

# Fine:HO Scale

## Curved Switch Turnout

# TURNOUT DIMENSIONS

Revised: February 2015

RP-12.12

Design and calculations by Van S. Fehr

| (1)                                                     | FROG NUMBERS              | 4      | 5                          | 6      | 7       | 8       | 9       | 10      | 11      | 12      |
|---------------------------------------------------------|---------------------------|--------|----------------------------|--------|---------|---------|---------|---------|---------|---------|
| <b>PROPERTIES OF CURVED SWITCHES</b>                    |                           |        |                            |        |         |         |         |         |         |         |
| (2)                                                     | Switch Rail Length        | 1.831  | 1.828                      | 1.863  | 3.127   | 3.203   | 3.269   | 3.276   | 3.316   | 4.926   |
| (3)                                                     | Switch Point Angle (deg.) | 1.571  | 1.574                      | 1.544  | 0.920   | 0.898   | 0.880   | 0.878   | 0.867   | 0.584   |
| (4)                                                     | Switch Heel Spread        | 0.095  | 0.095                      | 0.095  | 0.095   | 0.095   | 0.095   | 0.095   | 0.095   | 0.095   |
| (5)                                                     | Switch Heel Angle (deg.)  | 4.378  | 4.386                      | 4.303  | 2.563   | 2.502   | 2.452   | 2.447   | 2.417   | 1.627   |
| (6)                                                     | Switch Rail Radius        | 37.391 | 37.250                     | 38.706 | 109.053 | 114.402 | 119.173 | 119.621 | 122.580 | 270.539 |
| (7)                                                     | Switch Mid-Ordinate       | 0.011  | 0.011                      | 0.011  | 0.011   | 0.011   | 0.011   | 0.011   | 0.011   | 0.011   |
| <b>LEAD TO THEORETICAL POINT OF FROG</b>                |                           |        |                            |        |         |         |         |         |         |         |
| (8)                                                     | Lead                      | 4.937  | 5.572                      | 6.206  | 8.638   | 9.376   | 10.019  | 10.625  | 11.227  | 14.233  |
| <b>CLOSURE DISTANCE</b>                                 |                           |        |                            |        |         |         |         |         |         |         |
| (9)                                                     | Straight Rail Length      | 2.595  | 3.192                      | 3.749  | 4.772   | 5.370   | 5.756   | 6.337   | 6.807   | 8.080   |
| (10)                                                    | Curved Rail Length        | 2.649  | 3.235                      | 3.786  | 4.802   | 5.397   | 5.780   | 6.359   | 6.827   | 8.098   |
| (11)                                                    | Curved Rail Radius        | 15.372 | 26.348                     | 41.522 | 49.062  | 66.487  | 84.742  | 111.156 | 140.305 | 147.541 |
| <b>GAGE LINE OFFSETS ON CURVED CLOSURE RAIL</b>         |                           |        |                            |        |         |         |         |         |         |         |
| (12)                                                    | 1st Point Y1              | 0.159  | 0.168                      | 0.176  | 0.163   | 0.167   | 0.169   | 0.174   | 0.177   | 0.166   |
| (13)                                                    | 1st Point X1              | 2.480  | 2.626                      | 2.801  | 4.320   | 4.546   | 4.708   | 4.860   | 5.017   | 6.946   |
| (14)                                                    | Mid-Point Y2              | 0.250  | 0.266                      | 0.279  | 0.260   | 0.267   | 0.267   | 0.276   | 0.280   | 0.265   |
| (15)                                                    | Mid-Point X2              | 3.129  | 3.424                      | 3.738  | 5.513   | 5.888   | 6.147   | 6.444   | 6.719   | 8.966   |
| (16)                                                    | 3rd Point Y3              | 0.370  | 0.389                      | 0.403  | 0.387   | 0.394   | 0.390   | 0.400   | 0.404   | 0.392   |
| (17)                                                    | 3rd Point X3              | 3.778  | 4.222                      | 4.675  | 6.706   | 7.231   | 7.586   | 8.028   | 8.421   | 10.986  |
| <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            | 1.177  | 1.333                      | 1.490  | 1.783   | 1.940   | 2.371   | 2.459   | 2.782   | 3.024   |
| (20)                                                    | Toe Length                | 0.511  | 0.552                      | 0.594  | 0.738   | 0.803   | 0.993   | 1.012   | 1.105   | 1.227   |
| (21)                                                    | Heel Length               | 0.666  | 0.781                      | 0.896  | 1.045   | 1.137   | 1.378   | 1.447   | 1.677   | 1.797   |
| (22)                                                    | Toe Spread                | 0.127  | 0.110                      | 0.099  | 0.105   | 0.100   | 0.110   | 0.101   | 0.100   | 0.102   |
| (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   | 0.333   | 0.379   | 0.379   | 0.379   | 0.379   |
| (33)                                                    | Overall Length            | 1.137  | 1.137                      | 1.137  | 1.137   | 1.137   | 1.516   | 1.516   | 1.516   | 1.516   |
| (34)                                                    | Parallel Length           | 0.471  | 0.471                      | 0.471  | 0.471   | 0.471   | 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   | 0.013   | 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   |

