AIC NEWS
American Institute for Conservation of Historic & Artistic Works
September 2003 Vol. 28, No. 5

Inside

OSHA: A Dual Role in American Workplaces

WILLIAM COULEHAN

A wide variety of hazards can be found at American workplaces. Compliance officers from the Occupational Safety and Health Administration (OSHA) frequently share information about the more notable hazards encountered during their inspections. Some inspections suggest a high level of disregard for the safety of employees, but many hazards are only identified, often tragically, after a series of events reveal their true potential: a misaligned valve directs incompatible chemicals into a vessel. The unintended reaction generates hydrogen sulfide that fells a nearby operator. A scaffold is repositioned, and placed on an ungrounded extension cord. Over time the scaffold's leg cuts through cord's protective insulation and becomes energized, waiting for the touch of an unexpecting laborer. A touch that completes a "path to ground" eventually occurs and the electric circuit is completed. Death by electrocution is almost instantaneous.

Scenarios such as these are usually identified with the manufacturing and construction industries most often associated with OSHA's rules and regulations. However, the Occupational Safety and Health Act covers a wide spectrum of workplaces. When hazards are identified at workplaces where employees are generally not thought to be at risk, it must be determined how OSHA's rules and regula-

continued on page 5

Ten Points To Address before Trusting the Lightfastness Ratings of Non-Traditional Art Materials

ERIC EVERETT AND MARK GOTTSEGEN

Artists and designers, and especially conservators, have come to expect a greater degree of light stability from the colors they use. This is partly due to an increased awareness among those users in the last 20 years that materials are likely to change over time, and partly due to a desire to leave behind more durable works of art. The popularity of personal computers, digital cameras, and the use of non-traditional art materials (other than oils, acrylics, and watercolors) has ushered in an exploding new market for digital images printed from consumer printers, and pictures made with colored pencils (including water-soluble colored pencils), markers, oil crayons, oil sticks, pastels, and other coloring materials. There is an endless combination of inkjet inks, commercial photographic papers, and alternative coloring materials and surfaces currently available in the marketplace. However, no one is really sure how long images made with these products will remain lightfast.

Many computer printer manufacturers, ink jet ink, paper suppliers, and paint manufacturers are rushing to develop a standardized light stability test protocol that will generate meaningful test data. But, the problem is inherently complex. There are numerous

continued on page 5

OSHA
continued from page 1

tions apply. Identifying workplace hazards and developing safety programs, procedures, and policies to protect employees and comply with applicable federal, state, and local regulations are challenges all employers face.

OSHA inspections at museums, art galleries, botanical gardens, and zoos are not uncommon. Data obtained through OSHA's website lists more than 175 inspections at these facilities in the past five years. Although these institutions are not generally associated with workplace hazards, a wide range of hazards can exist and place employees at risk. These hazards include the presence of a variety of pesticides and preservatives historically used on museum collections, as well as hazards that are inherent to the artifact. For example, an occupational physician described a situation brought to his attention when a museum was preparing an interactive exhibit for children. While preparing a stuffed animal for display, a white residue was noticed on the fur. Analysis of the residue indicated it contained 1% arsenic. The arsenic had apparently migrated from the preservative used on the interior of the specimen, posing a hazard to anyone who came in contact with it.

My interest in the safety and health hazards associated with museums began after my office received a complaint and referral alleging potential exposure to arsenic and heavy metals at two different institutions. Until then, my career as an industrial hygienist with OSHA had not led me to recognize or consider museums as potentially hazardous places of employment. This changed as my office addressed the two scenarios brought to our attention.

In the first, an employee hired to photograph and catalog artifacts in storage grew increasingly concerned as more and more of the specimens included labels with hazard warnings indicating they had been treated with arsenic. When initially given the project, no procedures for the handling of the objects had been developed, nor was any information given about the nature of the hazard warnings or potential for exposure. Inquiries made to the manager of the project were rebuffed, and the employee was not directed to any person or additional sources of information. Blood and urine analyses requested by the employee's physician were positive for arsenic. After days of frustration, the employee filed a complaint with OSHA.

In the other scenario, a long-time employee worked with oriental silks. Periodically, the artifacts were removed from the displays for inspection, cleaning, and repair. Past work practices had not included the use of respirators or gloves. Symptoms indicating potential exposure to heavy metals brought the employee to the attention of an occupational physician. After concluding that the patient was potentially exposed to heavy metals in the workplace, the physician contacted OSHA.

continued on page 7

Lightfastness Ratings
continued from page 1

factors that can cause degradation of image quality. In addition to the familiar problem of exposure to UV light, consider these additional factors: ozone (or gas) fading, catalytic fading, and the effects of humidity, dark stability, and temperature. Together or individually, each can wreak havoc on a treasured image. Following are ten major issues related to light stability testing of colorants and surfaces.

