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22 October 2010

CAPT Tim Radtke, CIH
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Office of Occupational Health and Safety
755 Parfet Street
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CAPT Radtke:

I have enclosed a report of exposure assessments for the Marine and Coastal Science Center as part of the DOI Exposure Assessment and Medical Surveillance Inclusion project. In the report you will find two attachments and guidance for reading and interpreting assessment results. One attachment presents the processes, tasks, and agents that were evaluated during the 21 June 2010 on-site visit with details of the associated exposure profiles that were developed. The other provides a health risk-based prioritized summary list of process-task-agent groups for control and further information gathering.

An Access database containing complete data and supporting documentation is available for download at www.BleicherCIH.com/DoleA4TR.html (please note that the page address is case sensitive). This database file will be updated periodically as assessments and profiles are completed for additional facilities.

Please do not hesitate to contact me if you have any questions.

Sincerely,

David P. Bleicher, CIH

Enclosure: Marine and Coastal Science Center Occupational Exposure Assessment

Marine and Coastal Science Center
Occupational Exposure Assessment and Medical Surveillance Inclusion
For
Department of Interior, Safety Council/Office of Health and Safety
On-site: 21 June 2010

Exposure assessments have been conducted as a part of the Department of Interior's Exposure Assessment and Medical Surveillance Inclusion Determination initiative. The objective of this effort is to document work processes at DOI facilities, describe the individual tasks associated with those processes, identify hazardous agents that are used or generated during the task, and characterize employee exposure to those agents. The ultimate goal is to identify similarly exposed groups (SEGs) within and between bureaus in order to facilitate exposure management requirements including exposure control, validation of medical surveillance, and prioritized use of limited occupational health resources.

Methods.

Exposure assessments were conducted following the strategy set forth by the American Industrial Hygiene Association's Exposure Assessment Strategies Committee for assessing and managing occupational exposures¹.

An on-site visit to the Marine and Coastal Science Center was conducted on 21 June 2010 by David P. Bleicher, CIH to characterize selected processes and collect information needed to develop task-agent exposure profiles. A number of methods were available and used to gather this information. Characterization of processes, tasks, conditions and controls, and agent identification was obtained through observation of work sites and facilities, documentation of procedures, material safety data sheets, and importantly, worker interview. Data useful for estimating exposure was obtained through screening and short term measurement, historical sampling data, mathematical modeling, and the scientific literature.

Two reports are provided for this facility (Attachments A and B). One presents the processes, tasks, and agents that were evaluated during the site visit along with details of the associated exposure profile. The other is a health risk-based prioritized summary list of process-task-agent groups for control and further information gathering.

Task-Agent Exposure Profile Detail Report.

Task-agent exposure profiles are based on observation and employee description of processes. Due to the nature of many DOI missions, processes and tasks can be highly variable—task duration, frequency, and operating conditions can differ from one iteration to another. Therefore, process and task characterizations were frequently, and necessarily, reported as “typical” with a range of conditions described. Judgments about worker exposure are based on the tasks as presented in this report. When actual processes or the conditions under which they are carried out differ from those recorded, the exposure profile and classification should not be generalized without appropriate consideration of variables.

Reading the Report.

¹ Bullock, Wm.H. and J.S.Ignacio, Eds. 2006. A Strategy for Assessing and Managing Occupational Exposures, 3rd. AIHA Press, Fairfax.

The Task-Agent Exposure Profile Detail Report is arranged in hierarchical fashion by Division or Project, Process, Task, and Agent. Process entries include a brief description of the process and when appropriate, unique operating conditions. Task entries include a brief characterization of the task, a description of any controls in place, the duration and frequency of occurrence, and appropriate recommendations. It should be noted that many task characterizations and agent exposure profiles will immediately suggest rather obvious recommendations. Some of these have been included in the report. However, in many cases it would not be appropriate to make definitive control recommendations without more careful consideration of control strategies and factors that would affect their efficacy (e.g. design, economic, and cultural factors) which is beyond the scope of the exposure assessment project.

Exposure Profile. Information used to develop the exposure profile is found for each Agent under a Task. It is important to understand that the exposure profile accounts for engineered and administrative controls and reflects potential worker exposure in the absence of personal protective equipment such as respirators.

