CITY OF DALLAS

Green Building Program Guidebook

City of Dallas

Acknowledgements
This Guidebook was created by Hellmuth, Obata + Kassabaum Architects, LP (HOK) in Dallas, TX for the City of Dallas. The Guidebook was written for the Building Officials and Inspectors who are responsible for the implementation of sustainable strategies of the City of Dallas' Green Ordinance 27131 as approved by City Council on April 9, 2008. This Guidebook is intended to provide such officials with a resource to document the review process as required by the City of Dallas.

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Special Thanks to:

This Guidebook was commissioned by the Department of Building Inspection of the City of Dallas under the leadership of Zaida Basora, AIA, LEED AP, Peter Blanchette, M.S.F. and Leif Sandberg, AICP in order to assist building inspection personnel as well as external architecture and engineering service providers, builders and contractors with achieving green building certification as required by the Dallas City Code. It is intended to provide guidance, to facilitate the green building process and to assist project teams in making sound economic and environmental decisions for these projects. It is not intended to replace the LEED Reference Guides, which are all essential tools when designing and constructing a project under the LEED rating system, nor is it intended to replace the services of a sustainable design consultant, should the project scope or complexity benefit from outside expertise. This Guidebook is intended to provide greater insight into the green building process specifically for projects located in the City of Dallas.

The Leadership in Energy and Environmental Design (LEED) Rating System was developed by the United States Green Building Council (USGBC) and the term "LEED" is trademarked. It should not be used to describe projects that are not Registered with the USGBC, Certified by the USGBC or not intending to pursue LEED Certification. All LEED-related materials, such as the LEED Reference Guides, are copyrighted and should not be copied or distributed without permission from the USGBC.

At the time of publication of this Guidebook, the LEED Rating Systems referred to are:

- LEED for New Construction and Major Renovations v2.2
- LEED for Commercial Interiors v2.0
- LEED for Core and Shell v2.0
- LEED for Existing Buildings: Operations and Maintenance
- LEED for Schools
- LEED for Homes

All projects registered for LEED with the USGBC before updated Ratings Systems are released will still be using the Rating Systems listed above, and therefore this Guidebook.

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City of Dallas Ordinance for Sustainable Projects

Based on LEED for New Construction & Major Renovations v2.2

Building on the success of the LEED Rating System, the City of Dallas has adopted a new ordinance to meet their sustainable goals. The LEED Rating System was used as the framework for the ordinance. One of the great things about the Leadership in Energy and Environmental Design (LEED) Rating System is that it provides a framework in which a design and construction team has many options and great flexibility with which to customize a sustainable design approach. The following Prerequisite/Credit approaches and recommendations are therefore not meant to exclude any ideas or opportunities, rather to give a good starting point from which to launch a discussion about LEED strategy. An accompanying checklist has been provided, but this is not meant to mandate which credits should be pursued or to preclude the pursuit of additional credits. All strategies should be discussed by the whole project team on their merits for any given project at the Sustainable Design Charrette and throughout the design and construction process. Many new systems, methods, products, materials and other tools may (and probably will) become available in the time span of your project. An option which seems unaffordable or impractical now may become much easier to achieve as green building practices continue to grow in the marketplace.

In addition, your project site or program may have unique conditions to consider. Project teams should weigh the environmental merits of their LEED strategy against the building function and usefulness to its occupants. The LEED Rating System is intended to elevate the built environment above building codes, which represent the legal minimum standards to which we may design and construct buildings. It is not meant to be 'gamed' or worked around; doing so undermines the intent of the rating system as well as the City of Dallas's goal to create a more sustainable city and to ease the burden on municipally supported infrastructure as development advances.

This workbook is intended to provide the building inspector with a basic check list and additional insight to how this process works. It is organized by section, in accordance with the LEED rating system. Each Prerequisite or Credit will have recommended compliance paths specific to Dallas and will highlight responsibilities for team members in the design and construction phases. Each Prerequisite and Credit description will also indicate whether it is necessary to document the compliance in the Plan Review or at Final Inspection. Any Plan Review credit may be deferred to the Final Inspection for review if adequate documentation is not feasible or possible at the time of the Plan Review submittal. Please see LEED Process Management and Steps to LEED Certification chapters for more information on the Plan Review Phase and the Final Inspection Process.

It will be noted where City of Dallas or Dallas Building Inspection policies are in place already to address LEED requirements. Project teams pursuing LEED in the private sector may use these policies as a template or model if they so choose and provide the city with necessary signed documentation that such strategies have been pursued.

