



# Welding & Joining Management Group™

FORENSIC EXPERTS • METALS TESTING

## Jesse A. Grantham, Ph.D.

### Publications

#### Articles, Technical Articles

- *Establishing Weld Repair Procedures*, Welding Journal, 2/5/18
- *The Case of the Badly Welded High Pressure Hydraulic Cylinders*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 1/23/17
- *The Case of the Fatally Failed Hinge Pin*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 1/17/17
- *The Case of the One Million Gallon Welding Failure*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 1/30/16
- *The Case of the Exploded Barrel of a Muzzleloader Rifle*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 1/20/16
- *The Case of the Burning Steel Building*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 1/19/16
- *The Case of the Abandoned Pipeline*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 1/18/16
- *The Case of the Exploded Well-Head*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 1/15/16
- *The Case of the Escapee Cows and the Broken Chain Link*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 1/15/16
- *The Case of the Welding Wardrobe Malfunction*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 1/14/16
- *The Case of the Failed Robot Scaffold Welds*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 1/13/16
- *The Case of the Exploded Acetylene Cylinders*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 1/12/16
- *The Case of the Failed Windmill Ladder Rungs*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 1/6/16
- *The Case of the 2,600° F Molten Sparks*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 1/5/16
- *The Case of the Grand Canyon Skywalk Welds*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 12/31/15
- *The Case of the Fatal Refinery Fumes*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 12/28/15
- *The Case of the Injured Pole Dancer*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 12/22/15
- *The Case of the Aluminum Dump Trailer's Failed Repair Welds*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 12/18/15
- *The Case of the Dangerous Electrical Cabinet*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 12/15/15
- *The Case of the Moving Truck's Failed Ramp Welds*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 12/14/15
- *The Case of the Missing Rudder Access Plate on the Ocean-Going Container Vessel*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 12/12/15
- *The Case of the Molecular Sieve Vessel Explosion*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 12/3/15
- *The Case of a Fallen Welder from the Gymnasium Scoreboard*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 12/3/15
- *The Case of the Polypropylene Vane Demister*, *Welding Failures I Have Known*, [failuresihaveknow.com](http://failuresihaveknow.com), 12/1/15



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- *The Case of the Fillet Welds On Greased Structural Steel Surfaces, Welding Failures I Have Known, failuresihaveknow.com, 8/14/15*
- *The Case of the Precast Panel Collapse, Welding Failures I Have Known, failuresihaveknow.com, 2/3/15*
- *The Case of the Pressure Vessel Explosion after Weld Repairs, Welding Failures I Have Known, failuresihaveknow.com, 12/4/14*
- *The Case of the Trailer & Truck Frame Failures, Welding Failures I Have Known, failuresihaveknow.com, 5/22/14*
- *The Case of the Gas Pipe Failures at Mountain Condos, Welding Failures I Have Known, failuresihaveknow.com, 5/15/14*
- *Know the Code! Code Standards, Specifications, Verifications and Compliance, The Welding Leader, TheWeldingLeader.com, 5/12/14*
- *Important Welding Terms & Definitions, The Welding Leader, TheWeldingLeader.com, 5/12/14*
- *Who Cares About Metals, The Welding Leader, TheWeldingLeader.com, 5/12/14*
- *You Don't Have to Be An Engineer to Appreciate This Story, The Welding Leader, TheWeldingLeader.com, 5/12/14*
- *Commercial Welding Requirements, The Welding Leader, TheWeldingLeader.com, 5/12/14*
- *Making the Choice for Compliance, The Welding Leader, TheWeldingLeader.com, 5/12/14*
- *Professional Engineer (PE) versus Certified Welding Inspector (CWI), The Welding Leader, TheWeldingLeader.com, 5/12/14*
- *The History of Welding, The Welding Leader, TheWeldingLeader.com, 4/20/14*
- *Welding Codes, Standards, Specifications – Know the Authority Having Jurisdiction, The Welding Leader, TheWeldingLeader.com, 4/20/14*
- *Welding Design, a Guide for the Forensic Engineer, The Welding Leader, TheWeldingLeader.com, 4/20/14*
- *Educating Welders about Quality Welds, The Welding Leader, TheWeldingLeader.com, 4/20/14*
- *The Value of a Metals/Welding Expert, The Welding Leader, TheWeldingLeader.com, 4/20/14*
- *Using the Correct Materials and Consumables Solves Welding Problems, The Welding Leader, TheWeldingLeader.com, 4/20/14*
- *The Case of the Hardband Tungsten Particles, Welding Failures I Have Known, failuresihaveknow.com, 3/20/14*
- *Experts Never Agree – The Essential Vice, Welding Failures I Have Known, failuresihaveknow.com, 3/20/14*
- *The Case of the ATV A-arm Weld Fracture, Welding Failures I Have Known, failuresihaveknow.com, 3/20/14*
- *The Case of the Nitric Acid Reheater, Welding Failures I Have Known, failuresihaveknow.com, 3/20/14, 1/15/16*
- *The Case of the Defective Welds in Tower Arms, Welding Failures I Have Known, failuresihaveknow.com, 3/17/14*
- *The Case of the Failed Girth Welds, Welding Failures I Have Known, failuresihaveknow.com, 3/11/14*
- *Why Use an Experienced Forensic Welding Expert, The Welding Leader, TheWeldingLeader.com, 6/20/13*
- *Weld Failures (3 Parts), The Welding Leader, TheWeldingLeader.com, 3/21/13*
- *Trends in Nondestructive Testing of Infrastructure, NAFE – InterACTION, Spring/Summer 2010, Vol. 21, No. 1, pages 4-8.*
- *The Value of a Forensic Engineer, NAFE – InterACTION, Fall/Winter, 2009, Vol. 20, No. 2, pages 2-4.*
- *Certified Nondestructive Testing Infrastructure, NAFE – InterACTION, Spring/Summer 2009, Vol. 20, No. 1, pages 5-8.*

