Manual

Design Criteria for Boat Ramps

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Queensland Government

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1 Introduction

1.1 Applicability of these Design Criteria

These Design Criteria apply to the design of boat ramps for launching and retrieving recreational trailer boats where the Gross Combination Vehicle Mass (GCVM) does not exceed 8 000 kg.

1.2 Scope of boat ramp design

The scope of the design generally extends from the connection with landside facilities (that is, the anchor beam or the start of the connecting slab) down to the toe of the ramp. Unless otherwise advised, facilities above the landside connection are out of scope and are the responsibility of the facility manager.

The facilities which are out of scope include:

- car park pavements
- signage and line marking related to parking and rigging and securing areas
- services (lighting and water)
- waste facilities
- fish cleaning tables
- kerb, channelling and drainage before connection with the ramp.

The boat ramp information signage is an integral part of the design for safety and is therefore included in the scope of design, even though the physical location is above the landside connection.

In some situations, fill will be required at the top of the ramp to achieve the high water design level. Unless there is a commitment by the facility manager to construct the landside facilities concurrently with the ramp, the top end of the ramp should not be constructed higher than the existing surface level, and should be designed for later extension at the high end. Where separate portions (car park and ramp) are constructed concurrently, the project sponsor (Transport and Main Roads) should advise the designer on the agreement with the facility manager on the cost allocation of fill materials. Generally, costs allocated to the ramp construction should be restricted to those materials in the footprint of the ramp and shoulder batters.

1.3 Extent of design

The following criteria shall be considered:

- durability and maintenance
- dimensional, load and geometry requirements (including acceptable tidal accessibility)
- design for safety (hazards associated with slips, trips and entrapment of body parts, operational movements of vehicles on the ramp and vessels near the ramp).

The extent of design for construction or the substantial reconstruction of an existing ramp (which may include changes to lane width, slope and design water levels to conform to contemporary standards) includes:

- cast insitu concrete slabs (where required)
- the horizontal and vertical alignments and the longitudinal section
- selection of standard boat ramp information signs
- selection of the appropriate precast concrete ramp plank.

The extent of design for extensions and widenings to existing ramps (where the horizontal and vertical alignments are constrained by the existing structure) includes:

- cast insitu concrete slabs (where required)
- selection of standard boat ramp information signs (if required)
- selection of the appropriate precast concrete ramp plank and anchor beam (Type 1 or Type 2).

The design should reference and use the Technical Specifications and Standard Drawings for the following components and construction details:

MRTS300	*Boat Ramps*.
SD4000	Precast planks for Boat Ramps Type RG4000 and RG3500.
SD4001	Precast planks for Boat Ramps Type OS4000 and OS3500.
SD4020	Boat Ramp Construction – Precast Plank Installation and Anchor Beam – Types 1 and 2.
SD4021	Boat Ramp Construction – Earthworks and Crushed Rock Core Details.
SD4022	Boat Ramp Construction – Fully Grouted Shoulders and Ungrouted Shoulders.
SD4023	Boat Ramp Construction – Slab and Joint Details.
TC2100 and TC2101_1 to TC2101_8	Traffic Control (TC) standard boat ramp information signs.

2 Definition of terms

Table 2.1 – Definition of terms applicable to design of boat ramps

Definition of terms	
Designer	The Registered Professional Engineer of Queensland (RPEQ) engineer responsible for the design of the ramp.
Chevron	The pattern formed by the impression of the drainage/ traction grooves.
Connecting slab	An unchevronned cast insitu concrete slab which connects the head of the ramp to the car park access.
Core	Nominal 75 mm crushed rock compacted and contained within geogrid.
Design tidal planes	The design water levels for determining optimum head and toe of ramps. The design tidal planes should be referenced by the nearest primary and secondary place defined in the *Queensland Tide Tables* Standard Port Tide Times.
Design wheel load	The load and spacing diagram used for designing structural components of the ramp.
Full tide access	The facility is usable across the full tidal range. A full tide access ramp has: • the head of the ramp at HAT +0.5, and the toe of the ramp is at LAT –0.5.
Gross Combination Vehicle Mass (GCVM)	The combined mass of the trailer with load (vessel) and tow vehicle.
HAT	Highest Astronomical Tide.
LAT	Lowest Astronomical Tide.
LWR	Low Water Restriction – the lowest tide level expected in a watercourse that has a restriction (usually a narrowing or sandbank at the mouth of the watercourse) that prevents it getting down to LAT outside the restriction.
MHWS	• Mean High Water Springs.
Ramp slab	An unchevronned medium broom finished cast insitu concrete slab which forms the upper part of the ramp above Mean High Water Springs (MHWS) (and has the same slope as the ramp).
Ramp slab (chevronned)	A cast insitu concrete slab with an impressed or cast chevron pattern similar to the precast planks. Generally, cast insitu chevronned ramps are a superseded design and have been replaced by fully planked ramps.
Tide restricted ramp	Either or both of the requirements for full tidal access are not achieved. ‘Tide restricted ramp’ more commonly refers to a tide restriction at the low end. A ramp that is usable at all tidal levels within a tide restricted waterway is not a tide restricted ramp.
TIN	Triangulated Irregular Network (Terrain Modelling System)

