

Barriers

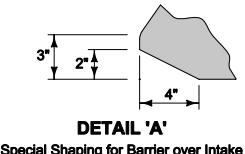
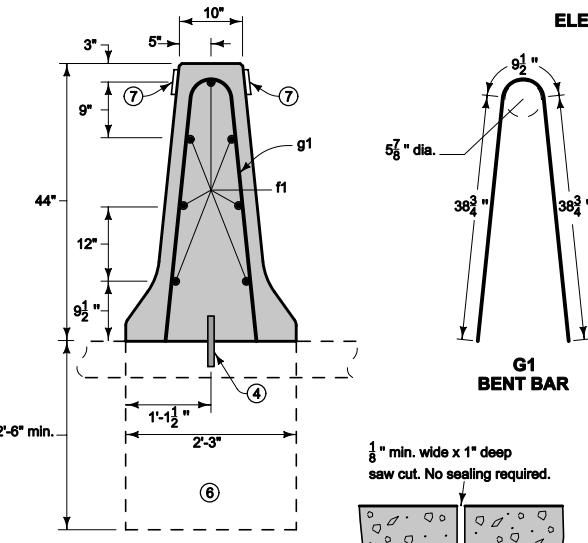
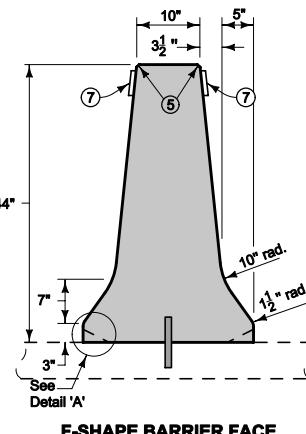
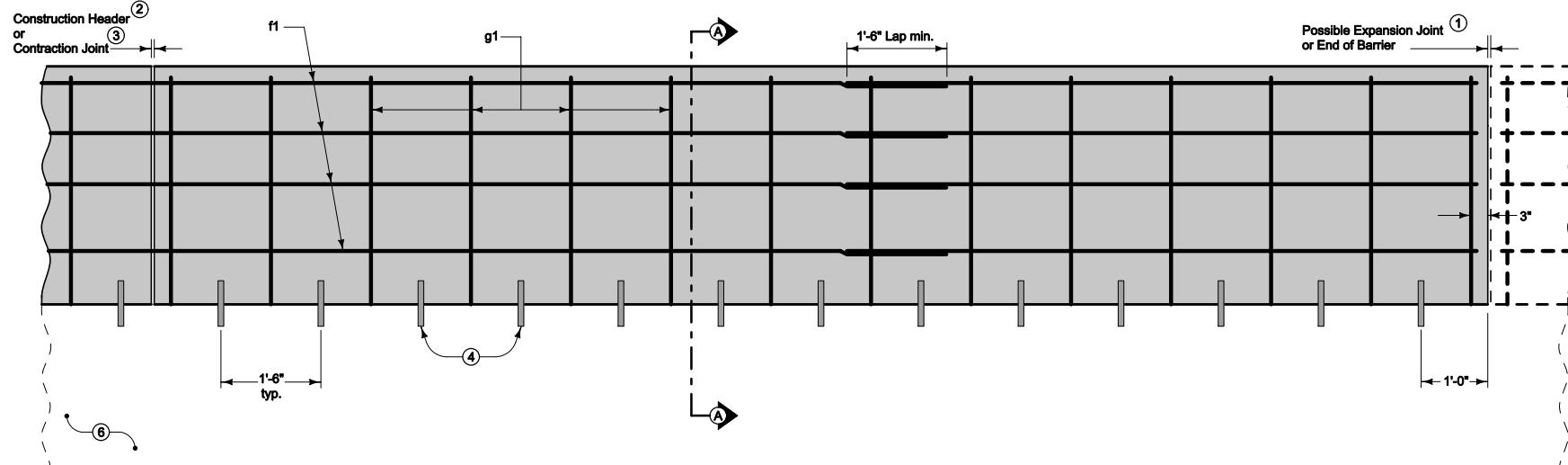
BA

Barriers

NO.	DATE	TITLE
Concrete Barriers		
BA-100	04-20-10	44" Concrete Median Barrier (Full Section)
BA-101	10-21-14	44" Concrete Median Barrier Width Transition
BA-102	10-21-14	44" Concrete Barrier (Half Section)
BA-103	04-20-10	34" Concrete Barrier (Half Section)
BA-104	04-20-10	34" Concrete Barrier for use with Reinforced Paved Shoulder
BA-105	04-20-10	34" to 44" Concrete Barrier Transition Section
BA-106	10-21-14	Reinforced Paved Shoulder for Concrete Barrier
BA-107	10-18-11	Concrete Barrier End Section
BA-108	04-19-11	Concrete Barrier Tapered End Section
BA-150	04-19-11	Side Obstacle Protection with Concrete Barrier and Guardrail
Steel Beam Guardrail		
BA-200	10-18-16	Steel Beam Guardrail Components
BA-201	10-18-16	Steel Beam Guardrail Barrier Transition Section (MASH TL-3)
BA-202	10-20-15	Steel Beam Guardrail Bolted End Anchor
BA-203	10-18-11	Steel Beam Guardrail W-Beam End Anchor
BA-204	10-18-11	Steel Beam Guardrail Thrie-Beam End Anchor
BA-205	04-19-16	Steel Beam Guardrail Tangent End Terminal (MASH TL-3)
BA-206	10-18-16	Steel Beam Guardrail Flared End Terminal For Cable Connection (MASH TL-3)
BA-210	04-19-16	Guardrail Post Adaptor Unit
BA-211	10-21-14	Steel Beam Guardrail Long - Span System for Post Conflicts
BA-221	10-18-16	Steel Beam Guardrail Barrier Transition Section (MASH TL-2)
BA-225	10-18-16	Steel Beam Guardrail Tangent End Terminal (MASH TL-2)
BA-250	10-18-16	Steel Beam Guardrail Installation at Concrete Barrier or Bridge End Post (MASH TL-3)
BA-251	04-19-16	Steel Beam Guardrail Installation at Side Obstacle (Two-Way Protection)
BA-252	04-19-16	Steel Beam Guardrail Installation at Side Obstacle (One-Way Protection)
BA-253	04-19-16	Steel Beam Guardrail Installation at Railroad Signal
BA-260	10-18-16	Steel Beam Guardrail Installation at Concrete Barrier or Bridge End Post (MASH TL-2)

Barriers

NO.	DATE	TITLE
BA-351	04-20-10	Cable Guardrail High Tension Cable Guardrail
BA-400	04-16-13	Temporary Barrier Rails
BA-401	04-16-13	Temporary Barrier Rail (Steel) Temporary Barrier Rail (Precast Concrete)
BA-500	04-19-16	Crash Cushions Temporary Crash Cushions Sand Barrel



Use epoxy-coated Grade 60 reinforcing bars. Provide 2 inches minimum cover. Anchor barrier reinforcement to prevent movement. Secure each section at the front, back, and at 3'-6" minimum intervals using a method approved by the Engineer.

- ① Expansion joints are necessary only where specifically required by project plans. Conform expansion material to the shape of the barrier. No sealer is required.
- ② Saw contraction joints as indicated. Where abutting sections are placed as separate pours, a butt joint may be used. Extend longitudinal reinforcement into the abutting section a minimum of 1'-6".
- ③ For barrier dowelled to pavement, match pavement joints. For free-standing barrier with integral footings, use 20 foot maximum, 15 foot minimum joint spacing.
- ④ Use 1 inch diameter deformed dowel bars of sufficient length to ensure 6 inch minimum embedment in barrier and supporting surface. Install dowels either in supporting surface when placed, or in drilled holes using polymer grout complying with Materials I.M. 491.11 or hydraulic cement grout complying with Materials I.M. 491.13.

- ⑤ Fillet all exposed corners with a $\frac{3}{4}$ inch dressed and beveled strip.
- ⑥ Construct concrete footing when barrier is not placed on concrete slab. Apply Section 2403.03, but the use of forms is optional. If forms are used, place backfill around the completed footing.
- ⑦ Place barrier markers at 100 foot increments in areas with non-continuous lighting, or 250 foot increments in areas with continuous lighting. Marker color to be the same as adjacent edge line.

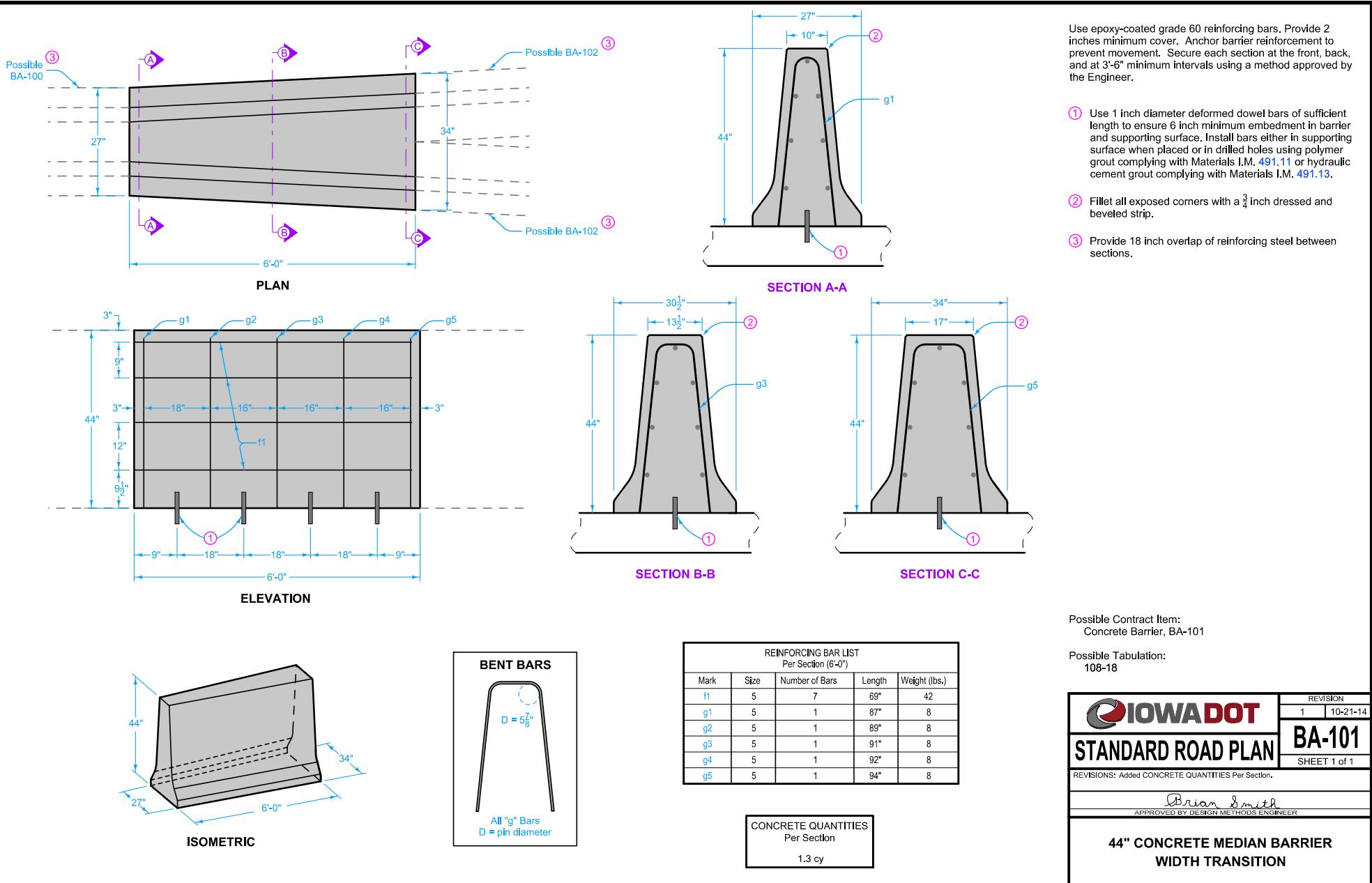
Possible Contract Item:
Concrete Barrier, BA-100 or
Concrete Barrier, BA-100 and Footing

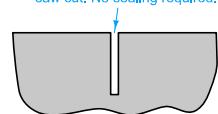
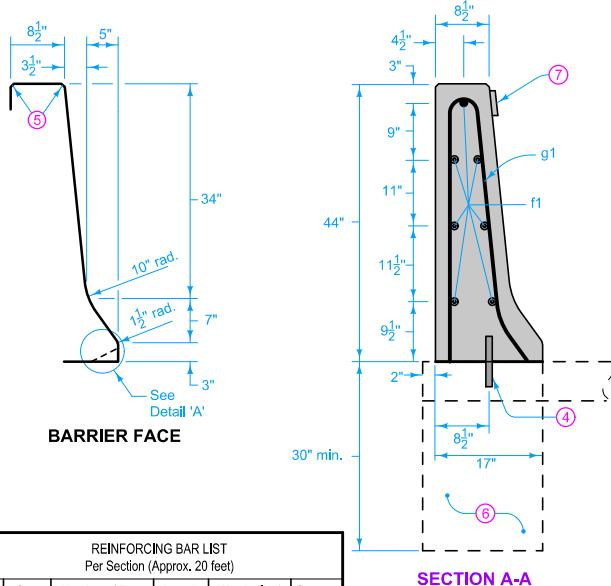
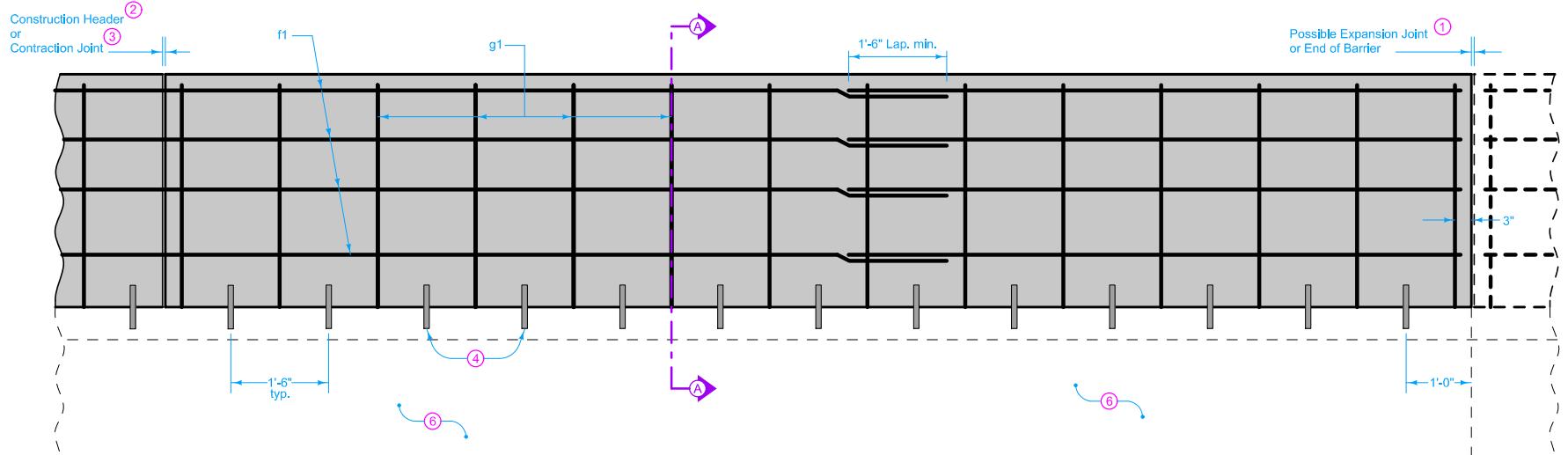
Possible Tabulation:
108-18

Iowa Department of Transportation		REVISION New 04-20-10
STANDARD ROAD PLAN		BA-100
SHEET 1 of 1		
REVISONS: New. Replaces RE-44A.		
 APPROVED BY DESIGN METHODS ENGINEER		
44" CONCRETE MEDIAN BARRIER (FULL SECTION)		

REINFORCING BAR LIST Per Section (Approx. 20 feet)					
Mark	Size	Number of Bars	Length	WT. (lbs.)	Max. Spacing
g1	5	14	7'-4"	107	1'-6"
f1	5	7	19'-6"	141	

CONCRETE QUANTITIES Per Foot	
0.15 cy	

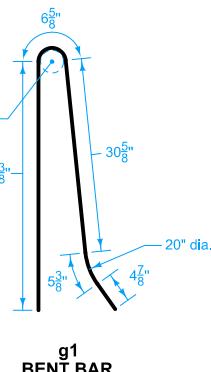




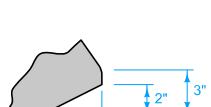
SAWED CONTRACTION JOINT
Saw cut top and front face. Saw cut back if exposed.

ELEVATION

Use Grade 60 epoxy-coated reinforcing bars. Provide 2 inches minimum cover. Anchor all reinforcement to prevent movement. Secure each section at the front, back, and at 3'-6" intervals using a method approved by the Engineer.



DETAIL 'A'
Special Shaping for Barrier over Intake



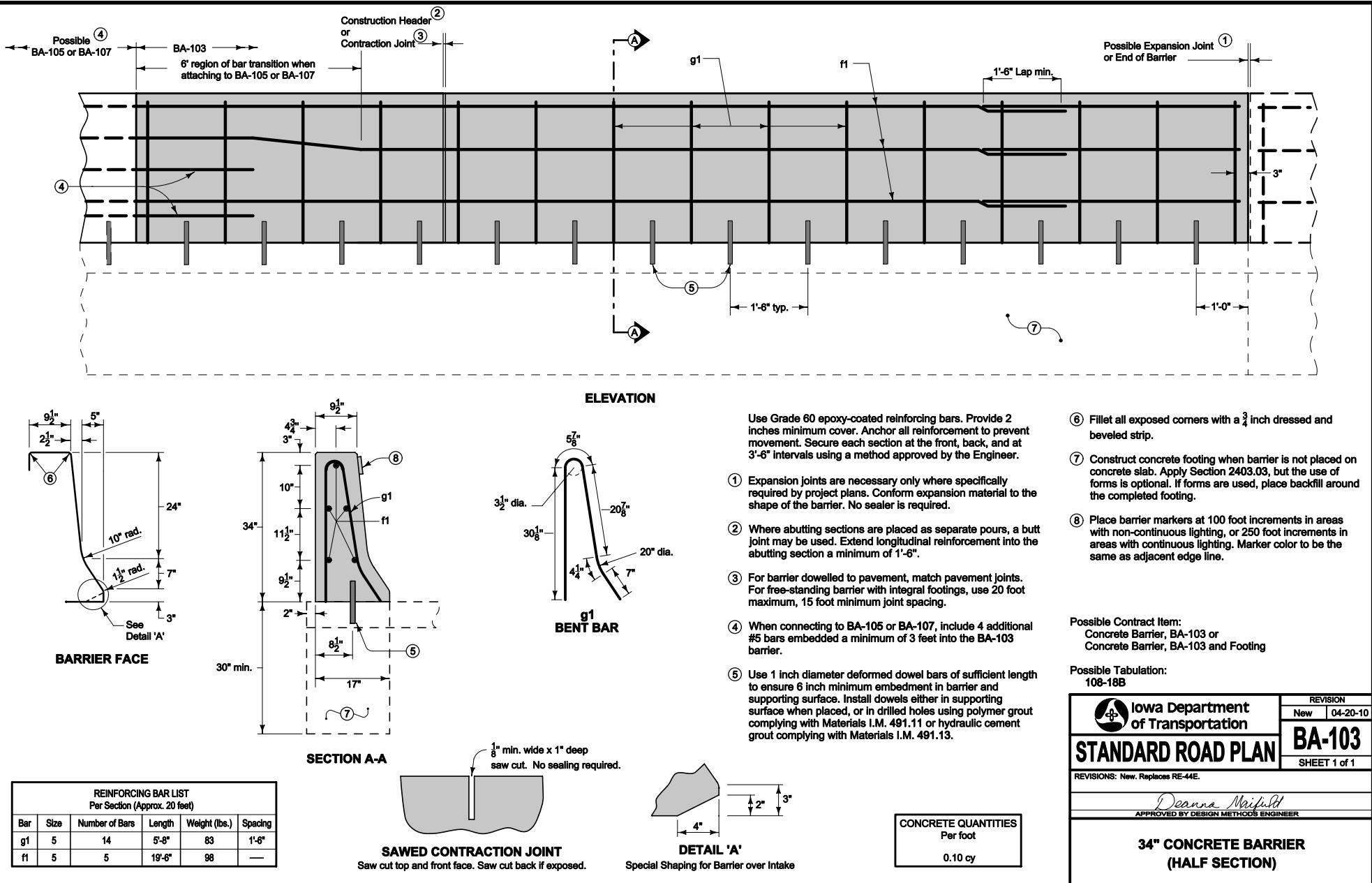
CONCRETE QUANTITIES Per foot				
0.11 cy				

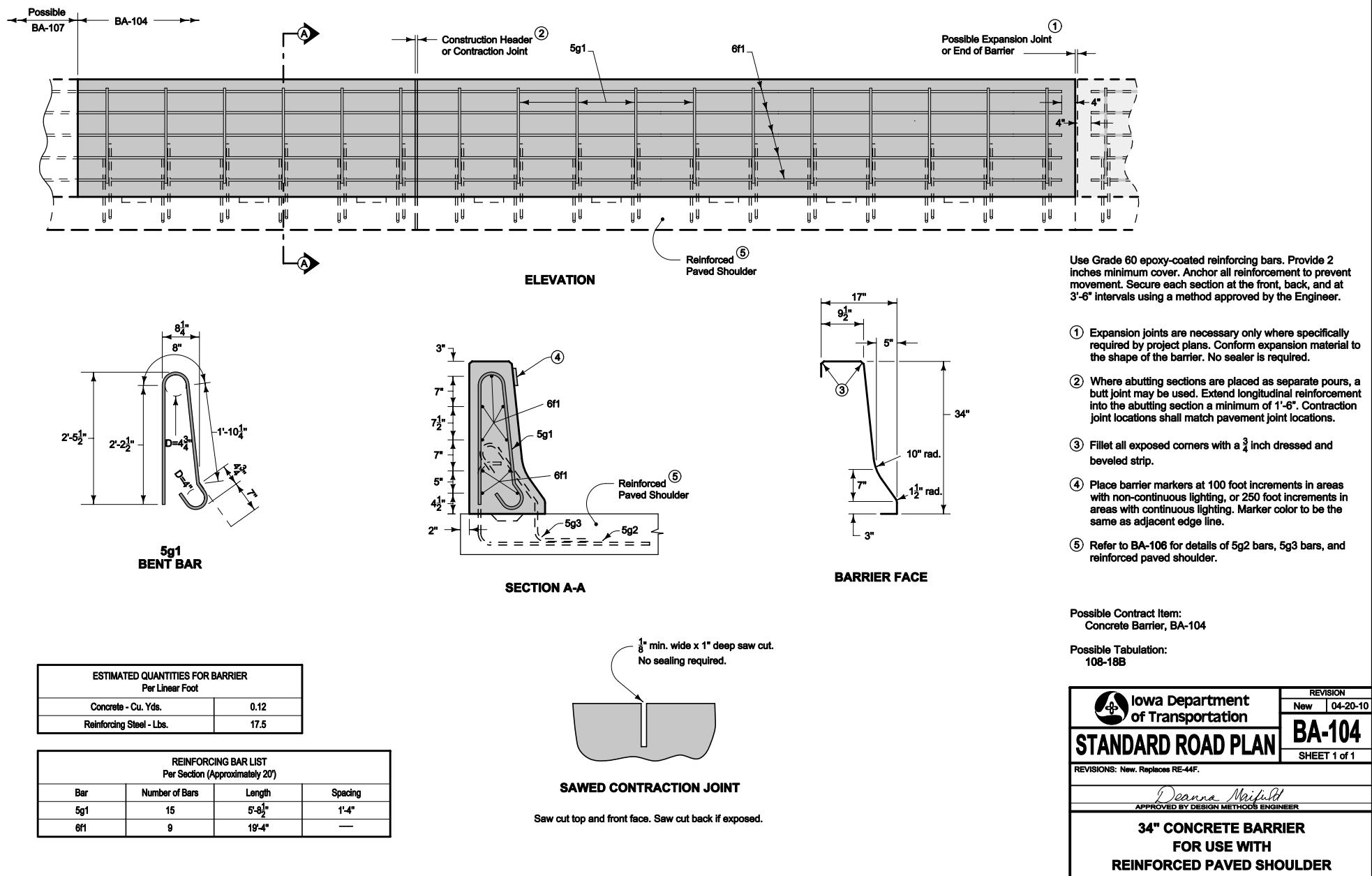
- ⑤ Fillet all exposed corners with a $\frac{3}{4}$ inch dressed and beveled strip.
- ⑥ Construct concrete footing when barrier is not placed on concrete slab. Apply Section 2403.03, but the use of forms is optional. If forms are used, place backfill around the completed footing.
- ⑦ Place barrier markers at 100 foot increments in areas with non-continuous lighting, or 250 foot increments in areas with continuous lighting. Marker color to be the same as adjacent edge line.

