



CODE OF PRACTICE - VOLUME THREE - TRAM SYSTEM [CP3] TRANSADELAIDE INFRASTRUCTURE SERVICES		
PART 8: STORM WATER DRAINAGE		DOC. NO. CP-TS-978
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TRACK AND CIVIL INFRASTRUCTURE

CODE OF PRACTICE

VOLUME THREE - TRAM SYSTEM [CP3]

STORM WATER DRAINAGE



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1.0 PURPOSE AND SCOPE

1.1 PURPOSE

The purpose of this part is to set standards to ensure that:

- a) waterways are fit for purpose, constructed, monitored and maintained to provide clear and unobstructed flow of storm water under all normal conditions;
- b) if a defined event occurs, action shall be taken in accordance with procedures to keep the track safe; and
- c) if storm water damage occurs to the track, appropriate measures shall be taken to avoid an incident.

1.2 PRINCIPLES

This part complies with the principles set out in the "Code of Practice for the Defined Interstate Rail Network", volume 4, part 2, section 10, Flooding.

1.3 SCOPE

Except for bridges or culverts over waterways which are included in CP-TS-977 (Structures), this part specifies general procedures for:

- a) the design/rating, monitoring and maintenance of new storm water drainage infrastructure;
- b) the identification of existing flood special locations; and
- c) the determination of the related defined events which may lead to unsafe conditions at those locations.

1.4 REFERENCES

1.4.1 Industry Codes of Practice

Australian Bridge Design Code

Austrroads Waterway Design Manual

Australian Rainfall and Runoff, published by The Institution of Engineers, Australia

Code of Practice for the Defined Interstate Rail Network, volume 4 (Track, Civil and Electrical Infrastructure), part 2 (Infrastructure Principles), section 10: Flooding.

1.4.2 TransAdelaide documents

a) CP2

CP-TS-973: Part 3, Infrastructure management and principles

CP-TS-977: Part 7, Structures

b) TransAdelaide Documents and Infrastructure Services Management System Procedure Manual

QP-IS-501: Document and Data Control

CPRD/PRC/046 Records Management



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2.0 DESIGN AND RATING

2.1 REFERENCE MANUALS AND CODES

Catchment parameters, waterway and drainage system capacity design and scour prediction shall be determined in accordance with the following manuals and codes of practice:

- a) Australian Bridge Design Code;
- b) Austroads Waterway Design Manual;
- c) Australian Rainfall and Runoff;
- d) Australian Standards as applicable.

2.2 SPECIAL LOCATIONS

2.2.1 Determination and review of defined events

The defined events at flood special locations shall be determined and reviewed in accordance with CP-TS-973 (Infrastructure management and principles) and through detailed inspection and analysis in accordance with the manuals and codes referred to in sub-section 2.1. The analysis shall take into account the environmental conditions at the location and documentation relating to unscheduled inspections resulting from previous defined event occurrences.

2.2.2 Inundation

Inundation or flooding, which results in the line being partly or wholly submerged may occur with only minimal or no damage to the infrastructure. Where the condition of the line does not prevent tram movements, whether under speed restriction or not, the depth of water over the line may be critical and shall be measured and appropriate action taken in accordance with section 3.

2.2.3 Register of special locations and defined events

A register of flooding special locations and the defined events requiring actions shall be established and maintained.



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PART 8: STORM WATER DRAINAGE**DOC. NO. CP-TS-978****Issue: 1****Date: 22/10/07****Page: 5 of 8****3.0 MONITORING AND MAINTENANCE****3.1 INSPECTION, ASSESSMENT AND MAINTENANCE ACTIONS**

- a) Track sections prone to storm water damage shall be identified and managed as flood special locations. Storm water and waterway structures, openings and catchments, in particular at defined flood special locations, shall be monitored and maintained in accordance with this section.
- b) Inspections of storm water drainage shall include the specific conditions shown in table 3.1.

