THE OFFICE OF PUBLIC SAFETY

Canadian Welding Bureau

Comparative Review
AWS D1.1 vs CSA W47.1 & CSA W59

The Similarities and Differences

This document summarizes the similarities and key difference in the requirements between welding standards published by the Canadian Standards Association (CSA) and the American Welding Society (AWS).

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Scope:
The technical review has been carried out with respect to the comparison of the welding certification, welding design, fabrication, inspection, qualification of welding procedures and welding personnel requirements listed in the following standards:

- AWS D1.1:2015 - Structural Welding Code – Steel
- CSA Standard W59-2013 - Welded Steel Construction (Metal Arc Welding)
- CSA Standard W47.1-09 Update 7 - Certification of Companies for Fusion Welding of Steel

The purpose of this comparative review is to provide the users of these Standards an overview of their similarities and differences. Unlike AWS D1.1 code that provides the best industry practice, the CSA standards provide minimum requirements that have to be met by welding fabricators.

In Canada, CSA Standards W47.1 defines the requirements for the certication of companies involved in welding steel, including qualification requirements for welders, welding procedures and welding supervisory personnel. Weld quality, electrode/base metal matching, pre-qualified joints and weld design, inspection, stud qualification and tubular structures requirements are specified in CSA Standards W59.

In the U.S.A., AWS D1.1 "Structural Welding Code – Steel" defines the requirements for the qualifcation of welders and welding procedures, weld quality, electrode/base metal matching, pre-qualifed joints and weld design are also specifed, but it does not have any administrator overlooking the certification program.

While CSA W47.1 Standard is administered by the Canadian Welding Bureau that has the mandate to certify welding fabricators and monitor their compliance to the standard, the AWS D1.1 is voluntary adopted by the welding fabricators and the AWS is not mandated for administering a certification program nor monitor or enforce the its conformance.

The major difference between these two systems is related to the certification program. Certification requires four key things be in place:

1. Welding must be done by competent, qualified individuals (welding personnel);
2. Welding operations must be overseen by competent, qualified individuals (welding super visors and welding engineers);
3. Welding must follow proven, qualified welding procedures;
4. Welding fabrication has to be performed under a quality system administered by the company and verified by the administrator on an ongoing basis.

While great effort is made to compare these Standards clause by clause, some clauses of general nature may be omitted. Some clauses are shown for their comparative differences and fundamental importance. As CSA W47.1 works in conjunctions with CSA W59 some clauses numbers listed in AWS may not match exactly the number of clauses listed in CSA Standards. The following abbreviations will be found on the comparison chart:

ID:	Identical - means the clauses are identical word by word
EQ:	Equivalent - means the contents are similar but the wording is different
NEQ	Not equivalent - means that the intent of the standards is not equivalent
N/A	Not applicable - means not applicable
Remarks	Comments are provide in order to explain the similarities or differences

AWS D1.1:2015 Structural Welding Code - Steel	CSA W59-2103 Welded Steel Construction (Metal Arc Welding)	CSA W47.1-09 U7 Certification of Companies for Fusion Welding of Steel	Identical (ID), Equivalent (EQ), or Not Equivalent (NEQ)	Remarks
Clause No.	**Clause No.**	**Clause No.**		
1 General Requirements	**1** Scope **2** Definitions and Reference Publications **3** General Requirements	**1** Scope **2** Definitions and Reference Publications **3** General Requirements	**EQ**	Although the general format of Clause 1 is similar in all three standards, the scope of CSA W47. 1 clearly specifies that the standard provides requirements for certification for welding fabricators and the qualification of their welding personnel and welding procedures which is different than the scope of CSA W59 and AWS D1.1. While all three standards provide definitions in either Clause 2 or 3, the CSA standards also provide a list of referenced publications. AWS D1.1 provides such a list in its Annex S.
N/A	**N/A**	**4** Administration	**NEQ**	In this Clause CSA W47.1 specifies the administrator for certification of welding fabricators. Canadian Welding Bureau administers this standard, certifies companies, plants and qualifies welding personnel and issues proper documentation to identify certification of companies. The companies are monitored by the CWB throughout the certification process and ongoing to ensure that the requirements of this Standard are being met.