- Exposure Category: Exposures have been categorized as Acceptable, Unacceptable, or Uncertain.
- OEL: The Occupational Exposure Limit or OEL is the threshold value used as a standard for comparison with the exposure estimate. OELs may describe full shift or short-term acceptable or unacceptable exposure limits.
- Exposure Rating & Exposure Estimate: When possible the Exposure Rating is based on quantitative data which yields an Exposure Estimate. In practice, very little quantitative information is available to support a judgment. In the absence of strong quantitative data, it is often practical and reasonable to categorize an exposure as acceptable, unacceptable, or uncertain based on qualitative or semi-quantitative information. However, in these cases it is difficult to assign intermediate exposure ratings as a fraction of the OEL, therefore an exposure rating of 4 is assigned to clearly unacceptable exposures and a rating of 1 for those that are clearly acceptable.
- Health Effects Rating: The Health Effects Rating reflects both the severity and permanence of the health impacts of an unacceptable exposure.
- Uncertainty Rating: The Uncertainty Rating provides an indicator of the level of certainty associated with the exposure profile. For example; exposure estimates based on definitive monitoring studies would be highly certain while profiles based on screening measurement, mathematical modeling, data from similar activities, or qualitative judgment may add degrees of uncertainty. Other factors that may affect the industrial hygienist's assignment of an uncertainty rating are inadequate understanding of health impacts by scientific community and excessive generalization of the task activity or conditions during the characterization process.
- Basis & Discussion: The Basis for the estimated exposure, its assignment to an exposure category, and the factors affecting certainty is given. A brief Discussion of available information and factors leading to judgments about the exposure profile is also provided.
- Risk/Control Priority: A Risk/Control Priority is calculated as the product of the Health Effects Rating and the Exposure Rating. Ratings range from 0 for the lowest risk exposures to a high of 16.
- FIG Priority: When uncertainty exists in the exposure profile, further information gathering may be required to resolve it. FIG Priority is calculated as the product of the Risk/Control Priority and the Uncertainty Rating. Both the Risk/Control Priority and the FIG Priority values may be used to more efficiently direct resources to control exposures and resolve exposure questions. FIG priority ratings range from a low of 0 to a high of 32.

Medical Surveillance. The exposure profile provides validation of, or indicates justification for, medical surveillance programs. In the report, medical surveillance is Justifiable when the exposure category is unacceptable or uncertain. Note that justifiable means simply that an unacceptable (or uncertain) exposure is identified. It does not suggest that medical surveillance is required, needed or even useful. On the other hand, some exposures are designated as Triggered or Critical Exposures. For unacceptable or uncertain exposure to some agents, medical surveillance may be triggered or required by regulation. A critical exposure refers to unacceptable or uncertain exposure to an agent which may pose very severe and irreversible health effects if not controlled. Examples include potent human carcinogens.

David P. Bleicher, CIH
22 October 2010

Attachment A: Task-Agent Exposure Profile Detail Report
Attachment B: Health Risk and Further Information Gathering Priorities Report

Task-Agent Exposure Profile Detail Report

Marine and Coastal Science Center

Climate History Calibration Study

Process: Sedimentation Laboratory

Twenty one samples are retrieved from automated sediment traps for the purpose of collecting foraminifera. Samples are collected into 250 ml containers. Samples are sent to a cooperater to be split.

Operating Conditions:

Task: Collect Samples

Sediment samples are fixed in the field using 10% formalin solution. Samples are collected into 250 ml containers.

Frequency: Bi-Annually

Duration: 1/2 - 1 hour

Controls:

Recommendation:

AGENT Formaldehyde

OEL: 0.1 ppm

Exposure Estimate: 1 ppm

Health Effects Rating: 3 Irreversible health effects of concern

Exposure Rating: 1 (<10% OEL; 95th %tile <0.1 OEL)

Exposure Category: Uncertain

Uncertainty: 1 Uncertain

Risk/Control Priority: 3

Basis: Qualitative Judgement

FIG Priority: 3

Discussion: OEL is REL-C. Other applicable OEL is REL-TWA (0.016 ppm). Transfer of formaldehyde solutions has been shown to result in exposure above the OEL. Risk is lower for 10% vice 37% formalin solutions.

