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IIW Commission V

Quality Control and Quality Assurance of Welded Products

Annual Report 1997/98

Thomas A. Siewert

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Thomas A. Siewert

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Contents

IIW Commission V

Quality Control and Quality Assurance of Welded Products

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National Institute of Standards and Technology
Boulder, Colorado

The Annual Report 1997/98 for Commission V, Quality Control and Quality Assurance of Welded Products, of the International Institute of Welding includes (a) minutes, resolutions, and the future program adopted at its Annual Assembly in July 1997, (b) the organization, officials, and delegates, (c) schedules of meetings, and (d) the status of documents published by Commission V. It reviews current research and work on standardization.

Key words: eddy-current inspection; nondestructive evaluation; quality assurance; ultrasonic inspection; welding; x-ray inspection

1. Introduction

Commission V, Quality Control and Quality Assurance of Welded Products, of the International Institute of Welding (IIW) meets annually to review the past year's accomplishments and to discuss future activities. In July 1997, the Annual Assembly was held in San Francisco, California, to review commission activities and accomplishments during the past year and to discuss future endeavors.

Commission V includes subcommissions that concentrate on quality assurance in welding technology and the principal techniques for nondestructive inspection (x-ray, ultrasonic, electrical, magnetic, and optical) and a working group whose task is inspection of offshore construction. This year, Commission V met July 16 through 18 in San Francisco. Thirty six delegates and experts from fourteen countries attended the meetings.

The organization, officials, and delegates of Commission V are outlined in Appendix A, along with the subcommittee and working group meetings held during the past year. Recent and current documents are listed in Appendix B.

The scope of Commission V includes the various issues associated with the inspection and quality control of welds. Currently, Commission V is concentrating on the following areas:

- validation of nondestructive testing (NDT) techniques,
- NDT to assess fitness for purpose,
- NDT acceptance criteria for weld-quality classes,

Neither endorsement nor criticism of tradenames mentioned in or omitted by this report is implied or intended. Tradenames, when given, are present only for scientifically complete description of apparatus used to produce standard reference radiographs.

- quality assurance in welding technology,
- radioscopic systems (including preparation of ISO standard proposals),
- radiographic imaging,
- classification of radiographic film systems (including preparation of ISO standard proposals),
- ultrasonic imaging and automated ultrasonic testing,
- revision of the manual for ultrasonic examination of ferritic welds,
- investigation of the use of low-frequency eddy currents for examining the surfaces of ferritic welds and austenitic material and the structure of Al welds,
- use of liquid penetrants to inspect welds,
- inspection of offshore welded constructions,
- review of the requirements of ISO 5817,
- digitization of radiographic film.

National delegates to Commission V are listed in Appendix A.5.

2. Minutes of the Annual Assembly 1997

This section summarizes the information presented at the Annual Assembly in 1997, which includes descriptions of both research and draft ISO standards being developed from the research data. The information comes from the various multinational subcommissions, working groups, and task groups within Commission V. Thus, the following summary provides an up-to-date review of research activities in the countries represented and advance notice of standardization activities. The following summary is based on notes taken during the meetings and on IIW documents V-1093-97, V-1094-97, and V-1095-97 (daily minutes of the Annual Assembly).

2.1 Subcommission VA – Radiography-Based Weld Inspection Topics

The Subcommission Chairman, H. Heidt, briefly summarized the status of the projects and read the report (IIW Document V-1081-97) of the progress over the past year. Perhaps the most important event is that ISO 5579 has been revised. The new version differs from the old by containing detailed specifications for the inspection procedures; for example, it lists radiographic details such as unsharpness and kilovoltage. This new version seems to be much more suitable for practical application, and seems to have addressed the criticisms of the previous version.

Heidt mentioned the approval of ISO 5576, on NDT Vocabulary. There was parallel voting in ISO and CEN (whose version was also approved), so the two standards are identical.

Also, he reported that ISO 11699 parts 1 and 2 were accepted worldwide. There are some small differences from EN 584-1 and 2 but the methodology and main limiting values for the film classes are identical.

The working party *Radioscopic Systems for Weld Inspection* held their last meeting at the Institut de Soudure on April 9, 1997, with 10 attendees, all from Europe. The meeting focused on the discussion of the recent draft of *Radioscopic Examination Part III: General Principles of Radioscopic Inspection of Construction Materials by X and Gamma Rays*. The participants at that meeting made revisions, which were accepted to the group. This latest

version will now be reviewed at another meeting, then forwarded to ISO for balloting. ASTM Standards E1000 and E1255 were considered as possible bases for these standards, but they are not in ISO format and so would have required a substantial effort before they could be used.

