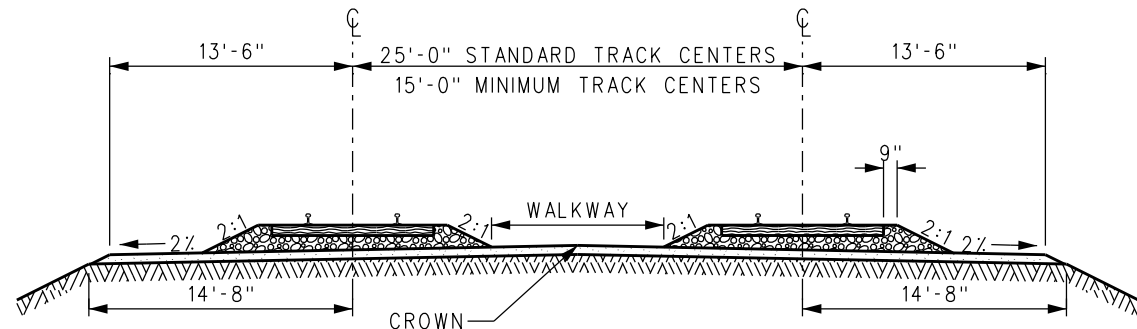


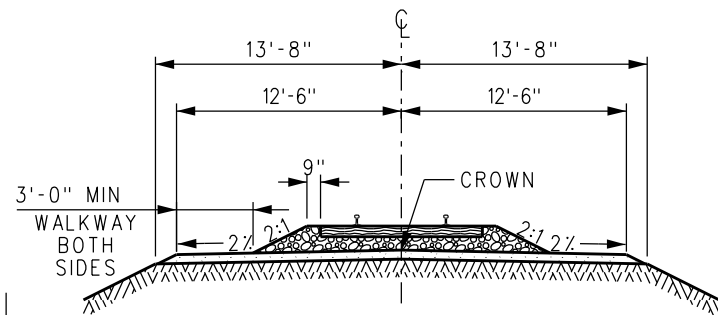
NOTES:

1. THE DEPTH OF BALLAST AND DEPTH OF SELECT MATERIAL SHALL BE DECIDED ON THE BASIS OF VOLUME OF TRAFFIC AND ON THE QUALITY OF SELECTED MATERIAL AND SUBGRADE AS DETERMINED BY SCRRRA.
2. SLOPES SHOWN FOR BANKS IN CUTS AND ON FILLS SHALL BE CONSIDERED STANDARD AND GENERALLY USED, BUT MAY BE MODIFIED BY THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION AS REQUIRED BY LOCAL CONDITIONS AND CHARACTER OF MATERIAL.
3. BALLAST MUST BE REGULATED IN ADVANCE OF DRESSING SO THAT FINAL SECTION WILL CONFORM TO SLOPE REQUIREMENTS AND CHARACTER OF MATERIAL.
4. WHERE OFF-TRACK ROADWAY IS TO BE PROVIDED, EXTEND THE ROADBED SECTION BY 8'-0" AND MAINTAIN 2% SLOPE AWAY FROM TRACK.
5. ALL FILL SLOPES SHALL BE FACED WITH COVER OF MATERIAL SUITABLE FOR GROWING GRASS AND HAVING A THICKNESS OF APPROXIMATELY 6". THE OUTER SURFACE OF THIS COVER SHALL COINCIDE WITH THE DESIGN SLOPE OF THE EMBANKMENT. MATERIAL FOR THIS COVER MAY BE OBTAINED FROM STRIPPINGS.
6. DEPTH OF DITCHES WILL VARY IN ORDER TO PROVIDE FLOW LINE OF 0.2% MINIMUM GRADE IN DITCHES AND IN BENCHES.
7. SLOPED BOTTOM DITCHES ARE REQUIRED FOR MAIN LINES. A "V" DITCH IS ACCEPTABLE FOR INDUSTRY TRACKS WHEN RIGHT-OF-WAY IS LIMITED AND WHERE LOCAL CONDITIONS AND CHARACTER OF MATERIAL SO REQUIRE. WIDTH OF SLOPED BOTTOM DITCHES MAY EXCEED 8' DEPENDING ON LOCAL CONDITIONS AND HYDRAULIC REQUIREMENTS. SEE SCRRRA DESIGN CRITERIA MANUAL CHAPTER 8 (DRAINAGE & GRADING), SECTION 8.5 (HYDRAULICS) FOR MINIMUM HYDRAULIC DITCH CAPACITY DESIGN REQUIREMENTS.
8. ALL MINIMUM DIMENSIONS SHALL BE MET UNLESS OTHERWISE APPROVED BY THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
9. THE PROFILE GRADE LINE ON SUPERELEVATED TRACK APPLIES TO THE LOW RAIL. MAINTAIN DEPTH OF BALLAST EQUAL TO TANGENT TRACK UNDER THE LOW RAIL.
10. ALL SECTIONS ON THIS STANDARD APPLY TO NEW TRACK CONSTRUCTION, AND WHERE PRACTICAL, TRACK RECONSTRUCTION.
11. SEE SCRRRA ES1201 FOR ABBREVIATIONS AND SYMBOLS.
12. WHEN TRANSITIONING FROM WOOD TO CONCRETE TIES, INCREASE BALLAST DEPTH LINEARLY TO 12" OVER A 50' SEGMENT ENDING AT THE CENTER OF THE LAST WOOD TIE.

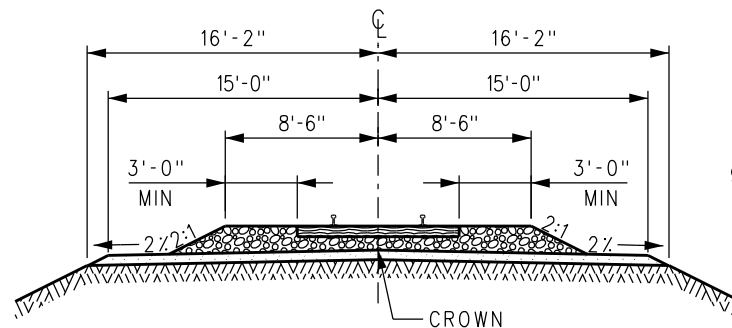


ROADBED SECTION FOR TWO MAINLINE TRACKS OR ADJACENT MAINLINE & SIDING

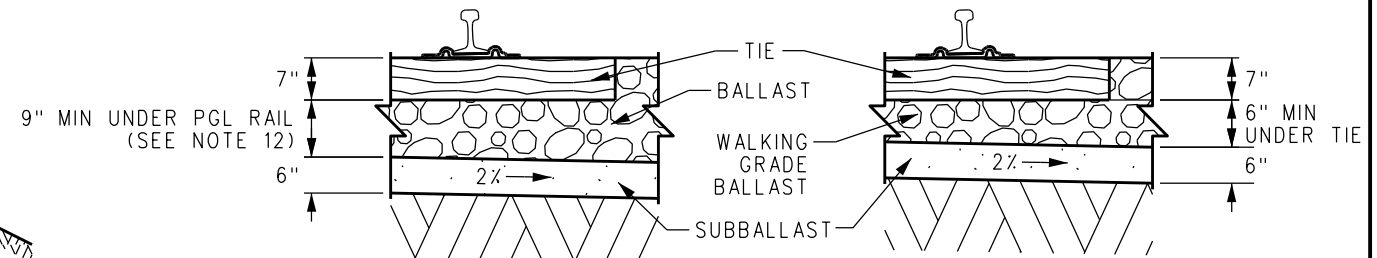
ROADBED SECTION AT CURVED TRACK
FOR DETAILS NOT SHOWN,
SEE CUT AND FILL SECTIONS ELSEWHERE ON THIS SHEET



ROADBED SECTION FOR YARD TRACKS

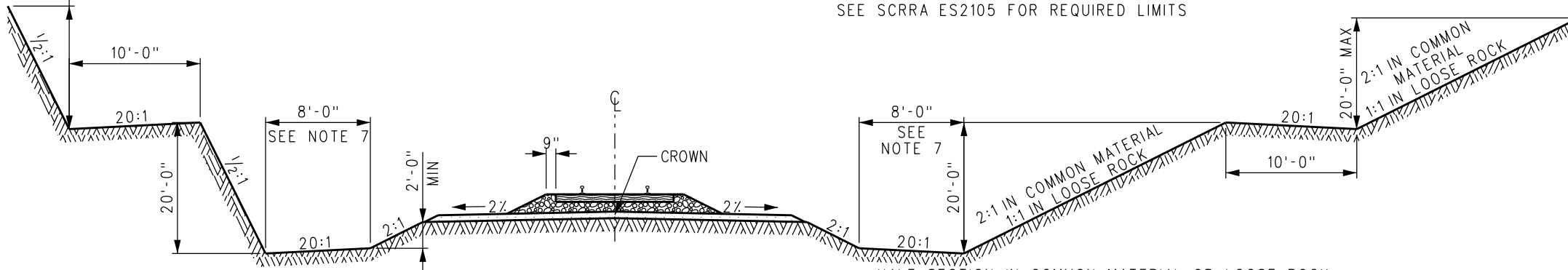


ROADBED SECTION FOR TURNOUTS AND CAR SPOTS IN YARDS
SEE SCRRRA ES2105 FOR REQUIRED LIMITS



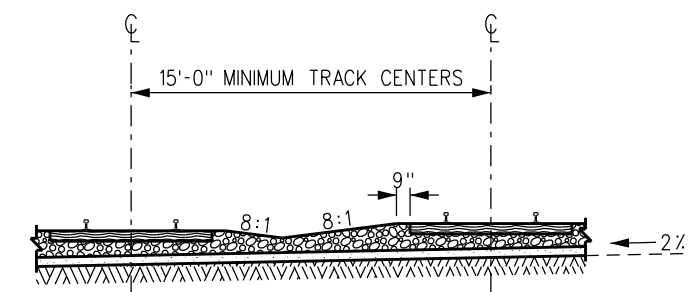
ROADBED SECTION DETAIL FOR MAINLINE & SIDING TRACKS

ROADBED SECTION DETAIL FOR YARD TRACKS



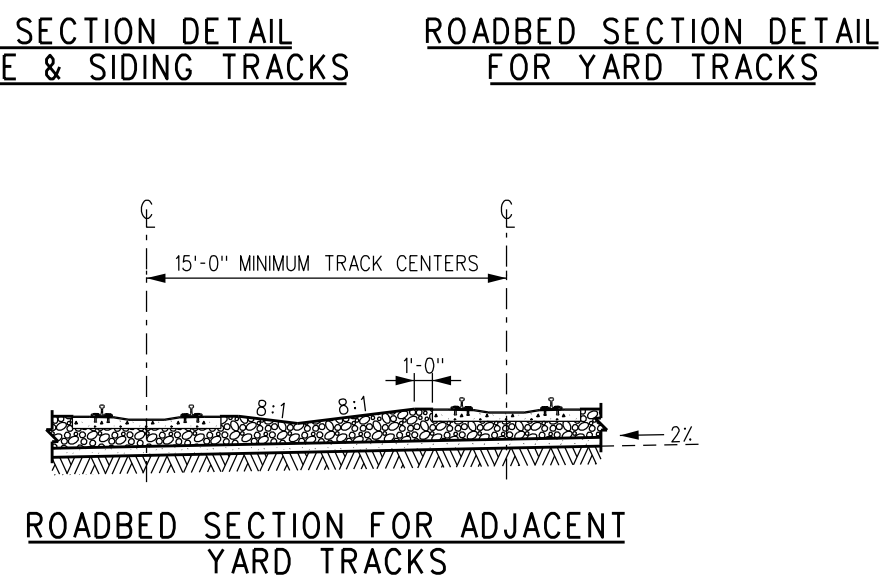
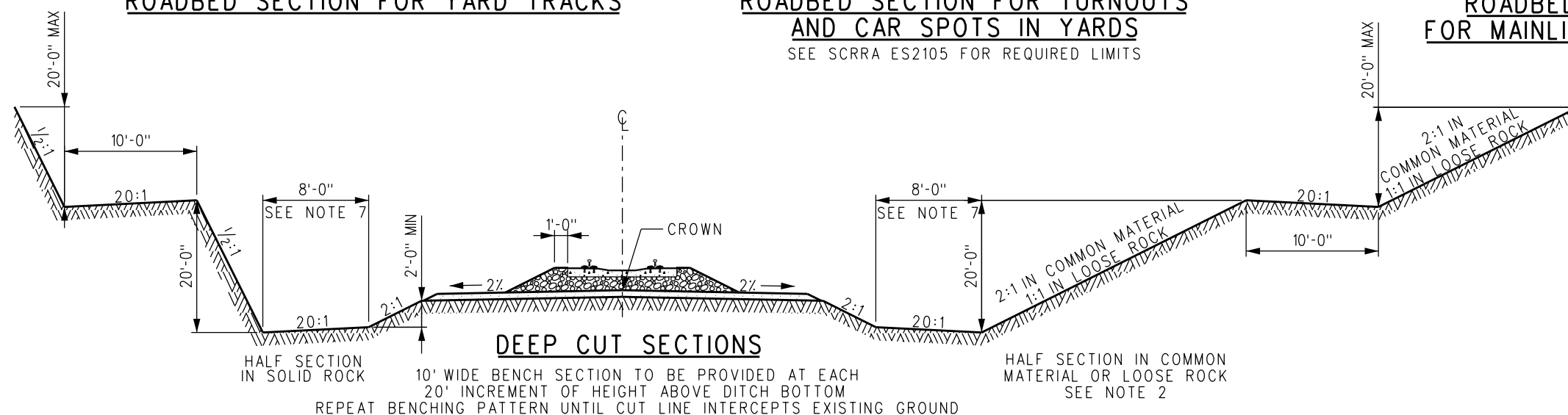
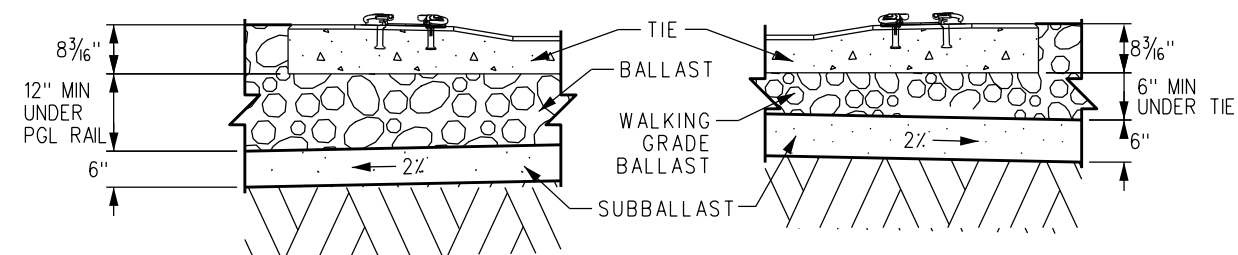
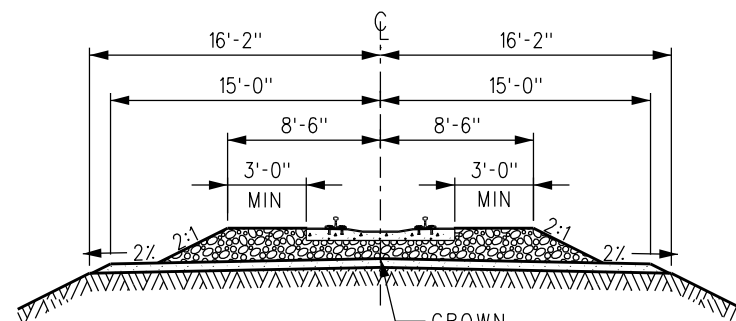
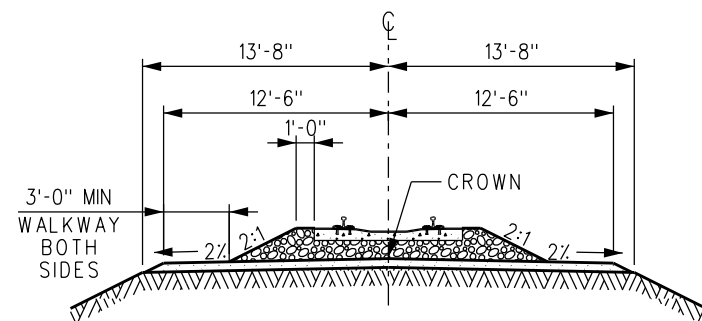
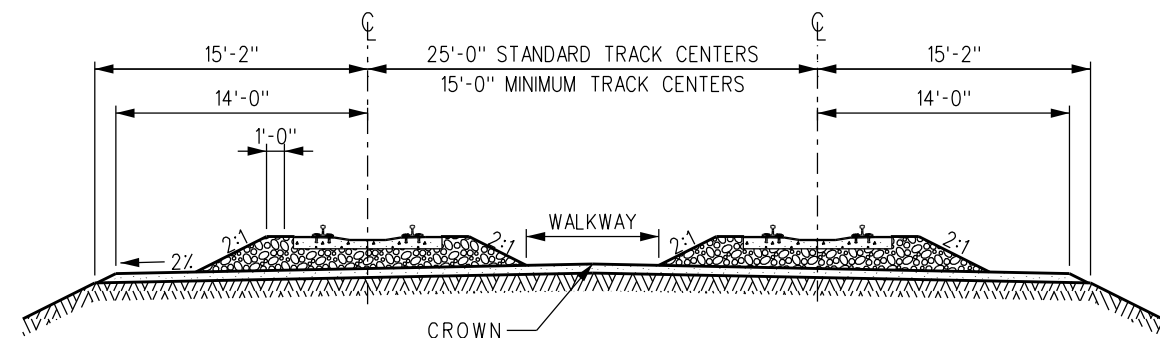
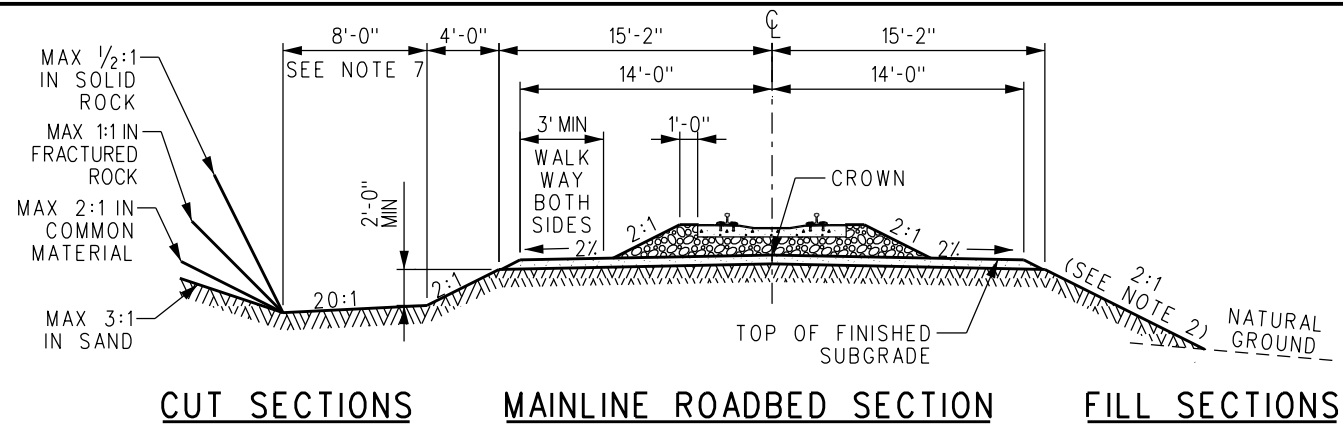
DEEP CUT SECTIONS

10' WIDE BENCH SECTION SHALL BE PROVIDED AT EACH 20' INCREMENT OF HEIGHT ABOVE DITCH BOTTOM
REPEAT BENCHING PATTERN UNTIL CUT LINE INTERCEPTS EXISTING GROUND



ROADBED SECTION FOR ADJACENT YARD TRACKS

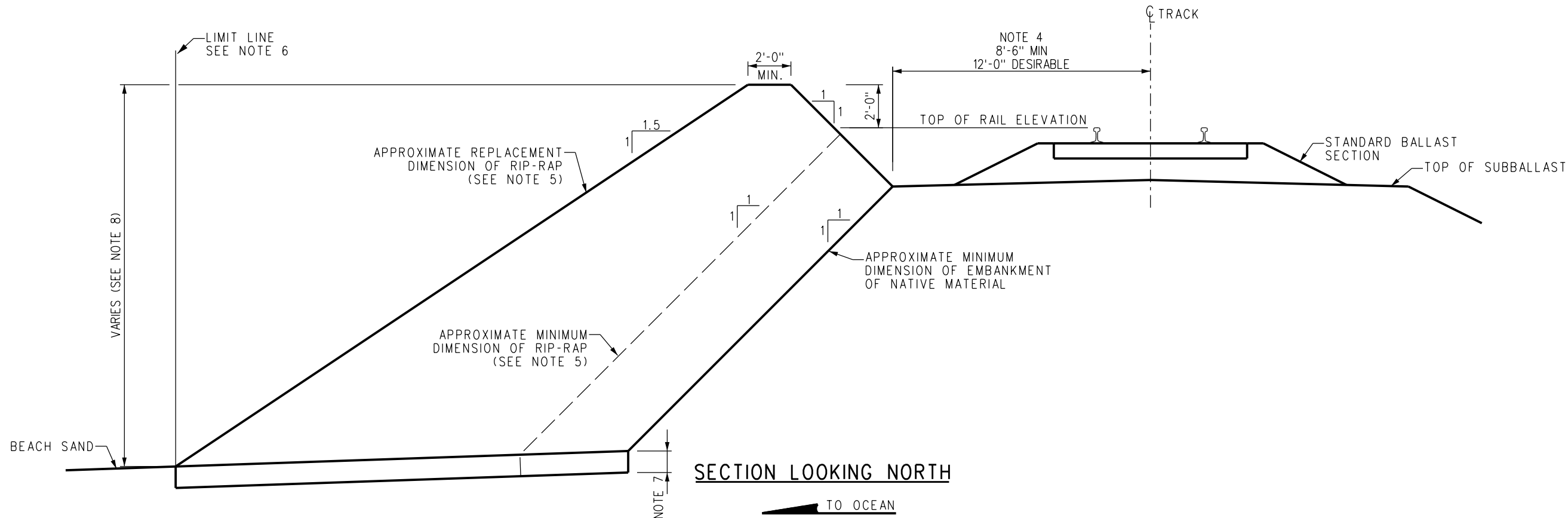
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



NOTES:

1. THE DEPTH OF BALLAST AND DEPTH OF SELECT MATERIAL SHALL BE DECIDED ON THE BASIS OF VOLUME OF TRAFFIC AND ON THE QUALITY OF SELECTED MATERIAL AND SUBGRADE AS DETERMINED BY SCRR.
2. SLOPES SHOWN FOR BANKS IN CUTS AND ON FILLS SHALL BE CONSIDERED STANDARD AND GENERALLY USED, BUT MAY BE MODIFIED BY THE SCRR DIRECTOR OF ENGINEERING AND CONSTRUCTION AS REQUIRED BY LOCAL CONDITIONS AND CHARACTER OF MATERIAL.
3. BALLAST MUST BE REGULATED IN ADVANCE OF DRESSING SO THAT FINAL SECTION WILL CONFORM TO SLOPE REQUIREMENTS AND CHARACTER OF MATERIAL.
4. WHERE OFF-TRACK ROADWAY IS TO BE PROVIDED, EXTEND THE ROADBED SECTION BY 8'-0" AND MAINTAIN 2% SLOPE AWAY FROM TRACK.
5. ALL FILL SLOPES SHALL BE FACED WITH COVER OF MATERIAL SUITABLE FOR GROWING GRASS AND HAVING A THICKNESS OF APPROXIMATELY 6". THE OUTER SURFACE OF THIS COVER SHALL COINCIDE WITH THE DESIGN SLOPE OF THE EMBANKMENT. MATERIAL FOR THIS COVER MAY BE OBTAINED FROM STRIPPINGS.
6. DEPTH OF DITCHES WILL VARY IN ORDER TO PROVIDE FLOW LINE OF 0.2% MINIMUM GRADE IN DITCHES AND IN BENCHES.
7. SLOPED BOTTOM DITCHES ARE REQUIRED FOR MAIN LINES. A "V" DITCH IS ACCEPTABLE FOR INDUSTRY TRACKS WHEN RIGHT-OF-WAY IS LIMITED AND WHERE LOCAL CONDITIONS AND CHARACTER OF MATERIAL SO REQUIRE. WIDTH OF SLOPED BOTTOM DITCHES MAY EXCEED 8' DEPENDING ON LOCAL CONDITIONS AND HYDRAULIC REQUIREMENTS. SEE SCRR DESIGN CRITERIA MANUAL CHAPTER 8 (DRAINAGE & GRADING), SECTION 8.5 (HYDRAULICS) FOR MINIMUM HYDRAULIC DITCH CAPACITY DESIGN REQUIREMENTS.
8. ALL MINIMUM DIMENSIONS SHALL BE MET UNLESS OTHERWISE APPROVED BY THE SCRR DIRECTOR OF ENGINEERING AND CONSTRUCTION.
9. THE PROFILE GRADE LINE ON SUPERELEVATED TRACK APPLIES TO THE LOW RAIL. MAINTAIN DEPTH OF BALLAST EQUAL TO TANGENT TRACK UNDER THE LOW RAIL.
10. ALL SECTIONS ON THIS STANDARD APPLY TO NEW TRACK CONSTRUCTION AND, WHERE PRACTICAL, TRACK RECONSTRUCTION.
11. SEE SCRR ES201 FOR ABBREVIATIONS AND SYMBOLS.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



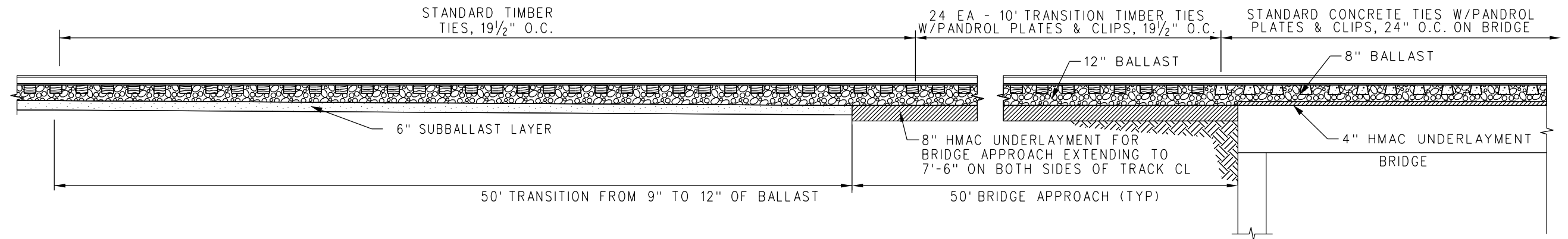
NOTES:

1. APPLICATION: THIS STANDARD SHALL BE USED FOR RAILROAD EMBANKMENTS EXPOSED TO OCEAN WAVES. THE RIP-RAP IS USED TO SECURE THE TRACK BALLAST FROM EROSION DUE TO WAVES, AS REQUIRED BY FEDERAL RAILROAD ADMINISTRATION TRACK SAFETY STANDARDS PART 213.103, PROTECTION OF THE BALLAST AND EMBANKMENT BEING FUNDAMENTAL IN SUPPORTING THE TRACK STRUCTURE.
2. DIMENSION LINES: DIMENSIONS FOR STONE RIP-RAP ARE THE AVERAGE OF THE EXPOSED SURFACE OF ROCK. DUE TO THE IRREGULAR SIZE AND SHAPE OF NATURALLY BROKEN ROCK, ANY SPECIFIC POINT MAY VARY TWO FEET FROM THE AVERAGE DIMENSION SHOWN.
3. RIP-RAP MATERIAL: GRANITE, BASALT OR SIMILAR IGNEOUS OR METAMORPHIC ROCK NATIVE TO ORANGE OR RIVERSIDE COUNTIES, BROKEN INTO SIZE DISTRIBUTION MEETING ASTM D5519 GRADATION WILL BE USED TO REPLACE ERODED RIP-RAP AREAS, HOWEVER EXISTING INVENTORIES OF LARGER ROCK MAY BE USED UNTIL EXHAUSTED. CONCRETE, ASPHALT, TIMBER OR METAL IS NOT PERMITTED IN THE RIP-RAP.
4. A WALKWAY GENERALLY CONFORMING TO SCRRRA ES2001 AND ES2002 WILL BE PROVIDED ON THE OCEAN SIDE OF THE TRACKS. THE MINIMUM WIDTH OF THE WALKWAY IN SURF AREAS IS EIGHT FEET AND SIX INCHES (8'-6") FROM THE CENTERLINE OF THE TRACK, WITH TWELVE FEET (12'-0") TO BE PROVIDED WHERE FIELD CONDITIONS PERMIT. WALKWAY SURFACE SHALL BE SUBBALLAST.
5. MINIMUM AND MAXIMUM REPLACEMENT DIMENSIONS: THE GENERAL CRITERIA FOR INITIATING REPLACEMENT OF RIP-RAP IS WHEN EROSION OR SETTLEMENT HAS DEGRADED THE RIP-RAP SUCH THAT THE TOP OF THE RIP-RAP HAS BECOME LOWER THAN THE TOP OF RAIL ELEVATION (AND THEREFORE DOES NOT SHIELD THE TRACK FROM WAVES), WHEN THE THICKNESS OF THE RIP-RAP HAS DETERIORATED SUCH THAT THE NATURAL EMBANKMENT IS EXPOSED TO WAVE ACTION, OR WHEN THE LOWER PORTIONS OF THE RIP-RAP HAVE BECOME ERODED LEAVING AN UNSTABLE (STEEPER THAN 1:1) SLOPE RATIO. RIP-RAP WILL BE REPLENISHED TO THE "REPLACEMENT LINE" SHOWN, GENERALLY TO A 1.5:1 SLOPE RATIO. (AT LOCATIONS WITH WELL-ESTABLISHED LARGE DIMENSION RIP-RAP AT A STEEPER SLOPE, LOCALIZED SEGMENTS OF NEW RIP-RAP MAY BE INSTALLED AT 1:1 SLOPE RATIO). THE NORMAL STATE OF MAINTENANCE WILL BE GRADUALLY ERODING COVER OF RIP-RAP BETWEEN THE "MINIMUM" AND "REPLACEMENT" DIMENSION LINES.
6. THE SCRRRA AND LOCAL AGENCIES HAVE ESTABLISHED A "LIMIT LINE" TO DEFINE THE MAXIMUM WIDTH OF THE RIP-RAP. THIS LINE IS LOCATED BY REFERENCE TO GPS MEASURED COORDINATES, TO OFFSETS FROM TRACK CENTERLINE, OR BOTH. PLACEMENT OF RIP-RAP SHALL CONFORM TO THE LIMIT LINE UNLESS UNPRECEDENTED EROSION OF THE BEACH LOWERS THE LEVEL OF THE SAND, IN WHICH CASE THE LIMIT LINE WILL BE ADJUSTED SEAWARD AT A 1.5:1 (OR 1:1 AT LOCALIZED SITES) SLOPE RATIO FOR THE ADDED HEIGHT OF THE EMBANKMENT. AFTER RIP-RAP REPLACEMENT OPERATIONS ARE COMPLETE SCRRRA WILL MAKE A SURVEY OF THE LIMIT LINE TO DETECT ANY DEVIATIONS FROM THE LIMIT LINE.

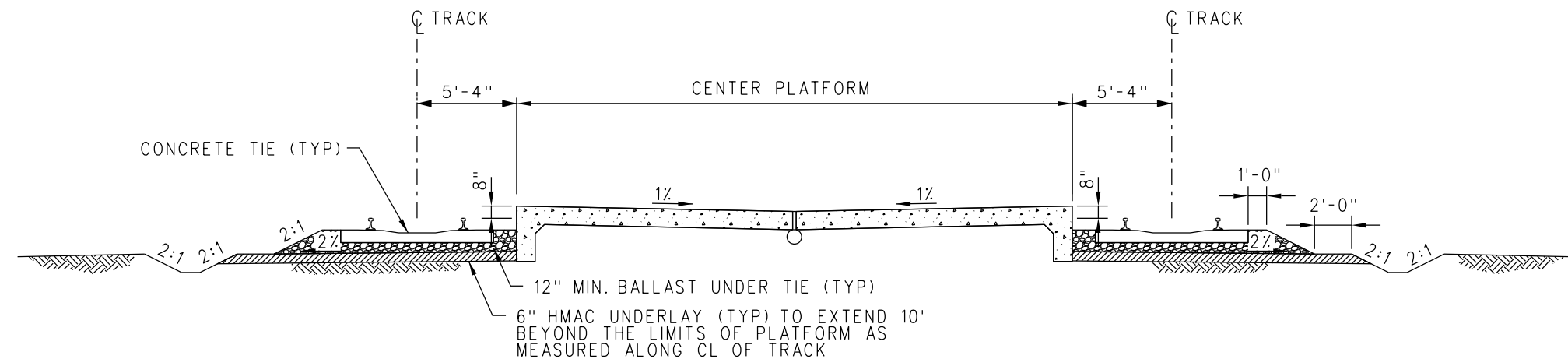
NOTES: (continued)

7. THE BOTTOM OF THE RIP-RAP SHALL BE KEYED INTO THE BEACH SAND BY APPROXIMATELY THE SIZE OF THE RIP-RAP ROCK NOMINAL DIMENSION. EXISTING RIP-RAP OR NATIVE ROCK SHALL NOT BE EXCAVATED TO ESTABLISH A NEW KEY UNLESS REQUIRED TO ACHIEVE A STABLE STRUCTURE.
8. THE ELEVATION OF THE TRACK SHALL BE MAINTAINED TO WHAT EXISTED UPON PURCHASE OF THE TRACK, HOWEVER TRACK RAISE NOT EXCEEDING 3 INCHES AT TIME OF THE REPLACEMENT MAY BE PERFORMED. THE ELEVATION OF THE RIP-RAP SHALL REMAIN AS DIMENSIONED ON THIS STANDARD. IF THE ELEVATION OF THE BEACH SAND RISES OR FALLS, THE EFFECTIVE HEIGHT OF THE RIP-RAP SHALL BE ADJUSTED AT THE 1.5:1 OR 1:1 SLOPE RATIO SHOWN.
9. RIP-RAP WILL BE PLACED BY GRAVITY DUMP FROM RAILROAD EQUIPMENT, FOLLOWED BY RE-STACKING WITH EQUIPMENT WORKING FROM THE BEACH THAT IS CAPABLE OF MOVING THE LARGEST ROCKS BEING USED. THE RE-STACKING IS TO PLACE ALL ROCKS IN A STABLE MATRIX, TO RECOVER ANY ROCKS BEYOND THE LIMIT LINE, AND TO FILL VOIDS BETWEEN LARGE ROCKS WITH SMALLER ROCK ELEMENTS. EXISTING RIP-RAP MAY BE MOVED PRIOR TO ADDITION OF REPLENISHMENT ROCK IN ORDER TO FACILITATE DUMPING.
10. FOR EMBANKMENT DETAILS NOT SHOWN, REFER TO SCRRRA ES2001 AND ES2002.
11. AT LOCATIONS WHERE SAND MOVES TO COVER UP THE RIP-RAP, RIP-RAP SHALL BE LEFT IN PLACE.
12. SCRRRA MAINTENANCE MANAGER WILL INFORM THE GOVERNING AGENCIES ONE MONTH IN ADVANCE OF PLANNED PLACEMENT OF REPLENISHMENT RIP-RAP. IF RAPID EROSION REQUIRES PLACEMENT IN LESS THAN THE FULL MONTH NOTIFICATION PERIOD, NOTICE WILL BE GIVEN AS PROMPTLY AS PRACTICABLE.
13. INSTALLATION AND RE-STACKING OF ROCK SHALL CONFORM TO PERMIT GUIDELINES AND SHALL BE PERFORMED ONLY AFTER PROVIDING PROTECTION FOR MEMBERS OF THE PUBLIC WHO MAY BE USING THE BEACH.
14. ROUTINE REPLENISHMENT AND MAINTENANCE OF THE RIP-RAP SHALL BE SCHEDULED TO AVOID PEAK BEACH RECREATIONAL USE TIMES.
15. LOCALIZED EXCEPTIONS TO THIS STANDARD SHALL BE MADE IN ORDER TO FIT RIP-RAP TO CONFORM TO DRAINAGE STRUCTURES, PUBLIC CROSSINGS, SIGNAL FACILITIES AND OTHER STRUCTURES.

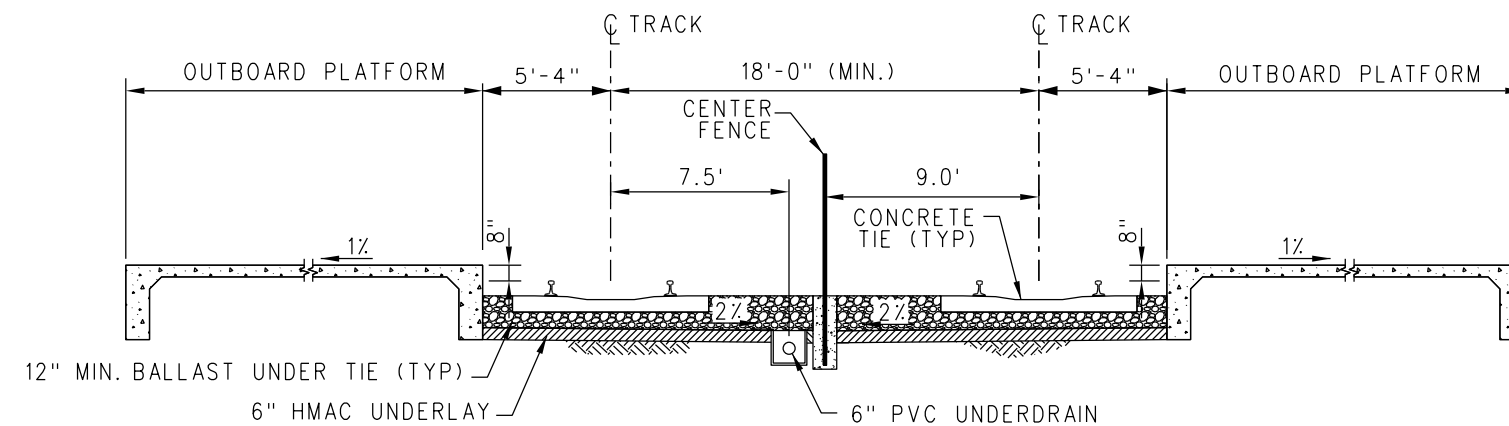
				DRAWN BY: A. CARLOS		DATE: 03/31/2011		<div>SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES, SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.</div>	<div>METROLINK[®]</div> <div>SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012</div>	ENGINEERING STANDARDS		STANDARD	
										2003			
										SCALE: NTS			
										REVISION SHEET - 1 OF 1			
										CADD FILE: ES2003			



**ON BRIDGES
(TYPICAL FOR BOTH ENDS)**

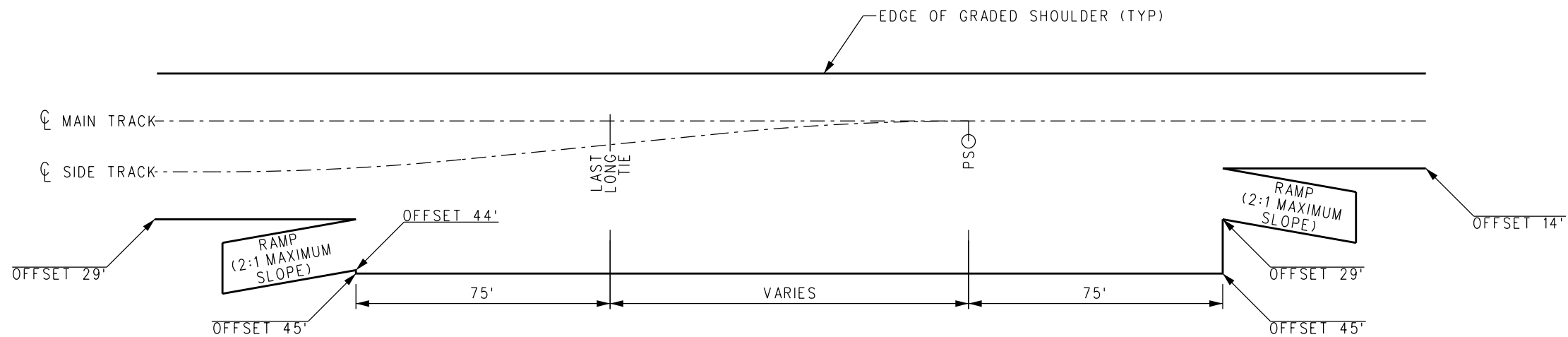


**AT STATIONS
(CENTER ISLAND PLATFORM)**



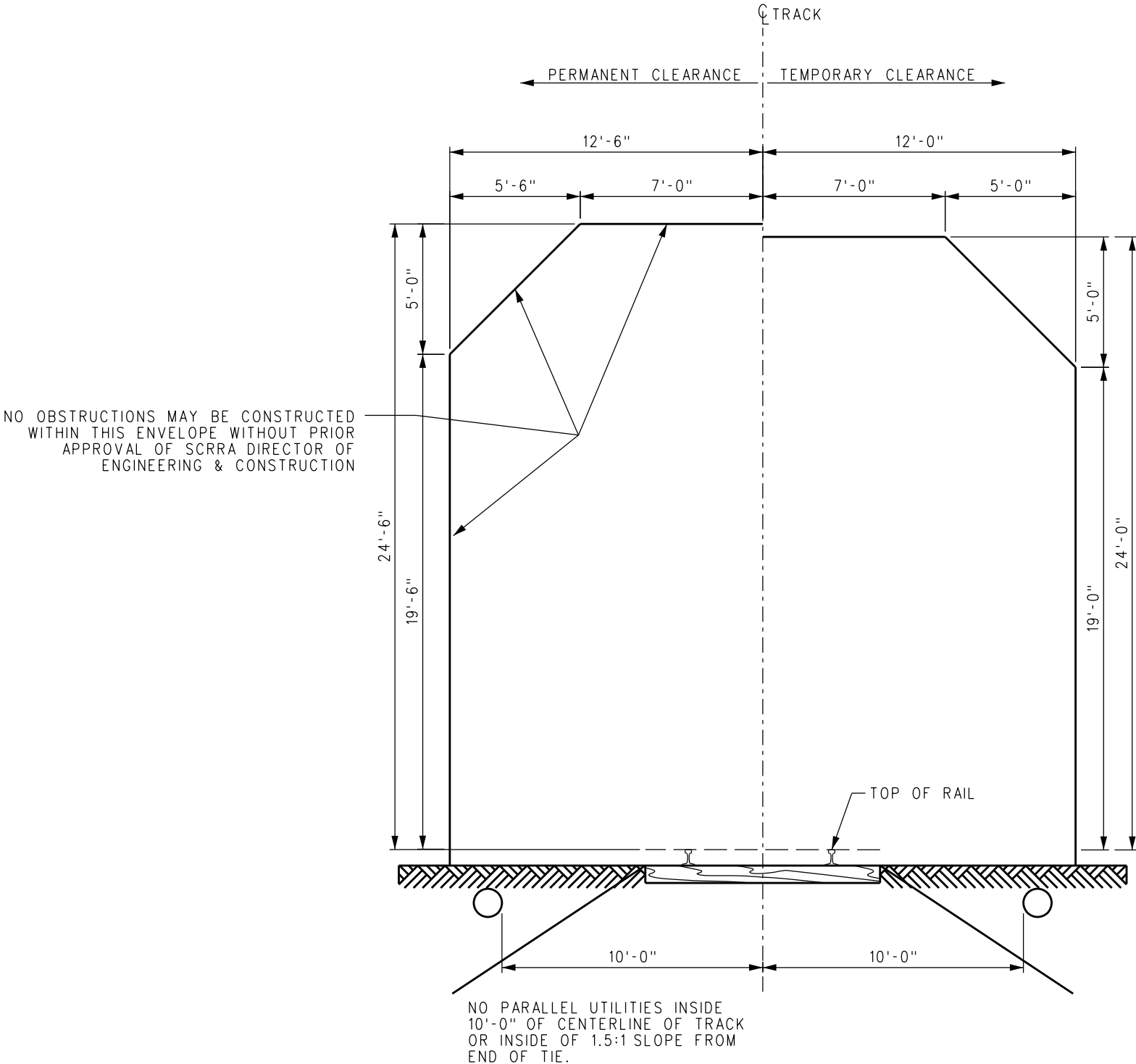
**AT STATIONS
(OUTBOARD PLATFORMS)**

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



NOTE:
OFFSETS ARE MEASURED FROM
CENTERLINE OF MAIN TRACK.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



- NOTES:**
1. STANDARD PERMANENT AND TEMPORARY CLEARANCES SHOWN ON THIS SHEET SHALL BE USED FOR NEW DESIGN AND CONSTRUCTION WHEREVER PRACTICAL. ANY PERMANENT OR TEMPORARY CONSTRUCTION PROPOSED WITHIN THE DIMENSIONS SHOWN SHALL REQUIRE THE PRIOR APPROVAL OF THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
 2. STANDARD PERMANENT CLEARANCE SHALL BE 14'-0" FROM CL OF TRACK FOR CANOPIES, STAIRWAYS AND SUPPORT COLUMNS. PROPOSED CLEARANCES LESS THAN THIS DISTANCE SHALL CONFORM TO THOSE SHOWN ON SCRRRA ES2102 AND WILL REQUIRE THE PRIOR APPROVAL OF THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
 3. SEE SCRRRA ES2104 FOR MINIMUM VERTICAL CLEARANCES FOR OVERHEAD WIRES.
 4. SEE SCRRRA ES3101, ES3201 AND ES3202 FOR REQUIRED PASSENGER PLATFORM CLEARANCES.
 5. RAIL/HIGHWAY GRADE SEPARATIONS MAY REQUIRE PROVISIONS FOR A MAINTENANCE ROAD AND/OR FUTURE ADDITIONAL TRACK(S).
 6. WIDER CLEARANCES MAY BE REQUIRED TO PROVIDE VISIBILITY FOR WAYSIDE SIGNALS.
 7. IN A CURVE ON SUPERELEVATED TRACK THE HORIZONTAL CLEARANCES SHALL BE MEASURED PERPENDICULAR TO THE PLANE ACROSS THE TOP OF BOTH RAILS AND THE VERTICAL CLEARANCE SHALL BE MEASURED FROM THE HIGH RAIL.

CLEARANCE REQUIREMENTS FOR NEW CONSTRUCTION OR DESIGN

				DRAWN BY: A. CARLOS		DATE: 03/31/2011		<div>SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES, SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.</div>	<div> METROLINK[®]</div> <div>SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012</div>	ENGINEERING STANDARDS		STANDARD		2101	
										SCALE: NTS		REVISION		SHEET	
										1 OF 1		-			
										CADD FILE:		ES2101			
X	XX-XX-XX		REVISION		XX		XX			ASSISTANT DIRECTOR: STANDARDS & DESIGN					
REV.	DATE		DESCRIPTION		DES.		ENG.			DIRECTOR OF ENGINEERING AND CONSTRUCTION					

A. CLEARANCE LINE SHOWN BELOW IS FOR SIGNALS OR SWITCH STANDS 3'-0" OR LESS ABOVE TOP OF RAIL AND LOCATED BETWEEN TRACKS WHERE NOT PRACTICABLE TO MAINTAIN CLEARANCES OTHERWISE PRESCRIBED.

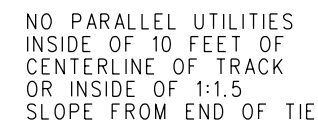
B. CLEARANCE LINE SHOWN BELOW IS FOR PORTIONS OF BLOCK SIGNALS 4'-0" OR LESS ABOVE TOP OF RAIL.

C. DECREASED CLEARANCES SHOWN BELOW ARE FOR:

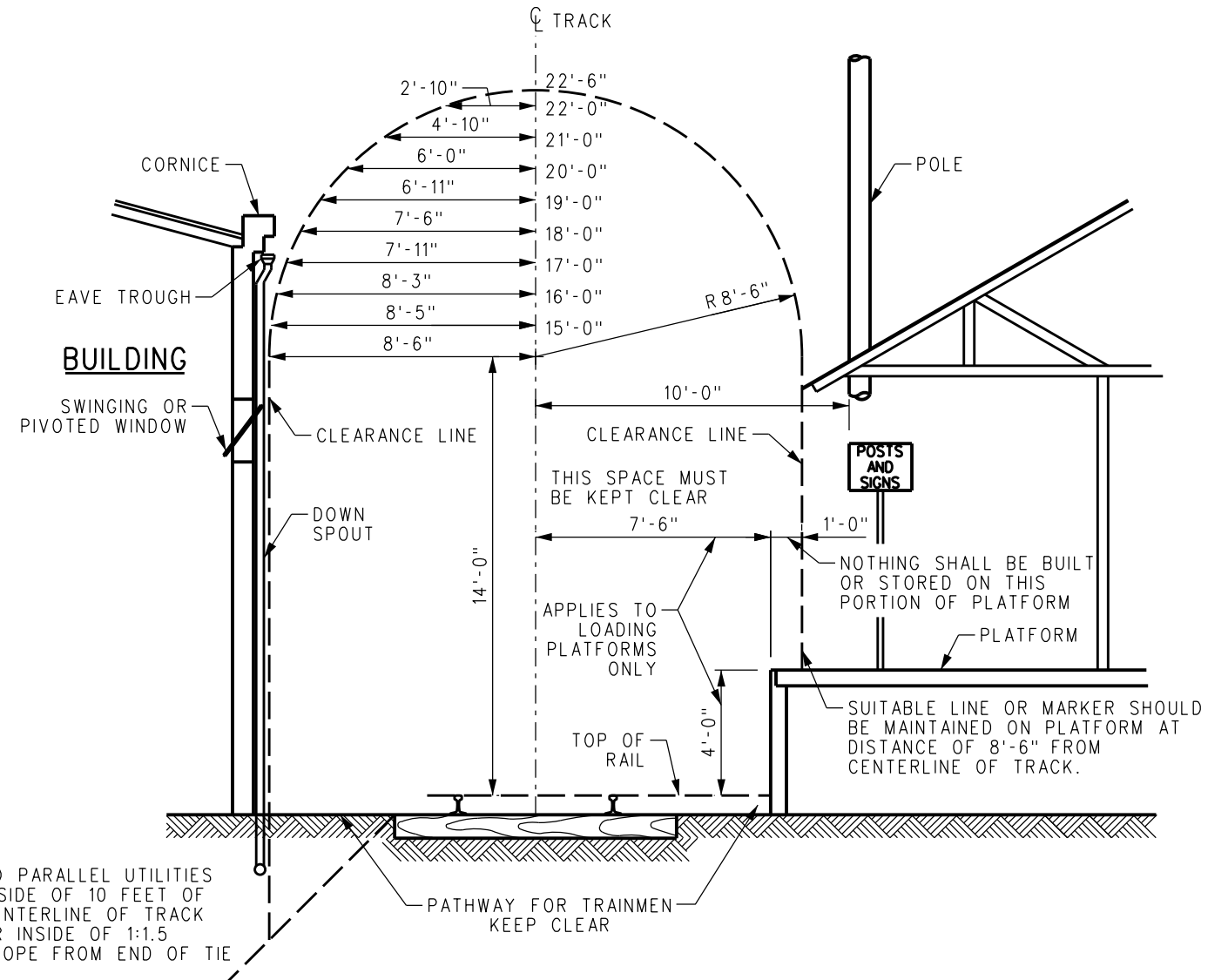
1) REFUGE PLATFORMS ON BRIDGES AND TRESTLES NOT PROVIDED WITH WALKWAYS

2) HANDRAILS

MINIMUM CLEARANCES FOR HANDRAILS ON BRIDGES WITH WALKWAYS SHALL BE 8'-6". DECREASED CLEARANCES EXCEPT AS PROVIDED FOR HANDRAILS ARE NOT PERMITTED ON THROUGH BRIDGES WHERE WORK OF TRAINMEN OR YARDMEN REQUIRE THEM TO BE ON DECK OF BRIDGE FOR PURPOSE OF COUPLING OR UNCOUPLING CARS IN PERFORMING SWITCHING SERVICE ON A SWITCHING LEAD.

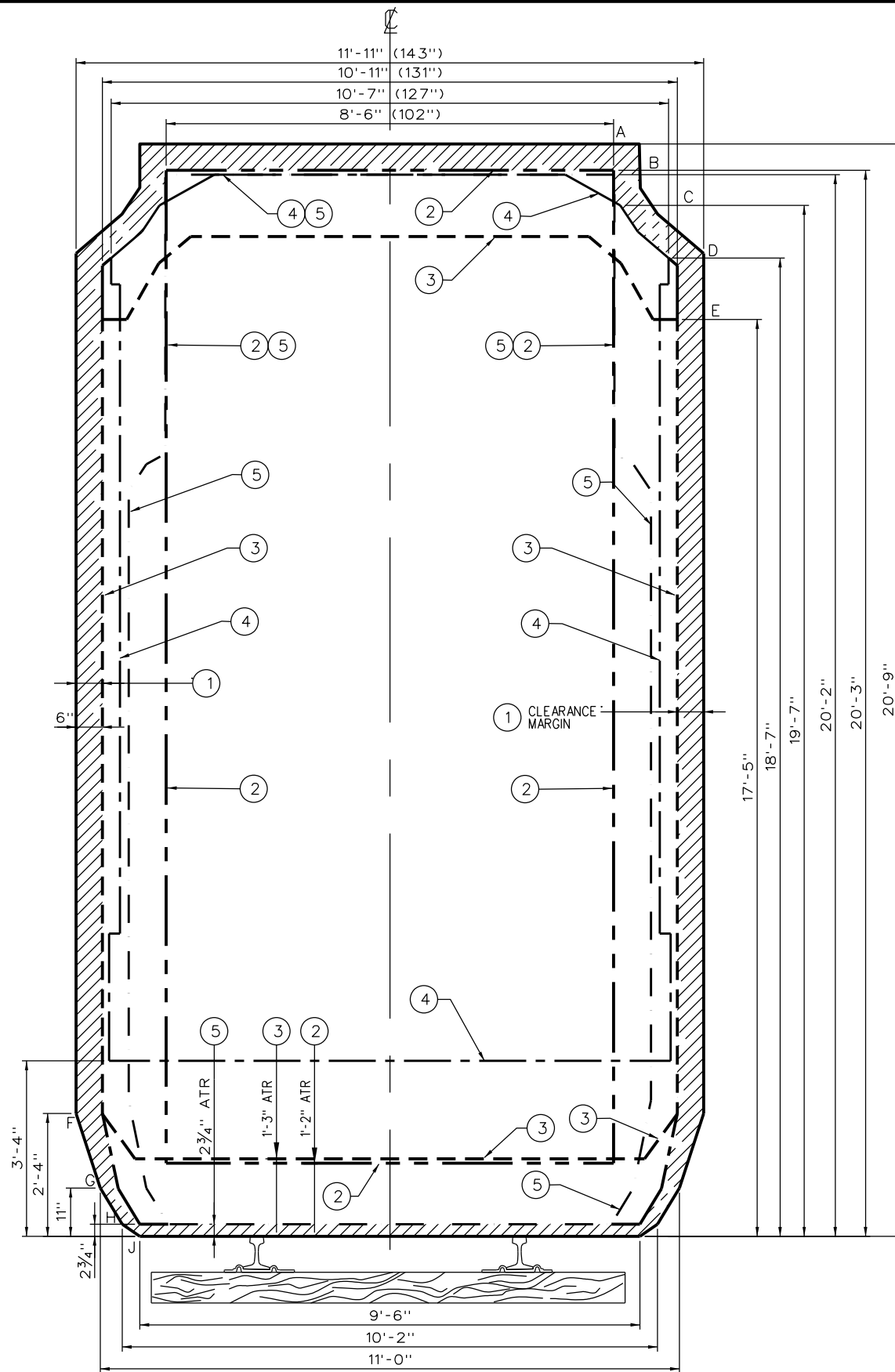


1. SEE SCRR ES2104 FOR MINIMUM VERTICAL CLEARANCES FOR OVERHEAD WIRES.
2. ALL CLEARANCES LISTED ON THIS SHEET ARE MINIMUM REQUIREMENTS. USE STANDARD CLEARANCES SHOWN ON SCRR ES2101 FOR NEW CONSTRUCTION.
3. POSTS, POLES, SIGNS AND SIMILAR FACILITIES MAY HAVE MINIMUM CLEARANCE OF 8'-6", BUT CLEARANCE OF 10'-0" IS RECOMMENDED WHERE PRACTICABLE
4. ALL SIDE CLEARANCE DIMENSIONS ARE FOR TANGENT TRACK. IN GENERAL, SIDE CLEARANCE FOR CURVED TRACK SHALL BE 1'-0" GREATER THAN THAT FOR TANGENT TRACK.
5. PLATFORMS 4'-0" OR LESS IN HEIGHT WITH MINIMUM CLEARANCE OF 7'-3" MAY BE EXTENDED AT EXISTING CLEARANCES IF SUCH EXTENSION IS NOT IN CONNECTION WITH RECONSTRUCTION OF ORIGINAL PLATFORM.








(EFFECTIVE FEBRUARY 1, 1948)
FOR NEW WORK AND RECONSTRUCTION OF EXISTING FACILITIES ADJACENT
TO STANDARD GAUGE RAILROAD TRACKS TRANSPORTING FREIGHT CARS.

																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									</
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----



CLEARANCE ENVELOPE

LEGEND FOR CLEARANCE ENVELOPE

- ①  CLEARANCE MARGIN FOR MAXIMUM DOUBLESTACK CONTAINERS, BI-LEVEL AND TRI-LEVEL CARRIERS. THIS AREA TO BE KEPT FREE AND CLEAR OF ANY PLATFORMS, TUNNELS, BRIDGE OVERHEADS, PASSENGER PLATFORMS, POLES, UTILITY LINES, WAYSIDE SIGNAL DEVICES, AND ALL OTHER NATURAL OR MAN-MADE STRUCTURES AND OBJECTS.
- ②  MAXIMUM COMBINATION DOUBLESTACK CARS (8'-6" WIDE BY 9'-6 1/2" HIGH CONTAINERS STACKED TWO HIGH, 1'-2" ATR).
- ③  ARTICULATED BI-LEVEL AUTO CARRIER CAR.
- ④  TRI-LEVEL AUTO CARRIER CAR (CHRYSLER TYPE).
- ⑤  AAR PLATE H CLEARANCE ENVELOPE (FOR DOUBLESTACK CARS WITHOUT CONTAINERS).

NOTES:

- ALL NEW CONSTRUCTION, RECONSTRUCTION, ALTERATIONS AND MODIFICATIONS MUST BE IN COMPLIANCE WITH THE CLEARANCE ENVELOPE REQUIREMENTS FOR UNOBSTRUCTED TRANSPORT OF THIS RAIL EQUIPMENT.
- HORIZONTAL CLEARANCE DISTANCES SHALL BE INCREASED ON CURVES AT RATE OF 1.07" ON INSIDE OF CURVES AND 1.05" ON OUTSIDE OF CURVES PER DEGREE OF CURVE.
- WHEN TRACK SUPERELEVATION IS SET APPROPRIATELY FOR THE AUTHORIZED TRAIN SPEED, ALL CLEARANCE MEASUREMENTS ARE TO BE MADE PARALLEL TO THE PLANE OF THE TOP OF RAIL AND PERPENDICULAR TO THE CENTERLINE OF TRACK.
- DIMENSIONS SHOWN ARE FOR INFORMATION ONLY AND NOT TO BE USED TO ESTABLISH LEGAL CLEARANCE REQUIREMENTS OR FOR HIGH-WIDE LOAD CLEARANCES.
- IN MANY INSTANCES, STATE LAW MAY REQUIRE GREATER CLEARANCE THAN PROVIDED FOR IN THE COMBINED CLEARANCE ENVELOPE, IN WHICH CASE THE GREATER CLEARANCE SHALL GOVERN.
- CLEARANCE DIMENSION REQUIREMENTS INDICATED EXCEED MOST STATES PERMISSIVE CLEARANCES FOR LOW PLATFORMS HOWEVER, THESE CLEARANCE STANDARDS SHALL GOVERN FOR 8 INCHES OR LOWER PLATFORMS.
- THE PRESCRIBED CLEARANCE MARGIN ENVELOPE MAY BE MODIFIED WHEN APPROVED BY THE DIRECTOR OF ENGINEERING AND CONSTRUCTION.

				DRAWN BY: A. CARLOS		DATE: 03/31/2011		SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES, SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.		 METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012		ENGINEERING STANDARDS		STANDARD 2103	
				 ASSISTANT DIRECTOR: STANDARDS & DESIGN		 DIRECTOR OF ENGINEERING AND CONSTRUCTION						CAR (EQUIPMENT) CLEARANCE ENVELOPE		SCALE: NONE	
				X XX-XX-XX		REVISION		XX XX				REVISION SHEET		1 OF 1	
				REV. DATE		DESCRIPTION		DES. ENG.				CADD FILE:		ES2103	

MINIMUM CLEARANCES OF WIRES ABOVE RAILROADS, ROADWAYS, ETC.

1. CLEARANCES BETWEEN OVERHEAD CONDUCTORS, GUYS, MESSENGERS OR TROLLEY SPAN WIRES AND TOPS OF RAILS, SURFACES OF ROADWAYS OR OTHER GENERALLY ACCESSIBLE AREAS ACROSS, ALONG OR ABOVE WHICH ANY OF THE FORMER PASS; ALSO THE CLEARANCES BETWEEN CONDUCTORS, GUYS, MESSENGERS OR TROLLEY SPAN WIRES AND BUILDINGS, POLES, STRUCTURES, OR OTHER OBJECTS, SHALL NOT BE LESS THAN THOSE SET FORTH IN TABLE 1, AT A TEMPERATURE OF 60°F AND NO WIND.
2. THE CLEARANCES SPECIFIED IN TABLE 1, CASE 1, COLUMNS A, B, D, E AND F, SHALL IN NO CASE BE REDUCED MORE THAN 5% BELOW THE TABULAR VALUES BECAUSE OF TEMPERATURE AND LOADING AS SPECIFIED IN CPUC G.O. 95 RULE 43. THE CLEARANCES SPECIFIED IN TABLE 1, CASES 2 TO 6 INCLUSIVE, SHALL IN NO CASE BE REDUCED MORE THAN 10% BELOW THE TABULAR VALUES BECAUSE OF TEMPERATURE AND LOADING AS SPECIFIED IN CPUC G.O. 95 RULE 43.
3. THE CLEARANCE SPECIFIED IN TABLE 1, CASE 1, COLUMN C (22.5 FEET), SHALL IN NO CASE BE REDUCED BELOW THE TABULAR VALUE BECAUSE OF TEMPERATURE AND LOADING AS SPECIFIED IN RULE 43.
4. WHERE SUPPLY CONDUCTORS ARE SUPPORTED BY SUSPENSION INSULATORS AT CROSSINGS OVER RAILROADS WHICH TRANSPORT FREIGHT CARS, THE INITIAL CLEARANCES SHALL BE SUFFICIENT TO PREVENT REDUCTION TO CLEARANCES LESS THAN 95% OF THE CLEARANCES SPECIFIED IN TABLE 1, CASE 1, THROUGH THE BREAKING OF A CONDUCTOR IN EITHER OF THE ADJOINING SPANS.

The diagram illustrates a cross-section of a double-track railway bridge. Two tracks are shown, each with a centerline labeled 'C TRACK'. The bridge structure is supported by piers. On the right side, a tall utility pole is shown with multiple cross-arms. The following table summarizes the clearance heights and equipment locations:

Equipment / Feature	Height / Clearance
SUPPLY LINES 22.5 KV AND GREATER	Top of the utility pole structure
SUPPLY LINES UNDER 22.5 KV, SIGNAL LINES, AND COMMUNICATIONS CONDUCTORS	Below the 22.5 KV lines
SPAN WIRES, OVERHEAD GUYS, AND MESSENGERS	Below the signal lines
Clearance to top of track structure	34'
Clearance to top of rail (T/R)	28'
Clearance to top of track structure (from rail level)	25'



ENGINEERING STANDARDS

MINIMUM VERTICAL CLEARANCE FOR WIRES

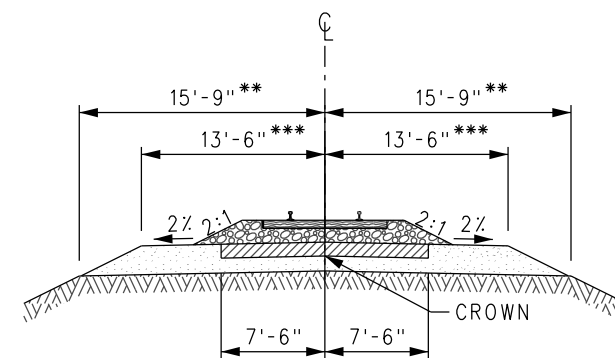
UserName-> carlosa Date Plotted: 10/5/2011 2:19:04 PM Plot Driver-> S:\Plot Drivers\pdf.plt FileName-> s:\V8EngStds\2000\ES2104.dgn



The diagram shows a cross-section of a roadbed with various layers and dimensions. The top layer is labeled "CROWN". Dimensions are given in feet and inches. Key dimensions include:

- Total width at the top: 17'-3" on each side of the centerline.
- Width of the upper layer: 15'-0" on each side of the centerline.
- Width of the lower layer: 8'-6" on each side of the centerline.
- Minimum width of the base layer: 3'-0" on each side of the centerline.
- Slopes: 2% on the outer edges and 2:1 on the inner slopes.

TYPICAL HMAC UNDERLAYMENT
SECTION IN YARDS



TYPICAL HMAC UNDERLAYMANT
SECTION ON MAINLINES

LEGEND



BALLAST



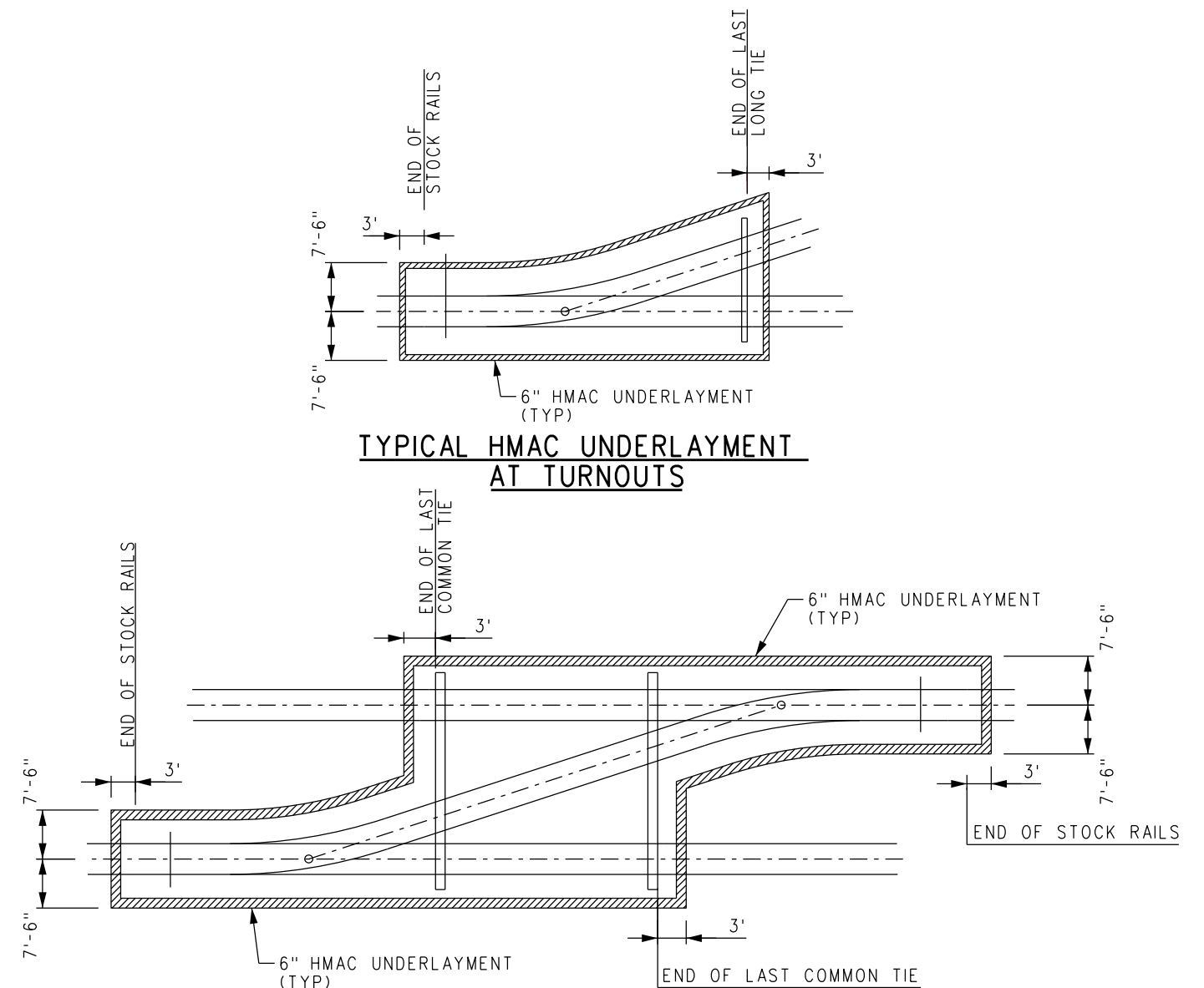
HOT MIX ASPHALT CONCRETE



SUBBALLAST



SUBGRADE





TYPICAL HMAC UNDERLAYMENT AT CROSSOVERS

HMAC VOLUME QUANTITIES

CROSSOVER NO	TRACK CENTER DISTANCE (FT)	AREA OF HMAC (SF)	VOLUME OF 6" HMAC (CY)	WEIGHT OF HMAC (TONS)
10	15	4490	84	146
14	15	6210	115	202
20	15	8760	163	285
24	15	11780	218	383

* CALCULATIONS FOR THEORETICAL WEIGHT OF HMAC
BASED ON UNIT WEIGHT OF 130 LBS PER CUBIC FEET.
THE QUANTITY WILL BE INCREASED IF TRACK CENTER
DISTANCE IS INCREASED.

						DRAWN BY:	A. CARLOS	DATE:	04/12/02
						 ASSISTANT DIRECTOR: STANDARDS & DESIGN			
A	11-11-16	REVISED TABLES		AC	NDP				
REV.	DATE	DESCRIPTION		DES.	ENG.	 DIRECTOR OF ENGINEERING AND CONSTRUCTION			

DRAWN BY:	A. CARLOS	DATE:	04/12/02
-----------	-----------	-------	----------

/	

2/2

1/ Vortex in KQ

ASSISTANT DIRECTOR: STANDARDS & DESIGN

Assistant Director, Structures & Design

[Signature]

SCRA ENGINEERING STANDARDS ARE INTENDED FOR SCRA APPROVED USES ONLY. FOR NON-SCRA APPROVED USES:

SCRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRA. ALL RIGHTS RESERVED


METROLINK®

SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

ENGINEERING STANDARDS

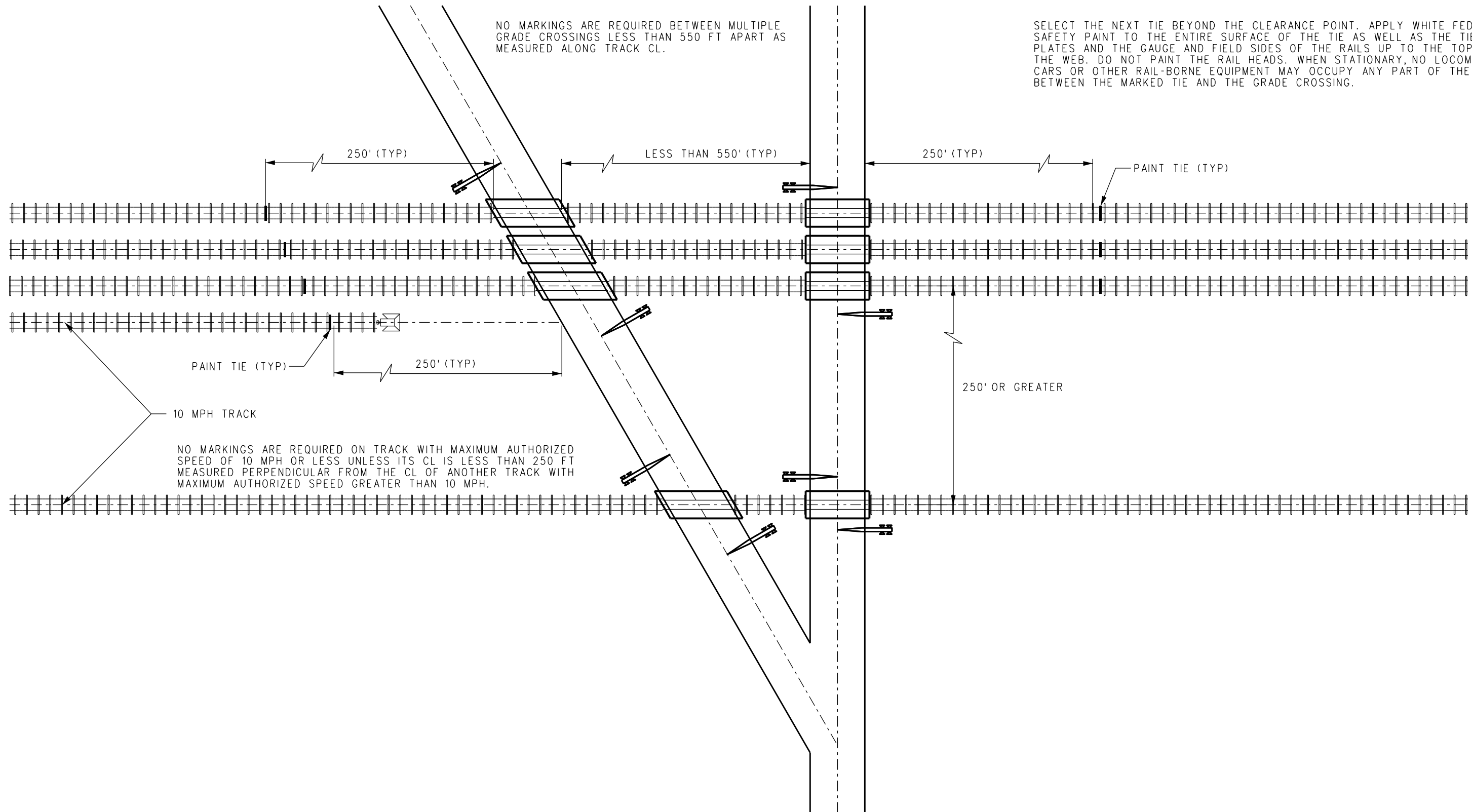
TURNOUT WALKWAYS AND HMAC UNDERLAYMENT

STANDARD	2105
----------	------

SCALE: NTS

REVISION	SHEET
A	1 OF 1

CADD FILE: ES2105



						DRAWN BY:	HDR	DATE:	03/31/2011
X	XX-XX-XX		REVISION		XX	XX			
REV.	DATE		DESCRIPTION		DES.	ENG.			

Narek D. Bhe
ASSISTANT DIRECTOR: STANDARDS & DESIGN
William D. Davis
DIRECTOR OF ENGINEERING AND CONSTRUCTION

SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY.
FOR NON-SCRRRA APPROVED USES:
SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.



METROLINK

SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

ENGINEERING STANDARDS

TRACK CLEARANCE POINTS
AT GRADE CROSSINGS

STANDARD	2106
SCALE:	NTS
REVISION	SHEET
-	1 OF 1
CADD FILE:	ES2106

INSTRUCTIONS FOR MARKING NO RIDE ZONE
FOR SIDE AND SECONDARY TRACKS
(BASED ON 13'-6" CLEARANCE POINT)

CASE 1 DIVERGING TRACKS

WHERE A TRACK TURNS OUT AND CONTINUES TO DIVERGE FROM THE PARENT TRACK, THE 13'-6" CLEARANCE POINT SHALL BE WHERE THE DISTANCE BETWEEN THE FIELD SIDES OF THE TWO CLOSEST RAILHEADS IS 8'-4" MEASURED PERPENDICULAR TO THE CL OF THE PARENT TRACK.

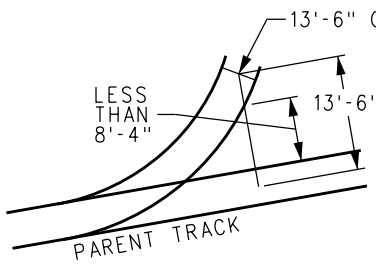


FIGURE 1A

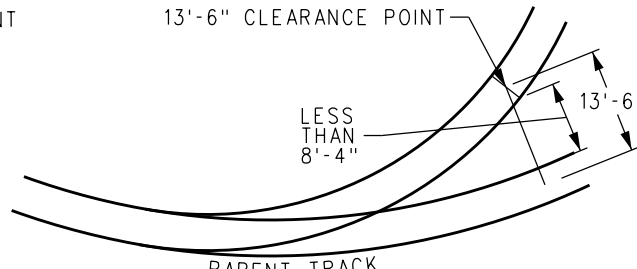


FIGURE 1B

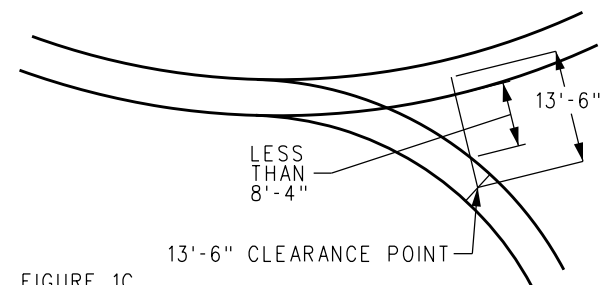


FIGURE 1C

CASE 2 PARALLEL TRACKS - TANGENT OR CURVED

WHERE A TRACK TURNS OUT AND BECOMES PARALLEL TO THE PARENT TRACK, THE 13'-6" CLEARANCE POINT SHALL BE WHERE THE DISTANCE BETWEEN THE FIELD SIDES OF THE TWO CLOSEST RAILHEADS IS 8'-4" MEASURED PERPENDICULAR TO THE CL OF THE PARENT TRACK. SEE FIGURES 2A AND 2C.

WHERE TRACKS ARE PARALLEL, BUT THE FIELD SIDES OF THE TWO CLOSEST RAILS ARE LESS THAN 8'-4" APART, THE CLEARANCE POINT SHALL BE WHERE THE TRACKS BECOME PARALLEL. SEE FIGURES 2B AND 2D.

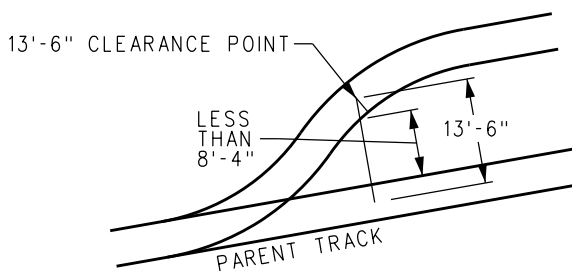


FIGURE 2A

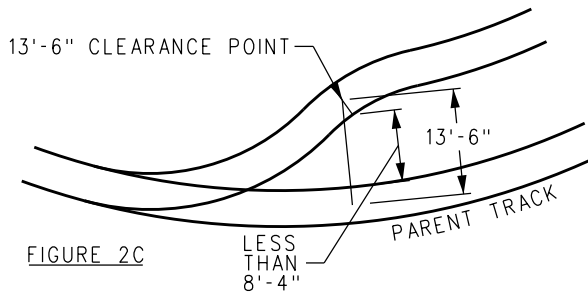


FIGURE 2C

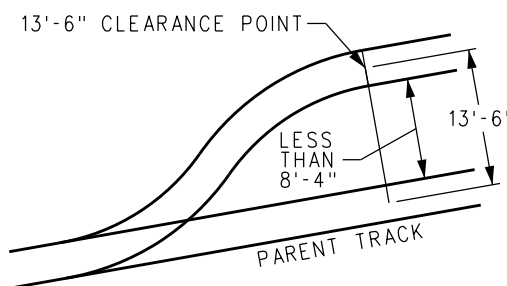


FIGURE 2B

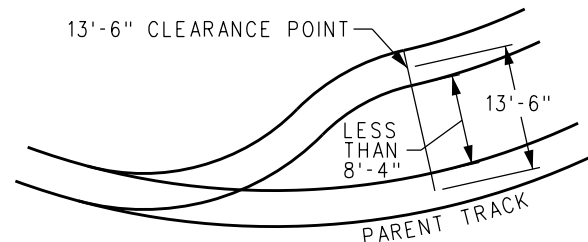
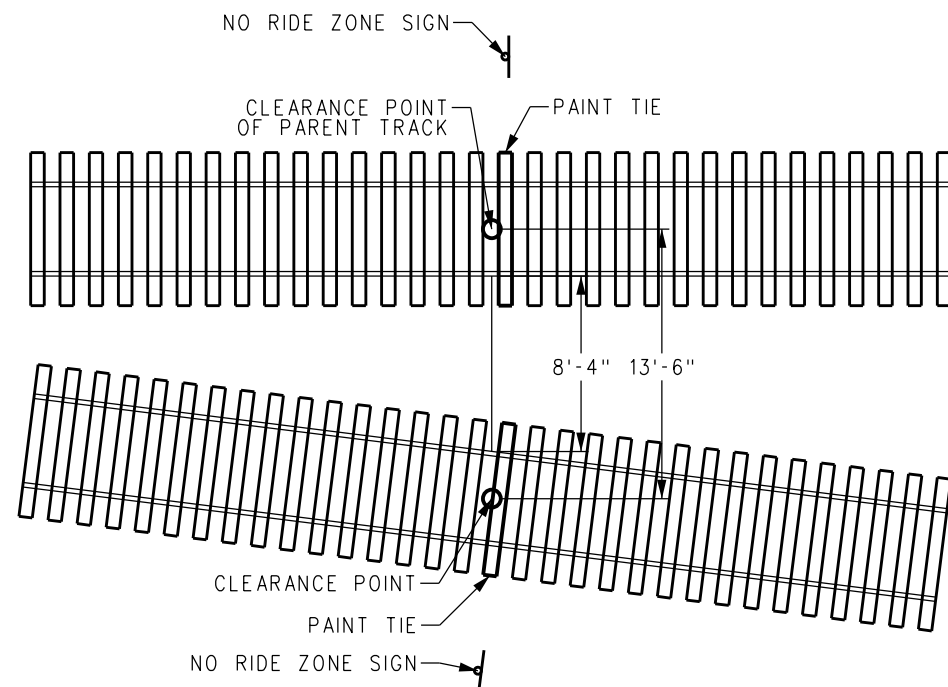


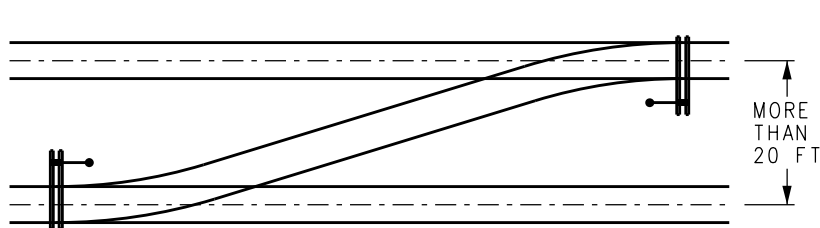
FIGURE 2D

SELECTING AND MARKING NO RIDE ZONE

SELECT THE NEXT TIES BEYOND THE NO RIDE POINT AS DETERMINED BY CASE 1 OR 2. APPLY WHITE PAINT TO THE ENTIRE TOP SURFACE OF THE TIES AS WELL AS THE TIE PLATES AND THE GAUGE AND FIELD SIDES OF THE RAILS UP TO THE TOP OF THE WEB. DO NOT PAINT THE RAIL HEADS.

