

NMRA Recommended Practices
Proto:20.32 Scale
Curved Switch Turnout

**TURNOUT
DIMENSIONS**

Revised: February 2015

RP-12.2

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	7.521	7.478	7.608	12.838	13.123	13.375	13.382	13.534	20.190
(3)	Switch Point Angle (deg.)	1.555	1.563	1.537	0.910	0.890	0.874	0.873	0.863	0.579
(4)	Switch Heel Spread	0.386	0.386	0.386	0.386	0.386	0.386	0.386	0.386	0.386
(5)	Switch Heel Angle (deg.)	4.331	4.356	4.282	2.537	2.482	2.435	2.434	2.406	1.613
(6)	Switch Rail Radius	155.200	153.434	158.791	452.243	472.578	490.871	491.356	502.643	1118.589
(7)	Switch Mid-Ordinate	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046
LEAD TO THEORETICAL POINT OF FROG										
(8)	Lead	21.161	23.880	26.599	37.020	40.182	42.938	45.534	48.117	60.999
CLOSURE DISTANCE										
(9)	Straight Rail Length	11.771	14.435	16.926	21.576	24.256	26.022	28.612	30.723	36.506
(10)	Curved Rail Length	12.001	14.621	17.085	21.706	24.370	26.126	28.706	30.810	36.583
(11)	Curved Rail Radius	69.323	118.575	186.617	220.720	298.926	381.396	499.745	630.691	663.503
GAGE LINE OFFSETS ON CURVED CLOSURE RAIL										
(12)	1st Point Y1	0.672	0.717	0.751	0.691	0.711	0.718	0.741	0.756	0.706
(13)	1st Point X1	10.464	11.087	11.839	18.232	19.187	19.881	20.535	21.215	29.317
(14)	Mid-Point Y2	1.086	1.159	1.214	1.129	1.159	1.162	1.200	1.219	1.152
(15)	Mid-Point X2	13.407	14.696	16.071	23.626	25.251	26.386	27.687	28.896	38.443
(16)	3rd Point Y3	1.630	1.714	1.775	1.701	1.732	1.718	1.761	1.777	1.724
(17)	3rd Point X3	16.350	18.305	20.303	29.020	31.315	32.892	34.840	36.577	47.570
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	4.723	5.314	5.904	7.085	7.675	9.446	9.741	11.045	12.005
(20)	Toe Length	1.868	1.967	2.065	2.606	2.803	3.540	3.540	3.860	4.303
(21)	Heel Length	2.855	3.347	3.839	4.479	4.872	5.906	6.201	7.185	7.702
(22)	Toe Spread	0.463	0.391	0.343	0.371	0.350	0.393	0.354	0.351	0.358
(23)	Heel Spread	0.708	0.666	0.638	0.638	0.608	0.655	0.619	0.653	0.641
(35)	Wing Rail Extension	1.748	1.981	2.215	2.449	2.682	2.916	3.150	3.384	3.617
(36)	Wing Rail Flare Length	0.886	0.886	0.886	0.886	1.181	1.181	1.575	1.575	1.772
(37)	Wing Rail Flare Width	0.118	0.118	0.118	0.118	0.112	0.112	0.107	0.107	0.106
(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	0.172	0.172	0.172	0.172	0.172	0.172	0.172	0.172	0.172
POINT OF FROG TO INTERSECTION OF CENTERLINES										
(24)	PF to ICL	11.124	13.905	16.686	19.467	22.248	25.029	27.810	30.591	33.372
DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS										
For Track Centers of:		7.677	(13 prototype feet)							
(25)	Straight Track Dist.	7.981	10.192	12.371	14.532	16.681	18.823	20.960	23.092	25.222
(26)	Crossover Track Dist.	8.940	10.960	13.011	15.080	17.161	19.250	21.344	23.441	25.542
For Track Center Increment of:		0.591	(1 prototype foot)							
(28)	Straight Track Incr.	2.325	2.923	3.519	4.113	4.706	5.299	5.891	6.483	7.074
(29)	Crossover Track Incr.	2.399	2.982	3.568	4.155	4.743	5.331	5.920	6.509	7.099
GUARD RAILS										
(30)	Parallel End Setback	0.394	0.419	0.443	0.468	0.493	0.517	0.542	0.566	0.591
(31)	Bevel Length	0.640	0.640	0.640	0.640	0.640	0.640	0.640	0.640	0.640
(32)	Flare Length	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427
(33)	Overall Length	4.872	4.872	4.872	4.872	4.872	4.872	4.872	4.872	4.872
(34)	Parallel Length	2.018	2.018	2.018	2.018	2.018	2.018	2.018	2.018	2.018
(37)	Flare Width	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
(38)	Plane Width	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056
(39)	End Chamfer	0.148	0.148	0.148	0.148	0.148	0.148	0.148	0.148	0.148