Table 3.1: Stormwater drainage inspection, assessment and maintenance actions

Type of inspection	Specific conditions or actions to observe
Scheduled inspections	
Walking inspections	<p>a) Identify visually, and report, obvious defects and conditions (i.e. indicators of a defect) that may affect waterway and drainage system capacity or indicate increased risk of flooding (e.g. debris build-up in waterways) including the following:</p> <ol style="list-style-type: none"> 1) scour; 2) blockage or partial blockage of the waterway, track drain or cess due to debris, rubbish or silt; 3) damage to waterways, drains or cesses by construction or vehicle access; 4) indications of floods overtopping a structure; 5) culvert/drain damage or collapse. <p>b) sections of track with suspected defects related to inadequate or reduced waterway or drainage capacity shall be subject to general inspection.</p> <p>c) Particular attention shall be paid to conditions at special locations.</p> <p>d) Walking inspections shall be timed to suit seasonal factors in particular at the onset of the wet season.</p> <p>e) Intervals between walking inspections shall not exceed 31 days.</p>
General inspections	<p>a) Shall be of sufficient detail to observe and document significant catchment, waterway, track drain and cess conditions and changes in condition that affect the vulnerability of the infrastructure to future flood events, including those changes resulting from flood damage.</p> <p>b) Identify and report defects and conditions as described for walking inspections in addition to conditions or changes in conditions which may affect the capacity of the waterway or drain including the following:</p> <ol style="list-style-type: none"> 1) scour around culvert walls, ends and barrels; 2) scouring or damage to or around foundations, abutments, wing-walls or temporary supports; 3) erosion or damage to levee banks or channels; \condition of sumps; 4) any other blockage or loss of slope of track drains or waterways. <p>c) Sections of track with identified conditions significantly restricting water capacity shall be nominated and managed as special locations until rectification or water capacity improvement work can be carried out. Detailed inspections may be required for this purpose.</p> <p>d) To be scheduled at an interval appropriate to each site, dependent on its nature and condition, and other seasonal factors but shall not exceed 12 months. Waterways, drainage systems and flood protection works shall be inspected prior to the risk season appropriate to the area.</p>



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Table 3.1 (continued): Stormwater drainage inspection, assessment and maintenance actions

Type of inspection	Specific conditions or actions to observe
Scheduled inspections (continued)	
Detailed inspections	To address all aspects of the flood special location at a level of detail sufficient to document its condition for the purpose of reviewing the defined event or events. Intervals between detailed inspections shall not exceed 5 years.
Unscheduled inspections	
Flood inspections – special locations	<p>a) At waterway and drainage systems nominated as special locations, defined events (e.g. rain events or stream flows as may be indicated by remote monitoring systems) exceeding a specified magnitude in the waterway catchment shall be subject to unscheduled general flood inspection until rectification or water capacity improvement work can be carried out. Waterway and drainage systems with a history of flooding shall be nominated as special locations.</p> <p>b) These inspections shall collect information on the physical condition of the waterway in flood and monitor the flood conditions until the risk to tram operations is assessed as acceptable. Detailed inspections may be required for this purpose. Operating restrictions may also be appropriate at some special locations prior to and during the general flood inspection.</p> <p>c) Records shall be maintained showing the history of rain events and results of unscheduled general flood inspections for special locations.</p>
General inspections	<p>a) These inspections shall be carried out to confirm the presence of suspected defects identified from walking inspections or in response to reported flooding or heavy rain in areas prone to flooding (e.g. by tram drivers) to allow required actions to be determined. The condition of the waterway and drains at the location shall be determined in terms of its impact on the waterway and drainage system capacity.</p> <p>b) Sections of track with identified reduced waterway or drainage system capacity shall be nominated as special locations until rectification or water capacity improvement work can be carried out. Detailed inspections may be required for this purpose.</p> <p>c) Traffic may need to be restricted until the suspected defect or failure is inspected and the necessary actions assessed.</p>
Assessment and actions	<p>a) The integrity of waterway and drainage system structures, openings and catchments shall be assessed to verify their capacity to safely perform the required function or determine the required actions. This is required in particular at special locations where significant changes in condition have been identified that may require reassessment of the defined event.</p> <p>b) During defined events requiring inspection, assessments of the condition shall be made to determine the required actions to maintain safety.</p>



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3.2 INUNDATION

Where inundation of the line occurs and the rails are wholly submerged the following action shall be taken:

- a) An examination of the track shall be made to determine whether it is safe to allow the passage of trams.
- b) If the track is safe, at the point where the water is deepest over the rails, the depth of water above the rail shall be measured.
- c) The depth of water shall be reported to Traffic Control, and a determination made whether trams are to be stopped from passing through the water.
- d) The depth of water shall continue to be monitored until the rail head is once again exposed.
- e) Traffic Control shall continue to be advised whenever a change in conditions occurs.



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4.0 DOCUMENTATION

4.1 REGISTER OF FLOOD SPECIAL LOCATIONS

A register of flood special locations and the defined events shall be established, and a history of incidents at each location maintained in accordance with QP-IS-501 (Document and Data Control). *REGISTER TO BE PREPARED*

4.2 INSPECTION REPORTS

All inspection reports shall be maintained in accordance with CPRD/PRC/046 Records Management.