THE 76th IIW ANNUAL ASSEMBLY

MARINA BAY SANDS CONVENTION CENTRE
SINGAPORE

The Canadian Delegate Report

International Institute of Welding Commission VIII
Health, Safety and Environment

David Hisey

This is a summary of the actions of IIW Commission VIII during the July 2023 conference in Singapore meeting. Should additional information be required the specific document which is published on the IIW web site.

INTERNATIONAL INSTITUTE OF WELDING

COMMISSION VIII HEALTH AND SAFETY

ANNUAL ASSEMBLY MEETING 17 - 19 July 2023

Singapore

Summary

Most of the papers identified here are available in their complete form by contacting the CCIIW. The IIW website is up and functioning and most if not all papers and reports discussed here are available from this report author or the IIW website. Dave Werba of USA is chair and Hong Li of China is vice-chair. As the author of this report was unable to attend, this report is assembled from posted documents and input from those able to attend. Professor Bernadette Quemerais presented the Canadian report and was the Canadian representative at the Commission VIII meetings.

I apologize for the incompleteness of this report, as I was not present and gleaned the information from the downloads and from others in attendance.

MONDAY, JULY 17, 2023, 8:30 – 10:30, 11:00 – 12:30 SGT

1. Opening items, 8:30 – 8:50

1.1. Opening and welcome by the Chair - Werba

Our Chair Dave Werba warmly greeted everyone who was in attendance.

1.2. Attendees & Apologies

Introductions were conducted and the list of members who could not attend was read.

1.3. Approval of the Agenda (VIII-2358-23)

The agenda was approved as submitted.

1.4. Approval of the minutes of the online intermediate meeting on March 29, 2023 (VIII-2357-23)

The minutes of the March 29 intermediate meeting were approved as published.

2. Administrative items, 8:50 – 9:20

2.1. Welding in the World (WitW) - Prof. John C. Lippold, Editor, Welding in the World

2.1.1. Update on the Journal status

2.1.2. Explain the roles and importance of PRs and Reviewers

2.2. Roll call of delegates

2.2.1. Clear delegate list

2.2.1.1. List of Delegates C-VIII R.pdf

2.3. Visit of the Secretariat

3. Communication-related items, 9:20 – 9:30

3.1. Announcements - Intermediate Meetings

3.1.1. Call for hosts, locations and dates

4. Technical items, 9:30 – 10:10

4.1. Review of health and safety training material as presented by Italo Fernandes during the 2022 intermediate meeting.

From 2022 Intermediate Meeting Minutes

"IIW Qualification System" was presented by Italo Fernandez, EWF/IIW-IAB Manager. He reviewed the history of IIW qualification and certification systems, the IIW-IAB members, the IIW-IAB areas of activity, and the three major pillars of the IIW-IAB Quality Assurance System. Commission VIII members were requested to review the training programs to see if content should be added or removed. Comments should be submitted to Dave Werba for compiling into a document which will be discussed at the next meeting in Tokyo. The comments will then be agreed by C VIII and forwarded to the IAB.

4.1.1. It was noted that the European Welding Association (EWA) recommended additional hours of training be added. Commission VIII members were requested to submit comments for discussion at this meeting. 9:30 – 9:50

4.2. Presentation/discussion of technical papers

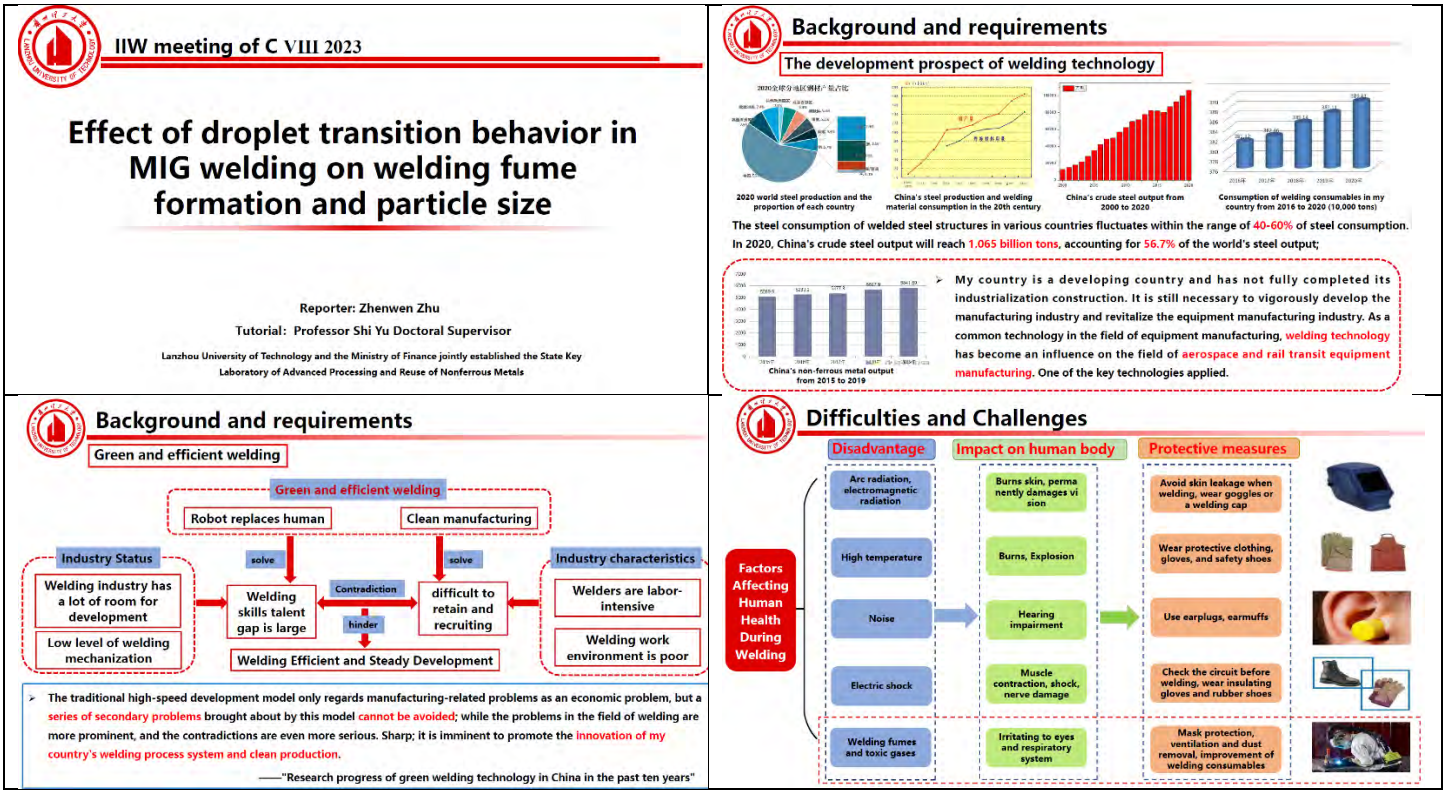
4.2.1. VIII-2359-23 "Characterization and evaluation of welding fumes emitted by flux cored wires", Kevin, Hoefer and Jonas, Hensel **Abstract**

The aim of the study is to reduce welding fume emissions from flux cored wires using pulse technology. Low-alloyed cored wires of the rutile, basic and metal powder type were selected for this purpose. The analyses were carried out on a DIN EN ISO 15011-1:2010 compliant test rig. In addition, high-speed recordings of the material transition mode and metallographic cross-sections were made to interpret the results. Using characteristic curves developed in pre-tests, the influence of pulse time, pulse frequency and trigger current on the welding fume emission potential of the rutile cored wire was first determined. Short pulses, medium trigger current and medium pulse frequency were found to have a positive influence on the emission rate.

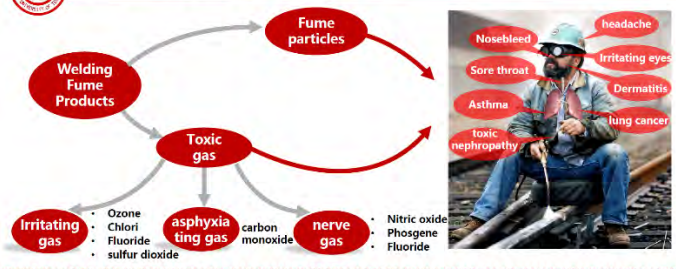
Finally, the welding fume emissions of the conventional characteristic are compared with the emission-optimized pulse characteristic. For all three filling types, emission reductions of up to 41 % were found when using the pulse technology. When considering the ratio of fume generated to the mass of the weld metal produced, it became apparent that pulse welding is not suitable for welding cored wires without restrictions.

In summary, the suitability of pulse GMAW technology for reducing welding fume emissions can also be con-firmed for flux cored wires.

4.2.2. VIII-2360-23 "The effect of droplet transfer mode on fume generation and particulate size during the MIG welding", PhD. Zhengwen Zhu, Prof. Yu Shi, Lanzhou University of Technology, China



Difficulties and Challenges



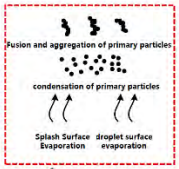
Welding fume products may cause asthma, bronchial inflammation, pneumonia, neurological diseases, and even pneumoconiosis, metal fume fever, respiratory function changes, and cancer. It has been reported abroad that the age of onset of Parkin's syndrome in electric welders is significantly earlier than that of ordinary people by about 20 years.

Difficulties and Challenges

Effects of welding fumes on human body

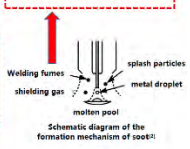
Physical properties

- The ultrafine size range of individual weld particles is in the submicron (0.01–0.10μm) range when first formed near the arc.
- Welding fume particles range in size from 0.50–2.0 μm in the atmosphere of the welder's breathing zone due to polymerization in air.
- Soot particles in this size range are mainly deposited in the lower respiratory tract (respiratory bronchioles and alveoli) and are difficult to excrete.



