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| Albedo<br><br>Definition: Albedo, or solar reflectance, is a measure of a material's ability to reflect sunlight (including the visible, infrared, and ultraviolet wavelengths) on a scale of 0 to 1. An albedo value of 0.0 indicates that the surface absorbs all solar radiation, and a 1.0 albedo value represents total reflectivity. ENERGY STAR Reflective Roof Products [http://www.energystar.gov/index.cfm?c=roof_prods.pr_roof_products ] criteria specify an albedo of 0.65 or higher for low-slope roof applications and 0.25 for sloped roofs. |
| American National Standards Institute<br><br>Definition: ANSI is a nonprofit organization that administers and coordinates the U.S. voluntary standardization and conformity assessment system. It is composed of approximately 1,000 companies, nonprofit organizations, government agencies, and other members.<br>Acronym: ANSI |
| American Society for Testing and Materials<br><br>Definition: ASTM is a member-based organization that develops a wide range of voluntary standards. It promulgates standard test methods, specifications, practices, classifications, and terminology in more than 130 industrial segments. Two ASTM standards used in defining the performance of cool roofs are ASTM E 903-88, for testing solar absorptance, and ASTM E 408-71 (1990), for testing the solar emittance of materials.<br>Acronym: ASTM |
| American Society of Heating, Refrigerating and Air-Conditioning Engineers |

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| Definition: ASHRAE is an international organization that establishes standards for the uniform testing and rating of heating, ventilation, air conditioning, and refrigeration equipment. It also conducts related research, disseminates publications, and provides continuing education to its members.<br>Acronym: ASHRAE |
| Anthropogenic Heat<br><br>Definition: Anthropogenic heat is heat generated by buildings, people, or machinery. Estimates of anthropogenic heat generation can be made by totaling all the energy used for heating and cooling, running appliances, transportation, and industrial processes. Anthropogenic heat is small in rural areas, becoming larger in dense urban areas. It is not usually large enough to be a significant factor in summertime heat island formation, but has a more significant impact on wintertime heat islands. |
| Asphalt Cement Concrete<br><br>Definition: ACC, commonly known as "asphalt," makes up approximately 90% of all paved surfaces in the United States. ACC is a hardened mixture of asphalt cement binder (about 7% total weight) and aggregate (about 93% total weight).<br>Acronym: ACC |
| Asphalt Chip Sealing<br><br>Definition: Asphalt Chip Sealing is a paving treatment in which a thin layer of asphalt emulsion binder is applied and immediately covered with a layer of light-colored aggregate. Afterwards, the aggregate is pressed into the binder using a heavy roller resulting in an exposed aggregate surface. Using light-colored aggregate increases reflectance as the surface wears. |
| Asphalt Emulsion Sealcoats |

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| Definition: An asphalt emulsion sealcoat is a paving option consisting of an aggregate of small rocks in an asphalt binder. Emulsion sealcoats are brushed over existing pavement to seal small cracks and protect the surface. Asphalt emulsion sealcoats are most commonly used in low-traffic applications such as parking lots and driveways. |
| Biogenic Hydrocarbons<br><br>Definition: Biogenic hydrocarbons are naturally occurring compounds, including VOCs (volatile organic compounds) that are emitted from trees and vegetation. High VOC-emitting tree species such as eucalyptus can contribute to smog formation. Species-specific biogenic emission rates may be an important consideration in large-scale tree plantings, especially in areas with high ozone concentrations. |
| Bioremediation &Phytoremediation<br><br>Definition: These terms refer to the ability of trees and vegetation to remove pollution from rainwater. Green roofs and shade trees, for example, mitigate urban runoff and nonpoint source nitrogen and phosphorus pollution through these processes. |
| British thermal unit<br><br>Definition: A Btu is the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit at a specified temperature.<br>Acronym: Btu |
| Built-Up Roof<br><br>Definition: Built-up roofs are a class of low-slope roof that consist of layers of reinforcing felt between either asphalt or coal tar bitumen. The reflectivity of BURs depends on the color of the surface layer. Four BUR surfacing options are aggregate, smooth, |

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| mineral cap, and protective coating.<br>Acronym: BUR |
| Canopy<br><br>Definition: Canopy refers to the tree cover in an urban setting. Canopy size is an important determinant of a city's heat island reduction potential. The "urban fabric" can be characterized both above and below the canopy for a better understanding of the area's surface cover. |
| Climate Change<br><br>Definition: Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from: (1) natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun; (2) natural processes within the climate system (e.g., changes in ocean circulation); (3) human activities that change the atmosphere's composition (e.g., through burning fossil fuels) and the land surface (e.g., deforestation, reforestation, urbanization, desertification, etc.). |
| Concrete |
| Consolidated Metropolitan Statistical Area<br><br>Definition: A CMSA is an area with a population of one million or more that meets a range of other statistical criteria. The Office of Management and Budget defines CMSAs for the purpose of collecting, tabulating, and publishing federal data.<br>Acronym: CMSA |
| Continental Climate |