He reviewed Resolution 2 from the 1996 Assembly, in which we stated that the reproduction technique being used to make our new film catalog was not acceptable, and the catalog should not be sold until the quality was improved. A small task group (Heidt, Weeber, Ewert, and Fisher) was convened in 1996 to evaluate alternate techniques to produce the radiographs. Samples produced by these new processes were shown at this meeting, and the consensus of the delegates, experts and observers was that the quality (digitized with a Lumiscan 85 scanner, then printed with a Drystar 2000 printer) was now suitable. Meanwhile, some sets will be produced by the old, direct-duplication technique (using AGFA Scopix Film) to satisfy the present, pent-up demand. We prepared a resolution (number 1) *Commission V proposes to digitize the original radiographs for the new radiographic catalog (V-1056-95) as soon as possible. The task group will establish the parameters for this digitization by 1 November 1997. Meanwhile, the original films will be copied by conventional film copying techniques to satisfy the pent-up demand.* This was passed unanimously by the delegates.

On the topic of standardization of film digitizers, an ASTM proposal was felt to be superior to the two European proposals and the working party has accepted this as a basis for further work. The definition of minimum requirements for different fields of application needs further discussion, so that the wording of the standard does not hamper further technical improvements in the equipment.

G. Rihar presented his report *Application of Imaging plates in the Radiographic Examination of Welded Joints*, Document VA 472-97. He compared the characteristics of film imaging to those of imaging plates, in the areas of: principles, conversion physics, procedures for production of the images, storage, and differences in use. He concluded that the advantages of imaging plates are: exposure time may be reduced, weaker sources may be used, information can be recorded on electronic media, and chemicals can be eliminated.

2.2 Subcommission VB – Quality Management in Welding Technology

The chairman, P. Kunzmann, began by reporting on the membership list. He described his use of a questionnaire to learn which of the former members are still interested in participating. The list includes 12 active members and 20 corresponding members. We considered the ones who have failed to respond one way or the other, and made decisions about whom to keep. The respondents expressed interest in the current topics, so all topics will be retained. Few people were interested in cooperating in projects, while most were interested in sharing information. Therefore, the subcommission will focus on collecting and reporting data from around the world. One intermediate meeting was held this year, on January 22 at the Institut de Soudure.

The Chairman summarized the Subcommissions's progress since the last Assembly (IIW Document V-1082-97). The first topic was the review of the concept of quality management. This review is a collection of the various standards that are available around the world, organized by the 20 quality elements listed in ISO 3834. We decided that this effort was complete and this list will guide us in selecting topics where standards are most needed. He will discuss the idea of refining this list with the Chairman of SC Standardization and report back at the intermediate meeting.

He reported that there has been little progress in the development of a guideline for quality

management in welding. He still thinks that it is feasible to make this into an expert system, which would be more useful than a document. We discussed ways to get help with programming and help in developing the decision tree to be used.

The Chairman described the IIW activity in fitness for purpose. He mentioned the IIW book IIW-SST-1157-90 *Guidance on Assessment of the Fitness for Purpose of Welded Structures* and derivative documents and study groups around the world (PD6493-91, SINTAP, API 579, CEN TC 121 WG 14, etc.). He also summarized the presentations at the special Subcommission XE seminar that was held the morning of July 18. He thought that the U.S. and Europe have been moving in divergent directions, but the seminar raised the possibility that the two approaches might be brought back together in the long term. We discussed the need to revise SST-1157-90 and concluded that there was little need to revise it. However, we recognized that other commissions are also considering this question, and they may have a task for us to consider in the future. We passed Resolution 4 — *Commission V has reviewed SST-1157-90 and has concluded that the NDE requirements do not need to be updated or revised.*

K. Verma gave a presentation, *Application of Run-On/Run-Off Tabs and Edge Blocks for Steel Bridges*. He showed the value of these tabs in containing all the defects that occur during weld starts and stops. When these tabs are removed, the remaining weld is uniform and free from crack starters. The edge blocks serve to block the overexposure that occurs at the edges of a weld in a plate as part of the x-ray beam being used to inspect the part passes through the edge.

We reviewed the plan for the VB microseminar to be held one afternoon at the 1998 Annual Assembly. It is nearly complete and will be finalized in the next few months.

The working program remains the same: (a) formulating a concept for quality management in welding (to clarify the relationship between existing standards and investigate the need for new standards), (b) formulating a guideline for quality management in welding (to help users to select a quality-management system adequate for their organization), and (c) collecting information on computer-aided quality control, on-line weld monitoring, fitness for purpose, and acceptance criteria in welding (to define the need for further support in applying these tools).

2.3 Subcommission VC – Ultrasonically Based Weld Inspection Topics

The Chairman of Subcommission VC, H. Wustenberg, gave a short summary from his report of the activities during the past year (IIW Document V-1083-97). The intermediate meeting of the Subcommission was held at the Institut de Soudure in Paris, France on January 20, 1997. Also, he reported that the working group on austenitic weld inspection met twice, and the group on validation met once.

