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Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings[1]

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1. Scope

1.1 This guide covers a procedure to assist owners and operators of commercial and institutional buildings in the stewardship of cleaning and housekeeping operations. The focus of this guide is to address appropriate cleaning activities and processes, to promote eco-efficiency and sustainability, and to avoid adverse impacts on the building occupants, cleaning personnel, the building structure itself, and the environment. Adherence to the principles set forth in this guide can lead to greater tenant/occupant satisfaction, reduced operational costs and greater productivity (of occupants and cleaning personnel).

1.2 This guide will focus on the development of a stewardship plan and will include the assessment of cleaning processes, product selection, storage, usage, disposal, equipment, training of cleaning personnel and communication throughout the chain-of-commerce.

1.3 This guide addresses issues relating to the operation and maintenance of the heating, ventilating and air conditioning (HVAC) systems which can have a major impact on indoor air quality (IAQ) only to the extent that the HVAC system provides adequate ventilation to lower risk to cleaning personnel, building occupants and the environment during or as a result of the cleaning process.

1.4 This guide is for use in a building that is maintained by either in-house cleaning personnel or an outside cleaning contractor.

1.5 This guide is not intended for construction related activities, but may be appropriate for post construction clean-up.

1.6 This guide is not intended as a procedural guide for cleaning personnel.

1.7 This guide is not intended for use in residential buildings.

1.8 The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

1.9 *This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

1.10 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E631 Terminology of Building Constructions

E833 Terminology of Building Economics

E2114 Terminology for Sustainability Relative to the Performance of Buildings

2.2 *Other Standards:*[3]

ISO 14040 Life Cycle Assessment

3. Terminology

3.1 *Definitions:*

3.1.1 For terms related to building construction, refer to Terminology E631.

[1] This guide is under the jurisdiction of ASTM Committee E60 on Sustainability and is the direct responsibility of Subcommittee E60.01 on Buildings and Construction.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.

3.1.2 For terms related to sustainability relative to the performance of buildings, refer to Terminology E2114. Some of these terms are reprinted here for ease of use.

3.1.3 *life-cycle, n—(1)* the length of time over which an investment is analyzed; and **E833**

(2) consecutive and interlinked stages of a product system, from raw material acquisition or generation of natural resources to the final disposal. **ISO 14040**

3.1.3.1 *Discussion*—Refer to the distinction between LCA and LCC. through which vapors are released from materials.

3.1.4 *2 life-cycle assessment (LCA), n*—a method of evaluating a product by reviewing the ecological impact over the life of the product.

3.1.4.1 *Discussion*—At each stage, the product and its components are evaluated based upon materials and energy consumed, and the pollution and waste produced. Life stages include extraction of raw materials, processing and fabrication, transportation, installation, use and maintenance, and reuse/recycling/disposal. ISO 14040 defines LCA as the compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle.

3.1.5 *life-cycle cost (LCC) method, n*—a technique of economic evaluation that sums over a given study period the costs of initial investment (less resale value), replacements, operations (including energy use), and maintenance and repair of an investment decision (expressed in present or annual value terms).

3.1.5.1 *Discussion*—LCC is distinct from LCA in that LCA is an environmental review methodology and LCC is an economic review methodology.

3.1.6 *non-renewable resource, n*—a resource that exists in a fixed amount in various places in the earth's crust and that cannot be replenished on a human time scale.

3.1.6.1 *Discussion*—Non-renewable resources have the potential for renewal only by geological, physical, and chemical processes taking place over hundreds of millions of years. Non-renewable resources exist in various places in earth's crust. Examples include: iron ore, coal, and oil.

3.1.7 *perpetual resource, n*—a resource that is virtually inexhaustible on a human time scale.

3.1.7.1 *Discussion*—Examples include solar energy, tidal energy, and wind energy.

3.1.8 *renewable resource, n*—a resource that is grown, naturally replenished, or cleansed, at a rate which exceeds depletion of the usable supply of that resource.

3.1.8.1 *Discussion*—A renewable resource can be exhausted if improperly managed. However, a renewable resource can last indefinitely with proper stewardship. Examples include: trees in forests, grasses in grasslands, and fertile soil.

3.1.9 *sustainability, n*—the maintenance of ecosystem components and functions for future generations.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *chain-of-commerce*—manufacturers and suppliers of raw materials; manufacturers, marketers, and distributors of building cleaning products (and systems/equipment); building owners and managers; building cleaning contractors; and cleaning personnel.

