



Tangent Track Centers and Clearance Diagrams

Author(s): Van S. Fehr, Brian Barnt, and Didrik A. Voss, MMR

NMRA Recommended Practices
RP-7.1
Rev. January 2019
© 2017 NMRA

Unobstructed and safe movement of rolling stock through bridges and tunnels, past nearby trackside objects, and by equipment on adjacent tracks, requires proper clearance. **NMRA RP-7.1** provides recommended track centers and clearances for use with tangent (straight) tracks only. Single and concentric curved tracks require additional clearance considerations prescribed in **NMRA RP-7.2 Curved Track Centers**, and **NMRA RP-7.3 Curved Track Obstacle Clearance**.

Bridge, obstacle, and tunnel clearances, and track centers, have increased over the long history of railroading to accommodate increasing rolling stock size, and for safety and regulatory reasons. Recognizing this dimensional evolution, the NMRA defines four modeling eras in which most modelers build their railroads. Those eras and their NMRA-recommended minimum tangent track centers (prototype) are:

<u>MODELING ERA</u>	<u>PERIOD</u>	<u>CENTERS</u>
Old-Time/Narrow Gauge	Before 1920	12 feet
Classic	1920 to 1969	13 feet
Early Modern	1969 to 1983	14 feet
Modern	After 1983	14 feet

Railroad authorities prescribe clearances in the form of clearance diagrams. Clearances for the Old-Time/Narrow Gauge era are primarily taken from those used by the Colorado Narrow Gauge Railroads. Narrow Gauge railroads in other parts of the country may be different. For Standard Gauge railroads, car and locomotive sizes were in considerable flux before 1920. Clearance dimensions for a particular railroad should be verified by reviewing that railroad’s bridge and tunnel diagrams.

In 1936, the American Railroad Engineering Association (AREA) solidified clearances for the Classic era. Changes to the AREA clearance diagram in the Early Modern era affected only the top diagonal of the bridge clearance diagram. In 1983, the American Railway Engineering and Maintenance-of-Way Association (AREMA), the successor to the AREA, modified the clearance diagrams for use in the Modern era.

Following below is one page for each era that has a figure and a table. Each figure consists of a combined **Bridge and Obstacle Clearance Diagram**, a **Single-Track Tunnel Clearance Diagram**, and a **Double-Track Tunnel Clearance Diagram**. For visual comparison, all three are drawn to the same scale. For reference, the heavier dashed lines in the tunnel diagrams show the relationship between the tunnel walls/roof and the bridge and obstacle clearance diagram outline.

Below the figure is a table containing the clearance diagram dimensions for the most popular modeling scales listed in the first column. The first row contains the prototype values, in units of decimal feet and in decimal millimeters, for conversion to modeling scales not listed. **NMRA Standards S-1.1, S-1.2, and S-1.3**, define the modeling scale proportionality factors repeated for reference in the first column of the table. The remaining columns, headed by the letter identifiers, contain the dimension values. For modeler convenience, the table presents dimensions in three formats; decimal inches rounded to the nearest 0.01 inches, fractional inches rounded to the nearest 1/32 inch, and decimal millimeters rounded to the nearest millimeter.

In the figures and tables, each dimension has an identifying letter defined as follows:

- A** Clearance for bridges, tunnels and [temporary] buildings
- B** Clearance for corner bracing on bridges and tunnels

- C** Clearance for corner bracing on bridges and tunnels
- D** Clearance for side walls in bridges and tunnels
- E** Clearance for platform height and other structures
- F** Clearance for bracing of adjacent structures (excluding Modern era)
- G** Clearance to adjacent structures
- H** Clearance for bridge height and [temporary] bridges
- P** Clearance from track center to platform
- Q** Center offset for tunnel corner radius center (Modern era only)
- R_C** Tunnel top corner radius
- R_S** Tunnel roof radius, single track
- R_D** Tunnel roof radius, double track
- S_{MIN}** Minimum tangent track center (table on page 1)

