



भारत हेवी इलेक्ट्रिकल्स लिमिटेड

( भारत सरकार का उपक्रम )

**BHARAT HEAVY ELECTRICALS LIMITED**

(A Govt. of India Undertaking)

**TCN - 01**

Ref: PSER:SCT: KDM-C1402:TCN-01

Date: 16-10-2012

|     |   |   |
|-----|---|---|
| Sub | <b>Tender Change Notice (TCN) - 01.</b>   |   |
| Job | Civil, Structural & Architectural Work for Ash Pond Package for 2x500 MW units # 1 & 2 at Koderma Thermal Power Station, Jharkhand. |   |
| Ref | 1.0   | Tender no PSER:SCT:KDM-C1402:12   |
|     | 2.0   | BHEL's NIT, vide reference no PSER:SCT: KDM-C1402:2974 Date: 27-09-2012 |
|     | 3.0   | Other References,if any.  |

With reference to above, following points, relevant to tender, may please be noted and complied with while submitting the offer.

1. Introduction of Technical Specification –Specification No PE-TS-280-600-C001.
2. Due date of offer submission is extended from 18-10-2012 to **31-10-2012** (15=00 Hrs). Bidders are requested to submit their offer by extended due date positively.
3. Revised 'No deviation certificate' is attached. Bidder to submit 'No deviation certificate' as per attached format only.
4. All other terms & conditions shall remain unchanged.

Thanking you,

Yours faithfully,  
for BHARAT HEAVY ELECTRICALS LTD

Engineer (SCT)

Encl:

- 1.0 Technical Specification –Specification No PE-TS-280-600-C001.
- 2.0 Revised Format of 'No deviation certificate'.

पावर सेक्टर पूर्वी क्षेत्र ( मुख्यालय )

POWER SECTOR EASTERN REGION, DJ-9/1, SALT LAKE CITY, KOLKATA - 700 091

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# **DAMODAR VALLEY CORPORATION**

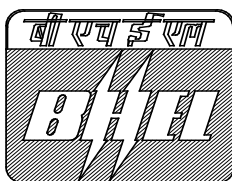
## **2X500 MW KODERMA THERMAL POWER STATION STAGE -1 [UNIT 1&2]**

### **MAIN PACKAGE**

#### **VOLUME – II B CIVIL, STRUCTURAL & ARCHITECTURAL WORKS**

**SPECIFICATION NO. PE-TS-280-600-C001**

#### **SECTION - C *SPECIFIC TECHNICAL REQUIREMENTS***



**Bharat Heavy Electricals Limited**  
Project Engineering Management  
PPEI Building, Power Sector,  
Plot No. 25, Sector 16A,  
Noida-201301

**20.00.00 ASH DYKE – CIVIL WORKS****General technical requirements**

Technical specifications related to the construction of ash dyke elements are given under this section in two parts. Section-I gives the general technical requirements whereas Section-II consists specifications for particular items. The specifications for Reinforced concrete works for spillways and water escape wells etc are given elsewhere in the specifications.

**Geotechnical investigation**

Detailed investigations shall be conducted by the Contractor to find out the properties of foundation soil as well as the borrow area soil.

**Design criteria**

The contractor shall submit the calculations for the ash storage capacity for the ultimate stage of the dyke for 25 years of plant operation, for approval of the Engineer. Accordingly, the scheme and design for the starter dyke and raisings thereafter shall also be submitted for approval. For defining the profile of the phreatic line across the dyke section, a comprehensive seepage analysis shall be done for the ultimate height of the dyke, with full water inside and tail water (if any due to H.F.L.), on outside of the dyke, before doing the stability analysis. The slope stability analysis of the dyke for ultimate stage shall be done for steady seepage condition both for static and dynamic (earthquake) cases as per IS: 7894 –Code of Practice for Stability Analysis of Earth Dams.

