Publications, Membership, Professional and Career Development Programs, Expositions, and More.

2019 SUMMER/FALL PRODUCTS AND SERVICES CATALOG

Publications, Membership, Professional and Career Development Programs, Expositions, and More.
Measure ferrite content of weld seams with the FERITSCOPE®!

- Measurement range 0.1 to 80% Fe or 0.1 to 110 FN
- Supplied with full range ferrite standard set
- Austenitic and duplex steel

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Fischer Technology Inc.
860.683.0781
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### New in this Catalog

C3.2M/C3.2:2019, *Standard Method for Evaluating the Strength of Brazed Joints* see page 54  
C1.5:2019, *Specification for the Qualification of Resistance Welding Technicians* see page 28
Certification Programs for Individuals

Certified Welder (CW)
The AWS Certified Welder program is designed to provide widely recognized credentials to professional welders who have demonstrated a higher skill level demanded by industry.

Certified Welding Inspector (CWI)
The AWS Certified Welding Inspector program confirms your skills and expertise in welding inspection according to the high standards required and outlined in the AWS B5.1, Specification for the Qualification of Welding Inspectors standard.

Senior Certified Welding Inspector (SCWI)
This level represents the pinnacle of being a welding inspector. The “Senior” can additionally supervise other inspector levels, write welding procedure specifications, test and qualify welders, prepare inspection reports, and review and interpret joining procedures.

Certified Associate Welding Inspector (CAWI)
Earning a CAWI gives you the opportunity to document your current skills, while gaining a valuable hands-on experience from a current CWI to help you make it to the next level.

Certified Welding Supervisor (CWS)
Earning an AWS Certified Welding Supervisor certificate shows you are committed to safety, quality, and productivity in the fabrication process and identifies you as a candidate with the knowledge and skills to save companies money. With these valuable skills you can expand your career and gain professional prestige that puts you among the industry’s elite.

Certified Welding Educator (CWE)
The AWS Certified Welding Educator program was developed to define the standards for welding educators. AWS CWEs are able to direct and perform operations associated with welder training and classroom instruction.

Certified Welding Engineer (CWEng)
AWS Certified Welding Engineer professionals are capable of directing operations associated with weldments and other types of joints to ensure satisfactory results, completed in accordance with appropriate contract documents, purchase orders, codes and all other standards.

Certified Radiographic Interpreter (CRI)
The AWS Certified Radiographic Interpreter program certifies the ability of individuals to properly assess welding-related indications produced on radiographic film and related media. If your job responsibilities include reading and interpretation of weld radiographs, this program is designed for you. You’ll learn how to identify proper film exposure, correct selection of image quality indicators, characterization of indications, and use of acceptance criteria as expressed in the AWS, API, and ASME codes.

Certified Robotic Arc Welding Technician/Operator (CRAW-T/CRAW-O)
The AWS Certification Program for Robotic Arc Welding - Operators and Technicians (CRAW) allows many welding personnel employed in various welding sectors to measure themselves against standards for their occupation. It also signifies that the CRAW Operator or Technician has demonstrated the capability of working with various codes, standards, and specifications. The examination tests applicants’ knowledge of welding processes, welding procedures, destructive and non-destructive tests, welding terms, definitions, symbols, reports, safety, quality assurance and responsibilities, robot programming and robot arc welding, and other related subjects.
Certified Welding Sales Representative (CWSR)
The AWS Certified Welding Sales Representative (CWSR) program requires documentation of experience, satisfactory completion of an examination, and proof of visual acuity. The examination tests the supervisor’s knowledge of welding processes, welding procedures, destructive tests, terms, definitions, symbols, reports, safety and responsibilities. The CWSR positions you as one of the industry’s top professionals. The AWS Certified Welding Sales Representative program ensures that the welding industry knows you bring years of expertise and insight to every recommendation and sale you make — and that your continued commitment to learning keeps your knowledge and skills at their peak.

Endorsement Programs for Individuals
Specification for AWS Certification of Welding Inspectors, provides for endorsements that may be added to the CWI and SCWI certifications. Endorsements are defined in AWS QC1 as the approval of an additional skill documented in writing and added to a certification credential.

D1.1 Structural Steel Welding Code Endorsement
This endorsement covers four subject areas in AWS D1.1, material and design, fabrication, inspection, and qualification. Subject weights for each of these areas are in conformance with the codebook examination requirements as expressed in section 7.1 of AWS B5.1, Specification for the Qualification of Welding Inspectors.

D1.2 Structural Aluminum Welding Code Endorsement
This endorsement covers four subject areas in AWS D1.2, material and design, fabrication, inspection, and qualification. Subject weights for each of these areas are in conformance with the codebook examination requirements as expressed in section 7.1 of AWS B5.1, Specification for the Qualification of Welding Inspectors.

D1.5 Bridge Welding Code Endorsement
This endorsement covers four subject areas in AWS D1.5, material and design, fabrication, inspection, and qualification. Subject weights for each of these areas are in conformance with the codebook examination requirements as expressed in section 7.1 of AWS B5.1, Specification for the Qualification of Welding Inspectors.

D15.1 Railroad Welding Specification for Cars and Locomotives Endorsement
This endorsement covers four subject areas in AWS D15.1, material and design, fabrication, inspection, and qualification. Subject weights for each of these areas are in conformance with the codebook examination requirements as expressed in section 7.1 of AWS B5.1, Specification for the Qualification of Welding Inspectors.

D17.1 Specification for Fusion Welding of Aerospace Applications Endorsement
This endorsement covers four subject areas in AWS D17.1, material and design, fabrication, inspection, and qualification. Subject weights for each of these areas are in conformance with the codebook examination requirements as expressed in section 7.1 of AWS B5.1, Specification for the Qualification of Welding Inspectors.

AWS Penetrant Testing (PT Type II - Method C) Endorsement
This endorsement shall govern visible Penetrant Testing (PT) of welds using the solvent removable method in ferrous and non-ferrous materials manufactured from non-porous materials.

AWS Magnetic Particle Testing (MT Dry Powder Yoke Method) Endorsement
This endorsement shall govern Magnetic Particle testing (MT) of welds in ferromagnetic materials using an electromagnetic yoke with visible dry powder.
API 1104 Welding of Pipelines and Related Facilities Endorsement
This endorsement covers four subject areas in API 1104, material and design, fabrication, inspection, and qualification, including Appendix A and B. Subject weights for each of these areas are in conformance with the codebook examination requirements as expressed in section 7.1 of AWS B5.1, Specification for the Qualification of Welding Inspectors.

ASME Pressure Vessel Section IX, Pressure Piping B31.1 and B31.3 Endorsement
This endorsement covers four subject areas in three ASME standards: material and design, fabrication, inspection, and qualification. Subject weights for each of these areas are in conformance with the codebook examination requirements as expressed in section 7.1 of AWS B5.1, Specification for the Qualification of Welding Inspectors.

ASME Pressure Vessel Section VIII, Div. 1 and Section IX Endorsement
This endorsement covers four subject areas in two ASME standards, material and design, fabrication, inspection, and qualification. Subject weights for each of these areas are in conformance with the codebook examination requirements as expressed in section 7.1 of AWS B5.1, Specification for the Qualification of Welding Inspectors.

AWS Structural Bolting Inspection - Building Structures Endorsement
This endorsement shall govern the written examination for structural bolting inspection.

AWS Structural Drawing Reading - Building Structures Endorsement
This endorsement shall govern the written examination for structural drawing reading.

2019 Price List

<table>
<thead>
<tr>
<th>INSPECTOR (CAWI, CWI, SCWI)</th>
<th>Member</th>
<th>Non-Member</th>
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<tr>
<td>Initial CAWI, CWI Exam</td>
<td>$1,070</td>
<td>$1,325</td>
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<tr>
<td>CWI by Reciprocity with CWB or INWC</td>
<td>$560</td>
<td>$815</td>
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<tr>
<td>Upgrade CAWI to CWI</td>
<td>$270</td>
<td>$525</td>
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<tr>
<td>Prometric Initial SCWI</td>
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<tr>
<td>Endorsement Structural Drawing Reading</td>
<td>$310</td>
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<tr>
<td>Endorsement MT/PT Exam Part B</td>
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<td>CAWI, CWI, CWE (Part B)</td>
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<td>CAWI, CWI, CWE (All Parts)</td>
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<th>PACKAGES</th>
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<tbody>
<tr>
<td>C WI Seminar and Exam Package</td>
<td>$2,585</td>
<td>$2,840</td>
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<tr>
<td>- CWI Pre-Seminar (online course)</td>
<td>$750</td>
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<tr>
<td>C WI Seminar and Exam Package (API 1104 Focus)</td>
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<tr>
<td>Exam Only</td>
<td>$710</td>
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<tr>
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<td>$405</td>
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<th>CERTIFIED RADIOGRAPHIC INTERPRETER (CRI)</th>
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<tr>
<td>Exam</td>
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<td>Seminar</td>
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<td>Initial Seminar and Exam</td>
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<td>Retest (All Parts)</td>
<td>$615</td>
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<th>CERTIFIED WELDING SUPERVISOR (CWS)</th>
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<tr>
<td>Prometric Exam</td>
<td>$570</td>
<td>$658**</td>
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<td>$370</td>
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<td>$433**</td>
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<td>$618**</td>
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<td>Supervisor Value Pak</td>
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<td>Supervisor Seminar Only</td>
<td>$1,313</td>
<td>$1,401**</td>
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<tr>
<td>Supervisor Seminar &amp; 1 Part Retest</td>
<td>$1,683</td>
<td>$1,771**</td>
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<tr>
<td>Supervisor Seminar &amp; 2 Part Retest</td>
<td>$1,883</td>
<td>$1,971**</td>
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<tr>
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<th>PACKAGES</th>
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<td>C WI Seminar and Exam Package (D1.1 Focus)</td>
<td>$2,585</td>
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<td>- CWI Pre-Seminar (online course)</td>
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<tr>
<td>C WI Seminar and Exam Package (API 1104 Focus)</td>
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<tr>
<td>Supervisor Seminar &amp; 2 Part Retest</td>
<td>$1,883</td>
<td>$1,971**</td>
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</table>
# Professional and Career Development Resources

## AWS Certification, Endorsement, and Accreditation Programs

### Professional Development Hours
- **80 Professional Development Hours (PDHs)**
- **Initial CRI Certification**

### 9-Year Recertification

<table>
<thead>
<tr>
<th><strong>AWS Certification</strong></th>
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### Certification Programs

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<th><strong>Prometric Endorsement MT Exam ^•</strong></th>
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<tbody>
<tr>
<td><strong>9-YEAR RECERTIFICATION MT/PT</strong></td>
<td><strong>Prometric Endorsement PT Exam ^•</strong></td>
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<td><strong>Endorsement MT/PT Exam (Part B)^ Contact ATF for pricing.</strong></td>
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### Certified Welding Sales Representative (CWSR)

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<tbody>
<tr>
<td><strong>Prometric Exam •</strong></td>
<td><strong>$370</strong></td>
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<tr>
<td><strong>Prometric Retest •</strong></td>
<td><strong>$370</strong></td>
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<tr>
<td><strong>Renewal</strong></td>
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### Certified Welding Engineer (CWEng)

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<tr>
<td><strong>Part 1 &amp; 2 Exam</strong></td>
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<td><strong>Part 3 &amp; 4 Exam</strong></td>
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<td><strong>PE Exemption</strong></td>
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### Certified Robotic Arc Welding (CRAW)

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<td><strong>Operator to Technician Upgrade</strong></td>
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<td><strong>Technician/Operator Renewal</strong></td>
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### Certified Welder (CW)

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<td><strong>Maintenance of Welder Certification</strong></td>
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### CLINICS / SEMINARS / WORKSHOPS

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<td><strong>(within 12 months of original event)</strong></td>
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<td><strong>CWI Pre-Seminar (online course)</strong></td>
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<td><strong>$350</strong></td>
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### RENEWAL

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<td><strong>CWI/SCWI 3rd and 6th Year Renewal by work Experience</strong></td>
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### 9-YEAR RECERTIFICATION

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<td><strong>SCWI Part A &amp; B Exams •</strong></td>
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<tr>
<td><strong>Prometric CWI/SCWI Endorsement Exam ^•</strong></td>
<td><strong>$1,035</strong></td>
<td><strong>$1,290</strong></td>
</tr>
<tr>
<td><strong>Structural Drawing Reading</strong></td>
<td><strong>$975</strong></td>
<td><strong>$1,230</strong></td>
</tr>
<tr>
<td><strong>CWI/SCWI Endorsement Exam</strong></td>
<td></td>
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<tr>
<td><strong>CWI/SCWI Non-Exam</strong></td>
<td><strong>$665</strong></td>
<td><strong>$920</strong></td>
</tr>
<tr>
<td><strong>80 Professional Development Hours (PDHs)</strong></td>
<td></td>
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</tr>
<tr>
<td><strong>Endorsement Exam Prior to 9th Year of Certification Period</strong></td>
<td></td>
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<tr>
<td><strong>Initial CRI Certification</strong></td>
<td></td>
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<tr>
<td><strong>CWI/SCWI 9-Year Course</strong></td>
<td><strong>$1,740</strong></td>
<td><strong>$1,995</strong></td>
</tr>
</tbody>
</table>

**Non-Member price includes a 1-year AWS Individual Membership.**

**No additional membership included with this price.**

^ Additional ATF fees will apply for the practical exam (part B). Prices reflect a $60 seat fee per part for Prometric initial and/or reexam endorsements. Contact the ATF for Pricing.

• Prices reflect a $60 seat fee per part (A or C) and $120 for ALL parts for Prometric Testing.

+ Student and transitional memberships do not included membership price.

^^ Price is for all endorsements except Structural Drawing Reading.

For a complete price list of our online courses, please visit awo.aws.org. Some online courses can be combined with other certification programs.

**Note:**
Prices are subject to change without notice.

Full payment must be received with your completed application or it will not be processed.

