

PLANNING SCHEME POLICY

STRUCTURES / BRIDGE DESIGN



Mackay Region
PLANNING SCHEME



Planning scheme policy – structures / bridge design

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Amendment history

This planning scheme policy commenced on 24 July 2017 as part of the Mackay Region Planning Scheme 2017. Amendments since this date are listed in the below table.

Version number	Amendment title	Summary of amendment	Date adopted and commenced
1.1	Planning scheme policy amendment 3	This amendment updated references, standards, and requirements to reflect modern practice.	Adopted 10 February 2021 Commenced 1 March 2021
1.0	Planning scheme administrative amendment 6, and Planning scheme policy administrative amendment 1	This amendment removed the planning scheme policies from Schedule 6 of the Mackay Region Planning Scheme 2017 and placed them in individual PDFs on Council's website. This amendment introduced standardised formatting, introductory sections and explanatory information regarding intent and legislative relationship for this planning scheme policy. It also updated numbering and cross references.	Adopted 11 December 2019 Commenced 3 February 2020

1 Introduction

1.1 Application

This planning scheme policy supports the Mackay Region Planning Scheme 2017 by providing information on: how to achieve compliance with assessment benchmarks; supporting information/studies required; and/or actions required under the development assessment process. This planning scheme policy has been made by Mackay Regional Council in accordance with Chapter 2, Part 3, Division 2 of the *Planning Act 2016*.

1.2 Relationship with planning scheme

Mackay Region Planning Scheme 2017 refers to this planning scheme policy in Part 1 or any other relevant part of the scheme.

1.3 Purpose

The purpose of this planning scheme policy is to set out guidelines developed specifically for the design considerations to be adopted in the design of structural engineering elements. The Guideline is to also apply to appropriate structural elements designed on behalf of Council.

Such elements include:

- (a) road traffic bridges;
- (b) pedestrian bridges;
- (c) structures other than bridges, but associated with roads (eg. major culverts, retaining walls, major sign support structures);
- (d) small earth dams, detention basins;
- (e) coastal erosion protection structures;
- (f) boat ramps and other marine structures;
- (g) structures used for public safety (road safety barriers, pedestrian safety rails, street lighting);
- and
- (h) temporary works.

Such structures may be of concrete, timber, rock or steel constructions, but with emphasis placed on low maintenance, safety and whole of life cycle costs.

Major culverts are defined as:

- Metal culverts (steel and aluminium) with at least one barrel (cell) with span , height or diameter $\geq 1.2\text{m}$; or
- All other culverts with:
 - Pipes with at least one barrel (cell) with diameter $\geq 1.8\text{m}$; or
 - Rectangular/oval/arch culverts with at least one barrel (cell) with span $> 1.8\text{m}$ and height $> 1.5\text{m}$;
 - Stock and pedestrian underpasses.

The aim of design shall be the achievement of acceptable probabilities that the structure being designed will not become unfit for use during its design life, having regard to economic, physical, aesthetic, flooding or hydraulic capacities, safety in design, maintenance and repair constraints, constructability, future infrastructure planning, and other relevant constraints.

1.4 Referenced documents

- (a) Council guidelines and specifications:

