NMRA Recommended Practices

Proto:32 Scale

Curved Switch Turnout

TURNOUT DIMENSIONS

Revised: February 2015 | **RP-12.4**

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	4.798	4.774	4.860	8.191	8.376	8.539	8.546	8.646	12.885
(3)	Switch Point Angle (deg.)	1.561	1.569	1.541	0.914	0.894	0.877	0.876	0.866	0.581
(4)	Switch Heel Spread	0.247	0.247	0.247	0.247	0.247	0.247	0.247	0.247	0.247
(5)	Switch Heel Angle (deg.)	4.350	4.371	4.295	2.547	2.491	2.443	2.441	2.413	1.619
(6)	Switch Rail Radius	98.578	97.614	101.135	287.326	300.479	312.300	312.836	320.193	711.100
(7)	Switch Mid-Ordinate	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029
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	7.450	9.138	10.716	13.658	15.355	16.473	18.113	19.451	23.110
(10)	Curved Rail Length	7.596	9.256	10.816	13.740	15.428	16.539	18.173	19.506	23.158
(11)	Curved Rail Radius	43.962	75.225	118.434	139.988	189.620	241.963	317.115	400.280	420.867
GAGE LINE OFFSETS ON CURVED CLOSURE RAIL										
(12)	1st Point Y1	0.429	0.457	0.479	0.441	0.453	0.458	0.473	0.482	0.450
(13)	1st Point X1	6.661	7.059	7.539	11.605	12.215	12.657	13.075	13.509	18.663
(14)	Mid-Point Y2	0.691	0.737	0.772	0.719	0.738	0.740	0.763	0.776	0.733
(15)	Mid-Point X2	8.523	9.343	10.218	15.020	16.054	16.776	17.603	18.372	24.440
(16)	3rd Point Y3	1.036	1.089	1.128	1.081	1.100	1.092	1.119	1.129	1.095
(17)	3rd Point X3	10.386	11.628	12.897	18.434	19.892	20.894	22.132	23.234	30.218
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	3.002	3.377	3.752	4.503	4.878	6.004	6.192	7.020	7.630
(20)	Toe Length	1.189	1.252	1.315	1.659	1.784	2.253	2.254	2.457	2.739
(21)	Heel Length	1.813	2.125	2.438	2.844	3.094	3.750	3.938	4.563	4.891
(22)	Toe Spread	0.295	0.249	0.218	0.236	0.223	0.250	0.225	0.223	0.228
(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	7.064	8.830	10.596	12.362	14.128	15.894	17.660	19.426	21.192
DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS										
	For Track Centers of:	4.875	**(13 prototype feet)**							
(25)	Straight Track Dist.	5.067	6.471	7.855	9.227	10.592	11.952	13.308	14.662	16.014
(26)	Crossover Track Dist.	5.677	6.959	8.261	9.575	10.896	12.222	13.552	14.884	16.218
	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	0.906	0.906	0.906	0.906
(33)	Overall Length	3.094	3.094	3.094	3.094	3.094	3.094	3.094	3.094	3.094
(34)	Parallel Length	1.281	1.281	1.281	1.281	1.281	1.281	1.281	1.281	1.281
(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	0.035	0.035	0.035	0.035
(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	12.976	13.101	13.272	13.433	16.625	16.831	16.972	17.135
(3)	Switch Point Angle (deg.)	0.577	0.571	0.564	0.557	0.450	0.445	0.441	0.437
(4)	Switch Heel Spread	0.247	0.247	0.247	0.247	0.247	0.247	0.247	0.247
(5)	Switch Heel Angle (deg.)	1.608	1.592	1.572	1.553	1.255	1.239	1.229	1.218
(6)	Switch Rail Radius	721.214	735.107	754.459	772.898	1183.851	1213.413	1233.743	1257.510
(7)	Switch Mid-Ordinate	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029
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	24.694	26.245	27.581	29.295	32.399	33.771	35.513	37.232
(10)	Curved Rail Length	24.739	26.287	27.621	29.332	32.434	33.803	35.544	37.262
(11)	Curved Rail Radius	506.694	602.861	704.494	829.205	878.837	996.905	1140.485	1296.552
GAGE LINE OFFSETS ON CURVED CLOSURE RAIL									
(12)	1st Point Y1	0.458	0.466	0.470	0.478	0.462	0.466	0.472	0.479
(13)	1st Point X1	19.150	19.662	20.167	20.757	24.725	25.274	25.850	26.443
(14)	Mid-Point Y2	0.745	0.755	0.761	0.774	0.752	0.756	0.767	0.777
(15)	Mid-Point X2	25.323	26.223	27.063	28.081	32.825	33.717	34.728	35.751
(16)	3rd Point Y3	1.107	1.117	1.119	1.135	1.116	1.118	1.130	1.142
(17)	3rd Point X3	31.497	32.785	33.958	35.404	40.925	42.159	43.606	45.059
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	8.240	8.849	9.147	9.757	10.366	10.976	11.281	11.586
(20)	Toe Length	2.880	3.021	3.303	3.288	3.577	3.867	3.851	3.836
(21)	Heel Length	5.360	5.828	5.844	6.469	6.789	7.109	7.430	7.750
(22)	Toe Spread	0.221	0.216	0.220	0.205	0.210	0.215	0.203	0.192
(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	22.958	24.724	26.490	28.256	30.022	31.788	33.554	35.320
DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS									
	For Track Centers of:	4.875	**(13 prototype feet)**						
(25)	Straight Track Dist.	17.365	18.715	20.064	21.412	22.759	24.106	25.453	26.799
(26)	Crossover Track Dist.	17.553	18.889	20.226	21.564	22.903	24.242	25.581	26.921
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	0.906	0.906	1.031	1.031	1.031	1.031	1.031	1.031
(33)	Overall Length	3.094	3.094	4.125	4.125	4.125	4.125	4.125	4.125
(34)	Parallel Length	1.281	1.281	2.063	2.063	2.063	2.063	2.063	2.063
(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	0.035	0.035	0.032	0.032	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