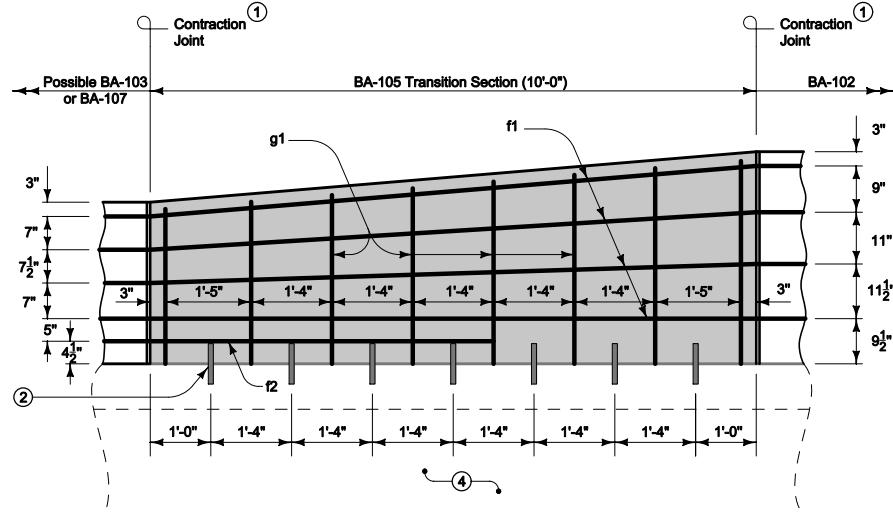
Possible Contract Item:
Concrete Barrier, BA-102 or
Concrete Barrier, BA-102 and Footing

Possible Tabulation:
108-18

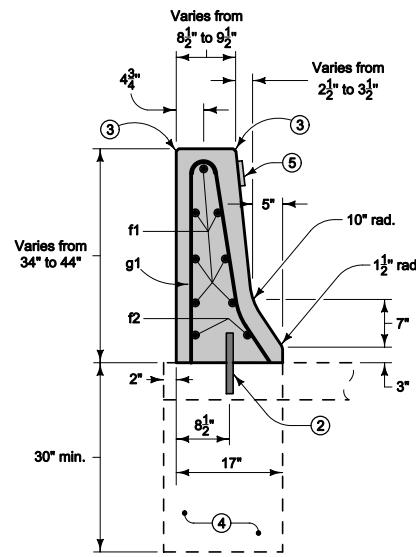
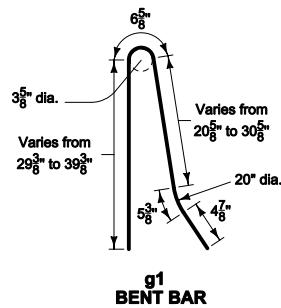
IOWADOT		REVISION 2 10-21-14
STANDARD ROAD PLAN		
BA-102		
SHEET 1 of 1		
REVISIONS: Changed Possible Tabulation.		
 APPROVED BY DESIGN METHODS ENGINEER Brian Smith		
44" CONCRETE BARRIER (HALF SECTION)		







ELEVATION



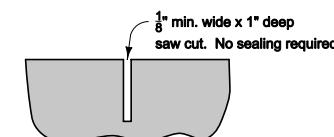
TYPICAL SECTION

REINFORCING BAR LIST for one Transition Section				
Bar	Size	Number of Bars	Length	Weight (lbs.)
g1	5	8	*	53.5
f1	5	7	10'-0"	73.5
f2	5	2	5'-0"	11.8

* Varies from 5'-7" to 7'-3"

Use Grade 60 epoxy-coated reinforcing bars. Provide 2 inches minimum cover. Anchor all reinforcement to prevent movement. Secure each section at the front, back, and at 3'-6" intervals using a method approved by the Engineer.

- ① Where abutting sections are placed as separate pours, a butt joint may be used. Extend longitudinal reinforcement into the abutting section a minimum of 1'-6".
- ② Use 1 inch diameter deformed dowel bars of sufficient length to ensure 6 inch minimum embedment in barrier and supporting surface. Install dowels either in supporting surface when placed, or in drilled holes using polymer grout complying with Materials I.M. 491.11 or hydraulic cement grout complying with Materials I.M. 491.13.
- ③ Fillet all exposed corners with a $\frac{3}{8}$ inch dressed and beveled strip.
- ④ Construct concrete footing when barrier is not placed on concrete slab. Apply Section 2403.03, but the use of forms is optional. If forms are used, place backfill around the completed footing.
- ⑤ Place barrier markers at 100 foot increments in areas with non-continuous lighting, or 250 foot increments in areas with continuous lighting. Marker color to be the same as adjacent edge line.



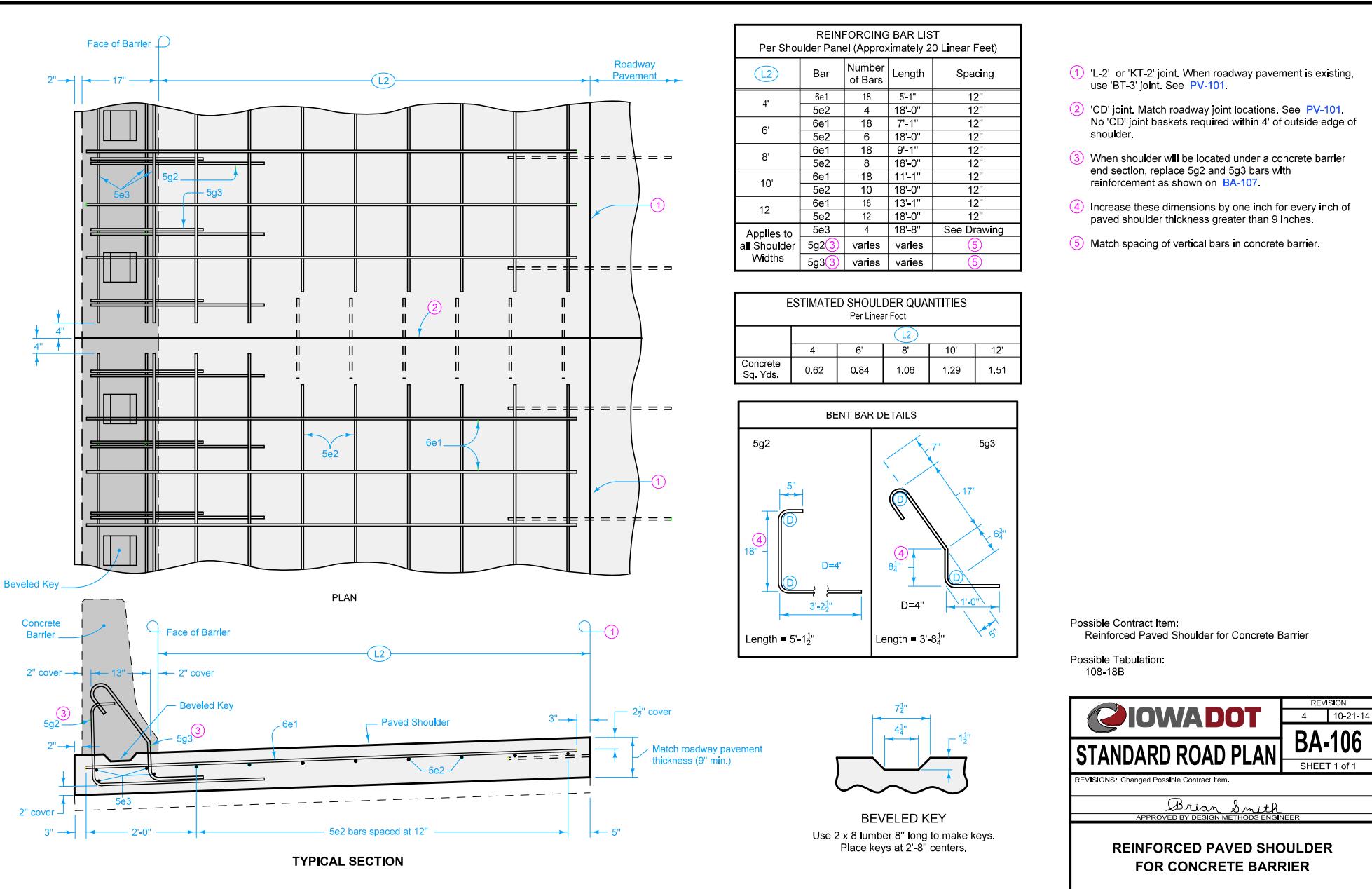
SAWED CONTRACTION JOINT
Saw cut top and front face. Saw cut back if exposed.

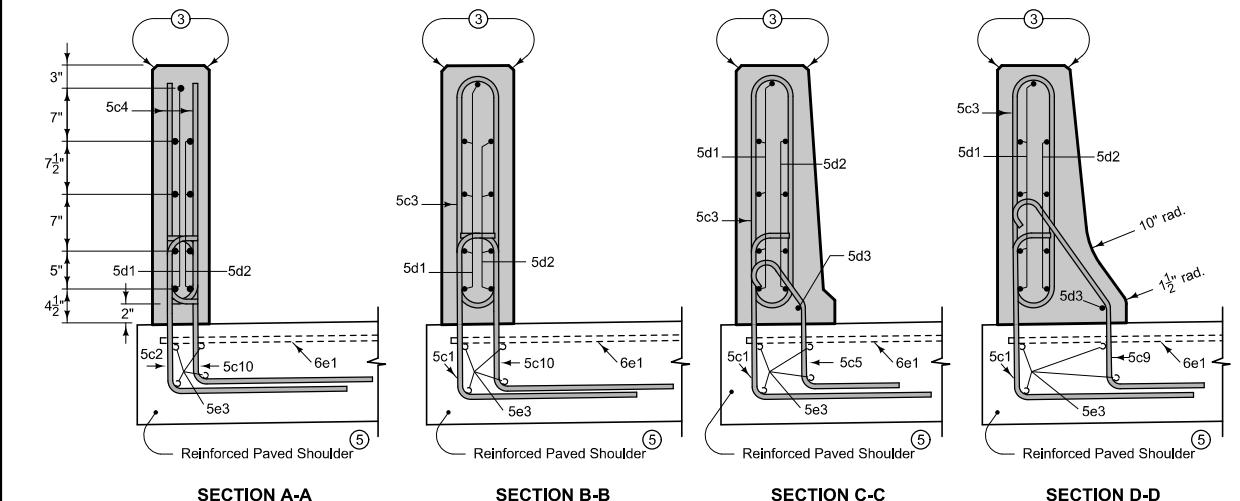
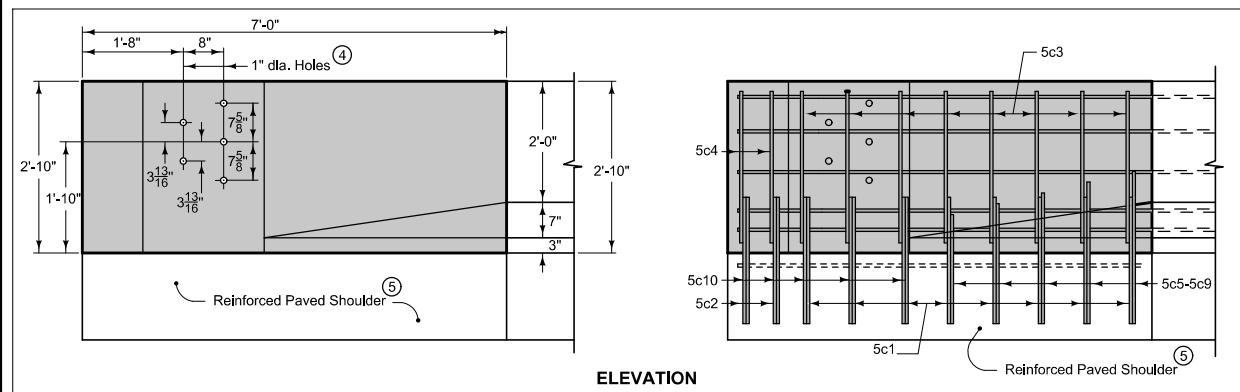
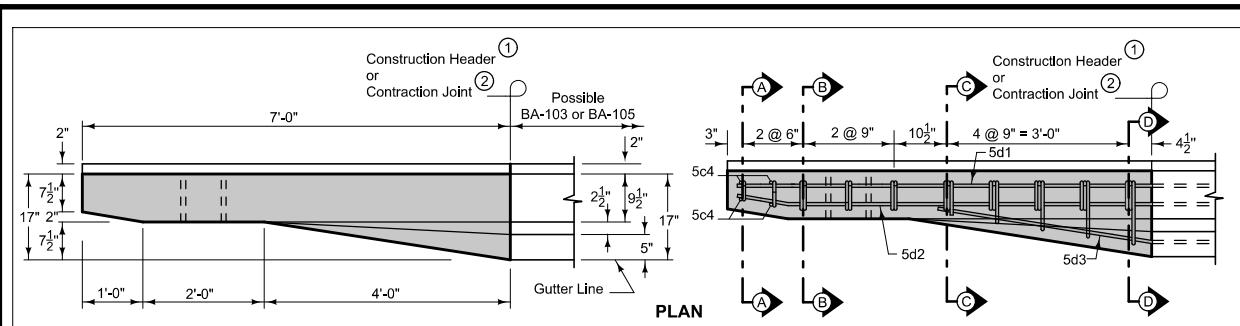
CONCRETE QUANTITIES
for one Transition Section
1.2 cy

Possible Contract Item:
Concrete Barrier, BA-105 or
Concrete Barrier, BA-105 and Footing

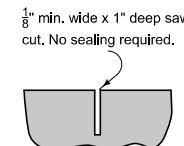
Possible Tabulation:
108-18B

Iowa Department of Transportation STANDARD ROAD PLAN <small>REVISION New 04-20-10</small>	
BA-105 <small>SHEET 1 of 1</small>	
<small>REVISIONS: New. Replaces RE-44G.</small>	
<small>Deanna Maiwald</small> <small>APPROVED BY DESIGN METHODS ENGINEER</small>	
34" TO 44" CONCRETE BARRIER TRANSITION SECTION	





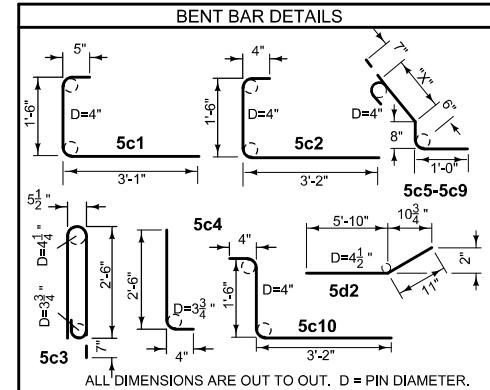
BAR	'X'
5c5	6 ³ / ₁₆ "
5c6	8 ¹ / ₈ "
5c7	10 ¹ / ₈ "
5c8	1 ¹ / ₈ "
5c9	1 ⁴ / ₈ "



SAWED CONTRACTION JOINT

Saw cut top and front face.
Saw cut back if exposed.

CONCRETE QUANTITIES
Per End Section
0.62 cu



BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT
5c1	VERTICAL	L	8	5'-0"	42
5c2	VERTICAL	L	2	6'-4"	10
5c3	VERTICAL	U	8	6'-4"	51
5c4	VERTICAL	Y	4	2'-10"	12
5c5-5c9	VERTICAL	Y	5	VARIABLES	17
5c10	VERTICAL	L	5	5'-0"	26
5d1	HORIZONTAL	—	5	6'-8"	35
5d2	HORIZONTAL	—	4	6'-9"	28
5d3	HORIZONTAL	—	1	3'-5"	4
TOTAL WEIGHT (LBS.)					225

Use Grade 60 epoxy-coated reinforcing bars. Provide 2 inches minimum cover. Anchor reinforcement to prevent movement. Secure each section at the front, back, and at 3'-6" intervals using a method approved by the Engineer.

- ① Expansion joints are necessary only where specifically required by project plans. Conform expansion material to the shape of the barrier. No sealer is required.
- ② Where abutting sections are placed as separate pours, a butt joint may be used. Extend longitudinal reinforcement into the abutting section a minimum of 1'-6".
- ③ Fillet all exposed corners with a $\frac{3}{4}$ inch dressed and beveled strip.
- ④ Form holes using 1 inch diameter plastic conduit.
- ⑤ See BA-106 for details of 5e3 bars, 6e1 bars, and reinforced paved shoulder.

Possible Contract Item:
Concrete Barrier Rail, BA-107

Possible Tabulation:
108-18B

Iowa Department of Transportation REVISION 2 10-18-11

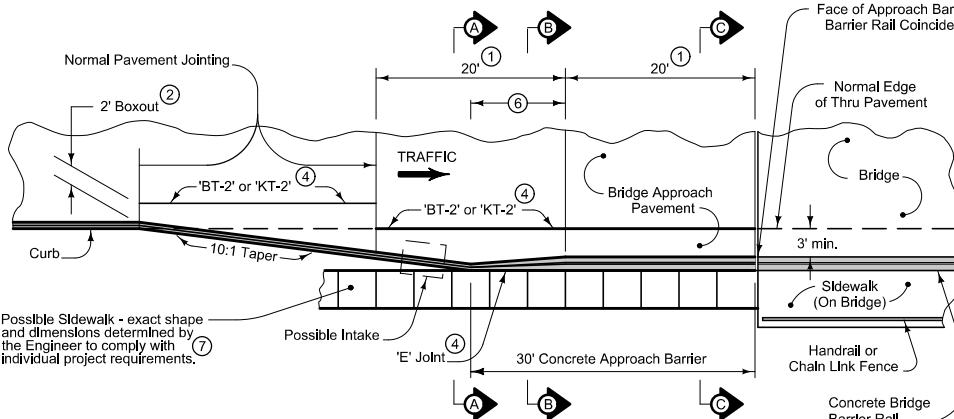
STANDARD ROAD PLAN **BA-107**

SHEET 1 of 1

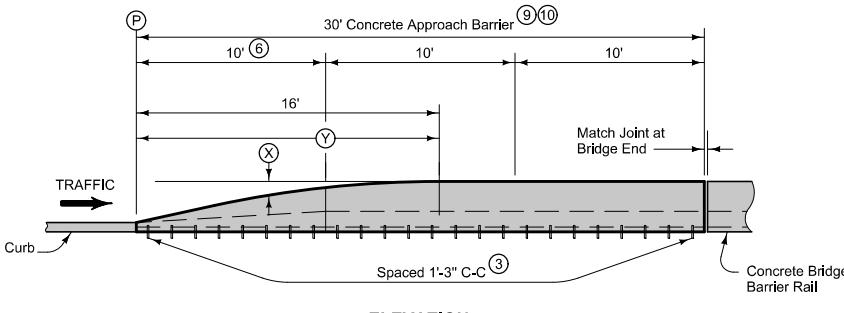
REVISIONS: Labeled 5d2 bars. Modified 'X' bar dimensions and respective bar lengths and bar weights. Updated language in notes.

Deanna Marlow
APPROVED BY DESIGN METHODS ENGINEER

CONCRETE BARRIER END SECTION

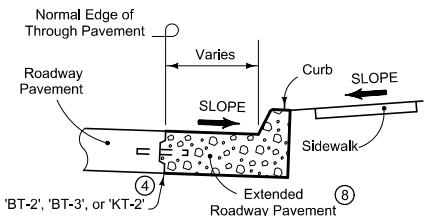


PLAN

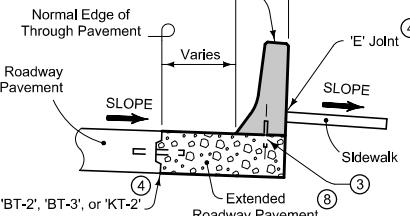


ELEVATION

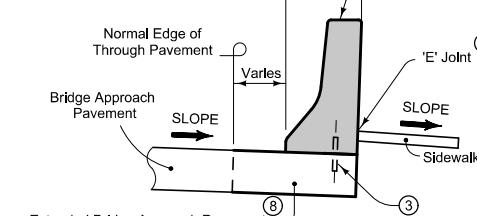
OFFSETS FOR ROUNDED BARRIER TOP																
Y = Distance from (P) ft.	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0
X = Offset to Rounded Top ft.	2.13	1.91	1.70	1.48	1.26	1.06	0.87	0.70	0.54	0.42	0.30	0.20	0.12	0.06	0.02	0.00



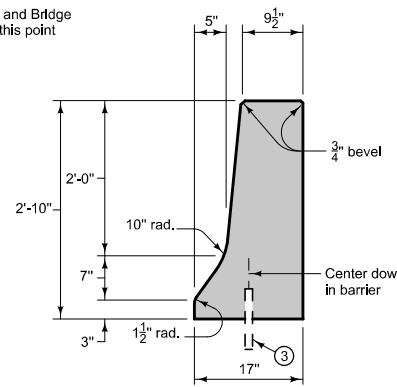
SECTION A-A



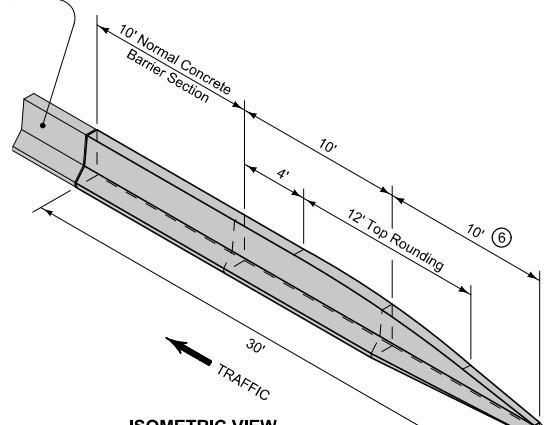
SECTION B-B



SECTION C-C



FULL BARRIER RAIL SECTION



ISOMETRIC VIEW

Install a 'C' joint in concrete approach barrier to match the location of each joint in both roadway and bridge approach pavement.

- ① Typical joint spacing and location. Specific project requirements shall be as directed by the Engineer.
- ② Match boxout width to existing curb and gutter joint. Use 2 foot wide boxout where curb and gutter are not constructed.
- ③ #8 x 8 inch deformed bars or 1 inch diameter smooth.
- ④ For joint detail, see PV-101.
- ⑤ Bottom width of barrier is maintained at 17 inches.
- ⑥ Bottom width of barrier transitions from 8 to 17 inches.
- ⑦ Required sidewalk will be measured and paid for separately.
- ⑧ Additional concrete quantity required for extended roadway pavement will be included in roadway paving quantity.
- ⑨ Place no delineator or object marker in front of, or on, the barrier.
- ⑩ Approximately 2.0 cubic yards of concrete are required to construct barrier as shown. Amount may vary depending on individual site requirements.

Possible Contract Item:
Concrete Barrier, Tapered End, BA-108

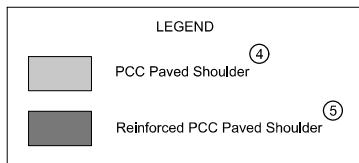
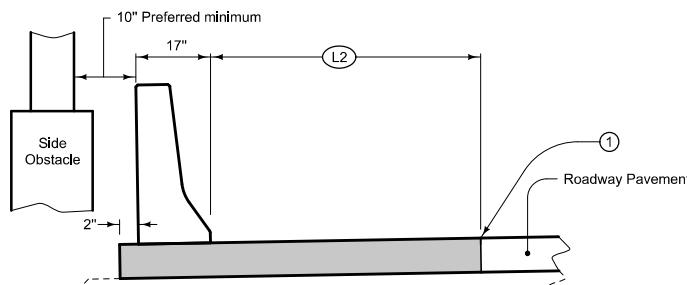
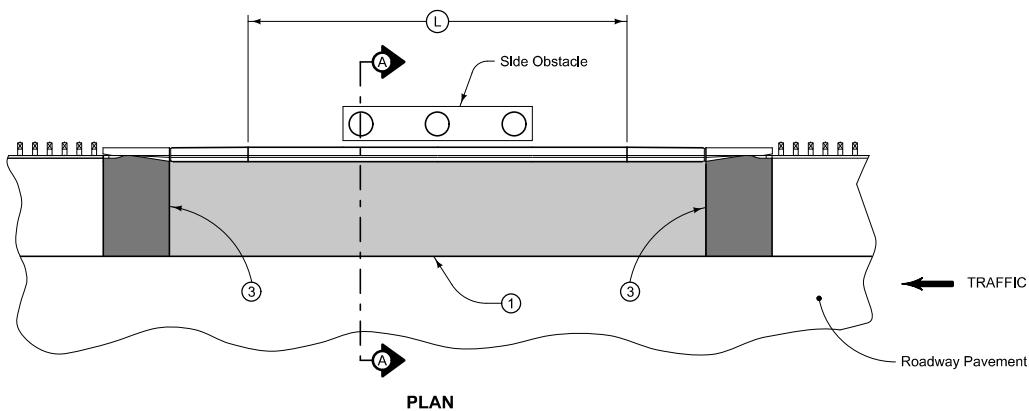
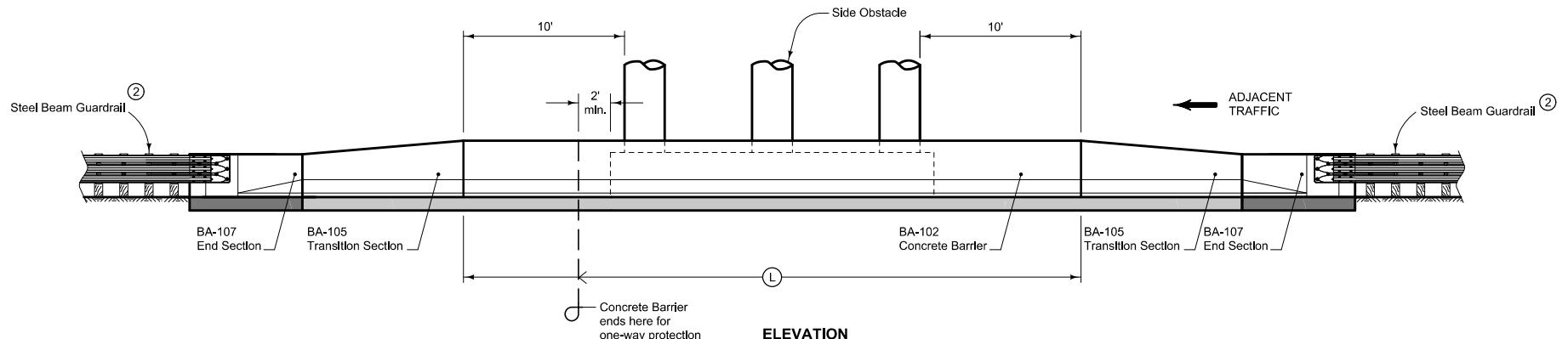
Possible Tabulation:
108-1B



REVISIONS: Changed title to remove reference to speed.

