

The 2007 FABTECH International & AWS Welding Show is packed with technical sessions, conferences, and seminars. If you are interested in the latest happenings in the research world, friction welding, hot wire welding, resistance welding, the D1.1 *Structural Welding Code — Steel*, visual inspection, welding stainless steel, welding procedure specifications, brazing and soldering, and education and training, to name a few, you are in the right place. Take a look at all the offerings below, and sign up today to improve your knowledge and productivity. It is a rare opportunity to have so much variety available in one place. Take advantage of it now.

## **Welding Show 2007** **Professional Program**

*Pick and choose between concurrent sessions for the latest in welding research and commercial developments. Pay by the day or attend the entire three-day program, with special discounts for students and members of AWS, SME, FMA, or NAM. On-site registration will be available at the event meeting room.*

*3-day Complete Professional Program; for Member of AWS/FMA/SME/NAM: \$225; Nonmember: \$360 (Code W84)  
3-day Student Professional Program; for Member of AWS/FMA/SME/NAM: \$75; Nonmember: \$90 (Code W85)  
1-day Professional Program (Monday [W81], Tuesday [W82] or Wednesday [W83] only); for Member of AWS/FMA/SME/NAM: \$150; Nonmember: \$285*

**Monday, November 12**  
**8:00 a.m.–5:00 p.m.**

### **Session 1** **Room S501a** **AUTOMOTIVE WELDING AND JOINING APPLICATIONS**

- A. 8:00 a.m.**      **“Panel Distortion Using Low-Heat MIG Braze Welding Process”**  
by C. Tsai and C. Kim, Ohio State University, Columbus, Ohio, and J. McClure and M. Garnett, DaimlerChrysler Corporation, Auburn Hills, Mich.
- B. 8:30 a.m.**      **“Modeling of High Frequency Induction Heating”**  
by J. Cadman, J. Swenson, Y. Adonyi, and R. Warke, LeTourneau University, Longview, Tex.
- C. 9:00 a.m.**      **“Comparison of Welding Processes and Base Metals for Automotive Applications”**  
by E. Surian, National University of Lomas de Zamora, and National Technological University Buenos Aires, Argentina, H. Svoboda, National University of Buenos Aires, Buenos Aires, Argentina, A. Scotti and V. A. Ferraresi, University of Uberlandia
- D. 9:30 a.m.**      **“New Arc Welding and Brazing Processes and Their Benefits in Auto Body Assembly”**  
by Y. Cho, Hyundai Motor Company, Hwaseong-si, Korea
- E. 10:00 a.m.**      **“Distortion Control of Resistance Spot Welding of Steel Sheets”**  
by K. Hou, L. Liu, and H. Wu, Chang Gung University, Taoyuan, Taiwan

### **Session 2:** **Room S501b, c** **INDUSTRIAL TECHNOLOGY 1: COATINGS TECHNOLOGIES**

- A. 8:00 a.m.**      **“Do All Paths Lead To The Same Coating?”**  
by D. Moody, Plasma Powders & Systems, Inc., The Villages, Fla.
- B. 8:30 a.m.**      **“Cold Spray, A New Solid-State Material Spraying Technology”**  
by J. Villafuerte, Windsor, Canada
- C. 9:00 a.m.**      **“Reliable and Simple Twin Wire Arc Spray Process for On-line Re-Coating from a Tubeweld Seam”**  
by F. Van Rodijnen, Sulzer Metco OSU GmbH, Duisburg, Germany
- D. 9:30 a.m.**      **“Overlay: Welding vs. Thermal Spray”**  
by P. Sahoo, ASM, LLC, Houston, Tex.
- E. 10:00 a.m.**      **“Industrial Application of Magnetic Pulse Welding for Dissimilar and Similar Metals”**  
by M. Blakely, Hirotec America, Auburn Hills, Mich.

### **Session 3:** **Room S501d** **MODELING OF WELDING AND JOINING PROCESSES 1**

- A. 8:00 a.m.**      **“Weld Pool Behavior in Arc Welding at High Current”**  
by P.F. Mendez, Colorado School of Mines, Golden, Colo.
- B. 8:30 a.m.**      **“Predicting Susceptibility of Aluminum Welds to Liquefaction Cracking”**  
by C. Huang, Taiwan Semiconductor Manufacturing Company, Hsin-Chu, Taiwan and G. Cao and S. Kou, University of Wisconsin, Madison, Wis.
- C. 9:00 a.m.**      **“Transformation Shears and Residual Stress in Constrained Welds”**  
by S. Kundu and H.K.D.H. Bhadeshia, University of Cambridge, Cambridge, United Kingdom
- D. 9:30 a.m.**      **“Simulation Based Design of Hybrid Laser Welding Processes”**  
by D.F. Farson, M.H. Cho and Y.C. Lim, The Ohio State University, Columbus, Ohio
- E. 10:00 a.m.**      **“Heat Transfer and Fluid Flow During Keyhole Mode Laser Welding of Tantalum, Ti-6Al-4V, 304 Stainless Steel and Vanadium”**  
by R. Rai, J.W. Elmer, T.A. Palmer and

T. DebRoy, The Pennsylvania State University, University Park, Pa.

**Session 4: Room S501a**  
**RECENT DEVELOPMENT IN CONSUMABLES DESIGN**

- A. 1:00 p.m.** “Effect of Fluoride Additions on the Diffusible Hydrogen Content in Steel Weld Metal”  
by Y. Murakami, JFE Steel Corporation, Golden, Colo, and S. Liu, Colorado School of Mines, Golden, Colo.
- B. 1:30 p.m.** “SMAW Consumable Trials for Strain-Based Design Requirements”  
by M. D. Crawford, G. J. Atkins, D.B. Lillig and J. Sleigh, ExxonMobil Development Company, Houston, Tex.
- C. 2:00 p.m.** “Welding High-Strength Steel with Reduced Heat Input and Improved Productivity”  
by K. Li and Y. Zhang, University of Kentucky, Lexington, Ky., and P. Xu, Link-Belt Construction Equipment Company, Lexington, Ky.
- D. 2:30 p.m.** “Novel Tools for Alloy and Welding Consumable Development”  
by B. T. Alexandrov and J. C. Lippold, Ohio State University, Columbus, Ohio and N. E. Nissley, ExxonMobil, Houston, Tex. and S.J. Norton, BP America, Houston, Tex.
- E. 3:00 p.m.** “Development of a Ni-Cu Consumable for Reduction of Hexavalent-Cr Emissions When Welding Stainless Steels”  
by J. W. Sowards, Boian T. Alexandrov, G. S. Frankel, D. Liang and J. C. Lippold, The Ohio State University, Columbus, Ohio
- F. 3:30 p.m.** “New Method to Design Consumables for Welding High Strength Pipe Steels”  
by J.C. Madeni, D. Tordonato, M. Lopetegui, S. Liu, and P. Mendez, Colorado School of Mines, Golden, Colo.
- G. 4:00 p.m.** “Influence of Ti and C Additions on the Microstructure of Fe-Al-Cr Weld Overlay Coatings”  
by K.D. Adams and J.N. DuPont, Lehigh University, Bethlehem, Pa.
- H. 4:30 p.m.** “Porosity Formation and Mitigation in Underwater Wet Welding”  
by F. Perez and S. Liu, Colorado School of Mines, Golden, Colo.

**Session 5: Room S501b,c**  
**WELDING WELD SENSING & CONTROL**

- A. 1:00 p.m.** “Machine Vision Recognition of Three-Dimensional GTA Weld Pool Surface”  
by H. Song, and Y. Zhang, University of Kentucky, Lexington, Ky.
- B. 1:30 p.m.** “Vision-Based Welding Pool Sensing and Control of Aluminum Alloy Pulsed GMA Welding”  
by Y. Shi, C. Xue, D. Fan and J. Chen, Lanzhou University of Technology, Lanzhou, China

- C. 2:00 p.m.** “Sensor Development for Shipbuilding and Offshore Application”  
by H.S. Moon, Y.B. Kim, J.G. Kim and I.W. Park, Hyundai Heavy Industries Co., Ltd., Ulsan, Korea
- D. 2:30 p.m.** “Automatic Detection and Identification of Contaminants during Welding”  
by G. Schwab, T. Vincent and J. Steele, Colorado School of Mines, Golden, Colo.
- E. 3:00 p.m.** “Analysis of Pulse Arc Characteristics and Application of Arc Sensor in Tandem Pulse Welding Process”  
by S.H. Ko, H.S. Moon, J.C. Kim and Y.B. Kim, Hyundai Heavy Industries Co., Ltd., Ulsan, Korea
- F. 3:30 p.m.** “Direct Welding Arc Observation without Harsh Flicker”  
by B. Hillers and A. Gräser, Institute of Automation/University of Bremen, Bremen, Germany
- G. 4:00 p.m.** “Weld Penetration at High Velocity in GTAW”  
by U. Duman and P.F. Mendez, Colorado School of Mines, Golden, Colo.

**Session 6: Room S501d**  
**FITNESS FOR SERVICE, RESIDUAL STRESSES AND MODERN NDE**

- A. 1:00 p.m.** “FFS Assessment of Crack-Like Flaws in Spherical Vessel”  
by S. Han and K. Park, Korea Gas Safety Corporation, Kong-Do, Korea, and D.S. Kim, Shell Global Solutions, Houston, TX, and C.L. Tsai, The Ohio State University, Columbus, Ohio
- B. 1:30 p.m.** “Weld Distortion Mitigation by Automated Thermal Forming”  
by J.E. Jones, V. Rhoades and P. Tarnow, Native American Technologies Company, Golden, CO, G. Turner, Northrop-Grumman Ship Systems, Pascagoula, MS, and J. McMahon, Bollinger Lockport, LLC, Lockport, La.
- C. 2:00 p.m.** “Residual Stress Evaluation of Thermal Barrier Coating with Cold Sprayed CoNiCrAlY Bond Coating”  
by K. Ogawa, T. Nike, and T. Shoji, Tohoku University, Sendai, Japan
- D. 2:30 p.m.** “In-Plane Shrinkage on Welding Distortion in Thin-Wall Structures”  
by W. Cheng, ExxonMobil Upstream Research Company, and C.L. Tsai, Ohio State University, Columbus, Ohio
- E. 3:00 p.m.** “Laser Ultrasonic NDE of Small Component Braze & Weld Joints”  
by G.A. Knorovsky, Sandia National Laboratories, Albuquerque, NM, and M. Klein and T. Sidekick, Intelligent Optical Systems, Torrance, Calif.



