

Maintenance Advisory

MA 2019-01

August 7, 2019

From Mark Geib, Engineer of Transportation Systems Management and Operations Division

MDOT
Transportation Systems
Management and
Operations Division
6333 Lansing Road
Lansing, MI 48917

For questions regarding
this advisory contact:

Carlos Torres
Crash Barrier Engineer
517-335-2852
torresc@michigan.gov

Discontinued Use of Breakaway Cable Terminals (BCTs)

All BCTs that are damaged are to be replaced with one of the endings shown on the historical standard plan R-61-H (i.e., SRT or FLEAT) or the steel post version of the FLEAT (i.e., FLEAT-SP).

Please disregard any X-Lite information on the plans as they are also discontinued.

MASH-compliant, tangent guardrail terminal (i.e., Type 2M guardrail approach terminals) may be used to replace a damaged BCT under certain conditions. In order to use a Type 2M terminal, it would be necessary to construct a transition section between the existing guardrail (Type B or Type T) and the Type 2M guardrail terminal. The transition sections required for attaching a Type 2M guardrail terminal to Type B or Type T guardrail are depicted in the current R-60 Standard Plans. It will also be necessary to ensure the guardrail length of need is satisfied with the proposed Type 2M guardrail approach terminal. Please consult with the Region/TSC road design staff for assistance with determining the guardrail length of need, current R-60 Standard Plans, or other guardrail design questions

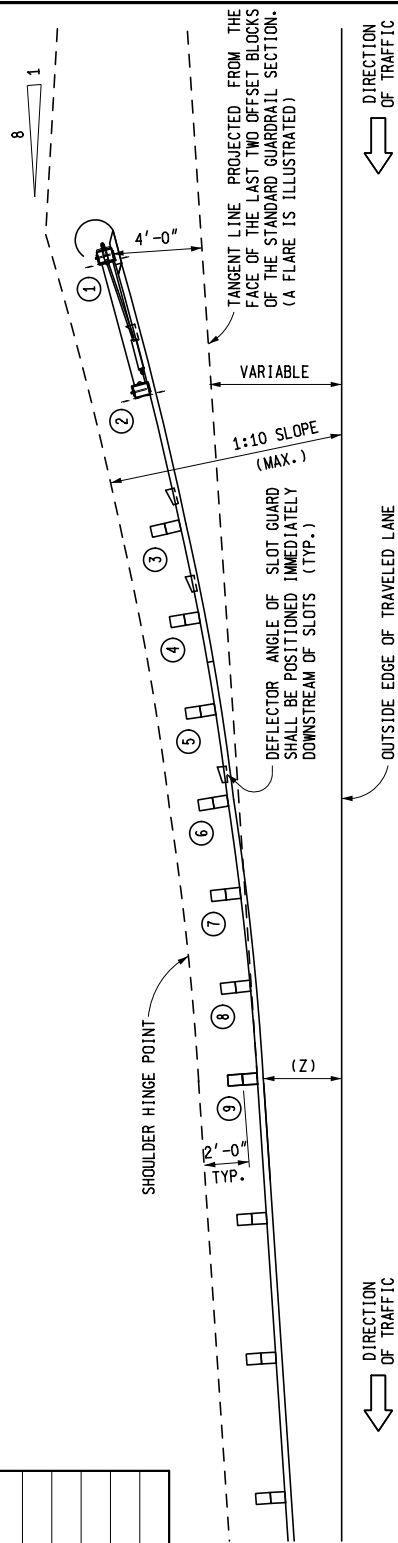
Attached are the following:

- Historical Standard Plan R-61-H (SRT and FLEAT)
- FLEAT-SP manufacturer's drawing (for reference when using the steel post version of the FLEAT)

POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.
 ** FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 19.

POST	** POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	52"
2	37 1/2"
3	33 1/4"
4	26 3/4"
5	21 1/2"
6	17 3/8"
7	14 3/8"
8	12 5/8"
9	12"

SEE END ANCHORAGE ASSEMBLY, SHEET 3

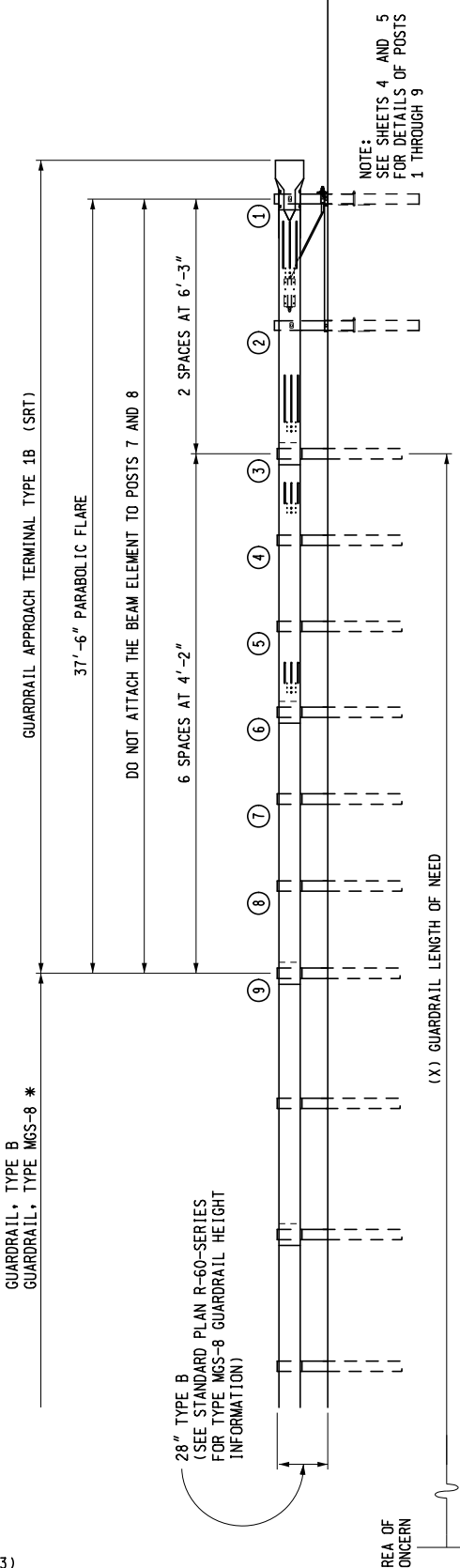


PLAN VIEW

* SEE STANDARD PLAN R-60-SERIES FOR POST SPACING AND GUARDRAIL LAYOUT TO TRANSITION FROM GUARDRAIL, TYPE MGS-8 TO GUARDRAIL APPROACH TERMINAL TYPE 1B

OPTION 1

(DETAILED ON SHEETS 1 THROUGH 7, 12 AND 13)



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1B "SRT"

NOTE:
 SEE SHEETS 4 AND 5 FOR DETAILS OF POSTS 1 THROUGH 9

(X) GUARDRAIL LENGTH OF NEED

AREA OF CONCERN



PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
 Kirk T. Stedule

APPROVED BY: _____ ENGINEER OF DELIVERY

APPROVED BY: _____ ENGINEER OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & W-LITE FLARED)