Deanna Marullo
APPROVED BY DESIGN METHODS ENGINEER

**CONCRETE BARRIER
TAPERED END SECTION**

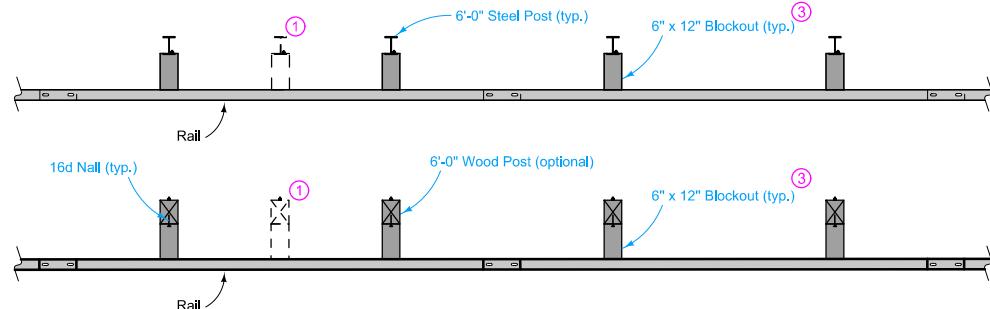


- ① "L-2" or "KT-2" joint. When roadway pavement is existing, use "BT-3" joint. See PV-101.
- ② Refer to BA-250.
- ③ "C" Joint; match existing roadway joints when possible. See PV-101.
- ④ Refer to project typicals.
- ⑤ Refer to BA-106.

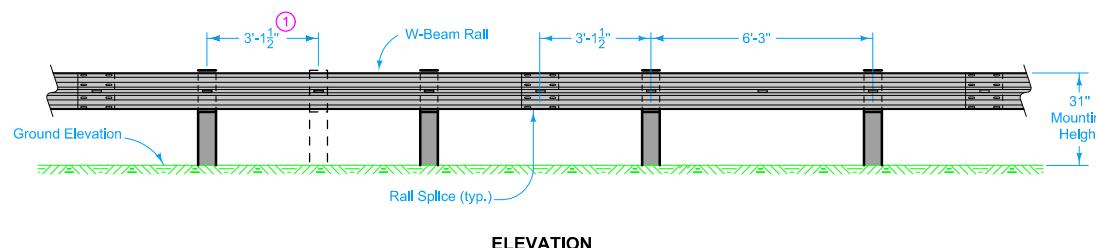
Possible Contract Items:
Concrete Barrier items
Steel Beam Guardrail items
PCC Paved Shoulder
Reinforced Paved Shoulder

Possible Tabulations:
108-1B
112-9

Iowa Department of Transportation		REVISION 1 04-19-11
STANDARD ROAD PLAN		
BA-150		
SHEET 1 of 1		
REVISONS: Updated references to renamed standards.		
Deanna Marfeldt APPROVED BY DESIGN METHODS ENGINEER		
SIDE OBSTACLE PROTECTION WITH CONCRETE BARRIER AND GUARDRAIL		



PLAN



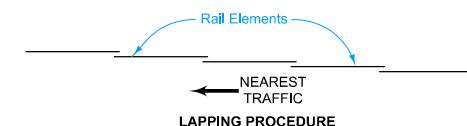
ELEVATION

At Bridge End Drains, cut Scour Protection (Transition Mat and Turf Reinforcement Mat) or remove rock as required to place post(s) such that Bridge End Drains abut post(s).

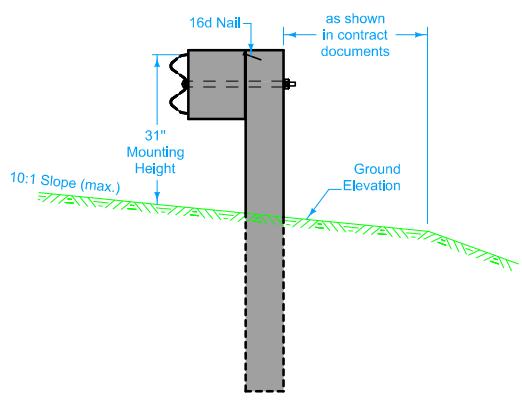
① When specified by the contract documents, install posts at 3'-1½" spacing.

② 6" maximum for 6" Standard or 6" Sloped curbs and for non-standard curbs.

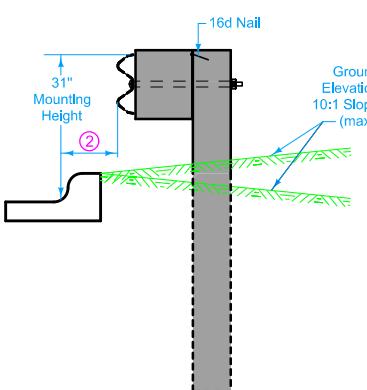
③ Wood or composite only. Steel blockouts will not be allowed.



LAPPING PROCEDURE



SECTION



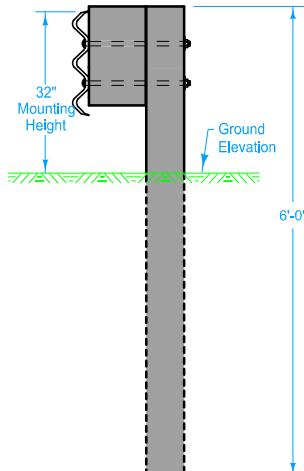
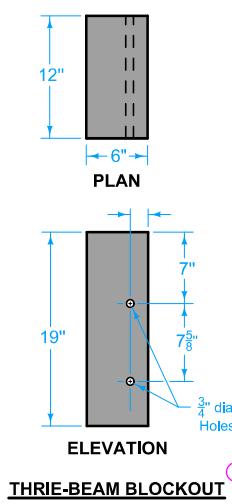
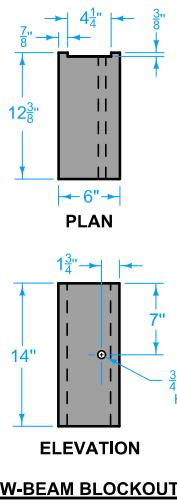
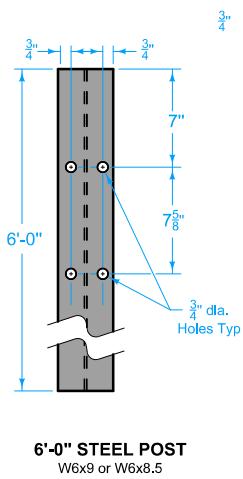
SECTION WITH CURB

W-BEAM INSTALLATION

Possible Contract Item:
Steel Beam Guardrail

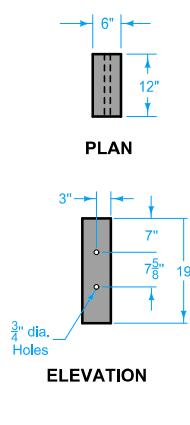
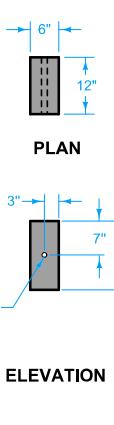
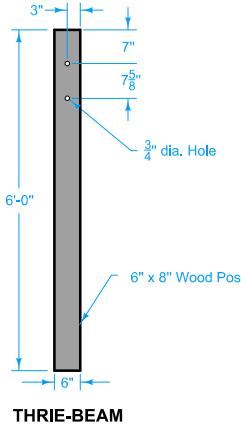
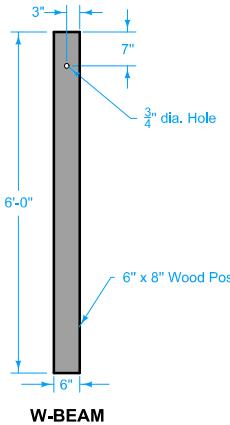
IOWADOT		REVISION 4 10-18-16
STANDARD ROAD PLAN		
BA-200		
SHEET 1 of 4		
REVISIONS: Added holes on steel posts and corresponding blockouts.		
Brian Smith APPROVED BY DESIGN METHODS ENGINEER		
STEEL BEAM GUARDRAIL COMPONENTS		

STEEL POST AND BLOCKOUT DETAILS



③ Wood or composite only. Steel blockouts will not be allowed.

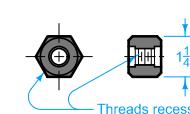
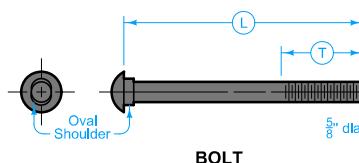
WOOD POST AND BLOCKOUT DETAILS



BOLT DETAILS

APPLICATION	(T)	(L)
Splice Bolt	1 1/16"	1 1/4"
Bolt for Steel Post with 8" Blockout	2 1/2"	10"
Bolt for Steel Post with 12" Blockout	2 3/2"	14"
Bolt for Wood Post with 8" Blockout	2 3/2"	18"
Bolt for Wood Post with 12" Blockout	2 3/2"	22"

(T) = Min. Thread Length (L) = Bolt Length

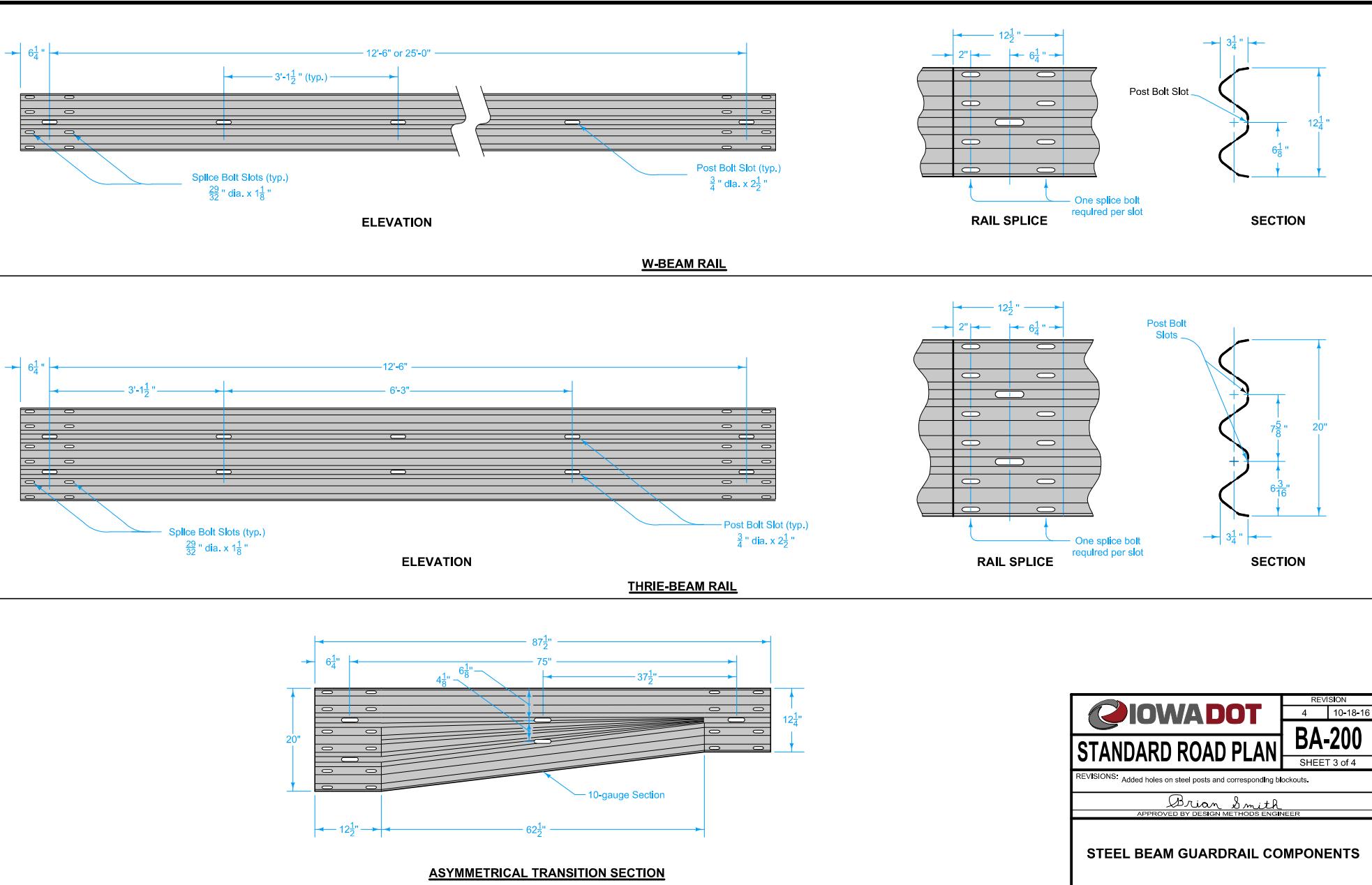


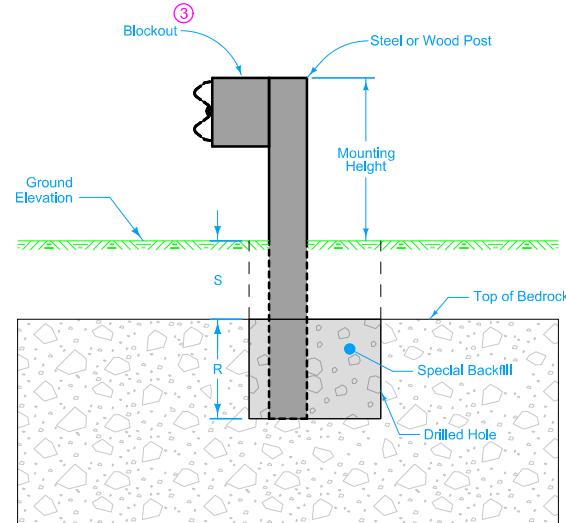
REVISIONS: Added holes on steel posts and corresponding blockouts.

Brian Smith

APPROVED BY DESIGN METHODS ENGINEER

STEEL BEAM GUARDRAIL COMPONENTS



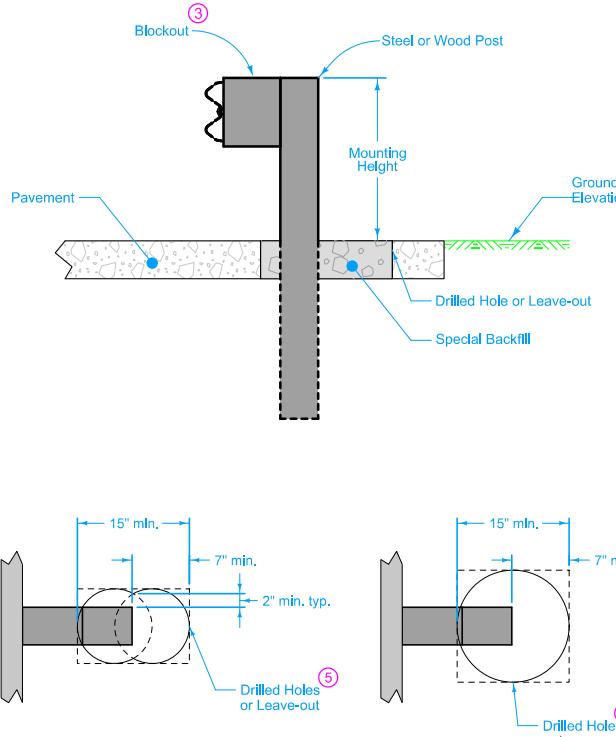


PLAN - CASE A

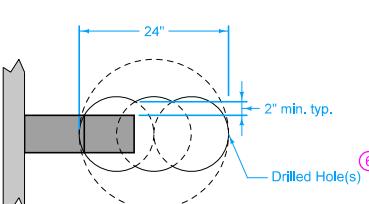
PLAN - CASE B

Post Embedment ④		
Case	Depth to Bedrock	Minimum Depth to Drill into Bedrock
A	S = 0" to 16"	R = 24"
B	S = 16" to 52"	R = Post Length - Mounting Height - S

POST INSTALLED IN BEDROCK



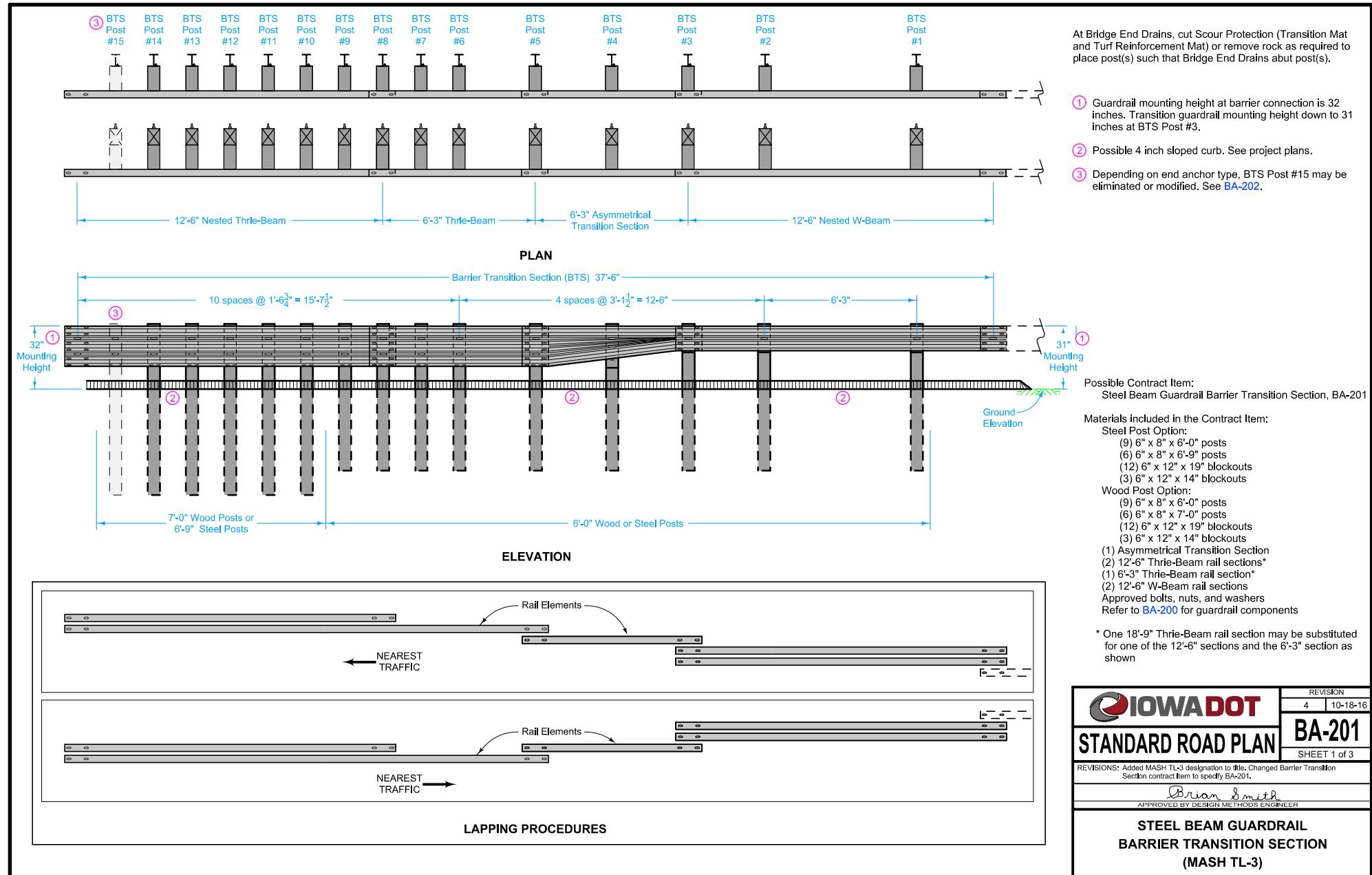
PLAN - PAVEMENT THICKNESS <= 8"
Either approach is acceptable.

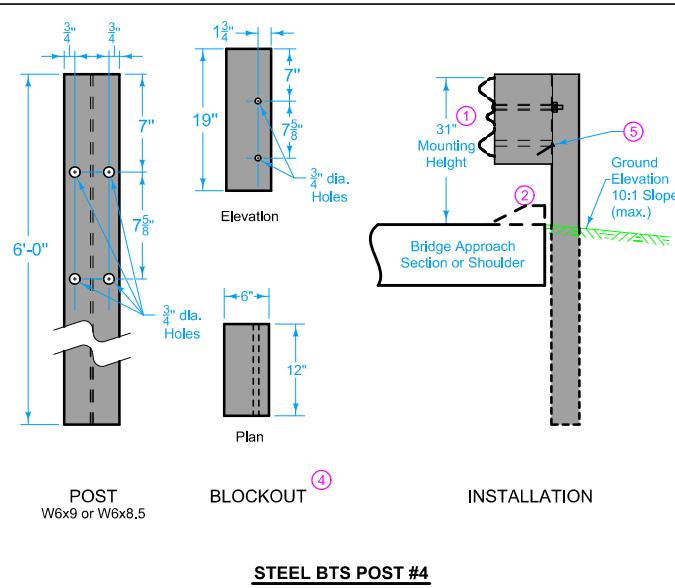
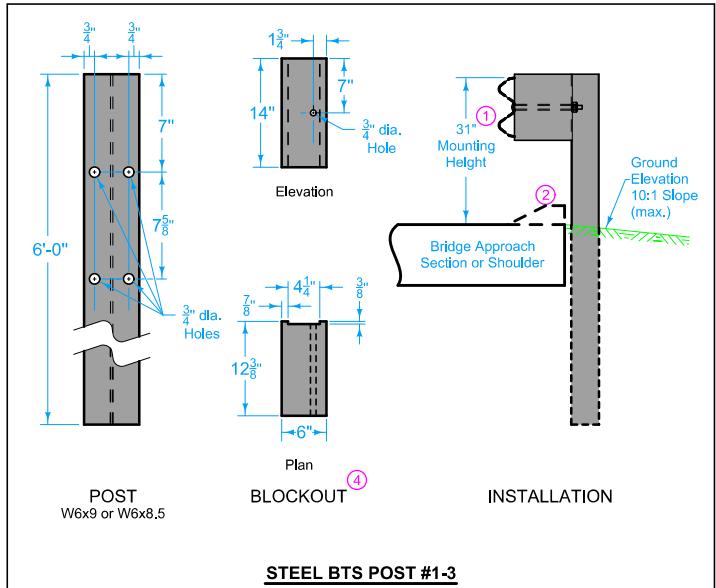


PLAN - PAVEMENT THICKNESS > 8"

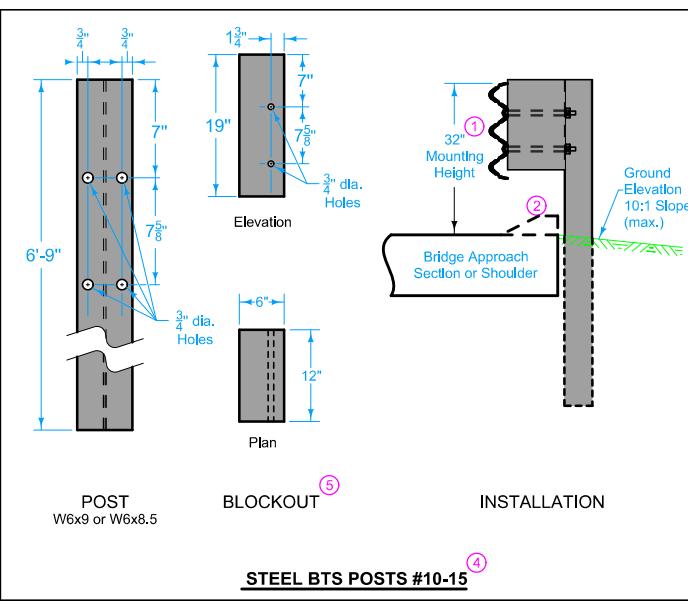
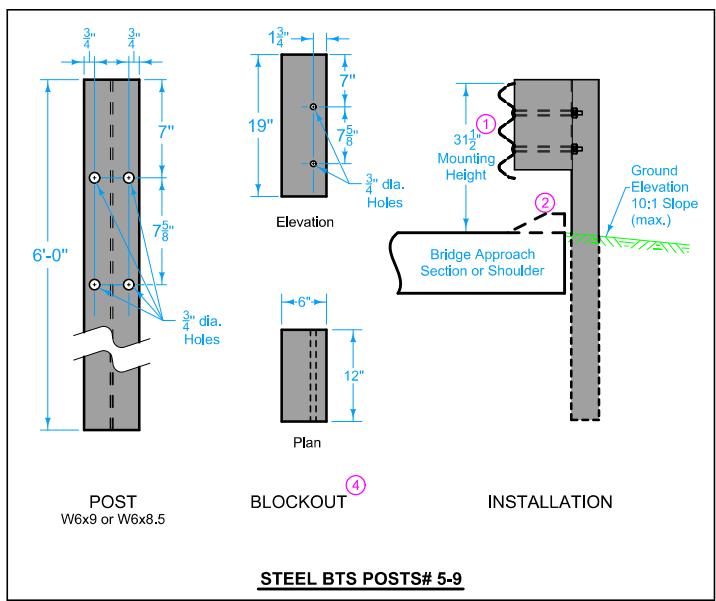
Installation information applies to both wood and steel posts.

