

Sustainable Operating Plan

Prepared for

**Spelman College
Student Housing, Dining Hall &
Structured Parking Garage
Atlanta, Georgia**

By S. Thompson



DELIVERING SUSTAINABLE, HEALTHY, HIGH PERFORMANCE BUILDINGS

Commissioning & Green Building Solutions, Inc.

Introduction

Spelman College has chosen to demonstrate its commitment to stewardship of the earth's natural resources and the health of its building occupants and visitors by applying the principles of sustainability to the design, construction and operation of its new Student Housing, Dining Hall, and Structured Parking Garage facility.

To accomplish this goal the new building is designed and constructed to the U.S. Green Building Council's LEED™ certification standards including building commissioning to assure that all building systems operate as designed. To encourage this level of commitment to the environment and to provide a healthy, comfortable, safe workplace, the Student Housing, Dining Hall, and Structured Parking Garage has also adopted a Sustainable Operating Plan. This plan includes policies adopted by the college, cleaning product purchasing requirements, cleaning procedures, communication strategy for identification and remediation of problems, construction standards for future retrofit, renovation or alterations of the site, use of integrated pest management, and a written training program.

At times understanding what something is can be more easily defined by describing what it is not. Thus, the concept most essential to understanding green housekeeping practices is that it is not simply replacing one product with another.

A Sustainable Operating Plan is not:

- just replacing a toxic product with a less toxic or non-toxic alternative
- just replacing a product made from non-renewable ingredients with one made from renewable or bio-based alternatives
- just replacing disposable items made from 100% virgin materials with those made from recycled materials

A Sustainable Operating Plan is:

- a process that allows the reduction in the overall impacts on human health and the environment
- an approach that takes a holistic view of a facility, its mission and the activities that take place within the facility.

The success of a sustainable operating plan hinges not on the products, but on a larger principle – **stewardship** – that strives to mobilize human resources including owners, occupants, cleaning/maintenance staff or outside contractors, visitors and vendors to minimize health and environmental risks while maximizing occupant morale and productivity.

After many years of research the EPA cites indoor environmental pollution as a serious health threat. Approximately 90-90% of our time is spent indoors where it has been documented that the indoor air in many instances is many times worse than outdoors. According to the EPA, the quality of a building's indoor environment is a combined product of the site, climate, building system, contaminant sources, and activities of occupants.¹

¹ U.S. Environmental Protection Agency

Indoor sources of pollutants are building materials and furnishings, equipment and supplies, dirt and moisture, cleaning operations, maintenance and operations, occupants and their activities. By utilizing the U.S. Green Building Council's LEED™ certification process in the construction of this facility, procedures were followed to limit the contaminants entering the building during the construction process. By adopting a Green Housekeeping or Sustainable Operating Plan further efforts are made to keep undesirable contaminants out of the building.

Toxic chemicals found in many cleaning products and pesticides can jeopardize the health of janitorial and maintenance staff as well as building occupants. Recently, the importance of reducing janitorial and maintenance staff exposure to the hazardous chemicals contained in the tools of their trade has been gaining attention from environmental and regulatory agencies. Studies are reporting that each year about six out of every one hundred professional janitors are injured by the chemicals they use. Burns to the eyes and skin are the most common injuries, followed closely by breathing toxic fumes. One third of the cleaning chemicals used today have ingredients that can harm you.

The purpose of this Sustainable Operations Manual is to provide the framework for maintaining a facility that reduces the overall impacts on human health and the environment

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Sustainable Operating and Site Management Plan

I. Construction Phase

Specifications

- Construction IAQ
- Construction Waste Management

Plans

- Indoor Air Quality (IAQ) Plan
- Construction Waste Management Plan

II. Post Construction / Pre-Occupancy Phase

Clean up

III. Occupancy Phase

Policies

- Stewardship
- Non-Smoking
- Integrated Pest Management
- Purchasing
- Recycling

Products

- Purchasing Guidelines
 - Cleaning Compounds
 - Paper Products
 - Janitorial Equipment
- Chemical Storage

Procedures

- Indoors
 - Cleaning
 - Integrated Pest Management
- Outdoors
 - Landscaping & Grounds
 - Roofs
 - Driveways/Walkways/Parking Lots
 - Integrated Pest Management
- Maintenance
 - HVAC
 - Grounds Keeping Equipment



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Training

Environmental Stewardship Committee
Policies/Specifications
Communication & Documentation
Procedures
References

IV. Renovations

V. References

Plan

Cleanup and Construction IAQ Management Plan

Prepared for
SPELMAN COLLEGE

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DELIVERING SUSTAINABLE, HEALTHY, HIGH PERFORMANCE BUILDINGS

Commissioning & Green Building Solutions, Inc.

4420 South Lee St
Buford, GA 30518



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SECTION 1

Overview

The following plan will be implemented to prevent indoor air quality problems resulting from the construction process. Poor control of indoor air quality (IAQ) during the construction activities produces odors, dust, and air pollutants, and moisture intrusion and absorption into building materials which can cause health and comfort concerns to construction workers as well as building occupants. To minimize the negative effects and reduce risk, the construction team must take measures to manage the IAQ during the construction process. By effectively managing the IAQ during construction, health and comfort issues that can result from the construction process can be reduced significantly.

This Construction IAQ Management Plan describes the types of pollutants that may be generated during construction, areas affected by these pollutants, the activities likely to produce pollutants and IAQ problems, and the classification of the pollutants. Most importantly, Section 7 contains the required measures to control the indoor air quality during the construction of the project. The construction manager will be observing the site during construction to help ensure compliance with the Construction IAQ Management Plan. The commissioning authority will verify correct filtration is in place prior to HVAC system start-up and operation. The controls contractor will trend the hours of air handler operation, return air and outside air damper positions during building flush-out at the end of construction, during furniture, fixture and equipment move-in. The building will be flushed with 14,000 cu. ft. of fresh air per sq. ft. of floor area prior to occupancy or the contractor will conduct a baseline indoor air quality test consistent with the EPA Protocol for Environmental Requirements, Baseline IAQ and Materials, for the Research Triangle Park Campus.

Construction workers will not smoke or use smokeless products within the building during construction. Smoking is not permitted on campus.



SECTION 2

Potential Sources of Odor and Dust

The following table lists potential sources of odor and dust, as well as the type of contaminant produced by each source.

Source	Type
Pressed wood products	VOCs
Treated wood products	VOCs
Adhesives	VOCs
Sealants	VOCs
Glazing compounds	VOCs
Caulking	VOCs
Grouting	VOCs
Wood preservatives, finishes and paint	VOCs
Control and/or expansion joint fillers	VOCs
All hard finishes requiring adhesive installation	VOCs
Wall coverings	VOCs
Solvents	VOCs
Fuels	VOCs
Cleaning agents	VOCs
Pesticides	VOCs
Epoxy flooring/finishes	Particulates, VOCs
Gypsum board and associated finish processes	Particulates, VOCs
Concrete	Particulates
Plaster	Particulates
Roofing	Particulates
Insulation	Particulates
Carpeting	Particulates
Other flooring	Particulates
Ductwork	Particulates
Ceiling panels	Particulates
Exterior insulation and finish system (EIFS)	Particulates



Source	Type
Automotive exhaust	Combustion products
Generators	Combustion Products
Saws	Combustion Products
Compressors	Combustion Products
Welders	Combustion Products
Forklifts	Combustion Products
Troweling machines	Combustion Products
Conveyors	Combustion Products
Pressure washers	Combustion Products
Mixers	Combustion Products
Cutting torches	Combustion Products
Portable heaters	Combustion Products
Soldering guns	Combustion Products
Cigarette smoke	Particulates, Combustion products
Moisture, Water	Biological materials
Bathrooms	Biological materials
Food products	Biological materials

Notes:

VOCs = volatile organic compounds



SECTION 3

Potential Sources of Mold & Mildew

Conditions that are conducive to microbial amplification resulting in mold and mildew growth require a food source and moisture. Building materials, dirt and debris are excellent food sources that mold and mildew thrive on if moisture is present. Mold growth, which is a symptom of moisture problems in a building, occurs when the following conditions are present:

- Temperature between 45 and 95 degrees Fahrenheit (°F)
- Oxygen
- Organic nutrients (many building materials provide food for mold growth)
- Moisture (water or RH above 70 percent)

The only one of these conditions that is easily controlled is moisture.

The construction of a building provides many opportunities for mold and mildew growth in the building before the building is even completed. Contractors must exercise great care in protecting the building and its materials during the construction process to prevent indoor air quality problems from affecting the building occupants after completion. Moisture intrusion from rain water before the building is dried-in, moisture generated in the building after dry-in, and the sequence the HVAC system is started and operated are all critical to managing indoor air quality during construction. Because of the magnitude of potential mold and mildew problems, it is extremely important to implement the control measures described in Section 7.

Determining the sources of moisture/mold growth and understanding the concepts of relative humidity, humidity ratio, and dew point are also crucial to understanding moisture related problems in buildings. In addition, it is critical to know how architectural features alone or in combination with the HVAC system can affect the potential for excess moisture buildup and mold growth.

Mold growth is dependent on the level of moisture and can be affected by direct moisture intrusion (such as rainwater) or by relative humidity of the air, because relative humidity determines how much moisture a porous material (such as gypsum wallboard) will absorb.

Some key concepts are as follows:

The *relative humidity* is the ratio of the amount of moisture vapor in the air at a given temperature to the maximum amount of moisture vapor the air can hold at that temperature.

The amount of moisture vapor that air can hold is heavily dependent on the temperature of the air sample. At higher temperatures, air can hold more moisture. Therefore, to calculate relative humidity, both the absolute moisture level and the temperature of the air must be determined.



Humidity ratio is the ratio of the weight of the moisture vapor in the air to the weight of the air. It is usually expressed as grains of moisture vapor per pound of air (grains/lb). Humidity ratio is an important value in moisture and mildew evaluations because it characterizes total moisture in a space.

EXHIBIT 1

Relationship Among Dew Point, Humidity Ratio, and Relative Humidity at Various Temperatures

At a given dew point and humidity ratio, a slight increase in temperature results in a significant decrease in RH.

Humidity Ratio (grains/lb)	Dew Point (°F)	Relative Humidity at 70 °F (%)	Relative Humidity at 75 °F (%)
54	50	49	38
65	55	59	45
78	60	71	54
93	65	84	64
111	70	100	76

Dew point is the temperature at which moisture in air begins to condense. At a given temperature, relative humidity, and absolute moisture level, the dew point is the air temperature at which the same absolute moisture level would represent 100 percent relative humidity. When the ambient temperature drops below the dew point temperature, the air can no longer hold all its moisture vapor and the moisture will therefore condense onto surrounding surfaces.

Both dew point and humidity ratio are constant with air temperature; they do not vary with temperature as relative humidity does. Exhibit 1 illustrates the relationship between relative humidity, dew point, and humidity ratio at several representative temperatures.

As can be seen in Exhibit 1, relative humidity varies significantly with temperature at a given dew point and humidity ratio. HVAC systems normally operate to maintain a temperature setpoint; only as a byproduct of their operation do they control relative humidity in the space. By cooling the supply air below its dew point, the HVAC system condenses moisture out of the air. The typical supply air temperature delivered by the HVAC system is between 55°F and 60°F. As shown in Exhibit 1, at 75°F, the air in a room will typically have a relative humidity of approximately 54 percent during summer months. However, if the room temperature is lowered to 70°F, the relative humidity in the room will rise to 71 percent, which exceeds the 70 percent minimum limit for mold growth.



SECTION 4

Affected Areas

Due to the nature of construction, all areas of the building will be affected by some contaminants. Additionally, the area surrounding the building will be affected by various contaminants, including dust from concrete masonry units (CMU), odors from adhesives, sealants, roofing, paints, and vehicle exhaust. All areas of the building can also be affected by moisture intrusion. Because of the magnitude of the potential dust, odors, pollutants, and risk of mold and mildew, it is extremely important to implement the control measures described in Section 7.



SECTION 5

Activities Likely to Produce Odor or Dust

Many activities during the construction are likely to produce odor and dust. Dust is produced during the following activities:

- Cutting materials
- Drilling materials
- Sawing materials
- Sanding materials
- Rasping EIFS

Odors are potentially emitted during any activity which involves the following products:

- Adhesives
- Sealants
- Paints
- Solvents
- Cleaning supplies

The following construction activities produce combustion products:

- Welding
- Cutting using torches
- Sawing using chainsaws
- Soldering

Additionally, every day activities such as smoking produce particulates and odor which results in a film of resin on surfaces. No smoking or smokeless products are permitted within the building or on campus during construction.



SECTION 6

Classification of IAQ Problems

Class 1

Class 1 air pollutants are expected to have only a nuisance impact on exposed occupants. Only very sensitive individuals should have adverse reactions to these pollutants. Activities which produce small amounts of dust and light dust disturbance, such as sweeping, are classified as Class 1.

Class 2

Class 2 air pollutants could cause moderate but temporary health impacts on some occupants. The majority of the activities listed in "Section 5 – Activities Likely to Produce Odor or Dust" are classified as Class 2.

Class 3

Class 3 air pollutants are the more hazardous air pollutants which could cause severe, acute, or chronic illness.

The following activities and pollutants are classified as Class 3:

- Disturbance of products of combustion
- Heating of roof tar
- Application of enamel paint
- Mixing of epoxy resins
- Non-vented operation of gasoline or diesel-powered equipment
- Microorganisms i.e. Staphylococcus, various species of fungi, spores, bacteria commonly referred to as mold & mildew.



SECTION 7

Control Measures

Several control measures may be necessary to maintain good indoor air quality during construction. The control measures required in this project, HVAC protection, moisture control, source control, pathway interruption, housekeeping and scheduling, are described in the following sections.

7.1 HVAC Protection

When possible, conduct all cutting and grinding of cementitious/masonry materials prior to delivery and installation of HVAC materials (supply and return ductwork, diffusers, grills, filters, terminal units, etc.) and equipment.

Once on site, protect all supply and return ductwork, accessories and HVAC equipment from dust, dirt, moisture and other airborne contaminants by covering with plastic or other suitable material. Secure tightly at openings to protect ductwork and HVAC equipment from collecting dust and odors (odors can “stick” to porous materials in the system and later be released).

Once installed, protect all surfaces of ductwork, duct insulation, accessories and equipment that will contact supply and return air during operation from dirt, moisture, and contaminants by sealing off ductwork and equipment openings during activities that may cause contamination such as sheet rocking, painting, demolition, etc. The General/Design Build Contractor and the HVAC contractor shall inspect often to ensure the integrity of the seal. The commissioning authority will randomly check the ductwork and associated equipment throughout the construction process to help ensure compliance with this Construction IAQ Management Plan.

Schedule installation of exterior duct insulation after building is dried-in and replace duct wrap that has become wet. Complete installation of HVAC insulation prior to start-up of HVAC systems operating in cooling mode. Develop and implement a startup plan that minimizes infiltration of warm outside air into the building during warm and humid periods of the year. The construction team will minimize the duration that HVAC equipment is operated during construction. The HVAC system should only be operated to protect the building or acclimate materials to the environment before installation, as required by manufactures. Do not operate equipment unless required for ventilation or space conditioning.

When the HVAC equipment is started up, protect the building from interior generation of moisture and all surfaces of ductwork, accessories and equipment that will contact supply



or return air during operation from dirt, moisture and other contaminants by implementing requirements of the following subsections.

7.1.1 Return Air Side

The return air side of the HVAC system shall be shut down and sealed with plastic during heavy construction/dust generating activities. If the HVAC system must be operated the HVAC contractor will install filter media with a minimum of MERV 8 efficiency over all return openings. Contractor shall ensure a good seal between the filters and return air openings and will inspect often to ensure the integrity of the seal.

During installation of VOC containing materials, return air shall be minimized and outside air shall be maximized. The system return air should be isolated from the surrounding environment as much as possible to prevent induction of pollutants. HVAC operation should promote exfiltration of air from the building to assist with VOC removal.

Utilize maximum volume of outside air while maintaining internal temperatures of at least 60 °F and relative humidity of 60% or lower. Utilize maximum volume of outside air when practical to minimize the amount of return air used, particularly during periods of high contamination. When relying on 100% outside air, seal off return air opening or install filters, as previously described. Closed return dampers alone are insufficient to prevent air in the return ducts. Protect air handling equipment as described below. All filters must receive frequent periodic maintenance. Filtration of MERV 8 efficiency shall be maintained during the construction.

7.1.2 Central Filtration

In areas where major dust loading is expected to impact operating HVAC systems (including systems utilized for temporary heat), provide filters with at least MERV 8 dust spot efficiency. Where other control options for construction related odors are not deemed effective, consideration may be given to filtration with media such as activated charcoal or potassium permanganate. All filters must receive frequent periodic maintenance. Filtration of MERV 8 efficiency shall be maintained.

7.1.3 Supply Side

When the system is off for the duration of construction, diffusers should be sealed in plastic for further protection. At the completion of construction (prior to occupancy) the construction manager and commissioning authority will randomly observe ducts and diffusers for deposited particulate. If there is only minor particulate discharge during start-up, the discharged dust must be cleaned up prior to occupancy. HVAC contractor shall install new final filters prior to final test and balance just prior to occupancy that have a minimum efficiency reporting value (MERV) of 13 as determined by ASHRAE 52.2-1999.

7.1.4 Duct & Equipment Cleaning

If the system becomes contaminated during the construction process, the ducts and associated equipment will be cleaned after dust producing activities (identified in "Section 4 - Activities Likely to Produce Odor or Dust") have been completed in the areas served by



the HVAC system. Ductwork and equipment contaminated with dirt, debris or moisture shall be cleaned prior to flush out, permanent filter installation, and occupancy. The mechanical designer will approve the appropriate cleaning process. New filter media will be installed after HVAC system has been cleaned just prior to flush out and substantial completion and occupancy. All mechanical rooms shall be kept clear of construction debris, materials and waste at all times.

Statements shall be submitted to the construction manager and sustainability consultant from the specialty contractor performing the duct cleaning indicating which sections of duct have been cleaned and which method was used. Construction manager will randomly observe the sections which have been cleaned to verify the performance of the cleaning contractor.

7.2 Odor and Dust Source Control

As the building is enclosed the use of portable combustion type heaters (i.e. kerosene, propane) will be eliminated to prevent elevated levels of combustion product contaminants.

Utilize products (solvents, caulks, carpet, adhesives, paints and coatings, composite wood and agrifiber products) that emit low quantities of VOCs listed in the specifications. During construction activities that produce odors or VOCs provide fresh ventilation air utilizing 100% outside air when possible, rather than return air. Do not exceed the HVAC systems ability to remove moisture from outside air.

Use bottled gas instead of diesel when using fuel powered equipment. Use electric equipment when possible, such as forklifts, chainsaws or masonry saw. Equipment that is not being used should be cycled off.

Containers of wet products (paint, adhesives, etc) should be kept closed when not in use. Before discarding, cover or seal waste materials that can release odor or dust.

Promptly discard all waste materials in the appropriate waste receptacle. Waste materials that are recyclable should be deposited in the appropriate recycling receptacle.

Smoking and the use of smokeless tobacco products shall be prohibited on campus. ~~Once all floors of the building have been closed in, smoking and use of smokeless tobacco products will only be allowed outside of the building.~~

7.3 Potential Sources of Mold & Mildew

Protect all materials stored on-site from moisture accumulation or damage by placing on elevated pallets and covering with plastic or other suitable material, especially before the building is dried-in. Protect installed absorptive materials and inspect often to ensure adequate protection. Contractors must schedule activities to minimize installation of materials that will absorb water before the building is dried-in and remove ponding water from the building. Placement of absorptive materials such as drywall, wall insulation, lined ductwork before dry-in that is wetted will be replaced.



Negative pressurization relative to the outside caused by HVAC operation results in uncontrolled infiltration of unconditioned air that will condense and cause moisture collection in duct insulation, increase moisture content in building materials which can result in condensation in wall cavity and poor indoor air quality problems in the building. Negative pressurization of the space also promotes rainwater infiltration during a storm event. Implement a startup plan designed to minimize the potential of moisture in the building by:

- Operating outside air (OSA) system to maximize quantity of outside air without creating indoor relative humidity conditions greater than 60%. Maintain exhaust air systems off until occupancy except for test and balance work or for short term removal of contaminants/pollutants.
- Insulate cold water, HVAC piping and ductwork before start of HVAC system in cooling mode.
- Seal all building openings with temporary measures to prevent moisture, dust and odor infiltration
- Install temporary dehumidifiers and spot coolers to help remove moisture (if necessary)

7.4 Pathway Interruption

During construction, it may be necessary to isolate areas of work to prevent contamination of clean or occupied spaces. When possible, erect barriers such as dust curtains or plastic sheets between work areas to prevent unwanted airflow from dirty to clean areas.

Dust and odor producing materials should be kept away from air intakes at all times. All mechanical rooms shall be kept clear of construction debris, materials and waste at all times.

Operate HVAC systems to maintain a positive pressure in the occupied spaces of a minimum 6 Pascals above the construction area pressure. Closely monitor the presence of the pressure differential under all operating conditions.

7.5 Housekeeping

Reduce construction contaminants in the building prior to occupancy through regular space cleaning activities. Once the building is enclosed, keep standing water cleaned up to prevent mold and mildew growth and keep solvent, paint and other VOC emitting chemical spills cleaned up. Keep equipment and materials that are not being used clean by covering them or moving them to a clean area. Building materials should be stored in a weather tight, clean area prior to unpacking for installation. All dirty coils, air filters, and fans should be cleaned before testing and balancing (TAB) procedures are performed and before baseline air quality tests are conducted.

Remove accumulated water within 24 hours. Keep work areas dry. Porous materials such as insulation should be protected from moisture. Porous materials that get wet shall be



dried out completely immediately after moisture is observed. Porous items such as duct insulation that remains damp for 24 hours or more shall be replaced. Any sheetrock, plaster, ceiling tiles, or other like materials that get wet must be replaced. Equipment such as terminal units which have duct insulation in the airstream should be stored on pallets (away from water) and should be sealed with plastic prior to installation. Before installation, check for possible damage to equipment from high humidity. Repair or replace any damaged equipment.

Suppress dust in the construction area with wetting agents or sweeping compounds. Regularly clean the dust from the site using a damp rag, wet mop or vacuum equipped with a high efficiency particulate filter or wet scrubber. Remove spills or excess applications of solvent-containing products immediately.

Products used in final cleaning shall be Green Seal certified.

7.6 Scheduling

Special construction scheduling is necessary to ensure dissipation of harmful emissions from finishes during curing. Complete application of wet and odor-emitting materials such as paints, sealants, and coatings before installing materials that act as “sinks” or absorbers such as ceiling tiles, carpets, insulation, gypsum products, and fabric-covered furnishings. Refer to manufacturers’ product data (MSDS) to determine the appropriate curing time for each type of finish. Failing to follow each manufacturer’s guidelines can result in emission of these pollutants during occupancy.

7.7 Flushout

Prior to occupancy, conduct a minimum two-week HVAC flush out of the building with new MERV13 filtration media and maximum outside air after completing installation of materials containing VOCs. Maintain indoor temperatures above 60 °F and relative humidity levels below 60% during flushout procedures. The controls contractor will trend the hours of each air handler operation, return air and outside air damper positions during building flush-out period. The building will be flushed with 14,000 cu. ft. of fresh air per sq. ft. of floor area prior to occupancy. General/Design Build Contractor must include the flushout requirements in the project schedule. Flushout typically occurs during furniture, fixture and equipment move-in.

