AWS ONLINE LEARNING:
WELDING EDUCATION ON THE GO

- FREE* Online Safety in Welding course.

Learn more at aws.org/courses

*Safety in Welding Course is free to view. For Certificate of Completion or PDHs, enrollment fee will be required.
### NEW IN THIS CATALOG

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2.4:2020, Standard Symbols for Welding, Brazing, and Nondestructive Examination</td>
</tr>
<tr>
<td>A4.3:1993-ADD1, Standard Methods for Determination of the Diffusible Hydrogen Content of Martensitic, Bainitic, and Ferritic Steel Weld Metal Produced by Arc Welding</td>
</tr>
<tr>
<td>A5.39/A5.39M, Specification for Flux and Electrode Combinations for Submerged Arc and Electroslag Joining and Surfacing of Stainless Steel and Nickel Alloys</td>
</tr>
<tr>
<td>C3.8M/C3.8:2020, Specification for the Ultrasonic Pulse-Echo Examination of Brazed Joints</td>
</tr>
<tr>
<td>AASHTO/AWS D1.5M/D1.5:2020, Bridge Welding Code</td>
</tr>
<tr>
<td>F4.2:2020, Safety Guidelines for Proper Selection of Welding Cables</td>
</tr>
</tbody>
</table>

### CONTENTS

#### PROFESSIONAL AND CAREER DEVELOPMENT

<table>
<thead>
<tr>
<th>RESOURCES</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certification, Endorsement, and Accreditation Programs</td>
<td>6</td>
</tr>
<tr>
<td>Conference Programs</td>
<td>26</td>
</tr>
<tr>
<td>Instructor-Led Seminar Programs</td>
<td>14</td>
</tr>
<tr>
<td>Online Courses</td>
<td>16</td>
</tr>
<tr>
<td>Online Code Clinics</td>
<td>18</td>
</tr>
<tr>
<td>Industry Partner Courses</td>
<td>19</td>
</tr>
<tr>
<td>Membership Programs</td>
<td>27</td>
</tr>
<tr>
<td>Publications &amp; Resources</td>
<td></td>
</tr>
<tr>
<td>Certification</td>
<td>30</td>
</tr>
<tr>
<td>Inspection</td>
<td>32</td>
</tr>
<tr>
<td>Qualification</td>
<td>33</td>
</tr>
<tr>
<td>Training</td>
<td>37</td>
</tr>
</tbody>
</table>

#### EXPOSITION PROGRAMS

<table>
<thead>
<tr>
<th>FABTECH Events</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FABTECH USA</td>
<td>39</td>
</tr>
<tr>
<td>FABTECH Mexico</td>
<td>39</td>
</tr>
<tr>
<td>FABTECH Canada</td>
<td>39</td>
</tr>
</tbody>
</table>

#### ACADEMIC RESOURCES

| Fundamentals of Welding Curriculum | 22 |
| AWS Digital Library | 40 |
| AWS Online Educational Library | 24 |
| AWS SENSE Program | 23 |

#### WELDING PROCESS PUBLICATIONS

| Brazing and Soldering | 54 |
| Food Processing Systems | 58 |
| Resistance Welding | 59 |
| Robotics & Automation | 61 |
| Thermal Spraying | 62 |
| Welding and Cutting Processes | 63 |

#### INDUSTRY APPLICATION PUBLICATIONS

| Aerospace | 65 |
| Automotive | 65 |
| Machinery | 66 |
| Marine | 68 |
| Pipe & Tubing | 69 |
| Plastics | 71 |
| Railroad | 71 |
| Structural | 72 |

#### MATERIALS PUBLICATIONS

| Base Metal Weldability | 75 |
| Consumables & Related Products | 76 |
| Filler Metal Specifications | 77 |
| Sheet Metal | 79 |

#### INDEXES

| Publications Subject Index | 81 |
| Publications Code Number Index | 90 |
ADVANCE YOUR CAREER IN WELDING WITH ONE OF OUR PROFESSIONAL CERTIFICATIONS

American Welding Society Certifications offer an opportunity to demonstrate your knowledge, skills, and abilities that can enhance your career in the welding industry. Nine different certifications are available to support your success.

- Certified Welder (CW)
- Certified Welding Inspector (CWI)
- Certified Resistance Welding Technician (CRWT)
- Certified Radiographic Interpreter (CRI)
- Certified Robotic Arc Welding Operator or Technician (CRAW)
- Certified Welding Educator (CWE)
- Certified Welding Engineer (CWEng)
- Certified Welding Sales Representative (CWSR)
- Certified Welding Supervisor (CWS)

NEW MEMBER BONUS
Become an AWS Member and purchase an AWS publication for $35 - up to a 82% discount! You can choose from a list of over 20 popular titles, including the Welding Handbook.

Learn More at aws.org/certification
For the past century, the American Welding Society (AWS) has pioneered the advancement of uniform practices and procedures used throughout the welding industry. Today, AWS Standards are used to ensure safety and conformity of weld quality in a multitude of industries worldwide. Welding technicians and professionals certified through AWS have proved their knowledge of and commitment to upholding these standards.
CERTIFICATION, ENDORSEMENT, AND ACCREDITATION PROGRAMS

Certification Programs for Individuals

CERTIFIED WELDER (CW)
The Certified Welder program is a performance-based credential that tests the candidate's practical skills and application of procedures used in the structural steel, petroleum pipelines, sheet metal, and chemical refinery welding industries.

CERTIFIED WELDING INSPECTOR (CWI)
The Certified Welding Inspector program evaluates the candidate's understanding of welding inspection concepts and principles, ability to locate and understand information within the specific code book, and knowledge of welds.

SENIOR CERTIFIED WELDING INSPECTOR (SCWI)
Expands on the education, knowledge and experience of the CWI and evaluates the candidate's ability to solve more complicated weldment issues.

CERTIFIED ASSOCIATE WELDING INSPECTOR (CAWI)
Candidates who need additional experience to qualify for CWI status may choose to take the CWI exam to achieve Associate Welding Inspector status.

CERTIFIED WELDING SUPERVISOR (CWS)
Certified Welding Supervisors are tested on their ability to manage resources, improve productivity and increase profitability based on their knowledge of welding safety, planning, fabrication, inspection, documentation, and economics.

CERTIFIED WELDING EDUCATOR (CWE)
The Certified Welding Educator program validates an educator's ability to direct and perform operations associated with welder training and classroom instruction against the globally recognized AWS standard.

CERTIFIED WELDING ENGINEER (CWEng)
The Certified Welding Engineer credential demonstrates that the holder possesses education and experience to oversee welding operations in accordance with appropriate codes and other documentation associated with weldments and other types of joints.

CERTIFIED RADIOGRAPHIC INTERPRETER (CRI)
The Certified Radiographic Interpreter program certifies the ability to properly identify and assess welding-related indications (e.g. proper film exposure, correct selection of image quality indicators and characterization of indications) produced on radiographic film and related media against acceptance criteria from AWS, API, and ASME codes.

CERTIFIED ROBOTIC ARC WELDING TECHNICIAN/OPERATOR (CRAW-T/CRAW-O)
The Certified Robotic Arc Welding exam tests the experience, education and training needed to effectively operate a robotic welding cell. Depending on the level of experience, individuals who pass a written exam and performance test can be certified as either robotic arc welding operator or technician.

CERTIFIED WELDING SALES REPRESENTATIVE (CWSR)
The Certified Welding Sales Representative (CWSR) program establishes an individual's skills, knowledge, and experience concerning basic terminology, processes, equipment and supplies used in welding sales.

CERTIFIED RESISTANCE WELDING TECHNICIAN (CRWT)
The Certified Resistance Welding Technician (CRWT) credential was developed jointly by AWS and RWMA – provides a nationally recognized benchmark for the evaluation of resistance welding personnel, testing their knowledge, skills and abilities in conducting the setup, operation, maintenance, testing and quality control of resistance welding equipment.
CERTIFICATION, ENDORSEMENT, AND ACCREDITATION PROGRAMS

Endorsement Programs for Certified Welding Inspectors

Certified Welding Inspectors (CWIs) and Senior Certified Welding Inspectors (SCWIs) may supplement their credentials by passing an exam on one or more of 12 endorsement options available through AWS.

Each endorsement focuses on a specific portion of welding code in conformance with codebook examination requirements found in AWS B5.1, Specification for the Qualification of Welding Inspectors, Section 7.1, and covers four subject areas: material and design, fabrication, inspection, and qualification. These endorsements also provide necessary PDHs toward recertification.

NEW ENDORSEMENT FOR 2020:
WELDER PERFORMANCE QUALIFIER
The all-new AWS Welder Performance Qualifier endorsement is a credential that assesses a candidate’s knowledge, skills, and abilities to conduct welder performance qualification tests.

D1.1 STRUCTURAL STEEL WELDING CODE ENDORSEMENT
D1.2 STRUCTURAL ALUMINUM WELDING CODE ENDORSEMENT
D1.5 BRIDGE WELDING CODE ENDORSEMENT
D15.1 RAILROAD WELDING SPECIFICATION FOR CARS AND LOCOMOTIVES ENDORSEMENT
D17.1 SPECIFICATION FOR FUSION WELDING OF AEROSPACE APPLICATIONS ENDORSEMENT
API 1104 WELDING OF PIPELINES AND RELATED FACILITIES ENDORSEMENT

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. Candidates are tested on PT fundamentals using the AWS PT Book of Specifications to answer a combination of multiple choice questions, a written portion and a practical examination.

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. Candidates are tested on MT fundamentals using the AWS MT Book of Specifications to answer a combination of multiple choice questions, a written portion and a practical examination.

AWS STRUCTURAL BOLTING INSPECTION - BUILDING STRUCTURES ENDORSEMENT
This endorsement tests the candidate’s knowledge of material and design, fabrication, inspection, and qualification of RCSC 30 June 2004, AISC LRFD (Load and Resistance Factor Design) THIRD EDITION and AISC Steel Construction Manual, Thirteenth Edition.

AWS STRUCTURAL DRAWING READING - BUILDING STRUCTURES ENDORSEMENT
This endorsement tests the candidate’s knowledge of structural construction drawings, blueprint standards, computer-aided design, sections, elevations, schedules, site plans and architectural plans of both residential dwellings and commercial structures.

ASME BPVC SECTION IX, POWER (B31.1) AND PROCESS (B31.3) PIPING
This endorsement tests the candidate’s knowledge of material and design, fabrication, inspection, and qualification as presented in ASME standards B31.1 (Power Piping), ASME B31.3 (Process Piping), and Section IX of the ASME Code. (Available on Dec. 1, 2020)

ASME BPVC SECTION VIII, DIV. 1 AND SECTION IX
This endorsement tests the candidate’s knowledge of material and design, fabrication, inspection, and qualification as presented in Section VIII and Section IX of the ASME Boiler and Pressure Vessel Code.
# CERTIFICATION PROGRAMS 2020 PRICE LIST

## INSPECTOR (CAWI, CWI, SCWI)

<table>
<thead>
<tr>
<th>Service</th>
<th>+Member</th>
<th>*Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial CAWI, CWI Exams</td>
<td>$1,070</td>
<td>$1,325</td>
</tr>
<tr>
<td>Initial CAWI, CWI and Part B Training</td>
<td>$1,580</td>
<td>$1,835</td>
</tr>
<tr>
<td>CWI by Reciprocity with CWB or INWC</td>
<td>$560</td>
<td>$815</td>
</tr>
<tr>
<td>Upgrade CAWI to CWI</td>
<td>$270</td>
<td>$525</td>
</tr>
<tr>
<td>Prometric Initial SCWI*</td>
<td>$1,070</td>
<td>$1,325</td>
</tr>
<tr>
<td>Endorsement Structural Drawing Reading</td>
<td>$310</td>
<td>$565</td>
</tr>
<tr>
<td>Prometric Endorsement Exam^•</td>
<td>$370</td>
<td>$625</td>
</tr>
<tr>
<td>Prometric Endorsement MT Exam^•</td>
<td>$430</td>
<td>$685</td>
</tr>
<tr>
<td>Prometric Endorsement PT Exam^•</td>
<td>$430</td>
<td>$685</td>
</tr>
</tbody>
</table>

*Contact ATF for pricing.

## RETEST

<table>
<thead>
<tr>
<th>Service</th>
<th>+Member</th>
<th>*Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAWI, CWI, CWE (Part A Or C)*</td>
<td>$370</td>
<td>$370 „</td>
</tr>
<tr>
<td>CAWI, CWI, CWE (Part A and C)*</td>
<td>$740</td>
<td>$740 „</td>
</tr>
<tr>
<td>CAWI, CWI, CWE (Part B)</td>
<td>$310</td>
<td>$310 „</td>
</tr>
<tr>
<td>CAWI, CWI, CWE (ALL parts)*</td>
<td>$785</td>
<td>$1,040</td>
</tr>
<tr>
<td>CAWI, CWI, CWE (Part B/Part B Training)</td>
<td>$1,240</td>
<td>$1,335 „</td>
</tr>
<tr>
<td>Prometric SCWI*</td>
<td>$785</td>
<td>$1,040</td>
</tr>
<tr>
<td>Prometric Endorsement MT/PT (One Part A or C)^•</td>
<td>$370</td>
<td>$370 „</td>
</tr>
<tr>
<td>Prometric Endorsement MT/PT (Two Part)^•</td>
<td>$430</td>
<td>$685</td>
</tr>
</tbody>
</table>

*Contact ATF for pricing.

## PACKAGES

<table>
<thead>
<tr>
<th>Service</th>
<th>+Member</th>
<th>*Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWI Seminar and Exam Package (D1.1 Focus)*</td>
<td>$2,585</td>
<td>$2,840</td>
</tr>
<tr>
<td>- CWI Pre-Seminar (online course)</td>
<td>$750</td>
<td>$750 „</td>
</tr>
<tr>
<td>CWI Seminar and Exam Package (API 1104 Focus)*</td>
<td>$2,585</td>
<td>$2,840</td>
</tr>
<tr>
<td>- CWI Pre-Seminar (online course)</td>
<td>$750</td>
<td>$750 „</td>
</tr>
</tbody>
</table>

## CLINICS/SEMINARS/WORKSHOPS (Exam not Included)

<table>
<thead>
<tr>
<th>Service</th>
<th>+Member</th>
<th>*Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWI Seminar Week (D1.1 Focus)</td>
<td>$1,865</td>
<td>$2,120</td>
</tr>
<tr>
<td>CWI Seminar Week (API 1104 Focus)</td>
<td>$1,865</td>
<td>$2,120</td>
</tr>
<tr>
<td>Seminar Retake (within 12 months of original event)</td>
<td>$845</td>
<td>$845 „</td>
</tr>
<tr>
<td>Part B Training Seminar Only</td>
<td>$930</td>
<td>$1,025 „</td>
</tr>
<tr>
<td>CWI Pre-Seminar (online course)</td>
<td>$865</td>
<td>$1,150 „</td>
</tr>
<tr>
<td>Welding Fundamentals I (online course)</td>
<td>$350</td>
<td>$470 „</td>
</tr>
</tbody>
</table>

## RENEWAL

<table>
<thead>
<tr>
<th>Service</th>
<th>+Member</th>
<th>*Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWI/SCWI 3rd and 6th Year Renewal by Work Experience</td>
<td>$525</td>
<td>$780</td>
</tr>
<tr>
<td>CWI/SCWI 3rd and 6th Year Renewal by Examination</td>
<td>$835</td>
<td>$1,090</td>
</tr>
<tr>
<td>CWB or INWC Renewal by Reciprocity</td>
<td>$480</td>
<td>$735</td>
</tr>
</tbody>
</table>

## 9-YEAR RECERTIFICATION

<table>
<thead>
<tr>
<th>Service</th>
<th>+Member</th>
<th>*Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWI Part B Exam</td>
<td>$975</td>
<td>$1,230</td>
</tr>
<tr>
<td>SCWI Part A &amp; B Exams*</td>
<td>$1,095</td>
<td>$1,350</td>
</tr>
<tr>
<td>CWI Part B Exam/Part B Training</td>
<td>$975</td>
<td>$2,160</td>
</tr>
<tr>
<td>CWI/SCWI Endorsement Structural Drawing Reading Exam</td>
<td>$975</td>
<td>$1,230</td>
</tr>
<tr>
<td>CWI/SCWI Non-Exam</td>
<td>$665</td>
<td>$920</td>
</tr>
</tbody>
</table>

*+ 80 Professional Development Hours (PDHs)
*+ Endorsement Exam Prior to 9th Year of Certification Period
*+ Initial CRI Certification

## 9-YEAR RECERTIFICATION MT/PT

<table>
<thead>
<tr>
<th>Service</th>
<th>+Member</th>
<th>*Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prometric Endorsement MT Exam^•</td>
<td>$1,095</td>
<td>$1,350</td>
</tr>
<tr>
<td>Prometric Endorsement PT Exam^•</td>
<td>$1,095</td>
<td>$1,350</td>
</tr>
</tbody>
</table>

*Contact ATF for pricing.

## CERTIFIED WELDING EDUCATOR (CWE)

<table>
<thead>
<tr>
<th>Service</th>
<th>+Member</th>
<th>*Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam Only*</td>
<td>$770</td>
<td>$1,025</td>
</tr>
<tr>
<td>Non-Exam</td>
<td>$405</td>
<td>$660</td>
</tr>
<tr>
<td>Retest</td>
<td>$355</td>
<td>$610</td>
</tr>
<tr>
<td>Renewal</td>
<td>$345</td>
<td>$600</td>
</tr>
</tbody>
</table>

## CWE FOR SENSE PARTICIPANTS ONLY

<table>
<thead>
<tr>
<th>Service</th>
<th>+Member</th>
<th>*Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam*</td>
<td>$370</td>
<td>$625</td>
</tr>
<tr>
<td>Retest</td>
<td>$355</td>
<td>$610</td>
</tr>
<tr>
<td>Retest (Single Part)</td>
<td>$310</td>
<td>$310 „</td>
</tr>
<tr>
<td>Renewal CWE Only</td>
<td>$225</td>
<td>$480</td>
</tr>
</tbody>
</table>

