The Canadian Delegate Report

International Institute of Welding Commission VIII Health and Safety

David Hisey

This is a brief summary of the actions of IIW Commission VIII during the conference in Melbourne, Australia. Should additional information be required often the specific document which is published on the IIW web site can be made available.

INTERNATIONAL INSTITUTE OF WELDING
COMMISSION VIII HEALTH AND SAFETY

ANNUAL ASSEMBLY MEETING 10 July – 13 July 2016

Melbourne Convention and Exhibition Centre, 1 Convention Centre Place South Wharf

Melbourne, Australia

Summary

MD PhD Wolfgang Zschiesche from Germany chairs this commission.

Its focus is in the areas of health, safety and environment as it has to do with welding. The IIW Commission VIII meetings have two main purposes: to gather together experts from around the world to discuss welding related health, safety and environment issues, and to allow the flow of information between the member welding societies in the parent countries. The meetings with commission VIII were done in the form of papers and presentations given by experts in the field of welding HS&E. I will provide short descriptions of the papers/presentations given. Some, but not all of the papers in their complete form are available by contacting the CCIIW.

Monday, July 10 2016: 08:30 – 12:30

Session I: General Matters / Administrative matters

1. The chair PD Dr. Wolfgang Zchiesche Wolfgang welcomed everyone, various individuals were recognized.
2. The latest agenda was reviewed and approved for the meeting, there had been several last minute changes.
3. Self-introductions completed the introductory session.
4. The list of members not attending was reviewed and regrets were noted.
5. Approval of the minutes of the meeting in Bochum, Germany, February 10 – 11, 2016 (Doc VIII-2116-16): Steve Hedrick, Wolfgang Zschiesche
6. **National Reports:**

Canada

The Female welder reproductive health study is reaching the 5-year interval and the first participants are beginning their 5-year follow-up and leave the co-hort. At the moment 444 female welders and 440 female electricians have been registered with 289 babies born and a reachable goal of 360. The study will continue until Dec 31, 2017 with a target date of 2018 IIW conference as release of the paper. In the equivalent men's study Drs. Cherry and Beach have exactly 1000 males, 555 welders and 445 electricians.

Canada is now an active participant in the IEC TC26 Electric Welding Equipment, I was asked to chair this committee and we had our first annual meeting Feb 17, 2016 in Toronto. We also hosted the IEC TC 26 annual conference in Toronto in June 2016.

The CWA continue the annual Welders Education Conference with the 7th annual conference being held in Moncton, Canada.

CWBi Acorn is a new national initiative to provide standardized training, testing, assessment, credentials and recruiting for welder education. It will be centrally administered and managed through CWB Groups' CWB Institute (CWBi) on behalf of industry, educators and students who want to support the program. The provincial governments have been mandated to harmonize trades education. Welding will be harmonized first and the Acorn program is already in place.

The Mind Over Metal camp is one of 35 camps across the country funded by the Canadian Welding Association Foundation for both young men and young women. In an effort get more girls interested in the welding industry, some of the camps are solely for women.

USA

Welding competition at World Skills Competition. A suggestion was made to follow-up that IIW safety refere3nces ae being used.

Japan

60,000 chemicals have been used in industry. Japan has issued a risk assessment in June 2016 on the use of chemicals to control the chemical industry. Japan is revising their welding safety and health standard. Part 4 deals with Electroshock and High Frequency Noise.

Netherlands

Vincent reported on projects. 5 times better project 350 work places were used to gather data, expanding the data base with foreign data to get it better. New welding process to reduce welding fume cyclone in the torch has been proven to be successful. CLP and REACH chemical being hazardous or not.

Sweden

Has reviewed their work related injuries and sickness, and specifically lost time incidents. Sweden considers injuries by trades, and not necessarily the welding trades**,** 2/3 are injuries to others not qualified in the welding trade but associated with welding. Between 2008 and 2016, Sweden has had fatalities to welders (4 have occurred), but none recorded from electrode electrocution. The majority of sick leave reported is due to ergonomics, problems with the neck and shoulder fatigue. They feel that a

lot of welders requiring glasses to weld, use inexpensive reading glasses for welding which provide an incorrect focal length, so assume a position which aggravates neck and shoulder strain. More follow-up needs to occur.

