

## **SECTION - 3**

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- 6) **Earth work excavation:** This includes excavation in all types of soil strata including hard rock and disposing of excavated surplus stuff after back filling to the places, shown by the Engineer-in-charge within the station premises or outside the premises of sub-station, to any notified disposal point of local bodies.
- 7) **Back filling and consolidation:** Back filling shall be done in layers of 250 mms thick for yard leveling & 150 mms thick for trenches backfilling duly watering and compacting to the required density. If the excavated earth is not suitable for back filling, then the approved new earth shall be brought from outside, mixed with 3% cement (only for casing below foundations / trenches backfilling) and shall be used for back filling. Back filled earth & the sub-grade for the roads and embankment shall be compacted to minimum 96% of the standard Proctor's Density at OMC.
- 8) **Cement concrete mixing and laying:** The cement concrete shall conform to the requirement mentioned in IS-456 and all the test shall be conducted as per relevant Indian standard codes. The concrete shall be machine mixed and laid in layers of 150 mms thick and compacted using suitable vibrators to required shape. The bidder shall arrange for testing of concrete cubes at different stages of work as desired by the owner at his own cost.
- 9) **Cement:** The cement used shall be ordinary port land cement (OPC) of 43/53 grade and shall conform to relevant IS. The bidder shall produce test certificates for each lot of cement procured.
- 10) **Reinforcement steel:** Reinforcement shall be cold twisted deformed bars conforming to IS-1786 (Tor steel 40 grade) and in specific areas mild steel (Grade-I) conforming to IS-432 can also be used. Bidder shall produce test certificates issued by SAIL for each lot of reinforcement procured at site. Clear cover of 40 to 50 mm shall be left to the reinforcement from the external concrete surface.
- 11) **Jelly:** The jelly used shall be of hard broken granite/basalt/trap metal free from dust and organic material and shall be well graded. For bed concrete/leveling course (PCC 1:4:8) 40 mm and down size jelly shall be used and for coping, basement, cills, screed concrete, structural concrete, Design Mix etc (PCC/RCC 1:2:4, 1:3:6 & concrete M20 Grade) 20 mm and down size jelly shall be used.
- 12) **Sand:** white river sand free from clay and any other organic materials very well grained and cleanly sieved shall be used.

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- 13) **Bricks:** Standard size table molded, well-burnt Bricks having minimum compressive strength of 45 Kgs per Sq Cms with neat edges shall be used. But in places where laterite stones are available the same may be used in place of bricks.
- 14) **Centering, formwork:** Only steel/plywood/plank centering shall be used for construction work. The centering material shall be discarded as soon as it losses its shape. Centering works shall be done to line and plumb with sufficient support to bear the dead weight of concrete and live loads during execution of work. The centering shall be water tight to avoid wheezing out of cement slurry during vibrating.
- 15) **Curing:** Curing shall be done for a minimum period of 10 days & maximum period of 28 days until the structures develops the required strength. The bidder shall construct a water storage tank for storing water and install 1 HP pump with distribution line for usage of water for construction & curing, as per the direction of Engineer-in-charge. The exposed faces of concrete shall be covered with gunny bags to keep the surface damp. The Max & Min period of curing may be decided with the Engineer in charge of the work depending upon the importance and type of the structure& surface to be kept damp.
- 16) **Taxes:** Bidder shall note that all the applicable taxes viz., sales tax, income tax, royalties, excise duties, octoroi, VAT etc will be deducted out of the bills submitted for payment during the course of work as per the prevailing rates of Govt of India and Karnataka State Government.
- 17) Contractor shall comply with all the applicable statutory rules pertaining to factories act (as applicable for the state), fire safety rules of Tariff Advisory committee, Water act for pollution control etc.
- 18) Foundation system adopted shall ensure that relative settlement shall be as per provision of IS-1904 and other Indian standards.
- 19) **Interaction:** The proper co-ordination and execution of all interfacing civil works activities like fixing of conduits in roofs/wall floors, fixing of foundation bolts, fixing of lighting fixtures, fixing of supports/embedment, provision of cutouts etc., shall be the sole responsibility of the contractor. He shall plan all such activities in advance and execute in such a manner that interfacing activities do not become bottlenecks and dismantling, breakage etc. is reduced to minimum.
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- 21) The excess quantity of earth obtained from site leveling and from foundations and other works shall be filled in low laying areas of the station premises or transported to any notified areas of local body outside the station without any extra cost.
- 22) Bidder shall visit the site and shall obtain all required information regarding the availability of labour, materials, machineries etc., before submitting their offer. Any other additional information and details can be obtained from the concerned transmission offices of KPTCL. Any plea/request for the revision of rates owing to non-availability of the materials or insufficient quantity of materials will not be considered/entertained under any circumstances, which may please be noted.