## CERTIFIED RADIOGRAPHIC INTERPRETER (CRI)

<table>
<thead>
<tr>
<th>Service</th>
<th>+Member</th>
<th>*Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam</td>
<td>$840</td>
<td>$1,095</td>
</tr>
<tr>
<td>Seminar Only</td>
<td>$1,407</td>
<td>$1,662</td>
</tr>
<tr>
<td>Initial Seminar and Exam</td>
<td>$1,833</td>
<td>$2,088</td>
</tr>
<tr>
<td>Retest (All Parts)</td>
<td>$615</td>
<td>$615 „</td>
</tr>
<tr>
<td>Retest (Per Part)</td>
<td>$310</td>
<td>$310 „</td>
</tr>
<tr>
<td>Renewal by Work Experience</td>
<td>$500</td>
<td>$755</td>
</tr>
<tr>
<td>Renewal by Part B Exam</td>
<td>$720</td>
<td>$975</td>
</tr>
<tr>
<td>9yr Recertification by Part B Exam</td>
<td>$805</td>
<td>$1,060</td>
</tr>
<tr>
<td>CERTIFICATION PROGRAMS 2020 PRICE LIST</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CERTIFIED WELDING SUPERVISOR (CWS)</strong></td>
<td>+Member</td>
<td>*Non Member</td>
</tr>
<tr>
<td>Prometric Exams•</td>
<td>$570</td>
<td>$658 **</td>
</tr>
<tr>
<td>Prometric Retest (Per Part)•</td>
<td>$370</td>
<td>$370 ***</td>
</tr>
<tr>
<td>Renewal</td>
<td>$345</td>
<td>$433 **</td>
</tr>
<tr>
<td>9-yr Recertification PDH•</td>
<td>$375</td>
<td>$463 **</td>
</tr>
<tr>
<td>Prometric 9yr Recertification Exam (A&amp;B)•</td>
<td>$530</td>
<td>$618 **</td>
</tr>
<tr>
<td>Supervisor Value Pak•</td>
<td>$1,784</td>
<td>$1,872 **</td>
</tr>
<tr>
<td>Supervisor Seminar Only</td>
<td>$1,313</td>
<td>$1,401 **</td>
</tr>
<tr>
<td>Supervisor Seminar &amp; 1 Part Retest•</td>
<td>$1,683</td>
<td>$1,771 **</td>
</tr>
<tr>
<td>Supervisor Seminar &amp; 2 Part Retest•</td>
<td>$1,883</td>
<td>$1,971 **</td>
</tr>
<tr>
<td><strong>CERTIFIED WELDING SALES REPRESENTATIVE (CWSR)</strong></td>
<td>+Member</td>
<td>*Non Member</td>
</tr>
<tr>
<td>Prometric Exams•</td>
<td>$370</td>
<td>$458 **</td>
</tr>
<tr>
<td>Prometric Retests•</td>
<td>$370</td>
<td>$458 **</td>
</tr>
<tr>
<td>Renewal</td>
<td>$310</td>
<td>$310 ***</td>
</tr>
<tr>
<td><strong>CERTIFIED WELDING ENGINEER (CWEng)</strong></td>
<td>+Member</td>
<td>*Non Member</td>
</tr>
<tr>
<td>Part 1 &amp; 2 Exam</td>
<td>$450</td>
<td>$538 **</td>
</tr>
<tr>
<td>Part 3 &amp; 4 Exam</td>
<td>$450</td>
<td>$538 **</td>
</tr>
<tr>
<td>PE Exemption</td>
<td>$395</td>
<td>$650</td>
</tr>
<tr>
<td>Retest (per part)</td>
<td>$225</td>
<td>$313 **</td>
</tr>
<tr>
<td>Renewal</td>
<td>$500</td>
<td>$755</td>
</tr>
<tr>
<td><strong>CERTIFIED RESISTANCE WELDING TECHNICIAN (CRWT)</strong></td>
<td>+Member</td>
<td>*Non Member</td>
</tr>
<tr>
<td>CRWT 2-day Seminar</td>
<td>$620</td>
<td>$830 ***</td>
</tr>
<tr>
<td>CRWT Exam•</td>
<td>$370</td>
<td>$495 ***</td>
</tr>
<tr>
<td>CRWT Seminar and Exam Package•</td>
<td>$855</td>
<td>$1,140 ***</td>
</tr>
<tr>
<td>Recertification by Exam•</td>
<td>$370</td>
<td>$495 ***</td>
</tr>
<tr>
<td>Retest</td>
<td>$185</td>
<td>$185 ***</td>
</tr>
<tr>
<td><strong>CERTIFIED ROBOTIC ARC WELDING (CRAW)</strong></td>
<td>+Member</td>
<td>*Non Member</td>
</tr>
<tr>
<td>Technician/Operator Exam or Retest</td>
<td>$395</td>
<td>$650</td>
</tr>
<tr>
<td>Operator to Technician Upgrade</td>
<td>$110</td>
<td>$110 ***</td>
</tr>
<tr>
<td>Technician/Operator Renewal</td>
<td>$225</td>
<td>$480</td>
</tr>
<tr>
<td>Technician/Operator Recertification by Exam</td>
<td>$395</td>
<td>$650</td>
</tr>
<tr>
<td>Technician/Operator Recertification by PDH/CEUs</td>
<td>$225</td>
<td>$480</td>
</tr>
<tr>
<td><strong>CERTIFIED WELDER (CW)</strong></td>
<td>+Member</td>
<td>*Non Member</td>
</tr>
<tr>
<td>Certified Welder Application</td>
<td>$50</td>
<td>$50 ***</td>
</tr>
<tr>
<td>Maintenance of Welder Certification</td>
<td>$25</td>
<td>$25 ***</td>
</tr>
<tr>
<td><strong>WELDER PERFORMANCE QUALIFIER ENDORSEMENT</strong></td>
<td>+Member</td>
<td>*Non Member</td>
</tr>
<tr>
<td>WPQ 2-day Seminar</td>
<td>$620</td>
<td>$705 **</td>
</tr>
<tr>
<td>WPQ Exam</td>
<td>$455</td>
<td>$540 **</td>
</tr>
<tr>
<td>WPQ Seminar and Exam Package</td>
<td>$940</td>
<td>$1,025 **</td>
</tr>
<tr>
<td>WPQ Retest</td>
<td>$455</td>
<td>$455 ***</td>
</tr>
</tbody>
</table>

| **EDUCATION’S ONLINE COURSES** | +Member  | *Non Member |
| 2-Week Online CWI Seminar (incl. 3 year membership) | $1,865 | $2,120 * |
| Member $1,865 (+ $2,400 refundable deposit) | Non-member $2,120 (+ $2,400 refundable deposit) |
| 2-Week Online CWI Seminar and Exam | $2,585 | $2,840 * |
| (incl. 3 year membership. Prices reflect a $60 seat fee per part (A or C) & $120 for ALL parts for Prometric Testing.) | Member $2,585 (+ $2,400 refundable deposit) | Non-member $2,840 (+ $2,400 refundable deposit) |
| 8-Week Online CWI Seminar (incl. 3 year membership) | $1,865 | $2,120 * |
| Member $1,865 (+ $2,400 refundable deposit) | Non-member $2,120 (+ $2,400 refundable deposit) |
| Science of Nondestructive Testing | $175 | $235 |
| Welding Sales Representative Seminar | $450 | $600 |
| Destructive Testing | $300 | $400 |
| AWS D1.1 Code Clinic | $250 | $300 |
| AWS D17.1 Code Clinic | $120 | $150 |
| API 1104 Code Clinic | $250 | $300 |
| Economics of Welding | $450 | $600 |
| Understanding Welding Symbols | $300 | $400 |
| Fabrication Math I | $385 | $510 |
| Fabrication Math II | $370 | $495 |
| Safety in Welding | $74 | $99 |
| WPS/PQR Explained | $120 | $150 |
| Metallurgy I | $175 | $235 |
| Metallurgy II | $175 | $235 |
| Welding Fundamentals I | $350 | $470 |
| Welding Fundamentals II | $210 | $265 |
| Welding Fundamentals III | $150 | $180 |
| Welding Supervisor Package: 7 Online Courses | $995 | $1,245 |
| CRWT 2-Day Seminar | $620 | $830 |

* Non-Member price includes a 3-year AWS Individual Membership unless otherwise noted.
** 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 include membership price.
^^ Price is for all endorsements except Structural Drawing Reading.
^ For a complete price list of our online courses please visit https://awo.aws.org/online-courses/. 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)
Accredited Test Facilities (ATFs) have met AWS facility, personnel and resource requirements to test welders and qualify them for their Certified Welder credential.

### 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>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>RE-AUDIT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-Site Audit**</td>
<td>$1,100</td>
<td>TBD ***</td>
</tr>
<tr>
<td><strong>YEARLY RENEWALS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual 1st Year</td>
<td>$360</td>
<td>$480</td>
</tr>
<tr>
<td>Annual 2nd Year</td>
<td>$360</td>
<td>$480</td>
</tr>
<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>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>MP/PT FEES</strong></td>
<td></td>
<td></td>
</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)
CERTIFICATION, ENDORSEMENT, AND ACCREDITATION PROGRAMS

APPROVED TESTING CENTER (ATC)
The 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 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><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>3rd YEAR RECERTIFICATION 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>AWS CERTIFICATION FOR AISC ACCREDITED FABRICATORS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial Application</td>
<td>$420</td>
<td>$480</td>
</tr>
<tr>
<td>Renewal Application (paid annually)</td>
<td>$140</td>
<td>$200</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)
Hey CWIs! Interested in expanding your professional credentials?

CWIs with elevated understanding and skills in specific welding codes are constantly in demand and usually are better compensated. AWS endorsements reflect your demonstrated additional knowledge, skill or ability and are added to your certification credentials.

New Endorsement for 2020: WELDER PERFORMANCE QUALIFIER
The all-new AWS Welder Performance Qualifier endorsement is a credential that assesses a candidate’s knowledge, skills, and abilities to conduct welder performance qualification tests.

Show your boss or your clients your commitment to conducting welder qualification testing by earning this endorsement.

Learn more at aws.org/wpqe
Whether you’re new to welding or preparing for that next great-paying job, AWS Learning is your one-stop resource for welding education. Our comprehensive catalog of seminars, online courses, and other educational materials are specifically designed to help you achieve your welding career goals.

Visit aws.org/ourcourses to schedule an online demonstration or to learn more about our programs.
INSTRUCTOR-LED SEMINAR PROGRAMS

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.

<table>
<thead>
<tr>
<th>COURSE DESCRIPTION</th>
<th>MEMBER</th>
<th>NON MEMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>CERTIFIED WELDING INSPECTOR SEMINAR</td>
<td>$1,865</td>
<td>$2,120</td>
</tr>
<tr>
<td>CERTIFIED WELDING INSPECTOR SEMINAR &amp; EXAM</td>
<td>$2,585</td>
<td>$2,840</td>
</tr>
<tr>
<td>The 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. Course Length: 6 Days</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESCRIPTION</th>
<th>MEMBER</th>
<th>NON MEMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>CERTIFIED WELDING INSPECTOR PART B TRAINING</td>
<td>$930</td>
<td>$1,025</td>
</tr>
<tr>
<td>PART B TRAINING &amp; EXAM PACKAGE</td>
<td>$1,580</td>
<td>$1,675</td>
</tr>
<tr>
<td>Earning the Certified Welding Inspector (CWI) credential is serious work and can have a significant impact on a CWI’s career. Some CWI candidates require more immersive preparation on the Part B practical application portion of the CWI exam. The session includes a full-length, timed practice examination to prepare candidates for the CWI practical exam. Length: Part B Training 3 days</td>
<td>Part B Training &amp; Exam 4 days</td>
<td></td>
</tr>
<tr>
<td>Part B Training: 3 Days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part B Training &amp; Exam: 4 Days</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESCRIPTION</th>
<th>MEMBER</th>
<th>NON MEMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-WEEK ONLINE CWI SEMINAR*</td>
<td>$1,865</td>
<td>$2,120</td>
</tr>
<tr>
<td>The 8-Week Online CWI Seminar is designed to prepare participants for the 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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESCRIPTION</th>
<th>MEMBER</th>
<th>NON MEMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-WEEK ONLINE CWI SEMINAR*</td>
<td>$1,865</td>
<td>$2,120</td>
</tr>
<tr>
<td>2-WEEK ONLINE CWI SEMINAR &amp; EXAM*</td>
<td>$2,585</td>
<td>$2,840</td>
</tr>
<tr>
<td>The 2-Week Online CWI Seminar is designed to prepare participants for the Certified Welding Inspector Exam from the comfort of their own homes. The course is similar to the 8-Week Online CWI Seminar; it’s just condensed into two weeks of four-hour online sessions hosted by 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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESCRIPTION</th>
<th>MEMBER</th>
<th>NON MEMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>CERTIFIED WELDING INSPECTOR 9-YEAR RECERTIFICATION SEMINAR</td>
<td>$1,740</td>
<td>$1,995</td>
</tr>
<tr>
<td>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. Course Length: 6 Days</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Course Length

*Plus $2,400 refundable deposit for replica rental
INSTRUCTOR-LED SEMINAR PROGRAMS

CERTIFIED RESISTANCE WELDING TECHNICIAN SEMINAR
$620  $830
CERTIFIED RESISTANCE WELDING TECHNICIAN SEMINAR & EXAM
$855  $1,140

The CRWT exam spans an array of principles, processes, metallurgy and machinery as presented in Standards AWS C1.5 and AWS QC20. This instructor-led course is an in-depth review of terminology, materials and techniques covered in these AWS resistance welding standards and has been designed to prepare those working in resistance welding operations for the CRWT exam. All students will have access to 16 online modules to get a head start on resistance welding fundamentals prior to attending the seminar.

CERTIFIED RADIOGRAPHIC INTERPRETER SEMINAR & EXAM
$1,675  $1,890

The 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.

CERTIFIED WELDING SUPERVISOR SEMINAR & EXAM
$1,313  $1,401

A good welding supervisor manages resources, improves productivity, and increases the bottom line. This course focuses on the knowledge a supervisor needs to support improvement of the welders’ environment, productivity, throughput, weld quality and safety.

WELDER PERFORMANCE QUALIFIER ENDORSEMENT SEMINAR 2-DAY & EXAM
$620  $705

This seminar offers an in-depth review of qualifier responsibilities, requirements for test facilities, equipment and materials, and how to prepare Procedure Qualification Records (PQRs) and other integral documents. The seminar concludes with a full-length practice exam and a detailed, instructor-led review of each question and answer in order to better prepare attendees for test day.

ON-LOCATION CUSTOM TRAINING/EXAM PREP

AWS brings instructors to your location. Build your staff’s skill sets, prepare them for their certification exam and ensure that they meet AWS qualifications, while eliminating travel costs and allowing you to control schedules. Duration and rates: TBD upon consultation with AWS.
## ONLINE COURSES

<table>
<thead>
<tr>
<th>COURSE</th>
<th>MEMBER</th>
<th>NON-MEMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CERTIFIED WELDING INSPECTOR PRE-SEMINAR</strong></td>
<td>$750</td>
<td>$750</td>
</tr>
<tr>
<td><strong>WELDING SUPERVISOR SEMINAR</strong></td>
<td>$995</td>
<td>$1,245</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WELDING SALES REPRESENTATIVE SEMINAR</strong></td>
<td>$450</td>
<td>$600</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WELDING FUNDAMENTALS I</strong></td>
<td>$350</td>
<td>$470</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WELDING FUNDAMENTALS II</strong></td>
<td>$210</td>
<td>$265</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WELDING FUNDAMENTALS III</strong></td>
<td>$150</td>
<td>$180</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*<em>SAFETY IN WELDING</em></td>
<td>FREE</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Approximate Hours | PDHs | CEUs

*Access to the 3 PDHs / 0.3 CEUs and Certificate of Completion requires a $74 / $99 payment.
# ONLINE COURSES

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FABRICATION MATH I</strong></td>
<td>$385</td>
<td>$510</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Hours</td>
<td>18 PDHs</td>
<td>1.8 CEUs</td>
</tr>
<tr>
<td><strong>FABRICATION MATH II</strong></td>
<td>$370</td>
<td>$495</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Hours</td>
<td>15 PDHs</td>
<td>1.5 CEUs</td>
</tr>
<tr>
<td><strong>UNDERSTANDING WELDING SYMBOLS</strong></td>
<td>$300</td>
<td>$400</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Hours</td>
<td>10 PDHs</td>
<td>1 CEUs</td>
</tr>
<tr>
<td><strong>METALLURGY I</strong></td>
<td>$175</td>
<td>$235</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Hours</td>
<td>6 PDHs</td>
<td>0.6 CEUs</td>
</tr>
<tr>
<td><strong>METALLURGY II</strong></td>
<td>$175</td>
<td>$235</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Hours</td>
<td>6 PDHs</td>
<td>0.6 CEUs</td>
</tr>
<tr>
<td><strong>THE SCIENCE OF NONDESTRUCTIVE TESTING</strong></td>
<td>$175</td>
<td>$235</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Hours</td>
<td>6 PDHs</td>
<td>0.6 CEUs</td>
</tr>
<tr>
<td><strong>DESTRUCTIVE TESTING</strong></td>
<td>$300</td>
<td>$400</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Hours</td>
<td>7 PDHs</td>
<td>1 CEUs</td>
</tr>
</tbody>
</table>

*Approximate Hours | Professional Development Hours | Continuing Education Units
## ONLINE COURSES

### ECONOMICS OF WELDING
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.

<table>
<thead>
<tr>
<th>Hours</th>
<th>PDHs</th>
<th>CEUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>18 PDHs</td>
<td>1.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$450</td>
<td>$600</td>
</tr>
</tbody>
</table>

### WPS/PQR EXPLAINED
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.

<table>
<thead>
<tr>
<th>Hours</th>
<th>PDHs</th>
<th>CEUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>4 PDHs</td>
<td>0.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$120</td>
<td>$150</td>
</tr>
</tbody>
</table>

### INSTRUCTIONAL STRATEGIES FOR WELDING EDUCATORS
The course is ideal for novice or experienced welding instructors looking to develop a stronger teaching foundation, develop more effective curriculum, and incorporate pedagogical best practices in the classroom and welding lab. This series of brief, interactive modules, each with corresponding knowledge checks, case studies, and assessments, was developed in partnership with Weld-Ed and delivered by Dr. W. Richard Polanin, a lifelong welding educator and industry professional, as well as current AWS Vice President and incoming AWS President (2021).

<table>
<thead>
<tr>
<th>Hours</th>
<th>PDHs</th>
<th>CEUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10 PDHs</td>
<td>1.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$150</td>
<td>$175</td>
</tr>
</tbody>
</table>

## ONLINE CODE CLINICS
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
This comprehensive 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.

<table>
<thead>
<tr>
<th>Hours</th>
<th>PDHs</th>
<th>CEUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>4 PDHs</td>
<td>0.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$250</td>
<td>$300</td>
</tr>
</tbody>
</table>

### API 1104 ONLINE CODE CLINIC
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.

<table>
<thead>
<tr>
<th>Hours</th>
<th>PDHs</th>
<th>CEUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3 PDHs</td>
<td>0.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$250</td>
<td>$300</td>
</tr>
</tbody>
</table>

### D17.1 ONLINE CODE CLINIC
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.

<table>
<thead>
<tr>
<th>Hours</th>
<th>PDHs</th>
<th>CEUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>4 PDHs</td>
<td>0.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$120</td>
<td>$150</td>
</tr>
</tbody>
</table>

Visit [aws.org/ourcourses](http://aws.org/ourcourses) to schedule an online demonstration or to learn more about our programs.

<table>
<thead>
<tr>
<th>Approximate Hours</th>
<th>Professional Development Hours</th>
<th>Continuing Education Units</th>
</tr>
</thead>
</table>
INDUSTRY PARTNER COURSES

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 $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
☐ 1 Hour

PRINCIPLES OF METALLURGY $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.
☐ 5 Hours

HARDNESS TESTING $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.
☐ 1/2 Hour

STEEL METALLURGY $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
☐ 3 Hours

STEEL CASE HARDENING $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
☐ 1 Hour

☐ Approximate Hours
INDUSTRY PARTNER COURSES

STEEL THROUGH HARDENING $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

1 Hour

TENSILE TESTING $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.

1/2 Hour

Non Destructive Testing Classroom
Learn from the experts including industry legends Chuck Hollier and Jim Treat. The NDT classroom offers the most comprehensive online training programs available today.

INTRODUCTION TO NDT $525
This course is ideal for those who would like a thorough overview of the major methods. Emphasis is placed on benefits, limitations, and applications 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).

5 Hours

EDDY CURRENT I $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 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.

20 Hours

EDDY CURRENT II $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.

20 Hours

Approximate Hours
INDUSTRY PARTNER COURSES

VISUAL TESTING I & II  
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 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.

- 12 Hours

$725

PENETRANT TESTING I & II  
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. PT materials, equipment, variables, techniques, and evaluation of test results are presented and demonstrated along with a description of widely used applications.

- 14.5 Hours

$835

MAGNETIC PARTICLE TESTING I & II  
This course combines the Level I and II subjects, 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.

- 11 Hours

$835

RADIOGRAPHY TESTING I  
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 emphasizes the essentials of radiation safety. It is also appropriate for other personnel who require a basic understanding of the basics of radiographic testing.

- 22 Hours

$725

RADIOGRAPHY TESTING II  
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 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.

- 22 Hours

$945

RADIATION SAFETY COURSE  
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. 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.

- 28 Hours

$1,045

Approximate Hours
ULTRASONIC TESTING I $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. 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.
26 Hours

ULTRASONIC TESTING II $945
Ultrasonic Testing II 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 is also beneficial for those preparing to take Level III examinations.
26 Hours

ULTRASONIC THICKNESS TESTING $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.
14 Hours

Visit aws.org/ourcourses to schedule an online demonstration or to learn more about our programs.

FUNDAMENTALS OF WELDING CURRICULUM
Instructors are busy. That’s why we’ve done some of the work for you. With over 100 lesson plans and a robust suite of digital and print resources, you can focus on what matters most: your students.

The AWS Fundamentals of Welding Curriculum is a newly-created collection of educational resources and learning tools designed by leading industry education professionals to help you effectively deliver quality instruction.

FUNDAMENTALS OF WELDING CURRICULUM $3,250
Print Materials
- 25 Fundamentals of Welding Textbooks
- 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

Learn more at aws.org/curriculum

Approximate Hours
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.

- One-time registration fee for Level I: $500
- One-time registration fee for Levels I and II combined: $600
- One-time upgrade registration fee from Level I to Level II: $100

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
ONLINE EDUCATIONAL LIBRARY

The Online Educational Library is designed to meet the needs of today’s welding students and instructors. Developed by AWS subject matter experts and learning professionals, our 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 Learning Management System to assign tasks and track student progress.

A COMPLETE SOLUTION DESIGNED FOR WELDING EDUCATORS

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.

Learning Objectives and quizzes allow students to orient themselves and assess their readiness to tackle new material.

Navigation Features allow students to skip or review course content as needed, giving the student complete control over their learning experience.
ONLINE EDUCATIONAL LIBRARY

The Online Educational Library complements existing welding education programs and provides over 110 hours of welding instruction throughout 13 comprehensive courses, including:

- 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

12-MONTH SUBSCRIPTIONS

The Online Educational Library is affordably priced on a sliding scale based on institution type. Annual subscriptions include any new courses that are added to enhance the Library.