3 Referenced documents

Table 3 – Referenced documents

Reference	Title
MRTS70	*Concrete*
MRTS300	*Boat Ramps*
SD4000	Precast planks for boat ramp – Types RG4000 and RG3500.
SD4001	Precast planks for boat ramp – Type OS4000 and OS3500.
SD4020	Boat ramp construction – Precast plank installation and anchor beam types 1 and 2
SD4021	Boat ramp construction – Earthworks and crushed rock core details
SD4022	Boat ramp construction – Fully grouted shoulders and ungrouted shoulders
SD4023	Boat ramp construction – Slab and joint details
	Queensland Tide Tables Standard Port Tide Times
SD1363	Traffic sign – Multiple traffic sign support – Standard and breakaway posts – Drawings 1 of 2 and 2 of 2
TC Signs	Non-standard Traffic Control Signs

4 Site investigations

4.1 Surveys

A land and hydrographic survey is required with enough detail and extent to locate services, natural and artificial features and determine contours. Refer to Appendix 1 for survey requirements.

4.2 Acid sulfate soil investigation

An acid sulfate soil investigation for the determination of the liming rate or management strategy should be undertaken dependent on the volume of cut or site conditions.

4.3 Geotechnical investigation

A geotechnical investigation should be undertaken if the surveyed contours and site observations indicate the potential for structural instability. These Design Criteria assume stable conditions and do not provide design guidance for these situations requiring specialist geotechnical design.

5 Ramp components and materials

A boat ramp typically has the following components:

- geotextile and geogrid for separation of base materials and containment of the core
- 75 mm crushed rock core or base
- precast concrete ramp planks
- fully grouted shoulders and shoulder batters (with spoon drain when constructed in cut)
- 75 mm crushed rock shoulder
- cast insitu anchor beam or connecting slab with anchor beam.

These components are detailed and specified on the Standard Drawings. The following tables (Tables 5.1 to 5.6) outline the design philosophy from which the requirements have been derived and are provided as a commentary for information only. They can be used as a guide for inspection and construction to provide understanding of the context for inclusion.

The major components of a boat ramp constructed part in cut and part on fill are shown in Figure 5.1.

Figure 5.1 – Typical major components of a ramp part in cut and part on fill.

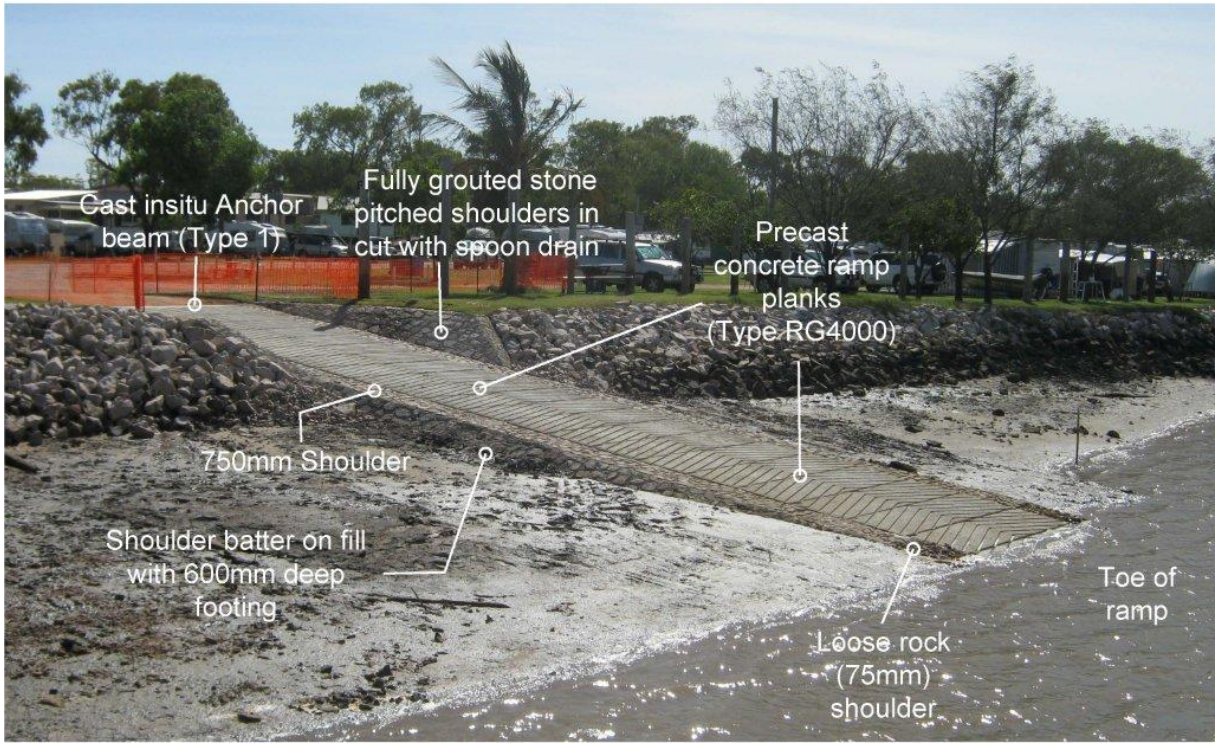


Table 5.1 – Geogrid

<table>
<tr><th>Purpose</th><th colspan="2">Requirements</th></tr>
<tr><td rowspan="4">Containment of rock as secondary protection of the core if stone grouted shoulders fail