AWS D1.1:2015 Structural Welding Code - Steel	CSA W59-2103 Welded Steel Construction (Metal Arc Welding)	CSA W47.1-09 U7 Certification of Companies for Fusion Welding of Steel	Identical (ID), Equivalent (EQ), or Not Equivalent (NEQ)	Remarks
2 Design of Welded Connections	**4** Design of Welded Connections	**N/A**	**EQ**	Overall this section is similar although it is slightly structured. The differences and similarities between AS D1.1 and CSA W59 are outlined below.
Part A Common Requirements for Design of Welded Connections	**4.1** General Requirements	**N/A**	**EQ**	Clauses 2.2 and 2.3 of AWS D1.1 are similar in content with Clause 4.1.1 of CSA W59 providing requirements for design, shop and field drawings, and requirements for welding symbols. In addition Clause 4.1.2 and 4.1.3 provide requirements for lamellar tearing and requirements for welds.
2.4	**4.3, 4.4, 4.5, 4.6, 4.7**	**N/A**	**EQ**	The outlined clauses are similar in content providing effective area, length of welds and weld sizes for groove welds, fillet welds, plug welds, slot welds, welds in skewed in joints, seal welds and filler. In addition to the above items AWS D1.1 provides a formula for reduction of fillet weld length when end – loaded fillet welds are 100-300 times longer than the weld size.
Part B Specific Requirements for Design of Non-tubular Connections (Statically or Cyclically)	**11**	**N/A**	**EQ**	Part A and Part B of AWS D1.1 provide provisions for the design of statically or cyclically loaded structures. Clause 11 of CSA W59 is similar in content with Part A and B of AWS D1.1, but provides provisions for statically loaded structures only. In addition CSA W59 provide provisions for matching base metal / electrode, visual and NDE examination and permissible values for discontinuities. Provisions of plug and slot welds along with fillers are covered by CSA W59 in its Clause 4.

AWS D1.1:2015 Structural Welding Code - Steel	CSA W59-2103 Welded Steel Construction (Metal Arc Welding)	CSA W47.1-09 U7 Certification of Companies for Fusion Welding of Steel	Identical (ID), Equivalent (EQ), or Not Equivalent (NEQ)	Remarks
Part B Specific Requirements for Design of Non-tubular Connections (Cyclically)	**12**	**N/A**	**EQ**	Part A and Part B except as modified in part C of AWS D1.1 provide provisions for the design of cyclically loaded structures. Clause 12 of CSA W59 is similar in content with Part A and B of AWS D1.1. In addition CSA W59 provide provisions for matching base metal / electrode, visual and NDE examination and permissible values for discontinuities. Provisions of plug and slot welds along with fillers are covered by CSA W59 in its Clause 4.
Table 2.1 Effective Weld Size of Flare Groove Welds Filled Flush	**Table 4.1** and **4.2**	**N/A**	**EQ**	In addition to providing values for the flare welds filled flush CSA W59 also provides values for flare welds not filled flush. The concept is similar but the values are slightly different.
Table 2.2 Z Loss Dimensions	**Figure 4.8**	**N/A**	**EQ**	The difference between these two concepts for measuring the size of the weld in skewed joint is that AWS D1.1 provides different Z loss factors based on the type of welding process used and welding position.
Table 2.3 Allowable Stresses	**Table 11.2**	**N/A**	**EQ**	
Table 2.4 Equivalent Strength for obliquely Loaded Fillet Welds	**N/A**	**N/A**	**NEQ**	
Table 2.5 Fatigue Design Parameters	**Table 12.4** and **Fig. 12.1**	**N/A**	**EQ**	

