CALTRAIN
STATIONS AND FACILITIES
SUSTAINABILITY DESIGN CRITERIA

Prepared for Caltrain
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1.0 GENERAL

These design criteria establish requirements for sustainability for Caltrain infrastructure development and improvements, in particular for stations and facilities. Sustainability refers to meeting the needs of today without sacrificing the capacity of future generations to meet their own needs.

1.1 CALTRAIN POLICY

It is Caltrain's intent to follow the general policy commitment of SamTrans (San Mateo County Transit District) in regards to sustainability as follows:

1. Deploy sustainability-themed programs that encourage the use of public transit and that support our local communities.
2. Evaluate and improve the long-term resource efficiency of our facilities and equipment, including the life cycle return on investment.
3. Streamline business practices to reduce waste and improve operational effectiveness.
4. Educate and incentivize Caltrain employees to integrate sustainability practices into their work and their personal lives.
5. Encourage business partners to incorporate sustainability practices into their own operations
6. Measure the environmental impacts of our activities on an ongoing basis, and set and meet targets to reduce our impacts.

1.2 SCOPE AND APPLICABILITY

These design criteria concern new facilities, refurbishment or renovation of existing facilities. Their purpose is to integrate sustainable design into Caltrain facility development, renovation and maintenance, including the following areas:

1. Planning and Design
2. Energy Efficiency
3. Water Efficiency and Conservation
4. Materials Conservation and Resource Efficiency
5. Environmental Quality

Caltrain capital improvement projects shall establish project specific sustainability goals, following the framework of the California Building Code, Part 11, Green Building Standards Code (CalGreen). New construction shall comply with CalGreen Nonresidential Mandatory Measures and these design criteria. Renovation and rehabilitation projects shall develop project specific goals following these design criteria and the general principles and design considerations per CalGreen.

Compliance with CalGreen Nonresidential Voluntary Measures, including Tier 1 and Tier 2, shall be considered and added based on cost/benefit considerations. CalGreen Tier 1 and Tier 2 measures are intended to further encourage incorporation of additional green building practices that improve public health, safety, and welfare as well as encourage environmental sustainability.

Designers for each project shall complete a sustainability design compliance checklist, detailing sustainability targets for each area.

2.0 REFERENCE STANDARDS AND PRACTICES

2.1 GOVERNMENT

1. California Code of Regulations, Title 24
    a. Part 6, California Energy Code (CEC)

        http://www.energy.ca.gov/2008publications/CEC-400-2008-001/CEC-400-2008-001-CMF.PDF

    b. Part 11, Green Building Standards Code (CalGreen)

        http://www.documents.dgs.ca.gov/bsc/CALGreen/2010_CA_Green_Bldg.pdf

2. California Division of the State Architect Environmentally Preferable Products Database

    http://www.dgs.ca.gov/Default.aspx?alias=www.dgs.ca.gov/buyinggreen

3. Comprehensive Procurement Guidelines (CPG) website 'buy-recycled' product list

    http://www.epa.gov/epawaste/conserve/tools/cpg/index.htm

4. Environmental Protection Agency (EPA) Environmentally Preferred Purchasing. This site is useful for consumers, particularly those engaged in sustainable design projects, to find and evaluate green products, services and tools.

    http://www.epa.gov/epp/index.htm

5. Transit Green Building Action Plan, a Report to Congress. Federal Transit Administration (FTA), July 2009

    http://www.fta.dot.gov/documents/Transit_Green_Building_Action_Plan.pdf

2.2 INDUSTRY

1. American National Standards Institute (ANSI). Standards developed in conjunction with the American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

2. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 189.1- 2009, Standard for the Design of High-Performance Green Buildings Except Low-rise residential:

   http://www.ashrae.org/publications/page/927

3. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), 62.1-2010, Ventilation for Acceptable Indoor Air Quality.