1. Light

First, we must acknowledge that there is no standard light used for replicating indoor lighting conditions during a lightfastness test. Let's review some widely used laboratory light sources for light stability testing of colorants, including digital prints:

Fluorescent Lamps

Historically, light stability tests using high output cool white fluorescent lamps have been used for color photographs. For example, the standard photography test condition (low-watt cool white fluorescent light at 450 lux/12 hr. a day, 60% RH and 70°F ambient room temperature) is not even close to approximating the variety of end-use environments of computer-generated images printed with ink jet inks, or of conditions that other works of art are exposed to. The light output of cool white fluorescent lamps may somewhat reproduce low light or office environments; the spectrum of these lamps is limited. That is, the lamp's output does not match the spectral power distribution or type of light in other commercially used light sources, or sunlight through window glass.

Cool white fluorescent lamps are useful for testing products whose primary end use is in lighted display cases or in retail environments. However, making lightfastness predictions with this lamp type for images displayed in typical indoor environments (i.e., homes, offices, art galleries, or museums) is inaccurate at best. For example, images displayed near windows, sliding glass doors, skylights, and so on, can receive up to 50,000 lux of full spectrum sunlight (that is, ultraviolet light, visible light, and infrared light) in the morning hours on a clear day.

Xenon Arc Lamps

The xenon arc lamp was adapted for accelerated weathering in Germany in 1954. Xenon arc testers are appropriate for testing the lightfastness of materials because they provide the best available simulation of full spectrum sunlight: a combination of ultraviolet, visible, and infrared light. Xenon arc testing instruments require a combination of filters to reduce unwanted radiation and to achieve the appropriate spectrum (outdoor sunlight or sunlight filtered through window glass). A "window glass" filter simulates

continued on page 8

continued from page 5

In both cases, OSHA procedures necessitated unannounced inspections of the workplaces. Responding to employee complaints and referrals made on behalf of employees account for the majority of OSHA inspections. OSHA procedures do not permit the identity of the complainant to be revealed to the employer. The Occupational Safety and Health Act also protects the rights of employees to file complaints, participate in an OSHA inspection, and bring safety concerns to the attention of the employer, without fear of retribution. OSHA regulations also require employers to notify OSHA within eight hours of a workplace incident that results in the in-patient hospitalization of three or more employees or the death of an employee. New regulations expand these reporting requirements to include deaths in the workplace from fatal heart attacks.

When the workplace is covered by federal regulations, the size of the company or the number of employees does not exempt the employer from complying with OSHA standards. Although certain standards may exempt recordkeeping and written program requirements for small employers, the vast majority of OSHA standards apply to all employers, regardless of the number of persons employed.

OSHA standards can be found in Title 29 in the Code of Federal Regulations (CFR). The collection of standards found in Part 1910, commonly referred to as "29 CFR 1910," applied to the work activities described in this article. Standards found in Part 1926 apply to construction work.

Some basic regulations apply to the majority of workplaces and affect most employees. These include the requirements under the Hazard Communication (1910.1200, 1926.59) and various standards involving Personal Protective Equipment (PPE) (Subpart I of 1910, Subpart E of 1926), and the requirement under Employee Emergency Plans and Fire Prevention Plans (1910.38).

Health hazards often involve exposure to airborne contaminates. The permissible exposure limits (PELs) of common contaminants are listed in 29 CFR 1910.1000. Additional contaminates may be covered by the "Expanded Heath Standards" (1910.1001 through 1910.1052). These standards include inorganic arsenic (1910.1018), benzene (1910.1028), ethylene oxide (1910.1047), formaldehyde (1910.1048), methylene chloride (1910.1052), and other chemicals likely to be found in a museum setting. These standards require the employer to conduct initial monitoring to determine the level of airborne contamination. Additional requirements in these standards are triggered by the level of exposure, and may include requirements for housekeeping, periodic exposure monitoring, medical surveillance, and the reduction of airborne levels through engineering or administrative controls.

In addition, hazards not specifically covered by an OSHA standard but recognized and documented in consensus standards, such as the American National Standards Institute (ANSI) and the National Fire Protection Association (NFPA), can be enforced through the General Duty Clause of the OSHA act.

Upon arriving at a worksite, an OSHA compliance officer will ask to meet with management officials. At this "opening conference" the scope of the inspection, alleged hazards, and inspection procedures will be outlined. During this initial meeting, OSHA will request that safety programs and other documentation be assembled for later review. Immediately after the opening conference the compliance officer will ask to be taken to the worksite. Photographs of the work activity and confidential interviews with employees are standard procedures. If exposure to an airborne contaminant is suspected, the compliance officer will arrange to return to determine the level of exposure through personal sampling. If physical contact with the contaminant is a factor, the potential for exposure through ingestion and skin absorption will be evaluated. During one of the inspections noted in this article, this included "wipe" samples confirming that the artifacts were contaminated with arsenic.

Upon completion of the inspection, the findings of the compliance officer will be summarized at the "closing conference." This includes a discussion of the alleged violations identified during the inspection and agreement on the time required to correct the violations. For the examples cited above, these inspections included violations for the personal protective equipment hazard assessment and training required by 1910.132, the respiratory protection program required under 1910.134, and the written Hazard Communication Program and training required under 1910.1200.