**C. 10:00 a.m.** **“Heat Transfer, Fluid Flow and Solidified Surface Profile of Various Fillet Joint Configurations and Welding Positions during GMAW”**  
by A. Kumar, ExxonMobil Upstream Research Company, Houston, Tex., and T. Debroy, The Pennsylvania State University, University Park, Pa.

**D. 10:30 a.m.** **“Automatic Weld Modeling Based On Finite Element Analysis and High Performance Computing Architecture”**  
by W. Zhang, S. Khurana and W. Gan, Edison Welding Institute Inc., Columbus, Ohio

**E. 11:00 a.m.** **“Bonding Mechanisms for Ultrasonic Consolidation Through Numeric Simulations”**  
by C. Zhang and L. Li, Utah State University, Logan, Utah.

**F. 11:30 a.m.** **“Development of Microalloyed Welding Consumables Using a Computational Thermodynamics Approach”**  
by D.S. Tordonato, J.C. Madeni, S. Liu and P. Mendez, Colorado School of Mines, Golden, Colo.

**Session 10: Room S501a**  
**WELDABILITY OF MATERIALS**

**A. 1:00 p.m.** **“The Influence of Gd and B on the Solidification and Weldability of a Ni-Cr-Mo Alloy”**  
by J.N. DuPont and T.D. Anderson, Lehigh University, Bethlehem, Pa., and C.V. Robino, Sandia National Laboratory, Albuquerque, N.Mex.

**B. 1:30 p.m.** **“Macrosegregation in Dissimilar-Filler Welds”**  
by Y. Yang and S. Kou, University of Wisconsin, Madison, Wis.

**C. 2:00 p.m.** **“Elevated Temperature Cracking in Alloy C22”**  
by M. Gallagher and J.C. Lippold, The Ohio State University, Columbus, Ohio.

**D. 2:30 p.m.** **“Microstructural Insights into Ductility Dip Cracking in Ni Based Filler Metals”**  
by F.F. Noecker II and J.N. DuPont, Lehigh University, Bethlehem, Pa., and G. A. Young Jr., Lockheed Martin, Schenectady, N.Y.

**E. 3:00 p.m.** **“Development and Application of Ternary Solidification Models for Understanding Weldability Phenomena in Engineering Alloys”**  
by J.N. DuPont, Lehigh University, Bethlehem, Pa.

**F. 3:30 p.m.** **“Effect of Microstructure on Reheat Cracking in the HAZ of Type 347 Stainless Steel”**  
by I. Phung-on and J.C. Lippold, The Ohio State University, Columbus, Ohio.

**G. 4:00 p.m.** **“Liquation Tendency of Al and Mg Alloys in Friction-Stir Spot Welding”**  
by Y. Yang and H. Dong, University of Wisconsin, Madison, Wis.

**H. 4:30 p.m.** **“Resistance Sealing and Parting of Stainless Steel Tubing for Nuclear Waste Applications”**  
by L. Zirker, Idaho National Laboratory, Idaho Falls, Idaho and RT. Chiarcos, CenterLine (Windsor) Ltd, Windsor, Canada

**Session 11: Room S501b, c**  
**NAVY-SPONSORED SESSION OF ARC WELDING PROCESSES**

**A. 1:00 p.m.** **“Development of Laser-Arc Hybrid Welding Technology for Ship Construction”**  
by R. P. Martukanitz and S. M. Kelly, Pennsylvania State University, State College, Pa., and T. D. Huang and L. Kvidahl, Northrop Grumman Ship Systems, New Orleans, La., and Pascagoula, Miss., and T. DebRoy, Pennsylvania State University, University Park, Pa.

**B. 1:30 p.m.** **“An Investigation into Cracking on Aluminum Superstructures”**  
by K.N. Tran, W. Goins and E. Murcko, Naval Surface Warfare Center, West Bethesda, Md. and Philadelphia, Pa.

**C. 2:00 p.m.** **“Joining AL6XNTM Superaustenitic Stainless Steel by GMAW-P, PAW, and Hybrid LBW”**  
by P.J. Konkol and M.F. Mruczek, Concurrent Technologies Corp., Pittsburgh, Pa.

**D. 2:30 p.m.** **“Reducing Mn Fumes during FCAW of High-Strength Steels”**  
by S. Ferree and M. Sierdzinski, ESAB Welding and Cutting Products, Hanover, Pa., and M. F. Mruczek and P. J. Konkol, Concurrent Technologies Corp., Pittsburgh, Pa.

**E. 3:00 p.m.** **“Tandem Gas Metal Arc Welding for Out-of-Position High Strength Steel Erection Joints”**  
by N. Porter, Edison Welding Institute, Columbus, Ohio

**F. 3:30 p.m.** **“Cold-Wire-Feed Submerged Arc Welding”**  
by P.J. Konkol and M.F. Mruczek, Concurrent Technologies Corp., Pittsburgh, Pa.

**G. 4:00 p.m.** **“High-Speed Tandem Submerged Arc Welding of Thin Steel Panels for Naval Surface Combatants”**  
by N. Porter, Edison Welding Institute, Columbus, Ohio

**Session 12: Room S501d**  
**INDUSTRIAL TECHNOLOGY 2: MANAGEMENT AND TRAINING**

**A. 1:00 p.m.** **“Total Welding Management”**  
by J. R. Barckhoff, Barckhoff Welding Management Corp., Victoria, Minn.

**B. 1:30 p.m.** **“What Contract Managers Need to Know About Welding Code Requirements in Their Projects”**  
by A. Petroski, Atema, Inc., Chicago, Ill.

**C. 2:00 p.m.**      **“CS WAVE: Virtual Reality for Welders’ Training”**  
by L. Da Dalto, CS Communications & Systems, Toulouse Cedex 6, France; D. Steib and D. Mellet-d’Huart, AFPA, Venissieux Cedex, France

**D. 2:30 p.m.**      **“Cracked Workmanship Sample Blocks Solve Unique Inspection Problems”**  
by L. Zirker and J. Dowallo, Idaho National Laboratory, Idaho Falls, Idaho

**E. 3:00 p.m.**      **“Saving Time and Money with Simulation Resistance Welding Software”**  
by K. Chan, Huys Industries Limited, Weston, Canada

**F. 3:30 p.m.**      **“Sensors in Welding Cells...Ten Iron-Clad Methods for Reducing Downtime, Increasing Productivity and Increasing Profitability”**  
by D. Bird, Balluff, Inc., Florence, Ky.

**G. 4:00 p.m.**      **“Fusion Bonding: Underwater Fastening Without Electricity”**  
by C. Hsu, J. Thomas and B. Rak, Nelson Stud Welding, Inc., Elyria, Ohio

**H. 4:30 p.m.**      **“New Advances in Induction Brazing”**  
by K. Spain, Radyne Corporation, Milwaukee, Wis.

**Wednesday, November 14**  
**8:00 a.m.–5:00 p.m.**

**PLENARY PRESENTATION**

**Room S502b**

**8:00 a.m. – 9:00 a.m.**      **“Welding and Joining in Korea”**  
Dr. Jeong-han Kim, Executive Director, KiTech Incheon Research Center, Korea

**Session 13:**      **Room S501a**  
**ELECTRON BEAM WELDING**

**A. 9:00 a.m.**      **“Coupling CNC Part Motion with High-Speed EB Pulsing Helps Enhance Hole Drilling Capabilities”**  
by G.G. Schubert, J. Dowd and D. Powers, PTR-Precision Technologies, Inc., Enfield, Conn.

**B. 9:30 a.m.**      **“Megahertz Beam Deflection Capability Broadens EB Usage Spectrum”**  
by G.R. LaFlamme, J. Rugh and D. Powers, PTR-Precision Technologies, Inc., Enfield, Conn.

**C. 10:00 a.m.**      **“Vacuum Effects Electron Beam Welding”**  
by P. Burgardt, Los Alamos National Laboratory, Los Alamos, N.M.

**D. 10:30 a.m.**      **“Low-Voltage EB Welders Using Enhanced Diagnostics”**  
by K.W. Lachenberg, Sciaky Incorporated, Chicago, Ill., and T.A. Palmer, A.T. Teruya and J.W. Elmer, Lawrence Livermore National Laboratory, Livermore, Calif.

**E. 11:00 a.m.**      **“Engineering Microstructures and Properties of EB Welds to Join Thick-Section HSLA-100 Steel”**  
by M. Johnson, A. Duffield and P. Burgardt, Los Alamos National Lab, Los Alamos, N.Mex.

**F. 11:30 a.m.**      **“A Comparison of Pulsed, Out of Focus and Circle Deflection Electron Beam Welding of Stainless Steel: Morphology and Microstructure”**  
by P. Hochanadel, D. Kautz and J. Martinez, Los Alamos National Lab, Los Alamos, N.Mex.

**Session 14:**      **Room S501b, c**  
**LASER BEAM WELDING**

**A. 9:00 a.m.**      **“Nonlinear Identification of Diode Laser Welding Process”**  
by X. Na, Y. Zhang and B.L. Walcott, University of Kentucky, Lexington, Ky.

**B. 9:30 a.m.**      **“Laser Beam Welding of Haynes 230”**  
by P. Burgardt and T.J. Lienert, Los Alamos National Lab, Los Alamos, N.Mex.

**C. 10:00 a.m.**      **“Evaluating Keyhole Mode Laser Welds via High Speed Imaging”**  
by J. Norris, C.V. Robino, M. Perricone, K. Fuerschbach and M. Martinez, Sandia National Laboratories, Albuquerque, N.Mex.

**D. 10:30 a.m.**      **“Hybrid Laser Arc Welding of HY-80 Steel”**  
by C. Roepke, Colorado School of Mines, Golden, Colo.

**E. 11:00 a.m.**      **“Time-Resolved Energy Absorption in Laser Spot Welds”**  
by J. Norris, C.V. Robino and M. Perricone, Sandia National Laboratories, Albuquerque, N.Mex.