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| Definition: A continental climate is a climate lacking oceanic influence and characterized by more extreme temperatures than marine climates. Therefore, a continental climate has a high annual temperature range for its latitude relative to a climate with marine influence. |
| Cool Roofs<br><br>Definition: The term cool roof is used to describe roofing material that has high solar reflectance. This characteristic can reduce heat transfer to the indoors and enhance roof durability. Cool roofs may also be highly emissive, releasing a large percentage of the solar energy they absorb. |
| Cooling Degree Day<br><br>Definition: Cooling degree days are used to estimate how hot the climate is and how much energy may be needed to keep buildings cool. CDDs are calculated by subtracting a balance temperature from the mean daily temperature, and summing only positive values over an entire year. The balance temperature used can vary, but is usually set at 65°F (18°C), 68°F (20°C), or 70°F (21°F).<br>Acronym: CDD |
| Direct and Indirect Energy Savings<br><br>Definition: Air conditioning energy savings from installing a cool roof or planting shade trees to reduce heat transfer into homes and buildings are direct energy savings. Indirect energy savings are savings accrued from lower ambient temperatures (presuming a decrease in air conditioning use under cooler outdoor temperatures). |
| DOE-2 Model |

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| Definition: The DOE-2 Model is a computer program that simulates hourly building energy use. It is an international benchmark used as the basis for building standards in the United States and other countries. |
| Elastomeric Roof Coatings<br><br>Definition: Elastomeric coatings have elastic properties, and can stretch in the summertime heat and then return to their original shape without damage. Elastomeric coatings include acrylic, silicone, and urethane materials. |
| Emittance<br><br>Definition: The emittance of a material refers to its ability to release absorbed heat. Scientists use a number between 0 and 1, or 0% and 100%, to express emittance. With the exception of metals, most construction materials have emittances above 0.85 (85%). |
| Energy Balance<br><br>Definition: An energy balance is a detailed accounting of all energy flowing into and out of a volume or surface. Examples of energy flows include convection, evaporation, heat stored or conducted, and heat generated in a volume (such as anthropogenic heat in a city). Energy balances of urban and rural areas can illustrate the cooling effects of trees and vegetation on evaporation and heat storage rates. |
| Evaporative Emissions<br><br>Definition: Evaporative emissions are from fuel evaporating from vehicle carburetors or fuel systems. Evaporative emissions can occur while vehicles are refueling, operating, or even when vehicles are parked. |
| Evapotranspiration |

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| Definition: Plants absorb water through their roots and emit it through their leaves. This movement of water is called "transpiration." Evaporation, the conversion of water from a liquid to a gas, also occurs from the soil around vegetation and from trees and vegetation as they intercept rainfall on leaves and other surfaces. Together, these processes are referred to as evapotranspiration, which lowers temperatures by using heat from the air to evaporate water. |
| Field Campaign<br><br>Definition: A field campaign, or field study, is an intensive monitoring effort in a small area that lasts for a few weeks or months. This on-the-ground research technique is used to monitor temperature differences within cities and between urban and rural areas. |
| Global Warming<br><br>Definition: Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, "global warming" often refers to the warming that can occur as a result of increased emissions of greenhouse gases from human activities. |
| Green Roofs<br><br>Definition: Green roofs are rooftops planted with vegetation. Intensive green roofs have thick layers of soil (6 to 12 inches or more) that can support a broad variety of plant or even tree species. Extensive roofs are simpler green roofs with a soil layer of 6 inches or less to support turf, grass, or other ground cover. |
| Greenhouse Gas<br><br>Definition: A greenhouse gas is any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include, but are not |

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| limited to, water vapor, carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), halogenated fluorocarbons (HCFCs), ozone (O3), perfluorinated carbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF6). |
| Heat Exhaustion<br><br>Definition: Heat exhaustion is a phenomenon caused by fluid loss, which in turn causes decreased blood flow to vital organs. Reduced blood flow from heat exhaustion can result in a form of shock. Victims of heat exhaustion often complain of flu-like symptoms hours after exposure. |
| Heat-Health Watch Warning Systems<br><br>Definition: Heat-health watch warning systems correlate weather conditions with human comfort and health risks. When harmful weather conditions are predicted, a warning is given to the public to guard against the effects of heat stroke and heat exhaustion. The alert system can also be used in conjunction with social service programs to check on at-risk populations and provide them with cooling services. |
| Heat Stroke<br><br>Definition: Heat stroke occurs when the body's heat regulating mechanisms-including convection, sweating, and respiration-fail. The likelihood of heat stroke increases when air temperatures are higher than skin temperature, and when individuals are low on fluids. During a heat stroke, body temperatures can be raised to the point at which brain damage and death can result unless cooling measures are quickly taken. |
| Heating Degree Day<br><br>Definition: Heating degree days are used to estimate how cold the climate is and how much energy may be needed to keep buildings |