Plan

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Overview

Preserving our natural resources and maximizing their efficient use is a basic requirement for sustainable development and a requirement for this project. To accomplish this all contractors and vendors must be actively involved in minimizing construction waste starting with site work through material acquisition, installation, and final clean-up. This draft plan is intended as a guide to assist the general contractor or construction manager in the development of a plan the construction team will follow to accomplish reduction of construction waste generated. The goal is to recycle as much of the waste materials from construction activities as possible and reduce cost associated waste removal.

Previous projects have demonstrated that as much as 90% of construction waste can be economically recycled resulting in lower waste removal costs. Most projects average between 70 to 76% construction waste recycling and moderate savings in waste removal costs compared to traditional haul-off to landfill. The most economically beneficial materials to recycle in the Atlanta, GA area are wood, metal, concrete, asphalt, drywall, and cardboard.

Strategies

Controlling the source of waste is important to reducing waste volumes and finding end uses for waste is necessary to recycling construction waste. Controlling the source starts with accurate ordering of materials, returning pallets to the suppliers or pallet recycler for reuse, reducing packaging from vendors, etc. Recycling construction waste is more difficult and requires several different strategies including:

- On site processing and reuse of waste materials
- A waste removal vendor who has established documented markets for removed construction waste materials
- Documentation of recycling including description of recycled material, weight delivered to recycler, location and contact information of recyclers, and how the material was recycled

Site clearing provides an opportunity to both process waste on site and recycle. Trees cleared are shipped to a manufacture needing raw wood material and the remaining branches, stumps, etc are ground-up into mulch that can be used for erosion and sediment control, landscaping, or existing tree protection. Demolition also provides an opportunity to both process waste on site and recycle. On a site requiring structural fill, demolished cementitious materials can be crushed and used for fill, steel reinforcement shall be separated and sold for scrap. These are just two examples out of hundreds of opportunities project teams have to reduce cost and environmental impact.

Preserving our natural resources and maximizing their efficient use is a basic requirement for sustainable development and a requirement for this project. To accomplish this, all contractors must be actively involved in minimizing construction waste, starting with the ordering of materials for delivery to separating waste materials for recycling. Each contractor is responsible for separation of waste material being recycled and the prevention of cross contamination of separated waste. Cross contamination of separated waste will damage material processing equipment, cause material to be rejected for recycled purpose, and create negative financial impact on the project. Contractors may be assessed damages caused by their cross contamination of separated waste.



The general / design build contractor / construction manager has overall responsibility for enforcement of construction waste specifications, removal of waste, recycling of selected materials, and documentation of recycled and landfill materials. The following materials are scheduled to be recycled: asphalt, concrete, brick, cementitious block, metals, glass, paper, cardboard, drywall, and untreated wood.

Contractor Responsibilities

Demolition

To minimize waste stream to the landfill typically associated with demolition concrete, metal, and asphalt materials will be recycled. During the demolition materials will be separated for recycling and general waste to the landfill. The demolition contractor will separate metals and concrete for recycling. Concrete will be crushed and the metal reinforcement separated from the concrete. Metal recovered during demolition will be trucked to _____ for recycling. Crushed cementitious material will be trucked to _____ for recycling.

Materials not being recycled will go to _____ landfill. Demolition contractor will provided the following information for each dumpster pull: dumpster contents (Trash asphalt, concrete, brick, cementitious block, metals, glass, paper, cardboard, drywall, or untreated wood), weight of waste materials, final destination with letters from recyclers indicating acceptance of the materials being recycled.

Site Clearing

Removed trees will be sold for use in agricultural product or may be ground for mulch that is used on-site. Trees, shrubs, and debris from removed trees will be ground on-site into mulch and used for erosion and sediment control or removed from site for use in landscape operation. Materials not recycled or sold for agricultural product will be sent to _____ landfill. Site contractor will provide weight and destination documentation for all materials removed from site.

Construction Phase

The contractor and subcontractors have the responsibility to minimize construction waste generated on the project and to implement this construction waste management plan. Contractor and subcontractors are responsible for training their employees in the procedures contained in this plan and continuously reminding their work force of waste management practices and the importance of construction waste management at regular job site meetings. This includes signage and verbal communication in both English and Spanish languages.

Contractor and subcontractors will monitor their employees activities on site and verify that their laborers separate waste in accordance with this plan. The contractors are also responsible for knowing and complying with regulatory requirements - Federal, State, and Local - pertaining to legal disposal of all construction and demolition waste materials

Contractor and subcontractors can reduce the amount of waste by discussing options with suppliers that minimize packaging material used in shipment without compromising the protection of materials being delivered. One example of this is returning undamaged delivery pallets to suppliers or pallet recycling center. Contractor and subcontractors must minimize bringing new materials on site for patching and utilizing to the maximum extent on-site remaining materials such as primers, sealers, underlayments,



supports, backing, blocking, furring, suspension systems, and accessories as required for any purpose in patching existing work.

Each subcontractor will set aside and protect all materials to prevent damage that would cause materials to be discarded to the waste stream. Any misdelivered and substandard products and materials provided will be returned to supplier. Each subcontractor has the responsibility to minimize construction waste generated on the project.

On-Site Procedures

The general / design build contractor / construction manager will be providing dumpsters for specific materials that are being recycled and a dumpster for general waste. Contractor and subcontractors' employees removing waste will separate the waste into the appropriate dumpster. The general / design build contractor / construction manager will monitor separation and arrange for dumpster pulls as needed as well as subcontractor separation. Separate dumpsters will be provided for the following materials: asphalt, cementitious materials, metals, glass, paper, cardboard, drywall, untreated wood, and general waste. The general waste dumpster will be for non-recycled materials such as treated lumber, and plastic.

Subcontractors must receive permission for materials delivered to the general waste dumpster prior to placing materials in the general waste dumpster. Materials placed by the subcontractors in the general waste dumpster without expressed permission from The general / design build contractor / construction manager or cross contamination of separated waste materials will bear the expense of removal and separation of such material from the general waste or cross contaminated dumpsters.

Off-Site Procedures

All materials removed from the site except for general waste are being recycled. The construction waste vendor will remove the dumpsters when requested by the general / design build contractor / construction manager to the recycle location for processing. Cementitious materials and asphalt materials will be delivered to _____; Metals will be delivered to _____; Glass will be delivered to _____; Cardboard will be delivered to _____; Paper will be delivered to _____, and drywall and untreated wood will be delivered to _____.

Some of the wood and gypsum materials will return to the site for use in landscaping. The landscape architect will obtain soil samples and a soil scientist's recommendation for application rates of gypsum from the ground drywall recycled on this project. Untreated wood, paper and gypsum from drywall from this project will be ground to the consistency required by the landscape architect and applied as mulch for landscaping.



SECTION 01451**INDOOR AIR QUALITY SCHEDULING/SEQUENCING REQUIREMENTS****PART 1- GENERAL****1.01 SUMMARY**

- A. This section outlines IAQ concerns that are directly related to contaminants generated during the project's construction and what actions are required by the contractors to minimize the potential impact on the building occupants after completion. Poor indoor air quality (IAQ) can be a major concern during building construction. Odors and dust produced during construction activities can cause health and comfort concerns. For this reason, measures must be taken to manage the IAQ during construction. By effectively managing the IAQ during construction, health and comfort issues during the construction process and once the building is occupied can be reduced significantly.

1.02 DEFINITIONS

- A. Indoor Air Quality (IAQ) – According to the U.S. Environmental Protection Agency and National Institute of Occupational Safety and Health, the definition of good indoor air quality includes (1) introduction and distribution of adequate ventilation air; (2) control of airborne contaminants; and (3) maintenance of acceptable temperature and relative humidity. According to ASHRAE Standard 62-1999, indoor air quality is defined as “air in which there are no know contaminants at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80 percent or more) of the people exposed do not express dissatisfaction.”
- B. TYPE 1 FINISHES: Materials and finishes which have a potential for short-term levels of off gassing from chemicals inherent in their manufacturing process, which are applied in a form requiring vehicles or carriers for spreading, or release a high level of particulate matter in the process of installation and/or curing. Type 1 Finishes include, but are not limited to the following:
1. Composite wood products, specifically including particleboard from which millwork, wood paneling, doors or furniture may be fabricated.
 2. Adhesives, sealants, and glazing compounds, specifically those with petrochemical vehicles or carriers.
 3. Wood preservatives, finishes, and paint.
 4. Control and/or expansion joint fillers and sealants.
 5. All hard finishes requiring adhesive installation.
 6. Gypsum board and associated finish processes.
- C. Type 2 Finishes: “Fuzzy” materials and finishes which are woven, fibrous, or porous in nature and tend to adsorb chemicals off-gassed by Type 1 finishes or may be adversely affected by particulates. These materials become "sinks" for harmful substances which may be released much later, or collectors of contaminants that may promote subsequent bacterial growth. Type 2 Finishes include, but are not limited to the following:
1. Carpet and padding.
 2. Fabric wall covering
 3. Insulation exposed to the air stream
 4. Acoustic ceiling materials
 5. Fabric covered acoustic wall panels

6. Upholstered furnishings

- D. Materials that can be categorized as both Type 1 and Type 2 materials shall be considered to be Type 1 materials.

1.03 SUBMITTALS

- A. Construction IAQ Management Plan: Submit four (4) copies of a Construction IAQ Management Plan based on sample document in Section 01451a to the Construction Manager. Incorporate comments from the Construction Manager into a Final Plan and submit four (4) copies to the Construction Manager for approval.
1. Indicate in the IAQ Management Plan the control measures that will be utilized in the project to help maintain good IAQ during construction and during the pre-occupancy phase in accordance with this specification.
- B. Supplementary Construction Schedule Information: Include in schedule of construction activities HVAC duct ruff-in, sequence of finishes applications, and HVAC start-up and operation in addition to construction schedule information required by Section 01320 Construction Progress Documentation. Schedule information shall be provided for each HVAC zone.
1. An HVAC zone is that part of any floor area served by a single air handling unit.
 2. Indicate and schedule types and durations of temporary HVAC operation proposed. Show schedule for commissioning procedures and all temporary usages of building mechanical systems, identifying types of filtration used and schedule of filter replacement and change outs.
- C. Material Safety Data Sheets (MSDSs): Provide MSDSs on all Type 1 Finishes, sealants, adhesives, and carpet systems as required in Section 01330 Submittal Procedures.

1.04 QUALITY ASSURANCE

- A. General: Perform the work of this section as a supplement to and in accordance with applicable requirements of Section 01400 Quality Requirements.
- B. Finishes Installation Scheduling: As part of the Pre-construction Conference, discuss the Supplementary Construction Schedule required under this section. The purpose of this agenda item is to assure understanding of the importance of sequencing of finishes to the overall Indoor Air Quality of the facility and to secure preliminary approval of the Owner for scheduling and installation requirements for on-site work.

1.05 WORK INCLUDED

- A. This section defines special construction scheduling/sequencing requirements and procedures necessary to assure achievement of designed Indoor Air Quality (IAQ) levels for the completed project required by the Construction IAQ Management Plan developed by the Contractor.
1. Scheduling - Special construction scheduling involves defined and controlled sequencing of finishes applications to ensure dissipation of emissions from finishes that off-gas significant quantities of harmful material during curing, to separate these effects from the installation of adsorptive materials that would act as a "sink" for storage and subsequent release of these unwanted substances into building spaces and mechanical systems after project occupancy.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

3.01 PREPARATION

- A. Certify in writing to the Owner's Representative that interior environmental control has been implemented as specified below and that required conditions are being maintained, and obtain the Owner's Representative's approval before starting HVAC equipment and installation of interior finishes.
- B. Coordination: The Contractor is responsible to schedule and coordinate the work of all finishes installers to assure compliance with the requirements of this specification section

3.02 CLEANING DURING CONSTRUCTION

- A. Remove accumulated water as soon as possible. Keep work areas dry. Porous materials such as insulation should be protected from moisture. Porous materials that get wet shall be dried out completely immediately after moisture is observed. Materials wet for over 24 hours will be removed and replaced at the contractors expense including but not limited to Porous items such as drywall, duct insulation. Finish materials such as flooring and fabrics that become damp shall be replaced immediately. Equipment such as terminal units, air handling units, etc which have duct insulation in the air stream, should be stored on pallets (away from water) and should be sealed with plastic prior to installation. Before installation, check for possible damage to equipment from high humidity. Repair or replace any damaged equipment.
- B. Suppress dust in the construction area with wetting agents or sweeping compounds. Regularly clean the dust from the site using a damp rag, wet mop or vacuum equipped with a high efficiency particulate filter or wet scrubber. Remove spills or excess applications of solvent-containing products as soon as possible.
- C. Protect duct work from contamination during construction. Seal HVAC duct at fabrication shop and maintain seal until duct is permanently installed. As duct is installed reseal duct openings as needed to prevent construction dust and debris from contaminating duct interior. At a minimum ducts and HVAC equipment seals shall be examined and sealed daily.

3.03 FINAL CLEANING

- A. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion:
- B. Remove labels that are not permanent.
- C. Clean transparent materials, including mirrors. Remove excess glazing compounds. Replace chipped or broken glass.
- D. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Sweep concrete floors broom clean.
- E. Vacuum carpeted surfaces and wax resilient flooring.
- F. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures. Clean light fixtures, lamps, globes, and reflectors.

- G. Clean Project site, yard, and grounds, in areas disturbed by construction activities. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds to a smooth, even-textured surface.

3.04 INTERIOR ENVIRONMENTAL CONTROL

- A. If the HVAC system is utilized during construction, provide and maintain controlled interior environment in accordance with the following requirements before beginning installation of interior finish.
 - 1. The supply air system must have MERV 8 filters in place. Filters shall fit tightly together and shall have gaps between filters. Damaged filters shall be replaced immediately. Integrity of the filters shall be checked daily.
 - 2. Return air openings shall have MERV 8 filter media installed during construction.
 - 3. Replace construction air filters with clean air filters in accordance with Section 15861 Air Filters. Clean exposed surfaces of diffusers, registers and grilles prior to occupancy.

END OF SECTION 01451



June 20, 2008

Environmental Stewardship Policy

Good indoor air quality contributes to a favorable work environment for building occupants and visitors providing a sense of comfort, health, and well-being. These elements combine to seek optimum performance in a comfortable working environment. Cleaning for health is more than changing products – it is a holistic approach to cleaning that encompasses cleaning products, paper products, equipment, processes, procedures, and training of staff, purchasing vendors and work loading.

Spelman College and its staff, vendors, and operators as stewards of the environment, will promote the practice of green housekeeping to prevent or reduce pollutants generated during the cleaning of the building interior, which in turn will provide a healthier environment. This stewardship includes establishing an Environmental Stewardship Committee; using integrated pest management for the interior and exterior of the building; purchasing cleaning products that meet the Green Seal Standard GS-37; adopting cleaning practices and procedures that minimize pollutants within the building; establishing a communication strategy for housekeeping/maintenance problems when they arise; adopting construction IAQ standards for future retro-fit, renovation or modifications that may occur on site; and developing an on-going use of a training module to educate housekeeping/maintenance staff on appropriate products, usage, handling and tools for their health and safety, the health and safety of the building occupants and visitors, and preservation of the environment.

Adopted this 20th day of June, 2008

By: Arthur E. Frazier III
Director/Facilities Management & Services
Spelman College

April 23, 2008



Smoke Free Policy

Due to the acknowledged hazards arising from exposure to environmental tobacco smoke, it is the policy of Spelman College to provide its building occupants and visitors with a smoke free environment that offers opportunity and resources to optimize their personal health and well-being. This policy covers the smoking of any tobacco product and applies to all building occupants and visitors of all buildings on the Spelman College Campus.

Spelman College Employee Handbook, Policy No. 505

Smoking

In keeping with Spelman's intent to provide a safe and healthful work environment, smoking in the workplace is prohibited. All buildings and entrances/exits to buildings are smoke free. In situations where the preferences of smokers and nonsmokers are in direct conflict, the preferences of nonsmokers will prevail. Smokers will not be given additional smoking breaks.

This policy applies equally to all employees, customers, and visitors. All employees are charged with enforcing this policy. Violators should be asked to extinguish their smoke and if they refuse it should be reported to their supervisor or the Office of Public Safety.

Effective Date: 9/1/2000

Definition

1. There will be no smoking of tobacco products within the building or within 25 feet of the building entrances, operable windows, or fresh air intakes.
2. The decision to provide designated smoking areas outside the building will be at the discretion of the Management/Administration or other decision making body.
3. All materials used for smoking including cigarette butts and matches, will be extinguished and disposed of in appropriate containers within the designated smoking areas. Custodial/Janitorial staff will ensure periodic cleanup of designated smoking area. If the designated smoking area is not maintained (for

example if cigarette butts are found on the ground), it can be eliminated at the discretion of the Management/Administration or other decision making body.

4. Breaks: Management/Administration will discuss the issue of smoking breaks with the building occupants. Together they will develop effective solutions that do not interfere with productivity of the building occupants.

Procedures

1. All building occupants will be informed of this policy through building occupant policy manuals, and orientation and training provided by Management/Administration. In addition, Visitors will be informed by appropriate signage and information provided for events.
2. Spelman College will assist building occupants who wish to quit smoking by facilitating access to recommended smoking cessation programs and materials.
3. All building occupants will be responsible for ongoing compliance with the smoke free policy. All building occupants will be held accountable according to applicable policies and procedures in resolving issues of noncompliance. Any violations of this policy will be handled through the standard disciplinary procedure.

Sincerely,

Arthur E. Frazier III
Director/Facilities Management & Services

Integrated Pest Management Policy

Structural and landscape pests can pose significant problems to people, property, and the environment. Pesticides can also pose risks to people, property, and the environment. It is therefore the policy of (company) to incorporate Integrated Pest Management (IPM) procedures for control of structural and landscape pests.¹

Pests

Pests are populations of living organisms (animals, plants or microorganisms) that interfere with use of the facility for human purposes. Strategies for managing pest populations will be influenced by the pest species and whether that species poses a threat to people, property, or the environment.

Pest Management

Approved pest management plans should be developed for the site and should include any proposed pest management measures. Pest will be managed to:

- Reduce any potential human health hazard or to protect against a significant threat to public safety.
- Prevent loss of or damage to structures or property.
- Prevent pests from spreading into the community, or to plant and animal populations beyond the site.
- Enhance the quality of life for occupants, staff, visitors and others.

Integrated Pest Management Procedures

IPM procedures will determine when to control pests and whether to use mechanical, physical, chemical, cultural, or biological means. IPM practitioners depend on current, comprehensive information on the pest and its environment and the best available pest control methods. Applying IPM principles prevent unacceptable levels of pest activity and damage by the most economical means and with the least possible hazard to people, property, and the environment.

The choice of using a pesticide will be based on a review of all other available options and a determination that these options are not acceptable or are not feasible. Cost or staffing considerations alone will not be adequate justification for use of chemical control agents, and selected non-chemical pest management methods will be implemented whenever possible to provide the desired control. It is the policy of this facility to utilize IPM principles to manage pest populations adequately. The full range of alternative, including no action, will be considered.

When it is determined that a pesticide must be used in order to meet important management goals, the least hazardous material will be chosen. The application of pesticides is subject to the Federal Insecticide, Fungicide and Rodenticide Act (7United States Code 136 et seq.), company policies and procedures, Environmental Protection Agency regulations in 40 Code of Federal

¹ United States Environmental Protection Agency, Office of Pesticide Programs

Regulations, Occupational Safety and Health Administration regulations, and state and local regulations.

Education

Occupants, staff, visitors and pest managers will be educated about potential pest problems and the IPM policies and procedures to be used to achieve the desired pest management objectives.

Record Keeping

Records of pesticide use shall be maintained on site to meet any state or local requirements. In addition, pest surveillance data sheets that record the number of pests or other indications of pest populations are to be maintained by the Environmental Stewardship Team to verify the need for treatments.

Notification

The facility manager takes the responsibility to notify the occupants, staff and visitors of upcoming pesticide treatments.

Pesticide Storage and Purchase

Pesticide purchases will be limited to the amount authorized for use. Pesticides will be stored and disposed of in accordance with EPA registered label directions and state and local regulations. Pesticides must be stored in appropriate, secure sites not accessible to unauthorized personnel.

Pesticide Applicators

Pesticide Applicators must be educated and trained in the principles and practices of IPM and the use of pesticides and possess the appropriate licensing required by the state or local regulations.

Environmentally Preferable Cleaning Products Sample Specifications

Statement of Policy

Many cleaning products contain chemicals that can be hazardous to custodial workers and building occupants. These chemicals can be acutely dangerous, causing respiratory irritation, chemical burns, or asthma attacks in children and adults, and/or they can be chronically hazardous to individuals who are exposed to them over a long period of time. Cost-competitive, environmentally preferable alternatives that meet performance specifications are readily available, and generally, products that are safer for people are safer for the environment as well.

In order to minimize the health and environmental impacts of maintaining _____,
_____ is electing to purchase environmentally preferable cleaning products.

_____ will specify, buy, and use, where feasible, only environmentally preferable custodial cleaning products.

Purpose

This policy is adopted to eliminate or reduce toxics that create hazards to workers and the environment. Some chemicals used in common cleaning products have been shown to cause adverse health effects and negatively affect indoor air quality. A growing body of research clearly shows a correlation between cleaning chemicals and asthma cases. This suggests that to minimize the potential for health and safety risks from cleaning products, the least toxic product that can perform the job should be purchased. In addition, toxic chemicals require special handling, storage, and disposal, which add to the cost of using, keeping, and disposing of these products.

Products

Bidders are to supply the following products:

1. General Purpose Cleaners
2. Bathroom Cleaners
3. Glass Cleaners
4. Carpet Cleaners
5. Disinfectants / Sanitizers
6. Floor-Care Products (all must be provided)
 - a. Floor Finishes
 - b. Floor Strippers
7. Hand Soaps

Training

The manufacturer, its distributor, or a third party must offer on-site (or at a designated site) training in the proper use of the product. This must include step-by-step instructions for the proper dilution, use, and disposal and for the use of equipment. In support of this training, the manufacturer or its distributor must provide a phone number that departments can call to receive instructions and assistance on product use.

