1. SCOPE

This Work Instruction sets out a method for macro testing of a welded joint. The test reveals the weld shape, the extent of penetration and the soundness of the welded joint.

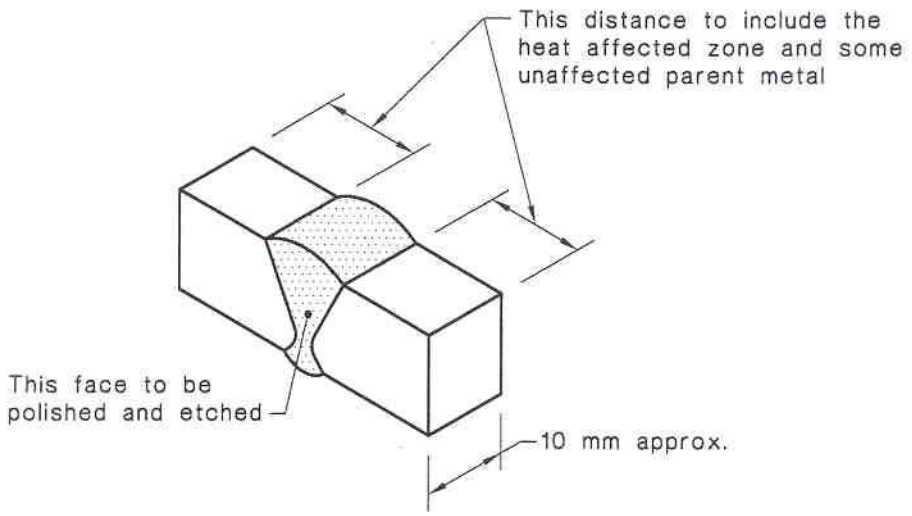
2. REFERENCED DOCUMENTS

The following documents are referred to in this work instruction:

AS/NZS 4533 Coated abrasive products – Dimensional tolerances on non-standard conversions
AS 2205 Methods for destructive testing of welds in metal
AS 2205.1Method 1: General requirements for tests
AS 2205.5.1Method 5: Macro metallographic test
AS/NZS 2243 Safety in laboratories
AS/NZS 2243.1 General
AS/NZS 2243.2 Chemical aspects

3. PREPARATION OF TEST SPECIMEN

The test specimen shall be detached from the weld zone as shown in Figure 1.



Note: This figure is merely schematic. The test may be applied to other weld configurations and test specimen thicknesses.

Figure 1 Test Specimen

4. PREPARATION OF TEST SPECIMEN

The initial preparation of a cut surface may be by milling, grinding, turning or alternatively by filing, using successively finer files until a satisfactory surface finish is obtained. The machined or smooth-filed surface is then abraded on successively finer grades of waterproof silicon carbide paper. A suitable sequence of grit sizes is 100 grit, P240, P600 and P1200.

If the specimen is of a suitable size to be conveniently handled, the most satisfactory procedure is to lay the appropriate sheet of abrasive paper face up on a flat surface (e.g. plate glass). The abrasive paper is then lubricated with water, kerosene or other suitable lubricant and the specimen carefully

abraded against it, using a uni-linear motion and applying moderate pressure until all surface indications from the previous treatment have been removed. The specimen is then washed to remove all traces of abrasive and the procedure repeated with the next finer grade of abrasive paper. The direction of abrading in each case should be at right angles to the marks made by the previous paper.

A fine-machined surface, produced by sharp tools with adequate lubrication or a surface abraded to P600, may be suitable for macro-etching without further preparation.

For thermally cut surfaces, care should be taken to remove the whole of the metal that has been affected as a result of the temperature attained in the thermal cutting operation.

Surfaces will etch more readily and evenly if any dirt, oil or grease is removed with a suitable solvent.

5. ETCHING PROCEDURES

Etching is carried out, either by swabbing the surface with cotton wool held by tongs or glass rod or by immersion of the specimen in the etchant, until good definition of the structure is obtained. After etching, the surface should be washed thoroughly in water, then rinsed in alcohol (ethanol or methanol) and dried as quickly as possible, preferably with a hot air blast. Care should be taken to choose a form of alcohol which does not leave an unwanted residue. A permanent preservation may be obtained by coating the surface with a thin clear lacquer.