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3 Prequalification of WPS 3.1 Scope	**10** Details and Welding Procedure Requirements for Prequalified Joints 10.1 General	**N/A**	**EQ**	Although AWS D1.1 provides provisions for prequalification throughout a number of different clauses, CSA W59 organized the same provisions under the general section. For this reason Section 10.1 of CSA W59 will be mentioned as being equivalent to other AWS D1.1 sub clauses outlined below. Also CSA W59 provides some provisions for prequalification in its clause 5, but clear outlined in Clause 10.1.3.1.
3.2 Welding Processes	**10.1.3**	**N/A**	**EQ**	In addition to the welding processes outlined in AWS D1.1, CSA W59 provides provisions for prequalification for GTAW process.
3.3 Base Metal / Filler Metal Combinations Table 3.1 Prequalified Base Metal / Filler Metal Combinations for Matching Strength	**Table 11.1** and **12.1**	**N/A**	**EQ**	Although the general concept of grouping materials is similar in both standards there are some differences as outlined below: • AWS D1.1 lists slightly more steels than CSA W59. • CSA W59 lists its materials in 7 groups as opposed to only 4 groups listed in AWS D1.1. • CSA W59 considers Q/T materials to be prequalified where AWS D1.1 doesn't. • CSA W59 provides separate tables with prequalified tables for statically and cyclically loaded structures and separate matching filler metal.
3.4 Engineer's Approval for Auxiliary Attachments	**3.2.1**	**N/A**	**EQ**	Using other than the steels listed is permitted only for auxiliary structures by the Engineer in accordance to AWS D1.1. In CSA W59 the usage of other steels not listed is permitted condition the Contractor's Engineer asses the equivalency of materials and it is accepted by the Engineer.

AWS D1.1:2015 Structural Welding Code - Steel	CSA W59-2103 Welded Steel Construction (Metal Arc Welding)	CSA W47.1-09 U7 Certification of Companies for Fusion Welding of Steel	Identical (ID), Equivalent (EQ), or Not Equivalent (NEQ)	Remarks
3.5 Min. Preheat and Interpass Temperature Requirements Table 3.3 Min. Preheat and Interpass Temperature	**5.7 and Table 5.3** Min. Preheat and Interpass Temperatures	**N/A**	**EQ**	In addition to provisions outlined in Table 3.3 of AWS D1.1, Table 5.3 of CSA W59 standard covers for the preheat temperature when welding with electrodes having H4 designator.
3.6 Limitation of WPS Variables **3.7** General WPS Requirements Table 3.6 and Table 3.7	**5.5** Details of Welding Procedures	**11.1 and 11.2** Welding Procedure Data Sheets (WDPSs)	**EQ**	AWS D1.1 provides in Table 3.6 more restrictions with respect to welding parameters, maximum root pass and maximum weld layer width. Also, Table 3.7 provides a list with essential variables for prequalification requirements.
3.8 Common Requirements for Parallel Electrode and Multiple Electrode SAW	**5.5.3.3** Procedures for Welding with Parallel Electrodes 5.5.3.4 Procedure for Welding with Multiple Electrodes	**N/A**	**EQ**	
3.9 Fillet Weld Requirements	**4.3.2** Fillet Welds	**N/A**	**EQ**	

AWS D1.1:2015 Structural Welding Code - Steel	CSA W59-2103 Welded Steel Construction (Metal Arc Welding)	CSA W47.1-09 U7 Certification of Companies for Fusion Welding of Steel	Identical (ID), Equivalent (EQ), or Not Equivalent (NEQ)	Remarks
3.10 Plug and Slot Weld Requirements	**4.3.3** **4.4.2** Appendix B	**N/A**	**EQ**	
3.11 Common Requirements of PJP and CJP Groove Welds	**4.3 and 10**	**N/A**	**EQ**	
3.12 PJP Requirements	**4.3 and 10**	**N/A**	**EQ**	
3.13 CJP Groove Weld Requirements	**4.3 and 10**	**N/A**	**EQ**	
3.14 Postweld Heat Treatment	**5.12** Stress Relief Heat Treatment	**N/A**	**EQ**	AWS D1.1 provides the temperatures for the heat treatment in its Clause 5.8.
Table 3.1 Approved Based Metals for Prequalified WPSs	**Table 11.1 and 12.1**	**N/A**	**EQ**	See comments related to Clause 3.3 of AWS D1.1
Table 3.2 Filler Metals for Matching Strength to Table 3.1	**Table 11.1 and 12.1**	**N/A**	**EQ**	AWS D1.1 considers MCAW as being similar to GMAW and not FCAW as W59 does.
Table 3.3 Prequalified Minimum Preheat and Interpass Temperature	**Table 5.3**	**N/A**	**EQ**	See comments related to Clause 3.5 of AWS D1.1.