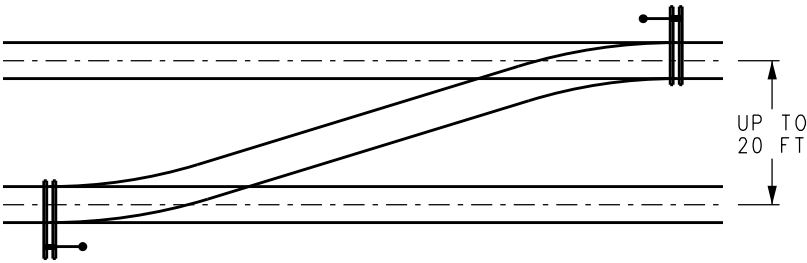


				DRAWN BY: HDR DATE: 03/31/2011		SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES, SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.	 METROLINK® SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012	ENGINEERING STANDARDS		STANDARD
								2107		
								SCALE: NTS		
								REVISION SHEET		
								1 OF 1		
								CADD FILE: ES2107		



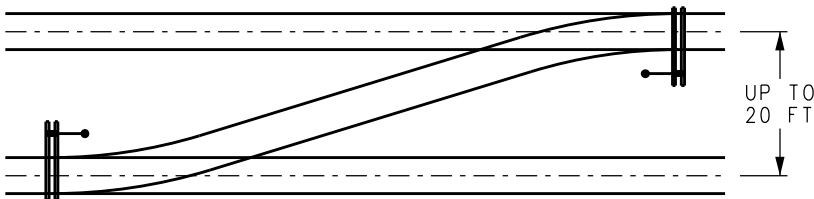
TRACKS MORE THAN 20 FT ON CENTER
(INSIDE PLACEMENT)

	SWITCH STANDS	ROD LENGTH	HEADBLOCK TIE LENGTH
MAIN LINE	112E, 36EH	7'-0"	17'-0"
YARD	22E, 36E	5'-0"	15'-0"



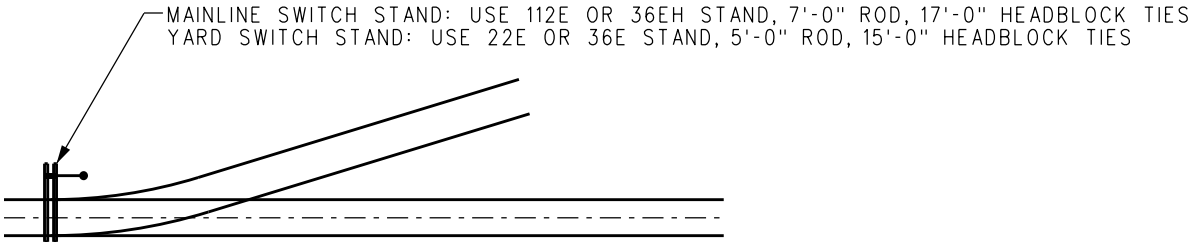
TRACKS 13 FT TO 20 FT ON CENTER
(OUTSIDE PLACEMENT)

	SWITCH STANDS	ROD LENGTH	HEADBLOCK TIE LENGTH
MAIN LINE	112E, 36EH	7'-0"	17'-0"
YARD	22E, 36E	5'-0"	15'-0"



TRACKS 13 FT TO 20 FT ON CENTER
(INSIDE PLACEMENT)

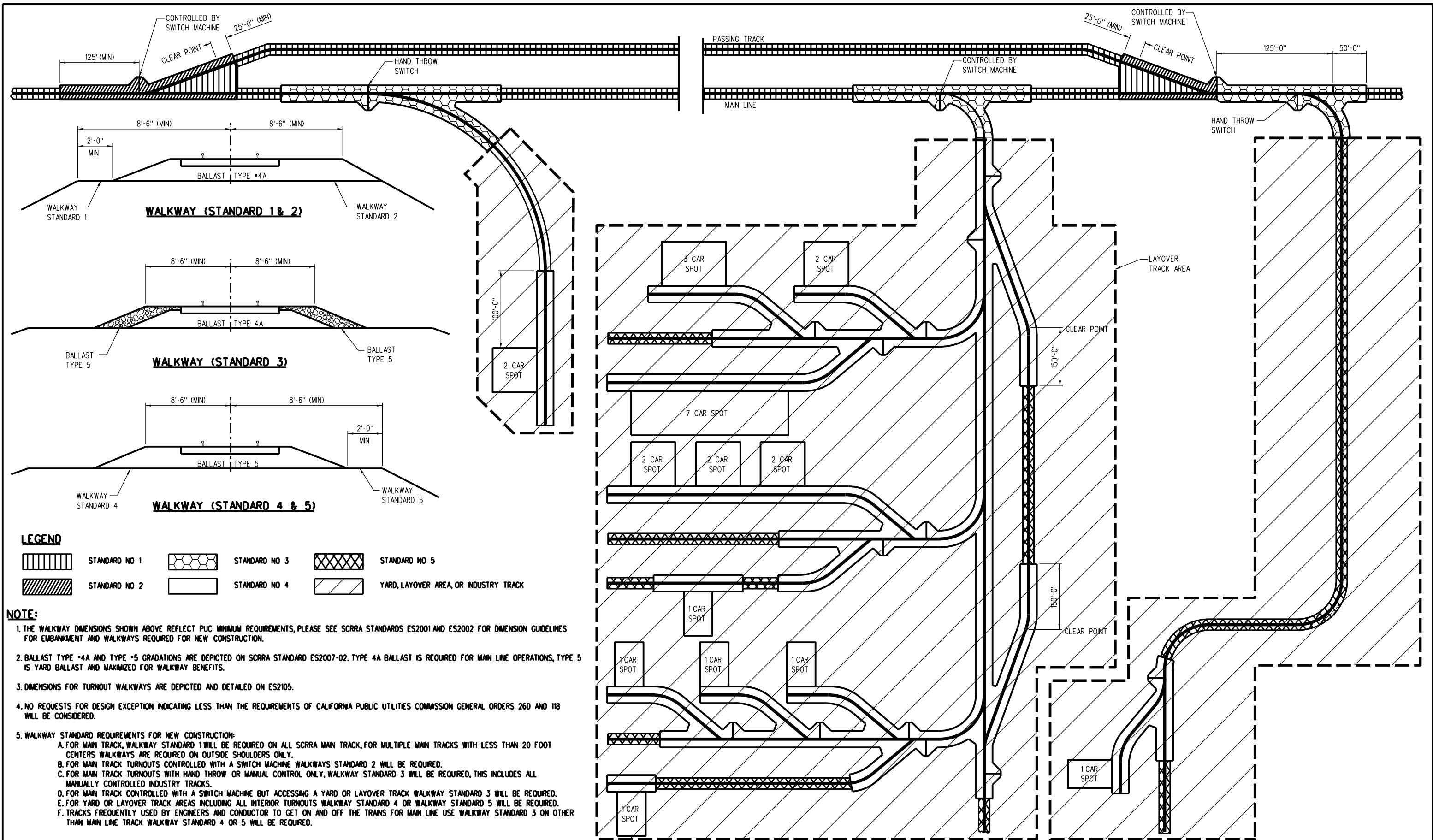
	SWITCH STANDS	ROD LENGTH	HEADBLOCK TIE LENGTH
MAIN LINE	36E WITH SWITCH HANDLE	3'-4"	14'-0"
YARD	22E, 36E WITH SWITCH HANDLE	3'-4"	14'-0"



TYPICAL ALIGNMENT WITH
NO CLEARANCE RESTRICTIONS

- NOTES:**
- SWITCH STANDS SHALL BE:
 - WHERE SPACE PERMITS, MOUNTED ON THE CLOSED POINT SIDE OF THE SWITCH WHEN LINED FOR THE MAIN TRACK.
 - NO LESS THAN 8'-6" (HIGH STANDS) OR 6'-0" (LOW STANDS) FROM THE CENTER OF ANY TRACK TO ANY PART OF THE STAND OR TARGET IN ITS MOST RESTRICTIVE POSITION.
 - POSITIONED WITH THE HANDLE POINTING TOWARD THE FROG WHEN THE SWITCH IS LINED FOR THE MAIN TRACK.
 - FIRMLY ATTACHED TO THE HEADBLOCK TIES.
 - WHERE TRACKS ARE 20 FT OR LESS ON CENTER, OUTSIDE PLACEMENT OF SWITCH STANDS IS PREFERRED. INSIDE PLACEMENT SHALL BE USED ONLY WHERE FIELD CONDITIONS MAKE OUTSIDE PLACEMENT IMPRACTICAL.

						DRAWN BY: HDR	DATE: 03/31/2011	SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES: SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.	 METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012	ENGINEERING STANDARDS	STANDARD 2108
										SCALE: NTS	
										REVISION SHEET	1 OF 1
										CADD FILE:	ES2108



LEGEND

	STANDARD NO 1		STANDARD NO 3		STANDARD NO 5
	STANDARD NO 2		STANDARD NO 4		YARD, LAYOVER AREA, OR INDUSTRY TRACK

NOTE:

1. THE WALKWAY DIMENSIONS SHOWN ABOVE REFLECT PUC MINIMUM REQUIREMENTS, PLEASE SEE SCRRRA STANDARDS ES2001 AND ES2002 FOR DIMENSION GUIDELINES FOR EMBANKMENT AND WALKWAYS REQUIRED FOR NEW CONSTRUCTION.
2. BALLAST TYPE #4A AND TYPE #5 GRADATIONS ARE DEPICTED ON SCRRRA STANDARD ES2007-02. TYPE 4A BALLAST IS REQUIRED FOR MAIN LINE OPERATIONS, TYPE 5 IS YARD BALLAST AND MAXIMIZED FOR WALKWAY BENEFITS.
3. DIMENSIONS FOR TURNOUT WALKWAYS ARE DEPICTED AND DETAILED ON ES2105.
4. NO REQUESTS FOR DESIGN EXCEPTION INDICATING LESS THAN THE REQUIREMENTS OF CALIFORNIA PUBLIC UTILITIES COMMISSION GENERAL ORDERS 260 AND 118 WILL BE CONSIDERED.
5. WALKWAY STANDARD REQUIREMENTS FOR NEW CONSTRUCTION:
 - A. FOR MAIN TRACK, WALKWAY STANDARD 1 WILL BE REQUIRED ON ALL SCRRRA MAIN TRACK, FOR MULTIPLE MAIN TRACKS WITH LESS THAN 20 FOOT CENTERS WALKWAYS ARE REQUIRED ON OUTSIDE SHOULDERS ONLY.
 - B. FOR MAIN TRACK TURNOUTS CONTROLLED WITH A SWITCH MACHINE WALKWAYS STANDARD 2 WILL BE REQUIRED.
 - C. FOR MAIN TRACK TURNOUTS WITH HAND THROW OR MANUAL CONTROL ONLY, WALKWAY STANDARD 3 WILL BE REQUIRED, THIS INCLUDES ALL MANUALLY CONTROLLED INDUSTRY TRACKS.
 - D. FOR MAIN TRACK CONTROLLED WITH A SWITCH MACHINE BUT ACCESSING A YARD OR LAYOVER TRACK WALKWAY STANDARD 3 WILL BE REQUIRED.
 - E. FOR YARD OR LAYOVER TRACK AREAS INCLUDING ALL INTERIOR TURNOUTS WALKWAY STANDARD 4 OR WALKWAY STANDARD 5 WILL BE REQUIRED.
 - F. TRACKS FREQUENTLY USED BY ENGINEERS AND CONDUCTOR TO GET ON AND OFF THE TRAINS FOR MAIN LINE USE WALKWAY STANDARD 3 ON OTHER THAN MAIN LINE TRACK WALKWAY STANDARD 4 OR 5 WILL BE REQUIRED.

				DRAWN BY: A. CARLOS	DATE: 03/31/2011	SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.		METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012		ENGINEERING STANDARDS		STANDARD 2109
				Narek D. Bze ASSISTANT DIRECTOR: STANDARDS & DESIGN						SCALE: NTS		REVISION SHEET 1 OF 1
				William D. Davis DIRECTOR OF ENGINEERING AND CONSTRUCTION						CPUC MINIMUM WALKWAY STANDARDS		CADD FILE: ES2109
X	XX-XX-XX	REVISION	XX	XX								
REV.	DATE	DESCRIPTION	DES.	ENG.								

STANDARD VERTICAL CURVES (AREMA SECTION 3.6)

EXAMPLE CALCULATION FOR FREIGHT OPERATIONS

CREST CURVE WITH +0.50% APPROACHING GRADE MEETING A -0.50% DEPARTING GRADE. MAXIMUM DESIGN SPEED IS 50 MPH.

A=0.10 FEET/SEC/SEC VERTICAL ACCELERATION (FREIGHT)
D=ABSOLUTE VALUE OF ((+0.005)-(-0.005))=0.01
K=2.15 CONVERSION FACTOR TO GIVE LVC IN FEET
V=50 MPH DESIGN SPEED

LVC= $\frac{D \times V^2 \times K}{A}$ = MINIMUM LENGTH OF VERTICAL CURVE IN FEET

LVC= $\frac{(0.01) \times (50\text{MPH})^2 \times 2.15}{0.10 \text{ FEET/SEC/SEC}}$ = 537.50 FEET SAY 540 FEET

EXAMPLE CALCULATION FOR PASSENGER OPERATIONS

CREST CURVE WITH +0.50% APPROACHING GRADE MEETING A -0.50% DEPARTING GRADE. MAXIMUM DESIGN SPEED IS 75 MPH.

A=0.60 FEET/SEC/SEC VERTICAL ACCELERATION (PASSENGER)
D=ABSOLUTE VALUE OF ((+0.005)-(-0.005))=0.01
K=2.15 CONVERSION FACTOR TO GIVE LVC IN FEET
V=75 MPH DESIGN SPEED

LVC= $\frac{D \times V^2 \times K}{A}$ = MINIMUM LENGTH OF VERTICAL CURVE IN FEET

LVC= $\frac{(0.01) \times (75\text{MPH})^2 \times 2.15}{0.60 \text{ FEET/SEC/SEC}}$ = 201.56 FEET SAY 205 FEET

1. VERTICAL CURVES AS CALCULATED IN ITEM 6 BELOW SHALL BE USED TO CONNECT ALL CHANGES IN GRADIENTS.
2. THE LENGTH OF VERTICAL CURVES IS DETERMINED BY CHANGES IN GRADIENT, VERTICAL ACCELERATION AND THE SPEED OF THE TRAIN.
3. THE PURPOSE OF VERTICAL CURVES IS TO EASE THE CHANGE OF THE GRADIENTS IN ORDER TO REDUCE COUPLER AND DIAPHRAGM BINDING AND ELIMINATE THE DANGER OF BREAKING THE TRAIN IN TWO AS A DIRECT RESULT OF TRAIN ACTION. PROPERLY DESIGNED VERTICAL CURVES WILL PROVIDE FOR PASSENGER COMFORT. VERTICAL CURVES SHALL BE DESIGNED LONG ENOUGH TO MATCH THE HIGHEST SPEEDS CONTEMPLATED FOR THE LINES.
4. A VERTICAL CURVE WHICH IS CONCAVE UPWARD SHALL BE DENOTED AS A SAG. A VERTICAL CURVE WHICH IS CONCAVE DOWNWARD SHALL BE DENOTED AS A SUMMIT (SEE DIAGRAMS BELOW).
5. VERTICAL CURVES SHALL BE PARABOLIC.
6. THE MINIMUM LENGTH OF VERTICAL CURVES FOR BOTH SAGS AND SUMMITS IS DETERMINED BY THE FOLLOWING FORMULA:

LVC = $\frac{D \times V^2 \times K}{A}$

WHERE: A = VERTICAL ACCELERATION IN FEET/SEC/SEC (FT/SEC²)
D = ABSOLUTE VALUE OF THE DIFFERENCE IN RATES OF GRADES EXPRESSED AS A DECIMAL
K = 2.15 CONVERSION FACTOR TO GIVE LVC IN FEET
V = DESIGN SPEED IN MILES PER HOUR

IT IS RECOMMENDED PRACTICE TO ROUND THE CALCULATED MINIMUM LVC UP TO A CONVENIENT WHOLE NUMBER. ON TRACKS WITH DESIGN SPEEDS GREATER THAN OR EQUAL TO 25 MPH, ANY CALCULATED MINIMUM LVC OF LESS THAN 100 FT SHALL BE ROUNDED UP TO AT LEAST 100 FT.

7. THE RECOMMENDED VERTICAL ACCELERATION (A) SHALL BE SELECTED BASED ON THE TYPE OF OPERATIONS AND IS THE SAME FOR BOTH SAGS AND SUMMITS. DEVIATIONS FROM THESE ACCELERATION CRITERIA MAY BE AUTHORIZED BY THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION. THE LONGEST VERTICAL CURVE COMPUTED BY THESE METHODS WITH EACH CRITERIA WILL GOVERN.

FREIGHT OPERATIONS:
A=0.10 FEET/SEC/SEC

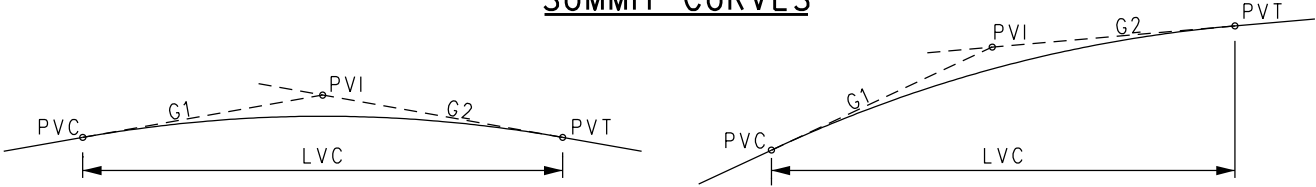
PASSENGER OPERATIONS:
A=0.60 FEET/SEC/SEC

MIXED PASSENGER WITH FREIGHT TRAFFIC NOT EXCEEDING 4000
TON TRAINS OR 8 MILLION GROSS TONS ANNUAL FREIGHT TRAFFIC
A=0.30 FEET/SEC/SEC FREIGHT SPEED
A=0.60 FEET/SEC/SEC PASSENGER SPEED

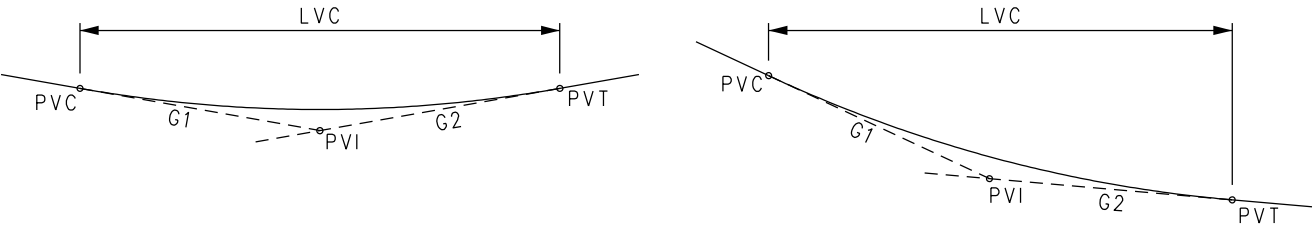
WHEN DESIGNING VERTICAL CURVES ON MIXED USE FREIGHT AND PASSENGER OPERATIONS, THE DESIGNER SHALL CALCULATE MINIMUM LVC'S USING THE APPLICABLE VALUES OF "A" AND "V" AND SELECT THE LONGEST VALUE YIELDED.

8. THE MINIMUM DISTANCE BETWEEN VERTICAL CURVES SHALL BE 3V OR 100 FT, WHICHEVER IS GREATER. (V=DESIGN SPEED IN MPH.)
9. TURNOUTS SHALL NOT BE PLACED WITHIN THE LIMITS OF ANY VERTICAL CURVE.
10. THE DESIRABLE LENGTH OF VERTICAL CURVES IN YARD TRACKS SHALL BE NOT LESS THAN 100 FT. THE MINIMUM LENGTH OF VERTICAL CURVES IN YARD TRACKS SHALL BE 30 FT.
11. THE GOAL OF DESIGN OF THE VERTICAL ALIGNMENT IS TO REDUCE THE NUMBER OF VERTICAL CURVES, CONSISTENT WITH ENGINEERING ECONOMY AND SITE CONSTRAINTS.
12. VERTICAL CURVES SHALL BE DESIGNED USING THE FUTURE MAXIMUM DESIGN SPEED FOR PASSENGER AND FREIGHT TRAINS EXPECTED ON A GIVEN SUBDIVISION. FUTURE MAXIMUM SPEEDS FOR PASSENGER TRAINS MAY EXCEED SPEEDS CURRENTLY IN EFFECT. DESIGNERS SHALL CONSULT WITH THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION FOR THE FUTURE MAXIMUM PASSENGER SPEED AT EACH LOCATION.
13. SPEED RESTRICTIONS DUE TO SIGNAL/STOPPING DISTANCE WILL NOT BE CONSIDERED.
14. PLANS FOR NEW CONSTRUCTION, REHABILITATION, AND TEMPORARY TRACK SHALL CLEARLY SHOW THE PERCENT GRADE CHANGE, DESIGN SPEED, BEGINNING AND ENDS, AND LENGTH OF EACH VERTICAL CURVE, AND MUST SHOW CONSTRAINTS TO VERTICAL PROFILE SUCH AS EXISTING OR FUTURE BRIDGES, TURNOUTS OR STATION PLATFORMS.
15. VERTICAL CURVES WITHIN 100 FEET OF A STATION PLATFORM SHALL BE AVOIDED.

SUMMIT CURVES



SAG CURVES



ABBREVIATIONS

G1	APPROACHING GRADE
G2	DEPARTING GRADE
LVC	LENGTH OF VERTICAL CURVE
PVC	POINT OF VERTICAL CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY
VC	VERTICAL CURVE

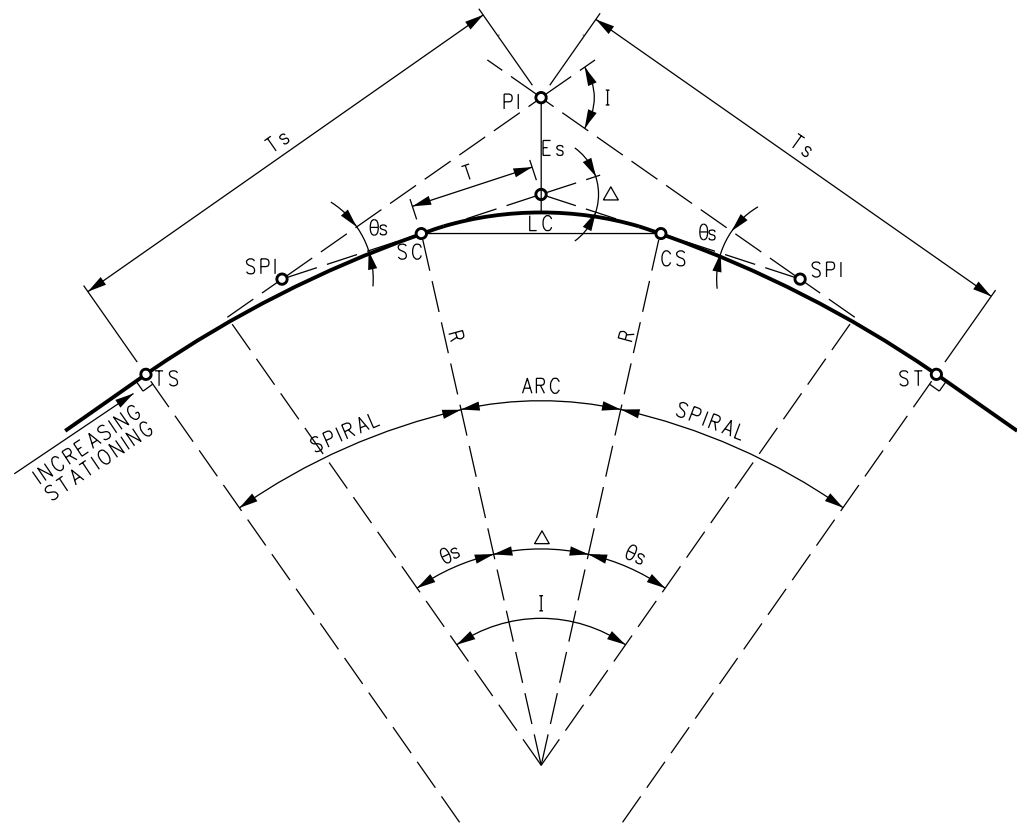


FIGURE A
CIRCULAR CURVE
WITH SPIRAL TRANSITIONS

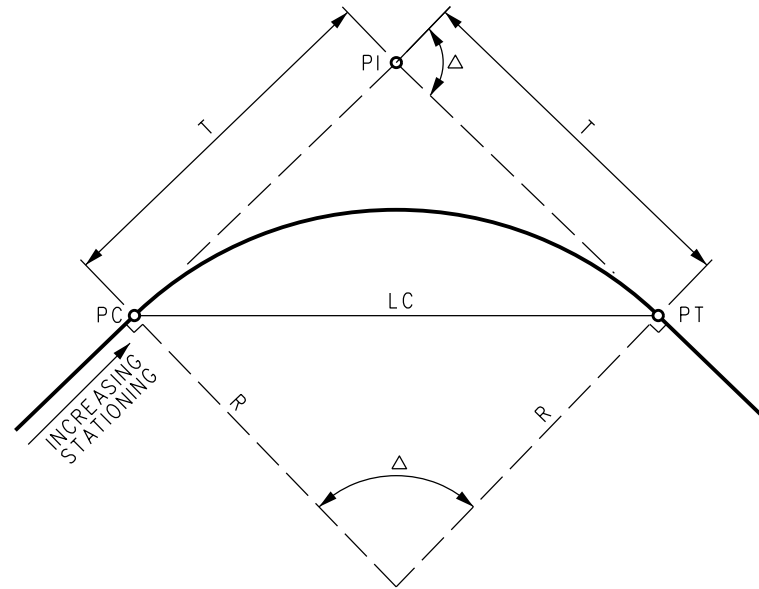


FIGURE B
SIMPLE CIRCULAR CURVE

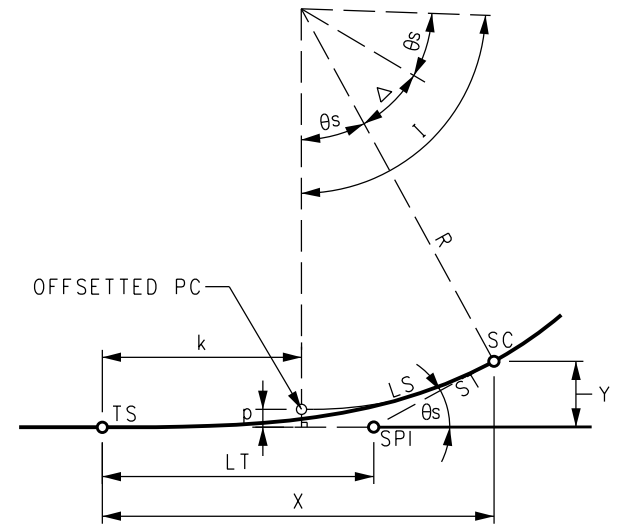


FIGURE C
SPIRAL TRANSITION CURVE

ABBREVIATIONS AND SYMBOLS

CC	COMPOUND CURVE
CS	CURVE TO SPIRAL
Δ	CENTRAL ANGLE OF CIRCULAR CURVE
Dc	DEGREE OF CURVATURE (CHORD DEFINITION)
E	EQUILIBRIUM ELEVATION (E _g + E _u)
E _a	ACTUAL ELEVATION
E _s	EXTERNAL DISTANCE FROM PI TO CIRCULAR CURVE
E _u	UNBALANCED ELEVATION (CANT DEFICIENCY)
I	TOTAL INTERSECTION ANGLE (DEFLECTION ANGLE AT THE PI)
K	INCREASE IN DEGREES OF CURVATURE PER 100 FT STATIONS ALONG SPIRAL
k	TANGENT DISTANCE FROM THE TS TO THE OFFSETTED PC
l	LENGTH FROM THE TS OR ST TO ANY POINT ON THE SPIRAL HAVING COORDINATES X AND Y
L	CHORDED LENGTH OF CIRCULAR CURVE
LC	LONG CHORD
LS	LENGTH OF SPIRAL
LT	LONG TANGENT (DISTANCE FROM THE TS TO THE SPI)
p	ORDINATE OF THE OFFSETTED PC
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PI	POINT OF INTERSECTION
PRC	POINT OF REVERSE CURVATURE
PT	POINT OF TANGENCY
R	RADIUS
s	LENGTH l IN 100 FT STATIONS
S	LENGTH OF SPIRAL (LS) IN 100 FT STATIONS
SC	SPIRAL TO CURVE
SPI	POINT OF INTERSECTION BETWEEN TS AND SC
SS	SPIRAL TO SPIRAL
ST	SPIRAL TO TANGENT
ST	SHORT TANGENT (DISTANCE FROM SPI TO SC)
θ _s	TANGENT LENGTH OF CIRCULAR CURVE
TS	TANGENT TO SPIRAL
Ts	TOTAL TANGENT DISTANCE OF A SPIRALED CURVE
X	TANGENT DISTANCE FROM TS TO SC
Y	TANGENT OFFSET TO THE SC

KEY FORMULAE

$R = \frac{50'}{\sin(\frac{\Delta}{2})}$	$T_s = (R+p)\tan(\frac{I}{2})+k$
$\Delta = I-2\theta_s$	$E_s = (R+p)\text{EX SEC}(\frac{I}{2})+p$
$L = \frac{\Delta}{D_c} \times 100$	$X = l - 0.003048\theta_s^2 s$
$T = R \tan(\frac{\Delta}{2})$	$Y = 0.582\theta_s s - 0.00001264\theta_s^3 s$
$LC = 2R \sin(\frac{\Delta}{2})$	$k = \frac{LS}{2} - 0.000508\Delta^2 s$
$LS = \frac{200\theta_s}{D_c}$	$p = 0.1454\theta_s s$
$S = \frac{LS}{100}$	
$\theta_s = \frac{LS \cdot D_c}{200}$	
$K = \frac{100 \cdot D_c}{LS}$	
$LT = X - \frac{Y}{\tan\theta_s}$	
$ST = \frac{Y}{\sin\theta_s}$	

NOTES:

- CIRCULAR CURVES ARE DEFINED BY THE CHORD DEFINITION (CENTRAL ANGLE SUBTENDED BY A CHORD OF 100 FEET) OF CURVATURE AND SPECIFIED BY DEGREE.
- SPIRALS ARE DEFINED BY THE CLOTHOID DEFINITION. AUTHORIZATION FROM SCRRRA SHALL BE OBTAINED IF ANY DIFFERENT METHOD OR PARAMETERS ARE UTILIZED FOR SPIRAL TRANSITION CURVES. THE REQUEST SHALL BE FULLY DOCUMENTED WITH DESIGN DATA, CALCULATIONS AND OTHER PERTINENT INFORMATION.
- THE TRACK GEOMETRY DATA TABLE, SHOWN IN ES2202-2, SHALL BE COMPLETED AND SUBMITTED TO SCRRRA FOR REVIEW, COMMENT AND APPROVAL FOR ALL CURVES.
- ALL ANGLES ARE IN DEGREES, DISTANCES AND LENGTHS ARE IN FEET, EXCEPT SUPERELEVATIONS ARE IN INCHES AND SPEEDS ARE IN MILES PER HOUR (MPH).

DRAWN BY: A. CARLOS DATE: 04/12/02				SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES: SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.				ENGINEERING STANDARDS				STANDARD
												2202
												SCALE:
												NTS
												REVISION SHEET
												A 1 OF 2
												CADD FILE:
												ES2202-01



METROLINK

SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

HORIZONTAL CURVE GEOMETRY

GENERAL

1. THERE ARE SIX TABLES OF DESIGN AND MAINTENANCE STANDARDS FOR SCRRRA TRACK ALIGNMENT:
TABLE P3.5: 3.5 - INCH UNBALANCED ELEVATION - STANDARD SPIRAL LENGTH TABLE FOR PASSENGER OPERATIONS
TABLE F2.0: 2.0 - INCH UNBALANCED ELEVATION - STANDARD SPIRAL LENGTH TABLE FOR FREIGHT OPERATIONS
TABLE P3.5M: 3.5 - INCH UNBALANCED ELEVATION - MINIMUM SPIRAL LENGTH TABLE FOR PASSENGER OPERATIONS
TABLE F2.0M: 2.0 - INCH UNBALANCED ELEVATION - MINIMUM SPIRAL LENGTH TABLE FOR FREIGHT OPERATIONS
TABLE PML: 4.0 - INCH UNBALANCED ELEVATION - MAINTENANCE LIMIT FOR PASSENGER OPERATIONS
TABLE FML: 3.0 - INCH UNBALANCED ELEVATION - MAINTENANCE LIMIT FOR FREIGHT OPERATIONS
2. FOR THE OPERATION OF PASSENGER EQUIPMENT NORMALLY USED IN SCRRRA AND AMTRAK TRAINS:

THE DESIGN AND MAINTENANCE OF CURVE GEOMETRY IS CONTROLLED BY FRA TRACK SAFETY STANDARDS (49CFR213.57), WHICH ESTABLISHES THE MAXIMUM SPEED FOR ANY COMBINATION OF CURVATURE AND SUPERELEVATION FOR PASSENGER TRAINS AS RESULTING IN 4 INCHES OF UNDERBALANCE. TO ASSURE THAT NORMAL MAINTENANCE VARIATIONS DO NOT INADVERTENTLY RESULT IN CURVE GEOMETRY THAT CAUSES MORE THAN 4 INCHES OF UNBALANCED ELEVATION, THE DESIGN UNDERBALANCE IS SET AT 3.5 INCHES FOR TABLES P3.5 AND P3.5M. THE FRA TABLES AND FORMULAS DEFINE 4 INCHES OF UNBALANCED ELEVATION AS THE THRESHOLD OF FAILURE; THESE SCRRRA TABLES DESIGNATE DESIGN PRACTICE THAT FITS WITHIN THE FRA LIMITS. DESIGNERS AND MAINTENANCE PERSONNEL WILL CONSTRUCT AND MAINTAIN TRACK TO THOSE VALUES EXCEPT AS AUTHORIZED BY THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION, OR AS EXCEPTED BELOW.

SCRRRA PASSENGER EQUIPMENT IS SUBJECT TO LESSENED STABILITY IN WINDS EXCEEDING 45 MPH AND ARE LIMITED TO AN UNDERBALANCE OF 3 INCHES UNDER THOSE CONDITIONS. INSTRUCTION TO TRAIN CREWS ARE TO REDUCE SPEED BY 5 MPH UNDER STRONG WIND CONDITIONS.

FREIGHT TRAIN SPEEDS ARE GOVERNED BY 49CFR213.57 TO NOT RESULT IN MORE THAN 3 INCHES OF UNDERBALANCE. FREIGHT TRAIN SPEEDS FOR NEW CURVES WILL BE DESIGNED PER TABLES F2.0 AND F2.0M, WHICH HAVE 2 INCHES UNDERBALANCE; EXISTING CURVES MAY BE MAINTAINED WITH UP TO 3 INCHES OF UNDERBALANCE AND REMEDIAL ACTION MUST BE TAKEN FOR ANY CURVE FOUND TO EXCEED 3 INCHES OF UNDERBALANCE FOR FREIGHT TRAIN SPEED.

SPIRAL EASEMENT CURVES WILL BE USED TO CONNECT CURVES TO TANGENT TRACK WHENEVER THERE IS SUPERELEVATION IN THE CURVE. THE SUPERELEVATION IS TO BE UNIFORMLY INCREASED FROM THE TANGENT TO THE CURVE THROUGHOUT THE LENGTH OF THE SPIRAL. THE SPIRAL IS ALSO A HORIZONTAL ALIGNMENT ELEMENT OF GRADUALLY DECREASING RADIUS, WHICH MATCHES THE RADIUS OF THE CIRCULAR CURVE ELEMENT AT THE POINT IT MEETS THE CURVE.

THE LENGTH OF THE SPIRALS IN THE TABLES HAS BEEN CALCULATED BASED UPON THE SPEED OF THE TRAIN AND ON THE MAXIMUM TWIST THAT ROLLING STOCK CAN SAFELY NEGOTIATE. LONG CARS THAT TRAVERSE SPIRALS THAT HAVE MORE THAN 1 INCH OF ELEVATION CHANGE IN 62 FEET BEGIN TO UNLOAD SOME OF THE VERTICAL LOAD ON WHEELS IF THEIR SIDE BEARING CLEARANCE IS AT MINIMUMS. THEREFORE STANDARD LENGTH SPIRALS DO NOT EXCEED THIS RATE OF CHANGE. A MAXIMUM CHANGE OF 1 INCH PER 50 FEET IS PERMITTED UNDER THE "MINIMUM" TABLES, BECAUSE SPIRALS WITH THESE PARAMETERS ARE FOUND ON SOME LINES AND CANNOT BE CHANGED DUE TO GEOGRAPHIC LIMITATIONS. THE MINIMUM SPIRAL LENGTHS FOUND IN TABLES P3.5M AND F2.0M MAY ONLY BE USED ON THE VENTURA AND ANTELOPE VALLEY SUBDIVISION. AT SPEEDS IN EXCESS OF 50 MPH, THE LENGTH OF SPIRALS IS INCREASED TO MINIMIZE TRANSIENT DYNAMIC LOADS AND PASSENGER DISCOMFORT.

SPIRALS MAY BE LONGER THAN THE STANDARD LENGTHS SHOWN. LONGER SPIRALS THAT EXIST FROM ORIGINAL CONSTRUCTION WILL NOT BE SHORTENED UNLESS NECESSARY TO OBTAIN REVERSING TANGENT LENGTH. SPIRALS FOR CURVES, WHICH MAY BE DESIGNED FOR HIGHER SPEED IN THE FUTURE (E.G. NEAR PRESENT SPEED RESTRICTIONS SUCH AS TUNNELS) SHOULD BE DESIGNED WITH SPIRAL LENGTHS FOR FUTURE HIGHER SPEED AND SUPERELEVATION; AND PRESENTLY NEEDED SUPERELEVATION RUNOFF OVER THE LENGTH OF THE SPIRAL.

NEW CONSTRUCTION WILL BE DESIGNED WITH STANDARD LENGTH SPIRALS PER THE EXAMPLE SHOWN ON THIS SHEET FOR THE MAXIMUM FUTURE DESIGN SPEED FOR THE LOCATION.

CURVE DESIGN PROCEDURE

1. REFER TO AREMA CHAPTER 5.3 FOR A COMPLETE DISCUSSION OF CURVE DESIGN.
2. IN ORDER TO SELECT THE SUPERELEVATION AND SPIRAL LENGTHS FOR CURVES, THE DESIGN SPEEDS FOR FREIGHT AND PASSENGER TRAINS MUST BE DEVELOPED. A SERIES OF TRIAL SOLUTIONS IS USUALLY NECESSARY. EVERY CURVE MUST MEET THE STANDARDS OF SPIRAL LENGTH AND SUPERELEVATION FOR THE SPEED CHOSEN. THE GOAL IS TO OBTAIN THE MAXIMUM SPEED FOR PASSENGER TRAINS CONSISTENT WITH GOOD TRAIN HANDLING, SIGNAL SPACING AND PRACTICAL LIMITS OF EQUIPMENT PERFORMANCE AND TO HAVE THE RESULTING DESIGN PROVIDE AN ACCEPTABLE FREIGHT TRAIN OPERATION AND MAINTENANCE ENVIRONMENT.
3. HORIZONTAL CURVES SHALL BE DESIGNED USING THE FUTURE MAXIMUM DESIGN SPEED FOR PASSENGER AND FREIGHT TRAINS EXPECTED ON A GIVEN SUBDIVISION. FUTURE MAXIMUM SPEEDS FOR PASSENGER TRAINS MAY EXCEED SPEEDS CURRENTLY IN EFFECT. THIS MAY RESULT IN SPIRAL LENGTHS THAT ARE LONGER THAN REQUIRED TO PROVIDE FOR PROPOSED SUPERELEVATION RUNOFF FOR NEW CONSTRUCTION. DESIGNERS WILL CONSULT WITH THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION FOR THE FUTURE PASSENGER SPEED AT EACH LOCATION. THE SPIRAL LENGTH DESIGN SHALL BE SUFFICIENT TO ALLOW SUPERELEVATION RUNOFF FOR THE FUTURE MAXIMUM DESIGN SPEED EVEN IF THE ACTUAL DESIGN OPERATING SPEED IS LESS THAN THE FUTURE MAXIMUM DESIGN SPEED.
4. THE MAXIMUM SPEED FOR FREIGHT TRAINS IS 60 MILES PER HOUR.
5. ALL NEW WORK SHOULD USE TABLES P3.5 AND F2.0 TO SPECIFY STANDARD LENGTH SPIRALS. TABLES WITH SUFFIX "M" ARE TO BE USED ONLY ON THE VENTURA AND ANTELOPE VALLEY SUBDIVISIONS AND ONLY AT LOCATIONS CONSTRAINED BY EXISTING TRACK GEOMETRY. CURVES WHICH DO NOT MEET THE STANDARDS OF TABLES P3.5, F2.0, P3.5M AND F2.0M MUST BE CORRECTED THROUGH REDUCTION OF TRAIN SPEED AND ALTERATION TO THE TRACK CHARACTERISTICS.
6. FOR MAXIMUM DESIGN SPEEDS UP TO 35 MPH, CURVES IN OPPOSITE DIRECTIONS SHALL BE SEPARATED BY A REVERSING TANGENT WITH A MINIMUM LENGTH OF 100'. FOR DESIGN SPEEDS GREATER THAN 35 MPH, CURVES IN OPPOSITE DIRECTIONS SHALL BE SEPARATED BY A REVERSING TANGENT WITH A MINIMUM LENGTH EQUAL TO 3 TIMES THE MAXIMUM DESIGN SPEED AS STATED IN MILES PER HOUR. FOR EXAMPLE, A DESIGN SPEED OF 50 MPH WILL REQUIRE A REVERSING TANGENT WITH A MINIMUM LENGTH OF 150' (3 TIMES 50). EXCEPTIONS WILL REQUIRE THE APPROVAL OF THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
7. REVERSING TANGENTS MAY BE REDUCED TO HALF OF THE ABOVE WHERE THERE IS LESS THAN 1 INCH OF SUPERELEVATION IN BOTH CURVES.
8. ALL DESIGN SPEEDS MUST BE APPROVED BY BOTH THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION AND THE SCRRRA MANAGER OF SIGNAL AND COMMUNICATIONS.
9. SPEEDS SHOULD BE ESTABLISHED IN CONSIDERATION OF PLACEMENT OF SPEED SIGNS PER SCRRRA ES5213, SUCH THAT THERE IS NO OVERLAP BETWEEN SIGNS FOR REDUCTION AND INCREASE OF SPEED IN THE SAME DIRECTION.
10. SPEED AND SUPERELEVATION WILL BE CONSISTENT THROUGH CURVES UNLESS AUTHORIZED BY THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION. ALL COMPOUND CURVES WILL BE SEPARATED WITH A SPIRAL OF AT LEAST 31 FEET. IN COMPOUND CURVES WHERE SUPERELEVATION DIFFERS IN EACH CURVE, A SPIRAL OF APPROPRIATE LENGTH WILL BE REQUIRED AT THE POINT OF COMPOUND CURVATURE. THE SPIRAL LENGTH WILL BE DESIGNED TO ACCOMMODATE THE DIFFERENCE OF THE COMPOUND CURVE'S SUPERELEVATIONS. A COMPOUND SPIRAL IS NOT REQUIRED WHERE THE SPIRAL OFFSET IS LESS THAN 0.25".
11. ACTUAL ELEVATION GREATER THAN 5 INCHES IS NOT PERMITTED WITHOUT PRIOR APPROVAL OF THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
12. SUPERELEVATION THROUGH GRADE CROSSINGS WILL BE DESIGNED WITH CONSIDERATION OF THE STREET PROFILE, WHICH MAY CONSTRAIN THE SUPERELEVATION AND THEREFORE THE CURVE SPEED. THE STREET PROFILE SHOULD BE CONSIDERED TO BE CHANGED IF PRACTICAL TO ACCOMODATE SUPERELEVATION FOR THE PROPOSED MAXIMUM SPEED.
13. SPEEDS FOR FREIGHT TRAINS SHOULD BE AS UNIFORM AS PRACTICABLE. FREIGHT TRAINS GENERALLY CANNOT UTILIZE HIGHER SPEEDS THAT ARE LESS THAN 2 MILES IN LENGTH. DUE TO BRAKING DISTANCES AND SIGNAL SPACING, FREIGHT TRAIN SPEEDS MAY BE SET WHICH ARE SUBSTANTIALLY LESS THAN PASSENGER TRAIN SPEEDS. OPERATION OF FREIGHT TRAINS AT

CURVE DESIGN PROCEDURE (CONT)

- SPEEDS LESS THAN EQUILIBRIUM (NO UNDERBALANCE) RESULTS IN HEAVY WEAR ON THE LOW RAIL AND LOW VERTICAL LOADS TO THE HIGH WHEELS.
14. DESIGNERS SHOULD AVOID SUPERELEVATIONS IN EXCESS OF 4 INCHES WHERE GRADES OR OTHER RESTRICTIONS CAUSE TRAINS TO RUN A SPEED LESS THAN 25 MILES PER HOUR.
15. FREIGHT TRAIN MAXIMUM AUTHORIZED SPEED SHALL BE BASED ON A STANDARD UNBALANCED ELEVATION BETWEEN 1 AND 2 INCHES. SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION MUST APPROVE ANY COMBINATION OF FREIGHT SPEED AND CURVE SUPERELEVATION OUTSIDE THESE LIMITS.
16. THE PRIORITIES FOR DESIGNERS ARE:
 - SET MAXIMUM DESIGN SPEED AND DEGREE OF CURVATURE FOR PASSENGER AND FREIGHT TRAINS ON A GIVEN SUBDIVISION AFTER CONSULTATION WITH SCRRRA.
 - ASSURE ADEQUATE REVERSING TANGENTS AND SPIRAL LENGTHS.
 - ASSURE ACTUAL ELEVATIONS AND STANDARD SPIRAL LENGTHS FOR HIGHEST PASSENGER AND FREIGHT TRAIN SPEEDS.
 - ASSURE UNIFORM FREIGHT TRAIN SPEED THAT CAN BE SUSTAINED FOR AT LEAST TWO (2) MILES.
 - ASSURE MAXIMUM FREIGHT TRAIN SPEED IS 60 MPH.
 - SET ACTUAL ELEVATION AND SPIRAL LENGTHS FOR FASTEST PRACTICABLE PASSENGER TRAIN OPERATION CONSISTENT WITH SCRRRA AND FRA STANDARDS.
17. THESE DESIGN STANDARDS DO NOT REPLACE FRA TRACK SAFETY STANDARDS PART 49CFR213.57. IN ADDITION TO COMPLYING WITH THE OVERALL PARAMETERS OF SUPERELEVATION AND SPIRAL LENGTH, CURVES MUST ALSO COMPLY WITH ALL PARTS OF 213.5 THRU 213.63. IN PRACTICE, DESIGNERS SET THE OVERALL PARAMETERS AND MAINTENANCE PERSONNEL PREVENT ANY IRREGULARITIES WHICH COULD BECOME EXCEPTIONS TO THE FRA STANDARDS.
18. THE HORIZONTAL ALIGNMENT OF SPIRAL CURVES MAY BE DESIGNED BY:
 - TEN CHORD SPIRAL
 - AREMA CHAPTER 5.3.1.2
 - CLOTHOID SPIRAL GENERATED UNDER CADD DESIGN, WHICH MEETS AREMA CRITERIA
19. WHEN THE CURVE CHARACTERISTICS ARE CHANGED AND APPROVED, THE NEW DATA SHOULD BE ENTERED ONTO THE TRACK CHARTS AND THE FIELD MARKING WILL BE UPDATED.
20. RUNOFF OF SUPERELEVATION ON TANGENT TRACK IS NOT PERMITTED.

SAMPLE CURVE DESIGN PROBLEM

A CURRENT RAIL LINE OPERATES PASSENGER SERVICE AT 70 MPH AND FREIGHT AT 50 MPH. A 2°-0'-0" HORIZONTAL CURVE HAS BEEN PROPOSED. WHAT SUPERELEVATION AND SPIRAL LENGTHS DO YOU USE? WILL PASSENGER AND FREIGHT BE ABLE TO MAINTAIN THEIR CURRENT SPEEDS?

1. LOOK UP THE E_a AND L_s FOR A 2°-0'-0" CURVE AT 70 MPH IN THE STANDARD SPIRAL LENGTH TABLE FOR PASSENGER OPERATIONS, TABLE P3.5.

E_a = 3.50", L_s = 300'
2. NOW CHECK CURVE FREIGHT SPEED AND ACTUAL ELEVATION FOR A 2°-0'-0" CURVE IN THE STANDARD SPIRAL LENGTH TABLE FOR FREIGHT OPERATIONS, TABLE F2.0.

FOR 65 MPH: E_a = 4.00" AND L_s = 320'
FOR 60 MPH: E_a = 3.25" AND L_s = 240'
FOR 50 MPH: E_a = 1.50" AND L_s = 100'
3. THE CURVE WILL NEED TO HAVE 3.50 INCHES OF SUPERELEVATION AND THE SPIRALS WILL NEED TO BE 300 FEET BECAUSE THE PASSENGER REQUIREMENTS GOVERN IN THIS SITUATION. FREIGHT CAN CONTINUE TO OPERATE AT 50 MPH OR MAY BE INCREASED TO 60 MPH IF THIS SPEED CAN BE SUSTAINED FOR AT LEAST 2 MILES (CURVE DESIGN PROCEDURE NO. 13).

						DRAWN BY: A. CARLOS	DATE: 03/31/2011	SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES, SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.	 <div>METROLINK®</div> SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012	ENGINEERING STANDARDS	STANDARD 2203
						 ASSISTANT DIRECTOR- STANDARDS & DESIGN				CURVE SPEED, SUPERELEVATION AND SPIRAL LENGTH NOTES	SCALE: NTS
						 DIRECTOR OF ENGINEERING AND CONSTRUCTION					REVISION SHEET - 1 OF 1
											CADD FILE: ES2203

TABLE P3.5 - 3.5 INCH UNBALANCED ELEVATION FOR PASSENGER OPERATIONS - STANDARD SPIRAL LENGTHS

ABBREVIATIONS			
E	=	EQUILIBRIUM ELEVATION OF OUTSIDE RAIL (IN)	V _{max} = MAXIMUM ALLOWABLE OPERATING SPEED (MPH)
E _u	=	UNBALANCED ELEVATION OF OUTSIDE RAIL (IN)	L _s = SPIRAL LENGTH (FT)
E _a	=	ACTUAL ELEVATION OF OUTSIDE RAIL (IN)	D = DEGREE OF CURVATURE (DECIMAL DEGREES)

FORMULAS			
SPIRAL LENGTH: THE LONGEST OF:			
E	=	0.0007DV _{max} ²	L _s = 1.2V _{max} E _a
E _a	=	E - E _u	L _s = 62E _a
			L _s MIN = 40'

MAXIMUM ALLOWABLE PASSENGER OPERATING SPEED - MILES PER HOUR																											
		20		25		30		35		40		45		50		60		70		80		90		100		110	
		E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s
CURVATURE - DEGREES AND MINUTES	0° 15'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	50'	0.00"	50'	0.00"	60'	0.00"	60'	0.00"	70'
	0° 30'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	50'	0.00"	50'	0.00"	60'	0.00"	60'	0.75"	100'
	0° 45'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	50'	0.00"	50'	1.00"	110'	1.75"	210'	3.00"	400'
	1° 00'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	50'	1.00"	100'	2.25"	250'	3.50"	420'	5.00"	660'
	1° 15'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	1.00"	90'	2.25"	220'	3.75"	410'	5.25"	630'		
	1° 30'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.50"	40'	1.75"	150'	3.25"	320'	5.25"	570'				
	1° 45'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	1.00"	80'	2.75"	240'	4.50"	440'						
	2° 00'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	1.75"	130'	3.50"	300'	5.50"	530'						
	2° 15'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.50"	40'	2.25"	170'	4.25"	360'								
	2° 30'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.25"	40'	1.00"	70'	3.00"	220'	5.25"	450'								
	2° 45'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.50"	40'	1.50"	100'	3.50"	260'	6.00"	510'								
	3° 00'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	1.00"	70'	1.75"	110'	4.25"	310'										
	3° 15'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.25"	40'	1.25"	80'	2.25"	140'	4.75"	350'										
	3° 30'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.50"	40'	1.50"	100'	2.75"	180'	5.50"	400'										
	3° 45'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.75"	50'	2.00"	130'	3.25"	210'	6.00"	440'										
	4° 00'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	1.00"	70'	2.25"	140'	3.50"	220'												
	4° 15'	0.00"	40'	0.00"	40'	0.00"	40'	0.25"	40'	1.50"	100'	2.75"	180'	4.00"	250'												
	4° 30'	0.00"	40'	0.00"	40'	0.00"	40'	0.50"	40'	1.75"	110'	3.00"	190'	4.50"	280'												
	4° 45'	0.00"	40'	0.00"	40'	0.00"	40'	0.75"	50'	2.00"	130'	3.25"	210'	5.00"	310'												
	5° 00'	0.00"	40'	0.00"	40'	0.00"	40'	1.00"	70'	2.25"	140'	3.75"	240'	5.25"	330'												
	5° 15'	0.00"	40'	0.00"	40'	0.00"	40'	1.25"	80'	2.50"	160'	4.00"	250'	5.75"	360'												
	5° 30'	0.00"	40'	0.00"	40'	0.00"	40'	1.25"	80'	2.75"	180'	4.50"	280'														
	5° 45'	0.00"	40'	0.00"	40'	0.25"	40'	1.50"	100'	3.00"	190'	4.75"	300'														
	6° 00'	0.00"	40'	0.00"	40'	0.50"	40'	1.75"	110'	3.25"	210'	5.25"	330'														
	6° 15'	0.00"	40'	0.00"	40'	0.50"	40'	2.00"	130'	3.50"	220'	5.50"	350'														
	6° 30'	0.00"	40'	0.00"	40'	0.75"	50'	2.25"	140'	4.00"	250'	5.75"	360'														
	6° 45'	0.00"	40'	0.00"	40'	1.00"	70'	2.50"	160'	4.25"	270'																
	7° 00'	0.00"	40'	0.00"	40'	1.00"	70'	2.75"	180'	4.50"	280'																
	7° 15'	0.00"	40'	0.00"	40'	1.25"	80'	2.75"	180'	4.75"	300'																
	7° 30'	0.00"	40'	0.00"	40'	1.25"	80'	3.00"	190'	5.00"	310'																
	7° 45'	0.00"	40'	0.00"	40'	1.50"	100'	3.25"	210'	5.25"	330'																
	8° 00'	0.00"	40'	0.00"	40'	1.75"	110'	3.50"	220'	5.50"	350'																
	8° 15'	0.00"	40'	0.25"	40'	1.75"	110'	3.75"	240'	5.75"	360'																
	8° 30'	0.00"	40'	0.25"	40'	2.00"	130'	4.00"	250'																		
	8° 45'	0.00"	40'	0.50"	40'	2.25"	140'	4.25"	270'																		
	9° 00'	0.00"	40'	0.50"	40'	2.25"	140'	4.25"	270'																		
	9° 15'	0.00"	40'	0.75"	50'	2.50"	160'	4.50"	280'																		
	9° 30'	0.00"	40'	0.75"	50'	2.50"	160'	4.75"	300'																		
	9° 45'	0.00"	40'	1.00"	70'	2.75"	180'	5.00"	310'																		
	10° 00'	0.00"	40'	1.00"	70'	3.00"	190'	5.25"	330'																		
	10° 15'	0.00"	40'	1.00"	70'	3.00"	190'	5.50"	350'																		
	10° 30'	0.00"	40'	1.25"	80'	3.25"	210'	5.75"	360'																		
	10° 45'	0.00"	40'	1.25"	80'	3.50"	220'	5.75"	360'																		
	11° 00'	0.00"	40'	1.50"	100'	3.50"	220'	6.00"	380'																		
	11° 15'	0.00"	40'	1.50"	100'	3.75"	240'																				
	11° 30'	0.00"	40'	1.75"	110'	3.75"	240'																				
	11° 45'	0.00"	40'	1.75"	110'	4.00"	250'																				
	12° 00'	0.00"	40'	1.75"	110'	4.25"	270'																				

NOTES:

1. NO SPIRALS OR SUPERELEVATIONS WILL BE PERMITTED TO THE RIGHT OF HEAVY LINE WITHOUT PRIOR APPROVAL FROM THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
2. WHERE CURVATURE IS MORE THAN 5 MINUTES MORE THAN A LISTED FIGURE, THE NEXT HIGHER ELEVATION AND RESULTING SPIRAL LENGTH WILL BE USED.

TABLE F2.0 - 2.0 INCH UNBALANCED ELEVATION FOR FREIGHT OPERATIONS - STANDARD SPIRAL LENGTHS

ABBREVIATIONS			
E	=	EQUILIBRIUM ELEVATION OF OUTSIDE RAIL (IN)	V _{max} = MAXIMUM ALLOWABLE OPERATING SPEED (MPH)
E _u	=	UNBALANCED ELEVATION OF OUTSIDE RAIL (IN)	L _s = SPIRAL LENGTH (FT)
E _a	=	ACTUAL ELEVATION OF OUTSIDE RAIL (IN)	D = DEGREE OF CURVATURE (DECIMAL DEGREES)

FORMULAS			
E = 0.0007DV _{max} ²		SPIRAL LENGTH: THE LONGEST OF:	
E _a = E - E _u		L _s = 1.2V _{max} E _a	
		L _s = 62E _a	
		L _s MIN = 40'	

MAXIMUM ALLOWABLE FREIGHT OPERATING SPEED - MILES PER HOUR																											
		20		25		30		35		40		45		50		55		60		65		70		75		80	
		E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s	E _a	L _s
CURVATURE - DEGREES AND MINUTES	0° 15'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	50'	0.00"	50'	0.00"	50'
	0° 30'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	50'	0.00"	50'	0.25"	50'
	0° 45'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.25"	70'	1.00"	90'	1.50"	150'
	1° 00'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.25"	40'	0.75"	60'	1.00"	80'	1.50"	130'	2.00"	180'	2.50"	240'
	1° 15'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.25"	40'	0.75"	50'	1.25"	90'	1.75"	140'	2.50"	210'	3.00"	270'	3.75"	360'
	1° 30'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.25"	40'	0.75"	50'	1.25"	90'	2.00"	150'	2.50"	200'	3.25"	280'	4.00"	360'	4.75"	460'
	1° 45'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.50"	40'	1.25"	80'	1.75"	120'	2.50"	180'	3.25"	260'	4.25"	360'	5.00"	450'	6.00"	580'
	2° 00'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.25"	40'	1.00"	70'	1.50"	100'	2.25"	150'	3.25"	240'	4.00"	320'	5.00"	420'	6.00"	540'		
	2° 15'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.75"	50'	1.25"	80'	2.00"	130'	3.00"	200'	3.75"	270'	4.75"	380'	5.75"	490'				
	2° 30'	0.00"	40'	0.00"	40'	0.00"	40'	0.25"	40'	1.00"	70'	1.75"	110'	2.50"	160'	3.50"	240'	4.50"	330'	5.50"	430'						
	2° 45'	0.00"	40'	0.00"	40'	0.00"	40'	0.50"	40'	1.25"	80'	2.00"	130'	3.00"	190'	4.00"	270'	5.00"	360'								
	3° 00'	0.00"	40'	0.00"	40'	0.00"	40'	0.75"	50'	1.50"	100'	2.50"	160'	3.25"	210'	4.50"	300'	5.75"	420'								
	3° 15'	0.00"	40'	0.00"	40'	0.25"	40'	1.00"	70'	1.75"	110'	2.75"	180'	3.75"	240'	5.00"	330'										
	3° 30'	0.00"	40'	0.00"	40'	0.25"	40'	1.25"	80'	2.00"	130'	3.00"	190'	4.25"	270'	5.50"	370'										
	3° 45'	0.00"	40'	0.00"	40'	0.50"	40'	1.25"	80'	2.25"	140'	3.50"	220'	4.75"	300'	6.00"	400'										
	4° 00'	0.00"	40'	0.00"	40'	0.75"	50'	1.50"	100'	2.50"	160'	3.75"	240'	5.00"	310'												
	4° 15'	0.00"	40'	0.00"	40'	0.75"	50'	1.75"	110'	3.00"	190'	4.25"	270'	5.50"	350'												
	4° 30'	0.00"	40'	0.00"	40'	1.00"	70'	2.00"	130'	3.25"	210'	4.50"	280'	6.00"	380'												
	4° 45'	0.00"	40'	0.25"	40'	1.00"	70'	2.25"	140'	3.50"	220'	4.75"	300'														
	5° 00'	0.00"	40'	0.25"	40'	1.25"	80'	2.50"	160'	3.75"	240'	5.25"	330'														
	5° 15'	0.00"	40'	0.50"	40'	1.50"	100'	2.75"	180'	4.00"	250'	5.50"	350'														
	5° 30'	0.00"	40'	0.50"	40'	1.50"	100'	2.75"	180'	4.25"	270'	6.00"	380'														
	5° 45'	0.00"	40'	0.75"	50'	1.75"	110'	3.00"	190'	4.50"	280'																
	6° 00'	0.00"	40'	0.75"	50'	2.00"	130'	3.25"	210'	4.75"	300'																
	6° 15'	0.00"	40'	0.75"	50'	2.00"	130'	3.50"	220'	5.00"	310'																
	6° 30'	0.00"	40'	1.00"	70'	2.25"	140'	3.75"	240'	5.50"	350'																
	6° 45'	0.00"	40'	1.00"	70'	2.50"	160'	4.00"	250'	5.75"	360'																
	7° 00'	0.00"	40'	1.25"	80'	2.50"	160'	4.25"	270'	6.00"	380'																
	7° 15'	0.25"	40'	1.25"	80'	2.75"	180'	4.25"	270'																		
	7° 30'	0.25"	40'	1.50"	100'	2.75"	180'	4.50"	280'																		
	7° 45'	0.25"	40'	1.50"	100'	3.00"	190'	4.75"	300'																		
	8° 00'	0.25"	40'	1.50"	100'	3.25"	210'	5.00"	310'																		
	8° 15'	0.50"	40'	1.75"	110'	3.25"	210'	5.25"	330'																		
	8° 30'	0.50"	40'	1.75"	110'	3.50"	220'	5.50"	350'																		
	8° 45'	0.50"	40'	2.00"	130'	3.75"	240'	5.75"	360'																		
	9° 00'	0.75"	50'	2.00"	130'	3.75"	240'	5.75"	360'																		
	9° 15'	0.75"	50'	2.25"	140'	4.00"	250'	6.00"	380'																		
	9° 30'	0.75"	50'	2.25"	140'	4.00"	250'																				
	9° 45'	0.75"	50'	2.50"	160'	4.25"	270'																				
	10° 00'	1.00"	70'	2.50"	160'	4.50"	280'																				
	10° 15'	1.00"	70'	2.50"	160'	4.50"	280'																				
	10° 30'	1.00"	70'	2.75"	180'	4.75"	300'																				
	10° 45'	1.25"	80'	2.75"	180'	5.00"	310'																				
	11° 00'	1.25"	80'	3.00"	190'	5.00"	310'																				
	11° 15'	1.25"	80'	3.00"	190'	5.25"	330'																				
	11° 30'	1.25"	80'	3.25"	210'	5.25"	330'																				
	11° 45'	1.50"	100'	3.25"	210'	5.50"	350'																				
	12° 00'	1.50"	100'	3.25"	210'	5.75"	360'																				

NOTES:

1. NO SPIRALS OR SUPERELEVATIONS WILL BE PERMITTED TO THE RIGHT OF HEAVY LINE WITHOUT PRIOR APPROVAL FROM THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
2. WHERE CURVATURE IS MORE THAN 5 MINUTES MORE THAN A LISTED FIGURE, THE NEXT HIGHER ELEVATION AND RESULTING SPIRAL LENGTH WILL BE USED.

TABLE P3.5M - 3.5 INCH UNBALANCED ELEVATION FOR PASSENGER OPERATIONS - MINIMUM SPIRAL LENGTHS

ABBREVIATIONS	
E = EQUILIBRIUM ELEVATION OF OUTSIDE RAIL (IN)	V _{max} = MAXIMUM ALLOWABLE OPERATING SPEED (MPH)
E _u = UNBALANCED ELEVATION OF OUTSIDE RAIL (IN)	L _s = SPIRAL LENGTH (FT)
E _a = ACTUAL ELEVATION OF OUTSIDE RAIL (IN)	D = DEGREE OF CURVATURE (DECIMAL DEGREES)

FORMULAS		
E = 0.0007DV _{max} ²	SPIRAL LENGTH; THE LONGEST OF:	L _s = 1.0V _{max} E _a
E _a = E - E _u		L _s = 50E _a
		L _{sMIN} = 30'

[illegible]

																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					</
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----

TABLE F2.0M - 2.0 INCH UNBALANCED ELEVATION FOR FREIGHT OPERATIONS - MINIMUM SPIRAL LENGTHS

ABBREVIATIONS	
E = EQUILIBRIUM ELEVATION OF OUTSIDE RAIL (IN)	V _{max} = MAXIMUM ALLOWABLE OPERATING SPEED (MPH)
E _u = UNBALANCED ELEVATION OF OUTSIDE RAIL (IN)	L _s = SPIRAL LENGTH (FT)
E _a = ACTUAL ELEVATION OF OUTSIDE RAIL (IN)	D = DEGREE OF CURVATURE (DECIMAL DEGREES)

FORMULAS		
$E = 0.0007DV_{max}^2$	SPIRAL LENGTH; THE LONGEST OF:	$L_s = 1.0V_{max}E_a$
$E_a = E - E_u$		$L_s = 50E_a$
		$L_{sMIN} = 30'$

		MAXIMUM ALLOWABLE FREIGHT OPERATING SPEED - MILES PER HOUR																											
		20		25		30		35		40		45		50		55		60		65		70		75		80			
		Ea	Ls	Ea	Ls	Ea	Ls	Ea	Ls	Ea	Ls	Ea	Ls	Ea	Ls	Ea	Ls	Ea	Ls	Ea	Ls	Ea	Ls	Ea	Ls	Ea	Ls		
CURVATURE - DEGREES AND MINUTES	0° 15'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'
	0° 30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	40'	0.00"	40'	0.00"	40'	0.00"	40'	0.25"	40'
	0° 45'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.25"	40'	0.75"	60'	1.00"	80'	1.50"	120'		
	1° 00'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.25"	30'	0.75"	50'	1.00"	70'	1.50"	110'	2.00"	150'	2.50"	200'		
	1° 15'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.25"	30'	0.75"	50'	1.25"	80'	1.75"	120'	2.50"	180'	3.00"	230'	3.75"	300'
	1° 30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.25"	30'	0.75"	40'	1.25"	70'	2.00"	120'	2.50"	170'	3.25"	230'	4.00"	300'	4.75"	380'
	1° 45'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.50"	30'	1.25"	70'	1.75"	100'	2.50"	150'	3.25"	220'	4.25"	300'	5.00"	380'	6.00"	480'
	2° 00'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.25"	30'	1.00"	50'	1.50"	80'	2.25"	130'	3.25"	200'	4.00"	260'	5.00"	350'	6.00"	450'				
	2° 15'	0.00"	30'	0.00"	30'	0.00"	30'	0.00"	30'	0.75"	40'	1.25"	70'	2.00"	100'	3.00"	170'	3.75"	230'	4.75"	310'	5.75"	410'						
	2° 30'	0.00"	30'	0.00"	30'	0.00"	30'	0.25"	30'	1.00"	50'	1.75"	90'	2.50"	130'	3.50"	200'	4.50"	270'	5.50"	360'								
	2° 45'	0.00"	30'	0.00"	30'	0.00"	30'	0.50"	30'	1.25"	70'	2.00"	100'	3.00"	150'	4.00"	220'	5.00"	300'										
	3° 00'	0.00"	30'	0.00"	30'	0.00"	30'	0.75"	40'	1.50"	80'	2.50"	130'	3.25"	170'	4.50"	250'	5.75"	350'										
	3° 15'	0.00"	30'	0.00"	30'	0.25"	30'	1.00"	50'	1.75"	90'	2.75"	140'	3.75"	190'	5.00"	280'												
	3° 30'	0.00"	30'	0.00"	30'	0.25"	30'	1.25"	70'	2.00"	100'	3.00"	150'	4.25"	220'	5.50"	310'												
	3° 45'	0.00"	30'	0.00"	30'	0.50"	30'	1.25"	70'	2.25"	120'	3.50"	180'	4.75"	240'	6.00"	330'												
	4° 00'	0.00"	30'	0.00"	30'	0.75"	40'	1.50"	80'	2.50"	130'	3.75"	190'	5.00"	250'														
	4° 15'	0.00"	30'	0.00"	30'	0.75"	40'	1.75"	90'	3.00"	150'	4.25"	220'	5.50"	280'														
	4° 30'	0.00"	30'	0.00"	30'	1.00"	50'	2.00"	100'	3.25"	170'	4.50"	230'	6.00"	300'														
	4° 45'	0.00"	30'	0.25"	30'	1.00"	50'	2.25"	120'	3.50"	180'	4.75"	240'																
	5° 00'	0.00"	30'	0.25"	30'	1.25"	70'	2.50"	130'	3.75"	190'	5.25"	270'																
	5° 15'	0.00"	30'	0.50"	30'	1.50"	80'	2.75"	140'	4.00"	200'	5.50"	280'																
	5° 30'	0.00"	30'	0.50"	30'	1.50"	80'	2.75"	140'	4.25"	220'	6.00"	300'																
	5° 45'	0.00"	30'	0.75"	40'	1.75"	90'	3.00"	150'	4.50"	230'																		
	6° 00'	0.00"	30'	0.75"	40'	2.00"	100'	3.25"	170'	4.75"	240'																		
	6° 15'	0.00"	30'	0.75"	40'	2.00"	100'	3.50"	180'	5.00"	250'																		
	6° 30'	0.00"	30'	1.00"	50'	2.25"	120'	3.75"	190'	5.50"	280'																		
	6° 45'	0.00"	30'	1.00"	50'	2.50"	130'	4.00"	200'	5.75"	290'																		
	7° 00'	0.00"	30'	1.25"	70'	2.50"	130'	4.25"	220'	6.00"	300'																		
	7° 15'	0.25"	30'	1.25"	70'	2.75"	140'	4.25"	220'																				
	7° 30'	0.25"	30'	1.50"	80'	2.75"	140'	4.50"	230'																				
	7° 45'	0.25"	30'	1.50"	80'	3.00"	150'	4.75"	240'																				
	8° 00'	0.25"	30'	1.50"	80'	3.25"	170'	5.00"	250'																				
8° 15'	0.50"	30'	1.75"	90'	3.25"	170'	5.25"	270'																					
8° 30'	0.50"	30'	1.75"	90'	3.50"	180'	5.50"	280'																					
8° 45'	0.50"	30'	2.00"	100'	3.75"	190'	5.75"	290'																					
9° 00'	0.75"	40'	2.00"	100'	3.75"	190'	5.75"	290'																					
9° 15'	0.75"	40'	2.25"	120'	4.00"	200'	6.00"	300'																					
9° 30'	0.75"	40'	2.25"	120'	4.00"	200'																							
9° 45'	0.75"	40'	2.50"	130'	4.25"	220'																							
10° 00'	1.00"	50'	2.50"	130'	4.50"	230'																							
10° 15'	1.00"	50'	2.50"	130'	4.50"	230'																							
10° 30'	1.00"	50'	2.75"	140'	4.75"	240'																							
10° 45'	1.25"	70'	2.75"	140'	5.00"	250'																							
11° 00'	1.25"	70'	3.00"	150'	5.00"	250'																							
11° 15'	1.25"	70'	3.00"	150'	5.25"	270'																							
11° 30'	1.25"	70'	3.25"	170'	5.25"	270'																							
11° 45'	1.50"	80'	3.25"	170'	5.50"	280'																							
12° 00'	1.50"	80'	3.25"	170'	5.75"	290'																							

NOTES:

1. NO SPIRALS OR SUPERELEVATIONS WILL BE PERMITTED TO THE RIGHT OF HEAVY LINE WITHOUT PRIOR APPROVAL FROM THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.

2. THIS TABLE MAY ONLY BE USED ON THE VENTURA AND ANTELOPE VALLEY SUBDIVISIONS AT LOCATIONS WHERE STANDARD SPIRAL LENGTHS CAN NOT BE OBTAINED DUE TO EXISTING FIELD CONDITIONS.

3. WHERE CURVATURE IS MORE THAN 5 MINUTES MORE THAN A LISTED FIGURE, THE NEXT HIGHER ELEVATION AND RESULTING SPIRAL LENGTH WILL BE USED.

NOTES:

1. NO SPIRALS OR SUPERELEVATIONS WILL BE PERMITTED TO THE RIGHT OF HEAVY LINE WITHOUT PRIOR APPROVAL FROM THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
2. THIS TABLE MAY ONLY BE USED ON THE VENTURA AND ANTELOPE VALLEY SUBDIVISIONS AT LOCATIONS WHERE STANDARD SPIRAL LENGTHS CAN NOT BE OBTAINED DUE TO EXISTING FIELD CONDITIONS.
3. WHERE CURVATURE IS MORE THAN 5 MINUTES MORE THAN A LISTED FIGURE, THE NEXT HIGHER ELEVATION AND RESULTING SPIRAL LENGTH WILL BE USED.

																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					</
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----

TABLE PML - 4.0 INCH UNBALANCED ELEVATION FOR PASSENGER OPERATIONS - MAINTENANCE LIMIT

ABBREVIATIONS	
E = EQUILIBRIUM ELEVATION OF OUTSIDE RAIL (IN)	V _{max} = MAXIMUM ALLOWABLE OPERATING SPEED (MPH)
E _u = UNBALANCED ELEVATION OF OUTSIDE RAIL (IN)	L _s = SPIRAL LENGTH (FT)
E _a = ACTUAL ELEVATION OF OUTSIDE RAIL (IN)	D = DEGREE OF CURVATURE (DECIMAL DEGREES)

FORMULAS
$E = 0.0007DV_{max}^2$ $E_a = E - E_u$

		MAXIMUM ALLOWABLE PASSENGER OPERATING SPEED - MILES PER HOUR																		
		20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
CURVATURE - DEGREES AND MINUTES	0° 15'	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"
	0° 30'	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.25"
	0° 45'	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.50"	0.75"	1.25"	2.00"	2.50"
	1° 00'	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.50"	1.25"	1.75"	2.50"	3.00"	3.75"	4.50"
	1° 15'	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.50"	1.00"	1.75"	2.50"	3.25"	4.00"	4.75"	5.75"	
	1° 30'	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.50"	1.25"	2.00"	2.75"	3.75"	4.75"	5.50"			
	1° 45'	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.50"	1.25"	2.25"	3.00"	4.00"	5.00"	6.00"				
	2° 00'	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.25"	1.25"	2.00"	3.00"	4.00"	5.00"						
	2° 15'	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	1.00"	1.75"	2.75"	3.75"	5.00"							
	2° 30'	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	0.50"	1.50"	2.50"	3.50"	4.75"	6.00"							
	2° 45'	0.00"	0.00"	0.00"	0.00"	0.00"	0.00"	1.00"	2.00"	3.00"	4.25"	5.50"								
	3° 00'	0.00"	0.00"	0.00"	0.00"	0.00"	0.50"	1.25"	2.50"	3.75"	5.00"									
	3° 15'	0.00"	0.00"	0.00"	0.00"	0.00"	0.75"	1.75"	3.00"	4.25"	5.75"									
	3° 30'	0.00"	0.00"	0.00"	0.00"	0.00"	1.00"	2.25"	3.50"	5.00"										
	3° 45'	0.00"	0.00"	0.00"	0.00"	0.25"	1.50"	2.75"	4.00"	5.50"										
	4° 00'	0.00"	0.00"	0.00"	0.00"	0.50"	1.75"	3.00"	4.50"											
	4° 15'	0.00"	0.00"	0.00"	0.00"	1.00"	2.25"	3.50"	5.00"											
	4° 30'	0.00"	0.00"	0.00"	0.00"	1.25"	2.50"	4.00"	5.75"											
	4° 45'	0.00"	0.00"	0.00"	0.25"	1.50"	2.75"	4.50"												
	5° 00'	0.00"	0.00"	0.00"	0.50"	1.75"	3.25"	4.75"												
	5° 15'	0.00"	0.00"	0.00"	0.75"	2.00"	3.50"	5.25"												
	5° 30'	0.00"	0.00"	0.00"	0.75"	2.25"	4.00"	5.75"												
	5° 45'	0.00"	0.00"	0.00"	1.00"	2.50"	4.25"													
	6° 00'	0.00"	0.00"	0.00"	1.25"	2.75"	4.75"													
	6° 15'	0.00"	0.00"	0.00"	1.50"	3.00"	5.00"													
	6° 30'	0.00"	0.00"	0.25"	1.75"	3.50"	5.25"													
	6° 45'	0.00"	0.00"	0.50"	2.00"	3.75"	5.75"													
	7° 00'	0.00"	0.00"	0.50"	2.25"	4.00"	6.00"													
	7° 15'	0.00"	0.00"	0.75"	2.25"	4.25"														
	7° 30'	0.00"	0.00"	0.75"	2.50"	4.50"														
	7° 45'	0.00"	0.00"	1.00"	2.75"	4.75"														
	8° 00'	0.00"	0.00"	1.25"	3.00"	5.00"														
8° 15'	0.00"	0.00"	1.25"	3.25"	5.25"															
8° 30'	0.00"	0.00"	1.50"	3.50"	5.75"															
8° 45'	0.00"	0.00"	1.75"	3.75"	6.00"															
9° 00'	0.00"	0.00"	1.75"	3.75"																
9° 15'	0.00"	0.25"	2.00"	4.00"																
9° 30'	0.00"	0.25"	2.00"	4.25"																
9° 45'	0.00"	0.50"	2.25"	4.50"																
10° 00'	0.00"	0.50"	2.50"	4.75"																
10° 15'	0.00"	0.50"	2.50"	5.00"																
10° 30'	0.00"	0.75"	2.75"	5.25"																
10° 45'	0.00"	0.75"	3.00"	5.25"																
11° 00'	0.00"	1.00"	3.00"	5.50"																
11° 15'	0.00"	1.00"	3.25"	5.75"																
11° 30'	0.00"	1.25"	3.25"	6.00"																
11° 45'	0.00"	1.25"	3.50"																	
12° 00'	0.00"	1.25"	3.75"																	

NOTES:

- AT ALL TIMES THE TRACK MUST BE IN CONFORMANCE WITH 49CFR213. TABLES P3.5 AND P3.5M DEFINE THE LIMITING DESIGN SPEED FOR PASSENGER TRAINS. TABLES F2.0 AND F2.0M DEFINE THE LIMITING DESIGN SPEED FOR FREIGHT TRAINS. OPERATION AT SPEEDS RESULTING IN 4 INCHES UNDERBALANCE IS PERMITTED FOR SCRRRA AND AMTRAK PASSENGER TRAINS EXCEPT WHEN ADVISED THAT SEVERE WIND CONDITIONS EXIST. 3 INCHES UNDERBALANCE IS THE LIMITING CONDITION FOR ALL FREIGHT TRAINS AND FOR PASSENGER TRAINS UNDER SEVERE WIND CONDITIONS. ANY COMBINATION OF CURVATURE OR ACTUAL ELEVATION THAT IS DISCOVERED OR CREATED THAT RESULTS IN THE OPERATING SPEED TO EXCEED THE SPEED PERMITTED BY THESE TABLES REQUIRES IMMEDIATE REMEDIAL ACTION.
- SOME CURVES WERE CONSTRUCTED AND SPEEDS ESTABLISHED WITH UNDERBALANCE FOR PASSENGER SPEEDS BETWEEN THE 3.5 INCH DESIGN VALUE OF TABLES P3.5 AND P3.5M AND THE 4 INCH LIMITING VALUE PER THE FRA. CURVES WITH THESE CHARACTERISTICS WILL BE MAINTAINED AS DESIGNED.
- SUPERELEVATION AND SPIRAL LENGTHS WILL BE MAINTAINED TO THE VALUES RECORDED IN THE SCRRRA TRACK CHARTS. SOME OF THESE DO NOT MEET THE LENGTH REQUIREMENTS FOR THE TABLES FOR NEW DESIGN, P3.5 AND F2.0. HOWEVER, THEY DO MEET THE REQUIREMENTS FOR THE P3.5M AND P2.0M TABLES.
- SPIRAL LENGTHS MUST NOT BE INCREASED EXCEPT AS PART OF AN ENGINEERED REALIGNMENT OF A CURVE. THE SHARPNESS OF THE CURVE IN THE CENTRAL BODY WILL BE INCREASED IF THE SPIRALS ARE EXTENDED INTO THE BODY OF THE CURVE.
- CONTRACT TRACK INSPECTORS WILL FIELD VERIFY THE CHARACTERISTICS OF AT LEAST TWO CURVES EACH MONTH, USING TRACK LEVEL AND STRING LINE, REPORTING THE OBSERVED 62-FOOT CHORD MID-ORDINATE AND SUPERELEVATION AT 15.5-FOOT INTERVALS FOR THE LENGTH OF THE CURVE. THE MANAGERS OF TRACK MAINTENANCE AND THE CONTRACT PROJECT MANAGER WILL REVIEW AND COMPARE THE PRECEDING TWO YEARS OF TRACK GEOMETRY DATA TO THE TRACK CHART DATA, AND WILL ARRANGE FOR FIELD VERIFICATION OF ALIGNMENT BASED UPON THESE REVIEWS.
- MANAGERS OF TRACK MAINTENANCE MUST RIDE WITH EACH OPERATION OF TRACK GEOMETRY CARS. THEY MUST MONITOR AND ENSURE THAT THE MAINTENANCE CONTRACTOR INVESTIGATES ANY NOTED REPORTS OF WARP OR UNDERBALANCE EXCEPTIONS AND TAKES THE REQUIRED REMEDIAL ACTIONS (SPOT REPAIRS OR REDUCTION IN SPEED). THEY MUST ALSO PROMPTLY REVIEW THE CURVE DATA GENERATED BY THE TRACK GEOMETRY CAR AND COMPARE THE AVERAGE CURVATURE, AVERAGE ELEVATION, LIMITING CURVATURE AND LIMITING ELEVATION FOR EACH CURVE TO THE RECORDS IN THE TRACK CHARTS WHETHER AN EXCEPTION IS NOTED OR NOT.
- COMPOUND CURVES DESCRIBED IN THE TRACK CHARTS THAT HAVE DIFFERING TRAIN SPEED, SUPERELEVATION, AND/OR CURVATURE NOTED FOR TWO OR MORE SEGMENTS OF ONE CURVE HAVE BEEN APPROVED BY THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
- IF THE ACTUAL SUPERELEVATION AND CURVATURE MEASURED IN THE FIELD BY GEOMETRY CARS OR BY MANUAL INSPECTION PER NOTE 5 ABOVE ARE FOUND TO RESULT IN AN ALLOWABLE SPEED LESS THAN PERMITTED BY TABLES PML AND FML, A TEMPORARY SPEED REDUCTION MUST BE IMPOSED TO THE NEXT LOWER SPEED THAT WILL ACCOMMODATE THE ACTUAL MEASURED SUPERELEVATION. THE TEMPORARY SPEED REDUCTION MUST REMAIN UNTIL THE SUPERELEVATION LIMITS ARE RAISED TO THE VALUES SHOWN IN TABLES P3.5, F2.0, P3.5M AND F2.0M FOR THE DESIGN SPEED.