**F. 11:30 a.m.**      **“Correction and Simulation of Post-Weld-Shift by Laser Hammering for Laser Diode Module Packaging”**  
by K. Hou, L. Liu and Y. Shih, Chang Gung University, Taoyuan, Taiwan

**G. 12:00 p.m.**      **“Distortion of Laser-Welded Thin Planar Microcomponents”**  
by D. MacCallum, G.A. Knorovsky and C.V. Robino, Sandia National Laboratories, Albuquerque, N.M.

**Session 15:**      **Room S501d**  
**NAVY-SPONSORED SESSION ON FRICTION STIR WELDING**

**A. 9:00 a.m.**      **“Friction Stir Welding of Ti-5111”**  
by J. Nguyen, Naval Surface Warfare Center, West Bethesda, Md and L. Salamanca-Riba, University of Maryland, College Park, Md.

**B. 9:30 a.m.**      **“Materials Selection Information on Friction Stir Welds for LHA-6”**  
by C. Davis, M. Posada and J. DeLoach, Naval Surface Warfare Center, West Bethesda, Md.

**C. 10:00 a.m.**      **“Aluminum Friction Stir Welds for Naval Structures”**  
by M. Posada, J. DeLoach and C. Davis, Naval Surface Warfare Center, West Bethesda, Md.

**D. 10:30 a.m.**      **“Nondestructive Inspection Requirements for Friction Stir Welds”**



# CONFERENCES

## Friction Welding Conference

*This conference will be packed with a number of short presentations on various facets of conventional friction welding, linear friction welding, and friction stir welding. Some of the versions of these processes are capable of welding practically any metal, and to do it without creating fumes.*

**Monday, November 12**

**8:50 a.m.–2:35 p.m.**

Member of AWS/FMA/SME/NAM: \$345, Nonmember: \$480  
Registration Code: W70 Room S401a

**8:50 a.m.–9:00 a.m.**

### Welcome and Introduction

Chairman: Bob Irving

Co-Chairman: Suhas Vaze

**9:00 a.m.–9:40 a.m.**

### The Four Friction Welding Processes

Daniel Adams, Vice President, Manufacturing Technology, Inc., South Bend, Ind.; and Tim Haynie, President, Transformation Technologies, Inc., Elkhart, Ind.

This overall presentation will cover the four main friction welding processes—direct-drive friction welding, inertia friction welding, linear friction welding, and friction stir welding. Daniel Adams will discuss the first three processes and Tim Haynie will discuss friction stir welding. The two companies are collaborating on friction stir welding.

**9:40 a.m.–10:20 a.m.**

### Friction Stir Welding at Concurrent Technologies Corporation

Robert W. Semelsberger, Manager, Combat Vehicle Research Program, Concurrent Technologies Corp., Johnstown, Pa.

Robert Semelsberger will discuss activities involving a \$1.3 million contract from the U.S. Army Tank Automotive Research, Development and Engineering Center, involving friction stir welding and the use of aluminum-lithium alloys on future lighter tanks and combat vehicles.

**10:20 a.m.–10:40 a.m.**

### New Applications for Friction Stir Welding

Mike Skinner, Business Development Manager, MTS Systems, Inc., Eden Prairie, Minn.

The aerospace, ground transportation, and marine industries have successfully introduced the friction stir welding (FSW) process into series production on 2-D panel welding applications using the conventional FSW process (fixed pin tools). The focus of this presentation will be on some of the latest production applications utilizing the FSW adjustable and self-reacting process on 3-D complex curvature applications. The following applications will be discussed: fabrication of Volvo XC-90 aluminum rims, Nippon Shario high-speed trains, and the NASA Constellation Program (Space Shuttle replacement).

**10:40 a.m.–11:00 a.m. Refreshment Break**

**11:00 a.m.–11:40 a.m.**

### Friction Welding of Federal Mogul's Monosteel Pistons

Carmo Ribeiro, Global Technology--Steel Pistons, Federal Mogul Corp., Ann Arbor, Mich.

Monosteel Piston innovative technology has been created to address the increasing thermal, mechanical, abrasive, and corrosive challenges placed on heavy-duty diesel engines resulting from emissions regulation. Therefore, an integration of welding

process technology (such as friction welding) and product design enhancements has been combined to market the idea.

**11:40 a.m.–12:30 p.m.**

### Linear Friction Welding for Aerospace Applications

Martin W. Moffat, Vice-President, Sales and Marketing, The Cyril Bath Company, Monroe, N.C.

Linear friction welding (LFW) is a relatively new joining technique finding significant value in aerospace turbine engine components and special airframe structures. The focus and value of this technology is with specialty metals such as titanium and certain nickel alloys. By eliminating machining and material loss during processing, LFW can be a valuable technology for joining fan blades to rotating discs. In addition, the use of titanium structures in new commercial aircraft requires new techniques for building various geometric profiles. LFW is a cost-effective process to create airframe structure components, while minimizing process yield loss.

**12:30 p.m.–1:30 p.m. Lunch**

**1:30 p.m.–1:45 p.m.**

### Applications for Direct-Drive Friction Welding

Adam Jarzebowski, President, NCT Friction Welding, Newington, Conn.

Equipped with nine direct-drive friction welding machines, NCT Friction Welding has compiled considerable experience in many different kinds of applications throughout industry, including the welding of dissimilar metals.

**1:45 p.m.–1:55 p.m.**

### Fusion Bonding: Underwater Fastening without Electricity

Chris Hsu, Director of Engineering, Nelson Stud Welding, Inc., Elyria, Ohio.

In fusion bonding, a lightweight portable air motor device is used to spin a fastener, which is rammed into the workpiece (e.g., hull of a ship) underwater, and the friction heat forms the weld. The process is a safe, fast, and economical method to attach studs, bolts, and other fasteners, in comparison with alternative methods of welding underwater. This presentation outlines a designed experiment to characterize the weld performance of fusion bonding.

**1:55 p.m. – 2:35 p.m.**

### Challenges to Deploying Friction Stir Welding in U.S. Army Weapon Systems

Suhas Vaze, Project Manager, Government Programs Office, Edison Welding Institute, Columbus, Ohio (Co-authors include Brian Thompson, Tim Stotler, Jeff Bernath, and Tim Trapp)

Edison Welding Institute (EWI) has been developing materials joining technologies for the US Army's Future Combat System (FCS) program under the direction of the Army Research Laboratory (ARL). Previous efforts related to the Expeditionary Fighting Vehicle (EFV, formerly AAV) have shown that friction stir welding can be successfully used in joining 2219/6061 to 2519. This presentation will showcase fabrication of complex aluminum and titanium FCS-like structures, which are technology demonstrators and represent full-scale application of friction stir welding and a step toward deployment of FSW for FCS; and application of VT, UT, and RT for inspecting friction stir welded structures.

**2:35 p.m. – Adjournment**

## Hot Wire Welding and Cladding Conference

There is a great deal of revived interest in hot wire welding and cladding. One version or the other is already being used by participants in the oil and gas industry, by the Navy, and by builders of aircraft engines. Presentations on both hot wire GTAW and hot wire plasma processes will be on the agenda. One topic will be the popular use of hot wire gas tungsten arc cladding of tube and piping for the offshore oil and gas industries. In another presentation, hot wire GTA "narrow groove" welding will be shown to have performed well on titanium. Advantages are increased deposition rates and faster travel speeds.

**Tuesday, November 13**

**8:50 a.m.—3:15 p.m.**

Member of AWS/FMA/SME/NAM: \$345, Nonmember: \$480  
Registration Code: W75 Room S401b, c

**8:50 a.m.—9:00 a.m.**

### Welcome and Introduction

Chairman: Bob Irving  
Co-Chairman: Tom Rankin

**9:00 a.m. - 9:40 a.m.**

### Hot Wire Gas Tungsten Arc Welding — An Overview of Process Applications and Capabilities

Jonathan T. Salkin, President, Arc Applications, Inc., York, Pa.

The hot wire gas tungsten arc welding process has found increasing use over a wide range of groove welding, buildup, and cladding operations. Commercially available and specialized hot wire equipment continues to promote application of the process for producing high-quality welds in industries including nuclear, power generation, pressure vessel, and offshore oil. Applications will be presented to show the process capabilities, characteristics, benefits, and limitations. Examples of process control and variations to consider will be discussed based on welding requirements, materials, process variables, weld design, and inspection.

**9:40 a.m.—10:20 a.m.**

### Hot Wire Narrow Groove Welding and Cladding with Nickel-Based Alloys

Jeff M. Kikel, Manager, Weld Engineering, BWX Technologies, Inc., Nuclear Operations Division, Barberton, Ohio

Where a considerable amount of work is directed toward pressure vessel fabrication, hot wire gas tungsten arc welding is used extensively for the narrow groove welding of nickel-based alloys. The hot wire process is also used for buildup, buttering, and cladding of high-strength low-alloy steel.

**10:20 a.m.—10:40 a.m.**

### Hot Wire GTAW—Practical Considerations and Applications

Tom Rankin, Vice President and General Manager, ITW Jetline Engineering, Irvine, Calif.

This talk will cover the early development of the process along with basic theory and important variables. Justification for the use of hot wire process and equipment requirements will be presented. Application examples of successful cladding, joining, and deep groove using stainless and Inconel® will be presented.

**10:40 a.m.—11:00 a.m. Refreshment Break**

**11:00 a.m.—11:40 a.m.**

### New Advances in Hot Wire Cladding Applications

Daniel Allford, President, ARC Specialties, Houston, Tex.

This presentation will be a discussion of recent advances in plasma, variable polarity, as well as new configurations for automatic cladding. New programming techniques for bore cladding will also be discussed.

**11:40 a.m.—12:30 a.m.**

### Wire Surface Condition Impacts Hot Wire Weld Quality

Harry Wehr, Technical Director, Arcos Industries, LLC, Mt. Carmel, Pa.

The surface condition of the welding wire used to make hot wire overlay deposits can impact the quality and integrity of the weld in several ways. A detailed study of 625 welding wire used for hot wire applications has shown that there are three major areas where wire surface condition can impact deposit integrity: surface roughness, residual contaminants, and wire cast. If the weld deposit must be clean and defect-free, each of these areas must be addressed.