AWS D1.1:2015 Structural Welding Code - Steel	CSA W59-2103 Welded Steel Construction (Metal Arc Welding)	CSA W47.1-09 U7 Certification of Companies for Fusion Welding of Steel	Identical (ID), Equivalent (EQ), or Not Equivalent (NEQ)	Remarks
Table 3.4 Filler Metal Requirements for Exposed Bare Applica-tions of Weathering Steels	**Table 5.2**	**N/A**	**EQ**	
Table 3.5 Minimum Prequalified PJP Weld Size	**Table 4.3**	**N/A**	**EQ**	Although similar in the concept of providing minimum requirements for PJPs in bevel, V, U and J grooves AWS D1.1 provides requirements for the minimum weld size, while CSA W59 provides requirements for minimum depth size.
Table 3.6 Prequalified WPS Requirements	**Table 10.1 and 10.2**	**N/A**	**EQ**	
Legend for **Figure 3.2** and **3..3**	**10.1.4**	**N/A**	**EQ**	
Figure 3.2 Prequalified PJP Groove Welded Joint Details	**Figure 10.1** to **10.14**	**N/A**	**EQ**	The concept of prequalification and the majority of the prequalified joints listed in both standards are similar. The following are the differences: • AWS D1.1 lists separate figures for PJP and for CJP as opposed to CSA W59 that covers both type of welds under the same process. • In addition to the processes listed in AWS D1.1 for prequalification CSA W59 adopted supplemental processes like GTAW and MCAW.

Figure 3.3 Prequalified CJP Groove Welded Joint Details				D1.1 for prequalification CSA W59 adopted supplemental processes like GTAW and MCAW. • CSA W59 provides separate prequalified joints for MCAW and FCAW although these two processes are considered to be within the same class. • AWS D1.1 considers prequalified joints applicable for GMAW to be valid for MCAW as well. • CSA W59 provides separate prequalified joints for GMAW-S and for GMAW-P.
AWS D1.1:2015 Structural Welding Code - Steel	**CSA W59-2103 Welded Steel Construction (Metal Arc Welding)**	**CSA W47.1-09 U7 Certification of Companies for Fusion Welding of Steel**	**Identical (ID), Equivalent (EQ), or Not Equivalent (NEQ)**	**Remarks**
Figure 3.4 prequalified Skewed T-joint Details	**Figure 4.8**	**N/A**	**EQ**	
Figure 3.5 Prequalified Fillet Weld Joint Details	**Table 4.4**	**N/A**	**EQ**	
Figure 3.6 Prequalified CJP Groove, T and Corner Joint	**N/A**	**N/A**	**NEQ**	CSA W59 does not have any equivalent provisions for such joint.
4 Qualification **4.1, 4.2** General	**N/A**	**Clause 10, 11 and 8**	**EQ**	This section covers for general requirements that are also available spread throughout CSA W47.1. While AWS D1.1 names the welding procedure WPS (welding procedure specification), CSA W47.1 names it WPDS (welding procedure data sheet). CSA W47.1 also requires the manufacturer to submit a WPS but it is in the format of a general document outlining requirements for the welding process in use.

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4.3 Common Requirements for WPS and Welding Personnel Performance Qualification	**N/A**	**Clause 8** and **11**	**EQ**	This section covers for general requirements that are also available throughout clause 8 and 11 of CSA W47.1.
4.5 Type of Qualification Tests	**N/A**	**11.4** Types of Test Groupings of Welds	**EQ**	CSA W47.1 better reflects what type of test is considered mandatory and what of type of test is considered optional. Also, it splits the type of test in two main categories: mechanical and soundness tests.
4.6 Weld Types for WPS Qualification	**N/A**	**10**	**EQ**	In addition to tests outlined in CSA W47.1, AWS D1.1 provides provisions for testing of plug and slot welds. Also testing for TKY joints is covered by CSA W59 in its Annex U.
4.7 Preparation of WPS	**N/A**	**11.1**	**EQ**	
4.8 Essential Variables	**N/A**	**11.4.2**, **11.4.3**, **Table 11** and **Table 12**	**EQ**	
4.9 Methods of Testing and Acceptance	**N/A**	**11.6** and **11.7**	**EQ**	
Criteria for WPS Qualification				

