



TRANSNET SOC LTD

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

PORT OF DURBAN

SPECIFICATION – PAVING

1785-CO-000-C-SPC-0007 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 construction of a jointed unreinforced cast in situ concrete pavement and asphalt paving in the marine environment. The scope of this portion of the works may be summarised as follows:

- a) The demolition and construction of a concrete pavement, and
- b) The construction of asphalt paving.

Asphalt paving is to be constructed between the back face of the capping beam and the slot drain.

Concrete paving is to be constructed between the slot drain and the landside crane beam. The concrete paving shall continue from the landward crane beam over the existing quay and tie in with the existing busbar tunnel.

2.0 NORMATIVE REFERENCES

2.1 Reference Documents

The following *Employer* and industry standardised specifications are referenced in this specification and form part of the Works Information.

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

- a) This Specification
- b) Industry Codes, Standards and Specifications as listed in Section 2.2
- c) *Employer's* Project Specific Technical Specifications as listed in Section 2.3
- d) Project Drawings:
 - 1785-CO-160-C series of drawings – Paving
 - 1785-CO-170-C series of drawings – Stack Markings, Road Markings and Fencing
- e) Method statement prepared by the *Contractor*, as described in Section 4

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 construction of jointed unreinforced cast in situ concrete pavement and asphalt paving in the marine environment shall comply with the following standard specifications.

The governing standard for this specification shall be the latest revision of:

- a) COTO – Standard Specifications for Road and Bridge Works for South African Road Authorities.

The following codes and standards shall supplement, but not supersede the primary codes and standards:

- a) SANS 121:2011 / ISO 1461:2009 Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods.
- b) SANS 920: 2011 Steel Bars for Concrete Reinforcement.
- c) SANS 4635:2004 / ISO 4635:1982: 2016 Rubber, vulcanized - Preformed compression seals for use between concrete motorway paving sections - Specification for material.
- d) AASHTO M153: 2006 Standard Specification for Preformed sponge rubber and cork expansion joint fillers for concrete paving and structural construction.

2.3 Employer's Project Specific Specifications and Standards

The construction of jointed unreinforced cast in situ concrete pavement and asphalt paving in the marine environment shall comply with the following Project Specific Specifications and Standards:

- 1785-CO-000-C-SPC-0001 – Concrete for Marine Construction.
- 1785-CO-000-C-SPC-0004 – Dredging and Reclamation (Including Vibro Compaction).
- 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 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. The method statements shall be submitted to the *Supervisor* for acceptance three weeks in advance of the particular activity being undertaken. Full details of all proposed Equipment (including temporary works) and methods shall be provided for acceptance by the *Supervisor*.

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

Further details of the requirements of particular method statements are provided in Section 4.

3.5 Technical Definitions

- a) Construction Joint means a joint made by design or made necessary by a prolonged interruption in placing of concrete.
- b) Longitudinal Joint means a joint parallel to the direction of construction.
- c) Transverse Joint means a joint at right angles to the direction of construction.
- d) Panel Length means the distance between 2 transverse joints.
- e) Panel Width means the distance between 2 longitudinal joints.
- f) Weakened Plane Joint means a plane of weakness created by sawing a groove in the surface of the concrete.
- g) Dowelled Weakened Plane Joint means a weakened plane joint at which the saw cut is made over the centre line of a row of dowels cast into the concrete.
- h) Tied-Weakened Plane Joint means a weakened plane joint at which the saw cut is made along the centre line of a row of tie-bars cast into the concrete.
- i) Butt Joint means a joint between adjacent slabs of concrete at which the meeting faces are plane surfaces.
- j) Keyed Construction Joint means a joint between adjacent slabs of concrete at which a groove in one slab is filled by a tongue of concrete in the adjacent slab.
- k) Dowelled or Tied Construction Joint means a butt or keyed joint at which dowels or tie-bars are set in the concrete with half their length on either side of the joint line.
- l) Isolation Joint means a butt joint at which there is no intimate contact between a concrete slab and an adjacent fixed structure or another concrete slab.
- m) Filler means a non-extruding pre-moulded compressible material is used to fill the gap at an expansion joint.
- n) Dowel means a plain mild steel bar set across a joint so as to permit contraction of the concrete and resist movement of one slab relative to another in a vertical plane or parallel to the joint.
- o) Tie-bar means a steel bar with a deformed surface set across a joint so as to prevent separation of the joint faces of adjacent slabs.
- p) Bond-Breaking Compound means a material with which dowels are coated to prevent concrete from adhering to the dowels.
- q) Concrete Infill means un-reinforced, cast in situ concrete, placed to the dimensions as indicated on the drawings, around rails in the rail recesses.
- r) Roadbed means:
 - In front of the existing quay wall: The hydraulically placed fill on which the pavement layers are to be constructed.
 - Behind the existing quay wall: The in situ material after excavation for pavement layers.

