



# A Guide to Green Purchasing for Multifamily Housing

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Prepared by Elevate Energy

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**ELEVATE ENERGY**  
Smarter energy use for all

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Thank you to the Housing  
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# Section 1: Introduction to Green Purchasing

## The Power of Purchasing

In 2011, multifamily property managers spent \$67.9 billion on operating, maintaining, and improving their properties according to the National Apartment Association. This is 4.5 times the amount spent on multifamily construction that year. Operation and maintenance (O&M) costs for a multifamily building vary by size and type of building. In general, operating costs can be grouped into five categories: utility costs; repair and maintenance expenses; building services such as lawn maintenance and snow removal; and management fees. Figure 1 shows the approximate breakdown of spending in each category for a typical multifamily building.<sup>1</sup>

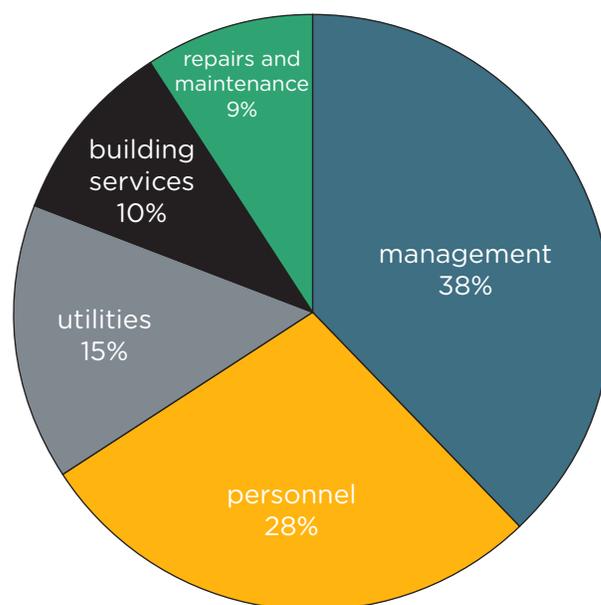
In order to improve building operations and contain and reduce costs, a purchasing strategy or policy should be part of any building operation and maintenance plan. For example, purchasing energy efficient appliances can reduce utility costs by 15 to 40 percent according to the U.S. Environmental Protection Agency (EPA) and ENERGY STAR.<sup>2</sup>

Purchasing is also a critical strategy for achieving green building goals and improving tenant comfort. Using fewer toxic cleaning products can improve indoor air quality by eliminating chemicals such as volatile organic compounds that can exacerbate health conditions. According to the Consumer Product Safety Commission, of chemicals commonly found in homes, 150 have been linked to asthma, allergies, birth defects, cancer, and psychological abnormalities.<sup>3</sup>

In order to harness the power of purchasing, building owners and managers first need to understand which products are being purchased in what quantities, as well as how the purchase happens (e.g. locally by the building superintendent versus centrally by a property management company). Once an inventory is established, the next steps are to target high volume or high cost products, and to identify alternative products that may cost less or improve building operations. This is also an opportunity to incorporate green attributes into purchasing decisions. The Responsible Purchasing Network, a nonprofit organization focused on greener purchasing, provides a roadmap to understanding and assessing purchasing activities in an organization ([www.responsiblepurchasing.org/publications/tensteps.pdf](http://www.responsiblepurchasing.org/publications/tensteps.pdf)).

Figure 1

### MULTIFAMILY HOUSING EXPENSES BY CATEGORY



Source: HPN Member Income Statements, 2012

One of the first steps in establishing a purchasing program is to create a green purchasing policy. A purchasing policy sets the purchasing objectives for the organization, establishes criteria, and sets goals based on organizational mission. CalRecycle, the California government waste reduction resource website, provides examples of green purchasing policies (<http://www.calrecycle.ca.gov/buyrecycled/Policies/>). The EPA and the U.S. Green Building Council (USGBC) LEED program provide additional resources for developing green purchasing policies.

## What is Green Purchasing?

Over the past decade, the demand for sustainable products has grown dramatically. According to the 2012 World Green Building Trends report,<sup>4</sup> investment in green building projects will increase from \$10 billion in 2005 to an estimated \$200 billion in 2016. This study defines a green building project as “one built to LEED or another recognized green building standard, or one that is energy-efficient, water-efficient, and improves indoor air quality and/or engages in material resource conservation.” Sales of green products in the U.S. alone increased to \$60 billion in 2013 – more than doubling in just six years.

The demand for green products has increased the variety of products available to consumers. However, the large number of sustainable or green products on the market has also contributed to confusion about how green products are defined, as well as concerns about false claims or “greenwashing.” One of the purposes of this guide is to provide information and resources that will enable building owners and managers to confidently choose green or environmentally preferred products (EPPs), for the operation and maintenance of multifamily buildings.

To this end, when referencing green or environmentally preferable products, this guide will rely on the U.S. General Services Administration’s definition of environmentally preferable products or EPPs as “products and services that have a lesser or reduced negative effect on human health and the environment when compared with competing products or services that serve the same purpose.”<sup>5</sup>

The intention of this guide is to provide an understanding of the language, tools, and processes needed to introduce EPPs into purchasing decisions for multifamily building operation and maintenance activities. This document supplements, but does not replace, more holistic sustainability programs such as the NeighborWorks Green Organization Programs,<sup>6</sup> Enterprise’s Green ToolKit<sup>7</sup>, or LEED for Existing Buildings.<sup>8</sup> A summary of such programs is provided in Figure 2. Building owners and managers are encouraged to further organizational greening efforts through one of these programs.

Figure 2

### PROGRAMS AND RESOURCES FOR GREEN OPERATIONS AND MAINTENANCE

#### **Green Asset Management Toolkit for Multifamily Housing**

This toolkit was developed by Enterprise Community Partners, Inc., a nonprofit organization that focuses on affordable housing. It provides step by step guidance in developing a green O&M plan for multifamily housing, along with practical steps for managing the plan moving forward.

#### **Green & Healthy Property Management**

Local Initiatives Support Corporation created this guide to provide community partners and other owners of low-income housing with a basis for an open discussion with their property managers about green and healthy goals, implementation of those goals, and ongoing oversight of the properties’ energy performance.

#### **A Guide to Green Operations & Maintenance**

StopWaste.org is a California based nonprofit that focuses on recycling and waste reduction. This guide provides clear guidance on greening specific areas of O&M for multifamily housing.

#### **Greening Your Non-Profit from the Inside Out**

This guide serves as a handbook that was designed to provide community development organizations with an easy-to-use resource for taking the first steps toward going green.

#### **U.S. GBC LEED Rating Program**

The U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) rating program provides a comprehensive rating system for greening new and existing buildings.

#### **Enterprise Green Communities Criteria**

The criteria was developed collaboratively by Enterprise with leading national organizations and experts to provide a clear, cost-effective framework for all affordable housing development types in any location in the country, including new construction and rehabilitation in multifamily as well as single-family buildings.

# Section 2: Considerations for Selecting Green Products

## Introduction

Making sound purchasing decisions for any product requires a balance between need, quality, and cost. Other factors such as organizational mission and goals may also inform the decision to purchase green products. For example, an organization focused on human health may focus its purchasing decisions on products containing fewer toxic chemicals. Alternatively, an organization committed to social justice may prioritize equity and diversity of the product manufacturing labor force as key purchasing considerations. Ultimately, organizational or programmatic priorities are balanced by the product cost.

Understanding a product's life cycle enables purchasing managers to align purchasing decisions with organizational mission and greening objectives. The product life cycle also helps uncover hidden costs such as disposal fees or excessive shipping fees that are often not included in the purchase price but are still borne by the purchaser. For example, a less expensive appliance may require significantly more maintenance, or a product made with toxic materials may require more costly disposal.

A simplified example of lifecycle costs is presented in Figure 3 comparing the lifecycle cost of compact fluorescent light (CFL) bulbs and incandescent bulbs. In an example taken from ENERGY STAR research, ten incandescent bulbs are needed to achieve the same output of light over the lifetime of one CFL.<sup>17</sup> This research includes the acquisition and operating costs for one CFL versus ten incandescent bulbs.

Figure 3

### LIFE CYCLE COSTS LIGHT BULBS

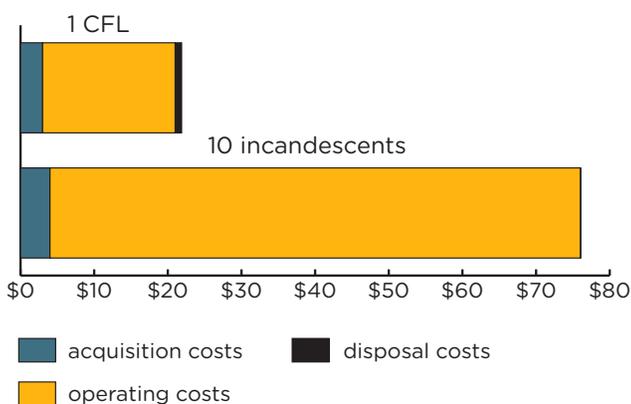


Figure 4

### PRODUCT LIFECYCLE



The ENERGY STAR data shows the average purchase price of one CFL bulb is \$3. This is less than the cost of \$4 to purchase 10 incandescent bulbs. Because CFLs use less energy, the \$18 operating cost of the CFL is significantly less than that of ten incandescent bulbs, at \$72 for the same light output. CFLs have the disadvantage of requiring additional disposal costs because of low levels of mercury in each bulb. Even at the higher end of disposal costs per CFL \$0.87 per bulb to mail the bulb to a recycler, the total lifetime cost for using a CFL is significantly less than the cost of the incandescent bulbs.

As shown in Figure 4 and in the light bulb example, there are many stages in a product life cycle. The following sections will focus on four major product lifecycle stages that can be considered during the purchasing process including:

- Source of materials
- Chemicals
- Packaging
- End of life management

## Source of Materials

The materials used to manufacture a product are either from recycled materials or virgin materials. Recycled materials can be categorized according to the source of the material, which can be pre-consumer or post-consumer. According to the International Organization of Standards, recycled content can be defined as “the portion of materials used in a product that has been diverted from the solid waste stream. If those materials are diverted during the manufacturing process, they are referred to as pre-consumer recycled content (sometimes referred to as post-industrial). If they are diverted after consumer use, they are referred to as post-consumer recycled content.”<sup>10</sup> While virgin materials include all non-recycled materials, they can be classified according to their source. Greener categories include rapidly renewable materials, regional materials, or certified materials as defined below.<sup>11</sup> Products containing virgin materials from one of these categories generally have less environmental impact than unclassified sources of virgin materials.

**Rapidly Renewable Materials:** Rapidly renewable materials are agricultural products, both fiber and animal, that take 10 years or less to grow or raise and can be harvested in a sustainable fashion.

**Regional Materials:** Regional materials are those that are harvested, processed or extracted within 500 miles of use. This lessens the impact of fuels used during shipping and often reduces overall costs.

**FSC-Certified Materials:** The Forest Stewardship Council (FSC) certification is a market-based tool that supports responsible forest management worldwide. The FSC label ensures the forest products used are from responsibly harvested and verified sources.

According to the U.S. EPA, when available, products with high recycled content are generally preferable to products comprised of virgin materials. For example, copier paper that is comprised of 100 percent recycled content contains no virgin materials. The recycled materials used in the paper manufacturing process are generally diverted from a landfill, saving valuable landfill space, and require less processing, thereby saving energy during the manufacturing process. Table 1, taken from the Environmental Defense Fund’s Paper Calculator<sup>12</sup>, is a tool developed to help consumers measure environmental impact by the type of paper. It shows how purchasing copier paper containing recycled content not only diverts waste from landfills, but also reduces the use of energy, water, and toxic materials.

Table 1

	Regular Uncoated Copy Paper	Regular Uncoated Copy Paper w/ 30% recycled content	Regular Uncoated Copy Paper w/ 100% recycled content
<b>Quantity per year</b>	1 Ton	1 Ton	1 Ton
<b>% Post-consumer material content</b>	0%	30%	100%
<b>Wood Use</b>	4 tons	3 tons	0 tons
<b>Net Energy</b>	33 million BTU's	29 million BTU's	22 million BTU's
<b>Greenhouse Gases</b>	5,601 lbs. CO2 equiv.	4,981 pounds CO2 equiv.	3,533 pounds CO2 equiv.
<b>Water Consumption</b>	22,853 gallons	19,488 gallons	11,635 gallons
<b>Volatile Organic Compounds (VOCs)</b>	3 pounds	3 pounds	1 pound

Source: Environmental Defense Fund Paper Calculator

## Chemicals

The type and use of toxic chemicals in consumer and institutional products varies widely based on the product, the way it is used, and the manufacturer. This guide addresses the class of chemicals called volatile organic compounds, or VOCs. This is because VOCs are most commonly associated with building operation and maintenance activities, such cleaning, painting, and pest management. VOCs can also be found in some new carpets and furniture.

VOCs can affect indoor air quality when released in relatively small quantities from certain products. According to a study conducted by GreenGuard<sup>13</sup>, within two hours of certain cleaning processes, the total VOC levels in the air can increase significantly, from 40 µg/m<sup>3</sup> to as much as 25,000 µg/m<sup>3</sup> (micrograms per cubic meter), and reach levels significantly higher than the acceptable value (500 µg/m<sup>3</sup> or 0.5 mg/m<sup>3</sup>). The U.S. EPA suggests that the concentration of VOCs when using some products can be as much as 10 times higher indoors than outdoors<sup>14</sup>. According to the U.S. EPA, when inhaled, VOCs can exacerbate health problems such as asthma, rhinitis, and other conditions<sup>14</sup>.

To minimize effects of VOCs on indoor air quality, it is particularly important to choose products with low VOC content for large O&M projects and for activities that are regularly performed, such as common area cleaning. Determining whether a product has low or no VOC content is not always straightforward.

Fortunately, several organizations have provided guides to assist in evaluating the VOC content of specific products:

- Enterprise Community Partners green criteria provide VOC specifications for paints and primers. All interior paints and primers must be less than or equal to the following VOC levels: Flats 50 g/L; Non-flats 50 g/L; Floor 100 g/L. Enterprise Green Community Checklist: [www.enterprisecommunity.com/servlet/servlet.FileDownload?file=00P30000008rMSlEAM](http://www.enterprisecommunity.com/servlet/servlet.FileDownload?file=00P30000008rMSlEAM)
- The South Coast Air Quality Management District, located in California, has issued VOC guidelines for adhesives, sealants, and solvents. [www.aqmd.gov/rules/cas/index.html](http://www.aqmd.gov/rules/cas/index.html)
- Third party certifiers, including GreenSeal and EcoLogo, have standards for certain categories of products. These include cleaning product and paints that contain low or no VOCs. Purchasing products labeled by these certifiers can assure the purchaser of low VOC content.  
GreenSeal: [www.greenseal.org/Standards/StandardsinDevelopment/VOCRevision.aspx](http://www.greenseal.org/Standards/StandardsinDevelopment/VOCRevision.aspx)  
EcoLogo/UL: [www.ul.com/global/por/pages/consumers/articles/?cpath=/global/eng/pages/consumers/articles/data/minding-your-vocs-indoor-air-quality-and-painting\\_20130619145100.xml](http://www.ul.com/global/por/pages/consumers/articles/?cpath=/global/eng/pages/consumers/articles/data/minding-your-vocs-indoor-air-quality-and-painting_20130619145100.xml)
- U.S. EPA provides EPP guides related to cleaning and painting that address VOC content. [www.epa.gov/epp/index](http://www.epa.gov/epp/index).
- The Responsible Purchasing Network also provides select guides about purchasing products that contain no or low VOCs. [www.responsiblepurchasing.org/purchasing\\_guides/all/index.phphtm](http://www.responsiblepurchasing.org/purchasing_guides/all/index.phphtm)

## Packaging

Packaging typically accounts for 10 to 40 percent of a product's cost according to Entrepreneur.com<sup>15</sup>. Any packaging needs to ensure that the product it contains is protected as it makes its way from manufacturer to user. The packaging may also offer additional benefits, including a means for conveying marketing, inventory control, or product and safety information.

