Technical Specification

Transport and Main Roads Specifications
MRTS300 Boat Ramps

July 2017

Queensland Government

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1 Introduction

This Technical Specification applies to the design and construction of boat ramps for launching and retrieving recreational trailer boats where the Gross Combination Vehicle Mass (GCVM) does not exceed 8000 kg.

This Technical Specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications*, MRTS50 Specific Quality System Requirements and other Technical Specifications as appropriate.

This Technical Specification forms part of the Transport and Main Roads Specifications Manual.

The requirements for construction of boat ramps shall include the use of approved suppliers of precast concrete boat ramp planks as defined in Clause 5.6 of MRTS72.

2 Definition of terms

The terms used in this Technical Specification shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*. In addition, terms listed in Table 2 apply to this Technical Specification.

Table 2 – Definition of terms

Term	Definition
RHM	Regional Harbour Master (for the watercourse)
Safety Plan	A Work Health and Safety Management Plan in accordance with the *Work Health and Safety Act* 2011
EMP (MP)	The Environmental Management Plan prepared by the Principal for obtaining approvals and attached as a contract document
EMP (C)	The Principal's EMP amended by the Contractor to include works program and dredging equipment specific details
Design Manual	Design Criteria for Boat Ramps

3 Referenced documents

Table 3 lists documents referenced in this Technical Specification.

Table 3 – Referenced documents

Reference	Title
MRTS300.1	*Annexure Boat Ramps*
MRTS70	*Concrete*
MRTS72	*Manufacture of Precast Elements*
SD4000	*Boat Ramp - Precast planks for Boat Ramps - Type RG4000 and RG3500*
SD4001	*Boat Ramp - Precast planks for Boat Ramps - Type OS4000 and OS3500*
SD4020	*Boat Ramp - Boat Ramp Construction – Precast Plank Installation and Anchor Beam – Types 1 and 2*
SD4021	*Boat Ramp - Boat Ramp Construction – Earthworks and Crushed Rock Core Details*
SD4022	*Boat Ramp - Boat Ramp Construction – Fully Grouted Shoulders and Ungrouted Shoulders*

4 Quality system requirements

4.1 Hold Points, Witness Points and Milestones

General requirements for Hold Points, Witness Points and Milestones are specified in Clause 5.2 of MRTS01 *Introduction to Technical Specifications.*

The Hold Points, Witness Points and Milestones applicable to this Technical Specification are summarised in Table 4.1.

Table 4.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
6.2			Submission of Construction Plan (10 days)
6.4	1. Possession of Site		
6.6	2. Start of works		
7.5		1. Treatment of acid sulfate soils	
7.6		2. Geogrid and geotextile placement in accordance with the layout and lapping plan	Supply of samples and layout and lapping plan for geogrid and geotextile (prior to commencement of earthworks)
7.7		3. Compaction of 75 mm crushed rock	
8.2	3. Concrete design mix		Submission of design mix (10 days)
8.3	4. Placement of concrete	4. Concrete to be placed in the presence of the inspector	
8.5	5. Manufacture of precast planks		
9		5. Construction of fully grouted shoulders	

5 Design of boat ramps

The design of boat ramps shall be in accordance with the Design Manual.

6 Site establishment

6.1 Scope of Works and extent of Contract

The scope of Works is defined in Clause 1 of the Annexure.

The Contract includes the supply of all plant, labour and materials necessary to complete the Works in accordance with the Particular and General Conditions of Contract, this Technical Specification, and the following contract documents in Table 6.1.

Table 6.1 – Contract documents

Contract document	Reference
Project specific drawings	Standard Drawings index on the: Site Plan, Locality Plan and Cadastral Plan
Standard Drawings	Standard Drawings index on the: Site Plan, Locality Plan and Cadastral Plan
Boat ramp information signs (TC)	General Arrangement- sign layout
Information Drawings	Clause 2 of Annexure MRTS300.1
Statutory Approvals	
Geotechnical Investigation	
Environmental Management Plan (Marine Planning)	

Information drawings (where provided) were prepared for purposes other than the Contract Works. The currency or accuracy of the information on these Standard Drawings has not been confirmed and shall be verified by the Contractor prior to commencing the Works.