F.H.W.A. APPROVAL

2-2-2017
 PLAN DATE

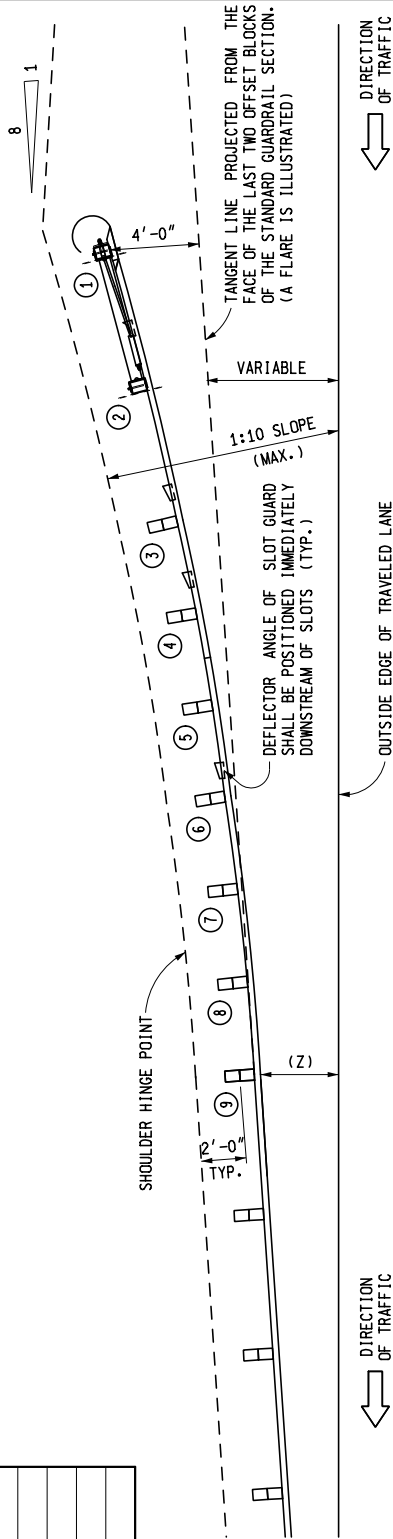
R-61-H

SHEET 1 OF 20

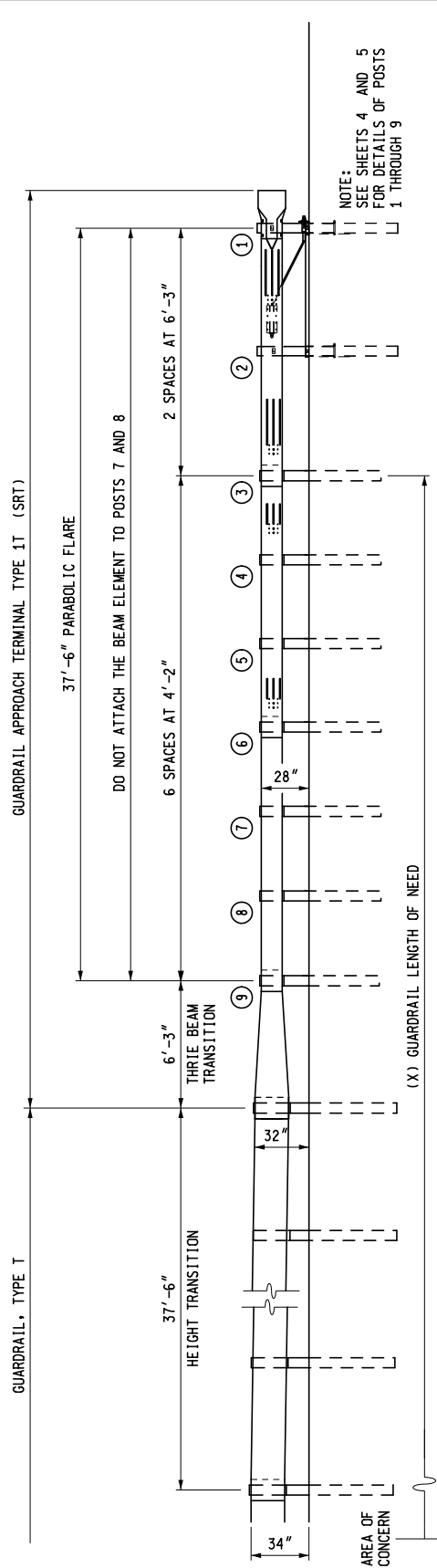
POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.
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POST	** POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	52"
2	37 1/2"
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5	21 1/2"
6	17 3/8"
7	14 3/8"
8	12 5/8"
9	12"

SEE END ANCHORAGE ASSEMBLY, SHEET 3



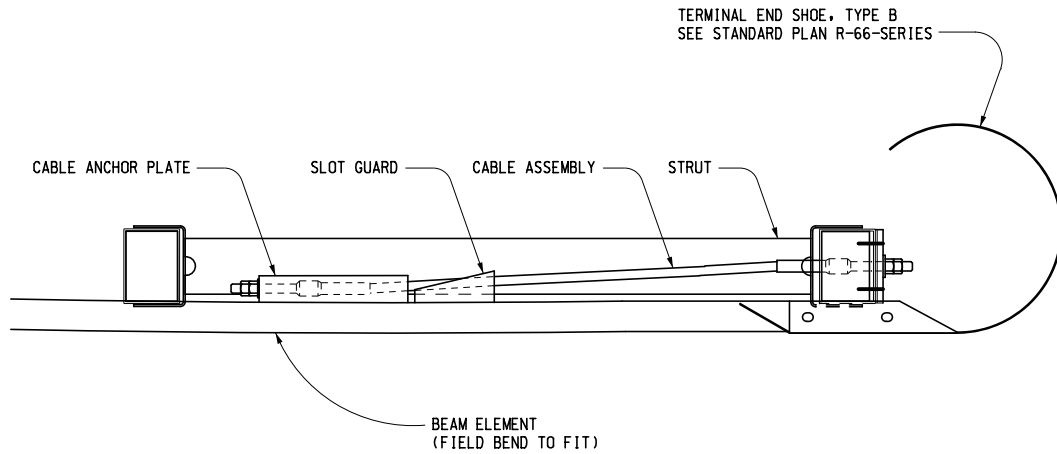
PLAN VIEW



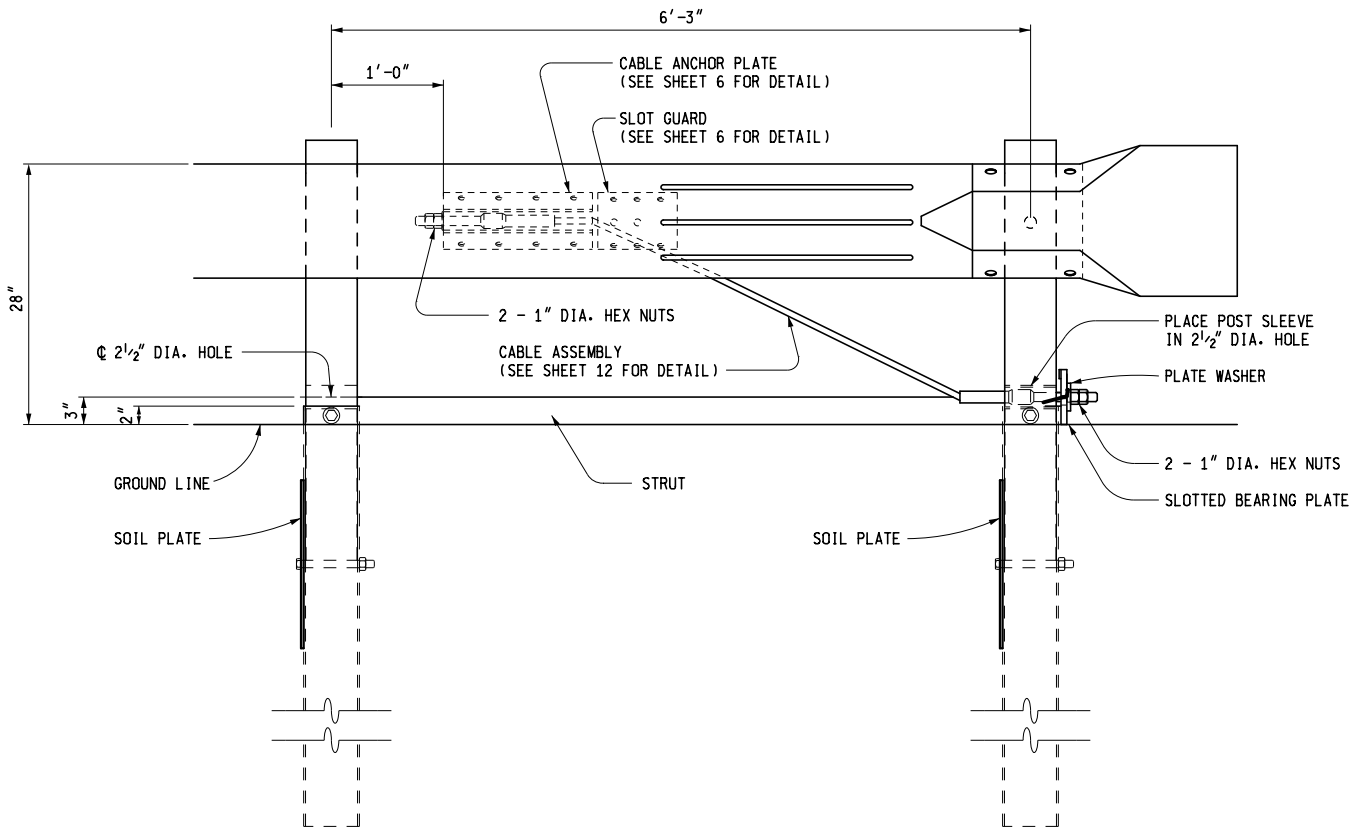
ELEVATION
 GUARDRAIL APPROACH TERMINAL TYPE 1T
 "SRT"

MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF DEVELOPMENT STANDARD PLAN FOR
**GUARDRAIL APPROACH
 TERMINAL TYPES 1B & 1T
 (SRT, FLEAT & X-LIFE FLARED)**

F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 2 OF 20
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PLAN VIEW



ELEVATION

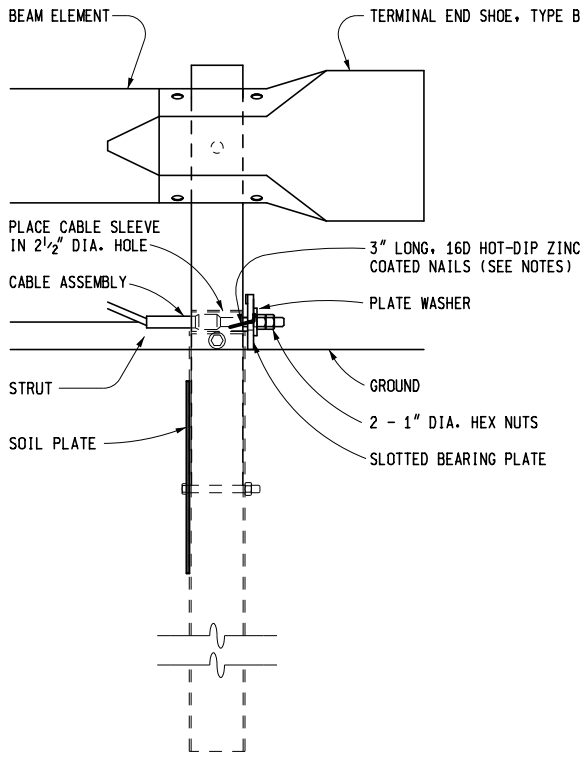
END ANCHORAGE ASSEMBLY
(SRT)

NOTES:

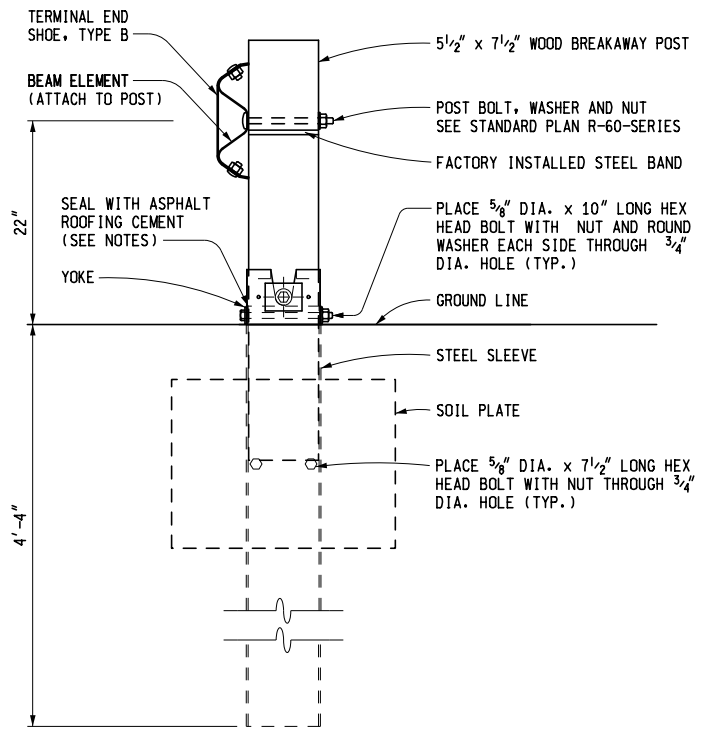
AFTER THE CABLE ASSEMBLY IS TAUT, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

ASPHALT ROOFING CEMENT SHALL BE USED TO SEAL THE PERIMETER AREA BETWEEN THE STEEL SLEEVE (SOIL TUBE) AND THE WOOD BREAKAWAY POST.

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR		
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & K-LITE FLARED)		
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H
		SHEET 3 OF 20

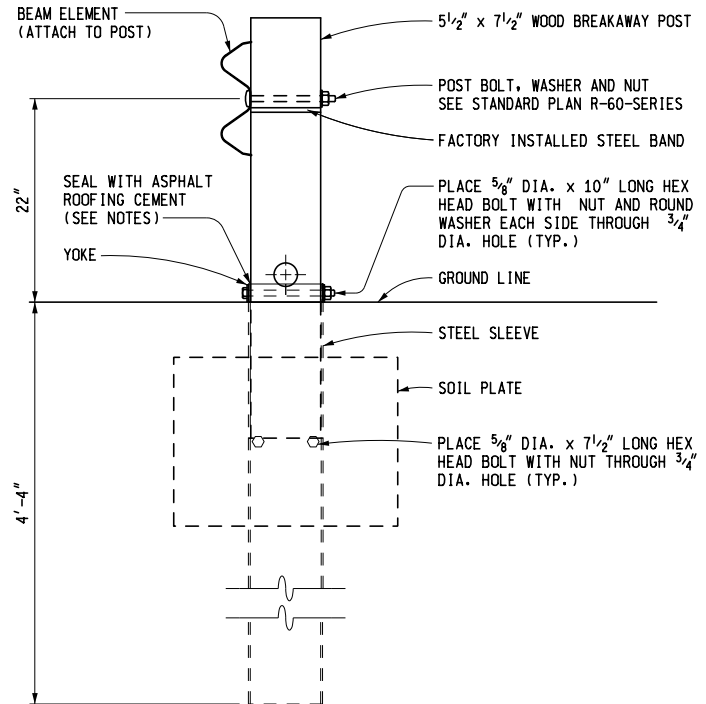


ELEVATION



SIDE

POST 1 DETAIL
(SRT)



POST 2 DETAIL
(SRT)

NOTES:

TWO 3" LONG, 16D HOT-DIP ZINC COATED NAILS SHALL BE DRIVEN INTO THE WOOD POST THROUGH THE HOLES IN THE SLOTTED BEARING PLATE ON POST 1 OF THE "SRT" TO KEEP THE PLATE FROM ROTATING.

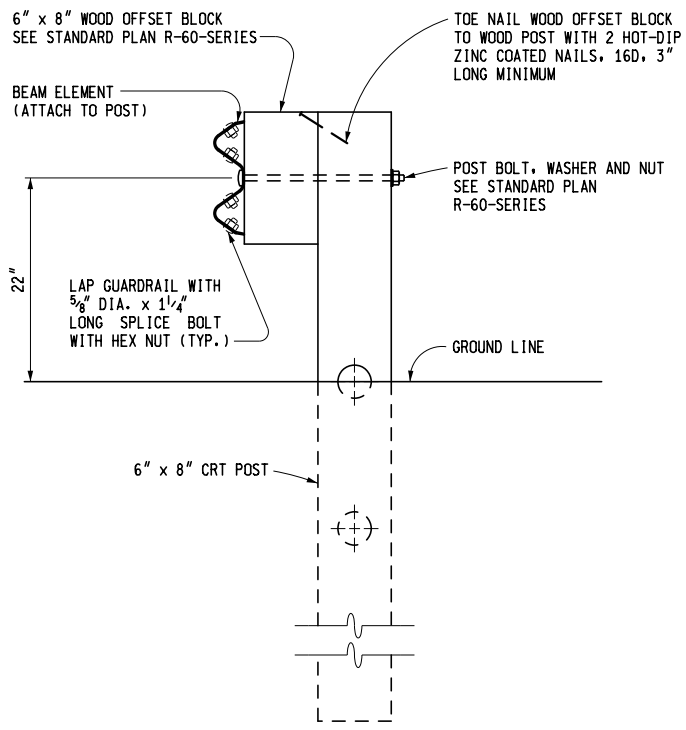
AFTER THE CABLE ASSEMBLY IS TAUT, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

ASPHALT ROOFING CEMENT SHALL BE USED TO SEAL THE PERIMETER AREA BETWEEN THE STEEL SLEEVE (SOIL TUBE) AND THE WOOD BREAKAWAY POST.

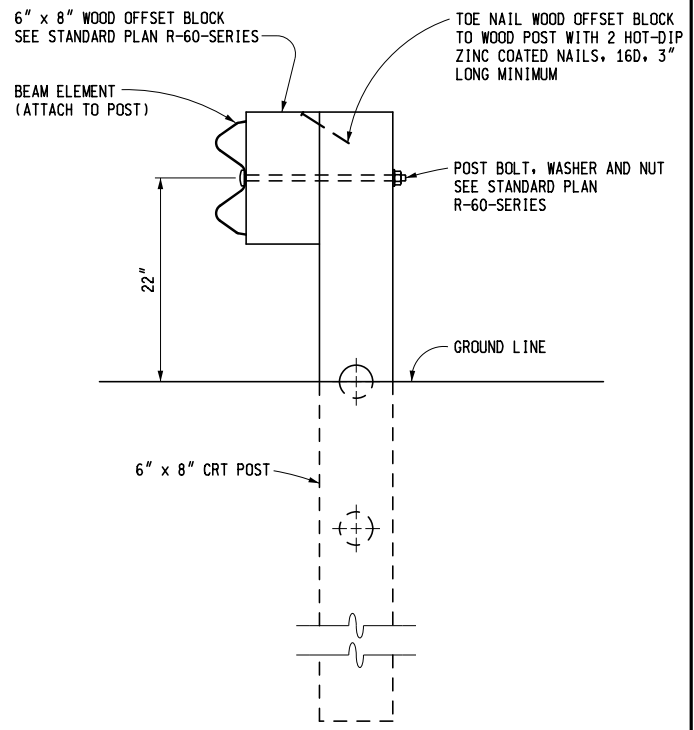
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**GUARDRAIL APPROACH
TERMINAL TYPES 1B & 1T
(SRT, FLEAT & K LIFE FLARED)**

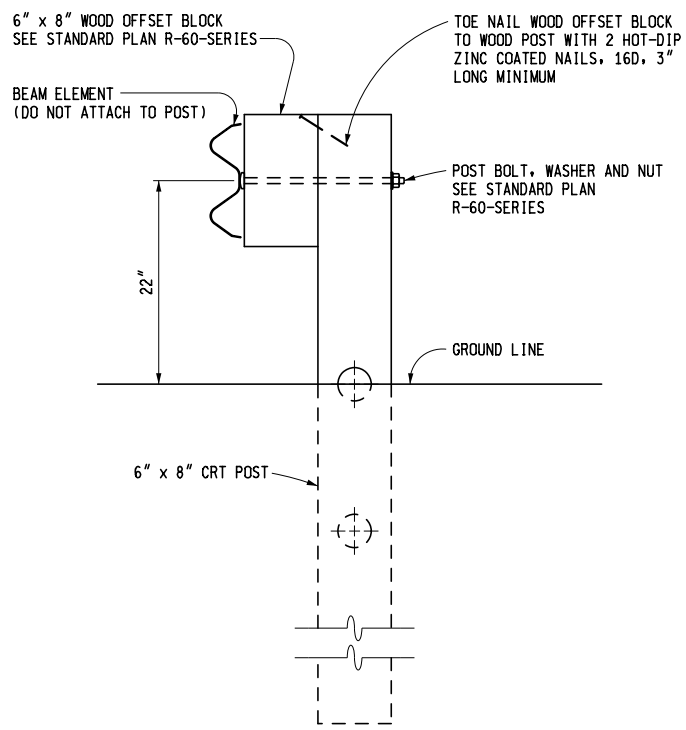
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 4 OF 20
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POST 3 AND 6 DETAIL
(SRT)



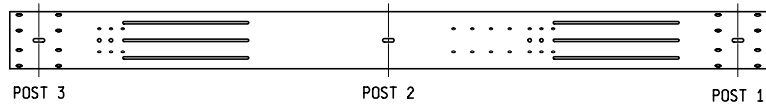
POST 4 AND 5 DETAIL
(SRT)



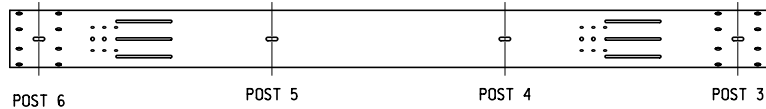
POST 7 AND 8 DETAIL
(SRT)

NOTE:
POST 9 IS A STANDARD LINE POST.