4. American Public Transit Association (APTA) Transit Sustainability Guidelines: Framework for Approaching Sustainability and Overview of Best Practices.

   http://www.aptastandards.com/LinkClick.aspx?fileticket=FWiDPdAQdU8%3d&tabid=330&mid=1686&language=en-US

5. Collaborative for High Performance Schools (CHPS) criteria, 2009

6. National Institute of Standards and Technology's (NIST). Building for Environmental and Economic Sustainability (BEES) 3.0, Building for Environmental and Economic Sustainability Technical Manual and User Guide.

   http://www.nist.gov/el/economics/BEESSoftware.cfm

7. Resilient Floor Covering Institute (RFCI) FloorScore Program

8. US Green Building Council Leadership (USGBC) in Energy and Environmental Design (LEED™) Green Building Rating System for New Construction (NC); Existing Buildings: Operations and Maintenance (EB:O&M); and Neighborhood Development (ND).

   http://www.usgbc.org/

3.0 PLANNING AND DESIGN

3.1 SITE SELECTION AND OPTIMIZATION

Site selection shall optimize transit use and access, including intermodal opportunities such as pedestrian and bike routes, and the potential for transit-oriented development

(TOD). Site selection shall comply with the Nonresidential Voluntary Measures described in Section A5.103 of CalGreen concerning community connectivity and brownfield and greyfield sites and shall avoid site disturbance or development on previously undeveloped land having an elevation lower than 5 feet above the elevation of the 100 year flood as defined by USFEMA.

Consideration should be given to locating facilities in an existing building envelope, on a brownfield site, or on a greyfield site. A brownfield site is a site that is contaminated or potentially contaminated, and a greyfield site is one which is previously developed with impervious surfaces over 50 percent or more of site.

3.2 TRANSIT-ORIENTED DEVELOPMENT

Caltrain supports and encourages community planners to explore opportunities to develop transit-oriented development (TOD) adjacent to Caltrain facilities. TODs are mixed-use, walkable communities developed around transit stops.

1. In developing opportunities for TOD at existing or proposed Caltrain stations, consider exercising the principles of high-performance, sustainable neighborhoods, as addressed in the LEED for Neighborhood Development (ND) guidance, and in compliance with potential local Sustainable Communities planning requirements under SB 375.
2. Consider modifications at existing facilities that would support the construction and operation of TOD on or adjacent to Caltrain property.
3. Parking is an important factor in TOD. Housing developed in close proximity to a station should include fewer parking spaces per unit than is typically required. Consider replacing station surface parking with a parking structure freeing up land for TOD. Since parking may be plentiful at stations after hours and on weekends, TOD may incorporate attractions that draw primarily after-hours patrons that could share station parking facilities.

3.3 REDUCE IMPACT OF PROJECT SITE

Designers and planners shall consider the range of impacts, including erosion, stormwater, heat island effect, light pollution, noise, and vibration, a site can have on the surrounding community, and investigate means to reduce those impacts.

1. Stormwater: Limit disruption and pollution of natural water flows by managing stormwater runoff.[1]

[1] LEED NC SS 6.1 or LEED ND GIB credit 8 are relevant areas of the USGBC system that pertain to this topic.

a. Stormwater design: Design stormwater system in accordance with the Nonresidential Voluntary Measures of the CalGreen Code or local requirements, whichever are stricter.
b. Use site planning, design, construction, and maintenance strategies to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of sites with regard to the temperature, rate, volume, and duration of flow.
c. Evaluate multiple techniques to limit disruption and pollution of natural stormwater flows including:
    i. Minimize impervious surfaces through use of pervious paving and other elements
    ii. Raingardens, or bioretention areas, are planted depressions that allow the collection, filtration, and infiltration of rainwater runoff from impervious surfaces
    iii. Vegetative roof treatments
    iv. Collect stormwater and use it for site irrigation, toilet and urinal flushing, and custodial uses

2. Mitigation of heat island effect on both hardscapes and roofs (CalGreen A5.106.11): The term "heat island" describes built up areas that are hotter than nearby rural areas. Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality.

