



# LEED BD&C Version 3.0 (2009) Certification & Accreditation

## Session 2: Sustainable Sites

May 4, 2009

California Department of General Services

## Today's Agenda

- Construction pollution prevention
- Environmental site assessment
- Site selection
- Development density & brownfield redevelopment
- Alternative transportation & parking capacity
- Site development
- Stormwater design
- Heat island effect
- Light pollution
- Tenant Design & Construction Guidelines
- Site Masterplan
- Joint Use of Facilities

Sustainable Sites		NC	Schools	CS
		26 Pts.	24 Pts.	28 Pts.
Prereq 1	Construction Activity Pollution Prevention	Req'd	Req'd	Req'd
Prereq 2	Environmental Site Assessment	NA	Req'd	NA
Credit 1	Site Selection	1	1	1
Credit 2	Development Density & Community Connectivity	5	4	5
Credit 3	Brownfield Redevelopment	1	1	1
Credit 4.1	Alternative Transportation, Public Transportation Access	6	4	6
Credit 4.2	Alt. Transportation, Bicycle Storage & Changing Rooms	1	1	2
Credit 4.3	Alt. Transportation, Low-Emitting & Fuel-Efficient Vehicles	3	2	3
Credit 4.4	Alternative Transportation, Parking Capacity	2	2	2
Credit 5.1	Site Development, Protect or Restore Habitat	1	1	1
Credit 5.2	Site Development, Maximize Open Space	1	1	1
Credit 6.1	Stormwater Design, Quantity Control	1	1	1
Credit 6.2	Stormwater Design, Quality Control	1	1	1
Credit 7.1	Heat Island Effect, Non-Roof	1	1	1
Credit 7.2	Heat Island Effect, Roof	1	1	1
Credit 8	Light Pollution Reduction	1	1	1
Credit 9	Tenant Design & Construction Guidelines	NA	NA	1
Credit 9	Site Masterplan	NA	1	NA
Credit 10	Joint Use of Facilities	NA	1	NA

## SS Prereq. 1: Construction Activity Pollution Prevention

1. Req'd. for NC, Schools & CS
2. Construction Phase Credit
3. Intent

- Reduce pollution from construction activities by:
  1. Control soil erosion
  2. Reduce waterway sediments
  3. Reduce airborne dust



## SS Prereq. 1: Construction Activity Pollution Prevention

### 4. Requirements

- Create & implement Erosion & Sedimentation Control (ESC) Plan
  - a) Comply with 2003 EPA Construction General Permit

<http://cfpub.epa.gov/npdes/stormwater/cgp.cfm>

-or-

- b) Comply w/ local standard or code if more stringent



## SS Prereq. 1: Construction Activity Pollution Prevention

### 5. Strategies & Implementation

- Create Erosion & Sedimentation Control (ESC) Plan during design
  - a) Stabilization
    - Temporary & permanent seeding
    - Mulching
  - b) Structural Control
    - Silt fencing
    - Earth dike
    - Sedimentation traps/basins
    - Dust Control Measures



## SS Prereq. 1: Construction Activity Pollution Prevention

### 6. Documentation

- Copy of project drawings documenting erosion & sedimentation control measures
- Document implementation
  - Date-stamped photos
  - Inspection logs or reports
- Describe corrective actions taken



## SS Prereq. 2: Environmental Site Assessment

### 1. Req'd. only for Schools

### 2. Intent

- Ensure site is assessed for environmental contamination
- If contaminated, remediate to protect children's health



## SS Prereq. 2: Environmental Site Assessment

### 3. Requirements

- Conduct Phase I Environmental Site Assessment (ESA)
- If contamination is suspected, conduct Phase II ESA
  - School sites contaminated as past landfill are ineligible
  - Contaminated sites must be remediated
  - Must meet local, state or federal standards & documented to prove safe.



## SS Prereq. 2: Environmental Site Assessment

### 4. Strategies & Implementation

- Phase I ESA by professional
  - Review historic records
  - Site visit, interviews & report
  - If no signs of suspected contamination, no more testing required
- If Phase I suspects contamination:
  - Phase II ESA required
  - Further testing
  - Remediation required



## SS Prereq. 2: Environmental Site Assessment

### 5. Documentation

- Copies of executive summaries from all ASTM site assessments performed
- Description of any remediation efforts
- Copy of government documentation showing completion

## SS Credit 1: Site Selection

### 1. Credit for NC, Schools & CS

### 2. Design Phase Credit

### 3. Intent

- Avoid development of inappropriate sites
- Reduce environmental impact from locating building on site



## SS Credit 1: Site Selection

### 4. Requirements

- Do not develop buildings, hardscape, roads or parking on portions of sites that meet the following:
  - Prime Farmland
  - Undeveloped land <5' above FEMA's 100 yr. flood elevation
  - Habitat for threatened or endangered species
  - Within 100' of wetlands or within state or local wetlands setbacks
  - Undeveloped land within 50' of water body
  - Prior public parkland



## SS Credit 1: Site Selection

### 5. Strategies & Implementation

- During site selection, give preference to previously developed and non-sensitive sites
- Select suitable building location on site to minimize footprint and environmental impact



### 6. Documentation

- Confirm sited does not meet prohibited criteria
- Narrative(s) for any special circumstances

## SS Credit 2: Development Density & Community Connectivity

### 1. Credit for

- NC – 5 Points
- Schools – 4 Points
- CS – 5 Points

### 2. Design Phase Credit

- Aligns with LEED-O&M credit

### 3. Intent

- Channel development to urban areas w/ existing infrastructure
- Preserve natural habitats & greenfields



