Evaluation of Parameters in A Turnout Taking Off a Main Line Curve (of a KTMB track)

Example for similar flexure:

A 1 in 15 turnout (Degree of curvature 4°) takes off from the inside of a main line curve of 500m radius. Find out the cant to be provided and Permissible Speed on main line, if the speed on turnout is 20 Km/hr

Degree of curvature of Turnout from a straight = 4°
Degree of curvature main line = 1750/R = 1750/500 = 3.5°
Degree of curvature of turnout from a curve = 4° + 3.5° = 7.5°
Radius of the turnout = 1750/7.5 = 233.33m.
Speed on the turnout = 20Km/hr
Super elevation for turnout = $GV^2/127.14R$

$$= \frac{1063.5 \times 20 \times 20}{127.14 \times 233.33}$$

= 14.34 mm
say 15 mm.

Cant on the main line = 15 mm + cant excess
= 15 + 65 mm
= 80 mm

Maximum permissible speed on main line with a cant of 80 mm

$$Vm = \frac{[\,R\,(Ca + Cd)\,]^{0.50}}{[\,8.37\,]^{0.50}}$$

= 88.15 or say 85 Km/hr

Example for contrary flexure:

Procedure for finding respective speeds on main and branch lines will be as follows:

- The equilibrium cant on branch line is calculated by usual formula by assuming suitable speed on branch line.
- The permissible cant deficiency is deducted from the equilibrium cant.
- The result thus obtained will represent the negative super-elevation to be given on the branch line.
- Evidently, the negative cant on branch line will be equal to the maximum cant permitted on the main line.
- Permissible cant deficiency is added to the maximum cant permitted on the main line and correspondingly, the restricted speed on main line is worked out.

A 1in 15 turnout (Degree of curvature 4°) takes off from the outside of a main line curve of 700 m radius. Find out the cant to be provided and permissible speed on mainline, if the speed on turn out is 20 Km/hr.

Degree of curvature turn out from a straight	= 4°
Degree of curvature of main line	= 1750/R
	= 1750/700
	= 2.5°
Degree of curvature of turnout from a curve	= 4 - 2.5 = 1.5°
Radius of the turn out	= 1750/1.5
	= 1166.67 m.
Speed on turn out	= 20 Km/hr
Super elevation for turn out	= $GV^2/127.14\ R$
	= $\frac{1063.5 \times 20^2}{127.14 \times 1166.67}$
	= 2.87 mm
	or, say 5 mm

For line with speed less than 100km/hr, maximum cant deficiency is 50mm.

Negative cant on turn out	= 50 - 5 = 45 mm
Hence positive cant on the main line	= 45 mm

Maximum permissible speed on main line with a cant of 45 mm

$$Vm = \frac{[\ R\ (Ca + Cd)\ ]^{0.5}}{[8.37\ ]^{0.5}}$$

$$= \frac{[700\ (45 + 50)]^{0.5}}{[8.37]^{0.5}}$$

$$= 89.16 \text{ or say } 85 \text{ Km/hr.}$$

Problem 1

A 6 degrees curve branches off from a 3 degrees main curve in an opposite direction in the layout of a B.G. yard. If the speed on the branch line is restricted to 35 kmph; determine the speed restriction on the main line. Assume permissible deficiency in cant as 76 mm.

Solution:

S.E. for branch line $= 1.315 \frac{v^2}{R} = 1.315 \frac{35^2}{1750/6} = 5.523$ cm

Negative super-elevation = 5.523 – 7.60 = -2.077 cm

Maximum S.E. that can be given on main line = 2.077 cm

Theoretical S.E. on main line = 2.066 + 7.60 = 9.677cm

Hence, $9.677 = 1.315 \frac{v^2}{1750/3}$

V = 65.92 kmph speed on main line

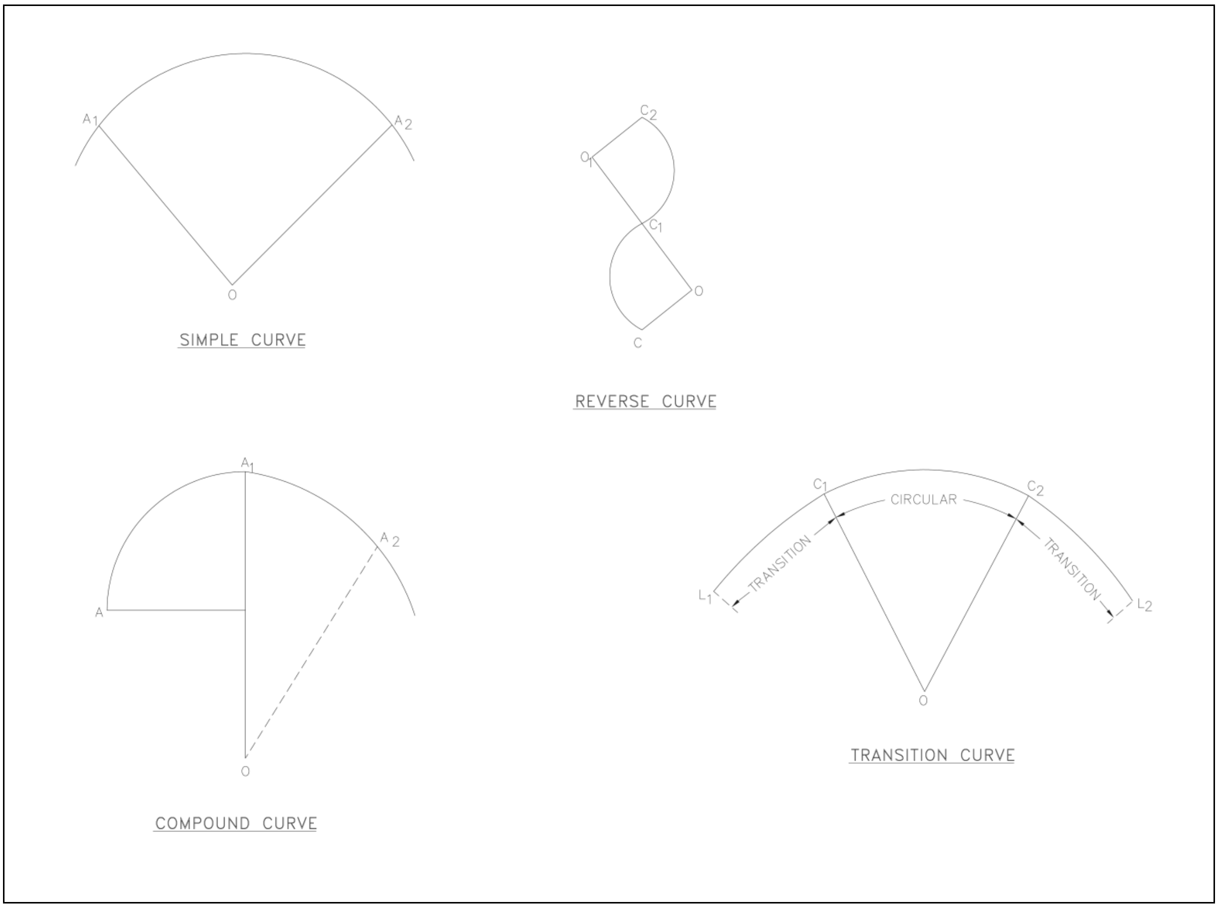

Figure C1: Types of Curves