- (i) Planning scheme policy – geometric road design
- (ii) Planning scheme policy - healthy waters
- (iii) Planning scheme policy – stormwater drainage design
- (iv) Planning scheme policy – subsurface drainage design
- (v) Mackay Regional Council - Guideline for Preparation of Flood and Stormwater Drainage Catchment Reports
- (vi) Mackay Regional Council – D20 Drawings and Documentation Guideline - https://www.mackay.qld.gov.au/_data/assets/pdf_file/0005/13964/D20.pdf
- (vii) Stormwater drainage studies and flood studies - https://www.mackay.qld.gov.au/business/planning_and_development/waterway_and_coastal_hazard_planning/flood_studies
- (viii) External Documents Register - https://www.mackay.qld.gov.au/_data/assets/pdf_file/0003/253380/External_Document_Registry_for_Technical_Services_2019_002.pdf
- (ix) Construction standard C220 – Stormwater drainage – general
- (x) Construction standard C221 – Pipe drainage
- (xi) Construction standard C222 – Precast box culverts
- (xii) Construction standard C223 – Drainage structures
- (xiii) Construction standard C224 – Open drains including kerb and gutter
- (xiv) Mackay Regional Council (MRC) Supplementary Specifications - https://www.mackay.qld.gov.au/business/planning_and_development/design_and_construction_requirements/design_guidelines2
- (xv) ADAC - How to use the As Constructed Documents (PDF 327.5 KB)
ADAC 4.1 - As Constructed and ADAC Survey Pick-up (PDF 3.3 MB)
ADAC 4.1 - Creation of XML using 12d Model (PDF 734.1 KB)
ADAC 4.1 - Guidelines for Creation and Submission of XML Files (PDF 3.8 MB)
ADAC 5.0.1 - As Constructed and ADAC Survey Pick-up (PDF 3.6 MB)
ADAC 5.0.1 - Creation of ADAC XML using 12d Model (PDF 623.4 KB)
ADAC 5.0.1 - Guidelines for Creation and Submission of XML Files (PDF 4.6 MB)
- (xvi) Standard drawings - https://www.mackay.qld.gov.au/business/planning_and_development/design_and_construction_requirements/standard_drawings/drainage
https://www.mackay.qld.gov.au/business/planning_and_development/design_and_construction_requirements/standard_drawings/footpaths
https://www.mackay.qld.gov.au/business/planning_and_development/design_and_construction_requirements/standard_drawings/parks_and_gardens
- (b) Department of Transport and Main Roads (TMR) Specifications:
 - MRTS59 Manufacture of Fibre Reinforced Polymer Composite Girders
 - MRTS60 Installation of Fibre Reinforced Polymer (FRP) Composite Girders
 - MRTS61 Gantries and Support Structures for Road Signs, Tolling Systems and ITS Devices
 - MRTS62 Bridge Substructure
 - MRTS63 Cast-In-Place Piles
 - MRTS63A Piles for Ancillary Structures
 - MRTS64 Driven Tubular Steel Piles (with reinforced concrete pile shaft)
 - MRTS65 Precast Prestressed Concrete Piles
 - MRTS66 Driven Steel Piles
 - MRTS68 Dynamic Testing of Piles
 - MRTS70 Concrete
 - MRTS71 Reinforcing Steel
 - MRTS71A Stainless Steel Reinforcing
 - MRTS72 Manufacture of Precast Concrete Elements
 - MRTS73 Manufacture of Prestressed Concrete Members and Stressing Units
 - MRTS74 Supply and Erection of Prestressed Concrete Deck and Kerb Units
 - MRTS75 Supply and Erection of Prestressed Concrete Girders
 - MRTS76 Supply and Erection of Steel Girders
 - MRTS77 Bridge Deck
 - MRTS78 Fabrication of Structural Steelwork
 - MRTS78A Fabrication of Structural Stainless Steelwork

MRTS79 Fabrication of Aluminium Components
 MRTS80 Supply and Erection of Bridge Barrier
 MRTS81 Bridge Bearings
 MRTS81A Stainless Steel Bridge Bearings
 MRTS82 Bridge Deck Expansion Joints
 MRTS82A Finger Type Bridge Deck Expansion Joints
 MRTS83 Anti-Graffiti Protection
 MRTS84 Deck Wearing Surface
 MRTS84A Removal of Bridge Deck Wearing Surface
 MRTS85 Repainting Steel Bridges
 MRTS85A Repainting Existing Steel Bridges and New Steel Bridges Zinc Metal Systems
 MRTS86 Widening, Strengthening and Rehabilitation of Bridges
 MRTS87 Supply of Timber Bridge Materials and Components
 MRTS88 Protective Coating for New Work
 MRTS89 Post-tensioned Concrete
 MRTS90 Modular Bridge Expansion Joints
 MRTS97 Mounting Structures for Roadside Equipment
 MRTS270 Precast Geopolymer Concrete Elements
 MRTS300 Boat Ramps
 MRTS301 Fabrication and Construction of Floating Walkways
 MRTS302 Fabrication and Construction of Pontoons
 MRTS305 Dredging

(c) Australian Standards:

