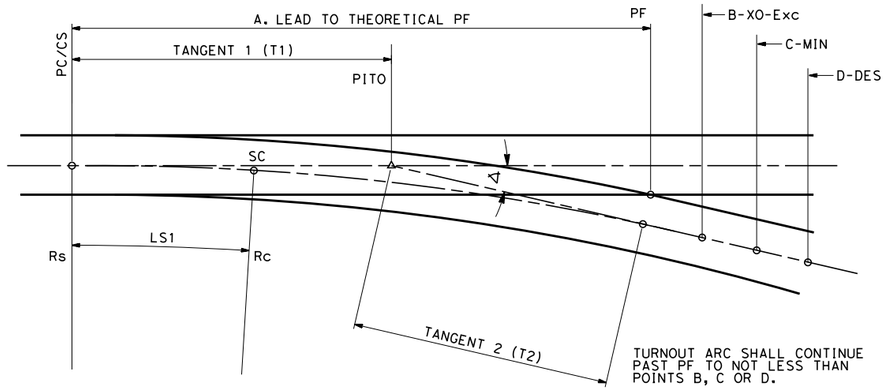

FIGURE 6.1.1: HIGH-SPEED TURNOUT LAYOUT
(SEE NOTE 2)

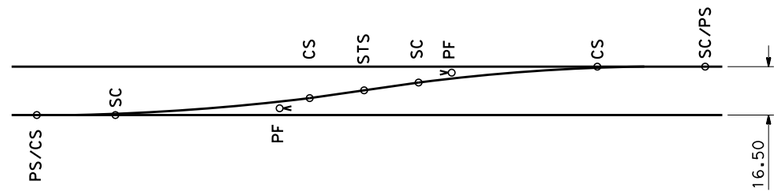

FIGURE 6.1.2: TYPICAL HIGH-SPEED CROSSOVER LAYOUT

NOTES:

1. BASIS OF DATA: TM 2.1.3, TURNOUTS AND STATION TRACK.
2. FORCE DIAGRAMS FOR THESE TURNOUTS SHALL BE SHOWN WITH THE APPLICATION OF THESE TURNOUTS TO CROSSOVERS AND STATION ENTRY TRACKS.

PART 1: GEOMETRY OF TURNOUT AND ITS SEGMENTS, IN FEET UNLESS STATED OTHERWISE				
DESIGN SPEED	60 MPH	80 MPH	110 MPH	150 MPH
TURNOUT ENTRY RADIUS	10,000.00	18,000.00	34,000.00	80,000.00
TURNOUT BODY RADIUS	5,000.00	9,000.00	17,000.00	32,000.00
SWITCH SPIRAL LENGTH AND DESIRABLE FROG END SPIRAL LENGTH	90.00	120.00	160.00	220.00
A. DISTANCE TO THEORETICAL POINT OF FROG	237.53	318.53	436.76	610.07
ANGLE AT THEORETICAL POINT OF FROG	2d27m49s	1d50m12s	1d20m14s	0d58m27s
DERIVED FROG NUMBER (AREMA METHOD)	23.25	31.2	42.8	58.8
TURNOUT BODY CURVE ARC LENGTH, SC TO PF	147.50	198.51	276.74	375.18
B. DISTANCE TO POINT OF 5.85 FT. SEPARATION	262.62	352.18	482.98	673.52
C. DISTANCE TO POINT OF 7.00 FT. SEPARATION	285.48	382.85	525.11	731.34
D. DISTANCE TO POINT OF 8.00 FT. SEPARATION	303.85	407.49	558.97	777.81
PART 2: UNBALANCED SUPERELEVATION AND TRANSITION RATES, INCHES OR IN./SEC AS APPLICABLE				
UNBALANCE AT TURNOUT ENTRY	1.44	1.42	1.42	1.13
UNBALANCE IN TURNOUT BODY	2.88	2.84	2.85	2.81
VIRTUAL TRANSITION TIME	0.68	0.51	0.37	0.27
VIRTUAL TRANSITION RATE AT ENTRY	2.13	2.80	3.86	4.16
VIRTUAL TRANSITION RATE 59.50 FEET IN	3.54	4.20	5.30	5.85
ACTUAL TRANSITION RATE IN SWITCH	1.41	1.39	1.44	1.69
PART 3: RUN TIME OF SEGMENTS, IN SECONDS				
SWITCH SPIRAL	1.02	1.02	0.99	1.00
TURNOUT ARC TO POINT OF FROG	1.67	1.69	1.72	1.71

