

ABSTRACTS (IIW DOCUMENTS)

REFERENCE WORKPLACES FOR MANUEL WELDING

R. Kadefors, J. Laring and G. Bengtsson (Sweden).

IIW/IIS VIII-1565-91

The welding workplaces at Lindholmen show that it is feasible to implement a safe working environment in a welding workshop at reasonable cost, and that integrated solutions are available which facilitate productivity and product quality.

AS WELDERS AREN'T MADE OF STEEL.....

The Swedish Work Environment Fund and the Swedish Institute of Production Engineering Research/IVP (Sweden).

IIW/IIS VIII-1566-91

The Swedish Institute of Production Engineering Research (IVP) is involved in the development of new production technology with the objective of improving efficiency and working conditions in industry.

This publication presents a selection of current Swedish knowledge concerning ways and means of improving the working conditions of welders.

EVALUATION OF EXPOSURES DURING THE WELDING OR FLAME-CUTTING OF PAINTED STEEL

K. Engstrom, B. Engstrom, M. L. Henriks-Eckerman (Finland).

IIW/IIS VIII-1567-91

We suggest that the assessment of exposure during the welding or flame-cutting of coated steel should be made preferably by measuring a few relevant compounds. A scheme for such a test procedure can be outlined by (i) screening the pollutants emitted, (ii) determining the principal components of various paints, and (iii) selecting compounds relevant to the workers' health.

SEMEN QUALITY AND SEX HORMONES AMONG MILD STEEL AND STAINLESS STEEL WELDERS : A CROSS SECTIONAL STUDY

J. P. Bonda (Denmark)

Published in British Journal of Industrial Medicine, 1990, 47, pp. 508-514.

IIW/IIS VIII-1568-91

Welding may be detrimental to the male reproductive system. To test this hypothesis, semen quality was examined in 35 stainless steel welders, 46 mild steel welders, and 54 non-welding metalworkers and electricians. These figures represent a participation rate of 37.1% in welders and 36.7% in non-welding subjects. The mean exposure to

welding fume particulates was 1.3 mg/m SD 0.8) in stainless steel welders using tungsten inert gas, 3.2 mg/m³ (SD 1.0) in low exposed mild steel welders using manual metal arc or metal active gas (n = 31), and 4.7 mg/m³ (SD 2.1) in high exposed mild steel welders (n = 5). The men quality of each participant was defined in terms of the mean values of the particular semen parameters in three semen samples delivered at monthly intervals in a period with occupational exposure in a steady state. The sperm concentration was not reduced in either mild steel or stainless steel welders. The sperm count per ejaculate, the proportion of normal sperm forms, the degree of sperm motility, and the linear penetration rate of the sperm were significantly decreased and the sperm concentration of follicle stimulating hormone (FSH) was non-significantly increased in mild steel welders. A dose response relation between exposure to welding fumes and these semen parameters (sperm count excepted) was found. Semen quality decreased and FSH concentrations increased with increasing exposure. Significant deteriorations in some semen parameters were also observed in stainless steel welders. An analysis of information from questionnaires obtained from the whole population including subjects who declined to participate indicated an underestimation of effects due to selection bias. Potential confounding was treated by restriction and statistical analysis. The results support the hypothesis that mild steel welding and to a lesser extent stainless steel welding with tungsten inert gas is associated with reduced semen quality at exposures in the range of the Danish process specific threshold limit values of welding.

SEMEN QUALITY IN WELDERS BEFORE AND AFTER THREE WEEKS OF NON-EXPOSURE

J. P. Bonda (Denmark)

Published in British Journal of Industrial Medicine, 1990, 47 pp. 515-518.

IIW/IIS-VIII-1569-91

In a cross sectional field study concerning the male reproductive system in metal workers, the major findings were a moderate deterioration of semen quality in mild steel welders and less reliable changes in semen quality in low exposed stainless steel welders. In the present study, a longitudinal design was adopted to deal with methodological drawbacks inherent in the cross sectional approach. The study relies on the assumption that the effect of welding is causal and reversible. The semen quality of 19 mild steel welders, 18 stainless steel welders and 16 non-welding metal-workers, was examined before and three, five, and eight weeks in exposure (summer vacation). No consistent improvement in any semen parameter in the follow up period relative to the pre-exposure period was found in either mild steel or stainless steel welders. The results indicate either a non-causal nature of reported associations between welding exposure and poor semen quality, or that the effect of welding is non-reversible within the rather short non-exposure period.

ASSESSMENT OF EXPOSURE TO FUME FROM WELDING AND ALLIED PROCESSES

Health and Safety Executive (United Kingdom)

Published as Guidance Note EH 54 in Environmental Hygiene Series EH 54 (March 1990) by Health and Safety Executive, United Kingdom.

