The AWS Safety and Health Committee (SHC) is aware of the International Agency for Cancer Research (IARC) Monograph 118 which reclassified welding exposures from "possibly carcinogenic to humans" to "carcinogenic to humans." AWS SHC currently recommends the welding community follow the guidance in ANSI Z49.1, *Safety in Welding, Cutting and Allied Processes,* and all recommendations of manufacturers including Safety Data Sheets (SDSs), warning labels and product use instructions.

AWS engaged an independent, 3rd party expert (Ramboll Group) to evaluate the IARC reclassification. Additionally, the National Shipbuilding Research Program (NSRP) undertook its own independent evaluation of the IARC reclassification.

The following are the summary statements from the Ramboll and NSRP reviews:

> "Ramboll found that the evidence for lung cancer effects from welding fumes exposures remains inconsistent and that confounding by smoking, asbestos, and other lung toxicants was not sufficiently accounted for even in the most rigorous, higher quality studies. These limitations preclude clear causal inference. Exposure assessment remains a major limitation in these occupational studies, as individual level exposures are not used to assess cancer risks. Exposure-response relationships were inconsistent across the higher quality studies, and risk were low and often not statistically significant. In fact, in the 1990 IARC monograph, IARC (1990) concluded that "[i]n the absence of an increasing trend with duration of exposures a relative risk for lung cancer lower than about 1.5 should be interpreted with caution." Although relative risks in the more recent epidemiological studies remain in this range, IARC did not include similar language in the more recent evaluation. Epidemiologists generally agree that such weak correlations make causation difficult to establish because there is a higher likelihood that unmeasured or residual confounding would explain the observations (e.g., Boffetta et al., 2008; Flewell et al. 2007)."
>
> "In addition, several of the higher quality studies found evidence of the potential for differential risks by welding type (arc vs. gas welding) and welding material (MS vs SS). We also note that some of the authors of the key epidemiological and animal studies held important positions in the IARC Working group, which may present a real or perceived conflict of interest when evaluating the scientific evidence in an objective manner."
>
> "Based on the available literature, Ramboll found that data are generally lacking to provide any definite causal conclusions regarding welding fume exposures and cancer. In particular, there is ina lack of long-term animal studies that could be conducted to evaluate carcinogenesis of well-characterized welding fume exposures (i.e., from different processes, and including composition of welding fume components). In addition, there is a need to evaluate occupational exposures in epidemiological studies, such that cancer risks are based on actual or modelled welding fume exposure concentrations (i.e., rather than job type) or on biomonitoring results, and should be stratified by welding processes or welding fume composition. In addition, the IARC evaluation is limited to cancer, and a similar evaluation of non-cancer risks from welding fume exposures is needed."
>
> "Lastly, an important limitation of the IARC evaluation is that IARC does not quantify the level of risk or provide guidelines or health-based exposure limits that could be used for implementation

of adequate process controls. In light of the lack of clear guidelines, Ramboll offers the following recommendations:

• Updating hazard communication materials to inform workers of IARC's new classification of welding fume as a Group 1 carcinogen:

• Documenting and better characterizing welding fume exposures in the workplace for both workers and nearby workers (not engaged in welding):

o Exposure data can be used in future epidemiological studies

o Exposure data can be used to evaluate current exposures and identify areas for improvement of process controls as well as tracking of progress.

• Assess areas of improvement for reducing exposures and implement controls that maximize reductions per NIOSH guidelines for carcinogens that aim to make exposures as low as feasible."

The NSRP findings are summarized below.

"Upon review and analysis, it is difficult to recommend substantive changes to current welding processes or materials in U.S. shipyards based upon the IARC report. This is because the IARC methodology and subsequent report:

- Did not recommend new or revised occupational exposure limits
- Did not define specific exposure control methods or changes to current working practices
- Derives conclusions on risk of disease from a statistical probability analysis that often does not clearly separate welding work history from the complex relationship of confounding variables such as smoking, asbestos exposure, and other environmental and individual risk factors
- Rely on reports from international sources and older publications that may not be representative of current work practices, conditions, or materials in U.S. shipyard welding
- Did not define or present any consideration of elevated cancer risk if U.S. shipyards adhere to current OSHA Permissible Exposure Limits (PEL) and industry safety guidelines."

"Data within Monograph 118 demonstrate that occupational exposures in welding work have decreased substantially over time. U.S. shipyards should continue to evaluate and refine welding operations for both productivity and reduction of airborne contaminants in accordance with established occupational exposure standards and industry guidelines such as ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*. Ongoing risk assessment and control, training, and application of safe work practices will continue to be effective measures to ensure the continued health, safety, and productivity of shipyard personnel."

After consideration of these two independent analyses, the AWS Safety and Health Committee recommends that the welding community continue to follow the guidance in ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes,* and all recommendations of manufacturers including Safety Data Sheets (SDSs), warning labels and product use instructions.

The Ramboll report is available at the following link: https://www.aws.org/standards/page/safety-health

Request NSRP report by email NSRP@ATI.ORG : Advanced Impact Analysis- Potential Changes to Weld Fume Carcinogenicity Designation (2019-473-001)