
PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .2 Section 23 05 05 - Installation of Pipework.

1.2 REFERENCES

- .1 American National Standards Institute/American Society of Mechanical Engineers. (ANSI/ASME)
 - .1 ANSI/ASME B31.1, Power Piping.
 - .2 ANSI/ASME B31.3, Process Piping.
 - .3 ANSI/ASME B31.5 – Refrigeration Piping and Heat Transfer Components.
 - .4 ANSI/ASME B31.9 Building Services.
 - .5 ANSI/ASME Boiler and Pressure Vessel Code
 - .1 Section I: Power Boilers.
 - .2 Section V: Nondestructive Examination.
 - .3 Section IX: Welding and Brazing Qualifications.
- .2 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA C206, Field Welding of Steel Water Pipe.
- .3 American Welding Society (AWS)
 - .1 AWS C1.1, Recommended Practices for Resistance Welding.
 - .2 AWS Z49.1, Safety Welding, Cutting and Allied Process.
 - .3 AWS W1, Welding Inspection Handbook.
- .4 Canadian General Standards Board
 - .1 CAN/CGSB-48.2, Spot Radiography of Welded Butt Joints in Ferrous Materials.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA W47.2, Certification of Companies for Fusion Welding of Aluminum.
 - .2 CSA W48 series-, Filler Metals and Allied Materials for Metal Arc Welding.
 - .3 CSA B51, Boiler, Pressure Vessel and Pressure Piping Code.
 - .4 CSA B52 Mechanical Refrigeration Code.
 - .5 CSA W117.2, Safety in Welding, Cutting and Allied Processes.
 - .6 CSA W178.1, Certification of Welding Inspection Organizations.
 - .7 CSA W178.2, Certification of Welding Inspectors.

- .6 Provincial regulations: Boiler, Pressure Vessel and Compressed Gas Regulations.

1.3 QUALIFICATIONS

- .1 Welders
- .1 Welding qualifications in accordance with CSA B51
 - .2 Use qualified and licensed welders possessing certificate for each procedure performed from authority having jurisdiction.
 - .3 Furnish welder's qualifications to Department Representative.
 - .4 Each welder to possess identification symbol issued by authority having jurisdiction.
 - .5 Certification of companies for fusion welding of aluminum in accordance with CSA W47.2.
- .2 Inspectors
- .1 Inspectors qualified to CSA W178.2.

1.4 QUALITY ASSURANCE

- .1 Registration of welding procedures in accordance with CSA B51, CSA B52 and provincial regulations.
- .2 Copy of welding procedures available for inspection.
- .3 Safety in welding, cutting and allied processes in accordance with CSA-W117.2.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction / Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Department Representative.

PART 2 PRODUCTS

2.1 ELECTRODES

- .1 Electrodes: in accordance with CSA W48 Series.

PART 3 EXECUTION

3.1 WORKMANSHIP

- .1 Welding: in accordance with ANSI/ASME B31.1 B31.3, B 31.5, B31.9, ANSI/ASME Boiler and Pressure Vessel Code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS C1.1, and special procedures specified elsewhere in Mechanical Division and applicable requirements of provincial authority having jurisdiction.

3.2 INSTALLATION REQUIREMENTS

- .1 Identify each weld with welder's identification symbol.
- .2 Backing rings:
 - .1 Where used, fit to minimize gaps between ring and pipe bore.
 - .2 Do not install at orifice flanges.
- .3 Fittings:
 - .1 NPS 2 and smaller: install welding type sockets.
 - .2 Branch connections: install welding tees or forged branch outlet fittings.

3.3 INSPECTION AND TESTS - GENERAL REQUIREMENTS

- .1 Review weld quality requirements and defect limits of applicable codes and standards with Department Representative before work is started.
- .2 Formulate "Inspection and Test Plan" in co-operation with Department Representative.
- .3 Do not conceal welds until they have been inspected, tested and approved by Department Representative.
- .4 Provide for inspector to visually inspect welds during early stages of welding procedures in accordance with Welding Inspection Handbook. Repair or replace defects as required by codes and as specified.

3.4 SPECIALIST EXAMINATIONS AND TESTS

- .1 General
 - .1 Perform examinations and tests by specialist engaged by contractor, qualified in accordance with CSA W178.1 and CSA W178.2 and approved by Department Representative.
 - .2 To ANSI/ASME Boiler and Pressure Vessels Code, Section V, CSA B51 and requirements of authority having jurisdiction.
 - .3 Inspect and test welds in accordance with "Inspection and Test Plan" by non-destructive visual examination and magnetic particle (hereinafter referred to as

"particle") tests and/or spot or full gamma ray radiographic (hereinafter referred to as "radiography") tests. As per applicable reference standard or as specified.

- .2 Hydrostatically test welds to requirements of ANSI/ASME B31.1.
- .3 Visual examinations: include entire circumference of weld externally and wherever possible internally.
- .4 Failure of visual examinations:
 - .1 Upon failure of welds by visual examination, perform additional testing as directed by Department Representative of total of up to 10 % of welds, selected at random by Department Representative by radiographic tests.
- .5 Full radiographic tests for piping systems.
 - .1 Spot radiography to CAN/CGSB-48.2.
 - .1 Conduct spot radiographic tests of up to 10% of welds, selected at random by Department Representative from welds which would be most difficult to repair in event of failure after system is operational.
 - .2 Radiographic film:
 - .1 Identify each radiographic film with date, location, name of welder, and submit to Department Representative. Replace film if rejected because of poor quality.
 - .3 Interpretation of radiographic films:
 - .1 By qualified radiographer.
 - .4 Failure of radiographic tests:
 - .1 Extend tests to welds by welder responsible when those welds fail tests.
- .6 Magnetic particle tests for piping systems as indicated.

3.5 DEFECTS CAUSING REJECTION

- .1 As described in ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure Vessels Code.
- .2 In addition, chilled water systems below 1000 kPa:
 - .1 Undercutting greater than 0.8 mm adjacent to cover bead on outside of pipe.
 - .2 Undercutting greater than 0.8 mm adjacent to root bead on inside of pipe.
 - .3 Undercutting greater than 0.8 mm at combination of internal surface and external surface.
 - .4 Incomplete penetration and incomplete fusion greater than total length of 38 mm in 1500 mm length of weld depth of such defects being greater than 0.8 mm.
 - .5 Repair cracks and defects in excess of 0.8 mm in depth.
 - .6 Repair defects whose depth cannot be determined accurately on basis of visual examination or radiographic particle tests.

3.6 REPAIR OF WELDS WHICH FAILED TESTS

- .1 Re-inspect and re-test repaired or re-worked welds at Contractor's expense.

END OF SECTION