NOTES:

1. AT ALL TIMES THE TRACK MUST BE IN CONFORMANCE WITH 49CFR213. TABLES P3.5 AND P3.5M DEFINE THE LIMITING DESIGN SPEED FOR PASSENGER TRAINS. TABLES F2.0 AND F2.0M DEFINE THE LIMITING DESIGN SPEED FOR FREIGHT TRAINS. OPERATION AT SPEEDS RESULTING IN 4 INCHES UNDERBALANCE IS PERMITTED FOR SCRRRA AND AMTRAK PASSENGER TRAINS EXCEPT WHEN ADVISED THAT SEVERE WIND CONDITIONS EXIST. 3 INCHES UNDERBALANCE IS THE LIMITING CONDITION FOR ALL FREIGHT TRAINS AND FOR PASSENGER TRAINS UNDER SEVERE WIND CONDITIONS. ANY COMBINATION OF CURVATURE OR ACTUAL ELEVATION THAT IS DISCOVERED OR CREATED THAT RESULTS IN THE OPERATING SPEED TO EXCEED THE SPEED PERMITTED BY THESE TABLES REQUIRES IMMEDIATE REMEDIAL ACTION.
2. SOME CURVES WERE CONSTRUCTED AND SPEEDS ESTABLISHED WITH UNDERBALANCE FOR PASSENGER SPEEDS BETWEEN THE 3.5 INCH DESIGN VALUE OF TABLES P3.5 AND P3.5M AND THE 4 INCH LIMITING VALUE PER THE FRA. CURVES WITH THESE CHARACTERISTICS WILL BE MAINTAINED AS DESIGNED.
3. SUPERELEVATION AND SPIRAL LENGTHS WILL BE MAINTAINED TO THE VALUES RECORDED IN THE SCRRRA TRACK CHARTS. SOME OF THESE DO NOT MEET THE LENGTH REQUIREMENTS FOR THE TABLES FOR NEW DESIGN, P3.5 AND F2.0. HOWEVER, THEY DO MEET THE REQUIREMENTS FOR THE P3.5M AND P2.0M TABLES.
4. SPIRAL LENGTHS MUST NOT BE INCREASED EXCEPT AS PART OF AN ENGINEERED REALIGNMENT OF A CURVE. THE SHARPNESS OF THE CURVE IN THE CENTRAL BODY WILL BE INCREASED IF THE SPIRALS ARE EXTENDED INTO THE BODY OF THE CURVE.
5. CONTRACT TRACK INSPECTORS WILL FIELD VERIFY THE CHARACTERISTICS OF AT LEAST TWO CURVES EACH MONTH, USING TRACK LEVEL AND STRING LINE, REPORTING THE OBSERVED 62-FOOT CHORD MID-ORDINATE AND SUPERELEVATION AT 15.5-FOOT INTERVALS FOR THE LENGTH OF THE CURVE. THE MANAGERS OF TRACK MAINTENANCE AND THE CONTRACT PROJECT MANAGER WILL REVIEW AND COMPARE THE PRECEDING TWO YEARS OF TRACK GEOMETRY DATA TO THE TRACK CHART DATA, AND WILL ARRANGE FOR FIELD VERIFICATION OF ALIGNMENT BASED UPON THESE REVIEWS.
6. MANAGERS OF TRACK MAINTENANCE MUST RIDE WITH EACH OPERATION OF TRACK GEOMETRY CARS. THEY MUST MONITOR AND ENSURE THAT THE MAINTENANCE CONTRACTOR INVESTIGATES ANY NOTED REPORTS OF WARP OR UNDERBALANCE EXCEPTIONS AND TAKES THE REQUIRED REMEDIAL ACTIONS (SPOT REPAIRS OR REDUCTION IN SPEED). THEY MUST ALSO PROMPTLY REVIEW THE CURVE DATA GENERATED BY THE TRACK GEOMETRY CAR AND COMPARE THE AVERAGE CURVATURE, AVERAGE ELEVATION, LIMITING CURVATURE AND LIMITING ELEVATION FOR EACH CURVE TO THE RECORDS IN THE TRACK CHARTS WHETHER AN EXCEPTION IS NOTED OR NOT.
7. COMPOUND CURVES DESCRIBED IN THE TRACK CHARTS THAT HAVE DIFFERING TRAIN SPEED, SUPERELEVATION, AND/OR CURVATURE NOTED FOR TWO OR MORE SEGMENTS OF ONE CURVE HAVE BEEN APPROVED BY THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
8. IF THE ACTUAL SUPERELEVATION AND CURVATURE MEASURED IN THE FIELD BY GEOMETRY CARS OR BY MANUAL INSPECTION PER NOTE 5 ABOVE ARE FOUND TO RESULT IN AN ALLOWABLE SPEED LESS THAN PERMITTED BY TABLES PML AND FML, A TEMPORARY SPEED REDUCTION MUST BE IMPOSED TO THE NEXT LOWER SPEED THAT WILL ACCOMMODATE THE ACTUAL MEASURED SUPERELEVATION. THE TEMPORARY SPEED REDUCTION MUST REMAIN UNTIL THE SUPERELEVATION LIMITS ARE RAISED TO THE VALUES SHOWN IN TABLES P3.5, F2.0, P3.5M AND F2.0M FOR THE DESIGN SPEED.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

ABBREVIATIONS	
E = EQUILIBRIUM ELEVATION OF OUTSIDE RAIL (IN)	V _{max} = MAXIMUM ALLOWABLE OPERATING SPEED (MPH)
E _u = UNBALANCED ELEVATION OF OUTSIDE RAIL (IN)	L _s = SPIRAL LENGTH (FT)
E _a = ACTUAL ELEVATION OF OUTSIDE RAIL (IN)	D = DEGREE OF CURVATURE (DECIMAL DEGREES)

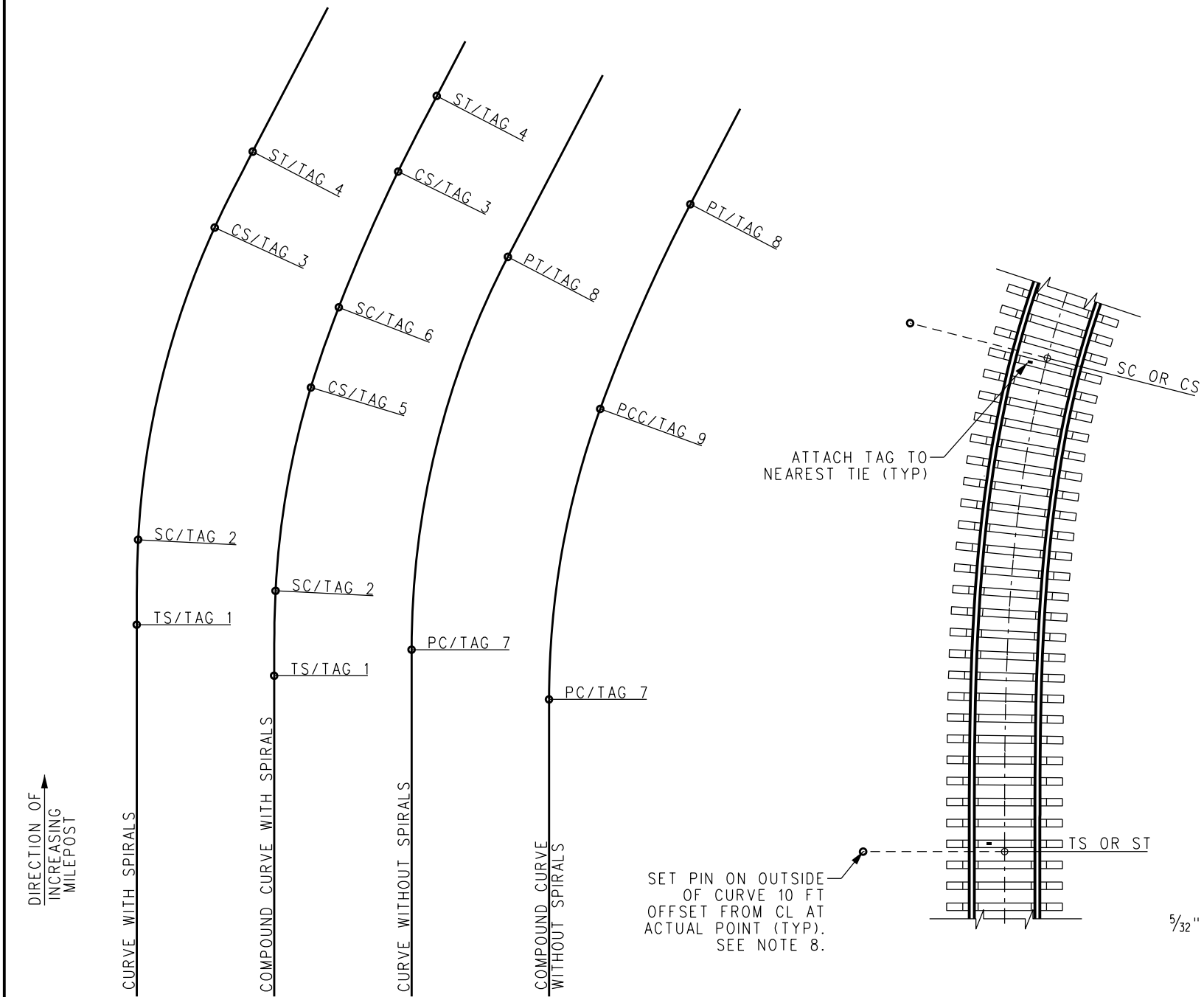
$$E = 0.0007DV_{max}^2$$

$$E_a = E - E_u$$

NOTES:

1. AT ALL TIMES THE TRACK MUST BE IN CONFORMANCE WITH 49CFR213. TABLES P3.5 AND P3.5M DEFINE THE LIMITING DESIGN SPEED FOR PASSENGER TRAINS. TABLES F2.0 AND F2.0M DEFINE THE LIMITING DESIGN SPEED FOR FREIGHT TRAINS. OPERATION AT SPEEDS RESULTING IN 4 INCHES UNDERBALANCE IS PERMITTED FOR SCRRRA AND AMTRAK PASSENGER TRAINS EXCEPT WHEN ADVISED THAT SEVERE WIND CONDITIONS EXIST. 3 INCHES UNDERBALANCE IS THE LIMITING CONDITION FOR ALL FREIGHT TRAINS AND FOR PASSENGER TRAINS UNDER SEVERE WIND CONDITIONS. ANY COMBINATION OF CURVATURE OR ACTUAL ELEVATION THAT IS DISCOVERED OR CREATED THAT RESULTS IN THE OPERATING SPEED TO EXCEED THE SPEED PERMITTED BY THESE TABLES REQUIRES IMMEDIATE REMEDIAL ACTION.
2. SOME CURVES WERE CONSTRUCTED AND SPEEDS ESTABLISHED WITH UNDERBALANCE FOR PASSENGER SPEEDS BETWEEN THE 3.5 INCH DESIGN VALUE OF TABLES P3.5 AND P3.5M AND THE 4 INCH LIMITING VALUE PER THE FRA. CURVES WITH THESE CHARACTERISTICS WILL BE MAINTAINED AS DESIGNED.
3. SUPERELEVATION AND SPIRAL LENGTHS WILL BE MAINTAINED TO THE VALUES RECORDED IN THE SCRRRA TRACK CHARTS. SOME OF THESE DO NOT MEET THE LENGTH REQUIREMENTS FOR THE TABLES FOR NEW DESIGN, P3.5 AND F2.0. HOWEVER, THEY DO MEET THE REQUIREMENTS FOR THE P3.5M AND P2.0M TABLES.
4. SPIRAL LENGTHS MUST NOT BE INCREASED EXCEPT AS PART OF AN ENGINEERED REALIGNMENT OF A CURVE. THE SHARPNESS OF THE CURVE IN THE CENTRAL BODY WILL BE INCREASED IF THE SPIRALS ARE EXTENDED INTO THE BODY OF THE CURVE.
5. CONTRACT TRACK INSPECTORS WILL FIELD VERIFY THE CHARACTERISTICS OF AT LEAST TWO CURVES EACH MONTH, USING TRACK LEVEL AND STRING LINE, REPORTING THE OBSERVED 62-FOOT CHORD MID-ORDINATE AND SUPERELEVATION AT 15.5-FOOT INTERVALS FOR THE LENGTH OF THE CURVE. THE MANAGERS OF TRACK MAINTENANCE AND THE CONTRACT PROJECT MANAGER WILL REVIEW AND COMPARE THE PRECEDING TWO YEARS OF TRACK GEOMETRY DATA TO THE TRACK CHART DATA, AND WILL ARRANGE FOR FIELD VERIFICATION OF ALIGNMENT BASED UPON THESE REVIEWS.
6. MANAGERS OF TRACK MAINTENANCE MUST RIDE WITH EACH OPERATION OF TRACK GEOMETRY CARS. THEY MUST MONITOR AND ENSURE THAT THE MAINTENANCE CONTRACTOR INVESTIGATES ANY NOTED REPORTS OF WARP OR UNDERBALANCE EXCEPTIONS AND TAKES THE REQUIRED REMEDIAL ACTIONS (SPOT REPAIRS OR REDUCTION IN SPEED). THEY MUST ALSO PROMPTLY REVIEW THE CURVE DATA GENERATED BY THE TRACK GEOMETRY CAR AND COMPARE THE AVERAGE CURVATURE, AVERAGE ELEVATION, LIMITING CURVATURE AND LIMITING ELEVATION FOR EACH CURVE TO THE RECORDS IN THE TRACK CHARTS WHETHER AN EXCEPTION IS NOTED OR NOT.
7. COMPOUND CURVES DESCRIBED IN THE TRACK CHARTS THAT HAVE DIFFERING TRAIN SPEED, SUPERELEVATION AND/OR CURVATURE NOTED FOR TWO OR MORE SEGMENTS OF ONE CURVE HAVE BEEN APPROVED BY THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
8. IF THE ACTUAL SUPERELEVATION AND CURVATURE MEASURED IN THE FIELD BY GEOMETRY CARS OR BY MANUAL INSPECTION PER NOTE 5 ABOVE ARE FOUND TO RESULT IN AN ALLOWABLE SPEED LESS THAN PERMITTED BY TABLES PML AND FML, A TEMPORARY SPEED REDUCTION MUST BE IMPOSED TO THE NEXT LOWER SPEED THAT WILL ACCOMMODATE THE ACTUAL MEASURED SUPERELEVATION. THE TEMPORARY SPEED REDUCTION MUST REMAIN UNTIL THE SUPERELEVATION LIMITS ARE RAISED TO THE VALUES SHOWN IN TABLES P3.5, F2.0, P3.5M AND F2.0M FOR THE DESIGN SPEED.

				DRAWN BY: A. CARLOS DATE: 03/31/2011				SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES: SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.				 METROLINK® SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012				ENGINEERING STANDARDS				STANDARD 2204	
				 ASSISTANT DIRECTOR: STANDARDS & DESIGN												SCALE: NTS					
X XX-XX-XX				REVISION XX XX												REVISION SHEET - 6 OF 6					
REV. DATE				DESCRIPTION DES. ENG.												CADD FILE: ES2204-06					
				 DIRECTOR OF ENGINEERING AND CONSTRUCTION																	



PLAN - LOCATIONS TO BE TAGGED

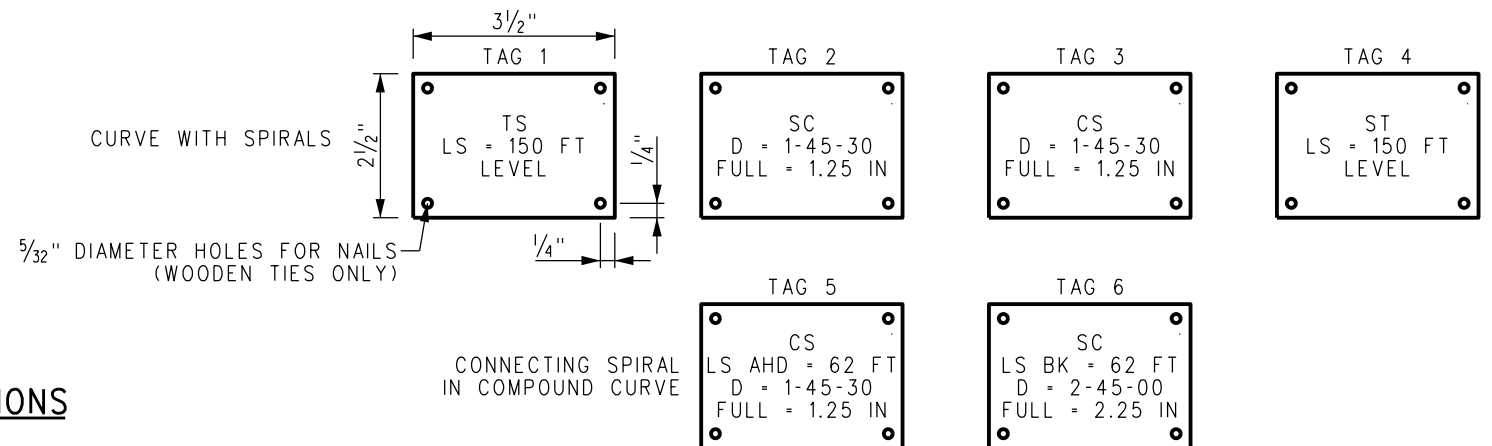
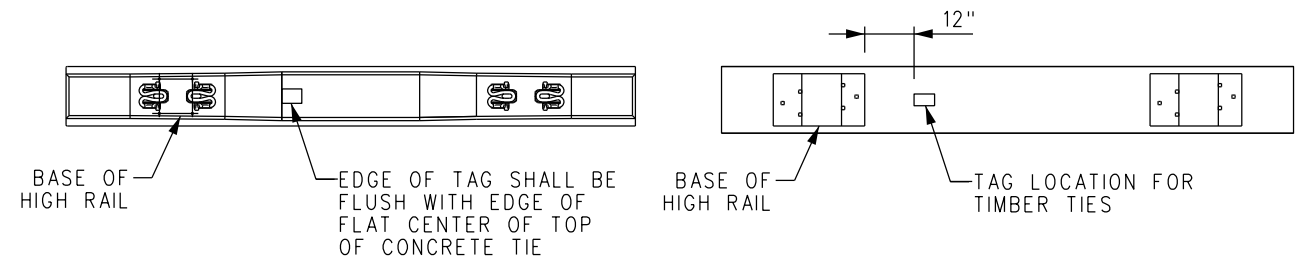
PLAN - TAG AND PIN LOCATIONS

	TS		SC		CS		ST	
HIGH RAIL	LEVEL		FULL = 1.50 IN		FULL = 1.50 IN		LEVEL	
LOW RAIL	TS LS = 150 FT		SC D = 1-45-30		D = 1-45-30 CS		LS = 150 FT ST	

INFORMATION TO BE PLACED IN WRITING ON GAUGE SIDE WEB OF RAIL
WITH PERMANENT METAL MARKER OR PAINT STICK


NOTES: (RH CURVE AS SHOWN, LH OPPOSITE)

1. TAGS SHALL BE CLEAR ANODIZED ALUMINUM, 16 GAUGE, WITH EMBOSSED LETTERING, AS SHOWN.
2. TAGS SHALL INDICATE NO SUPERELEVATION OF OUTSIDE RAIL AT THE TS AND THE ST AND FULL SUPERELEVATION OF OUTSIDE RAIL IN INCHES AT ALL SC AND CS POINTS.
3. ORIENT TAGS TO BE READ WHILE WALKING IN THE DIRECTION OF INCREASING MILE POSTS.
4. ATTACH TAGS TO CONCRETE TIES WITH MANUS-PRENE 65-A ADHESIVE; TO WOOD TIES WITH GALVANIZED 10 PENNY NAILS OR APPROVED EQUAL.
5. TAGS ATTACHED TO ANY TIE BEING REPLACED SHALL BE REMOVED AND ATTACHED TO THE REPLACEMENT TIE BY THE CONTRACTOR.
6. CURVE INFORMATION WRITTEN ON RAIL BEING REPLACED SHALL BE WRITTEN IN THE SAME LOCATION ON THE REPLACEMENT RAIL BY THE CONTRACTOR.
7. SUPERELEVATED CURVES MUST INCLUDE SPIRALS. CURVES WITHOUT SPIRALS SHALL NOT BE SUPERELEVATED.
8. OFFSET PINS SHALL BE #5 REBAR, AT LEAST 24 IN LONG, DRIVEN VERTICALLY INTO GROUND WITH 1-2 IN REMAINING EXPOSED. PIN SHALL BE MADE HIGHLY VISIBLE WITH BRIGHT ORANGE PAINT AND ORANGE SURVEYOR TAPE. WITH APPROVAL OF SCRRRA, THE DESIRED 10 FT OFFSET MAY VARY BASED ON FIELD CONDITIONS OR TO AVOID HAVING THE PIN BE A TRIPPING OR TIRE-PUNCTURE HAZARD.



CURVES W/O SPIRALS

TAG DETAIL

				DRAWN BY: A. CARLOS		DATE: 03/31/2011		SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES, SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.		 METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012		ENGINEERING STANDARDS		STANDARD 2206	
				ASSISTANT DIRECTOR: STANDARDS & DESIGN								SCALE: NTS		REVISION SHEET 1 OF 1	
				DIRECTOR OF ENGINEERING AND CONSTRUCTION										CADD FILE: ES2206	

MAXIMUM SPEEDS THROUGH TURNOUTS, SPRING SWITCHES AND SLIP SWITCHES

SUBJECT TO SPEED RESTRICTIONS IMPOSED BY LOCAL CONDITIONS, OTHER THAN THE NUMBER OF THE TURNOUT OR TYPE OF SWITCH, THE FOLLOWING WILL GOVERN THE MAXIMUM SPEEDS PERMITTED THROUGH TURNOUTS AND OVER SPRING SWITCHES AND SLIP SWITCHES:

FREIGHT						
TURNOUT NO	TANGENTIAL		STANDARD		EQUILATERAL (MPH)	DOUBLE SLIP (MPH)
	SWITCH LENGTH (POINTS)	MPH	SWITCH LENGTH (POINTS)	MPH	-	-
-	-	-	16'-6"	10	N/A	10
8	-	-	16'-6"	10	N/A	N/A
9	-	-	16'-6"	10	N/A	N/A
10	21'-6"	15	19'-6"	15	N/A	10
11	-	-	19'-6"	15	N/A	N/A
14	29'-0"	25	26'-0"	20	N/A	N/A
15	-	-	26'-0"	20	N/A	N/A
20	47'-0"	40	39'-0"	35	50	N/A
24	61'-6"	50	39'-0"	40	60	N/A
30	82'-0"	60	-	N/A	80	N/A

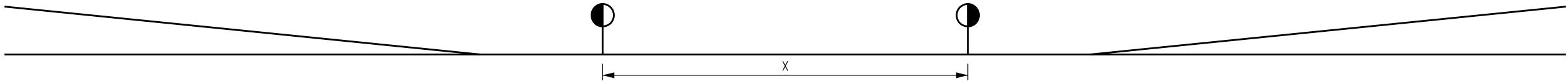
PASSENGER						
TURNOUT NO	TANGENTIAL		STANDARD		EQUILATERAL (MPH)	DOUBLE SLIP (MPH)
	SWITCH LENGTH (POINTS)	MPH	SWITCH LENGTH (POINTS)	MPH	-	-
-	-	-	16'-6"	12	N/A	12
8	-	-	16'-6"	12	N/A	N/A
9	-	-	16'-6"	12	N/A	N/A
10	21'-6"	25	16'-6"	20	N/A	15
11	-	-	19'-6"	20	N/A	N/A
14	29'-0"	35	26'-0"	30	N/A	N/A
15	-	-	26'-0"	30	N/A	N/A
20	47'-0"	50	39'-0"	45	70	N/A
24	61'-6"	60	39'-0"	55	85	N/A
30	82'-0"	75	-	N/A	110	N/A

NOTE:

1. MAXIMUM SPEEDS WERE CALCULATED BASED ON TURNOUT GEOMETRY WITH E_o = 0" AND ASSUMED E_u = 3.5" FOR PASSENGER TRAINS AND E_u = 2.0" FOR FREIGHT TRAINS.

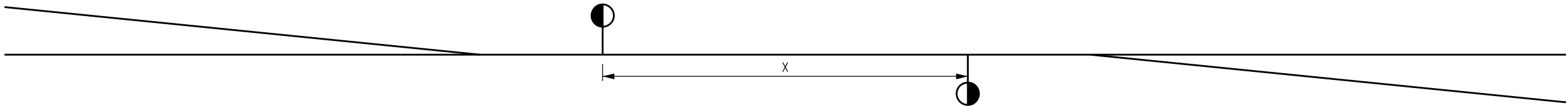
						DRAWN BY: A. CARLOS	DATE: 03/31/2011	SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES:	<div>METROLINK[®]</div> <div>SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012</div>	ENGINEERING STANDARDS		STANDARD 2208
								SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.		SCALE: NTS		
										REVISION SHEET		
										- 1 OF 1		
										CADD FILE: ES2208		
X	XX-XX-XX	REVISION	XX	XX		<div> ASSISTANT DIRECTOR: STANDARDS & DESIGN</div> <div> DIRECTOR OF ENGINEERING AND CONSTRUCTION</div>						
REV.	DATE	DESCRIPTION	DES.	ENG.								

FACING TURNOUTS OF OPPOSITE HAND



FROG NO	DESIRABLE X (FT)	MINIMUM X (FT)
8, 10	82	46
14	122	86
20	N/A	118
24	N/A	150

FACING TURNOUTS OF LIKE HAND



FROG NO	DESIRABLE X (FT)	MINIMUM X (FT)
8, 10	82	52
14	125	90
20	N/A	122
24	N/A	150

- NOTES:
- DESIGN SPEED, SIGNAL SPACING AND CIRCUITS WILL GOVERN AT LOCATIONS WHERE INSULATED JOINTS ARE REQUIRED.
 - ANY DISTANCE BETWEEN FACING POINTS OF SWITCH LESS THAN THE MINIMUMS GIVEN SHALL REQUIRE THE APPROVAL OF THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.

X	XX-XX-XX	REVISION	XX	XX	
REV.	DATE	DESCRIPTION	DES.	ENG.	

DRAWN BY: HDR DATE: 03/31/2011


ASSISTANT DIRECTOR: STANDARDS & DESIGN


DIRECTOR OF ENGINEERING AND CONSTRUCTION

SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES: SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.

 **METROLINK**
SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

ENGINEERING STANDARDS

FACING POINT TURNOUT
ARRANGEMENT AND SPACING

STANDARD 2209

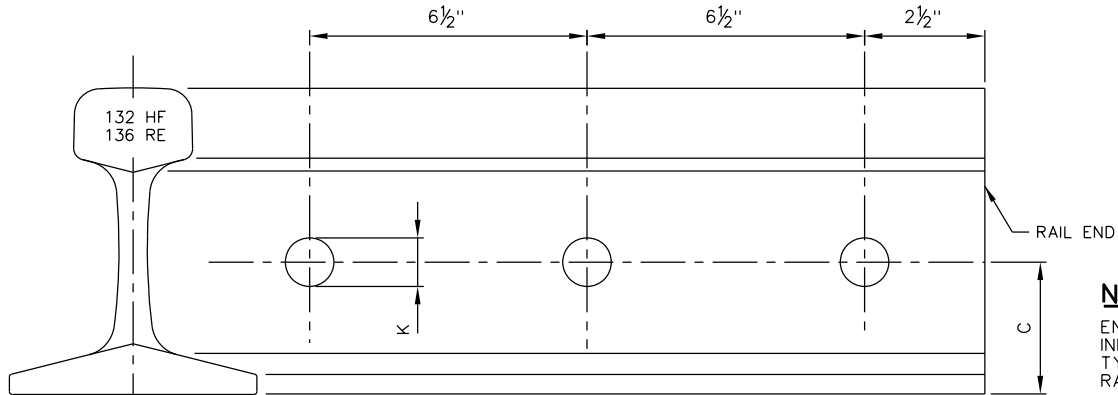
SCALE: NTS

REVISION SHEET - 1 OF 1

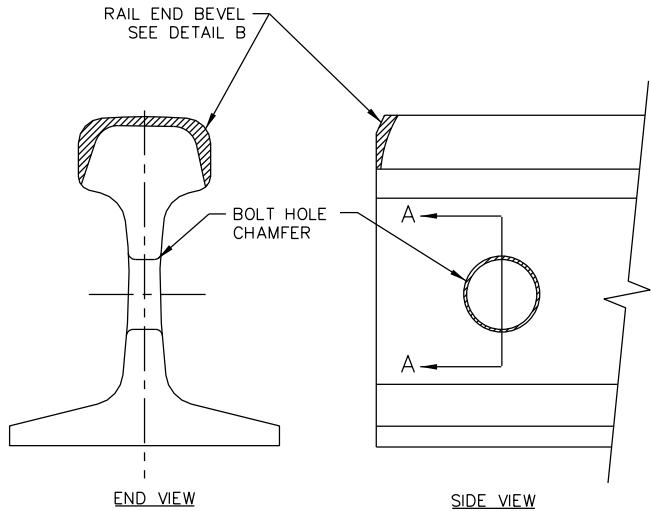
CADD FILE: ES2209

D I M E N S I O N S	RAIL SECTION	HEIGHT OF RAIL	WIDTH OF BASE	WIDTH OF HEAD	WEB THICK-NESS	DEPTH OF HEAD		FISHING DEPTH	DEPTH OF BASE	THICKNESS AT EDGE OF BASE	HEAD ANGLE	BASE ANGLE	SLOPE OF HEAD	HEAD RADIUS	CHORD OF HEAD RADIUS	HEAD CORNER RADIUS	HEAD & WEB FILLET	WEB & BASE FILLET	WEB RADIUS	BOTTOM OF RAIL TO			DIAM. OF BOLT HOLES
						AT CENTER	AT CORNER													℄ OF WEB RADIUS	NEUT. AXIS	℄ OF BOLT HOLES	
		INCHES H	INCHES B	INCHES HD	INCHES W	INCHES D	INCHES D'	INCHES F	INCHES E	INCHES T	INCHES A ¹	INCHES A ²	INCHES S	INCHES R ¹	INCHES CH	INCHES R ¹	INCHES R ²	INCHES R ³	INCHES R ^W	INCHES L	INCHES N	INCHES C	INCHES K
	132-LB. HEAD FREE	7 5⁄16	6	2 3⁄32	2 1⁄32	1 15⁄16	2 3⁄32	4 3⁄16	1 3⁄16	7⁄16	60 1⁄2°	1:4	1:40	14	1 13⁄16	1 3⁄16	1⁄2	3⁄4	10-TOP 23-BOT.	4 1⁄4	3.30	3 3⁄32	1 5⁄16
	136-LB. RE	7 5⁄16	6	2 15⁄16	1 1⁄16	1 15⁄16	1 9⁄16	4 3⁄16	1 3⁄16	7⁄16	1:4	1:4	1:40	14	1 13⁄32	1 1⁄4	9⁄16	5⁄16 & 3⁄4	8-TOP 20-BOT.	3 7⁄8	3.35	3 3⁄32	1 5⁄16

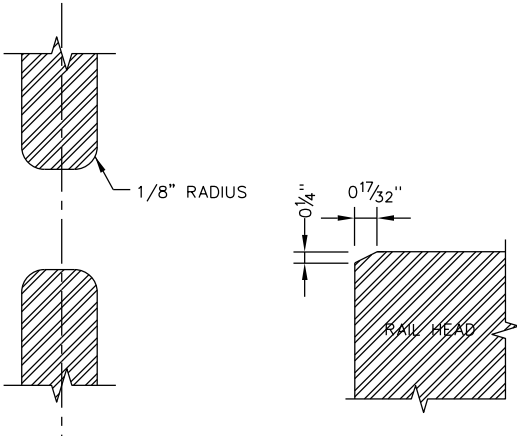
P R O P E R T I E S	RAIL SECTION	WEIGHT PER YARD	NET TONS PER MILE OF TRACK	TRACK MILES PER 1000 NET TONS	AREA OF				MOMENT OF INERTIA	SECTION MODULUS		RATIOS	
					SECTION	HEAD	WEB	BASE		HEAD	BASE	MOM. OF INERTIA TO AREA	SEC. MOD. OF HEAD TO AREA
		POUNDS			SQ. IN.	%	%	%		INCHES ³	INCHES ³		
	132-LB. HEAD FREE	132.40	233.02	4.29	12.98	35.8	26.7	37.5	93.80	23.38	28.42	7.23	1.80
	136-LB. RE	136.17	239.66	4.17	13.35	36.4	27.1	36.5	94.90	23.93	28.35	7.11	1.79



RAIL DRILLING FOR JOINTS

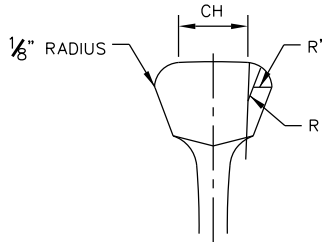


RAIL CHAMFERING AND BEVELING

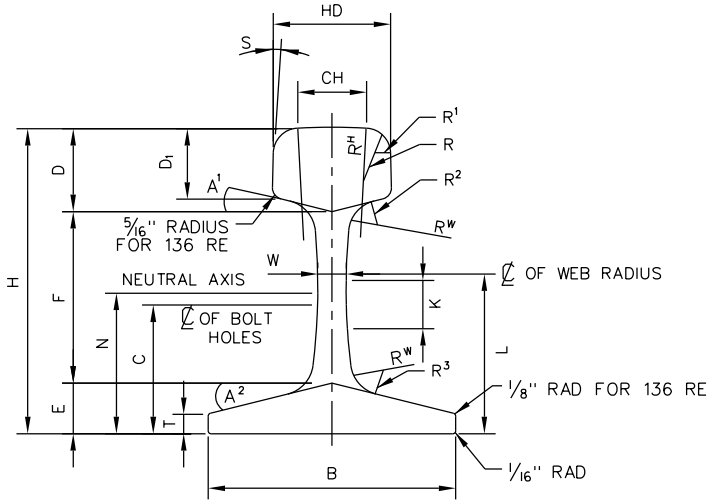


BOLT HOLE CHAMFER
SECTION A-A

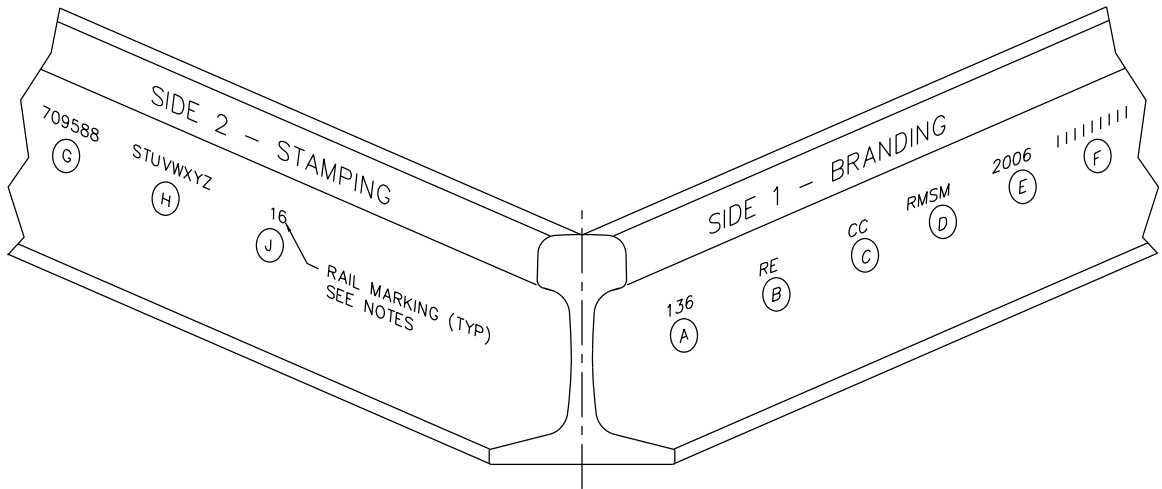
RAIL END BEVEL
DETAIL B



HEAD FREE
SECTION



RAIL SECTION

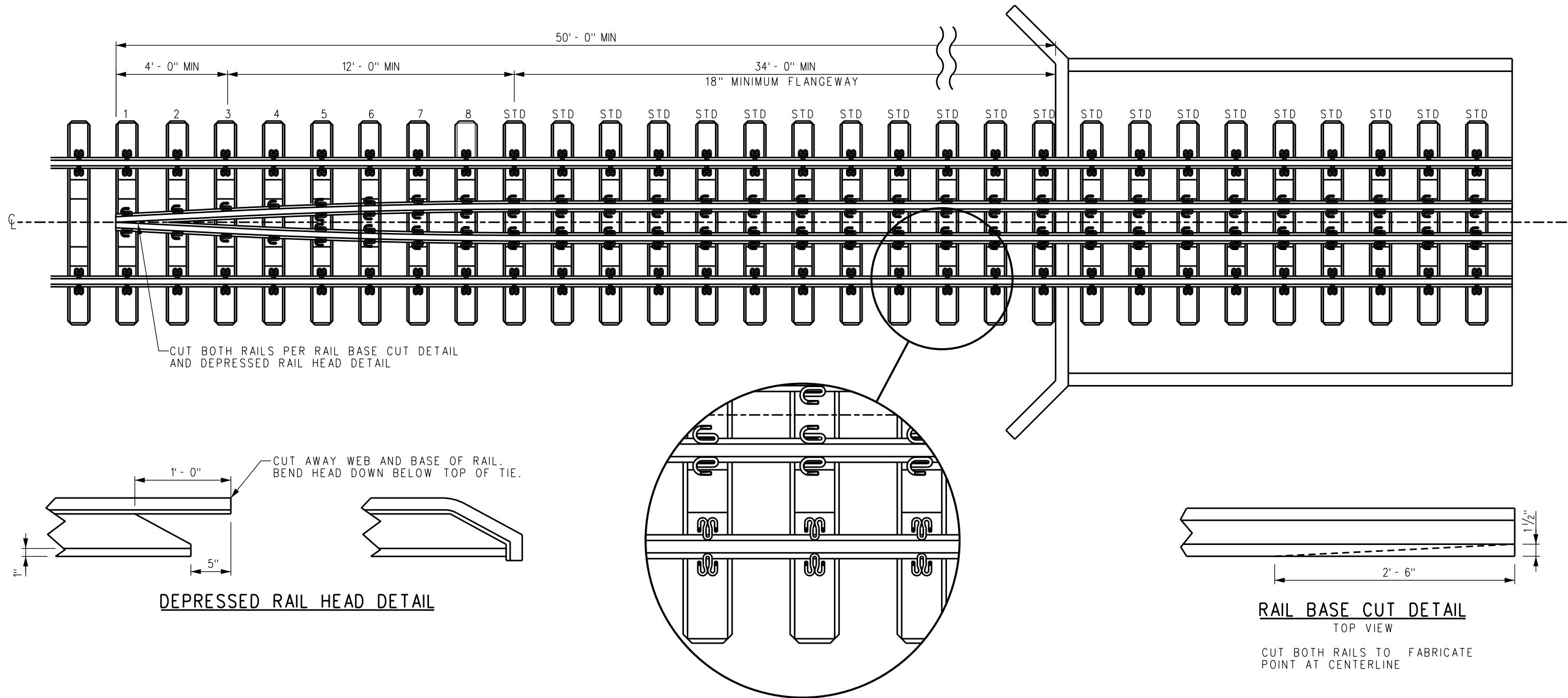


RAIL MARKINGS

RAIL MARKING NOTES

- SIDE 1: BRANDING SHALL BE ROLLED IN RAISED CHARACTERS ON THE SIDE OF THE WEB OF EACH RAIL IN ACCORDANCE TO AREMA.
- A = WEIGHT OF RAIL
B = SECTION
C = HYDROGEN REDUCTION METHOD (CC = CONTROL COOLED, VT = VACUUM TREATED)
D = MANUFACTURER (EG, RMSM = ROCKY MOUNTAIN STEEL MILLS)
E = YEAR ROLLED
F = MONTH ROLLED
- SIDE 2: THE WEB OF OPPOSITE SIDE OF THE RAIL SHALL BE HOT STAMPED IN ACCORDANCE TO AREMA.
- G = HEAT NUMBER
H = RAIL LETTER
J = INGOT NUMBER OR STRAND AND BLOOM NUMBER (IF APPLICABLE)

				DRAWN BY: A. CARLOS	DATE: 03/31/2011	SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES: SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.		METROLINK®		ENGINEERING STANDARDS		STANDARD 2301
				Narek D. Bae		SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY		ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012		DATA FOR STANDARD RAIL SECTIONS		SCALE: NTS
				Wilton Davis								REVISION SHEET 1 OF 1
				DIRECTOR OF ENGINEERING AND CONSTRUCTION								CADD FILE: ES2301

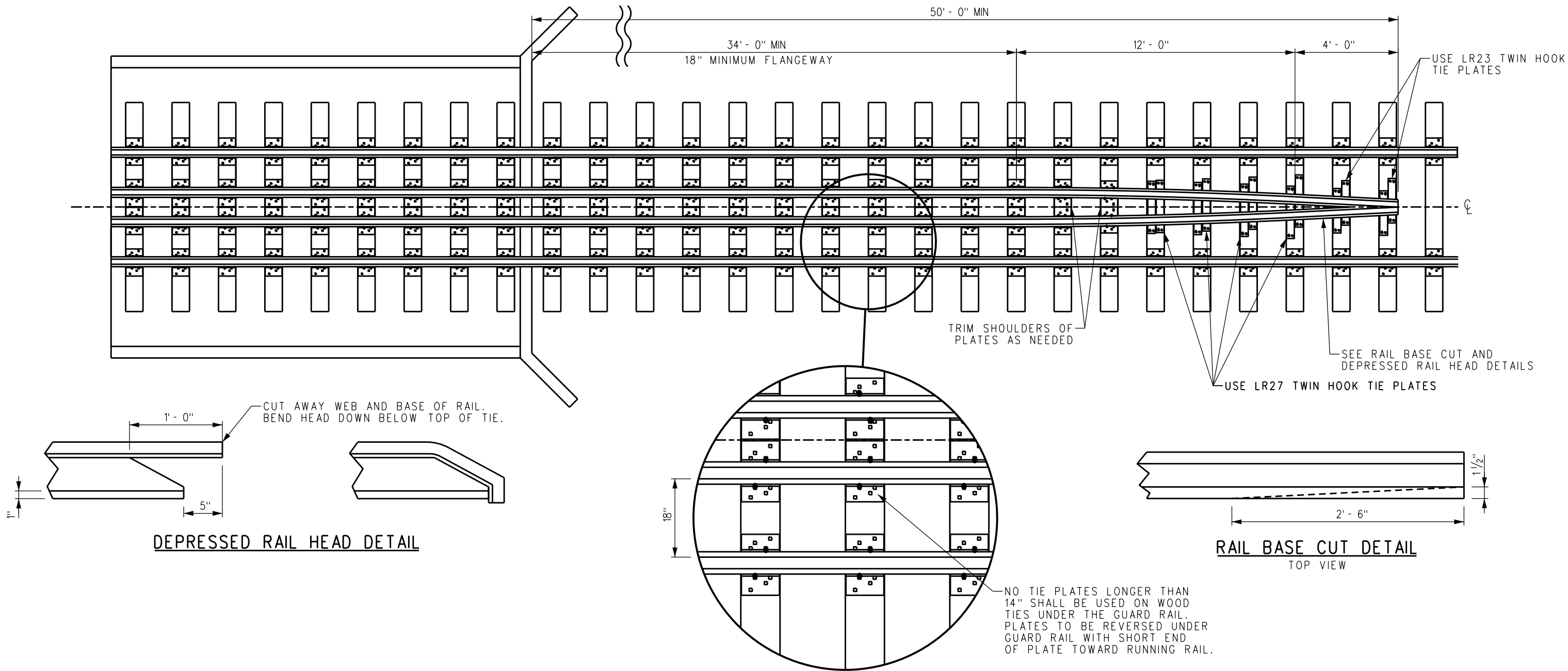


NOTES:

1. INNER GUARD RAILS ON BRIDGES SHALL BE REQUIRED FOR ALL SPANS WHERE EXPOSED STRUCTURAL STEEL IS PRESENT ABOVE T/R AND IS SUBJECTED TO STRUCTURAL DAMAGE BY DERAILED EQUIPMENT. INNER GUARD RAILS SHALL BE INSTALLED ON BRIDGES WHERE INDIVIDUAL SPANS ARE OVER 100 FEET IN LENGTH OR WHERE THE ENTIRE STRUCTURE IS OVER 800 FEET IN LENGTH AND AT LEAST ONE SPAN CROSSES OVER A WATERWAY THAT NORMALLY CONTAINS WATER AT LEAST 15 FEET DEEP. INNER GUARD RAILS SHALL EXTEND 50 FEET BEYOND THE SPAN OR SPANS TO BE PROTECTED.
2. INNER GUARD RAILS SHALL BE INSTALLED ON ANY OTHER BRIDGE AS DIRECTED BY THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
3. INSIDE GUARDRAILS ARE NOT REQUIRED ON BRIDGES UNTIL BRIDGE OR BRIDGE DECK IS REPLACED OR RUNNING RAIL IS REPLACED ACROSS BRIDGE UNLESS DIRECTED BY SCRRRA DIRECTOR OF ENGINEERING.
4. INSIDE GUARD RAILS MAY BE CONSTRUCTED USING SECOND HAND RAIL NOT LESS THAN 23 LBS LIGHTER OR NO LARGER THAN RUNNING RAILS. IF GUARD RAIL HAS 5 1/2" BASE, USE MODIFIED PLATES FOR 5 1/2" BASE SCRRRA ES2371.
5. ON CONCRETE TIES, GUARD RAILS SHALL BE FASTENED TO EACH TIE.
6. GUARD RAIL JOINTS, IF PRESENT, SHALL BE FULLY BOLTED USING SECOND-HAND JOINT BARS.
7. THE QUANTITY OF STD PLATES ON CONCRETE TIES WILL VARY DEPENDING ON THE NUMBER OF TIES. THEY ARE TO BE ORDERED AS NEEDED. PLATES 1 THROUGH 8 COME AS TWO SETS AND ARE TO BE ROTATED 180° ON OPPOSITE ENDS.

REFERENCE DRAWINGS:
FOR PLATES SEE SCRRRA ES2371
FOR CONCRETE TIE SEE SCRRRA ES2406 OR ES2407
FOR SCREW AND WASHER SEE SCRRRA ES2356

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



NOTES:

1. INNER GUARD RAILS ON BRIDGES SHALL BE REQUIRED FOR ALL SPANS WHERE EXPOSED STRUCTURAL STEEL IS PRESENT ABOVE T/R AND IS SUBJECTED TO STRUCTURAL DAMAGE BY DERAILED EQUIPMENT. INNER GUARD RAILS SHALL BE INSTALLED ON BRIDGES WHERE INDIVIDUAL SPANS ARE OVER 100 FEET IN LENGTH OR WHERE THE ENTIRE STRUCTURE IS OVER 800 FEET IN LENGTH AND AT LEAST ONE SPAN CROSSES OVER A WATERWAY THAT NORMALLY CONTAINS WATER AT LEAST 15 FEET DEEP. INNER GUARD RAILS SHALL EXTEND 50 FEET BEYOND THE SPAN OR SPANS TO BE PROTECTED.
2. INNER GUARD RAILS SHALL BE INSTALLED ON ANY OTHER BRIDGE AS DIRECTED BY THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
3. INSIDE GUARDRAILS ARE NOT REQUIRED ON BRIDGES UNTIL BRIDGE OR BRIDGE DECK IS REPLACED OR RUNNING RAIL IS REPLACED ACROSS BRIDGE
4. INSIDE GUARD RAILS MAY BE CONSTRUCTED USING SECOND HAND RAIL NOT LESS THAN 23 LBS LIGHTER OR NO LARGER THAN RUNNING RAILS. IF GUARD RAIL HAS 5 1/2" BASE, USE MODIFIED PLATES FOR 5 1/2" BASE SCRRRA ES2371.
5. ON WOOD TIES, GUARD RAILS SHALL BE FULLY PLATED AND SPIKED.
6. GUARD RAIL JOINTS, IF PRESENTS, SHALL BE FULLY BOLTED USING SECOND-HAND JOINT BARS.
7. ON TANGENT TRACK, SPIKE THE INSIDE GUARD RAIL WITH TWO SPIKES PER PLATE ON EACH RAIL OF THE TANGENT PORTION AND THREE SPIKES ON EACH RAIL OF THE CURVED PORTION. ON CURVED TRACK, SPIKE THE ENTIRE GUARD RAIL WITH THREE SPIKES PER PLATE ON EACH RAIL.
8. ON WOOD TIES, BOX ANCHOR TWO TIES NEAR THE CENTER OF BRIDGE TO RESTRICT LONGITUDINAL MOVEMENT OF GUARD RAIL.

REFERENCE DRAWINGS:
FOR PLATES SEE SCRRRA ES2371
FOR SCREW SPIKE SEE SCRRRA ES2355

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

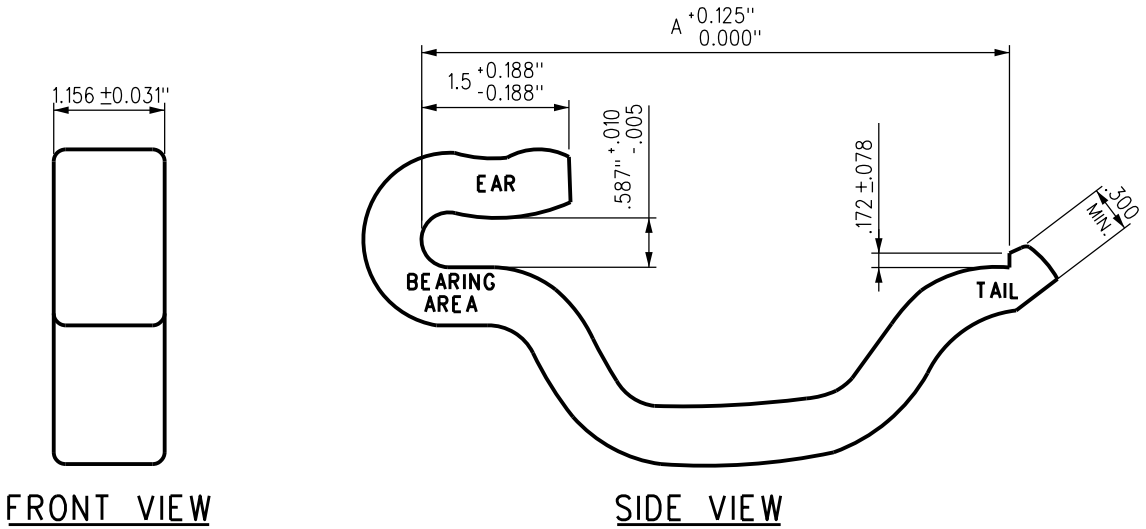
ANCHOR NOTES:

- 1. MATERIAL FOR RAIL ANCHOR TO BE HIGH CARBON STEEL.
- 2. MATERIAL FOR RAIL ANCHOR TO BE HEAT TREATED TO RC 34-47, TARGET RANGE RC 39-44.
- 3. ALL DIMENSIONS ARE MINIMUM UNLESS OTHERWISE SPECIFIED.
- 4. TYPICAL CHEMISTRY, CARBON .58-.90, MANGANESE .7-1.1, SILICON .5 MAXIMUM.
- 5. RAIL ANCHORS SHALL CONFORM TO AREMA MANUAL, CHAPTER 5, PART 7, SECTION 7.1.

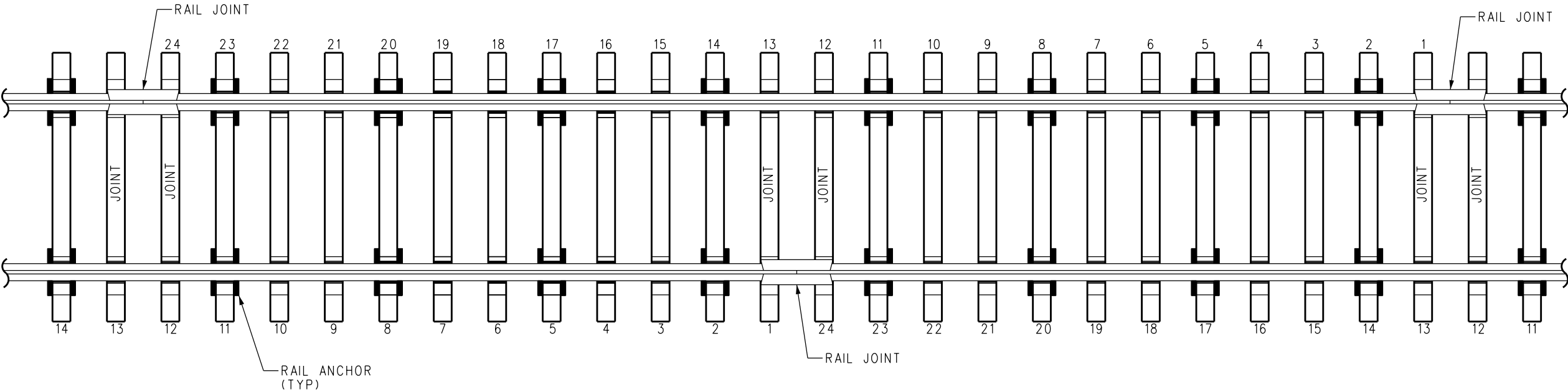
NOTES:

- 1. RAIL ANCHORS SHALL NOT BE PLACED AGAINST JOINT TIES, INCLUDING INSULATED JOINTS.
- 2. WHILE THE NUMBER OF ANCHORS REQUIRED MAY VARY WITH LOCAL CONDITIONS, STANDARD IS 16 ANCHORS PER RAIL LENGTH OF 39 FT OR 24 TIES.
- 3. AT LOCATIONS WHERE ADDITIONAL ANCHORS ARE REQUIRED, SCRRA ENGINEER WILL DETERMINE THE NUMBER OF ANCHORS REQUIRED.
- 4. RAIL ANCHOR SHALL BE DRIVEN ON BASE OF RAIL UNTIL LOCKING NOTCH ENGAGES EDGE OF OPPOSITE FLANGE. ANCHORS MUST NOT BE DRIVEN ALONG THE RAIL. IF ADJUSTMENTS ARE NECESSARY, REMOVE AND RE-APPLY.
- 5. FOR CONTINUOUS WELDED RAIL, APPLICATION OF ANCHORS SHALL BE IN ACCORDANCE WITH SCRRA ES2351-02.
- 6. TURNOUTS THAT ARE NOT FASTENED WITH ELASTIC CLIPS ARE TO BE FULLY BOX ANCHORED EXCEPT AT JOINTS OR LOCATIONS WHERE ANCHOR WILL INTERFERE WITH SWITCH OPERATION.
- 7. ELASTIC FASTENERS WILL SATISFY RAIL ANCHORAGE NEEDS. USE OF ANCHORS IN COMBINATION WITH ELASTIC FASTENERS SHALL BE DONE ONLY AS DIRECTED BY SCRRA ENGINEER.
- 8. FOR JOINTED RAIL IN LENGTHS IN EXCESS OF 39 FT, CONTINUE THE PATTERN OF BOX ANCHORS APPLIED TO EACH RAIL ON EVERY THIRD TIE, SKIPPING AND ADJUSTING FOR JOINT TIES.
- 9. ANCHOR PATTERN IS EVERY THIRD TIE TO BE BOX ANCHORED SKIPPING TIES WHERE JOINT BAR IS PRESENT. TIES NUMBER 2, 11, 14, AND 23 MAY BE IMPACTED BY JOINT BAR. IF THIS OCCURS, ANCHOR ADJACENT TIE INSTEAD TO MAINTAIN 8 BOX ANCHORED TIES PER 39 FT.
- 10. EPOXY BONDED INSULATED JOINTS ARE TO BE CONSIDERED AS CONTINUOUS LENGTHS OF RAIL AND NOT AS "JOINTS" FOR THE PURPOSES OF SELECTING ANCHOR PATTERNS.

RAIL BASE SIZE	A
5 1/2"	5.625"
6"	6.125"



RAIL ANCHOR

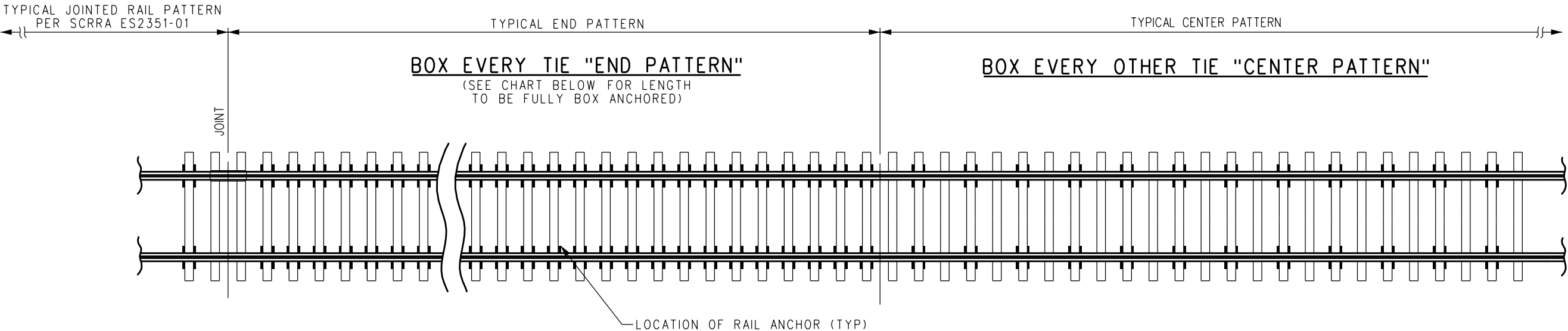


16 ANCHORS PER 39 FT RAIL

				DRAWN BY: A. CARLOS DATE: 04/12/02		SCRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRA APPROVED USES ONLY. FOR NON-SCRRA APPROVED USES, SCRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRA. ALL RIGHTS RESERVED.		 METROLINK®		ENGINEERING STANDARDS		STANDARD 2351	
				 ASSISTANT DIRECTOR: STANDARDS & DESIGN		SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012		RAIL ANCHOR APPLICATIONS TO JOINTED RAIL		SCALE: NTS		REVISION SHEET	
A 02-28-13				ADDED RAIL ANCHOR DETAILS						A 1 OF 4		CADD FILE: ES2351-01	
REV. DATE DESCRIPTION DES. ENG.				DES. ENG.									

NOTES:

1. END PATTERN IS TO BE APPLIED TO BOTH RAILS WHEN JOINT IS ON ONLY ONE RAIL.
2. FOR JOINTED RAIL, APPLICATION OF ANCHORS SHALL BE IN ACCORDANCE WITH DRAWING ES2351-01.
3. BOX ANCHOR EVERY TIE FOR A DISTANCE OF 200 FT AHEAD OF AND BEHIND TURNOUTS ON MAIN TRACK AND TO THE CLEARANCE POINT ON SIDE TRACK OF TURNOUT FOR ALL SWITCHES IN CWR TERRITORY. ALSO BOX ANCHOR EVERY TIE AS ABOVE FOR RAILROAD DIAMOND CROSSINGS.
4. FULLY BOX ANCHOR HOT BOX OR DRAGGING EQUIPMENT DETECTORS FOR 200 FT IN EACH DIRECTION.
5. EPOXY BONDED INSULATED JOINTS DO NOT REQUIRE END PATTERNS.
6. RAIL ANCHORS MUST NOT BE PLACED AGAINST JOINT TIES, INCLUDING INSULATED JOINTS.
7. AT LOCATIONS WHERE ADDITIONAL ANCHORS ARE REQUIRED, SCRRRA ENGINEER WILL DETERMINE THE NUMBER OF ANCHORS REQUIRED.
8. RAIL ANCHOR SHALL BE DRIVEN ON BASE OF RAIL UNTIL LOCKING NOTCH ENGAGES EDGE OF OPPOSITE FLANGE, ANCHORS MUST NOT BE DRIVEN ALONG THE RAIL. IF ADJUSTMENTS ARE NECESSARY, REMOVE AND RE-APPLY.
9. ELASTIC FASTENERS WILL SATISFY RAIL ANCHORAGE NEEDS. USE OF ANCHORS IN COMBINATION WITH ELASTIC FASTENERS SHALL BE DONE ONLY AS DIRECTED BY SCRRRA ENGINEER.
10. IF FIELD WELD INTERFERES WITH TYPICAL END PATTERN, ANCHOR MAY BE OMMITTED. DO NOT APPLY ANCHOR TO SAME SIDE OF TIE ON OPPOSITE RAIL, AS ANCHOR PATTERN MUST BE A MIRROR PATTERN TO AVOID SKEWING TIES.
11. APPLIES TO ALL TRACKS-ML, SIDING, AND YARD WITH CONTINUOUS WELDED RAIL.



END PATTERN ANCHORING REQUIRED AT EACH END OF CWR		
LENGTH OF CWR	MIN DISTANCE OF END PATTERN (FT)	EQUIVALENT NUMBER OF TIES
1000' OR MORE	200	120
800' TO 1000'	150	96
550' TO 800'	120	72
400' TO 800'	80	48
200' TO 400'	40	24

X	XX-XX-XX	REVISION	XX	XX	
REV.	DATE	DESCRIPTION	DES.	ENG.	

DRAWN BY: A. CARLOS

DATE: 03/31/2011

SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES, SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.

 **METROLINK**

SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

ENGINEERING STANDARDS

RAIL ANCHOR APPLICATIONS
FOR CONTINUOUS WELDED RAIL
WITH WOOD CROSS TIES

STANDARD

2351

SCALE:

NTS

REVISION

SHEET

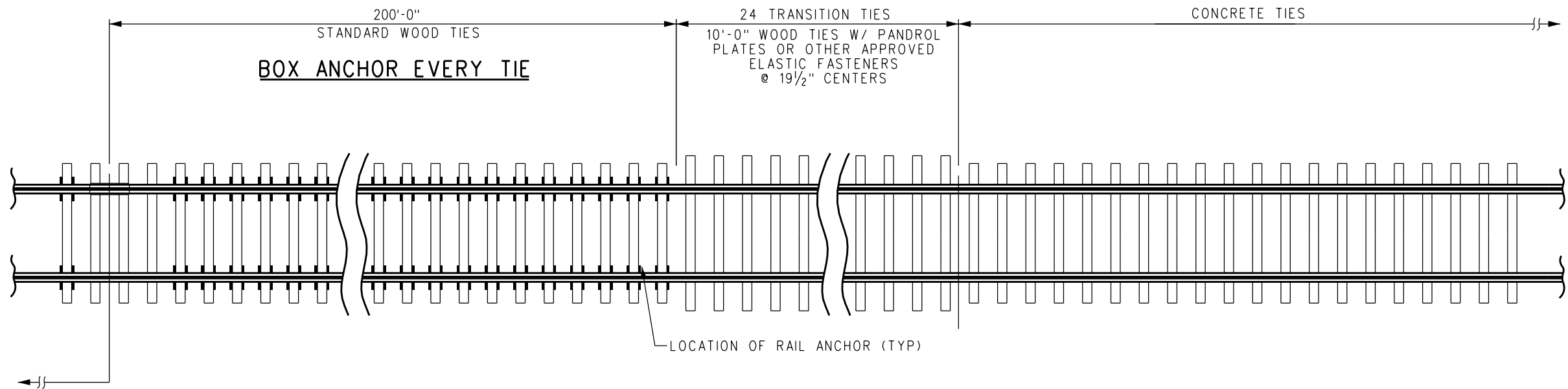
2 OF 4

CADD FILE:


ES2351-02

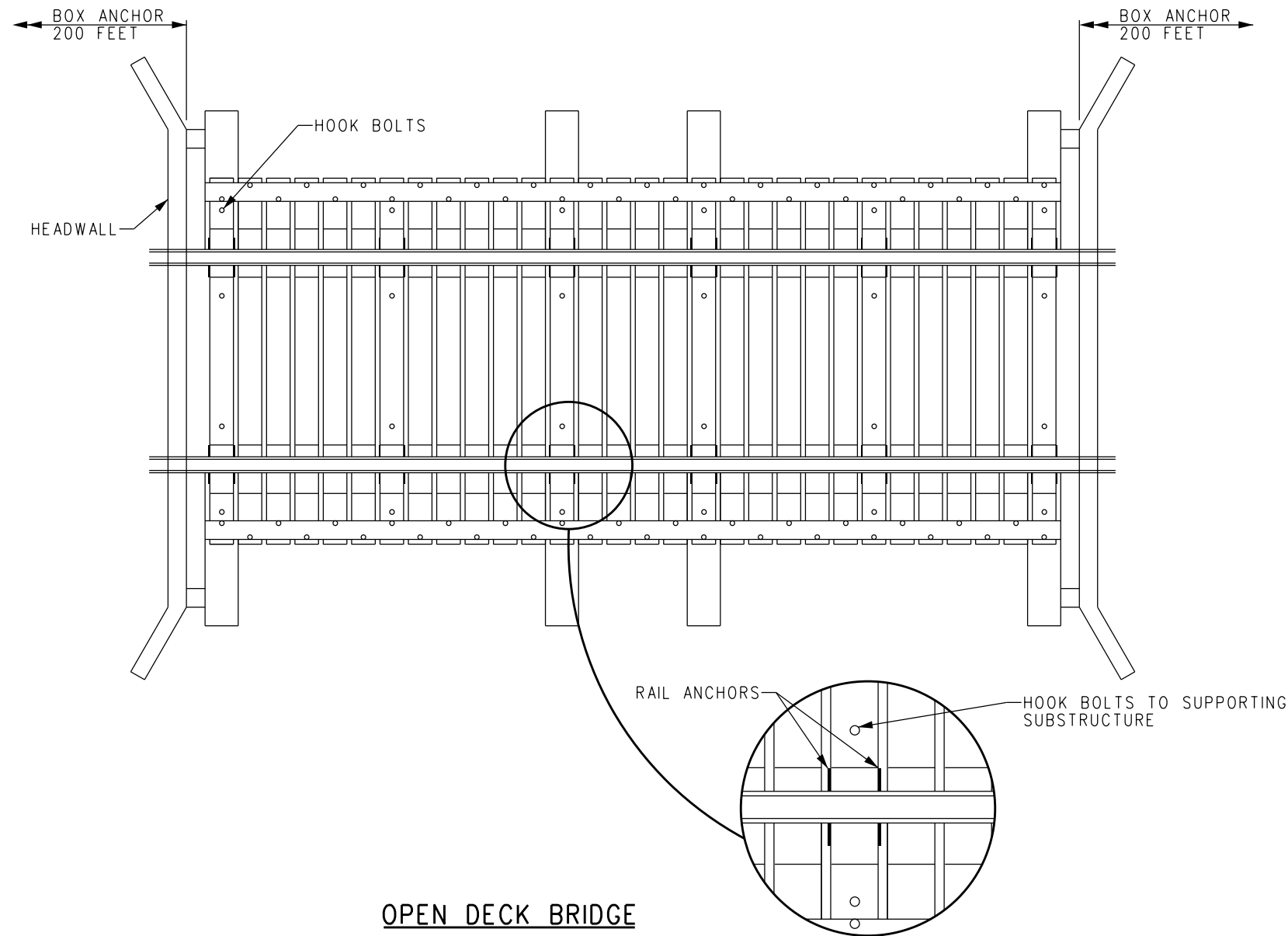
NOTES:

- 1. TRANSITION TIES TO CONSIST OF 24, 10'-0" LONG, WOOD TIES WITH PANDROL TYPE, GALVANIZED CLIPS OR EQUAL.
- 2. BOX ANCHORS ARE REQUIRED FOR 200 FT IN THE WOOD TIES AFTER TRANSITION TIES. ANCHORS ON BOTH RAILS MAY BE OMITTED IF RAIL JOINTS ARE PRESENT.
- 3. RAIL ANCHORS MUST NOT BE PLACED AGAINST JOINT TIES, INCLUDING INSULATED JOINTS. GLUE LAMINATED INSULATED JOINTS ARE NOT CONSIDERED AS JOINTS AND WILL BE FULLY ANCHORED.
- 4. AT LOCATIONS WHERE ADDITIONAL ANCHORS ARE REQUIRED, SCRRRA ENGINEER WILL DETERMINE THE NUMBER OF ANCHORS REQUIRED.
- 5. RAIL ANCHOR SHALL BE DRIVEN ON BASE OF RAIL UNTIL LOCKING NOTCH ENGAGES EDGE OF OPPOSITE FLANGE. ANCHORS MUST NOT BE DRIVEN ALONG THE RAIL. IF ADJUSTMENTS ARE NECESSARY, REMOVE AND RE-APPLY.
- 6. ELASTIC FASTENERS IN WOOD TIE ZONE WILL SATISFY RAIL ANCHORAGE NEEDS. USE OF ANCHORS IN COMBINATION WITH ELASTIC FASTENERS SHALL BE DONE ONLY AS DIRECTED BY SCRRRA ENGINEER.
- 7. APPLIES TO ALL CONCRETE TIE TRACKS-ML, SIDING, AND YARD.



STANDARD RAIL ANCHOR PATTERN PER SCRRRA ES2351-02 IF CWR, AND SCRRRA ES2351-01 IF JOINTED RAIL

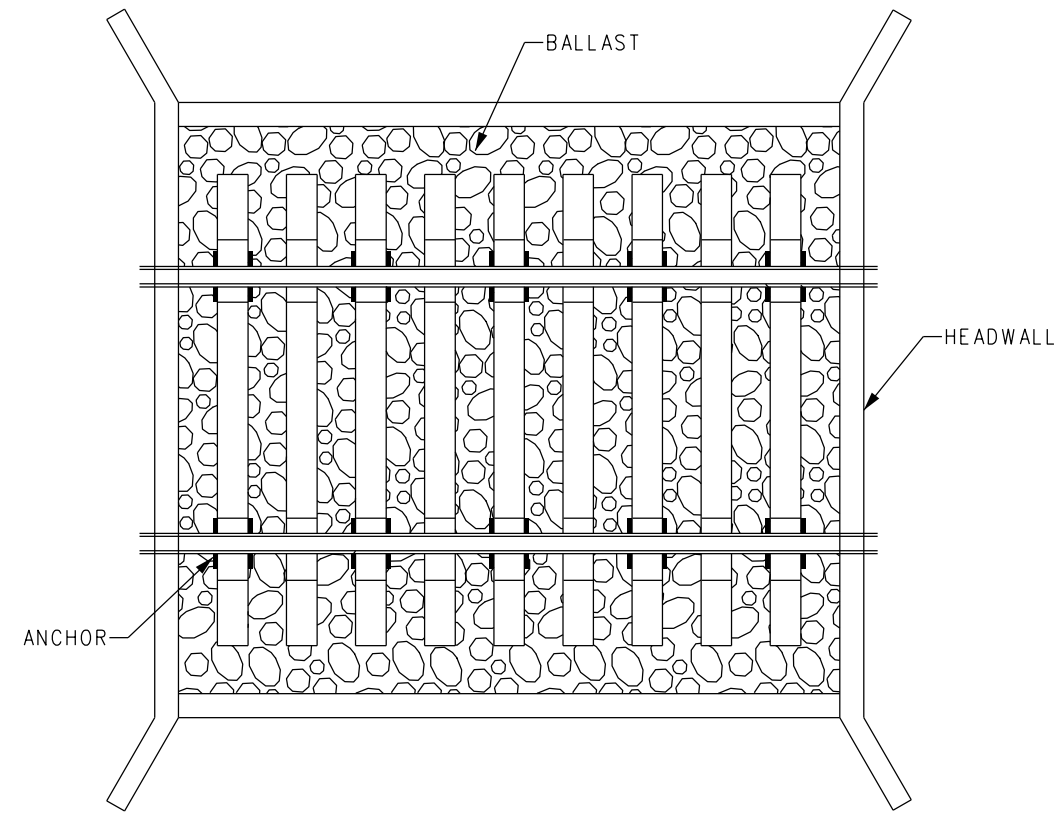
					DRAWN BY: A. CARLOS	DATE: 03/31/2011	SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES: SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.	 METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012	ENGINEERING STANDARDS	STANDARD 2351
					<i>Nancy D. Pae</i> ASSISTANT DIRECTOR: STANDARDS & DESIGN				RAIL ANCHOR APPLICATIONS FOR CONTINUOUS WELDED RAIL – TRANSITION FROM WOOD TO CONCRETE CROSS TIES	SCALE: NTS
					<i>William D. Davis</i> DIRECTOR OF ENGINEERING AND CONSTRUCTION					REVISION SHEET - 3 OF 4
X	XX-XX-XX	REVISION	XX	XX						CADD FILE: ES2351-03
REV.	DATE	DESCRIPTION	DES.	ENG.						



OPEN DECK BRIDGE

OPEN DECK BRIDGES:

- 1. BOX ANCHOR EVERY TIE FOR 200 FEET AWAY FROM HEADWALL ON ALL OPEN DECK BRIDGE APPROACHES. USE ANCHOR PATTERN ON SCRRA ES2351-02.
- 2. ALL TIES ACROSS OPEN DECK BRIDGES WHICH ARE ANCHORED TO SUBSTRUCTURE WILL BE BOX ANCHORED.
- 3. ONLY APPLIES TO BRIDGE 200' OR LONGER.



BALLAST DECK BRIDGE

FOR ANCHORING RAIL ON BALLAST DECK BRIDGES, BRIDGE HAS NO IMPACT ON PATTERN, USE PATTERN REVISIONS IN ES2351-02.

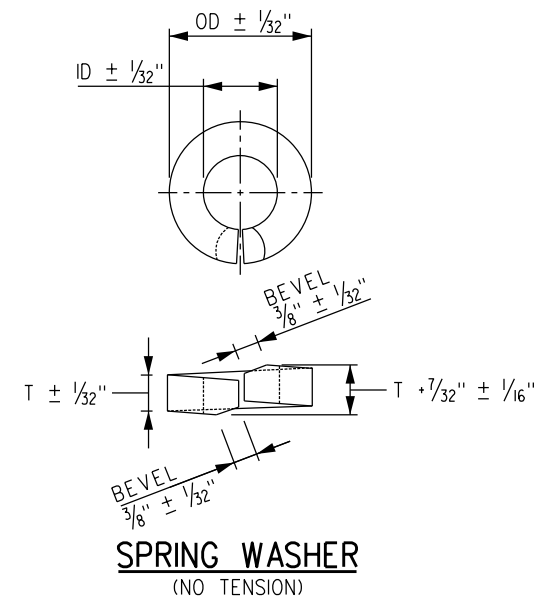
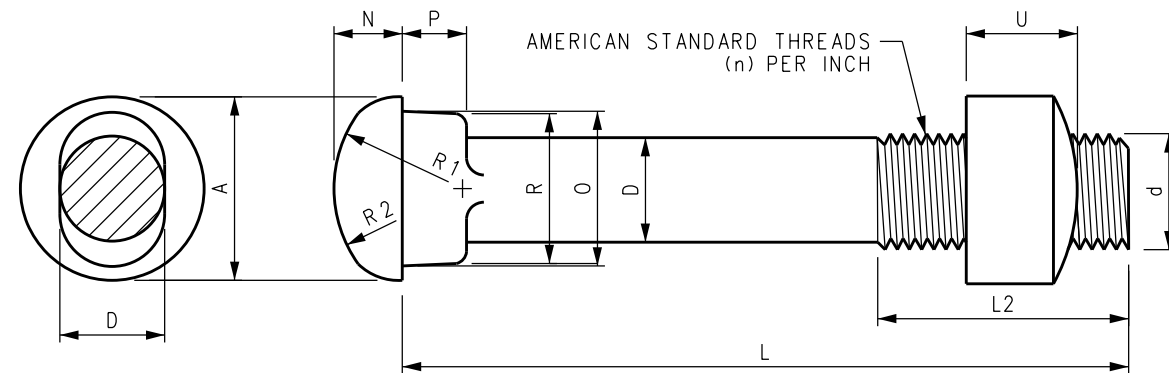
NOTES:

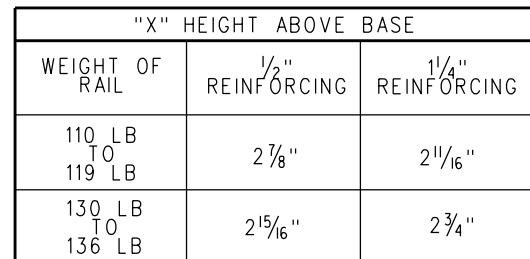
- 1. EXISTING ANCHOR PATTERNS MAY REMAIN UNTIL RAIL RELAY IS COMPLETE.
- 2. SECOND HAND ANCHORS MAY BE USED ON ALL INDUSTRY AND YARD TRACKS.
- 3. AS A GENERAL RULE, TRACK WITH ELASTIC FASTENERS DOES NOT REQUIRE ANCHORING. HOWEVER, IF THE SCRRA ENGINEER DEEMS IT NECESSARY TO PROPERLY RESTRAIN THE RAIL FROM MOVING LONGITUDINALLY, RAIL ANCHORS SHALL BE INSTALLED.

		DRAWN BY: HDR DATE: 03/31/2011		SCRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRA APPROVED USES ONLY. FOR NON-SCRRA APPROVED USES, SCRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRA. ALL RIGHTS RESERVED.		 METROLINK®		ENGINEERING STANDARDS		STANDARD 2351	
		 ASSISTANT DIRECTOR: STANDARDS & DESIGN				SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY		RAIL ANCHOR PATTERNS FOR CWR ON BRIDGES		SCALE: NTS	
		 DIRECTOR OF ENGINEERING AND CONSTRUCTION				ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012				REVISION SHEET 4 OF 4	
X XX-XX-XX		REVISION		XX XX						CADD FILE: ES2351-04	
REV. DATE		DESCRIPTION		DES. ENG.							

1. BOLTS AND NUTS TO BE MADE OF CLASS B STEEL.
2. NOMINAL SIZE OF BOLT IS THE THREAD DIAMETER (d).
3. WASHERS TO CONFORM TO AREMA SPECIFICATIONS.

DIMENSION TABLE (INCHES)																									
WEIGHT AND SECTION OF RAIL	BOLT												NUT		WEIGHT EACH (BOLT AND NUT)	NUMBER OF BOLTS PER 200 LB KEG	SPRING WASHER								
	THREADS			BODY		HEAD				NECK							THICKNESS	WIDTH	INSIDE DIAMETER	OUTSIDE DIAMETER	THICKNESS				
	OUTSIDE DIAMETER	LENGTH	NUMBER PER INCH	SHANK DIAMETER	LENGTH UNDER HEAD	DIAMETER	THICKNESS	LONG RADIUS	SHORT RADIUS	MAXIMUM WIDTH	MINIMUM WIDTH	DEPTH													
	d	L2	n	D	L	A	N	R1	R2	O	R	P	U	W								LBS	ID	OD	T
	80 LB ASCE	1 ³ / ₁₆	1 ¹ / ₂	10	3 ⁷ / ₈	4 3 ³ / ₈	1 ⁷ / ₁₆	9 ⁹ / ₁₆			1 ¹ / ₁₆	1 ¹ / ₃₂	7 ⁷ / ₁₆	3 ³ / ₄								1 ³ / ₈	1.09	184	7 ⁷ / ₈
75 LB CS & CS REV	1 ⁵ / ₁₆	1 ⁷ / ₈	9	7 ⁷ / ₈	4 3 ³ / ₄	1 ⁹ / ₁₆	1 ¹ / ₁₆			1 ⁷ / ₃₂	1 ³ / ₁₆	1 ¹ / ₂	1 ¹ / ₈	1 ¹ / ₂	1.56	128	1 ¹ / ₁₆	2 ¹ / ₁₆	9 ⁹ / ₁₆						
80 LB ASCE																									
90 LB AREA	"	"	"	7 ⁷ / ₈	5 ⁵ / ₈	"	"			"	"	"	"	"	1.62	123	1 ¹ / ₁₆	2 ¹ / ₁₆	9 ⁹ / ₁₆						
110 LB RE	1 ¹ / ₁₆	2 ¹ / ₈	8	1	5 3 ³ / ₈	1 ¹¹ / ₁₆	3 ³ / ₄			1 ¹¹ / ₃₂	1 ⁵ / ₁₆	5 ⁵ / ₈	1 ¹ / ₄	1 ⁵ / ₈	2.22	90	1 ¹ / ₈	2 ¹ / ₈	9 ⁹ / ₁₆						
130 LB PS, 130 LB RE	"	"	"	1	6 3 ³ / ₈	"	"			"	"	"	"	"	2.45	82	1 ¹ / ₈	2 ¹ / ₈	9 ⁹ / ₁₆						
112 LB, 115 LB, 131 LB RE	1 ¹ / ₈	2 ¹ / ₂	7	1 ¹ / ₁₆	6 ¹ / ₂	1 ⁵ / ₆₄	4 ⁵ / ₆₄	1 ⁵⁵ / ₆₄	4 ³ / ₆₄	1 ¹⁷ / ₃₂	1 ¹ / ₂	5 ⁵ / ₈	1 ¹ / ₈	1 ¹¹ / ₁₆	2.62	76	1 ³ / ₁₆	2 ⁷ / ₃₂	9 ⁹ / ₁₆						
113 LB HF, 132 LB HF																									
119 LB CF&I, 136 LB RE 141 LB RE																									

[illegible]



CAST STEEL CLIPS
RIGHT AND LEFT HAND
RIGHT HAND SHOWN





SWITCH LENGTH	ROD NO.	TYPE CLIP	LENGTH OF BOLTS "L"	
			SPLIT SWT	SPRING SWT
16'-6"	1	TRANSIT	4"	
		OSJ	*4"	4"
	2	TRANSIT	4"	4 1/2"
		OSJ		+ 4 3/4"
24'-0" AND 30'-0"	1	TRANSIT	4 1/2"	
		OSJ	*4"	4 3/4"
	2-5IN	TRANSIT	4 1/2"	5 1/4"
		4	OSJ	
*FOR MACHINE OPERATED SWITCHES +FOR FACING POINT LOCK OPERATION				



THIS BOLT TO BE USED FOR REPLACING LOOSE RIVETS ON SWITCHES FORMERLY FURNISHED WITH TRANSIT CLIPS RIVETED TO SWITCH POINTS.

FOR MAINTENANCE ONLY

						DRAWN BY:	A. CARLOS	DATE:	04/12/02
						 ASSISTANT DIRECTOR: STANDARDS & DESIGN			
A	05/01/12	REVISED "AS MAINTENANCE ONLY"	AC	NDP		 DIRECTOR OF ENGINEERING AND CONSTRUCTION			
REV.	DATE	DESCRIPTION	DES.	ENG.					

2 SCRA ENGINEERING STANDARDS ARE INTENDED FOR SCRA APPROVED USES ONLY.
3 FOR NON-SCRA APPROVED USES
4 SCRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF
5 THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE
6 STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED
7 WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES
8 AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF
9 THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH
10 USE. COPIES OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN
11 ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRA.
12 ALL RIGHTS RESERVED.



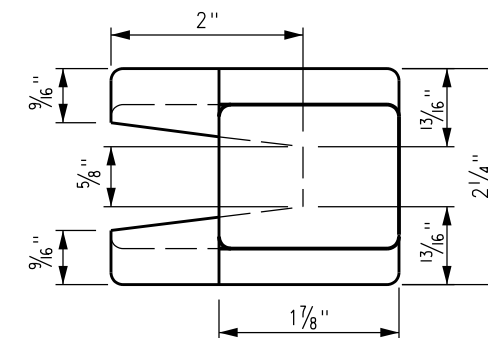
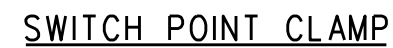
METROLINK®

SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

ENGINEERING STANDARDS

SWITCH ROD CLIPS AND BOLTS

STANDARD		2353
SCALE:		NTS
REVISION	SHEET	
AC	1 OF 1	
ADD FILE:		ES2353



1. TO BE INSTALLED ALONG SWITCH POINT
BETWEEN POINT OF SWITCH AND NO 2 ROD.
2. PAINT ASSEMBLY DARK BLUE-EXCEPT THREADS.
USE SCRRA MAINTENANCE PADLOCK.
3. WHEN CLAMP IS APPLIED ON SWITCH WITH HAND
THROW SWITCH STAND, STANDARD SWITCH LOCK WILL
BE REPLACED WITH SCRRA MAINTENANCE PADLOCK,
AND TAGGED "OUT OF SERVICE".

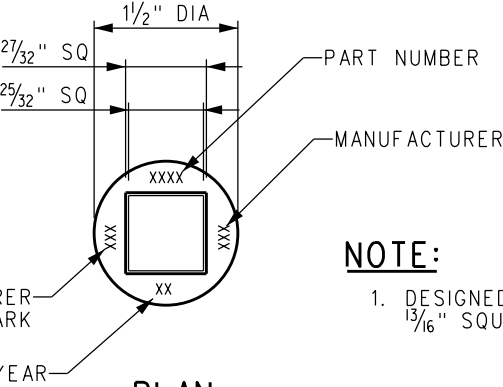
				DRAWN BY: <u>Narek D. Bae</u> HDR DATE: <u>03/31/2011</u>		SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.		 METROLINK®		ENGINEERING STANDARDS		STANDARD 2354	
				ASSISTANT DIRECTOR: STANDARDS & DESIGN						SCALE: NTS			
				 DIRECTOR OF ENGINEERING AND CONSTRUCTION						REVISION SHEET		1 OF 1	
										-			
										CADD FILE:		ES2354	
X XX-XX-XX		REVISION		XX XX									
REV. DATE		DESCRIPTION		DES. ENG.									

TIGHT SPIKE

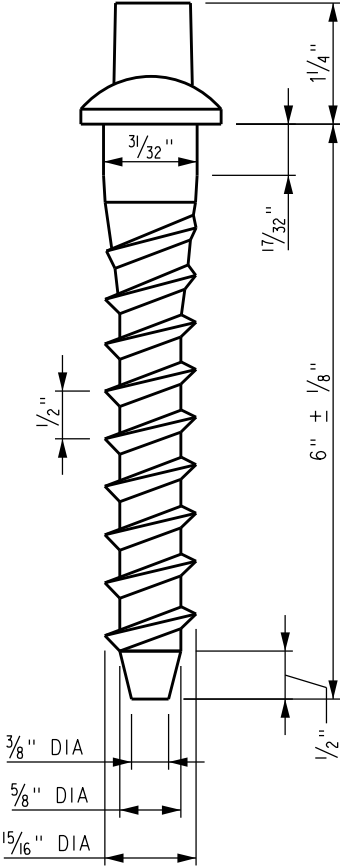
OR APPROVED EQUAL, SPIKE HOLE FINISHING COMPOUND

NOTES:

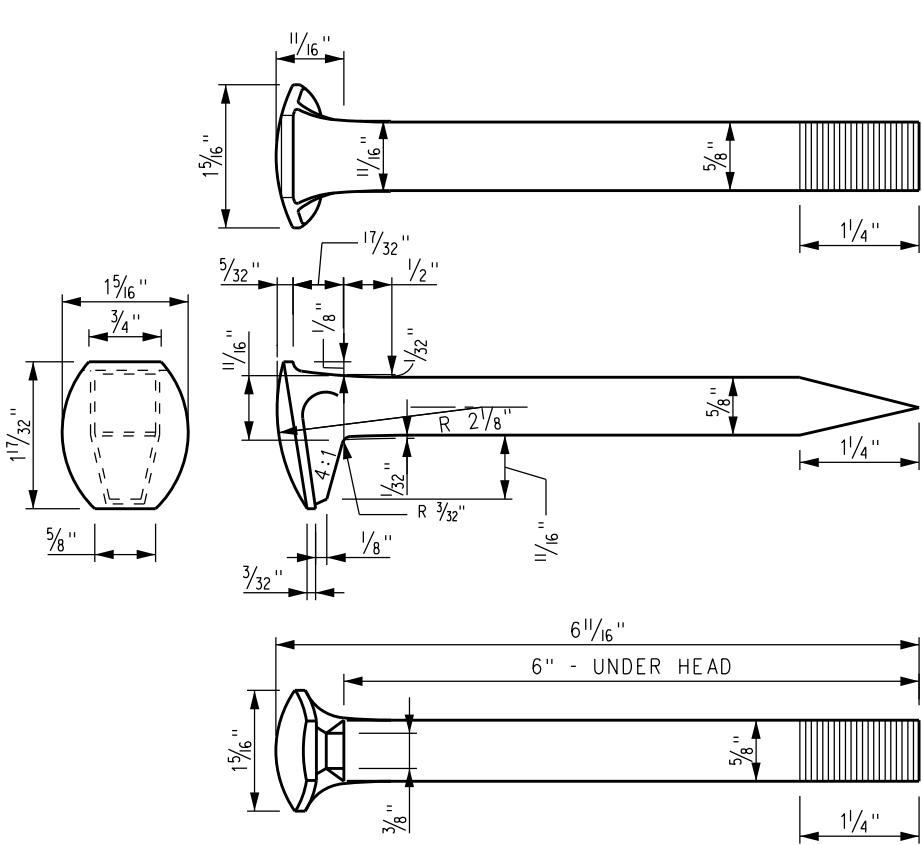
- 1. CONSISTS OF A 2-PART FILLER MATERIAL-PART A (ISOCYANATE) AND PART B (POLYOL).
- 2. OPERATORS MUST BE PROPERLY TRAINED AND USE APPROPRIATE EQUIPMENT FOR INSTALLATION OF MATERIAL.
- 3. MATERIAL IS SUPPLIED IN SEVERAL SIZES INCLUDING SMALL CAULK GUN TUBES FOR MINOR INSTALLATION REQUIREMENTS.
- 4. MUST ADHERE TO REQUIREMENTS OF MATERIAL SAFETY DATA SHEET WHEN HANDLING MATERIAL.



