**Commission XI and IX Delegate Report**
**for**
**60th International Institute of Welding (IIW) Annual Assembly**
**01-04 July 2007 Dubrovnik, Croatia**

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## General

### 60th International Institute of Welding (IIW) Annual Assembly 2007

Attendance at IIW Annual Assembly was very strong with over 600 delegates/experts from 51 member countries gathered in Dubrovnik & Cavtat, Croatia from July 1-6, 2007. John Bowker (C-IX, X, XI) and Jim Gianetto (C-IX, XI) shared the responsibilities of serving as the Canadian delegates/experts for Commissions XI (Pressure Vessels, Boilers and Pipelines), IX (Behaviour of Metals Subjected to Welding) and X (Structural performances of welded joint - Fracture avoidance) over the first four days (July 1-4). We also attended the International Conference – Welding & Materials: Technical Economic and Ecological Aspects, July 5th and 6th, 2007 that was attended by both IIW delegates/experts as well as over 200 other conference registrants.

The IIW Annual Assembly began on Sunday (July 1st) with the Opening Ceremony where the President of IIW, Mr. Chris Smallbone opened the event. His presentation was very well received and he reinforced his objective for IIW which focuses *on improvement of the global quality of life through the optimum use of welding and joining technology.*

## IIW COMMISSION XI- PRESSURE VESSELS, BOILERS AND PIPELINES

Dr. Martin Prager, (WRC, PVRC, and MPC) from the USA chairs this commission. The IIW meetings have two main purposes: to gather together experts from around the world to discuss welding related issues, and to allow the flow of information between the member welding societies in the parent countries. The Commission XI meetings were organized with a series of presentations given by experts in the field of welding (see attached agenda). Eric Sjerve, IRISNDT, also attended some of the commission XI meetings and kindly shared some of his notes on the presentations and discussions. The full texts of the majority of the papers are available by contacting the CCIIW.

### July 2, 2007- Commission XI-Meetings- Overview and Hydrogen Documents

→ **Dr. Martin Prager (WRC, PVRC and MPC) USA ( XI-884-07)** presented an overview of the activities of IIW Commission XI present and future – This commission has an important role to play in a wide range of technologies related to Pressure Vessels, Boilers and Pipelines. He stated that "The introduction of new materials and new designs in power plants, pushing the temperature limits with modified versions of current alloys, is bold and introduces hazards. The notion of an infrastructure to support hydrogen fuelled vehicles should give every materials and welding engineer pause. LNG transport, a new generation of nuclear plants, risk based design and inspection, undersea pipelines, and Fitness-for-Service are but a few of the topics requiring extensive and intensive international cooperation if we are to enjoy a good safety record and spread prosperity with out environmental hazard."

Some hot topics that have been identified are closely aligned with R&D activities in Canada, particularly those related to pipelines and new generation nuclear plants (GenIV).

- Creep strength reduction factors for advanced Cr-Mo-V and Cr-W-V ferritic alloys
- New methods for weldment fatigue life prediction
- Risk assessment procedures (RIMAP, API etc)
- Hydrogen infrastructure
- Residual stress estimates for Fitness-for- Service
- Repair welding
- Marine/Offshore deep hole applications
- Oil/Gas pipeline and storage and transportation (LNG)
- Welds for nuclear power plants
- Welding Duplex Steels
- Correlating and Estimating toughness of new and degraded steels

Dr. Prager indicated that each of the topics on the hot list is a major area for work and that the role of Commission XI could be expressed as follows:

- Compare experiences
- Collect data
- Coordinate plans
- Collaborate in planning programs
- Combine results
- Coalesce on conclusions
- Communicate to industry, government and academia
- Cooperate in codes and standards development

→ **Tom Siewert, NIST, USA (XI-879-07) -The Status of Hydrogen as Fuel.** He gave an interesting overview presentation on hydrogen economy and activities related to development of materials and joining for hydrogen pipelines. The driving issue is the decline in the amount of oil available, and how to replace it when it starts to run out. There are a number of options to replace this, hydrogen being one choice. There are also a number of ways to generate the large amount of required hydrogen, and there is currently a Northern Hydrogen highway of filling stations going into Manitoba. The time frames for major hydrogen usage are projected to be: 2015 for a decision to proceed and 2020 for mass usage.

