

5. Appendix A: Cost Implications by LEED Credit

5.1 SUSTAINABLE SITES

5.2 WATER EFFICIENCY

5.3 ENERGY AND ATMOSPHERE

5.4 MATERIALS AND RESOURCES

5.5 INDOOR ENVIRONMENTAL QUALITY

VA Project Start Point LEED-CI

Credits highlighted in green indicate Federal Mandates

| 0 0 0 Total Project Score | | Possible Points | | Possible Points |
|--|--|-----------------|----|-----------------|
| 0 | 0 | 0 | 0 | 57 |
| Certified 21 - 26 points Silver 27 - 31 points Gold 32 - 41 points Platinum 42 + points | | | | |
| 0 0 0 Sustainable Sites | | Possible Points | | Design/Constr. |
| Y | ? | N | | 14 |
| Prereq 1 | Erosion and Sedimentation Control | Construction | 0 | |
| Credit 1.1 | Site Selection, Stormwater, Irrigation, Water Use Reduction | Design | 2 | |
| Credit 1.2 | Site Selection | Design | 1 | |
| Credit 1.3 | Development Density and Community Connectivity | Design | 1 | |
| Credit 3.1 | Alternative Transportation, Public Transportation Access | Design | 1 | |
| Credit 3.2 | Alternative Transportation, Bicycle Storage and Changing Rooms | Design | 1 | |
| Credit 3.3 | Alternative Transportation, Parking Availability | Design | 1 | |
| 0 | 0 | 0 | 2 | Possible Points |
| Y | ? | N | | |
| Prereq 1 | Water Efficiency | Design | 1 | |
| Credit 1.1 | Water Use Reduction, 20% Reduction | Design | 1 | |
| Credit 1.2 | Water Use Reduction, 30% Reduction | Design | 1 | |
| 0 | 0 | 0 | 12 | Possible Points |
| Y | ? | N | | |
| Prereq 1 | Energy & Atmosphere | Construction | 0 | |
| Prereq 2 | Fundamental Building Systems Commissioning | Design | 0 | |
| Prereq 3 | Minimum Energy Performance | Design | 0 | |
| Credit 1.1 | CFC Reduction in HVAC&R Equipment | Design | 3 | |
| Credit 1.2 | Optimize Energy Performance, Lighting Power | Design | 1 | |
| Credit 1.3 | Optimize Energy Performance, Lighting Controls | Design | 2 | |
| Credit 1.4 | Optimize Energy Performance, HVAC | Design | 2 | |
| Credit 1.5 | Optimize Energy Performance, Equipment and Appliances | Design | 2 | |
| Credit 1.6 | Enhanced Commissioning | Construction | 1 | |
| Credit 1.7 | Energy Use, Measurement and Payment, Accountability | Construction | 2 | |
| Credit 4 | Green Power | Construction | 1 | |
| 0 | 0 | 0 | 5 | Possible Points |
| Y | ? | N | | |
| Credit 1.1 | Innovation in Design: Integrated Design | TBD | 1 | |
| Credit 1.2 | Innovation in Design: Specific Title | TBD | 1 | |
| Credit 1.3 | Innovation in Design: Specific Title | TBD | 1 | |
| Credit 1.4 | Innovation in Design: Specific Title | TBD | 1 | |
| Credit 2 | LEED™ Accredited Professional | Design | 1 | |
| Materials & Resources | | | | |
| Y | ? | N | | 17 |
| Prereq 1 | Storage and Collection of Recyclables | Design | 0 | |
| Credit 1.1 | Tenant Space, Long Term Commitment | Design | 1 | |
| Credit 1.2 | Building Reuse, Maintain 40% of Interior Non-Structural Components | Construction | 1 | |
| Credit 1.3 | Building Reuse, Maintain 60% of Interior Non-Structural Components | Construction | 1 | |
| Credit 2.1 | Construction Waste Management, Divert 50% | Construction | 1 | |
| Credit 2.2 | Construction Waste Management, Divert 75% | Construction | 1 | |
| Credit 3.1 | Resource Reuse, Specify 5% | Construction | 1 | |
| Credit 3.2 | Resource Reuse, Specify 10% | Construction | 1 | |
| Credit 3.3 | Resource Reuse, 30% Furniture and Furnishings | Construction | 1 | |
| Credit 4.1 | Recycled Content, Specify 10% | Construction | 1 | |
| Credit 4.2 | Recycled Content, Specify 20% | Construction | 1 | |
| Credit 5.1 | Local/Regional Materials, 20% Manufactured Regionally | Construction | 1 | |
| Credit 5.2 | Local/Regional Materials, 10% Extracted & Manufactured Regionally | Construction | 1 | |
| Prereq 1 | Rapidly Renewable Materials | Construction | 1 | |
| Prereq 2 | Certified Wood | Construction | 1 | |
| 0 | 0 | 0 | 17 | Possible Points |
| Y | ? | N | | |
| Prereq 1 | Indoor Environmental Quality | Design | 0 | |
| Prereq 2 | Minimum IAQ Performance | Design | 0 | |
| Prereq 3 | Environmental Tobacco Smoke (ETS) Control | Design | 0 | |
| Credit 1 | Outdoor Air Delivery Monitoring | Design | 1 | |
| Credit 2 | Increased Ventilation | Design | 1 | |
| Credit 3.1 | Construction IAQ Management Plan, During Construction | Construction | 1 | |
| Credit 3.2 | Construction IAQ Management Plan, Before Occupancy | Construction | 1 | |
| Credit 4.1 | Low-Emitting Materials, Adhesives & Sealants | Construction | 1 | |
| Credit 4.2 | Low-Emitting Materials, Paints and Coatings | Construction | 1 | |
| Credit 4.3 | Low-Emitting Materials, Carpet Systems | Construction | 1 | |
| Credit 4.4 | Low-Emitting Materials, Composite Wood & Laminate Adhesives | Construction | 1 | |
| Credit 4.5 | Low-Emitting Materials, Systems Furniture and Seating | Construction | 1 | |
| Credit 5 | Indoor Chemical & Pollutant Source Control | Construction | 1 | |
| Credit 6.1 | Controllability of Systems, Lighting | Design | 1 | |
| Credit 6.2 | Controllability of Systems, Temperature and Ventilation | Design | 1 | |
| Credit 7.1 | Thermal Comfort, Compliance | Design | 1 | |
| Credit 7.2 | Thermal Comfort, Monitoring | Design | 1 | |
| Credit 8.1 | Daylight & Views, Daylight 75% of Spaces | Design | 1 | |
| Credit 8.2 | Daylight & Views, Daylight for 90% of Spaces | Design | 1 | |
| Credit 8.3 | Daylight & Views, Views for 90% of Seated Spaces | Design | 1 | |

5. Appendix A: Cost Implications by LEED Credit

This section supplements information found in Section 2, *Mapping the Federal Mandates to LEED*. In this section, each LEED credit is reviewed individually and the overall likely cost effect is documented for the following categories: construction cost, design and construction management cost, and documentation cost. The section is organized by LEED-NC requirements with tracking to appropriate LEED-CI credits.

5.1 SUSTAINABLE SITES

LEED-CI credits for Sustainable Sites are similar in requirements to the LEED-NC credits, but points are structured differently, and awarded in a different manner. Because of this, LEED-NC and LEED-CI Sustainable sites are addressed separately.

LEED-NC

- **SS Prerequisite 1: Construction Activity Pollution Prevention**

LEED-NC

Create and implement an Erosion and Sedimentation Control (ESC) Plan for all construction activities associated with the project. The ESC Plan shall conform to the erosion and sedimentation requirements of the 2003 EPA Construction General Permit OR local erosion and sedimentation control standards and codes, whichever is more stringent.

In order to comply, it is necessary to develop a compliant site sedimentation and erosion control plan. These plans are mandatory in many parts of the country. Compliance with this credit is generally within customary practices for design and construction teams.

In most cases, this credit has no construction or design and construction management cost impact. The standards and technologies required for this point are standard to most projects; if not, they are achieved at minimal added cost. The credit can generate a very small reduction in overall construction costs by reducing cleanup and corrective action which would otherwise arise following significant storm events.

| Overall Likely Cost Effect: SS Prerequisite 1 | |
|---|------|
| Construction Cost | None |
| Design and Construction Management Cost | None |
| Documentation | None |

- **SS 1: Site Selection**

LEED-NC

Do not develop buildings, hardscape, roads or parking areas on portions of sites that meet any one of the following criteria:

- *Prime farmland as defined by the United States Department of Agriculture in the United States Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5 (citation 7CFR657.5)*

- *Previously undeveloped land whose elevation is lower than 5 feet above the elevation of the 100-year flood as defined by FEMA (Federal Emergency Management Agency)*
- *Land that is specifically identified as critical habitat for any species on Federal or State threatened or endangered lists*
- *Within 100 feet of any wetlands as defined by United States Code of Federal Regulations 40 CFR, Parts 230-233 and Part 22, and isolated wetlands or areas of special concern identified by state or local rule, OR within setback distances from wetlands prescribed in state or local regulations, as defined by local or state rule or law, whichever is more stringent*
- *Previously undeveloped land that is within 50 feet of a water body, defined as seas, lakes, rivers, streams and tributaries which support or could support fish, recreation or industrial use, consistent with the terminology of the Clean Water Act*
- *Land which prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is accepted in trade by the public landowner (Park Authority projects are exempt)*

Most healthcare site selection is driven by a wide range of factors, and appropriateness of the site is usually a result of, not a driver of the site selection. Because of this, the credit is usually suited to urban projects where the site happens to comply, and not to rural/suburban projects where the requirements are more likely to be violated.

There are typically no construction or design and construction management costs associated with the credit, since there is no mitigation other than avoiding non-compliant sites. However, choice of location can affect feasibility and cost of sustainable design measures, and thus overall project costs. Rural sites are more likely to be noncompliant with this credit, and possible increased construction costs in such cases would be related to land value where appropriate sites are available at an added cost.

| Overall Likely Cost Effect: SS 1 | |
|---|---------|
| Construction Cost | |
| Urban | None |
| Rural | <0.1% |
| Design and Construction Management Cost | None |
| Documentation | <40 hrs |

▪ **SS 2: Development Density and Community Connectivity**

LEED-NC

OPTION 1 — DEVELOPMENT DENSITY

Construct or renovate building on a previously developed site AND in a community with a minimum density of 60,000 square feet per acre net (Note: density calculation must include the area of the project being built and is based on a typical two-story downtown development).

