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**IIW Commission V
Quality Control and Quality Assurance
of Welded Products
Annual Report 1994/95***

Thomas A. Siewert



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**IIW Commission V
Quality Control and Quality Assurance of
Welded Products
Annual Report 1994/95**

Thomas A. Siewert

Materials Reliability Division
Materials Science and Engineering Laboratory
National Institute of Standards and Technology
Boulder, Colorado 80303-3328

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U.S. DEPARTMENT OF COMMERCE, Ronald H. Brown, Secretary
TECHNOLOGY ADMINISTRATION, Mary L. Good, Under Secretary for Technology
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IIW Commission V

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The Annual Report 1994/95 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 September 1994, (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 September 1994, the Annual Assembly met in Beijing, China, to review commission activities and accomplishments during the past year and to discuss future endeavors. The minutes of the Annual Assembly 1994 included in this report are based on notes taken during the meeting and on IIW documents V-1041-94, V-1043-94, and V-1045-94 (Annual Assembly daily minutes).

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. Substantial progress occurred in the past year, as evidenced by the documents listed in Appendix B. Participation at intermediate meetings was acceptable. To be more productive, we must encourage more professionals to contribute to the work of Commission V.

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
- 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 low-frequency eddy currents for examining the surface of ferritic welds and austenitic material and the structure of Al welds
- The use of liquid penetrants to inspect welds
- Inspection of offshore welded constructions

During the Annual Assembly 1994, the delegates resolved that Commission V should move into new areas:

- Review of the requirements of ISO 5817
- Digitization of radiographic film

During 1994/95, Commission V delegates from some countries have changed. For the first time, Mexico, Egypt, and Russia are represented on the commission, and John Zirnhelt will return as the Canadian delegate after several years of absence. Commission V delegates are listed in Appendix A.

2. Minutes of the Annual Assembly 1994

For the International Institute of Welding, Commission V focuses on weld inspection and quality control. This report summarizes the information presented at the Annual Assembly 1994, 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, this summary provides an up-to-date review of research activities in the countries represented and advance notice of standardization activities.

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 7 through 9 September in Beijing, China. Thirty-four delegates and experts from eighteen countries attended the meetings. Following are edited reports of the subcommissions and working groups, in order of their presentation.

2.1 "The Status of NDT Technology Used for Welded Structures in China" by S. Li and Z. Liu

The keynote presentation, "The Status of NDT Technology Used for Welded Structures in China," by S. Li and Z. Liu, included many interesting statistics on nondestructive evaluation (NDE) in China, information that has not been widely reported.

S. Li stated that the concept of NDE is widely applied and well-developed throughout China: products are inspected in factories, new equipment is being developed, laboratories are investigating new inspection applications, calibration standards are being produced, personnel qualification programs are in place, education programs are underway, and professional societies have been established. Many types of inspection equipment are built domestically; only a few are imported. China has about 80,000 qualified NDE practitioners, more than 3,000 companies that use NDE methods in their daily production, several hundred manufacturers of NDE equipment, three major NDE societies, and five national NDE journals (additional journals have regional distributions). The application of the technology includes critical components such as pressure vessels, ship hulls, offshore structures, and pipelines.

The selection of the inspection process is based on the location of the structure to be inspected and the portability of the equipment. Fixed x-ray systems are most commonly used during fabrication. Portable (lower energy) x-ray systems or ultrasound is used for field erection or preservice applications. Magnetic and penetrant techniques are used for in-service inspection, especially for applications such as pressure vessels, where they may be supplemented with ultrasound.

About six universities and ten research institutes compete for national research and development programs. Recent accomplishments include

- development of a model for the inspection of pressure-vessel nozzle welds, where the complex changes in curvature had made interpretation of the defect depth very difficult
- development of an ultrasonic probe with a simple lens that enables changing the focus of the beam for inspecting workpieces from 10 to 200 mm thick

- analysis of echo-amplitude characteristics and comparison to field data, to determine which signal characteristics provide the most information on size and location of defects
- development of a fully automatic inspection system for nozzle welds
- development and testing of an expert system to distinguish defects on radiographs and to classify them according to a given standard or other criteria
- installation (in Harbin Boiler Works) of a digital image-processing system and its integration with a computer system for automatic identification of defects
- wide application of linear electron accelerators for heavy structures
- determination of the critical variables in magnetic test signals

There are three levels of NDT standards in China: the national programs are identified by the symbol GB, the industrial programs are identified by the symbol JB, and programs of the individual companies do not use a symbol. Two universities have set up special NDT programs since 1984; five research institutes and four universities now have M.S. or Ph.D. programs in NDT.

Equipment and accessories are an important market. Statistical data for 1988 showed sales of 5,000 x-ray inspection systems, 1,300 ultrasonic inspection systems, and 1,400 magnetic inspection systems. There are more than 10 domestic manufacturers of x-ray inspection systems (up to 400 kVp), 4 manufacturers of gamma-ray inspection systems (Ir 192 and Co 60), 12 manufacturers of ultrasonic inspection systems (1–5–20 MHz), and 9 manufacturers of magnetic inspection systems (500 to 12,500 A).

Commission V passed a resolution that this report be published in *Welding in the World* as a Class A document.

2.2 Subcommission VA – Radiography-Based Weld Inspection Topics

In the absence of H. Heidt, Chairman of Subcommission VA, T. Siewert summarized the subcommission annual report (IIW V-1004-93).

The last intermediate meeting was held on Tuesday, 25 January 1993, at the Institut de Soudure in Paris. Seven of the eleven subcommission members attended. South Africa has indicated that it wishes to become more active; it has assigned representatives to the subcommission, as well as to the working parties on standardization, film classification, radioscopic acceptance criteria, and reliability of radiography.

The working party on classification of film systems has found some differences in the test procedures and limiting values between CEN (draft prEN 584, part 1) and ISO (WI 11699), especially in the areas of measurement of film gradient and in the classification system. After discussion, Subcommission VA members decided to support a film classification system that provides constant film quality based on traditional measurements of film characteristics.

