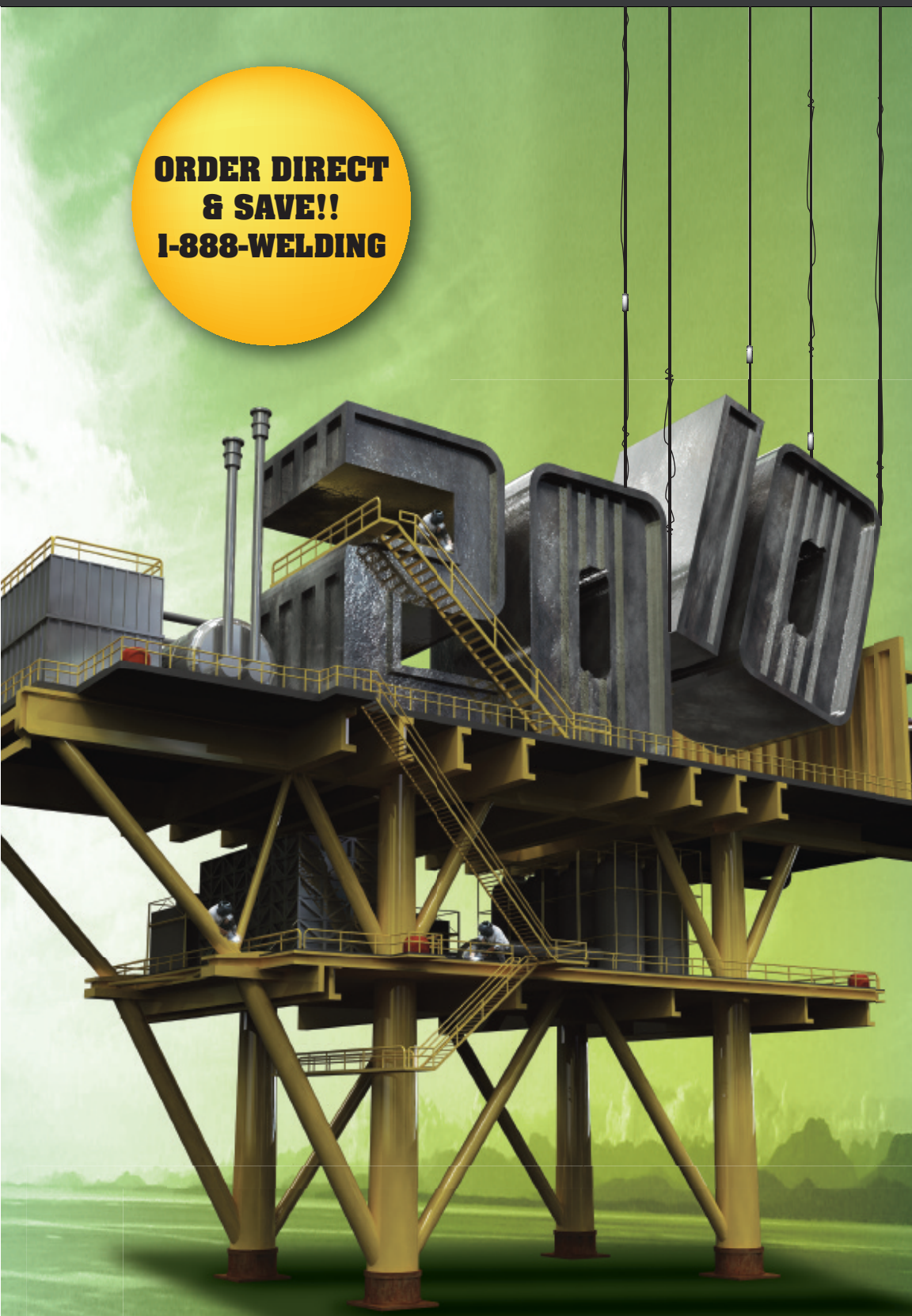


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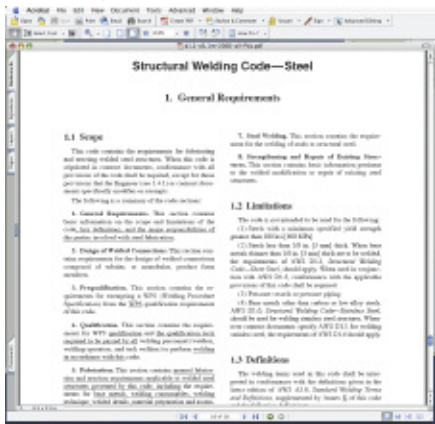
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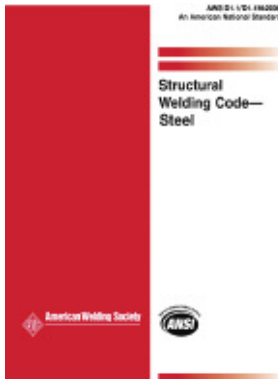
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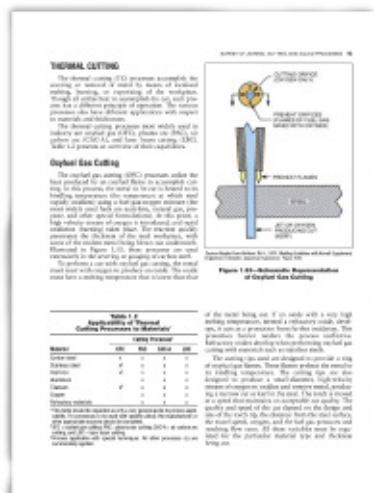
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### QC19:2002, Standard for the AWS Certification of Robotic Arc Welding Personnel

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## The Everyday Pocket Handbook for Visual Inspection and Weld Discontinuities—Causes and Remedies

Covers cracks, inclusions, incomplete fusion, incomplete joint penetration, overlap, porosity, undercut, and weld profiles. Compiled from AWS sources by Ted Weber, principal consultant for Weber and Associates. *34 pages, spiral-bound, 3-1/2" x 6", (2000).*

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## The Everyday Pocket Handbook on Welded Joint Details for Structural Applications

Twenty diagrams of structural joints with prequalified details from D1.1 in a pocket handbook format. *32 pages, spiral-bound, 3-1/2" x 6", (Revised 2004).*

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## The Everyday Pocket Handbook for Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW)

Includes shielding gas information for gas metal arc welding using spray arc transfer, short-circuiting arc transfer, globular to spray transition currents, arc voltages, wire-feed speed, melting rates, and typical welding conditions for carbon and low-alloy steels, stainless steels, and aluminum. Includes specification and classification system for flux cored arc welding electrodes, and same topics as gas metal arc welding portion for CO<sub>2</sub> and self-shielding. Covers troubleshooting advice for mechanical and electrical gas metal arc welding and flux cored arc welding. *50 pages, spiral-bound, 3-1/2" x 6", (2000).*

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## The Everyday Pocket Handbook on Metric Practices for the Welding Industry

Includes table conversions for common welding terms, length conversions, electrode sizes, fillet weld sizes, welding travel and wire feed speeds, deposition rates, and gas flow rates. *24 pages, spiral-bound, 3-1/2" x 6", (2000).*

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## The Everyday Pocket Handbook for Visual Inspection of AWS D1.1 Structural Welding Code's Fabrication and Welding Requirements

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Emphasizes shielded metal arc welding electrode care, handling, and use. Includes convenient classification suffix charts, suggested amperage ranges, stub loss, electrode orientation, and suggested joint designs. *34 pages, spiral-bound, 3-1/2" x 6", (1998).*

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## The Everyday Pocket Handbook for Gas Metal Arc Welding (GMAW) of Aluminum



Covers preparation of aluminum for welding, tips and troubleshooting, typical procedures for groove and fillet welds in aluminum alloys with argon shielding, aluminum filler metal properties (as-welded condition), and guide to selection of filler metal for general-purpose welding. *32 pages, spiral-bound, 3-1/2" x 6", (1998).*

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# Testing and Inspection

For brazing inspection/testing standards, see page 22.

For plastics inspection/testing standards, see page 17.

For thermal spray inspection standards, see page 16.

## **NEW EDITION: B1.10M/B1.10:2009, Guide for the Nondestructive Examination of Welds**

Addresses which examination method—visual, liquid penetrant, magnetic particle, radiographic, ultrasonic, electromagnetic (eddy current), or leak testing—best detects various types of discontinuities. Note: Does not address acceptance criteria. 64 pages, 30 figures, 4 tables, (2009), fourth edition.

Order Code: B1.10 \$104/\$78

## **B1.11:2000, 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. 42 pages, 3 annexes, 48 figures, (2000).

Order Code: B1.11 \$104/\$78

## **B4.0:2007, Standard Methods for Mechanical Testing of Welds**

Describes the most common mechanical test methods applicable to welds and welded joints. Each test method gives details concerning specimen preparation, test parameters, testing procedures, and suggested report forms. Acceptance criteria are not included. Three new weldability tests (WIC, trough, and GBOP) and resistance weld tests have been included in this new edition. (Note: Joint tests for brazements are covered in AWS C3.2M/C3.2.) U.S. Customary Units. 152 pages, 97 figures, (2007).