For the design of ash dyke, some basic design guide lines are given below:

**Basic guidelines****a) Lagooning system**

The ash disposal area has to be developed for the storage of ash generated in the full life of the power plant (25 yrs). The ash disposal area will consist of two storage lagoons , 150 acres each and one common overflow lagoon of about 70 acres. The storage lagoons shall be planned in such a way that when one lagoon is in the process of filling, the other lagoon can be constructed before the first lagoon is filled up.

The starter dykes of all three lagoons shall be constructed using earth as the main construction material to be arranged by contractor. Once the starter dyke is filled, then alternate raisings of ash dykes of 3 m height each, using ash as main construction material, may be constructed till the ultimate height is reached. Free board of 1.5 m shall be kept for starter dyke as well as in subsequent raisings. Only starter ash dyke with earth is in presently envisaged for all lagoons..

The water from the storage lagoons shall escape to the overflow lagoon (OFL) (of about 70 acres) through RCC water escape well type structures and RCC hume pipes of suitable diameter. These hume pipes shall be lined with rectangular RCC section, with minimum lining thickness of 250 mm at bottom & 150 mm on all other sides.

The water from the OFL shall escape through a RCC box culvert spillway on the upstream and down stream side shall be lined with min 200 thick RCC. The outfall structure shall have stairway type energy dissipating devices on the down stream slope of the dyke.

#### **b) Design of Embankment**

For Layout of ash dykes along with ground contours refer Drg No 0000-999-POC-A-002. The design of embankment shall be done by a process of successive trials and refinements. The following steps may be followed.

Select a trial embankment section incorporating the available materials, with the following parameters.

- |             |   |  |
|-------------|---|--|
| Top width   | - | 6 metre minimum having a WBM road of 3.75 m wide with 100 mm and 150 mm of base & sub-base respectively. Higher top width shall be provided if pipe lines are to be run over the dyke top. |
| Free board  | - | 1.5 metre minimum. Higher free board shall be provided if required from the anticipated wave height and from run up point of view.   |
| Side slopes | - | Minimum 2.5 Horizontal to 1 Vertical. 3m wide berms shall be provided for all slopes at about 6 metre height intervals.  |

- Clay blanket - Bottom of all the three lagoons shall be provided with a minimum of 600 mm thick clay blanket.

Internal drainage arrangement should be provided as follows:

- a) Sand chimney of minimum 0.5 metre thickness, upto 1.5 m below dyke top.
  - b) Sand blanket of minimum 0.5m depth
  - c) Rock toe at the downstream toe of embankment. Height of rock toe should be minimum 1.0 metre. With the above drainage arrangements, the phreatic line is expected to follow the drainage path.
  - d) The exit gradient of seepage flow near the downstream toe shall be checked by drawing flownets. The exit gradient shall not exceed about 0.14. If the gradient is more than this value, the dyke slope will have to be flattened to reduce the gradient.
- c) Slope protection works

- a) On the downstream slopes, where the annual rainfall is less than 200cm, and where there is no existence of water collections, turf sodding is sufficient.

When the annual rainfall is more than 200cm, downstream slopes shall be protected by minimum 30cm thick stone pitching.

Wherever, there are chances of water accumulation on the downstream side, the slope shall be protected by stone pitching of suitable thickness, depending upon the wave height likely to act on the slope, in the region from 1.5 metre above the maximum water level to 1.5 metre below the minimum water level.

- b) On the upstream slope, stone pitching 30cm thick shall be provided for the top portion, (from about 1.5 metre below the FRL upto the top of the dyke).

No protection is required below FRL for U/S slope since it will be submerged under water/ash always.

- c) On the top of dyke, Water Bound Macadam surfacing shall be made for movement of vehicles, which will also give protection to the earth surface against rain and wind erosion.

**d) Cut-off trench**

If foundation material is very impermeable, a nominal cut-off trench shall be provided in the portion upstream of sand chimney, to increase the drainage path of any seepage occurring at the junction between the embankment and its foundation. A minimum bottom width of 4m shall be provided for the cut-off trench to facilitate compaction with rollers. A depth of 1 to 1.5m may be adopted with 1:1 side slope in earth. If rock is available at a depth less than 1 metre, the cut-off trench may be stopped at the rock level itself.

