

# Inspection and Test Plans

EGP-20-02

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ARTC Network Wide

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## **1 Introduction**

### **1.1 General**

This procedure is provided to assist ARTC project delivery teams in preparing Inspection and Test Plans (ITPs) for all new or upgrading works carried out on ARTC Track and Civil Infrastructure.

### **1.2 Purpose**

The purpose of an Inspection and Test Plan is to put together a single document that records all inspection and testing requirements relevant to a specific process. On a construction project the process is likely to be a construction activity, element of work, trade work or providing a product section as reflected on the Work Breakdown Structure (WBS).

### **1.3 Scope**

This procedure covers all new, or modified, rail network infrastructure on the ARTC network and applies to all rail safety work.

Inspection and Test Plan requirements for signalling are documented separately in signalling commissioning plan requirements.

ITP requirements for routine rail network infrastructure maintenance are covered by completion of Maintenance Scheduled Tasks (MST) and the use of any measurements records required by relevant standard.

Routine maintenance rectification of defects will not require ITPs.

### **1.4 Procedure Owner**

The General Manager Technical Standards is the owner of this procedure and is responsible for reviewing this procedure in line with the SMS.

### **1.5 Responsibilities**

The Project Manager is responsible for the implementation of this procedure.

The Project Engineer is responsible for managing the process.

It is the responsibility of the Project Manager and /or his delegate to ensure that ITPs are developed and implemented for works they are responsible for.

The person documenting ITPs should receive input from those with a good technical and practical knowledge of, and experience in, the activities involved. The use, understanding and acceptance of ITPs by inspectors and other personnel will generally be greatly enhanced if they are involved in their preparation.

### **1.6 Reference Documents**

The following documents support this procedure:

- EGP-20-01 Project Management

## 1.7 Definitions

The following terms and acronyms are used within this document:

Term or acronym	Description
Customer	For the purposes of this procedure, customer refers to ARTC maintenance team.
Hold Point	<p>A 'hold' point defines a point beyond which work may not proceed without the authorisation of a designated authority.</p> <p>This 'designated authority' might be a customer's representative/authorised person, or a regulatory authority (such as a local, state or federal government department, water authorities, utilities providers, WorkCover and the like) representative, or it may be the project team inspecting its service provider or employee or agent.</p>
ITP (Inspection and Test Plan)	A simple document that identifies the items of materials and work to be inspected or tested, by whom and at what stage or frequency, as well as Hold and Witness Points, references to relevant standards, acceptance criteria and the records to be maintained.
Roles	Roles identified in this document are as defined by the Rail Safety Worker (RSW) competence.
Witness Point	A 'witness' point provides a party (such as the customer, the project team and a regulatory authority) with the opportunity to witness the inspection or test or aspect of the work, at their discretion.
Surveillance	Intermittent monitoring of any stage of the work in progress (whether by the project team or customer)
Self-inspection	Where the team performing the work verifies the quality progressively, often with the aid of checklists.
WBS (Work Breakdown Structure)	The logical breakdown of the work into its separate parts for the purposes of scheduling and testing of each part of the works.
Work area	A discrete section of the whole work, usually defined by location, where any trade work or activity would be completed before it moves onto another area. Examples include formation, ballasting, re-sleepering, tamping, rerailing, and the like. Also referred to as lots.

## 2 Specification

### 2.1 Quality Requirements

- The ITP shall be version controlled and approved by the responsible ARTC Project Engineer for the item under test. The responsible Project Engineer shall be an ARTC engineer who shall have been authorised for “Scoping/Acceptance of Design” in the relevant discipline per Appendix 1 of PEO-PR-008 Engineering Design and Management Rail Safety Worker Competence. Where the ITP is prepared by a contracted organisation, the ITP shall be approved by the contractor’s relevant Design Verifier/Approver (authorised per PEO-PR-008) and reviewed and accepted by the responsible ARTC engineer.
- The ITP shall reference all relevant standards.
- The ITP process should reflect Project Quality, Risk and Safety Management Plans.
- ITPs for all completed activities shall be signed off by the responsible ARTC Engineer (authorised per PEO-PR-008) and the ITPs for the work package shall be signed off by the responsible Project Manager as part of the work package.

