

## Clearance Required on Curves

Part 1, Section 1.9 gives the limiting dimensions for structures (see Figure 1). On curves, horizontal dimensions in this structure gauge must be increased to take into account the effect of the throwover (see Figure 2). This is done by including a factor 'E' in the structure gauge. E can be calculated for all types of vehicle using the formula given in Part 2, Section 1, but this Data Sheet enumerates E for common varieties of rolling stock and model curves. This data sheet uses the formula method of calculation, but other methods are described in Part 2 Section 1.

Additional width is required on curves for two reasons. The first is that the vehicle 'cuts the corner' of the curve by drawing a straight line between its axles, or, for bogie stock, between its bogie centres. This causes an overhang on the inside of the curve (VDi, Vehicle centre Displacement, inside curve). There is a corresponding overhang on the outside of the curve caused by the fact that the vehicle extends beyond its outer axles or bogie centres, termed VDo (Vehicle end Displacement, outside curve).

The value of E which should be used is the maximum of VDi and VDo. For long vehicles on sharp curves, VDi is significantly larger than Vdo. Ei = VDi and Eo = Vdo may be calculated separately. Figure 1 shows Ei and Eo

individually, with the inside of the curve on the left. However, in most cases it is advisable to take  $E_i = E_o = E$ , and use the values in Table 1.

The minimum distance between tracks on a curve is  $VDi + VDo + VW + CI$ , where VW is the vehicle width and CI is a clearance margin. The prototype loading gauge allows a CI of 457mm, which is about 10.5mm. However, since model curves are much sharper than their prototype equivalents this value can be reduced to improve appearance. For maximum flexibility, it is recommended that VW be taken as 67mm, as this is the maximum defined by the loading gauge, and CI be taken to be at least 3mm. However, if compatibility with visiting stock is not required, a smaller maximum vehicle width may be used which reduces the track centre distance.

The formulae for VDo and VDi are as follows (see Part 2 Section 1).

$$VDi = Rc - R^1, \text{ where } Rc \text{ is the curve radius and}$$

$$R^1 = \sqrt{Rc^2 - Bc^2}, \text{ where } Bc = WB/2$$

$VDo = \sqrt{R^1^2 - LV^2} - Rc$ , where LV is the greater of the lengths from the wheelbase centre to the end of the vehicle (half the overall length of a symmetrical vehicle).

