

Design Speed mph	Length Of Advancement, Ft. (X)
≤45	= 16 (D-d)

Note: The minimum length of advancement for both near and opposing lane approaches is 40'.

Equation Variables:

D = Distance in feet from near edge of the near approach traffic lane to back of hazard or clear zone width whichever is lesser. For left side hazards and clear zones on two-way undivided facilities D is measured from the inside edge of the near approach traffic lane.

d = Distance in feet from near edge of the near approach traffic lane to the face of barrier (at offset control point). For left side hazards on two-way undivided facilities d is measured from the inside edge of the nearest opposing traffic lane.

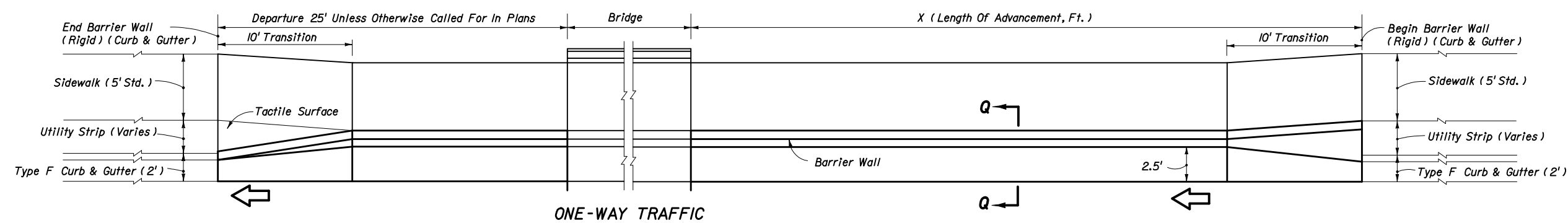
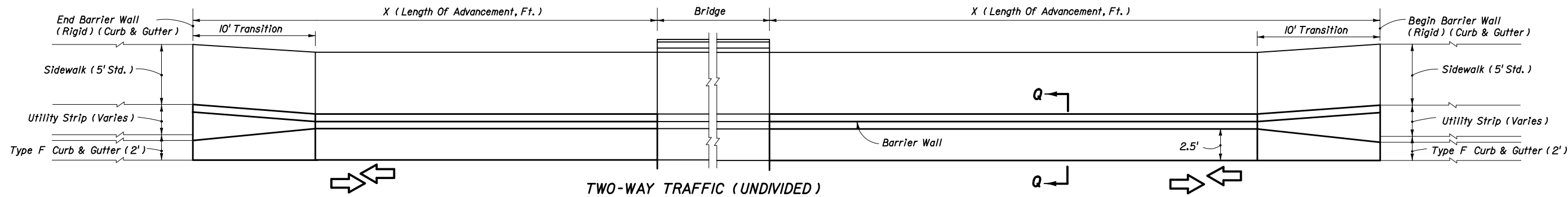
Note: All longitudinal reinforcement #4 bars. Minimum segment length for this wall is 40'. Shorter segments due to construction or expansion joint shall be dowled in the manner described for 'Transition Segments' on Sheet II. Transverse expansion joints are to be constructed at the juncture of wall transitions and curb and gutter, and at intervals so that spacing will not exceed 100'. For barrier wall inlet details see Index No. 219. Inlet extends into bicycle lane 12". Wall to be paid for under the contract unit Price for Concrete Barrier Wall (Rigid-Curb & Gutter), LF.

Estimated Quantities Per Linear Foot Of Wall:
Class II Concrete: 0.23 C.Y.
Reinforcing Steel: 20.7 Lbs.

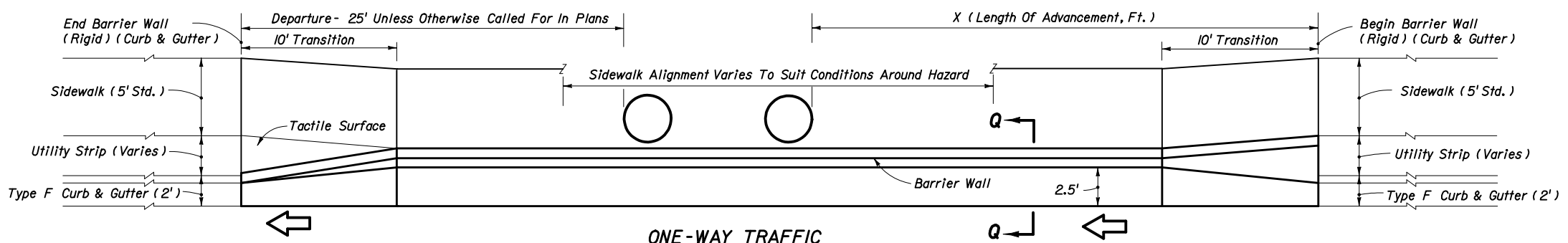
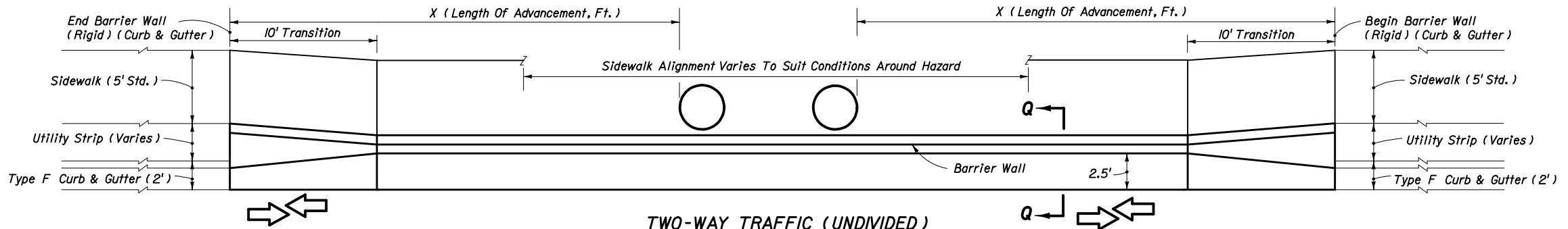
LENGTH OF ADVANCEMENT