## SS Credit 2: Development Density & Community Connectivity

### 4. Requirements

- Option 1** – Development Density
  - Construct or renovate on previously developed site -and-
  - In community with density of 60,000 s.f./acre (Min. 2-story)
    - Playgrounds, playing fields, sports-related buildings excluded for schools



## SS Credit 2:

### 4. Requirements

- Option 2** – Community Connectivity
  - Construct or renovate on previous developed site – and –
  - Within ½ mile of residential zone (10 units per acre min.) – and –
  - Within ½ mile & ped. access of 10 commun. services



- |            |                  |                        |                        |
|------------|------------------|------------------------|------------------------|
| • Bank     | • Beauty         | • Convenience/grocery  | • Day care             |
| • Cleaners | • Fire station   | • Place of worship     | • Hardware             |
| • Laundry  | • Library        | • Senior care facility | • Post office          |
| • Park     | • Pharmacy       | • Medical/dental       | • Restaurants (2 max.) |
| • School   | • Supermarket    | • Community Center     | • Theater              |
| • Museum   | • Fitness center | • Etc.                 | • Etc.                 |

## SS Credit 2: Development Density & Community Connectivity

### 5. Strategies & Implementation

- During site selection, give preference to urban sites with higher densities and/or within walking distance of amenities



## SS Credit 2: Development Density & Community Connectivity

### 6. Documentation

- Enter site & building areas
- Check off compliance method
- **Density Option:**
  - Site vicinity plan for density option identifying density radius & properties
  - Complete density calculations
- Narrative for special circumstances

$$\text{Development Density} = \frac{\text{Gross Bldg. Area (sf)}}{\text{Site Area}}$$

$$\text{Density Radius} = 3 \times \sqrt{[\text{Site Area (Acres)} \times 43,560 \text{ (sf/acre)}]}$$

$$\text{Ave. Prop. Density within Density Boundary} = \frac{\sum \text{Square Footage}}{\sum \text{Site Area}}$$

## SS Credit 2: Community Connectivity

### 6. Documentation

#### Community Connectivity

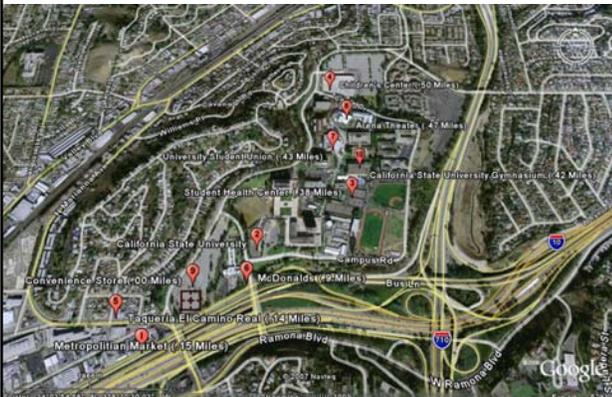
##### Option:

½ mile radius vicinity map for community connectivity option



Business Name	Service Type	Business Name	Service Type
1. Four Points Mortgage Corp	Bank	6. Ici Paints	Hardware
2. JK Market	Convenience Grocery	7. Arlington Dental Group	Dental
3. Corona Chem Dry	Cleaners	8. Roundup Restaurant	Restaurant
4. Hope Lutheran Church	Place of Worship	9. Law Office of Niswonger J	Office
5. Fernando Alvarez Hair Design	Beauty	10. Aurelia's Assisted Living for the Elderly	Senior Care

## Community Connectivity



## SS Credit 4.1: Public Transportation Access

### 1. Credit for

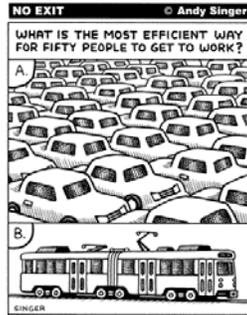
- **NC – 6 Points**
- **Schools – 4 Points**
- **CS – 6 Points**

### 2. Design Phase Credit

- Aligns with O&M credit

### 3. Intent

- Reduce pollution and land development impacts from automobile use.



## SS Credit 4.1: Public Transportation Access

### 4. Requirements

- **Option 1: Rail Station Proximity**
- Locate project within ½ mile walking distance of existing or planned and funded commuter rail, light rail or subway station.
- OR –
- **Option 2: Bus Stop Proximity**
- Locate project within ¼ mile walking distance of one or more stops for two or more public, campus or private bus lines usable by building occupants.
- Schools can count school bus system as 1 line



## SS Credit 4.1: Public Transportation Access

### 4. Requirements (cont.)

- **Option 3: Pedestrian Access for Schools**
- 80% of K-8 students within ¼ mile & 9-12 within 1 ½ miles
- Provide dedicated walking or biking lanes from school building(s) to end of school property
  - In 2 or more directions
- **Exemplary Performance:**
  1. Develop comprehensive Management Plan
  2. Double transit ridership
    - 2 rails or 4 bus lines
    - (min. 200 total transit rides/day from stops)



## SS Credit 4.1: Public Transportation Access

### 5. Strategies & Implementation

- Perform a transportation survey of future building occupants to identify transportation needs.
- Select sites w/ convenient access to public transit
- Look for functional access paths to transit from site
- For schools, analyze attendance boundary for walkability/bike traffic & give preference to safe accessible sites