NIST will be building a new hydrogen test facility in Boulder, Co that will allow a variety of test programs to be carried out over the next few years. Collaborative research on development of testing methodologies for evaluation of materials and welds will be possible through an MOU between CANMET-MTL and NIST. A NIST Workshop on Materials Test Procedures for Hydrogen Pipelines is scheduled for August 2007 with the purpose of developing a roadmap for materials, test procedures, mechanical properties data and standards for future hydrogen pipelines.

NIST is focusing on the metrology and science of hydrogen usage: metering (filling stations), codes and standards, materials for fuel cells/stationary storage and hydrogen pipeline materials for transportation infrastructure. The DOE in the USA and various industry consortiums is looking at a number of technologies to store hydrogen in vehicles. NIST is building a hydrogen center to go back to basics and start testing modern steels for hydrogen service.

One of the issues for Canadian industry is the generation and transportation of hydrogen. Three technologies that are being considered are generating hydrogen from methane gas, from coal and from nuclear power plants, all of which are readily available in Canada. Transportation to market using existing oil and gas pipeline networks is being considered as the cost effective solution, which is also of interest to Canadian industry. There is a whole host of issues that need to be resolved before this will be commercial.

→ **Prof. Bilal Dogan, GKSS, Germany (XI-887-07)** presented the objectives for Sub-Commission XI-H on Hydrogen effects on welded components which will focus on concerns for welds in the future hydrogen economy applications (transportation, energy, storage etc). This area is expanding very rapidly and could potentially become a major topic within Canada.

→ **M. Prager, USA, XI-893-07-** Setting the Charpy Requirements and a Stress Temperature Relation. A toughness approach using FAD (failure assessment diagram) based fracture mechanics was outlined. This considers primary/secondary stresses, a hypothetical flaw, PWHT, rate issues, geometry issues and new materials indexing. The paper presents updates to these estimates of toughness, and puts them in the context of historical methods of calculation including comparisons to significant amounts of experimental data.

**<u>July 3, 2007- Commission XI Meeting – Fatigue, Residual Stress, High Temperature, & Creep Documents</u>**

→ **Pingsha Dong, Battelle, USA** presented two commission documents; the first on Advanced Fatigue Evaluation of Weldments under new API and ASME codes (XI-885-07); and a very in depth and comprehensive presentation on Minimizing Weld Residual Stresses in High Alloy Weldment Applications (XI-886-07) that provided the latest information on;

→ Residual stresses in SS weldments:

- For same joint geometry and welding conditions, the overall residual stress distributions are very similar to CS weldments
- The magnitude can all be scaled by their respective yield strengths
- Residual stress distributions in SS welds tend to be little more localized than those in CS.

→ Residual stress in repair welds
  - High through thickness membrane and bending content
  - Important parameters: repair length, depth, width

→ Residual stress treatment in FFS:
  - Residual stress induced triaxiality
  - Fracture driving force should be calculated by imposing displacement controlled conditions

→ Various stress improvement techniques can be implemented for a specific application;
  - Thermal and/mechanical induced local stretching

→ **Dr. Martin Prager (WRC, PVRC and MPC) USA ( XI-882-07)** gave a presentation focused on Additional Reports of Problems with Installed Alloy 91 utility components that clearly showed the current experience with application of high temperature materials and issues with fabrication, welding and service performance of Alloy 91. This clearly reinforces the need to ensure that future GenIV nuclear plant materials and welding are adequately researched to ensure similar problems are not repeated in their design, construction and operation.

