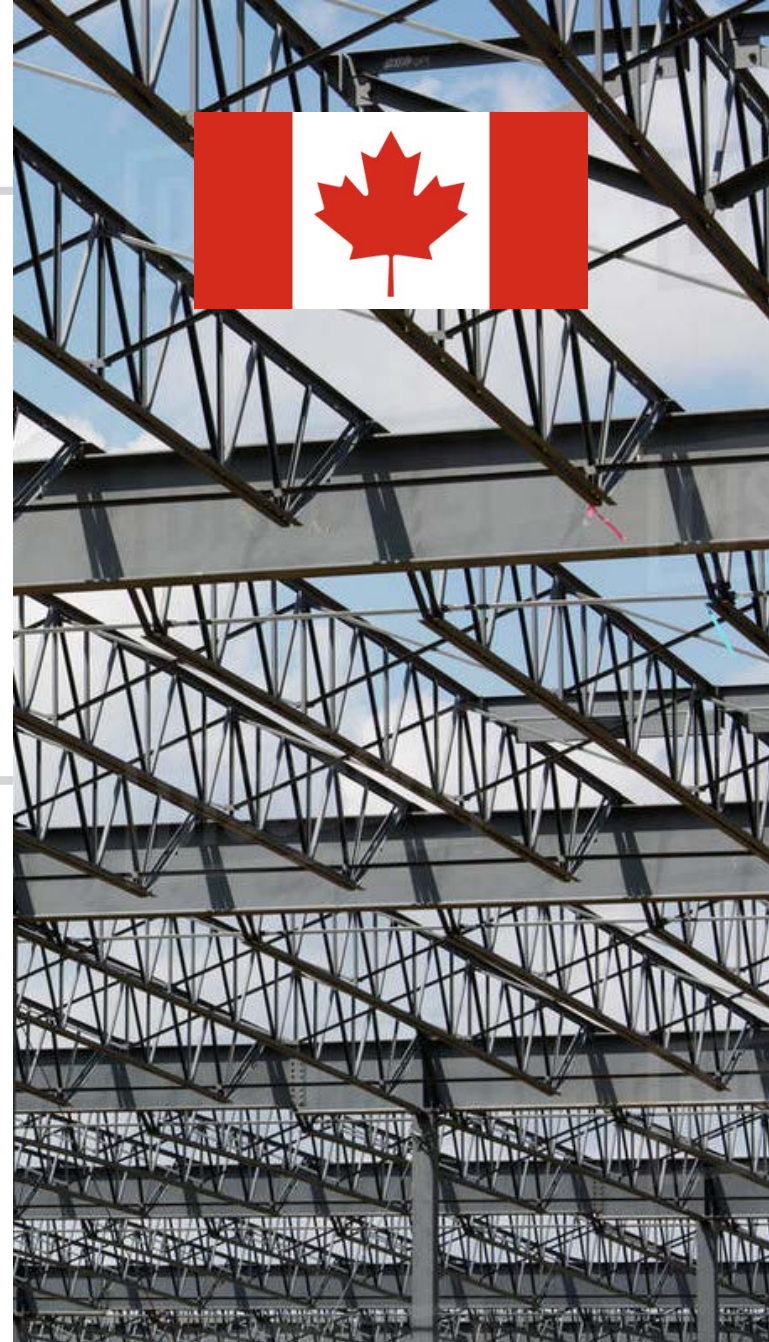

Notes on Quality Management System of Welded Steel Structures in Canada

Faramarz Rahiminia

October 2018
Toronto



Quality Management System of welding



International Organization for Standardization

ISO 3834:2015

**Quality requirements for fusion welding of
metallic materials**

ISO 3834: Quality management system of welding



Workmanship

(Welding Company)



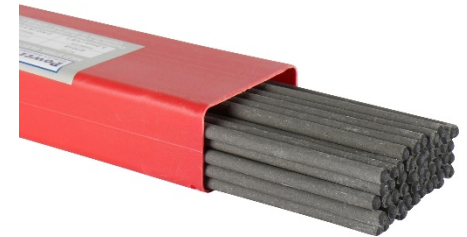
Inspection

(Inspection Company)