The LEED Reference Guide for the LEED-NC (New Construction) rating system provides invaluable technical assistance and this Guidebook will not attempt to duplicate the substantial efforts of the United States Green Building Council (USGBC). Please refer to the LEED-NC Reference Guide for all technical credit support. This Guidebook will offer clarity on documentation, calculations and City of Dallas appropriate strategies. This Guidebook will also provide some additional representational images or diagrams to project teams. These resources are not comprehensive, nor do they imply any endorsement by the City; they are for informational purposes only.

All Prerequisites in the LEED-NC Rating System need not be achieved to attain sustainable approval from the city but they are required for LEED Certification. A minimum number of credits must also be achieved to reach each level of Certification. The City of Dallas requires that a minimum level of 22 credits are pursued and in the Residential category that all of the requirements are met. The City may provide expedited permitting for projects that plan to achieve a Gold or Platinum level of Certification.

The current credit requirements for LEED-NC Certification at each level are shown below. The

project team should target at least 2-3 credits above the minimum threshold for the intended level of certification as a cushion against changes that may be made to the project at a later date, or in case a credit is not awarded in the documentation and review process.

LEED-NC v2.2 Certification Levels

Certified	26-32
Silver	33-38
Gold	39-51
Platinum	52-69

All web sites referenced in this document represent free resources. Any mention of products or services is for informational purposes only. Inclusion in the Resources section does not imply endorsement or approval by the City of Dallas Building Inspection. This list is not intended to be exhaustive, merely examples of various products, materials and sources of information to get LEED project teams started. New sustainable products, materials, services and technologies enter the market every day and may not be included in this Guidebook because they were not available at the time of publication.

SYMBOL LEGEND

☆ OWNER

0 DESIGN PROFESSIONAL

△ GENERAL CONTRACTOR

Section One: Sustainable Sites

Overview

This section of the LEED Rating System deals with the project site and context, rather than the building itself. The greenest building still misses many environmental opportunities if it is located on a Greenfield site with no previously existing infrastructure or access to alternative transportation options. This section also addresses some of the burdens that increasing density present to local air quality and municipal infrastructure, such as stormwater treatment and roads.

Fortunately for Dallas projects, many of the Sustainable Sites credits are attainable by virtue of location. Dallas is a dense, urban environment with a vast network of resources.

In addition, as mandated by the City of Dallas, Green Building Ordinance #27131 building codes are evolving to support greater conservation of resources and to address many environmental challenges faced by the the City. Achievement of some prerequisites and credits may be attainable by complying with current building codes. Please refer to the most recent updates to the City of Dallas codes on the City of Dallas web site.

As with a LEED project in any jurisdiction, Sustainable Sites credits work particularly well in concert with one another on projects. The USGBC uses the term Credit Synergies to refer to the combination of strategies that span multiple credits to achieve a sum greater than its parts. Keep in mind, as a Sustainable Sites strategy is developed, LEED is most effective and economical if a holistic approach, rather than an additive approach to followed. A strategy that achieves many credits at once may appear to be costly as a single line item, but if it is eliminated in the Value Engineering (VE) process, it may eliminate eligibility for LEED credits as well as incur some unforeseen costs, cancelling out any savings hoped to achieve in VE.

Before any project begins the design team must:

1. Check the zoning requirements for open space, parking, etc. You will need to know zoning requirements for Site Selection credits in order to verify compliance.

2. Define the LEED Site Boundary. This may or may not coincide with the Limit of Disturbance (LOD). It may or may not coincide with the property line. It should include all area within the project scope, with the exception of any right of way (ROW), unless you choose to include it. If you are making improvements to the ROW, you may include it but are not required to do so. The project team may discover that a broader LEED site boundary line assists in achievement of some credits while reducing opportunities for others. The team should locate the boundary where it accurately reflects the scope of work and has the most benefit for LEED credit achievement; however the boundary line must be consistent for all LEED credits and prerequisites.

3. Establish the Full Time Equivalent (FTE) number as well as a Peak Demand that includes any visitors, or transient occupants. See glossary for FTE instructions.

4. Project teams should be aware that any demolition that occurs prior to project construction must be included in calculations for Construction Waste Management (CWM) in the Materials & Resources section of LEED. Please review requirements before any site clearing takes place.