The effect of cut-off trench is not taken in the design and it is only provided as an additional precaution against piping failure in foundation.

**e) Filters**

Filters are to be provided below stone pitching and between rock toe and the embankment material.

**f) Instrumentation**

In order to monitor the performance of ash dyke during construction and operation the following instruments should be installed at approximate distance of 500 metre along the alignment of dyke and at critical locations.

- a) Piezometers
- b) Surface settlement markers

**REFERENCES**

- i) IS: 1498 : Classification and Identification of Soils for General Engineering Purposes.
- ii) IS: 7894 : Code of Practice for stability Analysis of Earth Dams.
- iii) IS: 8237 : Code of Practice for Protection of Slopes for Reservoir Embankment.
- iv) IS: 8826 : Guidelines for design of large Earth and Rockfilled Dams.
- v) IS: 9429 : Code of Practice for drainage system for Earth and Rockfill Dams,

- |                      |                         |
|----------------------|-------------------------|
| vi) Singh and Sharma | Earth and Rockfill Dams |
| vii) USBR            | Design of Small Dams    |
| viii) USBR           | Earth Manual            |

**Other requirements**

The proposed ash dyke area is 520 Acres and its boundary is about 1 Kms from the plant boundary. The ground level at the proposed ash dyke area is varying from RL 344 to RL 366. The contractor is expected to visit actual site conditions in order to assess its actual area, distance etc, and other conditions which will have bearing on the design and construction of the ash dyke as per specified requirements and the cost thereof.

The required borrow areas for dyke construction and clay blanket shall be identified and arranged by contractor. All costs associated to borrow material / borrow areas including any royalties, tax, cess, etc. to be paid, shall be borne by the contractor.

Depth of cuts in all parts of borrow areas will be determined by the Engineer and shall be as uniform as possible. No earth shall be borrowed from inside the lagoons.

When the borrow area is located contiguous to the dyke alignment then it must be ensured that the borrow area shall not be opened within a distance of 5 times the height of embankment contiguous to the heel or the toe of the embankment or 25 metres whichever is more.

The required approach roads and haul roads shall be constructed and maintained by the contractor. The contractor shall divert the existing roads, if any which are in the ash dyke area at his own cost before the start of work.

The foundations of the different stretches of the dykes may fall on different soil conditions depending on actual site conditions. It may be on virgin ground or may be on filled up area. However, for peripheral starter dyke, if filling is encountered in the alignment, the same shall be stripped to virgin ground before construction.

A cut-off trench with 4.0m base width, 1.0m deep and 1:1 side slopes shall be excavated at base of the dyke and shall be filled with impervious soil as per specifications.

The foundation shall be stripped for the full width of the dyke including the width of the toe drain plus 1.0 m more on both sides.

The slopes of divide bund between two storage lagoons shall be lined on both sides for top 3.0m vertical height for protection against wave, with brick lining in brick masonry panel walls. This divide bund will have sand chimney

and sand blanket also to take care of any seepage water from the first lagoon when under use.

The divide bund between storage lagoons and overflow lagoon shall not have sand chimney and sand blanket but will have brick lining on both sides, but the slopes of the bund shall not be steeper than 1:3

To ensure proper compaction of the shoulders, the WBM road on top of the dyke shall be constructed by making the dyke embankment upto the design top level of the dyke first and then cutting the box for accommodating the road construction. The width of road shall be 3.75m. The sub base shall be placed in two layers of 100 mm compacted thicknesses each with 90-45 mm graded stone aggregates. The base shall be placed in two layers of 75 mm compacted thicknesses each with 63-45 mm and 53-22.4 mm graded stone aggregates.

### **Stripping the foundation**

The entire area of embankment shall be stripped to minimum 300 mm depth in soil or virgin ground and to minimum 500mm depth in ash bed to remove all unsuitable materials and to provide for benching. The unsuitable material shall include all debris, vegetable matter including roots, weathered and disintegrated rocks, organic silts, swamps material, that are unsuitable for use in permanent construction or that might interfere with the proper binding of the embankment with the foundation, or the proper compaction of the materials in the embankment or that may be otherwise objectionable.