Health and Environmental Specifications

The above products must meet the following health and safety specification:

- A. The undiluted product must not be toxic to humans.
- B. The undiluted product must not contain any ingredients that are carcinogens or that are known to cause reproductive toxicity, unless present in concentrations below the applicable maximum contaminant levels in drinking water.
- C. The undiluted product must not be corrosive to the skin or eyes, nor be a skin sensitizer.
- D. The undiluted product must not be combustible.
- E. The product as used must not contain substances that contribute significantly to the production of photochemical smog, tropospheric ozone, and poor indoor air quality. The volatile organic compound (VOC) of the product used must be less than 0.1% by weight. The product as used must not be toxic to aquatic life.
- F. The product as used must not contain more than 0.5% by weight of total phosphorus.
- G. Each of the organic ingredients must be readily biodegradable.
- H. The product must be a concentrate, except for FIFRA-registered bathroom cleaners.
- I. Manufacturers must identify any fragrances on their MSDSs, and they should follow the Code of Practice of the International Fragrance Association.
- J. The product must not contain the following ingredients:
 - o Alkylphenol ethoxylates
 - o Dibutyl phthalate
 - o Heavy metals, including arsenic, lead, cadmium, cobalt, chromium, mercury, nickel, or selenium
 - o Ozone-depleting compounds
- K. In addition, vendors shall provide information as to whether their products contain ingredients that may be identified as asthmagens (asthma-causing agents), such as:
 - o Monoethanolamine (CAS 141-43-5)
 - o Tall oil or rosin (CAS 8002-26-4)
 - o Chlorhexidine (CAS 55-56-1)
 - o Chloramine T (CAS 127-65-1)
 - o Ammonium quaternary disinfectants (not limited to the following CAS numbers: 8001-54-5, 121-54-0, 122-18-9, 8044-71-1, 124-03-5, 122-19-0)

Full listing available at <http://www.aoc.org/tools.htm>

All products shall meet the Green Seal Industrial and Institutional Cleaners Standard (GS-37) or Green Seal Floor Care Standards (GS-40) criteria or have undergone testing to demonstrate compliance with Green Seal's GS-37 or GS-40 criteria.

Labeling

The manufacturer's label must state clearly and prominently that dilution with water from the cold tap is recommended and shall state the recommended level of dilution. The manufacturer shall

also include detailed instructions for proper use and disposal and for the use of personal protective equipment.

Product Specific Requirements

Carpet Cleaners

Carpet cleaners must meet Health and Environmental Specifications established above. Carpet cleaners must exhibit a VOC limit of not greater than 0.1%.

Disinfectants / Sanitizers

Disinfectants / sanitizers must meet the Health and Environmental Specifications established above, EXCEPT for the active ingredients with respect to biodegradability.

Disinfectants / sanitizers must exhibit a VOC limit of not greater than 0.1%.

Disinfectants / sanitizers must be registered by the US Environmental Protection Agency.

Floor-Care Products (all must be provided)

- a. Floor Finishes
- b. Floor Strippers
- c. Maintenance Products

All floor-care products must be free of zinc and other heavy metals.

Floor-care products must not contain phthalates.

Floor-care products must not contain glycol ethers or ammonia.

It is preferable that the floor finish does not need to be stripped prior to reapplications of the floor finish.

Floor strippers must exhibit a VOC limit of not greater than 0.1%.

Maintenance products must exhibit a VOC limit of not greater than 0.1%.

Hand Soaps

These products must not be anti-microbial (a low-level preservative is permissible, however, to prevent bacterial growth). Non-scented is preferred.

Non-animal testing

It is required that bidders' products not be tested on animals. To discourage animal testing, the results of past peer-reviewed or standard tests demonstrating compliance with a criterion will be accepted. In addition, a mixture need not be tested (or retested) if existing information demonstrates that each of the ingredients complies with a criterion.

Priorities

The health and safety of workers and citizens is of utmost importance and takes precedence over all other policies.

This policy shall not be construed as requiring a department, purchaser, or contractor to procure products that do not perform adequately for their intended use, exclude adequate competition, or are not available at a reasonable price in a reasonable period of time.

Program Evaluation

The _____ shall review this policy on an annual basis to evaluate the success of the policy's implementation.

Definitions

"Asthmagens" are chemicals known to cause asthma in a person who never had asthma prior to exposure. A list of asthmagens is available at the following Association of Occupational and Environmental Clinics (AOEC) website: <http://www.aoec.org/tools.htm>

Asthmagens are listed with the Exposure Code "A."

"Environmentally Preferable Cleaning Products" are defined as products that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purposes.

Resources

INFORM, Inc., offers a *Cleaning for Health Guide*: http://www.informinc.org/cfh_00.php.

Center for the New American Dream provides information about products that meet the above specifications: <http://www.newdream.org/procure/products/approved.php>

Green Seal provides information about less toxic cleaning products:
<http://www.greenseal.org/certproducts.htm#cleaners>

The US Environmental Protection Agency's Environmentally Preferable Purchasing Program website provides general information about environmentally preferable purchasing at <http://www.epa.gov/oppt/epp>, guidance on specific products at <http://www.epa.gov/epp/pubs/pfs.htm>, and a database of environmental information for products and services at <http://yosemite1.epa.gov/oppt/eppstand2.nsf/pages/search.html?open>.

Examples of specifications written by state purchasing agencies are available at:

Commonwealth of Massachusetts: <http://www.mass.gov/epp>

State of Connecticut: http://www.das.state.ct.us/rfpdoc/004_0070.pdf

State of Vermont: <http://www.bgs.state.vt.us/pca>

Recycling and Trash Disposal

Recycling Action Items:

1. Match facility recycling collection with the guidelines from the local recycling hauler and recycling facility.
2. Publish and circulate a list to facility users what items can be recycled and how it needs to be separated.
3. Food containers such as soda cans should be rinsed clean by occupants before placing in recycling containers so as not to attract pests (see section on Integrated Pest Control).
4. Recycling collection should be removed from inside the building frequently and not left in the building over extended periods of time i.e. weekends and holidays.
5. Make sure all occupants, staff and outside contractors know how the recycling system works.
6. Track recycling results.
7. Use email and on-line publishing when feasible to avoid excess paper.

Recycling is a very important pollution prevention activity to reduce our burdens on the environment as a result of both solid waste disposal and the extraction of the natural raw materials. Check with local waste haulers and recycler to determine what materials are picked up and for the best sorting strategies.

One of the primary keys to making the recycling effort work, especially in a way that is efficient for both occupants and cleaning/maintenance personnel, is to develop clear facility goals and procedures. It is important to work with the Stewardship Team, cleaning/maintenance personnel or outside contractors to engage the occupants in this effort. It is important to enlist the occupants to separate their own recyclable and where they are to be placed.

Cleaning/Maintenance personnel should not be required to separate recyclable from the trash nor rinse out containers being recycled.

It is important that the Stewardship Team and/or IAQ Management Team work to support the recycling efforts as well as address the issue of non-compliance by individual occupants or those that frequently contaminate the mix.

Trash Action Items:

1. Remove trash especially that which contains food waste is removed frequently and is not left in the building over and extended period of time i.e. weekends and holidays.
2. Dispose of trash properly and keep trash collection area clean so it does not attract pests, birds, rodents, etc.
3. Make sure trash and recyclables are separated properly.
4. Make sure all occupants, staff and outside contractors know how the recycling system works.

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The _____ shall review this policy on an annual basis to evaluate the success of the policy's implementation.

Definitions

“Asthmagens” are chemicals known to cause asthma in a person who never had asthma prior to exposure. A list of asthmagens is available at the following Association of Occupational and Environmental Clinics (AOEC) website: <http://www.aoec.org/tools.htm>

Asthmagens are listed with the Exposure Code “A.”

“Environmentally Preferable Cleaning Products” are defined as products that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purposes.

Resources

INFORM, Inc., offers a *Cleaning for Health Guide*: http://www.informinc.org/cfh_00.php.

Center for the New American Dream provides information about products that meet the above specifications: <http://www.newdream.org/procure/products/approved.php>

Green Seal provides information about less toxic cleaning products:
<http://www.greenseal.org/certproducts.htm#cleaners>

The US Environmental Protection Agency’s Environmentally Preferable Purchasing Program website provides general information about environmentally preferable purchasing at <http://www.epa.gov/oppt/epp>, guidance on specific products at <http://www.epa.gov/epp/pubs/pfs.htm>, and a database of environmental information for products and services at <http://yosemite1.epa.gov/oppt/eppstand2.nsf/pages/search.html?open>.

Examples of specifications written by state purchasing agencies are available at:
Commonwealth of Massachusetts: <http://www.mass.gov/epp>

State of Connecticut: http://www.das.state.ct.us/rfpdoc/004_0070.pdf

State of Vermont: <http://www.bgs.state.vt.us/pca>



Questions For Evaluating Products

Here are about 30 questions that you can use to evaluate the risks of janitorial products. It takes quite a bit of effort to answer all of the questions, so it may be best to initially focus on the product characteristics that pose a higher hazard. Later you can expand to include the other issues.

	How easy is it to use this question?	Do you want to use this question?
<u>Health & Safety Impacts</u>		
Carcinogenic / Prop. 65	Easy	_____
Reproductive Hazard - Mutagen	Hard	_____
Reproductive Hazard - Teratogen	Hard	_____
Endocrine Modifier	Medium	_____
Corrosivity / pH	Easy	_____
Flammability / Flash Point	Easy	_____
Reactivity	Easy	_____
Eye Irritant	Medium	_____
Skin Irritant	Medium	_____
Inhalation Irritant	Medium	_____
Ease of Skin Absorption	Hard	_____
Ease Of Inhalation / Vapor Pressure	Hard	_____
Overall Toxicity (LD50)	Medium	_____
<u>Environmental Impacts</u>		
Ozone Depleting Substance	Easy	_____
Global Warming Substance	Easy	_____
Hazardous Waste	Medium	_____
Stormwater Pollutant	Hard	_____
Sanitary Sewer Pollutant	Hard	_____
Persistence / Biodegradability / Bioaccum.	Hard	_____
Indoor Air Quality	Hard	_____
Phosphates	Medium	_____
Volatile Organic Compounds	Medium	_____
<u>Other Impacts</u>		
Has Added Fragrance	Hard	_____
Has Added Dye	Hard	_____
Packaged As Concentrate / Mixing System	Medium	_____
Safe Container	Medium	_____
Refillable Container	Medium	_____
Container Made Of Recycled Material	Medium	_____
Non-Aerosol Container	Medium	_____

<u>Impacts</u>	<u>Description Of Criteria</u>	<u>Where To Get Info</u>
Carcinogenic / Prop. 65 List	<p>Does the product contain ingredients that are known or suspected of causing cancer, either in animals or humans?</p> <p>Example: Tetrachloroethylene Nitrilo Triacetic Acid</p> <p>Recommendation: Avoid products that have even trace amounts of cancer causing ingredients.</p>	<p>Material Safety Data Sheet (MSDS) for the product, or MSDSs for each ingredient, or published cancer studies.</p> <p>Cancer studies are available for only a few of the many hundreds of ingredients used in janitorial products.</p> <p>California's Proposition 65 chemical list is available on the internet.</p>
Reproductive Hazard - Mutagen	<p>Known or suspected of interfering with conception, either in animals or humans?</p> <p>Example: Tetrachloroethylene</p> <p>Recommendation: Avoid even trace amounts of such ingredients.</p>	<p>MSDS for the product, or separate MSDSs for its ingredients, or published toxicology studies.</p>
Reproductive Hazard - Teratogen	<p>Known or suspected of interfering with fetal development, either in animals or humans?</p> <p>Example: Tetrachloroethylene</p> <p>Recommendation: Avoid even trace amounts of such ingredients.</p>	<p>MSDS for the product or its ingredients, or published toxicology studies.</p>
Endocrine Modifier	<p>Known or suspected of interfering with hormone systems, either in animals or humans?</p> <p>Example: Alkylphenol Ethoxylate Dibutyl Phthalate</p> <p>Recommendation: Avoid even trace amounts of such ingredients. Although in normal use these ingredients do not affect the janitor, they do persist in the environment and affect fish and other animals, and can contaminate drinking water used by humans.</p>	<p>Contact product supplier for information - these ingredients are not yet required by OSHA to be listed on the MSDS.</p> <p>Refer to our project web site for links to internet sites with information about endocrine modifiers.</p>

<p>Corrosivity / pH</p>	<p>Will the product cause burns, or destroy skin, or cause blindness?</p> <p>Is the pH below 4 or above 11.5?</p> <p>Examples: Hydrochloric Acid Sodium Hydroxide</p> <p>Recommendation: Avoid corrosive ingredients (high or low pH) where possible. If no alternatives are available, then use product with extreme care.</p>	<p>MSDS for the product or its ingredients. Older MSDSs may not include pH.</p>
<p>Flammability / Flash Point</p>	<p>Is the product flammable or extremely flammable?</p> <p>Is the flash point below 140 F?</p> <p>Is the NFPA or HMIS fire rating 2 or higher?</p> <p>Examples: Propane (Aerosol Propellant) Isopropanol Toluene</p> <p>Recommendation: Avoid flammable (low flash point) ingredients where possible. Change to non-aerosol products if it is the propellant that causes the fire rating to exceed 2..</p>	<p>MSDS for the product or its ingredients.</p>
<p>Reactivity</p>	<p>Does the product contain ingredients that combine violently with other chemicals?</p> <p>Is the NFPA or HMIS reactivity rating 2 or higher?</p> <p>Examples: Bleach & Ammonia</p> <p> Bleach & Acid</p> <p>Recommendation: Avoid reactive ingredients where possible. Keep incompatible products away from each other.</p>	<p>MSDS for the product or its ingredients.</p>

<p>Eye Irritant</p>	<p>Does the product contain ingredients that irritate the eyes “moderately” or “severely”, or cause eye burns, or cause blindness?</p> <p>Examples: Hydrochloric Acid Ammonium Hydroxide</p> <p>Recommendation: Where possible, avoid ingredients that cause moderate eye irritation or worse. Otherwise use such products with extreme care.</p>	<p>MSDS for the product or its ingredients.</p> <p>Ask the supplier for eye irritation test data. Once scarce, these data are now becoming available for more products.</p>
<p>Skin Irritant</p>	<p>Does the product contain ingredients that irritate the skin “moderately” or “severely”, or cause skin burns, or damage/scar the skin?</p> <p>Examples: Hydrochloric Acid Sodium Hydroxide</p> <p>Recommendation: Where possible, avoid ingredients that cause moderate skin irritation or worse. Otherwise use such products with extreme care.</p>	<p>MSDS for the product or its ingredients.</p> <p>Ask the supplier for skin irritation test data. Once scarce, these data are now becoming available for more products.</p>
<p>Inhalation Irritant</p>	<p>Does the product contain ingredients that irritate the nose, throat, or lungs “moderately” or “severely”, or cause burns, or damage/scar the air passage?</p> <p>Examples: Hydrochloric Acid Sodium Hydroxide</p> <p>Recommendation: Where possible, avoid ingredients that cause moderate irritation or worse. Otherwise use such products with extreme care.</p>	<p>MSDS for the product or its ingredients.</p>
<p>Ease of Skin Absorbtion</p>	<p>Does the product contain ingredients that readily absorb through the skin, and that then damage or poison the kidneys, liver, or other internal organs?</p> <p>Examples: 2-Butoxyethanol Ethanolamine Acetone</p> <p>Recommendation: Where possible, avoid ingredients that can be absorbed through skin. Otherwise use such products with extreme care.</p>	<p>MSDS for the product or its ingredients.</p> <p>Ask the supplier for skin absorbtion test data. These data are available for only a few products and ingredients.</p>

<p>Ease of Inhalation / Vapor Pressure</p>	<p>Does the product contain ingredients that evaporate readily, and therefore are easy to inhale, and that then damage or poison the kidneys, liver, or other internal organs?</p> <p>Is the vapor pressure of the product or its most toxic ingredients more than 18 millimeters of mercury measured at 20 C?</p> <p>Examples: Isopropanol Tetrachloroethylene</p> <p>Recommendation: Where possible, avoid toxic ingredients that evaporate faster than water. Otherwise use such products with extreme care, provide good ventilation, and wear a breathing mask.</p>	<p>MSDS for the product or its ingredients.</p>
<p>Overall Toxicity (LD50)</p>	<p>Is the product or any of its ingredients highly toxic?</p> <p>Is the LD50 (oral - rat) for any ingredient less than 500 mg/kg?</p> <p>Examples: Naphthalene Quaternary Ammonium Chloride</p> <p>Recommendation: Where possible avoid ingredients that are highly toxic. Otherwise use such products with extreme care.</p>	<p>MSDS for the product or its ingredients.</p>
<p>Ozone Depleting Substance</p>	<p>Does the product contain any ingredient that evaporates readily and affects the earth's ozone layer?</p> <p>Examples: CFC-12 HCFC - 141</p> <p>Recommendation: Do not use any product with ingredients that harm the earth's ozone layer.</p>	<p>MSDS for the product or its ingredients.</p>
<p>Global Warming Substance</p>	<p>Does the product contain any ingredient that evaporates readily and affects the earth's ozone layer?</p> <p>Examples: CFC-12 HCFC - 141</p> <p>Recommendation: Do not use any products with ingredients that have a global warming potential.</p>	<p>MSDS for the product or its ingredients.</p>

<p>Hazardous Waste</p>	<p>Does the product contain any ingredient regulated under SARA Title III?</p> <p>Examples: Glycol Ethers Methylene Chloride</p> <p>Recommendation: Where possible avoid ingredients that are listed by SARA Title III. Otherwise use such products with extreme care.</p>	<p>MSDS for the product or its ingredients.</p>
<p>Stormwater Pollutant</p>	<p>If the product is to be used outdoors, does it contain any ingredients that are considered stormwater pollutants.</p> <p>Examples: Most Chemicals</p> <p>Recommendation: Do not use products containing stormwater pollutants outdoors, unless steps are taken to collect wastes before they can reach stormwater system.</p>	<p>Newer MSDSs (with 16-part format) might describe stormwater requirements. Otherwise ask local stormwater management agency for guidance.</p>
<p>Sanitary Sewer Pollutant</p>	<p>Will any unused product or any wastes be put into the sewer? If yes, does the product contain any ingredients regulated by the local sewer agency?</p> <p>Examples: High or low pH Toxic Organics Zinc & other metals</p> <p>Recommendation: Do not use products containing sanitary sewer pollutants, unless steps are taken to ship wastes off-site rather than putting them into the sewer system.</p>	<p>A few MSDSs mention specific ingredients of concern to local sewer agencies. Ask your local agency for guidance.</p>
<p>Persistence / Biodegradability / Bioaccumulation</p>	<p>Does the product contain any toxic ingredients that persist in the environment and bioaccumulate?</p> <p>Examples: Dibutyl Phthalate Alkylphenol Ethoxylate</p> <p>Recommendation: Do not use products containing ingredients that are not readily and fully biodegraded in the sanitary sewer system.</p>	<p>A few MSDSs mention specific ingredients of concern in this area.</p> <p>Contact product supplier and ask for their ecological fate assessment of the product.</p> <p>Ask your local county health agency for guidance.</p>

<p>Indoor Air Quality</p>	<p>Does the product contain any ingredient that evaporates easily, and that has a smell, is flammable, or is toxic?</p> <p>Examples: Isopropanol d-Limonene</p> <p>Recommendation: Where possible avoid ingredients that affect indoor air quality. Otherwise use such products with extreme care, with good outside ventilation, and at times when the building is empty.</p>	<p>MSDS for the product or its ingredients. Look for added unnecessary fragrances, flammables, and other volatile ingredients.</p>
<p>Phosphates</p>	<p>Does the product contain phosphates?</p> <p>Example: Trisodium Phosphate</p> <p>Recommendation: Where possible use products with no phosphates, or very low phosphate levels. In any case, be sure phosphate levels are less than required by local sewer agency.</p>	<p>MSDS for product.</p>
<p>Volatile Organic Compounds</p>	<p>Does the product have higher VOC levels than are allowed by California air quality rules?</p> <p>Example: General purpose cleaners must have less than 10% VOC content.</p> <p>Recommendation: Where possible do not use products containing any VOCs. If VOC ingredients are needed, assure that the VOC % is as low as possible.</p>	<p>MSDS for the product or its ingredients. Look for unnecessary added fragrances, flammables, and other volatile ingredients.</p>
<p>Has Added Fragrance</p>	<p>Does the product have a separate fragrance in addition to the natural odors of its other ingredients.</p> <p>Example: Lemon Oil</p> <p>Recommendation: Do not use products with unnecessary fragrances.</p>	<p>Product MSDS. Ask supplier for unscented products.</p>
<p>Has Added Dye</p>	<p>Does the product have a separate dye in addition to the natural colors of its other ingredients.</p> <p>Example: F&D Red</p> <p>Recommendation: Do not use products with unnecessary dyes.</p>	<p>Product MSDS. Ask supplier for uncolored products, or for ones where the color serves to identify different products.</p>

<p>Packaged As Bulk Concentrate / Mixing System</p>	<p>Is the product available as a concentrate?</p> <p>Example: Disinfectant</p> <p>Recommendation: If you have trained people responsible for mixing, and have safe mixing systems, then purchase concentrates. Otherwise buy only ready-to-use (RTU) products.</p>	<p>Ask supplier for mixing systems, dispensers, and mixing guides.</p>
<p>Safe Container</p>	<p>Is the product container spill resistant?</p> <p>Are product containers shipped in spill resistant packaging?</p> <p>Are the container and trigger strong enough to survive routine use?</p> <p>Example: Trigger assembly shipped separate with product in containers having tightly closed screw tops.</p> <p>Recommendation: Consider container safety when selecting products.</p>	<p>Ask supplier about spill resistant containers and packaging.</p>
<p>Refillable Container</p>	<p>Is the product container refillable?</p> <p>Example: Trigger bottles that can be refilled at a dispensing station.</p> <p>Recommendation: Use products that come in refillable containers.</p>	<p>Ask supplier about refillable containers and dispensing systems.</p>
<p>Container Made Of Recycled Material</p>	<p>Is the product container made of recycled plastic? Are shipping packages made of recycled cardboard?</p> <p>Example: Trigger bottles</p> <p>Recommendation: Use products whose shipping containers and trigger bottles are made of recycled materials.</p>	<p>Ask supplier about recycled content of containers and packaging.</p>
<p>Non-Aerosol Container</p>	<p>Is the product sold as an aerosol?</p> <p>Example: Baseboard stripper Furniture polish Glass Cleaner Graffiti Remover</p> <p>Recommendation: Where possible buy non-aerosol products.</p>	<p>Ask supplier for non-aerosol version of products.</p>

Evaluating Cleaning Chemicals

Each category of cleaning products has a limited number of health and environmental attributes that might differentiate one product from another. The following list of product issues is for 17 individual products that cover the majority of janitorial requirements. This list is not intended to be complete, but is only intended to serve to identify some of the typical issues for each product type.

Always consult the Furniture and Finishes Care and Cleaning Instructions Manual which references each area of the building to the manufacturer's cleaning and warranty guidelines before applying any cleaning product. The nature of green housekeeping products is to contain less or no harsh contents but reference to the manual is essential for preservation of the exemplary finishes in this building.

Eliminate the use of aerosol cans!

1. ALL PURPOSE CLEANERS

All Purpose Cleaners consist of a broad array of possible formulations. The following are some of the specific issues to compare for this product category:

pH: Prefer those with a neutral pH (closer to 7) as compared to those with extreme pH (Closer to 1 or 14)

Biodegradability: Prefer those that are readily biodegradable as compared to those that are slower to degrade. Unfortunately, many older formulations use excellent performing ingredients that have been found to have serious environmental and health concerns (see ingredients to avoid).

Dyes & Fragrances: Prefer those with no or low levels of dyes and fragrances compared to those products that are heavily dyed or fragranced. If dyes are necessary use those that are approved for foods and cosmetics (F&C).

VOCs: Prefer those that have no or low VOC as compared to alternatives with higher levels. Consider detergent based products compared to those containing solvents.

More Preferable Ingredients: surfactants containing terms such as lauryl, amides, and glycosides.

