

TERMS OF REFERENCE (TOR)

SCOPE OF WORK FOR BRIDGE DPR PREPARATION

The consultant engaged for DPR Preparation for bridges shall be rendered the following services.

1) Survey work (Maps & Plan)

The survey comprises of the following

- a) Name of the channel/river, name of road, road code, location of the bridge (chain-age of the road with corresponding Km.), block, police station and district. The latitude and longitude of the bridge site should also be furnished.
- b) The Long Section and Cross Section of the approach road for at least 500 m for both U/S AND D/S side should be surveyed.
- c) The consultant should prepared an Index Map drawn into a scale of 1 cm – 0.5 Km. (1:50,000) showing the catchment area at the site of the proposed bridge all topographical features including Bridge & hydraulic structures within 5 Km. u/s and d/s of the proposed site should be clearly mentioned with dimension.
- d) A site plan should be prepared to a suitable scale showing details of the site selected and the extent of which not less than 100m on u/s and d/s side. The extent of the boundary should be selected as per the catchment area of the bridges. The following table may be referred (Table 3.1 of SP-13-2004)

Catchment Area	Distance (u/s and d/s from bridge point)
1. Up to 3.0 Km ²	100m
2. From 3.0 Km ² to 15 Km ²	300m
3. Over 15 Km ²	500m

The site plan should comprises of the following

- i) Out lines of the banks
- ii) High Water Channels
- iii) Low Water channels
- iv) Direction of the flow at maximum discharge
- v) Location and alignment of the existing bridge crossing the stream.
- vi) Proposed alignment of the bridge preferably normal crossing the stream.
- vii) The locations of the long section & cross sections taken with section number
- viii) The plan of proposed approach road along with location/marking of long & cross section. The cross section of existing approach should be taken at 30m interval.

2) Collection of Hydrological data of the catchment :

All hydrological data should be collected in consultation with the local irrigation Sub-divisional office at the bridge site. The following data should be collected.

- a) Highest flood level with respect to the GTS as per record of irrigation Department.
- b) Ordinary flood level with respect to GTS as per I & WD record.
- c) Low water level with respect to GTS as per record of I & WD.
- d) Maximum velocity corresponding to highest flood discharge as per record of I & WD.

- e) The level of deepest Scour hole observed at site/maximum scour during highest flood discharge as per record of I & WD.
- f) Silt factor of bed material as per record of I & WD.
- g) The river long section data starting from upstream side from the extent of boundary demarcated in site plan upto the extent of downstream side along the approximate centre line of the river/channel.
- h) Longitudinal slop (Energy slop) i.e. the equivalent stream slop/statistical mean stream slope of the river or channel showing HFL, LWL and bed level at suitable interval.
- i) The c/s of the river/stream to be furnished at 30m interval for both upstream and downstream side upto the extent of the boundary located in site plan. The data related to the catchment should be furnished as follows.
- j) The slope of the catchment both longitudinal and cross slope.
- k) The fall in level from the extreme point to the bridge point.
- l) The nature of the catchment whether under forests or under cultivation. This parameter is essential for assuming approx. correct value of drainage co-efficient.

3) Joint site Inspection of Consultant, SE & STA.

On the basis of hydrological survey and irrigation & Waterway sub division data the design discharge at the bridge site shall be fixed up. The site shall be jointly inspected by SE and STA in presence of Consultant and Consultant shall note their (SE & STA) valuable instruction regarding the span fixation of the bridges. The following criteria shall be verified at site.

a) Site Selection

Normally selection of site for bridges guided by existing road alignment for minimize the land acquisition however the following point should be verified.

- The site should situated on a straight reach to stream, sufficiently downstream at the bends.
- The site should be sufficiently away from the confluence of large tributaries as to be beyond their disturbing influence.
- The site should have a well defined banks.
- The site shall make approach roads feasible on the straight.
- It should be properly verified whether the stream have a tendency to charge the course to ascertain proper protection work if required.
- The site should offer a normal crossing.

b) Existing Drainage structure :

If there is an existing structure than it should be carefully verified for maximum flood level mark, occurrence of afflux, the tendency of scour and development of scour hole, the likelihood of collection of brushwood during floods and if any other special features available which could be effect the design.

c) Channel Condition

The condition of channel should also verified carefully for obtaining data regarding the silt factor and rugosity co-efficient.

All the reports shall be noted during site inspection and which shall be included in the body of Preliminary Project Report after compiling the recommendation of SE & STA.

4) Preliminary Project Report

The consultant who will engage for DPR preparation shall submit the preliminary project report to the Superintending Engineer for obtaining approval prior to the waterway vetting. The Preliminary Project Report shall be comprises of the following.

- a) Connectivity requirement of the bridge along with the habitations benefited, topography of the site and surroundings, Social and economical aspect of the area, traffic survey data, PCU calculation, description of the channel, location of the bridge along with geo-referenced co-ordinate, condition of existing road, description of catchment and other relevant points connected with the preliminary design.
- b) Hydraulic calculation at the proposed bridge site for calculating the design discharge. The hydraulic calculation shall be made as per the following three steps.
 - i) Using the any one of the impirical formula as per Article 4 of IRC : SP-13-2004 suitable for the respective catchment. The catchment area should preferably be estimated from the Topo-sheet of G.S.I. In case of non availability of the topo sheet the catchment area shall be obtained from the record of respective Irrigation sub divisional office / by actual boundary determined by the consultant during survey work. In such cases the catchment area shall be verified by local irrigation sub division.
 - ii) Using the rational formula for peak run-off through the catchment as per Article 4, cl 4.7.9 of IRC:SP-13-2004.
 - iii) Using the method of conveyance factor and slop of the stream as per cl 5.5 of IRC:SP-13-2004.

The design discharge shall fixed up as per cl 6.2.1 of IRC:SP-13-2004. The design discharge should be prepared in consultation of local irrigation sub divisional office.
- c) On the basis of the design discharge calculation of Lacey's regime linear waterway shall be made. If the constriction of waterway is made than the amount of afflux generated should be calculated.
- d) A Preliminary scour calculation should be furnished in the PPR on the basis of silt factor obtained from the local irrigation sub division or as per IRC:78-2014. The design discharge should be enhanced as per recommendation of IRC:78-2014 depending upon the catchment area. The scour calculation must be made on the basis of restricted waterway.
- e) On the basis of span Arrangement adopted and other data calculated in PPR the General Arrangement Drawing shall be prepared. In GAD both long section/Elevation. Cross view, Plan should clearly mentioned. All important levels with RL should be clearly mentioned in GAD.
- f) A preliminary cost estimate should be provided in PPR.
- g) A preliminary Soil Investigation report with probable type of foundation proposed should furnished in PPR.

The consultant shall accord necessary approval for PPR & GAD from Concerned EE & SE prior to the submission for waterway vetting.

5) Vetting of Waterway