- (i) AS 5100 – Bridge Design (Set)
- (ii) AS 4997 - Guidelines for the design of maritime structures
- (iii) AS/NZS 2566.1 – Buried flexible pipelines, structural design
- (iv) AS/NZS 3725 – Design for installation of buried concrete pipes
- (v) AS/NZS 4058 – Precast concrete pipes (pressure and non-pressure)
- (vi) AS/NZS 4139 – Fibre reinforced concrete pipes and fittings
- (vii) AS/NZS 1597.1 & AS/NZS 1597.2 - Precast reinforced concrete box culverts
- (viii) AS/NZS 2041 Buried corrugated metal structures - Design methods
- (ix) AS/NZS 3845 – Road safety barrier systems
- (x) AS1158 – The lighting of urban roads and other public thoroughfares
- (xi) AS1170 – Structural Design Actions (Set)
- (xii) AS3600 – Concrete structures
- (xiii) AS4100 – Steel structures
- (xiv) Other codes and guidelines as relevant

(d) Queensland legislation:

- (i) *Local Government Act 2009*
- (ii) *Planning Act 2016*
- (iii) *Environmental Protection Act 1994*
- (iv) *Water Act 2000*
- (v) *Fisheries Act 1994*
- (vi) *Coastal Protection and Management Act 1995*
- (vii) *Aboriginal Cultural Heritage Act 2003*
- (viii) *Professional Engineers Act 2002*

(e) Queensland and Australian Government:

- (i) Commonwealth of Australia (Geoscience Australia). 2019. *The Australian Rainfall and Runoff, a guide to flood estimation (ARR)*
- (ii) State of Queensland (Department of Infrastructure, Local Government and Planning). 2017. *State Planning Policy, State interest – natural hazards, risk and resilience*
- (iii) State of Queensland (Department of Transport and Main Roads). 2019. *Road Drainage Manual, 3rd Edition.*
- (iv) State of Queensland (Department of Infrastructure, Local Government and Planning). 2017. *State Planning Policy*

- (v) State of Queensland (Department of Agriculture, Fisheries and Forestry). 2013. Guide for the determination of waterways using the spatial data layer Queensland waterways for waterway barrier works.
 - (vi) State of Queensland (Department of Agriculture and Fisheries). 2018. Accepted development requirements for operational work that is constructing or raising waterway barrier works
 - (vii) State of Queensland (Department of Science, Information Technology, Innovation and the Arts). 2014. Queensland Acid Sulfate Soil Technical Manual
 - (viii) State of Queensland (Department of Natural Resources, Mines and Energy). 2018. Guidelines for the construction or modification of category 2 & 3 levees
 - (ix) State of Queensland (Department of Natural Resources, Mines and Energy). 2018. Guidelines for the construction or modification of category 1 levee
 - (x) State of Queensland (Department of Natural Resources and Mines). 2017. Guide for Flood Studies and Mapping in Queensland.
 - (xi) Queensland Government. 2007. Crime Prevention through Environmental Design, Guidelines for Queensland – Part A: Essential features for safer Places.
 - (xii) Queensland Government. 2007. Crime Prevention through Environmental Design, Guidelines for Queensland – Part B: Implementation Guide.
 - (xiii) Department of Transport & Main Roads - Bridge-design-and-assessment-criteria
 - (xiv) Department of Transport & Main Roads - Technical Notes – Bridges and other structures
 - (xv) Department of Environment and Heritage - Operational policy -Building and engineering standards for tidal works
 - (xvi) Department of Transport & Main Roads - Design Design Criteria for Boat ramps
 - (xvii) Department of Transport & Main Roads - Design Design Criteria for Floating Walkways &Pontoons
 - (xviii) State Development Assessment Provisions Version 2.3
 - (xiv) Guideline: State Development Assessment Provisions - State Code 8: Coastal development and tidal works
 - (xv) Operational policy - Coastal Protection and Management Act 1995 - Building and engineering standards for tidal works
https://www.qld.gov.au/__data/assets/pdf_file/0014/107240/op-cd-building-engineering-standards-tidal-works.pdf
- (f) Other:
- (i) Austroads - Guide to Bridge Technology:
 - Part 1: Introduction and Bridge Performance
 - Part 2: Materials
 - Part 3: Typical Superstructures, Substructures and Components
 - Part 4: Design Procurement and Concept Design
 - Part 5: Structural Drafting
 - Part 6: Bridge Construction
 - Part 7: Maintenance and Management of Existing Bridges
 - Part 8: Hydraulic Design of Waterway Structures
 - (ii) Concrete Pipe Association of Australia, *Concrete Pipe Guide, charts for the selection of concrete pipe to suit varying conditions*
 - (iii) Institute of Public Works Engineering Australasia, Queensland (IPWEAQ), 2017 *Queensland Urban Drainage Manual (QUDM)*
- (g) Mackay Regional Council Policy
- (i) Policy No. 23.062 – Building Over or Adjacent to Constructed Council Drainage Systems and Easements
 - (ii) Policy No 063 – Clearances to water and sewerage assets

1.5 Basis of design

The design shall be based on scientific theories, experimental data and experience, interpreted statistically as far as possible. The safety and service performance of a structure depends also on the quality control exercised in fabrication, supervision onsite, the control of unavoidable imperfections and

the qualifications, experience and skill of all personnel involved. Adequate attention shall therefore be given to these factors.

