Companion Guide to the ASME Boiler & Pressure Vessel Code

Criteria and Commentary on Select Aspects of the Boiler & Pressure Vessel and Piping Codes
Third Edition

VOLUME 2

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DEDICATION TO THE FIRST EDITION

THIS MONUMENTAL EFFORT IS DEDICATED TO THE ASME PRESSURE VESSELS AND PIPING DIVISION AND TO TWO SIGNIFICANT CONTRIBUTORS TO THE DEVELOPMENT OF THE DESIGN-BY-ANALYSIS CON-STRUCTION RULES IN THE MODERN ASME CODE.

This two-volume compendium dedication is not the first recognition of the achievements of Bernard F. Langer and William E. Cooper. The Bernard F. Langer Nuclear Codes and Standards Award, established in 1977, provides a posthumous and lasting tribute to one of these contributors, an intellectual giant who was instrumental in providing the leadership and statesmanship that was essential to the creation of construction rules for nuclear vessels and related equipment. William E. Cooper, the first recipient of the Bernard F. Langer Nuclear Codes and Standards Award, is another intellectual giant instrumental in the creation of the modern ASME Code. In addition, Dr. Cooper acted in a number of ASME Codes and Standards leadership positions. It was my pleasure to join many of my colleagues in April 2001 for the presentation to Dr. Cooper of the ASME President's Award from the 120th President of ASME International, William A. Weiblen. That most prestigious award recognized a lifetime of achievement in ASME and, in particular, in ASME Code activities.

Bernie Langer and Bill Cooper were essential in both the development of the modern ASME Code and in the creation of the forums for technical information exchange that support the Code rules. The publication of these two volumes by ASME International is a legacy of that duality. These volumes continue a long and productive relationship between the development of the modern ASME Code and the technical exchanges on pressure vessel and piping technology sponsored by the ASME Pressure Vessels and Piping Technical Division. This process of technical information exchange, through conference paper and panel presentations, and through refereed paper publication, is an essential step in the reduction to standard practice, standard practice that is eventually embodied in the rules of the ASME Code. Information exchange at technical conferences and in technical publications goes hand in hand with the deliberations of ASME Code bodies.

This relationship goes back to the pivotal events leading up to the development of the modern ASME Code — the appointment of the Special Committee to Review Code Stress Basis in the late 1950s. The principles formulated by that group became the basis for Section III and Section VIII, Division 2 (design by analysis) of the Code. These basic principles were published by ASME in 1968 under the title “Criteria of the ASME Boiler and Pressure Vessel Code for Design by Analysis in Sections III and VIII, Division 2.” At the same time that the work of the Special Committee to Review Code Stress Basis was nearing fruition, leaders in the field of pressure vessel design, including Bernie Langer and Bill Cooper, recognized that an improved forum for fundamental technical information exchange was needed. The need eventually led to the formation of an ASME technical division, the Pressure Vessel and Piping (PVP) Division, in 1966.

Many of us who became involved in the PVP Division in the early years were drafted by the leaders in the field to help prepare a compendium of the technical information on pressure vessel and piping technology. The Decade of Progress volumes, as they were known then, were published by ASME in the early 1970s, covering the most significant contributions to pressure vessel and pip-ing design and analysis; materials and fabrication; and operations, applications, and components. The Decade of Progress volumes should be considered the antecedents of these two volumes. Both sets of volumes should be considered as integral parts of the technical literature supporting the Code and the Criteria document.

The PVP Division has acted with great vigor over the years to continue to provide the technical forums needed to support improvements in the modern ASME Code. This year marks the Division's 35th anniversary. When I first became involved in PVP Division activities, the second year had just been completed, with Vito Salerno as the second Chair of the Division Executive Committee. Dana Young had been the first Chair, during 1966–1967, and Gunther Eschenbrenner was ready to become the third Chair, for the 1968–1969 year. Planning was well underway for the first International Conference on Pressure Vessel Technology (ICPVT), scheduled for Delft, the Netherlands, in the following year. The plan was to hold such an international conference every four years, with the Secretariat rotating between Europe (1969), the United States (San Antonio, 1973), and Asia (Tokyo, 1977). Nine of these international conferences have now been held, the most recent in Sydney, Australia, in April 2000.

At the same time, initial planning for the First U.S. National Congress on Pressure Vessels and Piping, to be held every four years in the United States, was also underway. It was my privilege to be the Technical Program Chair for the Second U.S. National Congress on PVP in 1975 in San Francisco, and the Conference Chair for the Third U.S. National Congress on PVP in 1979, also in San Francisco. In addition, the activity within the PVP Division was such that we cosponsored ASME technical conferences with the Materials Division, the Nuclear Engineering Division, and the Petroleum Division in alternate years. This has since led to the annual PVP Conference, the most recent being PVP 2001 in Atlanta, Georgia, in July 2001.

The paper flow from the technical conferences and the network of contributors for the Decade of Progress volumes eventually led to the creation of the *ASME Transactions Journal of Pressure Vessel Technology* in late 1973, only seven years after formation of the Pressure Vessel and Piping Technical Division. Dr. Irwin Berman was its first Senior Technical Editor, with two Technical Editors representing the PVP Division and the Petroleum Division. Once again, I consider it a privilege to have been selected as

the Technical Editor for the PVP Division, later becoming the Senior Technical Editor in 1978. The Journal and the technical conferences have provided robust mechanisms for the needed technical information exchange.

But ASME Code rules and the associated technical information exchange is not enough. In one of the very early issues (November 1974) of the *Journal of Pressure Vessel Technology*, two articles were published on the duty and responsibility of engineers and their engineering societies to address public concerns about the safety and reliability of power plants. One, by Bernie Langer, was titled "The Role of the Engineering Societies in Obtaining Public Acceptance of Power Plants." The other, by Bill Cooper, was titled "Nuclear — Pressure Vessels and Piping — Materials: Where to Next." Both articles clearly identified the additional commitment that we all share to bring sound information to the attention of the general public and to policymakers in federal, state, and local jurisdictions. In the almost three decades since the publication of those two articles, this commitment has been extended, as the reach of ASME International, the ASME Boiler and Pressure Vessel Code, and the PVP Division covers the entire world. We owe a debt of gratitude to these two giants, and these two volumes represent a "down payment" on that debt.

Robert E. Nickell, Ph.D.
1999–2000 President
ASME International

William E. Cooper, Ph.D, P.E.

Acknowledgements to the First Edition

The editor is indebted to several individuals and organizations in the preparation of this two-volume book. Some of them are identified for their assistance in completion of this effort. My thanks are to all of the thirty-nine contributors whose dedicated efforts made this possible by their singular attention to detail, even while they succinctly conveyed the voluminous information.

I wish to thank Dr. Jack Ware, Pressure Vessels and Piping Division who suggested this effort. My thanks are in particular to Martin D. Bernstein who had from the start of this project been my inspiration to rally around during several ups and downs. I also thank Dr. Robert E. Nickell for his encouragement to see the end of the tunnel.

This effort would not have been possible but for the encouragement and support provided by my employer, Entergy Operations Inc., and in particular by Frederick W. Titus, William R. Campbell, John R. Hamilton, Willis F. Mashburn, Raymond S. Lewis, Jaishanker S. Brihmadesam, Brian C. Gray, and Paul H. Nehrenz.

My special thanks to Professor Dr. Robert T. Norman, University of Pittsburgh, for the untiring pains he had taken in training me to undertake efforts such as these — from their very initiation to their logical conclusion.

This unique two-volume publication, which Dr. Frederick Moody aptly called a "monumental effort," would have never taken off had it not been for the vision and sustained support provided by the staff of ASME Technical Publishing. My thanks to them for their support.

Finally, all of this saga-type effort, spread over three years, would have never been possible had it not been for the constant encouragement and untiring support provided by my wife, Dr. Indira Rao, that included all of the sundry chores associated with this project. In addition, I wish to thank other members of my family, Uma and Sunder Sashti, and Dr. Ishu V. Rao, for their zealous support.

Acknowledgements to the Second Edition

This second edition following the success of the first edition has an enlarged scope including the addition of a third volume. This warranted the addition of several contributors who are all experts in their respective specialties. The editor appreciates their contributions, as well as the continued support of the contributors from the first edition.

Editor intends to once again thank Entergy Operations for their continued support. Thanks are especially due to Dr. Indira Rao whose support in several capacities made this voluminous effort possible. My thanks are to the staff of ASME publishing for their continued zeal and support.

ACKNOWLEDGEMENTS TO THE THIRD EDITION

This third edition follows the unprecedented success of the previous two editions.

As mentioned in the first edition, this effort was initiated with the 'end user' in mind. Several individuals and a few organizations had provided support ever since this effort started.

In the second edition the success of the first edition was enlarged in scope with the addition of a third volume, with experts in their respective specialties to contribute chapters they authored.

In response to the changing priorities of Boiler and Pressure Vessel (B&PV) industry and global use of ASME B&PV Codes and Standards the scope and extent of this edition has increased. The result of the current effort is in a 2,550 page book spread in three volumes.

The editor pays homage to the authors Yasuhide Asada, Martin D. Bernstein, Toshiki Karasawa, Douglas B. Nickerson and Robert F. Sammataro who passed away and whose expertise enriched the chapters they authored in the previous editions.

This comprehensive Companion Guide with multiple editions spanning over several years has several authors contributing to this effort. The editor thanks authors who had contributed to the previous editions but did not participate in the current edition and they are Tom Ahl, Domenic A. Canonico, Arthur E. Deardorff, Guy H. Deboo, Jeffrey A. Gorman, Harold C. Graber, John Hechmer, Stephen Hunt, Yoshinori Kajimura, Pao-Tsin Kuo, M. A. Malek, Robert J. Masterson, Urey R. Miller, Kamran Mokhtarian, Dennis Rahoi, Frederick A. Simonen, John D. Stevenson, Stephen V. Voorhees, John I. Woodworth and Lloyd W. Yoder.

The editor appreciates the effort of the continuing contributors from the previous editions, who had a remarkable influence on shaping this mammoth effort, few of them from the very beginning to this stage. The editor gratefully acknowledges the following authors Kenneth Balkey, Warren Bamford, Uma Bandyopadhyay, Jon E. Batey, Charles Becht IV (Chuck), Sidney A. Bernsen, Alain Bonnefoy, Marcus N. Bressler, Marvin L. Carpenter, Edmund W. K. Chang, Kenneth C. Chang, Peter Conlisk, Joel G. Feldstein, Richard E. Gimple, Jean-Marie Grandemange, Timothy J. Greisbach, Ronald S. Hafner, Geoffrey M. Halley, Peter J. Hanmore, Owen F. Hedden, Greg L. Hollinger, Robert I. Jetter, Guido G. Karcher, William J. Koves, John T. Land, Donald F. Landers, Hardayal S. Mehta, Richard A. Moen, Frederick J. Moody, Alan Murray, David N. Nash, W. J. O'Donnell, David E. Olson, Frances Osweiller, Thomas P. Pastor, Gerard Perraudin, Bernard Pitrou, Mahendra D. Rana, Douglas K. Rodgers, Sampath Ranganath, Roger F. Reedy, Wolf Reinhardt, Peter C. Riccardella, Everett C. Rodabaugh, Robert J. Sims Jr., James E. Staffiera, Stanley Staniszewski, Richard W. Swayne (Rick), Anibal L.Taboas, Elmar Upitis and Nicholas C. Van Den Brekel.

Similarly the editor thanks the contribution of authors who joined this effort in this third edition. Sincerity and dedication of the authors who joined in this effort is evident from two instances *— in one case, a contributor hastened to complete his manuscript before going for his appointment for heart surgery! In another case, when I missed repeatedly a correction made by a contributor, he never failed to draw my attention to the corrections that I missed!*

Thus, the editor wishes to appreciate efforts of authors who joined in this edition and worked zealously to contribute their best for the completion of this 'saga'. The authors are Joseph F. Artuso, Hansraj G.Ashar, Peter Pal Babics, Paul Brinkhurst, Neil Broom, Robert G. Brown, Milan Brumovsky, Anne Chaudouet, Shin Chang, Yi-Bin Chen, Ting Chow, Howard H. Chung, Russell C. Cipolla, Carlos Cueto-Felgueroso, K. B. Dixit, Malcolm Europa, John Fletcher, Luc H. Geraets, Stephen Gosselin (Steve), Donald S. Griffin, Kunio Hasegawa, Philip A. Henry, Ralph S. Hill III, Kaihwa Robert Hsu, D. P. Jones, Toshio Isomura, Jong Chull Jo, Masahiko Kaneda, Dieter Kreckel, Victor V. Kostarev, H. S. Kushwaha, Donald Wayne Lewis, John R. Mac Kay, Rafael G. Mora, Dana Keith Morton, Edwin A. Nordstrom, Dave A. Osage, Daniel Pappone, Marty Parece, Michael A. Porter, Clay D. Rodery, Wesley C. Rowley, Barry Scott, Kaisa Simola, K. P. Singh (Kris), Alexander V Sudakov, Peter Trampus, K. K. Vaze, Reino Virolainen, Raymond (Ray) A. West, Glenn A. White, Tony Williams.

The editor thanks Steve Brown of Entergy Operations for his help in the search for expert contributors for this edition.

This edition was initiated by me in August 2006 and has taken over 3000 hours of computer connection time. My thanks are especially to my wife, Dr. Indira Rao whose sustained support for this effort and participation in several chores related to editing. In addition, I appreciate her tolerating my working on it during a 4-month overseas vacation.

The editor thanks the staff of ASME Technical Publications for their unstinted zeal and support in aiming at this publication's target of 'zero tolerance' for 'errors and omissions'.

Finally, the editor thanks all of you, readers and users of this 'Companion Guide' and hopes it serves the purpose of this publication.

CONTRIBUTOR BIOGRAPHIES

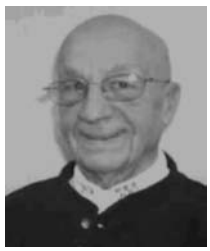
AHL, THOMAS J.

Thomas J. Ahl earned a B.S.C.E. in 1960 and M.S.C.E. in 1961 from University of Wisconsin. He is a Registered Structural and Professional Engineer in Illinois. He held the position of Principal Engineer in Nuclear & Pressure Vessel Design Department, Chicago Bridge & Iron Co., Plainfield, IL, (1961–1998), and was engaged in design and analysis of nuclear related vessels and structural components. Ahl was a Member of ANSI Working Group ANS-56.8 that prepared the ANSI/ANS-56.8-1981—Containment System Leakage Testing Requirements standard.

Ahl is a Member of ASCE, Member of ASCE Hydropower Development Committee, and Conventional Hydropower Subcommittee. He served as Co-Chair of the Task Committee preparing the publication "Manual of Practice for Steel Penstocks ASCE Manual No. 79," Vice-Chair-ASCE Committee preparing the "Guidelines for Evaluating Aging Penstocks," and member of ASCE Hydropower Committee preparing "Civil Engineering Guidelines for Planning and Design of Hydroelectric Developments."

Two of these publications received the ASCE Rickey Award Medal in 1990 and 1994. Thomas Ahl is a member of the Peer Review Group to Sandia National Laboratories and the U.S. Nuclear Regulatory Structural Engineering Branch for the Safety Margins for Containment's Research Program, 1980–2001.

ARTUSO, JOSEPH F.



Joseph F. Artuso is the CEO of Construction Engineering Consultants, Inc. He has over 40 years experience in developing and managing quality control inspection and testing programs for construction materials. He is also actively involved in the Code and Standards writing bodies of ACI and ASME. Mr. Artuso earned a B.S. in Civil Engineering at Carnegie Institute of Technology in 1948 and became a Level III Inspection Engineer at the National Council of Engineering Examiners in 1975. He is a registered Professional Engineer in the states of Pennsylvania, Ohio, New York, Florida, Maryland and West Virginia, as well as being registered as Quality Control Engineer in state of California. His memberships in national committees include A.S.C.E. (Task committee on Inspection Agencies), A.C.I (Committees 214, 304 and 311), A.N.S.I (N-45-3.5 Structural Concrete and Steel), A.S.M.E. (Committee 359 (ASME Sec. III, Div. 2) Construction Materials and Exam.), ACI-ASME (Committee on Concrete Pressure Components for Nuclear Service), ASTM, and NRMCA. He was a contributing editor of McGraw-Hill "Concrete Construction Handbook". Mr. Artuso was the Director of Site Quality Control for the Duquesne Light Company, Beaver Valley, Unit 2. He also supervised construction quality control activities on many nuclear power plants during the period of high construction activity from the 1970's to 1980's.

ASADA, YASUHIDE

Late Dr. Yasuhide Asada was Professor Emeritus of The The University of Tokyo. He has been an internationally renowned scientist in the area of Elevated Temperature Design technology as well as plasticity, creep and creep and fatigue. He was an author of over 150 scientific/technical publications with respect to the technical area of his specialty. His contributions have been awarded by JSME, ASME, ASTM and other engineering organizations.

After six years of field experience at Mitsubishi Heavy Industries Ltd., he was invited to be a faculty member of School of Engineering, The University of Tokyo in 1969. He has been a Professor of Applied Mechanics in the Mechanical Engineering Department since 1980 and retired from the university in 1999 due to the university retirement age of 60.

He was a leader of structural integrity administration at METI on Japanese Nuclear Power plants and components and a leader of Japanese Codes and Standards activity for nuclear and non-nuclear facilities and Japanese representative for ISO/TC11 Boilers and Pressure Vessels where he proposed a new concept of IPEC for international standards.

He has been contributing in international codes and standards activity and was a member of SC. III of ASME B&PV Code Committee, Board on Nuclear Codes and standards of ASME and was a member of ASME Council on Codes and Standards as well as to the Board on Codes and Standards Technology Institute. He has contributed to JSME Power generation Code Committee was a member since 1998 and was chair for first four years.

In scientific activity, he chaired International Council on Pressure Vessel Technology (ICPVT) for 1996 to 2000 and chaired Asian and Oceanic regional Committee (AORC) of ICPVT since 1996. He was a Japanese representative member of International Creep Conference and chaired 7th International creep Conference 2000. Dr. Asada was the recipient of Bernard F. Langer Award and the ASME Dedication Service Award. Professor Emeritus Yasuhide Asada passed away on Nov. 23rd, 2005.

ASHAR, HANSRAJ, G.

Mr. Ashar has a Master of Science degree in Civil Engineering from the University of Michigan. He has been working with the Nuclear Regulatory Commission for the last 35 years as a Sr. Structural Engineer. Prior to that Mr. Ashar has worked with a number of consultants in the U.S. and Germany designing Bridges and Buildings. Mr. Ashar has authored 30 papers related to structures in nuclear power plants.

Mr. Ashar's participation in National and International Standards Organization includes Membership of the NSO and INSO Committees such as American Institute of Steel Construction (AISC), Chairman of Nuclear Specification Committe (January 1996 to March 2008), (AISC/ANSI N690); Member of Building Specification Committee, and Corresponding of Seismic Provisions Committee.

Mr. Ashar's professional activities with The American Concrete Institute (ACI) 349 Committees include Member of the Main committee, Subcommittee 1 on General Requirements, Materials and QA, and Subcommittee 2 on Design. His professional activities also include American Society of Mechanical Engineers (ASME), Corresponding Member, Working Group on lnservice Inspection of Concrete and Steel Containments (Subsections IWE and IWL of ASME Section XI Code), Member, ASME/ACI Joint Committee on Design, Construction, Testing and Inspection of Concrete Containments and Pressure Vessels; Member, RILEM Task Committee 160-MLN: Methodology for Life Prediction of Concrete Structures in Nuclear Power Plants; Member, Federation Internationale du Beton (FIB) Task Group 1.3: Containment Structures, and Consultant to IAEA on Concrete Containment Database (2001 to 2005).

Mr Ashar is a Professional Engineer in the State of Ohio and State of Maryland; Fellow, American Concrete Institute; Fellow, American Society of Civil Engineers; Professional Meer – Posttensioning Institute. Mr. Ashar is a Peer Reviewer of the Papers to be published in ASCE Material Journal, Nuclear Engineering and Design (NED) Periodicals and ACI Material Journal.

BABICS, PETER PAL

Peter Pal Babics graduated as Mechanical Engineer from Bánki Donát Polytechnic Institute (BDPI) of Budapest, Hungary in 1975 and obtained an MSc equivalent degree in 1980 as ME at the Technical University of Miskolc. He post graduated as Welding Engineer at the Technical University of Budapest, and European Welding Engineer (EWE) at the Austrian Institute of Material Science and Welding Technology (SZA), Wien. After graduating he worked as pressure vessel designer and technologist of welding material production (1975–80). From 1980 he directed pressure vessel and pipelines construction in the oil refinery and gas industry. Since 1990 he has been working as member of the Hungarian Atomic Energy Authority (HAEA). His main activity is licensing ISI programs, welding procedures, repairs and replacements of safety related equipment of NPP of the Nuclear Safety Directorate (NSD). In 1997 he took part in a six-month training at the US NRC to study the ASME B&PV CODE Section XI regulatory application and practice. Since 2003 he has been responsible for the ISI System Qualification of the NSD. Since March 2007 he works as leader of Section of Component Supervision in Licensing Department of NSD.

Since 1996 he has been member of the Hungarian Association of Welding and Non-destructive Testing Organisation and his duty is the education, training and examination of metal welders. He has taken part and given presentations in more than 30 conferences and workshop. He is the author of several Hungarian Regulatory Guides.

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Kenneth R. Balkey is currently a Consulting Engineer in Nuclear Services, with Westinghouse Electric Company in Pittsburgh, PA with over 36 years of service in the nuclear power industry. Mr. Balkey provides consultation and advises technology developments related to Codes and Standards and critical asset protection initiatives. He performed and directed reliability and risk evaluations for nuclear and non-nuclear structures, systems and components over his lengthy career. He has produced more than 100 publications and documents relating to risk evaluations of the integrity of piping, vessels and structures, and the performance of components using state-of-the-art probabilistic assessment techniques.

Mr. Balkey is vice chair, ASME Codes and Standards Board of Directors (June 2008 – June 2011), a member of the ASME Board on Nuclear Codes and Standards, past vice president, Nuclear Codes and Standards (June 2005 – June 2008), and past chair, ASME Board on Nuclear Codes and Standards (June 2005 – June 2008). Mr. Balkey also served as a senior technical advisor to the ASME Innovative Technologies Institute LLC, providing consultation on the development of guidance for Risk Analysis and Management for Critical Asset Protection (RAMCAP™) and working with the U.S. Department of Homeland Security. His honors include ASME's Dedicated Service Award (1991), the Bernard F. Langer Nuclear Codes and Standards Award (2002), the Melvin R. Green Codes and Standards Medal (2008), and several other awards from ASME, Westinghouse, and other institutions. Mr. Balkey earned B.S. and M.S. degrees in Mechanical Engineering at the University of Pittsburgh. Mr. Kenneth R. Balkey is a Registered Professional Engineer.

BAMFORD, WARREN

Warren Bamford has been a member of Section XI since 1974, and now serves as Chairman of the Subgroup on Evaluation Standards, whose charter is to develop and maintain flaw evaluation procedures and acceptance criteria. He is a member of the Executive Committee of Section XI, and was also a charter member of the ASME Post Construction Committee, whose goal is to develop inspection, evaluation and repair criteria for non-nuclear plants. He has taught a course on the Background and Technical Basis of the ASME Code, Section III and Section XI.

Warren has been educated at Virginia Tech, Carnegie Mellon University, and the University of Pittsburgh.

Warren's research interests include environmental fatigue crack growth and stress corrosion cracking of pressure boundary materials, and he has been the lead investigator for two major programs in this area. He was a charter member of the International Cooperative Group for Environmentally Assisted Cracking, which has been functioning since 1977.

Warren Bamford has been employed by Westinghouse Electric since 1972, and now serves as a consulting Engineer. He specializes in applications of fracture mechanics to operating power plants, with special interest in probabilistic applications. Over 80 technical papers have been published in journals and conference proceedings.

BANDYOPADHYAY, UMA S.

Bandyopadhyay received his BSME from Jadavpur University (1970), Calcutta, India, MSME from the Polytechnic Institute of Brooklyn (1974). He is a registered Professional Engineer in the states of New York, New Jersey, Connecticut, Massachusetts, Virginia, Wyoming and District of Columbia. He has 28 years of extensive experience in design, engineering and manufacturing of pipe supports and pipe support products for Water Treatment and Waste Water Treatment Facilities, Oil Refineries, Co-generation, Fossil and Nuclear Power Plants. Bandyopadhyay is currently employed by Carpenter and Paterson, Inc. as Chief Engineer and works as a consultant and Registered Professional Engineer for affiliate Bergen-Power Pipe Supports, Inc. Prior to his current employment, he held the positions of Design Engineer (1977–1980), Project Engineer (1980–1986) and Chief Engineer (1986–1992) with Bergen-Paterson Pipesupport Corp. Bandyopadhyay is a member, Working Group on Supports (Subsection NF), since 1993; was an alternate member, Subsection NF (1986–1993). He is also an alternate member, Manufacturer's Standardization Society (MSS), Committee 403-Pipe hangers (MSS-SP-58, 69, 89, 90 and 127) since 1992.

BATEY, JON E.

