

NMRA Recommended Practices  
**Proto:64 Scale**  
**Straight Switch Turnout**

**TURNOUT  
DIMENSIONS**

Revised: February 2015

RP-12.7

Design and calculations by Van S. Fehr

(1)	FROG NUMBERS	4	5	6	7	8	9	10	11	12
<b>PROPERTIES OF STRAIGHT SWITCHES</b>										
(2)	Switch Rail Length	2.409	2.344	2.340	3.586	3.688	3.671	3.851	4.859	4.879
(4)	Switch Heel Spread	0.126	0.126	0.126	0.126	0.126	0.126	0.126	0.126	0.126
(5)	Switch Heel Angle (deg.)	2.989	3.072	3.077	2.007	1.952	1.961	1.869	1.481	1.475
<b>LEAD TO THEORETICAL POINT OF FROG</b>										
(8)	Lead	7.015	7.937	8.859	11.586	12.687	13.484	14.687	17.137	18.031
<b>CLOSURE DISTANCE</b>										
(9)	Straight Rail Length	4.010	4.965	5.859	7.166	8.104	8.682	9.705	11.043	11.777
(10)	Curved Rail Length	4.081	5.022	5.907	7.207	8.139	8.714	9.733	11.069	11.801
(11)	Curved Rail Radius	20.762	34.466	52.472	66.989	89.673	113.517	144.651	170.314	205.108
<b>GAGE LINE OFFSETS ON CURVED CLOSURE RAIL</b>										
(12)	1st Point Y1	0.202	0.215	0.225	0.212	0.218	0.221	0.225	0.219	0.223
(13)	1st Point X1	3.412	3.585	3.805	5.378	5.714	5.841	6.277	7.620	7.823
(14)	Mid-Point Y2	0.328	0.349	0.366	0.347	0.356	0.358	0.366	0.358	0.362
(15)	Mid-Point X2	4.414	4.826	5.269	7.170	7.739	8.012	8.703	10.381	10.767
(16)	3rd Point Y3	0.504	0.529	0.548	0.531	0.540	0.536	0.547	0.542	0.544
(17)	3rd Point X3	5.417	6.068	6.734	8.961	9.765	10.182	11.129	13.142	13.711
<b>PROPERTIES OF FROGS</b>										
(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	1.503	1.691	1.879	2.255	2.443	3.006	3.101	3.516	3.821
(20)	Toe Length	0.596	0.628	0.660	0.833	0.896	1.131	1.132	1.234	1.376
(21)	Heel Length	0.906	1.063	1.219	1.422	1.547	1.875	1.969	2.281	2.445
(22)	Toe Spread	0.148	0.125	0.110	0.119	0.112	0.125	0.113	0.112	0.115
(23)	Heel Spread	0.225	0.211	0.202	0.203	0.193	0.208	0.197	0.207	0.204
(35)	Wing Rail Extension	0.555	0.629	0.703	0.777	0.852	0.926	1.000	1.074	1.149
(36)	Wing Rail Flare Length	0.281	0.281	0.281	0.281	0.375	0.375	0.500	0.500	0.563
(37)	Wing Rail Flare Width	0.038	0.038	0.038	0.038	0.035	0.035	0.034	0.034	0.034
(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	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
<b>POINT OF FROG TO INTERSECTION OF CENTERLINES</b>										
(24)	PF to ICL	3.532	4.415	5.298	6.181	7.064	7.947	8.830	9.713	10.596
<b>DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS</b>										
<b>For Track Centers of:</b>		2.438	<b>(13 prototype feet)</b>							
(25)	Straight Track Dist.	2.534	3.236	3.927	4.613	5.296	5.976	6.654	7.331	8.007
(26)	Crossover Track Dist.	2.838	3.479	4.131	4.788	5.448	6.111	6.776	7.442	8.109
<b>For Track Center Increment of:</b>		0.188	<b>(1 prototype foot)</b>							
(28)	Straight Track Incr.	0.738	0.928	1.117	1.306	1.494	1.682	1.870	2.058	2.246
(29)	Crossover Track Incr.	0.762	0.947	1.133	1.319	1.506	1.693	1.880	2.067	2.254
<b>GUARD RAILS</b>										
(30)	Parallel End Setback	0.125	0.133	0.141	0.149	0.156	0.164	0.172	0.180	0.188
(31)	Bevel Length	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203
(32)	Flare Length	0.453	0.453	0.453	0.453	0.453	0.453	0.453	0.453	0.453
(33)	Overall Length	1.547	1.547	1.547	1.547	1.547	1.547	1.547	1.547	1.547
(34)	Parallel Length	0.641	0.641	0.641	0.641	0.641	0.641	0.641	0.641	0.641
(37)	Flare Width	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
(38)	Plane Width	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
(39)	End Chamfer	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047

