Materials & Resources

Required

MR Prerequisite 1

Storage & Collection of Recyclables

Intent

Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills and incinerators through reduction, reuse, recycling and composting.

Health Issues

A 1998 Memorandum of Understanding between the U.S. EPA and the American Hospital Association targeted a 33% reduction in solid waste to landfill or incineration by 2005; 50% by 2010. As hospitals develop environmentally preferable purchasing standards and implement recycling programs to achieve this goal, the spatial and programming implications associated with these goals must be considered. More than 50% of a hospital's waste stream is composed of the materials addressed in this credit. Diverting a building's operational waste stream constituents from landfilling and incineration reduces the need to extract virgin natural resources, saves energy, reduces emissions associated with new production and transportation, and reduces potential groundwater contamination from landfills and toxic air emissions from incineration.

Credit Goals

- Provide an easily accessible area that serves the entire building and is dedicated to the collection and storage of materials for recycling in accordance with Section 6.5.3.1 (and Appendix) of the 2006 AIA Guidelines for Design and Construction of Health Care Facilities. Establish a collection system and controlled areas serving the portion of the building affected by the project dedicated to the separation, storage, and collection of materials for recycling including (at a minimum) paper, corrugated cardboard, glass, plastics, metals, fluorescent lamps (tube, compact fluorescent and HID) and batteries.

Suggested Documentation

- ❑ Confirm that recycling collection areas have been provided in accordance with Section 6.5.3.1 (and Appendix) of the 2006 AIA Guidelines for Design and Construction of Health Care Facilities, to meet the needs of the project.
- ❑ Confirm the types of materials that are being collected for recycling.
- ❑ Provide an optional narrative describing any special circumstances or considerations regarding the project's prerequisite approach.

Reference Standards

American Institute of Architects 2006 Guidelines for Design and Construction of Hospital and Health Care Facilities, http://www.aia.org/aah_gd_hospcons.

MR Prerequisite 1 continued

Storage & Collection of Recyclables

Potential Technologies & Strategies

- To facilitate space planning, develop a Waste Management Plan projecting the categories and volumes of waste for recycling.
  - The functional program should include the space requirements associated with the waste management plan, and include centralized recycling collection and storage spaces.
  - Determine size of spaces based upon volume of projected waste and length of anticipated storage. At loading docks or other waste removal areas, include space for compactors and balers for recycling cardboard waste.
  - Staging areas for sharps containers and recycling containers must be included to facilitate efficient operation of the recycling program.
  - Secure storage should be provided for fluorescent lamps and batteries to minimize risk of mercury contamination.
- Coordinate on-site processing and haul-away arrangements for collected recyclables with storage space and methods of containment to preserve neighborhood health and safety.

Resources

The American Hospital Association (AHA) and the United States Environmental Protection Agency (EPA) signed a Memorandum of Understanding (MOU) identifying goals to reduce the impact of health care facilities on the environment. A primary goal is the reduction of the health care solid waste stream. http://www.h2e-online.org/about/mou.htm. Other credits relevant to the AHA/EPA MOU include GGHC MR Prerequisite 2 (Mercury Elimination), GGHC MR Credits 2.1 & 2.2 (Construction Waste Management) and GGHC MR Credit 8.2 PBT Elimination: Mercury).

Basel Action Network (BAN) - http://www.ban.org/. Learn about an organization working towards controlling the flow of toxic materials (electronics and e-waste) to other countries, where safety protocols are not in place. Do you know where your computers are going? You can order their video “Exporting Harm.”

Earth 911 – Resource for finding a recycler in your region, http://www.earth911.org/master.asp?s=lib&a=brrc/default.asp

Hospitals for a Healthy Environment – Current List of Partner Facilities at http://h2e-online.org/partners/all.cfm

Hospitals for a Healthy Environment – Guidance on recycling various materials, including HIPAA compliant office paper recycling, http://h2e-online.org/wastereduction/overview.html

Hospitals for a Healthy Environment’s – Universal Waste, http://h2e-online.org/tools/univwast.htm. Includes recycling information on batteries, bulbs and more.

Massachusetts Department of Environment, Helpful Table to convert various recycling streams into pounds, http://www.mass.gov/dep/recycle/approvals/dsconv.pdf

MR Prerequisite 1 continued

Storage & Collection of Recyclables

Memorandum of Understanding between the American Hospital Association and the U.S. EPA, kEPA-742-F-99-018, http://www.h2e-online.org/about/mou.htm.

National Recycling Coalition www.nrc-recycle.org.

Tellus Institute, Boston, MA under US EPA Cooperative Agreement X 821580-01-0, 2000, *Healthy Hospitals: Environmental Improvements through Environmental Accounting*.

U.S. EPA Discarded Mercury Equipment Rule, http://www.epa.gov/epaoswer/hazwaste/recycle/electron/crt.htm.

U.S. EPA 2002 Case Study on Blue Wrap Recycling (Sterile Wraps from Operating Rooms), http://www.ciwmb.ca.gov/WPIE/HealthCare/EPATote.pdf

For space programming data, see the following resources:

California Integrated Waste Management Board http://www.ciwmb.ca.gov.US EPA, Business Guide for Reducing Solid Waste - Volume To Weight Conversion Table appendices http://yosemite.epa.gov/R10/OWCM.NSF/recycle/vol_wght.

Architectural Graphic Standards, 10th Edition, pp.942-43, .

GGHC Construction Credit Synergies

- SS Credit 2: Development Density
- SS Credit 5: Reduced Site Disturbance
- MR Credit 1: Building Reuse
- EQ Prerequisite 1: Minimum IAQ Performance
- EQ Credit 5: Chemical & Pollutant Source Control

GGHC Operations Credit Synergies

- CM Credit 2: Indoor Pollutant Source Control
- CM Credit 3: Chemical Discharge
- EP Credit 2: Janitorial Paper & Other Disposable Products
- WM Prerequisite 1: Waste Stream Audit
- WM Credit 1: Total Waste Reduction
- WM Credit 2: Regulated Medical Waste Reduction
- WM Credit 3: Food Waste Reduction

Required

MR Prerequisite 2

Mercury Elimination

Intent

Eliminate mercury-containing building products and reduce mercury discharge through product substitution and capture.

Health Issues

In 1998, a Memorandum of Understanding between the American Hospital Association and the US EPA set new goals for hospital pollution prevention. One of the top priorities was the virtual elimination of mercury and mercury-containing devices from the hospital waste stream by the year 2005. Mercury is a potent neurotoxin. Significant amounts of mercury released into the environment are transformed into methylmercury, which bioconcentrates in the foodchain. Prenatal exposure to methylmercury can result in deficits in language, memory and attention. The most sensitive health effect of mercury is an adverse impact on the neurological development of fetuses, infants and children. Low-level prenatal exposure can result in language, memory and attention deficits in children who were exposed in-utero. Hospitals have substantially reduced the purchase of mercury containing chemicals and medical devices and found substitutes for many pharmaceuticals. To achieve virtual elimination of mercury from the waste stream, however, requires the phasing out and recycling of mercury containing building products, such as thermostats, switches, batteries, and lamps, for mercury recovery.

Credit Goals

- Highlight in the project's Waste Management Plan (see GGHC MR Prerequisite 1) the types of mercury containing devices that are handled by the recycling program and disposal methods for captured mercury. Include dental wastes, such as scrap amalgam, chair side traps, and separator wastes.
- In facilities delivering dental care, install amalgam separation devices that meet or exceed the standard ISO-11143.
- Comply with the 2006 *AIA Guidelines for Design and Construction of Hospital and Health Care Facilities* requirement regarding mercury elimination (Section 1.3, 4.2 Mercury Elimination):
  - 4.2.1.1 New construction. In new construction, health care facilities shall not use mercury-containing equipment, including thermostats, switching devices, and other building system sources.
  - 4.2.1.2 Renovation. For renovation, health care facilities shall develop a plan to phase out mercury-containing sources and upgrade current mercury-containing lamps to low or no mercury lamp technology.
- Do not specify or install mercury vapor High Intensity Discharge (HID) lamps in the project.
- Specify and install all illuminated exit signs to meet the following criteria: LED lamps, Energy Star qualified and UL certified.

MR Prerequisite 2 continued

Mercury Elimination

- Specify and install low mercury fluorescent lamps according to the following specifications:

Fluorescent Lamp	Criteria
Eight-foot T-8 (Standard and High Output)	Maximum 10 mg mercury
Four-foot T-8 (Standard and High Output)	Maximum 3.5 mg mercury
Three-foot T-8	Maximum 6 mg mercury
Two-foot T-8	Maximum 6 mg mercury
U-Bent T-8	Maximum 8 mg mercury
28-watt T-5	Maximum 2.5 mg mercury
24-watt T5HO (High Output)	Maximum 2.5 mg mercury
54-watt T5HO (High Output)	Maximum 2.5 mg mercury
22-watt Circular T-5	Maximum 9 mg mercury
Compact fluorescent lamps	Maximum 5 mg mercury Energy Star® qualified, (excluding pin base lamps)

Suggested Documentation

- ❑ Compile a copy of the Waste Management Plan in accordance with the Credit Goals.
- ❑ Document that the facility is free of or phasing out mercury containing devices (excepting lamps and any devices mandated by Federal law), and that any dental facilities have installed amalgam separators that meet or exceed the standard ISO-11143.
- ❑ Compile documentation including mechanical schedules noting the mercury-free specifications.
- ❑ Document that mercury vapor High Intensity Discharge (HID) lamps were not specified or installed for the project.
- ❑ Compile documentation verifying compliance with the prerequisite credit goal criteria for mercury content in fluorescent lamps and illuminated exit signs.
- ❑ Provide specification language that identifies the mercury reduction goal in equipment and fluorescent lighting in accordance with the prerequisite credit goals, and request that all submittals for products covered by this prerequisite disclose the maximum mercury content in milligrams.

MR Prerequisite 2 continued

Mercury Elimination

Reference Standards

American Institute of Architects 2006 Guidelines for Design and Construction of Hospital and Health Care Facilities. http://www.aia.org/aah_gd_hospcons

The International Organization for Standardization, ISO-11143, http://www.iso.org.

US EPA Energy Star Program, http://www.energystar.gov/index.cfm?c=lighting.pr_lighting.

Potential Technologies & Strategies

- Establish a project goal for mercury-free materials and identify materials and suppliers to fulfill this goal. Consider digital measurement devices and controls.
- PBT elimination is reflected in policies established by a broad range of local, state, federal and international governmental bodies as well as major health care systems and organizations. Refer to the listing in GGHC MR Credit 4.1.
- Consider long life, low mercury lamps to reduce costs associated with relamping, recycling and purchase.
- Very low mercury induction lamps, with instant on–off control, offer reduced energy usage and long life.
- Verify that high-intensity discharge lamps are purchased with the lowest mercury content available, providing that all other performance specifications are met. Low mercury, high intensity discharge lamps such as ceramic metal halides and low mercury high-pressure sodium lamps are increasingly available.
- Avoid eight-foot T-8 lamps and U-bent lamps when possible due to concerns that breakages during installation can expose staff to mercury contamination.
- Mercury ballast lamps contain more mercury than electronic ballast lamps. Specify and install only electronic ballasts on the project.
- Reduce mercury in the facility by specifying LED lamps instead of low wattage fluorescent lamps.
- Require disclosure of lead content in lamp glass and solder. Specify that lamps contain 100% lead-free solder. Avoid use of “lead free” products as defined by the U.S. EPA Safe Drinking Water Act (SDWA) (http://www.epa.gov/safewater/sdwa/index.html), because these products may contain lead. The SDWA defines “lead free” as:
  - Solders and flux containing 0.2% lead or less.
  - Pipes, pipe fittings, and well pumps containing 8% lead or less.
- Mercury Elimination Plan
  - Successful implementation of the *Green Guide* mercury elimination prerequisite and credit requires an understanding of potential sources of mercury within the building. Developing a spreadsheet of potential sources and an action plan for their removal are the first steps in mercury elimination. The following plan paraphrases the Health Care Without Harm “Mercury Alternatives” website, http://www.noharm.org/mercury/alternatives.
    1. Identify mercury-containing items using resources from organizations such as Health Care Without Harm, National Institutes of Health, U.S. EPA, and Hospitals for a Healthy Environment.