PLAN



ELEVATION
SCREW SPIKE



TRACK SPIKE

NOTES:

- 1. TRACK SPIKES MUST CONFORM TO AREMA SPECIFICATIONS.
- 2. WEIGHT = 0.85 LBS.
- 3. PACKAGE IN 50* BOX OR 100* KG.



TIE PLUG

NOTES:

- 1. TIE PLUG TO CONFORM TO AREMA STANDARDS.
- 2. TIE PLUG TO BE FABRICATED FROM HARDWOOD TREATED WITH CREOSOTE, CCA, OR BORATE.
- 3. MAY BE BUNDLED OR BAGGED.
- 4. PLUG MUST BE FULLY INSERTED INTO EMPTY SPIKE HOLE AND TAMPED INTO PLACE. REMOVE EXCESS PLUG WITH ADZE.

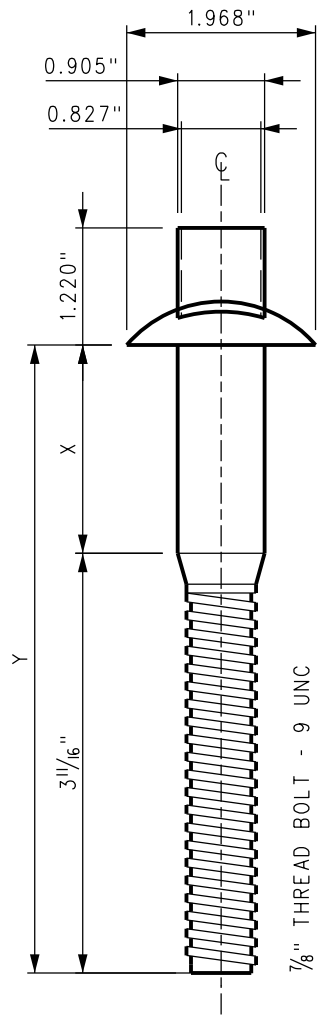
MATERIAL SPECIFICATIONS:

- 1. ALL SCREW SPIKES TO BE HOT FORGED.
- 2. SCREW SPIKES TO BE MADE FROM MEDIUM CARBON STEEL TO MEET ASTM A-66 SPECIFICATIONS.
- 3. SCREW SPIKES TO BE COATED TO RESIST CORROSION.
- 4. APPROXIMATE SHIPPING WEIGHT OF EACH SCREW SPIKE: 1.1 LBS.
- 5. SCREW SPIKES TO BE PACKED 100 TO A BAG.

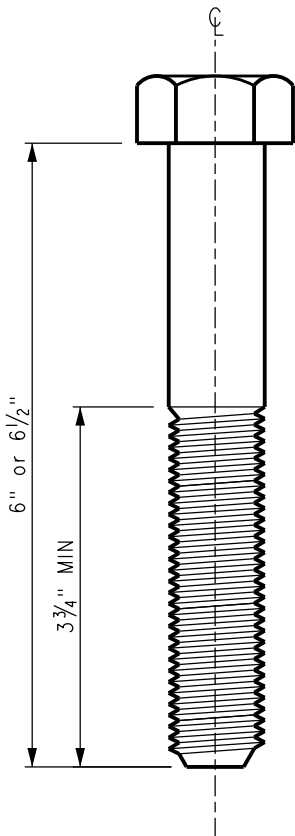
INSTALLATION INSTRUCTIONS:

- 1. PRE-DRILL WOOD TIES WITH 1/16" DIA DRILL BIT TO DEPTH OF 5 1/2".
- 2. PRE-DRILLED HOLES MUST BE PERPENDICULAR WITH BASE PLATE.
- 3. USING A 3/4" SQUARE DRIVE SOCKET AND AN IMPACT WRENCH, SCREW IN UNTIL SNUG.

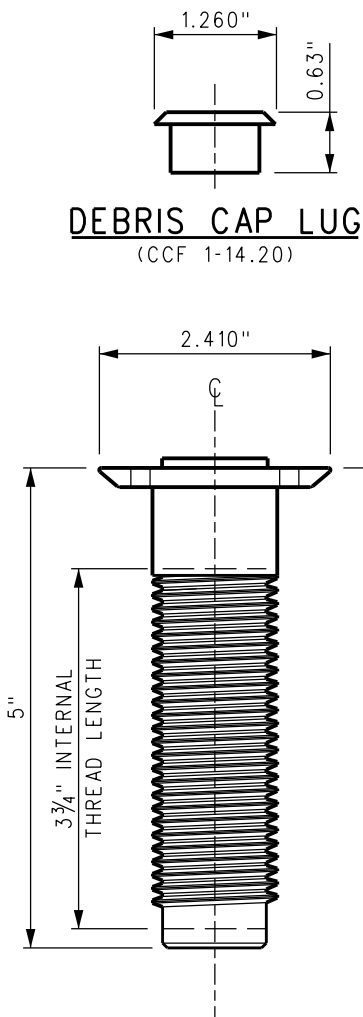
				DRAWN BY: A. CARLOS		DATE: 03/31/2011		SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES, SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.		STANDARD 2355	
				ASSISTANT DIRECTOR: STANDARDS & DESIGN				SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY		ENGINEERING STANDARDS	
				DIRECTOR OF ENGINEERING AND CONSTRUCTION				ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012		6" TRACK SPIKES, 15/16" SCREW FASTENER, TIE PLUGS AND TIGHT SPIKE FILLER	
										SCALE: NTS	
										REVISION SHEET 1 OF 1	
										CADD FILE: ES2355	



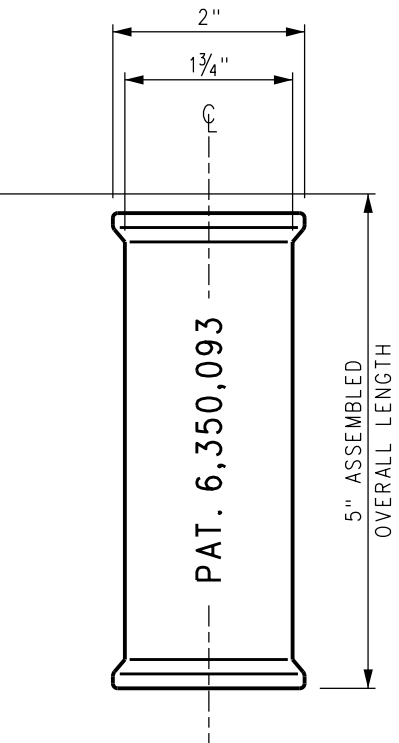
VAPE BOLT



6" OR 6-1/2" LONG
7/8" UNC BOLT
GR A-325
YELLOW ZINC BICHROMATE



NYLON 66
THREAD INSERT
COLOR-WHITE
REMOVABLE/REPLACEABLE

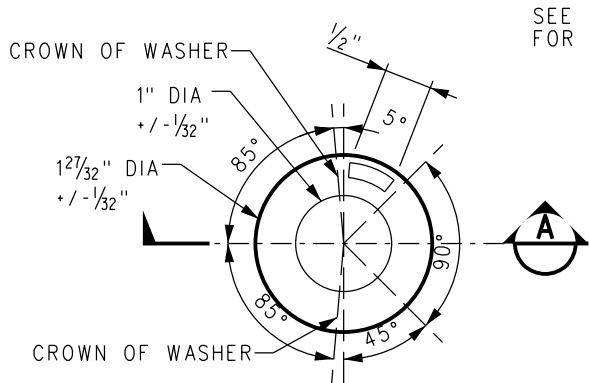


DUCTILE IRON HOUSING
INTERNALLY THREADED

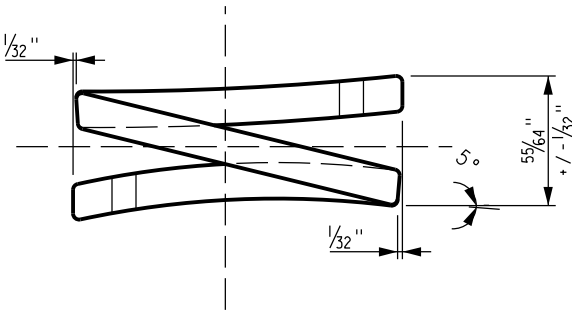
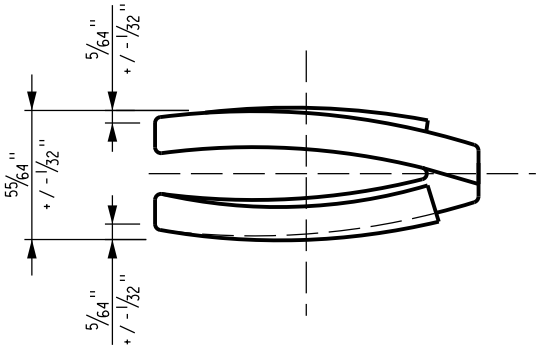
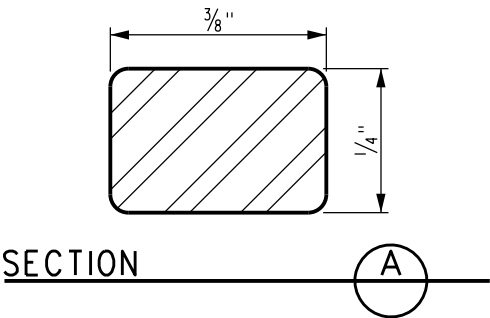
VAPE BOLT DIMENSIONS		
X GRIP LENGTH	Y SHANK LENGTH	FOR USE THROUGH
2 3/16"	5 7/8"	3/4" PLATING
2 5/8"	6 3/8"	1" PLATING

NOTES:

1. 6" OR 6-1/2" LONG 7/8" UNC BOLT
GR A-325 YELLOW ZINC BICHROMATE.
2. TO AVOID DAMAGE TO THE TIE, ENSURE THAT PROPER SCREW SIZE
IS USED FOR VARIOUS PLATE THICKNESSES. (SEE TABLE)
3. VAPE SCREW TO BE TORQUED TO 150 FT-LBS. THIS TORQUE
CORRESPONDS TO A 1mm CLEARANCE BETWEEN COILS ON
THE SPRING WASHER.
4. FOR CONCRETE GUARD RAIL TIE SEE SCRRRA ES2406 OR ES2407.
FOR CONCRETE SWITCH TIE SEE CORRESPONDING TIE PLAN.
5. SPRING WASHERS SHALL CONFORM TO UIC CODE 864-3. DIMENSIONS
AS DELIVERED (UNLOADED). STAMPING IS TO BE DONE IN AREA
INDICATED ON CURRENT YEAR AND SUPPLIER'S LOGO.



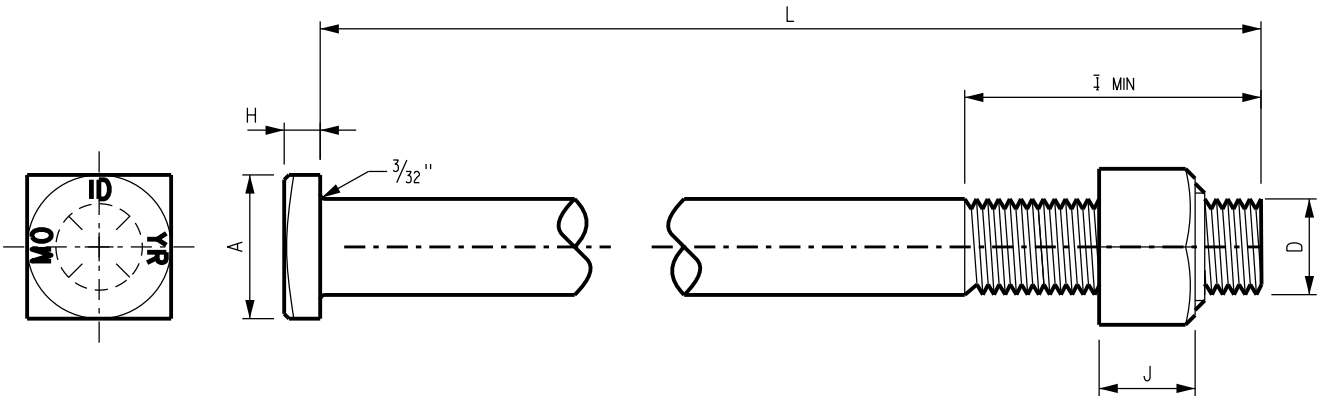
SEE NOTE
FOR STAMPING



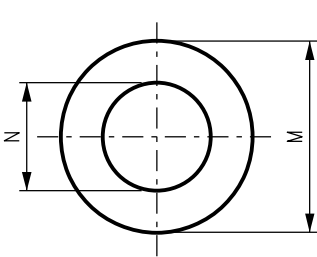
HELICAL SPRING WASHER

				DRAWN BY: HDR DATE: 03/31/2011		SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES: SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.		 METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012	ENGINEERING STANDARDS		STANDARD 2356	
				PIM 532 SCREW, INSERT AND HELICAL WASHER FOR CONCRETE TIES		SCALE: NTS			REVISION SHEET 1 OF 1		CADD FILE: ES2356	

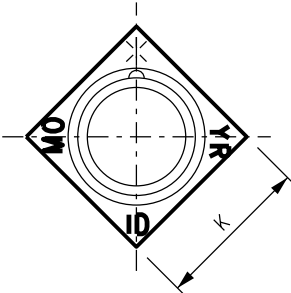
FROG BOLTS, NUTS, AND WASHERS								
TABLE OF DIMENSIONS								
D	L	A	H	I	J	K	M	N
1"	3 1/2"	1 1/2"	3/8"	2"	-	-	-	-
"	4"	"	"	"	-	-	-	-
"	4 1/2"	"	"	"	-	-	-	-
"	5"	"	"	2 1/2"	-	-	-	-
"	5 1/2"	"	"	"	-	-	-	-
"	6"	"	"	"	-	-	-	-
"	6 1/2"	"	"	"	-	-	-	-
"	7"	"	"	"	-	-	-	-
1"	3 1/2"	1 1/2"	21/32"	"	-	-	-	-
"	4"	"	"	"	-	-	-	-
"	4 1/2"	"	"	"	-	-	-	-
"	5"	"	"	"	-	-	-	-
"	5 1/2"	"	"	"	-	-	-	-
"	6"	"	"	"	-	-	-	-
"	6 1/2"	"	"	"	-	-	-	-
"	7"	"	"	"	-	-	-	-
WASHER							2"	1 1/8"
SQ NUT						1"	1 5/8"	
HEX NUT						1"	1 5/8"	
1 3/8"	4"	2 1/16"	29/32"	2 3/4"	-	-	-	-
"	4 1/2"	"	"	"	-	-	-	-
"	5"	"	"	"	-	-	-	-
"	5 1/2"	"	"	"	-	-	-	-
"	6"	"	"	3 1/4"	-	-	-	-
"	6 1/2"	"	"	"	-	-	-	-
"	7"	"	"	"	-	-	-	-
"	8"	"	"	"	-	-	-	-
"	9"	"	"	"	-	-	-	-
"	10"	"	"	"	-	-	-	-
"	11"	"	"	"	-	-	-	-
"	12"	"	"	"	-	-	-	-
"	13"	"	"	"	-	-	-	-
"	14"	"	"	"	-	-	-	-
"	15"	"	"	"	-	-	-	-
"	16"	"	"	"	-	-	-	-
"	17"	"	"	"	-	-	-	-
"	18"	"	"	"	-	-	-	-
"	19"	"	"	"	-	-	-	-
"	20"	"	"	"	-	-	-	-
"	21"	"	"	"	-	-	-	-
"	22"	"	"	"	-	-	-	-
"	23"	"	"	"	-	-	-	-
"	24"	"	"	"	-	-	-	-
WASHER							2 3/4"	1 1/2"
SQ NUT						1 3/8"	2 3/16"	
HEX NUT						1 3/8"	2 3/16"	



SQUARE HEAD FROG BOLTS



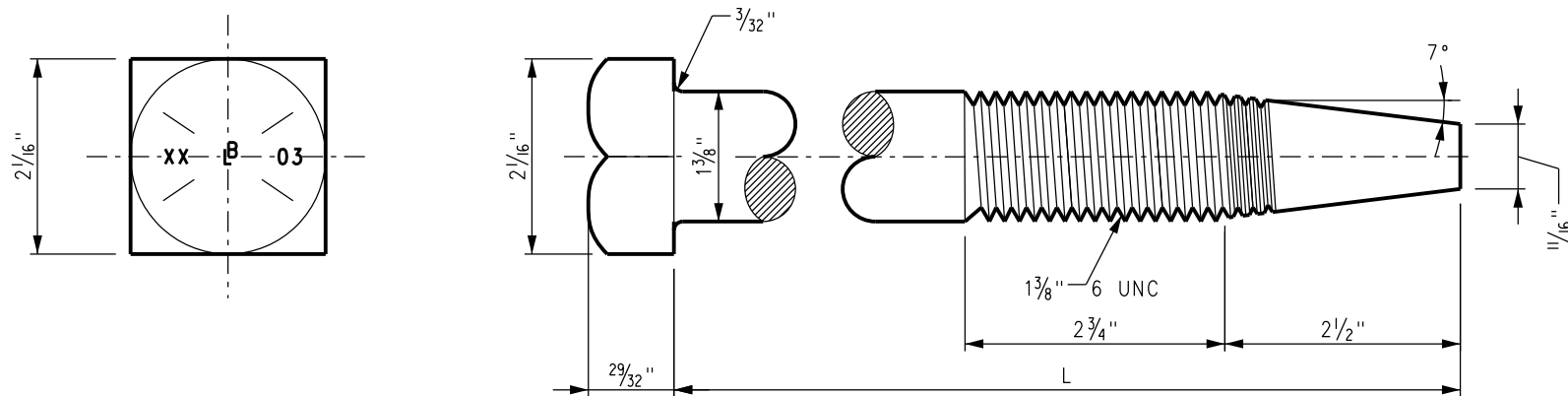
WASHER



SQ NUT OR HEX NUT

NOTES:

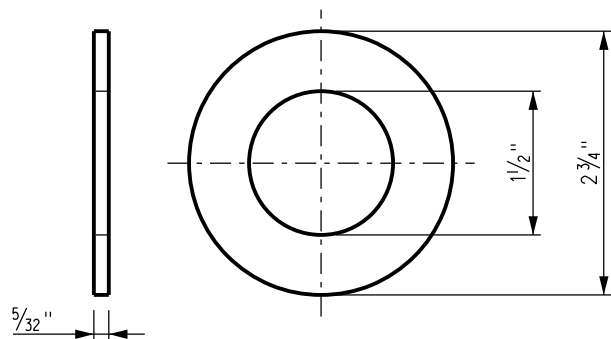
1. BOLT SHALL CONFORM TO THE CURRENT VERSION OF SAE J429 GRADE 8. HEAT TREATED TO 150,000 PSITENSILE STRENGTH, 130,000 PSIYIELD, OIL QUENCHED FROM 4140 STEEL. HEAD MARKINGS SHALL INCLUDE GRADE 8 GRADE MARKINGS, MANUFACTURER ID, MONTH AND YEAR OF MANUFACTURE. THREADS TO BE ROLLED AND CONFORM TO ANSI/ASME B1.1UNC-2A THREAD FORM.
2. NUTS SHALL CONFORM TO HARDNESS AND MATERIAL REQUIREMENTS OF SAE J995 GRADE 8 OR ASTM A-563 GRADE 'DH', AND DIMENSIONAL REQUIREMENTS OF ANSI/ASME B18.2.2 HEAVY HEX OR SQUARE NUTS, PLAIN FINISH. HEAVY HEX OR SQUARE LOCK NUT THREADS SHALL CONFORM TO ANSI/ASME B1.1UNC-2B THREAD FORM, FREE FIT.
3. FLAT WASHERS SHALL CONFORM TO HARDNESS REQUIREMENTS OF THE CURRENT VERSION OF ASTM F-436 AND BE 5/32" THICK.
4. WORKMANSHIP: BOLTS, NUTS, AND WASHERS SHALL BE FREE FROM BURRS, SEAMS, LAPS, AND SCALE.
5. BOLT TIGHTENING SEQUENCE SHALL START WITH THE BOLT NEAREST THE CENTER OF FROG. WORK IN A CIRCULAR PATTERN IN A CLOCKWISE DIRECTION, PROGRESSING OUTWARD TO THE NEXT NEAREST FROG BOLT UNTIL ALL BOLTS ARE TIGHTENED TO PROPER TORQUE, OR AS DIRECTED BY MANUFACTURER. ALL BOLTS AND NUTS WILL BE SUPPLIED WITH SELF-CENTERING WASHERS OR EQUIVALENT FOR PROPER LOAD DISTRIBUTION. SEE SCRRA ES2359.



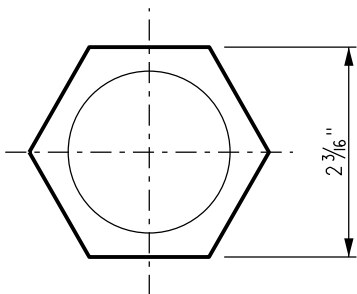
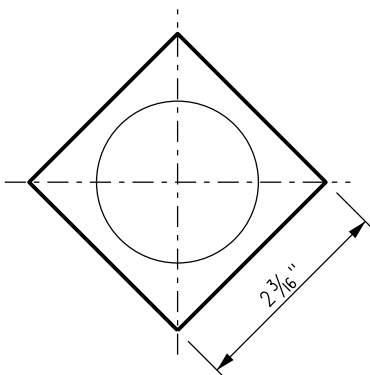
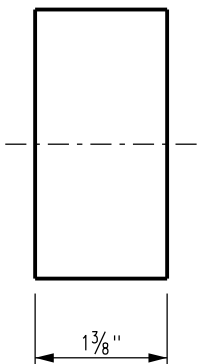
LENGTH = L
19 1/2"
20"
20 1/2"
21"
21 1/2"

- NOTES:**
1. WHEN USING/ORDERING TAPERED BOLTS, ADD 2 1/2" TO OLD BOLT LENGTH.
 2. BOLT SHALL CONFORM TO THE CURRENT VERSION OF SAE J429 GRADE 8. HEAT TREATED TO 150,000 PSITENSILE STRENGTH, 130,000 PSIYIELD, OIL QUENCHED FROM 4140 STEEL. HEAD MARKINGS SHALL INCLUDE GRADE 8 GRADE MARKINGS, MANUFACTURER ID, MONTH AND YEAR OF MANUFACTURE. THREADS TO BE ROLLED AND CONFORM TO ANSI/ASME B1.1UNC-2A THREAD FORM.
 3. NUTS SHALL CONFORM TO HARDNESS AND MATERIAL REQUIREMENTS OF SAE J995 GRADE 8 OR ASTM A-563 GRADE 'DH' AND DIMENSIONAL REQUIREMENTS OF ANSI/ASME B18.2.2 HEAVY HEX OR SQUARE NUTS, PLAIN FINISH. HEAVY HEX OR SQUARE LOCK NUT THREADS SHALL CONFORM TO ANSI/ASME B1.1UNC-2B THREAD FORM, FREE FIT.
 4. FLAT WASHERS SHALL CONFORM TO HARDNESS REQUIREMENTS OF THE CURRENT VERSION OF ASTM F-436 AND BE 5/32" THICK.
 5. WORKMANSHIP: BOLTS, NUTS, AND WASHERS SHALL BE FREE FROM BURRS, SEAMS, LAPS, AND SCALE.

TAPERED FROG BOLTS

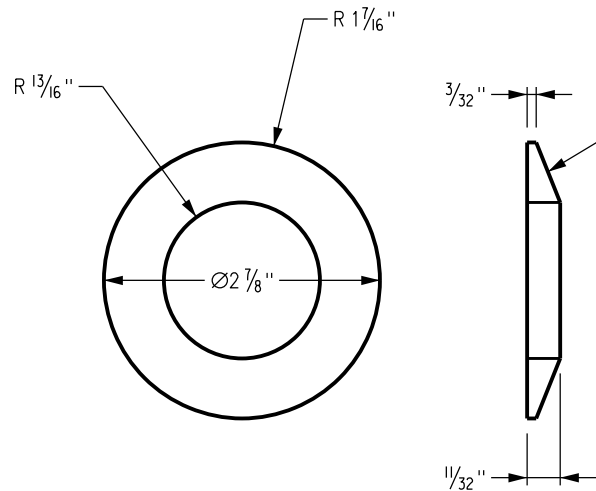


WASHER



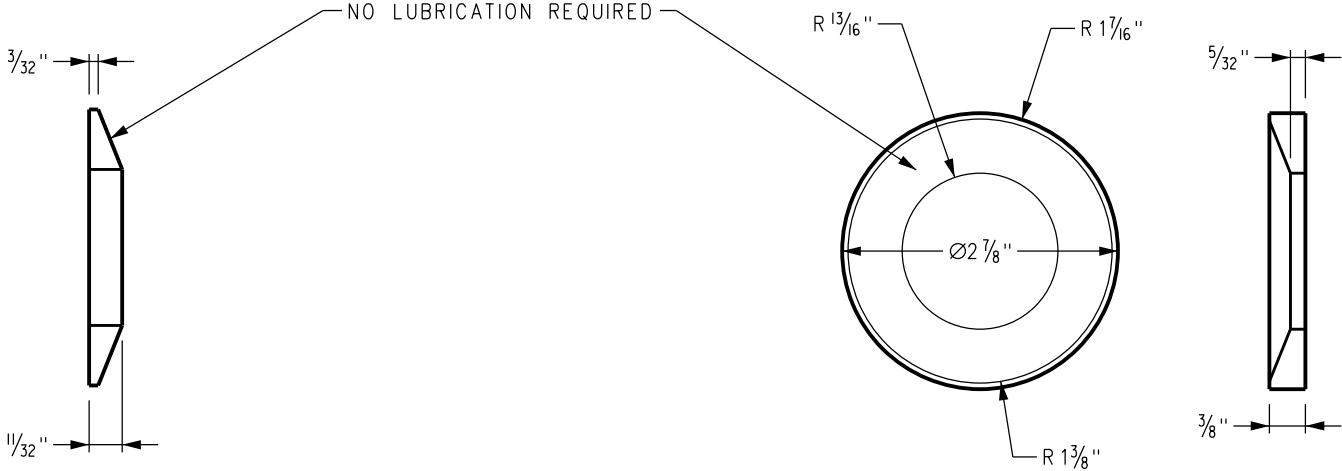
SQ NUT OR HEX NUT

																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											</
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----



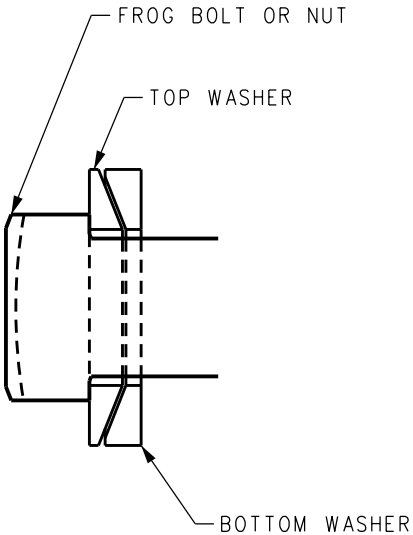
PLAN VIEW SECTION VIEW

TOP WASHER
INSTALL UNDER BOLT HEAD OR NUT



PLAN VIEW SECTION VIEW

BOTTOM WASHER
INSTALL AGAINST ITEM BEING BOLTED BELOW TOP WASHER



SECTION VIEW

ASSEMBLED WASHER SET

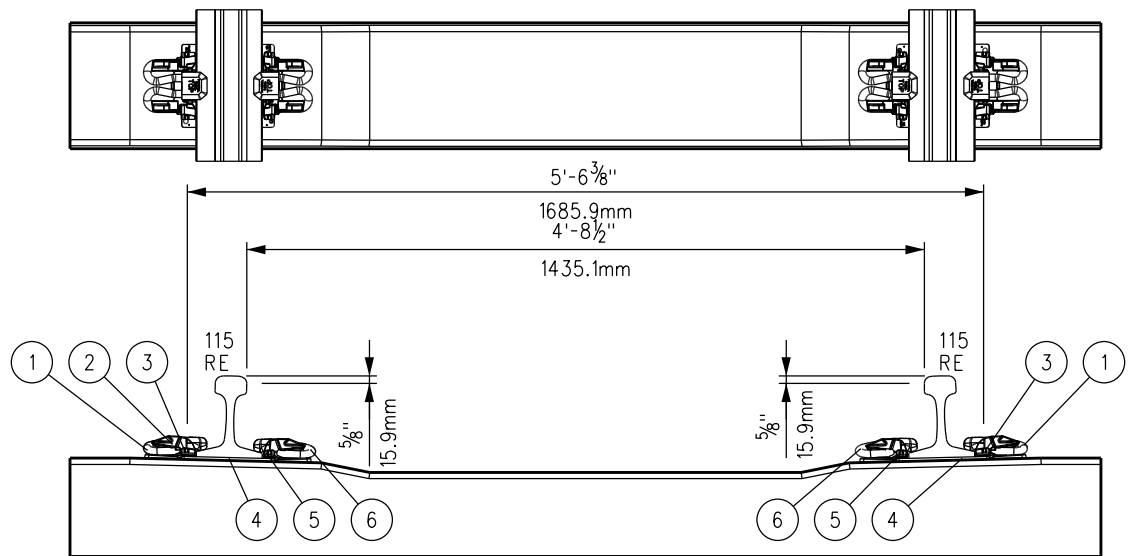
INSTALLATION NOTES:

1. INSTALL TOP WASHER UNDER BOLT HEAD OR NUT.
2. INSTALL BOTTOM WASHER BELOW TOP WASHER AND AGAINST FROG OR OBJECT BEING CLAMPED.
3. USE OF D-WASHER OR BEVELED WASHERS ARE REQUIRED WHEN INSTALLING SPHERICAL (SELF-ALIGNING) WASHERS ON RAIL AND ON FROGS, WHERE APPLICABLE.
4. BOLT HEAD LOCKS WILL NOT WORK WITH SPHERICAL WASHERS, AND NEED TO BE REPLACED WITH D-WASHERS, BEVELED WASHERS, OR REMOVED BY GRINDING.

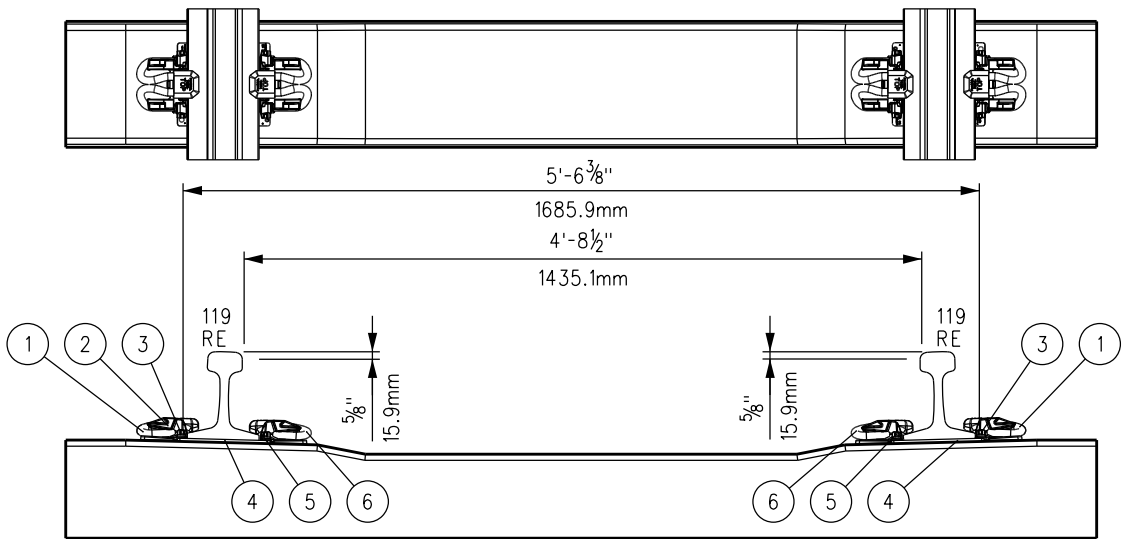
MANUFACTURING SPECIFICATION:

1. SURFACE FINISH COEFFICIENT OF FRICTION SHALL BE 0.05-0.10.
2. FINISHED SURFACES MUST PROVIDE LONG-TERM (NOT TEMPORAL) LUBRICATION EFFECTS UNDER EXTREME PRESSURE: 150,000 PSI (10,500 KG/CM SQUARED).
3. FINISHED WASHERS MUST WITHSTAND 1000 HOURS OF ASTM B-117 SALT FOG TEST, WITH LESS THAN 15% RED RUST.
4. FINISHED WASHERS SHALL HAVE THE MINIMUM HARDNESS APPROPRIATE AND SUFFICIENT FOR USE WITH HIGH STRENGTH FASTENERS.
5. MINIMUM COMPENSATING ANGLE SHALL BE 10 DEGREES IN ALL DIRECTIONS.
6. PARTS SHALL BE MARKED WITH MANUFACTURERS IDENTIFYING CHARACTERISTICS.

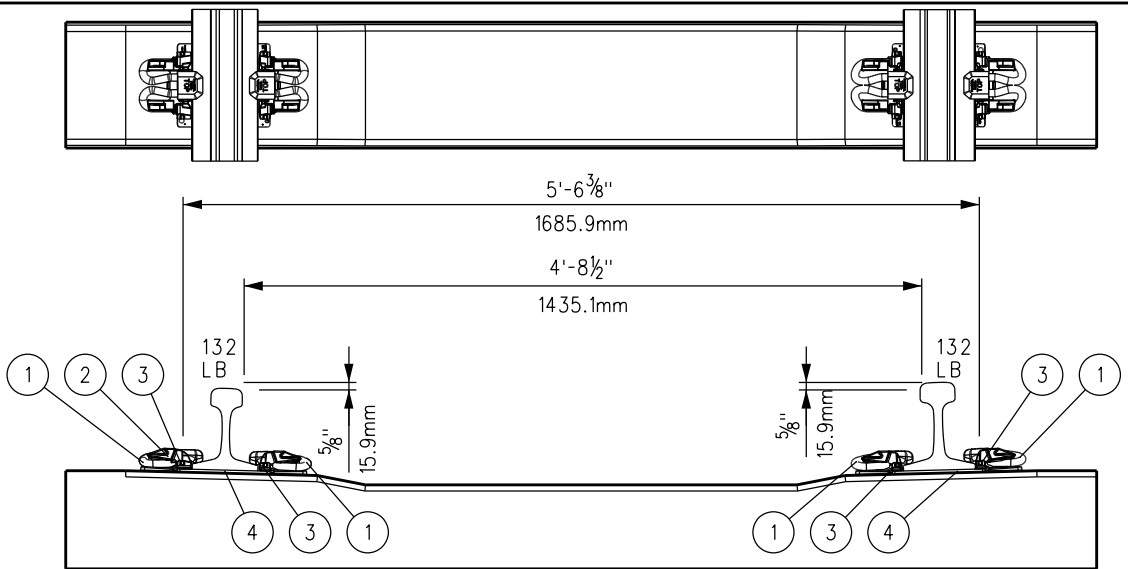
				DRAWN BY: HDR DATE: 03/31/2011		SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES: SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.	 METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012	ENGINEERING STANDARDS		STANDARD
X	XX-XX-XX	REVISION	XX	XX				2359		SCALE:
REV.	DATE	DESCRIPTION	DES.	ENG.				SPHERICAL (SELF – CENTERING) WASHER SET		NTS
								1 OF 1		CADD FILE:
								ES2359		



115 RE RAIL AND 136 LB RAIL CONCRETE TIE				
ITEM NO	PART NO	DESCRIPTION	COLOR	QTY
1	10218	RAIL CLIP ASSY - FC1603 CLIP / 7695 TOE INSULATOR	BLUE	2
2	9086	FASTCLIP TWIN-STEM SHOULDER		4
3	11458	SIDE POST INSULATOR - 0.726" THICK POST	BLUE	2
4	11549	RAIL PAD		2
5	11459	SIDE POST INSULATOR - 0.430" THICK POST	GREEN	2
6	10216	RAIL CLIP ASSY - FC1601 CLIP / 7695 TOE INSULATOR	NEUTRAL	2



119 RE RAIL AND 136 LB RAIL CONCRETE TIE				
ITEM NO	PART NO	DESCRIPTION	COLOR	QTY
1	10218	RAIL CLIP ASSY - FC1603 CLIP / 7695 TOE INSULATOR	BLUE	2
2	9086	FASTCLIP TWIN-STEM SHOULDER		4
3	11458	SIDE POST INSULATOR - 0.726" THICK POST	BLUE	2
4	11549	RAIL PAD		2
5	11459	SIDE POST INSULATOR - 0.430" THICK POST	GREEN	2
6	10216	RAIL CLIP ASSY - FC1601 CLIP / 7695 TOE INSULATOR	NEUTRAL	2


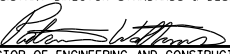


132 LB RAIL AND 136 LB RAIL CONCRETE TIE				
ITEM NO	PART NO	DESCRIPTION	COLOR	QTY
1	10216	RAIL CLIP ASSY - FC1601 CLIP / 7695 TOE INSULATOR	NEUTRAL	4
2	9086	FASTCLIP TWIN-STEM SHOULDER		4
3	7692	STANDARD SIDE POST INSULATOR - 0.326" THICK POST	NUETRAL	4
4	7083	RAIL PAD ASSEMBLY		2

NOTES:

1. FOR RAIL PAD DETAILS, SEE SCRRA ES2364.
2. FOR SIDE POST INSULATOR DETAILS, SEE SCRRA ES2365.
3. FOR RAIL CLIP DETAILS, SEE SCRRA ES2366.
4. FOR TOE INSULATORS DETAILS, SEE SCRRA ES2367.
5. ALL COMPONENTS FOR TIE ASSEMBLIES TO BE PANDROL TYPE OR EQUIVALENT AS APPROVED BY THE SCRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
6. ALL PART NUMBERS LISTED ON THIS DRAWING CORRESPOND TO PANDROL BRAND COMPONENTS AND ARE SUBJECT TO CHANGE.
7. FOR CONCRETE TIE DETAILS AND FRICTION PATTERN, SEE SCRRA ES2402.

REV.	DATE	DESCRIPTION	DES.	ENG.
A	05-16-16	REVISED RAIL PAD ASSEMBLY NUMBER	AC	NDP

DRAWN BY:	A. CARLOS	DATE:	04/12/02
 ASSISTANT DIRECTOR: STANDARDS & DESIGN			
 DIRECTOR OF ENGINEERING AND CONSTRUCTION			

SCRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRA APPROVED USES ONLY.
FOR NON-SCRRA APPROVED USES:
SCRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRA. ALL RIGHTS RESERVED.



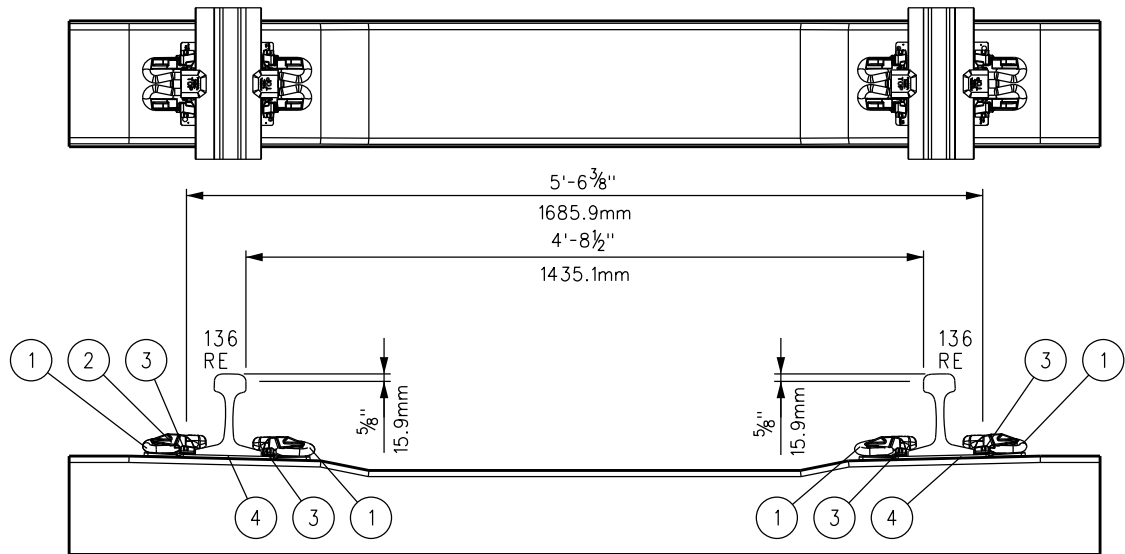
METROLINK

SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

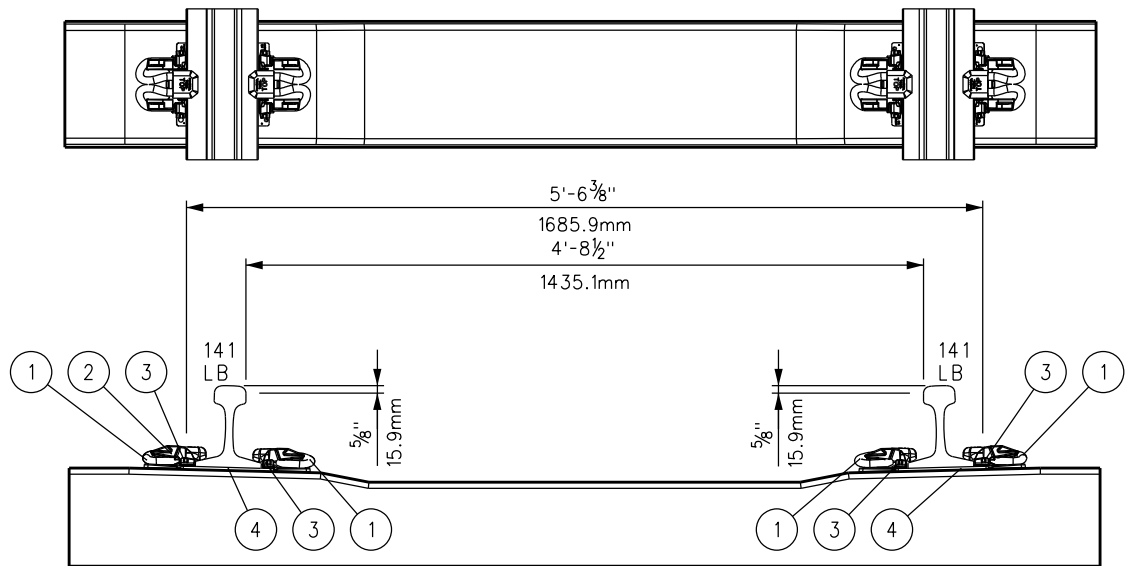
ENGINEERING STANDARDS

PANDROL FASTCLIP CONCRETE TIE ASSEMBLIES
FOR VARIOUS RAIL COMBINATIONS

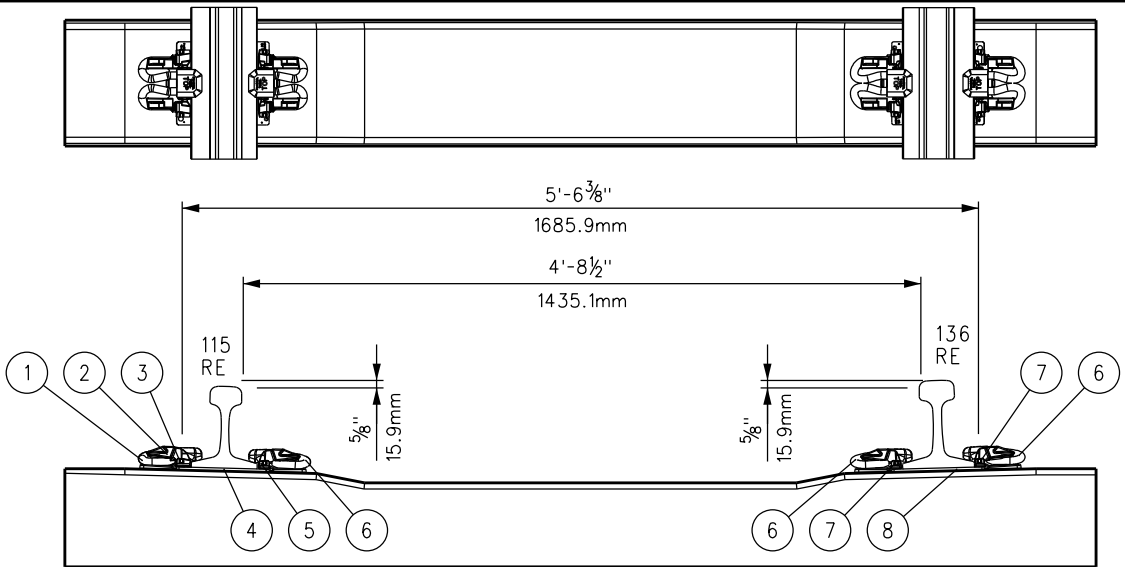
STANDARD	2360
SCALE:	NTS
REVISION	SHEET
A	1 OF 3
CADD FILE:	ES2360-01



136 RE RAIL AND 136 LB RAIL CONCRETE TIE				
ITEM NO	PART NO	DESCRIPTION	COLOR	QTY
1	10216	RAIL CLIP ASSY - FC1601 CLIP / 7695 TOE INSULATOR	NUETRAL	4
2	9086	FASTCLIP TWIN-STEM SHOULDER		4
3	7692	STANDARD SIDE POST INSULATOR FOR TWIN-STEM SHOULDER	NUETRAL	4
4	7083	RAIL PAD ASSEMBLY		2



141 LB RAIL AND 136 LB RAIL CONCRETE TIE				
ITEM NO	PART NO	DESCRIPTION	COLOR	QTY
1	10216	RAIL CLIP ASSY - FC1601 CLIP / 7695 TOE INSULATOR	NUETRAL	4
2	9086	FASTCLIP TWIN-STEM SHOULDER		4
3	7692	STANDARD SIDE POST INSULATOR FOR TWIN-STEM SHOULDER	NUETRAL	4
4	7083	RAIL PAD ASSEMBLY		2





COMBINATION 115 RE RAIL AND 136 RE RAIL				
ITEM NO	PART NO	DESCRIPTION	COLOR	QTY
1	10218	RAIL CLIP ASSY - FC1603 CLIP / 7695 TOE INSULATOR	BLUE	1
2	9086	FASTCLIP TWIN-STEM SHOULDER		4
3	11458	SIDE POST INSULATOR - 0.726" THICK POST	BLUE	1
4	11549	RAIL PAD		1
5	11459	SIDE POST INSULATOR - 0.430" THICK POST	GREEN	1
6	10216	RAIL CLIP ASSY - FC1601 CLIP / 7695 TOE INSULATOR	NUETRAL	3
7	7692	STANDARD SIDE POST INSULATOR	NUETRAL	2
8	7083	RAIL PAD ASSEMBLY		1

NOTES:

1. FOR RAIL PAD DETAILS, SEE SCRRRA ES2364.
2. FOR SIDE POST INSULATOR DETAILS, SEE SCRRRA ES2365.
3. FOR RAIL CLIP DETAILS, SEE SCRRRA ES2366.
4. FOR TOE INSULATORS DETAILS, SEE SCRRRA ES2367.
5. ALL COMPONENTS FOR TIE ASSEMBLIES TO BE PANDROL TYPE OR EQUIVALENT AS APPROVED BY THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
6. ALL PART NUMBERS LISTED ON THIS DRAWING CORRESPOND TO PANDROL BRAND COMPONENTS AND ARE SUBJECT TO CHANGE.
7. FOR CONCRETE TIE DETAILS AND FRICTION PATTERN, SEE SCRRRA ES2402.

REV.	DATE	DESCRIPTION	DES.	ENG.
A	05-16-16	REVISED RAIL PAD ASSEMBLY NUMBER	AC	NDP

DRAWN BY:	A. CARLOS	DATE:	04/12/02
			
ASSISTANT DIRECTOR: STANDARDS & DESIGN			
			
DIRECTOR OF ENGINEERING AND CONSTRUCTION			

SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY.
FOR NON-SCRRRA APPROVED USES:
SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.



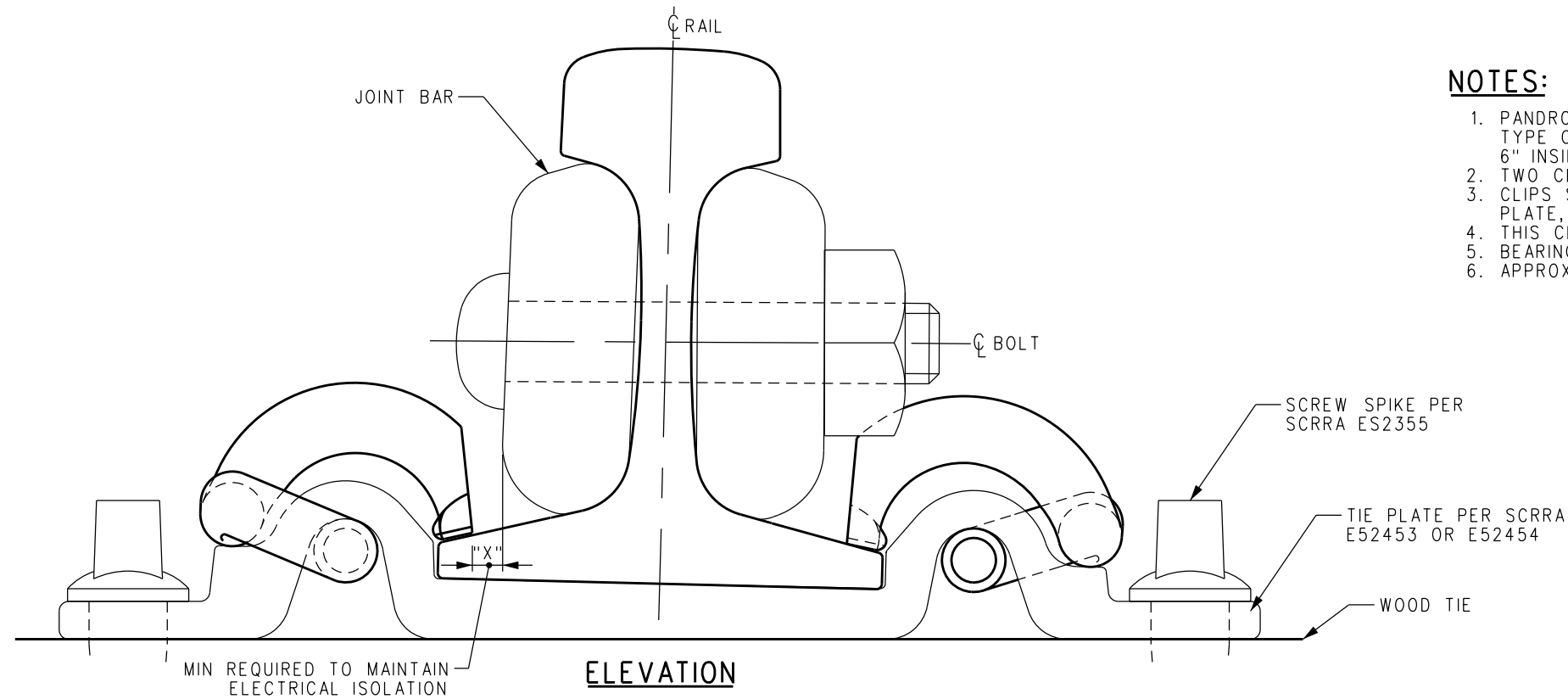
METROLINK

SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

ENGINEERING STANDARDS

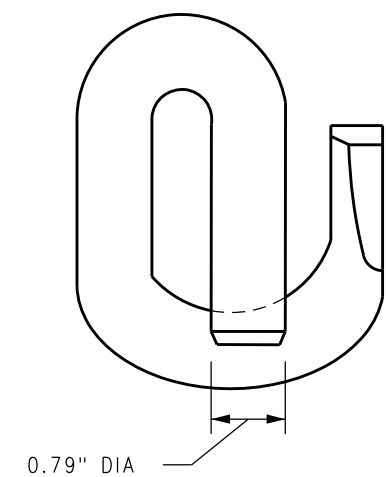
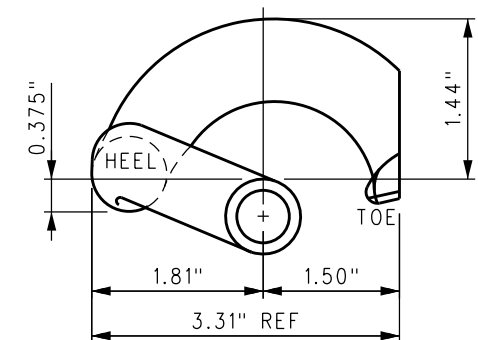
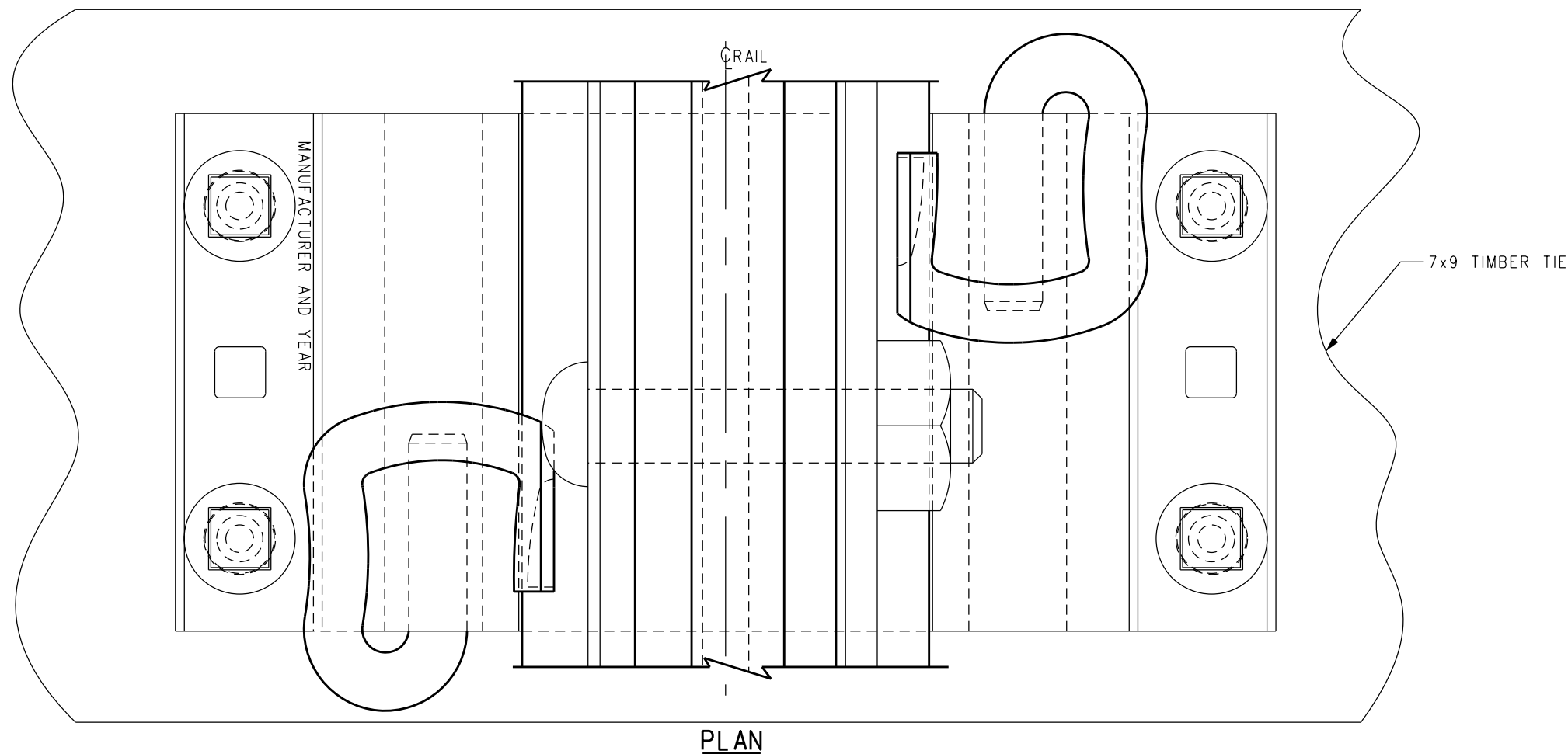
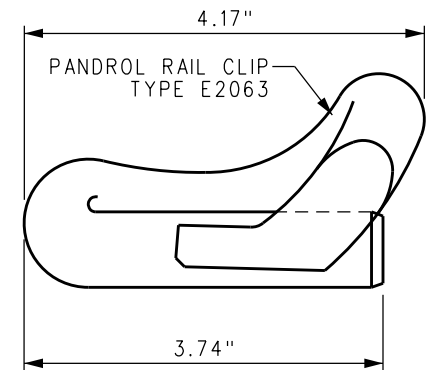
PANDROL FASTCLIP CONCRETE TIE ASSEMBLIES
FOR VARIOUS RAIL COMBINATIONS

STANDARD	2360
SCALE:	NTS
REVISION	SHEET
A	2 OF 3
CADD FILE:	ES2360-02

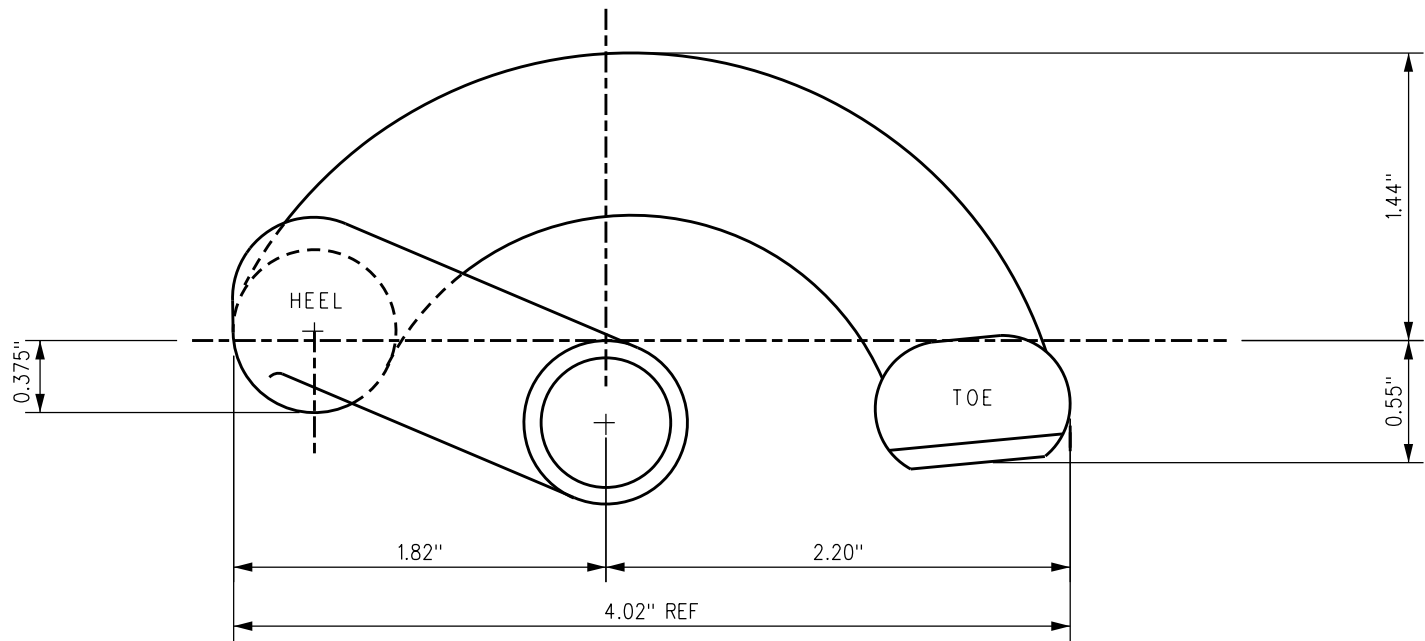


NOTES:

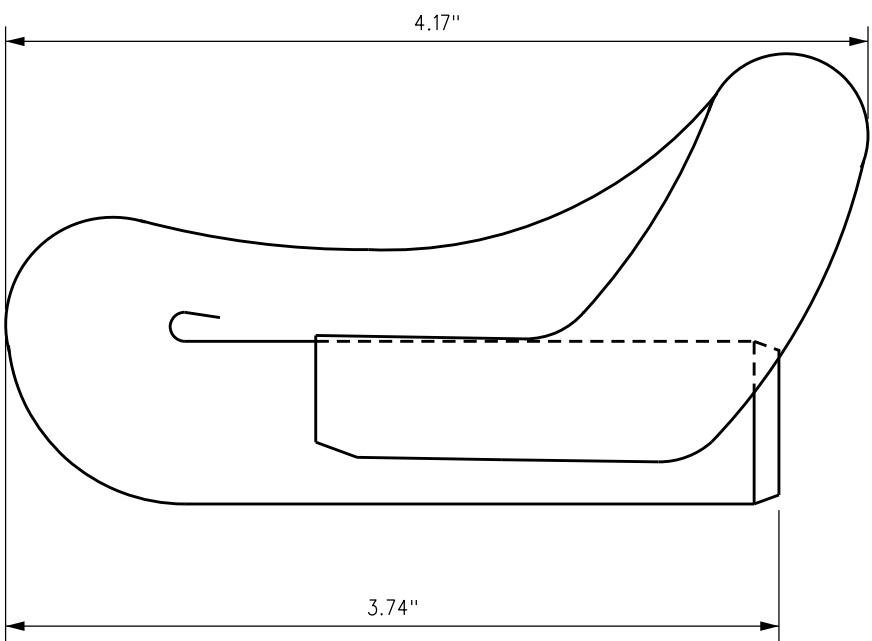
1. PANDROL RAIL CLIP TYPE e2063, AS SHOWN, IS USED WITH PANDROL TYPE OR EQUIVALENT ROLLED STEEL BASE PLATES FOR RAIL WITH 5½" OR 6" INSIDE BASE.
2. TWO CLIPS REQUIRED FOR EACH BASE PLATE.
3. CLIPS SHALL BE DRIVEN TO FULLY INSERT STRAIGHT PART OF ANCHOR INTO PLATE, AND CURVED TO BE FULLY OUTSIDE PLATE.
4. THIS CLIP IS TO BE USED FOR BOLTED OR INSULATED JOINTS.
5. BEARING AREA OF TOE = 0.7 IN.
6. APPROX WEIGHT = 1.69 LBS.



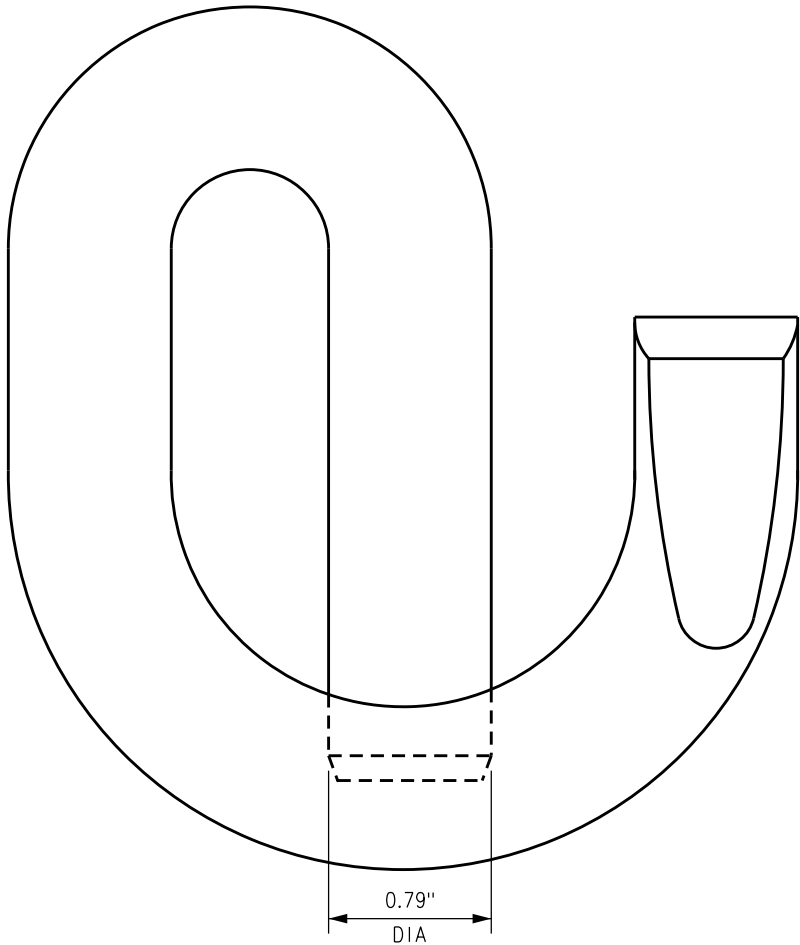
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



FRONT



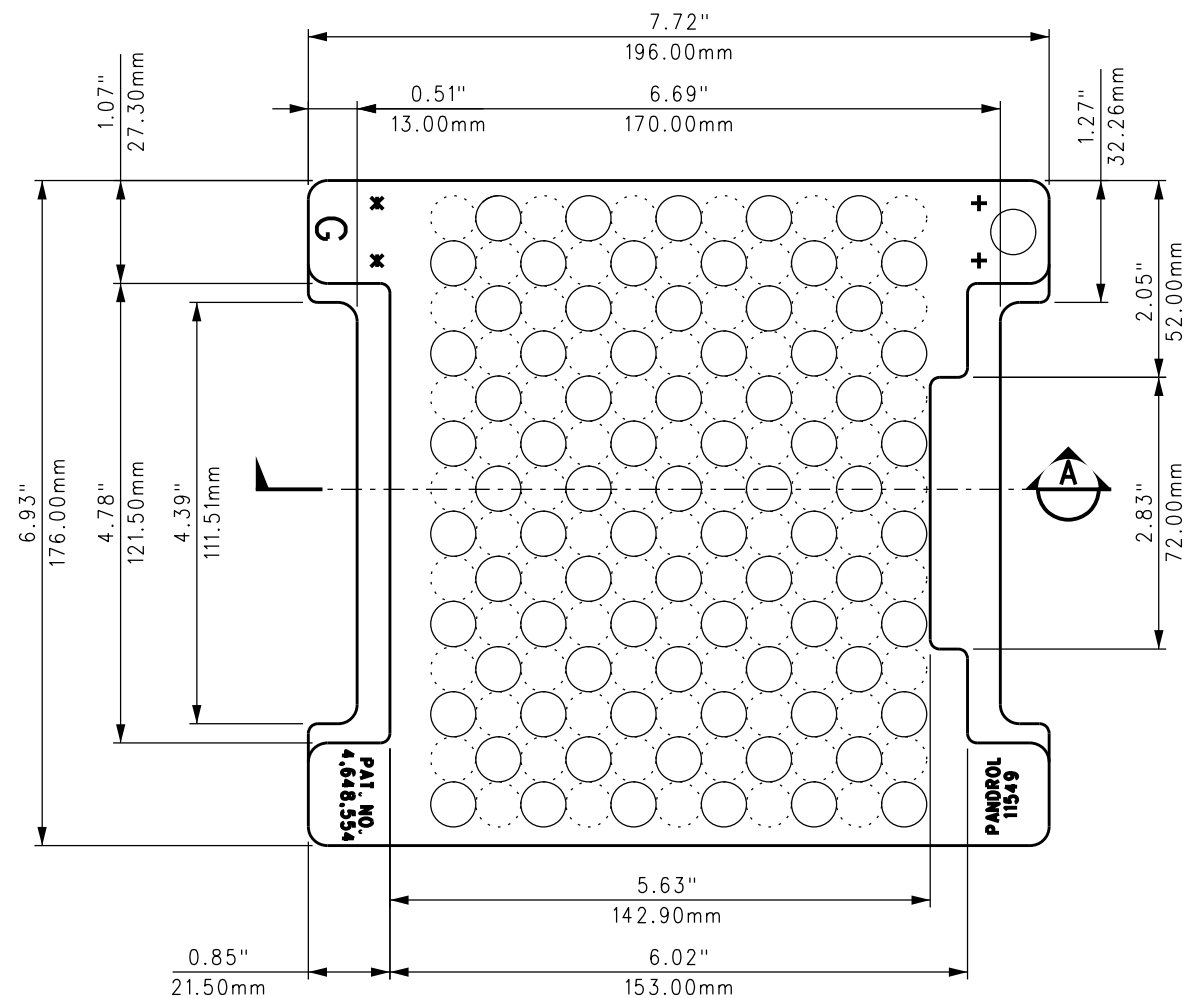
SIDE
(RH CLIP SHOWN, LH OPPOSITE)



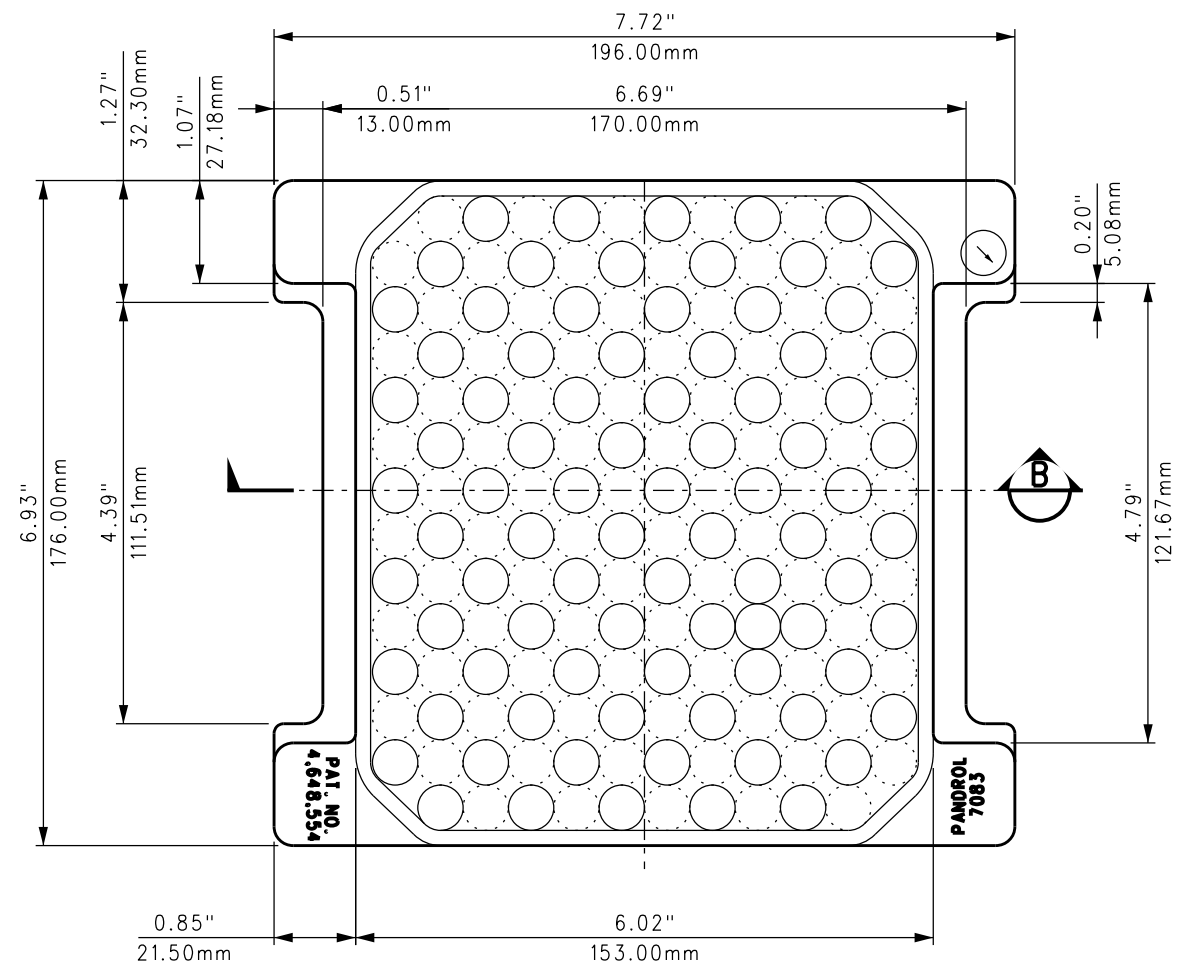
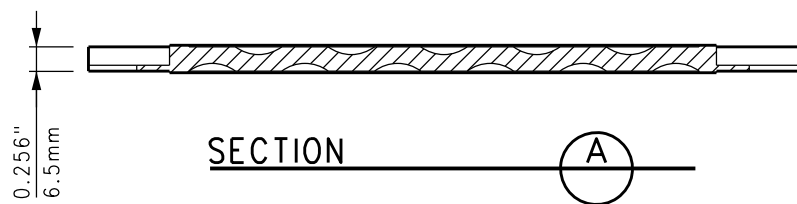
BOTTOM

- NOTES:
- 1. PANDROL PART NO 2055
 - 2. CLIP IS STANDARD TYPE. GALVANIZED CLIP IS NOT REQUIRED TO COMPLY WITH THIS STANDARD.

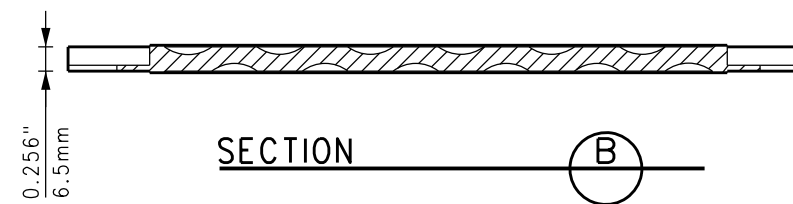
				DRAWN BY: HDR		DATE: 03/31/2011	SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES, SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.	 METROLINK [®] SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012	ENGINEERING STANDARDS		STANDARD 2362		
				 ASSISTANT DIRECTOR: STANDARDS & DESIGN						SCALE: NTS		REVISION SHEET	
				 DIRECTOR OF ENGINEERING AND CONSTRUCTION						1 OF 1		CADD FILE: ES2362	
X	XX-XX-XX	REVISION	XX	XX						PANDROL BRAND RAIL CLIP "E" CLIP			
REV.	DATE	DESCRIPTION	DES.	ENG.									





FASTCLIP TIE PAD
FOR 5 1/2" RAIL
USING SCRRRA STANDARD
6" BASE CONCRETE TIE
(PART #11549)

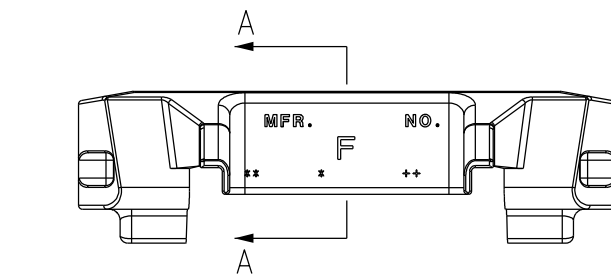


FASTCLIP TIE PAD
FOR 6" RAIL
PANDROL RAIL PAD ASSEMBLY
(PART #7083)

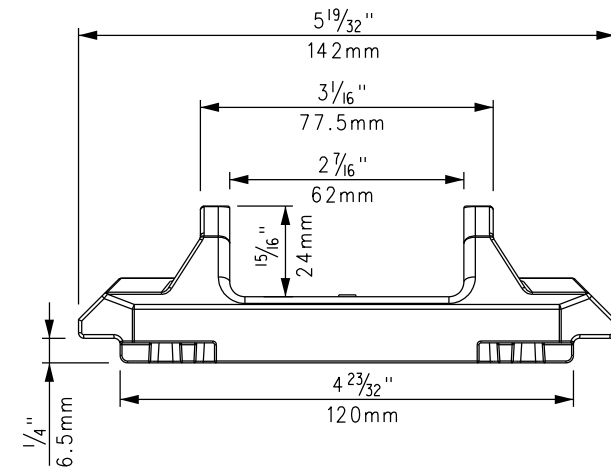


				DRAWN BY: HDR DATE: 03/31/2011		<div>SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES: SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.</div> <div> METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012</div>	ENGINEERING STANDARDS		STANDARD		
									2364		
									SCALE: NTS		
									REVISION SHEET		
A	05-16-16	REVISED TIE PAD FOR 6" RAIL	AC	NDP	 DIRECTOR OF ENGINEERING AND CONSTRUCTION		PANDROL CONCRETE TIE PADS FOR 5½" & 6" RAIL BASE		A	1 OF 1	
REV.	DATE	DESCRIPTION	DES.	ENG.					CADD FILE:	ES2364	

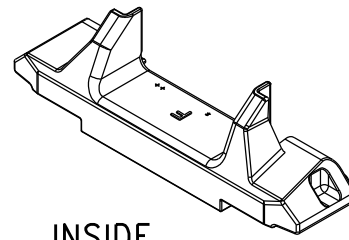
User Name= carlosa Date Plotted: 6/7/2016 8:03:30 AM Plot Driver= S:\Plot Drivers\practice.pdf.plt File Name= S:\V8EngStds\Revisions in progress\ES2364_revA.dgn



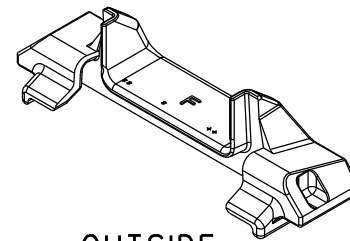
TOP VIEW



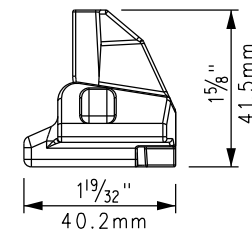
INSIDE VIEW



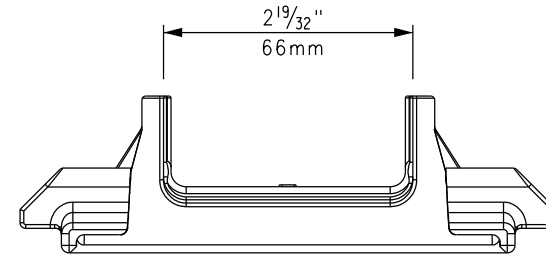
INSIDE
ISOMETRIC



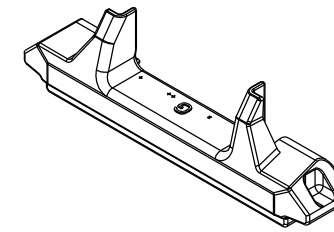
OUTSIDE
ISOMETRIC



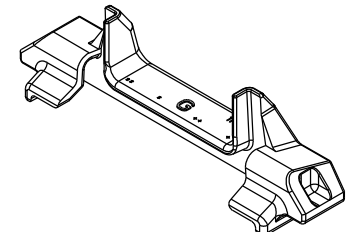
SIDE VIEW



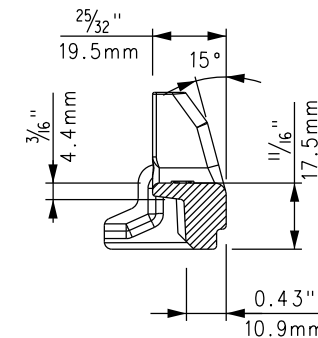
OUTSIDE VIEW



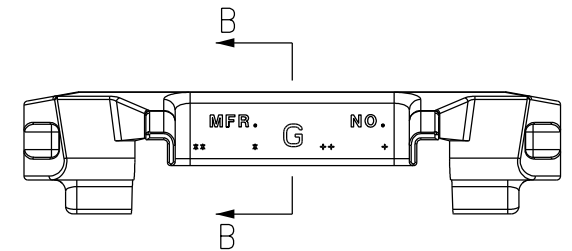
INSIDE
ISOMETRIC



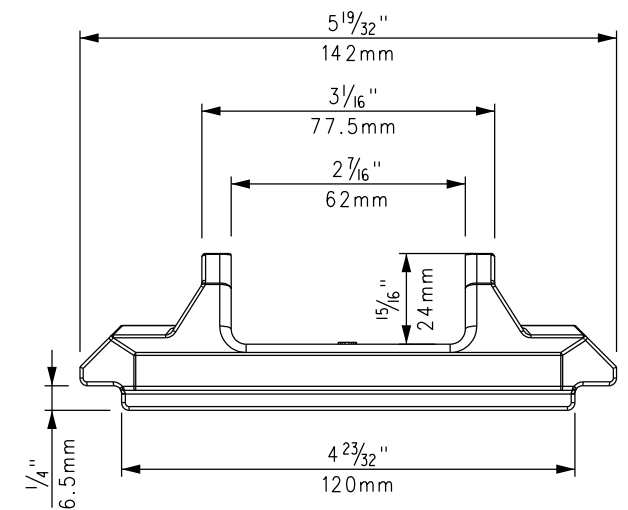
OUTSIDE
ISOMETRIC



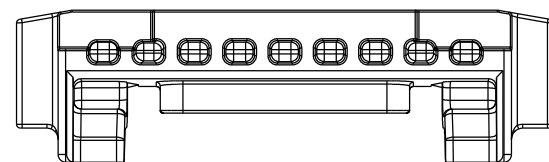
SECTION B - B



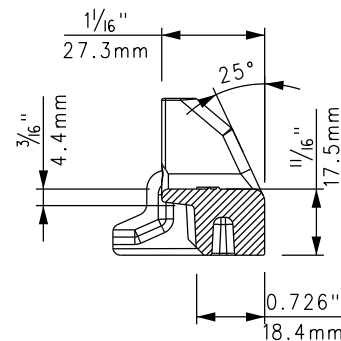
PLAN VIEW



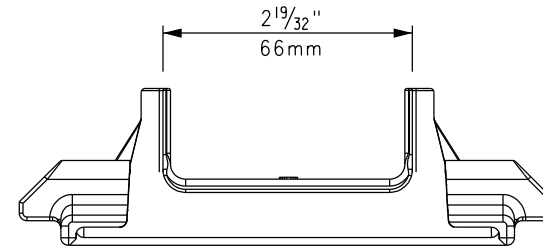
INSIDE VIEW



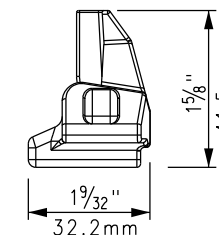
FIELD SIDE POST INSULATOR
(PART #11458)



SECTION A - A



OUTSIDE VIEW



SIDE VIEW

GAUGE SIDE POST INSULATOR
(PART #11459)

NOTES:

1. INSULATORS TO BE PANDROL TYPE OR EQUIVALENT.
2. APPROXIMATE WEIGHT OF GAUGE SIDE INSULATOR, 1.6 OZ COLOR, GREEN.
3. APPROXIMATE WEIGHT OF FIELD SIDE INSULATOR, 2.3 OZ COLOR, BLUE.
4. STANDARD SIDE POST INSULATOR (PART #7692) (SEE SCRR ES2365-02).

						DRAWN BY: A. CARLOS	DATE: 03/31/2011		
X	XX-XX-XX		REVISION		XX	XX			
REV.	DATE		DESCRIPTION		DES.	ENG.			

Nancy D. Pae
ASSISTANT DIRECTOR: STANDARDS & DESIGN
William D. Davis
DIRECTOR OF ENGINEERING AND CONSTRUCTION

SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY.
FOR NON-SCRR APPROVED USES:
SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.