The main activities of the subcommission include: ultrasonic inspection of austenitic welds, ultrasonic inspection of spot welds, revision of IIW documents on ultrasonic inspection of welds (especially the IIW calibration block), validation of ultrasonic techniques for weld inspection, automation and imaging for ultrasonic inspection of welds, and acceptance criteria.

He began with a few comments on ultrasonic reference blocks. He attributed the large changes in the echo amplitude (perhaps 12 dB or more) that have been measured in recent round robins to the nonuniform texture in some blocks. Studies to understand this are underway at various organizations, including NIST.

He described the progress in ENIQ (European Network for Inspection Qualification) toward methodology for validation of NDT procedures. Also, he circulated their documents *European Methodology for Qualification of Nondestructive Tests: Second Issue* and *Development of ENIQ Terminology, Taking into Account New Standards: Glossary of Terms used in Qualification.*

The working group on ultrasonic inspection of austenitic welds and clad components, now chaired by Mr. Hennaut of Belgium, held one meeting this last year. The group is now revising the handbook on austenitic stainless steel inspection, based on their experiences with the cladding handbook, and plans to include a chapter on the ultrasonic inspection of dissimilar welds.

Dr. Dobmann summarized several documents that have come from P. Ciorau in Canada, and from N. Khimchenko.

He suggested that we promote some basic investigations of the IIW block. We passed Resolution 2: *Commission V advises the other commissions that recent round robins have shown more than 12 dB variation in the sensitivity setting of IIW ultrasonic calibration blocks. Various institutes are now investigating this problem, with the goal of revising the standard (ISO 2400). Any organization interested in participating should contact Hermann Wustenberg at BAM in Berlin, Germany.*

The future work program of subcommission VC includes:

- revision of the Handbook on the Examination of Austenitic Welds,
- revision of the IIW document concerning ultrasonic inspection, especially for the IIW calibration block,
- validation of ultrasonic techniques for weld inspection,
- review of automatic ultrasonic inspection methods, and revision of the manual on this topic,
- inspection of electroslag welds, and
- inspection of spot welds.

The next meeting of the subcommission is proposed for Tuesday, January 20, 1998 at the Institut de Soudure. It was suggested that the 1999 intermediate meeting once again be planned to be held in conjunction with ASTM's January meeting near Fort Lauderdale, Florida.

2.4 Subcommission VE – Weld Inspection Topics Based on Electrical, Magnetic, and Optical Methods

The Subcommittee Chairman, G. Dobmann, reviewed recent activities (IIW Document V-1084-97). The subcommittee held one intermediate meeting on January 21, 1997 at the Institut de Soudure in Paris. He reviewed the activities of the meeting. At that meeting, A. Doubov presented his work on the magnetic memory technique.

The working party on characterization of black light lamps (chaired by R. Marmigi of Italy) is preparing a document *Technical Evaluation of Liquid Penetrants for Hot Surfaces in the Weld Testing Field.* It has been recently revised to include some comments, but is now available only in Italian. It is expected to be translated into English and ready for distribution for the January 1998 meeting.

Francesco Peri chairs the working party on characterization of nonmetallic welds. Several years ago, Dr. Peri prepared and circulated a questionnaire on experimental research and standardization activities, but received replies from only two countries. The scope of the questionnaire was broadened to include thermal-barrier and corrosion-protection coatings. The questionnaire was distributed again to the delegates. Anyone with information to contribute should contact Dr. Peri. Dr. Dobmann described the contribution of J. Moulder to our special microseminar that morning on modeling.

We recommended that document V-1096-97 *Screening of Weld Quality using the Magnetic Memory Effect*, by A. Doubov, be published in *Welding in the World*. Final editing will be done by G. Dobmann and Tom Siewert.

Dr. Dobmann presented his proposal for a round robin that would produce plates for a comparison of magnetic memory inspection to other techniques. This would include the preparation of special welds using a variety of process and currents (to introduce a wide variety of magnetic fields).

The future working program includes:

- low-frequency eddy-current inspection as a replacement for magnetic particle inspection of ferritic weldments,
- application for volumetric inspections, which will be chaired by John Moulder,
- preparation of a document *Characterization of the Inspection Media for Liquid Penetrant Testing*, IIW Recommendations for ISO Standardization,
- preparation of a document on the application of liquid penetrant testing in welding, with different annexes that describe the application of this technique for specific industries,
- preparation of a document describing the inspection of hot surfaces with penetrants,
- activation of the working party on non-metallic welds (collection of responses to a questionnaire), and
- harmonization of the European initiatives on measurements of residual stress.