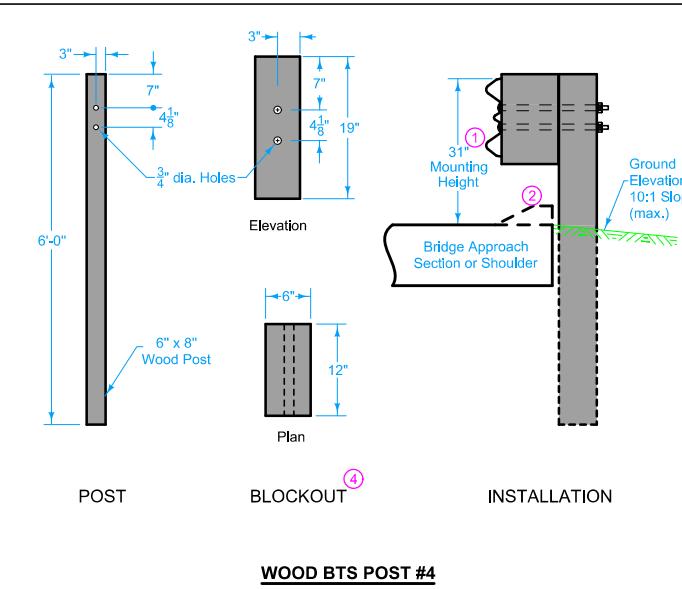
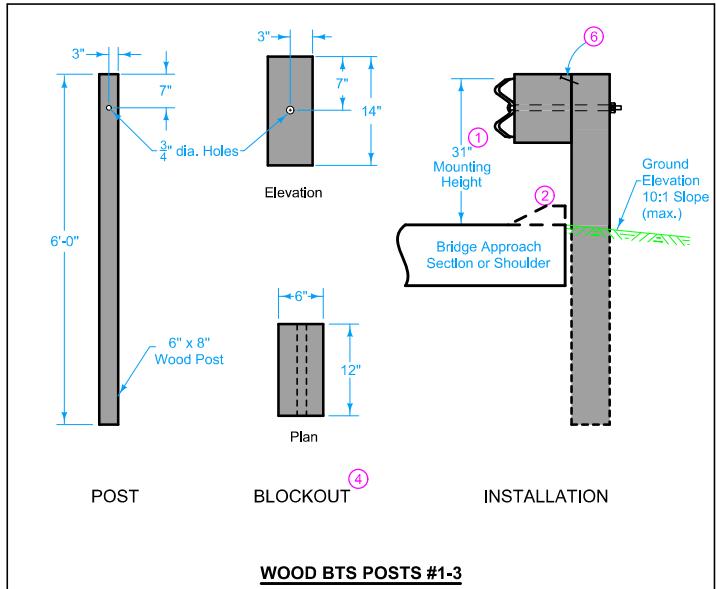
- ③ Wood or composite only. Steel blockouts will not be allowed.
- ④ Post extends to bottom of hole in all cases. Trim top of post as required and treat with preservative according to Section 4161 of the Standard Specifications.
- ⑤ Use a 12 inch bit with two drills or a 15 inch bit with one drill. If placing post before paving, provide required leave-out area. If placing post after paving, drill or cut required area. Leave-out may be round or square.
- ⑥ Use a 12 inch bit with three drills or a 24 inch bit with one drill.



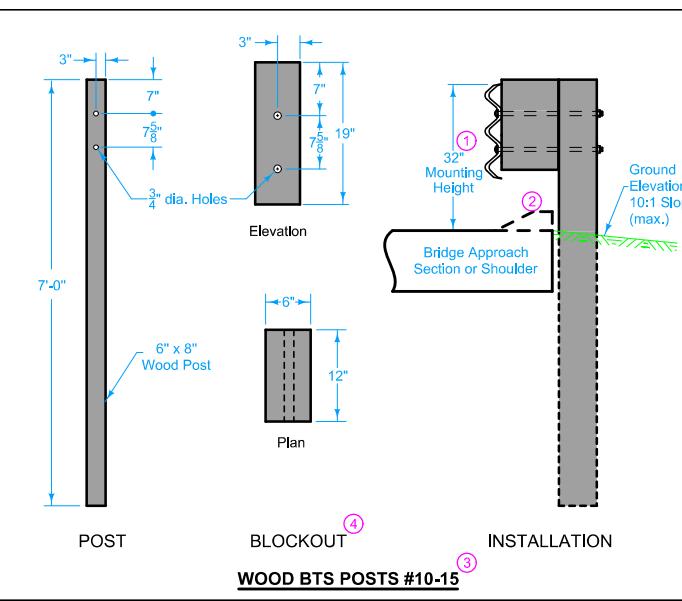
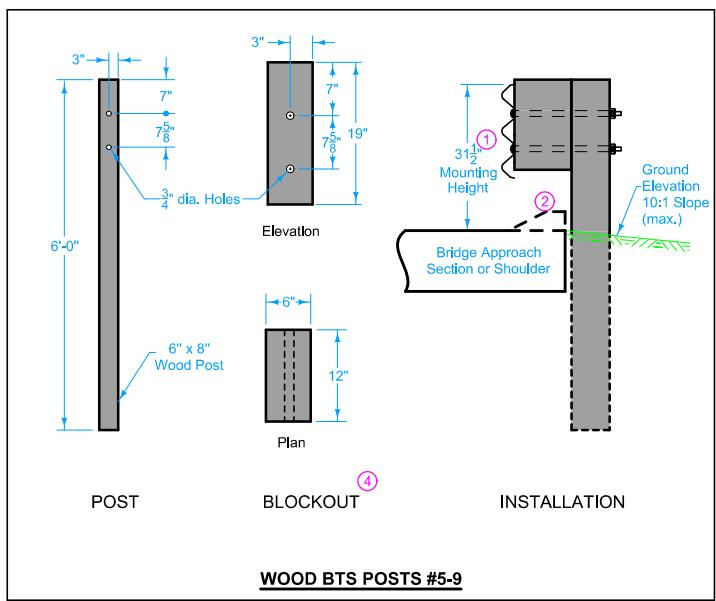


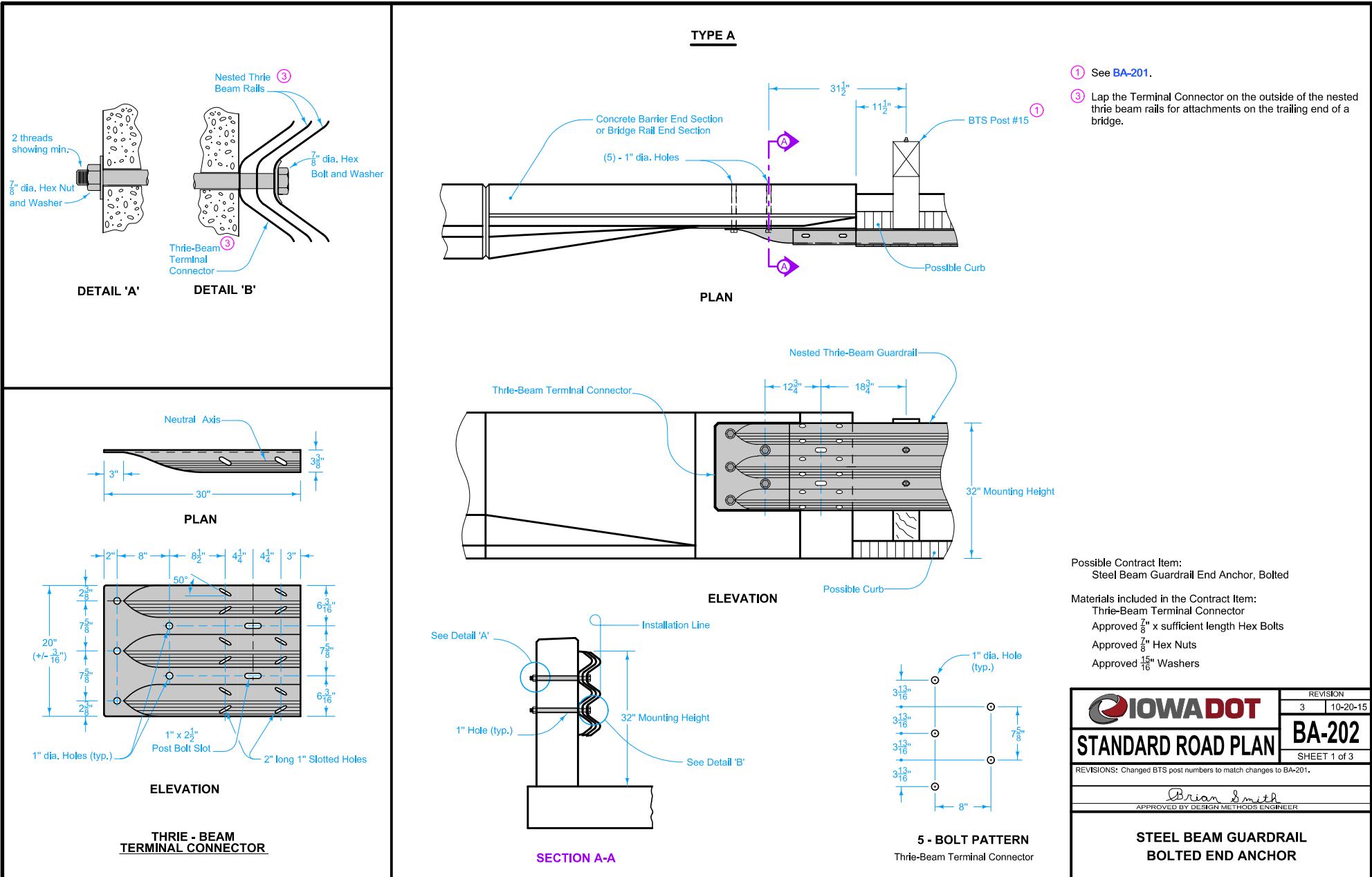
- ① Guardrail mounting height at barrier connection is 32 inches. Transition guardrail mounting height down to 31 inches at BTS Post #3.
- ② Possible 4 inch sloped curb. See project plans.
- ③ Depending on end anchor type, BTS Post #15 may be eliminated or modified. See BA-202.
- ④ Wood or composite only. Steel blockouts will not be allowed.
- ⑤ 16d nail through bolt hole to prevent blockout rotation.

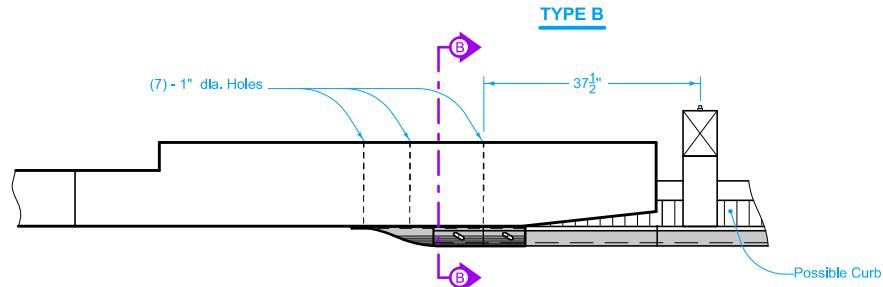




- ① Guardrail mounting height at barrier connection is 32 inches. Transition guardrail mounting height down to 31 inches at BTS Post #3.
- ② Possible 4 inch sloped curb. See project plans.
- ③ Depending on end anchor type, BTS Post #15 may be eliminated or modified. See BA-202.
- ④ Wood or composite only. Steel blockouts will not be allowed.
- ⑤ 16d nail to prevent blockout rotation.

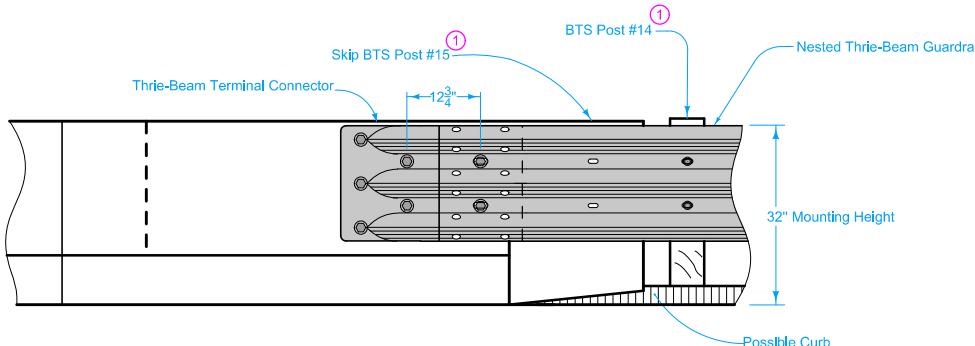




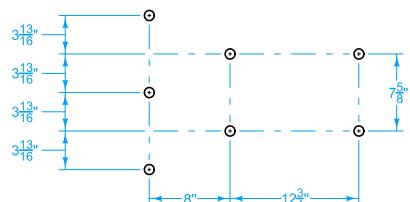


① See BA-201.

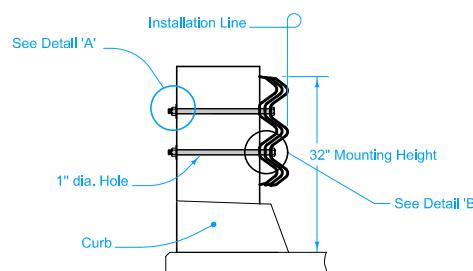
PLAN



ELEVATION



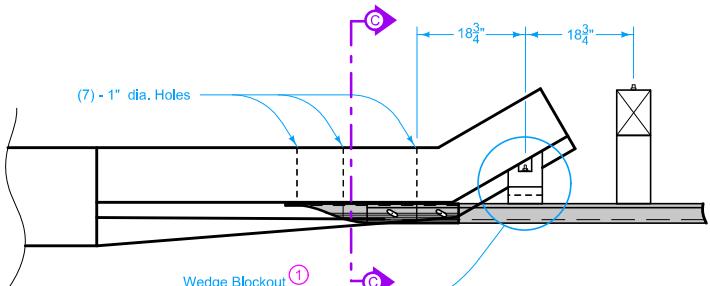
7 - BOLT PATTERN
Thrie - Beam Terminal Connector



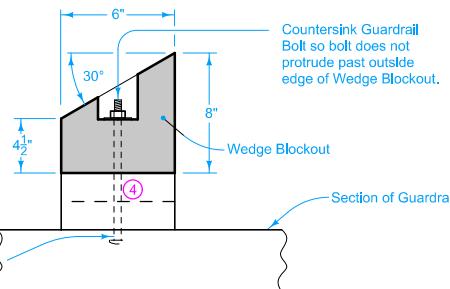
SECTION B-B

IOWADOT		REVISION 3 10-20-15
STANDARD ROAD PLAN		BA-202
SHEET 2 of 3		
REVISONS: Changed BTS post numbers to match changes to BA-201.		
 APPROVED BY DESIGN METHODS ENGINEER		
STEEL BEAM GUARDRAIL BOLTED END ANCHOR		

TYPE C

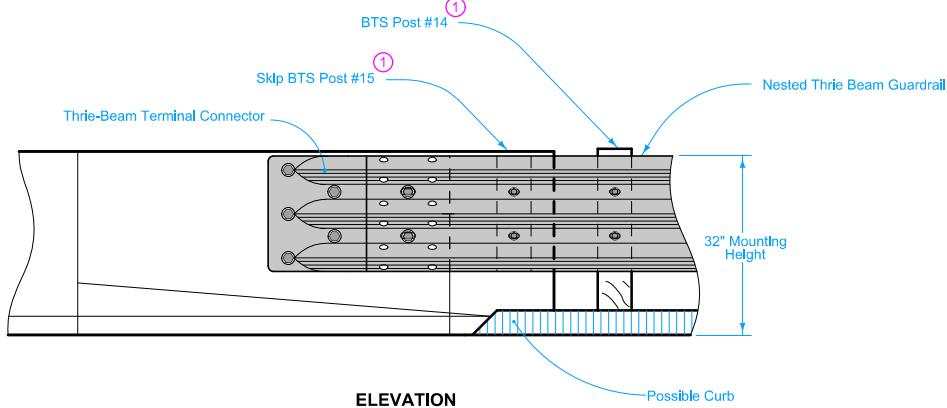


PLAN

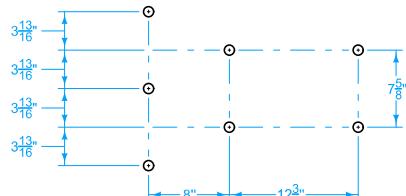


① See BA-201.

④ Use treated spacer boards (1 in. x 6 in. or 2 in. x 6 in.) to produce a tight fit between the wedge blockout and endpost. A nominal 1 inch gap is acceptable. Spacer boards are incidental to bolted end anchor.

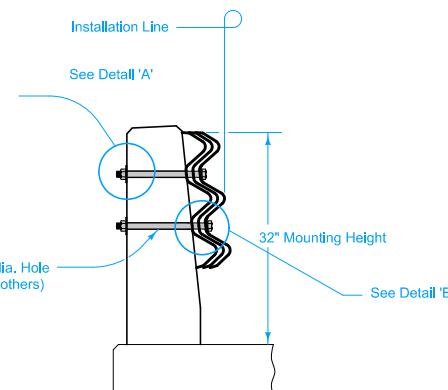


ELEVATION



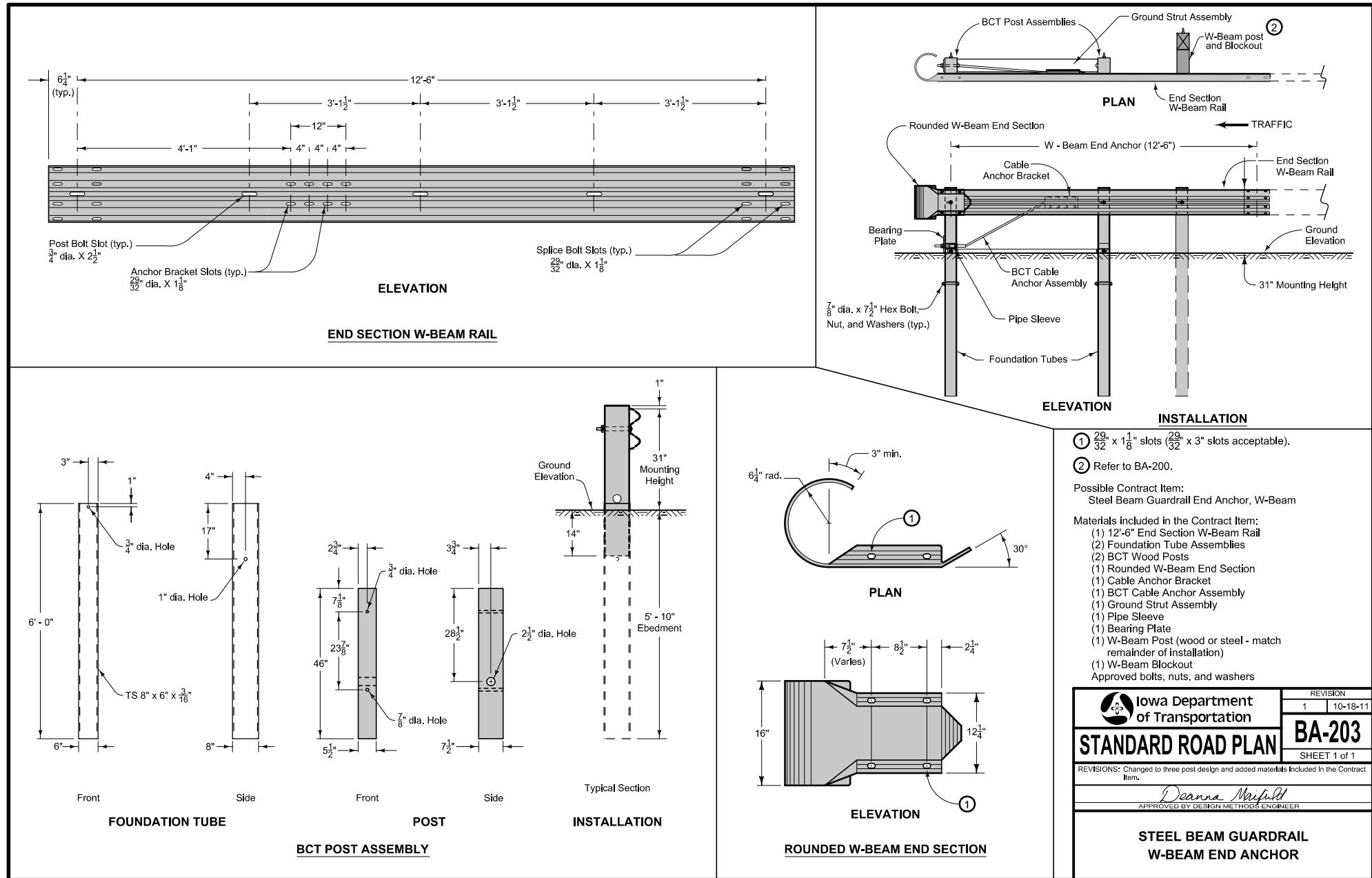
7 - BOLT PATTERN

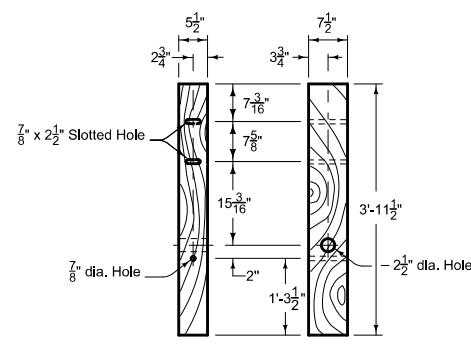
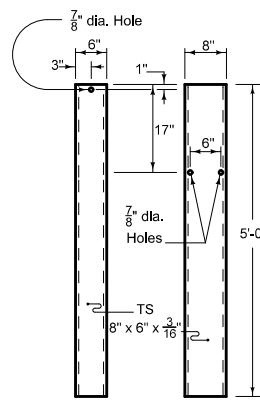
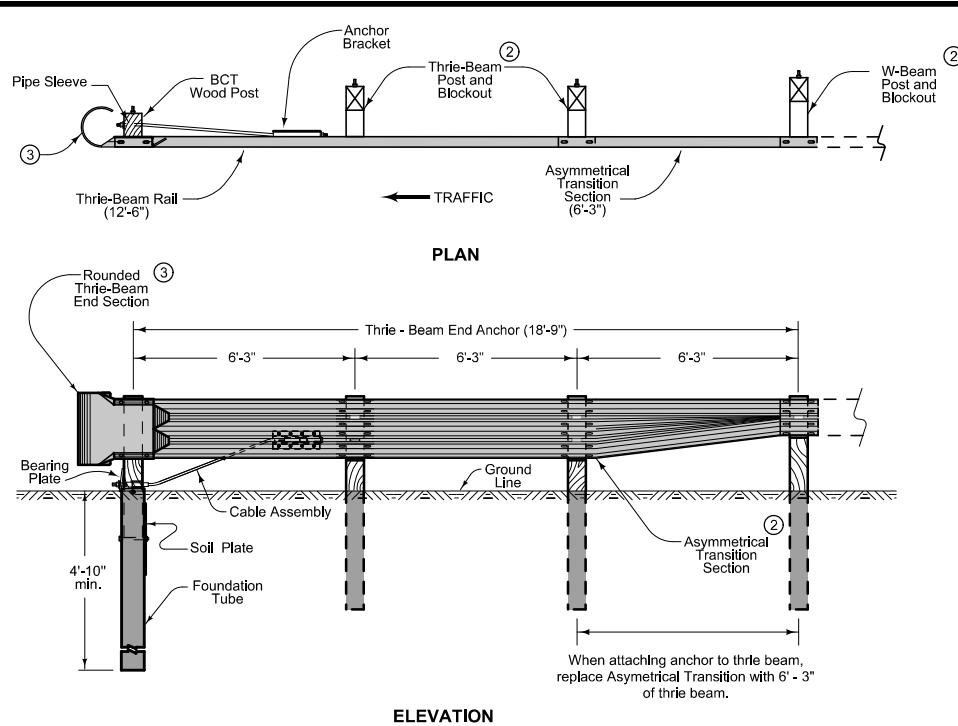
Thrie - Beam Terminal Connector



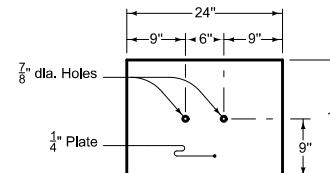
SECTION C-C

IOWADOT		REVISION 3 10-20-15
BA-202		
STANDARD ROAD PLAN		
SHEET 3 of 3		
REVISONS: Changed BTS post numbers to match changes to BA-201.		
<i>Brian Smith</i> APPROVED BY DESIGN METHODS ENGINEER		
STEEL BEAM GUARDRAIL BOLTED END ANCHOR		

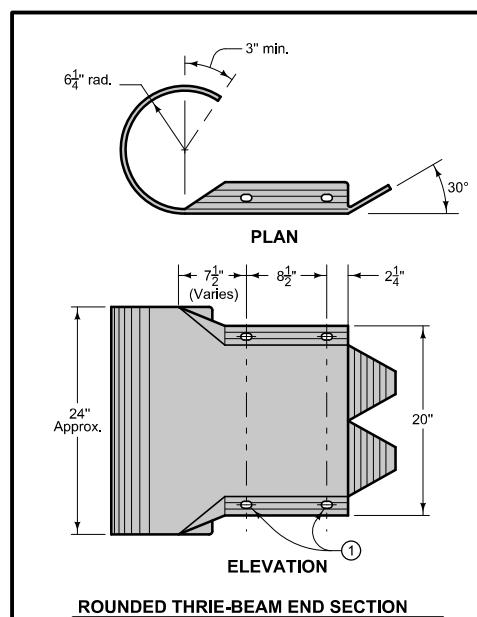




(1) Slotted holes $\frac{29}{32}$ " x $1\frac{1}{8}$ " long.
 (2) Refer to BA-200.
 (3) Cover entire face of end section with alternating black and yellow striped adhesive sheeting. Stripes shall be approximately 3 inches in width and shall be sloped down at an angle of 45 degrees toward the side on which traffic is to pass the end anchor. Yellow stripes shall meet the retroreflectivity requirements for Type III or Type IV reflective sheeting.