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| warm. HDDs are calculated by subtracting the mean daily temperature from a balance temperature, and summing only positive values over an entire year. The balance temperature used can vary, but is usually set at 65°F (18°C), 68°F (20°C), or 70°F (21°F).<br>Acronym: HDD |
| Heating Penalty<br><br>Definition: Cool roofs reflect solar energy year-round. In the winter, cool roofs reflect solar energy that could have been used to warm the building, and more heating energy may be required. This heating penalty is small in most U.S. climates because there is less sunlight available during the winter. In addition, it is usually offset by cooling energy savings during the summer. Cool roofs typically result in net annual energy savings. |
| Homology Mapping<br><br>Definition: Homology mapping is an analytic technique in which similarities in the geographical, land-use, and meteorological characteristics of a monitoring site are used to identify a homologue, or best match, for that site or area. This technique was developed to estimate ozone concentrations in unmonitored areas using data from actual monitoring sites. Homology mapping can therefore provide the basis for impact calculations in unmonitored areas. |
| Infrared Radiation<br><br>Definition: Infrared radiation is the heat energy emitted from a material. The term infrared refers to energy in the region of the electromagnetic radiation spectrum at wavelengths longer than those of visible light, but shorter than those of radio waves. |
| Joule<br><br>Definition: A joule is a metric unit of energy equal to the work done by a force of one newton acting through a distance of one meter. |

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| Acronym: J |
| Kilowatt hour<br><br>Definition: A kilowatt hour is a metric unit of energy most often used to measure electricity use.<br>Acronym: kWh |
| Landsat 7 Satellite<br><br>Definition: Landsat 7 is a U.S. satellite used to acquire remotely sensed images of the Earth's land surface and surrounding coastal regions. The Landsat 7 satellite was launched in 1999 and was designed to last five years. It continues to function at diminished capacity. The Landsat Data Continuity Mission, scheduled to be launched in 2011, will be the next satellite in the Landsat series. The goal of the Landsat satellite program is to improve our understanding of the Earth as an integrated system, including how it responds to natural and human-induced disturbances. |
| Low-Slope Roof<br><br>Definition: A low-slope roof is a roof surface with a maximum slope of 2 inches' "rise" for 12 inches' "run" as defined in American Society for Testing and Materials Standard E 1918-97. |
| Mesoscale Model<br><br>Definition: The MM5 model was developed by the National Center for Atmospheric Research and Penn State University. It is used in a range of applications, including evaluations of how heat island mitigation strategies affect weather in different regions of the country.<br>Acronym: MM5 |

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| Microclimate<br><br>Definition: A microclimate is a climate in a small area that varies significantly from the overall climate of a region. Microclimates are formed by natural or man-made geography and topography, such as hills, buildings, and the presence or absence of trees and vegetation. |
| Mixing Layer<br><br>Definition: The atmosphere's mixing layer is the near-surface area where air is well mixed from turbulence caused by the interaction of the Earth's surface and atmosphere. The mixing layer is usually located at the base of a temperature inversion. |
| National Ambient Air Quality Standards<br><br>Definition: In 1971, EPA promulgated NAAQS for six classes of air pollutants, known as "criteria" air pollutants. According to the Clean Air Act, the purpose of the NAAQS is to protect the public from air pollutants "with an adequate margin of safety" (primary NAAQS) and to promote the public welfare (secondary NAAQS). Under the Clean Air Act, individual states are required to develop plans for implementing, enforcing, and maintaining the standards. Several states have considered including heat island mitigation in their air quality plans for ozone, a criteria air pollutant.<br>Acronym: NAAQS |
| Nitrogen Oxides<br><br>Definition: NOx is the collective term for nitrogen compounds such as NO and NO2. Nitrogen oxides are an environmental and public health concern because human activity has increased their concentration in the atmosphere. NO and NO2 are interconvertible and are precursor molecules for the production of ground-level ozone. |

