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15-063

Mr. Merritt N. Baker, Senior Project Manager
Mail Stop T4A60
Division of Fuel Cycle Safety and Safeguards, NMSS
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852

References: (1) License No. SNM-42, Docket 70-27

(2) Letter dated September 15, 2014, M.G. Bailey (NRC) to J.R. Schlueter (NEI), Response to March 26, 2014, Nuclear Energy Institute Letter on Dermal and Ocular Quantitative Exposure Standard

Subject: Proposed Standard for Dermal and Ocular Quantitative Exposure

Dear Sir:

As requested in the letter dated September 15, 2014, *M.G. Bailey (NRC) to J.R. Schlueter (NEI), Response to March 26, 2014, Nuclear Energy Institute Letter on Dermal and Ocular Quantitative Exposure Standard* (Reference 2) and in accordance with 10 CFR 70.65(b)(7), Babcock & Wilcox Nuclear Operations Group, Lynchburg, VA (B&W NOG-L) is providing a proposed quantitative standard for assessing the consequences to an individual from acute dermal and ocular chemical exposure to licensed material or chemicals produced from licensed materials for hydrofluoric acid (HF).

B&W has performed a literature review of information provided by chemical manufacturers, the National Institute for Occupational Safety and Health's (NIOSH) Skin Notation Profiles, the Globally Harmonized System of Classification and Labeling of Chemicals (GHS), and the Nuclear Regulatory Commission's Interim Staff Guidance ZZ, Revision 0, *Guidance for the Evaluation of Acute Chemical Exposures and Proposed Quantitative Standards*. Based on information obtained from these documents and B&W NOG-L's production process experience, the following quantitative standard is proposed for an individual's acute exposure to hydrofluoric acid (HF) that is commingled with licensed material.

Chemical	Consequence Event Determination	Dermal Exposure	Ocular Exposure
Hydrofluoric Acid (HF)	High Consequence	Worker contact with HF ($c > 11$ %) that covers 10% (1,610 cm^2) or greater body area for longer than 30 minutes untreated	
	Intermediate Consequence	Worker contact with dilute HF (1 % $< c \leq$ 11 % concentration) that covers 10% (1,610 cm^2) or greater body area for longer than 30 minutes untreated	Worker contact with any amount of HF to the eye for greater the 30 minutes untreated.

The above quantitative standard was derived based on several pertinent factors identified in the research. Research confirmed that HF is present in many consumer products such as rust remover, automotive detailing products, and stain cleansers/removers. HF concentrations in these products range from one to eleven percent (1%-11%). An article written in the *Annals of Emergency Medicine* and referenced in the NIOSH Skin Notation Profiles states that direct adverse effects have occurred in accidental occupational dermal exposures to dilute HF solutions of 70% concentration covering as little as 9% to 10% of the body surface area. NOG-L's production processes utilize HF at much lower concentrations. NOG-L's processes introduce a maximum of forty-nine percent (49%) concentrated HF to fuel. An immediate reaction incurs during which the majority of HF is consumed and complexes out to aluminum fluoride. Any remaining free HF contained in the solution is further reduced to concentrations of less than one percent (1%). The proposed quantitative standard is broken down as follows:

Concentration Threshold:
B&W proposes a one percent (1%) HF Concentration Threshold as the minimum concentration at which an Intermediate Consequence Event can occur. B&W proposes an eleven percent (11%) HF Concentration Threshold for the distinction between an Intermediate Event and a High Consequence Event (i.e., 11% being the maximum concentration at which an Intermediate Consequence Event can occur). These concentration thresholds will establish the Intermediate Consequent Event definition to be consistent with HF concentrations found in consumer products.

Surface Area:
B&W proposes a standard ten percent (10%) body surface exposure area as a reasonable and technically justifiable exposure area threshold. The proposed standard takes into account the NIOSH Skin Notation Profiles literary review of accidental exposures relative to body surface area interface and it is a threshold that can be easily applied in the process areas because it is readily approximated (i.e., it is approximately the body surface area of a workers arm, chest, stomach or front of the leg).

Exposure Time:
B&W proposes a thirty minute (30 min) exposure time as the threshold at which an untreated exposure will be defined as an event. The untreated exposure time of 30 minutes is an NRC accepted standard that has previously been approved for use in some of the industry's Integrated Safety Analyses for assessing HF exposures. It is also readily and easily quantified in the process areas.

Ocular Exposure:
B&W proposes that an ocular exposure be defined as an Intermediate Consequence Event. This determination is based on the fact that the human eye is a very small percentage of the potentially exposed human surface area. Our research revealed no scientific evidence, or documented occurrences, supporting the premise that an eye exposure would endanger the life of an individual. An eye exposure is more accurately described by the GHS listing for HF, H314 "Causes severe skin burns and *eye damage*". An ocular exposure should therefore be defined as an Intermediate Consequence Event.

Hydrofluoric acid causes tissue destruction and necrosis, which is consistent with the ocular and dermal exposure hazards of other chemicals utilized in the processing of uranium. However, it differs from other acids because the fluoride ion readily penetrates skin causing destruction of deep tissue layers. Dermal HF exposure leads to both corrosive burns, from the free hydrogen ions, and

chemical burns, from the fluoride ion penetrating the skin, causing tissue damage. Systemic effects of fluoride ion poisoning can lead to low calcium and magnesium levels and high potassium levels. HF is the only chemical utilized in NOG-L's uranium processing which has been identified as potentially being "fatal in contact with skin" by the Globally Harmonized System of Classification and Labeling of Chemicals and the Nuclear Regulatory Commission's Interim Staff Guidance ZZ, Revision 0. For these reasons, NOG-L considers an ocular and dermal HF exposure to bound other acidic and corrosive chemicals commingled with licensed material.

Once approved by the NRC, the process accident scenarios will be reviewed and any IROFS that are identified will be incorporated into the Integrated Safety Analysis (ISA). Laboratory experiments and analytical testing will be excluded from the utilization of this methodology and follow their specific operating procedures and/or Chemical Hygiene Plan in accordance with OSHA 1910.1450(e). These activities will be completed within one year following NRC concurrence with the proposed standard.

If you have questions or require additional information, please contact Tony England, Manager of Licensing and Safety Analysis, at caengland@babcock.com or 434-522-6405.

Sincerely,

B. Joel Burch
Vice President and General Manager
Babcock & Wilcox Nuclear Operations Group, Inc. – Lynchburg

Enclosure

cc: NRC, Resident Inspect