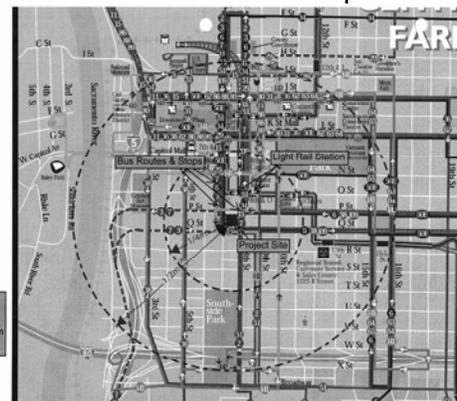


## SS Credit 4.1: Public Transportation Access

### 6. Documentation

- Check off compliance method
- Include site/vicinity drawing showing mass transit stops within ½ mile if rail, or ¼ mile if bus.
  - Label walking paths from building to transit
- Include description table for rail or bus stops
  - Distance to station
  - Name of line/route
- For schools option, identify on site plan 2 or more paths from building to property boundary toward bus/ped. paths

## SS Credit 4.1: Public Transportation Access



## SS Credit 4.2: Alternative Transportation Bicycle Storage & Changing Rooms

### 1. Credit for

- **NC – 1 Point**
- **Schools – 1 Point**
- **CS – 2 Points**

### 2. Design Phase Credit

### 3. Intent

- Reduce pollution and land development impacts from automobile use.



## SS Credit 4.2: Alternative Transportation Bicycle Storage & Changing Rooms

### 4. Requirements: NC

- **Case 1 – Commercial or Inst. Projects**
  - Secure bike racks and/or storage within 200 yds. of entrance for 5% of building users **-AND-**
  - Provide shower and changing facilities in bldg. or within 200 yds. for 0.5% of Full Time Equivalent (FTE) occupants.
- **Case 2 – Residential Projects**
  - Covered bike storage for 15% or more of building occupants



## SS Credit 4.2: Alternative Transportation Bicycle Storage & Changing Rooms

### 4. Requirements: CS

- **Case 1 – Commercial or Inst. Projects ≤300,000 s.f.**
  - Secure bike racks and/or storage within 200 yds. of entrance for 3% of building users (annual calculated average) **-AND-**
  - Provide shower and changing facilities in bldg. or within 200 yds. for 0.5% of Full Time Equivalent (FTE) occupants.
- **Case 2 – Commercial or Inst. Projects >300,000 s.f.**
  - Secure bike racks and/or storage within 200 yds. of entrance for 3% of building users for first 300K s.f. of bldg. + for 0.5% of addtl. occupants over 300K s.f. **-AND-**
  - Provide shower and changing facilities in bldg. or within 200 yds. for 0.5% of Full Time Equivalent (FTE) occupants.
- **Case 3 – Residential Projects**
  - Covered bike storage for 15% or more of building occupants

## SS Credit 4.2: Alternative Transportation Bicycle Storage & Changing Rooms

### 4. Requirements: Schools

- Secure bike racks and/or storage within 200 yds. of entrance for 5% of building staff & students above 3<sup>rd</sup> grade (peak periods) **-AND-**
- Provide shower and changing facilities in bldg. or within 200 yds. for 0.5% of Full Time Equivalent (FTE) staff **-AND-**
- Provide dedicated bike lanes to end of school property in 2 or more directions without barriers



## SS Credit 4.2: Alternative Transportation Bicycle Storage & Changing Rooms

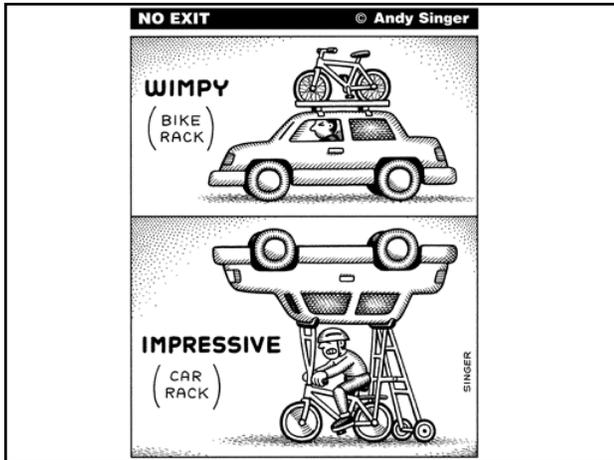
### 5. Strategies & Implementation

- Select site with convenient access to bicycle pathways
- Design building with transportation amenities such as bike racks, lockers, showering & changing facilities
- For schools, provide clear separation between cycle & vehicle traffic and well lit paths & storage

## SS Credit 4.2: Alternative Transportation Bicycle Storage & Changing Rooms

### 6. Documentation

- Check off case that applies
- Calculate FTE's for facility occupants or staff (FTE's = total occupant hours / 8)
- Calculate # of secure bicycle spaces
  - For schools, calculate staff, K-3, 4-12 for bike storage
- Calculate # of staff showering facilities (= FTE x 0.005)
- Include site/vicinity drawing showing bike locker area(s)
- Include building plan showing shower/changing area(s)
- Document each shower/changing and bike locker area
  - Distance to building entry
  - Covered if residential or secure if non-residential



### SS Credit 4.3: Alternative Transportation Low Emitting & Fuel Efficient Vehicles

#### 1. Credit for

- NC – 3 Points
- Schools – 2 Points
- CS – 3 Points

#### 2. Design Phase Credit

#### 3. Intent

- Reduce pollution and land development impacts from automobile use.