Poland
Weld through coatings, main idea is exposure assessment, automotive industry has been supplying a lot of information. Testing has been conducted on resistance welding and spot welding, zinc/iron zinc/aluminum, braze welding. Program is continuing.

United Kingdom
Slips trip's and falls, lifting accidents seem to be the UK big issues for welding related accidents. UK is still concentrating on welding fume issues.

Italy
Big issue is EMF. In a local issue, a manufacturer of glasses is having a problem with process welding glasses frame in regards to fume created and how to deal with it.

Australia
They have been auditing welding contractors, many are not doing what they think they are. Lung cancer case was assessed to be caused by welding by the court system. OH&S was ordered to consider the death as a workplace fatality.

7. **List of Best Practice Papers: Update, Website of Commission VIII; Future Tasks/ Topic Leaders/Hot Spots**: Steve Hedrick

VIII-2081r2-09
Health and safety in welding-guidelines for risk assessment of welding fabrication activities
Note: This is a re-print of ISO Technical Report 18786:2014, so will be listed not posted on line.

VIII-2090r6-11
Lung Cancer and Arc Welding of Steels
Commission VIII "Health, Safety and Environment" of IIW
Lung Cancer and Arc Welding of Steels
Weld World 2011:55:12-20

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VIII-2172-12
Welding with non-consumable thoriated tungsten electrodes
Luca Costa
Weld World 2011; 59: 145-150

VIII-2108r-10
Exposure to nitrogen oxides (NO, NO_2) in welding
Vilia Elena Spiegel-Ciobanu, Wolfgang Zschiesche
Best practice document on exposure to nitrogen oxides (NO, NO_2) in welding
Weld World 2014; 58: 499-510

III-2136r3
Arc welding and airways disease
Martin Cosgrove
Weld World 2015; 59: 1-7

VIII- 2171r-14
Arc welding of steels and pulmonary fibrosis
Martin Cosgrove, Wolfgang Zschiesche
Weld World 2016; 60: 191-199

VIII-2145-12
Welding electrical hazards: an update
David A S Hisey
Welding electrical hazards: an update
Weld World 2014; 58: 171-191

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8. **VIII – 2079r4 – 16 List of International and National Standards on Health and Safety in Welding**/Best Practice Paper: Update, additional items: Mathias Lundin
   This document was updated by all countries present if they had something to contribute. Canada updated our list after verification with CSA offices. Mathias updated the document and placed it on file.

Session II: Technical Papers

9. **Transport and Deposition of Welding Fume Agglomerates in a Realistic Human Nasal Airway** (Doc VIII-2236-16): Presentation by Dr. Lin **Tian**, Prof. JiYuan **Tu,** Dr. Kiao **Inthavong** and coauthors, RMIT University, Melbourne;

The Inhalation Project
How do particles of different size shape charge move through the air?
Where do they end up in the airway?
Cab we relate the exposure to the dose response?

Applications – one is welding fume exposure
Airborne concentration
Aspiration
Deposit fraction
Health effects

How do we design to remove theses contaminates?

This study also looked at wood working and other causes of particulate contamination in the work place. This study tracked what particles are likely to be inhaled and which are not likely to inhaled. They also looked at where they would be deposited in the nasal passages.
A relationship between particle size and location of deposit was established. This study will later tie into the effectiveness of half mask respirators and the study on the Blood Brain Barrier.

As a part of this study a comparison was done between a rat's nasal passage and a human nasal passage and it appeared that they were able to rationalize the use of a rat to compare to a human when in fact there is a huge difference in the design of a rat's nasal passage and a human. They used a comparison to a flat map of the world and a globe map and laid out the mapping in a similar perspective.