2.5 Working Group 2 – Inspection of Offshore Welded Constructions

In the absence of the chairman, A. Raine, O. Forli summarized the accomplishments of this group. Their major output is IIW Doc. V-1097-97, *Information on Practices for Underwater Non-Destructive Testing*. This is a revision of IIS/IIW 1033 (V-908-89); it is being driven by new developments in remote inspection and electromagnetic techniques. It has been reviewed by the SC VA, VC, and VE Chairmen. BINDT is interested in publishing it. The last revision is about 50 pages long. We passed a resolution (number 5) that it be published as a Class B document to replace the old version.

Forli reviewed the progress in the development of equipment for offshore NDE during the past four decades, as the techniques were improved and as the oil companies tapped the fields in deeper water and in more severe environments. In summary, there is less underwater inspection, more topside inspection (such as for corrosion, sometimes under lagged or coated surfaces), more extensive use of newer electromagnetic techniques, extended use of remotely operated vehicles, more use of cost- and risk-based optimization of inspection using reliability data such as provided by ICON and UCL (University College of London) studies, and use of new materials (such as duplex stainless steels).

He discussed the significance of weld defects in pipeline girth welds. The significance must be assessed by considering the effects of internal pressure and variations, laying forces, vibration, accidental loads, and corrosion. Such assessments are difficult because much of the necessary information is not available and is expensive to generate.

Forli mentioned that the 7th European Conference on NDT (ECNDT) will be held in Copenhagen 26 to 29 May 1998. O. Forli will be organizing the sessions.

The working program for the group includes review of new problem areas and new techniques, such as:

- personnel qualification systems for offshore NDT,
- reliability of offshore NDT techniques/compilation of test trial data,
- comparison of surface inspection techniques,
- offshore/underwater electromagnetic techniques and applications,
- underwater NDT equipment,
- recent developments in automated and remotely operated NDT systems,
- downhole inspection,
- recent developments in monitoring techniques for local and global structural integrity in offshore structures, and
- inspection systems, planning and cost optimization, including probabilistic techniques.

2.6 Seminar on Recent Improvements in NDE Modeling

The Commission V Subcommission Chairman decided that the improvements in NDE justified a review of the state-of-the-art in a special seminar. Thus, we started planning this special seminar about a year ago, and began inviting leading researchers from around the world. In this half-day seminar, held the morning of July 16, we had 12 presentations from 6 countries, on 5 different NDE technologies. Its scope was the modeling of various NDE processes, validation, training, design, and evaluation of results. The speakers and topics are listed below:

1. Ultrasound
   - B. Thompson, T. Gray, F. Margetan, R. Roberts, L. Schmerr, C. Chiou, I. Yalda and M. Garton (Iowa State University), *Recent Advances in Ultrasonic NDE Modeling*
   - F. Walte, S. Klaholz, M. Spies, V. Schmitz, and K. Langenberg (Germany), *Modeling of Ultrasonic Pulse Iinspection in Austenitic Welds with Simplified Structures*,
   - H. Wustenberg, additional information on modeling of ultrasonic inspection
   - A.S. Eriksson (ABB), *Ultrasonic Crack Detection Simulation in Austenitic Materials*
   - A. Lhémery, P. Calmon, L. Paradis, and P. Benoist (CEA/ CEEM, France), *Modeling Tools for Ultrasonic Inspection of Welds*
   - H. Yamawaki and T. Saito, NRIM, Japan, *Computer Simulation of Acoustic Wave Propagation in Elastically Anisotropic Materials*
   - N. Khimchenko (NIIXIMASH, Russia), *Statistical Analysis of Weld Acoustic Measurements Results*

2. Eddy Current
   - J. Moulder, N. Nakagawa (Center for NDE, Iowa State University) and G. Dobmann (IZfP, Saarbrücken), *Advances in Modeling of Eddy Current Nondestructive Inspection*

3. X-ray

- J. Gray (Center for NDE, Iowa State University), *Application of X-ray Simulations for Determining Optimal Weld Inspections*
- C. Nockemann, G.-R. Tillack, C. Bellon (BAM, Berlin), *X-Ray Modeling for In-the-Field Applications*

4. Thermal Imaging
   - G. Brueggemann and T. Beniziger (Magdeburg University) and A. Mahrle and J. Schmidt (Inst. Fluid Dynam. and Thermo.), *Modeling of Cooling Rates of Laser Beam Welds in Steels: Comparison of Experiments and Numerical Simulation*

5. Other Techniques
   - M. Bakirov, (Russia), *Numerical Modeling of the Contact Deformation Processes for Specimen-free Non-destructive Control of the Weld Metal Mechanical Properties*

The papers are being collected by G. Dobmann, who has arranged to have them published in a special issue of the NDE International.

