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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 Central Region Drilling Project 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 19 May 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: Central Region Drilling Project Occupational Exposure Assessment

Central Region Drilling Project
Occupational Exposure Assessment and Medical Surveillance Inclusion
For
Department of Interior, Safety Council/Office of Health and Safety
On-site: 19 May 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 Central Region Drilling Team was conducted on 19 May 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

Central Region Drilling Project

Drilling

Process: Air Drilling

Air drilling is reportedly discouraged, however the method may be required to meet certain project objectives. No drilling mud is used. Water is typically injected.

Operating Conditions:

Task: Air drilling

In air drilling, compressed air is used to clear the bit and remove cuttings from the bore. Frequency and duration are project dependant. Some projects reportedly require drilling for up to 5 months.

Frequency: Daily

Duration: extended shift

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: Uncertain

Uncertainty: 1 Uncertain

Risk/Control Priority: 12

Basis: Qualitative Judgement

FIG Priority: 12

Discussion: Sound level and dosimetry data are not available for this task. Hazardous noise is anticipated.

Medical Surveillance Justifiable yes
Triggered or Critical Exposure yes
Reference: 29 CFR 1010.95

AGENT Particulates, NOC/R

OEL: 5 mg/m3

Exposure Estimate: mg/m3

Health Effects Rating: 1 Reversible health effects of concern

Exposure Rating: 4 (>10% OEL; 95th %tile > OEL)

Exposure Category: Uncertain

Uncertainty: 2 Highly Uncertain

Risk/Control Priority: 4

Basis: Qualitative Judgement

FIG Priority: 8

Discussion: OEL is PEL for respirable fraction. Task is expected to create conditions for potentially high concentrations of particulates. Water injection was reported as typical. When used, airborne particulate is expected to be reduced. No exposure data were available for this task.

Medical Surveillance Justifiable yes
Triggered or Critical Exposure no
Reference:

AGENT Silica, crystalline quartz

OEL: 25 ug/m3

Exposure Estimate: ug/m3

Health Effects Rating: 3 Irreversible health effects of concern

Exposure Rating: 4 (>10% OEL; 95th %tile > OEL)

Exposure Category: Uncertain

Uncertainty: 2 Highly Uncertain

Risk/Control Priority: 12

Basis: Qualitative Judgement

FIG Priority: 24

Discussion: OEL is TLV for respirable fraction. Task requires dry drilling through sandstone and shale formations. Uncontrolled release of particulates including crystalline silica is anticipated. Note that if the Brief and Scala method for determining adjusted OELs for extended shifts and for extended work weeks is used the OELs for this task-agent would be 12.5 ug/m3 and 7.8 ug/m3 respectively.

Medical Surveillance	Justifiable	yes
	Triggered or Critical Exposure	no
	Reference:	

Process: Auger Drilling

Auger drilling is used to install shallow wells (100ft). After drilling, bentonite pellets and silica sand may be added to the well bore. The process may conclude with the installation of a concrete pad.

Operating Conditions:

Task: Operate Auger Drill

Frequency: Daily

Frequency and duration of this task are variable. In 2010, the task required 70 days split between two projects. Task is conducted daily for extended shifts.

Duration: extended shift

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: Uncertain

Uncertainty: 2 Highly Uncertain

Risk/Control Priority: 12

Basis: Qualitative Judgement

FIG Priority: 24

Discussion: Sound level and dosimetry data were not available for this task. Engineering controls on equipment were not reported.

Medical Surveillance	Justifiable	yes
	Triggered or Critical Exposure	yes
	Reference:	29 CFR 1010.95

AGENT Silica, crystalline quartz

OEL: 25 ug/m3

Exposure Estimate: 1 ug/m3

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 TLV. Release of fine particulate is anticipated during task when drilling through sediments. OEL is not expected to be exceeded. Uncertainty is due to silica and moisture content of drilled formations. Transfer of pelletized bentonite product to the well bore after drilling has been completed is not expected to contribute significantly to exposure. (Note: product label and MSDS were not available. An MSDS for a similar product gave silica content as <18%.) Transfer of sand to the well bore may release small amounts of fine crystalline silica dust, for the short duration of that step of the task.