**II. SITE LEVELING:**

SCOPE: - The scope of Site leveling work includes the following with out any additional cost.

- 1) The bidder shall take the block levels of entire station area at an interval of 5 mtrs and plot the same marking contours at regular intervals. The block level drawing shall be submitted for approval along with calculations of cutting and filling quantities duly proposing the economical FGL of the yard.
- 2) Based on the above block levels,
- 3) the owner will decide the FGL to suit the requirement of station yard.
- 4) Clearing the site area free of bushes, trees including removal of roots, any unsuitable materials, demolition of any temporary building/structure and removal of debris/unserviceable materials, stacking within the premises or any disposal point away from the station area as per the decisions of the Engineer in charge of the work and stacking of useful/serviceable materials outside the yard within the station premises in the manner directed.
- 5) Leveling the station area to the required RL. The work includes cutting/excavating the areas above FGL in all types of soil and rock including soft rock, hard rock, hard laterite by blasting or chiseling, transporting the excavated earth to the areas lower than FGL, removal of roots, vegetation and other organic materials, breaking of clods, filling the areas lower than FGL in layers of 250mm loose thickness and consolidating the same using PRR to Proctors density of 96% to the required line, grade and cross section.

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- 6) The shortage of earth if any shall be made good with the surplus earth from the foundation and other works. However if the earth is found shortage for leveling even after usage of all surplus available earth from all excavations, then such excess quantity of new earth brought from outside and used for site leveling only, will be paid at such rates provided in the price schedule for associated civil Engineering works or payment will be regulated as per the terms and conditions stipulated in the contract.
- 7) The excess/surplus earth & excavated rock shall be disposed off to the places within the station premises/stocked at the desired places or outside the premises to any notified disposal point of the local bodies as per the decisions & directions of the Engineer in charge of the work.
- 8) In the areas where the movement of roller is not possible, compaction shall be done using surface vibrators duly adding water to get the required density. Due care shall be exercised so as not to damage any foundation, structure, equipments etc during compaction.
- 9) If the type of soil encountered is black cotton soil/expansive soil or unsuitable for acceptance, then new approved earth/murram brought from outside shall be spread to the entire switchyard area to a depth of 300mm (compacted thickness) excluding plinths of the structures, roads, drainage, buildings, cable ducts etc and consolidated/compacted to proctors density of 96% to the line, grade and cross section after completion of casting of foundations and other works before Antiweed treatment and Jelly spreading. Payment for the use of new earth for site leveling will be regulated as stated under Sl.NO. (6) above.
- 10) Bidder shall quote rate per CMTR to carryout:
  - (i) Site leveling – Cutting in all types of soil and rock and filling with available earth including compaction, disposal of surplus earth etc
  - (ii) Filling the yard with new / borrowed earth including compaction etc.

**III. FOUNDATION TO STATION TOWERS, EQUIPMENTS AND OTHER SUCH WORKS**

**a) General:**

- 1) Copy of the soil investigation report if available may be obtained from the concerned transmission office of KPTCL and if the same is not available the contractor has to carryout the soil investigation and the designs shall be based on the test report.

