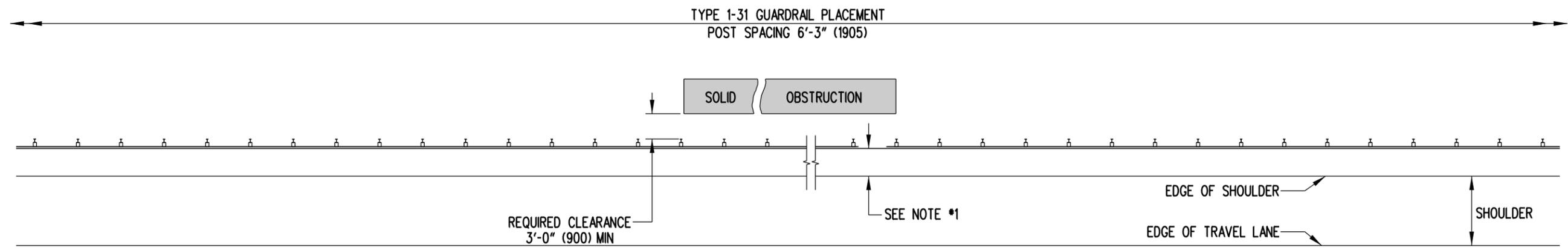
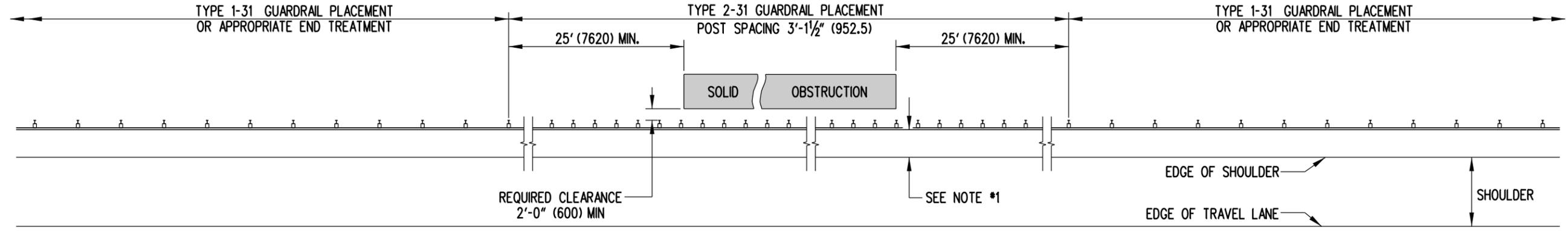


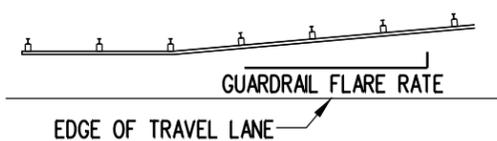
BARRIER LEGEND	
ITEM NO.	DESCRIPTION
1	W-BEAM
2	W6 X 9 (W150 x 13.5) STEEL POST
3A 3B	3A - 6" (150) x 12" (300) x 14" (350) OFFSET BLOCK 3B - 6" (150) x 8" (200) x 14" (350) OFFSET BLOCK
4	SPLICE - REQUIRES EIGHT(8) 5/8" (16) GUARDRAIL BOLTS (L=1 1/4" (35)) WITH RECESS NUTS
5	W-BEAM TERMINAL CONNECTOR
6	5/8" (16) GUARDRAIL BOLT (L=1 1/4" (35)) AND RECESS NUT
7A 7B	7A - 5/8" (16) GUARDRAIL BOLT (L=14" (455)) AND RECESS NUT 7B - 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



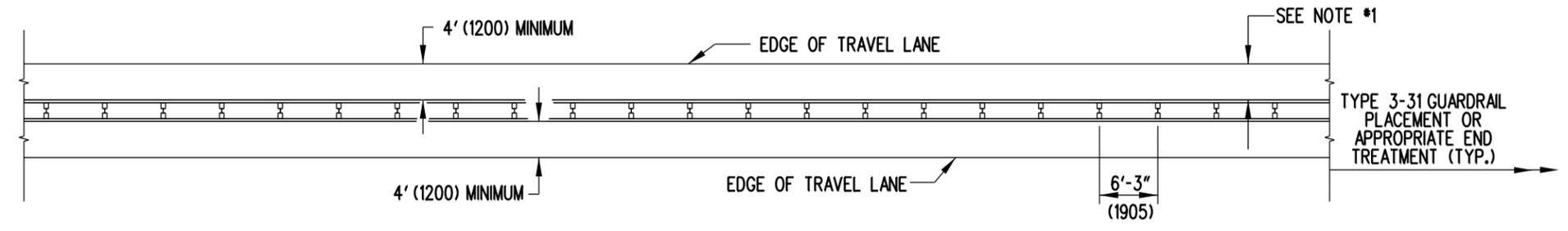
TYPE 1-31 GUARDRAIL
TYPICAL GUARDRAIL TREATMENT
WHEN THE REQUIRED 3'-0" (900) CLEARANCE TO OBSTRUCTION IS AVAILABLE



TYPE 2-31 GUARDRAIL
TYPICAL GUARDRAIL TREATMENT
WHEN 2'-0" (600) TO 3'-0" (900) OF CLEARANCE TO OBSTRUCTION IS AVAILABLE

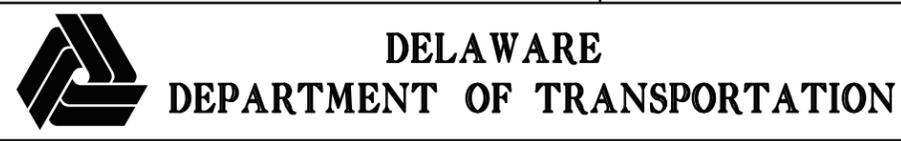


FLARE RATES	
DESIGN SPEED	FLARE RATE
70 MPH (110 km/h)	15:1
60 MPH (100 km/h)	14:1
55 MPH (90 km/h)	12:1
50 MPH (80 km/h)	11:1
45 MPH (70 km/h)	10:1
40 MPH (60 km/h)	9:1
30 MPH (50 km/h)	7:1



TYPE 3-31 GUARDRAIL
TYPICAL MEDIAN GUARDRAIL TREATMENT

- 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 DELINEATORS AT THE INTERVALS SPECIFIED IN THE DELAWARE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.



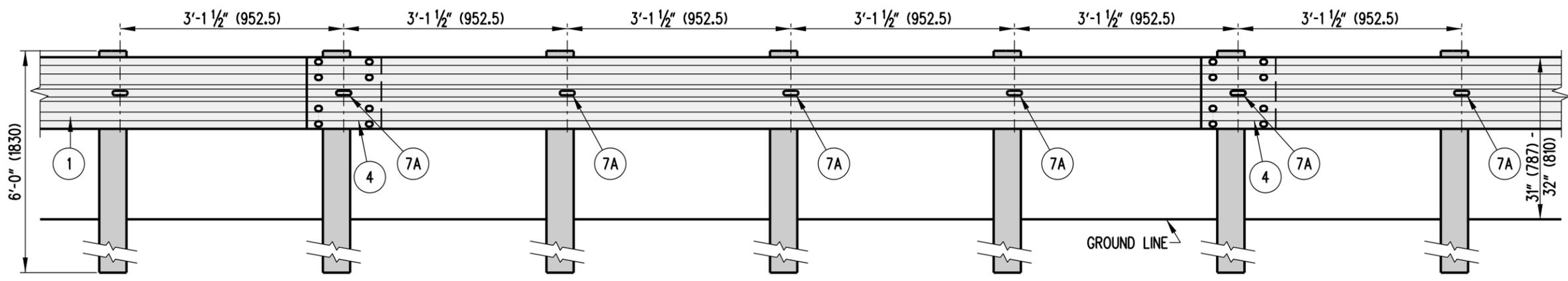
TYPES 1-31, 2-31, AND 3-31 GUARDRAIL APPLICATIONS

STANDARD NO. **B-1 (2010)** SHT. **1** OF **3**

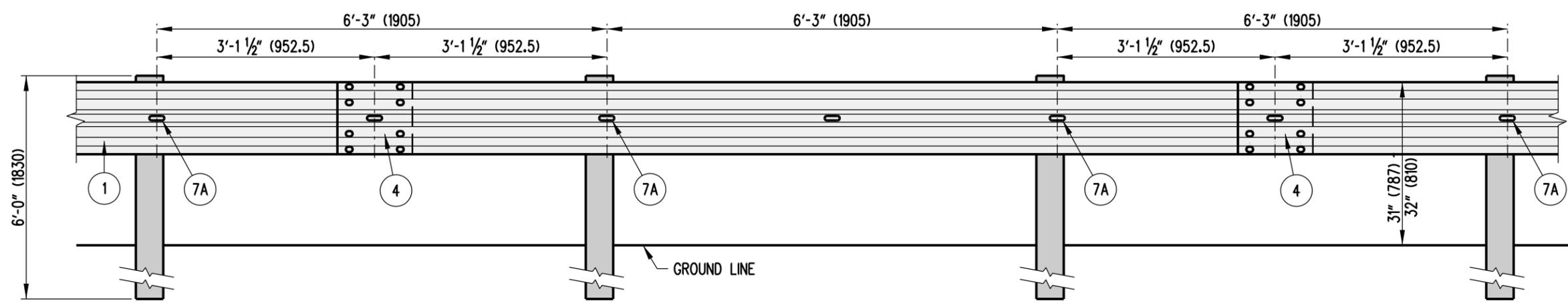
APPROVED SIGNATURE ON FILE 12/28/2010
CHIEF ENGINEER DATE

RECOMMENDED SIGNATURE ON FILE 12/27/2010
DESIGN ENGINEER DATE

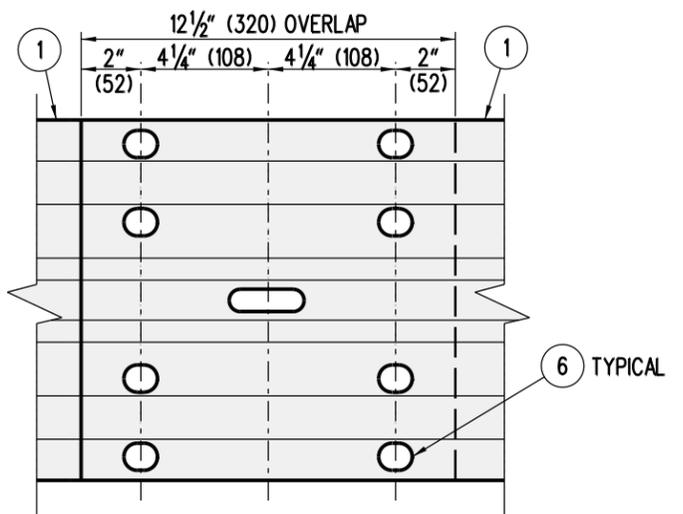
SCALE : N.T.S.



TYPE 2-31

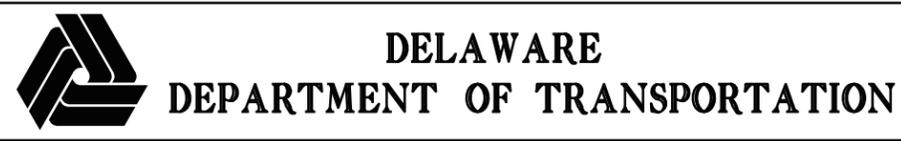


TYPE 1-31 OR 3-31



4 SPLICE DETAIL

NOTE : OVERLAP W-BEAMS IN DIRECTION OF TRAVEL.

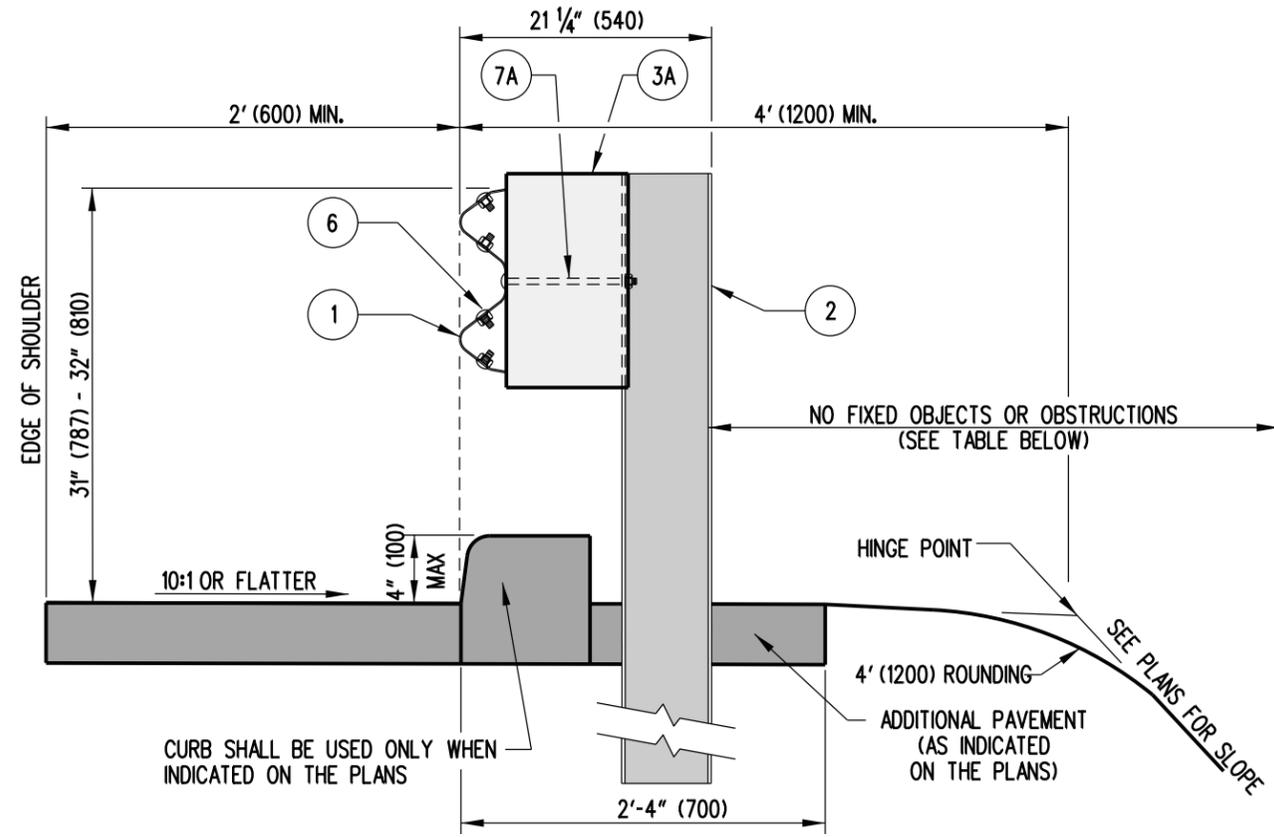


TYPES 1-31, 2-31, AND 3-31 GUARDRAIL APPLICATIONS

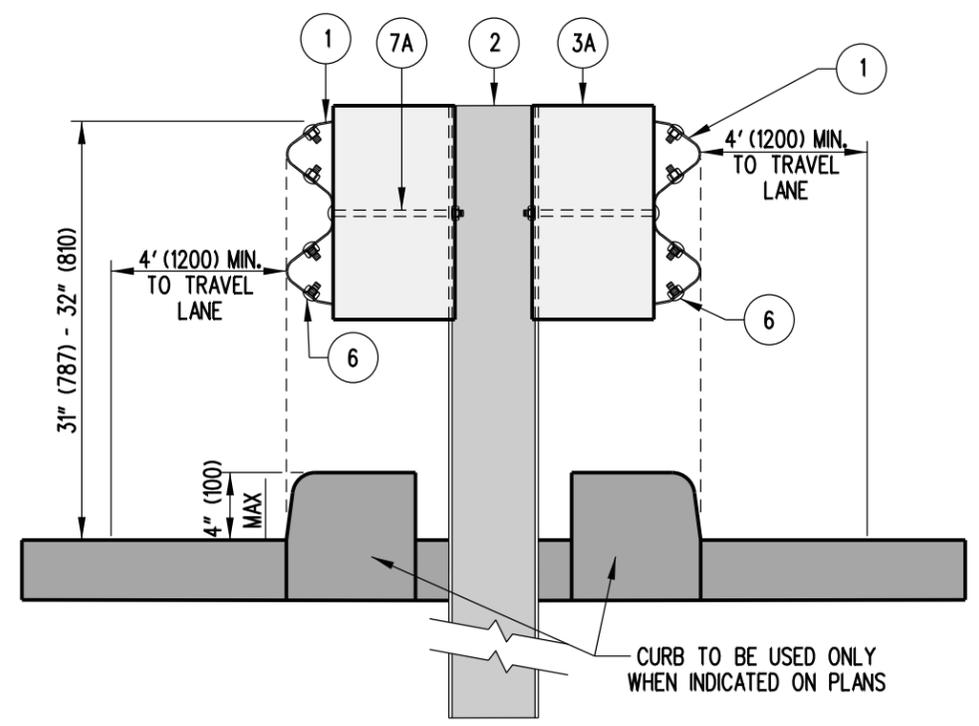
STANDARD NO. **B-1 (2010)** SHT. **2** OF **3**

APPROVED _____ SIGNATURE ON FILE _____ 12/28/2010
CHIEF ENGINEER DATE

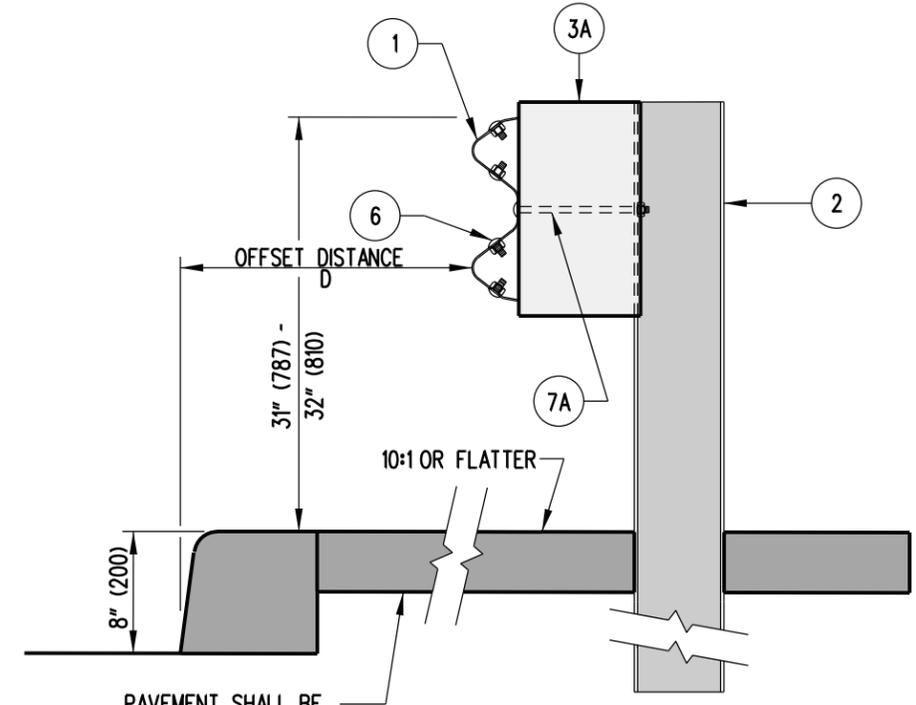
RECOMMENDED _____ SIGNATURE ON FILE _____ 12/27/2010
DESIGN ENGINEER DATE



GUARDRAIL SECTION
RURAL SHOULDER APPLICATION



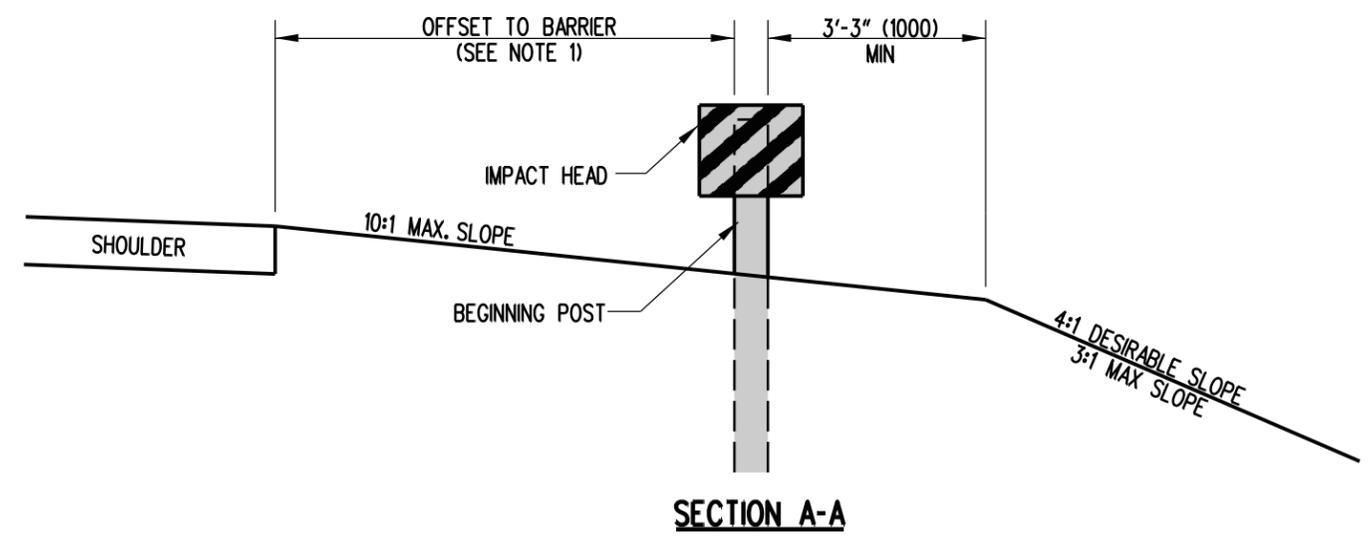
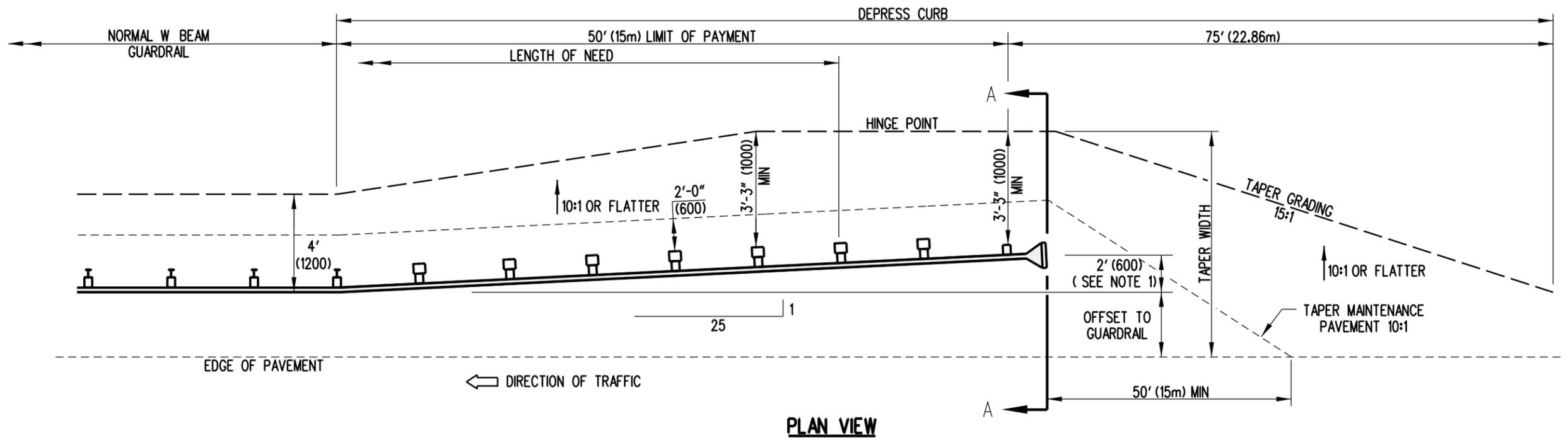
GUARDRAIL SECTION
MEDIAN APPLICATION



GUARDRAIL SECTION
URBAN SHOULDER APPLICATION

TYPE	POST SPACING	CLEAR AREA BEHIND POST
1	6'-3" (1905)	3'-0" (900) MIN
2	3'-1 1/2" (952.5)	2'-0" (600) MIN

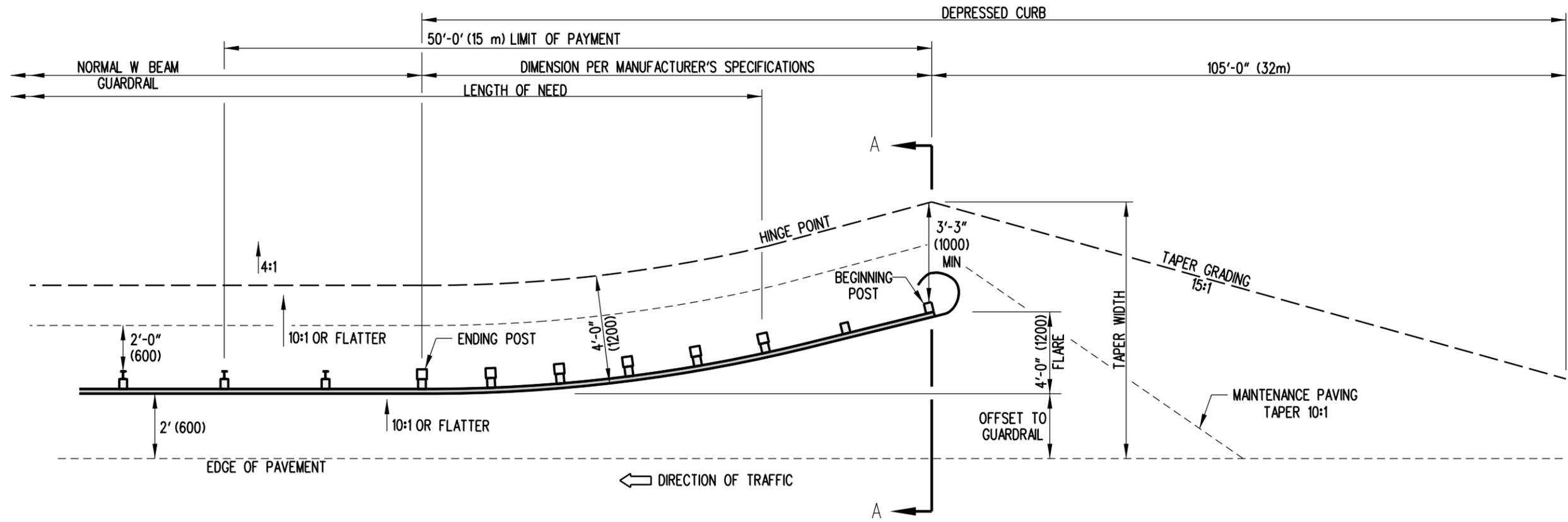
DESIGN SPEED	D
< 50 MPH (80 km/h)	8'-0" (2400)
> 50 MPH (80 km/h)	13'-0" (3900)



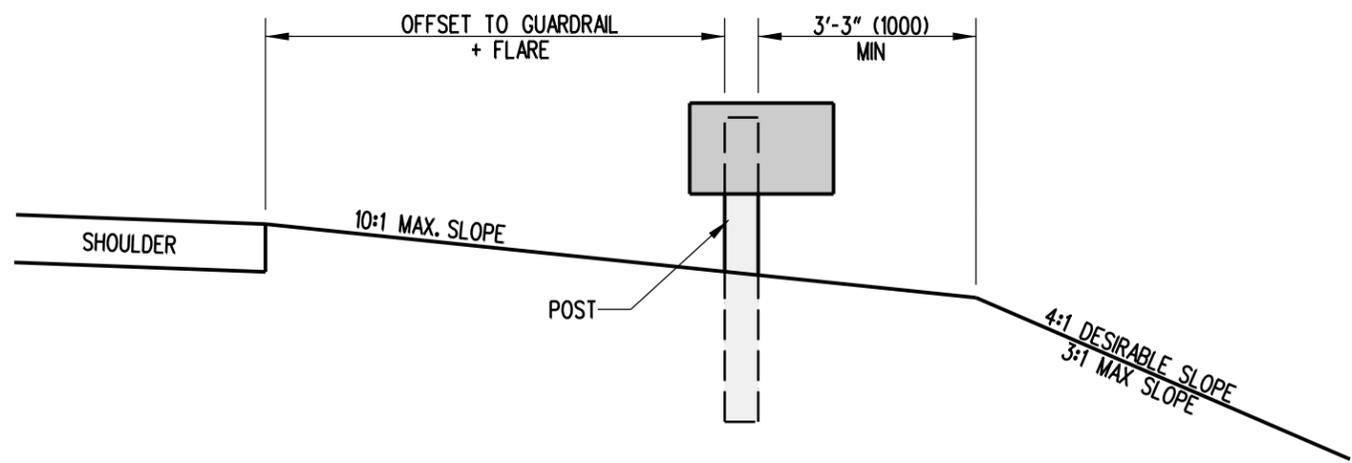
- NOTES:**
- 1). FLARE THE END TREATMENT AT 25:1 BEGINNING 50' (15 m) FROM THE END OF THE IMPACT HEAD, UNLESS THE CONSTRUCTION PLANS OR SPECIFICATIONS SPECIFY A SMALLER FLARE.
 - 2). THIS DETAIL WAS SOLELY CREATED TO SHOW THE GRADING REQUIRED FOR THIS TYPE OF ATTENUATOR AND IS APPLICABLE REGARDLESS OF THE HEIGHT OF THE GUARDRAIL SYSTEM.
 - 3). THE GUARDRAIL END TREATMENT ATTENUATOR SHALL BE INSTALLED AS PER THE MANUFACTURER'S AND THE DEPARTMENT OF TRANSPORTATION'S SPECIFICATIONS.
 - 4). IF CURB IS PRESENT, DEPRESS THE CURB TO A MAXIMUM HEIGHT OF 2" (50) WITHIN THE LIMITS OF THE END TREATMENT AND THROUGHOUT THE LENGTH OF THE TAPER GRADING.