IIW/IIS VIII-1570-91

The aim of this guidance note is to help employers, and anyone they may appoint, to carry out the assessment of exposure required under the Control of Substances Hazardous to Health (CoSHH) Regulations 1988, for welding fume. It outlines factors that influence the formation, composition and concentration of fume and gases that occur in welding and allied processes, such as burning and gouging, and gives guidance on the application and use of occupational exposure limits.

□ **PRODUCTIVITY, OR QUALITY OF WORK AS THE DECISIVE FACTOR IN MARKETING ERGONOMICS? - DESIGN CONSIDERATIONS FOR A NEW ERGONOMIC WELDING - TABLE.**

F. van der Veen and R. E. Regensburg (Netherlands)

Published in ERGONOMICS, 1990, Vol. 33 No. 4, pp 407-411.

IIW/IIS VIII-1575-91

Quality tools should be designed from the starting point of adjusting tasks and equipment to human possibilities and limitations. Companies should consider an investment in ergonomic equipment as a profitable addition to indispensable productive machinery. As an example to support this statement, the authors describe the health risks of welders and the possible solutions. As the result of investigations a list of requirements was drafted for a product that would have less of the disadvantages of the products mentioned. The designed product, the 'ergonomic welding-table' aims to be a quality tool for welders working at small and medium-sized tasks. The product consists of a cabin (2.35 m wide) with a built-in ventilator for very efficient welding fume extraction (90%-95%). Welders can set their preferred working height at any time. Another advantage is the option of performing the welding task while standing or sitting. The results of user-evaluation among welders and purchasers indicates considerable satisfaction.

□ **Co₂-LASERS AND NOISE CONTROL**

A. Honkasalo, J. Kuronen, P. Narhi (Finland)

IIW/IIS VIII-1578-91

High-power co₂ lasers are being used for welding drilling and cutting in machine shops. In the near future, different kinds of surface treatments will also become usual practice with laser units.

In the next presentation the sound power levels of high-powered Co₂-laser is studied. The presentation is based on a research work carried out at the Lappeenranta University of Technology. The laser system consisted of two laser units and three work stations. The laser system had maximum output of 2.5 KW. and 6 KW. The sound power levels were measured with intensity method in welding and cutting of steel sheets (3mm). The sound pressure levels at work stations were also measured.

The sound power level produced by Co₂-lasers in welding was 88 dB(A). The sound pressure level (1 m from welding) was circa 10 dB minor than in MIG-welding. The worker is however exposed to the welding noise in a still minor extent, because he works behind safety

walls. In cutting of steel sheet the sound power level was as low as 61 dB (A). The sound power level produced by power unit of laser system studied was, however, so high (89-88 dB) (A) that although the operator's seats were placed 5 meters from this source of noise, sound pressure levels of 69-76 dB(A) were measured in them. Partly this was because the walls of the hall reflected sound well. If more attention had been paid on noise control when installing the machinery it would have been easy to isolate the power unit in its own closed space.

High-powered Co₂-lasers can decrease noise indirectly in machine shops because the scrap material recycled stays low. No grinding or other noisy after handling processes are usually needed. In laser cutting the sheets usually come to the unit automatically. This also lessens impulsive noise, because the moving and transporting of the sheets is decreased, although the automatic transporting machinery causes noise, too.

High-powered Co₂-lasers can be considered favourably from the aspect of noise control. Especially in cutting noise emissions can be decreased with laser equipments. This requires, however, that in the instalment of the laser unit and in the planning of the layout of the work shop the demands of noise control are considered. If this is not done, laser can easily be placed so near other pieces of equipments with high sound power out put that they set the noise level in the laser unit.

□ **WELDING AERSOLS : FORMATION PROCESSES IN GAS-SHIELDED WELDING, ESTIMATION CRITERA, RECOMMENDATIONS ON IMPROVING WORKING CONDITIONS**

A.P. Golovatyuk, O.G. Levehenko

(E.O. Paton Electric Welding Institute of the Ukrainian SSR Academy of Sciences, Kiev, USSR)

IIW/IIS VIII-1579-91

The paper considers processes of welding aerosol formation in Co₂ welding, studies the effect of welding conditions and electrode wire diameter results are given on the effect of shielding gas composition. Recommendations on improving the welders' working conditions are made on the basis of the investigations conducted.

ESTIMATED RADIATION DOSES FROM THORIUM AND DAUGHTERS CONTAINED IN THORIATED WELDING ELECTRODES

L. M. McDowell-Boyer (USA)

IIW/IIS VIII-1582-91

Some welding electrodes used in gas tungsten-arc welding contain between 1 and 2% radioactive Thoria by weight which, as an alloy, provides several advantages to this welding process. Radiation doses potentially received by members of the general U.S. population as a result of the distribution, use, and disposal of one million thoriated-tungsten welding electrodes were estimated in this assessment, although the actual magnitude of distribution is unknown. Persons considered potentially exposed to thorium and daughters contained in these consumer products included truck drivers, United Parcel Service (UPS) employees, warehouse and retail personnel, and retail customers, all assumed to be involved in distribution from manufacturers to consumers; welders and other welding shop personnel

involved in the use of these products; and members of the general population who may be exposed to airborne radionuclides as a result of incineration or burial of discarded electrodes. Doses resulting under abnormal circumstances, where electrodes stored in a warehouse might be subjected to fire such that all radionuclides contained in the products are volatilized, or where welders may carry extra electrodes in shirt pocket, were also estimated.