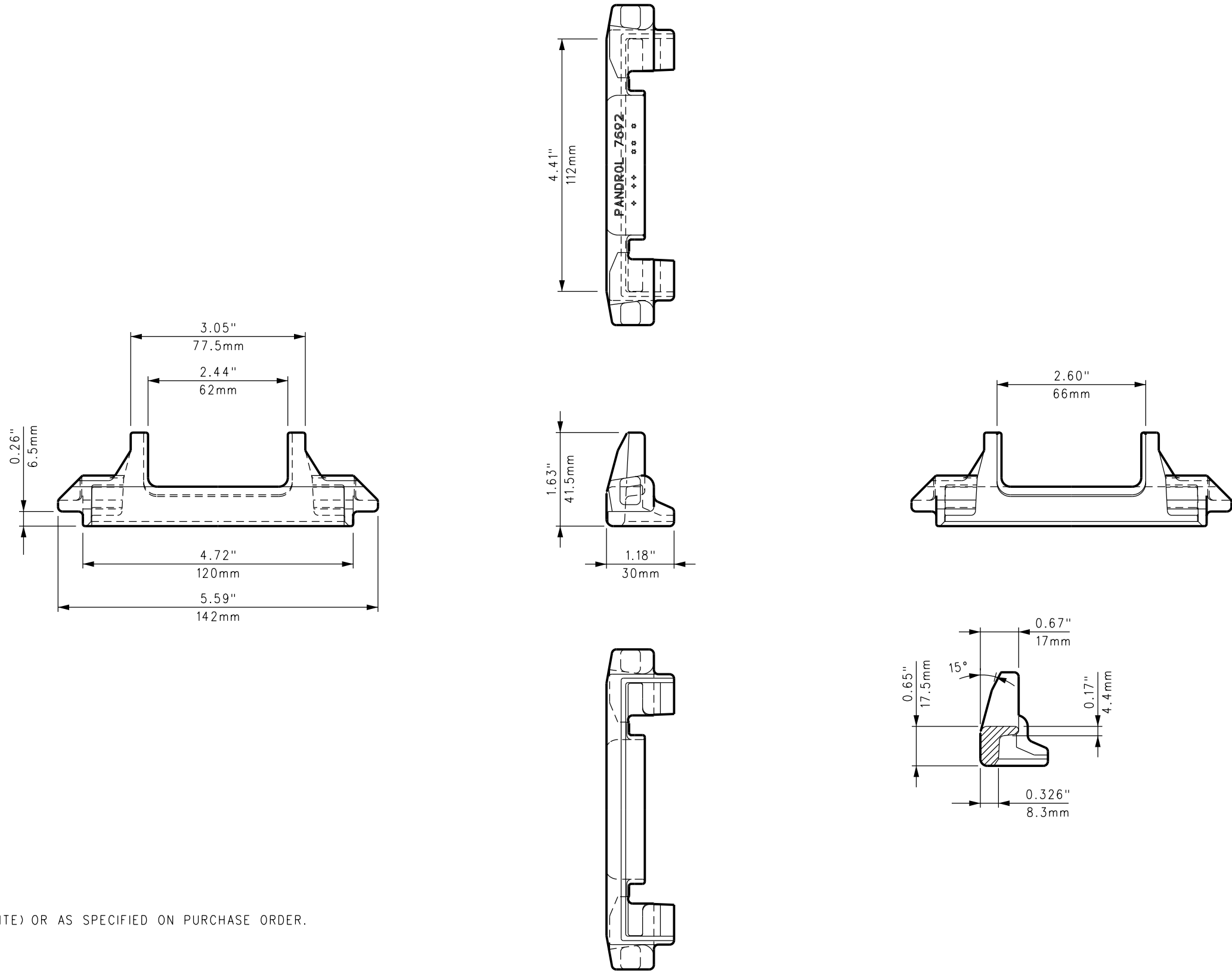
METROLINK

SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

ENGINEERING STANDARDS

PANDROL FASTCLIP TYPE SIDE POST INSULATORS

STANDARD	2365
SCALE:	NTS
REVISION	SHEET
-	1 OF 2
CADD FILE:	ES2365-01



NOTE:

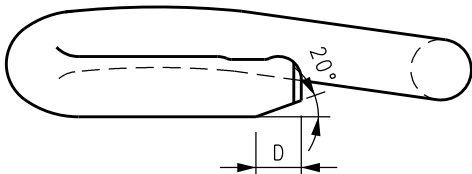
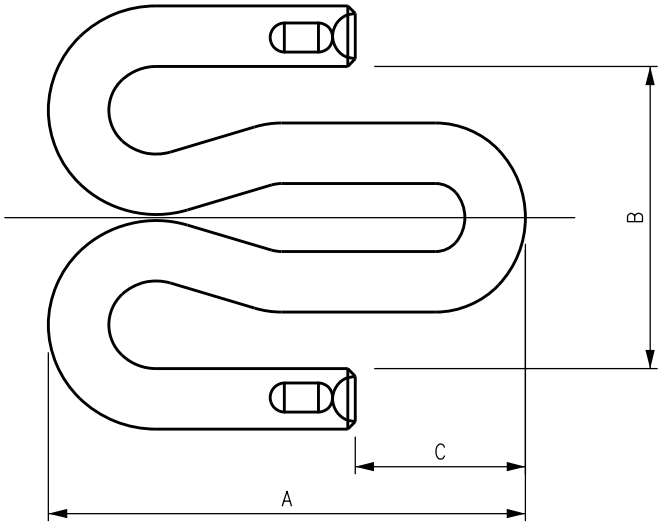
1. COLOR: NATURAL (OFF-WHITE) OR AS SPECIFIED ON PURCHASE ORDER.

**STANDARD SIDE POST INSULATOR
(PART #7692)**

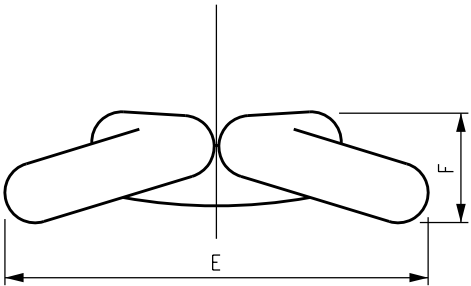
				DRAWN BY: HDR DATE: 03/31/2011		SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES, SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.	 METROLINK® SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012	ENGINEERING STANDARDS		STANDARD
X	XX-XX-XX	REVISION	XX	XX				INSULATOR SIDE POST FOR FC1600 SERIES PANDROL FASTCLIP		2365
REV.	DATE	DESCRIPTION	DES.	ENG.	DIRECTOR OF ENGINEERING AND CONSTRUCTION					SCALE: NTS
										REVISION SHEET
										- 2 OF 2
										CADD FILE: ES2365-02

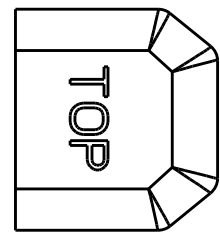
NOTES:

1. PANDROL RAIL CLIP TYPE FC1601 AND FC1603 AS SHOWN ARE USED WITH PANDROL TYPE OR EQUIVALENT FASTCLIP CONCRETE TIE ASSEMBLIES FOR 5½" BASE AND 6" BASE RAIL RESPECTIVELY.
2. TWO CLIPS ARE REQUIRED PER ASSEMBLY. SEE SCRRRA ES2360-01 THROUGH ES2360-03.

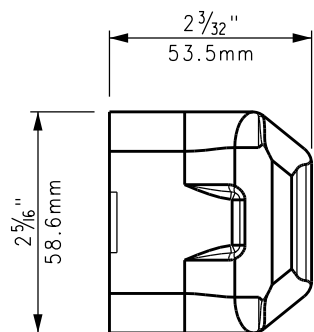


DIMENSION TABLE				
PANDROL FAST CLIP TYPE RAIL CLIPS (OR EQUAL)				
DIM	INCHES	mm	INCHES	mm
A	4 31/32"	126	5 5/32"	131
B	3 5/32"	80	3 5/32"	80
C	1 25/32"	45	2 3/32"	53
D	1 5/32"	12	1 5/32"	12
E	4 13/32"	112	4 13/32"	112
F	1 1/8"	29	1 1/16"	27
NO	FC1601 (136 LB)		FC1603 (115-119 LB)	

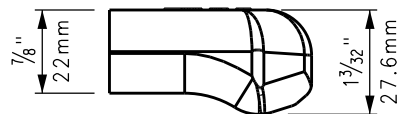




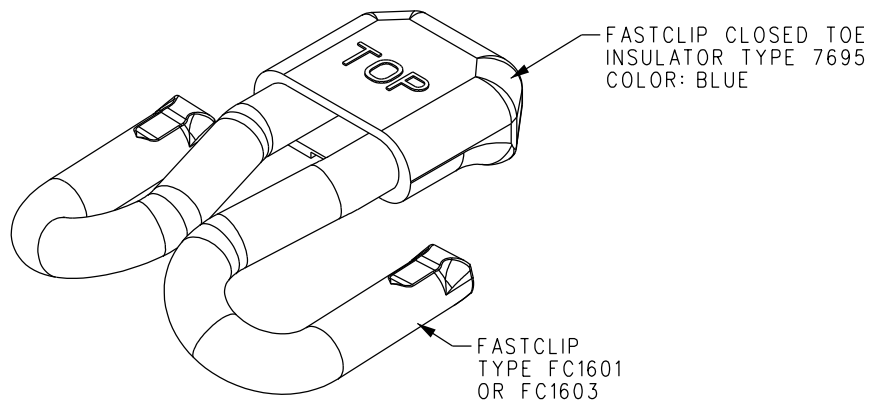
TOP VIEW



BOTTOM



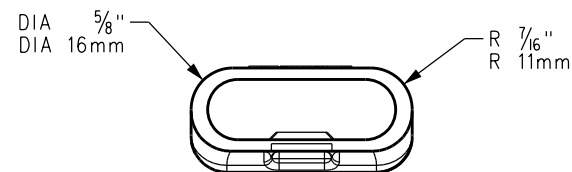
SIDE VIEW



ISOMETRIC
(ASSEMBLED)



ISOMETRIC

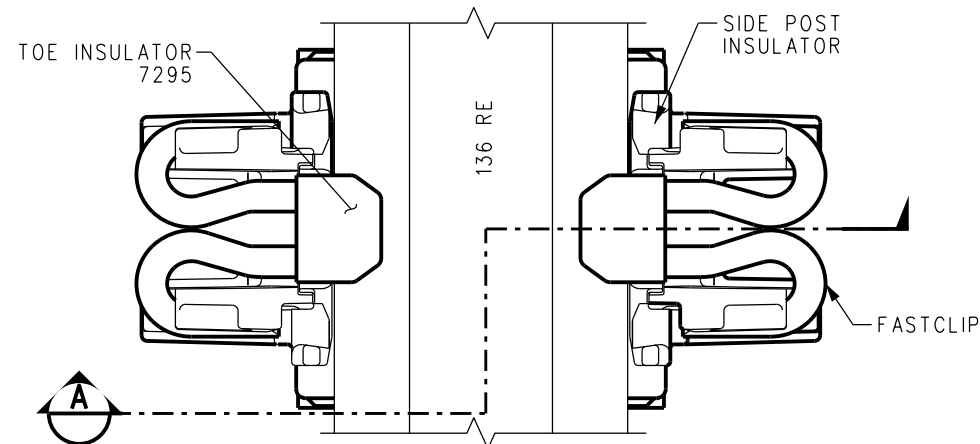


END VIEW

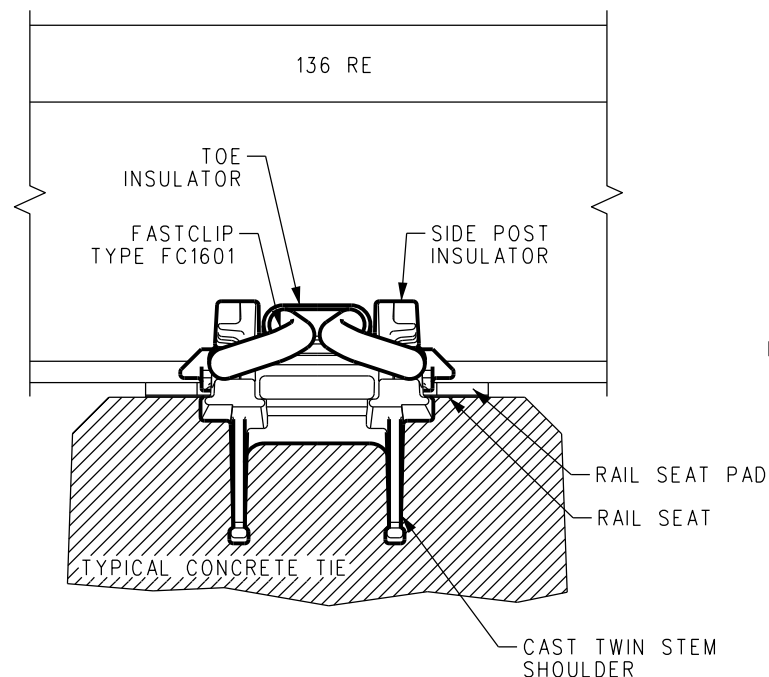
NOTE:

1. TOE INSULATOR TO BE PANDROL TYPE 7695 OR EQUIVALENT. INSULATOR COLOR: BLUE
2. FOR USE WITH PANDROL FASTCLIP TYPE FC1601, FC1603, OR EQUIVALENT.
3. TYPE 7695 TOE INSULATOR IS A HEAVY DUTY PART NUMBER.

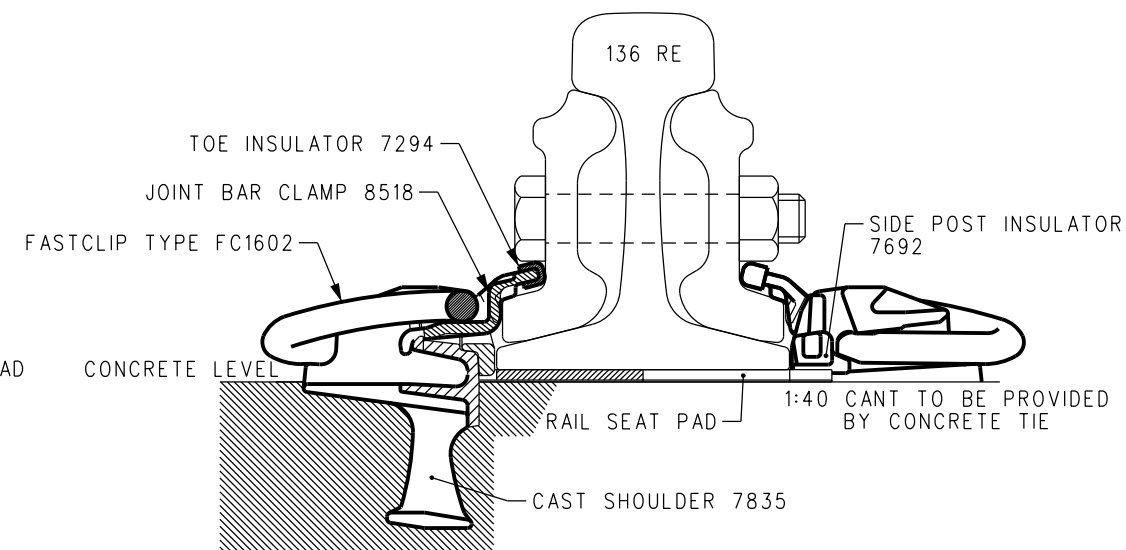
				DRAWN BY: A. CARLOS		DATE: 03/31/2011		SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES, SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.		 METROLINK®		ENGINEERING STANDARDS		STANDARD 2367		
												SCALE: NTS		REVISION SHEET		
				ASSISTANT DIRECTOR: STANDARDS & DESIGN										1 OF 1		
														CADD FILE: ES2367		
				DIRECTOR OF ENGINEERING AND CONSTRUCTION												
X	XX-XX-XX	REVISION	XX	XX					SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY		PANDROL TYPE TOE INSULATOR TO SUIT PANDROL FASTCLIP					
REV.	DATE	DESCRIPTION	DES.	ENG.					ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012		1600 SERIES RAIL CLIPS					



**STANDARD FASTCLIP
ON CONCRETE TIE**



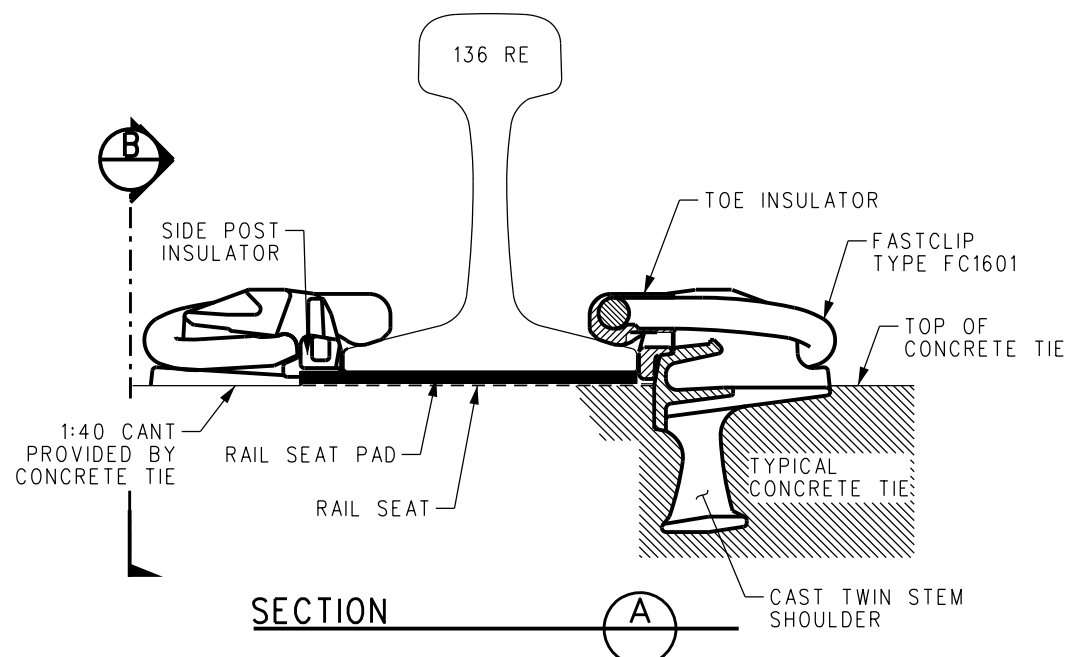
SECTION B



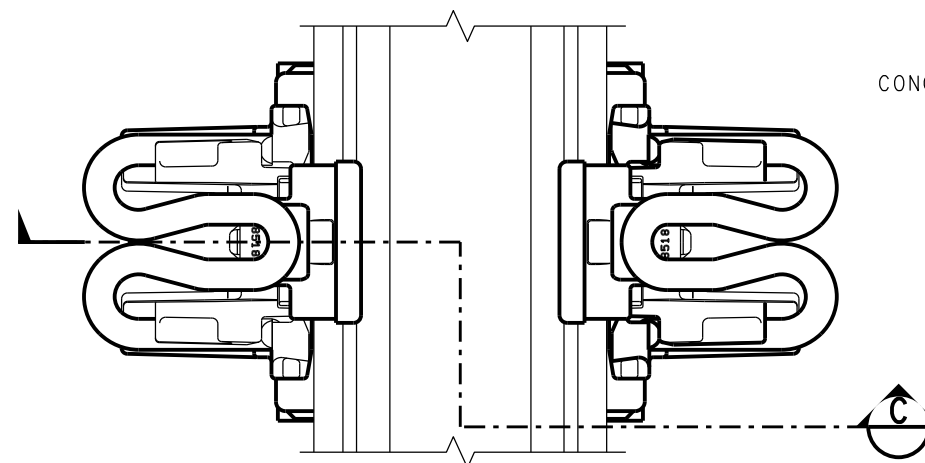
**MODIFIED FASTCLIP
FOR STANDARD JOINTS
ON CONCRETE TIE**

NOTES:

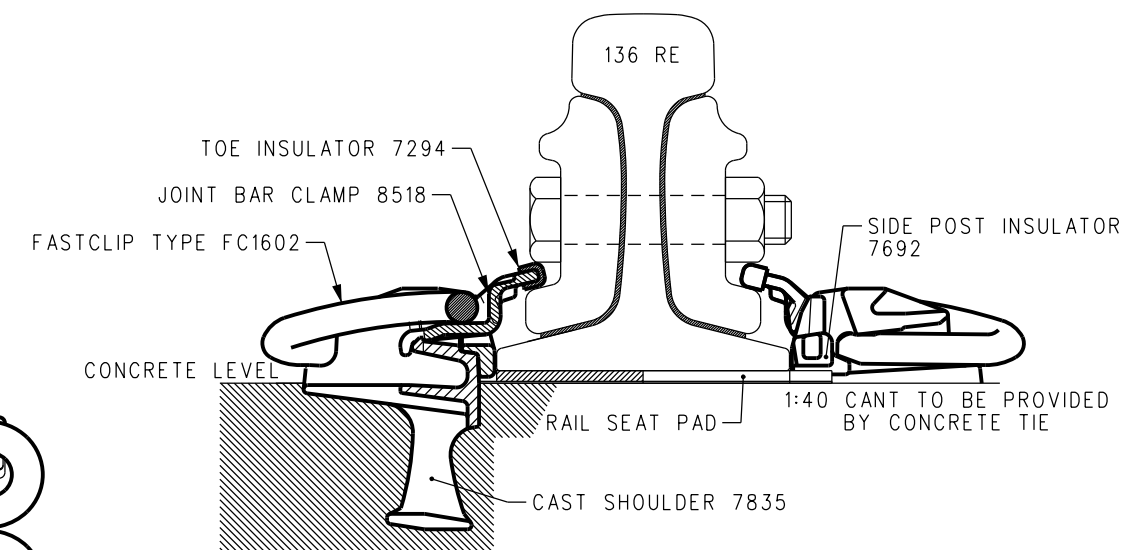
1. FASTCLIP FC1601 SHALL BE USED AT ALL LOCATIONS OTHER THAN JOINTS.
2. A MODIFIED FASTCLIP FC1602 SHALL BE USED ONLY AT JOINT BAR LOCATIONS.
3. FASTCLIP ASSEMBLIES FOR JOINTS (FC1602, FC8518, & FC7294) ARE PAINTED YELLOW FOR SIMPLE IDENTIFICATION.



SECTION A



MODIFIED FASTCLIP FOR JOINTS



NOTE:

1. SECTION C PROVIDES A VIEW OF A MODIFIED FASTCLIP FOR EITHER A STANDARD JOINT OR AN INSULATED JOINT ON A CONCRETE TIE.

**MODIFIED FASTCLIP
FOR INSULATED JOINTS
ON CONCRETE TIE**

DRAWN BY: <i>Narek D. Bpe</i>		HDR: DATE: 03/31/2011	
ASSISTANT DIRECTOR: STANDARDS & DESIGN			
DIRECTOR OF ENGINEERING AND CONSTRUCTION			
REV.	DATE	DESCRIPTION	DES. ENG.
X	XX-XX-XX	REVISION	XX XX

SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES, SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.



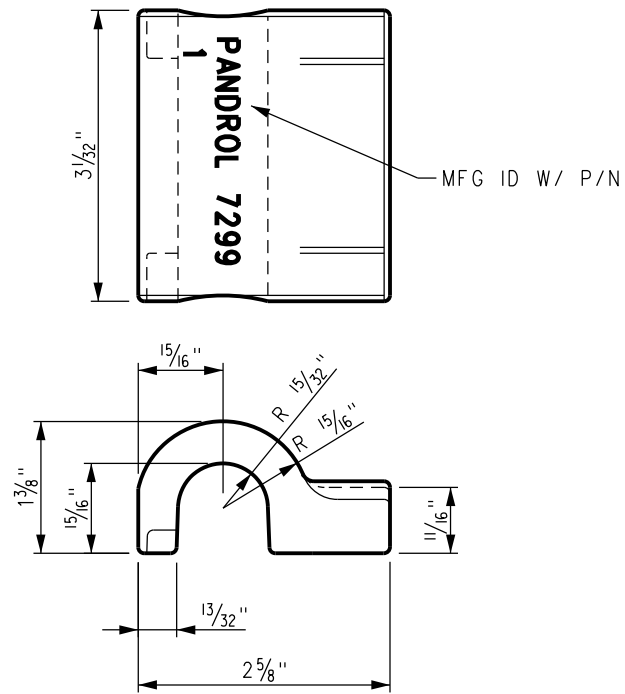
METROLINK

SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

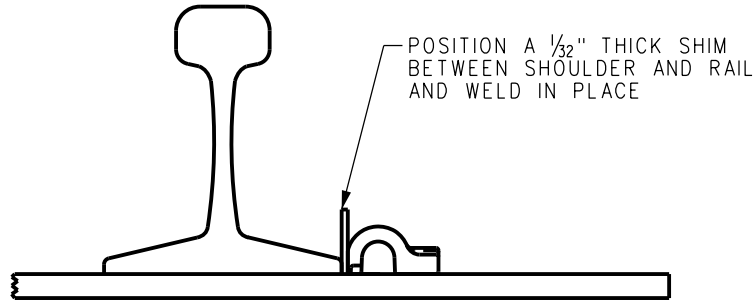
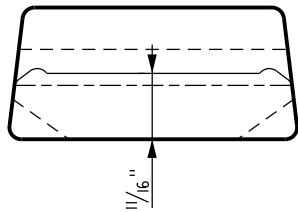
ENGINEERING STANDARDS

PANDROL TYPE TOE INSULATOR TO SUIT
PANDROL FASTCLIP 1600 SERIES RAIL CLIPS
FOR STANDARD RAIL & JOINT APPLICATIONS

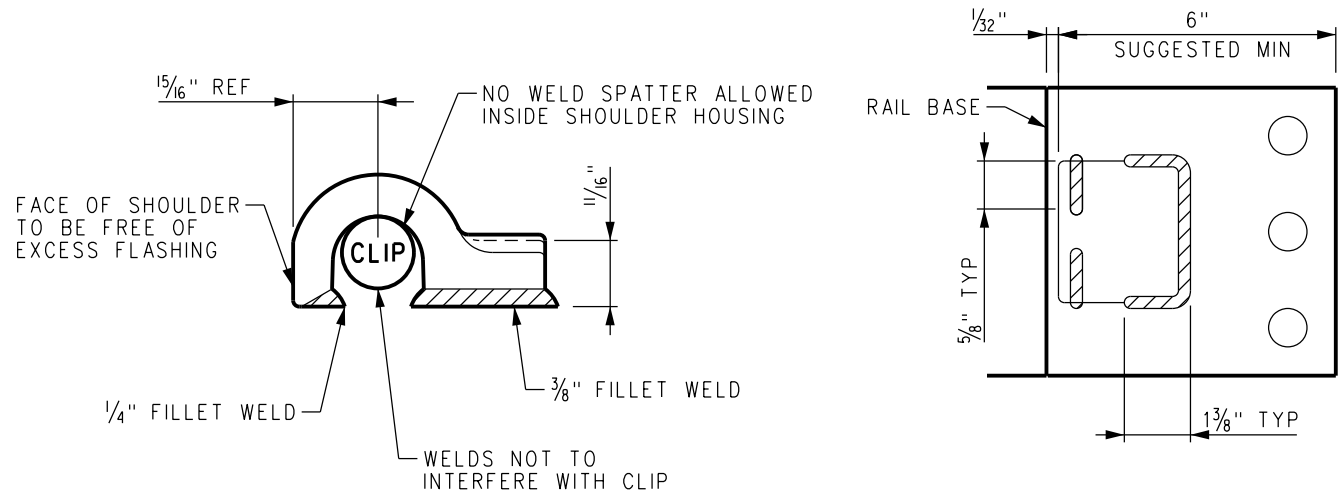
STANDARD	2368
SCALE:	NTS
REVISION	SHEET
-	1 OF 1
CADD FILE:	ES2368



WELD-ON SHOULDER PANDROL P/N 7299-1



POSITIONING SHOULDER

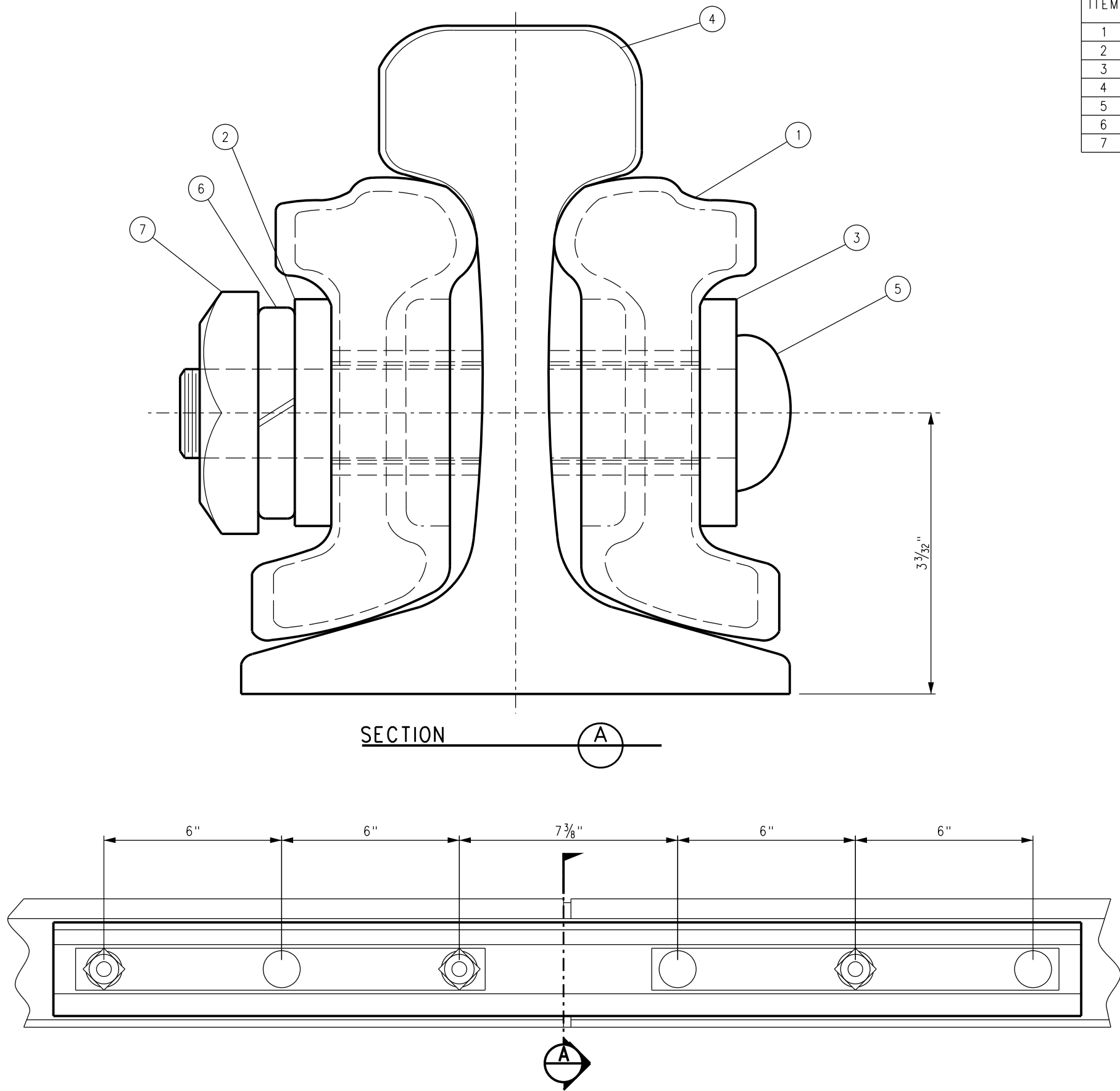


WELDING DETAIL OF 7299-1 SHOULDER

NOTES:

1. ALL WELDS TO BE IN ACCORDANCE WITH AREMA WELDING SPECIFICATIONS, 1/8" 7018 WELDING ROD, 3-PASSES.
2. ALL WELDS TO HAVE FULL PENETRATION TO BOTH PLATE AND SHOULDER.
3. WELD MUST NOT INTERFERE WITH EITHER THE RAIL OR THE CLIP.
4. RAIL SEATS AND INSIDE SHOULDER HOUSING TO BE FREE OF EXCESS WELD, SLAG, AND SPATTER.
5. SHOULDERS TO BE TACKED (OR CLAMPED) DOWN PRIOR TO FINAL WELDING, TO PREVENT THE CLIP FROM RISING DURING THE FINAL WELDS.
6. SHOULDER TO BE GENERALLY CENTERED ON THE PLATE, IF POSSIBLE.

				DRAWN BY: HDR DATE: 03/31/2011		<div>SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES: SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.</div> <div> METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012</div>		ENGINEERING STANDARDS		STANDARD 2369			
				ASSISTANT DIRECTOR: STANDARDS & DESIGN						WELD-ON SHOULDER FOR PANDROL "E" – CLIPS		SCALE: NTS	
				DIRECTOR OF ENGINEERING AND CONSTRUCTION								REVISION SHEET 1 OF 1	
												CADD FILE: ES2369	
X	XX-XX-XX	REVISION		XX	XX								
REV.	DATE	DESCRIPTION		DES.	ENG.								



ITEM	QTY	DESCRIPTION
1	2	POLY INSULATED JOINT BAR 36½" LONG
2	2	STEEL BACKUP PLATE ½" THICK X 15¼" LONG
3	2	STEEL BACKUP PLATE ½" THICK X 15¼" LONG
4	1	SCOTCHPLY END POST ¾" THICK
5	6	OVAL NECK BOLT 1" X 7½" LONG
6	6	1" LOCKWASHER
7	6	1" SQUARE NUT

				DRAWN BY: HDR DATE: 03/31/2011		<div>SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES: SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.</div>	<div>METROLINK[®] SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012</div>	ENGINEERING STANDARDS		STANDARD	
										2370	
										SCALE: NTS	
										REVISION SHEET	
										1 OF 1	
										CADD FILE: ES2370	

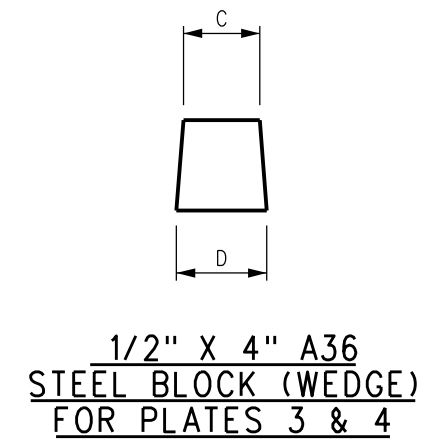
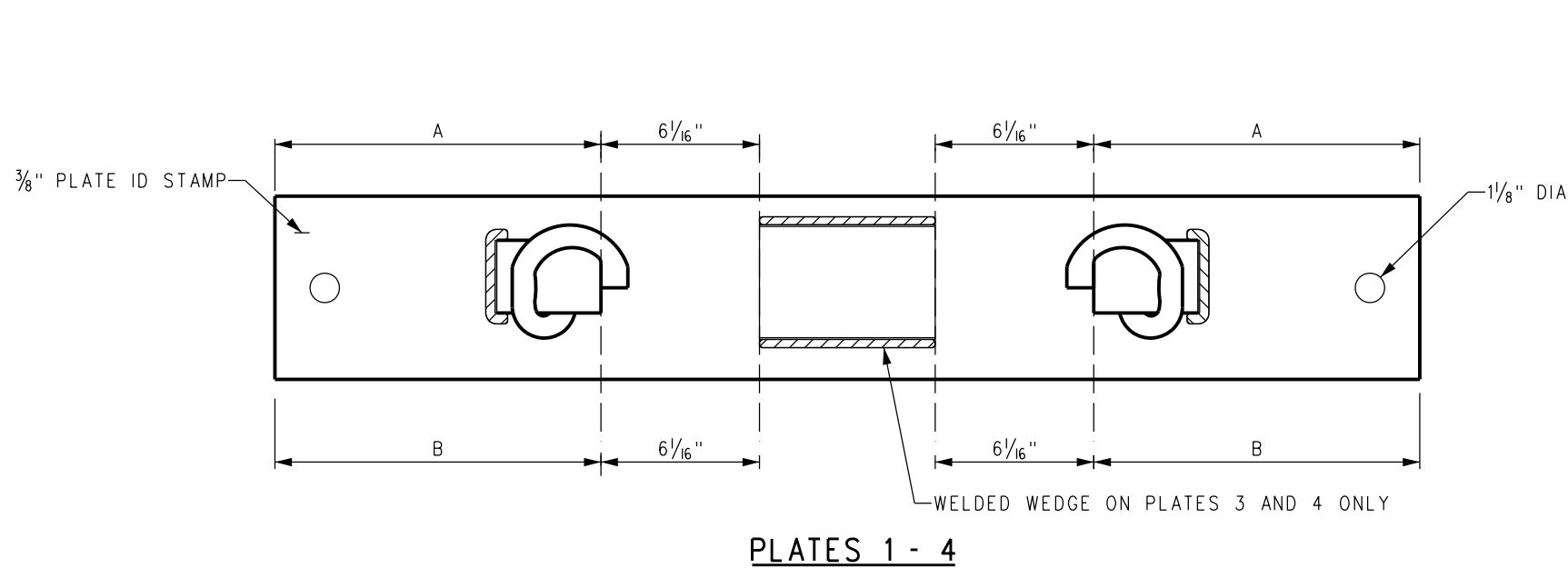
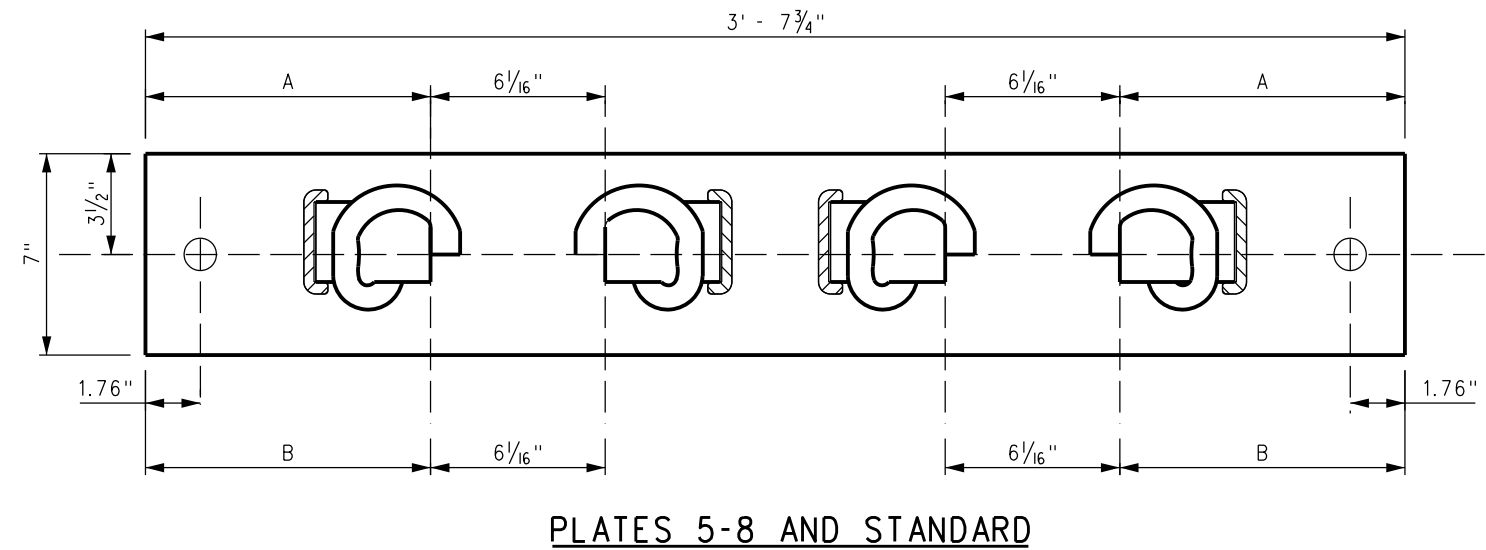


PLATE ID	C (IN)	D (IN)
3	2.65	3.14
4	5.34	5.74

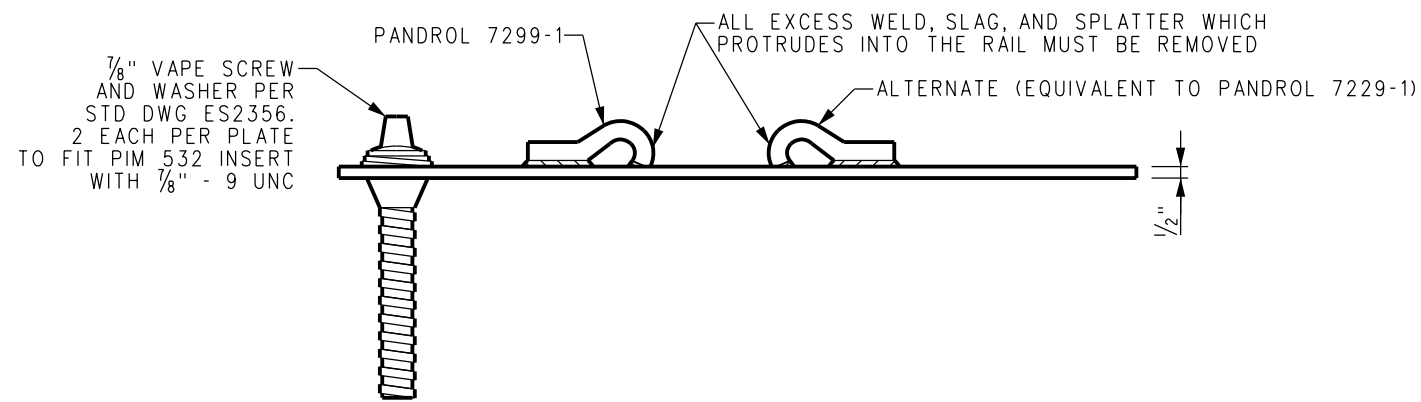
ENTRY PLATES

PLATE ID	A (IN)	B (IN)
1	17.12	16.75
2	15.85	15.69
3	14.59	14.15
4	13.21	12.87
5	12.11	11.83
6	11.24	11.03
7	10.60	10.47
8	10.21	10.14



STANDARD PLATE

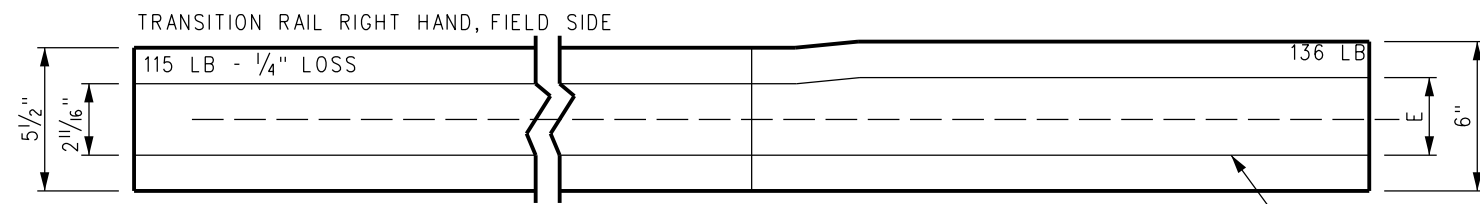
PLATE ID	A (IN)	B (IN)
STD	10.05	10.05



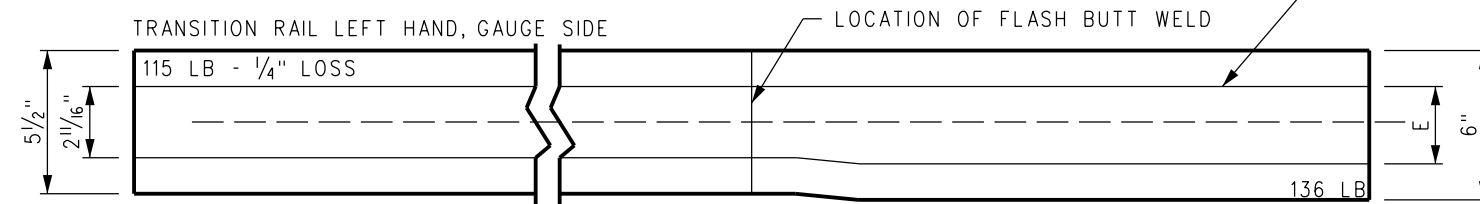
DOUBLE INSIDE GUARD RAIL PLATE DETAILS

DOUBLE INSIDE GUARD RAIL ITEM NUMBERS SET INCLUDES ALL ENTRY PLATES (2 OF EACH)	
STD PLATE (EACH)	ENTRY PLATES 1-8 (SET)

- NOTES:**
1. NO INSIDE CLIPS FOR PLATES 1, 2, 3, & 4. REQUIRES STEEL WEDGE ON PLATES 3 & 4.
 2. IF 5 1/2" BASE RAIL WILL BE USED FOR GUARD RAIL, THEN DIMENSIONS A & B ARE TO BE INCREASED BY 0.50 (IN), AND THE RAIL SEAT DIMENSION WILL CHANGE FROM 6 1/16" TO 5 9/16".

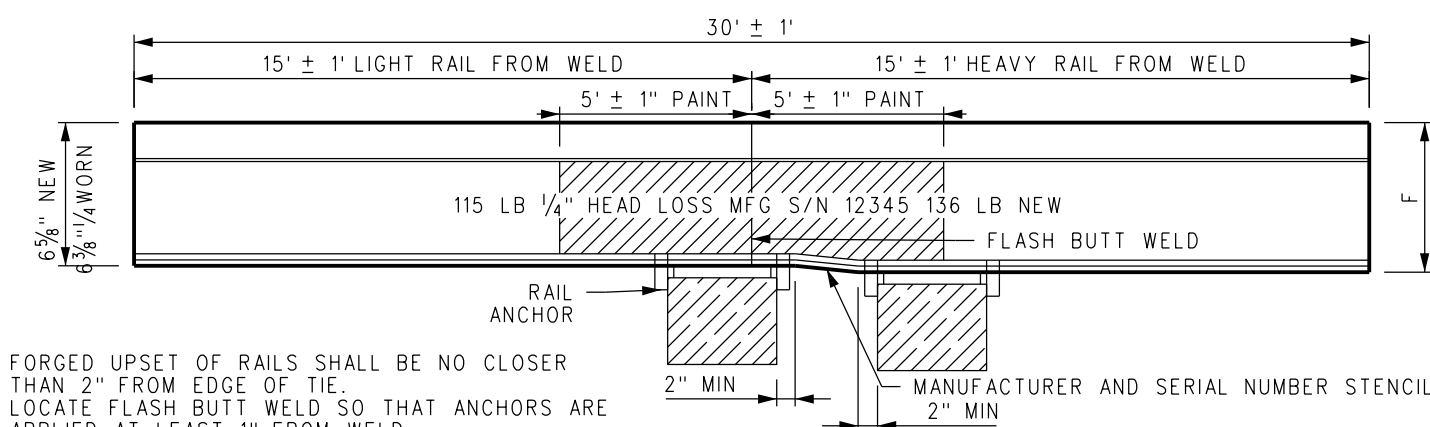


PLAN RIGHT HAND



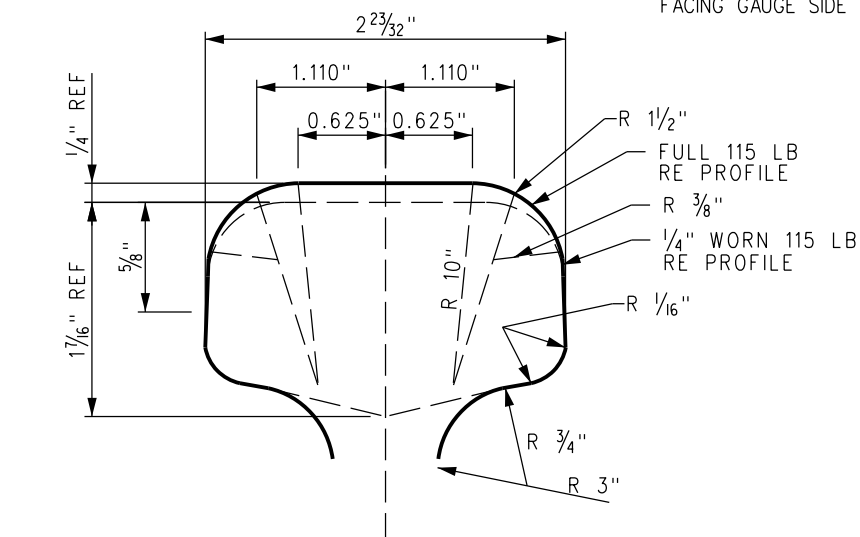
PLAN LEFT HAND

TRANSITION RAIL HAND IDENTIFICATION



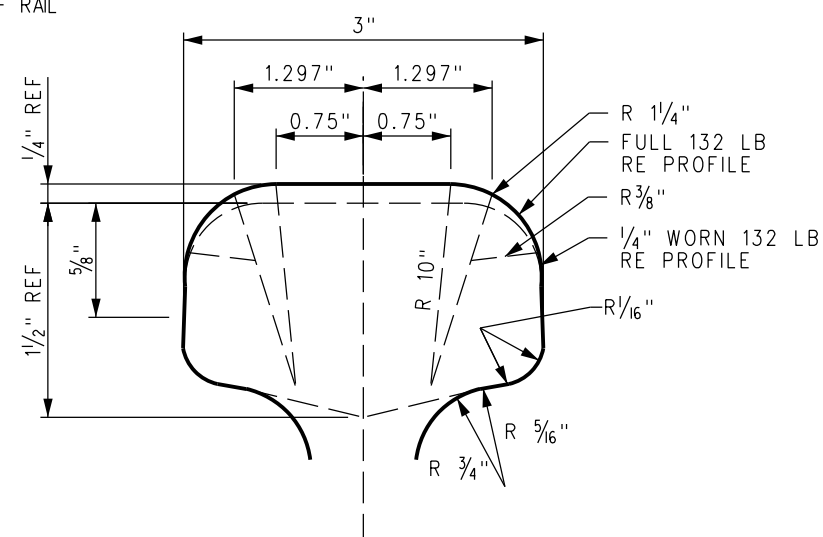
ELEVATION

FACING GAUGE SIDE OF RAIL



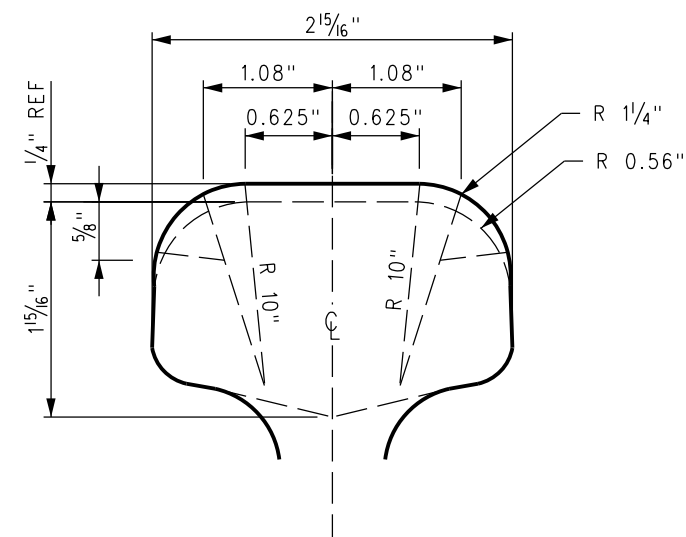
TOP RADII DETAIL

115 LB



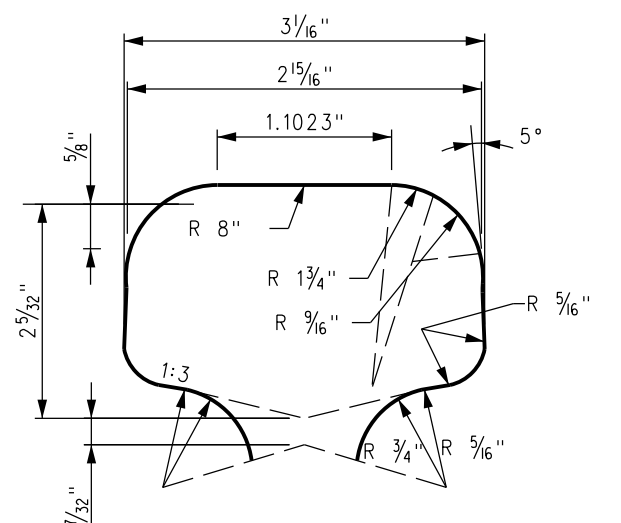
TOP RADII DETAIL

132 LB



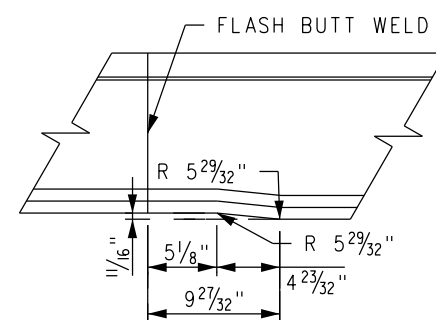
TOP RADII DETAIL

136 LB



TOP RADII DETAIL

141 LB



TRANSITION DETAIL

NOTES:

- TO DETERMINE HAND OF TRANSITION RAIL:
 - FACE GAUGE SIDE OF TRANSITION RAIL. IF TRANSITION RAIL IS INSTALLED IN TRACK, STAND IN CENTER OF TRACK.
 - MANUFACTURER'S TAG SHOULD BE VISIBLE IN WEB AREA, GAUGE SIDE.
 - TAG SHOULD READ "GAUGE SIDE".
 - WHEN HEAVY OR HIGH RAIL IS ON THE RIGHT, IT IS A RIGHT HAND TRANSITION RAIL. WHEN HEAVY OR HIGH RAIL IS ON THE LEFT, IT IS A LEFT HAND TRANSITION RAIL.
- TRANSITION RAIL LENGTHS WERE CALCULATED USING 19 1/2" TIE SPACING FOR WOOD AND 24" TIE SPACING FOR CONCRETE.
- ALWAYS MEASURE TRANSITION RAIL LENGTH BEFORE CUTTING OUT OLD RAIL.
- BOX ANCHOR TIE EACH SIDE OF TRANSITION. BOX ANCHOR TIE EACH SIDE OF THERMITE WELDS, AS SHOWN. OTHERWISE, ANCHOR PER SCRRR ES2351-02.

NOTES FOR MANUFACTURERS:

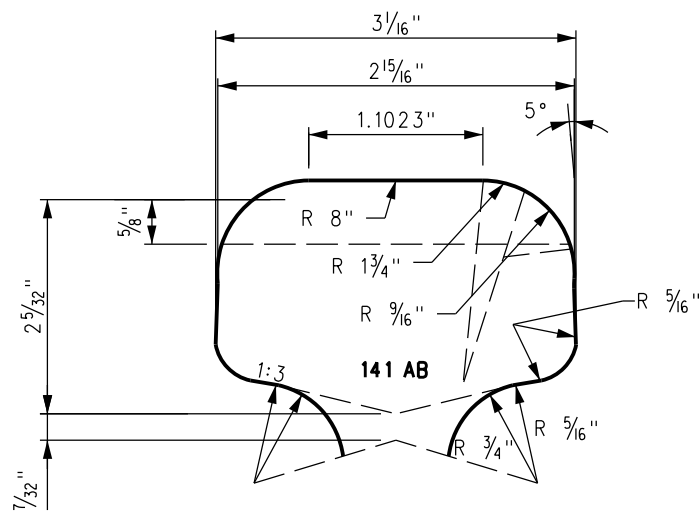
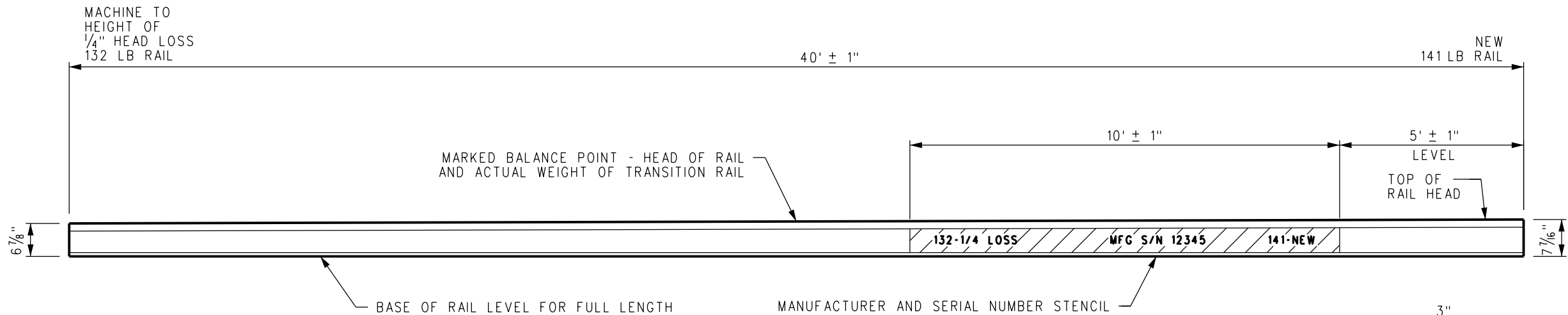
- TRANSITION RAILS ARE FURNISHED AS PAIRS AND ARE RIGHT OR LEFT HANDED.
- MANUFACTURER TO PLACE ID TAG READING "GAUGE SIDE" ON WEB OF RAIL GAUGE SIDE AND OTHER APPROPRIATE INFORMATION AS SHOWN.
- MACHINED SURFACES MUST BE FREE OF SEAMS AND RIDGES.
- FLASH BUTT WELD TO BE GROUND FLUSH WITH PARENT RAILS ON BASE AND SIDES OF BASE, +0.000" TO -0.010".
- TEMPLATES MUST BE USED TO CHECK FINISHED GAUGE CORNER AND TOP RADII.
- HEAD HARDENED RAIL TO BE USED UNLESS OTHERWISE SPECIFIED.
- MANUFACTURER TO MARK LIFT/BALANCE POINT FOR EACH RAIL LENGTH MANUFACTURED AND ACTUAL WEIGHT OF RAIL, STENCILED ON HEAD OF RAIL.
- MANUFACTURER TO PAINT WEB OF RAIL, 10 FEET CENTERED ON WELD AND SOLID WHITE BOTH SIDES. USING 2 1/2" BLOCK STENCIL AND BLACK PAINT, MARK RAIL TRANSITIONS, I.E. 136 LB NEW AND 132 LB 1/4" HEAD LOSS AT APPROPRIATE END OF THE WHITE PAINTING. STENCIL IN BLACK THE MFG NAME AND S/N BETWEEN MARKING RAIL TRANSITIONS USING 2" BLOCK STENCIL.

BILL OF MATERIALS

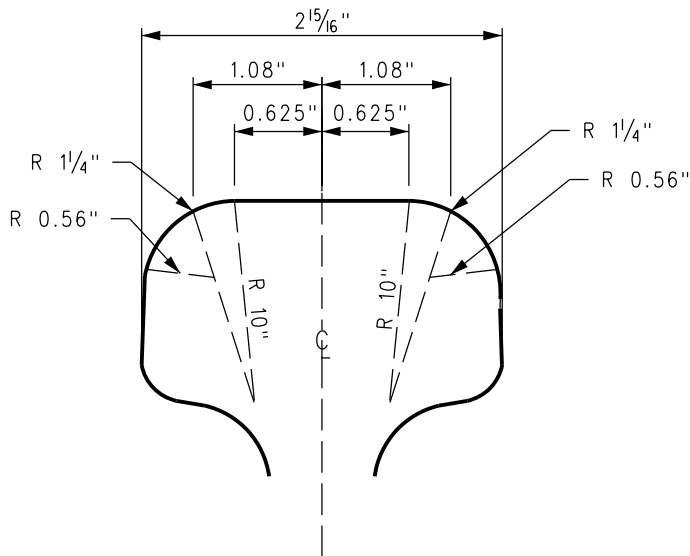
TRANSITION RAIL ASSEMBLIES - LEFT HAND AND RIGHT HAND

- 141 LB NEW TO 115 LB NEW
- 141 LB NEW TO 115 LB 1/4" HEAD LOSS
- 136 LB NEW TO 115 LB NEW
- 136 LB NEW TO 115 LB 1/4" HEAD LOSS
- 136 LB 1/4" HEAD LOSS TO 115 LB 1/4" HEAD LOSS
- 132 LB 1/4" HEAD LOSS TO 115 LB 1/4" HEAD LOSS

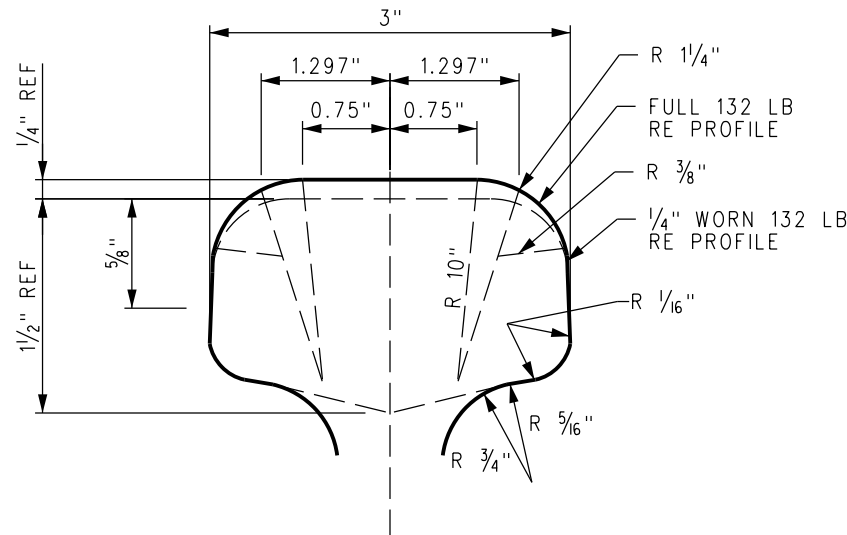
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



TOP RADII DETAIL
141 LB



TOP RADII DETAIL
136 LB



TOP RADII DETAIL
132 LB

RAIL HEIGHT		
SECTION	NEW	1/4" HEAD LOSS
141 LB	7 7/16"	-
136 LB	7 5/16"	-
132 LB	-	6 7/8"

BILL OF MATERIALS

QUANTITY TRANSITION RAIL
1 EA TRANSITION RAIL, 141 LB NEW TO 132 LB 1/4" HEAD LOSS
1 EA TRANSITION RAIL, 136 LB NEW TO 132 LB 1/4" HEAD LOSS

NOTES:

1. RAIL TO BE PURCHASED AND MANUFACTURED TO CURRENT "SCRRRA SPECIFICATIONS FOR HEAD HARDENED RAIL".
2. TRANSITION RAIL TO BE MANUFACTURED FROM HEAD HARDENED RAIL.
3. MACHINED SURFACES MUST BE FREE OF SEAMS AND RIDGES.
4. TEMPLATES MUST BE USED TO CHECK FINISHED GAUGE CORNER AND TOP RADII.
5. MANUFACTURER TO MARK LIFT/BALANCE POINT FOR EACH RAIL LENGTH AND ACTUAL WEIGHT OF RAIL, STENCILED ON HEAD OF RAIL.
6. MANUFACTURER SHALL PAINT WEB OF RAIL, 10 FEET AS SHOWN ON RAIL, SOLID WHITE, BOTH SIDES. USING 2 1/2" BLOCK STENCIL AND BLACK PAINT, MARK RAIL TRANSITIONS, I.E. 141-NEW AND 132 1/4" LOSS AT EACH END OF THE WHITE PAINTING. STENCIL IN BLACK THE MFG NAME AND S/N BETWEEN MARKING RAIL TRANSITIONS USING 2" BLOCK STENCIL.
7. THE 141 LB TRANSITION RAIL CAN BE USED WITH 136 LB AND 132 LB RAIL SECTIONS NEW TO 1/4" HEAD LOSS.
8. TRANSITION RAIL IS UNIVERSAL AND CAN BE USED AS RIGHT HAND OR LEFT HAND RAIL.

						DRAWN BY:	HDR	DATE:	03/31/2011
						<i>Nancy D. Bae</i>			
						ASSISTANT DIRECTOR: STANDARDS & DESIGN			
						<i>William Davis</i>			
						DIRECTOR OF ENGINEERING AND CONSTRUCTION			
X	XX-XX-XX	REVISION	XX	XX					
REV.	DATE	DESCRIPTION	DES.	ENG.					

SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY.
FOR NON-SCRRRA APPROVED USES:
SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.



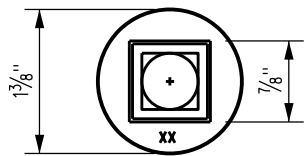
METROLINK

SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

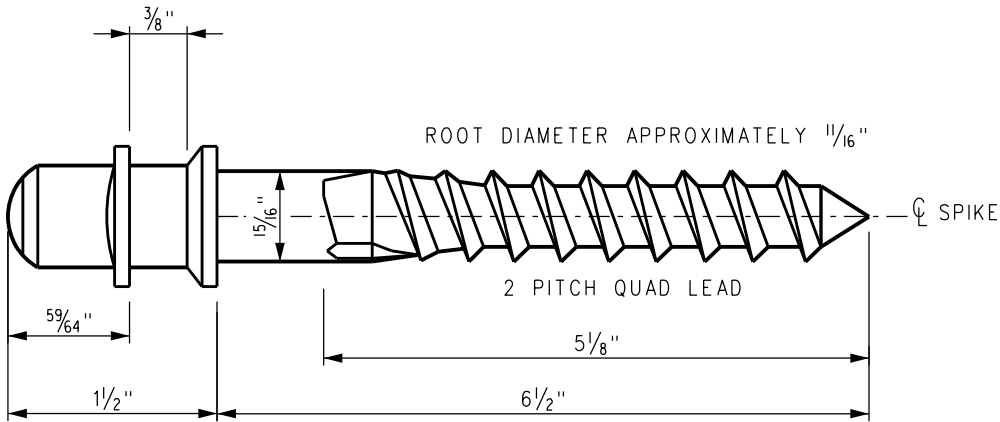
ENGINEERING STANDARDS

TRANSITION RAILS (PLANED)
FOR NEW 141LB. AND 136LB.
TO 132LB. 1/4" HEAD LOSS

STANDARD	2373
SCALE:	NTS
REVISION	SHEET
-	1 OF 1
CADD FILE:	ES2373



PLAN



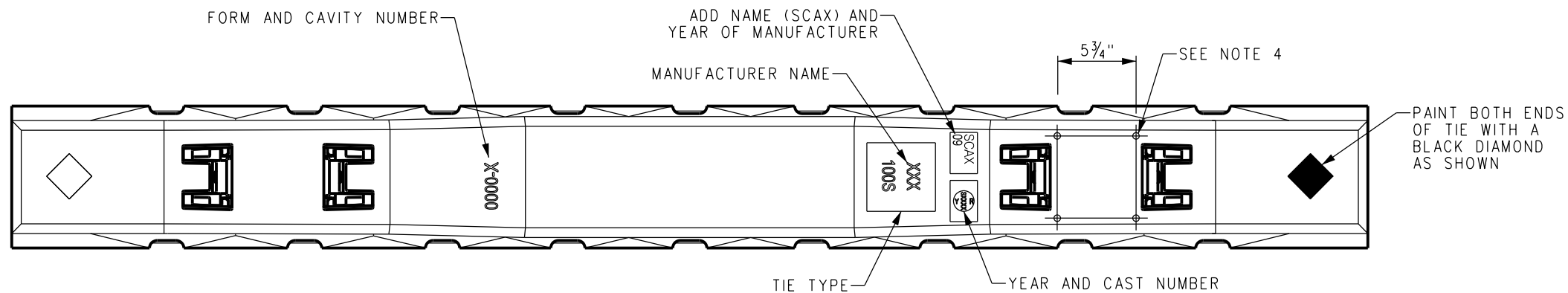
EVERGRIP SCREW SPIKE 5/16" X 6 1/2" U.S. PATENT 6.471.140
PART NUMBER SSEP2094-0650P

ELEVATION

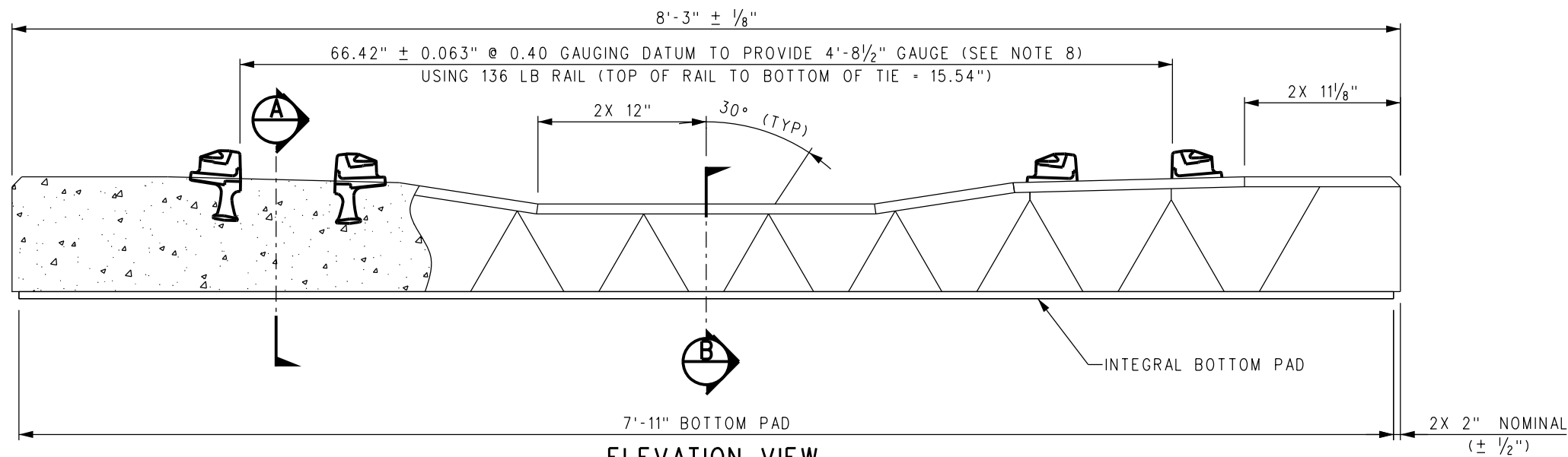
NOTES:

1. EASILY DRIVEN WITH CONVERTED AUTOMATIC SPIKE DRIVER, PORTABLE SPIKER OR MAUL.
2. FINS LOCK THE SPIKE INTO THE WOOD PREVENTING BACKWARD ROTATION.
3. CANNOT BE OVERDRIVEN.

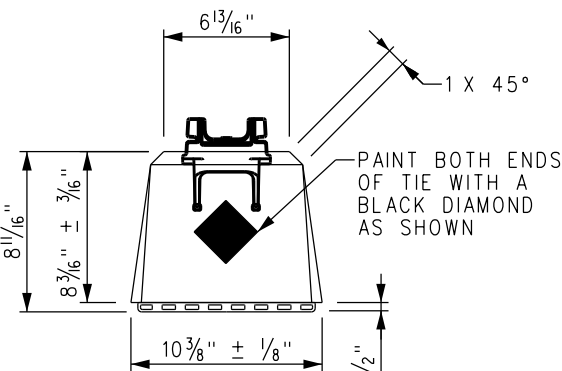
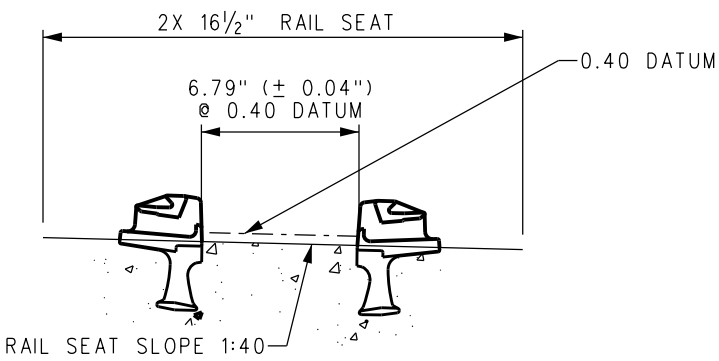
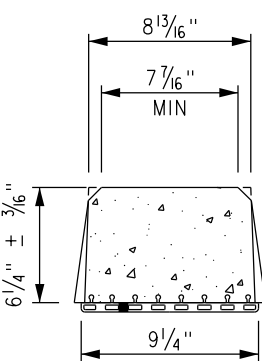
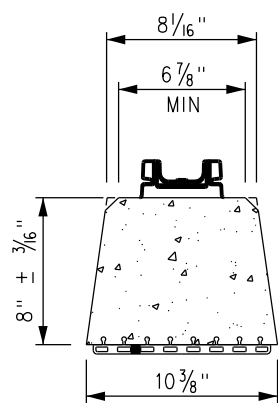
				DRAWN BY: HDR	DATE: 03/31/2011	SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES: SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.	 METROLINK® SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012	ENGINEERING STANDARDS		STANDARD						
				 ASSISTANT DIRECTOR: STANDARDS & DESIGN  DIRECTOR OF ENGINEERING AND CONSTRUCTION				2375								
									SCALE:	NTS						
									REVISION	SHEET						
X	XX-XX-XX	REVISION	XX	XX					-	1 OF 1						
REV.	DATE	DESCRIPTION	DES.	ENG.					CADD FILE:	ES2375						



PLAN VIEW



ELEVATION VIEW



NOTES:

1. CONCRETE COMPRESSIVE STRENGTH (USING 4" CYLINDER):
28 DAY SPECIFIED = 7000 PSI[48.3 MPa]
TRANSFER MINIMUM = 4500 PSI[31 MPa]
2. AIR ENTRAINED CONCRETE TO BE USED. AIR CONTENT TO BE MINIMUM OF 3.5% IN THE HARDENED CONCRETE.
3. THE RAIL SEAT SHALL BE A FLAT SMOOTH SURFACE ± 0.04" [1.0mm].
4. GAUGING POINTS FOR FLATNESS AND WIND. WIND BETWEEN RAIL SEATS NOT TO EXCEED 1/16" [1.6mm] BETWEEN THESE POINTS.
5. SEE APPROPRIATE WIRE PATTERN DRAWING FOR WIRE AND STRESSING DETAILS. (SCRR ES2402)
6. ENDS OF PRESTRESSING WIRE TO BE CUT OFF WITHIN 1/8" [3.2mm] FROM SURROUNDING CONCRETE AT TIE ENDS.
7. TIES TO BE MANUFACTURED IN ACCORDANCE WITH CUSTOMER SUPPLIED SPECIFICATIONS AND/OR ACCEPTED PCI PRACTICE FOR PRESTRESSED CONCRETE.
8. THIS TIE IS DESIGNED TO PROVIDE TRACK GAUGE USING RAIL AND THE FASTENING COMPONENTS LISTED HEREON. THE OUT-TO-OUT SHOULDER DIMENSION IS CALCULATED TO PROVIDE THE GAUGE INDICATED ASSUMING NOMINAL DIMENSIONS FOR RAIL PADS, INSULATORS, AND RAIL TOLERANCE ON SHOULDER POSITION AND RAIL SEAT INCLINATION ARE THOSE FOUND BY EXPERIENCE TO BE ACHIEVABLE AND SATISFACTORY IN PRACTICE. SEE SCRR ES2360-01 THROUGH ES2360-03 FOR SIDE POSTS AND CLIPS FOR VARIOUS OTHER RAIL WEIGHTS.
9. RAIL FASTENING INFORMATION:
CAST IN COMPONENTS:
DUCTILE IRON SHOULDER
SHOULDER FACE ANGLE
LOOSE COMPONENTS:
INSULATOR:
SIDE POST THICKNESS:
TOE INSULATOR THICKNESS:
CLIP:
PAD THICKNESS:
RAIL SEAT CANT: 1:40 (0.144" @ 5 3/4" GAUGING POINT)
MAX = 0.164" @ 5 3/4" GAUGING POINT
MIN = 0.128" @ 5 3/4" GAUGING POINT
APPROXIMATE WEIGHT OF TIE = 610 LBS.
(USING AIR ENTRAINED CONCRETE).
10. THIS TIE TO ONLY BE USED ON BRIDGE DECKS WITH LESS THAN 12" OF BALLAST UNDER TIES OR AS DIRECTED BY SCRR ENGINEER.

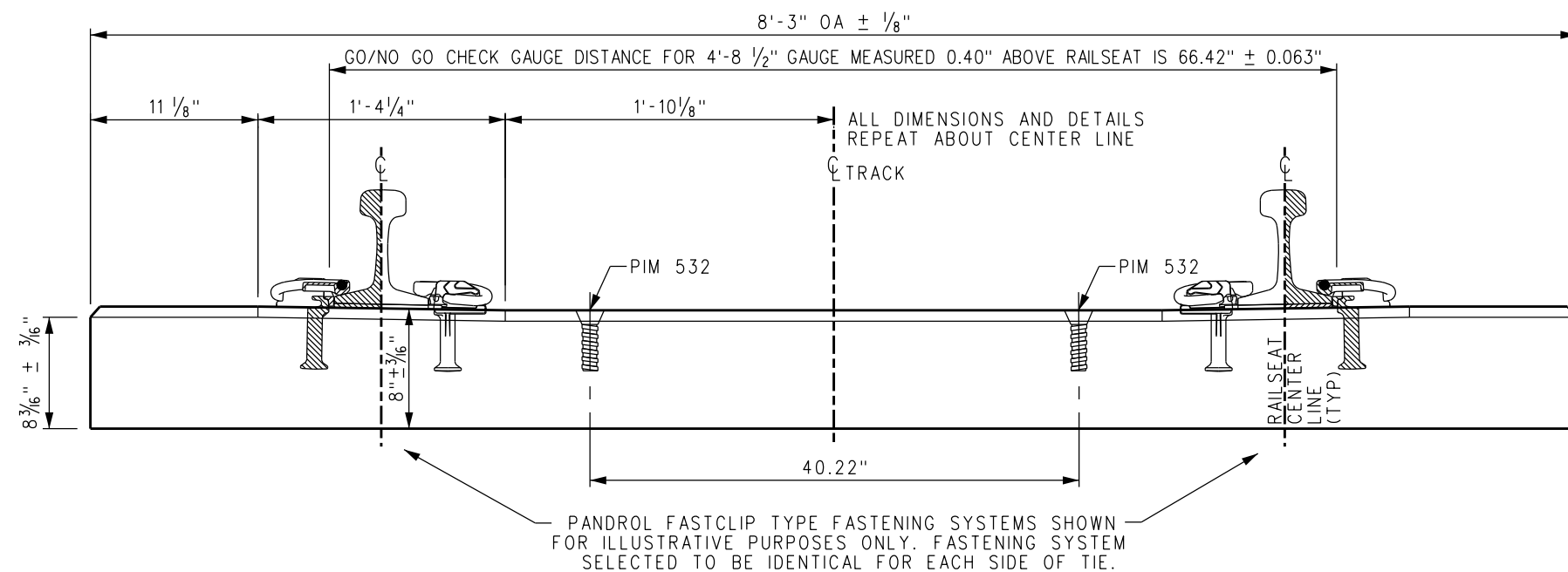
MIDWAY BETWEEN SHOULDERS

CENTER OF TIE

SHOULDER LOCATION DETAIL

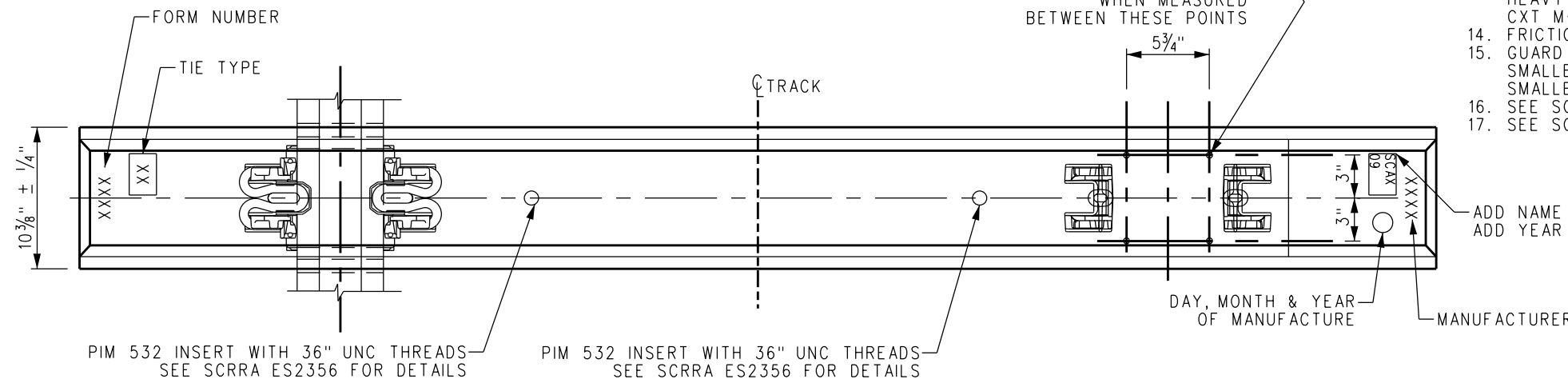
END VIEW

DRAWN BY: HDR DATE: 03/31/2011				SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES: SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.				ENGINEERING STANDARDS				STANDARD
REV. DATE DESCRIPTION DES. ENG.				1 06/27/2011 REVISED NOTE AND STAMP, PLAN VIEW AC NDP				8'-3" BOTTOM PAD TIE (FASTCLIP) FOR USE ON BRIDGE DECKS				2403
User Name: carlosa Date Plotted: 10/5/2011 2:19:35 PM Plot Driver: S:\Plot Drivers\pdf.plt				File Name: s:\V8EngStds\2000\ES2403.dgn				1 1 OF 1				ES2403

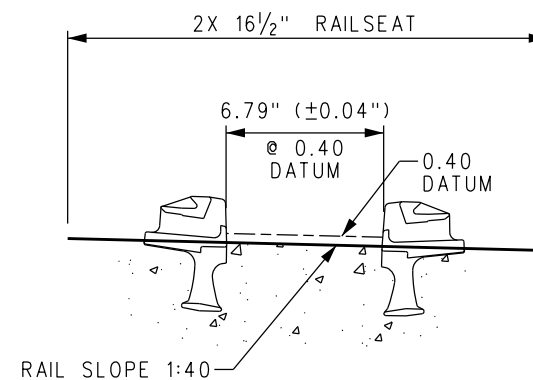


ELEVATION
(FRICTION PATTERN NOT SHOWN FOR CLARITY)

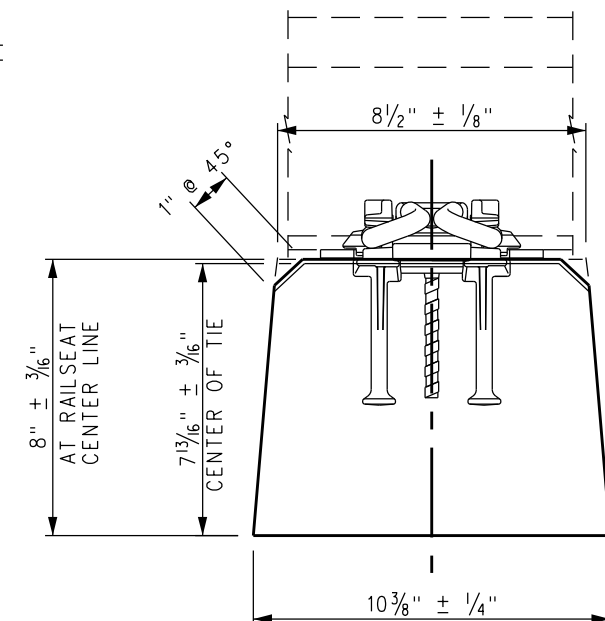
GAUGING POINT: WIDTH BETWEEN RAIL SEATS NOT TO EXCEED 1/16" WHEN MEASURED BETWEEN THESE POINTS



PLAN VIEW



SHOULDER LOCATION DETAIL



SECTION THROUGH RAILSEAT CENTERLINE
(PRESTRESSING WIRE NOT SHOWN)

NOTES:

1. CONCRETE STRENGTH (USING CYLINDER STRENGTHS), 28 DAY SPECIFIED = 7000 PSI. TRANSFER MINIMUM = 4500 PSI.
2. RAILSEAT CANT = 1:40 ± 5.
3. THE RAILSEAT SHALL BE A FLAT, SMOOTH SURFACE ±0.04" (1.0mm).
4. APPROXIMATE WEIGHT OF TIE = 600 LBS (USING AIR ENTRAINED CONCRETE).
5. FOR DIMENSIONAL ACCEPTANCE PURPOSES, THE GAUGING DIMENSION BETWEEN OUTER SHOULDERS IS CHECKED WITH GO/NO GO GAUGES TO BE WITHIN 1/16" OF CALCULATED DIMENSION, AT A HEIGHT OF 0.4" ABOVE THE RAIL SEAT SURFACE. GO/NO GO DIMENSION IS 66.42" ± 0.063".
6. THIS TIE IS DESIGNED FOR USE WITH 136 LB RE RAIL. THIS TIE WILL ALSO ACCOMMODATE 115 LB, 119 LB, 132 LB, AND 141 LB RAIL WITH MINOR CHANGE IN SIDE POST TO ACHIEVE CORRECT GAUGE. SEE SCRRR ES2360 FOR DETAILS CONCERNING SIDE POST AND RAIL SIZE.
7. PRESTRESSING WIRE IS 5.32mm DIAMETER DEFORMED WIRE STRESS RELIEVED WITH A MINIMUM BREAKING LOAD OF 9200 LBS AND WITH OTHER REQUIREMENTS CONFORMING WITH ASTM A-881, "STEEL WIRE DEFORMED FOR PRESTRESSED CONCRETE RAILROAD TIES".
8. ENDS OF PRESTRESSING WIRE TO BE CUT OFF TO WITHIN 1/8" OF SURROUNDING CONCRETE AT TIE ENDS.
9. AIR ENTRAINED CONCRETE TO BE USED, AIR CONTENT TO BE 5 1/2% ± 1% IN PLASTIC CONCRETE.
10. THE OUT TO OUT SHOULDER SPACING DIMENSION FOR THIS TIE IS CALCULATED TO PROVIDE THE GAUGE INDICATED ASSUMING NOMINAL DIMENSIONS FOR RAIL PADS, INSULATORS AND RAIL. TOLERANCE ON SHOULDER POSITIONS AND RAILSEAT INCLINATION ARE THOSE FOUND BY EXPERIENCE TO BE ACHIEVABLE AND SATISFACTORY IN PRACTICE.
11. TIES TO BE MANUFACTURED IN ACCORDANCE WITH ACCEPTED PC CONSTRUCTION PRACTICE FOR PRESTRESSED CONCRETE.
12. FASTENING SYSTEM TO BE APPROVED BY SCRRR DIRECTOR OF ENGINEERING AND CONSTRUCTION.
13. GUARD RAIL FASTENINGS:
PIM 532 INSERT 7/8" - 9 UNC THREAD
VASSLOH FE6 SPRING WASH
HEAVY HEX 7/8" - 9 UNC BOLT
CXT M-180 CAST IRON CLIP OR EQUIVALENT.
14. FRICTION PATTERN SHALL BE CAST INTO SIDES OF TIES AND EMBOSSED INTO BOTTOM OF TIES.
15. GUARD RAIL MUST BE SMALLER THAN OR EQUAL IN HEIGHT TO RUNNING RAIL. DO NOT USE SMALLER THAN 115 LB GUARD RAIL SECTION WITH 132 LB - 136 LB RUNNING RAIL. DO NOT USE SMALLER THAN 132 LB GUARD RAIL SECTION WITH 141 LB RUNNING RAIL.
16. SEE SCRRR ES2356 FOR DETAILS ON COACH SCREW, INSERT, AND WASHER.
17. SEE SCRRR ES2371 FOR DETAILS ON INSIDE GUARD RAIL PLATES FOR CONCRETE TIES.