**12:30 p.m.—1:30 p.m. Lunch**

*Note: There will be no afternoon refreshment break; however, refreshments will be available in the back of the room.*

**1:30 p.m.—1:45 p.m.**

### Observations from Gus Manz, Inventor of Hot Wire Welding

Gus Manz, President, A. F. Manz Associates, Union, N.J.

Hear from the inventor himself, who was awarded a patent on the hot wire welding process on February 25, 1964.

**1:45 p.m.—1:55 p.m.**

### Observations from Fritz Saenger, Member of the Original Hot Wire Welding Research Team

Fritz Saenger, Consultant, Columbus, Ohio

Listen to the observations of Saenger, who was a member of the original research team for the hot wire welding process.

**1:55 p.m.—2:35 p.m.**

### Welding and Cladding in the Oil and Gas Industry

Don Schwemmer, President, AMET Inc., Rexburg, Idaho; and Galen Wright, President, Arc Innovations Inc., Edmonton, AB, Canada

In response to some of the requirements by the oil and gas industry in Canada, the presenter talks of narrow groove welding 1-1/2 to 2 in. thick 2205 duplex stainless steel, and cladding 625 Inconel® tubulars.

**2:35 p.m.—3:15 p.m.**

### The Benefits of Hot Wire GTAW in the Orbital Welding Industry

Rob Pistor, Managing Director, Liburdi Engineering, Dundas, ON, Canada

In this presentation, several applications will be discussed. Included are narrow groove welding, cladding, nuclear canister closure welding, and 1G vs. 5G parameters.

**3:15 p.m. — Adjournment**

## SEMINARS

**Monday, November 12**

**8:30 a.m.—4:30 p.m.**

Member of AWS/FMA/SME/NAM: \$345, Nonmember: \$480  
Registration Code: W71 Room S401b, c

### ROAD MAP THROUGH THE D1.1/D1.1M:2006 STRUCTURAL WELDING CODE—STEEL



This one-day program provides a comprehensive overview of AWS D1.1:2006, *Structural Welding Code — Steel*. Each code section, including General Requirements, Design of Welded Connections, Prequalification, Qualification, Fabrication, Inspection, Stud Welding, and Strengthening and Repair of Existing Structures, will be summarized with emphasis on their interrelationships and usage. In addition, the role of mandatory and nonmandatory annexes will be reviewed, along with tips on using the code Commentary. This program will benefit managers, engineers, supervisors, inspectors, and other decision-makers who need comprehensive understanding of what is, and what is not, covered by AWS D1.1:2006 to improve their job effectiveness.

Attendees must bring their own copy of D1.1:2006, *Structural Welding Code — Steel*. Order it online at <http://www.awspubs.com> or contact the AWS Store at (888) 935-3464.

### Monday, November 12

8:30 a.m.—4:30 p.m.

Member of AWS/FMA/SME/NAM: \$345, Nonmember: \$480  
Registration Code: W72 Room S401d

#### PRICING AND PROFITABILITY— CONTROLLING THE COSTS OF WELDING

If you're responsible for estimating the cost of welding and determining which process and selection of weld joints is required, then you'll want to attend this course.

This program will provide a value-added experience for estimators, small job shops, and owner operators. Topics to be covered include responsible weld design, weldment cost elements, welding process efficiencies, deposition efficiencies, and Weld Cost Express.

You'll learn how to compare costs associated with use of different weld joint geometries, processes, and filler metal combinations; application of code and standards documents when generating an estimate; how to document welding variables and the costs associated with them; and how economic order lot quantities affect the weld estimate.

### Monday, November 12

8:30 a.m.—4:30 p.m.

Member of AWS/FMA/SME/NAM: \$345, Nonmember: \$480  
Registration Code: W73 Room S402a

#### INSPECTION TO THE 2006 D1.1 STRUCTURAL WELDING CODE — STEEL

This one-day course is devoted to inspection of structural steel welds. Inspector qualifications and the responsibilities of inspectors and contractors will be covered. Inspection procedures and techniques are highlighted as a prelude to a detailed review of the inspection acceptance standards. Test method fundamentals will be covered, where necessary, to understand the more in-depth tables and criteria, along with tips on what to look for in inspection reports.

Supervisors, engineers, inspectors, and auditors will gain a better understanding of weld quality from this presentation.

Attendees must bring their own copy of D1.1:2006, *Structural Welding Code — Steel*. Order it online at <http://www.awspubs.com> or contact the AWS Store at (888) 935-3464.

### Monday, November 12

8:30 a.m.—4:30 p.m.

Member of AWS/FMA/SME/NAM: \$345, Nonmember: \$480  
Registration Code: W74 Room S402b

#### THE WHY AND HOW OF WELDING PROCEDURE SPECIFICATIONS

If you are responsible for planning a welding operation, which of the following items are most critical: base metal, welding

process, filler metal, current and range, voltage and travel speed, joint design tolerances, joint and surface preparation, tack welding, welding position, preheat and interpass temperature, or shielding gas? This course provides the answers.

This program will benefit owners, managers, engineers, and supervisors who must qualify, write, or revise their own welding procedure specifications to satisfy codes and contract documents.

#### Topics covered:

- Proper preparation and qualification of welding procedure specifications
- Selecting and documenting welding variables
- Documenting standard procedure qualification testing for commonly used processes for joining ferrous plate and pipe materials.

#### You can learn how to:

- Specify essential and nonessential variables commonly used in sample AWS, ASME, and API code formats
- Use standards when preparing procedures
- Document welding variables and qualification tests
- Avoid the pitfalls in revising previously qualified procedures.

### Tuesday, November 13

8:30 a.m.—4:30 p.m.

Member of AWS/FMA/SME/NAM: \$345, Nonmember: \$480  
Registration Code: W76 Room S401d

#### VISUAL INSPECTION WOKSHOP

This workshop provides eight hours of expert instruction that includes approximately three hours of instruction in the use of inspection tools, followed by "hands-on" learning for the balance of the workshop. This hands-on training incorporates plastic replicas of welds and also includes a sample practical examination to prepare test candidates for the CWI practical exam.

#### By attending, you can learn:

- How to use weld measuring instruments
- Compliance to a specific code
- Dos and don'ts of documentation
- When a discontinuity is OK
- When a defect is rejectable
- Why visual inspection can be the most effective NDE technique.

### Tuesday and Wednesday, November 13–14

8:30 a.m.—4:30 p.m.

Member of AWS/FMA/SME/NAM: \$550, Nonmember: \$685  
Registration Code: W79 Room S401a

#### WELDING OF STAINLESS STEELS (BASICS AND AVOIDING WELD DEFECTS)

The two-day program focuses on the basic weldability of all types of stainless steels. If you need a comprehensive look at the weldability of stainless steels, particularly the 300 series, this course is for you.

#### Topics covered:

- Why alloys are "stainless"
- Stainless-steel differences
- Selecting a stainless for use
- Mechanical properties
- Properties after welding
- Heat treatment factors
- Selecting filler metals
- Gas vs. flux shielding
- Code requirements

### You'll learn:

- Five stainless-steel types
- The effects of welding on all types of stainless steels
- Why some stainless steels require preheat and others prohibit it
- Answers to your questions about selecting and welding stainless steels.

### Wednesday, November 14

8:30 a.m.–4:30 p.m.

Member of AWS/FMA/SME/NAM: \$345, Nonmember: \$480  
Registration Code: W77 Room S401b, c

#### METALLURGY APPLIED TO EVERYDAY WELDING

Metallurgy of welds in carbon and low alloy-steels doesn't need to be complicated. This short course will help you understand how welding affects the properties of base materials, and how weld defects occur.

Owners, inspectors, engineers, and supervisors who specify welding and need to understand the interaction of base, filler, and welding processes should attend.

### Wednesday, November 14

8:30 AM–4:30 PM

Member of AWS/FMA/SME/NAM: \$345, Nonmember: \$480  
Registration Code: W78

#### INTRODUCTION TO MT, PT, UT AND RT

The morning session (8:30 a.m.–Noon) will introduce the non-destructive methods of magnetic particle (MT) and liquid penetrant (PT) testing, and explain inspection techniques and operating principles for visible and fluorescent MT and PT. The discussion will cover basic principles of magnetic particle testing, with emphasis on the characteristics of longitudinal and circular magnetism, and will summarize the use of MT equipment such as yokes, prods, central conductors, and coils. The liquid penetrant testing discussion will include solvent-removable, water-washable, and post-emulsifiable penetrant testing methods.

The afternoon session (1 p.m.–4:30 p.m.) will introduce and review the fundamentals of ultrasonic and radiographic testing. Specific topics will include the principles and physics of each method, equipment, measurement techniques, and each method's advantages and disadvantages. A special section on weld inspection using ultrasonics with AWS D1.1:2006, Structural Welding Code–Steel will be included.

Who Should Attend: Inspectors, welders, production personnel, and students whose responsibilities include the application of quality in welding, and individuals seeking certification in PT and MT from the American Society for Non-destructive Testing.

## Resistance Welding School

*This two-day resistance welding school is sponsored by the American Welding Society and the Resistance Welding Manufacturing Alliance (RWMA), and conducted by industry specialists with extensive resistance welding experience. The basics of resistance welding and real-life application of the process are covered. Each participant may learn at his/her own pace, and discuss specific welding concerns with the instructors. You are invited to bring your own samples for discussion.*

*Please plan to be present for both days of the school. The program is limited to 100 students. The registration fee includes a copy of the Resistance Welding Manual, Revised Fourth Edition (a \$125 value) and a course binder containing all instructor presentations. Participants will also receive a certificate of completion. In addition, there will be a tabletop reception following the first day of classes, demonstrating the latest resistance*

*welding products offered by RWMA-member companies.*

*The following processes will be covered:*

*Resistance Spot Welding  
Projection Welding  
Cross Wire Resistance Welding  
Upset Resistance Welding  
Flash Butt Welding  
Resistance Butt Welding  
Resistance Seam Welding  
Resistance Mash Seam Welding  
Roll Spot Resistance Welding  
Resistance Welder Electrodes and Tooling  
Resistance Welder Controls  
Resistance Welder Equipment Selection and Setup  
Resistance Welder Power Systems  
Resistance Welder Maintenance and Troubleshooting*

### Tuesday, November 13

7:45 a.m.–5:00 p.m.