The magnitude of the radiation source to which individuals may be exposed was estimated from literature regarding electrode characteristics and loss of electrode material during welding. Exposure scenarios were developed from information obtained through informal interviews with welders from documentation on consumer product distribution procedures and common disposal methods utilized in the United States. Where uncertainties existed regarding the value of specific parameters necessary to quantify exposure, estimates were made from supplementary data.

The maximum individual and collective dose commitments, or dose ranges, estimated in this assessment are summarized. The maximally exposed individual indicated from exposure scenarios developed is the welder, who is estimated to receive a bone dose commitment between 20 millirem and 1 rem (2.4 to 88 millirem whole body dose commitment). In this assessment, welders who may receive such doses were assumed to be engaged in welding with thoriated electrodes in a shop for 4 hr/day (1000 hr/year) and in welding at home for 4 hr/week (200 hr/year). For what are assumed more typical conditions, with no home welding, bone dose commitments were estimated to range between 0.9 and 160 millirem (0.07 to 14 millirem whole body dose commitment). Because uncertainties regarding the amount of thorium and daughters that may become airborne during welding were great, only ranges of potential doses could be calculated.

The collective dose commitment estimated for the annual distribution, use, and disposal of one million thoriated welding electrodes was estimated to range between 7.9×10^2 to 6.4×10^3 man-rem to the bone (56 to 5.4×10^2 man-rem to the whole body). These values represent the potential dose received by the general U.S. population over a 50-year period following exposure during one year.

FUME AND VENTILATION-EXTRACTS FROM AWRA-AWI TECHNICAL NOTE-7 (HEALTH & SAFETY WELDING)

AWRA-AWI (USA).

Published in Founding, Welding, Production Engineering, (FWP), Vol. 30, No. 12 Dec. 1990 pp. 17-23.

IIW/IIS VIII-1583-91

In all arc or gas welding and cutting operations some fume will be given off. Welding processes and procedures generally keep or control these fumes to acceptably low levels, but in some situations the components and amount of fume present could affect the welder's comfort and health. Then special precautions are needed.

EYE HAZARDS IN WELDING — RECOGNITION, EVALUATION AND CONTROL

M. E. Kennebeck (USA)

IIW/IIS VIII -1584-91

By following recommended safety precautions, eye injuries from all types of radiation and flying objects can be prevented. Enforcing a

safety policy on the part of the management and good supervisory control on the shop floor are absolutely necessary to the reduction of serious eye problems.

ON THE QUESTION OF MILK DRINKING OF WELDERS AS MEASURE OF HEALTH PROTECTION

W. Zschiesche (Germany)

IIW/IIS VIII-1588-91

Since long, in many countries welders were encouraged to drink milk as a mean to protect themselves against possible health impacts of welding fumes and gases on the organism. Up to now, there are numerous employers who therefore provide free milk for the welders.

Milk was then and is still believed to facilitate the excretion of metals and other hazardous substances out of the organism. Meanwhile, the technology and kinetics of welding fumes and gases are much better understood. It is now known that most impact of welding fumes is on the airways and the lungs. Also, the incorporation of possible hazardous substances takes almost exclusively place via the airways.

The gastro-intestinal uptake of milk does neither inhibit any possible absorption of fumes and gases nor does it contribute to a facilitated excretion of pollutants from the smoke. From the medical point of view milk drinking is neutral as far as possible impact of welding fumes and gases on the organism.

In so far there is no medical reasons for providing an extra milk meal for welders by the employers.

A HISTORICAL PROSPECTIVE STUDY OF EUROPEAN STAINLESS STEEL, MILD STEEL, AND SHIPYARD WELDERS

L. Simonato et al.

Published in British Journal of Industrial Medicine, 1991, 48, pp. 145-154.