3.2.2 *commercial and institutional buildings*—indoor or enclosed workspaces such as office buildings, educational facilities, health care facilities, retail establishments, and other similar facilities, but not including manufacturing and production facilities, warehouses, residences, and agricultural operations.

3.2.3 *eco-efficiency*—the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing negative ecological impacts and natural resource intensity throughout the life cycle, to a level at least in line with the Earth's carrying capacity.

3.2.4 *hazard*—the potential health or physical effect(s) attributable to a specific chemical, mixture, or physical agent.

3.2.5 *material safety data sheet (MSDS)*—a written or printed material concerning a hazardous chemical which contains the information set forth in the OSHA Hazard Communication Standard (see paragraph (g) of 29 CFR 1910.1200) (**1**).[4]

3.2.6 *pollutant*—any substance that directly or indirectly creates an adverse human health or environmental effect when introduced into any environmental media.[5]

3.2.7 *pollution prevention*—the act of reducing or eliminating the use, release, or generation of a pollutant or potential pollutant through source reduction, recycling, reuse, reclamation, or modification of operating practices.

3.2.8 *risk*—the probability of deleterious health or environmental effects, (**2**).

3.2.9 *stewardship*—careful and responsible management, especially with respect to avoiding negative environmental impacts and to promoting sustainability.

3.2.10 *worker participation*—the involvement of cleaning personnel or their representatives, or both, in all aspects of the cleaning process; including product selection, evaluation and appropriate work practices, training, and communication of hazards, and "the process of work."

4. Significance and Use

4.1 Cleaning provides well documented benefits in terms of creating cleaner, safer, and healthier surroundings by extracting harmful pollutants from the indoor environment (see Ref (**3**)). An improperly maintained indoor environment could give rise to biological contaminants, and buildup of particulate matter and gases which can have serious health effects. These negative impacts may have adverse affects on worker productivity affecting both cleaning personnel and tenants through increased complaints, absenteeism, injuries, asthmatic incidents, or other symptoms. Inappropriate or improper use or selection of cleaning products and processes, along with failure to follow label directions could result in injury or illness to cleaning personnel or building occupants. In addition, it may be

[4] The boldface numbers given in parentheses refer to the list of references at the end of this standard.

[5] It should be noted that ASTM's definition of Pollution Prevention is different from some definitions used by the Environmental Protection Agency. See, for example, 58Fed.Reg.6478 (Jan. 29, 1993, Council on Environmental Quality), and 58Fed.Reg.41,981 (Aug. 6, 1993, Executive Order).

detrimental to the physical structure and systems of the building, or to the environment. Moreover, owners and operators maintain the liability for the proper function of the building and its impacts on the occupants and cleaning personnel.

4.1.1 This guide provides a basic reference for the development and preservation of a building environment that is considered safe and healthy for occupants, while reducing the stress on the overall environment as a result of routine maintenance. The anticipated users of this guide include building managers, cleaning personnel, product suppliers and distributors, union representatives, and building occupants who serve together in a stewardship role regarding the maintenance of the building. This guide is intended to raise pertinent questions regarding specific building environments in order that an appropriate stewardship strategy may be developed, for example:

4.1.1.1 How is the building used?

4.1.1.2 Are there any special cleaning requirements?

4.1.1.3 Are there any at-risk populations that need to be considered, such as children, asthmatics, or pregnant woman?

4.1.1.4 How are cleaning materials used?

4.1.1.5 Are there any special issues relevant to construction and furnishings?

4.1.1.6 Are there any issues relating to building age/architectural, such as historic preservation requirements?

4.1.1.7 are there any engineering concerns, such as HVAC systems and natural ventilation?

4.1.1.8 How is the quality of cleaning being evaluated or measured?

4.1.2 Regardless of the specific requirements, this guide will help in the formulation of a comprehensive plan resulting in reduced risk to cleaning personnel, building occupants, and the environment.

4.2 This guide will help the building owner and operator understand the cleaning process through the following:

4.2.1 The development of a stewardship plan (see Section 6), will clarify the level of cleanliness that is required or expected, and will ensure that the cleaning process is carried out in a consistent manner with adequate communication feedback to promote success of the plan.