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- *No Nonsense with NDT, Nondestructive Testing Methods in Infrastructure*, Welding Update for Infrastructure, a Supplement to Practical Welding Today, May/June 2009, Jesse A. Grantham and Andrew McGoldrick, pages W12-W14.
- *Hazard Communication and Hazard Determination for Brazing and Soldering*, 2009 International Brazing and Soldering Conference, Orlando, Florida, April 2009
- *Metal and Weld Testing, a guide for the Forensic Engineer*, The Welding Leader, TheWeldingLeader.com, 3/16/08
- *History: METALS a guide for the Forensic Engineer*, NAFE – InterACTION, Spring/Summer 2008, pages 2-5
- *Welding Design, a Guide for the Forensic Engineer*, InterACTION, Fall/Winter 2007, pages 5-7
- *The History of Welding*, InterACTION, Spring/Summer 2007, pages 3-5
- *First Line of Defense – Educating Welders to Achieve Quality Welds*, The Fabricator, April 2007, pages 48-49
- *Lines of Defense Against Weld Defects*, Fabricating & Metalworking, May 2006, Phil Walters, page 58
- *Quality as Part of the Contract, Blending NDT into the Welding Business*, Jesse A. Grantham Ph.D., P.E. Contributing Writer, Practical Welding Today, October 24, 2002
- *Principles of Welding Productivity*, Practical Welding Today, March/April 2001.
- *Dealing with Warranty Costs in Welded Products*, Practical Welding Today, July/August 1999.
- *Supporting Welders with Sales, Estimating and Cost Accounting*, Practical Welding Today, March/April 1999.
- *Using the Correct Materials and Consumables Solves Welding Problems*, Practical Welding Today, January/February 1999.
- *Following Welding Codes and Standards in Part Design*, Practical Welding Today, May/June 1999.
- *Expanding Core Competency of Your Managers*, Practical Welding Today, 1999.
- *How to Estimate Direct Arc Welding Costs*, Practical Welding Today, September/October 1998.
- *The Welding Manager's Role in EHS Issues*, Practical Welding Today, July/August 1998.
- *Breaking the Rework Cycle, Identifying Factors for Improvement*, Practical Welding Today, April/May 1998, May/June 1998.
- *Eliminating Rejects and Rework. Reducing Cost by Doing it Right the First Time*, Practical Welding Today, March/April 1998.
- *Training the Welding Manager*, Practical Welding Today, January/February 1998.
- *Renewing Manager Involvement in Welding Leadership, Providing Welders with Authority and Support*, The Fabricator, November 1997.
- *Fitness-for-Service Design for Underwater 'Wet' Welds*, American Welding Society, Welding Journal, January 1994. C.L. Tsai, J. Grantham, Z. Feng, L. Soisson, L. Zirker, J. Papritan.
- *Effect of Surface Tension on SMAW Weld Profile*, American Welding Society, Welding Journal, Research Supplement, December 1992. L. Jiang, J. Grantham, C.L. Tsai, Z. Feng.
- *Development of an Electrode for Improved Fatigue and Impact Strength in Wet Welded Joints*, American Welding Society, Granjon International Award for Student Research, October 15, 1991.
- *Design of Connection Pad for Underwater Welding Tubular Structure Using Finite Element Method*, American Welding Society, Welding Journal, 1991. J. Grantham, C.L. Tsai, Z. Feng, L. Soisson.
- *Wet and Weld*, OSU News in Engineering, featured research report, The Ohio State University, College of Engineering, Columbus, OH, Fall 1989. C.L. Tsai, J. Grantham, L. Zirker, B. Boyce.
- *Welding Predictability*, OSU News in Engineering, The Ohio State University, College of Engineering, Columbus, OH, Summer 1989.
- *Evaluation of Design and Fabrication Methods for Underwater Welding*, The Welding Innovation Quarterly, Volume VI, No. 1, Cleveland, OH, 1989. J. Grantham, C.L. Tsai, Z. Feng.
- *OSU Proficiency in Submerged Arc Welding*, American Welding Society, Welding Journal, page 50, October 1988.