Containment of rock beneath planks for flood resilience – where not contained by fully grouted stone pitched shoulders</td><td colspan="2">The important property for the containment of rock is that the junctions between the transverse and longitudinal ribs do not fail (refer to junction strength properties).
The grid must be manufactured from polypropylene sheet with transverse and longitudinal ribs of minimum thickness 1.3 mm and have the following properties:</td></tr>
<tr><td>Aperture size</td><td>Approximately 37 mm x 37 mm to contain 75 mm crushed rock</td></tr>
<tr><td>Quality control strength</td><td>30 kN / m with a peak strain of 10% in both directions</td></tr>
<tr><td>Junction strength between the longitudinal and transverse ribs</td><td>Greater than 95% of the quality control strength in both directions.
Grids with welded junctions shall not be used.</td></tr>
<tr><td>In situations where there is low Californian Bearing Ratio (CBR) and / or steep contours, the grid is also used to improve geotechnical conditions</td><td colspan="2">In these situations the grid should be:
run longitudinally with 500 mm braided laps
anchored back to the anchor beam.
In these situations the geotextile and geogrid design may require input from a geotechnical engineer.</td></tr>
</table>

Table 5.2 – Geotextile

<table>
<tr><th>Purpose</th><th colspan="2">Requirements</th></tr>
<tr><td rowspan="5">Separation of layers (base material from 75 mm rock core) to minimise consolidation and locally strengthen on soft base material</td><td colspan="2">It is essential that the textile is suitable for wave and tidal action within the marine environment. The textile must therefore be manufactured from non-woven needle punched staple fibre polyester or polypropylene. The textile has been over-specified for the worst case CBR and shall have the following properties: (Class D and Filtration Class 1 of MRTS27).</td></tr>
<tr><td>Elongation</td><td>>= 30%</td></tr>
<tr><td>Grab strength</td><td>1200 N</td></tr>
<tr><td>Tear strength</td><td>450 N</td></tr>
<tr><td>G rating</td><td>3000</td></tr>
</table>

Table 5.3 – 75 mm (nominal) crushed rock core and shoulders

<table>
<tr><th>Purpose</th><th colspan="2">Requirements</th></tr>
<tr><td rowspan="5">Compacted base to support cast insitu slabs
Fill material that is resistant to erosion and dissolving
Provide a flat surface to evenly support precast planks
Structural support across low CBR subgrades (when used within geogrid and geotextile)</td><td colspan="2">(Under slabs) compacted using dedicated compaction plant (five tonne drum roller) until no further evident deformation (the ‘mechanical interlock method’).
Grading (below) is nominal, but needs to be large enough so that it is contained within the geogrid aperture, and small enough to allow flat, even surfacing for load distribution under precast planks.</td></tr>
<tr><td>Australian Standard sieve size</td><td>Per cent passing</td></tr>
<tr><td>100 mm</td><td>100</td></tr>
<tr><td>53 mm</td><td>< 30</td></tr>
<tr><td>37.5 mm</td><td>0</td></tr>
<tr><td colspan="3">Bound or unbound granular fill (blinding layer) IS NOT TO BE USED in the base beneath precast or cast insitu concrete elements.</td></tr>
</table>

Table 5.4 – 10 mm gravel blinding layer

Purpose	Requirements
Debonding the cast insitu slab from the 75 mm compacted crushed rock core	• Maximum depth allowed volume is 30 mm. Most of this will be lost in the crushed rock voids and geogrid. • It is not to be used as a level corrector for the base under the slabs.
For payment purposes the gravel blinding layer should be included as part of the cast insitu slab.	
Blinding layer IS NOT TO BE USED under planks 10 mm gravel cannot be contained in geogrid, and will be lost from underneath the planks. Voids under planks will cause ramp unevenness or other failures.	

Table 5.5 – Cast insitu concrete anchor beams (Type 1 and 2) and slabs

Purpose	Requirements
Anchor beams to resist permanent loads and flood, wave action and operational loads	Desirable that the anchor beam is cast into the subgrade, but there is usually sufficient mass and friction to resist sliding.
Safety in design	Medium broom finish to minimise slip hazards (applies to slabs and anchor beam Type 1 only).
Durability	50 year design life and exposure classification C2 is to be used for all concrete elements which mandates the following requirements: • design concrete mix to be MRTS70 S50/20 for Exposure Classification C2 • all reinforcing shall be hot dipped galvanised with 65 mm cover • stainless steel Grade 316 shall be used for all penetrations (link bars, dowels and lifters) • composite dowels and preformed plastic slab separations (key joints) are permitted.
For payment purposes the slabs should include blinding layer and plastic membrane.	

Table 5.6 – Fully grouted stone pitched shoulders and shoulder batters

Purpose	Requirements
The primary purpose of the shoulders and batters is to provide protection to the ramp core and base.	• Footings are required to be full depth (600 mm) below existing surface and align with the edge of stone pitched face. • Batters to be 400 mm thick and full thickness grouted. • Stone to be durable.
Shoulders – Ramps in cut: Provides a drainage channel and a buffer between trailers, vessels on trailers and the shoulder batters	• Drainage channel to have a medium broom finish perpendicular to the slope to reduce slipping down the ramp. • Drainage channel to have 10 mm clearance below the invert of the plank or ramp drainage groove to ensure free drainage of the ramp surface.
Shoulders – Ramps on fill: Provides a safety buffer / over-run protection for trailer wheels between the edge of the lane and the shoulder batter	• Stone pitched surface is to be 30 mm below the ramp surface so that the drainage grooves are free draining. • The 30 mm height difference will impart a visible or tactile indication that a trailer wheel has departed the ramp slab.
Visual amenity	• Stone/grout matrix ratio is greater than 80%. • Close faced grouted finish (0 to 10 mm). • Essentially flat outer stone faces.
Safety in design	• Stone faces are to be essentially flat to reduce potential for hull damage and trip hazards to ramp users. • The slope of the shoulder batters discourages pedestrian access. • Stairs should separate from the shoulders and provided in the adjacent seawall as close as possible to the head of the ramp (where the ramp surface is more than 600 mm above natural surface and beach access is required).

