



SOUTH CENTRAL RAILWAY

Works Branch,
Rail Nilayam,
Secunderabad -71

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DEN/Bridges/SC, BZA, GTL & HYB

Sub: Measurement of Camber in Steel & PSC girders.

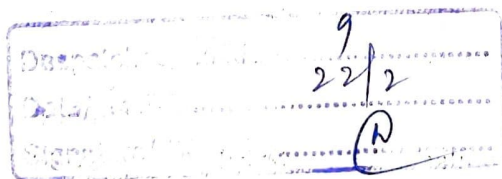
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Measurement of Camber in Steel Open Web girders & PSC girders for assessing camber loss if any, is a part of detailed bridge inspection of SSE/Bridges and AEN/Bridges. IRBM mentions the use of a reliable method for camber measurement which includes Piano wire, Leveling instrument or Theodolite. At present, Leveling instrument is being widely used in South Central Railway for measuring the camber of both Steel & PSC girders. To have uniformity as well as improvement in the existing method of measurement of camber, following instructions are issued:

1. Camber shall be measured for Steel Triangulated girders and PSC girders at the time of initial erection and subsequently during the detailed inspection of Superstructure as per the schedule given in IRBM.
2. Readings should be taken over the same marked locations for comparison of camber values measured periodically. Camber is measured by taking the relative position of the nominated locations of the girders with reference to the end points i.e., average of the readings taken at end points of the girder will be the reference for camber measurement at other points of the girder.
3. All readings of a girder span should be taken between passage of two consecutive trains. If any train passes over the bridge while taking the readings, all readings of this girder span shall be repeated again.
4. Temperature at the time of taking camber measurements shall also be recorded.
5. Camber measurement in Steel Triangulated Girders.
 - 5.1 Good quality Leveling instrument shall be used for measuring the camber and readings shall be taken on the cross girder at the panel point locations. Instrument shall be placed on the bridge approaches for taking measurements of the end spans and on trolley refuges for intermediate span measurements.
 - 5.2 For reliable measurements, the readings of each girder shall be taken from a single setting of the instrument. To minimize errors, the instrument shall be set in such a way that there is minimum or no traversing of telescope in horizontal plane.
 - 5.3 A sliding Vernier scale over the levelling staff with a least count of at least 0.5mm shall be used to improve accuracy of measurements.
 - 5.4 Two readings shall be taken at each panel point over the cross girder, one on each side of the track which is well marked with paint. Average of the two readings shall be considered.

6. Camber measurement in PSC Girders.

- 6.1 Camber measurements shall be taken underside of the girders. Total Station instrument shall be used for taking the measurements.
- 6.2 For girders with span up to 20m, camber readings at mid-span are sufficient. For girders of span greater than 20m, camber readings at quarter spans are also required to be taken.
- 6.3 In case of PSC I-girders, readings are to be taken for each of the I-girders in a span. For PSC BOX girders, readings along the centre line of girder bottom shall be taken at end, mid and quarter points.
- 6.4 End/Mid/quarter point locations shall be marked clearly with paint on the bottom surface of each of the girders. For easy visibility, the respective points shall be painted with a white circle of 10cm dia along the centre line of the girder bottom. White paint will facilitate proper reflection of laser beam back to the instrument where reflector less method of Total Station is adopted for measurement. If the concrete surface at the marking location is uneven or having any projections, mild grinding of the surface shall be done before painting the circle.
- 6.5 End point locations of each girder shall be marked near the face of pier cap so that they are visible to the telescope of the Total station and facilitate placement of prism reflector staff over the points.
- 6.6 It is preferable to take the Total station readings by using a Prism reflector staff wherever feasible. For spans having shorter pier heights and which are easily accessible during dry season of the year without any water flow in the span, it is possible to place the reflector staff on the girder underside for measurements.
- 6.7 For spans having flowing water throughout the year or where piers are very tall and girder underside is not easily accessible for placing the staff, readings may be taken using Reflector less method of Total station.
- 6.8 To minimize errors, the Total station shall be positioned approximately mid-way of each of the spans at a minimum lateral distance from the bridge. All readings of a span shall be taken with a single setting of the instrument. Taking readings of two or more spans with a single setting should not be resorted to.
- 6.9 If it is not possible to position the instrument mid-way of a particular span of the bridge due to water flow or any other reason, cradle type arrangement shall be made around the piers of this span for positioning the Total Instrument. Two sets of readings shall be taken for such spans with instrument positioned over the cradles at each pier and average of these readings shall be considered.



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22/2/2021
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