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- a) All machine foundations shall be designed in accordance with the provisions of the relevant parts of latest revisions of Indian standards IS: 2974, IS: 456, IS: 2911. The provisions of DIN 4024 (latest) shall also be followed.
- b) All block foundations resting on soil or piles shall be designed using the elastic half space theory. The mass of the RCC block shall not be less than three times the mass of the machine. Dynamic analysis shall be carried out to calculate natural frequencies in all the modes including coupled modes and to calculate vibration amplitudes. Frequencies and amplitude criteria as lay down by the relevant IS codes and/or machine manufacturers, shall be satisfied. Minimum reinforcement shall be governed by IS: 2974 and IS: 456. & M 20 concrete shall be used for construction.
- c) For the foundations supporting minor equipments weighing less than one tone or if the mass of the rotating parts is less than one-hundredth of the mass of the foundation, no dynamic analysis is necessary. However, if such minor equipments is to be supported on building structure, floors etc., suitable vibration isolation shall be provided by means of springs, neoprene pads etc. and such vibration isolation system shall be designed suitably.
- 18) Other foundations:
- All foundations shall be designed in accordance with the provisions of the relevant parts of latest revisions of Indian Standards IS: 2911 and IS: 456. & M 20 concrete shall be used for construction.
- i) Type of foundation system i.e., isolated or combined footing or raft or piling shall be decided based on the load intensity and soil-strata.
- ii) Minimum three piles shall be provided in any pile group, if required. The tower and equipment foundations shall be designed for a factor of safety of 2.2 for normal/broken wire condition and 1.65 for short circuit conditions.
- c) Admixtures & Additives:

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- 1) Only approved admixtures shall be used in the concrete for the works. When more than one admixture is to be used, each admixture shall be batched in its own batch and added to the mixing water separately before discharging into the mixer. Admixtures shall be delivered in suitably labeled containers to enable identification.
  - 2) Admixtures in concrete shall conform to IS: 9103. The waterproofing cement additives shall conform to IS: 2645. Concrete admixtures / Additives shall be approved by Owner.
  - 3) The contractor shall use an approved neutralized vinsol resin air-entraining agent in all concrete. The air-entraining agent shall be supplied and batched as a solution with solids content not exceeding 15 percentages by weight with suitable, stable & consistent pH. Air –entraining requirements shall be in accordance with CP 100 part I.
  - 4) The contractor may propose and the Owner may approve the use of water reducing set-retarding admixture in some of the concrete. The use of such an admixture will not be approved to overcome problems associated with inadequate concrete plant capacity or improperly planned placing, operating and shall only be approved as an aid overcoming unusual circumstances and placing conditions.
  - 5) The water-reducing set-retarding admixture shall be an approved brand of ignosulphonate type admixture
  - 6) The waterproofing cement additives shall be used as required / advised by the owner.
- d) Hot Weather Requirement:
- 1) As per relevant code, during hot weather, precautions shall be taken to avoid premature stiffening of the fresh mix and to reduce water absorption and evaporation losses and when the temperature of the surrounding air is higher than 30 degree C; the following shall apply unless otherwise approved by the owner.

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- a) The formwork shall be continuously sprayed with cold water in advance of concreting and excess water shall be removed from inside the forms immediately prior to placement of concrete.
- b) The reinforcement and the formwork (if metal forms are used) shall be protected from the effect of hot winds and direct sunlight.
- c) Suitable barriers shall be provided to protect the freshly placed concrete from wind until the concrete is sufficiently hard.
- d) The concrete when placed shall be maintained at a temperature of less than 30 degree C by the use of chilled water or by spraying the aggregate with cold water.
- e) The concrete shall be mixed, transported, placed and consolidated, as rapidly as possible and shall then be covered with an impervious membrane or wet Hessian until moist curing begins.
- f) Curing compounds shall not be used as an alternative to the requirements of (clause 8.10.3) curing.
- g) During hot weather (atmospheric temperature above 40<sup>0</sup> C) or cold weather (atmospheric temperature at & below 5<sup>0</sup> C) the concreting shall be done as per the procedure set out in IS: 7861 (part I & II).