The second part of this presentation described the deposition of nanoparticles within the nasal cavity. The single sphere particles are most likely to deposit within the nasal cavity, the larger the particle of amalgamation of nan particles the less likely the particle is t0 deposit within the nasal cavity.

The best part of this presentation was the relationship of particulate size and a drawing which showed the cross section from mucus membrane to cell to blood flow, more study is needed to understand how the particle gets into the blood and what form it takes to get there.

This did not look at respirable products only what was inhalation.

This has been a 10-year study.

Coffee Break / Morning Tea (10:30-11:00)

Session III:

10. **Doc VIII-2188r4ff-15: Hazardous Substances in Welding and Allied Processes -** Luca Costa, Steve Hedrick

Vilia Spiegel-Ciobanu, being the author of the document, has provided a revision on the booklet.
The aim of the session was the finalization and approval of the document as a Best Practice Paper and the publication as an IIW Booklet.

Starting in section 6 a line by line review was conducted. It was suggested that the document be given to 3 volunteers to do a technical and wordsmithing review to prepare the document for publication. The document was split up amongst the various team members to modify and approve the various technical areas, by the end of November.

The document will then undergo a thorough review for language and word-smithing. The target date for completion of this document is the interim meeting which will be held in Feb/Mar 2017.

Canada is responsible to review the ventilation portion for correct technical content and for the final general review of the wording.

Tuesday, 12th of July 2016: 08:30-12:30

Session IV: Technical Papers

Previous item continued until coffee break.

Coffee Break / Morning Tea (10:30-11:00)

Session V: JOINT MEETING with Commission II (Chairman: Gerhard Posch): Meeting Room 104

11. **Discussion on the use of Polytetrafluoroethylene** (PTFE, Teflon®) as a lubricant for wire consumables; **concern of health hazards due to thermal decomposition products** (strong irritant and toxic substances such as HF, carbonyl fluoride, perfluorisobutylene): Wolfgang Zschiesche, Gerhard Posch

Thermal decomposition of Teflon creates perfluoroisobutylene. Perfluoroisobutylene (PFIB) is produced as a main by-product in large quantities by the fluoropolymer industry. As a highly toxic compound, even the case of brief inhalation of PFIB can result in acute lung injury (ALI), pulmonary edema and even death.
More to come.

12. **Doc VIII-2238-16: Pollutants emission during arc welding brazing of steel sheets with** coatings
Presentation by Jolanta Matusiak and Joanna Wycislik;
This is a research paper.

Arc weld brazing processes are associated with the emission of welding fume and gases, the source of which is high temperature and the radiation of welding arc.
Weld brazing of steel plates with zinc coatings is connected with the significant zinc emission due to the fact that the essence of this process is not melting of parent metal (steel sheet) but mainly melting of electrode wire and coating.

Weld brazing accompanying occupational exposure to such varied chemical substances causes a number of negative health - related reactions in various organs, particularly in the respiratory tract.
The list of conditions attributable to work performed by a person dealing with weld brazing includes;
- metal fume fever,
- bronchial asthma,
- chronic obtrusive pulmonary disease,
- pneumoconiosis
- lung cancers

Summary
From the work environment point of view, the presence of high contents of zinc, copper and manganese compounds in fume generated during weld brazing is of great importance. Shielding gases tested show a possibility of reducing Zn, Cu and Mn compounds present in fume during weld brazing processes.

The use of “traditional” MIG / MAG weld brazing with Ar + 2 % H_2 and Ar + 3 % CO_2 + 1 % H_2 shielding gas mixtures has an advantageous effect on reducing the content of ZnO in fume.

During CMT and ColdArc weld brazing, reduction of a Cu content in fume is connected with using argon or Ar + 2 % O2 mixture as a shielding gas and in case of CuO content reduction in fume, it is necessary to use argon or Ar + 2 % CO2 mixture.

