

**CPSC INVESTIGATION OF IMPORTED DRYWALL**  
***STATUS REPORT, JULY 2009***

**I. Background**

In late December 2008, CPSC first began to receive drywall-related complaints from consumers. The chief complaints were obnoxious odors emanating from the drywall; corrosion of metal items inside the home, especially copper air conditioning coils; and short-term health effects generally involving the upper respiratory tract. CPSC staff first contacted the Florida Department of Health about the drywall issue on January 23, 2009.

CPSC staff assembled a team to address the emerging issue. On March 25-27, 2009, four members of CPSC's Drywall Team traveled to Florida to meet with county health officials and to visit four affected homes in the Tampa area. The team members observed firsthand the noxious smell in the homes, as well as varying levels of corrosion in electrical outlets, circuit breakers, mirrors, plumbing fixtures, and air conditioning coils. While in the homes, they also consistently experienced some throat irritation, scratchy eyes, headache, and other symptoms that tended to clear up or dissipate after some time outside the homes.

To date, CPSC has received 608 incident reports relating to drywall from 21 states and the District of Columbia. The majority of the reports are from Florida, Louisiana, and Virginia.

**II. Federal Coordination**

On April 14, 2009, CPSC staff hosted a joint meeting with the Environmental Protection Agency (EPA) and the Centers for Disease Control and Prevention (CDC)/Agency for Toxic Substances and Disease Registry (ATSDR). Senior staff from these agencies met in order to discuss coordination of a federal action plan to address the health hazards from Chinese drywall. The group agreed that CPSC would take the lead role in this investigation and that EPA and CDC would support our efforts. The multi-pronged, concurrent approach suggested by CPSC staff included import investigations; field measurements in the affected homes; chamber studies to assess the possible health risk (to homeowners and workers) and corrosion to electrical, gas, and fire safety systems; and laboratory studies on gypsum elemental characterization and environmental release from waste disposal sites.

CPSC staff has since held regular weekly calls to discuss developments and plan next steps. EPA's Emergency Response Team is developing a protocol that will inform the federal protocol for the air testing program. CDC/ATSDR will also assist in the development of a public health awareness publication at some future point in time.

### **III. Progress in the Investigation**

#### ***A. Materials Used to Manufacture Drywall***

One focus of the CPSC staff's investigation is to determine whether the imported drywall contains substances not usually found in drywall made domestically. The team consulted the United States Geological Survey and conducted its own literature reviews about gypsum mining in China, and particularly in ShanDong province, which was known to be the point of origin of at least some of the problem drywall.

An academic paper published in 2009 discussed Chinese gypsum and its tendency to emit odors.<sup>1</sup> The authors found that the Chinese gypsum ore and the finished Chinese wallboard were both sources of unpleasant sulfur-like odors. In comparison, non-Chinese samples contained some similar substances, generally at much lower levels, and did not give off the same smell. The authors thought that some of the odor-related compounds might be derived from the raw materials, while others could have been introduced as a result of processing conditions such as crushing and heat. CPSC staff suspected and later confirmed that the Chinese samples used in this study were from the LuNeng mine, located in ShanDong province. In 2006 and earlier, this mine was the sole source of gypsum used by a large manufacturer of plasterboard, which probably manufactured more of the drywall exported to the United States in 2006 than any other company. The academic paper was commissioned by the manufacturer in 2006 when they began to receive complaints of malodorous drywall in Florida.

To become more familiar with drywall manufacturing, members of the Drywall Team toured a domestic wallboard manufacturing facility. The manufacturing process used at this particular U.S. plant is similar to the Chinese manufacturing operations that made the problem drywall in 2006. The staff at the manufacturing facility pointed out where other chemicals could or would be added by a Chinese manufacturer and identified potential additives.

It is possible that gypsum from the LuNeng mine is characteristic of gypsum from other mines in the ShanDong province, and that other manufacturers using gypsum from mines in that area may have the same problem. CPSC Compliance staff has asked our Chinese government counterpart (General Administration of Quality Supervision, Inspection and Quarantine, or AQSIQ) for a list of all drywall producers that have used the LuNeng mine. We are working to obtain the same information for other mines in the region.