MR Prerequisite 2 continued

Mercury Elimination

2. Implement a mercury-free purchasing policy that targets construction materials, equipment, and medical supplies. Most purchasing policies phase in substitutions as equipment ages rather than rushing premature equipment replacement. The policy must also develop a plan for proper disposal or recycling of mercury-containing materials as they are replaced.
3. Set mercury reduction goals for mercury-containing devices in use at the facility. Policies that phase in substitutions in conjunction with a facility-wide education campaign will raise the level of awareness among the staff regarding the importance of eliminating mercury use.
4. Measure success through a program such as the Hospitals for a Healthy Environment "Making Medicine Mercury Free" award.

- Specify HVAC systems, control systems, and other large electrical product and/or systems that are free of mercury switches (tilt, float, pressure and temperature) and mercury relays. Categories of equipment screened should include, but not be limited to:
  - HVAC systems
  - Control systems
  - Boiler systems
  - Pump and other fluid control systems

Resources

The American Hospital Association (AHA) and the United States Environmental Protection Agency (EPA) signed a Memorandum of Understanding identifying goals to reduce the impact of health care facilities on the environment. A primary goal included the virtual elimination of mercury waste from the health care waste stream. Other credits relevant to the AHA/EPA MOU include GGHC MR Prerequisite 1 (Storage and Collection of Recyclables), GGHC MR Credits 2.1 & 2.2 (Construction Waste Management) and GGHC MR Credit 8.2 (PBT Elimination: Mercury). http://www.h2e-online.org/about/mou.htm

A variety of state laws prohibiting some or all uses of mercury-containing building products have been enacted. These include but are not limited to:

- California State law (SB 633) restricts the use and distribution of mercury fever thermometers and other uses.
- California Health and Safety code (Rule 25214) prohibits the sale of mercury-added thermostats, switches, and relays. It also prohibits the sale of refurbished mercury-added barometers, esophageal dilators, bougie tubes, gastrointestinal tubes, flow meters, hydrometers, psychometers, manometers, pyrometers, sphygmomanometers, and thermometers.
- Connecticut State law (House Bill 5539) bans the sale and distribution of mercury fever thermometers and places restrictions on the sale of other mercury-containing equipment.
- Maine State law (LD 1159) prohibits the sale of mercury in switches, measuring devices (including sphygmomanometers), instruments and thermostats.
- Oregon State law (HB 3007) phases out mercury thermostats and prohibits the sale of fever thermometers and other uses.
- Washington State law (House Bill 1002) requires the labeling of fluorescent lamps that contain mercury and prohibits the sale of mercury-containing items in products such as thermometers and thermostats.

Demolition checklists for mercury and other toxics: http://www.pca.state.mn.us/publications/w-sw4-20, http://www.enveng.ufl.edu/homepp/townsend/Research/DemoHW/Guide/DHW99_12_30.PDF

MR Prerequisite 2 continued

Mercury Elimination

Health Care Without Harm report on the release of dental mercury; http://www.noharm.org/details.cfm?type=document&id=655

Hospital for a Healthy Environment's Mercury Page – Includes background info, educational info, alternatives and state locator page. http://h2e-online.org/hazmat/mercury.html

Osram-Sylvania, http://www.sylvania.com/ProductCatalogs/LampandBallastProductCatalog2004/; maximum mercury content, mean lumen output, and rated hours in Sylvania lamps are available on the Sylvania calculator by typing in the product order number (NAED#): http://www.sylvania.com/AboutUs/EnergyAndEnvironment/EnvironmentalTrends/GreenBuildings/USGBCLEED/LEEDexistingbuilding/;

Philips Lighting Company, http://www.nam.lighting.philips.com/us/sustainability/

"Shedding Light on Mercury in Fluorescents: A Workbook for Design Professionals," INFORM, http://www.informinc.org.

Sustainable Hospitals – Alternatives to mercury-containing equipment, http://www.sustainablehospitals.org

Thermostat Recycling Corporation, http://www.nema.org/gov/ehs/trc.

GGHC Construction Credit Synergies

- SS Credit 8: Light Pollution Reduction
- EA Prerequisite 2: Minimum Energy Performance
- EA Credit 1: Optimize Energy Performance
- EA Credit 7: Medical Equipment Efficiency
- MR Credit 8: PBT Elimination

GGHC Operations Credit Synergies

- EE Credit 1: Optimize Energy Performance
- EE Credit 3: Energy Efficient Equipment
- WM Prerequisite 1: Waste Stream Audit
- WM Credit 2: Regulated Medical Waste Reduction
- CM Prerequisite 1: Polychlorinated Biphenyl (PCB) Removal
- CM Credit 2: Indoor Pollutant Source Control
- CM Credit 3: Chemical Discharge
- EP Credit 4: Toxic Reduction

1 point

MR Credit 1.1

Building Reuse: **Maintain 40% of Existing Walls, Floors & Roof**

Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Health Issues

Current health care facility construction in the U.S. represents more than 100 million square feet annually, valued at approximately $17 billion in the U.S. of completed construction, with renovations and expansions representing a significant percentage. The extraction of raw materials used in the construction of new buildings represents significant natural resource extraction with the potential for ecological disruption, while fossil fuel and chemical emissions associated with materials' processing and product manufacturing and transportation can result in exposures harmful to human health.

In addition, building reuse reduces the amount of solid waste leaving the project site. Construction and demolition debris accounts for more than 30% of municipal solid waste.

Credit Goals

- Maintain at least 40% (based on surface area) of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing material). Hazardous materials that are remediated as a part of the project scope shall be excluded from the calculation of the percentage maintained.

Suggested Documentation

❑ Calculate the total area of existing exterior envelope (not including windows) and existing building structure to ensure that the credit goals have been met.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- Consider reuse of existing, previously occupied buildings, including structure and envelope elements. Remove elements that pose contamination risk to building occupants and upgrade components that would improve energy and water efficiency such as windows, mechanical systems and plumbing fixtures. Quantify the extent of building reuse.
- Use only areas (sq. ft.) to calculate the quantity of preserved materials. The area to be used in the denominator is the sum of all (1) floor and roof area, including the ground floor to account for slabs-on-grade and footings, and (2) the exterior wall area, excluding window assemblies. The area to be used in the numerator is the sum of reused floor, roof, and wall area, excluding window assemblies.

MR Credit 1.1 continued

Building Reuse: **Maintain 40% of Existing Walls, Floors & Roof**

GGHC Construction Credit Synergies

- SS Credit 4: Alternative Transportation
- SS Credit 5: Site Development
- SS Credit 6: Stormwater Design
- SS Credit 7: Heat Island Effect
- SS Credit 8: Light Pollution Reduction
- WE Credit 1: Water Efficient Landscaping
- WE Credit 2: Potable Water Use Reduction
- EA Prerequisite 2: Minimum Energy Performance
- EA Prerequisite 3: Fundamental Refrigerant Management
- EA Credit 1: Optimize Energy Performance,
- EA Credit 4: Enhanced Refrigerant Management
- MR Prerequisite 1: Storage & Collection of Recyclables
- MR Credit 2: Construction Waste Management
- EQ Credit 5: Chemical & Pollutant Source Control
- EQ Credit 6: Controllability of Systems
- EQ Credit 8: Daylight & Views

GGHC Operations Credit Synergies

- TO Credit 1: Alternative Transportation
- WC Credit 1: Water Efficient Landscaping
- WC Credit 2: Building Water Use Reduction
- WC Credit 3: Performance Measurement: Enhanced Metering
- EE Prerequisite 3: Ozone Protection
- EE Credit 1: Optimize Energy Performance
- EE Credit 4: Refrigerant Selection
- WM Prerequisite 1: Waste Stream Audit
- WM Credit 1: Total Waste Reduction
- WM Credit 2: Regulated Medical Waste Reduction

1 point in addition to MR 1.1

MR Credit 1.2

Building Reuse: **Maintain 80% of Existing Walls, Floors & Roof**

Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Health Issues

Current health care facility construction in the U.S. represents more than 100 million square feet annually, valued at approximately $17 billion in the U.S. of completed construction, with renovations and expansions representing a significant percentage. The extraction of raw materials used in the construction of new buildings represents significant natural resource extraction with the potential for ecological disruption, while fossil fuel and chemical emissions associated with materials' processing and product manufacturing and transportation can result in exposures harmful to human health.

In addition, building reuse reduces the amount of solid waste leaving the project site. Construction and demolition debris accounts for more than 30% of municipal solid waste.

Credit Goals

- Maintain an additional 40% (80% total, based on surface area) of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing material). Hazardous materials that are remediated as a part of the project scope shall be excluded from the calculation of the percentage maintained.

Suggested Documentation

- ❑ Calculate the total area of envelope skin (not including windows) and existing building structure to ensure that the credit goals have been met.
- ❑ Use only areas (sq. ft.) to calculate the quantity of preserved materials. The area to be used in the denominator is the sum of all (1) floor and roof area, including the ground floor to account for slabs-on-grade and footings, and (2) the exterior wall area, excluding window assemblies. The area to be used in the numerator is the sum of reused floor, roof, and wall area, excluding window assemblies.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

See GGHC MR Credit 1.1 Potential Technologies & Strategies and Credit Synergies.

1 point

MR Credit 1.3

Building Reuse: **Maintain 50% of Interior Non-Structural Elements**

Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Health Issues

Current health care facility construction in the U.S. represents more than 100 million square feet annually, valued at approximately $17 billion in the U.S. of completed construction, with renovations and expansions representing a significant percentage. The extraction of raw materials used in the construction of new buildings represents significant natural resource extraction with the potential for ecological disruption, while fossil fuel and chemical emissions associated with materials' processing and product manufacturing and transportation can result in exposures harmful to human health.

Construction and demolition debris accounts for more than 30% of municipal solid waste, whereas building reuse reduces the amount of solid waste leaving the project site. In addition, renovations and upgrades to existing buildings may reduce overall disruption to patients, such as demolition noise and dust, as well as take advantage of environmental quality improvements demonstrated by older hospital buildings, such as a higher percentage of daylit space.

Credit Goals

- Use existing non-shell elements (interior walls, doors, floor coverings, and ceiling systems) in at least 50% (by area) of the renovated area.
- Remove and properly dispose of abandoned wiring.