4.0 GENERAL REQUIREMENTS

The clauses in this section apply to both the flexible pavement and the concrete pavement.

4.1 Method Statement

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

- a) Nature and sources of materials in base courses and concrete mix with test certificates and results.
- b) Mix designs.
- c) Details of proposed concrete mix design and programme of trial mix production.
- d) Method of material storage and production, delivery and quality control.
- e) Method of placing concrete including vibration.
- f) Curing methods.
- g) Concrete pavement jointing procedures.
- h) Falsework, formwork and methods of achieving specified finishes.
- i) Details for positioning and securing cast-in items to specified tolerances.
- j) Details of flexible pavement materials.

4.2 Sequencing

No pavement works shall commence prior to the compacted hydraulic fill meeting the performance requirements as specified in specification 1785-CO-000-C-SPC-0004 Dredging and Reclamation (Including Vibro Compaction).

4.3 Compaction Equipment

Compaction equipment shall be in accordance with the relevant clauses of COTO Chapter 5 Earthworks Layers.. In restricted areas where the specific rollers cannot be used, compaction shall be carried out with hand operated mechanical compaction equipment or approved smaller vibratory rollers. The revised compaction procedure shall be submitted to the *Supervisor* for approval.

4.4 Demolition of Existing Concrete and Asphalt Pavement

All spoil from concrete and asphalt demolition shall be disposed of offsite at a registered disposal site of the *Contractor's* choice. Where the new concrete abuts existing asphalt or existing concrete, the existing pavement shall be saw cut to form a neat edge.

4.5 Roadbed Preparation

The roadbed (as defined in 3.5 above) shall be prepared in accordance with COTO Chapter 5 c) to a depth of 150mm at a minimum compaction density of 93% MOD AASHTO (100% for sand).

4.6 G7 Selected Layer

The G7 selected layer shall be constructed between the hydraulic fill and the G1 crushed stone base. The layer shall be compacted to 93% MOD AASHTO in accordance with COTO Chapter 5.

4.7 Road and Stack Markings

Stack and road markings shall be applied in accordance with COTO Chapter 11 Ancillary Road Works.

4.7.1 Surface Preparation

All new and existing surfaces shall be prepared for the road and stack markings in accordance with COTO Chapter 11. The *Contractor* shall lightly sandblast the concrete surface to which paint is to be applied to ensure the removal of curing compound and any fine surface laitance to achieve a light (shallow) profile. All grit that is a by-product of the sandblasting operation must be removed to spoil outside the Port boundaries. The *Contractor* shall not sweep the grit into the slot drains or harbour water.

The *Contractor* shall ensure that all joints and joint sealant is properly protected while the surface is being treated by sand blasting or water jetting. The *Contractor* shall be held responsible for the repair of any damaged jointing.

4.7.2 Paint

The lines or markings are to be painted with Plascon Hysheen Road and Runway Paint or similar approved, at an application rate of 0.42 l per m². The colour of paint to be used shall be as specified on the drawing issued. All paint shall conform to SABS 731-1995.

The following must be noted by the *Contractor* in terms of SABS 731-1:1995:

1. The paint shall be a Type 2 Paint.
2. The paint shall be suitable for use on both a concrete surface and an asphalt surface
3. The paint is not required to be retro reflective.
4. Drying time classification shall be Class 1.
5. The colours required for the completion of the contract shall be:
 - a) White
 - b) Yellow
6. All the above colours to meet classifications according to SABS 1091.

5.0 CONCRETE PAVEMENT REQUIREMENTS

5.1 Scope

The following activities are required to construct the concrete pavement structure:

- a) G7 natural gravel.
- b) G1 crushed stone base.
- c) De-bonding/separation asphalt surfacing layer over existing capping beam.
- d) Concrete including batching, placing and finishing.
- e) Jointing including galvanised steel tie bars, dowels, joint filler and sealants.
- f) One component polyurethane joint sealant (Installed as per the manufacturer's specifications).

Alternative materials shall be considered provided that full details of the materials characteristics and applicable specifications are submitted to the *Supervisor* for approval.

5.2 Asphalt Separation Layer

The layer shall be a 25 mm thick medium continuously graded asphalt surfacing layer in accordance with COTO Chapter 9: Asphalt Layers. The existing concrete surface shall be water jetted or grit blasted prior to placement of the asphalt layer.

5.3 G1 Crushed Stone Base

The *Contractor* shall construct a 300 mm G1 crushed stone base with a minimum apparent relative density of 88% in accordance with COTO Chapter 5: Earthworks and Pavement Layers: Construction. The base shall be placed and compacted in two layers of 150 mm thickness.

5.4 Concrete Pavement

A 375 mm thick un-reinforced slab shall be constructed in accordance with the drawings and in strict accordance with *Employers* specification 1785-CO-000-C-SPC-0001 and COTO Chapter 6: Concrete Layers.