#### ***B. Cooperation with the Chinese Government***

Since the beginning of our investigation, it has been increasingly apparent that some answers to the cause of the drywall problem will have to come from sources in China. With that in mind, CPSC staff took steps early on to involve AQSIQ in our investigation to the greatest extent possible under the law. The Drywall Team sent an initial list of questions to AQSIQ on April 9, 2009. AQSIQ requested, in turn, that CPSC staff arrange for a visit by two Chinese

---

<sup>1</sup> Freitag, Mayer, and Breuer, *Identification of Odor-Active Organic Sulfur Compounds in Gypsum Products*, February 2009, [www.clean-journal.com](http://www.clean-journal.com)

experts (one an academic specializing in building materials and, another, a government official with a chemistry background).

On June 15 and 16, 2009, the two Chinese experts joined CPSC staff on inspections of homes in Florida and Louisiana. On June 17, CPSC staff engaged the Chinese experts in technical discussions at CPSC headquarters and arranged meetings with EPA and CDC on that same date. At that time, CPSC staff expressed to the Chinese our view that a visit to China would be necessary, and staff requested their support. CPSC staff is following up on that request and pressing for approval for a visit to specific mines and manufacturers. Some of our initial questions have been answered, and the Chinese have volunteered additional information. CPSC staff continues to follow up with them to obtain answers to outstanding questions.

### *C. The Chain of Commerce: Tracing Drywall Imports and Complaints*

Another key ingredient of the investigation is to establish the provenance of the problem drywall. The Drywall Team is pursuing a comprehensive approach to learn where all the known imports of Chinese drywall went and where all the problem drywall came from. CPSC staff began with information gleaned from the Customs and Border Protection databases, and then sent requests for information to drywall importers and to builders who are suspected of using imported drywall. As CPSC staff learns more, the staff is prioritizing our work and following up with other entities in the supply chain to piece together the whole picture.

Compliance Field staff is conducting inspections of selected importers and securing samples of imported drywall. All of the major domestic gypsum manufacturers have also been inspected and samples obtained for comparison with the samples of imported product. New imports of drywall from China have decreased dramatically to a very low volume. Compliance Field staff is working closely with CBP to ensure that CBP notifies CPSC if any new materials are presented for clearance. Staff is working hard to determine exactly how much drywall was imported into the United States. Unfortunately, that effort is hampered by the dual use of the same commodity code as acoustic or ceiling tiles. CPSC is developing a more accurate accounting through manufacturer and trading company records. To date, CPSC staff has confirmed that 5,503,694 sheets of Chinese drywall were imported into the United States during 2006. This is not all of the imports; staff is continuing to verify more shipments.

Field staff is also conducting In-Depth Investigations (IDIs) of complaints received by CPSC. Staff developed a selection process to prioritize the complaints for investigation. The assignments reflect three different exposure scenarios:

- locations reporting both health effects and corrosion to home components,
- locations reporting health effects but no corrosion, and
- locations reporting corrosion but not health effects.

The selection process takes into consideration and includes a range of dwelling settings (e.g., single family homes, condominiums, townhomes), the geographic distribution of incident reports (with the number of assigned IDIs weighted towards states with the greatest percentage of

incident reports), and incident reports with notations of unique corrosion or home appliance and component failures. Thus far, Field staff has completed 49 of 51 IDIs initially assigned.

#### **IV. Health Effects Analysis**

CPSC Health Sciences staff is pursuing three major tracks in order to evaluate the relationship between drywall emissions and consumer reported health effects. The three tracks for assessing the impact on human health are *elemental analysis*, *emission chamber studies*, and *in-home indoor air sampling*.