Medical Surveillance

Justifiable yes

Triggered or Critical Exposure yes

Reference: 29 CFR 1910.1048

Task: Dilute Formalin Solution

Formalin (37%) is diluted with filtered sea water. Two 10 liter carboys are diluted.

Frequency: Bi-Annually

Duration: <1/2 hour

Controls:

Work is conducted within a laboratory hood. The hood function is tested annually.

Recommendation:

AGENT Formaldehyde

OEL: 0.1 ppm

Exposure Estimate: 0 ppm

Health Effects Rating: 3 Irreversible health effects of concern

Exposure Rating: 1 (<10% OEL; 95th %tile <0.1 OEL)

Exposure Category: Acceptable

Uncertainty: 0 Certain

Risk/Control Priority: 3

Basis: Engineering Controls in Place

FIG Priority: 0

Discussion: OEL is REL-C. Task is conducted within a laboratory hood.

Medical Surveillance

Justifiable no

Triggered or Critical Exposure yes

Reference: 29 CFR 1910.1048

Task: Sort Samples

Frequency:

Samples are sorted at a desk for foraminifera after they have been returned from a cooperating lab where they have been spun, split, and had buffered water added. Some formaldehyde may remain in small amounts.

Duration:

Controls:

Recommendation:

AGENT Formaldehyde

OEL: 0.016 ppm

Exposure Estimate: ppm

Health Effects Rating: 3 Irreversible health effects of concern

Exposure Rating: 1 (<10% OEL; 95th %tile <0.1 OEL)

Exposure Category: Acceptable

Uncertainty: 1 Uncertain

Risk/Control Priority: 3

Basis: Qualitative Judgement

FIG Priority: 3

Discussion: OEL is REL. Some low level formaldehyde may be present, but is expected to be negligible. Some uncertainty exists due to very low OEL.

Medical Surveillance

Justifiable no

Triggered or Critical Exposure yes

Reference: 29 CFR 1910.1048

Coastal and Marine Geology, Biological Resources Division

Process: Coral Cutting

Corals are cut using a tile cutter and a slab saw.

Operating Conditions:

Task: Operate Slab Saw

Frequency:

Slab saw is used to cut coral.

Duration:

Controls:

Operation is enclosed and utilizes wet methods.

Recommendation:

AGENT Noise

OEL: 85 dBA

Exposure Estimate: dBA

Health Effects Rating: 3 Irreversible health effects of concern

Exposure Rating: 1 (<10% OEL; 95th %tile <0.1 OEL)

Exposure Category: Acceptable

Uncertainty: 0 Certain

Risk/Control Priority: 3

Basis: Qualitative Judgement

FIG Priority: 0

Discussion: Sound level or dosimetry data are not available for this task. However, sound level data obtained during operation of several similar pieces of equipment at another facility show a maximum sound level of 72 dBA. OEL is not expected to be exceeded as a result of this task.

Medical Surveillance

Justifiable no

Triggered or Critical Exposure yes

Reference: 29 CFR 1010.95

Task: Operate Tile Saw

Frequency: Daily

A tile saw is operated to cut coral. Task may require a full shift and be repeated over two days.

Duration: 4 - 8 hours

Controls:

Recommendation:

AGENT Noise	OEL:	85 dBA
Exposure Estimate:	dBA	Health Effects Rating: 3 Irreversible health effects of concern
Exposure Rating:	4 (>10% OEL; 95th %tile > OEL)	Exposure Category: Unacceptable
Uncertainty:	0 Certain	Risk/Control Priority: 12
Basis:	Qualitative Judgement	FIG Priority: 0
Discussion:	Sound level or dosimetry data are not available for this task. However, sound level data obtained during operation of similar equipment showed high hazardous noise levels of greater than 112 dBA. Task may extend for a full shift. OEL is expected to be exceeded.	
Medical Surveillance	Justifiable	yes
	Triggered or Critical Exposure	yes
	Reference:	29 CFR 1010.95

Process: Sediment Core Cutting

Field collected sediment cores are transported to the lab in sections ranging from 2 m to 20 ft. Samples are contained within aluminum irrigation pipe of 3 inch diameter. Samples are cut into 1 meter sections in the laboratory using a radial arm saw. Then, using the core saw, simultaneous longitudinal cuts are made along opposite sides of the core, cutting just through the metal casing. Core sediment is then cut with a wire.