6 Selection of anchor beam and precast concrete ramp plank types

6.1 Anchor beams

Refer to SD4020 for anchor beam types 1 and 2 details.

All full length lanes (including widenings to existing ramps) should use anchor beam type 1, which may either be a discrete component or shall be integrated with a ramp or connecting slab (where used).

Anchor beam type 2 is mostly used when lengthening an existing slab ramp.

6.2 Planks

The principal plank type is the Reduced Gap (RG) of width 4 000 mm to reflect the contemporary lane width standard for single lane and multilane ramps. The RG4000 was developed to lessen the grouting requirements in gaps below water level and reduce safety hazards related to slips, trips, falls and entrapment of body parts.

Refer to SD4000 for RG4000 plank details.

Modifications to existing ramps (that is, widening or extensions) that use the original style (OS) plank in widths 3500 mm or 4000 mm should consider design solutions using the RG4000, and further consider later projects which may require replacement of the existing OS-type planks.

Where the design requires replacement or extension to the end of existing cast insitu slabs, consideration should be given to using 4 000 mm lanes, even if the existing, remaining upper parts of the lanes are narrower. The upper slab should then be given a mass concrete infill out to the shoulder pending later replacement with RG4000 planks.

The following tables list recommended design solutions (that is, the correct plank and anchor beam) for common ramp design scenarios.

Table 6.2.1 – Applications by plank type

Plank type	Width	
	4000	**3500**
RG	Must be used for: • all full length ramp lanes • widening an existing RG4000 ramp. It may also be used for extensions to existing OS4000 ramps, but will require one RG4000 anchor plank for each lane as it cannot be bolted direct to existing planks.	Only to be used: • extending an existing OS3500 type lane. This will require an RG3500 anchor plank as it cannot be bolted direct to existing planks. **Consideration should be given to rebuilding the lane to 4 000mm (using the RG4000)**.

Plank type	Width	
	4000	**3500**
OS	Only to be used: • extending an existing OS4000 type lane and can be bolted direct to existing planks • widening an existing OS-type ramp so that planks align across lanes. **Preference is to be given to a RG4000 solution**.	Only to be used: • extending an existing OS3500 type lane and can be bolted direct to existing planks. **Consideration should be given to widening to 4 000 mm and using the RG4000**.

Table 6.2.2 – Plank type by application

Application	Plan type and connection
All full length ramps (single lane and multilane)	RG4000 with anchor beam type 1
Widening an existing RG4000 type ramp or concrete slab / OS-type ramp	RG4000 with anchor beam type 1
Extending an existing concrete slab ramp	RG4000 or RG3500 (depending on lane widths) with anchor beam type 2
Extending an existing OS4000 type ramp	• OS4000 with bolted connection, or • RG4000 with Anchor beam type 2 (preferred)
Extending an existing OS3500 type ramp	• OS3500 with bolted connection, or • RG3500 with anchor beam type 2 **Consider removing all existing planks and widening to 4000 mm lanes**

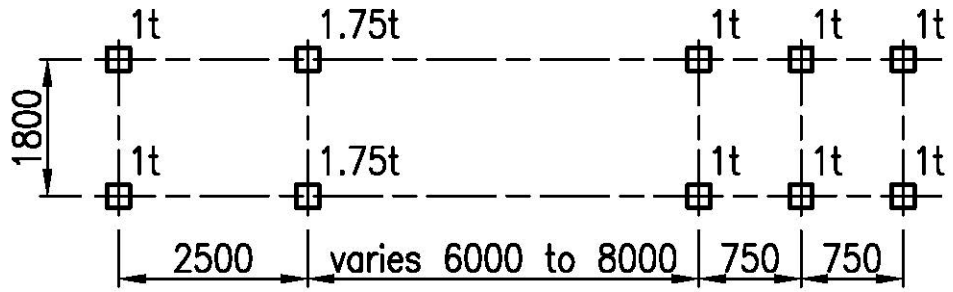
7 Geometric and loading design

Table 7 – Geometric standards (mandatory)

Parameter	Design standard	Comments
Lane width (single and multilane)	4 meters	
Maximum slope (steepest)	1:8	The range of allowable ramp slopes: • considers traction and safety requirements for ramp users, tow vehicles and trailers • minimises depth and length of trailer submersion.
Minimum slope (shallowest)	1:10	
Design levels	HAT +0.5m to LAT -0.5 m (or LWR -0.5 m)	These are the vertical alignment design objectives for full tidal accessibility subject to the design constraints listed following (refer to Vertical Alignment Design Objectives).

Unless specified to a higher load rating, the design wheel load shown in Figure 7 shall be used and have a signed GCVM (refer to sign face TC2101_1) of eight tonnes per lane.

Figure 7 – Design wheel load



7.1 Horizontal alignment design objectives

The horizontal alignment should ideally be perpendicular to the contours so that the ramp is evenly supported transversely (across the planks).