**IV(a). R.C.C. CABLE DUCTS**

- 1) Cable ducts shall be constructed by RCC of grade M 20 as per typical drawings furnished by the owner. RCC pre-cast cover slabs shall be provided for covering the top portion. At junction and where pre-cast slabs cannot be provided cast-in situ slabs may be provided.
- 2) The trench bed shall have a slope of 1 in 500 along the run and 1 in 250 perpendiculars to the run.
- 3) Trench wall shall not foul with the foundation. Suitable clear gap shall be provided.
- 4) Water flow diagram to drain the storm water collected in the drain shall be prepared and got it approved. If the topography of the area permits the gravity flow, water collected in the drain shall be effectively discharged to the convenient point outside the station by



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- 1) The length of the crossing shall be to the full width of the road and section shall be kept as that of the duct for which the crossing is required.
- 2) The scope of work applicable to RCC duct specified under 4(a) is also applicable to cable duct crossing.

**IV(c).RCC HUME PIPE SUB DUCTS**

**Bidder shall quote Rate per Rmtr of cable duct. Rate shall include cost of excavation in all types of soil and rock, backfilling and disposal of surplus earth/rock, supplying, providing and jointing RCC hume pipes of 150mm dia NP2 class/of required dia with collars, GI/PVC pipes for taking cables from equipments to ducts/chambers, etc as per detailed specification and directions of the Engineer in charge of work.**

**IV (d). INSPECTION CHAMBERS:**

**Inspection chambers of size 650x450mm / 450X450mm as required shall be provided wherever required as per layout and directions of Engineer-In-Charge of work. Rate per number shall be quoted. Work includes excavation, back filling and disposal of surplus earth / rock, bed concreting, brick masonry / laterite masonry walls, CI frame and cover, plastering etc., required for the completion of work as per specifications and directions of the Engineer-In-Charge of the work.**

**V. JELLY SPREADING:**

Bidder shall quote rate per Smtr of area for Jelly spreading. After the soil sterilization, material is applied and surface prepared/compacted to the required slope/grade, 100 mm thick layer of granite/basalt/trap jelly of 20/25mm size shall be spread over the area marked in drawing for jelly spreading as per drawing and directions of Engineer in charge of work.

The material required for jelly spreading shall be free from all types of organic materials, flakes and shall be of standard approved quality and as directed by the owner.

The 20mm nominal size shall pass through IS sieve designation 40mm and nothing through 16mm IS sieve.

The area marked in the drawing (excluding buildings, pathways, roads, drains, cable ducts, equipment/structure plinths etc) shall be covered with jelly.

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The work shall be taken up after completion of all construction activities including Antiweed treatment.

**VI. AUTO TRANSFORMER/REACTOR FOUNDATION, RAIL TRACK/ROAD CUM RAIL TRACK:**

The Contractor shall provide a permanent transfer track system integrated with the Auto transformer/reactor foundation to enable installation and the replacement of any failed unit by the spare unit located at the site. The transfer track system shall be suitable to permit the movement of any failed unit fully assembled (including OLTC, bushings) with integral radiators and oil, without the deenergization of any other equipment in the station. This system shall enable the removal of any failed unit from its foundation to a repair area and the installation of the spare unit. This system, preferably, shall not interfere with the normal internal road and trench system. If trench/drain crossings are required, then suitable RCC culverts shall be provided in accordance with IRC Code/relevant IS. Rail tracks shall be of RCC, minimum M20 grade. The space between the tracks shall be suitably filled with local sand and 75 mm thick PCC of grade 1:4:8 placed over sand filling. The top of PCC shall be up to the formation level. Suitable drainage system between the tracks shall be provided.

The rails shall be first quality 52 Kg/m medium manganese steel as per Indian Railway specification T-12-64 and its subsequent revision, joined together by fish plates as per Indian Railway specification T-1/57 and their drawing no.090 M and 27mm diameter fish bolts.

The Contractor shall provide a pylon support system for supporting the fire fighting system.

**Reactor/Transformer shall rest on block foundations only.**

**Waste oil pit /Soak pit:**

A waste oil pit/ soak pit shall be provided for storage of oil during fire break out and operation of Nitrogen fire fighting system. Size and other details shall be as per the recommendations of the Nitrogen fire extinguish system Manufacturer. The soak pit shall be constructed with RCC M20 Grade.