

STATE OF NEW HAMPSHIRE
BRIDGE DESIGN MEMORANDUM

FROM: L. Robert Landry, Jr., PE
Administrator

DATE: May 15, 2018
AT (Office): Bureau of Bridge Design

SUBJECT: Design Memorandum 2018-03
Temporary Barrier for Bridge Projects

TO: Bureau of Bridge Design Staff, Bridge Design Consultants, FHWA, NHDOT Bureaus

The Bureau of Bridge Design is updating the Bridge Design Manual. During this process, certain design decisions are being issued for immediate implementation. Consequently, the Bridge Design Manual, Bridge Details, and Bridge Detail Sheets have been modified as follows:

A. Bridge Design Manual:

- Chapter 7, Section 7.6.5 Temporary Barrier

B. Bridge Detail Sheets:

- Portable Concrete Barrier – Braced
- Texas Restrained Barrier (X-Bolt)

C. Special Provision:

- Item 606.41741 – Portable Concrete Barrier for Traffic Control (Bridge)

D. Summary: The above noted revisions are being implemented to specify the following:

- NHDOT policy for required use of temporary barrier for bridge projects has been added.
- Bridge Detail Sheets (.dgn and .pdf format) for use on bridge projects are located on the Bureau of Bridge Design web page:
<https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/detailsheets/index.htm>

E. Background:

This memorandum incorporates modifications to current NHDOT Bridge Design Manual and Bridge Detail Sheets and provides the modified details on the NHDOT Bridge Design Website.

For bridge construction, the workers are in close proximity to the portable concrete barrier (pcb). In order to protect the workers and the traveling public, the required deflection room behind the pcb shall be provided or a low deflection barrier shall be used for all phased bridge projects (rehabilitation and new).

Item 606.4171, Portable Concrete Barrier for Traffic Control (Bridge) shall be used for all bridge projects except as noted in Chapter 7, Section 7.6.5. This pcb is the Braced or Texas Restrained Barrier (X-Bolt). Both barrier bridge detail sheets shall be included in the contract plans and the Contractor can choose which barrier to use. Both barriers have been successfully crash tested per requirements of updated NCHRP Report 350, TL 3-11 (MASH TL-3). Both barriers remained connected with a dynamic deflection of approximately 27-in.

Each barrier has layout requirements and limitations as noted on their respective detail sheets and Chapter 7, Section 7.6.5.

This memorandum clarifies NHDOT’s policy for the use of a temporary barrier for bridge construction projects and incorporates the details that shall be included in the contract plans.

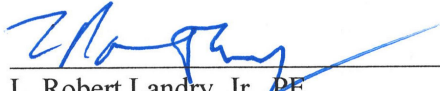


STATE OF NEW HAMPSHIRE
BRIDGE DESIGN MEMORANDUM

2 of 2

F. Implementation:

The update to the Bridge Design Manual, Bridge Details shall be implemented as of the date of this memorandum and shall be used on all applicable projects.



L. Robert Landry, Jr., PE
Administrator, Bureau of Bridge Design

Enclosures

7.6.5 Temporary Barrier

Temporary barriers are used in work zone areas and shall be crash tested to be able to contain, redirect, and shield vehicles, as well as workers with a limited escape route.

January 7, 2016 FHWA memorandum states, “Temporary work zone devices, including portable barriers, manufactured after December 31, 2019, must have been successfully tested to the 2016 edition of *MASH*. Such devices manufactured on or before this date, and successfully tested to NCHRP Report 350 or 2009 edition of *MASH*, may continue to be used throughout their normal service life.”

A. Temporary Barrier Types

NHDOT preferred temporary barriers are listed as follows:

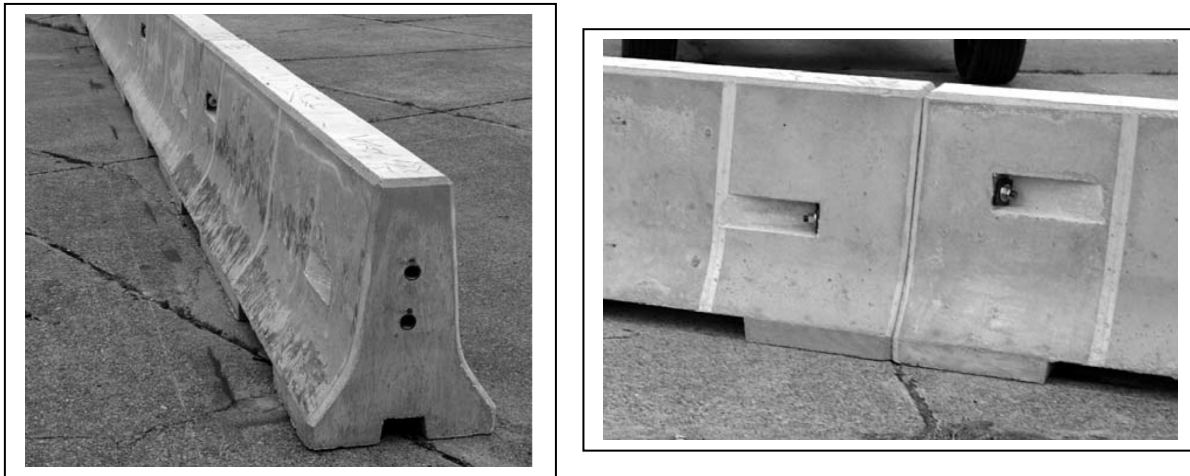
- Portable Concrete Barrier – Braced:
 - Crash tested by Midwest Roadside Safety: NY Box Beam Stiffening of Unanchored TCB, March 2008 per requirements of updated NCHRP Report 350, TL 3-11 (MASH TL-3). The FHWA approval letter B-239 (11/1/2012) is located at: https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/barriers/pdf/b239.pdf
 - 20-ft. long F-shape precast concrete barrier with a structural steel tube attached. The barrier system has been crash tested with a 27.6-in. dynamic deflection which will allow the braced barrier to be placed a minimum 12-in. from the back of the barrier to the edge of the deck, unanchored, since the barrier did not separate (i.e., stayed connected acting as one long unit).
 - The barrier has a minimum radius of curvature of approximately 230-ft. Gaps created between structural tubes and concrete barrier, during a radial layout, shall be shimmed with 8”x8”x1/2” plates and fender washers to firmly attach structural tubing to barrier.
 - The weight of one 20-ft. F-shape barrier segment is approximately 4.16-tons.
 - A minimum of two 20-ft. braced segments shall extend beyond the bridge work area before they can be flared or connected to NHDOT Highway Design 10-ft. portable concrete barrier for speeds greater than 45-mph. The final 20-ft. concrete segment shall be anchored into the ground as shown on the Bridge Detail Sheet.
 - Layout and installation shall be according to the Bridge Detail Sheet: *Portable Concrete Barrier – Braced* located at: <https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/detailsheets/index.htm>



Portable Concrete Barrier -Braced

Figure 7.6.5-1

- Texas Restrained Barrier (X-Bolt):
 - Crash tested by Texas Transportation Institute May 2005 per requirements of updated NCHRP Report 350, TL 3-11 (MASH TL-3). Test report is located at: <https://static.tti.tamu.edu/tti.tamu.edu/documents/0-4692-1.pdf>
 - 10-ft. long F-shape precast concrete barrier with a steel bolts crossing at joints. The barrier system has been crash tested with a 27.0-in. dynamic deflection which will allow the braced barrier to be placed a minimum 12-in. from the back of the barrier to the edge of the deck, unanchored, since the barrier did not separate (i.e., stayed connected acting as one long unit).
 - The barrier has a minimum radius of curvature of approximately 125-ft. and the relative angle that can be achieved between barrier segments is 4-degrees.
 - The weight of one 10-ft. F-shape barrier segment is approximately 2.38-tons.
 - The 10-ft. long cross-bolt segments shall extend a minimum of 50-ft. beyond the bridge work area before they can be flared or connected to NHDOT Highway Design 10-ft. portable concrete barrier for speeds greater than 45-mph.
 - The Bridge Detail Sheet: *Portable Concrete Barrier – X-Bolt* is located at: <https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/detailsheets/index.htm>



Portable Concrete Barrier –Texas X-Bolt

Figure 7.6.5-2

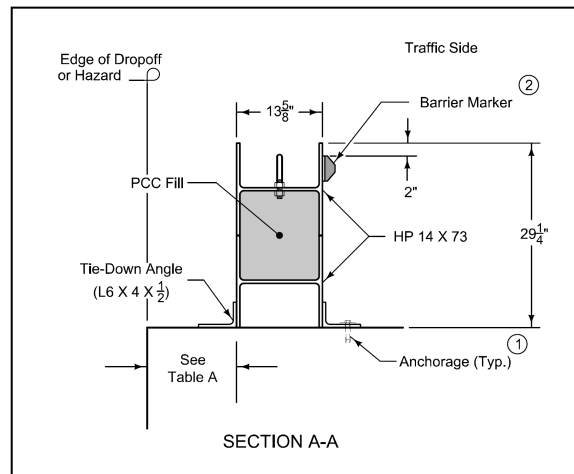
- NHDOT 10-ft. Portable Concrete Barrier:
 - Crash tested by North Carolina DOT (10-ft. NJ barrier w/ triple loops and drop-in pin) per requirements of NCHRP Report 350, TL 3-11. The FHWA approval letter HSA-10/B-98 (5/10/2002) is located at: https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/listing.cfm?code=long&filter=
 - The 10-ft. long F-shape precast concrete barrier, unanchored, with a pin and loop connection has been crash tested with a 5.0 to 5.5-ft. dynamic deflection.
 - The weight of one 10-ft. F-shape barrier segment is approximately 2.0-tons.
 - The Bridge Detail Sheet: *Portable Concrete Barrier (10-ft. long)* is located at: <https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/detailsheets/index.htm>



Portable Concrete Barrier – NHDOT

Figure 7.6.5-3

- Iowa DOT (BA-400) HP steel beam (concrete filled) with double nested standard beam guardrail:
 - Crash tested by University of Nebraska-Lincoln (Steel H-section Barrier for temporary use on bridge decks) per requirements of NCHRP Report 350, TL 3-11. The FHWA approval letter HSA-10/B-117 (9/12/2003) is located at: https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/listing.cfm?code=long&filter=
 - The HP steel beam (concrete filled) with double nested standard beam guardrail has been crash tested with a 9.5-in. dynamic deflection.
 - The weight of HP steel beam (concrete filled) with double nested standard beam guardrail is approximately 321-lb/ft.
 - The stacked HP steel beams are 29¼ -in. high and 13 5/8-in. depth that are anchored into the deck with ¾-in. diameter x 1¾-in. long ASTM A307 Grade B heavy hex bolt and a ¾-in. Red Head Multi-set II drop-in anchor.
 - Plans are located at *Iowa DOT Standard Road Plans – BA Series* located at: <https://iowadot.gov/design/stdplne-ba>



**Temporary Barrier Rail –
Iowa BA-400**
Figure 7.6.5-4

B. Temporary Barrier Selection

The following is NHDOT Bridge Design's policy for selecting temporary barrier for use on bridges, unless approved otherwise by the Bridge Design Chief:

- Bridges on National Highway System (NHS); use Test Level 3 (minimum).
- Bridges not on NHS and speeds posted ≥ 45 mph; use Test Level 3 (minimum).
- Bridges not on NHS and speeds posted < 45 mph; use Test Level 2 (minimum).
- For bridge construction, the workers are in close proximity to the portable concrete barrier (pcb). In order to protect the workers and the traveling public, the required deflection room behind the pcb shall be provided or a low deflection barrier shall be used for all bridge projects (rehabilitation and new).

- When developing phase construction on bridges, the following recommendations shall be considered:
 - 1) New bridge decks and widenings:
 - Use the maximum clear distance from behind the pcb to the edge of the deck while meeting the required lane widths and minimal phases. See *Chapter 7, Section 7.7 Preservation and Rehabilitation of Structures* for further information on developing phase construction and minimum lane widths.
 - Use Item 606.4171, Portable Concrete Barrier for Traffic Control (Bridge), for *all* bridge projects except as noted below. This pcb is the Braced or Texas Restrained Barrier (X-Bolt). Both barrier sheets shall be included in the contract plans and the Contractor can choose which barrier to use.
 - For bridges on Tier 1 roads, the minimum clear distance from behind the pcb to the edge of the deck shall be 2-ft. (0.6-m). If 2-ft. (0.6-m) cannot be obtained, use Iowa DOT (BA-400) HP steel beam (concrete filled) or an anchored pcb that has been MASH crash-tested. Avoid anchoring through precast concrete panels, if possible. If there is no other option, the panels need to be designed for loss of strains due to the possibility of the anchor hitting the strands.
 - For bridges on Tier 2, 3, 4 or 5 roads, the minimum clear distance from behind the pcb to the edge of the deck shall be 1-ft. (0.3-m). If 1-ft. (0.3-m) cannot be obtained, use use Iowa DOT (BA-400) HP steel beam (concrete filled) or an anchored pcb that has been MASH crash-tested.
 - 2) Rehabilitated bridge decks:
 - See *Chapter 7, Section 7.7 Preservation and Rehabilitation of Structures* for further information on developing phase construction and minimum lane widths.
 - Use Item 606.4171, Portable Concrete Barrier for Traffic Control (Bridge), for *all* rehabilitation work (e.g., deck patching, pavement and membrane removal, expansion joint work, and bridge curb and railing work); all roads. This pcb is the Braced or Texas Restrained Barrier (X-Bolt). Both barrier sheets shall be included in the contract plans and the Contractor can choose which barrier to use.
 - 3) Bridge decks requiring a lighter portable concrete barrier:
 - Use Iowa DOT (BA-400) HP steel beam (concrete filled) with double nested standard beam guardrail. The weight of HP steel beam (concrete filled) with double nested standard beam guardrail is approximately 321-lb/ft.

04/24/17

SSD: 8/13/2012, 01/10/16

Page 1 of 1

PORTSMOUTH 13455D
PORTSMOUTH 13455E

July 6, 2017

SPECIAL PROVISION

AMENDMENT TO SECTION 606 -- GUARDRAIL

Item 606.41741 – Portable Concrete Barrier for Traffic Control (Bridge)

Add to 3.7:

3.7.5 Portable Concrete Barrier for Traffic Control (Bridge). Either of the following barriers are considered acceptable by the Department.

3.7.5.1 Braced. Braced portable concrete barrier shall consist of 20 foot long sections and shall be braced and pinned as detailed on the contract plans or as otherwise approved.

3.7.5.2 Texas Restrained Barrier (TRB). The TRB portable concrete barrier shall consist of 10 foot long sections and shall be connected as detailed on the contract plans or as otherwise approved.

Amend to 4.4.2 to read:

4.4.2 Portable concrete barrier for traffic control of the type specified will be measured by the linear foot for barrier delivered and installed for use on the project. Relocating portable concrete barriers on the project will not be measured for payment.