4.2.2 An understanding of extended product responsibility (see Section 7) and the importance of shared responsibility. This section includes task identification and performance requirements, process and product selection, use, storage, and disposal.

4.2.3 An identification of the training and communications issues (see Section 8) that will encourage involvement with the entire chain-of-commerce in the cleaning process. These issues are related to both procedural training and feedback opportunities for cleaning personnel, as well as information sharing with building tenants to inform them of possible cleaning process impacts.

5. Stewardship Principles

5.1 *Stewardship Principles*—A building owner or operator should manage the cleaning process according to the following stewardship principles:

5.1.1 Take a comprehensive process approach to cleaning. This includes:

5.1.1.1 Identifying the cleaning task and performance requirements,

5.1.1.2 Defining or outlining steps of the cleaning procedure,

5.1.1.3 Selecting the correct products and equipment,

5.1.1.4 Training cleaning personnel to use correct procedures and to understand the potential health, safety, and environmental impacts of the cleaning products and processes,

5.1.1.5 Ongoing inspection and monitoring programs,

5.1.1.6 Communicating clearly with building occupants, and

5.1.1.7 Practicing appropriate storage and disposal methods.

5.1.2 Focusing on only a single area can create unanticipated adverse impacts in other areas.

5.1.3 Foster participation of cleaning personnel and building occupants. A successful cleaning program should encourage participation and input along the entire chain-of-commerce. Cleaning personnel need to participate in the planning, implementation, and continual improvement of the cleaning program. Building occupants should be given the opportunity to participate.

5.1.4 Clean to protect health and safety. Appearances may be deceptive. Even buildings that appear to be clean can be unhealthy. Focus on cleaning for health and safety by controlling microorganisms, spills, gases, dust particles, and so forth. In most cases the appearance will be addressed at the same time.

5.1.5 Clean and maintain the building as a whole, not just separate components. Cleaning and maintenance in one area of a building can have a major impact on other areas. Appropriate actions should take place to ensure the health and safety throughout the entire building, in addition to the area where the work is being performed.

5.1.6 Recognize occupant impacts on the indoor environment. Occupants should share responsibility for maintaining health and safety. Occupants should quickly and clearly communicate with cleaning personnel to facilitate the rapid solution to problems. Furthermore, occupants should recognize how their behavior, such as food debris resulting from eating in their work areas, can contribute to additional cleaning and pest management requirements, which in turn have further impacts.

5.1.7 Ensure cleaning personnel and building occupant safety at all times. All products and processes may pose some risks, thus safety should always be considered. Safety precautions should be used during all cleaning processes, such as proper ventilation, personal protective equipment, and safety signs where necessary. Safety precautions should also apply to outside contractors, such as pest management or roofing contractors to protect building occupants from the impacts of those products and processes.

5.1.8 Be aware of the impacts to the outdoor environment. Impacts to the outdoor environment can include energy requirements, water usage, disposal of products in terms of solid waste, down-the-drain to the appropriate water treatment works, and emissions to the air during storage or use of products.

6. Developing A Stewardship Plan

6.1 *Plan Development*—Building owners and operators need to oversee the development of a written stewardship plan and its periodic review. This plan will help to ensure that expectations are being met and that the building is being cleaned and protected as required.

6.1.1 Components of the stewardship plan should include both scheduled routine cleaning, as well as responses to building occupant and worker related problems. Furthermore, specific sections need to be developed to address accidents and preventative maintenance programs. These sections of the plan should address common problems, as well as slip and fall accidents, weather-related problems, water leaks, smoke, or obnoxious odors.

6.1.1.1 *Building Policy and Goals*—Goals and policies for cleaning activities should be laid out clearly. The building plan should include a definition of the building's primary mission which will assist managers and staff in understanding the scope and priority of stewardship activities. For example, because the primary mission of a health care facility and that of a retail facility are different, the scope and priority of stewardship activities may be substantially different.

6.1.1.2 By carefully considering the traffic level, time to perform the task, types of soil, soil load, safety and hygiene performance requirements, and so forth. for each part of the building the cleaning process can be optimized. This should result in adequate cleanliness for the function of the building, optimal occupant/tenant satisfaction, improved productivity, optimal cleaning cost effectiveness, appropriate choice of cleaning processes and products, and the greatest achievable eco-efficiency and sustainability.

