

Australian Standard™

**Non-destructive testing—Visual
inspection of metal products and
components**

This Australian Standard was prepared by Committee MT-007, Non-destructive Testing of Metals and Materials. It was approved on behalf of the Council of Standards Australia on 29 September 2003 and published on 24 November 2003.

The following are represented on Committee MT-007:

- Australasian Railway Association
- Australian Aerospace Non-Destructive Testing Committee
- Australian Industry Group
- Australian Institute for Non-Destructive Testing
- Australian Nuclear Science & Technology Organization
- Australian Pipeline Industry Associations
- Bureau of Steel Manufacturers of Australia
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STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 3978—2003

Non-destructive testing — Visual inspection of metal products and components

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Technical Committee MT-007 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

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NOTES

Australian Standard™

Non-destructive testing—Visual inspection of metal products and components

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PREFACE

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee MT-007, Non-Destructive Testing of Metals and Materials to supersede AS 3978—1991, *Non-destructive testing—Visual inspection of metal products and components*. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian, rather than an Australian/New Zealand Standard.

The objective of this Standard is to establish requirements for the visual inspection for purchasers of metal products and components and the requirements for the qualification of personnel.

The objective of this revision is to incorporate new requirements for specifying procedures for visual inspection.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard

Non-destructive testing—Visual inspection of metal products and components**1 SCOPE**

This Standard specifies procedures for visual inspection of metal products and components, with specific reference to welded components, steel castings, and corroded metal surfaces. Procedures for conducting visual inspection under water may also be developed from this Standard.

This Standard specifies requirements for the qualification of inspectors, for the viewing and illumination of items being inspected, and makes recommendations for the use of approved visual aids to optimize recognition of surface features.

The qualifications for personnel to perform visual examinations are specified in AS 3998.

Requirements on information to be supplied by the purchaser at the time of inquiry or order are contained in Appendix A.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- | | |
|--------|---|
| 1171 | Non-destructive testings—Magnetic particle testing of ferromagnetic products, components and structures |
| 1627 | Metal finishing—Preparation and pretreatment of surfaces |
| 1627.1 | Part 1: Removal of oil, grease and related contamination |
| 1627.2 | Part 2: Power tool cleaning |
| 1627.4 | Part 4: Abrasive blast cleaning |
| 1627.5 | Part 5: Pickling |
| 1627.9 | Part 9: Pictorial surface preparation standards for painting steel surfaces |
| 1680 | Interior lighting (series) |
| 1988 | Welding of steel castings |
| 2062 | Non-destructing testing—Penetrant testing of products and components |
| 2177 | Non-destructive testing—Radiography of welded butt joints in metal |
| 2177.1 | Part 1: Methods of test |
| 2207 | Non-destructive testing—Ultrasonic testing of fusion welded joints in carbon and low alloy steel |
| 2812 | Welding, brazing and cutting of metals—Glossary of terms |
| 3998 | Non-destructive testing—Qualification and certification of personnel (ISO 9712). |

ISO

- | | |
|------|---|
| 3058 | Non-destructive testing—Aids to visual inspection—Selection of low-power magnifiers |
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ASTM

A802/A802M Standard practice for steel castings, surface acceptance standards, visual examination

F1130 Standard practice for inspecting the coating system of a ship

MSS

SP-55 Quality standard for steel castings for valves, flanges and fittings and other piping components—Visual method

3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 1680 and AS 2812 apply.

4 INSPECTOR REQUIREMENTS

Personnel performing visual inspections to this Standard shall have relevant experience and visual acuity as specified by the purchasers requirements (see Appendix A).

The following requirements and recommendations also apply:

(a) *Visual acuity requirements*

An inspector shall have qualifications and experience for their job function acceptable to the testing body*, the manufacturers, and where required, the purchaser. In addition the inspector shall have personnel characteristics of integrity and thoroughness. The inspector shall be conversant with drawings, codes, specifications as well as manufacturing, processing procedures and workmanship standards which apply to the inspection. Near vision acuity (Jaeger No.1) shall permit reading a minimum of Times Roman 4.5 points vertical height where 1 point = 0.3528 mm (1/72 inch) at not less than 30 cm with one or both eyes, either corrected or uncorrected.