Amend 5.3 to read:

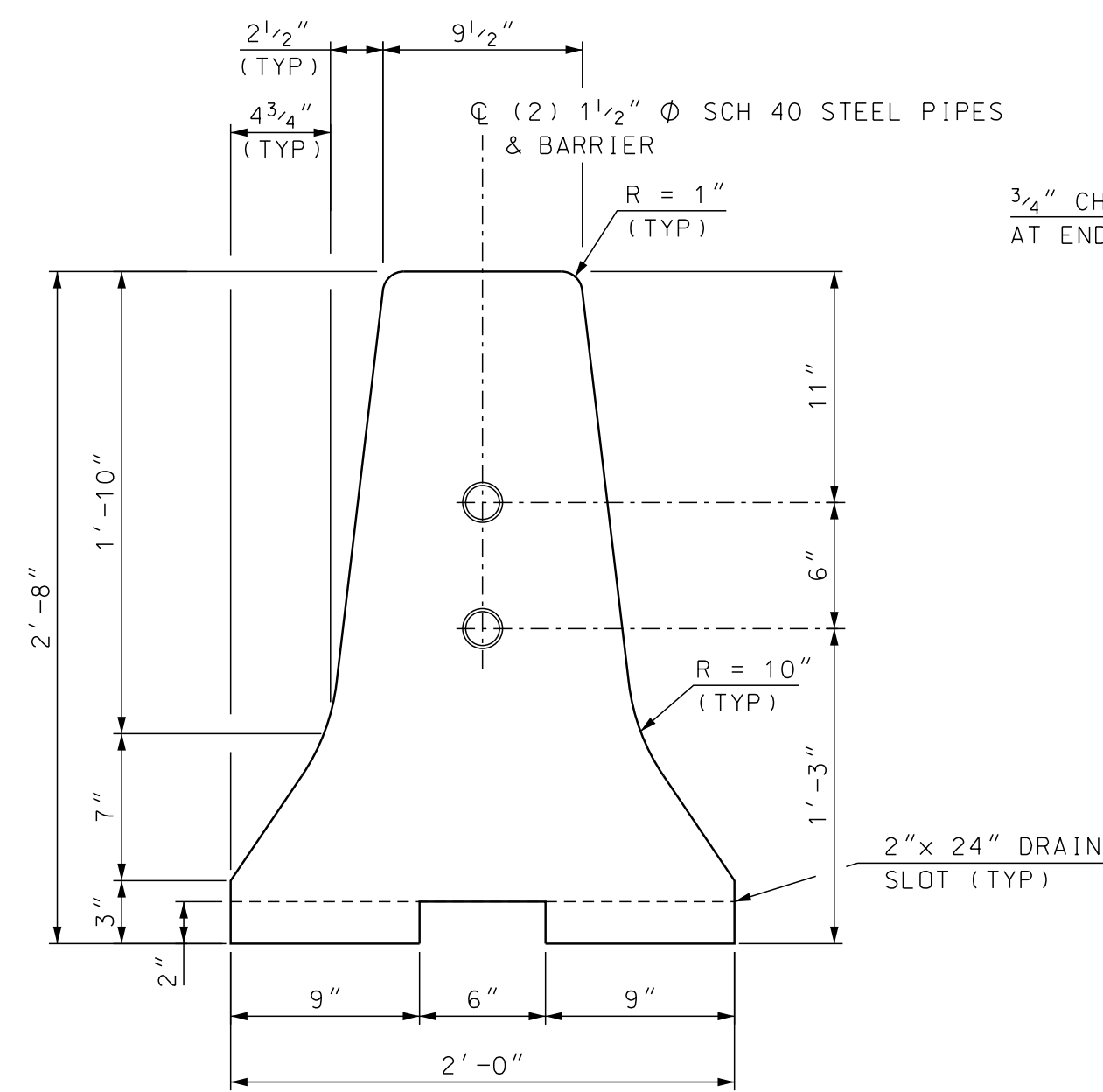
5.3 The accepted quantity of permanent concrete barrier of the type specified and portable concrete barrier for traffic control of the type specified will be paid for at the contract unit price per linear foot.

Add to 5.3

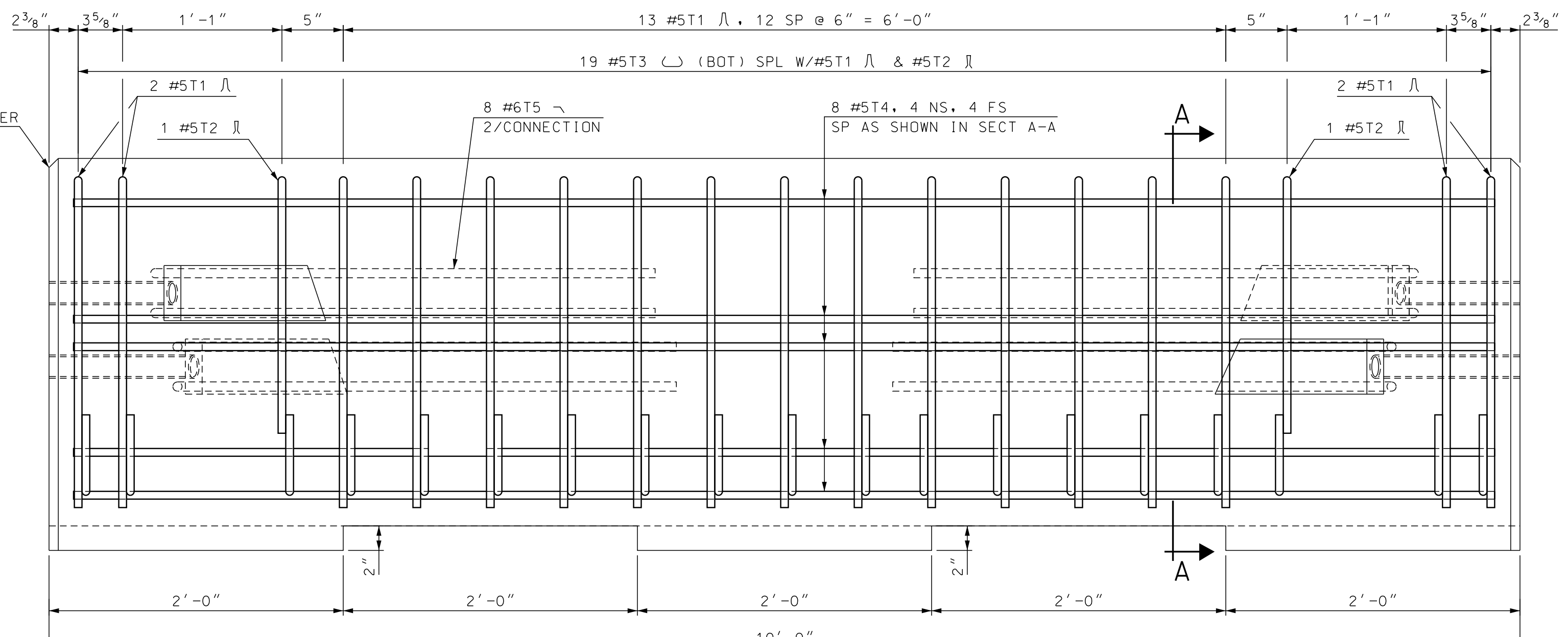
5.3.6 No separate payment will be made for the required bracing, pinning, or connections of the portable concrete barrier for traffic control. All structural steel, steel rods and hardware will be subsidiary.

Add to Pay items and units:

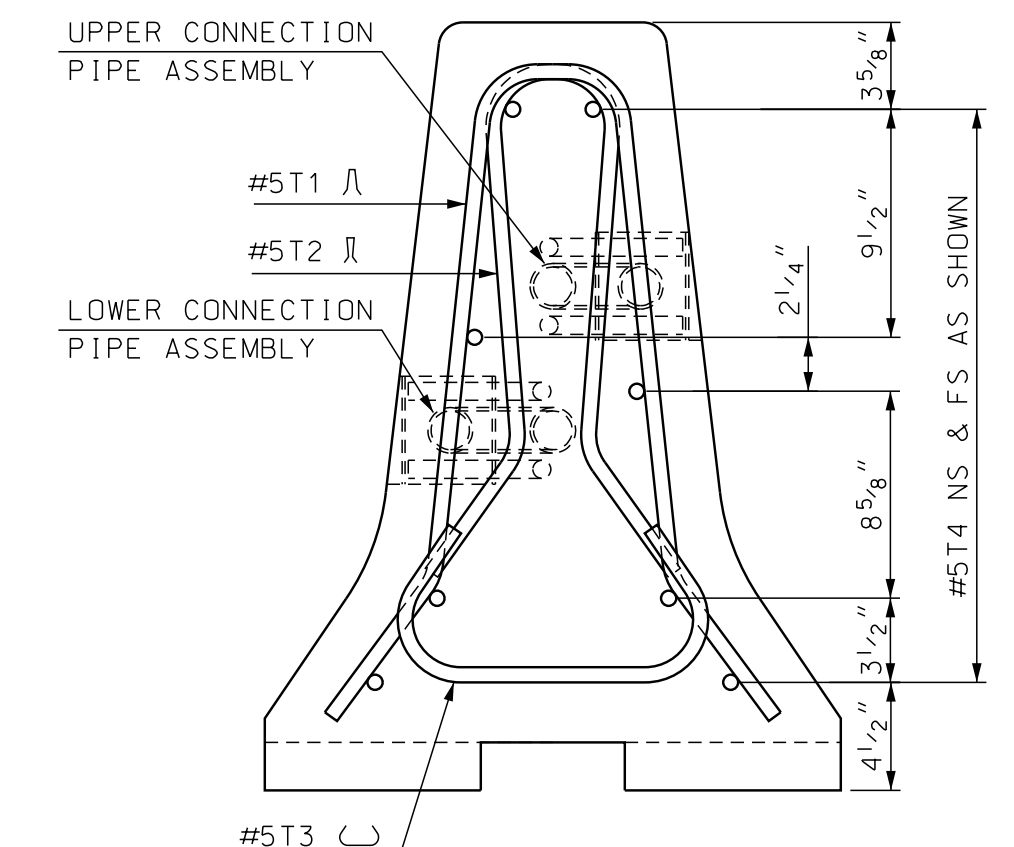
606.41741	Portable Concrete Barrier for Traffic Control (Bridge)	Linear Foot
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END VIEW
SCALE: 1 1/2" = 1'-0"

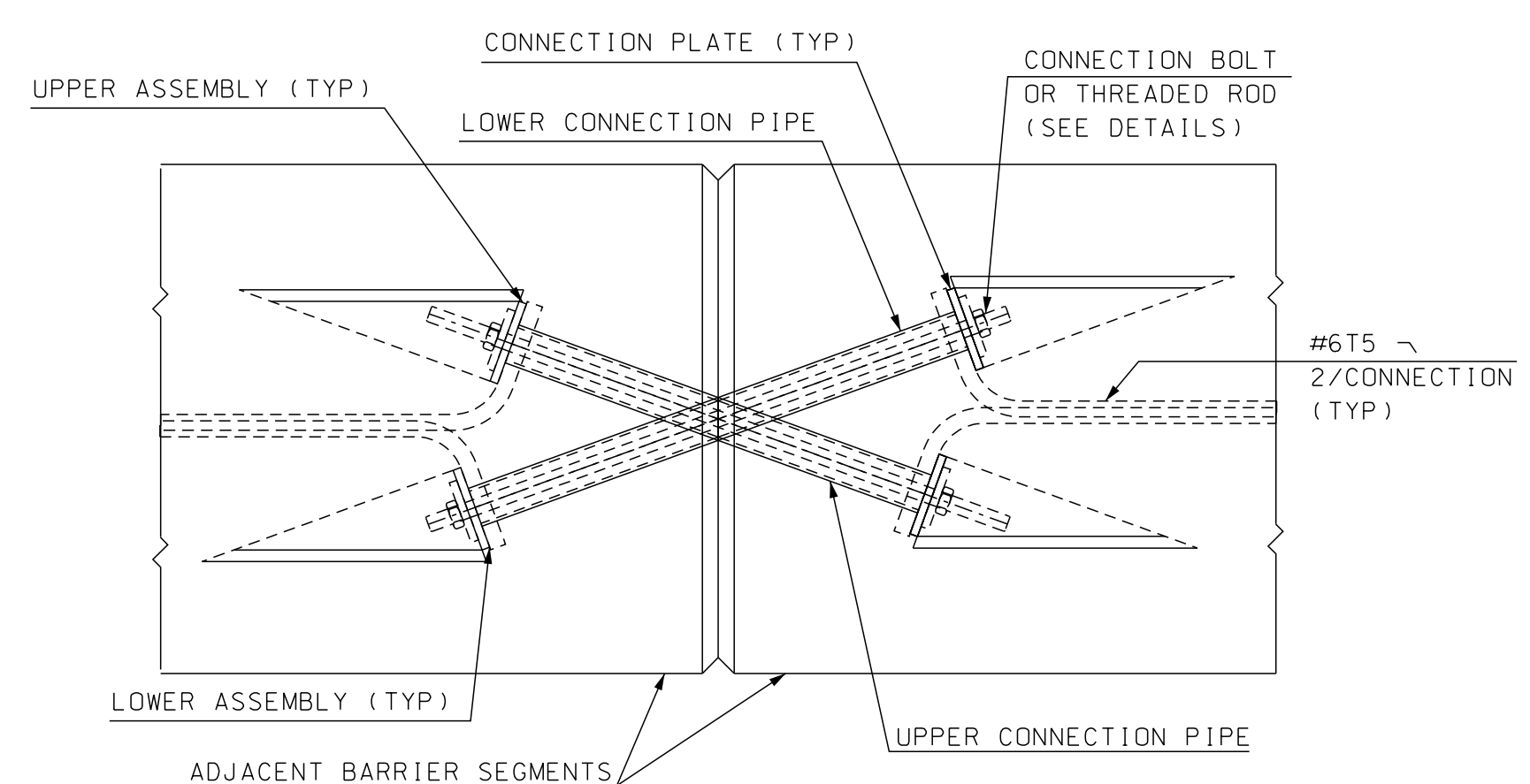


ELEVATION
SCALE: 1 1/2" = 1'-0"

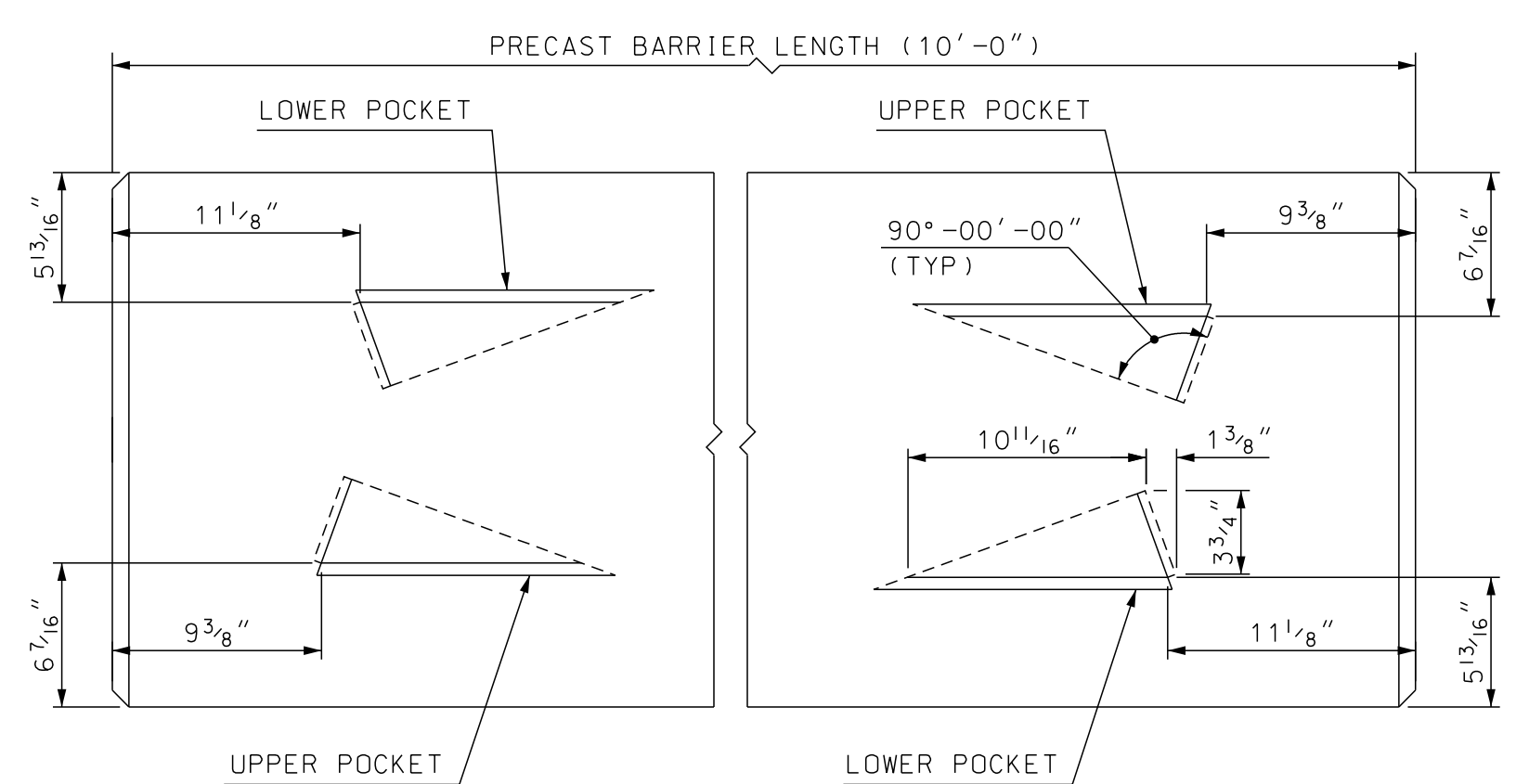


SECTION A-A
SCALE: 1 1/2" = 1'-0"