Skewed ramps may be considered if there are constraints on tidal accessibility, landside access, contours and infringement across the waterway. If the contours or other constraints dictate a skew, an upstream skew (the toe is pointing upstream) should be avoided as it will encourage debris deposition on the ramp.

7.2 Selection of design tidal planes

Tidal planes should be sourced from the current *Queensland Tide Tables* Standard Port Tide Times and be referenced by primary port and secondary place. The nearest secondary place should be used, but the relevance also needs to be considered when comparing river and coastal effects. Tidal planes should not be interpolated when the place is between two secondary places.

The tidal planes shown on the drawings shall be converted from the LAT datum to the Australian Height Datum (AHD).

Tidal planes are shown on the longitudinal section as design information only and should not be used by construction contractors for setout, determining data or developing or implementing a construction methodology.

7.3 Vertical alignment design objectives

The vertical alignment shall consider:

- allowable slope range
- the design tidal planes for maximising tidal accessibility
- minimising cut
- minimising intrusion into the water flow
- levels of car park connections, accessibility and the proximity to existing structures and roads.

Table 7.3 – Vertical alignment design objectives

Parameter	Comments
Maximise low tide accessibility	Desirable to achieve LAT -0.5 (or LWR -0.5)
Minimise cut	Ramps mostly in cut should be avoided as they will experience siltation which will affect traction, safety, accessibility, usability and maintenance Cut above MHWS is acceptable, cut above AHD can be considered if it improves other design objectives.
Minimise intrusion into the water flow	In watercourses subject to flooding the length and depth of fill should be minimised to reduce flood loading.
Maximise flood resilience	Consider the depth of fill, armouring and intrusion into the water flow.
Depth of fill	Ideally the design level should be 200 mm above the natural levels to resist siltation and minimise intrusion on water flow (in watercourses subject to flooding), sand transport processes or beach connectivity.

7.4 Longitudinal section

The current design philosophy is to use precast concrete planks for the full length of the ramp below MHWS, and broom finished unchevronned cast insitu concrete slab above MHWS.

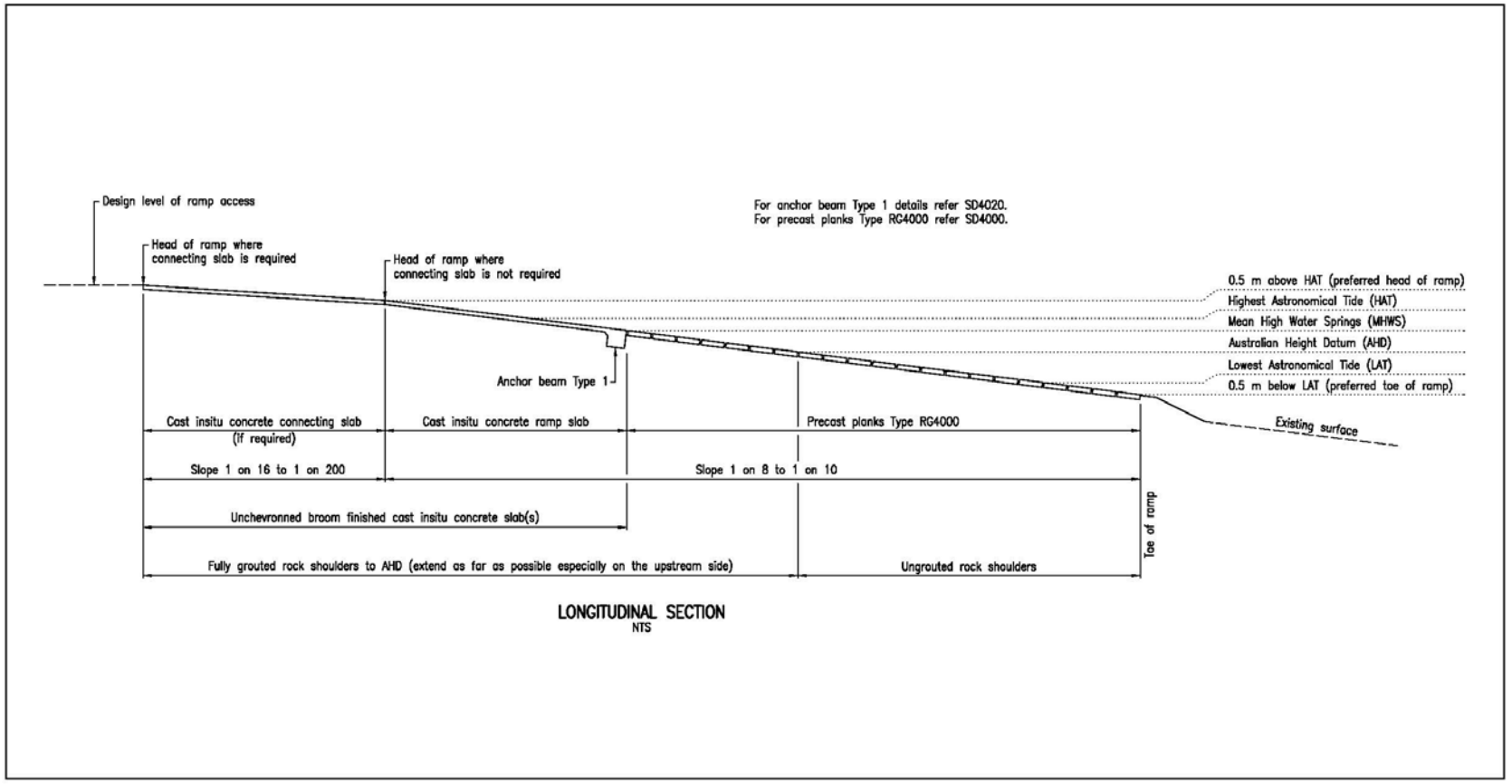
The longitudinal section will:

- Be grooved below MHWS for drainage and traction. A broom finished cast insitu ramp slab is permitted above MHWS.
- Consider shoulder armouring in the ungrouted section of the shoulders on the upstream side in watercourses subject to flooding.
- Have fully grouted shoulders on both sides to at least AHD. The fully grouted shoulders should extend further than AHD, this can be considered on tidal conditions during construction.

- Connecting slab. The slope is constrained by the relative heights of the head and the car park access connection. A flat connecting slab is acceptable, but a minimum slope of 1:200 is desirable for drainage. Maximum slope is 0.5 x ramp slope. The slope of a connecting slab shall never be negative, that is, the head of the ramp must not be higher than the car park access connection.
- A connecting slab is only required where the head of the ramp is constructed on fill.

Refer to the standard drawings for construction details. A generic longitudinal section is shown in Figure 7.4.

Figure 7.4 – Generic longitudinal section



7.5 Longitudinal section – lengthening or lower ramp repairs

This section applies to existing concrete slab ramps that:

- require extension to improve tidal accessibility, or
- have been damaged at the lower end and the upper ramp will be retained.

A connection to an existing slab will use the Anchor Beam Type 2.

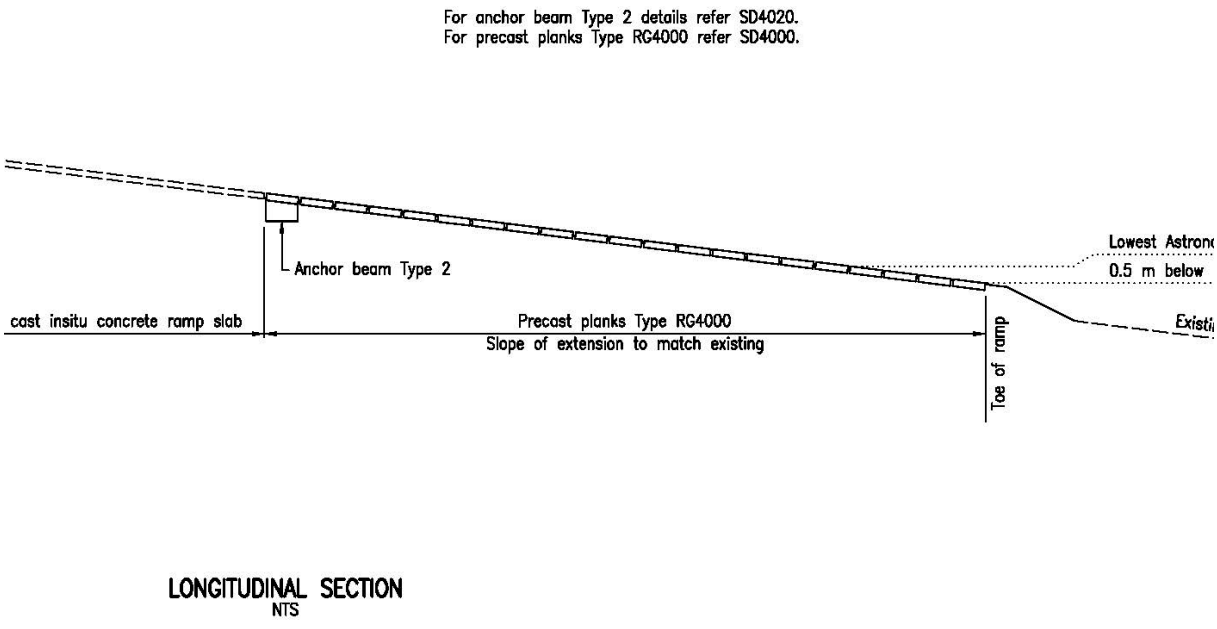
Sections of the existing lower slabs will require removal. The extent of removal and the location of the anchor beam shall consider:

- the location of existing construction joints in the slab(s)
- the condition of the lower slabs
- tidal accessibility (allow a minimum of four hours before inundation on the incoming tide)
- alignment of planks if an adjacent lane is planked.

Ideally the existing ramp should be removed at a construction joint to maintain reinforcement cover. On multilane ramps it is common that construction joints do not align on adjacent lanes. In this case the most suitable construction joint should be selected and the lanes sawcut at the same length.

A generic longitudinal section for a ramp extension is shown in Figure 7.5.

Figure 7.5 – Generic longitudinal section for a ramp extension



7.6 Longitudinal section – change of grade (local steepening)

This clause only applies if all of the following conditions below are satisfied and it provides a better solution for the longitudinal profile design objectives:

- the ramp is in a location where it will never have a floating walkway
- the increase in slope is restricted to the last five (5) metres
- the main ramp and end ramp is a minimum 200 mm above existing surface or the natural surface on both sides
- the steeper ramp is not more than twice as steep as the main ramp
- the change is grade is desirable to improve tidal accessibility and to improve flood resilience by reducing profile and intrusion into the watercourse
- the designer has approval from the Principal.