The stripping shall be kept far enough in advance of other items of works to ensure that no undesirable material will get mixed with approved embankment material and to allow for inspection. Unsuitable materials from stripping operations shall be disposed off to a disposal site to be arranged by the contractor.

The stripping shall be carried to the required level and to provide benching. Should the excavation be done deeper by error, the same shall be made good by filling with approved earth and properly compacted so that the required formation level is obtained.

### **Preparation of foundation surface**

Foundation preparation shall be performed as per approved drawings and as described herein subsequent to stripping of foundation and excavation. No material shall be placed in any section of the fill portion of the embankment until the foundation for the section of the fill portion of the embankment has been dewatered, suitably prepared and has been approved by the Engineer. All excavations made for test pits or other sub-surface investigations and all other existing cavities, found within the area which extends below the established lines of excavation for embankment foundation, shall be filled with earth/ash of the corresponding zone and properly compacted. The

foundation should be free from all organic materials, vegetable sods, and weak layers of compressive materials such as clays or low density silts.

Filling the cut off trench / trenches for water escape pipes / formation of impervious core of dyke

The cut off trench shall be filled up in layers not exceeding 150mm in compacted thickness using impervious soils CL or CI type having permeability less than  $1 \times 10^{-6}$  cm/sec, to be obtained by the contractor from approved borrow area. The suitability or otherwise of the material shall be determined by laboratory tests. In case clayey soil of the specified quality is not available, alternatively manufactured impervious soil by blending required quantity bentonite (not less than 2 percent) to available sandy silty soil to achieve the specified permeability also can be used. Blending of bentonite with earth shall be done in dry form in a concrete mixer. Each layer of earth deposited shall then be compacted to have a dry density not less than 98% of the maximum dry density (standard proctor) for the soil with suitable tractor drawn heavy sheep foot tamping rollers or by any other method approved by the Engineer. The compaction shall have to be uniform throughout the length and breadth of each layer. The roller should be made to travel over the entire section of each layer so that the earth is fully compacted and the roller leaves no visible marks on the surface. Where smooth rollers are used with the approval of the Engineer, the surface of each layer of compacted material shall be roughened with a harrow and thoroughly furrowed or raked before depositing the succeeding layer of material. Care shall be exercised to avoid occurrence of horizontal seams. Earth work should be continuous from day-to-day. In case of break in compaction exceeding four days, the dried surface shall be well watered and harrowed before a fresh layer of earth is laid on it.

Before placing the water escape pipes within the embankment, construction of dyke upto 600 mm above the RCC lining for pipes shall be carried out without actually placing the pipes. Later on, trenches shall be excavated for pipes and lining work, pits for cut-off collars and diaphragm filters. These trenches shall then be filled using naturally available CL-ML type soil (plasticity index 7-20) or with manufactured soil by blending with bentonite to achieve specified plasticity. Earth layer deposited in these trenches shall be compacted with plate compactors to have a dry density not less than 100 percent of the maximum dry density (standard proctor).

The spreading of the next layer shall be carried out only after the underlying layer has been approved by the Engineer.

The impervious core of the dyke shall be made with approved clayey soil brought from elsewhere and / or with manufactured soil by blending the available sandy silty soil with bentonite (not less than 2 per cent by volume) to achieve the permeability not more than  $1 \times 10^{-6}$  cm/ sec. The procedure

for laying and compaction shall be the same as specified for the shells of dyke.

### **Earthen or Ash Dyke / shell**

The shell / embankment shall be constructed to the lines and grades shown on the drawings. Placement of fill shall be performed in an orderly way and in an efficient and workman like manner, so as to produce fills having such quantities of density, strength and permeability as will ensure the highest practicable degree of stability and performance of the embankment.

