



Bridges and causeways

G-12.1

Bridge and causeway construction across estuaries and coastal areas requires considerable disturbance to coastal values and has the potential to cause adverse environmental impacts.

Thorough planning and specialist advice are essential. Managing problems after construction is more expensive than dealing with them in the planning stage. Ensure that all planning and approvals processes have been met. All structures should be designed by a suitably experienced engineer in consultation with a coastal geomorphologist.

Use these guidelines in conjunction with the information provided in Chapter 12 when planning works and engaging consultants and contractors to ensure the proposed works use the most effective methods and minimise the risk of causing damage to coastal values.

Planning

Identify any natural or cultural values at the work site that require protection and seek specialist advice. Consider Aboriginal and maritime heritage, threatened species, wildlife habitat, important vegetation communities and recreational values.

Specialist and/or engineering advice will be needed on a range of technical issues (e.g. hydrology and hydraulics).

If the bridge is to be used by the public and heavy vehicles, detailed design drawings will be required that satisfy all the relevant Australian Standards and are certified by a qualified engineer.

Align structures to minimise obstructing the movement of sediment. Seek specialist advice from a coastal geomorphologist.

Provide for navigation, where boating occurs.

Ensure the connectivity between the waterway by minimising any constriction of water flow and simulating natural channels and water flows.

Plan works in watercourses and estuaries to coincide with low water flows, unless this may have adverse effects on plant communities and animals (especially threatened aquatic, estuarine and marine species).

Approvals

Approval and permits will be required. All works on Crown Land which includes all land below the high tide mark will require approval from Crown Land Services. A planning permit from the local council may be required along with permission from the Department of Infrastructure, Energy and Resources. Other approvals and permits may be required depending on the nature of the works and the site.

Site selection

Choose a site that minimises interference with natural coastal systems and processes (including wave action and seasonal cycles of sediment accretion/erosion) and marine hydrology (seasonal patterns of tidal flushing, currents, etc).

Avoid unstable areas such as dunes, slip-prone areas, very erodible soils, natural drainage channels and stream banks. Avoid shoreline or marine vegetation, floodplains, wetlands and other sensitive sites, as far as possible.

Choose sites away from significant cultural or natural values. Seek specialist advice and assessments.

Avoid works in areas infected with phytophthora root-rot disease.

Avoid areas where the works could mobilise contaminated sediments.

Avoid works in acid sulfate soils (ASS), as disturbing ASS may lead to corrosion and loss of structures and environmental damage that requires remediation. Watch out for indicators of ASS such as rotten egg smell or yellow deposits when digging.

When selecting a site for a causeway, select a straight stretch of the waterway with a minimal gradient and a stable substrate where there is scour-resistant material immediately downstream.

Design

Structures need to accommodate all water flow conditions.

Permanent bridges and causeways over rivers and estuaries must be able to withstand the 1 in 50-year flood level and storm surges. Consider latest Intergovernmental Panel on Climate Change (IPCC) sea level rise and climate change predictions.

Preserve the waterway's natural hydraulic regime (pattern of water flows) as much as possible.

Place bridge piers and footings above the high water mark to avoid constricting the channel and reducing the flow area. If bridge piers and footings must be placed in the channel, make them parallel to the flow so the flow is not directed onto the banks.

Use the minimum number of piers, shaped to minimise eddying and scouring of the waterway. Include erosion protection if scouring is likely to occur.

Design structures to minimise disturbance to the passage of fish and other aquatic fauna. Provide enough space under the bridge for animals to walk along the riverbanks, where practicable. Seek specialist advice.

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Design and space the causeway openings to maximise tidal flushing.

Consider using grated decking on a multi-lane bridge, so light and moisture can penetrate, where the risk of pollution from road runoff is minimal.

Design structures to look attractive and to suit the coastal landscape, as well as provide access for vehicles, bicycles and pedestrians. Wherever appropriate and affordable, allow for safe fishing places on a bridge or causeway.

Construction

All works crew and contractors should be briefed on the environmental standards to be met by the project and adequate supervision should be provided to ensure these standards are met.

Obtain advice from a coastal engineer about the appropriate materials and methods for the site.

Minimise disturbance to the shoreline or to riverbanks, bed and natural flows. Avoid deep box cuts on the approaches to bridges and causeways.

Minimise erosion by protecting estuary banks or streambanks and bridge or causeway embankments with concrete, timber, geotextiles, vegetation or rip-rap.

Stabilise watercourse beds (e.g. by armouring the bed with large rocks). Use energy dissipaters if there is insufficient natural protection against scouring or erosion.

Do not obstruct passage of aquatic fauna during construction. Avoid works during breeding times for local fish species. Seek specialist advice.

Minimise disturbance to coastal wildlife. Schedule works to avoid shearwater and shorebird breeding times and penguin breeding and moulting times.

Employ sediment and erosion control measures during construction to minimise sediment flow into the waterway.

Install cross-drains (drains that run at right angles to the road) to drain water from the road into a sediment trap or into the roadside vegetation. Place the drains at least 20 m away from the crossing.

Both ends of the causeway should be 'keyed in' to the bank for 3-5 metres.

Construct the surface of the causeway with erosion-proof material, such as interlocking angular rock, concrete or flexmat (a concrete and webbing mat).

Keep water away from fresh concrete for at least seven days, where feasible. Fresh concrete is highly alkaline and can pollute the water for fish and other fauna. Some fast-drying mixes may allow a shorter curing time.

Operate construction equipment in a manner that causes the least disturbance to the watercourse or estuarine bed and banks:

- Keep machinery out of the channel as much as possible, and minimise entry points
- Do not dump construction materials (e.g. concrete) or push fill into the water
- Locate surplus fill at least 10 m from the shoreline, estuary or watercourse banks, separated by an effective filter strip of vegetation

Rehabilitation

Restore the natural vegetation as soon as possible to minimise the potential for bank erosion. It may be necessary to use geotextiles to stabilise banks.

Ongoing monitoring and maintenance of rehabilitation work is required.

Maintenance

All crossings should be maintained regularly to minimise the risk of causing erosion and flooding, or obstructing the passage of fish and other animals.

Regular inspections and maintenance should be carried out on new crossings, after storms and periods of high flow, and before fish and other animals begin migrating.

Minimise disturbance to the passage of fish and other aquatic fauna during maintenance works.

Inspection and maintenance should include the following:

- Clear debris from the crossing's surface, entrance and exit.
- Remove debris and sediment from culverts, if more than a third of the entrance is blocked, to allow passage of fish and other animals.
- Check erosion is not a problem.

More Information

Austroads AP-127/97: Concrete Structures Durability, Inspection and Maintenance Procedures—Position Paper.

Tasmanian coastal works manual: Chapter 15, Page & Thorp 2010

Transport Tasmania's Bridgeworks Specifications and Roadworks Specifications

- *Roadworks Specification R34—Drainage Maintenance*

Waterways and wetlands manual, Gallagher 2003

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