The final disposal of packaging is usually not the responsibility of the manufacturer and, therefore, the cost of disposal is typically an additional cost borne by the user after the initial purchase. Whenever possible,

reducing packaging can reduce handling and shipping costs as well as disposal costs. For example, most cleaning products contain more than 90 percent water, according to a study by the Michigan State University's School of Packaging<sup>16</sup>. Switching to concentrated cleaning chemicals that are mixed with water at the point of use reduces shipping expenses because only the chemical portion of the cleaning product is shipped in a single container. Disposal costs are reduced as well since only the one container, as compared to many small containers, needs to be discarded.

Best practices to reduce packaging volume and disposal of packaging material include the following:

- Whenever possible, use packaging that can be returned to the manufacturer (e.g. pallets).
- Work with your waste hauler to develop a resource management program that places the value of the waste management contract on resource conservation services rather than on disposal volume. Information about resource management programs and resources nationwide is available through the Minnesota Pollution Control Agency.
- Eliminate packaging materials that are hard to recycle, such as plastics.
- Order in bulk to reduce single use shipments.
- Consider a local materials exchange as a way to identify other organizations that may benefit from packaging waste products. The U.S. EPA maintains a list of domestic and international material resource exchanges at [www.epa.gov/waste/conserves/tools/exchnat.htm](http://www.epa.gov/waste/conserves/tools/exchnat.htm).

### HAVE YOU THOUGHT ABOUT PRODUCT PACKAGING?

- Does the package contain recycled materials? What percent?
- Is the package recyclable with the municipality or waste servicer?
- Can the packaging be returned to the seller or manufacturer?
- What are the costs and environmental considerations associated with disposal? packaging?

## End of Life Management

End of life management of left-over product and packaging is almost always the responsibility of the user. For some products, such as lighting, final disposal can be addressed at the time of purchase since many lighting manufacturers have product take-back programs or are aligned with recyclers. This example is more of the exception than the rule as most consumer products and packaging do not require special handling and therefore end up in the trash. Keeping materials out of landfills through recycling can reduce waste management costs. A study by the City of Chicago<sup>17</sup> shows that multifamily apartments building with between 6 and 40 units were able to save as much as 30 percent in waste management costs by recycling.

End of life management planning should be addressed at the time of purchase for products such as light bulbs and ballasts, paints, carpeting, certain chemicals, and appliances that generally require special handling to ensure proper disposal. Planning for end of life disposal for these types of products may reduce disposal costs and can ensure that products are handled according to the proper regulatory guidelines. A summary of disposal options for a selection of commonly used products is included in table 2:

Table 2

	End of life management	Disposal option
<b>Light bulbs and ballasts</b>	Requires recycling because of heavy metals	Participate in bulb take-back programs such as those sponsored by IKEA and The Home Depot, or search for similar programs locally. <a href="http://www.energystar.gov/?c=cfls.pr_cfls_savings">www.energystar.gov/?c=cfls.pr_cfls_savings</a>  In high volume situations, utilize a licensed recycler.
<b>Products containing toxic chemicals (e.g. non-latex paints)</b>	Classified as hazardous or special waste depending on the state thereby requiring special handlings	Avoid costly disposal by purchasing less toxic products.  Purchase in small quantities.
<b>Carpeting</b>	High volume	Purchase recyclable carpet.
<b>Appliances</b>	High volume Can contain hazardous materials such as refrigerants	Participate in manufacturer take-back programs.  Utilize a licensed recycler.

### CONSIDER RECYCLABILITY

- Can the product be recycled?
- Can recycling occur as part of the regular disposal service or at a nearby location?
- Can the product be reused or repurposed?
- If it cannot be recycled or reused, can it be disposed of safely? At what cost?

# Section 3: Products by Category

## Introduction

The following sections present information and data for choosing more efficient and greener equipment and operation and maintenance supplies. To facilitate review, each section describes the product-specific efficiency or green standard followed by considerations for making purchasing decisions. Descriptions for the following equipment and products commonly used in multifamily buildings are included:

- |                                     |                                      |
|-------------------------------------|--------------------------------------|
| 1. Appliances                       | 7. Furniture                         |
| 2. Lighting                         | 8. Pest management                   |
| 3. Cleaning and janitorial supplies | 9. Heating and cooling systems       |
| 4. Office supplies                  | 10. Plumbing                         |
| 5. Floor coverings                  | 11. Landscaping and lawn maintenance |
| 6. Paints                           |                                      |

## Overview of Standards and Certifications

Standards are a set of guidelines and criteria that a product or service can be measured against. The U.S. Department of Energy (DOE) has set minimum standards of energy efficiency for many of these product areas. ENERGY STAR and the Consortium for Energy Efficiency (CEE) have developed more stringent energy efficiency standards. Certification is a means to designate that the product meets a set of standards, and offers an easy way to confidently determine whether or not a product meets criteria that are important to the purchaser. However, not all certifications are the same.

### First-party certification:

Claims and certifications made by the product manufacturer.

### Second-party certification:

Claims and certifications made by industry groups and associations.

### Third-party certification:

Claims and certifications made by independent organizations.

Products can either be first, second, or third party certified. These categories designate the relationship of the certifier to the company whose product is being certified. Descriptors such as “all-natural,” “environmentally friendly,” and “green” are used regularly by manufacturers without any independent testing or verification. For

this reason, it is important to understand the kinds of certifications and their level of independence.

Third-party certifications are considered the most objective, and programs such as U.S. GBC LEED and Enterprise Community Partners Green Rating Criteria generally require products to be third party certified to comply with their standard. NeighborWorks, Enterprise Community Partners, and LEED for Existing Buildings each recommend using the U.S. EPA’s Database of Environmental Information for Products and Services as a resource for finding and understanding product specifications, standards, and recommended third-party certifications.

Purchasing managers can specify certifications as part of the procurement process for products where certifications exist, such as janitorial products or paints. When a certification for a product category has not been established, or where only very few products are certified, purchasers can include desired attributes, such as low or no-VOCs within the technical specifications for the product.

Some products are used directly by building personnel, and others are deployed through vendors such as landscaping services or cleaning providers. Understanding the types of products vendors are using and how those products are being used is important to building operation and maintenance activities. The products and best practices that are important to the property manager should be used by any vendors working at the site.

### Basic considerations when choosing vendors include:

- Does the vendor have necessary certifications or training for the job?
- Does the vendor have a sustainability policy?
- Does the vendor use environmentally preferable products?
- How does the vendor dispose of materials and debris?
- Do they recycle, reuse, or repurpose when possible?
- Is the vendor local?
- Does the vendor source their materials locally?

## Appliances: Clothes Dryers

### Standards and Certifications

While the DOE does not currently measure energy use for commercial clothes dryers, they do for residential clothes dryers. The energy rating for residential clothes dryers is measured as the Energy Factor (EF). The Energy Factor is the pounds of clothing (saturated to a certain standardized extent) that can be dried per kilowatt-hour (kWh) of electricity (for gas dryers, per “equivalent” kWh of natural gas consumed). The higher the Energy Factor, the greater the efficiency. All residential clothes dryers manufactured before May 14, 1994 must meet the following DOE minimum energy use standards:

Table 3

Product class	Energy factor (pounds/kWh)
1. Electric, Standard <i>4.4 ft3 or greater capacity</i>	3.01
2. Electric, Compact (120V) <i>Less than 4.4 ft3 capacity</i>	3.13
3. Electric, Compact (240V) <i>Less than 4.4 ft3 capacity</i>	2.90
4. Gas	2.67

The DOE’s new energy efficiency performance metric for clothes dryers, Combined Energy Factor (CEF), factors in the energy use in the standby mode and off mode to the overall operation of the dryer. These standards will increase the efficiency requirements of all clothes dryers when they go into effect on January 1, 2015.

### Purchasing Considerations

- Replace clothes dryers that are no longer working properly with models that meet the minimum DOE standards or better.
- Look for dryers with moisture sensors to detect clothes dryness.
- Choose a dryer that automatically shuts off once the clothes are dry, which can save 15 percent on energy costs compared to a conventional dryer.

### Best Practices

- When available, use the dryer setting that automatically shuts off the machine when clothes are dry. Not only will this save energy, but it will also save wear and tear on your clothes.
- Clean the lint filter. Cleaning the filter after every load will improve air circulation and increase the efficiency of the dryer. This is also an important safety measure.

- Scrub the lint filter regularly if you use dryer sheets. Dryer sheets can leave a film on the filter that reduces air flow and, over time, can affect the performance of the motor. Use a toothbrush to scrub it clean once a month.

Adapted from the American Council for an Energy Efficient Economy (ACEEE) and ENERGY STAR recommendations:  
<http://www.aceee.org/consumer/laundry>  
[https://www.energystar.gov/certified-products/detail/clothes\\_washers](https://www.energystar.gov/certified-products/detail/clothes_washers)

## Appliances: Clothes Washers

### Standards and Certifications

Central laundry facilities in multifamily buildings, whether machines are top-loading or front-loading, typically use less water per occupant than in-unit washing machines and dryers. Front-loading clothes washers are generally more efficient than top-loaders, although manufacturers have introduced some new high-efficiency top-loading models that are as efficient.

The DOE standards require clothes washers to have a Modified Energy Factor (MEF) of at least 1.26 and a maximum Water Factor (WF) of 9.5 or less. A higher MEF indicates better energy efficiency, while a lower WF indicates better water efficiency. Both ENERGY STAR and CEE rated clothes washers exceed the DOE standards. ENERGY STAR qualified clothes washers use 40 to 50 percent less energy and about 55 percent less water than standard washers. Most ENERGY STAR qualified washers extract more water during the spin cycle, saving energy while drying and reducing wear and tear on clothes. For more details about ENERGY STAR rated clothes washers, visit the website at [www.energystar.gov/certified-products/detail/clothes\\_washers](http://www.energystar.gov/certified-products/detail/clothes_washers). CEE rates clothes washers through their Super Efficiency Appliance Program. A list of CEE approved clothes washers can be found at: <http://library.cee1.org/content/qualifying-product-lists-residential-clothes-washers>.

### Purchasing Considerations

- Replace washers that are more than 10 years old with ENERGY STAR or CEE approved models manufactured after 2007. Replacement with ENERGY STAR qualified models is recommended by Enterprise Green Criteria and U.S. GBC LEED O+M.
- Look for rebates from local utilities for purchasing energy efficient models.

**Best Practices**

- Replace distressed or cracked hoses immediately; replace fittings every three years.
- Clean inside and out regularly; clean the tub thoroughly every three months.
- Consider a professional maintenance program that cleans the interior.

Adapted from ENERGY STAR recommendations: [https://www.energystar.gov/certified-products/detail/clothes\\_washers](https://www.energystar.gov/certified-products/detail/clothes_washers)

**Appliances: Refrigerators**

**Standards and Certifications**

Refrigerators can consume as much as 5 percent of all energy used in a residential unit. ENERGY STAR qualified refrigerators use up to 40 percent less energy than the conventional models sold before 2001, and at least 15 percent less energy than models built to current federal standards. These refrigerators feature high-efficiency compressors, improved insulation, and more precise temperature and defrost mechanisms. Additionally, ENERGY STAR qualified freezers are least 10 percent more efficient than required by current federal standards. Learn more about ENERGY STAR rated refrigerators at [www.energystar.gov/certified-products/detail/refrigerators](http://www.energystar.gov/certified-products/detail/refrigerators). CEE also rates refrigerators through their Super Efficiency Appliance Program. CEE Tier 1 refrigerators have similar energy savings to Energy Star qualified models, while CEE Tier 2 and 3 units are more efficient. The CEE qualifying products list can be found at [www.cee1.org/content/cee-program-resources](http://www.cee1.org/content/cee-program-resources).

**Purchasing Considerations**

- Replace units that are more than 15 years old or are not working.
- Purchase ENERGY STAR or CEE listed models. Replacement with ENERGY STAR qualified models is recommended by Enterprise Green Criteria and U.S. GBC LEED O+M.
- Top-mount refrigerators are more efficient than bottom-mount or side-by-side models.

**Best Practices**

- Check door seals
- Adjust the thermostat
- Check the power-saver switch

Purchasing considerations and best practices have been adapted from American Council for an Energy Efficient Economy recommendations: <http://www.aceee.org/consumer/refrigeration>

**Appliances: Room Air Conditioners**

**Standards and Certifications**

A room air conditioner’s efficiency is measured using the Energy Efficiency Ratio (EER). The EER is the ratio of the cooling capacity (in BTUs per hour) to the power input (in watts). The higher the EER rating, the more efficient the air conditioner.

ENERGY STAR qualified room air conditioners use at least 10 percent less energy than conventional models and are rated at a minimum EER of 11.2 for 8,000 BTU/Hour units. CEE rates clothes washers through their Super Efficiency Appliance Program. CEE Tier 1 rated units are the same efficiency as ENERGY STAR while CEE Tier 2 units are more efficient. CEE qualifying products list can be found at [www.cee1.org/content/cee-program-resources](http://www.cee1.org/content/cee-program-resources).

Table 4

Capacity (Btu/Hour)	< 8,000	8,000 to 13,999	14,000 to 19,999	≥ 20,000
Federal standard EER with louvered sides	≥ 9.7	≥ 9.8	≥ 9.7	≥ 8.5
ENERGY STAR EER with louvered sides	≥ 10.7	≥ 10.8	≥ 10.7	≥ 9.4
Federal Standard EER without louvered sides	≥ 9.0	≥ 8.5	≥ 8.5	≥ 8.5
ENERGY STAR EER without louvered sides	≥ 9.9	≥ 9.4	≥ 9.4	≥ 9.4

Casement type	Federal Standard EER	ENERGY STAR EER
Casement only	≥ 8.7	≥ 9.6
Casement-slider	≥ 9.5	≥ 10.5

### Purchasing Considerations

- Room air conditioners that are more than 15 years old should be replaced with ENERGY STAR rated or CEE listed models. Replacement with ENERGY STAR or CEE is recommended by Enterprise Green Criteria and U.S. GBC LEED O+M.
- Look for models with R-410A refrigerant, not R-22 (HCFC-22). R-22 and its by-product (R-23) are extremely harmful and contribute to ozone depletion.
- Proper sizing is important to ensure efficiency. Oversizing is a common mistake, which leads to significant inefficiency and does not increase comfort. (See table 5).

### Best Practices

- Reduce excessive use of room air conditioners.
- Clean the air filters on room air conditioners monthly.
- Inspect, clean, and tune the system every two to three years.

Purchasing considerations and best practices have been adapted from the American Council for an Energy Efficient Economy (ACEEE) recommendations: <http://www.aceee.org/consumer/cooling#improve>

Table 5

Area to be cooled <i>In square feet</i>	Capacity needed <i>BTU per hour</i>
100 to 150	5,000
150 to 250	6,000
250 to 300	7,000
300 to 350	8,000
350 to 400	9,000
400 to 450	10,000
450 to 500	12,000
500 to 700	14,000
700 to 1,000	18,000
1,000 to 1,200	21,000
1,200 to 1,400	23,000
1,400 to 1,500	24,000



## Cleaning and Janitorial Supplies

### Standards and Certifications

Cleaning and janitorial supplies can often contain harmful and toxic materials that can have an adverse impact on human health, particularly for sensitive populations such as children or the elderly. To be confident that the products purchased actually contain fewer toxic chemicals, purchase products that have been certified by a third party such Green Seal, Eco Logo, or Design for the Environment.

More importantly, green cleaning products should be used as part of a comprehensive green cleaning program in order to reduce the overall quantities of products used and increase confidence in the cleaning ability of green products. The U.S. EPA EPP website is a resource for green cleaning programs ([www.epa.gov/epp/pubs/products/cleaning.htm#d](http://www.epa.gov/epp/pubs/products/cleaning.htm#d)). The Responsible Purchasing Network provides additional information in a comprehensive guide to green cleaning as well as example specification for cleaning products ([www.responsiblepurchasing.org/purchasing\\_guides/cleaners/standards/](http://www.responsiblepurchasing.org/purchasing_guides/cleaners/standards/)).

