NMRA Recommended Practices

Proto:87 Scale

Curved Switch Turnout

TURNOUT DIMENSIONS

Revised: February 2015 | **RP-12.10**

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	1.797	1.794	1.830	3.069	3.143	3.209	3.216	3.257	4.834
(3)	Switch Point Angle (deg.)	1.588	1.591	1.559	0.929	0.907	0.889	0.887	0.876	0.590
(4)	Switch Heel Spread	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094
(5)	Switch Heel Angle (deg.)	4.425	4.432	4.345	2.590	2.529	2.477	2.472	2.440	1.644
(6)	Switch Rail Radius	36.295	36.172	37.643	105.898	111.090	115.740	116.274	119.258	262.708
(7)	Switch Mid-Ordinate	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
LEAD TO THEORETICAL POINT OF FROG										
(8)	Lead	4.937	5.572	6.206	8.638	9.376	10.019	10.625	11.227	14.233
CLOSURE DISTANCE										
(9)	Straight Rail Length	2.698	3.311	3.885	4.950	5.566	5.970	6.567	7.053	8.377
(10)	Curved Rail Length	2.752	3.355	3.922	4.980	5.593	5.994	6.589	7.073	8.395
(11)	Curved Rail Radius	16.047	27.503	43.362	51.124	69.298	88.465	116.046	146.585	153.779
GAGE LINE OFFSETS ON CURVED CLOSURE RAIL										
(12)	1st Point Y1	0.161	0.171	0.179	0.165	0.170	0.171	0.177	0.180	0.169
(13)	1st Point X1	2.472	2.622	2.801	4.307	4.535	4.701	4.858	5.020	6.928
(14)	Mid-Point Y2	0.256	0.273	0.286	0.266	0.273	0.274	0.283	0.287	0.272
(15)	Mid-Point X2	3.146	3.450	3.773	5.544	5.926	6.194	6.500	6.783	9.022
(16)	3rd Point Y3	0.381	0.401	0.415	0.398	0.405	0.402	0.412	0.416	0.403
(17)	3rd Point X3	3.821	4.277	4.744	6.782	7.318	7.686	8.141	8.547	11.116
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	1.108	1.248	1.387	1.664	1.803	2.218	2.288	2.594	2.820
(20)	Toe Length	0.442	0.467	0.491	0.619	0.666	0.840	0.841	0.918	1.022
(21)	Heel Length	0.666	0.781	0.896	1.045	1.137	1.378	1.447	1.677	1.797
(22)	Toe Spread	0.110	0.093	0.082	0.088	0.083	0.093	0.084	0.083	0.085
(23)	Heel Spread	0.165	0.155	0.149	0.149	0.142	0.153	0.145	0.152	0.150
(35)	Wing Rail Extension	0.408	0.462	0.517	0.571	0.626	0.680	0.735	0.790	0.844
(36)	Wing Rail Flare Length	0.207	0.207	0.207	0.207	0.276	0.276	0.367	0.367	0.413
(37)	Wing Rail Flare Width	0.028	0.028	0.028	0.028	0.026	0.026	0.025	0.025	0.025
(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	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
POINT OF FROG TO INTERSECTION OF CENTERLINES										
(24)	PF to ICL	2.596	3.245	3.894	4.543	5.192	5.841	6.490	7.139	7.788
DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS										
	For Track Centers of:	1.791	**(13 prototype feet)**							
(25)	Straight Track Dist.	1.861	2.377	2.885	3.389	3.891	4.390	4.889	5.386	5.883
(26)	Crossover Track Dist.	2.085	2.556	3.035	3.517	4.003	4.490	4.978	5.467	5.957
	For Track Center Increment of:	0.138	**(1 prototype foot)**							
(28)	Straight Track Incr.	0.543	0.682	0.821	0.960	1.098	1.236	1.375	1.513	1.651
(29)	Crossover Track Incr.	0.560	0.696	0.833	0.969	1.107	1.244	1.381	1.519	1.656
GUARD RAILS										
(30)	Parallel End Setback	0.092	0.098	0.103	0.109	0.115	0.121	0.126	0.132	0.138
(31)	Bevel Length	0.149	0.149	0.149	0.149	0.149	0.149	0.149	0.149	0.149
(32)	Flare Length	0.333	0.333	0.333	0.333	0.333	0.333	0.333	0.333	0.333
(33)	Overall Length	1.137	1.137	1.137	1.137	1.137	1.137	1.137	1.137	1.137
(34)	Parallel Length	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471
(37)	Flare Width	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022
(38)	Plane Width	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
(39)	End Chamfer	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034