5:00 p.m.–6:30 p.m. (Tabletop Exhibit and Reception)  
Room S402b

### Wednesday, November 14

8:00 a.m.–3:30 p.m.

Member AWS/FMA/SME/NAM: \$425, Nonmember: \$660  
Registration Code: W80 Room S402a

### Tuesday, November 13

7:45 a.m.–

8:00 a.m.

#### “Welcome and Introduction to Resistance Welding”

Bill Brafford, Technical Liaison Manager;  
Tuffaloy Products, Inc., Greer, S.C.

8:00 a.m.–

8:30 a.m.

#### “Basics of Resistance Welding Video–Part 1”

8:30 a.m.–

11:00 a.m.

#### “Electrodes and Tooling

Bill Brafford, Technical Liaison Manager,  
Tuffaloy Products, Inc., Greer, S.C.

Focus on the classification, selection and maintenance of electrodes and fixtures as they pertain to numerous applications. By revealing some problem-solving techniques and suggestions, Bill will familiarize you with some powerful problem/evaluation/solution techniques that will keep your production process running longer—and operation more efficient.

11:10 a.m. –

12:15 p.m.

#### “Welding Controls”

Don Sorenson, Director of Engineering,  
ENTRON Controls, Inc., Greer, S.C.

This discussion focuses on the selection, descriptions, and applications of welding timers, contactors, and accessories. Packed with a punch, Don drives home  $H = I^2 RT$  in a way you'll never forget. He shows you how this invaluable formula is used in every resistance welding application—every day—every cycle—all the time!

12:15 p.m. – 1:15 p.m.

Lunch Served

1:15 p.m. –

2:15 p.m.

#### “Welding Controls” (continued...)

Don Sorenson, Director of Engineering,  
ENTRON Controls, Inc., Greer, S.C.

Continuation of discussion on the selection, descriptions, and applications of welding timers, contactors, and accessories.

**2:30 p.m.– “Electrical Power Systems”**  
**5:00 p.m.**

Mark Siehling, Vice-President-Engineering,  
RoMan Engineering Services, Grand Rapids, Mich.

This session reviews the descriptions and maintenance of electrical power components and conductors from the weld control to the electrode. This lively presentation has something for everybody. Utilizing several small demonstrations, Mark helps you understand this very important part of the resistance welding process which will keep you on the edge of your seat!

**5:00 p.m. – 6:30 p.m.**  
**Tabletop Exhibits and Reception**

**Wednesday, November 14**

**8:00 a.m. – “Welding Processes and Machines”**  
**10:00 a.m.**

Tim Foley, Sr. Applications Engineer,  
Automation International, Inc., Danville, Ill.

This session will reinforce the very essence of how the resistance welding process works and how the process relates to each of the four resistance welding processes. This session will be full of application examples from each process and how machinery utilizes the individual components and elements illustrated in the other sessions.

**10:15 a.m.– “Basics of Resistance Welding Video –**  
**10:45 a.m. Part 2**  
**10:45 a.m. – “Troubleshooting and Maintenance”**  
**12:00 p.m.**

Bruce Kelly, President, Kelly Welding  
Solutions, Grand Ledge, Mich.

With over 30 years' experience in the auto industry, specifying, installing and troubleshooting resistance welding systems, Bruce will give you tips on how to find the reasons why welds don't turn out the way you would like. This presentation is filled with real-life examples of problems that baffled maintenance persons.

**12:00 p.m. – 1:15 p.m.**  
**Lunch Served**

**1:15 p.m. – “Initial Machine Set-Up”**  
**3:15 p.m.**

Robert Matteson, Director-Product  
Development, Taylor-Winfield, Inc.,  
Brookfield, Ohio

Robert takes you through the selection and maintenance procedures of proper weld schedules and preventive maintenance programs designed to make your resistance welding operations profitable. Hands-on demonstrations peak this presentation

**3:15 p.m. – 3:30 p.m.**  
**Question and Answer Session**

## Education Sessions

### PLUMMER MEMORIAL EDUCATION LECTURE

**Tuesday, November 13**

**10:00 a.m. – 11:30 a.m.**

Observations from 40 Years of Welding Training  
FREE

The Plummer Memorial Education Lecture Award has been established by the American Welding Society to recognize an outstanding individual who has made significant contributions to

welding education and training, and to recognize Fred L. Plummer's service to the Society as President from 1952 to 1954 and Executive Director from 1957 to 1969. The recipient of this award will deliver a lecture and receive this educational distinction.

This year's presenter is Mr. Andy Godley, Director of Training, Southern Company. Mr. Godley has devoted his entire life to welding education. From teaching and consulting in 1967 to presently working for Southern Company, as well as serving on the National SkillsUSA Welding Technical Committee and the AWS Education Committee, if it's been done in welding education, Andy's done it. Attend and enjoy a straightforward presentation as observed from over 40 years of welding education.

**Tuesday, November 13**

**1:00 p.m. – 4:00 p.m.**

**Registration Code: W86**

**Room S404a**

### NATIONAL SCIENCE FOUNDATION GRANT FOR NATIONAL CENTER OF EXCELLENCE IN WELDING EDUCATION AND TRAINING

The National Center for Welding Education and Training (NCWET) was created in July 2007 to increase the number of science and engineering welding technicians to meet workforce demands. The Center furthers comprehensive reform in welding education by providing technologically current educational materials and professional development opportunities to two-year colleges and other educational institutions.

Presentations in this session will discuss the formation of NCWET, the roles of the Center's partners and the initial plans for operation of the Center. Also to be discussed are industry training needs and expectations as well as the use of Workforce Skills Panels in providing input to Center planning and operations.

#### Session 1:

#### NATIONAL CENTER OF EXCELLENCE IN WELDING EDUCATION AND TRAINING

Ken Smith, Lorain County Community College, and Jim Key,  
AWS Past President

#### Session 2:

#### INDUSTRY INPUT AND EXPECTATIONS

Ernest Levert, Senior Staff Manufacturing Engineer, Lockheed  
Martin

#### Session 3:

#### PRESENTATION ON WORKFORCE SKILLS PANELS

Robert Vidos, Workforce Institute

#### HIGHER EDUCATION WELDING UPDATE

**Wednesday, November 14**

**10:00 a.m. – 2:00 p.m.**

**Registration Code: W86**

Experience the new technology and delivery methods that higher education is using to advance our students to new heights. Attend and find out how these educational institutions are preparing tomorrow's workforce, today!

**10:00 a.m. – 11:00 a.m.**

#### Session 1:

#### Ferris State University

Jeffrey Carney, Assistant Professor

11:15 a.m. – Noon

**Session 2:**

**Pennsylvania College of Technology**

Dave Cotner, Welding Instructor

1:00 p.m. – 2:00 p.m.

**Session 3:**

**Montana Tech of the University of Montana**

Mr. R. Bruce Madigan, PhD, P.E., Associate Professor

## International Brazing & Soldering Symposium

Free expert panel discussions on current and emerging technologies and developments in brazing and soldering.

The 36th Annual Brazing and Soldering Symposium is a must-attend event if you work in the field of brazing and soldering or have an interest in research and applications, as well as networking with industry experts.

**Tuesday, November 13**

**8:30 a.m. – 4:40 p.m.**

**Free • Registration Code: W87**

**Room S403b**

**8:30 a.m.**      **“Case Study: Failure Analysis of Solder Joints on a Connector Assembly**  
by P. Vianco, A. Kilgo, G. Zender, and P. Hlava (Sandia National Laboratories, Albuquerque, N.Mex.)

**8:50 a.m.**      **“Development and Characterization of Amorphous Filler Metals for Joining of Magnesium Alloys”**  
by Silke Muecklich, Gudrun Fritsche, Bernhard Wielage (Institute of Composite Materials and Surface Technology, University of Technology, Chemnitz, Germany)

**9:10 a.m.**      **“Effect of Ce on Property and Microstructure of Sn-Ag-Cu Solder”**  
by Xue Songbai, Wan Jiangsin, Han Zongjie (College of Materials Science and Technology, Nanjing University of Aeronautics, Nanjing, China); Gu Liyong, Gu Wenhua (Changshu Huayin Filler Metals Co., Ltd, Changshu, China)

**9:30 a.m.**      **“Laser Soldering with Lead-Free Solder Alloy for Electronic Packaging”**  
by Yu Shenglin (Nanjing Research Institute of Electronics Technology and College of Materials Science and Technology, Nanjing University of Aeronautics and Astronautics, Nanjing, China); Xue Songbai, Han Zongjie, Wang Jianxin, and Zhang Xin (College of Materials Science and Technology, Nanjing University of Aeronautics and Astronautics, Nanjing, China)

**9:50 a.m.**      **“Solderability Testing of Pb-Free Solder Alloys Versus Sn-37Pb Eutectic Solder for High-Reliability Applications”**  
by Edwin P. Lopez, and Paul Vianco (Sandia National Laboratories, Albuquerque, N.Mex.)

**10:10 a.m.**      **“Advances in Brazing and Soldering with Reactive Multilayer Foil Applications”**

by A. Duckham, Y. Xun, D. Deger, and T. P. Weihs (Reactive Nano Technologies, Inc., Hunt Valley, Md.)

**10:30 a.m.**      **“Joining of High Strength Aluminum-Based Lightweight Materials”**  
by Tin Based MMC Solders by Bernhard Wielage, Ina. Hoyer, and Sebastian Weis (University of Technology, Chemnitz, Germany)

**10:50 a.m.**      **“Ultrasonic Soldering and Brazing”**  
by T. Frech, K. Graf, and D. Hauser (Edison Welding Institute, Columbus, Ohio)

**11:10 a.m.**      **“The Arc Spray Application of Braze Material to Copper/Brass Heat Exchangers”**  
by P. Kutsopias (Praxair Surface Technologies, Grapevine, Tex.)

**11:30 a.m.**      **“Ultrasonic Imaging and Quantitative Analysis of Defects in Ag-Cu-Zr Active Braze Joints”**  
by D. F. Susan, D. R. Garcia, D. B. Appel, S. Younghouse, C. A. Walker, and M. Senkow (Sandia National Laboratories, Albuquerque, N.Mex.)

