

NMRA Recommended Practices
Fine:N Scale
Curved Switch Turnout

**TURNOUT
DIMENSIONS**

Revised: February 2015

RP-12.16

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	1.049	1.056	1.082	1.794	1.844	1.888	1.899	1.928	2.834
(3)	Switch Point Angle (deg.)	1.651	1.640	1.600	0.965	0.938	0.916	0.911	0.898	0.611
(4)	Switch Heel Spread	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
(5)	Switch Heel Angle (deg.)	4.599	4.570	4.457	2.689	2.615	2.554	2.539	2.502	1.702
(6)	Switch Rail Radius	20.382	20.647	21.705	59.605	63.035	66.074	66.828	68.858	148.779
(7)	Switch Mid-Ordinate	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007
LEAD TO THEORETICAL POINT OF FROG										
(8)	Lead	2.687	3.033	3.378	4.702	5.103	5.453	5.783	6.111	7.747
CLOSURE DISTANCE										
(9)	Straight Rail Length	1.347	1.660	1.953	2.483	2.796	2.995	3.301	3.546	4.207
(10)	Curved Rail Length	1.376	1.684	1.973	2.500	2.810	3.008	3.313	3.557	4.217
(11)	Curved Rail Radius	8.171	14.080	22.296	26.126	35.483	45.286	59.583	75.390	78.692
GAGE LINE OFFSETS ON CURVED CLOSURE RAIL										
(12)	1st Point Y1	0.091	0.097	0.101	0.094	0.096	0.097	0.100	0.101	0.095
(13)	1st Point X1	1.386	1.471	1.571	2.414	2.543	2.637	2.724	2.814	3.885
(14)	Mid-Point Y2	0.140	0.148	0.155	0.145	0.149	0.149	0.153	0.156	0.148
(15)	Mid-Point X2	1.722	1.886	2.059	3.035	3.242	3.386	3.549	3.701	4.937
(16)	3rd Point Y3	0.202	0.213	0.220	0.212	0.215	0.213	0.219	0.221	0.214
(17)	3rd Point X3	2.059	2.301	2.547	3.656	3.941	4.135	4.375	4.587	5.989
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	0.654	0.742	0.830	0.993	1.082	1.320	1.371	1.550	1.685
(20)	Toe Length	0.291	0.317	0.343	0.425	0.463	0.570	0.583	0.637	0.706
(21)	Heel Length	0.363	0.425	0.488	0.569	0.619	0.750	0.788	0.913	0.978
(22)	Toe Spread	0.072	0.063	0.057	0.061	0.058	0.063	0.058	0.058	0.059
(23)	Heel Spread	0.090	0.085	0.081	0.081	0.077	0.083	0.079	0.083	0.081
(35)	Wing Rail Extension	0.222	0.252	0.281	0.311	0.341	0.370	0.400	0.430	0.459
(36)	Wing Rail Flare Length	0.113	0.113	0.113	0.113	0.150	0.150	0.200	0.200	0.225
(37)	Wing Rail Flare Width	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.013
(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	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022
POINT OF FROG TO INTERSECTION OF CENTERLINES										
(24)	PF to ICL	1.416	1.770	2.124	2.478	2.832	3.186	3.540	3.894	4.248
DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS										
For Track Centers of:		0.975	(13 prototype feet)							
(25)	Straight Track Dist.	1.007	1.286	1.561	1.834	2.106	2.376	2.646	2.915	3.184
(26)	Crossover Track Dist.	1.129	1.384	1.643	1.904	2.166	2.430	2.694	2.959	3.224
For Track Center Increment of:		0.075	(1 prototype foot)							
(28)	Straight Track Incr.	0.295	0.371	0.447	0.522	0.598	0.673	0.748	0.823	0.898
(29)	Crossover Track Incr.	0.305	0.379	0.453	0.528	0.602	0.677	0.752	0.827	0.902
GUARD RAILS										
(30)	Parallel End Setback	0.050	0.053	0.056	0.059	0.063	0.066	0.069	0.072	0.075
(31)	Bevel Length	0.081	0.081	0.081	0.081	0.081	0.081	0.081	0.081	0.081
(32)	Flare Length	0.181	0.181	0.181	0.181	0.206	0.206	0.206	0.206	0.206
(33)	Overall Length	0.619	0.619	0.619	0.619	0.825	0.825	0.825	0.825	0.825
(34)	Parallel Length	0.256	0.256	0.256	0.256	0.413	0.413	0.413	0.413	0.413
(37)	Flare Width	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
(38)	Plane Width	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006
(39)	End Chamfer	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019