Table 7.6 – Allowable ramp slope changes

Main Ramp Slope	Maximum Slope for local steepening at end of ramp.
1:8	1:4
1:9	1:4.5
1:10	1:5

Floating walkways are usually incompatible with changes in slope and situations where flood resilience is required.

The steeper ramp section is restricted to the last five (5) metres so that only the trailer axles are on the steeper section, and the tow vehicle axles remain on the main ramp.

The 200 mm minimum clearance of design surface above natural surface assists with natural ramp cleaning.

The allowable changes in grade ensure that the rampover between the main and steeper ramp is less than the change in grade from a flat surface to a 1:8 ramp.

8 Slab Design

Refer to SD4023.

The ramp and connecting slabs shall be designed in accordance with AS3600 and MRTS70 for a 50 year design life and exposure classification C2. All of the reinforcing mesh shall be hot dipped galvanised. Penetrations (dowels) shall be corrosion resistant. Exposed edges shall have 20 mm x 20 mm chamfers or a 20 mm radius trowelled edge. The trafficable surface shall have a medium broom finish.

Slab design shall consider:

- the design wheel loading
- efficient use of the reinforcing mesh sheet. Where possible design the slabs for 6.2 metres in one of the directions (six metre sheet plus 100 mm cover at each end). This will require only a double lap (and not a four way lap).
- a maximum squareness ratio of 2:3.

Slabs are subject to saltwater splashing above HAT from vehicle movements and wave action and therefore use Exposure Classification C2.

9 Ramp signage

Table 9 – Sign types selection criteria

Sign	Drawing no.	Requirement	Comments
Boat ramp information signs			
Public boat ramp	TC2100	Mandatory	
Facility manager	TC2101_8	Mandatory	
Load limit 8 t (per lane)	TC2101_1	Mandatory	
Ramp may be slippery	TC2101_7	Mandatory	
Tide restricted	TC2101_2	Designer to determine	To be used where the ramp toe is at or higher than LAT (or LWR)
Steep drop off at end of ramp	TC2101_3	Designer to determine	Consider the effect from existing contours if trailer wheels overran the end of the ramp (end of the last plank) with rock end shoulder in place – would it be retrievable?
Ramp exposed to wave action	TC2101_5	Designer to determine	Exposure to wave action could occur: • in exposed open waters • in wide rivers with a large fetch • from vessel wash
Ramp exposed to cross currents	TC2101_4	Designer to determine	Consider susceptibility to tidal and flow currents
Steeper grade towards end of ramp	TC2101_6	Designer to determine	Only to be used with a designed change of grade at the lower end of the ramp
Overhead wires hazards			
Overhead Wires to be used with: • Boats Lower Masts	TC1015, and TC1016	Designer to determine	To be installed on both sides of the ramp if an overhead wire hazard exists between the ramp and the car park exit Signage for overhead wire hazards outside the car park are the responsibility of the electricity supply authority or the car park owner

9.1 Sign posts

Overhead Wires and Boats Lower Masts (where required)

These signs are to be installed together on a single post facing traffic leaving the boat ramp or car trailer park.

Boat ramp information signs

All of the boat ramp information signs are to be installed on a single pair of posts designed for the total sign height ‘B’ in accordance with SD1363. Refer to Table 9.1 for post specifications and footing design.

Table 9.1 – Sign post design

Total sign height 'B'	Clearance 'H'	Post specification*	Footing 'd' x 'L'
< = 2250	1 000	76.1 OD (65 NB)	300 x 1000
> 2250	1 000	101.6 OD (90 NB)	300 x 1200

* 3.2 wall thickness grade C350LO

9.2 Signage locations

The factors to be considered for signage location are:

- should be located near the head of the ramp in a position that could reasonably be expected to be visible to ramp users
- conflict with services (water or power)
- impact on visual amenity.

Generally signs are located perpendicular to the alignment of the ramp and offset to one side, or parallel to the alignment if they are visible to drivers entering the ramp access. Sign location should be confirmed onsite and in consultation with facility managers.

An indicative location for the boat ramp information signage should be shown on the General Arrangement drawing with a note that location is to be confirmed on site.

10 Design deliverables

The following documents and deliverables shall be provided:

- certified construction drawings and Certification of the Design (relevant Standard Drawings shall be listed in the Drawings Index)
- specifications and supplementary specifications (if required)
- certified design report.

Table 10 – Requirements for project specific construction drawings

Drawing	Requirements
Locality, Site, Survey and Cadastral plans	Locality plan Site Plan showing setout point, contours, footprint of the Works and adjacent features Cadastral plan showing adjacent property boundaries, and the bearing and distance of the setout point from the nearest cadastral boundary corner point Drawings Index listing the project drawings and relevant Standard Drawings (does not include TC signs) Survey setout marks, data and survey notes Notes: Construction to be in accordance with MRTS300.
General Arrangement	Fully dimensioned Top View and Longitudinal Section with design water levels and/ or tidal planes Design wheel loading diagram Plank schedule (quantities of RG or OS-type planks and anchor planks) Related civil construction details and Works Services locations (and relocations) Details of the proposed Works (including removal of existing structures) Adjacent existing structures which are not part of the proposed Works Signage schedule and indicative location (to be confirmed on site) Signpost design (Clearance 'H', post specification and footing 'd' x 'L') – refer to SD1363 Construction notes
Cross sections	If required

10.1 Certification of the design

The designer shall certify the construction drawings and shall also certify (by declaration notes on the drawings or by a separate Engineer's Certificate) that the design of the works:

a) is suitable for the intended usage
b) is structurally adequate for the intended location and anticipated usage
c) is structurally adequate to allow for the scour resulting from flood and tidal conditions (if applicable)
d) does not impose loads on existing structures that would exceed their design capability
e) would not adversely affect the stability of the bed and the banks of the waterway in which the Works are to be constructed

f) is designed in accordance with all appropriate Australian standards and guidelines except as detailed in the minimum design criteria in the Queensland Department of Environment and Heritage Protection operational policy *Building and engineering standards for tidal works*
g) does not adversely affect the use of adjacent structures
h) has a non-slip surface.

