Department of Pesticide Regulation

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# MEMORANDUM

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DATE: January 28, 2004

SUBJECT: RESULTS FROM AIR MONITORING STUDY CONDUCTED IN SOUTHERN CALIFORNIA IN POST-FUMIGATED STRUCTURES ENTERED BY GAS UTILITY WORKERS

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In response to concerns raised by a southern California gas-utility company related to the potential exposure of its workers to residual fumigant gases in domestic structures, the Industrial Hygiene Program (IHP) conducted a study of post-clearance fumigated houses. The utility company, Sempra Energy, had received sporadic complaints from field crews involved in the re-establishment of gas service to fumigated single and multi-family dwellings. Complaints of eye or throat irritation had been lodged by workers and were a source of concern for the utility company. Brain Heramb of Sempra contacted Worker Health and Safety (WHS) to discuss the potential for worker exposure to fumigant gasses in cleared houses. The key concern was that even though houses are "cleared" and eligible for re-occupancy when fumigant gas level readings register below 5 PPM for sulfuryl fluoride (VIKANE®, the predominate fumigant gas for structural applications), readings of chloropicrin are not made, nor are sulfuryl fluoride air levels tested in areas not normally considered "living spaces" (i.e. crawlspaces and attics). Additionally, "rebounding" air levels of fumigant gasses within cleared structures that have been closed up after clearance may be a source of potential exposure to utility workers and residents.

IHP proposed a workplace evaluation that included air monitoring to characterize air levels of both chloropicrin (the warning agent used in sulfuryl fluoride fumigations and material most likely responsible for reported irritations) and sulfuryl fluoride. The area to be tested would not necessarily be the living spaces of the structures, but the air parcels associated with areas that utility workers would normally perform their job function. These locations included, but were not limited to, crawlspaces, attics, utility closets and basements. The chemical of primary concern was chloropicrin (CAS #56-06-2). This material would be monitored using colorimetric indicator tubes (Sensidyne Gas Detector Pump Model AP-1S loaded with Sensidyne chloropicrin monitoring tube #172S). In addition, sulfuryl fluoride (CAS #2699-79-8) would also be monitored, using an Interscan Model CF-1900 VIKANE® monitor.

During development of the study protocol (*Air Sampling for Sulfuryl Fluoride and Chloropicrin in Southern California Fumigated Structures During Entrance by Utility Workers*, Project #0302, see attached), I met with representatives of Sempra Energy to discuss the draft protocol

and to establish necessary logistics to perform the study. This meeting occurred on October 29, 2003 in Los Angeles. A tentative start date of early November was agreed upon. The initial study sites were established in northern Orange County (Cycle I) and northern San Diego County (Cycle II).

Cycle I commenced on November 3, 2003. I met with Silvia Shattuck, CIH for Sempre and Don Melanson, a gas utility worker with Sempra. Mr. Melanson would be the person doing the actual re-establishing of gas service to the customer's homes.

The sampling day would start at the utility service facility. Mr. Melanson would gather his service call appointments and begin work at 0700 hrs. I followed Mr. Melanson and Ms. Shattuck to each of the homes listed for reconnection. On some of the houses, there were conditions preventing re-connection (no clearance certification, no resident at home). These were usually followed up either later in the day or the following day. However, for purposes of this study, they were counted as a "*site visit*" each time they were visited, but only counted as a "*sampling site*" when samples were actually drawn.

In synopsis, the protocol called for air samples being drawn from the air parcel from which the utility worker's breathing zone was located during the performance of his re-connection duties. This was restricted to air parcels within enclosed spaces, and usually involved the utility worker igniting pilot lights or checking for gas service of an appliance (water heater, space heater, oven, range). Air samples were not drawn from outdoor areas where he was reconnecting the gas meter, unless the meter was located in an outdoor utility closet. Most homes were tested both for sulfuryl fluoride and chloropicrin. However, a few of the homes had been clear for over 7 days. In these homes, usually only a chloropicrin sample was drawn, since set-up of this sampler was much less complicated than the Interscan. During the course of using the Interscan, it was found to be more efficient to connect the AC power unit to the Interscan and forego the use of the battery packs. In most cases, AC power was available and permission to use it was granted by the occupant.

In general, the study followed protocol. During the first three samplings of Cycle I, it was discovered that sulfur-containing gasses, such as the odorant of the natural gas or the combustion products of the match used to relight pilot lights, could cause the Interscan to behave erratically. In order to avoid such problems, it was decided that the industrial hygienist would enter the structure and take air samples from the interior work areas before Mr. Melanson actually ignited (or tested, in the case of piezoelectric igniters) the pilots.

In addition to sampling the general air parcel that the utility worker was working within, opportunity samples were also collected. Opportunity samples were defined as situations present that would indicate to the industrial hygienist that there might be concentrations of gas trapped within an enclosure. These include ovens, unopened cabinets and rooms where persons

(residents, utility worker, or sampling IH) reported signs of eye or throat irritation. Such samples were noted on the data sheets.