AWS D1.1:2015 Structural Welding Code - Steel	CSA W59-2103 Welded Steel Construction (Metal Arc Welding)	CSA W47.1-09 U7 Certification of Companies for Fusion Welding of Steel	Identical (ID), Equivalent (EQ), or Not Equivalent (NEQ)	Remarks
4.10 CJP Welds for Nontubular Connections	**N/A**	**Table 13** Procedure Qualification – CJP Groove Welds, Range of Thickness and Diameters Qualifications	**EQ**	
4.11 PJP Welds	**N/A**	**Table 14** Procedure Qualification – PJP Groove Welds, Range Qualifications	**EQ**	CSA W47.1 better reflects what type of test is considered mandatory and what of type of test is considered optional. Also, it splits the type of test in two main categories: mechanical and soundness tests.
4.12 Fillet Welds	**N/A**	**Table 15** Procedure Qualification – Fillet Welds, Range of sizes Qualified	**EQ**	
4.13 Plug and Slot Welds	**N/A**	**N/A**	**NEQ**	CSA W47.1 does not have any provisions for testing of plug and slot welds.
4.14 Welding Processes Requiring	**N/A**	**N/A**	**EQ**	Although CSA W47.1 does not have a similar question the intent of clause 4.14 is being met by the CSA standard as well.
Welder Performance Qualification **4.15** General	**N/A**	**8**	**EQ**	Although CSA W47.1 does cover for similar requirements the intent of clause 4.15 is being met by requirements of Clause 8 as well.

AWS D1.1:2015 Structural Welding Code - Steel	CSA W59-2103 Welded Steel Construction (Metal Arc Welding)	CSA W47.1-09 U7 Certification of Companies for Fusion Welding of Steel	Identical (ID), Equivalent (EQ), or Not Equivalent (NEQ)	Remarks
4.16 Type of Qualifications	**N/A**	**9**	**EQ**	Although there are some differences between the standards with respect to the test specimens required to be extracted the intent of testing of the welders is similar.
4.17 Weld Types for Welder and Welding Performance Qualification	**N/A**	**9**	**EQ**	The intent of AWS D1.1 for testing the welders to cover for welding of CJP, PJP, FW, and WT is covered by CSA W47.1 through the qualification of welding personnel for T, S, FW and WT class. AWS D1.1 does not have a class system similar to CSA W47.1. AWS D1.1 has an additional qualification welding personnel welding for plug and slot welds while CSA W47.1 has an additional qualification scheme for personnel performing ASW.
4.18 Preparation of Qualification Forms	**N/A**	**8.2.5** and **8.6**	**EQ**	While AWS D1.1 allows the manufacturer to issue qualification forms, CSA W47.1 requires the administrator to issue qualifications for all welding personnel regardless of the company or location.
4.19 Essential Variables	**N/A**	**8.6**	**EQ**	
4.21 Extent of Qualification	**N/A**	**9.6.1**, **9.6.2**	**EQ**	
4.22 Methods of Testing and Acceptance Criteria for Welder and Welding Operator Qualification	**N/A**	**9.10** Test Methods	**EQ**	CSA W59 doesn't have any provisions for testing of welders for plug and slot welds.

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4.23 Methods of Testing and Acceptance Criteria for Tack Welder Qualification	**N/A**	**9.14.4**	**EQ**	
4.24 Retest	**N/A**	**9.12**	**EQ**	Retest due to initial failure is similar in both standards. However, the periodically check test scheme available in CSA W47.1 is not similar in AWS D1.1. Welders qualified in accordance to AWS D1.1 are issued qualification without any expiry date.
Part D Requirements for CVN testing	**N/A**	**Annex E**	**EQ**	
Table 4.1 WPS Qualification– Production welding Positions	**N/A**	**Table 16**	**NEQ**	
Table 4.2 WPS Qualification – CJP Range of Thicknesses and Diam. Qualified	**N/A**	**Table 9** and **Table 13**	**EQ**	Table 4.2 doesn't reflect the range of diameters qualified.
Table 4.3 WPS Qualification – PJP Range of Thicknesses Qualif.	**N/A**	**Table 9** and **Table 14**	**EQ**	