OPTION 2 — COMMUNITY CONNECTIVITY

Construct or renovate building on a previously developed site AND within 1/2 mile of a residential zone or neighborhood with an average density of 10 units per acre net AND within 1/2 mile of at least 10 Basic Services AND with pedestrian access between the building and the services.

As with SS 1, this credit is usually a result of, rather than a driver of site selection, and credit compliance is a consequence of other factors. As a result the credit is usually suited to urban projects where the site happens to comply, and not to rural/suburban projects.

| | |
|---|---------|
| Overall Likely Cost Effect: SS 2 | |
| Construction Cost | None |
| Design and Construction Management Cost | None |
| Documentation | <40 hrs |

■ **SS 3: Brownfield Redevelopment**

LEED-NC

Develop on a site documented as contaminated (by means of an ASTM E1903-97 Phase II Environmental Site Assessment or a local Voluntary Cleanup Program) OR on a site defined as a brownfield by a local, state or federal government agency.

This credit is usually a result of, rather than a driver of site selection, and credit compliance is a consequence of other factors.

There are a variety of strategies for mitigating soils contamination, including encapsulation, remediation, etc. These can lead to a variety of costs, depending on the strategies selected or required (such as hazardous materials removal or encapsulation during demolition or renovation, removal or encapsulation of contaminated soils, and/or remediation of contaminated soils using chemical additives).

While the cost of this credit can be substantial, it is rarely a significant factor in site selection for healthcare projects. A brownfield site may be selected for other reasons, such as property availability, transit connections, etc. Costs to mitigate hazardous materials in an existing building (demolition or renovation) would typically be incurred regardless of sustainable design goals.

The cost of basic remediation of a brownfield site can range from \$50,000/acre to as much as \$2 million/acre, although the typical range is \$300,000 to \$500,000. For development densities of 80,000 SF to 120,000 SF/acre, this amounts to \$3.00 to \$6.00/SF of building area. There will also be additional design and construction management cost for design, testing and monitoring.

| | |
|---|---------------|
| Overall Likely Cost Effect: SS 3 | |
| Construction Cost | 0.1% to 0.25% |
| Design and Construction Management Cost | 1% to 2.5% |
| Documentation | 40 to 120 hrs |

■ **SS 4-1: Alternative Transportation - Public Transportation Access**

LEED-NC

Locate project within 1/2 mile of an existing, or planned and funded, commuter rail, light rail or subway station.

OR

Locate project within 1/4 mile of one or more stops for two or more public or campus bus lines usable by building occupants.

This credit is usually a result of, rather than a driver of site selection, and credit compliance is a consequence of other factors. Because of this, the credit is usually suited to urban projects where the site happens to comply.

If the site is not close to public transportation, it may be possible to work with transit providers to bring bus lines to the site. The project can also provide shuttle buses to transport staff and patients from the project site to bus or train stops to meet the credit requirements. This is more likely to be a concern for rural sites. In many cases this credit is simply not achievable in such settings.

Alternative transportation measures can reduce the amount of parking needed, and therefore reduce project costs. These strategies also allow healthcare access to persons without private transportation, thus providing social equity and sustainability.

In practice, this credit typically has no construction or design and construction management cost implications.

| Overall Likely Cost Effect: SS 4-1 | |
|---|---------------|
| Construction Cost | |
| Urban | Savings/None |
| Rural | Not Available |
| Design and Construction Management Cost | None |
| Documentation | <40 hrs |

■ **SS 4-2: Alternative Transportation - Bicycle Storage and Changing Rooms**

LEED-NC

For commercial or institutional buildings, provide secure bicycle racks and/or storage (within 200 yards of a building entrance) for 5 percent or more of all building users (measured at peak periods), AND, provide shower and changing facilities in the building, or within 200 yards of a building entrance, for 0.5 percent of Full-Time Equivalent (FTE) occupants.

OR

For residential buildings, provide covered storage facilities for securing bicycles for 15 percent or more of building occupants in lieu of changing/shower facilities.

This is a relatively inexpensive credit with low design impact and simply requires the installation of adequate bicycle racks.

In practice, this credit typically has no construction or design and construction management cost implications. Most healthcare facilities have adequate shower facilities for staff, which can also be made available for bicycle users. The number of racks and showers is usually quite small, typically in the range of eight to 12 racks and one to two showers even for large full-service hospitals.

Encouragement of the staff to use bicycles and other alternate transportations may alleviate the need for parking spaces and actually save money.

| Overall Likely Cost Effect: SS 4-2 | |
|---|-------------|
| Construction Cost | 0% to <0.1% |
| Design and Construction Management Cost | None |
| Documentation | <40 hrs |

■ **SS 4-3: Alternative Transportation - Low-Emitting and Fuel-Efficient Vehicles**

LEED-NC

OPTION 1

Provide low-emitting and fuel-efficient vehicles for 3 percent of Full-Time Equivalent (FTE) occupants AND provide preferred parking for these vehicles.

OPTION 2

Provide preferred parking for low-emitting and fuel-efficient vehicles for 5 percent of the total vehicle parking capacity of the site.

OPTION 3

Install alternative-fuel refueling stations for 3 percent of the total vehicle parking capacity of the site (liquid or gaseous fueling facilities must be separately ventilated or located outdoors).

This credit is typically achieved in the least costly manner – that is, by providing preferred parking for hybrid and alternatively fueled vehicles. In practice, provision of preferred parking for fuel efficient vehicles is unlikely to be acceptable to many projects since parking is generally highly constrained and any limitation or allocation is undesirable.

Electric refueling locations can be added almost any time during design and construction. This point could also be awarded if the owner provides a fleet of alternatively fueled vehicles, but typically few facilities take this route.

This credit typically has very minor construction and design and construction management cost implications, but the very high parking requirements associated with most healthcare facilities makes it impractical in most cases. This is driven more by impact on parking rather than cost.

| Overall Likely Cost Effect: SS 4-3 | |
|---|---------|
| Construction Cost | <0.1% |
| Design and Construction Management Cost | Minor |
| Documentation | <40 hrs |

■ **SS 4-4: Alternative Transportation - Parking Capacity**

LEED-NC

OPTION 1 — NON-RESIDENTIAL

Size parking capacity to meet, but not exceed, minimum local zoning requirements, AND, provide preferred parking for carpools or vanpools for 5 percent of the total provided parking spaces.

OPTION 2 — NON-RESIDENTIAL

For projects that provide parking for less than 5 percent of FTE building occupants: • Provide preferred parking for carpools or vanpools, marked as such, for 5 percent of total provided parking spaces.

OPTION 3 — RESIDENTIAL

Size parking capacity to not exceed minimum local zoning requirements, AND, provide infrastructure and support programs to facilitate shared vehicle usage such as carpool drop-off areas, designated parking for vanpools, or car-share services, ride boards, and shuttle services to mass transit.

OPTION 4 — ALL

Provide no new parking.

As with SS 4-3, this credit is not difficult to achieve, but compliance may be unacceptable in most VA facilities due to the restriction on available parking for users. Where sites are highly constrained and parking limited by available space, the credit may be met simply as a result of the program limitations. Also, in many projects parking is constrained to such a degree that it would not be possible to exceed local zoning requirements.

In practice, this credit can be difficult to achieve because of the preference for more, not less parking.

This credit can actually reduce construction and design and construction management costs by reducing overall parking and vehicular circulation area.

| | |
|---|--------------|
| Overall Likely Cost Effect: SS 4-4 | |
| Construction Cost | Savings/None |
| Design and Construction Management Cost | None |
| Documentation | <40 hrs |

■ SS 5-1: Reduced Site Disturbance - Protect or Restore Habitat

LEED-NC

OPTION 1

On greenfield sites, limit all site disturbance to 40 feet beyond the building perimeter; 10 feet beyond surface walkways, patios, surface parking and utilities less than 12 inches in diameter; 15 feet beyond primary roadway curbs and main utility branch trenches; and 25 feet beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities and playing fields) that require additional staging areas in order to limit compaction in the constructed area.

OPTION 2

On previously developed or graded sites, restore or protect a minimum of 50 percent of the site area (excluding the building footprint) with native or adapted vegetation. Native/adapted plants are plants indigenous to a locality or cultivars of native plants that are adapted to the local climate and are not considered invasive species or noxious weeds. Projects earning SS Credit 2 and using vegetated roof surfaces may apply the vegetated roof surface to this calculation if the plants meet the definition of native/adapted.

This credit can be very challenging to achieve because of limitations in the site area which make it difficult to find the required site area for restoration. This is particularly true for dense urban healthcare campuses.

For greenfield sites, the main strategies relate to managing the construction and ensuring that construction activities are kept within the limitations specified in the requirement. While this is a construction management issue, it is essential that the design team understand the constraints, and that these are detailed within the construction bid documents.

Credit requirements can be difficult if not impossible to achieve at greenfield sites with excavation below grade of more than one story.

For previously developed sites, the main strategies relate to designing appropriate site restoration. For sites with large impervious areas, such as surface parking lots, strategies can include construction of parking structures to allow for conversion of paved areas into landscaped areas, and replacement of impervious paved areas with pervious paving. Green roofs at parking structures and buildings can contribute to this point.

Many of the strategies for achieving this credit can be combined with other credits. For example, landscaped areas can be designed to provide natural habitat, to manage and filter stormwater, to facilitate both heat island credits, and to create healing gardens for places of respite. In many jurisdictions, strict stormwater mandates can be cost-effectively met using native landscape. Where strategies and credits can be integrated, costs can be greatly minimized.