Order Code: B4.0 \$104/\$78

## **B4.0M:2000 (metric only)**

Metric only: 114 pages, 64 figures, (2000).

Order Code: B4.0M \$88/\$66

## **WI:2000, Welding Inspection Handbook**

This invaluable training reference helps inspectors, engineers, and welders evaluate the difference between discontinuities and rejectable defects. Includes chapters on:

- Operations
- Safety
- Ferrous Welding Metallurgy
- Discontinuities
- Qualification of Welders
- Proof Tests
- Metrics
- Symbols
- Inspection
- QA
- Preheating/Postweld Heat Treating
- Qualification of Procedures
- Destructive Testing
- Nondestructive Examination
- Standards

254 pages 18 chapters, index, 108 figures, 16 tables, 6½" x 9", (2000), third edition.

Order Code: WI \$76/\$57

## **WIT-T:2008, Welding Inspection Technology**

For at-home study, this official reference textbook for the three-day AWS core seminar for CWI exam preparation is readable, informative, and comprehensive. 329 pages, 10 chapters, 379 figures and photographs, (2008).

Order Code: WIT-T \$272/\$204

## **WIT-W:2008, Welding Inspection Technology Workbook**

A companion to *Welding Inspection Technology*. 83 pages, (2008).

Order Code: WIT-W \$72/\$54

## **WIT-E:2008, Welding Inspection Technology Sample CWI Fundamentals Examination**

This study aid, used at the CWI seminar, is also a good home-study tool for exam preparation. Contains approximately 224 practice questions, 2 tables, and answer key. 44 pages, (2008), sixth edition.

Order Code WIT-E \$60/\$45

## **The Practical Reference Guide for Radiographic Inspection Acceptance Criteria**

Easy orientation to the levels of potential weld discontinuities that won't affect the weldments form, fit, or function. Provides three levels of conditions that can be specified to determine radiographic acceptance of welds. 36 pages, charts and diagrams, (1995).

Order Code: PRG \$56/\$41

## **The Everyday Pocket Handbook for Visual Inspection and Weld Discontinuities—Causes and Remedies** See page 29.

## **The Everyday Pocket Handbook for Visual Inspection of AWS D1.1 Structural Welding Code's Fabrication and Welding Requirements** See page 29.

## **The Practical Reference Guide for Welding Inspection Management—Visual Inspection of Pressure Vessels and Pressure Piping** See page 23.

## **G1.2M/G1.2:1999, Specification for Standardized Ultrasonic Welding Test Specimen for Thermoplastics** See page 17.

## **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 17.

## **G1.10M:2001, Guide for the Evaluation of Hot Gas, Hot Gas Extrusion, and Heated Tool Butt Thermoplastic Welds** See page 17.

# Operations

## **The Practical Reference Guide to Positioning**

Describes the basic operation of weldment positioners and welding head manipulators and gives information on their selection and use. 74 pages, 58 figures, 1 table, (2008).

Order Code: PRGP \$56/\$42

## **Total Welding Management** See page 6.

## **The Independent Shop's Guide to Welding Safety and Health** See page 9.

## **Design and Planning Manual for Cost-Effective Welding** See page 6.

## **D16.2M/D16.2:2007, Guide for Components of Robotic and Automatic Arc Welding Installations** See page 19.

## **C1.4M/C1.4:2009, 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. *30 pages, 5 figures, 6 tables, (2009).*

**Order Code: C1.4M/C1.4** **\$56/\$42**

## **D11.2-89(R2006), Guide for Welding Iron Castings**

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. *135 pages, 69 figures, 26 tables, (Reaffirmed 2006).*

**Order Code: D11.2** **\$96/\$72**

## **G2.1M/G2.1:2002, Guide for the Joining of Wrought Nickel-Based Alloys**

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. *56 pages, 5 figures, 17 tables, (2003).*

**Order Code: G2.1M/G2.1** **\$64/\$48**

## **G2.3M/G2.3:2009, Guide for the Joining of Wrought Solid Solution Austenitic Stainless Steels**

Presents a description of wrought 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. *88 pages, 8 figures, 27 tables, (2009)*

**Order Code G2.4/G2.4M** **\$76/\$57**

## **G2.4/G2.4M:2007, Guide for the Fusion Welding of Titanium and Titanium Alloys**

Best practices to allow first-time users of titanium as well as established fabricators to join titanium parts into quality components. *52 pages, 5 annexes, 8 figures, 20 tables, (2007)*

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## **The Practical Reference Guide for Corrosion of Welds—Causes and Cures**

Succinct introduction to basic corrosion mechanisms. Includes pitting, intergranular corrosion, stress corrosion cracking, erosion, crevice and galvanic corrosion, and selective leaching. Clear advice on how to avoid and correct corrosion, including alloying for resistance. *28 pages, 44 photos, (1999).*

**Order Code: PRGC** **\$52/\$39**

## **The Practical Reference Guide for High Quality Fusion Welding of Aluminum**

Gives engineers, designers, and technicians step-by-step directions in proper use of cleaning tools, assembling, and welding procedures. *20 pages, illustrations, photos, (2001).*

**Order Code: PRGQA** **\$52/\$39**

## **The Practical Reference Guide to Welding Titanium**

Topics include backing gas shielding, chambers, joint design, equipment, consumables, filler metal transfer, and special welding conditions for gas tungsten arc welding, gas metal arc welding, plasma arc welding, electron and laser beam welding, and resistance welding. *16 pages, 5 tables, (1999).*

**Order Code: PRGT** **\$48/\$36**

## **The Practical Reference Guide to Welding Aluminum in Commercial Applications**

Covers mechanical properties of aluminum affected by welding alloy and temper designations, filler metal selection, prewelding preparation, GTAW, GMAW, and SMAW defects, and discontinuities and problems in qualifying welding procedures. *38 pages, 24 figures, 14 tables, (2002).*

**Order Code: PRGWA** **\$56/\$41**

## **The Practical Reference Guide to Welding Metallurgy—Key Concepts for Weldability**

An intelligent introduction for the engineer new to welding, and the up-and-coming senior technician. Tables and figures support these topics: metal structures, metal forms, diffusion, solid solubility, residual stress, shielding and purging, phase transformation, hardness and hardenability, grain size, stainless steels, aluminum and its alloys, copper and its alloys, refractory alloys, and repair welding. *34 pages, 32 figures, (1999).*

**Order Code: PRGWM** **\$56/\$41**

## **Welding Aluminum—Questions and Answers**

This practical guide to troubleshooting aluminum welding-related problems is based on real-life questions and answers from author Tony Anderson's long-running column in the *Welding Journal*. Includes dozens of color photos. *170 pages, hard cover, 70 figures, 10 tables, (2008).*

**Order Code: WQA** **\$124/\$93**

## **The Professional's Advisor on Welding of Stainless Steels**

Focuses mainly on austenitic stainless steels (200 and 300 series). Also covers ferritic and martensitic (400 series), precipitation-hardening series, and duplex stainless steels. Contains chapters on definitions, stainless steel filler materials, preweld cleaning and preparation, welding and cutting of stainless steels, postweld cleaning, heat treatments, weld discontinuities and defects, stainless steels in welding codes and standards, and safety and health considerations. *103 pages, 13 figures, 47 tables, spiral-bound. 5 1/2" x 8 1/2", (1999).*

**Order Code: PASS** **\$84/\$63**

## **Welding Zinc-Coated Steels**

Results of a four-year work program sponsored by the International Lead Zinc Research Organization, provides procedures and safe practices. *144 pages, (1972).*

**Order Code: WZC** **\$100/\$75**

## **Guide to Weldability: Carbon and Low-Alloy Steels**

Aimed at those responsible for the operation of fabrication shops and maintenance/repair facilities, this guide helps the non-welding engineer in the selection of method, materials, and procedures to produce the "desired results and stay out of trouble." Compiled from information taken from the *Welding Handbook*, George E. Linnert's *Welding Metallurgy*, *ASM Handbook*, and *Jefferson's Welding Encyclopedia*, among others. *51 pages, 9 chapters, 2 appendices, 20 figures, 14 tables, (2005).*

**Order Code: GTW** **\$60/\$45**

## **B2.1/B2.1M-BMG:2009, Base Metal Grouping for Welding Procedure and Performance Qualification** See page 10.

## C2.16/C2.16M:2002, Guide for Thermal-Spray Operator Qualification

Recommendations for thermal-spray operator qualification based on knowledge and skill testing. Twelve individual thermal-spray operator qualification tests are included for engineering and corrosion control applications: one each for job knowledge, high-velocity oxygen fuel (HVOF) spraying and flame spray-fusing; two for arc spraying; and three each for flame spraying and air-plasma spraying. *86 pages, (2002).*