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(1)	FROG NUMBERS	13	14	15	16	17	18	19	20
<b>PROPERTIES OF STRAIGHT SWITCHES</b>									
(2)	Switch Rail Length	4.937	5.007	6.754	6.734	6.764	6.804	6.885	6.976
(4)	Switch Heel Spread	0.126	0.126	0.126	0.126	0.126	0.126	0.126	0.126
(5)	Switch Heel Angle (deg.)	1.458	1.438	1.066	1.069	1.064	1.058	1.045	1.032
<b>LEAD TO THEORETICAL POINT OF FROG</b>									
(8)	Lead	18.998	19.965	23.578	24.500	25.394	26.289	27.312	28.336
<b>CLOSURE DISTANCE</b>									
(9)	Straight Rail Length	12.615	13.440	15.165	16.115	16.834	17.543	18.492	19.432
(10)	Curved Rail Length	12.637	13.461	15.184	16.132	16.851	17.559	18.507	19.447
(11)	Curved Rail Radius	245.695	290.694	316.060	368.133	418.839	473.591	538.420	608.102
<b>GAGE LINE OFFSETS ON CURVED CLOSURE RAIL</b>									
(12)	1st Point Y1	0.226	0.229	0.219	0.223	0.225	0.227	0.230	0.233
(13)	1st Point X1	8.090	8.367	10.545	10.762	10.972	11.190	11.508	11.834
(14)	Mid-Point Y2	0.367	0.372	0.358	0.364	0.367	0.369	0.374	0.378
(15)	Mid-Point X2	11.244	11.727	14.337	14.791	15.181	15.575	16.131	16.692
(16)	3rd Point Y3	0.549	0.554	0.542	0.550	0.551	0.552	0.558	0.563
(17)	3rd Point X3	14.398	15.087	18.128	18.819	19.389	19.961	20.754	21.550
<b>PROPERTIES OF FROGS</b>									
(18)	Frog Angle (deg.)	4.405	4.091	3.818	3.580	3.369	3.182	3.015	2.864
(19)	Overall Length	4.126	4.432	4.581	4.886	5.192	5.497	5.650	5.803
(20)	Toe Length	1.447	1.518	1.659	1.652	1.797	1.942	1.935	1.928
(21)	Heel Length	2.680	2.914	2.922	3.234	3.395	3.555	3.715	3.875
(22)	Toe Spread	0.111	0.108	0.111	0.103	0.106	0.108	0.102	0.096
(23)	Heel Spread	0.206	0.208	0.195	0.202	0.200	0.197	0.195	0.194
(35)	Wing Rail Extension	1.274	1.399	1.473	1.625	1.699	1.773	1.898	2.023
(36)	Wing Rail Flare Length	0.733	0.830	0.866	0.970	1.004	1.038	1.136	1.234
(37)	Wing Rail Flare Width	0.033	0.032	0.032	0.032	0.032	0.032	0.032	0.032
(38)	Wing Rail Bend Width	0.033	0.032	0.032	0.032	0.032	0.032	0.032	0.032
(39)	Wing Rail End Chamfer	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
<b>POINT OF FROG TO INTERSECTION OF CENTERLINES</b>									
(24)	PF to ICL	11.479	12.362	13.245	14.128	15.011	15.894	16.777	17.660
<b>DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS</b>									
<b>For Track Centers of:</b>		2.438	<b>(13 prototype feet)</b>						
(25)	Straight Track Dist.	8.683	9.357	10.032	10.706	11.380	12.053	12.726	13.400
(26)	Crossover Track Dist.	8.776	9.445	10.113	10.782	11.451	12.121	12.791	13.460
<b>For Track Center Increment of:</b>		0.188	<b>(1 prototype foot)</b>						
(28)	Straight Track Incr.	2.434	2.622	2.809	2.997	3.185	3.372	3.560	3.748
(29)	Crossover Track Incr.	2.441	2.628	2.816	3.003	3.190	3.378	3.565	3.752
<b>GUARD RAILS</b>									
(30)	Parallel End Setback	0.195	0.203	0.211	0.219	0.227	0.234	0.242	0.250
(31)	Bevel Length	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203
(32)	Flare Length	0.453	0.453	0.516	0.516	0.516	0.516	0.516	0.516
(33)	Overall Length	1.547	1.547	2.063	2.063	2.063	2.063	2.063	2.063
(34)	Parallel Length	0.641	0.641	1.031	1.031	1.031	1.031	1.031	1.031
(37)	Total Flare at End	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
(38)	Bevel Cut at End	0.018	0.018	0.016	0.016	0.016	0.016	0.016	0.016
(39)	End Chamfer	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047