Raw Material

(Filler metal)



ISO 3834- Quality management system-**Welding Company**

Key elements to quality management of welding workmanship:



- 1. Qualified welder(s)**
 - 2. Qualified welding procedures**
 - 3. Qualified welding supervisor(s)**
 - 4. Qualified welding engineer(s)**
- In practical terms, this means that a welding company must have:
 - Competent individuals making the welds, who are...
 - Following proven and documented “recipes”, in a shop...
 - Overseen by competent “bosses”.
 - **When all three are in place, high quality welds will result!**

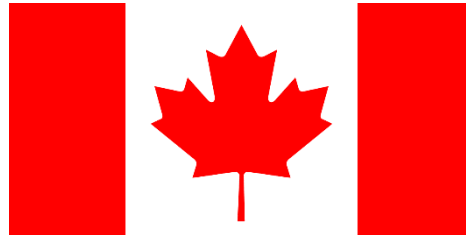
ISO 3834- Quality management system-**Inspection Company**

Key elements to quality management of welding inspection:

- **Inspection personnel**
- **Inspecting procedures**
- **Calibrated tools**



Quality management of welded steel structures in Canada



National & Provincial Building Codes



Ontario

Ministry of Municipal Affairs and Housing



Ontario Building Code, Act and Regulations



Quality management of welded steel structures in Canada



Ministry of Municipal Affairs and Housing



Ontario Building Code, Act and Regulations

Section 4.3.4.1 Design Basis for Structural Steel

*“Buildings and their structural members made of structural steel shall conform to **CAN/CSA S16, Design of Steel Structures**”*





CSA
Group

Standard development

CSA S16
Design of steel structures



CSA W59
Welded steel construction

24 Welding

24.1 Arc welding

Arc welded joints shall be designed in accordance with

(a)...

(b)...

For all other aspects of welding, the requirements of **CSA W59** shall be followed.





**CSA
Group**

Standard development

CSA W59

Welded steel construction



CSA W47.1

Certification of companies for fusion welding of steel

CSA W178.1

Certification of welding inspection organizations

CSA W178.2

Certification of welding inspectors

CSA W48

Filler metals and allied materials for metal arc welding

CSA W117.2

Safety in welding, cutting and allied processes”

ISO 3834 quality management system



Workmanship

(Welding Company)



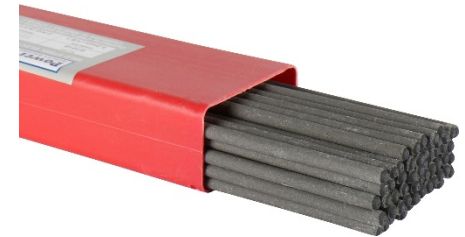
Inspection

(Inspection Company)



Raw Material

(Filler metal)



CSA W59: Qualification requirements for **workmanship**

3 General requirements

3.1 Qualification requirements

3.1.1 Contractor

When mandated in the contract or in the governing design Standard*, all Contractors performing work under this Standard shall comply with **CSA W47.1** for welded fabrications.

**Examples: CAN/CSA-S6 and CSA S16.*

CSA W59

Workmanship

CSA W47.1



CSA W59: Qualification requirements for **inspection**



INSPECTION



VISUAL WELDING INSPECTION

- Before welding
- During welding
- After welding

NON-DESTRUCTIVE TESTS (NDT)

- After welding
- Magnetic particle testing
- Ultrasonic testing
- Penetrant testing

CSA W59: Qualification requirements for **inspection**

7.1.2 Third-party inspection

7.1.2.1

When required by contract, **visual welding inspection** shall be performed by either an **individual welding inspector** or a **welding inspection organization**.

7.1.2.2

A visual welding inspector shall either be currently certified to **CSA W178.2** or AWS QC1 or shall be suitably trained and experienced, to the satisfaction of the Engineer, to ensure that adequate competency exists for the inspection tasks to be performed.

7.1.2.3

Welding inspection organizations shall either be certified to **CSA W178.1** or shall provide evidence to satisfy the Engineer that they are capable of performing welding inspection.

