



TRANSNET SOC LTD

**DCT BERTHS 203 TO 205 - RECONSTRUCTION, DEEPENING AND
LENGTHENING**

PORT OF DURBAN

SPECIFICATION – SANDBANK EXTENSION

1785-CO-000-C-SPC-0016 Rev T-01

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1.0 SCOPE

1.1 Project

This specification is a project specific technical specification for the DCT Berths 203 to 205 Reconstruction, Deepening and Lengthening Project in the Port of Durban.

1.2 Scope

The scope of this specification covers the *Employer's* requirements for the extension of the existing sandbank adjacent to Berths 203 to 205. The sandbank is being extended to compensate for the loss of existing sandbank area due to the extension of Berth 205 into the existing sandbank.

The specification details requirements of Materials, Equipment and procedures to be adopted to ensure that the sandbank is extended in a controlled and stable manner with minimum disruption to the environment.

The extension of the sandbank involves dredging of material from within the basin and from the off-shore sand-winning site and deposition thereof adjacent to the existing sandbank. Only works involving the placement of such material to form the extended sandbank are covered herein. Dredging is covered by Specification 1785-CO-000-C-SPC-0004.

2.0 NORMATIVE REFERENCES

2.1 Reference Documents

The *works* shall be carried out as specified in the following documents:

- a) This Specification.
- b) The Industry Codes, Standards and Specifications listed in Section 2.2.
- c) The *Employer's* Project Specific Technical Specifications listed in Section 2.3.
- d) The Project Drawings including the 1785-CO-020 series of drawings – Dredging and Reclamation.

2.2 Standard Specifications

The Contractor shall provide and maintain current copies of all the standard specifications referred to herein below on the site for reference by both parties.

The work required for extension of the sandbank shall comply with the following standard specifications, unless otherwise stipulated herein:

- a) SANS 1200 D:1988 – Earthworks.
- b) BS 6349-5:1991 – Maritime Structures – Code of practice for dredging and land reclamation.
- c) PIANC Report No 100 – 2009 – Dredging Management Practices for the Environment.
- d) PIANC Report No 144 – 2016 – Classification of Soils and Rocks for the Maritime Dredging Process.
- e) BS EN 1997-2: 2007 - Geotechnical design – Ground investigation and testing.
- f) BS EN ISO 22476-1:2012 – Geotechnical investigation and testing. Field testing. Electrical cone and piezocone penetration test.
- g) IHO Standards for Hydrographic Surveys, Special Publication No.44, 5th Edition, February 2008.
- h) DIN EN ISO 9864:2005. Geosynthetics - Test method for the determination of mass per unit area of geotextiles and geotextile-related products.
- i) DIN EN ISO 9863-1:2005. Geosynthetics - Determination of thickness at specified pressures -- Part 1: Single layers.
- j) EN ISO 10319:2015. Geosynthetics - Wide-width tensile test.
- k) BS EN 13251:2016. Geotextiles and geotextile-related products. Characteristics required for use in earthworks, foundations and retaining structures.

2.3 Employer's Project Specific Specifications and Standards

The work required for the extension of the sandbank shall also comply with the following Project Specific specifications:

- a) 1785-CO-000-C-SPC-0004 – Dredging and Reclamation (Including Vibro Compaction).
- b) 1785-CO-000-C-SPC-0008 – Scour Protection and Revetments.
- c) Project Environmental Specifications (PES) as contained in the Works Information and annexures.

3.0 DEFINITIONS

All definitions of responsibilities shall be in accordance with the NEC Engineering and Construction Contract (ECC) for the construction of the *works*.

Where the standard specifications referenced in this specification refer to the “*Engineer*”, replace this term with the term “*Supervisor*”.

For the purpose of this specification, the following definitions shall apply:

3.1 Chart Datum Port

Chart Datum Port refers to the reference level used in the Port of Durban, which is 0,900 m below Mean Sea Level. All levels referred to in this document are relative to Chart Datum Port (CDP).

3.2 Co-ordinate System

The co-ordinate system to be used for all setting out and survey shall be World Geodetic System 1984 (WGS84), LO31, referred to as WG31.

3.3 Tidal Levels

The Astronomical Tide Predictions as defined by the SA Navy Hydrographer and Chart SAN 2006 are as follows:

Table 3.1: Tide Data

Tide	Abbreviation	Level m, Chart Datum Port
Highest Astronomical Tide	HAT	2.287
Mean High Water Springs	MHWS	1.997
Mean Level	ML	1.097
Mean Low Water Springs	MLWS	0.197
Lowest Astronomical Tide	LAT	-0.013

3.4 Method Statements

Method statements shall be compiled by the *Contractor* for all activities entailed in the extension of the sandbank and submitted to the *Supervisor* for acceptance three weeks in advance of commencement of the activities referred to therein, including full details of all proposed Equipment, temporary works and proposed methods of working.

