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TITLE

ABSTRACTS AND SUMMARIES OF THE CANADIAN FORCES/CRAD MEETING ON NAVAL
APPLICATIONS OF MATERIALS TECHNOLOGY 27 - 28 - 29 APRIL 1993

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National Defence
Research and
Development Branch

Défense nationale
Bureau de recherche
et développement

ABSTRACTS and SUMMARIES
of the
CANADIAN FORCES / CRAD MEETING
on

NAVAL APPLICATIONS
of
MATERIALS TECHNOLOGY

27 - 28 - 29 APRIL 1993

**Defence
Research
Establishment
Atlantic**



**Centre de
Recherches pour la
Défense
Atlantique**

Canada

Compiled by J. R. Matthews

CF/CRAD MEETING

on

NAVAL APPLICATIONS OF MATERIALS TECHNOLOGY

27th, 28th and 29th April 1993

AGENDA

Tuesday April 27th

Registration:

Welcome: Cdr R. H. Stillwell, NAO, NEUA

Opening Remarks: Mr. Rod Schmitke, Director,
Technology Division, DREA

Introduction: Dr. R.S. Hollingshead, Head,
Dockyard Laboratory

SESSION I:

Welding Processes

Chairman: Dr. R.S. Hollingshead

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1. The DREA Welding Program 1980-1993, J. R. Matthews

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2. Pulsed Welding of HY80/HY100 T.I.M.E.TM Process, R. Robichaud,
Donelad Ltd and TIME Weld Canada

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3. Evaluation of Heat Affected Zone Microstructure/Mechanical Properties
of HY100 Grade Steels, J.T. Bowker, J.A. Gianetto and M.W. Letts,
CANMET

35

4. Progress in Surface Engineering Research at DREA, C.V. Hyatt and
J. Cunningham, DREA, K. Magee, Laser Institute, and T. Betancourt
NSRFC

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SESSION II:

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Fracture Toughness

Chairman: Mr. Ken KarisAllen

1. J-Resistance Curve of HY100, Dr. B. Faucher, CANMET, and K. KarisAllen, DREA 74
2. Fracture Toughness of Steel Weldments at High Loading Rates M.N. Bassim, University of Manitoba and J.R. Matthews, DREA 94

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3. Application of Very Low Yield Strength Electrodes In The Root Pass of Weldments to Prevent Preheating, J. Vuik, J. C. van Wortel, TNO and Cees Van Sevenhoven, Royal Netherlands Navy 119
4. Application of J and CTOD Estimation Formulas to Naval Construction Steels, Dr. Jack Morrison and Zhenhua Zhai, DREP, and Ken KarisAllen, DREA 137
5. The Feasibility of Determining Percent Plate Strain in HY80 Structures Using X-Ray Diffraction Peak Analysis, J. Pineault, M. Brauss, Proto Manufacturing and J.F. Porter, DREA 153

Demonstrations of TIME Welding in SRU Welding Shop

RECEPTION

TUESDAY EVENING, 27th APRIL

**TECHNICAL UNIVERSITY OF NOVA SCOTIA
FACULTY CLUB**

1334 Barrington St

7:30 to 10:00 pm

Wednesday, 28th April

SESSION III:

Welding Processes

Chairman: Dr. R.S. Hollingshead

1. Long Range Reaction Stresses in Ship Structures, L. Malik and B. Cowper, Fleet and W.R. Tyson, CANMET 154

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2. An Evaluation of Experimental Metal-Cored Electrodes For Submerged-Arc Welding of HSLA100 Steel, J.A. Gianetto, N.J.G. Smith and D.E. Dolan, CANMET 184

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| 3. Laser Assisted Gas Metal Arc Welding of Thick Steel Plate, by Ken Magee, Alberta Laser Institute | 211 |
| 4. Current Welding Consumables Research In The U.S. Navy, by J.J. DeLoach, Jr., G.L. Franke, M.G. Vassilaros, and R.J. Wong, presented by Paul Holsberg, Carderock Division, Naval Surface Warfare Center Welding Branch, Code 615, Annapolis, Maryland, USA 21402 | 212 |

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SESSION IV:

Fracture Control

chairman: Mr. John Porter

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| 1. The Influence of Weld Strength Mismatch on the Fitness-For Service of High Strength Steel Structures, Mark T. Kirk, Edison Welding Institute | 240 |
| 2. Development of Computational Algorithms for Probabilistic Fracture Mechanics, I.R. Orsamolu, Q. Liu and M.W. Chernuka, Martec Ltd. | 261 |

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| 3. The Effect of Finite Crack Tip Radius on Initiation Fracture Toughness, Ken MacKay, TUNS, Ken KarisAllen, DREA, and G. Lee, TUNS | 262 |
| 4. Buckling and Post-Buckling of Stiffened Shell Structures Using a Co-rotational Finite Element Formulation, L.Jiang and Dr M.W. Chernuka, Martec | 280 |
| 5. Four PC-based Fracture Mechanics Packages Reviewed, G.V. Gorveatte and J.F. Porter | 302 |

Demonstrations of TIME Welding in SRU Welding Shop

WEDNESDAY EVENING, 28th APRIL
BANQUET

Chateau Halifax
Bluenose Room

7:00 pm
(for 8:00 dinner)

Thursday, 29th April

SESSION V:

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Non Destructive Research and Development
Chairman: C.V. Hyatt

1. Introduction to the APHIUS Development Project
Gaetan Labbe, DSE 6, NDHQ, Ottawa 323
2. Background Research Leading to APHIUS Development Project,
J.R. Matthews, DREA 341

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3. Status of Current Development Project for APHIUS
Bob Hay, Tektrend International
4. Advanced Flaw Sizing in Practice, Cees VanSevenhoven, Royal
Netherlands Navy, and W.H. van Leeuwen, RTD 345
5. The Elastic Strain Field and Evidence for Plastic Deformation Near
Cracks in Loaded Steel Bars, T.M. Holden, J.H. Root and
J.F. Mecke, AECL and J.F. Porter, DREA 356

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SESSION VI:

Steel and Welding Development Activities and the Future
Chairman: Mr Rod Schmitke

1. Introduction to Development Project for Canadian Steel and Welding
Procedures For HY700WQT Steel, by Gaetan Labbe, DSE 6, NDHQ, Ottawa 383
2. Progress on Development Project for Canadian Steel and Welding
Procedures For HY700WQT Steel, R. Rene and Charles Billard,
Marine Industries Limited 396
3. Explosion Bulge Results for HY700WQT Steel, John Porter, DREA 422

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SESSION VII:

Discussion and Tours
Chairman:

1. Open Discussion
2. Demonstrations
 - i) TIME Welding
 - ii) DREA Dockyard Lab