Suggested Documentation

❑ Calculate the total and reused areas (sq. ft.) of each non-structural interior element in compliance with the credit goals.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- Reuse existing buildings, including structure, shell and non-shell elements whenever possible. Remove elements that pose contamination risk to building occupants, and upgrade inefficient components such as windows, mechanical systems and plumbing fixtures.
- Recycle abandoned wiring during demolition. Copper wiring, in particular, is a valuable recycling commodity.
- See GGHC MR Credit 1.1 Potential Technologies & Strategies and Credit Synergies.

2 points

MR Credit 2.1 & 2.2

Construction Waste Management: **Divert from Disposal**

Intent

Divert construction, demolition and land-clearing debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites. Redirect hazardous waste in compliance with federal and state regulations.

Health Issues

The US EPA estimates that more than 30% of municipal solid waste is generated by construction and demolition activities. Typical construction projects generate approximately 2.2 pounds of waste per square foot, which equates to over 110 thousand tons of construction waste annually based on current rates of over 100 million square feet of annual average health care construction. A 1998 study by the New York State Department of Health found that women living near solid waste landfills have a four-fold increased chance of bladder cancer or leukemia, based on data from 38 landfills, while a 1989 study by the U.S. EPA found elevated cancers of the bladder, lung, stomach and rectum in counties with the highest concentration of waste sites. Municipal solid waste incinerators emit hydrocarbons, heavy metals, dioxins and furans, acid gases, sulfur dioxide, nitrogen oxides and particulates, exposure to each of which pose risks to human health. Diversion of construction and demolition (C&D) debris through salvaging and recycling extends the life of existing landfills and reduces demand for virgin resources thereby curbing unhealthful air and water emissions resulting from manufacturing with virgin feedstocks and from landfill and incineration operations.

Credit Goals

- Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal in landfill or incineration. Identify whether the materials will be sorted on-site or co-mingled.
- Calculations can be done by weight or volume, but must be consistent throughout.
- Excavated soil and land-clearing debris do not contribute to the credit calculation.
- Comply with all applicable state and federal regulations for hazardous waste disposal. Hazardous waste does not contribute to the credit calculation.
- **Credit 2.1 (1 credit)** Recycle and/or salvage at least 50% of non-hazardous construction and demolition debris.
- **Credit 2.2 (1 credit)** Recycle and/or salvage an additional 25% (75% total) of non-hazardous construction and demolition debris.

Suggested Documentation

- ❑ Compile a Waste Management Plan tabulating the total waste materials, quantities diverted from landfill and incineration and the means by which diverted. Compare this to calculations of total C&D waste generated by the project.
- ❑ Record disposal methods for all hazardous construction and demolition debris in accordance with the credit goals.

MR Credit 2.1 & 2.2 continued

Construction Waste Management: **Divert from Disposal**

Reference Standards

California Integrated Waste Management Board. A Technical Manual of Material Choices in Sustainable Construction, Chapter 9 and Appendix C, July, 2000, http://www.ciwmb.ca.gov.

U.S. Clean Air Act (CAA); 42 USC s/s 7401 et seq. (1970).

U.S. Code of Federal Regulations (CFR)

29 CFR 1910.145 - Accident Prevention Signs and Tags; current edition.

29 CFR 1910.1000 - Air Contaminants; current edition.

40 CFR 273 - Standards For Universal Waste Management; current edition.

40 CFR 761 - Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, And Use Prohibitions; current edition.

49 CFR 178 - Shipping Container Specification; current edition.

40 CFR Part 61, Subpart M - National Emission Standard for Asbestos; current edition.

U.S. Toxic Substances Control Act (TSCA); 15 USC s/s 2601 et seq. (1976); www.eh.doe.gov/oepa/laws/tsca.html

Potential Technologies & Strategies

- Establish goals for diversion from disposal in landfills and incinerators and adopt a construction waste management plan to achieve these goals.
- Consider recycling:
  - Cardboard
  - Metal
  - Brick
  - Acoustical board and tile
  - Concrete
  - Plastic
  - Clean wood
  - Glass
  - Gypsum wallboard
  - Carpet
  - Insulation
- Designate a specific area on the construction site appropriate for either on-site or off-site sorting of materials.
- Record efforts throughout the construction process.
- Identify construction haulers and recyclers to handle the designated materials.
- Reuse unpainted gypsum board waste as a soil amendment if appropriate to project soil conditions.
- Note that salvage may include donation of materials to charitable organizations such as Habitat for Humanity.

MR Credit 2.1 & 2.2 continued

Construction Waste Management: **Divert from Disposal**

- Pay particular attention to lead in C&D debris, often used as components of Radiation Protection Systems. Separate sheet lead radiation protection, lead lined gypsum board products, and lead-lined doors and frames for reuse, salvage or reprocessing. Salvage all lead-lined glazing products for reuse or reprocessing.

Resources

Associated General Contractors of America. *Constructing an Environmental Management System: Guidelines and Templates for Contractors*. http://www.agc.org

Building Materials Reuse Association - scroll down for link to their directory which lists organizations/companies around the country that can assist with salvage and deconstruction on old hospitals (and other buildings) being taken down or remodeled. http://www.ubma.org/

Construction and Demolition Waste Recycling Information, California Integrated Waste Management Board (CIWMB), www.ciwmb.ca.gov/ConDemo/Materials/.

Construction Industry Compliance Assistance – How to find C&D regulations in your region and find a Construction and Demolition recycler? Construction Assistance Compliance Assistance including Construction and Demolition Debris State Resources, http://cicacenter.org/solidregs.html

Construction Waste Management Database, US Government Services Administration (GSA), http://www.wbdg.org/ccbref/cwm.php. Free online service for those seeking companies that recycle construction debris in their area.

"Deconstruction – The First Step in Green Building", Waste-Match. NY Wa$teMatch fosters environmentally sound economic development by doing research on solid waste reduction and resource recovery practices and by cultivating new opportunities in sustainable business. http://wastematch.org/

Institution Recycling Network document "Recycling Construction and Demolition Wastes – A Guide for Architects and Contractors." The site also includes sample specifications for Construction and Demolition Recycling. These specifications can be included in Requests for Proposals and contract language to assure that recycling will be part of the project. They allow the specification writer to identify what materials are to be recycled, and include planning, reporting, and recordkeeping requirements. The site also shares case studies demonstrating the cost effectiveness. http://www.wastemiser.com/resources.html

King County – Sample specification as well as other useful data,
http://www.metrokc.gov/dnrp/swd/construction-recycling/documents.asp

Massachusetts Department of Environmental Protection – Construction & Demolition Waste Plan,
http://www.mass.gov/dep/recycle/cdhome.htm

Recycling and Waste Management During Construction, City of Seattle,
http://www.metrokc.gov/procure/green/wastemgt.htm.

StopWaste.org - StopWaste.Org is the Alameda County, CA Waste Management Authority and the Alameda County Source Reduction and Recycling Board operating as one public agency. http://www.stopwaste.org/home/index.asp?page=292

MR Credit 2.1 & 2.2 continued

Construction Waste Management: **Divert from Disposal**

U.S. Environmental Protection Agency – Construction and Demolition Debris Page, http://www.epa.gov/epaoswer/non-hw/debris-new/index.htm

Waste Spec: Waste Specifications for Construction Waste Reduction, Reuse and Recycling, Triangle J Council of Governments, July, 1995, http://www.tjcog.dst.nc.us.

Whole Building Design Guide – Construction Waste Management Database. The Whole Building Design Guide provides government and industry practitioners with one-stop access to up-to-date information on a wide range of building-related guidance, criteria and technology from a 'whole buildings' perspective. http://www.wbdg.org/tools/cwm.php

GGHC Construction Credit Synergies

- SS Credit 2: Development Density & Community Connectivity
- SS Credit 3: Brownfield Redevelopment
- MR Credit 1: Building Reuse
- EQ Credit 3: Construction EQ Management Plan

1 point

MR Credit 2.3

Construction Practices: **Site & Materials Management**

Intent

Implement site and materials management practices during construction to minimize adverse impacts.

Health Issues

Health care construction rarely occurs on undeveloped sites remote from ongoing existing operations. In many instances, construction operations are proximate to existing operational health care facilities, where construction practices may affect the health of adjacent building occupants and building system performance. Careful attention to minimize construction-related adverse health and environmental impacts enhances high performance building objectives.

Credit Goals

- Develop and implement a Construction Practices Environmental Management System (EMS) for the construction and pre-occupancy phases of the building. The below listed "best practices" are strategies the contractor could employ as part of the EMS depending on the size, scope and circumstances of the project. Achieve five of the following six goals:
  - Goal 1: Temporary Facilities:
    - Utilize salvaged or refurbished materials for construction of temporary facilities, excluding reuse of CCA-pressure treated lumber or lumber with lead paint. Note that while most production of CCA (copper chromium arsenate) pressure treated wood was phased out in the US after Dec. 31, 2003, except for specialty markets such as highways and marine applications, there are no restrictions on continued sale or use of stockpiled or recycled CCA products after this date.
    - Make all temporary heated or air-conditioned facilities weathertight.
  - Goal 2: Delivery, Storage and Handling:
    - Coordinate delivery with scheduled installation date to minimize packaging, handling and storage time at site.
    - Implement best practices for proper disposal of waste materials (e.g., concrete truck wash out, tool cleaning, painter clean-up, waste oils from pipe cutting) to prevent discharges into sanitary and stormwater facilities.
  - Goal 3: Construction Site Housekeeping and Particulates Control. Establish a constructor's policy and document implementation of the following:
    - Control particulate discharge resulting from demolition, cutting, grinding and sandblasting operations.
    - Use water sprinkling to control dust generation.
  - Goal 4: Moisture Control
    - Develop a moisture control plan to address measures that will maintain dry conditions to protect installed work from damage due to spills, line breaks, severe weather and other causes within areas under construction.
    - Address removal and disposal of water damaged materials.

MR Credit 2.3 continued

Construction Practices: **Site & Materials Management**

- Implement spill control measures to clean-up spills before they spread to other parts of the work.

- Goal 5: Environmental Manager: Designate an on-site party responsible for overseeing the environmental goals for the project and implementing procedures for environmental protection.
- Goal 6: Environmental Training Program: Provide environmental training for construction workers on site. Include as a minimum:
  - Overview of environmental issues related to the building industry.
  - Overview of environmental issues related to the health care industry and this project.
  - Review site specific procedures and management plans, including GGHC SS Prerequisite 1; GGHC MR Credits 2.1, 2.2, 2.3; and, GGHC EQ Credits 3.1, 3.2, and 4.6.

Suggested Documentation

❑ Document that a Construction Practices Environmental Management System (EMS) was implemented for the project. Include evidence of compliance with the plan during the construction period.

Reference Standards

ANSI A10.34-2001, Protection of the Public on or Adjacent to Construction Sites, http://www.ansi.org.

Potential Technologies & Strategies

Demands are increasing from both private and public owners that contractors provide high-performance, environmentally friendly construction. An Environmental Management System (EMS) serves as a management tool to continually improve operations that impact the environment including regulatory compliance. It identifies goals and enlists the entire workforce in a coordinated effort to achieve them. A well-implemented plan reaps both short-term and long-term benefits and soon pays for itself by:

- Helping a company meet its environmental obligations and avoiding fines for noncompliance.
- Saving costs through process improvements: reducing material inputs, waste disposal costs, reporting costs, and risk of liability.
- Maintaining a company's competitiveness in its markets, and helping to solicit new business from owners specifying high performance, green construction.
- Retaining valuable employees by improving employee morale.
- Boosting public image and relations with regulatory agencies.
- Bringing public recognition by the federal government and some states. An EMS is one of the main criteria for participation in U.S. EPA's National Performance Track Program.