SOIL PLATE

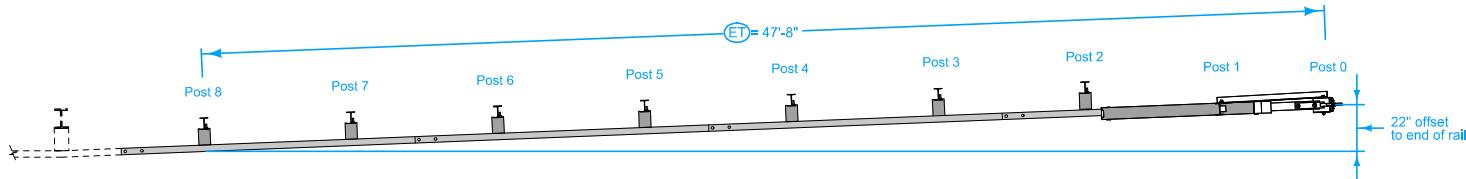


Possible Contract Item:
 Steel Beam Guardrail End Anchor, Thrie-Beam

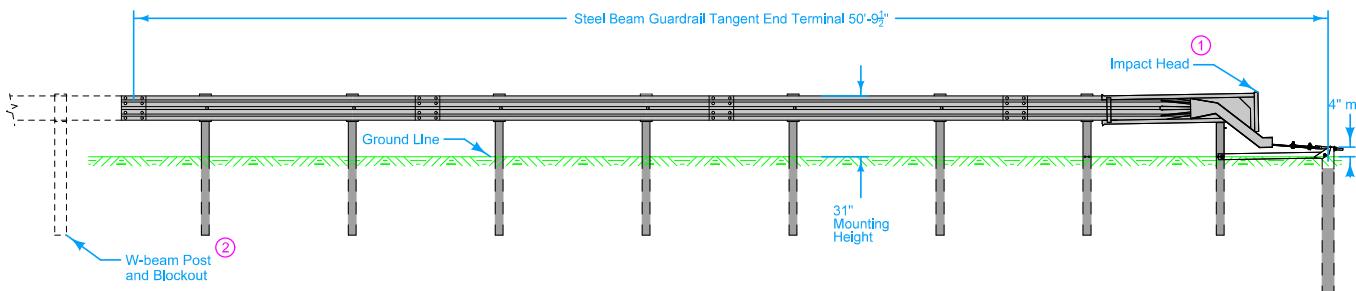
Materials included in the Contract Item:

- (1) 12'-6" Thrie-Beam rail section
- (1) Asymmetrical Transition Section
- (2) Thrie-Beam posts (wood or steel - match remainder of installation)
- (1) W-Beam post (wood or steel - match remainder of installation)
- (1) W-Beam blockout
- (2) Thrie-Beam blockouts
- (1) BCT Wood Post
- (1) Rounded Thrie-Beam End Section
- (1) Anchor Bracket Assembly
- (1) Cable Assembly
- (1) Foundation Tube Assembly with Soil Plate
- (1) Pipe Sleeve
- Approved bolts, nuts, and washers

Iowa Department of Transportation		REVISION 1 10-18-11
STANDARD ROAD PLAN		
SHEET 1 of 1		
REVISIONS: Changed block out size from 19" to 22". Clarified notes. Modified materials included in contract items.		
<i>Deanna Marifield</i> APPROVED BY DESIGN METHODS ENGINEER		
STEEL BEAM GUARDRAIL THRIE-BEAM END ANCHOR		



PLAN



ELEVATION



LAPPING PROCEDURE

Refer to Materials I.M. [455.02](#) for a list of approved sources.

Use materials meeting the respective manufacturer's specifications. Install end terminals according to the manufacturer's recommendations.

Note: at the Contractor's option, and at no cost to the Contracting Authority, alternate post designs developed by the manufacturer and accepted by the FHWA for use within the end terminal may be substituted for the post design shown. When such a substitution is made, provide the Engineer with three copies of the most current installation and maintenance manual for the alternate design.

① Cover entire face of impact head with alternating black and yellow striped adhesive sheeting meeting the following requirements:

- Stripes are approximately 3 inches wide and slope down at a 45 degree angle toward the side on which traffic is to pass the end terminal.
- Yellow stripes meet the retroreflectivity requirements for Type III or Type IV reflective sheeting.

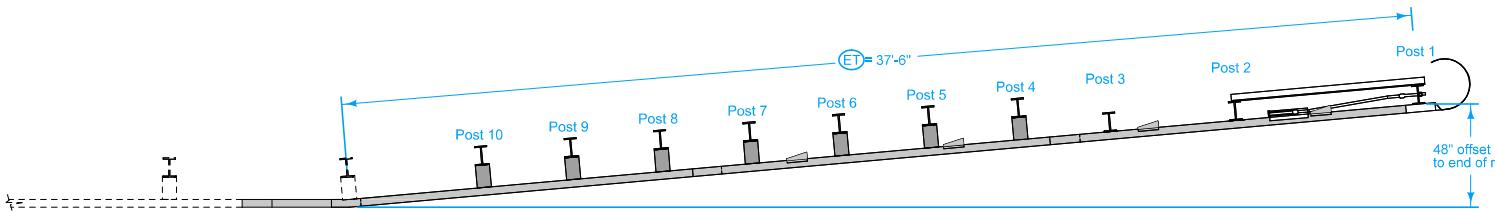
② Refer to [BA-200](#).

Possible Contract Item:
Steel Beam Guardrail Tangent End Terminal, BA-205

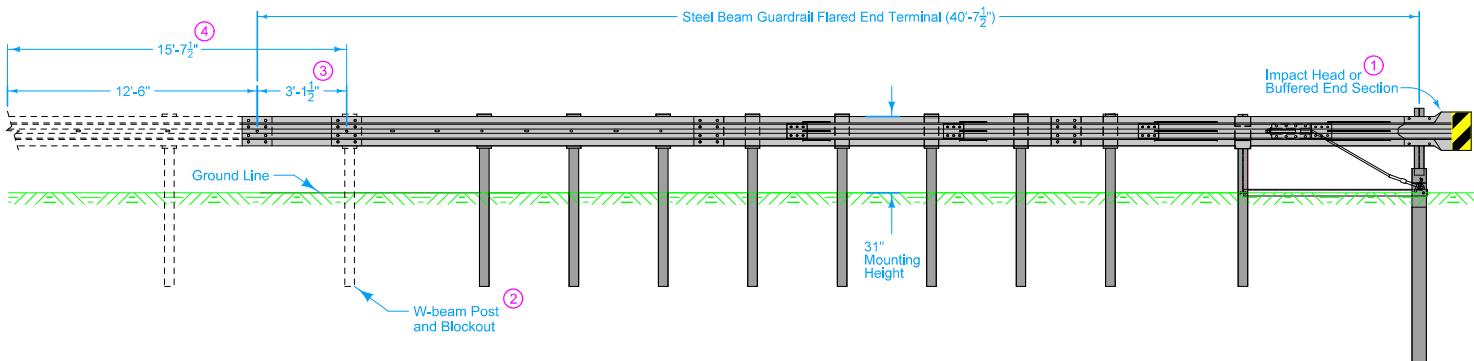
Possible Tabulations:

108-8A
108-8B
108-8C
108-8D

		REVISION 2 04-19-16
STANDARD ROAD PLAN		BA-205
SHEET 1 of 1		
REVISIONS: New layout, notes, and title to reflect MASH approved end terminal.		
Brian Smith APPROVED BY DESIGN METHODS ENGINEER		
STEEL BEAM GUARDRAIL TANGENT END TERMINAL (MASH TL-3)		



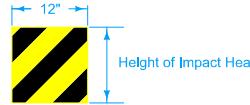
PLAN



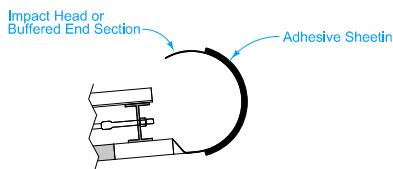
ELEVATION



LAPPING PROCEDURE



ADHESIVE SHEETING



ADHESIVE SHEETING PLACEMENT

Refer to Materials I.M. [455.02](#) for a list of approved sources.

Use materials meeting the respective manufacturer's specifications. Install end terminals according to the manufacturer's recommendations.

Note: at the Contractor's option, and at no additional cost to the Contracting Authority, alternate post designs developed by the manufacturer and accepted by the FHWA for use within the end terminal may be substituted for the post design shown. When such a substitution is made, provide the Engineer with three copies of the most current installation and maintenance manual for the alternate design.

① Cover face of impact head or buffered end section with alternating black and yellow striped adhesive sheeting meeting the following requirements:

- Stripes are approximately 3 inches wide and slope down at a 45 degree angle toward the side on which traffic is to pass the end terminal.

- Yellow stripes meet the retroreflectivity requirements for Type III or Type IV reflective sheeting.

② Refer to [BA-200](#).

③ The 3'-1 1/2" W-beam rail section is incidental to end terminal.

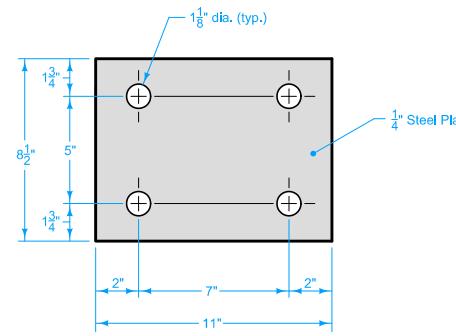
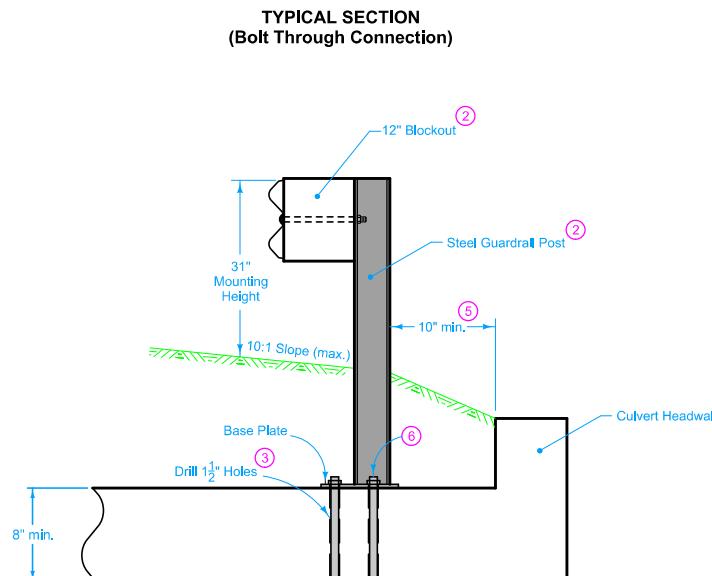
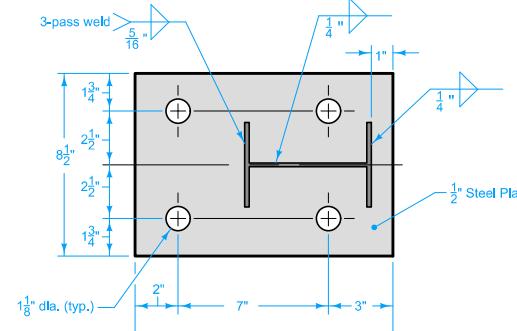
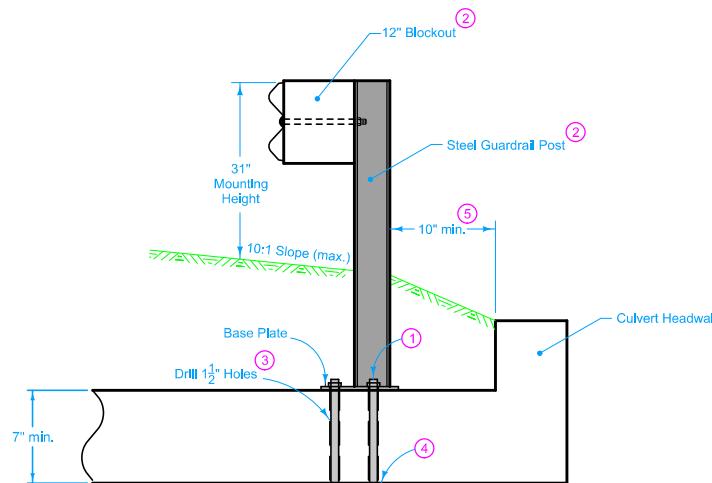
④ One 15'-7 1/2" W-beam rail section may be substituted for the 12'-6" section and the 3'-1 1/2" section as shown.

Possible Contract Item:
Steel Beam Guardrail Flared End Terminal, [BA-206](#)

Possible Tabulations:

[108-8A](#)
[108-8B](#)
[108-8C](#)

IOWADOT		REVISION 3 10-18-16
STANDARD ROAD PLAN		
SHEET 1 of 1		
REVISIONS: Modified note 1, Separated note 3 into notes 3 and 4, Modified ELEVATION view to add 15'-7 1/2" dimension. Added details for adhesive sheeting.		
Brian Smith APPROVED BY DESIGN METHODS ENGINEER		
STEEL BEAM GUARDRAIL FLARED END TERMINAL FOR CABLE CONNECTION (MASH TL-3)		



Install post adapter unit on top of box culverts or similar situations when standard post embedments are not possible. Not intended for use on intakes.

Contractor may elect to fabricate posts using a 6-foot post and adjusting in the field as follows:

- Saw off top end to proper length and drill new holes.
- Treat the sawed end and drilled holes with two coats of organic zinc rich paint containing at least 94% zinc dust. Ensure the surfaces to be treated are free of oil residues due to sawing or drilling.

The price bid for "Steel Beam Guardrail, Post Adapter Unit, BA-210" is full compensation for furnishing, assembling, and installing the adapter unit as shown. Quantity shown in the contract documents.

- Bolt length equals slab thickness plus 2 inches.
- Provide W6x9 or W6x8.5 steel guardrail post. Supply routed blockout or nail blockout to post in order to prevent twisting.
- Drill holes using equipment designed to cut through concrete and reinforcing steel.
- Grout spalling before placement of bottom plate using a grout consisting of equal parts by weight of Portland cement and concrete sand, mixed with sufficient water to form a paste.
- Twelve inch minimum to end of top of culvert if no headwall is present.
- Bolt length to provide a minimum of 8 inch embedment.

Possible Contract Items:
Steel Beam Guardrail
Steel Beam Guardrail, Post Adapter Unit, BA-210

Incidental to Adapter Unit:

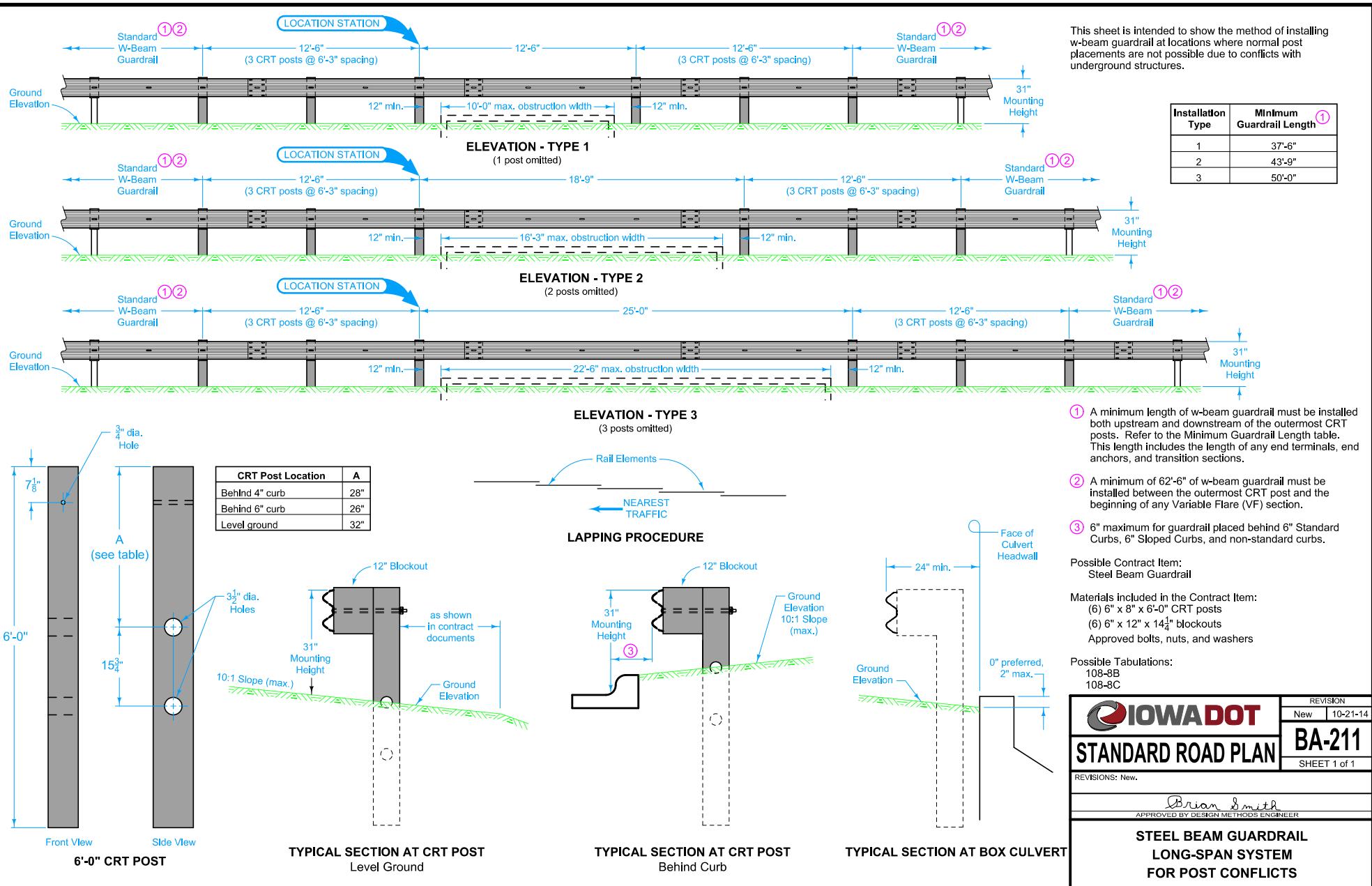
- 1 - 12" x 8 1/2" x 2" ASTM A36 Steel Plate
- 1 - 11" x 8 1/2" x 2" ASTM A36 Steel Plate
- 4 - 1" ASTM A307 Hex Head bolts with one nut and two washers per bolt

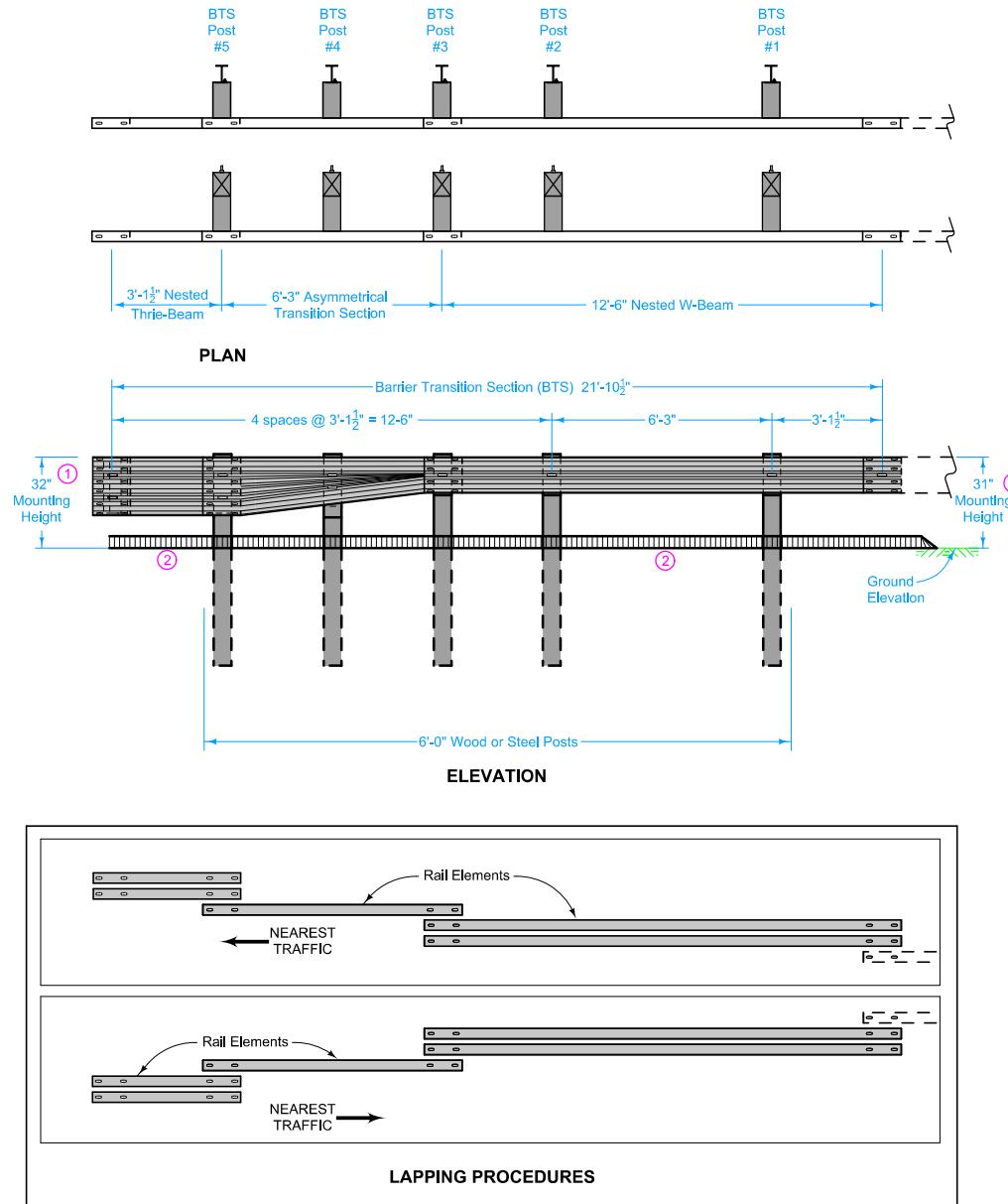
Incidental to Steel Beam Guardrail:
W6 x 9 or W6 x 8.5 Steel Guardrail Post (variable length)
6" x 12" x 14" Blockout

Possible Tabulations:

- 108-8A
- 108-8B
- 108-8C

IOWADOT		REVISION 2 04-19-16
STANDARD ROAD PLAN		
BA-210		
SHEET 1 of 1		
REVISIONS: Added EPOXY CONNECTION detail, circle notes 5 and 6, and possible tabulations. Changed standard note to state use is not intended for intakes.		
Brian Smith APPROVED BY DESIGN METHODS ENGINEER		
GUARDRAIL POST ADAPTER UNIT		





Possible Contract Item:
Steel Beam Guardrail Barrier Transition Section, BA-221

Materials included in the Contract Item:
Steel Post Option:

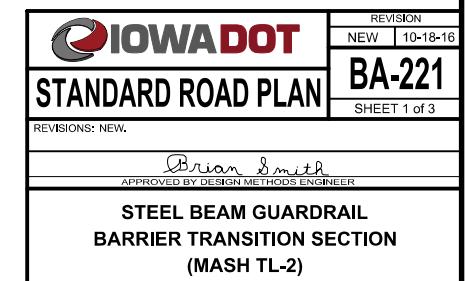
- (5) 6" x 8" x 6'-0" posts
- (2) 6" x 12" x 19" blockouts
- (3) 6" x 12" x 14" blockouts