All checks, money orders and demand drafts must be made payable to: American Welding Society
Accreditation Programs for Companies

**Accredited Test Facility (ATF)**
The AWS Accredited Test Facility (ATF) program establishes minimum requirements for test facilities and their personnel and equipment, to qualify for accreditation to test and qualify welders. Facilities earning an AWS ATF play an integral part in the operation of the AWS Certified Welder program. These highly dedicated facilities have the necessary resources to test welders to this nationally recognized and accepted program.

### Accredited Test Facility (ATF) Price Schedule*

<table>
<thead>
<tr>
<th>Service</th>
<th>North America</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Audit Fees</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document Review</td>
<td>$720</td>
<td>$720</td>
</tr>
<tr>
<td>Initial On-Site Audit**</td>
<td>$2,040</td>
<td>$840***</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$2,760</td>
<td>$1,560</td>
</tr>
<tr>
<td><strong>Additional Facilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document Review</td>
<td>$600</td>
<td>$600</td>
</tr>
<tr>
<td>Initial On-Site Audit**</td>
<td>$1,800</td>
<td>$600***</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$2,400</td>
<td>$1,200</td>
</tr>
<tr>
<td><strong>Re-Audit</strong></td>
<td></td>
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</tr>
<tr>
<td>On-Site Audit**</td>
<td>$1,100</td>
<td>TBD***</td>
</tr>
<tr>
<td><strong>Yearly Renewals</strong></td>
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<tr>
<td>Annual 1st Year</td>
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<td>$480</td>
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<tr>
<td>Annual 2nd Year</td>
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<td>$480</td>
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<tr>
<td><strong>Re-accreditation Audit Fee</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document Review</td>
<td>$600</td>
<td>$600</td>
</tr>
<tr>
<td>On-Site Audit**</td>
<td>$1,800</td>
<td>$600***</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$2,400</td>
<td>$1,200</td>
</tr>
<tr>
<td><strong>MP/PT Fees</strong></td>
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</tr>
<tr>
<td>On-Site Audit**</td>
<td>$1,100</td>
<td>TBD***</td>
</tr>
</tbody>
</table>

*Fees are subject to change due to individual circumstances for each facility. **Applicants are directly responsible for the auditor’s travel expenses. ***Auditor fees for international ATFs are as follows:

- Each Travel Day $400
- On-Site Audit Fee $800
- Total Fee (dependent on # of audit and travel days required)
The AWS ATC program was designed to complement the AWS Certified Robotic Arc Welding (CRAW) program by offering companies with robotic arc welding equipment the opportunity to test Certified Welding Inspectors (CWI) and Welders for the CRAW Operator and CRAW Technician certifications at their facility.

There are currently no up-front application fees for the ATC program; however, ATC applicants are responsible for auditor’s fees and travel expenses.

Certified Welding Fabricator (CWF)
The AWS Certified Welding Fabricator (CWF) program recognizes companies that have the resources, procedures, and personnel to apply a quality management system to their welding fabrication activities. An appropriate welding quality system is the foundation of delivering a quality welded product or service. When designed for the welding fabricator’s unique products and suitably committed to paper and practice, the daily manufacturing operations of the welding fabricator are more consistent and traceable when problems arise. This program is an affordable alternative or complement to ISO, AISC, NADCAP, and ASME quality certification.

Certified Welding Fabricator (CWF) Price Schedule*

<table>
<thead>
<tr>
<th></th>
<th>North America</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Audit Fees</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document Review</td>
<td>$720</td>
<td>$720</td>
</tr>
<tr>
<td>Initial On-Site Audit**</td>
<td>$2,040</td>
<td>$840***</td>
</tr>
<tr>
<td>Total</td>
<td>$2,760</td>
<td>$1,560</td>
</tr>
<tr>
<td><strong>Additional Facilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document Review</td>
<td>$600</td>
<td>$600</td>
</tr>
<tr>
<td>Initial On-Site Audit**</td>
<td>$1,800</td>
<td>$600***</td>
</tr>
<tr>
<td>Total</td>
<td>$2,400</td>
<td>$1,200</td>
</tr>
<tr>
<td><strong>3rd Year Recertification Audit Fee</strong></td>
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<tr>
<td>Document Review</td>
<td>$600</td>
<td>$600</td>
</tr>
<tr>
<td>On-Site Audit**</td>
<td>$1,800</td>
<td>$600***</td>
</tr>
<tr>
<td>Total</td>
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<td>$1,200</td>
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<tr>
<td><strong>AWS Certification for AISC Accredited Fabricators</strong></td>
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<tr>
<td>Initial Application</td>
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<tr>
<td>Renewal Application (paid annually)</td>
<td>$140</td>
<td>$200</td>
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</table>

*Fees are subject to change due to individual circumstances for each facility. **Applicants are directly responsible for the auditor’s travel expenses. ***Auditor fees for international CWFs are as follows:

- Each Travel Day $400
- On-Site Audit Fee $800
- Total Fee (dependent on # of audit and travel days required)
**Welding Industry Summit**

[aws.org/ws2019](aws.org/ws2019)

Drill deeper into welding operations, learn the best way to convert welding plans into successful projects and discover how more value can be brought to your welding operations. Join other industry professionals in a variety of interactive presentations, panels, and round table discussions focusing on personnel, equipment and project benchmarks that improve your operation’s quality, productivity and safety.

**Date:** August 29-30, 2019  
**Location:** Houston, Texas

<table>
<thead>
<tr>
<th>Registration Fee:</th>
<th>Member</th>
<th>Non-member</th>
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<tbody>
<tr>
<td>Early Bird (Before July 1)</td>
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<tr>
<td>Regular</td>
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<td>$575</td>
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<tr>
<td>Student</td>
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</table>
Aerospace Joining Conference
aws.org/aerospace19

Bringing together experts from Research & Development, Manufacturing and Applications in the areas of advanced welding and brazing, adaptive manufacturing, single crystal repair and advanced repair technologies for the aerospace and IGT engine industries.

Date: September 24-26, 2019
Location: Hyatt Regency Columbus, Columbus, OH

<table>
<thead>
<tr>
<th>Registration Fee</th>
<th>Member</th>
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</thead>
<tbody>
<tr>
<td>Regular</td>
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<tr>
<td>Student</td>
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<td>$75</td>
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<tr>
<td>Speaker</td>
<td>$675</td>
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Inspection Expo & Conference (IEC)
aws.org/iec2020

Join the only inspection conference in the industry created by inspectors for inspectors. Discover the latest tips, technology and resources common to inspectors in corrosion engineering, nondestructive testing and steel construction and welding. Don’t miss out on the Welding Cracking Workshop on Jan. 20. Seats are going fast!

Date: January 21-23, 2020
Location: Hyatt Regency Houston, Houston, Texas

<table>
<thead>
<tr>
<th>Registration Fee</th>
<th>Member</th>
<th>Non-member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Bird <strong>(Before August 1)</strong></td>
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<td>$450</td>
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<tr>
<td>Regular</td>
<td>$475</td>
<td>$550</td>
</tr>
<tr>
<td>Student</td>
<td>$75</td>
<td>$75</td>
</tr>
</tbody>
</table>

IEC Event Partners

Lower price shown is for AWS members. Always get the best price from the source: 1-888-WELDING (935-3464) Option 1
The seminars that AWS offers will give you the tools you need to make the most out of your welding career. Whether you’re looking for better opportunities, or fulfilling company requirements, our wide range of seminars will help you take your welding career to the next level.

Certified Welding Inspector Seminar  
Seminar & Exam  $2,120 / $1,865  
The AWS Certified Welding Inspector seminar is an intensive review of welding inspection science, documentation, and techniques. This six-day seminar assists practicing welding inspectors in mastering the Body of Knowledge that corresponds to the CWI Exam. Length: 6 days

Certified Welding Inspector PART B Training Length: 3 days $1,025 / $930  
Part B Training & Exam Package Length: 4 days $1,675 / $1,580  
Earning your Certified Welding Inspector (CWI) credential is serious work and has a significant impact on your future. Some customers feel that not enough time is spent on preparing for the Part B portion of the CWI exam. The session includes a full-length, timed practice examination to prepare candidates for the CWI practical exam.

8-Week CWI Seminar  
(+$2,400 refundable deposit for replica rental)  
The 8-Week Online CWI Seminar is designed to prepare participants for the AWS Certified Welding Inspector Exam from the comfort of their own homes. Students meet online twice per week for an interactive, two-hour session with an AWS instructor. All materials are included. Students receive books, practice tests, and inspection tools prior to the start of the course (yours to keep) and a set of plastic weld replicas for the Part B: Practical portion of the seminar (to borrow and return to AWS). Students also have access to online resources one month before and after the seminar.

Certified Welding Inspector 9-Year Recertification Seminar  
$1,995 / $1,740  
As an AWS Certified Welding Inspector or Senior Certified Welding Inspector, you must renew your certification every three years. Every nine years, you must recertify, either by examination, obtaining approved endorsements, by recertification course, or by demonstrating 80 hours of continuing education, along with other requirements. Neglecting to recertify prior to your expiration will result in the loss of your certification status and will require you to retest on all parts of the original exam to regain your certification. Length: 7 days

Certified Radiographic Interpreter Seminar  
Seminar & Exam  $1,662 / $1,407  
The five-day AWS Certified Radiographic Interpreter (CRI) Seminar is designed to ensure that individuals have the knowledge to properly assess indications produced on radiographic media of weldments or adjacent base metal. It will prepare you for the CRI Certification exam, which is given at the end of each seminar week. Length: 5 days

Certified Welding Supervisor Seminar  
Seminar & Exam  $1,401 / $1,313  
The Certified Welding Supervisor seminar was developed to teach individuals the mastery that welding supervisors must be capable of demonstrating. This 5-day course focuses on the knowledge a supervisor needs to support improvement of the welders’ environment, productivity, throughput, weld quality and safety. Length: 5 days

Custom Seminars  
AWS on-site training can make life less complicated and more rewarding for your company and your employees. Get a guaranteed combination of superior education plus convenience and affordability with one of our customized seminars. Duration and rates: TBD upon consultation with AWS.
Certified Welding Inspector
Pre-Seminar  Approx. 80 hrs. / 80 PDHs  $750 / $750

Welding Supervisor Seminar  Approx 84 hrs. / 84 PDHs.  $1,245 / $995
This seminar covers the wide range of management skills, welding processes, and welding economics required to plan, staff, monitor, and safely deliver welding projects according to schedule and budget. It is comprised of seven engaging, multimedia courses, totaling 84 hours of instruction.

Welding Sales Representative Seminar  Approx. 23 hrs / 23 PDHs / 2.3 CEUs  $600 / $450
Presented in 12 interactive and engaging modules, this online seminar is perfect for both inside and outside salespeople, distributors, supervisors, and managers who want to gain a technical understanding of welding principles, methodology, equipment, consumables, and variables.

Welding Fundamentals I  Approx. 14 hrs. / 14 PDHs / 1.4 CEUs  $470 / $350
A comprehensive overview of the basic principles of welding, including the science and practical application of the most commonly utilized welding and cutting processes. Topics include welding terminology, weld design, welding safety, electrical theory, the weldability of metals, and welding quality control.

Welding Fundamentals II  Approx. 7 hrs. / 7 PDHs / 0.7 CEUs  $265 / $210
A comprehensive overview of resistance welding, plasma arc welding, electron beam welding, and laser beam welding, cutting, and drilling. Topics include the science, equipment, consumables, process variables, safety precautions, and advantages and disadvantages inherent to each process.

Welding Fundamentals III  Approx. 5 hrs. / 5 PDHs / 0.5 CEUs  $180 / $150
A comprehensive overview of commonly utilized brazing and soldering processes. These processes include torch, furnace, dip, and induction brazing, as well as iron, torch, furnace, dip, and wave soldering. Presented in short, easy-to-understand modules, this multimedia course covers the science, equipment, consumables, process variables, safety precautions, and advantages and disadvantages inherent to each process.

*Safety in Welding  Approx. 3 hrs.  FREE
An extensive overview of welding safety in an accessible and engaging format. Topics include welding hazards, safety equipment, ventilation, welding in confined spaces, and safety precautions and specifications. *Access to the 3 PDHs / 0.3 CEUs and Certificate of Completion requires a $74 / $99 payment.

Lower price shown is for AWS members.
Always get the best price from the source: 1-888-WELDING (935-3464) Option 1
Fabrication Math I  Approx. 18 hrs. / 18 PDHs / 1.8 CEUs  $510 / $385
This introduction to basic math skills provides clear, step-by-step explanations that make each concept easy to understand and remember. Topics include place value estimation, measurement, and the addition, subtraction, multiplication and division of whole numbers, fractions, decimals, and mixed numbers.

Fabrication Math II  Approx. 15 hrs. / 15 PDHs / 1.5 CEUs  $495 / $370
Fabrication Math II builds upon the lessons learned in Fabrication Math I to explain the concepts and formulas that welders, welding supervisors, and other welding professionals require to plan and produce quality welds. Topics include percentages and ratios, order of operations, area and volume, and U.S./metric conversions.

Understanding Welding Symbols  Approx. 10 hrs. / 10 PDHs / 1 CEUs  $400 / $300
This in-depth course employs clear language, audio narration, and animated graphics to convey the principles of this often complex topic in short easy-to-understand modules.

Metallurgy I  Approx. 6 hrs. / 6 PDHs / 0.6 CEUs  $235 / $175
This multimedia course employs clear, simple terms, audio narration, and animated graphics to describe the basic principles that underlie the broad field of metallurgy. Concepts covered include the anatomy of atoms, the periodic table, chemical bonding, chemical reactivity, the atomic structure of materials and the properties of metals.

Metallurgy II  Approx. 6 hrs. / 6 PDHs / 0.6 CEUs  $235 / $175
Metallurgy II builds on the principles described in Metallurgy I to provide a basic understanding of the nature of metals and the properties that affect weldability. Topics include various metallurgical phenomena which, if disregarded, can lead to cracking, porosity, or welds with poor properties.