No activity shall commence until the method statement has been accepted by the *Supervisor*.

Further requirements for particular method statements are specified herein.

3.5 Approved Offshore Borrow Site

The “Approved Offshore Borrow Site” refers to a site located offshore, the locality of which is shown on drawing 1785-CO-020-C-DWG-0010-01.

3.6 Dredging

Excavation of all types of material within the marine environment below the Highest Astronomical Tide (HAT) level, in accordance with the SA Navy Hydrographic Office (SANHO) and as defined in Section 3.3, regardless of the type of Equipment or methods employed.

3.7 Reclamation

“Reclamation” refers to the forming of new land that stands above sea level for at least part of the tidal cycle.

3.8 Silt Curtain

A “silt curtain” refers to geotextile fabric suspended from floats laid out such as to prevent or to limit the dispersal of sediment-laden water generated within an area enclosed by such curtains out into the surrounding water body.

3.9 Geotextile Tubes

A “geotextile tube” refers to a sand-filled sleeve of geotextile fabric having an approximately oval cross section.

4.0 REQUIREMENTS

4.1 Method Statements

The *Contractor* shall prepare method statements that shall include, *inter alia*:

- a) The *Contractor's* chosen methodology and Equipment for placing and shaping or forming the placed material to form the specified extension of the sandbank such as to comply with the specified profile.
- b) The *Contractor's* proposed layout of discharge pipelines, diffusers, and other devices necessary to deliver material to form the sandbank extension.
- c) Estimated discharge rates and means of controlling such rates to ensure material is placed in the correct quantity such that the specified profile is achieved within the required tolerances.
- d) Estimated sediment concentrations in the water around points of discharge.
- e) Details of sampling and testing methodology to confirm whether the placed material complies with the specification.
- f) The *Contractor's* methodology for controlling sedimentation and turbidity in the vicinity of the sandbank extension activities, including details of silt curtains and methods of securing and/or mooring them.
- g) Detailed strength, buoyancy and stability design calculations for all components (fabric strength, anchorages, load lines and flotation) of the silt curtains.
- h) Details of the geotextile tube including its anchoring and filling details as necessary to secure it in place.
- i) Details of any bunding along and above the toe of the sandbank extension to ensure the sandbank remains stable during placement and to minimise over-spill into the dredged basin area.
- j) Details of the sequencing of the sandbank extension operations, including sizes of paddocks and layer thicknesses (refer to drawings 1785-CO-020-C-DWG-0007-01 and 02).

4.2 Materials

Material for the sandbank extension shall be won primarily from sand-rich zones within the basin, while the balance shall be obtained from the off-shore borrow area. The locations, properties, and estimated quantities of suitable material apparently available therefrom are described in the Site Information. The locations and extents of Zones A and B, from which most of the suitable material shall be dredged, are shown on drawing 1785-CO-020-C-DWG-0009-01, while the locations of the off-shore borrow areas are shown on drawing 1785-CO-020-C-DWG-0010-01.

Soil placed to extend the sandbank shall comply with the following:

- a) Excluding gravel size particles (i.e. 100% of particles shall be smaller than 4.75mm)
- b) Fines content (i.e. percentage passing 0.075 mm sieve) shall be less than 30%
- c) Free of debris and industrial waste

A representative sample of every barge-load of dredged material as may be contemplated to be placed to extend the sandbank shall be tested beforehand to confirm compliance herewith, failing which such load shall be disposed of to the off-shore spoil dump. Records shall be kept of such test results and of the corresponding volumes of material deposited on the sandbank and at the spoil dump respectively.

Every care shall be taken to avoid contamination of sand that is otherwise compliant with unsuitable material (i.e. gravel, fines, debris and/or industrial waste) and the consequent requirement wastefully to spoil the same. Excessively fine soil on the current seabed (i.e. bottom “mud”, comprised largely of silt and clay), such as may cover sand-rich areas within the basin, shall, if any, therefore be separately removed to the spoil dump, and not uplifted and mixed together with suitable compliant sand beneath. The *Contractor* shall sample the upper 0.5 m to 1.0 m below the current seabed within those otherwise compliant, sand-rich areas in the basin to determine whether and where such unsuitable superficial soil must thus be separately uplifted and disposed of.