MR Credit 2.3 continued

Construction Practices: **Site & Materials Management**

Resources

Associated General Contractors of America. *Constructing an Environmental Management System: Guidelines and Templates for Contractors*. http://www.agc.org

Environmental Management Systems Guidelines, New South Wales Construction Policy Steering Committee, November 1998. This initiative is aimed at providing a systematic approach to the management of the environmental impacts of the construction industry within the context of the principles of Ecologically Sustainable Development.

U.S. EPA's National Performance Track Program, http://www.epa.gov/performancetrack.

GGHC Construction Credit Synergies

- SS Credit 2: Development Density & Community Connectivity
- SS Credit 3: Brownfield Redevelopment
- MR Credit 1: Building Reuse
- EQ Credit 3: Construction EQ Management Plan

1 point

MR Credit 2.4

Construction Practices: **Utility & Emissions Control**

Intent

Minimize air and noise pollution from fossil fueled vehicle and construction equipment during the construction process. Implement conservation and efficiency practices for temporary utilities.

Health Issues

Health care construction rarely occurs on undeveloped sites remote from ongoing existing operations. In many instances, construction operations are proximate to operational health care facilities, where construction practices may affect the health of adjacent building occupants and building system performance. Emissions and particulate air pollution associated with operating construction-related vehicles and equipment adversely impacts air quality in and around adjacent buildings. Construction vehicles and equipment may operate outside routine traffic areas in locations near outdoor air intakes and operable windows. Noise from construction equipment, even within daytime working hours, can be particularly disruptive to therapeutic recovery and healing processes. Currently, the only diesel fuel regulated by the U.S. EPA is intended for use in highway engines. Specifically, diesel fuel sold for use in most non-road applications such as construction equipment has sulfur on the order of 3,300 parts per million (ppm). In comparison, current standards for fuel used in highway diesel engines limit sulfur concentrations to a maximum of 500 ppm, and the new 2007 rule will drop the cap even lower to 15 ppm in 2006. Higher sulfur content of diesel fuel directly correlates to higher health risks associated with fuel combustion.

Credit Goals

- Develop and implement a plan to reduce utility, vehicle and other emissions during the construction phase. Achieve nine of the fourteen goals listed below including at least one goal from each of the following three categories.
  - Category 1: Temporary Utilities: Efficiencies and Conservation
    - Temporary lighting & power: Use energy efficient fluorescent, LED, HID, and other efficient lighting and controls in lieu of incandescent lighting. Control light pollution.
    - Temporary water: Meter water usage. Use hoses with trigger nozzles. Control runoff, preventing pollutants from entering the storm sewer system; prevent ponding and creation of mosquito habitat.
    - Temporary heating & cooling: Use high efficiency equipment. Use Energy Star® rated equipment when available to meet performance requirements. Maintain enclosure integrity to reduce heat gain/loss.
  - Category 2: Engine use: Efficiencies and Conservation
    - Use low-emitting, fuel-efficient vehicles for on-road construction vehicles to provide 50% of the project's vehicular transportation needs (as measured by total mileage logged). Low-emitting and fuel-efficient vehicles are defined as follows: vehicles classified as Zero Emission Vehicles (ZEV) by the California Air Resources Board; hybrid vehicles; vehicles fueled by biodiesel, compressed natural gas, or liquid propane.

MR Credit 2.4 continued

Construction Practices: **Utility & Emissions Control**

- Implement a plan to minimize vehicle and equipment engine idling when machines are not moving or working.
- Use electric powered cranes, compressors and other equipment as appropriate in lieu of combustion engine powered equipment.
- Demonstrate efforts to establish carpooling or an alternative transportation program for full time on-site construction personnel.
- Reduce air emissions from construction equipment and other non-road diesel engines by utilizing low-sulfur diesel fuel or biodiesel, or converting to natural gas powered engines.

- Category 3: Noise and Vibration
  - Reduce noise emissions from construction equipment and other non-road engines, by specifying low noise emission design or the lowest decibel level available that meets performance requirements. Where available, use equipment that meets the allowable sound power levels listed below or equipment in compliance with the European Union's Blue Angel Criteria for Low-noise Construction Machinery RAL-UZ 53.
  - Perform a noise and vibration assessment in conjunction with the Owner and other affected stakeholders to establish acceptable limits, durations and schedules for operations that generate noise and/or vibration.
  - Assess available construction technology and choose low-impact tools, equipment and processes where feasible. Employ abatement measures where low-impact solutions are impractical.
  - Monitor noise and vibration in Owner-designated critical areas and modify process, schedule or duration to achieve resolution of disruptive conditions.
  - Set up portable barriers and enclosures to contain noise emissions from static equipment such as generators and concrete pumps.
  - Retrofit heavy equipment with cabs and insulation to reduce noise exposure to equipment operators.

MR Credit 2.4 continued

Construction Practices: **Utility & Emissions Control**

Table: Allowable Sound Power Levels

(Source: EU Blue Angel criteria, http://www.blauer-engel.de/englisch/produkte_zeichenanwender/vergabegrundlagen/ral.php?id=81)

Part 1 – Mainly Earth-moving Machinery

Type of Construction Machinery	Operating Conditions	Usable Power	Permissible Sound Power Level Lw dBA
Chain driven machinery except excavators	All	P < 87hp P >87hp	99dBA 101dbA
Mobile cranes and all rubber tired: loaders, graders, dump trucks, etc	All	P < 87hp P < 108hp P >108hp	97dBA 99dBA 101dBA
Vibratory compactors	All	P < 31hp P < 60hp P > 60hp	97dBA 99dBA 101dBA
Excavators	All	P < 20hp P < 38hp P < 72hp P < 108hp P > 108hp	91dBA 94dBA 97dBA 99 dBA 101dBA

"P" – represents the usable (taxable) machine power operating at the highest possible speed.

MR Credit 2.4 continued

Construction Practices: **Utility & Emissions Control**

Part 2 – Other Construction Machinery

Type of Construction Machinery	Operating Conditions	Permissible Sound Power Level Lw dBA
Engine Compressors	Q < 177cfm 177cfm < Q < 350cfm 350cfm < Q < 1050cfm Q > 1050cfm	88dBA 89 dBA 91 dBA 93 dBA
Engine Generators	All	91 dBA
Welding Generators	All	91dBA
Road Finishing Machines	< 300ton/hr > 300ton/hr	90dBA*/100dBA+ 94dBA*/104dBA+
Mobile Concrete Mixers	< 10cu. Yd > 10cu. Yd	98dBA+ 100dBA+

Type of Construction Machinery (continued)	Operating Conditions (continued)	Permissible Sound Power Level Lw dBA (continued)
Revolving Tower Crane – lifting gear	< 20hp 20hp < P < 40hp > 40hp	86dBA 88dBA 90dBA
Revolving Tower Crane – engine power	All	91dBA
Revolving Tower Crane - combined	All	91dBA
Concrete Pumps	< 67hp > 67hp	99dBA 101dBA

*Nominal power with heat activated

+Operation of all components simultaneously at 50% capacity and no material

Suggested Documentation

- ❑ Document the utility and emissions control plan and implementation.
- ❑ Photograph temporary lighting sources and controls.
- ❑ Photograph water conservation measures and control of runoff and ponding.

MR Credit 2.4 continued

Construction Practices: **Utility & Emissions Control**

- ❑ Document cranes and compressor equipment types for the construction period.
- ❑ Document the site carpooling program components, with annual summaries, indicating that the carpooling program has been developed and implemented throughout the entire construction period.
- ❑ Document proof of ownership of, or 2 year lease agreement for, alternative fuel vehicles and calculations indicating that alternative fuel vehicles comprise 50% of contractor operated vehicle fleet, in terms of miles driven per year. Document fleet total annual mileage as well as total annual mileage driven by alternative fuel fleet vehicles.
- ❑ Document the noise and vibration control plan, measurements and abatement efforts.

Reference Standards

California Air Resources Board, Zero Emission Vehicle (ZEV) Program, http://www.arb.ca.gov/msprog/zevprog/zevprog.htm

European Union Blue Angel Criteria for Low-noise Construction Machinery RAL-UZ 53, http://www.blauer-engel.de/englisch/produkte_zeichenanwender/vergabegrundlagen/ral.php?id=81)

U.S. Energy Star, http://www.energystar.gov

Potential Technologies & Strategies

- Use alternative fueled on-road construction vehicles, low-sulfur diesel fuel or biodiesel, electric powered cranes, compressors and other equipment and develop carpooling or alternative transportation programs.

Resources

Basic Criteria for the Award of the Environmental Label: Low-noise Construction Machinery RAL-UZ 53, Blue Angel, Sankt Augustin, Germany. http://www.blauer-engel.de/englisch/produkte_zeichenanwender/vergabegrundlagen/ral.php?id=81

Emission Reduction in Diesel Construction Equipment, http://www.epa.gov/ne/eco/gb3/pdfs/GB3_ConstructionEmissions.pdf

Noise Pollution Clearinghouse, www.nonoise.org

Occupational Health and Safety Administration (OSHA) Noise Website: www.osha.gov/SLTC/constructionnoise/, http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9735

Worker's Compensation Board of BC Engineering Section Report – “Construction Noise”, http://www.nonoise.org/resource/construc/bc.htm

GGHC Construction Credit Synergies

- SS Credit 2: Development Density & Community Connectivity
- SS Credit 3: Brownfield Redevelopment
- MR Credit 1: Building Reuse
- EQ Credit 3: Construction EQ Management Plan

5 points

MR Credit 3

Sustainably Sourced Materials

Intent

Reduce the environmental impacts of the materials acquired for use in the construction of buildings and in the upgrading of building services.

Health Issues

Resource reuse and recycling eliminates primary extraction of virgin resources and manufacturing, thus preventing associated ecosystem disruption, energy expenditure and toxic emissions, while diverting materials from disposal.

Recycled content materials have the potential to conserve non-renewable resources, lower embodied energy, reduce ecological disruption and air, land and water emissions associated with extracting, transporting, and processing raw materials and manufacturing, and lower global warming potential.

The use of regional building materials may avoid local and remote human health impacts that result from transportation activities and the resulting pollution associated with delivery of materials and products to the project site.

Rapidly renewable materials can generally yield more material from less acreage, with lower irrigation and pesticide requirements, and avoid significant biodiversity loss if they are grown at appropriate scale with sustainable agricultural or forestry practices that prevent pollution of water and land resources and help to maintain healthy ecosystems.

Human and environmental health is inextricably linked with forest health. Sustainable forestry protects water quality by reducing water and soil runoff and pesticide and herbicide use. Specifying and procuring certified sustainably harvested wood increases acreage using sustainable management practices. These practices also protect aquatic life, including threatened and endangered species, and maintain viable diverse plant life increasing air filtration and carbon dioxide sequestration. The balancing of carbon dioxide mitigates global climate change, and thereby reduces the spread and redistribution of disease that can be a consequence of climate change.

Sustainable sourcing of materials should not be done at the expense of indoor air quality so requires screening for emissions.