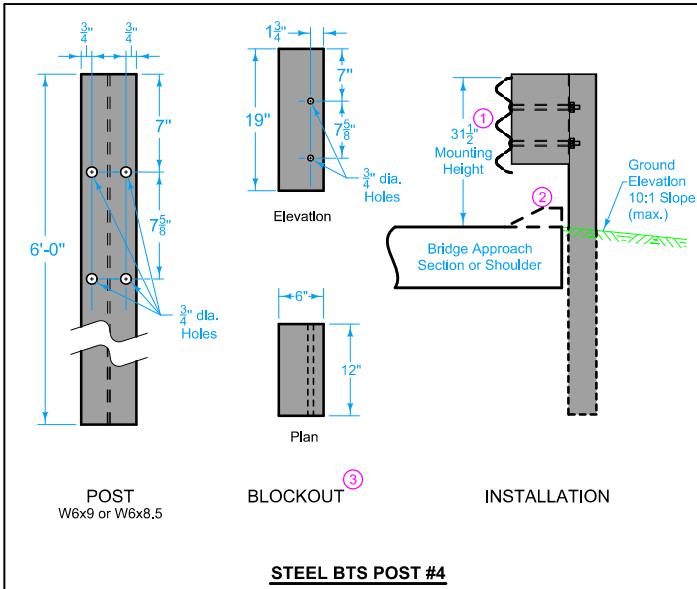
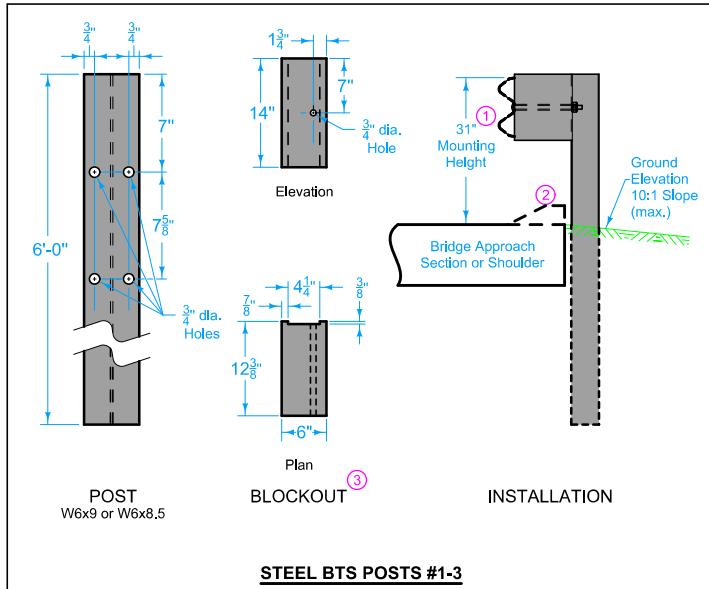
Wood Post Option:

- (5) 6" x 8" x 6'-0" posts
- (2) 6" x 12" x 19" blockouts
- (3) 6" x 12" x 14" blockouts

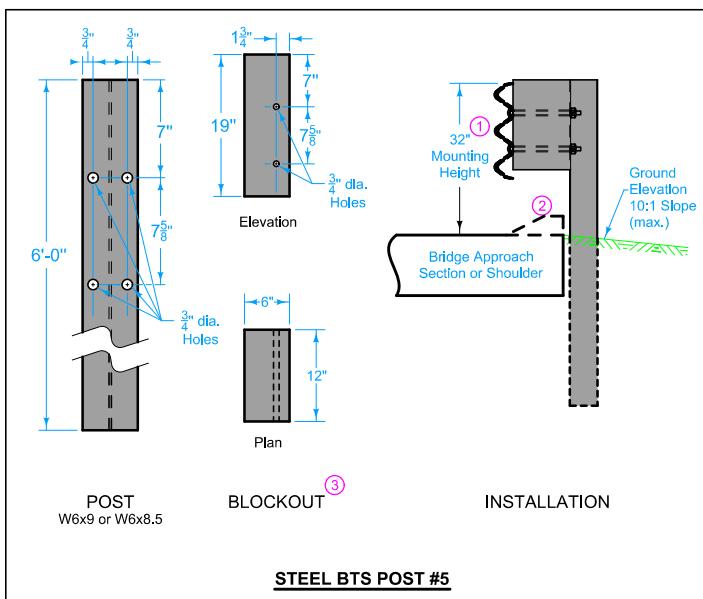
- (1) Asymmetrical Transition Section
- (2) 3'-1 $\frac{1}{2}$ " Thrie-Beam rail sections
- (2) 12'-6" W-Beam rail sections
- Approved bolts, nuts, and washers

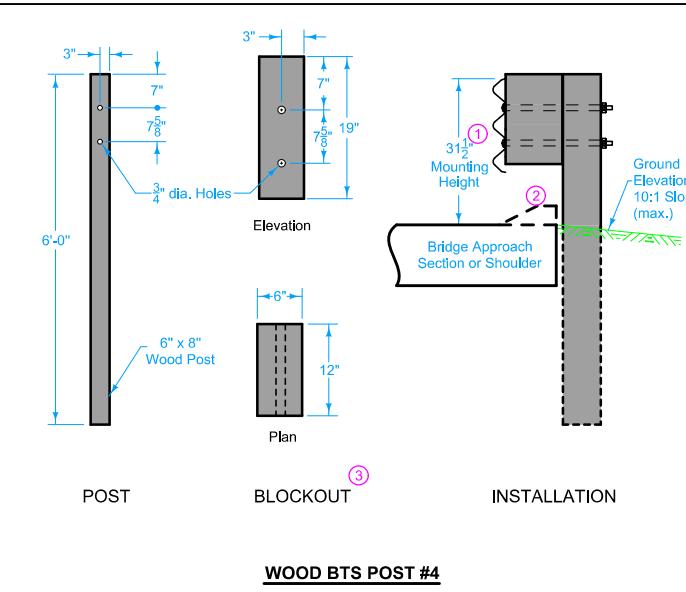
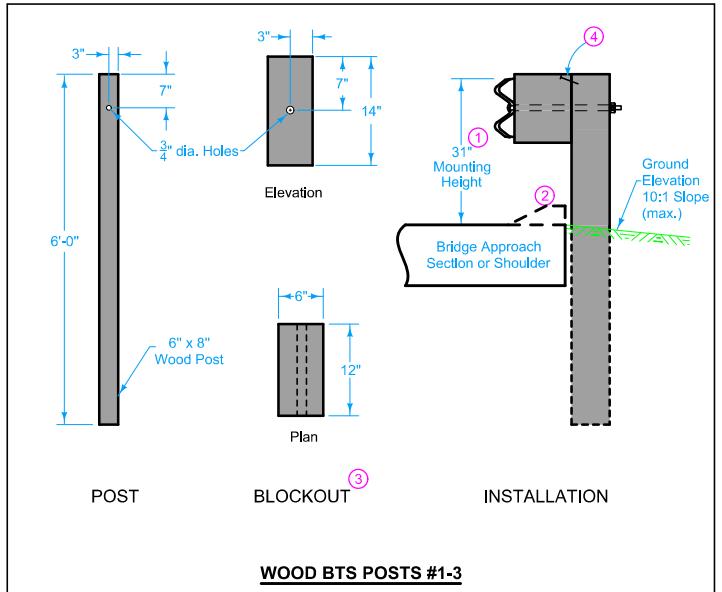
Refer to BA-200 for guardrail components



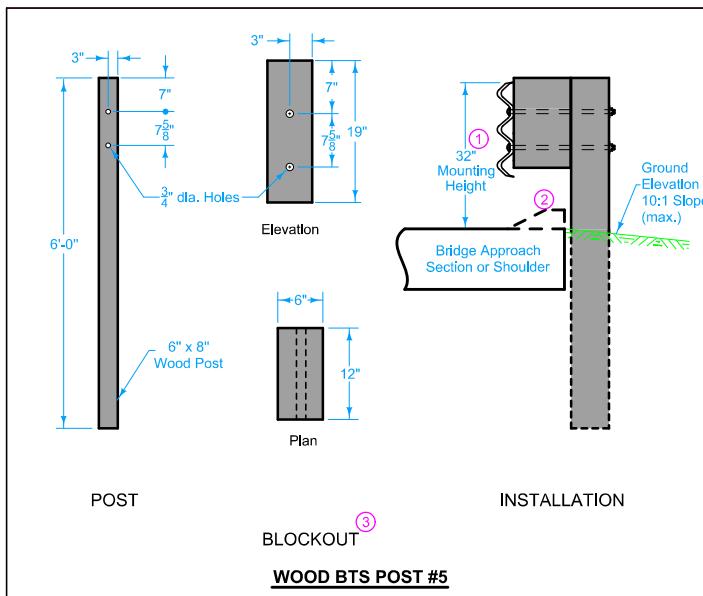


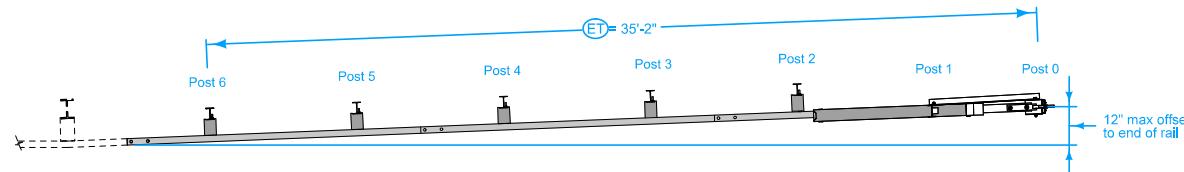
- ① Guardrail mounting height at barrier connection is 32 inches. Transition guardrail mounting height down to 31 inches at BTS Post #3.
- ② Possible 4 inch sloped curb. See project plans.
- ③ Wood or composite only. Steel blockouts will not be allowed.





- ① Guardrail mounting height at barrier connection is 32 inches. Transition guardrail mounting height down to 31 inches at BTS Post #3.
- ② Possible 4 inch sloped curb. See project plans.
- ③ Wood or composite only. Steel blockouts will not be allowed.
- ④ 16d nail to prevent blockout rotation.





PLAN

Refer to Materials I.M. [455.02](#) for a list of approved sources.

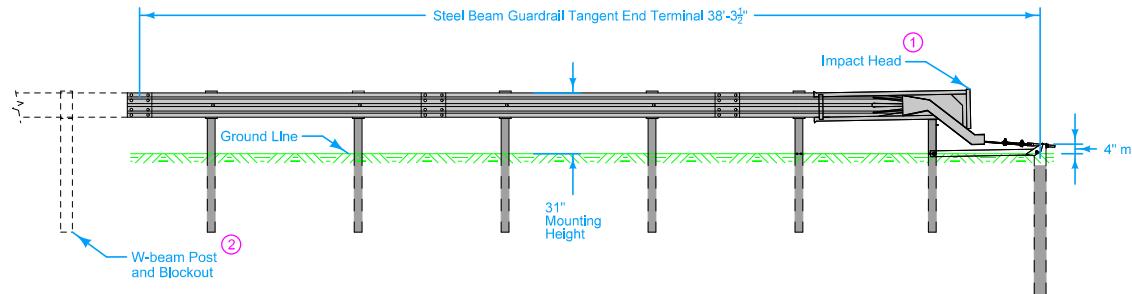
Use materials meeting the respective manufacturer's specifications. Install end terminals according to the manufacturer's recommendations.

Note: at the Contractor's option, and at no cost to the Contracting Authority, alternate post designs developed by the manufacturer and accepted by the FHWA for use within the end terminal may be substituted for the post design shown. When such a substitution is made, provide the Engineer with three copies of the most current installation and maintenance manual for the alternate design.

① Cover entire face of impact head with alternating black and yellow striped adhesive sheeting meeting the following requirements:

- Stripes are approximately 3 inches wide and slope down at a 45 degree angle toward the side on which traffic is to pass the end terminal.
- Yellow stripes meet the retroreflectivity requirements for Type III or Type IV reflective sheeting.

② Refer to [BA-200](#).



ELEVATION

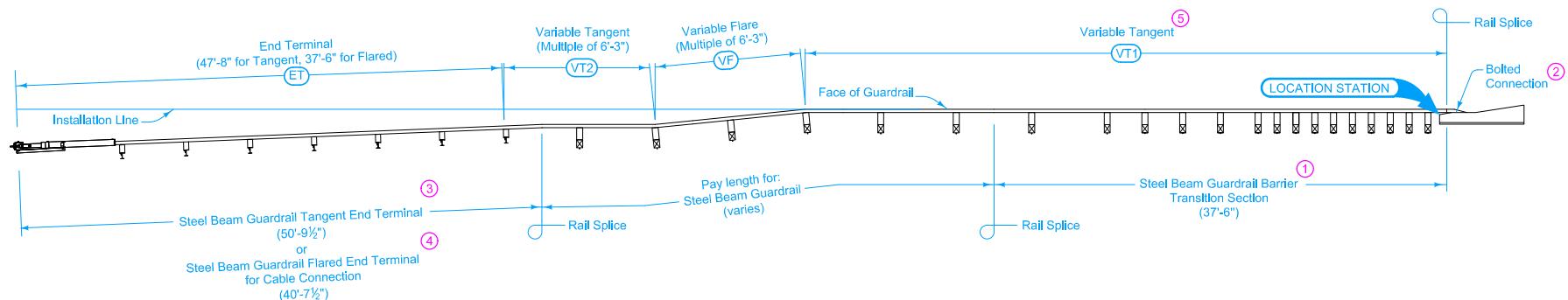


LAPPING PROCEDURE

Possible Contract Item:
Steel Beam Guardrail Tangent End Terminal, BA-225

Possible Tabulation:
[108-8A](#)

INTERIM		REVISION
		1 06-24-16
STANDARD ROAD PLAN		BA-225
SHEET 1 of 1		
REVISIONS: Changed 16" offset to 12" max offset.		
<i>Brian Smith</i> APPROVED BY DESIGN METHODS ENGINEER		
STEEL BEAM GUARDRAIL TANGENT END TERMINAL (MASH TL-2)		



Install delineators and object markers according to **SI-211**.

For grading requirements, see **EW-301**.

For general guardrail details, see **BA-200**.

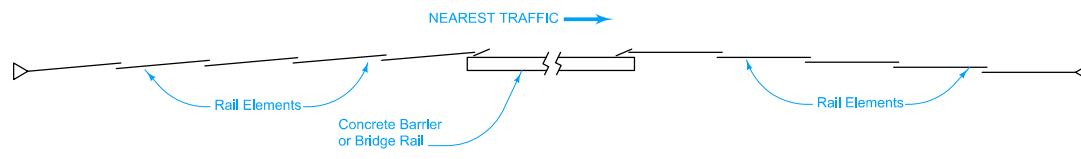
① See **BA-201**.

② See **BA-202** for connections to concrete barriers and bridge rail end sections.

③ See **BA-205**.

④ See **BA-206**.

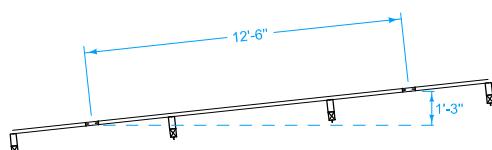
⑤ Minimum VT1 of 40'-7 1/2" if no VF is used. Minimum VT1 of 53'-1 1/2" if VF is used.



LAPPING PROCEDURE

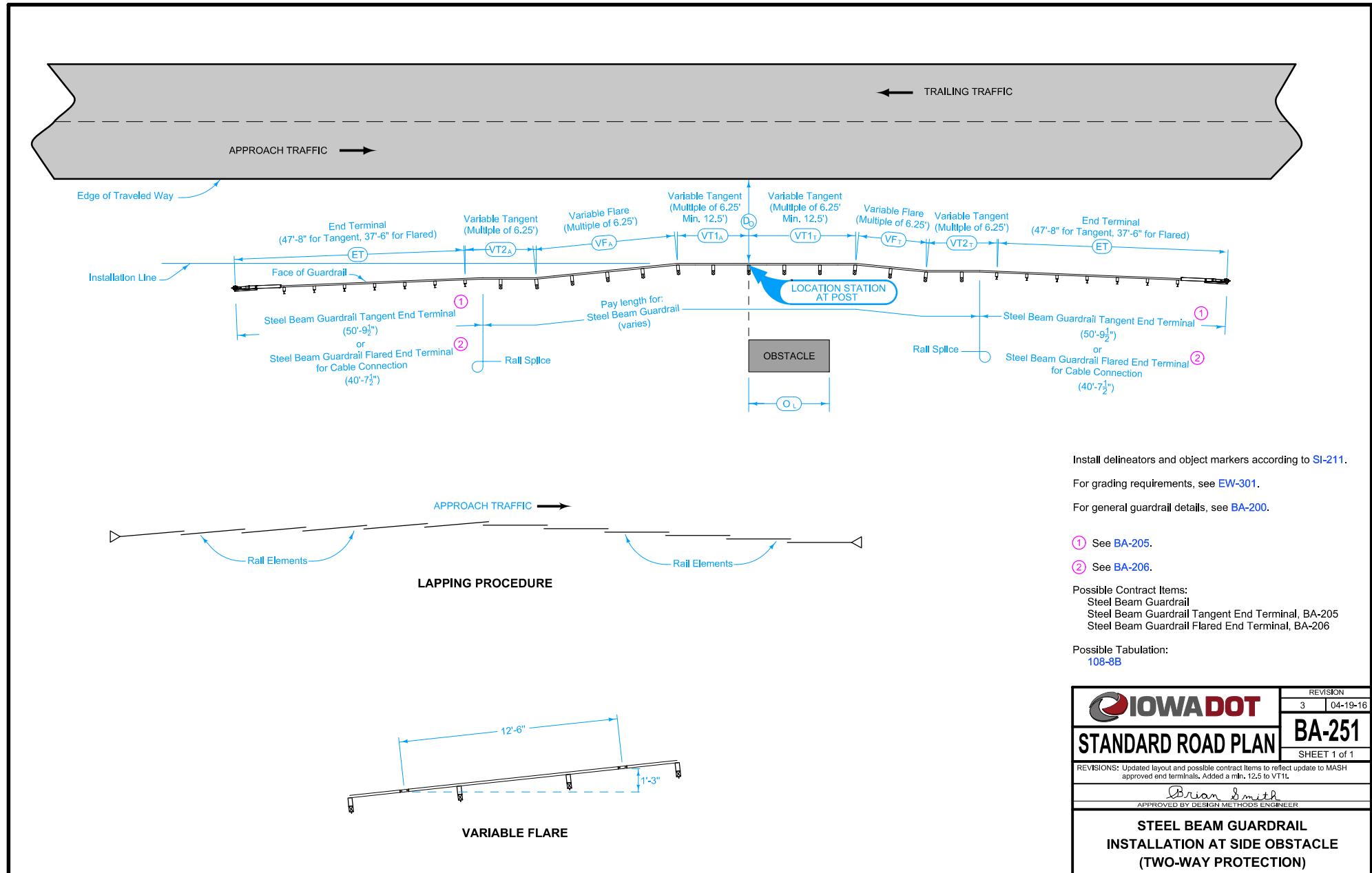
Possible Contract Items:
 Steel Beam Guardrail
 Steel Beam Guardrail Barrier Transition Section, BA-201
 Steel Beam Guardrail End Anchor, Bolted
 Steel Beam Guardrail Tangent End Terminal, BA-205
 Steel Beam Guardrail Flared End Terminal, BA-206

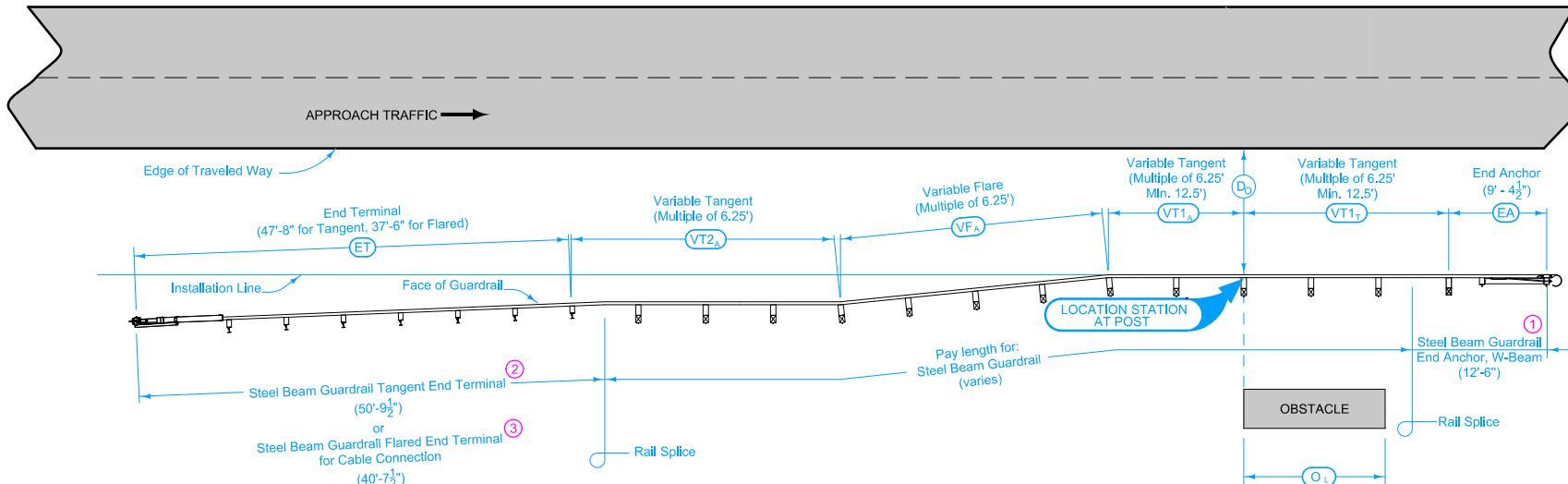
Possible Tabulation:
108-8A



VARIABLE FLARE

IOWADOT		REVISION 6 10-18-16
STANDARD ROAD PLAN		
BA-250		
SHEET 1 of 1		
REVISIONS: Added MASH TL-3 designation to title. Changed Barrier Transition Section contract item to specify BA-201.		
<i>Brian Smith</i> APPROVED BY DESIGN METHODS ENGINEER		
STEEL BEAM GUARDRAIL INSTALLATION AT CONCRETE BARRIER OR BRIDGE RAIL END SECTION (MASH TL-3)		





Install delineators and object markers according to [SI-211](#).

For grading requirements, see [EW-301](#).

For general guardrail details, see [BA-200](#).

① See [BA-203](#).

② See [BA-205](#).

③ See [BA-206](#).

Possible Contract Items:

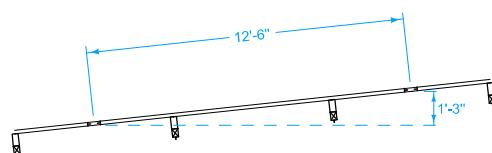
Steel Beam Guardrail
Steel Beam Guardrail End Anchor, W-Beam
Steel Beam Guardrail Flared End Terminal, BA-206
Steel Beam Guardrail Tangent End Terminal, BA-205

Possible Tabulation:

[108-8C](#)



LAPPING PROCEDURE



VARIABLE FLARE

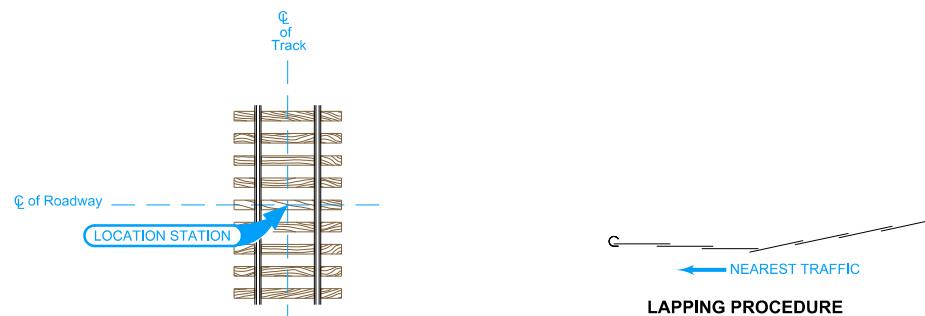
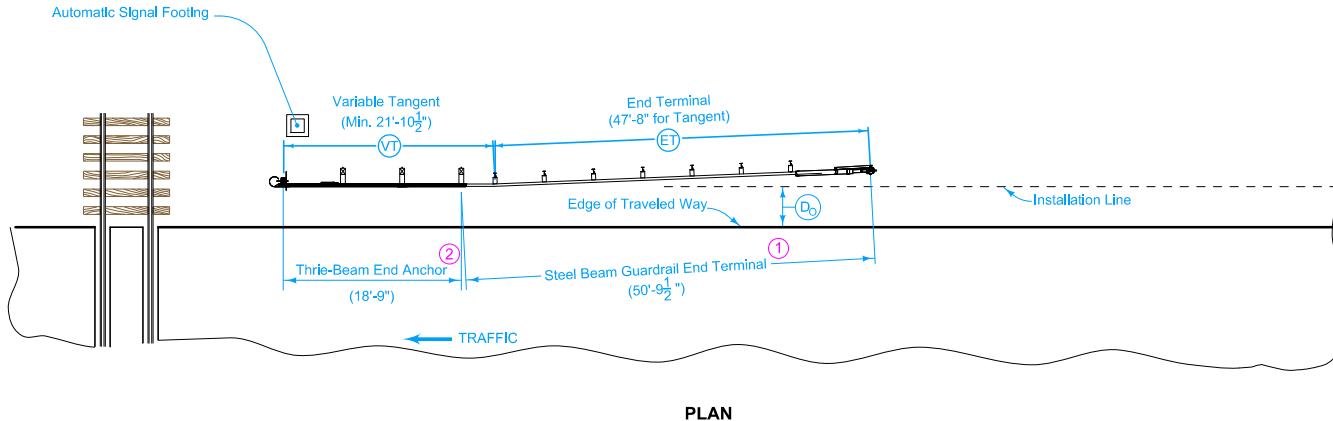
		REVISION 4 04-19-16
BA-252		
STANDARD ROAD PLAN		
SHEET 1 of 1		
REVISIONS: Updated layout and possible contract items to reflect updated to MASH approved end terminals. Added a min. 12.5 to VT1t.		
APPROVED BY DESIGN METHODS ENGINEER		
STEEL BEAM GUARDRAIL INSTALLATION AT SIDE OBSTACLE (ONE-WAY PROTECTION)		

For grading requirements, refer to [EW-301](#).

