

NMRA Recommended Practices
1 Inch Scale
Straight Switch Turnout

**TURNOUT
DIMENSIONS**

Revised: February 2015

RP-12.17

Design and calculations by Van S. Fehr

(1)	FROG NUMBERS	4	5	6	7	8	9	10	11	12
PROPERTIES OF STRAIGHT SWITCHES										
(2)	Switch Rail Length	11.981	11.469	11.317	17.645	18.020	17.807	18.610	23.682	23.657
(4)	Switch Heel Spread	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589
(5)	Switch Heel Angle (deg.)	2.817	2.942	2.982	1.912	1.872	1.895	1.813	1.425	1.426
LEAD TO THEORETICAL POINT OF FROG										
(8)	Lead	37.415	42.332	47.249	61.791	67.666	71.916	78.333	91.395	96.166
CLOSURE DISTANCE										
(9)	Straight Rail Length	22.010	27.209	32.048	39.282	44.385	47.535	53.084	60.469	64.452
(10)	Curved Rail Length	22.400	27.522	32.311	39.503	44.580	47.711	53.243	60.611	64.583
(11)	Curved Rail Radius	112.253	185.984	282.848	361.614	483.724	612.251	779.821	918.583	1105.965
GAGE LINE OFFSETS ON CURVED CLOSURE RAIL										
(12)	1st Point Y1	0.995	1.064	1.120	1.050	1.079	1.097	1.122	1.089	1.107
(13)	1st Point X1	17.484	18.271	19.329	27.465	29.116	29.690	31.881	38.800	39.770
(14)	Mid-Point Y2	1.676	1.790	1.881	1.780	1.825	1.838	1.882	1.839	1.861
(15)	Mid-Point X2	22.986	25.074	27.341	37.286	40.212	41.574	45.152	53.917	55.883
(16)	3rd Point Y3	2.635	2.772	2.873	2.780	2.828	2.811	2.869	2.839	2.851
(17)	3rd Point X3	28.489	31.876	35.353	47.106	51.308	53.457	58.423	69.034	71.996
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	8.259	9.322	10.385	12.449	13.512	16.576	17.139	19.411	21.100
(20)	Toe Length	3.424	3.654	3.884	4.864	5.261	6.575	6.639	7.244	8.058
(21)	Heel Length	4.835	5.668	6.501	7.584	8.251	10.001	10.501	12.167	13.042
(22)	Toe Spread	0.849	0.727	0.645	0.693	0.656	0.729	0.663	0.658	0.671
(23)	Heel Spread	1.199	1.128	1.080	1.081	1.029	1.109	1.049	1.105	1.086
(35)	Wing Rail Extension	2.960	3.355	3.751	4.147	4.542	4.938	5.334	5.730	6.125
(36)	Wing Rail Flare Length	1.500	1.500	1.500	1.500	2.000	2.000	2.667	2.667	3.000
(37)	Wing Rail Flare Width	0.200	0.200	0.200	0.200	0.189	0.189	0.181	0.181	0.179
(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	0.292	0.292	0.292	0.292	0.292	0.292	0.292	0.292	0.292
POINT OF FROG TO INTERSECTION OF CENTERLINES										
(24)	PF to ICL	19.000	23.750	28.500	33.250	38.000	42.750	47.500	52.250	57.000
DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS										
For Track Centers of:		13.000	(13 prototype feet)							
(25)	Straight Track Dist.	13.188	16.850	20.458	24.036	27.594	31.139	34.675	38.205	41.729
(26)	Crossover Track Dist.	14.813	18.150	21.542	24.964	28.406	31.861	35.325	38.795	42.271
For Track Center Increment of:		1.000	(1 prototype foot)							
(28)	Straight Track Incr.	3.938	4.950	5.958	6.964	7.969	8.972	9.975	10.977	11.979
(29)	Crossover Track Incr.	4.063	5.050	6.042	7.036	8.031	9.028	10.025	11.023	12.021
GUARD RAILS										
(30)	Parallel End Setback	0.668	0.709	0.751	0.792	0.834	0.876	0.917	0.959	1.000
(31)	Bevel Length	1.083	1.083	1.083	1.083	1.083	1.083	1.083	1.083	1.083
(32)	Flare Length	2.417	2.417	2.417	2.417	2.417	2.417	2.417	2.417	2.750
(33)	Overall Length	8.250	8.250	8.250	8.250	8.250	8.250	8.250	8.250	11.000
(34)	Parallel Length	3.417	3.417	3.417	3.417	3.417	3.417	3.417	3.417	5.500
(37)	Flare Width	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160
(38)	Plane Width	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.086
(39)	End Chamfer	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250