Chemical properties

- The main components of welding fumes are metal oxides produced in the process of welding consumables consumed in the welding process.
- Depending on the process and material used, welding fumes may also contain other elements (zinc, aluminum, chromium, copper, manganese, fluoride, silica, barium, magnesium, calcium, tin, etc.)
- Gases that are harmful to the respiratory tract are also generated during the welding process.



Schematic diagram of the formation mechanism of soot[2]

Difficulties and Challenges

The harm of fume particles of different sizes to the human body

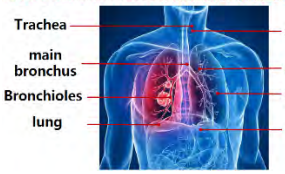
After research, it has been found that fume particles of 2-10μm can be excreted through cilia movement and secretion, while those below 2μm will stay in the body permanently, while the particle size of welding fume is mainly distributed between 0.1-2μm.

Normal human lung

Emphysema

Pulmonary Edema

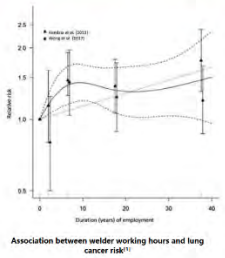
pneumoconiosis



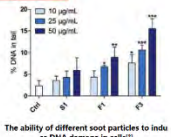
>10μm	Settled in upper airway trachea
5~10μm	Settled in the larger trachea of the upper respiratory tract
2~5 μm	Settled in the small trachea of the lower respiratory tract
<2 μm	deposits on the walls of the alveoli or into the lungs

Difficulties and Challenges

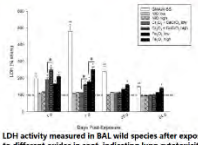
Pathological Study of Welding Fume



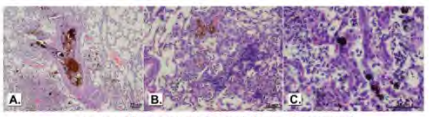
Association between welder working hours and lung cancer risk[1]



The ability of different soot particles to induce DNA damage in cells[2]



LDH activity measured in BAL wild species after exposure to different oxides in soot, indicating lung cytotoxicity [3]



Exudate and brown matter in the bronchial lumen of a rat exposed to different oxides (Panel A, 10X; B, 20X; C, 40X)[3]

- After a large number of harmful elements contained in welding fumes enter the human body, most of them will harm the human lungs and respiratory system, induce diseases, and the risk of disease increases with the working years.

[1] Honaryar M K, Lunn R M, Luce D. et al. Occup Environ Med, 2019.
[2] McCarrick S, Wei Z, Moeller N. et al. Nanotoxicology, 2019.
[3] Falcone L M, Erdely A, Salman R. et al. PLoS One ,2018.

Summary and Outlook

1. Compared with solid wire, the effective ionization voltage of the mixed gas is greatly reduced due to the easily ionizing elements such as Na, Mg, Al, K and Ti in the fluxcored wire, which promotes the generation of charged particles in the arc and reduces the critical heat input of the drop-transition mode.
2. During the transition of large droplets, the metal vapor on the surface of the droplets condenses rapidly to form fume due to the contact between the large size droplets and the cold air. During the jet transition, the droplet size is small, and there is no welding fume caused by necking burst and direct oxidation and condensation of metal vapor on the droplet surface. The fume mainly comes from condensation of metal vapor formed by evaporation of liquid metal on the droplet surface and molten pool at the arc edge.
3. The droplet transition mode has a great influence on the particle size distribution of the fume. With the transition from short circuit to jet droplet, the content of small size fumr particles increases gradually, while that of large size fume particles decreases gradually.

10:30 MORNING BREAK

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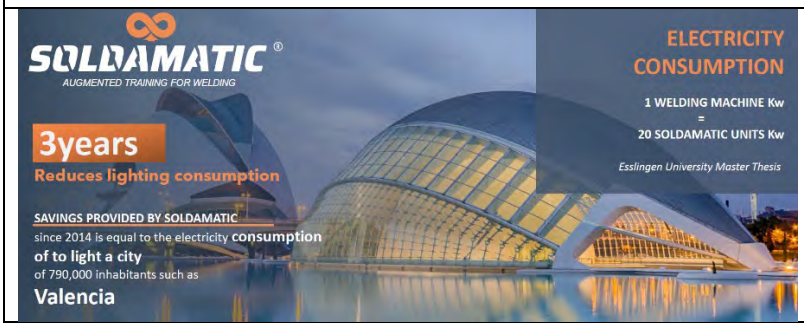
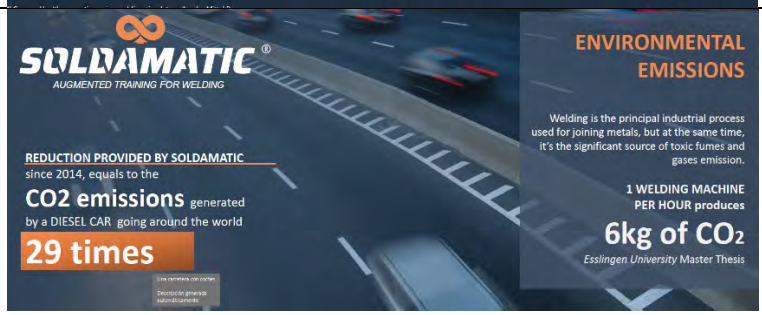
4.2.3. VIII-2361-23 "Development of a measuring method for inline determination of welding fume emission by using laser photometry", Benjamin Ebert, Rahul Sharma, Uwe Reisgen, Welding and Joining Institute, RWTH Aachen University, Aachen, Germany

This presentation was not available.

4.2.4. VIII-2362-23 "Augmented Reality Virtual Welding Training Systems: Advancing Health, Safety, and Environmental Sustainability in Welding Training", Antonio Fernández Pérez, Seabery Augmented Training





4.2.5. VIII-2363-23 "Effectiveness of Welding Fume Product Controls - A scientific study", David Chippendale, Apex Welding Safety Pty Ltd, Australia, www.apexweldingsafety.com.au

Abstract

Welding fume has been linked to multiple forms of cancer and is classified as a carcinogen by the International Agency for Research on Cancer. Whilst it is readily known that a welder will be exposed to weld fume that generally exceeds exposure standards where they have difficulty or cannot keep their head out of the weld plume which may well be invisible to the welder (and observer), this study is unique in that it looks at the efficacy of fume control methods including on-gun fume extraction, hooded local capture devices and helmets with an integrated powered air purifying system. The study found that where the welder alone requires protection from weld fume, helmets with an integrated powered air purifying system were most effective, and for workplaces where both welders and personnel nearby required protection from excess weld fume exposure, a combination of helmets with an integrated powered air purifying system for the welder and on-gun fume extraction provided good protection for nearby personnel. Hooded extraction systems could also be used in lieu of on-gun extraction systems where on-gun extraction is not practical.

4.2.6. VIII-2364-23 "A test chamber to quantify emission factors for welding fumes ", Bernadette Quémerais, PhD, Associate Professor, UNIVERSITY OF ALBERTA, Division of Preventive Medicine, Faculty of Medicine, and Dentistry

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A test chamber to quantify emission factors for welding fumes

Emily Quecke, Zaher Hashisho, Bernadette Quémerais

Introduction

- Literature review on emission factors
- Emission factors mainly for Gas Metal Arc Welding (GMAW) and particle concentrations
- Few studies on emission factors for metals (Fe, Ni, Mn, Cr (VI))
- Flux Core Arc Welding (FCAW) and Shielded Metal Arc Welding (SMAW) are poorly studied
- Interest of emission factors: using them to develop exposure models
- We built a test chamber and started to work on developing emission factors for particles and 10-15 metals for various processes, various base materials and electrodes

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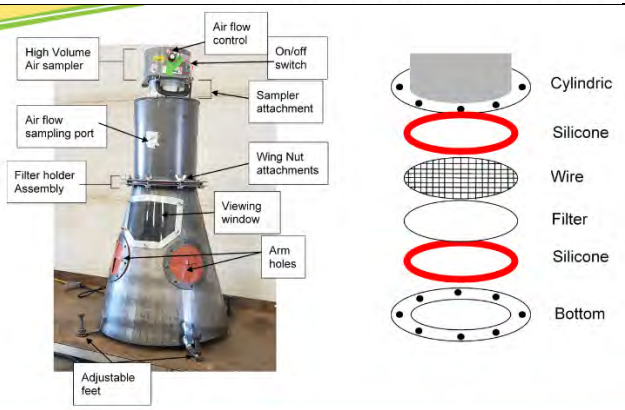

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Results

Electrode	Amperage	Avg Voltage	Avg FGR	Std FGR	Avg EF	Std EF	CV FGR (%)	CV EF (%)
E7014	100	26	0.22	0.03	9.77	1.14	11.4	11.7
	125	29	0.32	0.03	11.54	1.18	8.1	10.2
	150	30	0.43	0.05	12.13	1.35	11.0	11.1
E6013	90	23	0.11	0.01	5.54	0.80	13.7	14.5
	115	24	0.21	0.02	9.18	1.01	10.2	11.0
	140	25	0.32	0.06	11.33	2.05	17.5	18.1
E6011	80	27	0.39	0.03	20.25	1.62	8.3	8.0
	105	29	0.51	0.02	22.05	0.76	3.0	3.4
	130	32	0.65	0.03	24.81	1.20	3.9	4.8
E7018	105	23	0.34	0.03	13.76	1.42	8.0	10.3
	135	24	0.48	0.02	16.21	0.46	4.2	2.9
	165	27	0.62	0.02	18.32	0.04	2.5	0.2

Avg = Average; Std = Standard Deviation; CV = Coefficient of Variation; FGR = Fume Generation Rate; EF = Emission Factor