### Purchasing Considerations

- Purchase products that are GreenSeal, EcoLogo, or DfE certified. USGBC LEED O&M programs specify using third party certified cleaning products.
- Provide training to the cleaning team.
- Consider using concentrated cleaners to minimize waste.
- Minimize solid waste by selecting products with minimal packaging and recycled content, by recycling, and by reusing supplies when possible.

### Best Practices

- Isolate janitorial supplies.
- Consider adopting applicable procedures and practices from the Green Seal Commercial and Industrial Cleaning Services Standard (GS-42).
- Specify recyclable, recycled content, or reusable packaging.
- Request on-site training in proper produce use from product manufacturers or distributors.
- Consider reducing the total number of stocked cleaning products by using multi-use cleaners in concentrated formulas.

1. The Federal government provides product lists that are approved for purchase by federal agencies on its Comprehensive Procurement Guidelines website: <http://www.epa.gov/epawaste/conserves/tools/cpg/index.htm>.

Purchasing considerations and best practices have been adapted from the Stopwaste.org Guide to Green Operations & Maintenance: <http://www.stopwaste.org/docs/gbmg-dec-20-07ltr.pdf>

## Floor Coverings: Carpet

### Standards and Certifications

Volatile organic compounds that can be released or off-gassed both during and after installation are present in many floor coverings and installation adhesives. Choosing carpeting that is certified by the Carpet & Rug Institute Green Label and Green Label-Plus programs will ensure that the materials are low in VOCs. This will minimize off-gassing that could adversely impact indoor air quality.

### Purchasing Considerations

- Specify Green Label and Green Label-Plus carpets. Enterprise Green Community Criteria and USGBC LEED O&M specify the Green Label program.
- Specify low-solvent, low-VOC adhesives that comply with a VOC content that is less than the current VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168. Sealants used as fillers should meet or exceed the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51. Enterprise Green Community Criteria and USGBC LEED O&M recommend compliance with SCAQMD requirements.
- Specify backing and face-fibers with recycled content.
- Consider post-consumer, recycled carpet tiles, which can be selectively replaced.
- Consider bio-based carpeting materials where available (e.g. wool, jute, sisal, hemp, coir, etc.).
- Specify recyclable carpeting.

#### Specify a three-component entryway flooring system:

1. A permeable outdoor mat or grille system.
2. Indoor mats that aid in scrubbing shoes.
3. A smooth-surface, waterproof flooring material for the entryway.

### Best Practices

- Clean carpets regularly and as directed to minimize the growth of mold, mildew, and bacteria.
- Maintain carpets properly and selectively replace them.
- Emphasize intensive cleaning at entryways.
- Vacuum, sweep, and clean entryway areas frequently, especially during inclement weather.
- Avoid carpet in entryways because it is hard to clean and it traps dirt.

Purchasing considerations and best practices have been adapted from the Stopwaste.org Guide to Green Operations & Maintenance: <http://www.stopwaste.org/docs/gbmg-dec-20-07ltr.pdf>

### Disposal

Carpet consumes enormous amounts of landfill space. More than 4 billion pounds is discarded per year, with less than 1 percent recycled. To minimize the carpet in landfills:

- Contact manufacturers or vendors to determine if they have recycling programs.
- Find a carpet recycling facility.
- Reuse or donate carpeting when possible.

## Floor Covering: Natural Linoleum

### Standards and Certifications

Linoleum is often confused with vinyl tile. But natural linoleum is made from renewable materials, including linseed oil, powdered wood and cork, ground limestone, resin binders, and dry pigments. The backing is typically made with a natural jute fiber. Polyvinyl chloride (PVC or vinyl) is made from petroleum. Natural linoleum is durable and easy to clean, and while the installation of linoleum is more complex than vinyl or stone, it is easy to maintain and repair.

The SCS Global FloorScore program is for hard flooring services, including linoleum. Products bearing the FloorScore label have minimal off-gassing that could impact indoor air quality. FloorScore certification is also a valuable stepping stone to sustainability certification under NSF/ANSI 332- Sustainability Assessment for Resilient Floor Coverings.

### Purchasing Considerations

- Consider specifying linoleum products certified under FloorScore or NSF/ANSI 332 Sustainability Assessment for Resilient Floor Coverings. Enterprise Green Communities criteria and USGBC LEED O&M specify FloorScore.
- Consider sheet linoleum, which is more durable than tile linoleum.

### Best Practices

- Do not let water or liquid sit on the floor. This can warp or damage linoleum.
- Use water or mild dishwashing soap to clean spills. Do not use harsh chemicals or ammonia.
- Sweep loose debris from your floor regularly or as needed to minimize scratching.
- Remove scuff marks with a pencil eraser or baby oil.
- Remove scratches and burns immediately using a nylon brush or floor buffer.
- Use walk-off mats at entryways to keep dirt and debris outside.
- Linoleum adhesives typically have low or no VOC content and should not be confused or substituted with vinyl flooring adhesives.

Purchasing considerations and best practices have been adapted from the Stopwaste.org Guide to Green Operations & Maintenance: <http://www.stopwaste.org/docs/gbmg-dec-20-07ltr.pdf>

### Disposal

- Recycle linoleum when possible.
- Some linoleum is fully compostable. Check with your manufacturer.

## Floor Covering: Tile

### Standards and Certifications

Tile floors can be a durable and easy to maintain option. Ceramic and porcelain are particularly durable, and made of materials, that can be recycled or repurposed at the end of their useful lives. Conversely, floor coverings such as vinyl tiles release harmful chemicals in their production and cannot be recycled. Green Squared® and FloorScore® certify tile products, and Green Squared® and GREENGUARD certify adhesives, grout and additives.

### Purchasing Considerations

- Specify Green Squared® or FloorScore® certified tile products and Green Squared® or GREENGUARD certified adhesives, grout and additives. Enterprise Green Communities criteria and USGBC LEED O&M specify FloorScore.
- Consider tiles made with recycled materials.

### Best Practices

- Understand the type of tile used, and adjust cleaning products and maintenance based on the type of tile or stone. Consider a certified green neutral cleaner or stone soap. Approved green neutral cleaners are defined as surfactant type detergents that have a pH of 7-11.
- Dust mop regularly. The most destructive material to most stone is sand, dirt, and grit.
- Replace cracked tiles quickly. Pollutants can embed

into cracks and cause more damage.

- Use walk-off mats on the inside and outside of the entryway to minimize dirt and debris. Clean these mats daily, especially in high-traffic areas.
- Avoid impregnators, sealants, and additives. These can increase the wear of your stone tiles and actually attract dirt and debris. Stone or terrazzo floor without any coating can be easier to maintain and more cost effective.

Purchasing considerations and best practices have been adapted from the Stopwaste.org Guide to Green Operations & Maintenance: <http://www.stopwaste.org/docs/gbmg-dec-20-07ltr.pdf>

### Disposal

- Check with manufacturers or retailers about their take back programs for recycled tiles.
- Reuse or repurpose tiles when possible.



## Furniture

### Standards and Certifications

New furniture can contain volatile organic compounds that may off-gas for a period of time, potentially affecting indoor air quality. Additionally, some plywood and particleboard furniture can contain formaldehyde-based resins that can also off-gas and create harmful fumes. Enterprise Green Community criteria and USGBC LEED O&M do not specify specific certifications for furniture. Enterprise, however, recommends using wood products that do not contain formaldehyde. USGBC LEED O&M echoes this recommendation and encourages the use of recycled and reused materials, locally sourced materials, and products made from rapidly renewable and/or FSC-certified materials.

### Purchasing Considerations

- Consider used or refurbished furniture to minimize waste and reduce costs.
- When selecting new furniture, look for furniture with recycled content, locally sourced materials, rapidly renewable materials, or FSC-certified wood products.
- Specify furniture with one or more of the following certifications:

- GREENGUARD Environmental Institute (GEI) is a third-party certification for furnishings focused on indoor air quality.
- Forest Stewardship Council (FSC) is a third party certification for the sustainable and efficient use of wood products.
- MBDC Cradle to Cradle is a third-party certification for furnishings that were manufactured with the efficient use of energy and water, have used safe and healthy materials, and are designed for material reuse.
- Certified Sustainable Fabrics (Certified to NSF/ANSI 336 Standard) is a third-party certification for commercial furnishings, including fabrics used for office furniture upholstery and panel systems.
- Business and Institutional Furniture Manufacturers Association (BIFMA) is a second-party certification for furniture. While not completely independent of the industry, it provides a well-established certification where few exist.

**Best Practices**

- To the greatest extent practicable, reuse existing furniture instead of buying new.
- Select furniture that has recycled content and uses glues, finishes, and padding low in VOCs and formaldehyde.
- Plan a safe area for airing out new furniture for two weeks prior to use.

Purchasing considerations and best practices have been adapted from the Stopwaste.org Guide to Green Operations & Maintenance: <http://www.stopwaste.org/docs/gbmg-dec-20-07ltr.pdf>

**Heating and Cooling Systems and Equipment**

**Standards and Certifications**

Up to half of the energy used in a building is used for heating and cooling<sup>18</sup>. Therefore, ensuring that the building heating and cooling equipment are efficient is critical to minimizing energy loss, reducing costs, and making the property as comfortable as possible. CEE Tier 1 commercial HVAC standards are equivalent to ENERGY STAR standards, while CEE Tier 2 and Tier 3 offer more stringent voluntary requirements for efficiency.

Look for ENERGY STAR and CEE rated HVAC equipment at: [www.energystar.gov/?c=heat\\_cool.pr\\_hvac](http://www.energystar.gov/?c=heat_cool.pr_hvac) [www.ceedirectory.org/Content/centralairconditionerandheatpumpefficiency\\_2.aspx](http://www.ceedirectory.org/Content/centralairconditionerandheatpumpefficiency_2.aspx)

**Heating system efficiency**

A central furnace or boiler’s efficiency is measured using Annual Fuel Utilization Efficiency (AFUE). AFUE is the ratio of annual heat output of the furnace or boiler compared to

the total annual fossil fuel energy consumed. An AFUE of 90 percent means that 90 percent of the energy in the fuel becomes heat for the building. The higher the AFUE is, the more efficient the furnace or boiler.

**Air conditioning systems efficiency**

Every central air conditioning unit is assigned an efficiency rating known as its Seasonal Energy Efficiency Ratio or SEER. The SEER is defined as the total cooling output (in British thermal units or BTUs) provided by the unit during its normal annual usage period, divided by its total energy input (watt-hours) during the same period. ENERGY STAR and CEE have created further standards and accreditations more stringent than the DOE standard.

Table 6

Product Class	DOE Standards	ENERGY STAR
Split central air conditioners	13.0 SEER	14.5 SEER
Packaged central air conditioners	13.0 SEER or higher	14.0 SEER or higher

**Purchasing Considerations**

- Sizing: Incorrect sizing of a heating and cooling system can greatly diminish energy efficiency. Size heating and cooling equipment in accordance with the Air Conditioning Contractors of America (ACCA) Manuals, Parts J and S, or ASHRAE handbooks. Enterprise Green Communities criteria and USGBC LEED O+M require sizing according to these guidelines.
- Installation: Emphasis should be placed on quality installation. Most energy loss can be attributed to improper sizing, poor installation of duct work, and improper insulation. Seek a qualified and reputable contractor and understand the details of their installation.
- Packaged heating and cooling systems are convenient, but less efficient. Current minimum DOE standards for packaged systems are recommended to have a 13.0 Energy Efficiency Ratio (EER) or greater, with an Annual Fuel Utilization Efficiency (AFUE) of at least 80 percent. Choose ENERGY STAR and CEE rated equipment which are more efficient.
- Split systems are more efficient overall, with minimum DOE standards of 13.0 EER or greater, with an Annual Fuel Utilization Efficiency (AFUE) of at least 92 percent for furnaces and at least 90 percent for boilers.

### Best Practices

- Change air filter regularly.
- Tune up your HVAC equipment yearly.
- Install a programmable thermostat.
- Seal your heating and cooling ducts.
- Ask about Proper Installation of your new equipment.

Adapted from ENERGY STAR recommendations: [http://www.energystar.gov/?c=heat\\_cool.pr\\_hvac](http://www.energystar.gov/?c=heat_cool.pr_hvac)

### Retrofitting Your Property:

- Complete an energy audit: An energy audit will identify opportunities to implement energy saving measures that could reduce operating costs.
- Air-seal and insulate the building and add insulation as necessary. Air sealing and insulation can save 20 to 30 percent in overall energy costs.

### CONSIDER AN ENERGY AUDIT

Before replacing the heating or cooling system, consider getting an energy audit from a certified Building Performance Institute (BPI) professional. An energy audit provides an assessment of the property as well as tailored recommendations for optimizing energy use. Some cities or states offer incentives that help pay for the cost of an energy audit and for implementing certain energy efficiency measures.

## Landscaping and Lawn Maintenance

### Standards and Certifications

Whether outdoor spaces are functional or simply aesthetic, the products and practices used to create and maintain those spaces can have an impact on the property's overall performance, specifically with respect to water use. A high performing landscape reduces the use of water and chemicals. It also requires less maintenance, thereby reducing fuel use in mowers and tractors. Guidelines for sustainable site maintenance can be found at [www.epa.gov/watersense/outdoor](http://www.epa.gov/watersense/outdoor) and [www.sustainablesites.org](http://www.sustainablesites.org).

- Consider the new Sustainable Sites Initiative certification (SITES), which includes a sustainable landscaping certification.
- Specify U.S. EPA WaterSense certified irrigation controllers.
- Incorporate Xeriscaping practices into landscape plan, which BuildingScience.com defines as “climate-tuned landscaping that minimizes outdoor water use while maintaining soil integrity and building aesthetics. Xeriscaping typically includes emphasis on native plantings, mulching and no or limited drip/subsurface irrigation.”
- Utilize maintenance equipment that is electric or battery operated to reduce emissions.

### Purchasing Considerations

- Incorporate native plant species that fit with the site and regional rainfall patterns to minimize maintenance and water use.
- Select locally produced compost that includes at least 50 percent regionally generated plant debris or food scraps, and specifies less than 0.5 percent physical contaminants.
- Procure locally produced top soil.

### Best Practices

- Minimize use of fertilizers, pesticides, and chemicals.
- Use the natural surroundings and plants to your advantage. For example, plant deciduous trees on the south side of the building to protect the building from summer sun.
- Reduce the lawn area to conserve water and create a more sustainable landscape.
- Group plants with similar water needs together and close to a water source.
- Consider planting drought-tolerant native plants (xeriscaping) to conserve water.
- Reduce storm water run-off by reducing hard surfaces. Create rain gardens or utilize a rain barrel to collect water run-off.

- Use mulch strategically. It absorbs water and releases it slowly to conserve water.
- Harvest, treat, and reuse rainwater and/or gray-water.

Adapted from the Stopwaste.org Guide to Green Operations & Maintenance: and Enetrprise Communities Green Asset Management Toolkit <http://www.stopwaste.org/docs/gbm-g-dec-20-07ltr.pdf> <http://www.enterprisecommunity.com/servlet/servlet.FileDownload?file=00P3000000861xsEAE>.

**Disposal**

- Consider on-site composting of plant waste.
- Check with municipalities to determine if organic waste removal is available in your area.

**Lighting**

**Standards and Certifications**

Lighting typically represents 10 to 15 percent of energy related operating expenses in buildings<sup>20</sup>. According to ENERGY STAR, initial purchasing costs for energy efficient lighting products are often perceived to be higher than conventional, less efficient products. However, upgrading to more efficient lighting generally provides a significant and quick return on investment. ENERGY STAR and CEE qualify many fluorescent, CFL, and Light Emitting Diode (LED) light bulbs. Additionally, ENERGY STAR provides efficiency lighting guidelines through their Multifamily High Rise (MFHR) program. Enterprise Green Communities criteria recommend ENERGY STAR qualified fixtures or fixtures that meet ENERGY STAR MFHR program guidelines.

Additional resources for efficiency lighting can be found through the Responsible Purchasing Network lighting purchasing guide: [http://www.responsiblepurchasing.org/purchasing\\_guides/lighting/](http://www.responsiblepurchasing.org/purchasing_guides/lighting/)

Table 8, prepared by ENERGY STAR, illustrates the cost benefits of energy efficiency light bulbs.