<p>DELAWARE DEPARTMENT OF TRANSPORTATION</p>	GRADING FOR GUARDRAIL END TREATMENT ATTENUATOR, TYPE 1	APPROVED	SIGNATURE ON FILE <small>CHIEF ENGINEER</small>	12/28/2010 <small>DATE</small>
	STANDARD NO. B-2 (2010)	SHT. 1 OF 3	RECOMMENDED	SIGNATURE ON FILE <small>DESIGN ENGINEER</small>

SCALE : N.T.S.



PLAN VIEW

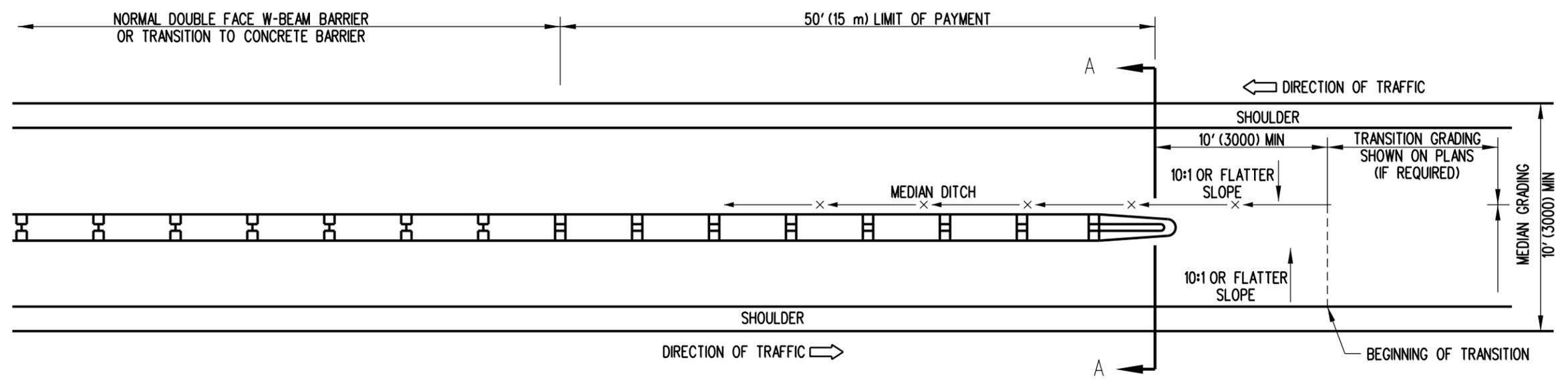


SECTION A-A

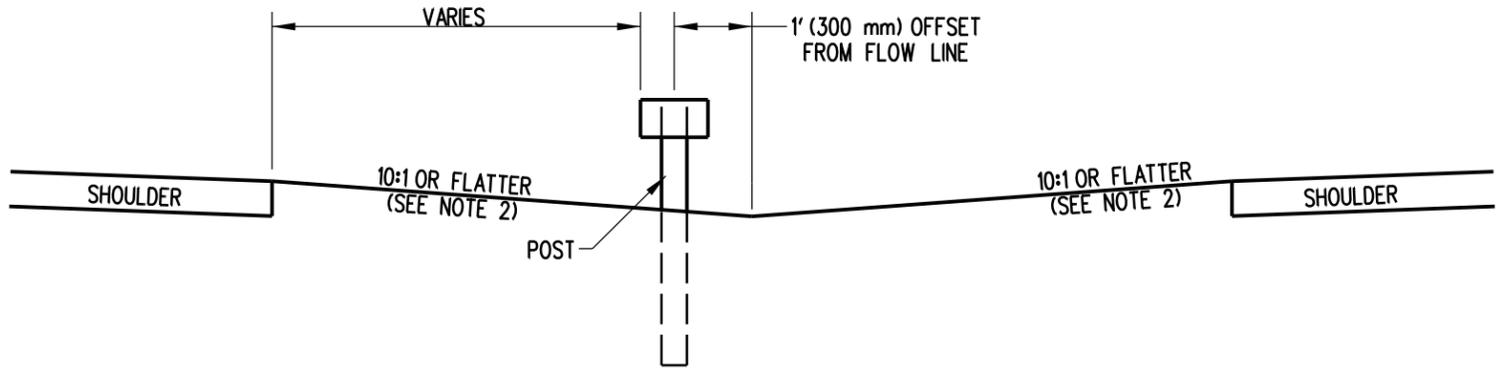
NOTES:

- 1). FLARE SHALL BE 4' (1200) UNLESS THE CONSTRUCTION PLANS OR SPECIFICATIONS SPECIFY A SMALLER FLARE. FLARE MAY BE PARABOLIC OR STRAIGHT BASED ON MANUFACTURER'S SPECIFICATIONS.
- 2). THIS DETAIL WAS SOLELY CREATED TO SHOW THE GRADING REQUIRED FOR THIS TYPE OF ATTENUATOR AND IS APPLICABLE REGARDLESS OF THE HEIGHT OF THE GUARDRAIL SYSTEM.
- 3). THE GUARDRAIL END TREATMENT ATTENUATOR SHALL BE INSTALLED AS PER THE MANUFACTURER'S AND THE DEPARTMENT OF TRANSPORTATION'S SPECIFICATIONS.
- 4). IF CURB IS PRESENT, DEPRESS THE CURB TO A MAXIMUM HEIGHT OF 2" (50) WITHIN THE LIMITS OF THE END TREATMENT AND THROUGHOUT THE LENGTH OF THE TAPER GRADING.

 DELAWARE DEPARTMENT OF TRANSPORTATION	GRADING FOR GUARDRAIL END TREATMENT ATTENUATOR, TYPE 2		APPROVED	SIGNATURE ON FILE <small>CHIEF ENGINEER</small>	12/28/2010 <small>DATE</small>
	STANDARD NO. B-2 (2010)	SHT. 2 OF 3	RECOMMENDED	SIGNATURE ON FILE <small>DESIGN ENGINEER</small>	12/27/2010 <small>DATE</small>



PLAN VIEW



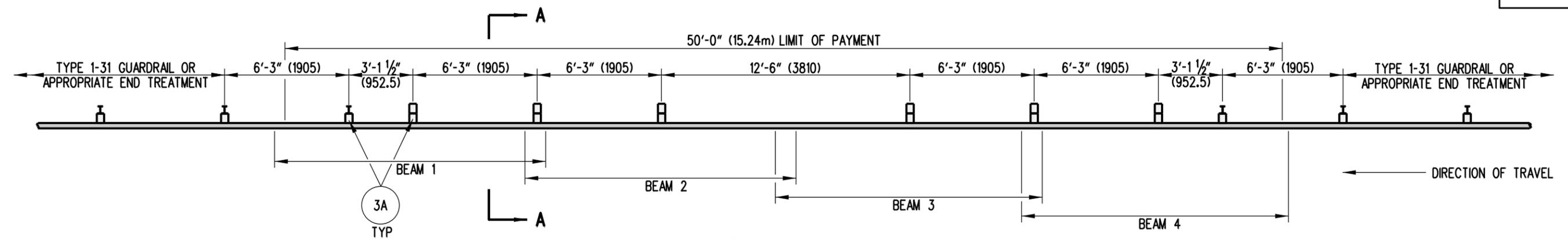
SECTION A-A

GRADING FOR END TREATMENT ATTENUATOR, TYPE 3

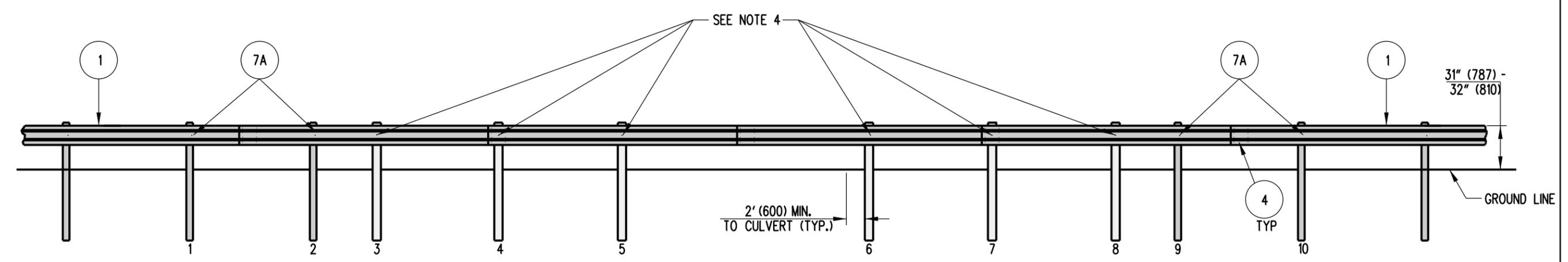
NOTES:

- 1). THIS DETAIL WAS SOLELY CREATED TO SHOW THE GRADING REQUIRED FOR THIS TYPE OF ATTENUATOR AND IS APPLICABLE REGARDLESS OF THE HEIGHT OF THE GUARDRAIL SYSTEM.
- 2). 6:1 OR FLATTER GRADING IS ALLOWABLE WHEN THE BARRIER IS LOCATED 12' (3.65m) OR MORE FROM THE OUTSIDE EDGE OF THE SHOULDER.
- 3). THIS END TREATMENT CAN ALSO BE USED IN RAMP GORES OR OTHER AREAS WHERE TWO 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.
- 6). IF CURB IS PRESENT, DEPRESS THE CURB TO A MAXIMUM HEIGHT OF 2" (50) WITHIN THE LIMITS OF THE END TREATMENT AND THROUGHOUT THE LENGTH OF THE TAPER GRADING.

<p>DELAWARE DEPARTMENT OF TRANSPORTATION</p>	GRADING FOR GUARDRAIL END TREATMENT ATTENUATOR, TYPE 3		APPROVED	SIGNATURE ON FILE <small>CHIEF ENGINEER</small>	12/28/2010 <small>DATE</small>
	STANDARD NO. B-2 (2010)	SHT. 3 OF 3	RECOMMENDED	SIGNATURE ON FILE <small>DESIGN ENGINEER</small>	12/27/2010 <small>DATE</small>



PLAN



ELEVATION

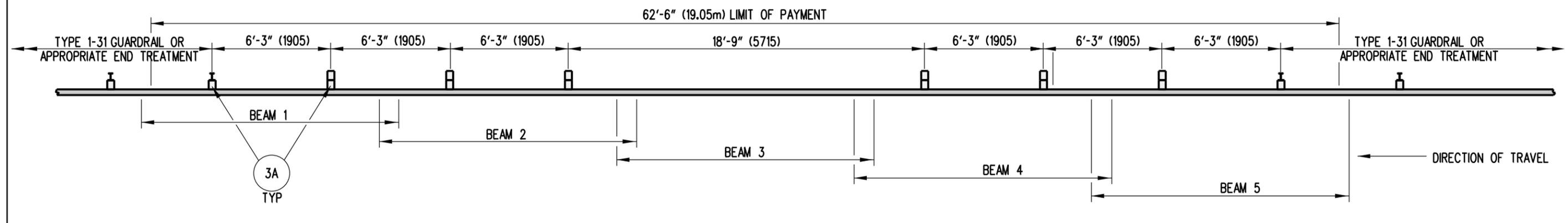
- NOTES:**
- 1). ALL W-BEAMS ARE 13'-6 1/2" (4130) IN LENGTH.
 - 2). PLACE GUARDRAIL DELINEATORS AT THE INTERVALS SPECIFIED IN THE DELAWARE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
 - 3). POSTS 1, 2, 9, & 10 ARE TO BE W6x9 (W15x13.5) STEEL POSTS. POSTS 3 THROUGH 8 ARE TO BE TYPE 31 LONG WOOD BREAKAWAY POSTS.
 - 4). THE RAIL SHALL BE ATTACHED AT POSTS 3 THROUGH 8 WITH A 5/8" (16) x 22" (560) GUARDRAIL BOLT, STEEL WASHER, AND RECESS NUT.



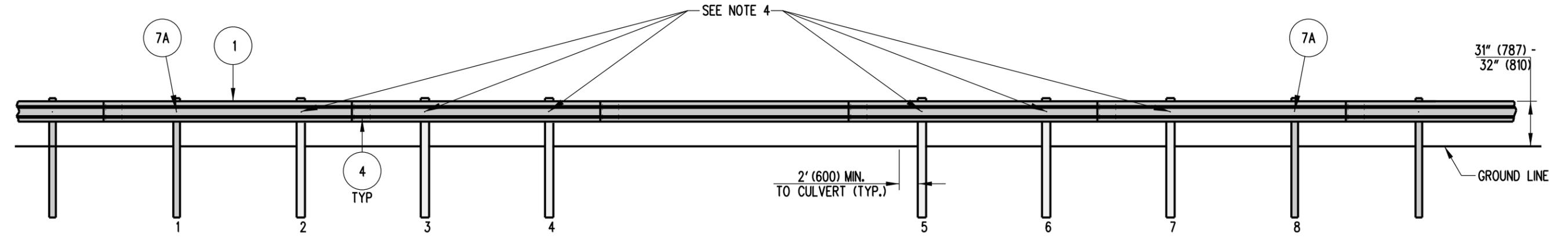
**DELAWARE
DEPARTMENT OF TRANSPORTATION**

GUARDRAIL OVER CULVERTS, TYPE 1-31			
STANDARD NO.	B-3 (2010)	SHT. 1	OF 3

APPROVED	SIGNATURE ON FILE <small>CHIEF ENGINEER</small>	12/28/2010 <small>DATE</small>
RECOMMENDED	SIGNATURE ON FILE <small>DESIGN ENGINEER</small>	12/27/2010 <small>DATE</small>

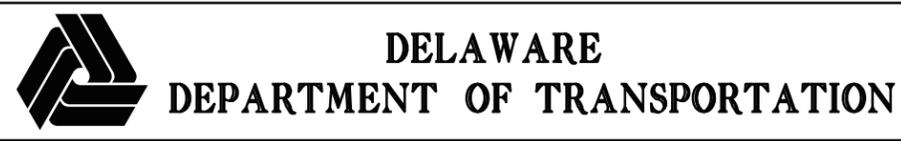


PLAN



ELEVATION

- NOTES:**
1. ALL W-BEAMS ARE 13'-6 1/2" (4130) IN LENGTH.
 2. PLACE GUARDRAIL DELINEATORS AT THE INTERVALS SPECIFIED IN THE DELAWARE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
 3. POSTS 1 AND 8 SHALL BE W6x9 (W15x13.5) STEEL POSTS. POSTS 2 THROUGH 7 SHALL BE TYPE 31 LONG WOOD BREAKAWAY POSTS.
 4. THE RAIL SHALL BE ATTACHED TO POSTS 2 THROUGH 7 WITH A 5/8" (16) x 22" (560) GUARDRAIL BOLT, STEEL WASHER, AND RECESS NUT.

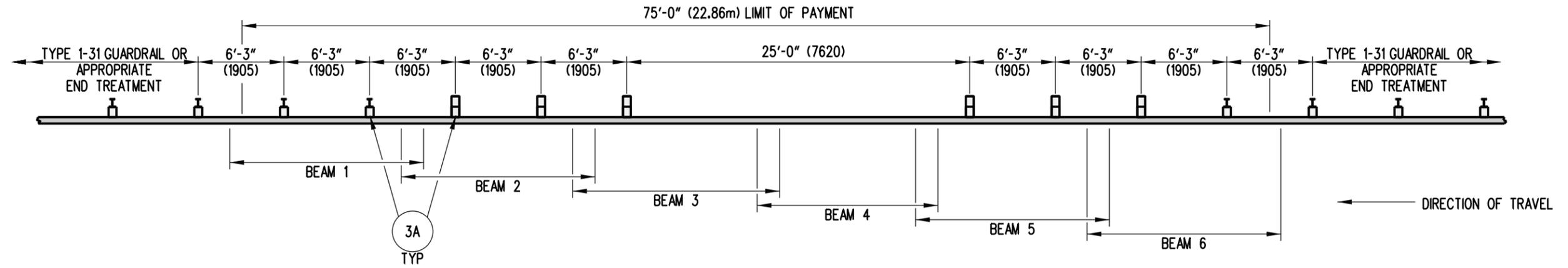


GUARDRAIL OVER CULVERTS, TYPE 2-31

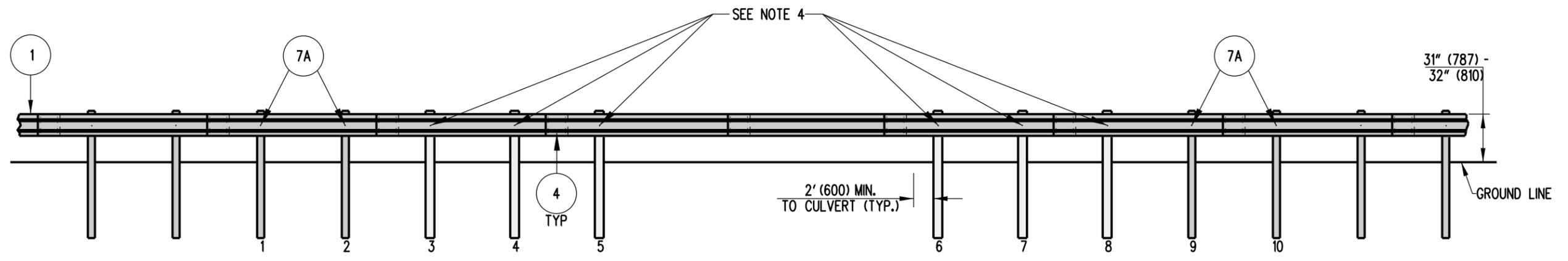
STANDARD NO. B-3 (2010) **SHT. 2 OF 3**

APPROVED _____ **SIGNATURE ON FILE** **12/28/2010**
CHIEF ENGINEER DATE

RECOMMENDED _____ **SIGNATURE ON FILE** **12/27/2010**
DESIGN ENGINEER DATE

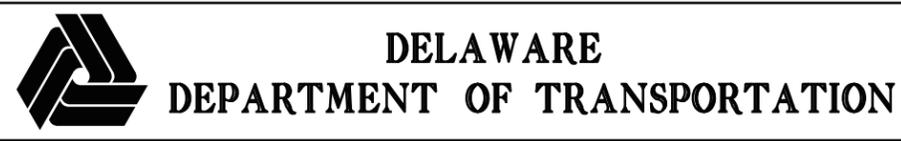


PLAN



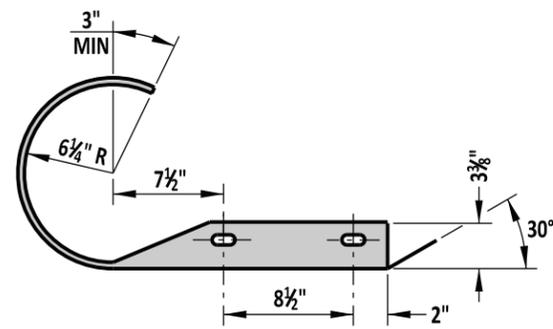
ELEVATION

- NOTES:**
1. ALL W-BEAMS ARE 13'-6 1/2" (4130) IN LENGTH.
 2. PLACE GUARDRAIL DELINEATORS AT THE INTERVALS SPECIFIED IN THE DELAWARE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
 3. POSTS 1, 2, 9, & 10 ARE TO BE W6x9 (W15x13.5) STEEL POSTS. POSTS 3 THROUGH 8 ARE TO BE TYPE 31 LONG WOOD BREAKAWAY POSTS.
 4. THE RAIL SHALL BE ATTACHED AT POSTS 3 THROUGH 8 WITH A 5/8" (16) x 22" (560) GUARDRAIL BOLT, STEEL WASHER, AND RECESS NUT.

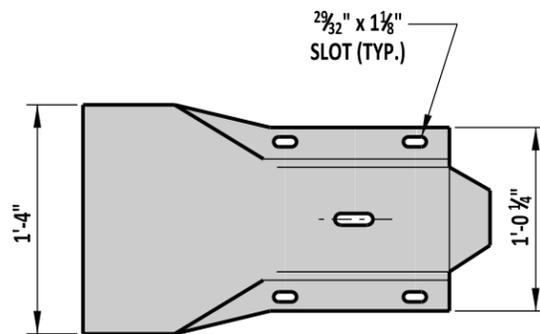


GUARDRAIL OVER CULVERTS, TYPE 3-31			
STANDARD NO.	B-3 (2010)	SHT. 3	OF 3

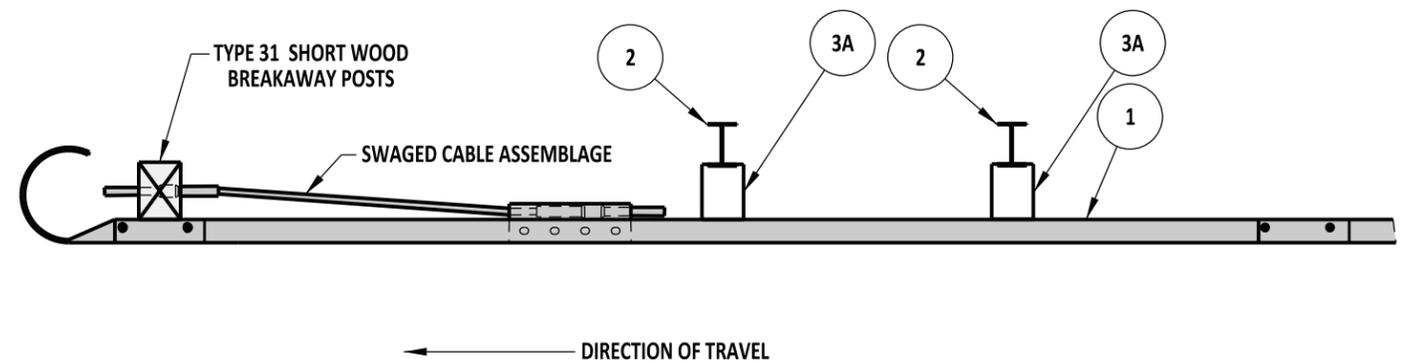
APPROVED	SIGNATURE ON FILE	12/28/2010
	<small>CHIEF ENGINEER</small>	<small>DATE</small>
RECOMMENDED	SIGNATURE ON FILE	12/27/2010
	<small>DESIGN ENGINEER</small>	<small>DATE</small>



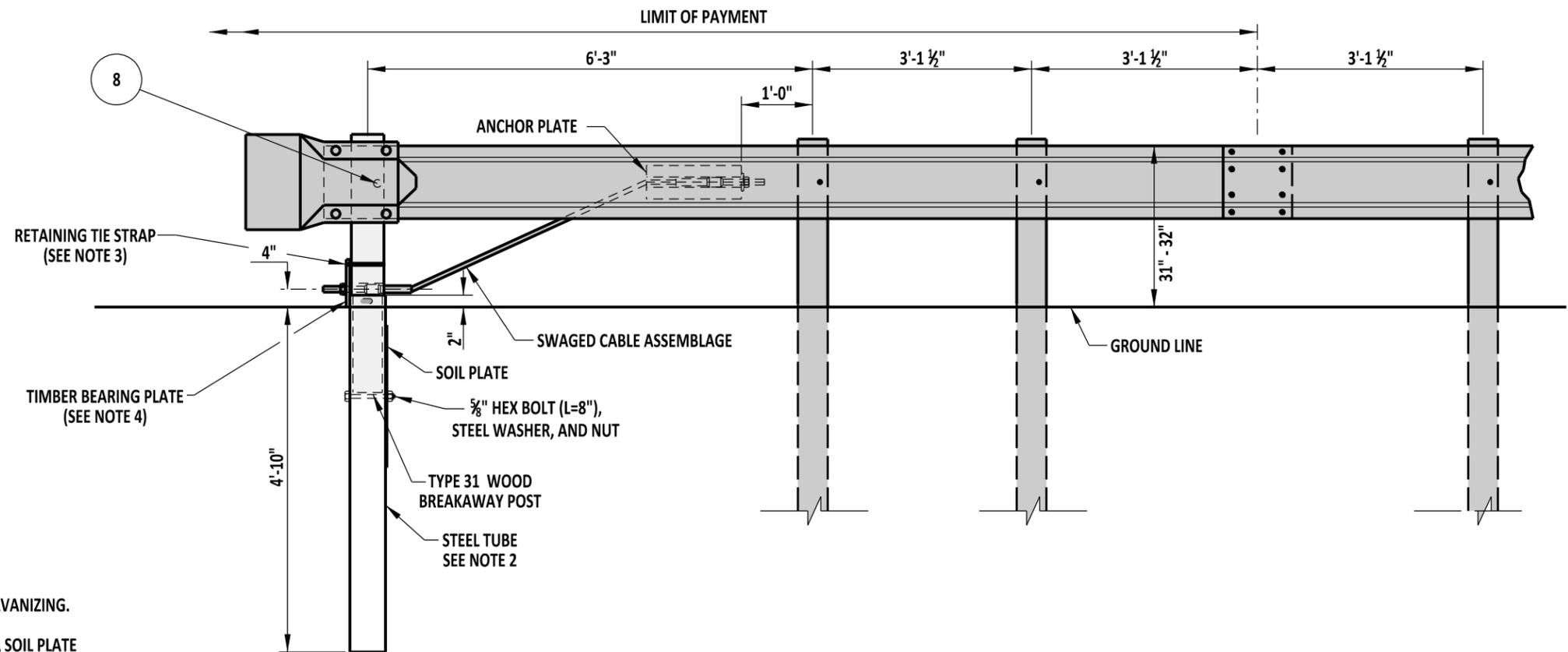
END SECTION PLAN



END SECTION ELEVATION



PLAN



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'-0" STEEL TUBE WITHOUT A SOIL PLATE OR A 5'-0" STEEL TUBE WITH A SOIL PLATE.
- 3). PLACE A 1/2" WIDE PLASTIC RETAINING TIE STRAP AROUND THE SHORT TIMBER BREAKAWAY POST AND TIMBER BEARING PLATE TO ENSURE THE PROPER ORIENTATION OF THE TIMBER BEARING PLATE.
- 4). REFER TO DETAIL B-13, SHEET 8 OF 10 FOR PROPER TIMBER BEARING PLATE ORIENTATION.



