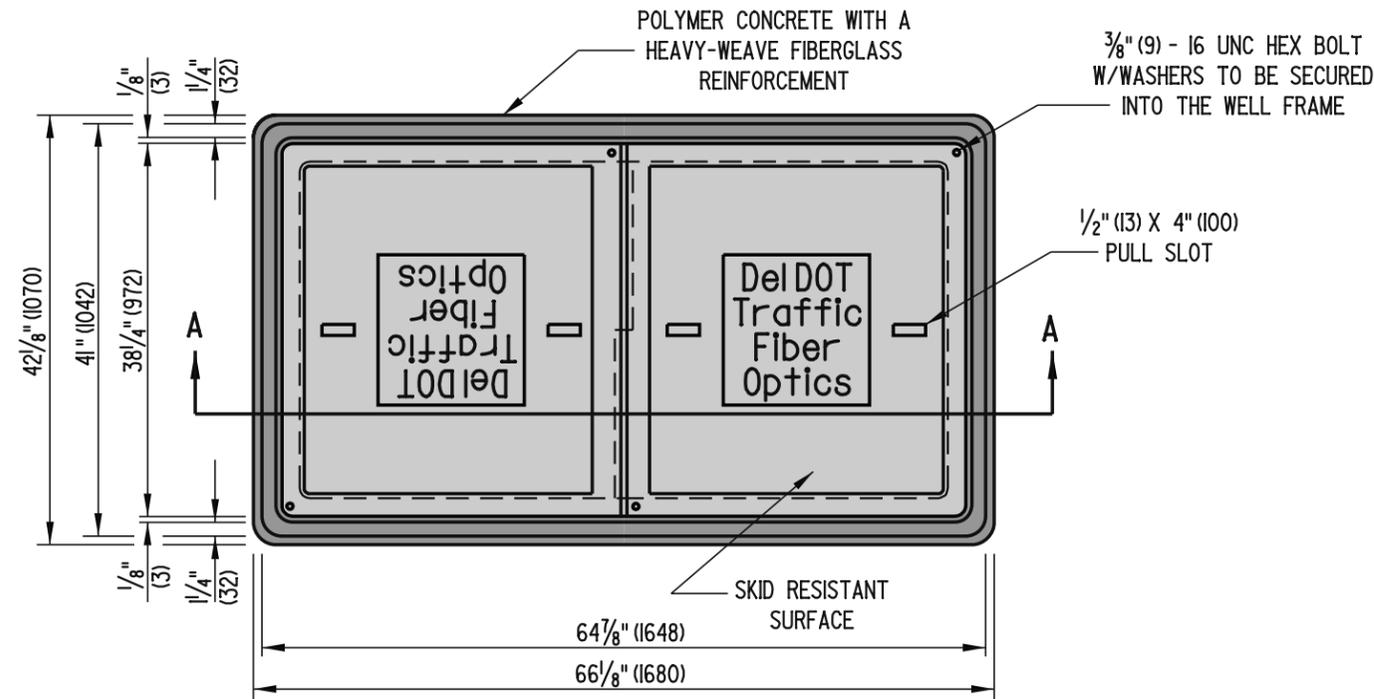


**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**CONDUIT JUNCTION WELL, TYPE 4**

STANDARD NO. **T-13 (2004)** SHT. **1** OF **3**

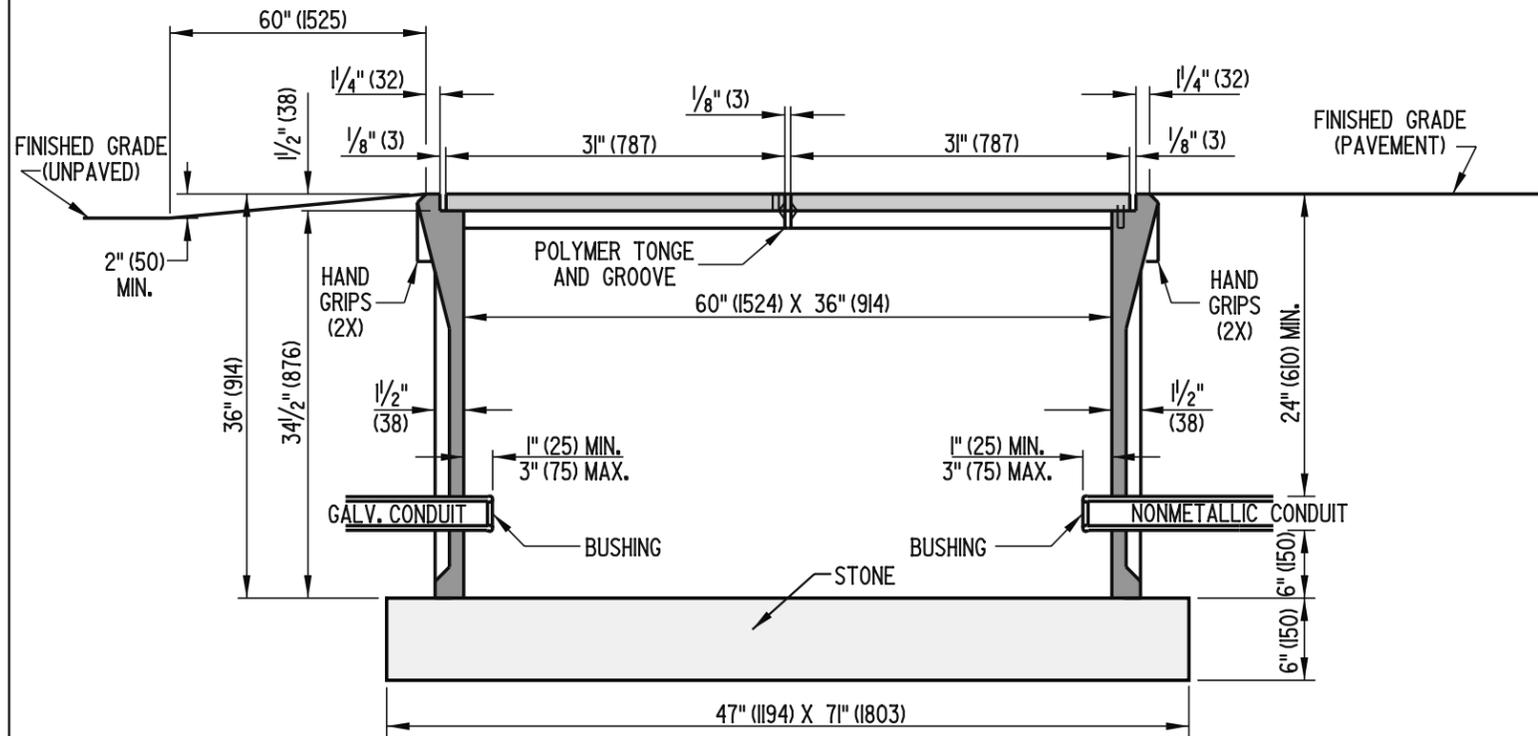
APPROVED *Carolann Wicks* 1/10/05  
CHIEF ENGINEER DATE  
 RECOMMENDED *Dennis M. O'Flaherty* 1/13/05  
DESIGN ENGINEER DATE



**NOTES:**

- 1). TYPE 7 CONDUIT JUNCTION WELL SHALL BE PRECAST POLYMER CONCRETE.
- 2). ALL CONDUIT JUNCTION WELLS CONSTRUCTED WITHIN PAVEMENT, SIDEWALKS, ETC. WILL BE CONSTRUCTED FLUSH WITH THE SURFACE OF THE SAME. INSTALLATION IN UNPAVED AREAS WILL BE CONSTRUCTED ABOVE GRADE AND GRADED TO DRAIN AWAY FROM THE CONDUIT JUNCTION WELL.
- 3). POLYMER CONCRETE COVERS SHALL BE THE HEAVY DUTY TYPE WITH A DESIGN LOAD OF 15,000 LBS (6800 kg) OVER A 10" (255) SQUARE.