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Table 4.11 Welder and Welding Operator – Number and Type of Specimens and Range of Thickness and Diameter Qualified	**N/A**	**Table 3, 4, 5, 6, 7, 8, 18, 19** and **20.** Welder and welding operators qualifications for S, T, FW and WT: Initial Test Upgrade Test Check Test	**EQ**	See detail comparison developed for welding personnel qualification.
Table 4.12 Welding Personnel Performance – Essential Variables	**N/A**	**Clause 9**	**NEQ**	See detail comparison developed for welding personnel qualification.
Table 4.13 Electrode Classification groups	**N/A**	**Table 1**	**EQ**	
Table 4.14 CVN Test Requirements	**N/A**	**Annex E**	**NEQ**	AWS D1.1 requires extraction of specimens from WM, FL+1 and FL+5, while CSA W47.1 requires extraction of specimens from WM and HAZ.
Table 4.15 CVN Test Temperature Reduction	**N/A**	**Annex E**	**NEQ**	CSA W47.1 uses the concept of reducing the energy when testing sub-size the specimen, while AWS D1.1 uses the concept of reducing the temperature below the temperature required for testing when testing sub-size the specimen.

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5 Fabrication **5.1** Scope	**5** Electrodes, Workmanship and Technique **5.1** General	**N/A**	**EQ**	
5.2 Base Metal	**3.2, Table 11.1** and **Table 12.1** Base Metal **5.5.1** Material for Extension Bars, Run-off Plates and Backing	**N/A**	**NEQ**	
5.3 Welding Consumables and Electrode Requirements	**5.2** Electrodes	**N/A**	**EQ**	
5.5 ESW and EGW Processes	**5.2.5** Electrodes, Fluxes and Gases for ESW and EGW 5.5.5 ESW and EGW	**N/A**	**EQ**	Testing required for ESW and EGW is outlined in CSA W47.1.
5.5 WPS Variables	**5.5** Details of Welding Procedures	**N/A**	**EQ**	CSA W59 provides more information than AWS D1.1 in this section.

AWS D1.1:2015 Structural Welding Code - Steel	CSA W59-2103 Welded Steel Construction (Metal Arc Welding)	CSA W47.1-09 U7 Certification of Companies for Fusion Welding of Steel	Identical (ID), Equivalent (EQ), or Not Equivalent (NEQ)	Remarks
5.6 Preheat and Interpass Temperatures	**5.7** and **Table 5.3** Preheat, Interpass Temperature, and Heat Input Control	**N/A**	**EQ**	
5.7 Heat Input Control for Quenched and Tempered Steels	**5.5.1.6** Welding Quenched and Tempered Steels Note 2 of Table 5.3	**N/A**	**EQ**	
5.8 Stress Relief Heat Treatment	**5.12** Stress Relief Heat Treatment	**N/A**	**EQ**	
5.9 Backing, Backing Gas and Inserts	**5.4.9** Backing **12.5.2** Groove Weld Backing	**N/A**	**EQ**	
5.11 Welding and Cutting Equipment	**N/A**	**N/A**	**EQ**	Although there is no equivalent clause the intent of this general requirements are covered by the intent of CSA W59
5.12 Welding Environment	**5.1.1, 5.1.2, 5.5.4.3, 5.5.5.4** and **Note 1 of Table 5.3**	**N/A**	**EQ**	
5.13 Conformance with Design	**4.1** Design of Welded Connections General Requirements	**N/A**	**EQ**	
5.14 Min. Fillet Weld Sizes	**Table 4.4** Min. Fillet Weld Size	**N/A**		