DELAWARE
DEPARTMENT OF TRANSPORTATION

END ANCHORAGE, TYPE 31

STANDARD NO. B-4 (2012) SHT. 1 OF 1

APPROVED

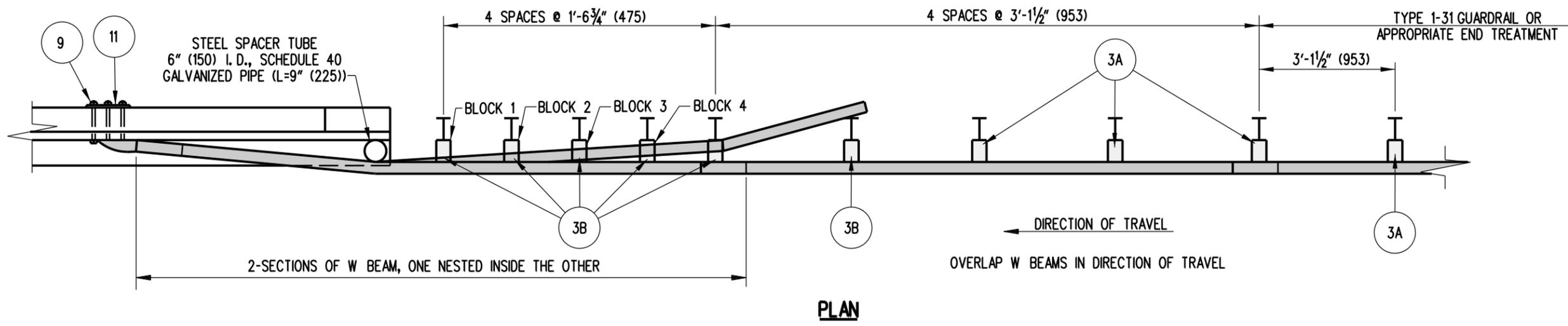
SIGNATURE ON FILE
CHIEF ENGINEER

01/07/2013
DATE

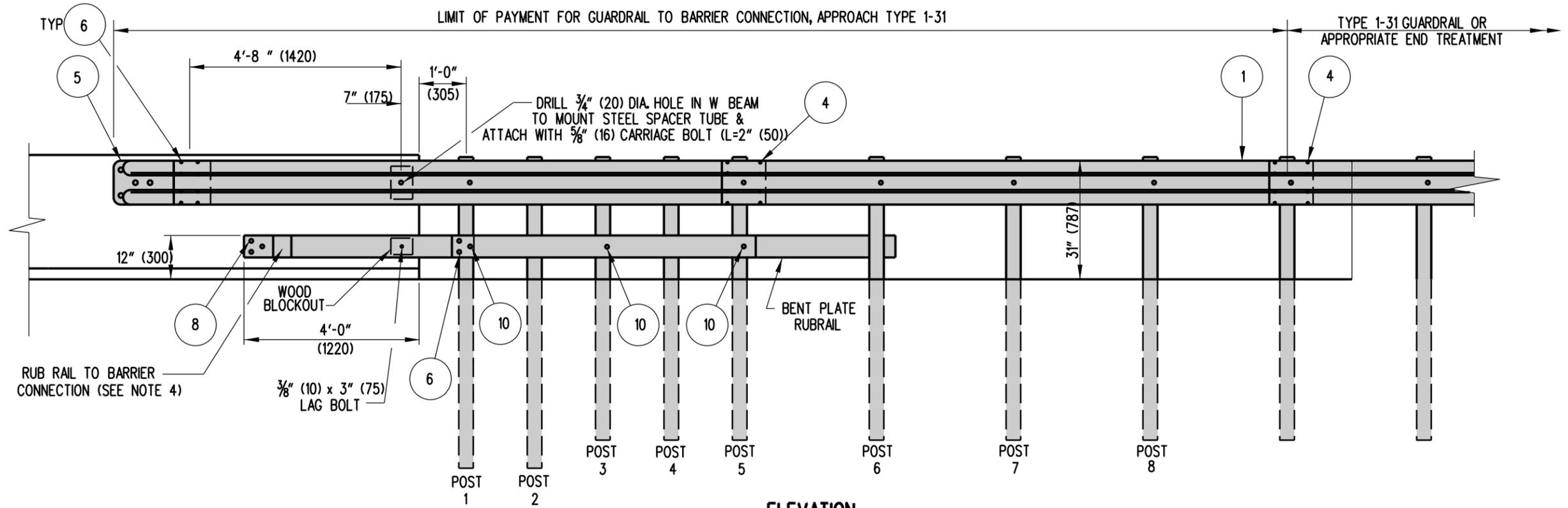
RECOMMENDED

SIGNATURE ON FILE
DESIGN ENGINEER

12/20/2012
DATE



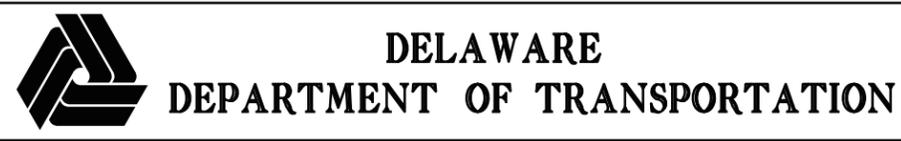
PLAN



ELEVATION

NOTES:

- 1). DO NOT ATTACH W BEAM TO POSTS 2 THROUGH 4.
- 2). DO NOT ATTACH RUB RAIL TO POSTS 2 AND 4.
- 3). POSTS 1 THROUGH 6 REQUIRE AN ADDITIONAL HOLE TO ATTACH LOWER OFFSET 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 HEADS AND RUB RAIL.
- 5). ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.
- 6). PLACE GUARDRAIL REFLECTOR AS PER THE DELAWARE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
- 7). APPROVED CONCRETE INSERTS MAY BE USED IN NEW CONSTRUCTION TO ATTACH TERMINAL CONNECTOR TO PARAPET.
- 8). POSTS 1 & 2 ARE W8x13 (W200x19.3), 7'-6" (2.3m) LONG. ALL OTHER POSTS IN TRANSITION ARE W6x9 (W150x13.5), 6'-0" (1.82m) LONG.
- 9). A 6" (150) x 8" (200) x 14" (350) OFFSET BLOCK IS USED AT POSTS 1 THROUGH 6 AND A 6" (150) x 12" (300) x 14" (350) OFFSET BLOCK IS USED AT POSTS 7 THROUGH 9.

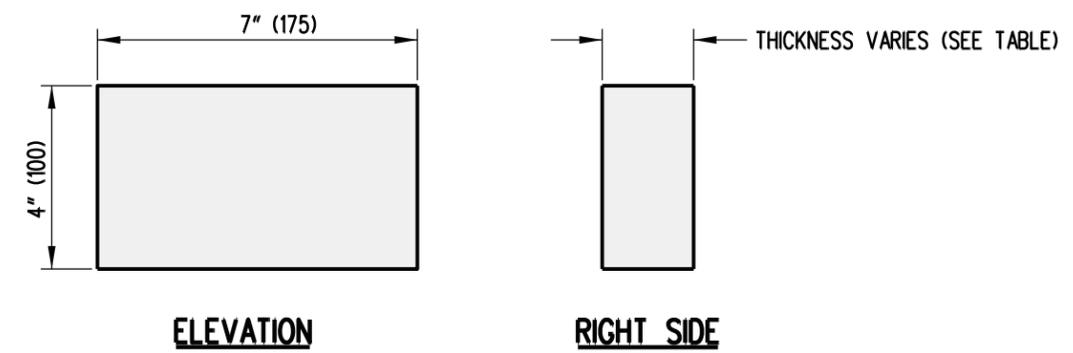
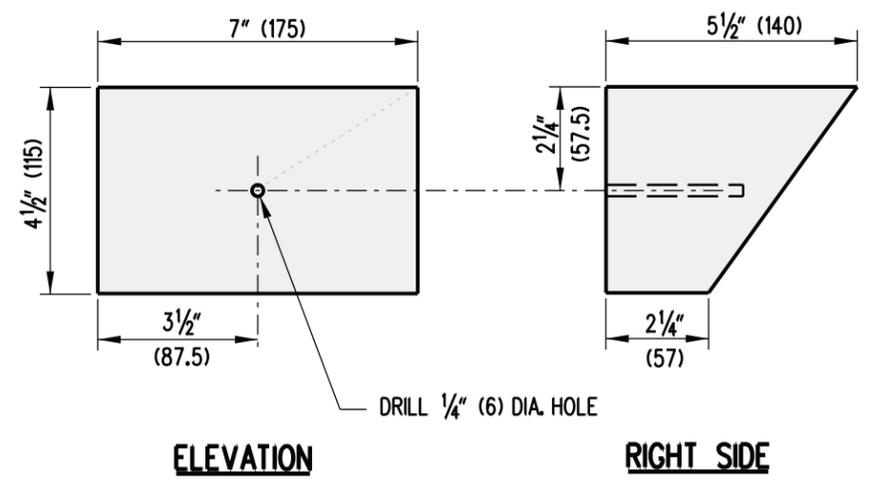


GUARDRAIL TO BARRIER CONNECTION, APPROACH TYPE 1-31

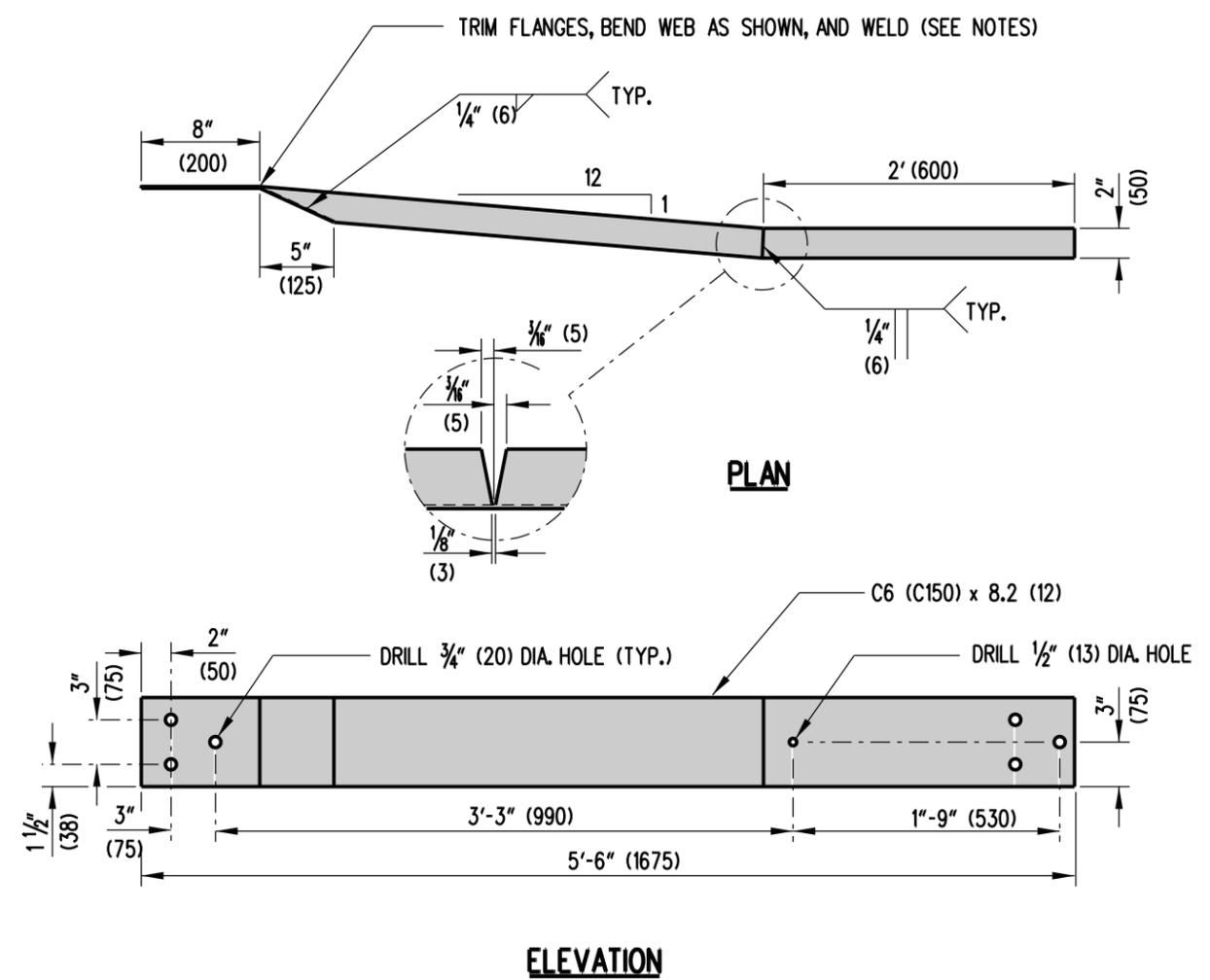
STANDARD NO. **B-5 (2010)** SHT. **1** OF **6**

APPROVED _____ SIGNATURE ON FILE 12/28/2010
CHIEF ENGINEER DATE

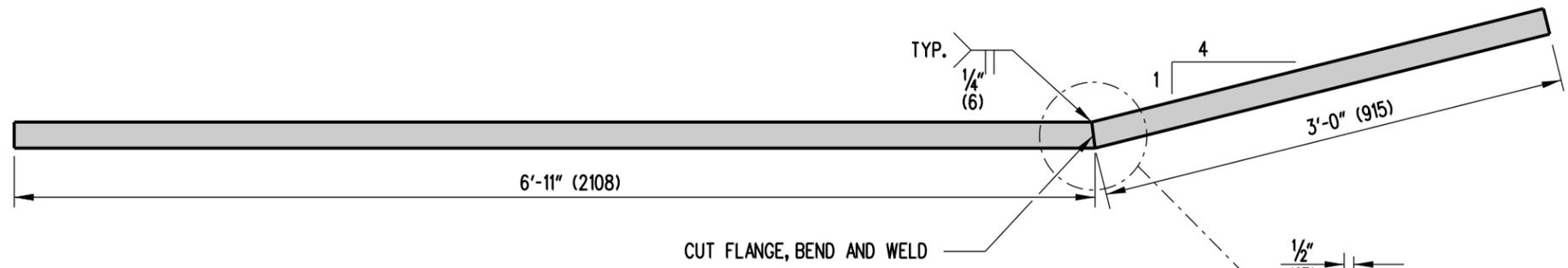
RECOMMENDED _____ SIGNATURE ON FILE 12/27/2010
DESIGN ENGINEER DATE



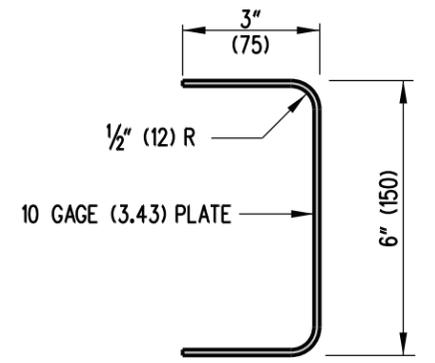
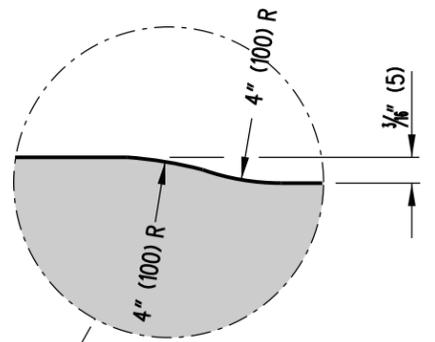
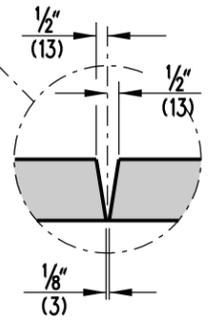
RUB RAIL OFFSET BLOCKS (7" (175) x 4" (100))		
POST NO.	THICKNESS	BOLT LENGTH
1	4 1/4" (108)	6" (150)
2	3 1/4" (83)	4" (100)
3	2" (50)	4" (100)
4	1" (25)	2" (50)



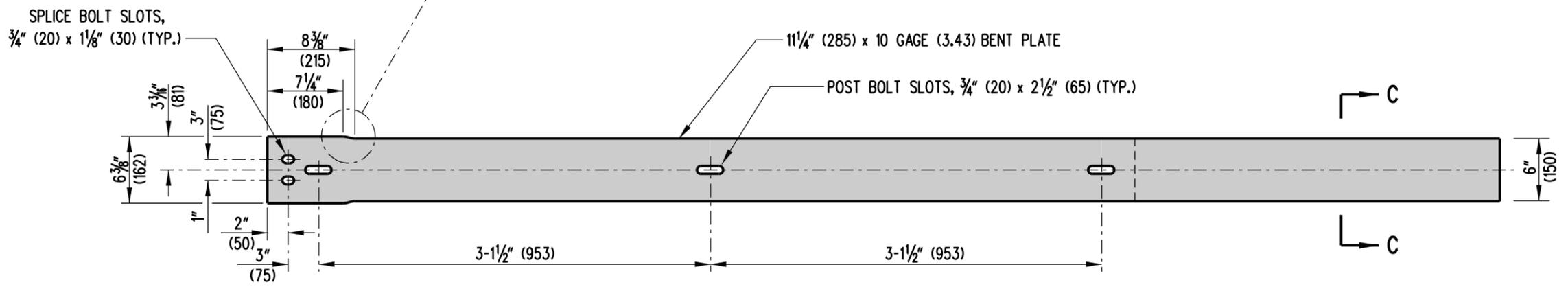
- NOTES:**
- 1). THE RUB RAIL TO BARRIER CONNECTION END MUST BE ATTACHED FLUSH WITH THE SLOPED TOE OF THE SAFETY BARRIER. INSTALLATION CAN BE SIMPLIFIED BY FABRICATING OR SHOP TWISTING THE RUB RAIL END TO BE CONSISTENT WITH THE SLOPE OF THE BARRIER, HOWEVER, FIELD BENDING USING HEAT IS PERMITTED.
 - 2). STEEL SPACER TUBE IS SCHEDULE 40 GALVANIZED PIPE, 6" (150) x 9" (225)
 - 3). ALL HARDWARE ON THIS DETAIL IS COMPATIBLE WITH GUARDRAIL TO BARRIER CONNECTION, TYPES 1-31 AND 1-27.



PLAN
SCALE: 1"=1'-0"



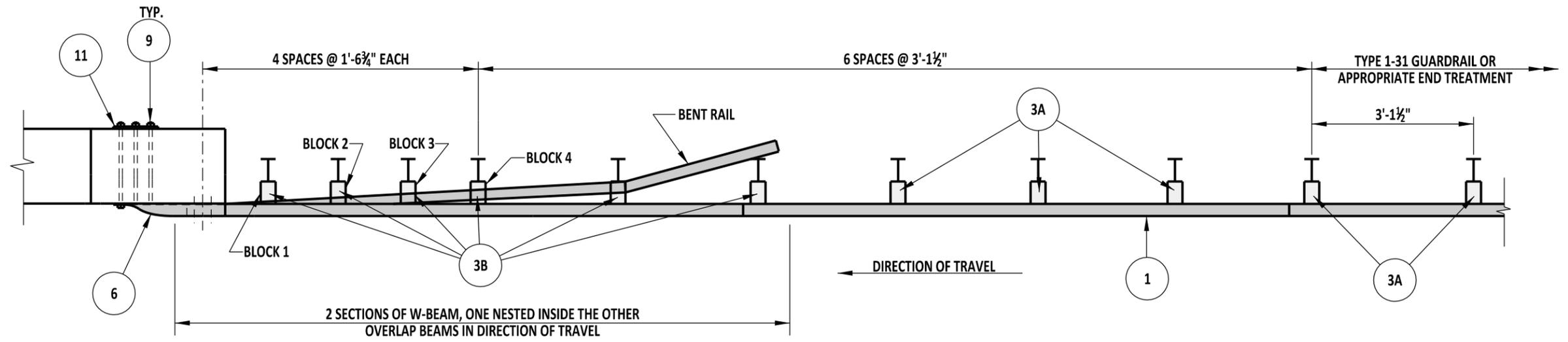
SECTION C-C
SCALE: 3" = 1'-0"



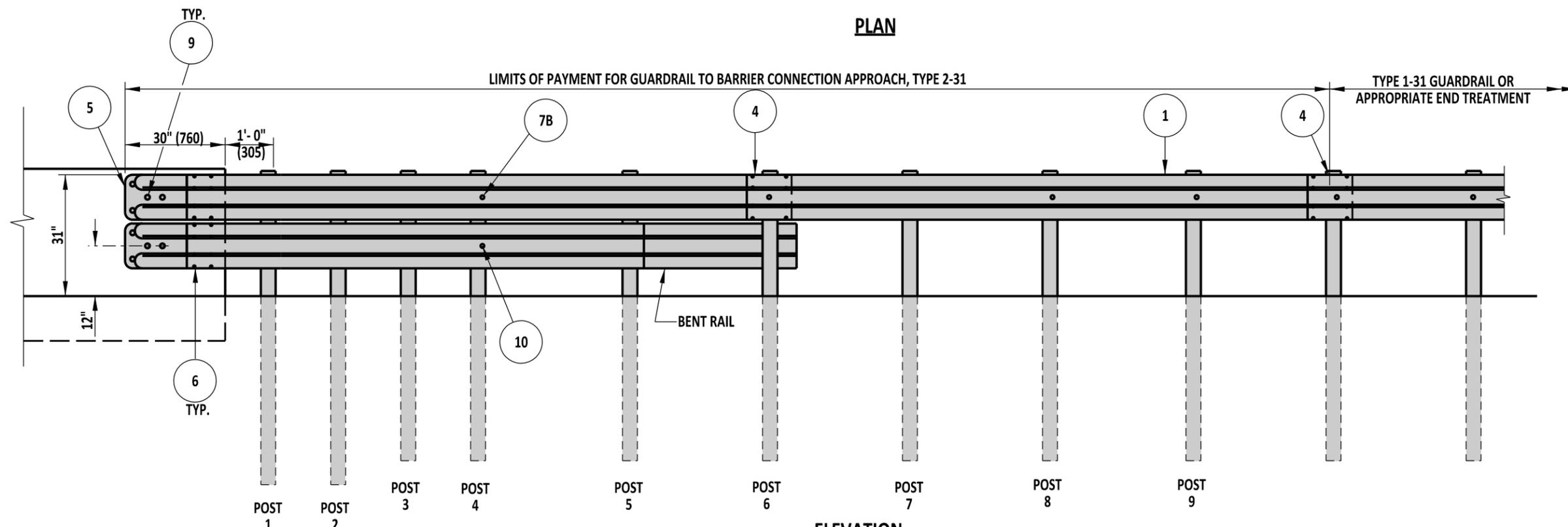
ELEVATION
SCALE: 1"=1'-0"

NOTE:
ALL HARDWARE ON THIS DETAIL IS COMPATIBLE WITH GUARDRAIL TO BARRIER CONNECTION, TYPES 1-31 AND 1-27.