Table 7

Product Class	Incandescent	CFL	LED
Watts of electricity used (equivalent to 60 watt incandescent bulb)	60 watts	13 watts	12 watts
Lifetime output hours (lifetime use for each bulb)	1,000	10,000	25,000
Equivalent Output Annual Operating Cost (25 Incandescent, 2.5 CFL, 1 LED bulbs per year equivalent)	\$180/year	\$45/year	\$60/year

**Purchasing Considerations**

- For interior residential lighting, purchase ENERGY STAR or CEE rated bulbs from utilities and local retailers.
- For interior commercial lighting needs, typically found in common areas, replace T-12 fluorescent bulbs and ballasts with T-8 or T-5 bulbs and ballasts. Reference ENERGY STAR and CEE specifications.
- For exterior lighting, purchase ENERGY STAR qualified fixtures or LEDs with a minimum efficiency of 45 lumens/watt.
- Look for programs from local utilities and nonprofits that offer free bulbs and installation.
- Use replacement lamps with low mercury content.
- Select longer-life linear fluorescent lamps with a minimum of 12,000 hours rated life.

**Best Practices**

- Determine a replacement schedule for lamps based on current use.
- Purchase the most efficient lighting products when installing replacements.
- Install lighting fixtures capable of using energy efficient bulbs.
- Ensure the ballasts are electronic as opposed to magnetic.
- Install LED (light emitting diode) and ENERGY STAR exit signs.
- Use replacement lamps with low mercury content.

Adapted from the Stopwaste.org Guide to Green Operations & Maintenance: <http://www.stopwaste.org/docs/gbm-g-dec-20-07ltr.pdf>

**Disposal**

- Fluorescent lamps and compact fluorescent lamps contain mercury and must be recycled. Older fluorescent light ballasts may contain polychlorinated biphenyls (PCBs) and should be handled by a qualified disposal company.
- Check with utilities, municipalities, or retailers about take back or lamp recycling programs.

## PHASE-OUT OF T12 LAMPS:

As of July 2012, T12 lamps and magnetic ballasts are no longer being manufactured. Therefore, replacing T12 fixtures with T8, T5, or LEDs fixtures will be necessary. T8 and T5 fixtures provide many benefits, including quieter operation, cost savings of 35 to 40 percent, and more appealing color. Those specific lamps being phased out include:

- Most F40 and F34T12 lamps and almost all FB40 and FB34T12 U-lamps
- All 75W F96T12 lamps
- All 60W F96T12/ES lamps, with the exception of a few 700/SP and 800/SPX lamps
- All conventional 110W F96T12 HO lamps that deliver fewer than 10,120 lumens



## Office Equipment and Supplies

### Standards and Certifications

Office equipment typically includes computers, monitors, copiers, printers, scanners, and power adapters. Office supplies include ongoing consumables such as copier paper, toner, batteries, and printing cartridges.

ENERGY STAR has ratings for more than 1,000 office equipment products. With respect to computers, ENERGY STAR rated computers must have power management controls to further reduce energy use when the computer is not being used. Electronic Product Environmental Assessment Tool (EPEAT) is a global rating system for electronics. It currently includes rating criteria for PCs and displays, imaging equipment, and televisions. EPEAT goes beyond ENERGY STAR as its criteria addresses energy use as well as toxics, disposal, and manufacturing processes. The following purchasing considerations are based on the Enterprise Green Communities and USGBC LEED O+M criteria for durable and consumable office products.

### Purchasing Considerations

- Specify ENERGY STAR rated equipment, including copiers, monitors, printers, etc.
- Specify ENERGY STAR or EPEAT rated computers.
- Use copier paper with at least 30 percent post-consumer recycled content or specify GreenSeal, EcoLogo or Forest Stewardship Council Certified (FSC) paper products.

- Purchase products with a high content (50 percent or more) of rapidly renewable materials.
- Purchase products that contain materials harvest and processed or extracted and processed with 500 miles.
- Purchase rechargeable batteries.
- Install water filters, rather than providing bottled water.
- Purchasing remanufactured toner and printer cartridges.

### Best Practices

- Enable sleep mode or turn off computers and other electronics.
- Specify new printers that have double sided printing capability.
- Subscribe to online billing to reduce paper use, when feasible.
- Buy in bulk to save money and reduce shipping and transport costs.
- Purchase warranties on office equipment to extend their life and limit service costs.
- Use refillable ink cartridges.
- Use double-sided printing, reduced page size, and e-fax to minimize ink and paper use.

### Disposal

- Recycle printer cartridges, electronics, paper, cans, bottles, light bulbs, and batteries.
- Provide easily accessible recycling options in your property offices and common areas.
- Reuse and recycle packaging.
- Look for manufacturer and retailer recycling options for equipment and other products that can be recycled or refurbished.



## Paints

### Standards and Certifications

Painting is a necessary and frequent part of operations and maintenance for multifamily buildings. Paint odors result from the off-gassing of VOCs, which can adversely affect indoor air quality. In multifamily buildings, vapors can move through common walls, gaps around pipes, and electrical outlets, affecting residents and employees.

Enterprise Green Communities Criteria define low-VOC contents in paints based on their type. They specify 150 grams/liter (g/l) for non-flat paints and 50 grams/liter (g/l) for flat paints. USGBC LEED O+M recommends using GreenSeal certified paints. Several additional certifications exist that independently verify these claims, including GreenGuard, SCS Indoor Advantage, and Green Wise.

#### Purchasing Considerations

- Choose No-VOC or Low-VOC paints certified by Green Seal, EcoLogo, or GreenGuard.
- When possible, choose flat paints versus gloss paints. Flat paints contain significantly less VOCs.
- Choose light or moderate tints for lower VOC content.
- Purchase water-based (latex) paint rather than oil-based paint when appropriate.
- Avoid mold inhibitors in paints, as their VOC content is typically very high.
- Consider recycled content latex paints.

#### Best Practices

- Schedule large painting projects during dry seasons (fall and spring) to allow for quicker drying and easy ventilation.
- Ventilate units with open windows, ideally for two to three days.
- Provide advance notice to residents and workers.

Adapted from the Stopwaste.org Guide to Green Operations & Maintenance: <http://www.stopwaste.org/docs/gbmg-dec-20-07ltr.pdf>

#### Disposal

- Buy paint in larger quantities and in common colors that can be used as needed over time.
- When disposal is needed, recycle unused amounts or donate them.



### Pest Control / Integrated Pest Management Standards and Certifications

Pesticides have been shown to have harmful effects on humans and the environment. However, controlling insects and vectors, such as rodents, is necessary to avoid a variety of public health concerns. Integrated Pest Management (IPM) is an approach that minimizes the use of highly toxic chemicals and pesticides by first employing a range of physical and biological practices

before using chemicals to control pests. Currently there are no environmental certifications specifically for pesticides. Design for the Environment (DfE) is piloting a certification process for pesticides that will be formally launched in 2015. There are, however, certifications for IPM professionals including Green Shield, Green Pro, or the IPM Star certified professionals. Both Enterprise Green Communities criteria and USGBC LEED O+M recommend using IPM strategies.

#### Purchasing Considerations

- The U.S. EPA offers a guide on Implementing Integrated Pest Management in Buildings: [http://www.epa.gov/pest/publications/ipm/ipm\\_in\\_buildings.pdf](http://www.epa.gov/pest/publications/ipm/ipm_in_buildings.pdf)
- Require all pest professionals to show proof of IPM training/certification from a state agency or third party such as Green Shield, Green Pro, or IPM Star.
- Conduct initial and regular inspections inside and outside of the property to identify potential pest entry points and evidence of pests.
- Monitor actions regularly for results and changes. Ensure your IPM professional reports monitoring regularly and thoroughly.
- Research products that have claims such as “all natural” and “green” but have no formal certification. Read labels and instructions carefully.

#### Best Practices

- Keep trash contained by providing sufficient bins, cans, or dumpsters before pick-up.
- Clean compactors and bins regularly to eliminate the build-up of debris.
- Clean all common areas, hallways, stairwells, laundry rooms, trash chutes, garbage areas, and supply/utility areas regularly.
- Pest proof by sealing cracks, crevices, and holes, around doors, windows, pipes, and other entry points to keep pests out (integrate with air-sealing and energy efficiency strategies).
- Keep landscaped areas well-maintained to reduce pest harborage.

#### Pesticide Use:

- Use the least hazardous pesticide, most precise application, and minimum quantity of pesticide necessary to achieve control.
- Apply insecticides as “crack and crevice” treatments; i.e. formulated insecticide is not visible to anyone during or after the application process.
- Avoid pesticide sprays, foggers or bombs, organophosphate, or chlorinated hydrocarbons pesticides. There may be exceptions for some bed bug applications.

- Utilize physical trapping for rodent control inside buildings.
- Provide on-site resident training and education to help encourage positive behaviors and minimize pest issues.
- Post notices of pesticide use clearly and well in advance for residents to see.

Adapted from the LISC Green and Healthy Homes Guide: [http://www.lisc.org/docs/publications/2013\\_green\\_healthy\\_prop\\_mgmt\\_guide.pdf](http://www.lisc.org/docs/publications/2013_green_healthy_prop_mgmt_guide.pdf)

**Disposal**

- If pesticide use cannot be avoided, purchase only what is needed and use the entire contents of the product to avoid disposal of excess product.

If pesticide product disposal is necessary, do not dispose of them in the trash. Contact your local trash management provider or municipality for local rules and household hazardous waste collection sites.



**Plumbing**

**Standards and Certifications**

Like many efficiency products, low-flow fixtures have been around for some time, with the earliest products underperforming and creating skepticism in the minds of many contractors and property managers. The science and production of these types of fixtures has advanced significantly with devices that outperform standard fixtures and significantly reduce the use of water.

The U.S. EPA WaterSense and ENERGY STAR certifications are the primary water conservation certifications for plumbing equipment, tools, and practices. Both certifications are generally more stringent than local codes. However, before installing any fixtures, local code requirements should be verified. Enterprise Green Communities criteria do not specify a certification but instead provides target flow rates for specific products and product types. The following table summarizes the flow rates for various fixtures and appliances based on U.S. EPA, WaterSense, and Enterprise.

Table 8

Fixtures and Appliances	EPA Standard	WaterSense	Enterprise
Residential toilets	1.6 GPF	1.28 GPF (with at least 350 gram waste removal)	1.28 GPF
Residential bathroom faucets	2.2 GPM at 60 PSI	1.5 GPM at 60 PSI (no less than .8 GPM at 20 PSI)	1.5 GPM at 60 PSI
Residential showerheads	2.5 GPM at 80 PSI	No specification	2.0 GPM at 60 PSI

Gallons per flush (GPF), Gallons per minute (GPM). Pounds per square inch (PSI)

ENERGY STAR and CEE are working together to promote energy efficiency water heaters through the Coalition of ENERGY STAR Water Heaters which would be relevant for buildings with individual in-unit water heaters. Water heating is the second highest energy use in residences; according to U.S. EPA, ENERGY STAR certified water heaters use 14 to 55 percent less energy than heaters that that meets the minimum federal standard.

Additionally, plumbing professionals can now be trained and certified in sustainable plumbing practices through the Green Plumbers certification program. The program focuses on using energy efficiency equipment and water-saving technologies to help consumers better manage their properties.

**Purchasing Considerations**

- Specify low flow standards and install low-flow plumbing appurtenances according to WaterWise or ENERGY STAR as long as the certification is more stringent than local plumbing codes.
- Install ENERGY STAR qualified ENERGY STAR appliances and water heaters to save water.
- Understand local plumbing codes and requirements.
- Check with municipalities or utilities for rebates and incentives on water efficient products.
- Consider dual-flush toilets, which have separate flush for urine at 0.8 GPM.
- If code allows, consider toilets with a high performance rating of 250 grams of waste removal or more.

### **Best Practices**

- Check with municipalities for local water restrictions and guidelines. More than 35 states are experiencing water shortages and restrict water use.
- Fix leaks quickly.
- Train and educate residents and staff on efficient water use practices.
- Consider gray-water or rainwater catchment systems for landscaping or toilets.

### **Disposal**

- Look for manufacturers, retailers or organizations in your area that recycle plumbing fixtures.
- Recycle fixture parts when the entire fixture cannot be refurbished.
- Check with municipalities about recycling centers that take plumbing fixtures, toilets, sinks, etc.

## Sources

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7. Enterprise's Green ToolKit. Enterprise Community Partners, Inc. <http://www.enterprisecommunity.com/solutions-and-innovation/enterprise-green-communities/criteria>
8. LEED for Existing Buildings. U.S. Green Building Council. <http://www.usgbc.org/Docs/Archive/General/Docs3617.pdf>
9. ENERGY STAR rated light bulbs. [http://www.energystar.gov/?c=cfls.pr\\_cfls\\_savings](http://www.energystar.gov/?c=cfls.pr_cfls_savings)
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13. Cleaning Chemicals and Their Impact on Indoor Environments and Health. UL Environment & GreenGuard, A Business Unit of Underwriter's Laboratory. [http://greenguard.org/Libraries/GG\\_Documents/Reformat\\_Inhalation\\_Risks\\_From\\_Cleaning\\_Products\\_FINAL3\\_2.sflb.ashx](http://greenguard.org/Libraries/GG_Documents/Reformat_Inhalation_Risks_From_Cleaning_Products_FINAL3_2.sflb.ashx)
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17. Recycling in Small Residential Buildings. The City of Chicago. [http://www.cityofchicago.org/content/dam/city/depts/streets/supp\\_info/Recycling/Recycling%20PDFdocs%202013/RecyclinginSmallResidentialBuildingsFinal13.pdf](http://www.cityofchicago.org/content/dam/city/depts/streets/supp_info/Recycling/Recycling%20PDFdocs%202013/RecyclinginSmallResidentialBuildingsFinal13.pdf)
18. Energy Consumption in Homes by End Uses. U. S. Energy Information Administration. <http://www.eia.gov/todayinenergy/detail.cfm?id=10271>

# Glossary of Resources and Tools

The following definitions are taken from various Environmental Protection Agency program glossaries, including:

- Environmentally Preferable Purchasing (EPP) Glossary
- Greener Products Glossary
- Measuring Recycling Guidance Glossary

## Appliances

### **The American Council for an Energy-Efficient Economy (ACEEE)**

The American Council for an Energy-Efficient Economy (ACEEE), a nonprofit, 501(c)(3) organization, acts as a catalyst to advance energy efficiency policies, programs, technologies, investments, and behaviors.

[www.aceee.org](http://www.aceee.org)

### **Build It Green**

Build It Green works with building and real estate professionals, local and state governments, and homeowners to increase awareness and adoption of green building practices. Their mission is to promote healthy, energy- and resource-efficient building practices through outreach and education. This is a California-based organization, but offers helpful resources and tools for property owners anywhere.

[www.builditgreen.org](http://www.builditgreen.org)

### **The Consortium for Energy Efficiency**

Energy efficiency program administrators from the United States and Canada formed the award-winning Consortium for Energy Efficiency to achieve lasting and verifiable energy efficiency.

[www.cee1.org](http://www.cee1.org)

## Building and Rehab

### **Green Rehabilitation of Multifamily Rental Properties: A Resource Guide**

The Green Guide for Rehab is an accessible and in-depth tool to help affordable housing owners and their consultants integrate green building and energy efficiency into the upgrades of their multifamily properties.

<http://www.lisc.org/content/publication/detail/7383>

### **ENERGY STAR**

ENERGY STAR is a U.S. Environmental Protection Agency (EPA) voluntary program that helps businesses and individuals save money and protect our climate through superior energy efficiency. Energy Star has implemented third-party certification requirements and testing for the products that earn certification.

[www.energystar.gov](http://www.energystar.gov)

### **The Consortium for Energy Efficiency**

Energy efficiency program administrators from the United States and Canada formed the award-winning Consortium for Energy Efficiency to achieve lasting and verifiable energy efficiency.