**Order Code: C2.16 \$76/\$57**

## C2.18-93, 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, railroad, fabrication, and repair industries. *40 pages, 13 tables, (1993).*

**Order Code: C2.18 \$60/\$45**

## C2.20/C2.20M:2002, Specification for Thermal Spraying Zinc Anodes on Steel Reinforced Concrete

Explains metalized zinc cathodic protection systems for corrosion protection of concrete structures with steel reinforcing. Useful to departments of transportation, port facilities, power plants, and other operations responsible for repair and maintenance of concrete structures affected by corrosion of steel reinforcement. Includes information on job safety, passfail reference standards, feedstock materials, needed equipment, and instructions for surface preparation, thermal spraying, and quality control. *40 pages, 3 figures, 5 tables, (2003).*

**Order Code: C2.20/C2.20M \$60/\$45**

## C2.21M/C2.21:2003, Specification for Thermal Spray Equipment Acceptance Inspection

Specifies thermal spray equipment acceptance requirements for plasma, arc-wire, flame-powder, flame-wire, flame-rod, and flame-cord, and high-velocity oxygen fuel equipment. Contains inspection report forms. *28 pages, (2004).*

**Order Code: C2.21M/C2.21 \$52/\$39**

## C2.23M/C2.23:2003, Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel

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, (2003).*

**Order Code: C2.23M/C2.23 \$60/\$45**

## C2.25/C2.25M:2002, Specification for Thermal Spray Feedstock—Solid and Composite Wire and Ceramic 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. *26 pages, 4 figures, 7 tables, (2002).*

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## Thermal Spray Manual

Introduction to thermal spraying, including fundamentals, sequencing the job, applications, processes, coating selection, finishing, training, certification, and safety. Excellent training manual. *176 pages, 12 chapters, glossary, (1996).*

**Order Code: TSM \$112/\$84**

## Thermal Spraying Practice, Theory, and Application

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. *194 pages, 48 figures, 59 tables (1985).*

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The live forums at [www.aws.org](http://www.aws.org) provide a fast way to get tips and advice from your inspection colleagues and other welding pro's. Search thousands of helpful postings or post your own inquiries and watch the suggestions pour in. **Just surf to [http://www.aws.org/cgi-bin/mwfl/forum\\_show.pl](http://www.aws.org/cgi-bin/mwfl/forum_show.pl) or follow the forum link on [www.aws.org](http://www.aws.org).**

## **B2.4:2006, 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. 42 pages, 21 figures, 11 tables, 1 mandatory annex, 1 non-mandatory annex, (2006).*

**Order Code: B2.4** **\$60/\$45**

## **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, (2006).*

**Order Code G1.1M/G1.1** **\$72/\$54**

## **G1.2M/G1.2:1999, 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. *28 pages, (1999).*

**Order Code: G1.2M/G1.2** **\$52/\$39**

## **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, (2006).*

**Order Code G1.6** **\$52/\$39**

## **G1.10M:2001, Guide for the Evaluation of Hot Gas, Hot Gas Extrusion, and Heated Tool Butt Thermoplastic Welds**

Lists and describes defects in welded joints in thermoplastic materials, and classifies each into one of three quality grades, allowing specific defects to be excluded or kept within limits. *44 pages, (2001).*

**Order Code: G1.10M** **\$60/\$45**

## **Handbook of Plastics Joining**

Provides detailed descriptions of joining processes and an extensive compilation of data on the joining of particular plastic materials. Divided into two main parts: processes and materials. The processing part is divided into 18 chapters, each discussing a different joining technique. The second part covers material-specific joining information. Includes 25 generic polymer families. In addition, the book contains an international suppliers directory and a glossary of the key terms used in plastics joining. *Second edition, 591 pages, 450 illustrations, (2008).*

**Order Code: HPJ** **\$325**

# Food Processing Systems

## **D18.1/D18.1M:2009, Specification for Welding of Austenitic Stainless Steel Tube and Pipe Systems in Sanitary (Hygienic) Applications**

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, (2009).*

**Order Code: D18.1** **\$56/\$42**

## **D18.2:2009, Guide to Weld Discoloration Levels on Inside of Austenitic Stainless Steel Tube**

Laminated sheet with color photograph showing degrees of coloration on the inside of an austenitic stainless steel tube with increasing amounts of oxygen in the backing shielding gas. Suitable as a specifying tool and visual examination guide. Includes two-page instruction sheet. *(2009).*

**Order Code: D18.2** **\$40/\$30**

## **D18.3/D18.3M:2005, Specification for Welding of Tanks, Vessels, & Other Equipment in Sanitary (Hygienic) Applications**

Covers issues not addressed by D18.1, including welding of carbon steels, stainless steels, and nickel alloys for construction of new tanks and other equipment. Includes welding of pipe to sanitary equipment. *38 pages, 3 nonmandatory annexes, 2 figures, 3 tables, (2005).*

**Order Code: D18.3/D18.3M** **\$56/\$42**



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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. *116 pages, 36 figures, 59 tables, (Reaffirmed 2006).*

**Order Code: C1.1M/C1.1** **\$88/\$66**

## **C4.1-77 (R2010) Set, Criteria for Describing Oxygen-Cut Surfaces, and Oxygen Cutting Surface Roughness Gauge**

Consists of a plastic gauge with samples of oxygen-cut surfaces, a list of descriptive terms, and an accompanying chart. *5 pages (Reaffirmed 2009).*

**Order Code: C4.1 SET** **\$56/\$42**

## **NEW EDITION: C4.2/C4.2M:2009, Recommended Practices for Safe Oxyfuel Gas Cutting Torch Operation**

Describes the oxyfuel gas cutting process and latest procedures and safety requirements, using terminology compatible with ISO documents. Illustrations show torch and nozzle configurations, and examples of production-cut surfaces. *48 pages, 20 figures, 4 tables, (2009).*

**Order Code: C4.2/C4.2M** **\$68/\$52**

## **C4.3/C4.3M:2007, Recommended Practices for Safe Oxyfuel Gas Heating Torch Operation**

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, (2007).*

**Order Code: C4.3/C4.3M** **\$56/\$42**

## **C4.4/C4.4M:2007, Recommended Practices for Heat Shaping and Straightening with Oxyfuel Gas Heating Torches**

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, (2007).*

**Order Code: C4.4/C4.4M** **\$64/\$48**

## **C4.5M:2006, 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, SI (metric) units, (2006).*

**Order Code: C4.5M** **\$48/\$36**

## **C4.6M:2006 (ISO 9013:2002 IDT), Thermal Cutting—Classification of Thermal Cuts—Geometric Product Specification and Quality Tolerances**

Provides the quantitative and qualitative methods for describing and classifying oxyfuel flame, plasma, and laser cutting. *48 pages, 5 annexes, 27 figures, 8 tables, (2006).*

**Order Code C4.6M** **\$60/\$45**

## **C5.1-73, Recommended Practices for Plasma Arc Welding**

Presents a description of the process and practical procedures as applied to joining parts and surfacing. Applies to a wide variety of metals and represents methods used in industry. *76 pages, (1973).*

**Order Code: C5.1** **\$72/\$54**

## **C5.2:2001, Recommended Practices for Plasma Arc Cutting and Gouging**

A great tool to optimize and troubleshoot your plasma arc cutting operations. Discusses basics of the process, components, controls, power supplies, and recommended process consumables and parameters, and gives you methods of optimizing cut quality and parameter settings. Also deals with safety and health aspects of the process, and methods for control of pollution and other hazards. *52 pages, 22 figures, 3 tables, (2001).*

**Order Code: C5.2** **\$64/\$48**

## **C5.3:2000, 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. *32 pages, 11 figures, 10 tables, (2000).*

**Order Code: C5.3** **\$56/\$42**

## **C5.4-93, Recommended Practices for Stud Welding**

These recommended practices for stud welding, prepared by the Subcommittee on Stud Welding of the AWS Committee on Arc Welding and Cutting, are intended to serve as a basic guide for those interested in attaching fasteners by arc and capacitor discharge stud welding. The variations of the process, stud design, equipment, welding procedures, quality control, and safety precautions are discussed. The information presented will guide the designer and the shop in the utilization of studs in many fields including automotive manufacture, boiler and building construction, farm and industrial equipment, railroads and shipbuilding, aircraft and aerospace, metal furniture, and other metal working industries. *44 pages, 37 figures, 11 tables, (1993).*

**Order Code: C5.4** **\$60/\$45**

## **C5.5/C5.5M:2003, Recommended Practices for Gas Tungsten Arc Welding**

Provides a fundamental explanation of the gas tungsten arc welding process, describes basic practices and concepts, and outlines advanced methods and applications. Addresses current uses of gas tungsten arc welding in the metal-fabricating industry, new applications, and advances in research and development. Presents many practical recommendations on the use of gas tungsten arc welding, and a handy trouble-shooting section. Includes process advantages and limitations; equipment and supplies; tungsten electrodes; gas shielding, purging, and backing; fixturing and tooling; welding techniques; quality control; troubleshooting and safety; joint design, preparation, and

welding positions; and welding characteristics of selected alloys. *130 pages, 79 figures, 22 tables, (2003).*