The Science of Nondestructive Testing  Approx. 6 hrs. / 6 PDHs / 0.6 CEUs  $235 / $175
The process and science behind five of the most common nondestructive tests used in the welding industry: visual testing, penetrant testing, magnetic particle testing, radiographic testing, and ultrasonic testing. This course is perfect for students and welding professionals involved in inspection, supervision, and quality control.

Destructive Testing  Approx. 7 hrs. / 7 PDHs / 1 CEUs  $400 / $300
This engaging online course describes the material properties of metals that can be evaluated with destructive testing, as well as the principles and performance of the most common destructive tests used in the welding industry.

Economics of Welding  Approx. 18 hrs. / 18 PDHs / 1.8 CEUs  $600 / $450
Participants learn to identify, measure, and manage the costs of production in order to reduce costs and ensure quality. Topics include welding process variables, comparing welding processes, calculating weld metal volume and deposition rates, and managing the costs of labor, materials, equipment, and overhead.

WPS/PQR Explained  Approx. 4 hrs. / 4 PDHs / 0.4 CEUs  $150 / $120
The characteristics and use of Welding Procedure Specifications (WPS) and Procedure Qualification Records (PQR) in an engaging multimedia format. Topics include essential and nonessential variables for arc welding, oxyfuel welding, resistance welding, and brazing procedure specifications; the procedure qualification process; and common nondestructive and destructive tests.

Lower price shown is for AWS members.

Always get the best price from the source: 1-888-WELDING (935-3464) Option 1
AWS Online Code Clinics offer a detailed road map through some of the most commonly used codebooks in the welding industry. Participants will learn to quickly identify, locate, and use important clauses, tables, and figures in time-sensitive testing and working environments. Each code clinic also includes an exclusive online pre-course designed to help participants develop successful test-taking strategies based on the actual structure of the code book exam.

**D1.1 Online Code Clinic**  Approx. 4 hrs. / 4 PDHs / 0.4 CEUs $300 / $250
This comprehensive, 4-hour course features easy-to-understand explanations as well as interactive questions and quizzes designed to help participants efficiently navigate the AWS D1.1 Structural Welding Code in the field or during the code book portion of the CWI exam.

**API 1104 Online Code Clinic**  Approx. 3 hrs. / 3 PDHs / 0.4 CEUs $300 / $250
This self-paced course is designed to help participants working in the field or preparing for an AWS code book exam to quickly identify, locate, and use important clauses, tables, and figures in API 1104 Welding of Pipelines and Related Facilities.

**D17.1 Online Code Clinic**  Approx. 4 hrs. / 4 PDHs / 0.4 CEUs $150 / $120
This detailed road map of the D17.1 code employs easy-to-understand language, audio narration, and guided questions. Participants will learn to quickly locate important clauses, charts, and tables in time sensitive testing or working environments.

To see a live demo or to register for our online programs visit [awo.aws.org](http://awo.aws.org)
Industrial Metallurgists, LLC

This series of courses is ideal for design, manufacturing, and quality engineers who need to better understand metallurgical concepts in order to help clients improve productivity and profitability. Courses include Principles of Metallurgy, Aluminum Metallurgy, Steel Metallurgy, and Tensile Testing.

Aluminum Metallurgy  Approx. 1 hr.  $85
There are a wide variety of wrought aluminum alloys. Each alloy was developed to provide specific properties. This course teaches the following aspects of aluminum metallurgy:

- The different families of wrought aluminum alloys
- The distinguishing features between the families
- The metallurgical factors that influence their mechanical properties
- How the mechanical properties are modified using alloy composition, cold-working, and heat treatment
- The temper designation systems for cold-worked and heat treated alloys

Principles of Metallurgy  Approx. 5 hrs.  $225
This course teaches 3 key principles about metallurgy:

1. The microscopic structures present in metals.
3. How composition, cold-working, and heat treating are used to modify metal microstructure to obtain desired mechanical properties.

Having a good understanding of how metals behave and what can be done to modify a metal’s properties is critical for being more productive and profitable. This knowledge enables people to make better design and manufacturing decisions, solve quality problems, and have productive conversations with suppliers, customers, and engineers.

Hardness Testing  Approx. 1/2 hr.  $39
This course teaches about Rockwell and Brinell hardness testing and Vickers and Knoop microhardness testing. You will learn how tests are performed, test sample and testing requirements, and test parameter selection.

Steel Metallurgy  Approx. 3 hrs.  $180
Understanding steel metallurgy involves understanding the effects of alloy composition and steel heat treating processes on the microstructure and properties of steel is critical for:

- Selecting the most appropriate alloy and heat treating process for your application
- Evaluating suppliers
- Developing manufacturing processes
- Solving quality problems

Steel Case Hardening  Approx. 1 hr.  $70
If your products use case hardened steel components, understanding the effects of alloy composition and heat treating process conditions on the microstructure and properties of the steel is critical for:

- Selecting the most appropriate alloy and heat treating process for your application.
- Evaluating suppliers
- Developing manufacturing processes
- Solving quality problems
Steel Through Hardening  Approx. 1 hr. $70
If your products use through hardened steel components, understanding the effects of alloy composition and heat treating process conditions on the microstructure and properties of the steel is critical for:
- Selecting the most appropriate alloy and heat treating process for your application.
- Evaluating suppliers
- Developing manufacturing processes
- Solving quality problems

Tensile Testing  Approx. 1/2 hr. $39
This course teaches about tensile testing of metals. You'll learn how tests are performed, test sample and testing requirements, and how tensile properties are determined from the test data.

NDT Classroom
NDT Classroom recognizes the need for effective online NDT training. NDT legends Chuck Helliier and Jim Treat have brought together industry leading instructors. Together they offer completely video-based online NDT training to create NDT Classroom.

Introduction to NDT  Approx. 5 hrs. $525
The Introduction to NDT course is ideal for those who would like a thorough overview of the major methods. Emphasis is placed on benefits, limitations, and applications and is a five-hour modularized program with quizzes after each module and a final course examination. Methods covered include Visual Testing (VT), Penetrant Testing (PT), Magnetic Particle Testing (MT), Radiographic Testing, (RT), Ultrasonic Testing (UT) and Eddy Current Testing (ET).

Eddy Current I  Approx. 20 hrs. $1,045
The Eddy Current Level I course covers the basic principles and fundamentals of Eddy Current Testing. It covers the theory and techniques essential for those seeking certification as ET Level I. The course is approximately 20 hours in duration and includes equipment calibration and use, selection of probes/coils, and focuses heavily on general surface techniques for a variety of industrial and aerospace applications. It also covers metal sorting procedures and a variety of other uses.

Eddy Current II  Approx. 20 hrs. $1,045
The Level II course provides additional reinforcement and expansion on the basic principles and fundamentals of eddy current testing that were covered in the Level I course. It covers the variables such as test frequency/and unique techniques for advanced applications and emphasizes the evaluation and interpretation of eddy current test results and includes reporting. Duration is approximately 20 hours.

Visual Testing I & II  Approx. 12 hrs. $725
Because Visual Testing is the oldest and most widely used nondestructive test method, this online course is ideal for individuals beginning their career in inspection or nondestructive testing. This course combines Level I and II subjects and runs approximately 12 hours in length It is highly recommended as a prerequisite for those planning to specialize in other NDT methods, or for personnel who are planning to become certified in visual testing. It covers fundamentals, equipment, techniques, procedures and evaluation criteria for a variety of applications including welds.
Penetrant Testing I & II  Approx. 14.5 hrs.  $835
Penetrant Testing is a widely used NDT method for the detection of very small discontinuities that are open to the surface in most metals and other solid nonporous materials. It is capable of detecting flaws well below the threshold of visual testing. This combined Level I and II course, which runs approximately 14.5 hours, both visual and fluorescent penetrants are discussed. PT materials, equipment, variables, techniques, and evaluation of test results are presented and demonstrated along with a description of widely used applications.

Magnetic Particle Testing I & II  Approx. 11 hrs.  $835
This course combines the Level I and II subjects lasting approximately 11 hours, and includes the principles of magnetism, test techniques and procedures as applied to the detection of flaws in ferromagnetic materials. Other subjects covered include variables, direct and indirect magnetization, equipment and accessories, precautions, and demagnetization. It is a quick and effective test for the detection and evaluation of discontinuities at or very close to the surface of the object being examined.

Radiography Testing I  Approx. 22 hrs.  $725
This course provides the student with the theory and principles of radiation and how they relate to the basics of radiographic testing. It is the first step for those who will be seeking a career as a radiographer. It covers the basic steps in producing an acceptable radiograph including the control of variables such as energy, exposure times, selection of film or imaging devices, and processing This course runs approximately 22 hours and emphasizes the essentials of radiation safety. It is also appropriate for other personnel who require a basic understanding of the basics of radiographic testing.

Radiography Testing II  Approx. 22 hrs.  $945
Radiography Testing Level II is a continuation of the Level I course and expands on the variables and how to control them in order to produce a high-quality image. It takes approximately 22 hours and includes the use of both x-ray and gamma-ray sources and conventional radiographic techniques using film. It also describes the benefits of computed and digital (CR/DR) techniques. Emphasis is placed on the evaluation and interpretation of radiographic images and the need for complete and concise reporting. It is an essential course that covers the advanced theory and principles necessary for those seeking to become Level II radiography technicians.

Radiation Safety Course  Approx. 28 hrs.  $1,045
The Radiation Safety course provides an understanding of the basic principles and fundamentals of radiation safety applicable to industrial radiography. It addresses the 40-hour training prerequisite and the required training topics for radiographic personnel as required by federal (10 CFR 34.43) and equivalent state radiation control regulations. This online course is 28 hours and upon completion, the individual's RSO should provide the remaining 12 hours of site-specific training if certification is to be achieved. Learning outcomes are assessed using written quizzes at the end of each lesson and through a comprehensive final exam.
Ultrasonic Testing I  Approx. 26 hrs.  $835
This course includes a basic introduction to the theory and principles of ultrasonic testing including frequency, velocity, and wavelength as well as wave modes. This course is essential for those desiring to enter and specialize in ultrasonic testing and takes approximately 26 hours to complete. It also covers materials considerations, calibration, equipment, selection of proper transducers, techniques, test procedures and applications. It is also beneficial for those who will not be practitioners but who want to understand the basic principles and applications of ultrasonic testing.

Ultrasonic Testing II  Approx. 26 hrs.  $945
Ultrasonic Testing is an extension of the Level I course and expands on the theory and principles to a much greater depth. A wider range of applications and applicable techniques are covered. Emphasis is placed on the evaluation of discontinuities and test requirements. The inspection of various types of welds are covered in detail. This is an essential course for those practitioners who will be pursuing a career in ultrasonic testing and for those striving for certification as a Level II. The course takes approximately 26 hours to complete and will also be beneficial for those preparing to take Level III examinations.

Ultrasonic Thickness Testing  Approx. 14 hrs.  $725
This course describes the basic principles of ultrasonic testing as they apply to thickness testing of materials and components and is ideal for those individuals who will be taking thickness measurements and/or are pursuing Limited Level II ultrasonic testing thickness certification. It covers the compressional wave technique, thickness testing equipment operation, transducers, and variables. Recording options are also discussed in the course that requires approximately 14 hours to complete.

To see a live demo or to register for our online programs visit awo.aws.org
# AWS Membership Programs

## Individual Membership
Annual dues: $88
Strengthen your professional career with member-only knowledge and tools, including leading welding industry publications and news; access to certification resources, educational programs and networking opportunities; exclusive discounts on home and auto insurance; and more.

## Welder Membership
Annual dues: $88
Take advantage of specialized membership benefits geared towards welders. Gain access to courses, seminars, certifications and other resources; gain exclusive discounts on home and auto insurance; discounts on tools and equipment; and more from the industry’s leading welding organization.

## Corporate Membership
Strengthen your business impact and employees’ expertise by joining the world’s leading welding organization. There are five different types of corporate programs: Sustaining Company, Supporting Company, Affiliate Company, Educational Institute, and Welding Distributor.

### Sustaining Company
Annual dues: $880 (domestic), $980 (international)
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### Affiliate Company
Annual dues: $200
Designed specifically for your independent shop. AWS keeps your team informed on industry changes and developments; recommends ways to increase productivity and solve problems; and helps you stand out from the competition.

### Educational Institute
Annual dues: $264
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### Welding Distributor
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Certification

QC1:2016, Standard for AWS Certification of Welding Inspectors (12 pages)
The Certified Welding Inspector (CWI) program identifies proven professionals who improve product quality through early detection of flaws and defects.
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QC4-89, Standard for Accreditation of Test Facilities for AWS Certified Welder Program (12 pages)
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QC5-91, Standard for Certification of Welding Educators (10 pages)
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QC7-93, Standard for AWS Certified Welders (10 pages)
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QC7-93 Supplement C, Welder Performance Qualification Sheet Metal Test Requirements (38 pages)
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QC7-93 Supplement F, Chemical Plant and Petroleum Refinery Piping (22 pages)
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QC7-93 Supplement G, AWS Performance Qualification Test (10 pages)
Order Code: QC7G $13 / $10

QC10:2017, Specification for Qualification and Certification of SENSE Level I-Entry Welders (Description & preview online. 34 pages)
Order Code: QC10 $32 / $24

QC11:2017, Specification for Qualification of Certification of SENSE Level II-Advanced Welders (Description & preview online. 38 pages)
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QC13:2006, Specification for the Certification of Welding Supervisors (16 pages)
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QC14:2009, Specification for the Certification of Welding Sales Representatives (16 pages)
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QC15:2008-AMD1, Specification for the Certification of Radiographic Interpreters (16 pages)
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QC17:2015, Specification for AWS Accreditation of Certified Welding Fabricators (14 pages)
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Order Code: QC19 $13 / $10

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Certified Welding Inspector Pre-Seminar
This self-paced interactive online program combines Welding Fundamentals I, Nondestructive Testing, Understanding Welding Symbols, Fabrication Math II, Metallurgy II, WPS/POR Explained, and Economics of Welding into a single package to prepare CWI candidates for the AWS CWI seminar and Part A (Fundamentals) of the examination. Approx. 72 hours.

