

# TECHNICAL SPECIFICATIONS

*Note: In all cases check against online version for the latest revision prior to use*

---

## **VARIATIONS TO SANS 2001-CC1, CONSTRUCTION WORKS, PART CC1: CONCRETE WORKS (STRUCTURAL) FOR MARINE WORKS**

Project Name:

CONSTRUCTION OF THE MARINE WORKS FOR THE UPGRADE OF BREAKWATER (NEW DOLOSSES) PROJECT AT PORT OF RICHARDS BAY

Transnet Project Number:

TNPA/2025/05/0010/95183/RFP

Author: PRDW

Owner: Transnet

Client: Transnet National Ports Authority

Project Sponsor: Dennis Mqadi

Project Manager: Lebeso Ramohlale

Revision Number: 001

Approved by: Malefetsane Setaka


# TECHNICAL SPECIFICATIONS

*Note: In all cases check against online version for the latest revision prior to use*

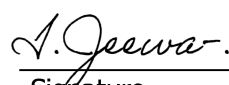
## DOCUMENTATION DISTRIBUTION, REVISION AND APPROVAL HISTORY

REVISION NUMBER	DATE	DISTRIBUTION/ REVISION	COMPILED BY	REVIEWED BY	ACCEPTED BY
0	2025/07/17	0	PRDW	Lebese Ramohlale	Imtiaz Jeewa

### SIGNATORIES:

Compiled by: Lance Kime  2025/07/17  
Project Lead - PRDW Signature Date

Reviewed by: Lebese Ramohlale  21/07/2025  
Contracts Lead Signature Date

Accepted by: Imtiaz Jeewa  21/07/2025  
Principal Project Manager Signature Date

# TECHNICAL SPECIFICATIONS

*Note: In all cases check against online version for the latest revision prior to use*

## RICHARDS BAY BREAKWATER UPGRADE AND REPAIRS

### VARIATIONS TO SANS 2001-CC1, CONSTRUCTION WORKS, PART CC1: CONCRETE WORKS (STRUCTURAL) FOR MARINE WORKS

FEL 4

S2072-01-TS-CS-Rbay Spec conc-002-R0

11 December 2019

Lead:



REV.	TYPE	DATE	EXECUTED	CHECK	APPROVED	CLIENT	DESCRIPTION / COMMENTS
0	A	2019/12/11	PES	RSS	PES		Draft for comment

TYPE OF ISSUE: (A) Draft (B) To bid or proposal (C) For Approval (D) Approved (E) Void

# TECHNICAL SPECIFICATIONS

*Note: In all cases check against online version for the latest revision prior to use*

TABLE OF CONTENTS	Page N°
1. INTRODUCTION .....	5
2. SCOPE .....	5
3. NORMATIVE REFERENCES .....	5
4. VARIATIONS TO SANS 2001-CC1 .....	5
4.1 Durability concrete mixes .....	7
4.2 Potential heat generation .....	8
4.3 Underwater concrete .....	8
4.3.1 Methods of depositing concrete underwater .....	8
5. QUALITY DOCUMENTATION .....	9
5.1 Prior to casting concrete .....	9
5.2 On partial and/or full completion of the works .....	9

TABLES	Page N°
Table 4-1: Variations to SANS 2001-CC1 .....	5
Table 4-2: Concrete mixes .....	7

FIGURES	Page N°
---------	---------

No table of figures entries found.

# TECHNICAL SPECIFICATIONS

*Note: In all cases check against online version for the latest revision prior to use*

**Transnet**

## RICHARDS BAY BREAKWATER UPGRADE AND REPAIRS

### VARIATIONS TO SANS 2001-CC1, CONSTRUCTION WORKS, PART CC1: CONCRETE WORKS (STRUCTURAL) FOR MARINE WORKS

FEL 4

#### 1. INTRODUCTION

This Specification covers the variations to SANS 2001-CC1, Construction works, Part CC1: Concrete works (structural), for the supply, delivery, handling, fabrication, storage and installation of concrete works required for use on marine structures.

#### 2. SCOPE

This Specification defines the minimum requirements for the materials, production, handling, placement, and curing of concrete for use in marine structures. SANS 2001-CC1 covers structural concrete works for buildings and other land-based structures. It specifically excludes marine works, and this specification details the additional requirements for concrete in the marine environment.

The standard, SANS 2001-CC1 Construction works, Part CC1: Concrete works (structural), as modified by this Specification, must be used for marine concrete works.

#### 3. NORMATIVE REFERENCES

The work completed under this Specification must conform to the current issue, including amendments, of the applicable normative standards given in SANS 2001-CC1.