**Order Code: C5.5/C5.5M** **\$96/\$72**

### **C5.6-89R, Recommended Practices for Gas Metal Arc Welding**

Learn from this document about the basic concepts of the gas metal arc welding (GMAW) process, including metal transfer modes, the nature of the process variables, and the necessary equipment and consumables. You'll obtain a fundamental understanding of GMAW and its variations, such as short circuit, spray, and pulse modes of metal transfer. *76 pages, (Reaffirmed 1994).*

**Order Code: C5.6** **\$72/\$54**

### **C5.7:2000 (R2006), Recommended Practices for ElectroGas Welding**

Fundamentals of the process, including the various methods of welding. Equipment, consumables, applications, and metallurgical advantages and limitations are discussed. Covers selection of process variables and operating conditions and typical EGW procedures. Inspection of welds, and training and qualification of welding procedures and operators are described. A troubleshooting guide, safety considerations, and a supplementary reading list are presented. *68 pages, 23 figures, 14 tables. (Reaffirmed 2006).*

**Order Code: C5.7** **\$68/\$52**

### **C5.10/C5.10M:2003, Recommended Practices for Shielding Gases for Welding and Cutting**

Covers six industrial gases – argon, carbon dioxide, helium, hydrogen, nitrogen, and oxygen – and various mixtures. Covers gas properties, uses, safe handling, distribution, mixtures and effects of shielding gases on arc characteristics and welds for flux cored arc welding, gas tungsten arc welding, gas metal arc welding, electrogas welding, plasma arc welding, plasma arc cutting, laser welding, and laser cutting. Includes sections on gas purging and backing gases as well as shielding and cutting gas safety. *64 pages, 26 figures, 17 tables, (2003).*

**Order Code: C5.10/C5.10M** **\$68/\$52**

### **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. *36 pages, 3 appendices, 9 figures, 2 tables. (Reaffirmed 2009).*

**Order Code: C6.1** **\$56/\$42**

### **C6.2/C6.2M:2006, Specification for Friction Welding of Metals**

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, (2006).*

**Order Code: C6.2/C6.2M** **\$56/\$42**

### **C7.1M/C7.1:2004, Recommended Practices for Electron Beam Welding**

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. *128 pages, 64 figures, 11 tables, (2004).*

**Order Code: C7.1** **\$92/\$69**

### **C7.2:1998, Recommended Practices for Laser Beam Welding, Cutting, and Drilling**

Recommended practices for laser beam welding, cutting, and drilling. Covers common applications of the process. Processes definitions, safe practices, general process requirements and inspection criteria are provided. *116 pages, (1998).*

**Order Code: C7.2** **\$88/\$66**

### **C7.3:1999R, Process Specification for Electron Beam Welding**

Sister publication to C7.1, *Recommended Practices for Electron Beam Welding*, this standard discusses applicable specifications, safety, requirements, fabrication, quality examination, equipment calibration and maintenance, approval, and delivery of work. Includes sample WPS and PQR forms, as well as a Nondestructive Evaluation Discontinuity Limits chart. *18 pages. (Reaffirmed 2003).*

**Order Code: C7.3** **\$48/\$36**

### **C7.4/C7.4M:2008, Process Specification and Operator Qualification for Laser Beam Welding**

Covers processing and quality control requirements for laser beam welding. *34 pages, 1 table. (2008).*

**Order Code: C7.4** **\$56/\$42**

### **D14.8M:2009 (ISO/TR 17844:2004 IDT), Standard Methods for the Avoidance of Cold Cracks**

The U.S. adoption of ISO 17844:2004, *Welding – Comparison of standardized methods for the avoidance of cold cracks*. Retains the technical content, structure, and wording of the ISO document. Compares currently available methods for determining welding procedures for avoiding hydrogen induced cold cracking during fabrication. *92 pages, 27 figures, 28 tables. (2009)*

**Order Code: D14.8M** **\$80/\$60**

### **D16.2M/D16.2:2007, Guide for Components of Robotic and Automatic Arc Welding Installations**

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. (2007)*

**Order Code: D16.2M/D16.2** **\$56/\$42**

### **Arc Welding with Robots: Do's and Don'ts**

Provides the novice as well as the seasoned user of industrial robots with information that can promote and expand successful use of robots in GMAW and FCAW applications. *36 pages. (1995).*

**Order Code: AWR** **(25 copies) \$24/\$18**

### **The Practical Reference Guide for Hardfacing**

Introduction to hardfacing, the surfacing process that helps protect against wear or corrosion exactly where needed. An excellent companion to A5.212001, *Specification for Bare Electrodes and Rods for Surfacing*. *20 pages, 4 figures, 12 tables, (2002).*

**Order Code: PRGHF** **\$52/\$39**

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

BASE METAL	THICKNESS	PROCESS	FILLER METAL	CONDITION	ORDER NO.
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## SHEET METAL

SHEET METAL	CARBON STEEL	Carbon Steel	10 – 18 gauge	GMAW-S	ER70S-6	As-welded, with or w/o backing	B2.1-1-004:2002
		Carbon Steel	10 – 18 gauge	GTAW	ER70S-2 or -3	As-welded, with or w/o backing	B2.1-1-008:2002
		Carbon Steel	10 – 18 gauge	SMAW	E6010 or E6013	As-welded, with or w/o backing	B2.1-1-012:2002
	GALVANIZED	Galvanized Steel	10 – 18 gauge	GMAW-S	ER70S-6	As-welded, with or w/o backing	B2.1-1-003:2002
		Galvanized Steel	10 – 18 gauge	GTAW	ER70S-2 or -3	As-welded, with or w/o backing	B2.1-1-007:2002
		Galvanized Steel	10 – 18 gauge	SMAW	E6010 or E6013	As-welded, with or w/o backing	B2.1-1-011:2002
	M-1 TO M-8	Carbon to Stainless	10 – 18 gauge	GMAW-S	ER309	As-welded, with or w/o backing	B2.1-1/8-006:2002
		Carbon to Stainless	10 – 18 gauge	GTAW	ER309	As-welded, with or w/o backing	B2.1-1/8-010:2002
		Carbon to Stainless	10 – 18 gauge	SMAW	E309-15,-16 or -17	As-welded, with or w/o backing	B2.1-1/8-014:2002
	STAINLESS	Stainless Steel	10 – 18 gauge	GMAW-S	ER3XX	As-welded, with or w/o backing	B2.1-8-005:2002
		Stainless Steel	10 – 18 gauge	GTAW	ER3XX	As-welded, with or w/o backing	B2.1-8-009:2002
		Stainless Steel	10 – 18 gauge	SMAW	E3XX-15,-16 or -17	As-welded, with or w/o backing	B2.1-8-013:2002
AL	Aluminum	10 – 18 gauge	GTAW	ER4043 or R4043	As-welded, with or w/o backing	B2.1-22-015:2002	

## PIPE OR PLATE (ALL STANDARDS BELOW ARE ADOPTED BY NATIONAL BOARD INSPECTION CODE)

PIPE OR PLATE	CARBON STEEL	Carbon Steel	3/16" – 7/8"	GTAW	ER70S-2 or -3	As-welded, with or w/o backing	B2.1-1-002-90
		Carbon Steel	1/8" – 1-1/2"	GTAW followed by SMAW	ER70S-2 & E7018	As-welded or PWHT	B2.1-1-021-94
		Carbon Steel	3/16" – 3/4"	SMAW	E7016 & E7018	As-welded, with backing	B2.1-1-001-90
		Carbon Steel	1/8" – 1-1/2"	SMAW	E7018	As-welded or PWHT	B2.1-1-016-94
		Carbon Steel	1/8" – 1-1/2"	SMAW	E6010	As-welded or PWHT	B2.1-1-017-94
		Carbon Steel	1/8" – 1-1/2"	SMAW	E6010 & E7018	As-welded or PWHT	B2.1-1-022-94
		Carbon Steel	1/8" – 1-1/2"	SMAW	E6010* & E7018	As-welded or PWHT	B2.1-1-026-94
		Carbon Steel	1/8" – 1-1/2"	FCAW, self-shielded	E71T-8	As-welded	B2.1-1-018-94
		Carbon Steel	1/8" – 1/2"	FCAW, self-shielded	E71T-11	As-welded	B2.1-1-027:1998
		Carbon Steel	1/8" – 1-1/2"	FCAW-G, CO <sub>2</sub> gas-shielded	E70T-1 or E71T-1	As-welded	B2.1-1-019-94
	Carbon Steel	1/8" – 1-1/2"	FCAW-G, Ar-CO <sub>2</sub> gas-shielded	E70T-1 or E71T-1	As-welded or PWHT	B2.1-1-020-94	
	STAINLESS	Stainless Steel	1/16" – 1-1/2"	GTAW	ER3XX	As-welded	B2.1-8-024:2001
		Stainless Steel	1/8" – 1-1/2"	GTAW followed by SMAW	ER3XX & E3XX-XX	As-welded	B2.1-8-025:2001
		Stainless Steel	1/8" – 1-1/2"	SMAW	E3XX-XX	As-welded	B2.1-8-023-94

\*Downhill progression on root pass. All other vertical position passes are uphill.