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Welding Sales Representative Seminar
A detailed examination of the technical aspect of welding and welding equipment as they relate to sales, distribution and manufacturing. Focuses on safety in welding, cutting and allied processes, the fundamental principles of welding operations and processes, basic arc equipment, shielding gases, consumables, and related components. Presented in 13 interactive and engaging modules, this seminar is perfect for both inside and outside salespeople, distributors, manufactures, supervisors, managers, and any other professional that wants to gain a technical understanding of welding principles, methodology, equipment, consumables, and variables. Approx. 23 hours.

Register at [awo.aws.org](http://awo.aws.org) $600 / $450

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Order Code: QC4 ............................................................... $13 / $10
Order Code: QC5 ............................................................... $13 / $10
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Order Code: QC7F .............................................................. $13 / $10
Order Code: QC7G .............................................................. $13 / $10
Order Code: QC13 ............................................................. $13 / $10
Order Code: QC14 ............................................................. $13 / $10
Order Code: QC15 ............................................................. $13 / $10
Order Code: QC17 ............................................................. $13 / $10
Order Code: QC19 ............................................................. $13 / $10
Order Code: QC20 ............................................................. $13 / $10
Inspection

B1.10M/B1.10:2016, Guide for the Nondestructive Examination of Welds
This guide acquaints the user with the nondestructive examination methods commonly used to examine weldments. The standard also addresses which method best detects various types of discontinuities. The methods included are visual, liquid penetrant, magnetic particle, radiographic, ultrasonic, electromagnetic (eddy current), and leak testing. 72 pages, 4 tables, 5 annexes, 33 figures, fifth edition.
Order Code: B1.10 $120 / $90

B1.11M/B1.11:2015, Guide for the Visual Examination of Welds
Provides guidance on visual examination of welds, including sections on prerequisites, fundamentals, surface conditions, and equipment. Sketches and color photographs illustrate common weld discontinuities. 62 pages, 1 table, 4 annexes, 58 figures.
Order Code: B1.11 $120 / $90

B4.0:2016, Standard Methods for Mechanical Testing of Welds
Mechanical test methods that are applicable to welds and welded joints are described. For each testing method, information is provided concerning applicable American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), and American Petroleum Institute (API) documents; the required testing apparatus, specimen preparation, procedure to be followed, and report requirements are also described. 168 pages, 97 figures.
Order Code: B4.0 $128 / $96

B4.0M:2000 (R2010)
Metric only. 120 pages, 64 figures (Reaffirmed 2010).
Order Code: B4.0M $104 / $78

WI:2015, Welding Inspection Handbook
This invaluable training reference helps inspectors, engineers, and welders evaluate the difference between discontinuities and rejectable defects. 289 pages 18 chapters, index, 108 figures, 16 tables, 6-1/2” x 9”, fourth edition.
Order Code: WI $92 / $69

C2.21M/C2.21:2015, Specification for Thermal Spray Acceptance Inspection see page 62

C3.2M/C3.2:2019, Standard Method for Evaluating the Strength of Brazed Joints see page 54

G1.2M/G1.2:1999 (R2010), Specification for Standardized Ultrasonic Welding Test Specimen for Thermoplastics see page 74

G1.10M:2016, Guide for the Evaluation of Thermoplastic Welds see page 74
APG-DISC – AWS Pocket Guide for Visual Examination of Welds - Discontinuity Causes and Remedies
This guide features an emphasis on the detection and repair of physical weld discontinuities found in common arc welding processes. The pocket guide is an excellent field tool for welders, welding inspectors and CWI’s, and can serve as an integral part of a Welding Inspection (WI) training program. 38 pages
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Qualification
Includes addenda. Covers all fusion welding processes and an exhaustive array of materials used in metal fabrication. Specifies requirements for the qualification of welding procedures, and for performance qualification of welders and welding operators for manual, semiautomatic, mechanized, and automatic welding. 326 pages.
Welding processes include:
• Oxyfuel Gas Welding • Shielded Metal Arc Welding • Gas Tungsten Arc Welding
• Submerged Arc Welding • Laser Beam Welding • Gas Metal Arc Welding
• Flux Cored Arc Welding • Plasma Arc Welding • Electroslag Welding
• Electrogas Welding • Electron Beam Welding • Stud Arc Welding
B2.1 gives a complete coverage of:
• Base Metals • Filler Metals • Qualification Variables
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Hard Copy Order Code: B2.1-BMG $88 / $66
Specifies requirements for qualification of brazing procedure specifications, and for performance qualification of brazers and brazing operators for manual, mechanized, and automatic brazing. 84 pages, 9 tables, 16 figures, 3 forms.
Order Code: B2.2  $88 / $66

This specification provides the requirements for qualification of soldering procedure specifications, solderers, and soldering operators for manual, mechanized, and automatic soldering. The soldering processes included are torch soldering, furnace soldering, induction soldering, resistance soldering, dip soldering, iron soldering, and infrared soldering. Base metals, soldering filler metals, soldering fluxes, soldering atmospheres, and soldering joint clearances are also included. 78 pages.
Order Code: B2.3  $92 / $69

Includes requirements for qualification of Welding Procedure Specifications, welders, and welding operators for manual, semi-automatic, mechanized, and automatic welding. Covers electrofusion, hot gas, socket fusion, butt contact fusion, infrared, extrusion welding, and flow fusion welding processes, as well as base materials, filler materials, qualification variables, and testing requirements. Adopted by NBIC. 54 pages, 21 figures, 12 tables.
Order Code: B2.4  $72 / $54

B5.1:2013-AMD1, *Specification for the Qualification of Welding Inspectors*
Defines qualification requirements for welding inspectors, including experience, satisfactory completion of an examination, and proof of visual acuity. 22 pages.
FREE Download at [go.aws.org/certdocs](go.aws.org/certdocs)
Hard Copy Order Code: B5.1  $68 / $51

Provides the framework for an in-house certification program and written practice for welding inspectors. This specification for the qualification of welding inspector specialists and welding inspector assistants was developed to provide a qualification basis which defines minimum requirements for a welding inspector specialist to demonstrate competence through a combination of education, experience, and examination. 28 pages.
Order Code: B5.2  $68 / $51

B5.4:2005, *Specification for the Qualification of Welder Test Facilities*
Details qualification methods and test facility and assessment requirements including personnel, organization, procedures, equipment, and capability. Includes a non-mandatory annex covering qualification of assessors. 22 pages, 6 chapters, 4 annexes.
FREE Download at [go.aws.org/certdocs](go.aws.org/certdocs)
Hard Copy Order Code: B5.4  $64 / $48
B5.5:2011, Specification for the Qualification of Welding Educators
This specification defines the requirements and program to qualify Welding Educators. The qualification of a Welding Educator is determined by a combination of education and experience, satisfactory demonstration of welding performance qualification tests, and written and practical examinations. The written examination demonstrates the educator's knowledge of welding processes, weld discontinuities, destructive and nondestructive test methods, safety, welding metallurgy, weld symbols, basic arithmetic, codes, and other standards.
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B5.9:2006, Specification for the Qualification of Welding Supervisors
This standard describes the requirements for qualification as a Welding Supervisor and Senior Welding Supervisor. The requirements include education, experience, and a written examination. This standard also covers the levels of qualification and the job functions a qualified Welding Supervisor should be able to perform. ANSI Approved. 18 pages.
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Hard Copy Order Code: B5.9 $60 / $45

B5.14:2009, Specification for the Qualification of Welding Sales Representatives
Establishes the minimum requirements to qualify as a Welding Sales Representative. This qualification is based on the individual's education and experience, and his or her ability to pass an examination. 16 pages, 1 table.
Order Code: B5.14 $60 / $45

B5.15:2010, Specification for the Qualification of Radiographic Interpreters
Defines requirements for qualification of radiographic interpreters, including experience, knowledge, and skills unique to interpretation of radiographic media and determination of acceptance criteria for weldments and adjacent base metal. Now provides examination subjects and weights. 24 pages.
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B5.16:2006, Specification for the Qualification of Welding Engineers
This specification establishes the requirements for qualification of Welding Engineers employed in the welding industry. The minimum experience, examination, application, qualification, and requalification requirements and methods are defined herein. This specification is a method for engineers to establish a record of their qualification and abilities in welding industry work such as development of procedures, processes controls, quality standards, problem solving, etc. 20 pages.
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Hard Copy Order Code: B5.16 $64 / $48

B5.17:2014, Specification for the Qualification of Welding Fabricators
Establishes minimum requirements necessary to qualify as a welding fabricator, based on an examination of the implementation of the fabricator's quality manual to verify compliance to defined requirements. Also defines the welding fabricator's functions and lists the minimum reference materials that should be possessed. 22 pages.
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Hard Copy Order Code: B5.17 $68 / $51
C1.5:2019, *Specification for the Qualification of Resistance Welding Technicians*
Establishes requirements for qualification of resistance welding technicians. Defines minimum experience, examination, application, qualification, and requalification requirements and methods. Provides a method for technicians to establish a record of their qualification and abilities, such as development of machine troubleshooting, processes controls, quality standards, and problem solving. 22 pages, 2 annexes.
Order Code: C1.5 $74 / $56

This guide contains recommendations for establishing a thermal spray operator qualification program. Information related to training, knowledge and skill testing, and coating system inspection methods is provided. Example thermal spray operator qualification tests (TSOQT) parameters and forms are provided, to address common engineering and corrosion control applications using arc, flame, atmospheric plasma, and high velocity oxygen fuel (HVOF) spray processes. 46 pages.
Order Code: C2.16 $71 / $53

This specification on laser beam welding discusses applicable specifications, safety, requirements, fabrication, quality examination, equipment calibration and maintenance, approval of work, and delivery of work. 52 pages.
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Provides processing and quality control requirements for Laser Hybrid Processing. Equipment includes any laser source (examples include, but are not exclusive to CO2, Nd: YAG, Diode, Ruby, Yb Fiber (Fibre), Yb Disk (Disc), Nd: Glass) in combination with an arc welding system (power supply, wire feeder, torch, etc.) as defined by AWS A3.0M/A3.0, Standard Welding Terms and Definitions Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying. 50 pages.
Order Code: C7.6 $76 / $57

Provides requirements for the qualification of robotic arc welding support personnel at three different levels: CRAW-L1, CRAW-O, and CRAW-T. The revisions in this edition align education and experience requirements more realistically with those in industry. This standard is the basis for the AWS Certification of Robotic Arc Welding Personnel (CRAW) program. (See AWS QC19:2002 on page 14.) 22 pages, 2 annexes, 3 figures, 4 tables.
Order Code: D16.4 $64 / $48

EG2.0:2017, *Guide for the Training of Welding Personnel; SENSE Level I-Entry Welders*
This guide contains information to assist education and training organizations in the development and administration of a modular, competency-based training that leads to the qualification of a trainee in accordance with the requirements of AWS QC10, Specification for Qualification and Certification of SENSE Level I-Entry Welders.
Order Code: EG2.0 $76 / $57

ELW Set A (EG2.0:2017, EG2.0 Supplement, and QC10:2017)
Order Code: ELW-SETA $163 / $122
EG2.0:2017, Supplement Guide to the Training of Welding Personnel;
Level I – Entry Welder
The goal of this supplement is to improve welder training by using and teaching the application of AWS SWPSs related to the SENSE Level I-Entry Welder workmanship and performance qualification tests. It provides Workmanship and Welder Performance Qualification Technique Sheets and accompanying SWPSs for each SENSE Level 1 workmanship and welder performance qualification test for production welding.
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SENSE Level II – Advanced Welder
A competency-based curriculum guideline detailing the minimum acceptable skill requirements for training and qualifying advanced welders. 168 pages.
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   Order Code: ELW-SETB $184 / $138

EG3.0:2017, Supplement SENSE Level II – Advanced Welder Training
Performance Testing Procedures
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Order Code: EG3.0 Supp $124 / $93

G1.6:2006, Specification for the Qualification of Plastics Welding Inspectors for Hot Gas,
Hot Gas Extrusion, and Heated Tool Butt Thermoplastic Welds
Defines the qualification requirements for plastics welding inspectors. 22 pages.
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Training

CM:2000, Certification Manual for Welding Inspectors
The best-selling reference used by thousands of CWI examination candidates since 1977. Chapters cover the welding inspector's responsibilities; standards; joint geometry and terminology; symbols; weldability; destructive testing; procedure and welder qualification; welding, brazing, and cutting processes; discontinuities; nondestructive examination; and inspector reports. Each chapter concludes with a self-administered test similar in content and style to the actual CWI exam questions. Features a contemporary layout that includes tip boxes. This book has been invaluable to literally thousands of CWI applicants who studied on their own for the AWS CWI exam. 314 pages, 11 chapters, 152 figures, 23 drawings, 8 tables.
Order Code: CM $200 / $150

Self-study guide for the AWS Certified Welding Supervisor certification exam. Will appeal to everyone concerned with enhancing productivity in the welding workplace. Reviews management systems for welding supervisors, requirements of welds, detailed descriptions of four welding processes (SMAW, GMAW, FCAW, and SAW), welding metallurgy, welding symbols, welding instructions, welding economics, the application of welding standards, welding inspection, health and safety, and work reports and records. The welding economics chapter will help the welding supervisor estimate and control costs for welding jobs. Includes practice questions and additional references. 400 pages, 14 chapters.
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Defines the physical requirements of a welding instruction facility. Intended to give step-by-step guidance to institutions that want to build or convert facilities for welder training. 20 pages.
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Official textbook for CWI preparatory seminar. Helps CWI candidates prepare for the open-book portion of the CWI examination, which tests ability to navigate through a code and find correct answers within a specified time. Includes practice questions similar to the exam questions, and the answers.
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Study Guide for API Standard 1104
Official textbook for CWI preparatory seminar. Helps CWI candidates prepare for the open-book portion of the CWI examination, which tests ability to navigate through the 21st edition of the API 1104 code and find correct answers within a specified time. Includes test questions similar to the exam questions, and the answers. 104 pages, 2 tables, 8 figures.
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Always get the best price from the source: 1-888-WELDING (935-3464) Option 1
### Weld Replicas
These are designed for training structural welding inspectors and welders. It is recommended for those preparing for the Practical (Hands-on) portion of the AWS Certified Welding Inspector examination. It is also excellent for other weld examination training programs requiring hands-on experience.