This credit can have significant construction costs, either in the provision of pervious parking or in the cost of restoration of native planting areas. There are usually relatively small design and construction management cost implications. If measures can be used that allow achievement of several sustainable design goals at once, costs can be controlled.

| Overall Likely Cost Effect: SS 5-1 | |
|---|---------------|
| Construction Cost | |
| Urban | >0.25% |
| Rural | 0.1% to 0.25% |
| Design and Construction Management Cost | <1% |
| Documentation | <40 hrs |

■ SS 5-2: Reduced Site Disturbance - Maximize Open Space

LEED-NC

OPTION 1

Reduce the development footprint (defined as the total area of the building footprint, hardscape, access roads and parking) and/or provide vegetated open space within the project boundary to exceed the local zoning's open space requirement for the site by 25 percent.

OPTION 2

For areas with no local zoning requirements (e.g., some university campuses, military bases), provide vegetated open space area adjacent to the building that is equal to the building footprint.

OPTION 3

Where a zoning ordinance exists, but there is no requirement for open space (zero), provide vegetated open space equal to 20 percent of the project's site area.

The main strategy for meeting this credit is to increase the density of construction by building more stories, as opposed to spreading development over the site. For a primary health care facility, number of stories and footprint area are usually defined by program, and it is often not possible or practical to increase the density in order to meet this credit. For secondary facilities, such as vehicular parking, it is possible to build structured parking as opposed to surface parking lots. This can have a significant impact on the developed footprint.

The credit is easier to achieve in rural sites, where there may be sufficient site area to allow for setting aside adequate open space.

| Overall Likely Cost Effect: SS 5-2 | |
|---|---------------|
| Construction Cost | |
| Urban | >0.25% |
| Rural | 0.1% to 0.25% |
| Design and Construction Management Cost | <1% |
| Documentation | <40 hrs |

■ **SS 6-1: Stormwater Management - Quantity Control**

LEED-NC

CASE 1 — EXISTING IMPERVIOUSNESS IS LESS THAN OR EQUAL TO 50 PERCENT

Implement a stormwater management plan that prevents the post-development peak discharge rate and quantity from exceeding the pre-development peak discharge rate and quantity for the one- and two-year 24-hour design storms.

OR

Implement a stormwater management plan that protects receiving stream channels from excessive erosion by implementing a stream channel protection strategy and quantity control strategies.

CASE 2 — EXISTING IMPERVIOUSNESS IS GREATER THAN 50 PERCENT

Implement a stormwater management plan that results in a 25 percent decrease in the volume of stormwater runoff from the two-year 24-hour design storm.

Stormwater can be detained on site prior to release to the stormwater system. Detention can involve dissipating the flow through swales, or holding the water in detention ponds, surge chambers or tanks. Water can also be retained on site for other uses, or for infiltration into the ground. Retention can involve holding the water in ponds, surge chambers or tanks, or the use of landscaped areas or permeable paving for infiltration. Detention ponds or tanks are usually smaller than retention ponds or tanks, since they typically need to hold water for shorter periods.

Site size plays a significant role in whether or not the stormwater related points result in additional cost. Swales tend to have a minimal cost impact; retention or detention ponds are more expensive, and installation of stormwater collection tanks can be very costly. Projects on large sites tend to install swales or ponds, while buildings on limited sites (usually urban) use collection tanks and filters to meet the requirements.

Increasingly, stormwater management is required by local jurisdictions, in which case there is no added cost for achieving this credit. In some cases, the project may be required to foot the bill to increase capacity of the local infrastructure; in such cases on site measures may be more cost-effective.

Local weather patterns will impact cost; frequency and amount of rainfall will determine the scale of both landscape and tank interventions. Soil conditions also can affect cost; sites with clay soils, high water tables or bedrock will not be able to use the swale and surface infiltration approaches.

In practice, many healthcare projects do not have sufficient site area to develop the less costly solutions to this credit, and as a result, the credit can be very challenging or expensive to achieve.

| Overall Likely Cost Effect: SS 6-1 | |
|---|---------------|
| Construction Cost | |
| Urban | >0.25% |
| Rural | 0.1% to 0.25% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

■ SS 6-2: Stormwater Management - Quality Control

LEED-NC

Implement a stormwater management plan that reduces impervious cover, promotes infiltration, and captures and treats the stormwater runoff from 90 percent of the average annual rainfall¹ using acceptable best management practices (BMPs).

BMPs used to treat runoff must be capable of removing 80 percent of the average annual post development total suspended solids (TSS) load based on existing monitoring reports.

The strategies for meeting this credit depend greatly on the extent of site area available for stormwater management. In sites with large landscaped areas, it is possible to provide treatment through the use of landscape elements such as vegetated swales and retention ponds to infiltrate water. Where site conditions do not allow use of landscaping to meet this credit, it is necessary to provide filtration tanks and oil separators at inlets. On very constrained sites, it may be necessary to capture rainwater in tanks and reuse it for irrigation and/or cooling towers.

An additional element is the development of a landscape management plan, aimed at reducing the total phosphorus load entering the stormwater system. This management plan includes both selection of appropriate landscaping and planting, and long-term fertilizer management by the facility.

In practice, most healthcare projects do not have sufficient site area to develop the less costly solutions to this credit, and as a result, the credit can be very challenging or expensive to achieve. However, many jurisdictions require the filtration of stormwater before it enters the municipal system; in such cases the cost is included in the base design, not added. An integrated design that uses landscape and other design elements to help meet credit requirements will reduce construction and operations costs.

| Overall Likely Cost Effect: SS 6-2 | |
|---|---------------|
| Construction Cost | |
| Urban | >0.25% |
| Rural | 0.1% to 0.25% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

■ SS 7-1: Heat Island Effect - Non-Roof

LEED-NC

OPTION 1

Provide any combination of the following strategies for 50 percent of the site hardscape (including roads, sidewalks, courtyards and parking lots):

- *Shade (within 5 years of occupancy)*
- *Paving materials with a Solar Reflectance Index (SRI)² of at least 29*
- *Open grid pavement system*

OPTION 2

Place a minimum of 50 percent of parking spaces under cover (defined as under ground, under deck, under roof, or under a building). Any roof used to shade or cover parking must have an SRI of at least 29.

This credit is most often achieved by changing the color of concrete paving and adding shade elements at relatively low cost. Where surface parking is provided, this credit can be

achieved at minimal or no added cost by using white asphalt or by providing open grid paving or gravel at parking stalls, leaving only the aisles asphalt.

By providing a parking structure, the site area can be freed for use in landscaping, which will help achieve other LEED or GGHC credits including stormwater management and filtration, open space and natural habitat, and places of respite.

In practice, this credit typically has very minor construction and design and construction management cost implications, since the most economical way in which to achieve this credit is to provide shade trees in parking areas, or to provide structured parking. Both of these strategies are common design elements of healthcare facilities regardless of this credit.

| Overall Likely Cost Effect: SS 7-1 | |
|---|---------|
| Construction Cost | |
| Shading | <0.1% |
| Structured parking | >0.25% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

■ SS 7-2: Heat Island Effect - Roof

LEED-NC OPTION 1

Use roofing materials having a Solar Reflectance Index (SRI) equal to or greater than 78 for a low sloped or 29 for a high sloped roof for a minimum of 75 percent of the roof surface.

OPTION 2

Install a vegetated roof for at least 50 percent of the roof area.

OPTION 3

Install high albedo and vegetated roof surfaces that, in combination, meet the criteria

The typical approach to this credit is to use a high emissivity roof. While costs for these are usually more than conventional black roofs, the overall impact on the cost of a healthcare facility is usually relatively low, since roofs make up a very small part of the total project cost.

Some hospital projects have used a green roof to achieve this credit. The added cost is significant, but green roofs can facilitate achievement of LEED or GGHC credits for places of respite, stormwater management and filtration, open space, and natural habitat, as well as contributing to energy efficiency. Few healthcare projects have attempted to achieve this point via a green roof, although the use of green roofs is increasing as designers and owners become more familiar with them and as the value of green roofs as places of respite or for views are more widely accepted.

| Overall Likely Cost Effect: SS 7-2 | |
|---|---------------|
| Construction Cost | |
| High Emissivity Roof | <0.1% |
| Green Roof | 0.1% to 0.25% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

■ SS 8: Light Pollution Reduction

LEED-NC

FOR INTERIOR LIGHTING

The angle of maximum candela from each interior luminaire as located in the building shall intersect opaque building interior surfaces and not exit out through the windows.

OR

All non-emergency interior lighting shall be automatically controlled to turn off during non-business hours. Provide manual override capability for after hours use.

AND

FOR EXTERIOR LIGHTING

Only light areas as required for safety and comfort. Do not exceed 80 percent of the lighting power densities for exterior areas and 50 percent for building facades and landscape features as defined in ASHRAE/IESNA Standard 90.1-2004, Exterior Lighting Section, without amendments.

All projects shall be classified under zones, as defined in IESNA RP-33, and shall follow all of the requirements for that specific zone

The primary strategy for this credit involves careful site lighting design and fixture selection. Many projects attempt this credit, but not all achieve it. Clients and code officials often perceive this point to be at odds with security requirements. In order to be successful with this credit, it is important to include site lighting in the earliest stages of site planning and to include security and site safety in the considerations of the design.

Specific strategies include:

- Selecting energy efficient lighting fixtures and lamps
- Avoiding uplighting of buildings and trees
- Using bollard fixtures and cut-off fixtures
- Using lower light levels and closer spacing between fixtures
- Identifying high-use paths and concentrating lighting in those areas, while minimizing lighting in less traveled areas
- Designing interior lighting to cast direct beams only internally

Where the credit is attempted, the credit typically has very low cost impact, both for construction and design and construction management costs.

| Overall Likely Cost Effect: SS 8 | |
|---|---------------|
| Construction Cost | None to <0.1% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

LEED-CI

LEED-CI credits for Sustainable Sites closely mirror the LEED-NC credits, but points are awarded in a different manner. LEED-CI awards three points for locating in a LEED certified building, alternatively, projects can achieve up to three points, in half point increments by locating in a building which meets specific LEED-NC criteria. A further four points are available for Development Density and Alternative Transportation Strategies.

Most of the cost impact of achieving LEED-CI Sustainable Sites credits will be in the rent, as opposed to direct construction cost, since most relate to building selection rather than the design and construction of Tenant Improvements.

