From: Waggoner, Larry O
Sent: Friday, June 22, 2007 1:46 PM
Subject: ALARA Center Activities for Week of June 18, 2007

Attachments: 7012.pdf; 7126.pdf; Characteristics of a Portable HEPA Filtered Ven System.doc; Websites with Info on CO2 Decontamination.mht; DSCF0180.JPG
Visit our Website at www.hanford.gov/rl/?page=974&parent=973

REMINDER: Fluor employees who work in or supervise workers who work in hot environments are required to complete training class 020193 on Heat Stress every two years.

1. Received call from Earl Lloyd looking for lessons learned on the hydrolasing that was accomplished at N-Reactor a few years ago. Found other reports, but none on N-Reactor. If anyone has a report, please forward to us and to Earl Lloyd. Brookhaven Radcon Manager requested info on the radiological containment training conducted by the ALARA Center Staff. Forwarded a package containing training materials and recommended they visit the ALARA Center and we will train their trainers on containments, capturing contamination using portable ventilation and other contamination control techniques. Discussed hot cell decontamination techniques with WCH Rad Engineer planning the job of removing the B Hot Cell in Building 324. They can't use water so are looking at strippable latex paint and decontamination processes used in gloveboxes. Forwarded a report on Hot Cells and decon techniques See http://www.osti.gov/bridge/servlets/purl/67617-cqIZf3/webviewable/67617.PDF and http://www.epa.gov/radiation/docs/cleanup/402-r-06-003.pdf One option is to decon the hot cell to reduce the contamination levels and then add several feet of concrete to the bottom of the hot cell and cut it into pieces using diamond wire cutting equipment.

2. (Tooling) J. Rush of FFTF reported they had tried out the 9" Evolution Metal Cutting Circular Saw and were very impressed. They intend to purchase a 7" saw that cuts 1/4" steel to use on cutting the covers off electrical equipment. See http://www.oceanmachinery.com/evolution_saw.htm This is one of the best tools we have seen and if you're doing D&D work and have to cut metal, you need to evaluate this or other metal cutting circular saws. The 7" saw will cut 250' of 1/4" steel plate before the blade needs changing and blades cost about $50.00 In Tri-Cities, the saw can be purchased at Norco in Pasco at 543-2022.

3. Jeff visited CVDC and supported the 100 K sludge treatment project design team performing an ALARA design review. The review included design package validation and a field walk down with the design team to determine if the project design included appropriate ALARA considerations. The ALARA design review concluded with a briefing to the project chief engineer from the entire review team. Jerry conducted glovebag training for 8 CH2M and 15 Fluor RCTs as part of their continuing education training.

4. (D&D Hotline) Received call from EM-53 Federal Project Manager working in Denver. He needed info on vendors that sell skid mounted water treatment systems. Gave them two vendor's names from the Nuclear News magazine Buyers Guide. He will contact NFS/Radiation Protection Services and P/N Services.

5. Forwarded info to a company that wanted to purchase inexpensive portable HEPA filtered vent units that would be attached to a containment tent. Recommended they look at www.omnitecdesign.com. Sent them a copy of our handout on the characteristics of a good portable vent system. See attachment Loaned 12 lead bricks to CH2M Radcon to construct a lead frisking cave.

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FOR YOUR INFORMATION

1. In 2003, a report on "Experiences in D&D of Former Plutonium Production Reactors at the Hanford Reservation" was presented at an Energy Facility Contractors Group (EFCOG) meeting in Salt Lake City by Guy Bishop. This report contains information on the lessons learned up to that date on the D&D of nine reactor plants. See http://www5.hanford.gov/pdwdocs/fsd0001/osti/2003/I0040749.pdf