### SS Credit 4.3: Alternative Transportation Low Emitting & Fuel Efficient Vehicles

#### 4. Requirements

- **Option 1: (for NC & CS)** – Provide preferred parking for low-emitting & fuel efficient (LE/FE) vehicles
  - For 5% of total site parking capacity
  - Also acceptable is discounted parking rates (min. 20% for all customers) for at least 2 yrs.
  - Schools also to provide 1 designated carpool drop-off area for LE/FE vehicles






### SS Credit 4.3: Alternative Transportation Low Emitting & Fuel Efficient Vehicles

#### 4. Requirements

- **Option 2: (for NC & CS)** – Install alternative-fuel refueling stations
  - For 3% of total site parking capacity
- **(for Schools)**
  - Implement plan for buses and maint. Vehicles to use 20% CNG, propane or biodiesel or to be LE/FE vehicles




### SS Credit 4.3: Alternative Transportation Low Emitting & Fuel Efficient Vehicles

#### 4. Requirements

- **Option 3: (for NC)** – Provide low-emitting & fuel-efficient vehicles & preferred parking
  - For 3% of FTE occupants.
- **Option 4: (for NC)** – Provide occupants access to LE/FE vehicle sharing program
  - 1 LE/FE vehicle per 3% of FTE's (assuming 8/vehicle) or 1 vehicle for bldgs. <267 FTE's
  - 2 yr. min. vehicle sharing agreement
  - Narrative explaining program
  - Space located nearest to bldg.

## SS Credit 4.3: Alternative Transportation Low Emitting & Fuel Efficient Vehicles

### 5. Strategies & Implementation

- Consider providing transportation amenities such as alternative fuel refueling stations, LE/FE fleet vehicles, preferred parking
- Investigate trade-offs using alt. fuel in school vehicles

### 6. Documentation

- Check off compliance method
- Calculate FTE's or occupants for facility & quantities
- Include site plan showing total parking & designated parking or refueling locations
- Provide list of complying vehicles if provided for Option 3
- Include vehicle information for Option 4

## SS Credit 4.4: Alternative Transportation Parking Capacity

### 1. Credit for 2 Points for NC, Schools & CS

### 2. Design Phase Credit

### 3. Intent

- Reduce pollution and land development impacts from automobile use.



## SS Credit 4.4: Alternative Transportation Parking Capacity

### 4. Requirements

- **Case 1: (NC & CS Non-Residential)**
  - **Option 1:** Size parking capacity not to exceed minimum local zoning requirement – and –
    - Provide preferred carpool/vanpool parking for 5% of total parking
  - **Option 2:** For projects providing parking for ≤5% FTE's (for NC) or 5% FTE's (for CS), provide preferred parking for carpool/vanpool
    - Or 20% min. discounted parking for carpool/vanpool (2 yr. min.)
  - **Option 3:** Provide no new parking

## SS Credit 4.4: Alternative Transportation Parking Capacity

### 4. Requirements

- **Case 2: (NC & CS Residential)**
  - **Option 1:** Size parking capacity not to exceed minimum local zoning requirement – and –
    - Provide infrastructure & programs to facilitate shared vehicle use
  - **Option 2:** Provide no new parking
- **All CS Cases** – Refer to Appendix 1 for default occupancy count requirements

## SS Credit 4.4: Alternative Transportation Parking Capacity

### 4. Requirements

- **Schools**
  - **Option 1:** Size parking capacity not to exceed minimum local zoning requirement – and –
    - Provide preferred carpool/vanpool parking for 5% of total parking
  - **Option 2:** Provide no new parking
  - **Option 3:** For projects w/no min. zoning reqm't, provide 25% fewer parking spaces than *Institute of Transportation Engineers* (ITE) "Parking Generation" study

## SS Credit 4.4: Alternative Transportation Parking Capacity

### 5. Strategies & Implementation

- Minimize parking lot/garage size
- Consider shared parking facilities with other buildings
- Consider alternatives to single occupant vehicles

### 6. Documentation

- Check off compliance method
- Calculate parking spaces for building type
- Include site plan showing parking, carpool/vanpool
- Enter data for parking space quantities, zoning data
- Zoning data, if applicable
- Narratives describing compliance method used

## SS Credit 5.1: Site Development: Protect or Restore Habitat

1. Credit for NC, Schools & CS
2. Construction Phase Credit
3. Intent
  - Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity



## SS Credit 5.1: Site Development: Protect or Restore Habitat

### 4. Requirements

- **Case 1** – Greenfield Sites
  - Limit site disturbance to 40 feet beyond building perimeter
  - 10 ft. beyond walkways, patios, parking & utilities <12”D.
  - 15 feet beyond roadway curbs & main utilities
  - 25 feet beyond constructed permeable areas including pervious paving, stormwater detention, playing fields



## SS Credit 5.1: Site Development: Protect or Restore Habitat

### 4. Requirements

- **Case 2** – Previously Developed or Graded Sites
  - Restore or protect 50% min. of site area (excl. bldg. footprint) - **OR** -
  - 20% min. of site area (incl. bldg. footprint),
  - Whichever is greater, with native or adaptive vegetation
  - Vegetated (green) roofs can count toward this area if using native or adaptive vegetation (SS c2)

\***Exemplary Performance** for using 75% or 30% thresholds, respectively

## SS Credit 5.1: Site Development: Protect or Restore Habitat

### 5. Strategies & Implementation

- On greenfield sites carefully site building to minimize disruption of existing ecosystems
- Clearly mark construction boundaries to avoid disruption
- On previously developed sites, research native and/or adaptive plant materials, which in turn require less or no water, less maintenance, etc.
- Monoculture plantings (e.g., turf) cannot contribute
- Consider vegetated roof where sites are tight
- Consider placing parking under building

