

**NMRA Recommended Practices**  
**HO Scale**  
**Straight Switch Turnout**

**TURNOUT  
DIMENSIONS**

Revised: February 2015

RP-12.31

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	1.945	1.918	1.932	2.922	3.021	3.025	3.182	3.989	4.021
(4)	Switch Heel Spread	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105
(5)	Switch Heel Angle (deg.)	3.095	3.138	3.115	2.060	1.992	1.990	1.892	1.509	1.497
<b>LEAD TO THEORETICAL POINT OF FROG</b>										
(8)	Lead	5.156	5.833	6.511	8.514	9.324	9.910	10.794	12.594	13.251
<b>CLOSURE DISTANCE</b>										
(9)	Straight Rail Length	2.659	3.312	3.924	4.784	5.420	5.801	6.500	7.390	7.883
(10)	Curved Rail Length	2.711	3.354	3.959	4.814	5.446	5.825	6.521	7.409	7.901
(11)	Curved Rail Radius	13.925	23.198	35.379	45.132	60.469	76.373	97.475	114.833	138.214
<b>GAGE LINE OFFSETS ON CURVED CLOSURE RAIL</b>										
(12)	1st Point Y1	0.157	0.165	0.172	0.164	0.167	0.169	0.172	0.169	0.171
(13)	1st Point X1	2.610	2.746	2.913	4.118	4.376	4.475	4.807	5.837	5.992
(14)	Mid-Point Y2	0.241	0.255	0.267	0.255	0.260	0.261	0.267	0.262	0.264
(15)	Mid-Point X2	3.274	3.574	3.895	5.314	5.731	5.925	6.432	7.684	7.963
(16)	3rd Point Y3	0.358	0.376	0.389	0.378	0.384	0.381	0.388	0.385	0.386
(17)	3rd Point X3	3.939	4.402	4.876	6.510	7.086	7.376	8.057	9.531	9.934
<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	1.218	1.384	1.550	1.854	2.020	2.462	2.559	2.892	3.144
(20)	Toe Length	0.552	0.603	0.654	0.809	0.883	1.084	1.112	1.215	1.347
(21)	Heel Length	0.666	0.781	0.896	1.045	1.137	1.378	1.447	1.677	1.797
(22)	Toe Spread	0.137	0.120	0.109	0.115	0.110	0.120	0.111	0.110	0.112
(23)	Heel Spread	0.165	0.155	0.149	0.149	0.142	0.153	0.145	0.152	0.150
(35)	Wing Rail Extension	0.408	0.462	0.517	0.571	0.626	0.680	0.735	0.790	0.844
(36)	Wing Rail Flare Length	0.207	0.207	0.207	0.207	0.276	0.276	0.367	0.367	0.413
(37)	Wing Rail Flare Width	0.028	0.028	0.028	0.028	0.026	0.026	0.025	0.025	0.025
(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	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
<b>POINT OF FROG TO INTERSECTION OF CENTERLINES</b>										
(24)	PF to ICL	2.596	3.245	3.894	4.543	5.192	5.841	6.490	7.139	7.788
<b>DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS</b>										
<b>For Track Centers of:</b>		1.791	<b>(13 prototype feet)</b>							
(25)	Straight Track Dist.	1.861	2.377	2.885	3.389	3.891	4.390	4.889	5.386	5.883
(26)	Crossover Track Dist.	2.085	2.556	3.035	3.517	4.003	4.490	4.978	5.467	5.957
<b>For Track Center Increment of:</b>		0.138	<b>(1 prototype foot)</b>							
(28)	Straight Track Incr.	0.543	0.682	0.821	0.960	1.098	1.236	1.375	1.513	1.651
(29)	Crossover Track Incr.	0.560	0.696	0.833	0.969	1.107	1.244	1.381	1.519	1.656
<b>GUARD RAILS</b>										
(30)	Parallel End Setback	0.092	0.098	0.103	0.109	0.115	0.121	0.126	0.132	0.138
(31)	Bevel Length	0.149	0.149	0.149	0.149	0.149	0.149	0.149	0.149	0.149
(32)	Flare Length	0.333	0.333	0.333	0.333	0.379	0.379	0.379	0.379	0.379
(33)	Overall Length	1.137	1.137	1.137	1.137	1.516	1.516	1.516	1.516	1.516
(34)	Parallel Length	0.471	0.471	0.471	0.471	0.758	0.758	0.758	0.758	0.758
(37)	Flare Width	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022
(38)	Plane Width	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012
(39)	End Chamfer	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034