[www.cee1.org](http://www.cee1.org)

### **The American Council for an Energy-Efficient Economy (ACEEE)**

The American Council for an Energy-Efficient Economy (ACEEE), a nonprofit, 501(c)(3) organization, acts as a catalyst to advance energy efficiency policies, programs, technologies, investments, and behaviors.

[www.aceee.org](http://www.aceee.org)

### **The U.S. EPA Green Building Site**

The U.S. EPA Green Building Site provides tools and resources for creating and using healthier and more resource-efficient models of construction, renovation, operation, maintenance, and demolition.

[www.epa.gov/greenbuilding](http://www.epa.gov/greenbuilding)

### **Green Rehabilitation of Multifamily Rental Properties: A Resource Guide**

This document provides guidelines for multifamily affordable housing providers and their consultants on how to prepare a green physical needs assessment. It provides rehab recommendations that incorporates green building principles as they apply to energy efficiency, water conservation, resource conservation, and healthy indoor environments. The information in this guide, published by Bay Area Local Initiatives Support Corporation and Build It Green, is applicable to both moderate rehab projects and substantial (or gut) rehabs.

[www.nw.org/network/green/documents/LISCGreenRehabofMFGuide.pdf](http://www.nw.org/network/green/documents/LISCGreenRehabofMFGuide.pdf)

### **Low-Income Housing Rehabilitation for Sustainability and Affordability**

A report prepared by the Portland Energy Office in 2000.

[www.serapdx.com/resource/publ/Low%20Income%20Housing.pdf](http://www.serapdx.com/resource/publ/Low%20Income%20Housing.pdf)

## Calculators

### **Return on Investment Calculator**

This cost analysis tool allows for the simultaneous calculation of simple payback, Return on Investment, Net Present Value, and Internal Rate of Return for several upgrade scenarios. The summary sheet provides a table for a basic comparison of the upgrade packages.  
[http://www.greencommunitiesonline.org/tools/documents/roi\\_calculator.xls](http://www.greencommunitiesonline.org/tools/documents/roi_calculator.xls)

### **Life-Cycle Cost Analysis (LCCA)**

Visit this website for a better understanding of lifecycle cost analysis. The site offers guidance on evaluating lifecycle costs of project alternatives, including links to several LCCA tools or calculators.  
[www.wbdg.org/resources/lcca.php](http://www.wbdg.org/resources/lcca.php)

### **EPA's Green Cleaning Pollution Prevention Calculator**

This calculator quantifies the projected environmental benefits of purchasing and using green janitorial services and products, showing the specific environmental benefits you can achieve by reducing chemical use in your typical cleaning routine. It also can help identify which of the green cleaning options available to you will have the greatest impact on reducing cleaning-engendered hazardous chemicals and pollution at your site. Though the tool is designed for green cleaning in office buildings, it is included here because many of the practices are similar to those used in affordable housing maintenance.  
[www.ofee.gov/janitor/index.asp](http://www.ofee.gov/janitor/index.asp)

### **Incremental Cost, Measurable Savings**

Enterprise Green Communities released Incremental Cost, Measurable Savings: Enterprise Green Communities Criteria, a first-of-its-kind study showing the cost effectiveness of meeting Enterprise Green Communities Criteria, the only comprehensive green building framework for affordable housing. In summary, estimated lifetime savings exceed the initial investment made to incorporate the Enterprise Green Communities Criteria into affordable housing.  
[www.greencommunitiesonline.org](http://www.greencommunitiesonline.org)

## Certifications and Standards

### **Behind the Logos:**

#### **Understanding Green Product Certification**

This article provides information on green product certifications.  
[www.buildinggreen.com/auth/article.cfm?fileName=170101a.xml](http://www.buildinggreen.com/auth/article.cfm?fileName=170101a.xml)

#### **StopWaste.org EPP Buying Guide**

A comprehensive Green Buying Guide with information and links on a variety of certifications.  
<http://www.stopwaste.org/docs/guidelinesforepproducts.pdf>

## Cleaning Products

### **Environmentally Preferable Cleaning Chemicals: A Buyer's Guide**

An excellent resource for understanding EPPs for cleaning products and best practices for greening your property's cleaning and janitorial maintenance.  
[http://www.cec.org/files/PDF/ECONOMY/NAGPI-Green%20Cleaners-FS\\_en.pdf](http://www.cec.org/files/PDF/ECONOMY/NAGPI-Green%20Cleaners-FS_en.pdf)

### **Green and Clean: The Designer's Impact on Housekeeping and Maintenance: Stephen Ashkin**

This article was published in Environmental and Economic Balance: The 21st Century Outlook, and offers interior design ideas that improve the "cleanability and maintainability" factors of a building.  
[www.ashkingroup.com/pdfs/Architect/AIAPAPER.PDF](http://www.ashkingroup.com/pdfs/Architect/AIAPAPER.PDF)

### **A 10-Step Guide to Green Cleaning Implementation: H2E**

You will find the basic process for making the switch to green practices outlined in this article, published by Hospitals for a Healthy Environment (H2E).  
[www.h2e-online.org/docs/h2e10stepgreenclean-r5.pdf](http://www.h2e-online.org/docs/h2e10stepgreenclean-r5.pdf)

## Energy Contractors

### **Building Performance Institute**

This website describes the training process, accreditation, and quality-assurance programs offered by BPI and its affiliates for Building Science and Energy Efficiency professionals. You will find resources for finding BPI accredited professionals nationwide.  
[www.bpi.org/](http://www.bpi.org/)

**Residential Energy Services Network (RESNET)**

The Residential Energy Services Network (RESNET) is an independent, non-profit organization committed to helping homeowners reduce the cost of their utility bills by making their homes more energy efficient. RESNET developed the Home Energy Rating System (HERS) Index that is the industry standard by which a home's energy efficiency is measured. You can search their site for contractors nationwide.  
[www.natresnet.org](http://www.natresnet.org)

**Energy Efficiency****Energy Efficient Rehab Advisor**

The U.S. Department of Energy has developed this tool for existing multifamily homes to provide easy access to tailored suggestions for energy upgrades. Plug in your building characteristics, and a list of recommended improvements will be presented, complete with estimated costs and payback periods. This tool cannot take the place of a full building audit and energy simulation, but is useful for creating a rudimentary guide that can serve as a starting place for potential next steps.  
[www.rehabadvisor.pathnet.org/calculator.asp](http://www.rehabadvisor.pathnet.org/calculator.asp)

**HUD Rehabilitation Energy Guidelines for Multifamily Dwellings**

This guidebook explains how property owners who are considering rehabilitating multifamily buildings can increase energy efficiency and reduce costs in the process. It discusses key issues and factors that determine how much energy a multifamily building consumes, such as heat flow, air leakage, insulation, and heating and cooling systems.  
[www.huduser.org/publications/destech/multi.html](http://www.huduser.org/publications/destech/multi.html)

**Long-Term Investments for Energy Savings:****U.S. Department of Energy**

Long-term investments in energy-efficient products and upgrades can save you even greater amounts of money and energy in years to come. Consider the suggestions listed at this site when purchasing new products or when improving a home's energy efficiency.  
[www.energysavers.gov/long\\_term\\_investments.html](http://www.energysavers.gov/long_term_investments.html)

**DOE Insulation Calculator**

Find the appropriate levels of insulation for your climate zone with this easy-to-use web tool.  
[www.ornl.gov/sci/roofs%2Bwalls/insulation/ins\\_16.html](http://www.ornl.gov/sci/roofs%2Bwalls/insulation/ins_16.html)

**Flooring Resources****Carpet Disposal and Recycling**

Finding ways to allow old carpets to be recycled at the end of their useful life is important. Many carpet manufacturers are implementing recycling programs for pick-up, reuse, or recycling of old carpet, so be sure to ask your supplier about this option. For other recycling questions related to carpeting, please see the on-line search tool RecycleWhere?  
[www.StopWaste.Org/Recycle](http://www.StopWaste.Org/Recycle)

**The Carpet America Recovery Effort**

The Carpet America Recovery Effort's website also contains useful resources on the recycling and reuse of postconsumer carpet.  
[www.carpetrecovery.org](http://www.carpetrecovery.org)

**Sustainable Carpet Certification**

Sustainable Carpet Certification (Certified to the NSF/ANSI 140 Standard).  
<http://www.scsglobalservices.com/sustainable-carpet-certification>

**Green Squared® Certification**

Green Squared® Certification (Established by the Tile Council of North America (TCNA) under ANSI A138.1) for ceramic and glass tiles and a wide range of tile installation materials.  
[www.scsglobalservices.com/green-squared](http://www.scsglobalservices.com/green-squared)

**The FloorScore® program**

The FloorScore® program, developed by the Resilient Floor Covering Institute (RFCI) in conjunction with SCS Global Services, tests and certifies hard surface flooring and flooring adhesives products for compliance with indoor air quality emission requirements.  
[www.scsglobalservices.com/floorscore](http://www.scsglobalservices.com/floorscore)

**Furniture Resources****BIFMA level® Furniture Industry Sustainability Standard**

BIFMA level® Furniture Industry Sustainability Standard (Certified to the ANSI/BIFMA e3 Furniture Sustainability Standard).  
[www.scsglobalservices.com/bifma-level](http://www.scsglobalservices.com/bifma-level)

**The GREENGUARD Environmental Institute (GEI)**

The GREENGUARD Environmental Institute (GEI), part of UL Environment, has performance-based standards to define office furniture with low chemical and particle emissions for use indoors. See their Product Guide for low emitting products.  
[www.greenguard.org](http://www.greenguard.org)

### **Certified Sustainable Fabrics**

Certified Sustainable Fabrics (Certified to NSF/ANSI 336 Standard) for commercial furnishings including fabrics used for office furniture upholstery and vertical fabrics for panel system.

[www.scsglobalservices.com/certified-sustainable-fabrics](http://www.scsglobalservices.com/certified-sustainable-fabrics)

## Incentives and Grants

### **EPA Green Building Funding Sources**

Numerous sources of funding for green building are available at the national, state, and local levels for homeowners, industry, government organizations, and nonprofits. We are providing the links on this page to help you find a variety of funding sources including grants, tax-credits, loans, or others.

[www.epa.gov/greenbuilding/tools/funding.htm](http://www.epa.gov/greenbuilding/tools/funding.htm)

### **Database of State Incentives for Renewables and Efficiency (DSIRE)**

DSIRE is a comprehensive source of information on state, local, utility, and federal incentives that promote renewable energy and energy efficiency.

[www.dsireusa.org](http://www.dsireusa.org)

### **The Tax Incentives Assistance Project (TIAP)**

This website is a great place to find updates on federal tax incentives. IRS forms are also available for download through this site.

[www.energytaxincentives.org](http://www.energytaxincentives.org)

### **Making Affordable Housing Truly Affordable: Advancing Tax Credit Incentives for Green Building and Healthier Communities**

This report presents an analysis of the tax credit allocation policies of all 50 states and identifies existing green building requirements for affordable housing projects.

[www.globalgreen.org/i/file/qap\\_report\\_2006.pdf](http://www.globalgreen.org/i/file/qap_report_2006.pdf)

## Landscaping

### **U.S. EPA WaterSense**

Sensible and water-efficient tools and resources for managing your property's landscape.

[www.epa.gov/watersense/outdoor](http://www.epa.gov/watersense/outdoor)

### **Sustainable Sites Initiative**

The Sustainable Sites Initiative™ (SITES™) program is an interdisciplinary effort to create voluntary national guidelines and performance benchmarks for sustainable land design, construction and maintenance practices.

[www.sustainablesites.org](http://www.sustainablesites.org)

### **Xeriscape Handbook for Apartment Complexes**

Developed by the U.S. Department of Agriculture/Rural Development, Colorado State Office, this offers a good primer on Xeriscaping – landscaping with maximum water efficiency or in dry climates.

[http://www.rurdev.usda.gov/co/pdf/colorado%20mfh%20landscaping%20policy%20appendix\\_june%202003.pdf](http://www.rurdev.usda.gov/co/pdf/colorado%20mfh%20landscaping%20policy%20appendix_june%202003.pdf)

## Life-Cycle Analysis

### **Cradle 2 Cradle**

A third party certification for a broad range of products that uses lifecycle as a measured criteria.

[www.c2ccertified.com](http://www.c2ccertified.com)

### **Life Cycle Cost**

A framework and tools for better understanding lifecycle cost analysis.

<http://www.wbdg.org/resources/lcca.php>

### **SCS Global Services**

Providing certifications, frameworks, and tools for Life-Cycle Analysis and green purchasing in general.

<http://www.scsglobalservices.com>

## Lighting Resources

### **ENERGY STAR Lighting**

Resources on efficient lighting, standards, and lighting products from Energy Star.

[http://www.energystar.gov/index.cfm?c=lighting.pr\\_lighting\\_landing](http://www.energystar.gov/index.cfm?c=lighting.pr_lighting_landing)

### **BetterBricks**

BetterBricks helps commercial building professionals use energy efficiency strategies to achieve sustainable high performance buildings.

[www.betterbricks.com](http://www.betterbricks.com)

### **Lamp Disposal and Recycling**

Because of the mercury contained in most lighting products, and the toxicity of mercury, it is important that lamps are disposed of or recycled properly as a hazardous waste. For disposal and recycling vendors and services related to lamps and ballasts, please see RecycleWhere?

[www.StopWaste.Org/Recycle](http://www.StopWaste.Org/Recycle)

## Mechanicals

### **A Guide to Energy Efficient Heating and Cooling**

This ENERGY STAR® publication describes how you can know when it's time to upgrade your heating and cooling systems, perform maintenance on your equipment, check your duct sealing, or work with a heating and cooling contractor.

[www.energystar.gov/ia/products/heat\\_cool/GUIDE\\_2COLOR.pdf](http://www.energystar.gov/ia/products/heat_cool/GUIDE_2COLOR.pdf)

### **Energy Design Resources: HVAC Design**

These design briefs and guidelines cover some of the major topics related to energy efficient HVAC.

[www.energydesignresources.com//technology/hvacdesign.aspx](http://www.energydesignresources.com//technology/hvacdesign.aspx)

### **ENERGY STAR® High Efficiency Water Heaters**

High Efficiency Water Heaters: Provide Hot Water for Less: Environmental Protection Agency (EPA), ENERGY STAR®. This document describes various water heating technologies, their efficiencies, and estimated savings.

[www.energystar.gov/ia/new\\_homes/features/WaterHtrs\\_062906.pdf](http://www.energystar.gov/ia/new_homes/features/WaterHtrs_062906.pdf)

### **Consortium for Energy Efficiency**

Central Air-Conditioner and Heat Pump Efficiency 101.

[http://www.ceedirectory.org/Content/CentralAirConditionerandHeatPumpEfficiency\\_2.aspx](http://www.ceedirectory.org/Content/CentralAirConditionerandHeatPumpEfficiency_2.aspx)

## Office Products

### **Responsible Purchasing Network**

Their Purchasing Guides section offers comprehensive sources for purchasing office equipment, paper, toner, and other EPPs for your office.

[www.responsiblepurchasing.org](http://www.responsiblepurchasing.org)

### **Greenbiz Environmentally Preferred Office Equipment**

A Guide to Purchasing Environmentally Preferred Office Equipment.

<http://www.greenbiz.com/research/report/2009/01/09/buying-environmentally-preferable-office-equipment>

## Operations and Maintenance

### **Multifamily Green Building Guidelines: StopWaste.org**

Architects and project managers will find 63 recommended measures for green multifamily projects, along with eight case studies. Topics covered in the guidelines include identifying which measures are appropriate in specific development scenarios; choosing when in the project schedule to incorporate measures; the relative costs and benefits of individual measures; and where to look for additional technical information or materials.

[www.recycle.stopwaste.org/mfdown/MultiFam.pdf](http://www.recycle.stopwaste.org/mfdown/MultiFam.pdf)

### **A Guide to Green Maintenance and Operations: StopWaste.org**

This guide identifies the factors you will want to take into consideration when selecting environmentally preferable products for use during building maintenance. Practical, effective operation and maintenance strategies for energy efficiency, natural resource conservation, and indoor air quality protection are integrated throughout.

