CAN/CSA-A277-16 - Procedure for certification of prefabricated buildings, modules, and panels
Welding Requirements

This document provides an overview of the requirements of *CAN/CSA-A277-16 - Procedure for certification of prefabricated buildings, modules, and panels* with respect to welding. It is designed to provide guidance for individuals and organizations involved in the certification programs for factory-constructed buildings and fully or partially closed panels and modules for panelized buildings. It applies to both residential and non-residential buildings in Canada.

The regulations around requirements for the modular manufacturers for all sectors are not consistent within all Canadian provinces. For this reason it is recommended during the contract review to be prudent to determine whether the application of A277 is a requirement in the jurisdiction where the work is being performed.

This document is only for general guidance purposes; reference to the full text of CSA A277 should be made. For further information, please contact the CWB at 1-800-844-6790 or info@cwbgroup.org.

Introduction

This Standard provides a framework for certification programs for factory-constructed buildings and fully or partially closed panels and modules for panelized buildings. It applies to both residential and non-residential buildings. It provides requirements for:
a) certification of the factory quality program;
b) certification of the prefabricated product;
c) auditing of the factory quality program; and
d) in-factory inspection of the prefabricated product.

Design requirements

4.1 General

Factory-built buildings shall be designed and built to comply with the following:
(a) the National Building Code of Canada or the applicable provincial, territorial, or municipal building code;
(b) the CSA Z240 MH Series;
(c) the Canadian Electrical Code, Part I, for the installation of electrical systems;
(d) the National Plumbing Code of Canada, for factory-installed plumbing and fixtures; or
(d) other applicable codes, standards, and requirements.
The codes, standards, and requirements specified in Items (a) and (e) shall be those in force at the final point of installation.

CSA A277 specifies that the design of the buildings shall comply with the National Building Code of Canada (NBCC) or CSA Z240 which will require that design of the factory built steel buildings to be made in accordance with CSA Standard S16, CSA Standard S136 and/or CSA Standard S850.

If the structure is defined as an integrated assembly of manufactured steel primary structural components, secondary structural components of any material, and cladding of any material, specifically designed by the manufacturer to support and transfer loads and provide a complete or partial building shell" certification to CSA A660 will be required in addition to the certification for CSA A277.

Welded Fabrication

Welding is a key joining method used in the fabrication of steel structures. To ensure welds of the highest quality and the safety of both the users of buildings and the general public, CSA Standard S16 and CSA A660 provide specific requirements around the design of steel structures and welded fabrication and erection of steel structures, with awareness that buildings are occupied by people.

CSA S16 provides the following requirements:

24.1 Arc welding
Arc welded joints shall be designed in accordance with
(a) Clause13.13 for factored resistance of welds under static loading with matching electrode (see CSA W59 for locations and conditions where non-matching is permissible); and
(b) Clause 26 for resistance to fatigue loading, with matching electrode (see CSA W59 for locations and conditions where non-matching is permissible).
For all other aspects of welding, the requirements of CSA W59 shall be followed.

24.2 Resistance welding
The resistance of resistance-welded joints shall be in accordance with CSA W55.3. Quality assurance and weld process control procedures shall be as specified in CSA W55.3.

24.3 Fabricator and erector qualification
Fabricators and erectors responsible for welding structures fabricated or erected under this Standard shall be certified by the Canadian Welding Bureau to the requirements of CSA W47.1 (Division 1 or Division 2), CSA W55.3, or both, as applicable. Part of the work may be sublet to a Division 3 fabricator or erector; however, the Division 1 or Division 2 fabricator or erector shall retain responsibility for the sublet work.

CSA A660 provides the following requirements:

8.2 Capabilities
The manufacturer shall demonstrate to the satisfaction of the certification agency that:
(a) the manufacturer is certified under CSA W47.1, Division 1 or 2 for welded fabrication;
(b) if resistance welding is used, the manufacturer is certified in accordance with CSA W55.3;
(c) fabrication conforms to the requirements of CAN/CSA-S16 and CAN/CSA-S136, as applicable to the steel building system; and
(d) arc welding conforms to CSA W59 and CAN/CSA-S136, as applicable to the steel building system.

CSA Standard W47.1 provides requirements for the qualification of welders and welding operators, welding procedures and welding supervisory and engineering personnel. A company certified to CSA W47.1 Division 1 requires having full time engineer(s) and a company certified to Division 2 requires having retained part time engineer(s).