**PLAN VIEW**



**SECTION A-A**



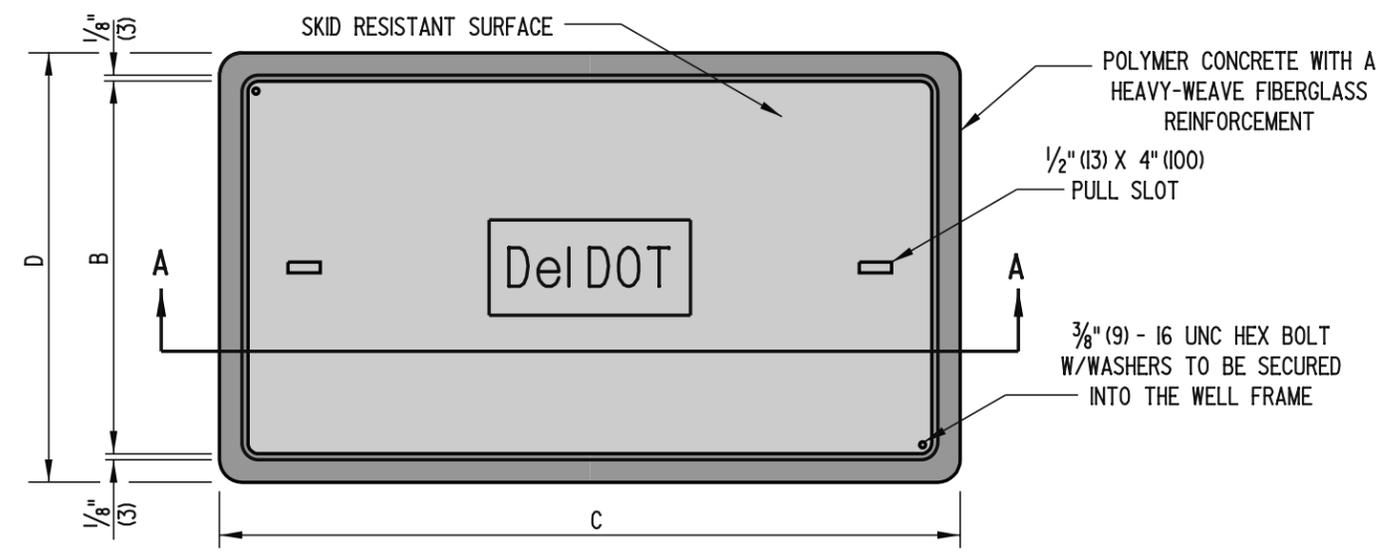
**DELAWARE  
DEPARTMENT OF TRANSPORTATION**