■ **SS 1: Site Selection**

LEED-CI

Select a LEED Certified Building (3 points), or locate the tenant space in a building that has two or more of the following characteristics:

- Brownfield Redevelopment (Corresponds to LEED NC SS3)*
- Stormwater Management: Rate and Quantity (Corresponds to LEED NC SS6.1)*
- Stormwater Management: Treatment (Corresponds to LEED NC SS6.2)*
- Heat Island Reduction, Non-Roof (Corresponds to LEED NC SS7.1)*
- Heat Island reduction, Roof (Corresponds to LEED NC SS7.2)*
- Light Pollution Reduction (Corresponds to LEED NC SS8)*
- Water Efficient Irrigation (Reduce by 50%) (Corresponds to LEED NC WE1.1)*
- Water Efficient Irrigation (No potable use or no irrigation) (Corresponds to LEED NC WE1.2)*
- Innovative Wastewater Technologies (Corresponds to LEED NC WE2)*
- Water Use Reduction (20% reduction) (Corresponds to LEED NC WE3.1)*
- On-Site Renewable Energy (Corresponds to LEED NC EA2)*
- Other Quantifiable Environmental Performance*

In most cases building selection is driven by a wide range of factors, including availability and cost of the space. Sustainable performance of a core/shell is usually a result of, not a driver of the selection. As such, achievement of these credits is usually not a cost factor. As more LEED certified Core/Shell projects become available, it is possible that there will be a small, but marked, lease rate premium associated with the higher performance that such buildings offer.

| Overall Likely Cost Effect: SS 1 | |
|---|---------|
| Construction Cost | None |
| Design and Construction Management Cost | None |
| Documentation | <40 hrs |

■ **SS 2: Development Density and Community Connectivity**

LEED-CI

Select space in a building that is located in an established, walkable community with a minimum density of 60,000 square feet per acre net

OR

Select space in a building that is located within ½ mile of a residential zone or neighborhood (with an average density of 10 units per acre net)

AND

The building has pedestrian access to at least 10 of the basic services below within ½ mile:
 Bank; Place of Worship; Convenience Grocery; Day Care; Cleaners; Fire Station; Hair Care; Hardware; Laundry; Library; Medical/Dental; Senior Care Facility; Park; Pharmacy; Post Office; restaurant; School; Supermarket; Commercial Office; Community Center

As with SS 1, this credit is usually a result of, rather than a driver of site selection, and credit compliance is a consequence of other factors. Sustainable performance of a core/shell is usually a result of, not a driver of the selection. As such, achievement of these credits is usually not a cost factor. As more LEED certified Core/Shell projects become available, it is possible that there will be a small, but marked, lease rate premium associated with the higher performance that such buildings offer.

| Overall Likely Cost Effect: SS 2 | |
|---|---------|
| Construction Cost | None |
| Design and Construction Management Cost | None |
| Documentation | <40 hrs |

■ **SS 3-1: Alternative Transportation - Public Transportation Access**

LEED-CI

Select building within 1/2 mile of a commuter rail, light rail or subway station or 1/4 mile of one or more stops for two or more public or campus bus lines usable by building occupants.

This credit is usually a result of, rather than a driver of site selection, and credit compliance is a consequence of other factors. Because of this, the credit is usually suited to urban projects, where the site happens to comply.

| Overall Likely Cost Effect: SS 3.1 | |
|---|---------|
| Construction Cost | None |
| Design and Construction Management Cost | None |
| Documentation | <40 hrs |

■ **SS 3-2: Alternative Transportation - Bicycle Storage and Changing Rooms**

LEED-CI

Provide secure bicycle storage with convenient changing/shower facilities (within 200 yards of the building) for 5 percent or more of tenant occupants

This can be a challenging credit for TI projects, particularly for small leased spaces, unless the selected building already complies. Simply finding space for bicycle storage and showers can be difficult, and the cost of adding shower facilities within a tenant space can be prohibitive. The most economical way to comply with this credit is to select a building which already meets the criteria

Encouragement of the staff to use bicycles and other alternate transportations may alleviate the need for parking spaces and actually save money.

| Overall Likely Cost Effect: SS 4-2 | |
|---|---------|
| Construction Cost | |
| Provided by Core/Shell | None |
| Not provided by Core/Shell | >0.25% |
| Design and Construction Management Cost | None |
| Documentation | <40 hrs |

■ **SS 3-3: Alternative Transportation - Parking Capacity**

LEED-CI

For projects occupying less than 75% of gross building square footage

Parking spaces provided to tenant shall not exceed minimum number required by local zoning regulations

AND

Priority parking for carpools or vanpools will be provided for 5% or more of tenant occupants

OR

No parking will be provided or subsidized for tenant occupants

For projects occupying 75% or over of Gross building Square Footage:

Parking capacity shall not exceed minimum local zoning requirements

AND

Priority parking for carpools or vanpools will be provided capable of serving 5% or the building occupants

OR

No new parking will be added for rehabilitation projects

AND

Preferred parking for carpools or vanpools will be provided capable of serving 5% or the building occupants

This credit is not difficult to achieve, but compliance may be unacceptable in most VA facilities due to the restriction on available parking for users. Where sites are highly constrained and parking limited by available space, the credit may be met simply as a result of the program limitations. Also, in many projects parking is constrained to such a degree that it would not be possible to exceed local zoning requirements.

In practice, this credit can be difficult to achieve because of the preference for more, not less parking.

This credit can actually reduce construction and design and construction management costs by reducing overall parking and vehicular circulation area.

| Overall Likely Cost Effect: SS 4-4 | |
|---|--------------|
| Construction Cost | Savings/None |
| Design and Construction Management Cost | None |
| Documentation | <40 hrs |

5.2 WATER EFFICIENCY

LEED-CI credits for Water Efficiency are limited to the reduction of water use. Reductions in the use of potable water for irrigation and Innovative Wastewater strategies can contribute to Credit SS 1, Site Selection. The Water Use Reduction credits are identical to the LEED-NC credits, but are numbered differently.

■ **WE 1-1: Water Efficient Landscaping - Reduce by 50 Percent**

LEED-NC

Reduce potable water consumption for irrigation by 50 percent from a calculated mid-summer baseline case.

LEED-CI

No corresponding credit.

■ **WE 1-2: Water Efficient Landscaping - No Potable Use or No Irrigation**

LEED-NC

Achieve WE Credit 1.1.and:

Use only captured rainwater, recycled wastewater, recycled greywater, or water treated and conveyed by a public agency specifically for non-potable uses for irrigation.

OR

Install landscaping that does not require permanent irrigation systems. Temporary irrigation systems used for plant establishment are allowed only if removed within one year of installation.

LEED-CI

No corresponding credit.

There are two main strategies for meeting these credits: the first is to use planting that requires less irrigation and potable water primarily by reducing the extent of grass and by increasing the use of native, and/or drought tolerant plants; the second is to use more efficient irrigation methods or reclaimed water for irrigation. Often elements of both strategies are combined to achieve this credit. There can be a sanitation issue with using reclaimed, grey, or rainwater for irrigation in healthcare settings. Some projects address such concerns by ensuring that the untreated irrigation water is never touchable by humans; this is done by using below-ground irrigation, such as drip irrigation systems.

Specific actions include:

- Providing native, and/or drought tolerant plants
- Avoiding the use of turf grass
- Using high efficiency irrigation methods such as drip irrigation or automated controls with moisture sensors
- Using municipally provided reclaimed water for irrigation
- Capturing site rainwater to reuse for irrigation
- Using cooling tower waste water for irrigation (only possible with non-chemical cooling tower treatments systems)

Installing hose bibs on the outside of each side of the building is usually necessary for maintenance purposes. However, the hose bibs can also be used for temporary irrigation purposes for establishment of plants as well.

In practice, these credits typically have very small construction and design and construction management cost implications. If no permanent irrigation system is installed, costs can actually be reduced. WE 1-1 is usually accomplished by the use of drought tolerant planting and efficient irrigation.

Where municipally provided reclaimed water is used, the cost is limited to the cost of connecting to the reclaimed water system, and of providing filtration if needed. In many areas where reclaimed water is municipally provided, it is mandatory to use it for irrigation; in such cases there is no added cost.

The most expensive strategies involve rainwater storage. The costs for water storage are significant, since large volumes are required for irrigation, particularly in climates with long dry seasons.

If cooling tower waste water is to be used for irrigation, storage tanks can be minimal in size, since cooling towers are likely to be running year round and will provide a consistent supply of water. Costs associated will be for collection, storage, and minimal filtration.

While potable water costs are currently quite low, it is extremely likely that costs will rise dramatically in the near future. Minor design changes now could save major costs later.

| Overall Likely Cost Effect: WE 1-1, 1-2 | |
|--|--------------|
| Construction Cost | |
| Xeriscape/no irrigation | Savings/None |
| Water storage / harvesting, cooling tower water | >0.25% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

■ WE 2: Innovative Wastewater Technologies

LEED-NC

OPTION 1

Reduce potable water use for building sewage conveyance by 50 percent through the use of water conserving fixtures (water closets, urinals) or non-potable water (captured rainwater, recycled greywater, and on-site or municipally treated wastewater).

OPTION 2

Treat 50 percent of wastewater on-site to tertiary standards. Treated water must be infiltrated or used on-site.

LEED-CI

No corresponding credit.

Low-flow and waterless flush fixtures are typically available at no added cost. Reclaimed water, grey water, and rainwater systems (which would typically include cisterns and filtration systems) all require the provision of additional supply. There would be minor increases in design and inspection costs, and moderate documentation costs associated with the necessary calculations and demonstration of compliance. On-site wastewater treatment adds significantly to the cost of a facility.

In practice, this credit is rarely achievable in acute care and long-term care facilities due to concerns about infection control and other operational considerations, both with low-flow fixtures and with non-potable water systems.

| Overall Likely Cost Effect: WE 2 | |
|---|---------------|
| Construction Cost | |
| Dual flush valves or low-flow fixtures | None |
| Reclaimed Water | 0.1% to 0.25% |
| Gray Water | 0.1% to 0.25% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

■ WE 3-1: Water Use Reduction – 20 Percent Reduction

LEED-NC

Employ strategies that in aggregate use 20 percent less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements. Calculations are based on estimated occupant usage and shall include only the following fixtures (as applicable to the building): water closets, urinals, lavatory faucets, showers and kitchen sinks.