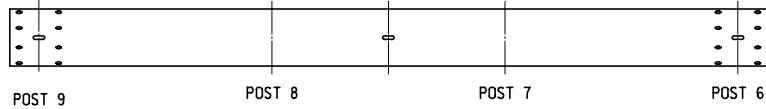
MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & K-LITE FLARED)		
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H
		SHEET 5 OF 20



SLOTTED RAIL BEAM ELEMENT #1 *
(POST 1 THROUGH 3)
(SRT)



SLOTTED RAIL BEAM ELEMENT #2 *
(POST 3 THROUGH 6)
(SRT)



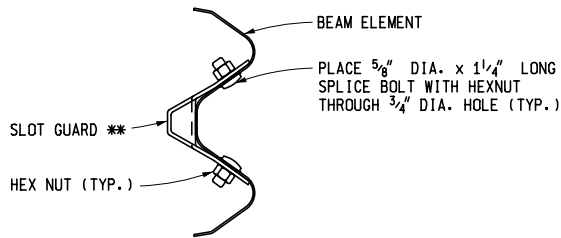
BEAM ELEMENT #3
(POST 6 THROUGH 9)
(SRT)

* INSTALL THE SLOTTED RAIL BEAM ELEMENTS IN THE ORDER AND ORIENTATION DETAILED ABOVE SO THAT THE SLOT GUARD ATTACHMENT HOLES ARE ON THE DOWNSTREAM END (AWAY FROM POST 1) OF THE ELONGATED SLOTS.

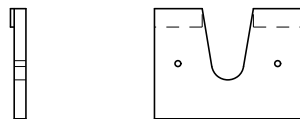
** PLACE THE SLOT GUARD SO THAT THE DEFLECTOR ANGLE GAP OPENS IN THE DIRECTION FACING THE ADJACENT SLOTS AND POST 1.



SLOT GUARD DETAILS
(SRT)



SLOT GUARD ASSEMBLY DETAIL **
(SRT)



SLOTTED BEARING PLATE
(SRT)

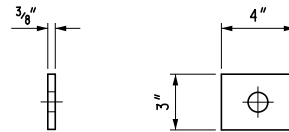
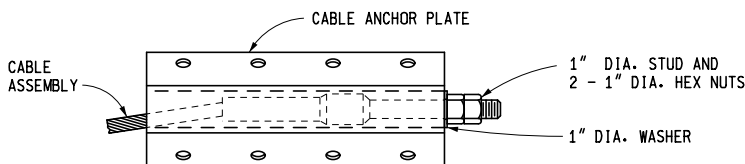
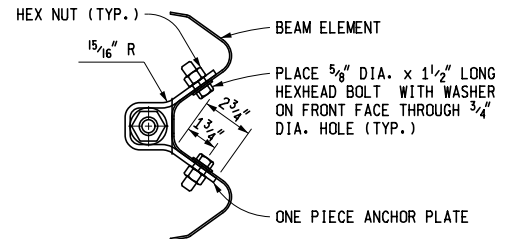


PLATE WASHER
(SRT)



CABLE ANCHOR PLATE DETAILS
(SRT)



NOTES:

ALL "SRT" ITEMS ILLUSTRATED WITHOUT DIMENSIONS SHALL BE ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

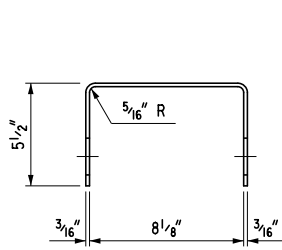
**GUARDRAIL APPROACH
TERMINAL TYPES 1B & 1T
(SRT, FLEAT ~~Q & Y LIFE FLARED~~)**

F.H.W.A. APPROVAL

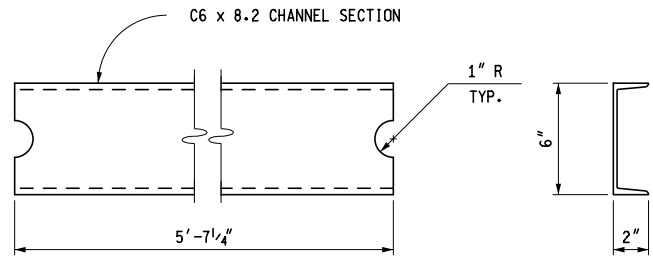
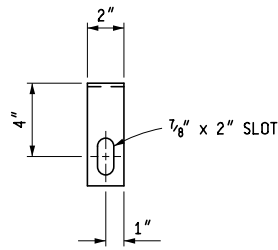
2-2-2017
PLAN DATE

R-61-H

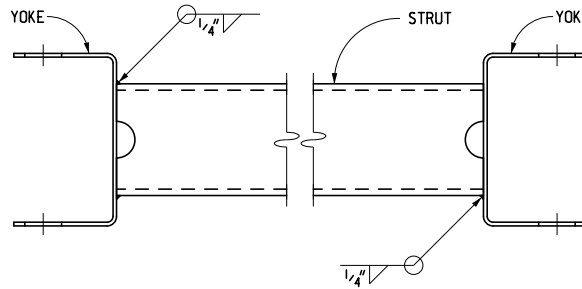
SHEET
6 OF 20



YOKE DETAIL



STRUT DETAIL



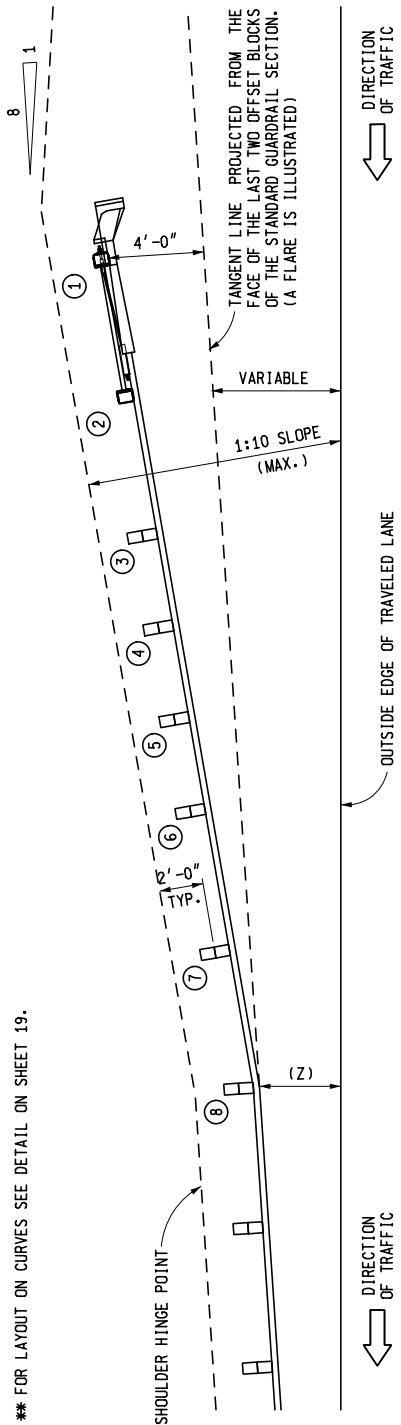
ASSEMBLY DETAIL

STRUT AND YOKE ASSEMBLY
(SRT)

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR		
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT AND X-LITE FLARED)		
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H
		SHEET 7 OF 20

POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.
 ** FOR LAYOUT ON CURVES SEE DETAIL ON SHEET 19.

POST	** POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	52"
2	44"
3	44"
4	38 11/16"
5	33 5/16"
6	28"
7	20"
8	12"

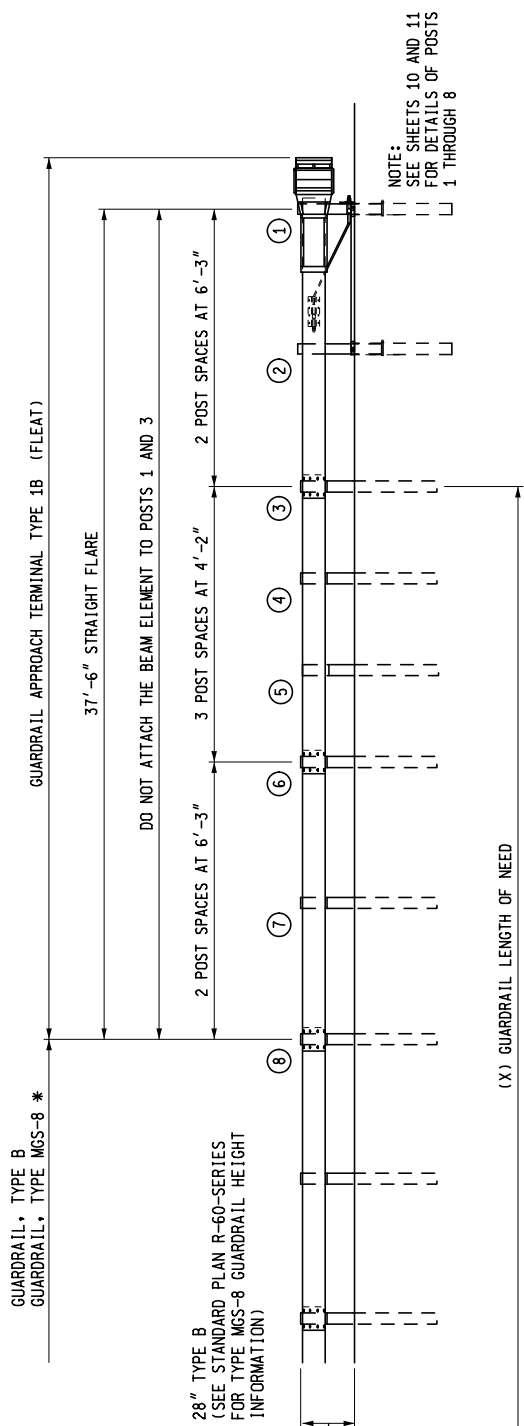


PLAN VIEW

* SEE STANDARD PLAN R-60-SERIES FOR POST SPACING AND GUARDRAIL LAYOUT TO TRANSITION FROM GUARDRAIL, TYPE MGS-8 TO GUARDRAIL APPROACH TERMINAL TYPE 1B