<table>
<thead>
<tr>
<th>Institution Type</th>
<th>Price</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH SCHOOL</td>
<td>$2,000</td>
<td>All courses</td>
</tr>
<tr>
<td>COMMUNITY COLLEGE/TECH SCHOOL*</td>
<td>$5,000</td>
<td>All courses</td>
</tr>
<tr>
<td>COLLEGE**</td>
<td>$7,000</td>
<td>All courses</td>
</tr>
<tr>
<td>UNIVERSITY***</td>
<td>$9,000</td>
<td>All courses</td>
</tr>
</tbody>
</table>

OPEN-ENROLLMENT PRICING

<table>
<thead>
<tr>
<th>Institution Type</th>
<th>Price</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMUNITY COLLEGE/TECH SCHOOL*</td>
<td>$150/STUDENT</td>
<td>All courses</td>
</tr>
<tr>
<td>MINIMUM SPENDING COMMITMENT</td>
<td>$3,000</td>
<td></td>
</tr>
</tbody>
</table>

* Associates is highest degree offered  
** Bachelors is highest degree offered  
*** Masters and/or Doctorate are highest degree offered
2020

QUALIFICATION OF WELDING PROCEDURES
October 7-8 | Virtual Event

ALUMINUM VIRTUAL CONFERENCE
October 20-21 | Virtual Event

2021

INTERNATION BRAZING AND SOLDERING
April 25-28 | Denver, CO

ADVANCES IN WELDING AND ADDITIVE MANUFACTURING RESEARCH
August 8-13 | Miami, FL

Learn more at awo.aws.org/conferences/upcoming-conferences/.
Make Your AWS Membership Work this Year

AWS member benefits are designed to support the growth of both the industry and the people who work in it. This year, make AWS work as hard as you do to advance your career, connect to our deep technical knowledge base and save on AWS products and services.
MAKE THE MOST OF YOUR DOWNTIME WITH YOUR AWS MEMBERSHIP

AWS member benefits are designed to support the growth of the industry and the people who work in it. This year, make your AWS membership work as hard as you do to advance your career, connect to our deep technical knowledge base and save on AWS products and services.

ADVANCE
- 10 Certifications
- Self-Paced Online Learning
- Online and In-Person Classroom Instruction
- Customized Instructor-Led On-Site Seminars

CONNECT
- Active Members-Only Online Community
- Industry Conferences and Events
- Technical Committees
- Section, District and Regional Networking Meetings

SAVE
- Discounts on: AWS Education and Training
- Standards and Publications
- Conferences
- Partner Products and Services

2-WEEK CWI SEMINAR IS LIVE ONLINE
The 2-Week Online CWI Seminar is 10 interactive, four-hour sessions hosted live by an AWS instructor. New sessions start regularly. For more information, visit https://awo.aws.org/online-courses/

800.443.WELD (9353), Option 4
MEMBERSHIP PROGRAMS

INDIVIDUAL MEMBERSHIP
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; and more.

WELDER MEMBERSHIP
Take advantage of specialized membership benefits geared towards welders. Gain access to courses, seminars, certifications and other resources; 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 Institution, and Welding Distributor.

SUSTAINING COMPANY
Designed for those who seek top industry impact. You get a choice between two primary benefits valued at up to $12,000; 10 individual memberships; powerful marketing exposure; plus dozens more resources and benefits.

SUPPORTING COMPANY
Designed to help your mid-size company boost productivity, solve production problems; improve competitiveness and offer valuable benefits to your employees.

AFFILIATE COMPANY
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 INSTITUTION
Designed for educational leaders who strive to maintain a reputation for teaching excellence. Your membership supports and rewards hard-working educators, staffs and students with valuable benefits and savings.

WELDING DISTRIBUTOR
Designed to provide you with valuable industry exposure and connections to increase your sales and market share.

STUDENT MEMBERSHIP
Build a stronger welding career with top knowledge, advice and industry contacts – plus dozens of money-saving programs and benefits. Your membership shows employers and fellow professionals you’re serious about your future. Don’t miss our deeply-discounted rate just for students.
Certification

QC1:2016, Standard for AWS Certification of Welding Inspectors
The Certified Welding Inspector (CWI) program identifies proven professionals who improve product quality through early detection of flaws and defects.

- 12 pages
- Order Code: QC1

QC4-89, Standard for Accreditation of Test Facilities for AWS Certified Welder Program

- 12 pages
- Order Code: QC4

QC5-91, Standard for Certification of Welding Educators

- 10 Pages
- Order Code: QC5

QC7-93, Standard for AWS Certified Welders

- 10 Pages
- Order Code: QC7

QC7-93 Supplement C, Welder Performance Qualification Sheet Metal Test Requirements

- 38 Pages
- Order Code: QC7C

QC7-93 Supplement F, Chemical Plant and Petroleum Refinery Piping

- 22 Pages
- Order Code: QC7F

QC7-93 Supplement G, AWS Performance Qualification Test

- 10 Pages
- Order Code: QC7G

QC10:2017, Specification for Qualification and Certification of SENSE Level I-Entry Welders

- 34 Pages. Description & preview online.
- Order Code: QC10


- 38 Pages. Description & preview online.
- Order Code: QC11

QC13:2006, Specification for the Certification of Welding Supervisors

- 16 Pages
- Order Code: QC13

QC14:2009, Specification for the Certification of Welding Sales Representatives

- 16 Pages
- Order Code: QC14

QC15:2008-AMD1, Specification for the Certification of Radiographic Interpreters

- 16 Pages
- Order Code: QC15

Total Pages
PUBLICATIONS & RESOURCES

PROFESSIONAL AND CAREER DEVELOPMENT RESOURCES

QC17:2015, Specification for AWS Accreditation of Certified Welding Fabricators

14 Pages
Order Code: QC17
Member $12 Non Member $16


24 Pages
Order Code: QC19
Member $12 Non Member $16

QC20:2020, Specification for AWS Certification of Resistance Welding Technicians

22 Pages
Order Code: QC20
Member $12 Non Member $16


see page 37

CM:2000, Certification Manual for Welding Inspectors

see page 37

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/PQR 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.

72 Hours
Register at aws.org/ourcourses
If purchased with a CWI Instructor-Lead Seminar
Member $750 Non Member $750

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.

23 Hours
Register at aws.org/ourcourses
Member $450 Non Member $600

The following certification documents are available for FREE Download at aws.org/ourcourses
Printed copy prices are included below.

Order Code: QC1 Member $12 Non Member $16
Order Code: QC4 Member $12 Non Member $16
Order Code: QC5 Member $12 Non Member $16
Order Code: QC7 Member $12 Non Member $16
Order Code: QC7C Member $12 Non Member $16
Order Code: QC7F Member $12 Non Member $16
Order Code: QC7G Member $12 Non Member $16
Order Code: QC13 Member $12 Non Member $16
Order Code: QC14 Member $12 Non Member $16
Order Code: QC15 Member $12 Non Member $16
Order Code: QC17 Member $12 Non Member $16
Order Code: QC19 Member $12 Non Member $16
Order Code: QC20 Member $12 Non Member $16
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**

- Member: $90
- Non Member: $120


**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**

- Member: $90
- Non Member: $120


**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**

- Member: $96
- Non Member: $128


**B4.0M:2000 (R2010)**
Metric only. 120 pages, 64 figures (Reaffirmed 2010).

Order Code: **B4.0M**

- Member: $78
- Non Member: $104

**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, fourth edition.

Order Code: **WI**

- Member: $69
- Non Member: $92


**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 71

**G1.10M:2016, Guide for the Evaluation of Thermoplastic Welds** see page 71

**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

Order Code: **APG-DISC**

- Member: $21
- Non Member: $28
10-Piece Toolkit
The tools to start your inspection career are now available in a heavy-duty vinyl case. These are the same tools used in the AWS hands-on Certified Welding Inspector Test.

Quality training kit contains:
- 7 Piece Fillet Weld Set
- V-WAC Gauge
- Inspection Mirror
- Hi-Lo Gauge
- Protractor
- C4.1 Gauge
- Weld Profile Gauge

Standard Unit Order Code: 10KIT
Metric Unit Order Code: 10KITM

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
- Stud Arc Welding
- Plasma Arc Welding
- Stud Arc Welding

B2.1 gives a complete coverage of:
- Base Metals
- Filler Metals
- Qualification Variables
- Testing Requirements

Order Code: B2.1

Order Code: B2.1


FREE Download at aws.org/ourcourses

Hard Copy Order Code: B2.1-BMG

 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

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
B2.4:2012, Specification for Welding Procedure and Performance Qualification for Thermoplastics
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 $54 $72

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 aws.org/ourcourses
Hard Copy Order Code: B5.1 $51 $68

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 $51 $68

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 aws.org/ourcourses
Hard Copy Order Code: B5.4 $48 $64

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.
Order Code: B5.5 $48 $64

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.
FREE Download at aws.org/ourcourses
Hard Copy Order Code: B5.9 $45 $60

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 $45 $60
Member Non Member

**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.

- FREE Download at [aws.org/ourcourses](http://aws.org/ourcourses)
- Hard Copy Order Code: **B5.15**

**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.

- FREE Download at [aws.org/ourcourses](http://aws.org/ourcourses)
- Hard Copy Order Code: **B5.16**

**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.

- FREE Download at [aws.org/ourcourses](http://aws.org/ourcourses)
- Hard Copy Order Code: **B5.17**

**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**

**C2.16/C2.16M:2017, Guide for Thermal Spray Operator Qualification Programs**
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**

**C7.4/C7.4M:2017, Process Specification and Operator Qualification for Laser Beam Welding**
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.

- Order Code: **C7.4**

**C7.6/C7.6M:2017, Process Specification and Operator Qualification for Laser Hybrid Welding**
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**
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
Member $48 Non Member $64

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
Member $57 Non Member $76

ELW Set A (EG2.0:2017, EG2.0 Supplement, and QC10:2017)
Order Code: ELW-SETA
Member $122 Non Member $163

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.

Order Code: EG2.0 Supp
Member $63 Non Member $84

EG3.0:2017, Guide for the Training of Welding Personnel; SENSE Level II — Advanced Welder
A competency-based curriculum guideline detailing the minimum acceptable skill requirements for training and qualifying advanced welders. 168 pages.

Order Code: EG3.0
Member $39 Non Member $52

Order Code: ELW-SETB
Member $138 Non Member $184

EG3.0:2017, Supplement SENSE Level II — Advanced Welder Training Performance Testing Procedures
The goal of this supplement is to improve welder training by using and teaching the application of AWS Standard Welding Procedure Specifications (SWPSs) related to the SENSE Level II—Advanced Welder workmanship and performance qualification tests.

Order Code: EG3.0 Supp
Member $93 Non Member $124

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.

Order Code: G1.6
Member $48 Non Member $64
Best Practices for Performing a Welder Qualification Test
The purpose of this technical manual is to define the best practices for qualification testing of welders. This manual is designed as a high-level reference guide, meaning it is purposely generic in order to facilitate qualification testing done to a variety of qualification standards and influenced by the needs of employers and individual welders. Due to the generic nature of this manual, the qualifier (person administering the test) cannot rely only on this content when conducting welder qualification testing. This manual is a crucial tool, but qualifiers will also need the applicable qualification standard and a WPS appropriate for the test being conducted, as well as any other resources relevant to the process.

This manual is divided into sections based on the three phases of welder performance qualification testing: Pre-Test Investigation, Conducting the Test, and Post-Test Activities. Further resources are included in the appendices, including sample documents the qualifier is encouraged to customize to their own needs and integrate into their regular procedures.

Order Code: BPWQ

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

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.

Order Code: GWF

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.

Order Code: CMWS

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.

Order Code: CCRM
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.

Order Code: API-M $66 $88

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-one experience.

Bend Test Replica Order Code: BTR $600 $600
Groove Weld Plate (A) Replica Order Code: GWPR-A $350 $350
Groove Weld Plate (B) Replica Order Code: GWPR-B $350 $350
Pipe Replica Order Code: PR $850 $850
T-Joint Replica Order Code: TJR $600 $600

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

Order Code: RWS $2,400 $2,400

10-Piece Toolkit
The tools to start your inspection career are now available in a heavy-duty vinyl case. These are the same tools used in the AWS hands-on Certified Welding Inspector Test. Quality training kit contains:

7 Piece Fillet Weld Set V-WAC Gauge Inspection Mirror
Hi-Lo Gauge Protractor C4.1 Gauge Weld Profile Gauge

Standard Unit Order Code: 10KIT $270 $360
Metric Unit Order Code: 10KITEM $270 $360

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 $222 $296
Chinese Edition (2008) $95 $95
Spanish Edition (2000) $95 $95

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

Order Code: WIT-W $63 $84

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.

Order Code: RIT-T $123 $164

Welding Fundamentals
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 16

Fabrication Math Levels I and II
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 17
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 worldclass 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.

**SAVE THE DATE**

**FABTECH USA**  
September 13-16, 2021  
McCormick Place  |  Chicago, IL  

Attendee admission: **Free if registered by 09/10**

<table>
<thead>
<tr>
<th>Exhibitor Pricing:</th>
</tr>
</thead>
</table>
| 0-299 sq.ft.       | US$36  
| 300-999 sq.ft.     | US$35  
| 1000-1999 sq.ft.   | US$33  
| 2000-4999 sq.ft.   | US$32  
| 5000-9999 sq.ft.   | US$31  
| 10000-14999 sq.ft. | US$28  
| 15000+ sq.ft.      | US$27  

**FABTECH Mexico**  
May 4-6, 2021  
Monterrey, Mexico  

Attendee admission: **Free**

<table>
<thead>
<tr>
<th>Exhibitor Pricing:</th>
</tr>
</thead>
</table>
| 1-200 sq.ft.       | US$40  
| 200-800 sq.ft.     | US$38  
| 801+ sq.ft.        | US$34  

**FABTECH Canada**  
June 14-16, 2022  
Toronto, Canada  

Attendee admission: **Free**

<table>
<thead>
<tr>
<th>Exhibitor Pricing:</th>
</tr>
</thead>
</table>
| 1-399 sq.ft.       | CAD$33  
| 400-799 sq.ft.     | CAD$32  
| 801-4000 sq.ft.    | CAD$34  
| 4001+ sq.ft        | CAD$32  

**FABTECH EVENTS**

**EXPOSITIONS PROGRAMS**
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 Digital Library includes a wide range of journals from across the web 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 web. 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.

Intuitive and User-Friendly Platform:
- Users can search for relevant information using key word search options, or they can discover new concepts and relationships using the discovery tool. Answer sets can be further refined to hone down the results to essential results.
- A glossary of key words is available for users to take advantage of – developed from the AWS standard A3.0, the authoritative source of welding terms and definitions.
- Multiple search refinement options give users different ways to find content important to their work. These include authors, publication year, type of publication, and titles.

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>
<thead>
<tr>
<th>Institution Size</th>
<th>1 Content Package</th>
<th>2 Content Packages</th>
<th>3 Content Packages</th>
<th>Full AWS Digital Library</th>
</tr>
</thead>
<tbody>
<tr>
<td>University (Masters and/or Doctorate are highest degree offered)</td>
<td>$3,125</td>
<td>$5,313</td>
<td>$6,563</td>
<td>$7,500</td>
</tr>
<tr>
<td>College (Bachelors is highest degree offered)</td>
<td>$2,500</td>
<td>$4,250</td>
<td>$5,250</td>
<td>$6,000</td>
</tr>
<tr>
<td>Community College/Tech School (Associates is highest degree offered)</td>
<td>$1,000</td>
<td>$1,700</td>
<td>$2,100</td>
<td>$2,400</td>
</tr>
</tbody>
</table>

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**
  Where there are no physical campuses, only a virtual presence.
  $12,000

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

**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, renown 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 1-800-798-9296 or submit and email to: aws@madcad.com. For additional information and to create a free trial account to review the Library’s features please refer to the following link: AWSDL.madcad.com.
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
- Welding Simulation
A1.1:2016, **Metric Practice Guide for the Welding Industry**
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.

- Order Code: A1.1
- Member: $60
- Non Member: $80
- $24
- $24

A2.1:2020, **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 36”)** Order Code: A2.1-WC
  - Member: $33
  - Non Member: $44
- **Desk Chart (11” x 17”)** Order Code: A2.1-DC
  - Member: $27
  - Non Member: $36
- **Buy Both Charts, SAVE 10%** Order Code: A2.1-WC & DC
  - Member: $57
  - Non Member: $76
- **Buy the Complete Set, SAVE 15%**
  - **A2.4:2020 (Book) and A2.1:2020-WC & DC (Charts)** Order Code: A2.4/A2.1 SET
  - Member: $174
  - Non Member: $232
- **Larger Wall Chart (36” x 27”)** Order Code: A2.1-WCXL
  - Member: $36
  - Non Member: $48

A2.4:2020, **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
- Spanish Edition (2020)
- Member: $129
- Non Member: $172
- $57
- $57

A3.0M/A3.0:2020, **Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying**
Alphabetical glossary of over 1,500 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
- Spanish Edition (2020)
- Member: $150
- Non Member: $200
- $51
- $68

A3.1:2020, **Master Chart of Welding and Joining Processes**
24” by 30” chart extracted from A3.0

- Order Code: A3.1
- Member: $33
- Non Member: $44

**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 or 8” x 10” best copy available, 18th edition.

- Order Code (Book): JWE
  - Member: $135
  - Non Member: $180
- Order Code (CD): JWE CD
  - Member: $135
  - Non Member: $180

**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
- Member: $114
- Non Member: $152
**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**  
Member $49.50  
Non Member $49.50

**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: **PWCEN**  
Member $62  
Non Member $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: **WPACEN**  
Member $102  
Non Member $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**  
Member $10  
Non Member $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**  
Member $210  
Non Member $280

**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**  
Member $75  
Non Member $100

**Welding Replica Set with Pelican Case**  
Order Code: **RWK-A-Case**  
Member $243  
Non Member $324
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 aws.org/health or purchase the printed document.
Order Code: Z49.1 $57 $76


F1.1M:2018, Methods for Sampling Fumes and Gases Generated by Welding and Allied Processes
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 $51 $68

F1.2:2013, Laboratory Method for Measuring Fume Generation Rates and Total Fume Emission of Welding and Allied Processes
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 $48 $64

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 $51 $68

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 $48 $64

F2.2:2001 (R2019), Lens Shade Selector
11” x 17” chart (Reaffirmed 2010).
Order Code: F2.2 $30 $40
F2.3M:2011 (R2019), 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 $48 $64

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 $60 $80

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 $48 $64

F4.2:2020, Safety Guidelines for Proper Selection of Welding Cables
Order Code: F4.2 $48 $64

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 aws.org/health or purchase the printed document.

<table>
<thead>
<tr>
<th>Member price: $39</th>
<th>Non member price: $52 per volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume Coverage</td>
<td># Pages</td>
</tr>
<tr>
<td>1940-1977</td>
<td>144</td>
</tr>
<tr>
<td>1978-1979</td>
<td>70</td>
</tr>
<tr>
<td>1979-1980</td>
<td>44</td>
</tr>
<tr>
<td>1980-1982</td>
<td>58</td>
</tr>
<tr>
<td>1982-1984</td>
<td>52</td>
</tr>
<tr>
<td>1984-1985</td>
<td>6</td>
</tr>
<tr>
<td>1986-1987</td>
<td>68</td>
</tr>
<tr>
<td>1988-1989</td>
<td>62</td>
</tr>
<tr>
<td>1990-1991</td>
<td>78</td>
</tr>
<tr>
<td>1992-1994</td>
<td>100</td>
</tr>
<tr>
<td>1995-1996</td>
<td>79</td>
</tr>
<tr>
<td>1997-1999</td>
<td>103</td>
</tr>
<tr>
<td>2000-2002</td>
<td>86</td>
</tr>
<tr>
<td>2002-2005</td>
<td>106</td>
</tr>
</tbody>
</table>
Effects of Welding on Health, Index—I through XIV
60 pages.
Order Code: EWH-I $27 $36

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

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 $108 $144

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 $87 $116

C4.2/C4.2M:2017, Recommended Practices for Oxyfuel Gas Cutting Torch Operation
see page 63

see page 63

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 16
Development and qualification of welding procedures can be time-consuming and expensive.