2.7 Miscellaneous Commission V Items

The Commission V part of the meeting began with a report of the Commission's activities and accomplishments for the last year. The complete report is available as Document V-1078-97, but the accomplishments are also reported above by the respective Subcommissions.

Also in this opening session, we heard reports of national and international NDE conferences in which our members participated. G. Dobmann reported on a summary of Commission V that he delivered at the World Congress on NDE in India in November 1996; T. Siewert reported on a summary of Commission V that he presented at a national NDE seminar in Russia in January 1997; and C. Nockemann reported on a European-American Workshop on NDE standards that was held in Berlin in May 1997.

We discussed the resignation of M. Rousseau as Vice Chairman of Commission V, and we discussed how to find a replacement. We decided to ask the French Delegation if they wished to continue the tradition of furnishing the Vice Chairman for this Commission.

New documents generated at the meeting were:

- V-1093-97 Minutes of the Meeting - July 16, 1997,
- V-1094-97 Minutes of the Meeting - July 17, 1997, and
- V-1095-97 Minutes of the Meeting - July 18, 1997.

3. Resolutions of the Annual Assembly 1997

3.1 Resolution 1

Commission V proposes to digitize the original radiographs for the new radiographic catalog (V-1056-95) as soon as possible. The task group will establish the parameters for this digitization by 1 November 1997. Meanwhile, the original films will be copied by conventional film copying techniques to satisfy the pent-up demand

3.2 Resolution 2

Commission V advises the other commissions that recent round robins have shown more than 12 dB variation in the sensitivity setting of IIW ultrasonic calibration blocks. Various institutes are now investigating this problem, with the goal of revising the standard (ISO 2400). Any organization interested in participating should contact Hermann Wustenberg at BAM in Berlin, Germany.

3.3 Resolution 3

Commission V forwards document *Screening of Weld Quality Using the Magnetic Memory Effect*, Doc. V-1096-07, by A. Doubov, for publication in *Welding in the World.*

3.4 Resolution 4

Commission V has reviewed SST-1157-90 and has concluded that the NDE requirements do not need to be updated or revised.

3.5 Resolution 5

Commission V forwards *Information on Practices for Underwater Nondestructive Examination*, Document V-1097-97, for publication by IIW as a Class B document, to replace the present IIW/IIS 1033.

3.6 Resolution 6

Commission V forwards *On-Line Weld Monitoring - CAQ in Welding - State of Technology and Practical Experiences in Germany*, Document V-1098-97, for publication in Welding in the World.

4. Work Program of Commission V

4.1 Subcommission VA – Radiography-Based Weld Inspection Topics

Subcommission VA will concentrate on the following:

- classification of film systems;
- completion of a standard on radioscopic systems: The Working Party is preparing a three-part standard about the properties and use of radioscopic systems for weld inspection. There will be an experimental phase to evaluate the practicality of the standard. After completion of parts 1 and 2, drafting of part 3 remains,
- revision of ISO standards: Subcommission VA supports ISO TC 44 and TC 135 with text proposals for the revision of weld inspection standards, such as the current review of ISO 5817,
- assessment of reliability of radiography: New statistical tools (Receiver Operation Characteristic, ROC) will be applied to the question of a quantitative assessment of radiography,
- evaluation of NDT acceptance criteria in relation to weld quality classes,
- examination of the new collection of reference radiographs for welds prepared by the German Welding Society and evaluation of its suitability as a basis for a new IIW reference collection, and
- digitization of film.

4.2 Subcommission VB – Quality Management in Welding Technology

Subcommission VB will concentrate on the following:

- formulation of a concept for quality management in welding (to clarify the relationships between existing standards and to investigate the need for new standards),
- formulation of a guideline for quality management in welding (to help the user select a quality management program adequate for their organization), and
- collection of information on computer-aided quality control, on-line weld monitoring, fitness for purpose, and acceptance criteria in welding (to define the need for further support in applying these tools).

4.3 Subcommission VC – Ultrasonically Based Weld Inspection Topics

Subcommission VC will concentrate on the following:

- validation of ultrasonic techniques for weld inspection.
  - collection of all available information on studies of the performance of NDT (PISC, Nordtest, Institute de Soudure, NIL) and compilation of results from such studies,
  - identification of main application areas for validation programs,
  - definition of the structure of a typical validation program and presentation of the results of the validation,

- characterization of ultrasonic probes for weld inspection,
- preparation of a revised manual for the ultrasonic inspection of ferritic welds (based on the experience gained during the preparation of the new European standard),
- assessment of modern imaging techniques for automatic ultrasonic inspection methods and their importance for the weld inspection,
- clarification and verification of use of the IIW ultrasonic calibration block,
- assessment of on-line weld monitoring by ultrasonic methods, and
- collaboration with Subcommission VA on the review of ISO 5817.