TABLE 6.1.1: HIGH-SPEED TURNOUTS

MAIN TRACK CROSSOVERS 16.50 FEET TRACK CENTERS				
PART 1: GEOMETRY OF TURNOUT AND ITS SEGMENTS, IN FEET UNLESS STATED OTHERWISE				
DESIGN SPEED	60 MPH	80 MPH	110 MPH	150 MPH
TRACK CENTERS	16.50	16.50	16.50	16.50
TURNOUT ENTRY RADIUS	10,000.00	18,000.00	34,000.00	80,000.00
TURNOUT BODY RADIUS	5,000.00	9,000.00	17,000.00	32,000.00
SWITCH SPIRAL LENGTH	90.00	120.00	160.00	220.00
FROG SPIRAL LENGTH	45.00	62.00	85.00	115.00
TOTAL LENGTH ALONG MAIN TRACK	618.74	829.97	1,138.63	1,583.92
TOTAL LENGTH ALONG CROSSOVER TRACK	619.05	830.20	1,138.80	1,584.04
ANGLE AT STS	3d01m31s	2d15m15s	1d38m28s	1d11m49s
LENGTH OF ENTRY CURVE	0.00	0.00	0.00	0.00
LENGTH OF TURNOUT BODY CURVE	173.52	233.10	324.40	457.02
PART 2: UNBALANCED SUPERELEVATION AND TRANSITION RATES, INCHES OR IN./SEC AS APPLICABLE				
UNBALANCE AT TURNOUT ENTRY	1.44	1.42	1.42	1.13
UNBALANCE IN TURNOUT BODY	2.88	2.84	2.85	2.81
VIRTUAL TRANSITION TIME	0.68	0.51	0.37	0.27
VIRTUAL TRANSITION RATE AT ENTRY	2.13	2.80	3.86	4.16
VIRTUAL TRANSITION RATE 59.50 FEET IN	3.54	4.20	5.30	5.85
TRANSITION RATE IN SWITCH	1.41	1.39	1.44	1.69
TRANSITION RATE AT FROG END	5.51	5.38	5.40	5.38
PART 3: RUN TIME OF SEGMENTS, IN SECONDS				
SWITCH SPIRAL	1.02	1.02	0.99	1.00
TURNOUT ARC TO REVERSING SPIRAL	1.98	1.99	2.01	2.08
REVERSING SPIRALS BETWEEN TURNOUTS	1.02	1.06	1.06	1.04
TURNOUT ARC TO SWITCH SPIRAL	1.98	1.99	2.01	2.08
SWITCH SPIRAL	1.02	1.02	0.99	1.00
TOTAL TIME THROUGH CROSSOVER	7.03	7.08	7.06	7.20

TABLE 6.1.2: HIGH-SPEED CROSSOVERS

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY D. MANITI
DRAWN BY D. SOLTERO
CHECKED BY G. HARRIS
IN CHARGE J. CHIRCO
DATE 04/09/10

PB PARSONS BRINCKERHOFF

CALIFORNIA HIGH-SPEED RAIL AUTHORITY
FLY CALIFORNIA
Without ever leaving the ground.

CALIFORNIA HIGH-SPEED TRAIN PROJECT

HIGH-SPEED
TURNOUTS AND CROSSOVER DATA

CONTRACT NO. 13259
DRAWING NO. TM 2.1.3-A
SCALE NTS
SHEET NO.