OPTION 2

(DETAILED ON SHEETS 8 THROUGH 13)



ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1B "FLEAT"

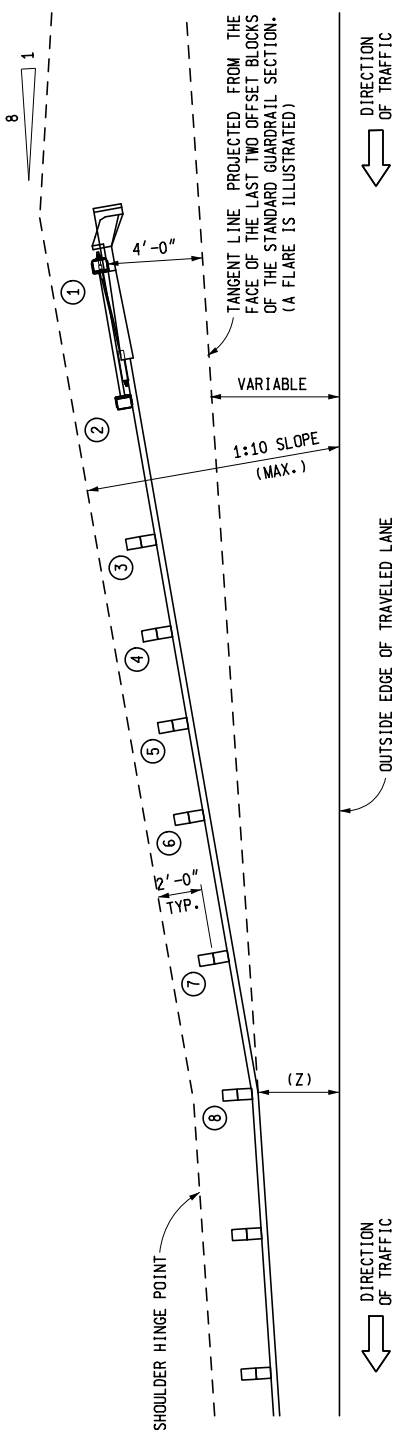
MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF DEVELOPMENT STANDARD PLAN FOR

GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & K-LITE FLARED)

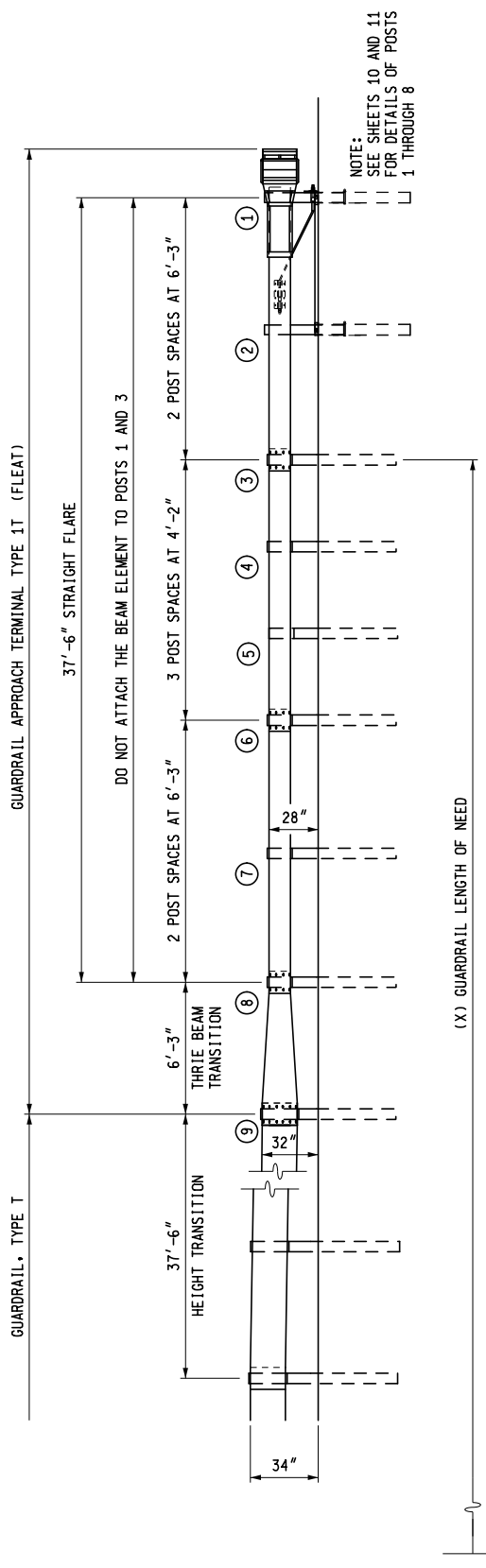
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 8 OF 20
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POSTS ARE TO BE SET APPROXIMATELY TANGENT TO THE BEAM ELEMENT AT EACH POST LOCATION.
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POST	** POST OFFSET DISTANCE (FROM TANGENT LINE TO CENTER OF POST)
1	52"
2	44"
3	44"
4	38 11/16"
5	33 5/16"
6	28"
7	20"
8	12"



PLAN VIEW



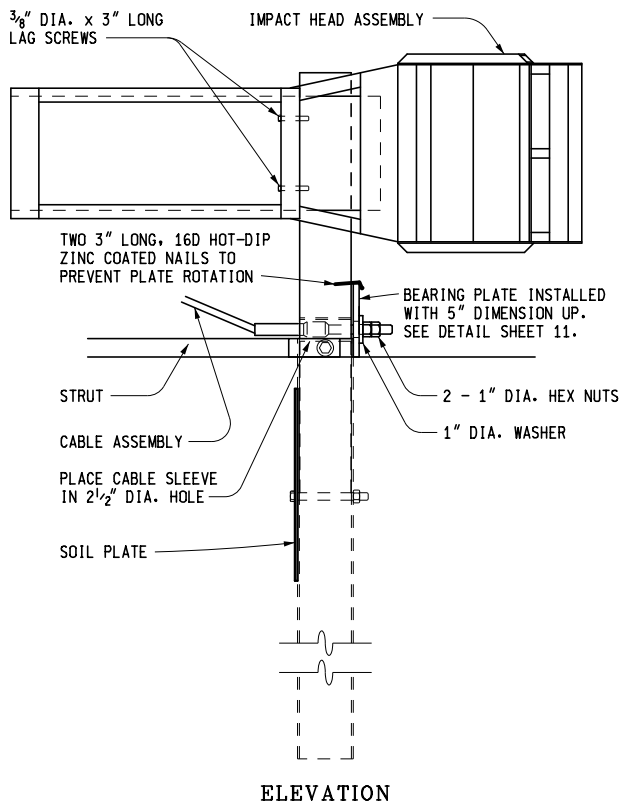
ELEVATION

GUARDRAIL APPROACH TERMINAL TYPE 1T
 "FLEAT"

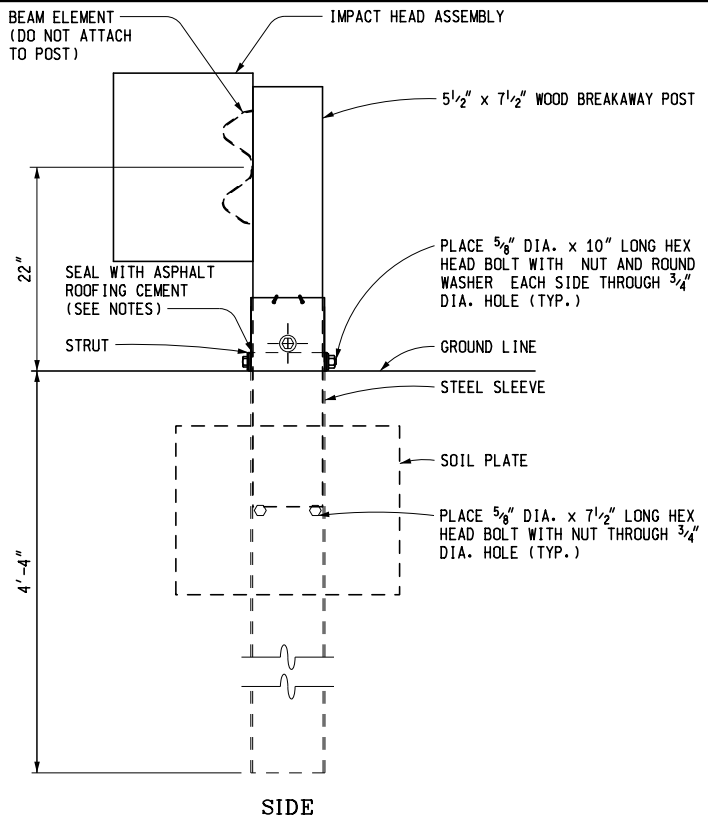
MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**GUARDRAIL APPROACH
 TERMINAL TYPES 1B & 1T
 (SRT, FLEAT & X-LITE FLARED)**