Notes:

1. Dimensions **E**, **F**, and **H** are measured from the top of the railheads.
2. Narrow gauge locomotives with extra wide cylinders, such as “K” types, require Classic era dimensions for **A**, **B**, **G**, and **P**.
3. Tunnel diagrams are symmetrical about their vertical centerlines.
4. The double-track tunnel diagrams are drawn to scale using the recommended minimum tangent track centers **S_{MIN}** for each era (see Table on page 1).
5. For all eras, the double-track tunnel roof radius **R_D** is the sum of the single-track roof radius **R_S** and the track centerline spacing **S_{MIN}**. Use this relationship to recalculate **R_D** if using a tangent track centerline spacing that is wider than the era’s recommended minimum.
6. NMRA members should examine **NMRA Data Sheet D9p Clearance Diagrams** for additional information.

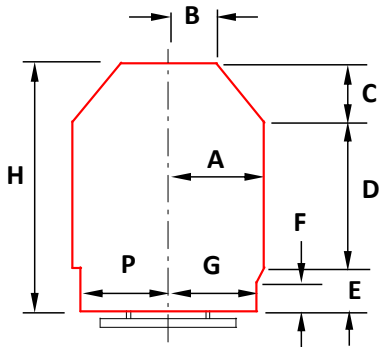
The figures and tables follow on the next four pages.

Revision History

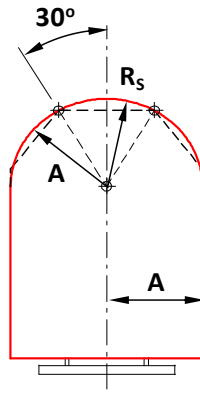
Jul 2017: Original Issue. Standard S-8 converted to new Recommended Practice RP-7 series.

Jan 2019: Removed overlapping dotted lines that caused misinterpretation of track center spacing in double track tunnel diagrams. Improved wording of Notes 4 and 5.

