



**STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
DESIGN DIVISION
NASHVILLE, TENNESSEE 37243-0348**

INSTRUCTIONAL BULLETIN NO. 10-07

Regarding New and Revised Standard Drawings

Effective immediately, new standard drawings RD-TS-9, RD-TS-10, and RP-R-2 to be used design and construction of Roundabouts. Additional guidance will be provided under section 1 of the Roadway Design Guidelines at a later date.

New standard drawings S-SSMB-5 provides catch basin details for single slope barrier walls and S-GR-45 provides installation details when site conditions necessitate omitting a guardrail post. S-GR-46 provides installation details for the guard rails to be placed in a radius.

EC-STR-30 and 30A to be used for the instream diversion during the construction of multi barrel structures and EC-STR-4B provides Enhanced Silt Check Dam design details. Additional guidance can be found in the Drainage Manual.

**Drawing
Number**

Drawing Title

RD-TS-9	DESIGN STANDARDS FOR SINGLE LANE URBAN AND RURAL ROUNDABOUTS
RD-TS-10	DESIGN STANDARDS FOR MULTI - LANE URBAN AND RURAL ROUNDABOUTS
RP-R-2	STANDARD CONSTRUCTION DETAILS FOR ROUNDABOUTS
S-SSMB-5	SINGLE SLOPE MEDIAN BARRIER WALL CATCH BASIN DETAIL
EC-STR-4B	ENHANCED SILT FENCE CHECK DETAILS
EC-STR-30	INSTREAM DIVERSION (WITHOUT TRAFFIC)
EC-STR-30A	INSTREAM DIVERSION (WITH TRAFFIC)
S-GR-45	LONG SPAN GUARDRAIL-ONE POST OMITTED
S-GR-46	CURVED GUARDRAIL

Effective for the December 10, 2010 letting (October 6, 2010 turn-in date), the Roadway Standard Drawings, **D-PE-6B(2)**, **D-SEW-6DA**, **D-SEW-6DC**, **D-SEW-12D**, and **D-PE-4** are revised to remove the note regarding the use of alternative reinforcement.

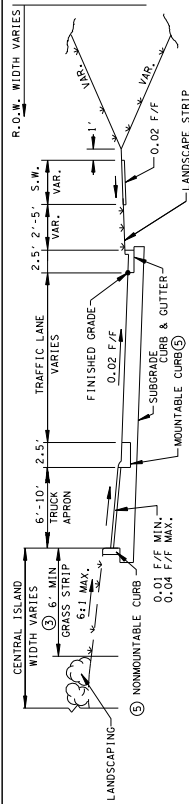
<u>Drawing Number</u>	<u>Current Revision Date</u>	<u>Drawing Title</u>
D-PE-6B(2)	07-19-10	CONCRETE ENDWALL TYPE "U" WITH STEEL PIPE GRATE (FOR 18" THRU 48" PIPES) (6:1 SLOPE)
D-SEW-6DA	07-19-10	CONCRETE ENDWALL TYPE "SD" WITH STEEL PIPE GRATE (FOR 15" THRU 48" PIPES) (6:1 SLOPE)
D-SEW-6DC	07-19-10	CONCRETE ENDWALL TYPE "SD" WITH STEEL PIPE GRATE (FOR 18" THRU 30" PIPES) (6:1 SLOPE)
D-SEW-12D	07-19-10	CONCRETE ENDWALL TYPE "SD" WITH STEEL PIPE GRATE (FOR 15" AND 18" PIPES) (12:1 SLOPE)
D-PE-4	07-19-10	STRAIGHT, "L" AND "U" TYPE CONCRETE ENDWALL

These drawings shall be identified on the lower left side of the index sheet **"To be printed with plans"** until the drawings are formally distributed.

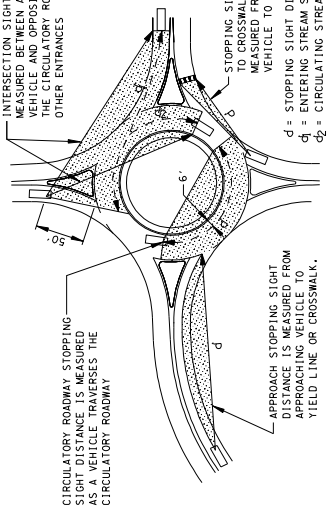
Copies of the new and revised standard drawings are attached.

Original signed by Jeff C. Jones
Jeff C. Jones, Civil Engineering Director
Design Division

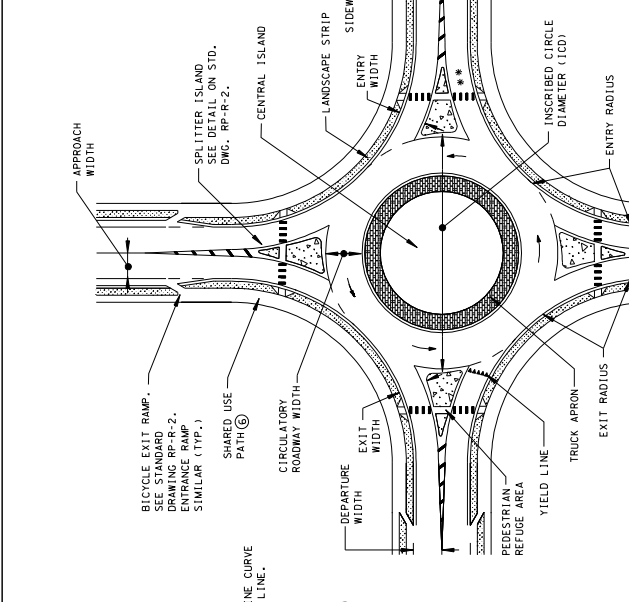
July 23, 2010
JCJ:arh



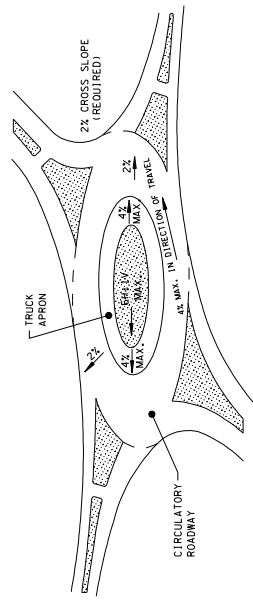
ROUNDABOUT TYPICAL SECTION



ROUNDABOUT SIGHT DISTANCE



TYPICAL PLAN VIEW OF ROUNDABOUT



CIRCULATORY ROADWAY SLOPES

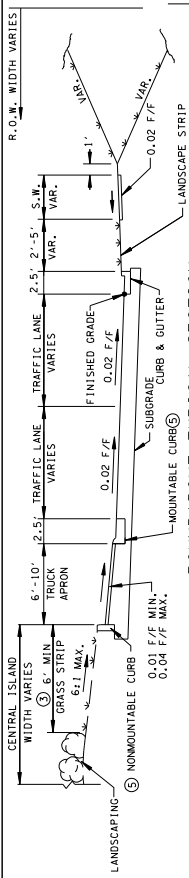
DESIGN SPEED	URBAN	RURAL	NOTES
INSCRIBED CIRCLE DIAMETER (ICD)	20 MPH	25 MPH	SEE FHWA EXHIBIT 6-4
CIRCULATORY ROADWAY WIDTH	105' - 150'	130' - 150'	MEASURED FROM CURB FACE TO CURB FACE
ENTRY WIDTH	1.0 - 1.2 TIMES THE MAXIMUM ENTRY WIDTH	1.0 - 1.2 TIMES THE MAXIMUM ENTRY WIDTH	
ENTRY RADIUS	18' - 22'	18' - 22'	MEASURED FROM CURB FACE TO CURB FACE
EXIT WIDTH	65' - 90'	65' - 90'	SAME AS ENTRY WIDTH
EXIT RADIUS	200' - 1000'	200' - 1000'	DOES NOT INCLUDE BIKE LANE OR GUTTER
APPROACH/DEPARTURE WIDTH	200' - 1000'	200' - 1000'	DOES NOT INCLUDE BIKE LANE OR GUTTER
DAILY SERVICE VOLUME (WITH CAPACITY ANALYSIS)	APPROXIMATELY 25,000 VEH/DAY		

ROUNDABOUT DESIGN CHECKS

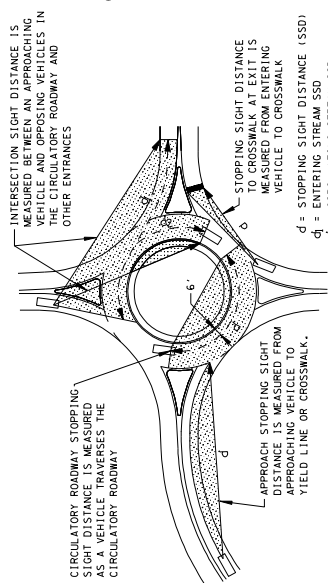
- DESIGN NOTES**
- FASTEST PATH CHECKS SHOULD BE COMPLETED PRIOR TO INTERSECTION SIGHT DISTANCE BEING CHECKED. STOPPING SIGHT DISTANCE CHECKS SHOULD BE COMPLETED PRIOR TO SIGHT DISTANCE CHECKS. SEE STANDARD DRAWING RP-R-2, "ROUNDABOUTS: AN INFORMATIONAL GUIDE", FHWA, 2000 AND R001-SD-1 THRU 7 FOR ADDITIONAL GUIDANCE.
 - CONSTRUCT A B-SPLINE (SHOWN AS DASHED LINE) FOR THE THROUGH, LEFT TURN, AND RIGHT TURN MOVEMENTS. THE RADIUS OF THE B-SPLINE AT EACH POINT MEASUREMENT SHOULD BE BETWEEN 65' AND 85' LONG. FOR THE R1 MEASUREMENT, THE RADIUS SHOULD NOT BE MEASURED THROUGH THE YIELD LINE.
 - PROVIDE 6' MINIMUM UNOBSTRUCTED HORIZONTAL CLEARANCE FROM THE NON-MOUNTABLE CURB TO THE CENTRAL ISLAND AND LANDSCAPE STRIP FOR CIRCULATORY ROADWAY SIGHT DISTANCE MEASUREMENTS. CLEARANCE MAY BE GREATER AND SHOULD BE DETERMINED AFTER SIGHT DISTANCE CHECKS ARE COMPLETE, BUT SHALL NOT BE LESS THAN 6 FEET.
 - SPLITTER ISLAND SHOULD BE A RAISED MEDIAN WITH CONCRETE HARDSCAPING (PREFERRED). SPLITTER ISLAND SHOULD EXTEND A MINIMUM OF 30' FROM THE YIELD LINE. SEE STANDARD DRAWING RP-R-6 FOR ADDITIONAL DETAILS.
 - FOR MOUNTABLE CURB BETWEEN CIRCULATORY ROADWAY AND TRUCK APRON, SEE STANDARD DRAWING RP-R-2.
 - SIDEWALK SHALL BE WIDENED TO ACCOMMODATE BICYCLES AND PEDESTRIANS AT ROUNDABOUT (SHARED USE PATH). SEE STANDARD DRAWING R0-TS-8 FOR ADDITIONAL DETAILS.
 - SEE STANDARD DRAWINGS T-M-10, 11 AND 12 FOR SIGNING AND PAVEMENT MARKINGS FOR SHARED USE PATHS AND BICYCLE LANES.
 - ASSUMES APPROXIMATELY 90-DEGREE ANGLES BETWEEN ENTRIES AND NO MORE THAN FOUR ENTRIES TO THE ROUNDABOUT.

GENERAL NOTES

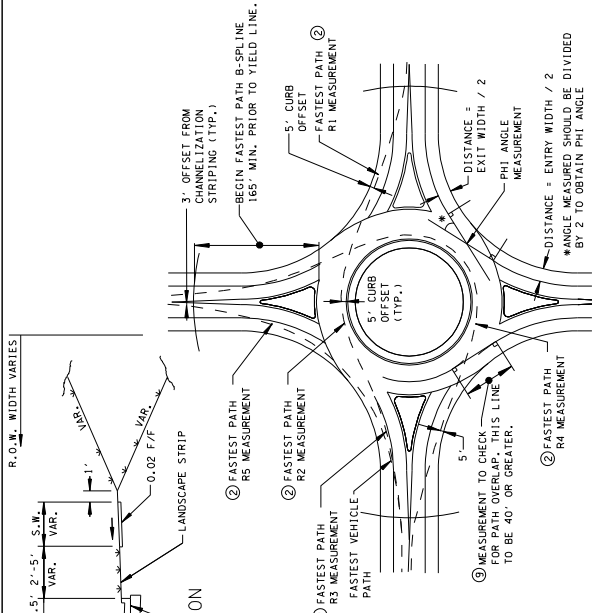
- FOR SPECIFIC CONDITIONS NOT COVERED ON THIS SHEET, REFERENCE SHOULD BE MADE TO "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS", ASHTO, 2001.
- REFERENCE SHOULD BE MADE TO "ROUNDABOUTS: AN INFORMATIONAL GUIDE", FHWA, 2000. REFERENCE SHOULD ALSO BE MADE TO THE "ROADSIDE DESIGN GUIDE", ASHTO, 2002.
- THIS STANDARD DRAWING IS INTENDED TO BE USED AS GUIDANCE FOR THE DESIGN OF SINGLE LANE URBAN AND RURAL ROUNDABOUTS. FOR MULTI-LANE DESIGNS, SEE STANDARD DRAWING R0-TS-10.
- TRUCK TURNING TEMPLATES SHOULD BE PERFORMED ON ALL TURNING MOVEMENTS WITHIN THE ROUNDABOUT. A WB-62 VEHICLE SHOULD BE USED WHERE APPROPRIATE.
- STANDARD ASHTO GUIDELINES FOR ISLAND DESIGN SHOULD BE FOLLOWED FOR SPLITTER ISLAND DESIGNS, INCLUDING LARGER NOSE RADIUS AT APPROACH CORNERS AND OFFSETTING CURB LINES AT THE APPROACH ENDS OF THE SPLITTER ISLAND.
- MAXIMUM LONGITUDINAL GRADE IN THE DIRECTION OF TRAVEL THROUGH THE CIRCULATORY ROADWAY SHALL BE 4 PERCENT.
- USE OF A RIGHT-TURN BYPASS LANE MAY BE WARRANTED FROM THE ROUNDABOUT TRAFFIC MODEL.
- ROUNDABOUT APPROACHES WITH SPEEDS OF 45 MPH OR GREATER ARE CONSIDERED HIGH SPEED APPROACHES. REFER TO SECTION 6.5 OF THE "ROUNDABOUTS: AN INFORMATIONAL GUIDE", FHWA, 2000 FOR ADDITIONAL INFORMATION ON DESIGN OF ROUNDABOUTS WITH HIGH SPEED APPROACHES.
- MINI ROUNDABOUTS, TRAFFIC CIRCLES, AND ROTARIES ARE NOT CONSIDERED ROUNDABOUTS AND SHOULD NOT BE DESIGNED TO THE STANDARDS ON THIS DRAWING.
- ROADWAY SHOULDERS AND BICYCLE LANE SHALL END PRIOR TO THE CIRCULATORY ROADWAY.
- FOR ROUNDABOUT CONSTRUCTION DETAILS, SEE STANDARD DRAWING RP-R-2.



