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1.0 PURPOSE

This chapter outlines the general design criteria and other specific requirements in relation to the provision of bridges and culverts in the City of Brisbane. Bridges and culverts should be designed and constructed to adequately provide for safe and effective access.

2.0 DESIGN REQUIREMENTS

2.1 REFERENCES

Design of bridges and major culverts should conform to the following references.

- *AS 5100 Bridge Design*.
- *Guide to Traffic Engineering Practice* (Austroads).
- Chapter 1 of Part A of this document for flood immunity standards.
- *Public Riverside Facilities – Design and Maintenance Guidelines* (Brisbane City Council).

Hydraulic assessment should be in accordance with procedures set in the publication *Waterway Design. A guide to the Hydraulic Design of Bridges, Culverts and Floodways* (Austroads, 1994).

2.2 GENERAL

The structure should be designed and constructed to achieve the minimum design life of 100 years for road bridge, and 50 years for bikeway or pedestrian bridges. All bridges and associated elements should be designed in accordance with AS 5100 Bridge Design. The structure should facilitate easy maintenance access and minimise routine and ongoing maintenance. Impacts to the operation of the structure during future maintenance operations should be minimised and a maintenance plan provided.

Construction materials should be selected to meet the following requirements:

- Materials are appropriate for the area or meet with character requirements.
- Materials accommodate the climate they are to survive in taking into account the design life, durability and maintenance requirements, and vandal and graffiti proofing.
- Materials are safe and suitable for the intended use.
- Materials used do not create unnecessary noise
- Materials are not hazardous.

Engineering plans and reports, including geotechnical investigations, should be prepared by a suitability qualified Registered Professional Engineer in Queensland (RPEQ) that:

- Details the location of the structure.
- Show areas of disturbance.
- Shows detail of the final landform.
- Details how the structure integrates with existing or proposed infrastructure, including treatment of approaches and abutments.
- Provide all structural details of the bridge design and associated elements.
- Provide details of ground conditions including borehole logs.
- Provide details of design loadings and flood immunity standard, and tide levels where appropriate.

- Provide construction details, including areas that will be impacted on by construction.
- Details future maintenance and growth requirements.

Prior to commencing design of a major bridge or culvert structure, advice on walkway/bikeway requirements should be obtained from Council.

2.3 SITING

The location of the structure should comply with the strategic plans and/or approved layout plans that:

- Manages the location in relation to property, boundaries, existing structures and land use.
- Manages impact to existing vegetation
- Support existing infrastructure, ie road networks pedestrian ways and bikeways.
- Considers future maintenance and growth requirements.
- Considers construction methods including material delivery.
- Considers impacts that disturbance and final landform.
- Manages safety and security requirements.

2.4 BRIDGES

Road bridges

The substructure and piles should be constructed from reinforced or prestressed concrete. Where the substructure is in the tidal or splash zone, stainless steel reinforcing should be used.

Galvanised or painted steel is not acceptable for bridge superstructures. The deck wearing surface for vehicles should be a minimum of 50 mm asphaltic concrete. Other surface finishes should be referred to Council for approval.

Expansion joints should be minimised in the design. Where required expansion joints should comprise steel nosing with neoprene seals. All other bridge deck joints (eg joints between precast elements, construction joints, etc) should be waterproofed using an approved membrane (500 mm wide strip of Bituthene 5000 or equivalent).

Bridge bearings should be made of stainless steel or neoprene. The design drawings should nominate jacking points and jacking loads for bearing replacement of all bridge bearings. A suitably qualified RPEQ should certify submitted designs.

Pedestrian/bike bridges

The substructure and piles should be constructed from reinforced or prestressed concrete. Steel superstructure and/or timber decking and balustrading may be used in locations with approval of Council. Timber handrails should be treated hardwood and timber decking should be 'Deckwood' or approved equivalent. Details of the current approved standards can be obtained from Principal Asset Officer Structures, Urban Management Division. Bikeway bridges should be of minimum 3.0 m width.

Culverts

Precast concrete pipe or box culverts, designed and manufactured in accordance with the relevant Australian Standards, should be used. Culvert joints should be waterproofed with an approved membrane (500 mm wide strip of Bituthene 5000 or equivalent).

2.5 SCOUR PROTECTION AND STABILISATION CONTROL

Scour protection and stabilisation control works are generally required at the bridge abutments, and at culvert inlets and outlets. These works can include grouted rock, sprayed concrete suitably finished to match the environment, formed concrete or block retaining walls.

2.6 WALKWAYS AND BIKEWAYS

Concrete footpaths should be provided on both sides of bridges and culverts and should generally be as wide as the verge either side of the bridge/culvert. However, the footpath width may be reduced to 3.0 m (minimum) subject to Council approval. Where appropriate, the design of bridges on major roads over major watercourses and creeks should incorporate provisions of a transverse walkway/bikeway crossing under the bridge, as well as the normal footway provisions on the superstructure.

2.7 SAFETY MEASURES

General

Appropriate safety measures should be incorporated into all bridges and culverts. These may include rails and barriers, lighting, approach warning signs, and flood depth indicators.

All handrails and vehicle barriers should be designed to withstand stream and debris loads as well as other forces. Steel handrails and vehicle barriers should be hot dipped galvanised and painted. Rigid vehicle barriers on the bridge/culvert should be suitably terminated and transitioned to flexible barriers on the approaches. Other specific requirements are outlined below.

Road bridges and culverts

For district access, suburban route, industrial access, and arterial route, rigid vehicle barriers should be provided on the kerb lines to prevent vehicle moving onto the footways. Vertical balustraded handrails with appropriate bicycle offset rail should be provided on the outer edge of the bridge/culvert.

For local access and neighbourhood access, combined rigid vehicle and balustraded pedestrian barriers should be provided on the outer edge of the bridge/culvert. A 200 mm high kerb should be provided on the outside edge of the vehicular lane.

Pedestrian/bike bridges and culverts

Where the bridge/culvert structure is over permanent water deeper than 0.3 m or where the drop height exceeds 1.5 m, vertical balustraded pedestrian handrails with appropriate bicycle offset rail should be provided on the outer edge of the structure. A two or three rail system may be used in other locations.

2.8 PUBLIC UTILITIES

The bridge or culvert should be designed to accommodate present and future services across the structure. A minimum of eight 100 mm diameter conduits should be provided in each footway of new bridges or culverts. The allocation of encased conduits on each footway typically comprise:

- Minimum 3 telecommunications (white).
- Minimum 2 electricity (orange).
- Minimum 1 gas (yellow or black with yellow stripes).
- Minimum 2 unallocated (white).