→ **Prof. Bilal Dogan, GKSS, Germany (XI-883-07)** gave a short presentation on the Draft ISO Standard on "TEST PROCEDURE FOR CREEP CRACK INITIATION AND GROWTH TESTING OF METALLIC MATERIALS" that was balloted on during the commission meetings in order to send it on to the ISO through the standardization committee.

→ Four other documents were presented on topics related to creep and guidance for heat treatment of dissimilar weld metals that were well received and generated some discussion. The full documents are available on-line at IIW website - http://www.iiw-iis.org

**July 4, 2007- Commission XI Meeting – Transmission Pipelines Sub-Commission XI-E Documents**

Prof. David Yapp (Cranfield University, UK) and Dr. Martin Prager (WRC, PVRC and MPC) USA co-chaired the session on research related to transmission pipelines that attracted over 35 delegate/experts.

→ **David Yapp, Cranfield University, UK (XI-873-07)** gave an overview of activities of Sub-Commission XI-E, 2006-2007 that included an intermediate meeting that was held in Europe, November 2006.

→ **D. Yapp & T. Liratzis, Cranfield University, UK (XI-875-07).** David Yapp gave a second presentation on Mechanical properties of pipe girth welds in high strength pipeline steels that provided data from recent research conducted at Cranfield University. The research has industrial support from BP and TransCanada and focused on welding large diameter high strength Grade 690 (X100) pipe using mechanized GMAW variants such as single, tandem, dual torch and dual tandem welding processes.

→ **Jim Gianetto, CANMET-MTL, Ottawa, ON, Canada, (XI-876-07)** gave a presentation entitled *"Towards Tensile and Toughness Testing Protocols for Evaluation of Pipeline Girth Welds" by J. A Gianetto, J.T. Bowker, D.V. Dorling, D. Taylor (TCPL), D.J. Horsley, (BP) and S. Fiore (Edison Welding Institute). The presentation* was well received and generated considerable interest from the (35) delegates/experts in attendance. An overview of the detailed mechanical testing and characterization that was conducted to assess three series of mechanized X100 girth welds for strain based designed pipelines was presented. This collaborative work is aimed at establishing recommended testing protocols to ensure girth weld integrity is achieved with application of higher productivity welding processes, while still meeting stringent property requirements.

→ **John Bowker, CANMET-MTL, Ottawa, ON, Canada (XI-877-07)** made a presentation on "*Toughness of the Heat Affected Zone in High Strength Line Pipe Steels" by J.T. Bowker, J.A. Gianetto and, O. Dremailnova* that was also well received. The presentation provided an example of how thermal HAZ simulation (Gleeble) can be used to assist with the understanding of complex microstructure/property relationships for two high strength line pipe steels.

→ **S. Felber, Austria XI-880-07** - Welding of the high grade pipeline-steel X80 and description of different pipeline-projects. An attempt was made to summarize technical welding conditions and information for pipeline construction projects from around the world.

→ **S. Felber, Austria XI-881-07** - Mechanical-technological and fracture mechanical properties of the high grade pipeline-steel X80 with results of different pipeline-projects. A summary of mechanical properties to develop a technical database for pipeline construction projects from around the world was attempted. The wide range of data made it difficult to analyzed and summarize any trends.

→ **BUSINESS PLAN FOR COMMISION XI XI-892-07**

The final item on the agenda dealt with a summary, review and discussion of the proposed strategic plan for Commission XI that was led by Dr. Prager. (See below). He outlined in more detail the specific items that link the objectives and key strategies, including several areas where complementary synergies exist within Canada, notably CANMET-MTL's PERD Pipeline and GenIV Nuclear Materials programs.