6.2 Construction Plan

The Contractor shall prepare and submit a Construction Plan for deemed approval prior to awarding Possession of Site. 10 business days shall be allowed for review by the Superintendent, and Extensions of Time (EoT) will not be granted for delays required by amendments. **Milestone**

The Construction Plan includes these elements:

- the Safety Plan
- the Works Program, and
- the EMP (C).

6.2.1 Plan

The Safety Plan will address the following general hazards related to construction of recreational boating facilities that have been identified in the design process:

a) undertaking construction activities near publicly accessible areas

b) working near, in, on or under water

c) operating plant and machinery

d) lifting, transporting and handling precast units and piling

e) slips, trips and falls on wet surfaces or submerged objects

f) dangerous marine animals (stingers, sharks, stone fish, crocodiles and so on), and

g) conflict with site services.

6.2.2 Works Program

The Contractor shall provide a works program consistent with:

- the allowable working times
- tide cycles (when required)
- project specific ramp closure constraints or program requirements defined in Clause 3 of Annexure MRTS300.1, and
- the Contract duration.

The Works Program shall show:

- establishment
- Hold Points and Witness Points
- major construction activities (where required):
  - removal of existing facilities
  - excavation for ramp
  - placement of geogrid and geotextile
  - placement and compaction of rock core
  - excavation for shoulder footings
  - cast insitu concrete slabs
  - placement of precast concrete planks
  - construction of shoulders
  - reinstallation of facilities, and
  - other works.
- anticipated Date of Practical Completion, and
- disestablishment.

6.2.3 EMP (C)

The Contractor shall amend the Principal's EMP (Marine Planning) to reflect their:

- project specific equipment and works program, and
- site practices that will meet the requirements defined in the EMP (Marine Planning) and conditions attached to the Statutory Approvals.

Where there are differences between the Principal's EMP and the Statutory Approvals the higher standard shall apply.

6.3 Site of Works

The Site of Works shall include:

- the footprint of the Works shown on the General arrangement Standard Drawing
- sufficient area to the sides, top and end of the works to safely access, operate plant and machinery, and allow a delineation for safety between the Works and publically accessible areas (subject to time and area constraints defined in Clause 3 of the Annexure)
- sufficient area for a fenced site compound
- temporary storage areas for construction materials outside the site compound (subject to implementation of a risk assessment defined in Clause 6.5), and
- temporary use of unfenced publically accessible areas during transfer or delivery of materials and plant (subject to implementation of appropriate traffic control defined in Clause 6.8).

6.4 Possession of Site

Further to Clause 27.1 of the General Conditions of Contract, the Contractor shall supply the following deliverables prior to being granted Possession of Site. **Hold Point 1**:

a) Security calculated in accordance with the Particular Conditions of Contract with the value for this project defined in the Letter of Acceptance.

b) WorkCover Certificate of Currency.

c) Evidence of insurances required under the Contract (refer to Clause 21 of the General Conditions of Contract) with the values and name of the Principal defined in the Letter of Acceptance, and

d) Construction Plan (including Works Program and Construction Safety Plan).

Establishment to Site (including preparation of the site compound) shall not commence prior to being granted Possession of Site.

6.5 Site compound

The site compound includes the Contractor's site facilities and fencing to delineate the work area from publically accessible areas.

The Contractor shall make its own arrangements with the relevant managing authority for a site compound adjacent to the Works. The site compound shall be:

- securely fenced to prevent public access
- located to minimise disruption to ramp users and car/ trailer parking (if applicable), and
- used for unloading and storage of materials for the works. When materials are unloaded outside the compound, public vehicular and pedestrian traffic is to be controlled to avoid conflict with manoeuvring vehicles and loads.