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(1)	FROG NUMBERS	13	14	15	16	17	18	19	20
PROPERTIES OF STRAIGHT SWITCHES									
(2)	Switch Rail Length	23.835	24.088	32.955	32.712	32.746	32.840	33.146	33.503
(4)	Switch Heel Spread	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589
(5)	Switch Heel Angle (deg.)	1.415	1.401	1.024	1.031	1.030	1.027	1.018	1.007
LEAD TO THEORETICAL POINT OF FROG									
(8)	Lead	101.323	106.479	125.750	130.666	135.437	140.208	145.666	151.125
CLOSURE DISTANCE									
(9)	Straight Rail Length	68.991	73.455	83.046	88.184	92.086	95.929	101.058	106.138
(10)	Curved Rail Length	69.113	73.569	83.150	88.282	92.179	96.017	101.142	106.218
(11)	Curved Rail Radius	1324.474	1566.827	1704.754	1984.744	2257.835	2552.812	2901.697	3276.788
GAGE LINE OFFSETS ON CURVED CLOSURE RAIL									
(12)	1st Point Y1	1.127	1.145	1.086	1.108	1.120	1.132	1.148	1.163
(13)	1st Point X1	41.083	42.452	53.716	54.758	55.767	56.822	58.411	60.037
(14)	Mid-Point Y2	1.891	1.918	1.837	1.873	1.887	1.900	1.927	1.952
(15)	Mid-Point X2	58.331	60.816	74.478	76.804	78.789	80.804	83.675	86.572
(16)	3rd Point Y3	2.880	2.906	2.841	2.883	2.888	2.894	2.926	2.956
(17)	3rd Point X3	75.579	79.180	95.239	98.850	101.810	104.786	108.940	113.106
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	22.788	24.477	25.332	27.021	28.710	30.398	31.275	32.151
(20)	Toe Length	8.496	8.935	9.749	9.771	10.605	11.440	11.462	11.484
(21)	Heel Length	14.292	15.542	15.584	17.250	18.104	18.959	19.813	20.667
(22)	Toe Spread	0.653	0.638	0.650	0.610	0.624	0.635	0.603	0.574
(23)	Heel Spread	1.099	1.109	1.038	1.078	1.065	1.053	1.042	1.033
(35)	Wing Rail Extension	6.792	7.459	7.855	8.667	9.063	9.459	10.125	10.792
(36)	Wing Rail Flare Length	3.908	4.425	4.619	5.174	5.355	5.536	6.059	6.582
(37)	Wing Rail Flare Width	0.174	0.173	0.172	0.171	0.171	0.170	0.170	0.169
(38)	Wing Rail Bend Width	0.174	0.173	0.172	0.171	0.171	0.170	0.170	0.169
(39)	Wing Rail End Chamfer	0.292	0.292	0.292	0.292	0.292	0.292	0.292	0.292
POINT OF FROG TO INTERSECTION OF CENTERLINES									
(24)	PF to ICL	61.750	66.500	71.250	76.000	80.750	85.500	90.250	95.000
DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS									
For Track Centers of:		13.000	(13 prototype feet)						
(25)	Straight Track Dist.	45.250	48.768	52.283	55.797	59.309	62.819	66.329	69.838
(26)	Crossover Track Dist.	45.750	49.232	52.717	56.203	59.691	63.181	66.671	70.163
For Track Center Increment of:		1.000	(1 prototype foot)						
(28)	Straight Track Incr.	12.981	13.982	14.983	15.984	16.985	17.986	18.987	19.988
(29)	Crossover Track Incr.	13.019	14.018	15.017	16.016	17.015	18.014	19.013	20.013
GUARD RAILS									
(30)	Parallel End Setback	1.042	1.084	1.125	1.167	1.209	1.250	1.292	1.334
(31)	Bevel Length	1.083	1.083	1.083	1.083	1.083	1.083	1.083	1.083
(32)	Flare Length	2.750	2.750	2.750	2.750	2.750	2.750	2.750	3.000
(33)	Overall Length	11.000	11.000	11.000	11.000	11.000	11.000	11.000	13.000
(34)	Parallel Length	5.500	5.500	5.500	5.500	5.500	5.500	5.500	7.000
(37)	Total Flare at End	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160
(38)	Bevel Cut at End	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.082
(39)	End Chamfer	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250