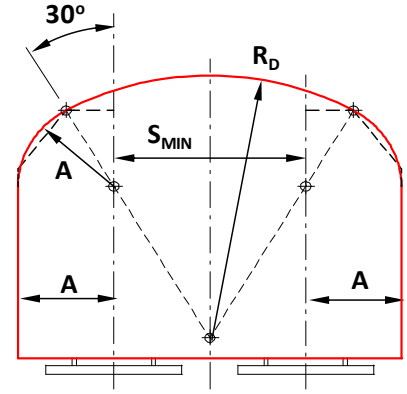
Old-Time/Narrow Gauge Era



Bridge and Obstacle Clearance Diagram



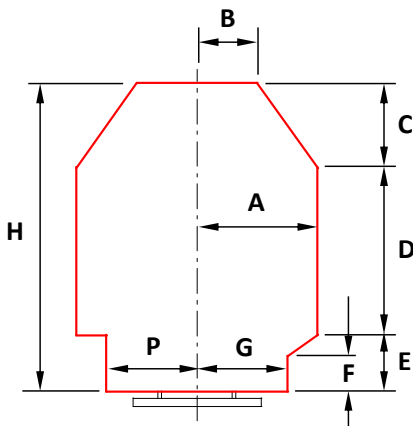
Single Track Tunnel Clearance Diagram



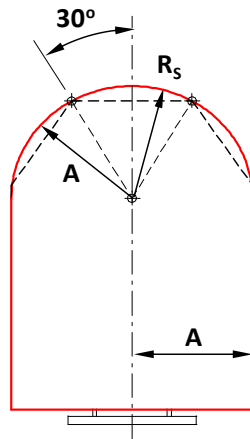
Double Track Tunnel Clearance Diagram

SCALE	Units	A	B	C	D	E	F	G	H	P	Q	R _c	R _s	R _D
Prototype 1.0	ft.	6.00	3.00	4.00	10.00	3.00	2.00	5.50	17.00	5.50	-	6.00	6.00	18.00
	mm	1828.8	914.4	1219.2	3048.0	914.4	609.6	1676.4	5181.6	1676.4	-	1828.8	1828.8	5486.4
LS 1:20.3 (F)	dec. in.	3.55	1.77	2.36	5.91	1.77	1.18	3.25	10.05	3.25	-	3.55	3.55	10.64
	frac. in.	3 17/32"	1 25/32"	2 3/8"	5 29/32"	1 25/32"	1 3/16"	3 1/4"	10 1/16"	3 1/4"	-	3 17/32"	3 17/32"	10 5/8"
	mm	90	45	60	150	45	30	83	255	83	-	90	90	270
LS 1:22.5 (G)	dec. in.	3.20	1.60	2.13	5.33	1.60	1.07	2.93	9.07	2.93	-	3.20	3.20	9.60
	frac. in.	3 3/16"	1 19/32"	2 1/8"	5 11/32"	1 19/32"	1 1/16"	2 15/16"	9 1/16"	2 15/16"	-	3 3/16"	3 3/16"	9 19/32"
	mm	81	41	54	135	41	27	75	230	75	-	81	81	244
LS 1:29	dec. in.	2.5	1.2	1.7	4.1	1.2	0.8	2.3	7.0	2.3	-	2.48	2.48	7.45
	frac. in.	2 15/32"	1 1/4"	1 21/32"	4 1/8"	1 1/4"	13/16"	2 9/32"	7 1/32"	2 9/32"	-	2 15/32"	2 15/32"	7 7/16"
	mm	63	32	42	105	32	21	58	179	58	-	63	63	189
LS 1:32 (No. 1)	dec. in.	2.25	1.13	1.50	3.75	1.13	0.75	2.06	6.38	2.06	-	2.25	2.25	6.75
	frac. in.	2 1/4"	1 1/8"	1 1/2"	3 3/4"	1 1/8"	3/4"	2 1/16"	6 3/8"	2 1/16"	-	2 1/4"	2 1/4"	6 3/4"
	mm	57	29	38	95	29	19	52	162	52	-	57	57	171
O Scale	dec. in.	1.50	0.75	1.00	2.50	0.75	0.50	1.38	4.25	1.38	-	1.50	1.50	4.50
	frac. in.	1 1/2"	3/4"	1"	2 1/2"	3/4"	1/2"	1 3/8"	4 1/4"	1 3/8"	-	1 1/2"	1 1/2"	4 1/2"
	mm	38	19	25	64	19	13	35	108	35	-	38	38	114
S Scale	dec. in.	1.13	0.56	0.75	1.88	0.56	0.38	1.03	3.19	1.03	-	1.13	1.13	3.38
	frac. in.	1 1/8"	9/16"	3/4"	1 7/8"	9/16"	3/8"	1 1/32"	3 3/16"	1 1/32"	-	1 1/8"	1 1/8"	3 3/8"
	mm	29	14	19	48	14	10	26	81	26	-	29	29	86
HO Scale	dec. in.	0.83	0.41	0.55	1.38	0.41	0.28	0.76	2.34	0.76	-	0.83	0.83	2.48
	frac. in.	13/16"	13/32"	9/16"	1 3/8"	13/32"	9/32"	3/4"	2 11/32"	3/4"	-	13/16"	13/16"	2 15/32"
	mm	21	10	14	35	10	7	19	59	19	-	21	21	63
TT Scale	dec. in.	0.60	0.30	0.40	1.00	0.30	0.20	0.55	1.70	0.55	-	0.60	0.60	1.80
	frac. in.	19/32"	5/16"	13/32"	1"	5/16"	3/16"	9/16"	1 11/16"	9/16"	-	19/32"	19/32"	1 13/16"
	mm	15	8	10	25	8	5	14	43	14	-	15	15	46
N Scale	dec. in.	0.45	0.23	0.30	0.75	0.23	0.15	0.41	1.28	0.41	-	0.45	0.45	1.35
	frac. in.	7/16"	7/32"	5/16"	3/4"	7/32"	5/32"	13/32"	1 9/32"	13/32"	-	7/16"	7/16"	1 11/32"
	mm	11	6	8	19	6	4	10	32	10	-	11	11	34
Z Scale	dec. in.	0.33	0.16	0.22	0.55	0.16	0.11	0.30	0.93	0.30	-	0.33	0.33	0.98
	frac. in.	5/16"	5/32"	7/32"	17/32"	5/32"	3/32"	5/16"	15/16"	5/16"	-	5/16"	5/16"	31/32"
	mm	8	4	6	14	4	3	8	24	8	-	8	8	25

