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From: Meredith Brown <racer@lanl.gov>
Subject: Yellow Alert: **Heater Malfunction**

The attached Pacific Northwest National Laboratory Lessons Learned, Yellow/Caution, is an advisory about a recent incident involving new gas-fired unit heaters, and a resultant natural gas leak discovered during initial operations. If you have any questions or need further information, please contact Henry M. (Matt) Jones, PNNL, F&O Lessons Learned Coordinator, (509) 376-7275, or email at matt.jones@pnl.gov.

TITLE: Apparent manufacturing process errors result in a gas unit heater malfunction and the build up of gas odor within the PDL-E facility at the Pacific Northwest National Laboratory.

IDENTIFIER: 97PNNLBOPER28

LESSON LEARNED STATEMENT: Newly manufactured or modified equipment can contain deficiencies, which do not become apparent during acceptance testing and may result in malfunctions. Operators of such equipment must be sensitive to this possibility during initial operating periods.

DISCUSSION: A strong natural gas odor was detected by a building occupant shortly after turning on the new gas space heaters. The heaters were installed earlier in the past summer as a part of an energy savings project in Battelle private facilities, which changed over the facility heating sources from electric to natural gas-fired unit heaters. During trouble shooting, the installation contractor discovered that the gas-fired unit heater was not operating as designed, which could have resulted in a significant safety hazard.

DISCUSSION AND ANALYSIS: Heaters installed earlier in the year were being used as a result of the colder weather. Although they had passed the designated acceptance testing, they were idle for several months before this most recent use. On November 13, shortly after the heaters were turned on, occupants of the facility noted a natural gas odor. The occupants immediately notified the Building Manager. The heaters were immediately shut off and the area was ventilated (via opening large roll up doors located at each end of the building). The Power Operator shut off the gas supply to the building. The installation contractor and Cascade Natural Gas representatives inspected the system and heaters to determine the source of the gas odor.

Inspections of the unit, a Modine, Model Number PV350A, determined that brass flakes in one of the burner orifices, were deflecting the flow of gas into the burner air mixing tube. These brass flakes are believed to be residual debris from the manufacturing and assembly process as no brass was used in upstream construction and installation. The deflection of the gas stream caused a portion of the gas to exit the air intake port on the side of the air mixing tube. This gas was escaping the heater unit and entering the facility workspace. The flakes were removed and subsequent operation of the burner demonstrated that the burner operated properly. In addition, the sight-viewing window (for viewing the flame) was found in the open position and an internal gas tubing connection (internal to the heater unit and installed by the manufacturer) was found to be loose. The sight-window is considered a possible source of gas release, and per the

manufacturer's operating instruction, should be closed prior to operation. The sight-window was closed and the tubing fitting tightened and tested for leakage.

Follow on discussion with the manufacturer revealed that this was not a previously noted deficiency. Inspection of other heaters in the same facility also revealed no deficiencies. It should be noted that the operations acceptance testing results were satisfactory and that no abnormal operating conditions were observed. It was only after some initial on-line operating time that the deficiencies were manifested.

RESOLUTION/RECOMMENDED ACTIONS: Equipment and components received from the manufacturer are expected to meet the specifications for which they are intended. Through the manufacturing and assembly processes deficiencies can be introduced that could later cause a malfunction. In this instance, it was debris left to collect in the gas burner nozzle and a loose gas-line fitting. To the extent possible and practicable, the equipment must be verified as meeting the specifications for which its use is intended. Personnel who are operating new equipment, or equipment that has undergone modification, should be made sensitive to the possibility of malfunction past the acceptance test phase, until the initial operating cycles have been completed satisfactorily.

Other Hanford site users of these heaters, Modine, Model Number PV350A, must be aware of the possible recurrence of this event. As cooler weather continues, and while these heaters complete initial operating periods, similar malfunctions could occur. In addition, operating procedures and practices must ensure that the sight-windows for these heaters are in the closed position before operation.

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