Construction Indoor Air Quality (IAQ) Management Plan

What is a Construction Indoor Air Quality (IAQ) Management Plan?

An indoor air quality management plan is a step-by-step approach to protecting indoor air during construction and renovation projects. People who work in an office environment spend up to 90% of their day indoors.¹ If certain protective practices are not followed during the construction phase, the air quality of a building may be compromised. Several studies show that pollutant levels indoors are two to five times greater than outdoors. Poor indoor air quality can cause “sick building syndrome,” which causes dizziness, asthma, fever, lung cancer and many other health problems, some deadly.²,³

Strategies, such as protecting absorptive materials from exposure to moisture and using filters when running equipment during installation of interior duct systems reduces the risk of poor air quality and protects the workforce during construction and building occupants after the structure is built (see Table 1 for a list of common sources of air pollution).

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental tobacco smoke</td>
<td>Other smokers</td>
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<tr>
<td>Asbestos</td>
<td>Insulating or fire-retardant building supplies</td>
</tr>
<tr>
<td>Biological contaminants</td>
<td>Mold, pollen, People plus dirty/poorly-maintained ventilation systems or water-damaged walls</td>
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<tr>
<td>Pesticides</td>
<td>Pest-controlling chemicals</td>
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<tr>
<td>Formaldehyde</td>
<td>Pressed wood products and adhesives</td>
</tr>
<tr>
<td>Other</td>
<td>Paints, adhesives, copying machines, air fresheners and other cleaning materials and chemicals</td>
</tr>
<tr>
<td>Gases</td>
<td>Radon (entering a building through cracks from water and/or natural breakdown in rocks and soil), Carbon Monoxide (combustion, exhaust, heating systems)</td>
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</tbody>
</table>

How to Implement a Construction IAQ Management Plan

The Construction IAQ Management Plan is developed during the design phase (see Integrated Design Process strategy) and implemented at the outset of the construction

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² See US EPA’s webpage on Health Effects due to poor indoor air quality for a list of identified illnesses.
³ Also see Health Impact at WHO’s webpage on Indoor Air Pollution and Health.
phase. The IAQ plan also addresses the period between completion of construction and occupancy. The following guidelines will help protect indoor air quality:

**Emission Control During Construction**

- Accelerate emissions of wet products by using high ventilation.
- During high emission periods, protect workers and increase ventilation.
- Delay installation of adsorbent (fleecy) materials such as carpet, furniture, or ceiling tiles until emissions from other construction contaminants (e.g. wet product emissions) have dissipated. Otherwise, these materials will adsorb the contaminants and later release them during occupancy.
- Protect ducts from construction dust and debris. Keep ducts clean.
- Delay occupancy until emissions have subsided.
- Continue high ventilation rates for a significant period after occupancy.

**Isolation of Construction Contaminants When Occupants are Present**

An isolation strategy is usually necessary for effective IAQ control, but it is made more feasible to achieve when pollutant emissions are also controlled through material selection and installation strategies.

- Establish a complete physical enclosure to the construction zone.
- Seal all return ducts to insure that contaminants do not enter the HVAC system.
- Using existing and temporary exhaust fans (negative air machines) establish a containment zone under significant negative pressure (e.g., 5 to 10 Pa. or 0.02 to 0.04 w.g.). The supply air to the construction area may also need to be shut down.
- Monitor pressure relationships to insure that the containment zone is under significant negative pressure, and that the construction zone beyond the containment area is under negative pressure relative to all surrounding occupied spaces on the same and on adjacent floors.
- Insure that exhausted contaminants do not re-enter the building through open windows or the air intake of the HVAC system.
- Maintain the occupied spaces under positive pressure relative to the outside.

The following list includes some of the construction IAQ management elements outlined in the US Green Building Council’s LEED Rating System for Existing Buildings to prevent IAQ problems resulting from renovation projects. These strategies can help maintain the comfort and well-being of construction workers and building occupants.

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5 LEED for Existing Buildings (2009).
During construction, meet or exceed the recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3).

Perform a flush-out procedure as follows: After construction ends and all interior finishes have been installed, install new filtration media and flush out the affected space. The flush out must be done by supplying a total outdoor air volume of 14,000 cubic feet per square foot of floor area while maintaining an internal temperature of at least 60° F and maintaining a relative humidity no higher than 60% where cooling mechanisms are operated. The affected space may be occupied only after the delivery of at least 3,500 cubic feet of outdoor air per square foot of floor area and the space has been ventilated at a minimum rate of 0.30 cfm per square foot of outdoor air or the design minimum outside air rate (whichever is greater) for at least 3 hours prior to occupancy until the total of 14,000 cubic feet per square foot of outdoor air has been delivered to the space. The flush-out may continue during occupancy.

Protect stored on-site or installed absorptive materials from moisture damage.

If permanently installed air-handlers must be used during construction, filtration media with a minimum efficiency reporting value (MERV) of 8 must be used at each return air grille, as determined by ASHRAE Standard 52.2-1999 (with errata but without addenda 1). Replace all filtration media immediately prior to occupancy.

Upon the completion of construction, HVAC and lighting systems must be returned to the designed or modified sequence of operations.

In addition to construction IAQ management, it is important to develop and implement an on-going IAQ management program. The US EPA Indoor Air Quality Building Education and Assessment Model (I-BEAM) provides guidance for IAQ management.

Benefits

- Protects the health of the construction team during construction phase
- Protects the health of the occupants following construction
- Prevents potential health problems by reducing airborne mold and bacteria
- Increases productivity of occupants through thermal comfort and proper ventilation
Costs

When combined with an integrated design process, ensuring good air quality is not a major financial burden. The implementation of the Construction IAQ Management Plan does require extensive coordination amongst the project team.

Resources

Whole Building Design Guide – Enhance Indoor Environmental Quality
http://www.wbdg.org/design/ieq.php

US Environmental Protection Agency – iBeam
http://www.epa.gov/iaq/largebldgs/i-beam/index.html

US EPA – Indoor Air Quality
http://www.epa.gov/iaq/

USGBC – LEED for Existing Buildings (2009)
www.usgbc.org/leed/eb/

Medline Plus – Indoor Air Pollution

US Department of Labor – Occupational Safety and Health Administration: IAQ

US EPA – Office Building Occupant’s Guide to Indoor Air Quality
http://www.epa.gov/iaq/pubs/occupgd.html

AIHA – Guidelines for Selecting an Indoor Air Quality Consultant

Whole Building Design Guide – Natural Ventilation
Definitions and design recommendations for non-mechanical ventilation
http://www.wbdg.org/resources/naturalventilation.php?r=ieq