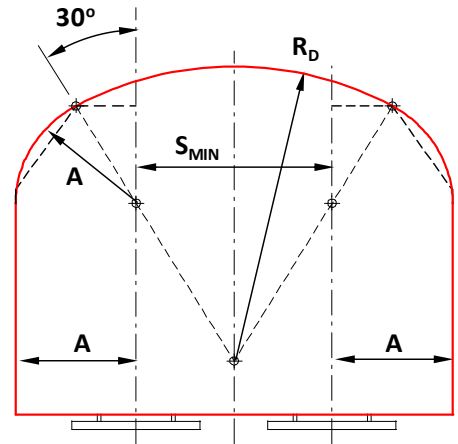
Classic Era



Bridge and Obstacle Clearance Diagram



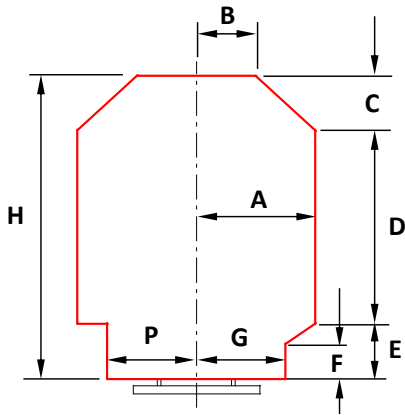
Single Track Tunnel Clearance Diagram



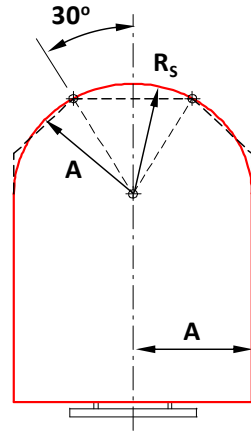
Double Track Tunnel Clearance Diagram

SCALE	Units	A	B	C	D	E	F	G	H	P	Q	R _C	R _S	R _D
Prototype 1.0	ft.	8.00	4.00	6.00	12.00	4.00	2.50	6.00	22.00	6.00	-	8.00	8.00	21.00
	mm	2438.4	1219.2	1828.8	3657.6	1219.2	762.0	1828.8	6705.6	1828.8	-	2438.4	2438.4	6400.8
LS 1:20.3 (F)	dec. in.	4.73	2.36	3.55	7.09	2.36	1.48	3.55	13.00	3.55	-	4.73	4.73	12.41
	frac. in.	4 23/32"	2 3/8"	3 17/32"	7 3/32"	2 3/8"	1 15/32"	3 17/32"	13"	3 17/32"	-	4 23/32"	4 23/32"	12 13/32"
	mm	120	60	90	180	60	38	90	330	90	-	120	120	315
LS 1:22.5 (G)	dec. in.	4.27	2.13	3.20	6.40	2.13	1.33	3.20	11.73	3.20	-	4.27	4.27	11.20
	frac. in.	4 9/32"	2 1/8"	3 3/16"	6 13/32"	2 1/8"	1 11/32"	3 3/16"	11 23/32"	3 3/16"	-	4 9/32"	4 9/32"	11 3/16"
	mm	108	54	81	163	54	34	81	298	81	-	108	108	284
LS 1:29	dec. in.	3.3	1.7	2.5	5.0	1.7	1.0	2.5	9.1	2.5	-	3.31	3.31	8.69
	frac. in.	3 5/16"	1 21/32"	2 15/32"	4 31/32"	1 21/32"	1 1/32"	2 15/32"	9 3/32"	2 15/32"	-	3 5/16"	3 5/16"	8 11/16"
	mm	84	42	63	126	42	26	63	231	63	-	84	84	221
LS 1:32 (No. 1)	dec. in.	3.00	1.50	2.25	4.50	1.50	0.94	2.25	8.25	2.25	-	3.00	3.00	7.88
	frac. in.	3"	1 1/2"	2 1/4"	4 1/2"	1 1/2"	15/16"	2 1/4"	8 1/4"	2 1/4"	-	3"	3"	7 7/8"