    Site Hardscape (For the purposes of this requirement, a site's hardscape includes roads, sidewalks, courtyards, and parking lots, but not constructed building services, or any portion covered by photovoltaic panels generating electricity or other solar energy systems): Designers shall evaluate providing at least 50 percent of the site hardscape with one or any combination of the following or put 50 percent of parking underground.

    a. Existing trees and vegetation or new bio-diverse planting or native plants and adapted plants located to provide shade within five years.
    b. Paving materials with a minimum initial Solar Reflectance Index (SRI) of 0.29. This applies to porous pavers, and open-graded aggregate materials as well as conventional pavement. These materials should be light colored and high-albedo.
    c. Shading through the use of structures, provided that the top surface of the shading structure complies solar reflectance and thermal requirements in CalGreen A5.106.11.
    d. Building or structures that provide shade to the site hardscape.

e. Use open-grid pavement system for non-walking surfaces. Open-grid pavement is a system that is less than 50 percent impervious and contains vegetation in open cells. Special design considerations shall be given to ensure even walking surfaces and ease of maintenance.

3. Light Pollution: In addition to following Caltrain's design criteria for lighting, follow CalGreen requirements in Section 5.106.8 regarding light pollution and design interior and exterior lighting such that zero direct-beam illumination leaves the building site. This shall eliminate, to the extent possible, light trespass from the buildings and site to improve night sky access and reduce the impact of facilities on nocturnal environments.

4. Noise and Vibration: Per Caltrain's Design Criteria, the designer shall consider noise and vibration mitigation as part of facility development. The object of this design requirement is to minimize the impacts to the adjacent residents from train loads and traffic.

4.0 ENERGY EFFICIENCY

Designers shall evaluate opportunities for buildings to achieve exemplary performance in the area of energy efficiency, and in compliance with the goal stated in CalGreen Section A5.201 designers shall evaluate methods to achieve at least a 15 percent reduction in energy usage when compared to the State's mandatory efficiency standards.

4.1 PASSIVE DESIGN

Passive design strategies are the lowest cost way to minimize energy consumption for buildings and facilities. Optimally orient the station or facility to minimize heat gain in summer, while maximizing natural light. Consider solar orientation, wind direction, and natural features.

4.2 BUILDING ENVELOPE

1. Design building envelope to optimize energy efficiency including the following:

   a. Provide adequate insulation
   b. Utilize cool roofing to decrease heat gain through roof and to reduce heat island effect
   c. Place windows and skylights to provide natural lighting while using glazing types, shading, and orientation to reduce heating and air conditioning energy use.

d. Optimize natural ventilation through use of operable windows, vents, and other devices.
e. Optimize building tightness to increase heating and cooling efficiencies during periods when natural ventilation is not sufficient for comfort.

2. Building Envelope Requirements:

The building envelope shall comply with the relevant code criteria, including the CalGreenCode and California Energy Code (CEC). Designers shall comply to the extent practicable with CalGreen Section A5.205.

4.3 BUILDING MECHANICAL SYSTEM

Optimize building mechanical systems energy use through maximizing systems performance and using energy efficient appliances and equipment.

Designers shall select energy efficient appliances and equipment (EnergyStar and Environmentally Preferred Purchasing).

4.4 LIGHTING

Maximize lighting system performance through selection of energy efficient equipment and controls and incorporating natural lighting to the extent practical. Lighting shall comply with the Nonresidential Voluntary Measures in CalGreen A5.209.

4.5 TOTAL BUILDING PERFORMANCE

1. New facilities should be commissioned in a manner that is equal to the provisions of CalGreen Nonresidential Mandatory Measures Section 5.410.2, or preferably, Voluntary Measures Section A504.4. Commissioning is a systematic process that starts during design and helps assure that building performance meets project requirements, including energy efficiency, air quality, and water conservation.