Credit Goals

- One point (up to a maximum of five) will be awarded for each 10% of the total value of all building materials used in the project (on a dollar basis) that achieve at least one of the following sustainability criteria:
  - Contains at least 70% salvaged material.
  - Contains at least 50% rapidly renewable materials. Materials or products may receive double credit toward the total percentage if they contain at least 50% rapidly renewable materials that meet at least one of the following criteria:
    - Certified USDA organic, California Certified Organic Farmers, Oregon Tilth, Pennsylvania Certified Organic; or,

MR Credit 3 continued

Sustainably Sourced Materials

    - Grown using environmentally sustainable agriculture harvest methods that have been certified under a program that meets the criteria of ISEAL Alliance full membership (e.g. IFOAM organically grown materials).
  - Contains 100% wood certified in accordance with the Forest Stewardship Council's (FSC) Principles and Criteria.
  - Contains at least 50% materials harvested and processed or extracted and processed within 500 miles of the project.
  - Contains recycled content. Materials with recycled content can be credited toward the sustainably sourced total at the sum of post-consumer recycled content plus one-half of the pre-consumer content. The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
- Do not include mechanical, electrical and plumbing components and specialty items in this credit calculation. Only include materials permanently installed in the project. Furniture is not included (see GGHC MR Credit 5.1-5.3).
- Due to the critical nature of indoor air emissions to health care, materials must meet any relevant credit goals of GGHC EQ Credit 4 to attain further points under this credit. (For example, a carpet claiming credit for recycled content under this credit must also meet the requirement for low emitting flooring of GGHC EQ Credit 4.3.)
- Define recycled content in accordance with the International Organization of Standards document, *ISO 14021-1999 — Environmental labels and declarations—Self-declared environmental claims (Type II environmental labeling).*
  - *Post-consumer material* is defined as waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose.
  - *Pre-consumer material* is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.
- Acceptable recycled-content cements used as substitutes for Portland cement include:
  - Fly ash generated as a coal combustion by-product only with documentation that the coal plant was not co-fired with hazardous waste, medical waste, or tire-derived fuel.
  - Ground granulated blast furnace slag as a by-product of pig iron production only with documentation that the plant was not co-fired with hazardous waste, medical waste, or tire-derived fuel.
  - Rice husk ash.
- Fly ash generated from municipal solid waste incinerators is not an acceptable recycled-content material under this credit.

Note: In calculating the percentage of purchases for the project conforming to the credit goals, each material or product can only receive credit against a single requirement (i.e., a product that contains both 10% post-consumer recycled content and is harvested within 500 miles of the project counts only once in this calculation).

MR Credit 3 continued

Sustainably Sourced Materials

Suggested Documentation

- ❑ For calculating the total value of all materials for this calculation, projects may choose to use a default value of 35% of total project cost instead of adding up the actual entire materials cost. Alternatively, projects can tally the actual materials cost in Divisions 2-10. If this calculation yields a smaller number than the default, achieving the desired percentage thresholds for GGHC MR c3 will be easier. (NOTE: The 35% default value is lower than the LEED for New Construction 45% default value recognizing the higher FF&E percentage in health care vs. commercial office buildings.)
- ❑ Provide documentation of all covered materials purchases that meet one or more of the specified sustainability criteria and the cost of these purchases for the project. The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
- ❑ Provide a calculation of the fraction of covered materials purchased that meet one or more of the specified sustainability criteria (on a cost basis).

Reference Standards

ASTM D4840-99 Standard Guide for Sampling Chain-of-Custody Procedures, http://www.astm.org.

ASTM E2129-01 Standard Practice for Data Collection for Sustainability Assessment of Building Products, http://www.astm.org.

Forest Stewardship Council's Principles and Criteria, http://www.fscus.org.

Guides for the Use of Environmental Marketing Claims, 16 CFR 260.7 (e), Federal Trade Commission http://www.ftc.gov/bcp/grnrule/guides980427.htm.

International Standard ISO 14021-1999 – Environmental Labels and Declarations – Self-Declared Environmental Claims (Type II Environmental Labeling), http://www.iso.org.

ISEAL Member certifying organizations, http://www.isealalliance.org/membership

Potential Technologies & Strategies

- Identify opportunities to incorporate salvaged materials into the building design and research potential material suppliers.
- Consider salvaged materials such as:
  - Beams and posts
  - Flooring
  - Paneling
  - Doors and frames
  - Metal casework
  - Brick
  - Decorative items

MR Credit 3 continued

Sustainably Sourced Materials

- During construction, ensure that the specified recycled content materials are procured and installed. Quantify the total percentage of recycled content materials installed. Third party certification can be useful to assure validity of recycling claims. While mechanical and electrical components are not included in this calculation, specification of products with recycled content is encouraged where available for electrical equipment, such as light fixture housings, electrical raceways and mechanical products such as air ducts, diffusers and return grilles.
- Seek to incorporate products into the building design that not only have recycled content but are also recyclable, reusable or compostable at the end of their useful life in the building.
- Consider rapidly renewable materials such as:
  - Bamboo flooring
  - Wool carpet
  - Straw and wheat board
  - Sunflower seed board
  - Cotton batt insulation
  - Linoleum flooring
  - Cork flooring
  - Poplar OSB
  - Plastics produced from bio-based materials
- For rapidly renewable materials, seek materials from producers using low impact sustainable agricultural practices to avoid eutrophication, soil depletion, and use of toxic chemicals.
- Seek FSC-certified wood for non-rented temporary construction applications such as bracing, concrete formwork and pedestrian barriers. See GGHC MR Credit 2.4 for additional information.

GGHC Construction Credit Synergies

- SS Credit 1: Site Selection
- SS Credit 2: Development Density & Community Connectivity
- SS Credit 3: Brownfield Redevelopment
- EA Credit 7: Equipment Efficiency
- MR Credit 1: Building Reuse
- EQ Credit 4: Low-Emitting Materials

GGHC Operations Credit Synergies

- EE Credit 3: Energy Efficient Equipment
- WM Credit 3: Food Waste Reduction
- EP Credit 1: Food
- EP Credit 2: Janitorial Paper & Other Disposable Products
- EP Credit 3: Electronics Purchasing & Take Back
- EP Credit 5: Furniture & Medical Furnishings

1 point

MR Credit 4.1

PBT Elimination: **Dioxins**

Intent

Reduce the release of persistent bioaccumulative toxic chemicals (PBTs) associated with the life cycle of building materials.

Health Issues

PBTs are toxic chemicals of particular health concern because they do not break down quickly in the environment, they become widely distributed geographically and they bio-magnify or concentrate in the tissue of living organisms as they move up the food chain. These toxic chemicals cause a range of adverse wildlife and human health effects, including cancer, and developmental impacts in the nervous, reproductive, and immune systems. Immature, developing organisms are often the most sensitive to exposures to PBTs.

Dioxin is an extremely potent carcinogen and reproductive/ developmental toxicant, with adverse impacts at extremely low levels of exposure.

The plastics that contain chlorine, such as PVC and cement from kilns fired with hazardous waste, are targeted by this credit because direct dioxin generation is associated with their manufacture as well as with many forms of disposal and accidental combustion of chlorine-containing materials in building fires or landfills. In addition, PVC feedstock production also creates several other target PBTs including PCBs (polychlorinated biphenyls), HCB (hexachlorobenzene), HCBD (hexachlorobutadiene) and octachloro-styrene (OCS).

Credit Goals

- Accomplish a minimum of three of the following five strategies:
  - Specify no use of cement from kilns fired with hazardous waste.
  - Specify no use of materials containing virgin or recycled chlorinated compounds in exterior and structural components (roof membranes, window and door frames, siding or other exterior finishes and geomembranes).
  - Specify no use of materials containing virgin or recycled chlorinated compounds in interior finishes (Flooring (minimum of 50% of total floor area), base, ceiling tiles, wall coverings, and window treatments). Due to the critical nature of indoor air emissions to healthcare, all interior materials must meet any applicable credit goals of GGHC EQ 4 to attain points under this credit.
  - Specify no use of materials containing virgin or recycled chlorinated compounds in piping, conduit and electrical boxes.
  - Specify no use of materials containing virgin or recycled chlorinated compounds in electrical cable and wire jacketing.
- Chlorinated compounds covered in this credit include:
  - Chlorinated polyethylene (CPE)
  - Chlorinated polyvinyl chloride (CPVC)
  - Chlorosulfonated polyethylene (CSPE)
  - Polychloroprene (CR or chloroprene rubber, also brand name Neoprene)
  - Polyvinyl chloride (PVC)

MR Credit 4.1 continued

PBT Elimination: **Dioxins**

- Exception can be made for minor parts, such as tracks, gaskets, and other seals, as long as a chlorinated compound is not one of the primary materials of the product.

Suggested Documentation

- ❑ Compile documentation verifying compliance with the credit goals.
- ❑ Provide specification language identifying the dioxin reduction goal to the contractor and indicating that review of material content will be a criterion in all substitution reviews.

Reference Standards

The American Hospital Association (AHA) and the United States Environmental Protection Agency (U.S. EPA) signed a Memorandum of Understanding (MOU) identifying goals to reduce the impact of health care facilities on the environment. One goal of the MOU is to minimize the production of PBT pollutants. http://www.h2e-online.org/about/mou.htm.

PBT elimination is reflected in policies established by a broad range of local, state, federal and international governmental bodies as well as major health care systems and organizations:

The Stockholm Convention on Persistent Organic Pollutants, signed by EPA Administrator Christine Todd Whitman for the United States with officials from 90 other countries in May 2001, addresses dioxins and furans, PCBs and HCB and commits signatories "to reduce the total releases with the goal of their continuing minimization and, where feasible, ultimate elimination." United Nations Environment Programme on Persistent Organic Chemicals, http://www.chem.unep.ch/pops/. Stockholm Convention on Persistent Organic Pollutants http://www.pops.int/.

United Nations Environment Programme (UNEP) Mandate 22/4 on Mercury calls for national action to reduce or eliminate releases of mercury and its compounds. http://www.chem.unep.ch/mercury/mandate-2003.htm.

The Canada – U.S. International Joint Commission (IJC) study of PBTs in the Great Lakes led to a "Canada -- United States Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes" signed in April of 1997 by both countries. The Strategy targets dioxins and furans, PCBs, HCB, HCBD, cadmium, lead and mercury, among other toxic substances, for elimination. http://www.epa.gov/glnpo/p2/bns.html.

The U.S. Environmental Protection Agency (U.S. EPA), in response to the Stockholm Convention, UNEP and IJC, has established a list of target PBTs including dioxins, PCBs, HCB, OCS, lead, and mercury. US EPA Strategy for Priority Persistent, Bioaccumulative and Toxic (PBT) Pollutants, http://www.epa.gov/opptintr/pbt/pbtstrat.htm.

U.S. EPA TRI PBT Chemical List, http://www.epa.gov/triinter/chemical/pbt_chem_list.htm.

Washington State's Department of Ecology has established a list of 22 PBTs including dioxins, HCB, HCBD, cadmium, lead, and mercury that the Department has targeted to be virtually eliminated from Washington sources. Washington State PBT Strategy, http://www.ecy.wa.gov/programs/eap/pbt/pbtfaq.html.

The cities of Seattle and San Francisco have both established plans to reduce PBT releases, including eliminating the use of PVC building materials. City of Seattle PBT Reduction Strategy, http://www.cityofseattle.net/environment/Documents/PBTStrategy3-07-03.pdf.