IIW/IIS VIII-1589-91

A multicentre cohort of 11 092 male welders from 135 companies located in nine European countries has been assembled with the aim of investigating the relation of potential cancer risk, lung cancer in particular, with occupational exposure. The observation period and the criteria for inclusion of welders varied from country to country. Follow up was successful for 96.9% of the cohort and observed numbers of deaths (and for some countries incident cancer cases) were compared with expected numbers calculated from national reference rates. Mortality and cancer incidence ratios were analysed by cause category, time since first exposure, duration of employment, and estimated cumulative dose to total fumes, chromium (Cr) VI, and nickel (Ni). Overall a statistically significant excess was reported for mortality from lung cancer (116 observed v 86.81 expected deaths, SMR=134). When analysed by type of welding an increasing pattern with time since first exposure was present for both mild steel and stainless steel welders, which was more noticeable for the subcohort of predominantly stainless steel welders. No clear relation was apparent between mortality from lung cancer and duration of exposure to or estimated cumulative dose of Ni or Cr. Whereas the patterns of lung cancer

mortality in these results suggest that the risk of lung cancer is higher for stainless steel than mild steel welders the different level of risk for these two categories of welding exposure cannot be qualified with precision. The report of five deaths from pleural mesothelioma unrelated to the type of welding draws attention to the risk of exposure to asbestos in welding activities.

☐ LUNG CANCER IN MILD STEEL WELDERS

K. Steenland, J. Beaumont, and L. Elliot (USA)

Published in American Journal of Epidemiology, 1991, Vol. 133, No. 3, pp. 220-229.

IIW/IIS VIII-1590-91

To investigate lung cancer risk, the authors conducted a historical cohort mortality study of 4,459 mild steel welders who had been employed at three midwestern plants which manufactured heavy equipment. Follow-up began in the mid-1950s and extended through 1988. All welders had at least 2 years welding experience (average duration 8.5 years). This cohort had no occupational exposure to asbestos or stainless steel fumes (containing nickel and chromium), two potential confounders in previous welders studies. A comparison population of 4,286 nonwelders, all with at least 2 years employment at the same plants was also studied. Nonwelders had never been welders and were allowed to have no more than 90 days employment as a painter, foundryman or machinist. Sampling data collected from 1974-1987 indicated that welders were exposed to 6-7 mg/m³ of total particulate and 3-4 mg/m³ of iron oxide, while nonwelders had negligible exposures to welding fumes. When compared with the United States population, both welders and nonwelders had elevated rates for lung cancer (standardized mortality ratios (SMRs) : welders, SMR=1.07; nonwelders, SMR = 7), but neither SMR was significantly elevated. Limited smoking data based on a 1985 survey indicated that both welders and nonwelders smoked more than than United States population, possibly accounting for part of their elevated lung cancer rates. There was no trend of increased risk for welders with increased duration of exposure. The only other cause of death significantly elevated was emphysema among welders. Nonmalignant respiratory disease was not elevated for welders (SMR=0.96). When welders were compared with nonwelders directly for lung cancer, the rate ratio was 0.90. *Am J Epidemiol* 1991; 133: 220-9.

☐ MORTALITY STUDY AMONG WORKERS PRODUCING FERRO ALLOYS AND STAINLESS STEEL IN FRANCE

by *J. J. Moulin, P. Portefaix, P. Wild, J. M. Mur, G. Smaghe, B. Mantout (France)*.

Published in British Journal of Industrial Medicine, 1990, 47 pp. 537-543.

IIW/IIS VIII-1591-91

A mortality study was carried out among the workers of a plant that had produced ferro-chromium and stainless steel, and was still producing stainless steel, in order to determine whether exposure to chromium compounds, to nickel compounds, and to polychyclic aromatic hydrocarbons (PAH) could result in a risk of lung cancer for the exposed workers. The cohort comprised 2269 men whose vital status were recorded between 1 January 1952 and 31 December 1982. The smoking habits

of 67% of the cohort members were known from medical records. The observed members of deaths were compared with the expected ones based on national rates with adjustment for age, sex, and calendar time. A low mortality, achieving statistical significance, was found from all causes (observed=137, standardised mortality ratio (SMR)=0.82) and from benign respiratory diseases (observed=1, SMR=0.15). With regard to mortality from lung cancer, a non-significant excess appeared in the whole cohort (observed=12, SMR=1.40). Among the exposed workers, however, a significant lung cancer excess was found (observed=11, SMR=2.04) that contrasted with a low SMR (0.32) in the non-exposed group. This excess is unlikely to be explained by smoking, as the tobacco consumption of these two groups was similar. No trend was observed for mortality from lung cancer either according to time since first exposure, or according to duration of exposure. A nested case-control study clearly suggested that this excess of deaths from lung cancer was attributable to former PAH exposures in the ferrochromium production workshops rather than to exposures in the stainless steel manufacturing areas.

☐ MANGANESE INDUCED PARKINSONISM : AN OUTBREAK DUE TO AN UNREPAIRED VENTILATION CONTROL SYSTEM IN A FERROMANGANESE SMELTER

J. D. Wang., C. C. Huang, Y. H. Hwang, J. R. Chiang, J. M. Lin, J. S. Chen (Taiwan).

Published in British Journal of Industrial Medicine, 1989, 46, pp 856-859.

