Weld Inspection is required for all welds. Radiographic Testing or Ultrasonic Testing is required if the temperature exceeds 750°F or if the temperatures are between 350°F and 750°F with pressures over 1025 psig.

ASME B31.2 ......................... Fuel Gas Piping

Applies to piping systems for fuel gases. These gases include manufactured gas, liquefied petroleum gas, natural gas, and mixtures above the upper combustible limits. The piping systems that are covered by this code maybe be in or between buildings from the meter set to the first pressure containment valve.

ASME B31.3 ......................... Process Piping

This code covers piping in chemical plants. The quality of the weld is set by the owner's determination of the safety aspects of the fluid being contained.

ASME B31.4 ......................... Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids

This code covers piping for liquid petroleum products such as crude oil and gasoline.

ASME B31.5 ......................... Refrigeration Piping and Heat Exchanger Components

This code applies to refrigerant and brine piping systems. It does not include self-contained or unit refrigeration systems that are subject to UL specifications.

ASME B31.8 ......................... Gas Transmission and Distribution Piping Systems

Applies to regulating stations, gas compressor stations, gas mains and service lines up to the end users meter set.

ASME B31.9 ......................... Building Services

Covers building services for heating and cooling water, condensing water, steam, vacuum, compressed air, combustible liquids and non-flammable gases. Boiler external piping has a max of 15 psig for steam boilers and for water heating units the max is 160 psig and 250°F. There is a maximum size for materials. For example carbon steel can not exceed 30" NPS or 0.50" wall. All welds must be VT although 100% penetrant is not required.
AWS D1.5 ........................ Bridge Welding Code
This code covers the welding fabrication requirements applicable to welded highway bridges. The Code does not apply to steels that are less than 3mm in thickness.

AWS D1.6 ........ Structural Welding Code - Stainless Steel
This Code applies to the welding of structural stainless steel.

AWS D1.7 ........ Structural Welding Code - Strengthening and Repair

AWS D1.8 ... Structural Welding Code - Seismic Supplement

AWS D1.9 .......... Structural Welding Code - Titanium

AWS D8.1 ........ Automotive Spot Welding Code

AWS D8.6 ........ Automotive Spot Welding Electrodes Supplement

AWS D8.7 .... Automotive Spot Welding Recommendations Supplement

AWS D8.8 ......... Automotive Arc Welding (Steel) Code

AWS D8.9 ........ Automotive Spot Weld Testing

AWS D8.14 ... Automotive Arc Welding (Aluminum) Code

AWS D9.1 ........ Sheet Metal Welding Code

AWS D10.10 .... Heating Practices for Pipe and Tube

AWS D10.11 .... Root Pass Welding for Pipe

AWS D10.12 ....... Pipe Welding (Mild Steel)

AWS D10.13 ........ Tube Brazing (Copper)

AWS D10.18 .......... Pipe Welding (Stainless Steel)

AWS D11.2 .......... Welding (Cast Iron) Code

AWS D14.1 ........ Industrial Mill Crane Welding

AWS D14.3 ... Earthmoving & Agricultural Equipment Welding

AWS D14.4 ............ Machinery Joint Welding

AWS D14.5 .................. Press Welding Code

AWS D14.6 ........................ Industrial Mill Roll Surfacing

AWS D15.1 ........ Railroad Welding Code

AWS D15.2 .... Railroad Welding Practice Supplement

AWS D16.1 ........ Robotic Arc Welding Safety

AWS D16.2 ........ Robotic Arc Welding System Installation

AWS D16.3 ........ Robotic Arc Welding Risk Assessment

AWS D16.4 .... Robotic Arc Welder Operator Qualification

AWS D17.1 ........ Aerospace Fusion Welding

AWS D17.2 ........ Aerospace Resistance Welding

AWS D18.1 ....... Hygienic Tube Welding (Stainless Steel)

AWS D18.2 ........ Stainless Steel Tube Discoloration Guide

AWS D18.3 ........... Hygienic Equipment Welding

**American Petroleum Institute (API Codes)**

API Standard 1104 ............ Welding Pipelines and Related Facilities

API Standard 620 ............ Design and Construction of Large, Welded, Low Pressure Storage Tanks

API Standard 653 ............ Tank Inspection, Repair, Alteration and Reconstruction

API Standard 650 ............ Welded Steel Tanks for Oil Storage

API Spec 5L ............ Specification for Line Pipe

API Spec 6D ............ Specification for Pipeline Valves

**American Society for Testing and Materials (ASTM codes)**


E114-10 ......... Standard Practice for Ultrasonic Pulse-Echo Straight-Beam Contact Testing

E164-08 ........ Standard Practice for Contact Ultrasonic Testing of Weldments

E165-09 ......... Standard Practice for Liquid Penetrant Examination for General Industry

E213-09 ............ Standard Practice for Ultrasonic Testing of Metal Pipe and Tubing