Jon Batey has been a member of ASME Subcommittee V since 1995 and has served as Chairman since 2002. Jon has served on various sub-tier committees of Subcommittee V since 1990 and currently is a member of the Subgroup on Volumetric Examination Methods, the Subgroup on General Requirements, Personnel Qualifications and Interpretations, the Working Group on Radiography, and the Working Group on Acoustic Emission. He is also a member of the ASME Boiler and Pressure Vessel Standards Committee plus its Honors and Awards Committee, and the ASME Post Construction Standards Committee and its Subcommittee on Inspection Planning. Jon was also a member of the ASME B-16 Standards Committee from 1979 to 1993.

Jon is the Global Inspection Leader for The Dow Chemical Company in Freeport, TX. In his current role, Jon is responsible for inspection performed by Dow or third-party inspectors at supplier fabrication shops. He received a B.S. in Physics from Texas State University. His certifications include ASNT Level III Certificates in Radiography, Ultrasound, Liquid Penetrant, Magnetic Particle, Visual and Leak Test Methods.

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Dr. Becht is a recognized authority in pressure vessels, piping, expansion joints, and elevated temperature design. He is President of Becht Engineering Co. Inc, a consulting engineering company providing services to the process and power industries (www.becht.com, www.bechtns.com for the nuclear services division, and www.tech-training.info for technical training); President of Becht Engineering Canada Ltd.; President of Helidex, LLC (www.helidex.com); and Director of Sonomatic Ltd. (also dba Becht Sonomatic, www.vsonomatic.com) a NDE company that provides advanced ultrasonic imaging. Chuck was previously with Energy Systems Group, Rockwell International and Exxon Research and Engineering where he was a pressure equipment specialist. He received a PhD from Memorial University in Mechanical Engineering (dissertation: Behavior of Bellows), a MS from Stanford University in Structural Engineering and BSCE from Union College, New York. Chuck is a licensed professional engineer in 16 states and provinces, an ASME Fellow since 1996, recipient of the ASME Dedicated Service Award in 2001, and has more than 60 publications including the book, *Process Piping: The Complete Guide to ASME B31.3*, and five patents.

Dr. Becht is Chair of the ASME B31.3, Process Piping Committee; Chair (founding) of the Post Construction Subcommittee on Repair and Testing (PCC), and member of other ASME Committees including the Post Construction Standards Committee (past Chair); Post Construction Executive Committee (past Chair); B&PV Code Subcommittee on Transport Tanks; B&PV Code Subgroup on Elevated Temperature Design (past Chair); B31 Code for Pressure Piping Standards Committee; B31 Mechanical Design Committee; B31 Executive Committee; and is a past member of the Board on Pressure Technology Codes and Standards; the B&PV Code Subcommittee on Design; and the B&PV Code TG on Class 1 Expansion Joints for liquid metal service. He is a member of ASTM Committee F-17, Plastic Piping Systems Main Committee; and the ASME PVP Division, Design and Analysis Committee.

BERNSEN, SIDNEY A.

Dr. Bernsen, earned his B.S.M.E in 1950, M.S.M.E in 1951, and Ph.D. in 1953, from Purdue University. He has been involved in nuclear power activities for over 50 years, initially at Argonne National Laboratory and subsequently with Bechtel Corporation. At Bechtel he held a variety of positions including Chief Nuclear Engineer and Manager of Quality Assurance for Bechtel Power Corporation. Since retirement from Bechtel, after more than 30 years, he has provided consulting services and has remained active in ASME Nuclear Codes and Standards. Dr. Bernsen

served as the initial Chair of the ASME Committee on Nuclear Quality Assurance (NQA) and is now an honorary member of the NQA committee.

Dr. Bernsen, was a founding member of the ASME Board on Nuclear Codes and Standards (BNCS) and has continuously served on BNCS since its inception. He was the initial Chair of the ASME Committee on Nuclear Risk Management and completed his second term in 2004. During his tenure, the committee completed and published the first issue of this Standard in April 2002 and the first addendum was published in December 2003. Through his long career, including extensive involvement in licensing and safety, as well as his work in coordinating the development and approval of the Nuclear Risk Management Standard, he has obtained valuable insight into nuclear risk related activities and how they are being and may be applied in the future to ASME Codes and Standards. Dr. Bernsen, an ASME Fellow, has been involved in Codes and Standards for over 35 years.

BERNSTEIN, MARTIN D.

Mr. Bernstein was involved in the design and analysis of steam power equipment since joining Foster Wheeler Energy Corporation in 1960. Retired in 1996, he continued to serve as a consultant to Foster Wheeler and as their representative on the ASME Boiler and Pressure Vessel Committee, on which he had served for more than 25 years. He was Vice Chair, Subcommittee on Power Boilers, Chair, Subcommittee on Safety Valve Requirements, a member of the Main Committee (Standards Committee) and past Chair of Subgroup General Requirements and the Subgroup Design of the Subcommittee on Power Boilers. Since 1986 he and Lloyd Yoder taught a two-day course on Power Boilers for the ASME Professional Development Department. In 1998, ASME Press published *Power Boilers—A Guide to Section I of the ASME Boiler and Pressure Vessel Code* that Bernstein and Yoder developed from their course notes.

Mr. Bernstein was active for many years in ASME's PVP Division. He was also author and editor of numerous ASME publications, including journal articles on ASME design criteria, ASME rules for safety valves, flow-induced vibration in safety valve nozzles, and tubesheet design. Mr. Bernstein obtained a B.S. and M.S. in civil engineering from the Columbia School of Engineering and Applied Science. He was elected an ASME Fellow in 1992, received the ASME Dedicated Service Award in 1994, and was awarded the ASME J. Hall Taylor Medal in 1998. He was a Registered Professional Engineer in New York State. Mr. Bernstein passed away in 2002.

BONNEFOY, ALAIN

Alain Bonnefoy graduated from the INSA in Lyon-France. He began his career at CETIM (French Technical Center of Mechanical Industries) in R & D in the field of Pressure Vessel, Piping and Boilers. In 1976 he held the position of Department manager for the design and analysis of structure and components. Mr. Bonnefoy has published more than 20 papers in structural design particularly seismic analysis, mounded vessels and buried piping areas. Since 2001 he is the Technical Manager of the SNCT (French Pressure Equipment Manufacturer's Association) that publishes the French Codes of Construction such as CODAP (Vessels), CODETI (Piping), COVAP (Boilers). Alain Bonnefoy is also in charge of the French version of the ASME Section VIII Division 1, currently under preparation.

Mr. Bonnefoy is a Member of the different working groups preparing these codes and is also active in European standardization in the field of piping.

BRESSLER, MARCUS N.

Mr. Bressler is President of M. N. BRESSLER, PE, INC., an engineering consulting firm founded in 1977, specializing in codes and standards, quality assurance, design, fabrication, inspection and failure analysis for the piping, power, petroleum and chemical industries. He has over 54 years of experience. He joined TVA in 1971 as Principal Engineer and was promoted in 1979 to Senior Engineering Specialist, Codes Standards and Materials. He took early retirement in 1988 to open up a private consulting practice. His previous experience was with the US Army (1952) where he served as an Industrial Hygiene Engineer; the Babcock & Wilcox Company(1955), where he held the positions of Engineering Draftsman, Stress Analyst, and Boiler Division Materials Engineer; Gulf & Western Lenape Forge Division (1966) where he became Senior Design Engineer, and Taylor Forge Division (1970) as Product Development Manager. At Lenape Forge he developed a design for a quick-opening manway for pressure vessels and piping that was granted a patent in 1971.

Mr. Bressler began his activities in Codes, Standards and Materials in 1960. He has been a member of the ASME B&PV Standards Committee since 1979 to 2009, and is now a member of the Technical Oversight Management Commitee. He is a member and past Vice Chair of the Committee on Nuclear Certification. He is a member of the Standards Committees on Materials and on Nuclear Power, the subgroup on Design (SCIII), the special working group on Editing and Review (SC III), the Boards on Nuclear Codes and Standards and on Conformity Assessment. He is the Chair of the Honors and Awards Committee (BNCS). Mr. Bressler is a member of the ASTM Committees A-01 and B-02 and many of their subcommittees.

Mr. Bressler holds a BME degree from Cornell University (1952) and an MSME degree from Case Institute of Technology (1960). In 1989 he received a Certificate of Achievement from Cornell University for having pursued a course that, under today's requirements, would have resulted in a Master of Engineering degree. He was awarded the ASME Century Medallion (1980), and became a Fellow of ASME in 1983. He is now a Life Fellow. He received the 1992 ASME Bernard F. Langer Nuclear Codes and Standards Award. and is the 1996 recipient of the ASME J. Hall Taylor Medal. He received the 2001 ASME Dedicated Service Award. He is a Registered Professional Engineer in the State of Tennessee (Retired).

BRINKHURST, PAUL

Mr. Brinkhurst graduated from the University of the South Bank, London in 1971 with a BSc (Hons) in Chemical Technology. After spending a number of years in the Chemical and Mining industries he has worked predominately in the nuclear power generation industry since 1983. Mr. Brinkhurst has been employed by the South African electricity utility Eskom since 1993, working mainly in the areas of inservice inspection, integrity and licensing.

Mr. Brinkhurst's specific activities included application of Sections III and XI of the ASME B&PV Code at Koeberg Nuclear Power Station. His current position is Chief Engineer in the Eskom Nuclear Safety Assurance department.

BROOM, NEIL

Neil Broom has been involved with heat exchanger and pressure vessel design and manufacture for the power generation industry for over 30 years. He is currently employed at PBMR with responsibility for Code related activities.

He serves as a member of Subgroup Strategy and Management Divisions 1 and 2 (SC III), Member of Special Working Group High Temperature Gas Cooled Reactors (SC XI).

BROWN, ROBERT G.

Mr. Brown is a Principal Engineer and Director of Consulting for the Equity Engineering Group in Shaker Heights, Ohio. He has experience as both an owner-user and consultant providing engineering support to refineries and chemical plants worldwide. Mr. Brown uses advanced skills in Finite Element Analysis to provide practical and cost effective solutions to solve design and operational issues related to fixed equipment.

Mr. Brown assisted with the development of API 579 *Fitness-For-Service* and has been a consultant for the PVRC effort to develop the new *ASME, Section VIII, Division 2, Boiler and Pressure Vessel Code*, taking into consideration the latest developments in materials, design, fabrication, and inspection technologies.

Mr. Brown is an active member of the Battelle International Joint Industry Project on the Structural Stress Method for Fatigue Assessment of Welded Structures and performs fatigue assessments/reviews of equipment in cyclic service. Mr. Brown also serves on the ASME Subgroup on Design Analysis and performs code compliance calculations and interpretations for pressure vessels. Mr. Brown is a registered Professional Engineer in the States of Ohio and Pennsylvania.

BRUMOVSKY, MILAN

Dr. Milan Brumovsky finished his M.S. in nuclear physics and RNDr. in experimental physics in Charles University in Prague, Czech Republic, and his PhD. in experimental physics at the Moscow Engineering Physics Institute, Moscow, Russia Federation. Then he joined Research and Development Centre of SKODA Nuclear Machinery in Pilsen, Czech Republic (head of Reactor Component Integrity and Safety) – manufacturer of WWER type reactors for Central Europe. After 35 years he moved to the Nuclear Research Institute Rez in Rez, Czech Republic as project manager. Thus, last year he celebrated 50 years in the nuclear power area.

During his career he was involved in many projects connected with the material and integrity research projects, mainly in the field of material qualification for WWER reactors pressure vessels, radiation damage in structural materials, material testing by standard and large scale test specimens and components, fracture mechanics study and application to components integrity. He worked also in preparation of many regulatory documents within the Interatomenergo organization as well as in the Czech nuclear codes. He was also co-ordinator of several IAEA Co-ordinated research projects in the field of radiation damage and fracture mechanics. He is also an active member in the ASTM E-10 Committee as well as in ASME PVP O&C Committee. Finally, he served as a co-ordinator of the European project for preparation of VERLIFE- "Unified Procedure for Lifetime Assessment of Components and Piping in WWER NPPs during Operation".

CANONICO, DOMENIC A.

Dr. Canonico received his B. S. from Michigan Technological University, M.S. and Ph.D. from Lehigh University. He has over 40 years experience in pressure parts manufacturing. Dr. Canonico is currently employed by ALSTOM POWER facilities in Chattanooga, Tennessee. He is Past Chair of the ASME Boiler Pressure Vessel (BPV) Code Main Committee and a member of the ASME Council on C. & S. and Vice President-elect Pressure Technology, C&S. He is a Fellow in ASME, the American Welding Society (AWS) and the American Society for Metals (ASM). In 1999 Dr. Canonico received the ASME Melvin R. Green C&S Medal. He was the 1994 recipient of the ASME J. Hall Taylor Medal, in 1996 and 1999 respectively he was awarded the Dedicated Service Award., and the ASME Region XI Industry Executive Award. In 1978, 1979, and 1985 respectively AWS awarded him the Dr. Rene Wasserman Award, the James F. Lincoln Gold Medal, and the William H. Hobart Memorial Medal; he was the 1983 Adams Lecturer. He is a member of the State of Tennessee Boiler Rules Board.

He has written over 100 technical papers and given technical talks in U.S., Canada, Mexico, Europe and Asia. He is named in Who's Who in Engineering and Men and Women of Science. Dr. Canonico is an Adjunct Professor at the University of Tennessee, Knoxville and on the Advisory Committee of the School of Engineering, University of Tennessee, Chattanooga.

CARPENTER, MARVIN L.

Marvin L. Carpenter graduated with honors from Michigan Technological University (MTU) with a B.S. in Metallurgical Engineering. He continued at MTU and received his Masters in Metallurgical Engineering in 1974. Since graduating, his career has been focused on welding fabrication and testing in accordance with the ASME Boiler and Pressure Vessel Code. ASME Code Committees first caught his attention in the late seventies and he has remained active in the Code ever since. He serves on the Subcommittee on Welding (IX), Chaired the Subgroup on Brazing (IX) and currently Chairs the Subgroup on Materials (IX).

Mr. Carpenter gained expertise in production welding, brazing, failure analysis, coatings, and material testing while working for major corporations including Westinghouse Electric Corporation, The Trane Company, and Bechtel. His experience ranges from supervising a Welding Engineering Develop group to setting up and operating a materials testing laboratory that performed chemical analysis, mechanical testing, metallography, and welding qualification.

In addition to his extensive materials and welding background, he was granted a patent in 1995 for a GTAW-HW circular welding system. His current position is as a Principal Engineer with a major U.S. company that provides power plant equipment. Mr. Carpenter resides in Pittsburgh, PA with his wife, Denise, and two children, Scott and Michelle.

CHANG, EDMUND W. K.

Edmund W.K. Chang, P.E., received his BSME from the University of Hawaii (UHM), 1969. Mr. Chang is currently employed as the Boiler & Welding Maintenance Engineer with Hawaiian Electric Company, Inc., Power Supply Engineering Department, Honolulu, Hawaii. Mr. Chang's responsibilities include being in-charge of all company boiler condition assessments, and National Board (NB) "R" and "VR" Symbol Stamp repair programs. Mr. Chang is also a NB commissioned O/U Inspector, in charge of in-service and acceptance inspections. He is a AWS Certified Welding Inspector (CWI), in charge of welding program, and the company's NDT Level III in PT and MT in charge of the NDT program.

Mr. Chang's professional affiliations include ASME Membership since 1971; association with ASME Hawaii Section as Chairman 2008–2009, Honors & Awards Committee Chair, Webmaster, Newsletter Editor, and Section Chair 1993–1994; ASNT Hawaii Section Director and Webmaster; AWS Hawaii Section Webmaster; and Chair 1996 of Hawaii Council of Engineering Societies. Mr. Chang is a member of the Department of Mechanical Engineering, UHM, Industry Advisory Board.

Mr. Chang's professional publications include as a lead author of "T91 Secondary Superheater Tube Failures Investigation," 1997, ASME PVP Conference, Orlando, Florida; and "Tangential-Fired Boiler Tube Failures, A Case Study," 2007, EPRI International Conference on Boiler & HRSG Tube Failures, Calgary, Alberta, Canada.

CHANG, KENNETH C.

Dr. Chang is a registered professional engineer and received his Ph.D. in applied mechanics from the Department of Mechanical Engineering, University of California, Berkeley. Through his technical and management career at Westinghouse, he has been involved in the design, analysis, and construction of nuclear power plant systems, structures and components, and ASME Section Code development for more than 34 years. Dr. Chang is a renowned professional in the field of fatigue design, structural dynamics, and aging managing for ASME Class 1 components, and authored over twenty-five technical papers and professional presentations. He is a key participant in the development of the new review and audit process for aging management reviews (AMRs) and aging management programs (AMPs) for license renewal applications (LRAs) at USNRC and conducted several training on the subject. Dd. Chang retired as a branch chief of License Renewal Division responsible for performing on-site audits and reviews for the new LRAs. In that capacity he was also a staff member planning for the guidance documents update, involving industry participation, for more efficient preparation and review of LRAs.

CHANG, SHIN

Dr. Chang received her B.S. in 1983 from the National Tsing Hua University in Taiwan. She continued her study in the USA and earned her MS and Ph.D. in Nuclear Engineering from the University of Illinois at Urbana-Champaign, Illinois. After graduation in 1991, she was employed by the Atomic Energy Council at Taiwan (TAEC). Since then, she has been working at the Department of Nuclear Regulation of TAEC for more than 15 years.

During Dr. Chang's career at TAEC, she has been involved in various regulatory safety reviews and inspection works related to nuclear power plants. She has been section chief of the License Review Section and section chief of the Kuosheng Regulatory Task Force of the Nuclear Regulation Department of TAEC. She is currently the section chief of Chinshan Regulatory Task Force of the Nuclear Regulation Department of TAEC. In this role, she is now responsible for all the regulatory activities, which include resident inspections, periodic inspections, maintenance quality inspections, safety review of measurement recapture power uprate application, safety review of the aging management program that includes Chinshan NPP operational safety.

CHAUDOUET, ANNE

Ms Chaudouet earned a Master of Pure Maths at Paris XIII University in 1974 and then obtained a Mechanical Engineering Degree from ENSMP (Mines) in Paris, France in 1976. The same year, she started her career at Cetim (French Technical Center of Mechanical Industries) in R&D in the field of solid mechanics analysed by the Boundary Element Method (BEM).

Soon after, she became in charge of the team responsible for the development of all software developed at Cetim in the domain of 2D and 3D heat transfer and solid mechanics. In that role she had the direct responsibility for the analyses of components by BEM and of fracture mechanics. In 1984, she became head of the Long Term Research Service involved in more theoretical studies and development of design rules for pressure vessels. In the same year she initiated Cetim's participation in PVRC (Pressure Vessel Research Council).

Since 2003, Ms Chaudouet has been actively involved in ASME Boiler and Pressure Vessel Code organization where she became a member of the Subcommittee on Materials, of SC II/International Material Specifications (currently, Chair) and of SC D/Bolted Flanged Joints. She is also an active member of the ASME/API Joint Committee on Fitness for Service. Ms Chaudouet has published over 30 papers in French and in English in the domain of Boundary Elements, Fracture Mechanics and more recently on Fitness-For-Service. Most of these were presented at International Conferences.

Ms Chaudouet has developed professional courses on these topics. In the domain of pressure equipment she has also given courses on the PED (European Directive).

CHEN YI-BIN

Dr. Chen received his B.S. in Nuclear Engineering from National Tsing-Hua University (Taiwan), M.S. and his Ph.D. in Nuclear Engineering from Massachusetts Institute of Technology, Cambridge, MA.

Dr. Chen has spent his entire career in the field of nuclear energy, beginning in research and development of thermal hydraulics and safety for light water reactors, and then with regulatory body conducting safety inspection, audit and review of design, construction and operation of nuclear power plants in Taiwan.

Dr. Chen has held a number of senior management positions including Deputy Director of the Institute of Nuclear Energy Research (INER) and Department Directors of Planning, Nuclear Technology, Radiation Protection and Nuclear Regulation at Atomic Energy Council (AEC). He has also taught graduate courses in the Nuclear Engineering Department of National Tsing-Hua University for more than 10 years.

CHOW, TING

Mr. Ting Chow, specialized in earthquake engineering application to nuclear power facilities, and has been acting head of Seismic Test/Research Laboratory of Institute of Nuclear Energy Research (INER) of Atomic Energy Council of Taiwan since the Lab.'s establishment in 1995.

Mr. Ting Chow has been working on varieties of seismic safety related topics, such as: (1) Seismic Probabilistic Risk assessment at Kuosheng Nuclear Power Plant, (2) Study on Necessity of Installing Earthquake Auto-Scram System for NPPs in Taiwan, (3) Principal review of several NPP's seismic/structural related topics and issues including USI A-46 issue, Chapter 3 of Final Safety Analysis Report of Maanshan PWR NPP, design earthquake review of Lungmen ABWR NPP FSAR, (4) Seismic shake table system for seismic qualification of safety related component (5) INER's seismic shake table set up, (6) Commercial Grade Item's Seismic Dedication, and (7) Soil structure interaction analysis for the Independent Spent Fuel Storage Installation.

Mr. Chow had also been adjunct associate professor in Chun-Yuan Christian University, Taiwan from 1997–2003. Mr. Chow, born in 1955, joined INER right after his MS degree in Civil-Structural Engineering from National Taiwan University in 1979. He also holds MS degree from Massachusetts Institute of .Technology (1987) and a Ph.D candidate from Rensselaer Polytechnic Institute (1990).

CHUNG HOWARD H.

Dr. Howard H. Chung has over 35 years of diversified technical and managerial experience in the nuclear, pressure vessel, and aerospace industries in the areas of analytical and experimental structural mechanics, fluid transport phenomena, flow-induced vibrations, shock and vibration isolation, seismic engineering, hazardous radioactive wastes transportation technologies, pressure vessels and piping design, computer codes development, and nuclear facility configuration management. Currently, he is the President of Structural System Integrity in Naperville, Illinois. He previously worked as a Research Engineer and Project Manager on nuclear reactor and nuclear fuel processing facility R&D programs at Argonne National Laboratory, Argonne, Illinois for twenty-five years (1994–1999). Prior to joining Argonne, he was a technical research staff at MIT Lincoln Laboratory, Lexington, Massachusetts working on U.S. Air Force satellite R&D program for two years (1992–1994).

Howard Chung received BS in Naval Architecture and Marine Engineering from Seoul National University, Seoul, Korea in 1966, MS and Ph.D. in Mechanical Engineering from Tufts University, Medford, Massachusetts in 1971 and 1974, respectively. In addition, he received his MBA degree from University of Chicago in 1983. Dr. Chung has published over 60 technical papers and reports in his fields of expertise and served as an Associate Editor of the ASME Journal of Engineering for Gas Turbines. Dr. Chung served as a member of the ASME Board on Nuclear Codes and Standards (BNCS) for ten years (1987–1997) and as a member of the ASME B&PV Section III Subgroup on Containment Systems for Nuclear Spent Fuel and High Level Waste Transportation Packaging (SG-NUPACK) for more than ten years. In addition, he has been serving as a member of the Committee on Design and Fabrication of Nuclear Structures (N690) of the American Institute of Steel Construction (AISC) since 1991.

Dr. Chung has been also active on serving various professional organizations including the Chair (2002–2003) of the ASME Pressure Vessels and Piping, the Vice-Chair (1995–1996) of the ASME Nuclear Engineering Division and the Vice-Chair (2003–2005) of the Anti-Seismic Systems International Society (ASSISi). He also chaired many international conferences, including the 2002 ASME Pressure Vessels and Piping Conference in Vancouver, Canada. Dr. Chung is an ASME Fellow and received the ASME Dedicated Service Award in 1999.

CIPOLLA, RUSSELL C.

Mr. Russell Cipolla is Vice President, Nuclear Power Generation, and Principal Engineer for APTECH Engineering Services, Inc., Sunnyvale, California (USA). Mr. Cipolla received his B.S. degree in Mechanical Engineering from Northeastern University in 1970, and his M.S. in Mechanical Engineering from Massachusetts Institute of Technology Mechanics in 1972. He has been active in the Nuclear Power Industry since the early 1970s having worked at the nuclear divisions of Babcock & Wilcox and General Electric in the area of ASME Section III design associated with both naval and commercial power plants systems.

Russ has specialized in stress analysis and fatigue and fracture mechanics evaluations of power plant components in operating plants. He has applied his skills to many service problems to include stress corrosion cracking (SCC) of J-groove attachments welds in reactor vessel head penetrations and pressurizer heater sleeves, mechanical and thermal fatigue in piping, SCC in low pressure steam turbine rotors and blades, and fitness-for-service of components supports. Russ was also involved in resolving the NRC Generic Safety Issues A-11 and A-12 regarding fracture toughness and bolted joint integrity. He is well versed in the integrity of threaded fasteners for both structural joints and pressure boundary closures.

In recent years, Russ has been active in both deterministic and probabilistic methods and acceptance criteria for nuclear steam generators (SG) regarding pressure boundary integrity in compliance with NEI 97-06 requirements. In support of industry group efforts, he has made significant contributions to the industry guidelines for the assessment of tube integrity and leakage performance for various degradation mechanisms affecting Alloy 600 and 690 tubing materials. He has development methods for predicting tube burst and leak rates under various service conditions, which have become part of the industry standards.