<p>DELAWARE DEPARTMENT OF TRANSPORTATION</p>	<p>GUARDRAIL TO BARRIER CONNECTION, BENT PLATE RUB RAIL</p>			<p>APPROVED</p> <p>SIGNATURE ON FILE _____ CHIEF ENGINEER</p> <p>12/28/2010 DATE</p>
	<p>STANDARD NO. B-5 (2010)</p>	<p>SHT. 3 OF 6</p>	<p>RECOMMENDED</p> <p>SIGNATURE ON FILE _____ DESIGN ENGINEER</p> <p>12/27/2010 DATE</p>	



PLAN

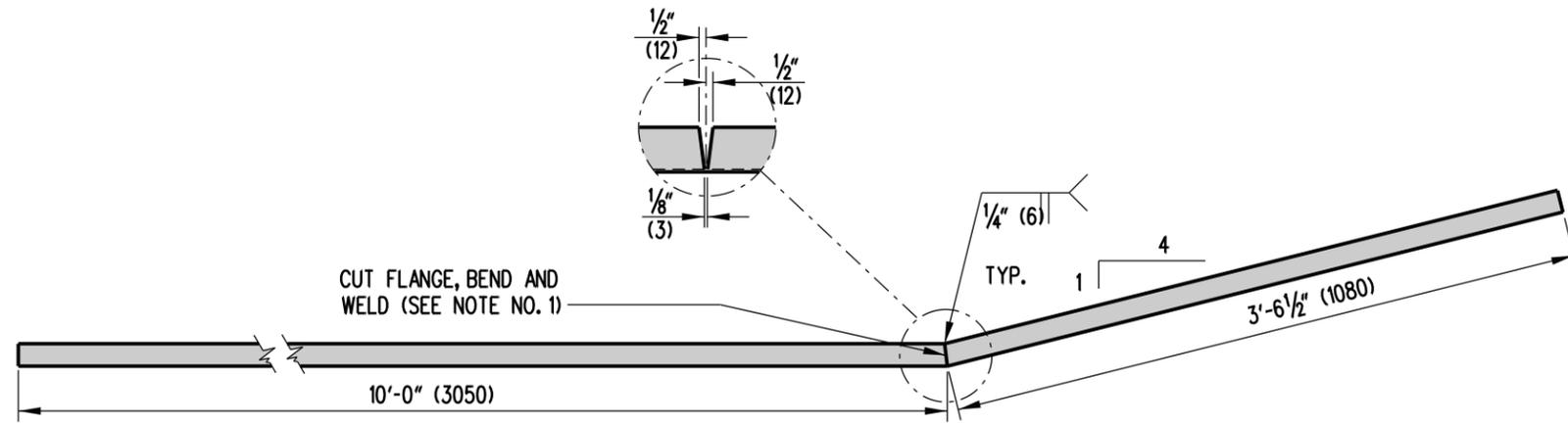


ELEVATION

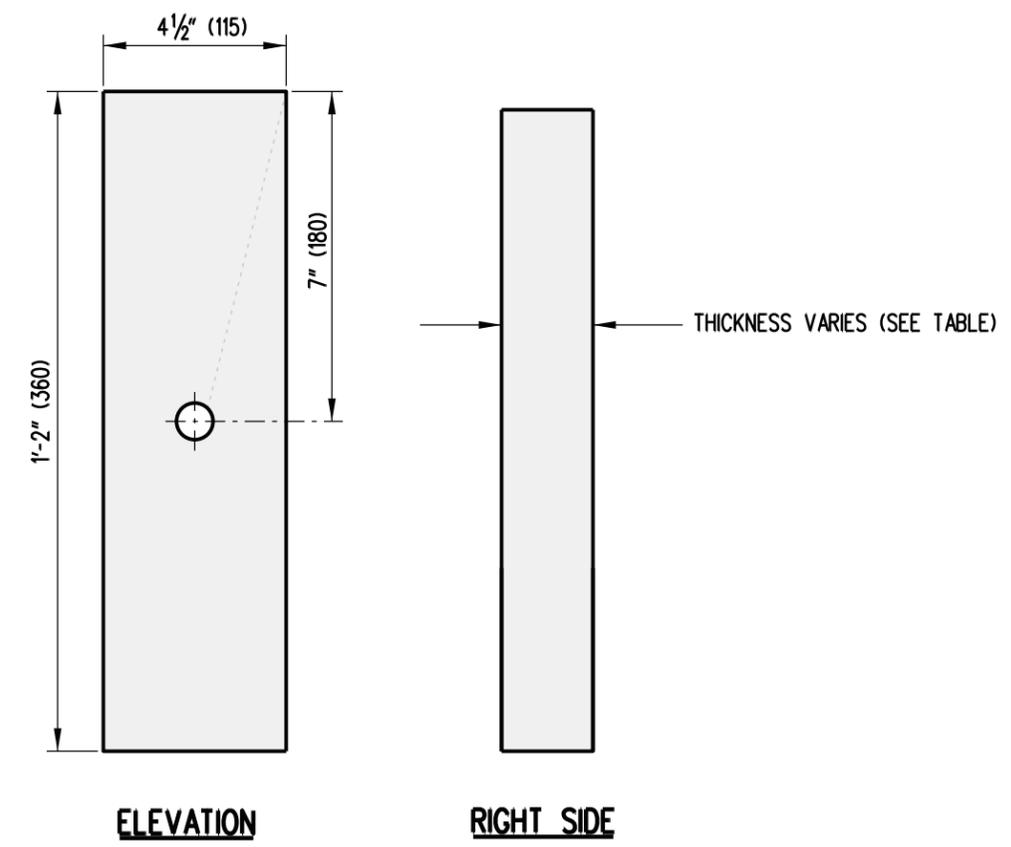
NOTES :

- 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 OFFSET BLOCKS AND/OR BENT RAIL.
- 3). DO NOT ATTACH RAILS TO POSTS 1, 2, 3, 5, OR 7.
- 4). POSTS 1 AND 2 ARE W8x13, 7'-6" LONG. ALL OTHER POSTS IN TRANSITION ARE W6x9, 6'-0" LONG.
- 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 DELINEATORS AT THE INTERVALS SPECIFIED IN THE DELAWARE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
- 9). FOR INSTALLATIONS WHERE CURB EXISTS, IF THE EXISTING CURB IS 8" (200) OR HIGHER AND CANNOT BE REMOVED, THE BOTTOM RAIL CAN BE ELIMINATED.
- 10). A 6" x 8" x 14" OFFSET BLOCK IS USED AT POSTS 1 THROUGH 6 AND A 6" x 12" x 14" OFFSET BLOCK IS USED AT POSTS 7 THROUGH 9.

	DELAWARE	GUARDRAIL TO BARRIER CONNECTION, APPROACH, TYPE 2-31		APPROVED	SIGNATURE ON FILE CHIEF ENGINEER	01/07/2013 DATE
	DEPARTMENT OF TRANSPORTATION	STANDARD NO. B-5 (2012)	SHT. 4 OF 6	RECOMMENDED	SIGNATURE ON FILE DESIGN ENGINEER	12/20/2012 DATE



BENT RAIL
SCALE: 1"=1'-0"

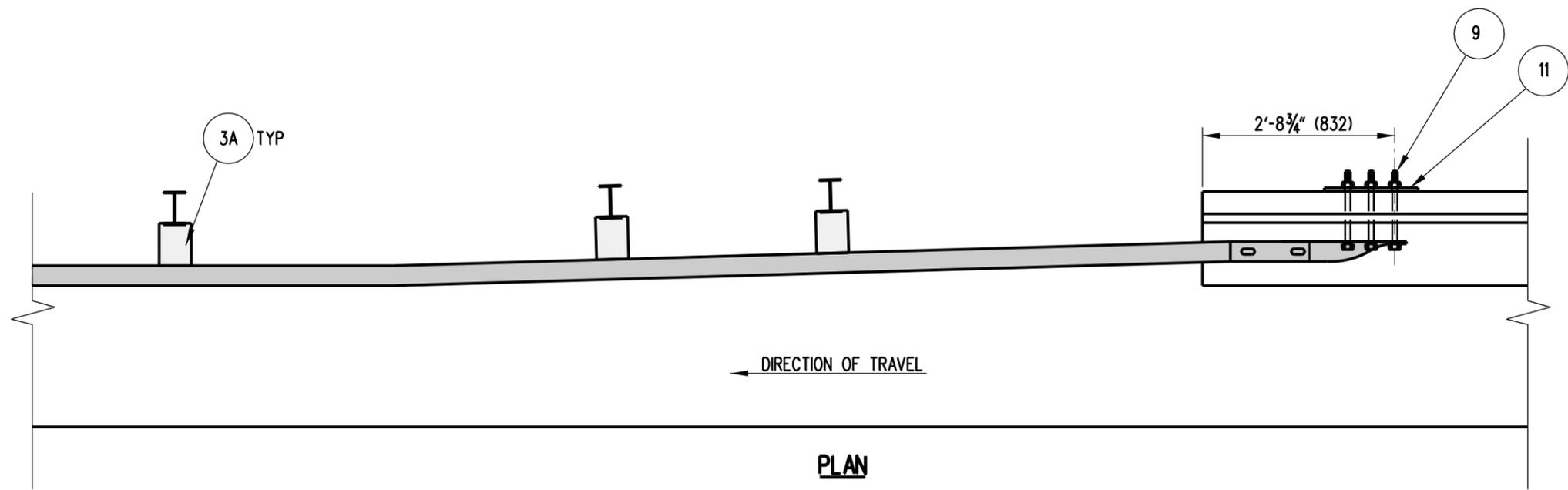


BENT RAIL OFFSET BLOCKS
SCALE: 3"=1'-0"

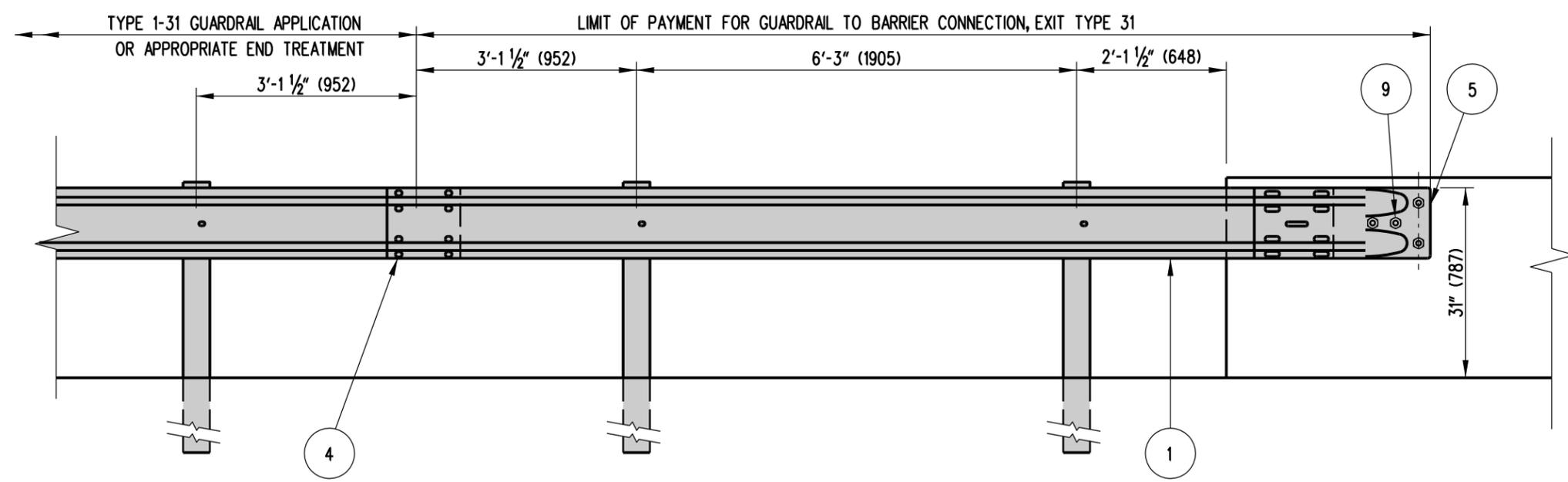
BENT RAIL OFFSET BLOCKS 1'-2" (360) x 4 1/2" (115)		
BLOCK	THICKNESS	BOLT LENGTH
1	5" (125)	8" (200)
2	4" (100)	6" (150)
3	3" (75)	6" (150)
4	2" (50)	4" (100)

NOTES:

- 1). BOTTOM OFFSET BLOCKS LOCATED ON POSTS 1-4 ARE OFFSET DRILLED TO SIT SQUARELY ON THE POST FLANGE AND SECURED WITH 5/8" (16) CARRIAGE BOLTS. SEE BENT RAIL OFFSET BLOCK TABLE FOR BOLT LENGTH.
- 2). ALL HARDWARE ON THIS DETAIL IS COMPATIBLE WITH GUARDRAIL TO BARRIER CONNECTION, TYPES 2-31 AND 2-27.



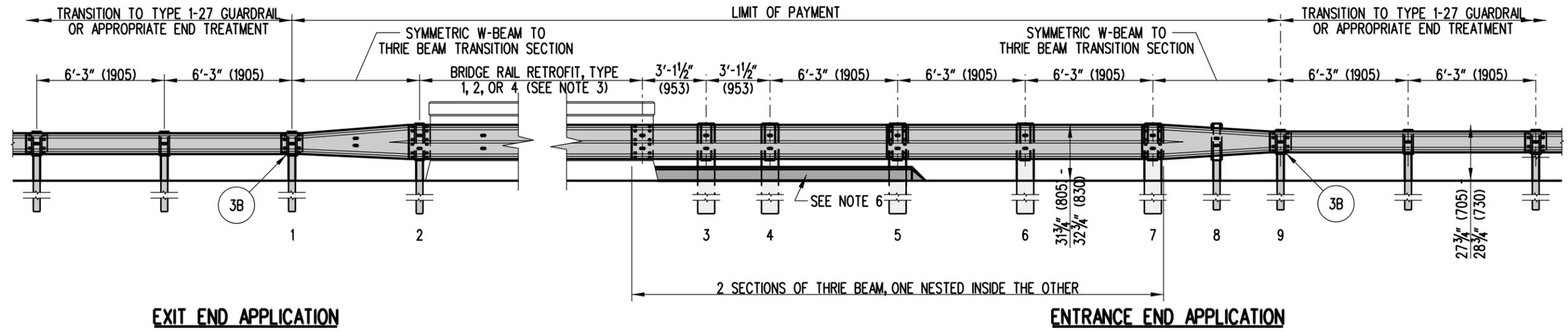
PLAN



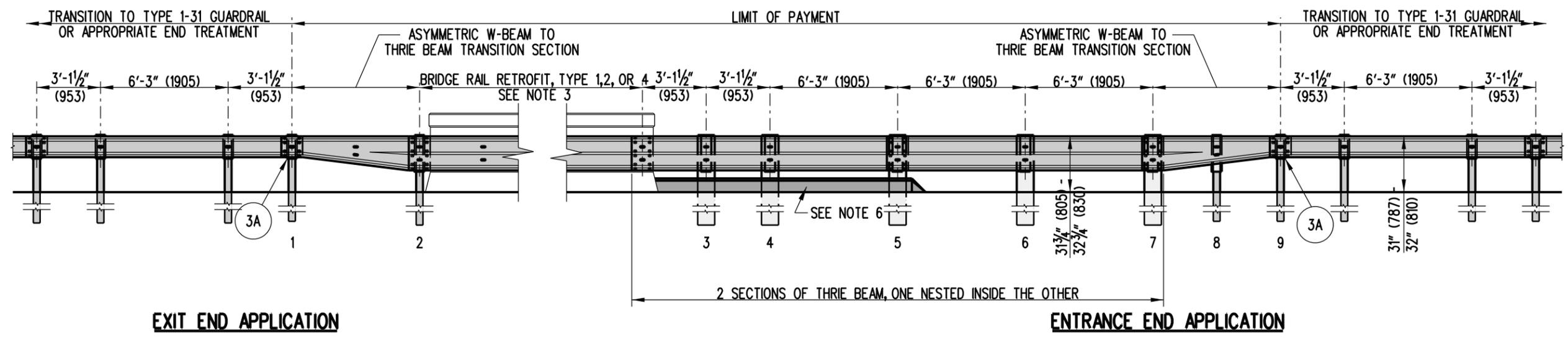
ELEVATION

NOTES:

- 1). CONCRETE INSERTS MAY BE USED IN NEW CONSTRUCTION TO ATTACH TERMINAL CONNECTOR TO PARAPET.
- 2). GUARDRAIL SECTION AND TERMINAL CONNECTIONS 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.



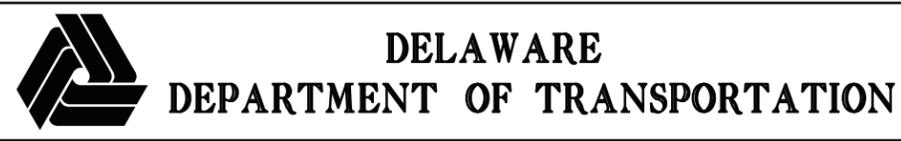
27" GUARDRAIL



31" GUARDRAIL

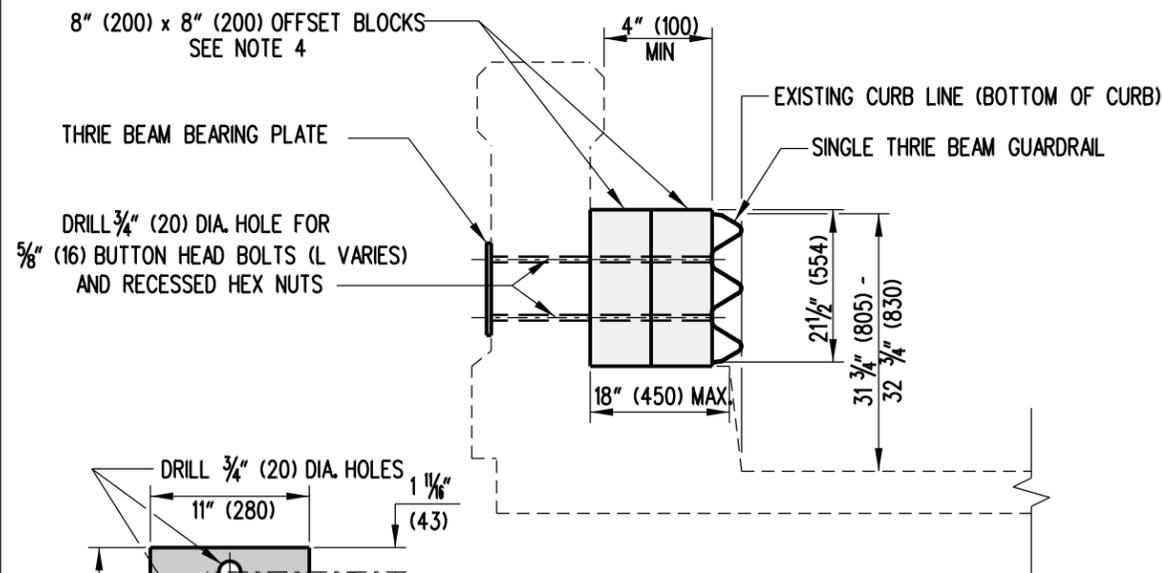
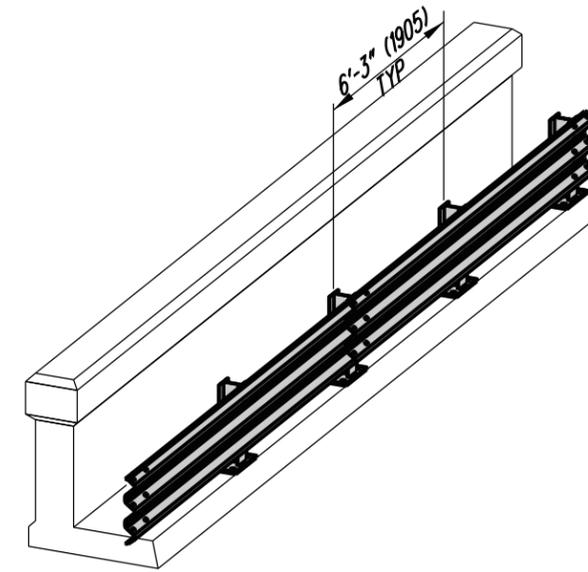
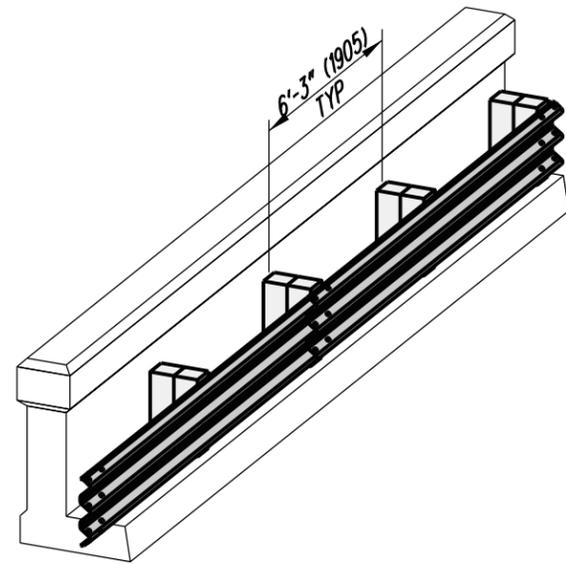
NOTES:

- 1). POSTS 1, 2, 8, & 9 ARE W6 x 9 (W150 X 13.5), 6'-0" (1.89m) LONG, STEEL POSTS AND POSTS 3 THRU 7 ARE 10" (250) x 10" (250) X 6'-6" (1980) TIMBER POSTS.
- 2). POSTS 2 THRU 8 HAVE STANDARD THRIE BEAM OFFSET BLOCKS. POSTS 1 & 9 HAVE STANDARD W-BEAM OFFSET BLOCKS.
- 3). SEE DETAIL B-6, SHEETS 4 & 5 OF 5 FOR NOTES PERTAINING TO THE BRIDGE RAIL RETROFIT SECTIONS.
- 4). THE EXIT END APPLICATION SHALL BE USED ONLY ON DIVIDED HIGHWAYS. FOR ALL OTHER CONDITIONS, THE ENTRANCE END APPLICATION SHALL BE USED ON BOTH ENDS OF THE BRIDGE PARAPET.
- 5). 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 RUBRAIL.
- 6). PLACE P.C.C. CURB, TYPE 1, STARTING AT PARAPET WALL AND TERMINATING AFTER POST 5. TAPER CURB TO FLUSH AT A 1:1 RATIO.

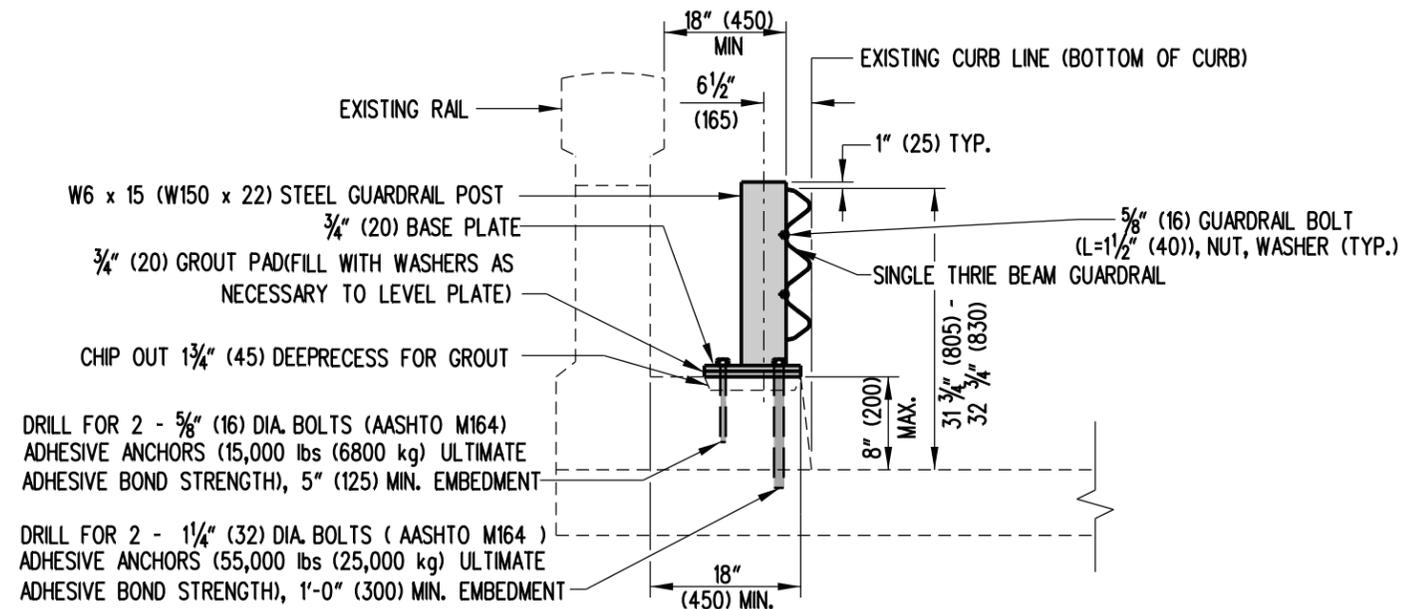


BRIDGE RAIL RETROFIT, ENTRANCE AND END APPLICATIONS			
STANDARD NO.	B-6 (2010)	SHT.	1 OF 5

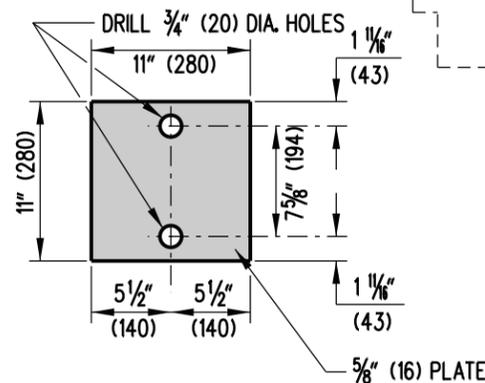
APPROVED	SIGNATURE ON FILE	12/28/2010
	<small>CHIEF ENGINEER</small>	<small>DATE</small>
RECOMMENDED	SIGNATURE ON FILE	12/27/2010
	<small>DESIGN ENGINEER</small>	<small>DATE</small>



BRIDGE RAIL RETROFIT, TYPE 1
SEE NOTE 1



BRIDGE RAIL RETROFIT, TYPE 2
SEE NOTE 2



THRIE BEAM BEARING PLATE DETAIL

NOTES:

- 1). BRIDGE RAIL RETROFIT, TYPE 1 SHALL BE USED WHEN THE PARAPET MONOLITHIC CURB IS 18" (450) OR LESS.
- 2). BRIDGE RAIL RETROFIT, TYPE 2 SHALL BE USED WHEN THE PARAPET MONOLITHIC CURB IS 18" (450) OR WIDER, AND DEAD LOAD CONSIDERATIONS ARE A CONCERN WHEN USING BRIDGE RAIL RETROFIT, TYPE 3 (SEE DETAIL B-6, SHEET 4 OF 5 FOR DETAILS).
- 3). ADHESIVE ANCHORS SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS AND SHALL BE GALVANIZED.
- 4). OFFSET BLOCK THICKNESS SHALL BE ADJUSTED TO ALLOW THE FACE OF THE THRIE BEAM TO BE FLUSH WITH THE BOTTOM OF THE CURB (MINIMUM THICKNESS SHALL BE 4" (100)).

- 5). SEE DETAIL B-6, SHEET 3 OF 5 FOR BRIDGE RAIL RETROFIT, TYPE 2 HARDWARE DETAILS.
- 6). TYPICAL LATERAL SPACING OF OFFSET BLOCKS OR STEEL POSTS THROUGHOUT THE BRIDGE RAIL SECTION SHALL BE 6'-3" (1905). HOWEVER, SPACING MAY NEED TO BE REDUCED TO ACCOMMODATE LINING UP BLOCKS OR POSTS AT THE END OF THE PARAPET.
- 7). USE A THRIE BEAM EXPANSION SECTION AT BRIDGE EXPANSION JOINTS.
- 8). PLACE GUARDRAIL DELINEATORS IN THE UPPER VALLEY OF THE THRIE BEAM AT THE INTERVALS SPECIFIED IN THE DELAWARE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
- 9). SEE DETAIL B-6, SHEET 1 OF 5 FOR ENTRANCE AND END APPLICATION DETAILS.



**DELAWARE
DEPARTMENT OF TRANSPORTATION**

BRIDGE RAIL RETROFIT, TYPES 1 & 2

STANDARD NO.