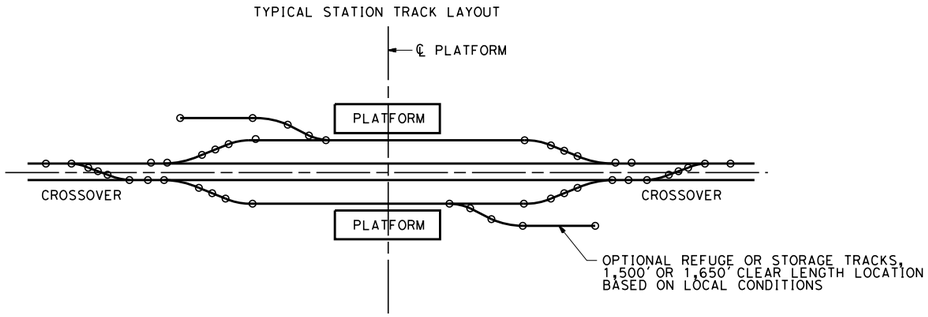

FIGURE 6.1.3: TYPICAL TRACK LAYOUT, INTERMEDIATE STATION WITH HIGH SPEED TURNOUTS

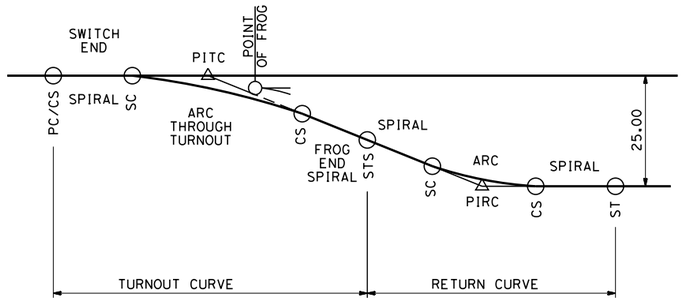

FIGURE 6.1.5: DETAIL OF STATION ENTRY/EXIT HIGH-SPEED TURNOUTS AND RETURN CURVE

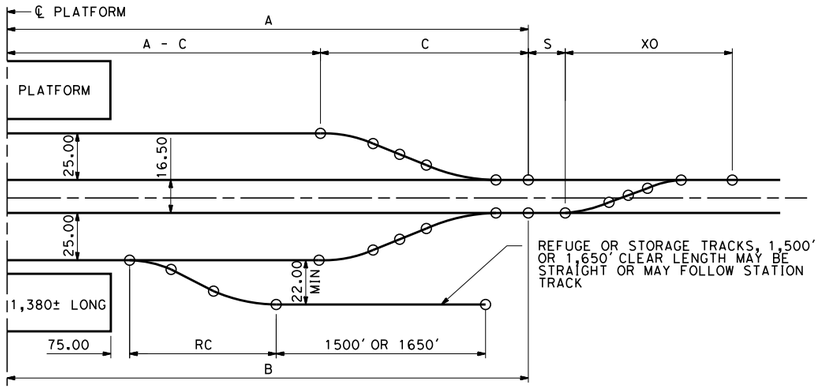

FIGURE 6.1.4: DETAIL OF INTERMEDIATE STATION TRACK LAYOUT

EXPLANATION OF UNDIMENSIONED DATA IN FIGURE 6.1.4:

A: DISTANCE FROM CENTER OF PLATFORM TO APPROACH TURNOUT, NORMAL ARRIVAL DIRECTION. SET BY OPERATIONAL REQUIREMENT, BUT WITH A MINIMUM DISTANCE OF C PLUS HALF PLATFORM LENGTH PLUS 85 FEET WITHOUT REFUGE/STORAGE TRACK, OR C PLUS HALF PLATFORM PLUS LENGTH OF REFUGE TURNOUT PLUS 75 FEET WITH REFUGE/STORAGE TRACK.

B: DISTANCE FROM CENTER OF PLATFORM TO APPROACH TURNOUT, NORMAL DEPARTURE DIRECTION. SET BY OPERATIONAL REQUIREMENT, BUT WITH A MINIMUM DISTANCE OF C PLUS HALF PLATFORM LENGTH PLUS 85 FEET WITHOUT REFUGE/STORAGE TRACK, OR C PLUS HALF PLATFORM PLUS LENGTH OF REFUGE TURNOUT PLUS 75 FEET WITH REFUGE/STORAGE TRACK.

C: DISTANCE REQUIRED BY GEOMETRY OF THE CONNECTION. SEE DISTANCE LABELED "TOTAL LENGTH ALONG MAIN TRACKS" IN TABLE 6.1.3.

S: MINIMUM DISTANCE BETWEEN END OF STATION TURNOUT AND CROSSOVER TURNOUT WHERE THEY ARE IN THE SAME TRACK. 1.5 SECONDS RUN TIME DESIRABLE, 1.0 SECONDS MINIMUM.

XO: LENGTH OF CROSSOVER. SEE "TOTAL LENGTH ALONG MAIN TRACK" IN TABLE 6.1.2.

RC: LENGTH REQUIRED TO ACHIEVE OFFSET FOR STORAGE/REFUGE TRACK. DETERMINED BY MEDIUM/LOW SPEED TURNOUT SELECTED FROM TABLE 6.1.5.