CSA W59: Qualification requirements for **inspection**

7.4 Nondestructive examination

7.4.7

Personnel performing **nondestructive examination** shall be qualified as a Level 1, 2, or 3 NDE Operators for the relevant examination method in accordance with the pertinent requirements of **CSA W178.1** and **CAN/CGSB-48.9712/ISO 9712**.



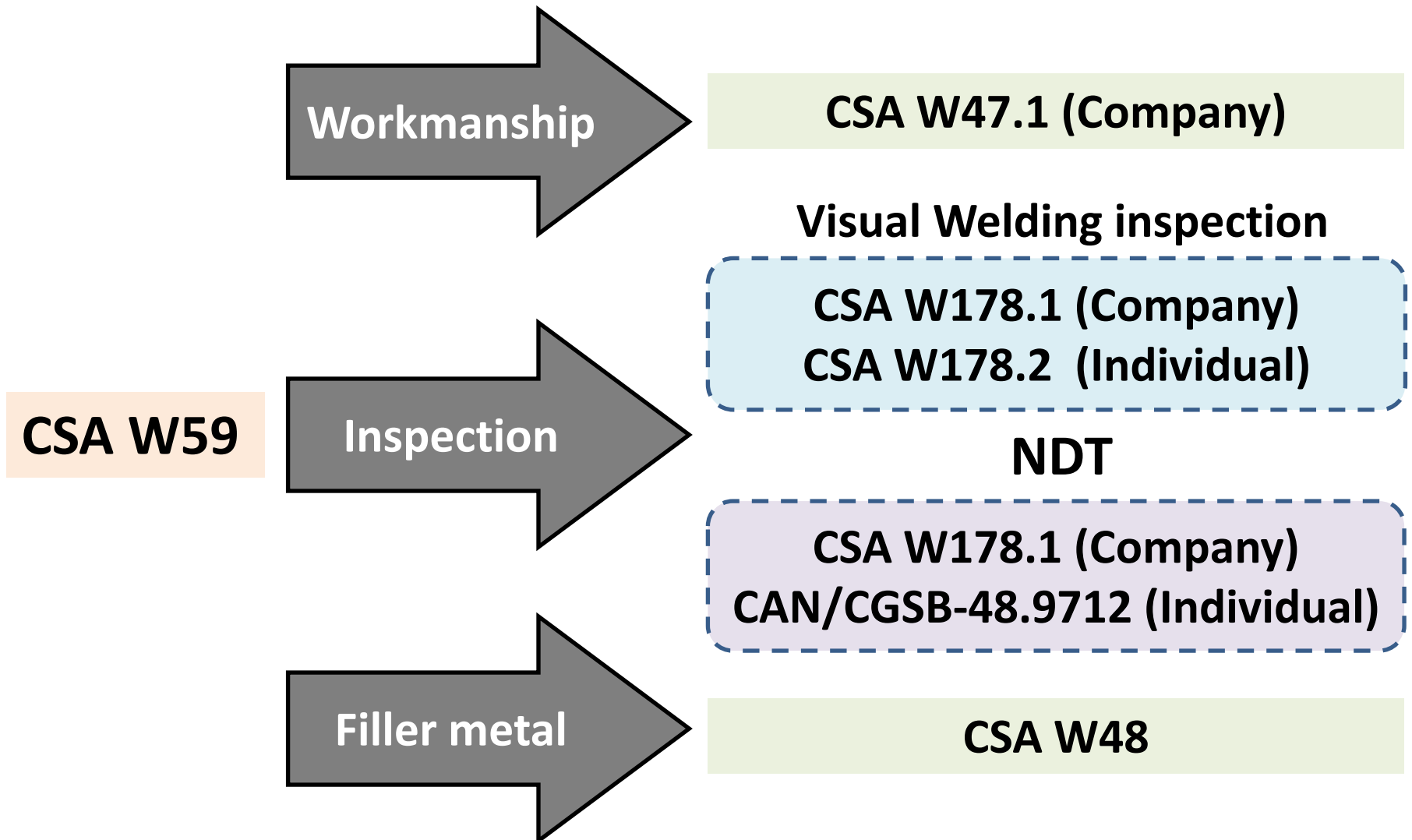
Natural Resources
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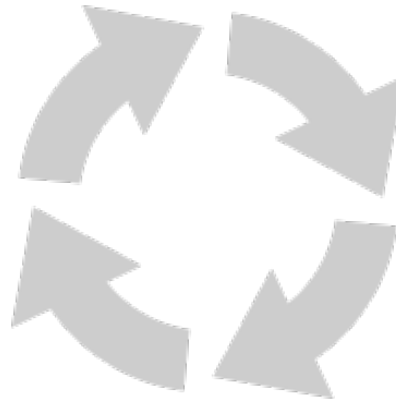
Canada