SECTION TT

CONCRETE BARRIER WALL (RIGID) (CURB & GUTTER) • WITH ADJACENT BICYCLE LANE



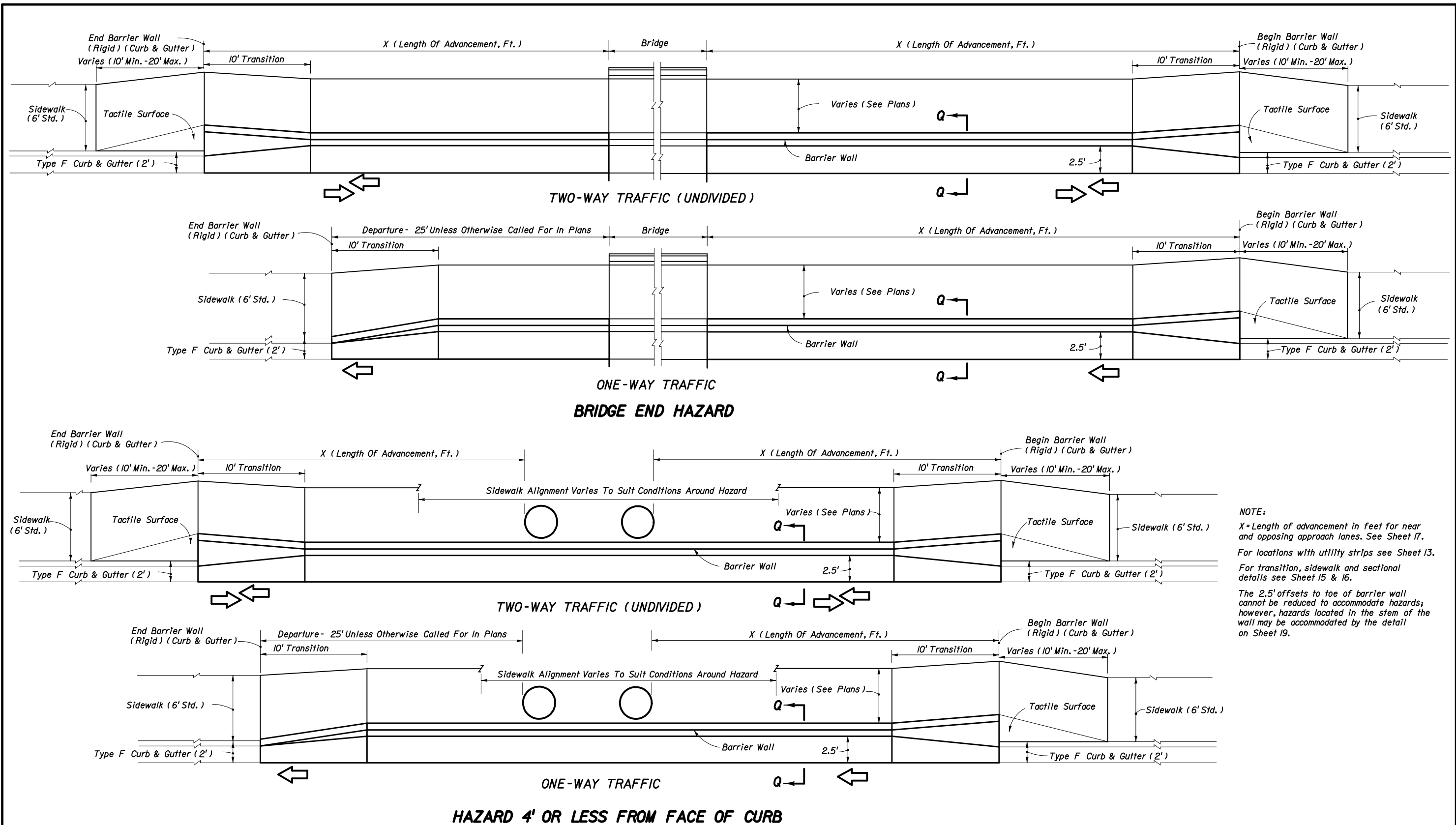
BRIDGE END HAZARD



HAZARD 4' OR LESS FROM FACE OF CURB

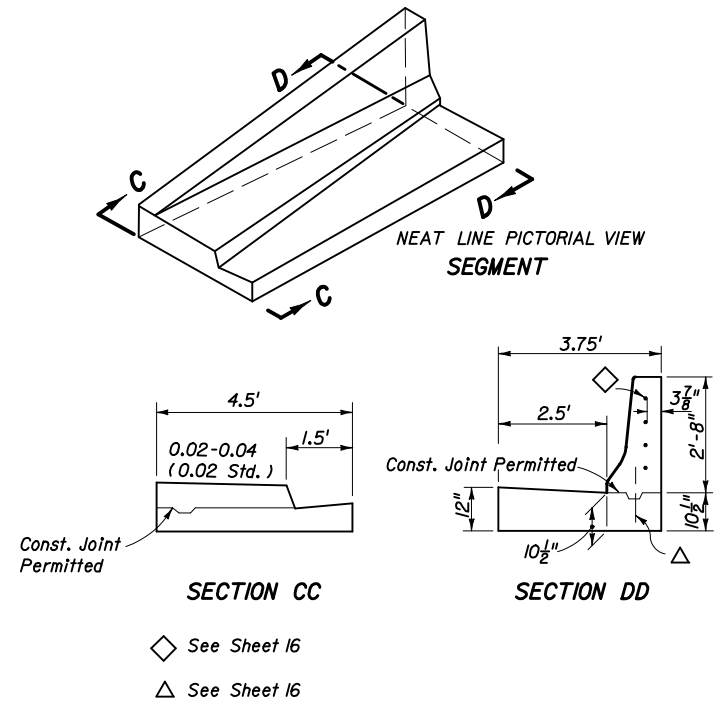
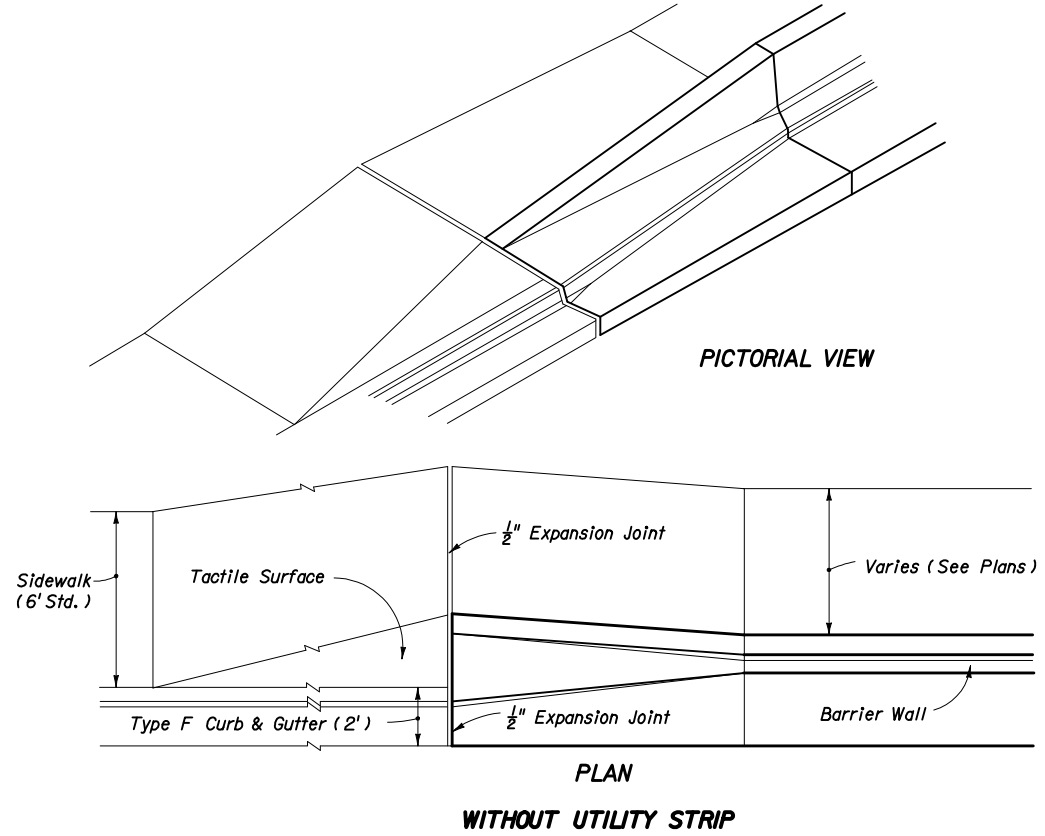
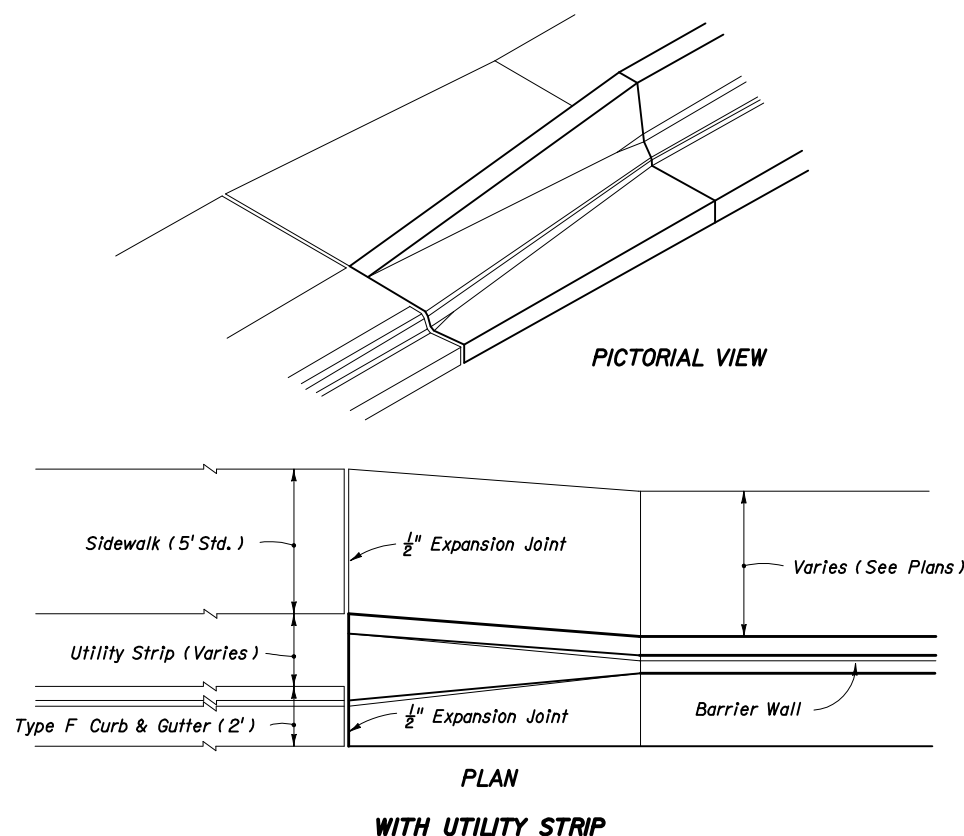
**CONCRETE BARRIER WALL (RIGID) (CURB & GUTTER)
CURB AND GUTTER WITH UTILITY STRIP AND WITHOUT ADJACENT BICYCLE LANE**

NOTE:
 X = Length of advancement in feet for near and opposing approach lanes. See Sheet 17.
 For locations without utility strips see Sheet 14.
 For transition, sidewalk and sectional details see Sheets 15 & 16.
 The 2.5' offsets to toe of barrier wall cannot be reduced to accommodate hazards; however, hazards located in the stem of the wall may be accommodated by the detail on Sheet 19.

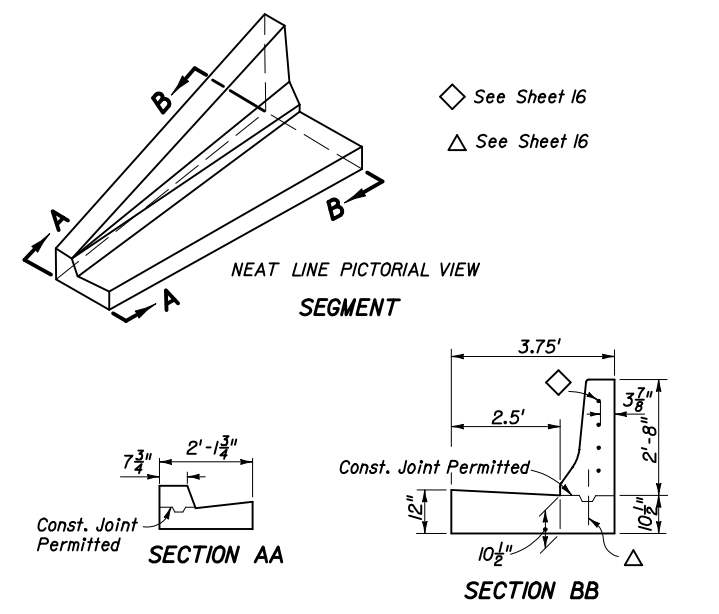
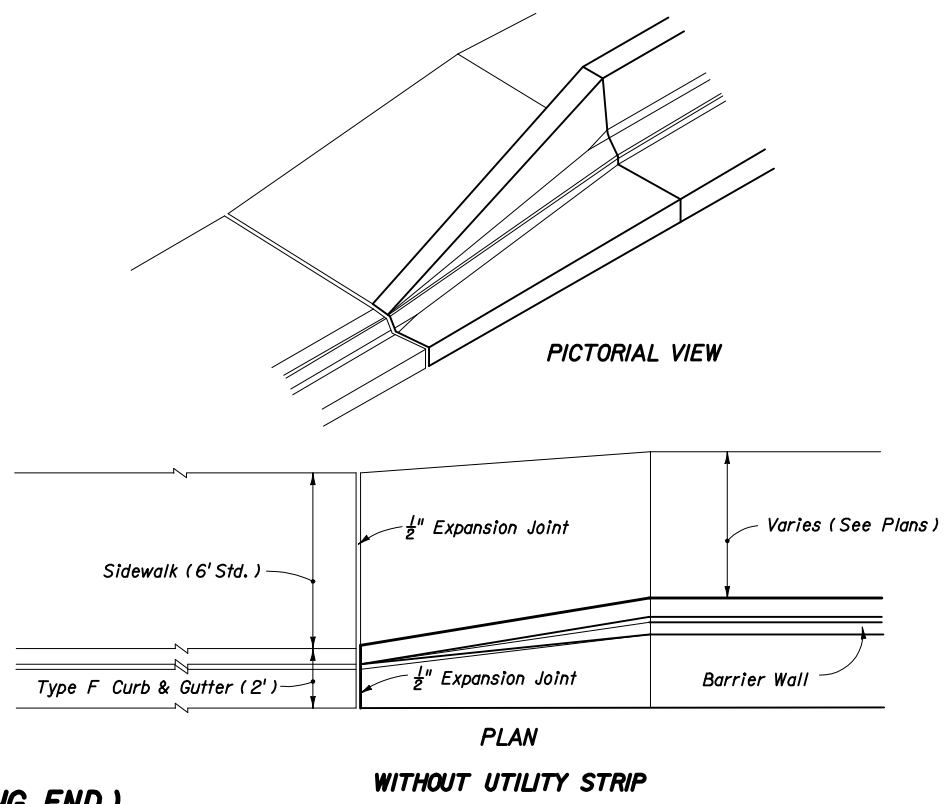
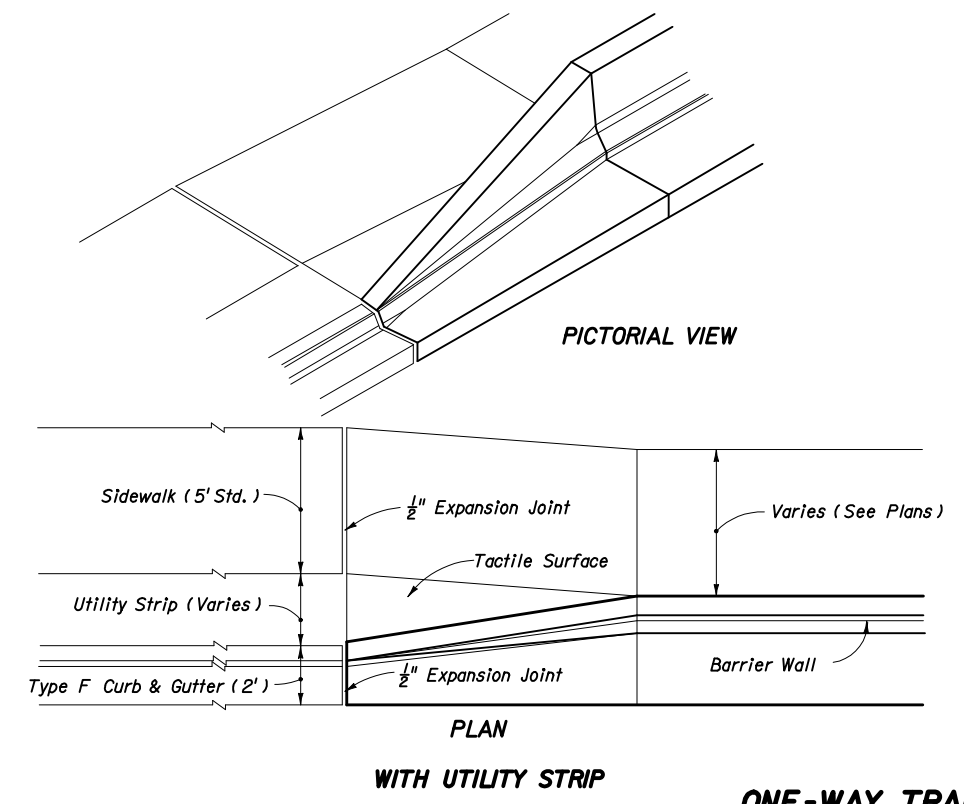


NOTE:
 X = Length of advancement in feet for near and opposing approach lanes. See Sheet 17.
 For locations with utility strips see Sheet 13.
 For transition, sidewalk and sectional details see Sheet 15 & 16.
 The 2.5' offsets to toe of barrier wall cannot be reduced to accommodate hazards; however, hazards located in the stem of the wall may be accommodated by the detail on Sheet 19.