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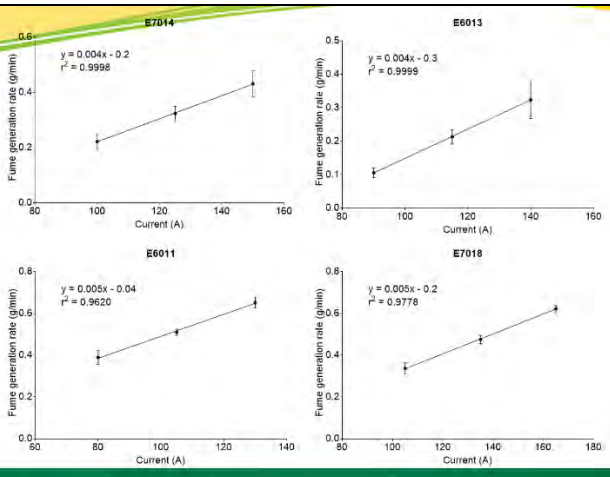

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Conclusion

- Test chamber works properly
- Results were quite reproducible (all < 20%)
- Linear increase with amperage increase for all electrodes
- E6011 and E7018 produce more fumes than the other two electrodes
- Current and the type of electrode is very important for fume generation rates (consistent with literature)

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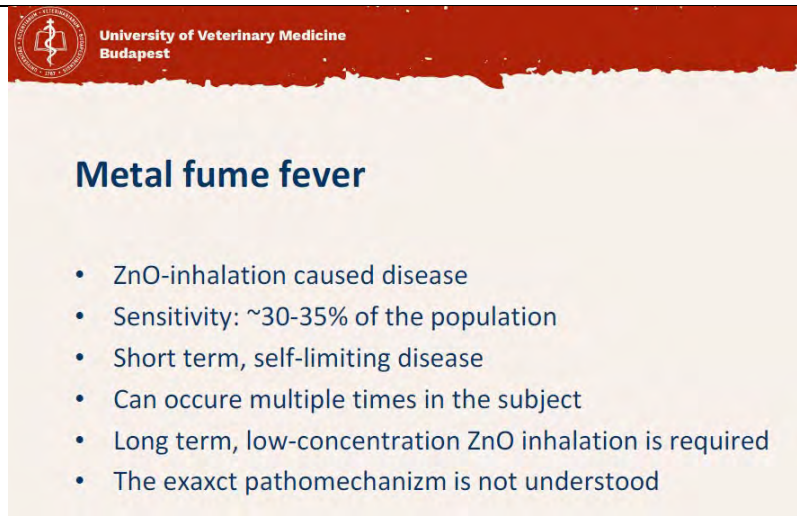
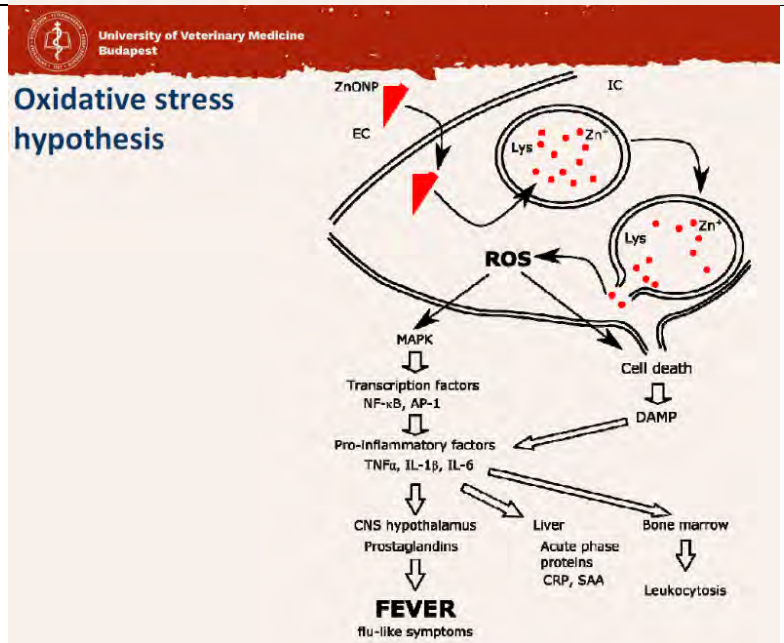
Bernadette also mentioned that a recent Canadian study showed that inexperienced welders produced more weld fume than experienced welders when they weld. In time and welders gain experience, fume generation levels decrease. This is consistent with the known fact that inexperienced workers are at greater risk of injury because they are less familiar with the hazards and controls associated with the work they are doing, and the procedures required to minimize their risks.

4.2.7. VIII-2366-23 Results of genetic examinations of the experimental Csaba Kővágó1,3, József Lehel1, Éva Szűcs-Somlyó1, Kornél Májlinger2; 1 University of Veterinary Medicine; 2 Budapest University of Technology and Economics; 3 Hungarian Welding Association (MAHEG)





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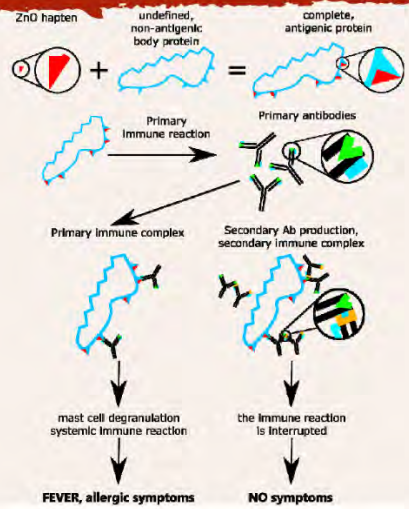
Immuno-allergic theory



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Known laboratory signs

- IL-1 increase
- IL-5 increase
- IL-6 increase
- IL-13 increase
- Serum Amiloid alpha (SAA) increase
- C-reactive protein (CRP) increase
- IFNγ increase

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Materials and methods

- ZnO nanoparticle generation:
  - TIG arc, 80A, 6l/min Ar (99,996)
  - Analytic grade Zn granules
- Animal treatment:
  - Fume concentration: ~ 2mg/m^3 ZnO (~ 0.6 ppm PM10)
  - Air exchange in the chambers: 0.5l/min
  - Daily 4 hours treatment for 3 days long
- Sampling:
  - 3h and 12h post treatment
  - Lungs and mediastinal lymph nodes
- mRNA measurement
  - Immune related-, oxid. stress-, p53 pathway genes, 84 each
  - Evaluation threshold: X>10* ; X<0.1* vs untreated control

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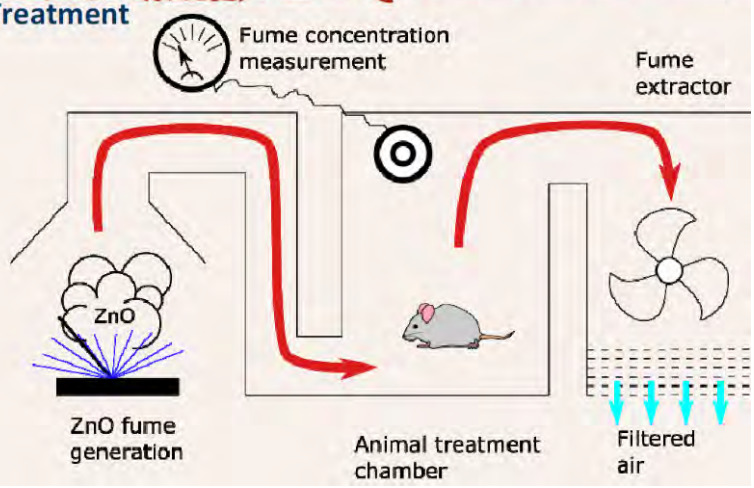
Treatment



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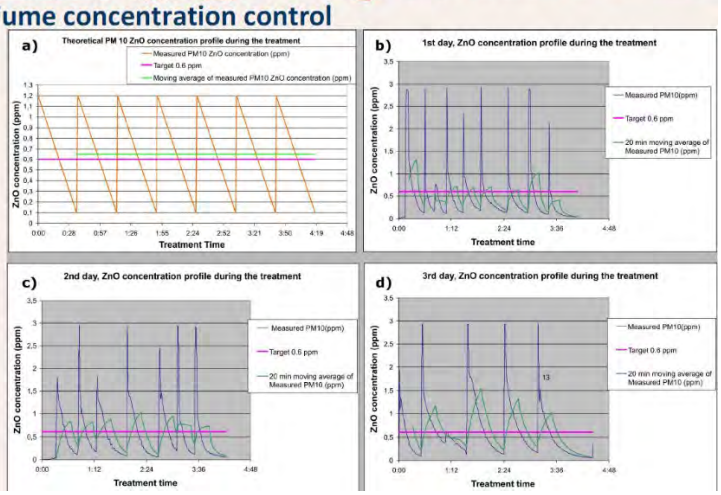
Fume concentration control



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Pre-treatment selection

- 3 days – 4h/day fume treatment, ~2 mg/m^3 PM10 conc.
- 3 days post-treatment thermal movement tracking,
- 6 min/frame, 6 hours time frame evaluation
- position density graphing

Main experiment

- 3 days – 4h/day fume treatment, ~2 mg/m^3 PM10 conc.
- Extermination 3h ; 12h post treatment
- Sample: lungs and mediastinal lymph nodes
- [mRNA] measurement
- Evaluation: treated vs. untreated control

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Conclusion

- Succesfully created realistic animal model for metal fume fever
- Confirmed several earlier findings (Il-4, Il-5, Il-13, Cxcl-24, ect.)
- Got deeper insight of the pathomechanism than before
- The oxidative stress- and the immuno-allergic theory can be unified
- The central organs are the mediastinal lymph nodes

Immune Response to Zinc Oxide Inhalation in Metal Fume Fever – Is the IL-17f the missing link?

