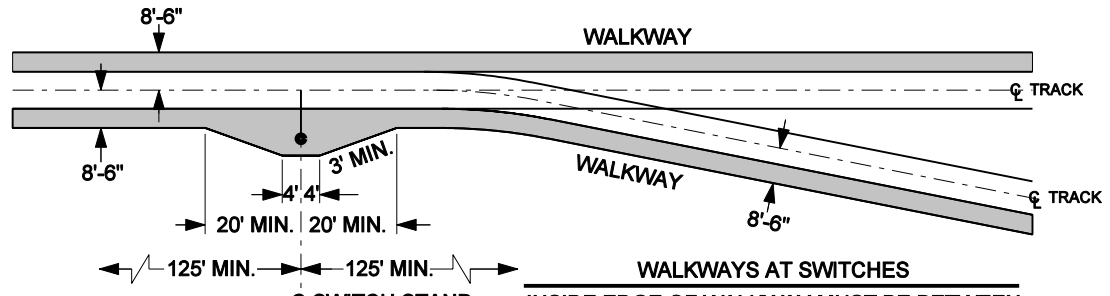
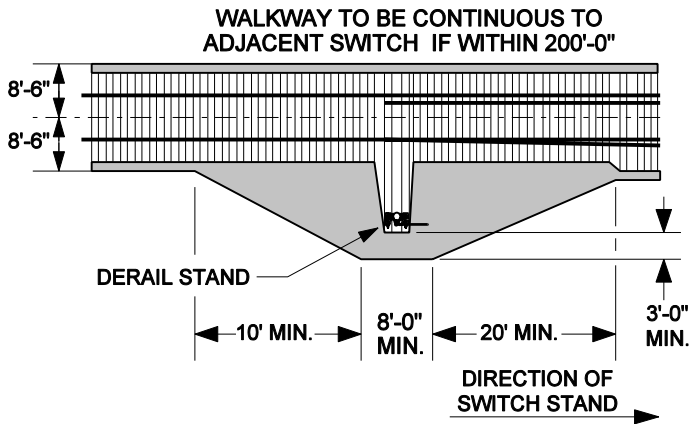


WALKWAY STANDARDS NO. 1 AND 2

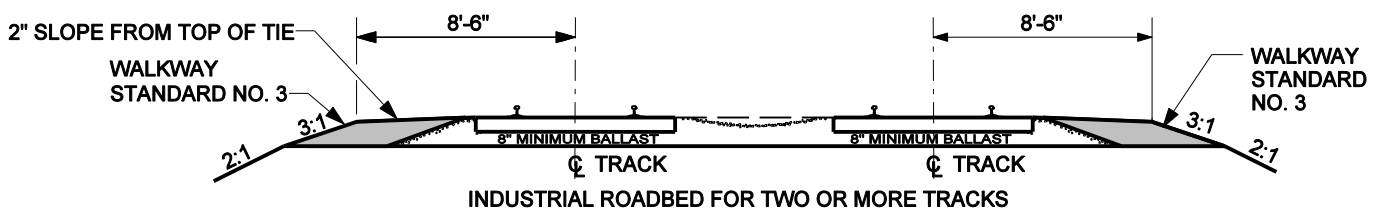


WALKWAYS AT SWITCHES
 INSIDE EDGE OF WALKWAY MUST BE BETWEEN THE OUTSIDE EDGE OF THE RAIL AND A POINT THREE FEET FROM ϕ OF THE TRACK.

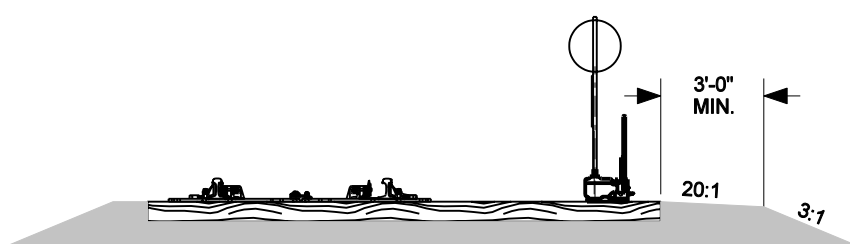
WALKWAY STANDARD NO. 3



WALKWAY STANDARD NO. 4



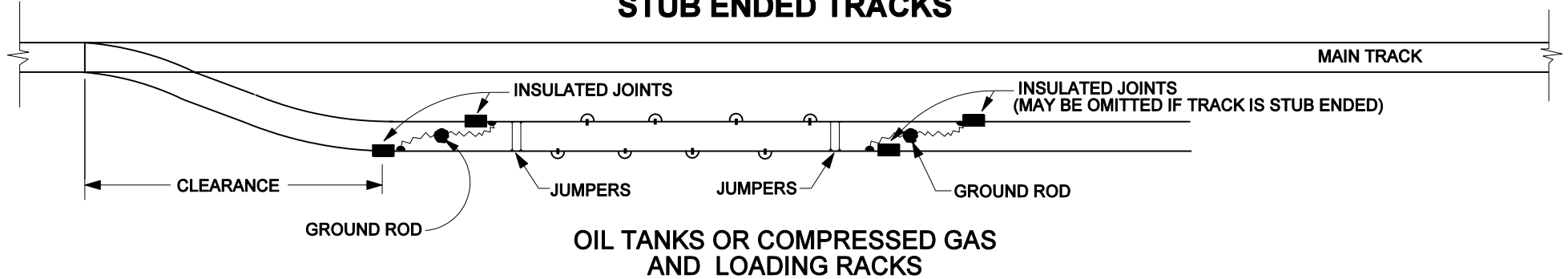
WALKWAY STANDARD NO. 5



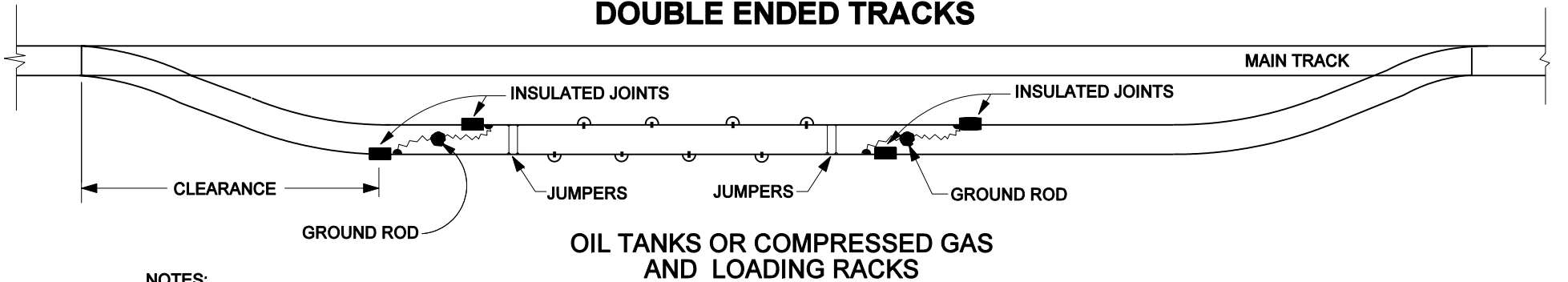
TYP. SWITCH STAND SECTION

 <p>UNION PACIFIC RAILROAD Office of Chief Engineer Design</p>	<p>INDUSTRY STANDARDS</p>
	<p>TYPICAL WALKWAY STANDARDS FOR INDUSTRIAL TRACKS</p>
<p>ADOPTED: JAN. 1, 1996 REVISED: AUG. 4, 2003 FILE NO.: EXHIBIT E</p>	<p>EXHIBIT "E"</p>

STUB ENDED TRACKS



DOUBLE ENDED TRACKS



NOTES:

1. THE SECTION OF TRACK ON WHICH ANY PART OF A TANK CAR MAY STAND WHILE A FLAMMABLE LIQUID OR FLAMMABLE COMPRESSED GAS IS BEING LOADED OR UNLOADED SHALL BE BONDED AT EACH RAIL JOINT WITH 2 W-15 STRANDED WIRES.
2. AT LEAST FOUR JUMPER WIRES EQUIVALENT TO J-65 STRANDED JUMPERS SHALL BE CROSS CONNECTED BETWEEN THE TWO RAILS. TWO NEAR EACH END OF THE BONDED SECTION.
3. THE BONDED RAILS SHALL BE CONNECTED TO COPPERWELD GROUND RODS 5/8" (1.59CM) IN DIAMETER AND 9'-0" (2.74M) LONG, DRIVEN FULL LENGTH WITH AT LEAST 5'-0" (1.52M) IN NATURAL EARTH. THE CONNECTION BETWEEN THE RAILS AND THE GROUND RODS SHALL BE AT LEAST #6 AWG SOFT ANNEALED COPPER, CHANNEL- PINNED TO RAIL AND CONNECTED TO THE GROUND ROD BY MEANS OF A CLAMP.
4. PERMANENT MULTIPLE CONNECTIONS OF AT LEAST #6 AWG SOFT ANNEALED COPPER WIRE SHALL BE PROVIDED BETWEEN THE BONDED TRACK SECTION AND THE LOADING AND UNLOADING PIPES.
5. WHERE A CONSIDERABLE AMOUNT OF STRAY CURRENT EXISTS, PIPE AND METALLIC STRUCTURE SHOULD BE ELECTRICALLY INTERCONNECTED AND GROUNDED IN ADDITION TO THE ABOVE CONNECTION TO RAILS; AND IN ADDITION TO THE PERMANENT CONNECTIONS, A TEMPORARY ELECTRICAL CONNECTION OF #0 FLEXIBLE COPPER STRAND FROM EACH OIL PIPE OUTLET TO EACH CAR TANK SHOULD BE MADE.