MR Credit 4.1 continued

PBT Elimination: **Dioxins**

A wide range of health care related organizations have passed resolutions directly encouraging action by member organizations to reduce dioxin releases or to reduce or eliminate the use of PVC due to its association with PBTs, including the American Public Health Association, American Nurses Association, California Medical Association, Chicago Medical Society and the Maine Hospital Association. Several major health care systems, including Kaiser Permanente and Catholic Healthcare West are acting to reduce their use of PVC and other PBT related materials from health care products and building materials. American Public Health Association resolution, "Prevention of Dioxin Generation from PVC Plastic Use by Health Care Facilities," http://www.noharm.org/details.cfm?type=document&id=725.
Health Care Without Harm listing of resolutions on PVC, http://www.noharm.org/pvcDehp/reducingPVC.

Potential Technologies & Strategies

- Establish a project goal for materials that meet the dioxin reduction emission goals and identify materials and suppliers to fulfill this goal.
- The following list indicates where the specified chlorinated compounds are primarily used in building materials:
  - Chlorinated polyethylene (CPE) – geomembranes, wire and cable jacketing
  - Chlorinated polyvinyl chloride (CPVC) - water pipes
  - Chlorosulfonated polyethylene (CSPE) – roof membranes, electrical connectors and sheet membrane for pond liners
  - Neoprene - weather stripping, expansion joint filler, water seals, and other gaskets and adhesives
  - Polyvinyl chloride (PVC) – pipes and conduit, waterproofing, siding, roof membranes, door and window frames, resilient flooring, carpet backing, wall covering, signage, window treatments, furniture, wire and cable sheathing
  - While exception can be made for minor parts, specifiers are encouraged to seek EPDM and silicone or other non-chlorinated alternative seals and other minor parts where possible.
- Consider materials that are not manufactured with chlorine or other halogens. Options include (but are not limited to) TPO, EPDM, and FPO for roof membranes; natural linoleum, rubber, or alternate polymers for flooring and surfacing; natural fibers, polyethylene, polyester and paint for wall covering; polyethylene for wiring; wood, fiberglass, HDPE, and aluminum with thermal breaks for windows; and, copper, cast iron, steel, concrete, clay, polypropylene and HDPE for piping.
- Substitutions consistent with this credit are also encouraged in furniture and wiring. In wiring substitution, also avoid other halogenated compounds (compounds containing chlorine, bromine or fluorine), most notably the fluoropolymers that have similar health concerns.

MR Credit 4.1 continued

PBT Elimination: **Dioxins**

Resources

Dioxin formation and waste combustion continues to be studied by the U.S. EPA and others. For reference, please consult http://www.h2e-online.org/ for recent U.S. EPA findings on the subject.

Healthy Building Network, PVC Alternatives Database, http://www.healthybuilding.net/pvc/alternatives.html.

GGHC Construction Credit Synergies

- SS Credit 8: Light Pollution Reduction
- EA Prerequisite 2: Minimum Energy Performance
- EA Credit 1: Optimize Energy Performance
- EA Credit 7: Equipment Efficiency
- MR Prerequisite 2: Mercury Elimination

GGHC Operations Credit Synergies

- EE Credit 1: Optimize Energy Performance
- EE Credit 3: Energy Efficient Equipment
- WM Prerequisite 1: Waste Stream Audit
- WM Credit 2: Regulated Medical Waste Reduction
- CM Prerequisite 1: Polychlorinated Biphenyl (PCB) Removal
- CM Credit 2: Indoor Pollutant Source Control
- CM Credit 3: Chemical Discharge
- EP Credit 4: Toxic Reduction

1 point

MR Credit 4.2

PBT Elimination: **Mercury**

Intent

Reduce the release of persistent bioaccumulative and toxic chemicals (PBTs) associated with the life cycle of building materials.

Health Issues

PBTs are toxic chemicals of particular health concern because they do not break down quickly in the environment, they become widely distributed geographically and they bio-magnify or concentrate in the tissue of living organisms as they move up the food chain. With a few exceptions, the major source of human exposures to PBTs in the general population occurs from the consumption of contaminated food in the ordinary diet. These toxic chemicals cause a range of adverse wildlife and human health effects, including cancer, and developmental impacts in the nervous, reproductive, and immune systems. Immature, developing organisms are often the most sensitive to exposures to PBTs.

Because of their toxicity, persistence, and bioaccumulative characteristics, even very small, difficult to detect releases can lead to harmful exposures. This has led to an emphasis on strategies targeting elimination of the production and use of PBT substances, or those that are known to lead to their formation, rather than attempts to control emissions.

Mercury is a potent neurotoxin. Significant amounts of mercury released into the environment are transformed into methylmercury, which bioconcentrates in the foodchain. Prenatal exposure to methylmercury can result in deficits in language, memory and attention. Mercury is one of at least six PBTs commonly addressed in PBT elimination policies that have direct links with building materials. Others include cadmium, lead, dioxins (including furans and dioxin like compounds), PCBs (polychlorinated biphenyls) and PBDEs (polybrominated diphenyl ethers). These PBTs are used in the manufacture of building materials or unavoidably produced and released into the environment during one or more stages of the material's life cycle. These credits are aimed at eliminating building materials typically used in construction that either contain one or more PBTs or are associated with PBT releases at one or more stages of their life cycle. PBT elimination is reflected in policies established by a broad range of local, state, federal and international governmental bodies as well as major health care systems and organizations as reflected in the Resources section in GGHC MR Credit 4.1.

Credit Goals

- In addition to the Credit Goals outlined in GGHC MR Prerequisite 2: Mercury Elimination, specify and install low mercury fluorescent lamps according to the following criteria:

Fluorescent Lamp	Criteria
Eight-foot T-8 (both Standard and High Output)	18,000 rated hours on instant start ballasts OR 24,000 rated hours on program start ballasts
Four-foot T-8 (both Standard and High Output)	18,000 rated hours on instant start ballasts OR 24,000 rated hours on program start ballasts
Three-foot T-8	18,000 rated hours on instant start ballasts OR 24,000 rated hours on program start ballasts
Two-foot T-8	18,000 rated hours on instant start ballasts OR 24,000 rated hours on program start ballasts

MR Credit 4.2 continued

PBT Elimination: **Mercury**

Fluorescent Lamp (continued)	Criteria
U-Bent T-8	18,000 rated hours on instant start ballasts OR 24,000 rated hours on program start ballasts
28-watt T-5	20,000 rated hours on program start ballasts
24-watt T5HO (High Output)	20,000 rated hours on program start ballasts
54-watt T5HO (High Output)	25,000 rated hours on program start ballasts
Compact fluorescent lamps	Minimum 10,000 rated hours

Note: Longer lamp life contributes to lower mercury use by reducing the frequency of lamp replacement.

- Do not specify or install circular fluorescent lamps on the project.
- Do not specify or install standard (e.g. non-pulse start) metal halide lamps on the project.

Suggested Documentation

- ❑ Compile documentation verifying compliance with the credit goal criteria for mercury content in fluorescent lamps.
- ❑ Document that circular fluorescent lamps were not specified or installed for the project.
- ❑ Document that standard metal halide High Intensity Discharge (HID) lamps were not specified or installed for the project.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

See GGHC MR Prerequisite 2 for Potential Technologies & Strategies and Credit Synergies.

Resources

See GGHC MR Prerequisite 2 for Resources.

1 point

MR Credit 4.3

PBT Elimination: **Lead & Cadmium**

Intent

Reduce the release of persistent bioaccumulative toxic chemicals (PBTs) associated with the life cycle of building materials.

Health Issues

PBTs are toxic chemicals of particular health concern because they do not break down quickly in the environment, they become widely distributed geographically and they bio-magnify or concentrate in the tissue of living organisms as they move up the food chain. With a few exceptions, the major source of human exposures to PBTs in the general population occurs from the consumption of contaminated food in the ordinary diet. These toxic chemicals cause a range of adverse wildlife and human health effects, including cancer, and developmental impacts in the nervous, reproductive, and immune systems. Immature, developing organisms are the most sensitive to exposures to PBTs.

Because of their toxicity, persistence, and bioaccumulative characteristics, even very small, difficult to detect releases can lead to harmful exposures. This has led to an emphasis on strategies targeting elimination of the production and use of PBT substances, or those that are known to lead to their formation, rather than attempts to control emissions.

Lead is a potent neurotoxin, particularly in the developing brain of fetuses and children, and can also cause kidney and reproductive system damage. Cadmium is a carcinogen and causes kidney, lung, intestinal, and placental damage.

Lead and cadmium are two of at least five PBTs commonly addressed in PBT elimination policies that have direct links with building materials Others include cadmium, lead, dioxins (including furans and dioxin like compounds), PCBs (polychlorinated biphenyls) and PBDEs (polybrominated diphenyl ethers). These PBTs are used in the manufacture of building materials or unavoidably produced and released into the environment during one or more stages of the material's life cycle. These credits are aimed at eliminating building materials typically used in construction that either contain one or more PBTs or are associated with PBT releases at one or more stages of their life cycle.

Credit Goals

- Specify substitutes for materials manufactured with lead and cadmium, when cost effective alternatives that meet or exceed performance standards are available, as follows:
  - Specify use of 100% lead-free solder and roofing. Lead is typically found in roofing products in terne, copper roofing, and roof flashing.
  - Specify use of 100% lead-free insulated jacketing of electrical wire and cable that meets or exceeds performance requirements.
  - Specify no use of interior or exterior paints containing cadmium or lead. Green Seal certified or recommended paints meeting Green Seal criteria exclude metals including cadmium, lead, mercury, antimony, and hexavalent chromium.
- For renovation projects, ensure the removal and appropriate disposal of disconnected wires with lead stabilizers

  Note: Avoid use of "lead free" products as defined by the U.S. EPA Safe Drinking Water Act (SDWA) (http://www.epa.gov/safewater/sdwa/index.html), because these products may contain lead.

  The SDWA defines "lead free" as:

  - *Solders and flux containing 0.2% lead or less.*

MR Credit 4.3 continued

PBT Elimination: **Lead & Cadmium**

- *Pipes, pipe fittings, and well pumps containing 8% lead or less.*

To comply with the intent of this credit, specify only "100% lead free" products.

Suggested Documentation

- ❑ Prepare roofing, electrical wiring and painting schedules noting the 100% lead- and cadmium-free specifications.
- ❑ Prepare specification language identifying the lead- and cadmium-free goal to the contractor for the aforementioned material categories and indicating that review of material content will be a criterion in all substitution reviews.

Reference Standards

Green Seal, http://www.greenseal.org

PBT elimination is reflected in policies established by a broad range of local, state, federal and international governmental bodies as well as major health care systems and organizations. Refer to the listing in GGHC MR Credit 4.1.

Potential Technologies & Strategies

- Establish a project goal for lead- and cadmium-free products and identify products and suppliers to fulfill this goal. Consider products such as silver and other lead-free solder, solderless copper connectors and polyethylene piping, aluminum flashing and Green Seal compliant paints. Note that it is understood that there may be a small allowable use of cadmium in equipment beyond the knowledge and access of the designer, such as relay contacts.
- Consider lead-free alternatives for radiation shielding materials.
- Note that some PVC products contain lead or cadmium as stabilizers. For example, lead remains the primary stabilizer in PVC insulation for electrical wire and cable, and cadmium and lead are both still found in PVC resilient flooring products. While not all PVC products contain lead or cadmium, specifying PVC-free products as per GGHC MR Credit 4.1 (Dioxin) will help ensure greater elimination of potential lead and cadmium sources.