**STRATEGIC PLAN FOR COMMISION XI**

| Objective A: | Objective B: | Objective C: | Objective D: |
|---|---|---|---|
| Initiate and develop World's Best Practices | Organise the exchange of scientific and technical information and provide an environment to encourage and sustain the transfer of knowledge | Assist in the formulation and preparation of International Standards | Encourage and support a safe, healthy and environmentally friendly world |
| **Key Strategies** | **Key Strategies** | **Key Strategies** | **Key Strategies** |
| 1A Develop a Practice for Calculating Weld Strength Reduction Factors for Components in Creep Service | 1B Collect Data On the Effects of Hydrogen on Ordinary Strength Steel that May be Useful in Predicting the Performance of Welds in Hydrogen Environments | 1C Work With Other Commissions on Standardizing approaches to the Structural Stress Evaluation of Welds for Welds in Fatigue Service | 1D Contribute the Results of 1A and 5A to Conferences |
| 2A Develop a Practice for Heat Treatment of Dissimilar Metal Welds that Optimizes the Performance of the Joint | 2B Collect Toughness Data for Steels That will Enable Better Prediction for the Purposes of Fitness for Service and Design | 2C Continue to Advance International Standards on Creep Crack Growth of Welds | 2D Compile the Results of 1B and Disseminate to Pipeline, Automotive and other Infrastructural Industries |
| 3A Develop Systematic Procedures for Estimating the Long-Term Stress Rupture Properties of Welds | 3B Organize Activities of That Promote Comparisons of Measurements and Prediction of Residual Stresses | 3C Develop Needed Additional International Standards for Consumables and Welding of Steel pipelines Up X-120 to | 3D Encourage National Standards to Adopt the work Product of 4C and 5C |
| 4A Develop a Best Practice Document for Repair Welding Ferrous alloys | 4B Organize Activities of That Facilitate Sharing and Discussions of Information that pertains To Risk Assessment of Welded Components | 4C Formulate Procedures on Fitness for Service Procedures for Welds in Ambient and Low Temperature Service | 4D Disseminate the Results of 6B to Electric Power and Petroleum Organizations |
| 5A Develop a Practice for Optimizing Joint Design and Consumable Selection and Heat Treatment for Components in Creep Service | 5B Gather Data on the Effects of Time and Temperatures up to 300C on Toughness of Duplex Steels | 5C Formulate Procedures on Fitness for Service Procedures for Welds in Elevated Temperature Service | 5D Identify and Explore Potential Problems Associated with Welds in New Nuclear Plant Designs |
| | 6B Act as a Clearing House for Causes and Corrective Actions for Problems Associated with the Introduction of High Strength Cr-Mo-W-V steels for Creep service | | |

**IIW COMMISSION IX - BEHAVIOUR OF METALS SUBJECTED TO WELDING**

**<u>July 2-4, 2007- Commission IX Meetings-</u>**

Chairman – Th. Boellinghaus (Germany) Vice-Chairman – H. Cerjak (Austria)

John Bowker and I attended different sessions throughout the three-days of C-IX meetings (see attached agenda). The strategic plans for Commission IX were presented and discussed in detail. Many of the topics are relevant to Canadian Industry and fit well with CANMET-MTL current programs, including Pipelines, Transportation and GenIV Nuclear Materials. As evident from the wide array of topics that Commission IX deals with many materials welding issues that spans several materials systems and welding processes as well as detailed testing and evaluation of weld metal and HAZ. The commission has four sub-commissions that focus on the following:

# IIW Commission IX Working Program 2007 ++

GOAL: Identify, create, develop and transfer World's best practices

| SC | Materials | Subjects |
|---|---|---|
| **IX-C** | **Creep and Heat Resistant Welds** | 1. Repair and replacement in power plants<br>2. Creep behaviour of similar and dissimilar metal welds<br>3. Effect of weld metal selection and PWHT selection on creep life<br>4. Design standards relationships<br>5. Case studies<br>6. Testing and assessment (Damage, Remnant life)<br>7. Influence of weld design and procedures |
| **IX-L** | **Low Alloyed Steel Welds** | Materials included within this SC: C-Mn and micro-alloyed high strength steel welds, low alloyed steel welds (Mn-Mo and Mn-Ni grades), Cr-Mo ferritic steel welds (up to 12% chromium), Ni steel welds (up to 9%)<br>1. Cracking phenomena in HAZ (hot cracking, cold cracking, reheat cracking)<br>2. Effects of weld heat treatments (preheating, postheating, controlled interpass temperature, soaking)<br>3. Service Properties of Weld Joints (metallurgical, hardness, tensile properties, toughness, hydrogen service, sour service)<br>4. Microstructure prediction and control in low alloyed steel welds (focus on understanding and control of acicular ferrite or intragranular ferrite as well as on the effect of Nb on the development of martensite-austenite constituent (MA) and its effect on weld toughness)<br>5. Modeling of microstructure development |
| **IX-H** | **Stainless Steels and Nickel Alloys** | 1. Welding of Ferritic and Martensitic Stainless Steels (responsible: M. du Toit)<br>2. Welding of Ferritic/Austenitic Steels (responsible: A. Marshall)<br>3. Welding of Highly Alloyed Austenitic Steels and Ni Alloys (responsible: B.Holmberg & M. Gittos)<br>4. Welding of Dissimilar Materials (responsible: L. Karlsson)<br>5. Hot Cracking in Stainless and Ni-base Weldments (responsible: J. Ramirez)<br>6. Guidance on Specifications of Ferrite in Weld Metal (responsible: D. Kotecki)<br>7. Effects of Residual and Microalloying Elements (responsible: N. Ames)<br>8. Corrosion of Welds in Stainless Steel and Nickel Alloys (responsible: C.-O. Pettersson) |
| **IX-NF** | **Non-Ferrous Metals** | 1. High temperature cracking and defect formation in Aluminium welds<br>2. Structure-property relationships of Al, Mg and Ti Friction Stir Welds<br>3. Structure-property relationships of dissimilar welds in non-ferrous materials<br>4. Weldability of fusion welds in Magnesium alloys |

→ Jim Gianetto attended session on low alloyed steel welds in C-IX-L and Stainless Steels and Nickel Alloys in C-IX-H. Several interesting papers were presented, including one excellent paper entitled "Development of In-situ Microstructure Observation Technique in Welding" by Y. Komizo and H. Terasaki (Osaka Univ.), M Yonemura and T. Osuki (Sumitomo Metal Industry) (Japan). This work provided a real-time video that showed transformation of martentsite and acicular ferrite in weld metals that clearly demonstrated theories and fundamentals for weld metal transformation that have not been previously possible to view.

→ The strategic plans 2007-2010 for Commission IX are attached and clearly outline the very diverse range of topics that dealt with in this commission.

# IIW Commission IX Strategic Plans 2007 - 2010

GOAL: Identify, create, develop and transfer World's best practices

General Key Strategies – Behaviour of Metals Subjected to Welding

| Objective A: Initiate and develop World's Best Practices | Objective B: Organise the exchange of scientific and technical information and provide an environment to encourage and sustain the transfer of knowledge | Objective C: Oversight of IIW standardization activities | Objective D: Encourage and support a safe, healthy and environmentally friendly world |
|---|---|---|---|
| **Key Strategies** | **Key Strategies** | **Key Strategies** | **Key Strategies** |
| A1 Identify new work subjects to meet global needs including hot topics regarding the behaviour of materials subjected to welding | B1 Continuously review the work and the working program of Commission IX and its sub-commissions | C1 Maintain recognition of IIW as an ISO international standards body and promote IIW standards to the ISO level | D1 Develop ways of improving the image of welding for feedback to the IIW Secretariat and other Working and Administrative Units |
| A2 Initiate, develop and format products, handbooks, guidelines, recommendations and specifications focussing on the behaviour of materials subjected to welding | B2 Provide an international forum for the presentation, review and discussion of scientific and technical information about the working items of Commission IX | C2 Identify, encourage and assist individual standardization activities | D2 Develop and recommend ways to promote co-operation with the best knowledge and research organisations in OH&S and environment |
| A3 Create real innovations (= invention + direct transfer into practise) regarding the behaviour of materials subjected to welding | B3 Contribute substantially to international IIW overall workshops, seminars and conferences | C3 Evaluate and review through Commission IX the ISO Standards needed | D3 Provide a current international consensus view on contentious OH&S issues |
| A4 Recommend the adoption of Member Society documents under IIW badge | B4 Contribute substantially to a living structure of the IIW by creation, re-organization and disbanding of sub-commissions, working units and working items within Commission IX | C4 Guide, assist member societies in the use of ISO, national and regional standards, support the benefits of ISO as the international standardization body | D4 Encourage exchange of information among IIW Working Units and non-IIW organisations about OH&S and environment |