**CONDUIT JUNCTION WELL, TYPE 7**

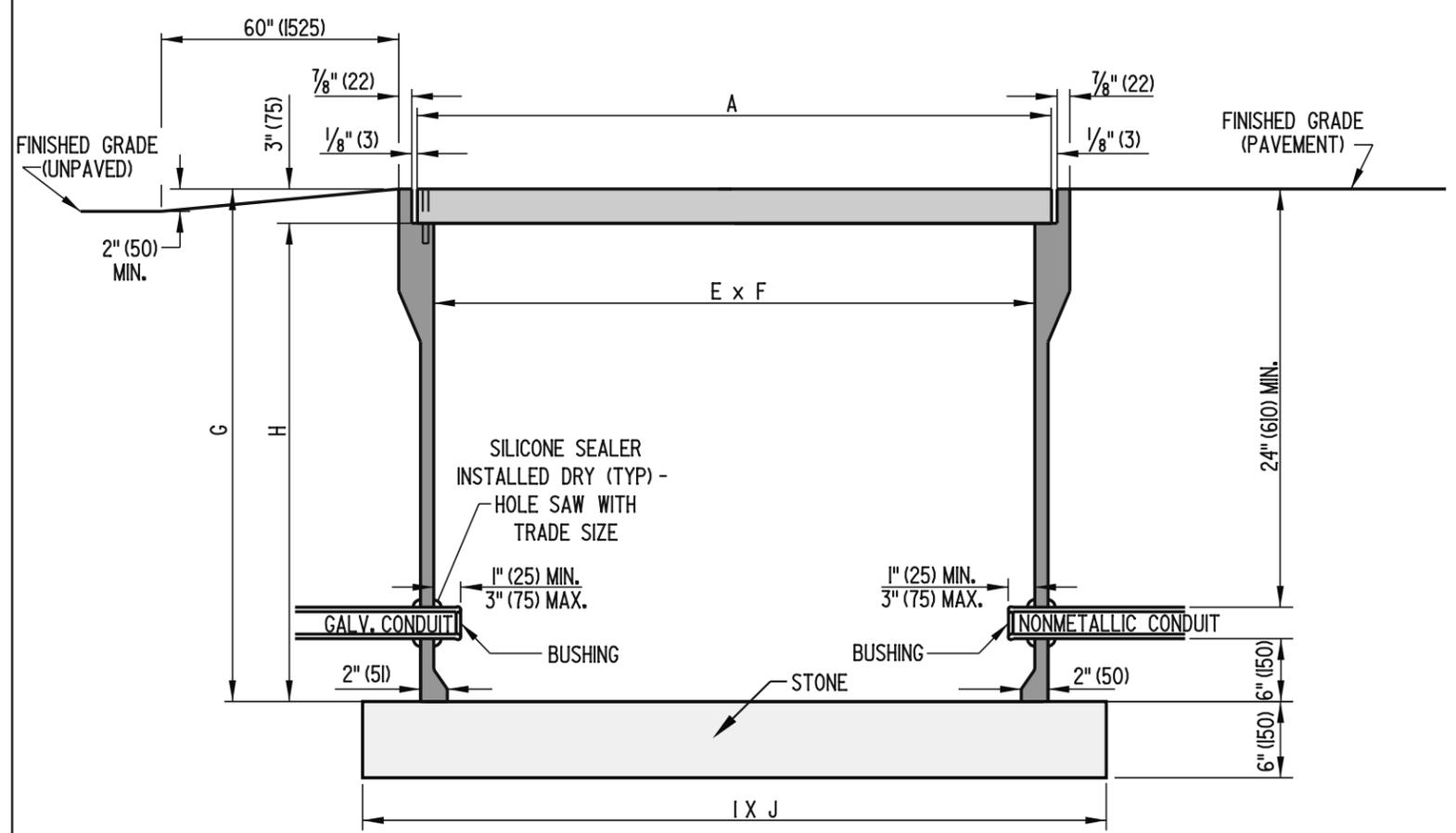
STANDARD NO. **T-13 (2006)** SHT. **2** OF **3**