<table>
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<th>Replica</th>
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### Replica Welding Set
The complete, five-piece set of replicas. Includes Bend Test, Groove Weld Plates (A) & (B), Pipe and T-Joint Replicas.

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- 7 Piece Fillet Weld Set
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- Hi-Lo Gauge
- Protractor
- C4.1 Gauge
- Weld Profile Gauge

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<tr>
<th>Quality training kit contains:</th>
<th>Metric Unit Order Code: 10KITM</th>
<th>$270</th>
</tr>
</thead>
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### WIT-T:2008, Welding Inspection Technology
For at-home study, this official reference textbook for the two-day AWS core seminar for CWI exam preparation is readable, informative, and comprehensive. 329 pages, 10 chapters, 379 figures and photographs.

Order Code: WIT-T $296 / $222

### WIT-W:2008, Welding Inspection Technology Workbook
A companion to Welding Inspection Technology. This publication includes practice questions. 83 pages.

Order Code: WIT-W $84 / $63

### RIT-T:2016, Radiographic Interpretation Textbook
Course designed to provide a basic foundation of knowledge for the Radiographic Interpreter (RI) and to prepare them for the American Welding Society’s Radiographic Interpreter Certification Examinations in accordance with AWS B5.15, Specification for Qualification of Radiographic Interpreters.

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Presented in short easy-to-understand online modules, this self-paced online course provides a comprehensive overview of the basic principles of welding. *see page 13*

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Makes each mathematical concept easy to understand. Practical exercises allow welders, welding students, supervisors and inspectors to apply basic math skills to various aspects of the welding process. *see page 14*
The FABTECH family of events are the premier shows dedicated to welding, metal forming, fabricating, and finishing technologies. FABTECH provides a convenient ‘one-stop shop’ venue where you can meet with world-class suppliers, see the latest industry products and developments, and find the tools to improve productivity, increase profits and discover new solutions to all your metal forming, fabricating, welding and finishing needs. FABTECH events are held in the USA, Mexico, and Canada.

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- 1200-1999 sq. ft. ................................. CAD$30
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**May 12-14, 2020**  
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Attendee admission:  
Free if registered

Exhibitor Pricing:

- 1-200 sq. ft. ..................................... US$40
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- 801+ sq. ft. ........................................ US$34

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**November 18-20, 2020**  
Las Vegas Convention Center  |  Las Vegas, NV

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$50 after the deadline

Exhibitor Pricing:

- 1-299 sq. ft. ........................................ $36
- 300-999 sq. ft. ...................................... $35
- 1000-1999 sq. ft. .................................. $33
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---

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- 25 Fundamentals of Welding Lab Manuals
  - Featuring 100+ guided laboratory activities
- Classroom posters
  - 8 informational
  - 4 decorative

**Digital Material**
- 74 online modules
- 18 instructional videos

**Instructor Resources**
- 100+ detailed lesson plans
- 12 extensive PowerPoint slide decks
- Handouts, student assessments, and checklists
- Standards and supplemental documents including:
  - SWPSs
  - ANSI Z49.1
  - A compendium of Health and Safety Fact Sheets for Welding Education

Member/Non-Member: $3,250

For more information, visit [aws.org/bookstore](http://aws.org/bookstore)
Your Source for Welding and Metallurgy Technology Content

The AWS Digital Library unlocks the world of metallurgy, welding process technology, and related engineering and manufacturing sciences for academia. Our platform gives access to unique content from the American Welding Society which has not been readily available before, including standards, reference materials, periodicals, and instructional videos. Additionally, the AWS Digital Library includes a wide range of journals from across the Internet that have been indexed and made discoverable in the platform.

Users will experience an intuitive, easy-to-use interface that provides multiple pathways to search, discover, and retrieve relevant content, supplementing and enhancing instructional plans, coursework and studies.

The AWS Digital Library delivers a wealth of content to academia and the subscription pricing is developed with academic budgets in mind.

BENEFITS

Unique Content:

- **Standards:** AWS is the sole producer of its welding standards which are the national standards in the USA (ANSI accredited).
- **Reference Books:** Our books include the AWS Welding Handbook series, Welding Metallurgy, Brazing Handbook, as well as others.
- **Periodicals:** Welding Journal, Inspection Trends, and Spraytime are AWS periodicals that have long been member benefits without wide public distribution. Now these periodicals and their archives are delivered through the AWS Digital Library.
- **Added Journal Content:** Indexed journals across all disciplines from the WWW. Generally hard to find titles that contain important discoveries and prior art and now accessible through the periodicals package.
- **Videos:** Instructional videos that give insights into fundamentals, processes, and health and safety considerations of welding and metallurgy.

Affordably Priced:

- The AWS Digital Library is a 12-month subscription model with pricing based on the size of the academic institution.
- An institution can tailor the subscription to meet its needs by being able to pick and choose among the four content packages (standards, references, periodicals, videos). Volume discounts are built in as more of the packages are subscribed to.
- No additional fees for access to archives of the AWS periodicals.
- Subscriptions can be started at the beginning of any month, adhering to the schedule and budget cycle of the academic institution.
# 12-Month Subscription Pricing

<table>
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<th>Institution Size</th>
<th>1 Content Package</th>
<th>2 Content Packages</th>
<th>3 Content Packages</th>
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<td>College (Bachelors is highest degree offered)</td>
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<td>Community College/ Tech School (Associates is highest degree offered)</td>
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<td>$1,700</td>
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Pricing is based on a single campus location only. A campus is defined as a location within a city.

### Other Special Pricing Situations:

- **Online Only Schools**: $12,000
  - Where there are no physical campuses, only a virtual presence.

- **Consortia, State Systems, and Multi-Campus Programs**: Handled on a case-by-case basis
  - Group purchases for multiple entities by an legally authorized body.

### BY THE NUMBERS:

**Standards Package**: Contains all the AWS welding standards, procedures, qualifications, and recommended practices – over 160 documents updated with the most current editions of each valued at over $20,000.

**Reference Package**: Includes the AWS Welding Handbook series, a must-have reference set for engineers, structural designers, technologists, inspectors, welders, welding educators, and others who need to understand this dynamic industry. Other critical reference books include the Brazing Handbook, Welding Metallurgy, and more valued at over $2,000.

**Periodicals Package**: Contains a century of the Welding Journal – from current edition all the way back to volume 1, issue 1 in 1919. Additionally, renowned publications Inspection Trends and Spraytime magazine comprise the package. AWS has also indexed thousands of open access journals from across the internet to ensure the latest developments in engineering technology are discoverable. This package is valued at over $14,000.

**Video Package**: Contains 13 synopses of important process, safety, and fundamentals and theory of welding, metallurgy and related topics. These videos are important precursors to the AWS Online Educational Library valued at $9,000.

---

**Interested in Subscribing?**

Contact 1-800-443-9353 Option 2 or submit an e-mail to: customerservice@aws.org.

For additional information and to create a free trial account to review the Library’s features please refer to the following link: [AWSL.madcad.com](http://AWSL.madcad.com)
The AWS Online Educational Library is designed to meet the needs of today’s welding students and instructors. Built by AWS subject matter experts and learning professionals, AWS online courses feature engaging multimedia content that stimulates learning and long-term retention.

Brief modules, learner-centered navigation, and 24/7 access allow time-strapped students to learn at their own pace from any laptop, phone, or tablet. Equally busy instructors can use the AWS Learning Management System to assign tasks and track student progress.

The AWS Online Educational Library includes the following courses:

- Destructive Testing
- Economics of Welding
- Fabrication Math I
- Fabrication Math II
- Metallurgy I
- Metallurgy II
- Nondestructive Testing
- Welding Fundamentals I
- Welding Fundamentals II
- Welding Fundamentals III
- Welding Safety
- Welding Symbols
- WPS/PQR Explained

The AWS Online Educational Library is affordably priced to fit the budgets of both corporate and academic institutions. Visit [awo.aws.org](http://awo.aws.org) to learn more about each course, and contact us today to receive a personal online demonstration of all the features that the AWS Learning Management System has to offer.
The AWS Online Educational Library is designed to meet the needs of today’s welding students and instructors.

- **24/7 Access** to your courses and records from any device with an internet connection.
- **Practice Quizzes** allow students to measure content retention and comprehension.
- **Learning Management System** allows instructors to view tests and quizzes, and track student progress.
- **Short Modules** allow students to digest information in manageable chunks, and allow instructors more flexibility in the assignment of material.
- **Interactive Elements** at key junctures throughout each module provide students with ample opportunity to master concepts and formulas.
- **Audio Narration** as well as animated graphics, and video footage make even the most complex topics both engaging and easy to understand.
- **Navigation Features** allow students to skip or review course content as needed, giving the student complete control over their learning experience.
- **Learning Objectives** and quizzes allow students to orient themselves and assess their readiness to tackle new material.

### 12-Month Subscription Pricing

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<td>University</td>
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### Open-Enrollment Pricing

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<table>
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<th>Level</th>
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<tbody>
<tr>
<td>Minimum spending commitment</td>
<td>$3,000</td>
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</table>
AWS SENSE for Educational Organizations
The AWS Schools Excelling through National Skill Standards Education (SENSE) program began in 1993 with the award of a grant by the U.S. Department of Education to develop a series of voluntary standards to promote consistency and quality in welding education on a national basis. Currently, there are two levels of SENSE: Level I—Entry Welder and Level II—Advanced Welder. Both levels are designed to facilitate the implementation of a modular welder training program based on best practices. The program is governed by a set of standards: QC10, EG2.0, and EG2.0 Supplement for Level I—Entry Welder and QC11, EG3.0, and EG3.0 Supplement for Level II.

<table>
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<tr>
<th>Fee Description</th>
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<tr>
<td>One-time registration fee for Level I</td>
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<tr>
<td>One-time registration fee for Levels I and II combined</td>
<td>$600</td>
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<tr>
<td>One-time upgrade registration fee from Level I to Level II</td>
<td>$100</td>
</tr>
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</table>

AWS SENSE for Students
A student who graduates from a program which meets the SENSE requirements is eligible for a SENSE completion certificate from AWS. An AWS SENSE Entry Welder is an individual who has achieved full or partial completion status by successfully completing compulsory and optional modules in accordance with the requirements of SENSE Level I—Entry Welder. An AWS SENSE Advanced Welder is an individual who has achieved full or partial completion status by successfully completing compulsory and optional modules in accordance with the requirements of SENSE Level I—Entry Welder and AWS SENSE Level II—Advanced Welder. AWS SENSE Entry Welder and Advanced Welder should not be confused with AWS Certified Welder.

Administrative Fee (per student, per level) $20

In 2019, the AWS Foundation has over $1.4 million dollars in scholarships available for students pursuing education and training in welding and related fields. The AWS Foundation offers various types of scholarships at the National, District, and Section level for four-year, two-year, and certificate programs.

For more information on all scholarship programs, please visit aws.org/scholarships
AWS now delivers ISO Welding Standards

Standards published under ISO/TC 44, “Welding and allied processes and ISO/TC 167, Steel and aluminum structures,” are available in the AWS bookstore at member and nonmember pricing under the following categories:

- Aluminum Structures
- Brazing Materials and Processes
- Equipment for Gas Welding, Cutting and Allied Processes
- Execution of Steel Structures
- Safety and Health
- Personnel Qualification Requirements
- Quality Requirements Including Welding Procedure Specifications
- Representation and Terms
- Resistance Welding and Allied Mechanical Joining
- Soldering Materials
- Steel: Fabrication and Erection
- Steel: Material and Design
- Testing and Inspection of Welds
- Welding and Brazing in Aerospace
- Welding Consumables
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This metric practice guide is based on the International System of Units (SI) as defined in the U.S. Federal Register notice of July 28, 1998, “Metric System of Measurement: Interpretation of the International System of Units for the United States.” It includes the base units, derived units, and rules for their use. Also covered are conversion factors and rules for their use in converting U.S. customary units to SI units. 58 pages.