4.4 Subcommission VE – Weld Inspection Topics Based on Electrical, Magnetic, and Optical Methods

Subcommission VE will concentrate on the following:

- numerical modeling studies on electric, magnetic, and electromagnetic techniques of NDT for detection and sizing of defects in austenitic cladding. The working party in question has agreed upon a near-future research program to compare the software packages that are in use,
- round-robin action on residual-stress measurement techniques,
- testing of nonmetallic weldments and preparation of an IIW document on the topic, and
- liquid-penetrant inspection of welds, including the preparation of an IIW document to summarize the state of standardization for characterization of black-light lamps.

For 1994/97 the work has concentrated on the following:

- activation of the Eddy-Current Working Party. Topics are: surface examination of ferritic welds, including sizing and replacement for magnetic-particle examinations, and low-frequency application for volumetric inspections, i.e., of austenitic cladding or aluminum weldments,
- preparation of either written recommendations or a handbook on the characterization of black-light equipment,
- preparation of a document on the application and the procedure of the inspection of hot weldments by using liquid penetrants,
- preparation of a document on the characterization of the inspection media for the inspection of hot weldments by liquid penetrants,
- preparation of a document on the measurement of relative intensity of fluorescence (low-cost equipment for on-site applications),
- preparation of a document on the use of the meniscus test for penetrants by image processing,
- thermography for surface inspection and welding process control,
- activation of the Working Party on the inspection of nonmetallic weldments, and
- reconciliation of European initiatives on residual-stress measurements.

4.5 Subcommission VF – Weld Defects and Their Significance

No work is planned for 1997/98, apart from necessary follow-up work related to *IIW Guidance on Assessment of the Fitness for Purpose* (SST-1141-89).

4.6 Working Group 2 – Inspection of Offshore Welded Constructions

Working Group 2 will concentrate on the following:

- revision of "Information on Practices for Underwater Non-Destructive Testing," IIW V-908-89 (IIS/IIW-1033-89),
- review of special problem areas, new techniques, and applications; collection and organization of information of general interest; report to IIW, if appropriate, in the form of guideline or recommendation proposals. This work shall include, but not be limited to the following topics:
  - reference documents on NDT of offshore constructions,
  - personnel qualification schemes for underwater NDT,
  - reliability of offshore NDT techniques and compilation of trial results,
  - comparative evaluation of surface techniques and the preparation of guidelines,
  - examination of offshore, underwater eddy-current tests and the preparation of a "green paper,"
  - fabrication versus in-service NDT of offshore constructions,
  - underwater NDT equipment,
  - recent developments in automated and remotely operated NDT for offshore use,
  - preparation of a survey of ongoing and planned developments and existing equipment,
  - downhole inspection,
  - pipeline inspection,
  - recent developments in local and global monitoring techniques for structural-integrity of offshore constructions,
  - inspection systematics, planning, cost effectiveness, and optimization, including the use of probabilistic assessment.

Appendix A. Organization, Officials, and Delegates

A.1 Organization of IIW Commission V, Quality Control and Quality Assurance of Welded Products

A.1.1 Subcommissions

VA Radiography-Based Weld Inspection Topics
Working Parties
- Classification of Film Systems
- Radioscopic Systems for Weld Inspection
- Validation of Radiographic Techniques for Weld Inspection
- Revision of ISO Standards

VB Quality Management in Welding Technology

VC Ultrasonically Based Weld Inspection Topics
Working Parties
- Ultrasonic Examination of Austenitic Welds
- Validation of Ultrasonic Techniques for Weld Inspection
- Characterization of Ultrasonic Probes for Weld Inspection

VE Weld Inspection Topics Based on Electrical, Magnetic, and Optical Methods
Working Parties
- Stress Measurement Techniques
- Liquid Penetrants and Black-light Lamps
- Eddy-Current Modeling
- Inspection Techniques for Nonmetallic Joints

VF Weld Defects and Their Significance

A.1.2 Working Group

2 Inspection of Offshore Welded Construction

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A.6 Attendance Record – Annual Assembly 1997