No bushes, roots, sods or other perishable or unsuitable materials shall be placed in the embankment. The suitability of each part of the foundation for placing embankment materials thereon and of all materials for use in embankment construction shall be subject to the approval of the Engineer. The dyke may be constructed in separate portions or reaches, provided that:

- i) The slopes of the bonding surfaces between the previously completed portions of the embankment and materials to be placed in each zone shall not be steeper than 2.5 horizontal to 1 vertical in case of earth and 3 H : 1 V in the case of ash.
- ii) The embankment is constructed right across the whole section in each portion or reach.

### **Fill materials**

The materials for shell / embankment shall be obtained from the approved borrow areas and available excavated material to the extent possible. In general all materials from the particular borrow area shall be a mixture of materials obtained for the full depth of the cut. Some earth material available from the excavation of cut-off trench etc. if found suitable can also be used for the embankment construction.

### **Placing the fill material**

The distribution and gradation of materials throughout the fill shall be as shown in the approved drawings or as directed. The fills shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. The combined excavation and placing operations shall be such that the materials when compacted in the fill will be blended sufficiently to produce the specified degree of compaction and stability.

No stones, cobbles or rock fragments, having maximum dimensions of more than 10 cm shall be placed in the fill. Such stones and cobbles shall be removed either at the borrow pit or after being transported to the fill but before the materials in the fill are rolled and compacted. The materials shall be placed in the fill in continuous horizontal layers, stretching right across the

whole section, not more than 20 cm in compacted thickness and rolled. During construction a small transverse slope from centre towards the edges should be given to avoid pools of water forming due to rains. The surface of materials to be placed thereon, shall be moistened and/or worked with harrow, scarifier or other suitable equipment, in an approved manner to a sufficient depth to provide a satisfactory bonding surface before the next layer of fill material is placed. If the rolled surface of any fill is found to be too wet for proper compaction, it shall be raked up, allowed to dry, or shall be worked with a harrow or any other approved equipment to reduce the moisture content to the required amount and then it shall be recompacted before the next layer is placed.

When compacting the fill material against steep rock abutment or walls or masonry or concrete structure the construction surface of embankment shall be sloped away from rock or masonry or concrete structures for a distance of 3 m to 4 m at an inclination not steeper than 6 horizontal to 1 vertical. If the foundation surface is too irregular to allow the use of a large roller directly against a structure/rock out crop, the roller shall be used to compact the fill material as close to the structure or the out crop as possible and the portion of the embankment directly abutting against the rock or the structure shall be compacted with pneumatic hand compactors/tampers in thin layers. The moisture content of the fill material placed against the rock or the structure shall be high enough to allow it to be compacted into all irregularities of the rock or the structure. Care shall be taken in placing the first layer of the fill so that no damage is caused by the hauling machinery to the base grade as this may get concealed by the spread layer or fill. Sheep foot roller shall not be employed for compacting till the thickness of the layers already compacted by other means is greater by 30 cm than the depth of the feet on the roller drum. The material for the first layer shall be at moisture content sufficient to enable bonding of the fill with the rock surface.

### **Weather Conditions**

Embankment materials shall be placed only when the weather conditions are satisfactory to permit accurate control of the moisture content in the embankment materials.

### **Moisture Control**

Prior to and during compacting operations, the materials in each layer of fill shall have a moisture content about 2% less than the optimum moisture content, in the case of cohesive soil. In the case of cohesion less material including ash, the placement moisture content may have only little effect on the compaction behaviour of the fill and hence appropriate moisture content required from other site considerations such as dust suppression etc, may be adopted. As far as practicable the materials shall be brought to the proper moisture content in the borrow area before excavation. If additional moisture content is required, it shall be added on the embankment by sprinkling water before rolling the layer. Contractor shall make his own arrangements for

supply of water. If the moisture content is greater than required, the material shall be spread and allowed to dry before starting rolling. The moisture content shall be uniform throughout the layer of materials and ploughing, discing, harrowing or other methods of mixing may be required to obtain uniform distribution. If the moisture content is more or less than the range of the required practicable moisture content, or if it is not uniformly distributed throughout the layer, rolling shall be stopped and shall be started again only when the above conditions are satisfied.

