

ANNEXURE C1
PARTICULAR SPECIFICATIONS
COASTAL STRUCTURES

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C1 COASTAL STRUCTURES

1. INTERPRETATIONS

1.1 Supporting specifications

The specifications listed in this section shall, inter alia, be read in conjunction with this specification.

- SABS 1200D
- Annexure B3: PSG Concrete
- Annexure E1: Geotextile
- Annexure E2: Rock

Notwithstanding the above the *Contractor* shall familiarise itself with "Part C4 – Site Information" of the contract documentation as pertinent information required for the planning and construction is contained within the documentation.

The *Contractor* will be deemed to have made its own assessment of the ground conditions from the information contained in "Part C4 - Site Information".

1.2 Definitions

For the purposes of this specification the following definitions will apply:

- Mean Sea Level: Land Levelling Datum, abbreviated as MSL.
- Chart Datum: Abbreviated as CD. This level will be taken 0.9 m below Mean Sea Level.

1.3 Abbreviations

The following abbreviations will be used in addition to those described in SANS 1200A:

- SANS: South African Bureau of Standards (recent South African Standards have the designation SANS rather than SABS)

2. SCOPE

2.1 General

This specification covers the construction of the rock revetment as described in the drawings:

- Supply, and placement of filter rock (type 3) to blind the existing revetment.
- Supply and placement of geotextile fabric on to embankment
- Supply and placement of filter rock (types 1 and 2)
- Supply and placement of armour rock (types 1, 2, 3 and 4)
- Extension of existing Stormwater outlet pipes

The extent of the revetments shall be in accordance with the drawings. The crest width and levels shall be in accordance with the drawings. The construction of the rock revetment must include the procurement of specified gradings of rock from a quarry licensed by the Department of Mineral Resources and Energy in the Durban area.

The detailed scope for each Section is described in the following.

2.2 Standard rock revetment

Standard revetments shall be constructed at the following Sections:

- Berth 1, 3, 7, 8
- Mole
- Berth 10 (Bunker)

Filter rock type 3 shall be placed on all existing seawall rock armour, to a minimum layer thickness of 0.5 m. Existing slopes steeper than a slope of 1:1.5 (V:H) shall be profiled using filter rock 3 to a slope of 1:1.5 (V:H). This rock shall be placed over all sharp objects which are not able to be removed that may cause damage to the geotextile. Sharp objects shall have a minimum filter rock cover of 0.5 m.

The geotextile shall be placed on top of the existing seabed and filter rock type 3, following the profile of the existing seabed and filter rock type 3. The geotextile shall cover the entire extent of the Section.

Filter rock type 1 shall be placed on top of the geotextile, following the geotextile's profile.

Armour rock, as specified in the drawings, shall be placed on top of the filter rock type 1, following the profile of the filter rock.

The seaward side of the new revetment shall not terminate on a seabed slope steeper than 1:3 (V:H).

2.3 Deep rock revetment

Berths 1 to 2 and Berths 2 to 3

Armour rock type 3 shall be placed on top of the filter rock type 1, following the profile of the filter rock, at a level of -2.5 m CD. Armour rock type 2 shall be placed on top of the filter rock type 1, following the profile of the filter rock, between a level of -2.5 m CD and the crest.

Berths 6 to 7, Berths 7 to 8 and Berths 8 to 10

Armour rock type 3 shall be placed on top of the filter rock type 1, following the profile of the filter rock, to the crest.

2.4 Under-berth revetment

Revetments shall be constructed under the following berths:

- Berth 1
- Berth 3
- Berth 7
- Berth 8
- Berth 10 (Bunker)

Filter rock type 3 shall be placed on all existing seawall rock armour, to a minimum layer thickness of 0.5 m. Existing slopes steeper than a slope of 1:1.5 (V:H) shall be profiled using filter rock 3 to a slope of 1:1.5 (V:H). This rock shall be placed over all sharp objects which are not able to be removed that may cause damage to the geotextile. Sharp objects shall have a minimum filter rock cover of 0.5 m.

The geotextile shall be placed on top of the existing seabed and filter rock type 3, following the profile of the existing seabed and filter rock type 3. The geotextile shall cover the entire extent of the Section.

