

## 9.3

# Maintaining Healthy Indoor Environments

Perhaps there is no more visible and important issue facing facility managers today than that of indoor environmental quality. Employees who remain healthy will be more productive and lose fewer workdays to illness. Conversely, buildings that make employees sick may be very expensive—not only direct expenses to fix problems but also indirect expenses such as legal fees and payments to settle lawsuits. O&M procedures play a very important role in this—a healthy indoor environment cannot be sustained without careful attention to how the facility is operated and maintained, including routine cleaning procedures.

## Opportunities

Good O&M procedures are essential to creating and maintaining a healthy interior environment. Attention to O&M can actually reverse poor working conditions and greatly improve the workspaces of the Federal work force. Areas needing attention include indoor climate conditions, moisture control, HVAC system performance, lighting quality, acoustics, pest control, and cleaning procedures. Most changes in building management can be made at any time. A few changes, such as relamping and noise mitigation, are most easily accomplished during building renovation or reconfiguration of spaces.

## Technical Information

**What makes a healthy indoor environment?** Many factors keep the interiors of buildings healthy, including the following:

- Proper temperature control;
- Proper humidity control;
- Adequate removal of stale indoor air and introduction of fresh outside air (ventilation);
- Low VOC emissions within buildings;

- Control of what gets brought into buildings—from particulates tracked in on employees' shoes to pollen or vehicle exhaust entering through the ventilation system, to perfumes worn by employees;
- Avoidance of chemical-intensive pest control within buildings;
- Proper cleaning procedures, including the selection of cleaning chemicals and the performance of vacuum cleaners;
- Avoidance of mold- and mildew-producing conditions, which generally involve high humidity levels or water leaks; and
- Strict controls on smoking within or immediately outside buildings.

Note that nearly all of these conditions can be either maintained or reversed through O&M procedures.

**HVAC and indoor environmental health** are tightly interconnected. Proper maintenance will ensure that HVAC systems continue to function over their operational lives as intended by the designer. Controls, including dampers and their pneumatic or electric motors, must be checked periodically to ensure their proper operation. Filters have to be serviced or replaced at regular intervals. Flow rates of chilled water, hot water, cooling-tower water, and other fluids have to be monitored to maintain their design values.

**Volatile organic compounds** are usually the most significant chemical source of IAQ problems. When operating and maintaining buildings, all materials used in maintenance should be scrutinized for their emissions. Sources of high-VOC emissions include cleaning solvents, floor waxes and finishes, carpet shampoos, paints, and varnishes. As noted in the *Materials Selection Issues* and *Indoor Air Quality* sections of this guide, more and more zero-VOC or low-VOC products are becoming available all the time, and many are specifically marketed for their IAQ benefits.

**Biological contaminants and bioaerosols** emitted from some organisms can sometimes be the greatest IAQ problem in buildings—and are among the most difficult to control. These biological contaminants include molds and mildews, bacteria, dust mites, insects,

and rodents. Avoiding conditions conducive to the growth of these organisms should be a high priority. Most important in this regard is the control of moisture. Any leaks in plumbing or the weathertight envelope should be promptly fixed. Glazings and other building components that permit condensation on interior surfaces should be replaced or retrofit with more energy-conserving products. The seepage or wicking of moisture from the ground or from surface drainage should be stopped by changing drainage patterns around buildings or modifying basement floor and wall systems. Indoor relative humidity levels should be maintained below 50%—and in some regions, even lower.

**A well-designed track-off system** should be provided at all building entrances. Tracked-in particulates, heavy metals, mold spores, pesticides, and other chemicals can be significant sources of IAQ problems, and they can be relatively easily controlled with a three-level track-off system that provides coarser-to-finer particulate removal as people enter the building. Ideally at least 15 feet (4.6 m) of track-off system should be provided.

**Cleaning procedures** can have significant impacts on indoor environmental health. First, lack of cleaning allows the buildup of dirt and dust, which can become airborne for a variety of reasons—not the least of which is the movement of people through the building. Second, attention should be given to the types of cleaners being used, including disinfectants, waxes, polishes, and cleaning solutions; some of these merely contribute unpleasant odors, while others emit compounds that can make people feel sick. Third, vacuum cleaners should adequately contain fine particulates—HEPA filtration is most effective (or central vacuum systems that vent to the outdoors). Fourth, provide ongoing training and education for maintenance and custodial staff on product evaluation and practices to maintain good indoor environmental quality.

**Pest control** is a very important issue in many parts of the country and one that can have significant impacts on indoor environmental quality. Avoid plantings right against buildings, contain food to designated areas with resilient or hard-surface flooring that can easily be cleaned, avoid moisture problems (see above), and practice integrated pest management when pest problems do arise.

**Other considerations for healthy indoor environments include** the quality of lighting in buildings, connections to the outdoors, and the control of distracting noises.

**The General Services Administration maintains an active program to reduce toxic chemical use** in Federal buildings—both to avoid indoor environmental quality problems and to minimize environmental releases and off-site transfers of toxic chemicals. GSA's New Item Program promotes pollution prevention technologies and environmentally beneficial products and services, including cleaning products.

## References

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Olkowski, William, Sheila Daar, and Helga Olkowski, *Common-Sense Pest Control*, Taunton Press, Newtown, CT, 1991.

*Environmental Products Guide* (RCPG-0001). Catalog of environmentally oriented products (paper, paints, cleaning products, etc.) available through the GSA Federal Supply Service system; (817) 334-5215, (817) 334-5227 (fax); [www.gsa.gov](http://www.gsa.gov).