**CONCRETE BARRIER WALL (RIGID) (CURB & GUTTER)
 CURB AND GUTTER WITHOUT UTILITY STRIP AND WITHOUT ADJACENT BICYCLE LANE**

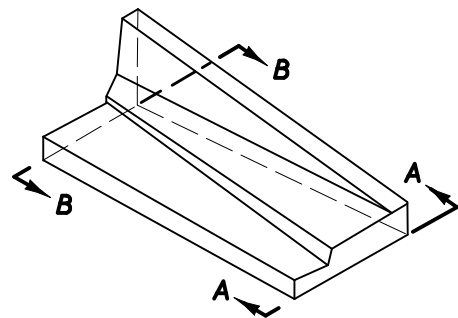
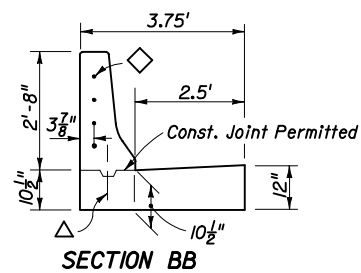


TWO-WAY TRAFFIC (OPPOSING LANE APPROACH)

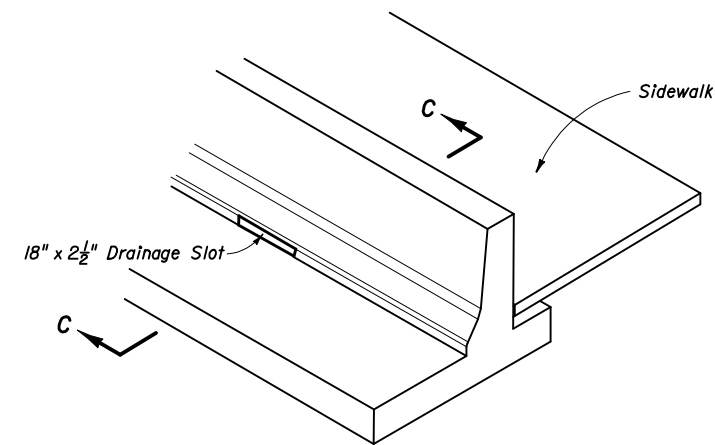
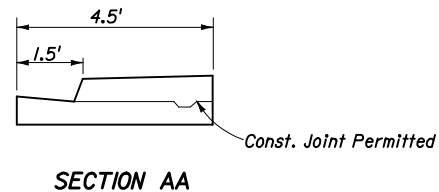


ONE-WAY TRAFFIC (TRAILING END)

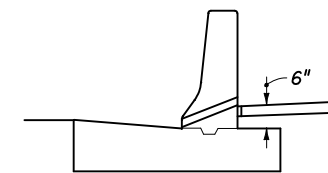
CONCRETE BARRIER WALL (RIGID) (CURB & GUTTER) • TRANSITION SEGMENTS • WITHOUT ADJACENT BICYCLE LANE



WITH OR WITHOUT UTILITY STRIP
NEAT LINE PICTORIAL VIEW



NEAT LINE PICTORIAL VIEW

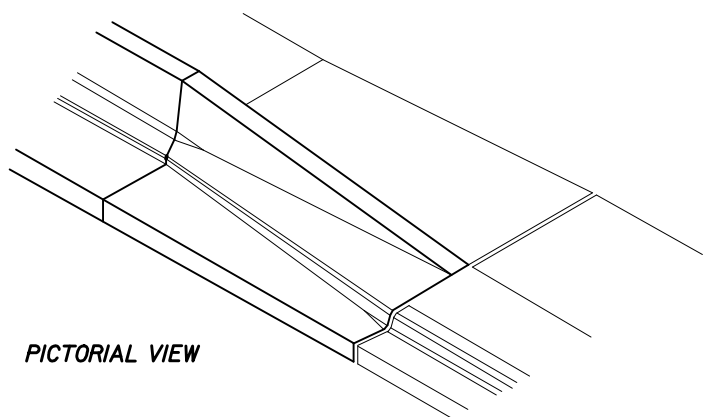


SECTION CC

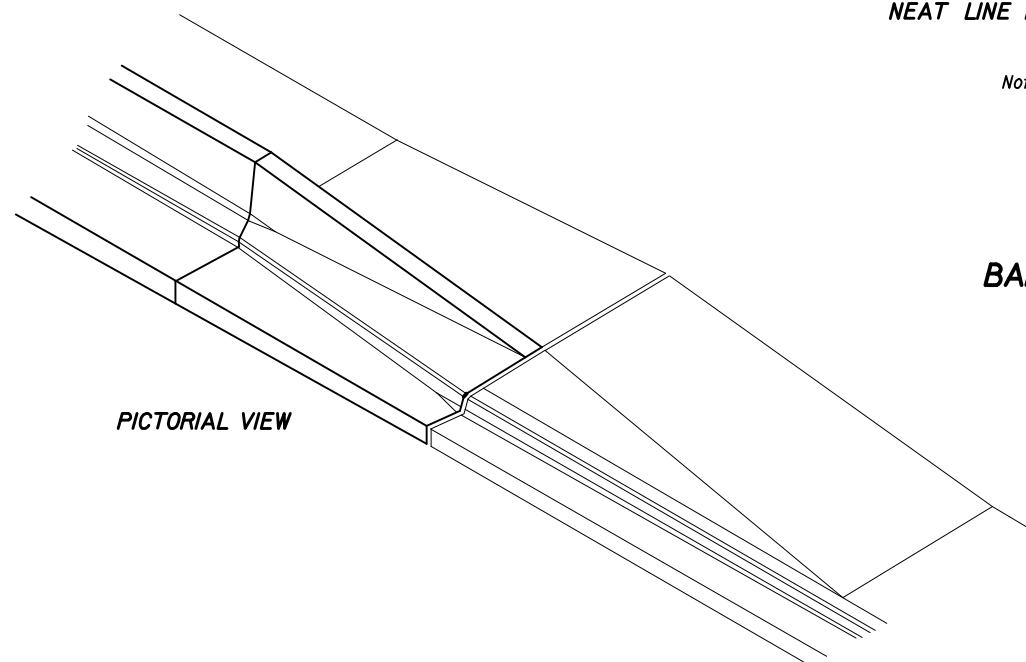
Note: Drainage slots shall be located at all low points along the sidewalk, and, unless otherwise shown in the plans, slots shall be spaced at intervals not exceeding 50' in fill sections and 20' in cut sections. Slots shall be located such that only one bar is cut away or deleted in front and back lines of vertical reinforcement.

SIDEWALK DRAINAGE SLOT FOR BARRIER WALL (RIGID) (CURB & GUTTER)

◇ See Notes This Sheet
△ See Notes This Sheet



PICTORIAL VIEW

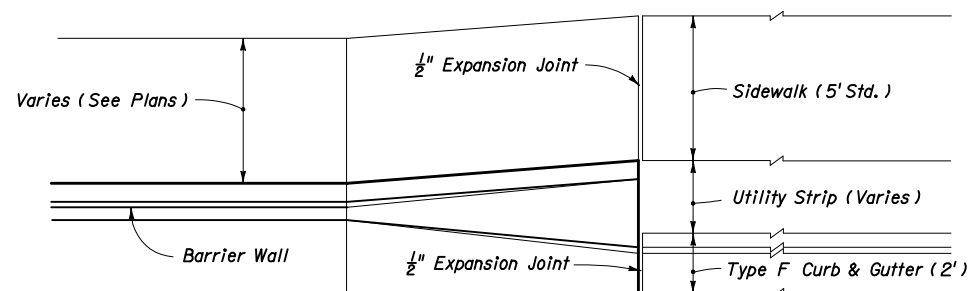


PICTORIAL VIEW

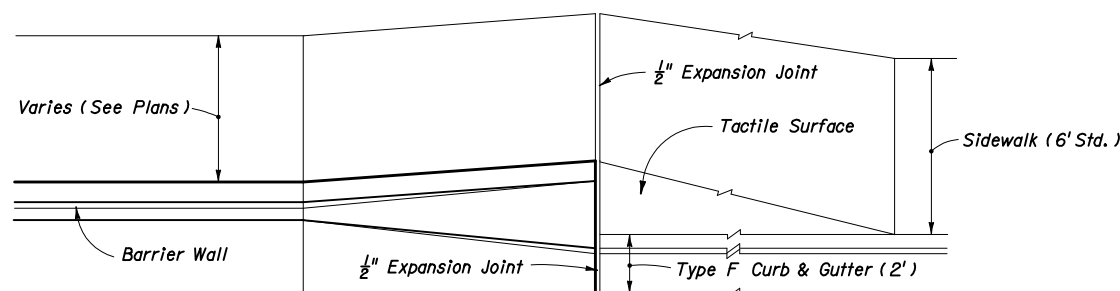
NOTE:

◇ Transition Segments Shall Be Doweled Into The End Of The Barrier Wall In The Following Manner:
Four 1/4" diameter holes 6" deep on 6" centers shall be drilled in the end of the barrier and #6 bars 15" long set in epoxy mortar. The ends of the dowels extending into the transition segment shall be wrapped with one layer of 15 lb. Type I asphalt-saturated roofing felt with the ends crimped.

△ When Construction Joints Are Utilized For Transition Segment Construction The Stem Shall Be Doweled To The Footing In The Following Manner:
Five #5 bars 15" long shall be embedded 7" into the footing. The dowels shall be spaced 15" on centers with the first dowel located 12" from the barrier wall. Dowels may be placed within or adjacent to the keyway.



PLAN
WITH UTILITY STRIP



PLAN
WITHOUT UTILITY STRIP

RIGHT SIDE SHOWN, LEFT SIDE OPPOSITE HAND

ONE-WAY AND TWO-WAY TRAFFIC (NEAR LANE APPROACH)

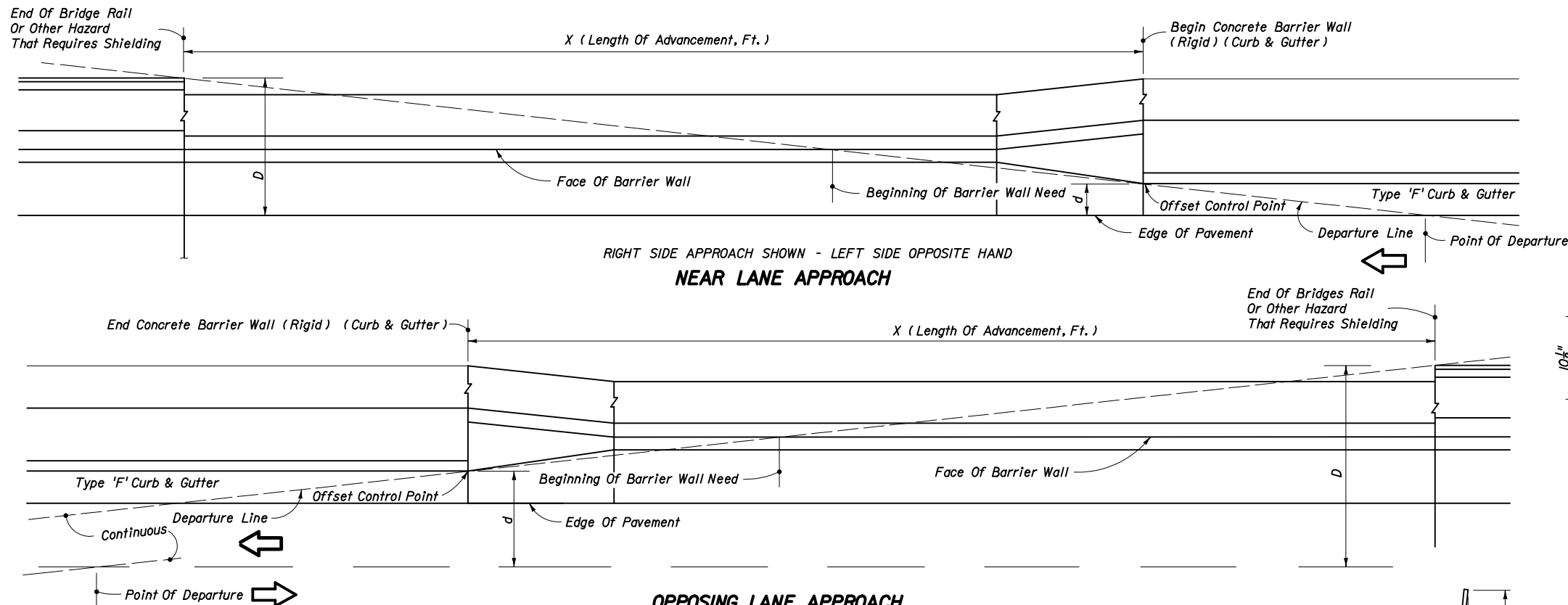
CONCRETE BARRIER WALL (RIGID) (CURB & GUTTER) • TRANSITION SEGMENT • WITHOUT ADJACENT BICYCLE LANE



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CONCRETE BARRIER WALL

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OPPOSING LANE APPROACH
WITH OR WITHOUT UTILITY STRIP - UTILITY STRIP SHOWN - SEE SHEET 13 & 14 FOR APPLICATIONS

Design Speed mph	Length Of Advancement, Ft. (X)
≤45	16 (D-d)

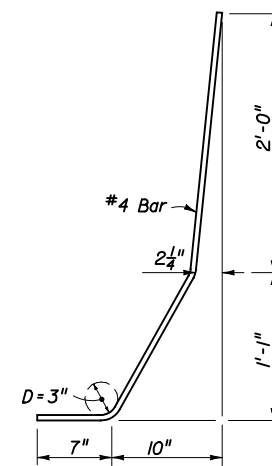
Note: The minimum length of advancement for both near and opposing lane approaches is 40'.