ROUNDABOUT TYPICAL SECTION



ROUNDABOUT SIGHT DISTANCE



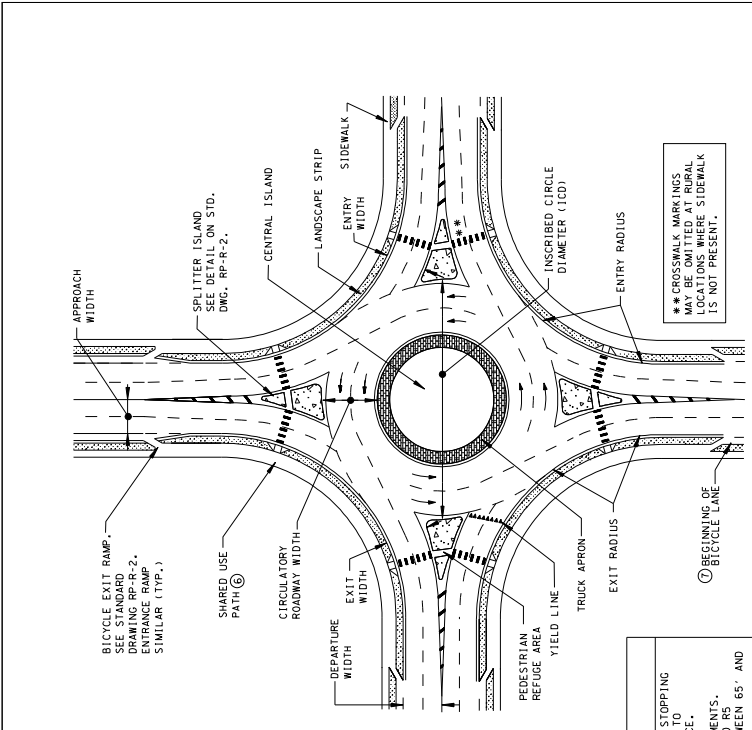
ROUNDABOUT DESIGN CHECKS

DESIGN STANDARDS FOR MULTI-LANE ROUNDABOUTS		NOTES
DESIGN SPEED	RURAL 30 MPH URBAN 25 MPH	SEE FHWA EXHIBIT 6-4
INSCRIBED CIRCLE DIAMETER	165' - 220'	MEASURED FROM CURB FACE TO CURB FACE
CIRCULATORY ROADWAY WIDTH	1.0 - 1.2 TIMES THE MAXIMUM ENTRY WIDTH	
ENTRY WIDTH	24' - 28'	MEASURED FROM CURB FACE TO CURB FACE
ENTRY RADIUS	65' - 100'	
EXIT WIDTH	SAME AS ENTRY WIDTH	SAME AS ENTRY WIDTH
EXIT RADIUS	200' - 1000'	WIDTH OF APPROACHING LANE
APPROACH/DEPARTURE WIDTH	WIDTH OF APPROACHING LANE	DOES NOT INCLUDE BIKE LANE OR OUTER DAILY SERVICE VOLUME (WITHOUT CAPACITY ANALYSIS) APPROXIMATELY 45,000 VEH/DAY

- DESIGN NOTES**
- FASTEST PATH CHECKS SHOULD BE COMPLETED PRIOR TO INTERSECTION SIGHT DISTANCE BEING CHECKED. STOPPING SIGHT DISTANCE AND INTERSECTION SIGHT DISTANCE SHOULD BE CHECKED FOR ALL APPROACHES. REFER TO "ROUNDABOUTS; AN INFORMATIONAL GUIDE", FHWA, 2000 AND AASHTO-SD-1 THRU 7 FOR ADDITIONAL GUIDANCE.
 - CONSTRUCT A B-SPLINE (SHOWN AS DASHED LINE) FOR THE THROUGH, LEFT TURN, AND RIGHT TURN MOVEMENTS. B-SPLINE SHOULD TOUCH THE 5' CURB OFFSETS AT THE POINTS INDICATED FOR THE R1, R2, R3, R4 AND R5 MEASUREMENTS. MEASURE THE RADIUS OF THE B-SPLINE AT EACH POINT. MEASUREMENT SHOULD BE BETWEEN 65' AND 85' LONG. FOR THE R1 MEASUREMENT, THE RADIUS SHOULD NOT BE MEASURED THROUGH THE YIELD LINE.
 - PROVIDE 6' MINIMUM UNOBSTRUCTED HORIZONTAL CLEARANCE FROM THE NON-MOUNTABLE CURB TO THE CENTRAL ISLAND LANDSCAPING TO ALLOW FOR CIRCULATORY ROADWAY SIGHT DISTANCE. ACTUAL DISTANCE MAY BE GREATER AND SHOULD BE DETERMINED AFTER SIGHT DISTANCE CHECKS ARE COMPLETE, BUT SHALL NOT BE LESS THAN 6 FEET.
 - SPLITTER ISLAND SHOULD BE A RAISED MEDIAN WITH CONCRETE HARDSCAPING (PREFERRED). SPLITTER ISLAND SHOULD EXTEND A MINIMUM OF 50' FROM THE YIELD LINE. SEE STANDARD DRAWING RP-H-6 FOR ADDITIONAL DETAILS.
 - FOR MOUNTABLE CURB BETWEEN CIRCULATORY ROADWAY AND TRUCK APRON. SEE STANDARD DRAWING RP-R-2. FOR NONMOUNTABLE CURB BETWEEN TRUCK APRON AND CENTRAL ISLAND. SEE STANDARD DRAWING RP-WC-10.
 - SIDEWALK SHALL BE WIDENED TO ACCOMMODATE BICYCLES AND PEDESTRIANS AT ROUNDABOUT (SHARED USE PATH). SEE STANDARD DRAWING RD-TS-8 FOR ADDITIONAL DETAILS.
 - SEE STANDARD DRAWINGS T-M-10, 11 AND 12 FOR SIGNING AND MARKINGS FOR SHARED USE PATHS AND BICYCLE LANES.
 - ASSUMES APPROXIMATELY 90-DEGREE ANGLES BETWEEN ENTRIES AND NO MORE THAN FOUR ENTRIES TO THE ROUNDABOUT.
 - PATH OVERLAP SHOULD BE MEASURED AT THE ENTRANCE AND EXITS OF MULTI-LANE ROUNDABOUTS. LINE SHOULD BE DRAWN TANGENT TO THE CENTER OF THE ENTRANCE/EXIT AND CIRCULATORY ROADWAY.

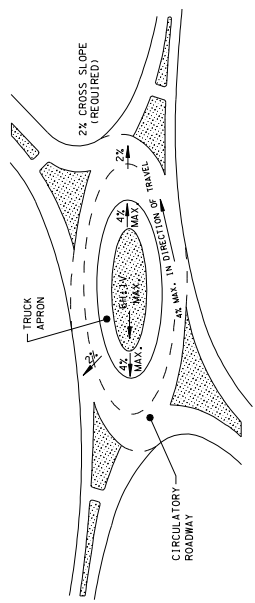
GENERAL NOTES

- FOR SPECIFIC CONDITIONS NOT COVERED ON THIS SHEET, REFERENCE SHOULD BE MADE TO "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS", AASHTO, 2001.
- REFERENCE SHOULD BE MADE TO "ROUNDABOUTS; AN INFORMATIONAL GUIDE", FHWA, 2000. REFERENCE SHOULD ALSO BE MADE TO THE "ROADSIDE DESIGN GUIDE", AASHTO, 2002.
- THIS STANDARD DRAWING IS INTENDED TO BE USED AS GUIDANCE FOR THE DESIGN OF MULTI-LANE URBAN AND RURAL ROUNDABOUTS. FOR SINGLE LANE DESIGNS, SEE STANDARD DRAWING RD-TS-9.
- TRUCK TURNING TEMPLATES SHOULD BE PERFORMED ON ALL TURNING MOVEMENTS WITHIN THE ROUNDABOUT. A 40'62' VEHICLE SHOULD BE USED WHERE APPROPRIATE.
- STANDARD AASHTO GUIDELINES FOR ISLAND DESIGN SHOULD BE FOLLOWED FOR SPLITTER ISLAND DESIGNS, INCLUDING LARGER NOSE RADIUS AT APPROACH CORNERS AND OFFSETTING CURB LINES AT THE APPROACH ENDS OF THE SPLITTER ISLAND.
- MAXIMUM LONGITUDINAL GRADE IN THE DIRECTION OF TRAVEL THROUGH THE CIRCULATORY ROADWAY SHALL BE 4 PERCENT.



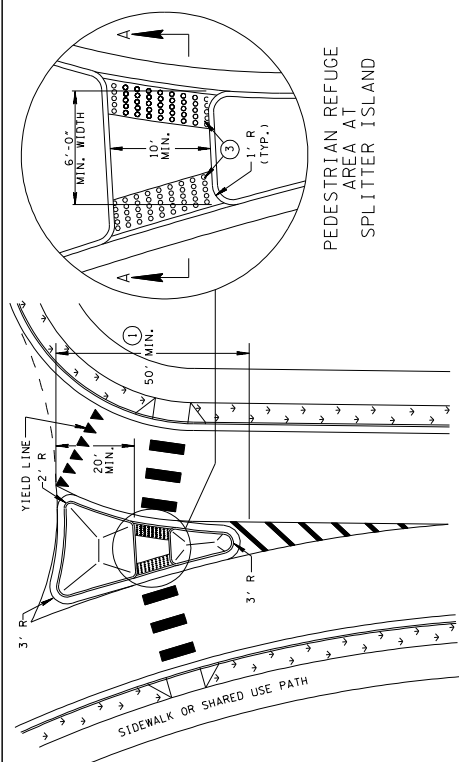
TYPICAL PLAN VIEW OF MULTI-LANE ROUNDABOUT

SEE GENERAL NOTE K

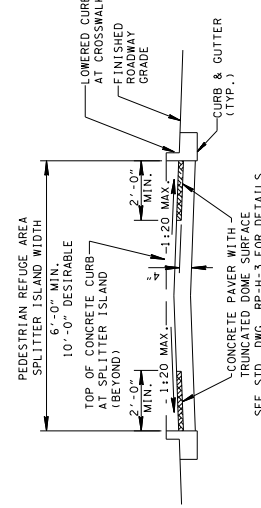


CIRCULATORY ROADWAY SLOPES

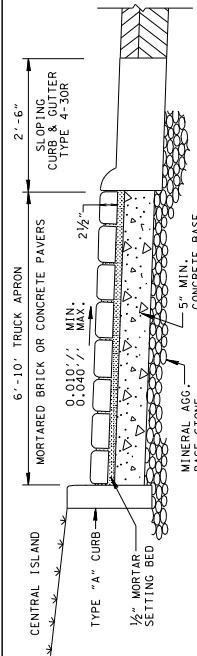
NOTE: TRUCK APRON CROSS SLOPE SHOULD MATCH CIRCULATORY ROADWAY CROSS SLOPE OR MAY BE INCREASED UP TO 4 PERCENT MAX.



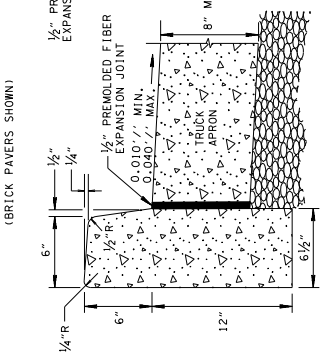
TYPICAL SPLITTER ISLAND



SPLITTER ISLAND CROSSING SECTION A-A



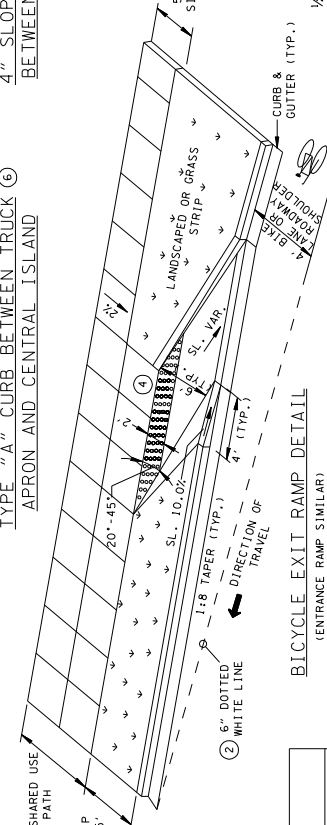
TRUCK APRON WITH CONCRETE OR BRICK PAVERS (BRICK PAVERS SHOWN)



TYPE "A" CURB BETWEEN TRUCK APRON AND CENTRAL ISLAND



4" SLOPING CONCRETE COMBINED CURB AND GUTTER BETWEEN CIRCULATORY ROADWAY AND TRUCK APRON TYPE 4-30R



BICYCLE EXIT RAMP DETAIL (ENTRANCE RAMP SIMILAR)

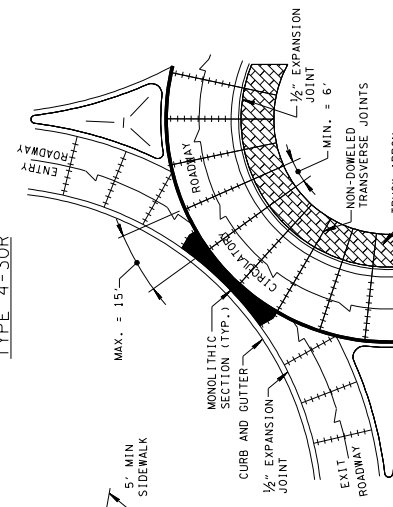
GENERAL NOTES

- A 4" SLOPING CONCRETE COMBINED CURB AND GUTTER SHOULD BE USED BETWEEN CIRCULATORY ROADWAY AND TRUCK APRON UNLESS OTHERWISE NOTED. TYPE "A" CURB SHOULD BE USED BETWEEN THE TRUCK APRON AND THE CENTRAL ISLAND.
- B THE CROSS SLOPE OF THE LANDING AREA SHALL NOT EXCEED 2% IN THE SIDEWALK AREA.
- C SPLITTER ISLAND SIZE AND SHAPE WILL BE DETERMINED BY THE ROADWAY DEFLECTION.
- D THE FINISH ON THE TRUCK APRON SHOULD CREATE A CONTRAST IN COLOR OR TEXTURE BETWEEN THE CIRCULATORY ROADWAY AND THE APRON. THIS CAN BE ACCOMPLISHED WITH THE USE OF COLORED OR TEXTURED CONCRETE OR WITH THE USE OF COLORED OR TEXTURED CURB PAVERS. WHEN PAVERS ARE USED, A BASKETWEAVE OR HERRINGBONE PATTERN SHOULD BE APPLIED.
- E FOR PAVEMENT MARKINGS AND SIGNAGE AT BICYCLE RAMP AND SHARED USE PATH, SEE STANDARD DRAWING T-M-10.
- F UNLESS OTHERWISE NOTED ON PLANS, THE CIRCULATORY ROADWAY SHOULD BE CONSTRUCTED OF ASPHALT. THE USE OF CONCRETE PAVEMENT SHALL BE ON A CASE-BY-CASE BASIS.
- G CONCRETE QUANTITY FOR TYPE 4-30R CURB & GUTTER SHALL BE COMPUTED USING 0.06731 CUBIC YARDS PER LINEAR FOOT. PAYMENT WILL BE AS FOLLOWS:
ITEM NO. 702-01 CONCRETE CURB PER CUBIC YARD
ITEM NO. 702-02 CONCRETE GUTTER PER CUBIC YARD
ITEM NO. 102-03 CONCRETE COMBINED CURB AND GUTTER PER CUBIC YARD