NOTE: CONNECTION HARDWARE SHALL NOT EXTEND BEYOND THE CONCRETE FACE OF BARRIER



TYPE X JOINT CONNECTION DETAILS
SCALE: 1 1/2" = 1'-0"



TOP VIEW CONNECTION POCKETS
SCALE: 1 1/2" = 1'-0"

GENERAL NOTES:

- PORTABLE CONCRETE BARRIER SHALL BE FURNISHED BY THE CONTRACTOR AND PAID FOR AS ITEM 606.41741, PORTABLE CONCRETE BARRIER FOR TRAFFIC CONTROL (BRIDGE). CONCRETE BARRIER AND ALL ATTACHMENTS SHALL BE FABRICATED IN ACCORDANCE WITH SPECIAL PROVISIONS. ALL BARRIER UNITS SHALL BE 10' LONG.
- PORTABLE CONCRETE BARRIER DETAILS, AS SHOWN ON THESE PLANS, ARE IN COMPLIANCE WITH REQUIREMENTS PER UPDATED NCHRP REPORT 350 FOR TEST NO 3-11 (MASH TEST LEVEL 3), CRASH TESTED BY TEXAS A&M UNIVERSITY SYSTEM, MAY 2005, AND ACCEPTED PER REPORT FHWA/TX-05/0-4692-1.
- THE BARRIER HAS BEEN CRASH TESTED WITH A 27" DYNAMIC DEFLECTION WHICH WILL ALLOW THE BARRIER TO BE PLACED A MINIMUM 12" FROM THE EDGE OF THE DECK.
- USAGE OF THE TEXAS X-BOLT BARRIER REQUIRES A MINIMUM OF 100 LINEAR FEET (10 - 10' UNITS). THE X-BOLT BARRIER SHALL EXTEND A MINIMUM OF 50' BEYOND THE BRIDGE AT EACH END, PARALLEL TO THE ROADWAY CENTERLINE. THE ENDS OF THE BARRIER SHALL CONNECT TO THE TRANSITION UNIT AND THEN TO NHDOT PCB FLARED OUT THE REQUIRED CLEAR ZONE AS SHOWN ON SHEET 2 OF 3.
- THE CONNECTION BOLTS AT THE BARRIER JOINTS SHALL BE TIGHTENED TO THE "TURN OF THE NUT" METHOD IN ACCORDANCE WITH SECTION 550.3.11.6.4 OF NHDOT STANDARD SPECIFICATIONS. AFTER INSTALLATION, ALL X-BOLT JOINTS SHALL BE CHECKED BY THE CONTRACT ADMINISTRATOR CONFIRMING THEY MEET THE TIGHTENED REQUIREMENT.
- THE TEXAS X-BOLT BARRIER MAY BE INSTALLED WITH A 125' MINIMUM RADIUS OF CURVATURE AND A RELATIVE ANGLE OF 4 DEGREES BETWEEN THE 10' UNITS.
- THE CONTRACTOR SHALL FURNISH AND INSTALL APPROVED RETROREFLECTIVE DELINEATORS AT 25-FOOT INTERVALS ALONG TOP AND/OR ONE FOOT DOWN THE SIDE OF PORTABLE CONCRETE BARRIER, SUBSIDIARY TO ITEM 606.41741 (SEE STANDARD NO. DL-1 OF NHDOT STANDARD PLANS FOR ROAD CONSTRUCTION). THE COLOR OF THE DELINEATORS SHALL, IN ALL INSTANCES, CONFORM TO THE COLOR OF THE EDGE LINE MARKINGS. DELINEATOR SUPPLEMENT, BUT DO NOT REPLACE, THE NEED FOR RETROREFLECTIVE SOLID EDGE LINE MARKINGS.

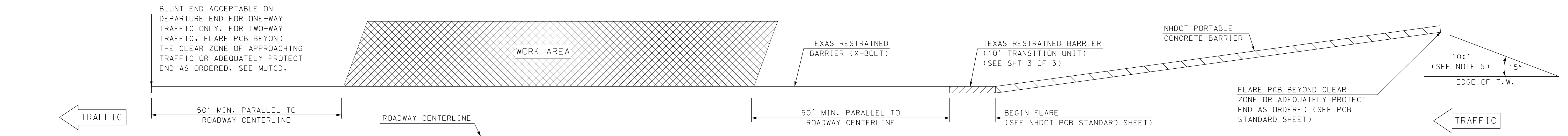
MATERIAL NOTES:

- BARRIERS SHALL BE LIGHT COLORED CLASS AA CONCRETE, WITH COMPRESSIVE STRENGTH OF 4000 psi, AND SHALL HAVE A SMOOTH UNIFORM SURFACE FREE OF DEFECTS AND IRREGULARITIES. CASTING DATE SHALL BE SHOWN ON BARRIER. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4", UNLESS OTHERWISE NOTED.
- ALL REINFORCING STEEL SHALL BE AASHTO M31 (ASTM A615) GRADE 60. ALL REINFORCEMENT SHALL HAVE 1 3/4" MINIMUM CLEAR COVER, UNLESS OTHERWISE NOTED.
- CONNECTION BOLTS SHALL BE 7/8" DIAMETER GALVANIZED HIGH STRENGTH THREADED RODS CONFORMING TO ASTM A325. STEEL PIPES, PLATE WASHERS, AND CONNECTION PLATES SHALL BE GALVANIZED ASTM A36 STEEL.
- ALL STEEL FOR CONNECTIONS SHALL BE GALVANIZED IN ACCORDANCE WITH SECTION 550.

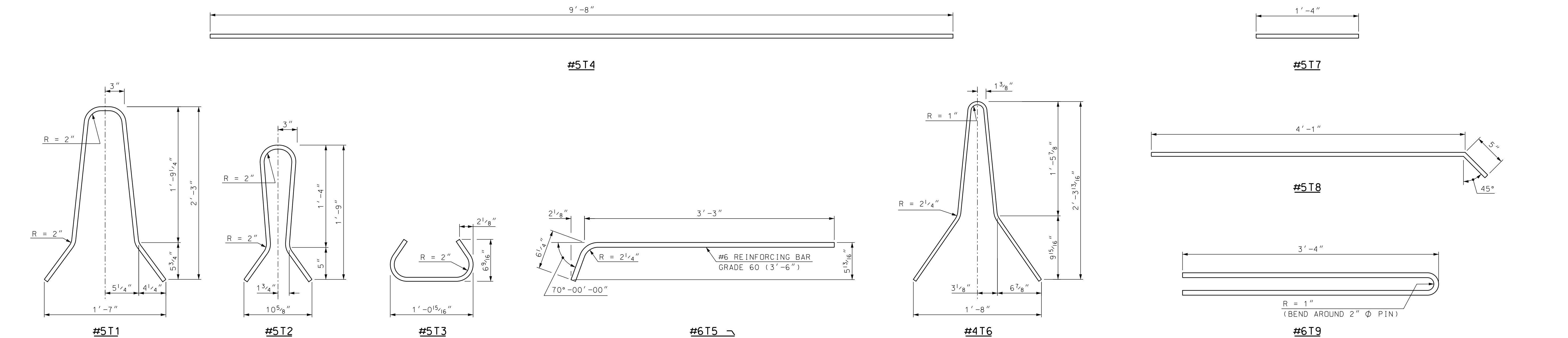
NO MODIFICATIONS SHOULD BE MADE TO THIS SHEET

BARRIER WEIGHT APPROX. 2.38 TONS

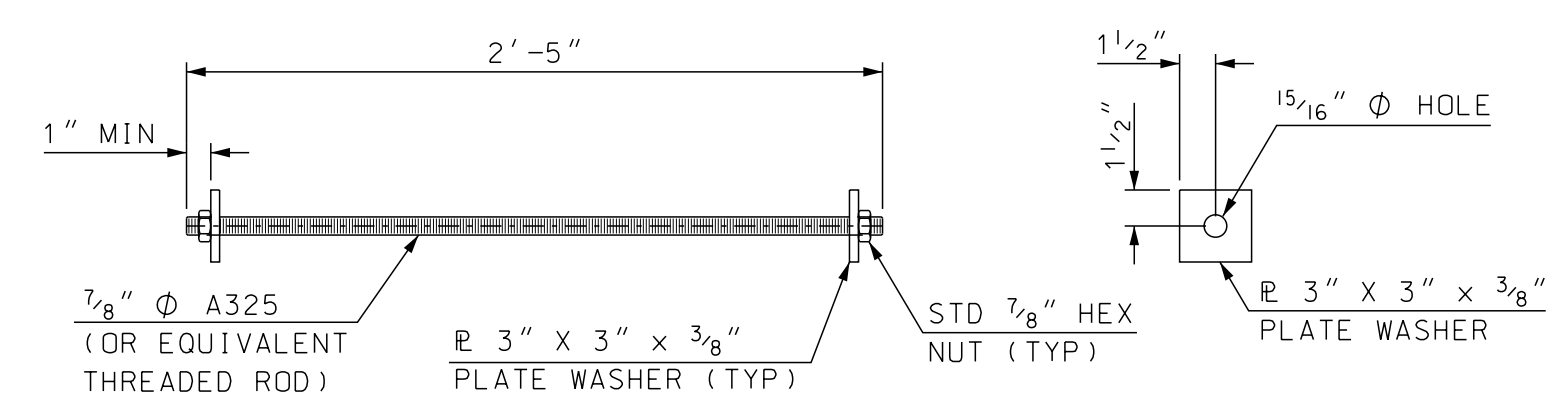
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DEPARTMENT OF TRANSPORTATION * BUREAU OF BRIDGE DESIGN									
TOWN	XX	BRIDGE NO.	XXXXXX	STATE PROJECT	XX				
LOCATION	XX								
TEXAS RESTRAINED BARRIER (X-BOLT) (1 OF 3)								BRIDGE SHEET	
REVISIONS AFTER PROPOSAL		BY	DATE	BY	DATE			XX OF XX	
		DESIGNED	TXDOT 12/10	CHECKED	NHDOT 4/18			FILE NUMBER	
		DRAWN	GMC 1/18	CHECKED	NHDOT 4/18			XX-X-X	
		QUANTITIES	XXX	CHECKED	XXX				
		ISSUE DATE	5/15/18	FEDERAL PROJECT NO.				TOTAL SHEETS	
		REV. DATE							
SUBDIRECTORY	DGN LOCATOR	SHEET SCALE							
standard/english/barrier	X-Bolt Barrier	AS NOTED							



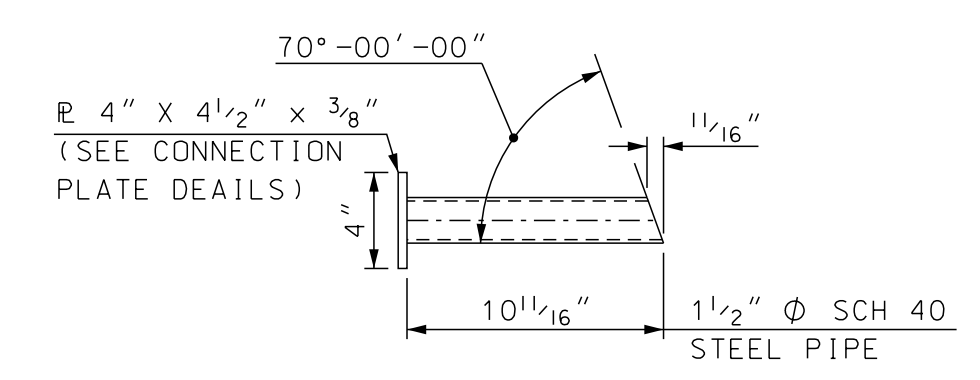
PLAN - BARRIER LAYOUT
(NTS)



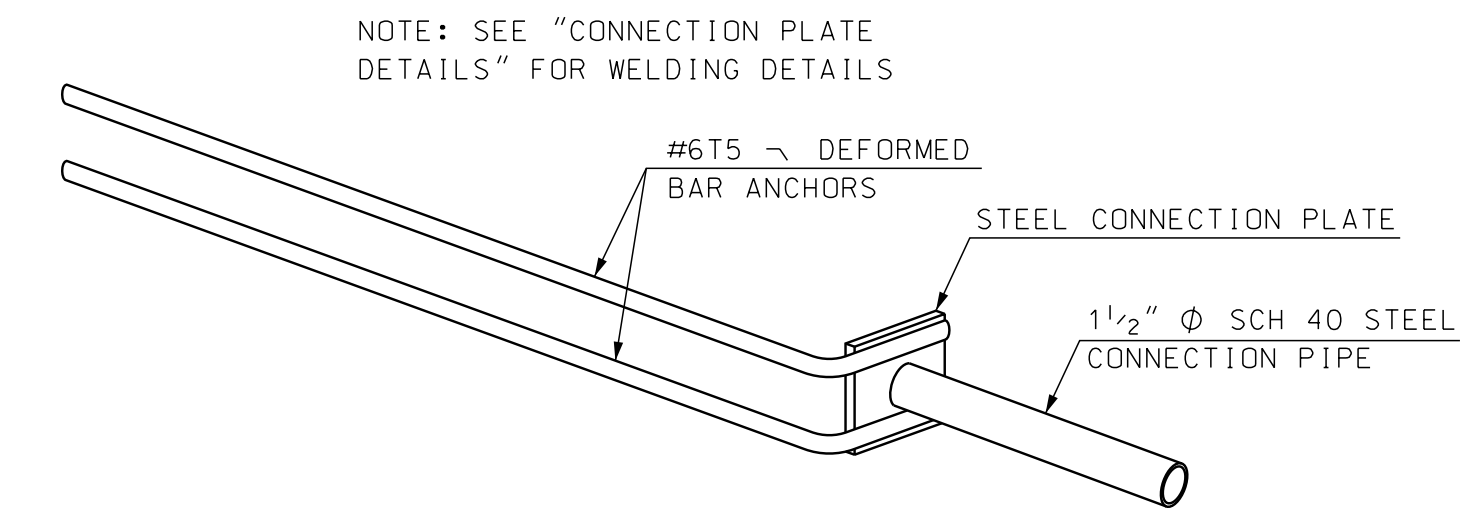
BENDING SCHEDULE
SCALE: 1 1/2" = 1'-0"



CONNECTION BOLT OR THREADED ROD DETAILS
SCALE: 1 1/2" = 1'-0"