Equation Variables:

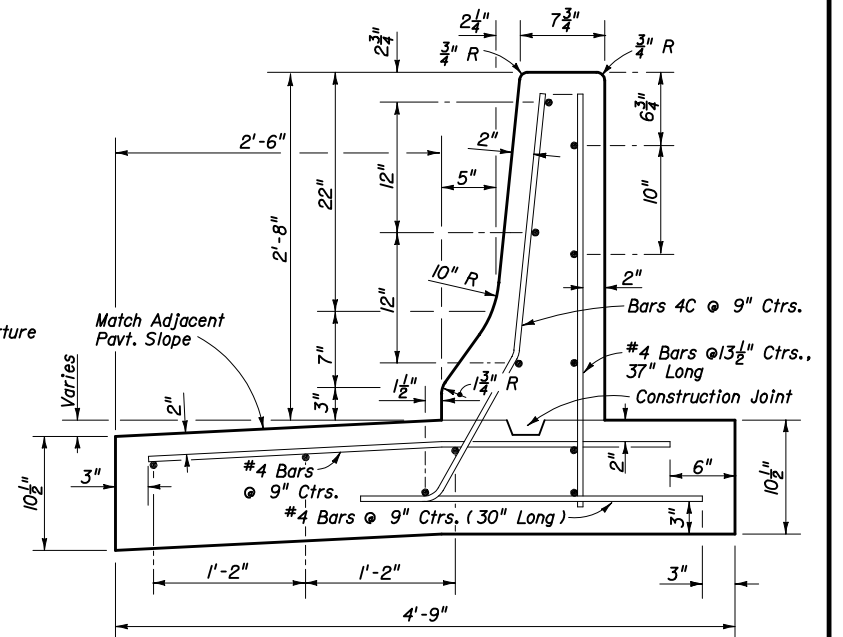
D = Distance in feet from near edge of the near approach traffic lane to back of hazard or clear zone width whichever is lesser. For left side hazards and clear zones on two-way undivided facilities D is measured from the inside edge of the near approach traffic lane.

d = Distance in feet from near edge of the near approach traffic lane to the face of curb (at offset control point). For left side hazards on two-way undivided facilities d is measured from the inside edge of the nearest opposing traffic lane.

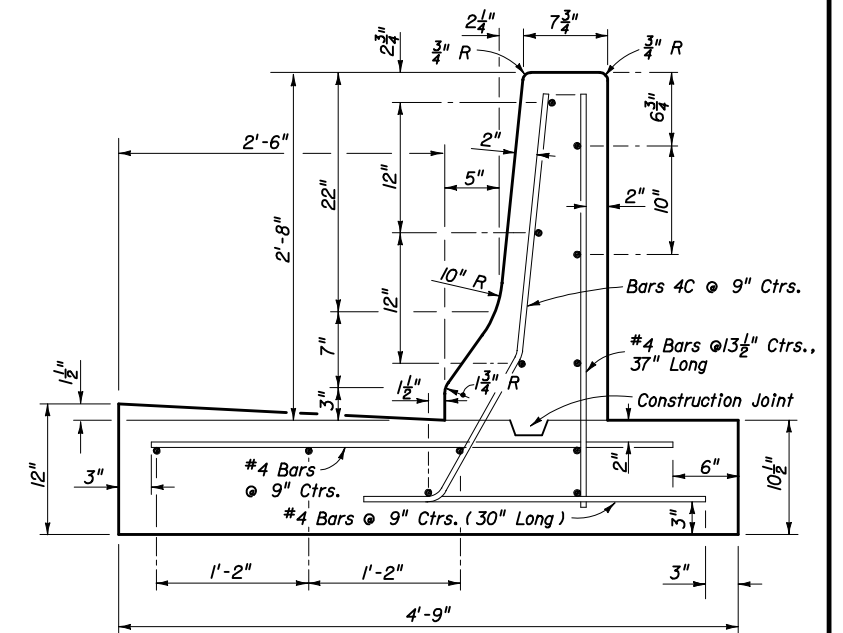
LENGTH OF ADVANCEMENT



BAR 4C BENDING DIAGRAM



FOR HIGH SIDE



FOR LOW SIDE

Note: All longitudinal reinforcement #4 bars. Minimum segment length for this wall is 40'. Shorter segments due to construction or expansion joint shall be dowled in the manner described for 'Transition Segments' on Sheet 16. Transverse expansion joints are to be constructed at the juncture of wall transitions and curb and gutter, and at intervals so that spacing will not exceed 100'. For barrier wall inlet details see Index No. 219. Wall to be paid for under the contract unit Price for Concrete Barrier Wall (Rigid-Curb & Gutter), LF.

Estimated Quantities Per Linear Foot Of Wall:
Class II Concrete: 0.23 C.Y.
Reinforcing Steel: 19.7 Lbs.

SECTION QQ

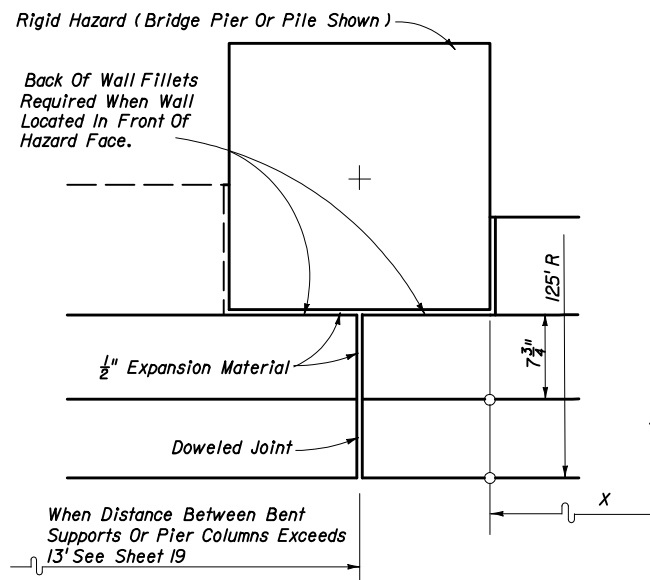
CONCRETE BARRIER WALL (RIGID) (CURB & GUTTER) • WITHOUT ADJACENT BICYCLE LANE



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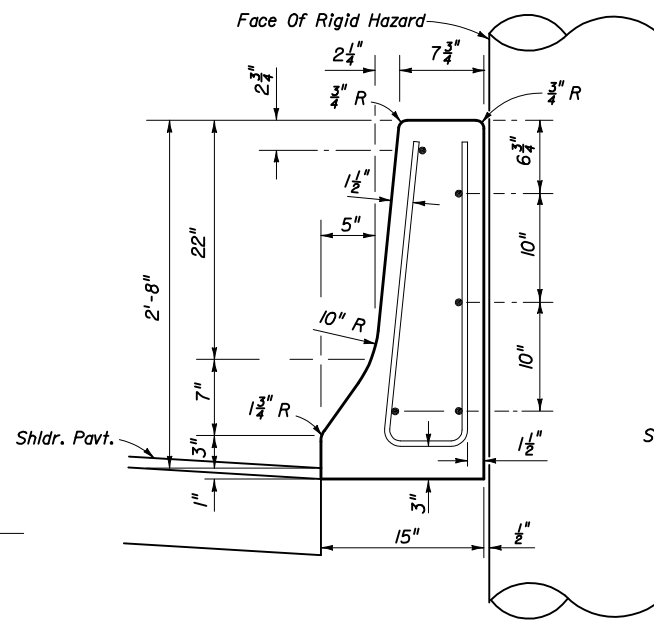
CONCRETE BARRIER WALL

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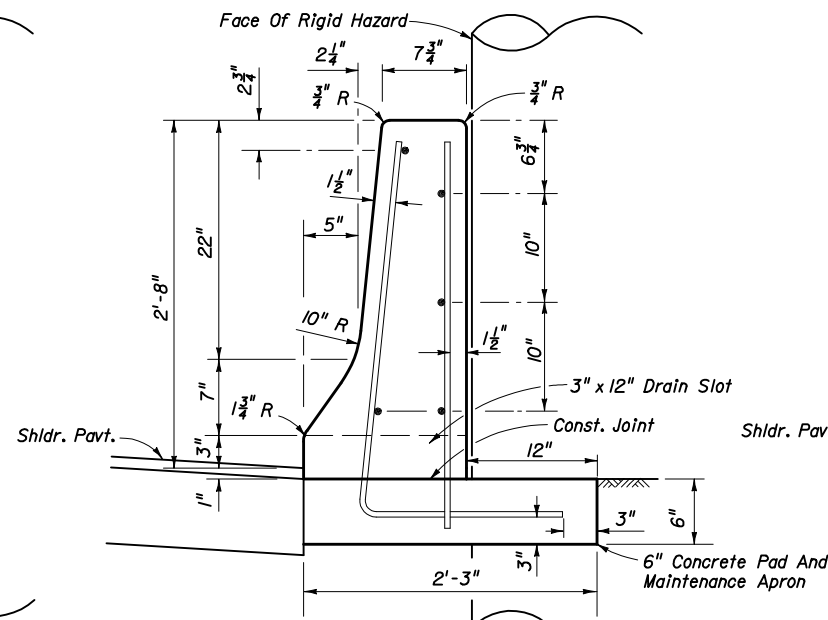