| Objective A: Initiate and develop World's Best Practices | Objective B: Organise the exchange of scientific and technical information and provide an environment to encourage and sustain the transfer of knowledge | Objective C: Oversight of IIW standardization activities | Objective D: Encourage and support a safe, healthy and environmentally friendly world |
|---|---|---|---|
| **Key Strategies** | **Key Strategies** | **Key Strategies** | **Key Strategies** |
| A5 Assist IIW Secretariat to develop Welding in the World further, in particular into a referenced journal | B5 Optimise the work, interaction and activities between the Working Units and promote a closer cooperation between Commission IX and other working units, in particular with Commission II | | D5 Support the identification and evaluation of reasonable, tolerable and measurable limits to be incorporated in laws, guidelines and standards |
| A6 Raise the importance and status of joining materials for the whole life cycle of technical products, in particular for the phases of design, fabrication, service, repair and recycling | B6 Identify and introduce methods to encourage involvement of individuals, organisations, industry sectors and countries in the field of materials subjected to welding | | |
| A7 Harmonise the effectiveness of each aspect of welding/joining to improve the global quality of life | B7 Attract, motivate and support young scientists and experts in the working fields of Commission IX, integrate and take care of young scientists and experts in joining the community by providing a discussion platform | | |

| Objective A: Initiate and develop World's Best Practices | Objective B: Organise the exchange of scientific and technical information and provide an environment to encourage and sustain the transfer of knowledge | Objective C: Oversight of IIW standardization activities | Objective D: Encourage and support a safe, healthy and environmentally friendly world |
|---|---|---|---|
| **Key Strategies** | **Key Strategies** | **Key Strategies** | **Key Strategies** |
| A10 Clarify the effects of shrinkage restraint in the cracking behaviour during fabrication and service life of welded components | B10 Create a knowledge exchange platform for young scientists and experts in all fields of the working program of Commission IX | C10 Provide guidelines and standard reviews for corrosion testing of welds | D10 Extend the application limits for C-Mn high strength structural steels in welded components |
| A20 Provide more insight into the mechanisms of cold cracking of welds | B20 Promote the development of data bases for thermal, physical, mechanical and corrosion related materials properties | C20 Develop a guideline for creep resistant materials (together with Commission XI) | |
| A30 Provide more insight into the mechanisms of hot cracking of welds | | | |
| A40 Develop realistic procedures for corrosion testing of welded components | | | |
| A50 Develop realistic test procedures for hot and cold cracking avoidance in welds which can be transferred to welded components | | | |