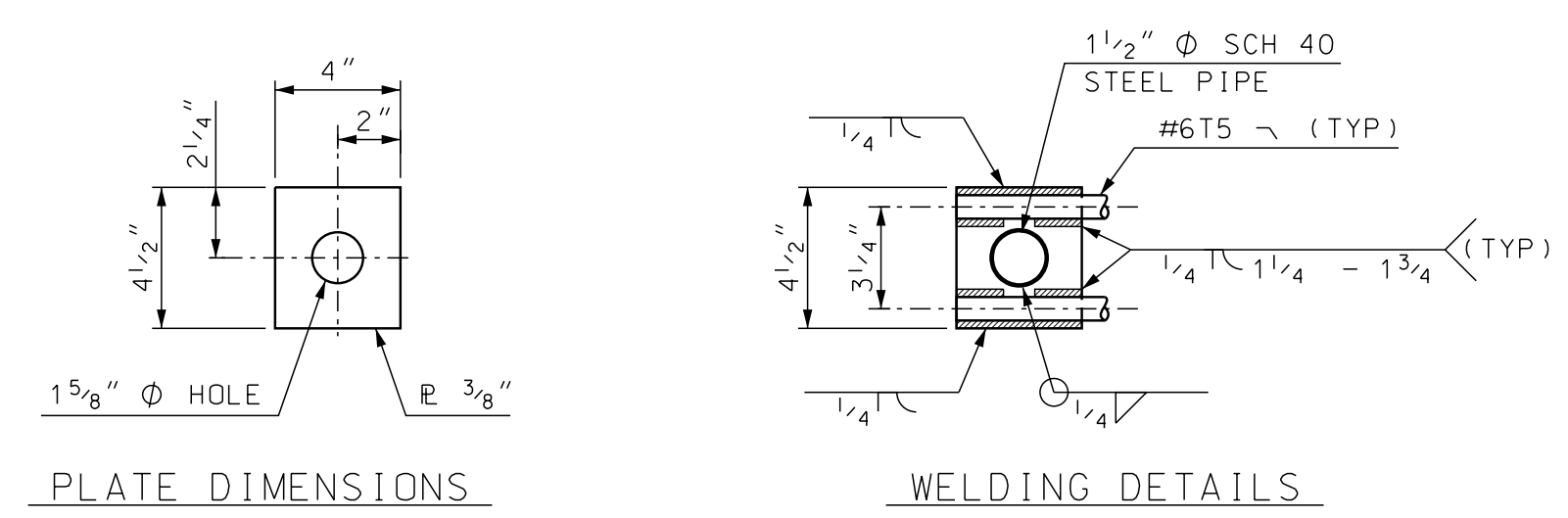
UPPER CONNECTION PIPE DETAIL
SCALE: 1 1/2" = 1'-0"



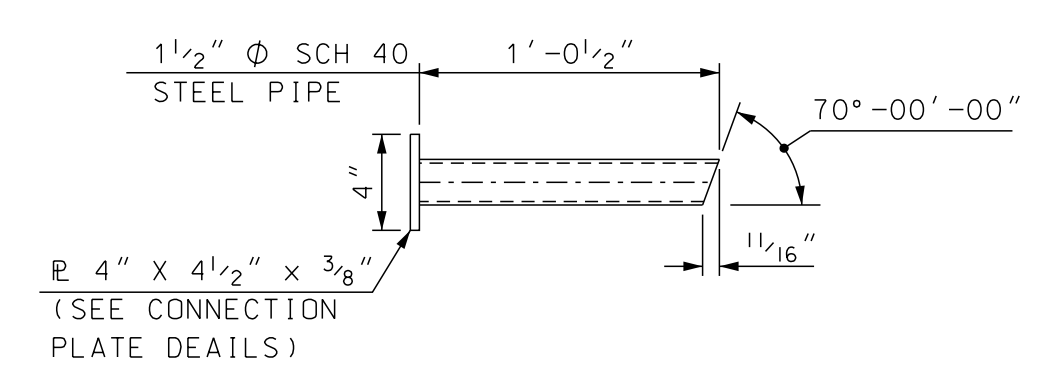
ISOMETRIC VIEW OF TYPICAL WELD ASSEMBLY
SCALE: N.T.S.

REBAR SCHEDULE TEXAS X-BOLT (10' BARRIER)			
MK	QTY	LENGTH	
T1	#5	17	5'-2"
T2	#5	2	4'-0"
T3	#5	19	2'-1"
T4	#5	8	9'-8"
T5	#6	8	3'-9"

REBAR SCHEDULE TRANSITION (10' BARRIER)			
MK	QTY	LENGTH	
T1	#5	9	5'-2"
T2	#5	1	4'-0"
T3	#5	10	2'-1"
T4	#5	8	9'-8"
T5	#6	4	3'-9"
T6	#4	4	5'-2"
T7	#5	4	1'-4"
T8	#5	2	4'-6"
T9	#6	3	6'-10"



CONNECTION PLATE DETAILS
SCALE: 2" = 1'-0"

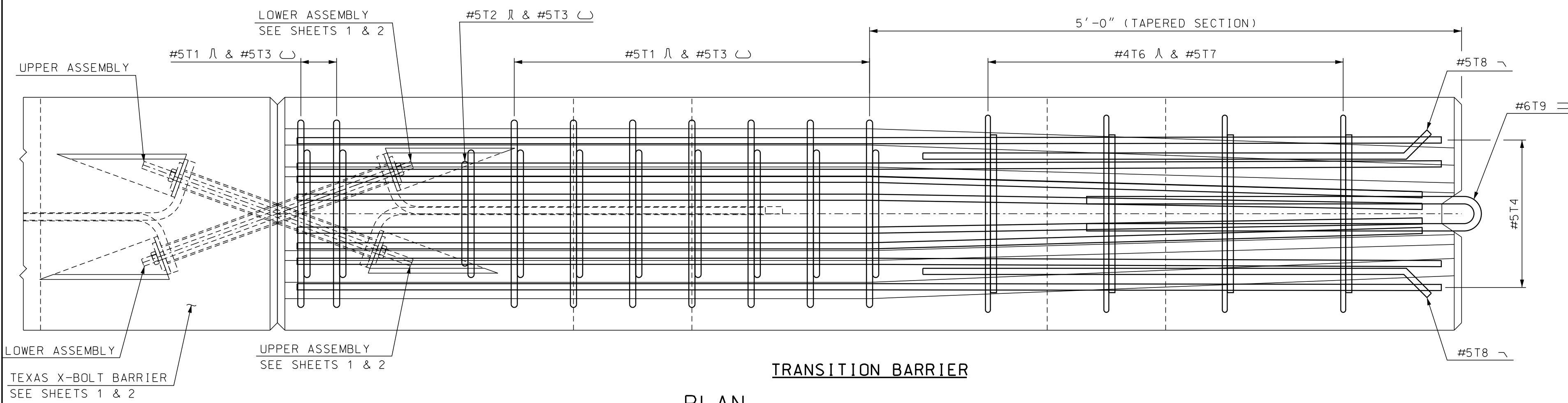


LOWER CONNECTION PIPE DETAIL
SCALE: 1 1/2" = 1'-0"

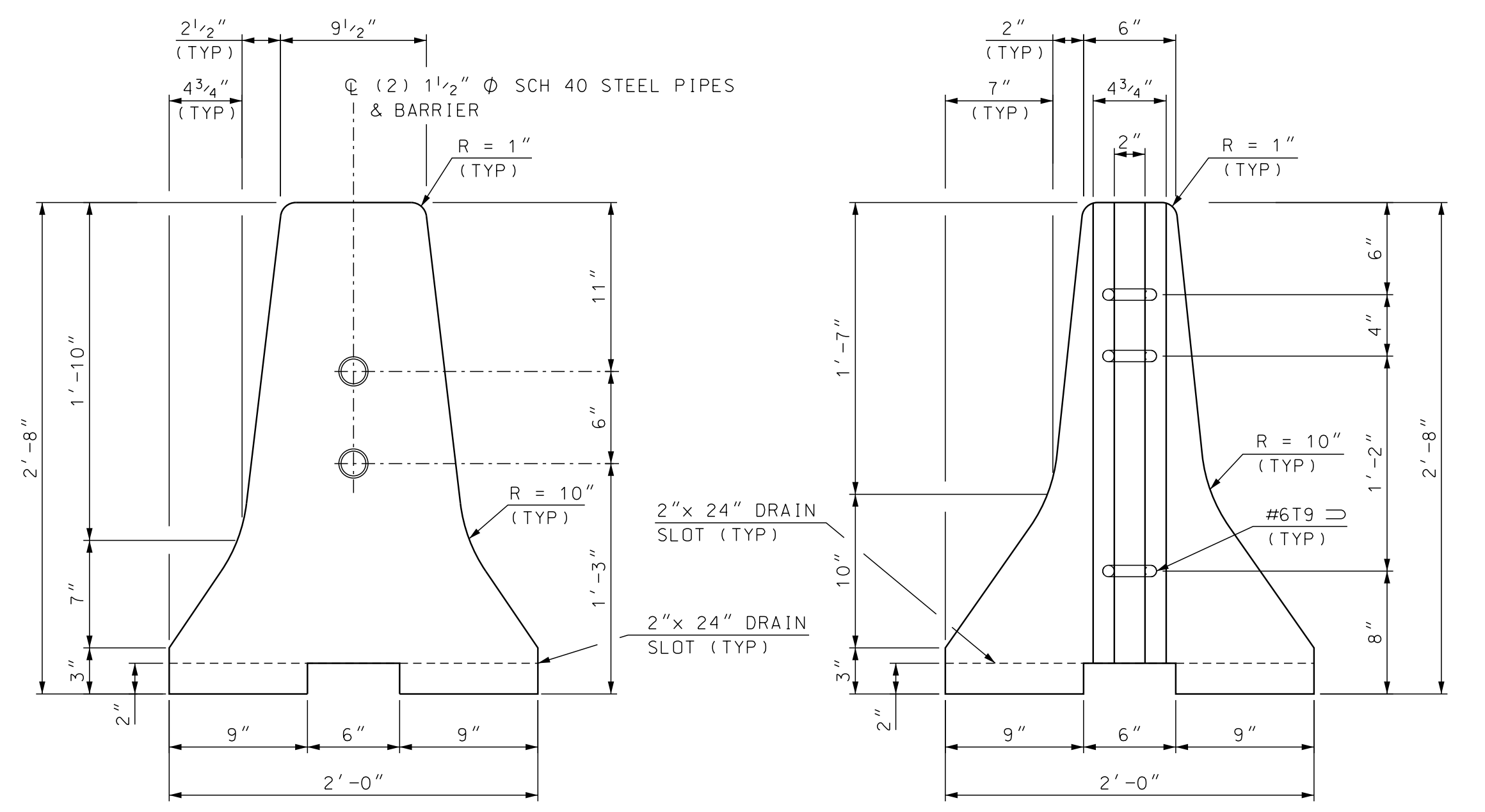
NO MODIFICATIONS SHOULD BE MADE TO THIS SHEET

STATE OF NEW HAMPSHIRE									
DEPARTMENT OF TRANSPORTATION * BUREAU OF BRIDGE DESIGN									
TOWN	XX	BRIDGE NO.	XXXXXX	STATE PROJECT	XX				
LOCATION	XX								
TEXAS RESTRAINED BARRIER (X-BOLT) (2 OF 3)									
REVISIONS AFTER PROPOSAL		BY	DATE	CHECKED	NHDOT	DATE	BRIDGE SHEET		
		DESIGNED	TXDOT	12/10	CHECKED	NHDOT	4/18	XX OF XX	
		DRAWN	GMC	1/18	CHECKED	NHDOT	4/18	FILE NUMBER	
		QUANTITIES	XXX	XX/XX	CHECKED	XXX	XX/XX	XX-X-X	
		ISSUE DATE	5/15/18	FEDERAL PROJECT NO.		SHEET NO.		TOTAL SHEETS	
		REV. DATE		-----					

SUBDIRECTORY	DGN LOCATOR	SHEET SCALE
standard/english/barrier	X-Bolt Barrier	AS NOTED

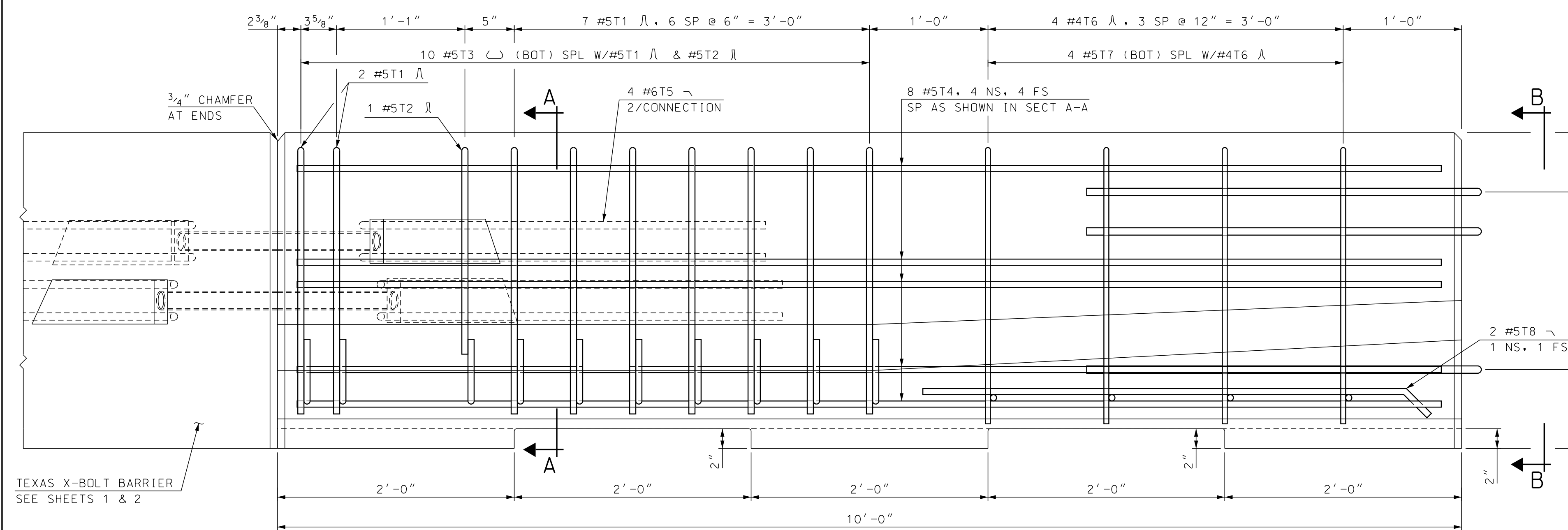


PLAN
SCALE: 1 1/2" = 1'-0"

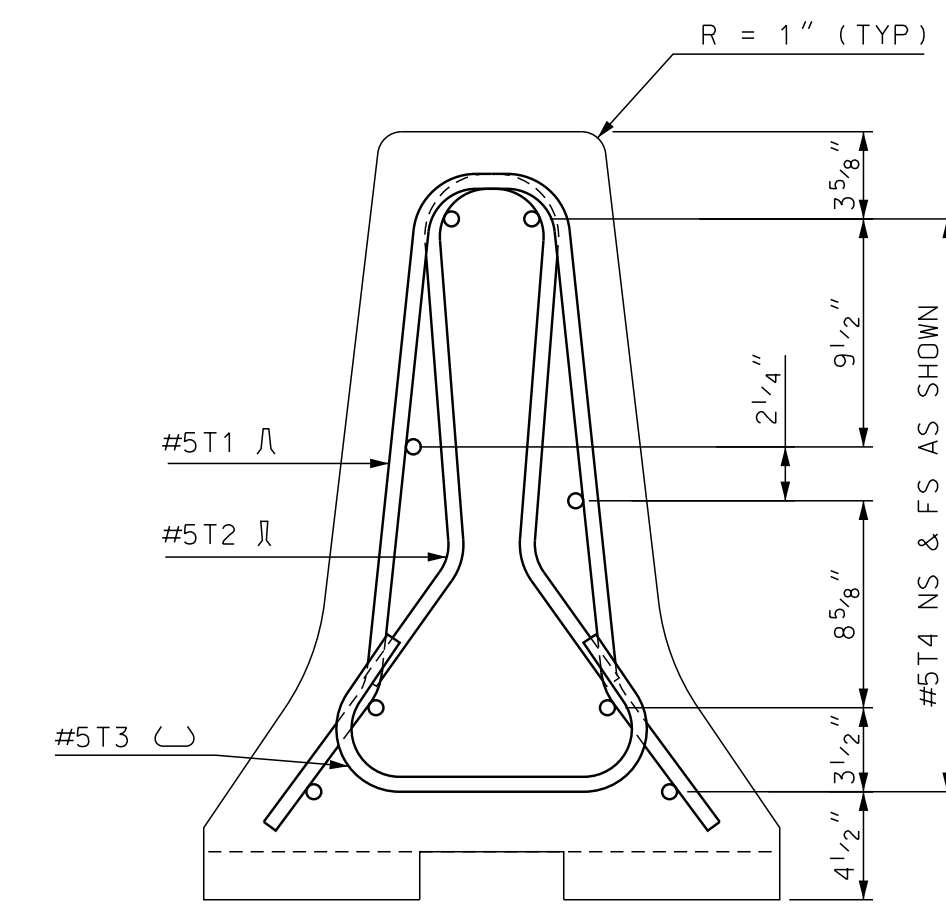


END VIEW SECTION A-A
SCALE: 1 1/2" = 1'-0"