DESIGN NOTES

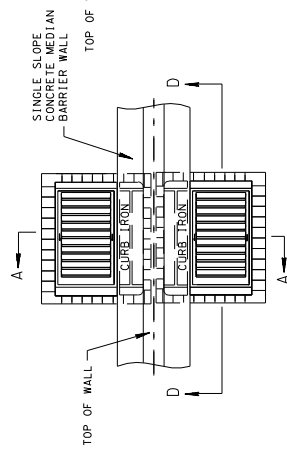
- 1 SPLITTER ISLAND SHOULD BE A RAISED MEDIAN WITH CONCRETE HARDSCAPING (PREFERRED). SPLITTER ISLAND SHOULD EXTEND A MINIMUM OF 50' FROM THE YIELD LINE. SEE STANDARD DRAWING RP-H-6 FOR ADDITIONAL DETAILS OF MEDIAN CROSSINGS.
- 2 6" X 2' DOTTED WHITE LINE ALONG ENTIRE LENGTH OF TAPER AT BICYCLE RAMP.
- 3 DETECTABLE WARNING SURFACE SHALL BE INSTALLED AT BOTH SIDES OF THE SPLITTER ISLAND AND PEDESTRIAN REFUGE AREA. SEE STD. DWG. RP-H-3 FOR DETAILS.
- 4 DETECTABLE WARNING SURFACE SHALL BE INSTALLED AT THE TOP OF ALL BICYCLE EXIT AND ENTRANCE RAMPS. SEE STD. DWG. RP-H-3 FOR DETAILS.
- 5 WHEN CIRCULATORY ROADWAY IS CONCRETE, THE TRANSVERSE CONTRACTION JOINTS IN THE TRUCK APRON SHOULD LINE UP WITH CONTRACTION JOINTS IN THE TRUCK APRON. THE JOINTS IN THE TRUCK APRON SHOULD NOT BE DOWELED. THE COMBINED CURB AND GUTTER SHOULD BE TIED TO THE ROADWAY CONCRETE.
- 6 FOR ADDITIONAL DETAILS OF TYPE "A" CURB, SEE STANDARD DRAWING RP-NMC-10.

TYPICAL JOINTING DETAIL FOR CONCRETE PAVEMENT

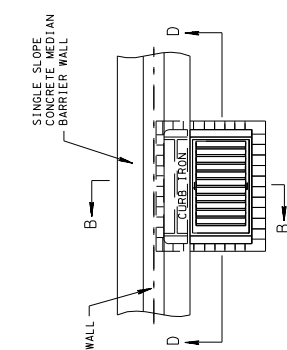


JOINT SYMBOLS

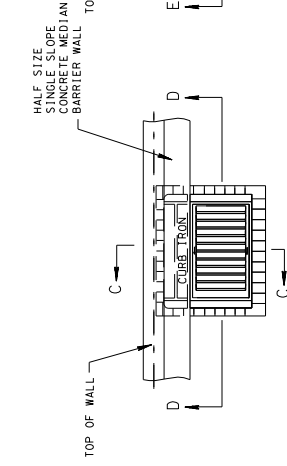
1/2" EXPANSION JOINT
TRANSVERSE CONTRACTION
LONGITUDINAL CONTRACTION OR LONGITUDINAL CONSTRUCTION



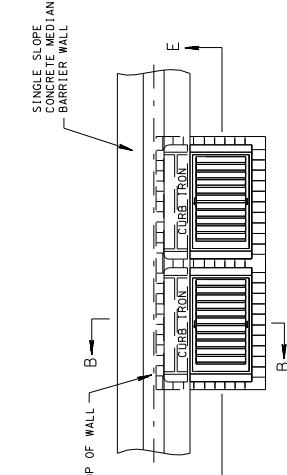
PLAN VIEW
NO. 31, NO. 32, AND
NO. 46 CATCH BASINS



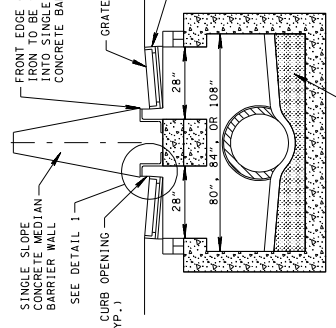
PLAN VIEW
NO. 41 CATCH BASINS



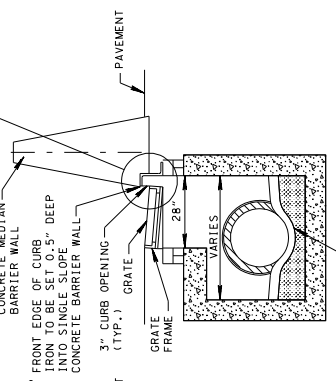
PLAN VIEW
NO. 51 AND NO. 52 CATCH BASINS



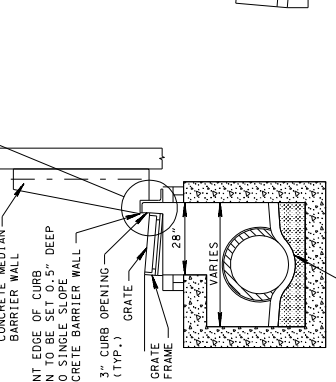
PLAN VIEW
NO. 45S CATCH BASINS



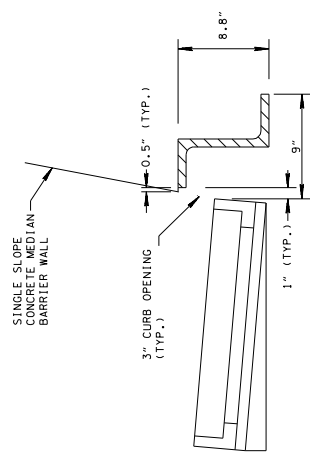
SECTION A-A
NO. 31, NO. 32 AND
NO. 46 CATCH BASINS



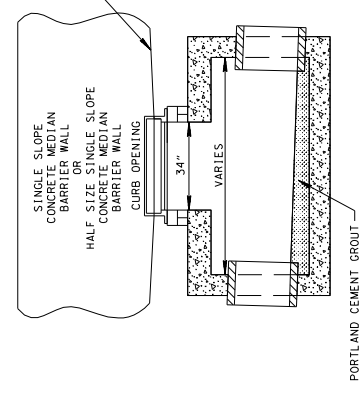
SECTION B-B
NO. 41 AND 45S CATCH BASINS



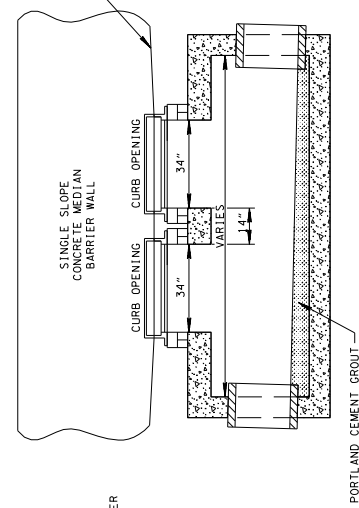
SECTION C-C
NO. 51 AND 52 CATCH BASINS



DETAIL 1



SECTION D-D
NO. 31, NO. 32, NO. 41, NO. 46,
NO. 51, AND NO. 52 CATCH BASINS



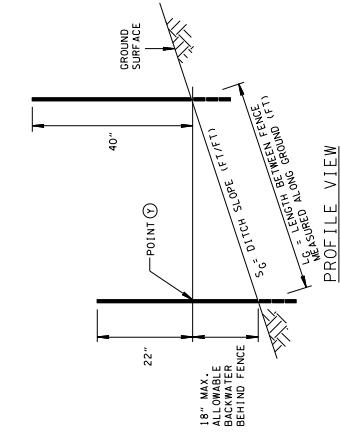
SECTION E-E
NO. 45S CATCH BASINS

STATE OF TENNESSEE DEPARTMENT OF TRANSPORTATION	
SINGLE SLOPE MEDIAN BARRIER WALL CATCH BASIN DETAIL	
10-15-09 S-SSMB-5	
GENERAL NOTES	
A	DRAWING TO BE USED FOR SINGLE SLOPE CONCRETE MEDIAN BARRIER WALL WHEN SPECIFYING A NO. 31, 32, 41, 45S, 46, 51, OR 52 CONCRETE CATCH BASIN AND ALL PRECAST NO. 32 CONCRETE CATCH BASINS.
B	SEE STANDARD DRAWING S-SSMB-2 FOR ADDITIONAL DETAILS AND GENERAL NOTES REGARDING SINGLE SLOPE CONCRETE BARRIER WALL.
C	SEE CATCH BASIN STANDARD DRAWINGS FOR ADDITIONAL DETAILS AND GENERAL NOTES REGARDING CATCH BASINS.

STATION (LT or RT)	L (FT) (1)	X1 (FT) (1)	X2 (FT) (1)	OVERFLOW WEIR LENGTH (FT)	TOTAL LENGTH OF ESF (FT)	WIDENED ZONE				
						BOTTOM WIDTH (FT)	SIDE SLOPE (H:1)	LENGTH (FT)	TRANSITION RATIO	LENGTH (FT)

(1) REFER TO STD. DWG. EC-STR-4 OR EC-STR-4A

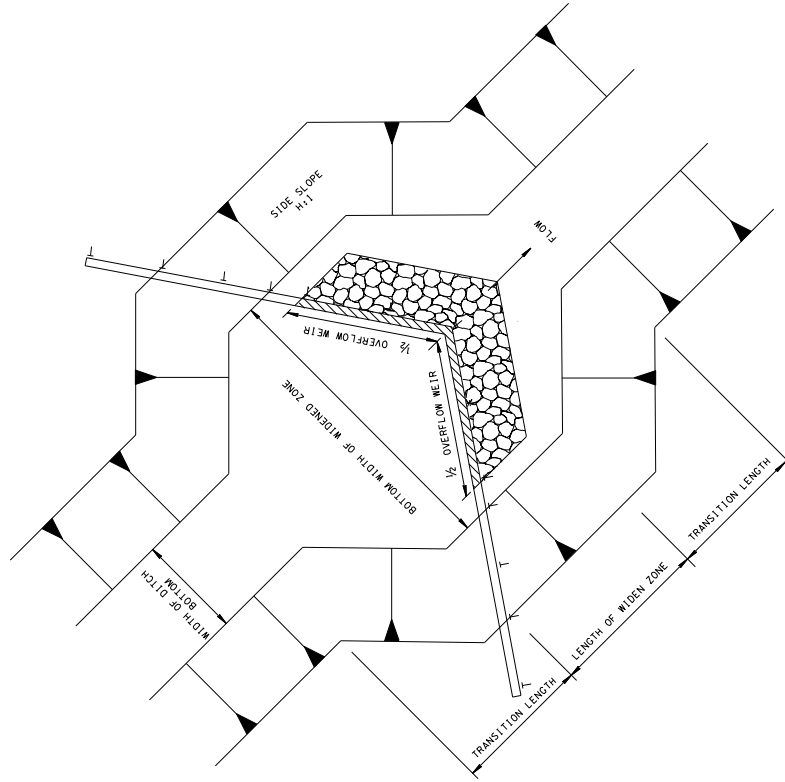
DITCH SLOPE S ₀ (FT/FT)	RECOMMENDED SPACING, (L _c) BETWEEN ENHANCED SILT FENCE CHECKS (FT)
0.01	150
0.02	75
0.03	50
0.04	40
0.05	30
0.06 AND STEEPER	25



**SPACING FOR ENHANCED
SILT FENCE CHECKS**

ENHANCED SILT FENCE CHECK GENERAL NOTES

- A ENHANCED SILT FENCE CHECKS ARE USED TO REMOVE SUSPENDED SEDIMENTS FROM STORM WATER FLOW VIA SETTLING AND FILTERING. THEY ARE NOT DESIGNED FOR FLOOD PROTECTION. ENHANCED SILT FENCE CHECKS SHOULD NOT BE PLACED IN STREAMS OR OTHER NATURAL WATER RESOURCES.
- B IT MAY BE NECESSARY TO FLATTEN THE DITCH SIDE SLOPES AND/OR WIDEN THE DITCH BOTTOM WIDTH IN THE LIMITS OF FLOW TABLE ON EC-STR-4 AND EC-STR-4A.
- C FOR ADDITIONAL INSTALLATION INFORMATION REFER TO EC-STR-4 FOR ENHANCED SILT FENCE CHECK USED IN TRAPEZOIDAL DITCHES AND EC-STR-4A FOR ENHANCED SILT FENCE CHECKS USED IN V-DITCHES.
- D FOR INSTALLATION DETAILS FOR ENHANCED SILT FENCE SEE STANDARD DRAWING EC-STR-3D AND EC-STR-3E.
- E THE SPACING OF ENHANCED SILT FENCE CHECKS, ALONG A DITCH, SHOULD BE BASED ON A COMBINATION OF HYDRAULIC PROPERTIES OF THE FENCE MATERIAL, LIMITS OF FLOW TABLE (EC-SRE-4 AND EC-STR-4A), AND THE SPACING TABLE.
- F UPON REMOVAL OF THE ENHANCED SILT FENCE CHECK, THE WIDENED ZONE SHOULD BE IMMEDIATELY RESHAPED TO MATCH ORIGINAL DITCH PROFILES. THE WIDENED ZONE SHOULD BE SEEDING AND EROSION CONTROL BARRIERS OR TURF REINFORCEMENT MATS OR T1 SHOULD BE SODDED.