Medical Surveillance Justifiable no
Triggered or Critical Exposure no
Reference:

Process: Mud Rotary Drilling

Mud Rotary Drilling requires the operation of multiple pieces of equipment including the drilling rig, and auxiliary mud pump, a portable mud system to clean the mud, and support equipment such as a water truck, a diesel powered portable welder, and Honda gas powered water pumps. Note: Tasks and agents described under this process were provided by the Central Region Drilling Project Supervisor, citing the Wainwright Coal Bed Methane Exploration project as an example.

Operating Conditions:

Example project: Coal Bed Methane Exploration at Wainwright, Alaska

Task: Operate Auxiliary Mud Pump

Frequency: Daily

The auxiliary mud pump is used to pump drilling mud to the dilling rig. The pump is powered by a Detroit Series 53 engine. Operation requires the worker to periodically approached the pump to place it in and out of gear.

Duration: extended shift

Controls:

Recommendation:

AGENT Noise

OEL: 85 dBA

Exposure Estimate: 4 dBA

Health Effects Rating: 3 Irreversible health effects of concern

Exposure Rating: 4 (>10% OEL; 95th %tile > OEL)

Exposure Category: Uncertain

Uncertainty: 2 Highly Uncertain

Risk/Control Priority: 12

Basis: Qualitative Judgement

FIG Priority: 24

Discussion: Sound level or dosimetry data were not available for this task. Although actual time spent tending the pump may be short, this work is conducted concurrently with other assumed noise hazardous tasks.

Medical Surveillance Justifiable yes
Triggered or Critical Exposure yes
Reference: 29 CFR 1010.95

Task: Operate Drilling Rig

Frequency: Daily

Operate drilling rig for daily 12 hour shifts for 2 week periods.
Requirements vary with project.

Duration: extended shift

Controls:

Recommendation:

AGENT Mosquitoes

OEL:

Exposure Estimate:

Health Effects Rating: 0 Reversible health effects of little concern

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

Exposure Category: Acceptable

Uncertainty: 0 Certain

Risk/Control Priority: 0

Basis: Qualitative Judgement

FIG Priority: 0

Discussion: Mosquitoes are likely to create a severe nuisance concern which may impact work efficiency. Although species in this region (Alaska arctic coastal plain) include potential disease vectors, disease agents are absent.

Medical Surveillance Justifiable no
Triggered or Critical Exposure no
Reference:

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: Uncertain

Uncertainty: 2 Highly Uncertain

Risk/Control Priority: 12

Basis: Qualitative Judgement

FIG Priority: 24

Discussion: Sound level or dosimetry data were not available for this task. Workers use single hearing protection during this task suggesting worker perceived hazardous noise.

Medical Surveillance Justifiable yes
Triggered or Critical Exposure yes
Reference: 29 CFR 1010.95

Task: Operate Portable Mud System

Frequency: Daily

During this task drilling mud is mixed. The equipment is powered by an air cooled Deutz diesel engine. Dry bentonite clay in 50 pound bags is manually loaded into the venturi hopper. Two bags are loaded for each batch. Mixing requires 15-20 minutes. The task may be conducted 3-4 times per day. A product reported as Pac-L Beroid dry polymer may be used as an additive. When it is used, 3-5 lbs per day may be required.

Duration: 1 - 4 hours

Controls:

Recommendation:

AGENT Cellulose

OEL: 5 mg/m3

Exposure Estimate: mg/m3

Health Effects Rating: 1 Reversible health effects of concern

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

Exposure Category: Uncertain

Uncertainty: 2 Highly Uncertain

Risk/Control Priority: 1

Basis: Qualitative Judgement

FIG Priority: 2

Discussion: OEL is PEL. TLV of 10 mg/m3 is based on mechanical irritation to eyes and mucous membranes. Product was reported as Pac-L Beroid dry polymer. Label and MSDS information are not available for this product. Agent is presumed to be cellulose, but this is not certain. OEL for cellulose is not expected to be exceeded based on quantity and frequency of use.

Medical Surveillance Justifiable yes
 Triggered or Critical Exposure no
 Reference:

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: 1 Uncertain

Risk/Control Priority: 12

Basis: Qualitative Judgement

FIG Priority: 12

Discussion: Sound level and dosimetry data were not available for this task. Equipment is expected to produce hazardous noise while the duration of the task is reported as between one and four hours.