6.1.2 *Management Commitment*—The success of the stewardship plan is contingent upon top management commitment. The building owner/operator should be personally committed to success and ensure that senior building management follow through on the stewardship program. Management commitment may be demonstrated through:

6.1.2.1 Selecting a stewardship coordinator and outlining his/her responsibilities,

6.1.2.2 Establishing a stewardship task force with adequate representation by staff from all key areas of the building, such as cleaning personnel, tenants, parents of students, and safety and health professionals,

6.1.2.3 Committing staff,

6.1.2.4 Committing funding,

6.1.2.5 Purchasing equipment (such as new vacuums, if required) and ensuring their maintenance,

6.1.2.6 Training programs, and

6.1.2.7 Ongoing communications with cleaning personnel and occupants.

6.1.2.8 The stewardship plan should discuss progress in each of these areas and plan for the future.

6.1.3 *Baseline Study/Benchmarking*—A baseline study or benchmarking will promote the development and implementation of a stewardship plan that may reduce the environmental, health and safety impacts of cleaning activities. This is a key element in the stewardship process. Two primary reasons for benchmarking are goal setting and process development. Baseline study or benchmarking can provide the building owner/manager with measurements to control and manage his/her operations. The key is that the building owner/manager should first define the goal to be achieved, whether it be a desired level of cleanliness, occupant satisfaction, or addressing a particular problem. A baseline study or benchmarking can be accomplished through facility auditing and should focus on the entire cleaning process from which one can identify the greatest risks and opportunities for risk reduction. In scoping the need, cleaning/maintenance management and the building owner/manager should be encouraged to evaluate or audit their operations, procurement, and processes to identify, prioritize, and focus on the greatest opportunities to reduce or eliminate the volume of environmental or human health impacts, while adequately performing the cleaning task.

6.1.4 The study should include a review of the:

6.1.4.1 Use of space within the building, including any potential changes in use or occupancy,

6.1.4.2 Occupant habits, such as smoking or eating at work stations,

6.1.4.3 Occupant or cleaning personnel complaints,

6.1.4.4 Existing information from occupants and cleaning personnel regarding cleaning products or processes,

6.1.4.5 Indoor air quality (IAQ) assessment or test results, if available,

6.1.4.6 Existing cleaning processes/methodologies,

6.1.4.7 Current cleaning schedules,

6.1.4.8 Utilization of cleaning personnel,

6.1.4.9 Training programs,

6.1.4.10 Communications,

6.1.4.11 Document handling,

6.1.4.12 Current product usage, handling, storage, and environmental attributes,

6.1.4.13 Hazard Communications, including Material Safety Data Sheets for cleaning products, and

6.1.4.14 Relevant OSHA injury/illness records or workers compensation claims, or both.

6.1.4.15 Some examples of existing forms, outlines, and communication tools (letters) to assist in the development of the baseline study can be found in Refs **(4)**, **(5)**, and **(6)**. The stewardship plan should summarize the information.

6.1.5 *Identification of Needs, Opportunities and Options*—Based on the results of the baseline study, brainstorming sessions should be held among staff and managers to identify systematically needs, opportunities and options for instituting stewardship measures. The plan should summarize the results of these efforts. Paragraphs 6.1.5.1 through 6.1.5.3 identify some of the key issues that can be considered.

6.1.5.1 *Cost*—The major cost element in cleaning is labor and thus will have a critical impact when identifying opportunities and options. In reviewing the overall cost of cleaning it is important to ensure that sufficient provisions are made for initial and continuing worker training and that appropriate staffing levels are allocated to achieve the desired performance requirements. Inadequate training of cleaning personnel and inadequate staffing levels may lead to improper handling of cleaning products and the failure to meet required performance

criteria. This, in turn, may lead to increased risk of worker and occupant exposure and the possible improper use of cleaning materials.

6.1.5.2 *Performance*—The question building owner/operator should ask is: "How clean is clean enough?" Building owners/operators should clearly understand the use of the building and the expectations of occupants/tenants. These expectations for cleaning performance should be clearly defined. The cleaning requirements should be agreed upon with cleaning personnel and translated into the size of the cleaning crew, time required on the job and choice of cleaning processes and products.