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| Acronym: NOx |
| Nonattainment Area<br><br>Definition: A nonattainment area is a region in which the level of a criteria air pollutant is higher than allowed by the federal NAAQS. For ground-level ozone, the one-hour standard is 120 parts per billion. EPA puts a city or metropolitan area on its "nonattainment" list when ozone exceeds, or violates, the standard more than once a year averaged over a three-year period. |
| Ozone<br><br>Definition: Ozone (O3) is a colorless gas with a pungent odor. It is found in two layers of the atmosphere, the stratosphere and the troposphere. In the stratosphere, ozone provides a protective layer shielding the Earth from ultraviolet radiation's potentially harmful health effects. At ground level (the troposphere), ozone is a pollutant that affects human health and the environment, and contributes to the formation of smog.<br>Acronym: O3 |
| Photochemical Modeling<br><br>Definition: Photochemical modeling is computer modeling of reactions in the atmosphere that produce ozone from nitrogen oxides and volatile organic compounds. Photochemical modeling can be used to evaluate the air quality impacts of heat island reduction strategies. |
| Photovoltaic Cells<br><br>Definition: Photovoltaic cells are designed and engineered to convert solar radiation into usable energy. They are considered a "renewable" form of energy and can be installed on rooftops in conjunction with cool roof materials. |

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| Polyurethane Spray Foam<br><br>Definition: Polyurethane spray foam is an insulating foam material often used on rooftops. Two liquid components are combined and sprayed onto a surface to form SPF. The components react and harden to form a rigid, waterproof insulating layer.<br>Acronym: SPF |
| Porous Block Pavement Systems<br><br>Definition: Porous block pavement systems are prefabricated lattice structures made of concrete or plastic that are designed to support light traffic from cars and pedestrians, while allowing water to drain through. The blocks are filled with aggregate, or with soil planted with vegetation. |
| Portland Cement Concrete<br><br>Definition: Concrete is a hardened mixture of portland cement, sand, and coarse aggregate. Waste materials like fly ash, slag and plastic fibers can also be used in the concrete mixture. These materials are mixed with water, installed between specially constructed forms, then allowed to dry and cure for as long as several days. The addition of various polymers and other additives to the pavement mix can increase pavement strength and decrease the curing time to 12 hours.<br>Acronym: PCC |
| Pyranometer<br><br>Definition: A pyranometer is an instrument for measuring the solar reflectance, or albedo, of materials. The American Society for Testing and Materials Standard E 903-88 provides guidance on performing these measurements. |
| R-Value |

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| Definition: R-value or "thermal resistance value" is a measure of the resistance of a material to heat flow. The term is typically used to describe the resistance properties of insulation. The higher the R-value, the greater the insulation's resistance to heat flow. |
| Radiation<br><br>Definition: Radiation is energy emitted in the form of electromagnetic waves. Radiation has differing characteristics depending upon the wavelength. Because the radiation from the sun is relatively energetic, solar radiation has a short wavelength (ultraviolet, visible, and near infrared). Energy radiated away from the Earth's surface and the atmosphere has a longer wavelength (e.g., infrared radiation) because the Earth is cooler than the sun. |
| Radiometer<br><br>Definition: A radiometer is an instrument for detecting and measuring the intensity of the sun's energy in the electromagnetic spectrum. Measured radiation is characterized by its frequency of oscillation of ultraviolet, visible, and infrared frequencies. |
| Remote Sensing<br><br>Definition: Remote sensing is a method of visualizing the radiative properties of the Earth's surface using instrumentation mounted on satellites or aircraft. Remote sensing instrumentation measures the radiation reflected and emitted from the earth at different wavelengths, primarily at those wavelengths not absorbed by the atmosphere. Remotely sensed data can be converted to maps showing the visible or thermal properties of an area. |
| Resin Modified Emulsion Pavement<br><br>Definition: Resin modified emulsion pavement contains a binder made primarily from tree resins. Construction processes using resin- |

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| modified emulsion are similar to those for asphalt pavements. The resin binder is translucent so that the pavement keeps the color of the aggregate. |
| Sedum<br><br>Definition: Sedum is a plant genus containing several species suited for use in green roof construction. Sedum species are a common choice for rooftop applications because they have high water-retention capability, an ability to filter pollution, and are hearty. |
| Single-Ply Roof<br><br>Definition: Single-ply roofing is a flexible or semi-flexible pre-manufactured membrane typically made of rubber or plastic materials. Single-ply roofing comes in large rolls and must be glued or mechanically fastened to a roof and sealed at all seams. |
| Sloped Roofs<br><br>Preferred Term: Steep-Slope Roofs |
| Solar Radiation<br><br>Definition: Solar radiation is heat energy from the sun, including the infrared, visible, and ultraviolet wavelengths. For heat island mitigation purposes, solar radiation is measured by American Society for Testing and Materials Standard E 1918, which provides for in-field use of a pyrometer to measure incoming and outgoing radiation. |
| Solar Reflectance<br><br>Definition: Solar reflectance is a measure of the ability of a surface material to reflect sunlight-including the visible, infrared, and ultraviolet wavelengths-on a scale of 0 to 1. Solar reflectance is also called "albedo." |