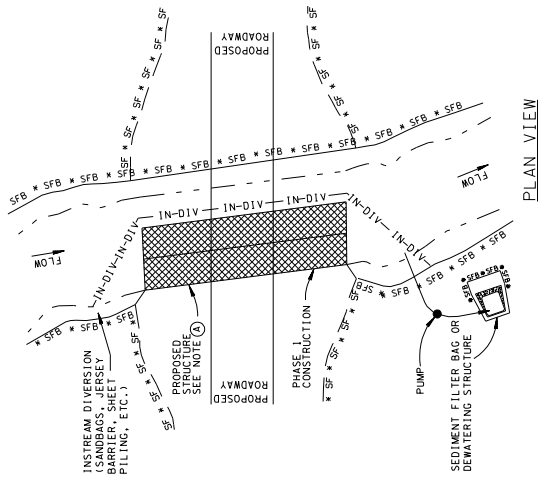


MINOR REVISION ... PER APPROVAL NOT REQUIRED.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

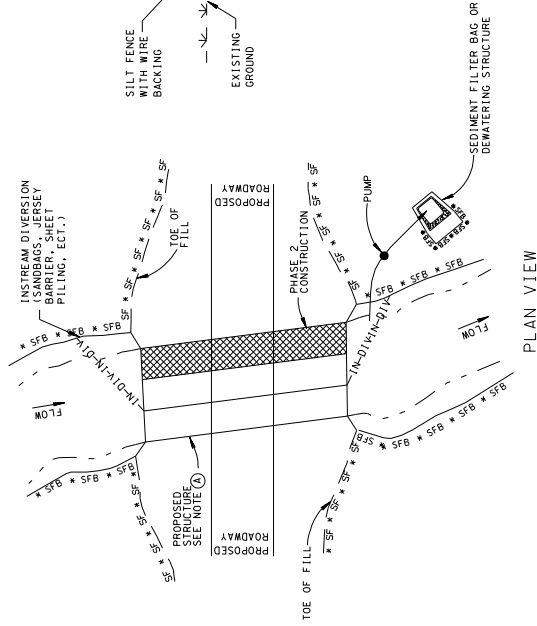
ENHANCED SILT
FENCE CHECK
DETAILS

PHASE 1



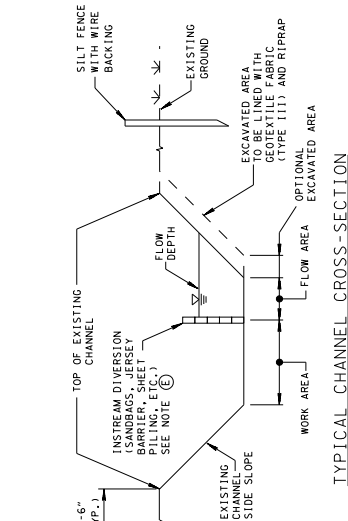
PLAN VIEW

PHASE 2

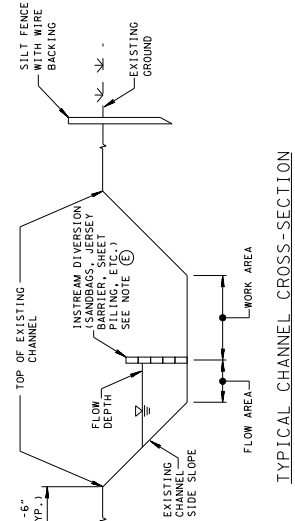


PLAN VIEW

- ### INSTREAM DIVERSION GENERAL NOTES
- (A) INSTREAM DIVERSIONS ARE GENERALLY USED WHERE IT IS NECESSARY TO MAINTAIN THE STREAM FLOW WITHIN THE EXISTING CHANNEL DURING THE CONSTRUCTION OF A STRUCTURE. THIS ALLOWING INSTREAM WORK TO BE COMPLETED IN THE DRY, SEPARATED FROM FLOWING WATER.
 - (B) EXAMPLE SHOWN IS FOR NEW CONSTRUCTION OR REPLACEMENT OF A STRUCTURE WHEN THE ROADWAY IS CLOSED TO TRAFFIC OR WHEN A RUNAROUND IS USED. FOR AN EXAMPLE WHEN TRAFFIC IS MAINTAINED DURING CONSTRUCTION SEE THE CHANNEL CONTROL SHOULD BE BASED ON THE SPECIFIC PROJECT, NOT ON THE EXAMPLE SHOWN.
 - (C) EXAMPLE SHOWN IS FOR NEW CONSTRUCTION OF A MULTI-BARREL STRUCTURE. ADJUSTMENTS SHOULD BE MADE TO THE INSTREAM DIVERSION FOR A STRUCTURE REPLACEMENT OR WHEN A BRIDGE IS REPLACED WITH A MULTI-BARREL STRUCTURE.
 - (D) THE CONSTRUCTION PHASING SHOWN IS AN EXAMPLE. THE CONSTRUCTION PHASING USED SHOULD BE BASED UPON FIELD CONDITIONS OF THE SPECIFIC PROJECT AT THE TIME OF CONSTRUCTION. THE INSTREAM DIVERSION SHOULD BE ADJUSTED ACCORDINGLY.
 - (E) THE HEIGHT OF THE INSTREAM DIVERSION SHOULD BE A MINIMUM OF 1 FOOT HIGHER THAN THE ORDINARY FLOW IN THE REDUCED CHANNEL WIDTH.
 - (F) WHERE IT IS NECESSARY TO EXCAVATE THE CHANNEL TO PROVIDE SUFFICIENT FLOW AREA FOR THE ORDINARY FLOW THE EXCAVATED AREA SHOULD BE LINED WITH GEOTEXTILE FABRIC AND RIPRAP. THE EXCAVATED AREA SHOULD BE LIMITED TO CONSTRUCTION LIMITS OF THE STRUCTURE.
 - (G) DURING CONSTRUCTION OF THE INSTREAM DIVERSION, DAMAGE TO THE EXISTING STREAM AND CANOPY SHALL BE MINIMIZED. ALL EXISTING VEGETATION OUTSIDE THE EXCAVATED AREA SHOULD BE PROTECTED. CONSTRUCTION SHOULD NOT BE DISTURBED UNLESS IT INTERFERES WITH CONSTRUCTION OR SAFETY STANDARDS.
 - (H) CONSTRUCTION SHALL PROCEED AS FOLLOWS:
 1. USE INSTREAM DIVERSION TO DIVERT FLOW TO ONE SIDE OF THE EXISTING CHANNEL AND/OR INTO BARRELS) OF THE EXISTING CULVERT.
 2. REMOVE PORTION OF EXISTING STRUCTURE, IF APPLICABLE, AND CONSTRUCT ONE OR MORE BARRELS OF THE PROPOSED CULVERT AND PLACE INLET AND OUTLET PROTECTION.
 3. USE INSTREAM DIVERSION TO DIVERT FLOW TO OTHER SIDE OF THE EXISTING CHANNEL AND INTO BARRELS) OF THE NEWLY CONSTRUCTED PROPOSED STRUCTURE.
 4. REMOVE REMAINING PORTION OF EXISTING STRUCTURE, IF APPLICABLE, AND CONSTRUCT REMAINING BARRELS OF THE PROPOSED STRUCTURE AND PLACE INLET AND OUTLET PROTECTION.
 5. REMOVE INSTREAM DIVERSION.
 - (I) INSTREAM DIVERSION SHALL BE INSPECTED WEEKLY OR AFTER EVERY RAIN EVENT. ANY NEEDED REPAIRS SHALL BE DONE IMMEDIATELY.
 - (J) INSTREAM DIVERSION MAY BE CONSTRUCTED OF SANDBAGS, JERSEY BARRIER, RIPRAP, SHEET PILING, OR OTHER MATERIALS USED TO SEPARATE THE FLOWING WATER FROM THE WORK AREA.
 - (K) ONLY GEOTEXTILE FABRIC (TYPE III) LISTED ON THE QUALIFIED PRODUCTS LIST SHALL BE USED.
 - (L) FOR INSTALLATION DETAILS AND ITEM NUMBERS FOR DEWATERING STRUCTURES (EC-SIR-1), SEDIMENT FILTER BAGS (EC-SIR-2), SILT FENCE (EC-SIR-3B) AND SILT FENCE WITH WIRE BACKING (EC-SIR-3C), SEE THEIR RESPECTIVE STANDARD DRAWINGS.
 - (M) INSTREAM DIVERSIONS SHALL BE PAID FOR UNDER THE FOLLOWING ITEM NUMBERS:
 - 209-65.04 TEMPORARY IN STREAM DIVERSION PER LINEAR FOOT
 OPTIONAL EXCAVATION, GEOTEXTILE, AND RIPRAP SHALL BE INCLUDED IN THE COST OF INSTREAM DIVERSION.
 - DEWATERING STRUCTURES, SEDIMENT FILTER BAGS, SILT FENCE, AND SILT FENCE WITH WIRE BACKING SHALL BE PAID FOR ACCORDING TO THEIR RESPECTIVE STANDARD DRAWINGS.
- PAYMENT SHALL INCLUDE ALL MATERIALS AND LABOR NECESSARY FOR CONSTRUCTION, MAINTENANCE, AND REMOVAL OF INSTREAM DIVERSION.



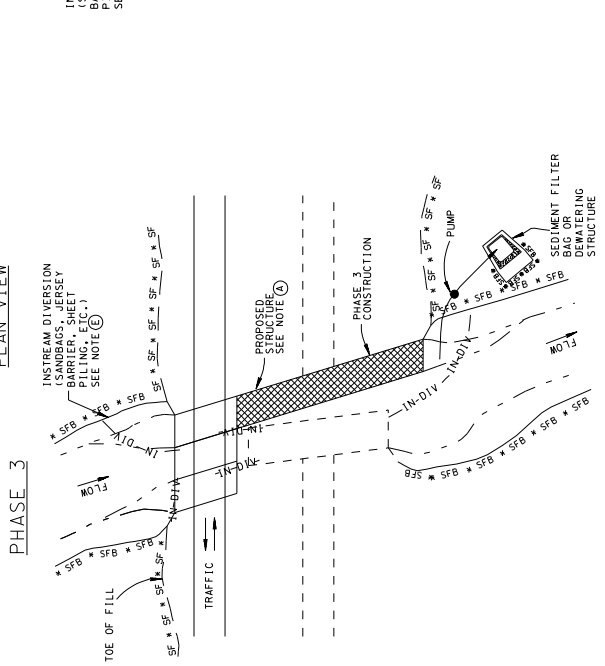
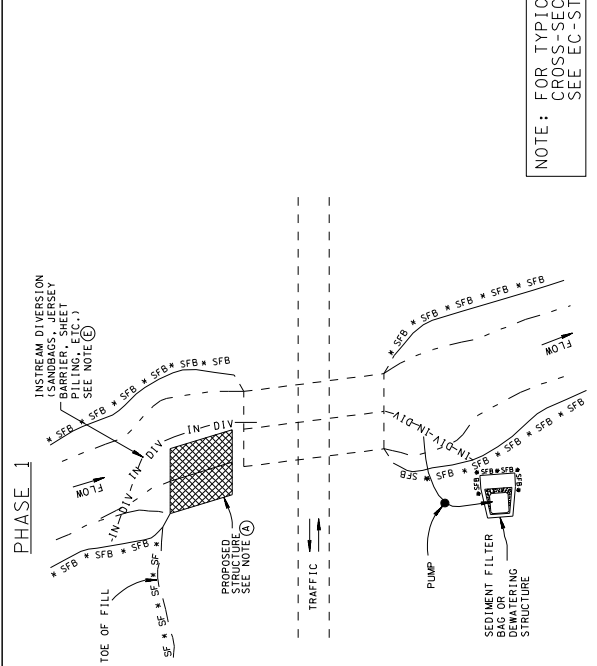
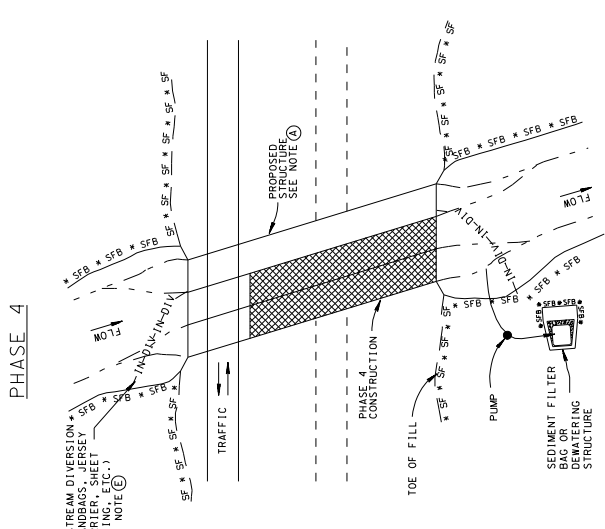
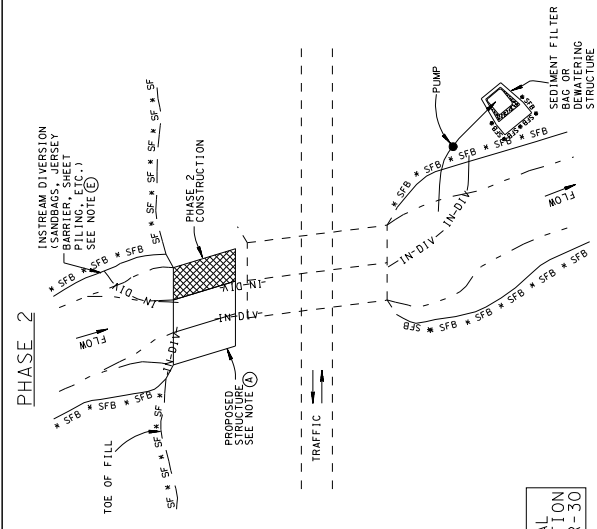
TYPICAL CHANNEL CROSS-SECTION