Specifications with order numbers indicated in red are adopted by ASME with additional requirements.

### PRICES:

The one-time user-license fee for each SWPS is \$186 (\$248 for nonmembers).

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. 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 intracompany applications.

# Let AWS Standard Welding Procedure Specifications (SWPSs) do the work for you.

	BASE METAL	THICKNESS	PROCESS	FILLER METAL	CONDITION	ORDER NO.	
<b>PRIMARILY PIPE</b>							
ALL STANDARDS BELOW ARE ADOPTED BY <i>NATIONAL BOARD INSPECTION CODE</i> , except B2.1-1-202							
<b>PRIMARILY PIPE</b>	<b>CARBON STEEL</b>	Carbon Steel	1/8" – 1-1/2"	GMAW-S followed by FCAW-G	ER70S-3 & E70T-1M, E71T-1M or -12M	As-welded or PWHT	B2.1-1-232:2006
		Carbon Steel	1/8" – 1-1/2"	GMAW-S followed by GMAW spray transfer	ER70S-3	As-welded or PWHT	B2.1-1-233:2006
		Carbon Steel	1/8" – 1-1/2"	FCAW-G, Ar-CO <sub>2</sub> shielded	E70T-1M, E71T-1M, or E71T-12M	As-welded or PWHT	B2.1-1-234:2006
		Carbon Steel	1/8" – 1-1/2"	GMAW spray transfer	ER70S-3	As-welded or PWHT	B2.1-1-235:2006
		Carbon Steel	1/8" – 1-1/2"	GTAW	ER70S-2	As-welded or PWHT	B2.1-1-207-96
		Carbon Steel	1/8" – 1-1/2"	GTAW followed by SMAW	ER70S-2 & E7018	As-welded or PWHT	B2.1-1-209-96
		Carbon Steel	1/8" – 1-1/2"	GTAW, consumable inserts	INMs-1 & ER70S-2	As-welded or PWHT	B2.1-1-210:2001
		Carbon Steel	1/8" – 1-1/2"	GTAW, consumable inserts/SMAW	INMs-1, E70S-2 & E7018	As-welded or PWHT	B2.1-1-211:2001
		Carbon Steel	1/8" – 3/4"	SMAW	E6010 & E7018	As-welded	B2.1-1-201-96
		Carbon Steel	1/8" – 3/4"	SMAW	E6010* & E7018	As-welded	B2.1-1-202-96
		Carbon Steel	1/8" – 3/4"	SMAW	E6010	As-welded	B2.1-1-203-96
		Carbon Steel	1/8" – 3/4"	SMAW	E6010*	As-welded	B2.1-1-204-96
		Carbon Steel	1/8" – 1-1/2"	SMAW	E6010 & E7018	As-welded or PWHT	B2.1-1-205-96
		Carbon Steel	1/8" – 1-1/2"	SMAW	E6010* & E7018	As-welded or PWHT	B2.1-1-206-96
		Carbon Steel	1/8" – 1-1/2"	SMAW	E7018	As-welded or PWHT	B2.1-1-208-96
<b>PRIMARILY PIPE</b>	<b>M-1 TO M-8</b>	Carbon to Stainless	1/16" – 1-1/2"	GTAW	ER309(L)	As-welded	B2.1-1/8-227:2002
		Carbon to Stainless	1/8" – 1-1/2"	GTAW followed by SMAW	ER309(L) & E309(L)-15,-16 or -17	As-welded	B2.1-1/8-229:2002
		Carbon to Stainless	1/16" – 1-1/2"	GTAW, consumable inserts	IN309 and ER309(L)	As-welded	B2.1-1/8-230:2002
		Carbon to Stainless	1/8" – 1-1/2"	GTAW, consumable inserts/SMAW	IN309, ER309 & E309-15,-16 or -17, or ER309(L) & E309(L)-15,-16 or -17	As-welded	B2.1-1/8-231:2002
		Carbon to Stainless	1/8" – 1-1/2"	SMAW	E309(L)-15,-16 or -17	As-welded	B2.1-1/8-228:2002
<b>PRIMARILY PIPE</b>	<b>STAINLESS</b>	Stainless Steel	1/16" – 1-1/2"	GTAW	ER3XX	As-welded	B2.1-8-212:2001
		Stainless Steel	1/8" – 1-1/2"	GTAW followed by SMAW	ER3XX & E3XX-XX	As-welded	B2.1-8-214:2001
		Stainless Steel	1/8" – 1-1/2"	GTAW, consumable inserts	IN3XX & ER3XX	As-welded	B2.1-8-215:2001
		Stainless Steel	1/8" – 1-1/2"	GTAW, consumable inserts/SMAW	IN3XX, ER3XX & E3XX-XX	As-welded	B2.1-8-216:2001
		Stainless Steel	1/8" – 1-1/2"	SMAW	E3XX-XX	As-welded	B2.1-8-213-97
<b>PRIMARILY PIPE</b>	<b>CHROME-NIOLY STEEL</b>	Cr-Mo (M-4/P-4)	1/8" – 3/4"	GTAW	ER80S-B2	As-welded ( $\leq 1/2"$ ) or PWHT (all thicknesses)	B2.1-4-217:1999
		Cr-Mo (M-4/P-4)	1/8" – 1-1/2"	GTAW followed by SMAW	ER80S-B2 & E8018-B2	As-welded ( $\leq 1/2"$ ) or PWHT (all thicknesses)	B2.1-4-219:1999
		Cr-Mo (M-4/P-4)	1/8" – 3/4"	GTAW, consumable inserts	IN515 & ER80S-B2	As-welded ( $\leq 1/2"$ ) or PWHT (all thicknesses)	B2.1-4-220:1999
		Cr-Mo (M-4/P-4)	1/8" – 1-1/2"	GTAW, consumable inserts/SMAW	IN515, ER80S-B2, & E8018-B2	As-welded ( $\leq 1/2"$ ) or PWHT (all thicknesses)	B2.1-4-221:1999
		Cr-Mo (M-4/P-4)	1/8" – 1-1/2"	SMAW	E8018-B2	As-welded ( $\leq 1/2"$ ) or PWHT (all thicknesses)	B2.1-4-218:1999
		Cr-Mo (M-5A/P-5A)	1/8" – 3/4"	GTAW	ER90S-B3	As-welded ( $\leq 1/2"$ ) or PWHT (all thicknesses)	B2.1-5A-222:1999
		Cr-Mo (M-5A/P-5A)	1/8" – 1-1/2"	GTAW followed by SMAW	ER90S-B3 & E9018-B3	As-welded ( $\leq 1/2"$ ) or PWHT (all thicknesses)	B2.1-5A-224:1999
		Cr-Mo (M-5A/P-5A)	1/8" – 3/4"	GTAW, consumable inserts	IN521 & ER90S-B3	As-welded ( $\leq 1/2"$ ) or PWHT (all thicknesses)	B2.1-5A-225:1999
		Cr-Mo (M-5A/P-5A)	1/8" – 1-1/2"	GTAW, consumable inserts/SMAW	IN521, ER90S-B3, & E9018-B3	As-welded ( $\leq 1/2"$ ) or PWHT (all thicknesses)	B2.1-5A-226:1999
		Cr-Mo (M-5A/P-5A)	1/8" – 1-1/2"	SMAW	E9018-B3	As-welded ( $\leq 1/2"$ ) or PWHT (all thicknesses)	B2.1-5A-223:1999

# Brazing and Soldering

## **C3.2M/C3.2:2008, 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, (2008).*

**Order Code: C3.2M/C3.2** **\$60/\$45**

## **C3.3:2008, Recommended Practices for the Design, Manufacture, and Examination of Critical Brazed Components**

Procedures that should be followed in the design, manufacture, and examination of brazed joints to ensure reliability of critical components. *42 pages, 4 tables, 1 figure (2008).*

**Order Code: C3.3** **\$60/\$45**

## **C3.4M/C3.4:2007, Specification for Torch Brazing**

Provides the minimum fabrication, equipment, process procedure requirements, and inspection requirements for the torch brazing of copper, copper alloys, heat and corrosion-resistant alloys, and other materials that can be adequately torch brazed. *24 pages, (2007)*