For additional guardrail requirements, refer to [BA-200](#).

(1) Refer to [BA-205](#).

(2) Refer to [BA-204](#).

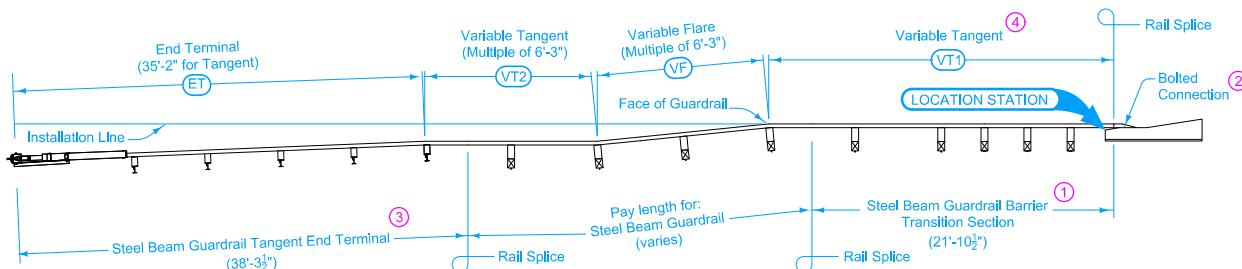


Possible Contract Items:
Steel Beam Guardrail End Anchor, Thrie-Beam
Steel Beam Guardrail Tangent End Terminal, BA-205

Incidental to Steel Beam Guardrail End Anchor, Thrie-Beam:
Deflector, Rigid - Type I
Object Marker, Type 2
Object Marker, Type 3

Possible Tabulation:
[108-8D](#)

IOWADOT		REVISION 3 04-19-16
STANDARD ROAD PLAN		
BA-253		
SHEET 1 of 1		
REVISIONS: Updated to MASH approved end terminal. Removed circle note 1, Added VT.		
Brian Smith APPROVED BY DESIGN METHODS ENGINEER		
STEEL BEAM GUARDRAIL INSTALLATION AT RAILROAD SIGNAL		



Install delineators and object markers according to [SI-211](#).

For grading requirements, see [EW-301](#).

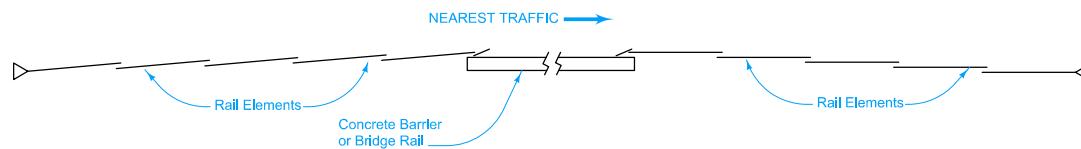
For general guardrail details, see [BA-200](#).

① See [BA-221](#).

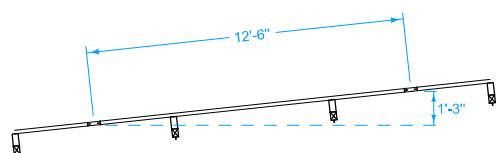
② See [BA-202](#) for connections to concrete barriers and bridge rail end sections.

③ See [BA-225](#).

④ Minimum VT1 of 25'-0" if no VF is used. Minimum VT1 of 37'-6" if VF is used.



LAPPING PROCEDURE

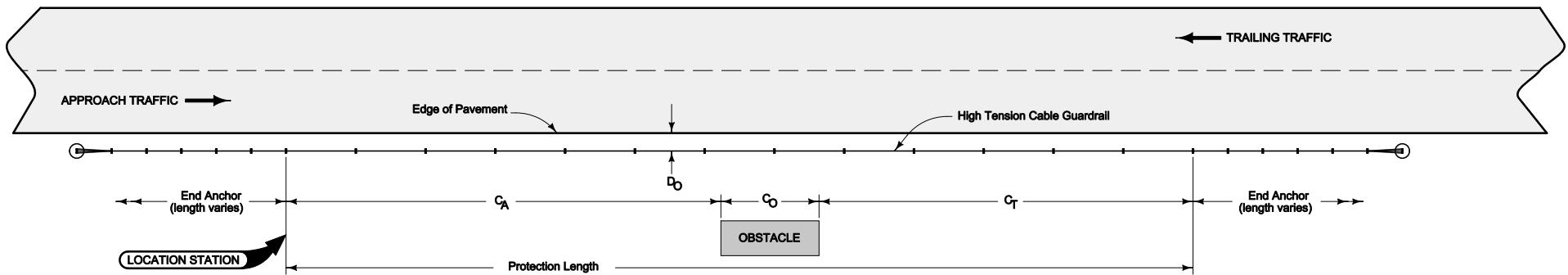


VARIABLE FLARE

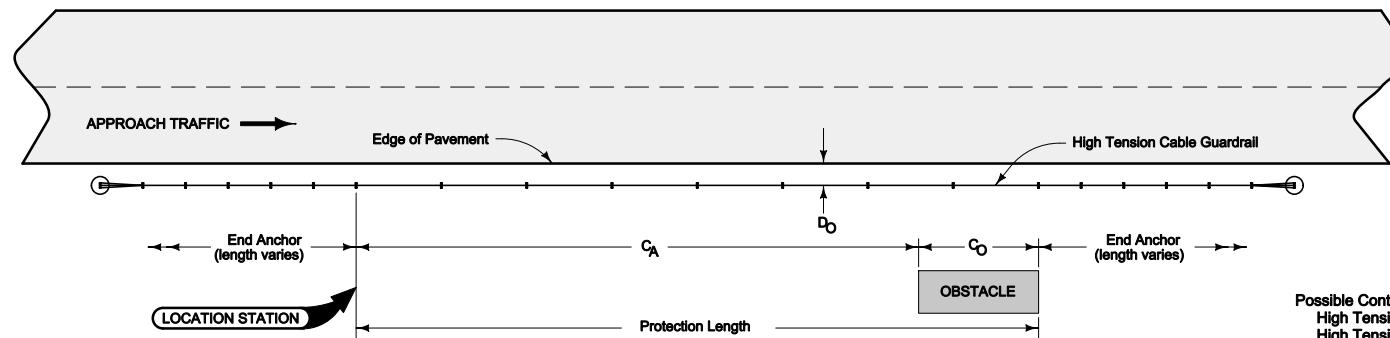
Possible Contract Items:
 Steel Beam Guardrail
 Steel Beam Guardrail Barrier Transition Section, BA-221
 Steel Beam Guardrail End Anchor, Bolted
 Steel Beam Guardrail Tangent End Terminal, BA-225

Possible Tabulation:
[108-8A](#)

		REVISION NEW 10-18-16
BA-260		SHEET 1 of 1
STANDARD ROAD PLAN		
REVISIONS: NEW		
APPROVED BY DESIGN METHODS ENGINEER		
STEEL BEAM GUARDRAIL INSTALLATION AT CONCRETE BARRIER OR BRIDGE RAIL END SECTION (MASH TL-2)		



ROADSIDE OBSTACLE, TWO-WAY PROTECTION

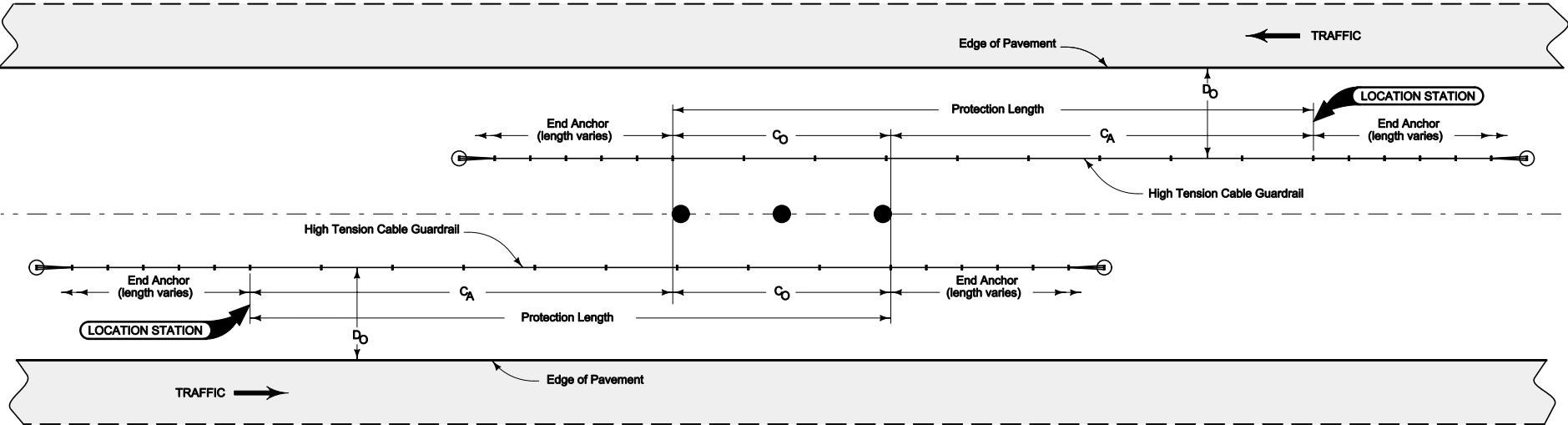


ROADSIDE OBSTACLE, ONE-WAY PROTECTION

Possible Contract Items:
High Tension Cable Guardrail
High Tension Cable Guardrail, End Anchor

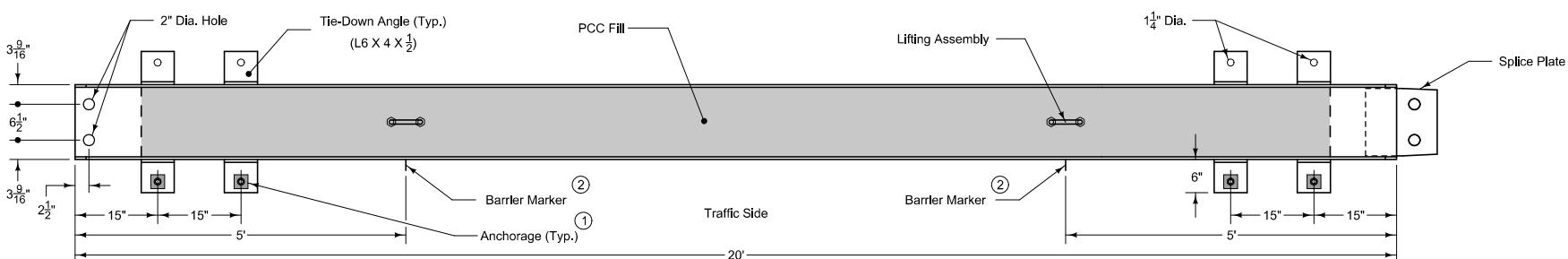
Possible Tabulation:
108-9A

 STANDARD ROAD PLAN	REVISION
	New 04-20-10
BA-351	
REVISIONS: New. Replaces RE-88.	
<i>Deanna Maiwald</i> APPROVED BY DESIGN METHODS ENGINEER	
HIGH TENSION CABLE GUARDRAIL	

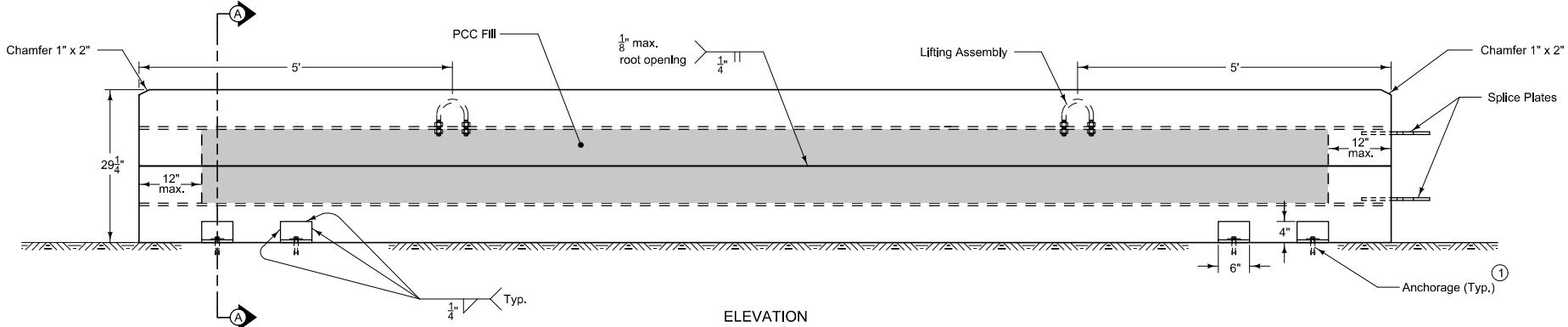


MEDIAN OBSTACLE PROTECTION

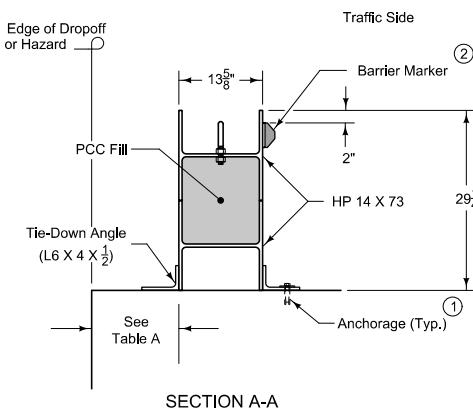
		REVISION
		New 04-20-10
		BA-351
		SHEET 2 of 2
 Iowa Department of Transportation		
STANDARD ROAD PLAN <small>REVISIONS: New. Replaces RE-88.</small>		
<small>Deanna Maiwald</small> <small>APPROVED BY DESIGN METHODS ENGINEER</small>		
HIGH TENSION CABLE GUARDRAIL		



PLAN



ELEVATION



SECTION A-A

Use steel meeting the requirements of ASTM A36.

Use an Iowa DOT Construction Specification mix or a commercial ready-mix with a minimum f_c' = 2500 psi. Deposit by a method approved by the Engineer. Limits of the fill shown are approximate and may be rough or slumped depending on the method of bulkheading.

Provide for an approved monitoring schedule with a person on call and available 24 hours a day, each day of the week, to realign barrier which has been struck. Initiate within one hour of notification of need.

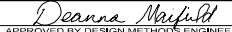
Unless stated otherwise, the barrier rail sections remain the property of the Contractor. Remove from the site upon completion of work.

① Anchorage for use on bridge decks or PCC pavement only. When installed in one-way traffic situations use and install anchorage on traffic side of barrier only. Anchorage consisting of a washer plate as shown, a 3/4" dia. x 1 3/4" long ASTM A307 Grade B heavy hex bolt, and a 3/4" Red Head Multi-Set II drop-in anchor (or approved equivalent). Following removal of anchorage, fill all holes with an approved non-shrink grout. The cost of anchorage, when required, is to be in the price bid for "Temporary Barrier Rail, Steel."

② Furnish and install Barrier Markers. Place Markers as shown on this sheet and attach to the barrier in a manner approved by the manufacturer. Place Markers to face oncoming traffic. Use a color to match the adjacent edge line. Maintain the markers and promptly repair or replace damaged or missing units. Include all costs for furnishing, installing and maintaining markers in the price bid for "Temporary Barrier Rail, Steel."

Possible Contract Item:
Temporary Barrier Rail, Steel

Possible Tabulation:
108-33

 Iowa Department of Transportation		REVISION 1 04-16-13
STANDARD ROAD PLAN		
SHEET 1 of 2		
REVISIONS: Defined dropoff on sheet 2.		
 APPROVED BY DESIGN METHODS ENGINEER		
TEMPORARY BARRIER RAIL (STEEL)		

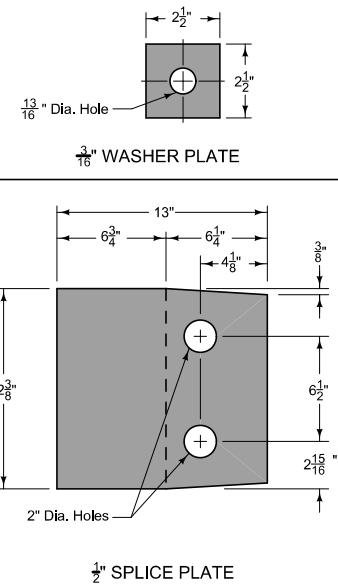
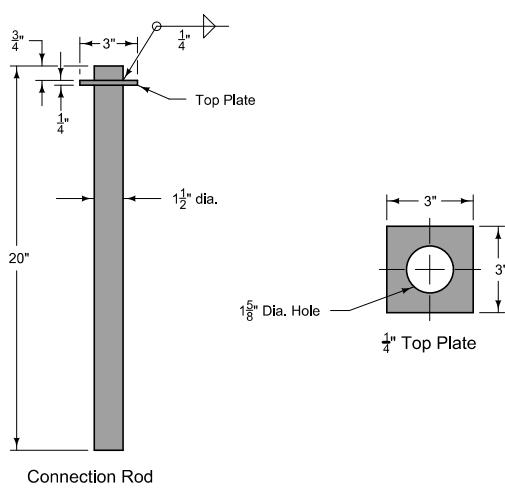
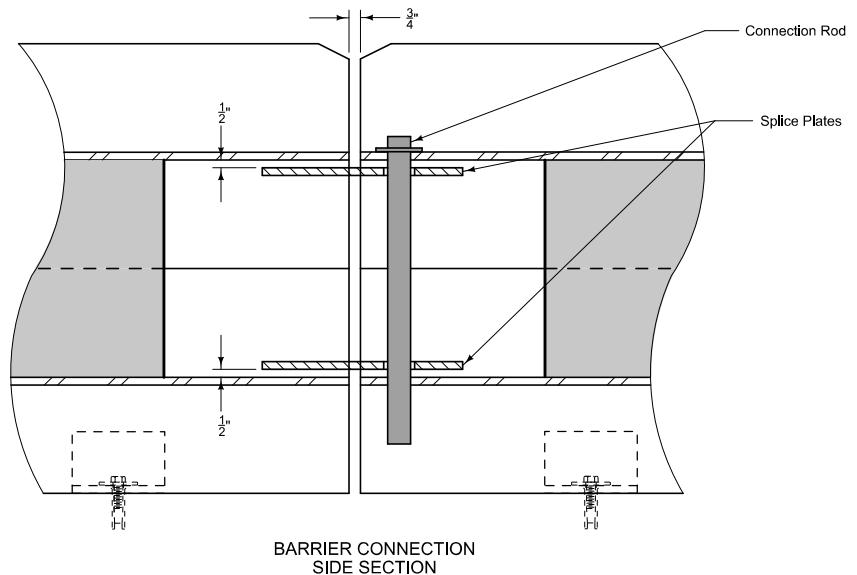
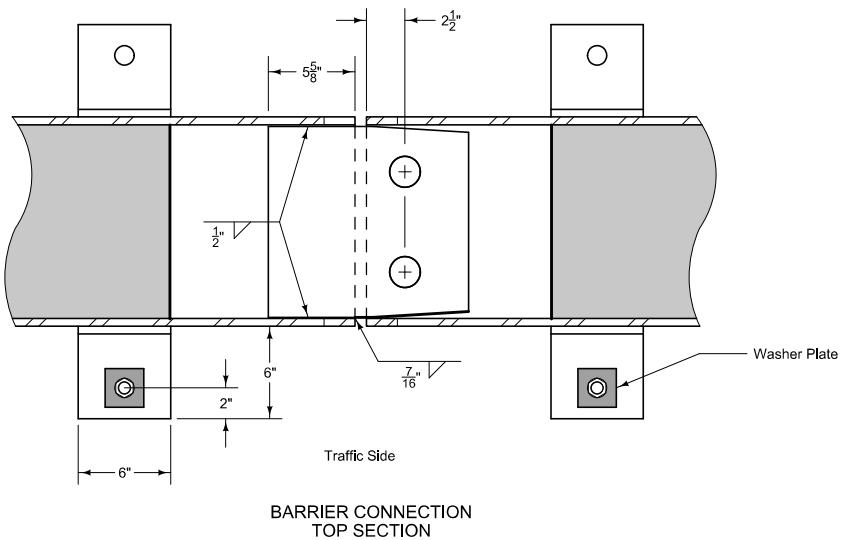
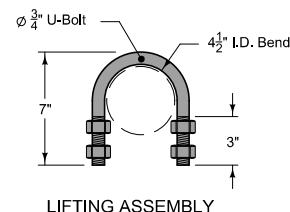


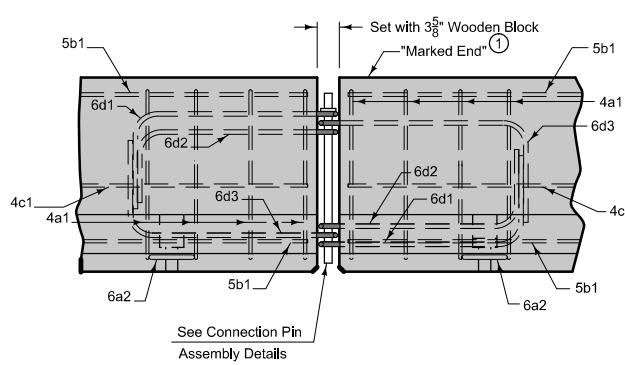
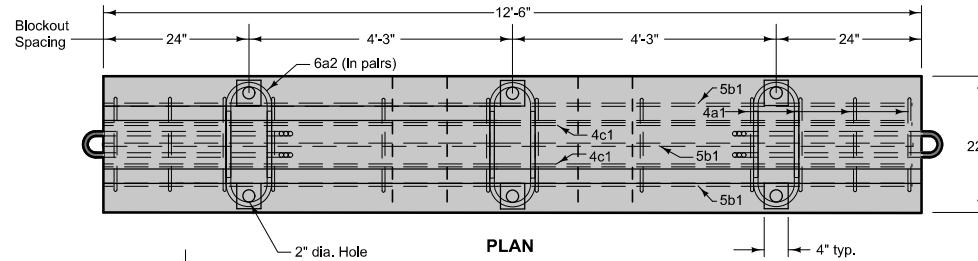
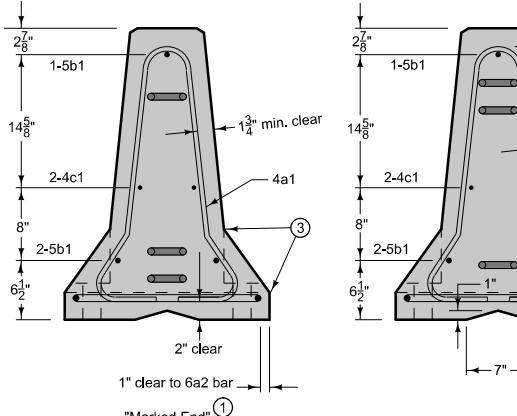
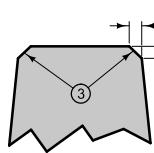
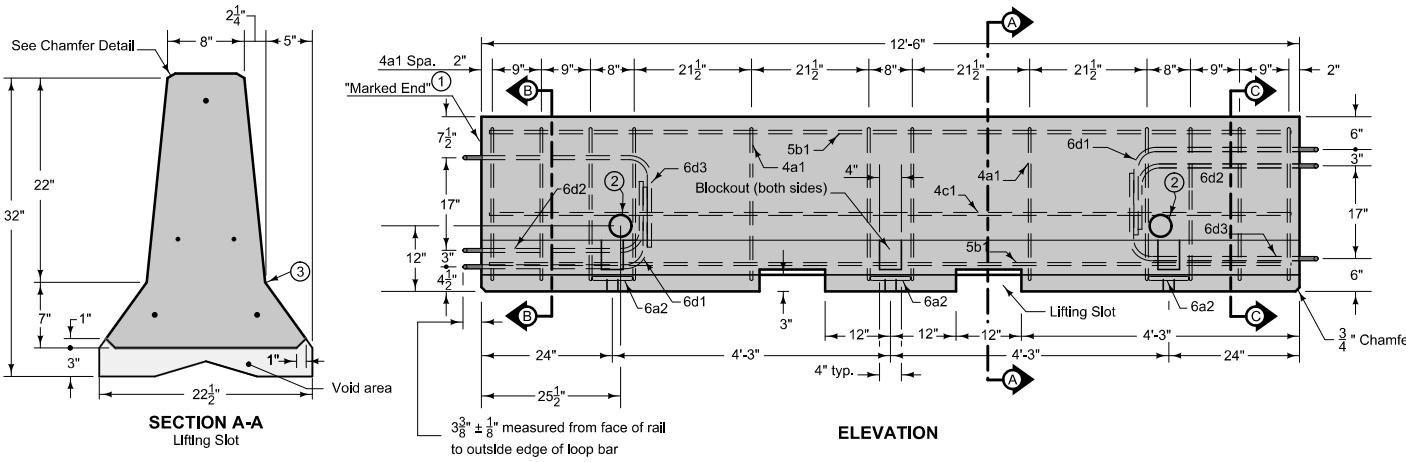
TABLE A
ANCHORAGE REQUIREMENTS

Obstacle		Dropoff Depth	Min. offset where TBR is Unanchored	Min. offset where TBR is Anchored
Dropoff*	from pavement	≤ 24"	10"	6"
	from bridge	> 24"	18"	6"
Fixed vertical object	N/A	1"	N/A	
		≥ 3"	18"	6"

* A dropoff is a slope of 2H:1V or steeper



Iowa Department of Transportation		REVISION 1 04-16-13
STANDARD ROAD PLAN		
BA-400		
SHEET 2 of 2		
REVISIONS: Defined dropoff on sheet 2.		
Deanna Mufeld APPROVED BY DESIGN METHODS ENGINEER		
TEMPORARY BARRIER RAIL (STEEL)		



For loop bars 6d1, 6d2, and 6d3, use $\frac{3}{4}$ " smooth steel bars with a minimum yield strength of 60 ksi, a tensile strength of not less than 1.25 times the yield strength but a minimum of 80 ksi, a minimum 14% elongation in 8 inches, and passing a 180 degree bend test using a $\frac{3}{2}$ " pin bend diameter. Install loops within $\frac{1}{8}$ " of the plan dimensions.