F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 9 OF 20
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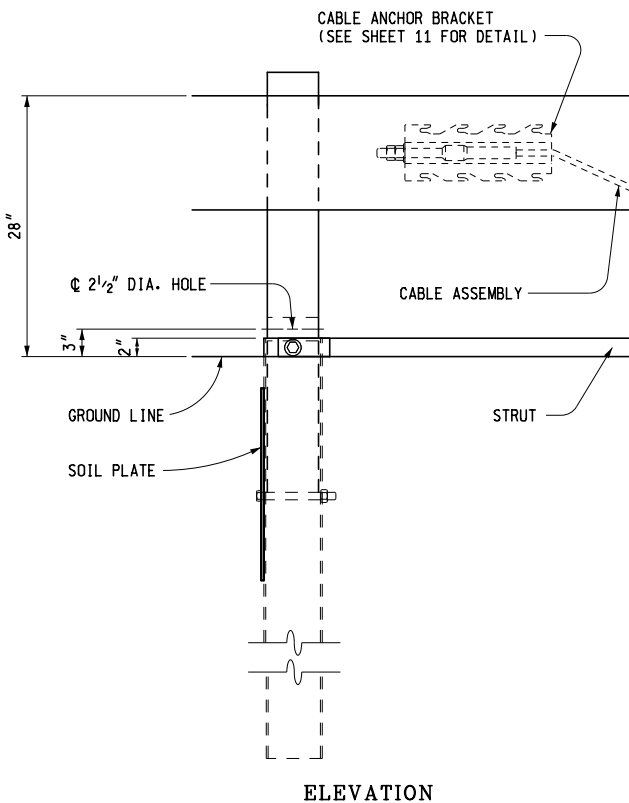


ELEVATION

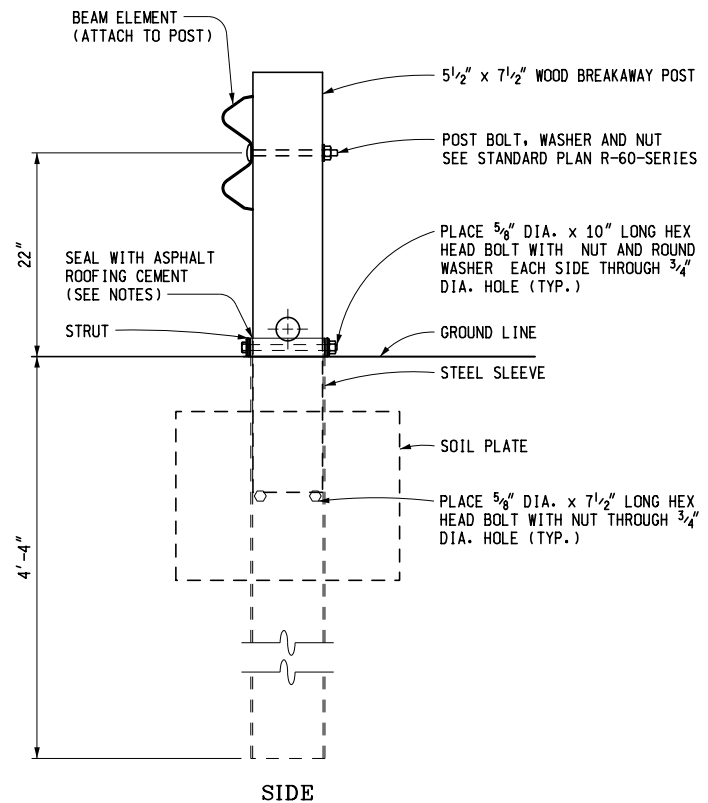


SIDE

POST 1 DETAIL
(FLEAT)



ELEVATION



SIDE

POST 2 DETAIL
(FLEAT)

NOTES:

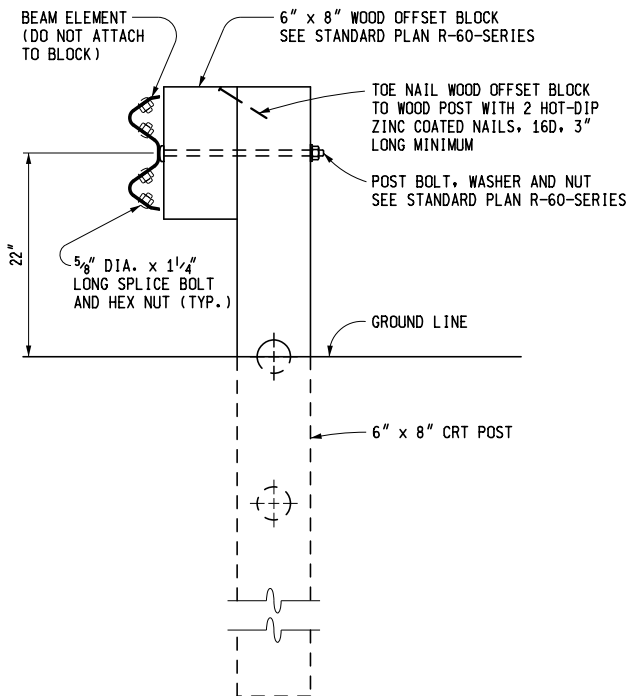
AFTER THE CABLE ASSEMBLY IS TAUT, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

ASPHALT ROOFING CEMENT SHALL BE USED TO SEAL THE PERIMETER AREA BETWEEN THE STEEL SLEEVE (SOIL TUBE) AND THE WOOD BREAKAWAY POST.

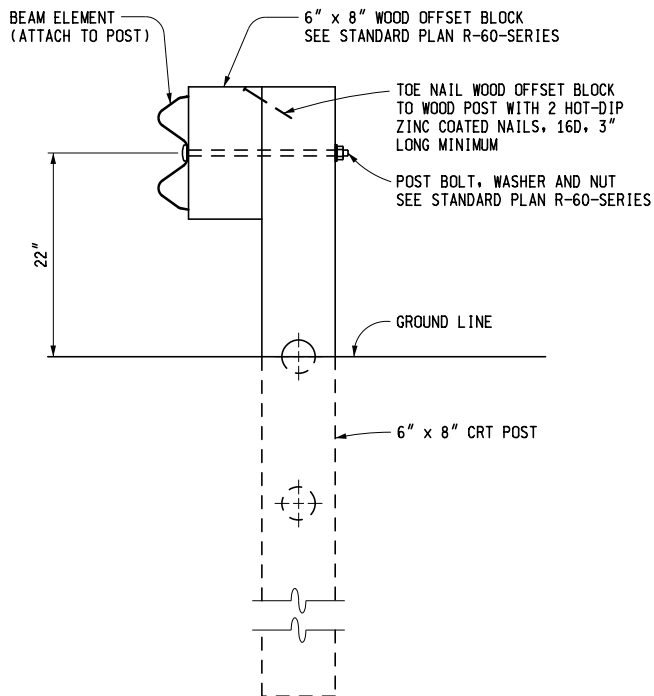
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

**GUARDRAIL APPROACH
TERMINAL TYPES 1B & 1T
(SRT, FLEAT & X-LITE FLARED)**

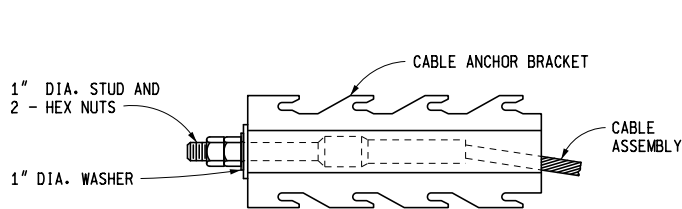
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 10 OF 20
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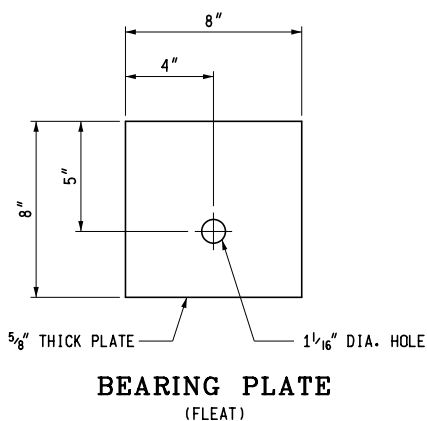
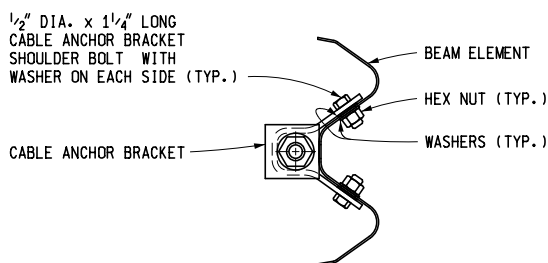
POST 3 DETAIL
(FLEAT)



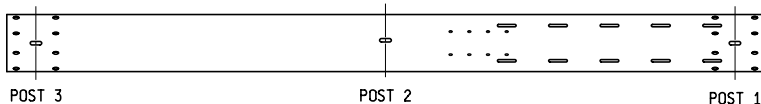
POST 4 THROUGH 7 DETAIL
(FLEAT)