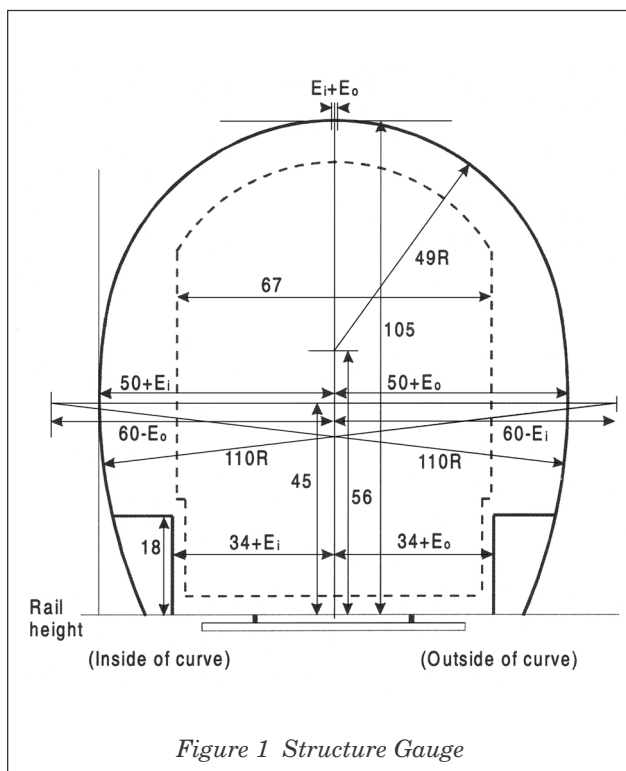


Figure 1 Structure Gauge

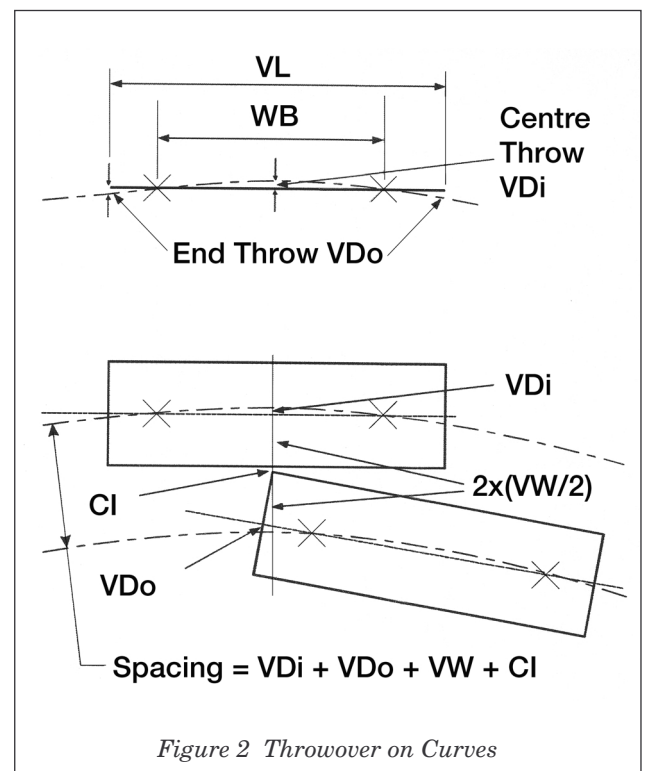


Figure 2 Throwover on Curves

**Table 1 Table of E for various vehicle lengths and curve radii**

Group		1	2	3		4	5				
Example vehicle		4-wheel Preston Tram	1950 16T Std. Open Wagon	Banana Van	BR 24T Std. mineral Wagon	Met. Stock 1898	BR 45T Wagon	LNER Non-corridor stock	LMS 57ft coach	BR Mk 1 coach	BR CI 156 'Sprinter'
Vehicle length over headstocks (VL)	Prototype ft	27' 6"	16' 6"	19' 10"	21' 6"	41' 10"	25' 8"	52' 4"	57'	64' 6"	73' 8"
	Model (mm)	192	116	139	150	293	180	366	399	452	515
Wheelbase (WB)	Prototype ft	6'	9'	10'	12'	25'	15'	36'	40' 6"	46' 6"	52' 8"
	Model (mm)	42	63	70	84	175	105	252	284	326	368
Curve radius	150	27.0									
	450	9.7	2.6	4.0	4.3	15.0	5.9	19.2	22.9	30.5	39.4
	600	7.3	1.9	3.0	3.2	11.3	4.4	14.5	17.0	22.5	29.0
	750	5.9	1.6	2.4	2.6	9.1	3.5	11.7	13.5	17.9	23.0
	900	4.9	1.3	2.0	2.2	7.6	2.9	9.8	11.2	14.8	19.1
	1200	3.7	1.0	1.5	1.6	5.7	2.2	7.3	8.4	11.1	14.2
	1500	2.9	0.8	1.2	1.3	4.6	1.8	5.9	6.7	8.9	11.4
	1800	2.4	0.7	1.0	1.1	3.8	1.5	4.9	5.6	7.4	9.5
	2400	1.8	0.5	0.8	0.8	2.9	1.1	3.7	4.2	5.5	7.1
	3000	1.5	0.4	0.6	0.6	2.3	0.9	2.9	3.4	4.4	5.7
3600	1.2	0.3	0.5	0.5	1.9	0.7	2.5	2.8	3.7	4.7	

Shaded region curves are below recommended minimum radius for the groups, (see Part 2, Section 1.1).

**The recommended track centre spacing is 80mm for running lines and 90mm for sidings.** These values are normally sufficient, but for long stock on sharper curves the 80mm value sometimes requires to be increased (denoted by bold entries in Table 2).

**Table 2 Minimum spacing between track centres for various curves and vehicle widths**

Group		1	2	3		4	5				
Example vehicle		4-wheel Preston Tram	1950 16T Std. Open Wagon	Banana Van	BR 24T Std. mineral Wagon	Met. Stock 1898	BR 45T Wagon	LNER Non-corridor stock	LMS 57ft coach	BR Mk 1 coach	BR CI 156 'Sprinter'
Vehicle length over headstocks(VL)	Prototype ft	27' 6"	16' 6"	19' 10"	21' 6"	41' 10"	25' 8"	52' 4"	57'	64' 6"	73' 8"
	Model (mm)	192	116	139	150	293	180	366	399	452	515
Wheelbase (WB)	Prototype ft	6'	9'	10'	12'	25'	15'	36'	40' 6"	46' 6"	52' 8"
	Model (mm)	42	63	70	84	175	105	252	284	326	368
Curve radius	150	<b>80.5</b>									
	450	62.2	73.7	75.4	76.3	93.6	78.9	107.2	114.3	126.9	144.2
	600	59.7	72.8	74.0	74.7	87.8	76.7	97.9	103.2	112.6	125.5
	750	58.2	72.2	73.2	73.8	84.2	75.4	92.3	96.5	104.0	114.3
	900	57.1	71.9	72.7	73.1	<b>81.9</b>	74.5	88.6	92.1	98.3	106.9
	1200	55.9	71.4	72.0	72.4	78.9	73.4	<b>84.0</b>	86.6	91.2	97.7
	1500	55.1	71.1	71.6	71.9	77.1	72.7	<b>81.2</b>	83.3	87.0	92.1
	1800	54.6	70.9	71.3	71.6	75.9	72.2	79.3	<b>81.1</b>	<b>84.2</b>	<b>88.5</b>
	2400	53.9	70.7	71.0	71.2	74.5	71.7	77.0	78.3	<b>80.6</b>	<b>83.8</b>
	3000	53.5	70.6	70.8	70.9	73.6	71.3	75.6	76.6	78.5	<b>81.1</b>
3600	53.3	70.5	70.7	70.8	73.0	71.1	74.7	75.5	77.1	79.2	