**UNION PACIFIC RAILROAD
ENGINEERING DRAWINGS**

**GROUNDING DETAIL FOR
LOADING AND UNLOADING
FLAMMABLE COMMODITIES**



ADOPTED: JAN. 21, 2005
REVISED: AUG. 26, 2008
FILE NO.: 6003A

MISC DWG
6003A

MISC DWG
6003A

GENERAL NOTES:

ANCHOR PATTERN #1 WILL BE USED FOR ALL RAIL RELAYS. EXISTING ANCHOR PATTERNS MAY REMAIN UNTIL A RAIL RELAY IS DONE.

WHERE ELASTIC FASTENERS FAIL TO PROPERLY RESTRAIN THE RAIL FROM MOVING LONGITUDINALLY, INSTALL ADDITIONAL ANCHORS AS REQUIRED.

WHERE PRACTICAL, ANCHOR TO BE INSTALLED FROM GAGE SIDE OF RAIL.

NOTES:

CONTINUOUS WELDED RAIL (NEW INSTALLATION):

- 1) EVERY OTHER TIE BOX ANCHORED (USE PATTERN #1).
- 2) BOX ANCHOR 120 TIES IN BOTH DIRECTIONS FROM OPEN DECK BRIDGES, INSULATED JOINTS, HOT BOX DETECTORS, CROSSING FROGS AND TURNOUTS (USE PATTERN #2).
- 3) CHIEF ENGINEER MAY AUTHORIZE ADDITIONAL ANCHORS TO BE INSTALLED WHERE INCREASED RAIL RESTRAINT IS DESIRED. SUCH LOCATIONS MAY BE: LINES EXPECTED TO HANDLE 95MG T OR MORE ANNUALLY, OPEN JOINTS IN CWR TERRITORY, HEAVY TRAIN BRAKING GRADES, ETC.

JOINTED RAIL (NEW INSTALLATION):

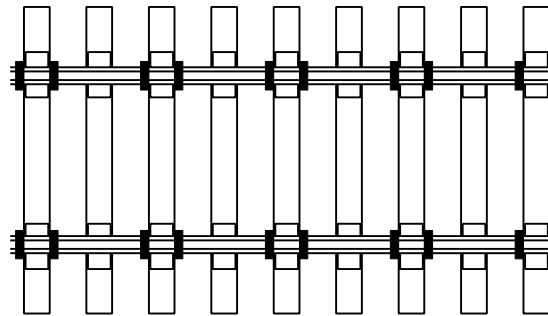
- 1) BOX ANCHOR EVERY OTHER TIE (USE PATTERN #1)
- 2) BOX ANCHOR 48 TIES AHEAD OF POINT OF SWITCH AND BEHIND LAST TURNOUT TIE

TURNOUTS (NEW INSTALLATION):

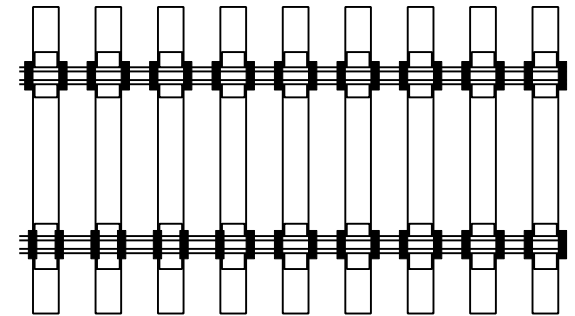
EVERY TIE BOX ANCHORED (USE PATTERN #2).

HOT BOX DETECTORS:

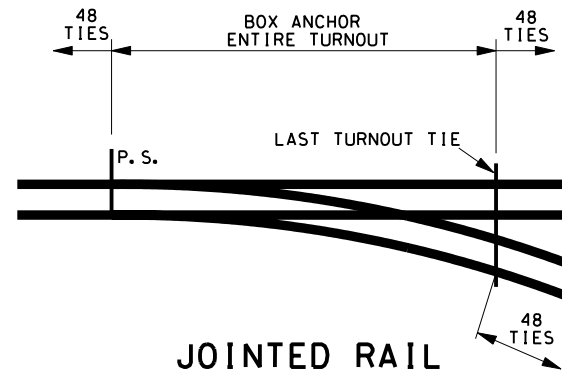
BOX ANCHOR 120 TIES AWAY FROM HOT BOX DETECTOR IN BOTH DIRECTIONS.



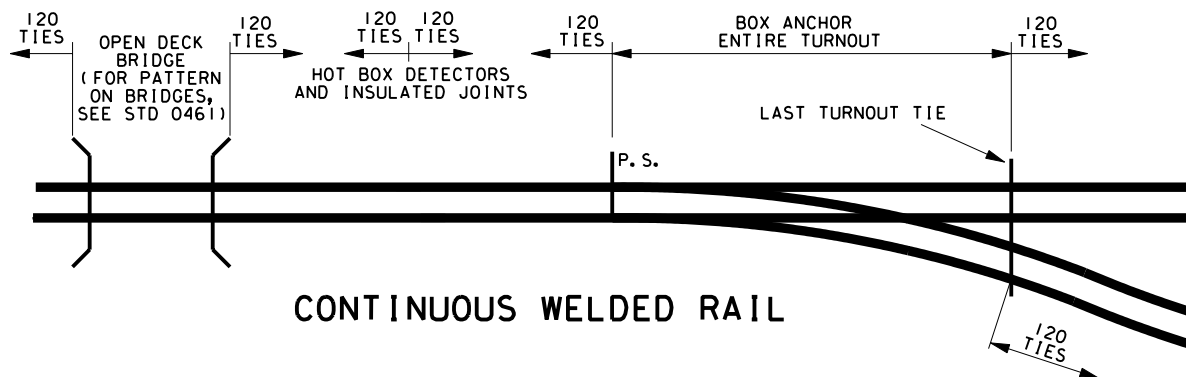
ANCHOR PATTERN #1



ANCHOR PATTERN #2



JOINTED RAIL



CONTINUOUS WELDED RAIL

UNION PACIFIC RAILROAD
ENGINEERING STANDARDS

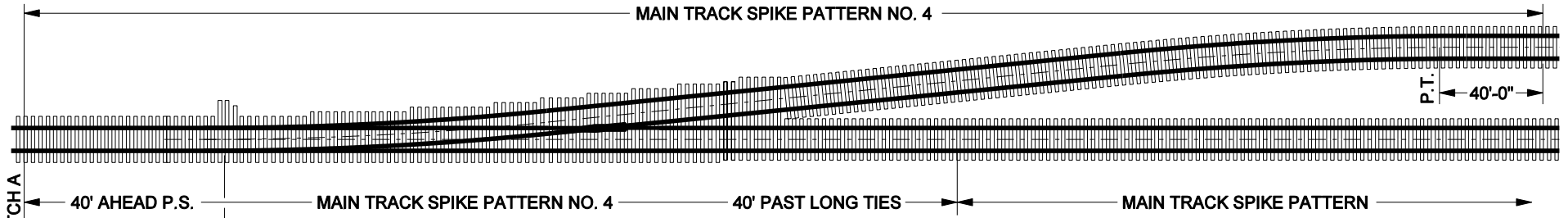
RAIL ANCHOR PATTERNS
FOR NEW RAIL
INSTALLATIONS



ADOPTED: DEC. 31, 1996
REVISED: MARCH 24, 2000
FILE NO.: 0460D

STD DWG
0460D

STD DWG
0460D

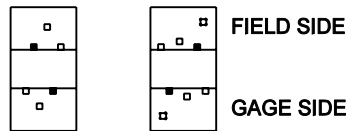


MAIN TRACK TURNOUT

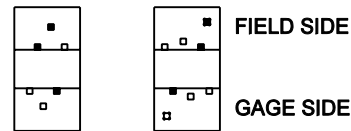
MAIN TRACK AND CTC SIDINGS LESS THAN 40 MPH	
APPLICATION	PATTERN
TANGENTS AND CURVES LESS THAN 1° 30'	1
CURVES AT LEAST 1° 30' BUT LESS THAN 4°	3
CURVES AT LEAST 4° BUT LESS THAN 8°	4
CURVES 8° OR MORE	5