Less Preferable Ingredients: Nonyl Phenol Ethoxylates, NTA, EDTA, glycol ethers, sodium hydroxide, potassium hydroxide, sodium metasilicate, phosphates.

2. BATHROOM CLEANERS

Bathroom Cleaners are often acids because of the need to remove mineral deposits from sinks, bowls and urinals. Frequently they are heavily dyed and strongly fragranced. The following are some of the specific issues to compare for this product category:

pH: Prefer those with a more neutral pH as compared to those with extreme pH (closer to 1). Bathroom cleaners may fall more in the range of pH 4 as compared to traditional products that may have a pH below 1.

Dyes & Fragrances: Prefer those with no or low levels of dyes and fragrances compared to those products that are heavily dyed or fragranced. If dyes are necessary use those that are approved for foods and cosmetics (F&C).

Biodegradability: Prefer those that are readily biodegradable as compared to those that are slower to degrade. Unfortunately, many older formulations use excellent performing ingredients that have been found to have serious environmental and health concerns (see ingredients to avoid).

More Preferable Ingredients: surfactants containing terms such as lauryl, amides, glycosides, citric or acetic acid.

Less Preferable Ingredients: nonyl phenol Ethoxylates, NTA, EDTA, hydrochloric acid, phosphoric acid.

3. BATHROOM DISINFECTANTS

Bathroom Disinfectants are similar to general disinfectants, but typically may have an acidic pH (closer to 1) to remove hard water deposits in sinks, bowls and urinals. The selection issues include both those under general disinfectants and bathroom cleaners. Care in selection and use is important. The following are some of the specific issues to compare for this product category:

See Bathroom Cleaners for similar attributes.

Antimicrobial Ingredients: Prefer antimicrobial ingredients that have a lower potential for persistence in the environment and to accumulate in living tissue compared to those with a greater potential.

More Preferable Active Ingredients: hydrogen peroxide.

Less Preferable Active Ingredients: sodium hypochlorite (chlorine bleach), quaternary ammonium compounds, alcohols, phenolic compounds.

4. CARPET CLEANER

See All Purpose Cleaners. In addition, select carpet cleaners that when dry are not sticky or tacky. This minimizes re-soiling and extends the time between cleaning.

5. METAL CLEANER/POLISH

Metal Cleaner/Polish frequently use petroleum distillates, which are poisonous and derived from a non-renewable resource. The following are some of the specific issues to compare for this product category:

VOC: Prefer those that have no or low VOC as compared to alternatives with higher levels.

Bio-Based / Renewable Resources: Prefer products that use oils derived from renewable resources as compared to oils from non-renewable resources.

More Preferable Ingredients: (examples needed)

Less Preferable Ingredients: petroleum distillates, ammonia.

6. FLOOR FINISHES

Floor Finishes must be durable and appropriate for the prescribed maintenance method, but they typically contain heavy metals. Importantly, floor finishes must be compatible with the stripping solution. The following are some of the specific issues to compare for this product category:

Durability: Prefer finishes that are more durable (require less maintenance such as buffing, restoring and recoating) than less durable finishes that require more frequent maintenance.

Heavy Metals: Prefer non-metal cross-linked polymers as compared to those containing heavy metals. Another significant benefit of non-metal polymer formulas is that frequently they can be removed with less hazardous floor strippers.

More Preferable Ingredients: metal-free polymers.

Less Preferable Ingredients: metal-cross linked polymers.

7. FLOOR STRIPPERS

Floor Strippers typically have extreme pH, solvents and ammoniated compounds necessary to remove metal cross-linked floor finishes. Floor strippers must be compatible with the floor finish. The following are some of the specific issues to compare for this product category:

pH: Prefer those with a pH closer to neutral (in the range of 10 to 12) as compared to those with extreme pH (closer to 14).

VOC: Prefer those that have no or low VOC as compared to alternatives with higher levels.

Bio-Based / Renewable Resources: Prefer those that containing naturally derived solvents as compared to those containing non renewable derived solvents.

More Preferable Ingredients: d-Limonene (citrus solvent) and methyl esters.

Less Preferable Ingredients: ethylene glycol mono butyl ether (butyl cellusolve), 2-butoxyethanol, ammonia, and sodium hydroxide.

8. FURNITURE POLISH

Furniture Polishes frequently use petroleum distillates, which are poisonous and derived from a nonrenewable resource. The following are some of the specific issues to compare for this product category:

VOC: Prefer those that have no or low VOC as compared to alternatives with higher levels.

Bio-Based / Renewable Resources: Prefer products that use oils derived from renewable resources as compared to oils from non-renewable resources.

More Preferable Ingredients: citrus (lemon and orange) oils.

Less Preferable Ingredients: petroleum distillates.

9. GENERAL DEGREASER

General Degreasers are typically heavy-duty cleaners that include solvents for removing oil-based soils. Traditional solvents are typically derived from a non-renewable sources (e.g., petroleum), can be flammable, have a high degree of VOCs which can cause respiratory irritation and contribute to environmental pollution and some have severe health impacts. The following are some of the specific issues to compare for this product category:

See All-Purpose Cleaners

VOC: Prefer those that have no or low VOC as compared to alternatives with higher levels.

Bio-Based / Renewable: Prefer products that use oils derived from renewable resources as compared to oils from non-renewable resources.

Flashpoint: Prefer products that have a high flashpoint compared to those with a low flashpoint.

More Preferable Ingredients: d-Limonene (derived from citrus fruits) and methyl esters from soy and corn.

Less Preferable Ingredients: glycol ethers in general, ethylene glycol mono butyl ether (butyl cellulose), and sodium hydroxide.

10. GENERAL DISINFECTANTS

General Disinfectants are similar to cleaners (see all-purpose cleaners) with additional ingredients added to kill bacteria and other unwanted organisms, and bathroom disinfectants. Because disinfectants kill organisms they are toxic by definition. Some are persistent in the environment and accumulate in living tissue. Care in selection and use is important. The following are some of the specific issues to compare for this product category:

See Bathroom Disinfectants for similar attributes.

Antimicrobial Ingredients: Prefer antimicrobial ingredients that have a lower potential for persistence in the environment and to accumulate in living tissue compared to those with a greater potential.

More Preferable Active Ingredients: hydrogen peroxide.

Less Preferable Active Ingredients: sodium hypochlorite (chlorine bleach), quaternary ammonium compounds and phenolic compounds.

11. GLASS CLEANERS

Glass Cleaners are cleaners that have ingredients added to reduce streaking and to evaporate quickly. Traditional glass cleaners can contain alcohol and other solvents

(typically glycol ethers) or ammonia. The following are some of the specific issues to compare for this product category:

VOCs: Prefer those that have no or low VOC as compared to alternatives with higher levels. Consider detergent based products compared to those containing solvents.

Flashpoint: Prefer products that have a high flashpoint compared to those with a low flashpoint.

pH: Prefer those with a neutral pH (closer to 7) as compared to those with extreme pH (Closer to 1 or 14)

Biodegradability: Prefer those that are readily biodegradable as compared to those that are slower to degrade. Unfortunately, many older formulations use excellent performing ingredients that have been found to have serious environmental and health concerns (see ingredients to avoid).

Dyes & Fragrances: Prefer those with no or low levels of dyes and fragrances compared to those products that are heavily dyed or fragranced. If dyes are necessary use those that are approved for foods and cosmetics (F&C).

More Preferable Ingredients: surfactants containing terms such as lauryl, amides, and glycosides.

Less Preferable Ingredients: ammonia, alcohols, propylene glycol, ethylene glycol and other glycol ethers.

12. GRAFFITI REMOVER

Graffiti Remover used to be formulated with chlorinated solvents (e.g., methylene chloride) before they were banned due to their environmental impact. Many graffiti removers are packaged in aerosol cans which often contain hydrocarbon propellants (e.g., propane, butane), which are highly flammable and can contribute to indoor air quality problems.

VOCs: Prefer those that have no or low VOC as compared to alternatives with higher levels.

Consider detergent based products compared to those containing solvents.

Flashpoint: Prefer products that have a high flashpoint compared to those with a low flashpoint.

pH: Prefer those with a neutral pH (closer to 7) as compared to those with extreme pH (Closer to 1 or 14)

More Preferable Ingredients: n-Methyl-2-Pyrrolidone, d-Limonene.

Less Preferable Ingredients: methylene chloride, petroleum distillates, propane, butane, isobutene, and sodium hydroxide.

13. GUM REMOVER

Gum Removers used to be formulated with chlorinated solvents (e.g., Freon) before they were banned due to their environmental impact. Dry ice and carbon dioxide

are preferable replacements. Degreasers can be used in some situations (see section on General Degreasers).

VOCs: Prefer those that have no or low VOC as compared to alternatives with higher levels. Consider detergent based products compared to those containing solvents.

Flashpoint: Prefer products that have a high flashpoint compared to those with a low flashpoint.

pH: Prefer those with a neutral pH (closer to 7) as compared to those with extreme pH (Closer to 1 or 14)

More Preferable Ingredients: dry ice, carbon dioxide.

Less Preferable Ingredients: Freon, dichloro-difluoromethane, trichloro-fluoromethane.

14. LIME & SCALE REMOVER

Lime & Scale Removers are acids because of the need to remove mineral deposits from sinks, bowls and urinals.

pH: Prefer those with a more neutral pH as compared to those with extreme pH (closer to 1). Environmentally preferable lime and scale removers may fall more in the range of pH 4 as compared to traditional products that may have a pH below 1.

More Preferable Ingredients: citric or acetic acid.

Less Preferable Ingredients: hydrochloric or phosphoric acid.

15. SOLVENT SPOT REMOVERS

Solvent Spot Removers are necessary for spot removal particularly on carpets. Use detergent based spotters if possible (must be followed with extraction or other method to remove/absorb the detergent).

See All-Purpose Cleaners

VOCs: Prefer products that have no or low VOC compared to those with higher VOC content.

Flashpoint: Prefer products that have a high flashpoint compared to those with a low flashpoint.

More Preferable Ingredients: d-Limonene (derived from citrus fruits) and methyl esters from soy and corn.

Less Preferable Ingredients: mineral spirits, 2-butoxyethanol

16. URINAL DEODORIZERS

Urinal Deodorizers are traditionally blocks placed in urinals to reduce odors. Preferably these deodorizers should be eliminated altogether through more frequent cleaning and other methods of deodorizing. However, if urinal deodorizers are still required preference should be given to those with the safest ingredients.

Biodegradability: Prefer detergents that are readily biodegradable as compared to those that are slower to degrade. Unfortunately, many older formulations use excellent performing ingredients that have been found to have serious environmental and health concerns (see ingredients to avoid).

More Preferable Ingredients: surfactants containing terms such as lauryl, amides, glycosides

Less Preferable Ingredients: nonyl phenol ethoxylates, Para dichlorobenzene

17. WOOD & STONE FLOOR COATINGS

Wood & stone floor coatings have traditionally been solvent-based products. While extremely durable to protect flooring materials that are very expensive to replace, these coatings can be quite hazardous during the drying and curing period. The two primary issues to consider during product selection is the use of zero or low-VOC containing materials which will reduce indoor air quality concerns and the products durability which is important to protect the flooring and due to the product and applications cost. One final note, many janitorial firms lack specific expertise in application for these types of finishes. Thus, supplier support (e.g., training) is very important.

Durability: Prefer durable finishes that require less maintenance (e.g., recoating) then less durable finishes that require more frequent recoating.

Flashpoint: Prefer products that have a high flashpoint compared to those with a low flashpoint.

More Preferable Ingredients: water- or epoxy-based finishes.

Less Preferable Ingredients: xylene, Stoddard solvent

Disposable Paper and Plastic Bags

The issues associated with selecting paper products compared to cleaning products are significantly simpler. The issues of concern for paper are primarily focused at the manufacturing stage of the product. Whereas cleaners may have more than a dozen individual ingredients which can vary significantly from category to category and even amongst different products within the same category, paper is relatively similar. Paper has less emphasis on health issues during the products usage stage, or environmental impacts as a result of disposal. The three basic issues of concern for paper include:

- Total recovered material (recycled content)
- Post-consumer recycled content
- Bleaching process

Environmentally preferable paper products recommended for use should meet the following standards for each of the following product categories:

- Bathroom tissue-minimum 100% recovered materials and 20% post-consumer content.
- Toilet seat covers-minimum 100% recovered materials and 40% post-consumer content.
- Paper towels and general-purpose industrial wipes-minimum 100% recovered materials and 40% post-consumer content.
- Plastic trash bags-minimum of 25% post-consumer content.

Three further recommendations for the paper include the following:

- No use of de-inking solvents containing chlorine or any other chemicals listed in the Toxics Release Inventory in the manufacture of paper products.
- No use of chlorine or chlorine derivatives in bleaching processes for paper products.
- Paper dispensers, for example those used in restrooms to dispense paper hand towels should be "touch free", which reduces the potential for cross-contamination of bacteria and other potentially harmful pathogens.

Grounds Keeping Equipment

- Comply with 2002 EPA Phase II Small Spark Ignition Engine Rule requiring 78% reduction in VOC NOx emissions when purchasing new equipment
- Winter-proof equipment to slow deterioration causing low efficiency
- Keep blades sharp
- Reduce mowing time when possible

Microfiber Products

Microfibers are an important part of a healthy high performance cleaning system. Microfibers are ultra fine manufactured fibers made from 80% polyester and 20% polyamide with a diameter of less than 1.0 denier. These fibers are 10 times finer than silk, 30 times finer than cotton, 40 times finer than wool and 100 times finer than a human hair and manufactured into cloth that attract and hold dust, dirt, grim, oil, grease, mildew, and water. This cloth is very strong and virtually lint free. It is manufactured into wiping cloths, dust and wet mop pads, applicator pads, and dusting mits.

- Microfiber is a chemical free, hypoallergenic textile with no traces of formaldehyde.
- Microfiber traps up to 96% dust and dirt.
- Microfiber will retain up to 7 times its weight in liquid and dirt. Microfiber products are an environmentally safe way to clean washable surfaces with little or no cleaning agents.
- When dry, Microfiber attracts dust electro-statically. As a mop they do not have to be treated with chemicals to pick-up dust like cotton mops.
- Microfiber can be used for dusting, polishing, mopping and sanitizing.
- Microfiber clothes are machine washable in normal laundry detergent and machine dryable on low setting.
- Microfiber clothes withstand up to 500 washings and dryings.
- Microfiber must be washed separately from other fiber content items such as cotton rags to prevent lint and residue from transferring to the Microfiber.
- Microfiber products come in numerous colors to easily differentiate clothes to be used in different areas, i.e., bathrooms, food areas, and common areas. Use of a color coded system prevents cross-contamination.

Microfiber products can be purchased from many different manufacturers. Most of these manufacturers also offer ergonomic cleaning equipment such as adjustable mop handles and Microfiber mop heads that can be changed without bending over, angled toilet brushes and dust pans, mop buckets, tool belts, etc. Ergonomic tool design reduces fatigue and work related injuries and increases productivity.

Minimizing Use of Janitorial Products

The following are examples of successful pollution prevention strategies for reducing the use of janitorial chemicals. These examples are from a series of fact sheets published on the internet by the Janitorial Products Pollution Prevention Project. Two of these fact sheets are included at the back this section of the workbook.

- **Chemical Substitutions** - Changing from highly-toxic to less-toxic ingredients. A number of effective, easy-to-use, and low-toxicity janitorial products are now becoming available. Because earlier “green” products did not always meet janitors’ expectations, extensive product trials are usually necessary to convince skeptical users to make a change.

Specific examples include changing from:

Carpet shampoo with nitrilotriacetic acid to one made with ingredients that are not carcinogenic;

Glass cleaner containing butoxyethanol to one formulated with isopropanol or non-hazardous ingredients;

General purpose cleaner with alkyl phenyl ethoxylates, ethanolamine, or butoxyethanol to one formulated with linear alcohol ethoxylates, citric acid, or non-hazardous ingredients.

- **Chemical Use Reduction** - Decreasing the amounts of products with toxic ingredients that janitors use. Some cleaning tasks must use hazardous products because there are no effective substitutes. In these instances the pollution prevention message is to ask the janitor to dilute the product as much as possible, and to use it only when absolutely necessary.

Floor finish strippers often contain ammonium hydroxide, ethanolamine, and butoxyethanol, making this product one of the most dangerous handled by janitors. Minimizing floor stripper use by 50% or more is possible by:

Scheduling floor renewal work according to wear patterns rather than simply following a calendar;

Diluting the stripper with as much water as possible (but not so much that the floor finish is removed unevenly);

Carefully and thoroughly applying the diluted stripper;

Using a rotating pad scrubber wherever possible; and

Thoroughly rinsing the stripped floor so as to neutralize the surface prior to applying the new floor finish.

Acid toilet bowl cleaners are another of the most hazardous janitorial products. Formulated with hydrochloric, phosphoric, or hydroxyacetic acid, these cleaners are very effective in removing hard water deposits and stubborn stains. However, this much cleaning power is not normally needed every day. Therefore a good pollution prevention strategy is to use two cleaners - a mild product for daily cleaning, and an acid cleaner that is only used when absolutely necessary. Adopting this strategy will usually decrease hazardous material use by over 80%.

- Building Perimeter Strategies - Managing the entry of dirt into the building is another way of accomplishing source reduction. Cleanable floor mats, double-door entry chambers, and positive air pressure are all very effective in preventing foot-borne dirt from entering the building in the first place. Less soil in the building means less frequent cleaning, which in turn requires less chemical use.
- Change Cleaning Process - Modifying the techniques janitors use for applying their cleaning products can accomplish source reduction. Many environmentally preferable cleaning products work best when they are applied to the surface with some force, and are left in place long enough to loosen and lift the soil that is present.

Work sequencing therefore is important for the product to be used successfully. For example, the first thing a janitor should do in daily cleaning of a restroom is to apply mild cleaners to the sinks and toilet bowls. These cleaners should be left in place while the trash containers are emptied and paper dispensers are refilled. Then the janitor can quickly scrub and rinse the fixtures once the cleaners have been in place for a few minutes. This sequence takes no more time than cleaning the fixtures separately before removing trash and stocking paper supplies.

Other, longer-term pollution prevention strategies include designing buildings with easy-to-clean architectural features (e.g., keep carpets out of locker rooms), taking care that features with incompatible cleaning needs are kept apart from each other (e.g., not situating carpets and vinyl tiles together), and operating building air conditioning systems so as to minimize the movement of dust.

The Physical and Theoretical Chemistry Laboratory Oxford University

How to interpret MSDS information sheets

This web page provides a little guidance on the interpretation of MSDS data sheets. These sheets may at first seem complicated and difficult to understand, but they are a reliable source of the data you need to handle chemicals safely.

We discuss here the different sections into which MSDS sheets are generally divided, using portions of a sheet provided by a commercial supplier.

Extracts from the MSDS for benzene (note that these are only extracts - the complete data sheet is long) are shown in blue, with a commentary (in black) where necessary.

Section 1 gives details of the company issuing the data sheet....

1 Identification of substance:

Trade name: Benzene

Manufacturer/Supplier:

Alfa Aesar, A Johnson Matthey Company Johnson Matthey Catalog Company, Inc. 30 Bond Street Ward Hill,

.... and, often, emergency call-out information.

Emergency information: During normal hours the Health, Safety and Environmental Department. After normal hours call

The second section identifies the material, and gives the CAS and other registry numbers.

2 Composition/Data on components:

Benzene (CAS# 71-43-3); 100%

Identification number(s):

EINECS Number: 200-753-7

EU Number: 601-020-00-8

The third section summarizes the major hazards associated with use of the chemical. The R and S codes in this section are followed by explanatory text.

3 Hazards identification

Hazard description:

T Toxic F Highly flammable

Information pertaining to particular dangers for man and environment

R 45 Can cause cancer - Group I (extremely hazardous)

R 11 Highly flammable.

R 48/23/24/25 Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.

The fourth section outlines first aid measures.

4 First aid measures

After inhalation: Supply fresh air. If required, provide artificial respiration. Keep patient warm. Seek immediate medical advice. After skin contact

Section 5 covers fire fighting and protective equipment.

5 Fire fighting measures

Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires

Section 6 outlines the procedures to be followed in case of accidental release of the chemical, including methods to be used to clean up spills. Note that these measures are unlikely to be sufficiently detailed if the chemical is particularly hazardous, and local procedures should be drawn up to supplement what is given in the MSDS sheet.

6 Accidental release measures

Person-related safety precautions: Wear protective equipment.....
Measures for environmental protection..... Do not allow material to be released to the environment without proper governmental permits.
Measures for cleaning/collecting: Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust). Dispose contaminated material as waste according to item 13

Section 7 is self-explanatory. This is an important section, sometimes overlooked by those using chemicals in the laboratory. It contains information about the possible formation of peroxides in storage, flammability, explosive risks, etc. Pay particular attention to the possible need for flammable storage cabinets, explosion-proof fridges, and also the need to avoid storage near incompatible chemicals.

7 Handling and storage

Information for safe handling:
Keep container tightly sealed. Store in cool, dry place in tightly closed containers. Ensure good ventilation at the workplace. Information about protection against explosions and fires: Keep ignition sources away. Protect against electrostatic charges. Fumes can combine with air to form an explosive mixture.

Storage

Requirements to be met by storerooms and receptacles: Store in a cool location. Store away from oxidizing agents

Section 8 provides information on regulatory standards for exposure, in other words, the maximum permitted concentration of the material in the environment to which you are allowed to be exposed. It also usually

contains information on suitable types of PPE (personal protective equipment)

8 Exposure controls and personal protection

Additional information about design of technical systems: Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.
Components with limit values that require monitoring at the workplace:
Benzene mg/m³ ml/m³ ACGIH TLV short term 1.6 0.5 ACGIH TLV long term 8 2.5 B VME 1,6 0,5

Personal protective equipment General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed. Keep away from foodstuffs, beverages and feed. Remove all soiled and contaminated clothing immediately..... Wash hands before breaks and at the end of work. Breathing equipment:.....
Protection of hands: Impervious gloves
Eye protection: Safety glasses, Full face protection

Section 9 is self-explanatory

9 Physical and chemical properties:

Form: Liquid
Color: Colorless
Odor: Aromatic
Change in condition
Melting point/Melting range: 5.51 ° C
Boiling point/Boiling range: 80.1 ° C
.....

The next section is also largely self-explanatory.

10 Stability and reactivity

Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Materials to be avoided: Oxidizing agents

Dangerous reactions No dangerous reactions known
Dangerous products of decomposition: Carbon monoxide and carbon dioxide

Section 11 outlines the risks to which you may be exposed when using the chemical. It is therefore a section of crucial importance!

11 Toxicological information

Acute toxicity: (The acute toxicity gives an indication of the kind of quantities of the chemical which may cause immediate damage to health if swallowed, inhaled or absorbed through the skin.)

LD/Lc50 values that are relevant for classification: If you have never heard of LD50s, look in the [glossary on this site](#).

Oral: LD50: 3306 mg/kg (rat)

Dermal: LD50: 48 mg/kg (mus)

Inhalative: LC50/7H: 10.000 ppm/7H (rat)

(There follows a section which gives, often in some detail, an indication of the health effects which may be attributable to this chemical. This section should be read particularly carefully, since the range of health effects may be broad, and may include carcinogenic or sensitizer effects.)

Primary irritant effect:

on the skin: Irritant to skin and mucous membranes.

on the eye: Irritating effect.