### **Compaction Equipment**

While the specifications provide that equipment of a particular type and size is to be furnished and used, it is to be understood that the use of improved equipment is to be encouraged. Tamping (sheep foot) rollers or pneumatic rollers shall be used for compacting cohesive materials and pneumatic rollers and vibratory rollers shall be used for compacting cohesion less materials including ash. Any other suitable type of compaction equipment also can be employed after necessary field trials about their effectiveness and with approval of the Engineer.

### **Rolling and tamping**

#### **Rolling**

When each layer of material has been conditioned so as to have the proper moisture content uniformly distributed throughout the material, it shall be compacted by passing the roller. The exact number of passes shall be decided based on compaction trials to be conducted in field before start of work. The layers shall be compacted in strips overlapping not less than 0.6 metre. Density tests shall be made after rolling and the dry density attained shall be not less than 95% of maximum dry density (Standard Proctor) obtained in the Laboratory for the type of material used.

#### **Tamping**

Rollers will not be permitted to operate within 1.0 M of concrete and masonry structures. In locations where compaction of the fill material by means of the roller is impracticable or undesirable the material shall be specially compacted as specified here in at following locations:

- a) Portions of the dyke embankment adjacent to masonry structures.
- b) Earth/ash in dyke embankment adjacent to steep abutments,
- c) Earth / ash fill at locations specially designated by the Engineer.

Fill shall be spread in layers not more than 20 cm. in compacted thickness and shall be moistened to have the required moisture content. When each layer of material has been conditioned to have the required moisture content

it shall be compacted to achieve the dry density of not less than 95% of Maximum Dry Density (Standard Proctor) by special rollers, mechanical tampers, hand held vibratory tampers or by other approved methods, and all equipment and methods used shall be subject to approval based on evidence of actual performance. The moisture control and compaction shall be equivalent to that obtained in the fill material actually placed in the dyke embankment.

### **Inspection Test**

Control tests shall be carried out in laboratory from time to time to determine whether the fill produced by methods employed satisfies the requirements of the specifications. Routine field tests shall also be carried out by the Engineer and the work shall be inspected regularly. Field density test should be particularly and specially made in the following areas:

- a) Where the degree of compaction is doubtful.
- b) Where embankment operations are concentrated i.e. where 2 or more layers are placed one over the other on the same day.
- c) To represent every 2000 cubic metres in case of earth and 1000 cubic metres in case of ash placed in the embankment.
- d) At least one test for every full or part shift of compaction operations and
- e) At least one test for every 250m length of dyke in each layer. The Engineer shall determine whether the desired results are being obtained.

Contractor shall provide all facilities such as labour, conveyance, equipment etc. required for collection of samples and to conduct tests in situ or at laboratory.

### **Dressing and Trimming of the Slopes**

The outer slopes of the embankments shall be neatly dressed to line as the placing of the fill progresses. Compaction shall extend over the full width of the embankment and the material in the slopes shall be compacted as for the rest of structure. To ensure proper compaction at the outer edge, the fill shall be constructed for a minimum of 0.5m extra width on either edges or the outer edge trimmed to specified width and slope, as per construction drawings, after completion of the dyke section upto top, in different stretches of the alignment. No slope shall be left without trimming to design slope. The trimmed slope surface shall be checked for adequate compaction as specified in the Quality Assurance check list and under compaction, if any, shall be corrected.



|            |    |
|------------|----|
| 0.5 to 1.0 | 25 |
| 1.0 to 2.0 | 30 |
| 2.0 to 5.0 | 40 |
| 5.0 to 10  | 50 |
| 10 to 50   | 60 |

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- g) The filter materials shall be suitably compacted to a firm condition to achieve a relative density of 70%.

### **Placing**

#### **Sand Blanket**

Sand blanket shall be laid subsequent to site clearance, stripping and excavation, if any. The foundation area shall be cleared before laying the bottom layer of blanket material. Filter material shall be laid in layers not exceeding 15 cms. Care shall be taken to ensure that materials of different layers do not get mixed, both at the time of placing and during compaction. After the layers of filter blanket material have been laid and compacted as directed by the Engineer earth fill material shall be laid.