## SS Credit 5.1: Site Development: Protect or Restore Habitat

### 6. Documentation

- For Greenfield sites, develop site plans demarcating disturbance boundaries
- For previously developed or graded sites (Case 2) calculate both conditions:
  - 50% of site area excluding footprint
  - 20% of site area including footprint
  - Larger number is min. area needing to be restored or protected
  - List native or adaptive plant species
  - Include site development and landscaping plans showing extent of development, protection & planting

## SS Credit 5.2: Site Development: Maximize Open Space

1. Credit for NC, Schools & CS
2. Design Phase Credit
3. Intent

- Promote biodiversity by providing a high ratio of open space to development footprint



## SS Credit 5.2: Site Development: Maximize Open Space

### 4. Requirements

- **Case 1 - Sites w/ Local Zoning Open Space Reqmts.:**
  - Exceed Local Open Space Zoning Requirements by 25%
- **Case 2 – Sites w/ No Local Zoning Requirements:**
  - Vegetated open space  $\geq$  building footprint (adjacent to bldg.)
- **Case 3 – Sites w/ Zoning but no Open Space Reqmts.:**
  - Vegetated open space  $\geq$  20% of project's site area
- **All Cases**
  - Projects earning SS c2 can count ped.-oriented hardscape areas for  $\leq$ 75% of total, or vegetated roofs areas
  - Wetlands or ponds may count if  $\leq$ 1:4 slopes are vegetated
- ★ Innovation credit available if open space required is doubled
  - i.e. 50% > zoning reqmts; > 2x footprint; or  $\geq$  40% of site area if no open space required

## SS Credit 5.2: Site Development: Maximize Open Space

### 5. Strategies & Implementation

- Survey site elements & develop master plan of project site.
- Select suitable building location with footprint minimizing site disruption.
- Consider
  - Multi-story construction
  - Parking beneath building
  - Shared facilities w/ neighbor sites

## SS Credit 5.2: Site Development: Maximize Open Space

### 6. Documentation

- Check off compliance path
- **Case 1 – Exceed zoning reqm't by 25%**
  - Enter open space zoning requirement
  - Enter vegetated open space provided
- **Option 2 – No local zoning reqm't**
  - Enter building footprint area
  - Enter larger vegetated open space provided
- **Option 3 – No open space reqm't**
  - Enter project area
  - Enter vegetated open space provided
- Include site plan highlighting qualifying open space

## SS Credit 6.1: Stormwater Design, Quantity Control

### 1. Credit for NC, Schools & CS

### 2. Design Phase Credit

### 3. Intent

- Limit disruption of natural hydrology by:
  - Reducing impervious cover
  - Increasing on-site infiltration
  - Reducing or eliminating pollution from stormwater runoff & eliminating pollutants



## SS Credit 6.1: Stormwater Design, Quantity Control

### 4. Requirements

- **Case 1 – Existing Imperviousness  $\leq$ 50%**
  - **Option 1** – Implement stormwater mgmt. plan keeping post-development peak discharge rate & quantity  $\leq$  pre-development levels
  - or –
  - **Option 2** - Implement stormwater mgmt. plan protecting stream channels from excessive erosion (strategy for quantity control & protection).
- **Case 2 – Existing Imperviousness >50%**
  - Implement stormwater management plan resulting in 25% decrease in volume of stormwater runoff from two-year 24-hour design storm.



## SS Credit 6.1: Stormwater Design, Quantity Control

### 5. Strategies & Implementation

- Reduce imperviousness
- Design project site to maintain natural stormwater flows, promoting infiltration
- Consider:
  - Pervious pavement
  - Bio-swales
  - Vegetated (green) roofs
  - Harvesting stormwater for reuse for irrigation, toilet & urinal flushing



## SS Credit 6.1: Stormwater Design, Quantity Control

### 6. Documentation

- **Case 1 – Existing Imperviousness ≤50%**
  - **Option 1** – Calculate pre and post-development discharge runoff rates (cfs) and runoff quantities (cf)
  - Use one- & two-year 24-hour design storms
  - or -
  - **Option 2** - Provide narrative describing site conditions, erosion control measures & controls used to protect stream channels from erosion
- **Case 2 – Existing Imperviousness >50%**
  - Provide narrative describing site conditions, erosion control measures & controls

## SS Credit 6.2: Stormwater Design, Quality Control

### 1. Credit for NC, Schools & CS

### 2. Design Phase Credit

### 3. Intent

- Limit disruption and pollution of natural water flows by managing stormwater runoff



## SS Credit 6.2: Stormwater Design, Quality Control

### 4. Requirements

- Implement stormwater management plan
  - Reducing impervious cover
  - Promoting infiltration
  - Capture and treat stormwater runoff from 90% of average rainfall using acceptable Best Management Practices (BMP's)
  - BMP's treating runoff must be capable of removing 80% of average post-development Total Suspended Solids (TSS) if
    - Designed in accordance w/ state or local standards and specs - OR -
    - Infield performance monitoring data demonstrates compliance