IIW/IIS VIII-1592-91

Several cases of parkinsonism were found in a ferromanganese smelter after the ventilation system had broken down and had not been repaired for eight months in 1985. To determine the aetiology and prevalence of parkinsonism, 132 workers were submitted to thorough medical examination and estimated air concentrations of carbon monoxide and manganese at different workers. Only six of eight workers performing electrode fixation or welding during 1985 developed parkinsonism. They were exposed for 30 minutes each day, seven days a week, to high concentrations of air manganese > 28.8 mg/m³. There was a consistent trend between the index of exposure to manganese and signs and symptoms exhibited by extrapyramidal systems. After repair of the ventilation system, the air concentration of manganese during electrode fixation and welding decreased to less than 4.4 mg/m³; furthermore, no new cases of parkinsonism have been observed. Workers with parkinsonism recovered partially after removal from original worksites and treatment with levodopa. It is concluded that the outbreak resulted from exposure to high concentrations of manganese fumes through the breakdown of the ventilation system.

☐ FERTILITY AMONG DANISH MALE WELDERS

J. P. Bonde (Denmark), K. S. Hansen (Denmark), R. J. Levine (USA).

Published in Scand. J. Work Environ. Health, 1990, 16, pp. 315-322.

IIW/IIS VIII-1593-91

BONDE JP, HANSEN KS, LEVINE RJ, Fertility among Danish male welders. *Scand J Work Environ Health* 1990; 16 : 315-22. Welding may be detrimental to the male reproductive system. Fertility was examined in a Danish cohort of 3702 male metalworkers over a follow-up of 47 674

person-years. Occupational histories were gathered by postal questionnaires. Information on births was obtained by record linkage to the Danish Central Population Register. Among persons who had ever worked as welders, the probability of having a child was slightly reduced the year after a year of welding exposure, even after control for differences in age, birth cohort, paternal parity, birth of a child in the preceding five years, smoking and consumption of alcoholic beverages (odds ratio 0.89, 95% confidence interval 0.83-0.97). The reduction in fertility was associated with the welding of mild steel, but not with the welding of stainless steel. These findings are consistent with results of previous studies of time to conception and semen quality in welders.

□ OPTICAL RADIATION HAZARDS OF LASER WELDING PROCESSES — PART II: CO₂ LASER

R. J. Rockwell and C. E. Moss (USA).

Published in Am. Ind. Hyg. Assoc. J., 1989, 50 (8), pp. 419-427.

IIW/IIS VIII-1954-91

There has been an extensive growth within the last five years in the use of high-powered lasers in various metal working processes. The two types of lasers used most frequently for their welding/cutting processes are the Neodymium-yttrium-aluminium-garnet (Nd : YAG) and the carbon dioxide (CO₂) systems. When such lasers are operated in an open beam configuration, they are designated as a Class IV laser system, Class IV lasers are high-powered lasers that may present an eye and skin hazard under most common exposure conditions, either directly or when the beam has been diffusely scattered. Significant control measures are required for unenclosed (open beam) Class IV laser systems since workers may be exposed to scattered or reflected beams during the operation, maintenance, and service of these lasers. In addition to ocular and/or skin exposure hazards, such lasers also may present a multitude of nonlaser beam occupational concerns. Radiant energy measurements are reported for both the scattered laser radiation and the plasma-related plume radiation released during typical high-powered CO₂ laser-target interactions. In addition the application of the nominal hazard zone (NHZ) and other control measures also are discussed with special emphasis on Class IV industrial CO₂ laser systems.

□ COMPUTER SIMULATION IN THE DESIGN OF LOCAL EXHAUST HOODS FOR SHIELDED METAL ARC WELDING

K. D. Tum Suden, M. R. Flynn, and R. Goodman (USA).

Published in Am. Ind. Hyg. Assoc. J., 1990, 51 (3), pp. 115-126.

IIW/IIS VIII-1595-91

Computer simulations were used to examine competing exhaust hood configurations for shielded metal arc welding. The welder's breathing zone concentration appears to be an inverse linear function of the computer-predicted hood capture efficiency. Hood aspect ratio, hood flow, and the welder's position relative to the hood all have a significant effect on the breathing zone concentration. The height of the hood above the welding surface showed no significant effect in reducing breathing zone concentration. Further examination of breathing zone concentration as a function of capture efficiency is needed before reliable design methods can be developed using this parameter.

□ COMPUTER-AIDED OZONE MEASUREMENTS IN GAS-SHIELDED ARC WELDING

A. Farwer and U. Sroka (Germany)

IIW/IIS VIII-1597-91

The complex formation and decay processes of ozone with gas-shielded arc welding requires a very sophisticated measuring equipment for investigations concerning questions of health and safety of the welder.

To overcome these problems a computer-aided analysis system was developed. A special feature of this system is its on-line measuring capability. So, for example it is possible to take simultaneously measurements directly above the arc and in the welder's breathing zone.