# Annex

## AGENDA – COMMISSION XI,

IIW ANNUAL ASSEMBLY 2007
UNIVERSITY OF DUBROVNIK, CROATIA

**IIW COMMISSION XI – Pressure Vessels, Boilers and Pipelines**
Chairman – Martin Prager (USA)

**MONDAY: JULY 2ND 2007-MORNING 8:30-12:30 -- ROOM B-18 FIRST FLOOR**

1) OVERVIEW OF ACTIVITIES OF COMM. XI-PRESENT AND FUTURE- *M. Prager, USA* XI-884-07
2) ADVANCED FATIGUE EVALUATION OF WELDMENTS UNDER NEW API AND ASME CODES- THE SSM *P. Dong. USA* XI-885-07
3) SETTING CHARPY REQUIREMENTS AND A STRESS TEMPERATURE RELATION *M. Prager, USA* XI-893-07
4) REPORT OF SUB COMMISSION XI-A ON TOUGHNESS DATA CORRELATION *S. Felber, Au* XI-888-07
5) MATERIALS TEST PROCEDURES FOR HYDROGEN PIPELINES *T. Siewert, USA* XI-879-07
6) OBJECTIVES FOR SUB-COMM. XI-H ON HYDROGEN EFFECTS ON WELDED COMPONENTS *B. Dogan, Ger.* XI-887-07
7) LASER ARC HYBRID WELDING OF COVER PLATE FOR ITER TF COIL *T. Ogawa et al, Japan* XI-874-07
8) BUSINESS PLAN FOR COMMISION XI XI-892-07

**TUESDAY: JULY 3RD 2007-MORNING 8:30-12:30 – ROOM B-18 FIRST FLOOR**

1) ADVANCED FATIGUE EVALUATION OF WELDMENTS UNDER NEW API AND ASME CODES- THE SSM *P. Dong. USA* XI-885-07
2) RESIDUAL STRESSES IN HIGH ALLOY WELDMENTS *P. Dong. USA* XI-886-07
3) ADDITIONAL REPORTS OF PROBLEMS WITH INSTALLED ALLOY 91 UTILITY COMPONENTS *M. Prager, USA* XI-882-07
4) TEST PROCEDURE FOR CREEP CRACK INITIATION AND GROWTH TESTING OF METALLIC MATERIALS *B. Dogan, Ger.* XI-883-07
5) REPORT OF IIW JOINT WORKING GROUP CREEP *J.Hald, Dan.* XI-878-07
6) A LOOK AT CREEP BEHAVIOR OF AUSTENITIC ALLOYS FOR USC APPLICATIONS *M. Prager, USA* XI-889-07
7) LIFE EXPECTATION IN CREEP SERVICE *M. Prager, USA* XI-891-07
8) GUIDANCE FOR DMW HEAT TREATMENT XI-890-07

**WEDNESDAY: JULY 4TH 2007-MORNING 8:30-12:30 – ROOM B-18 FIRST FLOOR**

1) REVIEW OF ACTIVITIES OF SUB-COMMISSION XI-E, TRANSMISSION PIPELINES, 2006-2007 *D Yapp, UK* XI-873-07
2) MECHANICAL PROPERTIES OF PIPE GIRTH WELDS IN HIGH STRENGTH PIPELINE STEELS *D Yapp & T Liratzis, UK* XI-875-07
3) TOWARDS TENSILE AND TOUGHNESS TESTING PROTOCOLS FOR EVALUATION OF X100 PIPELINE GIRTH WELDS
   *J.A. Gianetto, J.T. Bowker, D.V. Dorling, D. Taylor, D. Horsley and S. Fiore, Canada.* XI-876-07
4) TOUGHNESS OF THE HEAT AFFECTED ZONE IN HIGH STRENGTH LINE PIPE STEELS *J.T. Bowker, J.A. Gianetto and, O. Dremailnova, Canada*. XI-877-07
5) WELDING OF THE HIGH GRADE PIPELINE-STEEL X80 AND DESCRIPTION OF DIFFERENT PIPELINE-PROJECTS *S. Felber, Au* XI-880-07
6) MECHANICAL-TECHNOLOGICAL AND FRACTURE MECHANICAL PROPERTIES OF THE HIGH GRADE PIPELINE-STEEL X80 WITH RESULTS OF DIFFERENT PIPELINE-PROJECTS *S. Felber, Au* XI-881-07
7) CONFERENCE ON SAFETY AND RELIABILITY OF WELDED COMPONENTS IN ENERGY AND PROCESSING INDUSTRIES
8) BUSINESS PLAN FOR COMMISION XI XI-892-07