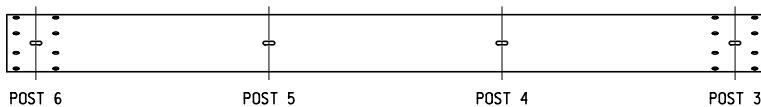
CABLE ANCHOR BRACKET DETAIL
(FLEAT)



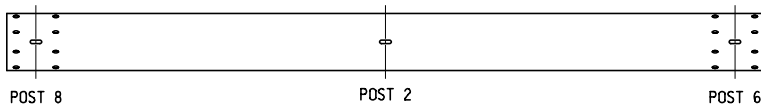
BEARING PLATE
(FLEAT)



BEAM ELEMENT #1 (SLOTTED RAIL)
(POST 1 THROUGH 3)
(FLEAT)



BEAM ELEMENT #2 WITH 4 POST BOLT SLOTS
(POST 3 THROUGH 6)
(FLEAT)



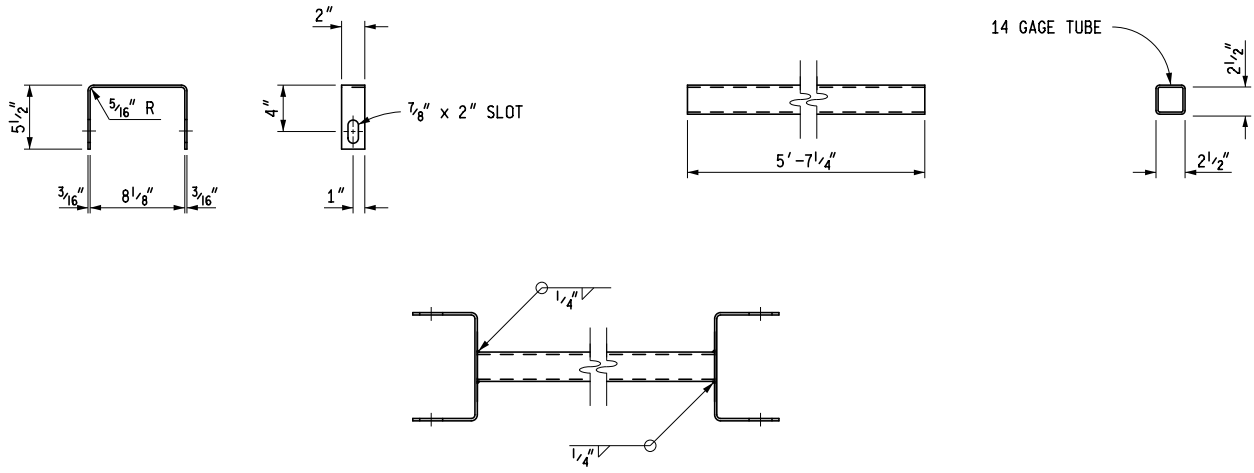
BEAM ELEMENT #3 WITH 3 POST BOLT SLOTS
(POST 6 THROUGH 8)
(FLEAT)

NOTES:

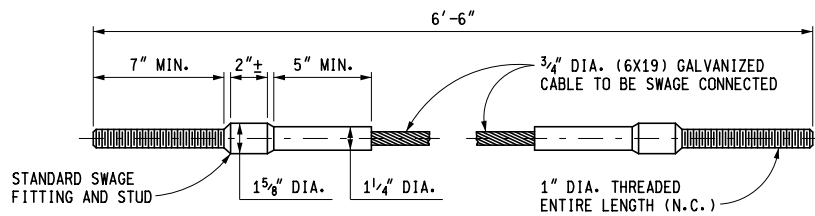
POST 8 IS A STANDARD LINE POST.

ALL "FLEAT" ITEMS ILLUSTRATED WITHOUT DIMENSIONS SHALL BE ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR		
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT AND Y-LITE FLARED)		
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H SHEET 11 OF 20



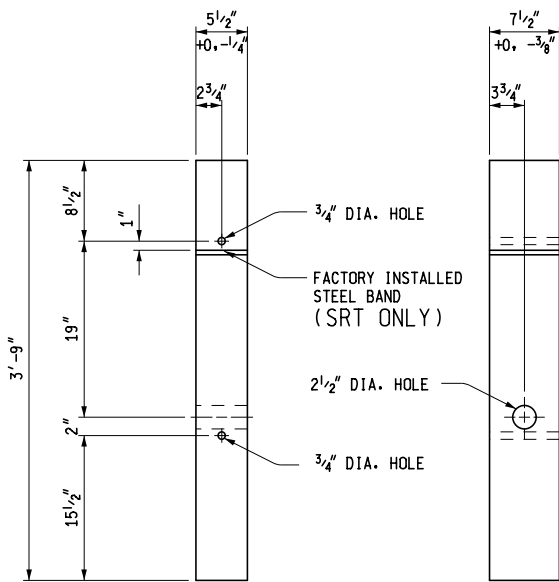
ASSEMBLY DETAIL
STRUT DETAILS
(FLEAT)



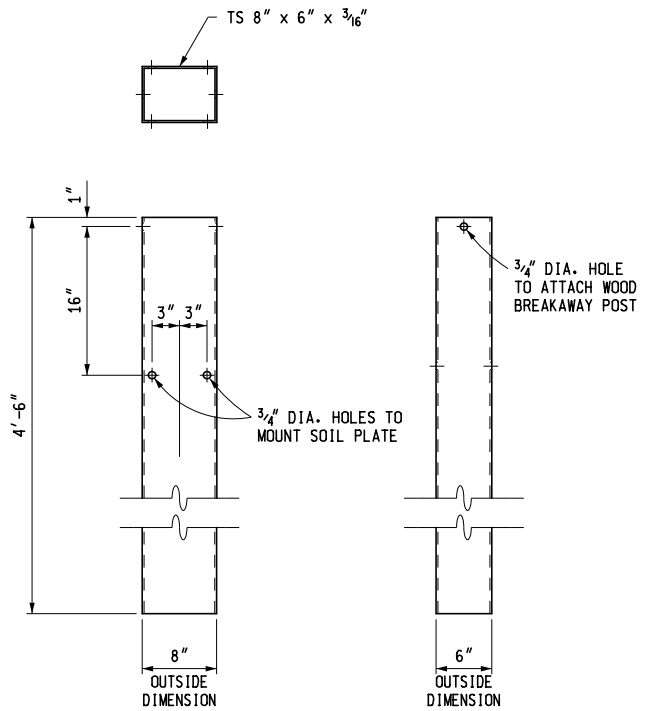
CABLE ASSEMBLY
(SRT, FLEAT ~~NO. N. LIFE FLARED~~)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
**GUARDRAIL APPROACH
TERMINAL TYPES 1B & 1T
(SRT, FLEAT ~~NO. N. LIFE FLARED~~)**

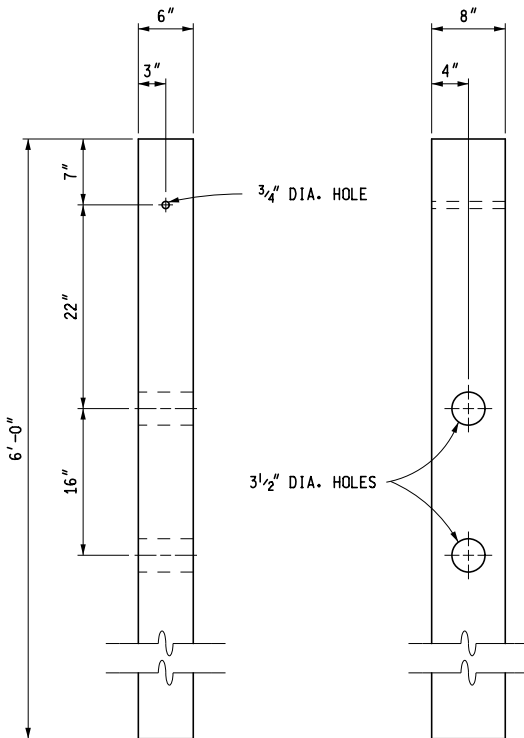
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H	SHEET 12 OF 20
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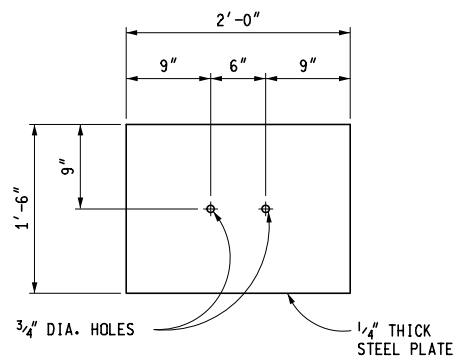
WOOD BREAKAWAY POST



STEEL SLEEVE



CRT POST



SOIL PLATE



CABLE SLEEVE

(FOR POST 1)

NOTES:

DETAILS ON THIS SHEET APPLY TO THE "SRT" AND "FLEAT" UNLESS OTHERWISE NOTED.

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR		
GUARDRAIL APPROACH TERMINAL TYPES 1B & 1T (SRT, FLEAT & Y-LITE FLARED)		
F.H.W.A. APPROVAL	2-2-2017 PLAN DATE	R-61-H SHEET 13 OF 20

NOTES:

ALL POSTS, OFFSET BLOCKS, BEAM ELEMENTS, AND HARDWARE (INCLUDING BOLTS, NUTS, AND WASHERS) SHALL CONFORM TO THE CURRENT STANDARD SPECIFICATIONS AND TO THE CURRENT STANDARD PLAN R-60-SERIES, WHERE APPLICABLE, EXCEPT AS SPECIFIED ON THIS STANDARD.

ALL 1:10 SLOPES SHALL BE GRADED TO CLASS A SLOPE TOLERANCES.