#### **Sand Chimney**

Sand chimney of specified thickness shall be laid at the specified location by excavating and removing the already compacted bund material, exposing sand chimney in the lower layers earlier laid, and refilling the trench with sand in layers. The layer of sand shall be well rammed. The depth of each layer of chimney to be laid shall not be more than 15 cm or as directed by the Engineer. While excavating the earth for filling sand for chimney drain, the top layer of sand which has been mixed with earth/ash, shall also be removed.

Alternatively, the sand chimney can also be laid in layers simultaneously with the laying of each layer of fill. In such case, the top level of sand layer shall always be kept at about 100 mm above earth/ash level on both sides. Each layer of sand shall be compacted. Care shall be taken to avoid mixing of earth/ash and sand.

#### **Sand filter**

The sand filter around the rock-toe and below rip rap shall closely follow the levels of the embankment in the area. Sand filter shall be laid subsequent to stripping of foundation and / or trimming of slope of compacted bund. The surface to receive the sand filter shall be properly cleaned before laying of filter material. The sand filter shall be laid in layers. The thickness of the layers shall not be more than 15 cms or as directed by the Engineer. The

sand layer shall be well compacted. Care shall be taken that materials of different layers do not get mixed, both at the time of placing and during compaction.

### **Graded coarse aggregate filters**

The coarse aggregate material shall consist of durable well graded broken rock of hard stone variety from the specified quarries and shall be approved prior to being transported to the area of deposition. The materials shall range in the size from 10mm to 75mm and shall satisfy the filter criteria.

The rock material used in the aggregate filters shall satisfy the following condition:

- a) Specific gravity shall not be less than 2.50.  
(As per IS: 1122)
- b) Sulphate soundness less than 10% loss of weight after 5  
(As per IS: 1126) (Five) cycles
- c) Aggregate Impact value shall not exceed 30%  
(As per IS: 2386)
- d) Water absorption shall not exceed 2.5%  
(As per IS: 2386)
- e) In slake durability test (as per IS: 10050), the percentage retained after two ten (10) minutes cycles shall be more than 85%.

### **Placing**

Graded aggregate filters shall be constructed over the trimmed surface of the embankment slope, as indicated in the drawings. The aggregate filters shall be placed in layers of uniform thickness as shown in the drawings and care shall be taken to avoid segregation of coarse and fine materials and formation of pockets.

### **Rock toe**

The rock material used for the rock toe shall satisfy the quality requirements. Rock toe shall be formed with rock material consisting of sound, durable and well graded broken rock obtained from approved quarries and shall be of approved quality. The materials shall range in size from 10 to 45 cm. All brush, roots or other perishable materials shall be removed from rock-fill during spreading and disposal off.

The rock available from the excavation of water escape structure/ stripping / drain channel etc. which satisfy the quality requirements specified and found suitable for construction of rock toe by Engineer may be used. These shall be washed, cleared, and broken into required size and stacked separately.

Similarly rock materials for rock toe satisfying the quality requirements specified can also be obtained from rock if any available within the land acquired for construction of earthen dyke, if it is found suitable. The rock shall be broken to required size and shape and will be cleaned before utilised.

### **Placing**

The stone pieces shall be hand placed to obtain a stable, well graded and free draining fill. The rock toe shall be constructed in layers so that the smaller rock fragments shall be placed adjacent to the filter of embankment and the large rock fragments near the outer edge of the rock toe. The rock fill shall be hand placed, spread and roughly levelled in layers not greater than 30 cm in thickness in order to maintain a reasonably uniform surface and ensure that the completed fill will be stable and do not contain any voids having least dimension larger than 50 mm.

Contamination of the rock with finer materials from any other zones shall be avoided. Accumulations of soil caused by contamination shall be removed.

Rock materials shall not be dumped directly but shall be hand placed in layers.