## SS Credit 6.2: Stormwater Design, Quality Control

### 5. Strategies & Implementation

- Use alternative surfaces
  - Vegetated (green) roofs,
  - Pervious pavement, open-grid pavers
- Non-structural techniques
  - Vegetated bio-swales & filters
  - Constructed wetlands & Rain gardens
  - Usually less expensive measures
- Structural techniques
  - Rainwater cisterns
  - Manhole treatment devices & ponds
  - Preferred on urban or constrained sites
- Reduced building footprint & impervious areas



## SS Credit 6.2: Stormwater Design, Quality Control

### 6. Documentation

- Identify & describe Best Management Practices (BMP's) & percent of annual rainfall volume treated by BMP's
  - Non-structural controls
  - Structural controls – list & describe each measure & percent of pollutant removal

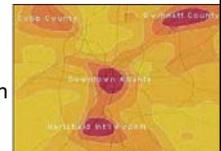
## SS Credit 7.1: Heat Island Effect: Non-Roof

### 1. Credit for NC, Schools & CS

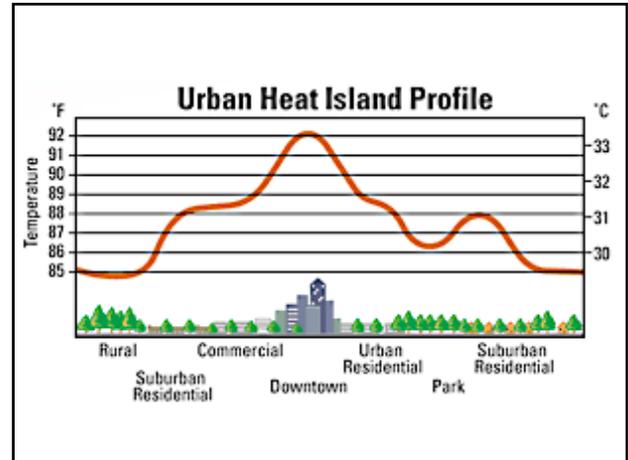
### 2. Construction Phase Credit

### 3. Intent

- Reduce heat islands to minimize impact on microclimate and human and wildlife habitat
- **Heat island** = Thermal gradient differences between developed and undeveloped areas
- <http://www.epa.gov/heatisland/about/videos.html>



## Thermal Images of Sacramento



## SS Credit 7.1: Heat Island Effect: Non-Roof

### 4. Requirements

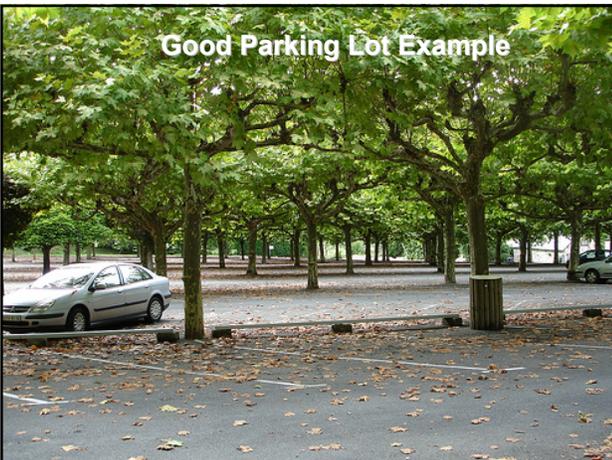
- **Option 1** – Combination of Strategies for 50% of Site Hardscape
  - (roads, sidewalks, courtyards, parking lots)
  - a) Shade from trees (within 5 years of occupancy)
  - b) Shade from structures covered by solar panels
  - c) Shade from arch. Devices or structures with **Solar Reflectance Index (SRI)  $\geq 29$**
  - d) Hardscape materials with **SRI  $\geq 29$**
  - e) Open Grid Pavement  $\geq 50\%$  pervious
- **Option 2** – Covered Parking  $\geq 50\%$ 
  - Under deck, under roof  $\geq$ SRI29, or PV's, or vegetated
- ★ Innovation Point for achieving 100%



## Bad Parking Lot Example



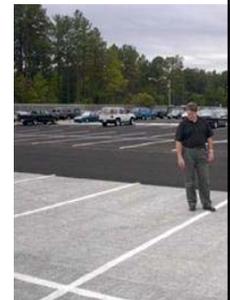
## Good Parking Lot Example



## SS Credit 7.1: Heat Island Effect: Non-Roof

### 5. Technologies & Strategies

- Shade constructed surfaces on site with landscape features
- Utilize high reflectance materials for hardscape
- Consider replacing constructed surfaces with open grid paving
- Consider covering parking with cool reflective roof or PV's
- Can use default table on pg. 112
- Reduce hardscape area



## High Reflectant Pavement

Reflectant pavement also is easier to light at night



## SS Credit 7.1: Heat Island Effect: Non-Roof

### 6. Documentation

- Attach drawings to show defined site areas, building footprint, hardscape, landscape plans (including shading)
  - Identify paving materials, shaded parking, and/or underground or covered parking
- **Option 1** – Combination of Strategies for 50% of Site Hardscape
  - Indicate SRI value for each paving material installed
  - Select paving materials from standard list of reflective materials and/or enter values into Paving Materials Table Calculator
  - Enter respective parking area & total calculations
  - Enter hardscape area expected to be shaded within 5 years

## SS Credit 7.1: Heat Island Effect: Non-Roof

### 6. Documentation

- **Option 2** – Covered Parking  $\geq 50\%$ 
  - Verify the roof material covering for shaded parking has an SRI  $\geq 29$ , PV's or green roof
  - Calculate total number of parking spaces and those under cover
  - Calculate percentage
- Narrative for any special circumstances