2. Consider the following in the design and operations and maintenance of facilities for optimum energy efficiency and other performance criteria:

   a. Utilize building controls / automation and reporting systems to help ensure optimum energy use. Allow for optimization of building performance and energy and water consumption over time.
   b. Recommend a program of periodic re-commissioning of buildings to check and then adjust building mechanical and other systems.
   c. Incorporate and optimize energy and environmental control devices and procedures as follows:

i. Incorporate, commission, and maintain control and monitoring devices including CO_2 monitoring sensors; energy monitoring/optimization devices; and temperature, ventilation, and humidity control devices.
ii. Add control devices to existing facilities for optimum energy and environmental performance.
iii. Establish and perform procedures including calibration and validation of control devices and sampling for air quality.

3. Energy Budget:: Achieve a level of energy performance above that required by the California Energy Code by reducing energy costs compared to the energy cost budget for energy systems as demonstrated by a whole building simulation using the performance approach described in CalGreen Section A5.203

4.6 ON-SITE RENEWABLE ENERGY SYSTEM

Evaluate and consider implementing on-site renewable energy systems that provide at least 1 percent of the electric power for each facility. Calculation and documentation should comply with CalGreen A 5.211.

5.0 WATER EFFICIENCY AND CONSERVATION

5.1 LANDSCAPE

Comply with CalGreen Division 5.3 and, to the extent practicable, with the Nonresidential Voluntary Measures, Division A 5.3, in the CalGreen Code and the following requirements.

1. Landscaping and any landscape irrigation system shall be designed to be water-efficient and to reduce or eliminate the need for irrigation, herbicides, pesticides, and fertilizers. Plant selection shall be done in accordance with water conservation strategy. At minimum, 60% of the landscaping shall be in bio-diverse planting of native plants and adapted plants. In general, landscaping shall not include turfgrass.
2. Irrigation system design: Design irrigation system so that it will deliver the amount of water the specific plants need. Where practical, group plants by how much irrigation water they need. The goal for landscaping should be to eliminate the need for potable water in the irrigation system and maximize the use of rain water catchment, drip irrigation systems, and recycled water from water treatment facilities. Alternatively, eliminate the need for a permanent irrigation completely through plant selection. The irrigation system shall be controlled by a smart

controller. A smart controller is a device with moisture sensors so that irrigation systems only operate when soil is dry and there is no pending rainfall.

3. Use recycled water for landscape irrigation where available. Where landscape irrigation is provided and no recycled water source is available, design system for conversion to recycled water whenever such becomes available at the site.

5.2 PLUMBING FIXTURES

Comply with the mandatory measures of CalGreen Division 5.3 and to the extent practicable with the Nonresidential Voluntary Measure in the CalGreen Code.

Plumbing fixtures (water closets and urinals) and fittings (faucets and showerheads) shall be water efficient and comply with CalGreen Section 5.303.

5.3 VEHICLE WASHER

Minimize the amount of vehicle wash water usage. Filter, recycle, and reuse vehicle wash water.

6.0 MATERIAL CONSERVATION AND RESOURCE EFFICIENCY

6.1 LIFE CYCLE EVALUATION OF FACILITIES

To optimize the facility's performance over its entire life-span, an analysis of life cycle value of the facility should be performed as part of evaluating construction materials and systems. A life cycle value of a facility shall consist of the initial investment, operability, maintainability, longevity, and life cycle operational and maintenance costs, as well as its reusability and adaptability. Life cycle value considers the total performance of materials and assemblies in an objective, balanced approach.

