Guidance for National Labour Inspectors (NLIs) on addressing health risks from Welding Fume

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Healthy Workplaces Campaign 2018-19 - Manage dangerous substances in the workplace

HWC Summit 2019 Bilbao, Spain
Background to Guidance for National Labour Inspectors (NLIs)

- Senior Labour Inspectors Committee (SLIC) – CHEMEX working group chaired by Kären Clayton (HSE UK).

- CHEMEX Long Latency Sub Group (LLSG) established in 2014 – to redress balance between safety & health. Chaired by Dr Chris Snaith (HSE UK).

- LLSG members from IE, NL, BE, SE, ES and IT

- Priority topics identified – respirable crystalline silica (RCS), welding fume etc.
  - Address topics that are pan-European occupational health issues, increase NLI confidence and inspection interventions via practical knowledge transfer.

- Guidance for NLIs on RCS developed and published October 2016 – Formally launched under Dutch Presidency.
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- Published November 2018 (CIRCA BC – EN only)

- Similar structure to RCS guidance:
  - Part 1 – Background, health effects, welding, legal framework, exposure assessment & controls, health surveillance, key information for NLIs, further information sources etc.
  - Part 2 – Welding Fume Task Sheets (9 in total) including inspector safety advice.
  - Appendix 1 – NL Welding inspection decision tool
  - Appendix 2 – List of LLSG member organisations
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- **Why welding fume?**
  - 2 Million welders in EU (EWI*) plus other workers undertaking welding (maintenance, construction, etc.), i.e. widespread across member states
  - High potential for exposure to hazardous substances:
    - Various toxic/carcinogenic metals (Al, Co, Cr, Cr(VI), Cu, Fe, Mg, Mn, Ni etc.)
    - UV radiation generating O3, nitric oxide (NO) and Nitrogen dioxide (NO₂). Carbon monoxide (CO) and carbon dioxide (CO₂) can also be produced
    - Exposures can be complicated by: surface coatings, contaminants and degreasing agents
  - Range of general hazards – electric shock, confined spaces, noise, arc eye and other eye injuries, musculoskeletal, etc.

*EWI: European welders Institute*
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Health effects from exposure to welding fume
- **Primarily the respiratory system**
- **Acute & long term (chronic) effects**
  - Acute – upper respiratory tract irritancy; irritant induced asthma; temporary lung function reduction; metal fume fever; acute pneumonia, CO effects, asphyxiation
  - Chronic – COPD, Welders Lung, Occupational Asthma and Lung Cancer
  - Other health effects – Neurological (Mn), Ototoxic effects (Noise/MN), Reprotoxic effects (Mn), Depression and sexual dysfunction
  - Skin effects – contact with consumables e.g. contact dermatitis from Ni/Cr.
- **NLIs urged to address exposure to welding fume due to the profound health effects caused.**
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Welding Methods

- Various common methods explained in Part 1
  - Metal inert gas (MIG)
  - Tungsten Inert gas (TIG)
  - Flux – cored arc welding (FCAW)
  - Shielded metal arc welding (SMAW)

- Also explain to NLIs other operations that can produce similar fumes
  - Plasma cutting
  - Lazer cutting
  - Flame cutting
  - Arc-air gouging
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Legal Framework outlined for NLIs