The working party on radioscopic systems for weld inspection reported that they are coordinating their activities with those of CEN TC 138 WG1 (Radiography) and those of ISO TC 135 Subcommission V. Through these interactions, they hope to gather a wide variety of comments on their documents, and so develop a standard format that will enjoy wide acceptance among the various standard developing bodies. Currently, they are considering how to set up radioscopic systems for specific applications. A round robin that will provide data on the

present capabilities of radioscopic systems and indicate what type of information would be required in a standard is being developed. Owing to rapid growth in this technology, they plan to develop a standard that can be modified as technical advances occur.

H. Heidt's report included some highlights from the October 1993 ISO TC 135 and ISO TC 135 SC V meetings in Pretoria, South Africa. He expects renewed interest in this topic since Japan has taken responsibility for leading the committee. A revision to ISO 5579, as proposed by IIW Subcommittee VA, was discussed in Pretoria, and an ISO working group will develop it further.

The subcommission has been considering some problems that have arisen as fitness-for-service criteria replace the previous defect-dimension criteria in weld inspection. Document ISO 5817, on acceptance criteria, provides strict limitations on the type and size of defects in welds; the dimensions do not agree with those of the defect-classification systems used with the previous film-based procedures. The subcommission suggested that ISO 5817 should be applied in a way that reflects the difficulties in determining the sizes of the weld. The subcommission discussed a resolution that would correct this situation, but postponed voting on it until Subcommittee VC presented its opinion on this problem.

The subcommission has reviewed its catalog of reference radiographs and thinks that it is time to produce a new version. The new version will be developed so that it will be suitable for use in conjunction with a fitness-for-service approach to weld inspection, and so be an important corollary to the activity on the use of ISO 5817. D. von Hofe brought a copy of the DVS film catalog to the Annual Assembly and offered it as possible basis for this new IIW document. The subcommission plans to begin working on this topic and to report to the next Annual Assembly. This topic is already included in the task list of the subcommission.

The commission reviewed a previous concern of the subcommission over the use of the IIW booklet with prints of weld radiographs (the "Blue Book") for weld evaluation. Responding to this concern, the commission passed a resolution last year requiring that this book have a nonremovable inscription added to the cover stating that it was to be used for education only. The commission believes that this problem is under control.

At the request of the subcommission, Commission V passed a resolution to add film digitization to its task list. The subcommission thinks that the market for film digitization has grown to where it is appropriate to consider standardization.

The future work planned for the subcommission includes a major emphasis on film digitization and a film reference catalog in addition to following the standardization needs associated with ISO 5579, film-system classification, and radioscopy.

2.3 Subcommittee VB – Quality Assurance

The new Chairman of Subcommittee VB, P. Kunzmann, suggested that we reconsider the audience for our documents. In particular, he suggested that we reduce our emphasis on transfer of information among experts on the commission and increase our emphasis on transfer of information to the final users.

This change in subcommission leadership provides an excellent opportunity to reevaluate the technical focus. To stimulate our thinking on possible topics, P. Kunzmann had invited various members to give short presentations on topics already in the subcommission's working program.

D. von Hofe gave an overview of the standards relevant to quality management in welding. He indicated that we have developed many standards (ISO 3834, ISO 5817, ISO 9000 to 9006, and others), but we still need to learn how to integrate them into a cohesive package. He described how we need to further consider the aspects of manufacturing, management, ecology, and so on. In particular, he described how ISO 5817 lists various aspects of weld quality, but does not explain how to achieve quality welds. He offers this research as an area of focus for the subcommission.

O. Delby gave an overview of some aspects of fitness-for-service experience in Sweden. He indicated that they are using it in maintenance, but not yet in design. He also reported that Germany has provided a document to Commission X (IIW X-1280-93) on the assessment of the significance of weld imperfections. The document includes seven cases from laboratory tests and four cases from service experience. The information on these cases was gathered with a very thorough questionnaire.

T. Siewert and G. Dobmann described aspects of on-line weld monitoring. T. Siewert described assessing weld quality in gas metal-arc welds (GMAW) from electrical signals. G. Dobmann described monitoring of spot-weld formation by ultrasonic shear waves that pass from the generating transducer on one electrode to the detecting transducer on the other. His data showed an increase in the transmitted signal as the increasing pressure across the spot weld improves the coupling, then a decrease in the transmitted signal as the weld nugget forms and is unable to transmit a shear wave. His institute is working with various automotive manufacturers to test this concept in production.

P. Kunzmann summarized the activity within ISO 9000. The number of pages of ISO 9000 documents has grown from 166 pages in 1985 to more than 1000 pages in 1993, paralleling the growth in the importance of quality control over the past 10 years. This area, now called quality management, has stabilized now, with few new documents being developed. The procedures of ISO 9000 are very general and applicable to all industries, not just welding. The family of the ISO 9000 documents is being revised, with a minor revision planned for publication in 1996 and a major revision in 1999. Management of the environment is now being transferred to a new committee, ISO TC 207.

Quality documents specific to welding (material, process, and technology standards) are described in ISO 3834 and documents referenced therein. The document topics include the aspects of the welder, NDT, imperfections, processes, electrodes, and joint preparation.

We learned that the European Community has completed its conversion to EN standards, with all national standards being withdrawn. In response to a request from one of the delegates, Subcommission VB will develop a list of the international quality documents that indicates the correspondence among documents of various countries.

The Commission V members discussed which of the topics covered in these presentations were most important, and so should form the basis for the working program. Based on the comments at this meeting, the proposed working program for the subcommission now includes

- formulation of a more thorough concept for quality management in welding
- formulation of a guideline for quality management in welding (to help the user install a QA system)
- collection of information from users on the practical application of the following tools: computer-assisted quality assurance (CAQ), on-line weld monitoring, and fitness for purpose

Subcommission VB may develop a questionnaire to gather more information on ideas for their working party.