[www.stopwaste.org/docs/gbmg-dec-20-07ltr.pdf](http://www.stopwaste.org/docs/gbmg-dec-20-07ltr.pdf)

### **Blueprint for Green Affordable Housing**

This guide for housing developers, advocates, public agency staff, and the financial community offers specific guidance on incorporating green building strategies into the design, construction, and operation of affordable housing developments.

[www.globalgreen.org/publications/](http://www.globalgreen.org/publications/)

### **The U.S. Green Building Council's LEED Rating System**

For more information and ideas on making existing buildings operations and maintenance green, see the LEED for Existing Buildings: Operations & Maintenance rating system (LEED-EBOM). By making the purchases and adopting the practices suggested in this Guide, approximately 18 – 37 points may be earned towards LEED-EB certification in addition to meeting several prerequisites.

[www.new.usgbc.org/leed](http://www.new.usgbc.org/leed)

## Paint

### **Green Seal**

Green Seal, a non-profit certification organization, has certified paints that meet the environmental requirements of their GS-11 and GS-43 standards.

[www.greenseal.org](http://www.greenseal.org)

### **Paint Disposal and Recycling**

To find locations for recycling or proper disposal of spray, acrylic, latex, lead, and oil-based paints and paint thinners, please see the on-line search tool RecycleWhere?  
[www.StopWaste.Org/Recycle](http://www.StopWaste.Org/Recycle)

## Pest Management

### **Integrated Pest Management: A Guide for Managers and Owners of Affordable Housing**

This guide, written by the Boston Public Health Commission, describes a process of pest control found to be effective in public housing developments around the country.

[www.healthyhomestraining.org/ipm/IPM\\_MFH\\_Hand\\_1\\_ARC\\_IPM\\_Toolkit\\_9-11-08.pdf](http://www.healthyhomestraining.org/ipm/IPM_MFH_Hand_1_ARC_IPM_Toolkit_9-11-08.pdf)

### **Integrated Pest Management in Multi Family Housing**

National Center for Healthy Housing, "IPM in Multi Family Housing," training for managers and contractors.

[www.healthyhomestraining.org](http://www.healthyhomestraining.org)

### **Integrated Pest Management: A Guide for Affordable Housing**

A new resource that will help affordable housing managers, owners, and agents use integrated pest management (IPM) to contend with a variety of urban pests in their facilities. It will also serve as a useful tool for anyone seeking to integrate IPM practices into a residential pest management strategy.

<http://www.stoppests.org/what-is-ipm/guide/>

### **Purchasing and EPP**

EPA's Environmentally Preferable Purchasing Tool Suite. This section of the EPA's site, under the subheading "Building and Construction," provides links to and information on decision-making tools for building material and product selection, including screening criteria based on social justice issues.

[www.epa.gov/epp/tools/index.htm#b](http://www.epa.gov/epp/tools/index.htm#b)

### **Green Vendor and Services Directory**

The Northeast Recycling Council has assembled this list of vendors who provide green products and services across the U.S.

[www.nerc.org/documents/green\\_purchasing/adtnlgrnvndrs.html](http://www.nerc.org/documents/green_purchasing/adtnlgrnvndrs.html)

### **Responsible Purchasing Network (RPN)**

Responsible Purchasing Network (RPN) is an international network of buyers dedicated to socially responsible and environmentally sustainable purchasing. RPN offers resources, tools, guides, and more for sustainable purchasing covering a variety of product categories.  
[www.responsiblepurchasing.org/](http://www.responsiblepurchasing.org/)

## Recycling and Waste Management

### **StopWaste.org**

Created by the Alameda County Waste Management Authority, this is an excellent resource for knowledge, tools, guides, and resources on recycling, disposal, and waste reduction.

[www.stopwaste.org](http://www.stopwaste.org)

### **Earth 911**

Recycling resources and tools, help for creating a lower-waster lifestyle.

[www.earth911.com](http://www.earth911.com)

### **National Recycling Coalition**

Advocating the benefits of recycling nationwide. Providing tools and resources to local governments and agencies to support recycling.

[www.nrc-recycle.org](http://www.nrc-recycle.org)

### **Recycling Guidelines for Multifamily Housing Design**

These guidelines, published by Stopwaste.org, offer ideas concerning design choices that can help make multifamily buildings more recycling friendly.

[www.stopwaste.org/docs/1720381662005mfudesignguidelines.Pdf](http://www.stopwaste.org/docs/1720381662005mfudesignguidelines.Pdf)

## Renewable Energy

### **Guide to Purchasing Green Power**

A Guide to Purchasing Green Power: Renewable Electricity, Renewable Energy Certificates and On-site Renewable Generation.

[http://www.epa.gov/greenpower/documents/purchasing\\_guide\\_for\\_web.pdf](http://www.epa.gov/greenpower/documents/purchasing_guide_for_web.pdf)

### **Green-e Renewable Energy Search Engine**

Find Green-e Energy Certified renewable energy sources by state for your home or organization through this search engine. Green-e is a third party certification program covering a number of product categories, including renewable energy.

<http://www.green-e.org/gogreene.shtml>

### **Dept. of Energy Renewables Site**

DOE provides information on renewable energy technology, sources, incentives, and more at their Renewable Energy Site.

[www.eere.energy.gov](http://www.eere.energy.gov)

### **American Solar Energy Society (ASES)**

This is a national membership organization whose mission is to attain a sustainable U.S. energy economy by accelerating the development and use of solar and other renewable energy resources through advocacy, education, research and collaboration among professionals, policy makers and the public.

[www.ases.org](http://www.ases.org)

## Resident Engagement

### **Trolley Square Living Green Manual**

Homeowners Rehab, Inc. wrote this manual to provide English- and Spanish-speaking residents at Trolley Square with green living guidance, in both site-specific and general terms. Use this as a template or a model for developing resident guidelines for your properties.

English: [www.greencommunitiesonline.org/tools/resources/](http://www.greencommunitiesonline.org/tools/resources/)

Spanish: [www.greencommunitiesonline.org/tools/resources/](http://www.greencommunitiesonline.org/tools/resources/)

### **Reasons to Explore Smoke-Free Housing**

Reasons to Explore Smoke-Free Housing: cohosted by Enterprise's Green Communities program and the National Center for Healthy Housing. This web-based training session brought together national experts and practitioners for a dialogue around implementing smoke free policies for multiunit buildings.

<http://www.enterprisecommunity.com/resources/ResourceDetails?ID=67520.pdf>

## Unit Turnover

### **Green Unit Turn: Seattle Office of Housing**

This website offers a list of best practices in Green O&M as gathered from experiences and recommendations of Seattle-based affordable housing owners and managers. The list features icons that provide a visual indication of the primary sustainability benefit associated with each option.

[www.seattle.gov/housing/GreenUnitTurn/default.htm](http://www.seattle.gov/housing/GreenUnitTurn/default.htm)

### **Green Unit Turnover: Sample Checklist**

Enterprise Community Partners developed this checklist to help Green your Unit turnover process. This can be adapted for your property, but offers a comprehensive starting point for property managers.

<http://www.enterprisecommunity.com/resources/ResourceDetails?ID=67522.pdf#>

## Water Efficient Product Resources

### **Retrofitting Apartment Buildings to Conserve Water**

The U.S. Dept. of Housing & Urban Development has developed this comprehensive guide to retrofitting multifamily buildings to conserve water. Step by step guidance, considerations, and resources will help you find the right solutions for your property.

[www.huduser.org/Publications/PDF/Book2.pdf](http://www.huduser.org/Publications/PDF/Book2.pdf)

### **The California Urban Water Conservation Council**

The California Urban Water Conservation Council has a wealth of resources on water efficiency and water efficient products. They also have a listing of High Efficiency Toilets and the MaP and UNAR reports. See "Water-Efficient Product Information" in the Research Center on their website.

[www.cuwcc.org](http://www.cuwcc.org)

### **WaterSense**

WaterSense is a partnership program of the U.S. Environmental Protection Agency. This website provides resources to help you save water, learn strategies for metering, leak detection, repair, best management practices, and more.

[www.epa.gov/watersense](http://www.epa.gov/watersense)

### **Water: Use it Wisely**

This website highlights over 100 ways to reduce water consumption.

[www.wateruseitwisely.com/100-ways-to- conserve/index.php](http://www.wateruseitwisely.com/100-ways-to- conserve/index.php)

# Glossary of Terms

**Abatement Debris:** refers to waste resulting from remediation activities. (U.S. EPA, 1994d)

**Accreditation:** Third party attestation related to a conformity assessment body conveying a formal demonstration of its competence to carry out specific conformity assessment tasks. (These tasks include sampling and testing, inspection, certification and registration.)

**Agricultural Waste:** refers to solid waste that is generated by the rearing of animals or the production and harvest of crops or trees. (Sullivan, 1993)

**Aluminum Cans:** refers to containers and packaging such as beverage cans or food and other nonfood cans. Examples of recycling include processing cans into new aluminum products (containers or foil). (U.S. EPA, 1995d)

**ANSI Accreditation:** The approval by the ANSI Executive Standards Council of the written procedures submitted by a standards developer relative to the development and documentation of evidence of consensus in connection with standards that are expected to be approved by the American National Standards Institute. Accreditation by ANSI signifies that the procedures submitted by the standards developer satisfy the essential requirements contained herein.

**Air Pollution Potential:** Products may contain volatile organic compounds (VOC). When these products are used, the VOCs may escape to the atmosphere and react to form smog. Smog and other atmospheric pollutants have been shown to cause irritation of the eyes, nose, throat, lungs, and to cause asthma attacks. Many state and local authorities have restrictions on the use of VOCs.

**Attribute (Environmental):** The characteristics or elements of products or services that determine the type and extent of their short and longer term impacts on the environment or human health. Environmental attributes include, for example, biodegradability, recyclability, VOC emissions, energy efficiency, water efficiency, indoor air emissions, hazardous waste, carcinogenicity, etc.

**Audit:** A systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which the criteria are fulfilled.

**Auditor:** A person with the competence to conduct an audit.

**Backyard Composting:** refers to the diversion of food scraps and yard trimmings from the municipal waste stream through the onsite controlled decomposition of organic matter by micro-organisms (mainly bacteria and fungi) into a humus-like product. Backyard composting is excluded from recycling activities. Rather, it is considered source reduction because the composted materials never enter the municipal solid waste stream. (U.S. EPA, 1991a)

**Benefit (Environmental):** An expected environmental or social improvement (or positive impact) that has been made as a result of procurement of an environmentally preferable product or service.

**Bio-based Products:** Commercial or industrial products (other than food or feed) that utilize biological products or renewable, domestic, agricultural (e.g., plant, animal and marine), or forestry materials.

**Bioconcentration Factor (BCF):** Ratio of the concentration of a chemical in an organism to the concentration of the chemical in its surrounding aqueous environment. BCF values are surrogate measures of the bioaccumulation potential of a chemical in organisms in the environment.

**Broad Categories (Recyclable Materials):** refers to general classifications of recyclable materials (glass, paper, plastic, metals).

**Broker (Recycling):** refers to an individual or group of individuals who act as an agent or intermediary between the sellers and buyers of recyclable materials. (U.S. EPA, 1989)

**Brush and Branches:** refers to the natural woody material collected from yard trimmings. Whole trees, such as Christmas trees, are included. Excludes leaves and grass. Examples of recycling include processing brush and branches into compost additive or mulch.

**Bulky Waste:** refers to those items that are large enough to warrant special collection services separate from regular residential curbside collection. Examples include major appliances and furniture.

**Buy-Back Center:** refers to a facility where individuals or groups of individuals exchange recyclables for payment. (U.S. EPA, 1989)

**Certification:** A) Third party attestation related to products, processes, or persons that convey assurance that specified requirements have been demonstrated. B) Procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements. (ISO/IEC Guide 2)

**Certifier:** An individual or organization who assesses compliance of an entity against an applicable standard or set of criteria, and issues a certificate if deemed successful.

**Chain of Custody:** Tracing of a product or commodity through a supply chain to determine that it has met the criteria of the eco-label and that the certified product is identifiable.

**Collector:** refers to public or private haulers that collect nonhazardous waste and recyclable materials from residential, commercial, institutional, and industrial sources. Also see Hauler.

**Combustion Ash:** refers to the residual substance produced during the burning, combustion, or oxidation of waste material. (U.S. EPA, 1994d)

**Commercial Waste:** refers to waste generated by businesses, such as office buildings retail and wholesale establishments and restaurants. Examples include old corrugated containers, food scraps, office papers, disposable tableware, paper napkins, and yard trimmings. (U.S. EPA, 1996b)

**Commingled Recyclables:** refers to a mixture of several recyclable materials in one container. (U.S. EPA, 1989)

**Competence:** demonstrated personal attributes and demonstrated ability to apply knowledge and skills.

**Compliance/Conformance Audit:** A compliance audit checks to see if an entity meets an applicable standard and/or set of criteria of an eco-labeling program or standards, and is correctly using the eco-label or standards in its marketing. (Note: In some contexts 'compliance' indicates adherence to laws or regulations; in other contexts the terms are used to indicate compliance with voluntary consensus based standards or sets of environmental performance criteria.)

**Composting Facilities:** refers to an offsite facility where the organic component of municipal solid scraps is biologically decomposed under controlled conditions; an aerobic process in which organic materials are ground or shredded and then decomposed to humus in windrow piles or in mechanical digesters, drums, or similar enclosures. (U.S. EPA, 1991a, 1994a)

**Computer Paper/Printout:** refers to a type of paper used in manifold business forms and produced in rolls and/or fan folded. It is used with computers and word processors to print data, information, letters, advertising, etc. (U.S. EPA, 1994b)

**Conformity Assessment:** Demonstration that specified requirements relating to a product, process, system, person or body are fulfilled. (This may include any activity concerned with determining directly or indirectly that relevant requirements are fulfilled.)

**Construction and Demolition (C&D) Debris:** refers to waste that is generated during the construction, remodeling, repair, or demolition of buildings, bridges, pavements, and other structures. C&D debris includes concrete, asphalt, lumber, steel girders, steel rods, wiring, dry wall, carpets, window glass, metal and plastic piping, tree stumps, soil, and other miscellaneous items related to the activities listed above. This category also includes natural disaster debris. (U.S. EPA, 1989, 1994d)

**Contaminated Soil:** refers to the introduction of micro-organisms, chemicals, toxic substances, wastes, or wastewater into soil in concentrations that make the soil unfit for its intended use. (U.S. EPA, 1994d)

**Corrective Action Reports:** Reports that are issued during certification evaluations or audits that require entities applying for an eco-label to make specific changes in order to meet criteria.

**Criteria:** The specific conditions or indicators that have to be met in order for an entity to attain a standard and/or be awarded the use of an eco-label.

**Crumb Rubber:** refers to ground rubber pieces the size of sand or silt used in rubber or plastic products, or processed further into reclaimed rubber or asphalt products. (U.S. EPA, 1991c)

**Declaration:** An enforceable attestation by a responsible authority within the manufacturer's organization that the product meets the requirements of the standard as declared.

**Desk Review:** Review of initial data provided by a manufacturer when they initiate registration of products to some eco-label systems.

**Disposal Facilities:** refers to repositories for solid waste including landfills and combustors intended for permanent containment or destruction of waste materials. Excludes transfer stations and composting facilities. (U.S. EPA, 1991b and National Recycling Coalition, 1995)

**Drop-Off Center:** refers to a method of collection whereby recyclable or compostable materials are taken by individuals to a collection site and placed in designated containers. (U.S. EPA, 1989)

**Dyes:** Dyes are both solid and liquid coloring matter used to impart a particular hue to liquids, cloth, or paper. Dyes may be composed of both synthetic and natural materials, which include both organic and inorganic chemicals. Dyes may be used in cleaning agents as a means to identify a particular solution. Depending on the chemical nature of dyes, their presence in cleaning a solution may pose human health and environmental hazards.

**Eco-label:** A visual communication tool indicating environmentally preferable products, services or companies that are based on standards or criteria. Note: Eco-labels may be referred to as tiered, pass-fail, Type I, II, III, multi-attribute, single attribute, etc.