LEED-CI

This credit is CI Credit WE 1-1. The credit requirements are identical

■ WE 3-2: Water Use Reduction – 30 Percent Reduction

LEED-NC

Employ strategies that in aggregate use 30 percent less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements. Calculations are based on estimated occupant usage and shall include only the following fixtures (as applicable to the building): water closets, urinals, lavatory faucets, showers and kitchen sinks.

LEED-CI

This credit is CI Credit WE 1-2. The credit requirements are identical

This credit is typically approached first by reducing the flow rates of lavatories and showers. There is often a perceived connection between reduced flow rates and compromised sanitary conditions, but reduced flow rate fixtures are steadily becoming more common. Such measures are usually enough to ensure achievement of the first point associated with this credit.

Additional savings can be achieved by reducing the rate of water use in flush fixtures. It seems likely that, given the concerns about infection control, the most that many projects will be willing to consider is the use of dual flush valves at toilets and 0.5 gallon flush urinals. Both products are widely available and cost competitive. Use of low-flush fixtures may make the second point of this credit available.

In practice, this credit is rarely attempted in health care settings due to concerns about infection control and other operational considerations. It is, however, achievable at relatively low cost and without negative health implications. Low-flow and conventional flow fixtures are equivalent in terms of cost both for materials and installation.

For LEED-CI projects, the fixture count is typically very low, particularly for small TI projects where most plumbing is provided in the Core/Shell portion of the work, and the only fixtures are sinks or dishwashers. In this case, it is still possible to achieve the credits, but it will usually require the use of low flow fixtures and motion sensor faucets. If the CI project does not include any plumbing fixtures, these credits can not be used.

| Overall Likely Cost Effect: WE 3-1, 3-2 | |
|---|---------------|
| Construction Cost | |
| WE 3-1 (20% Red.) | <0.1% |
| WE 3-2 (30% Red.) | 0.1% to 0.25% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

5.3 ENERGY AND ATMOSPHERE

Some of the LEED-CI credits for Energy and Atmosphere are similar to LEED-NC credits, but several, particularly the credits related to Optimization of Energy Performance (EA 1) are substantially different.

■ EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems

LEED-NC

The following commissioning process activities shall be completed by the commissioning team, in accordance with the LEED-NC 2.2 Reference Guide.

- 1) *Designate an individual as the Commissioning Authority (CxA) to lead, review and oversee the completion of the commissioning process activities.*
- 2) *The Owner shall document the Owner's Project Requirements (OPR). The design team shall develop the Basis of Design (BOD). The CxA shall review these documents for clarity and completeness. The Owner and design team shall be responsible for updates to their respective documents.*
- 3) *Develop and incorporate commissioning requirements into the construction documents.*
- 4) *Develop and implement a commissioning plan.*
- 5) *Verify the installation and performance of the systems to be commissioned.*
- 6) *Complete a summary commissioning report*

LEED-CI

This credit is CI Prerequisite 1. The credit requirements are identical

This credit has construction and design and construction management cost implications, although many healthcare facilities do undertake basic commissioning regardless of this credit. Usually commissioning is viewed as a design and construction management cost, and so the primary cost impact shows up in that category. There are, however, some additional construction costs related to commissioning arising from the additional work required of the contractor to support the commissioning process and the corrective work required as a result of the commissioning. Basic commissioning typically costs in the range of \$0.50 - \$1.00/SF.

This credit can provide significant benefits, both in the short and long term. The greatest benefits are achieved with the use of Additional Commissioning (GGHC and LEED EA 3), but even the basic conditioning under this prerequisite can provide significant benefits.

In the short term, commissioning can help the project team develop an efficient design, and in conjunction with design modeling, serve to reduce overall design and construction time. With the increasing use of 3-D modeling, significant time and cost savings are possible.

For CI projects, the cost impact of this prerequisite could be higher, proportionately, than for NC projects. The commissioning is not limited to work within the tenant space, but should extend to the systems serving the space. This means that the project could end up commissioning a much larger scope of plant and equipment, resulting in significantly higher commissioning costs, unless the building has already had commissioning as part of the Core/Shell project.

| Overall Likely Cost Effect: EA Prerequisite 1 | |
|---|-----------------|
| Construction Cost | <0.1% |
| Design and Construction Management Cost | |
| NC | 0.1% to 0.25% |
| CI | 0.1% or greater |
| Documentation | <40 hrs |

■ EA Prerequisite 2: Minimum Energy Performance

LEED-NC

Design the building project to comply with both—

- *the mandatory provisions (Sections 5.4, 6.4, 7.4, 8.4, 9.4 and 10.4) of ASHRAE/IESNA Standard 90.1-2004 (without amendments); and*
- *the prescriptive requirements (Sections 5.5, 6.5, 7.5 and 9.5) or performance requirements (Section 11) of ASHRAE/IESNA Standard 90.1-2004 (without amendments).*

LEED-CI

This credit is CI Prerequisite 2. The credit requirements are similar, but the scope of the requirement is limited to the tenant scope of work.

The energy performance standards set by the prerequisite are not particularly difficult to meet, but will require some change in VA's existing practice and procedures. They should not, however, lead to significant increases in first cost. If the decision to pursue energy efficiency is made early in design, it should be possible to meet minimum requirements without adding cost. With an integrated design approach, savings may even be realized. If energy efficiency is not addressed early the costs can become significant.

For CI projects, achievement of this credit will be dependent, in many instances, on the primary systems provided by the Core/Shell portion of the project. The costs for compliance will be lowest if the Core/Shell systems already meet ASHRAE standards. For buildings that do not, the cost of compliance is likely to be prohibitive.

| Overall Likely Cost Effect: EA Prerequisite 2 | |
|---|-----------------|
| Construction Cost | <0.1% |
| Design and Construction Management Cost | 0.1% or greater |
| Documentation | <40 hrs |

■ EA Prerequisite 3: Fundamental Refrigerant Management

LEED-NC

Zero use of CFC-based refrigerants in new base building HVAC&R systems. When reusing existing base building HVAC equipment, complete a comprehensive CFC phase-out conversion prior to project completion. Phase-out plans extending beyond the project completion date will be considered on their merits.

LEED-CI

This credit is CI Prerequisite 2. The credit requirements are similar, but the scope of the requirement is limited to systems within the tenant scope of work.

New facilities will automatically meet this prerequisite, unless an existing central plant uses CFC refrigerants. Equipment replacement can be costly and is typically undertaken only when that equipment has reached the end of its useful life. Since the prerequisite only requires the commitment to future replacement, there are no construction cost implications.

For CI projects, this should be achievable, since the credit is limited to systems within the tenant scope of work, and those should normally be CFC free.

| Overall Likely Cost Effect: EA Prerequisite 3 | |
|---|---------|
| Construction Cost | None |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

■ EA 1: Optimize Energy Performance (1 to 10 points)

LEED-NC

OPTION 1 — WHOLE BUILDING ENERGY SIMULATION (1–10 Points)

Demonstrate a percentage improvement in the proposed building performance rating compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004 (without amendments) by a whole building project simulation using the Building Performance Rating Method in Appendix G of the Standard.

OPTION 2 — PRESCRIPTIVE COMPLIANCE PATH (4 Points)

Comply with the prescriptive measures of the ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004. The following restrictions apply: Buildings must be under 20,000 square feet, Buildings must be office occupancy, and Project teams must fully comply with all applicable criteria as established in the Advanced Energy Design Guide for the climate zone in which the building is located

OPTION 3 — PRESCRIPTIVE COMPLIANCE PATH (1 Point)

Comply with the Basic Criteria and Prescriptive Measures of the Advanced Buildings Benchmark™ Version 1.1 with the exception of the following sections: 1.7 Monitoring and Trend-logging, 1.11 Indoor Air Quality, and 1.14 Networked Computer Monitor Control. The following restrictions apply: Project teams must fully comply with all applicable criteria as established in Advanced Buildings Benchmark for the climate zone in which the building is located.

LEED-CI

EA 1.1 Optimize Energy Performance – Lighting Power:

Reduce density to:

15% below the standard (1 point)

25% below the standard (1 point)

35% below the standard (1 point)

EA 1.2 Optimize Energy Performance – Lighting Controls

Install daylight responsive controls in all regularly occupied spaces within 15 feet of windows and under skylights

EA 1.3 Optimize energy Performance - HVAC**Option A***Equipment Efficiency (1 point)**Appropriate Zoning and controls (1 point)***Option B***Demonstrate that HVAC system component performance is 15% better than ASHRAE 90.1-2004 (not Appendix G) (1 point)**Demonstrate that HVAC system component performance is 30% better than ASHRAE 90.1-2004 (not Appendix G) (2 points)***EA 1.4 Optimize energy Performance – Equipment and Appliances***70%, by rated power, of EnergyStar eligible equipment shall be EnergyStar rated (1 point)**90%, by rated power, of EnergyStar eligible equipment shall be EnergyStar rated (2 point)*

The cost for compliance with the different requirements will vary greatly depending on the type of building and the extent of the energy saving sought. For most VA facilities, achieving the mandated energy reductions of 30 percent better than ASHRAE 2004, Appendix G will not be economically feasible. The LEED-NC requirements are also likely to be challenging and expensive for acute care facilities. The LEED-CI requirements are less challenging and projects should be able to achieve reasonable credit compliance with little added cost.

Energy performance costs and strategies are discussed under Section 4.2 Energy Efficiency Strategies.

- **EA 2: Onsite Renewable Energy (1 to 3 points)**

LEED-NC

Use on-site renewable energy systems to offset building energy cost. Calculate project performance by expressing the energy produced by the renewable systems as a percentage of the building annual energy cost.

LEED-CI

No corresponding credit.

On-site generation of renewable energy has a substantial construction cost impact. Installation of these systems usually provides a long-term cost savings, although the life cycle cost payback is usually very long even with available credits and incentives. Incorporating renewable energy into design will earn the project at least one additional energy use reduction point.