**SHEET METAL**

<table>
<thead>
<tr>
<th>Base Metal</th>
<th>Thickness</th>
<th>Process</th>
<th>Filler Metal</th>
<th>Condition</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Steel</td>
<td>10-18 gauge</td>
<td>GMAW-S</td>
<td>ER70S-6</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-1-004:2002(R2013)</td>
</tr>
<tr>
<td>Carbon Steel</td>
<td>10-18 gauge</td>
<td>GTAW</td>
<td>ER70S-2 or -3</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-1-008:2002(R2013)</td>
</tr>
<tr>
<td>Carbon Steel</td>
<td>10-18 gauge</td>
<td>SMAW</td>
<td>E6010 or E6013</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-1-012:2002(R2013)</td>
</tr>
<tr>
<td>Galvanized Steel</td>
<td>10-18 gauge</td>
<td>GMAW-S</td>
<td>ER70S-6</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-1-003:2002(R2013)</td>
</tr>
<tr>
<td>Galvanized Steel</td>
<td>10-18 gauge</td>
<td>GTAW</td>
<td>ER70S-2 or -3</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-1-007:2002(R2013)</td>
</tr>
<tr>
<td>Galvanized Steel</td>
<td>10-18 gauge</td>
<td>SMAW</td>
<td>E6010 or E6013</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-1-011:2002(R2013)</td>
</tr>
<tr>
<td>Carbon to Stainless</td>
<td>10-18 gauge</td>
<td>GMAW-S</td>
<td>ER309</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-1/8-006:2002(R2013)</td>
</tr>
<tr>
<td>Carbon to Stainless</td>
<td>10-18 gauge</td>
<td>GTAW</td>
<td>ER309</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-1/8-010:2015</td>
</tr>
<tr>
<td>Carbon to Stainless</td>
<td>10-18 gauge</td>
<td>SMAW</td>
<td>E309-15,-16 or -17</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-1/8-014:2002(R2013)</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>10-18 gauge</td>
<td>GMAW-S</td>
<td>ER3XX</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-8-005:2002(R2013)</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>10-18 gauge</td>
<td>GTAW</td>
<td>ER3XX</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-8-009:2002(R2013)</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>10-18 gauge</td>
<td>SMAW</td>
<td>E3XX-15,-16 or -17</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-8-013:2002(R2013)</td>
</tr>
<tr>
<td>Aluminum</td>
<td>10-18 gauge</td>
<td>GTAW</td>
<td>ER4043 or R4043</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-22-015:2011</td>
</tr>
</tbody>
</table>

**PLATE** (All standards below are adopted by National Board Inspection Code)

<table>
<thead>
<tr>
<th>Base Metal</th>
<th>Thickness</th>
<th>Process</th>
<th>Filler Metal</th>
<th>Condition</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Steel</td>
<td>3/16” – 7/8”</td>
<td>GTAW</td>
<td>ER70S-2 or -3</td>
<td>As-welded, with or w/o backing</td>
<td>B2.1-1-002:2020</td>
</tr>
<tr>
<td>Carbon Steel</td>
<td>1/8” – 1-1/2”</td>
<td>GTAW f/b SMAW</td>
<td>ER70S-2 &amp; E7018</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-021:2018</td>
</tr>
<tr>
<td>Carbon Steel</td>
<td>1/8” – 1-1/2”</td>
<td>SMAW</td>
<td>E7018</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-016:2018</td>
</tr>
<tr>
<td>Carbon Steel</td>
<td>1/8” – 1-1/2”</td>
<td>SMAW</td>
<td>E6010</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-017:2018</td>
</tr>
<tr>
<td>Carbon Steel</td>
<td>1/8” – 1-1/2”</td>
<td>SMAW</td>
<td>E6010 &amp; E7018</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-022:2018</td>
</tr>
<tr>
<td>Carbon Steel</td>
<td>1/8” – 1-1/2”</td>
<td>SMAW</td>
<td>E6010* &amp; E7018</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-026:2018</td>
</tr>
<tr>
<td>Carbon Steel</td>
<td>1/8” – 1/2”</td>
<td>FCAW, self-shielded</td>
<td>E71T-11</td>
<td>As-welded</td>
<td>B2.1-1-027:2018</td>
</tr>
<tr>
<td>Carbon Steel</td>
<td>1/8” – 1-1/2”</td>
<td>FCAW-G, CO2 gas shielded</td>
<td>E70T-1 or E71T-1</td>
<td>As-welded</td>
<td>B2.1-1-019:2018</td>
</tr>
<tr>
<td>Carbon Steel</td>
<td>1/8” – 1-1/2”</td>
<td>FCAW-G, CO2 gas shielded</td>
<td>E70T-1 or E71T-1</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-020:2018</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>1/16” – 1-1/2”</td>
<td>GTAW</td>
<td>ER3XX</td>
<td>As-welded</td>
<td>B2.1-8-024:2001(R2012)</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>1/8” – 1-1/2”</td>
<td>GTAW f/b SMAW</td>
<td>ER3XX &amp; E3XX-XX</td>
<td>As-welded</td>
<td>B2.1-8-025:2001(R2012)</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>1/8” – 1-1/2”</td>
<td>SMAW</td>
<td>E3XX-XX</td>
<td>As-welded</td>
<td>B2.1-8-023:2018</td>
</tr>
</tbody>
</table>

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

AWS publishes Standard Welding Procedure Specifications (SWPSs), which are reviewed and validated by the Welding Procedures Committee of the Welding Research Council. They are balloted through the AWS standards-development program as American National Standards. Standard Welding Procedure Specifications may be used on work covered by the AWS D1.1. Structural Welding Code—Steel with the engineer’s approval. The National Board Inspection Code has adopted all pipe SWPSs except B2.1-1-202 and pipe procedures for Naval Applications. SWPSs with red order numbers may be used on ASME Boiler and Pressure Vessel work with additional requirements spelled out in Section IX of ASME Boiler & Pressure Vessel Code. All licenses are good for unlimited intra-company applications.
### Stainless Steel

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Process</th>
<th>Welding Procedure</th>
<th>As-welded or PWHT</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GMAW-S f/b FCW-G**</td>
<td>ER70S-3 &amp; E70T-1M, E71T-1M or -12M</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-232:2020</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GMAW-s f/b, GMAW spray transfer***</td>
<td>ER70S-3</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-233:2020</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>FCAW-G, Ar-CO₂ shielded</td>
<td>E70T-1M, E71T-1M, or E71T-12M</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-234:2006</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GMAW spray transfer***</td>
<td>ER70S-3</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-235:2006</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GMAW f/b SMAW</td>
<td>ER70S-2</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-207:1996 (R2019)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W consumable inserts</td>
<td>IN6m-1 &amp; ER70S-2</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-210:2001 (R2012)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W, consumable inserts/SMAW</td>
<td>IN6m-1, E70S-2 &amp; E7018</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-211:2001 (R2012)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>SMAW</td>
<td>E6010 &amp; E7018</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-205:1996 (R2019)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>SMAW</td>
<td>E6010 &amp; E7018</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-206:1996 (R2019)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>E6010 &amp; E7018</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-208:1996 (R2019)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-229:2002-AMD1 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 3/4&quot;</td>
<td>SMAW</td>
<td>E3XX-XX</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-227:2002-AMD1 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 3/4&quot;</td>
<td>SMAW</td>
<td>E3XX-XX</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-228:2002-AMD1 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-229:2002-AMD1 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-229:2002-AMD1 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-229:2002-AMD1 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-229:2002-AMD1 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-229:2002-AMD1 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-229:2002-AMD1 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-229:2002-AMD1 (R2013)</td>
</tr>
</tbody>
</table>

### Carbon to Stainless

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Process</th>
<th>Welding Procedure</th>
<th>As-welded or PWHT</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W followed by SMAW</td>
<td>E309(L) &amp; E309(L)-15, -16 or -17</td>
<td>As-welded</td>
<td>B2.1-1-229:2002-AMD1 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W consumable inserts/SMAW</td>
<td>E309(L), and E309(L)-XX</td>
<td>As-welded</td>
<td>B2.1-1-231:2015</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>E309(L)-15, -16 or -17</td>
<td>As-welded</td>
<td>B2.1-1-228:2002 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3</td>
<td>As-welded</td>
<td>B2.1-1-229:2002 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3</td>
<td>As-welded</td>
<td>B2.1-1-229:2002 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3</td>
<td>As-welded</td>
<td>B2.1-1-229:2002 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3 &amp; E9018-B3</td>
<td>As-welded</td>
<td>B2.1-1-229:2002 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3 &amp; E9018-B3</td>
<td>As-welded</td>
<td>B2.1-1-229:2002 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3 &amp; E9018-B3</td>
<td>As-welded</td>
<td>B2.1-1-229:2002 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3 &amp; E9018-B3</td>
<td>As-welded</td>
<td>B2.1-1-229:2002 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3 &amp; E9018-B3</td>
<td>As-welded</td>
<td>B2.1-1-229:2002 (R2013)</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>ER90S-B3 &amp; E9018-B3</td>
<td>As-welded</td>
<td>B2.1-1-229:2002 (R2013)</td>
</tr>
</tbody>
</table>

### Carbon Steel

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Process</th>
<th>Welding Procedure</th>
<th>As-welded or PWHT</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>SMAW</td>
<td>E7018-M</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-302:2018</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>SMAW</td>
<td>E7018-M</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-303:2018</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>SMAW</td>
<td>E7018-M</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-304:2018</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>SMAW</td>
<td>E7018-M</td>
<td>As-welded or PWHT</td>
<td>B2.1-1-305:2018</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>E7018</td>
<td>As-welded</td>
<td>B2.1-1-306:2018</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>E7018</td>
<td>As-welded</td>
<td>B2.1-1-307:2018</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>E7018</td>
<td>As-welded</td>
<td>B2.1-1-308:2018</td>
</tr>
<tr>
<td>1/8&quot; – 1-1/2&quot;</td>
<td>GTA W</td>
<td>E7018</td>
<td>As-welded</td>
<td>B2.1-1-309:2018</td>
</tr>
</tbody>
</table>

**FCAW limited to uphill progression only when welding in the vertical position. / **GMAW spray transfer limited to flat position only for groove welds.

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

- **D1.1/D1.1M:2015, Structural Welding Code—Steel** see page 72
- **D1.5M/D1.5:2010, Bridge Welding Code** see page 72
- **WIT-T:2008, Welding Inspection Technology** see page 38

### Portuguese

- **D1.1/D1.1M:2010, Structural Welding Code—Steel** see page 72

### Russian

- **D1.1/D1.1M:2010, Structural Welding Code—Steel** see page 72
- **API 1104:2013, Welding of Pipelines and Related Facilities 21st Edition** see page 69

### Spanish

- **A1.1:2001, Metric Practice Guide for the Welding Industry** see page 43
- **A2.4:2020, Standard Symbols for Welding, Brazing, and Nondestructive Examination** see page 43
- **A3.0:2020, Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying** see page 43
- **B1.10:2009, Guide for the Nondestructive Examination of Welds** see page 32
- **B1.11:2000, Guide for the Visual Examination of Welds** see page 32
- **B4.0:2007, Standard Methods for Mechanical Testing of Welds** see page 32

### Translations

- **B5.1:2013-AMD1, Specification for the Qualification of Welding Inspectors** see page 34
- **CM:2000, Certification Manual for Welding Inspectors** see page 37
- **D1.1/D1.1M:2020, Structural Welding Code—Steel** see page 72
- **D1.2/D1.2M:2008, Structural Welding Code—Aluminum** see page 72
- **D1.5M/D1.5:2010, Bridge Welding Code** see page 72
- **D15.1/D15.1M:2019, Railroad Welding Specification for Cars and Locomotives** see page 71
- **D17.1:2017 AMD2, Specification for Fusion Welding for Aerospace Applications** see page 65
- **WI:2000, Welding Inspection Handbook** see page 32
- **WIT-T:2000, Welding Inspection Technology** see page 38
- **Z49.1:2012, Safety in Welding, Cutting, and Allied Processes** see page 45
- **API 1104:2013, Welding of Pipelines and Related Facilities 21st Edition** see page 69
Own the Entire Library of AWS Welding Handbooks

These are the must-have references for engineers, structural designers, technologists, inspectors, welders, welding educators and others who need to understand this dynamic and evolving industry. Put all the facts at your fingertips and make sure you’re on the cutting edge with new and updated material. Here are five good reasons you should add these valuable editions to your library. The books represent:

- The largest body of knowledge on welding available anywhere.
- Practical, hands-on information that you can put to immediate use.
- The most current information on best practices regarding safety, quality, and qualification issues.
- Unparalleled authority—chapters are written by leading scientists, engineers, educators, and other technical and scientific experts. Everything is peer-reviewed for accuracy and timeliness.
- The most valuable resource on welding on the market today, covering the entire spectrum of welding from science and technology, history, welding processes, and materials and applications.

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

The seventeen chapters in this volume cover the fundamentals of welding, cutting, joining, and allied processes. The chapters discuss metallurgy, the physics of welding and cutting, heat flow in welding, and residual stress and distortion. Other important topics include engineering considerations of weld design; weldment tooling and positioning; automation, process monitoring and control, methods for the evaluation and testing of welds; weld quality; weld inspection and nondestructive examination; the economics of welding; and safe practices. 900 pages, 17 chapters, 700 illustrations, 170 tables, hardbound. 8” x 10”.

Order Code: WHB-1.10

This volume of the Welding Handbook presents an overview of the most recent research and engineering developments in the field of welding and cutting science and technology. Upcoming volumes will address welding processes, materials, and applications. Together, the five volumes of the tenth edition substantially expand upon and update the information presented in the ninth edition.

Well-researched chapters on codes and other standards, the qualification and certification of welding techniques and personnel, the accurate communication of welding information, and safe practices are also included. The information in this volume is applicable to all categories of welding, from manual welding to the most sophisticated automated and robotic systems.

The peer-reviewed chapters in this volume are enhanced by the pertinent consensus standards that are referenced throughout. More than 700 drawings, schematics, and photographs illustrate the text. Approximately 170 tables provide categorized or comparative information. Explanatory information and sources are identified and referenced in footnotes.

This volume, like the others preceding it, is a voluntary effort by the members of the Welding Handbook Committee, the Welding Handbook Volume 1 Committee, and the Chapter Committees. Each chapter is reviewed by members of the American Welding Society’s Technical Activities Committee (TAC), Safety and Health Committee (SHC), and other specialists.
**WELDING HANDBOOKS**

**REFERENCE MATERIALS PUBLICATIONS**


Presents comprehensive information on welding and related processes. Contains detailed information on arc welding power sources; shielded metal arc, gas tungsten arc, gas metal arc, flux cored arc, submerged arc, and plasma arc welding processes. Includes chapters on electroslag welding, stud welding, oxyfuel gas welding, brazing, soldering, oxygen cutting, and arc cutting and gouging. 736 pages, 15 chapters, 260 line drawings, 100 photographs, 148 tables, hardbound. 8” x 10”.

Order Code: **WHB-2.9**

Member: $147  
Non Member: $196


Over 600 pages of comprehensive information on solid-state and other welding and cutting processes. The book includes chapters on resistance spot and seam welding, projection welding, flash and upset welding and high-frequency welding. In addition to a chapter on friction welding, a new chapter introduces friction stir welding. The most recent developments in beam technology are discussed in the greatly expanded chapters on laser beam welding and cutting and electron beam welding. Other chapters are on ultrasonic welding of metals, explosion welding, diffusion welding and diffusion brazing, adhesive bonding and thermal and cold spraying. The last chapter covers various other welding and cutting processes, including water jet cutting. Written, updated, and peer reviewed by a group of highly respected technical and scientific experts, the book has 15 chapters, more than 400 line drawings and photographs, and a comprehensive index. 669 pages, 15 chapters, 3 appendices, 438 illustrations, 59 tables; hardbound. 8” x 10”.

Order Code: **WHB-3.9**

Member: $147  
Non Member: $196


Extensively revised and updated from the eighth edition, this comprehensive volume had more than 50 experts in materials and materials applications assure its accuracy and the currency of its content. It is a great reference source for engineers, educators, welding supervisors, and welders. Covers carbon and low-alloy steels; high-alloy steels; coated steels; tool and die steels; stainless and heat-resisting steels; clad and dissimilar metals; surfacing; cast irons; maintenance and repair welding; and underwater welding and cutting. Includes more than 650 pages, 396 line drawings and photos, and 259 tables. 10 chapters, hardbound, 8” x 10”.

Order Code: **WHB-4.9**

Member: $147  
Non Member: $196

**Ninth Edition, Volume 5, Materials and Applications, Part 2**

New and extensively updated, Volume 5 of the Welding Handbook: Materials and Applications, Part 2 is an excellent reference source for engineers, designers, educators, technicians, and welders. Sixty seven experts from research labs, universities, manufacturers, and fabricators have collaborated on this volume to ensure the accuracy and currency of each of the 10 chapters. The volume covers aluminum; magnesium; copper; nickel and cobalt; lead and zinc; titanium; reactive, reflective and precious metals; plastics; ceramics; and composites. Each chapter includes a thorough explanation of the metal or material, details of the welding processes used to join it, safe practices, and a comprehensive bibliography. The volume includes more than 750 pages; 417 illustrations, which include photos, micrographs, and line drawings; and 274 tables. Hardbound, 8 in. x 10 in. (2015).

Order Code: **WHB-5.9**

Member: $147  
Non Member: $196

Get five volumes of the current *Welding Handbook* set at a substantial savings.

**Tenth Edition, Volume 1; Ninth Edition Volumes 2, 3, 4 and 5**

Order Code: **WHB-ALL**

Member: $584  
Non Member: $778

Get the two *Welding Handbook* volumes on Processes at substantial savings.


Order Code: **WHB-PRC**

Member: $219  
Non Member: $292

Get the two *Welding Handbook* volumes on Material and Applications at substantial savings.


Order Code: **WHB-MTA**

Member: $219  
Non Member: $292
PURCHASE SPECIFIC AWS WELDING HANDBOOK CHAPTERS

Get valuable information from the Welding Handbook on a specific topic without the need to purchase the whole volume. Individual chapters of the Welding Handbook Volumes 1, 2, 3, 4 and 5 are now available as PDF downloads from [aws.org/handbook](http://aws.org/handbook).