CSA W59: Qualification requirements



Quality management of welding in Canada



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Let's take a **break!**



Quality management of welded steel structures in Canada

Ontario Building Code, Act and Regulations



CSA S16 : Design of steel structures



CSA W59 :Welded steel construction (metal arc welding)



Workmanship

CSA W47.1:Certification of companies for fusion welding of steel



CSA W47.1: Certification of companies for fusion welding of steel

4 Administration

4.1 This Standard shall be administered by the Bureau.

Bureau — Canadian Welding Bureau.



Administrator of Canadian Standards Association (CSA) welding certification programs including those for steel fabricators, aluminum fabricators, inspectors and welding electrodes.

A certification organization accredited by the Standards Council of Canada (SCC).

CSA W47.1: Certification of companies for fusion welding of steel

- There are 4 key elements to a fabricator certification program:
 1. **Qualified welder(s)**
 2. **Qualified welding procedures**
 3. **Qualified welding supervisor(s)**
 4. **Qualified welding engineer(s)**
- In practical terms, this means that a welding fabricator must have:
 - Competent individuals making the welds, who are...
 - Following proven and documented “recipes”, in a shop...
 - Overseen by competent “bosses”.
- **When all three are in place, high quality welds will result!**
 - Certification ensures these key elements are in place and working



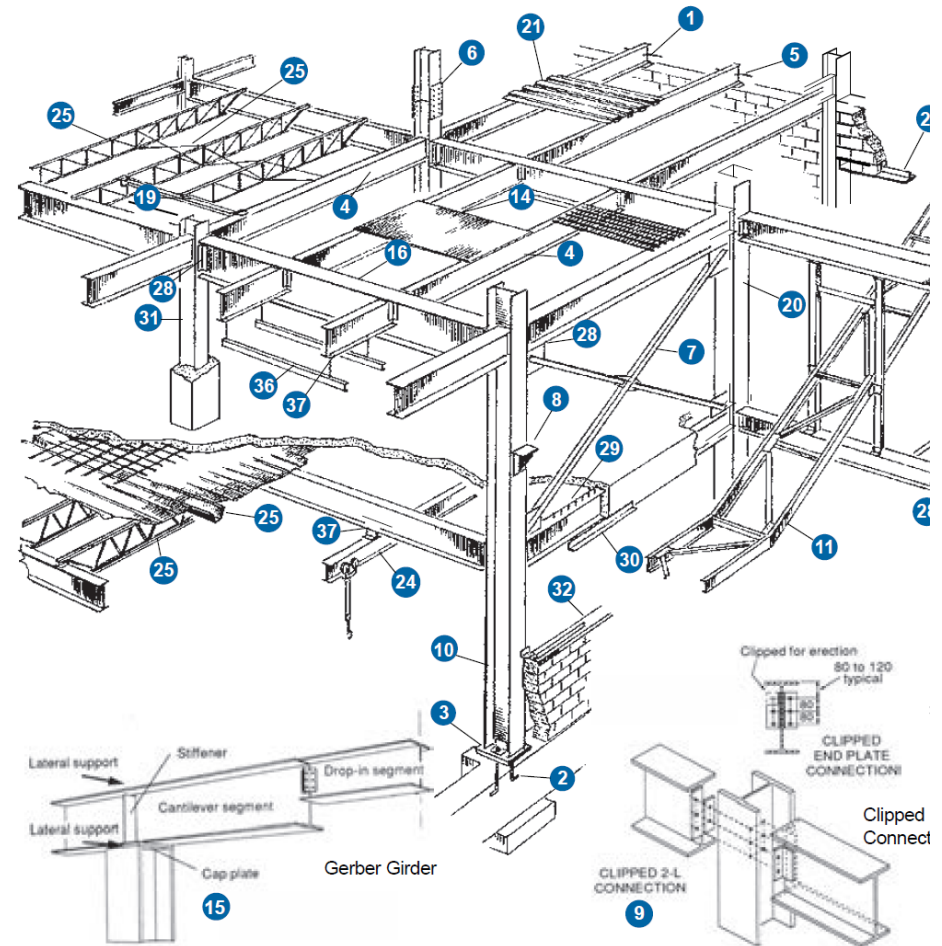
CSA W47.1: Certification of companies for fusion welding of steel