APPROVED *[Signature]* **10/10/06**  
CHIEF ENGINEER DATE

RECOMMENDED *[Signature]* **10/19/06**  
DESIGN ENGINEER DATE



**PLAN VIEW**

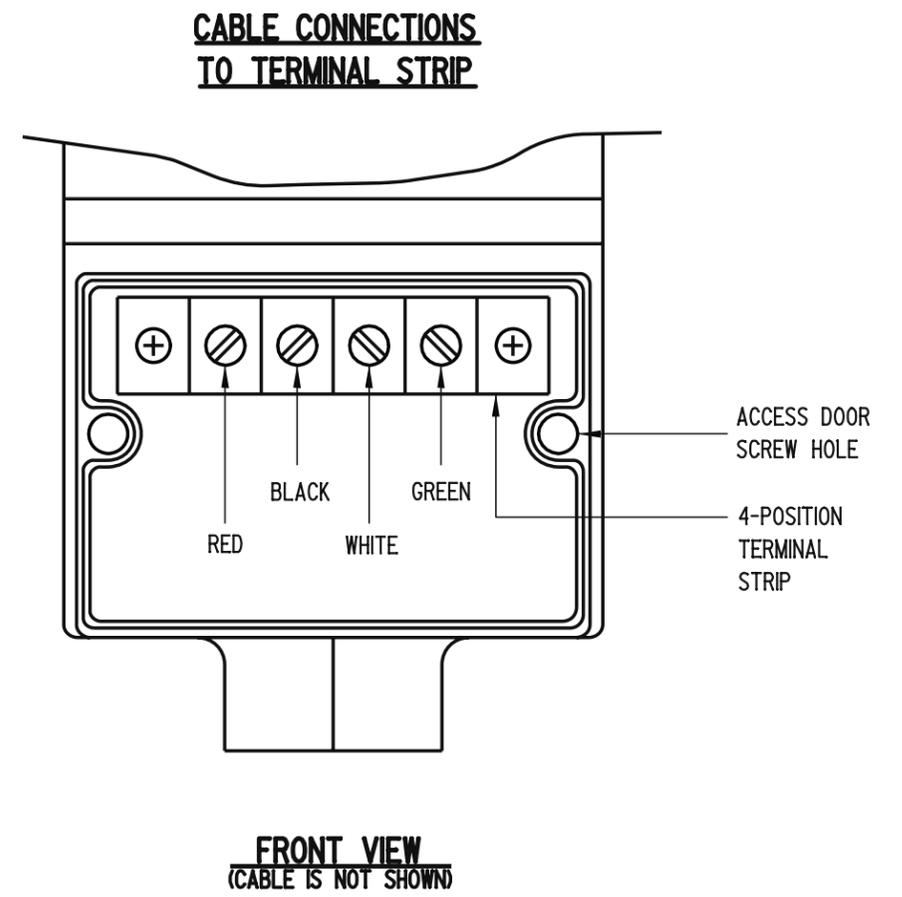
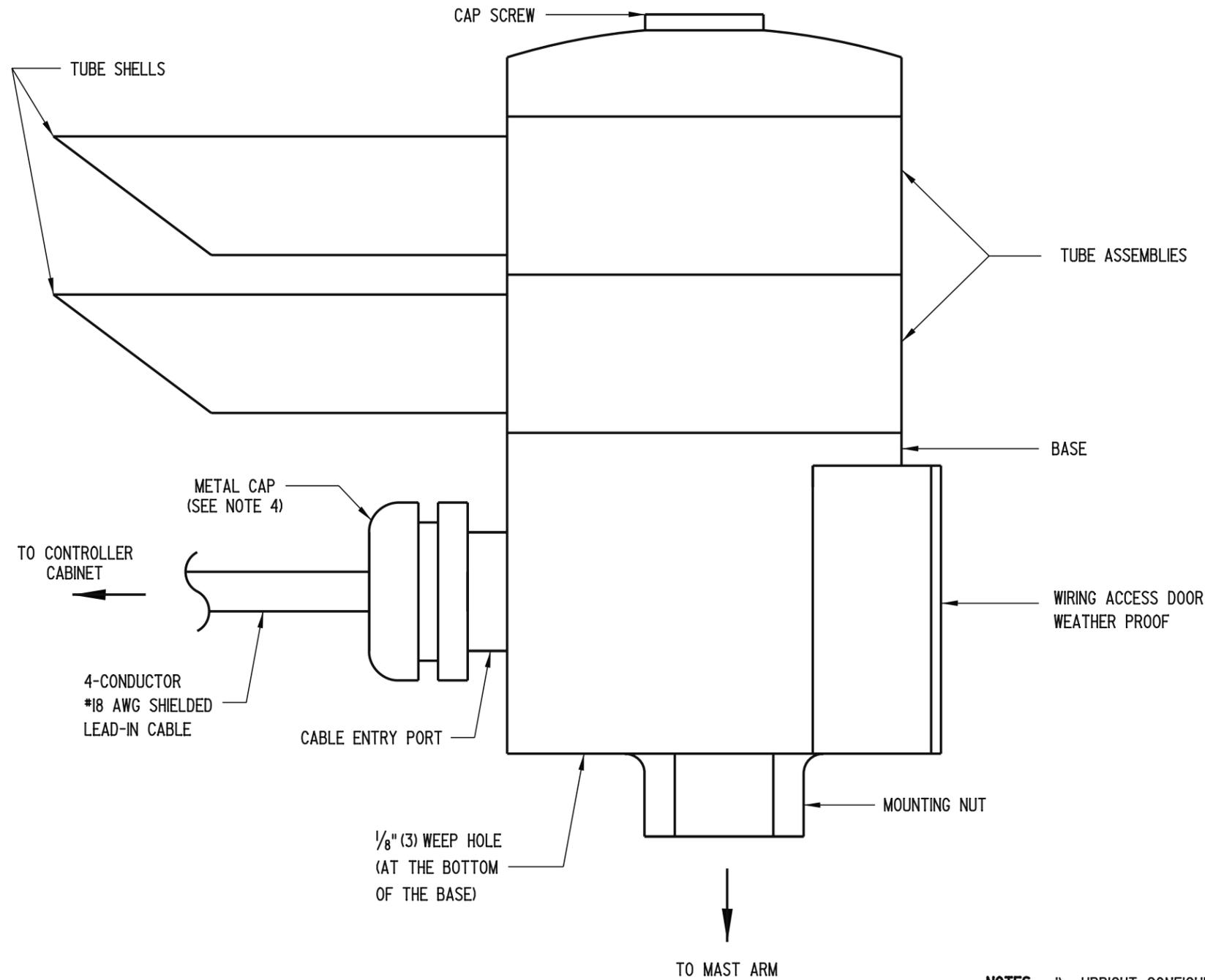