2. "Working in Hot Environments" is a publication by NIOSH and it can be found at http://www.cdc.gov/niosh/hotenvt.html
A more recent study concerns Heat Stress Exposures and Interventions for Mine Rescue Workers and it can be found at http://www.smenet.org/store/bookstore/ViewProductInfo.cfm?ItemKey=DIGIPREP04-107
The Abstract for this study reads: "Researchers from the National Institute for Occupational Safety and Health (NIOSH), in cooperation with mine operators, conducted a study of heat stress exposures among mine rescue workers in underground mines. Mine rescue workers face extreme heat loads as they enter hot and poorly ventilated environments, particularly when they are wearing breathing apparatuses. The burden of wearing a closed-circuit breathing apparatus (CCBA), the inability to drink fluids for extended periods of time, and the potential for ventilation disruptions and fires combine to increase the risk of heat illness during a response to an emergency. In this research, ambient environmental conditions and heat strain indicators were measured using conventional ventilation monitoring tools during mine rescue training exercises. Heat strain was measured with an ingestible temperature-sensing pill that measured core temperature continuously. In addition, a heart-rate monitoring chest strap was used to indicate physical strain resulting from physical activity and heat. Both core temperature and heart rate data were trans-mitted to a remote recorder worn by a rescuer and time-stamped. Team activities were also observed to determine the contribution of work rate to a person's total heat load. The effectiveness of several engineering controls, such as cooling the air inhaled by rescuers through an apparatus, wearing cooling vests, and supplying water through the CCBA masks, were investigated. Administrative controls, such as limiting the duration of exposure and controlling the work rate through forced-rest regimens, were also evaluated. Results to date are discussed, and tools for evaluating team condition and estimating the length of time it would be safe for rescuers to work are proposed."

3. Attached are two presentations from the Waste Management 07 Conference that may be valuable to people who are planning the D&D of old radiological work facilities. Attachment 7012 describes the use of underwater divers in fuel pools at INEL.

4. **Welcome to Perma-Fix Northwest**. Perma-Fix Environmental Services has purchased Pacific Eco-Solutions and has renamed it Perma-Fix Northwest. This is a company near downtown that size-reduces and treats some of the Hanford waste. Additional money is now available to expand the company and increase their capability to handle low-level and mixed hazardous waste. Offered to provide a tour of the ALARA Center to Perma-Fix Northwest personnel and show them the latest tools we have for size-reducing materials. They will set up the tour for a later date.

5. (Decon with Carbon Dioxide) We get an occasional call from personnel wanting info about decontamination with Carbon Dioxide pellets. Master-Lee Hanford has an office at the Richland airport and has a portable CO2 decontamination system that could be brought on site and decontamination accomplished at a Hanford facility. If you need this type of service, call Rick Largent at 943-2949 or email largent@!mlhcorp.com. We tested CO2 decontamination at Hanford several years ago and found that it will virtually clean everything. Dry ice pellets are propelled at an object using dehydrated compressed air. The pellets shatter upon impact and the resulting kinetic energy causes them to penetrate the base material and shatter it. The contaminants are atomized and blown away by the expanding CO2 gas. No secondary waste is produced. The CO2 becomes a gas and returns to the atmosphere. Airborne contamination will be present. See attached list of CO2 Websites

6. The ALARA Center display of Respiratory Protection was improved this week when the Bullard representative set up a new display. See attached photo.

USE OF PORTABLE HEPA FILTERED VENTILATION

An effective portable ventilation system has the following characteristics:

1. The ALARA Center recommends that facilities purchase "Nuclear Grade" ventilation blowers equipped with a HEPA filter if it is going to be used for radiological work. These may be high-quality units that will be used at a facility for many years or cheaper units used for D&D and disposed at the end of each project. When you're looking for a unit, remember the smaller units (<1,000 cfm) run on ~110 volts but larger units may run on 220 volts. If you don't have the correct electrical resources, you may not be able to operate your ventilation system. There are several companies that sell cheap imitation units that might be all right for asbestos, but don't work well for radiological work. If you want to purchase inexpensive ventilation equipment check the unit carefully before purchase; especially look at how securely the HEPA filter is forced against the seal inside the housing. Remember – <u>You get what you pay for</u>. Contact the ALARA Center or Vent & Balance for advice.

2. The fan should have flow characteristics that allow it to operate over a large pressure range to account for inherent losses in the system and increased pressure drop as the filters collect dirt and debris. Some newer models can be ordered with speed controllers for the fan and air flow rate indicators that show the cfm through the system. These allow you to preset the flow you want and the unit will maintain that flow during the job.