MAIN TRACK AND CTC SIDINGS 40 MPH OR MORE	
APPLICATION	PATTERN
TANGENTS AND CURVES LESS THAN 30'	2
CURVES AT LEAST 30' BUT LESS THAN 1° 30'	3
CURVES AT LEAST 1° 30' BUT LESS THAN 4°	4
CURVES 4° OR MORE	5

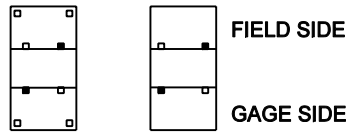
YARD AND INDUSTRY TRACKS	
APPLICATION	PATTERN
TANGENTS AND CURVES LESS THAN 4°	1
CURVES AT LEAST 4° BUT LESS THAN 8°	3
CURVES 8° OR MORE	4



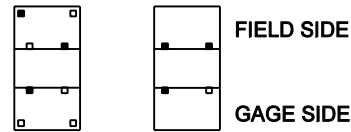
SPIKING PATTERN NO. 1



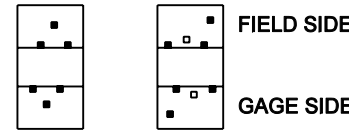
SPIKING PATTERN NO. 2



SPIKING PATTERN NO. 3



SPIKING PATTERN NO. 4



SPIKING PATTERN NO. 5

- NOTES:
1. THE SPIKE PATTERNS SHOWN ARE FOR MAIN TRACKS, BRANCH LINE TRACKS, HEAVY TONNAGE SPURS, AND C.T.C. SIDINGS WITH 13" AND LONGER PLATES.
 2. ANY SPIKING PATTERN OTHER THAN WHAT IS SHOWN ON THIS DRAWING ARE TO BE APPROVED BY THE CHIEF ENGINEER.

UNION PACIFIC RAILROAD ENGINEERING STANDARDS

SPIKING PATTERN

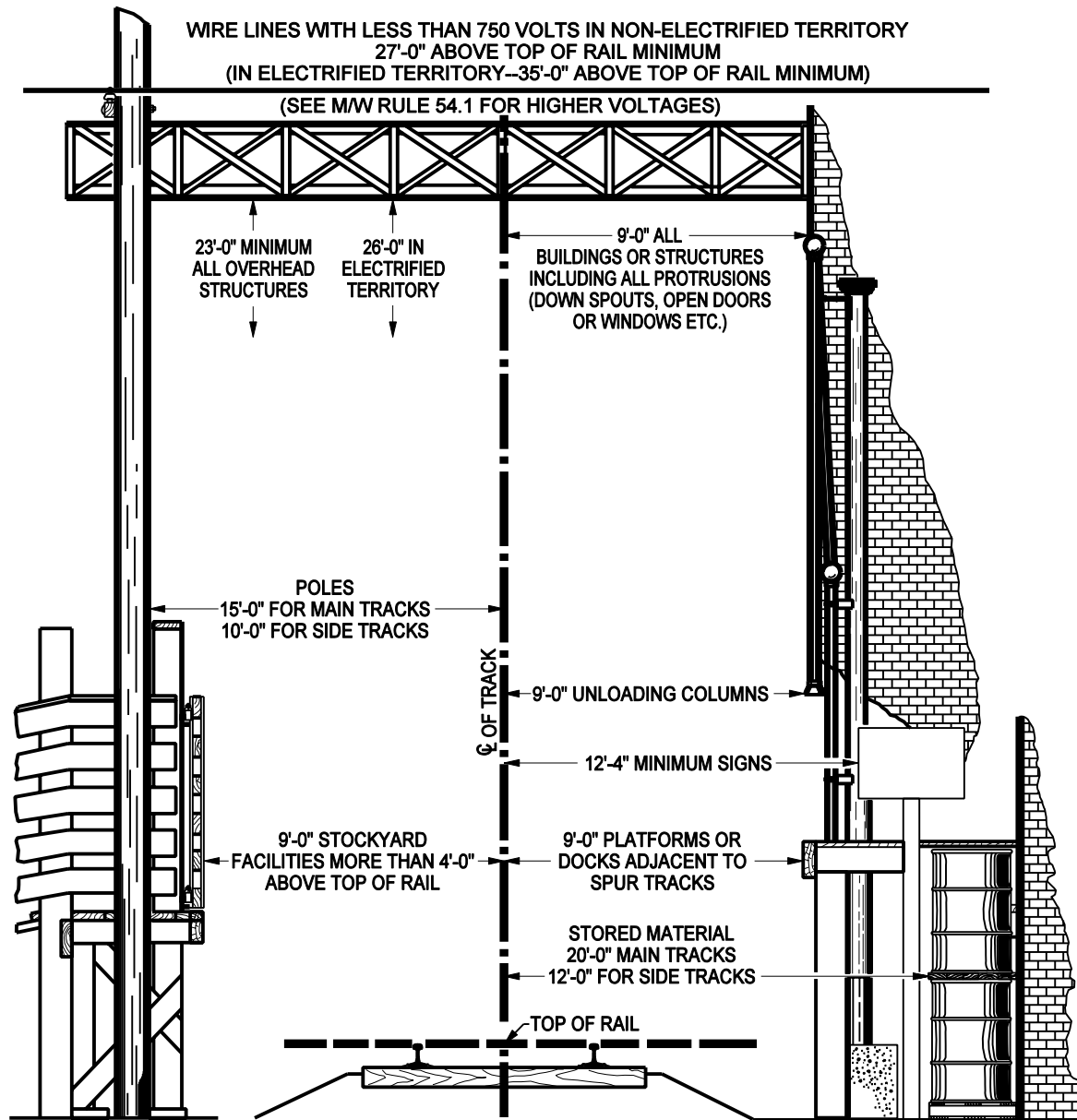
■ - DENOTES SPIKE FILLED HOLE

STD DWG
0453D



ADOPTED: DEC. 31, 1996
REVISED: JUL. 17, 2007
FILE NO.: 0453D

STD DWG
0453D



THROUGH INDUSTRY OWNED STRUCTURES AND FACILITIES

TRACK NOTES (SEE PAGE 2 FOR GENERAL NOTES):

TRACK CENTERS:

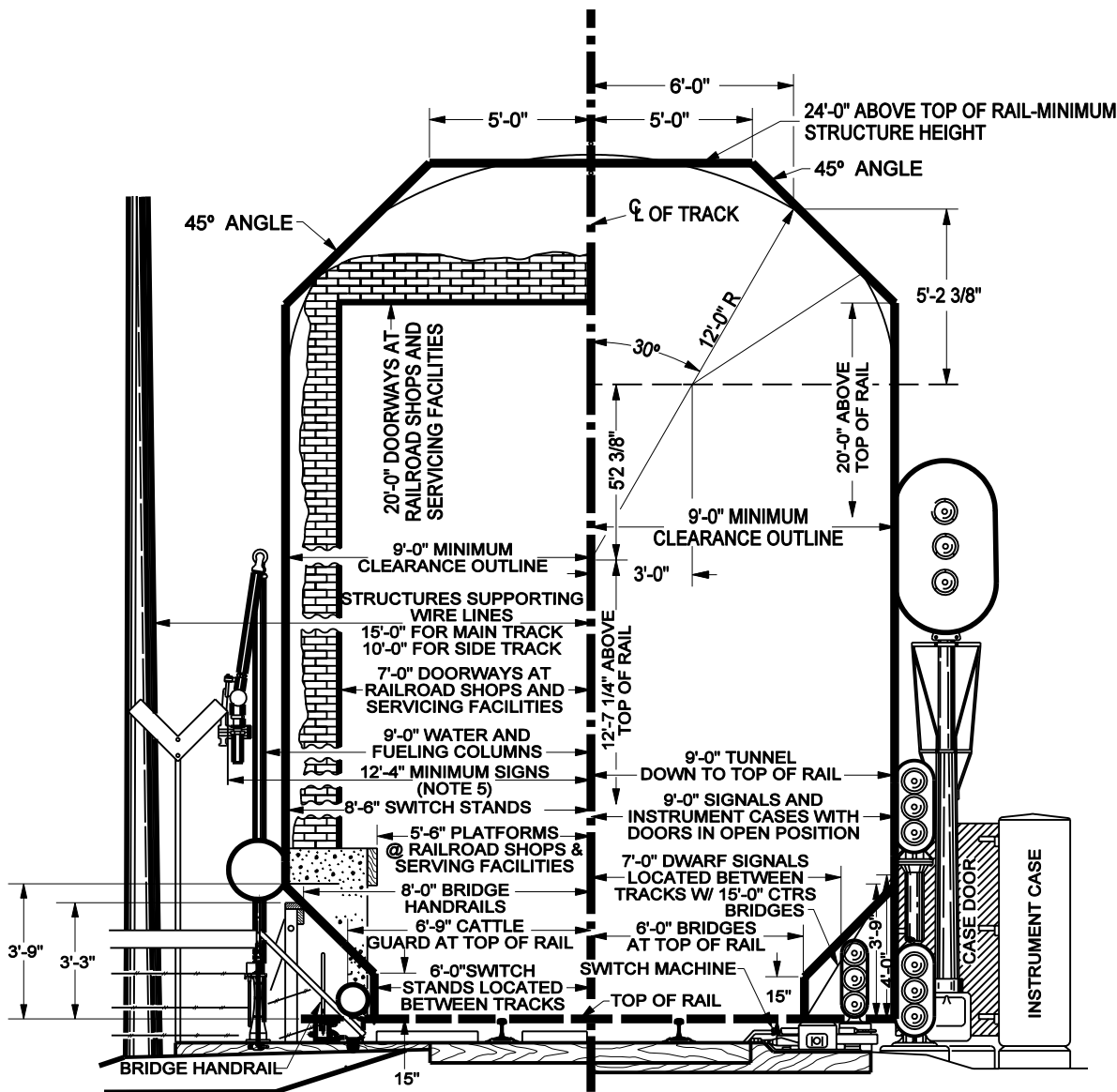
1. TWO OR MORE MAIN TRACKS WILL BE A MINIMUM OF 15'-0" CENTER TO CENTER. SIDE TRACKS ADJACENT TO A MAIN TRACK WILL BE A MINIMUM OF 15'-0" CENTER TO CENTER.
2. ANY TWO OR MORE SIDE OR INDUSTRY TRACKS WILL BE A MINIMUM OF 14'-0" CENTER TO CENTER.
3. LADDER TRACKS AND ANY ADJACENT TRACK WILL BE A MINIMUM OF 20'-0" CENTER TO CENTER.
4. TEAM TRACKS IN PAIRS MAY BE A MINIMUM OF 13'-0" CENTER TO CENTER.