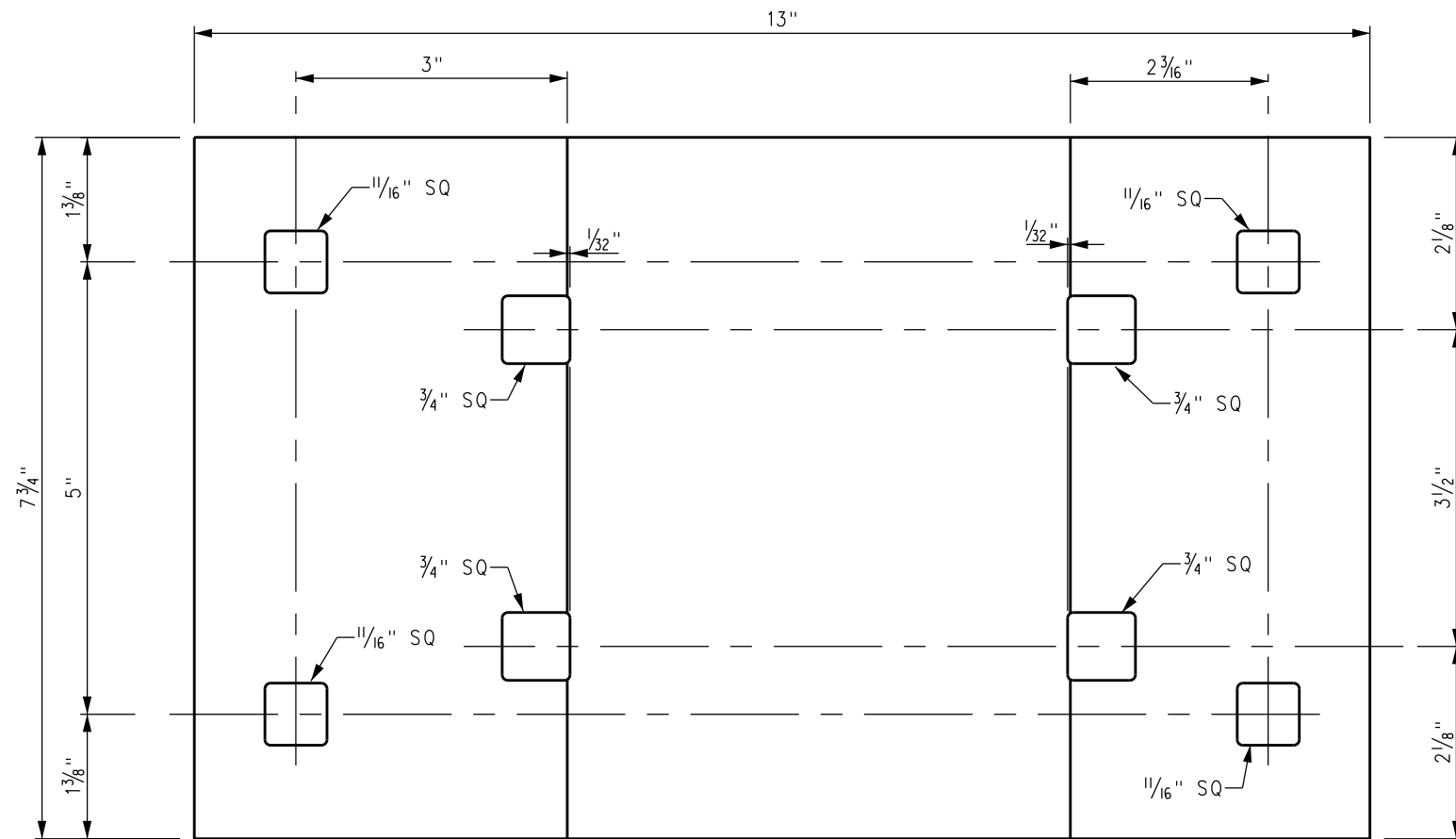
						DRAWN BY: A. CARLOS	DATE: 03/31/2011	
1	06/27/2011	REVISED NOTE AND STAMP, PLAN VIEW	AC	NDP				
REV.	DATE	DESCRIPTION	DES.	ENG.				

SCRRR ENGINEERING STANDARDS ARE INTENDED FOR SCRRR APPROVED USES ONLY. FOR NON-SCRRR APPROVED USES, SCRRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRR. ALL RIGHTS RESERVED.

 **METROLINK**

SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

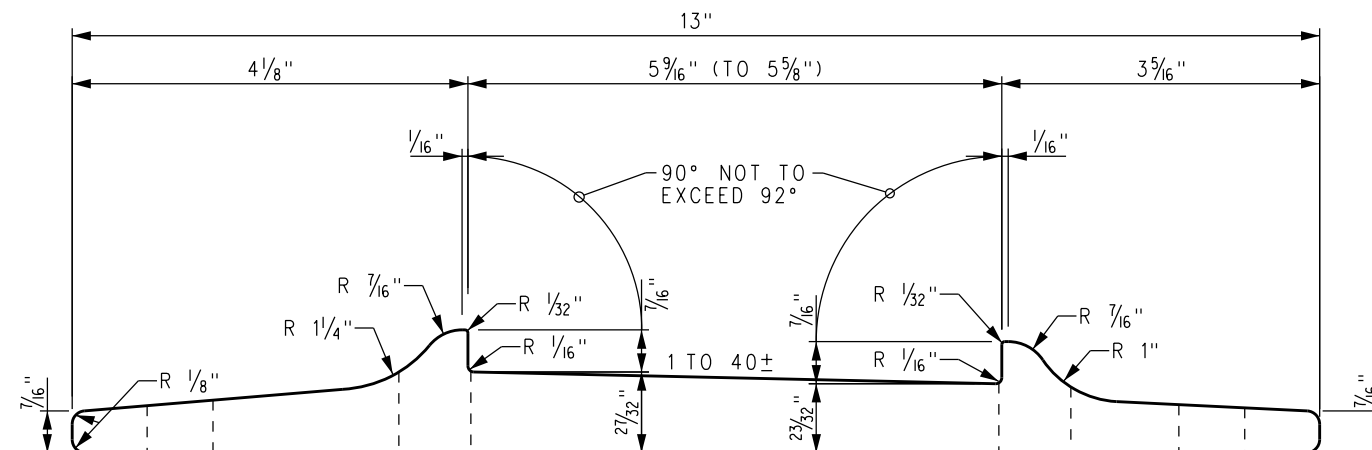
ENGINEERING STANDARDS		STANDARD
		2406
		SCALE: NTS
CONCRETE TIE - GUARD RAIL		REVISION SHEET
		1 1 OF 1
		CADD FILE: ES2406



NOTES:

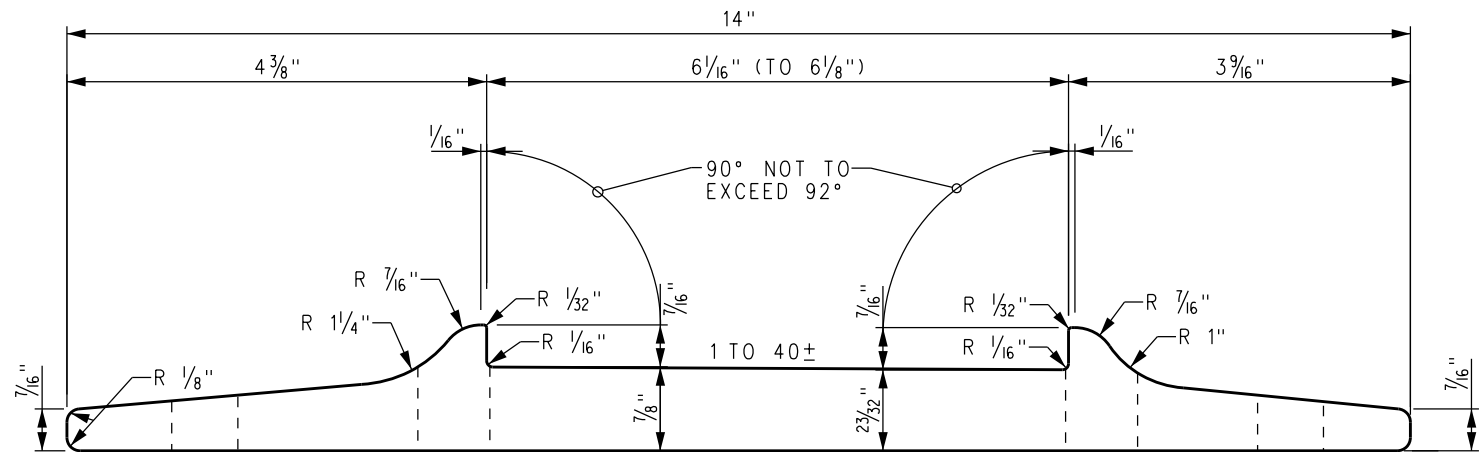
1. ALL SQUARE SPIKE HOLES SHALL HAVE 1/16" FILLETS IN CORNERS.
2. ESTIMATED WEIGHT: 19.60 LBS EACH.
3. MUST MEET AREMA SPECIFICATIONS.

PLAN




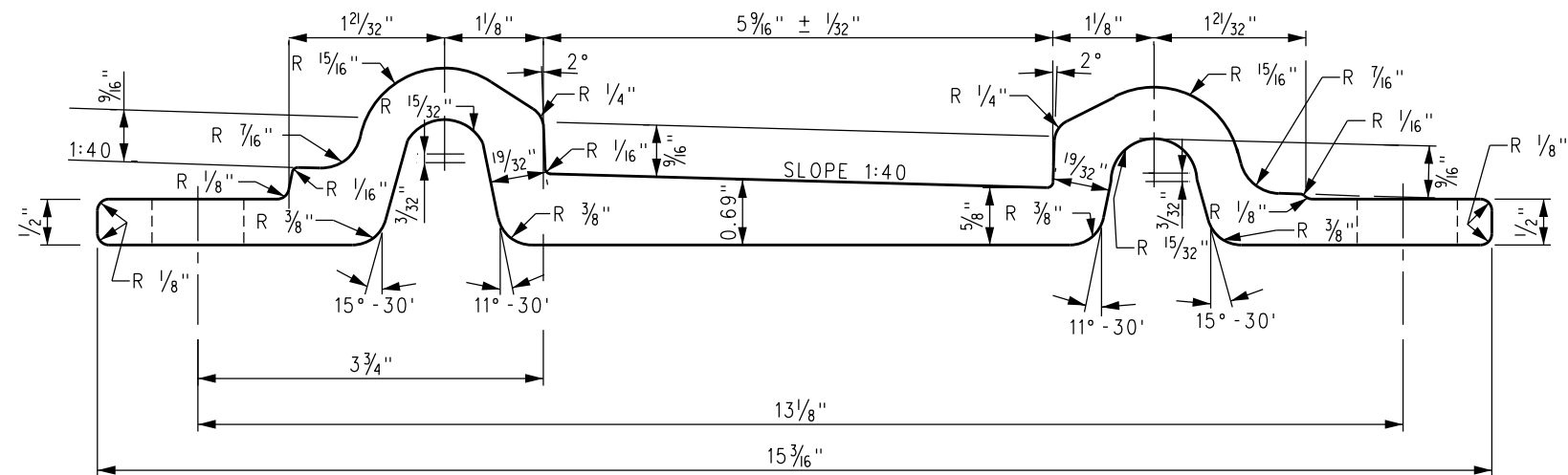
ELEVATION

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



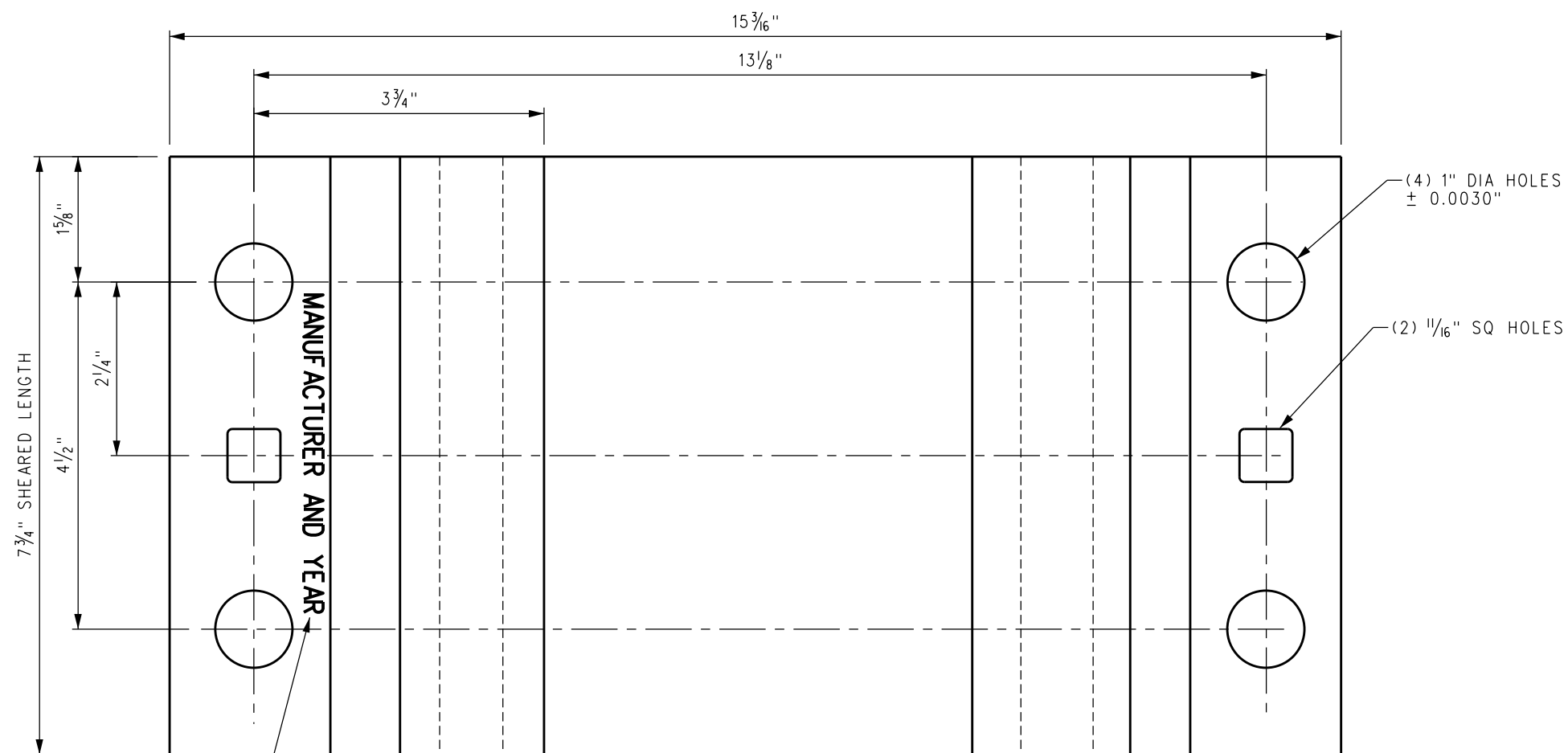
ELEVATION

										DRAWN BY: A. CARLOS DATE: 03/31/2011										SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES: SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.										 METROLINK®										ENGINEERING STANDARDS										STANDARD		2452											
										 ASSISTANT DIRECTOR: STANDARDS & DESIGN																														SCALE:		NTS																					
X XX-XX-XX										REVISION										XX XX																				REVISION		SHEET																					
REV.										DATE										DESCRIPTION										DES.										ENG.																				CADD FILE:		ES2452	
										 DIRECTOR OF ENGINEERING AND CONSTRUCTION																				SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012										14" TIE PLATE FOR 6" BASE RAIL																							




NOTES:

1. ALL HOLE MEASUREMENTS TO BE TAKEN FROM BOTTOM OF PLATE.
2. PLATE TO BE STANDARD PANDROL TYPE OR APPROVED
EQUAL TIE PLATE MODIFIED FOR 1" DIA HOLES.
3. PLATE TO BE INSTALLED WITH 2 EACH PANDROL
RAIL FASTENING "e" CLIP PER SCRR ES2362.
4. PLATE TO BE INSTALLED WITH 4 EACH SCREW SPIKES
PER PLATE PER SCRR ES2355.



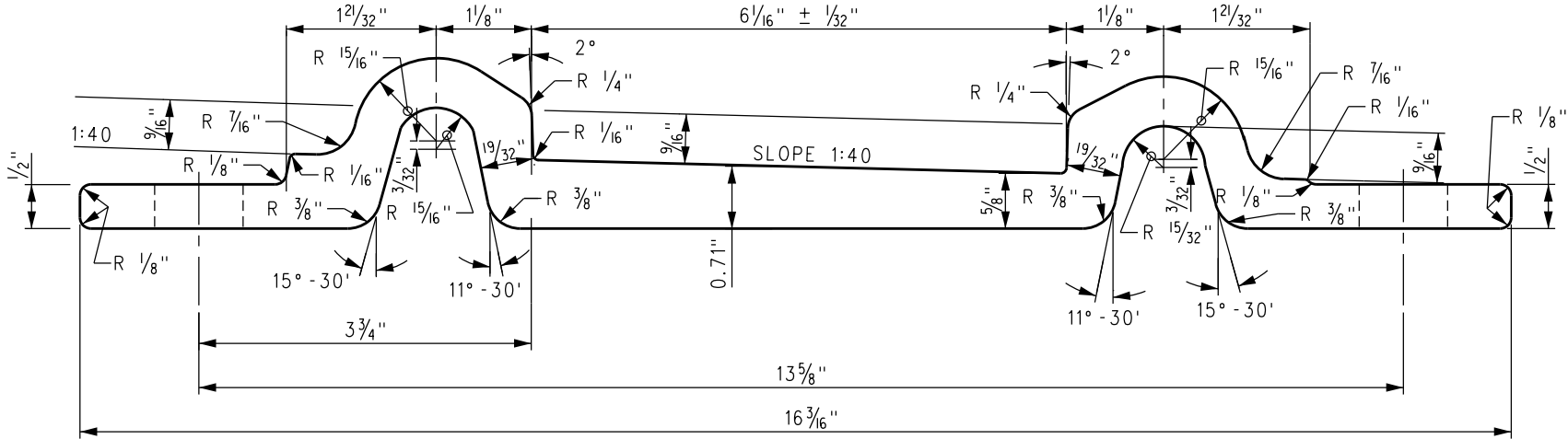
NAME OR BRAND OF MANUFACTURER AND
LAST TWO DIGITS OF YEAR MANUFACTURED
TO BE ROLLED IN RAISED LETTERS

PLAN

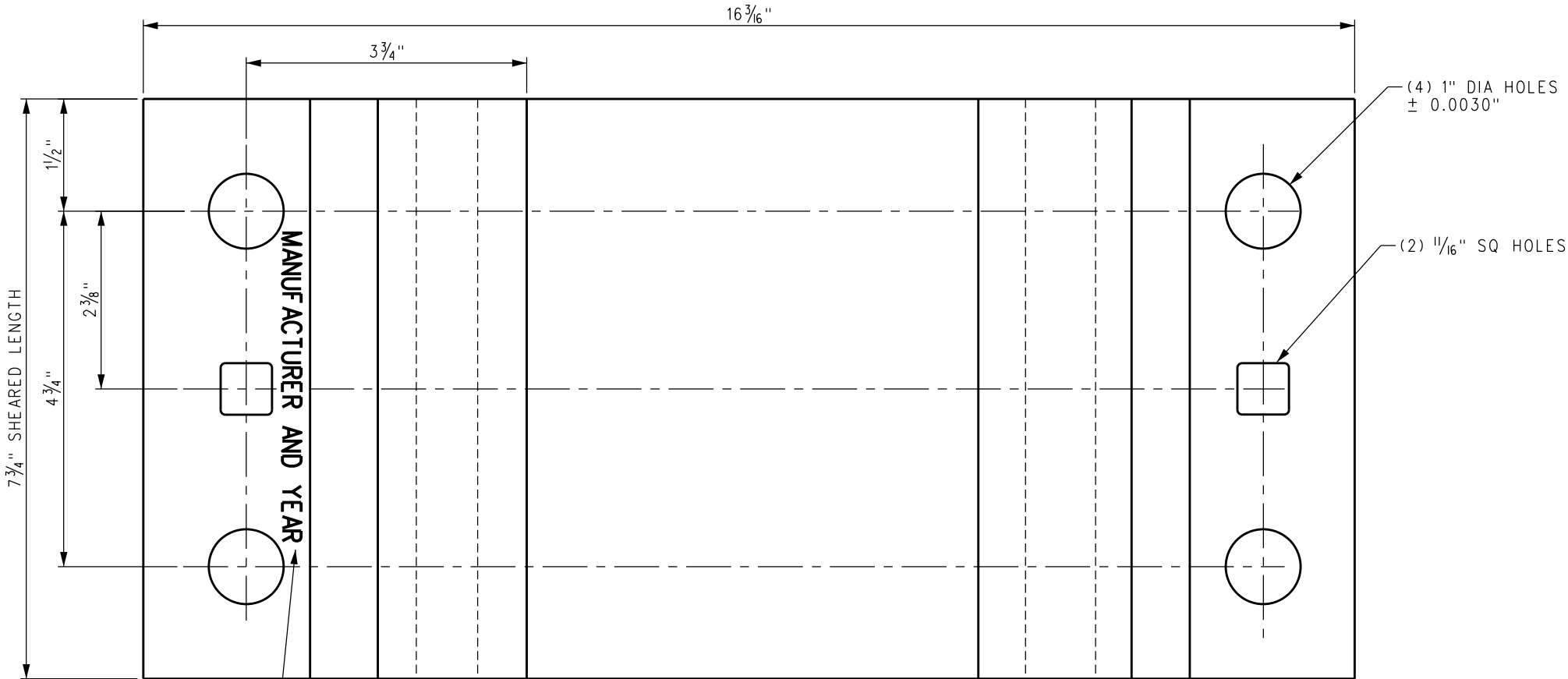
		DRAWN BY: A. CARLOS DATE: 03/31/2011		SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES. SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES TO THE LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.		 METROLINK® SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012		STANDARD 2453 SCALE: NTS REVISION SHEET - 1 OF 1 CADD FILE: ES2453	
		 ASSISTANT DIRECTOR, STANDARDS & DESIGN				ENGINEERING STANDARDS ROLLED STEEL TIE PLATE TO SUIT 5½" BASE AREMA RAIL AND PANDROL RAIL CLIPS E2055			
		 DIRECTOR OF ENGINEERING AND CONSTRUCTION							
X	XX-XX-XX	REVISION		XX	XX				
REV.	DATE	DESCRIPTION		DES.	ENG.				

NOTES:

- 1. ALL HOLE MEASUREMENTS TO BE TAKEN FROM BOTTOM OF PLATE.
- 2. PLATE TO BE STANDARD PANDROL TYPE OR APPROVED EQUAL TIE PLATE MODIFIED FOR 1" DIA HOLES.
- 3. PLATE TO BE INSTALLED WITH 2 EACH PANDROL RAIL FASTENING "e" CLIP PER SCRRRA ES2362.
- 4. PLATE TO BE INSTALLED WITH 4 EACH SCREW SPIKES PER SCRRRA ES2355.



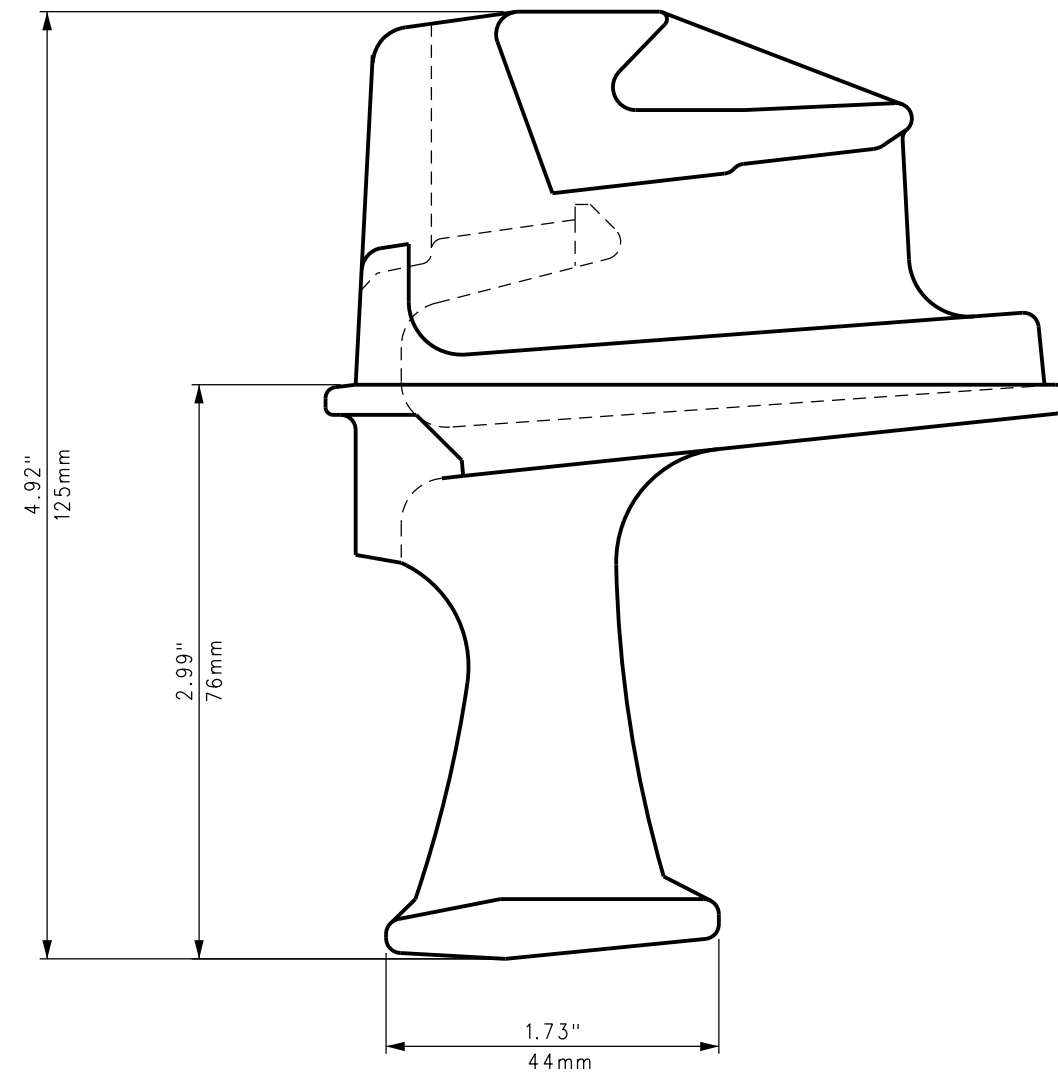
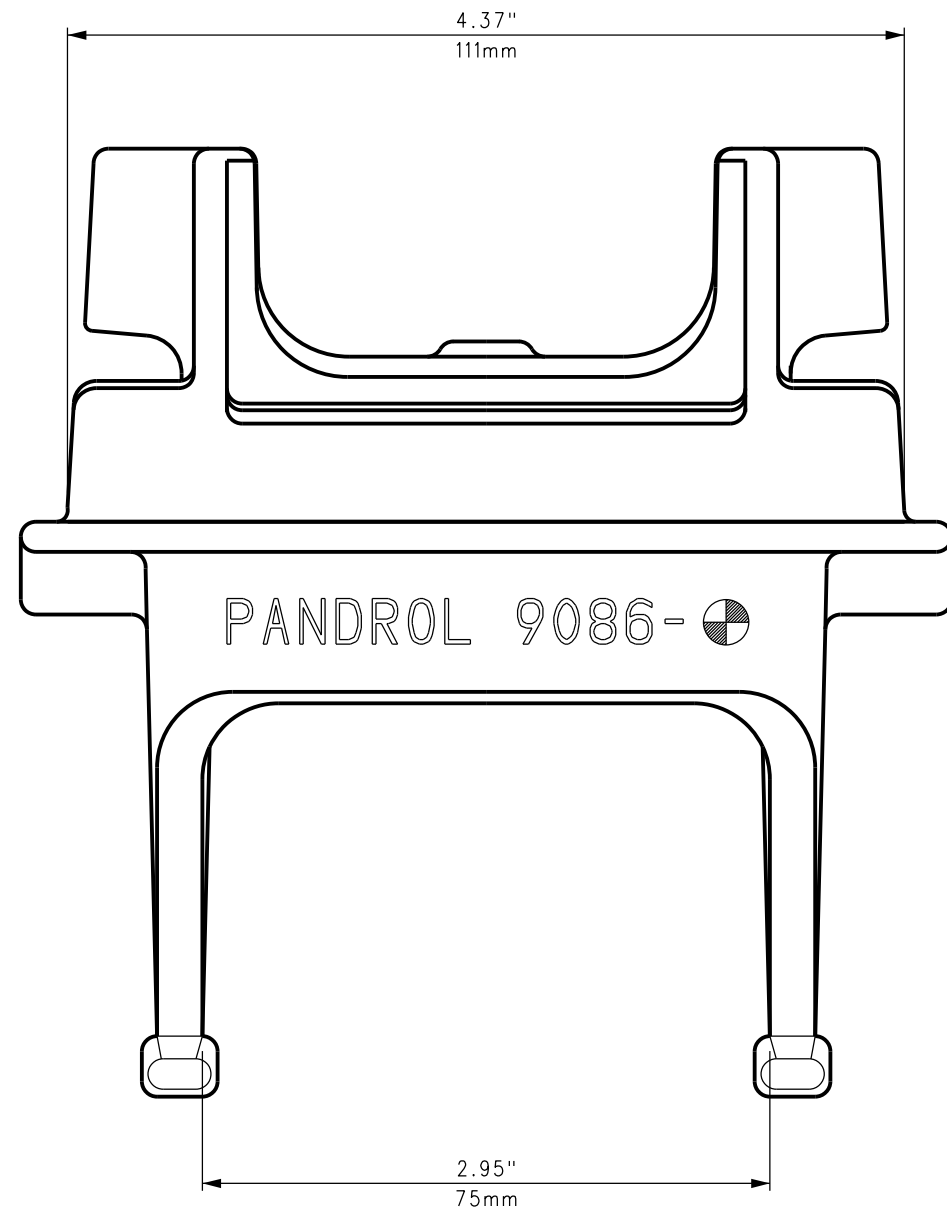
SECTION




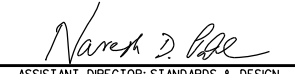
NAME OR BRAND OF MANUFACTURER AND
LAST TWO DIGITS OF YEAR MANUFACTURED
TO BE ROLLED IN RAISED LETTERS

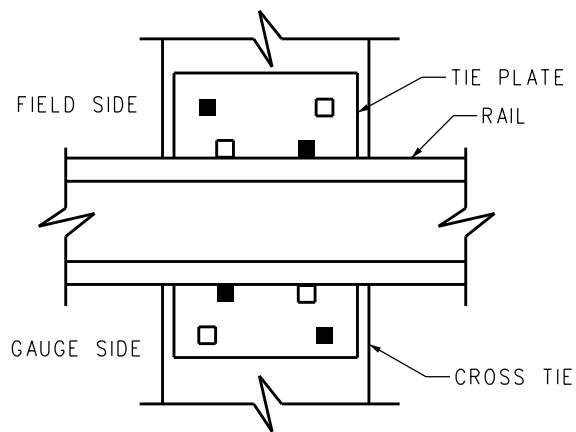
PLAN

				DRAWN BY: A. CARLOS		DATE: 03/31/2011		SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES: SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.		 METROLINK [®]		ENGINEERING STANDARDS		STANDARD	
														2454	
														SCALE: NTS	
														REVISION SHEET	
														- 1 OF 1	
														CADD FILE: ES2454	

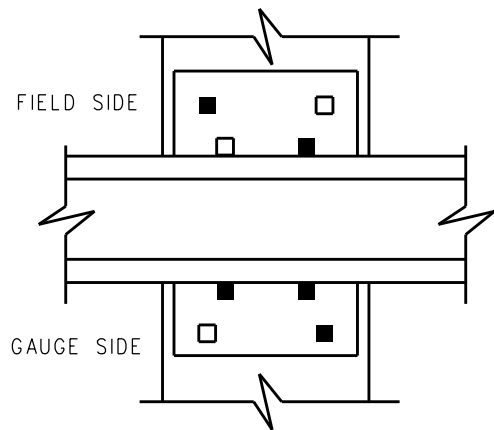


PART #9086

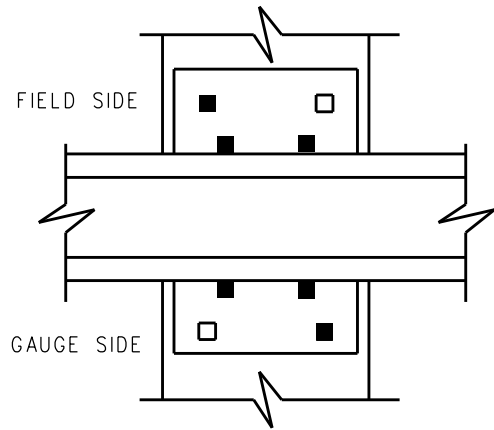
				DRAWN BY: HDR DATE: 03/31/2011		SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES: SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.		 METROLINK®		ENGINEERING STANDARDS		STANDARD 2455	
								SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY		CAST SHOULDER TO SUIT		SCALE: NTS	
				DIRECTOR OF ENGINEERING AND CONSTRUCTION				ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012		SERIES FC1600 FASTCLIP		REVISION SHEET NTS	
X XX-XX-XX		REVISION		XX XX								CADD FILE: ES2455	
REV. DATE		DESCRIPTION		DES. ENG.									



TANGENT AND CURVES 2° AND LESS
FIGURE A

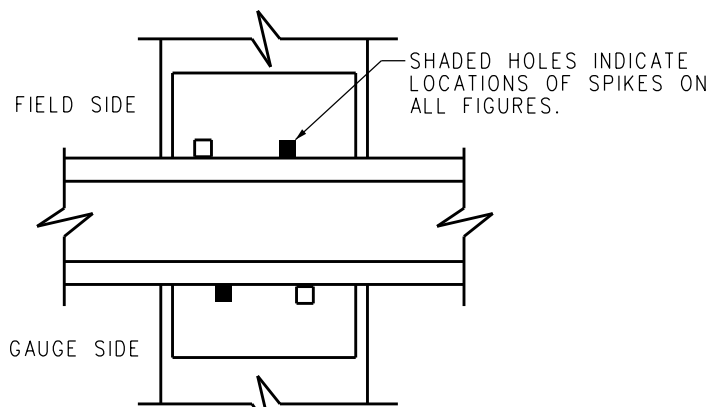


CURVES 2°01' TO 4°
FIGURE B

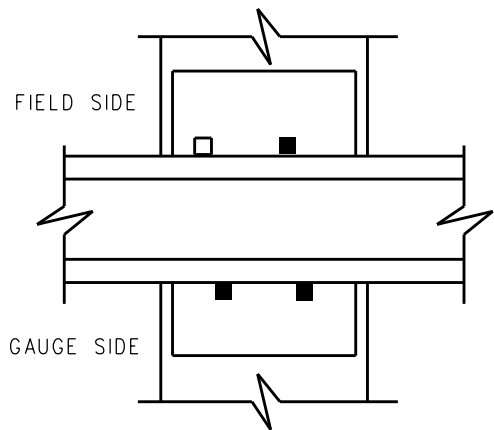


CURVES > 4°
FIGURE C

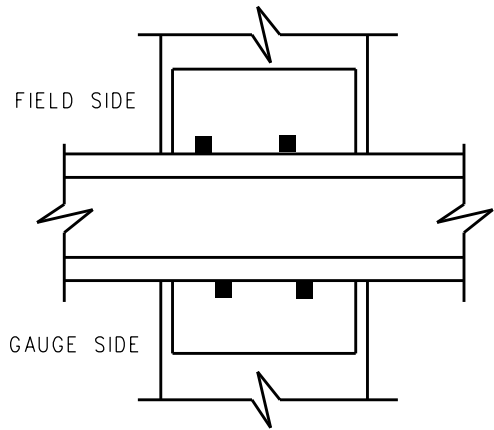
**TIE PLATE WITH
HOLD-DOWN SPIKE HOLES**
"NEW CONSTRUCTION"



TANGENT TRACK WHERE SPEED IS 25 MPH FREIGHT
OR 30 MPH PASSENGER OR LESS
YARD AND INDUSTRY TRACK < 6° CURVES
FIGURE D

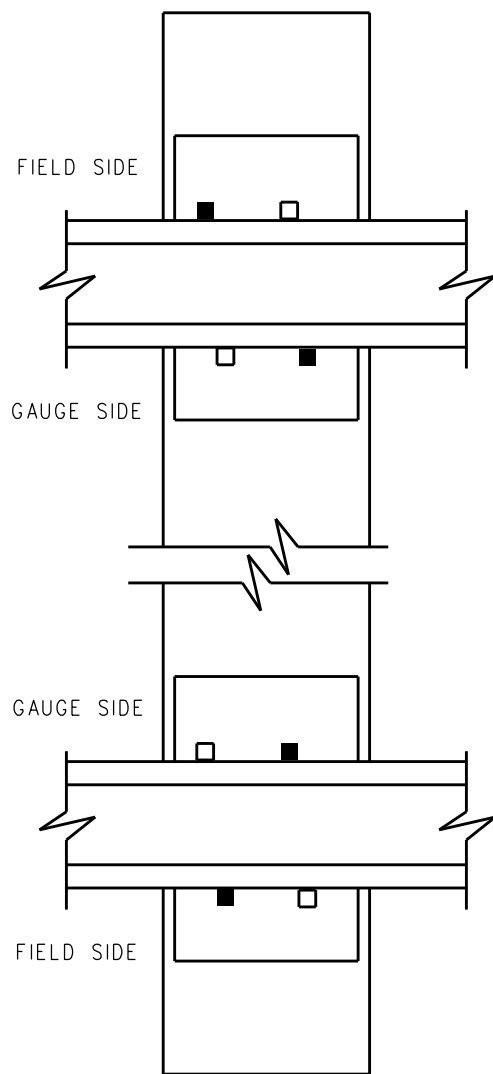


TANGENT AND CURVES TO 4°
YARD AND INDUSTRY TRACK > 6° CURVES
FIGURE E



CURVES > 4°
FIGURE F

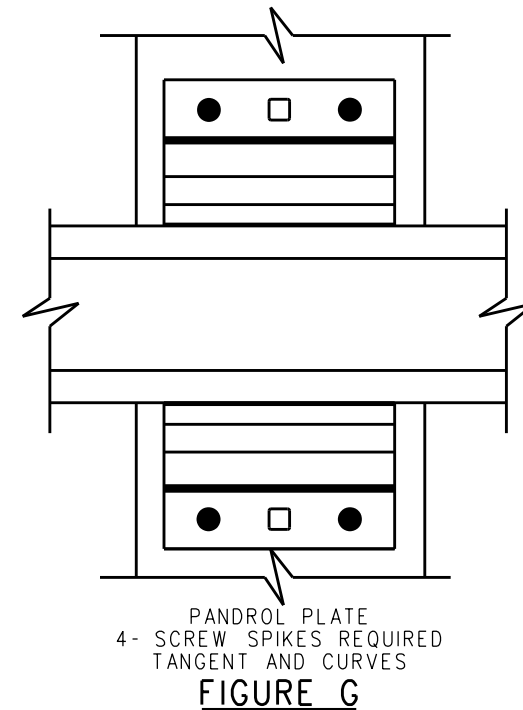
**TIE PLATE WITHOUT
HOLD-DOWN SPIKE HOLES**
"MAINTENANCE ONLY"



TANGENT AND CURVES TO 4°
YARD AND INDUSTRY TRACK > 6° CURVES
FIGURE H

NOTES:

- TIE PLATE SPIKING FOR PLATES WITH HOLD-DOWN SPIKE HOLES.
 - FIGURE A - TANGENT AND CURVES TO 2°00' - 4 SPIKES REQUIRED, 2 LINE AND 2 HOLD-DOWN.
 - FIGURE B - CURVES 2°01' TO 4°00' INCLUSIVE - 5 SPIKES REQUIRED, 3 LINE AND 2 HOLD-DOWN.
 - FIGURE C - CURVES OVER 4°00' - 6 SPIKES REQUIRED, 4 LINE AND 2 HOLD-DOWN.
- TIE PLATE SPIKING FOR PLATES WITHOUT HOLD-DOWN SPIKE HOLES.
 - FIGURE D - TANGENT TRACK WHERE THE MAXIMUM OPERATING SPEED DOES NOT EXCEED 25 MPH FOR FREIGHT AND 30 MPH FOR PASSENGER TRAINS, 2 LINE SPIKES REQUIRED.
 - FIGURE E - TANGENT AND CURVES TO 4°00' INCLUSIVE, 3 LINE SPIKES REQUIRED.
 - FIGURE F - CURVES OVER 4°00' - 4 LINE SPIKES REQUIRED.
- TIE PLATE SPIKING FOR PANDROL TYPE FASTENING SYSTEMS FIGURE G, 4 SCREW SPIKES REQUIRED.
- FIGURE H - THIS PATTERN TO BE USED ONLY ON EXISTING TRACK SO SPIKED.
- ANY VARIATIONS IN THE SPIKING PATTERNS ILLUSTRATED IN FIGURES A THRU F MUST BE APPROVED BY THE SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
- YARD AND INDUSTRY TRACK TO BE SPIKED WITH NOT LESS THAN TWO SPIKES TO EACH TIE PLATE.
- REFER TO SCRRRA ES2460-02 FOR "SP" PLATES.
- CUT SPIKES MAY BE USED ON PANDROL PLATE SQUARE HOLES FOR TEMPORARY ASSEMBLY OF TRACK. THEY WILL NOT BE REMOVED AFTER INSTALLATION OF SCREW SPIKES.



PANDROL PLATE
4- SCREW SPIKES REQUIRED
TANGENT AND CURVES
FIGURE G

						DRAWN BY: A. CARLOS	DATE: 04/12/02	SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES:
								SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.
						<i>Nancy D. Pae</i>		
						ASSISTANT DIRECTOR: STANDARDS & DESIGN		
						<i>William D. Davis</i>		
						DIRECTOR OF ENGINEERING AND CONSTRUCTION		
A	05/01/12	ADDED FIGURE H	AC	NDP				
REV.	DATE	DESCRIPTION	DES.	ENG.				



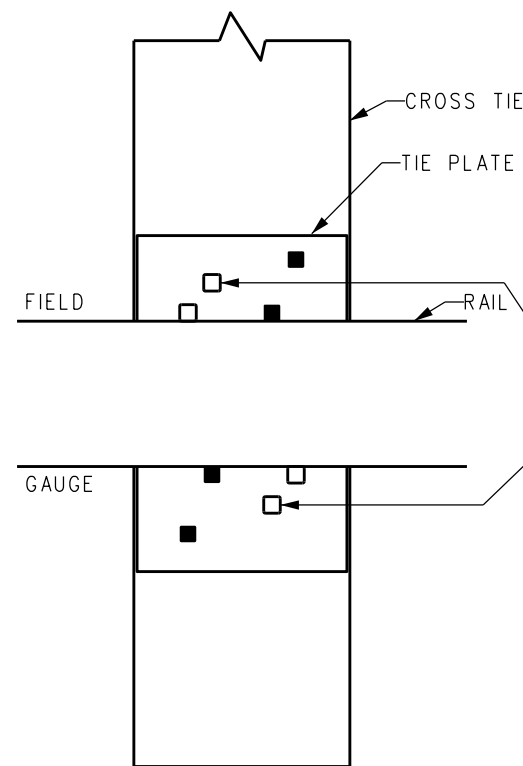
METROLINK

SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

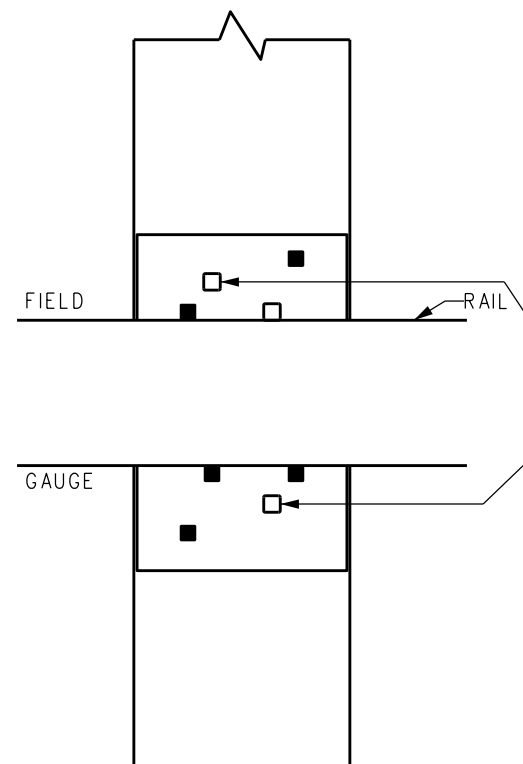
ENGINEERING STANDARDS

TIE PLATE SPIKING PATTERNS

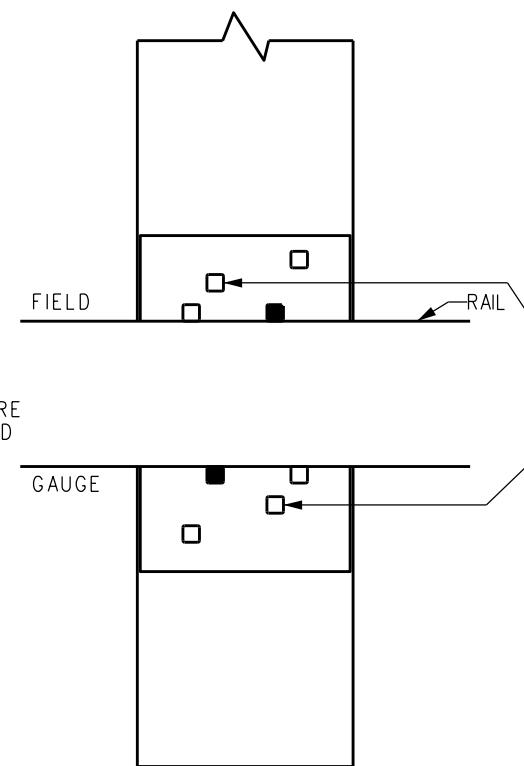
STANDARD	2460
SCALE:	NTS
REVISION	SHEET
A	1 OF 2
CADD FILE:	ES2460-01



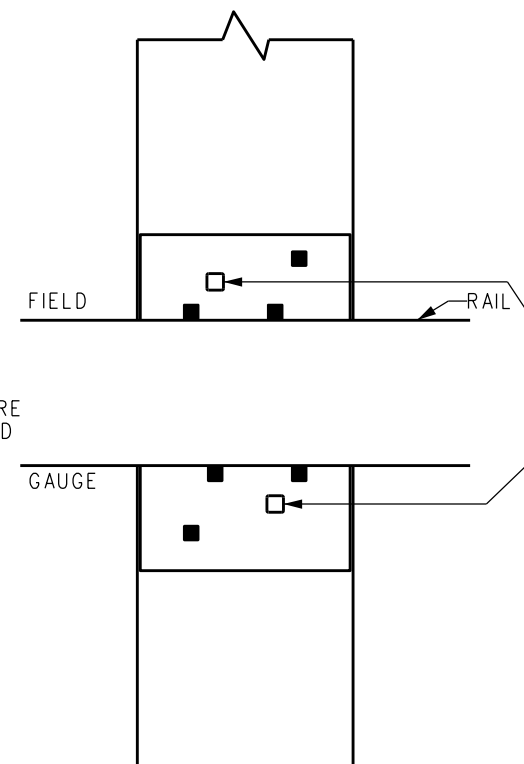
TANGENT AND CURVES TO 2°
(FIGURE A)



CURVES OVER 2° TO 4°
(FIGURE B)



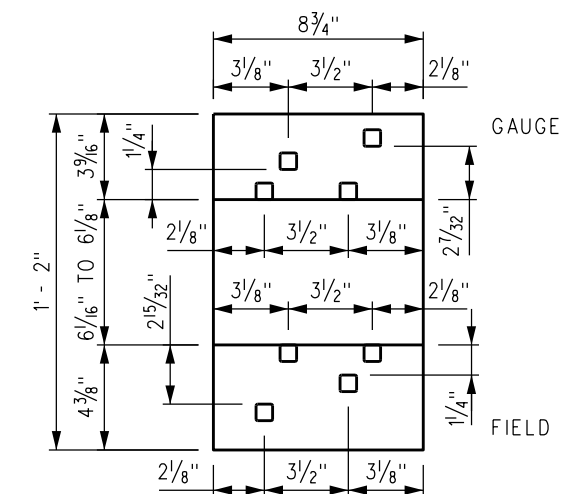
YARD AND INDUSTRY TRACK
MIN SPIKES PER PLATE



CURVES > 4°
(FIGURE C)

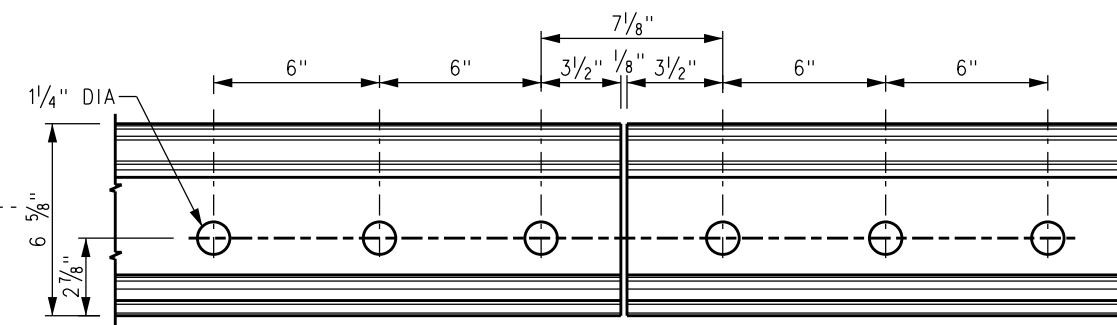
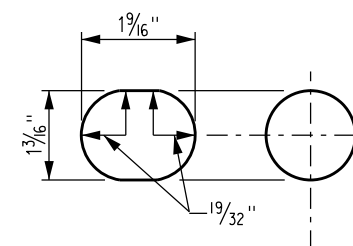
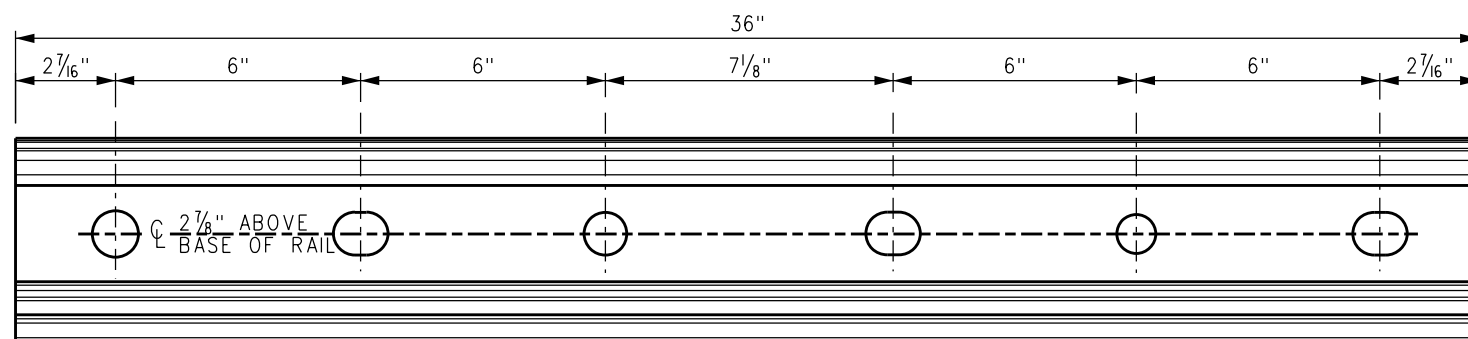
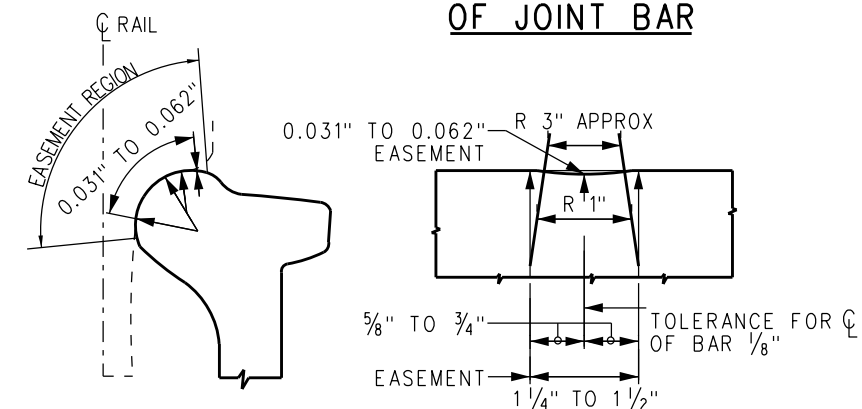
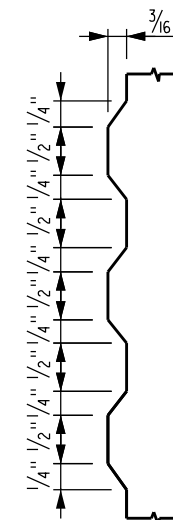
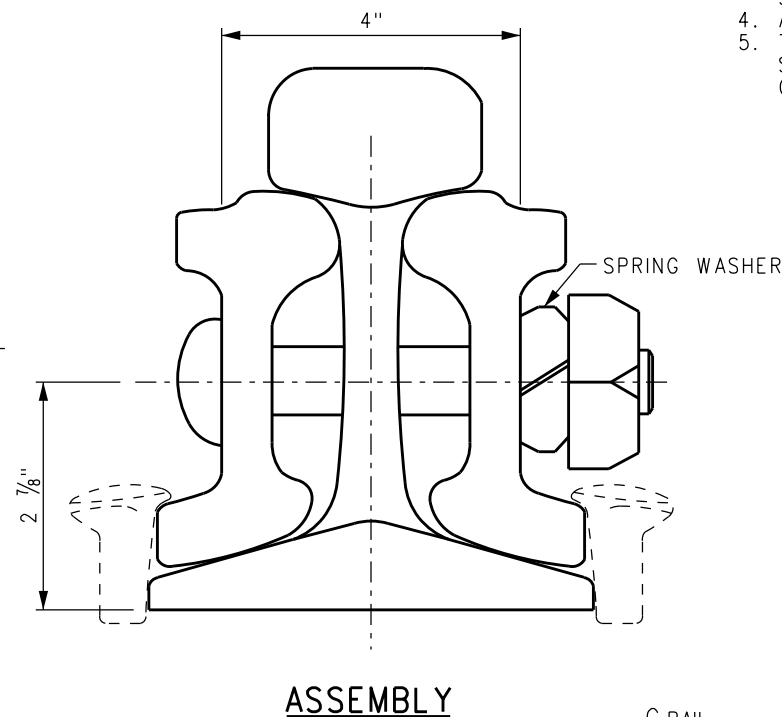
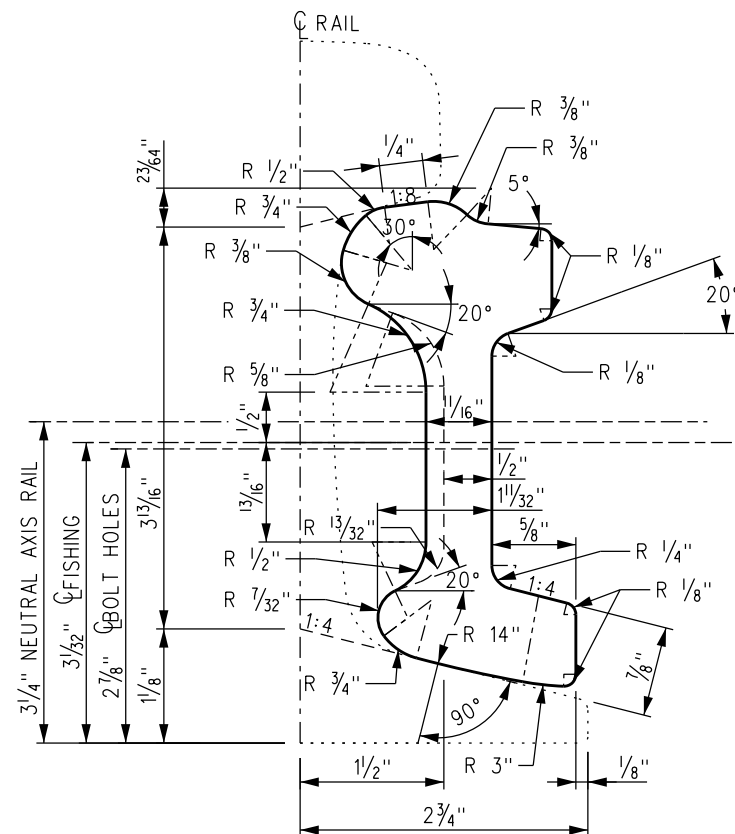
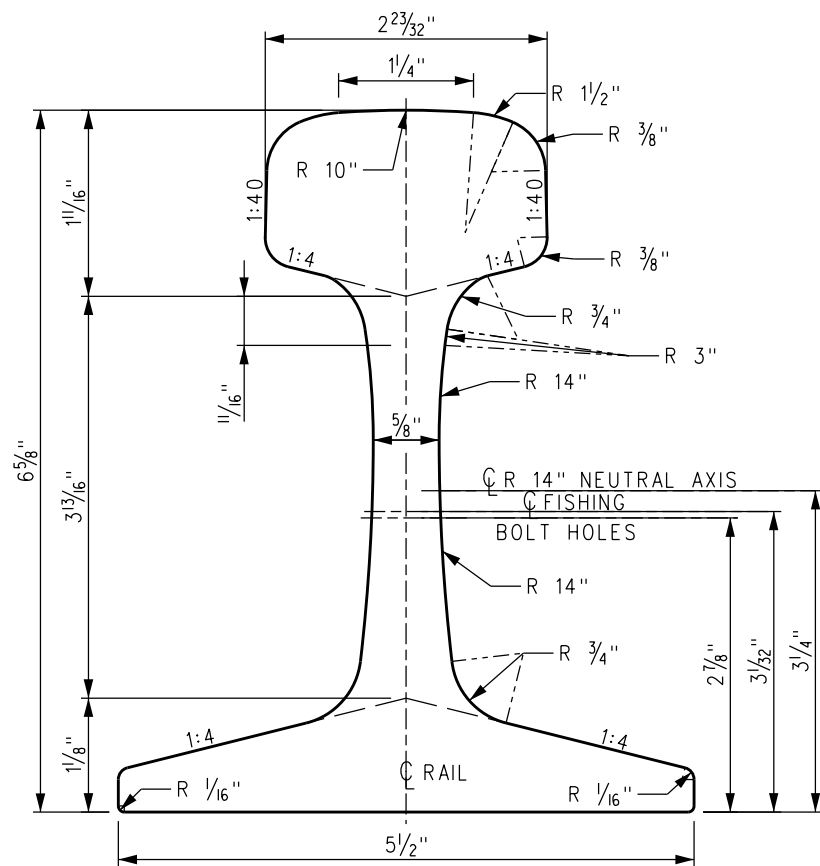
NOTE:

1. TIE PLATE SPIKING FOR PLATES WITH HOLD-DOWN SPIKE HOLES.
2. FIGURE A - TANGENT TO 2°00' - 4 SPIKES REQUIRED, 2 LINES AND 2 HOLD-DOWN.
3. FIGURE B - CURVES OVER 2°00' TO 4°00' INCLUSIVE - 5 SPIKES REQUIRED, 3 LINE AND 2 HOLD-DOWN
4. FIGURE C - OVER 4°00' - 6 SPIKES REQUIRED, 4 LINE AND 2 HOLD-DOWN





TIE PLATE



--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



- NOTES:

1. RAILS, JOINT BARS AND TRACK BOLTS SHALL CONFORM TO THE SCRRRA CURRENT SPECIFICATION.
2. REQUISITIONS AND ORDERS FOR TRACK BOLTS SHALL DESIGNATE DIAMETER OF BOLT PER SCRRRA ES2352.
3. LENGTH OF TRACK BOLT WILL PERMIT USE OF SPRING WASHER UP TO APPROXIMATELY 0.78" THICK.
4. ALL BOLT HOLES SHALL BE CHAMFERED.
5. THIS PLAN FOR USE IN NEW RAIL INSTALLATION (SEE SCRRRA ES2501-02) FOR EXISTING 115 LB 5"x6½" (OLD SP PUNCH).

								DRAWN BY:	A. CARLOS	DATE:	03/31/20
								<div> ASSISTANT DIRECTOR: STANDARDS & DESIGN  DIRECTOR OF ENGINEERING AND CONSTRUCTION</div>			
X	XX-XX-XX		REVISION		XX	XX					
REV.	DATE		DESCRIPTION		DES.	ENG.					

DRAWN BY:	A. CARLOS	DATE:	03/31/2011
			
ASSISTANT DIRECTOR: STANDARDS & DESIGN			
			
DIRECTOR OF ENGINEERING AND CONSTRUCTION			

SCRA ENGINEERING STANDARDS ARE INTENDED FOR SCRA APPROVED USES ONLY. FOR NON-SCRA APPROVED USES, SCRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. IF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRA, ALL RIGHTS RESERVED.



METROLINK®

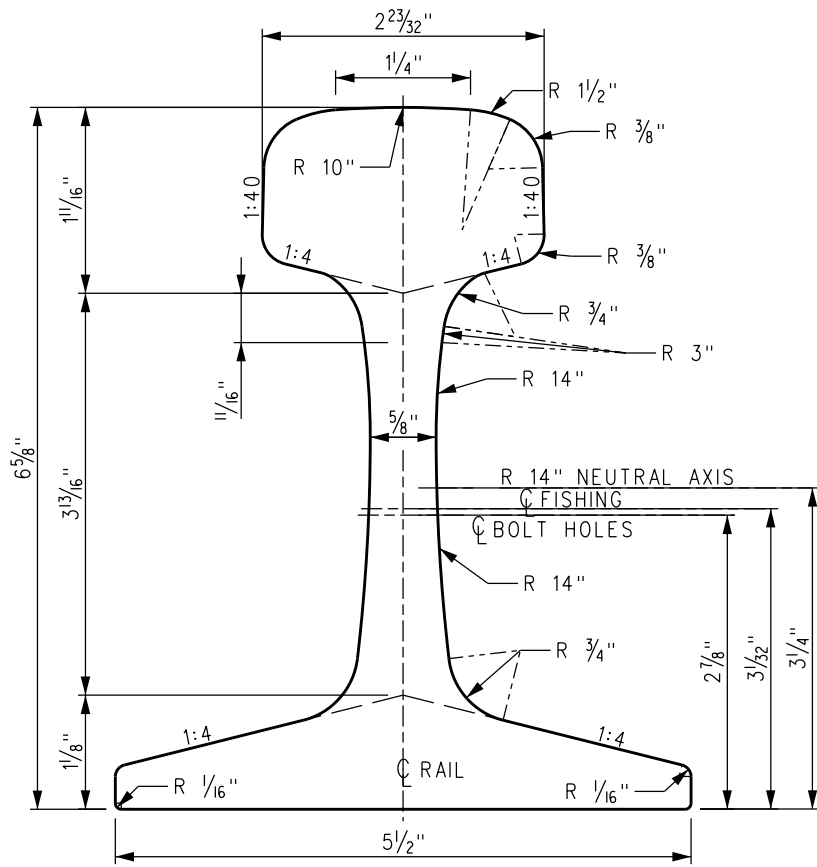
SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

ENGINEERING STANDARDS

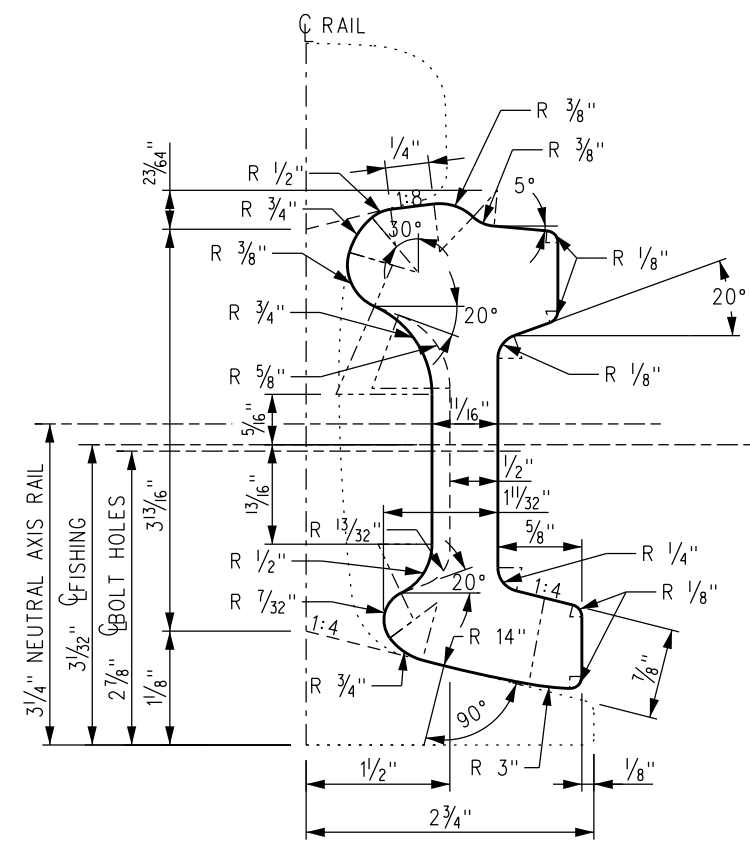
RAIL AND JOINT ASSEMBLY FOR 115 LB. RE RAIL

STANDARD		250
SCALE:		NTS
REVISION	SHEET	
—	1 OF 2	
CADD FILE:		ES2501-0

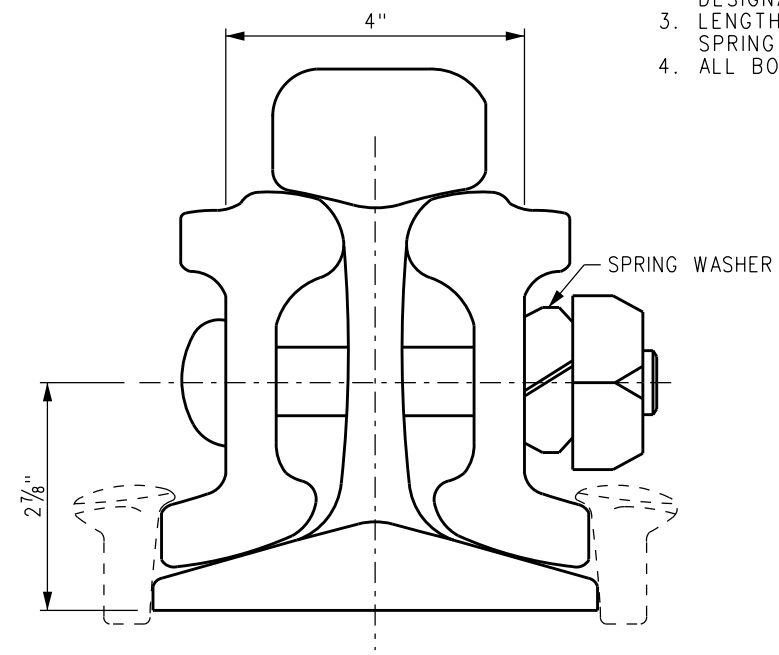
- NOTES:
- 1. RAILS, JOINT BARS AND TRACK BOLTS SHALL CONFORM TO THE SCRRRA CURRENT SPECIFICATION.
 - 2. REQUISITIONS AND ORDERS FOR TRACK BOLTS SHALL DESIGNATE DIAMETER OF BOLT PER SCRRRA ES2352.
 - 3. LENGTH OF TRACK BOLT WILL PERMIT USE OF SPRING WASHER UP TO APPROXIMATELY 0.78" THICK.
 - 4. ALL BOLT HOLES SHALL BE CHAMFERED.



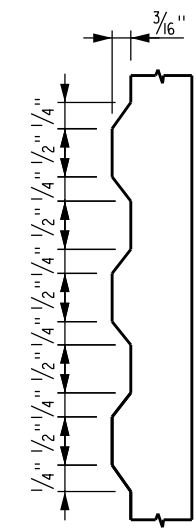
115 RE RAIL



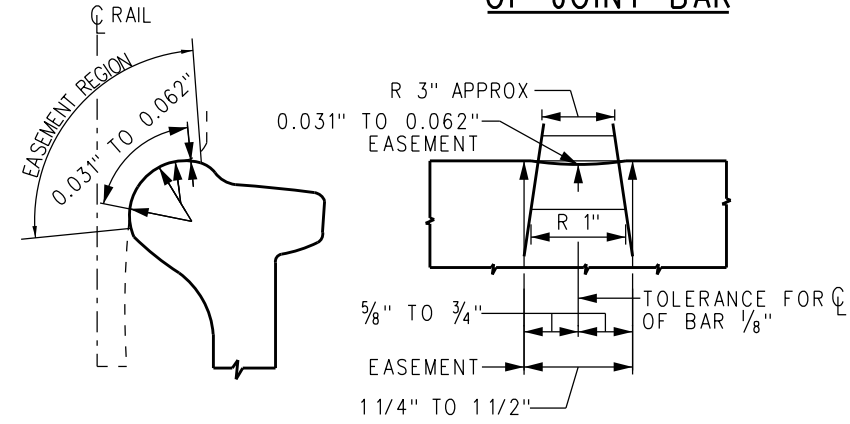
JOINT BAR



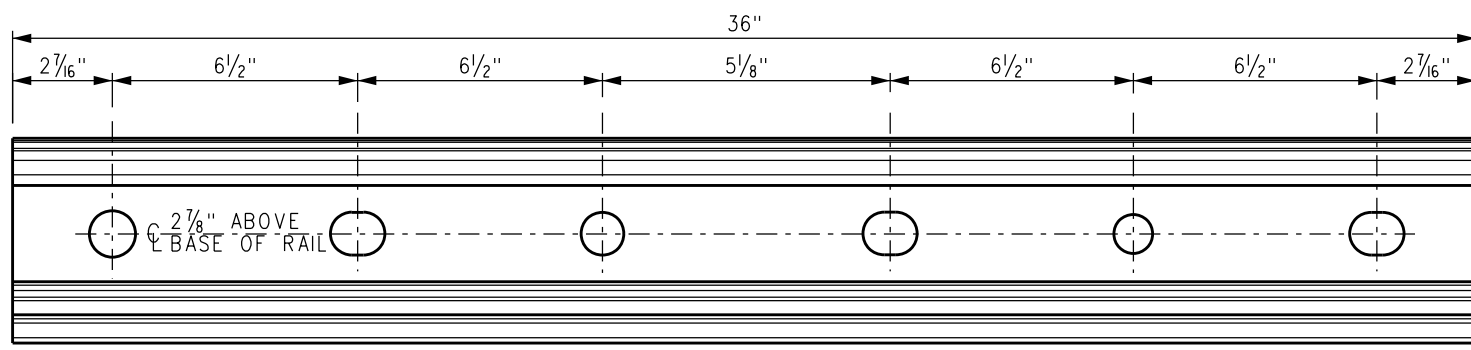
ASSEMBLY



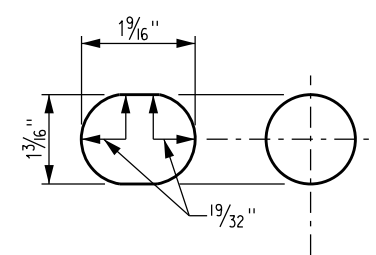
LONGITUDINAL SECTION OF JOINT BAR



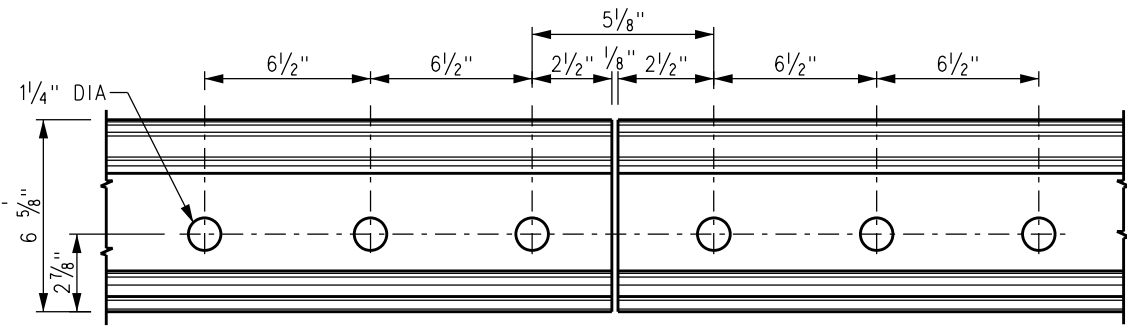
DETAIL OF HEAD EASEMENT



JOINT BAR PUNCHING (FRONT VIEW)

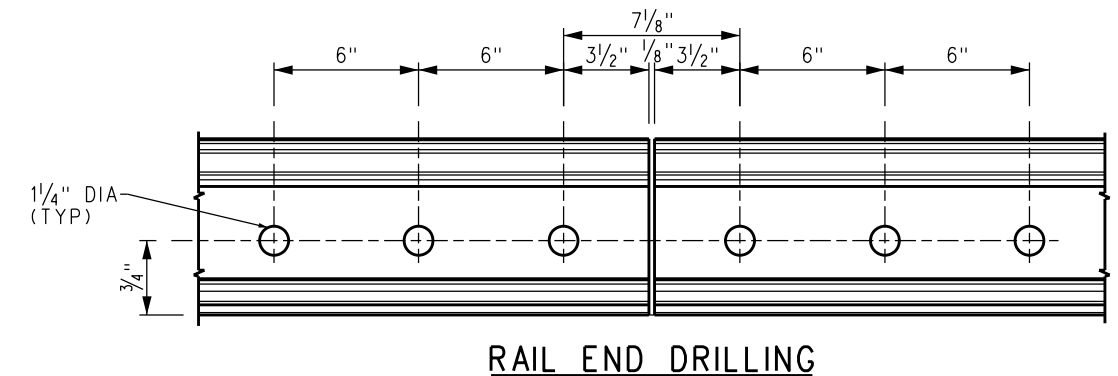
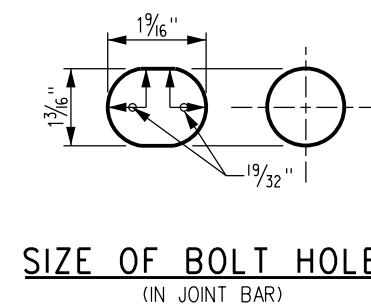
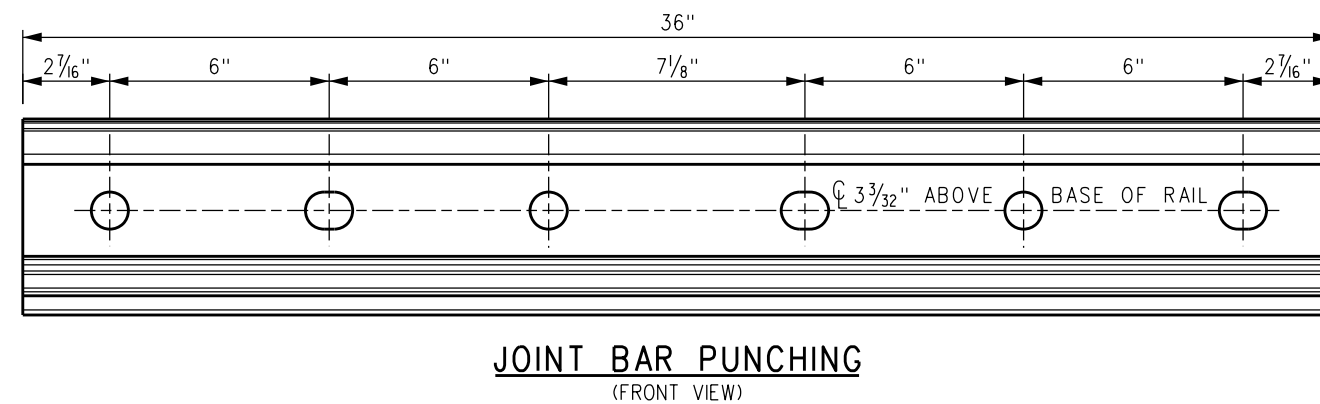
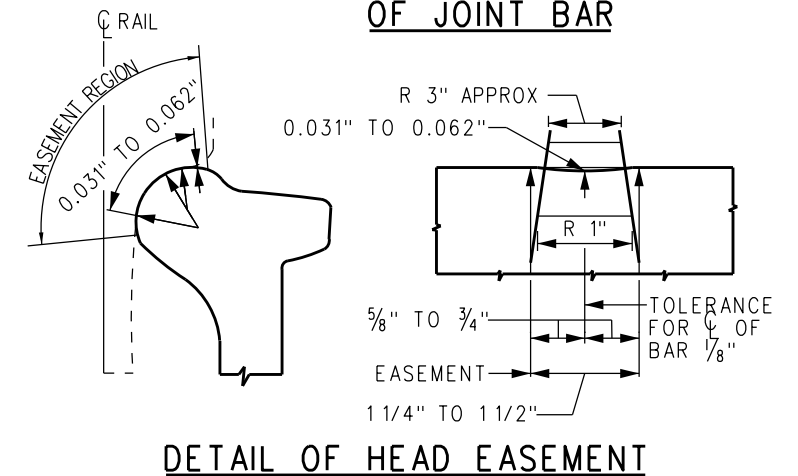
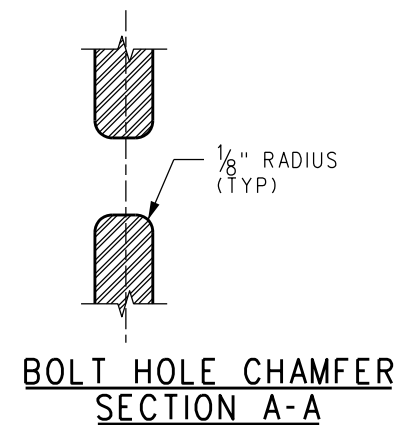
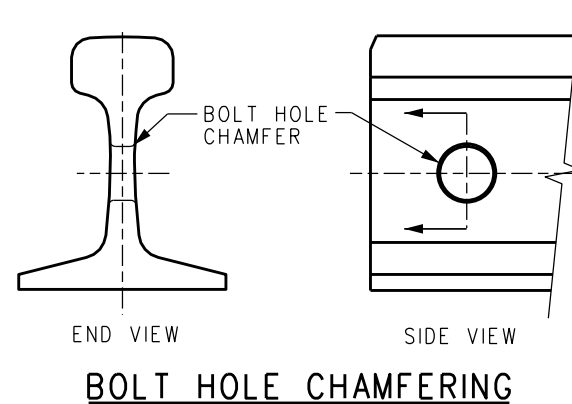
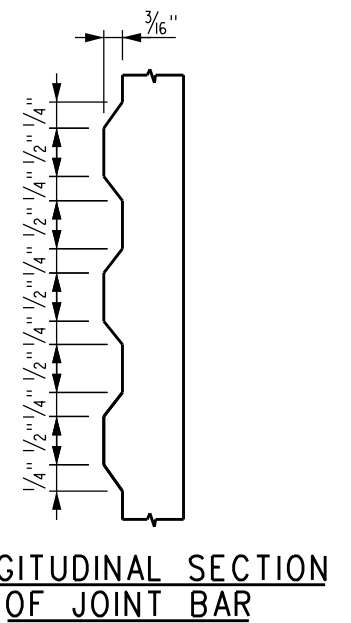
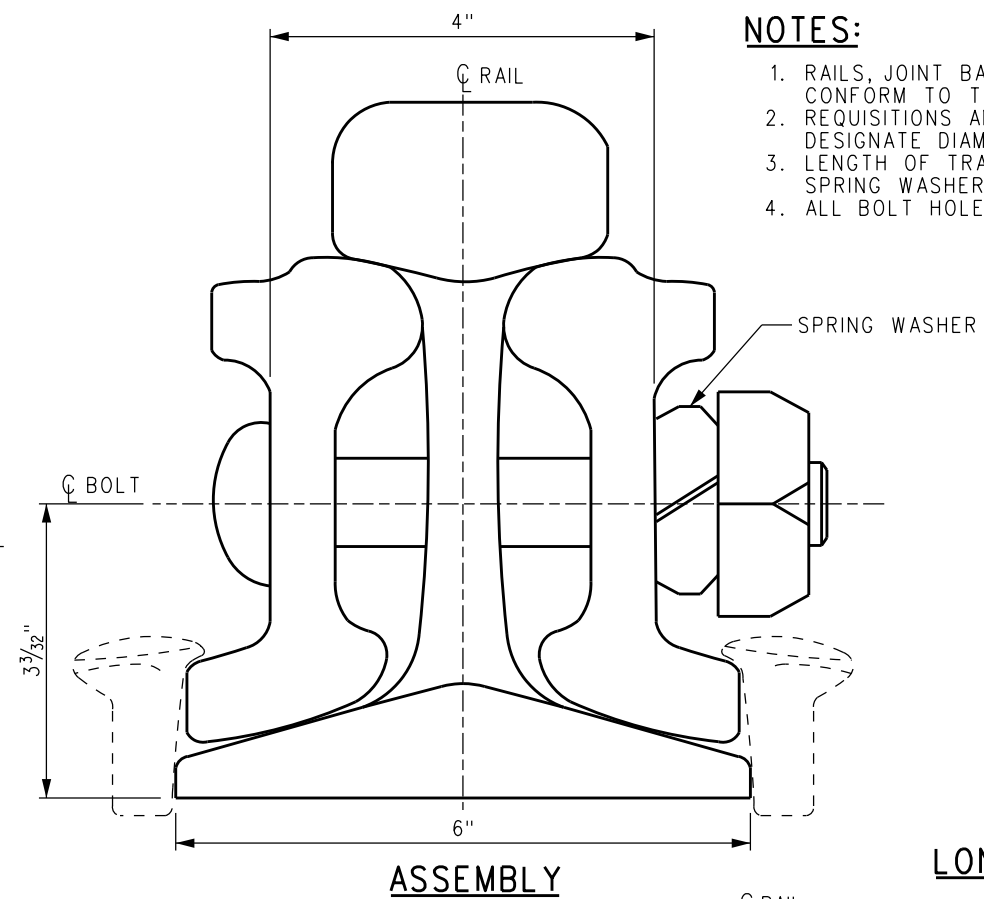
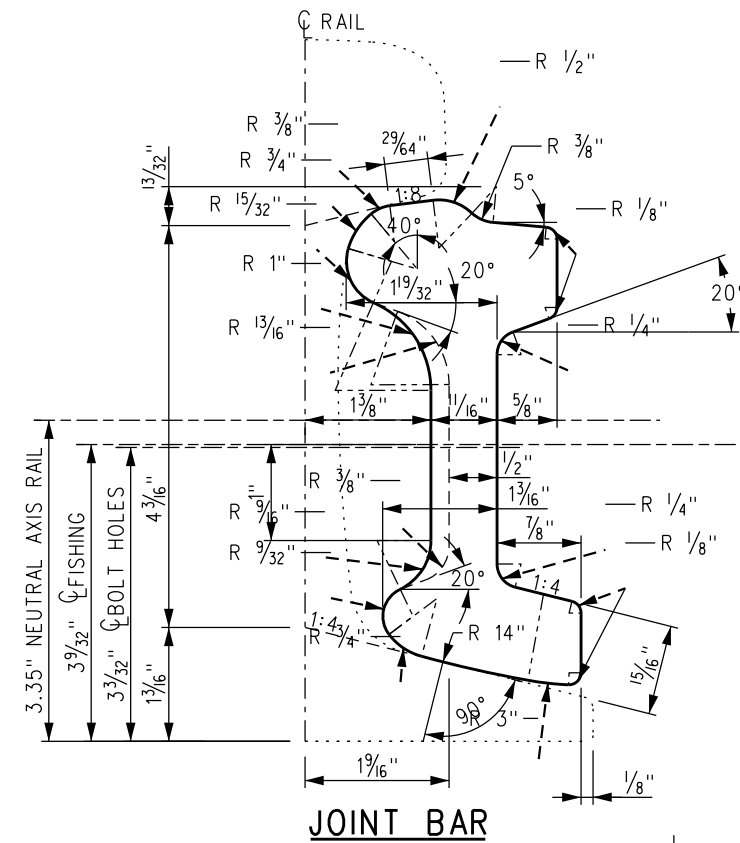
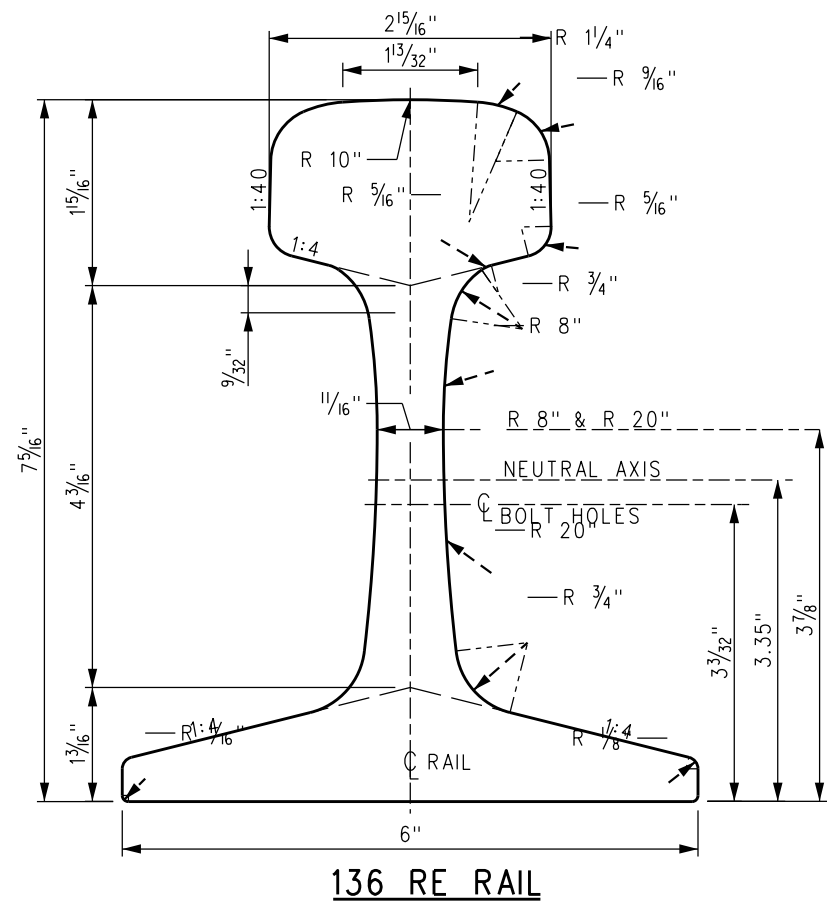


SIZE OF BOLT HOLES (INJOINT BAR)



RAIL END DRILLING

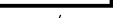

				DRAWN BY: A. CARLOS		DATE: 03/31/2011		SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES, SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.		 METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012		ENGINEERING STANDARDS		STANDARD 2501	
				REVISION		SHEET		RAIL AND JOINT ASSEMBLY FOR 115 LB. RE RAIL FOR MAINTENANCE USE WITH FORMER "SP" PUNCH 2 1/2" x 6 1/2" x 6 1/2"		SCALE: NTS		REVISION		2 OF 2	
				REV.		DATE		DESCRIPTION		DES.		ENG.		CADD FILE:	
														ES2501-02	



- NOTES:

1. RAILS, JOINT BARS AND TRACK BOLTS SHALL CONFORM TO THE SCRRRA CURRENT SPECIFICATION.
2. REQUISITIONS AND ORDERS FOR TRACK BOLTS SHALL DESIGNATE DIAMETER OF BOLT PER SCRRRA ES2352.
3. LENGTH OF TRACK BOLT WILL PERMIT USE OF SPRING WASHER UP TO APPROXIMATELY 0.76" THICK.
4. ALL BOLT HOLES SHALL BE CHAMFERED.