B-6 (2010)

SHT. **2**

OF **5**

APPROVED

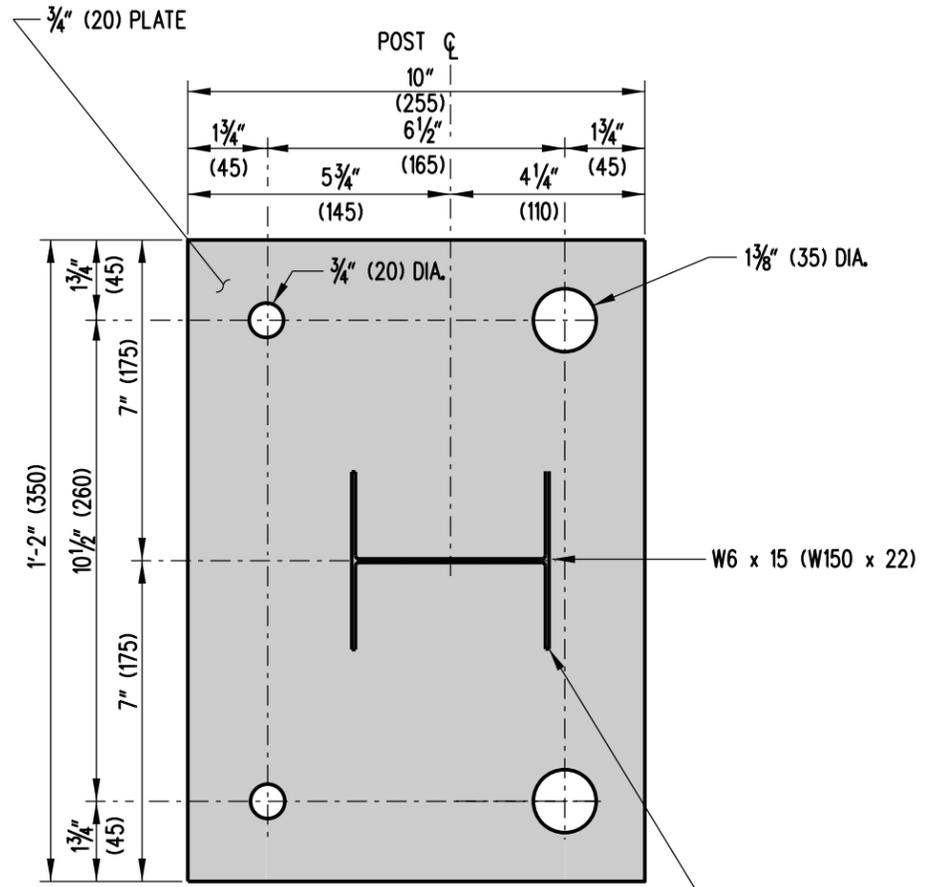
SIGNATURE ON FILE
CHIEF ENGINEER

12/28/2010
DATE

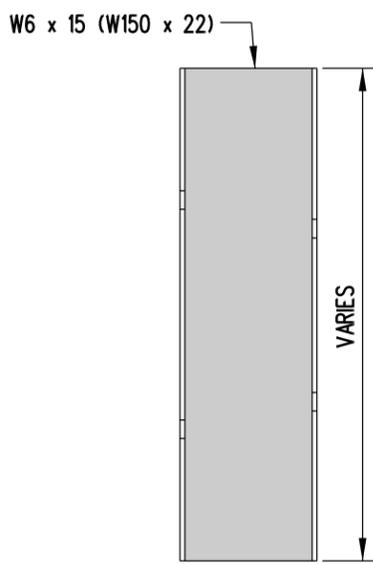
RECOMMENDED

SIGNATURE ON FILE
DESIGN ENGINEER

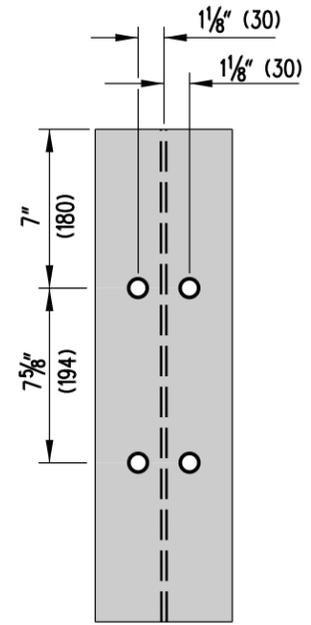
12/27/2010
DATE



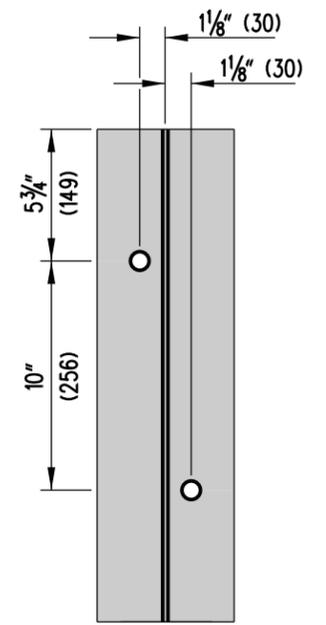
BASE PLATE DETAIL



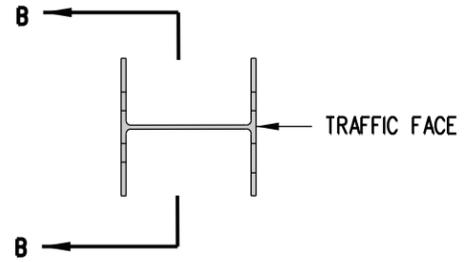
SIDE



FRONT



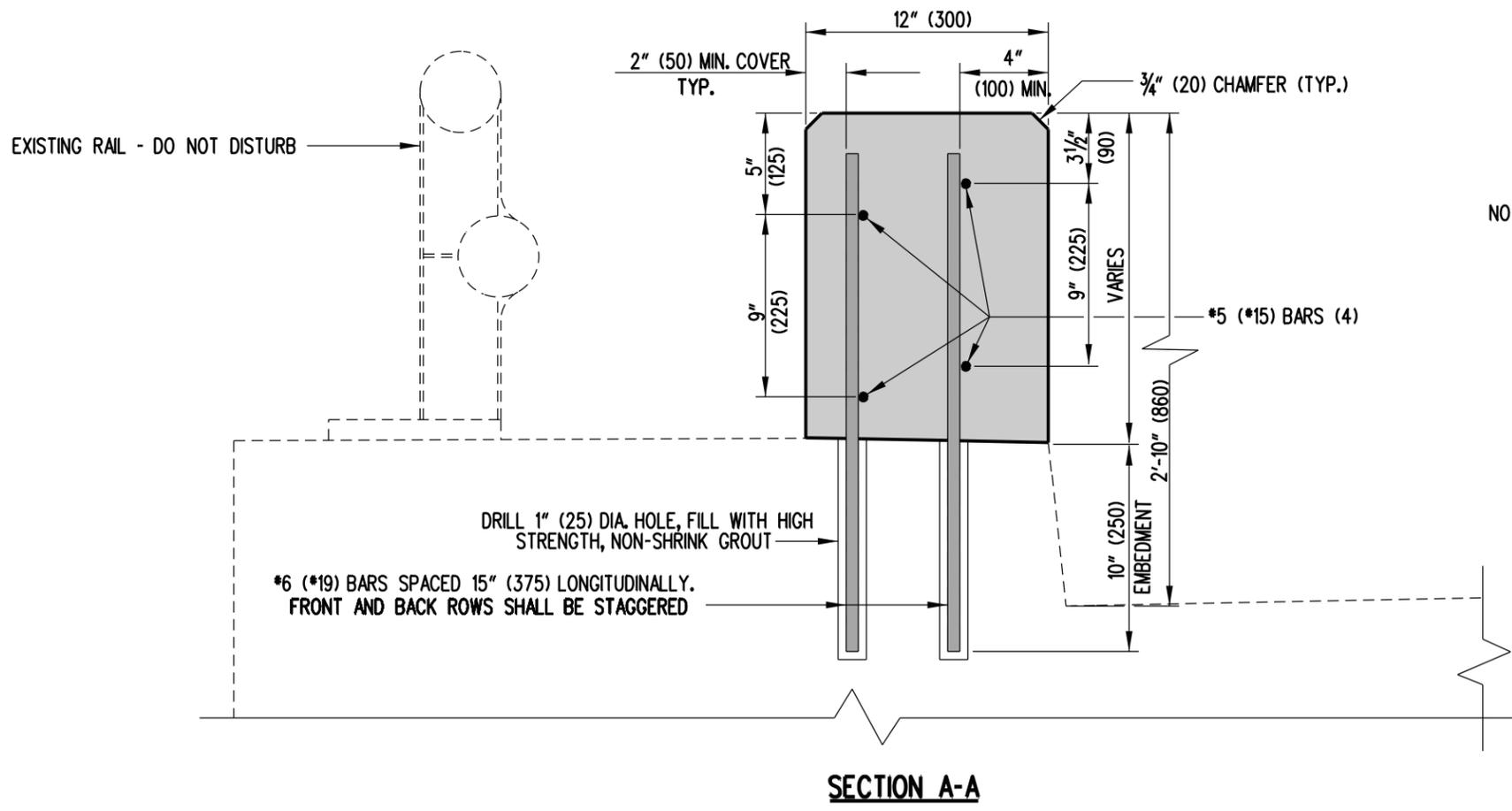
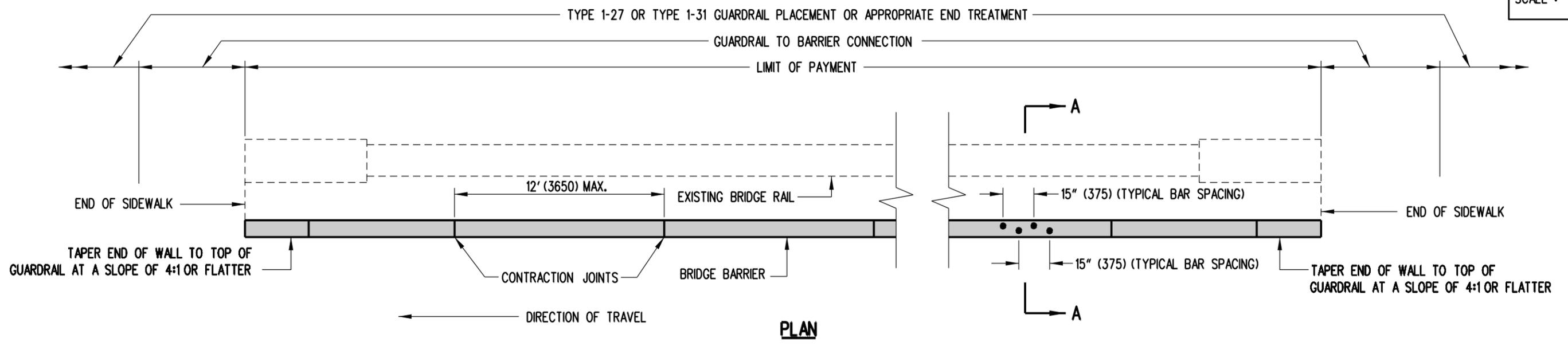
SECTION B-B



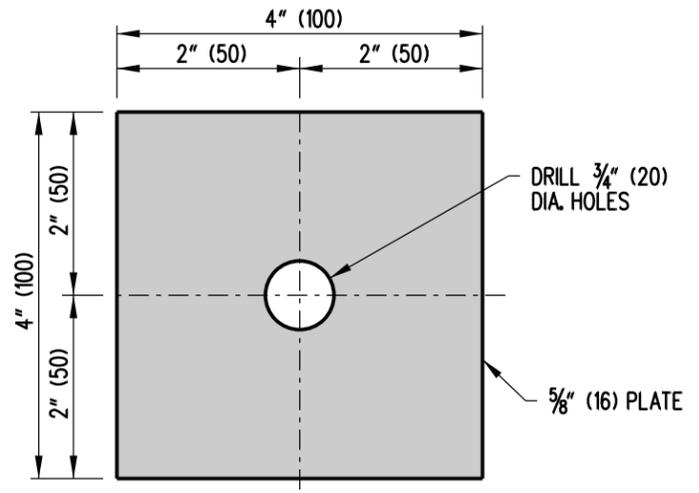
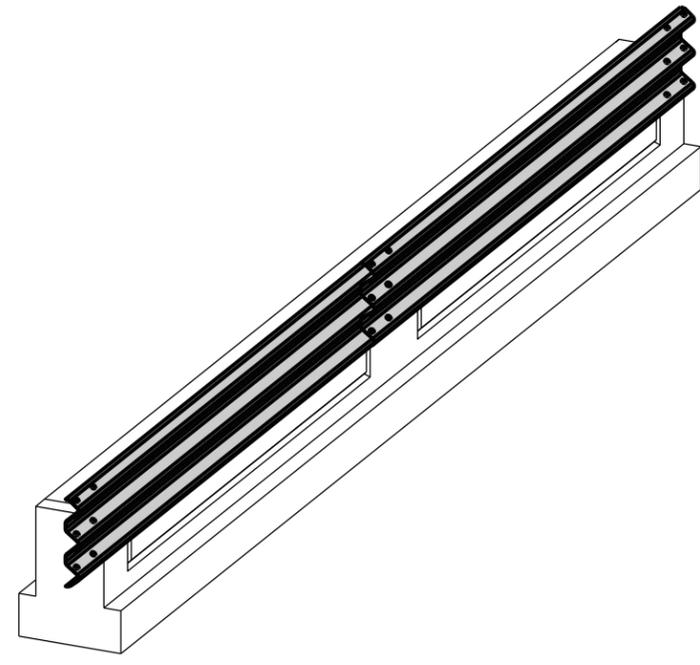
PLAN

WELD ALL AROUND INCLUDING EXTERIOR FLANGE SURFACE

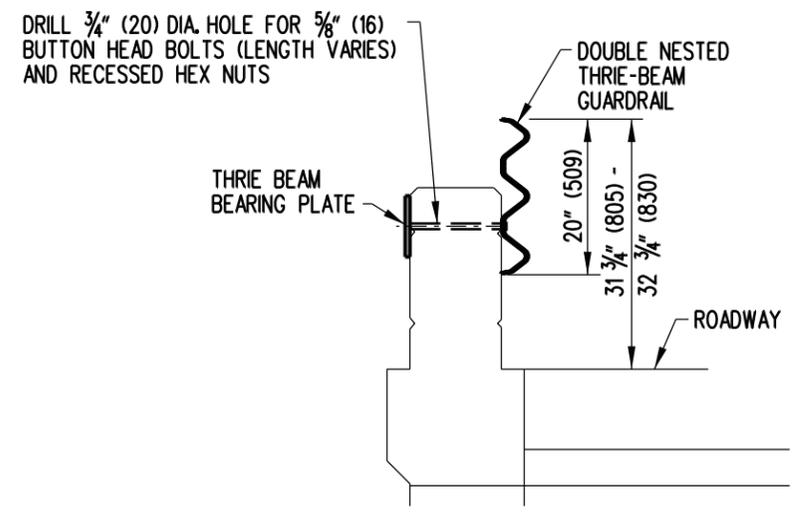
W6 x 15 (W150 x 22) STEEL GUARDRAIL POST



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



THRIE-BEAM BEARING PLATE DETAIL

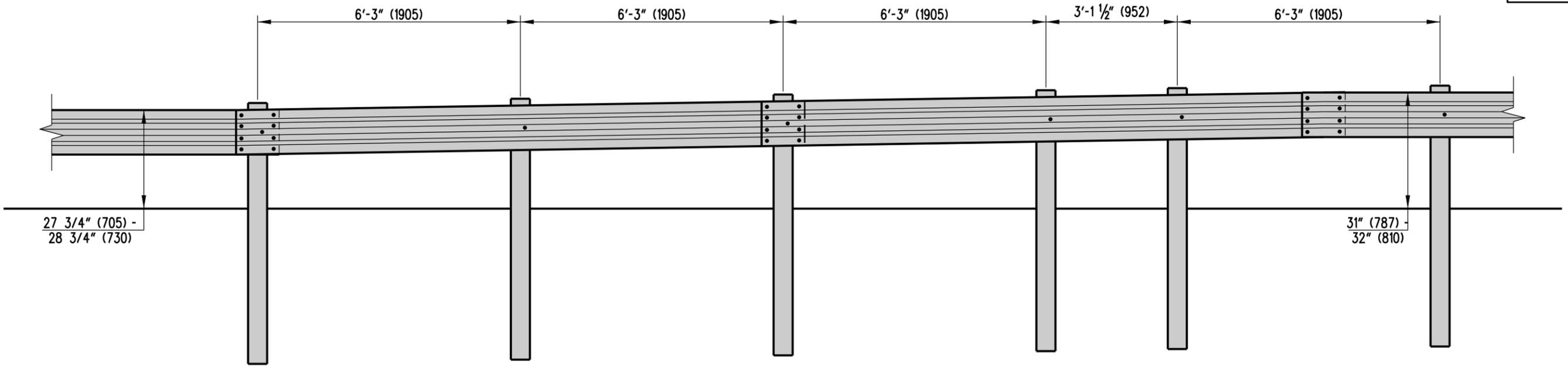


SECTION VIEW

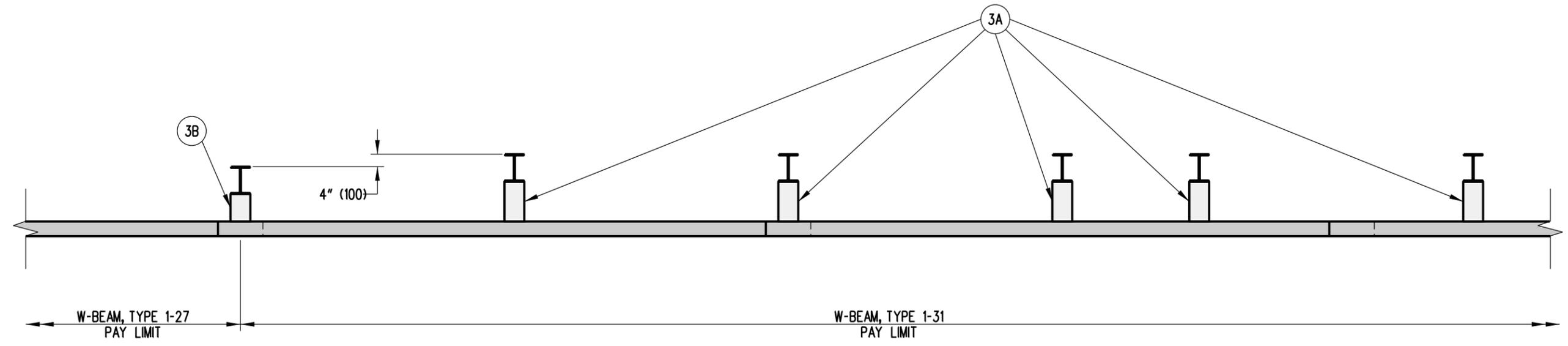
NOTES:

- 1). BRIDGE RAIL RETROFIT, TYPE 4 SHALL BE USED WHEN THE EXISTING PARAPET HEIGHT IS BETWEEN 22" (559) AND 26" (660).
- 2). USE A THRIE-BEAM EXPANSION ELEMENT AT BRIDGE EXPANSION JOINTS.
- 3). PLACE GUARDRAIL DELINEATORS IN THE UPPER VALLEY OF THE THRIE-BEAM AT THE INTERVAL SPECIFIED IN THE DELAWARE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
- 4). SEE DETAIL B-6, SHEET 1 OF 5 FOR ENTRANCE AND EXIT APPLICATION DETAILS AND NOTES.
- 5). SPACING OF WOOD POSTS MAY NEED TO BE REDUCED TO ACCOMMODATE LINING UP POSTS AT THE END OF THE PARAPET.
- 6). 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 RUBRAIL.
- 7). ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.

SCALE : N.T.S.

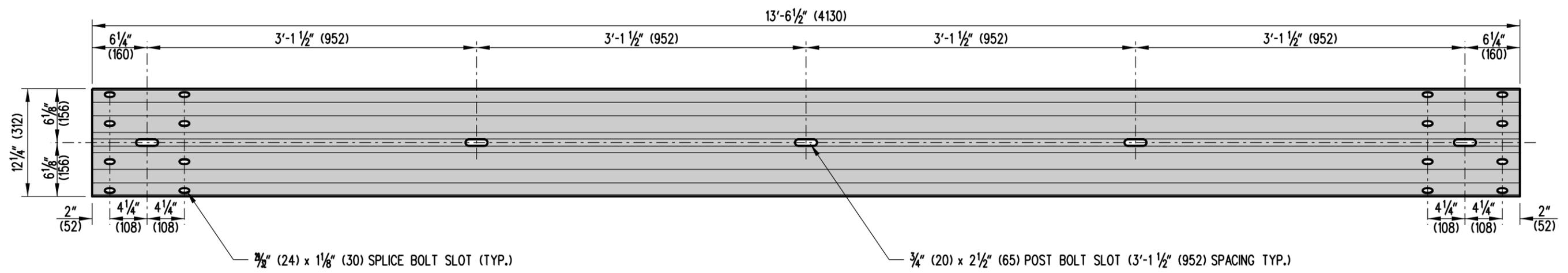


ELEVATION

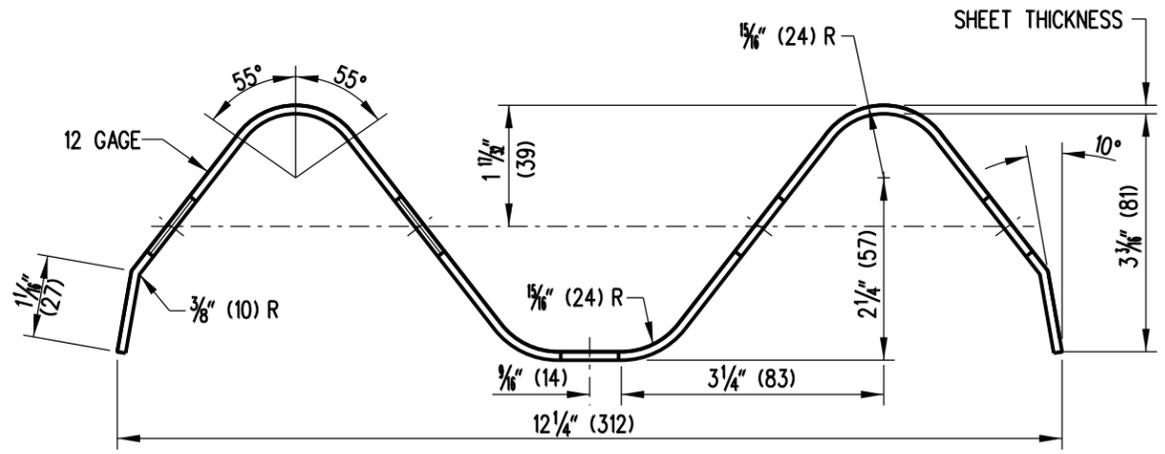


PLAN

 DELAWARE DEPARTMENT OF TRANSPORTATION	W-BEAM, TYPE 1-27 TO TYPE 1-31 TRANSITION SECTION		APPROVED	SIGNATURE ON FILE CHIEF ENGINEER	12/28/2010 DATE
	STANDARD NO. B-7 (2010)	SHT. 1 OF 1	RECOMMENDED	SIGNATURE ON FILE DESIGN ENGINEER	12/27/2010 DATE

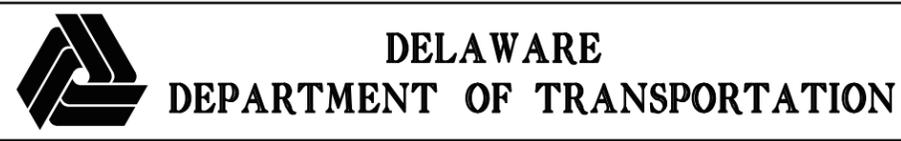


W-BEAM ELEVATION



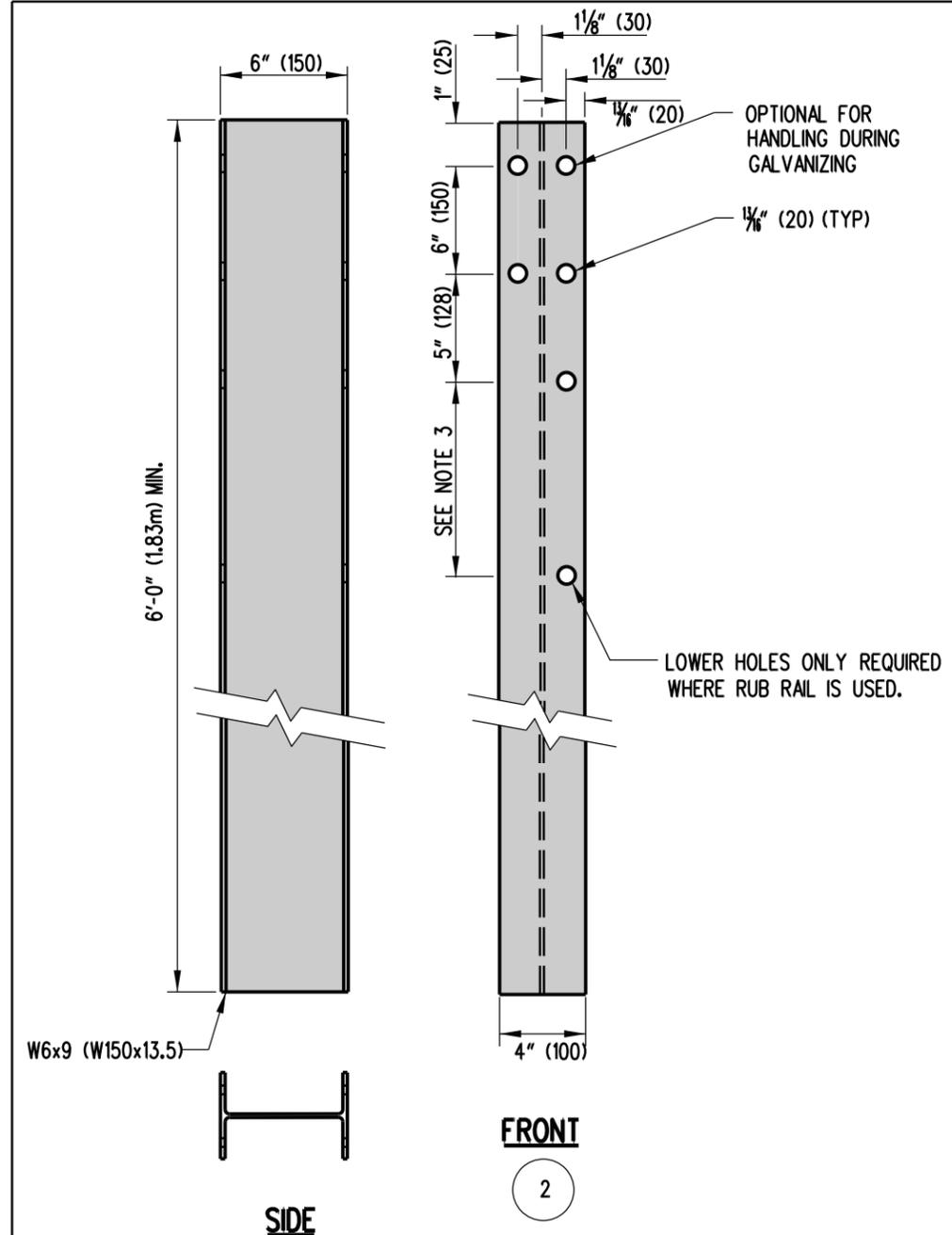
W-BEAM SECTION

NOTE:
 1). FOUR ADDITIONAL 3/4" (20) x 2 1/2" (65) SLOTS SHALL BE PROVIDED AT 3'-1 1/2" (952) SPACING FOR A 26'-1/2" (7940) BEAM LENGTH.