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## **Presentations and Seminars**

- *Volumetric Inspection of Welds*, AWS Colorado Section “Weld the Rockies” Symposium”, Warren Tech, Lakewood, CO, March 8, 2018
- *Forensic Engineer Assessments of Defective Welds in 12 Inch Inside Diameter Inlet Pipes of a 1 Million Gallon Municipal Water Storage Tank*, National Academy of Forensic Engineers Conference, Special Seminar, Atlanta, GA, July 21, 2017.
- *Metallurgy of an Arc Weld in Steel*, AWS Colorado Section “Weld the Rockies” Symposium”, Lincoln Tech, Denver, CO, April, 13, 2017
- *Simple Steps to a Successful Career in Welding*, Pikes Peak Community College, Colorado Springs, CO, October 12, 2016
- *Forensic Engineering Assessments of Defective Welds in Mobile Oilfield Fracking Tanks*”, National Academy of Forensic Engineers Conference, Special Seminar, Dallas, TX, June 24, 2016.
- *“Careers in Welding Failure Assessments”*, AWS Colorado Section “Weld the Rockies” Symposium”, Lincoln College of Technology, Denver, CO, March 13, 2015.
- *“Careers in Nondestructive Testing”*, AWS Colorado Section “Weld the Rockies” Symposium”, Lincoln College of Technology, Denver, CO, March 13, 2015. (Q/A and Commentary on film by ASNT – Choose NDT Nondestructive Testing.)
- *“Why Do You Need an Arc Welding Procedure Specification?”*, Colorado AWS Section 039 Meeting, Denver, CO, January 8, 2015.
- *“Contracts, Billing Getting Paid”*, National Academy of Forensic Engineers Conference, Special Seminar, Newport Beach, CA, January 20, 2013.
- *“Oh, the Places You’ll Go...When You Know Welding”*, Colorado AWS Section 039, Denver, CO, May 10, 2012.
- *Oilfield Welding Codes*, AWS Colorado Section “Weld the Rockies” Symposium”, Lincoln College of Technology, Denver, CO, March 9, 2012.
- *Welding Codes, Standards, Specifications*, Rooney Engineering Lunch and Learn, Englewood, CO, December 13, 2011.
- *Forensic Engineer Guide to Weld Failures*, National Academy of Forensic Engineers Conference, Special Seminar, Las Vegas, NV, July 16, 2011.
- *Welding Metallurgy Forensics*, Solutions Before Solutions After, Golden, CO, June 21, 2011.
- *Guide to Procedure Qualification Record (PQR) & Welder Performance (WQTR)*, “Weld the Rockies” Symposium at Colorado School of Mines, Denver, CO, March 11, 2011.
- *Contracts*, National Academy of Forensic Engineers Conference, Tucson, Arizona, January 16, 2011.
- *The Forensic Engineer Caught “Holding Harmless”*, National Academy of Forensic Engineers Conference, Orlando, Florida, July 17, 2010.
- *Guide to Arc Welding Metallurgy of Carbon Steel Alloys*, “Weld the Rockies” Symposium at Colorado School of Mines, Denver, CO, March 12, 2010.
- *A Guide for Metal Assessments and Spoliation Issues*, Rocky Mountain Property Claims Association, Denver, CO, September 10, 2009.
- *Forensic Engineering Assessments of Ruptured Acetylene Cylinders*, National Academy of Forensic Engineers Conference, St. Louis, Missouri, July 18, 2009.
- *Hazard Communication and Hazard Determination for Brazing and Soldering*, 2009 International Brazing and Soldering Conference, Orlando, Florida, April 2009
- *Storage, Spoliation, Disposal & Evidence Ownership*, National Academy of Forensic Engineers Conference, Special Seminar, Austin, Texas, January 18, 2009.
- *A Guide for the Forensic Engineer*, ASM International Rocky Mountain Chapter, Denver, Colorado, November 6, 2008.
- *Forensic Engineering Use of Medical Expert Information in Welding Fume Assessment*, National Academy of Forensic Engineers Conference, San Juan, Puerto Rico, January 6, 2008.
- *Safety in Cutting, Brazing & Welding with Acetylene & Oxygen*, AWS 36<sup>th</sup> International Brazing & Soldering Symposium, Chicago, IL, November 13, 2007.