						DRAWN BY:	A. CARLOS	DATE:	03/31/2
X	XX-XX-XX		REVISION		XX	XX			
REV.	DATE		DESCRIPTION		DES.	ENG.			

DRAWN BY:	A. CARLOS	DATE:	03/31/21
 Narex D. Pae ASSISTANT DIRECTOR: STANDARDS & DESIGN			
 Wilton Dacan DIRECTOR OF ENGINEERING AND CONSTRUCTION			

SCRA ENGINEERING STANDARDS ARE INTENDED FOR SCRA APPROVED USES ONLY. FOR NON-SCRA APPROVED USES:

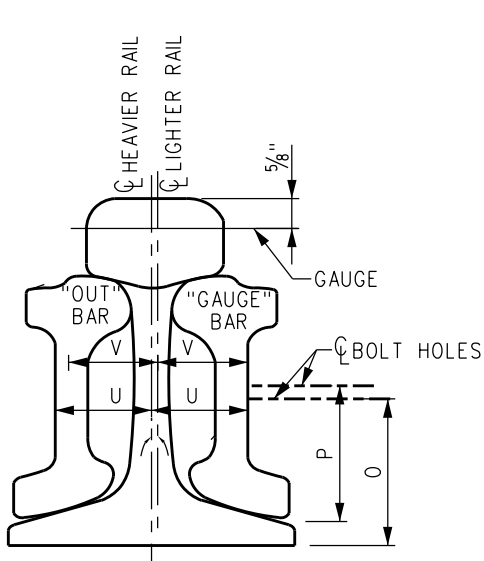
SCRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRA. ALL RIGHTS RESERVED


METROLINK®
 SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
 ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

ENGINEERING STANDARDS

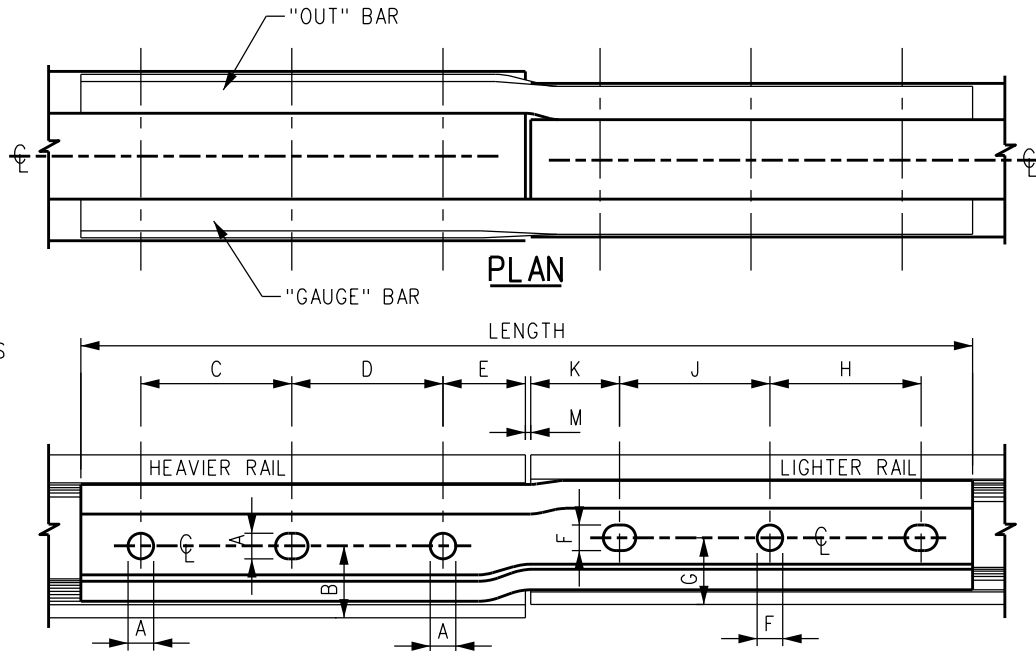
RAIL AND JOINT ASSEMBLY
FOR 136 LB. RE RAIL

STANDARD		2502
SCALE:		NTS
REVISION	SHEET	
-	1 OF 1	
CADD FILE:		ES2502

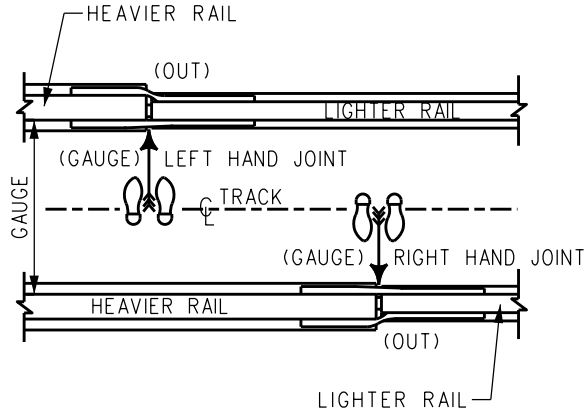


END ELEVATION

1. THIRD HOLE IN 110 LB RAIL TO BE DRILLED IN THE FIELD.
2. USE STANDARD JOINT BAR PER ES2501, MACHINED & LABELED TO INDICATE RAIL SIZE AND GAUGE AND FIELD SIDES.
3. USE STANDARD JOINT BAR PER ES2502, MACHINED & LABELED TO INDICATE RAIL SIZE AND GAUGE AND FIELD SIDES.



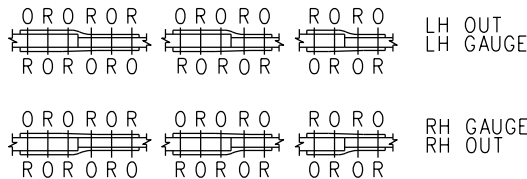
ELEVATION OF "GAUGE" BAR



IDENTIFICATION SKETCH

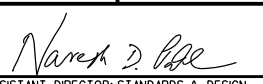
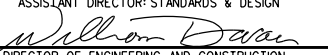
NOTES

1. THIS PLAN SHOWS GENERAL INFORMATION FOR COMPROMISE JOINTS. SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION WILL FURNISH DETAIL PLANS FOR THE MANUFACTURER.
2. TO DETERMINE RIGHT HAND OR LEFT HAND JOINT: STAND BETWEEN RAILS IN THE TRACK, FACING RAILS TO BE JOINED. WHEN HEAVIER RAIL IS ON THE RIGHT HAND SIDE, IT IS A RIGHT HAND JOINT AND WHEN HEAVIER RAIL IS ON THE LEFT HAND SIDE, IT IS A LEFT HAND JOINT. ONE RIGHT HAND AND ONE LEFT HAND JOINT FORM A SET (FOUR BARS).
3. EACH BAR TO BE MARKED WITH THE FOLLOWING STAMPED IN DATA: SECTION OF RAIL, AT EACH END, "RH" OR "LH", FOR RIGHT HAND OR LEFT HAND, "GAUGE" OR "OUT", FOR GAUGE SIDE OR OUTSIDE, PATTERN NUMBER, NAME OR TRADE MARK OF MANUFACTURER, YEAR MANUFACTURED.
4. ON ACCOUNT OF VARIOUS RAIL DRILLINGS FOR SECTIONS OTHER THAN SHOWN, REQUISITIONS AND ORDERS FOR COMPROMISE JOINTS FOR SUCH OTHER RAIL SHALL SHOW DIMENSIONS FOR B, F, J, K, AND O. FOR HEAVIER RAIL AND D, G, M AND P FOR THE LIGHTER RAIL.
5. BOLTS FOR COMPROMISE JOINTS ARE SAME AS FOR CORRESPONDING STANDARD JOINT BARS.
6. THE TYPE OF HOLES IN COMPROMISE BARS ARE AS SHOWN BELOW. "R" DENOTES ROUND HOLES AND "O" DENOTES OVAL HOLES.



COMPROMISE JOINT DIMENSIONS AND LENGTHS:																		
HEAVIER RAIL : LIGHTER RAIL		LENGTH	HEAVY		A	B	C	D	E	LIGHT		F	G	H	J	K	AMOUNT OF WEAR	GAP BETWEEN RAIL ENDS
			RAIL HEIGHT	BOLT DIA	DIAMETER OF HOLE IN BAR	BASE RAIL TO CL OF RAIL DRILLING	CTR 2nd TO CTR 3rd HOLE	CTR 1st TO CTR 2nd HOLE	RAIL END TO CTR 1st HOLE	RAIL HEIGHT	BOLT DIA	DIAMETER OF HOLE IN RAIL	BASE RAIL TO CL OF RAIL DRILLING	CTR 2nd TO CTR 3rd HOLE	CTR 1st TO CTR 2nd HOLE	RAIL END TO CTR 1st HOLE		
141 RE To 136 RE		36"	7 1/16"	1 1/8"	1 5/16"	3 3/32"	6"	6"	3 1/2"	7 5/16"	1 1/8"	1 5/16"	3 3/32"	6"	6"	3 1/2"	--	1/8"
141 RE To 132 RE		36"	7 1/16"	1 1/8"	1 5/16"	3 3/32"	6"	6"	3 1/2"	7 1/8"	1 1/8"	1 5/16"	3 3/32"	6"	6"	3 1/2"	1/4"	1/8"
141 RE To 119 CFI		36"	7 1/16"	1 1/8"	1 5/16"	3 3/32"	6"	6"	3 1/2"	6 13/16"	1 1/8"	1 5/16"	2 7/8"	6"	6"	3 1/2"	1/4"	1/8"
141 RE To 115 RE (MAINT ONLY)		36"	7 1/16"	1 1/8"	1 5/16"	3 3/32"	6"	6"	3 1/2"	6 5/8"	1 1/8"	1 5/16"	2 7/8"	6 1/2"	6 1/2"	2 1/2"	1/4"	1/8"
141 RE To 115 RE		36"	7 1/16"	1 1/8"	1 5/16"	3 3/32"	6"	6"	3 1/2"	6 5/8"	1 1/8"	1 5/16"	2 7/8"	6"	6"	3 1/2"	1/4"	1/8"
136 RE To 132 RE		36"	7 1/16"	1 1/8"	1 5/16"	3 3/32"	6"	6"	3 1/2"	7 1/8"	1 1/8"	1 5/16"	3 3/32"	6"	6"	3 1/2"	1/4"	1/8"
136 RE To 119 CFI		36"	7 5/16"	1 1/8"	1 5/16"	3 3/32"	6"	6"	3 1/2"	6 13/16"	1 1/8"	1 5/16"	2 7/8"	6"	6"	3 1/2"	1/4"	1/8"
136 RE To 115 RE (MAINT ONLY)		36"	7 5/16"	1 1/8"	1 5/16"	3 3/32"	6"	6"	3 1/2"	6 5/8"	1 1/8"	1 5/16"	2 7/8"	6 1/2"	6 1/2"	2 1/2"	1/4"	1/8"
136 RE To 115 RE		36"	7 5/16"	1 1/8"	1 5/16"	3 3/32"	6"	6"	3 1/2"	6 5/8"	1 1/8"	1 5/16"	2 7/8"	6"	6"	3 1/2"	1/4"	1/8"
132 RE To 119 CFI		36"	7 1/8"	1 1/8"	1 5/16"	3 3/32"	6 1/2"	6 1/2"	2 1/2"	6 13/16"	1 1/8"	1 5/16"	2 7/8"	6"	6"	3 1/2"	--	1/8"
132 RE To 115 RE		36"	7 1/8"	1 1/8"	1 5/16"	3 3/32"	6"	6"	3 1/2"	6 5/8"	1 1/8"	1 5/16"	2 7/8"	6"	6"	3 1/2"	--	1/8"
132 RE To 115 RE (MAINT ONLY)		36"	7 1/8"	1 1/8"	1 5/16"	3 3/32"	6 1/2"	6 1/2"	2 1/2"	6 5/8"	1 1/8"	1 5/16"	2 7/8"	6 1/2"	6 1/2"	2 1/2"	--	1/8"
119 RE To 115 RE		36"	6 13/16"	1 1/8"	1 5/16"	2 7/8"	6"	6"	3 1/2"	6 5/8"	1 1/8"	1 5/16"	2 7/8"	6 1/2"	6 1/2"	2 1/2"	--	1/8"
115 RE To 110 RE (MAINT ONLY)		30"	6 5/8"	1 1/8"	1 5/16"	2 7/8"	6 1/2"	6 1/2"	2 1/2"	6 1/4"	1"	1 3/16"	2 5/8"	--	5 1/2"	2 11/16"	--	1/8"
115 RE To 110 RE		30"	6 5/8"	1 1/8"	1 5/16"	2 7/8"	6"	6"	3 1/2"	6 1/4"	1"	1 3/16"	2 45/64"	--	5"	2 15/32"	--	1/8"
115 RE To 100 RA		30"	6 5/8"	1 1/8"	1 5/16"	2 7/8"	6"	6"	3 1/2"	6"	1"	1 3/16"	2 5/8"	--	5"	2 15/32"	--	1/8"
115 RE To 100 RE		30"	6 5/8"	1 1/8"	1 5/16"	2 7/8"	6"	6"	3 1/2"	6"	1"	1 3/16"	2 11/16"	--	5 1/2"	2 11/16"	--	1/8"
110 RE To 90 RA		24"	6 1/4"	1"	1 3/16"	2 5/8"	--	5 1/2"	2 11/16"	5 5/8"	1"	1 3/16"	2 31/64"	--	5"	2 13/32"	--	5/32"
110 RE To 85		24"	6 1/4"	1"	1 3/16"	2 5/8"	--	5 1/2"	2 11/16"	5 3/8"	1"	1 3/16"	2 29/64"	--	7"	2 1/16"	--	5/32"
90 RA To 85		24"	5 3/8"	1"	1 3/16"	2 13/16"	--	5"	2 13/32"	5 3/8"	1"	1 3/16"	2 29/64"	--	5"	2 15/32"	--	3/16"

X	XX-XX-XX	REVISION	XX	XX	
REV.	DATE	DESCRIPTION	DES.	ENG.	

DRAWN BY:	A. CARLOS	DATE:	03/31/2011
			
ASSISTANT DIRECTOR: STANDARDS & DESIGN			
			
DIRECTOR OF ENGINEERING AND CONSTRUCTION			

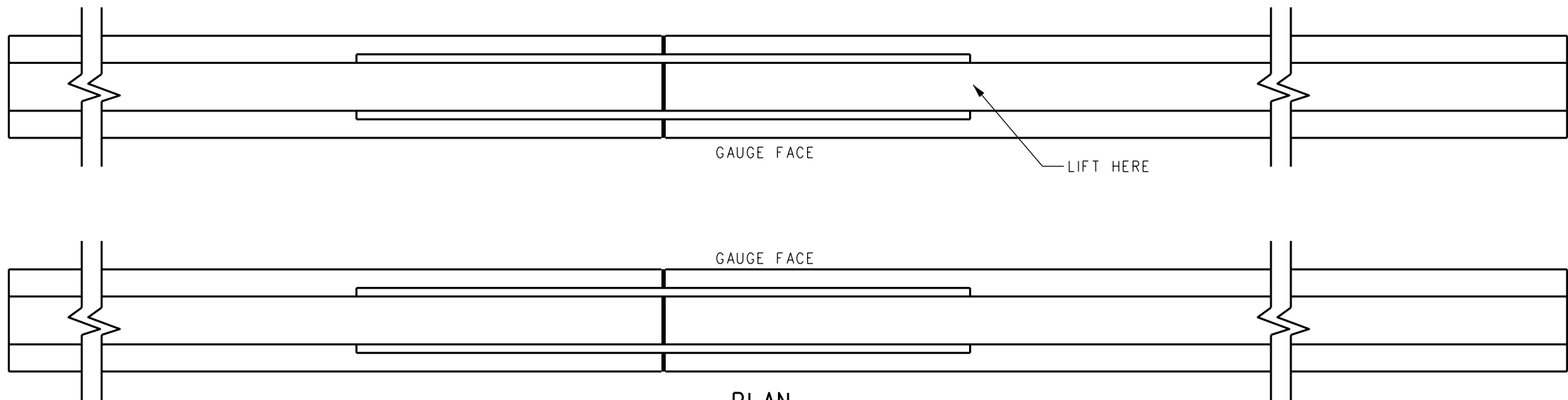
SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY.
FOR NON-SCRRRA APPROVED USES:
SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.

**METROLINK**[®]

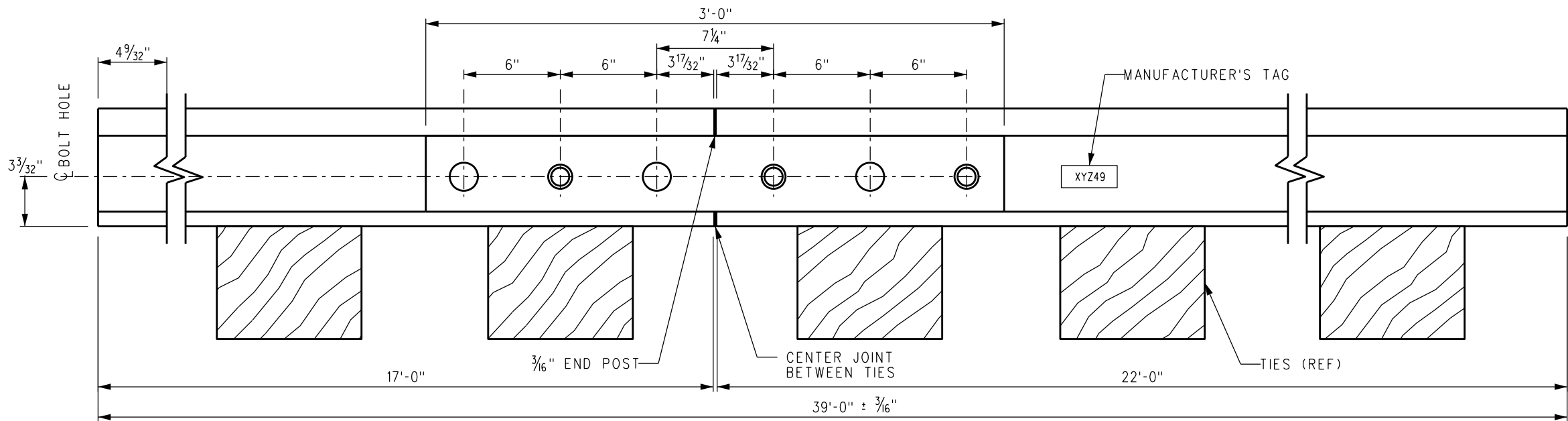
SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

ENGINEERING STANDARDS	
COMPROMISE JOINTS FOR VARIOUS WEIGHTS OF RAILS	

STANDARD	2503
SCALE:	NTS
REVISION	SHEET
-	1 OF 1
CADD FILE:	ES2503



PLAN



PROFILE

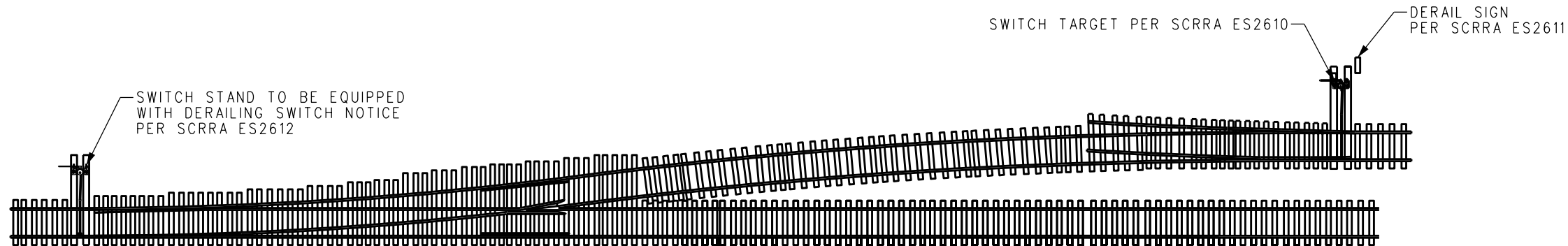
NOTES:

1. INSULATED JOINT PLUG SHALL MEET OR EXCEED CURRENT AREMA SPECIFICATION CHAPTER 4, PART 3. ONLY ALLEGHENY BONDED INSULATED JOINT OR APPROVED EQUAL WILL BE ACCEPTED.
2. INSULATED JOINT PLUGS SHALL BE MANUFACTURED FROM NEW HEAD HARDENED RAIL. INSULATED JOINTS SHALL BE INSTALLED AS SHOWN IN PLANS OR AS DIRECTED. GOOD USABLE SECOND HAND HEAD HARDENED RAIL WITH 1/4" HEADLOSS MAY BE USED FOR JOINTS MANUFACTURED FOR 1/4" HEADWEAR. INSULATED JOINTS FOR USE IN TURNOUTS, RAIL WILL BE BENT FOR CLOSURE OR TURNOUT SIDE.
3. ALL HOLES SHALL BE CHAMFERED.
4. 1" A490 HUCK BOLTS WITH STAGGERED PATTERN SHALL BE FURNISHED.
5. WHEN NECESSARY, 1 1/8" GRADE 8 BOLTS WITH SECURITY LOCKNUTS, LUBRICATED AND TORQUED TO 850 FT LBS, MAY BE SUBSTITUTED FOR HUCK BOLTS.
6. INSULATED JOINT PLUGS TO BE MANUFACTURED AND CURED IN A CONTROLLED ENVIRONMENT AT THE MANUFACTURER'S PLANT. NO FABRICATION OF INSULATED JOINT PLUGS IN THE FIELD WILL BE ACCEPTED. AFTER HUCKING OR BOLTING, MANUFACTURER SHALL REMOVE EXCESS EPOXY FROM RAIL AND JOINT BAR. MANUFACTURER SHALL ADHERE IDENTIFICATION TAG TO THE WEB OF RAIL DEPICTING MANUFACTURER'S NAME, CONTROL NUMBER, LOCATION, MONTH (01) AND YEAR (2XXX) WHERE JOINTS WERE FABRICATED.

NOTES: (CONT)

7. MANUFACTURER SHALL MARK A BALANCE POINT ON THE HEAD OF RAIL FOR HANDLING.
8. INSULATED JOINT PLUGS SHALL BE CENTERED BETWEEN TIE CRIBS WHEN INSTALLED.
9. SUPPLIERS OF MATERIAL SHOWN ON TRACK STANDARD DRAWINGS SHALL FORMALLY SUBMIT THEIR SHOP DRAWINGS TO SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION FOR APPROVAL. MATERIAL SHIPPED WITHOUT WRITTEN APPROVAL FROM SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION WILL NOT BE ACCEPTED.
10. PREFABRICATED JOINTS OF OTHER LENGTHS AS SPECIFIED MAY BE REQUIRED IN TURNOUTS.
11. ONLY TOELESS JOINT BARS ARE TO BE USED FASTENED WITH SHAVED E-CLIPS FOR INSULATED JOINTS. SEE SCRRRA ES2361.

				DRAWN BY: A. CARLOS		DATE: 03/22/02	<p>SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES: SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.</p>	 METROLINK [®] SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012	ENGINEERING STANDARDS		STANDARD	
									2504			
									SCALE:	NTS		
									REVISION	SHEET		
A	05-31-13	REVISED PROFILE	AC	NDP					-	1 OF 1		
REV.	DATE	DESCRIPTION	DES.	ENG.					CADD FILE:	ES2504		



GENERAL DERAIL LAYOUT PLAN

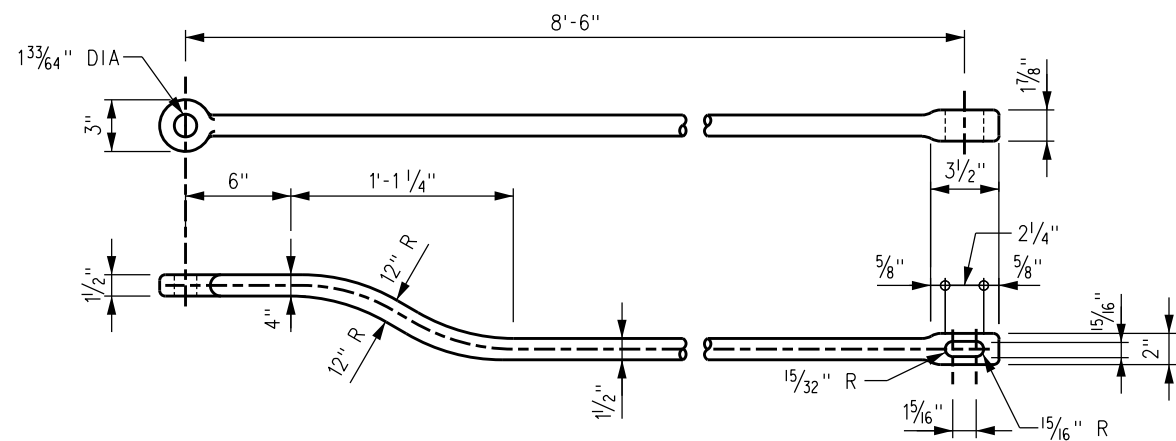
NOTE:

SEE SCRRRA ES2702 FOR DISTANCE FROM MAIN TRACK SWITCH TO POINT OF DERAIL AND INSULATED JOINT LOCATIONS.

REQUIRED DERAIL NOTES:

- 1. EXCEPT AT THE INTERLOCKINGS, DERAILS ARE REQUIRED AT THE FOLLOWING LOCATIONS UNLESS OTHERWISE AUTHORIZED.
 - a. INTERCHANGE TRACKS, REGARDLESS OF GRADE CONDITIONS, WHERE THERE IS HAZARD OF FOREIGN LINE OPERATION CAUSING ENGINES OR CARS TO MOVE FOUL OF MAIN TRACK, SIDING OR OTHER TRACKS.
 - b. INDUSTRY TRACKS, WHERE AN INDUSTRY CAN MOVE CARS TO CREATE A HAZARD BY FOULING THE MAIN TRACK, SIDING; OR ANY INDUSTRY TRACKS OR OTHER TRACKS WHERE CARS ARE LEFT UNATTENDED.
 - c. SPURS AND OTHER TRACKS ON WHICH CARS ARE LEFT UNATTENDED AND THE UNAUTHORIZED MOVEMENT OF SUCH CARS MAY FOUL MAIN TRACK OR SIDING, EXCEPT WHERE TRACK GRADE ASCENDS TOWARD MAIN TRACK OR SIDING AT GREATER THAN OR EQUAL TO 1.50% GRADIENT.
 - d. ANY TRACK, REGARDLESS OF GRADE, THAT IS USED FOR THE STORAGE OF LIVE ENGINES AND WHERE AN UNAUTHORIZED MOVEMENT OF THE ENGINES COULD FOUL MAIN TRACK.
 - e. OTHER LOCATIONS, REGARDLESS OF GRADE, WHERE SPECIAL CONDITIONS REQUIRE DERAIL PROTECTION AND SUCH PROTECTION IS AUTHORIZED BY SCRRRA.
 - f. ANY TRACK, USED FOR LOADING, UNLOADING OR STORAGE OF CARS CONTAINING HAZARDOUS MATERIAL AS LISTED IN THE HAZARDOUS MATERIALS REGULATIONS OF THE DEPARTMENT OF TRANSPORTATION, CODE OF FEDERAL REGULATIONS. SUCH OPERATIONS SHALL BE PROTECTED AGAINST INBOUND MOVEMENTS BY DERAILS, SECURED WITH LOCKS AND LOCATED BEYOND THE CLEARANCE POINT AND NOT LESS THAN 50 FEET FROM NEAR END OF THE CAR(S).
- 2. ALL NEW INSTALLATIONS OF DERAILS AS OUTLINED ABOVE SHALL BE THE DOUBLE SWITCH POINT TYPE SCRRRA ES2604. EXISTING SLIDING OR HINGED TYPE DERAILS CURRENTLY APPLIED ARE AUTHORIZED EXCEPT WHERE APPLIED:
 - a. ON INSIDE OF CURVES OVER 5 DEGREES.
 - b. ON TRACKS WHERE AN UNCONTROLLED CAR COULD REACH A SPEED IN EXCESS OF FOUR (4) MPH.
 - c. AT LOCATIONS WHERE A DERAIL IS INSTALLED TO PROTECT AGAINST THE MOVEMENT OF ENGINES OR TRAINS. SLIDING OR HINGED DERAILS ARE AUTHORIZED FOR PROTECTION AT LOCOMOTIVE AND CAR REPAIR FACILITIES WHEN ALSO PROTECED BY BLUE FLAG RULES AND PROCEDURES.
 - d. AT ANY OTHER LOCATION WHERE CONDITIONS ARE SUCH THAT THE SWITCH POINT DERAIL SHOULD BE INSTALLED TO ELIMINATE A POTENTIALLY HAZARDOUS SITUATION.
- 3. DOUBLE POINT DERAILS PER SCRRRA ES2604 ARE REQUIRED AS NOTED BELOW. AT OTHER LOCATIONS REQUIRING A DERAIL, A SLIDING OR HINGED DERAIL, SCRRRA ES2613 OR ES2614 WILL BE USED.
 - a. LOCATIONS WHERE UNCONTROLLED MOVEMENTS CAN EXCEED 20 MPH.
 - b. LOCATIONS PROTECTING TRACKS HOLDING 15 OR MORE CARS.
 - c. DIVERGING TRACK ASCENDS TOWARDS MAIN TRACK AT GRADE LESS THAN 0.5% OR DESCENDS TOWARD THE MAIN TRACK AT ANY GRADIENT.
 - d. AT OTHER LOCATIONS DESIGNATED BY SCRRRA DIRECTOR OF ENGINEERING AND CONSTRUCTION.
- 4. FOR DETAILS OF CONNECTING RODS FOR SLIDING AND HINGED DERAILS SEE SCRRRA ES2602.
- 5. SEE SCRRRA ES2610, ES2611 AND ES2612 FOR DERAIL SIGNAGE WHERE REQUIRED.
- 6. EXPOSED ENDS OF STOCK RAIL AND DEFLECTING RAILS SHALL BE CUT AND BENT PER DEPRESSED RAIL HEAD DETAIL PER SCRRRA ES2604.
- 7. HAND OPERATED DERAILS ARE ILLUSTRATED, HOWEVER POWER OPERATED DERAILS WILL BE INSTALLED AS DIRECTED BY SCRRRA.

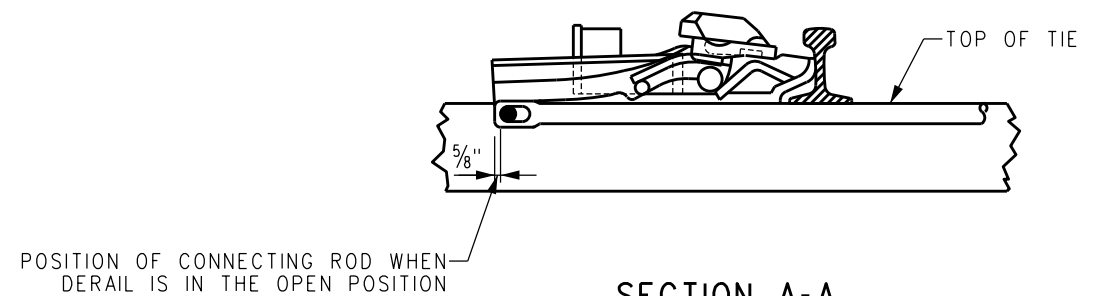
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



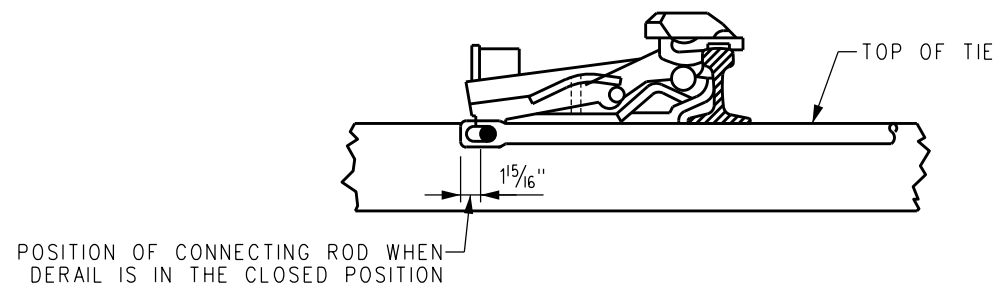
**CONNECTING ROD FOR USE WITH HAYES DERAIL AND
HIGH OR LOW SWITCH STANDS PER SCRRRA ES2701 & ES2704**

NOTE:

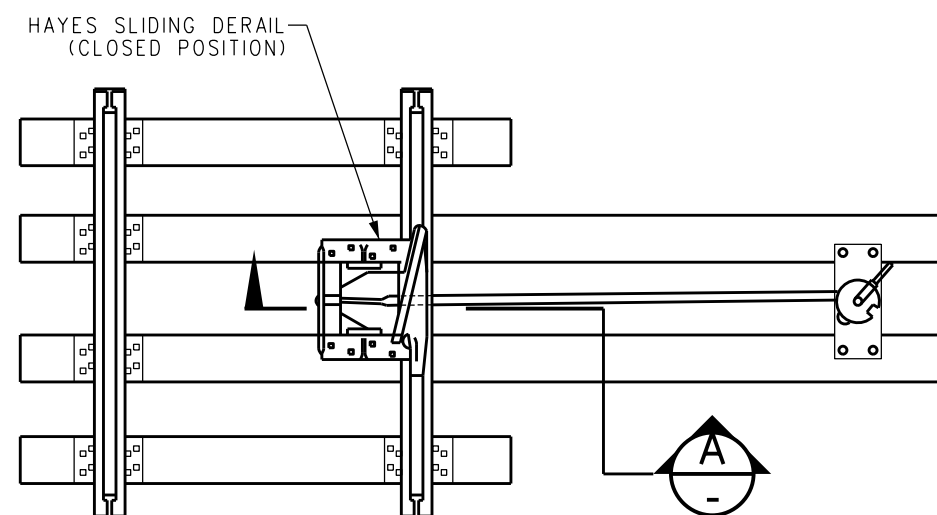
SINCE THE THROW OF SWITCH STAND IS ONLY 5", THE SLOTTED HOLE IN ROD IS PROVIDED TO PERMIT MOVEMENT OF 6 1/4" REQUIRED FOR PROPER FUNCTIONING OF HAYES SLIDING DERAIL.




**SECTION A-A
(OPEN)**

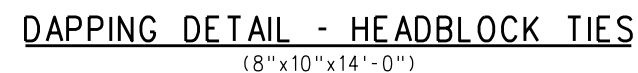


**SECTION A-A
(CLOSED)**



GENERAL PLAN FOR CONNECTING ROD WITH HAYES SLIDING DERAIL

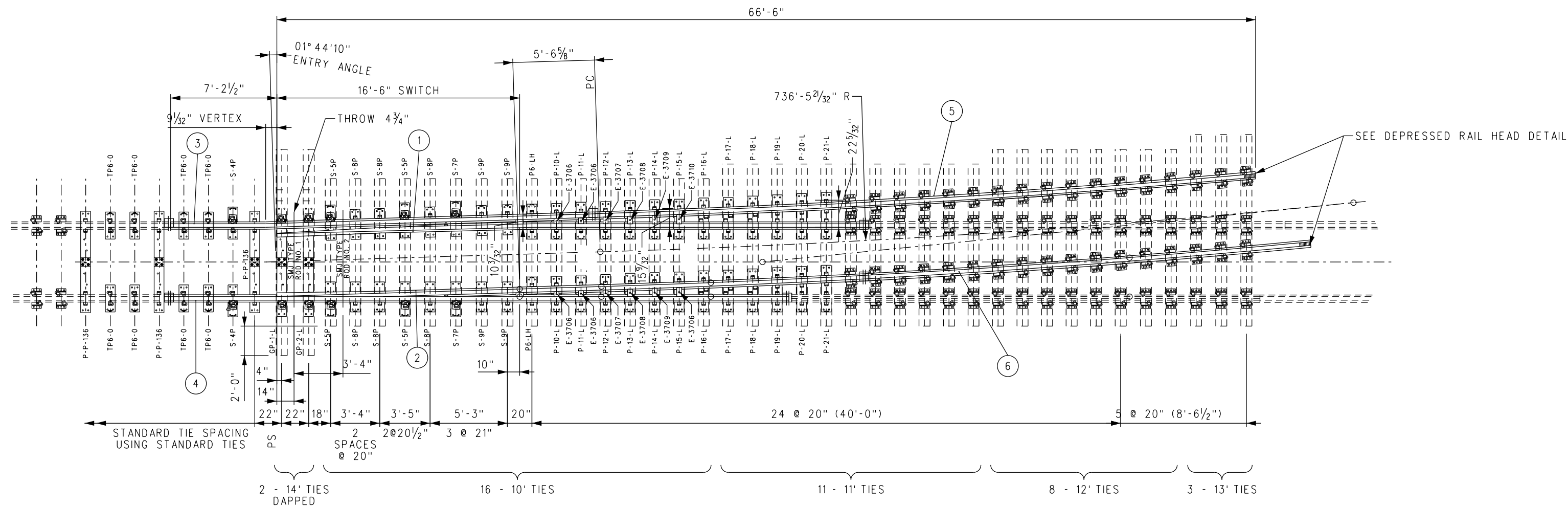
				DRAWN BY: A. CARLOS		DATE: 03/31/2011	<small>SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES: SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.</small>	 METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012	ENGINEERING STANDARDS		STANDARD
											2602
											SCALE: NTS
											REVISION SHEET 1 OF 1
											CADD FILE: ES2602




SWITCH GEOMETRY:	16'-6"
VERTEX DISTANCE:	9 ¹ / ₃₂ "
SWITCH ANGLE:	1° 4' 11"
SWITCH HEEL SPREAD:	6 ¹ / ₄ "
RADIUS OF CL CURVE:	736'-5.2 ¹ / ₃₂ "
DEGREE OF CL CURVE:	7° 46' 58"
CENTRAL ANGLE OF TURNOUT CURVE:	3° 59' 18"

WELDED JOINTS

1. SEE ES2604-02 FOR BILL OF MATERIALS. CIRCLED ITEM NUMBERS APPLY TO BILL OF MATERIAL ITEMS.
2. ALL RAIL SHALL HAVE IDENTIFICATION COLOR CODE PAINTED ON WEB CLEAR OF JOINT AREA.
3. LH AND RH SWITCH POINTS WITH MANGANESE TIP.
4. TIMBER TIES TO CONFORM TO SCRRRA STANDARD SPECIFICATIONS 34 11 34.
5. RH SWITCH POINT DERAIL IS MIRROR IMAGE OF THIS LAYOUT. SEE BILL OF MATERIALS FOR REFERENCE TO SPECIFIC PARTS.



				DRAWN BY: HDR DATE: 03/31/2011		SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES: SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.		 METROLINK® SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012		ENGINEERING STANDARDS 16'-6" DOUBLE POINT DERAIL (LEFT HAND SHOWN)		STANDARD 2604-0 SCALE: NTS REVISION SHEET - 1 OF CADD FILE: ES2604-0	
				Narek D. Bze ASSISTANT DIRECTOR: STANDARDS & DESIGN									
				William Davan DIRECTOR OF ENGINEERING AND CONSTRUCTION									
X	XX-XX-XX	REVISION		XX	XX								
REV.	DATE	DESCRIPTION		DES.	ENG.								

BILL OF MATERIAL						BILL OF MATERIAL					
ITEM	LH QTY	RH QTY	DESCRIPTION	DWG NO	SCRRA PART NO	ITEM	LH QTY	RH QTY	DESCRIPTION	DWG NO	SCRRA PART NO
1	1	1	SAMSON POINT, 16'-6"/40'-0" LONG, FLOATING HEEL, MANGANESE TIP, LH	ES2921-08		33	2	-	SWITCH PLATE (P-15-L)	ES2921-13	
2	1	1	SAMSON POINT, 16'-6"/40'-0" LONG, FLOATING HEEL, MANGANESE TIP, RH	ES2921-08		34	-	2	SWITCH PLATE (P-15-R)	ES2921-13	
3	1	-	STOCK RAIL, SAMSON UNDERCUT, BENT & CURVED, 28'-10" LONG, LH/LHTO	ES2921-09		35	2	-	SWITCH PLATE (P-16-L)	ES2921-13	
3	-	1	STOCK RAIL, SAMSON UNDERCUT, BENT & CURVED, 28'-10" LONG, RH/RHTO	ES2921-09		36	-	2	SWITCH PLATE (P-16-R)	ES2921-13	
4	1	-	STOCK RAIL, SAMSON UNDERCUT, STRAIGHT, 42'-0" LONG, RH/LHTO	ES2921-09		37	2	-	SWITCH PLATE (P-17-L)	ES2921-13	
4	-	1	STOCK RAIL, SAMSON UNDERCUT, STRAIGHT, 42'-0" LONG, LH/RHTO	ES2921-09		38	-	2	SWITCH PLATE (P-17-R)	ES2921-13	
5	1	1	CURVED RAIL 44'-11 ⁵ / ₁₆ " LONG	-		39	2	-	SWITCH PLATE (P-18-L)	ES2921-13	
6	1	1	CURVED RAIL 30'-4 ¹ / ₈ " LONG	-		40	-	2	SWITCH PLATE (P-18-R)	ES2921-13	
9	1	1	SWITCH ROD #1 ASSEMBLY, 'SMJ' VERTICAL C/W BASKET ASSEMBLY	-		41	2	-	SWITCH PLATE (P-19-L)	ES2921-13	
10	1	1	SWITCH ROD #2 ASSEMBLY, 'SMJ' VERTICAL	-		42	-	2	SWITCH PLATE (P-19-R)	ES2921-13	
11	3	3	GAUGE PLATE, INSULATED (P-P-136)	ES2802-80		43	2	-	SWITCH PLATE (P-20-L)	ES2921-13	
12	1	-	GAUGE PLATE, INS (GP-1-L)	ES2802-81		44	-	2	SWITCH PLATE (P-20-R)	ES2921-13	
13	-	1	GAUGE PLATE, INS (GP-1-R)	ES2802-81		45	2	-	SWITCH PLATE (P-21-L)	ES2921-13	
14	1	-	GAUGE PLATE, INS (GP-2-L)	ES2802-82		46	-	2	SWITCH PLATE (P-21-R)	ES2921-13	
15	-	1	GAUGE PLATE, INS (GP-2-R)	ES2802-82		47	72	72	TIE PLATE, ROLLED PANDROL, 6" RAIL BASE, CANTED, 1" DIA HOLES	ES2454	
16	2	2	BRACE SLIDE PLATE (S-4P)	ES2802-88		48	4	4	HOLD-DOWN CLIP (E3706)	-	
17	4	4	BRACE SLIDE PLATE (S-5P)	ES2802-85		49	2	2	HOLD-DOWN CLIP (E3707)	-	
18	2	2	BRACE SLIDE PLATE (S-7P)	ES2802-85		50	2	2	HOLD-DOWN CLIP (E3708)	-	
19	2	-	SWITCH HEEL PLATE (P6-LH)	ES2802-83		51	2	2	HOLD-DOWN CLIP (E3709)	-	
20	-	2	SWITCH HEEL PLATE (P6-RH)	ES2802-84		52	2	2	HOLD-DOWN CLIP (E3710)	-	
21	6	6	SLIDE PLATE (S-8P), 1/4" RISER	ES2802-86		53	264	264	PANDROL SPRING CLIP (E2055)	ES2362	
22	4	4	SLIDE PLATE (S-9P), 0" RISER	ES2802-86		54	8	8	PANDROL SPRING CLIP, (E2063), FOR JOINT BARS	ES2361	
23	2	-	SWITCH PLATE (P-10-L)	ES2921-13		55	536	536	SCREW SPIKE, 1 ⁵ / ₁₆ " DIA X 6" LONG	ES2355	
24	-	2	SWITCH PLATE (P-10-R)	ES2921-13		56	12	12	BOLTLESS BRACE, 136RE 'SURFIT'	-	
25	2	-	SWITCH PLATE (P-11-L)	ES2921-13		57	12	12	SERRATED WASHER FOR BOLTLESS BRACE	-	
26	-	2	SWITCH PLATE (P-11-R)	ES2921-13		58	16	16	TIE, HARDWOOD, TREATED, 7" X 9" X 10'-0" LONG	-	
27	2	-	SWITCH PLATE (P-12-L)	ES2921-13		59	11	11	TIE, HARDWOOD, TREATED, 7" X 9" X 11'-0" LONG	-	
28	-	2	SWITCH PLATE (P-12-R)	ES2921-13		60	8	8	TIE, HARDWOOD, TREATED, 7" X 9" X 12'-0" LONG	-	
29	2	-	SWITCH PLATE (P-13-L)	ES2921-13		61	3	3	TIE, HARDWOOD, TREATED, 7" X 9" X 13'-0" LONG	-	
30	-	2	SWITCH PLATE (P-13-R)	ES2921-13		62	2	2	TIE, HARDWOOD, TREATED, 10" X 8" X 14'-0" LONG, DAPPED	-	
31	2	-	SWITCH PLATE (P-14-L)	ES2921-13		63	8	8	TIE PLATE, TP6-0, NO CANT	-	
32	-	2	SWITCH PLATE (P-14-R)	ES2921-13							

				DRAWN BY: HDR DATE: 03/31/2011		SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES: SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.		 METROLINK®		ENGINEERING STANDARDS		STANDARD 2604	
		 ASSISTANT DIRECTOR: STANDARDS & DESIGN								SCALE: NTS			
		 DIRECTOR OF ENGINEERING AND CONSTRUCTION										REVISION SHEET	
X XX-XX-XX		REVISION		XX XX								- 2 OF 2	
REV. DATE		DESCRIPTION		DES. ENG.								CADD FILE: ES2604-02	



1. SIGNS SHALL INCLUDE ALUMINUM PANEL, RETROREFLECTIVE SHEETING, POLYURETHANE PAINT, SCREENED-PROCESS COLORS OR FILM, UV PROTECTION OVERLAY, ANTI-GRAFFITI OVERLAY, POSTS, ANCHORS AND HARDWARE.
2. ALUMINUM PANEL SHALL BE ALCOA 6016-T6 OR EQUAL.
3. TEXT FONT SHALL BE 1/32" ARIEL BOLD 9/32" AS PER SCRR A ES1212, SIZE AS INDICATED.
4. PANEL SHALL BE PAINTED ON ALL SIDES WITH TWO PART ACRYLIC POLYURETHANE PAINT COATING.
5. RETROREFLECTIVE SHEETING SHALL CONFORM TO THE REQUIREMENTS OF ASTM D4956, CLASS IX OR GREATER. RETROREFLECTIVE SHEETING SHALL HAVE CLASS 1, 3, OR 4 ADHESIVE BACKING WHICH SHALL BE PRESSURE SENSITIVE AND FUNGUS RESISTANT.
6. SCREENED-PROCESS COLORS AND NONREFLECTIVE, OPAQUE BLACK FILM SHALL HAVE EQUIVALENT OUTDOOR WEATHERABILITY CHARACTERISTICS AS THE RETROREFLECTIVE SHEETING.

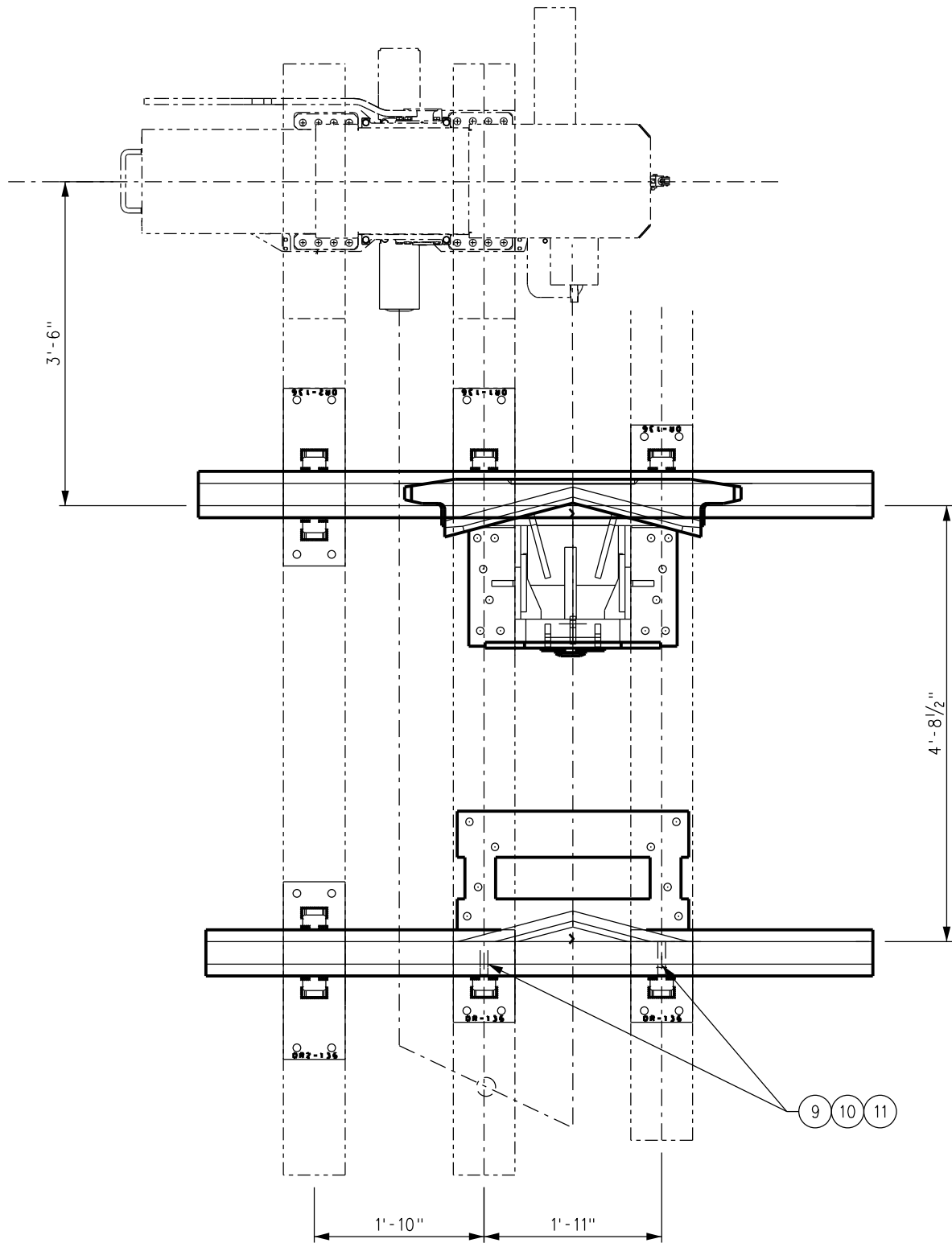


STANDARD		2610
SCALE:		NTS
REVISION	SHEET	
A	1 OF 1	
CADD FILE:		ES2610



1. SIGNS SHALL INCLUDE ALUMINUM PANEL, RETROREFLECTIVE SHEETING, POLYURETHANE PAINT, SCREENED-PROCESS COLORS OR FILM, UV PROTECTION OVERLAY, ANTI-GRAFFITI OVERLAY, POSTS, ANCHORS AND HARDWARE.
2. ALUMINUM PANEL SHALL BE ALCOA 6016-T6 OR EQUAL.
3. TEXT FONT SHALL BE ARIAL BOLD AS PER SCRR A ES1212, SIZE AS INDICATED.
4. PANEL SHALL BE PAINTED ON ALL SIDES WITH TWO PART ACRYLIC POLYURETHANE PAINT COATING.
5. RETROREFLECTIVE SHEETING SHALL CONFORM TO THE REQUIREMENTS OF ASTM D4956, CLASS IX OR GREATER. RETROREFLECTIVE SHEETING SHALL HAVE CLASS 1, 3, OR 4 ADHESIVE BACKING WHICH SHALL BE PRESSURE SENSITIVE AND FUNGUS RESISTANT.
6. SCREENED-PROCESS COLORS AND NONREFLECTIVE, OPAQUE BLACK FILM SHALL HAVE EQUIVALENT OUTDOOR WEATHERABILITY CHARACTERISTICS AS THE RETROREFLECTIVE SHEETING.

																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					</
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----



BILL OF MATERIAL				
ITEM	QTY	DESCRIPTION	PRODUCT NO	SCRRA PART NO
1	1	HAYS DERAIL HBXS-8-SS C/W CROWDER	X99-02310	
2	1	RODDING KIT FOR WCH DERAIL FOR USE WITH US&S M23E SW/MACHINE	X99-02314	
3	3	TIE PLATE DR-136	G90-00630	
4	1	TIE PLATE DR1-136	G90-00631	
5	2	TIE PLATE DR2-136	G90-00632	
6	2	TIE HARDWOOD TREATED DAPPED 8" X 10" X 12'-0"	J15-00068	
7	1	TIE HARDWOOD TREATED 8" X 10" X 9'-0"	J15-00069	
8	46	SCREW SPIKE 1 ⁵ / ₁₆ " X 6"	V50-00010	
9	2	BOLT HEX 1" X 4" GR5	V01-61010	
10	2	NUT HEVEY HEX 1" GR5	V30-60015	
11	2	WASHER SPRING HEAVY 1"	V35-60217	
12	8	CLIP PANDROL E2055G RH GALVANIZED	X25-00016	

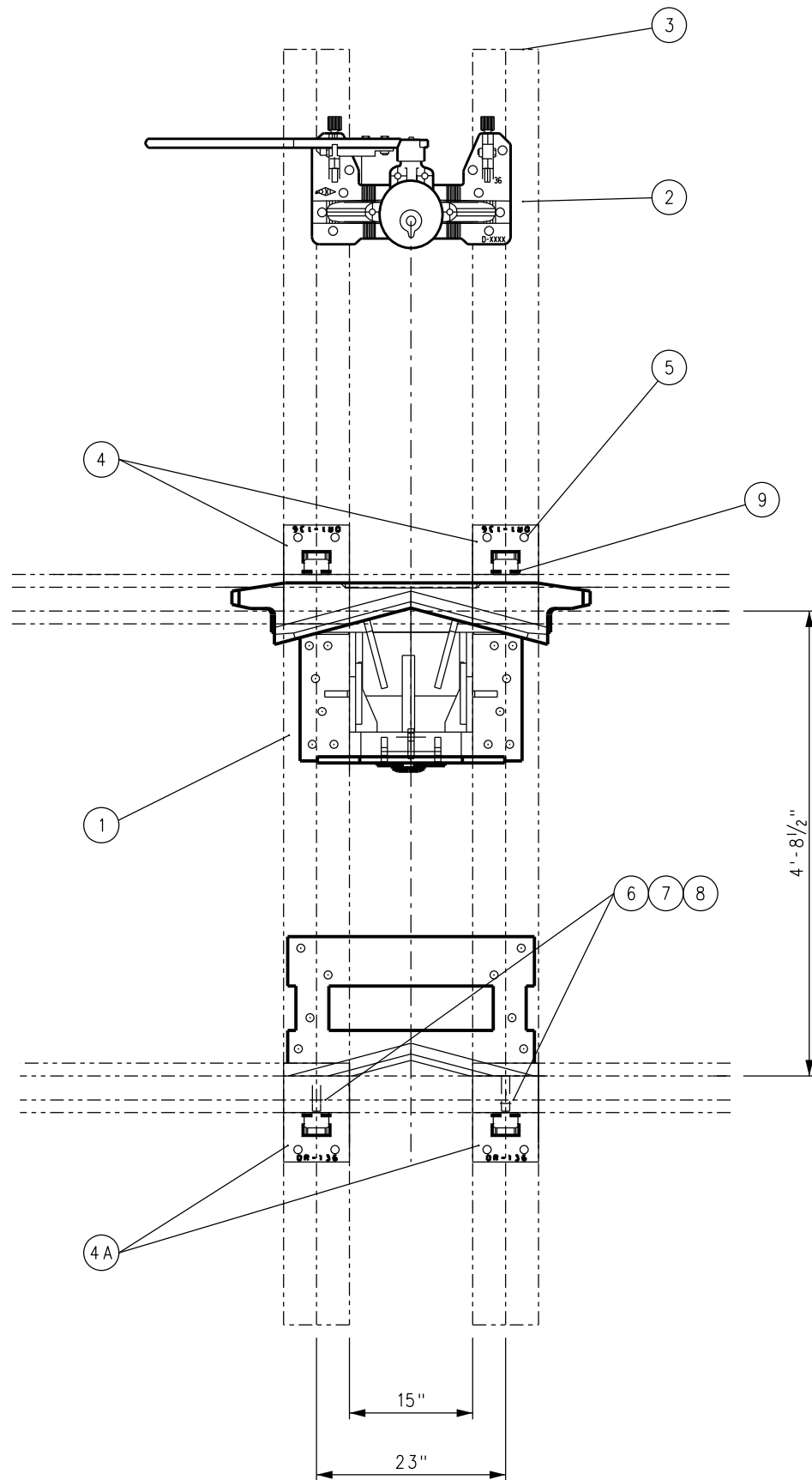
INSTALLATION REQUIREMENT NOTES:

1. CROWDER WITH SLIDING DERAIL SHOWN. WHEEL CROWDER STROKE IS 5¼" WITH ⅞" DIAMETER PINS.
2. PAINT: SAFETY YELLOW.
3. FOR PROPER THROW OF SWITCH STAND TO DERAIL/CROWDER, ADJUST SWITCH STAND CRANK EYE FOR 5¼" THROW.
4. MAKE SURE THAT YOUR SWITCH STAND (HEAD BLOCK) TIES THAT HOLD THE DERAIL ARE HIGH QUALITY.
5. READ THE MANUFACTURER'S INSTRUCTIONS.
6. PLACE THE DERAIL TIGHTLY AGAINST THE RAIL.
7. SPIKE BOTH RAILS TO THE TIES AT THE PROPER GAUGE.
8. FASTEN THE DERAIL AND CROWDER THROUGH ALL THE SCREW SPIKE HOLES. PRE-DRILL HOLES TO PREVENT THE TIES FROM SPLITTING.
9. HAVE GOOD DRAINAGE AND BALLAST. THE AREA UNDER THE DERAIL MUST BE POCKETED TO PREVENT BINDING IN ADVERSE WEATHER CONDITIONS.

INSTALLATION OF CROWDER NOTES:

1. PLACE THE WHEEL CROWDER TIGHTLY AGAINST THE WEB OF THE RAIL.
2. RAIL CROWDER MOUNTING BOLT HOLE TO BE MATCH MARKED FROM THE RAIL CROWDER AND DRILLED IN THE FIELD.
3. USE THE WEB SET SCREWS TO ADJUST AND MAINTAIN PROPER WHEEL CROWDER POINT CONTACTS WITH THE RAIL.
4. WITH BOTH RAIL AND WHEEL CROWDER SECURED AND IN DERAILING POSITION, ATTACH THE CONNECTING ROD TO THE LEFT LUG ON THE DERAIL, THEN CONNECT THE OPPOSITE END OF THE CONNECTING ROD WITH THE TURNBUCKLE INTO THE REVERSING CRANK MECHANISM ON THE BASE OF THE WHEEL CROWDER.
5. ATTACH THE SWITCH STAND CONNECTING ROD OF THE MANUAL OR ELECTRIC SWITCH STAND TO THE TURNBUCKLE ON THE SWITCH STAND OR ELECTRIC SWITCH STAND. THE OPPOSITE END OF THE CONNECTING ROD CONNECTS TO THE RIGHT HAND LUG ON THE DERAIL. ADJUST THE THROW ON YOUR SWITCH STAND TO A 5¼" THROW. A SHORTER THROW WILL GIVE YOU PRESSURE ON THE CONNECTING ROD OR SWITCH STAND EYE. PRESSURE ON THE EYE AND CONNECTING ROD CAN RESULT IN A FAILURE OF THAT COMPONENT. ADJUST AS NECESSARY.
6. PLACE COTTER KEYS TO SECURE THE NUTS.
7. INSTALL A SWITCH LOCK.

				DRAWN BY: HDR DATE: 03/31/2011		<div>SCRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRA APPROVED USES ONLY. FOR NON-SCRRA APPROVED USES: SCRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRA. ALL RIGHTS RESERVED.</div> <div> METROLINK®</div> <div>SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012</div>	ENGINEERING STANDARDS		STANDARD 2613	
				<div> ASSISTANT DIRECTOR: STANDARDS & DESIGN</div>			SCALE: NTS		REVISION SHEET 1 OF 1	
				<div> DIRECTOR OF ENGINEERING AND CONSTRUCTION</div>			BI-DIRECTIONAL DERAIL WITH CROWDER		CADD FILE: ES2613	
X	XX-XX-XX	REVISION		XX	XX					
REV.	DATE	DESCRIPTION		DES.	ENG.					



BILL OF MATERIAL				
ITEM	QTY	DESCRIPTION	PRODUCT NO	SCRRA PART NO
1	1	HAYS DERAIL HBXS-8-SS C/W CROWDER	X99-02310	
2	1	36E SWITCH STAND WITH TARGET & BALL HANDLE SCRRA STANDARD TARGET	R36-36094	
3	2	TIE HARDWOOD TREATED, 8" X 12" X 14'-0"	J15-00067	
4	2	TIE PLATE DR1-136		
4A	2	TIE PLATE DR-136		
5	38	SCREW SPIKE ¹⁵ / ₁₆ " X 6"	V50-00010	
6	2	BOLT HEX 1" X 4" GR 5	V01-61010	
7	2	NUT HEAVY HEX 1" GR 5	V30-60015	
8	2	WASHER SPRING HEAVY 1"	V35-60217	
9	4	CLIP PANDROL E2055G RH GALVANIZED	X25-00016	

INSTALLATION REQUIREMENT NOTES:

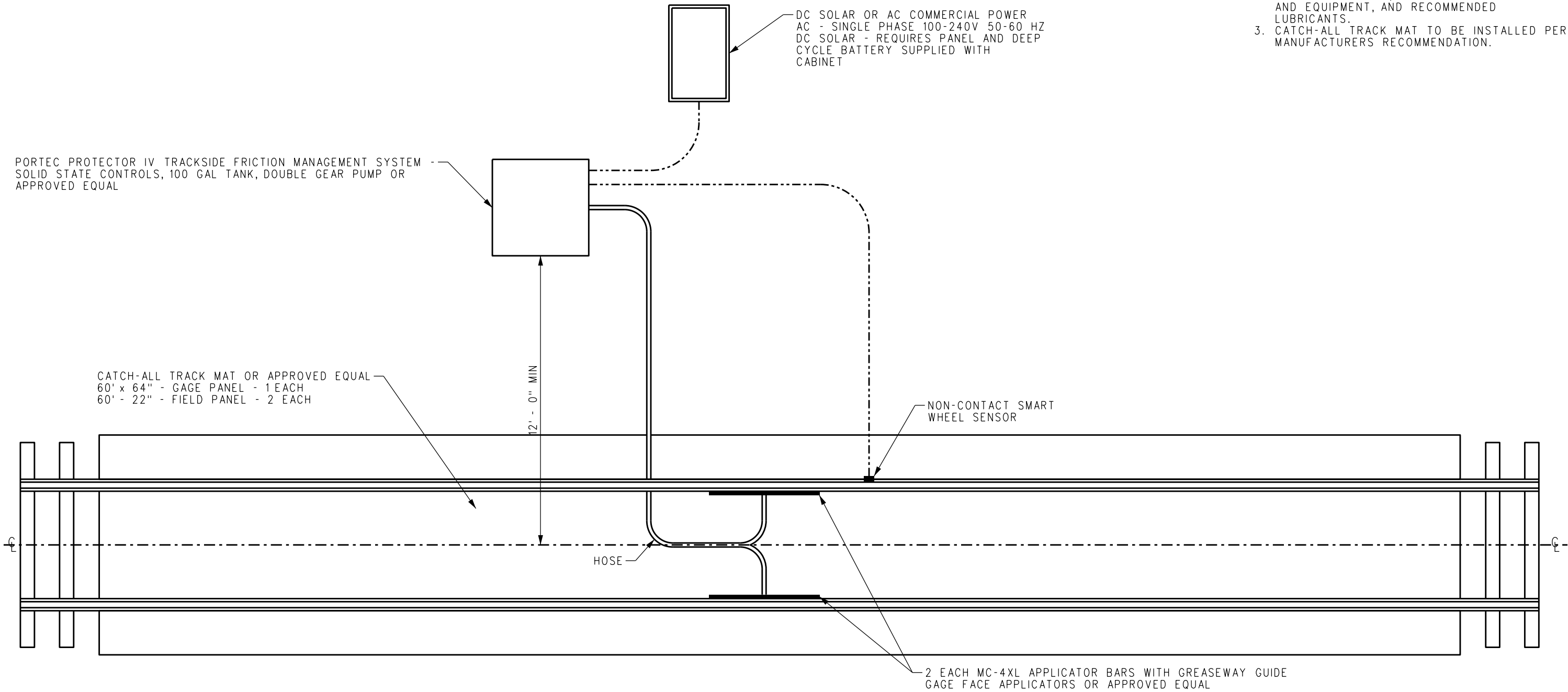
- 1. CROWDER WITH SLIDING DERAIL SHOWN. WHEEL CROWDER STROKE IS 5¼" WITH ⅞" DIAMETER PINS.
- 2. PAINT: SAFETY YELLOW.
- 3. FOR PROPER THROW OF SWITCH STAND TO DERAIL/CROWDER, ADJUST SWITCH STAND CRANK EYE FOR 5¼" THROW.
- 4. MAKE SURE THAT YOUR SWITCH STAND (HEAD BLOCK) TIES THAT HOLD THE DERAIL ARE HIGH QUALITY.
- 5. READ THE MANUFACTURER'S INSTRUCTIONS.
- 6. PLACE THE DERAIL TIGHTLY AGAINST THE RAIL.
- 7. SPIKE BOTH RAILS TO THE TIES AT THE PROPER GAUGE.
- 8. FASTEN THE DERAIL AND CROWDER THROUGH ALL THE SCREW SPIKE HOLES. PRE-DRILL HOLES TO PREVENT THE TIES FROM SPLITTING.
- 9. HAVE GOOD DRAINAGE AND BALLAST. THE AREA UNDER THE DERAIL MUST BE POCKETED TO PREVENT BINDING IN ADVERSE WEATHER CONDITIONS.

INSTALLATION OF CROWDER NOTES:

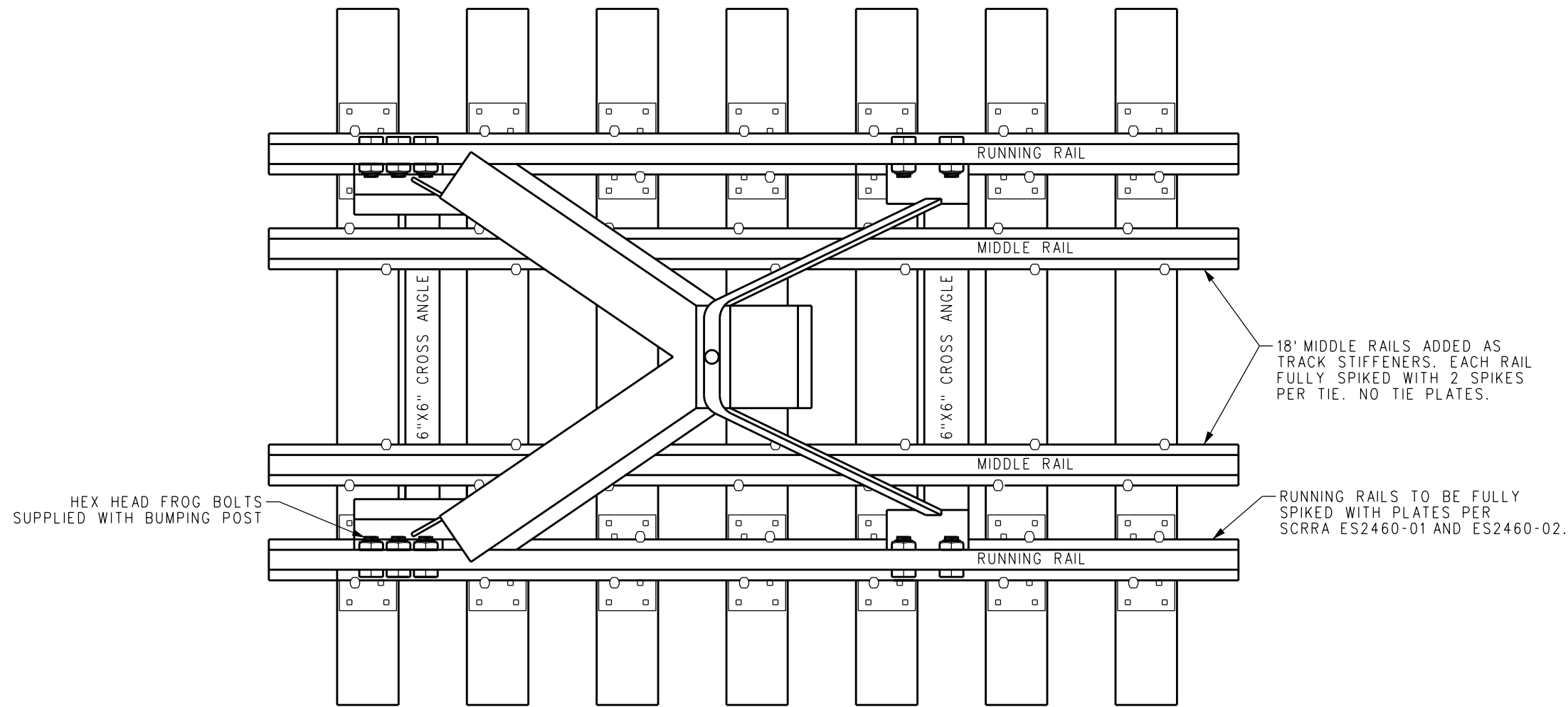
- 1. PLACE THE WHEEL CROWDER TIGHTLY AGAINST THE WEB OF THE RAIL.
- 2. RAIL CROWDER MOUNTING BOLT HOLE TO BE MATCH MARKED FROM THE RAIL CROWDER AND DRILLED IN THE FIELD.
- 3. USE THE WEB SET SCREWS TO ADJUST AND MAINTAIN PROPER WHEEL CROWDER POINT CONTACTS WITH THE RAIL.
- 4. WITH BOTH RAIL AND WHEEL CROWDER SECURED AND IN DERAILING POSITION, ATTACH THE CONNECTING ROD TO THE LEFT LUG ON THE DERAIL, THEN CONNECT THE OPPOSITE END OF THE CONNECTING ROD WITH THE TURNBUCKLE INTO THE REVERSING CRANK MECHANISM ON THE BASE OF THE WHEEL CROWDER.
- 5. ATTACH THE SWITCH STAND CONNECTING ROD OF THE MANUAL OR ELECTRIC SWITCH STAND TO THE TURNBUCKLE ON THE SWITCH STAND OR ELECTRIC SWITCH STAND. THE OPPOSITE END OF THE CONNECTING ROD CONNECTS TO THE RIGHT HAND LUG ON THE DERAIL. ADJUST THE THROW ON YOUR SWITCH STAND TO A 5¼" THROW. A SHORTER THROW WILL GIVE YOU PRESSURE ON THE CONNECTING ROD OR SWITCH STAND EYE. PRESSURE ON THE EYE AND CONNECTING ROD CAN RESULT IN A FAILURE OF THAT COMPONENT. ADJUST AS NECESSARY.
- 6. PLACE COTTER KEYS TO SECURE THE NUTS.
- 7. INSTALL A SWITCH LOCK.

				DRAWN BY: HDR DATE: 03/31/2011		<div>SCRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRA APPROVED USES ONLY. FOR NON-SCRRA APPROVED USES: SCRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRA. ALL RIGHTS RESERVED.</div> <div>METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012</div>	ENGINEERING STANDARDS		STANDARD	
				<div> ASSISTANT DIRECTOR: STANDARDS & DESIGN  DIRECTOR OF ENGINEERING AND CONSTRUCTION</div>			BI-DIRECTIONAL DERAIL WITH CROWDER WITH 36E SWITCH STAND		2614	
X	XX-XX-XX	REVISION	XX	XX			SCALE:	NONE		
REV.	DATE	DESCRIPTION	DES.	ENG.			REVISION	SHEET		
								-	NTS	
								CADD FILE:	ES2614	

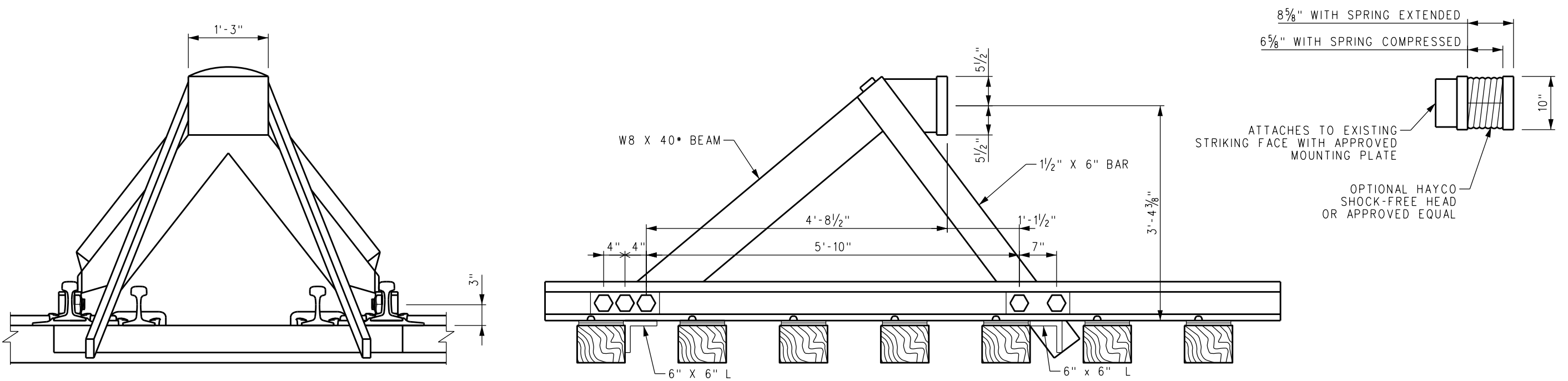
- NOTES:**
- 1. FIELD LOCATION OF RAIL LUBRICATOR TO BE DETERMINED BY SCRRRA. RAIL LUBRICATOR TO BE INSTALLED ON TANGENT TRACK.
 - 2. FOLLOW MANUFACTURER RECOMMENDATIONS FOR INSTALLATION, MAINTENANCE OF HOSES AND EQUIPMENT, AND RECOMMENDED LUBRICANTS.
 - 3. CATCH-ALL TRACK MAT TO BE INSTALLED PER MANUFACTURERS RECOMMENDATION.



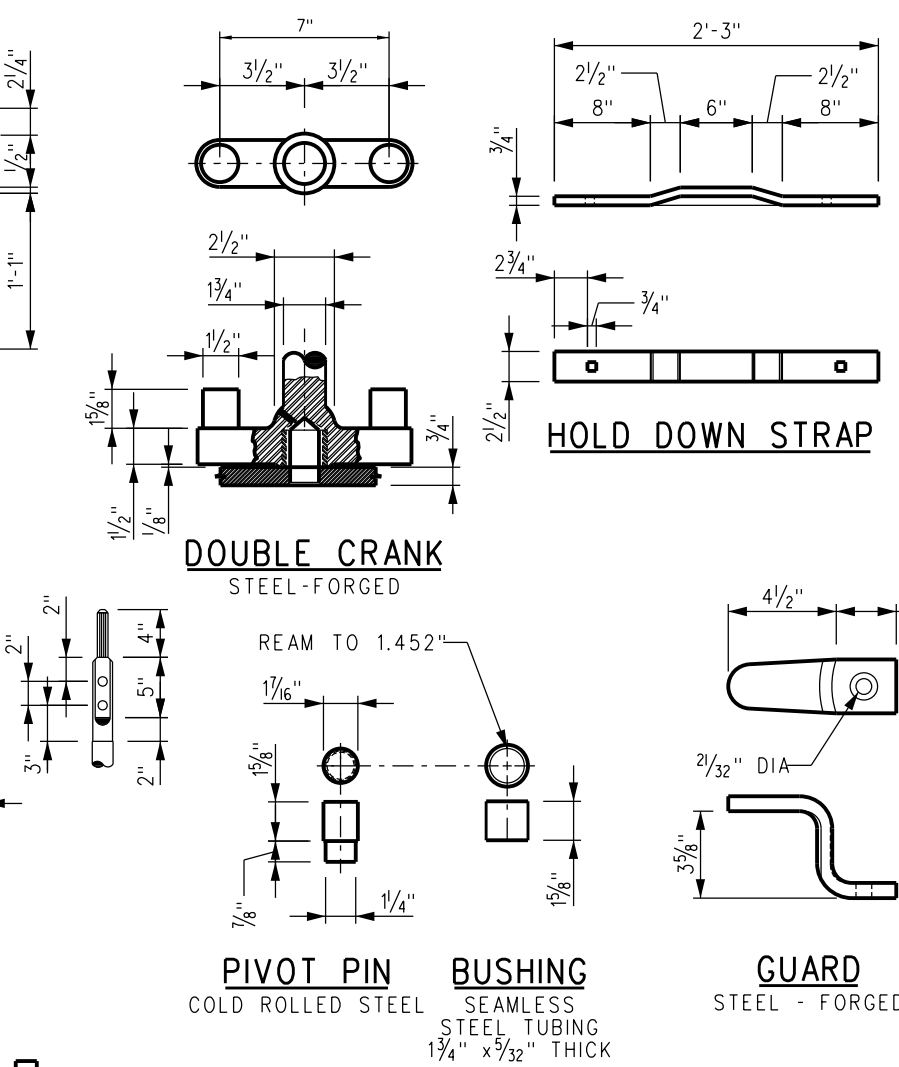
				DRAWN BY: HDR DATE: 03/31/2011		<div>SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES: SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.</div> <div> METROLINK®</div> <div>SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012</div>		ENGINEERING STANDARDS		STANDARD 2615	
				<div> ASSISTANT DIRECTOR: STANDARDS & DESIGN</div>				SCALE: NTS			
				<div> DIRECTOR OF ENGINEERING AND CONSTRUCTION</div>				RAIL LUBRICATOR		REVISION SHEET 1 OF 1	
										CADD FILE: ES2615	
X XX-XX-XX		REVISION		XX XX							
REV. DATE		DESCRIPTION		DES. ENG.							



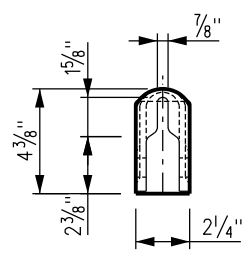
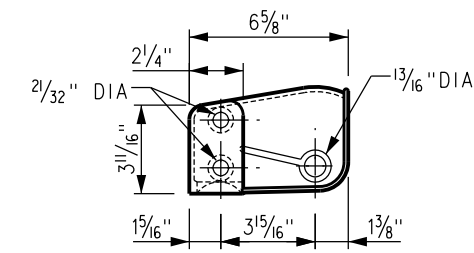
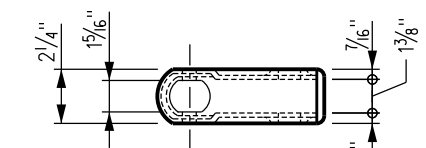
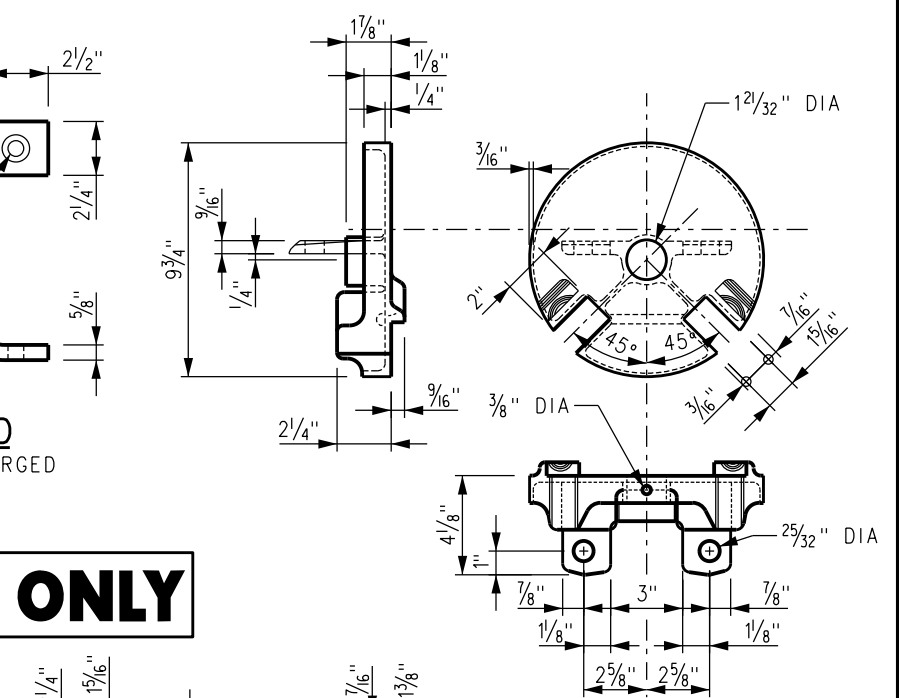
- NOTES:**
1. STEEL BUMPING POST TO BE WCH MODEL, WAC OR APPROVED EQUAL.
 2. OPTIONAL SHOCK FREE HEAD TO BE INSTALLED IF DIRECTED BY SCRRA.