<table>
<thead>
<tr>
<th>Volume 1, 10th Edition Welding and Cutting Science and Technology</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>WHC1.01: Survey of Joining, Cutting, &amp; Allied Processes</td>
<td>WHC2.01: Arc Welding Power Sources</td>
</tr>
<tr>
<td>WHC1.02: Physics of Welding and Cutting</td>
<td>WHC2.02: Shielded Metal Arc Welding</td>
</tr>
<tr>
<td>WHC1.03: Heat Flow in Welding</td>
<td>WHC2.03: Gas Tungsten Arc Welding</td>
</tr>
<tr>
<td>WHC1.04: Welding Metallurgy</td>
<td>WHC2.04: Gas Metal Arc Welding</td>
</tr>
<tr>
<td>Part II – Design Considerations</td>
<td>WHC2.05: Flux Cored Arc Welding</td>
</tr>
<tr>
<td>WHC1.05: Design for Welding</td>
<td>WHC2.06: Submerged Arc Welding</td>
</tr>
<tr>
<td>WHC1.06: Symbols for Joining and Inspection</td>
<td>WHC2.07: Plasma Arc Welding</td>
</tr>
<tr>
<td>WHC1.07: Residual Stress and Distortion</td>
<td>WHC2.08: Electrogas Welding</td>
</tr>
<tr>
<td>WHC1.08: Economics of Welding and Cutting</td>
<td>WHC2.09: Arc Stud Welding</td>
</tr>
<tr>
<td>Part III – Automation of Joining Processes</td>
<td>WHC2.10: Electroslag Welding</td>
</tr>
<tr>
<td>WHC1.09: Mechanized, Automated, and Robotic Welding</td>
<td>WHC2.11: Oxyfuel Gas Welding</td>
</tr>
<tr>
<td>WHC1.10: Weldment Tooling and Positioning</td>
<td>WHC2.12: Brazing</td>
</tr>
<tr>
<td>WHC1.11: Monitoring and Control of Welding and Joining Processes</td>
<td></td>
</tr>
<tr>
<td>WHC1.12: Weld Quality</td>
<td>WHC3.01: Resistance Spot and Seam Welding</td>
</tr>
<tr>
<td>WHC1.13: Test Methods for Evaluating Welded Joints</td>
<td>WHC3.02: Projection Welding</td>
</tr>
<tr>
<td>WHC1.14: Welding Inspection and Nondestructive Examination</td>
<td>WHC3.03: Flash and Upset Welding</td>
</tr>
<tr>
<td>WHC1.15: Personnel Qualification and Certification</td>
<td>WHC3.04: Resistance Welding Equipment</td>
</tr>
<tr>
<td>WHC1.16: Codes and Other Standards</td>
<td>WHC3.05: High-Frequency Welding</td>
</tr>
<tr>
<td>Part V – Safety and Health</td>
<td>WHC3.06: Friction Welding</td>
</tr>
<tr>
<td>WHC1.17: Safe Practices</td>
<td>WHC3.07: Friction Stir Welding</td>
</tr>
<tr>
<td>Volume 4, Materials and Applications, Part 1</td>
<td>WHC3.08: Ultrasonic Welding</td>
</tr>
<tr>
<td>WHC4.01: Carbon and Low-Alloy Steels</td>
<td>WHC3.09: Explosion Welding</td>
</tr>
<tr>
<td>WHC4.02: High-Alloy Steels</td>
<td>WHC3.10: Adhesive Bonding</td>
</tr>
<tr>
<td>WHC4.03: Coated Steels</td>
<td>WHC3.11: Thermal Spraying and Cold Spraying</td>
</tr>
<tr>
<td>WHC4.04: Tool and Die Steels</td>
<td>WHC3.12: Diffusion Welding and Diffusion Brazing</td>
</tr>
<tr>
<td>WHC4.05: Stainless and Heat Resistant Steels</td>
<td>WHC3.13: Electron Beam Welding</td>
</tr>
<tr>
<td>WHC4.06: Clad and DissimilarSteels</td>
<td>WHC3.14: Laser Beam Welding, Cutting &amp; Associated Processes</td>
</tr>
<tr>
<td>WHC4.07: Surfacing Materials</td>
<td>WHC3.15: Other Welding and Cutting Processes</td>
</tr>
<tr>
<td>WHC4.08: Cast Irons</td>
<td></td>
</tr>
<tr>
<td>WHC4.09: Maintenance and Repair Welding</td>
<td>Volume 5, Materials and Applications, Part 2</td>
</tr>
<tr>
<td>WHC4.10: Underwater Welding and Cutting</td>
<td>WHC5.01: Aluminum and Aluminum Alloys</td>
</tr>
<tr>
<td></td>
<td>WHC5.02: Magnesium and Magnesium Alloys</td>
</tr>
<tr>
<td></td>
<td>WHC5.03: Copper and Copper Alloys</td>
</tr>
<tr>
<td></td>
<td>WHC5.04: Nickel and Cobalt Alloys</td>
</tr>
<tr>
<td></td>
<td>WHC5.05: Lead and Zinc</td>
</tr>
<tr>
<td></td>
<td>WHC5.06: Titanium and Titanium Alloys</td>
</tr>
<tr>
<td></td>
<td>WHC5.07: Reactive, Refractory, and Precious Metals</td>
</tr>
<tr>
<td></td>
<td>WHC5.08: Plastics</td>
</tr>
<tr>
<td></td>
<td>WHC5.09: Ceramics</td>
</tr>
<tr>
<td></td>
<td>WHC5.10: Composites</td>
</tr>
</tbody>
</table>

Member price: $15   |   Non member price: $20 per chapter
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-nonmetal, and nonmetal-to-nonmetal joints. 42 pages, 16 figures, 4 tables.
Order Code: C3.2
Member $57  Non Member $76

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
Member $54  Non Member $72

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
Member $51  Non Member $68

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
Member $51  Non Member $68

C3.6M/C3.6:2016-AMD1, 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
Member $51  Non Member $68
# WELDING PROCESS PUBLICATIONS

## BRAZING & SOLDERING

**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

<table>
<thead>
<tr>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$48</td>
<td>$64</td>
</tr>
</tbody>
</table>

**C3.8M/C3.8:2020, 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

<table>
<thead>
<tr>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$60</td>
<td>$80</td>
</tr>
</tbody>
</table>

**C3.9M/C3.9:2020, 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

<table>
<thead>
<tr>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$48</td>
<td>$64</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$48</td>
<td>$64</td>
</tr>
</tbody>
</table>

**C3.12M/C3.12:2017, Specification for Furnace Soldering**
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

<table>
<thead>
<tr>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$48</td>
<td>$64</td>
</tr>
</tbody>
</table>

This standard describes and illustrates the test methods used to obtain information related to brazed joint quality and structural integrity. Verification methods include visual observation, as well as metallography of such parameters as braze wetting, braze joint erosion, brazing filler metal penetration, differences between excess wetting, lack of wetting and dewetting, and formation of voids, cracks, and features which may be detrimental to end use. Additionally, methods to determine diffusion of braze alloying elements and procedures to qualify such methods are described. Photographs illustrating visual inspection, schematic illustrations, and photomicrographs illustrating various aspects of brazed joint integrity are presented.

Order Code: C3.14

<table>
<thead>
<tr>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$54</td>
<td>$72</td>
</tr>
</tbody>
</table>
see page 33

see page 33

A5.8M/A5.8:2019, Specification for Filler Metals for Brazing and Braze Welding
see page 78

A5.31M/A5.31:2012, Specification for Fluxes for Brazing and Braze Welding
see page 78

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 $114 $152

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 $120 $160

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 $75 $100

Order Code:

BRH $114 $152
SHB $120 $160
GHSP $75 $100
PURCHASE SPECIFIC *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/handbook](http://aws.org/handbook).

### BRAZING HANDBOOK CHAPTERS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basics of Brazing</td>
</tr>
<tr>
<td>2</td>
<td>Brazement Design</td>
</tr>
<tr>
<td>3</td>
<td>Brazing Filler Metals</td>
</tr>
<tr>
<td>4</td>
<td>Fluxes and Atmospheres</td>
</tr>
<tr>
<td>5</td>
<td>Precleaning and Surface Preparation</td>
</tr>
<tr>
<td>6</td>
<td>Assembly and Fixturing</td>
</tr>
<tr>
<td>7</td>
<td>Corrosion of Brazed Joints</td>
</tr>
<tr>
<td>8</td>
<td>Inspection of Brazed Joints</td>
</tr>
<tr>
<td>9</td>
<td>Codes and Other Standards</td>
</tr>
<tr>
<td>10</td>
<td>Safety and Health</td>
</tr>
<tr>
<td>11</td>
<td>Introduction to the Brazing Processes</td>
</tr>
<tr>
<td>12</td>
<td>Torch Brazing</td>
</tr>
<tr>
<td>13</td>
<td>Induction Brazing</td>
</tr>
<tr>
<td>14</td>
<td>Furnace Brazing</td>
</tr>
<tr>
<td>15</td>
<td>Dip Brazing</td>
</tr>
<tr>
<td>16</td>
<td>Resistance Brazing</td>
</tr>
<tr>
<td>17</td>
<td>Diffusion Brazing</td>
</tr>
<tr>
<td>18</td>
<td>Other Brazing Processes</td>
</tr>
<tr>
<td>19</td>
<td>Braze Welding</td>
</tr>
<tr>
<td>20</td>
<td>Aluminum and Aluminum Alloys</td>
</tr>
<tr>
<td>21</td>
<td>Graphite and Carbon-Carbon Composites</td>
</tr>
<tr>
<td>22</td>
<td>Cemented Carbides and Cermets</td>
</tr>
<tr>
<td>23</td>
<td>Cast Iron</td>
</tr>
<tr>
<td>24</td>
<td>Ceramics</td>
</tr>
<tr>
<td>25</td>
<td>Copper and Copper Alloys</td>
</tr>
<tr>
<td>26</td>
<td>Low-Carbon, Low-Alloy, and Tool Steels</td>
</tr>
<tr>
<td>27</td>
<td>Magnesium and Magnesium Alloys</td>
</tr>
<tr>
<td>28</td>
<td>Nickel-Based and Cobalt-Containing Alloys</td>
</tr>
<tr>
<td>29</td>
<td>Precious Metals</td>
</tr>
<tr>
<td>30</td>
<td>Reactive Metals: Titanium, Zirconium, and Beryllium</td>
</tr>
<tr>
<td>31</td>
<td>Refractory Metals: Niobium, Molybdenum, Tantalum, and Tungsten</td>
</tr>
<tr>
<td>32</td>
<td>Stainless Steels</td>
</tr>
<tr>
<td>33</td>
<td>Electron Tubes and Vacuum Equipment</td>
</tr>
<tr>
<td>34</td>
<td>Honeycomb Structures</td>
</tr>
<tr>
<td>35</td>
<td>Pipe and Tubing</td>
</tr>
<tr>
<td>36</td>
<td>Diamond</td>
</tr>
</tbody>
</table>

### SOLDERING HANDBOOK CHAPTERS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fundamentals of Soldering Technology</td>
</tr>
<tr>
<td>2</td>
<td>Solder Materials</td>
</tr>
<tr>
<td>3</td>
<td>Substrate Materials</td>
</tr>
<tr>
<td>4</td>
<td>Fluxes</td>
</tr>
<tr>
<td>5</td>
<td>Solder Pastes</td>
</tr>
<tr>
<td>6</td>
<td>Assembly Processes</td>
</tr>
<tr>
<td>7</td>
<td>Inspection Techniques for Product Acceptance and Process Optimization</td>
</tr>
<tr>
<td>8</td>
<td>Environmental, Safety, and Health</td>
</tr>
</tbody>
</table>

Member price: $18  |  Non member price: $24 per chapter
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 $60 $80

D18.2:2020, Guide to Weld Discoloration Levels on Inside of Austenitic Stainless Steel Tube
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 $45 $60
13” X 19” Order Code: D18.2XL $54 $72

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 $51 $68
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  
Member: $90  
Non Member: $120

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  
Member: $51  
Non Member: $68

C1.5:2019, *Specification for the Qualification of Resistance Welding Technicians* see page 35


see page 65


see page 65

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  
Member: $54  
Non Member: $72

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  
Member: $54  
Non Member: $72

This standard builds upon the globally recognized material classification system described in the Resistance  
Welder Manufacturers’ Association (RWMA) Bulletin 16, Resistance Welding Equipment Standards, last  
published in 1996. The standard provides updated and expanded information useful to material and electrode  
manufacturers, distributors, and end users. This document describes common materials to facilitate  
identification and minimize variation. It is not intended to limit the range of resistance welding products or  
processes in the marketplace. 46 pages, 19 tables.  
Order Code: J1.3  
Member: $54  
Non Member: $72
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
$35  $46

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

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
$36  $48

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
$99  $132

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
$99  $132

QC20:2020, Specification for AWS Certification of Resistance Welding Technicians
see page 31
A9.5:2013, Guide for Verification and Validation in Computation Weld Mechanics
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 $54 $72

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 $57 $76

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 $51 $68

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

see page 36

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 $51 $68
C2.16/C2.16M:2017, Guide for Thermal Spray Operator Qualification Programs

See page 35
Order Code: C2.16
Member $66 Non Member $88

C2.18-93R, Guide for the Protection of Steel with Thermal Sprayed Coatings of Aluminum and Zinc and Their Alloys and Composites

Authoritative guide to select, plan, and control thermal sprayed coatings for preservation of steel. Indispensable for purchasers, architects, managers, supervisors, and contractors in the construction, marine, rail, fabrication, and repair industries. 41 pages, 4 figures, 13 tables (Reaffirmed 2001).
Order Code: C2.18
Member $54 Non Member $72


Replaces MIL-STD-1687A(SH). Defines requirements for high-velocity oxygen fuel coatings as alternatives to hard chrome plating. Details essential equipment, surface prep, and application of thermal spray coatings and sealers with in-process quality control checkpoints. Includes procedures for qualification, procedure approval, and documentation. 68 pages, 8 figures, 7 tables.
Order Code: C2.19
Member $63 Non Member $84

C2.20/C2.20M:2016, Specification for Thermal Spraying Zinc Anodes on Steel Reinforced Concrete

This AWS standard is a specification for thermal spraying zinc anodes on steel reinforced concrete. This standard is formatted as an industrial process instruction. The scope includes: job description, safety, pass/fail job reference standards, feedstock materials, equipment, a step-by-step process instruction for surface preparation, thermal spraying, and quality control. There are five annexes, including job control record and portable adhesion testing. 48 pages, 3 figures, 5 tables.
Order Code: C2.20
Member $51 Non Member $68

C2.21M/C2.21:2015, Specification for Thermal Spray Equipment Acceptance Inspection

This standard specifies the essential elements of a procedure for verifying the performance of thermal spray equipment to ensure it is capable of operating according to the manufacturer’s specifications or those established by the user. 38 pages
Order Code: C2.21
Member $54 Non Member $72


Covers safety, job reference standards, equipment setup and preparation, surface preparation, aluminum and zinc application, and sealer and topcoat application. Does not cover design and fabrication, thermal spray equipment qualification, coating selection, and operator and inspector certification. Same as NACE No. 12, SSPC-CS 23.00. 48 pages, 9 figures, 5 tables.
Order Code: C2.23
Member $54 Non Member $72

C2.25/C2.25M:2012 (R2018), Specification for Thermal Spray Feedstock—Wire and Rods

Classifies solid and composite wires and ceramic rods for thermal spraying, based on their as-manufactured chemical composition. Includes requirements for standard sizes, marking, manufacturing, and packaging. 32 pages, 3 figures, 7 tables (Reaffirmed 2017).
Order Code: C2.25
Member $54 Non Member $72

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
Member $212 Non Member $283
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  
Member $102  Non Member $136

A3.1:2020, Master Chart of Welding and Joining Processes  
24” by 30” chart extracted from A3.0.
Order Code: A3.1  
$33 $44

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  
$51 $68

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  
$54 $72

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  
$54 $72

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  
$57 $76

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  
$45 $60
WELDING PROCESS PUBLICATIONS

WELDING & CUTTING PROCESSES

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
Member $57 Non Member $76

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
Member $51 Non Member $68

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
Member $51 Non Member $68

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
Member $51 Non Member $68

C7.1M/C7.1:2013, Recommended Practices for Electron Beam Welding and Allied Processes
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.
Order Code: C7.1
Member $84 Non Member $112

C7.2M:2010, Recommended Practices for Laser Beam Welding, Cutting, and Allied Processes
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.
Order Code: C7.2
Member $87 Non Member $116

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.
Order Code: C7.3
Member $51 Non Member $68

see page 35

Order Code: D14.8
Member $69 Non Member $92
AEROSPACE

D17.1:2017 AMD2, Specification for Fusion Welding for Aerospace Applications
This specification provides the general welding requirements for welding aircraft and space hardware. It includes but is not limited to the fusion welding of aluminum-based, nickel-based, iron-based, cobalt-based, magnesium-based, and titanium-based alloys using electric arc and high energy beam processes. There are requirements for welding design, personnel and procedure qualification, inspection, and acceptance criteria for aerospace, support, and non-flight hardware. Additional requirements cover repair welding of existing hardware. A commentary for the specification is included. 120 pages.

Order Code: D17.1
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

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.

Order Code: D17.3

AUTOMOTIVE

D8.1M:2013, Specification for Automotive Weld Quality – Resistance Spot Welding of Steel
Establishes acceptance criteria for resistance spot welds in autos fabricated from steel, including Advanced High Strength Steels. 38 pages, 24 figures, 4 tables.

Order Code: D8.1

This document contains both visual and measurable acceptance criteria for resistance spot welds in aluminum. The information contained herein may be used as an aid by designers, resistance welding equipment manufacturers, welded product producers, and others involved in the automotive industry and resistance spot welding of aluminum. 40 pages.

Order Code: D8.2

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

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.

Order Code: D8.9

This specification covers the arc welding of automotive components that are manufactured from aluminum alloys. 42 pages.

Order Code: D8.14
Includes amendment. Specifies requirements for welding of all principal structural weldments and all primary welds used to manufacture cranes for industrial, mill, powerhouse, and nuclear facilities. Applies to other overhead material-handling machinery and equipment that support and transport loads within the design rating, vertically or horizontally, during normal operations. When agreed upon between owner and manufacturer, it may apply to loading caused by abnormal operations or environmental events, such as seismic loading. All provisions apply to strengthening and repairing of existing overhead cranes and material handling equipment. Contains figures and tables with prequalified joint details, allowable stress ranges, stress categories, and nondestructive examination techniques. Does not apply to construction or crawler cranes or welding of rails. 150 pages, 60 figures, 21 tables.
Order Code: D14.1 $90 $120

Includes amendment. For self-propelled, on- and off-highway machinery and agricultural equipment. Specifies requirements for structural welds used in the manufacture and repair of crawlers, tractors, graders, loaders, off-highway trucks, power shovels, backhoes, mobile cranes, draglines, and other heavy earthmoving, construction, and agricultural equipment. Provides exhaustive illustrations of prequalified complete and partial penetration welded joints (butt, corner, T-, or combination) for shielded metal arc welding, submerged arc welding, gas metal arc welding, and flux cored arc welding. Includes variables for prequalified fillet welds. Annexes include “Recommended Practices for Treatment of Shielded Metal Arc and Flux Cored Arc Electrodes.” Tables include “Weldability Classification—Typical Steel Products” and “Minimum Preheat and Interpass Temperatures.” 94 pages, 22 figures, 13 tables.
Order Code: D14.3 $81 $108

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.
Order Code: D14.4 $90 $120

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.
Order Code: D14.5 $90 $120

Specifies the requirements for weld joint detail and fabrication by welding of rotating elements for new equipment and modification or repair of existing equipment. Equipment types include, but not limited to: crushers, fans, impellers, centrifugal impellers, kilns, pulpers, gears, sheaves, drive trains, cranks shafts, flywheels, power transmission shafts, air moving devices, blowers, and rotating elements of hydroelectric generation equipment. The intent of this specification is not to include steam or combustion turbine rotors, blading, or camshafts. This specification includes requirements for welding procedure and welder performance qualification and inspection and quality control and refers to AWS B2.1/B2.1M for base material specifications and groupings (BMG), tables for welding consumable F and A numbers, welding positions, test fixtures, macroetch procedures, and sample forms. 86 pages, 10 tables, 19 figures.
Order Code: D14.6 $66 $88
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**

Member: $60  
Non Member: $80


see page 64

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.

Order Code: **D14.9**

Member: $60  
Non Member: $80

**HEAVY MACHINERY BUNDLES**

**BUNDLE E**

Order Code: **BUNDLE E** YOU SAVE $56/$42

Member: $249  
Non Member: $332

**BUNDLE F**

Order Code: **BUNDLE F** YOU SAVE $56/$42

Member: $237  
Non Member: $316
**D3.5-93R(2000), Guide for Steel Hull Welding**
Best practical methods to weld steel hulls for ships, barges, mobile offshore drilling units, and other marine vessels. Includes information on steel plates, shapes, castings, and forgings, their selection, and their weldability. 118 pages, 72 figures, 9 tables. (Reaffirmed 2000).

Order Code: **D3.5**  
$78  
$104

**D3.6M:2017, Underwater Welding Code**
This code covers the requirements for welding structures or components under the surface of water. It includes welding in both dry and wet environments. Clauses 1 through 8 constitute the general requirements for underwater welding, while clauses 9 through 11 contain the special requirements applicable to three individual classes of weld as follows:
- **Class A**—Comparable to above-water welding
- **Class B**—For less critical applications
- **Class O**—To meet the requirements of another designated code or specification.
146 pages, 47 figures, 13 tables, 4 forms, commentary.

Order Code: **D3.6**  
$87  
$116

**D3.7:2004, Guide for Aluminum Hull Welding**
Guidance on proven processes, techniques, and procedures for welding aluminum hulls and related ship structures. Chiefly for aluminum hulls over 30-ft. (9-m) long and made of sheet and plate 3/16-in. (4.8-mm) thick and greater. Sections on hull materials, construction preparation, welding equipment, processes, procedure and performance qualification, welding techniques, and safety. 86 pages, 11 figures, 18 tables.

Order Code: **D3.7**  
$66  
$88

**D3.9:2019, Specification for Classification of Weld-Through Paint Primers**
Specifies the classification requirements for weld-through paint primers for paint manufacturers, based on the maximum coating thickness and welding procedure used in testing. 20 pages, 1 figure, 1 table.

Order Code: **D3.9**  
$54  
$72

**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.

Order Code: **A5.35**  
$54  
$72

**Standard Welding Procedure, Specifications for Naval Applications (SWPS-Ns)** see page 49

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.

Order Code: API1104

<table>
<thead>
<tr>
<th></th>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$345</td>
<td>$373</td>
<td>$345</td>
</tr>
</tbody>
</table>

Spanish edition $345 $373

Russian edition $345 $373

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

Detailed discussion of the metallurgical characteristics and weldability of many grades of austenitic stainless steel used in piping and tubing. The delta ferrite content as expressed by ferrite number (FN) is explained, and its importance in minimizing hot cracking is discussed. Figures and tables illustrate recommended joint designs and procedures. Appendix A presents information on the welding of high-carbon stainless steel cast pipe fittings. 42 pages. (Reaffirmed 1992).

Order Code: D10.4

<table>
<thead>
<tr>
<th></th>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$54</td>
<td>$72</td>
<td>$54</td>
</tr>
</tbody>
</table>


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.