**11:50 a.m.**      **“Fundamental Studies for Joining Yttria Stabilized Zirconia (YSZ) to Croffer22-APU by Reactive Brazing”**  
by O. A. Quintana and J. E. Indacochea (Department of Civil and Materials Engineering, University of Illinois at Chicago, Chicago, Ill.)

**1:00 p.m.**      **“Corrosion Testing of BNi-3 Brazed Surfaces on Type 347 Stainless Steel for the Space Station Internal Cooling System”**  
by M. J. Pohlman and C. S. Jeffcoate (Honeywell Aerospace, Torrance, Calif.)

**1:20 p.m.**      **“Safety in Cutting, Brazing & Welding with Acetylene & Oxygen”**  
by Jesse A. Grantham (Welding & Joining Management Group, Westminster, Colo.)

**1:40 p.m.**      **“Brazing & Forming Technology Produce Economical High-Temperature Oven Trays”**  
by William J. Powers (HiTech Metal Group, Cleveland, Ohio)

**2:00 p.m.**      **“Fluoride Ion Cleaning as a Pre-Braze Process”**  
by Robert E. Kornfeld (High-Tech Furnace System, Inc., Shelby Township, Mich.)

**2:20 p.m.**      **“Innovations for the Manufacture of Industrial Heat Exchangers”**  
by S. Rangaswamy and D. Fortuna (Sulzer Metco [US] Inc., Troy, Mich.)

**2:40 p.m.**      **“Virtual Reality to Speed Up the Certification Process of Brazing”**  
by C. Choquet and O. LisotteCaron (123certification, Inc., Montreal, QC, Canada)

**3:00 p.m.**      **“Advantages of Flux-Cored Braze Materials for Open Air Brazing”**  
by Creed Darling (Lucas-Milhaupt, Inc., Cudahy, Wis.)

- 3:20 p.m.**      **“Brazing of Copper with Cu-Base Brazing Filler Metals”**  
by E. Vanegas and T. Oyama (WESGO Metals, Hayward, Calif.)
- 3:40 p.m.**      **“Comparison of Metal-Ceramic Brazing Methods”**  
by C. A. Walker and V.C. Hodges (Sandia National Laboratories, Albuquerque, N.Mex.)
- 4:00 p.m.**      **“High-Strength, Ductile Braze Repairs for Stationary Gas Turbine Components”**  
by Warren Miglietti (University of Pretoria and GE Aviation) and Prof. Madeline Du Toit (University of Pretoria)
- 4:20 p.m.**      **“Study on the Wetting of Glass-to-Metal Joining”**  
by C.-P. Chou, K.-H. Tseng, H.-Y. Huang, H.-D. Chen (National Chiao Tung University, Hsinchu, Taiwan; and Metal Industries Research & Development Center, Kaosiung, Taiwan)

Evaluating the Effect that Core Wire Alloy Content by W.T. Gunning IV, B. Navarre and O. Onwuama, The Ohio State University, Columbus, Ohio

Deformation Resistance Welding by D. Failla, C. Huber and E. Galbreath, The Ohio State University, Columbus, Ohio

Effect of Welding Power Supply Type on E9015-B9 SMAW Weld Deposits by W.J. Christy, K. Thomas and W.H. Thompson

Through-Transmission Laser Welding of Polypropylene Clay Nanocomposites by P. Gurnani, D. Han and D. Foster, The Ohio State University, Columbus, Ohio

Ultrasonic Weldability of Advanced Metals by H. Khan, C. Kramer and J. Ocasio, The Ohio State University, Columbus, Ohio

Joining of Aluminum to Ferrous Materials by S.A. Brooke, K.A. Craver and J. Robillard, The Ohio State University, Columbus, Ohio

### **GRADUATE DEGREE STUDENT LEVEL**

Thermit Welding of Heat Exchanger Tubes by J. Nickell, Colorado School of Mines, Golden, Colo.

### **PROFESSIONAL/COMMERCIAL**

Application of Robotic Arc Welding Technology by V. Pintos, and I.V. Crespo, AIMEN, Pontevedra, Spain, and S. Barreras, AISTER, Pontevedra, Spain

In-Process Quality Assurance for Titanium GMAW by D.A. Hartman, M.J. Cola and V.R. Dave, Beyond6-Sigma, Sante Fe, N.Mex.

Characterization of Friction Stir Welded and Superplastically Formed – Friction Stir Welded Titanium 6Al-4V Alloy by D.G. Sanders and P. Edwards, The Boeing Company, Seattle, WA and M. Ramulu, University of Washington, Seattle, WA

## **AWS POSTER SESSION**

**Sunday – Wednesday, November 11–14**

**9:00 a.m. – 5:00 p.m. Sunday, and show hours on Monday – Wednesday FREE**

The AWS Poster Session is an integral part of the Professional Program. Graphic displays of technical achievements are presented for close, first-hand examination in the Poster Session. Posters present welding results and related material, which are best communicated visually, as well as research results that call for close study of photomicrographs, tables, systems architecture, or other illustrative materials. Posters are presented in five categories: Students in a High School Welding Program, Students in a Two-Year College or Certificate Program, Undergraduate Students, Graduate Students, and Professionals. Be sure to stop by and observe this year’s entries.

### **2-YEAR DEGREE OR CERTIFICATE STUDENT LEVEL**

Effects of Different Shielding Gases on Bead Shape by Frank Starnes, Cy-Fair College, Houston, Tex.

### **4-YEAR DEGREE STUDENT LEVEL**

Joining of Aluminum to Non-Ferrous Metals by J. Sammons, K. Izor and M. Carney, The Ohio State University, Columbus, Ohio

Heat-Affected-Zone Cracking Mechanisms by N. Erchak, J. Will and E. Ash, The Ohio State University, Columbus, Ohio

Weldability of Hastelloy X and Haynes 230 by K. McCulloch, J. Seaman and M. Triplett, The Ohio State University, Columbus, Ohio

Empirical Formulae for Extended Stick-out Strip Cladding by R. Neal, A. Guethlein, and M. Myers, The Ohio State University, Columbus, Ohio

HAZ Study of SAW Welds on High-Strength Steel by M. Barrett, B. Hammond, and D. Straub

# AWS COMMITTEES

Open-to-the-public meetings of the volunteer committees and board of the American Welding Society.

| Events   | Date                   | Time                    | Room         |
|--|------------------------|-------------------------|--------------|
| AWS Foundation   | Sunday, November 11    | 7:45 a.m. – noon        | S503a (C)    |
| Districts Council  | Sunday, November 11    | 1:30 p.m.               | S502b (C)    |
| C7B Subcommittee on Electron Beam<br>Welding and Cutting                                   | Sunday, November 11    | 2:00 p.m. – 5:00 p.m.   | N226 (C)     |
| C7 Committee on<br>High Energy Beam Welding and Cutting                                    | Sunday, November 11    | 5:00 p.m. – 6:00 p.m.   | N226 (C)     |
| A5H Subcommittee on Filler Metals<br>and Fluxes for Brazing                                | Monday, November 12    | 8:00 p.m. – noon        | N227a (C)    |
| D17 Committee on Welding in the Aircraft and<br>Aerospace Industries and D17 Subcommittees | Monday, November 12    | 8:00 a.m. – 5:00 p.m.   | N226 (C)     |
| C3 Committee on<br>Brazing and Soldering and C3 Subcommittees                              | Monday, November 12    | 8:00 a.m. – 5:00 p.m.   | N227a (C)    |
| Opening Session & Annual AWS Business Meeting  | Monday, November 12    | 9:00 a.m.               | S404 (C)     |
| C1 Committee on Resistance Welding   | Monday, November 12    | 1:00 p.m. – 4:00 p.m.   | N229 (C)     |
| D14G Subcommittee on Welding<br>of Rotating Equipment                                      | Monday, November 12    | 1:00 p.m. – 5:00 p.m.   | N227b (C)    |
| Educational Scholarship Committee  | Monday, November 12    | 3:00 p.m.               | (H)          |
| D16 Committee on Robotic and Automatic Welding   | Tuesday, November 13   | 7:30 a.m. – 9:00 a.m.   | N227a (C)    |
| D17 Committee on Welding in the Aircraft and<br>Aerospace Industries and D17 Subcommittees | Tuesday, November 13   | 8:00 a.m. – 5:00 p.m.   | N226 (C)     |
| J1 Committee on Resistance Welding Equipment   | Tuesday, November 13   | 9:00 a.m. – 12:00 p.m.  | N229 (C)     |
| PACWI/POCWA  | Tuesday, November 13   | 10:00 a.m.              | S503a (C)    |
| G2C Subcommittee on Nickel Alloys (tentative)  | Tuesday, November 13   | 10:00 a.m. – 11:30 a.m. | N227a (C)    |
| B1 Committee on Methods of Inspection  | Tuesday, November 13   | 1:00 p.m. – 5:00 p.m.   | N227b (C)    |
| D18 Committee on Sanitary Applications   | Tuesday, November 13   | 1:00 p.m. – 5:00 p.m.   | N229 (C)     |
| C3 Committee on Brazing and Soldering<br>and C3 Subcommittees                              | Wednesday, November 14 | 8:00 a.m. – 5:00 p.m.   | N227a (C)    |
| D15C Subcommittee on Track Welding (tentative)   | Wednesday, November 14 | 8:00 a.m. – 5:00 p.m.   | N226 (C)     |
| American Council of the IIW  | Wednesday, November 14 | 10:30 a.m.              | S404b, c (C) |
| Preceded by Thomas Lecture at  | Wednesday, November 14 | 10:00 a.m.              | S404b, c (C) |
| Standards Council  | Wednesday, November 14 |                         | (H)          |
| Professional Development Council   | Wednesday, November 14 |                         | (H)          |
| Communications Council   | Wednesday, November 14 |                         | (H)          |
| Role and Missions Committee  | Wednesday, November 14 |                         | (H)          |
| Board of Directors – Day 1   | Wednesday, November 14 |                         | (H)          |
| 2:00 p.m. – 7:30 p.m. (rolling meeting format)   |                        |                         |              |
| Board of Directors – Day 2   | Thursday, November 15  | 8:00 a.m.               | (H)          |
| C6 Committee on Friction Welding   | Thursday, November 15  | 8:00 a.m. – 12:00 p.m.  | (H)          |

Key:

(H) = Chicago Hilton & Towers

(C) = McCormick Center

# Don't Miss the Action in the North Hall

Looking for that special spark to shift your career and business into overdrive? Well, look no further than the North Hall at the FABTECH International & AWS Welding Show in Chicago. With offerings from interactive welding displays to networking opportunities, the North Hall promises to deliver an exciting and valuable experience. Here are some highlights.