Operating Conditions:

Task: Operate Radial Arm Saw

Frequency:

During the summer of 2010, 150 core samples of 20 ft length were cut. Fifty to 60 cores may be cut at a time. Task requires a few seconds per cut.

Duration: <1/2 hour

Controls:

Recommendation:

AGENT Noise	OEL:	85 dBA
Exposure Estimate:	dBA	Health Effects Rating: 3 Irreversible health effects of concern
Exposure Rating:	3 (50-100% OEL; 95th %tile 0.5-1.0 OEL)	Exposure Category: Acceptable
Uncertainty:	1 Uncertain	Risk/Control Priority: 9
Basis:	Qualitative Judgement	FIG Priority: 9
Discussion:	Sound level and dosimetry data was not available for this task. Background (compressor) sound level data was provided that showed periodic levels of up to 85 dBA while the compressor was activated. Although high hazardous noise is anticipated for this equipment, short duration exposure will limit worker exposure.	
Medical Surveillance	Justifiable	no
	Triggered or Critical Exposure	yes
	Reference:	29 CFR 1010.95

Task: Operate Sediment Core Saw

Frequency: Daily

Task requires worker to cut one core (20ft), and then describe and photograph it before continuing with the next sample. Task is conducted on a project basis. Frequency may be daily for the duration of the project. Two to four cores may be processed per day, requiring approximately 15 minutes of saw use.

Duration: <1/2 hour

Controls:

Cutter is enclosed.

Recommendation:

AGENT Noise

OEL: 85 dBA

Exposure Estimate: dBA

Health Effects Rating: 3 Irreversible health effects of concern

Exposure Rating: 3 (50-100% OEL; 95th %tile 0.5-1.0 OEL

Exposure Category: Uncertain

Uncertainty: 1 Uncertain

Risk/Control Priority: 9

Basis: Qualitative Judgement

FIG Priority: 9

Discussion: Sound level and dosimetry data were not available for this task. High level hazardous noise is expected to be generated by this equipment. The cut is isolated by an enclosure. Daily exposure duration was reported as approximately 15 minutes.

Medical Surveillance

Justifiable yes

Triggered or Critical Exposure yes

Reference: 29 CFR 1010.95

Process: X-ray Coral and Sediment Core Samples

Sediment core samples and coral samples are x-rayed to identify sediment layers or annual growth bands.

Operating Conditions:

Task: X-ray

Frequency:

Task requires operation of a VR1020 Model UR1020 Diagnostic Imaging systems low output portable veterinary X-ray instrument. Frequency and duration is highly variable and dependant on project. Task may be conducted 3-4 times per year for one technician and require several days per project. Nineteen sessions were conducted in 2009. Specifications for analysis are: 50 kV and 0.3 mA-sec for coral and 2.5-3 mA-sec for sediment core. Task includes nine warm up shots.

Duration:

Controls:

Controls include use of caution lights, leaded barriers, personal dosimetry, and the use of a leaded apron.

Recommendation:

AGENT X-radiation

OEL: 5 rem

Exposure Estimate: rem

Health Effects Rating: 3 Irreversible health effects of concern

Exposure Rating: 1 (<10% OEL; 95th %tile <0.1 OEL)

Exposure Category: Acceptable

Uncertainty: 0 Certain

Risk/Control Priority: 3

Basis: Existing Quantitative Data

FIG Priority: 0

Discussion: Dosimetry shows no exposure by badge or ring dosimetry conducted quarterly, with the one exception of a single exposure recorded at 21 mrem by ring dosimetry.

Medical Surveillance Justifiable no
Triggered or Critical Exposure no
Reference:

Coral Reef Ecosystems Studies Project

Process: CO2 Coulometric Analysis

Coulometric analysis is conducted to determine CO2 level in samples. A VIC Coulometrics CM5130 Acidification module is used to acidify samples for analysis.