Russ has been very active in ASME Section XI since joining the Working Group on Flaw Evaluation in 1975, for which he is currently Chairman. Russ is also a member of the Subgroup on Evaluation Standards and Subcommittee Section XI, and has participated in many ad hoc committees on such topics as environmental fatigue, SCC of austenitic materials, and fracture toughness reference curves for pressure vessels and piping, and SG tube examination. Russ has authored/coauthored over 80 technical papers on various subjects and assessments from his past work.

CONLISK, PETER J.

Dr. Conlisk's has a B.S. in Mechanical Engineering and M.S. in Engineering Science from the University of Notre Dame and Ph.D. in Engineering Mechanics from the University of Michigan. He has forty years experience applying engineering principles, com-puters, experimental techniques, and Codes and Standards to solving design of processing equipment and vessels in the chemical industry. From 1960 until 1968, he worked in the Aerospace industry and from 1968 until his early retirement in 1993, Dr. Conlisk worked for the Monsanto Corporation, the last 19 years in the Engineering Department. He was a key member in a team at Monsanto that developed acoustic emission examination for fiberglass and metal tanks and vessels. His services are now available through Conlisk Engineering Mechanics, Inc., a consulting firm he formed in 1994. He has concentrated on design of tanks and pressure vessel, especially fiberglass composite (FRP) vessels. Dr. Conlisk is a nationally recognized authority in FRP equipment design and analysis. He is a member of the ASME committee that developed the ASME/ANSI Standard: "Reinforced Thermosetting Plastic Corrosion Resistant Equipment, RTP-1."

Dr. Conlisk is past chairman and current vice-chairman of the ASME B&PV Code subcommittee, Section X, governing FRP pressure vessels. He is also a past member of the main committee of the ASME B&PV Code. Dr. Conlisk is a registered professional engineer in Missouri.

CUETO-FELGUEROSO, CARLOS

Carlos Cueto-Felgueroso obtained a Naval Engineer (M.Sc.) degree in the Escuela Técnica Superior de Ingenieros Navales of the Polytechnic University of Madrid in 1977. He worked for four years in the Structural Mechanics Section of AESA, the major shipbuilding company in Spain. Carlos moved to IBM Spain, and in 1985 joined the Integrity of Components Group (now Materials and Life Management Unit) of Tecnatom S.A. He specializes in the stress and fracture mechanics analyses of components and piping, in both nuclear and fossil plants. Main activities to date have been in the analytical evaluation of flaws of major components (reactor pressure vessels, turbines, etc.) and piping. He developed Flaw Evaluation Handbooks for streamlining the evaluation of NDE flaw indications. Carlos was involved in the development of Steam Generator tubes plugging criteria for several types of degradation (PWSCC, IGA/ODSCC, etc.). He has expertise in the development of acceptance criteria for PWSCC defects in the CRDM penetrations of vessel heads, and in the Bottom Mounted Instrumentation penetrations.

Carlos has experience in the evaluation of piping failure probabilities for the development of Risk-Informed ISI programs. He participated in the Working Group on Codes and Standards (WGCS) organized by the European Commission and he is member of the ENIQ Task Group on Risk (TGR) dedicated to RI-ISI activities in Europe.

In recent years Carlos participated in several European projects such as the benchmarking of Structural Reliability Models for RI-ISI applications (NURBIM project) and the comparison of structural evaluation methodologies for Thermal Fatigue in piping (THERFAT project) both in the 5th Framework Program of the European Commission. Carlos is a member of the ASME B&PV Section XI Working Groups on Implementation on Risk Based Examination and of the Working Group and on Inspection on Systems and Components.

DEARDORFF, ARTHUR F.

Arthur F. Deardorff has a Mechanical Engineering B.S, from Oregon State University (1964) and MS, University of Arizona (1966). He is a Registered Mechanical Engineer, State of California. He is a Vice President, Structural Integrity Associates, San Jose, California. His professional experience includes 1987 to present with Structural Integrity Associates, San Jose, CA, 1976–1987 with NUTECH, San Jose, CA, 1970–1976 with General Atomic Company, San Diego, CA and 1966–1970 with The Boeing Company, Seattle, WA. His professional associations include American Society of Mechanical Engineers and American Nuclear Society. He is a Past Member of the ASME Code Section XI Subgroup Water Cooled Systems, Working Group on Implementation of Risk-Based Inspection, Task Group on Erosion-Corrosion Acceptance Criteria, Task Group on Fatigue in Operating Plants, and Task Group on Operating Plant Fatigue Assessment, and the ASME Code Post Construction Committee, Subgroup on Crack-Like Flaws.

Mr. Deardorff has expertise in fracture mechanics, stress analysis and reactor systems evaluation, with a strong academic background in thermal-hydraulics and fluid system. His expertise includes PWR and BWR systems and fossil-fired power plants. Art is known internationally for providing ASME Code training in Section III design and analysis and Section XI flaw evaluation.

DEBOO, GUY H.

Guy DeBoo has a B.S., Mechanical Engineering from Northwestern University, 1976 and M.S. Mechanical Engineering from University of Illinois, 1986. His professional experience from 1995 to present is as Senior Staff Engineer, Commonwealth Edison, Senior Staff Engineer with Exelon Nuclear and with Sargent & Lundy Engineers 1976 to 1995. During his 24 years in nuclear power generation, DeBoo has worked on major nuclear design projects including design, inspection and testing phases.

Mr. DeBoo's recent experience includes fatigue, crack growth, flaw stability analyses and operability for power plant components. He supervised functionality and operability evaluations of systems and components to address unanticipated operating events or conditions, which do not meet inspection or test requirements. Mr. DeBoo provides engineering direction for design and operability evaluations of pressure vessels, piping and components and provides technical responses to NRC.

He is a Member ASME B&PV Code Section XI, Secretary, WG Flaw Evaluation, and WG Pipe Flaw Evaluations. Guy is a PE (Illinois), Member of National Society of Professional Engineers.

His industry participation includes PVRC Technical Committee on Piping Systems; publications include "Position Paper on Nuclear Plant Pipe Supports," WRC Bulletin 353, May 1990, and a Tutorial on "An Integrated Approach to Address Engineering of Operating Nuclear Power Plants Functionality and Operability Criteria," 1994, ASME PV&P Conference.

DIXIT, K. B.

K.B. Dixit graduated from the Indian Institute of Technology, Bombay (IITB) with a B. Tech. in Mechanical Engineering in 1972. After completion from the 16th Batch of Training School of Bhabha Atomic Research Centre in 1973, he joined Nuclear Power Corporation of India Limited (NPCIL), Mumbai. His initial field of work was in the area of Structural Analysis and Design of Reactor Components of Indian Pressurized Heavy Water Reactors, using Finite Element Method and ASME Boiler & Pressure Vessel Code, Section III, Nuclear Vessels.

Mr. Dixit was involved in design of nuclear components of Narora Atomic power station, which has India's first indigenous Pressurized Heavy Water Reactors. He has made significant contributions in evolving technology, for design and manufacture, of nuclear components. He was also involved in Design of coolant channel components of PHWRs and development of shutdown systems of Indian PHWRs. He has also made important contributions in resolution of problems associated with core components where remotely operated toolings had to be developed indigenously.

In addition to design and analysis, Mr. Dixit has also gained expertise in Ageing Management, Equipment Qualification and Seismic Revaluation. He has also participated in regulatory reviews for operating reactors as well as those under various stages of design/construction. Publications by him include papers presented at Conferences for Structural Mechanics in Reactor Technology, International conference on Pressure Vessels technology etc. Presently he is working as Executive Director for engineering group of NPCIL and is in charge of all design activities for all systems and components of Indian PHWR plants.

EUROPA MALCOLM

Malcolm Europa is a Senior Engineer with the South African National Nuclear Regulator where he carries responsibility for coordination of safety and technical assessment of nuclear facilities and nuclear equipment under South African nuclear regulations. He has participated in regulatory reviews of the Koeberg nuclear reactors as well as design reviews of pressurized components of the PBMR plant. His background includes nuclear power industry operations experience which includes planning, engineering design, safety reviews and mechanical integrity assessment of pressurised equipment for both nuclear and conventional service.

He currently represents the South African National Nuclear Regulator at the Multinational Design Evaluation Programme (MDEP) on both the Codes and Standards and Vendor Inspection Cooperation working groups.

Malcolm is a Mechanical Engineering graduate from the Peninsula Technikon (1986) and the University of Southern California (1993). He is a Registered Professional Engineer in the Republic of South Africa.

FELDSTEIN, JOEL G.

Joel Feldstein has a Metallurgical Engineering B.S. (1967) and M.S. (1969) from Brooklyn Polytechnic Institute. He has more than 30 years experience in the welding field, ranging from welding research for a filler metal manufacturer to welding engineering in the aerospace and power generation industries. He began his career in power generation with Babcock & Wilcox in 1972 at their R&D Division working on manufacturing-related projects and moved into plant manufacturing in 1984 as the Manager of Welding. There he became familiar with the construction of components for both nuclear and fossil applications. His first assignment on coming to Foster Wheeler in 1993 was in the Technical Center as Manager of Metallurgical Services later taking on the additional responsibility of the Welding Laboratory. In 1998 Joel Feldstein assumed the responsibility of Chief Welding Engineer.

Joel Feldstein, who is currently Chairman of the ASME B&PV Code Standards Committee and a member of the Board on Pressure Technology Codes & Standards began his ASME Code involvement with the Subcommittee on Welding (the responsible subcommittee for Section IX) in 1986. In 1992 he became Chairman of the Subcommittee on Welding and became a member of the B&PVC Standards Committee. He is a recipient of the J Hall Taylor Medal from ASME for the advancement of standards for welding in pressure vessel and piping construction. He has also been an active member of the Subcommittee on Boilers (Section I).

Joel Feldstein is also active in other professional societies including AWS and the Welding Research Council where he served as Chairman of the Stainless Steel Subcommittee, the High Alloys Committee and a member of their Board of Directors.

FLETCHER, JOHN

John Fletcher earned a masters degree in Plasma Physics and spent the early part of his career as a researcher on the South African Tokomak, Tokoloshe. He spent 13 years in a Research & Development environment and during this period authored and co authored five papers in international research journals and thirteen contributions to international conferences. He then spent 10 years as project manager in the South African power generation industry, managing projects on fossil plants and the Koeberg nuclear power plant.

John Fletcher is currently employed at PBMR, with the responsibility for the development and implementation of an ISI program for PBMR. John Fletcher serves as the Chair of the Special Working Group HTGRs established in February 2004.

The SWG has the charter to rewrite SC XI Division 2 Rules for Inspection and Testing of Gas-cooled plants. This SWG has produced a first complete draft of a rewritten SC XI Div 2 for Gas Reactors. The draft introduces the concept of Reliability and Integrity Management (RIM) program that provides the rules and requirements for the creation of the RIM Program for the Modular High Temperature Gas-Cooled Reactor (MHR) type.

GERAETS, LUC H.

Dr. Geraets has an M.S. Degree and a Ph. D. in Mechanical Engineering from the University of Louvain in Belgium. He also holds an MBA from the Mons Polytechnical Institute (Mons, Belgium). He is an expert in the design of mechanical equipment and piping, seismic engineering, and the ASME Section III pressure component code. His fields of expertise include thermal transient, fatigue, water hammer, vibration, pipe rupture, dynamic analysis, finite element stress analysis, inelastic analysis, code compliance, inelastic response of piping, and fitness-for-service criteria. Dr. Geraets' extensive background in engineering mechanics in the areas of analysis, design, criteria development, and management of projects rest on 35 years of engineering experience with the various metamorphisms (Tractionel, Tractebel, SUEZ) of GDF SUEZ, including 20 years in the analysis and design of power plant buildings, mechanical equipment, and supports. He has participated in all phases of power projects including conceptual studies, licensing, design, construction, as-built, modifications, and resolution of operating problems. Based in Brussels (Belgium), Dr. Geraets is now in charge of Strategy, Business Development and Research for the Nuclear Activities Division of GDF SUEZ.

Dr. Geraets joined the ASME Pressure Vessel and Piping Division in 1983. He has published several Conference papers. A founding member of the Seismic Engineering Technical Committee, of which he has occupied various Offices, including Chairmanship (1995–1999), he has been the first International Coordinator of PVP between 2001 and 2004. In 2004, Dr. Geraets became a member of the Executive Committee of the PVP Division, in charge of Honors and Awards from 2004 to 2008, and Vice Chair and Secretary for 2008–2009. He served as Technical Program Chair of the 2008 Pressure Vessels and Piping Conference in Chicago, and will be the Conference Chair for the 2009 PVP Conference in Prague, Czech Republic.

Dr. Geraets is a Fellow of ASME. He has been extensively involved with ASME Code activities, strongly promoting the development of Code knowledge in Belgium, through various means including participation to Section III Code Committees; he has been a member of both the Working Group on Piping and the Working Group on Components Supports between 1984 and 1994. Dr. Geraets has been awarded the Calvin W. Rice Lecture Award in 2008

GIMPLE, RICHARD E.

Richard Gimple has a BSME from Kansas State University (1974) and is a Registered Professional Engineer. Since 1982 he has been employed by the Wolf Creek Nuclear Operating Corporation. Previous employment was with Sauder Custom Fabrication (1979–1982) and Fluor Engineers and Constructors (1974–1979).

As a nuclear utility employee, he has primarily been involved in implementation of ASME's Boiler & Pressure Vessel Code Section III and Section XI during construction and operation activities. Previous non-nuclear experience involved Section VIII pressure vessel and heat exchanger design and construction. At present, as a Principal Engineer, Mr. Gimple provides company wide assistance in the use of ASME Codes, with emphasis on Section III and Section XI.

Mr. Gimple has been active in the Codes and Standards development process since 1984. Mr. Gimple was the 2005 recipient of the ASME Bernard F. Langer Nuclear Codes and Standards Award. He is currently a member of the B&PV Standards Committee (since 2000), the Subcommittee on Inservice Inspection of Nuclear Power Plant Components (since 1994, serving 5 years as Chairman of Subcommittee XI during 2000–2004), the Section XI Executive Committee (since 1992), and the Subgroup on Repair/Replacement Activities (since 1987, serving as Chairman for 7 of those years). Past Codes and Standards participation included 6 years on the Board on Nuclear Codes and Standards and memberships on the Subcommittee on Nuclear Accreditation, Subgroup on Design (in Section III), and three Section XI Working Groups.

GORMAN, JEFFREY A.

Jeff Gorman has been working on materials issues related to nuclear power since 1959, when he was assigned to Naval Reactors. He studied civil engineering at Cornell before working for Naval Reactors. After leaving the Navy, he did graduate work in engineering science, with emphasis on materials science, at CalTech. Since 1968 he has worked as a consulting engineer in the civilian nuclear power program, with most of his work involving materials, corrosion, stress analysis and fracture mechanics.

In 1980, Dr. Gorman was a co-founder of Dominion Engineering, Inc., and is still actively working for the company. A significant part of his consulting work has been for EPRI. His work for EPRI has included preparation of many workshop proceedings involving PWR steam generator technology, preparation of topical reports on materials and corrosion issues, and assisting in revision of water chemistry guidelines. He has also worked extensively for utilities and other industrial organizations on materials and corrosion issues, such as evaluation of the causes of failures of pressure vessels and piping, and developing predictions of the probable rate of failure of PWR steam generator tubes. Dr. Gorman is a registered professional engineer and is a member of AMS, NACE and ANS.

GOSSELIN, STEPHEN R. (STEVE)

Steve Gosselin is a Senior Principal Consultant at Scandpower Risk Management (SRM) with over 30 years nuclear power industry experience. Prior to joining the SRM team in 2008, Mr. Gosselin was Chief Engineer in the Pacific Northwest National Laboratory (PNNL) Materials and Engineering Mechanics Group (1998–2008) and a Project Manager at Electric Power Research Institute (EPRI) from 1993–1998. His work has focused primarily on fitness-for-service, structural integrity, safety, and reliability of pressure vessels and piping components. He has made significant contributions in the areas of fatigue analyses and flaw tolerance methodologies for nuclear pressure vessel and piping components, environmental fatigue computational methods, fatigue crack flaw detection probability, on-line fatigue monitoring, and the development of risk-informed inservice inspection and reliability integrity management programs for nuclear power plant vessel and piping components.

Mr. Gosselin's computational expertise is complemented by over 13 years experience in system engineering and mechanical design analyses at Westinghouse and Combustion Engineering PWR commercial nuclear power plants and 8 years operating experience on U.S. Navy SIC, S5W, and S3G submarine nuclear power plant designs.

Mr. Gosselin is an ASME Fellow (2009) and is a member of the ASME Section XI Working Group on Operating Plant Criteria, ASME Section XI Special Working Group on High Temperature Gas Cooled Reactors, and the ASME Committee on Nuclear Risk Management (CNRM) Subcommittee on Applications. His work has resulted in improved Code rules for operating nuclear power plant piping and vessel component fitness-for-service (ASME Section XI Non-mandatory Appendices E and L) and risk-informed inservice inspection (Code Case N-578).

Mr. Gosselin has a B.S. degree in Mechanical Engineering from the California State Polytechnic University (1980) and a M.S. degree in Mechanical Engineering from the University of North Carolina at Charlotte (1998). He is a registered professional engineer in California. Mr. Gosselin has published 45 papers, articles, and reports in the open literature and is a consulting expert to the International Atomic Energy Agency (IAEA) in the areas of plant life extension, design reconciliation and risk-informed inservice inspection.

GRABER, HAROLD C.

Harold Graber works as an Independent Consultant. Previously he was with the Babcock Wilcox Company in the Nuclear Equipment Division for 34 years. He was Manager of NDT Operations and Manager of Quality Assurance Engineering. Harold Graber is a Member of ASME for 15 years.

He is an active participant on the B&PV Code, Subcommittee V on Nondestructive Examination. He was Vice Chair Subcommittee V; Chair, Subgroup on Surface Examination. He was Member of Subcommittee V on Nondestructive Examination, Subgroup of

Volumetric Examination, Subgroup on Personnel Qualification and Inquiries.

Harold Graber is a Member, American Society for Testing Materials (ASTM) for 26 years. He was Chairman, Subcommittee E7.01 on Radiology. His Committee memberships include Committee E-7 on Nondestructive Examination, Subcommittee E7.02—Reference Radiological Images, Subcommittee E7.06–Ultrasonic Method. He is a Member, American Society for Nondestructive Testing (ASNT). He is a Past Chair, Cleveland, Ohio Section—1971.

Harold Graber is the recipient of ASTM Merit Fellow Award (1992); ASTM Committee E-7—C.W Briggs Award (1989); ASNT Fellow Award (1978). His Certifications include ASNT; Level III certificates in Radiography, Ultrasonic, Liquid Penetrant and Magnetic Particle Methods.

GRANDMANGE, JEAN-MARIE

After graduating in 1972 from the Applied Physics Department of the Institut National Des Science Appliquées in Lyon (France), Jean-Marie Grandemange was a research engineer at the Ecole des Mines research laboratory in Paris, where for three years he worked in the field of fractures mechanics.

He joined the Framatome Group in 1976, working initially in the Safety Dept. on the safety of mechanical components (design assumptions and criteria). He then moved on to the Primary Components Division, working in the Materials and Technology Dept., where he was in charge of the "Design" section from 1981 to 1997, and later Assistant to the head of department. He was named Senior Consultant in 1996.

Since 1978 he has led the Editorial Group in charge of writing the RCC-M design rules. He became a member of the RCC-M Sub-Committee in 1984 and was appointed Chairman of the committee in 1989. Since 1989 he has been responsible for Framatome's contribution to the preparatory work for the construction joint rules for use in the EPR project.

He led the Framatome Structural Analysis Group during the period 1989–1995, representing the company in the Cetim Boilerwork Commission, the RSE-M sub-committee responsible for in-service component inspection rules, and the Working Group on Codes and Standards (WGCS) organized by the European Commission.

Since 1986, he has been the manufacturer's designated expert both to the CCAP (French Central Commission for Pressure-Retaining Equipment) and its Permanent Nuclear Section (SPN) in charge of regulatory text discussion and application. He has lectured in several courses organized by Framatome, EDF, various French Institutes and run seminars in South Korea, Taiwan and China.

GRIESBACH, TIMOTHY J.

Timothy J. Griesbach earned a B.S. in 1972 and M.S. in 1974 in Metallurgy and Materials Science from Case Western Reserve University in Cleveland, Ohio. He is currently an Associate with Structural Integrity Associates (SI) in San Jose, California. Before joining Structural Integrity Associates, Mr. Griesbach was the Director of Technical Services for ATI Consulting. Mr. Griesbach was a Project Manager with the Electric Power Research Institute (EPRI) from 1982 to 1993 where he managed programs on reactor vessel integrity, research on neutron irradiation embrittlement, vessel material toughness properties, fracture mechanics methods, and management of reactor vessel integrity issues including pressurized thermal shock. From 1977 to 1982 he was a Principal Engineer at Combustion Engineering responsible for evaluating the response of nuclear systems and components to severe loading conditions using advanced finite element techniques. From 1974 to 1977 Mr. Griesbach was a Materials Engineer with Pratt & Whitney Aircraft where he was a member of a select research team developing a unique process to produce diffusion bonded jet turbine blades.

Mr. Griesbach is a member of ASME and the American Nuclear Society, and he has been a member of Section XI since 1989. He is chairman of the Working Group on Operating Criteria whose charter is to develop and maintain the Code criteria for operating pressure vs. temperature limits, operating plant fatigue assessment, and related operating plant issues. He is also a member of the Working Group on Flaw Evaluation and Subgroup on Evaluation Standards.

Mr. Griesbach specializes in evaluation of aging degradation mechanisms for nuclear components, including developing databases and modeling predictions on irradiated materials behavior. He has taught courses on managing the integrity of reactor pressure vessels for extended vessel life, and he has written numerous technical papers on these topics.

GRIFFIN, DONALD S.

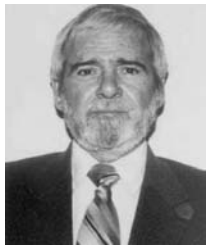
Dr. Don Griffin has 30 years of experience in the structural design, development, and evaluation of nuclear reactor systems. At Westinghouse he developed computer-oriented methods of analysis, structural design criteria, and design procedures for naval, PWR, and fast breeder reactors. He has directed structural analysis of static and dynamic systems including effects of fatigue, fracture, thermal shock, seismic, fluid-solid interactions, and non linear and creep response of materials. He has personal expertise in buckling and instability, inelastic analysis, and elevated-temperature structural design. Current ASME Boiler and Pressure Vessel Code activities include development of design limits for high-temperature and creep buckling, and participation in the Subgroup for Elevated-Temperature Design. Responsible for presentation and resolution of elevated-temperature structural design issues raised during NRC licensing review of CRBRP.

Key relevant experience of Dr. Griffin includes Support of integrity evaluation of the CRBRP Containment Vessel during NRC licensing review; Responsibility for evaluation of Hanford N Reactor pressure tube integrity and pressure tube rupture propagation; Provided structures, seismic, and materials input to the Westinghouse Independent Safety Review of Savannah River Production Reactors; and In-depth review of the Loss of Coolant Accident Design Basis for the Savannah River Production Reactors – Leak Before Break Report.

Dr. Griffin is a Fellow of ASME, past Associate Editor of the Journal of Applied Mechanics, past Chairman of the ASME Pressure Vessel and Piping Division, a recipient of the ASME PVP Medal, and author of 26 publications in applied mechanics,

computer methods, and elevated-temperature design. He has been an active contributor to the ASME Boiler and Pressure Vessel Code, Section III, Subsection NH for elevated-temperature nuclear applications. Griffin earned his BME, Cornell University (1952), MS (1953) and PhD (1959), at Stanford University.

HAFNER, RONALD S.



Ronald S. Hafner has more than 40 years experience in a variety of disciplines ranging from radar systems and nuclear instrumentation, to non-destructive testing using gamma-ray sources and electronic devices, to nuclear reactor- and tritium facility-operations, to regulatory issues associated with Department of Energy facilities and the transportation, storage, and disposal of radioactive materials. After a seven-and-a-half year enlistment in the U.S. Air Force, he went to work at Sandia National Laboratories, in Livermore, CA, in 1974, where he specialized in tritium operations and tritium health physics. While at Sandia, he went back to school and received his Bachelor of Science Degree from California State University, Hayward, CA, in 1983, with a major in Physical Sciences and a minor in Physics. In 1987, he moved to Lawrence Livermore National Laboratory where, for the first four years, he worked in tritium operations and tritium facility management. In 1991, he moved to the Mechanical Engineering Division, where he has been part of an engineering consulting organization.

His ASME activities started in 1993, with the Operations, Applications, and Components Committee of the PVP Division. Since that time, he has been involved with the development of more than 90 PVPD Conference sessions on the Transportation, Storage, and Disposal of radioactive materials. He is currently a member of the Executive Committee of ASME's Pressure Vessels & Piping Division.

HALLEY, GEOFFREY M.

Geoffrey M Halley, P.E. holds degrees in Electrical Engineering, Mechanical Engineering, and Engineering Administration (Masters). He is a Registered Professional Engineer in Illinois. From 1993 to the present he is the President of Sji Consultants, Inc., a technical consulting company, providing services to the boiler industry in the areas of product design, development, trouble shooting and forensic investigation/expert witness work. He has 40 years of boiler industry experience, ranging from research/product development, design and applications/installation., primarily in the institutional and industrial segments of the marketplace. He held various positions at Kewanee Boiler Corporation from 1968 to 1986, initially as Supervisor of Research and Development, and as Vice President – Technical Director from 1979 onwards. From 1986 through 1992 he was president of Halcam Associates a Mechanical Contracting Company specializing in commercial, institutional and industrial design/build/service and repair of boiler and HVAC systems. From 1959 through 1968 he was employed in the Aerospace and the Nuclear Engineering industries.

