TRACK PARAMETERS
STC/SBC.
The parameters which are normally measured in Permanent way are as follows.

1. Gauge
2. Twist (by measuring cross levels)
3. Alignment (by measuring versines in a curve)
4. General condition of track (in case of derailments)
A brief introduction of P.Way Components

• The basic components of Permanent way are

1. Rails
2. Sleepers
3. Ballast
4. Fittings for Rails and sleepers
RAILS

• Types of Rails used in IR are

<table>
<thead>
<tr>
<th>BG</th>
<th>MG</th>
</tr>
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<tbody>
<tr>
<td>60 KG/m</td>
<td>90R</td>
</tr>
<tr>
<td>52KG/m</td>
<td>75R</td>
</tr>
<tr>
<td>90 R</td>
<td>60R</td>
</tr>
</tbody>
</table>
SLEEPERS

1. Pre stressed Concrete sleepers (PSC)
2. Steel sleepers (ST)
3. CST – 9 Sleepers
4. Wooden sleepers
Fittings/Fastenings for Rails and sleepers

Rail Fastenings
1. Fish plates
2. Fish bolts
Sleeper fastenings

**Wooden sleeper**
Bearing plates – MS Canted bearing plate
   ACB plate
Spikes/Screws – Round spikes
   Plate screws
   Rail Screws
   (Dog spikes)
   Steel keys
Steel sleepers
Fastenings for steel sleepers

- Pandrol clips/ Steel keys
- Modified loose jaws/ ordinary loose jaws

Fastenings for CST-9 sleepers

- Steel keys
- MS Tie bar
- MS cotters
PSC sleeper Fastenings

- GRP (Grooved Rubber Pad)
- Liners (Metal/GFN)
- ERC (Elastic Rail Clips)

In case of PSC sleepers Periodical greasing of ERCs is to be done to avoid jamming.

(Periodicity)
Ballast

- Stone ballast is generally used in all types of track.
- In olden days ballast like sand, cinder, murrum etc., were being used.
- Minimum Recommended depth of clear ballast cushion for BG tracks.
  A - 300mm, B&C – 250mm, D – 200mm, E – 150mm
GAUGE

• It is the horizontal distance between the gauge faces of rails measured at 13 to 15mm from the rail top.
• BG – 1676mm
• MG – 1000mm
• NG – 762mm and 610mm
• It is measured with the help of Gauge cum level instrument.
Maintenance tolerances for gauge

- Broad Gauge
  - a) On straight -6mm to +6mm
  - b) On curves with radius\{ -6mm to +15mm
      350 m or more
  - c) On curves with radius\} upto +20mm
      less than 350 m
Maintenance tolerances for gauge

• Metre Gauge
  • a) On straight -3mm to +6mm
  • b) On curves with radius}
    290 m or more -3mm to +15mm
  • c) On curves with radius }
    Less then 290 m } Upto +20mm
Gauge cum level Instrument

With this instrument Gauge can be measured between -10mm to +20mm. Beyond this tape can be used.
**CROSS LEVEL**

- It is the level difference between two rails measured in mm with respect to one rail.
- Measured with the help of spirit level mounted over the gauge cum level.
- e.g. 10LL, 6RL, 4LL, 5RL etc.,
- LL means Left low
- RL means Right low
**TWIST**

- Twist is the calculated parameter with the readings of cross levels measured on track.
- It is defined as the rate of change of cross levels over a given base. (Algebraic difference)
- It is denoted as mm/m.
- For example, if the difference in cross levels measured at an interval of 3m is 6mm, then Twist = 6/3 = 2mm/m. (Depends on wheel base)
- On good riding comfort point of view for the passengers, the value of twist is limited to 2.8mm/m.
ALIGNMENT

• It is measured in terms of versine on a curve over a chord length at common intervals.
• In curves of plain track the versine is measured on 20m chord at the intervals of 10m.
• In points and crossings the turn in and turn out curves are measured on 6m chord at 3m intervals
### Service limit for station to station versine variation

<table>
<thead>
<tr>
<th>Speed Range</th>
<th>Limits of station to station Variation (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 Kmph and above</td>
<td>10 mm or 25% of the average versine on circular curve whichever is more</td>
</tr>
<tr>
<td>Below 120 Kmph and upto 80 Kmph</td>
<td>15 mm or 25% of the average versine on circular curve whichever is more</td>
</tr>
<tr>
<td>Below 80 Kmph and upto 50 Kmph</td>
<td>40 mm or 25% of the average versine on circular curve whichever is more</td>
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</tbody>
</table>
• Super Elevation – It is the amount by which the outer rail is raised over inner rail

• The formula for calculating SE

\[
\text{SE (in mm)} = \frac{GV^2}{127R}
\]

Where

G = Dynamic gauge in mm (1750 for BG, 1000 for MG), V = Max. Per. Speed in KMPH and R = Radius in ‘m’
CURVES

• Degree of curvature – The angle subtended at the center by a chord of 30.5 metres
• The radius for $1^\circ$ curve is 1750m
• The radius is inversely proportional to the degree of curvature
• The relation between Degree and radius is $D = \frac{1750}{R}$
RADIUS

• If we know the versine and chord length, we can calculate the radius with the formula
  \[ R(\text{in m}) = \frac{125C^2}{V} \quad (C= \text{Chord length in ‘m’}) \]
  \[ V \quad (\text{in mm}) \]

• The max. permissible curvature in BG is 10^0 i.e. the radius should not be less than 175m.
Max. Permissible SE

The max. permissible super elevation in BG
For A, B & C routes – 165mm
For D & E routes – 140mm
For MG – 90mm
For NG – 65mm
Types of routes in BG

- A route – Speed limit is up to 160kmph
- B route – Speed limit is up to 130kmph
- C route – Suburban sections of Mumbai, Kolkata, Delhi and Chennai.
- D route – Speed limit is 100kmph
- E route – Branch lines with speed less than 100 kmph.
Points and crossings

SRJ

Turn out

Check rail

Crossing

HOC
Points and crossings

• P&C are denoted with their angle of crossings such as 1 in 8.5, 1 in 12 etc.,
• Speed over 1 in 8.5 turnouts is 10kmph, and 1 in 12 turnouts is 15 kmph.
• In case of curved switches it is 15 kmph for 1 in 8.5.
• For 1 in 12 turnouts with PSC sleepers the speed can be increased to 30kmph with spl. approval.
Level Crossings

• The parameters to be checked in case of LCs are
Condition of road surface
Check rail clearance (Min-51, Max.-57mm)
Visibility for road users
Availability of road sign boards
Girder bridges

• Guard rail clearance 250± 50mm
• The guard rail should not be higher than running rail by not more than 25mm
• Full compliments of fittings are to be available on bridges.
• Inspection and painting once in 5 yrs.
• Greasing once in 3 years.
Track readings in Acc.spot

- Point of mount or point of drop to be established
- Track readings to be taken for 9m in rear of PM/PD at every sleeper and at 3m intervals for 90m
- For 45m over affected portion in the same manner
- Joint observations on general condition of track is to be recorded.
• Accident sketch is to be prepared involving all the features such as position of PM/PD, derailed wheels, direction of movement, track gradient, location of any fallen objects or foreign bodies.

• When the cause for the derailment is clearly established as other than track defect track readings need not be taken.