This credit can be cost effective for cemetery projects, where power needs are typically fairly low, and the cost of providing grid-based power to remote buildings and shelters can be substantial. Many cemetery projects are beginning to incorporate PV panels into shelters.

| Overall Likely Cost Effect: EA 2 | |
|---|---------|
| Construction Cost | >0.25% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

- **EA 3: Enhanced Commissioning**

LEED-NC

Implement, or have a contract in place to implement, the following additional commissioning process activities in addition to the requirements of EA Prerequisite 1 and in accordance with the LEED-NC 2.2 Reference Guide:

1. Prior to the start of the construction documents phase, designate an independent Commissioning Authority (CxA) to lead, review, and oversee the completion of all commissioning process activities.
2. The CxA shall conduct, at a minimum, one commissioning design review of the Owner's Project Requirements (OPR), Basis of Design (BOD), and design documents prior to mid-construction documents phase and back-check the review comments in the subsequent design submission.
3. The CxA shall review contractor submittals applicable to systems being commissioned for compliance with the OPR and BOD. This review shall be concurrent with A/E reviews and submitted to the design team and the Owner.
4. Develop a systems manual that provides future operating staff the information needed to understand and optimally operate the commissioned systems.
5. Verify that the requirements for training operating personnel and building occupants are completed.
6. Assure the involvement by the CxA in reviewing building operation within 10 months after substantial completion with O&M staff and occupants. Include a plan for resolution of outstanding commissioning-related issues.

LEED-CI

This credit is CI EA2. The credit requirements are similar.

This credit has construction and design and construction management cost implications. Usually commissioning is viewed as a design and construction management cost, and so the primary cost impact shows up in that category. There are, however, additional construction costs related to commissioning arising from the additional work required of the contractor to support the commissioning process and the corrective work required as a result of the commissioning. Additional commissioning typically costs in the range of \$1.00 - \$2.00/SF.

This credit can provide significant benefits, both in the short and long term. In the short term, it can help the project team develop an efficient design, and in conjunction with design modeling, serve to reduce overall design and construction time. With the increasing use of 3-D modeling, significant time and cost savings are possible. The short term benefit can be found to some degree with Basic Commissioning (LEED EA Prerequisite 1), but it is most achievable with the additional commissioning.

| Overall Likely Cost Effect: EA 3 | |
|---|---------------|
| Construction Cost | 0.1% to 0.25% |
| Design and Construction Management Cost | >0.25% |
| Documentation | <40 hrs |

■ **[EA 3: Energy Use, Measurement, and Payment Accountability]**

LEED-NC

No corresponding credit.

LEED-CI

Provide for the ongoing accountability and optimization of tenant energy and water consumption performance over time.

■ **EA 4: Enhanced Refrigerant Management**

LEED-NC
OPTION 1

Do not use refrigerants.

OPTION 2

Select refrigerants and HVAC&R that minimize or eliminate the emission of compounds that contribute to ozone depletion and global warming.

LEED-CI

No corresponding credit.

This credit is becoming quite easy to achieve, as more and more manufacturers provide compliant equipment. Typically, this credit has minor construction cost implications if any, and minimal design and construction management cost and documentation requirements.

| | |
|---|---------------|
| Overall Likely Cost Effect: EA 4 | |
| Construction Cost | None to <0.1% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

■ **EA 5: Measurement and Verification**

LEED-NC

Develop and implement a Measurement and Verification (M&V) Plan consistent with Option D: Calibrated Simulation (Savings Estimation Method 2), or Option B: Energy Conservation Measure Isolation, as specified in the International Performance Measurement and Verification Protocol (IPMVP) Volume III: Concepts and Options for Determining Energy Savings in New Construction, April, 2003.

The M&V period shall cover a period of no less than one year of post-construction occupancy.

LEED-CI

This credit is CI EA3. The credit requirements are similar to NC where the tenant space constitutes 75% or more of the total building area. Where the tenant space is less than 75% of the total building area, the requirements are:

Install sub-metering to the tenant space

Negotiate a lease where energy costs are paid by the tenant, and not included in the base rent.

The cost of metering to the level required by this credit can be significant. Individual meters are relatively inexpensive, but to provide the quantity required and to provide a good quality reporting system, this can add \$2.00 to \$4.00/SF to the overall cost of the project. For some projects, the initial cost is sufficiently high that adoption of this credit is not considered. It is possible that EPA compliance will drive achievement of this credit.

The CI requirement for smaller leased spaces is not expensive, but may not be achievable in some leases.

| | |
|---|---------|
| Overall Likely Cost Effect: EA 5 | |
| Construction Cost | <0.1% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

■ EA 6: Green Power Strategies

LEED-NC

Provide at least 35 percent of the building's electricity from renewable sources by engaging in at least a two-year renewable energy contract.

LEED-CI

This credit is CI EA4. The credit requirements are similar to NC, but the requirement is for 50% of tenant power to come from renewable sources.

The first cost of green power contracts is relatively low, but operationally it can add to overall long term costs. Currently VA contracts do not meet the level established by this credit.

| Overall Likely Cost Effect: EA 6 | |
|---|---------------|
| Construction Cost | <0.1% |
| Design and Construction Management Cost | 0.1% to 0.25% |
| Documentation | <40 hrs |

5.4 MATERIALS AND RESOURCES

Most of the LEED-CI credits for Materials and Resources are identical to LEED-NC credits. Two (MR 1, Long Term Commitment, and MR 3.3 Resource Reuse, Furniture and Furnishings) are new requirements. Of the remaining credits, some have different thresholds, and several have furnishings are include in the calculations

■ MR Prerequisite 1: Storage and Collection of Recyclables

LEED-NC

Provide an easily accessible area that serves the entire building and is dedicated to the collection and storage of non-hazardous materials for recycling, including (at a minimum) paper, corrugated cardboard, glass, plastics and metals.

LEED-CI

This credit is CI prerequisite 1. The credit requirements are similar, but the scope of the requirement is limited to the tenant scope of work.

In most cases, this credit has no construction or design and construction management cost impact. Most healthcare facilities have significant waste handling areas and procedures, and the incorporation of dedicated recycling areas represents a very small increase in program. In many healthcare facilities this is incorporated regardless of the credit.

| Overall Likely Cost Effect: MR Prerequisite 1 | |
|---|---------|
| Construction Cost | None |
| Design and Construction Management Cost | None |
| Documentation | <40 hrs |

■ **MR 1-1 to 1-3: Building Reuse**

LEED-NC

1.1 Maintain at least 75 percent (based on surface area) of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing material).

1.2 Maintain an additional 20 percent (95 percent total, based on surface area) of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing material).

1.3 Use existing interior non-structural elements (interior walls, doors, floor coverings and ceiling systems) in at least 50 percent (by area) of the completed building (including additions).

LEED-CI

These credits are CI credits MR 1-1 to 1-3. Credits 1-2 and 1-3 are similar, but with different thresholds, Credit 1-1 is fundamentally different.

MR 1-1 Tenant Space, Long Term Commitment

Occupant commits to remain in the same space for not less than 10 years

MR 1-2 Building Reuse, maintains 40% of interior non-structural components

MR 1-3 Building Reuse, maintains 60% of interior non-structural components

These credits simply require the reuse of specified percentages of a building's fabric. While many healthcare projects involve the reuse of existing buildings, few projects incorporate these points. It can be difficult for remodeling projects to achieve other points, especially site and energy use reduction, without significant increase in cost. Few remodel projects typically seek to pursue certification. These points in themselves do not necessarily add cost to a project; it is the impact of the cost of achieving other necessary points that tends to make these points uncommon.

■ **MR 2-1 and 2-2: Construction Waste Management - Divert From Landfill**

LEED-NC

2.1 Recycle and/or salvage at least 50 percent of non-hazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or commingled.

2.2 Recycle and/or salvage an additional 25 percent beyond MR Credit 2.1 (75 percent total) of non-hazardous construction and demolition debris.

LEED-CI

These credits are CI MR 2-1 and 2-2. The credit requirements are identical.

The ease and cost of compliance with this credit varies greatly by location. In areas where construction waste management is widely used, the costs are minimal, if any. In other areas, or with contractors unfamiliar with construction waste management, the costs can be substantial. In most areas there is no substantial difference between the two levels. Once the contractor has committed to achieving the first point, the second usually follows.

The cost premium can be seen in two forms. In the first instance there is the direct cost of waste management: developing procedures, training, recycling charges, savings in dump fees, etc. The second cost impact is less measurable, and that is the impact on bidders. In periods of high construction demand and limited competition, inexperienced bidders may view these requirements as unduly onerous, and as a result decline to bid, or bid high to cover what they perceive as the risk. This can be mitigated to some degree through bidder outreach and training, but the cost can, nevertheless, be significant in certain locations at periods of low competition. Where the contractor can be engaged during the design

process, the costs associated with this point can be reduced or eliminated simply through education.

There should be no additional design and construction management cost, but there will be moderate documentation requirements if the project wishes to demonstrate compliance with the credit.

| Overall Likely Cost Effect: MR 2-1, 2-2 | |
|---|----------------------------|
| Construction Cost | |
| Good Market | Savings/None |
| Poor Market | <0.1% |
| Design and Construction Management Cost | |
| Good Market | None |
| Poor Market | None |
| Documentation | |
| Good Market | 40 to 120 hrs40 to 120 hrs |
| Poor Market | |

■ MR 3-1 and 3-2: Materials Reuse

LEED-NC

3.1 Use salvaged, refurbished or reused materials such that the sum of these materials constitutes at least 5 percent based on cost, of the total value of materials on the project.

3.2 Use salvaged, refurbished or reused materials for an additional 5 percent beyond MR Credit 3.1 (10 percent total, based on cost).

LEED-CI

These credits are CI MR 3-1 to 3-3. The credit requirements are identical for credits 3-1 and 3-2. CI adds credit 3-3 for a 30% reuse of Furniture and Furnishings

These credits are usually not readily achievable in healthcare settings, primarily because there is not enough opportunity for use of salvaged, refurbished or reused materials, products or furnishings to meet the five or ten percent thresholds. Even though some reclaimed materials or products can be incorporated at low cost or even for a reduction in cost, the cost for compliance with these credits can be significant since the percentage thresholds are quite high. Achievement of this credit may not be achievable for all but a very few healthcare projects.

