**1.14 Construction Programme.**

Within **twenty-eight (28)** days from the date of receiving of notice for Commencement of Works, the Contractor shall submit to the Engineer for approval a complete and practicable construction programme **(GCC Clause 8.3, Part 3 of the Bidding Document)** showing the orderly performance of the Works. The Construction Programme shall show in detail the proposed method of operations, including purchase and delivery of materials and equipment, as well as the construction. The Programme shall be shown in a bar chart depicting each major item of the Works on separate horizontal lines, sequence of operation and the period required for the completion of each activity. The Construction Programme shall when approved by the Engineer become a part of the Contract.

**The construction programmes shall include the followings:-**

(a) the order in which the Contractor intends to carry out the Works, including the anticipated timing of each stage of design (if any), Contractor's Documents, procurement Equipment & Machinery, delivery to Site, construction, erection and testing,

(b) each of these stages for work by each nominated Subcontractor (as defined in GCC Clause 5 [Nominated Sub-contractors]),

(c) the sequence and timing of inspections and tests specified in the Contract, and

(d) a supporting report which includes:

(i) a general description of the methods which the Contractor intends to adopt, and of the major stages, in the execution of the Works, and

(ii) details showing the Contractor's reasonable estimate of the number of each class of Contractor's Personnel and of each type of Contractors Equipment, required on the Site for each major stage.

(iii) a statement and outline layout giving the proposals for location or locations and sizes of constructional camps, accommodation, offices, workshops and stores at the Site; and details of the programme for the construction of the works from the date of receipt of the Notice to Commence, including a complete resource allocation showing the number of units and allotted times for each unit of Contractors Equipment, Plant, materials and labour allocated for each part of the works

**1.15 Reports, Meetings and Data of the Works**

**1.15.1 Monthly Report**

The Contractor shall furnish Monthly 'Report to the Engineer, at the Contractor's' own costs, at regular monthly interval and in a form and number of copies determined by the Engineer, with the followings:

a. physical progress for the preceding month and estimated progress for the reporting month;

b. completion schedules (target and actual) based on the approved Construction Programme;

c. inventory of construction equipment and materials on which an advance was made by the Employer as provided in the Conditions of Contract;

d. a tabulation of construction equipment, listing the major items and pieces of equipment which were utilized for performance of the Works during the preceding month;

e. a tabulation of employees, showing the supervisory staff and the numbers of several classes of labourers employed by the Contractor in the preceding month; report covering the Plant and materials furnished by the Contractor for the Works; and

f. any report which may be specifically asked for by the Employer and/or the Engineer.

**1.15.2**

**1.15.3 Photographs and Videos**

The Contractor shall make all arrangements to provide photographs in albums, but not pasted, showing the work progress and shall promptly supply one electronic copy and four printed copies of such photographs of 4R size, of such portions of the works in progress and/or completed as may be directed by the Engineer. Each print shall contain on its back the date and title of the view taken. The Contractor shall also take Videos of work sequences time to time and supply the same in a CD.

**1.15.4 Audits by the Employer**

The Contractor shall note that the Employer shall be entitled at its discretion to conduct audits in respect to:

- costs incurred in the event of termination; and any other costs that the Contractor claims from the Employer which are not specifically covered by the terms of the Contract.

The Contractor shall be obliged to keep accurate up-to-date accounts with records concerning the above items.

**1.15.5 Measurement and Payment**

No separate payment shall be made for preparation of all documents, returns and reports etc. to be prepared by the Contractor and submitted to the Engineer and/or the Employer in accordance with the provisions of the Contract.

All costs including Contractor's margin, overhead, taxes, etc. incurred by the Contactor shall be deemed to be included in the unit rate of the Bill of Quantities.

**2.19.1 Geo-textile Fabric**

All geo-textile fabric shall meet in full the requirements of Physical, Mechanical and Hydraulic properties. The geo-textile manufacturer must be ISO 9001 certified by an accredited register. Geo-textile in standard rolls shall be clearly marked at regular intervals (every square meter or continuous marking at 1 m distance) with the product name and grade. Marking in every 100 sqm. is required to identify the supplier. Each roll of geo-textile shall be protected in a plastic foil wrapper, clearly labeled with the roll number, production of lot number and description of the product, product name, grade and manufacturers details. Geo-textile filter shall be extended up to 1000 mm below LWL. Geo-textile filter shall be protected from ultra violet ray and any sort of damage during handling and placing

The geo-textiles shall be manufactured from polypropylene or polyester fabric and shall be non-woven needle-punched and not solely thermally bonded. The thermal bond shall not influence the flexibility under water. The required porosity of geo-textile shall be minimum 80%. Porosity is a calculated value out of tested material characteristics and the specific weight of the fibers.

**2.19.2 Specification**

The geo-textiles shall be manufactured from polypropylene or polyester fabric and shall be non-woven and needle punched and not solely thermally bonded. The thermal bond shall not influence the flexibility of the sand bags including their launching behavior. The Geo-textile shall comply the following properties:

|  |  |  |
| --- | --- | --- |
| **SI** | **Test Parameter** | **Standard Value** |
| 1 | Mass per unit area | =>400 gm/ m2 |
| 2 | Thickness under a pressure of 2 kPa | =>3 mm |
| 3 | Apparent / Effective Opening size | >0.08 mm |
| 4 | Horizontal Permeability | > 3 x 10E-3 mlsec |
| 5 | Vertical Permeability - | > 4.5 x 10E3 m/sec |
| 6 | Grab Tensile Strength | => 1500 N |
| 7 | Strip Tensile Strength | =>23 KN / m |
| 8 | CBR Puncture Resistance | => 3800 N |
| 9 | Elongation at maximum force (machine direction MD) | =>60% and <=100% |
| 10 | Elongation at maximum force (CMD) | >40% and <=100% |
| 11 | Permeability (Velocity Index for a head loss of 50 mm- V H50 | => 2 x 103 m/sec |
| 12 | Ultra-Violet (UV) Resistance | =>70% of original tensile strength before exposure |