3. The ventilation system should be located in well-lighted areas that allow easy access for maintenance. If outside, the unit should be protected from wind, dust, and other inclement weather conditions.

4. The length of hose or duct from the blower/fan to the work area should be as short as possible and contain a minimum number of bends. The ducting should have no sharp bends. Bends should have a minimum radius of 2-2.5 times the duct/hose diameter. NOTE: as a rule, a 90-degree bend is the equivalent of adding extra hose equal to 6-8 times the hose diameter.

5. The ducting should be routed through low traffic areas where it is protected to avoid damage. If the hose is dented, the air flow through the hose is restricted and the flow decreases. A straight duct section of at least six equivalent duct diameters should be used where the hose connects to the fan.

6. The hose/duct should be round, have a smooth bore, and be free of obstructions, especially at joints. Joints should be securely sealed to avoid leaks.

7. Use of blast gates or other types of dampers should be avoided. If a blast gate must be used to adjust the flow, place it in a vertical section near the midway point. Install a tamper proof device. Note: Many larger units have blast gates on the discharge side of the unit. Although this is not the most desirable location, the losses are made up by using a larger unit than needed to get more air flow. The extra air flow overcomes all the losses in the system.

8. Capture Velocity is the flow rate at the point where airborne contamination is captured is sufficient to cause the particulate to follow the air stream into the ventilation. This capture velocity is recommended to be a minimum of 125-200 feet/min for the type of work to be performed. If the airborne activity is released into quiet air, a capture velocity of 50-100 feet/min

is all that's necessary. If grinding is performed, the particles will have a high initial velocity so the capture velocity of the ventilation needs to be in the 500-2000 feet/min range in order to get the ballistic particle to turn and enter the vent hose. A significant improvement in the amount of debris captured by the vent system can be attained if the suction hose is positioned so the grinding particles flow directly into the hose.

9. Use of a funnel, scoop, or hood attached to the hose/duct to collect airborne contamination will increase the amount of contamination collected over a "hose only" application. The design of the funnel or scoop reduces the amount of air being drawn from unwanted directions. This forces incoming air to be drawn from in front of the hose/duct where contamination is being created. Any particulate that is present is more likely to be captured in the air stream and carried into the vent system. A screen can also be installed to reduce the possibility that large objects will be drawn into the hose or duct.

10. If work is done inside a containment tent or room the ventilation suction can be located on a wall or a trunk line run into the work area near the source of contamination.

- "Localized" or "Point-Source" ventilation: Position the ventilation suction hose so that any airborne particles are drawn away from the worker's breathing zone. Normally the ventilation suction is placed 90 to 180 degrees from the worker on the opposite side of the source at a distance of one duct diameter or less. If the suction end of the hose is greater than one duct diameter away from the source, very little contamination will be captured in the air stream; so get it close, but don't interfere with the work.

- "Dilution Ventilation: Typically, the suction hose is mounted low on a containment wall at a location that is opposite the entrance to the containment. Make-up air should enter the containment through filter media, HEPA filters or dampers located above the access door or nearby above head height. This arrangement will provide a general downward flow of air through the containment. This clean air mixes with the potentially contaminated air at the source and the diluted mixture is drawn towards the suction.

- Air Changes" An air change occurs every time the vent system draws a volume equal to the volume of the containment work section. The industry standard for air changes in a containment tent is 7-12 air changes per hour. In the nuclear industry, air changes up to 20 per hour are common in rooms and containment tents. This is enough flow to ensure that contaminated airborne particles flow toward the exhaust, not out the containment door. If the ventilation system fails during use, covers can be placed over the make-up air inlets so that no contamination escapes the containment. *NOTE: If you want to capture airborne particulate, the important thing to consider is the amount and direction of flow at the source of the contamination. So if you're removing a flange from a contaminated system look at which direction the air flows and how much flow is present. Smoke or powdered material can be blown near the flange to determine the direction and make an estimate whether the flow rate is adequate. Vent & Balance can also take flow rate readings and tell you the exact flow rate at different locations. The ALARA Center recommends that facilities purchase "Flowchecker Silica Powder, Item 7904C from Lab Safety & Supply @ (800) 356-0783. WCH uses "baby powder" because it's cheaper, but it makes the work area slippery and sometimes a great deal of powder is ejected from the container when you only wanted a "poof". Another tool coming into use is the Pocket Wind Meter made by Kestrel. Models 1000 & 2000 allow you to measure the flow at the face of the vent system at different distances. Using this instrument permits the*

worker to find out which areas have enough flow to capture airborne particulate. For more info, see http://www.nfsrps.com/cat_air_instruments.html