## SS Credit 7.2: Heat Island Effect: Roof

1. Credit for NC, Schools & CS
2. Design Phase Credit
3. Intent

- Reduce heat islands to minimize impacts on microclimates and human and wildlife habitats



## SS Credit 7.2: Heat Island Effect: Roof

### 4. Requirements/Documentation

- **Option 1** – Reflective Roofing Materials for 75% min. of Roof Surface
  - Low-pitched roofs  $\leq 2:12 = \text{SRI} \geq 78$
  - Low-pitched roofs  $\geq 2:12 = \text{SRI} \geq 29$
  - See SRI table pg. 122 for typical roofing materials in Reference Guide
- **Option 2** – Vegetated (Green) Roof covering  $\geq 50\%$  of roof area
  - Enter total area of installed green roof system



## SS Credit 7.2: Heat Island Effect: Roof

### 4. Requirements/Documentation

- **Option 3** – Combined Reflective Roof & Green Roof Systems
  - $(\text{area of SRI roof} / 0.75) + (\text{area of vegetated roof} / 0.5) \geq \text{Total Roof Area}$
  - Enter areas of each roofing system(s)
  - Attach project roof plan(s) showing roof areas & identifying specific reflective roofing material or vegetate roof.
  - Complete Roofing Materials Table(s)
  - Narrative for any special circumstances
- ★ Innovation Point for achieving 100% vegetated roof (excluding any mech. equip, PV's & skylights)

## SS Credit 7.2: Heat Island Effect: Roof

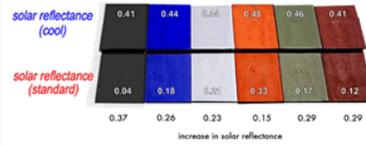
### 5. Strategies & Implementation

- Consider installing high-albedo and/or vegetated roofs to reduce heat absorption.
- Use default values from Reference Guide pg. 122 or other references
- Roof coatings also apply
- Consider cool color (infrared reflective) roof



## Cool Colors

[www.coolcolors.lbl.gov](http://www.coolcolors.lbl.gov)



courtesy American Pacific Coatings



LDS Conference Center, Salt Lake City



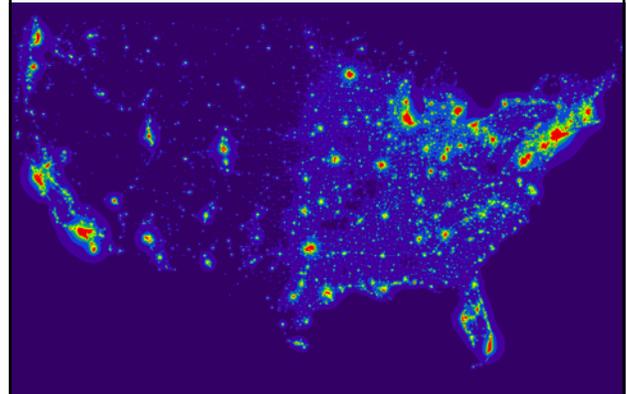
California Academy of Sciences  
San Francisco



## SS Credit 8: Light Pollution Reduction



## SS Credit 8: Light Pollution Reduction



## SS Credit 8: Light Pollution Reduction

1. Credit for NC, Schools & CS
2. Design Phase Credit
3. Intent

- Minimize light trespass from building and site
- Reduce sky-glow to increase night sky access
- Improve nighttime visibility through glare reduction
- Reduce development impact on nocturnal environments



## SS Credit 8: Light Pollution Reduction

### 4. Requirements/Documentation

- **For Interior Lighting**
  - **Option 1** – Reduce input power (by automatic device) of all nonemergency int. luminaires w/ direct line of sight to envelope openings by  $\geq 50\%$  11 PM-5 AM
    - Manual override on max. 30 min. timer for after hours can be provided (24 hour operations exempt)
    - Include including lighting drawings, fixture schedules, timers
  - **or** -
  - **Option 2** - All openings in envelope w/direct line of site to any nonemergency luminaires must have automatic shielding resulting in  $<10\%$  transmittance 11 PM – 5 AM



## SS Credit 8: Light Pollution Reduction

### 4. Requirements/Documentation

- **For Exterior Lighting**
  - Only light areas as required for safety and comfort
  - Lighting power densities must not exceed ANSI/ASHRAE/IESNA 90.1-2007 for classified zone
  - **Classify project and follow requirements per IESNA RP-33**
  - **LZ1 – Dark** (Park and Rural Setting)
  - **LZ2 – Low** (Residential Area, neighborhood business districts)
  - **LZ3 – Medium** (Commercial/Industrial, High Density Resid.)
  - **LZ4 – High** (Major City Centers, Entertainment Districts)
  - Schools Sports fields are excluded from requirements, but must have automatic shutoff by 11:00 PM w/ manual override.



## SS Credit 8: Light Pollution Reduction

### 5. Strategies & Implementation

- Utilize indirect interior lighting or automated non-emergency lighting shutoff controls
- Adopt site lighting criteria to maintain safety levels & avoid off-site lighting & night sky pollution
- Minimize site lighting where possible & model site lighting w/ computer model
- Use full cutoff luminaires, low reflectance surfaces and low-angle spotlights



## SS Credit 9: Tenant Design & Construction Guidelines

1. Credit only for CS
2. Design Phase Credit
3. Intent

- Educate tenants about implementing sustainable design and construction features in their tenant improvement build-out



## SS Credit 9: Tenant Design & Construction Guidelines (CS)

### 4. Requirements/Documentation (for CS only)

- Publish an illustrated document that provides tenants with design & construction information:
  - Description of sustainable features in core & shell project & goals of project, including those for tenant spaces
  - Info on LEED for Interior Design & Construction (ID&C) & how the CS building contributes to achieving these credits
  - Recommendations, including examples, for sustainable strategies, materials, products & services
  - Info enabling tenants to coordinate space design & const. with core & shell bldg. systems & specific applicable ID&C credits:
    - Water use reduction
    - Optimize energy performance
    - Energy use & metering
    - Measurement & verification, etc., etc., etc.