Resources

Gail Vittori, "Greening Divisions 15 and 16: Wires, cables, pipes, and environmental health," *The Construction Specifier*, November 2004. http://www.constructionspecifier.com/

MR Credit 4.3 continued

PBT Elimination: **Lead & Cadmium**

GGHC Construction Credit Synergies

- SS Credit 8: Light Pollution Reduction
- EA Prerequisite 2: Minimum Energy Performance
- EA Credit 1: Optimize Energy Performance
- EA Credit 7: Equipment Efficiency
- MR Prerequisite 2: Mercury Elimination

GGHC Operations Credit Synergies

- EE Credit 1: Optimize Energy Performance
- EE Credit 3: Energy Efficient Equipment
- WM Prerequisite 1: Waste Stream Audit
- WM Credit 2: Regulated Medical Waste Reduction
- CM Prerequisite 1: Polychlorinated Biphenyl (PCB) Removal
- CM Credit 2: Indoor Pollutant Source Control
- CM Credit 3: Chemical Discharge
- EP Credit 4: Toxic Reduction

1 point

MR Credit 5.1

Furniture & Medical Furnishings: **Resource Reuse**

Intent

Reduce the environmental impacts from the manufacture, use and disposal of furniture and medical furnishings products.

Health Issues

Resource reuse eliminates primary extraction of virgin resources, transportation and manufacturing, thus preventing associated ecosystem disruption, energy expenditure and toxic emissions, while diverting materials from disposal.

Credit Goals

- Specify salvaged, refurbished, or used furniture and medical furnishings for a minimum 20% of the total furniture and medical furnishings budget.

  Note: Hospital beds are excluded from this credit as they are customarily reused in hospitals.

Suggested Documentation

❑ Compile a list of furniture and medical furnishings, with the salvaged or reused components identified and indicate their replacement value to determine that the credit goals have been met for the requisite amount of furniture.

Potential Technologies & Strategies

- Identify opportunities to salvage and reuse furniture from existing inventory and research potential used furniture suppliers.
- Salvage and reuse systems furniture and furnishings such as:
  - Case pieces
  - Seating
  - Filing systems
  - Medical furnishings such as exam tables, stools, carts, etc.
- Furniture dealers are sources for reused furniture and furniture recycling programs at the local and regional levels. This helps save energy and other resources by reducing reshipping impacts and creation of new product using virgin material.

GGHC Construction Credit Synergies

- MR Credit 1: Building Reuse
- MR Credit 3: Sustainably Sourced Materials
- EQ Credit 4: Low-Emitting Materials

GGHC Operations Credit Synergies

- EP Credit 5: Furniture & Medical Furnishings

1 point

MR Credit 5.2

Furniture & Medical Furnishings: **Materials**

Intent

Reduce the environmental impacts from the manufacture, use and disposal of furniture and medical furnishings products.

Health Issues

The environmental and health issues surrounding materials used in the manufacture of furniture products parallel those outlined for building products in the Material and Resource credits. Significant health impacts are associated with the use of Persistent, Bioaccumulative and Toxic Chemicals (PBTs), chrome plated finishes, and wood harvesting for furniture products manufacture.

PBTs are toxic chemicals of particular health concern because they do not break down quickly in the environment, they become widely distributed geographically and they bio-magnify or concentrate in the tissue of living organisms as they move up the food chain. With a few exceptions, the major source of human exposures to PBTs in the general population occurs from the consumption of contaminated food in the ordinary diet. These toxic chemicals cause a range of adverse wildlife and human health effects, including cancer, and developmental impacts in the nervous, reproductive, and immune systems. Immature, developing organisms are often the most sensitive to exposures to PBTs.

Because of their toxicity, persistence, and bioaccumulative characteristics, even very small, difficult to detect releases can lead to harmful exposures. This has led to an emphasis on strategies targeting elimination of the production and use of PBT substances, or those that are known to lead to their formation, rather than attempts to control emissions.

Hexavalent chromium is another particularly toxic chemical used in furniture for chrome plating. It poses a wide range of health impacts ranging from respiratory tract damage to cancer, particularly for workers and for residents surrounding manufacturing sites.

The furniture industry is a major market for wood products. Human and environmental health is inextricably linked with forest health. Sustainable forestry protects water quality by reducing water and soil runoff and pesticide and herbicide use. Specifying and procuring certified sustainably harvested wood increases acreage using sustainable management practices. These practices also protect aquatic life, including threatened and endangered species, and maintain viable diverse plant life increasing air filtration and carbon dioxide sequestration. The balancing of carbon dioxide mitigates global climate change, and thereby reduces the potential disease spread predicted to be a consequence of global warming induced climate change.

Credit Goals

- Specify 40% of furniture and medical furnishings by cost that complies with a minimum of two (2) of the following three (3) goals:
  - No PBTs in material manufacture - Mercury, Cadmium, Lead or chlorinated compounds (including PVC) in furniture components, textiles, finishes or dyes (per GGHC MR Credit 4). Exception can be made for minor parts, as long as a chlorinated compound is not one of the primary materials of the product.
  - Comply with the European Union RoHS (Restriction of the Use of Certain Hazardous Substances) Directive regarding hexavalent chrome for plated finishes.
  - All wood components from FSC Certified Wood (per GGHC MR Credit 3).

MR Credit 5.2 continued

Furniture & Medical Furnishings: **Materials**

Reference Standard

European Union RoHS (Restriction of the Use of Certain Hazardous Substances) Directive, http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_037/l_03720030213en00190023.pdf.

Suggested Documentation

- ❑ Prepare a matrix indicating the three goals and a listing of furniture, indicating that the requisite amount of furniture complies with a minimum of two out of the three listed goals.
- ❑ For each material or product used to meet the Certified Wood goal, document the vendor or manufacturer's Forest Stewardship Council chain-of-custody certificate number.

Potential Technologies & Strategies

- Heavy metals, such as lead, cadmium, and mercury, can be found in PVC products, fabric dyes and leather tanning. Some manufacturers in the textile industry have eliminated heavy metals from the dyes used in upholstery, backing or barrier cloths, panel fabrics and window textiles. In addition, alternatives exist for PVC-free edging material, furniture connection pieces and panel base covers.
- Specify furniture from manufacturers that offer FSC-certified wood products, with an emphasis on regionally supplied products that can contribute to achieving this goal.

GGHC Construction Credit Synergies

- MR Credit 1: Building Reuse
- MR Credit 3: Sustainably Sourced Materials
- EQ Credit 4: Low-Emitting Materials

GGHC Operations Credit Synergies

- EP Credit 5: Furniture & Medical Furnishings

1 point

MR Credit 5.3

Furniture & Medical Furnishings: **Manufacturing, Transportation & Recycling**

Intent

Reduce the environmental impacts from the manufacture, use and disposal of furniture and medical furnishings products.

Health Issues

The use of regional assembly practices reduces transportation activities and the resulting pollution associated with delivery of furniture products to the project site. Reducing or eliminating packaging, and/or ensuring that the packaging is recyclable or compostable, results in a lessened reliance on disposal. Similarly, the end of life recycling of furniture products reduces solid waste volumes by diverting materials from disposal and reduces the need for continued extraction and raw manufacturing. In both cases, unhealthy air, water, and land pollution associated with landfill and incineration can be reduced.

Credit Goals

- Specify 40% of furniture and medical furnishings based on cost that complies with a minimum of two (2) of the following goals:
  - Locally and/or regionally sourced – Furniture and medical furnishings that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site.
  - Transported with a minimum of packaging - Reduce, reuse, recycle, compost or minimize packaging for shipping, and packaging that is "taken back" by manufacturer for reuse (such as blanket wrapping).
  - Has "end of life" destination – is designed for disassembly, recyclability, biodegradability, or is part of a "take back" program. Furniture that can be disassembled or recycled at end of life, either locally or by the manufacturer through a "take back" program, qualifies.

Suggested Documentation

❑ Prepare a matrix indicating the three goals and a listing of furniture and medical furnishings and their associated costs, indicating that the requisite amount of furniture complies with a minimum of two out of the three listed goals.

Potential Technologies & Strategies

- Specify furniture products that are assembled within 500 miles of the project site to reduce environmental impacts from transportation and support the regional economy.
- Packaging:
  - Minimize packaging and reuse or return packaging to the sender for recycling.
  - Encourage manufacturers to use cardboard with recycled content.
  - Soy inks should be substituted for inks made with heavy metals.
  - Encourage shippers to blanket wrap bulky items, such as chairs, if going directly to the end user. Blankets and pallets are reusable.

MR Credit 5.3 continued

Furniture & Medical Furnishings: **Manufacturing, Transportation & Recycling**

- A growing number of furniture items are available that can be disassembled to allow for almost 100% recycling done locally and/or by sending back to the manufacturer. A number of manufacturers also have programs to extend product life for reuse by re-manufacturing and recycling programs in furniture systems (see GGHC MR Credit 5.1).

GGHC Construction Credit Synergies

- MR Credit 1: Building Reuse
- MR Credit 3: Sustainably Sourced Materials
- EQ Credit 4: Low-Emitting Materials

GGHC Operations Credit Synergies

- EP Credit 5: Furniture & Medical Furnishings

1 point

MR Credit 6

Copper Reduction

Intent

Prevent copper-contaminated stormwater run-off from entering aquatic systems.

Health Issues

Copper is toxic to aquatic species and acutely toxic to plankton and thus can impair the vitality of aquatic ecosystems. Copper enters aquatic systems through direct and indirect sources. In a study of the South San Francisco Bay, 23% of copper was from wastewater treatment plants (the rest was from stormwater sources) and 60 percent of that was estimated to derive from copper pipe corrosion.

Credit Goals

- Eliminate the use of copper metal roofing, copper granule-containing asphalt shingles, copper gutters, and copper cladding.

AND

- If using copper pipe requiring the use of solder and flux during installation, specify all solder joints to be compliant with ASTM B828. Specify and use ASTM B813 flux to reduce copper pipe corrosion.

Suggested Documentation

❑ Document that the roofing and plumbing schedules and specifications for the project comply with the credit goals.

Reference Standards

ASTM B813-00e1 Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube, http://www.astm.org.

ASTM B828-02 Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings, http://www.astm.org.

Palo Alto, CA Municipal Ordinance 16.09.160(b), effective as of January 1, 2003. http://www.city.palo-alto.ca.us/government/municipalcode.html.

Potential Technologies & Strategies

- Establish a project goal to eliminate use of exterior copper building products at the project's inception, particularly if the run-off from the building site flows into a sensitive aquatic zone.
- Identify alternative material options.
- Reduce copper pipe corrosion through the use of less corrosive fluxes, identified as ASTM B813, offered by most flux manufacturers and by specifying that all solder joints comply with ASTM B828.
- Using a solderless copper pipe system, such as ProPress, eliminates the need for solder and flux and thereby the source of significant copper corrosion.
- Alternative pipe materials such as cross-linked polyethylene and cast iron, depending on application, should also be considered as substitutes for copper piping.