11. System fittings should be designed so there is a gradual taper on the HEPA filter inlet and outlet and a long straight inlet to the fan. Transition pieces that change from one dimension to another should also be tapered. Since having tapered connections on each side of the HEPA filter would require more space, you often find there is little or no taper. Manufacturers make up for this by using a motor that draws greater air flow.

12. If the HEPA filter is visible, check to make sure that any flow arrows on the filter are in the same direction as the system flow. *NOTE: The HEPA filter will filter in either direction but if it's installed so the flows arrows are pointed in the wrong direction, workers get concerned and shut down work. It's easier to just install it so the arrows are pointed in the same direction than deal with the concerns.*

13. If the system is going to draw moist or damp air, install a demister filter to remove the moisture before it reaches the HEPA filter. The demister media is similar to steel wool and the air stream has to change directions as it passes through the media. The water collects on the media and dribbles to the bottom where it drains or evaporates. Damp HEPA filters lose their tensile strength and could fail if they become stressed later, i.e., filtering the smoke from a fire.

14. Locate the ventilation system components in well-lighted areas with enough space to allow easy access for maintenance. Mark or label each hose or component to identify it has internal contamination.

15. If the system could become highly radioactive consider installing an in-line prefilter or HEPA filter in the suction hose. This filter will remove the particles with the highest radioactivity before they reach the ventilation system HEPA filter. The in-line filter can be changed when it becomes highly radioactive without affecting the HEPA filter aerosol test. Temporary shielding can be installed on the in-line filter and/or it can be replaced during work.

16. Air discharged from the blower flows in a straight line. If you measure the flow at the discharge point and call that 100%, you will still find 10% of the flow at a distance of 30 times the diameter of the discharge. Ensure the air being discharged does not disturb contamination or asbestos that might be present in the work area. This may require installing a hose on the discharge side of the blower and either pointing it up or routing it outside the work area.

17. If the system is going to be used for "hot work", a metal hose with a spark arrester is required to avoid causing a fire in the flex ducting and/or prefilter/HEPA filter. A spark arrestor contains a series of screens that are off-set so the air has to change direction several times as it passes through the screens. The sparks hit a screen as they flow along the tortuous path through the spark arrestor and this removes the sparks from the air stream.

18. After a ventilation system is installed, contact Vent & Balance at 373-2746 or 373-9275 to accomplish an aerosol leak test. This will ensure the HEPA filter is installed correctly against the sealing surfaces inside the housing. Additional tests will be required annually, whenever the unit is transported to a new location, when opened for maintenance, after becoming highly radioactive, or is exposed to hostile environments such as high moisture loading, chemical fumes or high temperatures.

19. Documents that are good sources of information include:

a. DOE/RL-96-75, Radioactive Air Emissions Notice of Construction, Portable/Temporary Radioactive Air Emission Units

b. DOE/RL-97-50, Radioactive Air Emissions Notice of Construction, HEPA Filtered Vacuum Radioactive Air Emission Units

c. Industrial Ventilation Manual, A Manual of Recommended Practice published by the American Conference of Governmental Industrial Hygienists, Library of Congress Card Catalog # 62-12929; phone (513) 742-2020 or http://www.acgih.org/home.htm

d. Handbook of Ventilation for Contaminant Control; http://www.acgih.org/home.htm

e. HNF-PRO-8323, Management of HEPA Filters; This document provides information on the procurement, storage and testing requirements for HEPA filters.

f. HNF-RD-8703, Air Quality- Radioactive Air Emissions, This document provides information on the environmental requirements for using portable ventilation systems.

g. DOE Nuclear Air Cleaning Handbook, HDBK-1169-2003; Note: We are not contractually bound to follow this document, but it contains a lot of useful information. See website at http://tis.eh.doe.gov/techstds/standard/hdbk1169/index.html