NMRA Recommended Practices

LSdf Scale

Curved Switch Turnout

TURNOUT DIMENSIONS

Revised: February 2015 | **RP-12.40**

Design and calculations by Van S. Fehr

(1)	**FROG NUMBERS**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
PROPERTIES OF CURVED SWITCHES										
(2)	Switch Rail Length	4.989	4.978	5.074	8.518	8.724	8.904	8.920	9.028	13.416
(3)	Switch Point Angle (deg.)	1.574	1.578	1.548	0.921	0.900	0.882	0.880	0.869	0.585
(4)	Switch Heel Spread	0.259	0.259	0.259	0.259	0.259	0.259	0.259	0.259	0.259
(5)	Switch Heel Angle (deg.)	4.386	4.395	4.312	2.568	2.507	2.457	2.452	2.423	1.630
(6)	Switch Rail Radius	101.649	101.235	105.158	296.443	310.948	323.857	325.014	332.988	735.340
(7)	Switch Mid-Ordinate	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031
LEAD TO THEORETICAL POINT OF FROG										
(8)	Lead	13.437	15.164	16.890	23.508	25.515	27.265	28.914	30.555	38.734
CLOSURE DISTANCE										
(9)	Straight Rail Length	7.020	8.636	10.145	12.915	14.533	15.576	17.149	18.418	21.870
(10)	Curved Rail Length	7.167	8.755	10.246	12.998	14.606	15.642	17.209	18.474	21.919
(11)	Curved Rail Radius	41.633	71.395	112.576	132.911	180.151	229.631	301.311	380.435	399.750
GAGE LINE OFFSETS ON CURVED CLOSURE RAIL										
(12)	1st Point Y1	0.431	0.458	0.479	0.444	0.455	0.460	0.474	0.482	0.452
(13)	1st Point X1	6.744	7.137	7.610	11.747	12.358	12.798	13.207	13.633	18.884
(14)	Mid-Point Y2	0.679	0.724	0.758	0.707	0.725	0.726	0.749	0.761	0.720
(15)	Mid-Point X2	8.499	9.296	10.147	14.976	15.991	16.691	17.494	18.237	24.351
(16)	3rd Point Y3	1.004	1.056	1.094	1.049	1.068	1.059	1.086	1.096	1.064
(17)	3rd Point X3	10.254	11.455	12.683	18.205	19.624	20.585	21.781	22.842	29.818
PROPERTIES OF FROGS										
(18)	Frog Angle (deg.)	14.250	11.421	9.527	8.171	7.153	6.360	5.725	5.205	4.772
(19)	Overall Length	3.241	3.675	4.109	4.918	5.352	6.536	6.783	7.670	8.339
(20)	Toe Length	1.428	1.550	1.671	2.074	2.258	2.786	2.845	3.108	3.448
(21)	Heel Length	1.813	2.125	2.438	2.844	3.094	3.750	3.938	4.563	4.891
(22)	Toe Spread	0.354	0.308	0.278	0.296	0.282	0.309	0.284	0.282	0.287
(23)	Heel Spread	0.450	0.423	0.405	0.405	0.386	0.416	0.393	0.414	0.407
(35)	Wing Rail Extension	1.110	1.258	1.407	1.555	1.703	1.852	2.000	2.149	2.297
(36)	Wing Rail Flare Length	0.563	0.563	0.563	0.563	0.750	0.750	1.000	1.000	1.125
(37)	Wing Rail Flare Width	0.075	0.075	0.075	0.075	0.071	0.071	0.068	0.068	0.067
(38)	Wing Rail Bend Width	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(39)	Wing Rail End Chamfer	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109
POINT OF FROG TO INTERSECTION OF CENTERLINES										
(24)	PF to ICL	7.080	8.850	10.620	12.390	14.160	15.930	17.700	19.470	21.240
DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS										
	For Track Centers of:	4.875	**(13 prototype feet)**							
(25)	Straight Track Dist.	5.035	6.431	7.807	9.171	10.528	11.880	13.228	14.574	15.918
(26)	Crossover Track Dist.	5.645	6.919	8.213	9.519	10.832	12.150	13.472	14.796	16.122
	For Track Center Increment of:	0.375	**(1 prototype foot)**							
(28)	Straight Track Incr.	1.477	1.856	2.234	2.612	2.988	3.365	3.741	4.116	4.492
(29)	Crossover Track Incr.	1.523	1.894	2.266	2.638	3.012	3.385	3.759	4.134	4.508
GUARD RAILS										
(30)	Parallel End Setback	0.250	0.266	0.282	0.297	0.313	0.328	0.344	0.360	0.375
(31)	Bevel Length	0.406	0.406	0.406	0.406	0.406	0.406	0.406	0.406	0.406
(32)	Flare Length	0.906	0.906	0.906	0.906	0.906	1.031	1.031	1.031	1.031
(33)	Overall Length	3.094	3.094	3.094	3.094	3.094	4.125	4.125	4.125	4.125
(34)	Parallel Length	1.281	1.281	1.281	1.281	1.281	2.063	2.063	2.063	2.063
(37)	Flare Width	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060
(38)	Plane Width	0.035	0.035	0.035	0.035	0.035	0.032	0.032	0.032	0.032
(39)	End Chamfer	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094