	mm	76	38	57	114	38	24	57	210	57	-	76	76	200
O Scale	dec. in.	2.00	1.00	1.50	3.00	1.00	0.63	1.50	5.50	1.50	-	2.00	2.00	5.25
	frac. in.	2"	1"	1 1/2"	3"	1"	5/8"	1 1/2"	5 1/2"	1 1/2"	-	2"	2"	5 1/4"
	mm	51	25	38	76	25	16	38	140	38	-	51	51	133
S Scale	dec. in.	1.50	0.75	1.13	2.25	0.75	0.47	1.13	4.13	1.13	-	1.50	1.50	3.94
	frac. in.	1 1/2"	3/4"	1 1/8"	2 1/4"	3/4"	15/32"	1 1/8"	4 1/8"	1 1/8"	-	1 1/2"	1 1/2"	3 15/16"
	mm	38	19	29	57	19	12	29	105	29	-	38	38	100
HO Scale	dec. in.	1.10	0.55	0.83	1.65	0.55	0.34	0.83	3.03	0.83	-	1.10	1.10	2.89
	frac. in.	1 3/32"	9/16"	13/16"	1 21/32"	9/16"	11/32"	13/16"	3 1/32"	13/16"	-	1 3/32"	1 3/32"	2 29/32"
	mm	28	14	21	42	14	9	21	77	21	-	28	28	73
TT Scale	dec. in.	0.80	0.40	0.60	1.20	0.40	0.25	0.60	2.20	0.60	-	0.80	0.80	2.10
	frac. in.	13/16"	13/32"	19/32"	1 3/16"	13/32"	1/4"	19/32"	2 3/16"	19/32"	-	13/16"	13/16"	2 3/32"
	mm	20	10	15	30	10	6	15	56	15	-	20	20	53
N Scale	dec. in.	0.60	0.30	0.45	0.90	0.30	0.19	0.45	1.65	0.45	-	0.60	0.60	1.58
	frac. in.	19/32"	5/16"	7/16"	29/32"	5/16"	3/16"	7/16"	1 21/32"	7/16"	-	19/32"	19/32"	1 9/16"
	mm	15	8	11	23	8	5	11	42	11	-	15	15	40
Z Scale	dec. in.	0.44	0.22	0.33	0.65	0.22	0.14	0.33	1.20	0.33	-	0.44	0.44	1.15
	frac. in.	7/16"	7/32"	5/16"	21/32"	7/32"	1/8"	5/16"	1 3/16"	5/16"	-	7/16"	7/16"	1 5/32"
	mm	11	6	8	17	6	3	8	30	8	-	11	11	29