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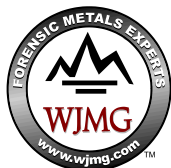
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- *Forensic Engineering Assessments of a Robotic Welding System*, National Academy of Forensic Engineers Conference, Denver, CO, July 28, 2007.
- *Safety in Cutting and Welding with Acetylene and Oxygen*, World Safety Organization, 20<sup>th</sup> Annual Health and Safety Conference and Exposition, Denver, CO, May 14-16, 2007.
- *(Welding) Failures I have Known*, American Welding Society, Colorado Section 039, Denver, CO, May 10, 2007.
- *Forensic Engineering Investigations of Welding Code Compliance*, National Academy of Forensic Engineers, Ponte Vedra, FL, January 7, 2007.
- *Forensic Catastrophic Investigation of Welding, Weld Failures & Inspection. Weld Failure Analysis & Prevention*, American Society of Nondestructive Testing, Denver, Colorado, September 12, 2006.
- *The Correct Processes for Visual Testing*, Welding & Joining Management Institute (Course 18), Westminster, CO, February 3, 2006.
- *Welding Hazards – Gases & Fumes*, World Safety Organization, 18<sup>th</sup> Annual Health and Safety Conference and Exposition, Denver, CO, May 2, 2005.
- *What Every Detailer, Fabricator & Erector Should Know About Welding*, Rocky Mountain Steel Construction Association, Inc., Denver, CO, January 25, 2001.
- *Forensic Engineering Analysis of Welding Process – Refinery Explosion*, National Academy of Forensic Engineers, Los Angeles, CA, January 20, 2001. J. Grantham, T. Beard
- *Business Strategies for Welding*, American Welding Society, Chicago, IL, April 26, 2000.
- *How to Reduce Automated Welding Costs with Real-Time Welding Data*, FABTECH International, Session on Automated Robotic Welding, November 14-18, 1999.
- *Business Strategies for Welding – the Nonwelder's Seminar*, The Fabricators and Manufacturers Association International, San Diego, CA, September 22, 1999.
- *Welding Inspection for Nonwelder's*, Welding & Joining Management Group, Denver, CO, August 1999 and February 2000.
- *How Welds Affect Safety*, World Safety Organization, Thornton, CO, June 25, 1999.
- *Tips for Managing the GMAW Process*, Welding & Joining Management Group, Denver, CO, June 1, 1999.
- *Six Steps to World-Class Welding Management*, Fabricators and Manufacturers Association International, Technical Conference, March 23, 1999, April 14, 1999.
- *NDT Methods for World Class Manufacturing*, American Society of Nondestructive Testing, Pueblo, CO, November 10, 1998.
- *Tips to Showcase your Welding Operations for Customers*, FABTECH International, Conference Papers, Automated Robotic Welding, Session 302, Cleveland, OH, November 3-5, 1998
- *Six Steps to World-Class Welding Management*, Fabricators and Manufacturers Association International, Technical Conference, September 24, 1998, October 5, 1998.
- *How to Evaluate Welding Contractors for Your Project*, National Society of Professional Engineers, Continuing Education Program, Tulsa, OK, July 26, 1998.
- *Welding: Land of Opportunities*, American Welding Society Colorado Section 039, Denver, CO, March 12, 1998.
- *Hot Stage Microscope Evaluations of Molten Slag and Weld Profiles*, Graduate Seminar, Colorado School of Mines, Golden, CO, January 29, 1998.
- *Stainless Steel Pipe – Root Welds*, National Association of Corrosion Engineers, Annual Corrosion Short Course, Colorado Springs, CO, January 28, 1998. J. Grantham, D. Culbert.
- *How to Totally Manage your Welding and Maximize Profit*, Welding & Joining Management Group, West, October 1997.
- *Introduction to Engineering Aspects of Underwater Welding*, Utah State University, College of Engineering, Logan, UT, May 19, 1995.
- *Managers, Engineers and Welders*, Institute of Industrial Engineers, Columbia Basin Section, Richland, WA, March 16, 1995.