Z. Liu presented his report "Welding Technology Margin and Its Application in Welding Quality Assurance" (IIW V-1044-94). He described how quality varies from factory to factory, even when personnel try to use the same welding parameters. He described a plot for developing a relationship between a welding parameter and an index for weld quality. On this plot, one can develop a lower bound for the weld quality and then determine the range in the welding parameter where the weld quality is above this lower bound. The commission passed a resolution to have this document published in *Welding in the World* as a Class A document.

The intermediate meeting of Subcommission VB will be on Friday, 17 March 1995, in Basel, Switzerland.

2.4 Subcommission VC – Ultrasonically Based Weld Inspection Topics

In the absence of H. Wüstenberg, Chairman of Subcommission VC, G. Dobmann summarized the report of activities during the past year (IIW V-1031-94).

The intermediate meeting of the subcommission was held at the Institut de Soudure on 26 January 1994. The working group Validation of Ultrasonic Techniques for Weld Inspection did not hold a separate meeting but gathered data at a March 1994 meeting on NDE "State of the Art and PISC III Results" in Petten, The Netherlands, at the Joint Research Center. Mr. Hudgell, chairman of the working group Ultrasonic Inspection of Austenitic Welds and Clad Components, held two meetings.

The subcommission is continuing its discussions about the validation of NDT techniques for weld inspection. Details on this program are included on the subcommission document VC-907-94/OE. The subcommission expects to begin preparing an IIW document on this topic in 1995.

Progress in the theoretical and practical understanding of the propagation and interaction of ultrasonic waves in anisotropic materials may lead to some improvements in the handbook on inspection of clad surfaces. Members of the subcommission will be looking for information on this topic at the 6th European Conference on NDT in October 1994.

The future work program of Subcommission VC includes

- work on the *Handbook on the Examination of Austenitic Clad Structures*
- revision of the manual for ultrasonic inspection of ferritic welds (including liaison between IIW and ISO TC 44)
- 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

A new working group, Automation and Imaging for Ultrasonic Weld Inspection, is being developed. At the request of the subcommission chairman (as stated in Appendix 1 to IIW V-1032-94), all delegates were asked to consider possible participants for the new working group and to provide their names and addresses to H. Wüstenberg.

The subcommission supports holding an intermediate meeting in conjunction with the ASTM E7 meeting in January in Fort Lauderdale, Florida, to gain further information on the need to revise the description of the IIW calibration block.

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

G. Dobmann, Chairman of Subcommission VE, reviewed recent activities (IIW V-1032-93). The subcommission held one intermediate meeting on 27 January 1994 at the Institut de Soudure; the working party on black-light lamps met on 3 June 1994, also at the Institut.

The working party on black-light lamps has finished its comprehensive report (IIW V-1035-94) "Characterization of Black Light Equipment: Critical Factors and Supporting Data," based on the research of the Italian Institute of Welding and the Energy Center Research in Rome. F. Peri of the Italian Institute of Welding summarized the data in the report, which was very interesting. For example, the light output takes about 30 min to stabilize after a light has been turned on; the output is determined by the temperature in the enclosure as well as the voltage. The commission passed a resolution to publish this as an IIW document.

F. Peri also presented "Nondestructive Testing of Weldments: Technical Evaluation of Black Light Equipment for Manual Application in Welding" (IIW V-1036-94). This document is intended to be a standard for controlling the application of black-light inspection equipment. It includes requirements on distances, times, and filters, and it details how to verify the critical parameters in the process. The commission passed a resolution to forward this document to ISO as a draft international standard.

The working party on characterization of nonmetallic welds is inactive and will remain so until we identify a chairman who is familiar with this topic. When G. Dobmann inquired whether anyone was interested in this topic, F. Peri volunteered to prepare a comprehensive survey of this topic for plastic pipe. Subsequent subcommission discussions judged that the problem might be due to the lack of association between those who weld plastics and those who inspect them.

The future working program includes

- activation of the working party on eddy-current inspection, which includes sizing of flaws, replacing magnetic-particle examination, and low-frequency eddy-current inspection of the entire weld
- preparation of the 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
- activation of the working party on nonmetallic welds
- harmonization of the European initiatives on residual stress measurements

2.6 Working Group 2 – Inspection of Offshore Welded Construction

In the absence of A. Raine, the new chairman, T. Siewert presented the annual report of the working group (IIW V-1033-94). The working group held one intermediate meeting in Stavanger, Norway, on 8 April 1994.

The emphasis of the working group has moved away from single-diver subsea inspection and is moving toward remotely operated vehicles and the inspection of topside structural and pressurized components. The interest in remotely operated vehicles is being driven by the need to inspect at greater depths and in more dangerous environments; the interest in the topside structures is being driven by the difficulty in inspecting for corrosion and cracking through lagging and coatings and by failures in more complex metallic materials. The working group is evaluating data from reliability trials to determine the optimum inspection frequency.

The future activities for the working group include revision of "Information on Practices for Underwater Non-Destructive Testing" (IIW V-908-89) and review of new problem areas and new techniques, such as

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

2.7 Miscellaneous Commission V Items

We discussed a proposal (IIW V-1028-94) to hold a workshop that would bring together the IIW Commission V members and the ASTM Committee E7 members, with the goal of increasing their interaction. This idea had been favorably received at the last intermediate meetings and was brought forward to the commission. Since the ASTM Committee meets the week of 16 January, we decided to hold this workshop on 14 January 1995.

For convenience, the next intermediate meetings of Commission V have been scheduled just prior to the workshop:

- Subcommission VC – 12 January 1995 in Fort Lauderdale, Florida
- Subcommission VE – 13 January 1995 in Fort Lauderdale, Florida
- Subcommission VA – 13 January 1995 in Fort Lauderdale, Florida
- Subcommission VB has less interaction with the activities of ASTM Committee E7, and so it plans to meet separately: Friday, 17 March 1995, in Basel, Switzerland. Likewise, Working Group 2 planned a meeting in London in late December.