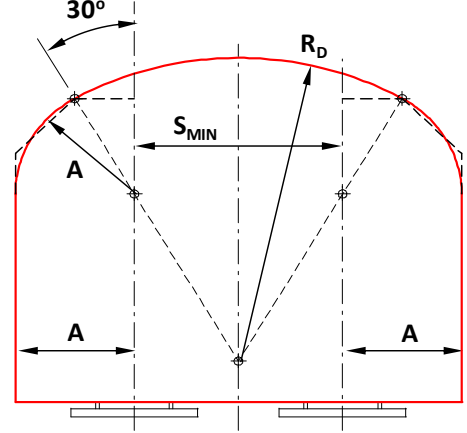
Early Modern Era



Bridge and Obstacle Clearance Diagram



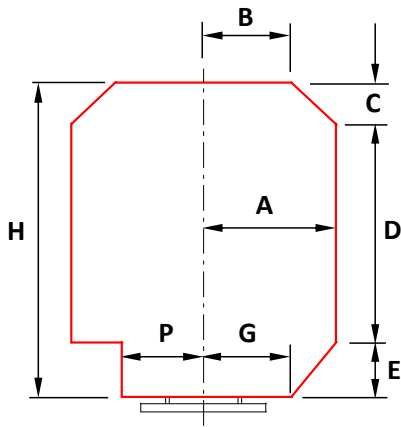
Single Track Tunnel Clearance Diagram



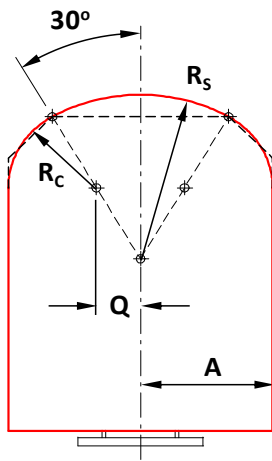
Double Track Tunnel Clearance Diagram

SCALE	Units	A	B	C	D	E	F	G	H	P	Q	R _C	R _S	R _D
Prototype 1.0	ft.	8.00	4.00	4.00	14.00	4.00	2.50	6.00	22.00	6.00	-	8.00	8.00	22.00
	mm	2438.4	1219.2	1219.2	4267.2	1219.2	762.0	1828.8	6705.6	1828.8	-	2438.4	2438.4	6705.6
LS 1:20.3 (F)	dec. in.	4.73	2.36	2.36	8.28	2.36	1.48	3.55	13.00	3.55	-	4.73	4.73	13.00
	frac. in.	4 23/32"	2 3/8"	2 3/8"	8 9/32"	2 3/8"	1 15/32"	3 17/32"	13"	3 17/32"	-	4 23/32"	4 23/32"	13"
	mm	120	60	60	210	60	38	90	330	90	-	120	120	330
LS 1:22.5 (G)	dec. in.	4.27	2.13	2.13	7.47	2.13	1.33	3.20	11.73	3.20	-	4.27	4.27	11.73
	frac. in.	4 9/32"	2 1/8"	2 1/8"	7 15/32"	2 1/8"	1 11/32"	3 3/16"	11 23/32"	3 3/16"	-	4 9/32"	4 9/32"	11 23/32"
	mm	108	54	54	190	54	34	81	298	81	-	108	108	298
LS 1:29	dec. in.	3.3	1.7	1.7	5.8	1.7	1.0	2.5	9.1	2.5	-	3.31	3.31	9.10
	frac. in.	3 5/16"	1 21/32"	1 21/32"	5 25/32"	1 21/32"	1 1/32"	2 15/32"	9 3/32"	2 15/32"	-	3 5/16"	3 5/16"	9 3/32"
	mm	84	42	42	147	42	26	63	231	63	-	84	84	231
LS 1:32 (No. 1)	dec. in.	3.00	1.50	1.50	5.25	1.50	0.94	2.25	8.25	2.25	-	3.00	3.00	8.25
	frac. in.	3"	1 1/2"	1 1/2"	5 1/4"	1 1/2"	15/16"	2 1/4"	8 1/4"	2 1/4"	-	3"	3"	8 1/4"