6.2 EVALUATION OF MAJOR BUILDING MATERIALS AND ASSEMBLIES

To optimize the embodied impacts (e.g. land use, resource use, climate change, ozone layer depletion, human health effects, ecotoxicity, smog, acidification, and eutrophication) of the facility due to materials, consider making a life cycle analysis evaluation of major building materials and assemblies to reduce consumption of natural resources and reduce the impact on the natural environment using Building for Environmental and Economic Sustainability (BEES), Athena Impact Estimator, or equivalent method acceptable to Caltrain, in accordance with ISO Standard 14044. [2]

[2] BEES software incorporates a technique for balancing environmental and economic performance o f building projects. It includes actual environmental and economic performance data for a number of building products.

Consult http://www.wbdg.org/tools/tools_cat.php?c=3 for BEES and Athena Impact Estimator software and other analysis tools to assist with life cycle analysis.

The designers should use the results of the evaluation to select the alternative that has a 5% improvement over other alternatives assessed in the life cycle analysis, in a minimum of two impact categories .

6.3 EVALUATION AND SPECIFICATION OF MATERIALS AND CONSTRUCTION PRACTICES

Evaluate materials and assemblies and configure construction contract requirements to reduce consumption of natural resources and reduce the impact on the natural world.

1. Incorporate recycled materials into transit projects when transit-specific requirements are met, (including longevity, durability, low-maintenance), and favor post-consumer recycled content.
2. Favor materials that can be further reused within the transportation system or recycled at the end of their useful life within the transportation system.

Designers shall use tools such as EPA's Environmentally Preferred Purchasing and Comprehensive Procurement Guidelines in selecting materials and assemblies. Designers shall incorporate selected materials and assemblies in construction contact documents.

Note: Materials traditionally considered environmentally preferable are not always best for transit systems. Designers shall select materials that meet both environmental and performance objectives.

6.4 CONSTRUCTION WASTE REDUCTION, DISPOSAL AND RECYCLING

Require that construction contractors and demolition contractors shall develop a construction waste management plan for diverted materials according to CalGreen Section 5.408, or meet local construction and demolition waste ordinances, whichever is more stringent. In addition to the construction waste reduction required under the CalGreen Code, consider requiring the enhanced construction waste reduction, Tier 1 or Tier 2, in accordance with the Nonresidential Voluntary Measures of the CalGreen Code.

1. All subcontractors shall comply with the contractor's waste management plan.
2. Require in the construction contract that Caltrain projects generate the least amount of waste possible by planning and ordering carefully, following proper storage and handling procedures to reduce broken and damaged materials, and reusing materials whenever possible.

Athena Institute's Impactor Estimator for Building helps designers assess the environmental implications of new buildings and renovations to existing buildings.

6.5 SUSTAINABLE MATERIALS AND POLLUTANT CONTROL

1. Heating, Ventilating, and Air Conditioning (HVAC) Equipment: Select equipment which utilizes no CFC and no HCFC-based refrigerants, or ozone-depleting materials. When appropriate, phase-out CFCs in existing building HVAC equipment.
2. Install HVAC, refrigeration, and fire suppression equipment that do not contain halons.
3. Designers shall evaluate the use of sustainable materials as described in CalGreen Section A5.405.
4. Designers shall specify materials, equivalent in performance to virgin materials, with postconsumer or preconsumer recycled content value for a minimum of 10 percent of the total value, based on estimated cost of materials on the project.
5. Finish material pollutant control: Finish materials shall comply with CalGreen Sections 5.504.4.1 through 5.504.4.4. These sections detail standards for VOC limits, based on the local and regional air pollution control or air quality management district rules for California.
6. For floor area receiving resilient flooring, install resilient flooring complying with the VOC-emission limits defined in the 2009 Collaborative for High Performance Schools (CHPS) criteria and listed on its Low-emitting Materials List (or products registry) or certified under the Resilient Floor Covering Institute (RFCI) FloorScore program.

Also, consider the use of linoleum, a rapidly renewable product, where resilient flooring is required.

6.6 OPERATION AND MAINTENANCE

Establish and follow routine maintenance procedures to maintain and optimize HVAC equipment itself as well as of control devices.