MR Credit 6 continued

Copper Reduction

GGHC Construction Credit Synergies

- ID Prerequisite 1: Integrated Design Process
- ID Prerequisite 2: Health Mission Statement & Program
- SS Prerequisite 1: Construction Activity Pollution Prevention
- SS Credit 6: Stormwater Design
- SS Credit 7: Heat Island Effect

GGHC Operations Credit Synergies

- CM Credit 1: Community Contaminant Prevention
- CM Credit 3: Chemical Discharge
- ES Credit 1: Outdoor Grounds & Building Exterior Management

Resources

New Palo Alto Ordinance Prohibits Copper Roofing Materials, http://www.city.palo-alto.ca.us.

1 point

MR Credit 7.1

Resource Use: **Design for Flexibility**

Intent

Conserve resources associated with the construction and management of buildings by designing for durability, flexibility and ease of future adaptation, and maximizing life of constituent components and assemblies.

Health Issues

Health care facilities undergo substantial renovation and remodeling to accommodate changing technologies and regulatory requirements, thereby generating significant quantities of construction-related wastes, and subjecting building occupants to noise, dust, and other health impacting disruptions associated with construction. By designing durable, flexible, adaptive, generic spaces, buildings can better respond to changes imposed by new equipment and infrastructure requirements with minimum waste and maintain a healthier environment during renovations.

Credit Goals

- Increase building flexibility and ease of adaptive reuse over the life of the structure by employing three (3) or more of the following design and/or space planning strategies:
  - Use of interstitial space serving for a minimum 20% of project diagnostic & treatment or other clinical floor area (calculation based on DGSF). Provide 'zonal service distribution systems' for electrical, information technology (IT), communication, medical gases, and sprinklers in all clinical spaces. (Inpatient units are excluded from this calculation.)
  - Provide programmed 'soft space' (such as administration/storage) equal to a minimum of 5% of total clinical space. Locate ‘soft space’ adjacent to clinical departments that anticipate growth. Determine strategy for future accommodation of displaced ‘soft space’ (calculation based on project DGSF).
  - Construct ‘soft space’ with movable or demountable partition systems, or use movable or demountable walls for a minimum of 20% of interior partitions (calculation based on LF of partition); inpatient units may be excluded from this calculation.
  - Locate 'shelled space' equal to a minimum of 5% of total project departmental clinical space, where it can be occupied without displacing occupied space (calculation based on project DGSF).
  - Identify horizontal expansion capacity equal to a minimum of 30% of diagnostic and treatment or other clinical space accessible without demolition of occupied space (other than at the connection point of future expansion). Reconfiguration of additional existing occupied space that has been constructed with movable partition systems is permitted. (Calculation based on project DGSF-Inpatient units are excluded).
  - Design for future vertical expansion on a minimum of 75% of roof, ensuring minimal disruption to existing operations and service systems.
  - Designate location(s) for future above-grade parking structure(s) equal to 50% of existing on-grade parking capacity, with direct access to the main hospital lobby/ circulation/ vertical transportation pathways.
  - Design on a modular planning grid based upon material size modules to reduce waste and increase flexibility. Use movable/modular casework for a minimum of 50% of casework and custom millwork. (Calculation is based upon the combined value of the two elements, as determined by the Cost Estimator or Constructor.).

MR Credit 7.1 continued

Resource Use: **Design for Flexibility**

Suggested Documentation

- ❑ Compile evidence of strategies employed to improve ease of adaptive reuse of the structure in future expansion, renovations, including floor plans, building sections, or modular technology technical data.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

Flexible, adaptable and generic spaces increase building longevity. Strategies for achieving this include:

- Right size the space program, insuring that space assignments are optimized through considering multiple uses for individual spaces, alternative officing (whereby unassigned, flexible workstations are shared by multiple users), and universal sizing (standardized room or workstation sizing).
- Dimensional planning to recognize standard material sizes – wherever possible, design rooms using 2-foot incremental dimensions. An 8' x 11'-6" room creates less waste than a 7'-6" x 11'-4" dimension.
- On large-scale projects, use repetitive elements throughout the design. Redundant dimensions facilitates cutting in large batches in a single location, which in turn facilitates recycling and efficient disposal of cutoffs.
- Plan for future adaptability, including ample floor-to-floor heights, raised floor distribution systems or interstitial space to allow for ease of future modifications, implementation of undifferentiated "technology floors" to accommodate surgical, cardiology and radiological procedures in equally sized and adaptable planning modules.
- Locating shell or 'soft space' adjacent to major clinical areas (such as radiology, surgery, etc) allows for ease of expansion rather than early obsolescence. Determine which programs are likely to require such expansion and locate shell or soft space to permit this needed expansion without major disruption or reconfiguration of existing, operational space.
- Consider components that can be removed and reused in future reconfigurations or may be salvaged for future renovations.
- Plan corridor systems and exit stairways to support future building additions such that demolition of occupied space will not be required. This will cause less disruption during future construction as well as reduce waste from demolition.
- Adopt acuity adaptable and universal patient room concepts to both enhance patient care quality and reduce the probability of need for future change.
- Consider ease of installation and deconstruction, including modular, demountable building systems that can be relocated, reused, or salvaged in the future. Detailing for easy disassembly by using screws and bolts in place of nails and adhesives will reduce future renovation costs.
- Employ design strategies to reduce the use of materials, such as exposed ceilings, concrete floors, and exposed structural framework.

MR Credit 7.1 continued

Resource Use: **Design for Flexibility**

Resources

Designing With Vision: A Technical Manual for Material Choices in Sustainable Construction, Chapter 8, California Integrated Waste Management Board, July, 2000, http://www.ciwmb.ca.gov/ConDemo/Pubs.htm.

New York City High Performance Building Guidelines, Dept of Design and Construction, 1999, http://www.nyc.gov/html/ddc/html/ddcgreen/.

GGHC Construction Credit Synergies

- ID Prerequisite 1: Integrated Design Process
- MR Credit 1: Building Reuse
- MR Credit 2: Construction Waste Management
- MR Credit 3: Sustainably Sourced Materials
- MR Credit 5: Furniture & Medical Furnishings
- EQ Credit 4: Low-Emitting Materials
- EQ Credit 8: Daylight & Views
- EQ Credit 9: Acoustic Environment

GGHC Operations Credit Synergies

- EP Credit 2: Janitorial Paper & Other Disposable Products

1 point

MR Credit 7.2

Resource Use: **Design for Durability**

Intent

Conserve resources associated with the construction and management of buildings by designing for durability, flexibility and ease of future adaptation, and maximizing life of constituent components and assemblies.

Health Issues

Health care facilities undergo substantial renovation and remodeling to accommodate changing technologies and regulatory requirements, thereby generating significant quantities of construction-related wastes, and subjecting building occupants to noise, dust, and other health impacting disruptions associated with construction. By designing durable, flexible, adaptive, generic spaces, buildings can better respond to changes imposed by new equipment and infrastructure requirements with minimum waste and maintaining a healthier environment during renovations.

Credit Goals

- Design and construct to achieve the minimum "*design service life"* of the building or renovation in accordance with the following table (*based upon Table 2 in CSA S478-95 (R2001):*

Category	Design Service Life	Examples
Temporary	Less than 10 years	Tenant Occupancies Portable Buildings 'Soft space" Fitouts Open Building: Tertiary Systems
Medium Life	20 – 49 years	Long Term Tenant Occupancies Medical Office Buildings Long Term Care Facilities Laboratory Core & Shell Most Parking Structures Open Building Secondary Systems
Long Life	50-99 years	Acute Care Medical Buildings Core & Shell Open Building Primary Systems Parking Structures as components of above
Permanent Buildings	Minimum 100 years	Historic Structures Monumental Buildings

AND

- For *Long Life* and *Medium Life* New Construction, develop and implement a Building Durability Plan for the major building components for the construction and pre-occupancy phases of the building as follows (all Tables cited are from the CSA S478 reference standard):
    - Design and construct the building to ensure that the predicted service life of major building structural and shell components exceeds the design service life.

MR Credit 7.2 continued

Resource Use: **Design for Durability**

a. Where component and assembly design service lives are shorter than the design service life of the building, design and construct those components and assemblies so that they can be readily replaced. For components and assemblies whose Categories of Failure are 6, 7 or 8 in Table 3, use a design service life equal to the design service life of the building.

b. For components and assemblies whose Categories of Failure are 4 or 5 in Table 3, use a design service life equal to at least half of the design service life of the building.

c. Document the elements of quality assurance activities to be carried out to ensure the predicted service life is achieved, in the format contained in *Table 1, Quality Assurance and the Building Process, of CSA S478.*

d. Develop and document the quality management program for the project that ensures the quality assurance activities are carried out, in accordance with the elements identified in Clause 5.3, Elements of Quality Management.

- For Renovations, the current condition of the building should be assessed for its ability to provide acceptable performance for the uses for which the renovation will be designed. Such assessment must include structure; codes and regulations; serviceability; mechanical and electrical systems, and identification of needed repairs. Ensure that the intended service life of the renovated area is matched by the service life of the existing building, in accordance with the table above and the reference standard.

Reference Standard

Canadian Standards Association, CSA S478-95 (R2001) – *Guideline on Durability in Buildings*, http://www.csa-intl.org.

Suggested Documentation

❑ Prepare a narrative indicating that construction systems or strategies comply with the credit goals. Design Life and Maintenance documents can be found in the Reference Standard, Appendix A. The narrative should reflect the understanding between the design team and owner regarding objectives and expectations.

Potential Technologies & Strategies

- Requirements for durability are expressed in terms of the design service life of the structure. The design service life of the building provides one basis for the design service life of the building components. Articulating expectation about design service life allows project teams to make important decisions regarding construction methods, system choices, and flexibility measures.
- Often, health care buildings include individual components of differing design service life. Design teams are encouraged to explore “open building” technologies and methodologies to match building and system components to design service life. In “open building design”, primary systems are designed with maximum flexibility and durability (core and shell, in most instances), with secondary and tertiary systems constructed for specific design service life well within the expected design service life of primary systems.

MR Credit 7.2 continued

Resource Use: **Design for Durability**

- Permanent components of the building (foundations, main structural members) are expected to perform for the entire life of the structure. Partition systems should be designed to last only as long as the interior installation is expected to remain useful. Exterior cladding systems should be selected to respond to the design service life of the structure – a cladding system with a service life of 20 years may require extensive maintenance if used on a building with a design service life of 50 years or more.
- Consider the local site parameters when selecting materials and construction systems. Local environmental conditions may impose particular parameters on material and component maintenance and damage.
- Where possible with temporary buildings, design for disassembly and deconstruction. Identify building components that may be salvaged for reuse, recycled, or adapted.

Resources

Designing With Vision: A Technical Manual for Material Choices in Sustainable Construction, Chapter 8, California Integrated Waste Management Board, July, 2000, http://www.ciwmb.ca.gov/ConDemo/Pubs.htm.

New York City High Performance Building Guidelines, Dept of Design and Construction, 1999, http://www.nyc.gov/html/ddc/html/ddcgreen/.

Construction Credit Synergies

- ID Prerequisite 1: Integrated Design Process
- MR Credit 1: Building Reuse
- MR Credit 2: Construction Waste Management
- MR Credit 3: Sustainably Sourced Materials
- MR Credit 5: Furniture & Medical Furnishings
- EQ Credit 4: Low-Emitting Materials
- EQ Credit 8: Daylight & Views
- EQ Credit 9: Acoustic Environment

Operations Credit Synergies

- EP Credit 2: Janitorial Paper & Other Disposable Products