- Fabricators can be certified to 1 of 3 “divisions”.

	Division 3	Division 2	Division 1
Qualified Welders	Yes	Yes	Yes
Qualified Welding Supervisor(s)	Yes	Yes	Yes
Qualified Welding Engineer(s)	No	Yes – Retained	Yes - Employed
Accepted Welding Procedures	Yes	Yes	Yes

CSA S16: Design of steel structures

- Fabricator shall be a CSA W47.1 certified company in **Division 1 or 2**
- Fabricator may sublet to a Division 3
- Division 3 companies **CANNOT** take on work directly



CSA W47.1: Certification of welding personnel

- Must pass a practical test
 - For joint, positions and processes used
 - Witnessed by the CWB
- Issued a Welder Card, or “Ticket”
 - Valid for the certified company named on the ticket
 - Tickets transferable between certified companies
- Use of Ticket
 - **Valid only while employed by a CSA W47.1 company**
 - Normally, valid only for 2 years



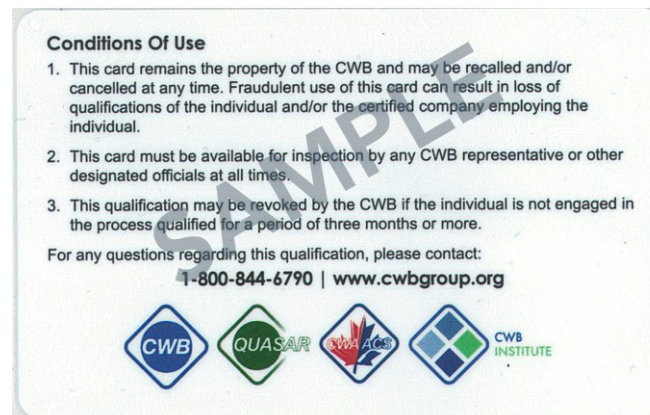
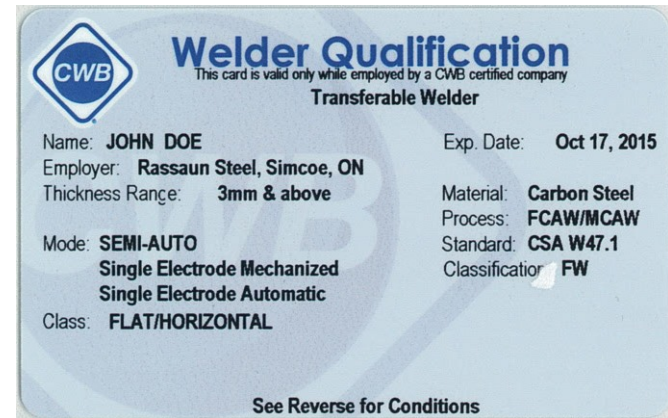
CSA W47.1: Certification of welding personnel

- Welders are tested for specific:
 - Welding processes
 - *SMAW, FCAW, GMAW*
 - Electrode type
 - *Steel, low-alloy, stainless, aluminum*
 - Welding position
 - *Flat, horizontal, vertical, overhead*
 - Welding joints / types
 - *Fillets, grooves, backing/no backing, plate, tubular*