SUPERELEVATION:

1. AN ADDITIONAL 4 1/4" HORIZONTAL CLEARANCE AT 20'-0" ABOVE TOP OF RAIL MUST BE ALLOWED ON THE LOW RAIL SIDE FOR EACH ONE INCH OF SUPERELEVATION TAPERING TO ZERO INCHES ADDITIONAL CLEARANCE AT THE TOP OF RAIL.

UNION PACIFIC RAILROAD ENGINEERING STANDARDS	
STANDARD MINIMUM OPERATING CLEARANCES	
	ADOPTED: MAY 2, 1977 REVISED: OCT. 25, 2004 FILE NO.: 0038F
STD DWG 0038F	PAGE 1 OF 2

STD DWG
0038F
 PAGE 1 OF 2



THROUGH RAILROAD OWNED STRUCTURES AND FACILITIES

GENERAL NOTES (SEE PAGE 1 FOR TRACK NOTES):

1. ALL STRUCTURES OR FACILITIES NOT SHOWN MUST BE AT LEAST 9'-0" FROM THE CENTER LINE OF TRACK AND AT LEAST 23'-0" ABOVE THE TOP OF RAIL.
2. CLEARANCES FOR STRUCTURES OR FACILITIES ON CURVES MUST BE INCREASED Laterally ON EACH SIDE 1 1/2" PER EACH DEGREE OF CURVATURE, EXTENDING TO 80'-0" BEYOND THE END OF THE CURVE.
3. ANY FACILITIES FALLING WITHIN THESE DIMENSIONS WILL BE CONSIDERED IMPAIRED CLEARANCE, SUBJECT TO AGREEMENT, AND MUST BE APPROVED PRIOR TO CONSTRUCTION BY UNION PACIFIC RAILROAD'S OFFICE OF THE CHIEF ENGINEER OF DESIGN.
4. WHERE STATE OR LOCAL LAWS REQUIRE GREATER CLEARANCES THAN SHOWN HERE, THOSE LAWS SHALL PREVAIL.
5. SIGNS FOR INTERIOR MAIN TRACKS IN MULTIPLE MAIN TRACK TERRITORY WILL BE A MINIMUM OF 9'-0" FROM CENTER OF TRACK.

UNION PACIFIC RAILROAD
ENGINEERING STANDARDS

STANDARD MINIMUM
OPERATING CLEARANCES



ADOPTED: MAY 2, 1977
REVISED: OCT. 25, 2004
FILE NO.: 0038F

STD DWG

0038F

PAGE 2 OF 2

STD DWG
0038F
PAGE 2 OF 2

GENERAL:
 FENCE SHALL BE PROVIDED AS INDICATED ON THE CROSS SECTION ON BOTH SIDES OF THE VIADUCT. THE FENCE SHALL EXTEND COMPLETELY ACROSS THE STRUCTURE OR UPRR RIGHT-OF-WAY, WHICHEVER IS SHORTER.

SPLASH BOARDS SHALL BE PROVIDED ON BOTH SIDES OF THE VIADUCT IN LOCATIONS WHERE SWITCHING OR OTHER FREQUENT RAILROAD ACTIVITIES ARE PERFORMED, THE SPLASHBOARD SHALL EXTEND COMPLETELY ACROSS THE STRUCTURE OR UPRR RIGHT-OF-WAY, WHICHEVER IS SHORTER.

LIGHTS ARE TO BE INSTALLED ON THE UNDERSIDE OF THE VIADUCT WHERE SHADOWS CAST BY THE STRUCTURE WOULD INTERFERE WITH RAILROAD OPERATIONS.

SLOPE PAVING SHALL BE PROVIDED WHERE END SLOPES EXCEED 2 HORIZONTAL TO 1 VERTICAL.

FALSEWORK, NETTING OR OTHER SUITABLE PROTECTION SHALL BE PROVIDED TO PREVENT DEBRIS FROM FALLING ON THE TRACK DURING DEMOLITION AND CONSTRUCTION OPERATIONS.

APPLICANT SHALL BE RESPONSIBLE FOR IDENTIFICATION, LOCATION AND PROTECTION OF EXISTING UTILITIES.

CONTACT UPRR'S "CALL BEFORE YOU DIG" AT LEAST 48 HOURS PRIOR TO COMMENCING WORK AT 1-800-336-9193 TO DETERMINE LOCATION OF FIBER OPTICS.

CERTAIN LOCATIONS MAY REQUIRE ADDITIONAL CLEARANCES OR FEATURES BEYOND THOSE SHOWN IN THIS DRAWING BASED ON LOCAL CONDITIONS

EXCEPTIONS TO THESE STANDARDS MUST BE APPROVED BY UPRR'S CHIEF ENGINEER DESIGN.

NOTES:
CLEARANCES:
 MINIMUM VERTICAL CLEARANCE SHALL BE 23' ABOVE THE PLANE OF TOP-OF-RAIL. ADDITIONAL CLEARANCE MAY BE REQUIRED IF SAG OF VERTICAL CURVE MUST BE ADJUSTED OR IF FUTURE TRACK RAISE FOR FLOOD CONSIDERATIONS OR MAINTENANCE IS PROBABLE.

MINIMUM HORIZONTAL CLEARANCES, MEASURED AT RIGHT ANGLE FROM CENTERLINE OF TRACK, SHALL BE AS SHOWN.

MINIMUM CONSTRUCTION CLEARANCES SHALL BE 21' VERTICAL ABOVE THE PLANE OF TOP-OF-RAIL AND 12' HORIZONTAL AT RIGHT ANGLE FROM CENTERLINE OF TRACK.

HORIZONTAL CLEARANCES ARE TO BE INCREASED 1 1/2" PER DEGREE OF CURVE WHERE THE STRUCTURE IS LOCATED ADJACENT TO OR WITHIN 80' OF THE CURVE LIMITS.

FUTURE TRACKS:
 SPACE IS TO BE PROVIDED FOR ONE OR MORE FUTURE TRACKS AS REQUIRED FOR LONG RANGE PLANNING OR OTHER OPERATING REQUIREMENTS. WHERE PROVISION IS MADE FOR MORE THAN TWO TRACKS, SPACE IS TO BE PROVIDED FOR ACCESS ROADS ON BOTH SIDES OF TRACK.

PIERS:
 PIER PROTECTION (CRASH WALLS) SHALL BE PROVIDED IN ACCORDANCE WITH AREA CHAPTER 8, PART 2.1.5 FOR PIERS WITHIN 25 FEET OF THE CENTERLINE OF TRACK.

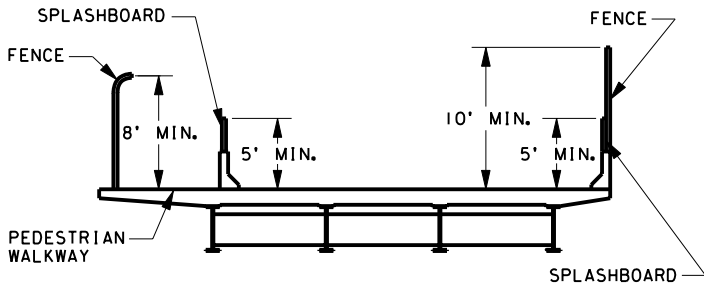
TOP OF FOOTING SHALL BE A MINIMUM OF 6' BELOW BASE OF RAIL AND A MINIMUM OF 1 FOOT BELOW FLOW LINE OF DITCH.