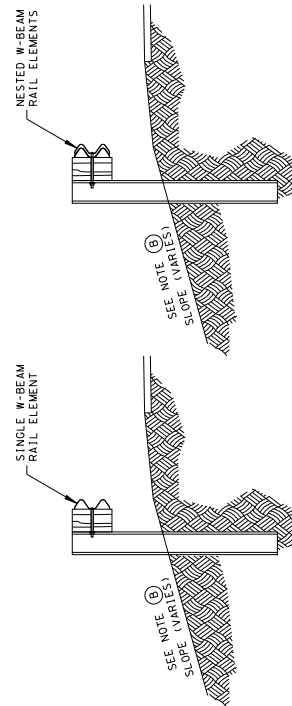
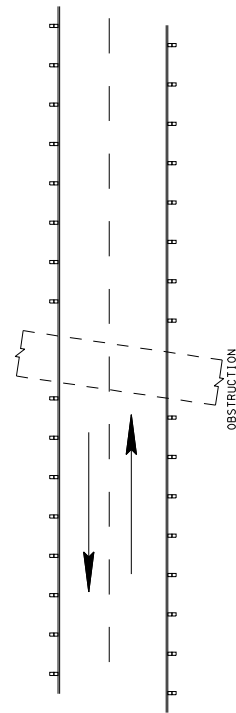
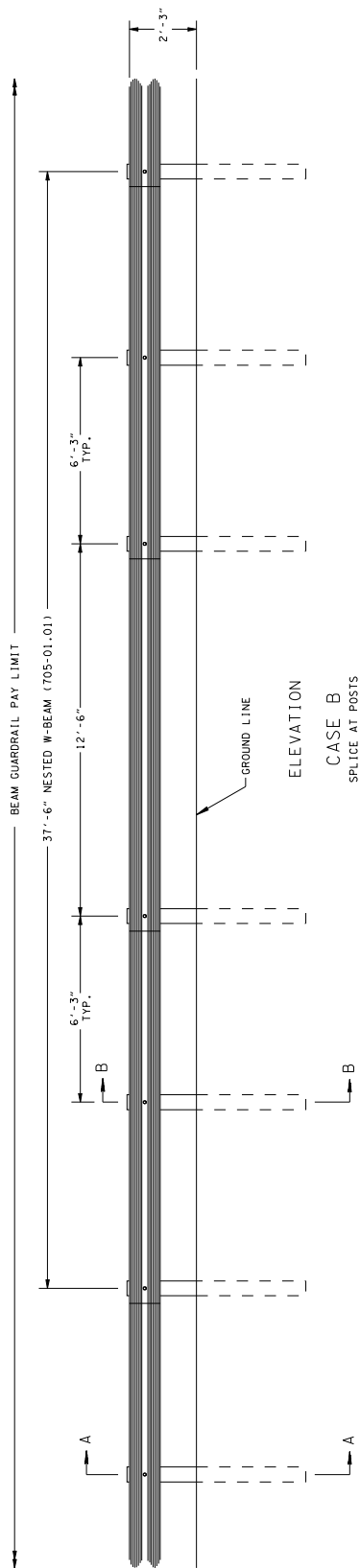
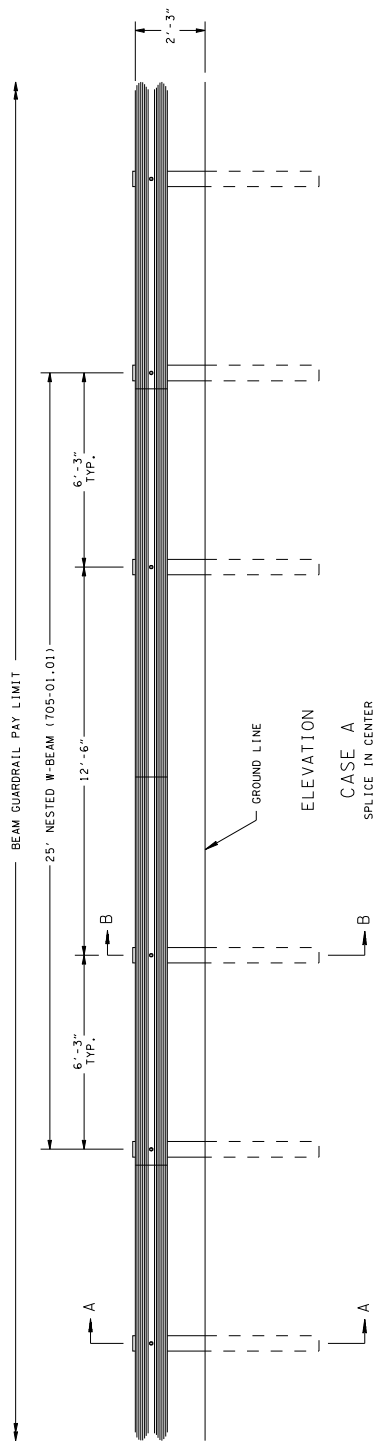
TYPICAL CHANNEL CROSS-SECTION

- ### INSTREAM DIVERSION GENERAL NOTES
- (A) INSTREAM DIVERSIONS ARE GENERALLY USED WHERE IT IS NECESSARY TO MAINTAIN THE STREAM FLOW WITHIN THE EXISTING CHANNEL DURING THE CONSTRUCTION OF A MULTI-BARREL CULVERT, BOX BRIDGE, OR SLAB BRIDGE. THIS ALLOWS INSTREAM WORK TO BE COMPLETED IN THE DRY, SEPARATED FROM FLOWING WATER.
 - (B) EXAMPLE SHOWN IS FOR THE REPLACEMENT OF A STRUCTURE WHEN TRAFFIC IS MAINTAINED ON THE ROADWAY. FOR AN EXAMPLE WHEN THE ROADWAY IS CLOSED TO TRAFFIC, OR A RUNAROUND IS USED, DURING CONSTRUCTION SEE EC-STR-30, TRAFFIC CONTROL SHOULD BE BASED ON THE SPECIFIC PROJECT, NOT ON THE EXAMPLE SHOWN.
 - (C) EXAMPLE SHOWN IS FOR REPLACEMENT OF A MULTI-BARREL STRUCTURE. ROADWAY IS CLOSED TO TRAFFIC. INSTREAM DIVERSION FOR WHEN A BRIDGE IS REPLACED WITH A MULTI-BARREL STRUCTURE.
 - (D) THE CONSTRUCTION PHASING SHOWN IS AN EXAMPLE. THE CONSTRUCTION PHASING USED SHOULD BE BASED UPON FIELD CONDITIONS OF THE SPECIFIC PROJECT AT THE TIME OF CONSTRUCTION. THE INSTREAM DIVERSION SHOULD BE ADJUSTED ACCORDINGLY.
 - (E) THE HEIGHT OF THE INSTREAM DIVERSION SHOULD BE A MINIMUM OF 1 FOOT HIGHER THAN THE ORDINARY FLOW IN THE REDUCED CHANNEL WIDTH.
 - (F) DURING CONSTRUCTION OF THE INSTREAM DIVERSION, DAMAGE TO THE EXISTING STREAM AND CANOPY SHALL BE MINIMIZED. ALL EXISTING VEGETATION OUTSIDE THE CUT AND FILL LINES BUT INSIDE THE RIGHT-OF-WAY SHALL NOT BE DISTURBED UNLESS IT INTERFERES WITH SAFETY STANDARDS.
 - (G) CONSTRUCTION SHALL PROCEED AS FOLLOWS:
 1. USE INSTREAM DIVERSION TO DIVERT FLOW TO ONE SIDE OF THE EXISTING CHANNEL AND INTO BARREL(S) OF THE EXISTING CULVERT OR ONE SPAN OF EXISTING BRIDGE.
 2. REMOVE PORTION OF EXISTING STRUCTURE. IF APPLICABLE, AND CONSTRUCT ONE OR MORE BARRELS OF THE PROPOSED CULVERT TO A LENGTH SUFFICIENT FOR TEMPORARY TRAFFIC LANES. PLACE INLET/OUTLET PROTECTION.
 3. USE INSTREAM DIVERSION TO DIVERT FLOW TO OTHER SIDE OF THE EXISTING CHANNEL AND INTO BARREL(S) OF THE NEWLY CONSTRUCTED PROPOSED STRUCTURE AND BARREL(S) OR SPAN (S) OF THE EXISTING STRUCTURE.
 4. REMOVE PORTION OF EXISTING STRUCTURE. IF APPLICABLE, AND CONSTRUCT REMAINING BARRELS OF THE PROPOSED STRUCTURE TO A LENGTH SUFFICIENT FOR TEMPORARY TRAFFIC LANES. PLACE INLET/OUTLET PROTECTION.
 5. MOVE TRAFFIC. REMOVE PORTION OF EXISTING STRUCTURE, AND CONSTRUCT REMAINING LENGTH OF ONE OR MORE BARRELS OF THE PROPOSED STRUCTURE. PLACE INLET/OUTLET PROTECTION.
 6. USE INSTREAM DIVERSION TO DIVERT FLOW TO OTHER SIDE OF THE EXISTING CHANNEL AND INTO BARREL(S) OF THE NEWLY CONSTRUCTED PROPOSED STRUCTURE.
 7. REMOVE REMAINING PORTION OF EXISTING STRUCTURE AND CONSTRUCT REMAINING BARREL(S) OF THE PROPOSED STRUCTURE. PLACE INLET/OUTLET PROTECTION.
 8. REMOVE INSTREAM DIVERSION.
 - (H) INSTREAM DIVERSION SHALL BE INSPECTED WEEKLY OR AFTER EVERY RAIN EVENT. ANY NEEDED REPAIRS SHALL BE DONE IMMEDIATELY.
 - (I) INSTREAM DIVERSION MAY BE CONSTRUCTED OF SANDBAGS, JERSEY BARRIER, RIPRAP, SHEET PILING, OR OTHER MATERIALS USED TO SEPARATE THE FLOWING WATER FROM THE WORK AREA.
 - (J) ONLY GEOTEXTILE FABRIC (TYPE III) LISTED ON THE QUALIFIED PRODUCTS LIST SHALL BE USED.
 - (K) FOR INSTALLATION DETAILS AND ITEM NUMBERS FOR DEWATERING STRUCTURES (EC-STR-11), SEDIMENT FILTER BAGS (EC-STR-2), SILT FENCE (EC-STR-38) AND SILT FENCE WITH WIRE BACKING (EC-STR-3C), SEE THEIR RESPECTIVE STANDARD DRAWINGS.
 - (L) INSTREAM DIVERSIONS SHALL BE PAID FOR UNDER THE FOLLOWING ITEM NUMBERS:

209-65.04	TEMPORARY IN STREAM DIVERSION PER LINEAR FOOT
	DEWATERING STRUCTURES, SEDIMENT FILTER BAGS, SILT FENCE, AND SILT FENCE WITH WIRE BACKING SHALL BE PAID FOR ACCORDING TO THEIR RESPECTIVE STANDARD DRAWINGS.
- PAYMENT SHALL INCLUDE ALL MATERIALS AND LABOR NECESSARY FOR CONSTRUCTION, MAINTENANCE, AND REMOVAL OF INSTREAM DIVERSION.

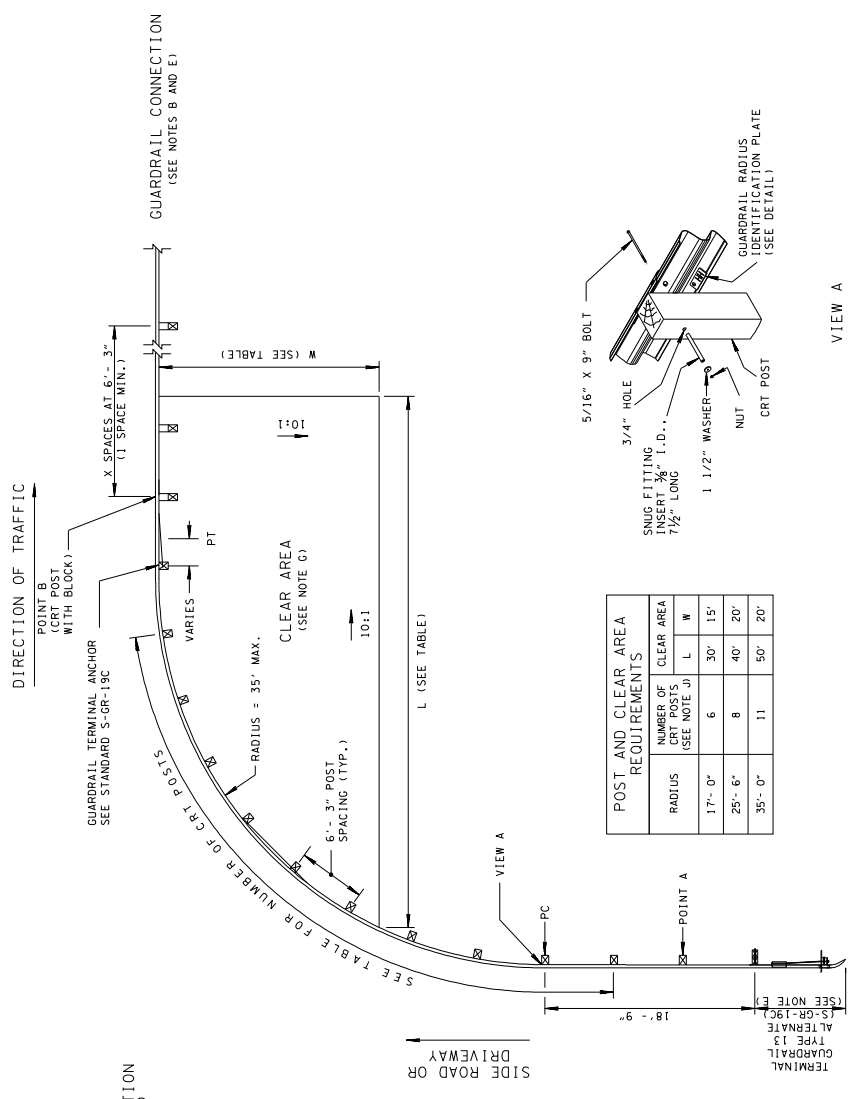
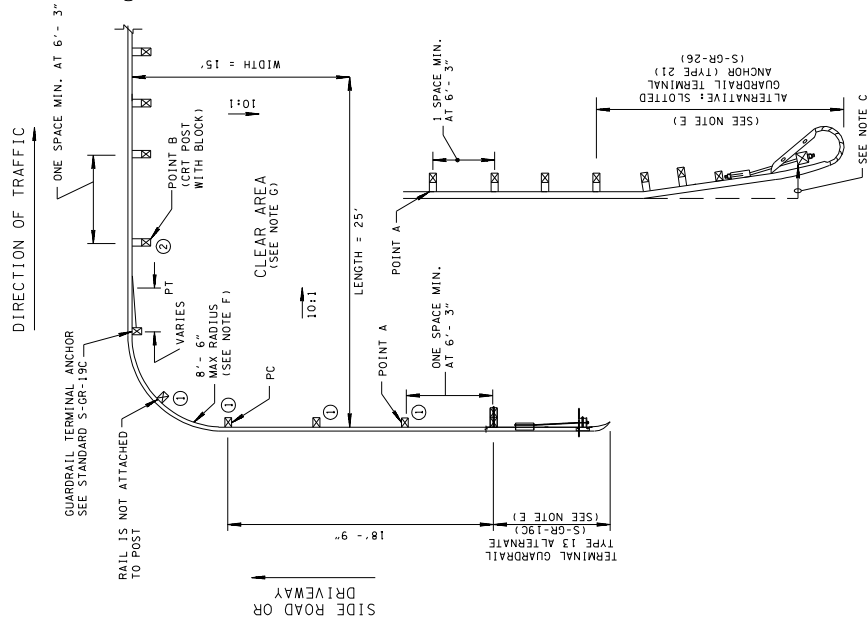


EROSION CONTROL PLAN LEGEND: — IN-DIV — INSTREAM DIVERSION

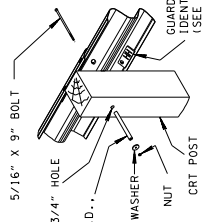


GENERAL NOTES

- (A) DRAWING TO BE USED FOR GUARDRAIL PLACEMENT WHEN ENCOUNTERING AN OBSTRUCTION SMALLER THAN 12.5 FT WIDE.
- (B) A POST MAY BE OMITTED ON A RUN OF GUARDRAIL ONLY. THIS APPLICATION IS NOT TO BE USED AS PART OF AN ANCHOR.
- (C) ONLY ONE POST MAY BE OMITTED AT AN OBSTRUCTION.
- (D) WHEN MORE THAN ONE OBSTRUCTION IS ENCOUNTERED ON A RUN OF GUARDRAIL, THREE CONSECUTIVE POSTS SHALL BE INSTALLED PRIOR TO OMITTING ANOTHER POST.
- (E) SEE STANDARD DRAWING R001-SERIES FOR SLOPE CRITERIA.