Sensitization: No sensitizing effects known. (Chemical sensitisation, for example by platinum compounds, is a potentially debilitating problem. Pay particular attention to any information which may suggest that the chemical is a sensitiser.)

Subacute to chronic toxicity: (Here we find details of the possible long-term effects of exposure to the chemical.)

Benzene has a strong irritating effect, producing erythema and burning. Edema and blistering is possible in more severe cases. Absorption through the skin may cause the same symptoms as inhalation or ingestion. These include gastrointestinal irritation, low blood pressure,

headache, blurred vision, nausea, vomiting, dizziness, loss of balance and coordination, confusion, unconsciousness, coma, respiratory failure and death. Blood, liver and kidney damage is possible. Benzene is a recognized leukemogen and an experimental mutagen and teratogen.

Additional toxicological information:

To the best of our knowledge the acute and chronic toxicity of this substance is not fully known. (For this chemical there now follow important comments regarding the carcinogenicity. The acronyms such as IARC refer to regulatory or health agencies.)

EPA-A: human carcinogen: sufficient evidence from epidemiologic studies to support a causal association between exposure and cancer.

IARC-2A: Probably carcinogenic to humans: limited human evidence; sufficient evidence in experimental animals

NTP-2: Reasonably anticipated to be a carcinogen: limited evidence from studies in humans or sufficient evidence from studies in experimental animals.

ACGIH A2: Suspected human carcinogen: Agent is carcinogenic in experimental animals at dose levels, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) considered relevant to worker exposure. Available epidemiologic studies are conflicting or insufficient to confirm an increased risk of cancer in exposed humans.

Section 12 is largely self-explanatory

12 Ecological information:

General notes: Do not allow material to be released to the environment without proper governmental permits.

Section 13, which deals with disposal, is often not sufficiently detailed for you to be able to undertake disposal yourself. If you need to dispose of the chemical after use, ensure that you know how to do this safely.

13 Disposal considerations

Consult state, local or national regulations for proper disposal.

Section 14 gives transport information, generally as a list of codes indicating the dangers associated with the chemical (flammable, radioactive, very toxic, etc) and the type of transport which may be used. There are usually UN hazard codes given in this section. A guide to these is available [here](#).

14 Transport information

DOT regulations:

Hazard class: 3 Identification number: UN1114 Packing group: II

.....

Section 15 lists the hazard codes (see [glossary](#) if you are not familiar with these) which indicate the principle hazards associated with the chemical and the precautions which should be taken when working with it.

15 Regulations

Hazard symbols:

T Toxic F Highly flammable

Risk phrases:

45 Can cause cancer - Group I (extremely hazardous)

11 Highly flammable.

48/23/24/25 Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.

A full list of these risk phrases is given [here](#).

Safety phrases:

20 When using do not eat or drink.

28 After contact with skin, wash immediately with plenty of

36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

45 In case of accident or if you feel unwell, seek medical advice immediately.

A full list of safety phrases is available [here](#).

National regulations (This may include a variety of country-specific detail) All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical Substance Inventory

This product contains a chemical known to the state of California to cause cancer or reproductive toxicity.

This product contains benzene and is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

Finally, a section of an additional information, such as the name of the person preparing the data sheet, a list of references from which data have been drawn, disclaimers, etc.

16 Other information:

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees

Contact:

[Return to [Physical & Theoretical Chemistry Lab. Safety home page.](#)]

This information was last updated on December 16, 2003. We have tried to make it as accurate and useful as possible, but can take no responsibility for its use, misuse, or accuracy. We have not verified this information, and cannot guarantee that it is up-to-date.



Safe Storage & Mixing

The following are ideas you can use to make your chemical storage and mixing safer.

Incompatible Products - Products with incompatible ingredients should be stored separately. For example keep glass cleaner with ammonia away from tub & tile cleaner containing bleach. “Away from” means in a separate room, in a separate cabinet, or on separate shelves (but not one over the other).

Strong Ingredients - If you have space, consider storing products with acids or other strong ingredients in plastic tubs so that any leaks will not harm the storage rack or janitorial closet.

Stock Rotation - Rotate your stock of stored products so that the oldest ones are used first. Some janitorial products (for example, bleach) have a shelf life. Be sure all such products are used before this time expires.

Spill Kits - Keep spill clean-up kits in each building, and train your workers in their use.

Dispensers - Automatic dispensers might make sense if you use lots of chemicals, and are working in a building with custodial closets. A well-designed dispensing system can save you money, and also can make chemical mixing safer for your employees. However, mixing units can have problems, particularly when filled with seldom used chemicals, so it is important evaluate your needs carefully before selecting a dispenser. Because of its simplicity and ease of maintenance, a manual dispensing system is usually best.

Safe Mixing - Floor strippers and other products with strong chemicals pose the greatest risks when your worker is handling the concentrate. To reduce these risks during mixing:

- Train your employees in safe work procedures.
- Have a supervisor do all mixing.
- Insist that protective gloves and goggles are worn when your employee is handling concentrated products.
- Be aware of Cal/OSHA regulations that require a 15-minute full-flow eye wash station be provided in any area where workers are exposed to corrosive chemicals.
- Many accidents occur when a worker lifts a full mop bucket to pour its contents into a janitorial sink. Teach your employees safe lifting methods.



Adding Labels To Your Containers

Labels are essential to identify hazardous and non-hazardous materials. They identify what's inside. If the material is a waste, a label tells us how long it has been there. Labels are required for used material or waste collection containers.

If a container loses its label, or if you feel that the original label does not provide all the information you want, prepare a replacement. An example of such a label is provided below:

ABC Glass Cleaner

**HAZARD - Moderate Eye Irritant
Flammable**

Contains Isopropanol

CAUTION!

MAY CAUSE EYE IRRITATION

Avoid contact with eyes.

Wash thoroughly after handling

FIRST AID: In case of contact, immediately flush eyes with plenty of water.
Call a physician if irritation persists.

Use Instructions

Apply to surface with a sponge. Wait 5 minutes. Wipe off.

For additional information, see Material Safety Data Sheet for this chemical

**ABC CHEMICAL COMPANY
One Industrial Drive
Anytown, NJ 08010**

This page was adapted from the City of Phoenix training program for Hazardous Materials Inventory Management.

Indoor Air Quality



"Green Label" Testing Program - Vacuum Cleaner Criteria

To help protect indoor air quality, keep all surfaces as clean as possible by vacuum cleaning -- without putting dust back into the air.

This IAQ program identifies vacuum cleaners that do each of three tasks well:



List of
"Green Label"
Approved
Vacuum Cleaners

- Removes soil
- Contains dust within the filtration bag and the machine itself, keeping it out of the air
- Doesn't damage the carpet and helps keep its appearance looking good.

Look for the CRI indoor air quality label on approved machine packaging and merchandising displays. In addition the manufacturer may place a logo on the machine itself.

Good Vacuum Cleaner Practices

Follow the vacuum cleaner manufacturer's instructions for proper use of their product. For the best cleaning results, inspect the vacuum cleaner periodically to be sure it is functioning properly:

- Keep brushes clean, and replace them when worn.
- Keep vacuum hoses and attachments free of obstructions that restrict air flow.
- Inspect belts frequently to make certain they are working properly.
- Always keep a spare belt for replacement as needed.
- Follow the vacuum cleaner manufacturer's instructions, and change the vacuum bag when it is more than half full. As the bag becomes full, soil removal efficiency is reduced.
- Use original equipment manufacturer (OEM) replacement bags or bag types recommended by the vacuum cleaner manufacturer.

The CRI Logo may be permanently placed on authorized vacuum cleaners.

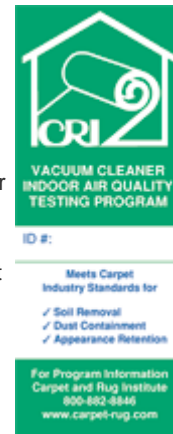
Carpet Industry Standard

The tests follow a procedure that has been developed by carpet manufacturers and vacuum cleaner manufacturers and peer reviewed by scientists who are respected for their expertise in the study of maintenance and indoor air quality.

Soil Removal – The soil removal test protocol requires that the vacuum cleaner must remove in 4 passes a satisfactory quantity of soil from the standard test carpet.

Dust Containment – The dust containment test protocol evaluates the total amount of dust particles released into the surrounding air by the action of the brush rolls, through the filtration bag, and any air leaks from the vacuum cleaner system. This protocol requires that a vacuum cleaner will release into the surrounding environment no more than 100 micrograms of dust particles per cubic meter of air, well below levels stated in the National Ambient Air Quality Standards.

Carpet Appearance Retention – The test protocol for appearance retention requires that the vacuum cleaner should affect the appearance of the carpet no more than a one-step change, based on one year of normal vacuum use.



Maintenance

Vacuum cleaners must meet all three elements of the Standard in order to obtain authorization to display the official CRI Indoor Air Quality Testing Program Label or CRI Logo.

[Selecting Carpet and Rugs](#) | [Care and Cleaning](#) | [Installation](#) | [Seal of Approval](#) | [Indoor Air Quality Technical Information](#) | [Carpet Industry Facts](#) | [CRI and Its Member Companies](#) | [Studies News Room](#) | [Links](#) | [Frequently Asked Questions](#) | [Contact Us](#) | [Home](#)



CRI publications

© The Carpet and Rug Institute

Visit our other websites: [Carpet America Recovery Effort \(CARE\)](#) | [Carpet and Your Health International Flooring Sciences Resource Center](#) | [Carpet In Schools](#) | [Flooring Industry B2B Standard](#)

Best viewed at monitor resolution setting of 800 x 600 pixels

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Cleaning Procedures

Green Housekeeping services are a process that reduces the overall impacts of cleaning on health and the environment. While product selection is important as discussed earlier, procedures for Green Housekeeping services are equally important, and perhaps more so. Selecting environmentally friendly products for operation and maintenance of a building is a conscious effort to reduce impacts on health and the environment. When addressing procedures in a green maintenance program the same approach must be followed.

Always consult the Furniture and Finishes Care and Cleaning Instructions Manual which references each area to the manufacturer's cleaning and warranty guidelines before applying any cleaning product. The nature of green housekeeping products is to contain less or no harsh contents but reference to your facility manual of finishes is essential for preservation of the exemplary finishes in this building.

ENTRYWAYS

Action Items:

- 1. Clean entryways beginning outside the building.**
- 2. Use walk-off matting outside and inside entry. Vacuum, sweep or clean these mats frequently, especially during inclement weather.**
- 3. Make sure mopping solutions are kept clean using only the correct amount of cleaning chemical (see section on product selection). Do not overuse concentrated cleaning chemicals. Remake as necessary and dispose spent solution appropriately.**
- 4. Use appropriate vacuums (see section on product selection). Dispose of captured material or empty bags before half full. Dispose appropriately.**

Entryways are the first line of defense against contaminants. Thus, special effort should be focused in these areas. Begin by cleaning outside walkways leading into the facility. This is especially true during inclement weather. Large outside entryway areas can be swept daily (weather permitting) with a mechanized sweeper and smaller areas with a large, high quality push broom.

- Outdoor areas should be periodically cleaned with a high-pressure power washer. During snow and ice, procedures need to be put in place to first protect occupants and visitors from slips and falls. The selection of the appropriate ice melting compounds that will not be tracked into the building is important.
- Use walk-off mats both outside the entryways, as well as just inside the doors. Mats should be long enough so that as an adult walks across the mat each foot hits the mat at least twice (typically a minimum of ten to twelve feet). Walk-off mats should not just be used during inclement weather, but all year round. Vacuum walk-off mats at least daily, more frequently in high traffic entryways, using a vacuum with a beater bar and vacuum in both directions. Walk-off mats must be cleaned frequently and don't forget to periodically clean underneath them as well.

DUSTING & DUST MOPPING

Action Items:

- 1. Use micro-fiber cloths, dust mop covers and dust mits.**
- 2. Use wide area vacuums fitted with appropriate bags/filters, as much as possible.**
- 3. Do not use feather dusters. Use lint-free micro-fiber dusting cloths or a vacuum instead.**

Traditional dusting and dust mopping techniques frequently move dust and other contaminants from one area to another, such as from a bookshelf to the floor. It is important to recognize that moving the dust around is more than just an efficiency issue. Dusting and dust mopping activities that do not capture soils frequently stir them into the air and re-introduce into the HVAC system where people can then inhale the particles, which for some can become a serious health hazard.

In addition to the traditional procedures for dusting and dust mopping it is preferable to minimize chemical dust treatments. It is preferable to use a vacuum cleaner fitted with a wide area hard floor attachment as compared to a dust mop treated with a high VOC content solvent. If dust mopping is used prefer the widest swivel action mop possible (based on the size of area and the physical abilities of the custodial worker) and a water-based dust mop treatment. Feather dusters should not be used. It is preferable to dust with lint-free micro-fiber clothes that are neatly folded like a handkerchief to expose multiple sides for absorbing dust (for recommendations on vacuums and dusting compounds see the section of product selection).

- Dust from high to low i.e., dust window blinds, light fixtures, and furniture before dust mopping floors.

DUST MOPPING

- Fill a properly labeled trigger spray bottle with dust mop treatment, which has been prepared according to label directions.
- Spray dust mop treatment onto a clean dust mop. Follow manufacturers' directions for application rate. Apply next to the backing, at the base of the yarn. Do not over treat.
- Dust mop the area, use a continuous motion, without lifting the mop from the floor.
- Begin with the mop next to the wall. Walk to the other end of the work area. At the opposite end, pivot the dust mop so that the leading edge remains the same. Return to the opposite end. Overlap the previously mopped path by 2 to 4 inches, to ensure complete coverage.
- One pass with a properly treated dust mop removes dirt, dust and abrasive particles, without leaving the floor dull or slippery. Sweep accumulated soil to a collection area, lightly shake loose soil from the dust mop, and continue. Remove gum, tape or other sticky residue with a scraper, using care not to mar or scratch the floor finish. Continue the dust mopping process until the entire area has been

dust mopped. When completely finished, pick up the collected debris using a counter brush and dustpan.

- Clean excess dust from the mop head. Place the mop over a trash container. Brush with a stiff bristle brush in a firm, downward motion.
- Store the mop in a hanging position. DO NOT store the dust mop on the floor.
- When the dust mop no longer attracts soil replace with a clean dust mop cover.
- Dust cloths may also be treated with dust mop treatment.
- Launder soiled dust mop heads. Soak mop heads overnight in a neutral pH cleaning solution, rinse thoroughly, wring out and hang to dry or wash on delicate cycle in a washing machine and hang to dry. Do not put treated clothes or dust mop heads in a dryer.
- Use a separate dust mop for entry ways and interior spaces to reduce the possibility of abrasive particles that scratch surfaces.

FLOOR CARE – GENERAL MAINTENANCE

Action Items:

- 1. Select appropriate metal-free floor finishes that are extremely durable to minimize the need for stripping and recoating.**
- 2. Build a solid base, which can be between 6 and 12 coats for a 20% solids floor finish.**
- 3. Develop a system to maintain floors on a daily basis, using walk-off mats, dust mopping or vacuuming.**
- 4. Develop an interim restoration program to maintain adequate levels of floor finish and appearances.**

The procedures for floor care in a green housekeeping program are similar in most instances with those of a traditional program. Beyond the traditional issues, floor care in a green housekeeping program addresses the selection of environmentally preferable products and equipment, along with some minor modifications of the procedures themselves.

In a green housekeeping program the primary effort should be a pollution prevention strategy, or one that minimizes the need to strip and recoat a floor, or extract a carpet. Thus, a specific focus should be on preventative measures, such as keep outside entryways clean to prevent soils from being tracked into the facility. This may include sweeping, use of a power sprayer, etc. Use entry mats to capture soils and moisture from shoes. It is preferable that the mats be large enough for each shoe to hit the mat two times (approximately ten to twelve feet).

- Frequent vacuuming of entryway mats and grating systems.
- Frequent dust mopping of resilient tile floors, especially close to entryways and other sources of particulates (i.e. near copier rooms).
- Periodically clean under floor mats to reduce the potential for moisture to lead to bacterial and fungal growth. Wet floor mats should be replaced with dry mats as soon as possible.

In general, an intensive cleaning focus is on the entryways to capture soils at the entries rather than to remove it after it has spread throughout the entire facility.

When floors and carpets need to be spray buffed or spot cleaned, solutions should be applied from a sprayer in a stream, as compared to a fine mist. This will minimize the amount of material that is atomized and potentially inhaled, as well as minimize over-spray. When floors and carpets need to be stripped, recoated or extracted, it is important that the work be scheduled in off peak hours and that occupants are notified. It is preferable to use the least toxic products possible. Use the least amount of water and ventilate the area with fans if necessary for rapid drying to minimize both the possibility of mold growth and slip-fall incidents.

It is preferable to conduct major cleaning activities on a weekend or some other extended time period when occupants will not be in the facility. This allows maximum time for the building to be ventilated (flushed with fresh air) prior to the return of the occupants.

FLOOR STRIPPING

- Prepare the area. Place "Floor Hazard" signs at entrances to the area being stripped. Move furniture. Work around heavy furniture or equipment that cannot be moved. Sweep the floor with a treated dust mop. Remove gum, tape and other foreign materials with a scraper using care not to mar or scratch the surface finish.
- Prepare equipment. Assemble two mop heads and handles. Label one "**Strip Mop**". Label the other "**Rinse Mop**". Assemble two mop buckets and wringers. Label one "**Strip Bucket**". Label the other "**Rinse Bucket**". Place black or high productivity stripping pad on the rotary floor machine. Fill the **Strip Bucket** with a solution of floor stripper (see section on product selection) following manufacturer's recommendations for dilution rates and water temperature. Fill the **Rinse Bucket** with clean, cold water. Add a small amount of a neutral pH cleaner (see section on product selection) following manufacturer's recommendations for dilution rates. Equip a wet vacuum with a floor squeegee tool. Place the equipment in the area where the work will begin.
- Apply stripping solution to the floor, using the **Strip Mop** and **Strip Bucket**. Dip mop in stripping solution. Lift mop and allow excess stripper to drain back into the bucket. Fan out the mop head on the floor and apply stripping solution along the edges. Continue applying solution using an arc motion from right to left, covering the area between the edges. Apply sufficient solution to thoroughly wet the floor, but DO NOT flood it. (Adequate solution coverage will allow a match or toothpick to float on the surface.) Do not allow solution to dry on the floor. Re-apply as necessary to keep the floor wet. Immediately wipe off splashes from walls, baseboards, glass partitions, etc. with a damp cloth. Allow solution to remain on the floor 5 to 10 minutes. Re-apply as necessary to keep the floor wet.
- Scrub the floor with the rotary floor machine and stripping pad. Scrub in a circular motion, from side to side. Overlap the strokes made by the machine. Keep the floor wet. Re-apply solution as necessary.
- Remove the stripping solution from the floor with the wet vacuum and floor squeegee tool. Examine the floor for complete finish removal. Re-strip any areas with residual gloss.

- Rinse the floor. Apply rinse solution using the *Rinse Mop* and *Rinse Bucket*. Apply sufficient water to thoroughly wet the floor, but DO NOT flood it. Remove the rinse solution from the floor using the wet vacuum and floor squeegee tool.
- Damp mop the floor with clean water. Empty the *Rinse Bucket* and refill with clean water. Rinse the *Rinse Mop* with clean water. Damp mop the floor with clean water. Remove Floor hazard signs only when floor is completely dry.

FLOOR CARE - RESTORATION / BUFFING & BURNISHING

Action Items:

- 1. Make sure that adequate floor finish exists. Determine if it is time for a scrub and recoat.**
- 2. Select the appropriate restoration product. Water-based or low VOC products are recommended (see section on product selection).**
- 3. Apply in a stream or coarse spray to minimize amount that gets in the air to breathe and overspray. Do not over apply.**

In a green housekeeping program the primary effort should be a pollution prevention strategy, or one that minimizes the need to extract a carpet. Thus, a specific focus should be on preventative measures, such as:

- Keep outside/outdoors entryways clean to prevent soils from being tracked into the facility. This may include sweeping, use of a power sprayer, etc.
- Use entry mats to capture soils and moisture from shoes. It is preferable that the mats be large enough for each shoe to hit the mat two times (approximately ten to twelve feet).
- Frequent vacuuming of entryway mats and grating systems.
- Frequent dust mopping of resilient tile floors, especially close to entryways and other sources of particulates (i.e. near copier rooms) to reduce soiling on surrounding carpeted areas.
- Establish a specific daily routine for cleaning carpets.
- Establish an interim cleaning process to address the needs of high traffic areas.
- Minimize the need for large scale extraction cleaning.

When carpets need to be spot cleaned, solutions should be applied from a sprayer in a stream or coarse spray, as compared to a fine mist. This will minimize the amount of material that is atomized and potentially inhaled, as well as minimize over-spray. When carpets need to be extracted, it is important that occupants be notified. It is preferable to use the least toxic products possible. Use the least amount of water and ventilate the area with fans if necessary for rapid drying to minimize both the possibility of mold growth and slip-fall incidents.

It is preferable to conduct major cleaning activities on a weekend or some other extended time period when occupants will not be in the facility. This allows maximum time for the building to be ventilated (flushed with fresh air) prior to the return of the occupants.

CARPET CARE - EXTRACTION CLEANING

Action Items:

- 1. Minimize the amount of cleaning chemicals. Excess chemicals result in rapid resoiling.**
- 2. Use the appropriate functioning equipment that will maximize the amount of water being extracted from the carpet to minimize moisture and potential for mold, mildew and bacterial growth.**
- 3. After extraction of carpet areas that were flooded spray treat the area with a disinfectant solution (e.g., Micro-Ban) to prevent mold, mildew, and bacteria growth.**
- 4. Increase ventilation, open windows if weather allows and use fans to dry carpets quickly. Carpets should be completely dry within 24 hours.**
- 5. Dispose of cleaning solutions properly.**

Carpets can act as a "sink" that allows particles and other unwanted material to filter down into the backing of the carpets. Once deep down in the carpet they can lead to damage of the fibers and the need to ultimately replace the carpets. But from a health perspective, the biggest enemy of a healthy indoor environment is when moisture provides an opportunity for these unwanted contaminants to become biologically active. Thus, extraction cleaning can get deep down into the carpets and remove the unwanted contaminants. Unfortunately, extraction cleaning can also add large amounts of water to the carpet, especially if the equipment is not functioning properly. Select appropriate cleaning solutions (see section on product selection).

- Mix cleaning solution properly. Using too much concentrated cleaner not only wastes product, but also can lead to more rapid resoiling of the carpet. Do not apply too much solution.
- Make sure that the vacuum pick-up is working properly and that there are no holes or leaks in wands or other attachments that decrease suction. When vacuuming up spent solution, repeat the process multiple times in both directions. Use increased ventilation to help dry carpets. This can be accomplished by opening windows when weather permits, increasing building ventilation and using floor level drying fans. Carpets should dry within 24 hours to minimize the potential for bacteria and other potentially harmful organisms to grow.
- Notify occupants before large-scale extraction procedures are used as this activity can affect more sensitive individuals. Proper scheduling is recommended when building is not to be occupied such as before weekends and holidays. Building should also be ventilated or flushed with fresh air prior to being reopened.

FOOD AREAS: BREAK ROOMS, CATERING KITCHEN, ETC.