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5.15 Preparation of Base Metal	**5.3** Preparation of Material	**N/A**	**EQ**	
5.16 Re-entrant Corners	**5.3.6** Re-entrant Corners	**N/A**	**EQ**	
5.17 Beam Copes and Weld Access Holes	**5.3.7** Beam Codes and Weld Access Holes 5.3.8 Weld Access Hole Dimensions **5.3.9** **Group 4** and **5** Shapes	**N/A**	**EQ**	
5.18 Camber in Built-Up Members	**5.3.10** and **5.3.1** Camber and Correction of Camber **11.4.13** and **12.4.13** Connection of Components of Built-Up Members	**N/A**	**EQ**	
5.19 Splices in	**11.4.10** and **12.4.10** Splices in Compression Members **11.4.10** and **12.4.11** Splices in Tension Members	**N/A**	**EQ**	

AWS D1.1:2015 Structural Welding Code - Steel	CSA W59-2103 Welded Steel Construction (Metal Arc Welding)	CSA W47.1-09 U7 Certification of Companies for Fusion Welding of Steel	Identical (ID), Equivalent (EQ), or Not Equivalent (NEQ)	Remarks
5.20 Control of Distortion and Shrinkage	**5.6** Control of Distortion and Shrinkage Stresses	**N/A**	**EQ**	
5.21 Tolerance of Joint Dimensions **5.22** Dimensional Tolerance of Welded Structural Members	**5.8, 11.5.3, 12.5.3** Dimensional Tolerances	**N/A**	**EQ**	
5.23 Weld Profiles Fig. 5.4	**Figure 5.4** Acceptable and Unacceptable Weld Profiles	**N/A**	**EQ**	
5.24 Technique for Plug and Slot Welds	**4** Appendix B Plug and Slot Welds	**N/A**	**EQ**	
5.25 Repairs	**5.10** Corrections	**N/A**	**EQ**	Although overall these two clauses are similar CSA W59 doesn't have any provisions for Welded Restoration of Base Metal with Mis-located Holes.
5.26 Peening	**5.11** Peening	**N/A**	**EQ**	
5.27 Calking	**N/A**	**N/A**	**NEQ**	Neither CSA W59 nor CSA W47.1 has any provisions for caulking.

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5.28 Arc Strike	**5.14** Arc Strikes	**N/A**	**EQ**	
5.29 Weld Cleaning	**5.13** Cleaning of Welds	**N/A**	**EQ**	
5.30 Weld Tabs	**11.5** and **12.5** Workmanship	**N/A**	**EQ**	
N/A	**5.15** Heat Shaping	**N/A**	**EQ**	
Table 5.1 Allowable Atmospheric exposure of Low-hydrogen electrodes	**N/A**	**N/A**	**EQ**	CSA W59 states that fabricators have to follow electrode manufacturer recommendations.
Table 5.2 Minimum Holding Time	**5.12.4** item (c) Stress Relief Heat Treatment	**N/A**	**EQ**	
Table 5.3 Alternate Stress-Relief Heat Treatment	**5.12.4**	**N/A**	**NEQ**	CSA W59 states that alternate stress-relief heat treatment requires approval by the Engineer.
Table 5.4 Laminar Discontinuities in Cut Surfaces	**5.3.5** and Table **5.2**	**N/A**	**EQ**	
Table 5.5 and **Table 5.6** Camber Tolerance	**N/A**	**N/A**	**NEQ**	

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Table 5.7 Minimum Fillet Weld Size	**Table 4.4** Minimum Fillet Weld Size	**N/A**	**EQ**	
Table 5.8 Weld Profiles	**Figure 5.4** Acceptable and Unacceptable Weld Profiles	**N/A**	**EQ**	
Table 5.9 Weld Profile Schedule	**N/A**	**N/A**	**EQ**	
6 Inspection **6.1** Scope	**7** Welding Inspection **7.1** Scope	**N/A**	**EQ**	
6.2 Inspection of Materials and Equipment	**7.2** Inspection of Materials	**N/A**	**EQ**	
6.3 Inspection of WPSs	**N/A**	**Clause 10** and **11**	**EQ**	One of the components for certification requires the company to have approved welding procedures by the CWB. Also through the certification program the inspector has the responsibility of verifying welding procedures.
6.4 Inspection of Welding Personnel Qualifications	**N/A**	**Clause 8** and **9**	**EQ**	One of the components for certification requires the company to use on qualified welding personnel by the CWB. Also through the certification program the inspector has the responsibility of verifying welders' qualifications.