STATION CONNECTION TRACKS WITH SPIRAL POINT TURNOUTS				
PART 1: GEOMETRY OF TURNOUT AND ITS SEGMENTS, IN FEET UNLESS STATED OTHERWISE				
DESIGN SPEED	60 MPH	80 MPH	110 MPH	150 MPH
PLATFORM TRACK OFFSET	25.00	25.00	25.00	25.00
TURNOUT ENTRY RADIUS	10,000.00	18,000.00	34,000.00	80,000.00
TURNOUT BODY RADIUS	5,000.00	9,000.00	17,000.00	32,000.00
SWITCH SPIRAL LENGTH	90.00	120.00	160.00	220.00
FROG SPIRAL LENGTH	90.00	120.00	160.00	220.00
RETURN CURVE RADIUS	4,000.00	7,000.00	13,500.00	24,000.00
CURVE SPIRAL LENGTH	90.00	120.00	160.00	220.00
C. TOTAL LENGTH ALONG MAIN TRACK	743.65	991.80	1,364.60	1,862.87
TOTAL LENGTH ALONG PLATFORM TRACK	744.25	992.25	1,364.92	1,863.11
ANGLE AT STS	3d44m07s	2d48m04s	2d02m17s	1d30m04s
LENGTH OF ENTRY CURVE	0.00	0.00	0.00	0.00
LENGTH OF TURNOUT BODY CURVE	213.47	290.02	404.71	574.35
LENGTH OF RETURN CURVE	170.78	222.24	320.21	408.76
PART 2: UNBALANCED SUPERELEVATION AND TRANSITION RATES, INCHES OR IN./SEC AS APPLICABLE				
UNBALANCE AT TURNOUT ENTRY	1.44	1.42	1.42	1.13
UNBALANCE IN TURNOUT BODY	2.88	2.84	2.85	2.81
SUPERELEVATION IN RETURN CURVE	1.25	1.25	1.25	1.25
UNBALANCE IN RETURN CURVE	2.35	2.41	2.34	2.50
VIRTUAL TRANSITION TIME	0.68	0.51	0.37	0.27
VIRTUAL TRANSITION RATE AT ENTRY	2.13	2.80	3.86	4.16
VIRTUAL TRANSITION RATE 59.50 FEET IN	3.54	4.20	5.30	5.85
ACTUAL TRANSITION RATE IN SWITCH	1.41	1.39	1.44	1.69
TRANSITION RATE AT FROG END	2.82	2.78	2.87	2.81
TRANSITION RATE IN CURVE SPIRALS	2.30	2.35	2.35	2.50
PART 3: RUN TIME OF SEGMENTS, IN SECONDS				
SWITCH SPIRAL	1.02	1.02	0.99	1.00
TURNOUT ARC	2.43	2.47	2.51	2.61
FROG SPIRAL	1.02	1.02	0.99	1.00
CURVE SPIRAL	1.02	1.02	0.99	1.00
CURVE ARC	1.94	1.89	1.98	1.86
CURVE SPIRAL	1.02	1.02	0.99	1.00
SUM THROUGH DIVERGENCE	8.46	8.46	8.46	8.47

TABLE 6.1.3: STANDARD STATION CONNECTION TURNOUTS AND CURVES, 25 FEET TRACK CENTERS

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY D. MANTINI
DRAWN BY D. SOLTERO
CHECKED BY G. HARRIS
IN CHARGE J. CHIRCO
DATE 04/09/10

PB PARSONS BRINCKERHOFF

CALIFORNIA HIGH-SPEED RAIL AUTHORITY
FLY CALIFORNIA
Without ever leaving the ground.

CALIFORNIA HIGH-SPEED TRAIN PROJECT

TYPICAL TRACK LAYOUT
INTERMEDIATE STATION
WITH HIGH-SPEED TURNOUTS

CONTRACT NO. 13259
DRAWING NO. TM 2.1.3-B
SCALE NTS
SHEET NO.