E273-10 ......... Standard Practice for Ultrasonic Testing of the Weld Zone of Welded Pipe and Tubing

E309-11 ............ Standard Practice for Eddy-Current Examination of Steel Tubular Products Using Magnetic Saturation

E426-98(2007) .... Standard Practice for Electromagnetic (Eddy-Current) Examination of Seamless and Welded Tubular Products, Austenitic Stainless Steel and Similar Alloys

E566-09 ............ Standard Practice for Electromagnetic (Eddy-Current) Sorting of Ferrous Metals

E587-10 ............ Standard Practice for Ultrasonic Angle-Beam Contact Testing

E703-09 ......... Standard Practice for Electromagnetic (Eddy-Current) Sorting of Nonferrous Metals

E709-08 .......... Standard Guide for Magnetic Particle Testing
E797/E797M-10 Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method
E999-10 Standard Guide for Controlling the Quality of Industrial Radiographic Film Processing
E1032-06 Standard Test Method for Radiographic Examination of Weldments
E1065-08 Standard Guide for Evaluating Characteristics of Ultrasonic Search Units
E1212-09 Standard Practice for Quality Management Systems for Non-Destructive Testing Agencies
E1255-09 Standard Practice for Radioscopy
E1316-11a Standard Terminology for Non-Destructive Examinations
E1411-09 Standard Practice for Qualification of Radioscopic Systems
E1416-09 Standard Test Method for Radioscopic Examination of Weldments
E1417-05e1 Standard Practice for Liquid Penetrant Testing
E1441-11 Standard Guide for Computed Tomography (CT) Imaging
E1444-05 Standard Practice for Magnetic Particle Testing
E1570-11 Standard Practice for Computed Tomographic (CT) Examination
E1742/E1742M-11 Standard Practice for Radiographic Examination
E1815-08 Standard Test Method for Classification of Film Systems for Industrial Radiography
E1901-08 Standard Guide for Detection and Evaluation of Discontinuities by Contact Pulse-Echo Straight-Beam Ultrasonic Methods
E2007-10 Standard Guide for Computed Radiography
E2192-08 Standard Guide for Planar Flaw Height Sizing by Ultrasonics
E2373-09 Standard Practice for Use of the Ultrasonic Time of Flight Diffraction (TOFD) Technique
E2375-08 Standard Practice for Ultrasonic Testing of Wrought Products
E2662-09 Standard Practice for Radiologic Examination of Flat Panel Composites and Sandwich Core Materials Used in Aerospace Applications
E2663-08 Standard Practice for Digital Imaging and Communication in Non-Destructive Evaluation (DICONDE) for Ultrasonic Test Methods
E2698-10 Standard Practice for Radiological Examination Using Digital Detector Arrays
E2700-09 Standard Practice for Contact Ultrasonic Testing of Welds Using Phased Arrays
E2736-10 Standard Guide for Digital Detector Array Radiology

Canada

Canadian Standards Association (CSA Codes)

CSA W47.1 Certification of Companies for Fusion Welding of Steel
CSA W59. . Welded Steel Construction (Metal Arc Welding)
CSA W59.2 . Welded Aluminum Construction
Europe
European Welding Standards

EN ISO 5817 ............ Welding – Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections
EN ISO 6520-1/2 ............ Welding and allied processes – Classification of geometric imperfections in metallic materials – Parts 1 and 2
EN ISO 6520-2
EN ISO 10863 .............. Non-destructive testing of welds – Use of time-of-flight diffraction technique (TOFD)
EN ISO 10893-112 ............ Non-destructive testing of steel tubes – Parts 1-12
EN ISO 10893-12
EN ISO 11666 ............ Non-destructive testing of welds – Ultrasonic testing of welded joints – Acceptance levels
prEN ISO 12932 ......... Welding – Laser-arc hybrid welding of steels, nickel and nickel alloys – Quality levels for imperfections
prEN ISO 13588 ......... Non-destructive testing of welds – Ultrasonic testing – Use of automated Phased Array technology
EN ISO/NP 17405 ............ Non-destructive testing – Ultrasonic testing - Technique of testing claddings produced by welding, rolling and explosion
EN ISO 17635 ............ Non-destructive testing of welds – General rules for metallic materials
prEN ISO 17636-1 ......... Non-destructive testing of welds – Radiographic examination of welded joints – Part 1: Industrial films
prEN ISO 17636-2 ......... Non-destructive testing of welds – Radiographic examination of welded joints – Part 2: Imaging plates
EN ISO 17637 ............ Non-destructive testing of welds – Visual testing of fusion-welded joints
EN ISO 17638 ............ Non-destructive testing of welds – Magnetic particle testing
EN ISO 17640 ............ Non-destructive testing of welds – Ultrasonic testing - Techniques, testing levels, and assessment
prEN ISO 19232-15 ......... Non-destructive testing – Image quality of radiographs – Parts 1-5: Image quality indicators (wire type) – Determination of image quality value
FprEN ISO 22825 ......... Non-destructive testing of welds – Ultrasonic testing – Testing of welds in austenitic steels and nickel-based alloys
EN ISO 23277 ............ Non-destructive testing of welds – Penetrant testing of welds – Acceptance levels
EN ISO 23278 ............ Non-destructive testing of welds – Magnetic particle testing of welds – Acceptance levels
EN ISO 23279 ............ Non-destructive testing of welds – Ultrasonic testing – Characterization of indications in welds
EN ISO 25239-5 ............ Friction stir welding – Aluminium – Part 5: Quality and inspection requirements