3. Resolutions of the Annual Assembly 1994

3.1 Resolution 1

Commission V recommends that "The Status of NDT Technology Used for Welded Structures in China" by S. Li and Z. Liu (IIW V-1034-94) be published in as a Class A Document in *Welding in the World*.

3.2 Resolution 2

Commission V proposes to add the topic of film digitization to the working program of Subcommission VA.

3.3 Resolution 3

Commission V proposes either to develop additional guidelines or to redraft ISO 5817 to include conventional inspection technologies, since the present fitness-for-service requirements cause excessive finishing and inspection costs. This task will be a joint effort of Subcommissions VA and VC. They will investigate liaisons with Commissions XV and XI on this topic.

3.4 Resolution 4

Commission V recommends that "Welding Technology Margin and Its Application in Welding Quality Assurance" by Z. Liu, K. Li, and H. Jiao (IIW V-1044-94) be published as a Class A document in *Welding in the World*.

3.5 Resolution 5

Commission V recommends that "Characterization of Black Light Equipment: Critical Factors and Supporting Data" (IIW V-1035-94) be published as a Class A Document in *Welding in the World*.

4. Future Work Program of Commission V

4.1 Subcommittee VA – Radiography-Based Weld Inspection Topics

The future work of Subcommittee VA will concentrate on the following:

- Classification of film systems.
- Completion of standard on radiosopic systems: The Working Party is preparing a three-part standard about the properties and use of radiosopic systems for weld inspection. There will be an experimental phase to experience the practicability of the standard. After finalization of parts 1 and 2, drafting of part 3 remains.
- Revision of ISO standards: Subcommittee 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.
- Digitization of film.

4.2 Subcommittee VB – Quality Management in Welding Technology

The future work of Subcommittee VB will concentrate on the following:

- Pursuance of the work of ISO/TC176 and ISO/TC44SC10 and especially the work of the corresponding CEN/CENELEC TCs with regard to the European development and emphasis on welding technology and quality.
- Support of QA activities and weld inspection by means of CAQ.
- Monitoring of welding processes and welding parameters for early prevention of weld defects.
- Assessment of on-line inspection by modern visual and dimensional checking.
- Review of the "fit-for-purpose" evaluation with special emphasis on welded compound analysis for life extension.
- Development of new aspects of Total Quality Management (TQM), with special regard to the human factor.
- Evaluation of NDT acceptance criteria with respect to weld quality classes.

4.3 Subcommission VC – Ultrasonically Based Weld Inspection Topics

The future work of 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 (e.g., 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.
- Collaboration with Subcommission VA on the review of ISO 5817.

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

The future work of Subcommission VE will concentrate on the following:

- Numerical modelling studies on electric, magnetic, and electromagnetic techniques of NDT for defect detection and sizing 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.
- 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 1994/95 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, 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 (see resolution 5 of Annual Assembly 1994 in section 3).*
- 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.

*High-priority item during 1994/1995.

- Preparation of a document on the relative fluorescence-intensity measurements (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.*
- Reconciliation of European initiatives on residual-stress measurements.*

4.5 Subcommission VF – Weld Defects and Their Significance

No work is planned for 1995/96, 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

The future work of 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 structural-integrity monitoring techniques for offshore constructions
 - inspection systematics, planning, cost effectiveness, and optimization, including the use of probabilistic assessment*

*High-priority item for 1994/1995.

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 Constructions

A.2 Officials of the International Institute of Welding**GENERAL SECRETARIAT****J. Hicks**, Secretary General

The Welding Institute
 Abington Hall
 Abington, Cambridge CB1 6AL
 United Kingdom
 Tel. +44 223 891162
 Fax +44 223 894180
 Telex 81183

TECHNICAL SECRETARIAT**M. Bramat**, Technical Secretary

Institut International de la Soudure
 PARIS NORD II
 90 rue des Vanesses
 BP 50362
 F-95942 Roissy CDG Cedex
 France
 Tel. +33 1 49 90 36 00
 Fax +33 1 49 90 36 50

A.3 Officials of Commission V**CHAIRMAN****Thomas A. Siewert**

National Institute of Standards and Technology
 NIST - Mail Code 853
 325 Broadway
 Boulder, Colorado 80303
 USA
 Tel. +1 303 497 3523
 Fax +1 303 497 5030
 e-mail siewert@micf.nist.gov

VICE-CHAIRMAN**Michel Rousseau**

Institute de Soudure
 PARIS NORD II
 90 rue des Vanesses
 BP 50362
 F-95942 Roissy CDG Cedex
 France
 Tel. +33 1 49 90 36 00
 Fax +33 1 49 90 36 50

CHAIRMAN, SUBCOMMISSION VA**Heinrich Heidt**

MFPA Weimar an der Hochschule für
 Architektur und Bauwesen
 Amalienstrasse 13
 D-99429 Weimar
 Germany
 Tel. +49 30 3643 564 301
 Fax +49 30 3643 564 201/302

CHAIRMAN, SUBCOMMISSION VB**Peter Kunzmann**

Schweizerischer Verein für Schweißtechnik
 St. Alban-Rheinweg 222
 CH-4052 Basel
 Switzerland
 Tel. +41 61 317 84 84
 Fax +41 61 317 84 80

CHAIRMAN, SUBCOMMISSION VC**Herman Wüstenberg**

Bundesanstalt für Materialprüfung
 Unter den Eichen 87
 D-12205 Berlin
 Germany
 Tel. +49 30 81046210
 Fax +49 30 811202
 Telex 183261 bamb d