**Order Code: C3.4** **\$56/\$42**

## **C3.5M/C3.5:2007, Specification for Induction Brazing**

The minimum fabrication, equipment, material, process procedure requirements, and 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. Criteria for classifying induction brazed joints based on loading and consequences of failure, and quality assurance criteria defining limits of acceptability of each class. Defines acceptable induction brazing equipment, materials, and procedures, as well as required inspection for each class of joint. *24 pages, (2007)*

**Order Code: C3.5** **\$56/\$42**

## **C3.6M/C3.6:2008, Specification for Furnace Brazing**

Provides the minimum fabrication, equipment, material, process procedure, and inspection requirements for the furnace brazing of steels, copper, copper alloys, nickel, heat and corrosion-resistant alloys, and other materials that can be adequately furnace brazed. 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. *26 pages, (2008).*

**Order Code: C3.6** **\$52/\$39**

## **C3.7M/3.7:2005, 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. *26 pages, (2005).*

**Order Code: C3.7** **\$52/\$39**

## **C3.8M/C3.8:2005, Specification for the Ultrasonic Examination of Brazed Joints**

Specifies requirements for the ultrasonic examination of brazed joints. Provides the minimum requirements for equipment, procedures, and the documentation of such tests. *18 pages, 1 nonmandatory annex, 3 figures, (2005).*

**Order Code: C3.8M/C3.8** **\$48/\$36**

## **C3.9M/C3.9:2009, Specification for Resistance Brazing**

Minimum fabrication, equipment, material, and process procedure requirements for resistance brazing of steels, copper and alloys, and 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, (2009).*

**Order Code: C3.9M/C3.9** **\$52/\$39**

## **D10.13/D10.13M:2001, Recommended Practices for the Brazing of Copper Tubing and Fittings for Medical Gas Systems**

Provides the minimum requirements for brazing of copper tubing for medicalgas and vacuum distribution systems in health-care facilities. Contains criteria for preparation and cleanliness of materials and equipment, joint heating and filler metal application techniques, and inspection and testing options. *20 pages, 1 figure, 3 tables, (2001).*

**Order Code: D10.13/D10.13M** **\$56/\$42**

## **Brazing Footprints**

A collection of case studies in high-temperature brazing, compiled from Robert L. Peaslee's "Brazing Q&A" column in the *Welding Journal*. *299 pages, (2003).*

**Order Code: BFP** **\$160**

## **International Brazing & Soldering Conference Proceedings**

2009 proceedings in book form. *425 pages, 74 papers.*

**Order Code: IBSC2009HC** **\$100/\$75**

2009 proceedings on CD. *425 pages, 74 papers, CD-ROM.*

**Order Code: IBSC2009** **\$84/\$63**

2006 proceedings. *414 pages, 68 papers, on CD-ROM.*

**Order Code: IBSC2006** **\$84/\$63**

2003 proceedings. *619 pages, 88 papers, on CD-ROM.*

**Order Code: IBSC2003** **\$84/\$63**

## **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. Includes new chapters on induction brazing and diamond brazing. A must-have for all brazers, brazing engineers, and students. *740 pages, 36 chapters, 3 appendices, 308 figures, 116 reference tables, fifth edition, (2007).*

**Order Code: BRH** **\$136/\$102**

## **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, (1999).*

**Order Code: SHB** **\$152/\$114**

## **Braze Safely** *See page 8.*

## **A5.8/A5.8M:2004, Specification for Filler Metals for Brazing and Braze Welding** *See page 25.*

## **A5.31-92R, Specification for Fluxes for Brazing and Braze Welding** *See page 25.*

## **B2.2-91, Standard for Brazing Procedure and Performance Qualification** *See page 10.*

## **B2.3/B2.3M:2008, Specification for Soldering Procedure and Performance Qualification** *See page 10*

## Pipe and Tubing

### **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 2000).*

**Order Code: D10.4** **\$60/\$45**

### **D10.6/D10.6M:2000, Recommended Practices for Gas Tungsten Arc Welding of Titanium Piping and Tubing**

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, (2000).*

**Order Code: D10.6/D10.6M** **\$52/\$40**

### **D10.7M/D10.7:2008, Guide for the Gas Shielded Arc Welding of Aluminum and Aluminum Alloy Pipe**

A comprehensive guide for the selection of filler metals which 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, (2008).*

**Order Code: D10.7M/D10.7** **\$60/\$45**

### **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, (1996).*

**Order Code: D10.8** **\$48/\$36**

### **D10.10/D10.10M:1999(R2009), Recommended Practices for Local Heating of Welds in Piping and Tubing**

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/D10.10M** **\$88/\$66**

### **D10.11M/D10.11:2007, Guide for Root Pass Welding of Pipe Without Backing**

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, (2007)*

**Order Code: D10.11M/D10.11** **\$56/\$42**

### **D10.12M/D10.12:2000, Guide for Welding Mild Steel Pipe**

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 A 53, A 106, A 135, A 179, A 524, A 587, 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 which may require post weld heat treatment. *48 pages, 19 line drawings and photographs, 10 tables, (2000).*

**Order Code: D10.12M/D10.12** **\$56/\$42**

### **D10.13/D10.13M:2001, Recommended Practices for the Brazing of Copper Tubing and Fittings for Medical Gas Systems** *See page 22.*

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### **The Practical Reference Guide for Welding Inspection Management—Visual Inspection of Pressure Vessels and Pressure Piping**

A planning survey for visual inspectors new to major in-service inspections of pressure vessels or pressure piping. Contains an annex on discontinuities. *32 pages, (1999).*

**Order Code: PRGVT** **\$52/\$39**

### **D18.1/D18.1M:2009, Specification for Welding of Austenitic Stainless Steel Tube and Pipe Systems in Sanitary (Hygienic) Applications** *See page 17.*

### **D18.2:2009, Guide to Weld Discoloration Levels on Inside of Austenitic Stainless Steel Tube** *See page 17.*

### **F4.1:2007, Safe Practices for the Preparation of Containers and Piping for Welding and Cutting** *See page 8.*

*For pipe welding Standard Welding Procedure Specifications (SWPSs), see page 21.*

# 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.*

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	OFW	SMAW	GTAW GMAW PAW	FCAW	SAW	ESW	EGW	BRAZING	THERMAL SPRAYING
Carbon Steel	A5.2/A5.2M	A5.1/A5.1M	A5.18/A5.18M	A5.20/A5.20M	A5.17/A5.17M	A5.25/A5.25M	A5.26/A5.26M	A5.8/A5.8M & A5.31	C2.25/C2.25M
Low-Alloy Steel	A5.2/A5.2M	A5.5/A5.5M	A5.28/A5.28M	A5.29/A5.29M	A5.23/A5.23M	A5.25/A5.25M	A5.26/A5.26M	A5.8/A5.8M & A5.31	C2.25/C2.25M
Stainless Steel		A5.4/A5.4M	A5.9/A5.22	A5.22	A5.9/A5.9M	A5.9/A5.9M	A5.9/A5.9M	A5.8/A5.8M & A5.31	C2.25/C2.25M
Cast Iron	A5.15	A5.15	A5.15	A5.15				A5.8/A5.8M & A5.31	
Nickel Alloys		A5.11/A5.11M	A5.14/A5.14M	A5.34/A5.34M	A5.14/A5.14M	A5.14/A5.14M		A5.8/A5.8M & A5.31	C2.25/C2.25M
Aluminum Alloys		A5.3/A5.3M	A5.10/A5.10M					A5.8/A5.8M & A5.31	C2.25/C2.25M
Copper Alloys		A5.6/A5.6M	A5.7/A5.7M					A5.8/A5.8M & A5.31	C2.25/C2.25M
Titanium Alloys			A5.16/A5.16M					A5.8/A5.8M & A5.31	
Zirconium Alloys			A5.24/A5.24M					A5.8/A5.8M & A5.31	
Magnesium Alloys			A5.19					A5.8/A5.8M & A5.31	
Tungsten Electrodes			A5.12M/A5.12 (ISO 6848)						
Brazing Alloys and Fluxes								A5.8/A5.8M & A5.31	
Surfacing Alloys	A5.21	A5.13	A5.21	A5.21	A5.21				C2.25/C2.25M
Consumable Inserts			A5.30/A5.30M						
Shielding Gases			A5.32/A5.32M	A5.32/A5.32M			A5.32/A5.32M		
Ceramics									C2.25/C2.25M

### A4.2M:2006 (ISO 8249: 2000 MOD), Standard Procedures for Calibrating Magnetic Instruments to Measure the Delta Ferrite Content of Austenitic and Duplex Ferritic-Austenitic Stainless Steel Weld Metal

Calibration procedures include those for the Magnet-Gauge, Ferritescope, and Inspector Gauge, using primary standards. Appendix discusses problems in measuring ferrite content. 56 pages, 17 figures, 14 tables, 7 annexes, (2006).

Order Code: A4.2M \$64/\$48

### A4.3-93 (R2006), Standard Methods for Determination of the Diffusible Hydrogen Content of Martensitic, Bainitic, and Ferritic Steel Weld Metal Produced by Arc Welding

26 pages, (Reaffirmed 2006).