ISO and European standards for non-destructive testing of welds

EN 1435 ............ Non-destructive examination of welds – Radiographic examination of welded joints
EN 4678 ............ Aerospace series - Weldments and brazements for aerospace structures - Joints of metallic materials by laser beam welding - Quality of weldments – Bilingual version
EN 12517-1 ............ Non-destructive testing of welds – Part 1: Evaluation of welded joints in steel, nickel, titanium and its alloys by radiography – Acceptance levels
EN 12517-2 ............ Non-destructive testing of welds – Part 2: Evaluation of welded joints in aluminium and its alloys by radiography – Acceptance levels
EN 12952-6 ............ Water-tube boilers and auxiliary installations – Part 6: Inspection during construction, documentation and marking of pressure parts of the boiler
prEN 13445-5 ............ Unfired pressure vessels – Part 5: Inspection and testing
EN 13480-5 ............ Metallic industrial piping – Part 5: Inspection and testing
**Japan**

**Japanese Welding Standards (WES)**

WES 7101........... Welding Position and Range of Plate Thickness for Qualified Welder

WES 7102........... Recommended Practices for Inert Shielded Arc Welding (Titanium and Titanium alloy)

WES 7103........... Recommended Practice for Oxyacetylene Welding of Cast Iron

WES 7014........... Recommended Practice for Arc Welding of Cast Iron

WES 7105........... Recommended HardFacing Practice with Shielded Metal Arc Welding

WES 7301........... Recommended Practice for Spot Welding (Low Carbon Steel and Low Alloy Steel)

WES 7302........... Recommended Practice for Spot Welding (Aluminum and Aluminum Alloy)

WES 7303........... Recommended Practice for Spot Welding (Stainless Steel)

WES 7601........... Recommended Practice for Field Welding of Foundation Piles

WES 7602........... Recommended Practices for Inert Gas Shielded Arc Welding of Titanium Clad Steel and for Titanium Lining

WES 8101........... Standard for Certification of Fillet Welding Operator

WES 8102........... Welder Performance Qualification (For Petroleum Industry)

WES 8103........... Standard for Certification of Welding Coordination Personnel

WES 8105........... Standard for Certification of Welding Operator of PC Steel Rods

WES 8106........... Standard for Certification of Welding Operator of Foundation Piles

WES 8107........... Standard for Certification of Welding Practitioner

WES 8109........... Standard for Certification of Micro-Soldering Personnel

WES 8110........... Standard Qualification Procedure for Robot Welding Operators of Building Structures

WES 8111........... Certification Procedure for Robot Welding Operators of Building Structures

WES 8201........... Standard for Certification of Manual Arc Welding Operator

WES 8205........... Standard for Certification of Titanium Welding Operator

WES 8207........... Standard for Certification of Welders and Welding Operators for Power Plant Equipment

WES 8217........... Standard for Certification of Welding Procedure for Power Plant Equipment

WES 8221........... Certification Procedure of Welders of Stainless Steels

WES 8231........... Certification Procedure of Welders of Plastics

WES 8241........... Standard for Certification of Semi-automatic Welding Operator

WES 8291........... Certification Procedure for Operators of Silver Alloy Brazing

WES 8302........... Certification Test Manual of Welders for the Processing Facility and Re-processing Facility Based on the Reader Regulation Law

WES 8312........... Certification Test Manual of Welding Procedure for the Processing Facility and Re-Processing Facility based on the Reactor Regulation Law

WES 8701........... Standard for Certification of Non-destructive Inspection Enterprise for Welded Structures

WES 8703........... Standard Qualification Procedure for Welding Robots for Building Structure

WES 8704........... Certification Procedure for Welding Robots of Building Structures

WES 8705........... Guideline for Accreditation of Non-destructive Testing Enterprise

WES 8706........... Standard of Registration of Personnel in Non-destructive Testing Enterprise for Welded Construction
China

Chinese Welding Standards
(GB Standards or Recommendations)

GB/T 12467 ........ Fusion Welding of Metallic Materials
GB/T 15169 ........ Qualification Test of Welders - Fusion for Welding Steels
GB 50235-97 ........ Chemical Metal Pipe Construction and Acceptance