## SS Credit 9: Tenant Design & Construction Guidelines (CS)

### 5. Strategies & Implementation

- Tenant design & construction guidelines must include:
  - Reduced water use
  - Optimize energy performance (lighting power & controls, HVAC)
  - Energy use & metering & Commissioning
  - Measurement & verification
  - Ventilation & outdoor air delivery
  - Construction indoor air quality management
  - Indoor chemical & pollutant source control & ETS
  - Controllability of systems
  - Thermal comfort
  - Daylighting & views
  - Recommendation for sustainable strategies, products, materials

## SS Credit 9: Site Master Plan



1. Credit only for Schools
2. Design Phase Credit
3. Intent

- Ensure that the environmental site issues included in the initial development of site and project are continued throughout future development caused by changes in programs or demography.

## SS Credit 9: Site Master Plan (Schools)

### 4. Requirements/Documentation (Schools only)

- Project must achieve at least 4 of 7 credits:
  1. SS-Credit 1: Site Selection
  2. SS Credit 5.1: Site Development – Protect or Restore Habitat
  3. SS Credit 5.2: Site Development – Maximize Open Space
  4. SS Credit 6.1: Stormwater Design – Quantity Control
  5. SS Credit 6.2: Stormwater Design – Quality Control
  6. SS Credit 7.1: Heat Island Effect – Nonroof
  7. SS Credit 8: Light Pollution Reduction
- Achieved credits req'd to be recalculated using masterplan
- Site Master Plan developed in collaboration w/ School Bd.
  - Previous sustainable measures should be considered in Plan
  - Must include current const. activity plus future construction that affects site.
  - Must also include parking, paving & utilities

## SS Credit 9: Site Master Plan (Schools)

### 5. Strategies & Implementation

- Masterplan should include:
  - Community centers
  - Fields
  - Libraries
  - Parks
  - Wetlands
- Work with community & school board
- Consider enrollment & growth (or decline) projections

## SS Credit 10: Joint Use of Facilities (Schools)

1. Credit only for Schools
2. Design Phase Credit
3. Intent

- Make the school a more integrated part of the community by enabling the building and its playing fields to be used for nonschool events and functions.



## SS Credit 10: Joint Use of Facilities (Schools)

### 4. Requirements/Documentation

- **Option 1** – In collaboration w/ school board, ensure that at least 3 of the following spaces included in the school are accessible & available by the general public:
  - Auditorium
  - Gymnasium
  - Cafeteria/cafetorium
  - 1 or more classrooms
  - Playing fields
  - Joint parking

Provide separate entry for spaces intended for joint use

- Can be from a school lobby or corridor accessible after normal business hours & with toilets available

- OR -

## SS Credit 10: Joint Use of Facilities (Schools)

### 4. Requirements/Documentation

- **Option 2** – In collaboration w/ school board, engage in a contract with community or other organizations to provide at least 2 dedicated-use spaces in the building:

- Commercial office
- Health clinic
- Community service centers (state, city or county offices)
- Police offices
- Library or media center
- Parking lot
- One or more commercial sector businesses

Provide separate entry for spaces intended for joint use

- Can be from a school lobby or corridor accessible after normal business hours & with toilets available

- OR -

## SS Credit 10: Joint Use of Facilities (Schools)

### 4. Requirements/Documentation

- **Option 3** – In collaboration w/ school board, ensure that at least 2 of the following 6 spaces that are owned by other organizations/agencies are accessible to students:
  - Auditorium
  - Gymnasium
  - Cafeteria/cafetorium
  - 1 or more classrooms
  - Playing fields
  - Joint parking
- Provide direct ped. access to these spaces from the school.
- Provide signed agreements w/ other organizations or agencies stipulating how spaces will be shared.

## SS Credit 10: Joint Use of Facilities (Schools)

### 5. Strategies, Implementation & Documentation

- Joint use agreements benefit both schools and the community
- For schools with 3 shared public spaces
  - List shared spaces
  - Depict doors or security gates & restrooms on drawings
  - Retain evidence of communications & public notifications
- For schools w/ 2 dedicated-use spaces
  - List shared spaces
  - Depict doors or security gates & restrooms on drawings
  - Retain copy of joint-use contract or agreement
  - Develop drawing showing pedestrian access

\* **Exemplary Performance for meeting 2 of 3 categories**

## Study References for Today's & Next Week's Classes

### LEED BD&C Reference Guide

- 5/4 AM: Intro (pp i-xxv)
- 5/4 PM: Sustainable Sites (pp. 1-159)
- 5/11 AM: Water Efficiency pp 161-212
- 5/11 AM: Multiple Building Application Guide  
[www.usgbc.org/ShowFile.aspx?DocumentID=1097](http://www.usgbc.org/ShowFile.aspx?DocumentID=1097)
- 5/11 AM: Energy and Atmosphere (pp. 213-333)
- 5/11 PM: Materials & Resources (pp. 335-400)