TEMPORARY OR PERMANENT SHORING SHALL BE DESIGNED IN ACCORDANCE WITH UPRR SHORING REQUIREMENTS (DRAWING NO. 106613).

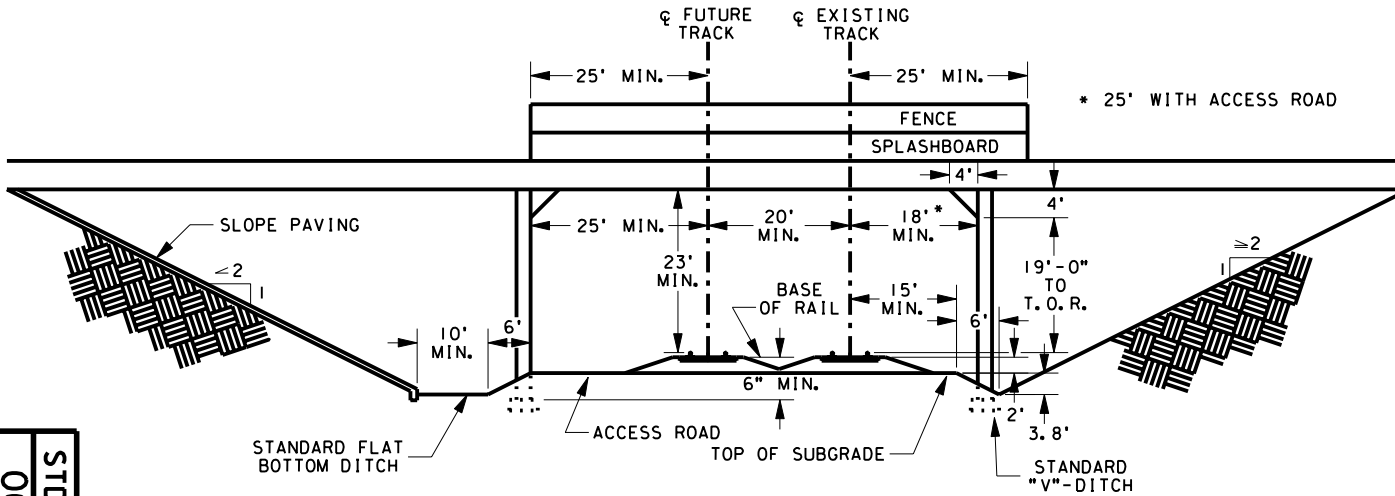
DRAINAGE:
 DRAINAGE FROM THE OVERPASS SHALL BE DIVERTED AWAY FROM UPRR TRACKS AND NOT DISCHARGED ONTO THE TRACKS OR ROADBED.

A STANDARD "V"-SHAPE OR FLAT-BOTTOM DITCH SHALL BE PROVIDED ON EACH SIDE OF TRACKS AS NECESSARY

CULVERTS MAY BE INSTALLED ON OPPOSITE SIDES OF COLUMN FROM TRACK IN LIEU OF STANDARD RAILROAD DITCHES WHEN APPROVED BY CHIEF ENGINEER DESIGN. MAINTENANCE OF CULVERTS IS TO BE AT APPLICANT'S EXPENSE.



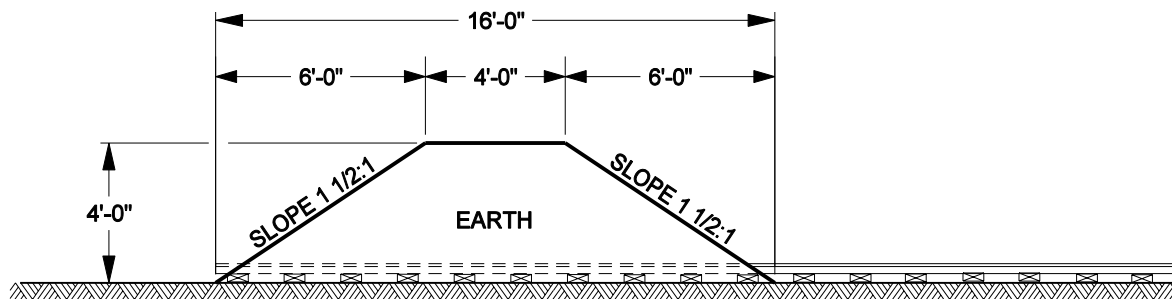
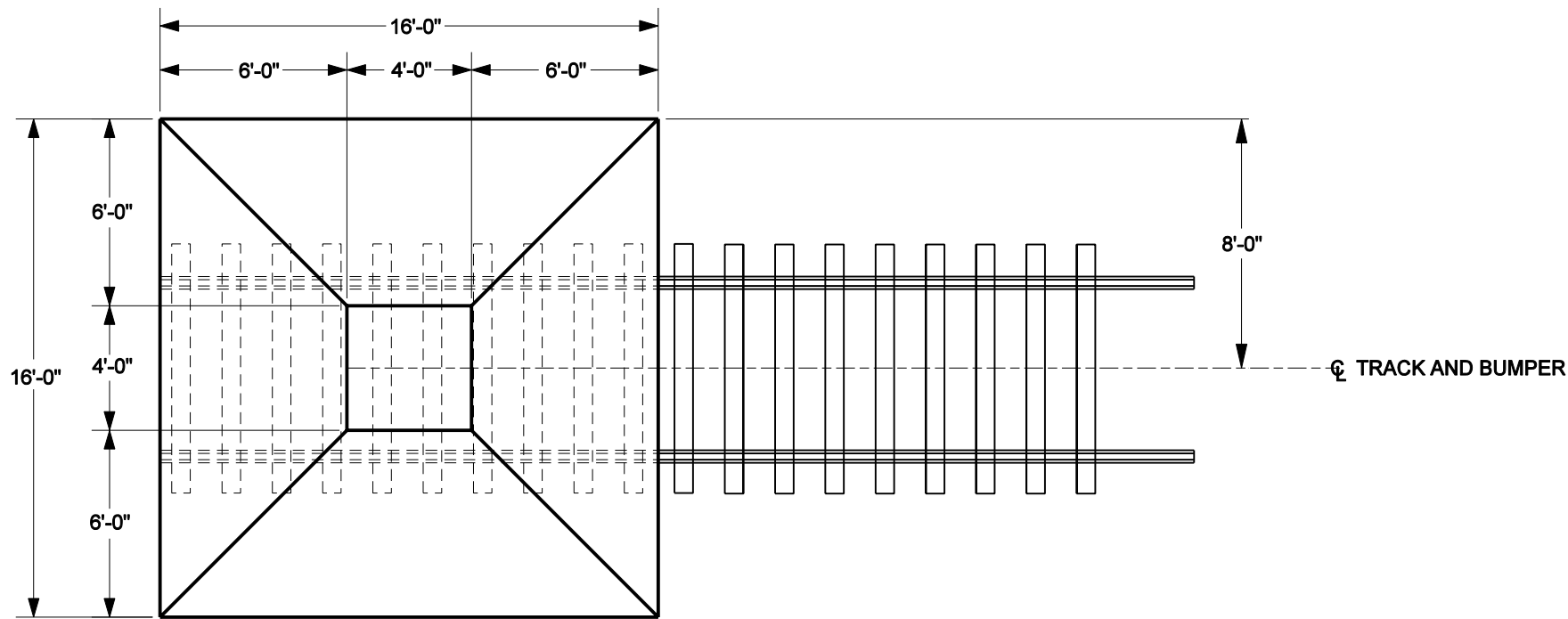
VIADUCT CROSS SECTION



ELEVATION
 PERPENDICULAR TO TRACKS

UNION PACIFIC RAILROAD ENGINEERING STANDARDS	
DESIGN CLEARANCES FOR HIGHWAY AND PEDESTRIAN OVERPASS	
	ADOPTED: DEC. 30, 1996 REVISED: FILE NO.: 0035
STD DWG 0035	

**STD DWG
0035**



NOTES:

1. SIZE OF BASE MAY BE REDUCED IN CASES WHERE WIDTH OF ROADBED WILL NOT PERMIT PLAN TO BE FOLLOWED.
2. EARTHEN BUMPER AS SHOWN HERE ON SHALL BE USED AT ALL LOCATIONS WHERE BUMPER IS REQUIRED EXCEPT ON THE AUTHORITY OF THE CHIEF ENGINEER OF MAINTENANCE TO USE A BUMPER OF SOME OTHER DESIGN.