After all suitable sand that is practically available from the sand-rich zones within the basin has been dredged and placed to extend the sandbank, the outstanding balance thereof required shall be dredged from the designated off-shore borrow area, again subject to such prior compliance testing of every barge-load.

At least 2No x 25kg representative samples shall be collected each day of material placed during the day to extend the sandbank, and tested to confirm compliance herewith, failing which the *Contractor* shall remove the non-compliant material from the *Works* and dispose of the same to the off-shore spoil dump.

To facilitate marine growth on the sandbank extension compatible with that already present on the existing sandbank, the top of the completed extension shall be covered with sand dredged from undisturbed areas of the existing sandbank within the Zone B dredge area, as shown on drawing 1785-CO-020-C-DWG-0009-01.

4.3 Equipment

4.4 Discharge Equipment

The *Contractor* shall provide discharge equipment suitable for the placement of suitable soil as specified to be placed to extend the sandbank without liquefaction as may cause excessive volumes thereof to displace beyond the specified limits.

4.4.1 Silt Curtains

The *Contractor* shall design, fabricate and install silt curtains around the sandbank extension work that shall effectively prevent the dispersal of turbid sediment-laden water into the surrounding waters. The *Contractor* shall be solely responsible for the effectiveness of such curtains in the given environment and shall consequently improve, repair or replace any ineffective or defective sections thereof as may deem necessary, at its own expense, notwithstanding that such curtains comply with the following specifications, and despite acceptance of the *Contractor's* proposals in this regard by the *Supervisor*:

- a) Curtains shall be a bright colour (yellow or "international" orange are recommended) to enhance visibility.
- b) Flotation devices shall be provided to support the weight of the curtain when fully sediment-laden, while maintaining a freeboard of at least 75 mm above the water surface level.
- c) Repair kits shall be available to patch minor tears in the fabric.

4.4.2 Survey Equipment

For details of the survey equipment requirements, refer to specification 1785-CO-000-C-SPC-0004 Dredging and Reclamation (Including Vibro Compaction).

4.4.3 Geotextile Tubes

Sand-filled geotextile tubes shall be placed tightly along the setting-out line along the new toe of the extended sandbank as detailed in the 1785-CO-020 series of drawings. The geotextile tube rows shall be staggered to eliminate gaps.

The geotextile tubes shall comprise a coastal protection tube made from high strength geotextile fabric, not less than 1 m high and roughly oval shaped when filled. The geotextile tube shall conform to the properties given in Table 4.1.

Table 4.1: Geotextile Tube Properties

Mass	Per unit area	g/m ²	> 600	DIN EN ISO 9864*
Thickness	Total thickness	mm	> 4.5	DIN EN ISO 9863-1
Tensile strength (T _{MAX})	Machine direction (MD)	kN/m	> 15	BS EN 13251* EN ISO 10319*
	Cross machine direction (CMD)	kN/m	> 40	
	Elongation MD (ε _{MAX})	%	> 60	
	Elongation CMD (ε _{MAX})	%	> 60	
*Or ASTM / EN ISO equivalent standard test method				

Geotextile tubes shall not be exposed to temperatures in excess of those recommended by the manufacturer. Outdoor storage shall not be for periods that exceed the manufacturer's recommendations. Geotextile tubes shall not be exposed to direct sunlight prior to installation for more than the duration recommended by the manufacturer.

The *Contractor* shall submit to *Supervisor* certified test results and statements of quality that show without exception that the proposed geotextile tubes meet the requirements of this specification.

4.5 Methods and Procedures

4.5.1 Sandbank Extension

The material placed to form the sandbank extension shall not be compacted.

The *Contractor* shall rectify any significant deviations from the specified dimensional tolerances, including by removal of any material that accumulates in the dredged basin below the outer slope of the sandbank, due either to slumping thereof or any other cause, at no additional cost to the *Employer*.

Extension of the sandbank shall be carried out as specified on drawings 1785-CO-020-C-DWG-0007-01 and 02, as follows:

1. Demarcate setting out points of the area to be filled.
2. Conduct a video survey of the existing slopes.
3. Place geotextile tubes filled with sand along the line of the new toe of the extended sandbank to form a low retaining structure 1 m high, staggered as necessary to eliminate gaps.
4. Set up silt curtains and other necessary turbidity control measures in a series of one or more, suitably dimensioned, separate paddocks.

The uppermost layer on top of the sandbank extension shall comprise material dredged from portions of Zone B that are rich in living marine organisms.