Éva Szűcs-Somlyó, József Lehel, Kornél Májlinger, Fruzsina Tóth, and 2 more

This is a preprint; it has not been peer reviewed by a journal.

https://doi.org/10.21203/rs.3.rs-2750061/v1

Abstract

Metal fume fever (MFF) is a work-related disease caused by the inhalation of metal particles, including zinc oxide. Chronic asthma may develop as a long-term consequence of exposure, particularly for welders and metal workers who are most at risk.

In this study, we investigated the effects of ZnO fume inhalation on multiple inflammation-related cytokine- and cytokine receptor genes in mice from lung and lymph node samples, to explore the role of these in the pathogenesis of MFF. In our experiments, the animals were treated with a sub-toxic amount of ZnO fume for 4 hours a day for 3 consecutive days. Sampling occurred 3 and 12 hours post-treatment.

We are the first to demonstrate that ZnO inhalation causes extremely increased levels of IL-17f gene expression at both sampling time points, in addition to increased gene expression rates of several other interleukins and cytokines, such as IL-4, IL-13, CXCL5, CSF-3, and IFN-γ.

Our animal experiment provides new insights into the immunological processes of early metal fume fever development. IL-17f plays a crucial role in connecting immunological and oxidative stress events. The increased levels of IL-4 and IL-13 cytokines may explain the development of long-term allergic asthma after exposure to ZnO nanoparticles, which is well-known among welders, smelters, and metal workers.

4.2.8. VIII-2367-23 The effectivity of nano-particle extraction of the Binzel xFUME extractor TIG torch Dr. Csaba Kővago, research fellow, University of Veterinary Medicine; Hungarian Welding Association (MAHEG)

University of Veterinary Medicine Budapest

The effectivity of nano-particle extraction of the Binzel xFUME TIG fume extractor TIG torch

Dr. Csaba Kővágó
research fellow
University of Veterinary Medicine
Hungarian Welding Assotiation (MAHEG)

University of Veterinary Medicine Budapest

Distribution of particular matter in the body

- PM10 : particle Ø ≤ 10 µm (10 000 nm)
- PM2,5 : particle Ø ≤ 2,5 µm (2500 nm)

https://safe-welding.com/how-do-ultrafine-welding-fume-particles-get-into-the-body-and-what-effects-do-they-have/

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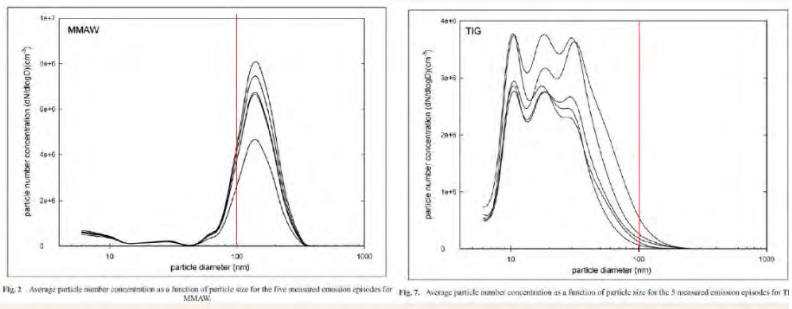
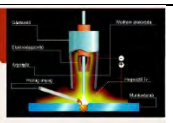
Particle size distribution in emission



BRAND P., LENZ K., REISGEN U. and KRAUS t., Number Size Distribution of Fine and Ultrafine Fume Particles From Various Welding Processes. Ann. Occup. Hyg., Vol. 57, No. 3, pp. 305–313, 2013

University of Veterinary Medicine Budapest

Materials and methods



- **Current source:** Tiger 180 AC/DC HIGH (Rehm GmbH u. Co, Uhingen Germany)
- **TIG:**
  - –Electrode: WT40 (4% ThO) Ø=2.4 mm ~80A, DC-
  - –Shildong gas: Ar 99,996% 6 l/p (Linde Hungary, Répcelak, Hungary)
  - –Welding rod: TigRod 12.64 (C: 0,08 % Si: 0,8 % Mn: 1,28 %) (ESAB, Göteborg, Sveden) Ø=2,4 mm
- **Ventillation:**
  - –Kemper SmartMaster fume extractor (Kemper GmBH, Vreden Germany)
  - –Binzel Abicor FEC fume extractor (Alexander Binzel Schweisstechnik GmbH & Co. KG, Buseck, Germany)
- **Base metal:**
  - –S235 structural steel (1,4% Mn, 0,3% Si, 0,17%C)

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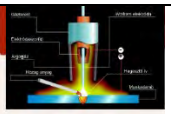
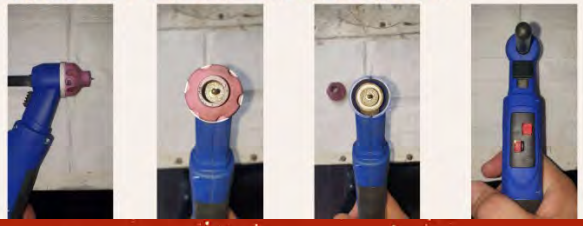
Materials and methods



Particule counter: Aeroqual S-500 [PM10-PM2,5] (Aeroqual Ltd, Auckland, New-Zeeland)

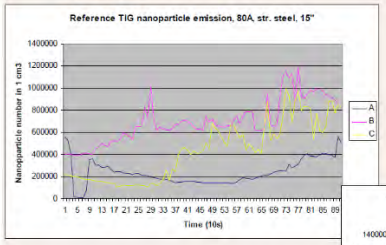
Nanoparticle-counter: Testo DiSC Mini (Testo SE & Co. KGaA, Titisee-Neustadt, Germany)

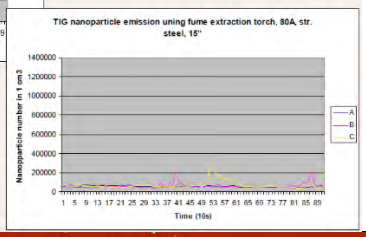
Welding time: 3 * 15" with torch- AND local fume extraction



University of Veterinary Medicine Budapest

Results





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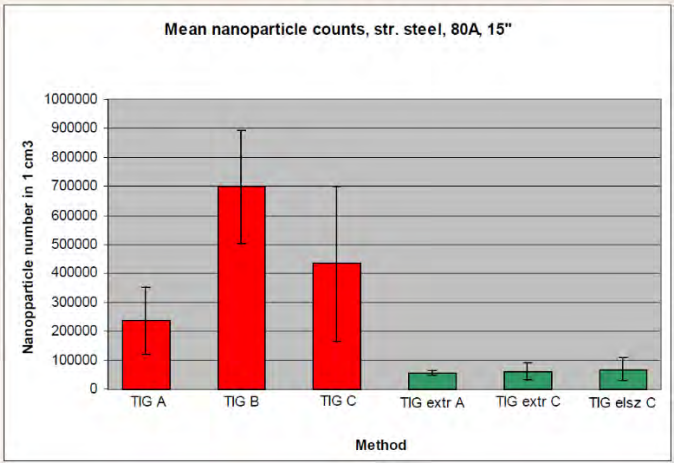

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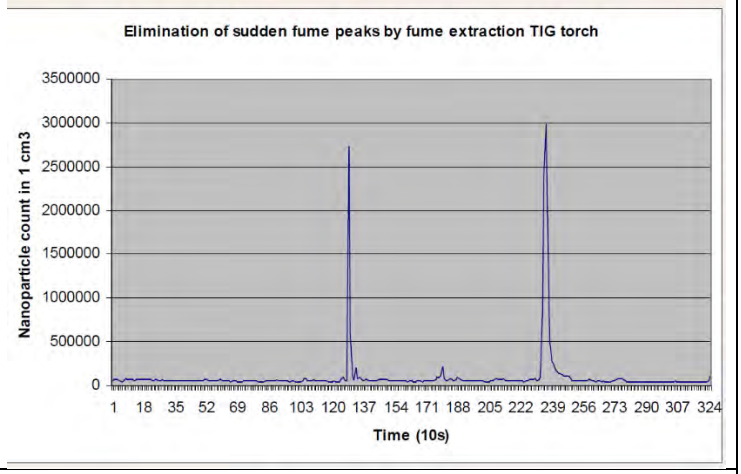

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Conclusions

- The torch fume extraction results half-one magnitude decrease in the nanoparticle concentration in the breathing zone
- The system is robust enough to deal with sudden fume generation
- The proper ventillation is necessery
- The torch fume extraction did not effected the arc
- Further examinations are necessery with different welding parameters and base- and welding materials

INTERNATIONAL INSTITUTE OF WELDING

COMMISSION VIII HEALTH AND SAFETY

ANNUAL ASSEMBLY MEETING 17 - 19 July 2023

Singapore

5. Review of Day 2 Agenda & Closure of Day 1 12:20 – 12:30

TUESDAY, JULY 18, 2023, 8:30 – 10:30, 11:00 – 12:30 SGT

6. National Reports, 8:30 – 9:30

6.1. Australia (Bruce Cannon)

Weld Australia

Country Report — Australia

18th July 2023 | Bruce Cannon

www.weldaustralia.com.au | office@weldaustralia.com.au | +61 (0)2 8748 0100

Australian country report

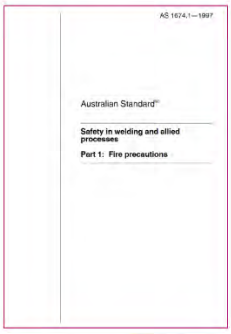
Weld Australia

1. Welding safety standards update

✓ Two standards being revised
- ➢ AS 1674.1 regarding fire precautions
- ➢ AS 1674.2 on welding electrical safety

✓ Welder's protective clothing
— ISO 11611 adoption pending

✓ AS 2865 *Confined spaces* revision pending

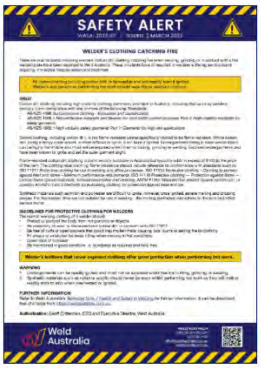


Australian country report

Weld Australia

2. Safety alerts – Welder's clothing fires

- ➢ Welder's clothing catching fire, mainly through incorrect use of grinders by inexperienced operators
- ➢ Clothing being worn is not flame resistant

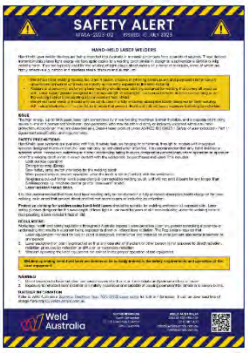


Australian country report

Weld Australia

3. Safety alerts – Hand-held laser welding machines

➢ Standards do not address use of hand-held laser welding machines
- ✓ Some machines have excellent in-built safety interlocks
- ❖ Others can be used in "*Star Wars*" mode with minimal effort!