Filter rock type 1 shall be placed on top of the geotextile, following the geotextile's profile.

Armour rock, as specified in the drawings, shall be placed on top of the filter rock type 1, following the profile of the filter rock.

The Contractor shall ensure that all existing berth structures (piles, deck, abutments etc.) are not damaged during installation of rock.

The seaward side of the new revetment shall not terminate of a seabed slope steeper than 1:3 (V:H).

Armour rock shall be packed up to the under-side of concrete structures.

2.5 Berth 3

Beginning at the top of the slope, existing handstone at a slope of 1:1.5 (V:H) or gentler shall be carefully removed to obtain the profile and revetment extents indicated in the drawings.

Existing slopes steeper than a slope of 1:1.5 (V:H) shall be profiled using filterrock type 3 to a slope of 1:1.5 (V:H). This rock shall be placed over all sharp objects which are not able to be removed that may cause damage to the geotextile. Sharp objects shall have a minimum filter rock cover of 0.5 m.

The geotextile shall be placed on top of the existing seabed and filter rock type 3, following the profile of the existing seabed and filter rock type 3. The geotextile shall

cover the entire extent of the Section.

Filter rock type 1 shall be placed on top of the geotextile, following the geotextile's profile.

Armour rock type 3 shall be placed on top of the filter rock type 1, following the profile of the filter rock at a level of -2.5 m CD. Armour rock type 2 shall be placed on top of the filter rock type 1, following the profile of the filter rock, between a level of -2.5 m CD and the crest.

Handstone which was removed may be used elsewhere if it complies with Section 4.1 and "Annexure E2: Rock".

2.6 Armour revetment toe

Toe stability is essential because failure of the toe will generally lead to failure throughout the entire structure. For the Island View berths a sacrificial toe at the bottom of every revetment slope will be provided with a maximum slope of 1:1.5 to ensure stability.

The sacrificial toe can be enhanced by digging a trench so that the toe can be keyed into the structure where possible. After the excavation, leveling and site preparation is done, Rocks are then placed on the overlaps or seams to bind the cloth together. Armour rock type 3 shall be placed on top of the geotextile cloth, following a horizontal profile of the rock toe as shown on the drawings.

2.7 Damaged Sheet Pile

Sections in the revetment where the existing sheet pile structure is damaged the recommended repair methodology will be as follows:

- Removing obstacles (foreign objects)
- Infill with filter rock Type 1 to maintain existing slope.
- Place geotextile (Bidim A10) or similar approved.
- Place armour rock Type 3 similar size to exiting rock.

2.8 Stormwater outlets

Approximately 35 storm water outlets terminate along the Island View shoreline. The diameters of these outlets range between 100 mm and 915 mm. These outlets shall be extended 1 m past the outer face of the new rock armour with HDPE pipe extensions, which shall overlap the existing outlet pipes by 1 m, as indicated in the drawings. The HDPE pipes shall comply with SANS 4427.

No grout shall be required at the interface of the pipes, however, the Contractor shall ensure that filter and armour rock is in contact with the new HDPE pipe and that the pipe is immobilised. The Contractor shall be responsible for damages caused or costs incurred by movement of any of the new pipe extensions.

The specification of HDPE pipes which shall be used is shown in Table 2-1.

Table 2-1: Characteristics of HDPE pipe extensions.

Diameter of existing outlet [mm]	Inside diameter of new HDPE pipe [mm]	HDPE pipe specification
100	113.2	PE100 PN16
300	323.6	PE100 PN16
450	453.2	PE100 PN16
535	574.4	PE100 PN16
600	647.4	PE100 PN16
760	810.4	PE100 PN16
900	949.7	PE100 PN4
915	949.7	PE100 PN4

2.9 Additional structures

Tie in details with additional structures such as mooring platforms shall be carried out in accordance with the drawings.

3. **CONTRACTOR'S EQUIPMENT**

3.1 General

The *Contractor* shall be fully responsible for the sufficiency of its equipment or implements and generally for all means used for the fulfilment of the Contract.

The requirements of SABS 1200D (Clause 4.3) shall apply to all vehicles that are required to operate on or over any public road. Spillage of materials, generation of dust, or contamination of public roads with mud from the site shall be controlled. The *Contractor* shall be responsible for cleaning the haul route of any spilled material from its vehicles at its own expense.

