

SPECIFICATION FOR POND RECLAMATION

1.0 GENERAL

This section of the Specifications covers earthworks in pond areas. The treatment of the pond and other soft ground areas specified in the drawings shall include part or all of the following operations in the sequence shown :-

- i) Clearing, grubbing and disposal of all vegetation and debris at the sides and bottom of the ponds.
- ii) Dewatering of pond water and removal of soft material through excavation or dredging to the extent as specified in the drawings. However, if conditions are favourable the soft material may be removed by displacement methods with prior approval from the Engineer.
- iii) Removal and disposal of existing slurry or as a result of disturbance.
- iv) Laying of geotextile separator.
- v) Placement of initial layer of sand fill.
- vi) Filling of rest of pond to the proposed finished level with suitable material, under dry condition, well compacted in layers as per the Earthwork Specification.
- vii) Place extra fill as surcharging material as specified in the drawings.
- viii) After a rest period stipulated in the drawings, removed the excessive material.

The details of the above operations may also be revised by the Engineer if site conditions so warrant. Supplementary soil investigation shall be required at locations as indicated by the Engineer. This soil investigation shall be carried out prior to, during and after the treatment works.

2.0 REMOVAL OF SOFT MATERIAL

2.1 Dewatering of the Ponds

Where dewatering procedure is followed, the clear water in the ponds shall be completely removed. Towards the end of dewatering, the slurry at the bottom of the ponds may be removed at the same time if the Contractor submits a sound proposal for the approval of the Engineer. Wherever possible, the water in the ponds shall be drained away in temporary open channels leading to an approved outfall or soakaway. Where the invert level of the channel inlet is higher than pond bottom level, pumping will be required.

The rate of dewatering shall be controlled so as to avoid collapse of the sides of the pond. The Contractor shall be required to submit his calculations to substantiate the stability of the sides of the ponds during dewatering. Pumping shall be continued during filling of suitable material to maintain a dry working condition.

2.2 Clearing of Vegetation and Debris

All vegetation and debris at the pond bottom and sides are to be cleared in the manner as described in the Earthwork Specification.

2.3 Removal of Soft Material

Where specified, removal shall be to the limits specified in the drawings. Removal of soft material shall be by dredging or other approved suitable methods. Detail method of statements shall be submitted to Engineer for approval. The excavated soft material may be reused after using treatment methods approved by the Engineer. Alternatively, the material may be disposed at an approved off-site dumping area.

2.4 Removal and Disposal of Slurry

The slurry is defined as material with unit weight ranging from 11kN/m³ to 13.4kN/m³. The top of the slurry level shall be established by a density probe consisting of an enclosed steel box with bulk density of 11kN/m³. The material removed shall be treated to render it usable or disposed off at an approved dumping site. The method of removal by pumping or other means shall be approved by the Engineer. The removal shall be carried out with a minimum disturbance to the rest of the pond bottom material. Removing of slurry shall begin at higher levels and working towards the lower levels.

3.0 GEOTEXTILE SEPARATOR

A geotextile separator furnished is to be laid at the bottom of the ponds after removal of slurry and prior to commencement of pond filling. Where necessary, geotextile separator shall be laid with fascine mattresses at the Contractor's own cost.

3.1 Material

All geotextile shall be from an approved manufacturer and shall be manufactured from polypropylene. Geotextiles shall be sufficiently durable and resistant to naturally occurring chemical, fungi and bacteria when installed in contact with the material to be separated. Geotextiles shall be free of any flaws, which may have an adverse effect on the physical and mechanical properties of the geotextiles.

Geotextile fabrics shall be non-woven needle punched staple fiber geotextile in accordance with the Specification and shall be used as shown and described on the Drawings or as directed by the Engineer. The type of geotextile fabrics as shown or as described on the Drawings shall comply with the following properties as listed in table below:

| ITEM | PROPERTIES | TEST METHOD | UNIT | VALUE |
|------|------------------------------------|---------------|---------------------|-------|
| 1 | Unit Mass | ASTM D5261-92 | g/m ² | >270 |
| 2a | Tensile strength | ASTM D4595-86 | kN/m | >17 |
| 2b | Elongation at break | ASTM S4595-86 | % | >50 |
| 3 | Trapezoidal tear strength | ASTM D4533-91 | N | >435 |
| 4 | CBR punture resistance | DIN 54307 | N | >3000 |
| 5 | Permeability at 100m head | BS 6906/3 | l/m ² /s | >100 |
| 6 | Apparent pore size O ₉₅ | ASTM D4751-87 | micron | <120 |

The above properties shall not be altered being in continuous contact with water.