Australian country report

Weld Australia

4. Enforceable undertaking

✓ Weld Australia working closely with a company and safety regulators on an enforceable undertaking
- On-line safety training materials being developed
  - ✓ 13 modules for welders
  - ✓ 6 modules for supervisors, managers and engineers
  - ✓ Anyone can access, optional exam to be available if required
- Program on-track
  — final videos and notes by Aug 2023
  — completion by May 2024

Australian country report

Weld Australia

5. Weld fume update

- Fume levels under review by Safe Work Australia
- Cancer awareness campaign on national TV by union and major law company to limit fume to 1.5mg/m^3 (*48% increased risk!*)
- Weld Australia has sent out a *Press release* advising that welding is safe if appropriate fume control measures are in place

6.2. Canada (Bernadette Quemerais)

➢Canadian Standards Association W117.2 TC

➢Annual meeting held March 08 as hybrid with good support

➢Revision tentative release date late 2024 with new annexes:
- **➢ Welder injury/fatality investigative checklist**
- **➢ Female welder reproductive health guidance**
- **➢ TIG electrode guidance**
- **➢ Worker breathing/health protection sections under review considering IARC Vol 118 guidance**

➢Transportation, Handling and Storage/Racking of Steel Coils

➢ CSA is reviewing the need for a combined standard after a fatality accident when a steel coil toppled killing a worker

➢ The next review date is July 18, 2023

➢ Marwood International is supporting this study with personnel and finances

➢Suicide Rates in Welders

➢ We were asked to look into cases of suicides in welders. While this study is in the infancy stages, it appears suicides in general have increased greatly in the last 2 – 3 years.

➢ It would be interesting to have input from others on this topic

➢ Canadian Welding Educators Conference

➢ Annual meeting held June 6-7, in-person (Hamilton, ON)
➢ Over 100 welding educators from across Canada attended

➢ Presentation: CWB WeldSAFE™- Improving Safety in Secondary School Weld Shops
- ➢ Stacy Richardson - Industrial Hygiene Technologist (IHT) at 3M Canada
- ➢ Victor Andrisani - Manager, CWB Consulting

➢ The presentation described a new nation-wide program of shop safety audits being offered free-of-charge to secondary schools.

➢ Canadian Research

➢Research funds obtained by University of Alberta to look at exposure to welding fumes; funded by Canadian Boilermakers and NSERC Alliance until May 2027

➢ Project on emission factors to model exposure

➢ Project on health effects of welding fumes

cwbwelding™ foundation — CWB — fondationdu soudagecwb^MC

CWB Welding Foundation
@cwbweldingfoundation
@cwb_foundation
CWB Welding Foundation

Target Demographic	Program and Status
Youth – Elementary Students	• Awareness programs and campaigns: videos, simulation program • Mind Over Metal™ youth camps to build confidence and awareness about welding and welding-related careers, delivered in partnership with host schools and groups across Canada • Sponsorship and engagement in Skills Canada provincial and national competitions
Youth – Grades 7 - 12	• School program awards and supports, including Capital Equipment and Consumables Grants for secondary technology programs related to welding and joining and secondary school curriculum in collaboration with CWB Group Education • Sparking Success Program – integrated co-investment model with industry providing awareness-building camps, capital equipment support, educator training and pre-employment training • WeldSAFE™ / SoudureSÛRE™ Program – updated PPE kits and safety-related resources, including secondary school shop Safety Reviews in collaboration with CWB Group Consulting • *Regionally directed: Welding Trailers for remote access to skills development and career opportunities in welding
Post-Secondary Students	• Sponsorship of programs, awards and initiatives in post-secondary institutions and with industry leaders (Western University, University of Waterloo, University of Alberta, Canadian Institute of Steel Construction) • Student awards (Hugh A. Krentz Student Award, Joseph G. Doria Exemplary Student Award) for individuals interesting in pursuing an education in a welding-related program
Educators	• Educator Training programs and bursaries • Education and awareness resources for technical educators, non-technical educators, guidance counsellors and administrators
Pre-Employment	• Women of Steel™ : Forging Forward initiative including pre-employment programs, workplace inclusivity programs, Women of Inspection virtual Level 1 program, and introductory welding workshops.
Career Development and Upskilling	• Women of Steel Women of Inspection program • Boilermakers Pressure Welding (UTIP) program

cwbwelding foundation fondationdu soudagecwb

CWB WeldSAFE™ Class Sets of PPE & Safety Resources

The CWB WeldSAFE Program is a national grant to support the growing need for updated classroom PPE. It provides enhanced safety resources to improve health and safety initiatives, awareness and education on the proper use and fit of safety gear in educational and workplace settings. It is a collaboration between the Foundation, CWB Consulting and industry partners.

By September 2023, **63 schools will have received a Safety Review** from CWB Consulting, **112 will have received updated PPE kits (1,400 total)**, supporting over **12,000+ students** across Canada.

cwbwelding foundation fondationdu soudagecwb

6.3. China No report available

6.4**. Japan (Satoshi Yamane)**

Introducing compulsory annual fit testing of respirators for welders. Also introducing mandatory requirements for managers to be aware of the hazards of welding.

6.5. USA (David Werba)

AWS Safety and Health Committee (SHC)

- Last Meeting - June 14, 2023, Hybrid
- Two International standards were balloted:
  - ISO 17846, Welding and allied processes — Health and safety — Wordless precautionary labels for equipment and consumables used in arc welding and cutting
  - ISO 10882-1, Health and safety in welding and allied processes — Sampling of airborne particles and gases in the operator's breathing zone — Part 1: Sampling of airborne particles
- The European Commission Directive 2004/37/EC - carcinogens, mutagens or reprotoxic substances at work was discussed

AWS Safety and Health Committee (SHC)

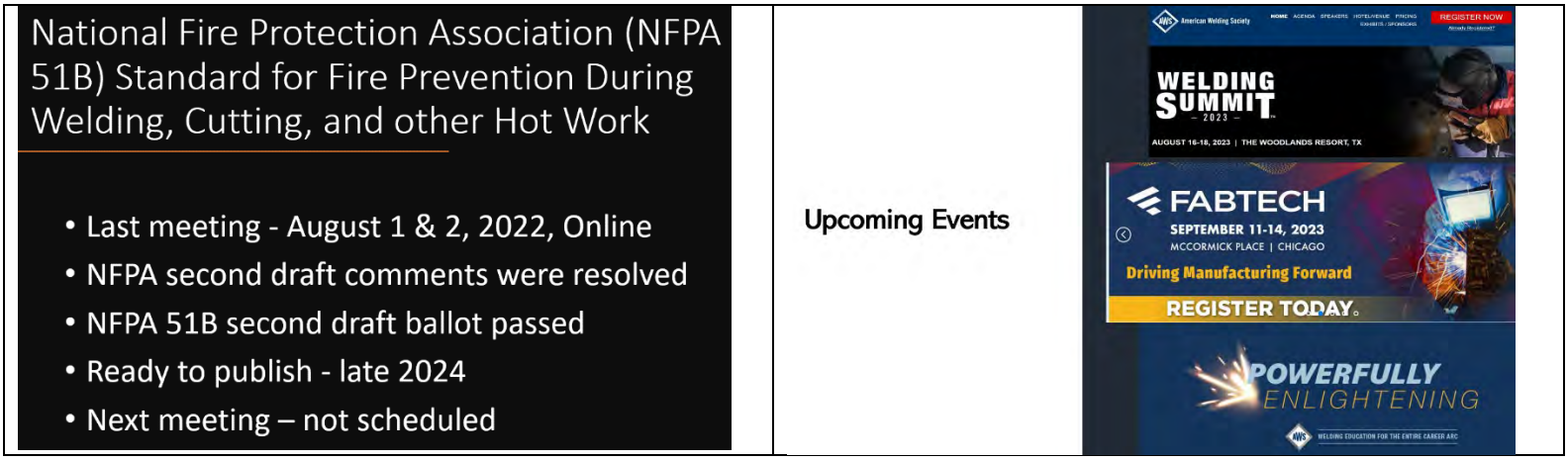
- Regulatory action update: OSHA was supposed to release its ruling on the GHS revision in December 2022, but the issuance has been delayed and it is not known when the ruling will be issued
- Handheld Laser Welding Safety
  - is a growing concern
  - not much information seems to be available
- Next meeting: The next meeting is scheduled for December 6, 2023, at AWS in Miami.