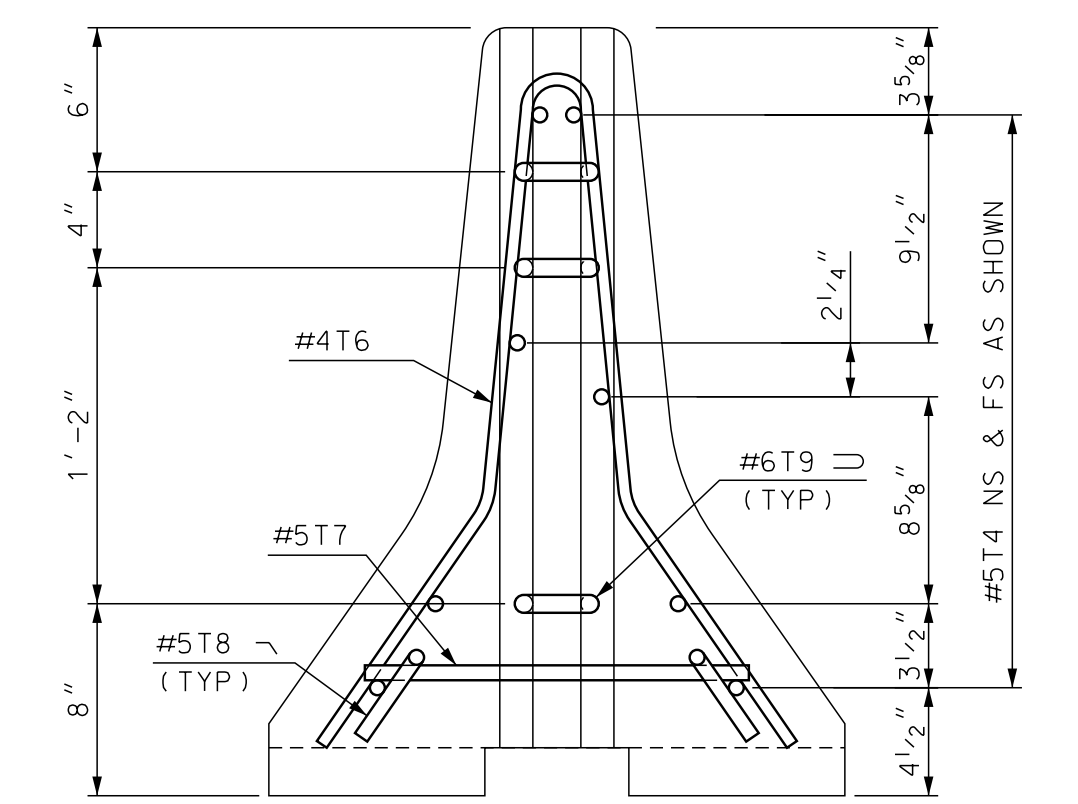
VIEW B-B
SCALE: 1 1/2" = 1'-0"



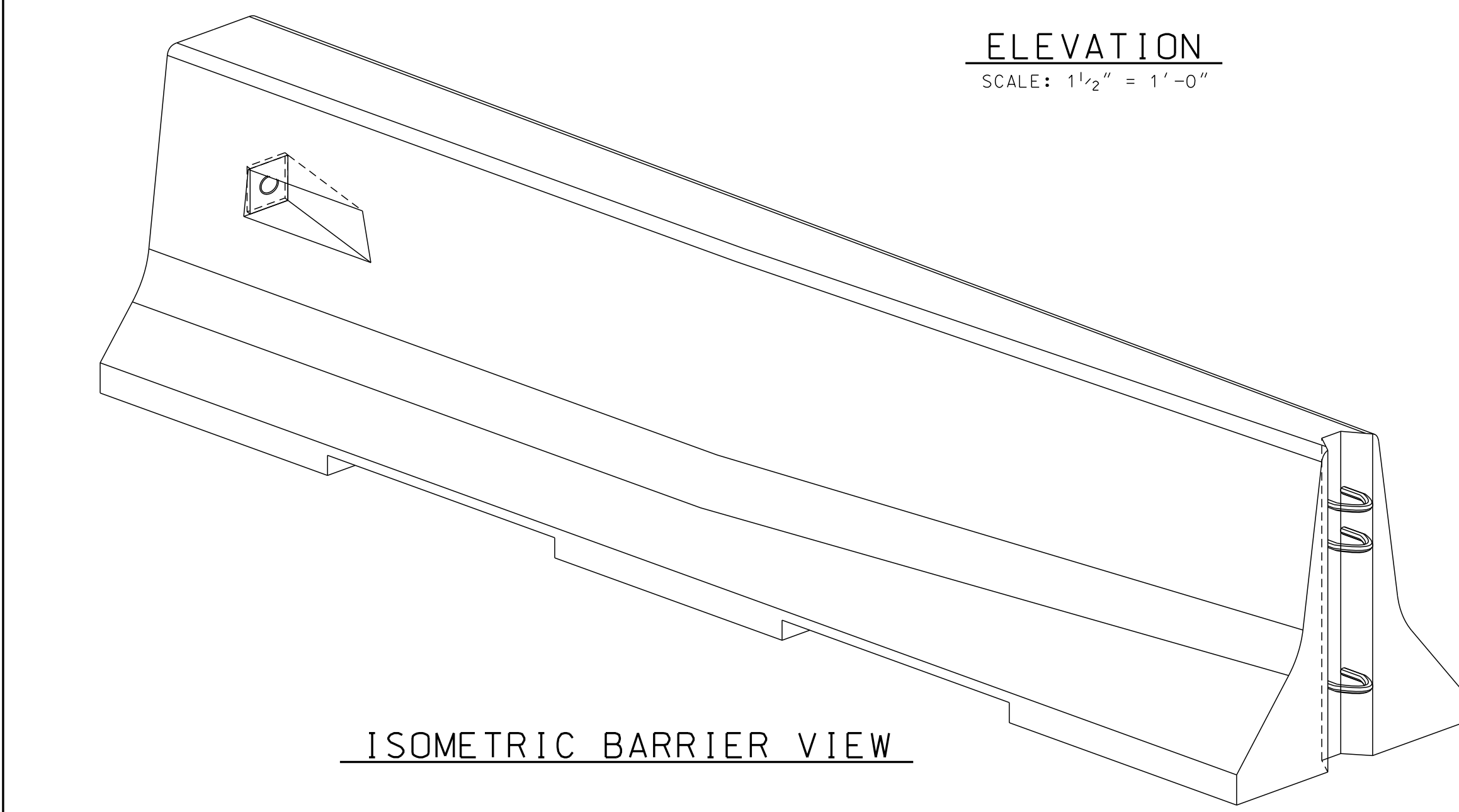
ELEVATION
SCALE: 1 1/2" = 1'-0"



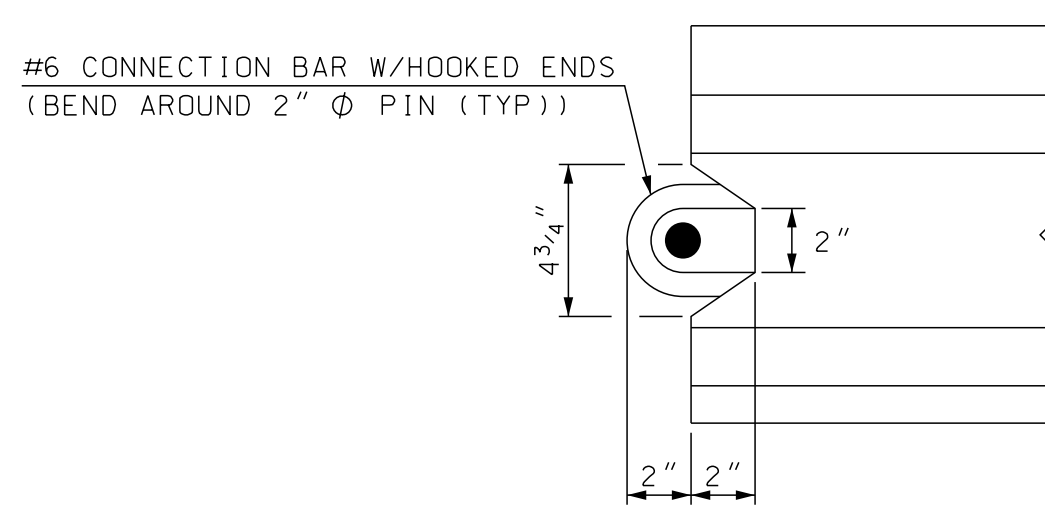
SECTION A-A
SCALE: 1 1/2" = 1'-0"



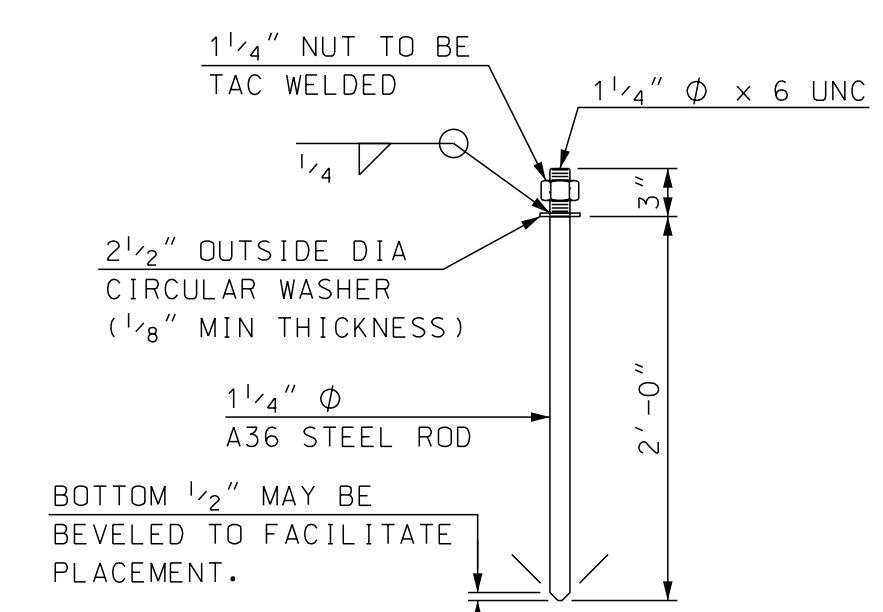
VIEW B-B
SCALE: 1 1/2" = 1'-0"



ISOMETRIC BARRIER VIEW



END NOTCH DETAIL
(AT VIEW B-B)
SCALE: 2" = 1'-0"



CONNECTOR PIN ASSEMBLY
SCALE: 1" = 1'-0"

NO MODIFICATIONS SHOULD BE MADE TO THIS SHEET

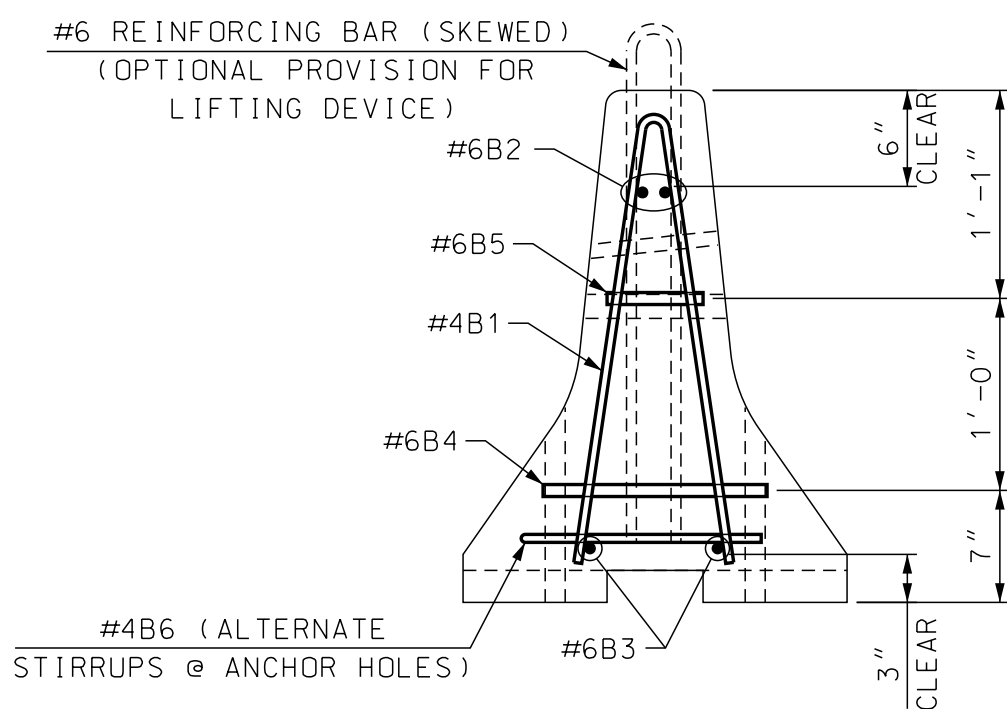
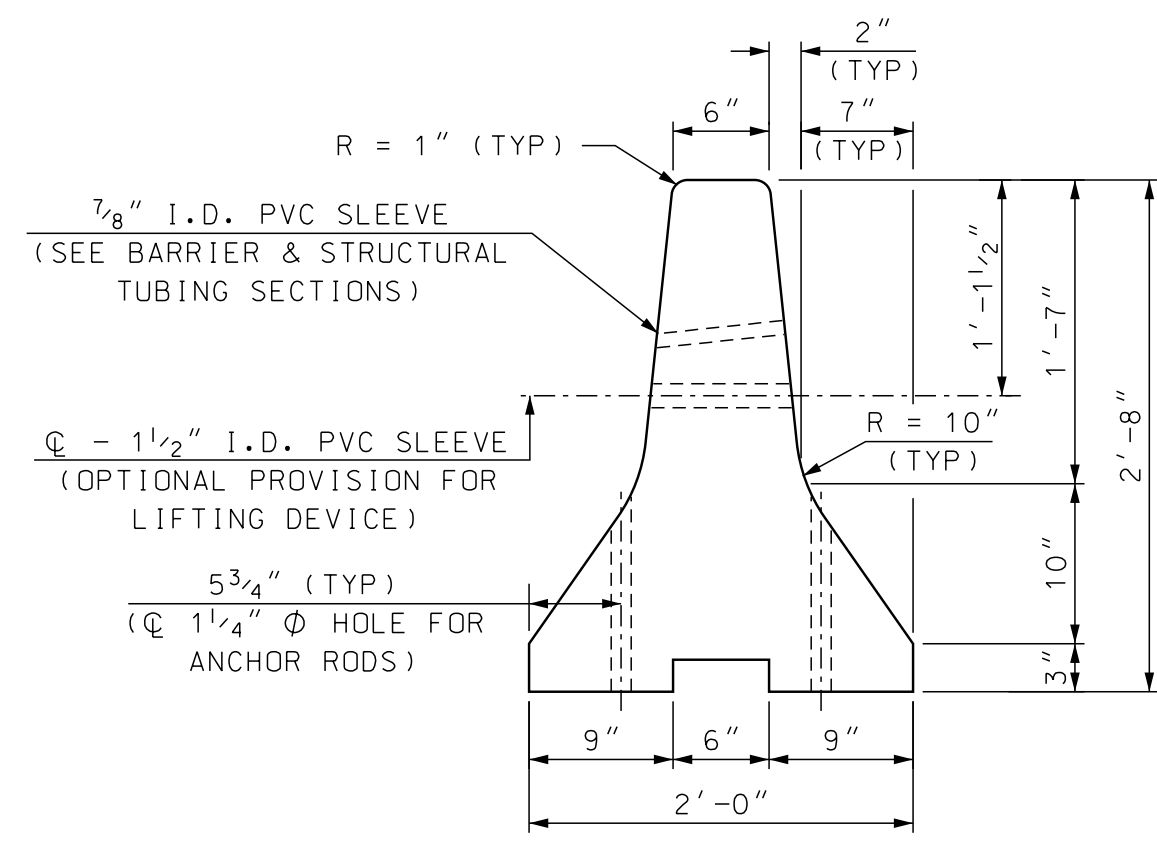
NOTES

1. TEXAS RESTRAINED BARRIER (TRANSITION UNIT) SHALL BE PAID FOR UNDER ITEM 606.41741, PORTABLE CONCRETE BARRIER FOR TRAFFIC CONTROL (BRIDGE).
2. SEE SHEET 1 OF 3 FOR NOTES AND SHEET 2 OF 3 FOR REBAR SCHEDULE.