Action Items:

- 1. Clean and sanitize floors, tables, etc. See section on product selection for recommended products.**
- 2. Separate recyclables from trash and makes sure recyclable areas are kept clean (i.e. rinse soda cans) not to attract pests.**
- 3. Make sure that occupants understand how to properly separate trash and recyclables and properly dispose of each.**
- 4. Make sure that waste containers are covered and emptied at least daily.**

Particular attention should be paid to food waste, trash receptacles containing food debris, recyclables such as soda cans, and other objects that contain food residues, which can attract pests. Making every effort to eliminate those things that attract pests is critical to protecting occupant health by reducing or eliminating the need for pesticides inside the building. Ask occupants to rinse out food and drink containers before placing in recyclable collection. Refrigerators used by occupants for their personal use should be emptied and cleaned periodically by the occupants. Integrated pest management (IPM) should be followed.

RESTROOMS

Action Items:

1. **Make sure sanitizing and disinfecting solutions are prepared and used properly (i.e. dwell time) and remix as required.**
2. **Use only approved products meeting Green Seal GS 37 Standards.**
3. **Frequently clean surfaces that hands touch to eliminate the spread of germs (i.e. door knobs, light switches, handles, etc.).**
4. **Frequently eliminate moisture.**
5. **Keep floors dry to eliminate slip falls and the build-up of bacteria mold and mildew.**
6. **Follow manufacturer's instructions for cleaning and maintenance of waterless urinals.**

While procedures for cleaning restrooms in a green maintenance program are similar to those in a traditional cleaning program, because of their heavy use and moisture, restrooms must be cleaned frequently using appropriate cleaning products (see section on product selection). Make sure that cleaning is done thoroughly, including hard to reach areas such as behind toilets and around urinals. Periodically machine scrub restroom floors with a sanitizer or disinfectant (see section on product selection). Make sure that label directions for appropriate dilutions for necessary dwell times are followed to allow for germ-killing activities to be thorough. Dwell time for many sanitizers and disinfectants is ten minutes.

Many products used in the restroom can be quite hazardous, such as drain cleaners and toilet bowl cleaners (see section on product selection). Make sure that appropriate personal protective equipment is used. **Never mix products.**

Use large trash cans where possible to minimize overflow and reduce the frequency for policing the area.

RESTROOM CLEANING –

- Check supply cart for proper equipment and supplies.
- Prepare the area. Place a Restroom Closed sign at the door, if applicable.
- Clean from high to low, towards the doorway, and do dry work before wet work
- Clean the exterior of all dispensers and re-stock supplies, including paper towel dispensers, feminine hygiene dispensers, toilet tissue dispensers and hand soap dispensers.
- Remove trash from all waste receptacles. Clean receptacles with a sanitizer cleaner. Replace liners.
- Dust mop or sweep the floor, pick up collected debris with dustpan, dispose of in trash receptacle.
- Clean all sinks using sanitizer cleaner and abrasive sponge. Leave sanitizer on surfaces according to manufacturer's directions.
- Clean all mirrors with glass cleaner and micro-fiber clothes.
- Clean and sanitize all toilets and/or urinals. Remove urinal screens from the urinals and using the bowl swab, push water level down in stools. Apply bowl cleaner to the exposed interior surfaces of the bowls and/or urinals, specifically

under the rim. Allow time for the chemical to work, while cleaning partitions and showers (approximately 10 minutes - follow manufacturer's directions).

Waterless urinals – remove debris from the bowl. Spray with mist cleaner. Wipe clean and dry. Never dump cleaning solutions or other chemicals into bowl.

- Remove graffiti from walls and stall partitions. Clean stall partitions and with disinfectant cleaner.
- Clean both sides of entrance/exit doors with a sanitizer cleaner, paying special attention to clean hand contact areas.
- Scrub the inside of the bowls and urinals with a bowl swab. Use an abrasive sponge for difficult soils. Clean the exterior of the bowls and urinals with disinfectant cleaner. Clean both sides of the toilet seat. Clean the walls around the bowls or urinals with disinfectant cleaner. Flush bowls and urinals. Polish all chrome surfaces with a dry cloth (after cleaning with sanitizer cleaner).
- Scrub the floor with a sanitizer cleaner using a wet mop, bucket and wringer. If needed, scrub floor grout with a tile and grout brush. Rinse with clear water. Squeegee or vacuum up water, if necessary.
- Treat sink, shower or floor drains with drain maintainer, if necessary. Flush toilets and run sink and shower water once a week to keep the drains clean and the “p” trap full of water.
- Inspect your work. If you are satisfied with your work, allow the floor to dry and re-open the restroom. Return cart to supply area and restock.

SPILLS

Action Items:

- 1. Clean spills while still fresh.**
- 2. Use the proper cleaning solutions and use only what is necessary.**
- 3. Dispose properly.**
- 4. Ensure that occupants know whom to contact in case of spills.**

All water or wet spills will be remedied as soon as possible to minimize impacts on both health and the environment. All moisture must be removed within 24 hours. Work with building occupants to communicate quickly to address spills.

OSHA BLOOD-BORN PATHOGEN STANDARDS

Action Items:

- 1. Use safety cones or other means to make sure that occupants do not come in contact with spill.**
- 2. Use proper personal protective equipment (i.e. gloves, goggles).**
- 3. Disinfect area with appropriate solution.**
- 4. Dispose properly in a red bag.**

While OSHA required training does not deviate in a green maintenance program, because the Blood-Borne Pathogen Standard requires among other things the use of an intermediate grade disinfectant that is tuberculocidal (kills TB), proven effective against the Hepatitis B Virus (HBV) or a specified dilution of chlorine bleach (sodium hypochlorite), special attention must be given under the green maintenance program.

Each of these disinfectant products is very effective at killing both HBV and HIV 1 (AIDS) the two target organisms of concern. However, these same products tend to have more health and environmental impacts than other possible disinfectant/sanitizers that may be desirable for general cleaning. However, because the OSHA Standard specifies the use of these more aggressive products, they must be used.

Thus, in a Green Housekeeping program, it is recommended that a product specifically meeting OSHA's requirements be used along with all of the specified procedures, and this be clearly separate from the products and procedures used for general disinfecting/sanitizing. This separation will meet the OSHA requirements, clearly differentiate the procedures for the different types of disinfecting/sanitizing reducing the potential for confusion and reduce overall health and environmental impacts. These specialized cleaning products will be kept in a separate plastic container, preferably red, and clearly marked "BLOOD-BORN PATHOGEN CLEANUP".

FALCON WATERFREE URINALS

Cleaning and cartridge change instructions



CLEANING



1 Remove debris from bowl



2 Spray (mist) cleaner onto bowl



3 Wipe clean and dry



Never dump cleaning solutions or other chemicals into bowl

CARTRIDGE CHANGE



1 Verify contents of kit



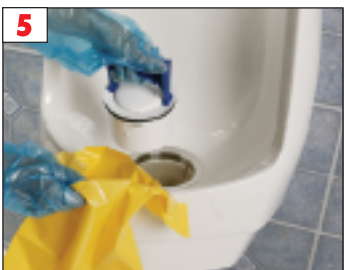
2 Insert key into cartridge



3 Turn key to left



4 Lift cartridge and drain all free liquids



5 Place cartridge into disposal bag and dispose



6 Flush housing with warm soapy water



7 Wipe clean inner stainless steel rim



8 Insert new cartridge into housing



9 Turn key to right



10 Fill cartridge with 1 quart or more of water until there are no air bubbles



11 Add blue sealant and allow time to drain into cartridge



12 Spray (mist) cleaner and wipe clean



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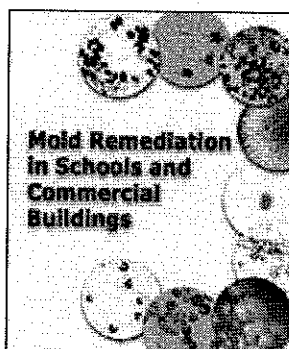
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Investigating, Evaluating, and Remediating Moisture and Mold Problems

Table 1: Water Damage - Cleanup and Mold Prevention

Table 1 presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Table 1, refer to Table 2 for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Table 1: Water Damage - Cleanup and Mold Prevention	
Guidelines for Response to Clean Water Damage within 24-48 Hours to Prevent Mold Growth*	
Water-Damaged Material□	Actions
Books and papers	<ul style="list-style-type: none"> For non-valuable items, discard books and papers. Photocopy valuable/important items, discard originals. Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing - dry within 24-48 hours§	<ul style="list-style-type: none"> Remove water with water extraction vacuum. Reduce ambient humidity levels with dehumidifier. Accelerate drying process with fans.
Ceiling tiles	<ul style="list-style-type: none"> Discard and replace.



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Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3	exposure and size of contaminated area	exposure and size of contaminated area
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		

LARGE - Total Surface Area Affected Greater Than 100 (ft²) or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant

Books and papers	3	Full	Full
Carpet and backing	1,3,4	Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Use professional judgment, consider potential for remediator exposure and size of contaminated area
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,2,4		

Personal Protective Equipment (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

- Limited: Use polyethylene sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999); see Resources List for more information

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7. Please note that [Table 1](#) and [Table 2](#) contain general guidelines. Their purpose is to provide basic information for remediation managers to first assess the extent of the damage and then to determine whether the remediation should be managed by in-house personnel or outside professionals. The remediation manager can then use the guidelines to help design a remediation plan or to assess a plan submitted by outside professionals.
 8. Although this document has a residential focus, it is applicable to other building types.

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Investigating, Evaluating, and Remediating Moisture and Mold Problems

Table 2: Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water

Table 2 presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in **Table 2** are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, *Should You Have the Air Ducts In Your Home Cleaned?* (8) (see [Resources List](#)). If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

In cases in which a particularly toxic mold species has been identified or is suspected, when extensive hidden mold is expected (such as behind vinyl wallpaper or in the HVAC system), when the chances of the mold becoming airborne are estimated to be high, or sensitive individuals (e.g., those with severe allergies or asthma) are present, a more cautious or conservative approach to remediation is

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indicated. Always make sure to protect remediators and building occupants from exposure to mold.

Table 2: Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*			
Material or Furnishing Affected	Cleanup Methods	Personal Protective Equipment	Containment
SMALL - Total Surface Area Affected Less Than 10 square feet (ft²)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 and 100 (ft²)			
Books and papers	3	Limited or Full	Limited

Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

Table 2 continued

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Table 1 if materials have been wet for less than 48 hours, and mold growth is not apparent. These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

Cleanup Methods

- **Method 1:** Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- **Method 2:** Damp-wipe surfaces with plain water or with water and detergent solution (except wood use wood floor cleaner); scrub as needed.
- **Method 3:** High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- **Method 4:** Discard _ remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

Cellulose insulation	<ul style="list-style-type: none"> • Discard and replace.
Concrete or cinder block surfaces	<ul style="list-style-type: none"> • Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	<ul style="list-style-type: none"> • Discard and replace.
Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	<ul style="list-style-type: none"> • Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • Check to make sure underflooring is dry; dry underflooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	<ul style="list-style-type: none"> • Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	<ul style="list-style-type: none"> • Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	<ul style="list-style-type: none"> • May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. • Ventilate the wall cavity, if possible.
Window drapes	<ul style="list-style-type: none"> • Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	<ul style="list-style-type: none"> • Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean

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	<p>water and allowed to dry.</p> <ul style="list-style-type: none"> • Wet paneling should be pried away from wall for drying.
<p>* If mold growth has occurred or materials have been wet for more than 48 hours, consult Table 2 guidelines. Even if materials are dried within 48 hours, mold growth may have occurred. Items may be tested by professionals if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.</p> <p>These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then Personal Protective Equipment and containment are required by OSHA. An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.</p> <p>If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.</p> <p>§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.</p>	

Indoor Plants

Action Items:

- 1. Educate occupants on appropriate care guidelines for indoor plants.**
- 2. Ensure that plants are not in direct contact with carpets and unit ventilators.**

Indoor plants are a wonderful addition to any facility. While the cleaning contractor is typically not responsible for watering and caring for indoor plants, they frequently are called upon to address spills from watering, mold growth in carpets from dampness, aphids and other pests, and other problems. Furthermore, occupant's use of pesticides and fertilizers should be managed with care because these products can impact health.

- Occupants should be educated on the proper and appropriate care for plants. This is an ideal communication issue for the Stewardship Team or IAQ Management Team.
- Avoid the use of aerosol fertilizers, leaf dressing, etc.
- If plants are on carpets there should be blocks or stands underneath to keep container from directly resting on carpet to keep moisture from building up in carpeting.
- Unit ventilators should not be used as plant stands.

Integrated Pest Management

“Integrated Pest Management is a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environment risks.”¹ IPM is a combination of common sense practices that include communication, education, ongoing maintenance and housekeeping to insure that pests will not find a hospitable environment in a building. Activities include building inspection and maintenance; climate control; restriction of food and plants; moisture control; regular cleaning; proper storage; control over incoming storage boxes and containers; and routine monitoring for pests. The following steps can be taken to provide the most economical means to manage pest damage with the least possible hazard to people, property, and the environment. These strategies closely follow the other stewardship practices in this manual.

- Develop an official IPM policy statement.
- Windows and doors should be tightly sealed; weather stripping may be necessary. Doors should not be propped open regularly. Openings around pipes should be sealed, as should all cracks in walls or foundations. Vents should be screened to keep out birds and rodents.
- Install air curtains where feasible.
- A vegetation and mulch free zone of 12 inches should be maintained around building perimeter. Plantings should be properly cared for and not over watered.
- Indoor climate should be moderate; conditions should be cool and dry.
- Pipes and other sources of water such as restrooms, kitchens, or climate control equipment should be inspected routinely to guard against water leakage. Close off unused drains or drainpipe openings. Roofs and garage should be inspected regularly to insure there is no standing water.
- Plants and cut flowers should be well cared for and kept to a minimum. Avoid over watering and watch plants carefully for signs of infestation or disease. Food consumption should be confined to staff lounge areas and designated gathering halls; staff should not eat at their desks. All leftovers should be tightly sealed or removed by caterers. Vacuuming and kitchen cleanup should be done immediately. All food should be stored in tightly sealed glass or metal containers or refrigerated, and a plastic garbage can with a tight-fitting lid should be provided for food waste. Trash should be removed from the building daily.
- If animals are present, store animal food in tightly sealed containers and regularly clean cages.
- Routinely inspect window sills, under bookcases, on and behind shelves, inside boxes and drawers for signs of insect activity. Look for small piles

¹ National Foundation for IPM Education

of dust, insect bodies, insect droppings, egg cases, and live insects. Clean up any insect debris immediately.

- Lockers and desks are emptied and cleaned at least once a year.
- Trash is collected at least once a week and garbage cans and dumpsters are cleaned regularly.
- Store paper products away from moist areas and direct contact with the floor or walls.
- In maintenance areas promptly empty and dry mop buckets after use and hang mops vertically on rack above a floor drain.

If there is evidence of pest infestation, contact a pest management professional practicing integrated pest management. Identify the problem or pest before taking action. If pesticides are necessary, use spot treatments rather than area wide applications.²

Storing Pesticides

- Store pesticides off site or in buildings that are locked and inaccessible to all undesigned persons.
- Be sure adequate ventilation is provided for the pesticide storage area. If pesticides are stored in occupied buildings, take special care that there is proper exhaust ventilation and that the air does not mix with the HVAC system.
- Avoid storing pesticides in places where flooding is possible or in open places where they might spill or leak into the environment.
- Store flammable liquids away from an ignition source i.e., a pilot light.
- Place a notice outside the designated storage area.
- Store all pesticides in their original containers and secure lids tightly.
- Periodically check stored pesticides for leaks or other hazards.

² EPA: Pesticides – Integrated Pest Management (IPM) in Schools
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Landscaping

Concern for the environment and the growing demand on water is being addressed by directing designers and landscapers to follow Xeriscape principles and adopting an aggressive approach to maintaining the new family office's landscape. Landscape design and on going maintenance will use Xeriscape principles of water conservation combined with plant choices based on site, exposure, and soil type and climate zone. The results of this effort produces quality landscaping that conserves water and protects the environment by requiring less fertilizer and fewer chemicals.

Xeriscape is a program of the following seven components:

1. Planning and Design
 - A site map will be developed showing planned structures, topography, orientation, sun and wind exposure, use of space and vegetation.
 - Designers will provide shadow profiles of landscape areas for each season, based on middle of the day conditions and based on these profiles will illustrate the plant selection within the profiles.
 - Heat island effect will be reduced by providing gardens over the parking garage and use of shade from trees and buildings, planting hard wood trees to increase shade canopy as necessary.
 - Plan water use zones
 - High – regular watering
 - Moderate – occasional watering
 - Low – natural rain fall
2. Practical turf areas

Plant turf grasses only for functional benefit such as recreational areas, pedestrian use, or specifically for soil conservation.
3. Soil analysis and preparation
 - Analyze the soil in each zone
 - Amend soil accordingly
4. Appropriate use of plant materials
 - Choose plants that will easily adapt to the site.
 - Choose with mature size and form in mind suitable for the location and intended purpose
 - Consider growth rate
 - Determine that texture and color combine with surrounding plantings and building background
 - Use no mono species or excessive multi-species selections

- Diversify species to prevent elimination of a species from diseases or pest infestation
5. Effective and efficient watering practices
- Use irrigation control system that waters based on evapotranspiration calculated from the systems weather station and site quantities of precipitation. Monitors zone flow and shuts off zones exceeding scheduled flow rates, and alarms landscape contractor to the problem. Regularly check irrigation systems for efficient and effective operation, verify watering schedules and duration on a monthly basis
 - Use drip and micro mister sprinklers systems where applicable and smart irrigation controllers throughout. Provide computer interface for monitoring and schedule modifications from a central location.
 - No irrigation in the months of November to April except for seasonal color plant beds
 - No irrigation of shrubs from September 1 to June 1
 - Capture rain water to meet 100% of the irrigation requirements based on historic average rainfall
6. Use of mulch on trees, shrubs and flower beds. Keep landscape areas mulched to conserves moisture and preventing evaporative water loss from the soil surface to reduce the need for supplemental irrigation during periods of limited rainfall.
7. Proper landscape maintenance
- Turf grasses
 - Use slow release fertilizers to provide essential nutrients based on soil analysis
 - Leave grass clippings on turf grass for “grass cycling”, recycled nutrients.
 - Test soil pH of turf areas every two to three years and apply nutrients accordingly
 - Mow at the recommended heights for turf grasses in Alabama
 - Trees, shrubs and bushes
 - Thin branches and twigs to encourage healthy growth– do not shear
 - Mulch pruning and dead limb waste, and compost material for landscape applications
 - Use slow release fertilizers to provide essential nutrients based on soil analysis
 - Weed Control
 - Provide fertilization and pest control necessary to maintain healthy turf Use pre-emergent herbicides to control weeds and minimize invasive weed problems in February or March and on an as needed basis in October

Identify weeds and apply appropriate post-emergent herbicides on weeds less than 4". Weeds over 4" will be manually removed.
Target fertilizers around the rooting zone or base of specific plants as much as possible
No ammonium nitrate or sulfur coated fertilizers will be used

Integrated Pest Control - Exterior

- Read and follow all label instructions
- Use proper protective clothing or equipment when applying pesticides.
- Notify occupants of upcoming pesticide applications.
- Keep copies of current pesticide labels, consumer information sheets and Material Safety Data Sheets (MSDS) easily accessible.
- Identify pest, its life cycle, and treat accordingly
- Treat as needed on a per plant application
- Limit the use of sprays, foggers or volatile formulations.
- Water turf infrequently but sufficiently during early morning hours to let turf dry before nightfall; let soil dry slightly between waterings.
- Provide good drainage and periodically inspect turf for evidence of pests or diseases.
- A vegetation and mulch free zone of 12 inches should be maintained around building perimeter.

Walkways / Driveways / Lighting

Snow and Ice

Reduce the need for chemical usage. Removing snow and ice from sidewalks and roadways is an important health and safety issue that can have significant environmental impacts depending on the ice melting chemicals used. Common ice melters include: ammonium sulfate, urea (nitrogen fertilizer), sodium chloride (rock salt), calcium chloride, magnesium chloride, potassium chloride, potassium acetate and calcium magnesium acetate. Ice melters should be used to break the bond between ice and the road surface so that the ice and snow can be physically removed by shoveling. An application of a liquid anti-icing agent may be considered where it is especially important to prevent ice from forming or where the use of an ice melting chemical is not possible. Maintenance staff can better clear snow from necessary areas and de-icing chemicals will be used over a smaller surface area.

Keep the weather in mind. A light, powdery snow may not require a de-icing chemical, just shoveling or sweeping. If freezing rain, wet, heavy snow, or sleet is expected, apply an ice melter before precipitation begins to maximize its effectiveness. If occupant and visitor movement and building materials permit, close redundant stairways, sidewalks, and roads during snow and ice days.

Chemical Considerations

Switch from sodium and calcium chloride products to potassium and magnesium chloride products. While all chlorides may be toxic to vegetation if used in large quantities, potassium and magnesium chloride products are less damaging to plants, concrete, carpeting and hard surface flooring. Apply chemical deicing compounds with a spreader (or sprayer for liquids) to minimize the amount of product used and ensure a uniform application.

Parking Lots

In addition to presenting a well-kept public image, regular cleaning of a parking garage can help identify and address potential problems. Trash that is not removed regularly can block floor drains and lead to water buildup, as well as attract rodents and pests. Trash left in walkways and stairwells can be a pedestrian hazard. Removing trash also eliminates debris that can hold moisture in contact with concrete. Sweeping and washing the parking deck helps remove dust, oil, grease, dirt, and de-icing chemicals from parking structures which can be tracked inside the building. Fluids from vehicles, such as grease, oil, and antifreeze, can build up in parking spaces and at the garage entrances and exits, and may become a slip hazard for pedestrians. If it is not possible to collect the dirty water after a wash down, consider using a mechanical scrubber that collects the dirty cleaning fluid as it cleans. Maintain waterproofing systems (e.g., deck sealers, joint sealants, membranes) according to manufacturer's instructions to ensure performance and check monthly for leaks or deterioration.

Inspect floor drains making sure that drains, basins, and traps are kept free of trash and debris to prevent clogging and standing water. Keeping water from ponding and penetrating is crucial for long-term structural stability. Water penetration into concrete presents a potential structural hazard to the reinforcing steel. Temporary filters (e.g., burlap) may be used during wash downs to prevent sediment and trash from entering the drains.

Pedestrian safety requires adequate lighting in all areas of the garage at all times. Inspect lighting fixtures for burned out bulbs, dirty lenses, dirty photocells or sensors, and battery pack status on emergency lighting.

Outdoor and Exterior Lighting Maintenance

Keys to energy-efficient outdoor and exterior lighting:

- Turn off all unnecessary light.
- Inspect and test regularly exterior lighting controls and associated photo sensors to turn on lights whenever adequate daylight is not available.
- Use energy management systems to limit exterior lighting to 11 pm.
- Check system setting to minimize operating hours and maximize savings.
- Adjust timer switches and sensor to turn on lights for only short duration, especially for non-essential or non-security lights (loading docks, for example).
- Clearly label all switching devices to save time and help employees identify which lights should be shut-off at specific times.
- Check and adjust fixtures so that lights are aimed where needed to minimize light pollution.
- Control incandescent sources to limit the time they operate.
- Keep fixtures and light bulbs clean for optimum illumination.