CHAIRMAN, SUBCOMMISSION VE**Gerd Dobmann**

Fraunhofer-Institut für Zerstörungsfreie
 Prüfverfahren
 Universität, Gebäude 37
 D-66123 Saarbrücken
 Germany
 Tel. +49 681 3023855
 +49 681 3023801
 Fax +49 681 39580
 Telex 4421328 izfp d

CHAIRMAN, SUBCOMMISSION VF**Birger Hansen**

FORCE Institutes
Park Allé 345
DK-2605 Brøndby
Denmark
Tel. +45 42968800
Fax +45 42962636
Telex 33388 svc dk

CHAIRMAN, WORKING GROUP 2**G. Alan Raine**

Technical Software Consultants Ltd.,
Northern Office
Hawthorn House
7 Tollgate Road
Hamsterley Mill, Rowlands Gill
Tyne and Wear NE39 1HF
England, United Kingdom
Tel. +44 207 542 860
Fax +44 207 542 860

A.4 Honorary Members of Commission V**Jacques Dubresson**

23 Rue Volta Prolongée
F-92400 Courbevoie
France

Arie de Sterke

Maasboulevard 20
NL-3133 AL Vlaardingen
The Netherlands

Ronald Halmshaw

49 Crouchcroft
New Eltham
London SE9 3HX
England, UK

Hans-Jürgen Meyer

Klosterweg 111
D-90455 Nürnberg
Germany
(April–September and December)

P.O. Box 1455
ZA Manaba 4276
Republic of South Africa
(October–November and January–March)

Roy Sharpe

British Institute of NDT
1 Spencer Parade
Northampton NN1 5AA
England, UK

A.5 National Delegates to Commission V

In the following list of delegates, the IIW member association is given followed by the delegate's business address, if different.

ARGENTINA

J. L. Otegui

Fundacion Latinoamericana de Soldadura
Calle 18, No 4113
1672 Villa Lynch
Buenos Aires
Argentina
Tel. +54 1 753 4039
Fax +54 1 755 1268

AUSTRALIA

J. C. S. Bowler

Welding Technology Institute of Australia
Unit 3, Suite 2
9 Parramatta Road
Lidcombe, P.O. Box 28
NSW 2141, Australia
Tel. +61 2 748 4443
Fax +61 2 748 2858

business address:

AFRDI
P.O. Box 2042
Launceston
Tasmania 7250
Australia
Tel. +61 03 432133
Fax +61 03 448990

AUSTRIA

H. Handl

Österreichische Gesellschaft für Schweisstechnik
Arsenal, Objekt 12
A-1030 Vienna
Austria
Tel. +43 1 798 21 68
Fax +43 1 798 21 6815

BELGIUM

J. Charlier

Institut Belge de la Soudure
21 Rue des Drapiers
1050 Brussels
Belgium
Tel. +32 2 512 2892
Fax +32 2 512 7457

business address:

Universite Libre de Bruxelles
Faculté des Sciences Appliquées
50 Avenue Roosevelt
1050 Bruxelles
Belgium
Tel. +32 2 642 2791/2723/2793

BRAZIL

C. Wahba

Brazilian Committee of IIW
Rua Sao Francisco Xavier 601
Maracana
20550-040 Rio de Janeiro - RJ
Brazil
Tel. +55 21 254 0203
Fax +55 21 284 2191

business address:

BARDONI ATB IND..
METALMECANICA S/A
Rua Arlindo Bettio s/n.
03828-000 Sao Paulo sp
Brazil
Tel +55 11 702 2111
Telex 1171560-1171636 abbx

BULGARIA**A. Skordev**

National Welding Society
 Union of Mechanical Engineering
 of Bulgaria
 Rakovski Street 108, POB 431
 Sofia 1000
 Bulgaria
 Tel. +359 2 877290
 Fax +359 2 879360

business address:

Head of Central Laboratory on NDT
 Central Institute of Mechanical Engineering
 12 Ho-Chi-Minh Boulevard
 Sofia 1574
 Bulgaria
 Tel. +359 2 723821

CANADA**J. H. Zirnhelt**

Canadian Council of the IIW
 391 Burnhamthorpe Road East
 Oakville, Ontario L6J 6C9
 Canada
 Tel. +1 905 257 9881
 Fax +1 905 257 9886

business address:

Charcas Technical Services
 Box 1571, Station B
 Mississauga, Ontario L4Y 4G3
 Canada
 Fax +1 905 897 7819

CHILE

(no nomination)

Centro Tecnico Chileno de la Soldadura
 Camino a Melipilla 7060
 P.O. Box 13850, Santiago
 Chile
 Tel. +56 2 571 777
 Fax +56 2 557 3471

CHINA**S. Li**

Chinese Welding Society
 111 Hexing Lu
 Harbin 150080
 China
 Tel. +86 451 6322012
 Fax +86 451 6325871

CROATIA

(no nomination)

Croatian Welding Society
 Dure Salaja 1
 41000 Zagreb
 Croatia
 Tel. +385 41 512 689
 Fax +385 41 512 689

CZECH REPUBLIC

(no nomination)

Czech Welding Society
 Novotneho lavka 5
 110 01 Praha 1
 Czech Republic
 Tel. +42 2 23 10 124
 Fax +42 2 26 18 97

DENMARK**W. D. Kristensen**

FORCE Institutes
 Park Allé 345
 DK-2605 Brøndby
 Denmark
 Tel. +45 43968800
 +45 42968446
 Fax +45 43962636
 Telex 33388 svc dk

EGYPT

(no nomination)

B. Zaghloul
 Central Metallurgical R&D Institute
 P.O. Box 87
 Helwan - Cairo
 Egypt
 Tel. + 20 790775
 Fax + 45 43 96 2636

FINLAND

P. Kopiloff

Suomen Hitsausteknillimen Yhdistys RY
Mäkelänkatu 36 A2
SF-00510 Helsinki
Finland
Tel. +358 0 773 2199
Fax +358 0 773 2661

business address:

NDT Tekniikka Oy
Teollisuustie 9 B
SF-02700 Kauniainen
Finland

FRANCE

M. Rousseau

Institut de Soudure
PARIS NORD II
90 rue des Vanesses
BP 50362
F-95942 Roissy CDG Cedex
France
Tel. +33 1 49 90 36 00
Fax +33 1 49 90 36 50

GERMANY

G. Dobmann

Deutscher Verband für Schweißtechnik e.V.
Postfach 10 19 65
400010 Düsseldorf
Germany
Tel. +49 211 1 59 10

business address:

Fraunhofer-Institut für Zerstörungsfreie
Prüfverfahren
Universität, Gebäude 37
D-66123 Saarbrücken
Germany
Tel. +49 681 3023855
Fax +49 681 39580

GREECE

A. Tzogios

Hellenic Institute of Welding Technology
c/o V. J. Papazoglou
P.O. Box 64070
GR-15710 Zografos
Greece
Tel. +30 1 7700671
Fax +30 1 7759213
Telex 221682 ntua gr

HUNGARY

S. Somogyi

Gepipari Tudományos Egyesület
Fó utca 68
P.O. Box 433
1371 Budapest
Hungary
Tel. +36 1 202 0582
Fax +36 1 202 0252
Telex 225792

IRAN

B. Chobak

The Iranian Institute of Welding and NDT
P.O. Box 14155-4686
Tehran
Iran
Tel. +98 21 834 715
Fax +98 21 651 809

business address:

IRAN ITOK Engineering and Technological Co.
Technical Inspection Department
24 Idgah Alley, Karegar Shomali St.
Tehran 14146
Iran

ISRAEL

A. Notea

Israel Metallurgical Society
Israel Institute of Metals
Technion City
PO Box 4910
32000 Haifa
Israel
Tel. +972 4 23 5104
Fax +972 4 22 1581

ITALY

G. Calcagno

Istituto Italiano Saldatura
Lugobisagno Istria 15
I-16141 Genova
Italy
Tel. +39 10 83411
Telex 283054 saldis i

business:

Tel. +39 10 853111
Fax +39 10 836 7780

JAPAN

T. Kishi

Japan Institute of Welding
1-11 Kanda Sakuma-Cho
Chiyoda-ku
Tokyo 101
Japan
Tel. +81 33253 0488
Fax +81 33253 3059

KOREA

(no nomination)

The Korean Welding Society
P.O. Box 6
Daeduk Science Town
Dae-jon 305-343
Korea
Tel. +82 42 861 2696
Fax +82 42 861 1172

MEXICO

(no nomination)

Colegio de Ingenieros Mecanicos
y Electricistas
Oklahoma 89
CP 03810
Mexico D.F.
Mexico
Tel. + 52 5 5231123
Fax + 52 5 5437902

THE NETHERLANDS

A. Arun Junai

Nederlands Instituut voor Laastechniek
Krimkade 20
NL-2251 KA Voorschoten
The Netherlands
Tel. +31 71 61 12 11
Fax +31 71 61 14 26

business address:

Production Technology Department
TNO Institute of Production and Logistics
Research
Apeldoorn Branch
PO Box 541
NL-7300 AM Apeldoorn
The Netherlands
Tel. +31 55 49 30 71
Fax +31 55 49 31 08

NEW ZEALAND

P. Hayward

New Zealand Welding Committee
HERA House, 17-19 Gladding Place
P.O. Box 76-134
Manukau City, Auckland
New Zealand
Tel. +64 9 2622885
Fax +64 9 2622856

business address:

Certification Board for Inspection Personnel
HERA House, 17-19 Gladding Place
P.O.Box 76-134
Manukau City, Auckland
New Zealand
Tel. +64 9 2622885
Fax +64 9 2622856

NORWAY**O. Førli**

Norsk Sveiseteknisk Forening
P. O. Box 7072 Homannsbyen
N-0603 Oslo
Norway
Tel. +47 22 46 58 20
Fax +47 22 46 18 38

business address:

Det norske Veritas Industry AS
Veritasveien 1
N-1322 Høvik
Norway
Tel. +47 67 57 88 33
+47 67 57 72 50
Fax +47 67 57 74 74
Telex 76192 verit n

POLAND**W.T. Szydlik**

Instytut Spawalnictwa
16/18 ul Bł Czesława
44-100 Gliwice
Poland
Tel. +48 32 31 0011
Fax +48 32 31 4652

business address:

Politechnika Gdanska
Unstytut Technologii Materialow
Maszynowych i Spawalnictwa
ul Majakowskiego 11/12
80-233 Gdansk-Wrzeszcz
Poland

PORTUGAL**A. Lopes Pereira**

Instituto de Soldadura e Qualidade
Estrada Nacional 249 - km 3
Cabanas/Leiao (Taguspark)
Apartado 119
2781 Oeiras Codex
Portugal
Tel. +351 1 4211307
+351 1 4429649
Fax +351 1 4211406

business address:

Estrada da Luz; 169; 5E
1600 Lisbon
Portugal

ROMANIA

(no nomination)

Institute of Welding and Materials Testing
Bv Mihai Viteazul Nr 30
1900 Timisoara
Romania
Tel. +40 56 191827
Fax +40 56 192797

RUSSIA

(no nomination)

c/o V. Chernykh
The Russian Welding Society
Shelaputinsky per. 1
109004, Moscow
Russia

SLOVAKIA**P. Pálffy**

Vyskumny Ustav Zvaracsky
Racianska 71
832 59 Bratislava
Slovakia
Tel. +42 7 279 6111
Fax +42 7 254 867

SLOVENIA**G. Rihar**

Zveza Drustev Za Varilno
Tehniko Slovenije
Ptujaska 19
61000 Ljubljana
Slovenia
Tel. +386 61 221 631
Fax + 386 61 349 282

SOUTH AFRICA**R.P. Chaix**

South African Institute of Welding
P.O. Box 527
Crown Mines
2025 Johannesburg, Transvaal
South Africa
Tel. +27 11 836 4121
Fax +27 11 836 4132

