Sustainable Design Practices

The sustainability design guidelines are intended to provide additional guidance on sustainable practices for design and construction of site and building. The use of sustainable practices, when feasible should be the goal of new development.

The guidelines are separated into site design guidelines and building design guidelines. They are designed to encourage resource and energy conservation in new development and should be incorporated whenever possible.

Minor improvements can improve building efficiency.

SITE DESIGN

This section provides recommendations on sustainable practices that can be employed for site design for projects. The guidelines in this section can help reduce energy and water use resulting in lower maintenance and operating costs over the long run. These are not requirements, but a useful list of design recommendations that can be utilized to improve energy efficiency and conserve resources. Key components include:

- Landscaping to provide shade and reduce energy needs
- Planting and irrigation systems to conserve water
- Permeable paving to reduce stormwater runoff
- Lighting to achieve energy efficiency

Permeable paving can help reduce storm water run-off.

72 Site Elements

Design Principle

The proper selection of site elements, consisting of landscape materials, irrigation materials, hardscape materials, and lighting materials will promote a long-lasting, resource efficient, sustainable development.

Rationale

Landscape elements are crucial to the sustainability of new development. Site level landscape design and building design should be considered as a whole. Trees and shrubs provide numerous benefits, such as aesthetics, shade to people and buildings, stomwater management and reducing the heat island effect.

Sustainable site design is the first step in reducing the amount of irrigation required. To conserve water select native and drought tolerant plant species. In addition to plant selection, proper operation and maintenance of the irrigation system should be done regularly to conserve water.

Hardscape materials that are durable and long lasting can reduce maintenance costs and more aesthetically pleasing than asphalt or plain concrete. Permeable materials reduce storm water run off and allows water to infiltrate into the ground. Light colored materials help to reduce the heat island effect.

Design Guidelines

Landscape: Trees and Vegetation

Landscape elements such as trees, shrubs, and groundcovers should be used throughout new development to enhance site and building sustainability.

72-1 Tree and plant species should be suitable for the Sacramento climate. Drought tolerant and native species are highly encouraged.

72-2 Deciduous shade trees and shrubs should be planted, where appropriate, to shade the west and south sides of buildings/ homes and all paved areas to reduce heat transmission.

72-3 Use groundcovers to prevent ground reflection and keep the surface cooler, preventing re-radiation.

72-4 For buildings with exposed east and west sides, use vegetation along the east and west walls as it is the most effective way of minimizing heat gain.

Trees can provide shade as well as cool buildings.

Bio-swales collect stormwater runoff and improve run-off water quality.

Drip irrigation systems can reduce water use.

72-4 All planting areas, including those designed to accommodate the 2-foot overhang on parking spaces, should be landscaped with groundcover or other planting materials to reduce stormwater runoff.

72-5 Paved and hardscaped surfaces should be shaded by trees, shade structures, or photovoltaic solar panels, when possible, to reduce heat transmission and reduce energy consumption.

72-6 Deciduous shade trees and shrubs should be planted on the west and south sides of buildings and homes to minimize solar heat gain and increase energy efficiency.

72-7 Alternatives to turf, such as groundcovers that can tolerate foot traffic, are encouraged.

72-8 Use 3”-5” of wood chips or bark multch in planting beds to retain moisture, control weeds and to promote healthy soil.

72-9 Parking lot and building shading with deciduous trees can provide significant reductions in cooling requirements and reduce the urban heat island effect.

72-10 Provide rain gardens and stormwater planters to manage stormwater run-off from the disconnected drain spouts and impervious surfaces on-site. Ensure adequate space and design for water to drain to reduce opportunities for ponding and utilize splash pads to minimize erosion under the drain spout.

72-11 Ensure medium- to large-canopy trees are planted in the front yards of private development and in greenways, parks and plazas to serve as interceptor trees for rainfall, slowing and reducing the amount of rainfall that falls to the ground.

72-12 Meander swales to maximize surface area for treatment.

72-13 Encourage the use of landscaping with plants that can withstand pollutants and are effective in their removal. Explore grasses such as Juncus, Carex and Festuca are effective at removing pollutants and are attractive options for landscaping.

72-14 The use of drainage bio-swales is encouraged to reduce stormwater runoff and to provide for surface water infiltration and groundwater recharge. Bio-swales should be designed to avoid conflicts with the planting of large and medium canopy species trees.

Irrigation

Every attempt should be made to conserve water by reducing the amount of irrigation required to sustain the landscape.

66-16 Landscape design should incorporate measures to conserve water, including plant selection and consideration of subsurface or drip irrigation.

72-17 Irrigate plants in the evening or early morning, to reduce water loss to evaporation.

72-18 Adjust irrigation controllers for seasonal weather conditions.

72-19 Use a shorter two cycle watering schedule, instead of a single long schedule.

Hardscape Materials

Durability, permeability and color should be considered in the selection of hardscape materials.