BARRIER WEIGHT APPROX. 2.28 TONS

STATE OF NEW HAMPSHIRE					
DEPARTMENT OF TRANSPORTATION * BUREAU OF BRIDGE DESIGN					
TOWN	XX	BRIDGE NO.	XXXXXX	STATE PROJECT	XX
LOCATION	XX	TEXAS RESTRAINED BARRIER (X-BOLT) (3 OF 3)			BRIDGE SHEET
DESIGNED	TXDOT	DATE	CHECKED	NHDOT	DATE
DRAWN	GMC	12/10	CHECKED	NHDOT	4/18
QUANTITIES	XXX	XX/XX	CHECKED	XXX	XX/XX
ISSUE DATE	5/15/18	FEDERAL PROJECT NO.		SHEET NO.	TOTAL SHEETS
REV. DATE					

SUBDIRECTORY	DGN LOCATOR	SHEET SCALE
standard/english/barrier	X-Bolt Barrier	AS NOTED

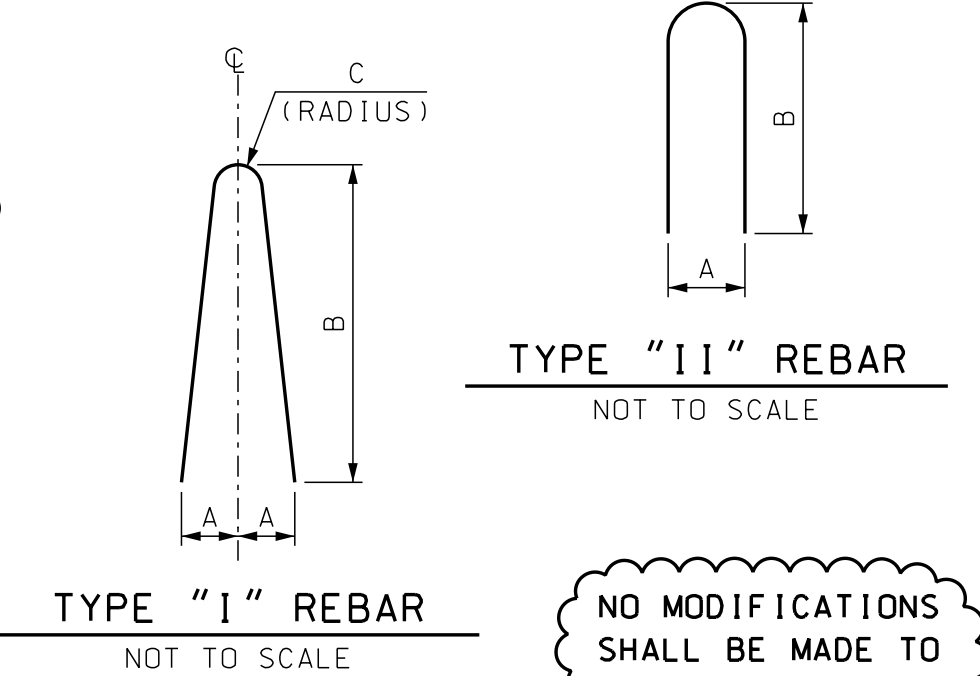
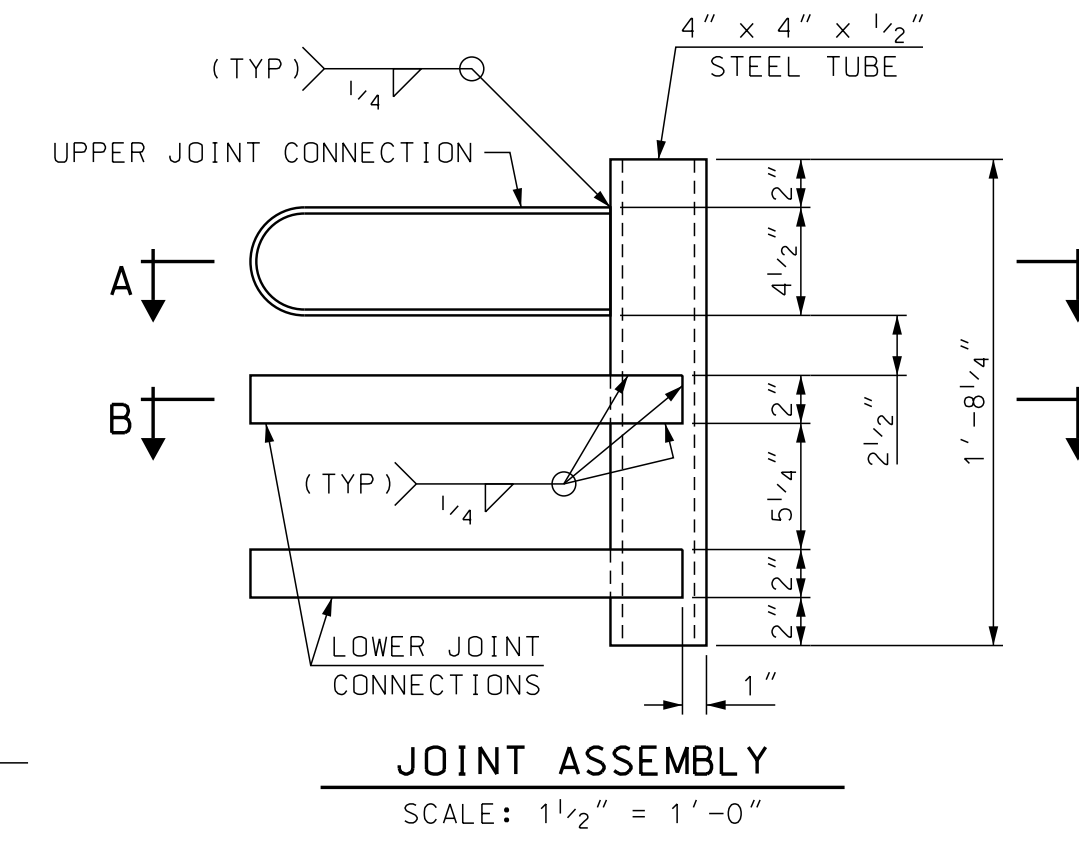
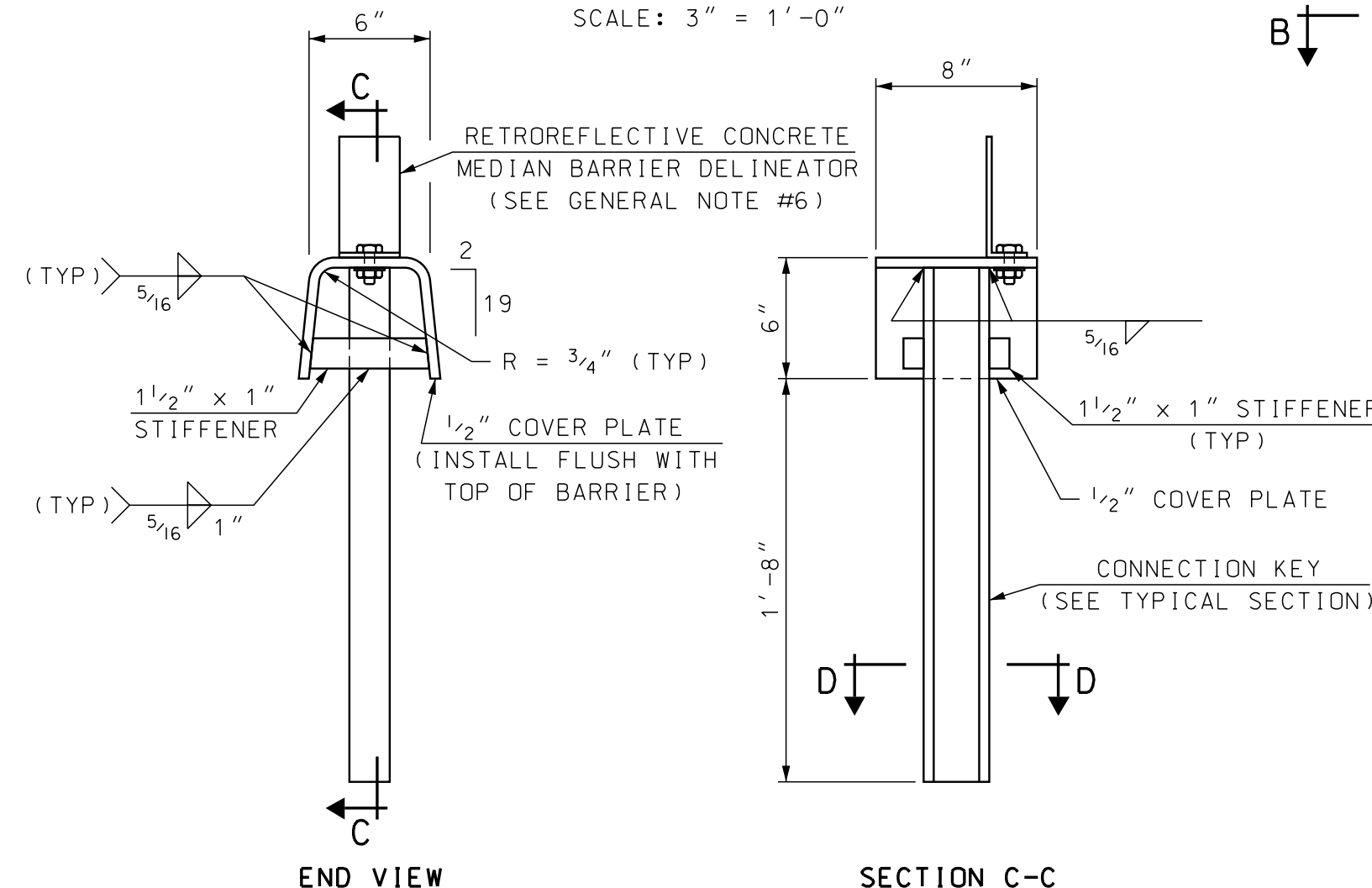
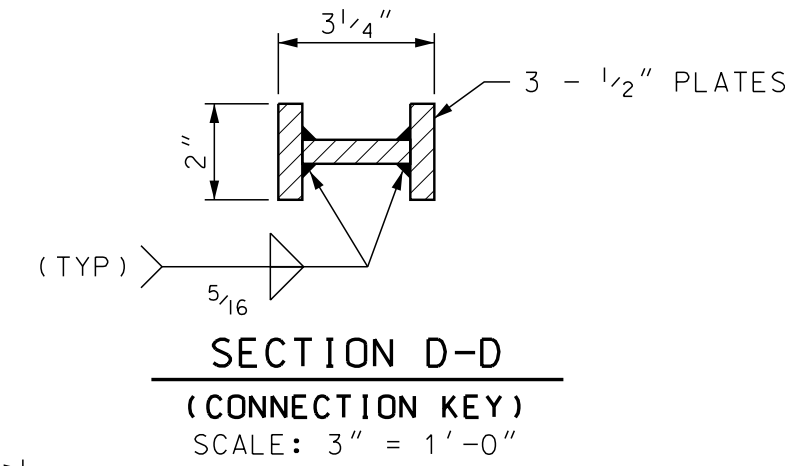
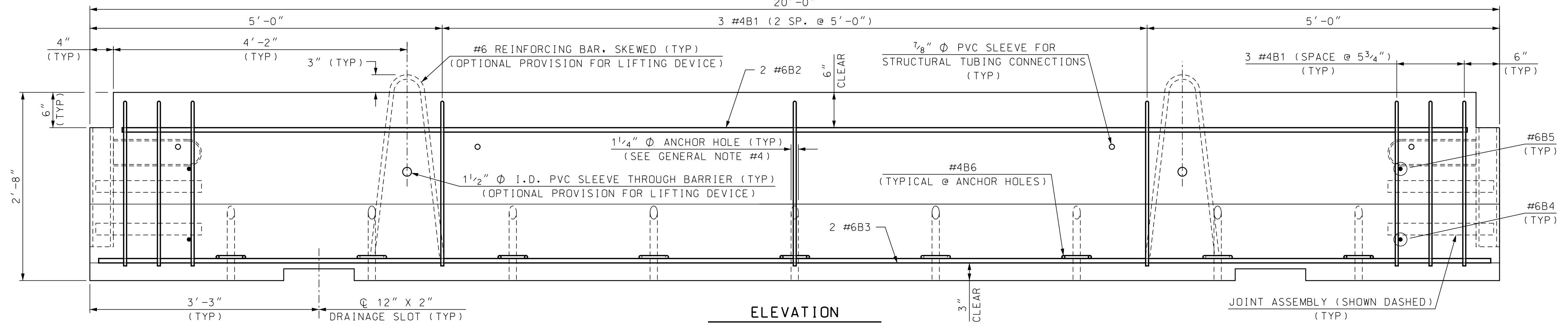
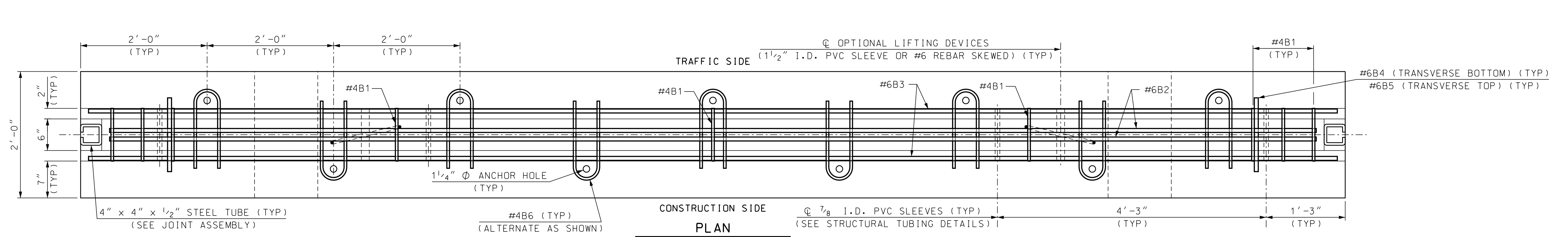