13. **Doc VIII-2056r3-15; Doc VIII-2226-16: Welding Fume Main Compounds**: Wolfgang Zschiesche,
The aim of the session is the finalization of doc VIII-2056 and the approval as a Best Practice Document and possibly for publication

Physical and chemical properties of materials cannot be predicted only taking into account their elemental composition. Their structure is critical information to make any assessment or to understand their properties. Health risks from welding fumes are generally based on elemental composition, not the compounds they're composed of. This sometimes leads to confusion or false assessments. A review of the main compounds of welding fumes, or the closest ones, in terms of both elemental composition and structure, is proposed.

Conclusion

Welding fumes exhibit a large diversity of constituents and chemical elements. The most common or significant compounds encountered in welding fumes have been reviewed. A summary of the principal compounds of welding fumes depending on the type of process and the type of consumable are given in the summary table 2.

- Fluorine is encountered in NaF (soluble fluoride), CaF_2, or $KCaF_3$ (both insoluble).
- K or Na chromates, found in noticeable content only in stainless steel stick electrodes and some flux cored wires fumes.
- NiO is only present in significant content in some nickel-based products fumes.
- Silicon is found as amorphous silica/silicates.
- Iron based spinels oxides with the general formula $Fe_{3-x}(Cr, Ni, Mn, Ti)_xO_4$.
- Al_2O_3 and possibly $MgAl_2O_4$ in aluminum WF.

It should also be underlined that, besides NiO Al_2O_3 and Fe_3O_4, no simple oxides are found, as major compounds, in welding fumes generated during welding on non-coated base metal. Therefore, it's irrelevant to compare the complex oxides found in welding fumes to simple oxides. As principal products in welding fumes, investigations shall be focused on spinel-type oxides.

Tuesday, July 12th 2016: 14:00-18:00; Meeting Room 109

14. **Session VI: JOINT MEETING with Commission VI "Terminology**" (Chair: Glenn Ziegenfuss), Project Group "Health and Safety" – ISO TR 25901 Part2/ISO TC 44 SC 7 (Project Leader: Jérõme Dietsch)

VI-1172-2016
supersedes VI-1155-2015
ISO/TR 25901-2 Welding and allied processes – Vocabulary – Part 2: Health and Safety
A list of definitions which were discussed is found in this document.

15. **Elaboration of an appropriate wording of terms regarding health and safety in welding** and their **correct definitions** for ISO standards (Docs: VI-1164R1-2016/Item 19; VI-1172-2016; VI-1173-2016; see also: Docs VI-1174-2016; VI-1115-2014; VI-1116-2014): Jérõme Dietsch, Steve Hedrick

This item will be looked at in the mid-term meeting in Germany.

Wednesday, July 13th 2016: 08:30-12:30

Session VII: Technical Papers

16. **Doc VIII-2232-16: Thermite Welding: Results of measurements of pollutants**: Presentation by Dave Hisey

This presentation is a follow-up to the one made in Helsinki on this subject. The Helsinki presentation was reviewed and the results of the testing presented.

Comments were supplied:

The experts in the room suggested that the testing/report was not complete and had the following questions or suggestions when doing this type of testing.

How much material (weight) was collected during the shift personal samples?

What was the material that was not analyzed? When you add up the sampling numbers, the math does not work.

Were gases measured? E.g. CO or other?

When you have some quantity of collected welding fume, you might want to run an XRD. (X-ray detection)

17. **Doc VIII-2234-16: WeldaPrime – Developing a weldable zinc-free primer**: Presentation by Eurico Assuncao, Lusia Coutinho and coauthors, European Welding Foundation (EWF)