Order Code: D10.6

<table>
<thead>
<tr>
<th></th>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$48</td>
<td>$64</td>
<td>$48</td>
</tr>
</tbody>
</table>


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.

Order Code: D10.7

<table>
<thead>
<tr>
<th></th>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$54</td>
<td>$72</td>
<td>$54</td>
</tr>
</tbody>
</table>

D10.8-96, *Recommended Practices for Welding of Chromium-Molybdenum Steel Piping and Tubing*

Recommendations for welding chromium-molybdenum steel pipe and tubing to itself and to various other materials. Covered in detail are filler metal selection, joint design, preheating, and postheating. Emphasis is placed on maintaining interpass temperature and dangers inherent in interrupted heating cycles. 18 pages, 1 figure, 4 tables.

Order Code: D10.8

<table>
<thead>
<tr>
<th></th>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$45</td>
<td>$60</td>
<td>$45</td>
</tr>
</tbody>
</table>


Provides information on recommended practices, equipment, temperature control, insulation, and advantages and disadvantages for the methods presently available for local heating of welded joints in pipe and tubing. 116 pages, 8 annexes, 23 figures, 16 tables (Reaffirmed 2009).

Order Code: D10.10

<table>
<thead>
<tr>
<th></th>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$78</td>
<td>$104</td>
<td>$78</td>
</tr>
</tbody>
</table>


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.

Order Code: D10.11

<table>
<thead>
<tr>
<th></th>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$51</td>
<td>$68</td>
<td>$51</td>
</tr>
</tbody>
</table>
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.
Order Code: D10.12
$51 $68

Extensive guidance on multipass orbital machine pipe groove welding for both plant and transmission applications. 76 pages, 29 figures, 1 table.
Order Code: D10.14
$66 $88

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
$54 $72


Pipe Welding Standard Welding Procedure Specifications (SWPSs) see page 49
PLASTICS

B2.4:2012, Specification for Welding Procedure and Performance Qualification for Thermoplastics see page 34

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.
Order Code: G1.1 $69 $92

G1.2M/G1.2:1999 (R2010), Specification for Standardized Ultrasonic Welding Test Specimen for Thermoplastics
Helps minimize variations in the geometry, welding, and testing of the ultrasonic welding test sample for thermoplastics. Detailed figures show tolerances on critical dimensions that may affect weldability. Use this specification for studies on the ultrasonic welding of thermoplastics, weldability studies, and optimizations. 36 pages. (Reaffirmed 2010).
Order Code: G1.2 $48 $64

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 36

G1.10M:2016, Guide for the Evaluation of Thermoplastic Welds
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
Order Code: G1.10 $78 $100

RAILROAD

This specification establishes minimum welding standards for the manufacture and maintenance of railcars, locomotives, and their components, intended for North American railroad service. Clauses 4 through 17 cover the general requirements for welding in the railroad industry. Clauses 18 through 23 cover specific requirements for the welding of base metals thinner than 1/8 in [3 mm]. 260 pages.
Order Code: D15.1 $129 $172

D15.2/D15.2M:2013, Recommended Practices for the Welding of Rails and Related Rail Components for Use by Rail Vehicles
Recommends the minimum standards for the welding of rails and related rail components used by rail vehicles. Covers repair procedures for rails and austenitic manganese steel components, thermitie welding, electric flash welding guidelines, procedure qualification, and welder qualification. 64 pages, 23 figures, 7 tables.
Order Code: D15.2 $60 $80
**D1.1/D1.1M:2020, Structural Welding Code—Steel**
For everyone involved in any phase of welding steel structures—Engineers, detailers, fabricators, erectors, inspectors, etc.—the latest D1.1 spells out the requirements for design, procedures, qualification, fabrication, inspection, stud welding, and repair of steel structures made of tubes, plate, and structural shapes that are subject to either static or cyclic loading. U.S. Customary and SI units of measurement. Over 650 pages, 19 annexes, 101 tables, and 184 figures, commentary. To see the main differences between the 2015 and 2020 editions, visit [aws.org/member_d1](https://aws.org/member_d1)

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Member Price</th>
<th>Non Member Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1.1</td>
<td>$480</td>
<td>$640</td>
</tr>
<tr>
<td>Spanish Edition (2020)</td>
<td>$175</td>
<td>$175</td>
</tr>
</tbody>
</table>

**D1.1-SWJ-WC, Welded Joint Details for Structural Applications Wall Chart**
A 36”-by-27” wall chart with selected joint details conforming to D1.1/D1.1M:2008 and 2010, applicable to low-carbon steel plate and shapes for structural applications.

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1.1-SWJ-WC</td>
<td>$39</td>
</tr>
</tbody>
</table>

**D1.2/D1.2M:2014, Structural Welding Code—Aluminum**
Covers welding requirements for any type of structure made from aluminum structural alloys, except aluminum pressure vessels and fluid-carrying pipelines. Includes sections on design of welded connections, procedure and performance qualification, fabrication, inspection, stud welding, and strengthening and repair of existing structures. A commentary offers guidance on interpreting and applying the code. 230 pages.

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1.2</td>
<td>$168</td>
</tr>
</tbody>
</table>

**D1.3/D1.3M:2018, Structural Welding Code—Sheet Steel**
This code covers the requirements associated with welding sheet steel having a minimum specified yield point no greater than 80 ksi [550 MPa]. The code requirements cover any welded joint made from the commonly used structural quality low-carbon hot rolled and cold rolled sheet and strip steel with or without zinc coating (galvanized). 106 pages, 5 Annexes, 11 Tables, and 48 Figures, commentary.

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1.3</td>
<td>$111</td>
</tr>
</tbody>
</table>

**D1.4/D1.4M:2018, Structural Welding Code—Steel Reinforcing Bars**
Covers requirements for welding steel reinforcing bars in most reinforced concrete applications. Includes a new clause on the design of welded joints, structural details, workmanship requirements, technique, procedure and performance qualification, and inspection. New content: GTAW now permitted as a prequalified welding process; lap joints; bar diameter range; effects of eccentricity; foreign materials and coatings; and radiographic methodology conforming to ASTM E94. New Table 4.1 covers design strength. 98 pages, 20 figures, 12 tables.

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1.4</td>
<td>$105</td>
</tr>
</tbody>
</table>

**AASHTO/AWS D1.5M/D1.5:2020, Bridge Welding Code**
Includes amendment. Covers welding requirements of the American Welding Society (AWS) and the American Association of State Highway and Transportation Officials (AASHTO) for welded highway bridges made from carbon, low-alloy high strength, and high performance steels. Covers design of welded connections, workmanship, technique, procedure and performance qualification, inspection, fracture control plan, and stud welding. Features content on advanced ultrasonic examination requirements. 490 pages, 18 annexes, 97 figures, 49 tables, 9 forms, commentary.

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1.5</td>
<td>$330</td>
</tr>
</tbody>
</table>
D1.6/D1.6M:2017, Structural Welding Code—Stainless Steel
Covers requirements for welding stainless steel structural assemblies/components (excluding pressure vessels or pressure piping) using gas metal arc welding, shielded metal arc welding, flux cored arc welding, submerged arc welding, and stud welding. Allows qualification directly under AWS B2.1 without approval from the Engineer, all while retaining D1.6 code qualification requirements. Clauses include design, procedure and performance qualification, fabrication, inspection, and stud welding. 340 pages, 10 annexes, 98 figures, 33 tables, 10 forms, commentary.
Order Code: D1.6
Member $219 Non Member $292

D1.7/D1.7M:2010, Guide for Strengthening and Repairing Existing Structures
Provides engineers and contractors with general direction and guidance on weld repairs, weld strengthening, and other procedures to correct problematic issues with existing structures made of steel (minimum yield strength of 100 ksi and minimum thickness of 1/8 inch), cast iron, and wrought iron. 52 pages, 4 tables.
Order Code: D1.7
Member $93 Non Member $124

D1.8/D1.8M:2016, Structural Welding Code—Seismic Supplement
This document supplements the requirements to the D1.1/D1.1M Structural Welding Code as it relates to seismic provisions. It is intended to cover common applications to welded joints in Seismic Force Resisting Systems designed in accordance with the American Institute of Steel Construction, Inc. Seismic Provisions. Covers additional controls on detailing, materials, workmanship, testing, and inspection necessary to achieve adequate performance of welded steel structures under conditions of severe earthquake-induced inelastic straining. 138 pages, 9 annexes, commentary, 23 figures, 8 tables.
Order Code: D1.8
Member $123 Non Member $164

D1.9/D1.9M:2015, Structural Welding Code—Titanium
Covers requirements for design, welding, and inspection of any type of titanium structure, except pressure vessels, pressure piping, and aerospace structures. Includes qualification requirements for weld procedures and personnel. 156 pages, commentary, 6 annexes, 53 figures, 19 tables.
Order Code: D1.9
Member $102 Non Member $136

ASTM Standards for Welding
A compilation of all 60 ASTM standards referenced by AWS D1.1 Structural Welding Code–Steel. An excellent companion to D1.1, it can be ordered at a savings bundled with D1.1/D1.1M:2020. 565 pages, 60 standards.
Order Code: ASTMSW
Member $372 Non Member $496
## STRUCTURAL BUNDLES

<table>
<thead>
<tr>
<th>Bundle</th>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bundle A</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- D1.1/D1.1M:2020, Structural Welding Code–Steel</td>
<td>$654</td>
<td>$872</td>
</tr>
<tr>
<td>- A2.4:2020, Standard Symbols for Welding, Brazing, and Nondestructive Examination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- A3.0M/A3.0:2020, Standard Welding Terms and Definitions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order Code: <strong>BUNDLE A</strong></td>
<td>YOU SAVE $114 / $152</td>
<td></td>
</tr>
<tr>
<td><strong>Bundle B</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- D1.1/D1.1M:2020, Structural Welding Code–Steel</td>
<td>$1,413</td>
<td>$1,884</td>
</tr>
<tr>
<td>- D1.2/D1.2M:2014, Structural Welding Code–Aluminum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- D1.4/D1.4M:2018, Structural Welding Code–Steel Reinforcing Bars</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- D1.5M/D1.5:2020, Bridge Welding Code</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- D1.6/D1.6M:2017, Structural Welding Code–Stainless Steel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order Code: <strong>BUNDLE B</strong></td>
<td>YOU SAVE $211 / $282</td>
<td></td>
</tr>
<tr>
<td><strong>Bundle C</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- A2.4:2020, Standard Symbols for Welding, Brazing, and Nondestructive Examination</td>
<td>$399</td>
<td>$532</td>
</tr>
<tr>
<td>- D1.5M/D1.5:2020, Bridge Welding Code</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order Code: <strong>BUNDLE C</strong></td>
<td>YOU SAVE $69 / $92</td>
<td></td>
</tr>
<tr>
<td><strong>Bundle D (Seismic Bundle)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- D1.8/D1.8M:2016, Structural Welding Code–Seismic Supplement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order Code: <strong>BUNDLE D</strong></td>
<td>YOU SAVE $120 / $90</td>
<td></td>
</tr>
<tr>
<td><strong>ASTM Standards bundled with D1.1/D1.1M:2020</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order Code: <strong>ASTMD1</strong></td>
<td>YOU SAVE $126 / $168</td>
<td></td>
</tr>
</tbody>
</table>

**For Heavy Machinery Bundles see page 67**
<table>
<thead>
<tr>
<th>Publication</th>
<th>Title</th>
<th>Description</th>
<th>Pages</th>
<th>Figures</th>
<th>Tables</th>
<th>Order Code</th>
<th>Price Member</th>
<th>Price Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1.4M/C1.4:2017</td>
<td>Specification for Resistance Welding of Carbon and Low-Alloy Steels</td>
<td>see page 59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D11.2-89 (R2006)</td>
<td>Guide for Welding Iron Castings</td>
<td>Briefly presents the history and metallurgy of cast iron and its welding processes. A weldability test is described, with instructions for its application in specific cases. Qualification of procedures and welders and quality control practice are also included. 208 pages, 71 figures, 27 tables. (Reaffirmed 2006).</td>
<td></td>
<td></td>
<td></td>
<td>Order Code: D11.2</td>
<td>$84</td>
<td>$112</td>
</tr>
<tr>
<td>G2.1:2012</td>
<td>Guide for the Joining of Wrought Nickel-Based Alloys</td>
<td>Definitive guide to welding metals and alloys not covered by other standards. Guidelines for welding different wrought nickel-based alloys, including solid-solution and precipitation-hardening alloys. 66 pages, 5 figures, 16 tables.</td>
<td></td>
<td></td>
<td></td>
<td>Order Code: G2.1</td>
<td>$60</td>
<td>$80</td>
</tr>
<tr>
<td>G2.3M/G2.3:2019</td>
<td>Guide for the Joining of Solid Solution Austenitic Stainless Steels</td>
<td>Presents a description of solid solution austenitic stainless steels and the processes and procedures that can be used for the joining of these materials. Discusses the welding processes and welding parameters, qualifications, inspection and repair methods, cleaning, and safety considerations. New content on reheat cracking in FCAW deposits and stabilization anneal heat treatment. Practical information has been included in the form of figures, tables, and graphs that should prove useful in determining capabilities and limitations in the joining of austenitic stainless steels. 112 pages, 32 tables, 7 figures.</td>
<td></td>
<td></td>
<td></td>
<td>Order Code G2.3</td>
<td>$78</td>
<td>$104</td>
</tr>
<tr>
<td>G2.5/G2.5M:2012</td>
<td>Guide for the Fusion Welding of Zirconium and Zirconium Alloys</td>
<td>First-time users of zirconium along with established fabricators will find this to be a useful guide to best practices for joining zirconium parts. 46 pages, 6 figures, 10 tables.</td>
<td></td>
<td></td>
<td></td>
<td>Order Code G2.5</td>
<td>$54</td>
<td>$72</td>
</tr>
<tr>
<td>Welding Stainless Steel—Questions and Answers</td>
<td>This practical guide for troubleshooting stainless steel welding problems is an organized collection of 15 years of questions and answers from Dr. Damian Kotecki’s column in the <em>Welding Journal</em>.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Order Code: WQS</td>
<td>$126</td>
<td>$168</td>
</tr>
<tr>
<td>Welding Zinc-Coated Steels</td>
<td>see page 47</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
WELDING PROCESS PUBLICATIONS

CONSUMABLES & RELATED PRODUCTS

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

A4.3:1993-ADD1, Standard Methods for Determination of the Diffusible Hydrogen Content of Martensitic, Bainitic, and Ferritic Steel Weld Metal Produced by Arc Welding
26 pages (Approved by ANSI in 2018).
Order Code: A4.3
Member: $54 Non Member: $72

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
Member: $54 Non Member: $72

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

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
Member: $54 Non Member: $72

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
Member: $54 Non Member: $72

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
Member: $54 Non Member: $72

C2.25/C2.25M:2012 (R2018), Specification for Thermal Spray Feedstock—Wire and Rods
see page 62
# AWS FILLER METAL SPECIFICATIONS BY MATERIAL AND WELDING PROCESS

<table>
<thead>
<tr>
<th>Material Type</th>
<th>OFW</th>
<th>SMAW</th>
<th>GTAW / GMAW / PAW</th>
<th>FCAW</th>
<th>SAW</th>
<th>ESW</th>
<th>EGW</th>
<th>BRAZING</th>
<th>THERMAL SPRAYING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Steel</td>
<td>A5.2</td>
<td>A5.1 • A5.35</td>
<td>A5.18</td>
<td>A5.20</td>
<td>A5.17</td>
<td>A5.25</td>
<td>A5.26</td>
<td>A5.8 • A5.31</td>
<td>C2.25</td>
</tr>
<tr>
<td>Low-Alloy Steel</td>
<td>A5.2</td>
<td>A5.5</td>
<td>A5.28</td>
<td>A5.29</td>
<td>A5.23</td>
<td>A5.25</td>
<td>A5.26</td>
<td>A5.8 • A5.31</td>
<td>C2.25</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>A5.4 • A5.35</td>
<td>A5.9 • A5.22</td>
<td>A5.22</td>
<td>A5.9 • A5.39</td>
<td>A5.9 • A5.39</td>
<td>A5.9</td>
<td>A5.8 • A5.31</td>
<td>C2.25</td>
<td></td>
</tr>
<tr>
<td>Cast Iron</td>
<td>A5.15</td>
<td>A5.15</td>
<td>A5.15</td>
<td>A5.15</td>
<td></td>
<td></td>
<td></td>
<td>A5.8 • A5.31</td>
<td>C2.25</td>
</tr>
<tr>
<td>Nickel Alloys</td>
<td>A5.11 • A5.35</td>
<td>A5.14</td>
<td>A5.34</td>
<td>A5.14 • A5.39</td>
<td>A5.14 • A5.39</td>
<td>A5.8 • A5.31</td>
<td>C2.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum Alloys</td>
<td>A5.3</td>
<td>A5.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A5.8 • A5.31</td>
<td>C2.25</td>
</tr>
<tr>
<td>Copper Alloys</td>
<td>A5.6</td>
<td>A5.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A5.8 • A5.31</td>
<td>C2.25</td>
</tr>
<tr>
<td>Titanium Alloys</td>
<td>A5.16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A5.8 • A5.31</td>
<td>C2.25</td>
</tr>
<tr>
<td>Zirconium Alloys</td>
<td>A5.24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A5.8 • A5.31</td>
<td>C2.25</td>
</tr>
<tr>
<td>Magnesium Alloys</td>
<td>A5.19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A5.8 • A5.31</td>
<td>C2.25</td>
</tr>
<tr>
<td>Tungsten Electrodes</td>
<td>A5.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A5.8 • A5.31</td>
<td>C2.25</td>
</tr>
<tr>
<td>Brazing Alloys and Fluxes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A5.8 • A5.31</td>
<td>C2.25</td>
</tr>
<tr>
<td>Surfacing Alloys</td>
<td>A5.21</td>
<td>A5.13</td>
<td>A5.21</td>
<td>A5.21</td>
<td>A5.21</td>
<td></td>
<td></td>
<td>C2.25</td>
<td></td>
</tr>
<tr>
<td>Consumable Inserts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shielding Gases</td>
<td>A5.32</td>
<td>A5.32</td>
<td></td>
<td></td>
<td></td>
<td>A5.32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceramics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C2.25</td>
<td></td>
</tr>
</tbody>
</table>

## 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 888.WELDING (935-3464) Option 1

<table>
<thead>
<tr>
<th>Price each</th>
<th>Member</th>
<th>Non Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>$54</td>
<td>$72</td>
<td></td>
</tr>
</tbody>
</table>

### 5% off purchase 5 at a time / 10% off purchase 10 at a time

### 15% off purchase 15 at a time / 20% off purchase 20 at a time

## AWS A5 FILLER METAL AND CONSUMABLES SPECIFICATIONS

- **A5.1/A5.1M:2012** Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding (60 pages) **A5.1**
- **A5.2/A5.2M:2018** Specification for Carbon and Low Alloy Steel Rods for Oxyfuel Gas Welding (26 pages) **A5.2**
- **A5.3/A5.3M:1999 (R2007)** Specification for Aluminum and Aluminum-Alloy Electrodes for Shielded Metal Arc Welding (28 pages) **A5.3**
- **A5.4/A5.4M:2012** Specification for Stainless Steel Electrodes for Shielded Metal Arc Welding (52 pages) **A5.4**
AWS A5 FILLER METAL AND CONSUMABLES SPECIFICATIONS

A5.5/A5.5M:2014 Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding (68 pages) A5.5
A5.6/A5.6M:2008 (R2017) Specification for Copper and Copper-Alloy Electrodes for Shielded Metal Arc Welding (36 pages) A5.6
A5.7/A5.7M:2007 (R2017) Specification for Copper and Copper Alloy Bare Welding Rods and Electrodes (30 pages) A5.7
A5.8M/A5.8:2019 Specification for Filler Metals for Brazing and Braze Welding (62 pages) A5.8
A5.9/A5.9M:2017 Welding Consumables—Wire Electrodes, Strip Electrodes, Wires, and Rods for Arc Welding of Stainless and Heat Resisting Steels—Classification (52 pages) A5.9
A5.14/A5.14M:2018 Specification for Nickel and Nickel-Alloy Bare Welding Electrodes and Rods (40 pages) A5.14
A5.15-90 (R2016) Specification for Welding Electrodes and Rods for Cast Iron (32 pages) A5.15
A5.18/A5.18M:2017 Specification for Carbon Steel Electrodes and Rods for Gas Shielded Arc Welding (42 pages) A5.18
A5.21/A5.21M:2011 Specification for Bare Electrodes and Rods for Surfacing (40 pages) A5.21
A5.22/A5.22M:2012 Specification for Stainless Steel Flux Cored and Metal Cored Welding Electrodes and Rods (55 pages) A5.22
A5.27/A5.27M:2020 Specification for Low Alloy Steel Electrodes and Rods for Gas Shielded Arc Welding (46 pages) A5.27
A5.29/A5.29M:2010 Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding (60 pages) A5.29
A5.30/A5.30M:2007 Specification for Consumable Inserts (36 pages) A5.30
A5.31M/A5.31:2012 Specification for Fluxes for Brazing and Braze Welding (36 pages) A5.31
A5.32M/A5.32:2011 Welding Consumables—Gases and Gas Mixtures for Fusion Welding and Allied Processes (42 pages) A5.32
A5.34/A5.34M:2018 Specification for Nickel-Alloy Flux Cored and Metal Cored Welding Electrodes A5.34
A5.35/A5.35M:2015-AMD1 Specification for Covered Electrodes for Underwater Wet Shielded Metal Arc Welding (32 pages) A5.35
A5.39/A5.39M Specification for Flux and Electrode Combinations for Submerged Arc and Electroslag Joining and Surfacing of Stainless Steel and Nickel Alloys A5.39
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**  
Member: $63  
Non Member: $84


Order your AWS publications today — it’s easy!
North America: 888.WELDING (935-3464) Option 1 / International: 305.443.9353 Option 1
Fax: 305.443.1552 / customerservice@aws.org

Prepaid Orders
Prepaid orders must include freight and, for Florida customers, state and local taxes. Missing fees will be invoiced to the customer. Please make checks payable to “American Welding Society” and send to 8669 NW 36 Street, #130, Miami, Florida 33166.