A2.1, Welding Symbol Charts
Easy-to-read laminated desk and wall charts to complement AWS A2.4:2012, Standard Symbols for Welding, Brazing, and Nondestructive Examination. For desktop, drafting table, shop, or classroom use.
Wall Chart (22” x 38”) Order Code: A2.1-WC $44 / $33
Desk Chart (11” x 17”) Order Code: A2.1-DC $36 / $27
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Buy the Complete Set, SAVE 15%
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A2.4:2012, Standard Symbols for Welding, Brazing, and Nondestructive Examination
Establishes a method of specifying certain welding, brazing, and nondestructive examination information by means of symbols. Contains detailed information and examples for the construction and interpretation of these symbols. This system provides a means of specifying welding or brazing operations and nondestructive examination, as well as the examination method, frequency, and extent. 150 pages.
Order Code: A2.4 $172 / $129

A3.0M/A3.0:2010, Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying
Alphabetical glossary of over 1,400 standard terms and definitions for welding, brazing, soldering, resistance welding, etc., as well as hybrid processes. Each term has one clearly applicable definition, accurately reflecting the term’s use in the joining world. Includes figures to illustrate the use of terms. For completeness, nonstandard terms are also included. Contains a Master Chart of Welding and Allied Processes, and the Joining Method Chart. 160 pages, 62 figures, 5 tables.
Order Code: A3.0 $184 / $138

A3.1:2010, Master Chart of Welding and Joining Processes
24” by 30” chart extracted from A3.0 Order Code: A3.1 $44 / $33

Jefferson’s Welding Encyclopedia
A handy reference for anyone who needs quick access to welding information. Topics are explained, illustrated, and made comprehensible. Includes a historical look at the welding industry. 768 pages, CD-ROM or 8” x 10” best copy available, 18th edition.
Order Code (Book): JWE $180 / $135
Order Code (CD-ROM): JWE CD $180 / $135
Welding Metallurgy, Carbon and Alloy Steels, Volume 1, Fundamentals
Written by the late George E. Linnert, one of America’s most respected and informed metallurgical authorities. Builders, manufacturers, welding shops, colleges, and universities will benefit from this indispensable reference book. Best copy available, 964 pages, 10 appendices, 248 figures, 62 tables, 7” x 10”, fourth edition.
Order Code: WM1.4 $152 / $114

Total Welding Management
Systematic approach to welding excellence and cost reduction. Drawing on 50 years of welding experience, author Jack R. Barckhoff, P.E. gives a step-by-step plan to maximize the productivity and cost efficiency of a welding operation. Explains the management principles, structure, and details needed to transform a welding operation from a cost center into a profit center. A must-read for supervisors, managers, and executives. 200 pages, 35 figures, 20 tables, 6” x 9”.
Order Code: TWM $49.50

The Industrial Hobarts
Peter C. Hobart, former vice president for international business at Hobart Brothers, tells the story of three generations of the Hobart family. 256 pages.
Order Code: TIH-H $40 / $30

Welding – A Journey to Explore Its Past
Welding – A Journey to Explore Its Past is for anyone interested in history or is involved in welding in some form or another including welders, welding inspectors, engineers, educators, students, as well as future welding students. This book strives to answer just a few questions about the origins of welding. Easy to read, it is not written as a text book or an academic paper. It aims to give the reader a basic knowledge of the history of welding, its problems, and its contributions to society. 213 pages; over 600 illustrations
Order Code: WJEP $29.95

Pipe Welding, 1st Edition
A comprehensive guide to pipe welding that will help you take your career potential to the next level. In the surging pipe welding job market, you need to not only know basic welding techniques, such as pipe layout and assembly, you also need to master welding techniques like SMAW, GMAW, FCAW, and GTAW processes. This textbook is the practical guide that can help you become a safe, effective, and marketable pipe welder.
Order Code: PWCE $62

Welding Principles and Applications
This proven guide provides the knowledge and skills you need to complete AWS SENSE Level I and Level II programs, create Workmanship Qualification Specimens, and earn professional certification. Advancing rapidly from basic concepts and processes to today’s most complex, cutting-edge welding technologies and practices, this comprehensive text features valuable information on topics such as welding metallurgy, metal fabrication, weld testing and inspection, joint design, job costing, and environmental and conservation tips. The author opens each section by introducing you to the materials, equipment, setup procedures, and critical safety information you need to execute a specific process successfully, while subsequent chapters focus on individual welding tasks leading to SENSE certificate.
Order Code: WPACE $102
Welder Log Book
The purpose of this log book is to serve as a tool for welding professionals to establish an independently verified log of welding processes to which they are qualified. The verifications (by a Certified Welding Inspector or an appointed person of the welder’s employer) will establish the welder’s compliance with period of effectiveness established in various welding codes.
Order Code: AWS WL $10

Welding Replica Set (RWK-A: REPLICA WELDING KIT)
The five-piece set is designed for training structural welding inspectors and welders. It is recommended for those preparing for the Practical (Hands-on) portion of the AWS Certified Welding Inspector examination. It is also excellent for other weld examination training programs requiring hands-on experience.
Order Code: RWK-A $280 / $210

Pelican Case for the Welding Replica Set
This case was customized to provide safe storage of the RWK-A replica set.
Order Code: Pelican Case $100 / $75

Welding Replica Set with Pelican Case
Order Code: RWK-A-Case $324 / $243
NOW AVAILABLE FOR SALE

Tenth Edition, Volume 1,
Welding and Cutting
Science and Technology

The new TENTH EDITION of the *Welding Handbook*, Volume 1 provides a solid background of the basic science and the latest technological developments in welding, cutting, and allied processes. The volume contains an overview of the most recent research and engineering developments, including codes and standards, certification, qualification, and more.

- 17 chapters cover all the fundamentals, including welding, cutting, joining, and allied processes; 4 chapters discuss metallurgy, physics, heat flow, residual stress and distortion; other important chapters discuss engineering, tooling and positioning, automation, and much more.
- Includes more than 700 drawings, schematics, and photographs, plus 170 tables for categorized or comparative information.
- Volunteer contributors include welding and metallurgy experts from many companies and institutions.

For more information, see page 51 in this Product Catalog or visit [aws.org/weldinghandbook](http://aws.org/weldinghandbook)
ANSI Z49.1:2012, *Safety in Welding, Cutting, and Allied Processes*

Addresses safe practices for performing welding, cutting, and allied processes in the welding environment, and addresses the mutual responsibilities for safety in welding by management, supervisors, educators, industrial hygienists, and welders. Suitable for issuance to the welder and shop management to give practical information to help them perform these functions safely. Specific provisions for oxyfuel gas and arc welding and cutting, resistance welding, electron beam welding, laser beam cutting and welding, and – new in this edition – brazing and soldering. Generally applicable to other welding processes such as submerged arc welding and allied processes. Contains information useful to educators, industrial hygienists, engineers, and other personnel responsible for safety and health in welding. Unions, societies, trade groups, and U.S. military and enforcement agencies – including AWS, Sheet Metal Workers, OSHA, and NIOSH – contributed in the development of this revision of Z49.1. 68 pages, 4 figures, 1 table, 11th edition.

Download FREE pdf at go.aws.org/weldsafe or purchase the printed document.
Order Code: Z49.1 $76 / $57


This document aids the reader in the proper technique for sampling welding fumes and gases in the workplace. Emphasis is placed on positioning the sampling device and calibration of the equipment. 38 pages.
Order Code: F1.1 $68 / $51


Outlines a laboratory method to determine fume generation rates and total fume emission, using a test chamber to collect representative fume samples under carefully controlled conditions. Allows use of alternative media if demonstrated to be equivalent to the glass fiber pad. 24 pages.
Order Code: F1.2 $64 / $48


Provides advice on contaminants that may be present in the welding environment, and presents a strategy for collecting valid samples from the welder’s breathing zone. Recommendations for fume analysis for various elements found in AWS filler metal specifications are presented in a table. 30 pages.
Order Code: F1.3 $68 / $51
This document assists companies in estimating emissions from welding processes for EPA reporting purposes by choosing the simplest applicable method and following its steps. Example calculations are included. 20 pages.
Order Code: F1.6 $64 / $48

F2.2:2001 (R2010), Lens Shade Selector
11” x 17” chart (Reaffirmed 2010).
Order Code: F2.2 $40 / $30

F2.3M:2011, Specification for Use and Performance of Transparent Welding Curtains and Screens
Reasonable and adequate methods for testing, selection, and use of transparent welding curtains and screens. Includes an annex on measurement of spectral transmittance. 24 pages, 3 tables.
Order Code: F2.3 $64 / $48

F3.2M/F3.2:2018, Ventilation Guide for Weld Fume
This document introduces the reader to various types of ventilation systems, including general supply and exhaust and local exhaust, for control of weld fumes. It contains or refers to information on air contaminants found in welding fumes, principles of system design and selection, and drawings that illustrate ventilation techniques. 42 pages.
Order Code: F3.2 $80 / $60

F4.1:2017, Safe Practices for the Preparation of Containers and Piping for Welding, Cutting, and Allied Processes
This standard informs the reader of the necessary safe practices to be followed in the cleaning and preparation of containers and piping for welding or cutting. It describes various methods for cleaning, including water, steam, hot chemical and mechanical, and techniques to be used for their proper preparation, such as inerting. 20 pages.
Order Code: F4.1 $64 / $48

Lower price shown is for AWS members.
Always get the best price from the source: 1-888-WELDING (935-3464) Option 1
Effects of Welding on Health
Reviews of worldwide medical literature on potential health effects of welding-related physical and chemical hazards. Each volume summarizes studies of occupational exposures, information on the human health effects of welding, and the effects of welding on experimental animals and cell cultures over a particular time period. Offers industrial hygienists and safety and medical professionals the necessary background and knowledge to deploy effective protective devices and engineering controls, and to respond to unique exposure situations. Compiled for the AWS Safety and Health Committee.

Download a FREE PDF at go.aws.org/weldhealth or purchase the printed document.

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Price (each) $52 / $39
Effects of Welding on Health, Index—I through XIV
60 pages.
Order Code: EWH-I $36 / $27

Effects of Welding on Health, Vol. I through XIV plus Index
Order the complete set.
Order Code: EWH-ALL $196 / $147

Fumes and Gases in the Welding Environment
Summarizes five experimental studies and several literature surveys (conducted by Battelle Memorial Institute-Columbus Laboratories for the American Welding Society) to evaluate the extent to which ventilation may control the exposure of the welder to these fumes and gases and to investigate the nature of the various fumes and gases generated in arc welding, in brazing with silver-based filler metals, in thermal spraying, and in oxyfuel gas cutting. 244 pages, 82 figures, 99 tables.
Order Code: FUMES AND GASES $144 / $108

Welding Zinc-Coated Steels
Results of a four-year work program from 1972 sponsored by the International Lead Zinc Research Organization, provides procedures and safe practices. 131 pages.
Order Code: WZC $116 / $87

C4.2/C4.2M:2017, Recommended Practices for Oxyfuel Gas Cutting Torch Operation see page 64

C4.3/C4.3M:2018, Recommended Practices for Oxyfuel Gas Heating Torch Operation see page 64

Safety in Welding
Comprehensive overview of welding hazards, safety equipment, ventilation, welding in confined spaces, and safety precautions and specifications in an accessible and engaging format. see page 13

Lower price shown is for AWS members.
Always get the best price from the source: 1-888-WELDING (935-3464) Option 1
### Sheet Metal

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### Plate

*All standards below are adopted by National Board Inspection Code.*

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*Downhill progression on root pass. All other vertical position passes are up hill.*
## Primarily Pipe

(All standards below are adopted by National Board Inspection Code, except B2.1-1-202)

### Carbon Steel

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<th>Welding Procedure</th>
<th>Requirements</th>
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<td>MIL-70T-1 or MIL-71T-1</td>
<td>As-welded or PWHT B2.1-1-304:2016</td>
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<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTAW</td>
<td>MIL-70T-1 or MIL-71T-2</td>
<td>As-welded or PWHT B2.1-1-305:2018</td>
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<td>1/8&quot; – 1-1/2&quot;</td>
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### Stainless Steel

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<th>Welding Procedure</th>
<th>Requirements</th>
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<td>MIL-70S-3</td>
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<td>MIL-701B-M</td>
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<td>MIL-70T-1 or MIL-71T-1</td>
<td>As-welded or PWHT B2.1-1-206:2016</td>
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<td>1/8&quot; – 1-1/2&quot;</td>
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<td>MIL-3XX-XX</td>
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<td>1/8&quot; – 1-1/2&quot;</td>
<td>FCAW-G</td>
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<td>1/8&quot; – 1-1/2&quot;</td>
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<td>As-welded or PWHT B2.1-1-305:2018</td>
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<td>1/8&quot; – 1-1/2&quot;</td>
<td>SMAW</td>
<td>MIL-3XX-XX</td>
<td>As-Welded B2.1-8-309:2018</td>
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### Reference Materials Publications

- B2.1-1-5A-222:1999
- B2.1-1-5A-224:1999
- B2.1-1-8-212:2001
- B2.1-1-8-211:2018
- B2.1-1-8-210:2018
- B2.1-1-8-209:2018
- B2.1-1-8-208:2018
- B2.1-1-8-207:2018
- B2.1-1-8-309:2018

**FCAW limited to uphill progression only when welding in the vertical position.**

**GMAW spray transfer limited to flat position only for groove welds.**

### NAVAL Applications

(Supports requirements of NAVEA S9074-AQ-GIB-010/248)

**Prices: The user-license one-time fee for each SWPS is $204 ($272 for non-members). Not adopted by ASME typesetter.**

**Carbon Steel**

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Welding Process</th>
<th>Welding Procedure</th>
<th>Requirements</th>
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C3.2M/C3.2:2019, Standard Method for Evaluating the Strength of Brazed Joints
Describes the test methods used to obtain reliable data on the strength of metal-to-metal, metal-to-non-metal, and nonmetal-to-nonmetal joints. 42 pages, 16 figures, 4 tables.
Order Code: C3.2 $76 / $57

C3.3:2008 (R2016), Recommended Practices for the Design, Manufacture, and Examination of Critical Brazed Components
This standard lists the necessary steps to assure the suitability of brazed components for critical applications. Although such applications vary widely, they have certain common considerations with respect to materials, design, manufacture, and inspection. It is the intent of this document to identify and explain these common considerations and the best techniques for dealing with them. It is beyond the scope of this document to provide specific details on these techniques, which the user must adapt to fit each particular application. 56 pages, 4 tables, 1 figure (Reaffirmed 2016).
Order Code: C3.3 $72 / $54

C3.4M/C3.4:2016, Specification for Torch Brazing
This specification presents the minimum fabrication, equipment, and process procedure requirements, as well as inspection requirements for the torch brazing of steels, stainless steels, copper, copper alloys, and heat- or corrosion-resistant alloys and other materials that can be adequately torch brazed (the torch brazing of aluminum alloys is addressed in AWS C3.7M/C3.7, Specification for Aluminum Brazing). This specification provides criteria for classifying torch brazed joints based on loading and the consequences of failure and quality assurance criteria defining the limits of acceptability in each class. The specification defines acceptable torch brazing equipment, materials, and procedures as well as the required inspection for each class of joint. 28 pages.
Order Code: C3.4 $68 / $51