In addition, adequate management control and supervision by experienced engineers shall be required at all stages of design and construction to prevent the occurrence of non-conformances.

The minimum design load for all road traffic bridges shall be determined from AS5100, either using the S or M 1600 load, and based on the particular traffic loadings reasonably expected to be imposed on the structure. The use of lesser design loads (eg T44) shall require specific Council approval and will require consideration of the most foreseeable load during the life of the bridge (for 100 years). The Designer will need to consider the likely future use of the bridge by heavy loads – e.g. cranes used in building works, as to whether the structure may have to be designed using higher design loads e.g. HLP 400. Approval for a design load lower than S or M 1600 will not be provided for a single-lane bridge.

Maintenance is a key factor affecting the design life of a structure/bridge. The Designer shall note on the drawings the adopted design life of the structure/bridge, together with the relevant maintenance program to be adopted by the asset owner (generally Council) upon which the design life has been based. Parameter used in the design shall also be shown on the design drawings.

Specifications shall be notated on the Drawings with sufficient detail to ensure that the above described strategies are able to be effectively implemented at the construction stage.

Structures are to be designed and constructed to minimise the maintenance impacts of either cathodic exchanges and or environmental conditions on the durability of the structure. The structure shall make use of suitable inert materials and or coating systems to ensure it ability to maintain its Design life with minimal life cycle costs.

2 Design, construction and other criteria

2.1 Road traffic and pedestrian bridges

The Australian Standard AS5100 *Bridge Design* and Austroads - Guide to Bridge Technology Part 8: Hydraulic Design of Waterway Structures shall be used as the basis for all bridge designs. Where bridges are to be constructed from materials other than those covered specifically by this Standard, reference shall be made to other specific Standards and current technical literature for materials performance and durability requirements.

The Designer shall incorporate current industry best practices into the bridge design to ensure the bridge has low maintenance finishes. Adequate precautions shall be taken for protection of the materials used in the bridge design; for example, timber and steel require special consideration.

Heavy debris and bed loads may be characteristic of some streams so that large spans with slender piers are encouraged. If overtopping is permitted, pedestrian safety rails and road safety barriers are usually omitted. Flood depth indicators and appropriate signposting will be provided in such cases.

Parameters used in the design shall also be shown on the Drawings.

Unless otherwise advised, small bridges within the project shall be designed with afflux as determined by Council with certification stating that the bridge is capable of withstanding the inundation loadings for up to the 1% Annual Exceedance Probability (including climate change factor) storm event.

If in the opinion of the Designer, such certification is impractical, the structure shall be designed to convey the 1% Annual Exceedance Probability (including climate change factor) storm event without inundation.

Where structures are designed to be inundated, the effect of the backwater gradient on upstream property shall be identified on the drawings.

The Designer shall also identify the current and possible future implications created because of the backwater effect on upstream properties.

Bridges located in roadways which are to be dedicated as public roads shall be designed to convey the stormwater event identified in the drainage design specification. Where no inundation is permitted, appropriate afflux shall be adopted together with a 500mm freeboard to underside of the bridge deck.

Designers should enquire regarding current or likely provision for public utilities on bridges. These should be concealed for aesthetic reasons.

The clear width for a pedestrian bridge shall be 2 metres minimum and 3.0m for a shared pedestrian cyclist facility. Barrier kerb shall be provided on both sides with adequate provision for drainage of the bridge surface.

2.2 Provision for pedestrians on road bridges

The minimum provision for pedestrians only is a 2.0m footpath with kerb at the road edge and pedestrian safety rails at the external edge and 3.0m for a shared pedestrian cyclist facility together with compliant bicycle safe safety rails .

Council may require the provision of separate pedestrian footpaths in other situations should the anticipated traffic warrant it.

Disabled access shall be considered and incorporated into the design.

Lighting shall be provided on urban road and footbridges in accordance with the appropriate Australian Standard.