SPAIN

F. Santamaria

Centro Nacional de Investigaciones Metalurgicas
 Departamento de Soldadura
 Avenida de Gregorio del Amo 8
 28040 Madrid
 Spain
 Tel. +34 1 553 8900
 Fax +34 1 534 7425

SWEDEN

C. Johansson

Svetskommissionen IVA
 Box 5073
 S-102 42 Stockholm
 Sweden
 Tel. +46 8 7912900
 Fax +46 8 679 9404
 Telex 17172 iva s

business address:

AB Materialröntgen
 Oddevillan, Strömstadsvägen
 S-45150 Uddevalla
 Sweden
 Tel. +46 31 513650
 Fax +46 31 235894
 Telex 2524 swetest s

SWITZERLAND

M. Gribi

Schweizerischer Verein für Schweißtechnik
 St. Alban-Rheinweg 222
 CH-4052 Basel
 Switzerland
 Tel. +41 61 317 84 84
 Fax +41 61 317 84 80

business address:

Sulzer Innotec
 Abt 1503/4
 CH-8401 Winterthur
 Switzerland
 Tel. +41 52 814257
 Fax +41 52 239245

UKRAINE

Yu. K. Bondarenko

National Welding Committee
 E. O. Paton Welding Institute
 Bozhenko Str. 11
 252 650 Kiev-5
 Ukraine
 Tel. +7 044 227 4288
 Fax +7 044 268 0486
 Telex 131139 radok su

UNITED KINGDOM

T. J. H. Webborn

UK Section of the IIW
 The Welding Institute
 Abington Hall
 Abington, Cambridge CB1 6AL
 United Kingdom
 Tel. +44 223 891162
 Fax +44 223 894180

Business address:

Llwyncelyn
 5 Richmond Villas, Ffynone
 Swansea SA1 6DQ
 Wales, United Kingdom
 Tel. +44 792 472257
 Fax +44 792 476617
 Tlx 81183

UNITED STATES

T. Siewert

American Council of IIW
 550 NW LeJeune Road
 P O Box 351040
 Miami, Florida 33135
 USA
 Tel. +1 305 443 9353
 Fax +1 305 443 7559
 Telex amweld soc 519245

business address:

Materials Reliability Division
 NIST - Mail Code 853
 325 Broadway
 Boulder, CO 80303
 USA
 Tel +1 303 497 3523
 Fax +1 303 497 5030

A.6 Attendance Record – Annual Assembly 1994

Name	Country	Function	7 Sept.	8 Sept.	9 Sept.
Siewert, T.	USA	Commission Chairman/Delegate	×	×	×
Varga, T.	Austria	Observer			×
Li, S.	China	Delegate	×	×	×
Liu, Z.	China	Expert	×		×
Chen, H.	China	Expert		×	
Wang, S.X.	China	Expert		×	
Wang,	China	Expert		×	
Li, K.	China	Expert		×	
Li, F.	China	Expert			×
Chen, H.	China	Expert			×
Xie, J.	China	Expert			×
Li, F.	China	Expert			×
Zaghloul, B.	Egypt	Expert	×		
Kopiloff, P.	Finland	Delegate	×	×	×
Rousseau, M.	France	Delegate	×	×	×
Dobmann, G.	Germany	Delegate/Chairman VE	×	×	×
Szelagowski, P.	Germany	Expert	×	×	×
von Hofe, D.	Germany	Expert		×	×
Somogyi, S.	Hungary	Delegate	×	×	
Konkoly, T.	Hungary	Expert			×
Chobak, B.	Iran	Delegate	×	×	
Avazeh, A.	Iran	Expert		×	
Rouzbehani, A.	Iran	Expert		×	
Peri, F.	Italy	Acting Delegate	×	×	×
Sampietro, L.	Italy	Expert	×	×	
Scasso, N.	Italy	Expert		×	
Lezzi, F.	Italy	Observer			×
Horikawa, K.	Japan	Acting Delegate	×		
Sohn, I.S.	Korea	Observer	×		
Torres, J.	Mexico	Delegate	×	×	
Arun Junai, A.	The Netherlands	Delegate	×	×	
Dellby, O.	Sweden	Observer		×	
Edstrom, J.	Sweden	Observer		×	
Kunzmann, P.	Switzerland	Delegate	×	×	×
Verma, K.	United States	Expert	×	×	×

A.6.1 Attendance statistics

	7 Sept.	8 Sept.	9 Sept.	Any day
Participants:	17	25	17	34
Delegates:	12	10	6	12
Experts:	5	13	9	18
Observers:	1	2	2	5
Countries present:	10	10	6	18

A.7 Subcommittee and Working Group Meetings 1994/95

Subcommission VA	13 January 1995	Fort Lauderdale, Florida, USA
Subcommission VB	17 March 1995	Basel, Switzerland
Subcommission VC	12 January 1995	Fort Lauderdale, Florida, USA
Subcommission VE	13 January 1995	Fort Lauderdale, Florida, USA
Subcommission VF	No meetings	
Working Group 2	8 April 1994	Stavanger, Norway
	16 December 1994	London, UK

A.8 Tentative Schedule for Commission V Meetings 1995/96

Tentative dates and places for subcommission and working group meetings in 1995/96 and for the Annual Assembly are

Subcommission VA	23 January 1996	Paris, France
Subcommission VB	June 1996	Basel, Switzerland
Subcommission VC	24 January 1996	Paris, France
Subcommission VE	25 January 1996	Paris, France
Subcommission VF	No meetings	
Working Group 2	1995/96	United Kingdom
Annual Assembly	2-6 September 1996	Budapest, Hungary

