



AUSTRALIAN RAIL TRACK CORPORATION LTD

Discipline: Engineering (Track & Civil)

Category: Code of Practice

Flooding

Section 10

Applicability

ARTC Network wide	✓	CRIA (NSW CRN)	
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Primary Source

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Document Status

Version	Date Reviewed	Prepared by	Reviewed by	Endorsed	Approved
2.2	08 Nov 11	Standards	Standards & Procedures Administrator	Track Standards Engineer	Manager Standards

Amendment Record

Version	Date Reviewed	Clause	Description of Amendment
2.0	31 Jul 09		Implementation draft of network wide document which is an amalgamation of the CoP for SA/WA & Vic and NSW requirements.
2.1	18 Jun 10		Banner added regarding mandatory requirements in other documents and alternative interpretations.
2.2	08 Nov 11		Banner added regarding elements of RISSB National CoP being incorporated

This ARTC CoP has drawn on the Rail Industry Safety and Standards Board (RISSB) National Code of Practice Volume 4, Track and Civil Infrastructure, but is not identical. The ARTC CoP has been subject to Risk Assessment as required by the various State Rail Safety Regulators. The results of these risk assessments have made it necessary to deviate from the RISSB CoP in some areas. ARTC maintains traceability of the differences.

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Mandatory requirements also exist in other documents.

Where alternative interpretations occur, the Manager Standards shall be informed so the ambiguity can be removed. Pending removal of the ambiguity the interpretation with the safest outcome shall be adopted.

10 Section 10: Flooding

10.1 Design and Rating

10.1.1 Waterway and drainage system drainage

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 Standard AS 5100;
- b) Waterway Design Manual;
- c) Australian Rainfall and Runoff;
- d) Australian standards as applicable.

10.1.2 Special locations

The defined events at flood special locations shall be determined and reviewed through detailed inspection and analysis in accordance with the above manuals and codes, or from records of actual flood events. The analysis should take into account the environmental conditions at the location and documentation relating to unscheduled inspections resulting from previous defined event occurrences.

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

10.2 Construction and Maintenance

10.2.1 Maintenance of waterways and drainage systems

Waterways and drainage systems should be cleaned, with water diverted away from the formation, to a profile and grade sufficient to ensure the structural integrity of the trackwork, formation and associated earthworks.

Care should be taken when undertaking maintenance, particularly at the toe of embankments or other retaining structures to ensure that they are not undermined causing a slip or collapse.

10.2.2 Drainage systems owned by other organisations

Where drainage systems owned by other organisations present an unacceptable risk to train operations the following action should be taken:

- a) Appropriate operational restrictions should be imposed;
- b) The owner should be advised to take appropriate action.

10.3 Inspection and Assessment

10.3.1 Special locations

Track sections prone to (eg. with a history of) flood damage shall be identified and managed as special locations.

10.3.2 Scheduled waterway and drainage system inspection

a) Patrol inspections

The interval between patrol inspections of waterways and drainage systems shall not exceed 7 days on main lines or as otherwise specified by ARTC e.g. in an approved Technical Maintenance Plan. Track patrols should keep a lookout for defects and conditions (i.e. indicators of a defect) that may affect waterway and drainage system capacity or indicate increased risk of flooding (eg. debris build-up in waterways) including:

- (i) Scour.
- (ii) Blockage or partial blockage of the waterway, track drain or cess due to debris, rubbish or silt.
- (iii) Damage to waterways, drains or cesses by construction or vehicle access.
- (iv) Indications of floods overtopping a structure.
- (v) Culvert/drain damage or collapse.

Sections of track with suspected defects related to inadequate or reduced waterway or drainage capacity shall be subject to general inspection.

The speed at which the inspection is carried out should be consistent with the local conditions and the full scope of the inspection being carried out (eg. the type and number of other infrastructure elements being inspected).

Particular attention shall be paid to conditions at special locations.

b) *General inspections*

Scheduled general inspections including surface and sub surface drain examinations should 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.

This inspection should include identification of defects and conditions as described for the patrol inspection in addition to conditions or changes in the conditions which may affect the capacity of the waterway or drain including the following:

- (i) Scour around culvert walls, ends and barrels.
- (ii) Scouring or damage to or around foundations, abutments, wing-walls, or temporary supports.
- (iii) Erosion or damage to levee banks or channels.
- (iv) Condition of sumps.
- (v) Condition of pump systems.
- (vi) Any other blockage or loss of slope of track drains or waterways.

General inspections shall be scheduled at an interval appropriate to each location, dependent on its nature and condition, and other seasonal factors but shall not exceed 12 months *or as otherwise specified by ARTC e.g. in an approved Technical Maintenance Plan* Waterways, drainage systems and flood protection works should be inspected prior to the risk season appropriate to the area.

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.

10.3.3 Unscheduled waterway and drainage inspection

a) Flood inspections—Special locations

At waterway and drainage systems nominated as special locations, defined events (eg. rain events or stream flows as may be indicated by automatic 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.

These inspections should collect information on the physical condition of the waterway in flood and monitor the flood conditions until the risk to train 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.

Records shall be maintained showing the history of rain events and results of unscheduled general flood inspections for special locations.

b) General inspections

These inspections should be carried out to confirm the presence of suspected defects identified from track patrol or general inspections, automatic rainfall monitoring or in response to reported flooding or heavy rain in areas prone to flooding (eg. by drivers) to allow required actions to be determined. The condition of the waterway and drains at the location should be determined in terms of its impact on the waterway and drainage system capacity.

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.

Traffic may need to be restricted until the suspected defect or failure is inspected and the necessary actions assessed.

10.3.4 Assessment and actions

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.

During defined events requiring inspection, assessments of the condition shall be made to determine the required actions to maintain safety.

Reportable exceedents are to be listed on the appropriate form.

Defects in waterway and drainage systems include the following:

- a) Blockage or partial blockage of the waterway and drainage structures due to debris, rubbish, siltation or upstream debris;
- b) Loss of cross section;
- c) Loss of longitudinal continuity;
- d) Scour of formation, culvert walls and barrels, particularly on downstream side of structures;
- e) Scouring or damage to or around foundations, abutments, wing walls or temporary supports;
- f) Culvert/drain barrel damage or collapse;
- g) Changes in adjoining properties that may increase water flows;
- h) Erosion or damage to levee banks or channels;
- i) Ineffective or defective sumps;
- j) Inadequate drainage on the upstream side of embankments.