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6.5 Inspection of Work and Records	**7.13, 7.1.4** and **7.1.5**	**N/A**	**EQ**	
6.6 Contractor Responsibilities	**7.3** Obligation of Contractor	**N/A**	**EQ**	
Part C **6.7** Acceptance Criteria **6.8** Visual Inspection	**11.5.4.1** **12.5.4.1**	**N/A**	**EQ**	
6.10 PT and MT	**N/A**	**N/A**	**EQ**	
6.11 Non Destructive Testing	**7.4**	**N/A**	**EQ**	
6.12 Radiographic Inspection	**8.1** Radiographic Examination of Welds	**N/A**	**EQ**	
6.13 Ultrasonic Inspection	**8.2** Ultrasonic Inspection of Groove Welds	**N/A**	**EQ**	
6.14 NDT Procedures	**8.1** and **8.2**	**N/A**	**EQ**	In addition to the common NDT procedures outlined in both standards AWS D1.1 outlines procedures for MT and PT.
6.15 Extent of Testing	**7.4.1, 8.1.2** and **8.2.2**	**N/A**	**EQ**	

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PART E Radiographic of Testing	**8.1**	**N/A**	**EQ**	
PART F Ultrasonic Testing of Groove Welds	**8.2**	**N/A**	**EQ**	
Part G Other Examination Methods	**8.1.6** Alternative radiation imaging System **8.2.12** Alternative ultrasonic methods	**N/A**	**EQ**	
7 Stud Welding	**6** Stud Welding Appendix H Material Requirements for Stud and Stud Base Qualification Requirements	**N/A**	**EQ**	The concept of qualification of stud base is similar in both standards. The major difference between these two standards is that the stud manufacturer's qualifications are required to be witnessed by the CWB when qualifying the studs to W59. In order to maintain the stud qualifications the stud manufacturer is required to be audited on an ongoing basis. Also, the CWB is responsible to publish a list containing all studs qualified for each manufacturer.
8 Strengthening and Repairing Existing Structures	**9** Strengthening and Repair of Existing Structures	**N/A**	**EQ**	

Comparative Review
AWS D1.1 vs CSA W47.1 & CSA W59

THE OFFICE OF PUBLIC SAFETY

AWS D1.1:2015 Structural Welding Code - Steel	CSA W59-2103 Welded Steel Construction (Metal Arc Welding)	CSA W47.1-09 U7 Certification of Companies for Fusion Welding of Steel	Identical (ID), Equivalent (EQ), or Not Equivalent (NEQ)	Remarks
9 Tubular Structures	Annex U Welding of Fixed Steel Offshore Steel Structures	**N/A**	**NEQ**	Although these two parts are somehow similar structured and have many similarities with respect to prequalification of welding procedures, qualification of welding personnel, etc., there still important differences between these two standards as outlined below: • Fabricator has to undergo a certification program administered by CWB when welding in Canada; • Fabricator is required to have accepted Welding Engineer(s) and Welding Supervisor (s); • Fabricator is required to submit for review and approval welding procedures. • All welding personnel requires to be qualified by the CWB; • All welding personnel requires to be re-tested on ongoing basis (at least every two years). • Qualification of welding personnel is structured on scheme that allows progression to a higher class; • All welding consumables have to be certified by the CWB, otherwise extensive testing is required. • Qualification ranges for welders and welding procedures are different.
General	**U1** Scope	**N/A**		
Part A Design Tubular	**U2** General Qualification Requirements	**N/A**		
Part B Prequalification of Welding Procedures	**U3** Tubular TKY joints	**N/A**		
Part C WPS Qualification **Part D** Performance Qualification	**U4** Qualification of Welding Procedures and Welders	**N/A**	**EQ**	
Part E Fabrication	**U5** Fabrication **U6** Fabrication Dimensional Tolerances	**N/A**		
Part D Inspection	**U7** Inspection and NDE Methods	**N/A**		
Annex A to **Annex J** Normative Annexes	**Annex U** Normative Annex	**N/A**	**NEQ**	
Annex K to **Annex U** informative Annexes	**Annexes A** to **Annex T** and **Annex V** informative Annexes	**N/A**	**NEQ**	
Commentary	**N/A**	**N/A**	**N/A**	