	mm	76	38	38	133	38	24	57	210	57	-	76	76	210
O Scale	dec. in.	2.00	1.00	1.00	3.50	1.00	0.63	1.50	5.50	1.50	-	2.00	2.00	5.50
	frac. in.	2"	1"	1"	3 1/2"	1"	5/8"	1 1/2"	5 1/2"	1 1/2"	-	2"	2"	5 1/2"
	mm	51	25	25	89	25	16	38	140	38	-	51	51	140
S Scale	dec. in.	1.50	0.75	0.75	2.63	0.75	0.47	1.13	4.13	1.13	-	1.50	1.50	4.13
	frac. in.	1 1/2"	3/4"	3/4"	2 5/8"	3/4"	15/32"	1 1/8"	4 1/8"	1 1/8"	-	1 1/2"	1 1/2"	4 1/8"
	mm	38	19	19	67	19	12	29	105	29	-	38	38	105
HO Scale	dec. in.	1.10	0.55	0.55	1.93	0.55	0.34	0.83	3.03	0.83	-	1.10	1.10	3.03
	frac. in.	1 3/32"	9/16"	9/16"	1 15/16"	9/16"	11/32"	13/16"	3 1/32"	13/16"	-	1 3/32"	1 3/32"	3 1/32"
	mm	28	14	14	49	14	9	21	77	21	-	28	28	77
TT Scale	dec. in.	0.80	0.40	0.40	1.40	0.40	0.25	0.60	2.20	0.60	-	0.80	0.80	2.20
	frac. in.	13/16"	13/32"	13/32"	1 13/32"	13/32"	1/4"	19/32"	2 3/16"	19/32"	-	13/16"	13/16"	2 3/16"
	mm	20	10	10	36	10	6	15	56	15	-	20	20	56
N Scale	dec. in.	0.60	0.30	0.30	1.05	0.30	0.19	0.45	1.65	0.45	-	0.60	0.60	1.65
	frac. in.	19/32"	5/16"	5/16"	1 1/16"	5/16"	3/16"	7/16"	1 21/32"	7/16"	-	19/32"	19/32"	1 21/32"
	mm	15	8	8	27	8	5	11	42	11	-	15	15	42
Z Scale	dec. in.	0.44	0.22	0.22	0.76	0.22	0.14	0.33	1.20	0.33	-	0.44	0.44	1.20
	frac. in.	7/16"	7/32"	7/32"	3/4"	7/32"	1/8"	5/16"	1 3/16"	5/16"	-	7/16"	7/16"	1 3/16"
	mm	11	6	6	19	6	3	8	30	8	-	11	11	30

