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June 11, 2004

Acceleron, Inc.
21 Lordship Road
East Granby, Connecticut 06026

Attention: Rory Montano

RE: Out of Vacuum Electron Beam Welds

Dear Mr. Montano,

On June 7, 2004 I inspected four welds plus photographs of additional welds made by your firm. The welds were made on 316 stainless steel, using 150 kV. Other parameters included:

1. High vacuum, 9 mA, 30 inches per minute.

2. High vacuum, 6 inches per minute.

3. Out of vacuum using plasma arc window, 6 inches per minute, made on March 25, 2004.

4. Similar to sample 3 but with reconfiguration of the plasma arc window, made April 28, 2004.

In my opinion, weld sample number 3 has the best appearance both on the top surface and in transverse cross-section. Welds 1 and 2 have the characteristic "nail head" shape of electron beam welds made in high vacuum, while weld 1 has the surface hump characteristic of very high speed welds. Weld 4 has part of this surface hump and a partial nail head cross-section. Weld 3 has an excellent top surface contour and a transverse shape similar to a very deeply penetrated gas tungsten arc weld. As such, weld 3 has the best surface uniformity and would be expected to have the best solidification structure.

Although my experience with evaluation of out of vacuum electron beam welds is nearly 30 years old, the bead shape represented by weld 3 is a significant improvement over the welds which were achievable in the past. I have also been informed that the bead shape is consistent at standoff distances of a few millimeters to 50 millimeters. If this is correct, this new plasma arc window represents a significant advance in out of vacuum electron beam welding technology.

Sincerely yours,

Tom Eagar

Thomas W. Eagar

jh

THOMAS W. EAGAR

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Cambridge, MA 02139 Belmont, MA 02478
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PROFESSIONAL INTERESTS:

Materials processing and manufacturing; special interests in welding and joining of metals, ceramics and electronic materials; deformation processing; alternate manufacturing processes; manufacturing management; materials systems analysis; selection of materials and failure analysis.

EDUCATION:

S.B. Metallurgy and Materials Science,
Massachusetts Institute of Technology, 1972
Sc.D. Metallurgy, Massachusetts Institute of Technology, 1975
--- Business Administration, Lehigh University, 1975-76
--- Program for Senior Executives, Sloan School of Management,
Massachusetts Institute of Technology, 1988

EMPLOYMENT:

Bethlehem Steel Corporation
Homer Research Laboratories
Research Engineer, 1974-1976
Massachusetts Institute of Technology
Department of Materials Science and Engineering
Assistant Professor of Materials Engineering, 1976-1980
Associate Professor of Materials Engineering, 1980-1987

US Office of Naval Research - Tokyo
Liaison Scientist, 1984-1985
Massachusetts Institute of Technology
Professor of Materials Engineering, 1987-
Professor of Engineering Systems, 2000-
Leaders for Manufacturing Professor, 1988-1993
Department Head, Materials Science and Engineering (Acting), March 1989
- August, 1989
Richard P. Simmons Professor of Materials Engineering, 1990-1993
Director, Materials Processing Center, 1991-1993
POSCO Professor of Materials Engineering, 1993-1999
Co-Director, Leaders for Manufacturing Program, 1993-1995
Department Head, Materials Science & Engineering, 1995-2000
Thomas Lord Professor of Materials Engineering and Engineering Systems, 2001-

HONORS AND AWARDS:

International Junior Civitan of the Year, 1968
Dennison K. Bullens Scholarship, 1969-1971
Foundry Educational Foundation Scholarship, 1970-1971
Phi Lambda Upsilon, Member 1971
Tau Beta Pi, Member, 1971; Distinguished Service Award, 1980
National Science Foundation Graduate Fellowship, 1972-1974
Metallurgy and Materials Prize, Boston Section AIME, 1972
Adams Memorial Membership Award, American Welding Society, 1979-1983
Charles H. Jennings Memorial Medal, American Welding Society, 1983, 1991
Champion H. Mathewson Gold Medal, TMS-AIME, 1987
Henry Krumb Lecturer, TMS/SME-AIME, 1987
National Science Foundation Creativity Extension Award, 1988-1990
ASM International, Fellow, 1989
Houdremont Lecturer, International Institute of Welding, 1990
Richard P. Simmons Professorship, 1990-1993
Warren F. Savage Award, American Welding Society, 1990, 1996
William Spraragen Award, American Welding Society, 1990, 1993
Comfort A. Adams Lecturer, American Welding Society, 1992
Henry Marion Howe Medal, ASM International, 1992
William Irrgang Award, American Welding Society, 1993
Leaders for Manufacturing Professorship, 1988-1993
Richard P. Simmons Professorship, 1990-1993
POSCO Professorship, 1993-1999
Thomas Lord Professorship, 2001-
American Welding Society, Fellow, 1994, Honorary Member, 1999
Nelson W. Taylor Lecturer, Pennsylvania State University, 1995
National Academy of Engineering, 1997

General Electric Distinguished Lecture, Rensselaer Polytechnic Institute, 2001
Silver Quill Award, American Welding Society, 2002
American Association for the Advancement of Science, Fellow, 2003

ACTIVITIES:

National Academy of Engineering, Member
American Welding Society, Fellow and Honorary Member; *Welding Journal*, Principal Reviewer;
Awards Committee, Professional Certification Committee
American Council of International Institute of Welding, Member
ASM International, Fellow
American Institute of Mining, Metallurgical and Petroleum Engineers,
Member, Professional Registration Committee
Tau Beta Pi, Member, New England District Director (1977-1980), MIT
Chapter Advisor, 1977- 2001, Chief Advisor, 2002 -
American Academy for the Advancement of Science, Fellow
Society of Automotive Engineers, Member
American Ceramic Society, Member
Society of Manufacturing Engineers, Member
American Society of Mechanical Engineers, Member
American Society for Testing and Materials, Member
Materials Research Society, Member
Registered Professional Engineer, Massachusetts Certificate Number 29726
Navy Joining Center, Technical Advisory Board
Editorial Board, *Science and Technology of Welding and Joining*
Automatic Welding Journal (Ukraine), Member International Editorial Council, 2002

PUBLIC SERVICE

National Research Council:
Board on Manufacturing and Engineering Design, 2003-2005
Committee on New Directions in Manufacturing, 2002-2004
Committee on Future Needs in Deep Submergence Science, 2003-2004
National Materials Advisory Board, 1998-2002
Panel on Structural and Multifunctional Materials, 2000-2001
Panel for Materials Science and Engineering, member, 1991-1996
Department of Energy Panel on Integrated Manufacturing, member, 1996
Unit Manufacturing Process Research Committee, member, 1991-1995
Department of Energy Panel on Integrated Manufacturing, member, 1994
SR-1256 Project Advisory Committee for Investigation of Steels for Improved Weldability in Ship Construction, member, 1978-1983

U.S. Congress:
Manufacturing R&D: How Can the Federal Government Help? - Testimony before the Subcommittee on Environment, Technology and Standards, Committee on Science, U.S. House of Representatives, 108th Congress June 5, 2003

U.S. Department of Energy:
Idaho National Engineering Laboratory, Review of Materials, 1999
Oak Ridge National Laboratory, Review Panel, Division of Metals, Ceramics and Engineering, 2002

State of Ohio:
Ohio State Board of Regents, Review Panel, Capital Equipment Funding, 1999

State of Massachusetts:
Technical Advisor, State Plumbing Board

TEACHING EXPERIENCE:

Undergraduate:	Graduate:	Professional:
Thermodynamics	Kinetics	Materials Selection
Chemical Metallurgy	Deformation Processing	Welding and Joining Processes
Physical Metallurgy	Welding and Joining Processes	Failure Analysis
Materials Processing	Materials Selection	Non-destructive Testing
Solid State Chemistry	Product Design	
Physical Chemistry	Colossal Failures	
Essentials of Engineering		