# HO Scale

## Straight Switch Turnout

# TURNOUT DIMENSIONS

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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	4.081	4.150	5.539	5.541	5.580	5.626	5.704	5.787
(4)	Switch Heel Spread	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105
(5)	Switch Heel Angle (deg.)	1.475	1.450	1.086	1.086	1.078	1.070	1.055	1.040
<b>LEAD TO THEORETICAL POINT OF FROG</b>									
(8)	Lead	13.962	14.672	17.328	18.005	18.663	19.320	20.072	20.824
<b>CLOSURE DISTANCE</b>									
(9)	Straight Rail Length	8.454	9.015	10.149	10.803	11.286	11.763	12.415	13.061
(10)	Curved Rail Length	8.470	9.031	10.163	10.816	11.298	11.775	12.426	13.071
(11)	Curved Rail Radius	165.598	195.945	213.155	248.493	282.571	319.342	363.285	410.513
<b>GAGE LINE OFFSETS ON CURVED CLOSURE RAIL</b>									
(12)	1st Point Y1	0.173	0.175	0.168	0.171	0.172	0.173	0.175	0.177
(13)	1st Point X1	6.194	6.404	8.077	8.242	8.402	8.567	8.807	9.052
(14)	Mid-Point Y2	0.268	0.271	0.262	0.266	0.268	0.269	0.272	0.276
(15)	Mid-Point X2	8.308	8.657	10.614	10.942	11.223	11.507	11.911	12.318
(16)	3rd Point Y3	0.390	0.393	0.386	0.391	0.391	0.392	0.396	0.400
(17)	3rd Point X3	10.421	10.911	13.151	13.643	14.045	14.448	15.015	15.583
<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	3.396	3.649	3.786	4.039	4.291	4.543	4.684	4.824
(20)	Toe Length	1.427	1.507	1.639	1.662	1.796	1.931	1.954	1.976
(21)	Heel Length	1.969	2.142	2.147	2.377	2.495	2.612	2.730	2.848
(22)	Toe Spread	0.110	0.108	0.109	0.104	0.106	0.107	0.103	0.099
(23)	Heel Spread	0.151	0.153	0.143	0.148	0.147	0.145	0.144	0.142
(35)	Wing Rail Extension	0.936	1.028	1.082	1.194	1.249	1.303	1.395	1.487
(36)	Wing Rail Flare Length	0.539	0.610	0.636	0.713	0.738	0.763	0.835	0.907
(37)	Wing Rail Flare Width	0.024	0.024	0.024	0.024	0.024	0.023	0.023	0.023
(38)	Wing Rail Bend Width	0.024	0.024	0.024	0.024	0.024	0.023	0.023	0.023
(39)	Wing Rail End Chamfer	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
<b>POINT OF FROG TO INTERSECTION OF CENTERLINES</b>									
(24)	PF to ICL	8.437	9.086	9.735	10.384	11.033	11.682	12.331	12.980
<b>DATA FOR CROSSOVERS: PF TO PF ON PARALLEL TRACKS</b>									
<b>For Track Centers of:</b>		1.791	<b>(13 prototype feet)</b>						
(25)	Straight Track Dist.	6.379	6.875	7.370	7.865	8.360	8.855	9.350	9.844
(26)	Crossover Track Dist.	6.448	6.939	7.430	7.921	8.413	8.905	9.397	9.889
<b>For Track Center Increment of:</b>		0.138	<b>(1 prototype foot)</b>						
(28)	Straight Track Incr.	1.789	1.927	2.065	2.203	2.340	2.478	2.616	2.754
(29)	Crossover Track Incr.	1.794	1.932	2.069	2.207	2.345	2.482	2.620	2.758
<b>GUARD RAILS</b>									
(30)	Parallel End Setback	0.144	0.149	0.155	0.161	0.167	0.172	0.178	0.184
(31)	Bevel Length	0.149	0.149	0.149	0.149	0.149	0.149	0.149	0.149
(32)	Flare Length	0.413	0.413	0.413	0.413	0.471	0.471	0.471	0.471
(33)	Overall Length	1.791	1.791	1.791	1.791	2.274	2.274	2.274	2.274
(34)	Parallel Length	0.965	0.965	0.965	0.965	1.332	1.332	1.332	1.332
(37)	Total Flare at End	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022
(38)	Bevel Cut at End	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
(39)	End Chamfer	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034