Anti-Corrosion Zinc-Free primer for steel

The high cost of steel corrosion has major implications to industry. The "WeldaPrime" project is a collaborative European funded project as part of the FP7 framework programme and aims at developing a weldable zinc-free anti-corrosion primer. Protective coatings, as anti-corrosion primers, are the most widespread solution for controlling steel (mild and carbon) corrosion. To avoid removal of the primer before further processing, weldable or weld-through primers were introduced in the 1990's. Most conventional primers last a maximum of 6 months, due to their formulation or to subsequent mechanical damage, leading to corrosion. An overview of commercially available weldable anti-corrosion primers for the protection of steel is given in the present work. The key characteristics of a good weldable anti-corrosion primer include robust protective performance together with acceptable weld-through capability. Thin films yielding good welding characteristics give inferior corrosion protection while corrosion resistance is high with thicker films but at the expense of weldability. In this work, candidate chemistries that offer the opportunity to overcome these challenges are explored, with a view to designing a novel weldable, corrosion-resistant primer that meets the needs of the industry. A novel primer is being developed in the WeldaPrime project (European funding: FP7 framework programme) that aims to develop a durable, zinc-free, weldable primer that can provide corrosion protection for steel products for 6 months to 1 year. This work will present the current state of the research.

18. **Doc VIII-2235-16**: **Electromagnetic fields (EMF) from resistance welding processes and the implications of the EMF Directive**: Presentation by Geoff Melton

The forthcoming European Electromagnetic fields (EMF) Directive 2013/35/EU will have a significant impact on the welding industry and in particular resistance welding. The Directive sets out to limit workers exposure to EMF from industrial processes and it is known that resistance welding produces high levels of EMF. In particular equipment that is hand held or processes in which components are held close to the electrodes may be significantly affected. The background to the Directive, the frequency dependent action levels and exposure limits, and how the Directive t will be implemented in Europe will be explained. Results from measurements carried out on equipment in the laboratory and the shop floor

will be presented and these will be compared to the levels in the Directive. The difficulties in choosing suitable measuring equipment and measurement protocols will be discussed. Examples will be given of how exposure can be reduced by changes to working methods and modifications to the equipment.

19. **Electric Hazards in Welding**: Topic Leader: Dave Hisey;
    Presentations: David Hisey, Carl Hussel / Glenn Allen:

Session VIII: Administrative Matters

20. **Visit and Information by IIW CEO, Cecile Mayer**

Coffee Break / Morning Tea (10:30-11:00)

Session IX: Technical Papers

21. **Electric Hazards in Welding**: Topic Leader: Dave Hisey;
    Presentations: David Hisey, Carl Hussel / Glen Allan

Prevention of Electric Shock in SMAW Welding
What does your country do to prevent electrode shock in stick welding?
Dave made a brief presentation of 3 electrode shock fatalities which had occurred in Canada, USA and Australia in recent years and some of the underlying causes. A request was made for each country to review their data for electrode shock fatalities.
Dave introduced Carl Hussell, Carl presented a presentation that Glen Allan had put together. This presentation covered the Australian ABC code and the back ground which caused it to be created. Also in this presentation was the charts from IEC TS 60479-1 Effects of current on human beings and livestock - general aspects, which the no-load voltage settings are derived for IEC 60974-1 and Part 7 welders are set.
Carl closed off his presentation with the coroner's report on Australia's last electrode shock fatality, Daniel Paul Morris who died while sitting on the equipment screens he was welding on. The current flow through his body was sufficient to cause foaming at the mouth. He died after a period of hospitalization, when he was taken off life support due to lack of brain activity.

Session X: Administrative Matters

22. Doc VIII-2233-16: Planned International Conference on Health and Safety in Welding: China 2017: Wolfgang Zschiesche

Discussion on date of conference in connection with the IIW Annuals Assembly in Shanghai 2017; nominations for conference board; topics and items for presentations;
key note speakers, presentations and other contributions from Commission VIII

23. Regulation

Re-Evaluation of Carcinogenicity of Welding Fumes by the International Agency for Research on Cancer (IARC) in March 2017-participation of observers, submission of papers to the group/EU Cancer Directive-Proposal

24. Need for an intermediate meeting 2017:

Will be held at Hanover, Feb 1 – 2, 2017

25. Future of Commission VIII: long term management of operating needs, Business Plan, Working Program

Underwater welding – needs a leader

26. Any other business, closing of the meeting

Wolfgang closed the meeting at 12:30 pm