odor of low intensity might be tolerated at reoccupancy if continued observation shows that it is eliminated within several weeks.

- HVAC systems should be restored to good operating condition prior to reoccupancy. This will often involve rebalancing the system to ensure that it meets current occupancy needs. All ventilation and air distribution systems should be reasonably clean of dirt and debris (based on a detailed visual inspection). Control systems should be functional and operating in accordance with the specified sequence of operation. Outside air ventilation should be initiated before occupancy to confirm acceptable space conditions in regard to the control of odors, dust, ventilation, and thermal comfort. Continuous ventilation should be provided, where feasible.

For additional information on the commissioning or recommissioning process, *see* SMACNA's *HVAC Systems Commissioning Manual*, latest edition.

9.5 PROJECT DOCUMENTATION

Project control and concerns for liability suggest that all observations and communications regarding site IAQ be documented and retained. This should include initial project specifications, change orders, status reports, inspections, and complaints with follow-up information.

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CHAPTER 10

COMMUNICATING WITH OCCUPANTS

10.1 OCCUPANT EDUCATION

Building renovation is a disruptive and often traumatic period for occupants. Fear of environmental exposures may become a major factor, especially when unexplained emissions of dust and odors or other contaminants of concern occur in occupied spaces. This may lead to complaints based on fear or rumors. It is important for occupants to know there is a plan to protect their health.

Preceding any major renovation project, potentially impacted occupants should be presented a description of the work planned and precautions being taken for air quality protection. Risks should be presented in the context of demonstrated science (*e.g.*, not "toxic mold"). Any occupant concerns should be discussed at this point and resolved, whenever possible. Occupants whose history suggests they may have adverse reactions (*e.g.*, be allergic to dust, chemicals) should be accommodated where possible (*e.g.*, moved away from active areas). As demolition and construction progress, occupants should be periodically updated and encouraged to voice any concerns.

A periodic progress meeting (weekly) should be considered that includes a representative or group of occupants. Occupants are entitled to product MSDS and they should be encouraged to report problems or concerns before they become serious issues.

10.2 COMPLAINT RESPONSE

Despite careful planning and oversight, environmental incidents are sometimes unavoidable. Prompt response and clear communications with occupants is essential at such times. Where sources, pathways, and risks are not obvious, a troubleshooting investigation can be initiated, *see* Chapter 11. Explanations of health risks can be made by an occupational physician or industrial hygienist where there is a high level of concern. In worst-case scenarios, renovation work may need to be stopped until potentially significant health issues are resolved. Whether or not exposure can be attributed to construction activities, construction delays and evaluation costs may result from occupant-reported IAQ concerns. An effective way to pro-actively meet these concerns is the formation of a project committee including representative occupants to periodically review the status of IAQ issues and provide input. When such a process focuses on maintaining building conditions instead of perceived risks, there can be a "win/win" for all parties involved.

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CHAPTER 11

TROUBLESHOOTING

11.1 TYPICAL COMPLAINT SCENARIOS

Failure to anticipate a source of airborne contaminants or failure to properly implement controls may result in occupant exposure. Impacts may range from nuisance odor or dust to bona fide health problems. Occupant complaints may also include nonspecific health problems with only a coincidental relationship to the renovation.

The dynamic nature of a major renovation makes investigation challenging. For example:

- The location, timing, and nature of construction activities change frequently.
- Control procedures may not be consistently implemented.
- Pathways for contaminant movement may vary based on HVAC schedule, winds, etc.
- Non-construction sources of dust and odors or other contaminants of concern can impact the building during the project.
- The recall of witnesses interviewed in an investigation may not be objective (*e.g.*, type and timing of odor).

Investigation of site conditions may be initiated by one or more of the following:

- an unexpected odor episode
- an unusual accumulation of settled dust
- excessive moisture or mold growth
- failure of barriers or other site controls
- health concerns

11.2 INVESTIGATION PROTOCOL

Response based primarily on testing often fails to answer basic questions. With site conditions constantly changing, testing after the fact is likely to be inconclusive. A more direct approach, based primarily on interviews and inspection, attempts to reconstruct sources, pathways, and controls at the time of concern and look for consistency with complaint allegations.

Where the problem is episodic or intermittent, a series of brief interviews with occupants and operational personnel helps determine whether a consistent odor pattern is being reported. A preliminary screening of health concerns may consider whether symptoms described represent a plausible reaction to the pollutants involved, whether a medical opinion has been presented, and whether there is consistent timing/location with any similar cases. A medical specialist (*e.g.*, occupational physician) may be needed for diagnosis and to work with site health and safety personnel to determine causation.

Site inspection should document critical conditions, including activities at the time of past complaints. Where an IAQ management plan is in place, potentially important sources, pathways, and controls should already be known, suggesting initial priorities for inspection. Pressurization and status of HVAC systems should also be evaluated. When there is a possible moisture issue, moisture levels can be measured with a moisture meter.

11.3 DEVELOPING CONCLUSIONS

In some cases, timing, location, and type of complaints will be generally consistent with site conditions, and the following questions may be pursued:

- What was the underlying cause of the problem?
- What impact did the problem have on what area?
- What remedial measures are needed (clean-up, etc.)?
- What procedures or controls will prevent a reoccurrence?

In other cases, complaint patterns show no consistency with the project. Where this appears to be the case, other underlying causes may be explored such as non-construction sources in the building, contagious or chronic illness and, where other factors are ruled out, psycho-social pressures.

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CHAPTER 12

EXAMPLES