## 3 Procedure

### 3.1 General

This section describes what needs to be considered for each component of an Inspection and Test Plan. It explains the components and how to select the relevant information required for each.

### 3.2 Requirements

- The ITP shall set out what actions are to be taken if an inspection or test is failed, the responsible ARTC engineer shall decide to accept (or not) a particular failure and allow the remainder of the inspection and test sequence in the ITP to be completed.
- The ITP shall set out that the responsible ARTC engineer has the authority to determine that the inspection and testing carried out under the ITP has been successfully completed. Forms associated with the ITP shall provide space for comments to be added regarding test completion and any follow-up testing required.
- The ITP shall detail the specific item under test, the date of testing and the names of staff who will be signing off the completion of inspections and testing. The responsible tester shall be annotated against each particular inspection and test within the ITP.
- The ITP shall reference relevant project documents including the Project Management Plan, together with all documents and drawings (at their relevant version number) needed to complete the inspections and tests listed in the ITP. The relevant Design Verifier/Approver shall be able to demonstrate that the relevant documents and drawings have been approved and are at the correct version number for the item under test.
- The ITP shall be developed from all of the requirements in the Scope of Works, specifications and Work Breakdown Structure (WBS) of the constituent elements of the item under test. The ITP shall include a data collection form for inspection and test results.

- The sequence of inspections and tests shall be set out so that any hold points or stage work are covered, and all components that need to be inspected or tested can be inspected or tested. Confirmation shall be sought regarding which tests that ARTC intends to witness.
- The quality requirements, associated measurements and test success criteria for each test shall be documented in the ITP.
- Any necessary test equipment shall be listed, and all test equipment that requires calibration shall be in current calibration at the time of test.
- Where there is an interface to the item under test, any quality aspects for the interface shall be listed in the ITP and evidence documented that the interface meets such quality requirements.
- Where applicable, material compliance to standards shall be confirmed by inspecting certificates from NATA accredited laboratories and the details signed off by the tester on the ITP form.
- Where a particular test requires a set of steps to be followed, these shall be set out in the ITP. The completion of each inspection or test shall be indicated by one of the testers named in the ITP signing against the particular inspection or test for which they are responsible.
- The ITP shall set out any access requirements or restrictions to the test site. Emergency and site safety requirements, including safety in the presence of test equipment, shall be set out.
- The relevant safeworking method and requirements during the testing shall be set out in the ITP.

## 4 Records

Records are essential to quality management because they provide the documented evidence necessary to verify that a product/service is in accordance with the contract requirements.

Each completed ITP (and associated forms and documents) shall be stored as an ARTC record in accordance with the ARTC Records Management Policy PPP-03, so that project staff and maintenance staff can have continuing ready access to them.

The records would be in various forms, and would include the checklists, test certificates, certificates of compliance/conformity, survey data, written approvals and the like. Inspection and Test Plans would help define the records required.

## 5 Appendix

### 5.1 Inspection and Test Plans

#### 5.1.1 Description of operation or stage of work requiring inspection or test

Because 100% inspection and testing in most cases is neither practical nor desirable, it is necessary to adopt a testing frequency and sampling process which provides a representative indication of the work to suit the risks involved.

Inspections and tests are often best done after a number of separate activities, but prior to a major one that will cover up previous work. It is advisable to carry out preliminary tests to assist in obtaining an early indication of conformity.

Determining the type and extent of inspections and tests is probably the most challenging aspect of documenting an Inspection and Test Plan. The approvals required are sometimes easier to determine as they are usually specified and identify particular work/stages requiring inspections and tests. The type, timing and frequency of inspections and tests vary to suit the risks and work involved.