Appendix B. Commission V Documents

B.1 Recent Publishing Action and Position, March 1995

B.1.1 Handbooks and Booklets

- V-847-87 *Non-destructive Measurement and Analysis of Residual Stress in Welds (IIS/IIW-936-87)*
Published as Bulletin 383 by the Welding Research Council, New York in July 1993
- SST-1141-89 *Assessment of the Fitness-for-Purpose of Welded Structures*
Published by the Danish Welding Society in English in May 1991
French version in preparation.
- 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-982-91 (IIS/IIW-1120-91) *Performance Assessment of Non-destructive Testing Techniques – Presentations during the IIW Commission V Seminar on 4 July 1991*
Compiled as a booklet by Subcommittee VC for circulation to Member Societies and Commission V Delegates
- V-1001-92 *Ultrasonic Imaging for Weld Inspection Proceedings from the IIW Commission V Seminar on 10 September 1992*
Compiled as a booklet by Subcommittee VC for circulation to Member Societies and Commission V Delegates

B.1.2 *Welding in the World* Articles

- V-1010-93 Published in Vol. 33, No. 3 (May/June)
- V-1012-93 Published in Vol. 33, No.3 (May/June)
- V-1013-93 Published in Vol. 33, No. 3 (May/June)
- V-1014-93 Withdrawn
- V-1015-93 Withdrawn
- V-1034-94 Awaiting Publication
- V-1035-94 Awaiting Publication
- V-1044-94 Awaiting Publication

B.2 Commission V Documents 1993/94

- V-1001-92 *Ultrasonic Imaging for Weld Inspection: Proceedings of the IIW Commission V Seminar on 10 September 1992*
- V-1026-93 "IIW Commission V, Quality Control and Quality Assurance of Welded Products – Annual Statement 1992/93"
- V-1027-94 Agenda for Commission V Annual Meeting – 1994
- V-1028-94 "International Workshop on NDE Standards" – January 1995
- V-1029-94 Subcommittee VA Annual Report
- V-1030-94 Subcommittee VB Annual Report
- V-1031-94 Subcommittee VC Annual Report
- V-1032-94 Subcommittee VE Annual Report
- V-1033-94 Working Group 2 Annual Report
- V-1034-94 "The Status of NDT Technology Used for Welded Structures in China," S. Li and Z. Liu
- V-1035-94 "Characterization of Black Light Equipment," G. Calcagno, G. Costa, R. Marmigi, and E. Pollicardo
- V-1036-94 "Non Destructive Testing of Weldments: Technical Evaluation of Black Light Equipment for Manual Application in Welding," IIW Recommendation of Practice, to ISO by Route 2
- V-1037-94 Agenda for Subcommittee VB Annual Report
- V-1038-94 "IIW Contribution to Inspection Validation," H. Wüstenberg Presented at Eurocourses: Qualification of Inspection Procedures, Ispra, Italy, 25 October 1993.
- V-1039-94 List of Commission V Documents – 1994
- V-1040-94 "Nondestructive Testing of Welding Residual Stresses by Acoustoelastic Technique, F. Jiao, W. Zhang, and Z. Yuan
- V-1041-94 Minutes of the Annual Assembly Meeting – 7 September 1994
- V-1042-94 "The Use of Fitness for Purpose (FFP) of Welded Structures in Sweden," Lars Dahlberg
This document has already circulated within Subcommittee VB.
- V-1043-94 Minutes of the Annual Assembly Meeting – 8 September 1994
- V-1044-94 "Welding Technology Margin and its Application in Welding Quality Assurance," Z. Liu, K. Li, and H. Jiao
- V-1045-94 Minutes of the Annual Assembly Meeting – 9 September 1994

B.3 Documents Recommended for Publication

- V-1034-94 Class A Resolution 94-01 "The Status of NDT Technology used for Welded Structures in China," S. Li and Z. Liu
- V-1035-94 Class A Resolution 94-05 "Characterization of Black Light Equipment," G. Calcagno, G. Costa, R. Marmigi, and E. Pollicardo
- V-1044-94 Class A Resolution 94-04 "Welding Technology Margin and its Application in Welding Quality Assurance," Z. Liu, K. Li, and H. Jiao

B.4 Sales of Commission V Documents

	<u>1993</u>	<u>1992</u>	<u>1991</u>	<u>1990</u>	<u>1989</u>	<u>1988</u>
<i>Collection of Reference Radiographs of Butt Welds in Steel</i>	67	111	74	89	93	110
<i>Collection of Reference Radiographs of Butt Welds in Aluminum and Aluminum Alloys</i>	22	21	16	18	28	*
<i>Reference Radiographs (Blue Booklet)</i>						
English/French	274	3252	56	204	219	364
English/French/3rd language	30	310	134	236		
<i>Handbook on Radiographic Apparatus Techniques</i>						
English	24	47	60	29	27	40
French	123	54	166	137	114	119
Swedish	10	5	5	10		1
<i>List of Terms Used in the Ultrasonic Examination of Welds</i>	2	3	3	30	6	9
<i>Handbook on Ultrasonic Examination of Welds</i>						
English	38	39	75	60	133	104
French	33	8	83	130	64	110
Dutch	0	0	15	29	29	48
Finnish					15	
<i>Handbook on the Ultrasonic Testing of Austenitic Welds</i>						
English	43	26	26	32	32	104
French	3	3	4	4	9	19
German	31	7	31	30	35	179
<i>Evaluation of Ultrasonic Signals</i>	10	35	55	84	94	216
<i>Handbook on the Magnetic Examination of Welds</i>	29	45	23	131	15	166
<i>Automated Ultrasonic Weld Inspection</i>	*	*	*	*		
<i>Guidelines for Quality Assurance in Welding Technology</i>	64	44	173	157	*	*
<i>IIW Guidance on Assessment of the Fitness for Purpose (SST-1141-89)</i>						
English	61	43	169			
<i>Non-destructive Measurement and Analysis of Residual Stress in and around Welds — A State of the Art Survey (V-847-87)</i>	330					
Total items sold	953	4053	1168	1410	902	1621

* information not available