**UNION PACIFIC RAILROAD
ENGINEERING STANDARDS**

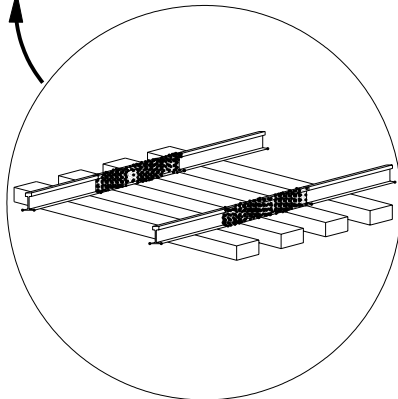
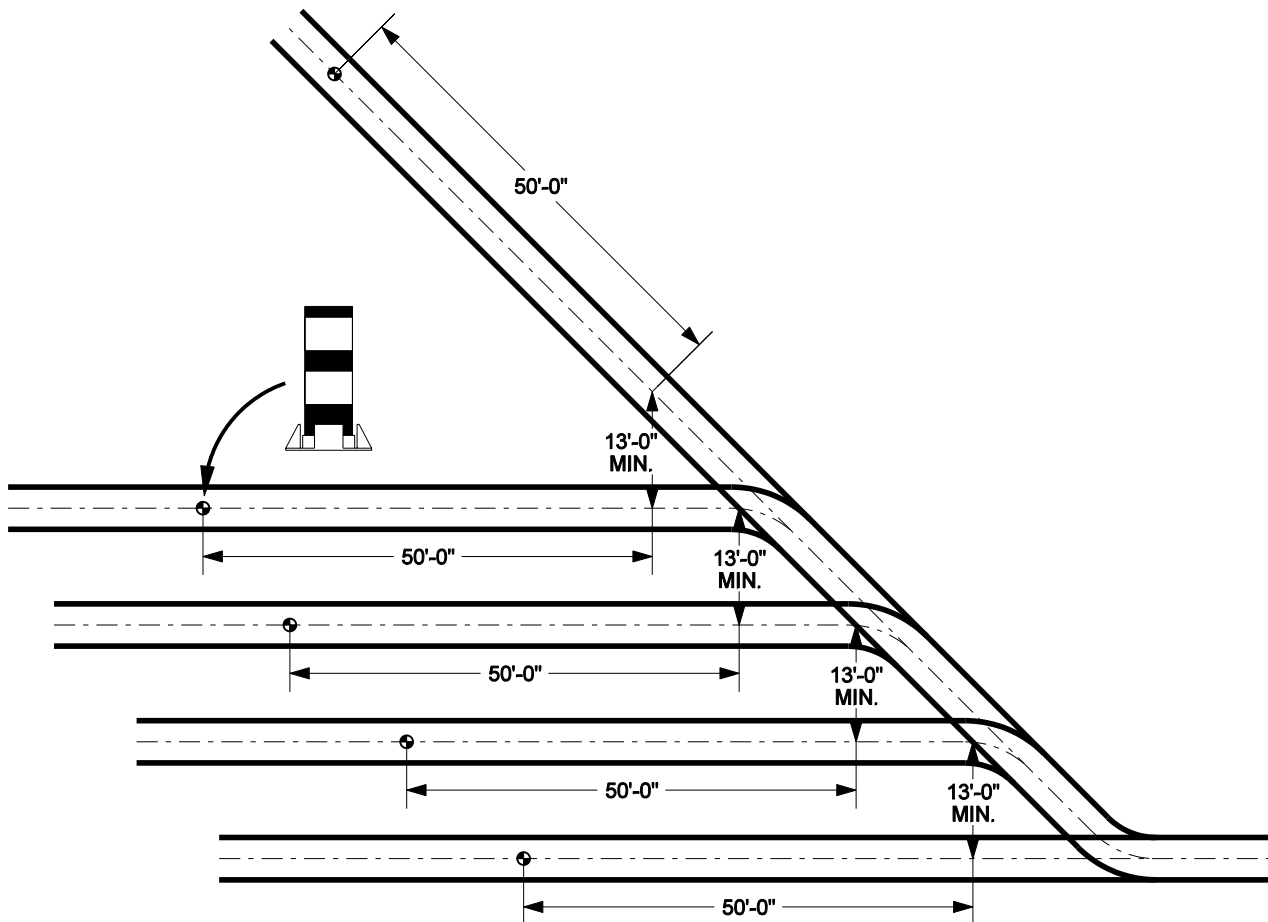
**STANDARD EARTH
BUMPER FOR END
OF SPUR TRACK**



ADOPTED: FEB. 16, 1965
REVISED: JAN. 21, 2004
FILE NO.: 0030A

STD DWG
0030A

STD DWG
0030A



PAINT BOTH SIDES OF WEB, SIDE OF RAIL HEAD AND BASE OF BOTH RAILS YELLOW (3'-0" LONG)

NOTES:

1. USE OF CONES OR PAINTING OF RAILS SERVE THE SAME PURPOSE. THE USE OF ONE OR BOTH IS ACCEPTABLE.
2. CONE/MARKINGS TO BE PLACED IN CLASSIFICATION YARDS AND AT OTHER SWITCHING LOCATIONS DESIGNATED BY THE SUPERINTENDENT
3. CONES/MARKINGS TO BE INSTALLED 50 FEET FROM 13 FEET TRACK CENTER LOCATION.
4. IN A YARD WHERE 12 FOOT 6 INCH TRACK CENTERS IS THE DESIGN, THIS WILL BE CONSIDERED THE CLEARANCE POINT
5. CONE TO BE MADE OF POLY ETHYLENE 2 3/4" OD 8" HIGH. CONE TO BE WRAPPED WITH 3 EA 2" YELLOW REFLECTORIZED ENGINEERING GRADE BANDS AND 2 EA 2" WHITE REFLECTORIZED ENGINEERING GRADE BANDS OR EQUIVALENT.
6. THE RECOMMENDED YELLOW PAINT IS RUSTOLEUM SUNBURST YELLOW #7747

**UNION PACIFIC RAILROAD
ENGINEERING STANDARDS**

**CLEARANCE POINT
MARKING**

STD DWG
0026

ITEM NO.
FOR CONE
380-0630



ADOPTED: NOV. 24, 2008
REVISED:
FILE NO.: 0026

STD DWG
0026

IN AREAS WHERE MULTIPLE ROAD GRADE CROSSINGS ARE LOCATED LESS THAN 550 FT.* APART, NO MARKINGS WILL BE REQUIRED.

* SEE D2 IN TABLE FOR EXCEPTIONS

LESS THAN 550' (TYP.)

250' (TYP.)

250' (TYP.)

WHERE PRACTICAL, BOTH RAILS ON EACH TRACK WHERE TWO OR MORE TRACKS EXIST AT EACH GRADE CROSSING SHALL BE MARKED AS SHOWN TO LOCATE CARS, ENGINES, OR EQUIPMENT TO A POINT NOT CLOSER THAN 250 FT.** FROM THE EDGE OF THE GRADE CROSSING AS MEASURED ALONG THE CENTER OF THE TRACK.

SEE TYPICAL RAIL MARKING DETAIL

250' (TYP.)

** SEE D1 IN TABLE FOR EXCEPTIONS

250' (TYP.)

10 M.P.H. TRACK

TEMPORARY ROAD CROSSING (SHOOLY)

250' OR GREATER

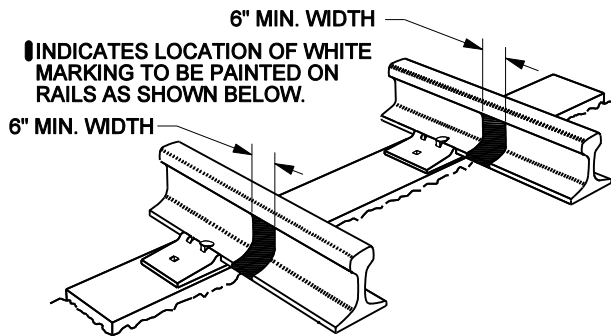
EXCEPTIONS (IN FEET)		
STATE	D1	D2
ILLINOIS	500	1050
WISCONSIN	330	710
LOUISIANA	300	700
ARKANSAS	300	700
KANSAS	300	700

NOTES:

APPLY A SIX INCH WIDE MARKING OF WHITE FEDERAL SAFETY PAINT TO THE WEB AND BASE AREA OF EACH RAIL OF THE TRACK ON THE FIELD AND GAGE SIDE OF EACH RAIL. MARKINGS SHALL BE LOCATED 250 FEET FROM EDGE OF GRADE CROSSING, UNLESS A GREATER DISTANCE IS REQUIRED BY STATE LAW (SEE EXCEPTIONS IN ABOVE CHART). THE EDGE OF GRADE CROSSING BEING SECTIONAL TREATED TIMBER, FULL WOOD PLANK, ASPHALT, CONCRETE SLAB, CONCRETE PAVEMENT, RUBBER SLAB, METAL SECTION AND UNCONSOLIDATED CROSSINGS, WHICH WOULD INCLUDE TEMPORARY CROSSINGS OR OTHER MATERIAL PLACED IN TRACK TO FACILITATE THE CROSSING OF VEHICLES OR EQUIPMENT.