This system has established that there is no definite general correlation between ozone values registered in the vicinity of the arc and those in the welder's breathing zone: Depending of the type of process variation there can be a positive correlation between the two values, but also in other cases a negative correlation, and partly there is neither a positive nor a negative correlation. So, fume extraction torches and shielding gas additives proved to be ineffective in order to reduce ozone values in the welders breathing zone in spite of the significant reduction reducing the ozone values above the arc. They even can lead to increased ozone levels. Additional tests conducted in welding shops fully confirmed the laboratory results concerning correlation questions. Moreover all breathing zone ozone values with TIG and MAG welding of steel were far below the threshold limit value (TLV) and fit well to former field test results from Finland and Sweden.

□ ISO/TC 176 QUALITY MANAGEMENT AND QUALITY ASSURANCE "VISION 2000" - A STRATEGY FOR INDIVIDUAL STANDARDS IMPLEMENTATION IN THE QUALITY ARENA DURING THE 1990'S.

DOC No. V-955-91

ISO TC 176 was established in 1979. This report reflects the position at the time of the meeting in Interlaken in October, 1990 and the progress of the work in the following months.

Annex A of the document illustrates the scope and committee structure. Annex B summarises the allocated secretariat assignments of TC 176 standard numbers, whereas Annex 'C' establishes the link to Vision 2000.

Trends, concerns for TC 176, product categories, Industry/Economic sectors, goals, strategy, the expectations for the year 2000 are summarised in Annex 'D'. Annex 'E' shows the tasks and targets of the revisions and provides details on task distribution among the active member countries and on the persons involved.

ISO recommendations have been made to investigate the desirability and options to harmonize a series of standards passed by national countries with relevant ISO guides and to transform the results into international standards. This is dealt in Annex 'F'.

Annex 'G' confirms the extreme importance of the European standardization work as well as the possibility of achieving a global introduction of European standards and thus harmonization of a worldwide scale.

Rapid acceptance of Draft international standards (ISO/DU) in the national standardization is given in Annex 'H'.

Annex 'I' deals with first summarized revision of quality terms and definitions as committee draft-ISO/CD 8402-1, Annexes 'J' & 'K' deal with quality management and quality system elements. Annex 'L' gives the systems approach to the economics of quality. Dependability management is discussed in Annex 'M'.

QUALITY POLICIES AND STANDARDISATIONS IN BRAZIL FOR WELDED CONSTRUCTIONS.

Brazilian Delegation.

DOC. V-958-91

Until 1990, Brazilian companies had to work with several quality systems at the same time to satisfy the different requirements of different clients.

There was no official Brazilian code for welded constructions, companies must work according to several codes like ASME, BS, API, AWS.

In November, 1990, the Brazilian government announced a new policy for the quality and productivity of Brazilian products and services.

This document deals with the new industrial strategy, market restrictions, quality system, standardisation, motivation for quality and productivity, training programmes and certification of laboratories.

ISO/CEN "STATE OF THE ART" RELATED TO WELDING TECHNOLOGY IN QUALITY ASSURANCE, INSPECTION AND PERSONAL QUALIFICATION.

DOC No. V-957-91

This European draft standard replaces various earlier drafts. This draft standard provides general principles for the supervision of welding both in the workshop and on site. The future EN standard will serve the purpose of providing evidence that a manufacturer is capable of producing welded components in the pre-determined quality. The details about "Qualification and Certification of NDT personnel" is dealt by ISO/DIS 9712, and is given in the document.

Sub commission VF - Annual Report, 1991.

BIRGER HANSEN

The fitness for purpose of welded structures document IIW/IIS-SST-1157-90 has been printed during the year. A list of all members of sub commission VF is included in the document.

SUB COMMISSION VE - ANNUAL REPORT, 1990-91

by Chairman Paul Holler

DOC No. V-955-91

Working party for eddy current modelling had discussed the current and future work and the objects for modelling were changed to austenitic claddings.

One document on the characterization of black - light lamps and liquid penetrants was prepared for publication and presented in the 91 - annual assembly.

The working party for the residual stress measurements in welds had agreed not to update the IIW handbook (VE 847-87) since there is no

necessity for this. It has been agreed that the handbook can be published by the American Welding Society.

FAILURE MODE AND EFFECT ANALYSIS (FMEA) IN WELDED CONSTRUCTIONS.

Brazilian Delegation

DOC No. : V-959-91

The rate of quality assurance in Engineering Companies has changed. Its activities are no longer restricted to product inspection and testing, but the main objective is to prevent potential errors as early as possible. The application of analytical techniques to design, manufacture and quality control is becoming popular. It has been identified that failure mode and effect analysis is a very powerful technique to integrate the many factors involved and to review the design, manufacture and quality control aspects. The basic objective of a failure mode and effect analysis is to prevent inservice failures.

This document deals with the approach of the Analysis. The whole analysis is divided into parts like (a) Structure of data (b) FMEA technique which consists of situation analysis, risk prediction and prevention priority.