				DRAWN BY: HDR DATE: 03/31/2011		<div>SCRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRA APPROVED USES ONLY. FOR NON-SCRRA APPROVED USES, SCRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRA. ALL RIGHTS RESERVED.</div> <div> METROLINK[®]</div> <div>SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012</div>	ENGINEERING STANDARDS		STANDARD 2616	
				<div> ASSISTANT DIRECTOR: STANDARDS & DESIGN</div>					SCALE: NTS	
				<div> DIRECTOR OF ENGINEERING AND CONSTRUCTION</div>					REVISION SHEET	
X XX-XX-XX				REVISION			XX XX		1 OF 1	
REV. DATE				DESCRIPTION			DES. ENG.		CADD FILE: ES2616	

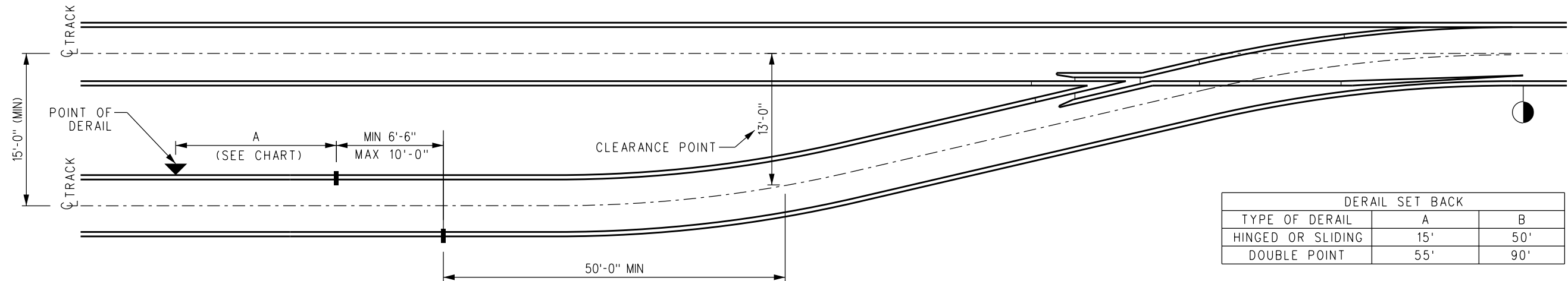


FOR MAINTENANCE ONLY



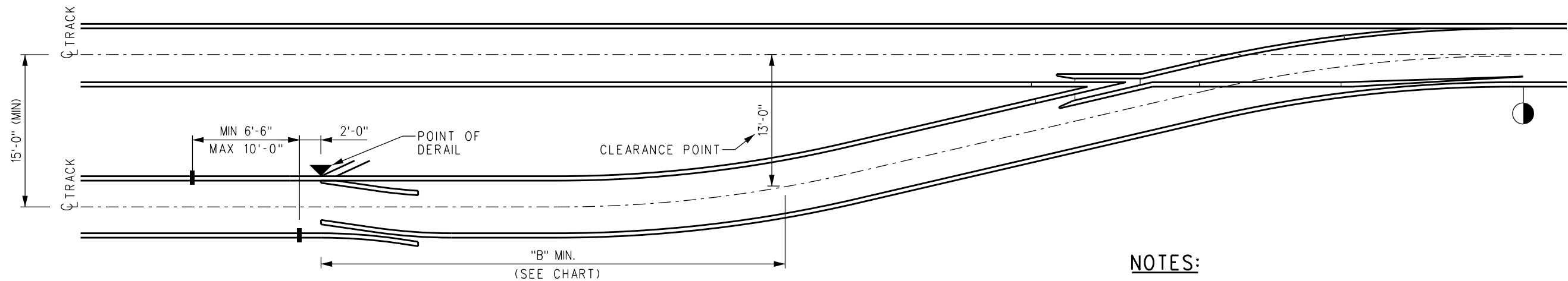
1. USE 36E (SCRRRA ES2708) STANDS FOR NEW INSTALLATION MAINLINE USE.
THIS HIGH STAR SWITCH STAND IS TO BE USED ONLY UNTIL THIS STYLE STAND IS REPLACED IN THE NORMAL COURSE OF MAINTENANCE OR CAPITAL PROJECT RENEWALS.
2. MAIN TRACK SWITCH STANDS SHALL BE PLACED ON THE TURNOUT SIDE TO THE TRACK WHEREVER STRUCTURES OR OTHER TRACKS PERMIT.
3. SWITCH STANDS OF THE TYPE SHOWN ON THIS PLAN SHALL BE USED FOR SINGLE AND DOUBLE SWITCH POINT DERAILS.
4. WHERE TWO HIGH STANDS COME SO CLOSE TOGETHER AS TO BLANKET EACH OTHER, USE ONE HIGH STAND AND ONE LOW STAND.
5. MANUFACTURER WILL NOT FURNISH TARGET, CONNECTING ROD AND HOLD DOWN STRAP UNLESS SPECIFIED ON ORDER.

STREET / FENCED				DRAWN BY: A. CARLOS DATE: 03/31/2011		SCRA ENGINEERING STANDARDS ARE INTENDED FOR SCRA APPROVED USES ONLY. FOR NON-SCRA APPROVED USES: SCRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT LIABILITY ARISING FROM SUCH USE, NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRA. ALL RIGHTS RESERVED.		 METROLINK®		ENGINEERING STANDARDS		STANDARD 2701	
				 ASSISTANT DIRECTOR: STANDARDS & DESIGN						SCALE: NTS		2701	
				 DIRECTOR OF ENGINEERING AND CONSTRUCTION						REVISION A		SHEET 1 OF 1	
A 12/05/11 ADDED "FOR MAINTENANCE ONLY" STAMP AC NDP										CADD FILE:		ES2701	
REV. DATE DESCRIPTION DES. ENG.													



DERAIL SET BACK		
TYPE OF DERAIL	A	B
HINGED OR SLIDING	15'	50'
DOUBLE POINT	55'	90'

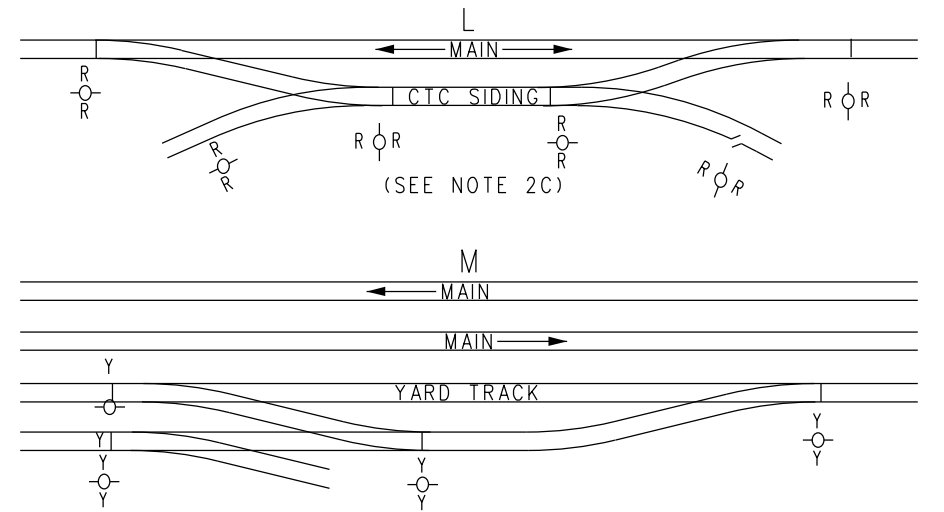
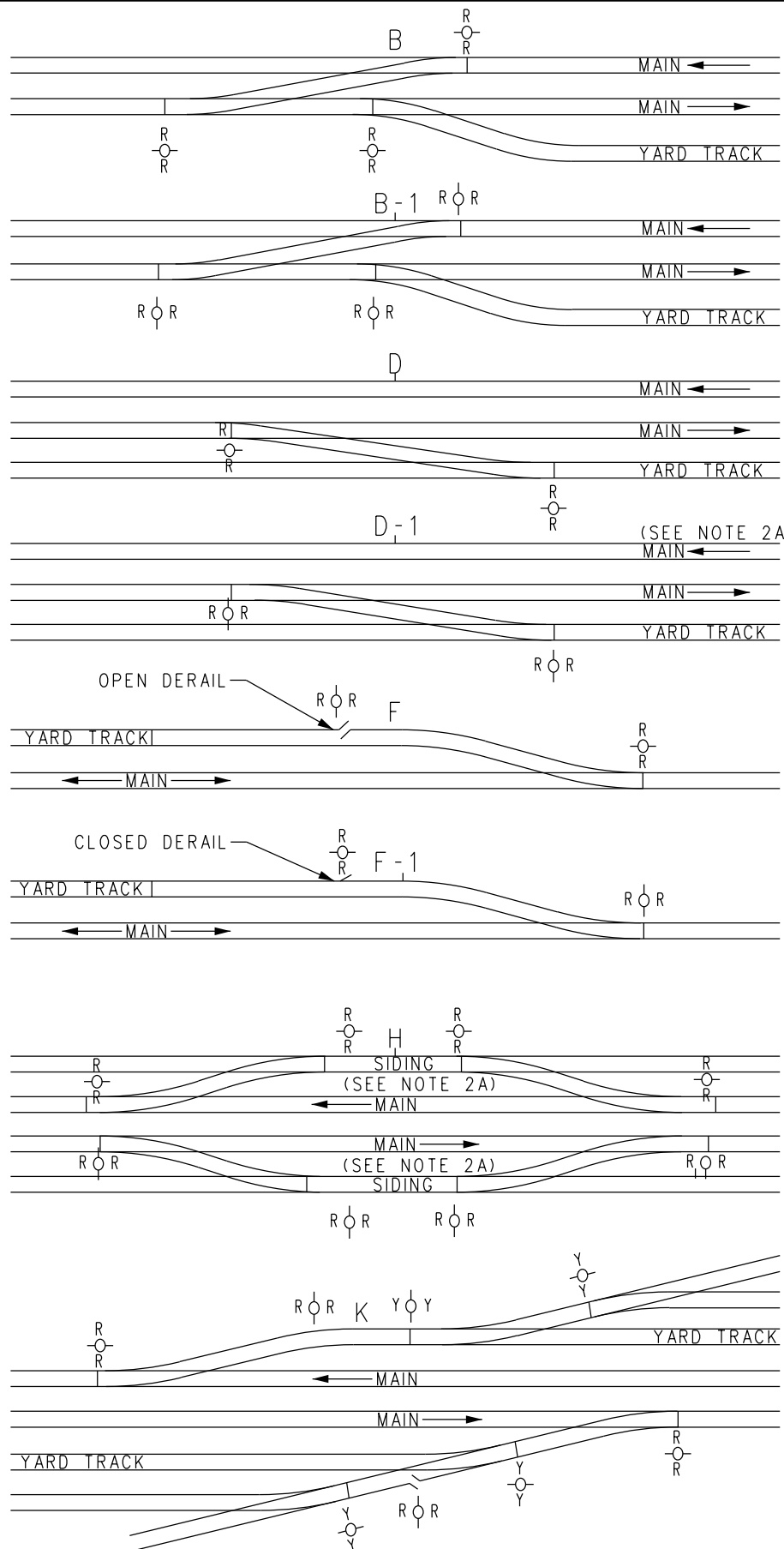
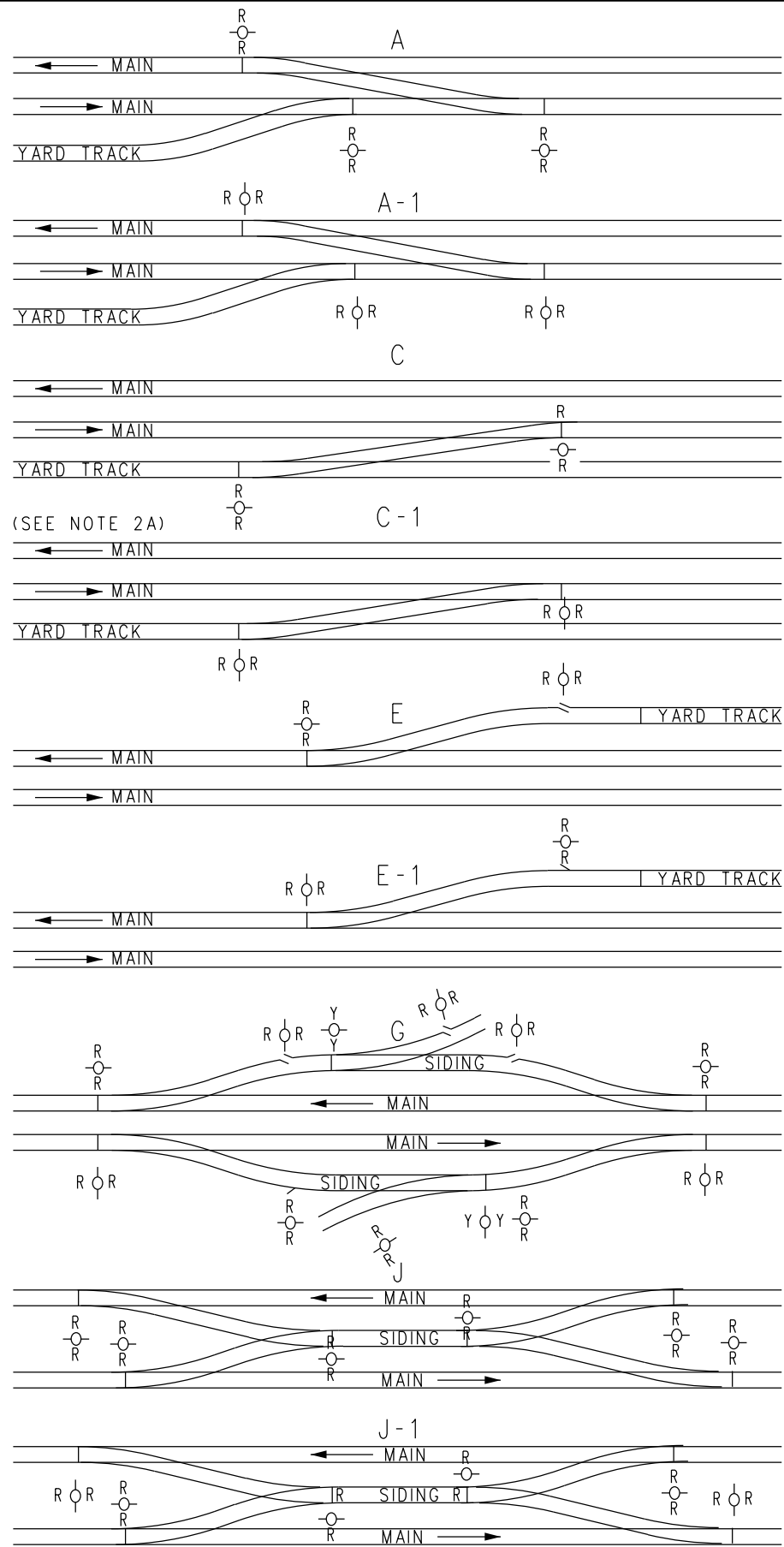
TURNOUT - DERAIL NOT CONNECTED TO SIGNAL SYSTEM - OUTSIDE INSULATED JOINTS



TURNOUT - DERAIL CONNECTED TO SIGNAL SYSTEM

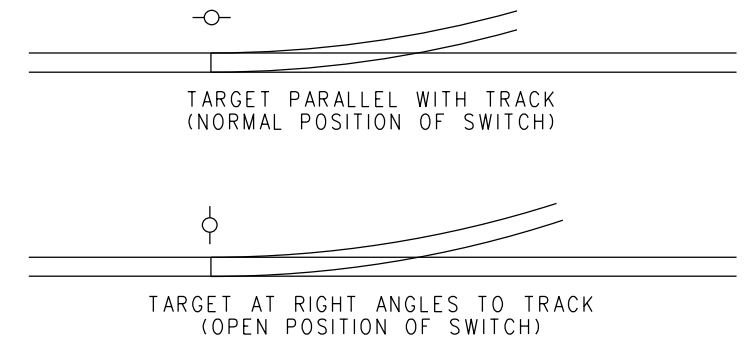
- NOTES:**
1. THIS SHEET ONLY DEPICTS THE INSULATED JOINTS REQUIRED IN CONNECTION WITH THE PLACEMENT OF THE DERAIL.
 2. SYMBOL "▼" DESIGNATES THE POINT OF DERAIL.
 3. DISTANCE MEASURED BETWEEN END POSTS OF INSULATED JOINTS SHALL BE A MINIMUM OF 6'-6" AND A MAXIMUM OF 10'-0". (FRA REGULATIONS ALLOW 19'-6" STAGGER BUT ABOVE STANDARD SHALL BE APPLIED TO ALL NEW CONSTRUCTION).
 4. DISTANCE FROM CLEARANCE POINT TO INSULATED JOINT SHALL BE A MINIMUM OF 50'-0".
 5. SEE ES8220 FOR PLACEMENT OF ALL OTHER NECESSARY INSULATED JOINTS IN CONNECTION WITH TURNOUTS OR OTHER THAN MAIN TRACKS.
 6. THE DOUBLE POINT DERAIL WILL BE PLACED ENTIRELY ON TANGENT TRACK (SEE ES2604-01 FOR DOUBLE SWITCH POINT DERAIL DIMENSIONS). CLOSURE CURVES MAY REQUIRE EXTENDING THE DIMENSION "B" LENGTH TO PROVIDE THE NECESSARY TANGENT TRACK LENGTH. THE DIMENSION DEPICTED IN THIS STANDARD IS THE MINIMUM PERMISSIBLE LENGTH.

				DRAWN BY: A. CARLOS		DATE: 03/31/2011		SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES, SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.		 METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012		ENGINEERING STANDARDS		STANDARD 2702	
				 ASSISTANT DIRECTOR: STANDARDS & DESIGN								SCALE: NTS		REVISION SHEET	
				 DIRECTOR OF ENGINEERING AND CONSTRUCTION								INSULATED JOINT PLACEMENT AND DERAIL LOCATION		1 OF 1	
														CADD FILE: ES2702	



NOTES:

1. LETTERS R (RED) AND Y (YELLOW) DENOTE COLORS OF TARGETS.
2. THE FOLLOWING SWITCH STANDS WILL HAVE RED TARGETS ON BOTH SIDES, THE SAME AS FOR MAIN LINE SWITCH STANDS.
(A) SIDING AND YARD TRACK SWITCH STANDS AT CROSSOVERS LEADING TO MAIN TRACK.
(B) SIDING AND YARD TRACK SWITCH STANDS WHICH ACTUATE MAIN LINE SIGNALS.
(C) YARD AND OTHER INSIDE TRACK SWITCH STANDS AT CONNECTIONS WITH CTC SIDINGS.
(D) DERAIL SWITCH STANDS.
3. ALL OTHER SWITCH STANDS ON SIDE TRACKS IN YARDS AND ON OTHER INSIDE TRACKS WILL HAVE YELLOW TARGETS ON BOTH SIDES.



TARGET SYMBOLS

REV.	DATE	DESCRIPTION	DES.	ENG.
X	XX-XX-XX	REVISION	XX	XX

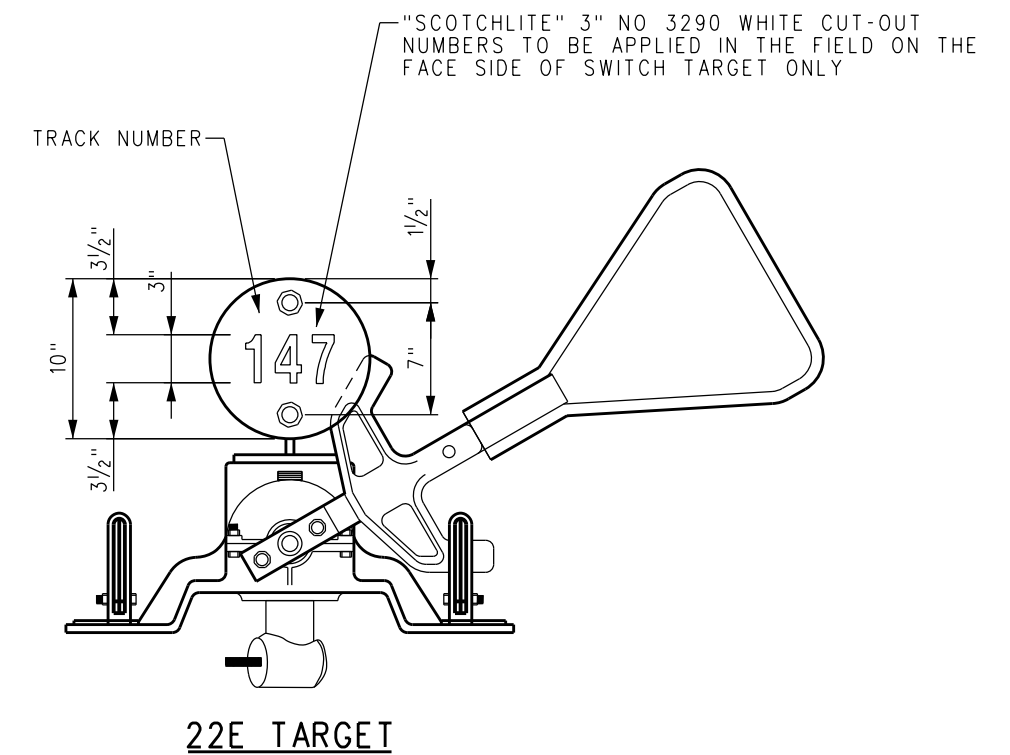
DRAWN BY: A. CARLOS DATE: 03/31/2011
ASSISTANT DIRECTOR: STANDARDS & DESIGN
DIRECTOR OF ENGINEERING AND CONSTRUCTION

SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY.
FOR NON-SCRR APPROVED USES:
SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.

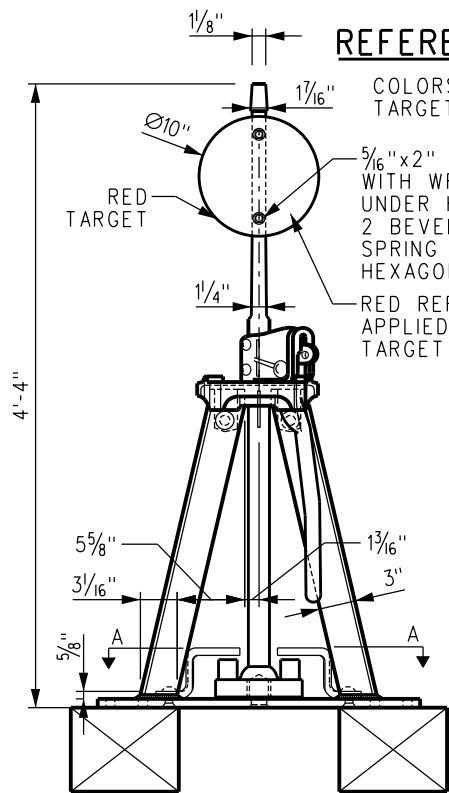
METROLINK
SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012

ENGINEERING STANDARDS	STANDARD 2703
COLOR INDICATORS OF TARGETS ON SWITCH STANDS	SCALE: NTS
	REVISION SHEET 1 OF 2
	CADD FILE: ES2703-01

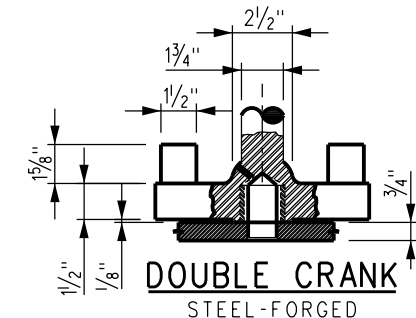
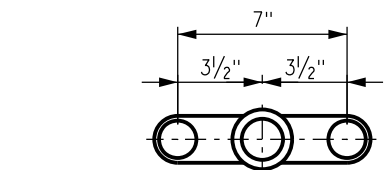
1. TRACK IDENTITY IS TO BE APPLIED TO SWITCH STAND TARGETS IN THE FIELD ONLY AND TARGETS MUST NOT BE ORDERED BEARING ANY TRACK I.D.



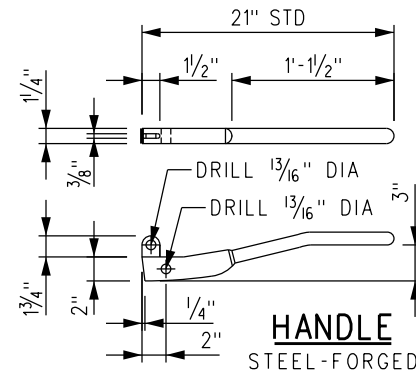
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



SWITCH STAND
(FRONT VIEW)



DOUBLE CRANK
STEEL-FORGED



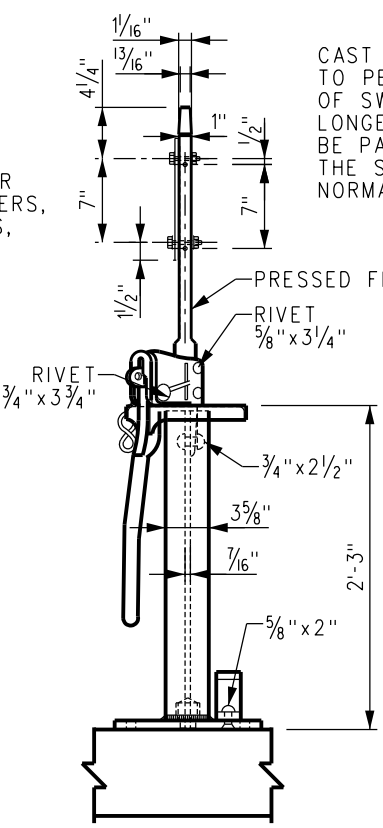
HANDLE
STEEL-FORGED

REFERENCE:

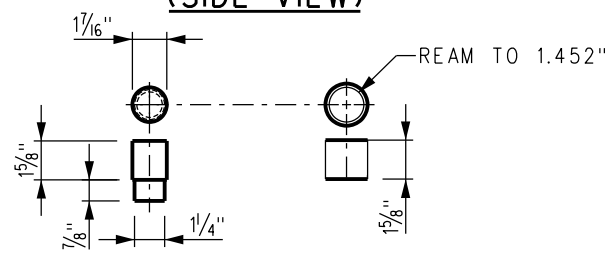
COLORS OF SWITCH
TARGETS: ES2705

5/16" x 2" SAE BOLT
WITH WROUGHT IRON WASHER
UNDER HEAD, 2 FIBRE WASHERS,
2 BEVELED ROUND WASHERS,
SPRING WASHER AND
HEXAGONAL NUT

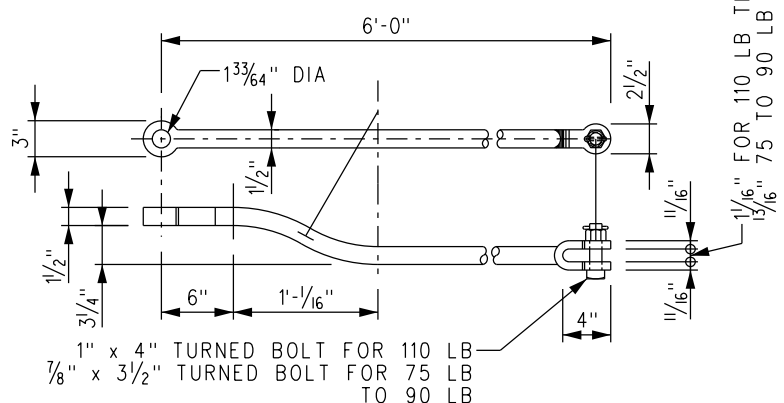
RED REFLECTIVE SHEETING
APPLIED TO BOTH SIDES OF
TARGET



SWITCH STAND
(SIDE VIEW)

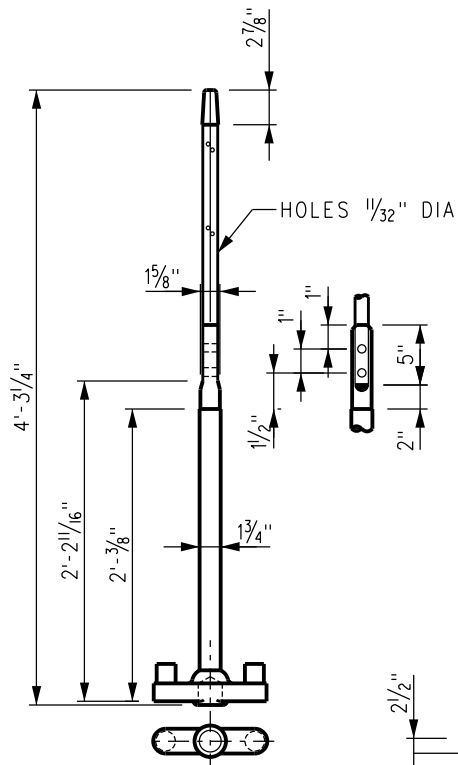


PIVOT PIN BUSHING
COLD ROLLED STEEL SEAMLESS
STEEL TUBING
1 3/4" x 5/32" THICK

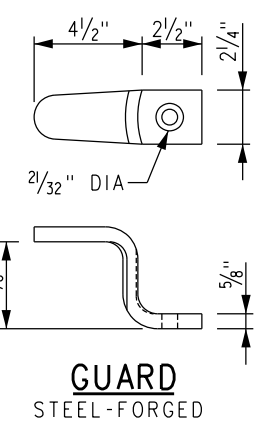


CONNECTING ROD

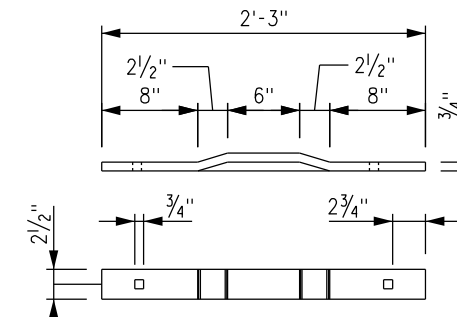
CAST IRON PLUG LAMP TIP
TO PERMIT INTERCHANGEABILITY
OF SWITCH LIGHTS, THE
LONGER SIDE OF TIP SHOULD
BE PARALLEL TO THE RAIL WHEN
THE SWITCH IS LINED FOR THE
NORMAL POSITION.



DOUBLE CRANK
AND MAST

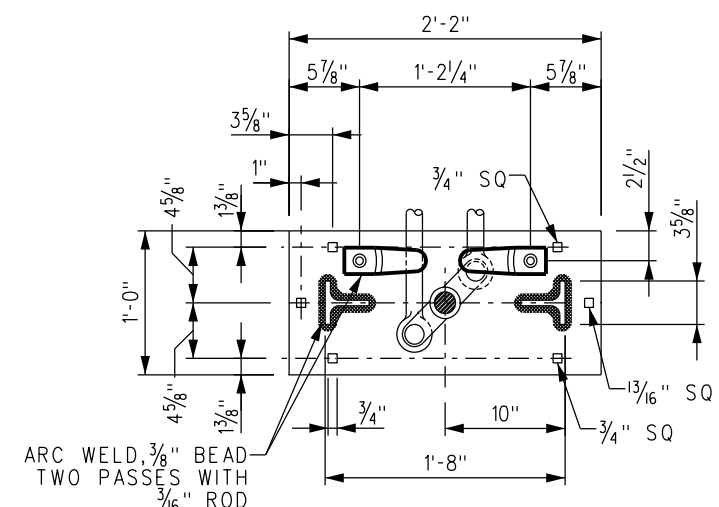


GUARD
STEEL-FORGED



HOLD DOWN STRAP

FOR MAINTENANCE ONLY



CONNECTING ROD
SECTION A-A

ARC WELD, 3/8" BEAD
TWO PASSES WITH
3/16" ROD

NOTES:

1. USE 36E (ES2708) STANDS FOR NEW INSTALLATION MAINLINE USE. THIS LOW STAR SWITCH STAND IS TO BE USED ONLY UNTIL THIS STYLE STAND IS REPLACED IN THE NORMAL COURSE OF MAINTENANCE OR CAPITAL PROJECT RENEWALS.
2. MAIN TRACK SWITCH STANDS SHALL BE PLACED ON THE TURNOUT SIDE TO THE TRACK WHEREVER STRUCTURES OR OTHER TRACKS PERMIT.
3. SWITCH STANDS OF THE TYPE SHOWN ON THIS PLAN SHALL BE USED FOR SINGLE AND DOUBLE SWITCH POINT DERAILS.
4. WHERE TWO HIGH STANDS COME SO CLOSE TOGETHER AS TO BLANKET EACH OTHER, USE ONE HIGH STAND AND ONE LOW STAND.
5. MANUFACTURER WILL NOT FURNISH TARGET, CONNECTING ROD AND HOLD DOWN STRAP UNLESS SPECIFIED ON ORDER.

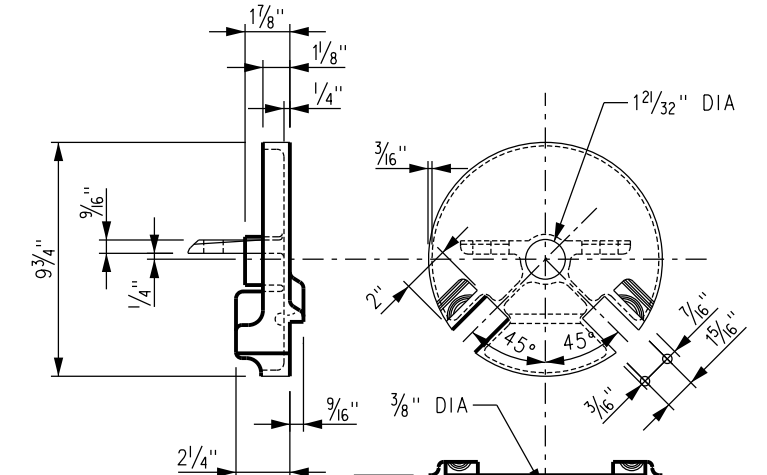
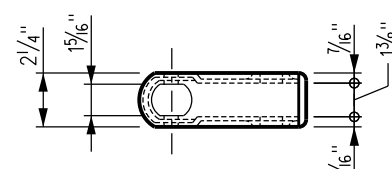
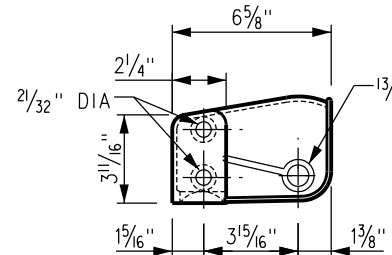


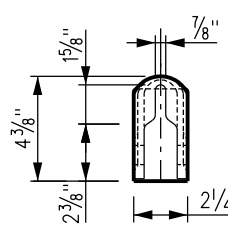
TABLE
CAST STEEL



PLAN



ELEVATION

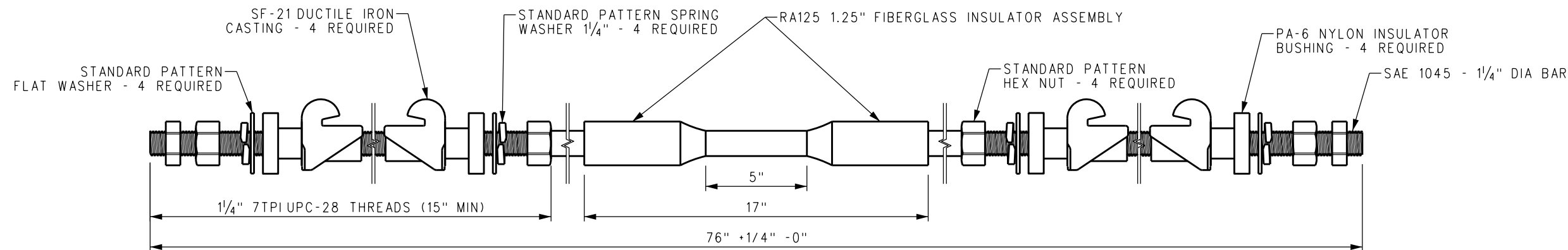


FRONT

YOKE
CAST STEEL

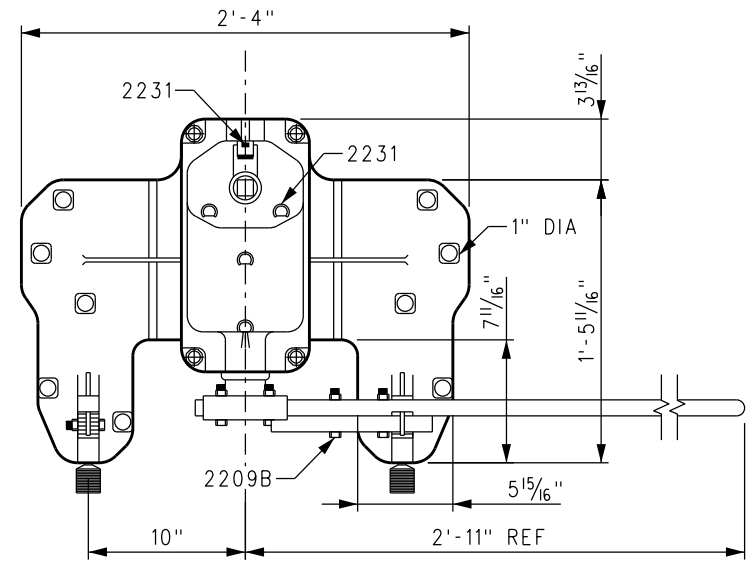
DRAWN BY: A. CARLOS DATE: 03/31/2011				SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES, SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.				ENGINEERING STANDARDS				STANDARD
A 12/05/11				ADDED "FOR MAINTENANCE ONLY" STAMP				LOW STAR SWITCH STAND DOUBLE CRANK - DOUBLE HEADBLOCK				2704
REV. DATE DESCRIPTION DES. ENG.				NTP				SCALE: NTS				REVISION SHEET
A 12/05/11				ADDED "FOR MAINTENANCE ONLY" STAMP				1 OF 1				CADD FILE:
												ES2704

- NOTES:**
- 1. ROD SHALL BE SAE1045. THREADS SHALL BE 1/4" 7 UNC-2B.
 - 2. RAIL ENGAGEMENT FITTINGS (SF-21) SHALL BE OF 60,000 PSI TENSILE, 45,000 PSI YIELD, AND 12% ELONGATION PROPERTIES WITH STANDARD MILL TOLERANCES.
 - 3. AFTER ASSEMBLING THE RA125, BUFF SMOOTH ALL WRENCH MARKS.
 - 4. PA-6 INSULATORS ARE POLYIMIDE TYPE 6 NYLON. ALL RODS SHALL BE SHIPPED ASSEMBLED.
 - 5. INCLUDE JAM NUT ON EACH OF ASSEMBLY.
 - 6. CHAMFER ENDS OF ROD BEFORE THREADING.

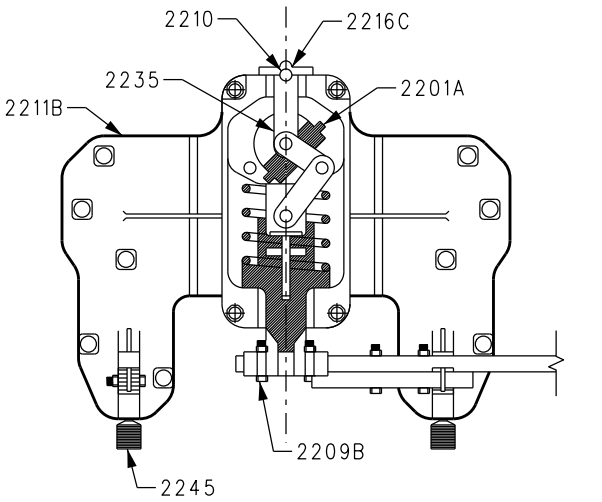


SPECIAL NOTE TO MANUFACTURER:
ALL THREADS TO BE COATED WITH BOSTIK "NEVER-SEIZE".

					DRAWN BY: HDR DATE: 03/31/2011		<div>SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES: SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.</div>	<div>METROLINK[®] SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012</div>	ENGINEERING STANDARDS		STANDARD 2706		
									SCALE: NTS		REVISION SHEET		
									INSULATED GAUGE ROD		1 OF 1		
											CADD FILE: ES2706		
X	XX-XX-XX	REVISION	XX	XX									
REV.	DATE	DESCRIPTION	DES.	ENG.									

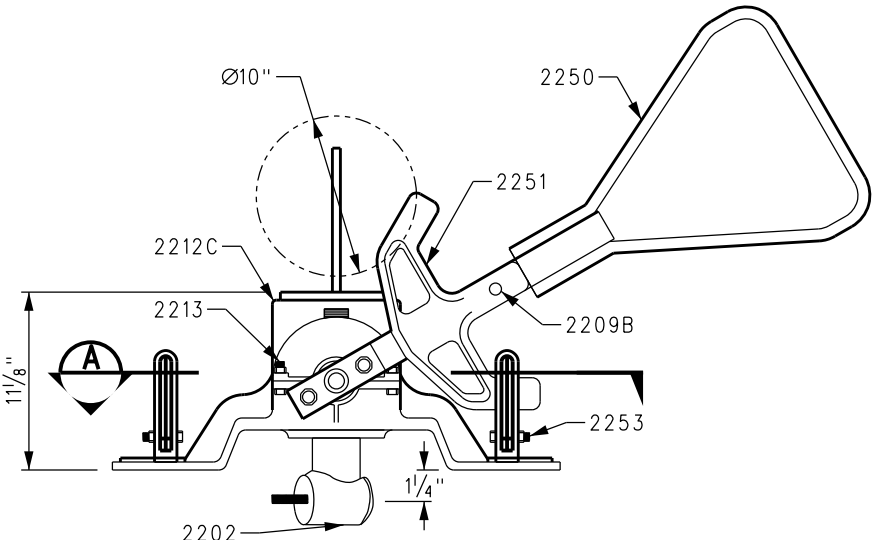


22E - TOP VIEW

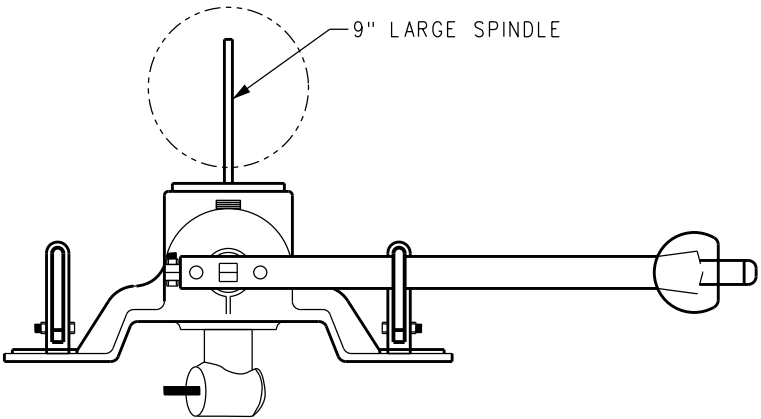


22E - DETAIL VIEW A

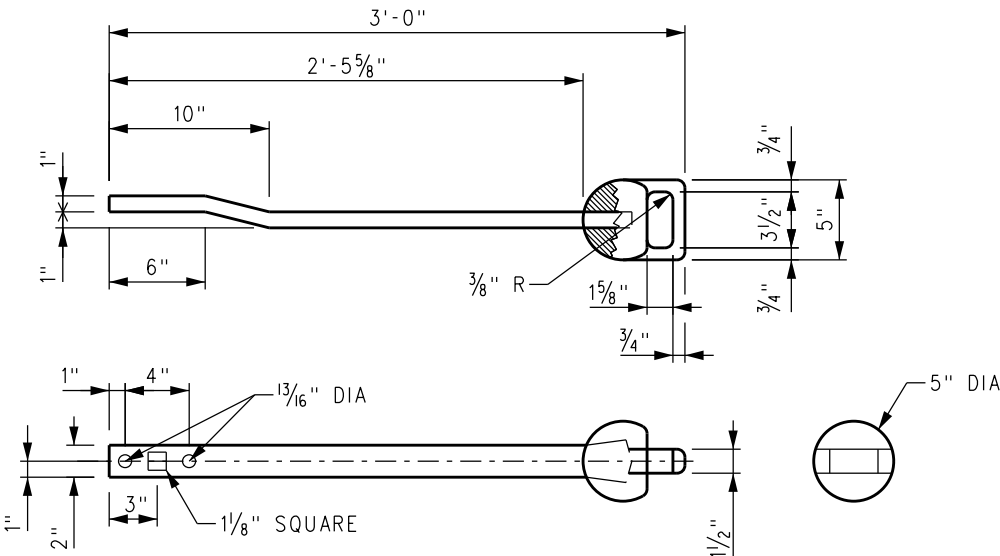
BILL OF MATERIAL			
CATALOG NO	QTY	DESCRIPTION	SCRRA PART NO
2235	1	LINKAGE AND SPRING CAGE ASSEMBLY (SEE ASSEMBLY DRAWING FOR PARTS DRAWINGS)	
2216C	1	THRUST BUSHING	
2210	1	THRUST BALL 1" DIA	
2212C	1	COVER (S-604-C)	
2252	1	BASE (D-34645)	
2201A	1	SPINDLE (GL-2762)	
2202	1	CRANK EYE (GL-1889)	
2250	1	TRI-HANDLE LEVER	
2213	4	SQUARE HEAD BOLT 5/8" X 3" LONG	
	4	HEX NUT 5/8" - 11	
	4	LOCK WASHER 5/8"	
2209B	4	SQUARE HEAD BOLT 3/4" X 2 3/4" LONG	
	4	SECURITY NUT 3/4" - 10	
2231	5	1608B GREASE FITTING - DRIVE TYPE	
2207	1	TARGET	
2208A	1	TARGET MAST	
	2	BOLT	
	2	NUT	
2251	1	YOKE (D-34637)	
2253	2	1/2" X 2 1/4" HEX CAP SCREW	
	2	HEX SECURITY NUT	
2254	2	FOOT LATCH	



22E SWITCH STAND



STAND WITH OPTIONAL 36" STRAIGHT HANDLE

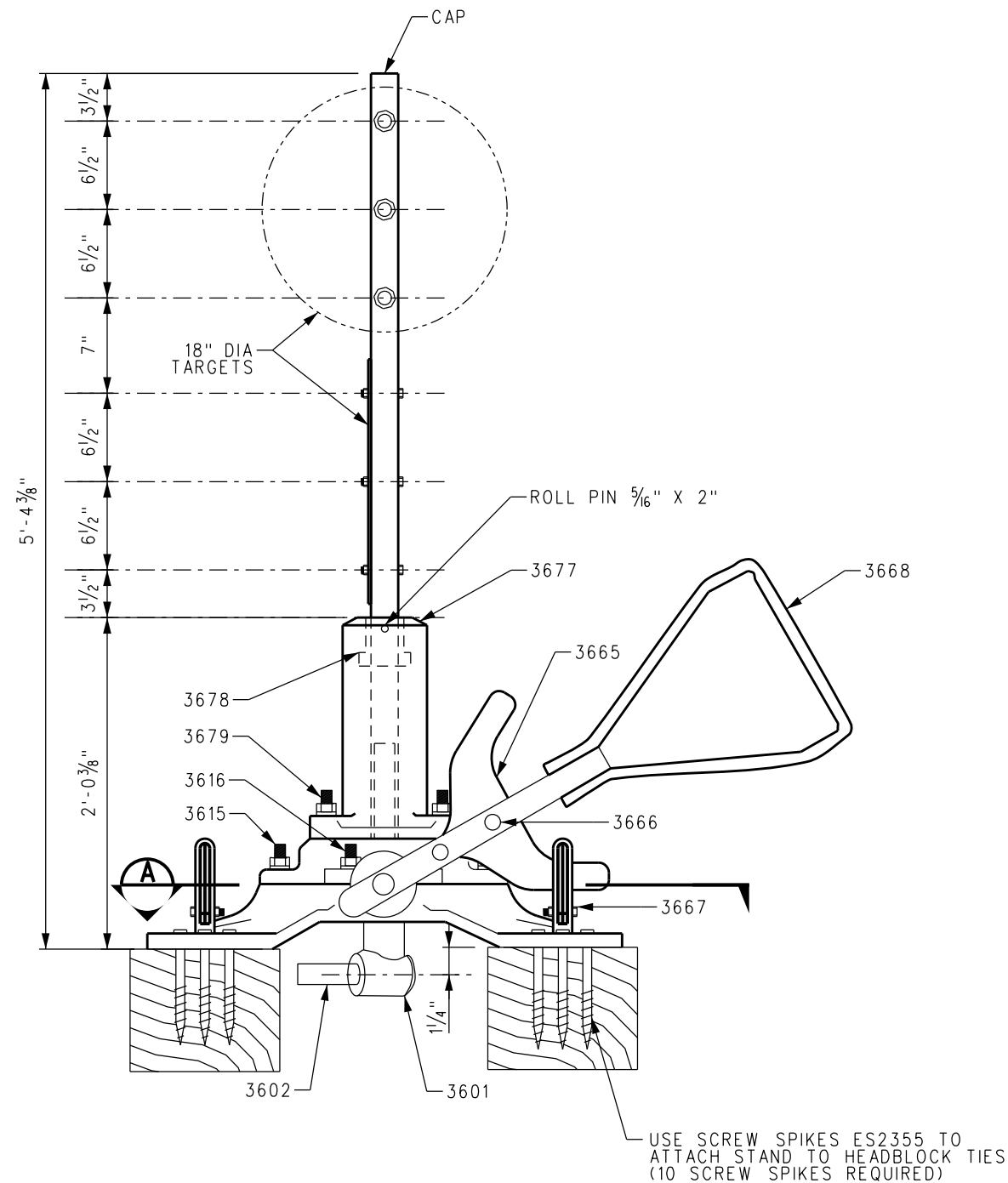


OPTIONAL 36" STRAIGHT HANDLE
(USE FOR TIGHT CLEARANCE ONLY)

NOTES:

- 22-E RECOMMENDED USE: YARD AND OTHER THAN MAIN TRACK
- IT IS RECOMMENDED THAT SWITCH STANDS BE INSPECTED AND LUBRICATED AT LEAST ONCE A YEAR. ADD OIL IN "OIL CUPS" WITH ANY GOOD GRADE ENGINE OIL. RECOMMEND OIL WITH GRAPHITE CONTENT SAE 60.
- IF SWITCH STAND IS DISASSEMBLED, REGREASING OF ALL INTERNAL PARTS IS REQUIRED. APPLY GREASE LIBERALLY IN "THRUST BUSHING" CAVITY, BOTH ENDS "SPRING BASE", "SPINDLE" SLOT, AND ALL BEARING SURFACES (TEXACO NO 904 GREASE).
- SWITCH STAND TO BE INSTALLED USING SCREW SPIKES (SCRRA ES2355)
- FOR SCREW SPIKES SEE SCRRA ES2355
FOR SWITCH TARGET DETAILS SEE SCRRA ES2703-01
FOR TRACK IDENTIFICATION SEE SCRRA ES2703-02
FOR CONNECTING ROD ASSEMBLY SEE SCRRA ES2108
- STRAIGHT HANDLE TO BE PAINTED SAFETY YELLOW.

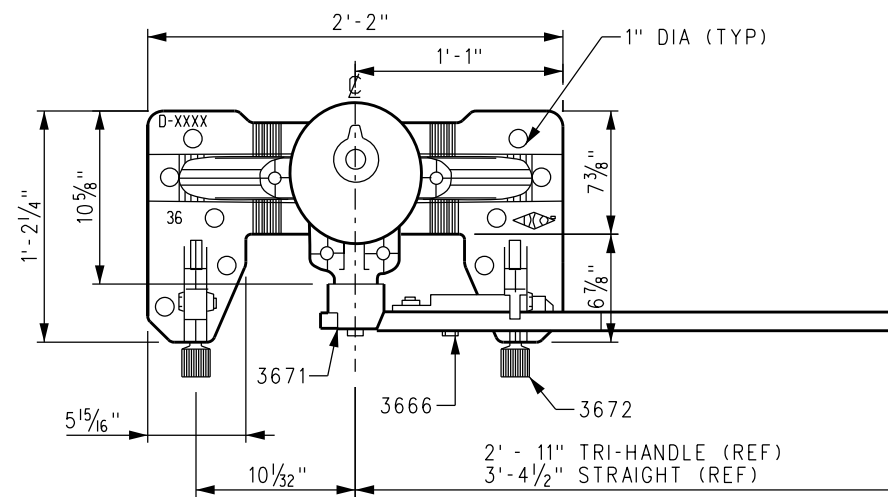
				DRAWN BY: HDR DATE: 03/31/2011		<div>SCRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRA APPROVED USES ONLY. FOR NON-SCRRA APPROVED USES: SCRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRA. ALL RIGHTS RESERVED.</div> <div> METROLINK[®]</div> <div>SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012</div>	ENGINEERING STANDARDS		STANDARD 2707		
				<div> ASSISTANT DIRECTOR: STANDARDS & DESIGN</div>					SCALE: NTS		
				<div> DIRECTOR OF ENGINEERING AND CONSTRUCTION</div>					22E SWITCH STAND		
X	XX-XX-XX	REVISION	XX	XX							
REV.	DATE	DESCRIPTION	DES.	ENG.							



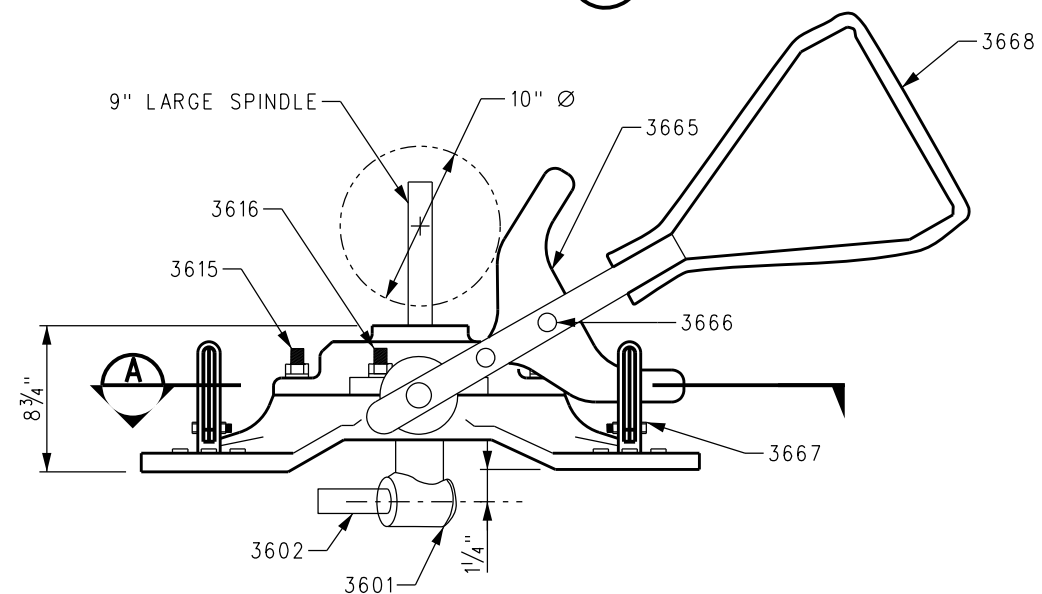
36-EH

NOTES:

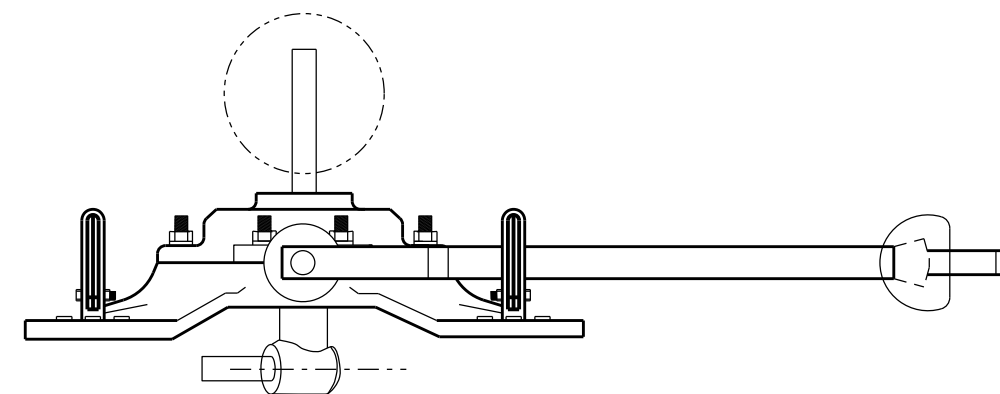
1. FOR BILL OF MATERIALS SEE SHEET ES2708, SHEET 2 OF 2



36-EH & 36-E

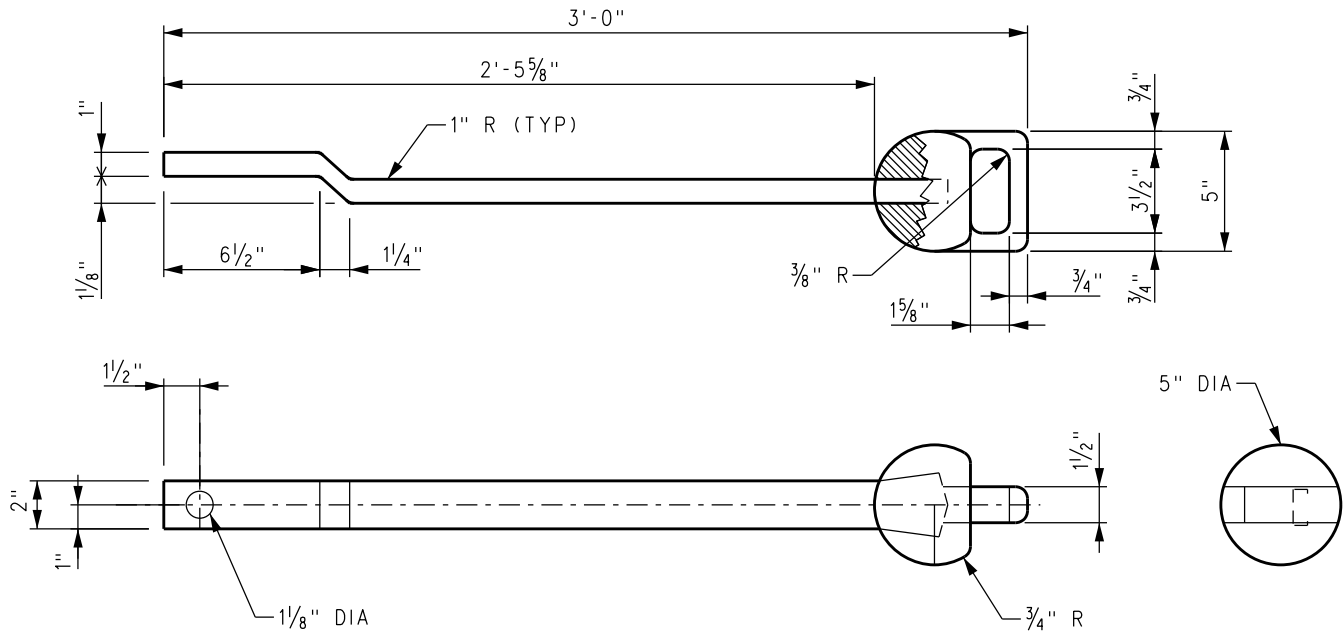


36-E

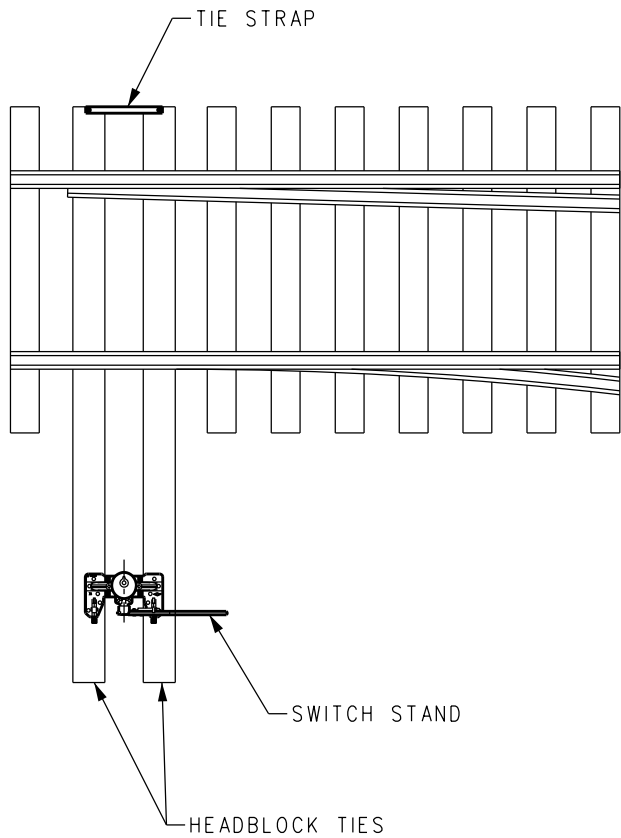


STAND WITH OPTIONAL STRAIGHT HANDLE

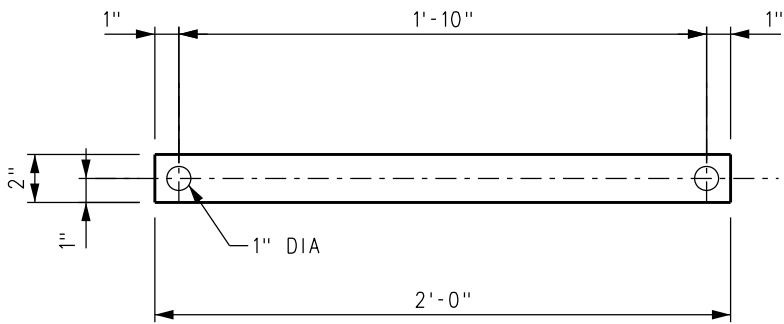
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



OPTIONAL 36" STRAIGHT HANDLE
(USE FOR TIGHT CLEARANCE ONLY)



TIE STRAP LOCATION



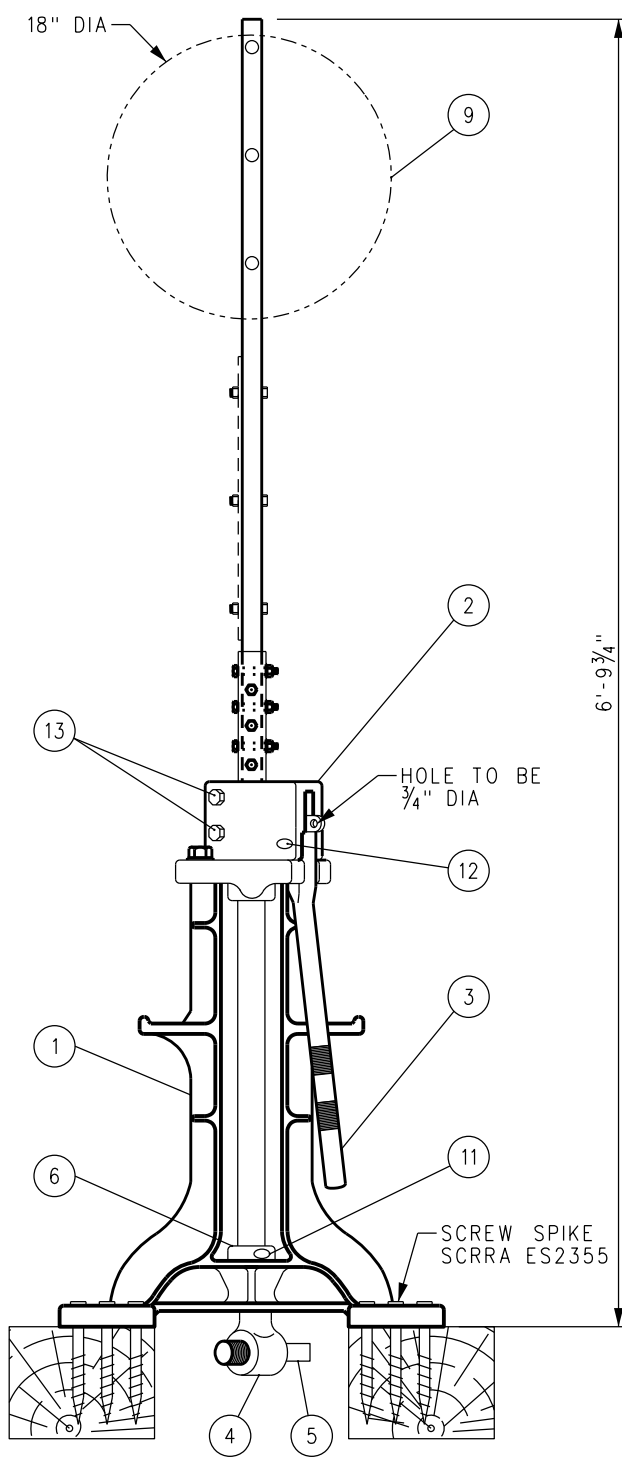
TIE STRAP
TIE MOUNTING KIT
(12) SCREW SPIKES ES2355
(10 FOR STAND AND 2 FOR STRAP)
(1) 1/2" X 2" X 2' STEEL STRAP

BILL OF MATERIAL			
CATALOG NO	QTY	DESCRIPTION	SCRRRA PART NO
3674	1	COVER (S-479)	
3669	1	BASE (D-34678)	
3601	1	SPINDLE	
3602	1	CRANKEYE (GL-1889)	
3668	1	TRI-HANDLE LEVER	
3616	2	SQ HD BOLT 3/4" X 3 1/4" LONG	
3615	2	SQ HD BOLT 3/4" X 4 3/4" LONG	
3671	1	HUB (D-34629)	
3665	1	YOKE (D-34679)	
3666	2	3/4" BUTTON RIVETS	
3672	2	FOOT LATCH	
3653	1	CRANK BUSHING	
3654	1	CRANK WASHER	
3652	1	CRANK GL-1908	
3656	1	COTTER	
3667	2	1/2" X 2 1/4" HEX CAP SCREW	
3677	1	STIFFENER S-480	
3678	1	ADAPTER S-481	
	1	SPINDLE EXTENSION *66	
3679	2	SQ HEAD BOLT 1/2" X 2 1/2" LONG 2" THDS	
	2	HEX NUT 1/2"	
	2	SPRING WASHER - 1/2"	
	2	ANCO HEX NUT - 1/2"	
	4	HEX SECURITY NUT 3/4" - 10	
	4	SPRING WASHER 3/4"	
3655	1	HEX NUT HEAVY WFI 1/8" - SLOTTED	
	2	HEX SECURITY NUT - 1/2"	
3673	1	FLAT WASHER 1 1/8"	
	2	GREASE FITTING	
	2	GREASE FITTING	
	1	ROLL PIN 5/16" X 2"	

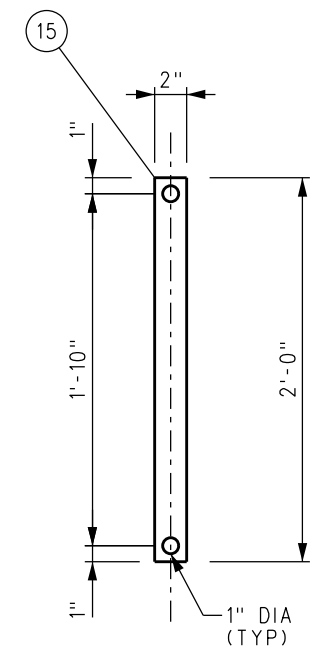
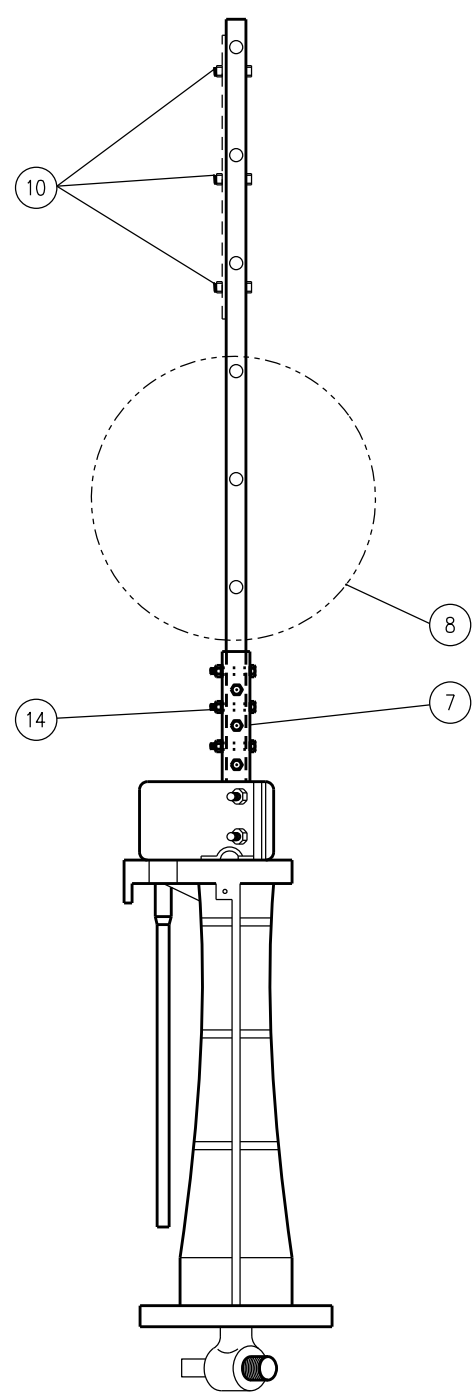
NOTES:

1. SEE ES2708-01 FOR REST OF THE DRAWING.
2. 36-E RECOMMENDED USE: MAIN TRACK CROSS-OVERS AND YARD TRACKS OR OTHER THEN MAIN LINE TRACKS.
3. 36-EH RECOMMENDED USE: MAIN TRACK.
4. FOR MAIN LINE INSTALLATION USE MOUNTING KIT. APPLY TIE STRAP ON HEADBLOCK TIES ON OPPOSITE SIDE OF TRACK FROM SWITCH STANDS.
5. LUBRICATE INTERNALLY AT LEAST ONCE A YEAR.
6. REFERENCE THE FOLLOWING DRAWINGS:
 - SCREW SPIKES - ES2358
 - SWITCH TARGET DETAILS - ES2703-01 & 02
 - CONNECTING ROD ASSEMBLY - ES2108
7. STRAIGHT HANDLE TO BE PAINTED SAFETY YELLOW.

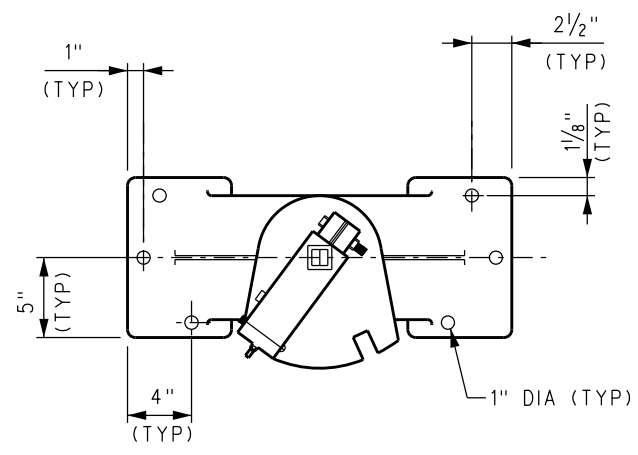
				DRAWN BY: HDR DATE: 03/31/2011		<div>SCRRRA ENGINEERING STANDARDS ARE INTENDED FOR SCRRRA APPROVED USES ONLY. FOR NON-SCRRRA APPROVED USES: SCRRRA SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRRRA. ALL RIGHTS RESERVED.</div> <div> METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012</div>	ENGINEERING STANDARDS		STANDARD 2708	
				<div> ASSISTANT DIRECTOR: STANDARDS & DESIGN</div>					SCALE: NTS	
				<div> DIRECTOR OF ENGINEERING AND CONSTRUCTION</div>					REVISION SHEET	
									- 2 OF 2	
								CADD FILE: ES2708-02		
X	XX-XX-XX	REVISION	XX	XX			36E & 36EH SWITCH STANDS			
REV.	DATE	DESCRIPTION	DES.	ENG.						



112E HIGH SWITCH STAND

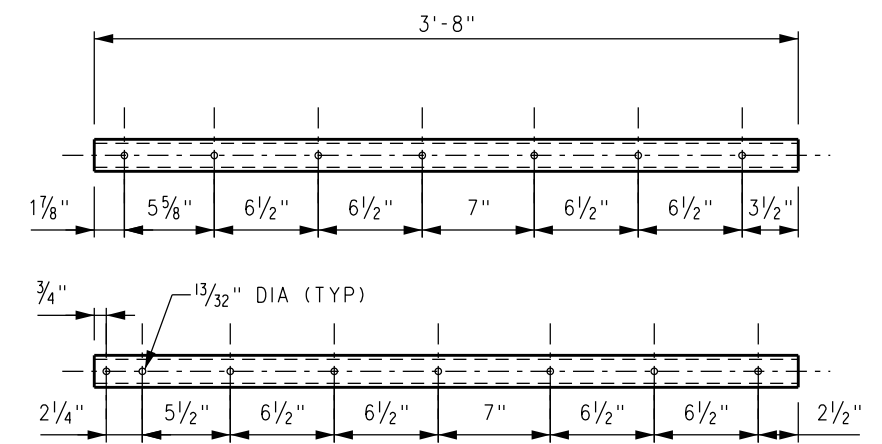


TIE STRAP MOUNTING KIT
(1) 1/2" X 2" X 2' STEEL STRAP



BASE

BILL OF MATERIALS				
ITEM	QTY	DESCRIPTION	SCRRRA PART NO	PART NO
1	1	MAIN CASTING (MODIFIED AS SHOWN)		11209E
2	1	LEVER BRACKET		11212E
3	1	HAND LEVER		11213E
4	1	SPINDLE		11201E
5	1	CRANK EYE		11202E
6	1	COLLAR		11210E
7	2	SPLICE BRACKET		11216E
8	1	SPINDLE EXTENSION		962023
9	1	TARGET		
10	3	3/8" X 2" BOLT SQUARE HD/HEX HD NUT 8 FLAT WASHER		
11	1	RIVET 1/2" X 3 3/4"		11211E
12	1	RIVET 5/8" X 3 1/4"		11214E
13	2	7/8" X 3 3/4" HT MACH BOLTS/ HEX SLOTTED NUTS 8 3/16" X 1 1/2" COTTER/SPRING WASHER		11215E
14	6	3/8" X 2 1/2" MACH BOLTS/SQUARE HD 8 HEX ANCO NUTS		11217E
15	1	TIE STRAP MOUNTING KIT		



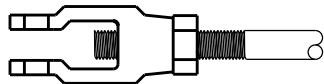
7/8" INSIDE, 1 3/16" OUTSIDE SQUARE TUBING

TARGET SPINDLE EXTENSION

- NOTES:
1. RECOMMENDED USE, MAIN TRACK FOR SWITCH STAND MOUNTING KIT.
 2. APPLY TIE STRAP ON HEADBLOCK TIES ON OPPOSITE SIDE OF TRACK FROM SWITCH STANDS.
 3. MINIMUM CONNECTING ROD LENGTH IS 6'-0 3/4".
 4. FOR SWITCH TARGET DETAILS: SCRRRA ES2703-01
FOR TRACK IDENTIFICATIONS: SCRRRA ES2703-02
FOR CONNECTING ROD ASSEMBLY: SCRRRA ES2108

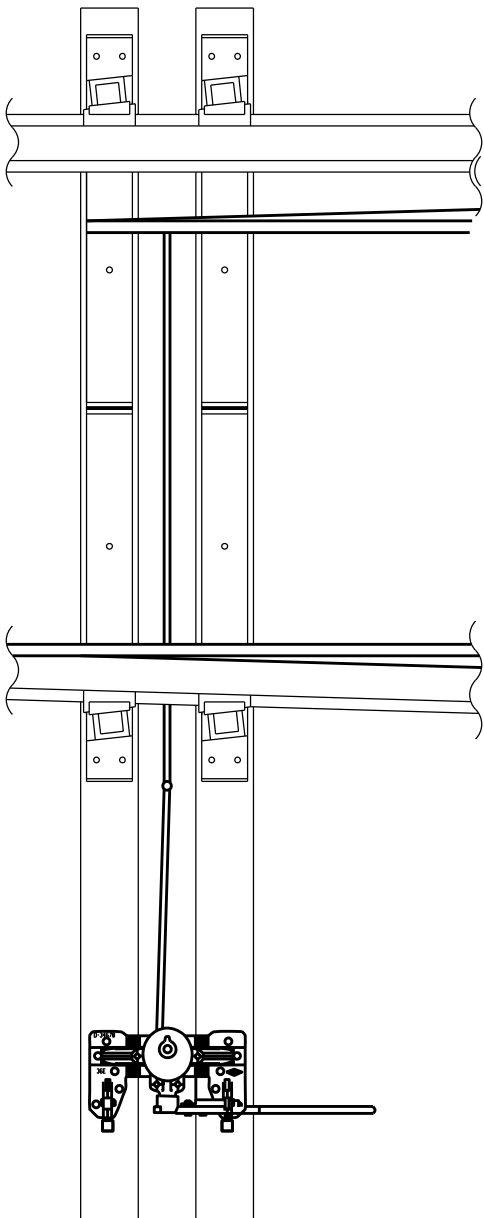
1

CRANKEYE AND CONNECTING ROD CLEVIS SHOULD BE GREASED PRIOR TO INSTALLATION OR ADJUSTMENT. START WITH ABOUT 1" OF THREADS SHOWING ON CONNECTING ROD TURNBUCKLE (TIGHTEN JAM NUT)



2

MEASURE THROW BETWEEN SWITCH POINT & STOCK RAIL AT FIRST ROD

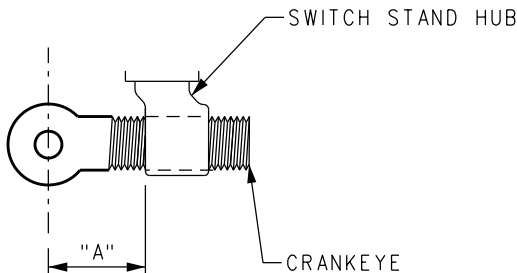


3

SET CRANKEYE SETTING AT DISTANCE "A" FOR MEASURED OPENING AND CORRECT STAND

THROW OF SWITCH	"A"	"A"
	RACOR 22E	RACOR 36E
4 1/2"	2 1/16"	2 9/16"
4 5/8"	2 3/16"	2 11/16"
4 3/4"	2 1/4"	2 3/4"
4 7/8"	2 5/16"	2 13/16"
5"	2 7/16"	2 15/16"
5 1/8"	2 1/2"	3"
5 1/4"	2 5/8"	3 1/8"
5 3/8"	2 11/16"	3 3/16"
5 1/2"	2 13/16"	3 5/16"
5 5/8"	-	3 3/8"
5 3/4"	-	3 7/16"

"A" WORKS FOR ALL ROD LENGTHS



RACOR 22E & 36E
STANDARD SIDE FOR CRANKEYE

NOTES:

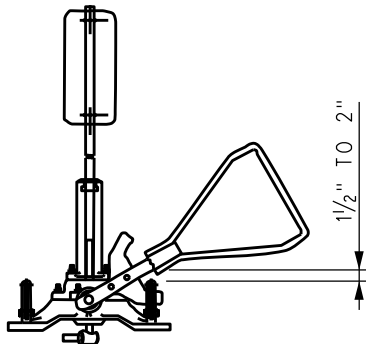
- USE 15/16" SCREW SPIKES OR APPROPRIATE PIM SCREWS WHEN INSTALLING NEW SWITCH STANDS ON TIMBER OR CONCRETE TIES.
- FIELD INSPECTION OF STAND IS RECOMMENDED AT LEAST ANNUALLY OR MORE WHERE STAND IS USED FREQUENTLY.
- OIL CUPS: USE SAE 40, ADD OIL FREQUENTLY.
- GREASE SHOULD BE LG312 LITHIUM GRADE 2. REGREASING OF ALL INTERNAL PARTS IS RECOMMENDED BEFORE REASSEMBLY AFTER INSPECTIONS.
- DIFFERENCES BETWEEN CRANKEYE MEASUREMENTS ON THIS DRAWING AND FINAL ADJUSTMENTS ARE PROBABLY DUE TO TOLERANCES (LOST MOTION) IN CONNECTING ROD/HEAD ROD CONNECTIONS.

4

MOVE SWITCH POINTS TO HALF-THROWN POSITION (OPENING EQUAL ON BOTH SIDES), AND STAND LEVER IN VERTICAL POSITION. CENTER STAND ON HEADBLOCK TIES AND SPIKE OR LAG TO TIES.

5

HAND THROW SWITCH TO BOTH SIDES SEVERAL TIMES. WHEN POINT CONTACTS STOCK RAIL, LEVER SHOULD NOT BE MORE THAN 1 1/2" TO 2" ABOVE FINAL POSITIONS ON TOP OF LEVER REST FOR BOTH POSITIONS.



ELEVATION

IF NOT, ADJUST AS FOLLOWS:

WHEN NEAR POINT FITS PROPERLY AND FAR POINT IS TOO TIGHT:
SHORTEN CRANKEYE SETTING AND SHORTEN CONNECTING ROD CLEVIS.


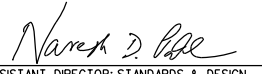
WHEN NEAR POINT FITS PROPERLY AND FAR POINT IS LOOSE:
LENGTHEN CRANKEYE SETTING AND LENGTHEN CONNECTING ROD CLEVIS.

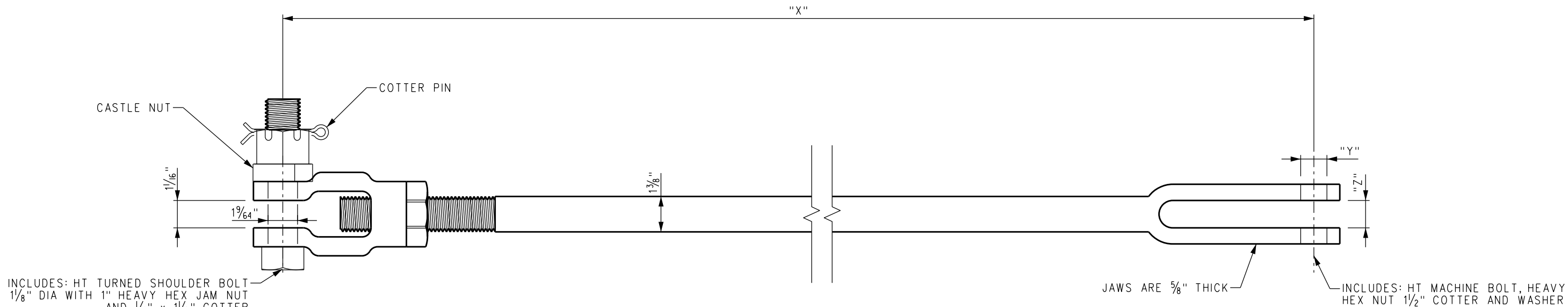
WHEN FAR POINT FITS PROPERLY AND NEAR POINT IS TOO TIGHT:
SHORTEN CRANKEYE SETTING AND LENGTHEN CONNECTING ROD CLEVIS.

WHEN FAR POINT FITS PROPERLY AND NEAR POINT IS LOOSE:
LENGTHEN CRANKEYE SETTING AND SHORTEN CONNECTING ROD CLEVIS.

WHEN BOTH POINTS ARE TIGHT:
SHORTEN CRANKEYE SETTING AND DO NOT CHANGE CONNECTING ROD CLEVIS.

WHEN BOTH POINTS ARE LOOSE:
LENGTHEN CRANKEYE SETTING AND DO NOT CHANGE CONNECTING ROD CLEVIS.

				DRAWN BY: HDR DATE: 03/31/2011		SCRR ENGINEERING STANDARDS ARE INTENDED FOR SCRR APPROVED USES ONLY. FOR NON-SCRR APPROVED USES: SCRR SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THE DATA OR INFORMATION CONTAINED HEREIN. THE SELECTION AND USE OF THESE STANDARDS IS THE SOLE RESPONSIBILITY OF THE USER AND SHOULD NOT BE USED WITHOUT CONSULTING A REGISTERED PROFESSIONAL ENGINEER. ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND ARE DISCLAIMED. ANYONE MAKING USE OF THIS INFORMATION AGREES THAT IT ASSUMES ALL LIABILITY ARISING FROM SUCH USE. NO PART OF THESE STANDARDS SHOULD BE REPRODUCED OR DISTRIBUTED IN ANY FORM OR BY ANY MEANS WITHOUT THE PRIOR WRITTEN PERMISSION OF SCRR. ALL RIGHTS RESERVED.		 METROLINK SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY ONE GATEWAY PLAZA, 12TH FLOOR, L. A., CA. 90012		ENGINEERING STANDARDS SWITCH STANDS HAND THROW ADJUSTMENTS AND INSTALLATION INSTRUCTIONS		STANDARD 2710 SCALE: NTS REVISION SHEET 1 OF 1 CADD FILE: ES2710	
				 ASSISTANT DIRECTOR: STANDARDS & DESIGN  DIRECTOR OF ENGINEERING AND CONSTRUCTION									
X	XX-XX-XX	REVISION	XX	XX									
REV.	DATE	DESCRIPTION	DES.	ENG.									



CONNECTING ROD ASSEMBLY FOR ALL SWITCH
STANDS WITH ADJUSTABLE CRANK EYE
(22E, 36E-EH, 112E, ETC)

- "Y" - 1 1/64" FOR 3/4" AND 1" HEAD RODS
- 1 9/64" FOR 1 1/4" HEAD RODS
- "Z" - 1 3/16" FOR 3/4" HEAD RODS
- 1 1/16" FOR 1" HEAD RODS
- 1 5/16" FOR 1 1/4" HEAD RODS

RAIL SIZE	"X"	HEAD ROD THICKNESS
90-115 LB	3'-4"	1"
132-136 LB	3'-4"	1 1/4"
90-115 LB	5'	1"
132-136 LB	5'	1 1/4"
90-115 LB	7'	1"
132-136 LB	13'-9"	1 1/4"
132-136 LB	7'	1 1/4"



SWITCH POINT TAG

STOCK RAIL TAG

GUARD RAIL TAG

BONDED INSULATED JOINT

RAILROAD CROSSING TAG

FileName-> S:\V8EngStdts\New Stdts (in progress)\ES2715.dgn