

# **CAN/CSA-N291-08 – Requirements for safety-related structures for CANDU nuclear power plants**

This document provides an overview of the requirements of *Welding Requirements CSA-N291 – Requirements for safety-related structures for CANDU nuclear power plants* with respect to welding. It is designed to provide general requirements for material, design, construction, fabrication, inspection, and examination requirements for safety-related structures for CANDU nuclear power plants.

This document is only for general guidance purposes; reference to the full text of CSA N287.3 should be made. For further information, please contact the CWB at 1-800-844-6790 or [info@cwbgroup.org](mailto:info@cwbgroup.org).

## **Introduction**

Welding is a key joining method used in the fabrication of structures that support, house, or protect nuclear safety systems, components of structures that are required for the safe operation and/or safe shutdown of the reactor and facilities for the storage of irradiated fuel and other radioactive waste material. To ensure welds of the highest quality and the safety of both the users of CANDU power plants and the general public, CSA Standard N291 provides specific requirements around the design, construction, fabrication, inspection, and examination requirements of structures, with awareness that the CANDU nuclear plants are used by people.

## **Welded Fabrication**

CSA N291 provides the following requirements:

### **5.6.3 Qualification of welding procedures**

*Welding procedures shall be qualified in accordance with CSA W47.1, with suitable allowance for welding stainless steel base material and filler material.*

### **6.1.3.3 Welding requirements**

*Welded joints shall be designed and examined in accordance with CSA WS9. Note: Certain metallic embedded parts may be governed by the requirements of the CSA N285 series. The jurisdictional boundaries between this Standard and the CSA N285 series should be determined in accordance with the requirements of Clause 4.7 of this Standard.*

### **6.8 Masonry structures**

*6.8.1 General Nuclear safety-related masonry structures, including high-density concrete block walls, shall be designed in accordance with the requirements of CSA S304.1, except as otherwise specified in this Standard.*

CSA Standard S304.1 Welded splices and mechanical connections require that all welding to conform to CSA Standard W186.

CSA Standard W47.1 and CSA Standard W186 provide 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 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. CSA Standard W47.1 provides requirements for the qualification of welders and welding operators, welding procedures and welding supervisory and engineering personnel.



An organization meeting the requirements of CSA Standard W47.1 and / or CSA Standard W186 will have qualified welders, 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, CSA Standard W186 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 place public safety at risk.

For a listing of all organizations that currently meet the requirements of CSA Standard W186 and / or CSA Standard W47.1 please see [www.cwbgroup.org](http://www.cwbgroup.org).

## **Welding Consumables**

### **5.6.2 Electrodes**

*Electrodes shall conform to one of the following Standards:*

- (a) CSA W48;
- (b) AWS AS.4/A5.4M; or
- (c) AWS AS.9/AS.9M.

CSA Standard W186 and CSA Standard W47.1 require fabricators welding to these standards to use CWB certified consumables to CSA Standard W48 or AWS 5 series in absence of provisions. An organization meeting the requirements of CSA Standard W48 will have all elements of the welding operation independently verified by the Canadian Welding Bureau on an on-going basis.

## **Welding Inspection**

### **7.1.3 Personnel qualifications**

*Personnel performing construction inspections and in-service examinations shall be qualified in accordance with CSA N287.1. A qualified engineer shall interpret the results of construction inspections and in-service examinations.*

### **7.2.3 Steel structures**

*7.2.3.1 The inspection and testing of steel structures shall be in accordance with CSA-S16 and with the requirements of this Standard.*

#### **7.2.3.2 Inspection of welded joints**

Welded joints shall be inspected in accordance with the requirements of CSA W59.

CSA Standard N287.1 requires that all welding inspectors involved in inspection to this standard to be qualified to the requirements of CSA Standard W178.2.

CSA Standard S16 requires that all welding inspection shall be performed by firms certified to CSA W178.1, except that visual inspection may also be performed by persons certified to Level 2 or 3 of CSA W178.2, when third-party welding inspection (visual and/or NDE) is specified by the owner.

CSA Standard W186 and CSA Standard W59 require 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 W186 and 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](http://www.cwbgroup.org).