Minimize pollution resulting from operation and maintenance.

1. Use environmentally preferred purchasing for lubricants, cleaning agents and paint.
2. Utilize methods that reduce pollution including methods that extend life of lubricants and reduce pesticide, herbicide, and fertilizer use.
3. Recycle magnetic ballast and older fluorescent lamps containing poly-chlorinated biphenyls (PCBs) and other toxic chemicals in such a manner that potentially dangerous chemicals are safely reprocessed.

7.0 ENVIRONMENTAL QUALITY

7.1 CONSTRUCTION INDOOR AIR QUALITY PLAN

In addition to the CalGreen Code requirements for Indoor Air Quality during construction, consider implementing the Nonresidential Voluntary Measures, Section A 5.504 for the construction and pre-occupancy phases of buildings to prevent indoor air quality problems resulting from construction.

7.2 INDOOR AIR QUALITY

Indoor air quality shall be addressed throughout facilities' life cycle including during construction and through operations and maintenance.

Design and operate facility to ensure indoor air quality as follows:

1. Incorporate indoor air quality procedures into construction contracts. Procedures shall include for protection of air quality in selection and application of materials and protection of permanent HVAC system from dust and other contaminants**.**
2. Ventilation requirements: The building shall comply with California Energy Code, 2008 Building Efficiency Standards, Section 121. Designers shall evaluate methods to increase ventilation rates above the minimum.
3. Outdoor air delivery monitoring: For spaces ventilated by mechanical systems, a permanently mounted, direct total outdoor airflow measurement device shall be provided that is capable of measuring the system minimum outdoor airflow rate.
4. Filtration Requirements: The particulate matter filters or air cleaners shall have a minimum efficiency reporting value (MERV) of not less than 8 and shall comply with and be provided for all regularly occupied areas of the building. Designers shall evaluate the use of MERV 13 filters for all regularly occupied areas of the building.
5. Building Entrance: All building entrances shall employ an entry mat system that shall have a scraper surface, an absorption surface, and a finishing surface. Each surface shall be a minimum of the width of the entry opening, and the minimum length, 6 feet, is measured in the primary direction of travel.
6. Thermal Comfort: The building shall be designed, at a minimum, to comply with A5.507 of CalGreen**.**
7. Low Emitting Materials: Select construction products to minimize indoor air pollution, in compliance with CalGreen 5.504. Comply to the extent practicable with CalGreen Nonresidential Voluntary Measures Section A 5.504.

7.3 LIGHTING AND VIEWS

Design spaces and provide openings to visually connect the indoor environment and outdoor spaces, particularly the natural environment.

1. Daylight regularly occupied spaces
2. Provide quality lighting to maximize productivity and safety
3. Views: To the extent practicable, design spaces and provide openings to visually connect the indoor environment and outdoor spaces, particularly the natural environment

7.4 ACOUSTIC AND VIBRATION CONTROL

Comply with CalGreen Section 5.507 concerning the selection of materials with appropriate Sound Transmission Class coefficient values and design indoor environments for comfort and audibility in regard to the acoustics and vibration. Control impact noise and vibration to the extent possible as part of ensuring occupants' comfort and productivity.

8.0 ABBREVIATIONS AND DEFINITIONS

Abbreviations:

APTA	American Public Transportation Association
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
BEES	Building for Economic and Environmental Sustainability
CEC	California Energy Code
CFC	Chlorofluorocarbon
CHPS	Collaborative for High Performance Schools
CPG	Comprehensive Procurement Guidelines
EPA	Environmental Protection Agency
EPP	EPA's Environmentally Preferred Purchasing
FTA	Federal Transit Administration
HCFC	Hydrochloroflurocarbon
HVAC	Heating, Ventilation and Air Conditioning
IAQ	Indoor Air Quality
ISO	International Standards Organization

