

**S .09: SHALLOW FOUNDATIONS****9.1. General**

The work shall cover furnishing and providing plain or reinforced concrete foundation placed in open excavation, in accordance with the drawings and these Specifications or as directed by the Engineer.

Shallow foundations shall be used where a suitable bearing stratum is found near the surface without any highly compressible layers below and calculated settlements are within acceptable limits.

A method statement indicating the following shall be submitted by the Contractor for approval of the Engineer, well in advance of the commencement of construction of open foundation:

- i) Sources of materials
- ii) Design, erection and removal of formwork
- iii) Production, transportation, laying and curing of concrete
- iv) Personnel employed for execution and supervision
- v) Tests and sampling procedures
- vi) Equipment details
- vii) Quality Management System to be adopted including Quality Manual
- viii) Any other relevant information

Details of necessary arrangements for execution under water wherever necessary, shall be included in the method statement.

Dimensions, lines and levels shall be set out and checked with respect to permanent reference lines and permanent benchmark so that the foundations are located correctly and in accordance with the drawings.

Formwork, steel reinforcement and structural concrete for open foundations shall conform to S.02, S.05 and S.03 of Section-VII-F respectively of these Specifications.

**9.2. Workmanship****Preparation of Foundations**

Excavation for laying the foundation shall be carried out in accordance with S.02 of Section-VII-F of these Specifications. The last 300 mm of excavation shall be done just before laying of lean concrete below foundation. Excavation shall be made only to the exact depth as shown on the drawing or as approved by the Engineer.

Open foundations shall be constructed in dry conditions and the Contractor shall provide for adequate dewatering arrangements, wherever required, to the satisfaction of the Engineer.

Open foundations should be located on the firm ground having stable strata of having SBC as per drawing or as specified by the Engineer. The strata shall be well compacted before levelling course and foundations are laid on the levelling. In case foundations resting on rock, no foundation shall be laid on sloping rock. The rock shall be made level for the width of the foundation before levelling course is laid. Before seating on the rock, bearing capacity of the rock shall be assessed properly, and safe bearing capacity assessed in the designs is to be confirmed.

In case of Open foundation resting on rock, seating of the rock shall be achieved by providing adequate no. of anchorage bars drilled to the required depth in the rock or as directed by Engineer-In-Charge.

Cost of the same is deemed to be included in the contract price and nothing extra shall be payable to the contractor in this regard.

**Setting Out**

The plan dimensions of the foundation shall be set out at the bottom of foundation trench and checked with respect to original reference line and axis.

**9.3. Construction**

- i. For foundation resting on soil, a layer of M15 concrete of minimum thickness 100 mm shall be provided above the natural ground to provide an even surface to support the foundation concrete. Before laying of lean concrete layer, the earth surface shall be cleaned of all loose material and wetted. Care shall be taken to avoid muddy surface. If any part of the surface has become muddy due to over-wetting, the same shall be removed. If required, the M15 concrete may be laid to a thickness of more than 100 mm, as per the direction of the Engineer. For foundations resting on rock, the rock surface shall be cleaned of any loose material and then levelled with a layer of concrete of the same grade as that of the foundation, so as to provide an even surface.
- ii. No point of the surface of the lean concrete, in the case of foundation on soil or the surface of hard rock, in the case of foundation on hard rock, shall be higher than the founding level shown on the drawing or as ordered by the Engineer. Levels of the surface shall be taken at intervals of not more than 3 metres centre-to-centre in each direction, subject to a minimum of nine levels on the surface.
- iii. Foundation Concreting to be done as per specified in the S.03 of Section-VII-F of these specifications. The concrete surface shall be finished smooth with a trowel.
- iv. Open foundations shall be laid dry. Where dewatering is necessary for laying of concrete, it shall be carried out adopting any one of the following methods or any other method, approved by the Engineer.
- v. All spaces excavated and not occupied by the foundations or other permanent works shall be refilled with sand or approved suitable material up to surface. surrounding ground with sufficient allowance for settlement. All backfill shall be thoroughly compacted and in general, its top surface shall be neatly graded. Backfilling shall be in accordance with S.02 of Section-VII-F of these Specifications.

**9.4. Tests and Standards of Acceptance**

The materials shall be tested in accordance with these Specifications and shall meet prescribed criteria.

The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

Test Bore shall be done at each Pier Location, or as approved by the Engineer-In-Charge, as per IS 1892 for determining strata of the sub-soil for Open Foundation. Standard Penetration Test (SPT), as per IS 2131, in a bore hole shall be conducted at 1.0 m intervals in the overburden soil and rock portion having core recovery  $\leq 30\%$ .

**Contractor shall conform bearing capacity and settlement for shallow foundation at each foundation location via SPT/Plate Load Test. Contractor shall conduct at-least one Plate Load Test for each type of shallow Foundation. Nothing extra shall be payable to the contractor on this regard.**

**9.5. Tolerances**

- a) Variation in dimensions : +50mm, -10mm
- b) Misplacement from specified position in plan : 15mm
- c) Surface unevenness measured with 3 m straight edge: 5mm
- d) Variation of levels at the top :  $\pm 25$ mm

**9.6. Measurement (applicable to the BOQ schedules)**

Excavation in foundation shall not be payable, rates of the same is deemed to be included in the rate of Concrete works.

Lean concrete shall be measured in cubic metres in accordance with S.03 of Section-VII-F of these Specifications, based on the as shown on the drawing.

Concrete in foundation shall be measured in cubic metres in accordance with S.03 of Section-VII-F of these Specifications, based on the as shown on the drawing.

Reinforcement steel shall be measured in tonnes in accordance with S.05 of Section-VII-F of these Specifications, based on the as shown on the drawing.

The contract unit rates for excavation in foundation, lean concrete, including dewatering and blasting where required, concrete in foundation and reinforcement steel shall include all works as given in respective Sections of these Specifications and cover all incidental items for furnishing and providing open foundation as mentioned in this Section and as show on the drawings.