#### 4. VARIATIONS TO SANS 2001-CC1

Variations to SANS S2001-CC1 are detailed in Table 4-1.

**Table 4-1: Variations to SANS 2001-CC1.**

Clause No	Description	Variation
4.2.3.4	Use of plums	Plums must not be used in the works.
4.2.3.5	Material tests	The tests listed in the clause must all apply.  The potential for alkali-aggregate reaction must be determined for the intended cement and aggregates according to SANS 6245 or ASTM C1260.
4.2.6	Grade of concrete	Concrete grades for each concrete element will be defined on the drawings. Concrete grade is defined as Grade X/Y, where X is the 28 day cube crushing strength in MPa, and Y is the maximum nominal aggregate size in mm.
4.2.7	Grout	A proprietary pre-packaged non-shrink grout must be used for grouting of dowels, anchor bolts, and similar applications.

# TECHNICAL SPECIFICATIONS

Note: In all cases check against online version for the latest revision prior to use

Clause No	Description	Variation
4.4.2.3	Spacers	Proprietary manufactured mortar cover blocks must be used to ensure the cover to reinforcement. They must be dense and have a minimum 28 day crushing strength of 50 MPa, and must be cured in water for at least 14 days before being used. Cover blocks made of plastic must not be used in the works.
4.4.3	Cover	The concrete cover to the reinforcement must be 65 mm (extreme exposure condition), as defined in Table 3, unless specified otherwise on the drawings.
4.7.4	Chloride and sulfate content	The maximum chloride contents in Table 5 of SANS 2001-CC1 specified for the marine environment for reinforced and post-tensioned concrete must be applied.
4.7.5	Durability	In order to enhance durability and notwithstanding strength considerations the concrete mixes must satisfy one of the mixes given in the Table 2 below.  Blends of CEM I and Condensed Silica Fume (CSF) must not be used for steel reinforced concrete. Ternary blends containing two extenders, such as CSF, FA, GGCS or GGBS, may be considered provided that they can be shown to be equivalent in durability to the mixes given.
4.7.10.13	Underwater concrete	It may be required to place concrete underwater, as specified on the drawings. In addition to this clause the recommendations and requirements of clause 4.3 below must be followed.
4.7.12.1	Construction joints	The preparation of the construction joint surface must follow the methodology given below. This replaces the methodology of SANS 2001-CC1 Table 7, Method 1.  The joint surface of the concrete is to be roughened while still green by means of brush and water spray to expose the coarse aggregate, and retarder may be used to facilitate the process. Retarders may be used on stop-ends for vertical construction joints, which should be removed after 12 hours for green cutting.  It is essential that the construction joint surface is prepared while the concrete is still green and the retarder is active. The joint preparation must therefore be undertaken before the concrete has hardened. Therefore the methodology of Table 7, Method 2 must not be used.  In the case of casting against the hardened concrete of an existing structure Table 7, Method 3 must be used.
4.7.13	Curing and protection	All reinforced concrete must be cured by moist curing methods. Curing compound (clause 4.7.13.2e) must not be used for curing reinforced concrete.  The curing periods must be as defined SANS 2001-CC1 Table 8.
4.7.15.	Concrete surfaces	The unformed surfaces of concrete armour units must be wood-floated.
4.7.19	Defects	All defective concrete must be repaired in accordance with the requirements of <i>EN 1504: Products and systems for the protection and repair of concrete structures, Parts 1 to 10</i> . <i>EN 1504</i> defines the type of products for the protection and repair of concrete

# TECHNICAL SPECIFICATIONS

Note: In all cases check against online version for the latest revision prior to use

Clause No	Description	Variation
		structures. Furthermore, the quality control of the repair materials production and the execution of the works on site are also part of this standard.
4.7.22	Records	In addition to the records listed in clause 4.7.22 the quality records listed in clause 5 below must be provided.
5.2	Tolerances	The concrete works must be constructed to Degree of accuracy II, unless specified otherwise on the drawings.

## 4.1 Durability concrete mixes

Concrete mixes are detailed in Table 4-2.

Table 4-2: Concrete mixes.