72-20 Use of permeable paving materials, such as permeable asphalt, grasscrete, and modular pavers, are encouraged to reduce stormwater runoff. Where possible, drainage should be directed into planting areas to increase percolation of water runoff.

72-21 Light colored paving materials should be considered for use as primary paving materials to reduce heat transmission.

72-22 The use of pervious paving and bio-swales is encouraged to reduce stormwater runoff.

72-23 Light colored paving materials are preferred for primary paving materials to reduce heat transmission. Darker colors may be used in small amounts to add visual interest.

72-24 Minimize on-site impermeable surfaces, such as concrete, asphalt and hardscaping.

72-25 Utilize permeable pavers, porous concrete, porous asphalt, reinforced grass pavement (turf-crete), cobblestone block pavement etc. to detain and infiltrate run-off on-site.

72-26 Pervious hardscape materials that reduce the heat island effect and stormwater runoff are encouraged.

72-27 Use of paving materials with recycled content is encouraged.

72-28 Parking lots which are part of new developments with 1 acre or more of impervious area are generally required to provide treatment control measures that capture and treat stormwater runoff through settling, filtration, and /or biodegradation. Water treatment planters should not to conflict with tree planting per City parking lot design guidelines.

Lighting

72-29 Compact fluorescent bulbs and photocell sensors are encouraged to achieve energy efficiency.

72-30 Reduce light pollution at night by properly sizing exterior light fixtures.

72-31 Use solar powered light fixtures where appropriate.

Alternative surfaces such as grass pavers keep stormwater runoff on-site and reduce heat production.

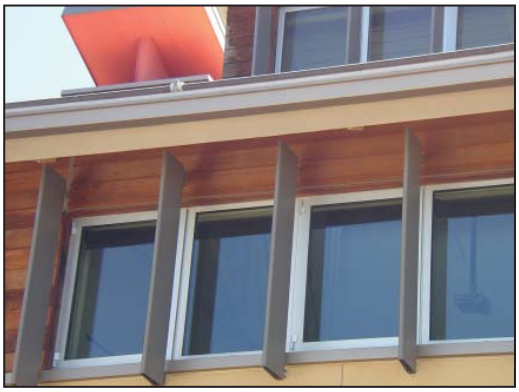
Modular pavers are another attractive alternative that helps to keep stormwater runoff onsite.

Compact fluorescent light (CFL) bulbs reduce energy use compared to typical incandescent bulbs.

BUILDING DESIGN

This section provides recommendations on sustainable practices that can be employed for the design of buildings. The guidelines in this section can help reduce energy and water use for buildings resulting in lower maintenance and operating costs over the long run. These are not requirements, but a useful list of design recommendations that can be utilized to improve energy efficiency and conserve resources. Key components include:

- Building orientation to reduce energy needs
- Passive cooling designs to reduce heat gain
- Building articulation to provide shading
- Types of windows and doors to improve energy efficiency
- Building materials that reduce air quality impacts and include recycled content



Building orientation can reduce energy needs.

73 Resource Conservation

Design Principle

New developments and rehabilitation of existing buildings should incorporate building design features that conserve resources.

Rationale

Attention to energy and resource conservation in design will lead to short- and long-term economically and environmentally sustainable development.

Design Guidelines

Energy: Building Orientation

73-1 Orient new buildings to minimize exposure to the southwest and west sun to minimize heat gain of buildings.

73-2 Orient new lots and buildings with the long axis along a north-south orientation to minimize heat gain.

73-3 Configure buildings in such as way as to create internal courtyards to trap cool air while still encouraging interaction with streets and open spaces.

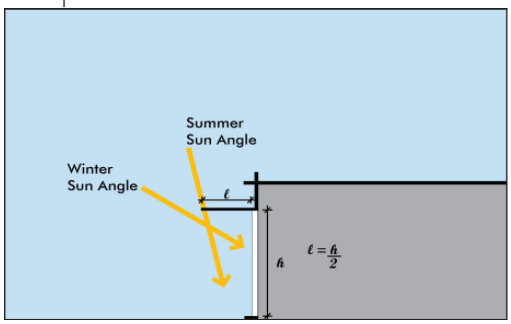
73-4 Minimize shade cast by buildings on greenways, parks and open spaces by stepping back upper floors on north-facing sides of buildings on the south-side of open spaces.

73-5 Massing design should provide opportunities for daylighting and solar panels. Glazing should be located predominantly on the north and south sides of the structure, with glazing on the west side of the structure minimized unless the west side is the street side.

73-6 Configure residential developments so that the majority of units minimize exposure to the south-west and west sun while still allowing plenty of light and ventilation from at least two sides in each unit.

73-7 Whenever possible, buildings should be oriented on the site to maximize solar access on southern exposures so that features such as photovoltaic solar panels and daylighting can be incorporated into the architectural design.

73-8 Solar access for daylighting and solar panels should be considered in massing design. Glazing should be located predominantly on the north and south sides of the structure. Glazing on the west side of the structure should be minimized, unless the west side of the structure is the street side.