BARRIER WALL AT SQUARE OR RECTANGULAR SHAPED HAZARD

PARTIAL PLAN

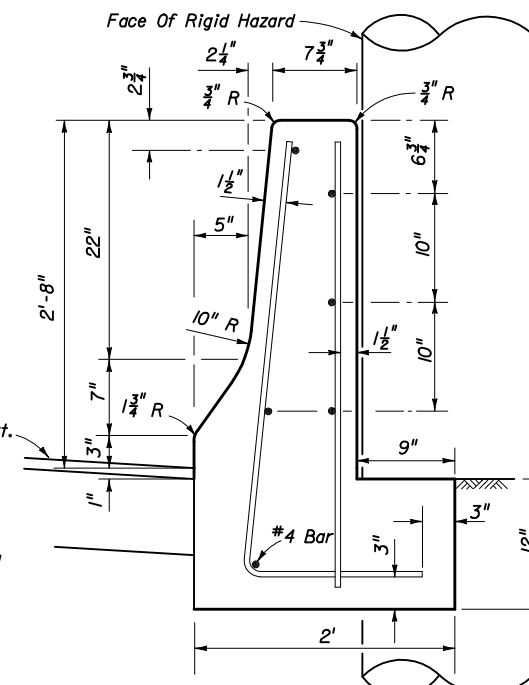


SECTION AA

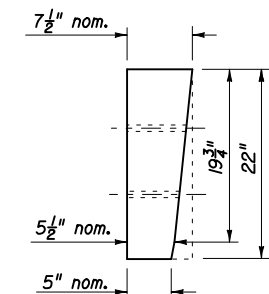


SECTION BB

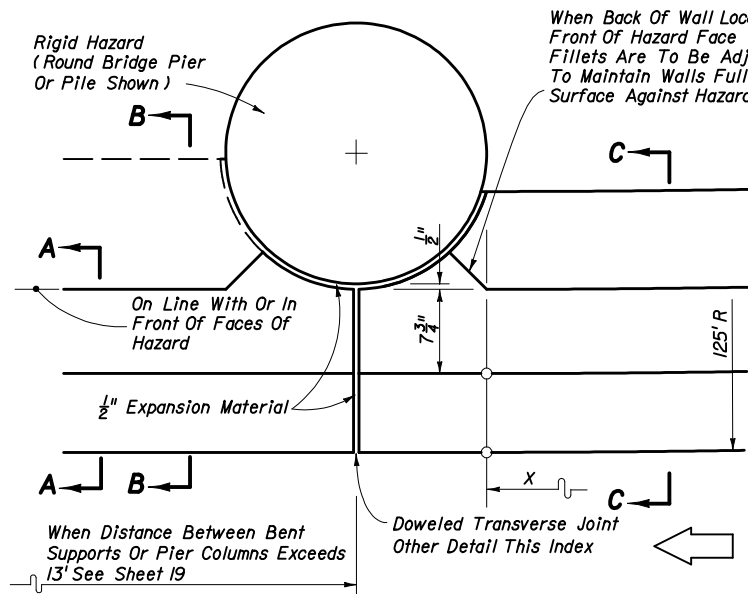
TO BE CONST. IN LIEU OF SECTION AA WHEN THRU DRAINAGE REQUIRED



SECTION CC



FOR USE WITH EITHER
1:10 OR 1:15
GUARDRAIL TRANSITIONS
**STANDARD THRIE-BEAM
OFFSET BLOCK
(FIELD TRIMMED)**



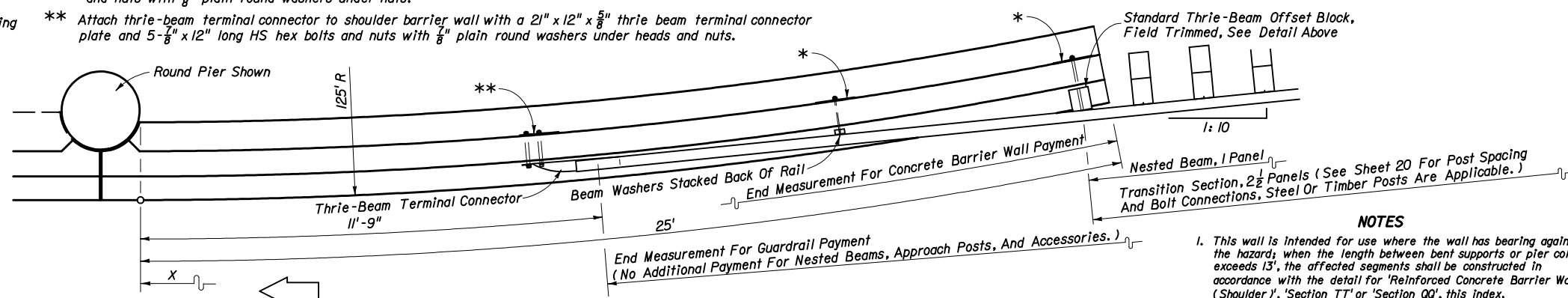
BARRIER WALL AT ROUND HAZARD

PARTIAL PLAN

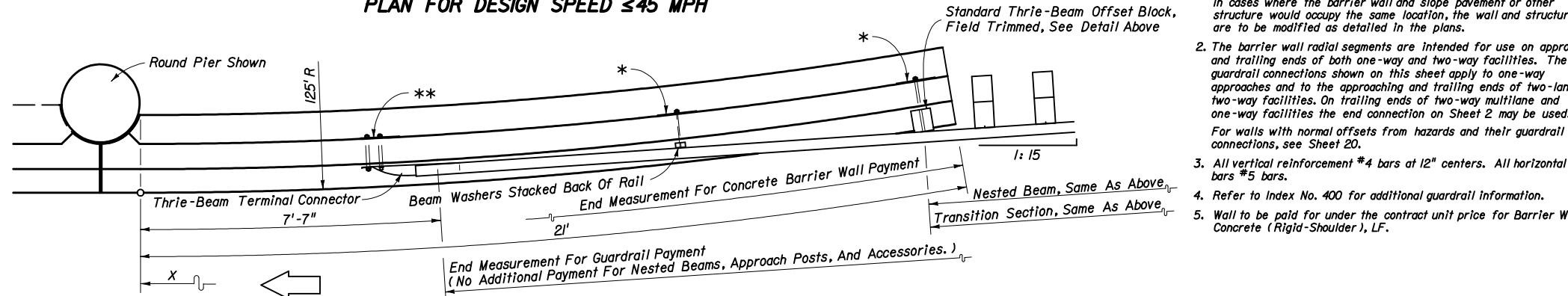
When Back Of Wall Located In Front Of Hazard Face The Fillets Are To Be Adjusted To Maintain Walls Full Bearing Surface Against Hazard.

* 12" x 12" x 1/4" galvanized steel back-up plate with 5/8" post bolts (either 14" or 18" long) and nuts with 3/8" plain round washers under nuts.

** Attach thrie-beam terminal connector to shoulder barrier wall with a 2 1/2" x 12" x 5/8" thrie beam terminal connector plate and 5-7/8" x 12" long HS hex bolts and nuts with 3/8" plain round washers under heads and nuts.



PLAN FOR DESIGN SPEED ≤ 45 MPH



PLAN FOR DESIGN SPEED ≥ 50 MPH

- NOTES**
- This wall is intended for use where the wall has bearing against the hazard; when the length between bent supports or pier columns exceeds 13', the affected segments shall be constructed in accordance with the detail for 'Reinforced Concrete Barrier Wall (Shoulder)', 'Section TT' or 'Section QQ', this index. In cases where the barrier wall and slope pavement or other structure would occupy the same location, the wall and structure are to be modified as detailed in the plans.
 - The barrier wall radial segments are intended for use on approach and trailing ends of both one-way and two-way facilities. The guardrail connections shown on this sheet apply to one-way approaches and to the approaching and trailing ends of two-lane two-way facilities. On trailing ends of two-way multilane and one-way facilities the end connection on Sheet 2 may be used. For walls with normal offsets from hazards and their guardrail connections, see Sheet 20.
 - All vertical reinforcement #4 bars at 12" centers. All horizontal bars #5 bars.
 - Refer to Index No. 400 for additional guardrail information.
 - Wall to be paid for under the contract unit price for Barrier Wall Concrete (Rigid-Shoulder), LF.

Note: For continuous barrier between independent bents or single pier columns see Sheet 19.

**SHOULDER BARRIER WALL AT ABOVE GROUND RIGID HAZARDS
WHEN GUARDRAIL OFFSET FROM HAZARD LESS THAN 3'**

ARC LENGTH (FT)	DISTANCE "x" (FT)	OFFSETS "y" "y" (FT)
4	4.00	0.06
8	7.99	0.26
12	11.98	0.58
16	15.96	1.02
20	19.91	1.60
24	23.85	2.30
25	24.83	2.49

Note:
Wall may be constructed in chords having lengths ≤ 4 feet.

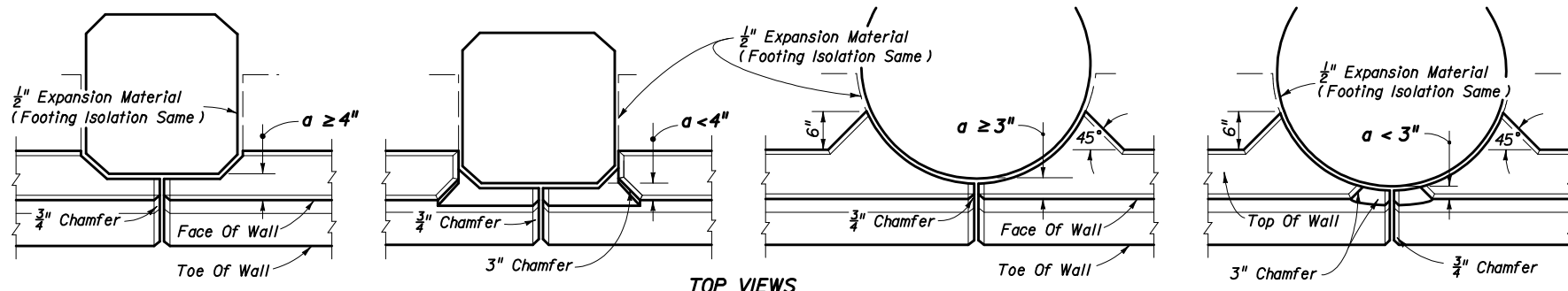


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CONCRETE BARRIER WALL

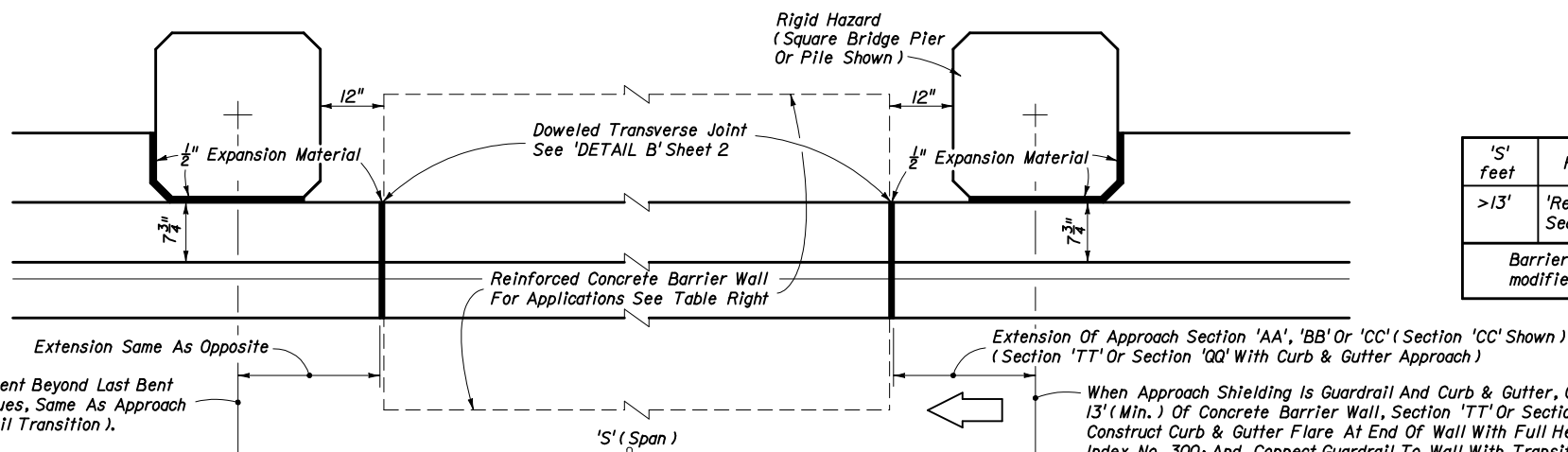
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Index No. 410



'a' Varies (Circular Or Octagonal Hazard Not More Than 2' In Front Of Face Of Wall).
 Applicable To Sections 'AA' And 'BB' With Spans Of $\leq 13'$, And To Section 'CC', Sheet No. 18.
 Applicable To Other Rigid Walls Of This Index For Spans $> 13'$ Unless Otherwise Shown In The Plans.

HAZARD PENETRATING STEM OF RIGID CONCRETE BARRIER WALLS

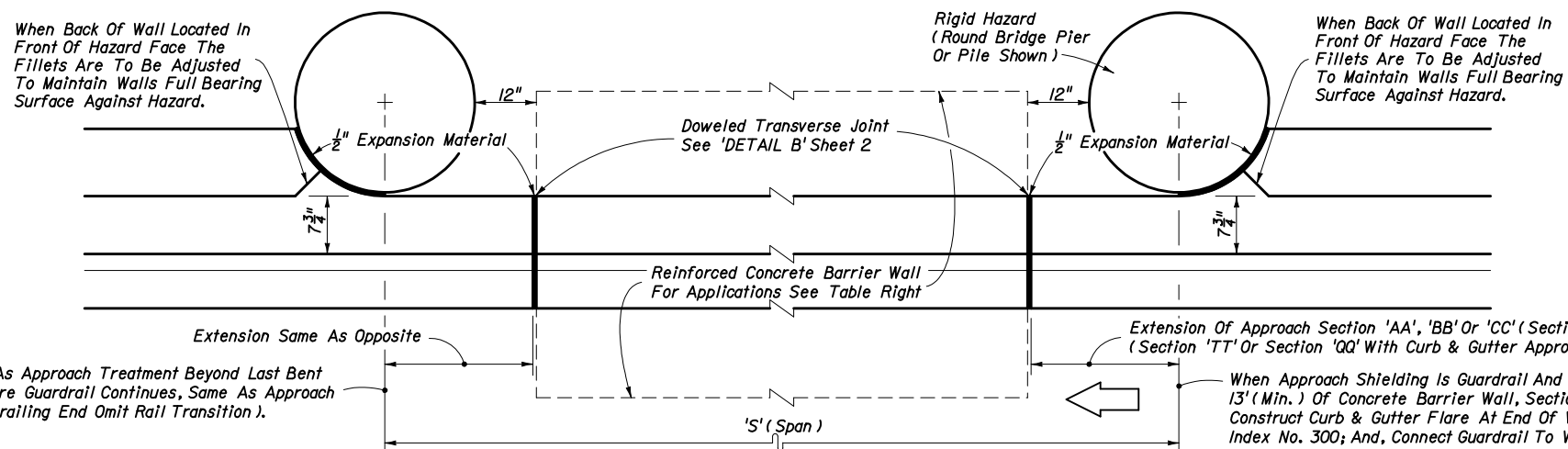


'S' feet	REINFORCED CONCRETE BARRIER WALL APPLICATIONS
$> 13'$	'Reinforced Concrete Barrier Wall (Shoulder)' With Flush Shoulders; Or, Section 'TT' Or Section 'QQ' With Curb & Gutter
Barrier wall footings that conflict with bent or pier foundations shall be modified as described in the plans.	