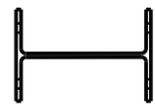


HARDWARE			
STANDARD NO.	B-13 (2010)	SHT.	1 OF 10

APPROVED	SIGNATURE ON FILE	12/28/2010
	CHIEF ENGINEER	DATE
RECOMMENDED	SIGNATURE ON FILE	12/27/2010
	DESIGN ENGINEER	DATE



W6x9 (W150x13.5)

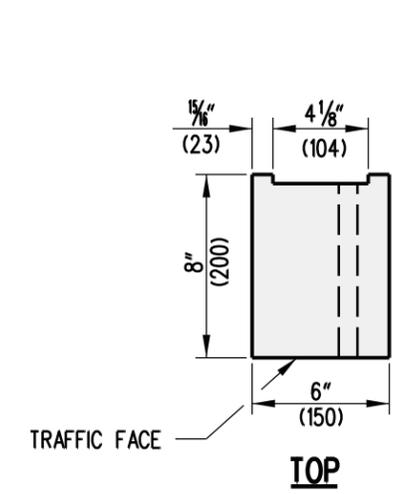


SIDE

FRONT

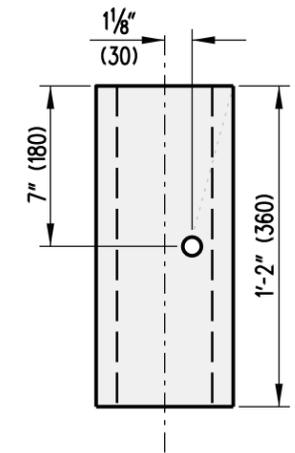
2

POST



TRAFFIC FACE

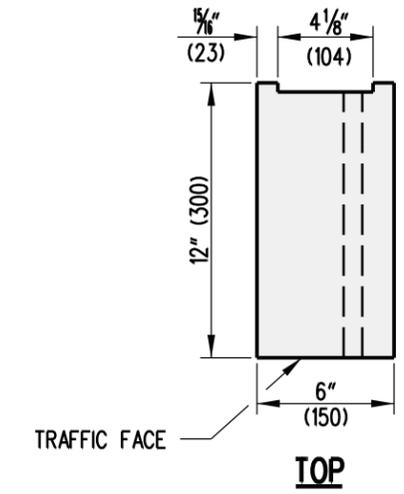
TOP



FRONT

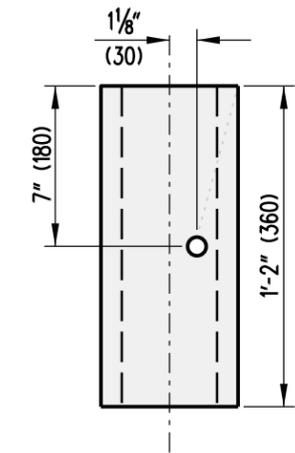
OFFSET BLOCK, TYPE 27

3B



TRAFFIC FACE

TOP



FRONT

OFFSET BLOCK, TYPE 31

3A

W-BEAM STEEL POST AND OFFSET BLOCK

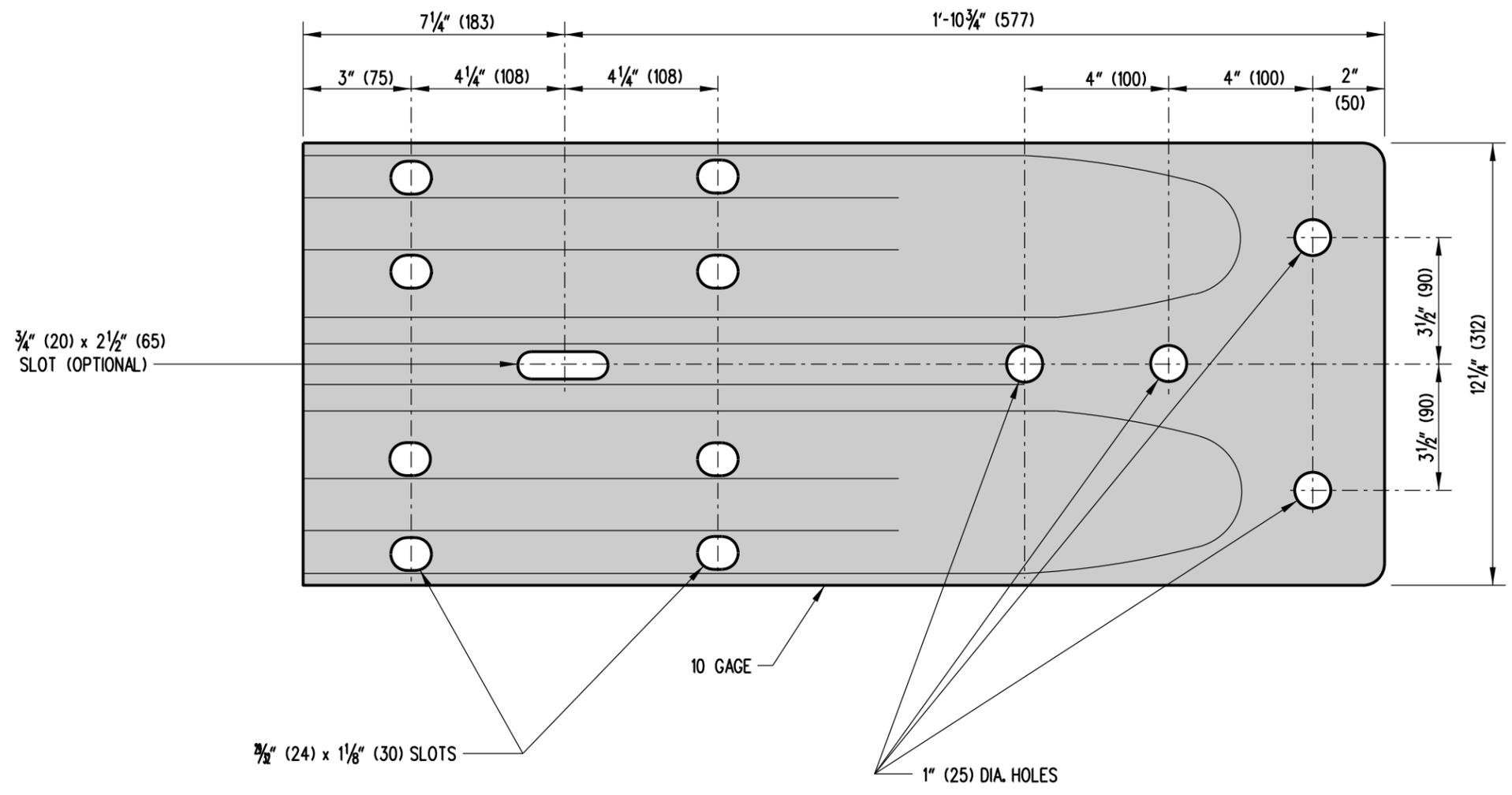
NOTE:

- 1). ALL HOLES SHALL BE 1/4" (20) DIA. BOLT HOLE PATTERN IS SYMMETRICAL WITH RESPECT TO THE VERTICAL AXIS OF THE POST.
- 2). WHERE CONDITIONS REQUIRE, ALTERNATE POST LENGTHS IN INCREMENTS OF 6" (150) MAY BE USED.
- 3). THE RUB RAIL HOLE OFFSET DISTANCE IS 12" (300) FOR GUARDRAIL TO BARRIER CONNECTION, TYPE 1-27 AND 1-31, 1'-2" (360) FOR GUARDRAIL TO BARRIER CONNECTION, TYPE 2-27, AND 1'-6" (460) FOR GUARDRAIL TO BARRIER CONNECTION, TYPE 2-31.

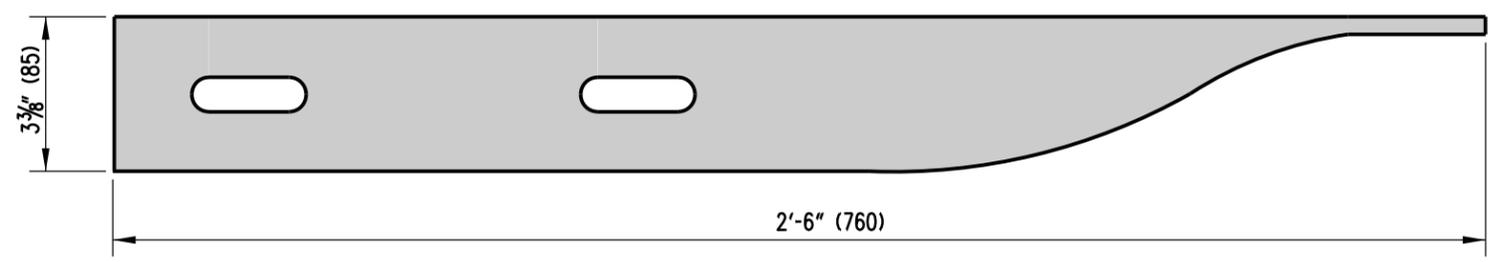
DELAWARE
DEPARTMENT OF TRANSPORTATION

HARDWARE			
STANDARD NO.	B-13 (2010)	SHT.	2 OF 10

APPROVED	SIGNATURE ON FILE	12/28/2010
	CHIEF ENGINEER	DATE
RECOMMENDED	SIGNATURE ON FILE	12/27/2010
	DESIGN ENGINEER	DATE



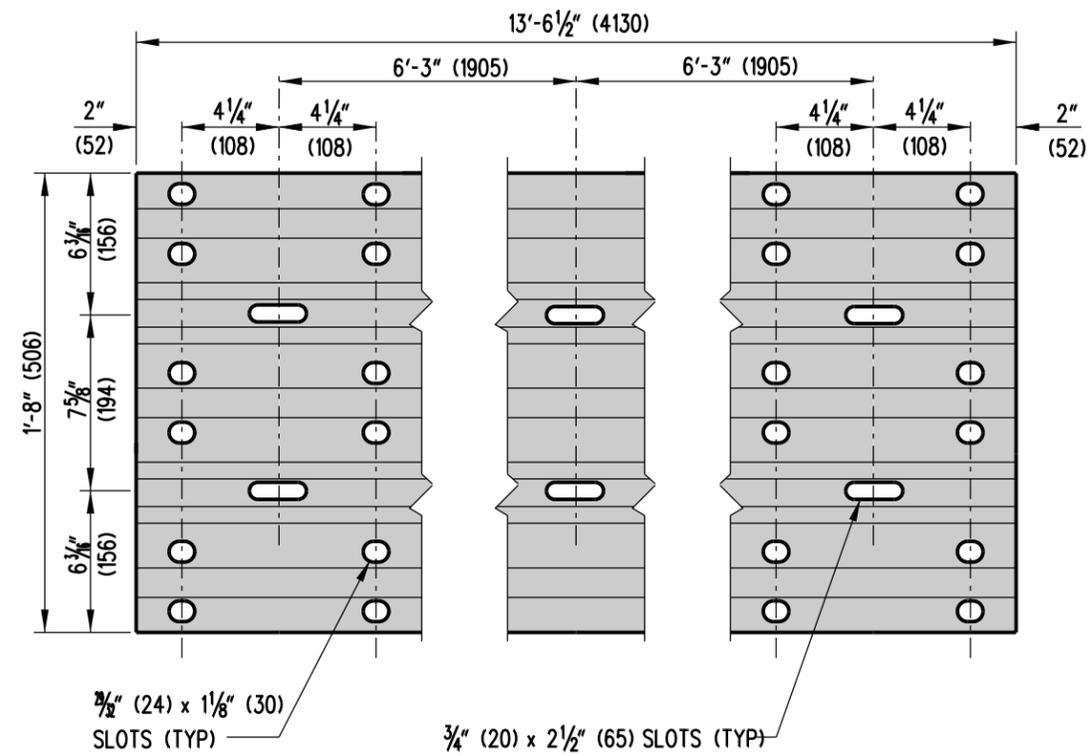
ELEVATION



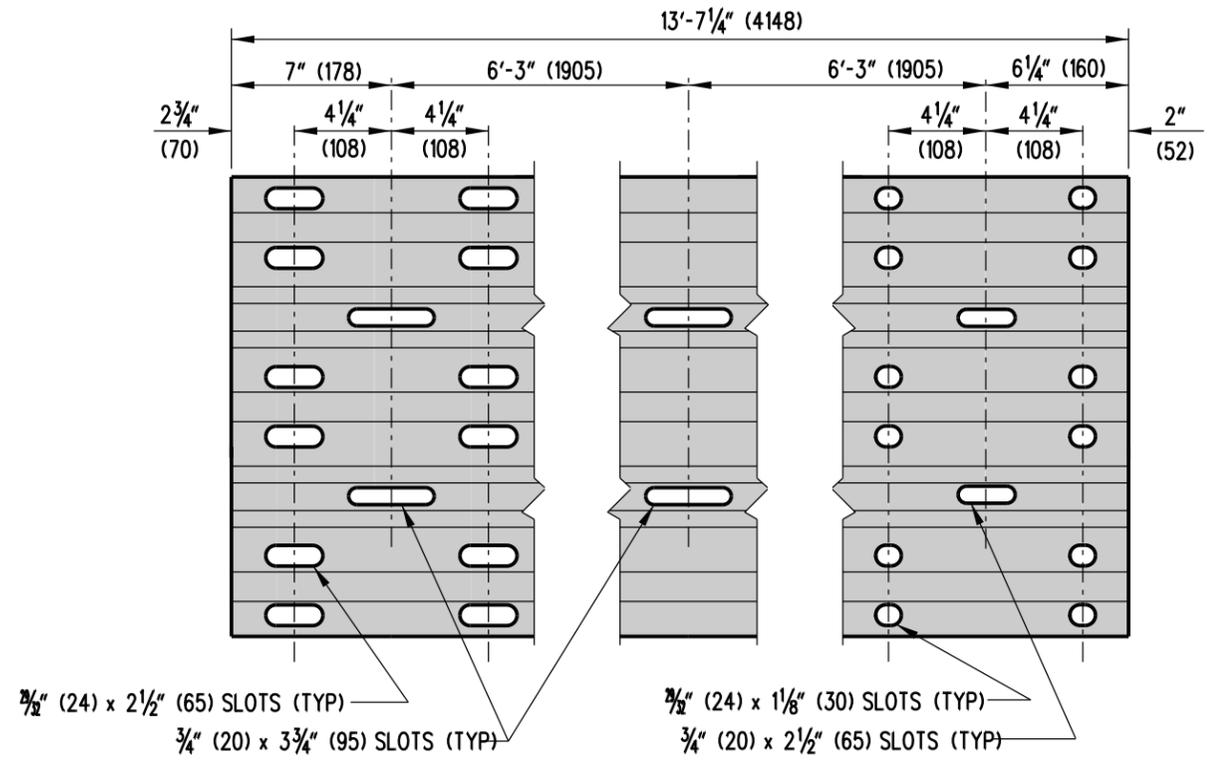
PLAN

W-BEAM TERMINAL CONNECTOR (5)

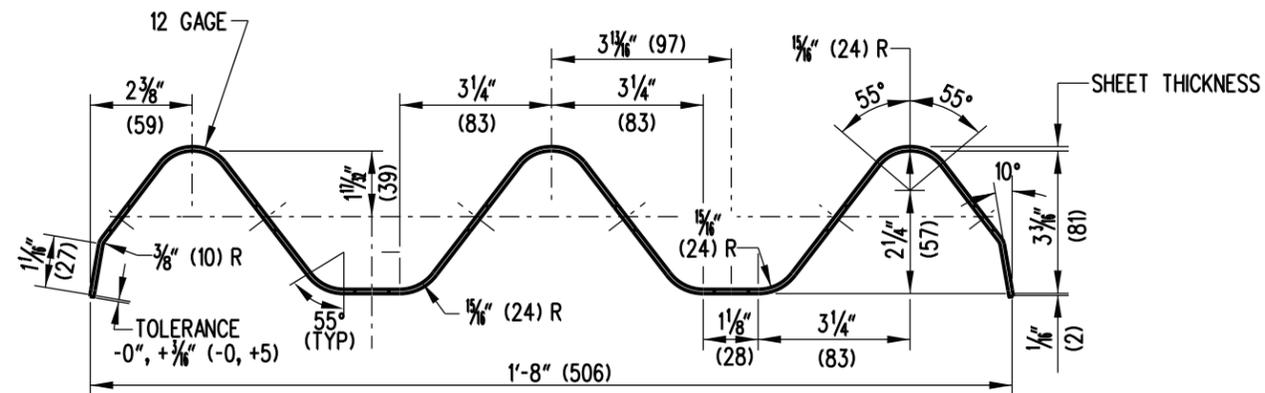
 DELAWARE DEPARTMENT OF TRANSPORTATION	HARDWARE			APPROVED	SIGNATURE ON FILE CHIEF ENGINEER	12/28/2010 DATE
	STANDARD NO. B-13 (2010)	SHT. 3	OF 10	RECOMMENDED	SIGNATURE ON FILE DESIGN ENGINEER	12/27/2010 DATE



THRIE BEAM ELEVATION



THRIE BEAM EXPANSION ELEMENT



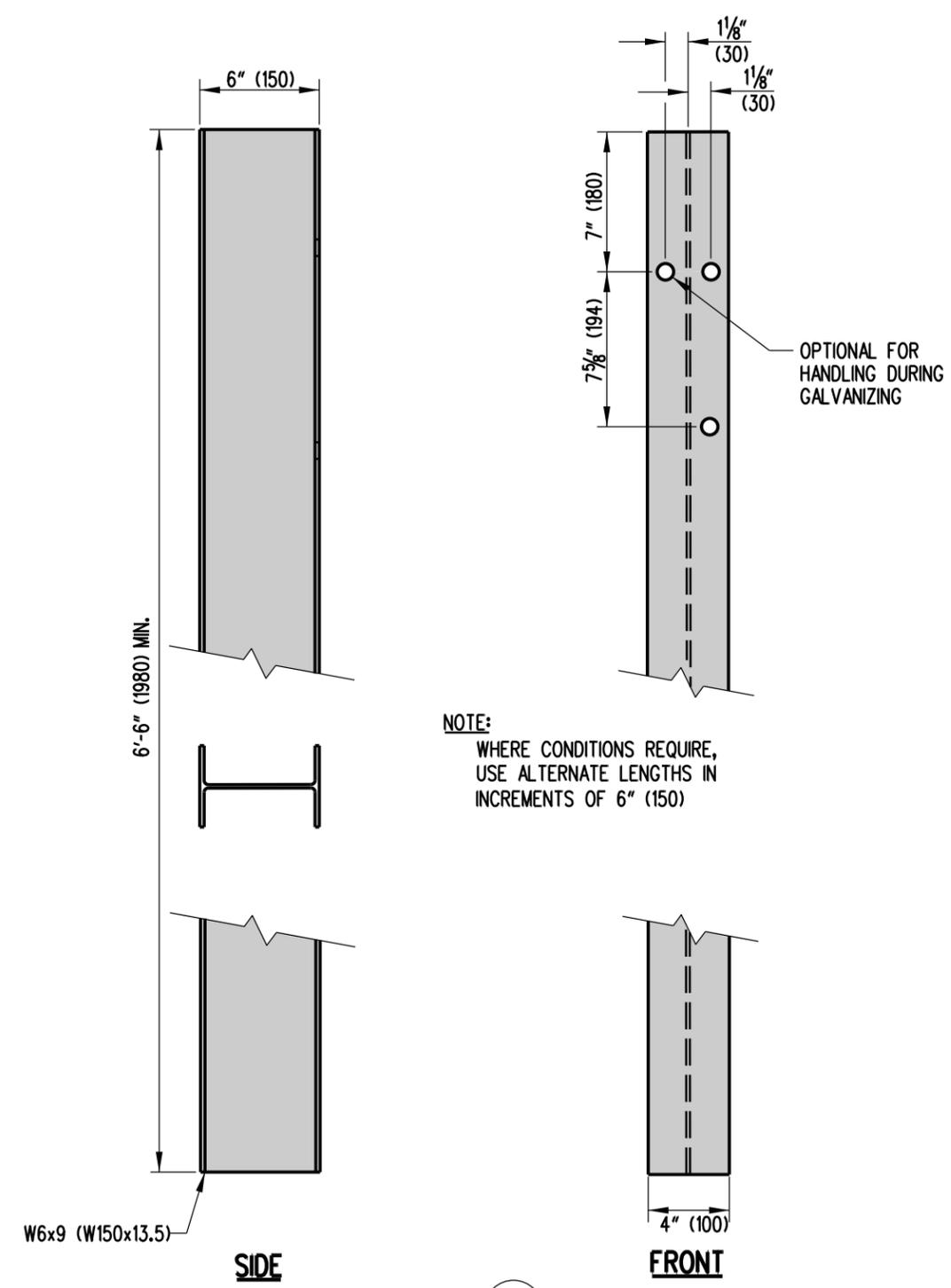
THRIE BEAM SECTION



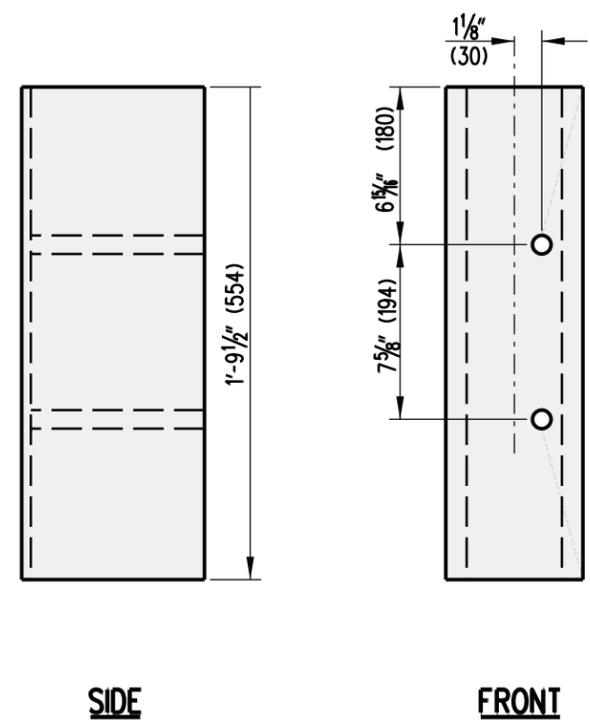
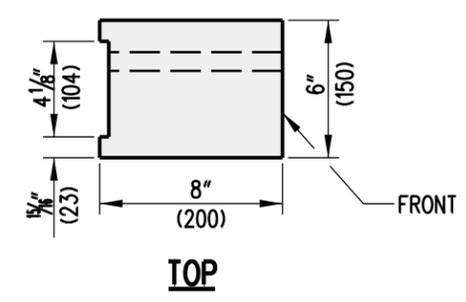
DELAWARE
DEPARTMENT OF TRANSPORTATION

HARDWARE			
STANDARD NO.	B-13 (2010)	SHT.	4 OF 10

APPROVED	SIGNATURE ON FILE	12/28/2010
	CHIEF ENGINEER	DATE
RECOMMENDED	SIGNATURE ON FILE	12/27/2010
	DESIGN ENGINEER	DATE



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

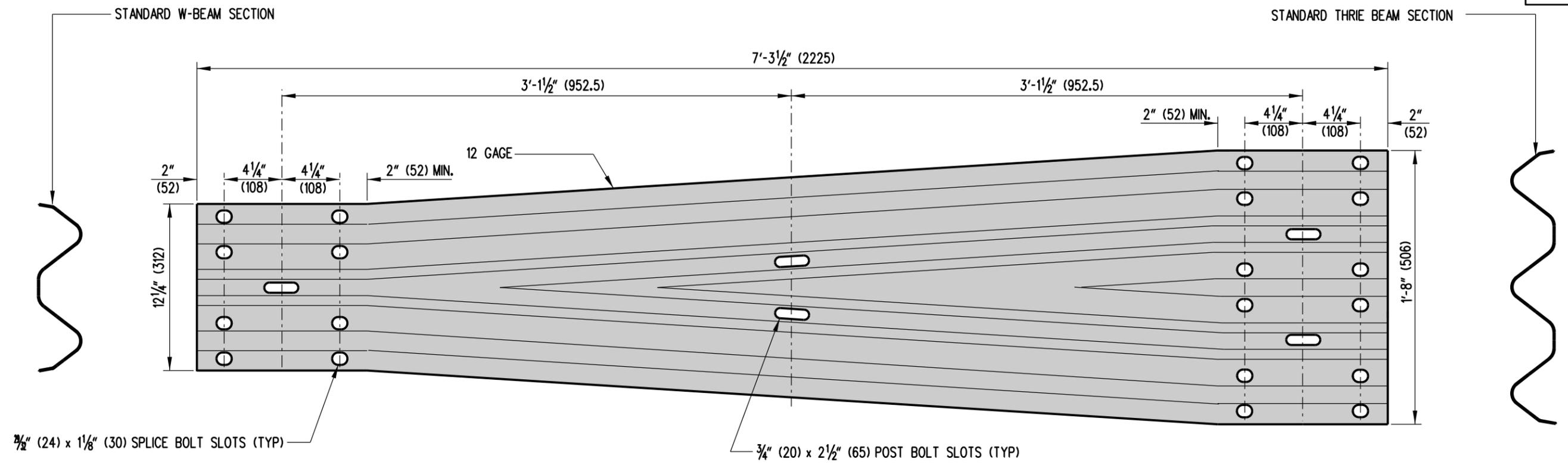


OFFSET BLOCK

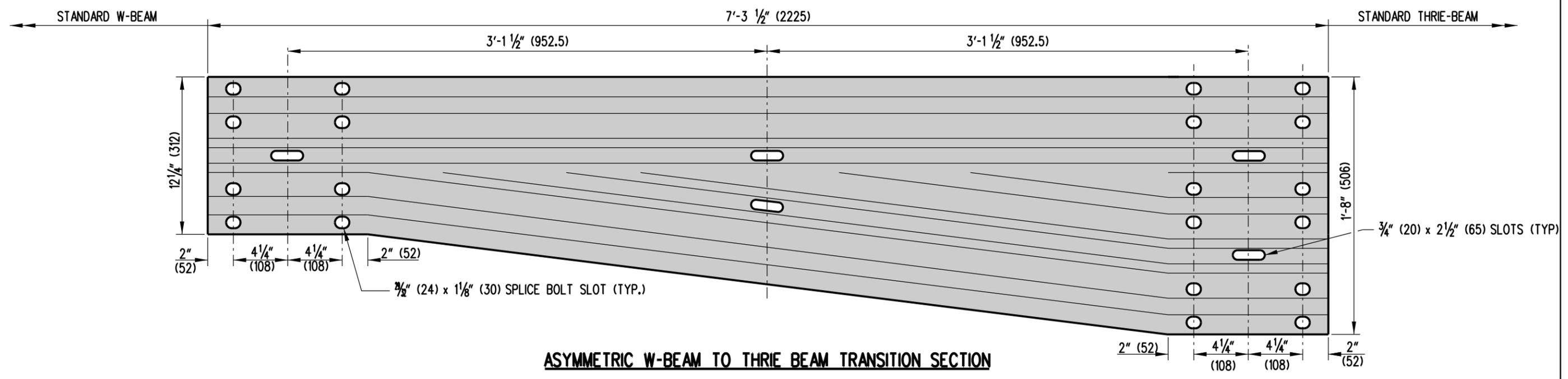
NOTE:
ALL HOLES SHALL BE 1/4" (20) DIA. BOLT HOLE
PATTERN IS SYMMETRICAL WITH RESPECT TO THE
VERTICAL AXIS OF THE POST.