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(1)	**FROG NUMBERS**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
PROPERTIES OF CURVED SWITCHES									
(2)	Switch Rail Length	13.523	13.662	13.847	14.021	17.330	17.553	17.707	17.882
(3)	Switch Point Angle (deg.)	0.580	0.574	0.567	0.560	0.453	0.447	0.443	0.439
(4)	Switch Heel Spread	0.259	0.259	0.259	0.259	0.259	0.259	0.259	0.259
(5)	Switch Heel Angle (deg.)	1.617	1.601	1.580	1.560	1.262	1.246	1.235	1.223
(6)	Switch Rail Radius	747.125	762.552	783.392	803.193	1226.951	1258.718	1280.903	1306.467
(7)	Switch Mid-Ordinate	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031
LEAD TO THEORETICAL POINT OF FROG									
(8)	Lead	40.551	42.367	44.156	46.016	52.601	54.469	56.336	58.203
CLOSURE DISTANCE									
(9)	Straight Rail Length	23.379	24.857	26.120	27.762	30.691	31.987	33.656	35.304
(10)	Curved Rail Length	23.425	24.899	26.160	27.799	30.725	32.020	33.687	35.334
(11)	Curved Rail Radius	481.430	572.970	669.487	788.540	835.410	947.512	1084.568	1233.593
GAGE LINE OFFSETS ON CURVED CLOSURE RAIL									
(12)	1st Point Y1	0.460	0.467	0.471	0.479	0.464	0.467	0.473	0.479
(13)	1st Point X1	19.368	19.876	20.377	20.962	25.002	25.549	26.121	26.708
(14)	Mid-Point Y2	0.732	0.742	0.747	0.760	0.739	0.742	0.753	0.763
(15)	Mid-Point X2	25.213	26.090	26.907	27.902	32.675	33.546	34.535	35.534
(16)	3rd Point Y3	1.075	1.084	1.087	1.102	1.084	1.085	1.098	1.109
(17)	3rd Point X3	31.058	32.305	33.437	34.843	40.348	41.543	42.949	44.360
PROPERTIES OF FROGS									
(18)	Frog Angle (deg.)	4.405	4.091	3.818	3.580	3.369	3.182	3.015	2.864
(19)	Overall Length	9.008	9.676	10.033	10.701	11.370	12.039	12.403	12.767
(20)	Toe Length	3.648	3.848	4.189	4.233	4.581	4.929	4.973	5.017
(21)	Heel Length	5.360	5.828	5.844	6.469	6.789	7.109	7.430	7.750
(22)	Toe Spread	0.280	0.275	0.279	0.264	0.269	0.274	0.262	0.251
(23)	Heel Spread	0.412	0.416	0.389	0.404	0.399	0.395	0.391	0.387
(35)	Wing Rail Extension	2.547	2.797	2.945	3.250	3.399	3.547	3.797	4.047
(36)	Wing Rail Flare Length	1.466	1.659	1.732	1.940	2.008	2.076	2.272	2.468
(37)	Wing Rail Flare Width	0.065	0.065	0.065	0.064	0.064	0.064	0.064	0.063
(38)	Wing Rail Bend Width	0.065	0.065	0.065	0.064	0.064	0.064	0.064	0.063
(39)	Wing Rail End Chamfer	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109
POINT OF FROG TO INTERSECTION OF CENTERLINES									
(24)	PF to ICL	23.010	24.780	26.550	28.320	30.090	31.860	33.630	35.400
DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS									
	For Track Centers of:	4.875	**(13 prototype feet)**						
(25)	Straight Track Dist.	17.261	18.603	19.944	21.284	22.623	23.962	25.301	26.639
(26)	Crossover Track Dist.	17.449	18.777	20.106	21.436	22.767	24.098	25.429	26.761
For Track Center Increment of:		0.375	**(1 prototype foot)**						
(28)	Straight Track Incr.	4.868	5.243	5.619	5.994	6.369	6.745	7.120	7.495
(29)	Crossover Track Incr.	4.882	5.257	5.631	6.006	6.381	6.755	7.130	7.505
GUARD RAILS									
(30)	Parallel End Setback	0.391	0.406	0.422	0.438	0.453	0.469	0.484	0.500
(31)	Bevel Length	0.406	0.406	0.406	0.406	0.406	0.406	0.406	0.406
(32)	Flare Length	1.031	1.031	1.125	1.125	1.125	1.125	1.281	1.281
(33)	Overall Length	4.125	4.125	4.875	4.875	4.875	4.875	6.188	6.188
(34)	Parallel Length	2.063	2.063	2.625	2.625	2.625	2.625	3.625	3.625
(37)	Total Flare at End	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060
(38)	Bevel Cut at End	0.032	0.032	0.031	0.031	0.031	0.031	0.029	0.029
(39)	End Chamfer	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094