C3.5M/C3.5:2016-AMD1, Specification for Induction Brazing
Includes amendment. This specification provides the minimum fabrication, equipment, and process procedure requirements, as well as inspection requirements for the induction brazing of steels, copper, copper alloys, and heat- and corrosion-resistant alloys and other materials that can be adequately induction brazed (the induction brazing of aluminum alloys is addressed in AWS C3.7M/C3.7, Specification for Aluminum Brazing). This specification provides criteria for classifying induction brazed joints based on loading and the consequences of failure and quality assurance criteria defining the limits of acceptability in each class. The specification defines acceptable induction brazing equipment, materials, and procedures, as well as the required inspection for each class of joint. 30 pages.
Order Code: C3.5 $68 / $51

C3.6M/C3.6:2016, Specification for Furnace Brazing
This specification provides the minimum fabrication, equipment, material, process procedure requirements, as well as inspection requirements for the furnace brazing of steels, copper, copper alloys, and heat- and corrosion-resistant alloys and other materials that can be adequately furnace brazed (the furnace brazing of aluminum alloys is addressed in AWS C3.7M/C3.7, Specification for Aluminum Brazing). This specification provides criteria for classifying furnace brazed joints based on loading and the consequences of failure and quality assurance criteria defining the limits of acceptability in each class. This specification defines acceptable furnace brazing equipment, materials, and procedures, as well as the required inspection for each class of joint. 30 pages.
Order Code: C3.6 $68 / $51
C3.7M/C3.7:2011, Specification for Aluminum Brazing
The minimum fabrication, equipment, material, process procedure, and inspection requirements for the brazing of aluminum by atmosphere furnace, vacuum furnace, and flux processes. Criteria for classifying aluminum brazed joints based on loading and the consequences of failure and quality assurance criteria defining the limits of acceptability of each class. 32 pages.
Order Code: C3.7  $64 / $48

C3.8M/C3.8:2011, Specification for the Ultrasonic Pulse-Echo Examination of Brazed Joints
Specifies requirements for the contact and immersion pulse-echo ultrasonic examination of brazed joints. Provides the minimum requirements for equipment, procedures, and the documentation of such tests. 28 pages, 4 figures.
Order Code: C3.8  $64 / $48

C3.9M/C3.9:2009, Specification for Resistance Brazing
Minimum fabrication, equipment, material, and process procedure requirements for resistance brazing of steels, copper and alloys, heat and corrosion-resistant materials, and other materials that can be resistance brazed. Criteria for classifying resistance-brazed joints based on loading and consequences of failure, and quality assurance criteria. 24 pages.
Order Code: C3.9  $64 / $48

C3.11M/C3.11:2011, Specification for Torch Soldering
Describes relevant equipment, fabrication procedures, and quality (inspection) requirements for torch soldering. Includes joint classification criteria based on loading and consequences of failure, and quality assurance criteria for each class. 28 pages.
Order Code: C3.11  $64 / $48

This specification provides the minimum requirements for equipment, materials, processing procedures as well as inspection for metal and ceramic base materials that can be furnace soldered. It provides criteria for classifying furnace soldered joints based on loading and the consequences of failure. It also provides quality assurance criteria that define the limits of acceptability in each class. This specification describes acceptable furnace soldering equipment, materials, and procedures, as well as the required inspection for each class of solder joint so produced. 28 pages.
Order Code: C3.12  $64 / $48

see page 26

see page 26

A5.8M/A5.8:2011-AMD1, Specification for Filler Metals for Brazing and Braze Welding
see page 83

A5.31M/A5.31:2012, Specification for Fluxes for Brazing and Braze Welding
see page 83
Brazing Handbook
A comprehensive, organized survey of the basics of brazing, processes, and applications. Addresses the fundamentals of brazing, brazement design, brazing filler metals and fluxes, safety and health, and many other topics. A must-have for all brazers, brazing engineers, and students. 740 pages, 36 chapters, 3 appendices, 308 figures, 116 reference tables, fifth edition.
Order Code: BRH
$144 / $108

Soldering Handbook
Covers soldering fundamentals, technology, materials, substrate materials, fluxes, pastes, assembly processes, inspection, and environment. Covers today's advanced joining applications and emphasizes new materials, including higher strength alloys; predictive performance; computer modeling; advanced inspection techniques; new processing concepts, including laser heating; and the resurgence in ultrasonic soldering. 579 pages, 299 figures, 112 tables.
Order Code: SHB
$160 / $120

Guideline for Hand Soldering Practices
This guideline serves as a primer for students, instructors, process engineers, and technical managers involved with manufacturing processes that require hand soldering practices. Instructors and students can consider this guideline as a reference text to instruction manuals, work control procedures, and drawings. Process engineers and technical managers will find this guideline to be an excellent resource for troubleshooting hand soldering processes.
A complementary document to the Soldering Handbook, this guideline is organized to allow quick access to hand soldering knowledge for application to process development and shop floor instructions. 122 pages.
Order Code: GHSP
$100 / $75

PURCHASE BRAZING AND SOLDERING HANDBOOK CHAPTERS
Get valuable information from the Brazing Handbook and Soldering Handbook on specific topics without the need to purchase the whole book. Individual chapters of both books are now available as a PDF download from aws.org/standards. Nonmember price: $24 each; Member price: $18 each.

BRAZING HANDBOOK CHAPTERS
1: Basics of Brazing BHC1 $24 / $18
2: Brazement Design BHC2 $24 / $18
3: Brazing Filler Metals BHC3 $24 / $18
4: Fluxes and Atmospheres BHC4 $24 / $18
5: Pre cleaning and Surface Preparation BHC5 $24 / $18
6: Assembly and Fixturing BHC6 $24 / $18
7: Corrosion of Brazed Joints BHC7 $24 / $18
8: Inspection of Brazed Joints BHC8 $24 / $18
9: Codes and Other Standards BHC9 $24 / $18
10: Safety and Health BHC10 $24 / $18
## Brazing & Soldering

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Lower price shown is for AWS members.
Always get the best price from the source: 1-888-WELDING (935-3464) Option 1

Specifies requirements for gas tungsten arc welding of austenitic stainless steel tube and pipe at least 1/4 inch (6 mm) diameter in the fabrication of sanitary processing systems for handling products for human and animal consumption. May also be applied to maintenance of food processing equipment. Addresses procedure and performance qualification, fabrication, visual examination requirements, and documentation. 34 pages, 2 figures.

Order Code: D18.1  
$68 / $51


Laminated sheet with color photograph shows degrees of coloration inside an austenitic stainless steel tube with increasing amounts of oxygen in the backing shielding gas. Suitable as a specifying tool and visual examination guide.

8-1/2" X 11"  Order Code: D18.2  
$52 / $39

13" X 19"  Order Code: D18.2XL  
$64 / $48


This specification provides the requirements for welding of tanks, vessels, and other equipment used in food processing plants and other areas where sanitary (hygienic) applications are required. The document addresses qualification, fabrication, extent of visual examination, acceptance criteria, and documentation requirements. 32 pages.

Order Code: D18.3  
$68 / $51

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*Always get the best price from the source: 1-888-WELDING (935-3464) Option 1*

AWS would like to thank our standing partners for their dedication to improving the technology and manufacture of welded products.
C1.1M/C1.1:2019, *Recommended Practices for Resistance Welding*
Covers spot, seam, projection, flash, and upset welding, as well as weld bonding for uncoated and coated carbon and low-alloy steels, aluminum alloys, stainless steels, nickel, nickel-base alloys, cobalt-base alloys, copper and alloys, and titanium and alloys. Details equipment and setup, welding variables, joint preparation, cleaning, welding schedules and parameters, weld quality testing, safety, and health. 132 pages, 58 tables, 39 figures.
Order Code: C1.1 $120 / $90

C1.4M/C1.4:2017, *Specification for Resistance Welding of Carbon and Low-Alloy Steels*
Provides the shear strength and weld button diameter requirements for carbon steel and low-alloy steel sheet resistance and projection welds. 34 pages, 5 figures, 6 tables.
Order Code: C1.4 $68 / $51

C1.5:2019, *Specification for the Qualification of Resistance Welding Technicians*
see page 28


D8.1M:2013, *Specification for Automotive Weld Quality — Resistance Spot Welding of Steel* see page 68


J1.1M/J1.1:2013, *Specification for Resistance Welding Controls*
Provides nomenclature pertaining to the design, construction, and programming of resistance welding controls. Standard calibration and performance parameters as well as labeling and documentation requirements are outlined. Promotes standardization, safety, and proper application of resistance welding controls. 46 pages, 13 figures, 1 table.
Order Code: J1.1 $72 / $54

This guide provides general instructions for the installation, operation, and maintenance of common types of resistance welding equipment. Generic preventative maintenance schedules and equipment troubleshooting recommendations are provided as an overview of common weld qualification techniques and corrective actions to common weld conditions. 42 pages, 2 figures.
Order Code: J1.2 $72 / $54
RWMA Bulletin #14: Maintenance Manual for Resistance Welding Machines
Explains installation, maintenance, and operation of a resistance welding machine’s electrical, pneumatic, hydraulic and cooling systems. Includes a trouble-shooting section. Useful for maintenance personnel and operators.
Order Code: RW14 $46 / $35

RWMA Bulletin #16: Resistance Welding Equipment Standards
RWMA standards for welding equipment, including electrical, electrode, and fluid-power standards.
Order Code: RW16 $158 / $119

RWMA Bulletin #34: Manufacturer’s Cross Reference of Standard Resistance Welding Electrode Numbers and Alloys
An extensive cross-reference of standard resistance welding electrodes and alloys recognized by the RWMA. 13 pages.
Order Code: RW34 $48 / $36

Provides information on different welding processes, types and weldability of different materials, and equipment such as machines, electrodes, jigs, fixtures, transformers, controls, and power supplies. Also covers control and maintenance. 468 pages, 25 chapters, 2 appendices (including an index), 308 figures, 85 tables. 8-3/4” x 11-1/4”.
Order Code: RWM $132 / $99

Introduction to Resistance Welding Video
Comprehensive training video illustrates technique, control, and application. Covers spot, projection, seam, and flash/butt welding. Explains basic principles, machine components and setup, electrodes, tooling, controls, and transformers. Ideal for classroom and seminar use, and for introducing a company’s personnel to resistance welding. DVD, 52 minutes.
Order Code: RWVID $132 / $99

QC20:2011, Specification for AWS Certification of Resistance Welding Technicians
see page 23

Lower price shown is for AWS members.
Always get the best price from the source: 1-888-WELDING (935-3464) Option 1
Provides guidance for assessing the capability and accuracy of computational weld mechanics (CWM) models. Presents current practices for heat transfer, microstructure, residual stress, and distortion calculations. Provides general guidance for implementing verification and validation (V&V) of computational models for complex systems in weld mechanics. 40 pages, 7 figures.
Order Code: A9.5  $72 / $54

This standard establishes safety requirements with respect to the design, manufacture, maintenance, and operation of arc welding robot systems and ancillary equipment. It also helps to identify and minimize hazards involved in maintaining, operating, integrating, and setting up of arc welding robot systems. 33 pages.
Order Code: D16.1  $76 / $57

Performance recommendations for evaluating components of a typical robotic or automatic welding installation. A pin arrangement and specific pin function for each location in a standardized 37-pin connector are proposed. 32 pages, 4 figures, 4 tables.
Order Code: D16.2  $68 / $51

Provides recommendations and guidelines for the safe application of robotic arc welding systems. 36 pages, 1 figure, 4 tables.
Order Code: D16.3  $68 / $51

see page 28

AWS D16.6M/D16.6, *Specification for Robot Arc Welding Training and Testing Cell*
Applies to the recommended design, integration, installation, and use of robotic arc welding systems used to train and certify operators and technicians under the AWS Certified Robotic Arc Welding (CRAW) program.
Order Code: D16.6  $68 / $51

Lower price shown is for AWS members. Always get the best price from the source: 1-888-WELDING (935-3464) Option 1
C2.16/C2.16M:2017, Guide for Thermal Spray Operator Qualification Programs
Order Code: C2.16
$88 / $66

C2.18-93R, Guide for the Protection of Steel with Thermal Sprayed Coatings of Aluminum and Zinc and Their Alloys and Composites
Order Code: C2.18
$72 / $54

Order Code: C2.19
$84 / $63

C2.20/C2.20M:2016, Specification for Thermal Spraying Zinc Anodes on Steel Reinforced Concrete
Order Code: C2.20
$68 / $51

C2.21M/C2.21:2015, Specification for Thermal Spray Equipment Acceptance Inspection
Order Code: C2.21
$72 / $54

Order Code: C2.23
$72 / $54

C2.25/C2.25M:2012 (R2018), Specification for Thermal Spray Feedstock—Wire and Rods
Order Code: C2.25
$72 / $54
ASM Handbook Volume 5A: Thermal Spray Technology
Co-published by the Thermal Spray Society and ASM, this volume provides an introduction to modern thermal spray processes, including plasma spray, high velocity oxyfuel, and detonation gun deposition; with a description of coating properties, their wear, corrosion, and thermal barrier characteristics. Principles, types of coatings, applications, performance, and testing/analysis are covered. 400 pages, hardcover.
Order Code: TST $283 / $212

Thermal Spraying Practice, Theory, and Application (Historical)
The thermal spraying processes are specialized, yet have a wide ranging utilization in both manufacturing and maintenance. There are many components and variables involved, which, when working together and properly applied, produce an effect far greater than indicated when they are considered individually. Yet each component and variable must be understood to permit the proper selection and operation of a particular process. With this background, the user is then in a position to tailor the process to a particular application. 202 pages, 48 figures, 59 tables.
Order Code: TSS $136 / $102
Consists of a plastic gauge with samples of oxygen-cut surfaces, a list of descriptive terms, and an accompanying chart. 18 pages (Reaffirmed 2009).
Order Code: C4.1 SET $68 / $51