**2.19.3 Testing Geo-textiles**

i) Geo-textile delivered at site should be certified by ISO with brand name.

ii) The properties of geo-textile to be delivered at site shall be tested at BRTC, BUET according to relevant test standard given in the specification.

iii) Tests shall be carried out from each quantity of 10,000 square meter of geo-textile fabric supplied. Seams shall be tested for tensile strength every 10,000 m of seam.

iv) The sample size for the fabric shall be 2 m2 and shall be marked to indicate its upper side, longitudinal and transverse directions, type of geo-textile and the date that the sample was taken. Seam samples shall be at least one meter in length and the ends of the threads are to be firmly tied off by the Contractor or Supplier at the time the samples are taken. Each test shall be carried out on at least three samples.

v) The Contractor shall bear the expenses of all routine tests. Notwithstanding the submission of repots to the effect that the geo-textile conforms to the Specification. the Engineer shall at all times be entitled to have additional samples of geo-textile tested if he is of the opinion that the geo-textile does not conform to the Specification. The Engineer shall only select samples from, any lot procured at site by the contractor.

**2.19.4 Construction**

The Geo-textile fabrics shall be placed above the inverted filter on the surface of slope of embankment / river bank as per design and drawing. The fabric shall be placed in position, providing machine seamed joints (with 100% polypropylene or nylon thread) minimum 35 cm lap in dry condition and minimum 100 cm lap under water Inducing protecting the geo-textile materials from UV sun ray and from any other damages.

**2.19.5 Measurement**

Measurement of Item geo-textile filter shall be made based on the area in square meters measured parallel to the face on the slopes as shown on the drawings or as approved or directed by the Engineer. No additional payment will be made for fabric used to provide specified laps.

**2.19.6 Payment.**

Payment of Item of Geo-textile Filter Fabric shall be at the unit rate per Square Meter as included in the Bill of Quantities.

**2.20 Supplying 8 Laying Sand Filter**

**2.20.1 General**

The fine filter shall consist of natural sand of FM 1.010 1.5 or as specified in the drawing. The material shall not contain any flint, chirp or lime. The quantity of silt, clay and dust, determined in accordance:   
with the decantation method given in BS 812, shall not exceed 3% by weight of the sample. The content of mica shall not exceed 3% by weight of the sample. The material shall not contain any deletenous material in such form or in sufficient quantity as to affect adversely on the geo-textile filter above.

**2.20.2 Construction**

**2.20.2.1 For Structure Loose Apron & Slope**

The foundation for the sand filter shall be thoroughly compacted and graded to the elevations shown on the Drawings prior to the placement. The filter material shall be placed in a uniform layer of the thickness shown on the drawing or approved or directed by the Engineer. Minimum 150 mm thickness of sand or as specified in the drawing having FM 1.0 to 1.5 shall be placed on prepared, well dressed and compacted bed and slope/surface.

**2.20.2.2 For Protective Work**

The foundation for the sand filter shall be thoroughly compacted and graded to the elevations shown on the Drawings prior to the placement. The filter material shall be placed in a uniform layer of the thickness shown on the drawing or approved or directed by the Engineer. Minimum 100 mm thickness sand or as specified in the drawing having FM 1.0 to 1.5 shall be placed on. prepared, well dressed and compacted slope/surface above LWL.

**2.20.3 Measurement**

Measurement of item sand filter shall be made in cubic meter. Separate Items for supplying and laying of sand filter for structure and protective works have been included in the BoQ

**2.20.4 Payment**

Payment of item Sand Filter for structure and protective works shall be made at the unit rate per Cubic Meter against separate items as included in the Bill of Quantities.

**2.21 Supplying & Laying 1St Class/Pick Jhama Chips as Filter**

**2.21.1 General**

Coarse (aggregate) filter materials shall be made from first class /picked jhama bricks. The bricks shall be sound, hard and well burnt, uniform in size, shape and color, homogeneous in texture and free from flaws & cracks. A fractured surface shall show a uniform compact structure, free from holes, lumps or grits. The unit weight shall not be less than 1100 kg/m3; minimum crushing strength 14 N/m2 and above; increase in weight after one hour absorption in water shall not more than 15% of dry weight. Any dust or fine materials below 5mm size are to be removed by screening and be thoroughly washed by an approved method.

**2:21.2 Construction**

**2.21 .2.1 Hydraulic Structure Loose Apron and Slope**

The aggregate filter materials shall be laid on two layers of equal thickness or as shown in the drawings. The filter material in the bottom layer of thickness 100 mm shall be well graded between 5 to 20 mm and the filter material at the top of thickness 100 mm shall be well graded between 20 to 40 mm in accordance with the grading shown on the drawings.

**2.21.2.2 Protective Work**

The aggregate filter materials shall be laid on two layers of equal thickness or as shown in the drawings. The filter material of thickness **100 mm /150 mm** (40mm to 20 mm well graded at top & 20mm to 5mm at bottom) shall laid in accordance with the grading shown on the drawings.

**2.21.3 Measurement**

Measurement of item Khoa filter shall be made in cubic meter. Separate items for supplying and, laying of khoa filter for structure and protective works have been included in have been included in the BoQ

**2.21.4 Payment**

Payment of item Coarse Filter or Khoa filter shall be at the unit rate per Cubic Meter as included in the Bill of Quantities.

**Pea Gravel Filter**