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- *Wet Welding Electrodes, Formulas and Rationale*, American Welding Society, 72<sup>nd</sup> Annual Convention, Granjon International Competition, Chicago, IL, 1992.
- *State of the Art Review, Fluxes and Slags in Arc Welding Carbon Steel*, Welding Engineering Design Group Seminar, The Ohio State University, Welding Engineering Department, Columbus Ohio, February 27, 1992.
- *Evaluation of Design and Fabrication Methods for Underwater Welding in an Open Lake Environment*, American Welding Society, 71<sup>st</sup> Annual Convention, Anaheim, CA, April 22-27, 1990. J. Grantham, C.L. Tsai, Z. Feng, F. Vendetta, R. Strohl.
- *Evaluation of Design and Fabrication Methods for Underwater Welding in an Open Lake Environment*, ASME paper number OAME-90-861, Ninth International Conference on Offshore Mechanics and Arctic Engineering, Houston, TX, February 18-23, 1990. J. Grantham, C.L. Tsai, Z. Feng, F. Vendetta, R. Strohl.

## Workshops and Videos

- *Underwater Welding Codes Workshop*, The Ohio Underwater Welding Center, Lake Erie, OH, August 31 – September 1, 1999
- *Workshop on Underwater Cutting, Welding and Inspection Workshop, Underwater Welding Codes*, The Ohio State University, Department of Welding Engineering, Fawcett Center for Tomorrow, Columbus, OH
- *Commentary Video on Nuclear Reactor Underwater Repair at the Susquehanna Plant for Pennsylvania Power and Light*, The Ohio State University, Welding Engineering and Nuclear Engineering, Columbus, OH, Winter 1990. J. Grantham, J. O'Sullivan.
- *The Ohio State University Welding Engineering Recruitment Video*, distributed to area high schools, colleges and universities throughout the United States and abroad, The Ohio State University, Columbus, OH, Summer 1989. Production and coordination, C.L. Tsai, J. Grantham.
- *Underwater Welding Video of Lake Erie Underwater Welding Field Tests*, The Ohio State University, Columbus, OH, Winter 1989. Production and editing, J. Grantham, C.L. Tsai.
- *ASME Section VIII Pressure Vessel Manufacturers and Quality Assurance Personnel*, GESI, Lafayette, LA and Tyler, TX, 1978-1987. Development of course materials and syllabus.
- *Corrosion Problems Concerning Welding*, IEEE, ASME, ASNT, Columbia Basin College, Applied Technology Division.

