AS 3752—1990

Australian Standard®

Welding—Methods for determination of the diffusible hydrogen content of ferritic weld metal produced by arc welding

STANDARDS AUSTRALIA

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Bureau of Steel Manufacturers of Australia

Confederation of Australian Industry

Department of Defence

Lloyd's Register of Shipping

Metal Trades Industry Association of Australia

Railways of Australia Committee

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PREFACE

This Standard was prepared by the Standards Australia Committee on Welding Consumables. It specifies the sampling and analytical procedures for the determination of diffusible hydrogen in weld metal produced by different arc welding processes.

The Standard describes two alternative methods for the measurement of diffusible hydrogen, viz the collection-over-mercury procedure which is basically in line with IIS/IIW Doc. 805-85, *Measurement of hydrogen in ferritic arc weld metal*, and a gas chromatography procedure.

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SECTION 1 SCOPE AND GENERAL

1.1 SCOPE. This Standard sets out the sampling and analytical procedures for the determination of diffusible hydrogen in weld metal arising from the welding of ferritic steel using arc welding processes with consumable electrodes.

This Standard describes the primary method of hydrogen determination using the method of collection over mercury. An alternative method of determination using gas chromatography is also given.

NOTE: The Standard specifically covers manual metal arc, gas metal arc, flux cored arc and submerged arc welding processes. Extension of the methods to other arc welding processes such as gas tungsten arc or plasma arc welding is possible; however, details should be agreed between the parties concerned.

1.2 APPLICATION. The two principal ways in which this Standard is intended to be used are as follows:

(a) To enable consumables to be qualified or conformance tested to relevant Australian Standard. In such cases, each consumable must be treated as specified in the relevant Section of this Standard.

(b) To provide information on the levels of weld hydrogen arising from the use of consumables in specific states (e.g. with varying moisture levels), or as a result of the use of specific welding parameters (e.g. different current levels). For such purposes, the methods can be applied with a variety of welding parameters and states of consumable, and these will be chosen on each occasion in order to provide the specific information sought. It is important, however, that such conditions are stated when results are reported so that misunderstandings between these hydrogen levels and qualification levels are prevented.

1.3 REFERENCED DOCUMENTS. The following documents are referred to in this Standard:

AS
1204 Structural steels—Ordinary weldable grades

1858 Electrodes and fluxes for submerged-arc welding
1858.1 Part 1: Carbon steels and carbon-manganese steels
1858.2 Part 2: Low and intermediate alloy steels

2203 Carbon steel electrodes, cored (for arc welding)

2409 Interchangeable conical ground glass joints

2717 Welding—Electrodes—Gas metal arc
2717.1 Part 1: Ferritic steel electrodes

2812 Welding, brazing and cutting of metals—Glossary of terms

2900 Quantities, units and symbols
2900.0 Part 0: General principles concerning quantities, units and symbols

1.4 DEFINITIONS. For the purpose of this Standard, the definitions given in AS 2812 apply.

1.5 PRINCIPLE. The welding consumable or consumables combination to be tested is used to deposit a single weld bead which is rapidly quenched and subsequently stored at −78 °C or lower, until required for preparation and analysis.

The specimen obtained in this way is then analysed to determine the diffusible hydrogen in weld metal using one of the following analytical techniques:

(a) Mercury displacement procedure. The test specimen is placed under clean mercury in the collecting limb of a eudiometer. As the diffusible hydrogen is released from the sample it collects above the mercury. When the evolution of hydrogen is complete, the length of the gas column is measured and the volume of hydrogen calculated. Evolution is judged complete when consecutive measurements of the collected volume, one day apart and corrected to STP, fail to show any increase greater than 3 percent. The time required for complete evolution depends on both the size of the sample and the temperature of collection, but complete evolution may require up to 14 days. The mass of weld metal is subsequently determined, and the concentration of hydrogen in the fused or deposited metal is calculated.

NOTE: For some purposes the time taken for complete evolution may be unacceptably long. To cater for such cases provision is also made for a 72 h determination (of reduced accuracy) by agreement between the parties concerned.