AWS Subcommittee on Fumes and Gases (SH1)

- Last meeting - April 12, 2023, Hybrid
- Reaffirmation of AWS F1.2:2013, Laboratory Method for Measuring Fume Generation Rates and Total Fume Emission of Welding and Allied Processes, was approved by ANSI
- AWS F1.6, Guide for Estimating Welding Emissions for EPA and Ventilation Permit Reporting, is currently under revision
- Next meeting - October 11, 2023, Hybrid

AWS Subcommittee on Labeling and Safe Practices (SH4)

- Last meeting - April 22, 2022, Online
- Chair A. Manz has resigned his chairmanship and Vice Chair D. Werba will temporarily become acting Chair
- Working on the maintenance and revisions of AWS Safety and Health Fact Sheets
- Next meeting - October 10, 2023, Hybrid



6.6. **Europe:** CMRD directive being strengthened. It covers the protection of workers from health and safety risks from exposure to carcinogens, mutagens and reprotoxic substances at work. There is a proposal to include weld fume in this document. However, there is general concern in the European community that to do so will send work done locally to 3rd world countries or elsewhere where WHS controls (if any) are minimal.

7. Any other business

7.1. EU PFAS Restrictions 9:30 – 9:40

7.2. Best Practice Documents/Guides

As discussed at the last meeting, the Best Practice Guides can be published by Springer and made available at limited cost. Springer will take care of editing. Commission VIII will need to review the list of Best Practice Guides and submit it for publication. The open-access online Best Practice Guide posting is under consideration. Here is an example:

https://www.springer.com/series/13906/books

7.3.1. VIII-1298-85 Contact lens use in industry.pdf

7.3.2. VIII-1588-91.pdf

7.3.3. VIII-1817-97.pdf

7.3.4. VIII-1823-97 Statement on welding and cutting containers.pdf

7.3.5. VIII-1856-98.pdf

7.3.6. VIII-1858-98.pdf

7.3.7. VIII-2028-06-Parkinson's-disease-and-exposure-to-manganese-during-welding.pdf

7.3.8. VIII-2029-06-Chromium-and-manganese-control-_Sweden_.pdf

7.3.9. VIII-2079-08-(list-of-welding-related-standards).pdf

7.3.10. VIII-2145-12.pdf

7.3.11. VIII-2146-12 (Hisey - Electrical hazard).pdf

7.3.12. VIII-2188-14 (Hazardous substances in welding).pdf

7.3.13. VIII-2223-16_Activities_Hungary_(Bakos_Bochum).pdf

7.3.14. VIII-2365-23 EWA 2023-04-Fact-sheet-on-EMF-in-welding-.pdf - see attached document

Note: The author has all of the listed documents if required.

8. Review of Joint C-II and C-VIII Agenda & Closure of Day 2 12:30

WEDNESDAY, JULY 19, 2023, 17:00 – 18:00 SGT

1. Welcome by the Chairs – Zhuyao Zhang & David Werba

2. Summary of C-VIII presentations
As above

3. Welding fume
3.1. EU Survey
3.1.1. The European Union has started a series of actions to discuss the possibility of having fumes from welding and allied processes ("welding + fumes") listed as carcinogenic in the CMRD Directive (Directive 2004/37/EC - carcinogens, mutagens or reprotoxic substances at work). The IIW believes that this possible inclusion requires in-depth evaluation as it may significantly impact the welding business, not only regionally but also globally. As such, IIW developed the herewith attached statement. In agreement EWF (European Welding Federation) and EWA (European Welding Association) IIW is requesting that these three organisations are recognised as a source of expertise to advise the Statutory bodies and assist them in the evaluation.

3.1.2. IIW Statement on the possible inclusion of "welding+ fumes" in Annex 1 of the CMRD

http://iiwelding.org/media/upload/link/63/iiw-statement-welding-fumes-in-cmrd.pdf - see attached

3.1.3. ECHA Scoping Study - Report for evaluation welding fumes+ under CMRD TCC-618-23 report for IIW TC-VIII.pdf - see attached

3.1.4. Summary of the Minutes & Presentation - Meeting with DG Employment of the European Commission – April 12, 2023

3.1.5. Minutes of the on-line meeting with Working Party on Chemicals (WPC) - May 17, 2023

3.1.6. Next steps

9. Closure of joint meeting 18:00

Annex A

Title	Document Number	Author(s)	Year
Contact lens use in industry	VIII-1588-91; IIW-1124-91	ZSCHIESCHE W.	1991
On the question of drinking of milk by welders as a health protection measure	VIII-1298-85; IIW-831-85		**1985**
Personal ultraviolet radiation exposure of workers in a welding environment	VIII-1817-97	TENKATE T.	1997
Statement on welding and cutting on containers	VIII-1823-97; IIW-1374-97		1997
Welding adds hazards to work in confined spaces	VIII-1856-98; IIW-1416-98		1998
Health hazards from exposure to electromagnetic fields in welding	VIII-1858-98; IIW-1415-98		1998
IIW Statement on Manganese: Chromium and manganese in welding - Exposure and the need of control measures	VIII-2029-06	GAVELIN F.	2007
Health and safety in fabrication and repair of welded components: aspects, impacts and compliance to regulations.	VIII-2078-08; IIW-1986-09	COSTA L.	2008
Title	**Document Number**	**Author(s)**	**Year**
Lung cancer and arc welding of steels	IIW-2223	IIW Commission VIII	2011

List of standards relevant to health, safety and environment	VIII-2079r3-11	COSTA L.; LUNDIN M.	2011
Welding Fumes Main Components and Structure*	VIII-2056r5-17	FLOROS, N.	2017
Hazardous Substances in Welding and Allied Processes	VIII-2188r10-17	SPIEGEL-CIOBANU, V.	2017

Best Practice Documents of Commission VIII Published as ISO Documents

IIW CVIII Title	IIW Document Number	ISO Title	ISO Document Number
Health and safety in welding-guidelines for risk assessment of welding fabrication Activities	VIII-2081r2-09	Health and safety in welding -- Guidelines for risk assessment of welding fabrication activities	ISO Technical Report 18786:2014
Health and safety in welding and allied processes – arc welding fume components	VIII-2057r3-07	Health and safety in welding-and allied processes -- Arc welding fume components	ISO Technical Report 13392:2014

INTERNATIONAL INSTITUTE OF WELDING

COMMISSION VIII HEALTH AND SAFETY

ANNUAL ASSEMBLY MEETING 17 - 19 July 2023

Singapore

Best Practice Documents of Commission VIII Published in *Welding in the World (WIW)*			
IIW CVIII Title	**IIW Document Number**	**Author(s)**	***WIW Citation***
Lung Cancer and Arc Welding of Steels	VIII-2090r6-11	IIW Commission VIII	Weld World 2011; 55: 12-20
Welding with non-consumable thoriated tungsten electrodes	VIII-2172-12	COSTA, L.	Weld World 2015; 59: 145-150
Exposure to nitrogen oxides (NO, NO2) in welding	VIII-2108r-10	SPIEGEL-CIOBANU, V.; ZSCHIESCHE, W.	Weld World 2014; 58: 499-510
Arc welding and airways disease	VIII-2136r3	COSGROVE, M.	Weld World 2015; 59: 1-7
Arc welding of steels and pulmonary fibrosis	VIII- 2171r-14	COSGROVE, M.; ZSCHIESCHE, W.	Weld World 2016; 60: 191-199
Welding electrical hazards: an update	VIII-2145-12	HISEY, D.	Weld World 2014; 58: 171-191
Fire prevention during hot work	VIII-2145r4-14	HEDRICK, S.; PETKOVSEK, J.; HISEY, D.	Weld World 2015; 59: 585-587

European Welding Association

2023-01

ELECTRIC AND MAGNETIC FIELDS (EMF) IN WELDING

Minimize your exposure to electric and magnetic fields generated by welding

INTRODUCTION

In the welding operation, the high electric currents generate local electric and magnetic fields (EMF) around the welding circuit and in the area of the welding equipment. In the case of human exposure, if the product is used properly and the recommended distances are observed, the device complies with the required limit values.

IS EMF HARMFUL?

According to the current state of knowledge, based on scientifically proven low-dose effects, no health-risks or long-term effects are to be expected from EMF exposure.

PARTICULAR ATTENTION SHOULD BE PAID TO:

- Neighboring people (also separated by walls) or visitors are also to be considered about possible hazard potentials and, if necessary, instructed.
- Wearers of implants and jewelry (prostheses, metal parts in and on the body) as well as active medical devices (pacemakers, hearing aids, etc.) must consult the responsible doctor regarding possible health risks.

HOW DO I MINIMIZE EXPOSURE?

- To avoid of large-area conductor loops with the welding cable and hose package.
    - Bundle the welding cable (hose package) and work cable and secure them with tape
    - Both cables must run on the same side of the body
    - Connect the work cable as close as possible to the area to be welded on the workpiece
- Maintain the longest possible distances to the welding cables and hose packages:
    - Do not work or remain in the immediate vicinity of the welding power source
    - Do not carry the welding power source during operation
    - Do not route the cables directly on the body
    - Do not place cables over the shoulder or on the thighs
    - Do not wrap cables around arm or body
- Notes and recommendations can be found in EN IEC 60974-9

INFORMATION SOURCES

Further information on the subject of EMF and helpful tips for practical application can be found on the websites of the responsible country-specific authorities and offices for employee protection.

European Agency for Safety and Health at Work (EU-OSHA).
Directive 2013/35/EU – Electromagnetic Fields, available from EU- OSHA;
(website: www.osha.europa.eu/en)

Non-binding guide to good practice for implementing Directive 2013/35/EU Electromagnetic Fields
(website: https://osha.europa.eu/en/legislation/guidelines/non-binding-guide-good-practice-implementing-directive-201335eu-electromagnetic-fields)

International Commission on Non-Ionizing Radiation Protection (ICNIRP).
Low Frequency Guidelines, available from ICNIRP; (website: www.icnirp.org)

ECHA Scoping Study

Report for evaluation welding fumes+ under CMRD

The European Commission is financing a study to carry out a detailed analysis of scientific and technical data and the socio-economic information for five substances/substance groups:

- Welding fume+;
- Polycyclic aromatic hydrocarbons;
- Cobalt and inorganic cobalt compounds;
- Isoprene; and
- 1,4-dioxane.

