Executive Summary of April 2, 2010 Release

Overview

Released today is additional information from the investigation of problem drywall including: (1) Interim Remediation Guidance; (2) results from a study of drywall emissions from the Lawrence Berkeley National Laboratories (LBNL); and (3) results from a study of sulfur reducing bacteria in drywall from Environmental Health and Engineering.

- **Interim Remediation Guidance:** The Interim Remediation Guidance addresses possible safety hazards related to corrosion in drywall homes by (1) eliminating the source of the corrosion, the problem drywall, and (2) replacing building components for which drywall-induced corrosion might cause a safety problem. The guidance calls for the replacement of: all possible problem drywall; all fire safety alarm devices (including smoke alarms and carbon monoxide alarms); all electrical components and wiring (including outlets, switches, and circuit breakers); and all gas service piping and fire suppression sprinkler systems.
- **Lawrence Berkeley National Laboratories:** LBNL measured in laboratory chambers the chemical emissions from thirty drywall samples. The top ten reactive sulfur emitting samples were of Chinese origin. Certain Chinese samples had emission rates of hydrogen sulfide one hundred times greater than non-Chinese samples. CPSC staff modeling based on these results shows that estimated concentrations of the reactive sulfur chemicals in the indoor air of a home that are predicted to result from the presence of the drywall can be approximately a factor of ten times greater for certain Chinese samples than for the non-Chinese samples.
- **Bacterial Study:** Based on a limited preliminary study of ten drywall samples, there appears to be no difference in the presence or absence of sulfur-reducing bacteria between the imported Chinese drywall and U.S. domestic drywall samples tested, including Chinese samples found by LBNL to have some of the highest reactive sulfur gas emissions.

The Interim Remediation Guidance and the results of the study of sulfur-reducing bacteria contribute to the science and information available to consumers considering ways to address a home impacted by problem drywall. Additional information expected this summer, specifically the results of long-term corrosion investigations underway at Sandia National Laboratories and the National Institute of Standards and Technology, will likely permit refinement and better understanding of the remediation approaches to this issue.

The LBNL data released today find greater emissions of reactive sulfur compounds, including hydrogen sulfide, from certain Chinese drywall than non-Chinese drywall. Expanding on the earlier scientific findings of the Interagency Task Force, these studies support the preliminary conclusion that: certain Chinese drywall emits reactive hydrogen sulfide at rates much higher than other, non-Chinese drywall, and that hydrogen sulfide has a strong association to corrosion in homes with problem drywall.

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Interim Remediation Guidance

The Interim Remediation Guidance intends to address possible safety hazards related to corrosion in drywall homes by (1) eliminating the source of the corrosion, the problem drywall, and (2) replacing building components for which drywall-induced corrosion might cause a safety problem. Initial studies in the drywall investigation found a strong association between the presence of problem drywall and corrosion of metal in homes. The Intergovernmental Task Force on Problem Drywall developed the interim guidance based on those findings.

The interim guidance calls for the replacement of: all possible problem drywall; all fire safety alarm devices (including smoke alarms and carbon monoxide alarms); all electrical components and wiring (including outlets, switches, and circuit breakers); and all gas service piping and fire suppression sprinkler systems. As a threshold matter, before remediation, the interim guidance cautions that care should be taken in determining whether the house has problem drywall. The Task Force recently released Interim Guidance – Identification of Homes with Corrosion from Problem Drywall,[1] to assist in such determinations.

The Interim Remediation Guidance is provided at this time and before the completion of all ongoing scientific studies of this matter, because the Task Force recognizes that many homeowners want to begin the process of repairing their homes. Less extensive or costly remediation methods may ultimately prove effective, but at present the Task Force lacks a scientific basis to evaluate those methods. The long term accelerated corrosion studies of Sandia National Laboratories and the National Institute of Standards and Technology, due in the summer of 2010, should provide relevant scientific information. The Task Force will continue its efforts to develop and refine procedures or standards related to the remediation of drywall homes and the interim guidance issued today will be modified as necessary.

Lawrence Berkeley National Laboratory

CPSC staff contracted with Lawrence Berkeley National Laboratories (LBNL) for measurement in laboratory chambers of chemical emissions from thirty samples of drywall products obtained as part of an investigation of problem drywall. The objectives of this preliminary evaluation are to: (1) evaluate chemical emissions from Chinese drywall and from drywall from other sources (in this report, non-Chinese drywall is referred to as North American or NA); (2) identify the possible differences in chemical emissions between the two sources of drywall products; and (3) evaluate the possible chemical exposures in homes that contain either of these two sources of drywall.

The LBNL data contained measures of the following reactive sulfur compounds: hydrogen sulfide, sulfur dioxide, carbon disulfide, methyl mercaptan, dimethyl sulfide, and carbonyl sulfide.

CPSC staff used the LBNL reported emission rates in a mathematical model to estimate the concentrations of the chemicals in the indoor air of a home that might result from the presence of drywall. A simple one-zone model was used to estimate concentrations of reactive sulfur gases. The model accounted for factors, such as air exchange rate and room volume, which impact the concentrations of chemicals in the indoor air. It was assumed that the ceilings and walls of all rooms in the home were covered with drywall. In addition, the model includes reactive decay rates to account for the chemical reaction between the reactive gases and surfaces in the room, such as furniture and carpeting.