CSA Standard W55.3 provides requirements for the qualification of welding operators, welding procedures and welding supervisory and engineering personnel. A company certified to CSA W55.3 Division 1 requires having full time engineer(s) and a company certified to Division 2 requires having retained part time engineer(s). All companies certified to CSA W55.3 require to have in place a quality system for resistance welding.

CSA Standard W59 provides guidance on weld design, fabrication techniques, inspection and other key considerations around welding for steel. CSA Standard W59 requires that contractors performing work under this standard be certified under the requirements of CSA Standard W47.1 unless the Engineer of record approves the contractor for the work to be undertaken.

An organization meeting the requirements of CSA Standard W47.1 and / or CSA Standard W55.3 will have qualified welders, operators, accepted welding procedures and accepted supervisory/engineering personnel. All elements of the welding operation will be independently verified by the Canadian Welding Bureau on an on-going basis.

Please note that there are no domestic or international equivalents to CSA Standard W47.1 and / or CSA Standard W55.3. Other national systems, such as that of the American Welding Society (AWS) do not include key concepts such as independent and on-going verification and welding supervisors/engineers. The CWB strongly cautions the reader around accepting substitutions; doing so may contravene the intent of CSA S16 and place public safety at risk.

For a listing of all organizations that currently meet the requirements of CSA Standard W47.1 and CSA Standard W55.3 please see www.cwbgroup.org.

Welding Inspection

30.5.1 Extent of examination
30.5.1.1 General
The fabricator or erector shall visually inspect all welds. Non-destructive examination of welds (other than visual) shall be completed by the fabricator or erector when specified by the owner. Third party welding inspection (visual and/or non-destructive) shall be performed when required by the owner.

30.5.2.2 Competency of all personnel performing non-destructive testing (not including visual inspection)
Competency of all personnel performing non-destructive testing, other than visual, shall be in accordance with CAN/CGSB-48.9712/ISO9712.

30.5.2.3 Competency for third-party personnel performing non-destructive testing (visual inspection only)
The competency of third-party visual inspection personnel shall meet the requirements of CSA W178.2 or AWS QC1. AWS inspectors shall have evidence of an eye exam showing 20/20 vision corrected or uncorrected within the last 2 years.

30.5.2.5 Non-destructive testing personnel
Non-destructive testing personnel referenced in Clause 30.5.2.2 and 30.5.2.3 shall meet the requirements of Level 2 or 3 of CSA W178.2, AWS QC1 or CAN/CGSB-48.9712/ISO9712 as applicable. Level 1 personnel (or a CAWI under AWS QC1) may only perform the applicable tasks under the direct supervision of a Level 2 or 3 personnel.
Note: *For personnel certified under AWS QC1, a CWI or SCWI is equivalent to an inspector certified to Level II of CSA W178.2.*

30.5.3 Acceptance criteria
The fabricator or erector shall ensure that all welds under their responsibility comply with the CSA W59. When third-party welding inspection is required by the owner, such verification shall be completed by the fabricator or erector prior to the third-party inspection.
Unless otherwise specified, the acceptance criteria for all welds shall be in accordance with CSA W59.

CSA Standard W59 requires that all welds be visually inspected. In addition, when required by contract weld inspection must be completed by certified welding inspectors or a welding inspection organization following the requirements of CSA Standard W178.2 or CSA Standard W178.1 respectively. It also requires that CSA Standard W59 be followed for the acceptance criteria for all welds. It should be noted that CSA Standard W178.2 has individual "product categories" that inspectors may qualify to, including one for CSA Standard W59.

For a listing of all organizations and individuals who currently meet the requirements of CSA Standard W178.1 and CSA Standard W178.2, please see www.cwbgroup.org .

Welding Consumables

5.1.8 Welding electrodes
Welding electrodes shall meet the requirements of CSA W48, as applicable.

CSA Standard W48 provides requirements for the classification and certification of welding consumables by itself or in conjunction with gas mixtures or fluxes as applicable. Welding consumables certified by the CWB have undergone through periodically testing and acceptance of quality management system of the manufactures.

For a listing of all consumables who currently meet the requirements of CSA Standard W48 please see www.cwbgroup.org .

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