Geoffrey Halley was Chair of ABMA Joint Technical Committee (1981–1986), and has been a member of several boiler industry advisory groups to the USEPA and USDOE. He currently is ABMA Director of Technical Affairs, and was Editor of ABMA Packaged Boiler Engineering Manual. He has been an Instructor at boiler industry technician training schools offered by ABMA/NBBI, and boiler manufacturers. He has authored a number of papers on boiler related topics, published in The National Board Bulletin, Boiler Systems Engineering, and Maintenance Management.

Geoffrey Halley currently is a member of the ASME CSD-1 Committee, and the National Board Inspection Code Sub-committee on Installation.

HANMORE, PETER

Peter has worked within the engineering inspection industry since 1972. After joining Commercial Union Assurance Company as a metallurgist in the engineering laboratory he moved into the New Construction Department in 1984 and has been continuously associated with inspection during the manufacture of many types of work equipment. Although qualified as a metallurgist he has been involved in many related aspects of work equipment. He is an Authorized Inspector Supervisor for the provision of ASME Code services and maintains close links with that organization. Peter is currently a member at Large of the Board of Directors of Codes and Standards. His career within the inspection industry is extremely varied and includes experience such as; Health and Safety Manager, Quality Manager as well Project Manager for the obtaining notification and subsequent implementation of services associated with the Machinery, Lift and Pressure Equipment Directives.

Peter Hanmore has been associated with the Pressure Equipment Directive for many years even before its publication and represents the UK Inspection Bodies on many national and European Committees. Peter represents Bureau Veritas (Notified Body) at the European and UK Conformity Assessment Body Forums for both machinery and pressure equipment. He is a Past-Chairman of the European Conformity Assessment Body Forum (CABF), for pressure equipment and currently Chairman of the UK Notified Body Forum for machinery. During his period as Chairman of the CABF he represented the notified bodies at member states working group meetings; Working Group Pressure, Working Party Guidelines and Working Party Materials, and is still an active member of the latter.

Peter has provided numerous training courses on European Directives and related topics throughout the world for various organisations, e.g. ASME, IMechE, BSI, JSME, European Commission as well as many workshops tailored to individual manufacturers/users requirements.

HASEGAWA, KUNIO

Dr. Kunio Hasegawa graduated from Tohoku University with a Doctor of Engineering degree in 1973. He joined Hitachi Research Laboratory, Hitachi Ltd., over 30 years back. During his term at Hitachi, he was also visiting professors of Yokohama National University and Kanazawa University for several years. Since 2006, Dr. Hasegawa serves as a principal staff in Japan Nuclear Energy Safety Organization (JNES).

Dr. Kunio Hasegawa is a member of Japan Society of Mechanical Engineers (JSME), and is a past member of the JSME Fitness-for-Service Committee for nuclear facilities. He is also a member of ASME and is involved in ASME Boiler and Pressure Vessel Code Section XI Working Group, Subgroup and Subcommittee activities. He has been active for three years as a Technical Program Representative of Codes and Standards Technical Committee in ASME PVP Division.

He has been involved with structural integrity for nuclear power components, particularly, leak-before-break, fracture and fatigue strengths for pipes with cracks and wall thinning, and flaw characterizations for fitness-for-service procedures. Dr, Hasegawa has published for over 100 technical papers in journals and conference proceedings.

HECHMER, JOHN

Mr. John Hechmer has a degree in I Mechanical Engineering from the University I of Notre Dame (1957). He joined the I Babcock & Wilcox Co. (now owned by I McDermott, Inc.) for design and analysis I work for pressure vessels. His work was I primarily for the power generation and I defense industries. His experience included project and engineering management, technology development, and management. His Power Generation products were for both BWR and PWR nuclear electric plants. Defense Industries work addressed Class 1 pressure vessels for the nuclear navy program, primarily nuclear reactors and steam generators for aircraft carriers and submarines. Research products included Breeder Reactor Program, Sodium-steam Generator, Molten Salt Steam Generator. Technology Development was spent in developing tools and procedures for design-analysis interfacing with the Research Center and Engineering Fabrication of Babcock & Wilcox Co. This was enhanced by many years of participation in ASME B&PV Committees, PVRC, and PV&P Conferences. These engineering efforts occurred for 40 years.

Mr. John Hechmer has more than 25 publications, addressing primary and secondary stress evaluation, stress intensity factors, finite element methods and its applications, brittle fracture, welding capability for fatigue, and material's characteristic, examples of this are PVRC Bulletins #429 (3D Stress Criteria Guidelines For Application) and #432 (Fatigue-Strength-Reduction Factors for Welds Based on NDE).

HEDDEN, OWEN F.

Owen F. Hedden retired from ABB Combustion Engineering in 1994 after over 25 years of ASME B&PV Committee activities with company support. His responsibilities included reactor vessel specifications, safety codes and standards, and interpretation of the B&PV Code and other industry standards. He Continued working part-time for that organization into 2002. Subsequently, he has been a part-time consultant to the ITER project and several other organizations. Prior to joining ABB he was with Foster Wheeler Corporation (1956–1967), Naval Nuclear program. Since 1968 Mr. Hedden has been active in the Section XI Code Committee, Secretary (1976–1978), Chair (1991–2000). In addition to Section XI, Owen has been a member of the ASME C&S Board on Nuclear Codes and Standards, the Boiler and Pressure Vessel Committee, and B&PV Subcommittees on Power Boilers, Design, and Nondestructive Examination. He is active in ASME's PVP Division. Mr Hedden was the first Chair of the NDE Engineering Division 1982–1984. He has presented ASME Code short courses in the US and overseas. He was educated at Antioch College and Massachusetts Institute of Technology.

His publications are in the ASME Journal of Pressure Vessel Technology, WRC Bulletins and in the Proceedings of ASME PVP, ICONE, IIW, ASM, and SPIE. He is an ASME Fellow (1985), received the Dedicated Service Award (1991), and the ASME Bernard F. Langer Nuclear Codes and Standards Award in 1994.

HENRY, PHILIP A.

Mr. Henry, Principal Engineer for the Equity Engineering Group in Shaker Heights, Ohio, is a specialist in the design, installation, sizing and selection of pressure relief devices and relieving systems. He is currently chairman of the API Pressure Relieving System Subcommittee's Task Force on RP 520 related to the design and installation of pressure relieving systems. He conducts audits of pressure relieving systems to ensure compliance with OSHA PSM legislation and ASME, API and DIERs standards, codes and publications. He also teaches the official *API Pressure Relieving Systems* course.

Mr. Henry is actively involved in the development of technology for the API Risk-Based Inspection (RBI) methodology. He is co-author of the re-write of API 581, *Risked-Based Inspection Base Resource Document* and is responsible for the development and implementation of Risk-Based Inspection programs for pressure relief valves and heat exchanger bundles at refining and petrochemical plants. He also teaches the official *API 580/581 Risk-Based Inspection* course.

Mr. Henry provides technical support and engineering consulting to all levels of refinery capital projects. He has been responsible for the preparation of purchase specifications, bid tabulations, design reviews and the development and validation of approved vendors lists. He conducts project safety reviews for construction and pre-startup phases of major capital projects. His responsibilities include developing and maintaining engineering specifications in the pressure relief and heat transfer areas and providing overall coordination.

Mr. Henry is a registered Professional Engineer in the States of Ohio and Texas.

HILL III, RALPH S.

Ralph S. Hill III is a Consulting Engineer with Westinghouse Electric Company in Pittsburgh, PA. He has over 30 years of technical and management experience including more than eighteen years in planning, engineering design, construction, and modification for the nuclear power industry and fourteen years providing

strategic planning, system engineering, risk management, process evaluation, and project management consulting services to the U.S. Department of Energy in spent nuclear fuel, radioactive waste management, and nuclear materials disposition-related projects.

Mr. Hill is a Member of the ASME Board on Nuclear Codes and Standards where he serves as Chairman of the Risk Management Task Group. Mr. Hill is actively involved in bringing risk-informed probabilistic design methods into the ASME Code and initiatives to support both advanced and next-generation nuclear reactors.

HSU, KAIHWA ROBERT

Kaihwa Robert Hsu earned a B.S. in Civil Engineering from Chung Yuan Christian College, and an M.S. from University of South Carolina. He has thirty years experience applying engineering principles, developing computer codes of corrosion erosion monitoring system, fatigue cycle monitoring system, fatigue crack growth, and fracture mechanics evaluation for nuclear industry. From 1981 until 2003, he worked in Westinghouse and has been involved in the areas of stress analysis, fatigue, fracture mechanics, leak before break, residual stress, primary water stress corrosion crack, and ASME Code related analyses pertaining to PWR. Mr. Hsu is currently a senior engineer with U.S. Nuclear Regulatory Commission (NRC). He is a key member in the development of the review and audit process improvement for aging management reviews. He is an audit team leader for license renewal application, responsible for metal fatigue time-limited aging analyses (TLAA) and aging management programs (AMPs) audit and review.

Publications of Kaihwa Robert Hsu are in the Proceedings of ASME Pressure Vessels and Piping Conference, the Proceedings of 10th Environmental Degradation Conference, and the Proceedings of 8th International Conference of Nuclear Engineering.

HOLLINGER, GREG L.

Greg L. Hollinger is a Senior Principal Engineer for BWX Technologies, Inc. in Barberton, Ohio. He has responsibility for Mechanical/Structural Technology Applications and Design Analysis of Navy Nuclear Pressure Vessel Components and use of the ASME Boiler & Pressure Vessel Code. He chairs the Engineering Department's Technical Support Team responsible for developing technology procedures. He is involved with both nuclear and non-nuclear ASME Certificates of Authorization for BWXT's Nuclear Equipment Division.

Greg is a Fellow Member of ASME, and was the 2004 recipient of the ASME Pressure Vessels and Piping Medal. He is the Chairman of the Subgroup on Design Analysis of the Subcommittee on Design of the ASME Boiler and Pressure Vessel Code. Greg is a member of the Pressure Vessel Research Council (PVRC) and the International Council on Pressure Vessel Technology (ICPVT). He has served on several Boards within the ASME Council on Codes and Standards, and he served as Chair of the ASME Pressure Vessels and Piping Division in 1995.

Greg is an Registered Professional Engineer (Ohio) with 30 years of engineering practice in power-related industries.

HUNT, STEPHEN

Since receiving his BSME from Purdue University in 1995, Steve Hunt has been involved in equipment design, stress analysis and root cause failure analysis of mechanical equipment primarily for the commercial nuclear power and offshore oil industries. This work has included commercial and research nuclear power plants, fossil power plants, floating and fixed offshore oil/gas production facilities, deep diving submersibles, large optical telescopes, tower cranes, paper mills, and chemical plants.

In 1980, Steve Hunt was a co-founder of Dominion Engineering, Inc., and he is currently a Principal Officer. A significant part of Mr. Hunt's recent consulting work has been for the Electric Power Research Institute (EPRI). Major areas of effort have included primary water stress corrosion cracking (PWSCC) of Alloy 600 material, boric acid corrosion, leakage reduction technology, and life cycle management. Publications for EPRI have included many documents related to Alloy 600 PWSCC, the *Boric Acid Corrosion Guidebook*, and most of the Sealing Technology and Plant Leakage Reduction Series reports. Mr. Hunt also works extensively for electric utilities in the areas of Alloy 600 PWSCC failure analysis and strategic planning, life cycle management, and root cause failure analysis. Mr. Hunt also provides technical consulting in the areas of offshore oil production facilities, high pressure sealing technology, large diameter bearings, and pressure vessel failure analysis. Mr. Hunt has authored several hundred reports for a wide range of clients and holds several patents. Mr. Hunt is a registered professional engineer and is a member of ASME and IEEE.

ISOMURA, TOSHIO

Toshio Isomura is a mechanical engineer with over 30 years of experience in all of the aspects of pressure vessels for petro and petrochemical plants. After graduating from Mechanical Engineering of Osaka University in 1972, he joined Chiyoda Chemical Engineering and Construction Co. Ltd, and was engaged in the design and development works of pressure vessels.

He started his new career in the High Pressure Gas Safety Institute of Japan at their Inspection and Certification Department in 2000, and is a manager of technical assessment division from 2006 succeeding Mr. Kajimura. At present, his main work is technical assessments of the technologies of non-standard pressure vessels for the special appraisal under the High Pressure Gas Safety Laws and the standardization tasks for technologies of pressure vessel designs, including Fitness-for-Service code.

He is also a member of the JIS (Japanese Industrial Standards) Pressure Vessels Technical Committee and contributes to the maintenance of existing JIS codes and development of new JIS codes.

He has also been involved with ISO/TC11 activities and Japanese committees and is the secretary of ISO/TC11/WG10 since 2006

JETTER, ROBERT I.

Mr. Jetter has over 40 years experience in the design and structural evaluation of nuclear components and systems for elevated temperature service where the effects of creep are significant. He was a contributor to the original ASME Code Cases eventually leading to Subsection NH. For over 20 years he was Chair of the Subgroup on Elevated Temperature Design responsible for the design criteria for elevated temperature nuclear components. He was Chair of the Subgroup on Elevated Temperature Construction, Vice Chairman of the Subcommittee on Design and a member of the Subcommittee on Nuclear Power. He currently again chairs the SG-ETD. Mr. Jetter has participated in domestic and international symposia on the elevated temperature design criteria. He was a member of a Department of Energy (DOE) steering committee responsible for the design criteria, and was a consultant and reviewer on various DOE projects. As a long time employee of Rockwell International/Atomics International, he was associated from the early sodium cooled reactors and space power plants through all the US LMFBR programs.

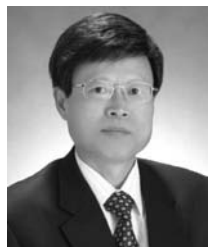
Recently he was an International Fellow for the Power Reactor and Nuclear Fuel Development Corporation at the Monju Fast Breeder Reactor site in Japan. He is a graduate in Mechanical Engineering from Cal Tech (BS) and Stanford (MS) and has a degree from UCLA in Executive Management. He is a fellow of the ASME.

JONES, DAVID P.

Dr. Jones has 40 years experience in structural design analysis and is lead consultant and developer on structural design procedures for SDB-63 (Structural Design Basis, Bureau of Ships, Navy Dept., Washington, D.C.). Dr. Jones is an expert on brittle fracture, fatigue crack growth, fatigue crack initiation, elastic and elastic-plastic finite element methods, elastic and elastic-plastic perforated plate methods, limit load technology, linear and non-linear computational methods and computer applications for structural mechanics. Dr. Jones's key contributions have been developing computer programs that allow use of complex three-dimensional finite element stress and strain results for the evaluation of ASME structural design stress limits. He introduced numerical methods to compute fatigue usage factors, fatigue crack growth, brittle fracture design margins and the like that have now become standards for use in naval nuclear design. He is currently working on using finite element elastic-plastic analysis tools for evaluation of limit load, fatigue, shakedown, and ratchet failure modes.

Dr. Jones has been an active contributor to the ASME Boiler and Pressure Vessel Code Committees; secretary and member of Subgroup on Fatigue strength, Member and chairman of the Subgroup on Design Analysis, Chairman of the Subcommittee on Design, and Chairman of the Task Force on Elastic-Plastic FEA. Dr. Jones was Chairman of Metal Properties Council Task Force on Fatigue Crack Growth Technology. He has also served as Associate Editor of the ASME *Journal of Pressure Vessels and Piping*. He has published over thirty papers on the topics of fatigue, fatigue crack growth, fracture mechanics, perforated plate technology, computational structural mechanics methods, non-linear structural analysis methods, finite element code development for fracture mechanics applications, finite element applications for perforated plate analysis (elastic and elastic-plastic), post-processing finite element results for ASME Boiler and Pressure Vessel Code Section III assessment, limit load technology, and elastic-plastic fracture mechanics. He has been awarded ASME PVP Literature Award – Outstanding Survey Paper of 1992 in ASME *Journal of Pressure Vessels and Piping* and ASME PVPD Conference Award – Outstanding Technical Paper form Codes & Standards – July 26, 2000. Dr. Jones received his BS and MS degrees from the University of Toledo in 1967 and 1968 and his PhD from Carnegie Mellon University in 1972. Dr. Jones is a member of ASME and has worked at the Bettis Atomic Power Laboratory in West Mifflin, Pennsylvania since 1968 where he currently holds the position of Consultant Engineer.

JO, JONG CHULL



Dr. Jong Chull Jo is a mechanical engineer who graduated from Hanyang University, Seoul, Korea in 1979, and obtained his M.S. and Ph. D. degrees from the same university in 1981 and 1985, respectively. Currently, he is a technical consultant of the Organisation for Economic Cooperation and Development (OECD), Nuclear Energy Agency in the area of Nuclear Safety and Regulation and concurrently is affiliated as a principal researcher with the Korea Institute of Nuclear Safety (KINS) Daejon, Korea for which he has been working since 1986. Before that, he worked as a full-time lecturer and subsequently an Assistant Professor of Mechanical Engineering Department at Induk College, Seoul for 5 years.

Dr. Jo's job for over the past two decades relates to the safety regulation of nuclear reactors including safety inspection and licensing review, preparing regulatory requirements and guides, and developing nuclear regulatory technology.

Dr. Jo was Head of Safety Issue Research Department at KINS and concurrently Project Manager of the Regulatory Framework Development for an Integral–Type Pressurized Water Reactor Licensing. He served as a member of the Korean National Technology Road Map Committee and a member of the National R&D Projects Evaluation Committee. He lectured extensively on the technologies for evaluation and resolution of nuclear reactor safety issues at National Research Institutions, Academic Conferences, Engineering Companies and Universities in Korea, and served as a lecturer from 2003–2005 at the Graduate School of Jeonju University, Korea.

Dr. Jo has been a member of the ASME Pressure Vessels and Piping Division (PVPD) since 1999 and has been serving as Chair of the PVPD Fluid-Structure Interaction Technical Committee since July of 2008. He has also been serving as Chair of the Fluid-Structure Interaction Division of the Korean Society of Pressure Vessels and Piping since 2004. He has been a member of the Korean Society of Mechanical Engineers since 1981, a member of the Korean Nuclear Society since 1986, and a member of the Korea Foundation of Science and Technology since 2003. He has published about 50 technical journal papers and over 100 conference proceeding papers. He has also co-authored or co-edited many monographs and books. He has been invited as a peer reviewer of

contributing papers for several archival journals such as ASME Journal of Pressure Vessel Technology, Journal of Numerical Heat Transfer, Journal of Numerical Heat and Mass Transfer, Journal of Nuclear Engineering and Design.

Dr. Jo received 'Korean Prime Ministerial Citation' for recognizing contribution to the promotion of science and technology in 1994 and 'Korean Presidential Citation' for contribution to development of science and technology in 2004.

KAJIMURA, YOSHINORI

Yoshinori Kajimura has a Mechanical Engineering B.S. (1966) from Hiroshima University. He has more than 30 years of experience in the design of all kinds of pressure vessels including multi-layered pressure vessels for oil refinery, petrochemical industries and so on for Mitsubishi Heavy Industries, Hiroshima Works as a manager of design.

He began his career in The High Pressure Gas Safety Institutes of Japan (called KHK) at their Inspection and Certification Department in 1995. He responsible as the manager of technical assessment and special appraisal for the pressure vessels under the High Pressure Gas Safety Law and their regulations.

He also has been an active member of the committee of JIS (Japanese Industrials Standards) for pressure vessels since 1990 and also contributes to the development and restructuring of the standards for pressure vessels in Japan.

He has also been involved in ISO/TC11 activities and Japanese committee since 1997 at the restart of ISO/TC11 activities and he began to be the secretariat of ISO/TCI11/WG10 since 2003.

KANEDA, MASAHIKO

Masahiko Kaneda is Senior Vice President of Mitsubishi Nuclear Energy Systems, Inc. He has more than thirty years of experience in development and management of nuclear power plant design in Japan. Mr. Kaneda received a B.S. in Mechanical Engineering from Seikei Univ. in Tokyo, Japan in 1978. From September 2006 to March 2008, he was employed by MHI in Tokyo, Japan as the General Manager of Advanced Pressurized Water Reactor Promoting Department, Nuclear Energy Systems Headquarters. He directed all aspects of the APWR Promoting Department's operations to control activities such as Design Certification of US-APWR, Luminant Project and Potential Customer Engineering. From October 2005 to August 2006, he was employed by MHI in Hyogo, Japan as the General Manager of the Water Reactor Engineering Department, Nuclear Energy Systems Engineering Center, Nuclear Energy Systems Headquarters.

Under the direction of Mr. Kaneda, The Water Reactor Engineering Department got involved in the conceptual and basic design of the entire nuclear power plant facility, and consisted of various sections specialized in the system design, layout design, structural and seismic design, electrical design, instrumentation and control design, turbine system design, and water reactor engineering. In this position, Mr. Kaneda directed the entire operations of the Water Reactor Engineering Department and he established the department's annual operational goals, and planned the budget and resources needed for the achievement of annual operation goals.

Thus, Mr. Masahiko Kaneda has nearly three decades of experience related to plant design for nuclear power plants such as Japanese prototype FBR, Monju and many commercial PWRs in Japan. He is not only a specialist for plant layout design but seismic design as well. Currently, as the General Manager of APWR Promoting Department, Nuclear Energy Systems Headquarters in Mitsubishi Heavy Industries, LTD Japan, he is responsible for the promotion of US-APWR.

KARASAWA, TOSHIKI

The late Toshiki Karasawa graduated with honors form Yamanashi University with a B.E in Mechanical Engineering in 1973. Since graduating, his career had focused on nuclear power technology in Tokyo Electric Power Company (TEPCO). He had more than 30 years of broad experience in Design, Manufacturing, Inspection, Quality Assurance (QA) and Nuclear Fuel. He was the general manager of QA of Nuclear Division at the time of his passing away in March 2008.

During 1980's, Mr. Karasawa demonstrated excellent leadership to introduce ASME Boiler and Pressure Code Sec. III to METI (Ministry on Economy, trade and Industry) Notification No.501, which regulated the detail design and manufacturing of equipment for nuclear power plant in Japan. Following that, he had been contributing to develop Codes and Standards (C&S) in Japan and ASME.

Mr. Karasawa was a member of ASME, a Member-at-large of Board on International Standards (BIS) of CCS, since 1997. His report entitled "ASME Success Story in Japan" was favorably received at BIS meeting in June 2003.

Mr. Karasawa was a member of Japan Society of Mechanical Engineers (JSME) and serves as a Secretary of C&S Main Committee since 2001. He was a member of Nuclear C&S Main Committee of Japan Electric Association (JEA) and he served as Vice Chair of QA committee and Chair QA Sub-committee. He was a member of Structural Design Sub-committee in Thermal and Nuclear Power Engineering Society (TENPES). He was a member of The Japan Welding Engineering Society (JWES) and served as Secretary of Codes and Accreditation Committee since 2001. He was an Executive member of Atomic Energy Society of Japan (AESJ) since 1999 up untill his passing away.

Mr. Karasawa resided in Yokohama City Kanagawa Prefecture, with his wife, Chiharu, and two daughters, Mayumi and Hanae.

KARCHER, GUIDO G.

Guido G. Karcher, P.E. is a consulting engineer with over 48 years of experience in the mechanical engineering aspects of pressure containing equipment. He retired from the Exxon Research and Engineering Co. after serving 30 years as an internationally recognized engineering advisor on pressure vessel, heat exchangers, piping and tankage

design, construction and maintenance. On retire from Exxon Research & Engineering Co. in 1994; he became a Consulting Engineer on fixed equipment for the petrochemical industry and related industry codes and standards. Guido has also functioned as the Technical Director of the Pressure Vessel Manufactures Association, for 15 years, in the areas of mass produced pressure vessel construction and inspection requirements.

Guido's code activities include over 35 years of participation in ASME, PVRC and API Codes and Standards activities serving on numerous committees and technical development task groups. He was elected to the position of Chairman of the ASME Boiler & Pressure Vessel Standards Committee for two terms of office (2001–2007) and was elected to the office of Vice President Pressure Technology Codes and Standards (2005–2008). Guido also served as Chairman of the Pressure Vessel Research Council and the American Petroleum Institute Subcommittee on Pressure Vessels and Tanks. He has written numerous technical papers on subjects related to pressure containing equipment.

Guido is an ASME Life Fellow and a recipient of the J. Hall Taylor Medal for outstanding contributions in the development of ASME Pressure Technology Codes and Standards. Guido was also recently awarded the 2007 Melvin R. Green Codes and Standards Medal for outstanding contributions to the development and promulgation of ASME Codes and Standards within the USA and Internationally. Other awards include the API Resolution of Appreciation and Honorary Emeritus Membership of Pressure Vessel Research Council. He earned a B.S.M.E. from Pratt Institute and M.S.M.E. from Rensselaer Polytechnic Institute and is a registered Professional Engineer in the States of New York and New Jersey.

KOSTAREV, VICTOR V.