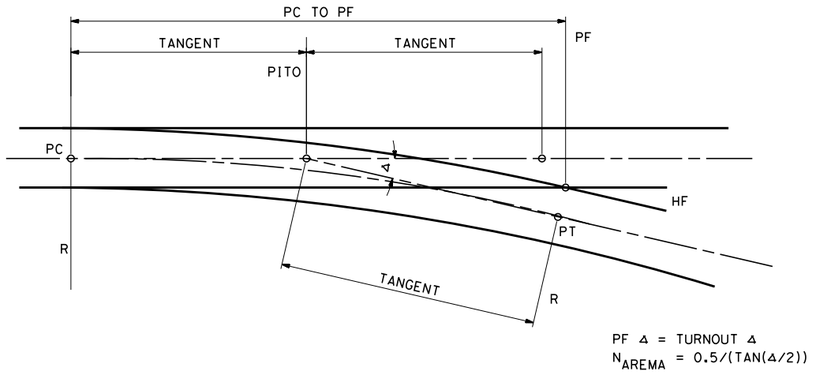

FIGURE 6.1.6: LOW AND MEDIUM SPEED TURNOUT LAYOUT

NUMBER	9	11	15	20
DEFINED ANGLE	6d21m35s	5d12m18s	3d49m06s	2d51m51s
RADIUS	620 FEET	950 FEET	1750 FEET	3275 FEET
TANGENT	34.44 FEET	43.18 FEET	58.33 FEET	81.87 FEET
LEAD, PC TO 1/2 INCH PF	77.19 FEET	95.43 FEET	129.58 FEET	176.87 FEET
TANGENT RAIL, 1/2 INCH PF TO CURVE PT	8.31 FEET	9.07 FEET	12.92 FEET	13.13 FEET
SET SPEED	20 MPH	25 MPH	35 MPH	50 MPH
UNBALANCE	2.58 INCHES	2.63 INCHES	2.80 INCHES	3.05 INCHES

TABLE 6.1.4: LOW AND MEDIUM SPEED TURNOUTS

1. THE REQUIREMENTS OF THIS SECTION ARE LIMITED TO GEOMETRIC CONSIDERATIONS ONLY. THE DETERMINATION OF THE NATURE OF THE POINT AND DRIVING MECHANISM ARE DESCRIBED ELSEWHERE IN THE DESIGN CRITERIA MANUAL.

2. USE OF THE NUMBER 9 TURNOUT SHALL BE TREATED AS AN "EXCEPTIONAL" CONDITION FOR ANY SITUATION WHERE THE TRAFFIC VOLUME IS OTHER THAN VERY LOW DUE TO THE KNOWN HIGH RATE OF SIDE WEAR OF THE RAILS THAT OCCURS IN SMALL RADIUS TURNOUTS UNDER HIGH-SPEED EQUIPMENT. NUMBER 11 TURNOUTS SHALL BE USED AS THE STANDARD YARD TURNOUT, AND AS THE MINIMUM SIZE TURNOUT TO BE INSTALLED IN MAIN TRACKS WITH SPEEDS OF 125 MPH OR LESS AND IN STATION TRACKS. NUMBER 15 TURNOUTS SHALL BE THE MINIMUM TURNOUTS OUT OF MAIN TRACKS FOR ALL OTHER SITUATION. YARD LEAD OR OTHER TRACKS THAT WILL HAVE TRAFFIC VOLUME OTHER THAN VERY LOW SHALL BE NO LESS THAN NUMBER 20 TURNOUTS IF CONDITIONS PERMIT.

NOTES:

1. NOT USED

NUMBER	11	15	20
SET SPEED	25 MPH	35 MPH	50 MPH
TRACK CENTERS	22 FEET	22	22
RETURN CURVE RADIUS	950 FEET	1750	3275
CURVE TANGENT	43.18 FEET	58.33	81.87
OVERALL LENGTH, PS TO END CURVE	327.87 FEET	446.30	603.48

TABLE 6.1.5: CONNECTION TO STORAGE AND REFUGE TRACKS AT HIGH-SPEED STATIONS

6.1.5: STORAGE AND REFUGE TRACKS AT HIGH-SPEED STATIONS

1. THE TURNOUT RETURN CURVE SELECTED FOR THIS APPLICATION WILL DEPEND UPON THE OPERATIONAL NEEDS. TURNOUTS SMALLER THAN THE NUMBER 11 SHALL NOT BE USED FOR THIS APPLICATION. FOR THE 22.00 FEET TRACK OFFSET THE TURNOUT RETURN CURVE SELECTIONS SHALL BE AS DEFINED IN TABLE 6.1.5. SPIRALS NEED NOT BE APPLIED TO THE RETURN CURVE FOR A STUB END TRACK. IF THE TRACK IS FOR YARD ACCESS INSTEAD OF TO STORAGE, A SPIRAL APPROPRIATE TO THE DESIGN SPEED OF THE ACCESS TRACK SHALL BE APPLIED.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY D. MANTINI
DRAWN BY D. SOLTERO
CHECKED BY G. HARRIS
IN CHARGE J. CHIRCO
DATE 04/09/10

PB PARSONS BRINCKERHOFF

CALIFORNIA HIGH-SPEED RAIL AUTHORITY
FLY CALIFORNIA
Without ever leaving the ground.

CALIFORNIA HIGH-SPEED TRAIN PROJECT

LOW AND MEDIUM SPEED TURNOUTS DATA

CONTRACT NO. 13259
DRAWING NO. TM 2.1.3-C
SCALE NTS
SHEET NO.