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(1)	FROG NUMBERS	13	14	15	16	17	18	19	20
PROPERTIES OF CURVED SWITCHES									
(2)	Switch Rail Length	2.864	2.900	2.945	2.988	3.673	3.726	3.765	3.808
(3)	Switch Point Angle (deg.)	0.604	0.597	0.588	0.579	0.471	0.464	0.460	0.454
(4)	Switch Heel Spread	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
(5)	Switch Heel Angle (deg.)	1.684	1.663	1.637	1.614	1.313	1.294	1.281	1.266
(6)	Switch Rail Radius	151.970	155.835	160.706	165.412	249.986	257.247	262.683	268.757
(7)	Switch Mid-Ordinate	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007
LEAD TO THEORETICAL POINT OF FROG									
(8)	Lead	8.110	8.473	8.831	9.203	10.520	10.894	11.267	11.641
CLOSURE DISTANCE									
(9)	Straight Rail Length	4.499	4.784	5.028	5.346	5.907	6.157	6.481	6.801
(10)	Curved Rail Length	4.508	4.793	5.035	5.354	5.914	6.163	6.487	6.807
(11)	Curved Rail Radius	94.902	113.098	132.293	156.045	164.776	187.032	214.335	244.056
GAGE LINE OFFSETS ON CURVED CLOSURE RAIL									
(12)	1st Point Y1	0.097	0.098	0.099	0.101	0.098	0.098	0.100	0.101
(13)	1st Point X1	3.988	4.096	4.202	4.324	5.150	5.265	5.385	5.509
(14)	Mid-Point Y2	0.150	0.152	0.153	0.155	0.151	0.152	0.154	0.156
(15)	Mid-Point X2	5.113	5.292	5.459	5.661	6.627	6.804	7.005	7.209
(16)	3rd Point Y3	0.216	0.218	0.219	0.222	0.218	0.219	0.221	0.223
(17)	3rd Point X3	6.238	6.488	6.716	6.998	8.103	8.343	8.626	8.909
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	1.820	1.955	2.028	2.163	2.298	2.433	2.507	2.581
(20)	Toe Length	0.748	0.789	0.859	0.869	0.940	1.011	1.021	1.031
(21)	Heel Length	1.072	1.166	1.169	1.294	1.358	1.422	1.486	1.550
(22)	Toe Spread	0.057	0.056	0.057	0.054	0.055	0.056	0.054	0.052
(23)	Heel Spread	0.082	0.083	0.078	0.081	0.080	0.079	0.078	0.077
(35)	Wing Rail Extension	0.509	0.559	0.589	0.650	0.680	0.709	0.759	0.809
(36)	Wing Rail Flare Length	0.293	0.332	0.346	0.388	0.402	0.415	0.454	0.494
(37)	Wing Rail Flare Width	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
(38)	Wing Rail Bend Width	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
(39)	Wing Rail End Chamfer	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022
POINT OF FROG TO INTERSECTION OF CENTERLINES									
(24)	PF to ICL	4.602	4.956	5.310	5.664	6.018	6.372	6.726	7.080
DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS									
For Track Centers of:		0.975	(13 prototype feet)						
(25)	Straight Track Dist.	3.452	3.721	3.989	4.257	4.525	4.792	5.060	5.328
(26)	Crossover Track Dist.	3.490	3.755	4.021	4.287	4.553	4.820	5.086	5.352
For Track Center Increment of:		0.075	(1 prototype foot)						
(28)	Straight Track Incr.	0.974	1.049	1.124	1.199	1.274	1.349	1.424	1.499
(29)	Crossover Track Incr.	0.976	1.051	1.126	1.201	1.276	1.351	1.426	1.501
GUARD RAILS									
(30)	Parallel End Setback	0.078	0.081	0.084	0.088	0.091	0.094	0.097	0.100
(31)	Bevel Length	0.081	0.081	0.081	0.081	0.081	0.081	0.081	0.081
(32)	Flare Length	0.206	0.225	0.225	0.225	0.225	0.256	0.256	0.256
(33)	Overall Length	0.825	0.975	0.975	0.975	0.975	1.238	1.238	1.238
(34)	Parallel Length	0.413	0.525	0.525	0.525	0.525	0.725	0.725	0.725
(37)	Total Flare at End	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
(38)	Bevel Cut at End	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
(39)	End Chamfer	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019