Use Grade 60, ASTM A615 for all other reinforcements. Do not lift or move using loop bars 6d1, 6d2 or 6d3.

Provide for an approved monitoring schedule with a person on call and available 24 hours a day, each day of the week, to realign barrier which has been struck. Initiate service within one hour of notification of need.

Unless stated otherwise in the plans, the barrier rail sections shall be the property of the Contractor. Remove from the site upon completion of work.

Following removal of anchorage, fill all holes with an approved non-shrink grout.

Tapered end section is not designed for use within 30 feet of traffic on facilities with speed limits 55 mph or greater, nor within 10 feet of traffic on facilities with speed limits 40 mph to 50 mph.

Estimated quantity of concrete for one taper section is 0.6 cubic yards.

Include the cost of anchorage, when required in the price bid for "Temporary Barrier Rail, Concrete".

① Permanently mark one end of each rail section with manufacturing information. The "marked end" is that end of the barrier having one loop bar at the top and two loop bars at the bottom. Include the following information in the marking:

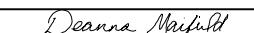
- Manufacturer Identification
- Date Manufactured (Month and Year)
- BA-401 Type A

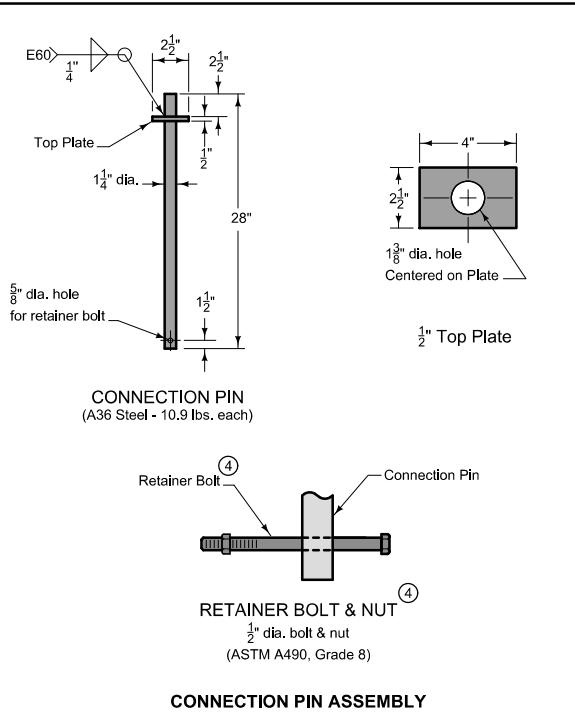
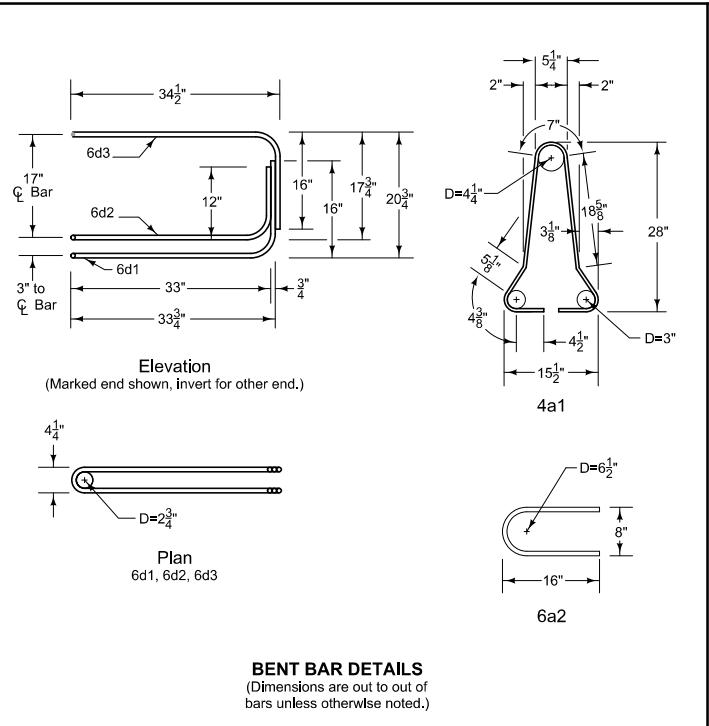
② Lifting hole. 4 inch diameter PVC Pipe.

③ 1 inch radius allowed.

Possible Contract Item:
Temporary Barrier Rail, Concrete

Possible Tabulation:
108-33

Iowa Department of Transportation		REVISION 1 04-16-13
STANDARD ROAD PLAN		
BA-401		
SHEET 1 of 4		
REVISIONS: Defined dropoff on sheet 3.		
 APPROVED BY DESIGN METHODS ENGINEER		
TEMPORARY BARRIER RAIL (PRECAST CONCRETE)		



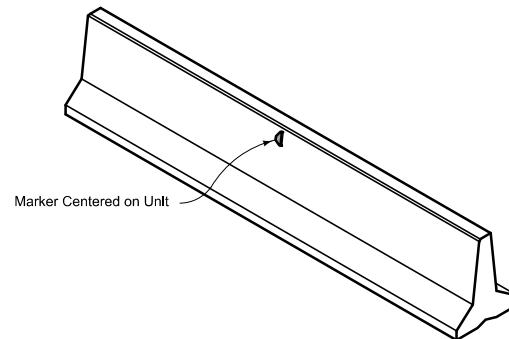
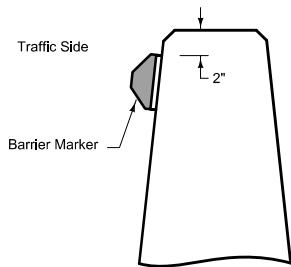
④ Retainer bolt & nut are required for connections with 2-loop barriers (previous designs) or in conjunction with Strap Anchorage.

⑤ Furnish and install Barrier Markers. Attach to the barrier in a manner approved by the manufacturer. Markers to face oncoming traffic and match the adjacent edge line in color. Maintain the markers and promptly repair or replace any damaged or missing units. Include costs for furnishing, installing and maintaining markers in the price bid for "Temporary Barrier Rail, Concrete."

Per 12'-6" Barrier Section

REINFORCING A615 Gr. 60					
Bar	Bar Size	Shape	No. of Bars	Length Ft.	Weight Lbs.
4a1	4	▲	12	6'-0"	48.1
6a2	6	□	6	35"	26.3
5b1	5	—	3	12'-2"	38.1
4c1	4	—	2	12'-2"	16.3

LOOP ASSEMBLY					
6d1	6d2	6d3	Length	Weight	
6d1	6	—	2	8'-5"	25.3
6d2	6	—	2	7'-7"	22.8
6d3	6	—	2	8'-6"	25.5



BARRIER MARKER PLACEMENT

⑤

Iowa Department of Transportation		REVISION 1 04-16-13
STANDARD ROAD PLAN		
BA-401		
SHEET 2 of 4		
REVISIONS: Defined dropoff on sheet 3.		
Deanna Maifeld APPROVED BY DESIGN METHODS ENGINEER		
TEMPORARY BARRIER RAIL (PRECAST CONCRETE)		

STRAP ANCHORAGE

For use on:
Bridge Decks
PCC Pavement

TIE-DOWN STRAP (before bending)

TIE-DOWN STRAP (after bending)

(6) $\frac{3}{4}$ inch Red Head Multi-Set II drop-in anchor with $\frac{3}{4}$ dia.
 $\times 1\frac{3}{4}$ long ASTM A325 structural bolt OR Red Head
Large Diameter Tapcon ($\frac{3}{4}$ dia. x $4\frac{1}{2}$ min.) OR Simpson
Titen HD Wedge Bolt ($\frac{3}{4}$ dia. x 5" min.).

(7) 3 stakes required per rail section.

(8) Pre-drill holes for stakes with $\frac{5}{8}$ core bit.

END VIEW

STAKE ANCHORAGE

For use on:
HMA Pavement (2" min. thickness)
Composite Pavement (8)
PCC Pavement (8)

STAKE

1/2" STOP PLATE

**TABLE A
ANCHORAGE REQUIREMENTS**

Obstacle		Dropoff Depth	Min. offset where TBR is Unanchored	Min. offset where TBR is Anchored
Dropoff*	from pavement	$\leq 24"$	24"	6"
	from bridge	$> 24"$	45"	6"
Fixed vertical object	$\leq 3"$	1"	N/A	
	$> 3"$	45"	6"	

* A dropoff is a slope of 2H:1V or steeper

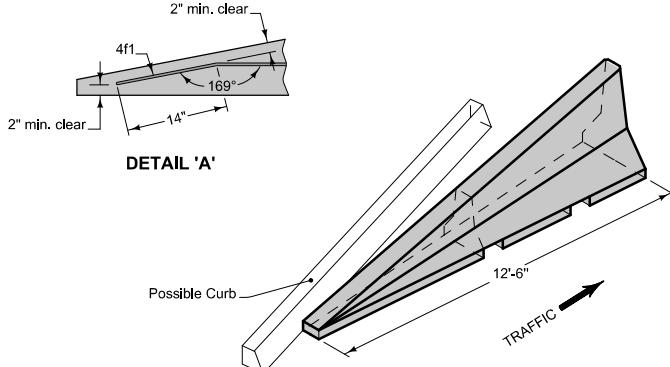
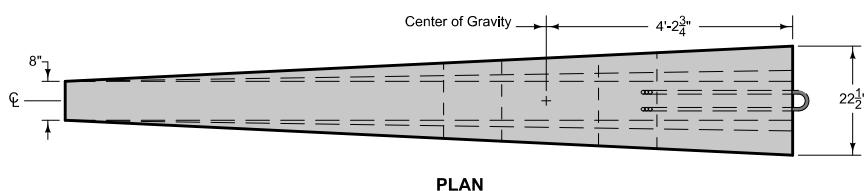
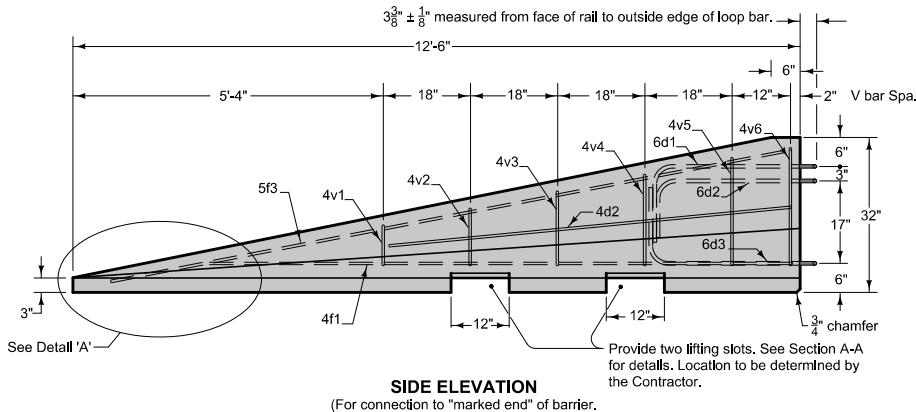
TYPICAL SECTION

Iowa Department of Transportation REVISION 1 04-16-13
STANDARD ROAD PLAN BA-401 SHEET 3 of 4
REVISIONS: Defined dropoff on sheet 3.

Deanne Maifeld APPROVED BY DESIGN METHODS ENGINEER

TEMPORARY BARRIER RAIL (PRECAST CONCRETE)

TAPERED END SECTION

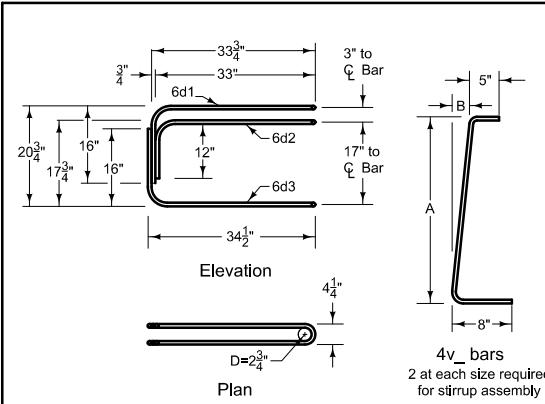


PERSPECTIVE VIEW

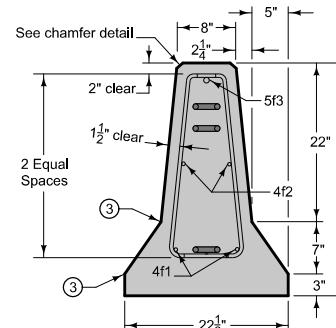
FRONT ELEVATION

END SECTION

③ 1 inch radius allowed.



BENT BAR DETAILS
(Dimensions are out to out of bars unless otherwise noted.)



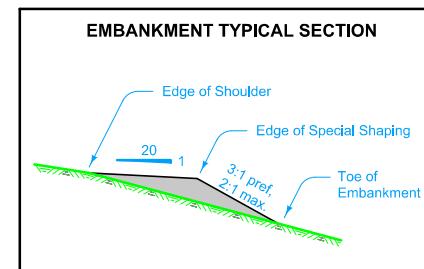
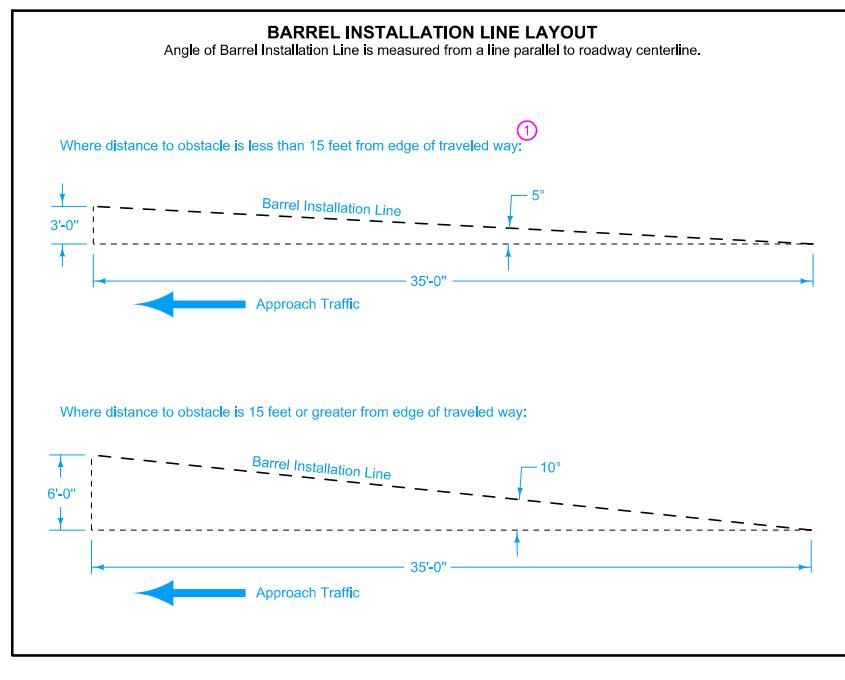
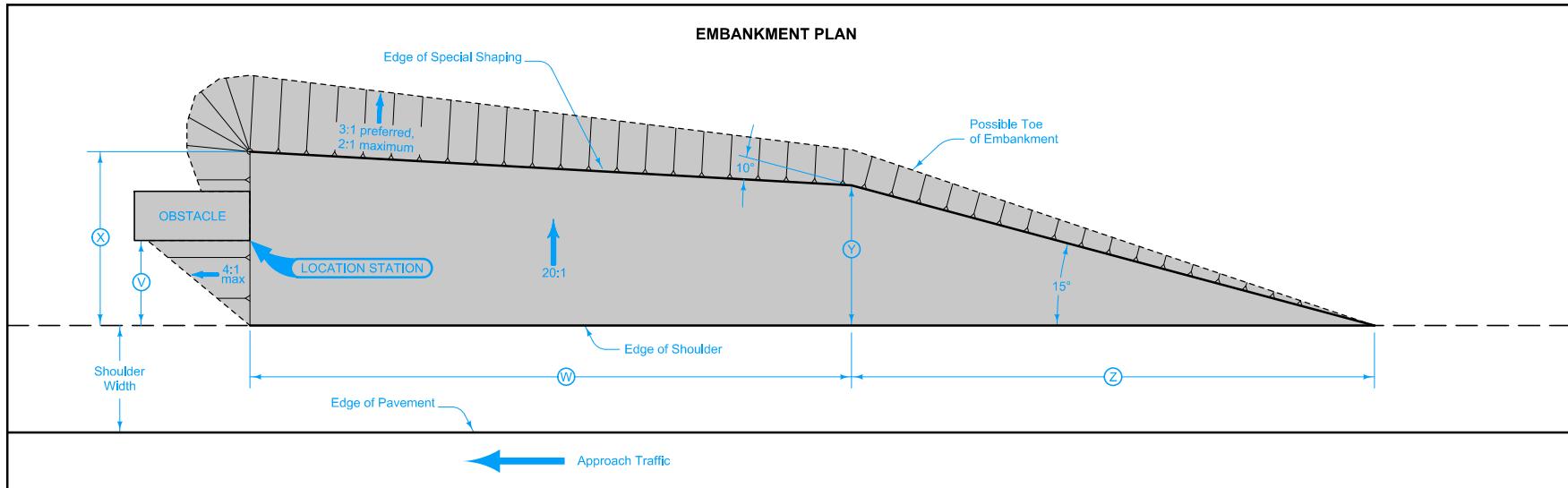
Per 12'-6" Barrier Taper Section

REINFORCING A615 Gr. 60					
Bar	Bar Size	Shape	No. of Bars	Length ft.	Weight lbs.
4v1	4	[2	23"	2.6
4v2	4	[2	26"	2.9
4v3	4	[2	30"	3.3
4v4	4	[2	33"	3.7
4v5	4	[2	3'2"	4.2
4v6	4	[2	3'4"	4.5
4f1	4	—	2	12'0"	16.0
4f2	4	—	2	7'6"	10.0
5f3	5	—	1	11'9"	12.3

LOOP ASSEMBLY		
Bar	A	B
6d1	6	—
6d2	6	—
6d3	6	—

Bar	A	B
4v1	10"	1"
4v2	13"	1 1/4"
4v3	17"	1 5/8"
4v4	20"	1 7/8"
4v5	24 1/2"	2 3/8"
4v6	27"	2 3/4"

 STANDARD ROAD PLAN	REVISION
	1 04-16-13
BA-401	
SHEET 4 of 4	
REVISIONS: Defined dropoff on sheet 3.	
 APPROVED BY DESIGN METHODS ENGINEER	
TEMPORARY BARRIER RAIL (PRECAST CONCRETE)	



① For obstacles located within the traveled way where space is limited, Barrel Installation Line may be parallel to roadway centerline. In this case, \textcircled{Y} dimension equals \textcircled{X} dimension.

Possible Contract Items:
Embankment In Place
Temporary Crash Cushion

Possible Tabulation:
108-30

EMBANKMENT DIMENSIONS

For Obstacle Widths:	Sand Barrel Layouts Required	(W)	(X)	(Y) (must not be negative)	(Z)
3'-6" or less	1	24'-3"	$(\textcircled{Y}) + 5'-3"$	$(\textcircled{Y}) + 3'-3"$	$3.73(\textcircled{Y}) + 12'-0"$
3'-7" - 10'-7"	2	25'-0"	$(\textcircled{Y}) + 12'-3"$	$(\textcircled{Y}) + 10'-0"$	$3.73(\textcircled{Y}) + 38'-0"$
10'-8" - 17'-9"	3	25'-9"	$(\textcircled{Y}) + 18'-3"$	$(\textcircled{Y}) + 17'-0"$	$3.73(\textcircled{Y}) + 64'-0"$
17'-10" - 32'-3"	4	26'-6"	$(\textcircled{Y}) + 26'-3"$	$(\textcircled{Y}) + 24'-0"$	$3.73(\textcircled{Y}) + 89'-0"$

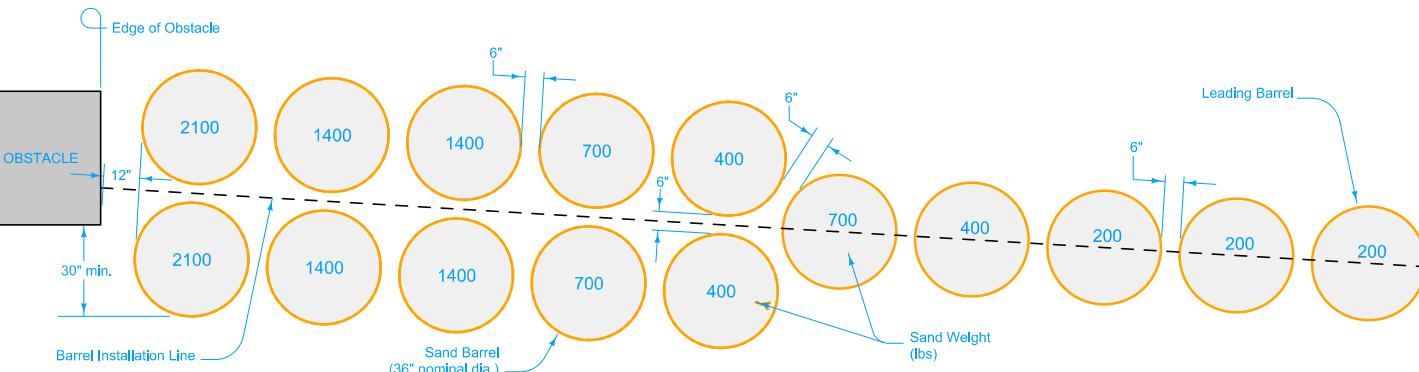
IOWADOT REVISION 1 04-19-16
STANDARD ROAD PLAN BA-500 SHEET 1 of 2

REVISIONS: Changed formula in Column Z.

Brian Smith APPROVED BY DESIGN METHODS ENGINEER

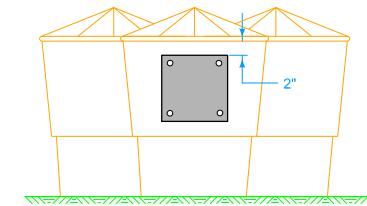
TEMPORARY CRASH CUSHIONS SAND BARREL

SAND BARREL LAYOUT

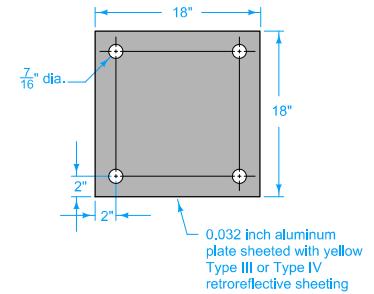


SAND BARREL DELINEATION

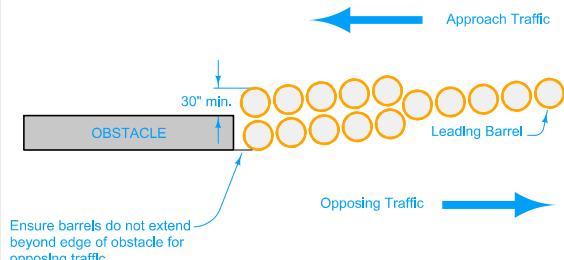
Mount marker plate on the leading barrel, centered on the barrel installation line.



MARKER PLATE



PROTECTING OBSTACLES BETWEEN OPPONDING TRAFFIC

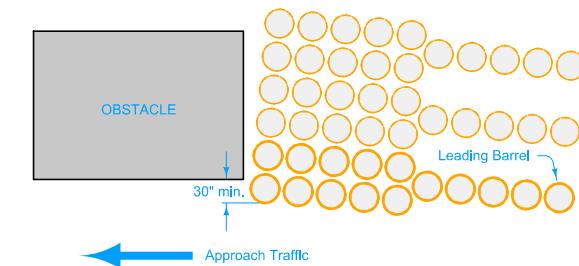


PROTECTING WIDE OBSTACLES

For wide obstacles, repeat sand barrel layout as needed

An installation consisting of multiple sand barrel layouts, similar to the one shown, will be measured as a single crash cushion.

All barrels separated by 6 inches.



Mount plate using four $\frac{3}{8}$ " bolts, nuts, and washers meeting the requirements of Article 4186.09 for Type A signs.

Self-adhesive sheeting meeting the above requirements may be substituted for the marker plate.



REVISIONS: Changed formula in Column Z.

Brian Smith
APPROVED BY DESIGN METHODS ENGINEER

TEMPORARY CRASH CUSHIONS SAND BARREL