Name	Country	Function	16 July	17 July	18 July
Siewert, T.	USA	Commission Chairman/Delegate	×	×	×
Varga, T.	Austria	Delegate			×
Lukacevic, Z.	Croatia	Delegate	×	×	×
Kopiloff, P.	Finland	Delegate	×		×
Lindewald, C.-G.	Finland	Expert		×	
Dobmann, G.	Germany	Delegate/Chairman VE	×	×	×
von Hofe, D.	Germany	Expert	×	×	×
Nockemann, C.	Germany	Expert	×	×	×
Wustenberg, H.	Germany	Expert/Chairman VC	×	×	×
Heidt, H.	Germany	Expert/Chairman VA		×	×
Szelagowski, P.	Germany	Expert			×
Hour, M.	Italy	Observer			×
Lessi, F.	Italy	Observer			×
Miki, C	Japan	Observer		×	
Lee, D.-E.	Korea	Observer	×	×	×
Kim, Y.-T.	Korea	Observer	×		
van den Berg, R.	The Netherlands	Expert			×
Forli, O.	Norway	Delegate	×	×	×
Khimchenko, N.	Russia	Delegate	×	×	×
Doubov, A.	Russia	Expert	×	×	×
Merinov, P.	Russia	Expert	×	×	×
Prideine, A.	Russia	Expert	×	×	×
Volkova, N.	Russia	Expert	×	×	
Zemlianski, V.	Russia	Expert	×	×	×
Remec, C.	Slovenia	Expert	×		
Rihar, G.	Slovenia	Delegate	×	×	×
Johansson, C.	Sweden	Delegate	×	×	×
Eriksson, A.	Sweden	Observer		×	
Kunzmann, P.	Switzerland	Delegate/Chairman VB	×		×
Gut, H.	Switzerland	Expert			×
Cullison, A.	United States	Observer	×		×
Moulder, J.	United States	Expert	×		
Shaw, R.	United States	Observer			×
Soltani, P.	United States	Observer	×		
Tahash, G.	United States	Expert	×		
Verma, K.	United States	Expert	×	×	×
Williams, D.	United States	Observer	×		

A.6.1 Attendance statistics

	16 July	17 July	18 July	Any day
Participants:	26	21	27	37
Delegates:	9	8	10	10
Experts:	10	10	12	17
Observers:	7	3	5	10
Countries present	10	10	13	14

A.7 Subcommission and Working Group Meetings 1995/97

Subcommission VA	13 January 1995	Fort Lauderdale, Florida, USA
	20 January 1997	Paris, France
Subcommission VB	17 March 1995	Basel, Switzerland
	23 January 1997	Paris, France
Subcommission VC	12 January 1995	Fort Lauderdale, Florida, USA
	12 December 1995	Paris, France
	21 January 1997	Paris, France
Subcommission VE	13 January 1995	Fort Lauderdale, Florida, USA
	13 December 1995	Paris, France
	22 January 1997	Paris, France
Subcommission VF	No meetings	
Working Group 2	4 May 1995	London, UK
	8 September 1995	Aberdeen, UK

A.8 Tentative Schedule for Commission V Meetings 1998/99

We plan to meet at the traditional venue for most of the Commission V intermediate meetings, the Institut de Soudure in Paris. The proposed dates for these meetings will be:

-Subcommission VA - 20 January,
-Subcommission VC - 21 January,
-Subcommission VE - 22 January, and
-Subcommission VB - 23 January, 1998 (later canceled).

Working Group 2 will hold their intermediate meetings as needed, probably in the U.K. or northern Europe.

The 1998 Annual Assembly will be in Hamburg, Germany, 16 to 18 September, with a Commission V Microseminar on standards in welding technology.

The 1999 Annual Assembly will be in Portugal, with a Commission V Microseminar on influence of automation on acceptance criteria.

Appendix B. Recent Commission V Publications and Documents

B.1 Handbooks and Booklets

V-939-90 *Handbook on the Ultrasonic Examination of Austenitic Clad Materials* (IIS/IIW-1080-90)
Published by the CEC Joint Research Establishment, Ispra, Italy, 1994

V-1056-95 *Reference Radiographs for Assessment of Welding Imperfections According to ISO 5817* (IIS/IIW 1290-95)

B.2 *Welding in the World* Articles

V-1067-96 "Lifetime Extension - The Contribution of Low- and Multi-Frequency Eddy Current Techniques to Assure the Integrity of the Cladding in Nuclear Power Plant Vessels," G. Dobmann, R. Becker, M. Disque, Ch. Rodner, and N. Both, *Welding in the World*, vol. 39, no. 5, 1997. (IIS/IIW 1328-96)

V-1068-96 "Online Closed Loop Control of Spot Welding - An Example of Process Integrated Non-Destructive Testing," E. Waschkies, *Welding in the World*, vol. 39, no. 6, 1997. (IIS/IIW 1329-96)

V-1069-96 "Predicting the Performance of Eddy Current Probes," J. Moulder, *Welding in the World*, vol. 39, no. 3, 1997. (IIS/IIW 1330-97)