2.3 Structures other than bridges

The design shall comply with all relevant requirements of:

- (a) this planning scheme policy;
- (b) all reference and source documents listed in section 1.4;
- (c) any relevant Australian Standard;
- (d) any relevant requirements of the utility owner;
- (e) any development approval conditions relevant to the design; and
- (f) any specific relevant and reasonable request provided by Council in writing.

The standards and guidelines detailed below apply to the design and construction of jetties and piers, pontoons, decks and boat ramps within tidal and non-tidal waterways.

Standards and guidelines for prescribed tidal works installations shall be in concert with requirements of the relevant State government concurrence agency requirements including the State Development Assessment Provisions and other relevant requirements and guidelines.

These standards and guidelines incorporate a number of key design considerations to endeavour to ensure that waterfront structures:-

- (a) remain structurally sound throughout their design life;
- (b) do not interfere with the structural stability of the waterway;
- (c) do not restrict the maintenance, hydraulic and flood carrying capacity of the waterway;
- (d) do not interfere with public access or usage of the waterway; and
- (e) allow for navigation where necessary along the waterway. Responsibility of owners
- (f) The owner of the property associated with any approved waterfront structure is required to maintain the structure in a sound state of repair in accordance with the approved plans and the conditions of the approval.

General requirements applicable to all structures

The following general requirements apply to the design and construction of any waterfront structure:-

- (a) any lighting installed, other than lighting which is specifically to aid navigation, should not cause significant adverse amenity effects to nearby residents, properties or fauna;
- (b) the works should be designed and constructed so as to avoid significant adverse impacts on the availability of public access to the foreshore of the waterway;
- (c) the works should be designed and constructed so as to avoid adversely impacting on the safety of members of the public using the waterway or accessing the foreshore of the waterway;
- (d) the works should be designed and constructed to ensure they are structurally sound, having regard to relevant Australian Standards and having regard to the impacts of flooding and hydrodynamic changes;
- (e) the proposed waterfront structure is not to place any additional load on existing revetment walls (a wall erected against an earth bank or rock face to protect it against erosion, or a structural retaining wall at the waterfront edge) and is not to adversely affect the stability of the bed and banks of the waterway. Works constructed within private property behind an existing revetment wall (such as swimming pools, retaining walls, decks, etc.) are to be designed and constructed so that there will be no adverse impact on the structural stability of the revetment wall;
- (f) the design and construction of the works is to ensure that access will be available for future remedial, repair or maintenance works on revetment walls and foreshore areas;
- (g) materials which will have a long life in an aquatic environment should be used in the structures;
- (h) the works are to be located clear of any existing stormwater outlet;
- (i) the structure is to be designed and constructed so as to ensure the safety of users. Surfaces are not to be slippery or present trip hazards, and barriers or railings should be provided in appropriate locations; and
- (j) setbacks are to be (the shortest distance) measured horizontally from the outermost projection of the structure concerned to the vertical projection of the boundary of the allotment. The setback from a revetment wall is from the landside of the revetment wall.

Jetties and piers

Jetties and piers and their associated mooring systems are to be designed and constructed to sustain all relevant loadings including hydraulic pressure, berthing impact, wind, flood flows (including debris), live loads, and other loadings relevant to the structure as assessed by a RPEQ. However, the design loads are in no case to be less than those applicable to a jetty or pier which is prescribed tidal work (as detailed in the IDAS Code for development applications for prescribed tidal work).

Jetties and piers and their associated shore abutments are to be designed and constructed so as not to impact adversely on the structural stability of the waterway and to be structurally independent of the revetment wall. RPEQ certification is required that the works will not impose additional loads on existing revetment walls.

The deck level of the jetty or pier is not to be less than 300mm above the predicted peak water level in the waterway, for a 1% AEP event.

Low level landings below the predicted peak water level may be incorporated into the structure design but fender piles (a vertical structural member that protects part of a structure from impact, damage or abrasion) or other markers are to indicate their presence when under water.

The width of the deck of a jetty or pier is to be not less than 900mm and not more than 3.0 metres. Handrails are to be provided along both sides of the jetty stem.

Jetties and piers are to be designed not to interfere with navigation or the public usage of the waterway, taking into account any vessel moored to the jetty or pier.

