

## Portable XRF Lead-in-Paint Surveys

Information Circular #6      March 2, 1998

### 1. Background

Lead is a heavy metal, which has been known to be toxic for over 200 years. Lead affects the nervous system and in high blood concentrations can cause hyper activity and mental retardation. Children under 7 years are especially at risk for lead poisoning. The reason for this is two-fold: the human nervous system is still under development until about age seven and lead is most commonly ingested by children through hand-to-mouth contact and chewing on foreign objects. Even in small quantities lead is dangerous since it is eliminated from the body very slowly. The final result is that small but persistent exposures cause lead to quickly build up to dangerous levels in the body where it is deposited on the bones. Lead-oxide was a major white pigment in paints manufactured before ~1945, but only in 1978 it was mandated the new paint could contain no more than 0.06% lead. For this reason the United States Department of Urban Housing (HUD) requires testing of public housing built prior to 1978 for the presence of lead. HUD has set the level of *probable hazard* at 1.0 milligrams of lead per square centimeter of paint, as tested using an X-ray fluorescence analyzer (XRF analyzer). Additionally, HUD has set guidelines governing the testing and removal of lead-containing paint. Paint that is negative according to the HUD standard can be thought of as safe to leave in place if not damaged or deteriorated. For more information about lead and its dangers call the National Lead Information Clearinghouse at 1-800-424-5323.

### 2. XRF Technology

X-ray fluorescence (XRF) is a technique to identify when lead is present in paint without taking a sample or damaging the paint surface. Energy, from a small radioactive source in the XRF gun, excites the paint lead atoms, which re-emit the energy as a characteristic and quantifiable signal. The most convenient portable XRF devices are the so-called "spectrum analyzers", which automatically subtract any re-emitted energy from the substrate of the paint so as to yield a more accurate result. The result can be viewed immediately, allowing the analyst to change or fine-tune the survey during the process. XRF testing can also be quick - some tests from the newer instruments can take less than 5 seconds, so the price per test will be much less than it is for physical sampling. Portable XRF instruments are designed to detect lead at the HUD action level of 1 mg/cm<sup>2</sup>. It is the perfect screening tool, therefore, for paint, which is to be left in place. For paint not to be left in place, such as paint involved in demolition or renovation, the XRF alone might not be the right choice. The results from the instrument, in mg/cm<sup>2</sup>, are not directly relatable to standards other than HUD, such as the CPSC limit of 0.06%. If the paint is to be damaged, as during a demolition or renovation, airborne lead levels could conceivably exceed the OSHA standards even if the paint was negative by HUD standards. For demolition or renovation screening, we recommend a combination of XRF testing and physical samples, which are then tested by atomic absorption (see Information Circular #1). Occasionally, the amount of lead in paint will be so close to 1.0 mg/cm<sup>2</sup> that the XRF cannot tell whether the test point is positive or negative. In that case, a physical sample and subsequent lab testing may also be required.

### 3. AA Testing

Atomic absorption spectroscopy (AA) is a laboratory method for analyzing lead in paint. It has greater potential accuracy and sensitivity than the portable XRF, and so is the choice when relatively small amounts of lead may be a problem, such as in demolition or renovation. It requires that a sample be taken, so the paint and substrate is damaged in the process. Depending on how the sample is taken, the AA results can be either by weight (ppm or %) or by area (mg/cm<sup>2</sup>). See Fiberquant information circular #1 for details on sampling.

### 4. Fiberquant Capabilities

In 1990, HUD first recommended the then new XRF technology as a tool for screening lead-based-paint. Fiberquant recognized that, even though it takes place in the field, this is an analytical technique, which could not be done better than by our degreed scientists. Consequently, Fiberquant purchased its first portable XRF in 1990, and therefore has 8 years experience in XRF screening and interpretation. In 1997, we purchased a second-generation (faster) instrument for state-of-the-art testing. For a given survey, one or two (depending on size and complexity) analysts having degrees in chemistry or geology will perform testing according to the scope required. Some surveys will be according to HUD guidelines and test every painted building component in every room or definable area in and out of the building(s). Also available is a preliminary survey, in which fewer points are tested than in a HUD survey, with an attendant reduction of cost. A narrative report, explaining the results in plain English, is issued, along with tables of all test results, summary tables, floor plan maps, etc. documenting the survey.

For more information about Fiberquant services and prices, please feel free to call or write.