Cycle II commenced on November 17, 2003. Frank Schneider, the Associate IH for WHS, conducted Cycle II in Northern San Diego County, part of the Sempa service area. He also worked with Ms. Shattuck and with utility worker Louie Lachusa. The same sampling procedures as used in Cycle I were followed in Cycle II.

At the end of Cycle II, a total of fifty-two site visits had been made, with a total of forty-nine sampled sites. Of the forty-nine, there was one (1) home with a positive sample for chloropicrin. This sample was recorded as 0.1 PPM. This value is also the Cal/OSHA permissible exposure limit (PEL) for chloropicrin. This home also had a sulfuryl fluoride level of approximately 2 PPM. This house was vacant and was closed up when the utility worker arrived. It should be noted that most of the houses where residents were present were usually opened up, with doors and windows wide open. This house was also registered as a positive sensory detection (eye irritation) by both the IH and the utility worker.

There were eleven positives for sulfuryl fluoride. In ten of the cases, samples were taken within six hours of the clearance time posted on the notice left by the fumigation company. One house had positive results (3 PPM) 23 hours after clearance. However, the residents had just entered that morning, approximately 20 hours after clearance. Doors and windows were open, but had only been open for a few hours. It may have been possible for sulfuryl fluoride levels to increase from the continuing off-gassing from within the closed structure (rebounding). Table One lists the sulfuryl fluoride levels found and the associated time post-clearance.

*Table One: Sulfuryl Fluoride Levels Post-clearance*

| *PPM sulfuryl fluoride* | *Hours post-clearance* | | | | |
|---|---|---|---|---|---|
| 1 | 6 | | | | |
| 2 | 3 | 1 | 1 | 1 | |
| 3 | 23 | 3 | 3 | 3 | 4 |
| 4 | 5 | | | | |

In no case was there detection at levels above the sulfuryl fluoride PEL of 5 PPM. In some cases, when ovens or cabinets that were closed were sampled, sulfuryl fluoride was detected even though there were no reportable concentrations (<1 PPM) in the house. In one case a cabinet was opened and the probe placed within a stack of afghan throws. The meter momentarily read >40 PPM but immediately dropped back below 1 PPM. It would not be unreasonable to speculate that objects with large amounts of trapped air, such as an afghan throw, could retain small pockets of concentrated gas. In another opportunity sampling, a closed (but empty) walk-in closet showed a higher concentration of sulfuryl fluoride than the rest of the

living spaces. Fully opening all doors, drawers, closets, cabinets, ovens, dishwashers, trash compactors, and other such enclosing structures must be performed to allow maximum dissipation of fumigant gasses.

There were three cases of sensory detection (eye irritation and/or throat irritation) noted by the IH, two cases noted by the utility worker and four cases reported by the occupants. The occupants reported that they had felt irritation or smelled something unusual the previous night or earlier the day of the sampling. In none of the occupant cases did either the IH or the utility worker report any detection. In one case only the IH had a sensory detection and in two cases both the IH and the utility worker experienced some level of irritation. In only one case, where both the IH and the utility worker experienced irritation, during Cycle II, was there a detectable level of chloropicrin (0.1 PPM). In all other cases the chloropicrin concentrations were below the level of detection (0.02 PPM).

Though only one concrete example of direct measurable exposure to chloropicrin was found, this concentration did not appear to exceed the PEL. All measurements of sulfuryl fluoride were below the PEL. However, there were sensory detections in some structures which were not measurable using colorimetric tubes. Though the odor threshold is approximately 1.1 PPM, sensory detection can vary widely in a human population. It would not be unreasonable to assume that some people may experience irritation at levels below both the odor threshold and the PEL.

The following recommendations are made to assist in handling future utility worker potential exposures to fumigant gasses:

1. The utility worker should always confirm, via either the clearance certification or direct communication with the resident or the fumigation company, that the structure has been cleared for sulfuryl fluoride.

2. If the utility worker has to enter an area not normally considered “living space” (crawlspace, attic, utility closet etc.) to relight pilots or perform some other associated function, the first action of the utility worker should be to open up this space and allow for ventilation while reconnecting the meter, if the meter is located outside. If the meter is within the area of concern, then the worker should open up the area (e.g. open utility closets) and wait until the area aerates.

3. On sensory detection (eye irritation, throat irritation, difficulty breathing) the utility worker should immediately exit the area and notify the resident, if present and the fumigation company that insufficient aeration has occurred in those areas. Further aeration, either active (blowers) or passive (open all access doors and windows) may be required of the area the utility worker must enter. It is suggested that the utility worker

not reenter the area unless 4 hours of active aeration or 24 hours of passive aeration have occurred.

4. Utilities should be reminded that these types of episodes are potentially pesticide exposure injuries and they should contact their local county agricultural commissioner (CAC). Title 3 of the California Code of Regulations, Section 6726 (c) requires that when exposure is suspected to lead to illness, or injury, the employer shall ensure the employee is taken to a physician. The CAC should be contacted so they can investigate whether proper ventilation procedures were followed.