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(1)	FROG NUMBERS	13	14	15	16	17	18	19	20
PROPERTIES OF CURVED SWITCHES									
(2)	Switch Rail Length	20.328	20.518	20.783	21.031	26.042	26.361	26.577	26.828
(3)	Switch Point Angle (deg.)	0.575	0.569	0.562	0.556	0.449	0.443	0.440	0.435
(4)	Switch Heel Spread	0.386	0.386	0.386	0.386	0.386	0.386	0.386	0.386
(5)	Switch Heel Angle (deg.)	1.602	1.587	1.567	1.548	1.250	1.235	1.225	1.214
(6)	Switch Rail Radius	1133.925	1155.259	1185.245	1213.771	1861.011	1906.930	1938.253	1975.018
(7)	Switch Mid-Ordinate	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046
LEAD TO THEORETICAL POINT OF FROG									
(8)	Lead	63.859	66.720	69.537	72.465	82.837	85.777	88.718	91.658
CLOSURE DISTANCE									
(9)	Straight Rail Length	39.008	41.457	43.567	46.271	51.177	53.344	56.093	58.808
(10)	Curved Rail Length	39.079	41.523	43.629	46.330	51.232	53.395	56.142	58.855
(11)	Curved Rail Radius	798.719	950.204	1110.290	1306.680	1385.275	1571.275	1797.410	2043.187
GAGE LINE OFFSETS ON CURVED CLOSURE RAIL									
(12)	1st Point Y1	0.718	0.730	0.738	0.750	0.725	0.730	0.741	0.751
(13)	1st Point X1	30.080	30.882	31.674	32.599	38.836	39.697	40.600	41.530
(14)	Mid-Point Y2	1.170	1.187	1.196	1.217	1.181	1.188	1.205	1.221
(15)	Mid-Point X2	39.832	41.247	42.566	44.167	51.631	53.033	54.623	56.232
(16)	3rd Point Y3	1.741	1.757	1.762	1.786	1.756	1.759	1.779	1.797
(17)	3rd Point X3	49.584	51.611	53.458	55.735	64.425	66.369	68.647	70.933
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	12.964	13.923	14.391	15.350	16.309	17.269	17.748	18.228
(20)	Toe Length	4.524	4.745	5.188	5.163	5.618	6.073	6.048	6.023
(21)	Heel Length	8.440	9.178	9.203	10.187	10.692	11.196	11.700	12.205
(22)	Toe Spread	0.348	0.339	0.346	0.323	0.330	0.337	0.318	0.301
(23)	Heel Spread	0.649	0.655	0.613	0.636	0.629	0.622	0.616	0.610
(35)	Wing Rail Extension	4.011	4.405	4.638	5.118	5.352	5.586	5.979	6.373
(36)	Wing Rail Flare Length	2.308	2.613	2.728	3.056	3.162	3.269	3.578	3.887
(37)	Wing Rail Flare Width	0.103	0.102	0.102	0.101	0.101	0.101	0.100	0.100
(38)	Wing Rail Bend Width	0.103	0.102	0.102	0.101	0.101	0.101	0.100	0.100
(39)	Wing Rail End Chamfer	0.172	0.172	0.172	0.172	0.172	0.172	0.172	0.172
POINT OF FROG TO INTERSECTION OF CENTERLINES									
(24)	PF to ICL	36.153	38.934	41.715	44.496	47.277	50.058	52.839	55.620
DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS									
For Track Centers of:		7.677	(13 prototype feet)						
(25)	Straight Track Dist.	27.350	29.475	31.600	33.723	35.845	37.966	40.087	42.207
(26)	Crossover Track Dist.	27.645	29.749	31.855	33.963	36.071	38.180	40.289	42.399
For Track Center Increment of:		0.591	(1 prototype foot)						
(28)	Straight Track Incr.	7.666	8.257	8.848	9.440	10.031	10.622	11.213	11.804
(29)	Crossover Track Incr.	7.689	8.278	8.868	9.458	10.048	10.638	11.228	11.818
GUARD RAILS									
(30)	Parallel End Setback	0.615	0.640	0.665	0.689	0.714	0.738	0.763	0.788
(31)	Bevel Length	0.640	0.640	0.640	0.640	0.640	0.640	0.640	0.640
(32)	Flare Length	1.427	1.427	1.624	1.624	1.624	1.624	1.624	1.624
(33)	Overall Length	4.872	4.872	6.496	6.496	6.496	6.496	6.496	6.496
(34)	Parallel Length	2.018	2.018	3.248	3.248	3.248	3.248	3.248	3.248
(37)	Total Flare at End	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
(38)	Bevel Cut at End	0.056	0.056	0.051	0.051	0.051	0.051	0.051	0.051
(39)	End Chamfer	0.148	0.148	0.148	0.148	0.148	0.148	0.148	0.148