The Contractor shall in addition provide the following information, for the approval of the Engineer for the acceptance of the geotextile fabric for the works.

- a) Manufacture's certificate which shall include :
 - Name of Manufacturer
 - Product name and type
- b) Test certificate which shall include :
 - Mass Per Unit Area
 - Wide Width Tensile Strength (longitudinal/transverse)
 - Elongation (longitudinal/transverse)
 - Apparent Pore Size (O_{95})
 - Trapezoidal Tear Strength
 - CBR Puncture Resistance

The tests shall be carried out in accordance with the codes of Practices and Standards as provided within this Specification, unless otherwise approved by the Engineer.

Prior to installation and at the discretion of the Engineer, samples of each 10,000m² of geotextile fabric shall be selected for routine test at approved testing laboratories.

The properties to be tested shall comprise index properties including unit mass, mechanical properties including tensile strength, CBR Puncture Resistance and hydraulic properties including pore size and permeability. Where the individual samples fail to satisfy the requirements of this Specification on the geotextile fabric, the roll from which the sample is obtained shall be rejected. Two additional samples are then selected from two other rolls from the same batch of geotextile fabric. If either of these two additional samples fail to comply with the requirements, the entire batch represented by the samples shall be rejected.

3.2 Geotextile Packaging and Storing

The geotextile rolls shall be furnished with suitable wrapping for protecting against moisture and extended ultra-violet exposure prior to placement. Each roll shall be labelled or tagged to provide product identification sufficient for field identification as well as inventory and quality control purposes. If stored outdoors, they shall be elevated and protected with a waterproof cover.

3.3 Site Preparation

Prior to the laying of the geotextile fabric, site clearance shall be carried out in accordance with the Specification and Drawings or as directed by the Engineer. All voids shall be filled with suitable material and the area cleared of large stones and exposed tree root systems or other such like protrusions.

3.4 Installation

Geotextile fabric shall be installed to the shape and requirements as specified herein or as shown and described on the Drawings. The geotextile separator shall be laid in as close contact with the pond sides and bottom as possible. The geotextile shall be unrolled smoothly on the prepared ground as approved by the Engineer and generally in a direction perpendicular to the edge of the platform, embankment or area of fill as approved by the Engineer. Adjacent geotextile rolls shall be overlapped and sewn in accordance with this Specification. On curves and corners geotextile may be folded or cut to conform to direction as approved by the Engineer. Overlapping of geotextiles without sewn connections shall only be allowed with the approval of the Engineer.

Geotextile fabrics shall be placed just in advance of placement of the specified overlying fill material. The relevant fill shall cover Geotextiles so placed within seven (7) days of being placed. Installation proposals and trials as deemed required shall be carried out for approval by the Engineer prior to the acceptance of the placement method for the main works. The installations trials shall include the placement operations of the overlying fill materials, including excavation of such materials thereafter for examination of the geotextile fabric installation and fill materials placement method in respect of the prevailing ground conditions and constraints.

3.5 Sewn Seams

The geotextile fabric shall be jointed using an approved portable industrial sewing machine and by sewing a double chain stitch with flat or "prayer" seam (minimum lap of 50mm) with high tenacity polyester threads and a minimum of 3.5 stitches per inch. The thread shall have a breaking load of not less than 19 kg. The sewn seam assembly and construction shall have equivalent strength properties not less than 80% of the geotextile fabric. Samples of such sewn seam assembly shall be tested in accordance with ASTM D4884-90 as deemed necessary by the Engineer.

3.6 Bamboo Fascine Mattress

Bamboo mattress shall be fabricated with fascines of bamboo between 5 to 10cm diameter, in two layers, one layer perpendicular to the other layer, binded at the crossings by the cords of the geotextile. The bamboo shall be equally spaced in both directions to suit the vertical spacing as shown in the drawings. The spacings of the bamboo fascine shall be no more than 1m unless otherwise approved by the Engineer.