If the facility has been designed to minimize light pollution, assistance will be required from the building operator to maintain the designers' intent and minimize unnecessary light and energy use as follows:

1. Turn off non-essential lighting especially after hours.
2. Eliminate light up into the atmosphere either by direct light or by reflected light.

Roof

Proper roof maintenance can identify and correct minor defects and problems that, if left unattended, can eventually lead to damage or roof failure as well as moisture intrusion to the building.

Perform Regular Inspections and Remove Debris

Qualified staff should thoroughly inspect the roof at least twice a year – once in the spring and once in the fall – to identify problems such as failed flashings, clogged drains, and surface punctures. Additional inspections should be performed after severe weather (high winds, heavy snow, ice loads) or building construction. The inspections should also include an examination of the building interior areas directly below the roof.

- Remove all debris, leaves, paper, vegetation, and other items that can clog drains and gutters.
- Observe for grease from exhaust fans, oil from HVAC units, fluid from cooling towers, and other pollutants.
- Clean roof drains and down spouts.
- Direct water from down spouts away from the building.
- Pay particular attention to any roof penetrations i.e. vents, equipment mountings, etc.
- Hire only trained and qualified staff to perform roofing repairs.

Keep Roof Access Restricted

Limit Roof Access to authorized personnel. The more traffic on the roof, the more potential for damage.

HVAC

HVAC maintenance practices can have a significant effect on a building's energy use and the comfort of its occupants. Mechanical systems - heating, ventilation, air-conditioning, and the associated component such as fans, pumps, etc. for space conditioning - are the second largest user of energy in most buildings, exceeded in most cases only by lighting energy consumption.

Devices Brought by Teachers, Staff and Students

High on the list of "external factors" are devices brought in by building occupants to help them deal with variable comfort levels and building conditions during the day. These devices range from desk lamps to electric fans to space heaters and blankets or other devices. These devices at best, help to provide occupants with the additional environmental controls that modern buildings have taken away, and at worst, become a nuisance, if not a fire hazard. Usually, building operations and maintenance personnel tend to ignore such devices, unless they interfere with the proper operations of the system - for example, a heater located too close to the zone's thermostat or sensor can result in the rest of the zone or the building being too cold. However, if the goal of O&M practices is to minimize building energy use, these devices have the potential to wreak havoc with system settings and other reduction measures, resulting in an increase in the building's energy consumption, instead of reducing it.

To maximize savings, one approach to addressing this situation is the possibility of the Stewardship Team negotiating an agreement with all of the building's or heating/cooling zones' occupants, where they can choose from a variety of solutions to meet their comfort needs. In exchange, the zones' or building's temperature settings can be set to take these devices into account - higher thermostat setting in the summer, and lower in the winter. Guidelines can also be set for these devices (maximum wattages, safety ratings, types of heating elements, etc; or the use of heating pads or feet warmers in winter, which use much less energy and actually provide more comfort than a space heater, due to their direct contact with the user).

Overall, there are opportunities to reducing energy consumption if these devices are taken into account rather than ignored. In addition, the involvement of the building occupants in the pilot and decision making process often helps to make the process work better, resulting in maximum energy savings.

Lighting

Inspect lighting fixtures for burned out bulbs, dirty lenses, dirty photocells or sensors, and battery pack status on emergency lighting.

LAMP DISPOSAL

Lamp disposal key points:

- **Handle spent lamps with care**
- **Avoid crushing or breaking lamps during transport**
- **Set aside a location to collect spent lamp**
- **Educate everyone on the need for careful handling**
- **Do not discard broken lamps - they should also be put aside for recycling.**
- **Arrange for regular recycling pickup.**

Fluorescent and other high-intensity-discharge light sources generally require care in their handling and disposal. Fluorescent light sources and other efficient sources such as HID, and even inefficient sources like mercury vapor lamps, require small amounts of mercury to operate. Care is needed during the unpacking, installing or replacing process for these light sources. CFLs, linear fluorescent, and HID are made of glass tubing and can break if it is dropped or mishandled. Mercury is a hazardous material, and its disposal and handling is regulated by the EPA and state regulations. In general, state waste disposal regulations take precedence over federal regulations.

Additionally, some county disposal regulations may be more stringent than a state's regulations. On July 6, 1999 EPA added hazardous waste lamps to the federal list of "universal wastes". Hazardous waste lamps are any lamps that are characteristically hazardous.

Grounds Keeping Equipment

- Comply with 2002 EPA Phase II Small Spark Ignition Engine Rule requiring 78% reduction in VOC NOx emissions when purchasing new equipment
- Winter-proof equipment to slow deterioration causing low efficiency
- Keep blades sharp
- Reduce mowing time when possible

Training for Stewardship of Your Building's Indoor Air Quality

Who	Owner Construction Team Facilities Management Cleaning Personnel/Contractor Occupants Visitors Vendors
What	Training to include: Specifications, Plans, Policies, Products, Procedures
Where	(To be determined)
When	(To be determined)

Why Meet requirements of LEED (For the purpose of)...providing healthy indoor air quality through the use of Green Housekeeping and Site Management.

The impacts of the operation and maintenance of a building and associated grounds on the health of its occupants and the environment at large can be significant. A building and its grounds constitute a microcosm or miniature version of a city: it takes in materials, expels other materials as waste, and uses a lot of energy in lighting, heating, and air conditioning the space. In addition, each building has its own climate and atmosphere, often more polluted than the outside air. The flow of materials alone is significant, with tap water, paper products, lighting, carpet, paint, cleaning product, and many others coming in. Some of these such as cleaning products, carpet and paint, may have impacts on maintenance workers and building occupants while used. Others are disgorged to streams through sewage where they can harm aquatic life or escape to the atmosphere to exacerbate local air pollution, global warming, or ozone depletion.¹ The goal of adapting green housekeeping procedures is to protect the health of building occupants, visitors, and cleaning personnel, as well as reduce polluting effects on our air and water. Above all, green cleaning incorporates a sense of “stewardship” for a building and its inhabitants by forming a team including the Owner, Construction Team, Facilities Manager, Cleaning Personnel/Contractor, Occupants, Visitors, and Vendors to minimize health and environmental risks while maximizing student and staff morale and productivity.

¹ Pennsylvania Green Building Operations and Maintenance Manual

WALKTHROUGH INSPECTION CHECKLIST

The walkthrough inspection is not intended to be an intensive, detailed, or costly inspection, but rather a quick overview of the conditions that affect the quality of air within your facility. You may wish to have someone who is familiar with the operation of the building to assist you during the inspection. The Walkthrough Inspection is part of the IAQ Management Plan. While some facilities wait until the initial parts of the Plan have been completed, some facilities have had success “jump-starting” their program by beginning with a quick walkthrough and taking immediate action where the potential problems are obvious and easy to correct.

During your walkthrough inspection, you can learn a lot by using your sense of sight, smell, feeling and hearing to gain information on factors which affect indoor air quality. You may even be able to make immediate corrections.

- ❖ **Observe** the general level of cleanliness in offices and mechanical rooms. Look for pollutant sources such as mold, improperly stored chemicals, or excessively dirty air filters and ducts. Look for signs of water damage which may point to an underlying problem which increases the chance of biological contaminants. And look for blocked airflows such as those caused by books or papers on top of unit ventilators or plywood covering outdoor air intakes.
- ❖ **Smell** for unique or objectionable odors – including mold, mildew, and “chemical” smells – as you move from room to room. Note any potential sources of these odors.
- ❖ **Feel** for uncomfortable air temperatures, drafts, and high or low humidity, and feel for air flowing into and out of grilles and air vents.
- ❖ **Listen** to the concerns of occupants regarding IAQ. Do they provide clues to problems such as using their own pest spray to control pests, or turning off the unit ventilator because it is too noisy? Do you hear unusual equipment noises which may indicate potential problems, and do you hear air blowing out of supply vents?

EXTERIOR INSPECTION

Begin the walkthrough inspection outside. You are looking for anything which might impact the air indoors. Considerations include ventilation inlets, outdoor sources of pollution such as vehicle exhaust or pesticides, site drainage, holes in the building shell, and evidence of pests. Use the checklist to guide your inspection, and note any relevant observations on this sheet or on a plan of the building.

GROUND LEVEL

- Ventilation units on and air flowing into outdoor air intakes?
- Outdoor air intakes free from blockage or obstruction (boards, leaves, vegetation, snow, etc.)?
- No bird or animal nests or droppings near outdoor

Location/Observation

- Plumbing stacks 10 feet away from outdoor intakes?
- Exhaust fans operating and air flowing out?
- Any exhaust air outlets within 10 feet of outdoor air intakes?

ATTIC

- Evidence of roof or plumbing leaks?
- Bird or animal nests?

Location/Observation

INTERIOR INSPECTION

Continue the walkthrough inspection inside. You are looking for noticeable temperature & humidity concerns, indications that the ventilation system is functioning, general cleanliness, evidence of pollutant sources including mold and mildew, anything which might impact the air indoors. Use the checklist to guide your inspection, and note any relevant observations on this sheet or on a floor plan of the building.

GENERAL CONSIDERATIONS

- Are temperature and humidity within acceptable ranges?
- Is air flowing into and out of the room as designed
- Are supply and exhaust vents free from blockage or obstruction/
- Area free of objectionable odors?
- No signs of mold or mildew growth?
- Is the area generally clean and dust under control?

Location/Observation



- Area free of evidence of pests or obvious food sources or entryways?
- Do the room occupants report any concerns or problems?

BATHROOMS AND GENERAL PLUMBING

- Bathrooms and restrooms have operating exhaust fans?
- All drains have traps?
- Drain traps are filled with water (floor drains, sinks, toilets)?

Location/Observation

MAINTENANCE SUPPLIES

- Odorous or hazardous chemicals used with adequate ventilation and only when building is unoccupied?
- Air exhausted from chemical (e.g., custodial closets) and trash storage areas?

Location/Observation

COMBUSTION APPLIANCES

- Combustion gas or fuel odors ever detected?
- Combustion appliances have flues (e.g., furnaces, boilers, water heaters) or exhaust hoods (e.g., kitchen ranges)?
- Flue components free from leaks, disconnections, deterioration, or soot?
- Soot outside of flue components?

Location/Observation



OTHER

- If the building was built before 1980, is paint inside or outside free from peeling or flaking? [lead paint hazard]
- Have radon measurements been performed in the facility?

Location/Observation

Construction Indoor Air Quality (IAQ) Management Plan

A construction IAQ plan meeting the U.S. Green Building Council's LEED™ for Existing Buildings will be created, made a part of the project specifications and enforced during any future building retrofits, renovations or modifications that may occur on the site to protect the occupants and building finishes from dust, fumes, and other related contaminants associated with construction.

The following plan will be implemented to prevent indoor air quality problems resulting from the construction process. Poor control of indoor air quality (IAQ) during the construction activities produces odors, dust, and air pollutants, and moisture intrusion and absorption into building materials which can cause health and comfort concerns to construction workers as well as building occupants. To minimize the negative effects and reduce risk, the construction team must take measures to manage the IAQ during the construction process. By effectively managing the IAQ during construction, health and comfort issues that can result from the construction process can be reduced significantly.

This Construction IAQ Management Plan describes the types of pollutants that may be generated during construction, areas affected by these pollutants, the activities likely to produce pollutants and IAQ problems, and the classification of the pollutants. Most importantly, Section 7 contains the required measures to control the indoor air quality during the construction or renovation of a project. The commissioning agent will be observing the site during construction to help ensure compliance with the Construction IAQ Management Plan. At the end of construction, during furniture, fixture and equipment move-in, the building will be flushed with fresh air prior to occupancy or a baseline indoor air quality test consistent with the EPA Protocol for Environmental Requirements, Baseline IAQ and Materials will be conducted.

Potential Sources of Odor and Dust

The following table lists potential sources of odor and dust, as well as the type of contaminant produced by each source.

Source	Type
Pressed wood products	VOCs
Treated wood products	VOCs
Adhesives	VOCs
Sealants	VOCs
Glazing compounds	VOCs
Caulking	VOCs
Grouting	VOCs
Wood preservatives, finishes and paint	VOCs
Control and/or expansion joint fillers	VOCs
All hard finishes requiring adhesive installation	VOCs
Wall coverings	VOCs
Solvents	VOCs
Fuels	VOCs
Cleaning agents	VOCs
Pesticides	VOCs
Epoxy flooring/finishes	Particulates, VOCs
Gypsum board and associated finish processes	Particulates, VOCs
Concrete	Particulates
Plaster	Particulates
Roofing	Particulates
Insulation	Particulates
Carpeting	Particulates

Source	Type
Other flooring	Particulates
Ductwork	Particulates
Ceiling panels	Particulates
Exterior insulation and finish system (EIFS)	Particulates
Automotive exhaust	Combustion products
Generators	Combustion Products
Saws	Combustion Products
Compressors	Combustion Products
Welders	Combustion Products
Forklifts	Combustion Products
Troweling machines	Combustion Products
Conveyors	Combustion Products
Pressure washers	Combustion Products
Mixers	Combustion Products
Cutting torches	Combustion Products
Portable heaters	Combustion Products
Soldering guns	Combustion Products
Cigarette smoke	Particulates, Combustion products
Moisture, Water	Biological materials
Bathrooms	Biological materials
Food products	Biological materials

Notes:

VOCs = volatile organic compounds

Potential Sources of Mold & Mildew

Conditions that are conducive to microbial amplification resulting in mold and mildew growth require a food source and moisture. Building materials, dirt and debris are excellent food sources that mold and mildew thrive on if moisture is present. Mold growth, which is a symptom of moisture problems in a building, occurs when the following conditions are present:

- Temperature between 45 and 95 degrees Fahrenheit (°F)
- Oxygen
- Organic nutrients (many building materials provide food for mold growth)
- Moisture (water or RH above 70 percent)

The only one of these conditions that is easily controlled is moisture.

The construction of a building provides many opportunities for mold and mildew growth in the building before the building is even completed. Contractors must exercise great care in protecting the building and its materials during the construction process to prevent indoor air quality problems from affecting the building occupants after completion. Moisture intrusion from rain water before the building is dried-in, moisture generated in the building after dry-in, and the sequence the HVAC system is started and operated are all critical to managing indoor air quality during construction. Because of the magnitude of potential mold and mildew problems, it is extremely important to implement the control measures described in Section 7.

Determining the sources of moisture/mold growth and understanding the concepts of relative humidity, humidity ratio, and dew point are also crucial to understanding moisture related problems in buildings. In addition, it is critical to know how architectural features alone or in combination with the HVAC system can affect the potential for excess moisture buildup and mold growth.

Mold growth is dependent on the level of moisture and can be affected by direct moisture intrusion (such as rainwater) or by relative humidity of the air, because relative humidity determines how much moisture a porous material (such as gypsum wallboard) will absorb.

Some key concepts are as follows:

The *relative humidity* is the ratio of the amount of moisture vapor in the air at a given temperature to the maximum amount of moisture vapor the air can hold at that temperature.

The amount of moisture vapor that air can hold is heavily dependent on the temperature of the air sample. At higher temperatures, air can hold more moisture. Therefore, to calculate relative humidity, both the absolute moisture level and the temperature of the air must be determined.

Humidity ratio is the ratio of the weight of the moisture vapor in the air to the weight of the air. It is usually expressed as grains of moisture vapor per pound of air (grains/lb). Humidity

ratio is an important value in moisture and mildew evaluations because it characterizes total moisture in a space.

EXHIBIT 1

Relationship Among Dew Point, Humidity Ratio, and Relative Humidity at Various Temperatures

At a given dew point and humidity ratio, a slight increase in temperature results in a significant decrease in RH.

Humidity Ratio (grains/lb)	Dew Point (°F)	Relative Humidity at 70 °F (%)	Relative Humidity at 75 °F (%)
54	50	49	38
65	55	59	45
78	60	71	54
93	65	84	64
111	70	100	76

Dew point is the temperature at which moisture in air begins to condense. At a given temperature, relative humidity, and absolute moisture level, the dew point is the air temperature at which the same absolute moisture level would represent 100 percent relative humidity. When the ambient temperature drops below the dew point temperature, the air can no longer hold all its moisture vapor and the moisture will therefore condense onto surrounding surfaces.

Both dew point and humidity ratio are constant with air temperature; they do not vary with temperature as relative humidity does. Exhibit 7 illustrates the relationship between relative humidity, dew point, and humidity ratio at several representative temperatures.

As can be seen in Exhibit 1, relative humidity varies significantly with temperature at a given dew point and humidity ratio. HVAC systems normally operate to maintain a temperature set point; only as a byproduct of their operation do they control relative humidity in the space. By cooling the supply air below its dew point, the HVAC system condenses moisture out of the air. The typical supply air temperature delivered by the HVAC system is between 55°F and 60°F. As shown in Exhibit 1, at 75°F, the air in a room will typically have a relative humidity of approximately 54 percent during summer months. However, if the room temperature is lowered to 70°F, the relative humidity in the room will rise to 71 percent, which exceeds the 70 percent minimum limit for mold growth.

Affected Areas

Due to the nature of construction, all areas of the building will be affected by some contaminants. Additionally, the area surrounding the building will be affected by various contaminants, including dust from concrete masonry units (CMU), odors from adhesives, sealants, roofing, paints, and vehicle exhaust. All areas of the building can also be affected by moisture intrusion. Because of the magnitude of the potential dust, odors, pollutants, and risk of mold and mildew, it is extremely important to implement the control measures described in Section 7.

Activities Likely to Produce Odor or Dust

Many activities during the construction are likely to produce odor and dust. Dust is produced during the following activities:

- Cutting materials
- Drilling materials
- Sawing materials
- Sanding materials
- Rasping EIFS

Odors are potentially emitted during any activity which involves the following products:

- Adhesives
- Sealants
- Paints
- Solvents
- Cleaning supplies

The following construction activities produce combustion products:

- Welding
- Cutting using torches
- Sawing using chainsaws
- Soldering

Additionally, every day activities such as smoking can produce particulates and odor

Classification of IAQ Problems

Class 1

Class 1 air pollutants are expected to have only a nuisance impact on exposed occupants. Only very sensitive individuals should have adverse reactions to these pollutants. Activities which produce small amounts of dust and light dust disturbance, such as sweeping, are classified as Class 1.

Class 2

Class 2 air pollutants could cause moderate but temporary health impacts on some occupants. The majority of the activities listed in “Activities Likely to Produce Odor or Dust” are classified as Class 2.

Class 3

Class 3 air pollutants are the more hazardous air pollutants which could cause severe, acute, or chronic illness.

The following activities and pollutants are classified as Class 3:

- Disturbance of products of combustion
- Heating of roof tar
- Application of enamel paint
- Mixing of epoxy resins
- Non-vented operation of gasoline or diesel-powered equipment
- Microorganisms i.e. Staphylococcus, various species of fungi, spores, bacteria commonly referred to as mold & mildew.

Control Measures

Several control measures may be necessary to maintain good indoor air quality during construction. The control measures required in this project, HVAC protection, moisture control, source control, pathway interruption, housekeeping and scheduling, are described in the following sections.

7.1 HVAC Protection

When possible, conduct all cutting and grinding of cementitious/masonry materials prior to delivery and installation of HVAC materials (supply and return ductwork, diffusers, grills, filters, terminal units, etc.) and equipment.

Once on site, protect all supply and return ductwork, accessories and HVAC equipment from dust, dirt, moisture and other air-borne contaminants by covering with plastic or other suitable material. Secure tightly at openings to protect ductwork and HVAC equipment from collecting dust and odors (odors can “stick” to porous materials in the system and later be released).

Once installed, protect all surfaces of ductwork, duct insulation, accessories and equipment that will contact supply and return air during operation from dirt, moisture, and contaminants by sealing off ductwork and equipment openings during activities that may cause contamination such as sheet rocking, painting, demolition, etc. Also see Section ([Reference section of project manual describing protection actions i.e. 15810, “Ducts”](#)) in the project contract documents. The General Contractor and the HVAC contractor shall inspect often to ensure the integrity of the seal. Commissioning agent will randomly check the ductwork and associated equipment throughout the construction process to help ensure compliance with this Construction IAQ Management Plan.

Schedule installation of exterior duct insulation after building is dried-in and replace duct wrap that has become wet. Complete installation of HVAC insulation prior to start-up of HVAC systems operating in cooling mode. Develop and implement a startup plan that minimizes infiltration of warm outside air into the building during warm and humid periods of the year. The construction team will minimize the duration that HVAC equipment is operated during construction. The HVAC system should only be operated to protect the building or to acclimate materials to the environment before installation, as required by manufactures. Do not operate equipment unless required for ventilation or space conditioning.

When the HVAC equipment is started up, protect the building from interior generation of moisture and all surfaces of ductwork, accessories and equipment that will contact supply or return air during operation from dirt, moisture and other contaminants by implementing requirements of the following subsections.

7.1.1 Return Air Side

The return air side of the HVAC system shall be shut down and sealed with plastic during heavy construction/dust generating activities. If the HVAC system must be operated the HVAC contractor will install filter media with a minimum of MERV 8 efficiency or more over all return openings. Contractor shall ensure a good seal between the filters and return air openings and will inspect often to ensure the integrity of the seal.

During installation of VOC containing materials, return air shall be minimized and outside air shall be maximized. The system return air should be isolated from the surrounding environment as much as possible to prevent induction of pollutants. HVAC operation should promote exfiltration of air from the building to assist with VOC removal.

Utilize 100% outside air when practical to minimize the amount of return air used, particularly during periods of high contamination. When relying on 100% outside air, seal off return air opening or install filters, as previously described. Closed return dampers alone are insufficient to prevent air in the return ducts. Protect air handling equipment as described below. All filters must receive frequent periodic maintenance. Filtration of MERV 8 efficiency shall be maintained.

7.1.2 Central Filtration

In areas where major dust loading is expected to impact operating HVAC systems (including systems utilized for temporary heat), provide filters with at least MERV 13 dust spot efficiency. Where other control options for construction related odors are not deemed effective, consideration may be given to filtration with media such as activated charcoal or potassium permanganate. All filters must receive frequent periodic maintenance. Filtration of MERV 13 efficiency shall be maintained.

7.1.3 Supply Side

When the system is off for the duration of construction, diffusers should be sealed in plastic for further protection. At the completion of construction (prior to occupancy) DNR and the commissioning agent will randomly observe ducts and diffusers for deposited particulate. If there is only minor particulate discharge during start-up, the discharged dust must be cleaned up prior to occupancy. HVAC contractor shall install new final filters prior to occupancy that have a minimum efficiency reporting value (MERV) of 13 as determined by ASHRAE 52.2-1999.

7.1.4 Duct & Equipment Cleaning

If the system becomes contaminated during the construction process, the ducts and associated equipment will be cleaned after dust producing activities (identified in "Section 4 – Activities Likely to Produce Odor or Dust") have been completed in the areas served by the HVAC system. Ductwork and equipment contaminated with dirt, debris or moisture shall be cleaned prior to flush out and occupancy. The mechanical designer will approve the appropriate cleaning process. New filter media will be installed after HVAC system has been cleaned just prior to flush out and substantial completion and occupancy. All mechanical rooms shall be kept clear of construction debris, materials and waste at all times.

