

# Earthworks

## Section 8

### Applicability

ARTC Network Wide SMS

### Publication Requirement

Internal / External

### Primary Source

### Document Status

Version #	Date Reviewed	Prepared by	Reviewed by	Endorsed	Approved
2.3	11 Jan 2018	Standards	Standards & Procedures Administrator	Manager Standards	A/General Manager Technical Standards 12/01/2018

### Amendment Record

Amendment 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
2.3	11 Jan 18	All	Rebranded.
		8.2	Removed reference to superseded document ETC-08-01.

**This ARTC CoP has drawn on the Rail Industry Safety and Standards Board (RISSB) National Code of Practice**

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**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.**

## **8 Section 8: Earthworks**

### **8.1 Design and Rating**

#### **8.1.1 Geotechnical Structures**

Geotechnical structures and their stability should be determined in accordance with the following documents:

Railway loading: AS 5100 Bridge Design

Geotechnical Structures: Australian standards as applicable

Design and rating of earthworks and geotechnical structures should where necessary include geotechnical investigation and specialist geotechnical advice of the site and or materials.

#### **8.1.2 Special Locations**

The determination of defined events at geotechnical special locations may require detailed investigation and analysis. 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 geotechnical special locations and the defined events requiring actions shall be established and maintained.

### **8.2 Construction**

Refer to relevant accepted ARTC standard and specification.

### **8.3 Inspection and Assessment**

#### **8.3.1 Special Locations**

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

### 8.3.2 Scheduled Earthworks Inspection

#### a. Patrol inspections

The intervals between patrol inspections of earthworks shall not exceed 7 days or as otherwise specified by ARTC e.g. in an approved Technical Maintenance Plan. These inspections should keep a lookout for earthworks defects and conditions (i.e. indicators of a defect) that may affect, or indicate problems with, the stability of earthworks including the following:

- i. Indications of recent movement including slippage, slumping, settlement or heaving.
- ii. Fissures and cracks in formation or earth batters.
- iii. Rock, earth, or other debris falling on or near the track.
- iv. Loss of track geometry.
- v. Track subsidence due to ground movements.
- vi. Earthwork scour and/or erosion including narrow formation leading to loss of ballast and undercutting of the toe of embankments and cuttings by water or wind.
- vii. Water seepage from embankments and cuttings.
- viii. Damage to embankments or cuttings including that caused by construction or vehicle access.
- ix. Conditions that may cause future slip, scour, slump, settlement including burning off or clearing of steep embankments and cuttings.
- x. Any other occurrence likely to impact on the stability of earthworks.

Sections of track with suspected defects related to the stability of earthworks should 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 should be paid to conditions at special locations.

#### b. General Inspection

Scheduled general inspections shall be of sufficient detail to observe and document earthworks conditions and changes in condition that affect their vulnerability to instability..

This inspection shall include identification of defects and conditions as described for the patrol inspection.

General inspections shall be scheduled at intervals appropriate to each location dependant on its nature, 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. Earthworks protection works (including those at special locations) shall be inspected prior to the risk season appropriate to the area.

Sections of track with identified conditions indicating a vulnerability to earthworks instability shall be nominated and managed as special locations until rectification or earthworks stabilisation work can be carried out. Specialist geotechnical advice together with detailed inspections may be necessary for this purpose.

### 8.3.3 **Unscheduled Inspections**

#### a. Earthworks instability unscheduled inspections at special locations

At earthworks nominated as special locations, the onset of defined events exceeding a specified magnitude, including indications from remote ground movement sensors (where installed), shall be subject to unscheduled inspections until rectification or stabilising work can be carried out. Track sections and associated earthworks with a history of instability shall be nominated as special locations.

These inspections should collect information on the physical condition of the earthworks to allow assessment of the stability and the actions to be taken. Specialist geotechnical advice together with detailed inspections may be necessary for this purpose.

Operating restrictions may also be appropriate at some special locations prior to and during the inspection.

Records shall be maintained showing the history of defined events and the results of unscheduled general earthworks instability inspections at special locations.

#### b. General Unscheduled Inspections

These inspections shall be carried out to confirm the presence of suspected defects identified from track patrol inspections or in response to reported movement, instability or failure of earthworks (eg. by drivers) to allow necessary actions to be determined. The condition of the earthworks at the location shall be determined in terms of its impact on stability. Sections of track with identified earthworks instability shall be nominated as special locations until rectification or earthworks stabilisation work can be carried out. Specialist geotechnical advice together with detailed inspections may be necessary for this purpose.

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

### 8.3.4 **Assessment and Actions**

The integrity of earthworks shall be assessed to verify their capacity to safely perform the necessary function or determine the necessary actions.

At special locations where significant changes in condition have been identified reassessment of the defined event shall be carried out.

During defined or other events requiring inspection, assessments of the condition shall be made to determine the actions necessary to maintain safety. Specialist geotechnical advice may be necessary for this purpose.