##### ***A. Elemental Analysis***

The purpose of elemental analysis is to characterize the components of domestic and imported drywall. The Environmental Protection Agency's Emergency Response Team (EPA ERT) agreed to do an analysis of 15 samples provided by CPSC staff. The 15 samples consist of uninstalled drywall from a variety of sources, including imported drywall, domestic calcined drywall, and domestic synthetic drywall collected from warehouses, suppliers, and manufacturers. The drywall samples will be analyzed for organic and inorganic compounds, metals, and other properties. CPSC staff sent 14 samples to EPA ERT on June 22, 2009. EPA ERT stated that their analysis will be completed by August 21, 2009.

##### ***B. Chamber Studies***

The purpose of the chamber studies is to isolate the drywall's chemical emissions from those of other products that can be found in the home (e.g., carpets, cleaners, paint, adhesives and beauty products) so that CPSC staff can determine what gases are emitted from each drywall sample. These laboratory investigations will provide quantitative data which will enable CPSC staff to model exposure and to perform a preliminary health risk assessment. The emission factors will be presented in a way that is sufficient for deriving exposure concentrations in consumer homes.

A contract for the chamber studies was awarded to Lawrence Berkeley National Laboratory (LBNL) on June 9, 2009. CPSC has shipped the imported and domestic drywall samples to LBNL. These include samples from the same 15 sources as the samples undergoing elemental analysis described above.

The chamber studies will proceed in two phases. The Phase I studies will screen drywall samples in controlled chambers to identify the chemicals (particularly sulfur containing but also major volatile organic compounds and other irritant gases) emitted from uninstalled drywall. The Phase I studies will be completed by late August 2009. A preliminary health risk assessment will be completed by CPSC staff by mid to late September 2009. The Phase II chamber studies will focus on a limited number of higher emitting materials identified in the Phase I studies. The Phase II studies will also characterize factors that influence long-term emissions such as temperature, moisture, ventilation, and wall treatments (e.g., paint, joint compound, texture, paper) and will commence upon completion of Phase I. Results from the *in-home sampling* studies (described below) will also inform the Phase II study design.

### ***C. In-home Indoor Air Sampling***

In-home indoor air sampling will be carried out on 50 homes (35 target homes selected from CPSC's incident report database and In-depth Investigation database, plus 15 control homes). A contract for this work was awarded to Environmental Health and Engineering (EHE) on June 1, 2009. The in-home indoor air sampling consists of residential building characterization and indoor environmental measurements in selected target residences with imported drywall and in control residences without imported drywall. The data from the residential building characterization activity will be incorporated into a relational database such that statistical trend analysis can be performed with respect to the indoor environmental measurements.

CPSC staff developed a methodology for selecting target homes. We expect to begin making contact with and scheduling of pilot test homes by late June 2009. Preliminary work by EHE including in-home sampling protocol refinement and pilot study performance will be completed by mid-July 2009. The 50 home in-home sampling will begin about July 20, 2009 and is scheduled for completion by late August 2009. Laboratory analysis of collected samples and receipt of a draft final report is expected to be completed by mid-September 2009.

## **V. Engineering Analysis**

The objective of the Engineering Sciences test program is to determine the effects of emissions from Chinese drywall on electrical/gas/HVAC components and fire safety equipment with respect to possible fire and shock hazards. The testing will consist of two major phases: examination of various components harvested from affected residences, and the reaction of new components to elevated levels of gases (identified in chamber studies of Chinese drywall samples) as part of an accelerated corrosion test program.

### ***A. Affected Home Site Inspections***

CPSC Engineering staff has visited homes in Florida, Virginia, and Louisiana to conduct a preliminary assessment of the extent of corroded components present in homes reported to have been constructed with imported drywall and any acute effects that may signal an impending safety problem. The home site inspections include the following:

1. Visual observation of the level of corrosion and photographic documentation of components of interest
2. In-situ functional testing of safety devices (e.g., ground-fault circuit-interrupters, smoke alarms)
3. To the extent possible, operation of home appliances to see evidence of potential problems that can effect life safety (e.g., cooking and heating equipment)
4. Notation of characteristic odors purported to have been related to the installation of imported drywall and positive identification of the presence of imported drywall in the home.