Statements shall be submitted to the commissioning agent from the specialty contractor performing the duct cleaning indicating which sections of duct have been cleaned and which method was used. Commissioning agent will randomly observe the sections which have been cleaned to verify the performance of the cleaning contractor.

7.2 Odor and Dust Source Control

As the building is enclosed the use of portable combustion type heaters (i.e. kerosene, propane) will be eliminated to prevent elevated levels of combustion product contaminants.

Utilize products (solvents, caulks, carpet, adhesives, paints and coatings, composite wood and agrifiber products) that emit low quantities of VOCs listed in the specifications. During construction activities that produce odors or VOCs provide fresh ventilation air utilizing 100% outside air when possible, rather than return air. Do not exceed the HVAC systems ability to remove moisture from outside air.

Use bottled gas instead of diesel when using fuel powered equipment. Use electric equipment when possible, such as forklifts, chainsaws or masonry saw. Equipment that is not being used should be cycled off.

Containers of wet products (paint, adhesives, etc) should be kept closed when not in use. Before discarding, cover or seal waste materials that can release odor or dust.

Promptly discard all waste materials in the appropriate waste receptacle. Waste materials that are recyclable should be deposited in the appropriate recycling receptacle.

Smoking and the use of smokeless tobacco products shall be prohibited, on a floor by floor basis, when a floor is closed in. Once all floors of the building have been closed in, smoking and use of smokeless tobacco products will only be allowed outside of the building.

7.3 Potential Sources of Mold & Mildew

Protect all stored on-site from moisture accumulation or damage by placing on elevated pallets and covering with plastic or other suitable material, especially before the building is dried-in. Protect installed absorptive materials and inspect often to ensure adequate protection. Contractors must schedule activities to minimize installation of materials that will absorb water before the building is dried-in and remove ponding water from the building. Placement of absorptive materials such as drywall, wall insulation, lined ductwork before dry-in that is wetted will be replaced.

Negative pressurization relative to the outside caused by HVAC operation results in uncontrolled infiltration of unconditioned air that will condense and cause moisture collection in duct insulation, increase moisture content in building materials which can result in condensation in wall cavity and poor indoor air quality problems in the building. Negative pressurization of the space also promotes rainwater infiltration during a storm event. Implement a startup plan designed to minimize the potential of moisture in the building by:

- Operating outside air (OSA) system to maximize quantity of outside air without creating indoor relative humidity conditions greater than 60%. Maintain exhaust air systems off until occupancy except for test and balance work or for short term removal of contaminants/pollutants.

- Insulate cold water, HVAC piping and ductwork before start of HVAC system in cooling mode.
- Seal all building openings with temporary measures to prevent moisture, dust and odor infiltration
- Install temporary dehumidifiers and spot coolers to help remove moisture (if necessary)

7.4 Pathway Interruption

During construction, it may be necessary to isolate areas of work to prevent contamination of clean or occupied spaces. When possible, erect barriers such as dust curtains or plastic sheets between work areas to prevent unwanted airflow from dirty to clean areas.

Dust and odor producing materials should be kept away from air intakes at all times. All mechanical rooms shall be kept clear of construction debris, materials and waste at all times.

Operate HVAC systems to maintain a positive pressure in the occupied spaces of a minimum 6 Pascal above the construction area pressure. Closely monitor the presence of the pressure differential under all operating conditions.

7.5 Housekeeping

Reduce construction contaminants in the building prior to occupancy through regular space cleaning activities. Once the building is enclosed, keep standing water cleaned up to prevent mold and mildew growth and keep solvent, paint and other VOC emitting chemical spills cleaned up. Keep equipment and materials that are not being used clean by covering them or moving them to a clean area. Building materials should be stored in a weather tight, clean area prior to unpacking for installation. All dirty coils, air filters, and fans should be cleaned before testing and balancing (TAB) procedures are performed and before baseline air quality tests are conducted.

Remove accumulated water within 24 hours. Keep work areas dry. Porous materials such as insulation should be protected from moisture. Porous materials that get wet shall be dried out completely immediately after moisture is observed. Porous items such as duct insulation that remains damp for 24 hours or more shall be replaced. Any sheetrock, plaster, ceiling tiles, or other like materials that get wet must be replaced. Equipment such as terminal units which have duct insulation in the air stream should be stored on pallets (away from water) and should be sealed with plastic prior to installation. Before installation, check for possible damage to equipment from high humidity. Repair or replace any damaged equipment.

Suppress dust in the construction area with wetting agents or sweeping compounds. Regularly clean the dust from the site using a damp rag, wet mop or vacuum equipped with a high efficiency particulate filter or wet scrubber. Remove spills or excess applications of solvent-containing products immediately. Also see Section **(Insert relative**

section of project manual i.e. Section 01700, “Execution Requirements”) in the Project Manual for cleaning requirements during construction.

7.6 Scheduling

Special construction scheduling is necessary to ensure dissipation of harmful emissions from finishes during curing. Complete application of wet and odor-emitting materials such as paints, sealants, and coatings before installing materials that act as “sinks” or absorbers such as ceiling tiles, carpets, insulation, gypsum products, and fabric-covered furnishings. Refer to manufacturers’ product data (MSDS) to determine the appropriate curing time for each type of finish. Failing to follow each manufacturer’s guidelines can result in emission of these pollutants during occupancy. Also see section (Insert relative section of project manual i.e. 01450, “Indoor Air Quality Scheduling/Sequencing Requirements”) in the Project Manual for construction scheduling requirements.

7.7 Flushout

Prior to occupancy, conduct a minimum two-week HVAC flush out of the building with new filtration media and 100% outside air after completing installation of materials containing VOCs. Maintain indoor relative humidity levels below 60% during flushout procedures.



Glossary

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [HJ](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [QR](#) | [S](#) | [TUV](#) | [WXYZ](#)

A

Alkanol amines

(also monoethanolamine, diethanolamine, triethanolamine) A class of synthetic solvents that are precursors to the carcinogen diethanolnitrosamine.

Alkyl aryl sodium sulfonates

(See Alkyl benzene sulfonates [ABS])

Alkyl benzene sulfonates or ABS

(also linear alkyl benzene sulfonates or LAS, linear alkyl sodium sulfonates) A class of synthetic surfactants (see Surfactants below for more information). ABS are very slow to biodegrade and seldom used. LAS, however, are the most common surfactants in use. During the manufacturing process, carcinogens and reproductive toxins such as benzene are released into the environment. While LAS do biodegrade, they do so slowly and are of low to moderate toxicity. LAS are synthetic. The pure compounds may cause skin irritation on prolonged contact, just like soap. Allergic reactions are rare. Because oleo-based alternatives are available, LAS should not be used.

Found in: Conventional laundry detergents (usually identified as "anionic surfactants").

Alkyl benzyl sulfonates

(See Alkyl benzene sulfonates [ABS])

Alkyl phenoxy polyethoxy ethanols

(also nonyl phenoxy ethoxylate or nonyl phenol ethoxylate)

This is a general name for a group of synthetic surfactants (see Surfactants below for more information). They are slow to biodegrade in the environment and have been implicated in chronic health problems. Researchers in England have found that in trace amounts they activate estrogen receptors in cells, which in turn alters the activity of certain genes. For example, in experiments they have been found to stimulate the growth of breast cancer cells and feminize male fish. One member of this family of chemicals is used as a common spermicide, indicating the general level of high biological toxicity associated with these compounds.

Found in: Conventional laundry detergents, all-purpose cleaners, hard surface cleaners.

Ammonia

Ammonia is an irritant that affects the skin, eyes and respiratory passages. The symptoms of ammonia exposure are: a burning sensation in the eyes, nose and throat; pain in the lungs; headache; nausea; coughing; and increased breathing rate. Ammonia adds nitrogen to the environment. In areas that cannot handle the added nitrogen, disruptions to the ecosystem will result. These include toxic effects to plants, fish and animals. Ammonia is included as a toxic chemical on the EPA's Community Right-to-Know list and the EPA has set limits on permissible levels in bodies of water. The FDA also regulates the amount of ammonium compounds in food. OSHA regulates the maximum allowable levels in the air to protect workers.

Found in: Conventional window cleaners.

Amyl acetate

A synthetic grease cutter, amyl acetate is a neurotoxin implicated in central nervous system depression.

Found in: Conventional furniture polishes.

Anionic surfactants

(See alkyl benzene sulfonates)

Aromatic hydrocarbons

A class of synthetic compounds used as solvents and grease cutters, these are members of the carcinogenic benzene family of chemicals. Though not all are carcinogenic, aromatic hydrocarbons should nonetheless be considered hazardous. Aromatic hydrocarbons also contaminate air and groundwater. (They cannot easily evaporate underground and little biological activity exists there to cause them to biodegrade.)

Found in: Conventional heavy-duty degreasers, deodorizers.

Artificial fragrances

Artificial fragrances can be made from petroleum. Many do not degrade in the environment, and may have toxic effects on both fish and mammals. Additionally, they often can cause allergies and skin or eye irritation.

Artificial colors

Artificial colors can be made from petroleum, though some are made from coal. Many do not degrade in the environment and also have toxic effects on both fish and mammals. They do not serve any useful purpose. Additionally, they often can cause allergies and skin or eye irritation.

B

Benzalkonium chloride

A synthetic disinfectant and bactericide, this chemical is biologically active (meaning it can negatively affect living organisms). The widespread indiscriminate use of bactericides is also now causing the emergence of new strains of bacteria that are resistant to them. Benzalkonium chloride, and other synthetic disinfectants, should be avoided for these reasons.

Found in: Conventional spray disinfectants, disinfecting cleaners, disinfecting hand soaps and lotions.

Benzene

(also benzol, benzole, annulene, benzeen, phenyl hydride, coal naphtha). Made from petroleum and coal, benzene is classified by the International Agency for Research on Cancer as a carcinogen, is listed in the 1990 Clean Air Act as a hazardous air pollutant, and is on the EPA's Community Right-to-Know list.

Found in: Conventional oven cleaners, detergents, furniture polish, spot removers.

Butoxyethanol

(see butyl cellosolve)

Butyl cellosolve

(also butoxyethanol, butyl oxitol, ethylene glycol monobutyl ether). A toxic synthetic solvent and grease cutter that can irritate mucous membranes and cause liver and kidney damage. Butyl cellosolve is also a neurotoxin that can depress the nervous system and cause a variety of associated problems.

Found in: Conventional spray cleaners, all-purpose cleaners, abrasive cleaners.

Butyl oxitol

(see butyl cellosolve)

C

Caustic soda

(see sodium hydroxide)

Chlorophene

(See O-benzyl-p-chlorophenol)

Crystalline silica

Crystalline silica is carcinogenic and acts as an eye, skin and lung irritant.

Found in: Conventional all-purpose cleaners.

D

Diammonium EDTA

(See EDTA)

Diethanolamines

(also diethanolamine, triethanolamine and monoethanolamine)

A synthetic family of surfactants, this group of compounds is used to neutralize acids in products to make them non-irritating. Diethanolamine is slow to biodegrade and reacts with natural nitrogen oxides and sodium nitrite pollutants in the atmosphere to form diethanolnitrosamine, a suspected carcinogen.

Found in: Conventional personal care products and some detergents.

Dioxane

(also diethylene dioxide, diethylene ether, diethylene oxide) (not to be confused with DIOXIN)

Dioxane is a solvent classified by the EPA as a probable human carcinogen, and some research suggests that it may suppress the immune system. Dioxane is listed in the 1990 Clean Air Act as a hazardous air pollutant and is on the EPA's Community Right-to-Know list.

Found in: Conventional window cleaners and is an impurity in some ethoxylated surfactants.

Diethylene dioxide

(see Dioxane)

E

EDTA

(ethylene-diamino-tetra-acetate)

A class of synthetic, phosphate-alternative compounds used to reduce calcium and magnesium hardness in water. EDTA is also used to prevent bleaching agents from becoming active before they're immersed in water and as a foaming stabilizer. EDTA does not readily biodegrade and once introduced into the general environment can re-dissolve toxic heavy metals trapped in underwater sediments, allowing them to re-enter and re-circulate in the food chain.

Found in: Conventional laundry detergents.

Ethyl cellosolve

This synthetic solvent is both a nasal irritant and a neurotoxin (see Solvents).

Found in: Conventional all-purpose cleaners, window cleaners.

Ethylene glycol

(also ethylene dihydrate, ethylene alcohol)

This synthetic solvent is highly toxic and is both a nasal irritant and a neurotoxin (see Solvents). Its vapors contribute to the formation of urban ozone pollution. Ethylene glycol is listed in the 1990 Clean Air Act as a hazardous air pollutant and is on the EPA's Community Right-to-Know list.

Found in: Conventional all-purpose cleaners

Ethylene glycol monobutylether

(see butyl cellosolve)

Fatty acid alkanol amides/amines

These surfactants are made by reacting an ethanolamine with a fatty acid obtained from either synthetic petroleum sources or natural vegetable oils. (Most fatty acids are produced synthetically as this method is currently less expensive.) Fatty acid alkanol amides can react with materials in the environment to form nitrosamines (see diethanolamines above).

Found in: Conventional shampoos and conditioners, liquid cleansers, and polishes.

F

Fatty acid diethanolamines

(See cocamide DEA)

Formaldehyde

Although not common as a primary ingredient, formaldehyde is present as a contaminant in many consumer household products. It is an extremely potent carcinogen and respiratory irritant and may appear as a preservative. Products containing this chemical should be considered unacceptable.

Found in: Conventional deodorizers, disinfectants, germicides, adhesives, permanent press fabrics, particleboard.

G

Germicides

A broad category of usually synthetic bactericides. While some germicidal ingredients are natural (tea tree oil, borax), it is safe to assume that any germicide ingredient has a synthetic source until proven otherwise. For more information, see benzalkonium chloride above.

Found in: Conventional spray disinfectants, disinfecting cleaners, disinfecting hand soaps and lotions.

Glycol ethers

(See butyl cellosolve and ethyl cellosolve)

HIJ**Hydrochloric acid**

(also muriatic acid)

A strong mineral or "inorganic" acid. In high concentrations, it is extremely corrosive.

Found in: Conventional toilet bowl cleaners.

Hypochlorite

(See chlorine)

Hydrogen chloride

(See hydrochloric acid)

K**Kerosene**

(also mineral spirits) A synthetic distillate used as a grease cutter, kerosene can damage lung tissues and dissolve the fatty tissue that surrounds nerve cells. Mineral spirits function similarly and often contain the carcinogen benzene as an impurity.

Found in: Conventional all-purpose cleaners and abrasives (use of kerosene in these product categories is rare), furniture polishes, degreaser.

L**Linear alkyl benzene sulfonates**

(See alkyl benzene sulfonates)

Linear alkyl sulfonates

(See alkyl benzene sulfonates)

M**Methanol**

(also methyl alcohol)

A solvent derived from wood, natural gas, or petroleum, methanol is acutely toxic and can cause blindness.

Found in: Conventional glass cleaners.

Methyl alcohol

(See methanol above)

Mineral acids

(See hydrochloric acid or phosphoric acid. Also sulfuric acid)

Mineral spirits

(See kerosene)

Monoethanolamine

(See diethanolamine)

Morpholine

A highly toxic synthetic that can cause liver and kidney damage. While this ingredient is rare in consumer products, its extreme toxicity warrants its inclusion on this list.

Found in: Conventional all-purpose cleaners and abrasives, waxes, polishes, antiseptic products.

Muriatic acid

(See hydrochloric acid)

N**Naphthas**

(See petroleum distillates)

Naphthalene

A member of the carcinogenic benzene family derived from coal tar or made synthetically. Known to bioaccumulate in marine organisms, naphthalene causes allergic skin reactions and cataracts, alters kidney function and is extremely toxic to children.

Found in: Conventional deodorizers, carpet cleaners, toilet deodorizers.

Nitritotriacetic acid

(See NTA)

Nonyl-phenol

(See alkyl phenoxy polyethoxy ethanols)

Nonyl phenoxy ethoxylate

(See alkyl phenoxy polyethoxy ethanols)

NTA

(Nitritotriacetic acid) This carcinogenic phosphate substitute is banned in the U.S. As with EDTA, it can free heavy metals in the environment and reintroduce them into the food chain. NTA is slow to biodegrade.

Found in: No U.S. manufactured products. However, imported products, especially laundry detergents, should be scrutinized to ensure that no NTA has escaped regulatory attention.

O**O-benzyl-p-chlorophenol**

(also 4-chloro-a-phenyl o-cresol, chlorophene) A synthetic disinfectant used in hand soaps, this is chlorinated hydrocarbon and is therefore unacceptable. Bacterial resistance hazards associated with the indiscriminate use of disinfectants (see benzalkonium chloride above for more information) can also occur with use.

Found in: Conventional hand soaps.

Optical brighteners

Optical brighteners are a broad classification of many different synthetic chemicals that, when applied to clothing, convert UV light wavelengths to visible light, thus making laundered clothes appear "whiter." Their inclusion in any formula does not enhance or affect the product's performance in any way; they simply trick the eye. Optical brighteners do not readily biodegrade. They are toxic to fish when washed into the general environment and can create bacterial mutations. They can cause allergic reaction when in contact with skin that is then exposed to sunlight. Most optical brighteners are given trade names which consumers are unlikely to see on a label.

Found in: Conventional laundry detergents.

Organic solvents

A category of solvents and grease-cutters of mostly synthetic origin (organic in this instance refers to their petroleum origins). All chemicals in this category are generally neurotoxins and nervous system depressants, especially if contacted in sufficient quantity.

Found in: Conventional all-purpose cleaners, degreasers and metal polishes.

P**p-Dichlorobenzene**

(See Paradichlorobenzene)

Paradichlorobenzene

(also p-Dichlorobenzene, PDCB) A chlorinated synthetic of extreme chronic toxicity and environmental concern. Paradichlorobenzene is an endocrine disrupter and carcinogen. It does not readily biodegrade.

Found in: Mothballs and deodorizers.

PDCB

(See Paradichlorobenzene)

Perchloroethylene

(also "Perc")

A chlorinated solvent used most commonly in the dry cleaning process, "perc" is implicated in 90% of all groundwater contamination.

Found in: Conventional degreasers, spot removers, dry cleaning fluids.

Petroleum-based waxes

A broad category of synthetic waxes. Although they may appear in products like Butcher's wax, typically these are used for polishing or waxing in conjunction with a solvent and a spray. Once sprayed, the solvent evaporates (creating air toxins) and leaves the wax behind as a residue. Additionally, spraying is an inefficient way to apply a product and ingredients that rely on it for dispersal are suspect.

Found in: Conventional furniture polishes and floor waxes.

Petroleum distillates

(also naphthas)

A broad category encompassing almost every type of chemical obtained directly from the petroleum refining process. Any ingredient listed as a "petroleum distillate" or "naphtha" should be suspect as it is, firstly a synthetic and, secondly, likely to cause one or more detrimental health or environmental effect.

Phosphates

A key nutrient in ecosystems, phosphates are natural minerals important to the maintenance of all life. Their role in laundry detergents is to remove hard water minerals and thus increase the effectiveness of the detergents themselves. They are also a deflocculating agent; that is, they prevent dirt from settling back onto clothes during washing. While relatively non-irritating and non-toxic in the environment, they nonetheless contribute to significant eutrophication of waterways and create unbalanced ecosystems by fostering dangerously explosive marine plant growth. For these reasons they are banned or restricted in many states. Products containing phosphates should be considered unacceptable. Almost all conventional dishwasher detergents contain phosphates.

Found in: Conventional laundry detergents, all-purpose cleaners, dishwasher detergents.

Phosphoric acid

(also metaphosphoric acid, orthophosphoric acid) Phosphoric acid is included as a toxic chemical on the EPA's Community Right-to-Know list. It is also controlled under the Clean Air Act as an air pollutant. OSHA regulates the maximum allowable levels in the workplace to protect workers.

Found in: Conventional bathroom cleaners.

Polycarboxylates

Similar in chemical structure to certain plastics and acrylic compounds, these are relatively new, synthetic phosphate substitutes. Because they are recent additions to the consumer product chemical arsenal, however, their effects on human and environmental health remain largely unknown. Though tests show they are non-toxic, do not interfere with treatment plant operation and generally settle out with the sludge during water treatment, until further study and analysis are conducted, use of this ingredient is not recommended. Further, they are not biodegradable and are petroleum based.

Found in: Conventional laundry detergents, all-purpose cleaners and dishwasher detergents.

Polyethylene glycol

(also PEG)

Another type of anti-redeposition agent, PEG is a polymer made from ethylene oxide and is similar to some non-ionic detergents. Not considered toxic, it takes large doses to be lethal in animals. However, PEG is slow to degrade and is synthetic.

QR

Quaternium 15

An alkyl ammonium chloride used as a surfactant, disinfectant and deodorant that releases formaldehyde, a potent toxin.

Found in: Conventional detergents, deodorizers, disinfectants.

S

Soda lye

(See sodium hydroxide)

Sodium dichloroisocyanurate

(See chlorine)

Sodium hydroxide

(also lye, caustic soda, white caustic, soda lye)

Sodium hydroxide is derived from the electrolysis of brine sea water as a co-product of chlorine. It is a strong, caustic substance and causes severe corrosive damage to eyes, skin and mucous membranes, as well as the mouth, throat,

esophagus and stomach. Injury can be immediate. Blindness is reported in animals exposed to as little as 2% dilution for just one minute. Skin is typically damaged by 0.12% dilutions for a period of one hour. Tests with healthy volunteers exposed to the chemical in spray from oven cleaners showed that respiratory tract irritation developed in 2 to 15 minutes. Sodium hydroxide is included as a toxic chemical on the EPA's Community Right-to-Know list. It is also a controlled substance in the workplace, and OSHA has set limitations on concentrations in the air.

Found in: Conventional oven cleaners, drain cleaners

Sodium hypochlorite

(See chlorine)

Stoddard solvent

A petroleum distillate used as a solvent and degreaser. (See kerosene)

Found in: Conventional all-purpose cleaners and abrasives.

Surfactants

A general term for Surface Active Agents. It is the term used to describe the active cleaning agents in a product. Conventional products use synthetic surfactants often derived from petroleum.

Found in: Conventional laundry products, all-purpose cleaners, dish detergent and dish liquids, and other common cleaning products.

etrapotassium pyrophosphate/Tetrasodium pyrophosphate

Basic phosphates (tetrasodium being the more common of the two) used to reduce water hardness. (See phosphates above)

Found in: Conventional laundry detergents, all-purpose cleaners.

TUV

Trichloroethane

(also methyltrichloromethane, TCA, methyl chloroform, chloroethane) A chlorinated solvent used for cleaning and degreasing, it is known to contribute to depletion of stratospheric ozone and will be phased out by the end of 2002. Trichloroethane is listed in the 1990 Clean Air Act as a hazardous air pollutant and is on the EPA's Community Right-to-Know list.

Triethanolamine

(See diethanolamine)

WXYZ

Xylene sulfonate

Xylene is a synthetic that, when reacted with sulfuric acid, creates a surfactant. Slow to biodegrade in the environment and moderately toxic.

Found in: Conventional laundry products, all-purpose cleaners, dish detergent.

© 2006 Seventh Generation, Inc.
60 Lake St.
Burlington, VT 05401-5218
802-658-3773 | 802-658-1771 (fax) | 800-456-1191 (toll free)
www.seventhgeneration.com

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