CSA W47.1: Certification of welding personnel

- Welders test are evaluated by either:
 1. Destructive tests
 - Bends, fracture, macro-etch
 2. Non-destructive tests
 - Radiography

CSA W47.1: Certification of welding personnel



CSA W47.1: Certification of welding supervisors

- Must demonstrate:
 - Minimum education/knowledge
 - welding codes and standards
 - Examinations are required
 - Minimum experience
 - 5 years of welding-related experience
- Key roles:
 - To ensure that welders are qualified
 - To ensure that welding procedures are in place and followed
 - To ensure visual weld quality requirements



CSA W47.1: Certification of welding supervisors



Welder Supervisor Superviseur en soudage

PRESENTED TO/ PRÉSENTÉE A

Who has completed the welding supervisor examinations as required by
CSA Standard

Qui a complété les examens de superviseur en soudage, tel que requis par
la norme CSA

Valid while employed with:
Valide tant qu'employé par:

Issue Date/ Date d'émission

Authorized Signature/ Signature autorisée

Issue Date/ Date d'émission

Authorized Signature/ Signature autorisée

Valid while employed with:
Valide tant qu'employé par:

CSA W47.1: Qualification of welding Engineers

- Preferably hold Professional Engineer designation


Minimum education/knowledge

- Steel / aluminum, welding fundamentals, welding metallurgy, and welding procedures and practice.
- Welding codes and standards
- Examinations are required
- Minimum experience
 - 5 years of welding-related experience
- Key roles:
 - Development of new welding procedures
 - Documentation related to welding procedures
 - Periodic review of overall welding operations

CSA W47.1: Qualification of welding procedures

- A document of welding details & parameters; a “recipe” for welding
- Covers items such as:
 - base material
 - filler materials / electrodes
 - joint details: thickness, preparation, position
 - welding parameters, pass/layer sequence
 - preheat
- Are reviewed and accepted by the CWB against the requirements of the certification standard and governing standards
- In some cases are deemed to be “pre-qualified”, i.e. no qualification testing is required

CSA W47.1: Certification of companies for fusion welding of steel




The CWB acknowledges that




ABC Welding Company
123 Main Street, Anytown, ON L7G 4C1

is certified to CSA Standard **W47.1**
"Certification of Companies for Fusion Welding of Steel"
in **DIVISION 2**


for the period **April 14, 2011** to **May 21, 2012**
Company Code: ABCDE1

Scope: The welding and fabrication of structural steel and its components.


Registrar



8260 Parkhill Drive, Milton, Ontario L9T 5V7
1-800-844-6790 | te: 905-542-1312 | Fax: 905-542-1318
Email: info@cwbgroupp.org | Web: www.cwbgroupp.org



CSA W178.2: Certification of welding **inspectors**

Individuals must meet a minimum number of years of experience.

Must demonstrate specific technical knowledge:

Welding fundamentals, welding inspection, and welding metallurgy

Written and practical examinations

Individual must meet minimum vision requirements

Must demonstrate ongoing compliance

Involvement in welding inspection activities

Understanding of current product standard requirements

CSA W178.2: Certification of welding **inspectors**

Level 1 welding inspector:

- (a) at least one year of experience
- (b) Successfully completed recognized
- (C) Pass the theory, standard and practical exam



Level 2 welding inspector:

- (a) must have at least 2 years of experience as a certified Level 1 welding inspector
- (b) Pass the theory, standard and practical exam

Level 3 welding inspector:

- (a) Must have at least 4 years of experience as a certified Level 2 welding inspector
- (b) Pass the theory, standard and practical exam

CSA W178.2: Certification of welding **inspectors**



CSA W178.1: Certification of welding **inspection organizations**

Certification can be sought in one or more of the following inspection methods:

- ✓ Visual examination
- ✓ Radiographic examination
- ✓ Ultrasonic examination
- ✓ Magnetic particle testing
- ✓ Liquid penetrant testing
- ✓ Eddy current testing
- ✓ Alternating current field measurement (ACFM)