The fascines can be composed from smaller bamboo diameters and mechanical binded together with wires or polypropene cords till fascines with a diameter between 5 to 10cm. The bamboo rods had to be splice lapped, not lapped all in the same cross-section, to give them sufficient pulling strength.

Unroll geotextile directly over the prepared bamboo mattress. The geotextile shall be sewn in a manner described in Clause 3.5 to form a large manageable sheet prior to placement over the bamboo. Alternatively, sewing of geotextile can be carried out simultaneously during placement of geotextile on the bamboo mattress.

4.0 SAND BLANKET

4.1 Sand Fill Material

The initial and foundation sand fill and part of the embankment fill shall comply with the following grading requirements :-

| <u>B.S. Sieve Size</u> | <u>% by Mass Passing</u> |
|------------------------|--------------------------|
| 10 mm | Up to 100% |
| 5 mm | Not more than 85% |
| 600 microns | Not more than 45% |
| 75 microns | Not more than 5 |

4.2 Filling

The specified overlying fill material on the geotextile fabric, shall be placed in accordance with the requirements shown and described on the Drawings or as directed by the Engineer. The procedure adopted for the deposition of the initial sand fill shall be such that stability of fills are maintained and heave minimised.

An initial sand fill of thickness 0.5m shall be spread over the geotextile separator in a single lift. The fill shall be placed starting from the lowest levels and working upwards. Further sand fill shall be carried out in layer not exceeding 0.5m until the specified sand blanket thickness has been reached. The foundation fill shall be placed in even horizontal layers until the top level is reached. At no juncture shall any part of the fill be more than 1.0m higher than the rest of the current fill.

No traffic shall travel directly on the geotextile and there shall be no sudden stops, starts or turns on the fill materials by the construction equipment or other such actions, which may cause damage to the geotextile.

5.0 SUITABLE FILL

Suitable fill material shall be placed over the sand blanket as per the Earthwork Specification. Pumping shall be maintained for a dry working condition.

6.0 CONTAINMENT BUNDS

For partially reclaimed ponds, containment bunds shall be constructed prior to reclamation of the pond.

The bunds shall be formed by sand fill using displacement method. Sand fill can be placed by pumping or method approval by the Engineer. The sand fill that replaces partly or completely the soft material shall be considered the base section. The base section shall not be smaller in dimension than as shown in the Drawing. The Contractor in his filling procedure, shall maintain adequate width and height of fill so as to attain the dimensions of base section as shown on the Drawings.

After filling the Contractor shall ascertain that the specified bund dimensions have been attained. If the dimensions have not been achieved the Contractor shall propose methods to improve that section to the satisfaction of the Engineer.

Upon reaching the finished level, sheet piles shall be installed along the centre line of the containment bund as per the Drawings.

TABLE OF CONTENTS

| | Description | Page |
|-----|---|-------------|
| 1.0 | GENERAL | PRS1 |
| 2.0 | REMOVAL OF SOFT MATERIAL..... | PRS1 |
| 2.1 | Dewatering of the Ponds | PRS1 |
| 2.2 | Clearing of Vegetation and Debris | PRS2 |
| 2.3 | Removal of Soft Material | PRS2 |
| 2.4 | Removal and Disposal of Slurry | PRS2 |
| 3.0 | GEOTEXTILE SEPARATOR | PRS2 |
| 3.1 | Material | PRS2 |
| 3.2 | Geotextile Packaging and Storing | PRS3 |
| 3.3 | Site Preparation | PRS3 |
| 3.4 | Installation | PRS3 |
| 3.5 | Sewn Seams | PRS4 |
| 3.6 | Bamboo Fascine Mattress | PRS4 |
| 4.0 | SAND BLANKET | PRS4 |
| 4.1 | Sand Fill Material | PRS4 |
| 4.2 | Filling | PRS4 |
| 5.0 | SUITABLE FILL | PRS5 |
| 6.0 | CONTAINMENT BUNDS | PRS5 |