## Books

- *Contracts, Billing & Getting Paid* ISBN 978-1-934918-05-0, 1-934918-05-9, Denver, Colorado, Scudder Press, December 2012
- *The Forensic Engineer Caught "Holding Harmless"* ISBN 978-1-934918-04-3, 1-934918-04-0, Denver, Colorado, Scudder Press, December 2011
- *Contract: A Guide for the Forensic Expert in the Welding Community*, ISBN 978-1-934918-03-6, 1-934918-03-2, Denver, Colorado, Scudder Press, December 2010
- *Spoilation: A Guide about Evidence for the Welding Community*, ISBN 978-1-934918-02-9, 1-934918-02-4, Denver, Colorado, Scudder Press, December 2009
- *Light*, ISBN 978-1-934918-01-2, Denver, Colorado, Scudder Press, December 2008
- *Choices*, ISBN 978-1-934918-00-5, Denver, Colorado, Scudder Press, December 2007

## Reports and Technical Papers

- *Forensic Engineer Guide to Weld Failures*, National Academy of Forensic Engineers Conference, Special Seminar, Vol. XXVIII No. 2, pages 41-49, December 2011.
- *The Forensic Engineer Caught "Holding Harmless"*, Journal of the National Academy of Forensic Engineers, Vol. XXVIII No. 1, pages 65-79, June 2011
- *Forensic Engineering Assessments of Ruptured Acetylene Cylinders*, Journal of the National Academy of Forensic Engineers, Vol. XXVIII No. 1, pages 1-10, June 2011

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- *Forensic Engineering Assessments of a Robotic Welding System*, Journal of the National Academy of Forensic Engineers, Vol. XXIV No. 2, pages 91-98, December 2007
- *Forensic Engineering Investigations of Welding Code Compliance*, Journal of the National Academy of Forensic Engineers, Vol XXIV No. 1, pages 121-130, June, 2007.
- *Forensic Engineering Analysis of Welding Process – Refinery Explosion*, Journal of the National Academy of Forensic Engineers, Volume XVIII, No. 1, page 25, June 2001.
- *Interfacial Tension Effects on Weld Bead Profiles*, American Welding Society, International Welding and Fabricating Exposition and Annual Convention, Professional Program, Technical Sessions, Session 17A, Process Physics II, Chicago, IL, April 27, 1996.
- *Strain Gauge Pressure Transducer Utilization*, A study for measuring internal rod pressure to 1000 psig in nuclear fuel rods. Proprietary for Siemens Power Corporation – Nuclear Division, 1996.
- *Alternative Manufacturing Process Concepts* for fuel rod welding, the effects of end cap multiple welds on Zircaloy-2 and Zircaloy-4 nuclear fuel rods. Proprietary for Siemens Power Corporation – Nuclear Division, 1995.
- *Qualification of Strain Gauge Pressure Transducer for Measuring Internal Rod Pressure in Nuclear Fuel Rods*, Siemens Power Corporation – Nuclear Division, EMF-PTA-574, November 11, 1994.
- *An Investigation of Alternative Manufacturing Processes used for Fuel Rod Welding*, Siemens Power Corporation – Nuclear Division, EMF-94-127 (P), Richland, WA, June 1994.
- *Development of Flux-Coated Electrodes for Underwater 'Wet' Welding*, ISOPE, Second International Offshore and Polar Engineering Conference, San Francisco, CA, June 14-19, 1992. C.L. Tsai, L. Jiang, J. Grantham, Z. Feng, W. Svekric, R. Holdren, L. Soisson.
- *Development of an Electrode for Improved Fatigue and Impact Strength in Wet Welded Joints*, American Welding Society, Convention and Exposition, International Award for Student Research, Chicago, IL, March 26, 1992.
- *Fundamental Study of Interfacial Tension Effects on Weld Bead Profile in the Shielding Metal Arc Welding Process*, publishing of dissertation, in-process, for the American Welding Society, Welding Journal. January 14, 1992.
- *Fitness-for-Service Design for Underwater 'Wet' Welds*, ASME Volume III-A, Materials Engineering, pages 197-204. Tenth International Conference on Offshore Mechanics and Artic Engineering, Stavanger, Norway, June 23-28, 1991. C.L. Tsai, L. Zirker, Z. Feng, J. Grantham, L. Soisson, J. Papritan.
- *Development of an Underwater Shielded Metal Arc Welding Electrode with Improved Fatigue Strength in Wet Welded Joints*, Submitted to Ohio's Thomas A. Edison Program, The Ohio State University, Department of Welding Engineering, State of Ohio, Columbus, OH, June 1991. C.L. Tsai, J. Grantham, L. Jiang, Z. Feng.
- *A Proposal for the Comparison of Practical Mechanisms for Laser Beam Welding in Pressurized Argon Atmospheres*, The Ohio State University, Welding Engineering 894A, Laser Material Processing Colloquium, Columbus OH, May 24, 1991.
- *Wet Welding Electrodes, Formulas and Rationale*, The Ohio State University, Department of Welding Engineering, State of Ohio, Department of Development, Thomas A. Edison program, Columbus, OH, 1991.
- *Design Guide for Wet Welding the Tubular Connection Pad*, The Ohio State University Development Foundation, Sea Grant Program, Center for Lake Erie Area Research, OSU Welding Engineering Department, Columbus, OH, September 1990. J. Grantham, C.L. Tsai
- *Development of an Improved Underwater Shielded Metal Arc Welding Electrode with Improved Fatigue Characteristics*, State of Ohio, Department of Development, Thomas A. Edison Program, Department of Welding Engineering, OHSU-RS-139, Columbus, OH, June 1990. J. Grantham, C.L. Tsai, L. Jiang, Z. Feng, L. Soisson.
- *Evaluation of Design and Fabrication Methods for Underwater Welding in an Open Lake Environment*, American Welding Society, 71<sup>st</sup> Annual Convention, Anaheim, CA, April 22-27, 1990. J. Grantham, C.L. Tsai, Z. Feng, F. Vendetta, R. Strohl.