C4.2/C4.2M:2017, *Recommended Practices for Oxyfuel Gas Cutting Torch Operation*
These recommended practices for oxyfuel gas cutting include the latest procedures to be used in conjunction with oxyfuel gas cutting equipment and the latest safety recommendations. Complete lists of equipment are available from individual manufacturers. 50 pages.
Order Code: C4.2 $72 / $54

Describes the best and most practical methods for safe and effective operation of oxyfuel gas heating torches, including information on equipment safety, setup, shutdown and operating procedures, and equipment maintenance. 36 pages, 10 figures, 4 tables.
Order Code: C4.3 $71 / $54

Describes methods and techniques for shaping and straightening metal parts (including steel plate, pipes, angles, channel, T bar, and compound structures) by careful application of heat. Presents theory and mathematical formulas for developing heat shaping patterns. Topics include oxyfuel gas equipment (torches, tips, regulators, fuel gases, gas cylinders, and bulk supply); torch procedures for spot, line, and V heating patterns; and safety procedures. Figures show where to place heating patterns for straightening, forming, or bending. 56 pages, 39 figures, 4 tables.
Order Code: C4.4 $76 / $57

C4.5M:2012, *Uniform Designation System for Oxyfuel Nozzles*
Proposes a marking system that includes the name, registration trademark, correct fuel gas symbol, nozzle cutting capacity, and a code or part number to permit easy reference to the manufacturer’s operating data. Provides a common identification system that will result in the safe operation of oxyfuel nozzles, including cutting, welding, heating, and brazing. 18 pages, 1 table, SI (metric) units.
Order Code: C4.5 $60 / $45

Provides the quantitative and qualitative methods for describing and classifying oxyfuel flame, plasma, and laser cutting. 50 pages, 5 annexes, 27 figures, 8 tables (Reaffirmed 2012).
Order Code: C4.6 $76 / $57

C5.3:2000 (R2011), *Recommended Practices for Air Carbon Arc Gouging and Cutting*
Helps the operator establish the correct air pressure, amperage, voltage, and techniques. Includes gouging recommendations and a handy troubleshooting guide. 38 pages, 11 figures, 10 tables (Reaffirmed 2011).
Order Code: C5.3 $68 / $51
C6.1-89 (R2009), *Recommended Practices for Friction Welding*
Describes friction welding fundamentals and basic equipment requirements. Suggested procedure qualification, inspection methods, and joint designs are detailed. Typical mechanical property data are referenced. 46 pages, 3 annexes, 9 figures, 2 tables. (Reaffirmed 2009).
Order Code: C6.1  $68 / $51

Provides for the qualification of friction welding machines, procedures, and training of welding operators. Qualification of welding procedure specifications includes the material specifications involved, weld joint design, and destructive and nondestructive examination requirements, as well as guidelines for categories of quality assurance. Qualification of welding equipment includes weld parameter control and weld reproducibility. 32 pages, 1 table, 4 forms.
Order Code: C6.2  $68 / $51

Presents descriptions of electron beam welding equipment and procedures for welding a wide range of similar and dissimilar metals and thicknesses. Includes sections on safety, process fundamentals, equipment and maintenance, metallurgical and general process considerations, inspection and testing of welds, training and qualification of operators, weld process and procedure development, practical examples, and power curves for various alloys. Also discusses electron beam braze welding, cutting, drilling, surfacing, additive manufacturing, surface texturing, and heat treating. 150 pages, 76 figures, 15 tables.
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Covers common applications of the process, including drilling and transformation hardening. Describes equipment and procedures. Practical information, including figures and tables, should prove useful in determining capabilities in the processing of various materials. 142 pages, 85 figures, 8 tables.
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This specification on electron beam welding discusses applicable specifications, safety, requirements, fabrication, quality examination, equipment calibration and maintenance, approval of work, and delivery of work. 36 pages.
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D17.1:2017 AMD2, Specification for Fusion Welding for Aerospace Applications
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Order Code: D17.1 $176 / $132
Spanish Edition (2017) $57

D17.2/D17.2M:2019, Specification for Resistance Welding for Aerospace Applications
This specification provides the general resistance welding requirements for aerospace resistance spot and seam welding of aluminum, magnesium, iron, nickel, cobalt, and titanium-based alloys. You’ll also find requirements for machine and welding schedule qualification, production witness samples, and inspection and acceptance criteria for aerospace hardware. Intended to replace MIL-W-6858D and AMS-W-6858A. 60 pages, 11 figures, 13 tables.
Order Code: D17.2 $80 / $60

Specifies general requirements for friction stir welding of aluminum alloys for aerospace applications. Includes the requirements for weldment design, qualification of personnel and procedures, fabrication, and inspection. 58 pages, 28 figures, 5 tables.
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Order Code: D8.2 $72 / $54

D8.8M:2014, Specification for Automotive Weld Quality – Arc Welding of Steel
Provides the minimum quality requirements for arc welding of various types of automotive and light truck components. Covers the arc and hybrid arc welding of coated and uncoated steels. 28 pages, 17 figures.
Order Code: D8.8 $64 / $48

Helps predict performance of sheet steel that is resistance spot welded for use in auto manufacturing. Also addresses equipment setup, electrode installation and dressing, electrode endurance testing, current level and range assessment, weld property testing, current break-through testing, and design of experiments testing. 124 pages, 47 figures, 22 tables.
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This specification covers the arc welding of automotive components that are manufactured from aluminum alloys. 42 pages.
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Order Code: D14.3 $92 / $69
Chinese Edition $92 / $69

Specifies common acceptance criteria for carbon and low-alloy steel welded joints in machines and equipment subject to static and dynamic loading. Covers classification of welded joints, weld joint design, workmanship, quality control requirements and procedures, welding operator and procedure qualification, weld joint inspection (visual, radiographic, ultrasonic, magnetic particle, liquid penetrant), repair, and postweld treatments. Describes the effect of weld joint geometry, welding practices, and quality control on allowable stress levels, and provides practices for qualification and examination of welded joints in machinery and equipment fabrication. Contains figures and tables with typical joint details, nondestructive examination techniques, and weld-inspection criteria. 122 pages, 38 figures, 16 tables.
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Presents the current minimum standards and guidelines for the welded fabrication and repair of presses and press components. Addresses classification, weld joint design, stresses, tolerances, welder qualification, and a welding quality program. 158 pages, 69 figures, 24 tables, 3 forms.
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Provides guidance on surfacing, repair, and reconditioning of industrial mill rolls in the heavy metals, paper, plastic, and lumber industries. Emphasizes the use of submerged arc welding, but also addresses gas metal arc welding, and flux cored arc welding, with suitable modifications. Applicable to electroslag cladding. Covers welding, postweld heat treating, finish machining, inspection, and record keeping. Provides detailed guidelines, tables, figures, and forms for use in establishing documented, qualified Welding Procedure Specifications. 66 pages, 20 figures, 13 tables.
Order Code: D14.7 $80 / $60

see page 65

Provides standards for the design and manufacture of pressure containing welded joints and structural welded joints used in the manufacture of hydraulic cylinders. Manufacturer’s responsibilities are presented as they relate to the welding practices that have been proven successful within the industry in the production of hydraulic cylinders. Included are sections defining welding procedure qualification, welder performance qualification, workmanship and quality requirements, as well as inspection requirements and repair requirements. 49 pages, 17 figures, 6 tables.
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A5.35/A5.35M:2015-AMD1, Specification for Covered Electrodes for Underwater Wet Shielded Metal Arc Welding
Includes amendment. This specification establishes the requirements for classification of covered electrodes for underwater wet shielded metal arc welding. The requirements include mechanical properties of weld metal, weld metal soundness, and usability of electrode. Requirements for composition of the weld metal, standard sizes and lengths, marking, manufacturing, and packaging are also included. 36 pages, 3 figures, 6 tables.
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Standard Welding Procedure, Specifications for Naval Applications (SWPS-Ns)
see page 49

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The purpose of this standard is to present methods for the production of high quality welds through the use of qualified welders using approved welding procedures, materials, and equipment. Its purpose is also to present inspection methods to ensure the proper analysis of welding quality through the use of qualified technicians and approved methods and equipment. It applies to both new construction and in-service welding.

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**D10.4-86R, Recommended Practices for Welding Austenitic Chromium-Nickel Stainless Steel Piping and Tubing**

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Incorporates results of research on the effects of atmospheric exposure during welding. Provides coverage on power sources, tungsten electrodes, titanium base metal grades, filler metals, joint design and preparation, pickling and cleaning, fitting and tacking, preweld cleaning, gas shielding, welding procedures and techniques, and preheat and postweld heat treatment. 28 pages, 4 figures, 7 tables.

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A comprehensive guide for the selection of filler metals that incorporates all the important weld metal characteristics. 56 different base metals and 13 filler metals are evaluated for weldability, strength, ductility, corrosion resistance, service temperature and color matching. 42 pages, 5 figures, 13 tables.

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Presents guidelines for welding the root pass of metal pipe butt joints with an open root or a consumable insert. Joint designs, assembly, consumable insert configurations, base metals, filler metals, and purging are discussed. Applicable arc welding processes and techniques are described. 34 pages, 11 figures.
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Contains recommended practices for welding piping systems of sizes DN 200 (NPS 8) and under and wall thickness of 13mm (0.5 in) and under for low-pressure heating, air conditioning, refrigeration, and water supply, as well as some gas and chemical systems. Covers carbon steels such as ASTM A53, A106, A135, A179, A524, A587, and API-5L, Grades A25, A and B, and X42 joined using oxyacetylene, shielded metal arc, gas tungsten arc, gas metal arc, and flux cored arc welding. Explains techniques for preheating, joint preparation, alignment and positioning, fittings, and root and hot passes. Does not address the needs of pipe steels or service conditions that may require postweld heat treatment. 48 pages, 19 line drawings and photographs, 10 tables.
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Extensive guidance on multipass orbital machine pipe groove welding for both plant and transmission applications. 76 pages, 29 figures, 1 table.
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This standard presents a detailed discussion of the metallurgical and welding characteristics and weldability of duplex stainless steel used in piping and tubing. 38 pages.
Order Code: D10.18 $72 / $54


D18.2:2009, Guide to Weld Discoloration Levels on Inside of Austenitic Stainless Steel Tube see page 58

F4.1:2017, Safe Practices for the Preparation of Containers and Piping for Welding, Cutting, and Allied Processes see page 45

Pipe Welding Standard Welding Procedure Specifications (SWPSs) see page 49
G1.1M/G1.1:2006, *Guide to Ultrasonic Assembly of Thermoplastics*
Details the ultrasonic equipment and processes used in fabricating thermoplastic parts. 94 pages, 45 figures, 9 tables.
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G1.6:2006, *Specification for the Qualification of Plastics Welding Inspectors for Hot Gas, Hot Gas Extrusion, and Heated Tool Butt Thermoplastic Welds* see page 29

This standard lists and describes flaws and defects in hot gas, hot gas extrusion, heated tool butt fusion, socket fusion, electrofusion, and flow fusion welded joints in thermoplastics. Its intent is to make possible a generally valid evaluation giving consideration to graded quality requirements. 60 pages
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D15.2/D15.2M:2013, *Recommended Practices for the Welding of Rails and Related Rail Components for Use by Rail Vehicles*
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D11.2-89 (R2006), Guide for Welding Iron Castings
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Welding Zinc-Coated Steels see page 47

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56 pages, 17 figures, 14 tables, 7 annexes. (Reaffirmed 2014).
Order Code: A4.2 $72 / $54

26 pages (Approved by ANSI in 2018).
Order Code: A4.3 $72 / $54

A4.4M:2001 (R2016), Standard Procedures for Determination of Moisture Content of Welding Fluxes and Welding Electrode Flux Coverings
32 pages, 4 figures, 3 tables (Reaffirmed 2016).
Order Code: A4.4 $72 / $54

24 pages, 3 figures.
Order Code: A4.5 $72 / $54

A5.01M/A5.01:2019 (ISO 14344:2010 MOD), Welding Consumables – Procurement of Filler Metals and Fluxes
Essential to today’s purchaser. Provides a means by which the information needed for the procurement of welding consumables to an AWS, ISO, or other filler metal specification can be stated clearly, concisely, and completely. 38 pages, 9 tables.
Order Code: A5.01 $72 / $54

A5.02/A5.02M:2007, Specification for Filler Metal Standard Sizes, Packaging, and Physical Attributes
Prescribes size, package, appearance, and identification requirements for filler metals for solid, tubular, bare, covered, and strip electrodes used in fusion processes, but not brazing, braze welding, thermal spraying, or granular products such as SAW fluxes. 28 pages, 4 figures, 4 tables.
Order Code: A5.02 $72 / $54

A5.32M/A5.32:2011 (ISO 14175:2008 MOD), Welding Consumables – Gases and Gas Mixtures for Fusion Welding and Allied Processes
42 pages, 5 tables.
Order Code: A5.32 $72 / $54

C2.25/C2.25M:2012 (R2018), Specification for Thermal Spray Feedstock—Wire and Rods
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Lower price shown is for AWS members.
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### Save When You Buy Multiple A5 Filler Metal Specs

These crucial specifications give the purchaser and distributor of filler metals a dependable, efficient recognition system. The classifications defined in these standards allow you to identify filler metals uniformly, without consideration of manufacturers’ trade names or brand names. AWS A5 Filler Metal Specifications are ANSI Approved and Dept. of Defense Adopted. For multiple purchases, contact 1-888-WELDING (935-3464) Option 1

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This code covers the arc and braze welding requirements for nonstructural sheet metal fabrications using the commonly welded metals available in sheet form. It provides standardized requirements for the qualification, production, and acceptance of welding or braze welding of nonstructural sheet metal components. 75 pages.
Order Code: D9.1
$84 / $63

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D8.9M:2012, Test Methods for Evaluating the Resistance Spot Welding Behavior of Automotive Sheet Steel Materials see page 68

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