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| Solar Reflectance Index<br><br>Definition: SRI is a value that incorporates both solar reflectance and emittance in a single value to represent a material's temperature in the sun. SRI quantifies how hot a surface would get relative to standard black and standard white surfaces. It is calculated using equations based on previously measured values of solar reflectance and emittance as laid out in the American Society for Testing and Materials Standard E 1980. It is expressed as a fraction (0.0 to 1.0) or percentage (0% to 100%).<br>Acronym: SRI |
| State Implementation Plan<br><br>Definition: A SIP is a detailed description of the programs a state will use to carry out its responsibilities under the Clean Air Act. SIPs are collections of regulations used by a state to reduce air pollution. The Clean Air Act requires that EPA approve each state's SIP. Members of the public have an opportunity to participate in review and approval of these plans.<br>Acronym: SIP |
| Steep-Slope Roofs<br><br>Definition: Steep-slope roofs, or sloped roofs, are roof surfaces with a slope greater than 2 inches' "rise" for 12 inches' "run." |
| Surface Roughness<br><br>Definition: The term surface roughness is used in the context of heat island mitigation to refer to the presence of buildings, trees, and other irregular land topography in an urban area. |
| Therm |

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| Definition: A therm equals 100,000 British thermal units. |
| Transect Study<br><br>Definition: For heat island monitoring purposes, a transect study measures temperature changes across a transect, or sample area, often using hand-held devices or measurement equipment mounted on cars or aircraft. When conducting transect studies to measure the heat island effect, researchers should select a transect that samples a range of land-uses and land-cover. Timing and weather conditions are also important factors, as the magnitude of heat islands is often greatest in the early evening. |
| Transmittance<br><br>Definition: Transmittance is the fraction of radiant energy that, having entered a layer of absorbing material, reaches its further boundary. For example, when sunlight reaches a tree's canopy, some amount of light is absorbed by the leaves and used for photosynthesis, some amount is reflected back into the atmosphere, and some amount is transmitted to the grass or ground below. The latter quantity determines the tree's transmittance, which is typically 10% to 30% in the summertime. |
| Typical Meteorological Year<br><br>Definition: A TMY is a data set of hourly values of solar radiation and meteorological elements for a one-year period. This concept is used in computer simulations of solar energy conversion systems and building systems to conduct performance comparisons of different systems, configurations, and locations. Because TMYs represent average rather than extreme conditions, they are not suited for designing systems to meet the worst-case conditions at a location.<br>Acronym: TMY |
| Urban Fabric Analysis |

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| Definition: An Urban Fabric Analysis is a method for determining the proportions of vegetative, roofed, and paved surface cover relative to the total urban surface in the city. To analyze the effect of surface cover modifications and simulate realistic estimates of temperature and ozone reductions resulting from such modifications, the baseline urban fabric must be quantified. |
| Urban Heat Island Effect<br><br>Definition: The urban heat island effect is a measurable increase in ambient urban air temperatures resulting primarily from the replacement of vegetation with buildings, roads, and other heat-absorbing infrastructure. The heat island effect can result in significant temperature differences between rural and urban areas. |
| Volatile Organic Compounds<br><br>Definition: VOCs are molecules containing carbon and varying proportions of other elements such as hydrogen, oxygen, fluorine, and chlorine. They are the "precursors" that react with nitrogen oxides in sunlight and heat to form ground-level ozone.<br>Acronym: VOCs |
| Watt<br><br>Definition: A watt is the absolute unit of power equal to the work done at the rate of one joule per second. |
| Whitetopping<br><br>Definition: Whitetopping is a cool paving technique in which an existing pavement is covered by a layer of light-colored concrete. Usually, whitetopping involves adding a four- to eight-inch-thick layer over the asphalt base. However, a new method called ultra-thin whitetopping requires only two to four inches of concrete. |
| Winter Penalty |

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| Definition: Also known as heating penalty. Just as cool roofs reflect solar radiation throughout the summer, they also reflect wintertime sunlight. Thus, the winter penalty is the potential for increased heating demand in winter due to reflected solar radiation by light colored roofs. Over an entire year, decreases in summer energy use typically exceed any wintertime increases. |