10.2 Design report

The design report shall contain the following sections:

a) document control page (for signoff by the designer and the client)

b) project details and scope

c) design details:

- site investigations (geotechnical, flood height and current, wave climate)
- design tidal planes (if applicable)
- assumptions
- design methodology
- compliance with these Design Criteria and reasons for deviations
- compliance with signage requirements

d) workplace health and safety hazards associated with the design (in the construction and operation phases)

e) special design and or construction requirements for approval conditions.

Appendix – Survey requirements for boat ramps

Introduction

This specification shall be used to define the survey requirements to assist with the planning and design of capital works for boat ramps. Capital works include:

- new ramp construction
- widening, lengthening or reconstruction at an existing ramp
- floating walkways
- standalone pontoons adjacent to boat ramps.

The purpose of this specification is to define:

- the extent of survey and the features to be recorded
- the consistent presentation of survey data.

Survey requirements

Areal extent

The areal extent of the survey shall be included in the brief or the limits shall be defined by:

- (in the offshore direction) – 10 metres beyond the LAT -1.0 m contour
- (on the landside direction) – Either 10 metres beyond the top of the bank or beyond the HAT +0.5 m contour (whichever is higher)
- (width) – Approximately 20 metres both sides of the centreline (proposed or existing).

Features to be captured

Existing ramps

- Extents of slabs including construction joints.
- Shoulders and batters (grouted and loose rock).
- Armour rock.
- Precast concrete planks.
- Abutments and floating walkways.
- Boat ramp signage.

Where the end of the boat ramp is covered by sediment, the limits of the ramp and depth of coverage should be determined by probing.

Other infrastructure, roads and roadside furniture

- Access roads and car parks.
- Fencing, barriers, kerbs and other signage.
- Lighting.
- Utilities and services (including line of services if determined).
- Rock walls, seawalls.
- Park furniture (tables and seats).

Natural features

- Vegetation and landscaping.
- Embankments and changes of grade.
- Soil types (mud, sand, loose rock, hard rock) above and below water level.
- Potential hazards to navigation.

Other

- Adjacent Real Property boundaries and descriptions.
- Spot heights and other points should be at regular uniform spacings to provide a useful triangulation model.

Survey data requirements

Deliverables

Site Plan

The Site Plan shall include:

- the surveyed features
- the Triangulated Irregular Network (TIN) surface
- the generated contours and a grid displaying Eastings and Northings.

The Site Plan and TIN surface shall be in model space and positioned to the coordinate datum. The TIN surface shall be checked to ensure that it provides a true 3D representation of the site.

Locality plan

The locality plan shall show major roads, rivers, creeks and town names out to a minimum 5 km radius around the survey site.

Accuracy and datum

The land and hydrographic surveys shall be undertaken to the datum and accuracy requirements defined in the following table:

Table A1 – Survey accuracy and datum requirements

Parameter	Requirement
Datum	Horizontal: MGA/GDA94 Vertical: AHD
Hydrographic Survey data accuracy	Horizontal: ± 1.5 metre Vertical: ± 0.2 metre (Equivalent to a Class C survey defined in *Standards for Hydrographic Surveys within Queensland Waters*)
Land Survey accuracy	Horizontal: ± 0.02 metre Vertical: ± 0.02 metre

File types

Surveys and drawings shall be provided in these file type formats:

- AUTOCAD file (*.dwg) with the associated files: linetypes (*.lin), shapes (*.shp & *.shx), plotstyles (*.ctb & *.stb) and fonts.
- PDF (not showing the TIN surface).
- A LandXML 1.0 data file containing all of the survey points and the TIN surface (if the TIN surface is not provided in the AUTOCAD file).
- A raw xyz (comma delimited) ASCII file supported by a point code listing.

Water levels

Tidal waters

The tidal planes (HAT, MHWS and LAT) relative to AHD. Tidal information can be derived from the *Queensland Tide Tables* Standard Port Tide Times available from:

http://www.msq.qld.gov.au/Home/Tides/

Non-tidal waters

For inland projects upstream of a dam or weir, the full supply level of the storage should be shown.

Digital photographs

General

The hardcopy survey plans shall feature markers showing the viewpoint of the photographs (without the images).

Photographs should show:

- the existing structures or proposed location from the top, both sides and (if feasible) from the water
- a close-up of any visible damage to existing structures
- the adjacent landscape and vegetation
- adjoining car-trailer park area viewed from the ramp
- existing ramp signage
- any other significant features or nearby structures (such as a jetties and pontoons).

File size and resolution

Image size should be around 1 Mb to 1.5 Mb as a compromise between satisfactory resolutions and file size.