Visit the **booths of the associations** and other groups who support these dynamic and changing industries. These important contacts include the American Welding Society, Society of Manufacturing Engineers, Fabricators and Manufacturers Association, Resistance Welding Manufacturing Alliance, Welding Equipment Manufacturers Committee, and Chinese Mechanical Engineering Society.

How about a chance to **win a free trip to Las Vegas**? To enter the drawing, visit Booth #35070 and simply scan your show badge. Multiple drawings will take place daily and 14 lucky winners will be selected over the course of four days. With an allowance of one entry per day, per person, you will have several chances to win. Representatives from Las Vegas will be at the booth to discuss next year's FABTECH International & AWS Welding show, Oct. 6–8, at the Las Vegas Convention Center.

The North Hall will also feature the **Job Fair & Workforce Development Pavilion**. Whether you are a veteran professional or student just entering the workforce, this comprehensive career expo will give you the opportunity to meet company representatives on the hunt for prospective employees.

In the North Hall, you can also find out solutions to some of industry's biggest problems.

A retiring workforce that makes up about half of today's welding industry, coupled with a lack of young people entering this field, has created an extremely challenging production environment for manufacturers. Consequences of this skills shortage can be severe. At the **Leadership Summit on Addressing the Shortage of Skilled Workers in U.S. Manufacturing**, key representatives from government and the manufacturing sector will reveal strategies and long-term approaches to building a competitive manufacturing workforce. This free event should interest anyone involved with manufacturing operations or production.

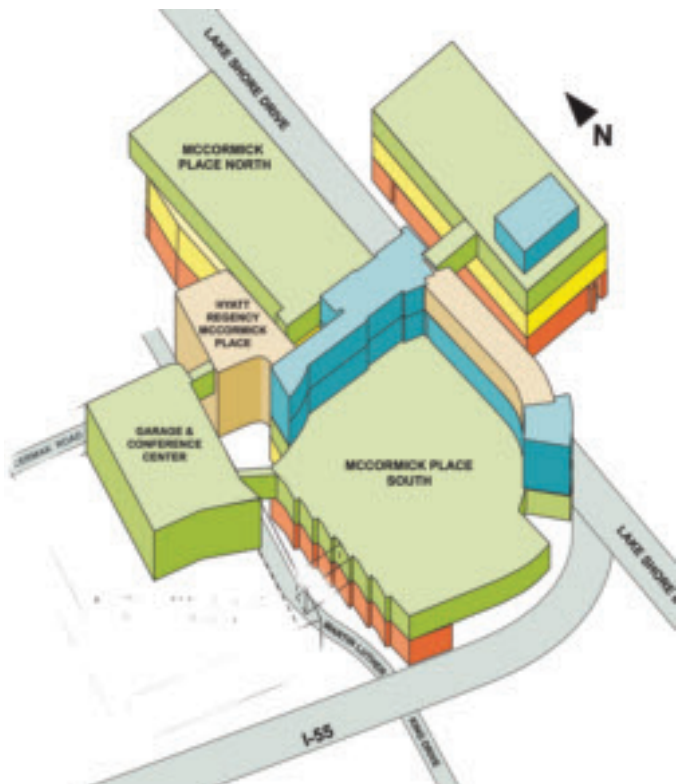
Scared of a little competition? If so, be very afraid of the North Hall. It will house this year's **Professional Welders Competition**. You can participate or watch by the sidelines as these pros fight for a \$2500 grand prize as they undergo a rigorous challenge to make the perfect simulated beam-to-column connection. A \$1000 second prize and a \$500 third prize will also be awarded, and the top 12 competitors will win an AWS duffel bag. Each participant will receive an AWS Professional Welders Competition T-shirt. For more information about the competition, including complete competition rules and safety rules, visit [www.aws.org/competition](http://www.aws.org/competition).

The North Hall is home to the popular Innovation Theater, where new products and solutions come to life. The theater will feature 27 exhibitors who will hold free technology sessions every 30 minutes, each day of the show.

Stop by **ESAB's Solutions Demo Trailer**. There, you will learn from the experts on how to save time and money, get the most out of your welding and cutting equipment, and achieve better end results. Watch practical, hands-on demonstrations from the ESAB crew.

Also rolling into town will be the **Miller Electric Welding and Cutting Road Show™**. This 62-ft-long semi is equipped with the latest welding power sources and systems. Not only will you be able to see Miller's products in action, you will have an opportunity to test them out yourself.

While we have covered a few of the North Hall highlights, we just can't capture all of the opportunities it has to offer. Visit the North Hall this year and take a journey into new territories.



# SHOW REGISTRATION FORM



**November 11 – 14, 2007**  
**McCormick Place,**  
**Chicago, Illinois, USA**  
[www.aws.org/show](http://www.aws.org/show)

### SHOW HOURS

Sun., Nov. 11: 11 am – 4 pm  
 Mon., Nov. 12: 9 am – 5 pm  
 Tues., Nov. 13: 9 am – 5 pm  
 Wed., Nov. 14: 9 am – 3 pm

• Online registrants will receive an immediate e-mail confirmation. Fax/Mail-in registrants will receive a confirmation within 3 business days.  
 • Students: DO NOT use this form to register. Please call (800) 733-4763 for assistance.  
 • No one under 16 years of age admitted.

## 2 EASY WAYS TO REGISTER:

**ONLINE:** [www.aws.org/show](http://www.aws.org/show)  
**FAX:** (708) 344-4444  
**MAIL TO:**  
 FABTECH/AWS Welding Show 2007  
 Compusystems  
 P.O. Box 541  
 Brookfield, IL 60513-0541 USA  
*If you register online or via fax, DO NOT mail this form.  
 Photocopy this form for additional registrants.*

### 1. Check if you are a member of:

A  AWS      B  FMA      C  SME      D  Nonmember      E  NAM

### 2. Check your ONE primary job function:

|  |  |  |
|--|--|--|
| 1 <input type="checkbox"/> Job Shop Owner            | 6 <input type="checkbox"/> Welding Engineer              | 11 <input type="checkbox"/> Purchasing       |
| 2 <input type="checkbox"/> Corporate Executive       | 7 <input type="checkbox"/> Welder, Welding Operator      | 12 <input type="checkbox"/> Sales/Marketing  |
| 3 <input type="checkbox"/> Manufacturing Engineering | 8 <input type="checkbox"/> Welding Distributor           | 13 <input type="checkbox"/> Educator/Student |
| 4 <input type="checkbox"/> Manufacturing Production  | 9 <input type="checkbox"/> Inspector/Tester              | 14 <input type="checkbox"/> Other            |
| 5 <input type="checkbox"/> Welding Management        | 10 <input type="checkbox"/> Product Design & Development |  |

### 3. Check the number of employees at your facility:

|   |                                    |   |
|---|------------------------------------|---|
| 0 <input type="checkbox"/> Less than 20 | 3 <input type="checkbox"/> 100-249 | 6 <input type="checkbox"/> 1,000-2,499    |
| 1 <input type="checkbox"/> 20-49        | 4 <input type="checkbox"/> 250-499 | 7 <input type="checkbox"/> 2,500 and Over |
| 2 <input type="checkbox"/> 50-99        | 5 <input type="checkbox"/> 500-999 |   |

### 4. Indicate the products or services you plan to evaluate at the show:

|  |   |  |
|--|---|--|
| A <input type="checkbox"/> Arc Welding           | M <input type="checkbox"/> Job Shop/Contract Mfg.         | Y <input type="checkbox"/> Saws                                |
| B <input type="checkbox"/> Assembly              | N <input type="checkbox"/> Lasers                         | Z <input type="checkbox"/> Software, Machine Controls          |
| C <input type="checkbox"/> Bending & Forming     | O <input type="checkbox"/> Lubrication                    | AA <input type="checkbox"/> Stamping                           |
| D <input type="checkbox"/> Brazing & Soldering   | P <input type="checkbox"/> Maintenance & Repair           | BB <input type="checkbox"/> Thermal Spraying                   |
| E <input type="checkbox"/> Business Services     | Q <input type="checkbox"/> Material Handling              | CC <input type="checkbox"/> Tooling                            |
| F <input type="checkbox"/> Coil Processing       | R <input type="checkbox"/> Metal Suppliers                | DD <input type="checkbox"/> Tube & Pipe Fabricating or Welding |
| G <input type="checkbox"/> Cutting               | S <input type="checkbox"/> Plate & Structural Fabricating | EE <input type="checkbox"/> Tube & Pipe Producing              |
| H <input type="checkbox"/> Fastening & Joining   | T <input type="checkbox"/> Press Brakes                   | FF <input type="checkbox"/> Welding Consumables                |
| I <input type="checkbox"/> Finishing             | U <input type="checkbox"/> Punching                       | GG <input type="checkbox"/> Other Welding Machines             |
| J <input type="checkbox"/> Gases & Gas Equipment | V <input type="checkbox"/> Resistance Welding             | HH <input type="checkbox"/> Workholding/Positioners            |
| K <input type="checkbox"/> Hydroforming          | W <input type="checkbox"/> Robotics                       |  |
| L <input type="checkbox"/> Inspection & Testing  | X <input type="checkbox"/> Safety & Environmental         |  |

### 5. Indicate your company's total budget for these products or services during the next 12 months:

|   |  |   |
|---|--|---|
| A <input type="checkbox"/> Up to \$20,000     | D <input type="checkbox"/> \$200,001-\$500,000     | G <input type="checkbox"/> Over \$5,000,000 |
| B <input type="checkbox"/> \$20,001-\$50,000  | E <input type="checkbox"/> \$500,001-\$1,000,000   |   |
| C <input type="checkbox"/> \$50,001-\$200,000 | F <input type="checkbox"/> \$1,000,001-\$5,000,000 |   |

### 6. Indicate your purchasing authority:

A  Evaluate/Recommend      B  Specify      C  Approve      D  No Role

### 7. Check the primary industry your company serves:

|  |  |  |
|--|--|--|
| A <input type="checkbox"/> Agriculture/Landscaping Equipment | H <input type="checkbox"/> Construction          | P <input type="checkbox"/> Industrial/Commercial Machinery |
| B <input type="checkbox"/> Aircraft/Aerospace                | I <input type="checkbox"/> HVAC                  | Q <input type="checkbox"/> Mining/Utilities                |
| C <input type="checkbox"/> Automotive                        | J <input type="checkbox"/> Appliance             | R <input type="checkbox"/> Fabricated Metal/Stampings      |
| D <input type="checkbox"/> Rail                              | K <input type="checkbox"/> Consumer Products     | S <input type="checkbox"/> Other Manufacturing             |
| E <input type="checkbox"/> Shipbuilding/Marine               | L <input type="checkbox"/> Electronics/Computers | T <input type="checkbox"/> Education                       |
| F <input type="checkbox"/> Other Transportation              | M <input type="checkbox"/> Furniture             | U <input type="checkbox"/> Non-Manufacturing               |
| G <input type="checkbox"/> Architectural Engineering         | N <input type="checkbox"/> Chemical & Petroleum  |  |
|  | O <input type="checkbox"/> Government/Military   |  |

**CODE: W02**

Mr.  Ms.  Mrs.  Dr.