GUARDRAIL REFLECTORS AND OTHER ATTACHMENTS ARE NOT TO BE USED ON THE GUARDRAIL APPROACH TERMINAL. PLACE REFLECTORS BEGINNING ON STANDARD RUN OF GUARDRAIL.

USE REFLECTIVE SHEETING ACCORDING TO THE FOLLOWING TRAFFIC CONDITIONS:
(NOTE: ALTERNATE 3" BLACK AND 3" YELLOW STRIPES ON A 45° ANGLE)



TRAFFIC PASSING ON
THE LEFT SIDE



TRAFFIC PASSING ON
BOTH SIDES



TRAFFIC PASSING ON
THE RIGHT SIDE

ON THE "SRT", THE CURVED PORTION OF THE TERMINAL END SHOE FACING TRAFFIC (HALF CIRCLE) SHALL BE COMPLETELY COVERED WITH HIGH INTENSITY ADHESIVE REFLECTIVE SHEETING.

ON THE "FLEAT" ~~AND "W-LITE FLARED"~~, THE PORTION OF THE IMPACT HEAD ASSEMBLY FACING TRAFFIC SHALL BE COMPLETELY COVERED WITH HIGH INTENSITY ADHESIVE REFLECTIVE SHEETING.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

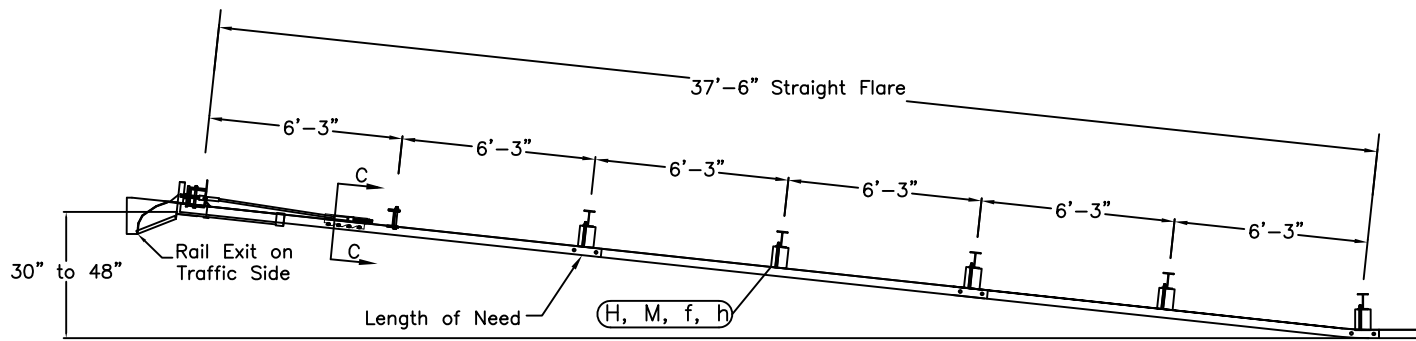
**GUARDRAIL APPROACH
TERMINAL TYPES 1B & 1T
(SRT, FLEAT ~~AND W-LITE FLARED~~)**

F.H.W.A. APPROVAL

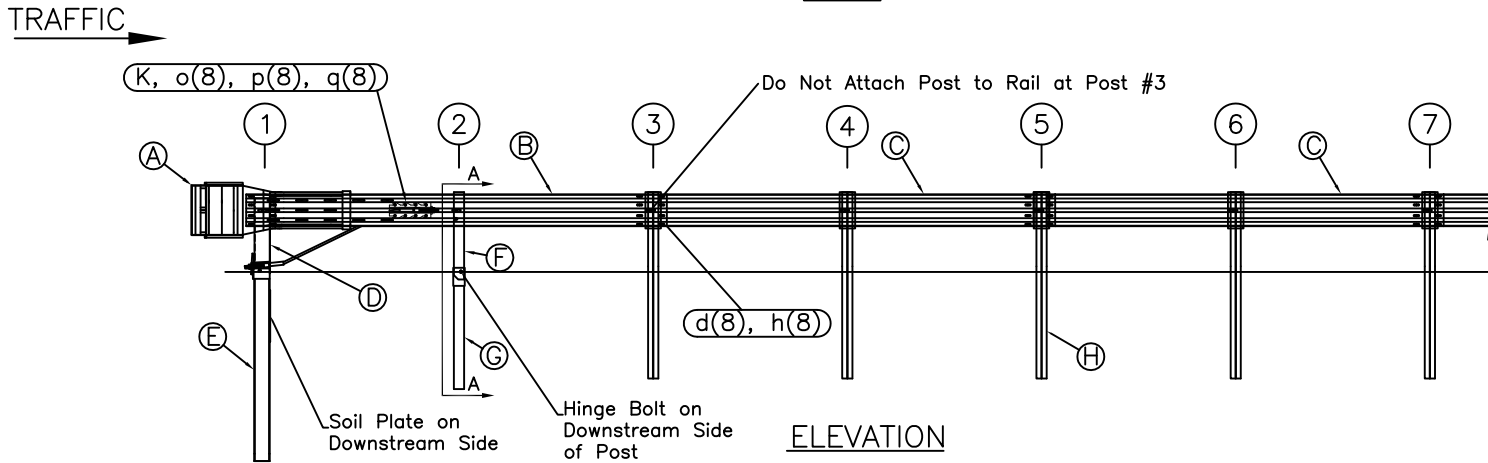
2-2-2017
PLAN DATE

R-61-H

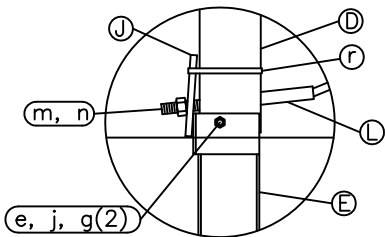
SHEET
20 OF 20



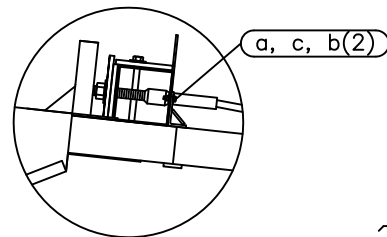
PLAN



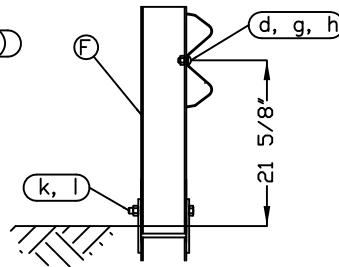
ELEVATION



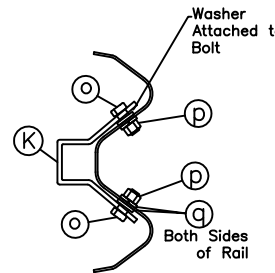
Post #1 Connection Detail



Impact Head Connection Detail



SECTION A-A
Post #2



SECTION C-C
Anchor Bracket

ITEM	QTY	BILL OF MATERIALS	ITEM NO.
A	1	FLEAT IMPACT HEAD	F3000
B	1	FLEAT ANCHOR RAIL 12"-6"	SF1303
C	2	W-BEAM GUARDRAIL 12"-6"	G1203
D	1	FIRST POST TOP (6x6x $\frac{1}{2}$ " Tube)	TPHP1A
E	1	FIRST POST BOTTOM (6" W6X15)	TPHP1B
F	1	UNIVERSAL HINGE POST #2 UPPER	UHP2A
G	1	HINGED POST LOWER	HP-B
H	5	STEEL LINE POST (6" W6x9)	P621
J	1	BEARING PLATE	E750
K	1	CABLE ANCHOR BOX	S760
L	1	BCT CABLE ANCHOR ASSEMBLY	E770
M	5	RECYCLED PLASTIC BLOCK OR EQUIV.	CBSP-14

HARDWARE (ALL DIMENSIONS IN INCHES)

a	2	5/16 x 1 HEX BOLT GRD 5	B5160104A
b	4	5/16 WASHER	W0516
c	2	5/16 HEX NUT	N0516
d	17	5/8 x 1 1/4 SPLICE BOLT	B580122
e	1	5/8 x 9 HEX BOLT GRD 5	B580904A
f	5	5/8 x 10 H.G.R. BOLT	B581002
g	3	5/8 WASHER	W050
h	22	5/8 H.G.R. NUT	N050
j	1	5/8 NUT	N055
k	1	3/4 x 8 1/2 HEX BOLT GRD A449	B340854A
l	1	3/4 HEX NUT	N030
m	2	1" ANCHOR CABLE HEX NUT	N100
n	2	1" ANCHOR CABLE WASHER	W100
o	8	1/2 RSI SHOULDER BOLT W/WASHER	SB12A
p	8	1/2 STRUCTURAL NUT	N012A
q	8	1/2 STRUCTURAL WASHER	W012A
r	1	BEARING PLATE RETAINER TIE	CT-100ST

GENERAL NOTES:

- All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
- The lower sections of the Posts 1&2 shall not protrude more than 4 in above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
- The lower sections of the hinged posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
- When competent rock is encountered, a 12" Ø post hole, 20 in. deep cored into the rock surface may be used if approved by the engineer for post 1. Granular material will be placed in the bottom of the hole, approximately 2.5" deep to provide drainage. The first post can be field cut to length, placed in the hole and backfilled with suitable backfill. The soil plate may be trimmed if required.
- The breakaway cable assembly must be taut. A locking device (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.



FLEAT-SP Terminal
TL-3 Standard Post System

2 Post System

Drawing Name:
FLT-SP-37

Scale:
None

Sheet:
1
Date:
01/06/13
By:
JRR
Rev:
0