6. ETCHANTS

6.1 Safety Precautions

The preparation of etchants involves the handling of potentially dangerous substances. Consequently, they should only be prepared by or under the guidance of experienced people using the appropriate safety equipment. Persons using the etchants must likewise be aware of the correct method of use and the potential hazards of misuse. Guidance on the safe handling of chemicals in laboratories is given in AS 2243.1 and AS 2243.2.

6.2 Carbon and low alloy steel

A3.2.2 Nitric acid in alcohol (10 percent nital). Add 10 mL of nitric acid to 90 mL alcohol (ethanol or methylated spirit).

CAUTION: GREAT CARE MUST BE EXERCISED IN THE PREPARATION OF THIS SOLUTION, AS THE MIXING OF CONCENTRATED NITRIC ACID AND ALCOHOL CAN BE EXTREMELY DANGEROUS. THE ACID SHOULD BE ADDED SLOWLY TO THE ALCOHOL WHILE THE MIXTURE IS BEING CONSTANTLY STIRRED. ALTHOUGH THIS IS MAINLY A LABORATORY ETCHANT, IT MAY BE USED ELSEWHERE, PROVIDED THAT CARE IS TAKEN CONCERNING ITS MIXING, ITS FLAMMABILITY AND ITS TENDENCY TO DECOMPOSE SLOWLY.

6.3 Aluminium and aluminium alloys

Tucker's reagent. Add 10 mL of nitric acid to 25 mL of water followed by 45 mL of hydrochloric acid** and 15 mL of hydrofluoric acid (40 percent).*

CAUTION: HYDROFLUORIC ACID IS EXTREMELY DANGEROUS AND EVEN WHEN VERY DILUTED MUST NOT COME IN CONTACT WITH SKIN OR FINGERNAILS.

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As part of the WTIA National Diffusion Networks Project, the Road Industry Sector has identified the need to develop a work instruction for carrying out Macro Examination of welds. The WTIA has prepared a Technical Guidance Note "Work Instruction for Macro Examination" to outline an approach to carry out macro examination of welds. As a valued technology expert in this area we would like you to be part of the Technology Expert Group to review this note. Please complete this questionnaire so that we can gauge the success of meeting this need.

Objective 1: Identify the need to increase understanding of carrying out Macro Examination of welds

There is an increasing need to be able to carry out macro examinations of welds within the Road Industry. This guidance note is intended to provide the Road Industry with a step by step work instruction for carrying out macro examination of welds in workshops thus reducing the need for outsourcing this task, therefore reducing costs and time. How well does the document explain the process of carrying out a Macro Examination?

poor ☐ average ☐ good ☐ very good ☐

Comments: _____

Objective 2: Identify appropriate technology receptors in the Road Industry

This document was written for Welding Coordinators and procurement personnel in the Road Industry. Are these people the appropriate individuals we should be targeting?

yes ☐ no ☐

What other types of companies and/or personnel do you suggest we target? _____

_____

Objective 3: Identify current best practice for carrying out Macro Examinations

The document was written to reflect current best practice for carrying out Macro Examinations. Do you envisage opportunities for the use of this technology in the industry?

yes ☐ no ☐

If yes, what and where, if no why not? _____

_____

Objective 4: Is the information provided clear, concise and accurate?

yes ☐ no ☐

If not, why? _____

Objective 5: Broad dissemination of technology to the Road Industry

Please indicate how best to disseminate this Technical Guidance Note to the appropriate Road Industry Recipients

Free Website Download ☐ Poster☐ Pocket Guide ☐ Pamphlet ☐

If poster, what size? A1 ☐ A2☐ A3 ☐ Laminated ☐ What selling price? $

If a pocket guide, what selling price? $

Other format? _____

Objective 6: Continuous Improvement

Please Identify areas where the document can be improved or return the document with your recommended additions/amendments. Alternatively, please use the area below to provide any additional comments.

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*Respondents Name:*_____ *Company:* _____ *Phone:* _____

Fax: _____ *Email:* _____ *Date:* _____

Please Fax (02 9748 2858) or E-mail (j.baker@wtia.com.au) your response. Your prompt response is appreciated.