ECONOMIC ADVANTAGES OF CAQ DEMONSTRATED BY THE EXAMPLE OF A COMPANY SPECIALISED IN THE MANUFACTURE OF WELDED STAINLESS TUBES.

DOC: V-960-91

The amount of necessary documentation in the area of quality assurance is increasing continuously. Hence economical aspects and customers demand more and more for the application of Computer Aided Quality (CAQ) in this area.

This document deals with the some practical experiences with a CAQ system installed in a production line for longitudinal welded stainless steel tubes and especially with the economical advantages achieved by the systematic application of this system all over the whole area of quality assurance.

Besides the advantages of increased quality, increased transparency of quality information all over the production, quick information about the status of orders and repair work and quick erection of final inspection certificates, a high reduction of costs could be achieved by the application of the installed CAQ System.

WORKING GROUP 3 OF IIW COMMISSION V "QUALITY ASSURANCE IN WELDING TECHNOLOGY" - ANNUAL REPORT 1990-91.

DOC No. V-954-91

This document deals with the number of European directives governing new European standards. One of the main objective of WG 3 is to follow this new development and to report on the "Status quo" with emphasis on the subject of harmonisation in Quality.

During the period of report, progress was made on the development of new standards and revisions of the 9001/9002/9003 series in order to contribute readily acceptable standards to further European standardisation.

COMMISSION V WORKING GROUP - 2 NON-DESTRUCTIVE TESTING OF OFFSHORE WELDED CONSTRUCTIONS - ANNUAL REPORT 1990/91.

DOC:V-953-91

This document deals with activities of the working group-2 during 1990-91. The technical topics dealt with are:

Reliability and comparative evaluation of surface techniques, offshore/underwater eddy current examination, fabrication versus in-service NDT, underwater NDT personnel qualification schemes, automated and remotely operated NDT equipments for underwater use, etc.

The future work for 1991/92 by the group will consist of:

- 1) Evaluate the necessity of and prepare for future revisions of DOC V-908-89 Information on practices for under-water Non-Destructive Testing.
- 2) Review special problem areas, new techniques and applications systematize information of general interest and if the informations are relevant, it shall be reported as guideline or recommendation proposals.

PISE-III - A STATUS REPORT.

*S. CRUTZEN, P. JEHEINSON
R. NICHOLS, J. STRONSNIDER*

DOC:IIW-V-973-91

The PISC Programme has the general objective of assessing procedures and techniques in use for the inspection of pressure components in particular the vessel and piping.

The programme is now on its third phase (PISC III). This document deals with the activities on the validation of PISC II results (modification of the ASME Inspection Codes) on real structures containing service defects and the extension of PISC methodology on most important structural components made of different materials. The third phase insists on the capability demonstration with assemblies of real geometry containing realistic defects.

PISC II PARAMETRIC STUDIES ROUND ROBIN TEST ON THE MEASUREMENT OF UT INSTRUMENT AND TRANSDUCER CHARACTERISTICS.

E.E. BORLOO

DOC:IIW-V-976-91

Within PISC II, a Round Robin Test (RRT) was performed by 9 teams on the measurement of certain characteristics of UT instruments and transducers. The participating teams were requested to apply the measurement procedure they normally follow when characterizing their equipment or when performing maintenance control.

The obtained results have shown a broad dispersion, the reasons for which are commented upon and important guidelines are given for organising the tests which involve codes, standards, clear definitions

of terms and clear indications of the settings of all the equipment variables that can affect the results.

PARAMETRIC STUDY ON THE EFFECT OF UT EQUIPMENT CHARACTERISTICS (EEC) ON DETECTION, LOCATION AND SIZING.

F. LAKESTANI, E.E. BORLOO, F. MERLI.

IIW-V-975-91

Within PISC II a parametric study was performed aiming to evaluate the effect of a rather large number of variable parameters of a UT testing system. Probe parameters, cable parameters and Instrument parameters have been considered individually and their effect on detection, location and sizing of defects is analyzed.

WORK IN THE PISC RELEVANT TO QUALIFICATION AND PERFORMANCE DEMONSTRATION OF NDE TECHNIQUES.

*R. NICHOLS, S. CRUTZEN,
P. HEHENSON, N. MCDONALD.*

DOC:IIW-V-974-91

Performance demonstration for NDT has been an active topic for the past one decade. This often involves the training and qualification of personnel to achieve certification. From the PISC exercises it was suggested that in addition to the certification process, the techniques used should be proven techniques and appropriate test blocks (standards) should be available.

This document gives the conclusion that the NDT procedure has to be validated and tested for its performance and for the reliability of its applications on structures containing defects that, not necessarily being real ones, still do induce the real ones, still do induce the real physical phenomena that the inspection techniques must be able to handle.

Mathematical models, involving a better understanding of the physical phenomena will also indicate which artificial defects could be used to replace natural ones for NDT techniques validation and inspection team training.