**Eco-labeling Program:** The organization that creates an eco-label, and is responsible for its ongoing management and use.

**End User:** refers to facilities that purchase or secure recovered materials for the purpose of recycling. Examples include recycling plants and composting facilities. Excludes waste disposal facilities.

**Environmental Claim:** Any statement, assertion, or visual display about the environmental aspects of an entity.

**Environmental Product Declaration (EPD®):** Quantified environmental data for a product with pre-set categories of parameters (raw material, energy use, etc.) based on the ISO 14040 series. Also includes additional product and company information.

**Environmentally Preferable Products:** Products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose. This comparison applies to raw materials, manufacturing, packaging, distribution, use, reuse, operation, maintenance, and disposal.

**Environmentally Preferable Purchasing (EPP):** Ensures that environmental considerations are included in purchasing decisions, along with traditional factors, such as product price and performance. The Environmental Protection Agency's EPP program provides guidance for Federal agencies to facilitate purchases of goods and services that pose fewer burdens on the environment.

**Eutrophication:** The process by which a body of water or eco system acquires a high concentration of organic matter with potentially damaging consequences.

**Exports (Waste):** refers to municipal solid waste and recyclables that are transported outside the state or locality where they originated.

**Ferrous Metals:** refers to magnetic metals derived from iron (steel). (U.S. EPA, 1995d) Products made from ferrous metals include major and small appliances, furniture, and containers and packaging (steel drums and barrels). Examples of recycling include processing tin/steel cans, strapping, and ferrous metals from appliances into new products. (U.S. EPA, 1995d)

**First, Second and Third Party:** The first party is generally the person or organization that provides the object, such as the supplier. The second party is usually a person or organization that has a user interest in the product, such as the customer. The third party is a person or body that is recognized as being independent of the person or organization.

**First Party Attestation:** When the producer of an entity claims to meet a criterion or standard without the verification or endorsement of another party.

**Food Chain Exposure:** Some ready-to-use cleaning products may contain ingredients that will be taken up by smaller aquatic plants and animals and increase in concentration through the food chain as these plants and animals are consumed by larger animals. If you intend to use these products in areas where wastewater is adequately treated, this attribute may be less important as an environmental impact. If you intend to use these products in areas where wastewater treatment is less efficient, this attribute may be more important to you. This attribute is measured by calculating its bioconcentration factor (BCF).

**Food Processing Waste:** refers to food residues produced during agricultural and industrial operations.

**Food Scraps:** refers to uneaten food and food preparation wastes from residences and commercial establishments (grocery stores, restaurants, and produce stands), institutional sources (school cafeterias), and industrial sources (employee lunchrooms). Excludes food processing waste from agricultural and industrial operations. Examples of recycling include composting and using food scraps to feed pigs, but excludes source reduction activities such as backyard (onsite) composting and use of food items for human consumption (food banks).

**General Services Administration (GSA):** GSA, along with the Defense Logistics Agency (DLA), supplies goods and services to all facilities and workers under the jurisdiction of the Federal government. GSA and DLA tend to offer different products and services to customers although there may be some overlapping coverage. Federal workers are no longer required to purchase all goods and services from GSA and DLA.

**Generators (Waste):** refers to producers of municipal solid waste such as residences, institutions, commercial businesses, and industry.

**Glass Beneficiation Plant:** refers to a glass processing facility where recovered glass cullet is cleaned of contaminants and processed into a form that is ready to be manufactured into a new product (mill-ready). (U.S. EPA, 1995c)

**Glass Containers:** refers to containers and packaging such as beer and soft drink bottles, wine and liquor bottles, and bottles and jars for food, cosmetics, and other products. For the purpose of recycling, container glass is generally separated into color categories (clear, green, and amber or brown). Examples of recycling include processing glass into new containers, construction materials (aggregate), or fiberglass (insulation). (U.S. EPA, 1995d) Grass: refers to lawn clippings. Excludes leaves, brush, and branches. (Mish et al., 1988)

**Grasscycling:** refers to the source reduction activity whereby grass clippings are left on the lawn after mowing.

**Green Product Index:** A set of environmental criteria that are aggregated and by which products in similar categories can be quantitatively compared.

**Harmonization:** A process whereby national or regional standards and requirements are aligned, including product and manufacturing standards and conformance assessment requirements. Harmonization does not necessarily mean that standards need to be identical in each jurisdiction, but rather that they are consistent or compatible so there is no barrier to trade.

**Harmonized standard:** Standards on the same subject approved by different standardizing bodies that establish interchangeability of products, processes and services, or mutual understanding of test results or information provided according to these standards.

**Hauler:** refers to a waste collection company that provides complete refuse removal services. Many will also collect recyclables. Includes both private and public entities. Also see Collector. (U.S. EPA, 1994d)

**High Density Polyethylene (HDPE):** refers to a plastic product in which the ethylene molecules are linked in long chains with few side branches. Examples of products made from HDPE include milk jugs, detergent bottles, margarine tubs, and garbage containers. (U.S. EPA, 1995c)

**Household Hazardous Waste (HHW):** refers to hazardous products that are used and disposed of by residential—rather than industrial—consumers. These products include some paints, stains, varnishes, solvents, and pesticides, and other materials or products containing volatile chemicals that catch fire, react, explode under certain circumstances, or that are corrosive or toxic. HHW is derived from municipal solid waste (MSW) with the exception of used oil which is excluded from the category of MSW. Examples of recycling include processing HHW components into new products after they have been diverted from the waste stream. Diversion from the waste stream only does not constitute recycling (i.e., through collection or drop-off programs). (U.S. EPA, 1992, 1993b)

**Impact/Impacts (Environmental):** The effect or output of an activity, product or substance on the environment or human health, whether adverse or beneficial.

**Imports (Waste):** refers to municipal solid waste and recyclables that have been transported to a state or locality for processing or final disposition, but that did not originate in that state or locality.

**Incinerator:** refers to a furnace for burning solid waste under controlled conditions. (U.S. EPA, 1994d)

**Industrial Process Waste:** refers to residues produced during manufacturing operations. (Sullivan, 1993)

**Industrial Sludge:** refers to the semiliquid residue remaining from the treatment of industrial water and wastewater. (U.S. EPA, 1989)

**Industrial Waste:** refers to nonhazardous wastes discarded at industrial sites from packaging and administrative sources. Examples include corrugated boxes, plastic film, wood pallets, lunchroom wastes, and office paper. Excludes industrial process wastes from manufacturing operations. (U.S. EPA, 1996b)

**Institutional Waste:** refers to waste generated at institutions, such as schools, libraries, hospitals, and prisons. Examples include cafeteria and restroom trashcan wastes, office papers, classroom wastes, and yard trimmings. (U.S. EPA, 1996b)

**Large Appliances:** see Major Appliances.

**Large Generator (Waste):** refers to commercial businesses, institutions, or industries that generate sufficient quantities of municipal solid waste and recyclables to warrant self-management of these materials. Examples of large generators include supermarkets, restaurants, hardware stores, shopping malls, warehouses, amusement parks, convention centers, and office and apartment complexes.

**Lead-Acid Batteries:** refers to batteries used in automobiles, trucks, and motorcycles. They contain plastic, lead (a toxic metal), and sulfuric acid. Excludes lead-acid batteries from large equipment, heavy-duty trucks and tractors, aircraft, military vehicles, and boats. (U.S. EPA, 1993a, 1996b)

**Leakage:** refers to cases in which residential recyclables are collected outside of a municipal collection system. As a result, these materials are often undetected during the course of normal data collection efforts.

**Leaves:** refers to the foliage of a plant. Excludes brush, branches, and grass. (Mish et al., 1988)

**Life-Cycle:** Consecutive and interlinked stages of a product system, from raw material acquisition or generation of natural resources to the final disposal. (ISO/IEC Guide 2)

**Life-cycle assessment (LCA):** A) Compilation and evaluation of the inputs, outputs, and the potential environmental impacts of a product system throughout its life cycle. B) The comprehensive examination of a product's environmental and economic aspects and potential impacts throughout its lifetime, including raw material extraction, transportation, manufacturing, use, and disposal.

**Life-Cycle Cost:** The amortized annual cost of a product, including capital costs, installation costs, operating costs, maintenance costs and disposal costs discounted over the lifetime of the product. However, this definition does not include external costs (i.e., those not borne directly by the entity that owns and operates a product/service, such as environmental costs to society at large).

**Life-Cycle Thinking (LCT):** LCT is a concept that integrates existing consumption and production strategies, preventing a piece-meal approach. LCT and other approaches can be used to improve the way we think about problem solving and use available information. Life-cycle approaches help avoid shifting problems from one life-cycle stage to another, from one geographic area to another and from one environmental medium (air, water, soil) to another.

**Low Density Polyethylene (LDPE):** refers to a plastic material in which the ethylene molecules are linked in a random fashion with the main chains of the polymer having long and short side branches. LDPE is used for both rigid containers and plastic film applications. (U.S. EPA, 1995c)

**Major (Large) Appliances:** refers to many different types, sizes, and styles of ovens, microwave ovens, air-conditioners, refrigerators, freezers, washers, dryers, dishwashers, water heaters, dehumidifiers, or trash compactors manufactured for household, commercial, or recreational use. Steel is the predominant material used in the manufacture of large appliances. Other materials found in appliances (in varying amounts) include, copper, brass, aluminum, glass, rubber, and paperboard. Also see White Goods.

**Material Recovery Facility (MRF):** refers to a facility where recyclables are sorted into specific categories and processed, or transported to processors, for remanufacturing. (U.S. EPA, 1994d)

**Material Safety Data Sheet (MSDS):** Forms that contain brief information regarding chemical and physical hazards, health effects, proper handling, storage, and personal protection appropriate for use of a particular chemical in an occupational environment.

**Medical Waste:** refers to any solid waste generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals, excluding hazardous waste identified or listed under 40 CFR Part 261 or any household waste as defined in 40 CFR Subsection 261.4 (b) (1). (U.S. EPA, 1994d)

**Mill-Ready Cullet:** refers to crushed and whole contaminant-free scrap container glass that complies with the proper Institute of Scrap Recycling Industries, Inc. glass specifications. (Institute of Scrap Recycling Industries, Inc., 1996)

**Minor Appliances:** see Small Appliances.

**Mixed Glass:** refers to recovered container glass that is not sorted into specific categories color and grade.

**Mixed Metals:** refers to recovered metal that is not sorted into specific categories (aluminum cans, tin/steel cans, other ferrous, and other nonferrous).

**Mixed Municipal Solid Waste:** refers to municipal solid waste that is not sorted into specific categories (plastics, glass, and yard trimmings).

**Mixed Paper:** refers to recovered paper that is not sorted into specific categories (old magazines, old newspapers, and old corrugated containers).

**Mixed Plastic:** refers to recovered plastic that is not sorted into specific categories (HDPE, LDPE, and PETE).

**Mulching:** refers to the process by which the volume of organic waste is reduced through shredding or grinding.

**Multi-Attribute Label:** A type of eco-label or standard that captures a number of environmental attributes or life-cycle attributes or impacts of a product.

**Municipal Sludge:** refers to the semiliquid residue remaining from the treatment of municipal water and wastewater. (U.S. EPA, 1989)

**Municipal Solid Waste (MSW):** refers to wastes such as durable goods, nondurable goods, containers and packaging, food scraps, yard trimmings, and miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources, such as appliances, automobile tires, old newspapers, clothing, disposable tableware, office and classroom paper, wood pallets, and cafeteria wastes. Excludes solid wastes from other sources, such as construction and demolition debris, autobodies, municipal sludges, combustion ash, and industrial process wastes that might also be disposed of in municipal waste landfills or incinerators. (U.S. EPA, 1996b)

**Mutual Recognition (Certifications):** Where eco-label programs or standard-setting organizations formally recognize the criteria and requirements of each-others' standards or sets of criteria. If such an agreement exists, entities that have been awarded the label in one program may therefore be able to register in another without undertaking the full certification evaluation procedures again.

**Natural Disaster Debris:** refers to wastes resulting from earthquakes, floods, hurricanes, tornados, and other natural disasters. Excludes wastes resulting from heavy storms. Natural disaster debris is classified as construction and demolition debris.

**Nonferrous Metals:** refers to nonmagnetic metals such as aluminum, lead, and copper. Products made from nonferrous metals include containers and packaging such as beverage cans, food and other nonfood cans; nonferrous metals found in appliances, furniture, electronic equipment; and non-packaging aluminum products (foil, closures, and lids from bimetal cans). Excludes lead-acid batteries and nonferrous metals from industrial applications and construction and demolition debris. (U.S. EPA, 1996b)

**Non-Governmental Entities:** Include, but are not limited to, voluntary consensus standards, environmental standard setting organizations, third party certification programs, environmental labeling or environmental "report card" programs, and other environmental consulting organizations.

**Nonhazardous Industrial Process Waste:** refers to waste that is neither municipal solid waste nor considered a hazardous waste under Subtitle C of the Resource Conservation and Recovery Act, such as certain types of manufacturing wastes and wastewaters. (U.S. EPA, 1996a)

**Office Paper:** refers to high-grade papers such as copier paper, computer printout, and stationery. These papers are almost entirely made of uncoated chemical pulp, although some amounts of groundwood are used. It should be noted that this category of paper also is generated at locations other than offices, such as homes and institutions (schools).

**Oil and Gas Waste:** refers to gas and oil drilling muds, oil production brines, and other wastes associated with the exploration, development, or production of crude oil or natural gas. (U.S. EPA, 1995a)

**Old Corrugated Containers (OCC):** refers to corrugated containers made from unbleached, unwaxed paper with a ruffled (corrugated) inner liner. (U.S. EPA, 1993a)

**Old Magazines:** refers to dry, coated magazines, catalogues, and similar printed materials. (Institute of Scrap Recycling Industries, Inc., 1996)

**Old Newspaper:** refers to periodicals printed on newsprint. Includes groundwood inserts (advertisements). Examples of recycling include processing old newspapers into new paper products (newspaper, paperboard, boxboard, or animal bedding). (U.S. EPA, 1996b)

**Other Ferrous Metals:** refers to ferrous metals from strapping, furniture, and metal found in tires and consumer electronics. Excludes the large quantities of metals found in construction materials or transportation products, such as automobiles, locomotives, and ships. (U.S. EPA, 1996b)

**Other Glass:** refers to glass from furniture, appliances, and consumer electronics. Excludes glass from transportation products and construction and demolition debris. Examples of recycling include processing glass into new glass products such as containers, construction materials (aggregate), or fiberglass (insulation). (U.S. EPA, 1996b)

**Other Nonferrous Metals:** refers to nonferrous metals (lead, copper, and zinc) from appliances, consumer electronics, and non-packaging aluminum products (foil, closures, and aluminum lids from bimetal cans). Excludes nonferrous metals from industrial applications and construction and demolition debris. (U.S. EPA, 1996b)

**Other Paper:** refers to paper from books, third class mail, other commercial printing, paper towels, paper plates and cups, other non-packaging paper (posters, photographic papers, cards, and games), milk cartons, folding boxes (cereal boxes), bags, wrapping papers, and other paper and paperboard products. (U.S. EPA, 1996b)

**Other Plastic:** refers to plastic from appliances, furniture, trash bags, cups, eating utensils, sporting and recreational equipment, and other non-packaging plastic products. (U.S. EPA, 1996b)

**Other Recyclables:** refers to household hazardous waste, oil filters, fluorescent tubes, mattresses, consumer electronics, circuit boards, and other miscellaneous recyclable items found in municipal solid waste that cannot be otherwise categorized.

**Other Solid Waste:** refers to nonhazardous solid wastes, other than municipal solid waste, covered under Subtitle D of the Resource Conservation and Recovery Act, such as municipal sludge, industrial nonhazardous waste, construction and demolition waste, agricultural waste, oil and gas waste, and mining waste. (U.S. EPA, 1996b)

**Other Wood:** refers to wood from furniture, cabinets from consumer electronics, and other non-packaging wood products. Excludes wood recovered from construction and demolition activities (lumber and tree stumps) and industrial process waste (shavings and sawdust). Examples of recycling include processing wood into mulch, compost additive, or animal bedding. (U.S. EPA, 1996b)

**Overissue Publications (Overissues):** refers to printed publications, such as newspapers and magazines, that are defined as unsold inventory by the publisher. Overissues are not considered postconsumer waste.

