Filler metals and allied materials for metal arc welding

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Contents

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Preface

This is the second edition of CSA W48, *Filler metals and allied materials for metal arc welding*. It supersedes the first edition published in 2001.

The first edition of a Canadian standard for welding consumables was published in 1938 as Canadian Engineering Standards Association (CESA) Tentative Standard S48T (CESA became the Canadian Standards Association in 1944). It covered shielded metal arc welding (SMAW) electrodes for mild and low alloy steels. Together with two other Standards, CESA W47, *Welding Qualification Code for the Application to Fabricating and Contracting Firms, Their Welding Personnel and Equipment*, and CESA W59, *Welding of Bridges, Buildings and Machinery*, it was designed to cover all aspects of the welding of structural steels. However, the advent of World War II prevented the adoption of these Standards.

Weld quality depends to a very large degree on the skill and training of the personnel directly involved in welding operations, and usually cannot be determined by visual inspection methods. For this reason, many municipal authorities and design engineers had reservations about using welding in the many projects that were necessary for growth after the cessation of hostilities. The Canadian Institute of Steel Construction (CISC) was very aware of the advantages of welding over other forms of joining. As a result, CISC promoted a program that would provide third-party verification of a company's competency to undertake welding of steel structures. This development culminated in the revision (published in 1947) and adoption (through CSA S16) of new versions of CSA W47, CSA W48, and CSA W59. In January 1947, the Canadian Welding Bureau (CWB) was inaugurated for the purpose of qualifying Canadian organizations and operators engaged in welding operations in structural steel and mechanical fields, and the consumables used by them. This innovation proved so popular that the application of these Standards has expanded to many areas outside the originally intended field.

Following publication in 1947, further revisions of the CSA W48 series of Standards were published to acknowledge the many strides made in the manufacture and application of welding consumables. In the early 1950s, it was decided that one standard was insufficient to cover the many types of electrode available, and CSA W48.1 and CSA W48.2 were published in 1952 and 1953, respectively. Further revisions were made as follows: CSA W48.1 was revised in 1962, 1969, 1976, 1980, and 1991; CSA W48.2 was revised in 1977, 1980, and 1992; CSA W48.3 was first published in 1968 and revised in 1976, 1982, and 1993; CSA W48.4 was first published in 1970 and revised in 1978 and 1995; CSA W48.5 was first published in 1970 and revised in 1982 and 1990; and CSA W48.6 was first published in 1970 and revised in 1980 and 1996.

The first edition of this Standard consolidated and superseded the previous CSA W48 series of Standards (CSA W48.1 to CSA W48.6) and contained several technical changes, including changes intended to harmonize with other regional and international standards. During preparation, close liaison was maintained between the American Welding Society (AWS), International Institute of Welding (IIW), and International Organization for Standardization (ISO). The Technical Committee was also in contact with other organizations, such as the European Committee for Standardization (CEN) and the Japan Welding Engineering Society (JWES).

In this edition, those parts of the first edition of this Standard that specified the classification requirements for solid wire gas metal arc consumables have been replaced by adoption of and reference to CAN/CSA-ISO 14341. Annex A (normative) provides classification equivalencies for the first edition of this Standard.

Filler metals standards are intended to provide a generic method of classification and evaluation that allows the end-user to select appropriate welding consumables for a given welding process and product or application. The procedures and tests set out in this Standard, when correctly followed, are designed to produce a consistent product with test results that are as reproducible as possible.

Non-mandatory annexes in this Standard provide general information and an explanation of the classification system (Annexes B and C); descriptions and intended uses of the welding filler metals and allied materials (Annexes D, E, F, G, and H); information on storage and conditioning of electrodes (Annex I); and information on diffusible hydrogen (Annex J).

This Standard was prepared by the Technical Committee on Welding Filler Metals, under the jurisdiction of the Strategic Steering Committee on Welding and Structural Metals, and has been formally approved by the Technical Committee.

April 2006

Notes:

(1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*

(2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*

(3) *This publication was developed by consensus, which is defined by* CSA Policy governing standardization — Code of good practice for standardization *as "substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity". It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this publication.*

(4) *CSA Standards are subject to periodic review, and suggestions for their improvement will be referred to the appropriate committee.*

(5) *All enquiries regarding this Standard, including requests for interpretation, should be addressed to Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.*

Requests for interpretation should

(a) define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;

(b) provide an explanation of circumstances surrounding the actual field condition; and

(c) be phrased where possible to permit a specific "yes" or "no" answer.

Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization *and are published in CSA's periodical* Info Update*, which is available on the CSA Web site at www.csa.ca.*

W48-06
Filler metals and allied materials for metal arc welding

1 Scope

1.1
This Standard specifies requirements for the classification and certification of
(a) carbon steel covered electrodes for shielded metal arc welding (SMAW);
(b) chromium and chromium-nickel steel covered electrodes for SMAW, including electrodes designated for welding heat-resistant steels containing more than 11% chromium and less than 50% nickel;
(c) low alloy steel covered electrodes for SMAW;
(d) wire electrodes and deposits for gas-shielded metal arc welding (GMAW) of non-alloy and fine-grained steels, as specified in Clause 1.2;
(e) carbon steel electrodes for flux-cored arc welding (FCAW) and metal-cored arc welding (MCAW);
(f) fluxes and solid carbon steel electrodes for submerged arc welding (SAW); and
(g) fluxes and composite carbon steel electrodes for SAW.

1.2
Wire electrodes and deposits for GMAW of non-alloy and fine-grained steels are classified and certified under this Standard using the designations and classification requirements specified in CAN/CSA-ISO 14341. The procedures and conditions for required tests, including radiographic test requirements, are specified in Clause 7.

1.3
The filler metals and allied materials covered by this Standard are classified in accordance with requirements based on one or more of the following criteria:
(a) chemical composition;
(b) usability characteristics;
(c) type of covering (for covered electrodes);
(d) diffusible hydrogen in weld metal (hydrogen-controlled classifications);
(e) mechanical properties of weld metal (including heat treatment condition); and
(f) positions of welding for which electrodes are suitable.