6.1.5.3 *Time Available to do the Task*—The time available to do a task affects the frequency and duration of the task. Processes and products should be compatible with any unique challenges this poses. For example, there will be greater flexibility in scheduling and completing a cleaning task in a building that is not occupied at night, than a facility that is used 24 hours a day. Sometimes, cleaning processes and products may need to address the requirement for rapid execution of a cleaning task in order to avoid interruption of the use of the building by occupants. If the allotted time is shortened to the point where only the most aggressive cleaning processes must be used to successfully accomplish the task, this demand may place cleaning personnel and building occupants at higher risk requiring additional training and more rigorous risk management steps to protect cleaning personnel and occupants when compared to using additional time with less aggressive products/processes. It should also be noted that the need for personnel resources has its own environmental impacts in the amount of employee hours necessary to accomplish any cleaning task.

6.1.6 *Ranking of Options*—Criteria should be developed for prioritizing the needs and opportunities identified and for ranking the options developed. The stewardship plan should explain the criteria used and present the results of the ranking. Typical criteria include (not in order of importance):

6.1.6.1 Worker safety,

6.1.6.2 Tenant and occupant requirements,

6.1.6.3 Costs (life cycle costs should be developed to the degree possible),

6.1.6.4 Liability,

6.1.6.5 Regulatory compliance,

6.1.6.6 Implementation feasibility,

6.1.6.7 Time and staff limitations,

6.1.6.8 Appearance and performance requirements,

6.1.6.9 Environmental impacts, and

6.1.6.10 Staff experience.

6.1.7 *Implementation and Evaluation*—The implementation section of the plan should set schedules for completion of major milestones, such as the completion of the stewardship plan, identify roles and responsibilities, identify barriers encountered or expected, outline communication and training needs for both cleaning personnel and tenants, indicate how success will be measured and evaluated, and outline priorities for future activities.

6.1.8 *New Goals*—After the stewardship plan has been developed, implemented and fully evaluated, the plan should be periodically reevaluated to identify opportunities for improvement.

7. Extended Product Responsibility

7.1 *Impacts of Extended Product Responsibility*—Extended product responsibility is an approach to identifying environmental considerations such as pollution prevention and conservation opportunities for renewable resources and nonrenewable resources. It identifies the underlying theme of shared responsibility, which includes the role played by those throughout the chain-of-commerce. In this case, the responsibility for reducing impacts is shared among product manufacturers and distributors, cleaning personnel, building owners/managers, and occupants.

7.2 *Process and Product Selection*—By evaluating cleaning procedures, a determination can be made as to which processes are truly necessary, which can be eliminated, and which can be replaced by other technologies. Cleaning procedures should be reviewed to identify and manage hazards.

7.2.1 *General Considerations*—The cleaning process (that includes equipment) and product selection should consider performance, cost, workplace health and safety, and environmental impacts. There is a role for both cleaning personnel and suppliers in ensuring proper process and product selection.

7.2.1.1 Employees responsible for procurement can influence the reduction of environmental impacts and maximize the environmental benefits across many stages of the product's life cycle. It is important to keep in mind that an environmental improvement in one stage of a life cycle may sometime occur at the expense of another life cycle stage. For example, some products that are packaged in a concentrated form may reduce packaging, but could also increase the potential that the product user may be exposed to the concentrate. Exposure to the concentrate may place the product user at greater risk than exposure to the ready-to-use product. Thus, in order to reduce negative environmental impact across both packaging and use stage of the product's life cycle, it is preferable in this example, that products shipped as concentrates are provided in packaging that minimizes concentrate exposure or are accompanied by additional appropriate precautionary measures, or both, and instructions or include the use of portion control equipment designed to minimize exposure to the concentrate, or both. Furthermore, even products that are considered "safe" when used as directed, can pose problems if misused. Risks associated with the use of products classified as "hazardous" can be minimized when all specified directions are followed.

7.2.1.2 It is important that process and product selections be made that consider the capability of the manufacturer/distributor to provide, in addition to fulfilling price and performance requirements, the necessary training and technical support. With proper training, cleaning process and product selection that take into account safety, health and environmental aspects during storage, handling, use, maintenance, and disposal can be assured. Manufacturers/distributors should also be able to demonstrate their capability to receive and act upon feedback from cleaning personnel regarding product

performance, use and disposal, as well as health, safety and environmental related matters.

7.2.2 *Workplace Health And Safety Considerations:*

7.2.2.1 *Product Labels*—The labels of products designed for the workplace are a valuable source of information which contain the product identity, appropriate hazard warnings, and the name and address of the manufacturer or other responsible party (see 29CFR1910.1200(f)) (**1**). Product labels also may contain manufacturers' instructions for proper use, as well as storage and disposal requirements for cleaning products. All products should be properly labeled.