Victor V. Kostarev is a Mechanical Engineering (Gas and Steam Turbines) graduate of Saint-Petersburg Polytechnic University, Russia. He earned his Ph.D. degree in 1979 for investigation of self-excited vibration of high speed rotors of supercritical steam turbines.

His professional career includes over 35 years experience in analysis and qualification of structures, systems, piping and components for vibration, operational, seismic loads and design basis accidental loads of nuclear power plants and other facilities in different industries. Dr. Kostarev is a founder of the State Laboratory for seismic and external events protection of SSC in CKTI Institute (1977). Then he established in 1992 a private Structural – Mechanical Engineering Company located in Saint-Petersburg, Russia (www.cvs.spb.su) where he is the president up to date. He is an author of more than 50 papers and 10 inventions.

V.Kostarev is a consultant for International Atomic Energy Agency. He is a member of ASME BPVC Nuclear Section III Subcommittee on Nuclear Power and Section III ASME BPVC Working Group on Piping. Victor Kostarev has been the volunteer ASME corresponding author/representative in Russia.

KOVES, WILLIAM J.

William Koves, Ph.D., P.E., ASME Fellow, is a Senior Engineering Fellow at UOP, a high technology company that develops and licenses process and related equipment technology in the petrochemical, process and related industries.

Dr. Koves has 40 years of experience in the design, analysis and troubleshooting of equipment and structures including aircraft, nuclear reactors, and petrochemical equipment. His specialties include stress analysis, fracture, elevated temperature design, heat transfer, stability, vibration, fatigue, fluid mechanics, and mechanics of granular solids.

Dr. Koves is author of numerous publications in the field and holder of 24 US and 3 European patents. He has been very involved with numerous ASME and PVRC committees including, Past Chair of ASME B31.3 Process Piping Committee, Chair of ASME B31 Mechanical Design Committee, Member of the B31 Standards Committee, Member of ASME Boiler and Pressure Vessel Subcommittee on Design Analysis, Elevated Temperature Design, Special Working Group on Design of Bolted Flange Joints and member of the Post Construction Standards Committee and Subcommittee on Repair.

Dr. Koves was Vice-Chair of the Pressure Vessel Research Council (PVRC), Member of PVRC Committee on Piping and Nozzles, Chair of PVRC Committee on Elevated Temperature Design, Chair of PVRC Subcommittee on Shell Intersections, and Past the Chair of the Post Construction Flaw Evaluation Committee and Member of the Main and Executive Committees.

KRECKEL, DIETER

Dieter Kreckel graduated in 1968 from the FH Bingen, Germany with a Dipl.-Ing. (FH) specializing in mechanical/chemical engineering. Dieter Kreckel started his active profession in 1968 within the Department of Engineering and Lay out, piping and components of the UHDE GmbH Company. The nuclear activities that he started in 1971 continue to this date. He is with AREVA NP GmbH (ex. Framatome ANP GmbH, ex. Siemens NP, and ex. KWU).

Dieter Kreckel's work experience includes Engineering components of BWR and PWR, Co-ordination of equipment specifications, QM- Engineering (ENACE Argentina 1981 to 1985), QM-Engineering in various Projects, International co-operation on Design Codes e.g. for EPR Development (GERMAN/ FRENCH), EU DG TREN, WGCS (Working Group "Codes and Standards").

Dieter Kreckel has immense experience in the field of European Nuclear Code activities that include Collaboration within the French REP 2000 Programme, Comparison of German and French Nuclear Codes and their application as a basis for the joint proposals to the **E**uropean Pressure Water Reactor **T**echnical **C**ode for **M**echanical Equipment (**ETC-M**), Elaboration of ETC-M Class 1 to 3 together with partner Framatome ANP SAS, Review of ETC-M Class 1 to 3 proposal together with German

Utilities and EDF, NPP upgrading of RUSSIAN NPP and compliance of the Russian Code analysis for applying to European Codes and Standards.

Dieter Kreckel organized various Seminars for the implementation of the PED and Harmonized EN Standards to Nuclear Codes in Europe. Since 2003 Dieter Kreckel is assigned and acts as Quality Manager for the Olkiluto 3 Project in Finland.

KUO, PAO-TSIN

Dr. Kuo earned an engineering diploma from Taipei Institute of Technology, a MS from North Dakota State University and a PhD from Rice University. He is a Registered Professional Engineer in the State of Maryland. He has been employed by the U.S. Nuclear Regulatory commission (NRC) since 1975. He held various positions in the NRC during this period.

He is currently the Program Director for the License Renewal and Environmental Impacts Program in the Office of Nuclear Reactor Regulation, responsible for guidance development and licensing activities of the license renewal programme as well as environmental reviews of application for license renewal, licensing amendments and early site permits.

Dr. Kuo is a member of the ASME Section XI Special Working Group on Plant Life Extension and former member of the ASME Section III Working Group of Piping Design as well as Task Group on Dynamic Stress Limits. Currently, he is the chairman of Working Group I, General Long Term Operation Framework, IAEA Extra Budgetary Program on Safety Aspects of Long Term Operation of Water Moderated Reactors.

KUSHWAHA H. S.

Mr. H.S. Kushwaha, M.Tech. (Mechanical Engineering), is Director, Health Safety and Environment Group at Bhabha Atomic Research Centre, Mumbai, India. He joined Reactor Engineering Division, Bhabha Atomic Research Centre (BARC) in 1971. Since then, he has been engaged in R&D activities for Structural Design and Safety Analysis of Indian Heavy Water Reactor program. He contributed significantly in the area of computational Mechanics, Pressure Vessel and Piping Design and Analysis and Leak-Before-Break (LBB) study of high energy piping system. Mr. Kushwaha has been associated with Seismic Design, Analysis and Testing of major components of 540 MW(e) Pressurized Heavy Water Reactor built at Tarapur, Maharashtra.

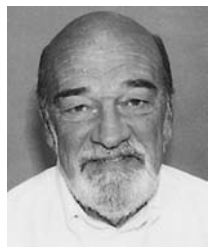
He is currently steering the research activities in the field of structural reliability, radiological risk assessment and uncertainty analysis. Mr. Kushwaha is Chairman of BARC Safety Council and President of Indian Association for Radiation Protection. Mr. Kushwaha is a member of Safety Review Committee for Operating Plants (SARCOP) of Atomic Energy Regulatory Board (AERB). He has published more than 600 technical papers. He is recipient of prestigious Indian Nuclear Society award. He is a Fellow of the National Academy of Engineering.

LAND, JOHN T.

John T. Land, P.E., has been involved in the design, analyses and manufacturing of Westinghouse's PWR nuclear primary equip-ment products for almost thirty years. His product design experience includes reactor internals, steam generators, presurizers, valves, and heat exchangers. Mr. Land also contributed to the design and development of the AP600 and AP1000 MWe Advanced Power Plants, the Westinghouse/Mitsubishi APWR 4500 MWt Reactor Internals, and many of the currently operating Westinghouse PWR domestic and international reactor internals components. In addition, he has directed and reviewed the design and analysis efforts of engineers from Italy (FIAT and ANSALDO), Spain (ENSA), Czech Republic, and Japan (MHI) on several collaborative Westinghouse international efforts. His experience included five years with Westinghouse as a stress analyst on nuclear valves in support of the Navy's Nuclear Reactor Program. Prior to working for Westinghouse, Mr. Land spent eleven years with the General Electric Company on the design and development of Cruise Fan and XV-5A Vertical Take-Off and Landing aircraft propulsion systems. He also holds eleven patents from General Electric, and Westinghouse. Mr. Land received his BS in Mechanical Engineering from Drexel University and his MS in Applied Mechanics from the University of Cincinnati.

Over the past thirty years, John has been active in ASME B&PV Code work. Mr. Land is currently member of the Working Group Core Support Structures and participates in the rule making and maintenance of Sub-Section NG. John is also a member of Sub-Group Design that oversees Section III and Section VIII Design Rules.

LANDERS, DONALD F.



Donald F. Landers, P.E., is currently Chief Engineer of Landers and Associates. He was General Manager and President of Teledyne Engineering Services where he was employed from 1961 to 1999. Mr. Landers, an ASME Fellow, has been involved in ASME Code activities since 1965 serving as a Member of B31.7 and Chairman of their Task Group on Design, Section III Working Group on Piping Design and Subgroup on Design. He continues as a member of these Section III groups as well as Subcommittee III and also served as a member of section XI and the BPVC Standards Committee.

Mr. Landers also served as a member of the Board on Nuclear Codes and Standards and as Vice Chairman. He has served on PVRC committees and was heavily involved in the PVRC research that led to the new seismic design rules in Section III.

He is an internationally recognized expert in piping design and analysis and application of ASME Code and regulatory requirements. Mr. Landers has authored over 20 technical papers related to design and analysis of pressure components.

He is currently involved in providing consulting services to the utility industry in the areas of Life Extension, Code compliance, and Operability issues. Don continues to provide training and seminars on Code Criteria and application internationally. He is recipient of the Bernard F. Langer Award, J. Hall Taylor Award, and ASME Dedicated Service Award.

LEWIS, D. WAYNE

Mr. Donald Wayne Lewis is a Project Engineer for Shaw Stone & Webster Nuclear with over 27 years of experience in commercial nuclear power and Department of Energy (DOE) nuclear related projects. He has worked on a variety of Mechanical/Structural engineering applications including nuclear power system design and construction, MOX fuel assembly design, spent fuel management and related NRC licensing. He has spent 17 years in his primary area of expertise which is related to dry spent nuclear fuel storage and is currently Project Engineer for several Independent Spent Fuel Storage Installation (ISFSI) projects. He has also served as a design reviewer for the DOE Yucca Mountain Project concerning spent fuel processing and disposal.

Mr. Lewis is a Member of the ASME Subgroup on Containment Systems for Spent Fuel and High-Level Waste Transport Packagings. He is the author of two publications related to spent fuel storage which are in the 2003 and 2005 proceedings of the International Conference on Environmental Remediation and Radioactive Waste Management (ICEM) sponsored by ASME.

Mr. Lewis received a B.S. in Civil Engineering from Montana State University in 1980. He is a Registered Professional Engineer in New York, Maine, Iowa, Utah and Colorado.

MAC KAY, JOHN R.

Mr. John Mackay has over 50 years experience as a mechanical engineering specialist in boilers, pressure vessels, steam accumulators, ASME Code construction, Nondestructive examination, heat transfer systems, combustion and municipal incinerator design and construction. John has a Bachelor of Engineering (Mech.), 1951 from McGill University, Montreal and followed it by numerous courses over the years in Management, Management Techniques, and Post-graduate engineering and management courses at Concordia University.

Mr. John Mackay was an employee of Dominion Bridge Company Limited in Montreal from 1951 to 1984 and has since continued to work as a private consultant in his field. His major accomplishments of the hundreds of projects he has been involved include the Primary System Feeder Pipes for the CANDU nuclear reactors, boilers for waste/refuse mass burn disposal systems and design and maintenance of API Storage Tanks. John has extensive experience in the design and construction of heat recovery boilers for the metallurgical industry. John is recognized as one of the leading practitioners of his specialties in Canada.

Mr. John Mackay has been a member of ASME for over 40 years, during which he has served on a variety of committees engaged in updating existing Codes, introduction of new Codes, and the investigation and resolution of questions referred to these committees. He has been a member of Section I Power Boiler Subcommittee since 1968 to present time, Chaired it 1989–2004; Member Standards Committee, 1971–present; Subgroup Electric Boilers (SCI) and chaired it in 1978–84; Member & Chairman Adhoc Task group on Acceptance Criteria. John was a Member and Chair of the Section V Subcommittee on Nondestructive Examination; Joint Task group B31.1/SCI. John is a member of Subgroup on General requirements & Surface Examination (SCV); and is a member of Subgroup on Materials (SCI). John was a member of Honors & Awards Committee (B&PV) from 1989–2006, and chaired in 1995–2006. He was a Member Executive Committee (B&PV Main Committee) from 1992–2004. In addition to ASME John is affiliated with several professional organizations including Engineering Institute of Canada and Quebec Order of Engineers.

John Mackay has several publications and has given lectures on engineering topics both in Canada and USA. John was a participant of several PVP conferences and ASHRAE. He has several hobbies that include Contract Bridge and John is happily married with adult children.

MALEK, M. A.

M. A. Malek is a Professional Engineer (P.E.) registered in the state of Maine, P.Eng. Canada registered in the Province of I New Brunswick and Prince Edward Island. Mohammad is a Certified Plant Engineer, CPE, U.S.A., and has more than 27 years experience in boiler and pressure vessel technology. Presently he is the Chief Boiler Inspector for the state of Florida. Prior to his present position, he was Chief Boiler, Elevator and Tramway Inspector for the state of Maine, Deputy Chief Inspector of state of Louisiana and Chief Boiler Inspector, Bangladesh.

Mr. Malek has demonstrated leadership in B&PV boiler and pressure vessel industry. His achievements include developing and designing a special husk-fired, fire-tube boiler of capacity 500 lbs/hr at 50 psi for developing countries. He has vast knowledge and experience in writing, and enforcing boiler and pressure vessel laws, rules, and regulations. He has written numerous articles and published in several technical journals. Malek obtained his BSME degree from Bangladesh Engineering and Technology, Dhaka (1972) and MBA from Institute of Business Administration, University of Dhaka (1979).

Malek has been a member of ASME since 1980 and Fellow of Institution of Engineers, Bangladesh. He is an instructor of ASME Professional Development courses, and serves on three ASME Committees including CSD-1 Committee, QFO-1 Committee, and Conference Committee of the ASME B&PV Committee. Malek has been a member of the National Board of Boiler and Pressure Vessel Inspectors since 1997.

MASTERSON, ROBERT J.

Masterson has a BSME from University of Rhode Island (1969) and course work for MSME, University of Rhode Island (1973). He is a Registered Professional Engineer in states of RI, MA, IL, NE, MI and AK, and is currently self-employed at RJM Associates in Fall River, MA. Masterson is a retired Captain, U.S. Army Corp of Engineers (1986). His professional experience included New England Electric System (1969–1970), ITT Grinnell Corporation, Pipe Hanger Division, Providence, RI (1972–1979). With ITT Grinnell he was a Manager of Piping and Structural Analysis for the Pipe Hanger Division (1974) and developed stress analysis, and testing for ASME Section III Subsection NF and provided training in Subsection NF for ITT Grinnell, several Utilities, AEs and support for NRC Audit. In 1978 he became Manager Research, Development and Engineering. He was Manager of Engineering (1979) at Engineering Analysis Services, Inc. East Greenwich RI later in 1990 called EAS Energy Services. He was Vice President of Operations (1984) and tasks included NRC audit support, turnkey projects and valve qualification.

Masterson was an alternate member, Working Group on Component Supports (Subsection NF), 1973–1979; Member Subsection NF 1979 to the present. Chaired Task Groups for Subsection NF jurisdiction; Chair of Working Group on Supports (SG-D) (SC III) since May, 2000 and Member of Committee for the First Symposium on Inservice Testing of Pumps and Valves, 1989, Washington, DC, NUREG/CP-0111.

MEHTA, HARDAYAL S.

Dr. Mehta received his B.S. in Mechanical Engineering from Jodhpur University (India), M.S. and Ph.D. from University of California, Berkeley. He was elected an ASME Fellow in 1999 and is a Registered Professional Engineer in the State of California.

Dr. Mehta has been with GE Nuclear Division (now, GE-Hitachi Nuclear Energy) since 1978 and currently holds the position of Chief Consulting Engineer. He has over 35 years of experience in the areas of stress analysis, linear-elastic and elastic-plastic fracture mechanics, residual stress evaluation, and ASME Code related analyses pertaining to BWR components. He has also participated as principal investigator or project-manager for several BWRVIP, BWROG and EPRI sponsored programs at GE, including the Large Diameter Piping Crack Assessment, IHSI, Carbon Steel Environmental Fatigue Rules, RPV Upper Shelf margin Assessment and Shroud Integrity Assessment. He is the author/coauthor of over 40 ASME Journal/Volume papers. Prior to joining GE, he was with Impell Corporation where he directed various piping and structural analyses.

For more than 25 years, Dr. Mehta has been an active member of the Section XI Subgroup on Evaluation Standards and associated working an task groups. He also has been active for many years in ASME's PVP Division as a member of the Material & Fabrication Committee and as conference volume editor and session developer. His professional participation also included several committees of the PVRC, specially the Steering Committee on Cyclic Life and Environmental Effects in Nuclear Applications. He had a key role in the development of environmental fatigue initiation rules that are currently under consideration for adoption by various ASME Code Groups.

MILLER, UREY R.

Mr. Miller is an ASME Fellow and has more than 30 years of experience in the pressure vessel industry. He has participated in ASME Pressure Vessel Code Committee activity for well more than 20 years. He is a Registered Professional Engineer in Indiana and Texas. He is currently a member of the following ASME Boiler and Pressure Vessel Committees:
Boiler and Pressure Vessel Standards Committee
Subcommittee Pressure Vessels—Section VIII
Subgroup Design—Section VIII (Chairman)
Special Working Group for Heat Transfer Equipment (past Chairman)
Special Committee on Interpretations—Section VIII
Subcommittee Design.

Mr. Miller has been the Chief Engineer with the Kellogg Brown & Root Company (KBR), a major international engineering and construction company for the petrochemical industry, since 1992. In this position, he consults on a wide array of subjects including pressure vessesl, heat exchanger, and piping design issues, including application and interpretation of all ASME Code requirements. He has had extensive experience with international projects. He has provided significant engineering support and advice to KBR projects throughout the world. In the role as Chief Engineer, he has traveled extensively providing engineering support for projects in Brazil, Malaysia, Egypt, Algeria, Nigeria, Philippine Islands, South Africa, United Kingdom, Mexico, etc. in addition to a variety of projects in United States. He has experience in refinery, petrochemical, liquefied natural gas, ammonia, phenol, and other types of projects. Previously, he held responsible positions related to process pressure equipment at Union Carbide Corporation and Foster Wheeler Energy Corporation. In addition, he has had over eight years experience in designing pressure vessels for nuclear power generation applications with the Babcock and Wilcox Co. Mr. Miller has a Bachelor's Degree in Mechanical Engineering (cum laud) from the University of Evansville (Indiana).

MOEN, RICHARD A.

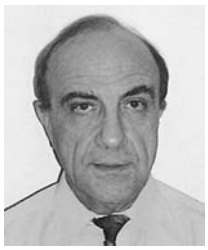
Richard (Dick) Moen has been a member of numerous Boiler and Pressure Vessel Code committees since 1969. Richard (Dick) Moen was an active member of various Boiler and Pressure Vessel Code committees from 1969, until his retirement in 2005. During that time span, he served on the Standards Committee, the Subcommittee on Materials, the Subcommittee on Nuclear

Power, and additional Subgroups and Task Groups serving in those areas. He is a life member of ASM International.

Richard Moen earned a BS degree in Metallurgical Engineering from South Dakota School of Mines and Technology in 1962, with additional graduate studies through the University of Idaho and the University of Washington. He has spent his entire professional career in the field of nuclear energy, beginning in research and development, and then with commercial power plant construction, operation support, and maintenance. He now consults and teaches through Meon Technical Services.

Richard Moen's primary area of expertise is in materials behavior and applications. He has authored numerous papers and has been involved in several national materials handbook programs. And with his long-time involvement in the ASME Boiler and Pressure Vessel Code, he has authored a popular book entitled "Guidebook to ASME Section II, B31.1, and B31.3—Materials Index". His classes are built around that book.

MOKHTARIAN, KAMRAN



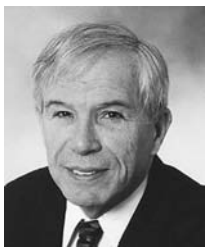
Kam Mokhtarian graduated from the Northwestern University with a Master of Science degree, in 1964. He worked for Chicago Bridge and Iron Company from 1964 through 2000, in a variety of assignments. He was responsible for design and analysis of nuclear vessels and pressure vessels for a number of years. He also provided technical consulting to the engineering staff.

Mr. Mokhtarian has been involved with the ASME B&PV Code Committee, since 1980. He has served as member and chairman of several committees. He was Chairman of Subgroup Design of Subcommittee VIII and the Vice-chairman of Subgroup Fabrication and Inspection. He is presently the Vice-chairman of Subcommittee VIII.

Mr. Mokhtarian is also a member of the Post Construction Standards Committee and the Vice-chairman of the Subcommittee on Flaw Evaluation. He has also served as an associate editor of the ASME's Journal of Pressure Vessel Technology for several years.

Mr. Mokhtarian has been an active member of the Pressure Vessel Research Council (PVRC) since 1980 and has served as Chairman of several committees. He is presently the Chairman of the PVRC. He has authored several WRC Bulletins, including Bulletin 297 that has become a major resource for pressure vessel designers. He has also been teaching a number of pressure vessel related ASME courses.

MOODY, FREDERICK J.



Ph.D., M.S., B.S., Mechanical Engineering (Stanford, Stanford, U. of Colorado) Consulting Engineer, Thermal-Hydraulics, GE Nuclear Energy, 41 years with emphasis on fluid mechanics, thermodynamics, heat transfer, and coupled fluid-structure interaction, pertaining to reactor and containment technology. Adjunct Professor, Thermosciences, San Jose State University, 28 years, Instructor, GE Advanced Engineering Programs. Instructor for ASME Continuing Education courses. Invited courses, lectures in U. S. universities and national labs, Rome, Israel, Holland, Japan, India, Germany, Spain, and Taiwan on unsteady thermofluid behavior. National Academy of Engineering, 2001, Induction into Silicon Valley Engineers Hall of Fame, 2000, ASME PV&PD Award (1999), ASME Fellow (1981); George Westinghouse Gold Medal Award (1980), and Alfred Noble Award for technical paper (1967). Has been Committee chair and co-chair, ASME Fluids Engineering Division, PV&P Division and Associate Editor of ASME Journals.

Participated on NRC-appointed peer review groups, and ongoing consulting assignments with several NRC studies and panels. Publications include *Introduction to Unsteady Thermofluid Mechanics*, Wiley, and *The Thermal-Hydraulics of a Boiling Water Nuclear Reactor*, ANS (co-author), and more than 50 publications in technical journals, and symposium volumes.

MORA, RAFAEL G.

Mr. Rafael Mora is a graduate in Civil Engineering from the University of La Gran Colombia, and holds a Master of Business Administration, UNET-UFPS, Venezuela-Colombia. He is a registered professional engineer in Canada.

Mr. Mora has been working for the pipeline industry for over seventeen years that include pipeline operating; integrity consulting and in-line inspection service companies. He recently joined the National Energy Board as a Technical Leader, Engineering within the Compliance Planning and Analysis Team.

Mr. Mora is currently also a professor in the Pipeline Engineering Master Degree program at the University of Calgary. He has taught courses in pipeline integrity extensively within North and South America and has authored a number of technical papers on this subject.

MORTON, D. KEITH

Mr. D. Keith Morton is a Consulting Engineer at the Department of Energy's (DOE) Idaho National Laboratory, operated by Battelle Energy Alliance. He has worked in the Applied Mechanics Department for nearly 33 years. Mr. Morton has gained a wide variety of structural engineering experience in many areas, including performing nuclear piping and power piping stress analyses, completing plant walkdowns, consulting with the Nuclear Regulatory Commission, developing life extension strategies for the Advanced Test Reactor, performing full-scale seismic and impact testing, and helping to develop the DOE standardized spent nuclear fuel canister. His most recent work activities include performing full-scale drop tests of DOE spent nuclear fuel canisters and developing a test methodology that allows for the quantification of true stress-strain curves that reflect strain rate effects.

Mr. Morton is a Member of the ASME Working Group on the Design of Division 3 Containments, is the Secretary for the ASME Subgroup on Containment Systems for Spent Fuel and High-Level Waste Transport Packagings, and is a Member of the ASME Section III Subcommittee. He has co-authored over twenty-five conference papers, one journal article, and recently co-authored an article on DOE spent nuclear fuel canisters for *Radwaste Solutions*.

Mr. Morton received a B.S. in Mechanical Engineering from California Polytechnic State University in 1975 and a Masters of Engineering in Mechanical Engineering from the University of Idaho in 1979. He is a Registered Professional Engineer in the state of Idaho.

MURRAY, ALAN

Dr. Alan Murray is the Professional Leader Engineering at the National Energy Board in Calgary and an Adjunct Professor in the Chemical Engineering Department of the University of Calgary.

He is a graduate of The Queen's University of Belfast, Northern Ireland in Civil Engineering and Mechanical Engineering and has spent most of his career in Design and Development activities mostly in heavy engineering. He has held a number of senior management positions with a major North American pipeline company and was founding chair of the ASME Pipeline Systems Division. He is the co—author of the ASME book *Pipeline Design and Construction: A Practical Approach*, and has published over 50 papers on a variety of engineering topics.

NASH, DAVID

Dr. Nash is the Vice-Dean of Engineering and a Reader in Mechanical Engineering at the University of Strathclyde in Glasgow, Scotland. After spending several years with a vessel fabricator, Dr Nash joined the Department as a researcher where he gained an MSc and PhD working on local load and saddle support contact problems. His research interests lie broadly in the area of pressure equipment design procedures, and most recently in the area of bolted joints and sealing technology. He has written over 90 papers and authored and contributed to several books. He has co-written and organised a suite of pressure equipment design courses for industry and these have been run on an annual basis since 1986.