U.S. Shipping
Orders placed before 12 pm EST are shipped the same day. Orders placed after 12 pm EST are shipped the next day. Ground shipping is our standard delivery method; however, expedited options are available upon request.

International Shipping
Standard international shipping is by air express (such as UPS or FedEx). Terms and conditions may vary outside the U.S. Customer is responsible for customs and exportation fees. Contact customer service at customerservice@aws.org for more information.

Returns
All returns must be in the same condition as received. Please call 888.935.3464 Option 1 or 305.443.9353 Option 1, or E-mail customerservice@aws.org for a return authorization number within 30 days of invoice date. A 15% restocking fee may be applied on returns. Shipping and handling charges are non-refundable. Electronically supplied products, special orders, and age-dated materials cannot be returned.

Customer Service/Billing Issues
Phone: 888.935.3464 Option 1 (8 AM – 7 PM EST) toll-free in North America. 305.443.9353 Option 1 elsewhere. Fax: 305.443.1552.
E-mail: customerservice@aws.org

Satisfaction Guarantee
Examine our products for 30 days at no risk. If you’re not satisfied for any reason, please see “Returns” above. A 30-day guarantee applies to all products except those delivered in electronic format (PDF); and to audiotapes, videos, software, special orders, and age-dated materials which are not returnable unless defective.

Security Features for Electronic Downloads
In an effort to protect their intellectual property and enforce existing copyright laws, many Standards Developing Organizations have required all distributors of their content to implement security features that prevent the reproduction and redistribution of downloaded documents. AWS implemented a security policy that uses a free Adobe Acrobat plug-in from FileOpen Systems, Inc.

Security Features:
- Reproduction and Redistribution Restrictions: The free Adobe Acrobat plug-in “locks” the PDF file to the computer on which it was first opened. Once a PDF file has been locked to a computer, it can be opened only from that computer.
- Networking Restrictions: Secure PDF files cannot be used in a multi-user, network environment.
- Viewing Restrictions: You must download the free plug-in to view any secured PDF document. There is no limit to the number of times a document may be viewed on your computer.
- Printing Restrictions: The plug-in limits the number of times the document may be printed to one copy. Since the software interprets printing a part of the document as the one allowable print attempt, we recommend you print the entire document.
- Copy & Paste Restrictions: The ability to copy and paste text from the PDF file has been disabled.
# PUBLICATIONS SUBJECT INDEX

## AEROSPACE
- D17.1/D17.1M, Specification for Fusion Welding for Aerospace Applications ........................................ 65
- D17.2/D17.2M, Specification for Resistance Welding for Aerospace Applications ........................................ 65

## ALUMINUM
- A5.3/A5.3M, Specification for Aluminum and Aluminum-Alloy Electrodes for Shielded Metal Arc Welding .................. 77
- A5.10/A5.10M (ISO 18273 MOD), Welding Consumables – Wire Electrodes, Wires and Rods for Welding of Aluminum and Aluminum-Alloys – Classification .................................................. 78
- C3.7M/C3.7, Specification for Aluminum Brazing ......................................................................................... 55
- D1.2/D1.2M, Structural Welding Code – Aluminum ..................................................................................... 72
- D3.7, Guide for Aluminum Hull Welding ........................................................................................................ 68
- D8.14M, Specification for Automotive Weld Quality – Arc Welding of Aluminum ............................................. 65
- D10.7M/D10.7, Guide for the Gas Shielded Arc Welding of Aluminum and Aluminum Alloy Pipe ....................... 69

## AUTOMOTIVE
- D8.1M, Specification for Automotive Weld Quality – Resistance Spot Welding of Steel ........................................ 65
- D8.2M, Specification for Automotive Weld Quality – Resistance Spot Welding of Steel ........................................ 65
- D8.8M, Specification for Automotive Weld Quality – Arc Welding of Steel ..................................................... 65
- D8.14M, Specification for Automotive Weld Quality – Arc Welding of Aluminum ............................................. 65

## BRAZING AND BRAZE WELDING
- A5.8M/A5.8, Specification for Filler Metals for Brazing and Brazing Welding .................................................... 78
- A5.31M/A5.31, Specification for Fluxes for Brazing and Brazing Welding ............................................................ 78
- B2.2/B2.2M, Specification for Brazing Procedure and Performance Qualification ............................................. 33
- BHC1, Basics of Brazing .............................................................................................................................. 57
- BHC2, Brazement Design .............................................................................................................................. 57
- BHC3, Brazing Filler Metal ............................................................................................................................ 57
- BHC4, Fluxes and Atmospheres .................................................................................................................... 57
- BHC5, Precleaning and Surface Preparation ................................................................................................ 57
- BHC6, Assembly and Fixturing ...................................................................................................................... 57
- BHC7, Corrosion of Brazed Joints ................................................................................................................ 57
- BHC8, Inspection Brazed Joints ..................................................................................................................... 57
- BHC9, Codes and Other Standards ............................................................................................................... 57
- BHC10, Safety and Health ............................................................................................................................ 57
- BHC11, Introduction to the Brazing Processes ............................................................................................... 57
- BHC12, Torch Brazing .................................................................................................................................. 57
- BHC13, Induction Brazing ............................................................................................................................... 57
- BHC14, Furnace Brazing ................................................................................................................................. 57
- BHC15, Dip Brazing ....................................................................................................................................... 57
- BHC16, Resistance Brazing ............................................................................................................................ 57
- BHC17, Diffusion Brazing ............................................................................................................................... 57
- BHC18, Other Brazing Processes ................................................................................................................... 57
- BHC19, Braze Welding .................................................................................................................................. 57
- BHC20, Aluminum and Aluminum Alloys .................................................................................................... 57
- BHC21, Graphite and Carbon-Carbon Composites ....................................................................................... 57
- BHC22, Cemented Carbides and Cermets ..................................................................................................... 57
- BHC23, Cast Iron .......................................................................................................................................... 57
- BHC24, Ceramics ............................................................................................................................................ 57
- BHC25, Copper and Copper Alloys ................................................................................................................ 57
- BHC26, Low-Carbon, Low-Alloy, and Tool Steels ....................................................................................... 57
- BHC27, Magnesium and Magnesium Alloys ................................................................................................ 57
- BHC28, Nickel-Based and Cobalt-Containing Alloys .................................................................................. 57
- BHC29, Precious Metals ............................................................................................................................... 57
- BHC30, Reactive Metals: Titanium, Zirconium, and Beryllium .................................................................... 57
- BHC31, Refractory Metals: Niobium, Molybdenum, Tantalum, and Tungsten ................................................. 57
- BHC32, Stainless Steels ................................................................................................................................ 57
- BHC33, Electron Tubes and Vacuum Equipment ........................................................................................... 57
- BHC34, Honeycomb Structures .................................................................................................................. 57
- BHC35, Pipe and Tubing ............................................................................................................................... 57
- BHC36, Diamond .......................................................................................................................................... 57
- BRH, Brazing Handbook ............................................................................................................................... 56
- Soldering Handbook ..................................................................................................................................... 56
INDEXES

PUBLICATIONS SUBJECT INDEX

Guideline for Hand Soldering Practices ..................................................56
C3.2M/C3.2, Standard Method for Evaluating the Strength of Brazed Joints ...............................54
C3.3, Recommended Practices for the Design, Manufacture, and Examination of Critical Brazed Components .................................54
C3.4M/C3.4, Specification for Torch Brazing ...........................................54
C3.5M/C3.5-AMD1, Specification for Induction Brazing ...............................54
C3.6M/C3.6, Specification for Furnace Brazing ...........................................54
C3.7M/C3.7, Specification for Aluminum Brazing ...........................................55
C3.8M/C3.8, Specification for the Pulse-Echo Ultrasonic Examination of Brazed Joints .........................55
C3.9M/C3.9, Specification for Resistance Brazing ...........................................55

BRIDGES
AASHTO/AWS D1.5-AMD, Bridge Welding Code ....................................72

CARBON STEEL
A5.1/A5.1M, Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding .....................................................77
A5.2/A5.2M, Specification for Carbon and Low Alloy Steel Rods for Oxyfuel Gas Welding ...............................77
A5.17/A5.17M, Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding .........................78
A5.18/A5.18M, Specification for Carbon Steel Electrodes and Rods for Gas Shielded Arc Welding ..................78
A5.20/A5.20M, Specification for Carbon Steel Electrodes for Flux Cored Arc Welding ...........................................78
A5.25/A5.25M, Specification for Carbon and Low-Alloy Steel Electrodes and Fluxes for Electroslag Welding ..................78
A5.26/A5.26M, Specification for Carbon and Low-Alloy Steel Electrodes for Electrogas Welding ..................78

CAST IRON
A5.15, Specification for Welding Electrodes and Rods for Cast Iron .....................................................78
D11.2, Guide for Welding Iron Castings ....................................................75

CERTIFICATION
CM, Certification Manual for Welding Inspectors .....................................37
CMWS, Certified Welding Supervisor Manual ...........................................37
QC1, Standard for AWS Certification of Welding Inspectors .......................31
QC4, Standard for Accreditation of Test Facilities for AWS Certified Welder Program ...........................................30
QC5, Standard for AWS Certification of Welding Educators ........................30
QC7, Standard for AWS Certified Welders ................................................30
QC7X, QC7 Supplements ........................................................................30
QC10, Specification for Qualification and Registration of Level I — Entry Welders ...........................................30
QC11, Specification for Qualification and Certification for Level II — Advanced Welders ...........................................30
QC13, Specification for the Certification of Welding Supervisors ..................30
QC14, Specification for the Certification of Welding Sales Representatives ...........................................30
QC15-AMD1, Specification for the Certification of Radiographic Interpreters ...........................................30
QC17, Specification for AWS Accreditation of Certified Welding Fabricators ...........................................31
QC19, Standard for the AWS Certification of Robotic Arc Welding Personnel ...........................................31
QC20, Standard for the AWS Certification of Resistance Welding Technicians ...........................................31

CHARTS
A2.1 WC, WCXL, and DC Welding Symbol Charts ....................................43
A2.1 WC & DC, Welding Symbol Charts ..................................................43
A3.1, Master Chart of Welding and Joining Processes ................................43, 63
D1.1-SWJ-WC, Welded Joint Details Wall Chart ........................................43
D18.2, Guide to Weld Discoloration Levels on Inside of Austenitic Stainless Steel Tube ...........................................58
F2.2, Lens Shade Selector ........................................................................45

COMPUTERIZATION
A9.5, Guide for Verification and Validation in Computation Weld Mechanics ..................................................61

CORROSION RESISTANCE
C2.20/C2.20M, Specification for Thermal Spraying Zinc Anodes on Steel Reinforced Concrete ..........................62
C2.23M/C2.23, Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel ..................................................62

CUTTING (see also Oxyfuel Welding and Cutting)
A5.12M/A5.12 (ISO 6848 MOD), Specification for Tungsten and Tungsten-Alloy Electrodes for Arc Welding and Cutting ...........................................78
C4.6M (ISO 9013 IDT), Thermal Cutting — Classification of Thermal Cuts — Geometric Product Specification and Quality Tolerances ...........................................64
### EDUCATION AND TRAINING (see also Reference)
- **API-M**, Study Guide for API Standard 1104 .................................................. 38
- **CM**, Certification Manual for Welding Inspectors ........................................... 37
- **CMWS**, Certified Welding Supervisor Manual ............................................. 37
- **EG2.0**, Guide for the Training of Welding Personnel; Level I – Entry Welder ........ 36
- **EG3.0**, Supplement Guide to the Training of Welding Personnel; SENSE Level II – Advanced Welder ................................................................. 36
- **GWF**, Guide for Setting Up a Welder Training Facility .................................. 37
- **QCS**, AWS Standard for Certification of Welding Educators .......................... 30
- **WIT-T**, Welding Inspection Technology ......................................................... 38
- **WIT-W**, Welding Inspection Technology Workbook ........................................ 38

### ELECTRODES (see **Filler Metals**)

#### ELECTROGAS AND ELECTROSLAG WELDING
- **A5.25/A5.25M**, Specification for Carbon and Low-Alloy Steel Electrodes and Fluxes for Electroslag Welding ......................................................... 78
- **A5.26/A5.26M**, Specification for Carbon and Low-Alloy Steel Electrodes for Electrogas Welding .......................................................... 78

#### ELECTRON BEAM WELDING
- **C7.11/C7.11**, Recommended Practices for Electron Beam Welding and Allied Processes ................................................................. 64
- **C7.3**, Process Specification for Electron Beam Welding .................................. 64

### FILLER METALS AND FLUXES
- **A4.2M**, Standard Procedures for Calibrating Magnetic Instruments to Measure the Delta Ferrite Content of Austenitic and Duplex Ferritic-Austenitic Stainless Steel Weld Metal ................................................................. 76
- **A4.3**, Standard Methods for Determination of the Diffusible Hydrogen Content of Martensitic, Bainitic, and Ferritic Steel Weld Metal Produced by Arc Welding .................................................. 76
- **A4.4M**, Standard Procedures for Determination of Moisture Content of Welding Fluxes and Welding Electrode Flux Coverings ................................................................. 76
- **A4.4M/A4.4.5**, Standard Methods for Classification Testing of Positional Capacity and Root Penetration of Welding Consumables in a Fillet Weld ........................................... 76
- **A5.01M/A5.01**, Welding Consumables – Procurement of Filler Metals and Fluxes ................................................................. 76
- **A5.02/A5.02M**, Specification for Filler Metal Standard Sizes, Packaging, and Physical Attributes ................................................................. 76
- **A5.1/A5.1M**, Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding ................................................................. 77
- **A5.2/A5.2M**, Specification for Carbon and Low-Alloy Steel Electrodes and Fluxes for Oxyfuel Gas Welding ................................................................. 77
- **A5.3/A5.3M**, Specification for Aluminum and Aluminum-Alloy Electrodes for Shielded Metal Arc Welding ......................................................... 77
- **A5.4/A5.4M**, Specification for Stainless Steel Electrodes for Shielded Metal Arc Welding ................................................................. 77
- **A5.5/A5.5M**, Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding ................................................................. 78
- **A5.6/A5.6M**, Specification for Copper and Copper-Alloy Electrodes for Shielded Metal Arc Welding ................................................................. 78
- **A5.7/A5.7M**, Specification for Copper and Copper-Alloy Bare Welding Rods and Electrodes ................................................................. 78
- **A5.8M/A5.8**, Specification for Filler Metals for Brazing and Brazing and Braze Welding ................................................................. 78
- **A5.9/A5.9M**, Specification for Stainless Steel Electrodes and Fluxes for Arc Welding of Stainless and Heat Resisting Steels – Classification ........................................... 78
- **A5.10/A5.10M**, Welding Consumables – Wire Electrodes, Wires and Rods for Arc Welding of Stainless and Heat Resisting Steels – Classification ........................................... 78
- **A5.11/A5.11M**, Specification for Nickel and Nickel-Alloy Welding Electrodes for Shielded Metal Arc Welding ................................................................. 78
- **A5.12M/A5.12**, Specification for Tungsten and Oxide Dispersed Tungsten Electrodes for Arc Welding and Cutting ................................................................. 78
- **A5.13/A5.13M**, Specification for Surfacing Electrodes for Shielded Metal Arc Welding ................................................................. 78
- **A5.14/A5.14M**, Specification for Nickel and Nickel-Alloy Bare Welding Electrodes and Rods ................................................................. 78
- **A5.15**, Specification for Welding Electrodes and Rods for Cast Iron ................................................................. 78
- **A5.16/A5.16M**, Specification for Titanium and Titanium Alloy Welding Electrodes and Rods ................................................................. 78
INDEXES
PUBLICATIONS SUBJECT INDEX

LASER BEAM WELDING
C7.2M, Recommended Practices for Laser Beam Welding, Cutting, and Allied Processes ................................................................. 64
C7.4/C7.4M, Process Specification and Operator Qualification for Laser Beam Welding ......................................................................................... 35
C7.6/C7.6M, Process Specification and Operator Qualification for Laser Hybrid Welding ......................................................................................... 35

MACHINERY AND EQUIPMENT
D14.1/D14.1M-AMD1, Specification for Welding of Industrial and Mill Cranes and Other Material Handling Equipment ......................... 66
D14.8M, Standard Methods for the Avoidance of Cold Cracks ................. 64

MANAGEMENT AND ECONOMICS
TWM, Total Welding Management ................................................................................. 44

MARINE
D3.5, Guide for Steel Hull Welding ......................................................................... 68
D3.6M, Underwater Welding Code .......................................................................... 68
D3.7, Guide for Aluminum Hull Welding .................................................................. 68
D3.9, Specification for Classification of Weld-Through Paint Primers .................. 68

METALLURGY
WM1.4, Welding Metallurgy, Carbon and Alloy Steels, Volume 1, Fundamentals ................................................................................................. 43

NICKEL
G2.1M/G2.1, Guide for the Joining of Wrought Nickel-Based Alloys .................................................................................................................. 75

OXYFUEL WELDING AND CUTTING
C4.1 SET, Criteria for Describing Oxygen-Cut Surfaces, and Oxygen Cutting Surface Roughness Gauge ............................................................... 63
C4.2/C4.2M, Recommended Practices for Safe Oxyfuel Gas Cutting Torch Operation ........................................................................................... 63
C4.3/C4.3M, Recommended Practices for Safe Oxyfuel Gas Heating Torch Operation ......................................................................................... 63
C4.4/C4.4M, Recommended Practices for Heat Shaping and Straightening with Oxyfuel Gas Heating Torches ......................................................... 63
C4.5M, Uniform Designation System for Oxyfuel Nozzles ..................................... 63
C4.6M, Thermal Cutting – Classification of Thermal Cuts – Geometric Product Specification and Quality Tolerances ................................................................. 64

PIPING AND TUBING
D10.4, Recommended Practices for Welding Austenitic Chromium-Nickel Stainless Steel Piping and Tubing .............................................................. 69
D10.6/D10.6M, Recommended Practices for Gas Tungsten Arc Welding of Titanium Piping and Tubing .......................................................... 69
D10.7M/D10.7, Guide for the Gas Shielded Arc Welding of Aluminum and Aluminum Alloy Pipe ................................................................. 69
D10.8, Recommended Practices for Welding of Chromium-Molybdenum Steel Piping and Tubing ................................................................. 69
D10.10/ D10.10M, Recommended Practices for Local Heating of Welds in Piping and Tubing ....................................................................................... 69
D10.12M/ D10.12, Guide for Welding Mild Steel Pipe ......................................... 70
D10.18M/D10.18, Guide for Welding Ferritic/Austenitic Duplex Stainless Steel Piping and Tubing ................................................................. 70
D18.1, Specification for Welding of Austenitic Stainless Steel Tube and Pipe Systems in Sanitary (Hygienic) Applications ................................................. 58
D18.2, Guide to Weld Discoloration Levels on Inside of Austenitic Stainless Steel Tube .......................................................................................... 58
F4.1, Safe Practices for the Preparation of Containers and Piping for Welding, Cutting, and Allied Processes ................................................................. 46

PLASTICS
B2.4, Specification for Welding Procedure and Performance Qualification for Thermoplastics ........................................................................... 34
G1.1M/G1.1, Guide to Ultrasonic Assembly of Thermoplastics ................................................. 71
## PUBLICATIONS SUBJECT INDEX