4.5.2 Demonstration Section

The *Contractor* shall demonstrate within an initial, limited area that the proposed method of extending the sandbank can be satisfactory implemented, before proceeding to complete the balance of the work.

4.5.3 Silt Curtain Installation, Operation and Maintenance

The installation, operation and maintenance of the silt curtains shall comply with the following:

- a) Floating containment silt curtains shall be provided to form a series of enclosed paddocks that can be used sequentially for sand deposition and to control turbidity by restricting movement of fines. At the top of the sandbank a shallow curtain shall be provided which shall be supported on floats at high tide.
- b) Operations within silt curtains shall not continue in current velocities greater than 2.0 knots.
- c) Extra length (up to 10% - 20%) and depth (slack) of curtains shall be included in designs to allow for tidal fluctuations and exchanges of water within the curtain.

- d) The *Contractor* shall adopt suitable measures to ensure that silt curtains are not:
 - Lifted out of the water during high winds.
 - Sunk due to excessive biological or silt fouling of the fabric.
- e) The number of joints in the curtain shall be minimized; a minimum continuous span of at least 15 m shall be provided between joints.
- f) Curtain anchor points shall be set prior to fabric installation. The anchor points shall have sufficient holding power to retain the curtain under the existing current conditions prior to putting the furled curtain into the water. Anchors shall be provided on both sides of the curtain to account for flows in both directions due to tidal movements.
- g) Once anchors are secured, the furled curtain shall be secured to the anchor points and then sequentially attached to each other until the entire curtain is secured in position. The furling lines shall then be cut to allow the skirts to drop, where after the lower load lines of adjacent curtains shall also be attached to each other, and the adjacent spans attached along their abutting vertical edges.
- h) Anchor lines shall be attached to the flotation devices and NOT to the bottom of the curtain.
- i) Anchors shall be attached on both sides of curtains to hold them in place and to prevent them over-running the anchors and pulling them out when the tide reverses.
- j) Anchor lines shall be attached to the flotation devices, not to the bottom of the curtain to prevent overstressing of the fabric material.
- k) Care shall be taken during removal of silt curtains to avoid or minimize re-suspension of settled solids.
- l) Should repairs to the geotextile fabric become necessary, a manufacturer approved repair kit shall be used in accordance with the manufacturer's specification.

4.5.4 Monitoring of Stability during Fill Placement

The *Contractor* shall continuously monitor the stability of the sandbank during placement by means of regular single beam echo-sounder surveys and dive surveys. The *Contractor* shall also undertake a multi-beam survey of the extension after the first layer has been placed, and thereafter after every second layer has been placed. The *Contractor* shall immediately notify the *Supervisor* if any abnormalities (slips, sloughing, scour, mud-slides etc.) are noticed.

4.5.5 Requirements of Marine Surveys

4.5.6 In-surveys

The *Contractor* shall survey the existing sandbank and adjacent seabed where material will be placed before any *works* associated with the sandbank extension commences in collaboration with the *Supervisor*. Both parties shall agree on the existing seabed levels before commencing work. A copy of the final agreed in-survey shall be furnished to the *Supervisor* for record purposes.

The in-survey shall form the basis for calculations of quantities of materials dredged or profiled as detailed in the Pricing Instructions.

4.5.7 Out-surveys

In addition to the interim surveys specified above, a survey of the completed extension shall be undertaken on completion thereof to confirm compliance with the specified dimensional tolerances.

The final levels shall be recorded on a drawing to be submitted to the *Supervisor* for acceptance.

The *Contractor* shall rectify the works as necessary to render it compliant herewith.



5.0 COMPLIANCE WITH REQUIREMENTS

5.1 Testing, Commissioning and Completion

The *Contractor* shall daily recover two bag samples (of 25 kg each) at depths up to 0.5m of the materials placed for the extension (not from the dredger hopper) at locations directed by the *Supervisor*, test the same for compliance herewith, and submit the results to the *Supervisor*. Non-compliant material shall be removed from the works and suitably disposed of by the *Contractor* at its own cost.

5.2 Tolerances

Tolerances shall be as follows:

- a) Points on the outer slope shall not be more than 500 mm above or below the specified surface.
- b) The outer side of the geotextile tube shall nowhere be more than 2.0 m from the specified line thereof in the direction away from the dredged basin.
- c) At no time during construction of the extension, shall the level of the deposited material exceed +2000 mm above final design level.
- d) The Contractor shall ensure that cumulative tolerances meet with tolerance requirements as defined within this specification.
- e) At completion of Phase-3 of the Project, the top of the sandbank should be visible at 0.0 m CDP.