Where piling for jetties or piers is required to be installed through any rock revetment or rock protection, the rocks are to be removed and a neat cut/penetration made to the geotextile fabric under the rocks prior to installation of driven or screw piling, and the geotextile fabric and rock protection reinstated around the piles. The geotextile fabric is to be fastened around the pile with a stainless steel strap.

Jetties and piers are not to have roofed structures.

Pontoons

Pontoons are to be designed and constructed to sustain all relevant loadings including earth and hydraulic pressure, berthing impact, wind, flood flows (including debris), live loads, and other loadings relevant to the structure as assessed by a RPEQ. However, the design loads are in no case to be less than those applicable to a pontoon which is prescribed tidal work (as detailed in the IDAS Code for development applications for prescribed tidal work).

Abutments for access walkways are to be structurally independent of the revetment wall (so as not to impose any additional loading on the revetment wall).

Pontoons are to be designed such that they can accommodate the rise in water level associated with a 1% AEP flood event, and still safely moor the “design” vessel.

In waterways which will convey flood flows, the flotation unit of the pontoon is to be moored by piles.

Access walkways are to extend a minimum distance of 500mm onto the pontoon’s flotation unit. Access walkways are to be constructed with a permanent non-slip surface and handrails along both sides and shall make full provision for the access requirements specified in AS1428 unless alternative assessments by a certified Access Auditor can justify alternative treatments..

Where piling for pontoons is required to be installed through any rock revetment or rock protection, the rocks are to be removed and a neat cut/penetration made to the geotextile fabric under the rock revetment prior to installation of driven or screw piling, and the geotextile fabric and rock protection reinstated around the piles. The geotextile fabric is to be fastened around the pile with a stainless steel strap.

Pontoons are not to have roofed structures.

Decks

Decks are to be designed and constructed to sustain all relevant loadings as assessed by a RPEQ. However, the design loads shall in no case be less than those applicable to a deck which is prescribed tidal work (as detailed in the Building and engineering standards for tidal works https://www.qld.gov.au/_data/assets/pdf_file/0014/107240/op-cd-building-engineering-standards-tidal-works.pdf). Decks must be able to withstand periodic total inundation.

The design and construction of the deck is to be such that it does not unreasonably restrict access for maintenance to the bank, foreshore, revetment wall, retaining wall or other infrastructure associated with the waterway.

Decks are not to extend more than 3.0m into the waterway, measured from the waterfront boundary of the lot connected to the deck.

Decks are not to extend any closer than 3.0m to the side boundary, or extended side boundary of the lot connected to the deck.

Access hatches of minimum size 200mm x 200mm are to be installed in a deck 300mm forward of the face of the revetment wall and located approximately every 4.0m and/or 2.0m from either side of the deck. These access hatches will be used for sand replenishment of the foreshore.

The finished deck surface is to be no higher than 500mm above the top of the revetment wall and is to have a minimum clearance of 50mm between the top of the revetment wall and any part of the deck.

All footings, piers, piles and the like associated with the deck are to be located no closer than 1.5m from the landside of the revetment wall and not be connected to or supported by the revetment wall.

Where piling for decks is required to be installed through any rock revetment or rock protection, the rocks are to be removed and a neat cut/penetration made to the geotextile fabric under the rock revetment, prior to installation of driven or screw piling and the geotextile fabric and rock protection reinstated around the piles. The geotextile fabric is to be fastened around the pile with a stainless steel strap.

Decks are not to have roofed structures.

Boat Ramps

Boat ramps are to be designed and constructed to sustain all relevant loadings as assessed by a RPEQ and in accordance with DTMR design requirements.

The top of each wall at the edge of the boat ramp is to be level with the surface of the land on which the boat ramp is located.

Side and edge walls of the ramp are to penetrate at least 600mm below natural surface level to prevent damage from scour.

The surface of the ramp across the foreshore of the waterway is to be no more than 200mm above the design surface of the foreshore.

Boat ramps are to have a minimum width of 4.0m for vehicular access.

Boat ramps should be designed and constructed with a gradient generally not steeper than 1 (V):8(H). Ramps with slopes as steep as 1:6 may be acceptable provided the surface is appropriate. Steeper slopes will require operation by a winch. Proposals to construct ramps steeper than 1:8 are to be supported by a detailed assessment study that demonstrates the sustainability of the proposal.

To facilitate safe movement of vehicles and persons, the surface of a boat ramp is to be treated to prevent it from becoming slippery either by forming grooves 40mm wide and 20mm deep at a spacing of 150mm and at an angle of 70 degrees to the centre line of the boat ramp, or by an alternative surface treatment which will provide a similar non-slip surface.