Medical Surveillance Justifiable yes
 Triggered or Critical Exposure yes
 Reference: 29 CFR 1010.95

AGENT Silica, crystalline quartz

OEL: 25 ug/m3

Exposure Estimate: ug/m3

Health Effects Rating: 3 Irreversible health effects of concern

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

Exposure Category: Uncertain

Uncertainty: 2 Highly Uncertain

Risk/Control Priority: 3

Basis: Qualitative Judgement

FIG Priority: 6

Discussion: OEL is TLV for respirable fraction. Product MSDS and label were not available for the product. Product information for other bentonite clay drilling mud additives show a range of crystalline quartz silica between one and 6 percent. As much as 24 lbs of agent may be manually handled during this task. In addition additional exposure to used product is likely to occur throughout the shift. Note that if the Brief and Scala method for determining adjusted OELs for extended shifts and for extended work weeks is used, the OELs for this task-agent would be 12.5 ug/m3 and 7.8 ug/m3 respectively.

Medical Surveillance Justifiable yes
 Triggered or Critical Exposure no
 Reference:

Process: Setting Casing

Well casing is set as soon after a well is drilled as is possible. Welding is required to join casing sections.

Operating Conditions:

Work is conducted outdoors under variable weather conditions.

Task: Weld Mild Steel

Frequency:

Casing sections made of mild steel are butt welded by SMAW using 7014 or 7018 rod. Approximately 5 joints are welded per hour (approximately 9 minutes per joint with 2 minutes between welds). Some sections may require preparation by cleaning with a wire wheel or brush. Joints are welded in a single pass and no grinding is required to finish the join.

Duration:

Controls:

Recommendation:

AGENT Welding fume, NOS	OEL:	5 mg/m3
Exposure Estimate: mg/m3	Health Effects Rating:	2 Severe, reversible health effects of concern
Exposure Rating: 1 (<10% OEL; 95th %tile <0.1 OEL)	Exposure Category:	Acceptable
Uncertainty: 1 Uncertain	Risk/Control Priority:	2
Basis: Qualitative Judgement	FIG Priority:	2

Discussion: OEL is TLV. Fumes from mild steel welding contain mostly iron with small amounts of additive metals (chromium, nickel, manganese, molybdenum, vanadium, titanium, cobalt, copper). Work is conducted outdoors. OEL is not expected to be exceeded during this task.

Medical Surveillance	Justifiable	no
	Triggered or Critical Exposure	no
	Reference:	

Health Risk and Further Information Gathering Priorities

Central Region Drilling Project

Division, Shop, Project	Process	Task	Agent	Exposure Category	Justified Medical Surveillance	Triggered Surveillance	Health Risk Priority	FIG Priority
Drilling	Auger Drilling	Operate Auger Drill	Noise	Uncertain	yes	yes	12	24
Drilling	Air Drilling	Air drilling	Silica, crystalline quartz	Uncertain	yes	no	12	24
Drilling	Mud Rotary Drilling	Operate Auxiliary Mud Pump	Noise	Uncertain	yes	yes	12	24
Drilling	Mud Rotary Drilling	Operate Drilling Rig	Noise	Uncertain	yes	yes	12	24
Drilling	Air Drilling	Air drilling	Noise	Uncertain	yes	yes	12	12
Drilling	Mud Rotary Drilling	Operate Portable Mud System	Noise	Unacceptable	yes	yes	12	12
Drilling	Air Drilling	Air drilling	Particulates, NOC/R	Uncertain	yes	no	4	8
Drilling	Mud Rotary Drilling	Operate Portable Mud System	Silica, crystalline quartz	Uncertain	yes	no	3	6
Drilling	Auger Drilling	Operate Auger Drill	Silica, crystalline quartz	Acceptable	no	no	3	3
Drilling	Setting Casing	Weld Mild Steel	Welding fume, NOS	Acceptable	no	no	2	2
Drilling	Mud Rotary Drilling	Operate Portable Mud System	Cellulose	Uncertain	yes	no	1	2
Drilling	Mud Rotary Drilling	Operate Drilling Rig	Mosquitoes	Acceptable	no	no	0	0