GENERAL NOTES

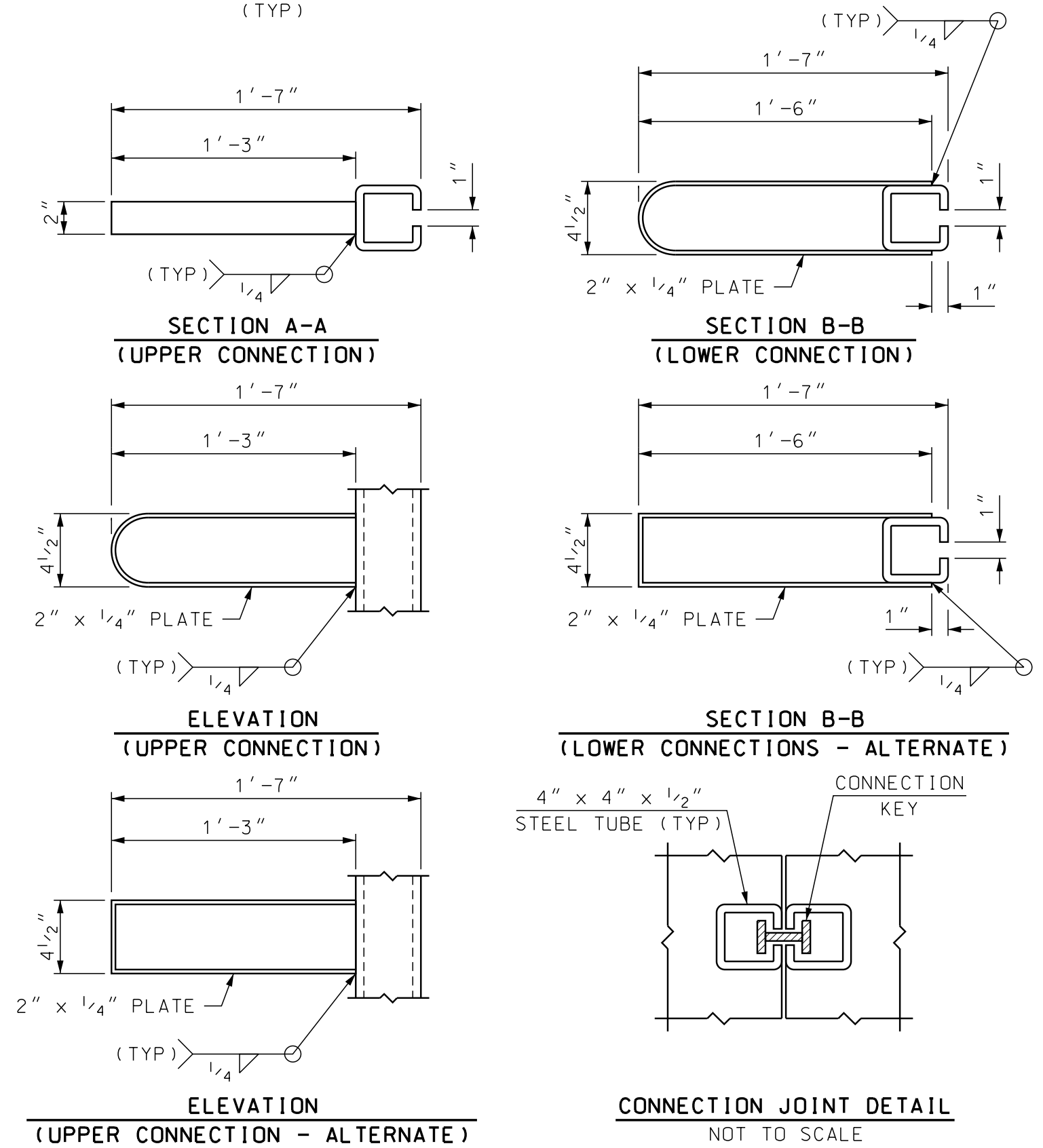
- PORTABLE CONCRETE BARRIER SHALL BE FURNISHED BY THE CONTRACTOR AND PAID FOR AS ITEM 606.41741 PORTABLE CONCRETE BARRIER FOR TRAFFIC CONTROL (BRIDGE). CONCRETE BARRIER AND ALL ATTACHMENTS SHALL BE FABRICATED IN ACCORDANCE WITH SPECIAL PROVISIONS. ALL BARRIER UNITS FOR BRACED SYSTEMS SHALL BE 20' LONG.
- PORTABLE CONCRETE BARRIER DETAILS, AS SHOWN IN THESE PLANS, ARE IN COMPLIANCE WITH REQUIREMENTS PER UPDATED NCHRP REPORT 350 FOR TEST NO. 3-11 (MASH TEST LEVEL 3), CRASH TESTED BY MIDWEST ROADSIDE SAFETY; NY BOX BEAM STIFFENING OF UNANCHORED TCB, MARCH 2008, AND ACCEPTED PER FHWA LETTER B-239 (11/1/2012). THE BARRIER SYSTEM HAS BEEN CRASH TESTED WITH A 27.6" DYNAMIC DEFLECTION WHICH WILL ALLOW BRACED BARRIER TO BE PLACED A MINIMUM 12" FROM THE EDGE OF BRIDGE DECK.
- A MINIMUM OF TWO BARRIER UNITS, WITH BRACED JOINTS ARE REQUIRED TO BE PLACED BEYOND BOTH ENDS OF THE BRIDGE WORK AREA. FOR SPEEDS GREATER THAN 45 MPH. FOR SPEEDS ≤ 45 MPH, A MINIMUM OF ONE BRACED BARRIER IS REQUIRED TO BE FULLY SET BEYOND EACH END OF BRIDGE WORK AREA.
- THE LAST CONCRETE BARRIER UNIT, AT EACH END OF BRACED BARRIER LAYOUT, SHALL BE ANCHORED A MINIMUM 18" BELOW THE ROADWAY SURFACE. REQUIRED 1" Ø ANCHOR RODS (A36 STEEL) SHALL BE INSTALLED WITH 5 ANCHORS ON THE TRAFFIC SIDE OF BARRIER AND 4 ON THE CONSTRUCTION SIDE. IF THE END(S) OF THE BRACED CONCRETE BARRIER SYSTEM EXTENDS 50' OR MORE BEYOND LIMITS OF BRIDGE WORK THE LAST BARRIER UNIT DOES NOT REQUIRE ANCHORAGE.
- PORTABLE CONCRETE BARRIER FOR TRAFFIC CONTROL (BRIDGE), ITEM 606.41741, MAY BE INSTALLED WITH A 230' MINIMUM RADIUS. GAPS CREATED BETWEEN STRUCTURAL TUBES AND CONCRETE BARRIER, DURING A RADIAL LAYOUT, SHALL BE SHIMMED WITH 8" x 8" x 1/2" PLATES & FENDER WASHERS TO FIRMLY ATTACH STRUCTURAL TUBING TO BARRIER.
- THE CONTRACTOR SHALL FURNISH AND INSTALL APPROVED RETROREFLECTIVE DELINEATORS AT 25-FOOT INTERVALS ALONG TOP AND/OR ONE FOOT DOWN THE SIDE OF PORTABLE CONCRETE BARRIER, SUBSIDIARY TO ITEM 606.41741 (SEE STANDARD NO. DL-1 OF NHDOT STANDARD PLANS FOR ROAD CONSTRUCTION). THE COLOR OF DELINEATORS SHALL, IN ALL INSTANCES, CONFORM TO THE COLOR OF EDGE LINE MARKINGS. DELINEATORS SUPPLEMENT, BUT DO NOT REPLACE, THE NEED FOR RETROREFLECTIVE SOLID EDGE LINE MARKINGS.

MATERIAL NOTES

- BARRIERS SHALL BE LIGHT COLORED CLASS AA CONCRETE, WITH MINIMUM COMPRESSIVE STRENGTH OF 4000 psi, AND SHALL HAVE A SMOOTH UNIFORM SURFACE FREE OF DEFECTS AND IRREGULARITIES. CASTING DATE SHALL BE SHOWN ON BARRIER. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4", UNLESS OTHERWISE NOTED.
- ALL REINFORCING STEEL SHALL BE AASHTO M31 (ASTM A615) GRADE 60. ALL REINFORCEMENT SHALL HAVE 1/2" MINIMUM CLEAR COVER, UNLESS OTHERWISE NOTED.
- STRUCTURAL STEEL, EXCEPT THE STEEL TUBES, SHALL BE ASTM A36 OR A572. ALL STEEL SHALL BE FABRICATED IN ACCORDANCE WITH SECTION 550.
- STEEL TUBES, 6" x 6" x 3/16" & 4" x 4" x 1/2", SHALL BE ASTM A 500 GRADE B OR C. ALL TUBES SHALL BE GALVANIZED IN ACCORDANCE WITH SECTION 550.
- ALL STEEL FOR CONNECTION KEY AND TRANSITION KEY ASSEMBLIES SHALL BE GALVANIZED IN ACCORDANCE WITH SECTION 550.
- A MINIMUM OF 2 LIFTING DEVICES, EACH WITH THE CAPACITY TO LIFT A MASS OF 6 TONS (MINIMUM), SHALL BE INSTALLED TO EACH BARRIER UNIT. TWENTY FOOT LONG CONCRETE BARRIER UNITS ARE APPROXIMATELY 400 LBS./FT.
- DELINEATORS SHALL BE ATTACHED TO BARRIER USING AN APPROVED ADHESIVE MATERIAL OR AS SHOWN ON THIS SHEET.



NO MODIFICATIONS SHALL BE MADE TO THIS SHEET

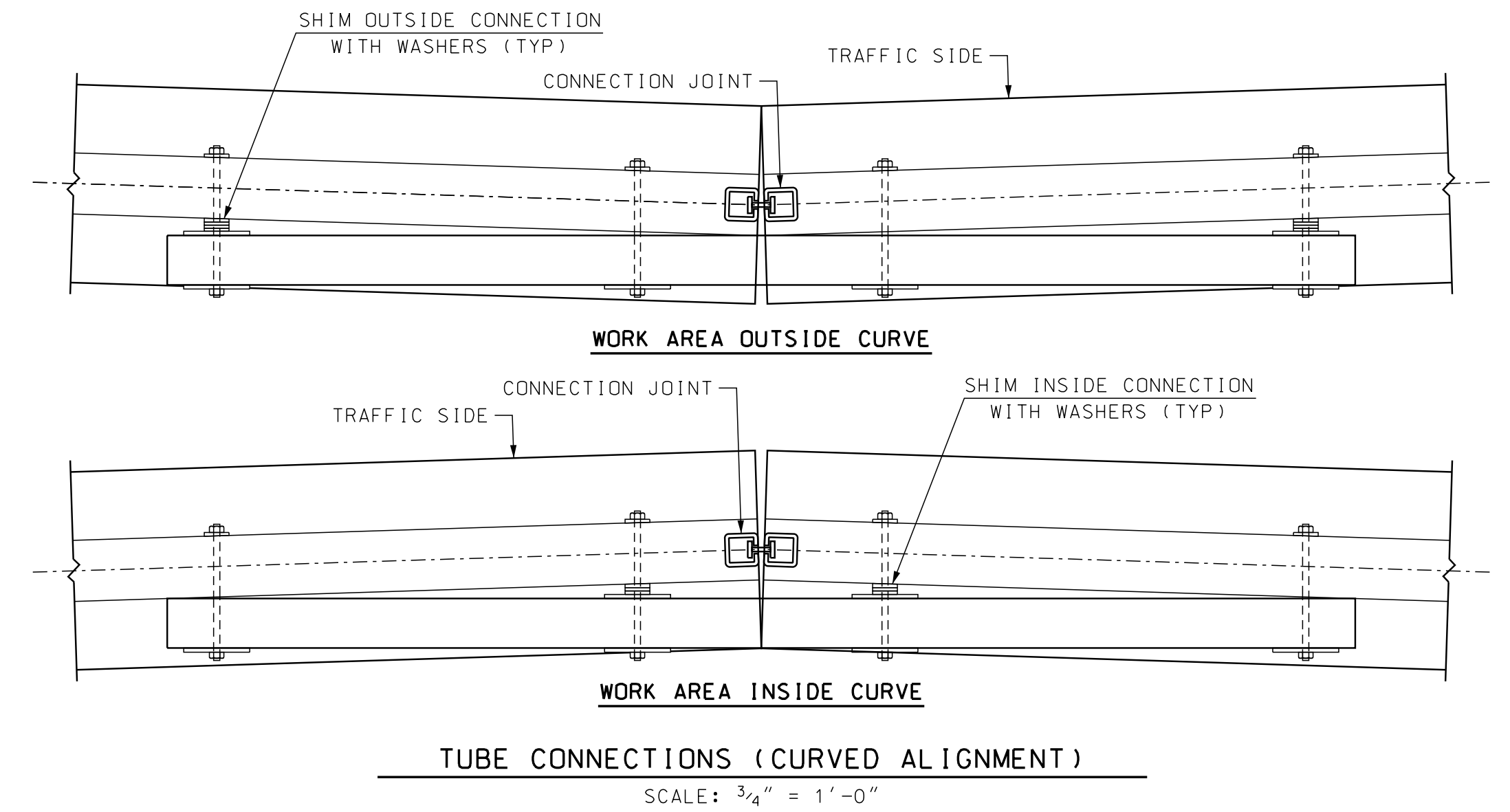
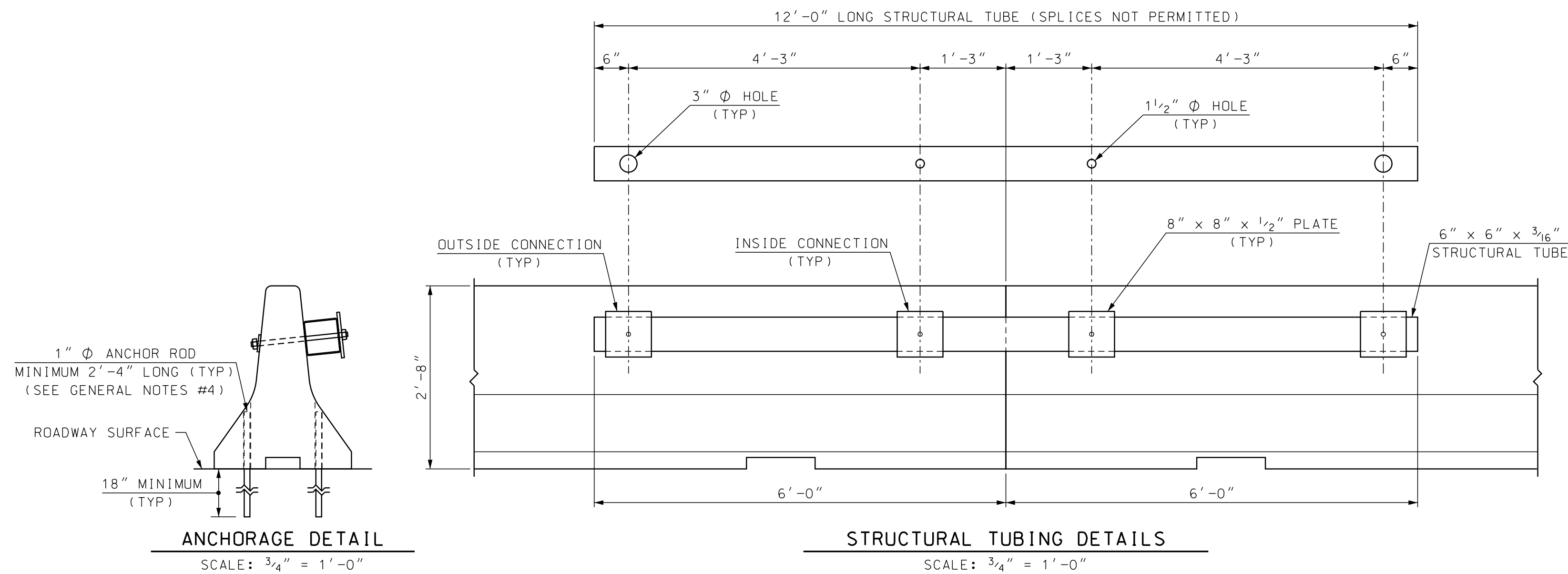
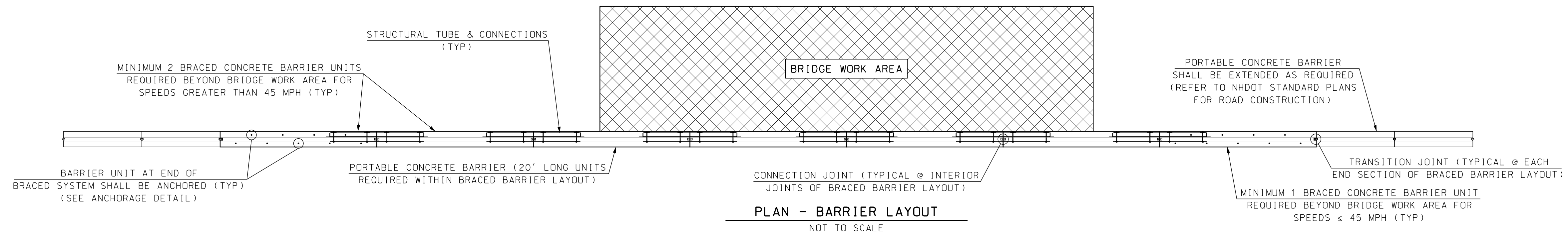