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- *Evaluation of Design and Fabrication Methods for Underwater Welding in an Open Lake Environment*, ASME paper number OAME-90-861, Ninth International Conference on Offshore Mechanics and Arctic Engineering, Houston, TX, February 18-23, 1990. J. Grantham, C.L. Tsai, Z. Feng, F. Vendetta, R. Strohl.
- *Connection Pad Design for Underwater Tubular Structures*, The Ohio State University, Department of Welding Engineering, OHSU-TD-020, Columbus, OH, January 1990. C.L. Tsai, J. Grantham, Z. Feng, L. Soisson.
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## Patents

- Underwater SMAW electrode, formula G4, Welding Consultants Inc. and OSU Engineering Experiment Station, in conjunction with the Thomas A. Edison Program, Ohio Department of Development, 1991. C.L. Tsai, J. Grantham, Z. Feng, L. Soisson, L. Jiang.

## Research Contracts

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- *Development of Designs for Mechanized Underwater 'Wet' Welding Processes*, Sea Grant, NOAA, The Ohio State University, Columbus, OH, April 16, 1994. C.L. Tsai, J. Grantham.
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- *Design Guide, Wet Welding, Flexible Tubular Connection Pad*, R/OE-8PD, The Ohio State University Development Foundation and Center for Lake Erie Research (CLEAR), Spring, 1990. (\$5000)
- *Development of an Underwater Shielded Metal Arc Welding Electrode with Improved Fatigue Strength in Wet Welded Joints*, State of Ohio, Thomas A. Edison Program, Ohio Department of Development and Welding Consultants Inc. 1989-1990. (\$50,000 + \$50,000 in-kind)
- *Evaluation of Design and Fabrication Methods for Underwater Welding in an Open-Lake Environment*, a program of research and improvements in underwater fabrication technology R/OE-5. Sponsored by Sea Grant, NOAA, Arcair Company, September 1987-August, 1989. (\$50,000)