**PLEASE PRINT - One Form per person**

Name \_\_\_\_\_

Title \_\_\_\_\_

### BUSINESS ADDRESS REQUIRED:

Company \_\_\_\_\_

Address \_\_\_\_\_

Address \_\_\_\_\_

City/State/Zip \_\_\_\_\_

Postal Code/Country \_\_\_\_\_

Phone \_\_\_\_\_ Ext. \_\_\_\_\_

Fax \_\_\_\_\_

E-mail \_\_\_\_\_

Please do not use my e-mail for communications outside of the FABTECH Int'l & AWS Welding Show.

## Free Special Events

### FREE AWS Programs

(W86) AWS Education Program *Tues., Nov. 13-Wed., Nov. 14*  
 (W87) Int'l Brazing & Soldering Symposium *Tues., Nov. 13*  
 (W88) End User Forum *Tues., Nov. 13*  
 (W89) Introduction to Thermal Spray *Tues., Nov. 13*  
 (S1) Leadership Summit *Mon., Nov. 12*  
 (J1) Job Fair *Mon.-Tues., Nov. 13-14*

### FREE Business Seminars

(B1) Selecting Lean Building Blocks *Mon., Nov. 12*  
 (B2) Job Shop Marketing *Tues., Nov. 13*  
 (B3) Workforce Performance Improvement *Wed., Nov. 14*

Some events require separate registration. To compete in the **Professional Welder Competition**, register onsite on Sunday afternoon or during the competition. To reserve for the **Image of Welding Awards Ceremony**, RSVP to [azalkind@aws.org](mailto:azalkind@aws.org) or (800) 443-9353 ext. 416. To register for the **AWS Awards/AWS Foundation Recognition Ceremony & Luncheon**, visit [www.aws.org/show](http://www.aws.org/show). To register for the **Prayer Breakfast**, visit [www.aws.org/show](http://www.aws.org/show) or pay at the door.



Please call (800) 733-4763 if you require special assistance.





# PAID PROGRAMS REGISTRATION FORM

Entry into the exposition is included in paid-event fee.  
**If faxing this form to register, please fax both sides of page.**

Please indicate your name and member number (if any) to receive full pricing benefits.

**CODE: W02**

Name \_\_\_\_\_

Company \_\_\_\_\_

I am a member of:  AWS  FMA  SME  NAM  Nonmember Member Number \_\_\_\_\_

## AWS PROGRAMS

### Conferences

*AWS/FMA/SME/NAM Member \$345; Nonmember \$480\**

#### Friction Welding Conference

(W70) Mon., Nov. 12

#### Hot Wire Welding and Cladding Conference

(W75) Tues., Nov. 13

### RWMA Resistance Welding School

*AWS/FMA/SME/NAM Member \$425; Nonmember \$660\**

(W80) Tues. & Wed., Nov. 13-14

### 2-Day Stainless Steel Seminar

*AWS/FMA/SME/NAM Member \$550; Nonmember \$685\**

#### Welding of Stainless Steels

(W79) Tues. & Wed., Nov. 13-14

### 1-Day Seminars

*AWS/FMA/SME/NAM Member \$345; Nonmember \$480\**

#### Road Map through the D1.1

(W71) Mon., Nov. 12

#### Pricing and Profitability

(W72) Mon., Nov. 12

#### Inspection to the 2006 D1.1

(W73) Mon., Nov. 12

#### Why & How of Welding Procedure Specification

(W74) Mon., Nov. 12

#### Visual Inspection Workshop

(W76) Tues., Nov. 13

#### Metallurgy Applied to Everyday Welding

(W77) Wed., Nov. 14

#### Introduction to MT, PT, UT and RT

(W78) Wed., Nov. 14

### 3-Day Professional Program\*\*\*

*AWS/FMA/SME/NAM Member \$225; Nonmember \$360\**

(W84) Mon.-Wed., Nov. 12-14

### 3-Day Student Professional Program\*\*\*

*AWS/FMA/SME/NAM Member \$75; Nonmember \$90\*\**

(W85) Mon.-Wed., Nov. 12-14

### 1 Day of Professional Program\*\*\*

*AWS/FMA/SME/NAM Member \$150; Nonmember \$285\**

(W81) Mon., Nov. 12

(W82) Tues., Nov. 13

(W83) Wed., Nov. 14

## FABTECH TECHNICAL SESSIONS

1 Session *FMA/AWS/SME/NAM Member \$165; Nonmember \$195*

2 Sessions *FMA/AWS/SME/NAM Member \$295; Nonmember \$345*

3 Sessions *FMA/AWS/SME/NAM Member \$395; Nonmember \$465*

4-5 Sessions *FMA/AWS/SME/NAM Member \$655; Nonmember \$765*

Please select the FABTECH Technical Sessions below you would like to attend. The price for a multiple session purchase is noted at left, and is not combinable with AWS programs above. Do not register for more than one session in each time slot each day as sessions run concurrently. After Oct. 26 and on-site, add \$25 to the purchase price of FABTECH Technical Sessions only.

| Monday, November 12   | Tuesday, November 13   | Wednesday, November 14  |
|---|--|---|
| <b>AM Sessions – 9:30-11:30 am</b><br><input type="checkbox"/> (F10) <input type="checkbox"/> (F11) <input type="checkbox"/> (F12) <input type="checkbox"/> (F13)<br><input type="checkbox"/> (F14) <input type="checkbox"/> (F15) <input type="checkbox"/> (F16) <input type="checkbox"/> (F17)  | <b>AM Sessions – 9:30-11:30 am</b><br><input type="checkbox"/> (F30) <input type="checkbox"/> (F31) <input type="checkbox"/> (F32) <input type="checkbox"/> (F33) <input type="checkbox"/> (F34)<br><input type="checkbox"/> (F35) <input type="checkbox"/> (F36) <input type="checkbox"/> (F37) <input type="checkbox"/> (F38) <input type="checkbox"/> (F39) | <b>AM Sessions – 9:30-11:30 am</b><br><input type="checkbox"/> (F50) <input type="checkbox"/> (F51) <input type="checkbox"/> (F52) <input type="checkbox"/> (F53)<br><input type="checkbox"/> (F54) <input type="checkbox"/> (F55) <input type="checkbox"/> (F56) |
| <b>PM Sessions – 1:30-3:30 pm</b><br><input type="checkbox"/> (F20) <input type="checkbox"/> (F21) <input type="checkbox"/> (F22) <input type="checkbox"/> (F23) <input type="checkbox"/> (F24)<br><input type="checkbox"/> (F25) <input type="checkbox"/> (F26) <input type="checkbox"/> (F27) <input type="checkbox"/> (F28) <input type="checkbox"/> (F29) | <b>PM Sessions – 1:30-3:30 pm</b><br><input type="checkbox"/> (F40) <input type="checkbox"/> (F41) <input type="checkbox"/> (F42) <input type="checkbox"/> (F43) <input type="checkbox"/> (F44)<br><input type="checkbox"/> (F45) <input type="checkbox"/> (F46) <input type="checkbox"/> (F47) <input type="checkbox"/> (F48) <input type="checkbox"/> (F49)  |   |

|  |  |
|--|--|
| <input type="checkbox"/> <b>EXHIBITS ONLY</b><br>Free if pre-registered. (\$50 on-site.) Complete the form on the next page or visit <a href="http://www.aws.org/show">www.aws.org/show</a> and register online. | <b>AWS PROGRAMS SUBTOTAL:</b> \$ _____                                       |
|  | <b>FABTECH SESSIONS SUBTOTAL:</b> \$ _____                                   |
|  | <b>TOTAL FEES</b> \$ _____<br>Full payment must accompany your registration. |

## Payment

Forms received without payment will not be processed. Payment due in U.S. Funds.

Check enclosed (checks payable to SME) Total amount due \$ \_\_\_\_\_

Authorize charge to my credit account (Complete credit card information below)

CHECK ONE:  VISA  American Express  MasterCard  Discover

Name (Please print) \_\_\_\_\_

Signature \_\_\_\_\_

-     -     -      
 Credit Card Number

-    
 Expiration Date

\*Nonmember price for AWS Sessions includes a two-year AWS Individual Membership. Member benefits include a subscription to the *Welding Journal*, a 25% discount on AWS publications, membership in a local section, and more.

\*\*Nonmember Student Professional Program price includes a one-year AWS Student Membership.

\*\*\*Professional Program fee includes one copy of the Professional Program Abstracts. Additional copies are available to the public at the AWS Publications Booth (North Building, #38011) for \$75.

### Cancellation Policy

Cancellations must be made in writing and faxed to Attn: FABTECH International & AWS Welding Show Conference Cancellation at (313)425-3407 no later than October 26, 2007 to receive a full refund. Cancellations received after this date are non-refundable.