Construction materials may be stored outside the site compound if:

- it is impractical to store the materials inside, and the storage area does not affect the use of facilities, and
- a risk assessment has identified and managed related safety hazards.

6.6 Start of Works

Hold Point 2

Onsite Works shall not commence until all of the following activities have been completed:

- environmental management controls have been implemented
- notifications required in the Approvals and Conditions have been issued with the required timeframes
- limits of work areas or limits of clearing (where defined on approvals and permits) have been identified and marked
- traffic control (if required) has been implemented and establishment of the site compound is complete
- the site compound has been established
- other public and worker safety management controls have been installed or implemented, and
- services that are part of the Works, may conflict with the Works, or will be hazardous to public or worker safety have been located and marked.

6.7 Disposal of waste materials

Waste materials generated in the course of the Works include:

- existing structures requiring to be removed as part of the Contract
- packaging of materials used in the Works
- surplus construction materials generated or not used in the Works
- excavated spoil, and
- liquid or solid wastes generated from servicing or maintenance of plant and equipment used in the Works.

Waste materials shall remain or become the responsibility of the Contractor to be appropriately managed and disposed. Appropriate management and disposal includes:

- temporary storage that does not create safety or environmental hazards, and
- disposing offsite at a place selected by the Contractor that complies with all relevant legislation and local authority requirements.

Payment for management and disposal of waste materials is defined in MRS300 *Boat Ramps*.

6.8 Traffic control

Public vehicular, vessel and pedestrian traffic and construction vehicles, plant and loads shall be controlled where required to avoid conflicts and maintain safe access to existing facilities outside the Site of Works.

For works to existing boat ramps which are to remain in service or partially in service during the Works, the Contractor shall:

- delineate the work area from the active boat ramp lanes
- leave adequate manoeuvring area for car/ trailer units to access the active boat ramp lanes

- delineate vessel movements from the Works area with buoys, and
- demonstrate that all anchors for any floating controls have been removed at the completion of Works.

7 Earthworks

7.1 Removal and disposal of existing structures and vegetation

The existing structures and locations of vegetation to be removed from the site and disposed are defined in Clause 4.1 of Annexure MRTS300.1.

7.2 Existing services relocation

The existing services that are required to be relocated are defined in Clause 4.2 of Annexure MRTS300.1.

7.3 Unsuitable material

Unsuitable material below the design excavated surface shall be left in place, covered with geotextile and allowed to consolidate under the weight of the 75 mm crushed rock.

Where the Contractor over-excavates below the design surface for safety, vehicle access or any other reason for their convenience or surveying errors, extra payment shall not be made for:

- excavation, treatment and disposal, and
- backfill with approved material.

7.4 Transport and disposal of excavated spoil

All excess cut material shall be transported from the site and disposed (except when defined in the Annexure that the material is to be used for beach nourishment). Where needed and indicated, excess material will be treated for contaminants prior to disposal.

The location and method for disposal will be:

- at the location defined in Clause 4.3 of the Annexure, or
- if a location is not defined in the annexure, at a place selected by the Contractor that complies with all relevant legislation and local authority requirements.

7.5 Treatment of acid sulfate soils (ASS)

Witness Point 1

This clause only applies when treatment of ASS is defined in Clause 4.4 of the Annexure.

Treatment

All excess excavated material shall be treated by the addition of fine agricultural lime at the defined rate within 24 hours of excavation. The lime shall be added after excavation and shall be thoroughly mixed with the soil by rotation or tilling with a rotary hoe, grader or excavator. If lime is added within 24 hours and material is still wet, further tilling shall be done when the material has dried to ensure full mixing.

Temporary Bunding

Temporary bunding shall be constructed from compacted uncontaminated soil to prevent acidic drainage entering watercourses if spoil is not treated on the same day as excavation. The Contractor is responsible for locating a suitable area for bunding, and will be to the approval of the Superintendent. After completion of the Works, all bunds shall be removed and the disturbed areas reinstated to that existing prior to commencement.