Dr Nash is a Fellow of the Institution of Mechanical Engineering and a Chartered Engineer and has been an ASME member since 1987. He was made an ASME Fellow in 2006. He is the present Vice-Chairman of the Pressure Systems Group of the Institution of Mechanical Engineers, is a member of the British Standards Committee for Design Methods (BSi PVE-1–15) and is the current UK national representative to EPERC, the European Equipment Research Council.

NICKERSON, DOUGLAS B.

Douglas B. Nickerson graduated from CalTech with a BSME. He was a registered Engineer in the State of California and is a Fellow of ASME. He worked in the Aerospace Industry until 1965 when he founded his consulting business, Stress Analysis Associates. During his tenure in the Aerospace Industry he developed the Hi-V/L ® pump for aerocraft booster pump application. He was active in dynamic analyses of pumps and valves as a consultant to most of the commercial pump manufacturers including those manufacturing nuclear pumps.

As a corollary to the dynamic analysis of pumps and valves Mr. Nickerson developed a number of computer programs to carry out these analyses. Some of these programs were successfully marketed. Not only active in Engineering he helped organize the Fluid Machinery Section of the Local ASME Section. In recognition of his activities he was made "Engineer of the Month" of Southern California for August 1973.

Mr. Nickerson was on the SURF Board of CalTech and was formerly its Chairman.

Douglas Nickerson had served on a number of ASME Section III Committees and was Chairman of QR Subcommittee of QME. Mr. Douglas B. Nickerson passed away since the completion of the first edition.

NORDSTROM, EDWIN A.

On the personal side, Ed is a native of Kansas who was educated at the University of Kansas as an undergraduate and the Massachusetts Institute of Technology where he earned graduate degrees in both Chemistry and Management – the latter from the Sloan School. He served in administrative positions for 16 years on school boards and 40 years in the Episcopal Church.

Without an engineering degree, Ed rose to be Manager of Process Engineering for a chemical company and then to VP Engineering for A O Smith Water Products Division. In the latter post, he became active in ASME where he has served on Section IV for 25 years. This activity continued across job changes to Amtrol [Manager, Hot Water Maker Sales]; Viessmann Manufacturing [COO for US operations]; Gas Appliance Manufacturers Association; and Heat Transfer Products.

O'DONNELL, WILLIAM J.

Bill O'Donnell has Engineering Degrees from Carnegie Mellon University and the University of Pittsburgh. He began his career at Westinghouse Research and Bettis where he became an Advisory Engineer. In 1970 Bill founded O'Donnell and Associates, an engineering consulting firm specializing in design and analysis of structures and components. The firm has done extensive work in the evaluation of structural integrity, including corrosion fatigue, flaw sensitivity, crack propagation, creep rupture and brittle fracture. Dr. O'Donnell has published 96 papers in engineering mechanics, elastic-plastic fracture mechanics, strain limits and damage evaluation methods. He is Chairman of the Subgroup on Fatigue Strength and a Member of the Subcommittee on Design of the ASME Code. He has patents on mechanical processes and devices used in plants worldwide. He is recognized expert in Failure Causation Analyses. Dr. O'Donnell has given invited lectures at many R&D laboratories, design firms and universities. He is a registered Professional Engineer. He received the National Pi Tau Sigma Gold Medal Award "For Outstanding Achievement in Mechanical Engineering"

and the ASME Award for "Best Conference Technical Paper" in 1973 and 1988. The Pittsburgh Section of ASME named Bill "Engineer of the Year." (1988) He was awarded the ASME PVP Medal (1994) and received the University of Pittsburgh ME Department's Distinguished Alumni Award (1996) and Carnegie Mellon University's 2004 Distinguished Achievement Award for distinguished service and accomplishments in any field of human endeavor. He is a Fellow of the ASME and is listed in the Engineers Joint Council "Engineers of Distinction," Marquis "Who's Who in Science and Engineering" and "Who's Who in the World."

OLSON, DAVID E.

David Olson, as part of his career at Sargent & Lundy LLC, has been involved in solving piping and rotating equipment vibration problems at over 50 nuclear and fossil power plants. He has managed the design and successful implementation of preoperational and initial startup piping test programs at BWR and PWR plants. Throughout his career has been responsible for diagnosing and solving field problems with piping systems at both nuclear and fossil power plants. Mr. Olson has also been responsible for initial design, backfits and modifications of both nuclear and fossil power plants. As part of this experience he has developed expertise in vibration analysis, testing and field problem resolution. Mr. Olson is the current and long standing Chairman of ASME Operation and Maintenance Subgroup on Piping Systems, the group responsible for writing the OM-3 standard on piping vibration. Mr. Olson has published numerous technical papers on vibration and piping dynamics, testing and design and has also given numerous training seminars.

Mr. Olson has also managed various industry initiatives including the development of improved guidance for piping design and analysis, piping operability criteria, the development of risk informed methods to reduce seismic loads, and the patented design of radiation shielding pipe insulation. University of Illinois – B.S. Engineering, University of Chicago - MBA, Registered Professional Engineer.

OSAGE, DAVID A.

Mr. Osage, President and CEO of the Equity Engineering Group in Shaker Heights, Ohio, is internationally recognized as an industry expert and leader in the development and use of FFS technology. As the architect and principal author of API 579 *Fitness-For-Service*, he developed many of the assessment methodologies and supporting technical information. As the chairperson for the API/ASME Joint Committee on Fitness-For-Service, he was instrumental in completing the update to API 579 entitled API *579-1/ASME FFS-1 Fitness-For-Service*. Mr. Osage provides instruction on Fitness-For-Service technology to the international community under the API University Program.

Mr. Osage is also a recognized expert in the design of new equipment. As the lead investigator and principal author of the new *ASME, Section VIII, Division 2, Boiler and Pressure Vessel Code*, he developed a new organization and writing style for this code and was responsible for introducing the latest developments in materials, design, fabrication and inspection technologies. These technologies include a new brittle fracture evaluation method, new design-by-analysis procedures including the introduction of elastic-plastic analysis methods, and a new fatigue method for welded joints. Mr. Osage has delivered lectures on the new pressure vessel code in Europe and Japan and will be offering a training course highlighting advantages of the new code for use with refinery and petrochemical equipment.

Mr. Osage was a lead investigator in revamping the API Risk-Based Inspection (RBI) technology and software. The main focus of this effort was a clean sheet re-write of API 581 *Risk-Based Inspection* and the development of a new version of the API RBI software. He is currently working on the next generation of RBI technology where Fitness-For-Service assessment procedures will be used to compute the Probability of Failure for Risk-Based Inspection.

As an Adjunct Visiting Assistant Professor at Stevens Institute of Technology, Mr. Osage has taught graduate level courses in strength of materials and elasticity, structural analysis and finite element methods, and structural optimization.

OSWEILLER, FRANCIS

Francis Osweiller got international recognition for his expertise in French, European and ASME Pressure Vessel Codes & Standards. He has been the head of the French delegation to CEN/TC 54 (European Technical Committee for Unfired Pressure Vessels) for several years and has chaired several committees such as Simple Pressure Vessels, Testing & Inspection, Tubesheets and Bellows. Mr. Osweiller has been actively involved in Europe with the development of the Pressure Equipment Directive and the new CEN Standard for Unfired Pressure Vessels. He gave several courses on these issues in France UK and USA. As member of the Main Committee of CODAP, he developed several design rules for the French Pressure Vessel Code (CODAP). His main contribution was the development of Tubesheet Heat-exchanger rules to replace the existing (TEMA) rules.

Francis Osweiller obtained a Mechanical Engineering degree in Paris, France. He started his career at CETIM-France with FEM analysis applied to pressure vessels. He has published more than 40 papers in France, UK, Germany and US on European Codes, ASME Code and Pressure Equipment Directive and gave lectures at AFIAP, ICPVT (International Conference of Pressure Vessel Technology) and ASME-PVP (Pressure Vessel & Piping Conference). He has been the representative for France at ICPVT andISO/TC11.

Since 1985 Osweiller has been actively involved in ASME Boiler and Pressure Vessel Code organization where he is member of SCII/International Material Specifications, SCSVIII/SWG on Heat Transfer Equipment, Post Construction Main Committee, Board on Pressure Vessel Technology and Council on Codes and Standards. His principal accomplishment is his role for the publication of common rules in ASME Code, European Code and French Code for the design of tube-sheets and expansion bellows. Osweiller is the recipient of several awards and certificates from ASME and PVP and was elevated to the grade of Fellow by ASME in 2001 and is listed in the Who's Who in the World.

PAPPONE, DAN

Mr. Daniel Pappone is Chief Consulting Engineer in Plant Performance at GE-Hitachi Nuclear Energy. He joined GE in 1978. Mr. Pappone has extensive experience in safety evaluations for BWR accident conditions with a primary focus on the vessel and containment response to Loss-of-Coolant Accidents. He is involved in the ongoing development of the generic extended power uprate programs and has held lead technical positions in several stretch and extended power uprate projects.

Currently, Mr. Pappone has been leading research into understanding the fatigue loading acting on BWR steam dryers. His past responsibilities have included degraded core cooling studies, Emergency Procedure Guideline development, and the design, plant application and installation of safety parameter display and plant monitoring computer systems. He brings an overall integrated perspective to the projects, including analysis, system design, operations, and regulatory aspects. Mr. Pappone holds a BS degree in Nuclear Engineering from the University of California, Los Angeles.

PARECE, MARTIN

Martin Parece is Chief Engineer and Vice President, Technology for AREVA NP, Inc. He is responsible for technical oversight and configuration control of pressurized water reactor and high temperature gas reactor designs planned for deployment in North America.

Mr. Parece has B.S. and M.S. degrees in Nuclear Engineering from the University of Illinois and is a member of the American Nuclear Society. During the last 26 years with Babcock & Wilcox, Framatome and AREVA NP, he has gained extensive experience in safety analysis, core reload analysis, plant performance analysis, plant simulation, computer code development, accident mitigation, operator guidance, thermal-hydraulics, plant auxiliary and control systems, Class 1 component design, and licensing. Mr. Parece is the author of numerous papers and topical reports, he also holds a patent on a method and system for emergency core cooling. Mr. Parece is a highly regarded speaker on reactor power uprates, nuclear power plant safety and new reactors.

PASTOR, THOMAS P.

Mr. Pastor has over thirty one years experience working in the areas of stress analysis and pressure vessel design. He holds a Bachelors and Masters degree in Civil Engineering from the University of Connecticut, with emphasis on structural design and analysis.

Mr. Pastor began his career with Combustion Engineering in 1977, where he was a member of the structural analysis group, responsible for performing load analyses of nuclear reactor inernals subject to seismic and LOCA events. Over nine years he developed significant expertise in performing finite element analyses and scientific programming.

In 1986 Mr. Pastor joined the Hartford Steam Boiler Inspection and Insurance Co. (HSB) working in the Codes and Standards Group in Hartford, Ct. During his 22 year tenure at HSB, Mr. Pastor rose from staff engineer, to Manager Codes & Standards, Director, and presently Vice-President Code Services. He has managed the Codes & Standards (C&S) Group for over 17 years, and led the development of several knowledge based databases which are used today to provide Code technical support to over 3000 ASME Certificate Holders and Inspectors worldwide. Mr. Pastor's ASME code expertise is in pressure vessels, and he has taught basic to advanced seminars on Section VIII, Division 1 over 100 times to audiences around the world. He has authored numerous technical papers on the subject of stress analysis and ASME Code developments,

Mr. Pastor is a licensed Professional Engineer in the states of Connecticut and Indiana. He is currently serves on several ASME Committees such as Codes & Standards Board of Directors, Board on Hearings and Appeals, Continuous Improvement Committee, Board on Pressure Vessel Technology, BPV Technical Oversight Management Committee (Vice-Chairman), Standards Committee on Pressure Vessels – Section VIII (Chairman), Subgroup Design – Section VIII, and Special Committee on Interpretations – Section VIII.

PERRAUDIN, GERARD

Gerard Perraudin is a recognized authority on materials in pressure vessel technology. Initially he worked on a variety of assignments for the French Technical Center of Mechanical industries from 1970 through 1980. There on he has been the supervisor of inspectors on a refinery of Exxon Chemical (1980–1983) and later was employed by TECHNIP, a major international engineering and construction company. He has been actively involved in various petroleum and chemical industries over the world (Exxon, BP, Elf). Mr. Perraudin is the Chairman of CODAP Committee responsible for French Pressure Vessel Code. Based on his expertise of Codes he is actively involved in several French and European Code working committees.

PITROU, BERNARD

Bernard Pitrou has more than 40 years of experience in the piping industry. He held the position of manager in Design and Calculations Department, ENTREPOSE (currently called ENDEL). He was engaged in design and analysis of power and process piping as well as nuclear and transportation piping. He is a member of the Pressure Vessel and Piping Committee of the Technical Center of Mechanical Industries and was responsible for several new theoretical developments in the field of piping such as flanges and large openings. Mr. Pitrou served on the first French Piping Committee (1970) created by the SNCT (French Pressure

Equipment Manufacturer's Association) and is now the Chairman of CODETI Committee responsible for French Piping Code. He has been active in the European Standardization and is currently Chairman of Working Group 1 (General) and 3 (Design) of the European Technical Committee 267 in charge of Industrial Piping.

PORTER, MICHAEL (MIKE) A.

Michael (Mike) A. Porter is the Principal Engineer of Porter McGuffie, Inc. In the 40 years since he obtained a Mechanical Engineering degree from the University of Illinois at Champaign/Urbana, he has worked in the natural gas industry, managed a construction firm and served as a consultant to numerous industries in the fields of vibration, thermal and stress analysis. He has published more than 30 ASME conference and journal publications, most of which have been for the Piping and Pressure Vessel Division. His most recent PVP Journal paper "A Suggested Shell/Plate Finite Element Nozzle Model Evaluation Procedure" provides guidance for the application of Finite Element (FE) analysis as it applies to the Boiler and Pressure Vessel Code. He has also authored papers for the Acoustical Society of America and published two books on the application of the FE method of analysis.

Mike has extensive experience in the diagnosis and solution of stress and vibration problems. Much of this experience stems from his work as a technical services engineer at Panhandle Eastern Pipeline Company and as a consultant with Bolt Beranek and Newman. Building on this base, Mr. Porter has established an integrated computational facility for the analysis of mechanical systems and their interaction with fluids. These capabilities include the codes for linear and non-linear stress analysis, computational fluid dynamics and gas/liquid pulsation FE analyses. For the past 15 years, Mike has served as a member of the Design and Analysis Committee of the Piping and Pressure Vessel Division of ASME. He has served as the Technical Program Representative for this committee as well as developing and chairing numerous conference sessions on the subjects of vibration, water hammer, pulsation and stress.

The projects overseen by Mr. Porter cover a broad range of industries and topics. Representative examples include the petrochemical industry (analyses of numerous pressure vessels and components); the aerospace industry (analyses for the International Space Station and FEA training for NASA personnel); and building dynamics (design review and analysis of multistoried structures for the Environmental Protection Agency and the National Ocean Service, among others). These projects have included linear and non-linear stress analyses as well as computational fluid dynamics, structural dynamics and thermal analyses.

RAHOI, DENNIS

D. W (Dennis) Rahoi is an authority on materials used in the pharmaceutical-/biotechnology, chemical process, fossil fuel, and nuclear power industries. The author of more than 50 papers on materials, corrosion and oxidation, he received the Prime Movers Award in Thermal Electric Generating Equipment and Practice by Edison Electric Institute for work published on solving problems in high pressure feedwater heaters. He currently consults in material selections, failure analysis and does other forensic metallurgical work. Mr. Rahoi is also the current editor of Alloy Digest (an ASM International, Inc. publication) and is an active consultant to the Nickel Institute. Mr. Rahoi was the first chairman of NACE's Power Committee and is active on many stainless steel ASTM and ASME (including B31) materials committees. He is the current chairman of the ASME Sub-Group Non-Ferrous Materials for Section II and holds a master's degree in metallurgical engineering from Michigan Technological University.

Mr. Rahoi's work on writing many new ASTM specifications, his active sponsoring of 10 pipe and tube specifications and his active involvement in Welding Research Council and EPRI research proposals on welding and repair keep him in constant touch with the needs of industry. This, combined with his other experiences and consulting, allow him to contribute to the current chapter in this book with authority.

RANA, MAHENDRA D.

Mahendra, an ASME Fellow has a bachelor's degree in mechanical engineering from M.S. University in Baroda, India, and a master's degree in mechanical engineering from the Illinois Institute of Technology, Chicago, Illinois. He is a registered professional engineer in New York State. He is an Engineering Fellow working in the Global Supply System Engineering Department of Praxair, Inc. for the last 34 years. He is involved in the areas of fracture mechanics, pressure vessel design, pressure vessel development, and materials testing. He is also involved in the structural integrity assessment, and fracture control programs of pressure vessels and the member of Board on Pressure Technology, Codes and Standards. Mahendra became the Chairman of the Subgroup on Design and Materials of Subcommittee XII when it was formed in 1996. He is a member of several other ASME Boiler and Pressure Vessel Code committees: member of Subcommittee VIII, member of joint API/ASME Fitness- for Service Committee and the member of the Main Committee of the Boiler and Pressure Vessel Code and the member of Board on Pressure Technology, Codes and Standards. Mahendra is also a member of several ISO, ASTM and CGA (Compress Gas Association) standards committees. He is a Chairman of the Codes and Standards Technical Committee of Pressure Vessel and Piping Division of ASME. He has received several awards from the Pressure Vessel and Piping Division for his contribution in organizing Codes and Standards sessions in Pressure Vessel and Piping Conferences. He has given several lectures in the pressure vessel technology topics in the USA and abroad. He has taught a course on ASME Section VIII, Division 1 to ASME section of Buffalo New York. He is the co-recipient of two patents and the co-author of 25 technical papers. He also has written several technical reports for his company.

RANGANATH, SAM

Dr. Sam Ranganath is the Founder and Pricipal at XGEN engineering, Sam Jose, CA. XGEN, founded in 2003, provides consulting services in fracture mechanics, materials, ASME Code applications and structural analysis to the power plant industry. Before that he held various leadership positions at General Electric for 28 years. Dr. Ranganath is a Fellow of the ASME and has been active in the development of Section III and Section XI, ASME Code rules for the evaluation and inspection of nuclear pressure vessel components. Sam has a Ph.D. in Engineering from Brown University, Providence, RI and an MBA from Santa Clara University, Santa Clara, CA. He has also taught Graduate Courses in Mechanical Engineering at Santa Clara University and Cal State University, San Jose for over 15 years.

RAO, K. R.

KR Rao retired as a Senior Staff Engineer with Entergy Operations Inc. and was previously with Westinghouse Electric Corporation at Pittsburgh, PA and Pullman Swindell Inc., Pittsburgh, PA. KR got his Bachelors in Engineering from Banaras University, India with a Masters Diploma in Planning from School of Planning & Architecture, New Delhi, India. He completed Post Graduate Engineering courses in Seismic Engineering, Finite Element and Stress Analysis, and other engineering subjects at Carnegie Mellon University, Pittsburgh, PA. He earned his Ph.D., from University of Pittsburgh, PA. He is a Registered Professional Engineer in Pennsylvania and Texas. He is past Member of Operations Research Society of America, (ORSA).

KR was Vice President, Southeastern Region, ASME International. He is a Fellow of ASME, active in National, Regional, Section and Technical Divisions of ASME. He has been the Chair, Director and Founder of ASME EXPO(s) at Mississippi Section. He was a member of General Awards Committee of ASME International. He was Chair of Codes & Standards Technical Committee, ASME PV&PD. He developed an ASME Tutorial for PVP Division covering select aspects of Code. KR is a Member, Special Working Group on Editing and Review (ASME B&PV Code Section XI) for September 2007 – June 2012 term.

Dr. Rao is a recipient of several Cash, Recognition and Service Awards from Entergy Operations, Inc., and Westinghouse Electric Corporation. He is also the recipient of several awards, Certificates and Plaques from ASME PV&P Division including Outstanding Service Award (2001) and Certificate for "Vision and Leadership" in Mississippi and Dick Duncan Award, Southeastern Region, ASME. Dr. Rao is the recipient of the prestigious ASME Society Level Dedicated Service Award.

Dr. Rao is a Fellow of American Society of Mechanical Engineers, Fellow of Institution of Engineers, India and a Chartered Engineer, India. Dr. Rao was recognized as a 'Life Time Member' for inclusion in the Cambridge "Who's Who" registry of executives and professionals. Dr. Rao was listed in the Marquis 25th Silver Anniversary Edition of "Who's Who in the World" as 'one of the leading achievers from around the globe'.

REEDY, ROGER F.

Roger F. Reedy has a B.S. Civil Engineering from Illinois Institute of Technology (1953). His professional career includes the US Navy Civil Engineering Corps, Chicago Bridge and Iron Company (1956–1976). Then he established himself as a consultant and is an acknowledged expert in design of pressure vessels and nuclear components meeting the requirements of the ASME B&PV Code. His experience includes design, analysis, fabrication, and erection of pressure vessels and piping components for nuclear reactors and containment vessels. He has expertise in components for fossil fuel power plants, and pressure vessels and storage tanks for petroleum, chemical, and other energy industries. Mr. Reedy has been involved in licensing, engineering reviews, welding evaluations, quality programs, project coordination and ASME Code training of personnel. He testified as an expert witness in litigations and before regulatory groups.

Mr. Reedy has written a summary of all changes made to the ASME B&PV Code in each Addenda published since 1950 which is maintained in a computer database, RA-search.

Mr. Reedy served on ASME BP&V Code Committees for more than 40 years being Chair of several of them, including Section III for 15 years. Mr. Reedy was one of the founding members of the ASME PV&P Division. Mr. Reedy is registered Engineer in seven states. He is a recipient of the ASME Bernard F. Langer Award and the ASME Centennial Medal and is a Life Fellow of ASME.

REINHARDT, WOLF D.

Wolf D. Reinhardt earned a Dipl. Ing. Degree in Mechanical Engineering from the Technical University in Braunschweig, Germany, and a Ph.D. from the University of Waterloo, Canada. He is a registered Professional Engineer in Ontario.

His current position as Senior Section Head, Computational Mechanics Development, at Atomic Energy of Canada encompasses the application of numerical analysis to problems in the design, analysis and fitness-for-service evaluation of reactor components. He is also engaged in performing applied research programs for the Canadian nuclear industry.

Previously, he worked as a Lead Engineer in Nuclear Engineering at Babcock & Wilcox Canada on the design and analysis of nuclear components, principally steam generators and heat exchangers, and in the in-service assessment of steam generator tubes.

Wolf is holding an appointment as adjunct professor at Memorial University in Newfoundland. He has published over 50 technical papers in the fields of nonlinear vibration, metal plasticity, computational methods for the nonlinear analysis of pressure vessels, elastic-plastic pressure vessel design and fracture mechanics. He received various Best Paper Awards at ASME PVP conferences and at the ASTM National Symposium on Fatigue and Fracture Mechanics. His current research interests include plastic shakedown analysis as well as structural performance criteria and in-service assessment of piping and reactor components.

Wolf Reinhardt is a member of the ASME B&PV Code Subgroup Design Analysis and participates in the Task Group Elastic-Plastic FEA. He is also contributing to the PVPD Computer Technology Technical Committee and acted as Technical Program Representative at PVP Conferences for this committee. He taught courses on elastic-plastic design using Section III and Section VIII rules, on methods for fitness-for-service assessment, and on the design, analysis and fabrication rules of Section III.

RICCARDELLA, PETER C.

Pete Riccardella received his Ph.D. from Carnegie Mellon University in 1973 and is an expert in the area of structural integrity of nuclear power plant components. He co-founded Structural Integrity Associates in 1983, and has contributed to the diagnosis and correction of several critical industry problems, including:

- Feedwater nozzle cracking in boiling water reactors
- Stress corrosion cracking in boiling water reactor piping & internals
- Irradiation embrittlement of nuclear reactor vessels
- Primary water stress corrosion cracking in pressurized water reactors
- Turbine-generator cracking and failures.

Dr. Riccardella has been principal investigator for a number of EPRI projects that led to advancements and cost savings for the industry. These include the **FatiguePro** fatigue monitoring system, the **RRingLife** software for turbine-generator retaining ring evaluation, **Risk-Informed Inservice Inspection methodology** for nuclear power plants, and several **Probabilistic Fracture Mechanics** applications to plant cracking issues. He has led major failure analysis efforts on electric utility equipment ranging from transmission towers to turbine-generator components and has testified as an expert witness in litigation related to such failures.

He has also been a prime mover on the ASME Nuclear Inservice Inspection Code in the development of evaluation procedures and acceptance standards for flaws detected during inspections. In 2002 he became an honorary member of the ASME Section XI Subcommittee on Inservice Inspection, after serving for over twenty years as a member of that committee. In 2003, Dr. Riccardella was elected a Fellow of ASME International.

RODABAUGH, EVERETT C.

Mr. Rodabaugh has B.S. from Iowa State College, Ames, Iowa (1939) and M.S. from the University of Louisville, Kentucky (1959). He is a Registered Professional Engineer in the State of Ohio.

He has extensive experience in power plant operations and the design of piping and pressure vessels. His previous experience was with Joseph E. Seagram Co., E.I. duPont, U.S. Maritime Service (1943–1946). He was with Tube Turns in Louisville, Kentucky (1946–1961). Mr. Rodabaugh was with Bat-telle-Columbus Laboratories, Columbus, Ohio (1961–1981).