■ MR 4-1 and 4-2: Recycled Content

LEED-NC

4.1 Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10 percent (based on cost) of the total value of the materials in the project.

4.2 Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes an additional 10 percent beyond MR Credit 4.1 (total of 20 percent, based on cost) of the total value of the materials in the project.

LEED-CI

These credits are CI MR 4-1 and 4-2. The credit requirements are similar, except that CI includes furniture in the calculation.

The use of recycled content is usually not difficult for most projects, and can be done at minimal or no added cost. Most buildings qualify for at least one point for recycled content with no additional cost impact, and minimal or no design effort.

The second point can be challenging for healthcare projects since the thresholds (20 percent by value) are quite high.

There should be no additional design and construction management cost, but there will be significant documentation requirements should the owner wish to demonstrate compliance with this credit.

Documentation involves tracking recycled content materials. This can be done with a simple one-page form that each trade is required to fill out for each product. Product manufacturers are familiar with this requirement and often provide recycled content data whether or not it has been requested. Trades are also asked to isolate the cost for materials, separate of labor and other costs. Once the general contractor has set up a tracking document and process, the added labor is not significant.

| Overall Likely Cost Effect: MR 4-1, 4-2 | |
|---|---------------|
| Construction Cost | |
| 4-1 (10%) | None |
| 4-2 (20%) | 0.1% to 0.25% |
| Design and Construction Management Cost | None |
| Documentation | 40 to 120 hrs |

■ MR 5-1 and 5-2: Local/Regional Materials

LEED-NC

5.1 Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10 percent (based on cost) of the total materials value.

5.2 Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for an additional 10 percent beyond MR Credit 5.1 (total of 20 percent, based on cost) of the total materials value.

LEED-CI

These credits are CI MR 2-1 and 2-2. The credit requirements are similar, except that CI includes furniture in the calculation.

Use of locally harvested and/or produced materials is usually neither difficult nor costly for most projects to achieve. Experience shows that more projects actually earn these points than initially expect to. This is because the difficulty of these points lies more with the documentation than with the actual specification. Once the contractor develops a documentation procedure, meeting the points becomes relatively straightforward.

As with recycled content, these points are typically earned using standard materials. The ease and cost of compliance with this credit varies greatly by location. Achieving the second point can be challenging because of the high threshold level.

There should be no additional design and construction management cost, but there will be significant documentation requirements.

| Overall Likely Cost Effect: MR 5-1, 5-2 | |
|---|---------------|
| Construction Cost | |
| 5-1 (10%) | None |
| 5-2 (20%) | 0.1% to 0.25% |
| Design and Construction Management Cost | None |
| Documentation | >120 hrs |

■ MR 6: Rapidly Renewable Materials

LEED-NC

Use rapidly renewable building materials and products (made from plants that are typically harvested within a ten-year cycle or shorter) for 2.5 percent of the total value of all building materials and products used in the project, based on cost.

LEED-CI

This credit is CI MR 6. The credit requirements are similar, except that CI includes furniture in the calculation.

Even though some rapidly renewable materials can be incorporated at low cost, the cost for compliance with these credits can be significant, since the percentage threshold is quite high.

There should be no additional design and construction management cost but there will be significant documentation requirements.

| Overall Likely Cost Effect: MR 6 | |
|---|----------|
| Construction Cost | >0.25% |
| Design and Construction Management Cost | None |
| Documentation | >120 hrs |

■ MR 7: Certified Wood

LEED-NC

Use a minimum of 50 percent of wood-based materials and products, which are certified in accordance with the Forest Stewardship Council's (FSC) Principles and Criteria, for wood building components

LEED-CI

This credit is CI MR 7. The credit requirements are similar, except that CI includes furniture in the calculation.

The cost of certified wood varies widely with location and timing, and is dependent primarily on supply and demand. Project teams should continually monitor supply and price and consider making a final decision as close to bid as possible.

For buildings using certified wood only in finished carpentry, and in areas where there is more than one supplier, the cost premium is minimal. For buildings requiring large quantities of dimensional softwood or sheet goods, the cost can be significant.

There should be no additional design and construction management cost but there will be significant documentation requirements.

| Overall Likely Cost Effect: MR 7 | |
|---|---------------|
| Construction Cost | |
| Steel or Concrete Frame | <0.1% |
| Wood Frame | 0.1% to 0.25% |
| Design and Construction Management Cost | None |
| Documentation | 40 to 120 hrs |

5.5 INDOOR ENVIRONMENTAL QUALITY

Most of the LEED-CI credits for Indoor Environmental Quality are identical to LEED-NC credits. Two of the credits, EQ 4 and EQ 8 have been expanded with the addition of credits for Low Emitting Materials in Furniture and Seating, and for Views from 90 percent of Seated Spaces (EQ 4-5 and EQ 8-3)

■ EQ Prerequisite 1: Minimum IAQ Performance

LEED-NC

Meet the minimum requirements of Sections 4 through 7 of ASHRAE 62.1-2004, Ventilation for Acceptable Indoor Air Quality. Mechanical ventilation systems shall be designed using the Ventilation Rate Procedure or the applicable local code, whichever is more stringent.

LEED-CI

This credit is prerequisite EQ1. The credit requirements are similar

In most cases, this prerequisite has no construction or design and construction management cost impact. The standards and technologies required for this point are standard to most projects. The documentation requirements are not onerous.

| Overall Likely Cost Effect: EQ Prerequisite 1 | |
|---|---------|
| Construction Cost | None |
| Design and Construction Management Cost | None |
| Documentation | <40 hrs |

■ EQ Prerequisite 2: Environmental Tobacco Smoke (ETS) Control

LEED-NC

OPTION 1

Prohibit smoking in the building and locate any exterior designated smoking areas at least 25 feet away from entries, outdoor air intakes and operable windows.

OPTION 2

Prohibit smoking in the building except in designated smoking areas, locate any exterior designated smoking areas at least 25 feet away from entries, outdoor air intakes and operable windows, and locate designated smoking rooms to effectively contain, capture and remove ETS from the building.

OPTION 3 (For residential buildings only)

Prohibit smoking in all common areas of the building, locate any exterior designated smoking areas at least 25 feet away from entries, outdoor air intakes and operable windows opening to

common areas, and minimize uncontrolled pathways for ETS transfer between individual residential units by sealing penetrations in walls, ceilings and floors in the residential units, and by sealing vertical chases adjacent to the units.

LEED-CI

This credit is prerequisite EQ2. The credit requirements are similar

Smoking is not permitted in Federal buildings, and there should be no new procedures or costs to comply with this credit

| Overall Likely Cost Effect: EQ Prerequisite 2 | |
|---|------|
| Construction Cost | None |
| Design and Construction Management Cost | None |
| Documentation | None |

■ EQ 1: Outdoor Air Delivery Monitoring

LEED-NC

Install permanent monitoring systems that provide feedback on ventilation system performance to ensure that ventilation systems maintain design minimum ventilation requirements. Configure all monitoring equipment to generate an alarm when the conditions vary by 10 percent or more from setpoint, via either a building automation system alarm to the building operator or via a visual or audible alert to the building occupants.

LEED-CI

This credit is CI EQ1. The credit requirements are similar

In most cases, this credit has little construction or design and construction management cost impact. The added sensors and the modifications to the control systems make a very small contribution to the overall cost of the air conditioning systems. The standards and technologies required for this point are standard to most projects or easily achieved at minimal added cost.

| Overall Likely Cost Effect: EQ 1 | |
|---|-------|
| Construction Cost | <0.1% |
| Design and Construction Management Cost | None |
| Documentation | None |

■ EQ 2: Increase Ventilation

LEED-NC

FOR MECHANICALLY VENTILATED SPACES

Increase breathing zone outdoor air ventilation rates to all occupied spaces by at least 30 percent above the minimum rates required by ASHRAE Standard 62.1-2004 as determined by EQ Prerequisite 1.

FOR NATURALLY VENTILATED SPACES

Design natural ventilation systems for occupied spaces to meet the recommendations set forth in the Carbon Trust "Good Practice Guide 237" [1998]. Determine that natural ventilation is an effective strategy for the project.

LEED-CI

This credit is CI EQ 2. The credit requirements are similar

VA has made some adjustments in the VA HVAC criteria that will help achieve this credit. Compliance with this credit has a very small construction cost impact, but can have a significant impact on the operational cost of the facility, particularly in areas where the outside air temperature or humidity is significantly different from the required indoor conditions. Increasing outdoor air quantities will usually lead to increased coil sizes, and possibly increased chilling and heating plant capacity. The increased operational costs can be offset to some degree through the use of total heat recovery.

| | |
|---|---------------|
| Overall Likely Cost Effect: EQ 2 | |
| Construction Cost | <0.1% |
| Design and Construction Management Cost | 0.1% to 0.25% |
| Documentation | <40 hrs |

■ EQ 3-1: Construction IAQ Management Plan - During Construction

LEED-NC

Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:

- *During construction meet or exceed the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 1995, Chapter 3.*
- *Protect stored on-site or installed absorptive materials from moisture damage.*
- *If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-1999. Replace all filtration media immediately prior to occupancy.*

LEED-CI

This credit is CI EQ 3-1. The credit requirements are similar

This credit is one that many projects aim for but fail to achieve. This is because the credit requires significant coordination and management on the part of the contractor and all members of the construction crew, as well as a strong commitment by all members of the construction crew to abide by the rules.

The ease and cost of compliance with this credit varies greatly by location. In areas where construction IAQ management is widely used, the costs are minimal, if any. In other areas or with contractors unfamiliar with construction IAQ management the costs can be substantial.

The cost premium can be seen in two forms. In the first instance there is the direct cost of IAQ management: developing procedures, training, material handling, etc. The second cost impact is less measurable, and that is the impact on bidders. In periods of high construction demand and limited competition, inexperienced bidders may view these requirements as unduly onerous, and as a result decline to bid, or bid high to cover what they perceive as the risk. This can be mitigated to some degree through bidder outreach and training, but the cost can be significant in certain locations at periods of low competition.