Employers can discuss the citations, penalties, and actions taken to abate the hazards at an "informal conference" with the area director of the local OSHA office. This conference must be conducted within 15 working days of the receipt of the citations. Upon payment of any penalties and after proof of abatement is submitted to OSHA, the file can be closed. However, past citations can be used to support "repeat" or "willful" violations if the situations reoccur at the site. These violations mandate much higher penalties.

Ultimately, the two inspections cited above shared interesting points. The industrial hygienist who conducted these inspections summarized her findings: "I found it surprising that both institutions had well-established hazard communication programs covering 'new' chemicals brought onto the sites. All employees had been trained on the hazards associated with these chemicals and knew where the Material Safety Data Sheets (MSDSs) were kept. However, the hazards associated with the preservatives historically used on museum artifacts were not a formal part of this program, even though professional personnel at both institutions were aware of these potential hazards, the existence of these hazards in the workplace, and possessed journal articles in which these hazards were discussed in great detail. Unfortunately, this knowledge did not translate into the task-specific hazard assessments, training, and safety programs the OSHA standards require.

The fact that this information had not been conveyed to the front-line employees was clearly evident by the way gloves were used when handling the artifacts. Employees

were under the impression these gloves were intended to protect the artifact, not to prevent their personal exposure to these contaminants. After being used, the gloves were frequently placed in a location where they would readily be available for reuse, usually in pockets or on top of the work area. This helped spread the contamination to hands, coffee cups, doorknobs, and other surfaces, increasing the potential for exposure through skin absorption or ingestion."

OSHA's compliance officer noted another important point. At one of the facilities, the safety department had been aggressively addressing past safety concerns. Ventilation systems had been upgraded, air monitoring had been conducted, employees had received additional training, and work practices had been modified to reduce physical handling of the artifacts and employee exposure. However, the medical legacy of past exposures apparently remained, and contributed to the referral filed with OSHA.

Addressing the problems faced by museum staffs is made more complicated because various agencies have been charged with enforcing the OSHA's regulations. Depending on the state, OSHA standards are enforced at the federal level or through one of the state plans approved and monitored by federal OSHA. These state plans must include coverage for employees of the various state, county, city, and local government agencies. In the states in which safety regulations for private sector employees are enforced at the federal level, state legislatures are encouraged to develop additional programs for the protection of the employees of local government. Many states have developed programs to protect these employees by adopting the federal standards. However, coverage for these employees does vary greatly.

Although primarily known for its role as an enforcement agency, OSHA does have resources available to assist employers in understanding the OSHA standards and finding the resources needed to address and resolve safety issues. To publicly emphasize this point, the new positions of "compliance assistance specialists" have recently been created in each federal area office. Personnel in these positions are dedicated to non-enforcement activities and offer valuable opportunities that all employers can utilize. An example was a seminar titled "Hazards in the Arts," recently held in Chicago and co-sponsored by OSHA, the Arts-Medicine Project at the University of Illinois at Chicago, the City of Chicago Department of Cultural Affairs, and safety and health professionals from local museums.

A significant resource available to small employers is the consultation service created in every state through the OSHA act. This free service is available to help qualifying employers with on-site safety audits and the development safety programs and the management system so crucial to workplace safety. These services may provide air monitoring and wipe samples needed to determine the level of contamination and potential for exposure.

These resources and a wide array of additional information can be found at OSHA's website at www.osha.gov. The website includes information regarding OSHA standards, letters of interpretation, the locations and telephone numbers of federal and state-plan offices, consultation services, and links to other safety internet sites. The website also includes information regarding the coverage of public sector employee in selected states.

—William Coulehan, Compliance Assistance Specialist, OSHA Region V; bill.coulehan@osha.gov

Note: William Coulehan is a compliance assistance specialist in OSHA's Region V. This article is a summary of his personal experiences and is not meant to portray OSHA's official position on inspection policies and procedures.

Lightfastness Ratings continued from page 5

sunlight through window glass. It is typically used to test products whose primary service life will be indoors.

Summary

Fluorescent lamps produce a much different light spectrum than sunlight or xenon-arc lamps. A laboratory light source must be selected to best match the product's actual service environment. To help illustrate the significance of lamp selection, consider the following example: An ink predicted to last 35 years by using a cool white fluorescent lamp (450 lux/12h per day) will only last for one year at 50,000 lux at 3 hours per day (equivalent to morning sunshine penetrating through a window).

The explanation for this discrepancy is that the spectral output of the cool white fluorescent lamp source is very different than the spectral power distribution of window-glass filtered sunlight. This example clearly demonstrates the danger of making service life predictions using a low-intensity light source that does not account for high-intensity, full-spectrum sunlight.

2. Light Intensity

There is no standard light intensity (irradiance) for indoor environments. As already noted, there are dozens of possible indoor environments, each with its own unique lighting conditions. Therefore, there is not one specific laboratory irradiance level to address all of these situations. Environmental exposure levels can range from 100 lux to 100,000 lux, depending upon the light source(s).

Temperature Sensitivity of Materials

Photochemical responses are material-dependent and influenced by temperature. In combination with UV light, high temperature will accelerate the photo degradation of many materials.