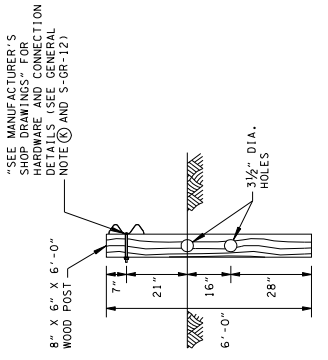
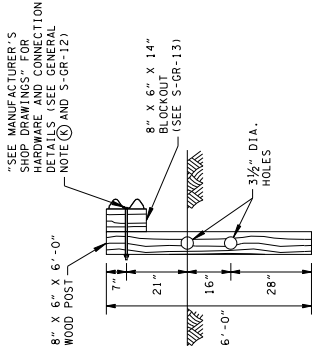


POST AND CLEAR AREA REQUIREMENTS			
RADIUS	NUMBER OF CRT POSTS (SEE NOTE J)	L	W
17'-0"	6	30'	15'
25'-6"	8	40'	20'
35'-0"	11	50'	20'



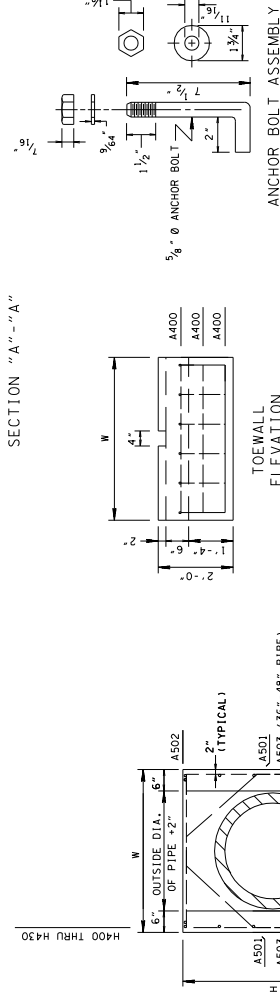
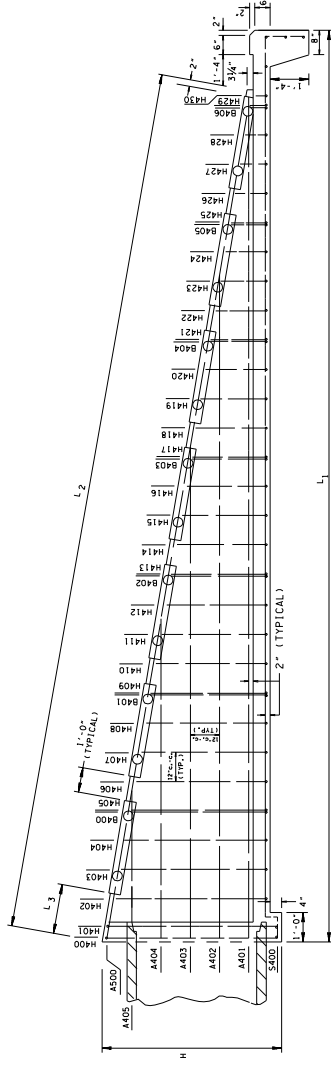
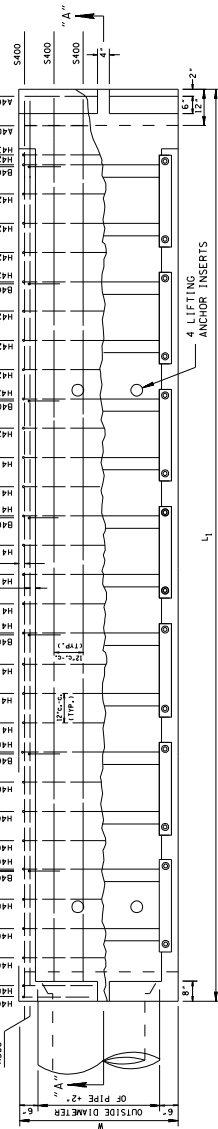
GENERAL NOTES

- (A) THIS STANDARD DRAWING IS TO BE USED AT INTERSECTIONS WITH RADI11 OF 35 FEET OR LESS. DESIGNER IS TO VERIFY THE ENTIRE LENGTH CAN BE CONSTRUCTED WITHIN THE PROPOSED RIGHT-OF-WAY.
- (B) SEE STANDARD DRAWINGS (S-GR-22, S-GR-23, S-GR-23A, S-GR-23B) FOR GUARDRAIL CONNECTION TO BRIDGE RAIL AND CONCRETE BARRIER.
- (C) THE SLOPE FROM THE EDGE OF THE SHOULDER INTO THE FACE OF GUARDRAIL SHOULD NOT BE STEEPER THAN 10(H):1(V).
- (D) SEE STANDARD DRAWINGS (S-GR-12, S-GR-13, S-GR-13A, S-GR-14) FOR POSTS, RAIL, AND HARDWARE STANDARDS FOR CONSTRUCTION.
- (E) USE APPROPRIATE END TERMINAL PER STANDARD DRAWINGS (S-GR-19, S-GR-26, S-GR-43).
- (F) FOR THE 8'-6" RADIUS, FIVE POSTS ARE REQUIRED INCLUDING THE POST AT POINT B.
- (G) THE CLEAR AREA BEHIND THE GUARDRAIL SHALL REMAIN UNOBSTRUCTED AND UNENCUMBERED TO ALLOW THE GUARDRAIL TO FUNCTION PROPERLY. OBSTACLES (I.E., ENDWALLS, STIONS, DITCHES, ETC.) WITHIN THIS AREA MUST BE REMOVED, RELOCATED, OR REDESIGNED.
- (H) W-BEAMS SHALL BE SHOP BENT AS REQUIRED.
- (I) LIMIT OF CURVED GUARDRAIL IS FROM POINT A TO POINT B.
- (J) FEWER CRT POSTS ARE REQUIRED FOR SMALLER RADI11; INCLUDE CRT POST AT POINT B. ATTACH GUARDRAIL TO POST WITH A 5/16" X 9" LONG BOLT, A 3/4" I.D. X 7/2" SHOD FITTING INSERT AND A 1/2" WASHER WITH NUT ON BACK OF POST.
- (K) THE FLAT WASHER IS USED UNDER THE NUT, BEHIND THE POST ONLY. NO WASHER IS USED AT THE RAIL.



- REV. 6-1-09: ADDED GENERAL NOTE ⑤ UNDER ②
- REV. 7-19-10: DELETED GENERAL NOTE ⑤
- REV. 10-26-92: CHANGED SHEET NO. (D) JAMES DIMENSION AND QUANTITIES FOR ONE ENDWALL TABULATED BLOCK.
- REV. 12-29-92: REDRAWN, RENAMED SHEET NUMBER FROM D-FE-80(1) TO D-FE-80(2) TO REFLECT UPDATE TO TYPE "50" ENDWALL QUANTITIES IN THE TABULATED BLOCK.
- REV. 5-27-94: ADDED ALTERNATE DRILLED - IN ANCHORS, SPECIFICATION TO TT-E-489J.
- REV. 5-27-99: CHANGED PAINT SPECIFICATION TO TT-E-489J.
- REV. 3-30-00: MODIFIES TOE ANCHORS TO CLASS "A" CONCRETE QUANTITIES.
- REV. 5-27-01: CHANGED ENDWALL ALTERNATE NOTE.
- REV. 5-27-01: CHANGED DESCRIPTION FOR ITEM NO. 611-07-03.

- REV. 11-15-05: SHEET EXHIBIT NO. (D) JAMES DIMENSION AND QUANTITIES FOR ONE ENDWALL TABULATED BLOCK.
- REV. 12-29-92: REDRAWN, RENAMED SHEET NUMBER FROM D-FE-80(1) TO D-FE-80(2) TO REFLECT UPDATE TO TYPE "50" ENDWALL QUANTITIES IN THE TABULATED BLOCK.



ALTERNATE DRILLED IN ANCHORS

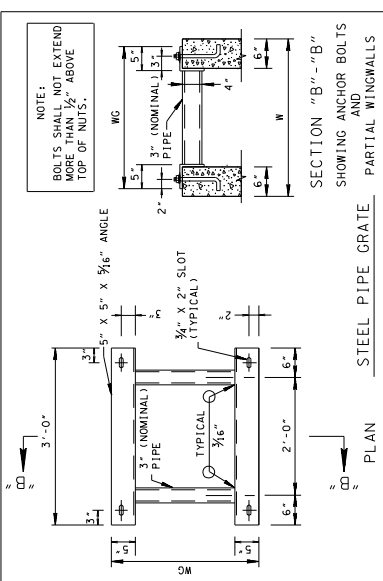
CERTIFICATION: THE CONTRACTOR SHALL FURNISH CERTIFIED ANCHOR PULL OUT DATA FROM AN INDEPENDENT TESTING LABORATORY USING CLASS "A" CONCRETE AS PRESCRIBED BY TENNESSEE HIGHWAY SPECIFICATIONS. THE REQUIRED ULTIMATE LOAD FOR 3/8" DIAMETER ANCHORS IS 11,000 POUNDS.

IN PLACE REQUIREMENTS: SURFET 3/4" TO 1/2" AND TORQUED WITH STEEL PIPE GRATE IN PLACE TO AN EQUIVALENT DIRECT PULL OUT LOAD 60 PERCENT OF REQUIRED ULTIMATE LOAD. SLIPPAGE SHALL NOT EXCEED 1/4". THE DEPARTMENT WILL PERFORM TESTING OF ANCHORS ON SITE TO INSURE THE REQUIRED IN PLACE REQUIREMENTS ARE MET. THIS TESTING AND TESTING REQUIREMENTS MUST BE CORRECTED AT THE CONTRACTOR'S EXPENSE.

THE SAFETY ENDWALL SHOWN ON STANDARD DRAWING D-SEW-60C MAY BE SUBSTITUTED FOR THIS SAFETY ENDWALL. BOTH THESE ENDWALLS ARE TO BE USED FOR SIDEDRAINS ONLY.

GENERAL NOTES

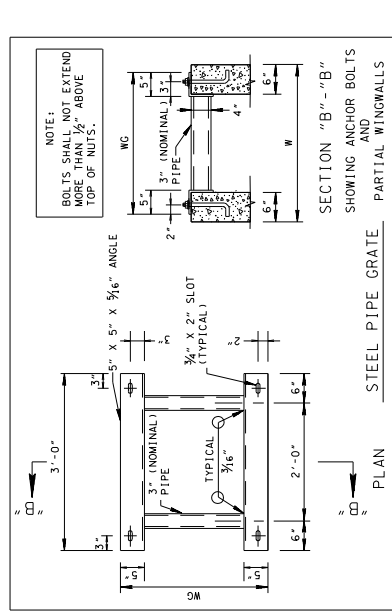
- ① CAST-IN-PLACE CONCRETE ENDWALLS SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD SPECIFICATIONS. SECTION 611 AND/OR SPECIAL PROVISIONS.
- ② THE MATERIALS, WELDING AND PAINTING FOR STRUCTURAL STEEL GRATE SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS:
 - ① STEEL PIPE: ASTM A53, TYPE E OR S, GRADE A OR B, WEIGHT CLASS STANDARD, SCHEDULE 40 (WALL THICKNESS 0.2161") FOR 15" THRU 24" DIAMETER PIPE CULVERT, ASTM A53, TYPE E OR S, WEIGHT CLASS STANDARD, SCHEDULE 40 (WALL THICKNESS 0.2161") FOR 30" THRU 48" DIAMETER PIPE CULVERT.
 - ② WELDING: WELDING SPECIFICATIONS D-1, LATEST EDITION AS MODIFIED BY CURRENT ASHTO STANDARD SPECIFICATIONS FOR THE WELDING OF STRUCTURAL STEEL HIGHWAY BRIDGES AND SUBSEQUENT ASHTO WELDING.
 - ③ THE GRATE SHALL BE PAINTED BLACK, FEDERAL SPECIFICATION TT-E-489J, AFTER FABRICATION.
- ③ THE MATERIAL AND GALVANIZING FOR BOLTS, NUTS AND WASHERS SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS:
 - ① BOLTS, NUTS AND WASHERS: ASTM A307
 - ② GALVANIZING: ASTM A153
- ④ THE COST OF FURNISHING BOLTS, NUTS AND WASHERS, INCLUDING ALL MATERIALS, LABOR AND INCIDENTALS NECESSARY TO COMPLETE THE INSTALLATION, SHALL BE INCLUDED IN THE PRICE BID FOR PIPE ENDWALL.
- ⑤ PRECAST UNIT NOTE: THE CONTRACTOR MAY, WITH PERMISSION FROM THE ENGINEER, SUBSTITUTE PRECAST ENDWALLS FOR CAST-IN-PLACE ENDWALLS PROVIDED THAT:
 - ① APPROPRIATE SIZING AND LOCATION OF THE FOUR (4) LIFTING INSERTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO MATCH ALL LIFTING INSERT HOLES AND PLACE A MINIMUM OF ONE (1) INCH OF COVER OVER THE HARDWARE OF THESE DEVICES ON BOTH TOP AND BOTTOM SURFACES.
 - ② THROUGH ENDWALL ARE CAST TWO INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE PROPOSED PIPE.
 - ③ PAYMENT FOR PRECAST ENDWALLS BASED ON THE QUANTITIES FOR CAST-IN-PLACE ENDWALLS IS ACCEPTABLE.
- ⑥ CONCRETE: 611, 500 POUNDS PER SQUARE YARD MINIMUM 18 DAYS. REINFORCING STEEL: ASTM A603, 60,000 POUNDS PER SQUARE INCH. ALL REINFORCING STEEL IS TO BE INSTALLED AS DETAILED ON THIS STANDARD DRAWING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPLACEMENT OF ALL DAMAGED ENDWALL UNITS AT HIS EXPENSE. RESPONSIBILITY OF THE CONTRACTOR TO REPLACE DAMAGED ENDWALL UNITS AT HIS EXPENSE.
- ⑦ PAYMENT FOR CAST-IN-PLACE ENDWALLS SHALL BE CUBIC YARD. ITEM NUMBER 611-07-01. CLASS "A" CONCRETE (PIPE ENDWALLS)----POUND. ITEM NUMBER 611-07-02. STEEL BAR REINFORCING (PIPE ENDWALLS)----POUND. ITEM NUMBER 611-07-05. STRUCTURAL STEEL (PIPE ENDWALLS)----POUND.