There should be minimal additional design and construction management cost, mainly related to collaboration with the contractor in developing and overseeing the operation of the IAQ plan, but there will be moderate documentation requirements in order to monitor and demonstrate compliance.

| Overall Likely Cost Effect: EQ 3-1 | |
|---|---------------|
| Construction Cost | |
| Good Market | <0.1% |
| Poor Market | <0.1% |
| Design and Construction Management Cost | |
| Good Market | <0.1% |
| Poor Market | <0.1% |
| Documentation | |
| Good Market | 40 to 120 hrs |
| Poor Market | 40 to 120 hrs |

■ **EQ 3-2: Construction IAQ Management Plan - Before Occupancy**

LEED-NC

Develop and implement an Indoor Air Quality (IAQ) Management Plan for the pre-occupancy phase as follows:

OPTION 1 — Flush-Out

After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total air volume of 14,000 cu.ft. of outdoor air per sq.ft. of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60 percent.

OR

If occupancy is desired prior to completion of the flush-out, the space may be occupied following delivery of a minimum of 3,500 cu.ft. of outdoor air per sq.ft. of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm/sq.ft. of outside air or the design minimum outside air rate determined in EQ Prerequisite 1, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14,000 cu.ft./sq.ft. of outside air has been delivered to the space.

OPTION 2 — Air Testing

Conduct baseline IAQ testing, after construction ends and prior to occupancy, using testing protocols consistent with the United States Environmental Protection Agency Compendium of Methods for the Determination of Air Pollutants in Indoor Air and as additionally detailed in the Reference Guide.

Demonstrate that the contaminant maximum concentrations are not exceeded.

LEED-CI

This credit is CI EQ 3-2. The credit requirements are similar

The feasibility of this credit depends a great deal on the climate. In hot, dry areas a two week flush-out with outdoor air is quite feasible as long as it is planned into the construction schedule. In areas where there is high humidity, however, this point is simply not feasible, since a two week flush-out with outdoor air in wetter climates is more likely to expose the interior of the building to mold and other problems.

| Overall Likely Cost Effect: EQ 3-2 | |
|---|---------|
| Construction Cost | <0.1% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

■ **Low Emitting Materials: EQ 4-1: Adhesives and Sealants; EQ 4-2: Paints and Coatings; EQ 4-3: Carpet Systems; EQ 4-4: Composite Wood and Agrifiber Products**

LEED-NC

4.1 All adhesives and sealants used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the requirements of the reference standards

4.2 Paints and coatings used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the specified criteria

4.3 All carpet installed in the building interior shall meet the testing and product requirements of the Carpet and Rug Institute's Green Label Plus program. All carpet cushion installed in the building interior shall meet the requirements of the Carpet and Rug Institute Green Label program. All carpet adhesive shall meet the requirements of EQ Credit 4.1: VOC limit of 50 g/L."

4.4 Composite wood and agrifiber products used on the interior of the building (defined as inside of the weatherproofing system) shall contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins.

LEED-CI

These credits are CI EQ 4-1 to 4-5. The credit requirements are similar, except that CI adds a credit EQ 4-5: Low Emitting Materials, Systems Furniture and Seating

The first three of these credits are fairly easy to achieve. In many cases, local or regional ordinances may already require that projects meet the required standards. Where local or regional regulations do not already establish the use of low emitting materials, making use of these should have only minimal – if any – impact on cost, as these are usually widely available. The requirement for composite wood and agrifiber products can be harder to achieve, as suitable products are less readily available.

In most cases, these credits have no construction or design and construction management cost impact. The standards and technologies required for these points are standard to most projects, or easily achieved at minimal added cost. The one exception is EQ 4-4: Composite Wood and Agrifiber Products. Prices for composite wood materials with no added urea-formaldehyde can vary widely depending on the product selected and market conditions. Documentation of the use of materials is a concern for contractors.

For CI projects, the credit 4-5 can be challenging, and have a significant cost impact.

| Overall Likely Cost Effect: EQ 4-1 to 4-4 | |
|---|---------|
| Construction Cost | <0.1% |
| Design and Construction Management Cost | None |
| Documentation | <40 hrs |

■ **EQ 5: Indoor Chemical and Pollutant Source Control**

LEED-NC

Design to minimize and control pollutant entry into buildings and later cross-contamination of regularly occupied areas:

Employ permanent entryway systems at least six feet long in the primary direction of travel to capture dirt and particulates from entering the building at all entryways that are directly connected to the outdoors.

Where hazardous gases or chemicals may be present or used (including garages, housekeeping/laundry areas and copying/printing rooms), exhaust each space sufficiently to create negative pressure with respect to adjacent spaces with the doors to the room closed. For each of these spaces, provide self-closing doors and deck to deck partitions or a hard lid ceiling. In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media prior to occupancy that provides a Minimum Efficiency Reporting Value (MERV) of 13 or better. Filtration should be applied to process both return and outside air that is to be delivered as supply air.

LEED-CI

This credit is CI EQ 5. The credit requirements are similar

This credit is usually fairly easy to achieve with little added cost. In most cases, the air intake placement requirements are easy to achieve; where they are not the cost of complying by building additional ductwork and structures can be very high.

In most cases, this credit has minor construction and no design and construction management cost impact. The standards and technologies required for this point are standard to most projects, or easily achieved at minimal added cost.

| Overall Likely Cost Effect: EQ 5 | |
|---|-------|
| Construction Cost | <0.1% |
| Design and Construction Management Cost | None |
| Documentation | None |

■ **EQ 6-1: Controllability of Systems – Lighting;**

EQ 6-2: Controllability of Systems – Thermal Comfort

LEED-NC

Provide individual lighting controls for 90 percent (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences.

AND

Provide lighting system controllability for all shared multi-occupant spaces to enable lighting adjustment that meets group needs and preferences.

Provide individual comfort controls for 50 percent (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences. Operable windows can be used in lieu

of comfort controls for occupants of areas that are 20 feet inside of and 10 feet to either side of the operable part of the window.

AND

Provide comfort system controls for all shared multi-occupant spaces to enable adjustments to suit group needs and preferences.

LEED-CI

These credits are CI EQ 6.1 and 6.2. The credit requirements are similar

These credits can be difficult to achieve in healthcare settings, where many areas are not directly under the control of a single occupant. Most patient rooms now incorporate some degree of lighting and ventilation control for the patient, and many of the individual workstations have individual lighting control. Nevertheless, achieving the 90 percent and 50 percent of occupants' level for lighting and ventilation is sometimes challenging.

The costs associated with credit 6-1 (lighting) are primarily those for daylight harvesting and automatic controls. In some locations, these are required by code. The added individual switching is not a significant cost. This can add \$2-\$3.00/SF in the perimeter areas.

The costs associated with credit 6-2 (ventilation) are primarily the added air conditioning zones, which can add from \$1,000 - \$2,000 per zone.

| Overall Likely Cost Effect: EQ 6-1, 6-2 | |
|---|---------------|
| Construction Cost | 0.1% to 0.25% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

■ **EQ 7-1: Thermal Comfort – Design; EQ 7-2: Thermal Comfort - Verification**

LEED-NC

Design HVAC systems and the building envelope to meet the requirements of ASHRAE Standard 55-2004, Thermal Comfort Conditions for Human Occupancy. Demonstrate design compliance in accordance with the Section 6.1.1 Documentation.

Agree to implement a thermal comfort survey of building occupants within a period of six to 18 months after occupancy. This survey should collect anonymous responses about thermal comfort in the building including an assessment of overall satisfaction with thermal performance and identification of thermal comfort-related problems. Agree to develop a plan for corrective action if the survey results indicate that more than 20 percent of occupants are dissatisfied with thermal comfort in the building. This plan should include measurement of relevant environmental variables in problem areas in accordance with ASHRAE Standard 55-2004.

LEED-CI

These credits are CI EQ 7-1 and 7-2. The credit requirements for 7-1 are similar to those for NC. For 7-2, the CI requirements include installation of a permanent comfort monitoring system

Since most projects will have a Building Management System (BMS) as part of their basic design, complying with this credit usually involves small increases to the capabilities of the BMS as opposed to adding new systems. The cost impact of this credit is therefore typically relatively low.

| Overall Likely Cost Effect: EQ 7-1, 7-2 | |
|---|---------|
| Construction Cost | <0.1% |
| Design and Construction Management Cost | <0.1% |
| Documentation | <40 hrs |

■ **EQ 8-1: Daylight and Views – Daylight 75 Percent of Spaces; EQ 8-2: Daylight and Views – Views for 90 Percent of Spaces Strategies**

LEED-NC

8.1 **OPTION 1 — CALCULATION**

Achieve a minimum glazing factor of 2 percent in a minimum of 75 percent of all regularly occupied areas.

OPTION 2 — SIMULATION

Demonstrate, through computer simulation, that a minimum daylight illumination level of 25 footcandles has been achieved in a minimum of 75 percent of all regularly occupied areas.

Modeling must demonstrate 25 horizontal footcandles under clear sky conditions, at noon, on the equinox, at 30 inches above the floor.

OPTION 3 — MEASUREMENT

Demonstrate, through records of indoor light measurements, that a minimum daylight illumination level of 25 footcandles has been achieved in at least 75 percent of all regularly occupied areas.

Measurements must be taken on a 10-foot grid for all occupied spaces and must be recorded on building floor plans.

8.2 *Achieve direct line of sight to the outdoor environment via vision glazing between 2'6" and 7'6" above finish floor for building occupants in 90 percent of all regularly occupied areas.*

LEED-CI

These credits are CI EQ 8-1 to 8-3. The credit requirements are similar, except that CI adds credit 8-3 for views from 90% of spaces

There are two main elements in the strategy to achieve these credits. The first is to reduce the maximum distance from the exterior by narrowing the floorplate as far as possible. The second is to maximize the daylight penetration into the building by the use of good orientation, high quality glazing, and effective light shelving.

In acute care facilities, the floor plate size is set by program, and it can be challenging to reduce the overall depth of the floorplate. For this reason, these credits can be challenging in acute care buildings. In long-term care and medical office buildings, it is generally easier to configure the floorplates to allow for greater daylight penetration and provide for the required views, but even so, it can be difficult to get enough daylight and views to achieve compliance with these credits.



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