REINFORCING SCHEDULE (PER 20' BARRIER UNIT)

MARK	SIZE	LENGTH	# PIECES	TYPE	A	B	C	LOCATION
B1	#4	4'-10"	9	I	5"	2'-4"	1"	STIRRUPS
B2	#6	19'-1"	2	—				LONGITUDINAL (TOP)
B3	#6	19'-9"	2	—				LONGITUDINAL (BOTTOM)
B4	#6	1'-2"	2	—				TRANSVERSE (BOTTOM)
B5	#6	6"	2	—				TRANSVERSE (TOP)
B6	#4	2'-9"	9	II	5"	1'-3"		STIRRUPS

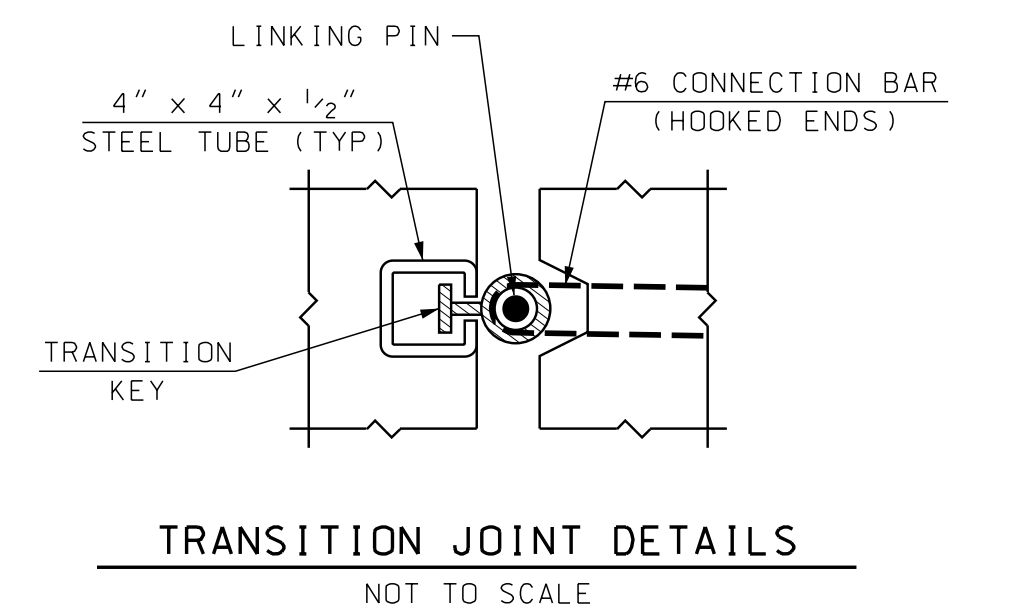
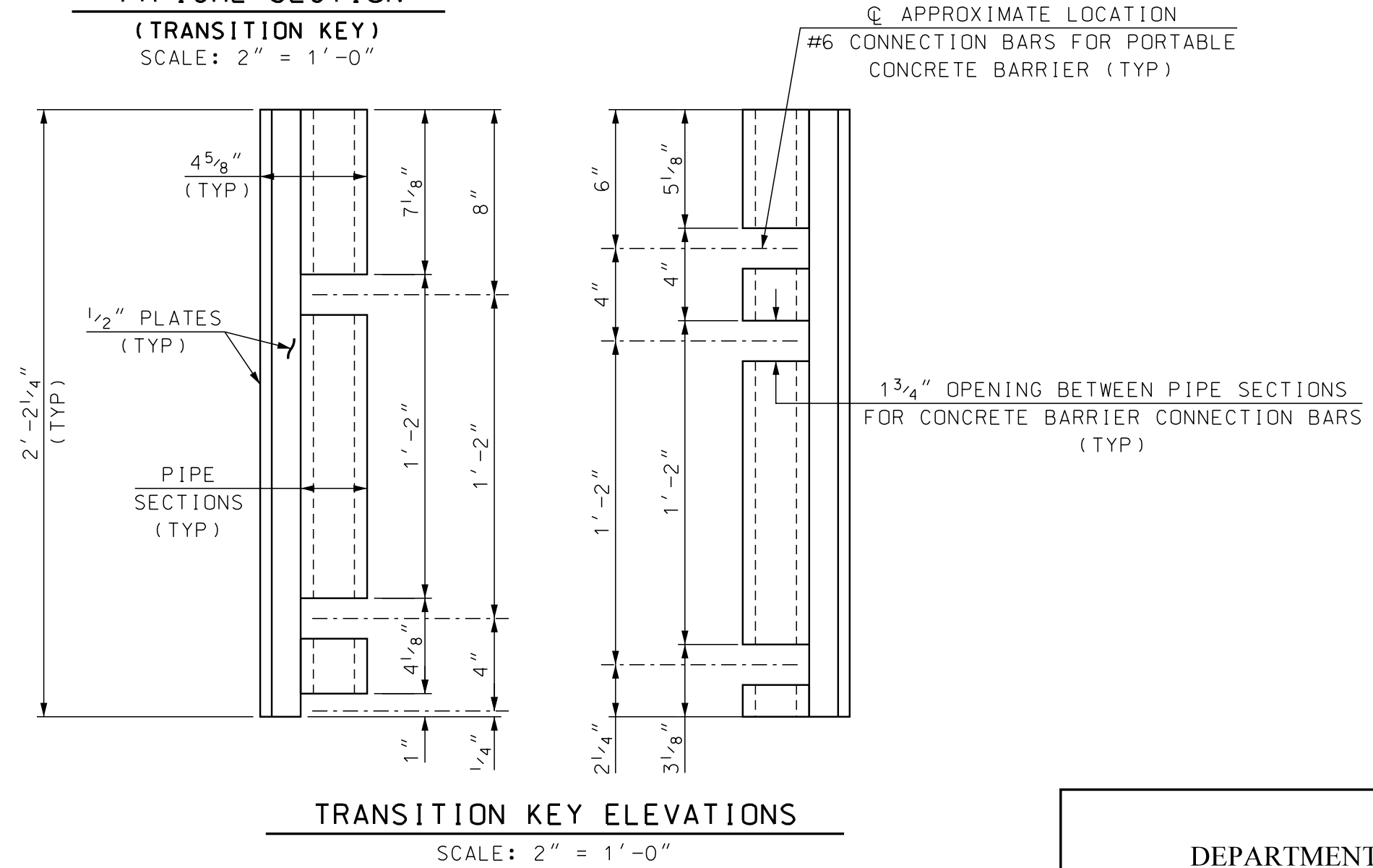
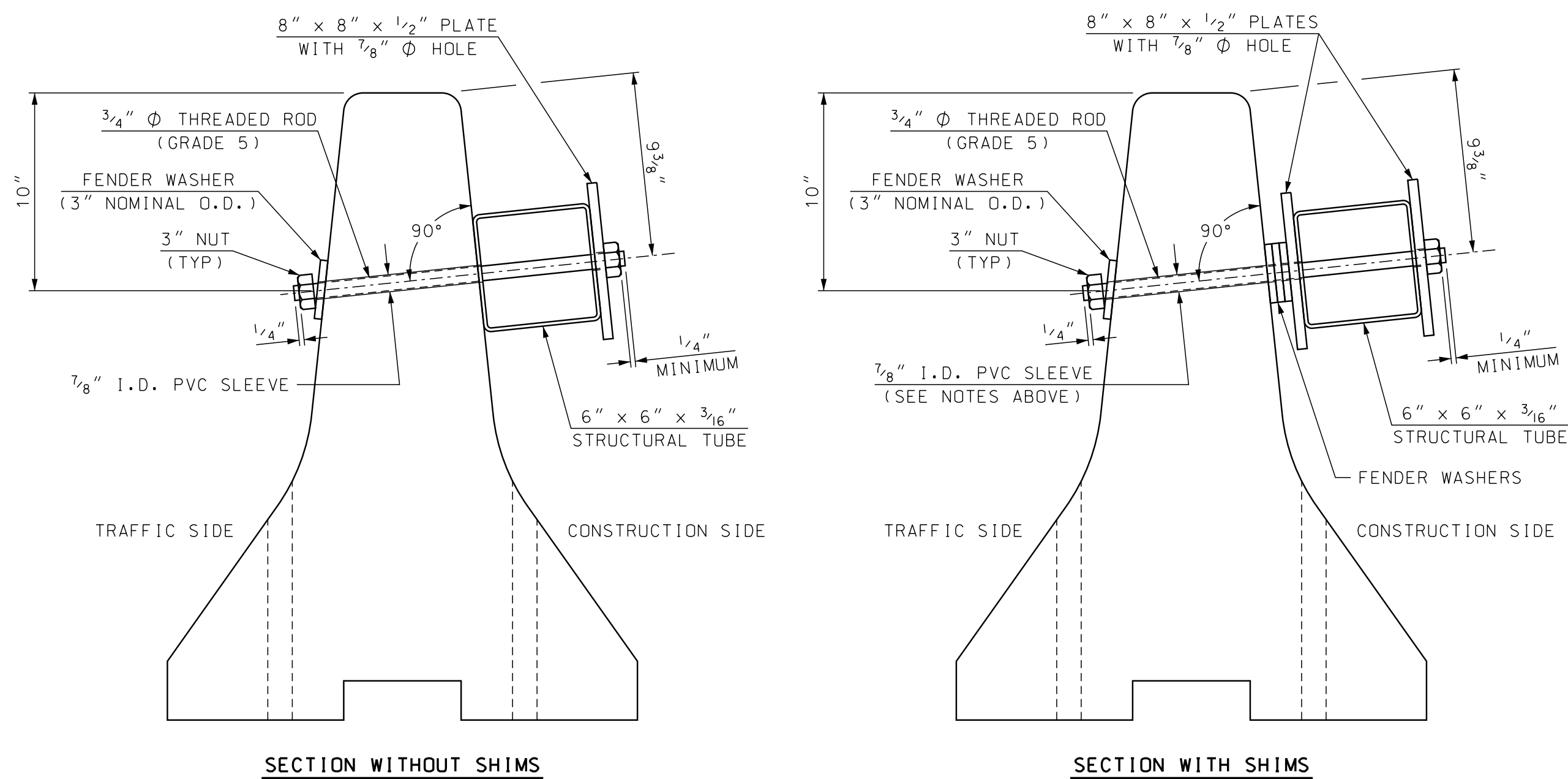
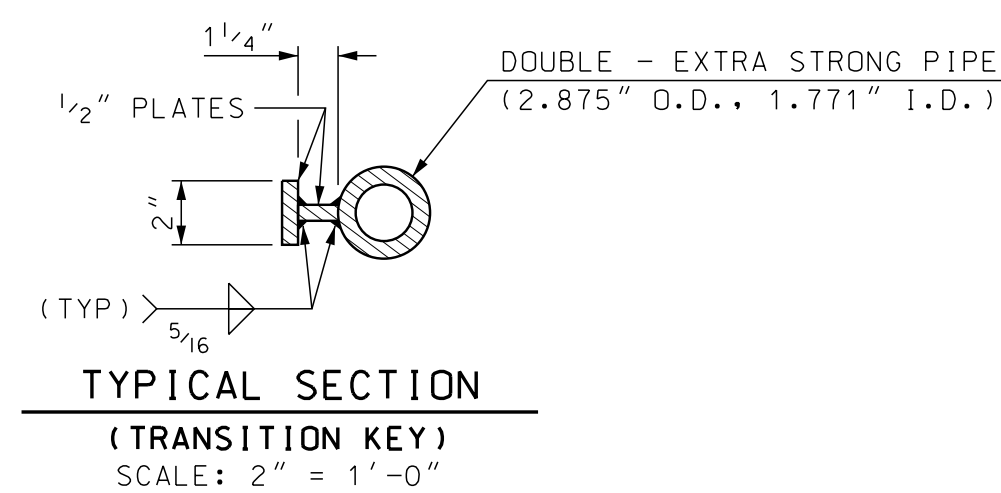
SUBDIRECTORY	DGN LOCATOR	SHEET SCALE
English/BARRIER	PCB-BRACED	AS NOTED

STATE OF NEW HAMPSHIRE					
DEPARTMENT OF TRANSPORTATION * BUREAU OF BRIDGE DESIGN					
TOWN	BRIDGE NO.		STATE PROJECT		
LOCATION					
PORTABLE CONCRETE BARRIER - BRACED (1 OF 2)					BRIDGE SHEET
					OF
					FILE NUMBER
DESIGNED	NHDOT	DATE	CHECKED	ABH	DATE
DRAWN	PJP	8/12	CHECKED	ABH	8/12
QUANTITIES			CHECKED		
ISSUE DATE	8/15/12	FEDERAL PROJECT NO.			
REV. DATE	5/15/18		SHEET NO.	TOTAL SHEETS	



PVC SLEEVE OPENINGS SHALL BE MODIFIED/DRILLED AS REQUIRED TO PROPERLY ALIGN STRUCTURAL TUBE BRACING UNITS FOR CURVED ALIGNMENTS

THE PRESENCE OF NORMAL HOLES WHICH HAVE BEEN MODIFIED/DRILLED WILL NOT AFFECT THE REUSE OF CONCRETE BARRIER UNITS



NO MODIFICATIONS SHALL BE MADE TO THIS SHEET

STATE OF NEW HAMPSHIRE									
DEPARTMENT OF TRANSPORTATION * BUREAU OF BRIDGE DESIGN									
TOWN		BRIDGE NO.			STATE PROJECT				
LOCATION									
PORTABLE CONCRETE BARRIER - BRACED (2 OF 2)								BRIDGE SHEET	
REVISIONS AFTER PROPOSAL		BY		DATE		BY		DATE	
		DESIGNED		NHDOT		7/12		CHECKED	
		DRAWN		PJP		8/12		CHECKED	
		QUANTITIES						CHECKED	
		ISSUE DATE		8/15/12		FEDERAL PROJECT NO.		SHEET NO.	
		REV. DATE		5/15/18		-----		TOTAL SHEETS	

SUBDIRECTORY	DGN LOCATOR	SHEET SCALE
English/BARRIER	PCB-BRACED	AS NOTED