Construct Wall Same As Approach Treatment Beyond Last Bent Support Or Pier (Where Guardrail Continues, Same As Approach Except On One Way Trailing End Omit Rail Transition).

When Approach Shielding Is Guardrail And Curb & Gutter, Construct 13' (Min.) Of Concrete Barrier Wall, Section 'TT' Or Section 'QQ'; Construct Curb & Gutter Flare At End Of Wall With Full Height Curb, Index No. 300; And, Connect Guardrail To Wall With Transition Rails In Accordance With Sheet No. 20.

TOP VIEW
BARRIER WALL AT SQUARE PIER



Construct Wall Same As Approach Treatment Beyond Last Bent Support Or Pier (Where Guardrail Continues, Same As Approach Except On One Way Trailing End Omit Rail Transition).

When Approach Shielding Is Guardrail And Curb & Gutter, Construct 13' (Min.) Of Concrete Barrier Wall, Section 'TT' Or Section 'QQ'; Construct Curb & Gutter Flare At End Of Wall With Full Height Curb, Index No. 300; And, Connect Guardrail To Wall With Transition Rails In Accordance With Sheet No. 20.

TOP VIEW
BARRIER WALL AT ROUND PIER

The details on this sheet are treatments to the F-shape concrete barrier walls depicted on Sheet Nos. 8 through 18, where site conditions impose reduced clearances between above ground hazards and the walls. Bridge bent supports and piers are shown. These treatments are not applicable to hazards that cannot provide lateral support for the walls. See the plans for limits of wall sections applied and other associated wall treatments.

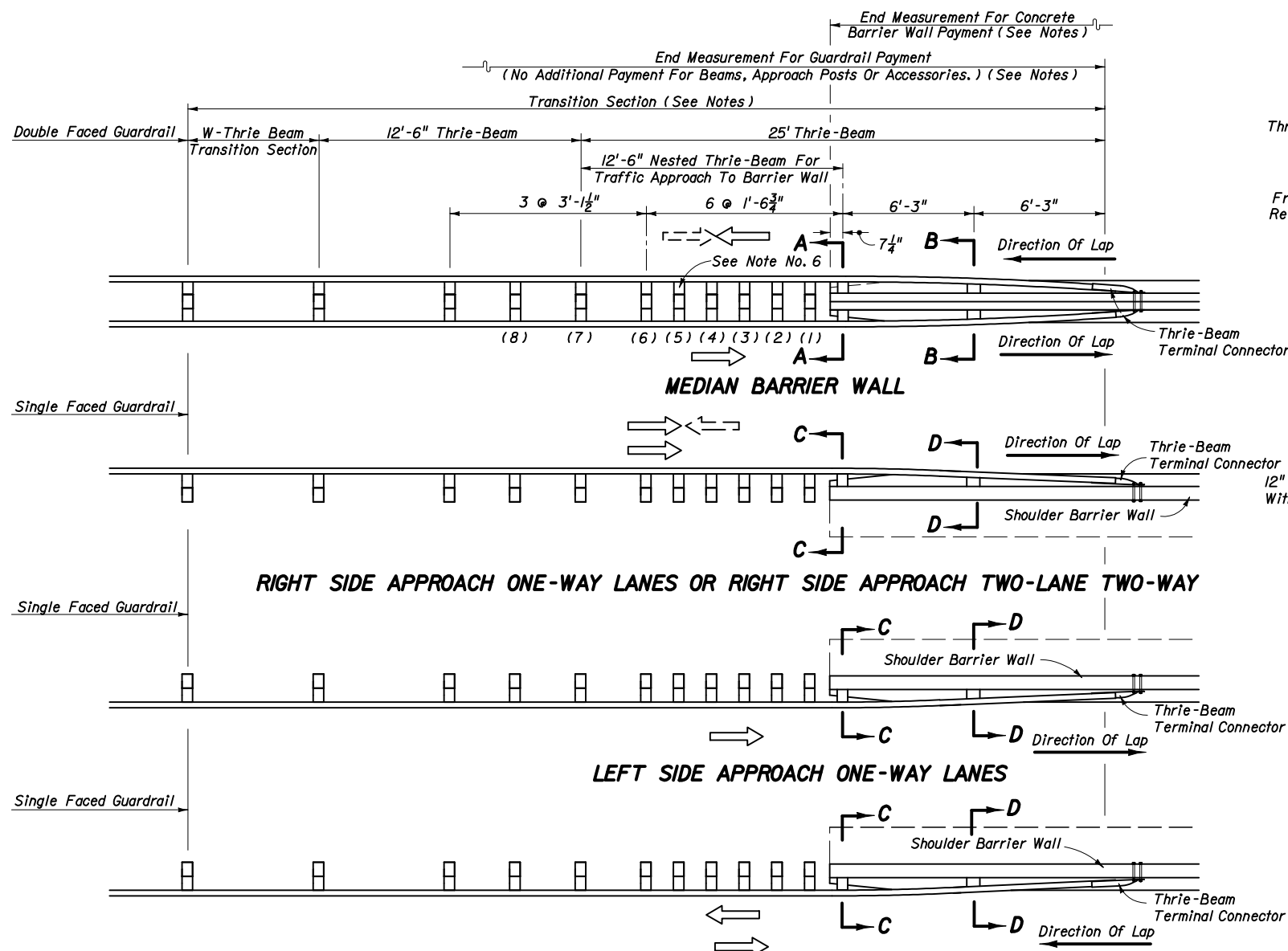
CONCRETE BARRIER WALL WHEN SPAN BETWEEN BENT SUPPORTS OR PIER COLUMNS EXCEEDS 13' CONCRETE BARRIER WALL WHEN GUARDRAIL OFFSET FROM BENT OR PIER LESS THAN 3 FEET OR WHERE WALL STEM ABUTTS SUPPORTS OR PIER COLUMN



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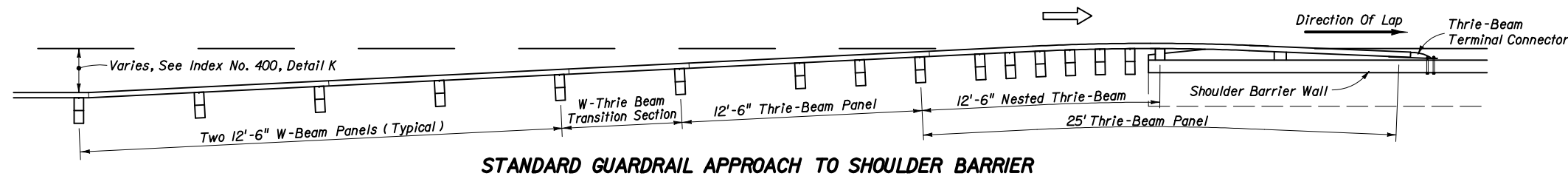
CONCRETE BARRIER WALL

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Attach thrie-beam terminal connector to median barrier wall with 5-7/8" x 15" long HS hex bolts and nuts with 7/8" plain round washers under heads and nuts. Attach to shoulder barrier wall with a 21" x 12" x 1/4" thrie-beam terminal connector plate and 5-7/8" x 12" long HS hex bolts and nuts with 7/8" plain round washers under heads and nuts.

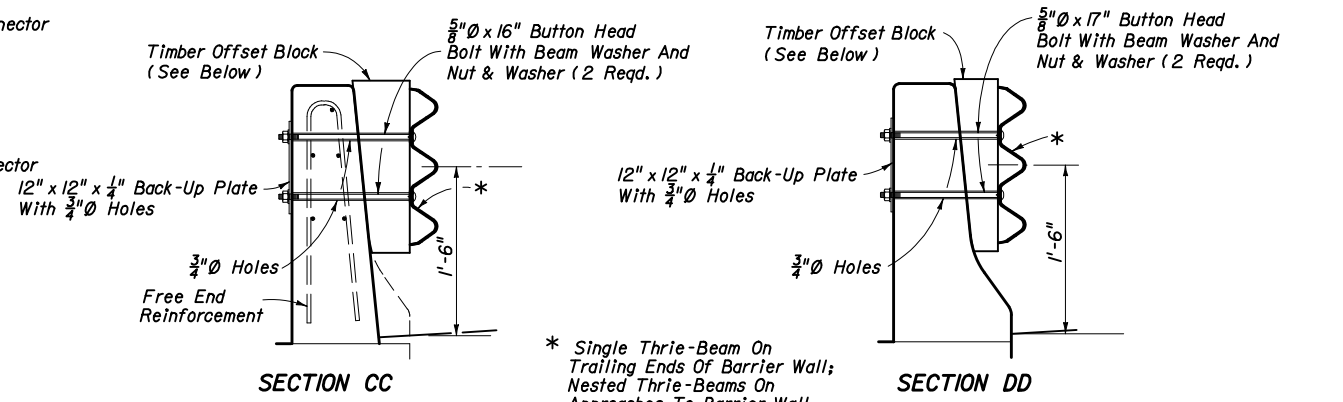
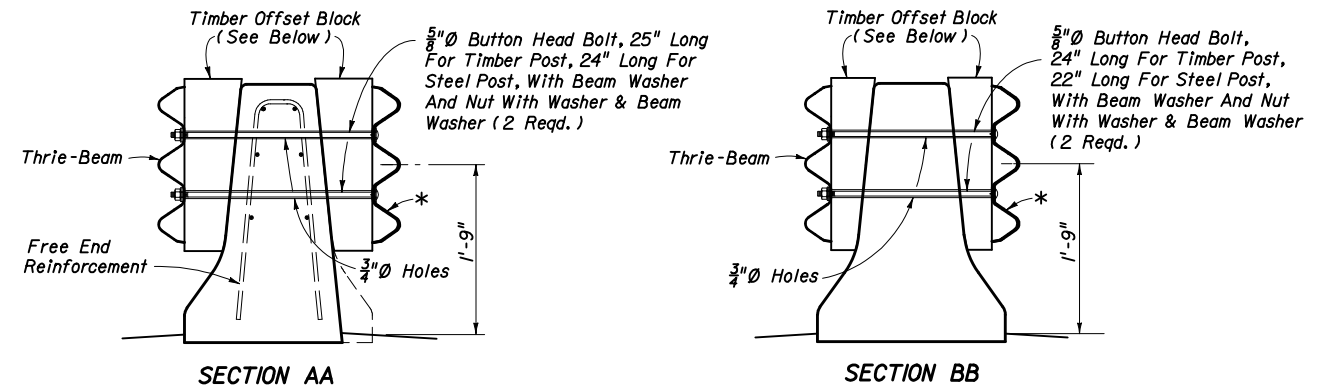
LEFT SIDE OF TWO-LANE TWO-WAY (APPROACH FOR FAR LANE)



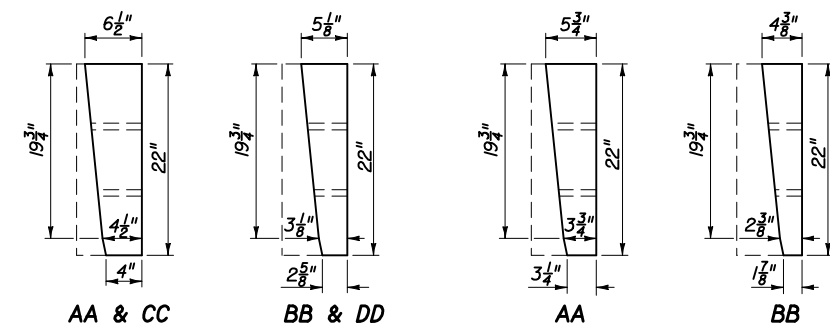
NOTES

- The longitudinal dimensions and payment limits shown for median concrete barrier wall also apply to shoulder concrete barrier walls.
- W-beam elements do not apply to these transition schemes. For barrier wall trailing end guardrail connections for one-way lanes, see Sheet 2.
- Where reaming is necessary to fit nested beams the reamed surfaces shall be metalized in accordance with Index No. 400.
- Either steel or timber guardrail post may be used, timber posts shown.
- The nested beams shall not be bolted to blocks and posts at posts numbers (1), (3) and (5).
- On the trailing side of MEDIAN BARRIER WALL, offset blocks may be omitted at posts numbers 1, 2, 3, 5, 6 and 8.
- For additional guardrail information refer to Index No. 400.