Boat ramps are to be located a minimum of 1.5m clear of the side boundary and extended side boundary of the property.

Revetment walls

Revetment walls must be wholly built within the subject lot including all elements of the revetment wall such as footings.

Revetment walls are to be designed and constructed to ensure they are able to support all intended loads, but in any case should be designed to support a distributed live load of at least 3 kPa in addition to applicable soil loads, with factor of safety of no less than 1.5.

The level and design of the bottom edge of the revetment wall should be such that it is likely to prevent any adverse effects from erosion for at least 100 years.

The design and construction of the revetment wall should provide for adequate filter material behind the wall and sufficient drainage holes to relieve hydrostatic pressure.

Maintenance of revetment walls is the responsibility of the owner and a minimum of 1.0m wide setback area behind the wall must be provided to allow maintenance to be performed. Within this area no structure is to be built that would restrict maintenance activities. This area should preferably be grassed, gravelled or loose-paved to allow monitoring of problems as they develop. If other surfacing is installed then it is to be easily removable should any maintenance be necessary.

Any structure built within the setback area is not to impose further loading on the revetment wall, and RPEQ structural certification will be required that specifically states that the revetment wall will continue to remain structurally sound with the additional loading for its design life.

Foreshores

The foreshore profile is to be constructed for long term stability with due consideration to flood flows, boat wash, wind induced waves and stormwater discharges.

Suitable access is to be provided to the waterway to enable maintenance activities to be undertaken. A typical access way would consist of a maintenance boat ramp constructed within a waterfront parkland area.

Weirs

Structural design of weirs (a structure which separates a tidal waterway from a non-tidal waterway, e.g. man-made lake) is to take account the impact loading from debris and watercraft, as well as applicable hydrostatic and hydrodynamic loads. Certification is to be provided by a suitably qualified RPEQ. The required design life will be 100 years.

Downstream scour protection shall be designed using appropriate hydraulic modelling techniques. Rock used for scour protection must have characteristics and qualities which are appropriate for the application.

Maintenance and operations manuals are to be supplied by the developer upon handover along with as-constructed drawings.

2.4 Structures used for public safety

The design shall comply with all relevant requirements of:

- (a) this planning scheme policy;
- (b) all reference and source documents listed in section 1.4;
- (c) any relevant Australian Standard;
- (d) any development approval conditions relevant to the design; and
- (e) any specific relevant and reasonable request provided by Council in writing.

Since the requirement of road safety barriers and pedestrian safety rails on bridges are different, the Designer shall consider whether separate traffic and pedestrian barriers can be detailed to satisfy the major functional requirements.

The Austroads Bridge Design Code and Department of Transport and Main Roads “*Road Planning and Design Manual*” are recommended references in this regard.

It is essential that all safety barriers and rails have been fully tested and accredited for the intended use under quality assurance provision. The Designer is to ensure that appropriate corrosion protection shall be considered in specifying the materials to be used.

Bridge crossings in urban and rural residential areas shall be provided with street lighting in accordance with AS 1158. Such requirements will be noted accordingly on the drawings.

2.5 Temporary works

The design shall comply with all relevant requirements of:

- (a) this planning scheme policy;
- (b) all reference and source documents listed in section D3.03;
- (c) any relevant Australian Standard;
- (d) any development approval conditions relevant to the design; and
- (e) any specific relevant and reasonable request provided by Council in writing.

A construction programme, indicating the sequence of events leading to the implementation and removal of the temporary structures shall be specified on the drawings.

2.6 Drawings and documentation

All drawings and documentation to be submitted to Council for approval shall conform to the requirements of Council’s *Drawings and Documentation Guidelines*.

Failure to comply with Council’s *Drawings and Documentation Guidelines* may result in the drawings and/or documentation being returned to the engineer without consideration by Council.

2.7 Design Project Team

The Designer of any bridge or bridge component, structure, span, safety or pedestrian barrier shall be a suitably qualified professional engineer who holds both appropriate certifications as an RPEQ certified engineer in the appropriate field as well as prequalification with the Department of Transport and Main Roads for bridge design. The level of prequalification must be commensurate to the expected value of the proposed structure. Evidence of this prequalification must be submitted to Council. All plans shall be signed and certified by an appropriately qualified professional engineer with RPEQ certification.