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# TURNOUT DIMENSIONS

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Design and calculations by Van S. Fehr

| (1)                                                     | FROG NUMBERS              | 13      | 14                         | 15      | 16      | 17      | 18      | 19      | 20      |
|---------------------------------------------------------|---------------------------|---------|----------------------------|---------|---------|---------|---------|---------|---------|
| <b>PROPERTIES OF CURVED SWITCHES</b>                    |                           |         |                            |         |         |         |         |         |         |
| (2)                                                     | Switch Rail Length        | 4.965   | 5.017                      | 5.085   | 5.149   | 6.363   | 6.445   | 6.502   | 6.567   |
| (3)                                                     | Switch Point Angle (deg.) | 0.579   | 0.573                      | 0.565   | 0.558   | 0.452   | 0.446   | 0.442   | 0.438   |
| (4)                                                     | Switch Heel Spread        | 0.095   | 0.095                      | 0.095   | 0.095   | 0.095   | 0.095   | 0.095   | 0.095   |
| (5)                                                     | Switch Heel Angle (deg.)  | 1.614   | 1.598                      | 1.576   | 1.556   | 1.259   | 1.243   | 1.233   | 1.220   |
| (6)                                                     | Switch Rail Radius        | 274.900 | 280.605                    | 288.306 | 295.621 | 451.461 | 463.187 | 471.384 | 480.826 |
| (7)                                                     | Switch Mid-Ordinate       | 0.011   | 0.011                      | 0.011   | 0.011   | 0.011   | 0.011   | 0.011   | 0.011   |
| <b>LEAD TO THEORETICAL POINT OF FROG</b>                |                           |         |                            |         |         |         |         |         |         |
| (8)                                                     | Lead                      | 14.900  | 15.568                     | 16.225  | 16.909  | 19.329  | 20.015  | 20.701  | 21.387  |
| <b>CLOSURE DISTANCE</b>                                 |                           |         |                            |         |         |         |         |         |         |
| (9)                                                     | Straight Rail Length      | 8.638   | 9.184                      | 9.652   | 10.258  | 11.339  | 11.819  | 12.435  | 13.044  |
| (10)                                                    | Curved Rail Length        | 8.655   | 9.200                      | 9.666   | 10.272  | 11.352  | 11.831  | 12.447  | 13.055  |
| (11)                                                    | Curved Rail Radius        | 177.663 | 211.413                    | 246.998 | 290.862 | 308.269 | 349.610 | 400.120 | 455.031 |
| <b>GAGE LINE OFFSETS ON CURVED CLOSURE RAIL</b>         |                           |         |                            |         |         |         |         |         |         |
| (12)                                                    | 1st Point Y1              | 0.169   | 0.172                      | 0.173   | 0.176   | 0.170   | 0.172   | 0.174   | 0.176   |
| (13)                                                    | 1st Point X1              | 7.125   | 7.313                      | 7.498   | 7.714   | 9.198   | 9.400   | 9.611   | 9.828   |
| (14)                                                    | Mid-Point Y2              | 0.269   | 0.273                      | 0.275   | 0.280   | 0.272   | 0.273   | 0.277   | 0.281   |
| (15)                                                    | Mid-Point X2              | 9.285   | 9.609                      | 9.911   | 10.278  | 12.033  | 12.355  | 12.720  | 13.089  |
| (16)                                                    | 3rd Point Y3              | 0.396   | 0.400                      | 0.400   | 0.406   | 0.399   | 0.400   | 0.405   | 0.409   |
| (17)                                                    | 3rd Point X3              | 11.444  | 11.905                     | 12.324  | 12.843  | 14.868  | 15.309  | 15.828  | 16.350  |
| <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            | 3.266   | 3.509                      | 3.636   | 3.878   | 4.121   | 4.363   | 4.494   | 4.624   |
| (20)                                                    | Toe Length                | 1.297   | 1.367                      | 1.489   | 1.501   | 1.626   | 1.751   | 1.764   | 1.776   |
| (21)                                                    | Heel Length               | 1.969   | 2.142                      | 2.147   | 2.377   | 2.495   | 2.612   | 2.730   | 2.848   |
| (22)                                                    | Toe Spread                | 0.100   | 0.098                      | 0.099   | 0.094   | 0.096   | 0.097   | 0.093   | 0.089   |
| (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              | 0.379   | 0.379                      | 0.379   | 0.413   | 0.413   | 0.413   | 0.413   | 0.471   |
| (33)                                                    | Overall Length            | 1.516   | 1.516                      | 1.516   | 1.791   | 1.791   | 1.791   | 1.791   | 2.274   |
| (34)                                                    | Parallel Length           | 0.758   | 0.758                      | 0.758   | 0.965   | 0.965   | 0.965   | 0.965   | 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          | 0.012   | 0.012                      | 0.012   | 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   |