POST 2

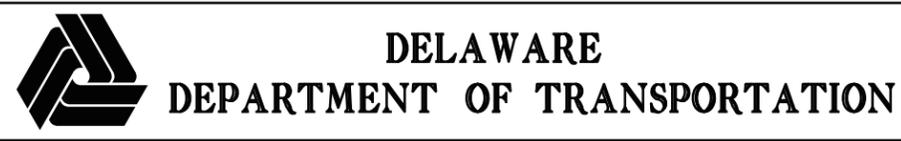
THRIE BEAM STEEL POST AND OFFSET BLOCK



SYMMETRIC W-BEAM TO THRIE BEAM TRANSITION SECTION

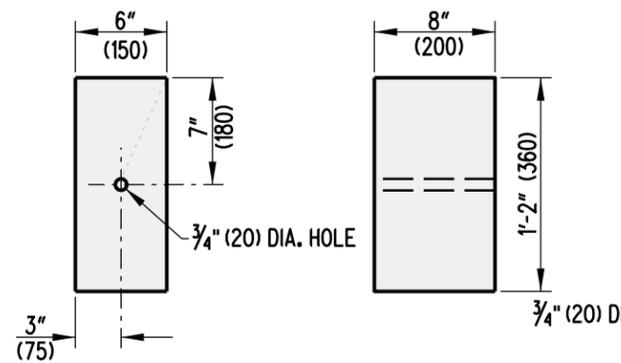


ASYMMETRIC W-BEAM TO THRIE BEAM TRANSITION SECTION

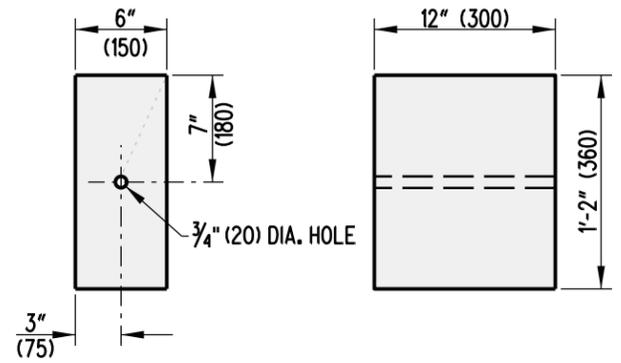


HARDWARE	
STANDARD NO. B-13 (2010)	SHT. 6 OF 10

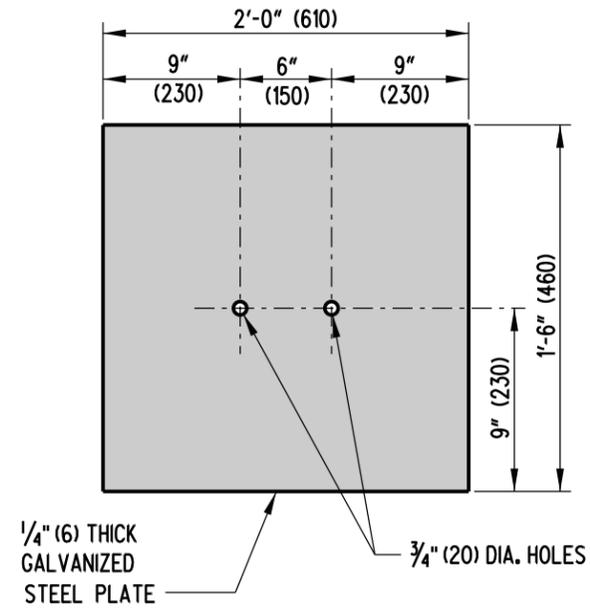
APPROVED	SIGNATURE ON FILE	12/28/2010
	CHIEF ENGINEER	DATE
RECOMMENDED	SIGNATURE ON FILE	12/27/2010
	DESIGN ENGINEER	DATE



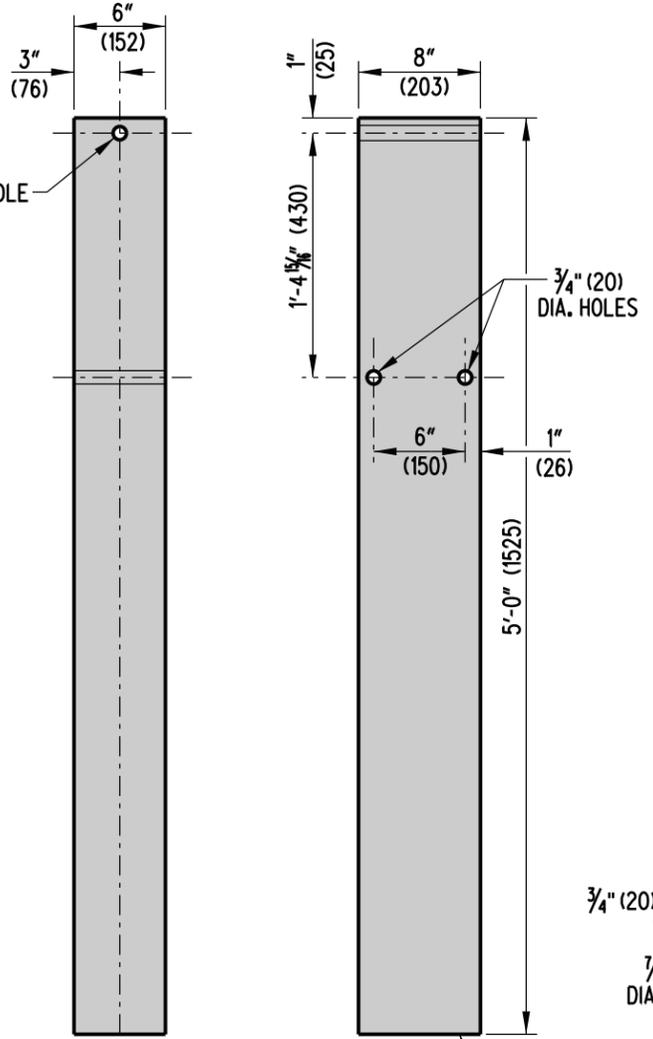
OFFSET BLOCK, TYPE 27



OFFSET BLOCK, TYPE 31



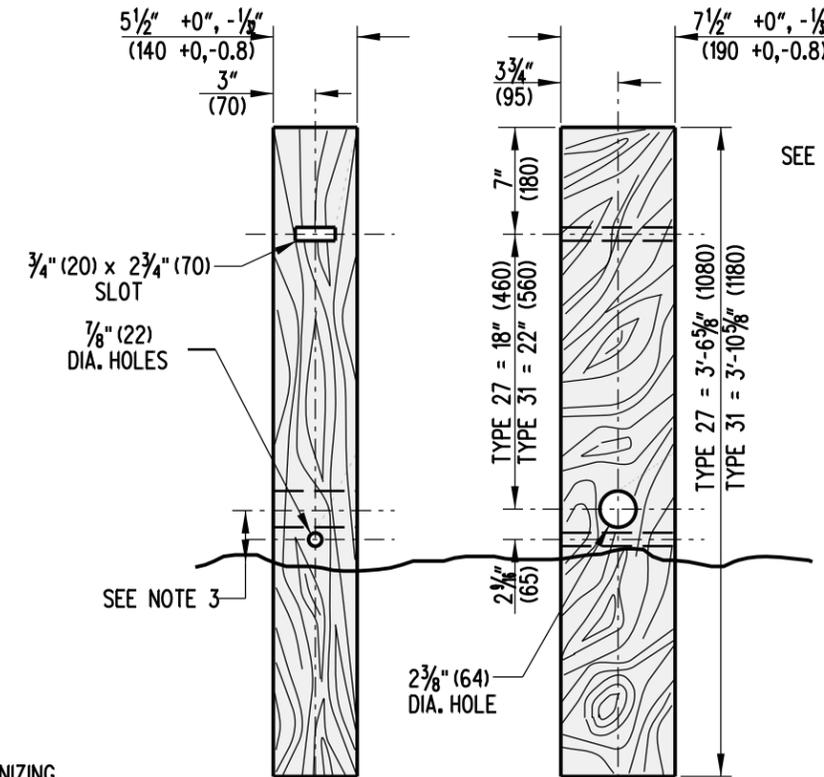
SOIL PLATE



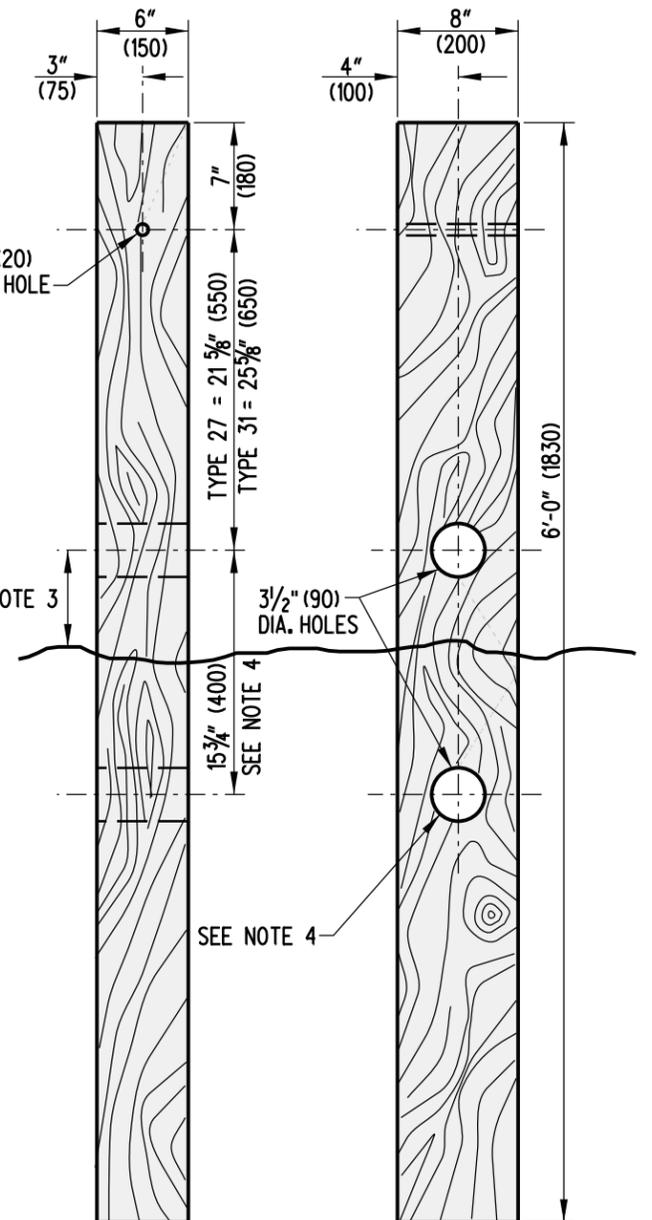
TS-8" X 6" X 3/16"
(TS-203 x 152 x 4.8)
GALVANIZED STEEL TUBING

STEEL TUBE

- NOTES :**
1. ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.
 2. ALL WOOD SIZES ARE NOMINAL DIMENSIONS.
 3. POSTS SHOULD BE PLACED SO THAT BREAKAWAY HOLES ARE NO LOWER THAN GROUND LEVEL AND NO HIGHER THAN 4" (100) ABOVE GROUND LEVEL.
 4. LOWER BREAKAWAY HOLE ONLY NEEDED ON BURIED END SECTION, TYPE 2.

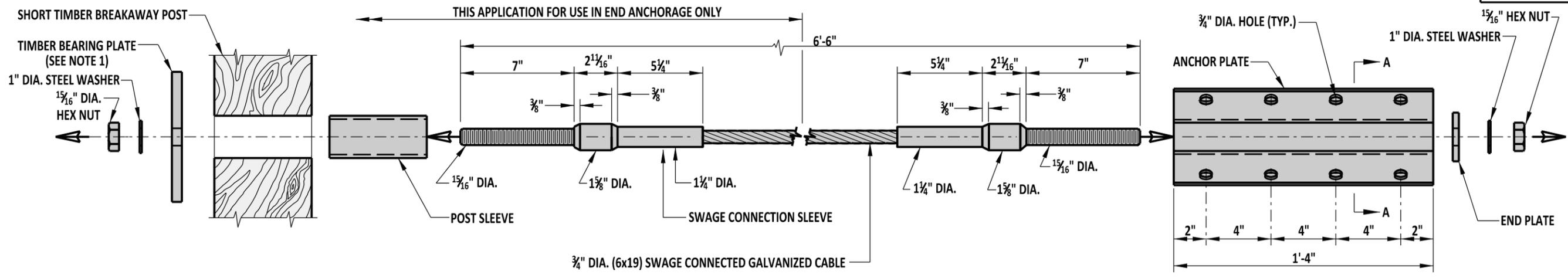


SHORT WOOD BREAKAWAY POST

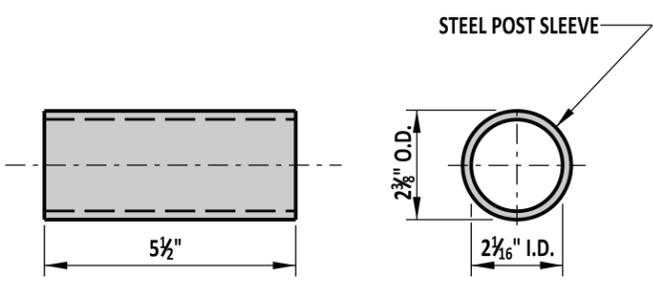


LONG WOOD BREAKAWAY POST

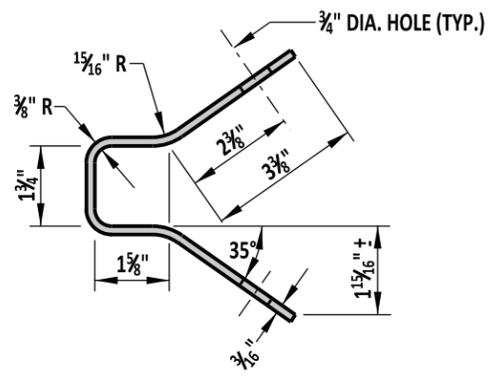
SCALE : NTS



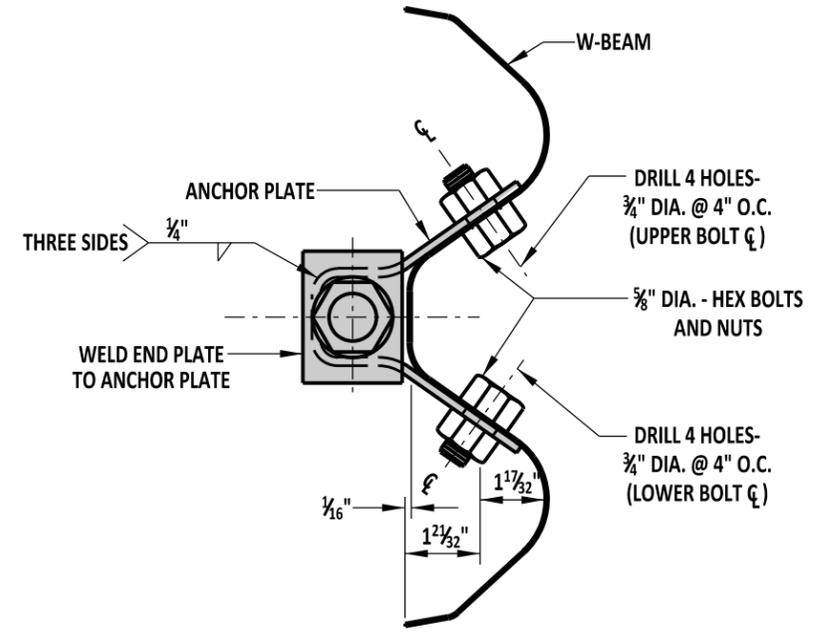
SWAGED CABLE ASSEMBLY AND RELATED HARDWARE ASSEMBLY



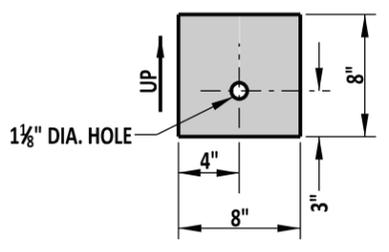
POST SLEEVE



SECTION A-A

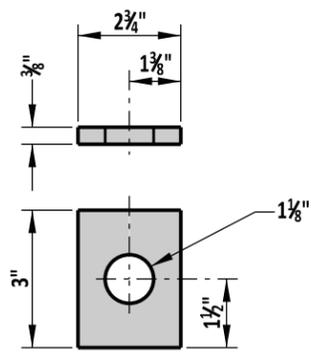


ANCHOR PLATE TO W-BEAM CONNECTION DETAIL



TIMBER BEARING PLATE

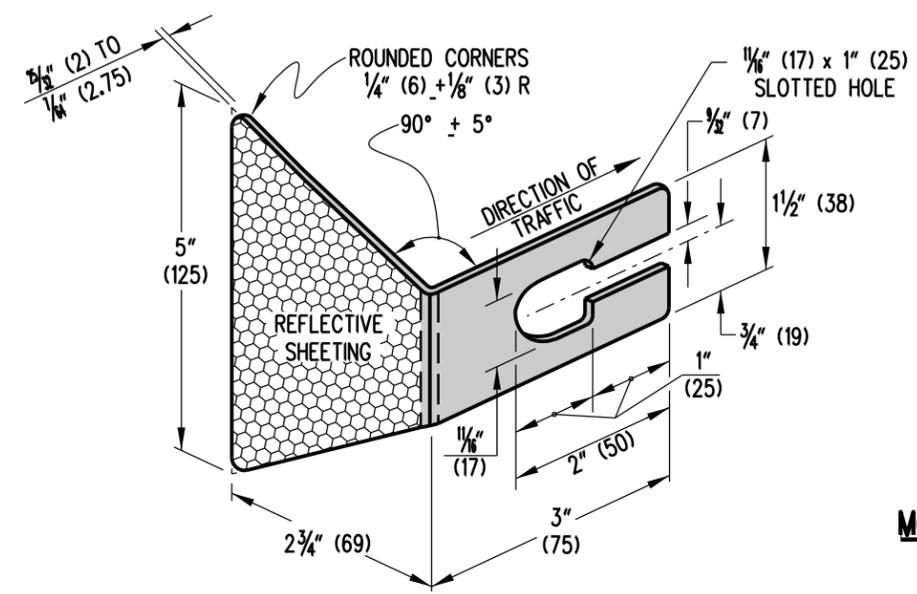
5/8" THICKNESS



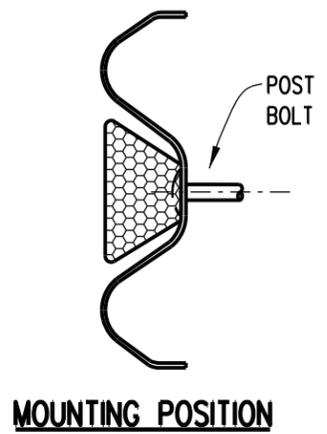
END PLATE

NOTES:

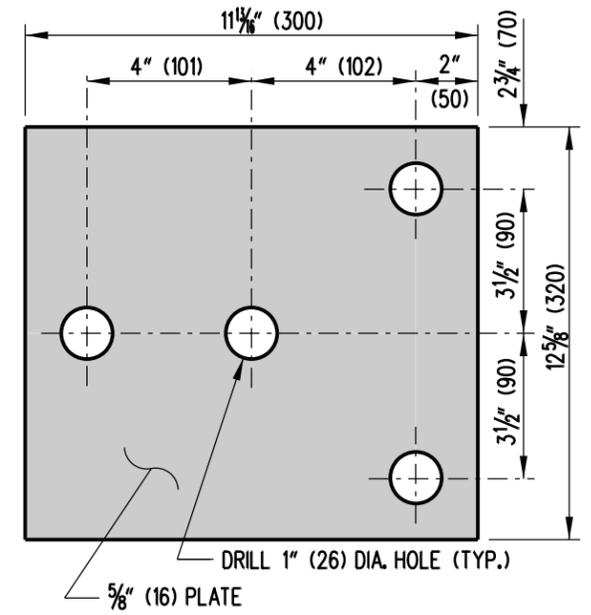
- 1). PLACE A 1/2" WIDE GALVANIZED RETAINING TIE STRAP AROUND THE SHORT TIMBER BREAKAWAY POST AND TIMBER BEARING PLATE TO ENSURE PROPER ORIENTATION OF THE TIMBER BEARING PLATE.
- 2). TIGHTEN ASSEMBLY UNTIL CABLE IS TAUGHT.
- 3). ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.