MEASUREMENTS OF 250 FEET TAKEN FROM THE EDGE OF THE GRADE CROSSING TO THE PAINTED MARK ON THE RAILS WILL BE MEASURED ALONG THE CENTER LINE OF THE TRACK.

MARKING MULTIPLE ROAD CROSSINGS IS NOT REQUIRED WHERE MAXIMUM AUTHORIZED TRACK SPEED IS 10 M.P.H. OR LESS, EXCEPT WHERE OTHER TRACK WITH A MAX AUTHORIZED SPEED GREATER THAN 10 M.P.H. IS WITHIN 250' OF THE CROSSING.



TYPICAL RAIL MARKING DETAIL

**UNION PACIFIC RAILROAD
ENGINEERING STANDARDS**

**RAIL MARKING FOR ENGINES,
CARS OR EQUIPMENT CLEAR
OF ROAD GRADE CROSSINGS**

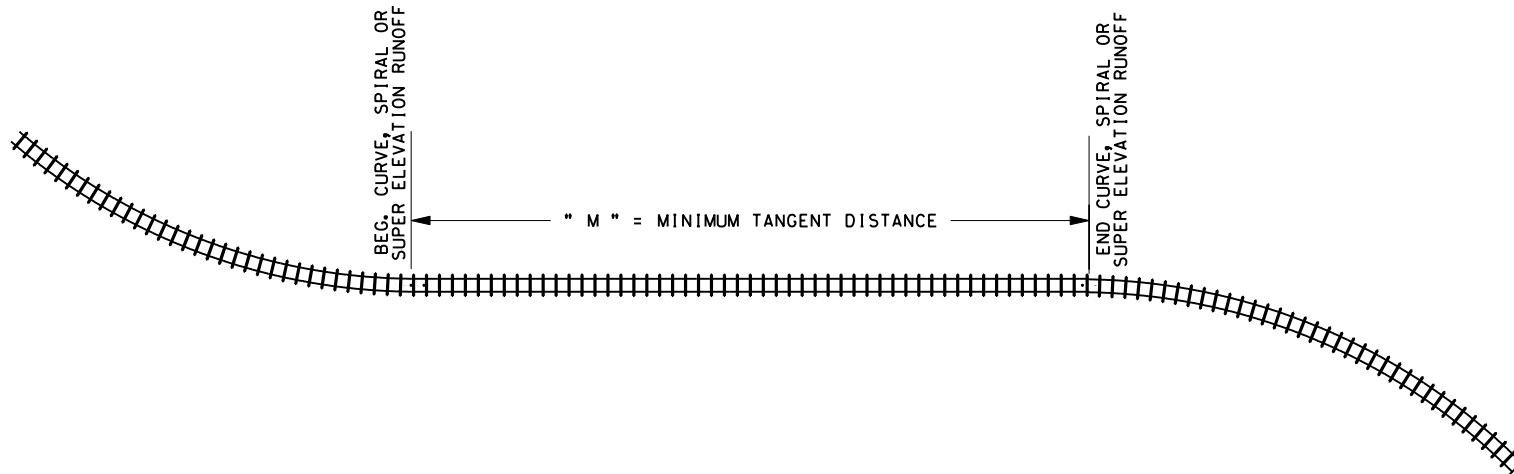


ADOPTED: JAN. 25, 1999
REVISED: JUNE 27, 2002
FILE NO.: 0025B

STD DWG
0025B

DESCRIPTION	ITEM NO.
WHITE SAFETY PAINT	353-4850

0025B
STD DWG



MAIN LINE AND BRANCH LINES

TRACK SPEED / TYPE	"M" DISTANCE
60 MPH AND ABOVE	500 FEET
40 MPH THRU 59 MPH	300 FEET
39 MPH AND BELOW	150 FEET

YARD AND INDUSTRY TRACKS

DEGREE OF CURVE	MINIMUM TANGENT DISTANCE "M"
7° 30' OR LESS	36 FEET
GREATER THAN 7° 30'	60 FEET

NOTES:
 ADJACENT SIDINGS AND RUNNING TRACKS SHALL CONFORM TO THE CRITERIA OF THE MAIN TRACK, REGARDLESS OF THE ALLOWABLE SPEED ON THE SIDING OR RUNNING TRACK

CONNECTIONS TO ADJACENT TRACKS SHALL BE DESIGNED AND CONSTRUCTED AS SHOWN ON STANDARD LAYOUT PLANS FOR MAINLINE TURNOUTS AND CROSSOVERS.

FOR MAIN AND BRANCH TRACKS, THE POINT OF SWITCH OR POINT OF FROG OF ANY TURNOUT SHALL BE NO CLOSER THAN 200 FEET FROM THE END OF A HORIZONTAL CURVE OR SUPERELEVATION RUNOFF, UNLESS AUTHORIZED BY THE CHIEF ENGINEER.

UNION PACIFIC RAILROAD
 ENGINEERING STANDARDS

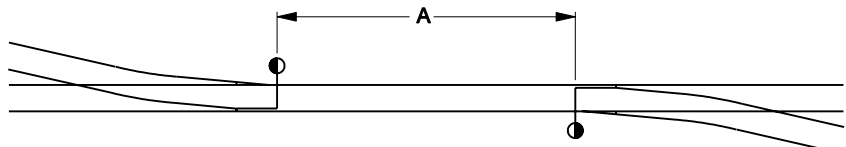
MINIMUM TANGENT
 DISTANCE



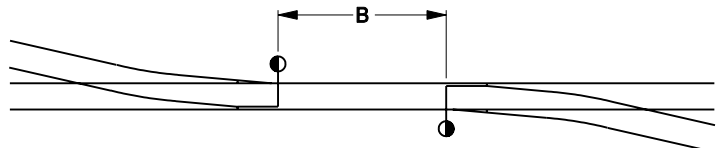
ADOPTED: DEC. 31, 1996
 REVISED:
 FILE NO.: 0018

STD DWG
 0018

STD DWG
 0018

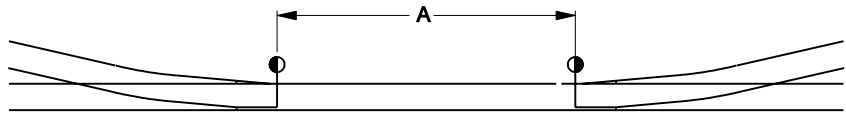


SAME HANDED TURNOUTS
PREFERRED ARRANGEMENT

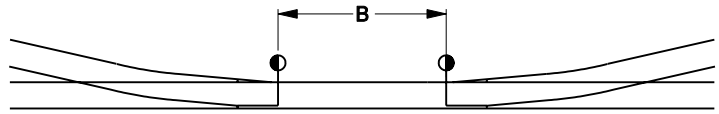


SAME HANDED TURNOUTS
MINIMUM ARRANGEMENT

SAME HANDED TURNOUTS		
TURNOUT	A	B
9	100'	60'
11	100'	60'
15	125'	90'
20	160'	120'
24	160'	120'



OPPOSITE HANDED TURNOUTS
PREFERRED ARRANGEMENT




OPPOSITE HANDED TURNOUTS
MINIMUM ARRANGEMENT

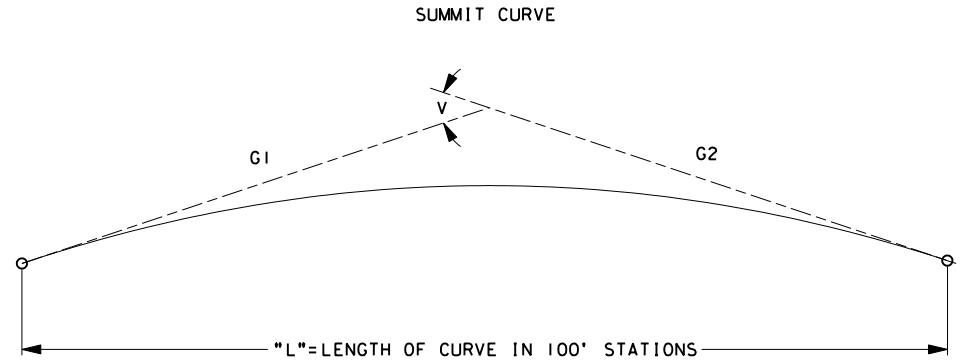
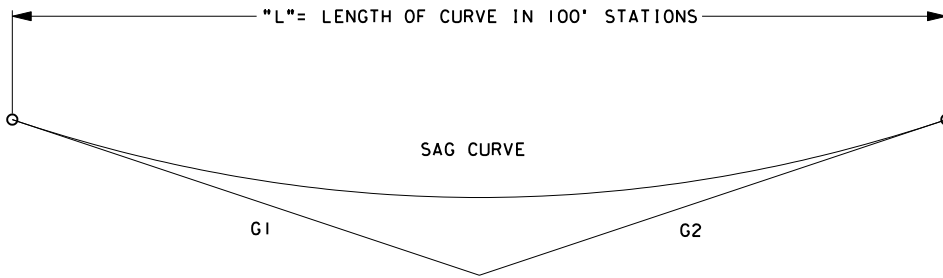
OPPOSITE HANDED TURNOUTS		
TURNOUT	A	B
9	100'	60'
11	100'	60'
15	125'	90'
20	160'	120'
24	160'	120'

NOTES:

1. INSULATED JOINTS MAY BE REQUIRED AT CERTAIN LOCATIONS. SIGNAL SPACING AND CIRCUITS WILL GOVERN.
2. FOR RAIL JOINT LOCATIONS THROUGH THE TURNOUT AREAS, SEE UPRR STD DWGS 5000 THRU 5999 AND COMMON STD DWGS 341000 THRU 347999.
3. WHERE IT APPEARS THAT GROUND CONDITIONS REQUIRE A DEVIATION FROM THE ARRANGEMENTS SHOWN, APPROVAL WILL BE CONSIDERED UPON WRITTEN REQUEST TO THE CHIEF ENGINEER, SETTING FORTH SUCH SIGNIFICANT REASONS.

