

## TABLE OF CONTENTS

### Sections A & B      Design Descriptions

Chairman:              Mr. G. Kharshafdjian (AECL-CANDU)

Paper A.1      S. Yokell, (Torque and Tension Equipment Inc., Santa Clara, California),  
*"History and Current Status of Expanded Tube-to-Tubesheet Joints"*.

Paper A.2      D.P. Updike, A. Kalnins (Lehigh University, Bethlehem, Pa.), and S.M.  
Caldwell (Eastman Chemical Co., Kingsport, Tennessee), *"Estimation of  
Hydraulic Pressure for Expansion of Heat Exchanger Tubes"*.

Paper A.3      M. Podhorsky (Bälcke-Dürr, A.G. Ratingen, Germany), *"Hydraulic Expansion  
of Tubes"*.

Paper B.4      R. McGregor, W. Schneider and F. Eagle (Babcock and Wilcox Ltd.,  
Cambridge, Ontario), *"Nuclear Steam Generator Tube-to-Tubesheet  
Expansion"*.

Paper B.5      D. Busine, B. Guerrand (EdF, Les Renardières, Moret sur Loing),  
M. Martinovitch G. Slama (Framatome, Paris, La Defense, France), *"French  
Experience in Tube-to-Tubesheet Joint Technology for Steam Generators"*.

Paper B.6      S. Venkatapathi (AECL Research, CRL), A. Mehmi and H. Wong (AECL  
CANDU, Mississauga, Ontario, Canada), *"Pressure Tube-to-End Fitting  
Roll-Expanded Joints in a CANDU PHWR"*.

### Sessions C & D:      Finite Element Analysis and Modelling

Chairman:              Professor A. Chabaan, (Université de Montreal)

Paper C.7      D.R. Metzger and R.G. Sauvé (Ontario Hydro Technologies, Toronto, Ontario),  
*"Numerical Simulation of a Rolled Joint Formation Process"*.

Paper C.8      B.J. Gracie, R. Metcalfe, J.M. Pietralik, and S.B. Baset (AECL-Research CRL,  
Ontario, Canada), *"Development of Rolled Joint Numerical Models"*.

- Paper C.9 U.A. Abdelsalam and M.A. Dokainish (McMaster University, Hamilton, Ontario), "*Tube-to-Tubesheet Joints: A Review and Finite Element Analysis*".
- Paper C.10 J.Y. Hwang, D.L. Harrod and W.B. Middlebrooks (Westinghouse Ltd., Pensacola, Florida), "*Analytical Evaluation of the Hydraulic Expansion of Steam Generator Tubing into Tubesheets*".
- Paper D.11 A. Chaaban, M. Allan, A. Bazergui and H. Ma (École Polytechnique, Université de Montreal, Montreal, Canada), "*Hydraulic Expansion of Tube-to-Tubesheet Joint*".
- Paper D.12 B. Kasraie and J.S. Porowski (AEA O'Donnell Inc., Pittsburgh, Pa.), "*Crack Closure Effects in the Tube-to-Tubesheet Weldments*".
- Paper D.13 W.R.C. Underhill and M.A. Dokainish (McMaster University, Hamilton, Ontario), "*The Estimation of Contact Pressure in Expanded Tube Joints Using Virtual Finite Elements*".
- Paper D.14 U.A. Abdelsalam and M.A. Dokainish (McMaster University, Hamilton, Ontario), "*Hydraulic Expansion of the Tube-to-Tubesheet Joints: A Finite Element Analysis*".

**Session E: Experimental Measurement**

**Chairman:** Mr. R. Metcalfe (AECL-RC, Chalk River Laboratories)

- Paper E.15 S. Venkatapathi (AECL-RC, CRL) and N.C. Johnston (AECL CANDU, Mississauga, Ontario Canada), "*Calandria Tube-to-Tubesheet Roll Expanded Joints in CANDU PWR*".
- Paper E.16 J.H. Kissel and L.R. Schroeder (ITT Standard Inc., Buffalo, New York), "*Laboratory Measurement of Tube-to-Tubesheet Joint Strength at Temperature*".

Paper E.17 K. Uragami (Nagoya R&D Centre, MHI), T. Kodama (Takasago R&D Centre, MHI), and O. Takaba (Kobe Shipyard and Machinery Works, Mitsubishi Heavy Industries, Japan), "*Study on Residual Stresses of Tube to Tubesheet Joint*".

Paper E.18 M.T. Flaman, B.E. Mills, S. Morely and J. Giunta (Ontario Hydro Technologies, Toronto, Ontario), "*Development of a Capability for the Measurement of Residual Stresses in Rolled Joints of CANDU Reactor Pressure Tubes*".

**Session F: Tool Design**

Chairman: Prof. M.A. Dokainish (McMaster University)

Paper F.19 C. Virkus (Elliot Co., Dayton, Ohio), "*Components of the Design of Tube Expanders*".

Paper F.20 A.F. Gottstein and J. Scherer (Sherex Industries, Burlington, Ontario), "*Comparisons Between Different Tube-to-Tubesheet Expansion Techniques*".

Paper F.21 Panel Discussion, Chairman: Professor M. Dokainish (McMaster University, Hamilton, Ontario).

**Session G & H: Deterioration**

Chairman: Mr. E.G Price (AECL CANDU)

Paper G.22 K. Uragami, (Nagoya R&D Centre, MHI), T. Kodama (Takasago R&D Centre, MHI) and O. Takaba (Kobe Shipyard and Machinery Works, Mitsubishi Heavy Industries Ltd., Japan), "*Study of the Effects of Cold Work in Heat Transfer Tubing on Stress Corrosion Cracking in High Temperature Water*".

Paper G.23 V.F. Urbanic, G.M. McDougall, A.J. White (AECL Research CRL, Ontario) and A.A. Bahurmuz (AECL-Research, Whiteshell, Manitoba, Canada), "*Deuterium Ingress at Rolled Joints in CANDU Reactors*".

- Paper G.24 A.J. White, V.F. Urbanic, A.A. Bahurmuz, W.R. Clendenning, R. Joynes, G.M. McDougall, B.C. Skinner and S. Venkatapathi (AECL Canada), *"Plating End Fittings to Reduce Hydrogen Ingress at Rolled Joints in CANDU Reactors"*.
- Paper H.25 A.R. McIlree, (EPRI, Palo Alto, California), C.O. Ruud and M.E. Jacobs, (The Pennsylvania State University, University Park, Pennsylvania), *"The Residual Stresses in and the Stress Corrosion Performance of Roller Expansion Transitions in Alloy 600 Steam Generator Tubing"*.
- Paper H.26 C.D. Cann, A.A. Bahurmuz, E.E. Sexton (AECL-RC, Whiteshell Laboratories, Manitoba), I. Grant, I. Inglis, E.V. Murphy, (AECL-CANDU, Mississauga, Ontario, and M. Natersan (Ontario Hydro, Toronto, Canada), *"Removal of Hydrogen from Rolled Joints in CANDU Reactors by Yttrium Getters"*.
- Paper H.27 S. Venkatapathi, (AECL-RC, CRL) N.C. Johnston and A. Mehmi (AECL-CANDU, Mississauga, Ontario, Canada), *"Roll Expanded Joints in the Reactor Assembly of CANDU PWR's"*.