LCA	Life Cycle Assessment
LEED™	Leadership in Energy and Environmental Design
MERV	Minimum Efficiency Reporting Value
NIST	National Institute of Standards and Technology
PCB	Poly-Chlorinated Biphenyl
RFCI	Resilient Floor Covering Institute
SB 375	State Bill 375 (California's Sustainable Communities and Climate Protection Act)
SRI	Solar Reflectance Index
TOD	Transit Oriented Development
USFEMA	United States Federal Emergency Management Agency
USGBC	United States Green Building Council
VOC	Volatile Organic Compound

Definitions:

Albedo: Synonymous with solar reflectance, which is a ratio of the energy reflected back into the atmosphere to the energy absorbed by the surface, with 100 percent being total reflectance.

Bioretention (raingarden): A shallow depression that utilizes conditioned soil and vegetation for the storage, treatment, or infiltration of storm water runoff

Brownfield Site: Real property, the expansion, redevelopment or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant or contaminant, with certain legal exclusions and additions.

Building Commissioning: A systematic quality assurance process that spans the entire design and construction process, including verifying and documenting that building systems and components are planned, designed, installed, tested, operated and maintained to meet the owner's project requirements.

Chlorofluorocarbons (CFC): An organic compound, a hydrocarbon, commonly used as a refrigerant, with a direct environmental impact of ozone depletion.

Embodied Energy: The energy used for raw material extraction, transportation, manufacturing, assembly, installation and disposal during the life of a product, including the potential energy stored within the product.

Energy Star: A joint program of the US Environmental Protection Agency and the US Department of Energy. Energy Star is a voluntary program designed to identify and promote energy-efficient products and practices.

Eutrophication: A syndrome of ecosystem responses to human activities that fertilize water bodies with nitrogen (N) and phosphorus (P), often leading to degradation of water and habitat quality.

Greyfield site: Any site previously developed with at least 50 percent of the surface area covered with impervious material.

Graywater: Untreated household waste which has not come into contact with toilet waste. This includes water from bathtubs, showers, bathroom wash basins and water from clothes washing machines and laundry tubs.

Halons: A compound consisting of bromine, fluorine, and carbon, commonly used as a fire extinguishing agent. It contributes to ozone depletion.

Heat Island. Describes built up areas that are hotter than nearby rural areas.

Hydrochloroflourocarbons (HCFC): A refrigerant, a subclass of CFCs but containing hydrogen, developed as a substitute for CFCs. HCFCs do not deplete stratospheric ozone layer, but some have a high global warming potential, so are not environmentally benign.

Life Cycle Assessment (LCA): A technique to evaluate the relevant energy and material consumed and environmental emissions associated with the entire life of a product, process, activity or service.

Low Impact Development (LID): Control of stormwater at its source to mimic drainage services provided by an undisturbed site.

Permeable Paving: Permeable paving materials and techniques which allow the movement of water around the paving material and allow precipitation to percolate through the paving surface to the soil below.

Potable Water: Water that is drinkable and meets the US Environmental Protection Agency (EPA) Drinking Water Standards.

Recycled Water: Water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur.

MERV: Filter minimum efficiency reporting value, based on ASHRAE 52.2-1999

Solar Reflectance Index: The fraction of the incident solar energy reflected by a given surface is its solar reflectance. Solar reflectance and thermal emittance are importance factors affecting surface and near-surface ambient temperatures. Determination of solar reflectance and thermal emittance, and subsequent calculation of the relative temperature of the surfaces with respect to black and white reference temperatures is the Solar Reflectance Index (SRI).

Sound Transmission Class (STC): STC is a single number rating of the barrier effect of a material or assembly. Higher STC values are more efficient for reducing sound transmission.

Volatile Organic Compound (VOC): Carbon compounds with vapor pressures greater than 0.1 millimeters of mercury at room temperature, i.e., they become a gas at normal room temperatures. These compounds typically contain hydrogen and may contain oxygen, nitrogen, and other elements.