Study to support a possible amendment of Directive 2004/37/EC on the protection of workers from exposure to carcinogens, mutagens or reprotoxic substances (CMRD) at work.

Specifically, the study assesses the impacts of an amendment to include welding fume in Annex I of the CMRD.

As welding fumes are process-generated, complex and have variable compositions, welding fumes as such do not have a harmonized classification and labelling for carcinogenic or other hazards under the CLP Regulation

ECHA Scoping Study

Report for evaluation welding fumes+ under CMRD

The European commission plans to modify the Directive 2004/37/EC on the protection of workers from exposure to carcinogens, mutagens or reprotoxic substances at work (CMRD) and will most probably integrate all welding, cutting and related processes in that directive."

The European Commission focusses on an entry in Annex I of the Cancer Directive. This would mean that welding is generally referred to as a carcinogenic activity.

All the changes in the directive will strongly affect our customers and EWA members, because it will stigmatize welding and related processes in general as carcinogenic**.**

All members have been strongly requested to fill-out the survey by March 3RD, 2023 (for 2ND time extended. Now to March 27, 2023) on:

https://ec.europa.eu/eusurvey/runner/Welding

ECHA Scoping Study

Survey stakeholders across 27 European countries by RPA

The survey is part of a study to support a possible amendment of Directive 2004/37/EC on the protection of workers from exposure to carcinogens, mutagens or reprotoxic substances at work (the Carcinogens, Mutagens or Reprotoxic substances Directive, CMRD).

Specifically, the study assesses the impacts of establishing new limit values for some substances or introducing a substance into Annex I.

This survey is intended for all companies where exposure to **welding fumes**[+] within the scope of the CMRD takes place.

The study is being undertaken by a consortium comprising **RPA Risk & Policy Analysts (United Kingdom)**, RPA Europe (Italy), RPA Europe Prague (Czech Republic) COWI (Denmark), FoBiG Forschungs- und Beratungsinstitut Gefahrstoffe (Germany), EPRD (Poland) and Force Technology (Denmark) under a contract for the European Commission's Directorate-General for Employment, Social Affairs and Inclusion.

ECHA Scoping Study

Survey stakeholders across 27 European countries by RPA

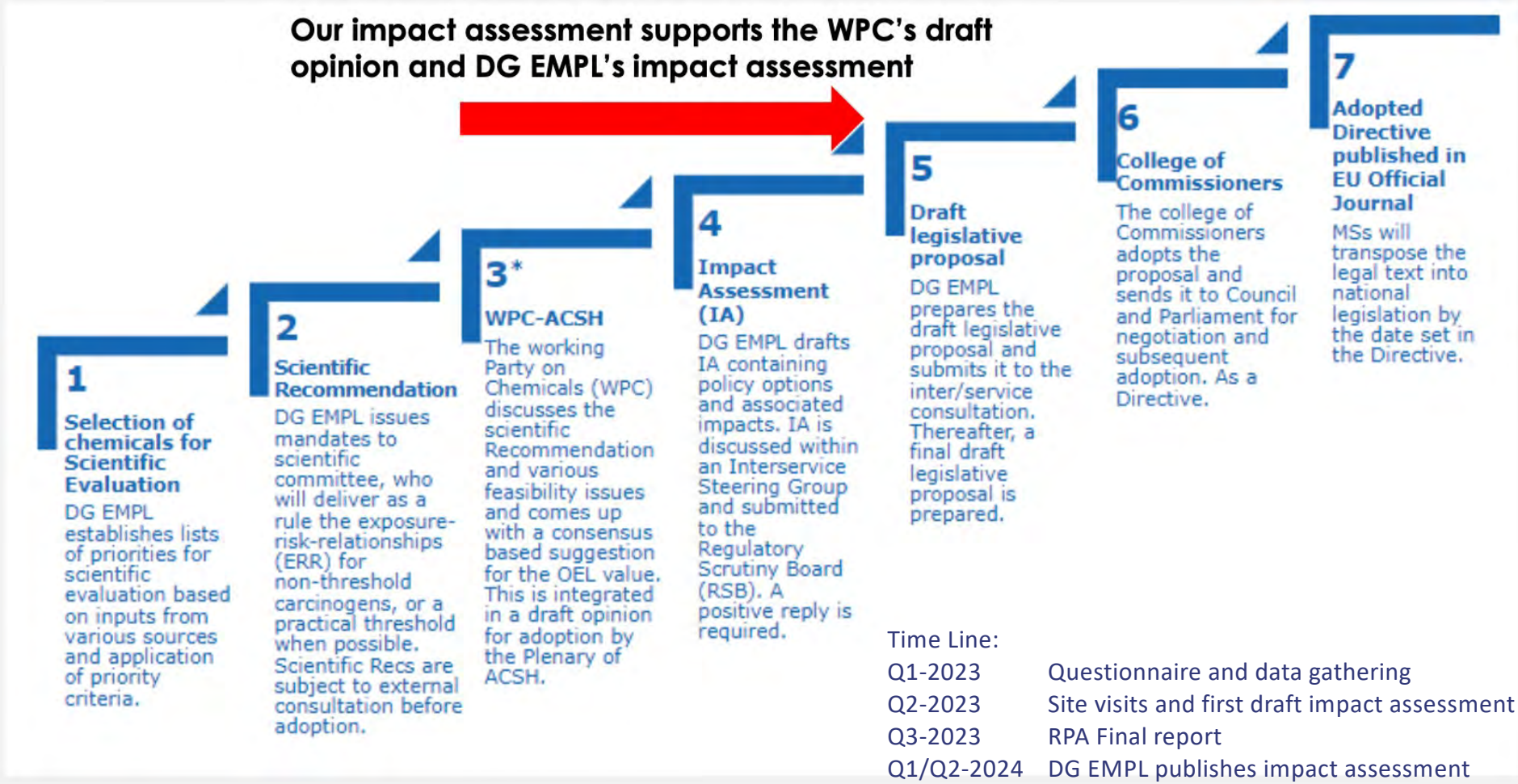
In the process, RPA (with partners) has been commissioned to undertake the impact assessment, which involves collating and summarising all available information/data and the results of the questionnaire survey to establish the baseline and the impact of putting welding fumes+ into Annex I of the CMRD.

This impact assessment then supports the Working Party on Chemicals opinion, and the impact assessment is discussed with an Interservice Steering Group and is then submitted to the Regulatory Scrutiny Board. **IF** the RSB give a positive reply (and it may not be positive), **THEN** legislation is drafted.

ECHA Scoping Study

Survey stakeholders across 27 European countries by RPA

OELs Process



Time Line:

Q1-2023	Questionnaire and data gathering
Q2-2023	Site visits and first draft impact assessment
Q3-2023	RPA Final report
Q1/Q2-2024	DG EMPL publishes impact assessment

DG EMPL = Directorate-General for Employment, Social Affairs and Inclusion

ECHA Scoping Study

Survey stakeholders across 27 European countries by RPA

- Data Gathering: Data input from stakeholders
  - Identification of the relevant uses, activities with exposure
  - Exposed workforce & levels of exposure
  - Number of companies with exposed workers
  - Current RMMs, actual exposure concentrations
  - Cost to achieve OEL/BLV
  - Known alternatives (where relevant)
  - Voluntary industry initiatives and best practices
  - Standard monitoring methods/tools

There are approx. 100.000 companies in Europe where welding is involved.
A timeframe of 3 months from sending out enquiry to receiving feedback is close to impossible.

CAUTION:
The impact assessment will be as good as the data it is based upon.

ECHA Scoping Study

Survey stakeholders across 27 European countries by RPA

- Scope: Impact of introducing welding+ fumes into Annex I of CMRD
- Welding fumes are 'process generated' under CMRD
- Definition of welding fumes+
- Policy options for full impact assessment:
  - Baseline;
  - CMRD Annex I inclusion: 'work involving exposure to fumes from welding (and similar) processes containing substances that meet the criteria for CMR Category 1A or 1B set out in Annex I to the CLP Regulation'
  - 'Complementary' policy options (for future) in addition to welding fume+ inclusion in Annex I (qualitative assessment only):
    - Setting a generic occupational exposure limit (OEL) for inhalable and respirable dust specific to welding fumes
    - Setting a non-specific generic dust metric (an inhalable limit and a respirable limit) applicable to all dusts

ECHA Scoping Study

EWA, IIW and AWS position statement

EWA Statement on Occupational exposure limits of Welding Fumes

IIW Statement on the possible inclusion of Welding Fumes+ in ANNEX 1 of CMRD

AWS review of IIW Statement on the possible inclusion of Welding Fumes+ in ANNEX 1 of CMRD

ECHA Scoping Study Summary EWA, IIW and AWS comments

If new EU OELs would differ substantially from other OELs in other globally competitive regions, neither employees nor employers will benefit; ultimately exporting workplaces and the value generated to outside the EU. Additionally, inclusion of welding fumes in Annex makes it more difficult to recruit workers

It is important to increase the level of training of welders, technicians and engineers with regular updates. We believe that this will be more effective at protecting workers than a general OEL for total or respirable welding fume particulate

In our experience, providing adequate ventilation is ultimately the key to preventing workplace overexposures, and in turn, their potential health effects.

While all welding fume cannot be uniformly characterized from a health-risk standpoint, neither can the potential byproducts arising from its allied processes.

IARC monograph, Volume 118, did not specifically include welding's allied processes in its change of carcinogenicity rating.

ECHA Scoping Study Summary EWA, IIW and AWS comments

Including welding fume+ in Annex 1 of CMRD, will generate high industry and societal cost, without any improvement of the welders' working conditions.

Stamping welding as carcinogenic activity in the EU will consequently trigger the export of workplaces, value generation and welding fumes to countries with lower OSH standards and regulation, which brings up an ethical question.