<table>
<thead>
<tr>
<th>Publication</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1.2M/G1.2</td>
<td>Specification for Standardized Ultrasonic Welding Test Specimen for Thermoplastics</td>
</tr>
<tr>
<td>G1.6</td>
<td>Specification for the Qualification of Plastics Welding Inspectors for Hot Gas, Hot Gas Extrusion, and Heated Tool Butt Thermoplastic Welds</td>
</tr>
<tr>
<td>G1.10M</td>
<td>Guide for the Evaluation of Thermoplastic Welds</td>
</tr>
<tr>
<td><strong>QUALIFICATION: PROCEDURES AND PERSONNEL</strong></td>
<td></td>
</tr>
<tr>
<td>B2.1/BMG</td>
<td>Base Metal Grouping for Welding B2.1M-Procedure and Performance Qualification</td>
</tr>
<tr>
<td>B2.2/B2.2M</td>
<td>Specification for Brazing Procedure and Performance Qualification</td>
</tr>
<tr>
<td>B2.4</td>
<td>Specification for Welding Procedure and Performance Qualification for Thermoplastics</td>
</tr>
<tr>
<td>B5.1-AMD1</td>
<td>Specification for the Qualification of Welding Inspectors</td>
</tr>
<tr>
<td>B5.2</td>
<td>Specification for the Qualification of Welding Inspector Specialists and Welding Inspector Assistants</td>
</tr>
<tr>
<td>B5.4</td>
<td>Specification for the Qualification of Welder Test Facilities</td>
</tr>
<tr>
<td>B5.5</td>
<td>Specification for the Qualification of Welding Educators</td>
</tr>
<tr>
<td>B5.9</td>
<td>Specification for the Qualification of Welding Supervisors</td>
</tr>
<tr>
<td>B5.14</td>
<td>Specification for the Qualification of Welding Sales Representatives</td>
</tr>
<tr>
<td>B5.15</td>
<td>Specification for the Qualification of Radiographic Interpreters</td>
</tr>
<tr>
<td>B5.16</td>
<td>Specification for the Qualification of Welding Engineers</td>
</tr>
<tr>
<td>B5.17</td>
<td>Specification for the Qualification of Welding Fabricators</td>
</tr>
<tr>
<td>C1.5</td>
<td>Specification for the Qualification of Resistance Welding Technicians</td>
</tr>
<tr>
<td>C2.16/C2.16M</td>
<td>Guide for Thermal Spray Operator Qualification Programs</td>
</tr>
<tr>
<td>C7.4/C7.4M</td>
<td>Process Specification and Operator Qualification for Laser Beam Welding</td>
</tr>
<tr>
<td>C7.6/C7.6M</td>
<td>Process Specification and Operator Qualification for Laser Hybrid Welding</td>
</tr>
<tr>
<td>D16.4M/D16.4</td>
<td>Specification for the Qualification of Robotic Arc Welding Personnel</td>
</tr>
<tr>
<td>EG2.0</td>
<td>Guide for the Training of Welding Personnel; SENSE Level I – Entry Welders</td>
</tr>
<tr>
<td>EG2.0:2017</td>
<td>Supplement Guide to the Training of Welding Personnel; Level I – Entry Welder</td>
</tr>
<tr>
<td>EG3.0</td>
<td>Guide for Training and Qualification of Welding Personnel; Level II – Advanced Welder</td>
</tr>
<tr>
<td>EG3.0</td>
<td>Supplement SENSE Level II – Advanced Welder Training</td>
</tr>
<tr>
<td>G1.6</td>
<td>Specification for the Qualification of Plastics Welding Inspectors for Hot Gas, Hot Gas Extrusion, and Heated Tool Butt Thermoplastic Welds</td>
</tr>
<tr>
<td>Best Practices for Performing a Welder Qualification Test</td>
<td>37</td>
</tr>
<tr>
<td><strong>RADIOGRAPHY</strong> (see also Inspection)</td>
<td></td>
</tr>
<tr>
<td>B5.15</td>
<td>Specification for the Qualification of Radiographic Interpreters</td>
</tr>
<tr>
<td>QC15-AMD1</td>
<td>Specification for the Certification of Radiographic Interpreters</td>
</tr>
<tr>
<td><strong>RAILROADS</strong></td>
<td></td>
</tr>
<tr>
<td>D15.1/D15.1M</td>
<td>Railroad Welding Specification for Cars and Locomotives</td>
</tr>
<tr>
<td>D15.2/D15.2M</td>
<td>Recommended Practices for the Welding of Rails and Related Rail Components for Use by Rail Vehicles</td>
</tr>
<tr>
<td><strong>REFERENCE</strong></td>
<td></td>
</tr>
<tr>
<td>A1.1</td>
<td>Metric Practice Guide for the Welding Industry</td>
</tr>
<tr>
<td>A2.1 WC&amp;DC</td>
<td>Welding Symbols Charts</td>
</tr>
<tr>
<td>A2.4</td>
<td>Standard Symbols for Welding, Brazing, and Nondestructive Examination</td>
</tr>
<tr>
<td>A3.0M/A3.0</td>
<td>Standard Welding Terms and Definitions</td>
</tr>
<tr>
<td>A3.1</td>
<td>Master Chart of Welding and Joining Processes</td>
</tr>
<tr>
<td>JWE</td>
<td>Jefferson’s Welding Encyclopedia</td>
</tr>
<tr>
<td>JWE-CD</td>
<td>Jefferson’s Welding Encyclopedia CD</td>
</tr>
<tr>
<td>TWM</td>
<td>Total Welding Management</td>
</tr>
<tr>
<td>WHB-X.X</td>
<td>Welding Handbooks</td>
</tr>
<tr>
<td><strong>RESISTANCE WELDING</strong></td>
<td></td>
</tr>
<tr>
<td>C1.1M/C1.1</td>
<td>Recommended Practices for Resistance Welding</td>
</tr>
<tr>
<td>C1.4M/C1.4</td>
<td>Specification for Resistance Welding of Carbon and Low-Alloy Steels</td>
</tr>
<tr>
<td>C1.5</td>
<td>Specification for the Qualification of Resistance Welding Technicians</td>
</tr>
<tr>
<td>C3.9M/C3.9</td>
<td>Specification for Resistance Brazing</td>
</tr>
<tr>
<td>D8.1M</td>
<td>Specification for Automotive Weld Quality — Resistance Spot Welding of Steel</td>
</tr>
</tbody>
</table>
PUBLICATIONS SUBJECT INDEX

A5.22/A5.22M, Specification for Stainless Steel Electrodes for Flux Cored Arc Welding and Stainless Steel Flux Cored Rods for Gas Tungsten Arc Welding.........................................................78
D1.6/D1.6M, Structural Welding Code—Stainless Steel ........73
D10.4, Recommended Practices for Welding Austenitic Chromium-Nickel Stainless Steel Piping and Tubing..........69
D10.18M/ D10.18, Guide for Welding Ferritic/Austenitic Duplex Stainless Steel Piping and Tubing.................................70
D18.2, Guide to Weld Discoloration Levels on Inside of Austenitic Stainless Steel Tube ..........................................................58
G2.3M/G2.3, Guide for the Joining of Solid Solution Austenitic Stainless Steels .............................................................................75
WQS, Welding Stainless Steel—Questions and Answers .........75
STEEL
D1.1/D1.1M, Structural Welding Code—Steel ................................72
ASTMSW, ASTM Standards for Welding ........................................73
STRUCTURAL WELDING
ASTMSW, ASTM Standards for Welding ........................................73
D1.1/D1.1M, Structural Welding Code—Steel ................................72
D1.1 CCRM, Code Clinic for Study of AWS D1.1 Structural Welding Code—Steel, Reference Manual .......................37
D1.1-SWJ-WC, Welded Joint Details Wall Chart .........................72
D2.1/D2.1M, Structural Welding Code—Aluminum .....................72
D1.3/D1.3M, Structural Welding Code—Sheet Steel ...................72
D1.4/D1.4M, Structural Welding Code—Steel Reinforcing Bars ....72
D1.5M/D1.5-AMD1, Bridge Welding Code ..................................72
D1.6/D1.6M, Structural Welding Code—Stainless Steel ..............73
D1.7/D1.7M, Guide to Repair and Strengthening of Existing Structures .........................................................................................73
D1.8/D1.8M, Structural Welding Code—Seismic Supplement ......73
D1.9/D1.9M, Structural Welding Code—Titanium .......................73
STUD WELDING
D1.1/D1.1M, Structural Welding Code—Steel .............................72
D1.2/D1.2M, Structural Welding Code—Aluminum .....................72
D1.5M/D1.5-AMD1, Bridge Welding Code ..................................72
D1.6/D1.6M, Structural Welding Code—Stainless Steel ..............73
SURFACING (see also Thermal Spraying)
A5.13/A5.13M, Specification for Surfacing Electrodes for Shielded Metal Arc Welding ...........................................................78
A5.21/A5.21M, Specification for Bare Electrodes and Rods for Surfacing .......................................................................................78
SYMBOLS
A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination...............................................................43
TERMINOLOGY
A3.0M/A3.0, Standard Welding Terms and Definitions ...............43
TESTING (see Inspection)
THERMAL SPRAYING
C2.16/C2.16M, Guide for Thermal Spray Operator Qualification Programs .................................................................35
C2.18, Guide for the Protection of Steel with Thermal Sprayed Coatings of Aluminum and Zinc and Their Alloys and Composites .................................................................62
C2.20/ C2.20M, Specification for Thermal Spraying Zinc Anodes on Steel Reinforced Concrete .................................................62
C2.21M/ C2.21, Specification for Thermal Spray Equipment Acceptance Inspection .................................................................62
C2.23M/ C2.23, Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel ........62
C2.25/ C2.25M, Specification for Thermal Spray Feedstock — Wire and Rods ..........................................................62
TSS, Thermal Spraying Practice, Theory and Application ............63
TST, ASM Handbook Volume 5A: Thermal Spray Technology ........62
THERMITE WELDING
D15.2/D15.2M, Recommended Practices for the Welding of Rails and Related Rail Components for Use by Rail Vehicles .......71
TITANIUM
A5.16/A5.16M (ISO 24034 MOD), Specification for Titanium and Titanium—Alloy Welding Electrodes and Rods ......................78
D1.9/D1.9M, Structural Welding Code—Titanium .......................73
D10.6/D10.6M, Recommended Practices for Gas Tungsten Arc Welding of Titanium Piping and Tubing .........................69
G2.4/G2.4M, Guide for the Fusion Welding of Titanium and Titanium Alloys ..................................................................................75
INDEXES

PUBLICATIONS SUBJECT INDEX

UNDERWATER WELDING (see Marine)

WELDING CURTAINS AND SCREENS
F2.3M, Specification for Use and Performance of Transparent Welding Curtains and Screens .......................................................46

ZINC COATINGS
WZC, Welding Zinc-Coated Steels ......................................................47

ZIRCONIUM
A5.24/ A5.24M, Specification for Zirconium and Zirconium-Alloy Welding Electrodes and Rods .................................................................78
G2.5/ G2.5M, Guide for the Fusion Welding of Zirconium and Zirconium Alloys .................................................................................75

CAREERS IN WELDING
powered by AWS

WELDING OPENS A WORLD OF OPPORTUNITIES

Take a quiz to learn which welding specialties best fit your interests and get salary, education and training information.

Visit CareersinWelding.com
INDEXES

PUBLICATIONS CODE NAME INDEX

A5.35/A5.35M—Specification for Covered Electrodes for Underwater Wet Shielded Metal Arc Welding .......................... 78
A5.39/A5.39M, Specification for Flux and Electrode Combinations for Submerged Arc and Electroslag Joining and Surfacing of Stainless Steel and Nickel Alloys ........................................... 78
A9.5—Guide for Verification and Validation in Computation Weld Mechanics ................................................................. 61
B1.10M/B1.10—Guide for the Nondestructive Examination of Welds .......................................................... 32
B1.11M/B1.11—Guide for the Visual Examination of Welds ........................................................................ 324
B2.1—B2.2M—Specification for Brazing Procedure and Performance Qualification ................................................. 33
B2.2/B2.2M—Specification for Brazing Procedure and Performance Qualification .................................................. 33
B2.3/B2.3M—Specification for Soldering Procedure and Performance Qualification .................................................. 33
B2.4—Specification for Welding Procedure and Performance Qualification for Thermoplastics ............................ 34
B4.0—Standard Methods for Mechanical Testing of Welds ........................................................................ 32
B4.0M—Metric Only ........................................................................... 32
B5.1-AMD1—Specification for the Qualification of Welding Inspectors ................................................................. 34
B5.2—Specification for the Qualification of Welding Inspector Specialists and Welding Inspector Assistants .......... 34
B5.4—Specification for the Qualification of Welder Test Facilities .............................................................. 34
B5.5—Specification for the Qualification of Welding Educators ........................................................................ 34
B5.9—Specification for the Qualification of Welding Supervisors ........................................................................ 34
B5.14—Specification for the Qualification of Welding Sales Representatives ......................................................... 34
B5.15—Specification for the Qualification of Radiographic Interpreters ............................................................... 35
B5.16—Specification for the Qualification of Welding Engineers ........................................................................... 35
B5.17—Specification for the Qualification of Welding Fabricators .............................................................. 35
C1.1M/C1.1—Recommended Practices for Resistance Welding............................................................................. 59
C1.4M/C1.4—Specification for Resistance Welding of Carbon and Low-Alloy Steels ............................................. 59
C1.5—Specification for the Qualification of Resistance Welding Technicians .......................................................... 35
C2.16/C2.16M—Guide for Thermal Spray Operator Qualification Programs .............................................................. 62
C2.18—Guide for the Protection of Steel with Thermal Sprayed Coatings of Aluminum and Zinc and Their Alloys and Composites .................................................................................. 62
C2.20/C2.20M—Specification for Thermal Spraying Zinc Anodes on Steel Reinforced Concrete ......................... 62
C2.21M/C2.21—Specification for Thermal Spray Equipment Acceptance Inspection ........................................ 62
C2.23M/C2.23—Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel ........ 62
C2.25/C2.25M—Specification for Thermal Spray Feedstock—Wire and Rods ..................................................... 62
C3.2M/C3.2—Standard Method for Evaluating the Strength of Brazed Joints .......................................................... 54
C3.3—Recommended Practices for the Design, Manufacture, and Examination of Critical Brazed Components ......... 54
C3.4M/C3.4—Specification for Torch Brazing .................................................................................................. 54
C3.5M/C3.5—Specification for Induction Brazing .............................................................................................. 54
C3.6M/C3.6—Specification for Furnace Brazing ................................................................................................ 54
C3.7M/C3.7—Specification for Aluminum Brazing ............................................................................................ 55
C3.8M/C3.8—Specification for the Ultrasonic Pulse-Echo Examination of Brazed Joints ........................................... 55
C3.9M/C3.9—Specification for Resistance Brazing ............................................................................................. 55
C3.11M/C3.11—Specification for Torch Soldering ............................................................................................... 55
C3.12M/C3.12—Specification for Furnace Soldering ............................................................................................ 55
C4.1 SET—Criteria for Describing Oxygen-Cut Surfaces, and Oxygen Cutting Surface Roughness Gauge ......... 63
C4.2/C4.2M—Recommended Practices for Safe Oxyfuel Gas Cutting Torch Operation ........................................ 63
C4.5M—Uniform Designation System for Oxyfuel Nozzles ............................................................................. 63
C4.6M (ISO 9013 IDT)—Thermal Cutting—Classification of Thermal Cuts—Geometric Product Specification and Quality Tolerances ............................................................................. 64
C5.3—Recommended Practices for Air Carbon Arc Gouging & Cutting ............................................................ 64
<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1.1/D1.1M</td>
<td>Structural Welding Code—Steel</td>
<td>72</td>
</tr>
<tr>
<td>D1.2/D1.2M</td>
<td>Structural Welding Code—Aluminum</td>
<td>72</td>
</tr>
<tr>
<td>D1.3/D1.3M</td>
<td>Structural Welding Code—Sheet Steel</td>
<td>72</td>
</tr>
<tr>
<td>D1.4/D1.4M</td>
<td>Structural Welding Code—Steel Reinforcing Bars</td>
<td>72</td>
</tr>
<tr>
<td>D1.5M/D1.5-AMD1</td>
<td>Bridge Welding Code</td>
<td>72</td>
</tr>
<tr>
<td>D1.6/D1.6M</td>
<td>Structural Welding Code—Stainless Steel</td>
<td>73</td>
</tr>
<tr>
<td>D1.7/D1.7M</td>
<td>Guide to Repair &amp; Strengthening of Existing Structures</td>
<td>73</td>
</tr>
<tr>
<td>D1.8/D1.8M</td>
<td>Structural Welding Code—Seismic Supplement</td>
<td>73</td>
</tr>
<tr>
<td>D1.9/D1.9M</td>
<td>Structural Welding Code—Titanium</td>
<td>73</td>
</tr>
<tr>
<td>D3.5</td>
<td>Guide for Steel Hull Welding</td>
<td>68</td>
</tr>
<tr>
<td>D3.6M</td>
<td>Underwater Welding Code</td>
<td>68</td>
</tr>
<tr>
<td>D3.7</td>
<td>Guide for Aluminum Hull Welding</td>
<td>68</td>
</tr>
<tr>
<td>D3.9</td>
<td>Specification for Classification of Weld-Through Paint Primers</td>
<td>68</td>
</tr>
<tr>
<td>D8.1M</td>
<td>Specification for Automotive Weld Quality—Resistance Spot Welding of Steel</td>
<td>65</td>
</tr>
<tr>
<td>D8.2M</td>
<td>Specification for Automotive Weld Quality—Resistance Spot Welding of Aluminum</td>
<td>65</td>
</tr>
<tr>
<td>D8.8M</td>
<td>Specification for Automotive Weld Quality—Arc Welding of Steel</td>
<td>65</td>
</tr>
<tr>
<td>D8.14M</td>
<td>Specification for Automotive Weld Quality—Arc Welding of Aluminum</td>
<td>65</td>
</tr>
<tr>
<td>D9.1/D9.1M</td>
<td>Sheet Metal Welding Code</td>
<td>79</td>
</tr>
<tr>
<td>D10.4</td>
<td>Recommended Practices for Welding Austenitic Chromium-Nickel Stainless Steel Piping and Tubing</td>
<td>69</td>
</tr>
<tr>
<td>D10.6/D10.6M</td>
<td>Recommended Practices for Gas Tungsten Arc Welding of Titanium Piping and Tubing</td>
<td>69</td>
</tr>
<tr>
<td>D10.7M/D10.7</td>
<td>Guide for the Gas Shielded Arc Welding of Aluminum and Aluminum Alloy Pipe</td>
<td>69</td>
</tr>
<tr>
<td>D10.8</td>
<td>Recommended Practices for Welding of Chromium-Molybdenum Piping and Tubing</td>
<td>69</td>
</tr>
<tr>
<td>D10.10/D10.10M</td>
<td>Recommended Practices for Local Heating of Welds in Piping and Tubing</td>
<td>69</td>
</tr>
<tr>
<td>D10.12M/D10.12</td>
<td>Guide for Welding Mild Steel Pipe</td>
<td>70</td>
</tr>
<tr>
<td>D10.18M/D10.18</td>
<td>Guide for Welding Ferritic/Austenitic Duplex Stainless Steel Piping and Tubing</td>
<td>70</td>
</tr>
<tr>
<td>D11.2</td>
<td>Guide for Welding Iron Castings</td>
<td>75</td>
</tr>
<tr>
<td>D14.8M</td>
<td>Standard Methods for the Avoidance of Cold Cracks</td>
<td>64</td>
</tr>
<tr>
<td>D15.1/D15.1M</td>
<td>Railroad Welding Specification for Cars and Locomotives</td>
<td>71</td>
</tr>
<tr>
<td>D15.2/D15.2M</td>
<td>Recommended Practices for the Welding of Rails and Related Rail Components for Use by Rail Vehicles</td>
<td>71</td>
</tr>
<tr>
<td>D16.2M/D16.2</td>
<td>Guide for Components of Robotic and Automatic Arc Welding Installations</td>
<td>61</td>
</tr>
<tr>
<td>D16.4M/D16.4</td>
<td>Specification for the Qualification of Robotic Arc Welding Personnel</td>
<td>36</td>
</tr>
<tr>
<td>D17.1/D17.1M</td>
<td>Specification for Fusion Welding for Aerospace Applications</td>
<td>65</td>
</tr>
</tbody>
</table>
The American Welding Society is the worldwide authority in the development of standards, certifications and educational programming for the welding community. We are committed to connecting the welding industry to our extensive collection of resources, informing our members of technological advancements, and developing the next generation of welding professionals.