[1] http://www.cpsc.gov/info/drywall/interimidguidance012810.pdf

There are a number of uncertainties that limit the ability of the model to accurately estimate the levels of sulfur gases in actual homes. The tested wallboard samples were from a warehouse, where the stacking may have limited emissions of the sulfur compounds during storage and increased the tested chamber emissions relative to drywall that had been installed in homes. The tested drywall samples were not painted or otherwise coated, which likely increased drywall emissions relative to drywall installed in a home. Homes may have drywall from multiple manufacturers and sources. There is also a general lack of data on reactive decay rates for the sulfur gases. The decay factors used in the model are estimates based on professional judgment, and it is unknown whether they may over or under-predict results in actual homes.

The top ten reactive sulfur emitting drywall samples are from China. The patterns of reactive sulfur compounds emitted from drywall samples show a clear distinction between the Chinese drywall samples manufactured in 2005/2006 and NA drywall samples, except for two such Chinese samples that have similarities to the NA emission profile. Finally, several Chinese samples manufactured in 2009 demonstrate a marked decrease in sulfur emissions as compared to the 2005/2006 Chinese samples.

While the data provided by LBNL to date are limited and the sample size is small, these data provide important information about chemicals that may be emitted from older Chinese drywall but are not released from NA drywall. Based on these preliminary results, the most salient difference between older Chinese and NA drywall is in the number and amount of reactive sulfur compounds emitted.

The data and analysis presented here are preliminary. This evaluation on reactive sulfur compounds will be followed by a more comprehensive exposure study once additional chamber data become available. CSPC staff will also continue its evaluation of possible health effects by comparing the emissions determined in the chamber studies and the Environmental Health and Engineering 51-home study with concentrations of compounds known to result in health effects as noted in the scientific literature.

Bacterial Study

Various parties have proposed that sulfur-reducing bacteria may be a source for sulfur emissions from problem drywall. Environmental Health & Engineering, Inc. (EH&E), under contract with the CPSC, conducted a study on a limited preliminary sampling of ten drywall samples and found no apparent difference in the presence or absence of sulfur-reducing bacteria between imported Chinese drywall and U.S. domestic drywall.

EH&E submitted ten drywall samples (four Chinese and six U.S.) supplied by CPSC to EMLab P&K for evaluation for the presence of sulfur-reducing bacteria. These drywall samples were collected by CPSC staff from manufacturers, drywall suppliers, and storage warehouses. U.S. samples were manufactured in 2009 while Chinese drywall samples were manufactured in 2006. These drywall samples were not obtained from individual homes and were unfinished (*i.e.*, no paint, plaster, or other modification had been applied). Additional sub-samples of these same Chinese drywall samples were among those tested in emissions chambers by LBNL, including several which were among the highest hydrogen sulfide emitters in the LBNL testing.

The paper and the gypsum core of each sample were evaluated separately for the presence of sulfur-reducing bacteria. No bacterial growth was observed in the twenty paper samples. Sulfur-reducing bacterial growth was detected in one of four Chinese gypsum core samples and one of six U.S. gypsum core samples.

There are limitations to this study. The culture conditions selected for use are for known species of sulfur-reducing bacteria. However, this does not exclude the possibility that sulfur-reducing bacterial species that are not known to the scientific community may be present in the drywall. Furthermore, the low number of colony forming units that were found in the two core samples do not necessarily support the contention that sulfur-reducing bacteria were metabolically active in the problem drywall and causing the emission of sulfur gases, the reported health effects, and the reported corrosion to metal components in homes.

With this limited preliminary sampling of ten drywall samples, there appears to be no difference in the presence or absence of sulfur-reducing bacteria between imported Chinese drywall and U.S. domestic drywall. One sample of Chinese drywall and one sample of U.S. drywall demonstrated very low levels of sulfur-reducing bacterial growth; the remaining samples showed no bacterial growth.

Ongoing Work: Evaluation of Electrical, Gas Distribution, Fire Safety and HVAC Components

Sandia National Laboratories (Sandia) is assessing the long-term effects of problem drywall on the safe operation of electrical components. Results of this work are expected by the summer of 2010. The study will accelerate corrosion on exemplar samples of electrical components as a means of inferring the long-term effects of the corrosive gases emitted by the drywall on the safety of the components. Based on LBNL's determination that the primary corroding gas emitted by the problem drywall is hydrogen sulfide, and measurements of hydrogen sulfide in affected homes by EH&E, Sandia will conduct a chamber study using a standardized mixed-flowing gas test procedure to accelerate the corrosion rate of various electrical components exposed to hydrogen sulfide.

The National Institute of Standards and Technology (NIST) is assessing the immediate and long-term impacts of problem drywall emissions on the performance of gas distribution, fire safety, and HVAC components. Results of this work are also expected by the summer of 2010. The NIST Material Science and Engineering Laboratory is conducting metallurgical and corrosion analyses of these components to characterize the nature of corrosion and the extent of damage. In addition, NIST's Building and Fire Research Laboratory is evaluating the performance of residential smoke alarms and fire sprinklers to determine if there can be a loss of functionality of these components from exposure to drywall emissions. The assessment involves analysis of component samples collected from homes and the evaluation of exemplar samples after accelerated aging at Sandia, noted above, to assess long-term performance.

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