In accordance with COTO Chapter 6, the *Contractor* shall be responsible for the construction of the concrete pavement which shall not exhibit any cracks. Construction of the pavement includes placing, curing and sawing of the concrete. In accordance with COTO Chapter 6 the *Supervisor* shall, in his opinion, where the strength and durability of the panel is compromised by any form of cracking, regard such panel as a Defect. Such defects shall warrant the removal and reconstruction of that particular panel or section of pavement. Where, in the opinion of the *Supervisor*, cracking is not detrimental to the strength and durability of the pavement the *Contractor* shall repair such cracks, if so required by the *Supervisor*. The method used to repair such superficial cracks shall be approved by the *Supervisor*.

Jockey slabs are deemed to be reinforced concrete and shall comply with the durability requirements of reinforced concrete as detailed in specification 1785-CO-000-C-SPC-0001 Concrete for Marine Construction.

5.5 Jointing

All jointing shall be in strict accordance with COTO Chapter 6.

Tie-bars and dowel bars are to be hot-dipped galvanised in accordance with SANS 121. The bond breaking cord shall be a closed-cell expanded polyethylene cord.

5.6 Tolerances

The *Contractor* shall ensure that cumulative tolerances meet with tolerance requirements as defined within this specification.

6.0 FLEXIBLE PAVEMENT REQUIREMENTS

6.1 Scope

The following activities are required to construct the flexible pavement structure in accordance with COTO Standard Specifications:

- a) G7 natural gravel
- b) C3 cement stabilised base
- c) C1 cement stabilised base
- d) Prime Coat
- e) Asphalt base
- f) Tack coat
- g) Semi rigid asphalt surfacing as detailed below

6.2 Prime Coat (COTO Chapter 9)

A MC-30 cut back bitumen prime coat will be applied to the surface of the underlying G1 layer. The application rate shall be at 0.7 l/m² unless otherwise instructed by the *Supervisor*. The prime coat shall comply with SANS 4001-BT1.

6.3 Continuously Graded Asphalt Base Layer (COTO Chapter 9 Asphalt Layers)

The base layer shall consist of a continuously graded 26.5 mm asphalt layer, with a 35/50 penetration grade bitumen binder. Asphalt base total thickness of 200 mm and constructed in lifts of 100 mm.

The nominal mix proportions and rates of applications are provided in COTO Chapter 9, Clause A9.1.7 Execution of the Works. The materials, climate and construction conditions must be taken into consideration when determining the rates and proportions. A nominal mix variation in the bitumen content after approval shall be adjusted in accordance with COTO Chapter 9, Clause A9.1.7.

6.4 Tack Coat (COTO Chapter 9)

A tack coat consisting of a stable grade bituminous emulsion shall be applied to the surface of the underlying layer or lift. The tack coat shall be applied at an application rate of 0.4 l/ m² or as otherwise directed by the *Supervisor*. Additionally, to improve adhesion a tack coat layer is required at all transverse and longitudinal joints.

6.5 Semi Rigid Asphalt Surface

6.5.1 Materials

The asphalt surfacing shall be a composite semi rigid surfacing, consisting of an open graded asphalt layer. The type of penetration grade bitumen shall consist of binder type 35/50 as specified in SANS 4001-BT2 and latest amendments.

The voids in the open graded asphalt are filled with resin modified cementitious grout. The grout shall be a Salphalt Grout supplied and applied in accordance with the manufacturer's specifications and recommendations.

The grading and properties of the mix are provided in Table 6.1.

6.5.2 Equipment

A paver shall be used to lay the Material. Compaction of the open graded asphalt shall be undertaken with a tandem steel wheeled vibratory roller only. No pneumatic tyre rollers are permitted.

6.5.3 Construction

The surface shall be applied in accordance with COTO Chapter 6 Concrete Layers unless otherwise noted below.

Surfacing shall be constructed in two stages as follows:

- The open graded asphalt shall be laid and compacted.
- After asphalt has cooled to below 30 degrees Celsius, the resin modified cementitious grout shall be poured onto the asphalt and vibrated into the voids.

No grouting shall be undertaken if the surface temperature rises above 40 degrees Celsius. No traffic shall be permitted onto the layer before the grout is applied or until a period agreed to by the manufacturer after the grout has been applied.

Table 6.1: Properties of Surface Layer

Sieve Sizing (mm)	% Passing	
	Min	Max
19.000	100	
13.200	90	100
9.500	40	60
4.750	15	30
2.360	10	15
0.600	3	8
0.300		
0.150		
0.075	1	3
Voids (%)	20	25
Bitumen Content (%)	3.9	4.2

6.6 Tolerances

The *Contractor* shall ensure that cumulative tolerances meet with tolerance requirements as defined within this specification.