**SECTION A-A**

**NOTES:**

- 1). TYPES 8 & 10 CONDUIT JUNCTION WELLS SHALL BE PRECAST POLYMER CONCRETE.
- 2). ALL CONDUIT JUNCTION WELLS CONSTRUCTED WITHIN PAVEMENT, SIDEWALKS, ETC. WILL BE CONSTRUCTED FLUSH WITH THE SURFACE OF THE SAME. INSTALLATION IN UNPAVED AREAS WILL BE CONSTRUCTED ABOVE GRADE AND GRADED TO DRAIN AWAY FROM THE CONDUIT JUNCTION WELL.
- 3). POLYMER CONCRETE COVERS SHALL BE THE HEAVY-DUTY TYPE WITH A DESIGN LOAD OF 15,000 LBS (6800 kg) OVER A 10\"/>

DIMENSIONS		TYPE 8	TYPE 10
COVER	A	47 5/8" (1210)	35 5/8" (905)
	B	30 1/8" (765)	24" (610)
FRAME	C	49 5/8" (1261)	37 5/8" (956)
	D	32 1/8" (816)	26" (660)
	E	45 5/8" (1159)	33 7/8" (860)
	F	28 1/8" (714)	22 1/4" (565)
	G	36" (914)	30" (1067)
	H	33" (838)	27" (991)
BASE	I	58" (1473)	46" (1168)
	J	40" (1016)	34" (864)