### **Rip rap on the slope of embankment**

Rip rap shall be hand placed on the slopes of the dam embankment as per IS: 8237 - "Code of practice for Protection of slope for reservoir embankments". The thickness of rip rap layer shall be as indicated in the drawings. The thickness shall be measured normal to slope of the embankment.

The rock materials used for rip-rap shall satisfy the quality requirements specified.

The rip-rap material shall consist of the most durable rock fragments or approved quality selected for the purpose. The quality of individual rock fragments shall be dense, sound and resistant to abrasion, and shall be free from cracks, seams, shale partings, conglomerate bands and other defects that would tend to increase unduly their susceptibility to destruction by water and weathering action. The shape of the individual rock fragment shall be angular. Fragments having thickness less than 50% of their maximum dimensions shall not be used as rip rap. The stones shall be evenly distributed over the paved area. The average weight of stones shall be 15

Kgs. for 300 thick rip rap and 50 Kgs. for 600 thick rip rap. These stones shall be placed on the edge with longer dimension normal to the slope. Rock fragments and spells shall be tightly driven into the interstices to wedge the rip rap in place and close direct opening to underlying slope. The wedging shall be done with the largest chip practicable, each chip being well driven home with a hammer so that no chip can be removed by hand. Stones shall be laid in a compact manner beginning at the bottom of the slope.

Rip rap shall be placed along with the fill so that a minimum of break down will occur during placing and spreading.

### **Dealing with water**

The whole of the works shall be carried out in the dry condition. Water from any source shall be diverted or pumped as required, clear of the works. Contractor shall make all necessary arrangement whatsoever required for keeping the work area dried by diverting and pumping of water, and also provision and operation of all temporary works including pumps, motors, fuel, piping and for the formation of any sumps, drainage channels, flumes, coffer dams and other protective works.

### **Rainfall run-off**

s part of the work may have to be carried out in wet season, Contractors programme and methods must be capable of dealing with run-off from rainfall on the adjacent catchment area. The associated flow in the nullahs etc. shall be diverted clear of the works by an approved system of bunds and channels. Contractor shall supply, install and operate his own temporary pumping installation.

### **Prevention of pollution**

Arrangement shall be made by the contractor to prevent pollution of the water in any streams, springs, nullahs and lakes. Arrangements for sprinkling of water in the construction and borrow area to prevent any dust blowing also shall be done by the contractor. Contractor shall be solely responsible and liable for all damage caused by any pollution that may take place during the execution of the works, and he shall make arrangements, as the Engineer may approve, for preventing pollution but, notwithstanding such approval, the entire responsibility for any pollution shall rest with the contractor.

**FORMAT FOR NO DEVIATION CERTIFICATE**  
**(To be submitted in the bidder's letter head)**

BHARAT HEAVY ELECTRICALS LIMITED,  
Power Sector - Eastern Region,  
Plot no 9/1, DJ Block, Sector – II, Salt Lake City,  
Kolkata – 700 091

|     |   |   |
|-----|---|---|
| Sub | No Deviation Certificate.   |   |
| Job | Civil, Structural & Architectural Work for Ash Pond Package for 2x500 MW units # 1 & 2 at Koderma Thermal Power Station, Jharkhand. |   |
| Ref | 1.0   | Tender no PSER:SCT:KDM-C1402:12   |
|     | 2.0   | BHEL's NIT, vide reference no PSER:SCT: KDM-C1402:2974 Date: 27-09-2012     |
|     | 3.0   | BHEL's TCN-01, vide reference no PSER:SCT: KDM-C1402:TCN-01 Date:16-10-2012 |
|     | 4.0   | All other pertinent issues till date.                                       |

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited site before submission of our offer and noted the job content & site conditions etc. We also confirm that we have not changed/ modified the tender documents as appeared in the website/ issued by you and in case of such observance at any stage, it shall be treated as null and void.

We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT. We hereby confirm our unqualified acceptance to all terms & conditions, unqualified compliance to technical specification, integrity pact (if applicable) and acceptance to reverse auctioning process.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

We confirm to have submitted offer in accordance with tender instructions and as per aforesaid references.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized  
representative of the bidder)