Personnel involved in inspections for which the ability to discriminate between colours appropriate to the task is required, shall pass a colour perception test.

NOTE: Appendix B gives notes on the factors affecting visual acuity and the measurement of visual acuity.

(b) *Experience requirements*

An inspector ideally shall have practical experience in the environment in which he or she is operating. Inspectors shall have a sound knowledge of relevant surface characteristics of metal discontinuities and defect types. Personal characteristics of integrity and thoroughness are required. An inspector shall be conversant with drawings, codes, specifications, procedures and workmanship standards which apply to the inspection.

5 EQUIPMENT

5.1 General requirements

The use of proper lighting is critical in visual examination. To achieve optimum viewing conditions, inspections not carried out under daylight conditions shall be performed under artificial lighting conditions, in accordance with the recommendations of AS 1680.

* Qualifications normally accepted for visual inspection of metal products and components include the following:

- (a) Certification by the Australian Institute for Non-Destructive Testing (AINDT) in accordance with AS 3998 (ISO 9712) in visual inspection of metal products.
- (b) Qualifications deemed equivalent to (a) above.

Inspection may be supplemented by the use of hand-held magnifying devices or by the use of other more powerful equipment and appropriate measuring devices as set out in Clauses 5.2 to 5.5.

NOTE: Appendix C lists inspection aids and measuring devices approved for use by this Standard.

5.2 Low-power magnifying equipment

5.2.1 Classification

This Standard recommends the use of low-power magnifiers (see ISO 3058) categorized as follows:

- (a) Type A—single-element magnifiers of magnification up to $\times 3$.
- (b) Type B—multi-element magnifiers of magnification up to $\times 10$.
- (c) Type C—twin-system magnifiers of magnification up to $\times 15$, categorized as follows:
 - (i) Type C1—binocular, normally with a long working distance.
 - (ii) Type C2—bi-ocular, including those fitted with stops or other attachments, for quasi-stereoscopic vision.

NOTE: Both binocular and bi-ocular viewing employ two eyepieces. In bi-ocular viewing, the same image from a single objective lens is presented through each eyepiece. In binocular viewing, each eye receives a unique image appropriate to its position relative to the field of view.

- (d) Type D—concave-mirror magnifiers with front-surface reflectors in powers up to $\times 6$.

5.2.2 Description

An illuminator may be incorporated in the lens mount or in the stand of all magnifier types, except Type A. The stand may consist of a distance-piece, a tripod, a pillar or some other form of support.

Type A ‘reading-glass’ magnifiers are normally hand-held. Hand-held pocket-size magnifiers are also included in Types A and B.

Type C1 twin-system magnifiers are normally mounted on a stand, but may be demountable for use when access to the surface to be examined is difficult. Type C2 magnifiers are stand-mounted.

Types C1 and D, and also some forms of Type A magnifiers, provide the viewing conditions required for binocular vision, with the accompanying extended field of view and depth of focus. Type D magnifiers are used for examining small objects.

5.2.3 Magnification

The magnification shall be stated in terms of linear enlargement. Where appropriate, magnifiers of Types A and B shall have the nominal magnification permanently marked on the lens mount.

In cases where the manufacturer customarily rates lens power in dioptres, the equivalent linear magnification shall also be marked. If this is not practicable, the magnification shall be certified in a written statement.

NOTES:

- 1 Lenses should be made from optical glass or an optically equivalent plastics material which is dimensionally stable, does not change colour with age, and is free from veins, striae or other manufacturing defects which may cause distortion or colour fringes.
- 2 The mounts for magnifiers of Types A, B and C should be such that the lenses are free from undue constraint. In hand-held magnifiers, the mounts should provide protection for the lens from damage when the magnifier is laid down on a level surface.