Order Code: A4.3 \$52/\$39

### A4.4M: 2001 (R2006), Standard Procedures for Determination of Moisture Content of Welding Fluxes and Welding Electrode Flux Coverings

32 pages, 4 figures, 3 tables, (Reaffirmed 2006).

Order Code: A4.4M \$56/\$42

### A5.01M/A5.01:2008 (ISO 14344:2002 MOD), Procurement Guidelines for Consumables—Welding and Allied Processes—Flux and Gas Shielded Electrical Welding Processes

Essential to today's purchaser. Describes how to state required filler metal specifications clearly, concisely, and completely,

including heat, lot, testing, and certification requirements. 38 pages, 12 tables (2008).

Order Code: A5.01 \$52/\$39

### 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, (2007).

Order Code: A5.02/A5.02M \$52/\$39

### FMC:2000, Filler Metal Comparison Charts

- Contains:
- 83 national and international suppliers, with their mailing address, telephone, fax, and Web site address.
  - Handy indexes arranged by classification numbers (1,500) and brand names (11,000) for finding information quickly.
  - AWS classifications used as "chapters."
- 494 pages, (2000).

Order Code: FMC \$168/\$126

### IFS:2002, International Index of Welding Filler Metal Classifications

55 pages, 4 figures, 42 tables. (2002.) CD-ROM only.

Order Code: IFS CD \$52/\$39

### User's Guide to Filler Metals

130 pages, (1995).

Order Code: UGFM \$68/\$52

## AWS A5 Filler Metal Specifications

=D1.1 REFERENCED		ORDER CODE	PRICE
A5.1/A5.1M:2004	Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding (54 pages)	A5.1/A5.1M	\$52/\$39
A5.2/A5.2M:2007	Specification for Carbon and Low Alloy Steel Rods for Oxyfuel Gas Welding (26 pages)	A5.2/A5.2M	\$52/\$39
A5.3/A5.3M:1999(R2007)	Specification for Aluminum and Aluminum-Alloy Electrodes for Shielded Metal Arc Welding (28 pages)	A5.3/A5.3M	\$52/\$39
A5.4/A5.4M:2006	Specification for Stainless Steel Electrodes for Shielded Metal Arc Welding (52 pages)	A5.4/A5.4M	\$52/\$39
A5.5/A5.5M:2006	Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding (54 pages)	A5.5/A5.5M	\$52/\$39
A5.6/A5.6M:2008	Specification for Copper and Copper-Alloy Electrodes for Shielded Metal Arc Welding (36 pages)	A5.6/A5.6M	\$52/\$39
A5.7/A5.7M:2007	Specification for Copper and Copper Alloy Bare Welding Rods and Electrodes (30 pages)	A5.7/A5.7M	\$52/\$39
A5.8/A5.8M:2004	Specification for Filler Metals for Brazing and Braze Welding (46 pages)	A5.8/A5.8M	\$52/\$39
A5.9/A5.9M:2006	Specification for Bare Stainless Steel Welding Electrodes and Rods (40 pages)	A5.9/A5.9M	\$52/\$39
A5.10/A5.10M:1999(R2007)	Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods (40 pages)	A5.10/A5.10M	\$52/\$39
A5.11/A5.11M:2005	Specification for Nickel and Nickel-Alloy Welding Electrodes for Shielded Metal Arc Welding (48 pages)	A5.11/A5.11M	\$52/\$39
A5.12M/A5.12:2009 (ISO 6848:2004 MOD)	Specification for Tungsten and Tungsten-Alloy Electrodes for Arc Welding and Cutting (36 pages)	A5.12M/A5.12	\$52/\$39
A5.13:2000	Specification for Surfacing Electrodes for Shielded Metal Arc Welding (36 pages)	A5.13	\$52/\$39
A5.14/A5.14M:2009	Specification for Nickel and Nickel-Alloy Bare Welding Electrodes and Rods (38 pages)	A5.14/A5.14M	\$52/\$39
A5.15-90 (R2006)	Specification for Welding Electrodes and Rods for Cast Iron (32 pages)	A5.15	\$52/\$39
A5.16/A5.16M:2007	Specification for Titanium and Titanium-Alloy Welding Electrodes and Rods (36 pages)	A5.16/A5.16M	\$52/\$39
A5.17/A5.17M-97(R2007)	Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding (40 pages)	A5.17/A5.17M	\$52/\$39
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A5.19-92(R2006)	Specification for Magnesium Alloy Welding Electrodes and Rods (26 pages)	A5.19	\$52/\$39
A5.20/A5.20M:2005	Specification for Carbon Steel Electrodes for Flux Cored Arc Welding (48 pages)	A5.20/A5.20M	\$52/\$39
A5.21:2001	Specification for Bare Electrodes and Rods for Surfacing (40 pages)	A5.21	\$52/\$39
A5.22-95(R2005)	Specification for Stainless Steel Electrodes for Flux Cored Arc Welding and Stainless Steel Flux Cored Rods for Gas Tungsten Arc Welding (Reaffirmed 2005, 44 pages)	A5.22	\$52/\$39
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A5.25/A5.25M-97(R2009)	Specification for Carbon and Low-Alloy Steel Electrodes and Fluxes for Electroslag Welding (Reaffirmed 2009, 34 pages)	A5.25/A5.25M	\$52/\$39
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<b>NEW!</b> A5.29/A5.29M:2010	Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding (60 pages)	A5.29/A5.29M	\$52/\$39
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A5.31-92R	Specification for Fluxes for Brazing and Braze Welding (Reaffirmed 2003, 20 pages)	A5.31	\$52/\$39
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**D8.1M:2007, Specification for Automotive Weld Quality—Resistance Spot Welding of Steel**

Establishes acceptance criteria for resistance spot welds in autos fabricated from steels, including Advanced High Strength Steels. *38 pages, 24 figures, 4 tables, (2007).*

**Order Code: D8.1M** **\$56/\$42**

**D8.6:2005, Specification for Automotive Resistance Spot Welding Electrodes**

Supplement to RWMA Bulletin 16, *Resistance Welding Equipment Standards*. Specifies chemical composition, physical requirements, dimensions, and identification of various shapes and nose configurations of electrodes, electrode caps, and cap-adaptor shanks used in the automotive industry. Annexes describe recommended electrode material for spot welding similar and dissimilar metals, and standard gauges for confirmation of RWMA electrode tapers. *98 pages, 8 annexes, 47 figures, 37 tables, (2006).*

**Order Code: D8.6** **\$80/\$60**

**D8.7M:2005, Recommended Practices for Automotive Weld Quality – Resistance Spot Welding**

Presents recommended practices and criteria for evaluating resistance spot welds typical of automotive sheet steel applications. Contains weld characteristics, metrics, and testing methods useful in evaluating spot welding quality on coated and uncoated automotive sheet steels of all strength levels and compositions. The test methods are designed to assess static and dynamic properties of automotive sheet steel welds. *28 pages, 18 figures, 3 tables, (2005).*

**Order Code: D8.7M** **\$52/\$39**

**D8.8M:2007, 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. *26 pages, 17 figures, (2007).*

**Order Code: D8.8M** **\$52/\$39**

**D8.9M:2002, Recommended Practices for Test Methods for Evaluating the Resistance Spot Welding Behavior of Automotive Sheet Steel Materials**

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, and current level and range assessment. *78 pages, 3 annexes, 30 figures, 12 tables, (2002).*

**Order Code: D8.9M** **\$72/\$54**

**D8.14M:2008, Specification for Automotive Weld Quality—Arc Welding of Aluminum**

Covers the arc welding of automotive and light truck components that are manufactured from aluminum alloys. *32 pages, 18 figures, 3 tables, (2008).*

**Order Code: D8.14M** **\$56/\$42**

**COMING SOON: D10.17M:2010, Guide for Welding Tubular Steel Vehicle Structures**

*See page 23.*

**D14.3/D14.3M:2005, Specification for Welding Earthmoving, Construction, and Agricultural Equipment** *See page 27.***D17.1:2001, Specification for Fusion Welding for Aerospace Applications**

Specifies general welding requirements for welding aircraft and space hardware. Includes fusion welding of aluminum-based, nickel-based, iron-based, cobalt-based, magnesium-based, and titanium-based alloys using arc and high energy beam welding processes. Includes sections on design of welded connections, personnel and procedure qualification, fabrication, inspection, repair of existing structures and nonflight hardware acceptance. Additional requirements cover repair welding of existing hardware. *94 pages, 5 annexes, commentary, 47 figures, 14 tables, (2001).*

**Order Code: D17.1** **\$160/\$120**

**D17.2/D17.2M:2007, Specification for Resistance Welding for Aerospace Applications**

Requirements for aerospace resistance spot and seam welding of aluminum, magnesium, steel, nickel, cobalt, titanium, and their alloys. Intended to replace MIL-W-6858D and AMS-W-6858A. *42 pages, 13 figures, 13 tables (2007).*