B.3 Commission V Documents 1996/97

Number	Title/Document Description
V-1074-96	*Weld Quality Degradation at Starts and Stops*, Z. Lukacevic and I. Samardzic, revised version, edited to reflect suggestions at 1996 Annual Assembly
V-1075-96	Minutes of the Annual Assembly Meeting - 4 September 1996
V-1076-96	Minutes of the Annual Assembly Meeting - 5 September 1996
V-1077-96	Minutes of the Annual Assembly Meeting - 6 September 1996
V-1078-97	Commission V Annual Report - 1996/97
V-1079-97	Agenda for 1997 Annual Assembly - San Francisco
V-1080-97	Commission V Documents - 1996/97
V-1081-97	Subcommission VA Annual Report
V-1082-97	Subcommission VB Annual Report
V-1083-97	Subcommission VC Annual Report
V-1084-97	Subcommission VE Annual Report
V-1085-97	Reserved for Working Group 2 Annual Report
V-1086-97	*Examination and Diagnostics for Thermal Images for Welds*, A.F. Keremzhanov, also identified as XII-1477-96
V-1087-97	Agenda and Abstracts for Commission V Microseminar: *Recent Improvements in NDE Modeling*
V-1088-97	*Reliability and Lifetime of Welded Structures for Nuclear Power Equipment*, A.S. Zubchenko, G.S. Vasilchenko, and A.V. Ovichinnikov
V-1089-97	*Report of an Russian NDE Symposium - Moscow - January 1997*, T. Siewert
V-1090-97	*Technique to Test Pipes of Heating Surfaces in Power and Water-Heating Boilers by Metal Magnetic Memory*, A. Doubov
V-1091-97	*Experience of Applying Instrumental-Computer Complex to Determine the Lifetime of Equipment by means of Metal Magnetic Memory*, A. Doubov
V-1092-97	*Draft program for the Subcommission VE Special Session on Failure Assessment Concepts and Applications*, now scheduled for the morning of 18 July in San Francisco

B.4 Documents Recommended for Publication

1995 Assembly

Commission V recommends that the DVS Reference Radiograph set be adopted as the newest IIW reference radiograph set for use with ISO 5817. The new set will be titled "Reference radiographs for assessment of weld imperfections according to ISO 5817" and should be identified as IIW Document number V-1056-95, a class B document.

The older sets (both radiographs and a printed book, as listed in the IIW catalog) shall continue to be offered for sale.

Resolution 2 at the 1996 Annual Assembly discussed mandatory changes in the radiograph duplication techniques before the radiographs were suitable for sale.

1996 Assembly

Commission V forwards documents V-1067-96 on lifetime extension of pressure vessels through eddy current inspection, V-1068-96 on closed loop control of spot welding, and V-1069-96 on prediction of eddy current probe performance for publication in Welding in the World.

1997 Assembly

Commission V forwards document *Screening of Weld Quality using the Magnetic Memory Effect*, Doc. V-1096-07, by A. Doubov, for publication in *Welding in the World*.

Commission V forwards *Information on Practices for Underwater Nondestructive Examination*, Document V-1097-97, for publication by IIW as a Class B document, to replace the present IIW/IIS 1033.

Commission V forwards *On-line Weld Monitoring - CAQ in Welding - State of Technology and Practical Experiences in Germany*, Document V-1098-97, for publication in Welding in the World.

B.5 Sales of Commission V Documents

	1995	1994	1993	1992	1991
Collection of Reference Radiographs of Butt Welds in Steel	*	*	67	111	74
Collection of Reference Radiographs of Butt Welds in Aluminum and Aluminum Alloys	*	20	22	21	16
Reference Radiographs (Blue Booklet)					
English/French	*	2250	274	3252	56
English/French/3rd language			30	310	134
Handbook on Radiographic Apparatus Techniques					
English	33	19	24	47	60
French	48	53	123	54	166
Swedish	*	0	10	5	5
List of Terms Used in the Ultrasonic Examination of Welds	*	*	2	3	3
Handbook on Ultrasonic Examination of Welds					
English	19	33	38	39	75
French	44	76	33	8	83
Dutch	0	0	0	0	15
Finnish					
Handbook on the Ultrasonic Testing of Austenitic Welds					
English	3	3	43	26	26
French	0	52	3	3	4
German	1	12	31	7	31
Evaluation of Ultrasonic Signals	12	41	10	35	55
Handbook on the Magnetic Examination of Welds	6	77	29	45	23
Automated Ultrasonic Weld Inspection	*	*	*	*	*
Guidelines for Quality Assurance in Welding Technology	18	15	64	44	173
IIW Guidance on Assessment of the Fitness for Purpose (SST-1141-89)					
English	0	9	61	43	169
Non-destructive Measurement and Analysis of Residual Stress in and around Welds — A State of the Art Survey (V-847-87)	0	71	330		
Total items sold	184	2731	1194	4053	1168

* information not available