7.2.2.2 *Material Safety Data Sheets*—Building owners/operators can use the product Material Safety Data Sheet (MSDS) as a tool in the cleaning process/product selection review. The purpose of the MSDS is to alert employees to the potential risks associated with a product and to provide the employee with appropriate information (that is, precautionary measures) necessary to avoid those risks. In addition, the MSDS will provide information including the physical and health hazards of the product, any generally applicable work practices or personal protective equipment, emergency and first aid procedures, and procedures for clean up of spills and leaks (see 29CFR1910.1200(g)) (**1**).

7.2.2.3 The MSDS is limited in its content to information of importance to the safety and health of employees and therefore, may not include environmental related information. Furthermore, the MSDS is often written for the concentrated product and may not accurately reflect the product that will be used after appropriately diluted. Additional information can be obtained from product suppliers and through OSHA's Consultation Service.

7.2.3 *Environmental Considerations:*

7.2.3.1 *Source of Environmental Information*—Many suppliers provide environmental information with their product literature which can be used during product or process selection. Often, additional information is available on request from the supplier.

7.2.3.2 *Environmental Marketing Statements*—The Federal Trade Commission (FTC) has published Guides for Environmental Marketing Claims which are administrative interpretations of laws administered by the FTC and which offer guidance in the use of environmental claims in marketing and advertising (**7**). The Guides specifically address the application of Section 5 of the Federal Trade Commission Act, which prohibits unlawful deceptive advertising acts and practices, to environmental advertising and marketing practices.

7.2.3.3 The FTC has concluded that it is deceptive to misrepresent, directly or by implication, that a product or package offers a general environmental benefit. Unqualified use of terms such as "eco-safe," "environmentally friendly," "environmentally safe," "essentially non-toxic," or "environmentally preferable" is recognized by the FTC to be deceptive.

7.2.3.4 *Evaluating Environmental Impacts*—Cleaning provides well documented (see Ref (**3**)) benefits in terms of creating cleaner, safer, healthier surroundings, but, like all processes, has some environmental impact. One important step in managing the environmental impact is to choose the correct product and process for the job and use only what is needed of the product.

7.2.3.5 Information on environmental impacts is most useful in product/process selection when the use situations and local environmental conditions are considered. For example, some cleaning products may require the use of organic solvents in their formulation to satisfactorily and efficiently perform the task. In such cases, the volatile organic compound (VOC) content does not necessarily indicate high VOC emissions. Differences in VOC content can be overshadowed by in-use amounts needed to do the job. That is to say, using 0.1 oz of a 100 % VOC product may have a lower impact than using 1 oz of a 25 % VOC product.

7.2.3.6 At this time there is no scientifically agreed upon method for making product comparisons. However, efforts are being expended to develop methods at the international, federal, state, and local levels, as well as by private organizations.

7.2.4 *Supplier Support*—A building owner or operator should take into account the ability of a product supplier to support the proposed cleaning program when evaluating which products to use. Indicators of support would include:

7.2.4.1 A commitment to train cleaning personnel (see 7.3.2),

7.2.4.2 The availability of product labeling and other communication systems designed for non-English speaking and illiterate personnel,

7.2.4.3 Open communication channels to ensure two-way information flow to/from product users to encourage product development that meets user needs,

7.2.4.4 A willingness to discuss specific environmental attributes of processes and products on an in-use performance basis, and

7.2.4.5 Access to information to substantiate process and product claims.

7.3 *Use Stage:*

7.3.1 *Guidelines for Proper Use*—A successful cleaning program carried out correctly, will maximize worker/tenant safety, tenant satisfaction, and cost efficiency. Cleaning procedures and product use training are essential components of a stewardship plan.

7.3.1.1 It is important that cleaning products be used in accordance with the manufacturer's recommendations or directions, or both. Common recommendations include, but are not limited to, the proper use concentration for dilutable products and utilization of ventilation appropriate to the product and process being used. The MSDS and the label of cleaning products should also be reviewed for any applicable precautions and control measures for safe handling and use, such as the use of appropriate personal protective equipment, adequate ventilation, and appropriate work practices. A review of the MSDS and product label will also indicate whether additional precautions may be necessary to protect building occupants.