DIMENSIONS AND QUANTITIES FOR ONE ENDWALL

PIPE CULVERT DIA.	CONCRETE ENDWALL DIMENSIONS				STRUCTURAL STEEL GRADE DIMENSIONS AND QUANTITY		ESTIMATED QUANTITIES			
	H	L1	L2	L3	W	WC	NO.	RECD.		
15"	3'-1 3/4"	14'-0"	12'-2"	1'-0"	2'-10"	2'-7"	3	1-55	203	266
18"	3'-3 3/4"	15'-0"	13'-2 3/4"	1'-0"	3'-1"	2'-10"	3	1-78	222	277
24"	3'-9 1/4"	18'-0"	16'-2 3/4"	1'-0"	3'-8"	3'-5"	4	2-49	292	405
30"	4'-5 1/4"	22'-0"	20'-3 3/4"	1'-0"	4'-3"	4'-0"	5	3-55	403	898
36"	5'-1 1/4"	26'-0"	24'-4"	1'-2"	4'-10"	4'-7"	6	4-82	521	1,207
42"	5'-9 1/4"	30'-0"	28'-4 3/4"	1'-2 1/2"	5'-5"	5'-2"	7	6-27	653	1,560
48"	5'-11 1/4"	31'-0"	29'-5"	1'-2 3/4"	6'-0"	5'-9"	7	6-91	707	1,712

REV. 7-19-10: DELETED GENERAL NOTE ①
 REV. 4-15-05: MODIFIED REINFORCING STEEL IN HEADWALLS TO BE PLACED ACCORDING TO TABLE. GENERAL NOTE ② UNDER ①
 REV. 5-27-01: CHANGED DESCRIPTION FOR ITEM NO. 1 TO READ "CONCRETE ENDWALL WITH REINFORCING STEEL". NOTE ③ ADDED SUB-SECTION TO ITEM NO. 1. GENERAL NOTE ④ UNDER ①



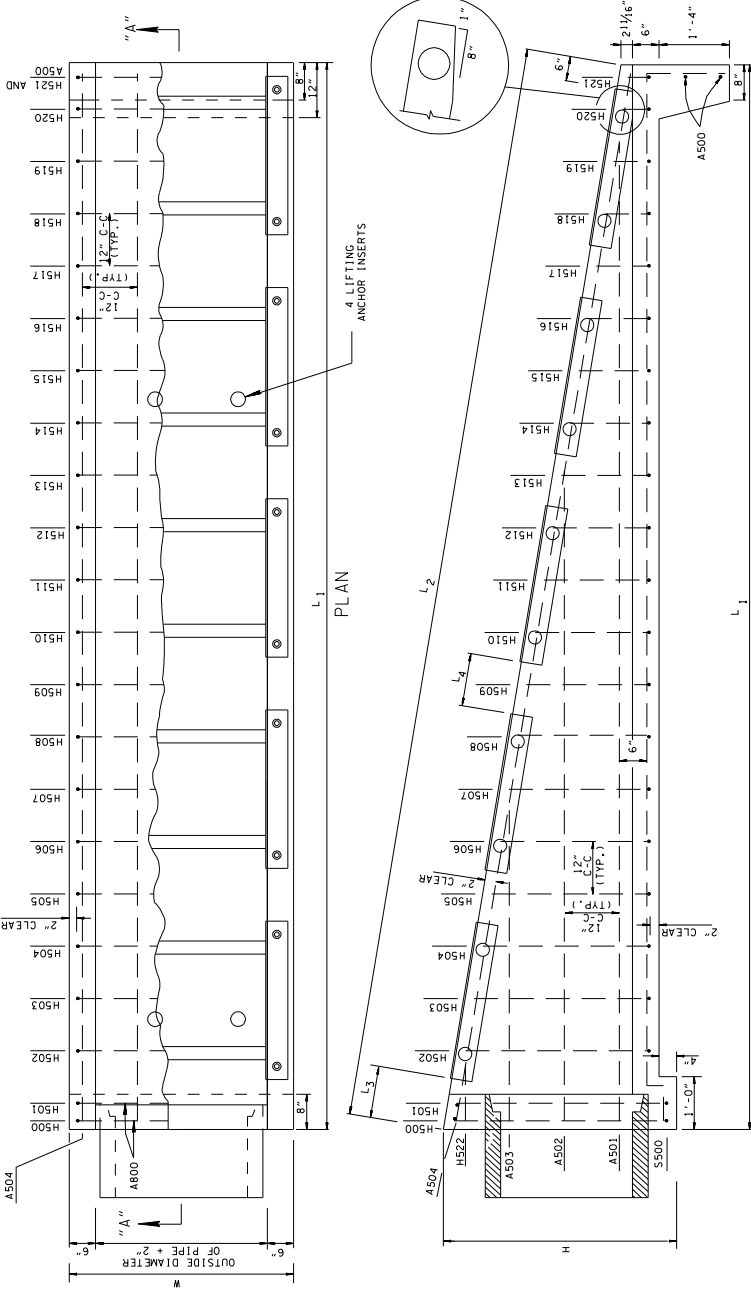
- GENERAL NOTES**
- CAST-IN-PLACE CONCRETE ENDWALLS SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD SPECIFICATIONS, SECTION 611 AND/OR SPECIAL PROVISIONS.
 - THE MATERIALS, WELDING AND PAINTING FOR STRUCTURAL STEEL GRADE SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS:
 - STEEL GRADE: ASTM A53, TYPE E OR S, GRADE A OR B, WEIGHT CLASS STANDARD, SCHEDULE 40
 - WELDING: E70XX (TYPICAL) FOR 1/2" THRU 24" DIAMETER PIPE; E60XX (TYPICAL) FOR 30" THRU 48" DIAMETER PIPE
 - PAINTING: AS SPECIFIED IN SECTION 01111 (LATEST EDITION) AS MODIFIED BY CURRENT ASSTO STANDARD SPECIFICATIONS FOR THE WELDING OF STRUCTURAL STEEL HIGHWAY BRIDGES AND SUBSEQUENT ASHRO
 - THE GRADE SHALL BE PAINTED BLACK, FEDERAL SPECIFICATION T1E-4893, AFTER FABRICATION.
 - THE MATERIAL AND GALVANIZING FOR BOLTS, NUTS AND WASHERS SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS:
 - BOLTS, NUTS AND WASHERS: ASTM A307
 - GALVANIZING: ASTM A153
 - THE COST OF FURNISHING BOLTS, NUTS AND WASHERS, INCLUDING ALL MATERIALS, LABOR AND INCIDENTALS NECESSARY TO COMPLETE THE INSTALLATION, SHALL BE INCLUDED IN THE PRICE BID FOR PIPE ENDWALL.
 - PRECAST UNIT NOTE: THE CONTRACTOR MAY, WITH PERMISSION FROM THE ENGINEER, SUBSTITUTE PRECAST ENDWALLS FOR CAST-IN-PLACE ENDWALLS PROVIDED THAT:
 - THE CONTRACTOR SHALL OBTAIN THE LOCATION OF THE FOUR (4) LIFTING INSERTS SHALL BE THE RESPONSIBILITY OF THE FABRICATOR TO ASSURE BALANCED HANDLING DURING INSTALLATION OF THE PRECAST ENDWALL
 - THE CONTRACTOR TO PATCH ALL LIFTING INSERT HOLES AND PLACE A MINIMUM OF ONE (1) INCH OF COVER OVER PROPOSED PIPE.
 - PIPE OPENINGS THROUGH HEADWALL ARE CAST TWO INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE PROPOSED PIPE.
 - PAINT FOR PRECAST ENDWALLS BASED ON THE QUANTITIES FOR CAST-IN-PLACE ENDWALLS IS ACCEPTABLE.

CONCRETE: 254,500 POUNDS PER SQUARE FOOT MINIMUM AT 98 DAYS
 REINFORCING STEEL: ASTM A615, TYPE 60, 48" DIA. MINIMUM PER SQUARE FOOT
 ALL REINFORCING STEEL IS TO BE INSTALLED AS DETAILED ON THIS STANDARD DRAWING.
 CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF ALL REINFORCING STEEL.
 RESPONSIBILITY OF THE CONTRACTOR TO REPAIR DAMAGED ENDWALL UNITS AT HIS EXPENSE.
 PAYMENT SHALL BE FOR THE FOLLOWING: CLASS "A" CONCRETE (PIPE ENDWALLS)-----CUBIC YARD.
 ITEM NUMBER 611-07-02, STEEL BAR REINFORCING (PIPE ENDWALLS)-----POUND.
 ITEM NUMBER 611-07-05, STRUCTURAL STEEL (PIPE ENDWALLS)-----POUND.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

STATE OF TENNESSEE DEPARTMENT OF TRANSPORTATION
 CONCRETE ENDWALL TYPE "SD" WITH STEEL PIPE GRADE FOR 18" THRU 30" PIPES - 6:1 SLOPE
 5-15-00 D-SEW-6DC

THIS ENDWALL MAY BE USED FOR SIDEDRAINS IN LIEU OF THE SAFETY ENDWALL SHOWN ON STANDARD DRAWING D-SEW-6DA. IT IS TO BE USED FOR SIDEDRAINS ONLY.

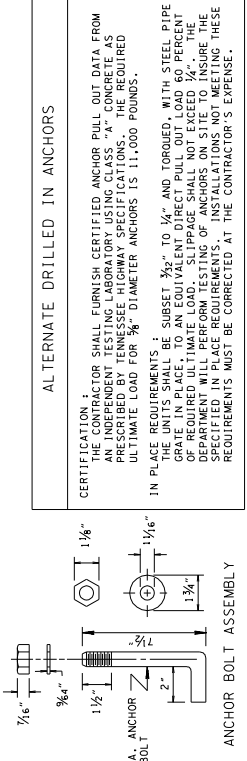


SECTION "A" - "A"

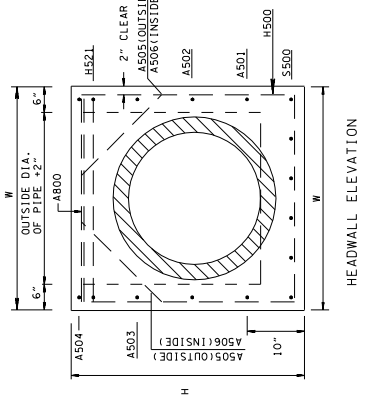
DIMENSIONS AND QUANTITIES FOR ONE ENDWALL

PIPE CULV. DIA.	CONCRETE ENDWALL DIMENSIONS			STRUCTURAL STEEL GRADE DIMENSIONS			ESTIMATED QUANTITIES					
	H	L ₁	L ₂	L ₃	L ₄	W	WG	NO.	REQU.	CU. YD.	STEEL BAR WEIGHT, LB.	CONCRETE WEIGHT, LB.
18"	3'-2"	12'-8"	12'-10 1/2"	1'-4 1/8"	1'-0"	3'-1"	2'-10"	3	1.84	238	277	
24"	3'-9"	16'-2"	16'-4 1/8"	0'-10 1/8"	1'-0"	3'-8"	3'-5"	4	2.57	360	405	
30"	4'-5"	20'-2"	20'-5 3/8"	0'-11 3/8"	1'-0"	4'-3"	4'-0"	5	3.64	491	898	

SEE D-SEW-600 FOR BILL OF STEEL.



ANCHOR BOLT ASSEMBLY



HEADWALL ELEVATION

REV. 7-28-84: CHANGED MATERIAL SPECIFICATIONS FOR STRUCTURAL STEEL, PIPES AND PAINT SPECIFICATIONS.

REV. 5-26-86: CHANGED FEDERAL PAINT SPECIFICATION.

REV. 5-27-87: REMOVED SHEET NUMBER FROM D-PE-12 TO D-PE-10 TO CHANGE ENWALLED SPECIFICATIONS IN THE GENERAL AND ESTIMATED QUANTITIES IN THE DIMENSION AND QUANTITY IN ITEM NO. 18.

REV. 10-26-88: IN GENERAL, NOTE CHANGED MINIMUM WALL THICKNESS FROM 0.28" TO 0.216".

REV. 1-19-97: CHANGED WEIGHT OF STRUCTURAL STEEL GRATES.

REV. 5-27-99: CHANGED PAINT SPECIFICATION TO 11-E-489J.

REV. 4-15-00: MODIFIED THE WALL AND CLASS "A" CONCRETE QUANTITIES.

REV. 5-27-01: CHANGED CLASSIFICATION FOR ITEM NO. 18.

REV. 5-1-03: ADDED GENERAL NOTE ⑥.

REV. 7-19-10: DELETED GENERAL NOTE ⑥.

GENERAL NOTE

① CONCRETE ENDWALL SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD SPECIFICATIONS, SECTION 611 AND/OR SPECIAL PROVISIONS.

② THE MATERIALS, WELDING AND PAINTING FOR STRUCTURAL STEEL GRATE SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS:

③ ANGLES: ASTM A36

④ STEEL PIPE: ASTM A53, TYPE E OR S, GRADE A OR B, SCHEDULE 40

⑤ WELDING: AWS SPECIFICATIONS D1.1 (LATEST EDITION), AS MODIFIED BY CURRENT AASHTO STANDARD SPECIFICATIONS FOR THE WELDING OF STRUCTURAL STEEL HIGHWAY BRIDGES AND SUBSEQUENT AASHTO SPECIFICATIONS-BRIDGES. MATERIALS SHALL BE PAINTED BLACK, FEDERAL SPECIFICATION TT-E-489J, AFTER FABRICATION.