On June 2, 2009, CPSC Engineering staff visited a townhome community in Chesapeake, Virginia in which the builder is conducting a removal of drywall and affected components. Unoccupied homes in various stages of remediation were visited. In addition, site visits were made to two occupied homes in Louisiana. All of the homes that were visited exhibited characteristic effects that have been attributed to the presence of imported drywall. All of the houses staff visited had a very distinctive and pervasive “chemical” odor, which was found (subjectively) to be very similar in homes in Florida, Louisiana, and Virginia. Copper components were widely affected, as evidenced by the presence of a black coating on exposed surfaces, including central air conditioner evaporator coils, electrical wiring, and copper piping (including water and gas lines). Other non-safety related symptoms included tarnishing and degradation of other metallic components like picture frames, light fixtures, and mirrors.

### ***B. Incident Sample Collection (Harvesting Effort)***

The staff is collecting samples of components of interest for analysis to determine the risk of electrocution and fire hazards that may exist as a result of the corrosive gases to which they have been exposed while installed in affected homes. The harvested components will be analyzed to determine their present condition, the extent of deterioration and any possible degradation of performance of affected components that can lead to safety hazards. Staff has elected to collect samples from homes that are being remediated in order to maximize the number of available samples and minimize the impact that this collection could cause to the systems in an occupied home. CPSC staff has been coordinating with a builder in Florida and a builder in Virginia to identify candidate homes scheduled for drywall removal and replacement. We are seeking other builders doing remediation as potential sources for sample collection. The following are the components of interest:

1. Standard receptacles/light switches
2. Ground-fault circuit-interrupter (GFCI) receptacles
3. Standard circuit breakers
4. Arc-fault circuit-interrupter (AFCI) circuit breakers
5. Flexible gas connectors
6. HVAC evaporator coils and tubing
7. Gas service distribution tubing and fittings
8. Smoke alarms
9. Fire sprinklers

Sample collection is expected to be completed by September 30, 2009.

### ***C. Evaluation of Field Samples and Accelerated Corrosion Testing***

Engineering Sciences staff plans to enter into an interagency agreement to conduct corrosion analysis of affected field components; staff expects to complete this agreement in July 2009. Under the agreement, the laboratory will perform optical examination and analysis on field samples to characterize the extent and nature of corrosion found on these electrical components. The analysis will focus on contact surfaces of wire/terminal connection points to devices, individual circuit conductors, and switch contacts. In addition, the laboratory will

conduct accelerated corrosion testing and analysis of new components in an attempt to predict long-term effects of the identified gases on these components and correlate these with the collected samples.

Engineering Sciences plans to use a contractor for analysis and functional testing of gas service and fire safety components. Smoke alarms, fire sprinklers, flexible gas connectors, and gas distribution pipes will be analyzed. The analysis will include:

- Smoke alarms – to determine if their ability to sense smoke and provide notification has been compromised,
- Fire sprinklers – to evaluate potential changes in temperature sensitivity and to determine operational pressure,
- Flexible gas connectors and gas service connections – to ensure they can maintain a leak-tight condition under normal operating pressures, and
- HVAC evaporator coils and copper tubing – to determine if refrigerant leaks are possible.

#### ***D. Potential Fire Incident Follow-Up***

To date, there have been two unconfirmed reports of fire incidents involving Chinese drywall. Staff is working with the Florida State Fire Marshal's Office to get details of the incidents and explore the possibility of sample collection for testing and analysis.

## **VI. Public Affairs**

The Office of Public Affairs has focused on ensuring that the Commission's message on drywall has remained consistent, informative to the general public, and in coordination with our other federal partners. CPSC has developed a new *Drywall Information Center*, available on the CPSC Web site, to provide the public with the latest information on technical developments and news about drywall. As part of this process, the total number of consumer reports is being tracked along with the resultant number of States.