Audible reversing warning signals shall be provided for all transport vehicles exceeding a GVM of 3 tonnes.

All equipment to be used in the Works shall be subject to the safety, environmental and legal requirements.

3.2 Lifting machinery

All cranes and/or gantries together with all slings, ropes and hooks to be used on site of the Works shall be tested and certified as required by legislation. Revetment construction cranes shall be equipped with load measuring devices, and shall be provided with a means to monitor the location of the crane hook in three degrees of freedom, whether in air or underwater.

3.3 Transportation

The Contractor shall provide its own transport onshore and offshore for the duration of revetment construction works.

4. **MATERIALS, PLANT AND WORKMANSHIP**

4.1 Rock for revetment

The following rock gradings will be required in the *Works*.

Table 4-1: Armour rock gradings.

Category	Group	Designation
Armour 1	Non-Standard Grading	1000 kg – 2500 kg
Armour 2	Non-Standard Grading	500 kg – 1500 kg
Armour 3	Non-Standard Grading	150 kg – 700 kg
Armour 4	Non-Standard Grading	30 kg – 200 kg

Table 4-2: Filter rock gradings.

Category	Group	Designation
Filter 1	Non-Standard Grading	30 kg – 130 kg
Filter 2	Non-Standard Grading	2 kg – 10 kg
Filter 3	Standard Grading	63 mm stone

Table 4-3: Non-standard grading designation.

Grading class designation (kg)	ELL $y < 5\%$	NLL $0\% < y < 10\%$	NUL $70\% < y < 100\%$	EUL $97\% < y$
1000 kg – 2500 kg	550	1 000	2 500	3 800
500 kg – 1500 kg	250	500	1 500	2 300
150 kg – 700 kg	100	150	700	1 000
30 kg – 200 kg	10	30	200	300
30 kg – 130 kg	10	30	130	250
10 kg – 20 kg	1	2	10	20
Where y is the percent by weight lighter on the cumulative plot.				

The filter 3 rock shall consist of crushed and graded stone having a nominal aggregate size of 63mm and a grading as defined in the table below. The stone shall comply with SANS 201, Table 5. The 10% Fine Aggregate Crushing Test value shall be at least 210 kN according to SANS 5842.

Table 4-4: Aggregate grading of 53 mm nominal stone size(Filter type 3).

Nominal aperture size of sieve (mm)	Percentage of material passing sieve (%)
75.0	100
53.0	85 to 100
37.5	0 to 50
26.5	0 to 25
19.0	0 to 5

4.2 Filter fabric

Filter fabric for placement underneath the rock revetment shall be grade A10 and is covered by "Annexure E1: Geotextile".

4.3 Selection, transport and placement of rock

Methods and procedures for the selection, transport and placement of rock are covered by "Annexure E2: Rock".

5. **EXECUTION**

5.1 General

The Contractor is to source rock to conform to the quality requirements as specified in "Annexure E2: Rock".

5.1.1 Precautions

The Contractor is to note that it shall select its equipment and methods, and programme its operations accordingly. In this regard the Contractor shall include in its programme sufficient allowance for weather related downtime.

The Contractor shall further note that there is a high risk of encountering man-made debris, including but not limited to concrete pieces, steel pieces and scrapped vessel debris. Hard calcrete may also be present within the volume to be excavated.

The Contractor is to note that accurate as-built details are lacking in some areas and it shall allow for detail site inspection to avoid damage to existing infrastructure in executing the work.

5.1.2 Sequence of *works*

The sequencing of the revetment construction works shall follow the general sequencing.

5.1.3 Method Statements

The Contractor shall provide the following method statements:

- Method statement for the management of the site, with special emphasis on how the materials on site will be managed.
- Method statements for the transport and placement of rock.
- Method statement for working under berths with restricted access.
- Method of placing filter fabric below and above water.
- Programme for rock revetment construction.

Activities shall not commence without the written approval from the *ProjectManager* of the above-listed method statements.

5.2 Surveys

Survey requirements for the revetment are covered by "Annexure E2: Rock".

6. **TOLERANCES**

Tolerances for the revetment construction are covered by "Annexure E2:Rock"