



## NZ Non Destructive Testing Association

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**Please note – The information contained within this document is published for the sole reason to assist with the preparation for sitting NDT examinations. It is subjective and based on the experience of the author.**

### **NDT Level 1 Written Instruction**

AS and ASTM documents discuss the requirement for a **Procedure** to be produced when ever these documents are specified by the customer.

The content of this **Procedure** is specified in the applicable standards (eg AS2062 and AS1171) and is slightly different from a “**Level 1 Written Instruction**”.

The **Procedure** is used to ensure the quality level of the inspection is documented and the inspection is carried out in accordance with the requirements of the standard and is auditable.

The **Level 1 Written Instruction** is used to allow the inspection to be performed by someone qualified to level 1 without any guesswork or interpretation of the standards. It is also assumed that the person working to this instruction has reached the required competence and knowledge required by ISO 9712 at level 1.

ISO 9712 requires that a level 1 be directed and under the supervision of a level 2. It also states that a level 1 be authorized to set up equipment, perform tests in accordance with **written instructions** and record and report on results

Responsibilities of a level 2 as per ISO 9712 require that they be able to translate codes, standards and procedures into **written instructions**. This document also defines the minimum information that should be included in this written instruction.

Producing a **Level 1 Written Instruction** is part of the Level 2 qualification process and is sometimes part of the practical exam. When preparing a **Level 1 Written Instruction** consideration should be given to the fact that the Level 1 has reached a certain knowledge level. This means that it is not necessary to list in precise detail every step in the instruction.

As an example a level 1 should be fully conversant with being able to de-magnetise an item after MT using either an AC coil or Yoke, therefore the written instruction need only specify that the item is to be demagnetized along with the maximum residual field.

The table on the following pages lists the basic categories identified by ISO 9712 as being required for the **Level 1 Written Instruction**. Also included in this table is a brief description of the information that would generally be required in order to achieve a passing grade in this part of the exam.

## 1 Forward, Scope and Purpose

This section identifies the reason for the written instruction and sets the rules regarding what part, or parts, it is applicable to and when it shall be used.

Any other relevant information that has a direct affect on the quality of the inspection should be included here. Such information could include:

- Previous defect history.
- Critical or highly stressed areas.
- Manufacturing processes used.
- In service operating conditions.

## 2 Reference documents

The purpose of the reference document in the **Level 1 Written Instruction** is to allow the inspection to be controlled by an internationally recognised standard. It is also used to control aspects of the inspection procedure not necessarily included within the written instruction.

The following reference standards are generally used for this purpose

- AS 1171 or ASTM E 1444. (MT)
- AS 2062 or ASTM E 1417. (PT)

Reference should be made to the most current revision

**Note** – If reference is made to these documents then the instructions in the **Level 1 Written Instruction** should comply with the standard identified by the candidate. Eg Ambient light conditions, water wash pressure, MT bath wet concentration limits.

## 3 Status and Authorization

As a controlled document the **written instruction** should be traceable via an individual identification (including revision or date) and reference to the owner and authorizer (Level 3).

## 4 Personnel

The document is produced so that the inspection can be performed by a Level 1. This should be identified within the instruction.

As NDT Level 1's are company certified the name of the company should also be included here.

This should also state if it is applicable to Level 2.

## **5 Apparatus and Settings**

A list of the specific equipment to be used should be included. The level 1 should not be allowed to choose between any items such as MT bench units, penetrant materials or ultrasonic probes.

This section should also make reference to any required Pre-Calibrations, Standardizations or Bath Checks. Examples are:

- UV (Black Light checks)
- Process sensitivity bath checks (TAM Panel, Ketos ring)
- Bath concentration
- Ammeter calibration
- Probe index and angle beam verifications

## **6 Product description**

A description of the product to be tested including surface condition and manufacturing process if applicable.

Pictures and sketches should be used when available

## **7 Test conditions**

Any specific conditions required for testing should be identified.

For Fluorescent MT or PT the maximum ambient white light should be stated.

For visual MT and PT the minimum inspection white light conditions should also be stated

Other considerations could be: Inspection area cleanliness, ambient temperature, safety equipment and personnel clothing.

## **8 Part preparation**

Reference should be made to part cleanliness and any specific cleaning procedures used.

PT inspection requires the most stringent pre cleaning including drying.

Other considerations could be: paint and corrosion removal, etching, blasting scale removal etc.

## 9 Detailed instructions for performing test

This forms the basic instruction for physically inspecting the part. It also attracts the most examination points.

There are generally two areas that points are allocated for.

The first area is based around the knowledge of the candidate in selecting the most appropriate inspection technique.

Some examples of **inappropriate** techniques are:

- Selecting a “yoke”: to carry out a MT inspection of a crankshaft.
- Identifying only one magnetising direction eg Circular.
- Using a PE penetrant to inspect a casting.
- Selecting an incorrect angle shear wave ultrasonic probe.

The second area for allocating points is associated with the actual content of the instructions with respect to the Level 1. Remembering that the Level 1 should not have to guess or decide on any aspect of the inspection.

Examples of items that should be included are:

- Sequencing of inspections
- Current values,
- Part placement and handling
- Particle application
- Washing techniques (PT)
- Scanning patterns
- Equipment recalibration intervals.

This is not an exhaustive list and will depend on the specific procedure chosen by the candidate.

There are a number of items in this section that can be referenced back to the “Reference Document” and need not be re stated here. Eg water wash temperature and pressure limits.

## 10 Evaluation

The written instruction should include the requirement for all indications to be evaluated by a Level 2 or 3

## **11 Test Record**

Confusion generally exists regarding the difference between a “record” of the test and a “test report”

The test record is used to document the test as it was carried out. This is used to demonstrate conformance to the customer requirements and also so that the inspection can be reproduced at a later date if required.

A test record includes most of the items required for a test report and in addition requires the documentation of the specific equipment/materials used including settings and batch numbers if applicable

## **12 Test Report**

The written instruction should include the need for a test report and identify the specific items required to be included. Along with the requirement to document all recordable indications including datum's.