GUARDRAIL CONNECTION TO CONCRETE BARRIER WALL APPROACH ENDS

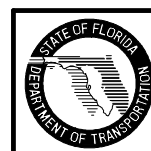


* Single Thrie-Beam On Trailing Ends Of Barrier Wall; Nested Thrie-Beams On Approaches To Barrier Wall.



FOR DOUBLE FACED GUARDRAIL USING TIMBER POSTS AND FOR SINGLE FACED GUARDRAIL USING EITHER TIMBER OR STEEL POSTS

STANDARD TIMBER OR PLASTIC OFFSET BLOCKS • FIELD TRIMMED FOR USE AT SECTIONS AA, BB, CC & DD



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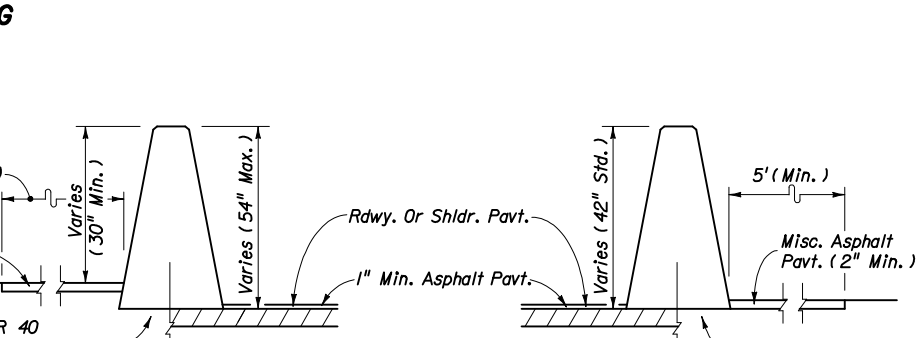
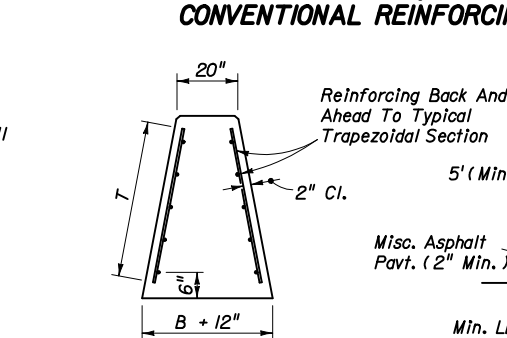
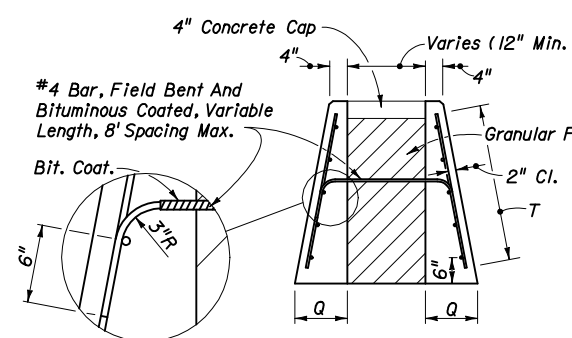
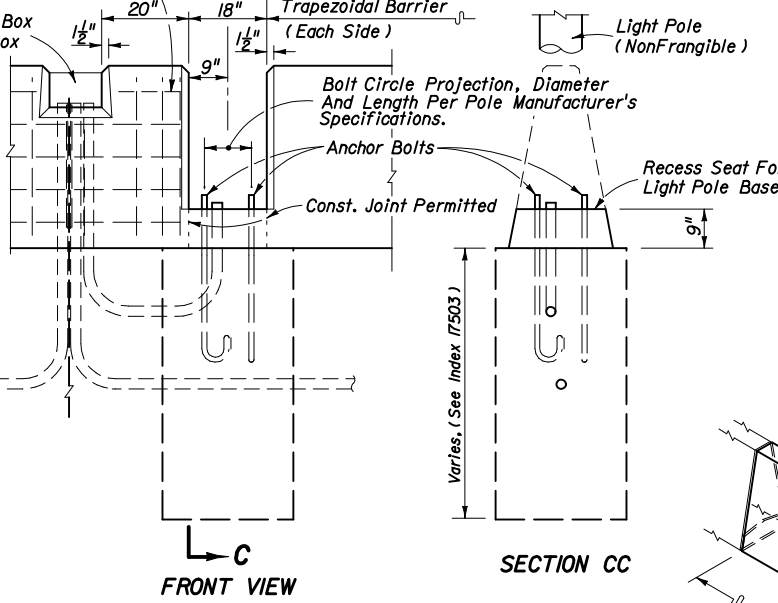
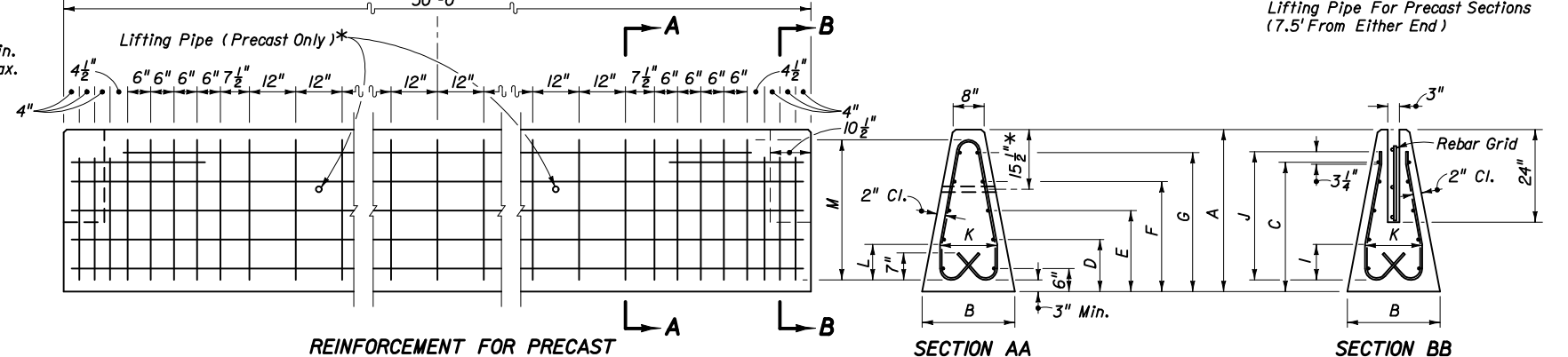
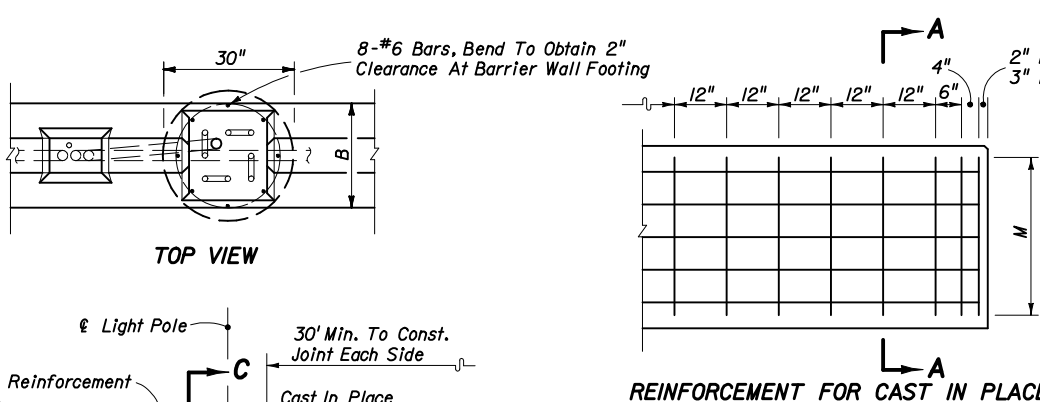
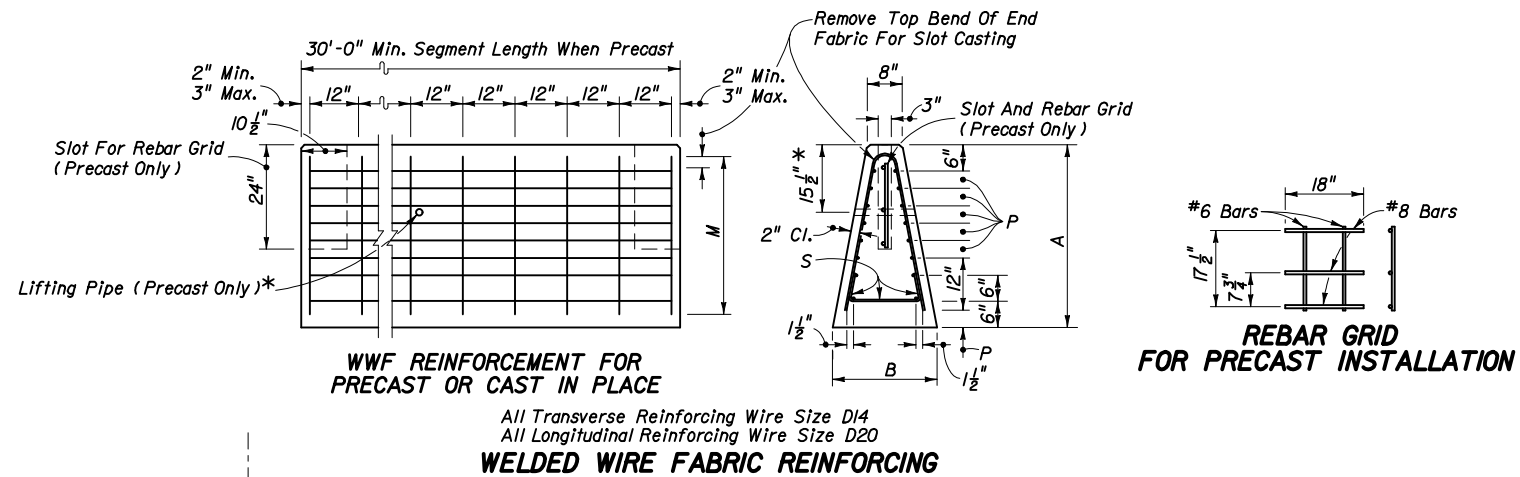
CONCRETE BARRIER WALL

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GENERAL NOTES FOR TRAPEZOIDAL BARRIER WALL

- Concrete trapezoidal barrier wall can be either precast or cast in place. The wall is designed for zero deflection and shall have a minimum system length of 120'.
- Where concrete trapezoidal barrier wall height changes from 42" to 48" or from 48" to 54", height change will be uniform for each 6" of height change per 90' of wall. Steel placement shall meet the dimensional positioning requirements of 42", 48" and 54" high barriers at the respective points along the vertical transition, with the vertical steel uniformly lengthened and the horizontal steel uniformly splayed throughout.
- Welded wire fabric (WWF) made in accordance with ASTM A497 may be used as an option to the conventional reinforcement for precast or cast in place barrier wall, with the exception that only conventional reinforcement shall be used for horizontal transition and half wall sections. These sections shall be cast in place with length, shape and reinforcement as shown in this Index.
- To attain system length, precast segments shall be interconnected with rebar grids placed in the preformed slots and grouted into place. Segment length shall be not less than 30' unless otherwise specified in the plans.
- The centerline axis of the barrier shall be vertical except where the roadway is superelevated in which case it shall be normal to the cross slope unless otherwise shown in the plans or directed by the Engineer.
- For reflective barrier marker requirements see 'STANDARD BARRIER WALL SECTIONS' and the GENERAL NOTES, Sheet I.
- The concrete trapezoidal barrier wall is considered by the Federal Highway Administration to be innovative and may be used as such on Federal Aid projects.
- The concrete trapezoidal barrier wall is to be paid for under the contract unit price for Barrier Wall Concrete (Trapezoidal), LF. This price will include full payment for transitions, half walls, fill and concrete caps.