7.6 Supply and placement of geotextile and geogrid

Geogrid, geogrid braid and the geotextile shall have the properties defined on SD4021.

Prior to commencement of earthworks the following deliverables shall be submitted to the Superintendent for approval: **Milestone**

- samples of the materials
- the geogrid layout, lapping and braiding plan, and
- the geotextile layout and lapping plan.

Geotextiles and geogrid shall be stored within an opaque, protective, waterproof and UV resistant cover, and shall not be stored directly on the ground or where they could be affected by heat.

Geogrid and geotextiles shall be placed in accordance with the layout and lapping plan. **Witness Point 2**

The area for geotextile placement shall be prepared by clearing and removing all sharp objects. Cut trees and shrubs shall not protrude above the surface but existing soil and vegetation mat may remain.

Geotextiles shall be placed just ahead of advancing construction work, and where they are affected by wave action they shall be covered with construction materials on the same working day.

7.7 Compaction of 75 mm crushed rock core (under slabs)

The 75 mm crushed rock core beneath concrete slabs (and within the angle of repose) shall be compacted using the “mechanical interlock method”.

Compaction shall use vibrating compacting plant (drum rollers) in lifts proportional to the capacity of the roller, and within the minimum and maximum layer thicknesses defined in Table 7.7. Each layer of 75 mm crushed rock shall be compacted until no further visible reduction in volume or vertical displacement occurs. **Witness Point 3**

Table 7.7 – Allowable compaction layer thicknesses

Uncompacted Layer Thicknesses (Lifts)	
Minimum thickness	115 mm
Maximum thickness	400 mm

Compaction of crushed rock under the toe planks may be achieved by compacting layers of up to 200 mm thickness by pressing down on the crushed rock material with an excavator bucket or another approved method.

The design surface levels shall be restored if distortion occurs during compaction so that precast planks and cast insitu concrete slabs are evenly supported across their full length and width.

The blinding layer beneath slabs shall only be used to debond the slab from the rock core, and shall not be used as a level corrector.

Blinding layer shall not be used under planks. **Nonconformance**

7.8 Finished surface level tolerances

7.8.1 Longitudinal tolerances

The acceptable longitudinal (along lanes) deviations from the design surface levels (topside of the precast planks) are defined in Table 7.8.1.

Table 7.8.1 – Finished surface level tolerances

Surface	Tolerance (from design levels)
Cast insitu concrete slabs and elements (anchor beam Type 1)	+5 -5
Planked Ramps Chainage = L/4	+10 -20
Planked Ramps Chainage = L/2	+20 -50
Planked Ramps Chainage = L3/4	+20 -100
Planked Ramps Chainage = L*	+20 -150

* L = total length from end of the last plank to the anchor beam.

7.8.2 Transverse tolerances

The constructed surface levels across lanes shall be within 20 mm of the adjacent lane while also complying with Table 7.8.1 for longitudinal tolerance.

8 Concrete

8.1 General

All concrete supply, placement and curing for precast elements and cast insitu slabs shall be in accordance with MRTS70 *Concrete* with the exception of the clauses defined below.

8.2 Concrete design mix

Hold Point 3

The concrete design mix shall comply with the requirements of MRTS70 *Concrete* and are summarised in Table 8.2.

Table 8.2 – Design mix for boat ramp slabs and precast elements (planks)

Parameter	Requirement
Items requiring use of registered suppliers and products	Table 1 of MRTS70 *Concrete*
Strength grade	50MPa
Minimum cementitious content	450 kg/m³
Maximum water cement ratio	0.4

Parameter	Requirement
Nominal maximum aggregate size	20 mm
Target slump range	50 – 150 (cast insitu) 100 – 150 (pumped)
Natural sand content of fine aggregates	Minimum of 40%

The Contractor shall allow a minimum of ten business days for approval of the mix design. **Milestone**

8.3 Placement of concrete

Placement of concrete shall comply with Clause 19.1 of MRTS70 *Concrete*. **Hold Point 4**

Concreting shall be undertaken in the presence of the Inspector. **Witness Point 4**

8.4 Concrete testing

This clause replaces Clauses 13.3.2 and 13.3.3 of MRTS70 *Concrete*.