Welding inspection supervisor – Must be a CSA W178.2 L3 certified

Qualified NDT Personnel

Qualified NDT Procedures

Calibrated NDT Equipment

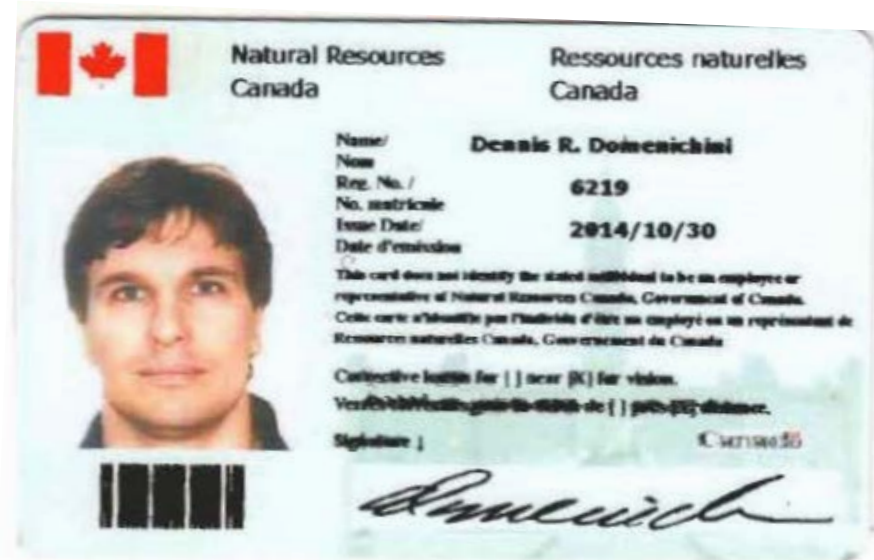
Documented inspection reports

Annually Audited by CWB

CAN/CGSB-48.9712 : Certification of NDT personnel

Nondestructive testing:

- ✓ Radiographic examination
- ✓ Ultrasonic examination
- ✓ Magnetic particle testing
- ✓ Liquid penetrant testing
- ✓ Eddy current testing



CSA W48: Certification of **filler metals**

Quality management system used in manufacturing

Chemical properties

Mechanical properties

Dimensional tolerances

Other property requirements (e.g. hydrogen level)