The “what to test”, “how to test” and “when to test” is governed by:

- What the work is and how complex it is
- Accessibility for inspections and sampling
- Consequences of failure, including as follows:
  - Cost of remedial work
  - Effect on construction program
  - Accessibility for rectification
  - Disruption to use of the infrastructure
  - Consequential damage to other elements
  - Threat to safety of workers and public
  - Availability of resources

The type, timing and frequency (the what, when and how often) of inspections and tests are best determined in conjunction with the consideration of the characteristics to be verified.

### 5.1.2 Characteristics of inspection / test / approval

The characteristics of a work item can be defined as “a distinguishable property of an item, material or process”. Examples of characteristics are colour, texture, size, strength, levelness, gauge, alignment, capacity and the like.

The characteristics to be verified will frequently determine the stage at which the inspection or test must take place if the potential for subsequent nonconformities is to be avoided. This further work might also cover up or deny access for the purposes of verifying certain characteristics.

Some characteristics can only be considered after one particular operation and before another, such as the inspection of formation after compaction but prior to laying of ballast.

### 5.1.3 Stage / frequency

The inspection/test stage/frequency will often be determined by the requirements of the type of inspection and/or test and the characteristics under consideration, as outlined above. In the latter case however, there is the potential for a considerable range in what constitutes the most appropriate frequency and sampling process. It is suggested that a representative sampling of the work to suit the risks involved be used as a guide initially. Thereafter, frequencies would be increased and processes reviewed for ‘problem’ work activities and decreased where consistent conformity was evidenced.

#### 5.1.4 Specification / standard

The standards against which conformity is measured can take various forms. The most common source is usually the technical specifications. Other standards would often be referenced in this document, and may include any of the following: -

- Construction drawings
- Approved workshop drawings and/or calculations
- Approved technical details/procedures
- Approved samples and/or prototypes
- Regulatory requirements
- Australian/RISSB Standards
- ARTC Standard specifications
- Manufacturers' recommendations

#### 5.1.5 Acceptance criteria

Acceptance criteria would normally be defined in the Project Scope documents (either directly or by reference to other standards such as ARTC Standards). Where this is not the case it would be necessary to identify them and possibly to agree to them with the customer. It is preferable to establish acceptance criteria with the customer (where they are not specified or clear) to agree the yardsticks (such as test panels/sections or previous work) against which a product/service is to be declared conforming or nonconforming.

#### 5.1.6 Inspection / test procedures

For many inspections/tests, the methods employed will be specified or self-evident and determined by the characteristics being examined. In other cases, however, the precise manner in which the inspection/test is carried out would need to be identified and described. A clearly described test procedure will usually be necessary to help achieve consistent and reliable results.

A typical test procedure using statistical techniques might, for example, cover:

- reference to work areas/lots or batches
- frequency of sampling
- method of taking samples
- method of conducting a test (including conditions)
- qualifications of test personnel and equipment calibration/condition/specification
- method of documenting results

In some cases it may be possible to satisfy the requirements simply by referencing the requirements of relevant standards.



### 5.1.7 Hold and Witness Points

It is the Project Engineer's responsibility to identify the Hold and Witness Points (with the people responsible for the inspection/test/endorsement and other requirements) that are required. This should be done to the extent that is necessary to be confident that the work is being carried out to the standards required.

The customer usually retains the option to inspect the work at any stage and may identify Hold and Witness Points requiring the customer's attendance. When preparing an ITP, the word "Surveillance" would be shown against all selected inspection or test points that are not otherwise covered by Hold or Witness Points.

### 5.1.8 Checklists

With some work, the logical stage to carry out an inspection or test is often after a number of separate activities, but prior to a major one that will cover up previous work.

It is often useful to complete checklists at such stages and with each inspection and test - where they will, in effect, summarise the procedures that have, and should have, taken place up to the particular point in the work process.