The sampling frequency per batch is defined in Table 8.4.

Table 8.4 – Sampling frequencies for 28 day strength (boat ramps)

Use	Sampling Frequency
Cast insitu	One sample per batch to a maximum of four samples
Precast ramp planks (first 50 planks per project)	One sample per batch to a maximum of four samples
Precast ramp planks (thereafter 50 planks or part thereof per project)	One sample per batch to a maximum of two samples

8.5 Manufacture of precast concrete elements (ramp planks)

Hold Point 5

Manufacture of precast concrete ramp planks shall comply with SD4000, SD4001 and MRTS72 *Manufacture of Precast Elements*.

9 Fully grouted shoulders

Witness Point 5

The fully grouted shoulders shall be constructed in accordance with the materials and requirements shown on SD4022.

10 Floating walkway support lanes

This clause applies only when the Scope of Works includes:

- construction of a floating walkway support lane, and
- modifying an existing boat ramp lane to be used as a floating walkway support lane.

10.1 Construction of a floating walkway support lane.

The design requirements for a floating walkway support lane are defined in the Manual “Design Criteria for Floating Walkways”. The construction shall comply with:

- Standard Drawings SD4020, SD4021 and SD4022, and
- this Technical Specification.

10.2 Modifying an existing boat ramp lane to be used as a floating walkway support lane

Cast insitu slabs

Areas of slabs requiring removal for abutments and piles shall be neatly sawcut (or cored for piles) and exposed reinforcement shall be protected with an epoxy based sealer. After construction of the abutment or after the pile sleeve has been driven the remaining void shall be concreted or filled with an epoxy based filler.

Percussion methods of removal (jackhammers or rockbreakers) shall only be used to the extent required to remove concrete inside the area of sawcutting.

Precast planks

Precast planks shall preferably be removed and replaced with a custom plank of suitable width to allow the pile to be driven at one end. Planks may be cored if removal and replacement is impractical, subject to:

- only one plank is affected at each pile
- two link bars remain to connect planks above and below, and
- the reinforcement is protected with an epoxy based filler after the pile sleeve has been driven.

11 As constructed survey

11.1 Purpose

The purpose of the ‘as constructed’ survey is to:

- confirm the as constructed horizontal and vertical alignments within the specified tolerances, and
- record the differences between the design and the as constructed details.

11.2 Survey feature requirements

The survey shall pick up the following details:

- slab details including construction joints and the finished surface heights along the centreline of each lane and at the corners (of each slab)
- changes in grade
- finished surface heights of each precast planks along the centrelines of each lane (taken at the lower edge)
- edges and joints of ramp / floating walkway components (abutment, slabs, planks, anchor beam and shoulders)

- footprint of the ramp over the natural surface (where the embankment meets the existing surface)
- contours and features within five metres beyond the footprint of the ramp, or to a greater extent if required to capture these features such as top of or bottom of cut and fill
- signs that were installed as part of the works, and
- as driven positions of piles (for floating walkways).

11.3 As-Constructed survey outputs

The as-constructed survey outputs shall include:

- the AutoCAD file (.dwg) and associated files (.lin, .shp, .shx, .ctb and .stb) and fonts
- .pdf files of all the survey plot sheets, and
- the raw xyz (comma delimited) ASCII file with point code listing.

11.4 Drawings requirements

The as-constructed survey drawing(s) shall be drawn using standard undistorted engineering scale on either standard A3 or A1 sized media when printed at full size and show the following details:

- a site plan showing all of the survey features, generated contours and a labelled grid displaying Eastings and Northings to horizontal datum MGA, and
- longitudinal section(s) showing chainage and heights along the centreline of each constructed boat ramp lane.

12 Supplementary requirements

The requirements of MRTS300 *Boat Ramps* are varied by the Supplementary requirements given in Clause 5 of Annexure MRTS300.1.