7.3.1.2 *Manufacturer's Instructions*—Cleaning personnel should always follow manufacturer's instructions for proper

storage, use and disposal as detailed on the product label. Following those instructions is essential to ensure worker health and safety.

7.3.1.3 *Workplace Health And Safety Requirements*—Compliance with all applicable Occupational, Safety, and Health Administration (OSHA), and other federal, state and local workplace health and safety requirements is mandatory. If products are transferred to other containers, ensure that OSHA-required labeling information accompanies the product. The label should include product identity, appropriate hazard warnings, and the name and address of the manufacturer or other responsible party. In addition, labels often contain information related to the product's use, dilution, proper application, and storage and disposal instructions. Care should be taken to prevent the spread of vapors and spills when chemicals are transferred to other containers.

7.3.1.4 Material Safety Data Sheets (MSDS) must be kept on file for all current products and be readily available for review by cleaning personnel and other employees who may be exposed to such products. The MSDS must include details of hygiene practices, personal protective equipment, and clean-up procedures for spills and leaks. Regular safety training sessions, as well as specific training for introduction of new cleaning processes and hazards in the workplace should be provided to cleaning personnel. Personnel protective equipment, if specified on the product's label for specific cleaning tasks should be worn. Finally, appropriate safety signs, such as "Caution—Wet Floor" should be utilized.

7.3.1.5 *Cleaning Schedule*—Cleaning should be scheduled to minimize risks to tenants/occupants. Work should be scheduled in such a way that it does not impact other areas, for example inadvertently via the HVAC system. Building occupants should be informed of cleaning activities that may have an affect on their health and welfare.

7.3.1.6 *Ventilation*—Adequate ventilation (see for additional information on ventilation see Ref (**8**)) should be available for cleaning personnel during normal occupancy hours, as well as other times if cleaning is taking place.

7.3.2 *Training in Product Use:*

7.3.2.1 *Accountability for Training*—Building owners/operators should ensure that appropriate procedural and product training for cleaning staff and supervisors is taking place. Adherence to manufacturer's label instructions, and workplace health and safety requirements are necessary to ensure a safe, healthy environment.

7.3.2.2 *Recognition of Workforce Dynamics*—Where turnover of cleaning personnel is frequent, the building owner or operator will need to be especially diligent with respect to routine process and product use training. Use of multi-lingual labels, pictograms and color coded process/product systems may help reduce the potential for misuse. When training employees, consideration should be given to the employees' education and literacy level, as well as any potential language barriers.

7.4 *Storage and Disposal:*

7.4.1 *Storage*—The stewardship plan should ensure that cleaning equipment and products are stored in a controlled environment. Equipment and products must be stored in accordance with manufacturer's instructions and all federal, state, and local requirements to facilitate product identification and safe use. An inventory control system could be used so that only the required amounts of a product are purchased for the job, and that products are rotated so that the oldest product is used first.

7.4.1.1 Storage areas should be secured to allow access only to those qualified and trained in proper use. This may require a lockable facility for buildings with large "at risk" populations, for example school children. Special requirements for equipment and products that pose particular hazards, such as electrical shock, flammability, reactivity, etc. shall be followed. All wastes, including used packaging and wash solutions should be stored or disposed of in a manner consistent with the label instructions on the cleaning product, and with federal, state and local regulations.

7.4.1.2 *Waste Management/Recycling*—The waste management system instituted by building owners and their cleaning personnel/contractors should fully utilize recycling programs available in their communities. This action may keep significant amounts of packaging out of the disposal waste stream. To this end, products should be used completely, so that their packaging can be placed in community recycling programs. It is recommended that purchases of cleaning products be limited to the amount necessary to perform the task. This will minimize the potential problems that can result from the need to dispose of excess product.

7.4.2 *Disposal*—Extended product responsibility requires a life cycle approach. As such, emphasis should be placed on completely using up the product, which is the best method to minimize disposal needs and to facilitate container recycling. If there is product remaining that requires disposal, the manufacturer's instructions provide the starting point for ensuring proper disposal. Compliance with federal, state and local regulations, (including those relating to the nature, quantity and maximum length of time that wastes can be stored on a site without a permit) is mandatory. Rinse containers prior to recycling/disposal and use the rinse water, if appropriate, or dispose properly. If excess product is to be exchanged or given away, it should be in its original container with its label intact and its MSDS provided.