EUROPEAN HARMONISATION CEN/CENELEC ACTIVITIES AND MEMBER COUNTRIES RESPONSE TO QUALITY SYSTEM ASSESSMENT AND CERTIFICATION.

DOC:V-956-91

The term "harmonisation" is defined as the correlation of legislation relating to European national technical standards. The correlation of legislation in the community has made considerable headway because of the following developments for the last five years in the field of harmonisation

- New concept (reference to standards)
- Conversion from optional to compulsory harmonisation
- Change from the principle of unanimous agreement in the council to the principle of qualified majority
- Global concept for testing and certification

The document describes in detail about these activities and concludes that these activities are intended to improve the quality of the products the production processes and the testing and certification methods.

It was emphasised to collect more data on the following topics:

- (1) On line inspection/monitoring
- (2) QA and the human factor
- (3) Fit for purpose evaluation with special emphasis on welded compound analysis for life extension and
- (4) Failure Mode and Effect Analysis (FMEA) in welded structures.

Annex 'D' of the document gives the membership list.

DEVELOPMENT AND OPTIMIZATION OF NDT FOR PRACTICAL USE - NORD TEST NDT PROGRAMME - PROJECT PRESENTATION.

DOC No. IIW-V-967-91

In this document, a review is given of the Nordtest NDT programme including the projects technical content, organization, funding as well as results achieved and experience gained. In the Nordtest NDT programme conducted between 1984 - 1990, topics covered have been optional use of NDT and NDT results, reliability trials of commonly applied techniques, assessment of techniques and preparation of a handbook for defect sizing, the impact of computers and computing on NDT.

The technical contents of Nordtest NDT programme consists of the following parts :

- (1) Optical use of NDT and NDT results
- (2) Defect detection probabilities for different NDT techniques
- (3) Defect sizing and type estimation and
- (4) Handling and documentation of NDT results.

The results of the Nordtest NDT programme and the experience gained are summarized in the document.

ANNUAL REPORT OF SUB COMMISSION VA FOR 1991.

DOC: V 949-91

This document deals with the activities of Sub commission VA during 1991. The paper "ROC - study of inspection performance in radiographic testing of welded joints" by Heidt, Nockman, Thomson was accepted for application. Part I a film system classification standard was accepted and proceeded by the annual assembly of commission V in Montreal.

The working party "Radioscopic systems for weld inspection" was very active during this period to produce the final editions of Part 1 and 2 of the standard proposal.

The working party "Radiographic acceptance criteria for weld inspection" finished its work with a publication about the reliability of radiographic weld inspection.

The future work of sub Commission VA will concentrate on the fields of standardization and test reliability.

COMPARISON OF ULTRASONIC ECHO AND THERMAL INSPECTION METHODS.

V.A. TROLTSKII & V.I. ZAGREBELNY.

DOC: V. 966-91

This document deals with problems concerning inspection of

adhesion strength of protective and strengthening thermal - sprayed and clad coatings by the ultrasonic and thermal methods. These methods are compared on the basis of theoretical and experimental studies. The experimental studies on specimens having defects show good agreement between the results of both inspection methods. The advantages drawbacks and applications of these methods are described.

SUBMISSION VC ANNUAL REPORT - 1990/91

DOC: V-950-91/OE

This document contains the report of the intermediate meetings of Sub-Commission VC. The future work (planned) of subcommission V consists of the following :

1. Validation of ultrasonic techniques for Weld Inspection.
2. Characterization of ultrasonic probes for Weld Inspection.
3. Preparation of a revised manual for the ultrasonic inspection of ferritic welds.
4. Modern imaging techniques for automatic ultrasonic inspection methods and their importance for the Weld Inspection.

RELIABILITY OPTIMISATION OF MANUAL ULTRASONIC WELD INSPECTION

DOC : IIW-V-971-91

The round robin programme (1983-86) conducted by Dutch Welding Institute on a series of butt welded test plates revealed that manual ultrasonics the correct rejection rate of unacceptable defects was of the order of 50% and large variations and inconsistencies between the results of various operators were found.

These results prompted to start a second phase of the NDT programme with the aim to evaluate the factors which are responsible for the low reliability of manual ultrasonics.

This document deals with the recommendations for better reliability with respect to probes (transducers), flaw detectors, procedures, operators, etc.

ASSESSMENT OF NUCLEAR REACTOR FABRICATION - A REGULATORY VIEW

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DOC:IIW-V-972-91

HM Nuclear Installations Inspectorate in carrying out its control and regulatory function, ensure that the highest practicable standards are used for the fabrication of new nuclear plants or the repair and replacement of components in existing plants.

In this document, various issues are discussed which must be considered during the design and fabrication of components to ensure the required high quality. These have been divided into three main areas, relating to materials, welding and inspection and indicate the range of assessments undertaken by Nuclear Installations Inspectorate.