**Order Code: D17.2/D17.2M** **\$60/\$45**

**NEW PUBLICATION: D17.3/D17.3M:2010, Specification for Friction Stir Welding of Aluminum Alloys for Aerospace Applications**

Requirements for designing, welding and inspecting aluminum aerospace hardware with the friction stir welding process. Intended to replace MIL-STD-1595A and MIL-STD-2219. *54 pages, 28 figures, 5 tables (2009).*

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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 illustrations, 9 tables, (Reaffirmed 2000).*

**Order Code: D3.5** **\$88/\$66**

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Covers the requirements for the underwater welding of structures or components in wet and dry environments. *144 pages, 6 annexes, (1999).*

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**D3.7:2004, Guide for Aluminum Hull Welding**

Guidance on proven processes, techniques, and procedures for welding aluminum hulls and related ship structures. Applies chiefly to 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 and processes, procedure and performance qualification, welding techniques, and safety. *86 pages, (2004).*

**Order Code: D3.7** **\$76/\$57**



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*See page 6*

## **D14.1/D14.1M:2005, Specification for Welding of Industrial and Mill Cranes and Other Material Handling Equipment**

Specifies requirements for welding of all principal structural weldments and all primary welds used to manufacture cranes for industrial, mill, powerhouse, and nuclear facilities. Also applies to other overhead material-handling machinery and equipment that support and transport loads within the design rating, vertically or horizontally, during normal operations. Additionally, when agreed upon between the owner and manufacturer, it may apply to loading caused by abnormal operations or environmental events, such as seismic loading. All provisions apply equally 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 (2005).*

**Order Code: D14.1/D14.1M** **\$104/\$78**

## **D14.3/D14.3M:2005, Specification for Welding Earthmoving, Construction, and Agricultural Equipment**

### ***For Self-Propelled, On- and Off-Highway Machinery and Agricultural Equipment***

Specifies requirements for structural welds used in the manufacture 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. Emphasizes workmanship and welder qualification. Annexes include a forms collection and "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 Temperature for Prequalified Procedures." *114 pages, 42 figures, 4 forms, 14 tables, 1 mandatory annex, 6 nonmandatory annexes, (2005).*

**Order Code: D14.3/D14.3M** **\$88/\$66**

## **D14.4/D14.4M:2005, Specification for Welded Joints in Machinery and Equipment**

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 welding procedure qualification, weld joint inspection (visual, radiographic, ultrasonic, magnetic particle, liquid penetrant), repair, and post weld 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 prequalified joint details, nondestructive examination techniques, and weld-inspection criteria. *132 pages, 1 mandatory annex, 2 nonmandatory annexes (including a bibliography), 68 figures, 20 tables, (2005).*

**Order Code: D14.4/D14.4M** **\$96/\$72**

## **D14.5/D14.5M:2009, Specification for Welding of Presses and Press Components**

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 (2009).*

**Order Code: D14.5/D14.5M** **\$104/\$78**

## **D14.6/D14.6M:2005, Specification for Welding of Rotating Elements of Equipment**

Specifies requirements for weld joint detail and welding of rotating elements in new equipment of a few inches to over 200 inches (5 m) in diameter. Also applies to modification or repair welding of rotating elements in existing equipment. Equipment types covered by this specification include crushers, fans, gears, crankshafts, flywheels, centrifugal impellers, kilns, air moving devices, and blowers. Includes sections on materials, welding processes, procedure and performance qualification, fabrication requirements, inspection and quality control, modification and repair. Contains a useful updated table on ferrous and nonferrous material groupings for procedure qualification. Not applicable to steam or combustion turbine rotors or blading, camshafts, or power transmission shafts. *222 pages, 42 figures, 18 tables, (2005).*

**Order Code: D14.6/D14.6M** **\$132/\$99**

## **D14.7/D14.7M:2005, Recommended Practices for Surfacing and Reconditioning of Industrial Mill Rolls**

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, (2005).*

**Order Code: D14.7/D14.7M** **\$68/\$52**

## **D14.8M:2009(ISO/TR 17844:2004 IDT), Standard Methods for the Avoidance of Cold Cracks** *See page 19.*

# Railroad

## **D15.1/D15.1M:2007, Railroad Welding Specification for Cars and Locomotives**

Specifies requirements for the manufacture and maintenance of railroad equipment. Includes procedure and performance qualification, including welder operator and tack welder qualification, design of welded joints, inspection, and acceptance criteria. Not applicable to tank car tanks or rails. *224 pages, 7 appendices, 85 figures, 33 tables, (2007).*

**Order Code: D15.1/D15.1M** **\$132/\$99**

## **D15.2:2003, Recommended Practices for the Welding of Rails and Related Rail Components for Use by Rail Vehicles**

Covers the joining, repair, maintenance, and inspection of rail welds, and welding of related components. Processes include thermite welding and flash welding. Contains a special annex on welding austenitic manganese steel. *48 pages, annex, charts and figures, (2003).*

**Order Code: D15.2** **\$60/\$45**

# Resistance Welding

## **RWMA Bulletin #5: Resistance Welding Control Standard**

Discusses weld controls, timing diagrams, input/output connections, SCR sizing, and terminal markings. Explains voltage compensation and other critical performance standards, plus safety, construction, installation, and operation standards. 62 pages, (1994).

**Order Code: RW5** **\$55/\$42**

## **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. (1996).

**Order Code: RW14** **\$38/\$29**

## **RWMA Bulletin #16: Resistance Welding Equipment Standards**

RWMA standards for welding equipment, including electrical, electrode, and fluid-power standards. *In a 1 1/2" three-ring binder*, (1996).

**Order Code: RW16** **\$150/\$115**

## **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, (1997).

**Order Code: RW34** **\$39/\$30**

## **RWMA Resistance Welding Manual, Revised Fourth Edition**

The latest and most complete compilation of basic information on resistance welding available anywhere. 468 pages, 25 chapters, 2 appendices (including an index), 308 figures, 85 tables. 8 3/4" x 11 1/4", (2003).

**Order Code: RWM** **\$125/\$94**

## **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, (1999).

**Order Code: RWVID** **\$415/\$320**

## **The Professional's Advisor on Resistance Welding**

This fits-in-a-briefcase book accompanies the busiest professionals on resistance welding worksites. Addresses welding definitions, resistance welding electrodes, spot and seam welding parameters, multiple thickness combinations, projection and flash welding, defects and their causes in resistance welding, testing, safety/health precautions for

resistance welding, and more. 74 pages, 9 chapters (tabbed for quick access), spiral-bound. 5 1/2" x 8 1/2", (1998).

**Order Code: PARW** **\$76/\$57**

## **A10.1M:2007, Specification for Calibration and Performance Testing of Secondary Current Sensing Coils and Weld Current Monitors used in Single-Phase AC Resistance Welding**

Sets forth accepted methods for testing and describing the performance of Rogowski-type air core current sensing coils (CSC) and weld current monitors (WCM) used in the measurement of single-phase AC resistance welding currents. Definitions of terms relevant to this measurement are included. CSC and system tests and calibration methods are described in detail. Detailed information that shall be made available to the user is prescribed. 54 pages, 15 figures, 5 tables, (2007).

**Order Code: A10.1M** **\$64/\$48**

## **C1.1M/C1.1:2000 (R2006), Recommended Practices for Resistance Welding** See page 18.

## **C1.4M/C1.4:2009, Specification for Resistance Welding of Carbon and Low-Alloy Steels** See page 15.

## **C1.5:2009, Specification for the Qualification of Resistance Welding Technicians** See page 10.

## **C3.9M/C3.9:2009, Specification for Resistance Brazing** See page 22.

## **D8.1M:2007, Specification for Automotive Weld Quality—Resistance Spot Welding of Steel** See page 26.

## **D8.6:2005, Specification for Automotive Resistance Spot Welding Electrodes** See page 26.

## **D8.7M:2005, Recommended Practices for Automotive Weld Quality – Resistance Spot Welding** See page 26.

## **D8.9M:2002, Recommended Practices for Test Methods for Evaluating the Resistance Spot Welding Behavior of Automotive Sheet Steel Materials** See page 26.

## **D17.2/D17.2M:2007, Specification for Resistance Welding for Aerospace Applications** See page 26.

## **The Emmet A. Craig RESISTANCE WELDING SCHOOL is coming to Atlanta!**

This two-day certificate program is a resistance welding school sponsored by the American Welding Society and the Resistance Welding Manufacturing Alliance, and taught by industry specialists with extensive resistance welding experience. It covers the basics of resistance welding, reviews the process, and offers enrichment opportunities. Each participant may learn at their own pace, and discuss specific welding concerns with the instructors.

November 2010 during the FABTECH INT'L and AWS WELDING SHOW in Atlanta.

For more information, visit [www.aws.org/show](http://www.aws.org/show).

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