GUARDRAIL DELINEATOR

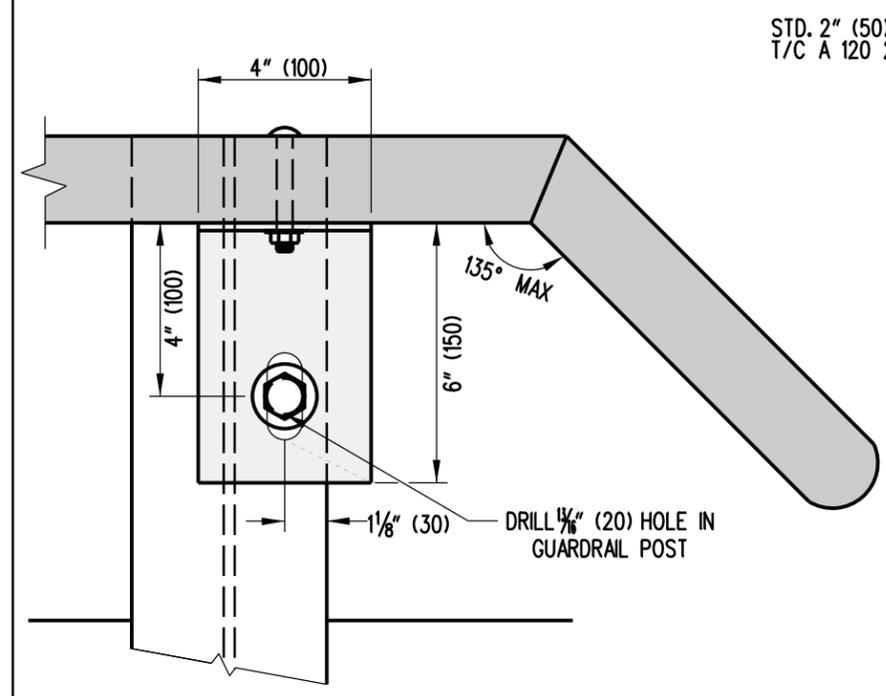


MOUNTING POSITION

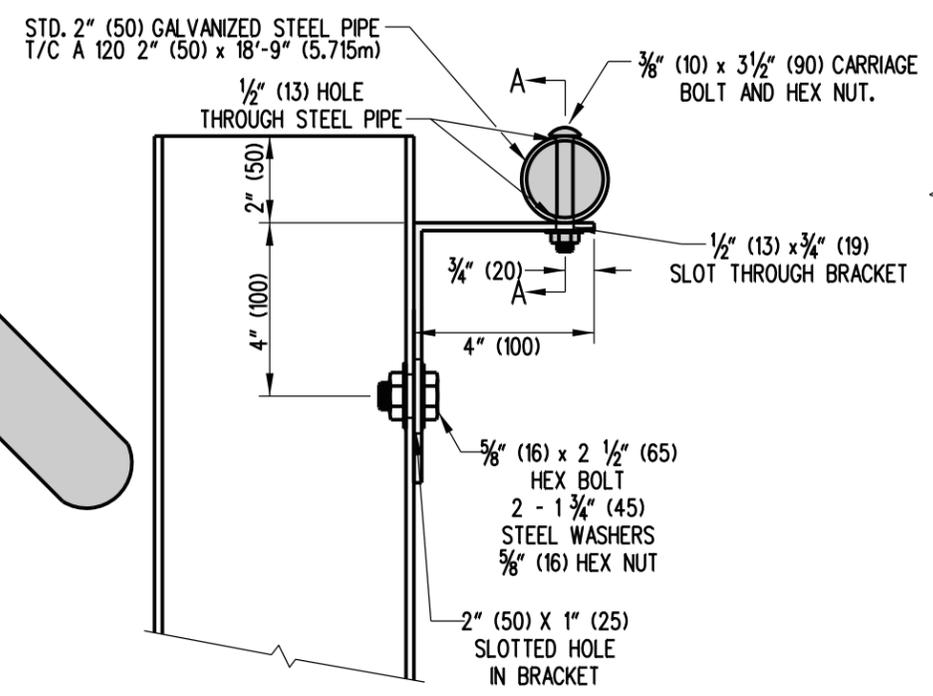


W-BEAM BEARING PLATE DETAIL

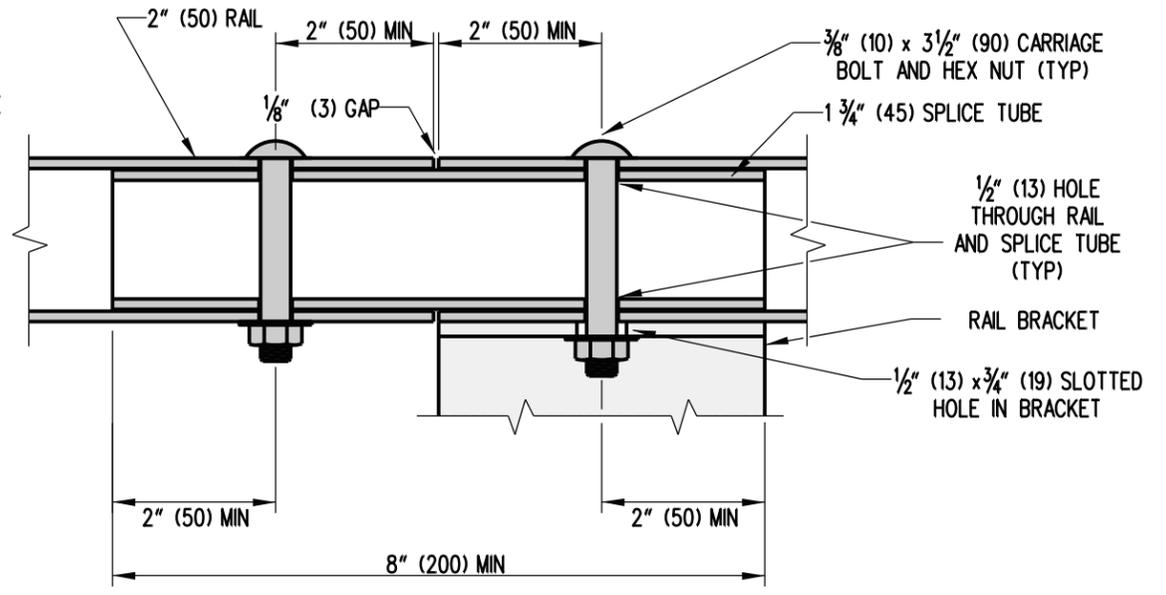
11



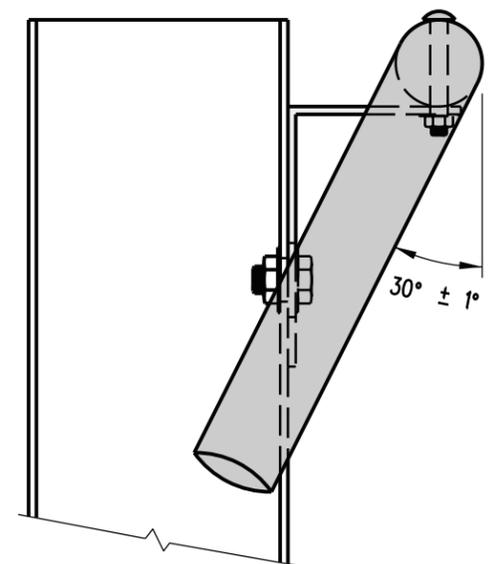
REAR VIEW WITH START & END SECTION



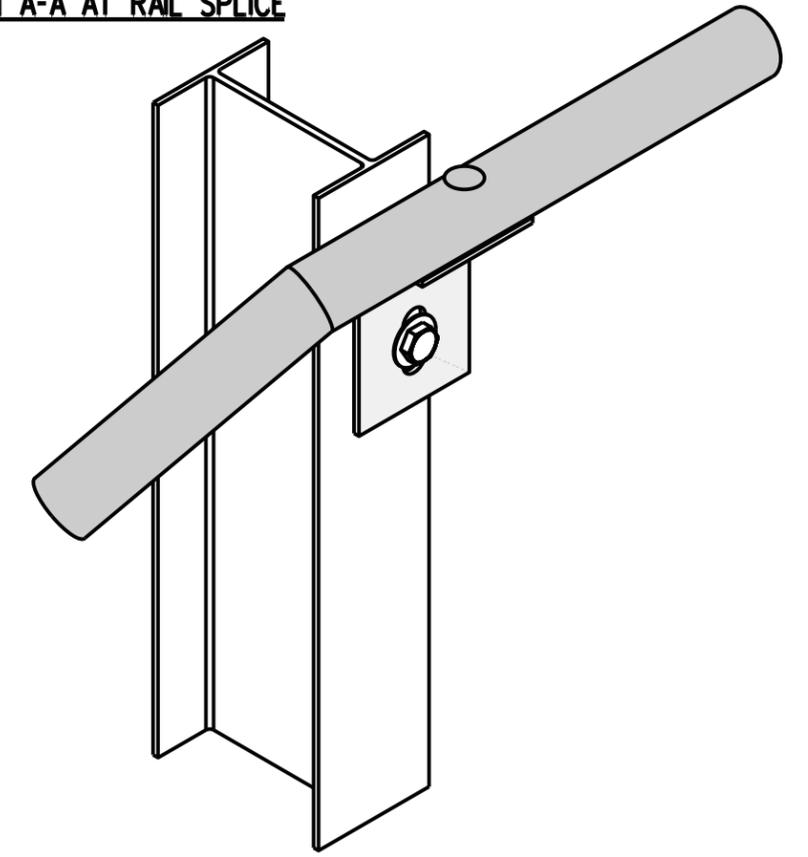
SIDE VIEW



SECTION A-A AT RAIL SPLICE

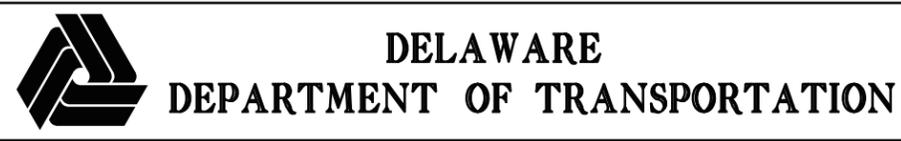


SIDE VIEW WITH START & END SECTION



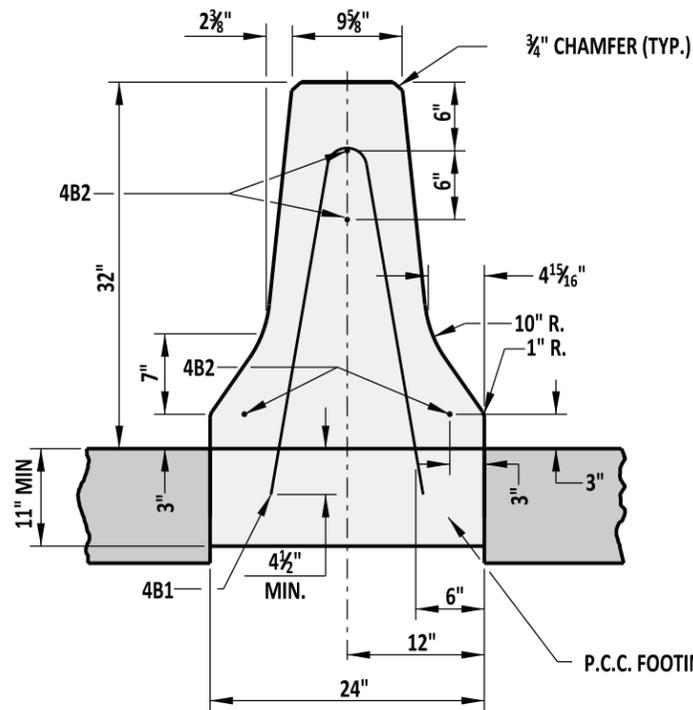
ISOMETRIC VIEW WITH START & END SECTION

- NOTES:**
- 1). RAIL SHALL BE MOUNTED ON GUARDRAIL ADJACENT TO A BIKEWAY OR SIDEWALK.
 - 2). ALL COMPONENTS OF THE RAIL SHALL BE SHOP FABRICATED. ALL CUTTING AND DRILLING SHALL BE DONE IN THE SHOP.
 - 3). ALL EXPOSED THREADED HARDWARE SHALL BE BURRED.
 - 4). GUARDRAIL POSTS UPON WHICH RAIL IS TO BE INSTALLED SHALL BE SHOP DRILLED FOR THE RAIL BRACKETS DURING FABRICATION.
 - 5). ALL RAIL SPLICES WILL BE AT RAIL SUPPORT BRACKETS, THE SAME BOLT USED TO ATTACH THE RAIL TO THE BRACKET WILL BE USED TO SECURE THE SPLICE TUBE.
 - 6). RAILS SHALL BE INSTALLED ONLY ON STANDARD W-BEAM SECTIONS AND AT LEAST ONE POST AWAY FROM THE PAYMENT LIMITS OF THE END TREATMENT.

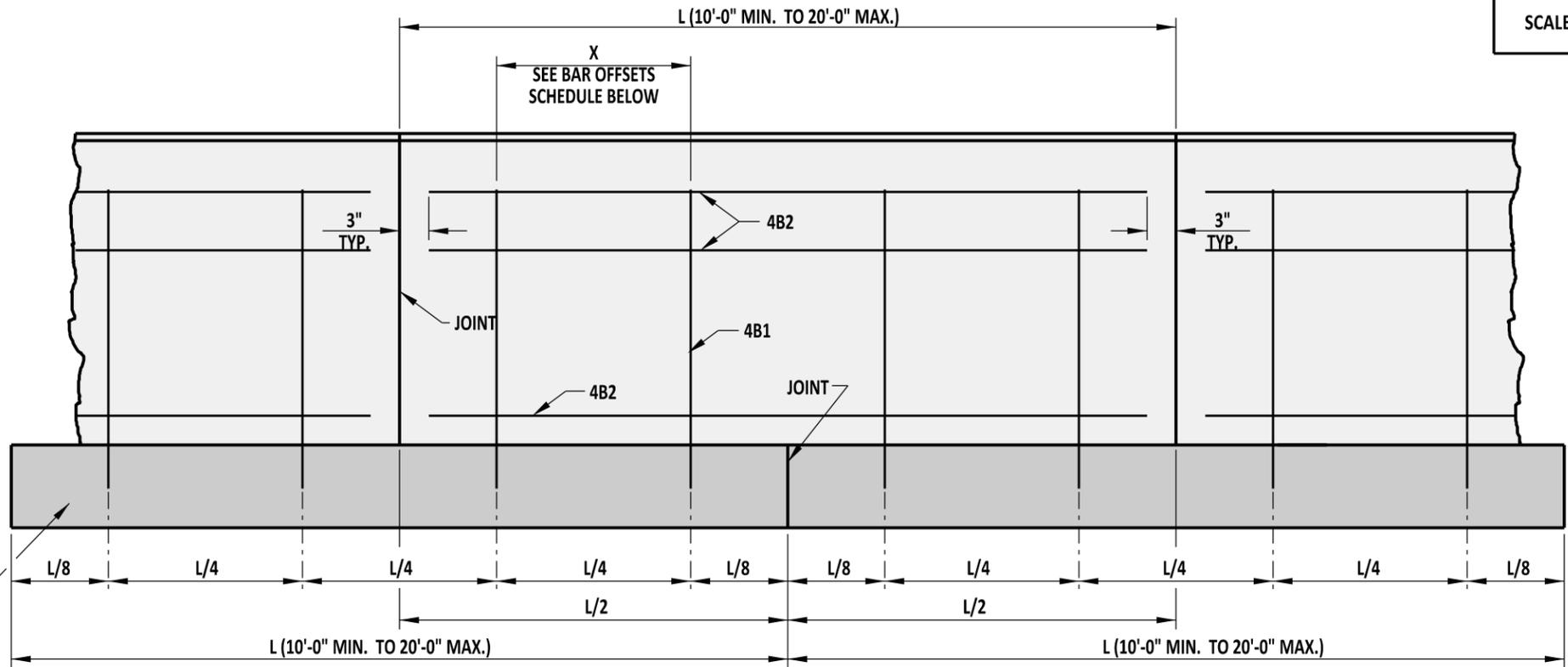


GUARDRAIL MOUNTED RAIL			
STANDARD NO.	B-13 (2010)	SHT. 10	OF 10

APPROVED	SIGNATURE ON FILE CHIEF ENGINEER	12/28/2010 DATE
RECOMMENDED	SIGNATURE ON FILE DESIGN ENGINEER	12/27/2010 DATE

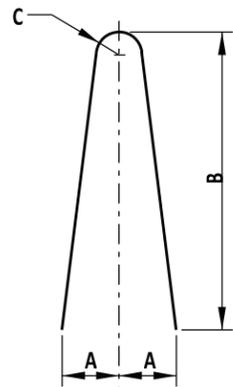


SECTION



ELEVATION

TYPICAL CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION



TYPE '1' BAR

BAR OFFSETS		
NOMINAL LENGTH OF BARRIER SECTION (L)	X	NO. REQ'D FOR EACH BARRIER SECTION
20'-0"	5' - 0"	4
18'-0"	4' - 6"	4
16'-0"	4' - 0"	4
14'-0"	3' - 6"	4
12'-0"	3' - 0"	4
10'-0"	2' - 6"	4

BAR LIST							
MARK	SIZE	NUMBER IN EACH SECTION	LENGTH	TYPE	A	B	C
4B1	4	**	5'-4"	1	7"	30 1/2"	2"
4B2	4	4	*	STR.	N/A	N/A	N/A

* THE LENGTH OF BAR 4B2 SHALL BE 6" 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 1/2" MIN.
- 2). FOR SLIP-FORM CONSTRUCTION, THE 4B2 BARS SHALL BE PLACED AS ONE CONTINUOUS PIECE. THE BARS SHALL OVERLAP A MINIMUM OF 12" IN THIS CASE.
- 3). FOR SLIP-FORM CONSTRUCTION, A JOINT SHALL BE CUT IN THE BARRIER EVERY 10'-0" AT A MAX DEPTH OF 1/2"



**DELAWARE
DEPARTMENT OF TRANSPORTATION**

32" CONCRETE SAFETY BARRIER (F SHAPE)

STANDARD NO. B-14 (2012) SHT. 1 OF 4

APPROVED

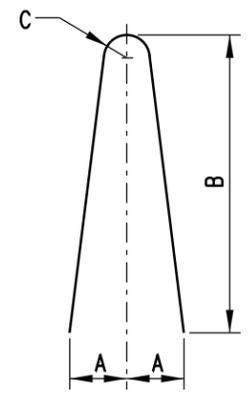
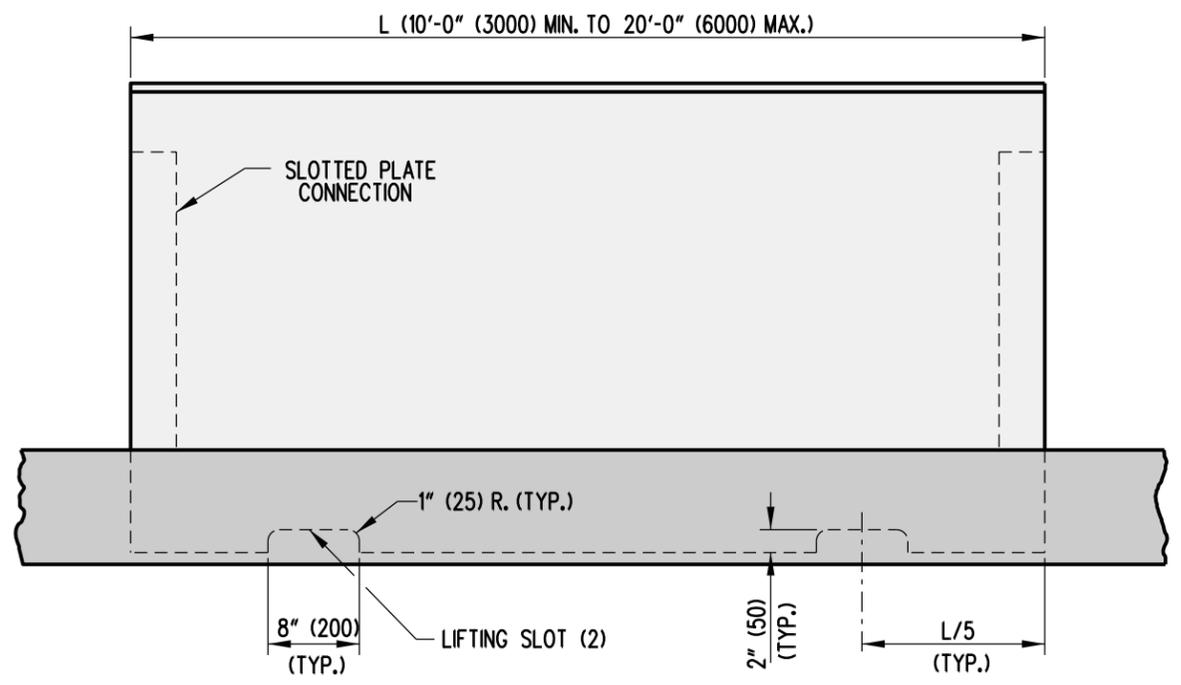
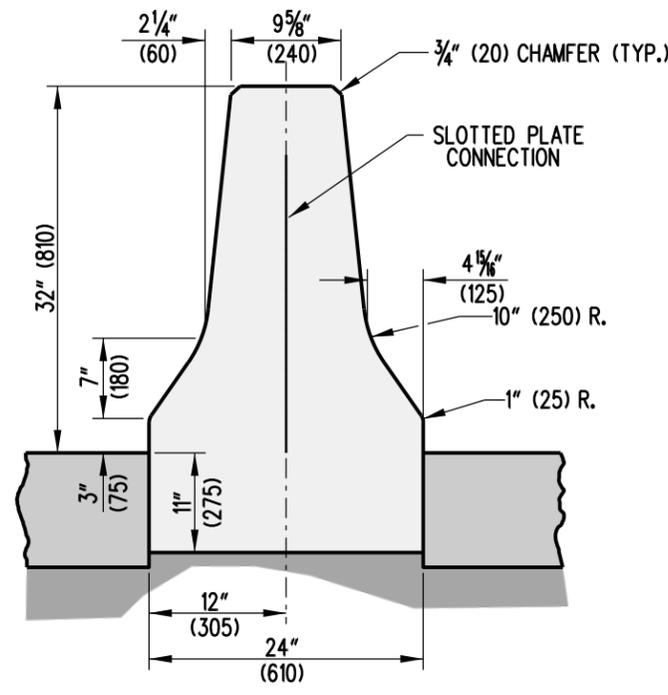
SIGNATURE ON FILE
CHIEF ENGINEER

01/07/2013
DATE

RECOMMENDED

SIGNATURE ON FILE
DESIGN ENGINEER

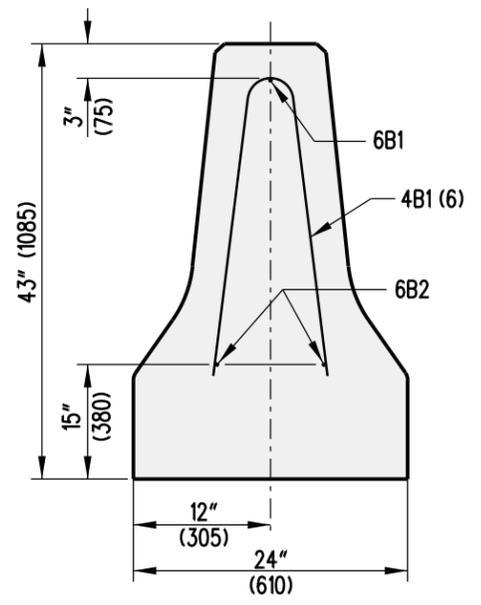
12/20/2012
DATE



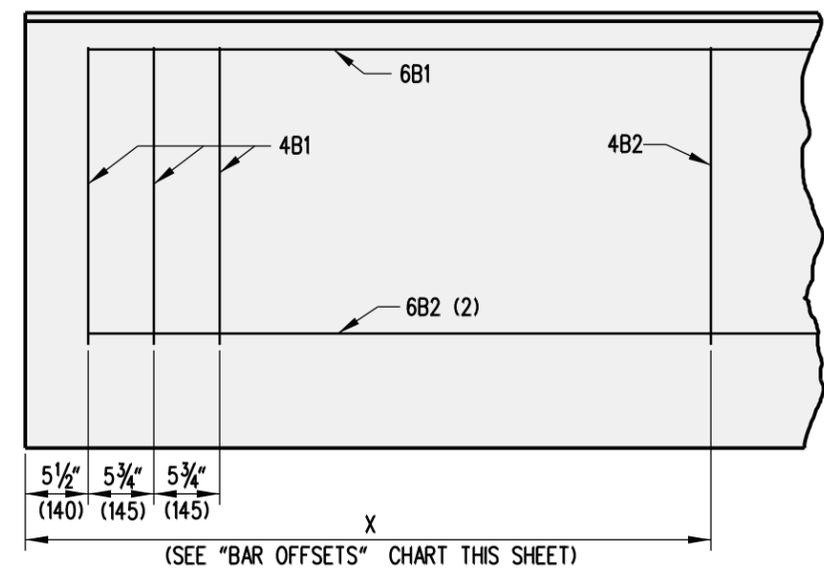
TYPE '1' BAR

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



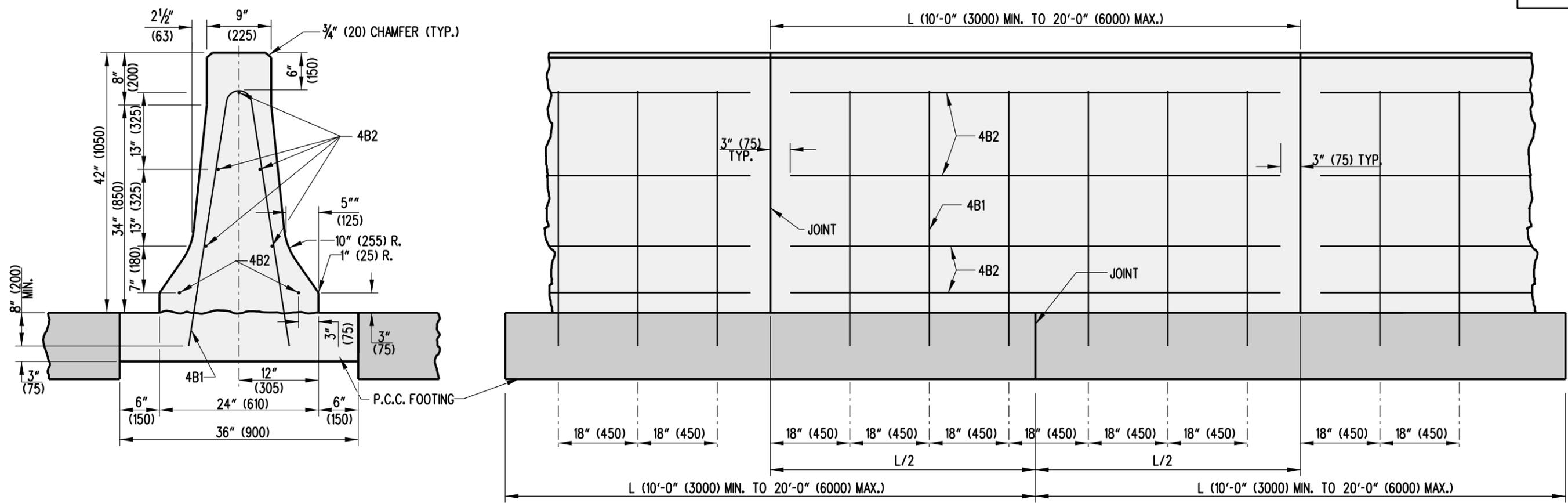
ELEVATION

TYPICAL PRE-CAST REINFORCEMENT DETAILS

BAR LIST							
MARK	SIZE	NUMBER IN EACH SECTION	LENGTH	TYPE	A	B	C
4B1	4 (13)	6	4'-7" (1400)	1	5" (125)	26" (660)	2" (50)
4B2	4 (13)	**	4'-7" (1400)	1	5" (125)	26" (660)	2" (50)
6B1	6 (19)	1	*	STR.			
6B2	6 (19)	2	*	STR.			

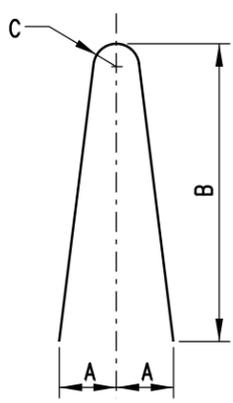
* THE LENGTH OF BARS 6B1 AND 6B2 SHALL BE 11" (280) SHORTER IN LENGTH THAN THE NOMINAL SIZE OF THE BARRIER IN WHICH IT IS USED.
 ** SEE "BAR OFFSETS" CHART ON THIS SHEET FOR MORE INFORMATION.

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



SECTION

ELEVATION



TYPE '1' BAR

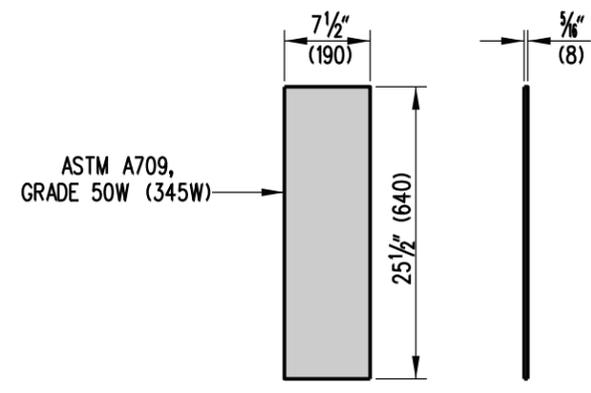
BAR OFFSETS	
NOMINAL LENGTH OF BARRIER SECTION (L)	NO. REQ'D FOR EACH BARRIER SECTION
20' (6000)	13
18' (5500)	12
16' (5000)	10
14' (4500)	9
12' (4000)	8
10' (3000)	6

BAR LIST							
MARK	SIZE	NUMBER IN EACH SECTION	LENGTH	TYPE	A	B	C
4B1	4 (13)	**	7'-6" (2286)	1	6" (150)	44" (1118)	2" (50)
4B2	4 (13)	7	*	STR.	N/A	N/A	N/A

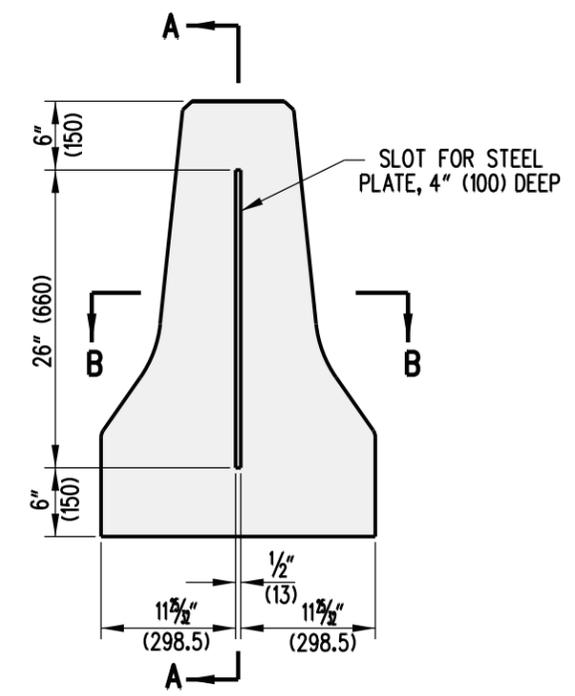
* THE LENGTH OF BAR 4B2 SHALL BE 6" (150) SHORTER IN LENGTH THAN THE NOMINAL SIZE OF THE BARRIER IN WHICH IT IS USED.
 ** SEE "BAR OFFSETS" CHART ON THIS SHEET FOR MORE INFORMATION.

TYPICAL CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION

NOTES: 1). CONCRETE CLEAR COVER FOR REINFORCING BARS SHALL BE 1 1/2" (40) MIN.
 2). BARS SHALL BE CUT AT EVERY JOINT IF MADE USING CONTINUOUS SLIP-FORM CONSTRUCTION.

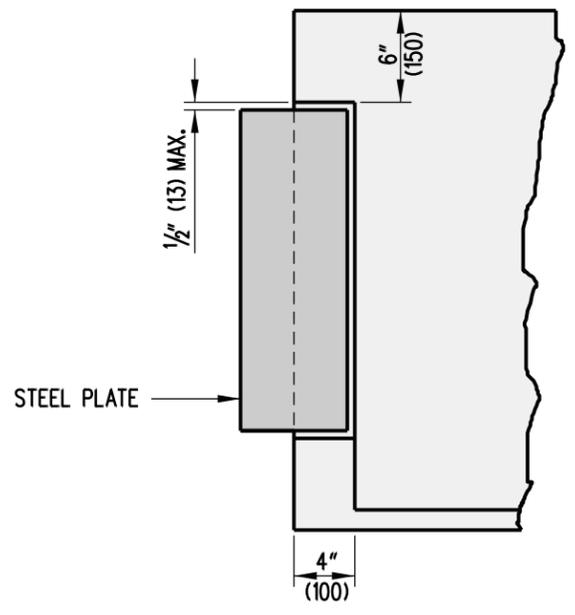


STEEL CONNECTOR PLATE

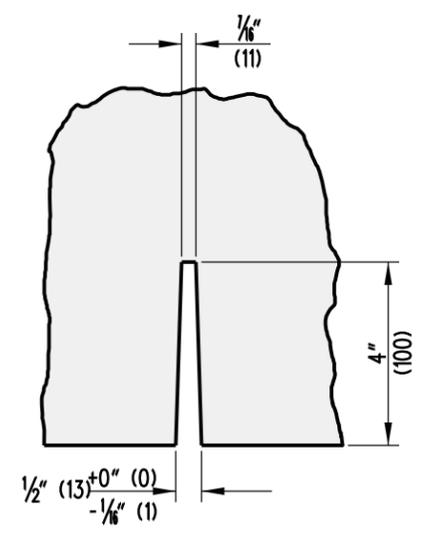


SLOT DIMENSIONS

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



SECTION A-A



SECTION B-B