- Framework Directive
- Council Directive EU 2004/34 (Carcinogens & Mutagens Directive) e.g. Cr(VI)
- Occupational Exposure Limit Values
- Hierarchy of Control emphasised, particularly elimination and substitution of hazards – See Table 3 of guidance
<table>
<thead>
<tr>
<th>Control</th>
<th>Method</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Elimination</strong></td>
<td>Is process required?</td>
<td>Cold cut, e.g. guillotine, Redesign of the job so there is less need to weld</td>
</tr>
<tr>
<td><strong>Substitution</strong></td>
<td>Can a cleaner process be used?</td>
<td>MNA to MIG/MAG; MIG to TIG, Flame cut to plasma cut to laser cut</td>
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<tr>
<td></td>
<td>Can different consumable be used?</td>
<td>Cleaner rods/wires</td>
</tr>
<tr>
<td></td>
<td>Can it be automated?</td>
<td>Robotic Welding, CNC cutting</td>
</tr>
<tr>
<td></td>
<td>Can the workpiece be better positioned?</td>
<td>Use of jigs, etc. may require better planning</td>
</tr>
<tr>
<td></td>
<td>Is the workpiece clean?</td>
<td>Remove grease, flash rust, debris or surface coatings prior to welding</td>
</tr>
<tr>
<td><strong>Ventilation</strong></td>
<td>Can the process be enclosed?</td>
<td>Associated with automation</td>
</tr>
<tr>
<td></td>
<td>Can fume be extracted at source (LEV)?</td>
<td>On-gun extraction, Extracted benches – rear slots, Flexible or hinged arm</td>
</tr>
<tr>
<td></td>
<td>Can fume be extracted by general ventilation?</td>
<td>Wall or roof fans</td>
</tr>
<tr>
<td><strong>Administrative control &amp; work practices</strong></td>
<td>Can number of exposed workers be reduced?</td>
<td>Use dedicated area for welding with restricted access</td>
</tr>
<tr>
<td></td>
<td>What information, instruction &amp; training is required?</td>
<td>In addition to technical training for the equipment used, workers must receive Health &amp; Safety training</td>
</tr>
<tr>
<td><strong>Respiratory Protective Equipment (RPE)</strong></td>
<td>Is this appropriate exposure control?</td>
<td>Must be appropriate to fume hazards and wearer (fit properly), Workers with facial hair must use positive pressure RPE (e.g. battery powered respirator with welding visor or helmet)</td>
</tr>
</tbody>
</table>
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Part 2 –Welding fume task sheets

Inspector safety addressed
• Welding flash (arc eye), burns from hot metals & sparks, noise, etc.

Each task sheet (2-9) has six sections & good/poor practice photo examples:
1. General comments
2. Recommended controls
3. Possible actions by NLI
4. Designing out risks
5. Maintenance of control equipment and RPE
6. Other benefits

Task Sheet 1 addresses welding general hazards
• Electric shock, confined spaces, noise, MSDs, etc.
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- Appendix 1 – NLI Welding Inspector Decision Tool
  - Not an exposure assessment but assists NLIs judgement of workplace.
  - Semi – quantitative tool - gives an indication of level of enforcement that may be required.
  - Four key factors addressed
    a) Fume composition
    b) Fume concentration
    c) Exposure Time
    d) Location or working environment
    e) Control factors

Factors a+b+c+d multiplied by e
Low = <7 , Medium = 8-20; High>20
Guides level of enforcement

Factors a & b tables from Appendix 1
Example – Use of Welding Inspector Decision Tool – MIG welding on mild steel with no extraction

- **A) Fume composition** – Mild steel (Fe/Mn) - 1
- **B) Fume concentration** - Visible fume, not dispersing – 2
- **C) Exposure time (et)** – Full time manual welders (10-25% et) - 2
- **D) Location or working environment** – Smaller workshop - 2
- **E) Control factors** – No LEV – 3

**Result** – \( a+b+c+d \times e = 21 \) (HIGH)

**Inspector Action (HIGH)** – Consider immediate action when all controls missing/effective – stop work, use of notices, fines etc.
Final Thoughts!

- CHEMEX remit is to support the SLIC in promoting consistency in the application and enforcement of the secondary EU law on health and safety of chemicals at work.

- Guidance produced by CHEMEX is for non-specialist NLIs but is made publicly available so that employers can understand what they need to do to protect their employees and comply with the law.

- CHEMEX evaluates published guidance using feedback questionnaires via the SLIC Knowledge Sharing Site (KSS).

- CHEMEX are currently working on new NLI guidance based around the Hierarchy of Control.
Thank You!