**Paper (Recyclable):** refers to paper products and materials such as old newspapers, old magazines, office papers, telephone directories, old corrugated containers, bags, and some paperboard packaging. Examples of recycling include processing paper into new paper products (tissue, paperboard, hydromulch, animal bedding, or insulation materials). (U.S. EPA, 1996b)

**Paper Processor:** refers to an intermediate operating facility where recovered paper products and materials are sorted, cleaned of contaminants, and prepared for final recycling. Examples include paper stock dealers and paper packers.

**Plastic (Recyclable):** refers to plastic containers and packaging made from various resins, including PETE, HDPE, PVC, LDPE, PP, and PS. Excludes plastics in transportation (automobiles) and construction products (PVC piping). (U.S. EPA, 1996b)

**Plastic Processor:** refers to an intermediate operating facility where recovered plastic products and materials are sorted, cleaned of contaminants, and prepared for final recycling. Examples include plastics handlers and plastics reclaimers.

**Plastics Handler:** refers to companies that prepare recyclable plastics by sorting, baling, shredding, granulating, and/or storing plastics until a sufficient quantity is on hand. (American Plastics Council, 1996)

**Plastics Reclaimer:** refers to companies that further process plastics after the handling stage by performing at least one of the following functions: washing/cleaning, pelletizing, or producing a new product. (American Plastics Council, 1996)

**Pollution Prevention:** Practices that reduce or eliminate the creation of pollutants through: increased efficiency in the use of raw materials, energy, water, or other resources; or protection of natural resources by conservation, including:

- Reduction in the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal.
- Reduction in hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants.

**Polyethylene Terephthalate (PETE):** refers to a thermoplastic material used to manufacture plastic soft drink containers and rigid containers. PETE has a high melting point, is clear in its natural state, and has a relatively high density. (U.S. EPA, 1995c)

**Polypropylene (PP):** refers to a plastic polymer formed by linking propylene molecules. PP has good resistance to heat and is used in flexible and rigid packaging, film, and textiles. (U.S. EPA, 1995c)

**Polystyrene (PS):** refers to a plastic polymer formed by linking styrene molecules. PS is used to make a variety of products including plastic cutlery and food containers. It is often used in its foamed state. (U.S. EPA, 1995c)

**Postconsumer Materials/Waste:** refers to recovered materials that have been used as a consumer item and are diverted from municipal solid waste for the purpose of collection, recycling, and disposition (aluminum beverage cans, plastic bottles, old newspapers, and yard trimmings). Excludes materials from industrial processes that have not reached the consumer, such as glass broken in the manufacturing process or overissues of newspapers and magazines. (U.S. EPA, 1994d, 1995c)

**Pre- and Post-Market Certification:** There are two types of certification: pre-market and after-market verification. In this case “market” means when the claim is publicized to the market, not necessarily when the product is introduced to the market. “Verification” means a check for conformance. These two approaches would be utilized within a certification system that implements a strategy for credibility assurance.

**Pre-consumer Materials/Waste:** refers to materials generated in manufacturing and converting processes, such as manufacturing scrap and trimmings/cuttings. Also includes print overruns, overissue publications (newspapers and magazines), and obsolete inventories. (U.S. EPA, 1995c)

**Processors (Recycling):** refers to intermediate operators that handle recyclable materials from collectors and generators for the purpose of preparing materials for recycling (material recovery facilities, scrap metal yards, paper dealers, and glass beneficiation plants). Processors act as intermediaries between collectors and end users of recovered materials.

**Procurement:** The acquisition of products and services by contract through purchase or lease, whether the supplies or services are already in existence or must be created, developed, demonstrated, and evaluated. Acquisition begins at the point when needs are established and includes the description of requirements to meet those needs, solicitation and selection of sources, award of contracts, contract financing, contract performance, contract administration, and those technical and management functions directly related to the process of fulfilling purchaser needs by contract.

**Product:** The result of a process, i.e., a set of interrelated or interacting activities which transforms inputs into outputs, of which four generic categories are services, software, hardware, and processed materials.

**PVC (Polyvinyl Chloride):** refers to the family of plastic copolymers, also known as vinyl. PVC is used to make products such as pipes, bottles, upholstery, and automotive parts. (U.S. EPA, 1995c)

**Recovery (Materials):** refers to the diversion of materials from the municipal solid waste stream for the purpose of recycling or composting. Excludes reuse and source reduction activities such as yard trimmings diverted to backyard (onsite) composting, the repair of wood pallets, and the refilling of beverage containers. (U.S. EPA 1996b)

**Recyclables:** refers to those materials recovered from the solid waste stream and transported to a processor or end user for recycling. (National Recycling Coalition, 1995)

**Recycling:** refers to the series of activities by which discarded materials are collected, sorted, processed, and converted into raw materials and used in the production of new products. Excludes the use of these materials as a fuel substitute or for energy production. (National Recycling Coalition, 1995)

**Recycling Plant:** refers to a facility where recovered materials are remanufactured into new products.

**Redemption Program (Recycling):** refers to a program where consumers are monetarily compensated for the collection of recyclable materials, generally through pre-paid deposits or taxes on beverage containers. In some states or localities, legislation has been passed to implement redemption programs to assist in the prevention of roadside litter (bottle bills).

**Registration (Environmental Certification):** A) Third party attestation related to systems that convey assurance that specified requirements have been demonstrated. Such systems include those established for the management of product, process or service quality and environmental performance. B) In order to begin the certification process entities need to be registered with the eco-label program. In some eco-label programs, once registration is complete, entities can start using the eco-label because no up-front certification is required. C) In some programs when a product is declared by a manufacturer to be in conformance with a standard, and that product is placed onto a registry of conforming products, it is said to be registered to an eco-label. This is a legally enforceable attestation by a responsible authority within the manufacturer's organization that the product meets the requirements of the standard as declared, and the manufacturer can begin claiming in the market that the product is conformant or begin using the eco-label.

**Reinventing Government Initiative:** Under the Reinventing Government initiative launched by President Bill Clinton and Vice President Al Gore, GSA was tasked with improving government procurement methods. Under this initiative, GSA's Commercial Products Acquisition Laboratory (CPAL) is developing procedures to allow GSA customers to purchase commercially available items in addition to products based on government specifications. Cleaning products are among the first commercially available items under this reinvention program. Additional GSA reinvention efforts include improving GSA Advantage! system, an electronic shopping service available to Federal purchasers over the Internet, and facilitating government use of commercial credit cards, which are intended to streamline procurement and payment schedules.

**Residential Waste:** refers to waste generated by single- and multifamily homes including old newspapers, clothing, disposable tableware, food packaging, cans and bottles, food scraps, and yard trimmings. Excludes food scraps and yard trimmings that are diverted to backyard (onsite) composting. (U.S. EPA, 1996b)

**Residues (Waste):** refers to the materials remaining after processing, incineration, composting, or recycling have been completed. Residues are usually disposed of in landfills. (U.S. EPA, 1989)

**Reuse:** refers to the use of a product or component of municipal solid waste in its original form more than once. Examples include refilling glass or plastic bottles, repairing wood pallets, using corrugated or plastic containers for storage, and returning milk crates. (U.S. EPA, 1994d)

**Scrap Metal Processor:** refers to an intermediate operating facility where recovered metal is sorted, cleaned of contaminants, and prepared for final recycling. Examples include scrap metal yards and scrap metal dealers.

**Second Party Certified or Verified:** When an entity is assessed against a standard by an organization that has an interest in the entity but is not the producer of it.

**Single-Attribute:** Type of environmental claim that captures one aspect or quality of a product's performance.

**Skin Irritant:** Some ready-to-use cleaning products may contain chemicals that will cause redness or swelling of skin.

**Specifications:** Tolerances, limiting values, and other defining characteristics for materials, products, services, processes, systems or persons, contained within the provisions of a standard.

**Small (Minor) Appliances:** refers to many different types, sizes, and styles of electric fans, coffeemakers, electric irons, food mixers, etc. Aluminum and plastic are the predominant materials used in small appliances. (U.S. EPA, 1995d)

**Source Reduction:** refers to the design, manufacture, purchase, or use of materials, such as products and packaging, to reduce the amount or toxicity of materials before they enter the municipal solid waste management system, such as redesigning products or packaging to reduce the quantity of materials or the toxicity of the materials used; reusing products or packaging already manufactured; and lengthening the life of products to postpone disposal. Examples include donating food to food banks, diverting food scraps and yard trimmings through backyard (onsite) composting, and reusing plastic pallets. Also referred to as waste prevention. (U.S. EPA 1996b)

**Standard (Technical):** According to Office of Management and Budget (OMB) Circular A-119, the term “standard,” or “technical standard” as cited in the National Technology Transfer and Advancement Act (NTTAA) includes all of the following:

- Common and repeated use of rules, conditions, guidelines or characteristics for products or related processes and production methods, and related management systems practices.
- The definition of terms; classification of components; delineation of procedures; specification of dimensions, materials, performance, designs, or operations; measurement of quality and quantity in describing materials, processes, products, systems, services, or practices; test methods and sampling procedures; or descriptions of fit and measurements of size or strength. Note that “performance standard” is a standard as defined above that states requirements in terms of required results with criteria for verifying compliance but without stating the methods for achieving required results. A performance standard may define the functional requirements for the item, operational requirements, and/or interface and interchangeability characteristics. A performance standard may be viewed in juxtaposition to a prescriptive standard which may specify design requirements, such as materials to be used, how a requirement is to be achieved, or how an item is to be fabricated or constructed.

Also see ISO/IEC Guide 2:2004 .

**Standards Developing Organization (SDO):** The organization responsible for creating and maintaining the set of criteria that makes up a standard; and which stipulates the requirements or conditions of the eco-label’s use.

**Surveyor (Recycling):** refers to the state, locality, or individual responsible for the collection of recycling measurement data through the use of survey forms.

**Technical Harmonization:** Process of harmonizing technical practices of any kind, whether at the national, regional, or international level. This process deals with technical issues, is facilitated by standards and is often used in support of policy objectives. One example would be a country that legislates mandatory compliance with ISO/IEC 14065, Greenhouse gases. Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition, as part of its overall policy objective to reduce greenhouse gas emissions.

**Telephone Directories:** refers to telephone directories printed on paper with high groundwood content. Other directories, such as zip code and area code directories, are included in this category when they are printed on the same type of paper.

**Textiles:** refers to fibers from discarded apparel, furniture, linens (sheets and towels), and carpets. Examples of recycling include converting apparel and linens into wiper rags and processing textiles into new products (linen paper or carpet padding). (U.S. EPA, 1996b)

**Third Party Certified or Verified:** When an entity is assessed against a standard by an independent (third party) organization that is different to the entity being certified (first party), and the eco-label program that set the standard (second party).

**Tin/Steel Cans (Recycling):** refers to tin-coated steel containers such as cans used for food packaging. (U.S. EPA, 1993a)

**Tire Processor:** refers to an intermediate operating facility where recovered tires are processed in preparation for recycling.

**Tires (Recycling):** refers to passenger car and light- and heavy-duty truck tires. Excludes high-speed industrial tires (from airplanes), bus tires, motorcycle tires, and special service tires, such as military, agricultural, off-road, and slow-speed industrial tires (from construction vehicles). Examples of recycling include processing car and truck tires into new rubber products (trash cans, storage containers, and rubberized asphalt), and the use of whole tires for playground and reef construction. (U.S. EPA, 1994b)

**Transfer Station:** refers to a facility where solid waste is transferred from collection vehicles to larger trucks or rail cars for longer distance transport. (U.S. Congress, 1989)

**Transparency:** Open, comprehensive, and understandable presentation of information.

**Tree Stumps:** refers to the portion of a tree remaining after it has been cut. Tree stumps are categorized as yard trimmings when found in municipal solid waste. Otherwise, tree stumps are generally found in, and categorized as, construction and demolition debris. (Mish et al., 1988)

**Unit-Based Pricing/Pay-As-You-Throw:** refers to a system under which residents pay for municipal solid waste management services per unit of waste (by weight or volume) collected rather than through a fixed fee. (U.S. EPA, 1994c)

**Used Oil:** refers to spent motor oil from passenger cars and trucks that is collected at specified locations for recycling. Used oil is excluded from the category of municipal solid waste.

**Verification:** Systemic, independent, and documented practice for the evaluation of a particular assertion against agreed verification criteria (where validation criteria/ verification criteria are a policy, procedure or requirement used as a reference against which evidence is compared).

**Volatile Organic Compounds (VOCs):** Organic chemical compounds, such as Benzene, that have a low vapor pressure and therefore will readily volatilize into the surrounding air in the form of a vapor. This property of VOCs causes them to have a comparatively high inhalation and dermal exposure potential, as well as a tendency to affect the air quality of a region.

**Voluntary Consensus Standards:** According to Office of Management and Budget (OMB) Circular A-119, standards developed or adopted by voluntary consensus standards bodies, both domestic and international. These standards include provisions requiring that owners of relevant intellectual property have agreed to make that intellectual property available on a non-discriminatory, royalty-free or reasonable royalty basis to all interested parties. For purposes of the Circular, “technical standards that are developed or adopted by voluntary consensus standard bodies” is an equivalent term.

**Voluntary Consensus Standards Bodies:** According to Office of Management and Budget (OMB) Circular A-119, voluntary consensus standards bodies are domestic or international organizations which plan, develop, establish, or coordinate voluntary consensus standards using agreed-upon procedures. For purposes of the Circular, “voluntary, private sector, consensus standards bodies,” is an equivalent term. The Act and the Circular encourage the participation of federal representatives in these bodies to increase the likelihood that the standards they develop will meet both public and private sector needs. A voluntary consensus standards body is defined by the following attributes:

- Openness.
- Balance of interest.
- Due process.
- An appeals process.
- Consensus, which is defined as general agreement, but

not necessarily unanimity, and includes a process for attempting to resolve objections by interested parties, as long as all comments have been fairly considered, each objector is advised of the disposition of his or her objection(s) and the reasons why, and the consensus body members are given an opportunity to change their votes after reviewing the comments.

**Waste Characterization Studies:** refers to the identification and measurement (by weight or volume) of specific categories of municipal solid waste materials (glass, plastic, and metals) for the purpose of projecting landfill capacity, determining best management practices, and developing cost-effective recycling programs.

**Waste Generation:** refers to the amount (weight or volume) of materials and products that enter the waste stream before recycling, composting, landfilling, or combustion takes place. (U.S. EPA 1996b)

**Waste Stream:** refers to the total flow of solid waste from homes, businesses, institutions, and manufacturing plants that must be recycled, incinerated, or disposed of in landfills; or any segment thereof, such as the “residential waste stream” or the “recyclable waste stream.” (U.S. EPA, 1989)

**Waste-To-Energy Facility/Combustor:** refers to a facility where recovered municipal solid waste is converted into a usable form of energy, usually through combustion. (U.S. EPA, 1995b)

**White Goods:** refers to major appliances such as refrigerators, stoves, air conditioners, and washing machines. Also see Major Appliances and Bulky Waste. (U.S. EPA, 1989)

**White Ledger:** refers to printed or unprinted sheets of white sulphite or sulphate ledger, bond, writing paper, and other papers which have a similar fiber and filler content.

**Wood Packaging:** refers to wood products such as pallets, crates, and barrels. Excludes wood from furniture and other non-packaging wood products. Examples of recycling include processing wood into new products (mulch and compost). (U.S. EPA, 1996b)

**Yard Trimmings:** refers to grass, leaves, tree branches and brush, and tree stumps from residential, institutional, and commercial sources. Examples of recycling include processing yard trimmings into compost, mulch, or other similar uses, and land-spreading leaves (when the depth of the application allows for degradation of the organic plant material). (U.S. EPA, 1996b)

**Yard Trimmings Processor:** refers to an intermediate operating facility where recovered yard trimmings are sorted, cleaned of contaminants, and prepared for final recycling.