# AGENDA – COMMISSION IX,

IIW ANNUAL ASSEMBLY 2007
UNIVERSITY OF DUBROVNIK, CROATIA

**IIW COMMISSION IX - BEHAVIOUR OF METALS SUBJECTED TO WELDING**
Chairman – Th. Boellinghaus (Germany)
Vice-Chairman – H. Cerjak (Austria)

**MONDAY, 2nd of July 2007, 14:00 – 18:00**
**I. GENERAL MATTERS**
Opening of the Session
Approval of the Agenda IX-2242-07
Annual Report of Commission IX
Strategic Plan for Commission IX
**II. LOW ALLOYED STEEL WELDS**
II.1 Annual Report of Subcommission IX-L by T. Koseki (Japan)
II.2 Technical Contributions
→ On the Influence of Hot Straining of Austenite in Solid-State Welding Process of High Carbon Steel by M. Maalekian, E. Kozeschnik and H. Cerjak (Austria) IX-2235-07
II.3 Technical Contributions
→ Hydrogen Embrittlement of Multi Pass Weld Metal for HT780 Steel by Y. Kitagawa, K. Ikeuchi, and T. Kuroda (Osaka Univ.), Y. Matsushita, K. Suenaga, T. Hidaka and H. Takeuchi (Kobe Steel) (Japan)
→ Reheat Cracking Susceptibility and Toughness & Ductility Behaviour of Multipass Welds and Simulated HAZs In Modified 2%CrMo(W)V P23 Steel by Pekka Nevasmaa (Finland)
→ Development of In-situ Microstructure Observation Technique in Welding by Y. Komizo and H. Terasaki (Osaka Univ.), M Yonemura and T. Osuki (Sumitomo Metal Industry) (Japan)
→ Ferrite Transformation from Oxide/Steel Interfaces in HAZ-simulated C-Mn Steel by T. Koseki, H. Kato, M. Tsutsumi and J. Inoue (Japan)
→ Effects of Preheating and Interpass Temperature on Stresses in S1100QL Multi-Pass Butt-Welds by P. Wongpanya, Th. Boellinghaus and Th. Kannengiesser (Germany)
→ Cold Cracking Tests (Revised II-A-111-06) by Th. Boellinghaus and Th. Kannengiesser (Germany)

**TUESDAY, 3rdof July 2007, 14:00 – 18:00**
**III. Creep and Heat Resistant Welds**
III.1
III.2 Annual Report of Subcommission IX-C by J. Hald (Denmark)
Technical Constributions
III.3 Resolutions and Future Working Program
**IV. PRESENTATION OF THE GRANJON PAPER**
The development of a compressive residual stress field around a weld toe by means of phase transformations by Martinez Diez (USA) IX-2231-07
**V. NON FERROUS METALS**
V.1 Annual Report of Subcommission IX-NF by J. F. dos Santos (Germany)
V.2 Technical Contributions

**WEDNESDAY, 4th of July 2007, 14:00 – 18:00**
**VI. STAINLESS STEELS AND NICKEL ALLOYS**
VI.1 Annual Report of Subcommission IX-H by L. Karlsson (Sweden)
VI.2 Technical Contributions
→ Weldable 12Cr ferritic stainless steel with expanded field of application by E. Deleu and A. Dhooge FN by DeLong vs WRC-92 by D. Kotecki.
→ Suitable corrosion testing methods for welded joints by B. Holmberg and A. Bergqvist
→ Effect of post-weld straining on temper-rolled austenitic stainless steel welds by E. Westin
→ The influence of interstitial diffusion across the fusion line on the HAZ microstructure and properties in 12% chromium type 1.4003 steels by M. du Toit and A.M. Meyer
→ Disbonding of austenitic stainless steel cladding following high temperature hydrogen service by M Gittos
→ Crystal Growth in Laser Surface Melting and Cladding of Ni-Base Single Crystal Superalloy by K. Nishimoto, K. Saida and Y. Fujita (Japan)

**VII. OTHER BUSINESS**

**VIII. CONCLUSIONS – Summary of decisions**