Operating Conditions:

Analysis is conducted using bench top instruments. A laboratory hood is used for reagent dilution and purging.

Task: Dilution of Perchloric acid

Frequency: Monthly

Concentrated perchloric acid is diluted from 12 N to 2 N. Using volumetric flask 1/2 full of water, 172 ml of acid which was measured with a graduated cylinder is added. Remainder of flask volume is filled with water to make 1 liter.

Duration: <1/2 hour

Controls:

Work is conducted under a laboratory hood.

Recommendation:

AGENT Perchloric acid

OEL: mg/m3

Exposure Estimate: mg/m3

Health Effects Rating: 3 Irreversible health effects of concern

Exposure Rating: 1 (<10% OEL; 95th %tile <0.1 OEL)

Exposure Category: Acceptable

Uncertainty: 0 Certain

Risk/Control Priority: 3

Basis: Qualitative Judgement

FIG Priority: 0

Discussion: OEL for this agent is not available. Agent is highly corrosive to skin and mucous membranes. Routes of exposure are inhalation and direct contact with concentrated agent. Inhalation exposure is adequately controlled by laboratory hood. Eye and skin contact can occur in the event of splash or spill. Appropriate personal barrier protections were reportedly used.

Medical Surveillance Justifiable no
Triggered or Critical Exposure no
Reference:

Task: Sample Acidification for Coulemetric analysis

Frequency:

Samples are acidified for coulometric analysis. Up to 15 runs may occur during an 8 hour period. Samples require approximately 20 minutes to run. Samples are purged into waste container which is located within a laboratory hood. Task requires about 1 week per month. For example, approximately 40 samples may require one week to run.

Duration:

Controls:

Recommendation:

AGENT Perchloric acid

OEL:

Exposure Estimate:

Health Effects Rating: 3 Irreversible health effects of concern

Exposure Rating: 1 (<10% OEL; 95th %tile <0.1 OEL)

Exposure Category: Acceptable

Uncertainty: 0 Certain

Risk/Control Priority: 3

Basis: Qualitative Judgement

FIG Priority: 0

Discussion: OEL for this agent is not available. Agent is highly corrosive to skin and mucous membranes. Agent is dilute. Routes of exposure are inhalation and direct contact with agent. Eye and skin contact can occur in the event of splash or spill. Appropriate personal barrier protections were reportedly used.

Medical Surveillance

Justifiable no

Triggered or Critical Exposure no

Reference:

Health Risk and Further Information Gathering Priorities

Marine and Coastal Science Center

Division, Shop, Project	Process	Task	Agent	Exposure Category	Justified Medical Surveillance	Triggered Surveillance	Health Risk Priority	FIG Priority
Coastal and Marine Geology, Biological Resources Division	Coral Cutting	Operate Tile Saw	Noise	Unacceptable	yes	yes	12	0
Coastal and Marine Geology, Biological Resources Division	Sediment Core Cutting	Operate Radial Arm Saw	Noise	Acceptable	no	yes	9	9
Coastal and Marine Geology, Biological Resources Division	Sediment Core Cutting	Operate Sediment Core Saw	Noise	Uncertain	yes	yes	9	9
Climate History Calibration Study	Sedimentation Laboratory	Sort Samples	Formaldehyde	Acceptable	no	yes	3	3
Climate History Calibration Study	Sedimentation Laboratory	Collect Samples	Formaldehyde	Uncertain	yes	yes	3	3
Coastal and Marine Geology, Biological Resources Division	Coral Cutting	Operate Slab Saw	Noise	Acceptable	no	yes	3	0
Coral Reef Ecosystems Studies Project	CO2 Coulometric Analysis	Dilution of Perchloric acid	Perchloric acid	Acceptable	no	no	3	0
Climate History Calibration Study	Sedimentation Laboratory	Dilute Formalin Solution	Formaldehyde	Acceptable	no	yes	3	0
Coral Reef Ecosystems Studies Project	CO2 Coulometric Analysis	Sample Acidification for Coulometric analysis	Perchloric acid	Acceptable	no	no	3	0
Coastal and Marine Geology, Biological Resources Division	X-ray Coral and Sediment Core Samples	X-ray	X-radiation	Acceptable	no	no	3	0