Checklists are useful reminders to the person doing the work of all the matters that are to be addressed. They are used to confirm all the matters have been attended to. They are also reminders to the person inspecting the work of all the matters that should be checked.

A checklist also gives an opportunity to record any special or unusual conditions, and draw these to the attention of the people doing the work. For example, special precautions for protecting existing work, notifications to the public and other matters that might not normally be required for the particular trade or activity, may be included.

The fact that checklists exist, and that their use and content have been verified, would give a customer confidence that the person doing the work is aware of all the important steps, attributes and matters to be addressed, and the standards that should be complied with, and that conformity is being verified.

## 5.2 Documenting Inspection and Test Plan

The following steps are involved in documenting Inspection and Test Plans for a construction Project:

<b>Step 1</b>	Read the standards and technical specifications and prepare a list of any discrepancies, ambiguities, missing information and standards of materials and/or workmanship that are considered inappropriate.
<b>Step 2</b>	Contact the Manager Standards to resolve the issues listed as a result of Step 1.
<b>Step 3</b>	Examine the scope of work and divide it into a WBS requiring an Inspection and Test Plan. As a general guide it is normally most convenient to document a separate Inspection and Test Plan for each trade or work area/section.
<b>Step 4</b>	Note the Hold and Witness Points required by the customer.
<b>Step 5</b>	Review the technical specifications and note the requirements that have the most impact on the quality of the finished work. For each, ask the question "What will be the consequences if it is not made sure this is right?" Be certain to include any references to tests, submitting information to and where required obtaining approvals from the responsible Delivery Manager or his delegate.

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<b>Step 6</b>	Determine from Step 5 which items or aspects of each inspection will need to be recorded on checklists and prepare these.
<b>Step 7</b>	Discuss the checklists with those directly involved with the work and obtain their input. This input should particularly be directed at identifying those issues that have caused problems (and involved extra costs) in the past, and therefore warrant checking at the earliest opportunity to avoid unnecessary and costly rectification.
<b>Step 8</b>	Prepare each Inspection and Test Plan to reflect the requirements of the scope documents. Reference the ITP in the Quality Management Plan and cross-reference to the other related ITPs.
<b>Step 9</b>	Issue each Inspection and Test Plan and/or associated certification to the customer for consideration within a reasonable period prior to commencing the work described in the Plan and adjust them to suit any comment received.
<b>Step 10</b>	Decide how best to divide the whole of the work into work areas for control purposes and indicate these locations either on a schedule (with reference to grids and levels) or by marking up drawings.
<b>Step 11</b>	Prepare and issue checklists for each work area and identify them according to location.
<b>Step 12</b>	Train those directly involved with each of the ITP in their use. Formalise a procedure for the notification of Witness and Hold Points to the appropriate person(s).
<b>Step 13</b>	Carry out inspections and tests in accordance with the Inspection and Test Plans, provide notices to the customer and/or regulatory authorities for Hold or Witness Points, as designated or applicable, and record the results on checklists.

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### 5.3 Inspection and test forms checklist

Do the ITP forms indicate:

- all the inspection and testing required by the customer?
- inspections and tests to verify and validate design (where applicable)?
- inspections and tests required for the supplied product before it is used in the works?
- inspections and tests required for the products/services during construction of the works?
- who performs the inspection or test and at what stage of the works?
- how each inspection or test is to be carried out and recorded? (such as a documented testing procedure or by reference to a standard test method)
- the acceptance criteria and frequency of testing, including customer's requirements?
- the record reference verifying conformity of materials/product or preceding work to the requirements?
- who reviews inspection/test results, evaluates whether work conforms to the product requirements, determines what to do next if work does not pass a required inspection or test, and closes out completed and conforming work areas?
- when statistical analysis of test results is required?
- provision for confirmation that all inspections and tests have been carried out to verify completely conformity to product requirements in each work area?