7.4.2.1 Liquid cleaning residues/wastes are typically designed to be disposed of to a sanitary wastewater treatment system and must not be disposed of down an untreated storm drain. Importantly, even though the cleaning product in liquid waste may be safe for disposal, depending on the building being cleaned, substances removed during cleaning may have adverse environmental impact.

7.5 *Occupant Responsibilities*—Occupants should share responsibility for maintaining health and safety. This begins with the recognition of how their own activities may impact the building in total, or the occupants working in nearby areas. For example, food debris resulting from eating in work areas, can impact the building's requirements for cleaning and pest management.

7.5.1 Furthermore, in the event of a spill or accident, such as coffee or toner cartridge spill, occupants should take care of the problem themselves, or communicate quickly and clearly with

cleaning personnel. Often the failure to quickly address these problems, results in the need for more rigorous cleaning later.

8. Training and Communications

8.1 *Importance and Legal Requirements*—While training and communications are addressed in almost every section of this guide, the importance of these issues cannot be over emphasized in the successful implementation of a stewardship program. Furthermore, training is a legal requirement for users of hazardous products as part of OSHA's Hazard Communication Standard (see Ref (**1**)) or relevant state regulations.

8.1.1 *Training and Communication On Infectious Disease*—OSHA also requires training for certain employees who are determined to have occupational exposure to blood or other potentially infectious material to reduce the risk of exposure to blood and certain body fluids containing bloodborne pathogens.

8.1.1.1 The OSHA standard requires the employer to identify every worker who performs tasks and procedures in the workplace that may involve exposure to blood or infectious agents. Once occupationally exposed employees have been identified, the next step is to communicate the hazards of the exposure to the employees.

8.1.1.2 Employees who are determined to have occupational exposure to blood and certain body fluids containing blood, must be provided comprehensive training on bloodborne pathogens, the OSHA regulations and the employer's exposure control plan.

8.1.1.3 For those with the potential for occupational exposure to airborne infectious agents, such as tuberculosis (TB), training should be provided that includes signs and symptoms, modes of transmission, the difference between infection and disease, method for diagnosis, ways of preventing transmission and current treatment methods.

8.2 *Training and Communication Plans*—Written training and communication plans should be developed addressing the needs of both cleaning personnel and building occupants.

8.2.1 *Safety Training*—OSHA requires that employers provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment and whenever a new physical or health hazard the employees have not previously been trained about is introduced into their work area (see Ref (**1**)). Implement the safety program with regular meetings to discuss safety related topics. Training should emphasize the necessity of always following the manufacturer's recommendations for use, storage, disposal, safety precautions and first aid.

8.2.2 *Correct Product Usage, Storage and Disposal*—Training on correct product usage, storage and disposal will help to ensure minimal adverse health and environmental impacts, as well as the most efficient utilization of labor.

8.2.3 *Cleaning Personnel/Worker Participation*—Building owners/operators should ensure that cleaning personnel participate on an equal basis, and are provided with the necessary training and education to participate effectively in the stewardship program. Specific attention should be made to individuals susceptible to language and literacy barriers, and for any special situations.

8.2.3.1 Cleaning personnel should select their own representatives to provide input into and participate in all essential aspects of the stewardship program, including process and product selection, usage and evaluation. Building owners/operators should monitor feedback from cleaning personnel who should be assured that communications are open and that retribution will take place, if complaints are made.

8.2.4 *Communicating with Building Occupants*—Communications are essential within a building to inform occupants of cleaning activities. This is especially important in areas where building occupants may have pre-existing health conditions.

8.2.4.1 Furthermore, for the stewardship plan to succeed, occupants should share responsibility for their building environment and should be informed of activities that contribute to building problems, such as storing and consuming of food in their work areas.

8.2.5 *Feedback Loops*—Communication plans should provide feedback loops and a log should be kept to register suggestions, and to track response to problems and complaints. Information should be provided to building occupants and cleaning personnel about how and with whom to log suggestions and complaints. A communications schedule should be established to assure regular and timely interactions.

9. Keywords

9.1 cleaning; commercial buildings; custodial services; extended product responsibility; green buildings; housekeeping; indoor air quality; janitorial services; loss prevention; operations and maintenance; regulatory compliance; risk minimization; stewardship

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