Testing criteria






Labeling requirements

CWB audits the manufacturing process every 2 years



CSA W48: Filler metals and allied materials for metal arc welding



CLIENT PORTAL ABOUT SHOP      EN/FR

CERTIFICATION

EDUCATION

CWBi ACORN

PUBLIC SAFETY

CONSULTING

ISO REGISTRATION

ASSOCIATION

FOUNDATION

CERTIFICATION &
QUALIFICATION

CERTIFIED DIRECTORY SEARCH

DOCUMENTS & FORMS

SALES BROCHURES

ONLINE QUOTE

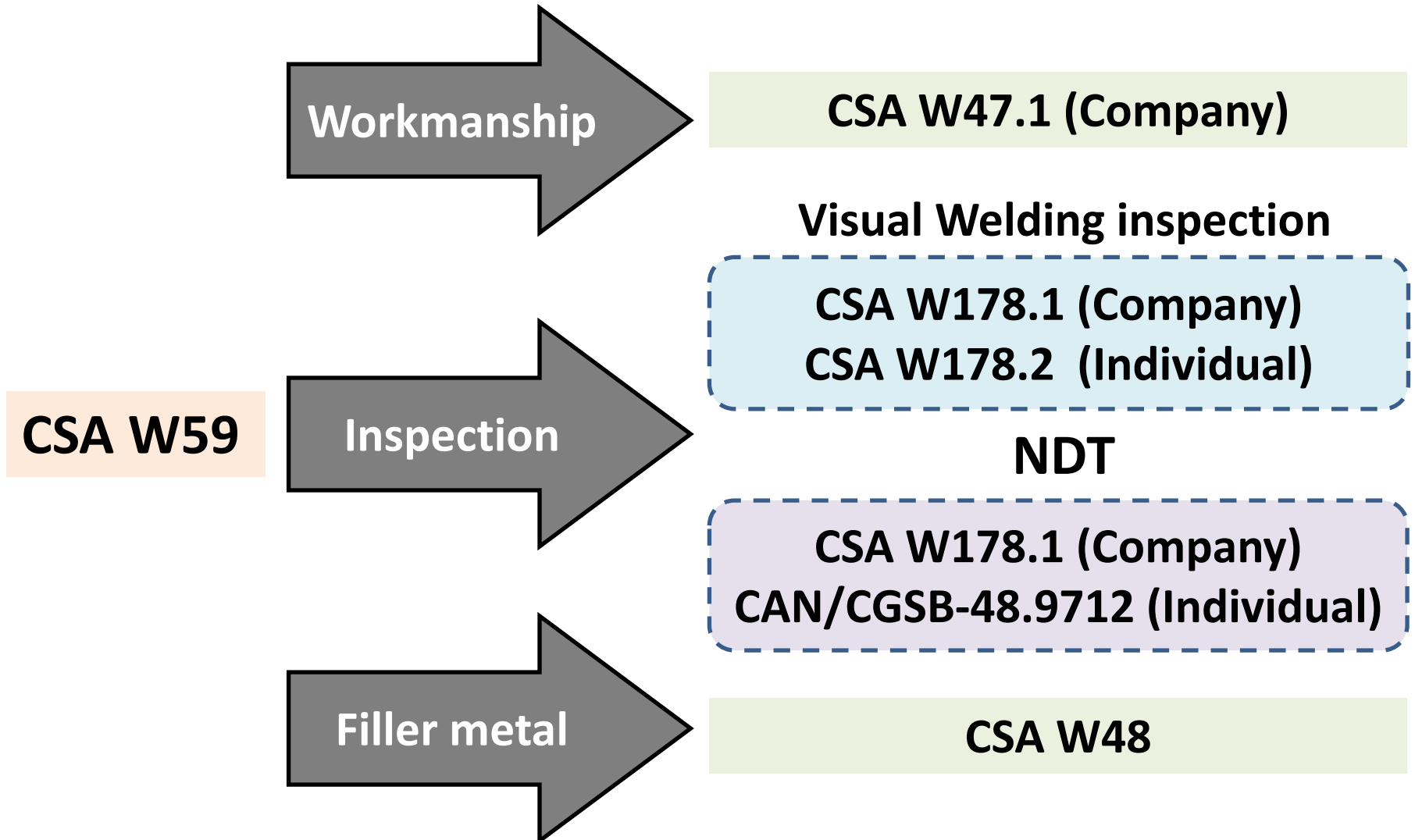
CERTIFIED DIRECTORY SEARCH

The CWB Group maintains directories of certified companies, welding consumables, inspectors and inspection organizations.

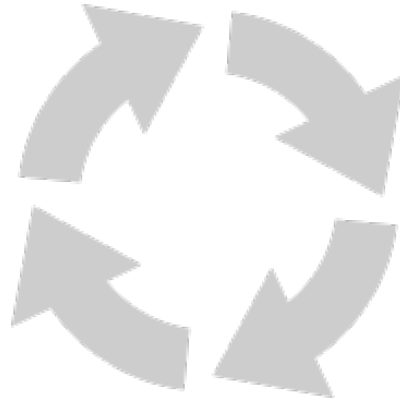
SEARCH THE CWB GROUP DIRECTORIES FOR:

- [Certified Companies](#)
Search for companies certified to CSA W47.1, W47.2, W186, W55.3, W59 or A660.
- [Certified Welding Inspection Companies](#)
Search for companies certified to CSA W178.1
- [Certified Welding Inspectors](#)
Search for individuals certified to CSA W178.2
- [Certified Welding Consumables](#)
Search for welding consumables certified to CSA W48
- [Accredited Testing Centres](#)

CSA W59: Qualification requirements



Quality management of welding in Canada



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Thank you for your attention!



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frahiminia@gmail.com