Concrete Type	Cement Type & % Content	Extender Type & % Content	Minimum Binder Content (Cement + Extender) Kg/M <sup>3</sup>	Maximum Water/Binder Ratio
STEEL REINFORCED	CEM I 50% – 60%	GGBS/GGCS 40% – 50%	400	0.40
STEEL REINFORCED	CEM I 70% - 75%	FA 25% – 30%	400	0.40
PLAIN	CEM I 100%	NIL	340	0.50
PLAIN	CEM I ≥ 75%	FA ≤ 25%	340	0.50
PLAIN	CEM I 35% - 65%	GGBS/GGCS 35% – 65%	340	0.50
PLAIN	CEM I 65% – 74%	FA 26% – 35%	300	0.55

Note:

- CEM I may be CEM I 42,5, 42,5 R, 52.5 or 52.5R.
- GGBS - Ground Granulated Blast Furnace Slag
- GGCS - Ground Granulated Corex® Slag
- FA - Fly Ash
- Factory blended cements (CEM II/B-V, CEM II/B-W or CEM III/A) will be accepted provided that they conform to one of the blends specified in the table. The *Contractor* must supply certification thereof.
- Water-reducing admixtures may be used to improve workability (See also Clause PSG 2.3 above). The water cement ratio must include the water content of admixtures.
- Cement/binder content valid only for nominal maximum size of aggregate of 20mm.

*Note: In all cases check against online version for the latest revision prior to use*

## 4.2 Potential heat generation

In addition to the requirements of SANS 2001-CC1 clause 4.7.14, Adverse weather, consideration must be given to the potential heat generation when casting large concrete elements.

Where the minimum dimension of concrete to be placed at a single time is greater than 600 mm and especially where the cement/binder content is likely to be 400 kg/m<sup>3</sup> or more, measures to reduce the temperature, such as the selection of a cement type with a slower release of heat of hydration, should be considered. In exceptional cases other measures to reduce the temperature or to remove evolved heat may be necessary.

## 4.3 Underwater concrete

Unless otherwise permitted, the technique adopted for placing of concrete and any dewatering must be designed to prevent the washing out of cement from the concrete mixture, minimise the segregation of materials and the formation of laitance, and prevent the flow of water through or over new concrete less than 24 hours old. Use of a concrete admixture such as Sika UCS-01 ZA or other similar approved proprietary admixture to minimise the washout of cement paste is recommended.

After commencement, the placing of concrete must be continuous until completion, unless otherwise permitted.

No vibration must be carried out until the top of the concrete is above water or tide level.

The maximum size of aggregate must be 50 mm, and the aggregates must be well graded.

The slump must not be less than 80 mm or more than 150 mm.

If concrete is to be cast onto the seabed the founding area must be cleaned of silt and loose material.

### 4.3.1 Methods of depositing concrete underwater

#### 4.3.1.1 By tremie

The top section of the tremie must consist of a hopper of greater capacity than the pipe.

The tremie must be sturdily constructed of steel, and be not less than 200 mm in diameter. It must be strong enough to withstand the full hydrostatic pressure, even if a partial vacuum develops in the pipe, and must be completely watertight.

The lower end of the tremie must be equipped with an approved automatic check valve which must be watertight.

Initial filling of the tremie must be carried out with the valve closed, in such a manner as to avoid air locks.

When concrete is deposited, the tremie must penetrate the concrete bed and must be slowly raised to discharge a uniform flow of concrete. The end of the tremie must be under concrete during the whole operation.

Concreting must continue to such a point that laitance can be removed and a sound surface left at the final finished level.



# TECHNICAL SPECIFICATIONS

*Note: In all cases check against online version for the latest revision prior to use*

## 4.3.1.2 By pumping concrete

The same conditions and criteria as for concreting by tremie as described in (i) above, apply.

## 4.3.1.3 By grouting aggregate

Coarse aggregate, 40 mm or larger, must first be placed and compacted in position.

Grout in a colloidal state must be pumped into the voids through a pipe which must reach to the bottom of the aggregate. The grout must rise through the aggregate until all voids are filled.

## 5. QUALITY DOCUMENTATION

The minimum quality documentation required for the concrete works is listed in this section.

### 5.1 Prior to casting concrete

- Materials sources and certification for each type.
- Manufacturers' product sheets for proprietary items such as admixtures, cover blocks, waterstops, joint fillers etc.
- Report on concrete mix designs for each required grade. Report to include details of all materials (cements, extenders, aggregates, water and admixtures), and strength test results from trial mixes.
- Report on potential for alkali aggregate reaction, and mitigation measures to be implemented if required.
- Construction method statements

### 5.2 On partial and/or full completion of the works

- Casting records. Casting records must include:
  - Records of pre-casting inspections
    - Founding
    - Formwork
    - Reinforcement
    - Cover blocks
    - Cast-in items
    - Safety (access, formwork)
    - etc
  - Records of post-casting inspections
    - Dimensions
    - Finish
    - Defects
    - Construction joints
    - Test results (slump)
    - Curing records

# TECHNICAL SPECIFICATIONS

---

*Note: In all cases check against online version for the latest revision prior to use*

- etc
- Concrete strength test results
- Report on any remedial works undertaken on the concrete