In 1981 he started his own consulting firm and since 1991 he has continued his work on piping and pressure vessels as a consultant.

Mr. Rodabaugh was a member of the original ASME Design Group that prepared ANSI B31.7. He was a member of several ASME Code committees including Section III Committees and Subgroup on Design and Working Group on Piping. Everret Rodabaugh was Chairman of ANSI B16 and its Subcommittees.

Mr. Rodabaugh is also a member of the Pressure Vessel Research Council, Design Division and its Subcommittee on Piping, Nozzles and Vessels. Mr. Rodabaugh published over 60 articles and has written over 100 reports. Everret Rodabaugh is a Fellow in the ASME and received the ASME Bernard F. Langer award in 1998.

RODERY, CLAY D.

Clay Rodery is Technical Authority/ Fixed Equipment for BP North American Products. He has over 27 years of experience consulting in the areas of pressure vessels and piping to Amoco and BP refining, chemicals, and upstream facilities and projects worldwide. After receiving his BSCE from Purdue University in 1981, he joined Amoco Oil Company's Texas City Refinery, where he was involved in project, maintenance, and inspection engineering. In 1990, he moved to Amoco Oil's Refining & Transportation Engineering Department as pressure vessel specialist. In 1995, he became the principal vessel specialist within Amoco Corporation's Worldwide Engineering & Construction Department. In 1999, he moved to BP Chemicals' Technology & Engineering Department as pressure vessel and piping specialist. He became BP Chemicals' Pressure Vessel and Piping Advisor in 2004, until moving to his current role in 2006.

Clay began participating in ASME Boiler and Pressure Vessel Code activity in 1993. He joined the Subgroup on Fabrication & Inspection (Section VIII) in 1997, and the Subgroup on Design in 1999. In May 2000, he was appointed Chairman of the Subgroup on Fabrication & Inspection and member of the Subcommittee on Pressure Vessels. Clay is a member of the ASME Post Construction Standards Committee, and Vice Chair of the Subcommittee on Repair and Testing. He is also a member of the Special Working Group on Flange Joint Assembly.

As a member of the Design & Analysis Technical Committee of the ASME Pressure Vessels and Piping Division, Clay has served as an Author, Session Developer/Chair, Editor, Technical Program Representative, and Tutorial Presenter. Clay is a member of the API Subcommittee on Inspection and the Task Group on Inspection Codes. He is former Team Leader of the Process Industry Practices (PIP) Vessel Function Team.

RODGERS, DOUGLAS K.

Doug Rodgers earned a B.A.Sc (1982) in Engineering Science, with a specialization in Material Science from the University of Toronto and an M.A.Sc (1992) in Mechanical Engineering from the University of Ottawa. Doug has been a member of the ASM International (formerly the American Society for Metals) since 1982 and is currently a Chapter Sustaining Member of the Ottawa Valley Chapter. Doug is a registered professional engineer in the Canadian provinces of Ontario and New Brunswick, and has been a member of ASME since 1999.

Doug has worked for Atomic Energy of Canada Limited for more than 20 years, specializing in performance characteristics of CANDU power reactor materials. Initially with the engineering design group, Doug transferred to the Metallurgical Engineering Branch of the Reactor Materials Division where he was responsible for failure analysis and material surveillance testing of CANDU fuel channel components. With a well-established interest in fracture phenomena, Doug spent several years studying delayed hydride cracking in Zr-2.5Nb pressure tube materials, later becoming the manager of the Materials and Mechanics Branch, responsible for research and development programs relevant to metal fracture. Doug is currently Director of the Fuel Channels Division, incorporating material expertise, varying from computational mechanics, metallurgy, surface science, corrosion, deformation, and fracture, as it is applied to design, research & development, and services for CANDU nuclear reactor systems.

ROWLEY, C. WESLEY

C. Wesley Rowley is Vice President, Engineering & Technical Services, with The Wesley Corporation in Tucson, AZ. He has been with TWC since 1985. Mr. Rowley manages engineering and non-metallic structural repair activities for nuclear power plants. He has published numerous reports and technical papers for EPRI, ASME, ICONE Conferences, Pump & Valve Symposiums, and other nuclear industry events. He is a recognized expert on risk-informed Inservice Testing, as well as non-metallic materials and non-metallic structural repairs.

Mr. Rowley has been a member of the ASME Board on Nuclear Codes and Standards for over fifteen years. He is also a member of the ASME Post Construction Committee, the Subcommittee on Repair & Testing, and the Chairman of the Non-metallic Repair Project Team. Additionally he has been the Chairman of the ASME BPV/Subcommittee II, Materials/Special Working Group, Nonmetallic Material since 2002. He is the past Chairman of the ASME BPV Joint Subcommittee III/XI Project Team for Plastic Pipe. ASME past Vice President, Nuclear Codes & Standards and past Chairman, Board on Nuclear Codes & Standards. He is currently a member of the ASME BPV/ Subcommittee III/Special Working Group on Polyethylene Pipe. ASME, Member, Operations & Maintenance Committee (and Sub-group ISTE, Risk-Informed Inservice Testing).

Mr. Rowley is a retired Submarine Captain in the U. S. Naval Reserve. He has a M.A. degree in International Relations and Strategic Studies from the Naval War College (1986). He also has a B.S. in General Engineering (1965) and M.S. in Nuclear Engineering from the University of Illinois (1967). Mr. Rowley is a Registered Professional Engineer.

SAMMATARO, ROBERT F.

The late Mr. Sammataro was Proto-Power's Program Manager — ISI/IST Projects. He was responsible for Proto-Power's Inservice Inspection (ISI) and Inservice Testing (IST) programs. These programs included development and implementation of programs involving ISI, IST, design integrity, design reconciliation, 10CFR50, Appendix J, integrated leakage rate testing, and in-plant and out-plant training and consulting services.

Mr. Sammataro was also responsible for Proto-Power's ISI and IST Training Programs has developed Proto-Power's three-day *Workshop on Containment Inservice Inspection, Repair, Testing, and Aging Management*. He was recognized as an expert in containment inservice inspection and testing.

Mr. Sammataro was the past Chair of the ASME PV&P Division (1999–2000), General Chair of PVP Conference (1999) and was the Technical Program Chair (1998).

He was a member and chair of an ASME Section XI Subgroup and a member of an ASME Section XI Subgroup Subcommittee. He was a past member of the ASME BP&V Code Main Committee (1989-1994). Mr. Sammataro was an ASME Fellow. Mr. Sammataro earned BSCE and MSCE from Rensselaer Polytechnic Institute.

SCOTT, BARRY

Barry Scott is currently Director of Quality Assurance Department (Power) with responsibility to provide QA/QC support for the engineering, procurement and construction phases of Power projects. Barry has experience in the development, implementation and auditing of Quality Programs. He has considerable knowledge of industry Quality Standards, including ISO 9000, 10CFR50 Appendix B, NQA 1 and Government (DOE, DOD) requirements. Barry has extensive experience with projects and project engineering management with special expertise in the structural design of Nuclear Power Plant structures including design of reinforced concrete Containment structures. Barry has been a Member of various ASME Section III committees including Subgroup on General Requirements, Subcommittee on Nuclear Power and Joint ASME-ACI Committee on Concrete Components for Nuclear Service for more than 30 years.

Barry has a Master of Science in Civil Engineering from Drexel University and is a licensed PE (Civil Engineering) in the states of Pennsylvania, California and Washington. He is a certified Lead Auditor in accordance with the requirements of ASME NQA-1 and previously held certification as an ACI Level III Concrete Inspector as required by the ASME Section III Division 2 Code.

SIMOLA, KAISA

Dr. Kaisa Simola is a senior research scientist with 20 years research experience in risk and reliability analysis, analyses of nuclear power plant operating experience, ageing analyses, and risk-informed decision making. Presently her main area of interest is risk-informed in-service inspections at nuclear power plants. She has worked for the Technical Research Centre of Finland, VTT, since 1987. In 2004–2006 she was a Visiting Scientist at the Joint Research Centre of the European Commission in Petten, the Netherlands. She is the chairperson of the Task Group on Risk of the European Network for Inspection and Qualification (ENIQ). She is also a member of the board of directors of the European Safety, Reliability and Data Association (ESReDA).

SIMONEN, FREDRIC A.

Fredric A. Simonen earned B.SM.E in 1963 from Michigan Technology University and a Ph.D. in Engineering Mechanics form Stanford University in 1966. Since joining Pacific Northwest Laboratory in 1976, and before that at the Battelle Columbus Division, Dr. Simonen has worked in the areas of fracture mechanics and structural integrity. His research has addressed the safety and reliability of nuclear pressure vessels and piping as well as other industrial and aerospace structural components.

Since the early 1980's he has been the lead for several studies for the U.S. Nuclear Regulatory Commission (NRC) of the effects of pressurized thermal shock on the failure probability of reactor pressure vessels. This work has advanced the technology of probabilistic fracture mechanics and has developed methods for estimating the number and sizes of flaws in vessel piping welds. During the 1990's Dr. Simonen was a leader on the behalf of NRC and the American Society of Mechanical Engineers in developing the technology and furthering the implementation of risk-informed methods for the inspection of nuclear piping systems.

Dr. Simonen is a member of the Section XI Working Groups on Implementation of Risk-Based Inspection, Flaw Evaluation, and Operating Plant Criteria. He is also a member of the ASME Committee on Nuclear Risk Management and the ASME Research Committee on Risk-Based Technology. He has published over 200 papers, articles and reports in the open literature.

SIMS, J. ROBERT, J.

Mr. Sims is a recognized authority in the field of pressure equipment, with over years experience in risk based technologies for optimizing inspection and maintenance decisions, high pressure equipment, and mechanical integrity evaluation of existing equipment. He has been with Becht Engineering since 1998. Prior to that, he worked for more than thirty years with Exxon as a pressure equipment specialist, developed risk based decision-making tools, led a multi-disciplinary team in development of the flaw evaluation guide that was used as the basis for the API-579 Standard on Fitness for Service, and designed a 30,000 psi reactor vessel. Other positions within Exxon included design and operation of high pressure equipment used in the production of low density polyethylene at facilities worldwide.

Bob is the current Senior Vice President of Codes and Standards of ASME. He is a member of several ASME Committees, such as the Council on Codes and Standards, the B&PV Code Subcommittee VIII for Pressure Vessels, and he chairs the Special Working Group on High Pressure Vessels.

Bob is also the past Chair of the ASME Post Construction Committee, and chair of the Pressure Vessel Research Council Committee on Continued Operation of Equipment. He was previously a member of ASME B31.3 Process Piping Code Committee and Chair of the B31.3 Task Group on High Pressure Piping. He is an ASME Fellow and has more than 20 publications and two patents.

SINGH K. P. (KRIS)

Dr. K.P. (Kris) Singh is the President and Chief Executive Officer of Holtec International, an energy technology company that he established in 1986. Dr. Singh received his Ph.D. in Mechanical Engineering from the University of Pennsylvania in 1972, a Masters in Engineering Mechanics, also from Penn in 1969, and a B.S. in Mechanical Engineering from the Ranchi University in India in 1967.

Since the mid-1980s, Dr. Singh has endeavored to develop innovative design concepts and inventions that have been translated by the able technology team of Holtec International into equipment and systems that improve the safety and reliability of nuclear and fossil power plants. Dr. Singh holds numerous patents on storage and transport technologies for used nuclear fuel, and on heat exchangers/pressure vessels used in nuclear and fossil power plants. Active for over thirty years in the academic aspects of the technologies underlying the power generation industry, Dr. Singh has published over 60 technical papers in the permanent literature in various disciplines of mechanical engineering and applied mechanics. He has edited, authored, or co-authored numerous monographs and books, including the widely used text "Mechanical Design of Heat Exchangers and Pressure Vessel Components", published in 1984. In 1987, he was elected a Fellow of the American Society of Mechanical Engineers. He is a Registered Professional Engineer in Pennsylvania and Michigan, and has been a member of the American Nuclear Society since 1979, and a member of the American Society of Mechanical Engineers since 1974.

Over the decades, Dr. Singh has participated in technology development roles in a number of national organizations, including the Tubular Exchange Manufacturers Association, the Heat Exchange Institute, and the American Society of Mechanical Engineers. Dr. Singh has lectured extensively on nuclear technology issues in the U.S. and abroad, providing continuing education courses to practicing engineers, and served as an Adjunct Professor at the University of Pennsylvania (1986–92).

Dr. Singh serves on several corporate boards including the Nuclear Energy Institute and the Board of Overseers, School of Engineering and Applied Science (University of Pennsylvania), Holtec International, and several other industrial companies.

STAFFIERA, JIM E.

Jim E. Staffiera earned a BS in Mechanical Engineering from Drexel University in 1971 and a Masters in Business from Old Dominion University in 1975. He has been involved with nuclear power plant containment vessel and steel structure design, fabrication, construction, and operation since 1971. Originally employed by Newport News Industrial Corporation (a subsidiary of Newport News Shipbuilding), he assisted with development of commercial nuclear fabrication programs for ASME Code N-type Certificate authorization. This progressed into nuclear component fabrication and construction activities, resulting in his current employment with FirstEnergy Corporation at the Perry Nuclear Power Plant, where he works in the Structural Mechanics Unit and is frequently involved with ASME Code Section XI-related issues.

Jim has been a member of ASME since 1972 and is involved in numerous ASME Boiler and Pressure Vessel Code Committee activities, including holding positions as Chair, Secretary, and Member of various Section XI committees on inservice requirements for operating nuclear power plants. He currently chairs the Working Group on Containment and is also a member of the Section XI Subcommittee, the Subgroup on Water-Cooled Systems, and the Special Working Group on Editing and Review.

Jim is an active member of the ASME Pressure Vessels and Piping Division, having chaired the Codes and Standards (C&S) Technical Committee and been C&S Technical Program Representative for the annual ASME Pressure Vessels and Piping Conference. He has also been a member of the American Society for Quality (ASQ) since 1975.

Jim has been involved in several nuclear industry initiatives, the most recent of which was as a member of the Expert Panel for the EPRI Containment Integrated Leak-Rate Test (ILRT) Interval Extension Project.

STANISZEWSKI, STANLEY (STAN)

Stanley Staniszewski is a senior Mechanical Engineer with the U.S. Department of Transportation, Pipelines and Hazardous Materials Safety Administration. He is a '76 Alumni of the Fenn College of Engineering, from Cleveland State University of Ohio and has completed graduate level course work in Business Administration at Johns Hopkins University and advanced engineering degree work at the University of Virginia. Mr. Staniszewski has been a member of the American Society of Mechanical Engineers, since joining as a student. He currently serves on the ASME Section XII SubCommittee on Transport Tanks, Vice Chairs the Sub Group on General Requirements, and is a member of the ASME Hydrogen Steering Committee, and various taskgroups. Mr. Staniszewski is also a member of the National Board Inspection Code, Main Committee, Subgroups RB, and Nonmandatory Appendices. He has experience in the international standards arena through membership and participation as a governmental technical expert to the United Nations and International Standards Organizations on various Technical Committees, Sub-Committees and Work-Groups on gas cylinders, cryogenic vessels and Hydrogen technologies.

He has 10 years of varied experience in the private sector spanning tool & die, manufacturing, research and product development, design, construction and inspection. Within the federal government he has spent 20 years in the areas of mechanical/electrical/chemical project engineering, management, inspection and enforcement issues that affect hazardous materials/dangerous goods in national and international commerce.

SUDAKOV, ALEXANDER V.

Alexander V. Sudakov was born in 1944 in Rybinsk, Russia. In 1962 after high school graduation he entered Saint Petersburg Polytechnic University, Division of Nuclear Power Stations and graduated in 1968 as a NPP engineer. The same year he started his professional engineering activity in the Central Boiler and Turbine Institute. He held positions from scientific researcher (1968) up to Deputy Director General of the Institute (current position).

Dr. Sudakov obtained a Doctor of Science in 1994 and subsequently held a position as Professor of Saint Petersburg Polytechnic University. Dr Sudakov has authored 10 books and published over 100 papers and manuscripts on thermodynamics, strength analysis and life extension of NPPs components and piping. Dr Sudakov is a Member of a number of Russian scientific committees and nuclear power associations. He was honored with the Russian Federation Government Prize in 1995.

STEVENSON, JOHN D.

Dr. John D. Stevenson is a Senior Consultant for J.D. Stevenson, Consulting Engineer Co. He has extensive experience worldwide in the nuclear power field where he served as a consultant to the IAEA and several non U.S. utilities and consulting firms. He holds a Ph.D. in Civil Engineering from Case Western Reserve University. He has provided structural-mechanical consulting services to the nuclear power industry in the U.S. and abroad for the past 35 years and has been a member of various committees of ASME and B&PVC Section III for the past 35 years. He is currently also a member of several of American Society of Civil Engineers, American Nuclear Society, and American Concrete Institute committees and consultant to government agencies dealing with the structural-mechanical safety of nuclear facilities.

SWAYNE, RICHARD W.

Mr. Swayne has worked as a metallurgist, welding engineer, quality assurance manager, and consultant, in the pressure vessel and piping industry, since 1975. He has experience in design, fabrication, and operation of various power and refinery plant components, including valve design and application, welding and materials engineering, and quality assurance program management for construction and operation. He is an expert and well-known instructor in inservice inspection, inservice testing, and repair/replacement

programs in operating power plants. He has assisted many organizations in preparation for new and renewal ASME Certificates of Accreditation and has participated in many ASME National Board Accreditation Surveys. Mr. Swayne has been an active participant since 1977 as a member of ASME and ASTM Codes and Standards Committees. He is a member of the ASME Board on Nuclear Codes and Standards and the ASME Boiler and Pressure Vessel Standards Committee and is the Vice Chair of the ASME Subcommittee on Nuclear Inservice Inspection. Mr. Swayne is also a past member of the Subcommittee on Materials and several working groups under the Subcommittee on Nuclear Power.

He has served as a consultant to utilities, architect/engineers, manufacturers, and material manufacturers and suppliers. He is a Qualified Lead Auditor, and was a Qualified Level II Examiner in several nondestructive examination methods. He has been involved in engineering reviews, material selection and application, and quality assurance auditing.

TABOAS, ANÍBAL L.

Aníbal L. Taboas is an executive generalist who consults on environment, governance, and strategic risk management. His background ranges from nuclear CONOPS, to line management of national laboratories and programs, and conflict resolution. He led various regulatory and legislative initiatives, including changing the disposal limits for transuranic waste. Accomplishments in the federal Senior Executive Service have been recognized by the Vice President's Hammer Award, Secretary of Energy Gold Medal, the University of Chicago Medal for Distinguished Performance, and several Exceptional and Distinguished Service Awards. Taboas has a solid reputation for innovative resolution of regulatory and legislative issues, project management, diversity, and independent peer review. Aníbal actively participates in pro-bono activities, such as the Board of Directors of the Center of Excellence for Hazardous Materials Management, and of the Institute for Regulatory Science, editorial boards, and peer review (e.g., National Science Foundation and International Atomic Energy Agency). Dr. Taboas has a BS in Physics/Theology (Univ. of Dayton), MS in Physics (Indiana State Univ.), MS in Mechanical & Nuclear Engineering (Northwestern Univ.), a PhD *honoris causa* in Environmental Policy (UPAEP), and numerous peer-reviewed publications. Aníbal is Fellow of the American Society of Mechanical Engineers, edited The Decommissioning Handbook, and has served multiple times as Chair of the International Conference on Environmental Management. Aníbal L. Taboas can be reached via electronic mail at: TaboasA2@ASME.org.

TRAMPUS, PETER

Peter Trampus earned his MSc in 1972 in Mechanical Engineering from the Technical University of Budapest, Hungary. He obtained his second degree as Specialized Engineer on Plastic Deformation from the same university in 1979. He earned his PhD in Materials Science in 1985 from the Technical University of Dresden, former East Germany. After graduating, Peter Trampus joined the Csepel Iron and Steel Works, where he worked as research engineer and, then, head of laboratory. In 1982, Peter Trampus moved to the Paks NPP, where he was in charge of the Material Testing and Evaluation Section (1982 to 92) being responsible for in-service inspection and RPV surveillance, basically all structural integrity related issues of the pressurized components, and later (1992 to 95) he was the Head of the Advisory Board to the General Director.

From 1996 to 2003, he worked for the International Atomic Energy Agency (IAEA), a member of the United Nations family, Vienna. He headed projects on managerial and engineering aspects of nuclear power program development, implementation and performance improvement. From 2003 to 2004 he was a visiting scientist at the Institute for Energy, Petten, The Netherlands, one of the seven institutes of the European Commission's Joint Research Center. Here, he was dealing with nuclear safety issues in Central and Eastern European countries. In 2003, Peter Trampus established his own consultant company and now works as principal consultant. Currently, the major focus of his activity is on nuclear power plant life management.

Peter Trampus is a Founding Member of the Hungarian Academy of Engineering (1990), recipient of the IAEA's Distinguished Service Award (2002), the Hungarian delegate of IIW Commission V "Quality control and quality assurance of welded products" (since 2006), President of the Hungarian Association for Nondestructive Testing (since 2005). He is the author of more than 100 papers in technical journals and conference proceedings, several of which are in English.

UPITIS, ELMAR

Elmar Upitis received a B.S. degree in Civil Engineering from University of Illinois in 1955 and did postgraduate studies at the Illinois Institute of Technology. He served in the US Army and was employed by Chicago Bridge & Iron Company from 1955 to 1995 in various capacities, including Chief Design Engineer, Manager of Metals Engineering, and Senior Principal Engineer–Materials. He was also responsible for oversight of CBI engineering in South America, Europe and Africa and Middle East. Mr. Upitis provides engineering consulting services in the areas of codes and standards (ASME, API, ASTM, etc.), design of plate structures, fitness-for-service evaluation, and materials related issues. He is a licensed professional and structural engineer in the State of Illinois, ASME Fellow and a member of various technical committees in the ASME B&P Vessel Code, ASTM Fellow and a member of several ASTM technical committees, former Chair of Pressure Vessel Research Council (PVRC) and an active participant in the PVRC, and a member of AWS and WRC. He is involved in the development of the new B&PV Code to replace the present Section VIII, Division 2 and several other projects related to the ASME B & PV Code.

Mr. Upitis is a co-author of WRC Bulletin 435 on design margins in ASME Section VIII, Divisions 1 and 2, WRC Bulletin 447 on evaluation of operating margins for in-service pressure equipment, WRC Bulletin 453 on minimum weld spacing requirements for API Standard 653, PVRC report on the European Pressure Equipment Directive, and several other published papers on Cr-Mo steel pressure vessels.

VAN DEN BREKEL, NICHOLAS C.

Nicholas C. van den Brekel is a recognized authority on Periodic Inspection for CANDU Nuclear Power Plants (the CANDU equivalent to ASME XI In-Service Inspection requirements). Over the last 16 years, Nick has been a major contributor to the Canadian Standards Association (CSA) N285B Technical Committee on Periodic Inspeciton of CANDU NPPs. Nick has served as an Executive Member and Secretary of this committee for the last 5 years (1999 onwards).

Nick has 23 years of experience in the Inspection and Maintenance of CANDU Nuclear Power Plants. Much of Nick's experience has been in dealing with the unique inspection and fitness for service evaluation challenges posed by the zirconium alloy fuel channels and other reactor internals at the heart of the CANDU reactor design. Many of these components are subjected to irradiation damage, damage that can result in physical changes to the material and material properties, conditions that must be monitored in accordance with Canadian nuclear standards. Nick has been involved in development of new non-destructive evaluation techniques to assess the material condition of zirconium alloy pressure tubes. Nick's experience extends to inspection and maintenance of all CANDU reactor components, including nuclear fuel, fuel channel feeder pipes, steam generator tubes, nuclear piping and vessels, as well as conventional side heat exchangers and steam turbines.

Nick is currently employed as the Technical Advisor to Inspection Services Division of Ontario Power Generation, which provides specialized inspection services to all CANDU reactor units, including 16 operating units in Canada. Nick's experience includes consultation to the international CANDU community on inspection and maintenance related issues.

VAZE, K.K.

K.K. Vaze graduated from Indian Institute of Technology, Bombay (IITB) with a B. Tech. in Mechanical Engineering in 1973. After completion of the 17th Batch of Training School of Bhabha Atomic Research Centre in 1974, he joined the Nuclear Systems Division of Indira Gandhi Centre for Atomic Research, Kalpakkam. He worked in the area of Structural Analysis and Design of Fast Reactor Components using Finite Element Method and ASME Boiler & Pressure Vessel Code, Section III, Nuclear Vessels.

In 1989, he joined the Reactor Safety Division of Bhabha Atomic Research Centre, Mumbai. Mr. Vaze was involved in the Structural analysis and design of Pressurized Heavy Water Reactor (PHWR) Components. The scope of work included Fatigue and Fracture Analysis, Experimental Stress Analysis, Fracture Mechanics, Seismic analysis, Fitness-for-Purpose Evaluation, Residual Life Estimation and Life Extension. He piloted a project on "Leak before Break evaluation of Primary Heat Transport piping of PHWR".