Design and orient buildings to take advantage of the sun's angle to increase natural light, yet reduce heat gain.

Internal courtyards can help trap cool air.

Solar panels on southern exposures of buildings can reduce electricity use.

Awnings on south facing windows can reduce heat gain.

Energy: Passive Cooling

73-9 Plant deciduous trees on the south side of buildings to shade the south face and roof during the summer while allowing sunlight to penetrate buildings in the winter.

73-10 Minimize impervious surfaces that have large thermal gain. Plant groundcovers that prevent ground reflection and keep the surface cooler, preventing re-radiation.

73-11 For buildings with exposed east and west sides, use vegetation along the east and west walls as it is the most effective way of minimizing heat gain.

73-12 Use exterior shades and shade screens on east, west and south-facing windows as alternate methods for blocking sunlight.

73-13 Maximize natural cooling by installing high vents or open windows on the leeward side of the building to let the hottest air, near the ceiling, escape. In addition, create low open vents or windows on the windward side that accepts cooler air to replace the hotter air.

Energy: Building Articulation

73-14 Provide awnings, canopies and deep-set windows on south facing windows and entries to minimize heat gain.

73-15 Use exterior shades and shade screens on east, west and south-facing windows as alternate methods for blocking sunlight.

73-16 Use horizontal overhangs, awnings or shade shelters above south windows to block summer sun but allow winter sun. Encourage overhang width to equal half the window height to shade the window completely from early May to mid-August yet allow for winter sun.

73-17 For buildings with exposed east and west sides, provide vertical shading or fins.

73-18 Maximize natural cooling by installing high vents or open windows on the leeward side of the building to let the hottest air, near the ceiling, escape. In addition, create low open vents or windows on the windward side that accepts cooler air to replace the hotter air.

73-19 Ensure that leeward openings have substantially larger total area (50 to 100%) larger than those on the windward side to ensure adequate pressure to facilitate air movement.

73-20 Include high ceiling vaults and thermal chimneys to promote rapid air changes and to serve as architectural articulation for buildings.

73-21 Use wing walls (vertical solid panels placed along side of windows perpendicular to the wall on the windward side of the building) to accelerate the natural wind speed due to pressure differences.

Energy: Windows and Doors

73-22 Skylights are encouraged to daylight the interior floor area, thus reducing energy use and creating a more pleasant retail/ commercial environment.

73-23 Prismatic glazing is encouraged to increase the energy efficiency of skylights.

73-24 Windows should be oriented to maximize controlled daylighting from the south and north.

73-25 The use of insulating glazing such as LoE2 is encouraged to increase energy efficiency.

73-26 Daylighting should be incorporated into the architectural design of the home, where feasible, to increase energy efficiency.

73-27 Energy consumption of buildings can be reduced through design choices. Examples include building orientation that minimizes sun exposure on glazing, use of shade trees to reduce solar gain, reducing interior volume, using light colored roofing materials such as 'cool roof' coating, etc.

73-28 Install energy efficient lighting in public and private areas where feasible.

73-29 Install measures such as Energy Star rated roofs, strategically placed shade trees, shaded pavement and other landscaping to reduce site and building temperatures.

73-30 Where possible, include renewable energy measures such as photovoltaic (PV) roofs and ground source heat pumps. Avoid PV installations that conflict with trees or strategically located tree plantings as trees typically provide a wider range of environmental benefits than PV panels.

73-31 Where feasible, heating, ventilation, and air conditioning units should be placed on the north side of the building (if not the street side) to shade the units and minimize energy consumption.

73-32 LED's, Compact fluorescent bulbs and photocell sensors are encouraged to achieve energy efficiency.

73-33 Photovoltaic solar panels or solar shingles such as "solar slate" are encouraged to reduce the home's use of energy from conventional sources.

"Cool roof" options can achieve higher energy efficiency.
Photo Courtesy of Met Tile

Energy efficient windows can help reduce heating and cooling costs.
Photo by Greg Vojtko

The use of compact fluorescent bulbs can improve energy efficiency.

Green roofs can help capture rainwater for building reuse.

73-34 The use of “cool roof” options, including lighter colored roofing and reflective coatings, is encouraged to achieve energy efficiency.

Water

73-35 Encourage the use of intensive and extensive green roofs and water collection devices, such as cisterns and rain barrels, to capture rainwater from the building for re-use.

73-36 Utilize disconnected drain spouts to interrupt the direct flow of rainwater from the building to the stormwater system. Integrate these features to articulate building character.

Materials

73-37 Use recycled and sustainability harvested building materials wherever possible.

73-38 Use low voc paints and coatings when feasible, and avoid use of solvent and other materials that negatively impact air quality.

73-39 The use of materials that include recycled content is encouraged.

73-40 Reuse and recycling of materials, and selection of materials which are produced using sustainable methods such as plantation grown wood is encouraged.