Beyond, if even more than arc welding (welding fume+) is falling under the intended listing (like Laser cutting & welding, AM, brazing, flame cutting & heating, etc.), the complete metal fabrication will lose competitiveness and innovation power in the EU., including:

- green energy transition,
- automotive electrification,
- hydrogen industry infrastructure.

ECHA Scoping Study Summary EWA, IIW and AWS comments

Recommended consideration:

- **Harmonization across EU**: many of our members operate across national borders and cannot use different measures for different employees in different EU countries. If welding fume, regardless of process origin, is listed in Annex I of CMRD, there will be a dramatic impact on the whole of industry. This listing unnecessarily results in welding, as a key production process, being labelled as "carcinogenic" technology.
- **Simplification**: Clear, understandable, measurable and communicable OEL values for the most hazardous substance, less singular elements to be controlled, subsuming of OELs where possible.
- **International adequacy**: if new EU OELs would undermatch substantially OELs announced in other globally competitive regions, neither employees nor employers will benefit; exporting workplaces and the value generated outside EU is not an option.

ECHA Scoping Study Summary EWA, IIW and AWS comments

Recommended consideration:

- **Improve information and training all over Europe**: Increase level of training of welders, welding technicians and engineers. The ways to protect welders exist, but a strict application of use of protection equipment and fume treatment systems has to be applied.
- **For small and medium sized companies**: Implementation of financial support programs for improvement of PPE for welders and implementation of fumes extraction and general ventilation systems.
- **EWA is supporting Industry initiatives** to reduce welding fume exposure, through DVS as well as a collaborative consortium with research and educational centers, unions and trade associations, The initiative comprises two workstreams, one on “Innovation” and one on “Information”.
- EWA has created a new group of European companies producing **equipment which improve the health and safety of welders** – the main European companies developing fumes extraction systems are part of this new group

ECHA Scoping Study

- Meeting scheduled with European Commission
  William Tailler – Policy Officer – Risk Management
  Directorate- General for Employment, Social Affairs and Inclusion
  Health & Safety at Work

- April 12 in Luxembourg

- Representatives IIW, EWF and EWA

INTERNATIONAL INSTITUTE OF WELDING
A world of joining experience

IIW Statement on the possible inclusion of "welding+ fumes" in Annex 1 of the CMRD

13 February 2023

The IIW is the association globally representing and connecting industry, research and education in welding and allied technologies. It was established 75 years ago and represents the national welding communities from 51 countries around the world. The activities of the association include:

- the development of best practices and position statements for the wider use
- standardisation (as IIW is currently recognised by ISO and CEN as a standardisation body)
- the exchange of knowledge among industry, education and research organisations,
- education, training, qualification and certification of personnel and companies.

IIW manages and hosts a Working Unit explicitly concerned with "Health, Safety, and Environment" (IIW-C-VIII). This unit is extensively involved in addressing at the health and safety for welding and related activities and has a long history of standards, best practices and position papers on the matter. The group is composed of leading global experts in the field of welders' and welding personnel's safety and protection research, with some involved in producing the IARC Monograph Volume 118. This monograph may be the primary reason for the European Commission to consider an amendment to Directive 2004/37/EC. The research of IIW-C-VIII is also very focused on the protection of welders and welding personnel from exposure to harmful substances, which can be discussed in greater depth with the EU Commission beyond this IIW Position Statement.

It is also important to note that IIW is closely aligned with other international organisations, including, at the European level

- the "European Welding Federation" (EWF), representing and managing the "International System for Training, Qualification and Certification of both welding personnel and companies using welding, in Quality, Environment, Health and Safety."
- the "European Welding Association" (EWA) joining together "manufacturers of welding equipment, welding consumables and equipment to improve the health and safety of welders across Europe and associations from the welding industry."

This Position Statement is consistent with these organizations' views and they are both aware of IIW's plan on bringing this communication to your attention.

INTERNATIONAL INSTITUTE OF WELDING
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We have also been informed that a UK-based consultancy firm, see also: https://rpaltd.co.uk/about, is conducting a survey, see also: https://ec.europa.eu/eusurvey/runner/Welding (deadline to respond March 3rd, 2023) asking industry stakeholders' opinions and feedback on the abovementioned issue.

The IIW, aligned with both the EWF and EWA, wish to inform you of the extensive feedback received from our global members. These members have serious concerns about the questionnaire, as many questions are hard to understand and consequently impractical to answer. Even for technically specialized individuals, the questionnaire asks for a wide set of data and information which are difficult to source to ensure an effective representation of the working environment.

From our experience with surveys in this industry, it is thus believed that **only a limited number of responses will be returned to the European Commission due to the nature of this questionnaire, which we are sure is not the intent of this survey. As such, IIW and its members' concern is that a limited number of responses may be misinterpreted as a general endorsement of having "welding+ fumes" listed in Annex 1 of CMRD.**

We kindly request the European Commission to make reasonable and meaningful use of the expertise within IIW, EWF and EWA to discuss this subject and gain insight and expertise from those active in welding and joining industry. This subject is of critical importance to all of those involved in the welding and joining industry to rely solely on a questionable survey format.

In addition to the above, we would like to highlight our recommendations on the following critical success factors (CSFs);

a. Harmonization across the EU is critical as many of our members operate across national borders and should not require different measures for different employees in different EU countries.
b. Simplification: There need to be clear, understandable, measurable and communicable OEL values for the most hazardous substance, fewer singular elements to be controlled, subsuming of OELs where possible.
c. International adequacy. If new EU OELs would differ substantially from other OELs in other globally competitive regions, neither employees nor employers will benefit; ultimately exporting workplaces and the value generated to outside the EU.
d. Improve information and training across Europe of welders and their employers on the risks and methods of protection: It is important to increase the level of training of welders, welding technicians and engineers during the development period of this process with regular updates. Ways to protect welders exist, but the strict application of guidelines for the use of protection equipment and fume treatment systems has to be applied uniformly.
e. For small and medium sized companies it is important to implement financial support programs for the implementation of personal protective equipment for welders and implementation of fume extraction and general ventilation systems.

We appreciate a response to this communication as soon as possible to arrange for personal consultations and discussion including our experts before amending Directive 2004/37/EC by adding "welding+ fumes" to Annex 1 of the CMRD. To that end, the IIW is at your disposal wherever and whenever desired to discuss and collectively help find a solution to improve the quality of life for citizens and workers involved in the welding sector.

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SAFETY ALERT

WASA-2023-02 | ISSUED: 10 JULY 2023

HAND-HELD LASER WELDERS

Hand-held laser welder devices are being imported into Australia in increasing numbers from a variety of sources. These devices transmit invisible laser light energy via fibre optic cables to a welding torch similar in design to a conventional GMAW or Mig welding torch. They are typically used for the welding of light-gauge sheet metals on a range of materials, some of which are highly reflective e.g. carbon and stainless steels, titanium and aluminium.

- Hand-held laser welding devices are Class 4 lasers, capable of inflicting severe burns and permanent blindness on unprotected personnel who may be directly or indirectly exposed to the laser radiation.
- Welders and personnel performing laser welding should wear clothing designed for welding that covers all exposed skin. Laser safety glasses designed for the wavelength of laser light in use must be worn at all times including under the welding helmet incorporating a laser resistant face shield.
- Hand-held laser welding should only be conducted in a fully enclosed absorptive booth designed for laser welding with safety interlocks on the door(s), or in areas that prevent direct and indirect beam exposure including by reflection.

ISSUE

The high energy (up to 8kW peak) laser light transmitted by these welding machines is often invisible, and is capable of inflicting severe burns and permanent blindness upon personnel who may be either directly or indirectly exposed without suitable protection. Accordingly, they are classified as a Class 4 laser product under AS/NZS IEC 60825.1 *Safety of laser products - Part 1: Equipment classification and requirements*.

SAFETY PRECAUTIONS

Hand-held laser systems are available with inbuilt safety features ranging from minimal, through to models with integrated systems designed to ensure that the laser can only be activated when intended. It is recommended that only hand-held laser systems which incorporate switching and other interlocking safety features designed to prevent inadvertent operation or operation when the welding torch is not in direct contact with the workpiece, be purchased and used. This includes:

- Lock out key operation
- Emergency stop (Estop)
- Door safety entry switch interlocks for the welding booth
- Work piece clamp to prevent operation when the torch is not in Contact with the workpiece
- No-plasma cut-out (when work piece clamp is connected to welding touch, unit will not emit a beam for any longer than 5 milliseconds i.e. machine cannot go into "star-wars" mode)
- Laser radiation hazard labels.

It is also recommended that hand-held laser welding only be conducted in a fully enclosed absorptive booth designed for laser welding, or in areas that prevent direct and indirect beam exposure including by reflection.

Protective clothing for welders using hand-held lasers should be suitable for welding and cover all exposed skin. Laser safety glasses designed for the wavelength of laser light in use must be worn at all times including under the welding helmet incorporating a laser resistant face shield.

REGULATIONS

Workplace health and safety regulations throughout Australia impose severe penalties upon any person controlling a business or undertaking that results in a person being exposed to direct or indirect laser radiation. The Regulations requires that:

1. Laser equipment intended for use on plant is designed, constructed and installed so as to prevent accidental irradiation of any person
2. Laser equipment on plant is protected so that any operator of the plant or other person is not exposed to direct radiation, radiation produced by reflection or diffusion or secondary radiation
3. Workers operating the laser equipment are trained in the proper operation of the equipment.

Welders operating hand-held laser welders must be suitably trained in the safety requirements and operation of the laser equipment.

WARNING

1. Direct exposure to laser radiation can cause severe skin burns and immediate and permanent loss of vision.
2. Exposure to reflected laser radiation is similarly hazardous and capable of causing permanent blindness and severe burns.

FURTHER INFORMATION

Refer to Weld Australia's *Technical Guidance Note TGN-SW02 Laser safety* for further information. It can be download free of charge from https://weldaustralia.com.au.

Weld Australia

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