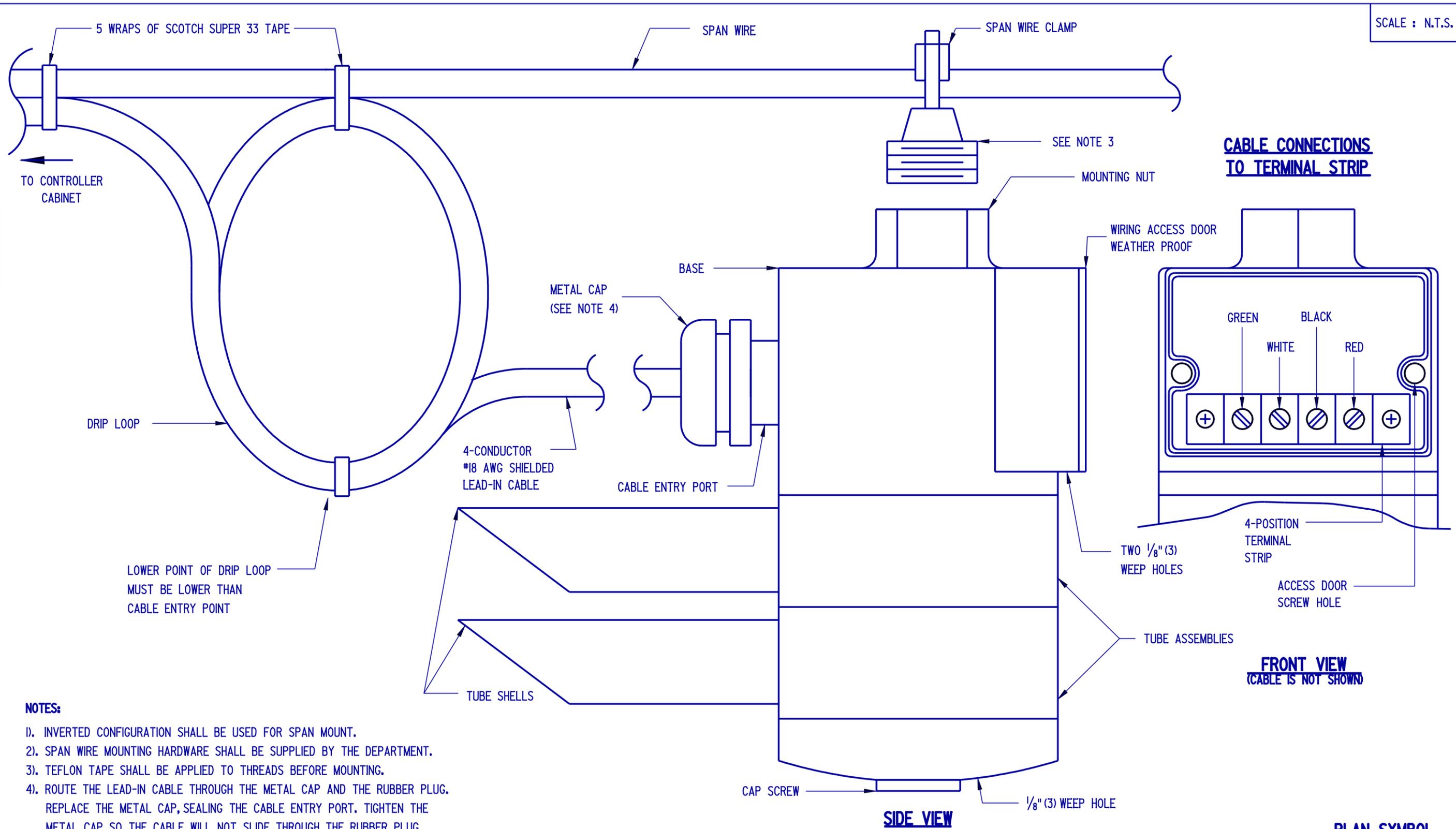


**SIDE VIEW**

**FRONT VIEW  
(CABLE IS NOT SHOWN)**

- NOTES:**
- 1). UPRIGHT CONFIGURATION SHALL BE USED FOR MOUNTING ON MAST ARMS, SIGNAL HEAD FRAMEWORKS AND PEDESTALS.
  - 2). UPRIGHT MOUNTING HARDWARE SHALL BE SUPPLIED BY THE DEPARTMENT.
  - 3). TEFLON TAPE SHALL BE APPLIED TO THREADS BEFORE MOUNTING.
  - 4). ROUTE THE LEAD-IN CABLE THROUGH THE METAL CAP AND THE RUBBER PLUG. REPLACE THE METAL CAP, SEALING THE CABLE ENTRY PORT. TIGHTEN THE METAL CAP SO THE CABLE WILL NOT SLIDE THROUGH THE RUBBER PLUG.

SCALE : N.T.S.



**NOTES:**

- 1). INVERTED CONFIGURATION SHALL BE USED FOR SPAN MOUNT.
- 2). SPAN WIRE MOUNTING HARDWARE SHALL BE SUPPLIED BY THE DEPARTMENT.
- 3). TEFLON TAPE SHALL BE APPLIED TO THREADS BEFORE MOUNTING.
- 4). ROUTE THE LEAD-IN CABLE THROUGH THE METAL CAP AND THE RUBBER PLUG. REPLACE THE METAL CAP, SEALING THE CABLE ENTRY PORT. TIGHTEN THE METAL CAP SO THE CABLE WILL NOT SLIDE THROUGH THE RUBBER PLUG.