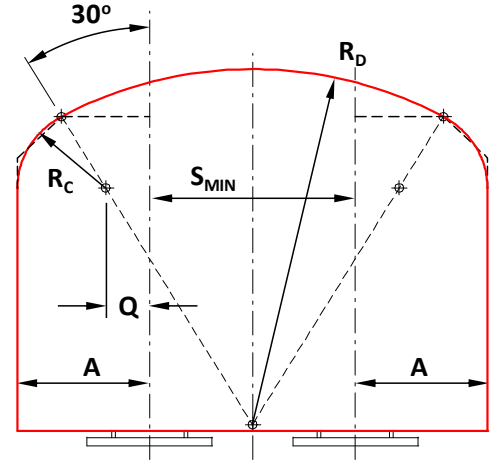
Modern Era



Bridge and Obstacle Clearance Diagram



Single Track Tunnel Clearance Diagram



Double Track Tunnel Clearance Diagram

SCALE	Units	A	B	C	D	E	F	G	H	P	Q	R _c	R _s	R _D
Prototype 1.0	ft.	9.00	6.00	3.00	16.00	4.00	-	6.00	23.00	5.58	3.00	6.00	12.00	26.00
	mm	2743.2	1828.8	914.4	4876.8	1219.2	-	1828.8	7010.4	1701.7	914.4	1828.8	3657.6	7924.8
LS 1:20.3 (F)	dec. in.	5.32	3.55	1.77	9.46	2.36	-	3.55	13.60	3.30	1.77	3.55	7.09	15.37
	frac. in.	5 5/16"	3 17/32"	1 25/32"	9 15/32"	2 3/8"	-	3 17/32"	13 19/32"	3 5/16"	1 25/32"	3 17/32"	7 3/32"	15 3/8"
	mm	135	90	45	240	60	-	90	345	84	45	90	180	390
LS 1:22.5 (G)	dec. in.	4.80	3.20	1.60	8.53	2.13	-	3.20	12.27	2.98	1.60	3.20	6.40	13.87
	frac. in.	4 13/16"	3 3/16"	1 19/32"	8 17/32"	2 1/8"	-	3 3/16"	12 9/32"	2 31/32"	1 19/32"	3 3/16"	6 13/32"	13 7/8"
	mm	122	81	41	217	54	-	81	312	76	41	81	163	352
LS 1:29	dec. in.	3.7	2.5	1.2	6.6	1.7	-	2.5	9.5	2.3	1.24	2.48	4.97	10.76
	frac. in.	3 23/32"	2 15/32"	1 1/4"	6 5/8"	1 21/32"	-	2 15/32"	9 17/32"	2 5/16"	1 1/4"	2 15/32"	4 31/32"	10 3/4"
	mm	95	63	32	168	42	-	63	242	59	32	63	126	273
LS 1:32 (No. 1)	dec. in.	3.38	2.25	1.13	6.00	1.50	-	2.25	8.63	2.09	1.13	2.25	4.50	9.75
	frac. in.	3 3/8"	2 1/4"	1 1/8"	6"	1 1/2"	-	2 1/4"	8 5/8"	2 3/32"	1 1/8"	2 1/4"	4 1/2"	9 3/4"
	mm	86	57	29	152	38	-	57	219	53	29	57	114	248
O Scale	dec. in.	2.25	1.50	0.75	4.00	1.00	-	1.50	5.75	1.40	0.75	1.50	3.00	6.50
	frac. in.	2 1/4"	1 1/2"	3/4"	4"	1"	-	1 1/2"	5 3/4"	1 13/32"	3/4"	1 1/2"	3"	6 1/2"
	mm	57	38	19	102	25	-	38	146	35	19	38	76	165
S Scale	dec. in.	1.69	1.13	0.56	3.00	0.75	-	1.13	4.31	1.05	0.56	1.13	2.25	4.88
	frac. in.	1 11/16"	1 1/8"	9/16"	3"	3/4"	-	1 1/8"	4 5/16"	1 1/32"	9/16"	1 1/8"	2 1/4"	4 7/8"
	mm	43	29	14	76	19	-	29	110	27	14	29	57	124
HO Scale	dec. in.	1.24	0.83	0.41	2.20	0.55	-	0.83	3.17	0.77	0.41	0.83	1.65	3.58
	frac. in.	1 1/4"	13/16"	13/32"	2 7/32"	9/16"	-	13/16"	3 5/32"	25/32"	13/32"	13/16"	1 21/32"	3 19/32"
	mm	31	21	10	56	14	-	21	80	20	10	21	42	91
TT Scale	dec. in.	0.90	0.60	0.30	1.60	0.40	-	0.60	2.30	0.56	0.30	0.60	1.20	2.60
	frac. in.	29/32"	19/32"	5/16"	1 19/32"	13/32"	-	19/32"	2 5/16"	9/16"	5/16"	19/32"	1 3/16"	2 19/32"
	mm	23	15	8	41	10	-	15	58	14	8	15	30	66
N Scale	dec. in.	0.68	0.45	0.23	1.20	0.30	-	0.45	1.73	0.42	0.23	0.45	0.90	1.95
	frac. in.	11/16"	7/16"	7/32"	1 3/16"	5/16"	-	7/16"	1 23/32"	13/32"	7/32"	7/16"	29/32"	1 15/16"
	mm	17	11	6	30	8	-	11	44	11	6	11	23	50
Z Scale	dec. in.	0.49	0.33	0.16	0.87	0.22	-	0.33	1.25	0.30	0.16	0.33	0.65	1.42
	frac. in.	1/2"	5/16"	5/32"	7/8"	7/32"	-	5/16"	1 1/4"	5/16"	5/32"	5/16"	21/32"	1 13/32"
	mm	12	8	4	22	6	-	8	32	8	4	8	17	36