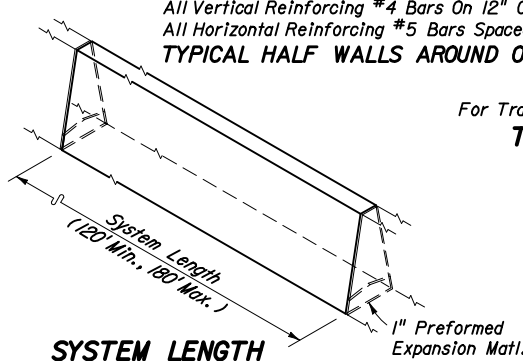


All Vertical Reinforcing #4 Bars On 12" Centers
 All Horizontal Reinforcing #5 Bars Spaced As Tabulated

TRANSITION SECTIONS
 For Transition Wall Plan See DETAIL I 'PLAN'

Note: Foundation and paving options can be either or both sides of the wall; see the plans for the options applied.

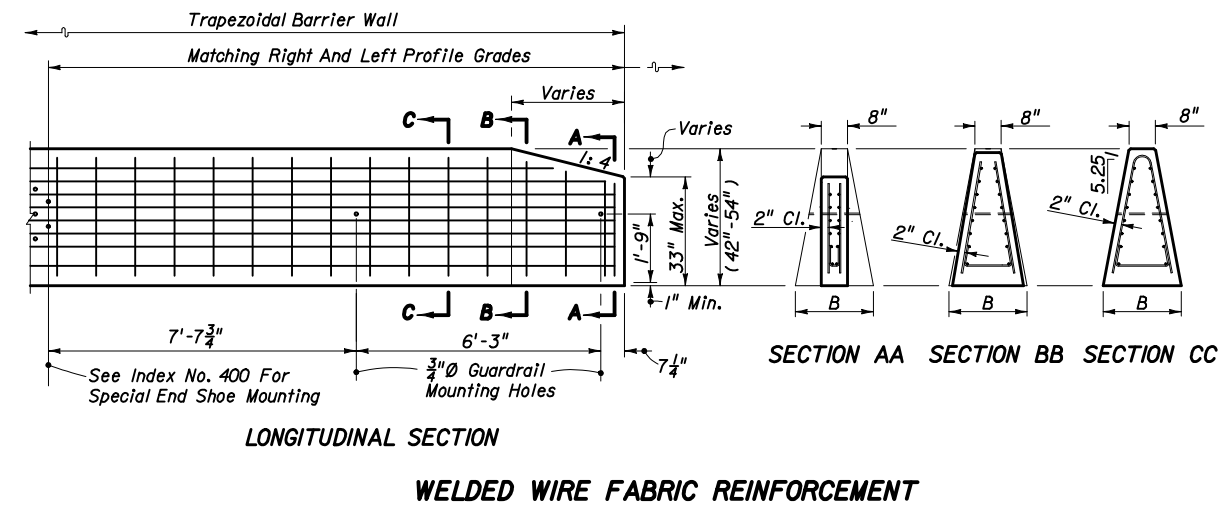
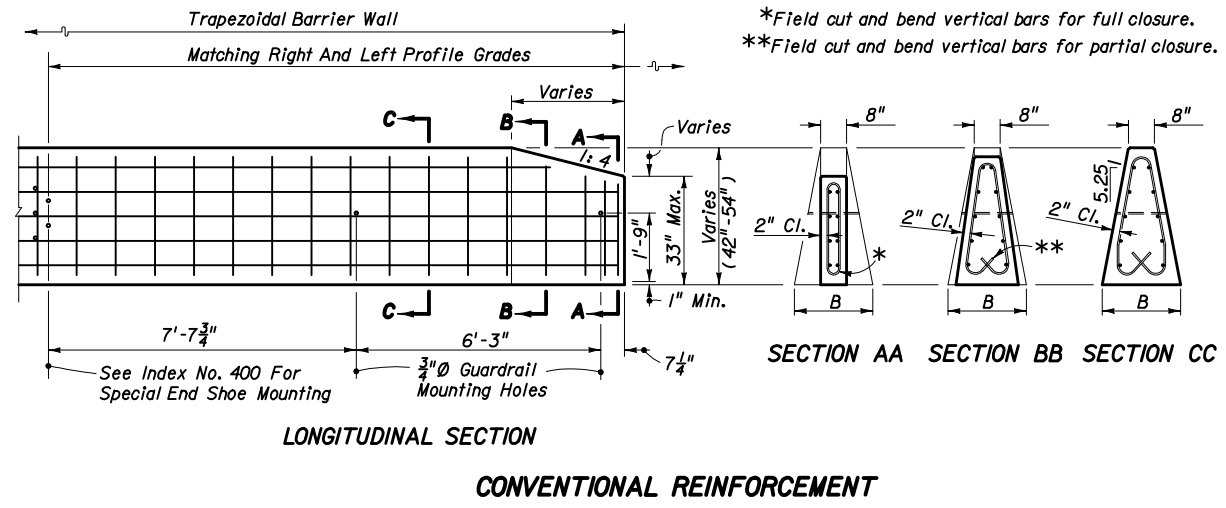
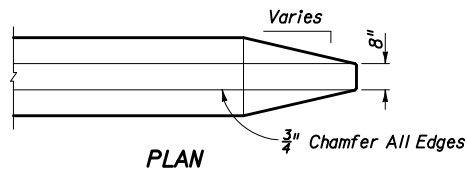
TYPICAL TRAPEZOIDAL SECTIONS



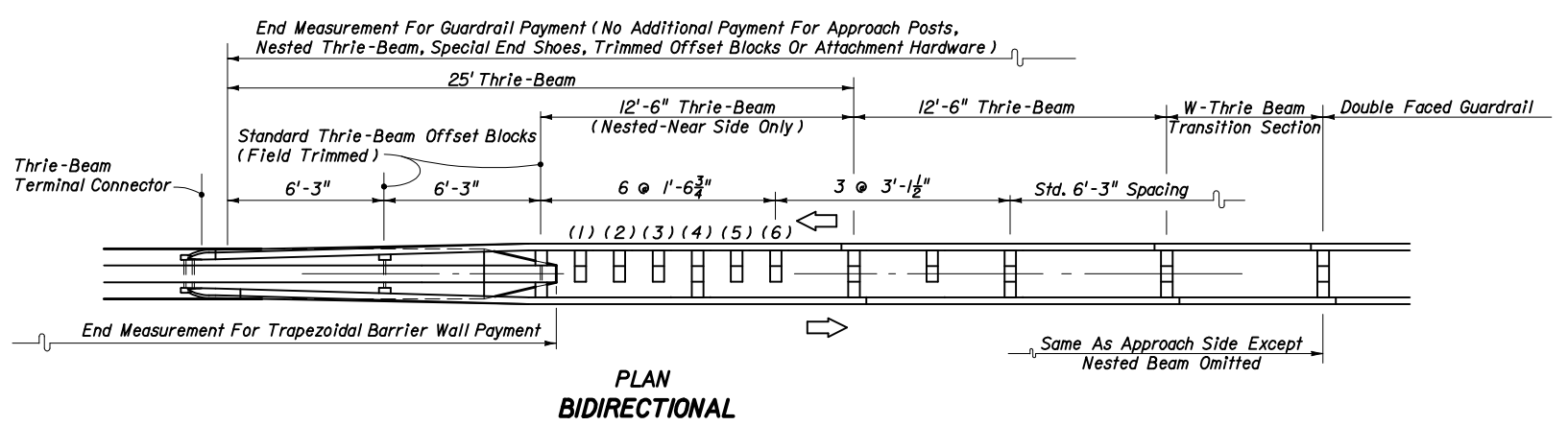
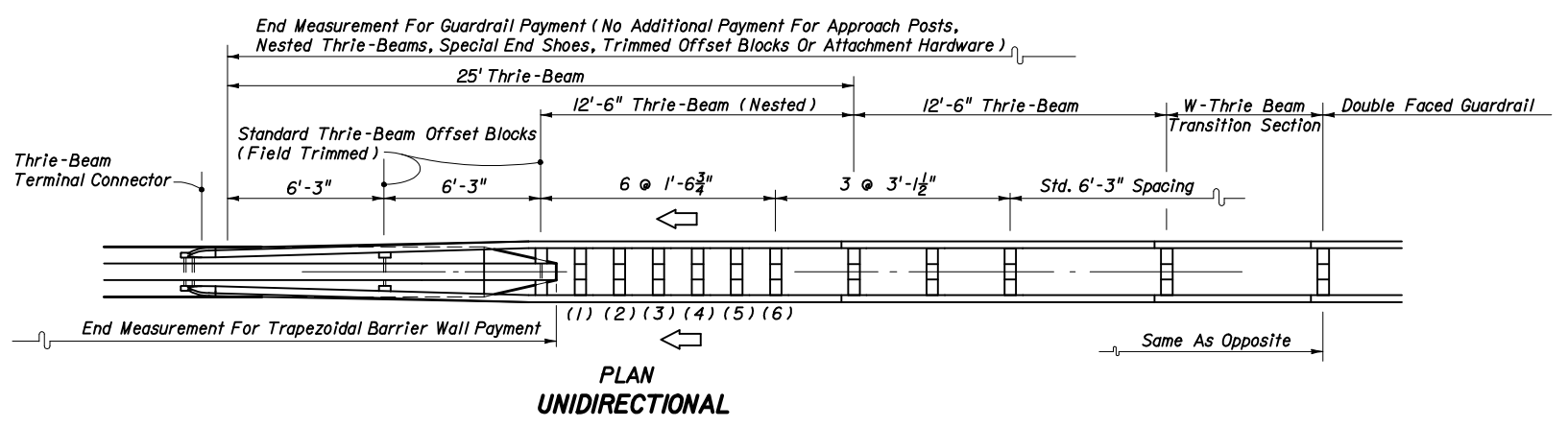
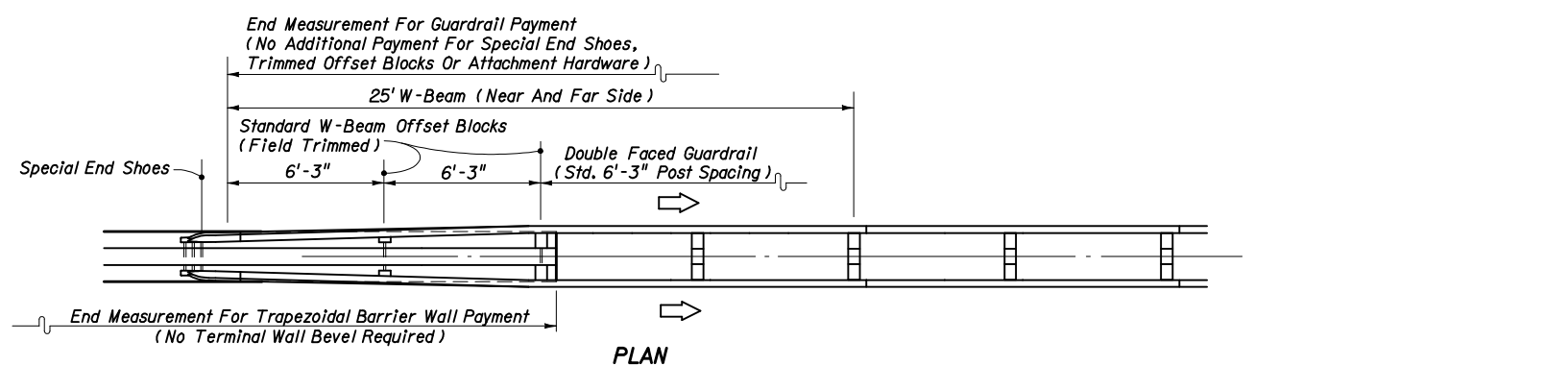
Barrier Height (in.)	DIMENSIONS (Inches)																	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	S	T
42	42	24	33 1/2	13 1/2	21	28 1/2	36	15	9 1/4	33 1/4	15	9 1/4	36	72	4	12	28	36
48	48	26 3/8	39 1/2	15	24	33	42	17 1/4	10 3/4	39 1/4	17 1/4	10 3/4	42	84	5	13 3/8	31 1/2	42
54	54	28 3/16	45 1/2	16 1/2	27	37 1/2	48	19 1/2	12 1/4	45 1/4	19 1/2	12 1/4	48	96	6	14 3/8	34 3/4	48

Note: For Additional Details See Sheet 4

TRAPEZOIDAL BARRIER WALL



END TREATMENT FOR PRECAST OR CAST-IN-PLACE WALLS



GUARDRAIL TRANSITIONS AND CONNECTIONS

NOTES

1. Where reaming is necessary to fit nested beams the reamed surface shall be metalized in accordance with Index No. 400.
2. The nested beams shall not be bolted to the posts and blocks at post numbers (1), (3) and (5).
3. For additional wall details, see Sheet 21.
4. For additional guardrail information refer to Index No. 400.

GUARDRAIL CONNECTION TO TRAPEZOIDAL BARRIER WALL