⑥ THE MATERIAL AND GALVANIZING FOR BOLTS, NUTS AND WASHERS SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS:

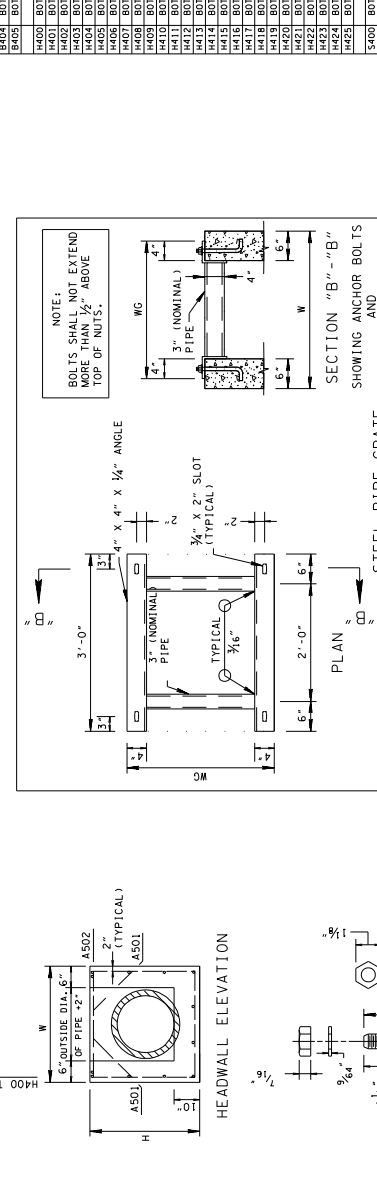
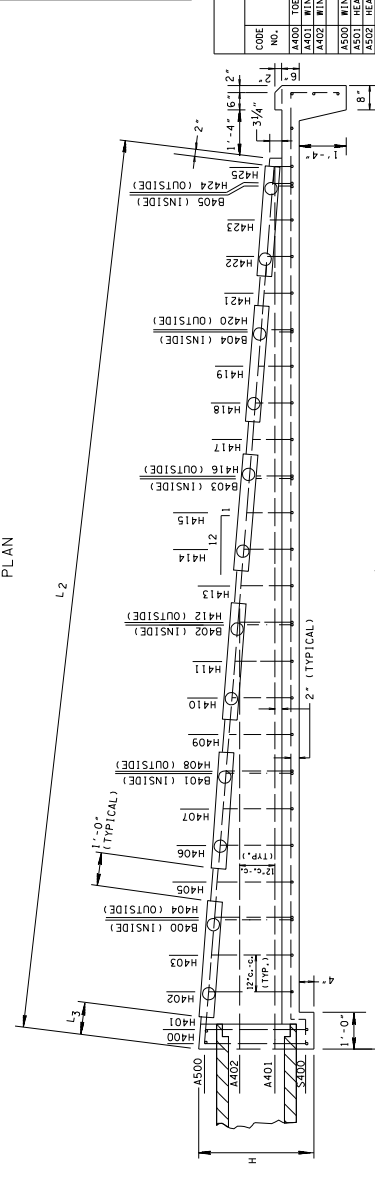
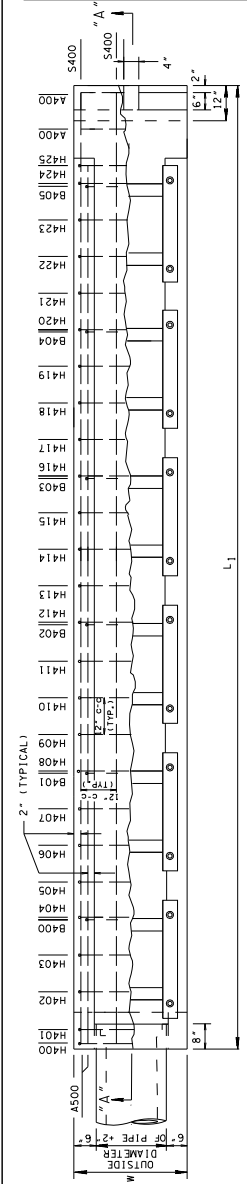
⑦ BOLTS, NUTS AND WASHERS: ASTM A307

⑧ GALVANIZING: ASTM A153

⑨ THE COST OF FURNISHING BOLTS, NUTS AND WASHERS, INCLUDING ALL MATERIALS, LABOR AND INCIDENTALS NECESSARY TO COMPLETE THE INSTALLATION, SHALL BE INCLUDED IN THE PRICE BID FOR PIPE ENDWALL.

⑩ PAYMENT WILL BE MADE UNDER:

ITEM NUMBER 611-07-01, CLASS "A" CONCRETE (PIPE ENDWALLS)-----CUBIC YARD,
 ITEM NUMBER 611-07-02, STEEL BAR REINFORCING (PIPE ENDWALLS)-----POUND,
 ITEM NUMBER 611-07-03, STRUCTURAL STEEL (PIPE ENDWALLS)-----POUND.



B I L L O F S T E E L

CODE NO.	LOCATION	BAR SIZE			BENDING DIMENSIONS			15" PIPE			18" PIPE		
		A	B	C	D	E	F	G	H	I	J	K	L
A400	TOTAL	4	2'-6"		4	2'-6"	2'-9"	2	2'-9"	2	2'-9"	2	2'-9"
A401	MINOR WALLS	4	20'-11"		4	20'-11"	2'-9"	2	2'-9"	2	2'-9"	2	2'-9"
A402	MINOR WALLS	4	8'-11"		4	8'-11"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A403	MINOR WALLS	4	20'-9"		4	20'-9"	2'-9"	4	2'-9"	4	2'-9"	4	2'-9"
A404	MINOR WALLS	5	20'-9"		5	20'-9"	2'-9"	4	2'-9"	4	2'-9"	4	2'-9"
A405	MINOR WALLS	5	1'-8"		5	1'-8"	1'-8"	4	1'-8"	4	1'-8"	4	1'-8"
A406	MINOR WALLS	5	2'-6"		5	2'-6"	2'-9"	2	2'-9"	2	2'-9"	2	2'-9"
A407	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A408	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A409	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A410	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A411	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A412	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A413	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A414	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A415	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A416	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A417	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A418	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A419	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A420	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A421	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A422	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A423	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A424	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A425	MINOR WALLS	4	0'-10"	1'-11"	4	0'-10"	1'-11"	2	1'-11"	2	1'-11"	2	1'-11"
A400	TOTAL	4	22'-0"	0'-4"	4	22'-0"	0'-4"	4	22'-0"	4	22'-0"	4	22'-0"

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

CONCRETE ENDWALL
 TYPE "SD" WITH
 STEEL PIPE GRATE
 FOR 15" AND 18"
 PIPES - 12:1 SLOPE

D-SEW-12D

MINOR REVISION -- FIRM APPROVAL NOT REQUIRED.

DIMENSIONS AND QUANTITIES FOR ONE ENDWALL

PIPE CULV. DIA.	CONCRETE ENDWALL DIMENSIONS				W	NO. REED.	ESTIMATED QUANTITIES			
	H	L1	L2	L3			CLASS "A" CONCRETE CU. YD.	STEEL STRUCT. REINF. LB.		
15"	2'-10 1/4"	23'-0"	21'-0"	1'-10"	2'-10"	2'-5"	5	2.70	302	331
18"	3'-1 1/4"	25'-11"	24'-0"	0'-10"	3'-1"	2'-8"	6	3.30	354	420

TOEWALL ELEVATION

REINFORCING STEEL LEGEND

BAR A: a x b

BAR B: a x b

BAR H: a x b

BAR S: a x b

REV. 9-28-83: REDREW AND ADDED TABLE FOR PIPE ENDWALLS WHEN PIPE IS SKEWED. WHEN REV. 2-19-88: ADDED SAFETY ADJUSTMENTS TO "U" TYPE ENDWALL.

REV. 1-19-94: REDREW DRAWING TO REFLECT ESTIMATED QUANTITIES FOR SKEWED PIPE. REV. 1-19-97: ADDED TABLE FOR SKEWED PIPE. GENERAL NOTE: SEE GENERAL NOTE REMOVED.

TABLE OF DIMENSIONS AND ESTIMATED QUANTITIES FOR ONE STRAIGHT CONCRETE ENDWALL (SKEW 90°)

OPENING		WALL			FOOTING			CONC. IN ONE ENDWALL			C. Y. FOR EACH ADDITIONAL LINE OF PIPE			C. Y. PER FOOT OF LENGTH "L"	
D	AREA	L	H	E	F	G	C. Y.	C. Y.	C. Y.	WALL	FOOTING	TOTAL	WALL	FOOTING	TOTAL
1'-6"	1.77	6'-0"	2'-6"	1'-3"	1'-11"	1'-3"	0.51	0.53	1.04	0.39	0.086	0.185	0.120	0.099	0.219
2'-0"	3.14	8'-0"	3'-0"	1'-4"	2'-0"	1'-4"	0.83	0.79	1.62	0.52	0.120	0.219	0.120	0.121	0.241
2'-6"	4.91	10'-0"	3'-6"	1'-6"	2'-2"	1'-6"	1.29	1.21	2.50	0.74	0.151	0.272	0.151	0.121	0.272

ESTIMATED QUANTITIES FOR TWO STRAIGHT CONCRETE ENDWALLS WHEN PIPE IS SKEWED (CUBIC YARD)

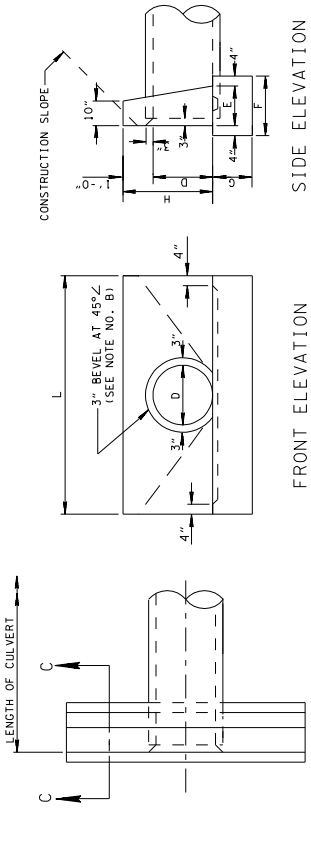
D	SKEW											
	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°
1'-6"	4.15	3.61	3.23	2.93	2.71	2.53	2.39	2.29	2.21	2.15	2.11	2.08
2'-0"	6.45	5.62	5.02	4.56	4.21	3.94	3.73	3.56	3.43	3.34	3.28	3.24
2'-6"	9.96	8.68	7.75	7.05	6.50	6.08	5.75	5.50	5.30	5.16	5.06	5.00

NOTE: WHEN PIPE IS ON A SKEW USE TWO STRAIGHT ENDWALLS AND MAKE "L" EQUAL TO "L". IN TABLE ABOVE DIVIDED BY SINE OF ANGLE OF SKEW.

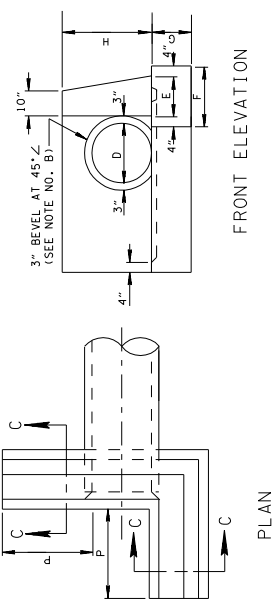
ESTIMATED QUANTITIES FOR ONE "L" TYPE CONCRETE ENDWALL

DIAMETER	P	CONC. C. Y.
1'-6"	2'-3"	1.28
2'-0"	3'-0"	1.91
2'-6"	3'-9"	2.90

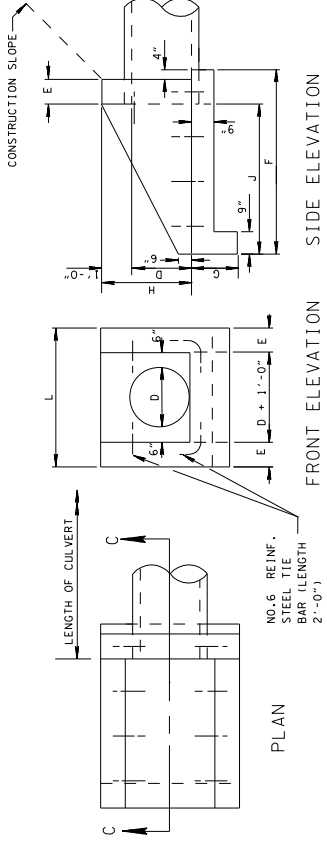
NOTE: DIMENSIONS NOT SHOWN ARE SAME AS FOR STRAIGHT ENDWALL.



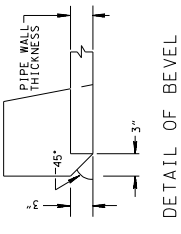
STRAIGHT TYPE CONCRETE ENDWALL



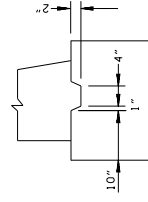
"L" TYPE CONCRETE ENDWALL



"U" TYPE CONCRETE ENDWALL



DETAIL OF BEVEL



SECTION C - C SHOWING CONSTRUCTION JOINT

GENERAL NOTES

- CONCRETE ENDWALL SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD SPECIFICATION, SECTION 611 AND/OR SPECIAL PROVISIONS.
- ALL STRAIGHT AND "U" TYPE CONCRETE ENDWALLS ON INLET END OF PIPE AND AT 90° SKEW SHALL BE BEVELED AT 3" AT 45° ANGLE. BEVEL WILL NOT BE REQUIRED WHEN ENDWALL IS CONSTRUCTED ON THE "BELLED" END OF CONCRETE PIPE.
- WHEN MORE THAN ONE LINE OF PIPE IS REQUIRED THE DISTANCE FROM CENTER TO CENTER OF PIPE SHALL BE $D + 1'-0"$.
- PAYMENT FOR ENDWALLS WILL BE MADE AS FOLLOWS:
ITEM 611-07.01, CLASS 4A CONCRETE (PIPE ENDWALLS)---CUBIC YARD.
ITEM 611-07.02, STEEL BAR REINFORCING (PIPE ENDWALLS)---FOUND.

TABLE OF DIMENSIONS AND ESTIMATED QUANTITIES FOR ONE "U" TYPE CONCRETE ENDWALL (SLOPE 1 1/2 : 1 & 2 : 1)

OPENING		WALL			FOOTING			CONC. IN ONE ENDWALL			C. Y. FOR EACH ADDITIONAL LINE OF PIPE			REINF. PER FOOT OF STEEL LENGTH "L"	
D	AREA	L	H	E	F	G	C. Y.	C. Y.	C. Y.	WALL	FOOTING	TOTAL	WALL	FOOTING	TOTAL
1'-6"	1.77	4'-0"	2'-6"	9"	4'-0"	5'-1"	1'-3"	0.61	0.62	1.23	0.86	0.554	0.225	20	20
2'-0"	3.14	4'-8"	3'-0"	10"	5'-0"	6'-2"	1'-6"	0.86	0.90	1.76	1.16	0.728	0.275	20	20
2'-6"	4.91	5'-2"	3'-6"	10"	6'-0"	7'-2"	1'-6"	1.12	1.14	2.26	0.996	0.328	0.328	20	20

NOTE: USE "U" TYPE ENDWALL SHOWN ON STANDARD DRAWINGS D-PF-4B (FOR 3:1 SLOPES), D-PE-4B (FOR 4:1 SLOPES) AND D-PE-6B (FOR 6:1 SLOPE) WITHOUT GRATES OUTSIDE THE RELAX ZONE.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

STATE OF TENNESSEE DEPARTMENT OF TRANSPORTATION

STRAIGHT, "L" AND "U" TYPE CONCRETE ENDWALL