STD DWG
0017A

UNION PACIFIC RAILROAD ENGINEERING STANDARDS	
FACING POINT TURNOUT ARRANGEMENT	
	ADOPTED: NOV. 17, 1972 REVISED: FEB. 20, 2007 FILE NO.: 0017A
STD DWG 0017A	



$$V/L = \frac{|(G2 - G1)|}{L}$$

G1 AND G2 DESIGNATE GRADES IN PERCENT.
 L=LENGTH OF CURVE IN 100' STATIONS.
 V=ALGEBRAIC DIFFERENCE IN GRADES IN PERCENT(G2-G1)
 V/L=AVERAGE CHANGE IN GRADIENT PER 100' STATION.
 TO DETERMINE LENGTH (L), DIVIDE V BY THE DESIRED V/L
 ROUND UP THE RESULT TO THE NEAREST 100' STATION.

EXAMPLES:
 GIVEN G1=1.05 AND G2=-0.71 V=(-.71)-(1.05)=1.76%
 GIVEN V/L=.10 L=1.76/.10=17.6' STATION.
 VERTICAL CURVE LENGTH=1800' (ROUNDED UP).

TRACK	MAXIMUM V/L	
	SAG	SUMMIT
ALL MAIN TRACKS	0.06	0.10
BRANCH TRACK SPEEDS 40 MPH AND GREATER	0.06	0.10
BRANCH TRACK SPEEDS UNDER 40 MPH	0.12	0.20
YARD TRACKS	0.40	0.80
INDUSTRIAL LEADS	0.60	1.00
INDUSTRY TRACK	1.20	2.00

NOTES:
 VERTICAL CURVES SHALL NOT FALL WITHIN THE
 LIMITS OF HORIZONTAL CURVES OR TURNOUTS
 UNLESS AUTHORIZED BY THE CHIEF ENGINEER.

UNION PACIFIC RAILROAD
 ENGINEERING STANDARDS

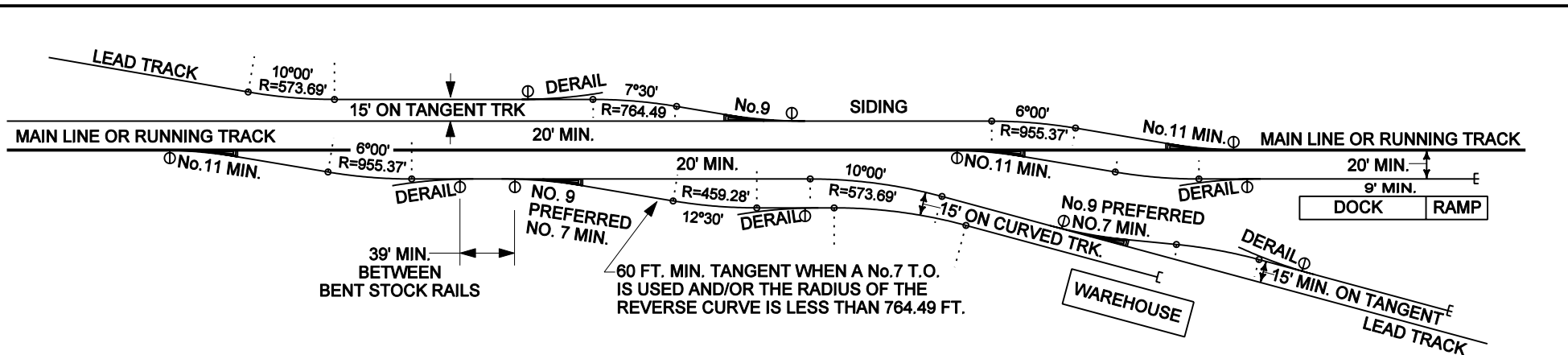
VERTICAL CURVE
 DESIGN



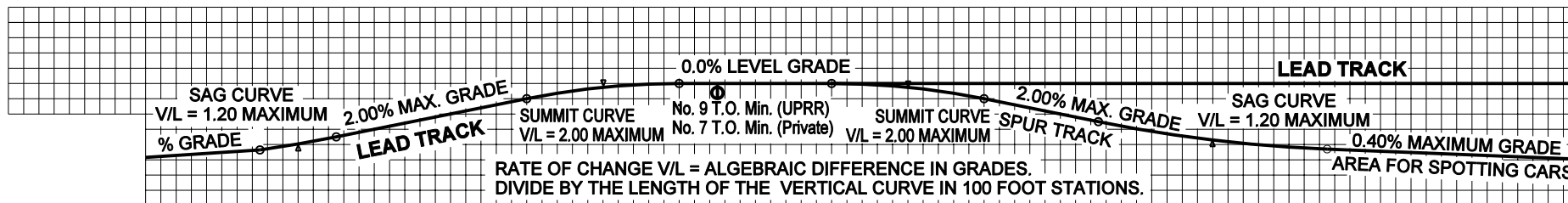
ADOPTED: DEC. 31, 1996
 REVISED:
 FILE NO.: 0016

STD DWG
 0016

STD DWG
 0016



TURNOUTS, TRACK CENTERS, CURVES AND DERAILS



GRADES AND VERTICAL CURVES

NOTES:

1. THE PREFERRED MINIMUM RADIUS OF CURVE IS SHOWN ON THIS TYPICAL LAYOUT DRAWING. WHERE POSSIBLE THE MINIMUM RADIUS SHOULD BE 573.69- FEET FOR INDUSTRIAL LEAD TRACKS, EXCEPT THAT THE RADIUS OF THE REVERSE CURVE FOR ANY TRACK ADJACENT AND PARALLEL TO A MAIN LINE, RUNNING TRACK OR SIDING TRACK SHOULD CORRESPOND TO THE THEORETICAL CURVE FOR THE TURNOUT USED FOR THE TRACK.
2. IN ALL CASES THE MINIMUM ALLOWABLE RADIUS OF A CURVE IS 459.28- FEET, EXCEPT THAT THE RADIUS ON A LEAD OR SPUR TRACK MUST BE INCREASED BY THE TRACK CENTER DISTANCE FOR EACH ADDITIONAL TRACK WHERE IT IS PLANNED TO CONSTRUCT ADDITIONAL TRACKS AS CONCENTRIC CURVES ON THE INSIDE OF A LEAD OR SPUR TRACK.
3. DERAILS SHALL BE INSTALLED TO PROTECT MAINLINE, SIDING, RUNNING OR LEAD TRACKS WHERE GRADE AND OTHER LOCAL CONDITIONS JUSTIFY THE INSTALLATION AS DETERMINED BY THE CHIEF ENGINEER.
4. THERE MUST BE AT LEAST 60- FEET OF TANGENT BETWEEN REVERSE CURVES.
5. TRACK CENTERS MUST BE AT LEAST 17- FEET WHERE NO. 7 CROSSOVERS ARE INSTALLED. MEASUREMENT FROM THE HEEL OF FROG IS PREFERRED FOR TANGENT TRACK BETWEEN TURNOUT AND REVERSE CURVE OR TANGENT IN CROSSOVERS, BUT MEASUREMENT FROM TOE OF FROG IS ALLOWABLE.
6. A NEW CURVE MUST BEGIN AT THE HEEL OF FROG OR BEYOND FOR ADDITIONAL CURVATURE IN THE SAME DIRECTION, BUT OF A DIFFERENT RADIUS OF CURVE THAN THE THEORETICAL CURVE OF THE TURNOUT.

EXHIBIT "A-3"

	UNION PACIFIC RAILROAD Office of Chief Engineer Design
INDUSTRY STANDARDS	
PREFERRED LAYOUT STANDARDS FOR INDUSTRIAL TRACKS	
ADOPTED: JAN. 1, 1980 REVISED: AUG. 4, 2003 FILE NO.: EXHIBIT A-3	EXHIBIT "A-3"