NMRA Recommended Practices

Proto:87 Scale

Curved Switch Turnout

TURNOUT DIMENSIONS

Revised: February 2015 | **RP-12.10**

Design and calculations by Van S. Fehr

(1)	**FROG NUMBERS**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
PROPERTIES OF CURVED SWITCHES									
(2)	Switch Rail Length	4.873	4.924	4.992	5.056	6.245	6.326	6.383	6.448
(3)	Switch Point Angle (deg.)	0.585	0.579	0.571	0.564	0.457	0.451	0.447	0.442
(4)	Switch Heel Spread	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094
(5)	Switch Heel Angle (deg.)	1.631	1.614	1.592	1.572	1.273	1.256	1.245	1.233
(6)	Switch Rail Radius	266.980	272.600	280.175	287.437	438.513	449.981	458.106	467.467
(7)	Switch Mid-Ordinate	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
LEAD TO THEORETICAL POINT OF FROG									
(8)	Lead	14.900	15.568	16.225	16.909	19.329	20.015	20.701	21.387
CLOSURE DISTANCE									
(9)	Straight Rail Length	8.952	9.515	10.000	10.623	11.747	12.244	12.877	13.503
(10)	Curved Rail Length	8.968	9.531	10.014	10.637	11.759	12.256	12.889	13.514
(11)	Curved Rail Radius	185.226	220.479	257.742	303.516	321.327	364.592	417.264	474.540
GAGE LINE OFFSETS ON CURVED CLOSURE RAIL									
(12)	1st Point Y1	0.172	0.174	0.176	0.179	0.173	0.174	0.177	0.179
(13)	1st Point X1	7.111	7.303	7.492	7.712	9.182	9.387	9.603	9.824
(14)	Mid-Point Y2	0.276	0.280	0.282	0.287	0.278	0.280	0.284	0.288
(15)	Mid-Point X2	9.349	9.682	9.992	10.368	12.118	12.448	12.822	13.199
(16)	3rd Point Y3	0.407	0.411	0.412	0.418	0.411	0.411	0.416	0.420
(17)	3rd Point X3	11.587	12.060	12.492	13.024	15.055	15.509	16.041	16.575
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	3.045	3.270	3.381	3.606	3.832	4.057	4.170	4.284
(20)	Toe Length	1.076	1.129	1.233	1.229	1.337	1.445	1.440	1.436
(21)	Heel Length	1.969	2.142	2.147	2.377	2.495	2.612	2.730	2.848
(22)	Toe Spread	0.083	0.081	0.082	0.077	0.079	0.080	0.076	0.072
(23)	Heel Spread	0.151	0.153	0.143	0.148	0.147	0.145	0.144	0.142
(35)	Wing Rail Extension	0.936	1.028	1.082	1.194	1.249	1.303	1.395	1.487
(36)	Wing Rail Flare Length	0.539	0.610	0.636	0.713	0.738	0.763	0.835	0.907
(37)	Wing Rail Flare Width	0.024	0.024	0.024	0.024	0.024	0.023	0.023	0.023
(38)	Wing Rail Bend Width	0.024	0.024	0.024	0.024	0.024	0.023	0.023	0.023
(39)	Wing Rail End Chamfer	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
POINT OF FROG TO INTERSECTION OF CENTERLINES									
(24)	PF to ICL	8.437	9.086	9.735	10.384	11.033	11.682	12.331	12.980
DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS									
	For Track Centers of:	1.791	**(13 prototype feet)**						
(25)	Straight Track Dist.	6.379	6.875	7.370	7.865	8.360	8.855	9.350	9.844
(26)	Crossover Track Dist.	6.448	6.939	7.430	7.921	8.413	8.905	9.397	9.889
For Track Center Increment of:		0.138	**(1 prototype foot)**						
(28)	Straight Track Incr.	1.789	1.927	2.065	2.203	2.340	2.478	2.616	2.754
(29)	Crossover Track Incr.	1.794	1.932	2.069	2.207	2.345	2.482	2.620	2.758
GUARD RAILS									
(30)	Parallel End Setback	0.144	0.149	0.155	0.161	0.167	0.172	0.178	0.184
(31)	Bevel Length	0.149	0.149	0.149	0.149	0.149	0.149	0.149	0.149
(32)	Flare Length	0.333	0.379	0.379	0.379	0.379	0.379	0.379	0.379
(33)	Overall Length	1.137	1.516	1.516	1.516	1.516	1.516	1.516	1.516
(34)	Parallel Length	0.471	0.758	0.758	0.758	0.758	0.758	0.758	0.758
(37)	Total Flare at End	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022
(38)	Bevel Cut at End	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.012
(39)	End Chamfer	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034