In addition to design and analysis, Mr. Vaze has expertise in Ageing Management, Equipment Qualification and Seismic Revaluation. He is a member of many committees formed by Atomic Energy Regulatory Board to look into the safety aspects of operating reactors as well as those under various stages of design/construction. He has 24 publications in Journals and over 60 papers in International Conferences. His current position is Head, Reactor Structures Section, in Reactor Safety Division of Bhabha Atomic Research Centre, Mumbai. Mr. Vaze resides in Mumbai with his wife, Ashlesha and two daughters, Anuja and Manasi.

VIROLAINEN, REINO

Mr. Virolainen graduated from Helsinki University of Technology (Material Engineering) in 1972. In 1973–1982, he worked at VTT, Electrical engineering laboratory, as a research scientist. Since 1982 he has been working for STUK (Radiation and Nuclear Safety Authority) as inspector, section leader and head of office of risk assessment. His main topics at VTT and STUK have been method development for level 1 PRA, CCFs, reviews of PRA applications for the Finnish NPPs and development of Risk Informed Regulation procedures including Risk-Informed Inservice Inspection (RI-ISI). Mr. Virolainen has been a long term member of Working Group RISK at OECD/NEA/CSNI, Vice Chairman in 1991–1992 and Chairman 1992–1996. He is a member of IAPSAM Board since 2006.

Mr. Virolainen is a special lecturer on systems reliability and risk assessment at Lappeenranta University of Technology. He has several technical publications in U.S., European and International Journals covering PRA, Risk-Informed Regulation and Nuclear Engineering and Design.

VOORHEES, STEPHEN V.

Employed in the Authorized Inspection Agency sector since 1976 with Factory Mutual, Commercial Union Insurance Company, Hartford Steam Boiler I and I, and OneBeacon America Insurance Company. Duties have included inspection of all types of boilers, pressure vessels, heat exchangers, nuclear components as well as supervision of these activities and finally management of same.

Currently serves on Section IV Heating Boilers as Vice Chair, Section XII, Transport Tanks as a member and Chair of Sub-Group Fabrication and Inspection, and serve as member of the Standards Committee.

From 1970 to 1974 served in the US Navy in the Western Pacific on destroyers as a boiler technician.

Married to Louise for 25 years with two sons. Reside in Allentown, PA. Hobbies include hunting, shooting and golf.

WEST, RAYMOND (RAY) A.

Mr. West began his nuclear career in the US Navy in 1971 and then proceeded into its Nuclear Power Program in 1976. He has been a welder, a Level III in several Non-destructive Examination (NDE) methods, and has developed Inservice Inspection (ISI) programs for both Pressured Water Reactors and Boiling Water Reactors. In 1979 he began work in the commercial nuclear industry and he continues to do so today.

His major accomplishments include ASME Engineer of the Year in 1997 in the State of Connecticut for Northeast Utilities, and several other ASME awards including one for the development of the Section XI, Nonmandatory Appendix R, "Risk-Informed Inspection Requirements For Piping," where he served as the ASME Technical Project Manager Responsible for Development and Approval of this Appendix (a 14 year effort), Approved for Publication in the 2005 Addenda of Section XI, October 2004. He has also authored or co-authored many technical papers centering on ISI and Risk-Informed Inservice Inspection (RI-ISI) and the latest was for the ASME 16th International Conference on Nuclear Engineering (ICONE16) in May 2008 that was related to the U.S. Nuclear Regulatory Commission's Rulemaking Process and its effects on the Endorsement of ASME Nuclear Codes and Standards in the USA.

Ray is currently the Vice Chair of the ASME Board on Nuclear Codes and Standards (BNCS), the Co-Chair of the BNCS Task Group on Regulatory Endorsement (TG-RE), a member of the ASME Boiler and Pressure Vessel (BPV) Code Subcommittee XI on Nuclear Inservice Inspection ISI, a member of the Section XI Executive Committee, and several of its lower level BPV Code writing groups. He has been involved with nuclear power for over 30 years. His experience has been focused on welding, NDE, and ISI and he is currently a Technical Consultant and the senior ASME representative for his company Dominion Resources, Inc. at the Millstone Power Station in Waterford, Connecticut.

WHITE, GLENN A.

Glenn White is a principal engineer and principal officer at Dominion Engineering, Inc. in Reston, Virginia. Mr. White manages consulting and analysis projects primarily for the nuclear power industry and often related to aging degradation of materials, boric acid corrosion, or thermal performance.

Mr. White was the principal author of the Electric Power Research Institute (EPRI) safety assessment report for primary water stress corrosion cracking (PWSCC) of U.S. PWR Alloy 600 reactor vessel closure head penetrations. In 2007, he was the principal investigator for EPRI's crack growth and leak-before-break evaluation of PWSCC of PWR pressurizer nozzle dissimilar metal welds in response to indications of circumferentially oriented PWSCC at one plant. Mr. White's projects to evaluate materials degradation include nuclear safety and economic risk assessments and apply analytical tools such as probabilistic Monte Carlo simulation, net present value analysis, Weibull statistical modeling, and stress and fracture analyses.

In the area of thermal performance degradation of nuclear steam generators, Mr. White investigates the sources of steam pressure loss, the fouling deposition process, and the effects of tube deposits on boiling heat transfer and corrosion.

Before joining Dominion Engineering, Inc. in 1993, Mr. White received BS (summa cum laude) and MS degrees in mechanical engineering from the University of Maryland at College Park. Mr. White is a registered professional engineer and is a member of NACE.

WILLIAMS, TONY

Tony Williams is head of the nuclear fuel department of the Nordostschweizerische Kraftwerke AG (NOK), the company responsible for the general management and fueling of the two Beznau PWR units and the Leibstadt BWR in Switzerland. Both plants are renowned for their progressive fuel burnup strategies as well as extensive use of MOX and Reprocessed Uranium fuels.

In addition to fuel procurement, his responsibilities include in-house fuel assembly and core design, administration of reprocessing contracts, planning of interim off-site storage, flask procurement and transport as well as some aspects of final disposal. He is a member of the Swiss nuclear fuel commission and a board member of ZWILAG, the facility responsible for interim dry fuel storage and waste conditioning in Switzerland. In previous positions he was manager of a research program investigating fuel and core issues related to Pebble Bed Modular Reactors as well as working as a reactor physicist for the British commercial nuclear industry.

Dr. Williams holds a diploma in Business Management, has an honors degree in Physics from Durham University (1981) as well as an M.Sc. and Doctors degree in neutron physics from Birmingham University (1984).

WOODWORTH, JOHN I.

John I. Woodworth has BSME from Univ. of Buffalo, 1948. He is engaged in consulting on Steam and Hot Water (hydronic) heating systems and Codes and Standards. He provides information for legal proceedings of hydronic heating systems and equipment. He was previously with Fedders Corp. (1948–1959), as Technical Director of Hydronics Institute (predecessor Institute of Boiler and Radiator Manufacturers.), 1959–1990. Woodworth's professional activities 1990 to date are supported by Hydronics Institute Division, GAMA.

He is a member of ASME, and a member of several ASME Code Committees such as Section IV, (1967–date), Cast-Iron Subgroup; Chair, ASME Section VI; Vice-Chair Controls and Safety Devices for Automatically-Fired Boilers Standards Committee (1973–2000). He was a consultant with the National Institute of Science and Technology (formerly the National Bureau of Standards). Woodworth is a Life Member of ASHRAE, Member of several of its Technical Committees, Secretary, Vice Chair and Chair of SPC. He has written numerous technical articles for trade magazines.

John received ASME Distinguished Service Award (1991), Dedicated Service Award (2000) and ASHRAE Standards Achievement Award (1996). He was a Member, National Fuel Gas Code Committee, VP, Uniform Boiler and Pressure Vessel Laws Society and Liaison to Building Energy Codes & Standards Committee. He was a Member of technical advisory committees for Brook-haven National Laboratories.

YODER, LLOYD W.

Mr. Yoder is a Mechanical Engineering graduate (BSME) of the University of Pittsburgh (1952). He joined ASME as a student member and continued membership until now as an honorary life member. Upon graduation from college, he joined Babcock and Wilcox Company as a graduate student that provided intense training in the operations of all divisions of the Company. Upon graduation from this program, he joined the Company's research center as a test and research engineer. During six years at the research center, he worked on both fossil and nuclear projects and was awarded several patents for fossil boiler inventions.

Mr. Yoder later transferred to the Company's main office, initially as a functional performance contact engineer and later as a design engineer responsible for developing utility boiler Company standards. It was during this time in 1971, that Mr. Yoder became a committee member of the Subcommittee on Power Boilers of the ASME Boiler and Pressure Vessel Code. He continued this membership and is now an honorary member of that Subcommittee. Mr. Yoder later became an engineering manager in Babcock & Wilcox's marketing department and with the Company's international business growing he subsequently joined the International Division as Technical Operations Manager of Licensee and Joint Venture Companies. After retirement in 1996, he became a consultant for several engineering companies on various problems and served as an expert witness in a number of litigations. For fourteen consecutive years, he and the late Martin D. Bernstein taught a continuing education course for the ASME on Section I of the ASME Boiler and Pressure Code. In 1999 the ASME published a book, *Power Boilers: A Guide to Section I of the ASME Boiler and Pressure Vessel Code*, which was co-authored by Lloyd W. Yoder and the late Martin D. Bernstein.

CONTENTS

PREFACE TO THE FIRST EDITION

This book provides "The Criteria and Commentary on Select Aspects of ASME Boiler and Pressure Vessel and Piping Codes" in two volumes. The intent of this book is to serve as a "Primer" to help the user weave through varied aspects of the ASME Codes and B31.1 and B31.3 Piping Codes and present a summary of specific aspects of interest to users. In essence, this Primer will enable users to understand the basic rationale of the Codes as deliberated and disseminated by the ASME Code Committees. This book is different from the Code Cases or Interpretations of the Code, issued periodically by these ASME Code Committees, although these are referred in the book. It is meant for a varied spectrum of users of Boiler and Pressure Vessel (B&PV) and B31.1 and B31.3 Piping Codes in United States and elsewhere in the world. This book should be considered as a comprehensive guide for ASME B&PV Code Sections I through XI, B31.1 and B31.3 Piping Codes. The contents of these two volumes can be considered as a companion book—a criteria document—for the latest editions of the Code, written by thirty-six professionals with expertise in its preparation and use.

ASME and the industry volunteers have invested immense resources in developing Codes and Standards for the Power and Petrochemical Industry, including nuclear, non-nuclear, fossil, and related. The industry has been relying on these documents, collectively referred to as the ASME Code, on a day-today basis, and regulators consult them for enforcing the rules. Research and development, in both the material science and analytical areas, find their results in the revisions and updates of the Codes. Over a period of time, these B&PV and Piping Codes, encompassing several disciplines and topics, have become voluminous Standards that belie the intent and expectations of the authors of the Codes. In a word, the B&PV Codes can become a "labyrinth" for an occasional user not conversant with the information contained in the Code. Thus, given the wealth of information contained in the Code, these cannot be easily discerned. For example, the B&PV Code, even though it is literally an encyclopedia of rules and standards to be followed by engineers in the nuclear or fossil or related industries, is not easy to comprehend and conform to. Alphanumeric text and graphics are loaded with information, arrived at by a consensus process from the deliberations of practicing engineers, professionals, academia, and regulators meeting several times a year. A lack of understanding of the Code, therefore, can cause not only professional errors but also misplaced confidence and reliance on the engineer's interpretation that could lead to serious public safety hazards. Spread over several volumes and thousands of pages of text, tables, and graphics, it is not easy to decipher the criteria and the basis of these Codes.

Thus, given the importance of these ASME Codes related to the industry and the attendant technological advances, it becomes a professional expediency to assimilate and appropriately apply the wealth of information contained in the Codes. The first step, then, is to ask, "Where is what?" The Code is spread over eleven Sections; attending the tutorials is one way to understand firsthand the various Sections of the Code. However, this is not within the reach of all of the engineers in the industry. The next best solution is to have expert authors, versatile in the individual Sections and Subsections, to make the subject matter understandable to the practicing engineers in a book format such as "A PRIMER."

In this book, all of the Sections I through XI of the B&PV and B31.1 and B31.3 Piping Codes are summarily addressed with examples, explanatory text, tables, graphics, references, and annotated bibliographical notes. This permits engineers to more easily refer to the material requirements and the acceptance criteria whether they are in the design basis or in an operability situation of a nuclear plant or process piping. In addition, certain special topics of interest to engineers are explicitly addressed. These include Rules for Accreditation and Certification; Perspective on Cyclic, Impact, and Dynamic Loads; Functionality and Operability Criteria; Fluids; Pipe Vibration; Stress Intensification Factors, Stress Indices, and Flexibility Factors; Code Design and Evaluation for Cyclic Loading; and Bolted-Flange Joints and Connections. Important is the inclusion of unique Sections such as Sections I, II, IV through VII, IX, and X that enriches the value of the book as a comprehensive companion guide for B&PV and Piping Codes. Of considerable value is the inclusion of an in-depth treatment of Sections III, VIII, and XI. A unique aspect of the book chapters related to the Codes is the treatment of the origins and the historical background unraveling the original intent of the writers of the Criteria of the Codes and Standards. Thus, the current users of these Codes and Standards can apply their engineering knowledge and judgment intelligently in their use of these Codes and Standards.

Although these two volumes cannot be considered to be a perfect symphony, the subject matter orchestrates around a central theme, that is, "The Use of B&PV and Piping Codes and Standards." Special effort is made by the contributors, who are experts in their respective fields, to cross-reference other Sections; this facilitates identifying the interconnection between various B&PV Code Sections, as well as the B31.1 and B31.3 Piping

Codes. The Table of Contents, indexing, and annotated notes for individual Chapters are provided to identify the connection between varied topics. It is worth mentioning that despite the chapters not being of equal length, comprehensive coverage is ensured. The coverage of some sections is intentionally increased to provide in-depth discussion, with examples to elucidate the points citing the Code Subsections and Articles.

K. R. Rao, Ph.D., P. E.
Editor

Robert E. Nickell, Ph.D.
1999–2000 President
ASME International

PREFACE TO THE SECOND EDITION

This edition continues to address the purpose of the first edition to serve as a "Primer" to help the user weave through varied aspects of the ASME Codes and B31.1 and B31.3 Piping Codes and present a summary of specific aspects of interest to users. In providing the "end user" all of these aspects, the first edition has been revised appropriately to be consistent with the current 2004 Codes.

Contributors of the first and second volumes had taken immense pains to carefully update their write-ups to include as much of the details that they could provide. Significant changes can be seen in Sections II, III, VIII and XI with repercussions on Sections I, IV, V, VII, IX and X. Thus, these consequences had been picked up by the contributors to bring their write-up up-to-date. Similarly changes of Power Piping (B31.1 Code) and B31.3 (Process Piping) have also been updated.

Included in this edition is a third volume that addresses the critical issues faced by the BWR and PWR Nuclear facilities such as BWR Internals, PWR Reactor Integrity, and Alloy 600 related issues. With the aging of the Nuclear Plants, the regulators perspective can be meaningful, and this has been addressed by experts in this area. In today's industrial spectrum the role of Probabilistic Risk Analysis has taken an important role and this volume has a chapter contributed by recognized authorities. With the increased use of computer–related analytical tools and with ASME Codes explicitly addressing them, a chapter has been devoted to the Applications of Elastic Plastic Fracture Mechanics in ASME Section XI Code.

ASME Codes are literally used around the world. More importantly the European Community, Canada, Japan and UK have been increasingly sensitive to the relevance of ASME Codes. In this second edition, experts conversant with these country Codes had been invited to detail the specifics of their Codes and cross-reference these to the ASME Codes.

Public Safety, more so than ever before, has become extremely relevant in today's power generation. Experts hade been invited to provide a perspective of the regulations as they emerged as well as discuss the salient points of their current use. These include the transportation of radioactive materials and the new ASME Section XII Code, Pipe Line Integrity and pertinent topics involved in decommissioning of nuclear facilities.

K. R. Rao, Ph.D., P.E.
Editor

PREFACE TO THE THIRD EDITION

This edition continues to address the purpose of the previous editions to serve as a "Primer" to help the user weave through varied aspects of the ASME Codes and B31.1 and B31.3 Piping Codes, in addition to a discussion of "The Criteria and Commentary on Select Aspects of ASME Boiler and Pressure Vessel and Piping Codes" of interest to "end users". This publication has been revised in providing all of the aspects of the previous editions, while updating to the current 2007 Codes, unless otherwise mentioned. This book in three volumes strives to be a comprehensive 'Companion Guide to the ASME Boiler and Pressure Vessel Code'.

Since the first edition, a total of 140 authors have contributed to this publication, and in this edition there are 107 contributors of which 51 are new authors. Several of the new contributors are from countries around the world that use ASME B&PV Codes, with knowledge of ASME Codes, in addition to expertise of their own countries' B&PV Codes. All of these authors who contributed to this third edition considerably updated, revised or added to the content matter covered in the second edition to address the current and futuristic trend as well as dramatic changes in the industry.

The first two volumes covering Code Sections I through XI address organizational changes of B&PV Code Committees and Special topics relating to the application of the Code. Considering significant organizational changes are taking place in ASME that reflect the industry's demands both in USA and internationally, the salient points of these have been captured in this publication by experts who have first hand information about these.

Volume 1 covers ASME Code Sections I through VII, B31.1 and B31.3 Piping Codes. Continuing authors have considerably updated the text, tables, and figures of the previous edition to be in line with the 2007 Code, bringing the insight knowledge of these experts in updating this Volume. Fresh look has been provided by new authors, who in replacing previous contributors of few chapters, have provided an added perspectives rendered in the earlier editions. In one case, the chapter had been entirely rewritten by new experts, with a new title but addressing the same subject matter while updating the information to the 2007 ASME Code Edition.

ASME Code Committees have spent time and considerable resources to update Section VIII Division 2 that was completely rewritten in the 2007 Code Edition, and this effort has been captured in Volume 2 by several experts conversant with this effort. Volume 2 has chapters addressing Code Sections VIII through XI, refurbished with additional code material consistent with the current 2007 Code edition. Notable updates included in this Volume relate to maintenance rule; accreditation and certification; perspectives on cyclic, impact and dynamic loads; functionality and operability criteria; fluids; pipe vibration testing and analysis; stress intensification factors, stress indices and flexibility factors; Code design and evaluation for cyclic loading; and bolted-flange joints, connections, code design and evaluation for cyclic loading for Code Sections III, VIII and a new chapter that discusses Safety of Personnel using Quick-actuating Closures on Pressure Vessels and associated litigation issues. While few chapters have been addressed by new authors who added fresh perspective, the efforts of continuing authors have provided their insights with additional equations, figures and tables in addition to extensive textual matter.

The third volume of this edition is considerably enlarged to expand the items addressing changing priorities of Codes and Standards. Continuing authors who addressed these topics in the previous edition have discussed these with respect to the ASME 2007 Code Edition. The discussions include chapters on BWR and PWR Reactor Internals; License Renewal and Aging Management; Alloy 600 Issues; PRA and Risk-Informed Analysis; Elastic-Plastic Fracture Mechanics; and ASME Code Rules of Section XII Transport Tank Code. Chapters covering 'U.S. Transportation Regulations for Radioactive Materials'; 'Pipeline Integrity and Security', and 'Decommissioning of Nuclear Facilities' have been considerably revised.

In Volume 3 experts around the world capture 'Issues Critical for the Next Generation of Nuclear Facilities' such as Management of Spent Nuclear Fuel, Generation III+ PWRs, New Generation of BWRs and VERY High Temperature Generation IV Reactors.

The impact of globalization and inter-dependency of ASME B&PV Codes had been examined in the previous edition in European Community, Canada, France, Japan and United Kingdom. Contributors who authored these country chapters revisited their write-up and updated to capture the current scenario.

Significant contribution in the third volume is the inclusion of additional countries with changing priorities of their Nuclear Facilities. In-depth discussions cover the international

experts of these countries which own and operate nuclear reactors or have nuclear steam supply vendors and fabricators that use ASME B&PV Code Sections I through XII. This information is meant to benefit international users of ASME Codes in Finland, Belgium, Germany, Spain, Czech and Slovakia, Russia, South Africa, India, Korea and Taiwan that have been added in this third edition.

A unique feature of this publication is once again, as in the previous editions, the inclusion of all author biographies and an introduction that synthesizes every chapter, along with an alphabetical listing of indexed terms

K. R. Rao, Ph.D., P.E.
Editor

INTRODUCTION

This third edition is in three volumes composed of 19 Parts, with Parts 1–5 in Volume 1, Parts 6–11 in Volume 2 and Parts 12–19 in Volume 3. Common to all three volumes is the front matter, including the Organization of the Code. Organization and Operation of the ASME Boiler and Pressure Vessel (B&PV) Committee has been initially authored by Martin D. Bernstein for the first edition but considerably updated in the previous second edition by Guido G. Karcher. However, the current dramatic changes in the ASME B&PV organization these have been captured by Guido Karcher in this current third edition. Included are detailed discussions pertaining to the "Research Projects for the Maintenance and Development of Codes and Standards" and "Realignment Activities of the ASME B&PV Code Committee Structures". An index is provided at the end of each volume as a quick reference to topics occurring in different Code Sections of that volume. In addition to indexing several topics covered in this publication, it is also meant to assist in reviewing the *interconnection* of the ASME Boilers & Pressure Vessel Code Sections/Subsections/Paragraphs occurring in the particular volume. In each chapter, all discussions generally pertain to the latest 2007 Code Edition unless noted otherwise by the chapter author(s). The ASME Code is generally accepted in the United States (and in many foreign countries) as the recognized minimum safety standard for the construction of pressure vessels and piping. Toward that end, the first two volumes can be considered "a primer." Although this primer is authored by several Code Committee members who are considered experts in their respective fields, the comments and interpretations of the rules contained in this book are strictly the opinions of the individual authors; they are not to be considered official ASME Code Committee positions.

Since the first edition, a total of 140 authors contributed to this publication and in this edition there are 107 contributors of which 51 are new authors. Several of the new contributors are from countries around the world that use ASME Boiler & Pressure Codes, with knowledge of ASME Codes in addition to expertise of their own country Boiler & Pressure Vessel Codes. All of these authors who contributed to this third edition considerably updated, revised or added to the content matter covered in the second edition.

Volume 1 has five Parts, each addressing a unique aspect of the Code. Part 1 covers *Power Boilers* (Code Sections I and VII); Part 2 covers *Materials and Specifications* (Code Section II); Part 3 provides an in-depth commentary on *Rules for Construction of Nuclear Power Plant Components* (Code Section III, Divisions 1, 2, and 3); Part 4 covers *Power Piping* (B31.1 Code) and *Process Piping* (B31.3 Code); and Part 5 covers *Heating Boilers* (Code Sections IV and VI).

Volume 2 covers Parts 6–11, with Part 6 covering *Nondestructive Examination* (NDE) (Code Section V); Part 7 providing in-depth criteria and commentary of Code Section VIII, including Divisions 1, 2, and 3; Part 8 covering welding and brazing qualifications of Code Section IX; Part 9 covering Code Section X and pertaining to fiber-reinforced plastic pressure vessels; Part 10 providing in-depth discussions of Code Section XI; and Part 11 covering special topics of interest to ASME Boiler and Pressure Vessel (B&PV) Code Users and Practicing Engineers.

The scope of Volume 3 that contains Parts 12 to 19 has considerably expanded from the previous edition. This volume has in addition to aspects with critical bearing on ASME Boiler & Pressure Vessels addresses countries that have become increasingly important with ASME Codes being applicable to them. Part 12 addresses Current BWR Reactor Internals & Other BWR Issues in chapters that cover License Renewal and Aging Management (NRC), PWR Reactor Vessel Integrity, PWR Reactor Vessel Alloy 600 Related Issues, PRA & Risk Based Analysis, and Applications of Elastic Plastic Fracture Mechanics in ASME Section XI Code Applications. In Part 13 International Codes & Standards Related to ASME B&PV Code are addressed, which include Pressure Equipment Directive used by the European Community, Canadian B&PV Codes & Standards, French Pressure Equipment Codes, Recent Development of Boiler and Pressure Vessel Codes in Japan, and British Codes & Standards. With the recent trends to pay particular attention to Public Safety, more so than previously, Part 14 focuses on Other Ongoing Issues of Public Safety with chapters covering 40-Year Retrospective on the Transportation Regulations for Radioactive Materials, Description of Rules of Section XII Transport Tank Code, Pipe Line Integrity & Security, and Decommissioning of Nuclear Facilities. In Part 15 issues critical for the next generation of nuclear facilities is addressed. In this Part, topics deal with Management of Spent Nuclear Fuel, Generation III+ PWRs, New Generation of BWRs and very High Temperature Generation IV Reactors. Global Pressure Vessel and Piping Issues of several countries of Western and Eastern Europe, Africa and Asia are dealt with in Parts 16 to 19. In each of these Chapters authors with expertise in their Country Codes and conversant with ASME Pressure Vessel Codes provided the write-up. In Part 16 PV&P Codes of West European Countries covered are Finland, Belgium, Germany and Spain. In Part 17 the PV&P Codes of East European Countries included are Czech and Slovakian Codes, Hungary and Russia. Codes and standards used in the nuclear industry in the Republic of South Africa are covered in Part 18. Pressure & Vessel Issues of Asian countries such as India, Korea and Taiwan are included in Part 19.

VOLUME 1

Chapter 1 of the 1st edition was authored by the late Martin D. Bernstein. It discussed *Power Boilers*, Section I of the ASME Code. His objective was to provide an overview of the intent,