In this Section

- Prerequisite 1: Construction Activity Pollution Prevention
- Credit 1: Site Selection
- Credit 2: Development Density & Community Connectivity
- Credit 3: Brownfield Redevelopment
- Credit 4.1: Alternative Transportation, Public Transportation Access
- Credit 4.2: Alternative Transportation, Bicycle Storage & Changing Rooms
- Credit 4.3: Alternative Transportation: Low Emitting & Fuel Efficient Vehicles
- Credit 4.4: Alternative Transportation: Parking Capacity
- Credit 5.1: Site Development, Protect or Restore Habitat
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- Credit 6.1: Stormwater Design, Quantity Control
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- Credit 7.1: Heat Island, Non-Roof
- COD prerequisite 7.2: Heat Island, Roof
- COD prerequisite 8: Light Pollution Reduction
- Section Resources

SS Prereq 1

Construction Activity Pollution Prevention

Design Responsibility
Design Professional

Documentation Phase
Final Inspection

This prerequisite is identified in the Application Checklist in the Sustainable Sites section as Prerequisite 1. It is the responsibility of a design professional as marked by the round shaped symbol. Please note that LEED prerequisites are not required prerequisites to meet the Dallas Green Building Program. This credit will be initially verified as submitted during the plan review stage and then monitored periodically during construction by a field inspector until project completion. Ultimately, the general contractor will be responsible for implementing the pollution activity prevention plan on site.

Documentation
Required submittal documents to be reviewed are identified in the Application Checklist. Review which box has been checked for the project and look for the appropriate seal and signature of the design consultant or the required Affidavit.

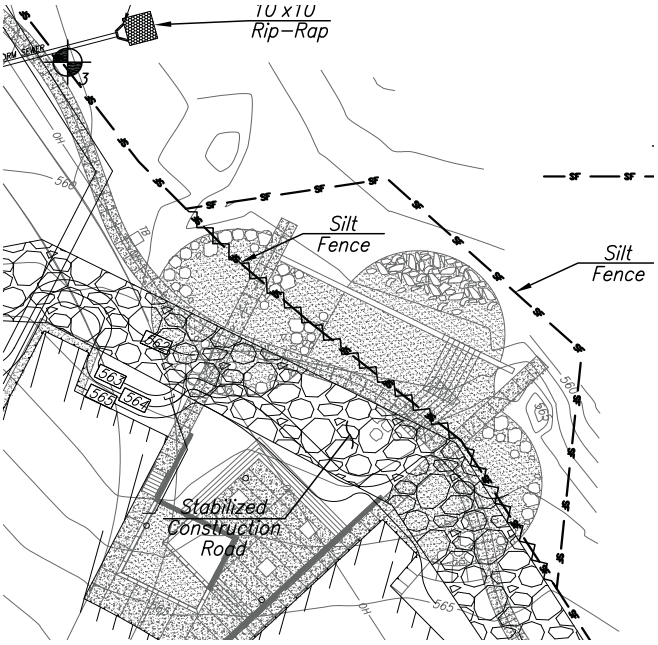
If the storm water pollution prevention plan (SWP3) box is checked, Dallas requirements are equal to or greater than the LEED requirements for this Prerequisite. The civil engineer shall indicate on the Application Checklist by certifying with his/her seal and signature that a copy of the project SWP3 has been submitted in accordance to the permit requirements. Often this plan is included in the Civil design documents and in that case, the civil drawings should be reviewed.

It may be helpful for the contractor to take pictures of compliance with this plan periodically throughout construction in the event there are any questions raised by the Texas Commission on Environmental Quality (TCEQ), Public Works and Transportation, Building Inspection or the LEED Reviewers. City inspectors may also document compliance with this credit through photographs and periodic inspection reports.

Information can be found on the Civil consultants SWP3 plan or refer to specification section as outlined in the project manual site sections.

Intent and Sample Strategies
This Prerequisite requires that the project have measures in place to prevent waterborne and airborne particulate matter from leaving the job-site and polluting local water ways and diminishing local air quality. Strategies in Dallas typically include silt fences around the site perimeter and wetting down the job site to prevent erosion of disturbed earth and dust (air borne matter) during site work and construction activity. Sometimes bumpers are required to prevent site runoff from entering and clogging stormwater grates at the curb.

Erosion Control Strategy: Silt Fence.



Construction Activity Pollution Plan

SS Credit 1

Site Selection

Design Responsibility
Owner

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Sustainable Sites section as Credit 1. It is the responsibility of the owner as marked by the star-shaped symbol. This credit will be verified during plan review.

Documentation
The owner/developer or the civil engineer must complete the Application Checklist, indicating that none of the restricted criteria are met, and should note on the site plan or location plan that shows the context of the project.

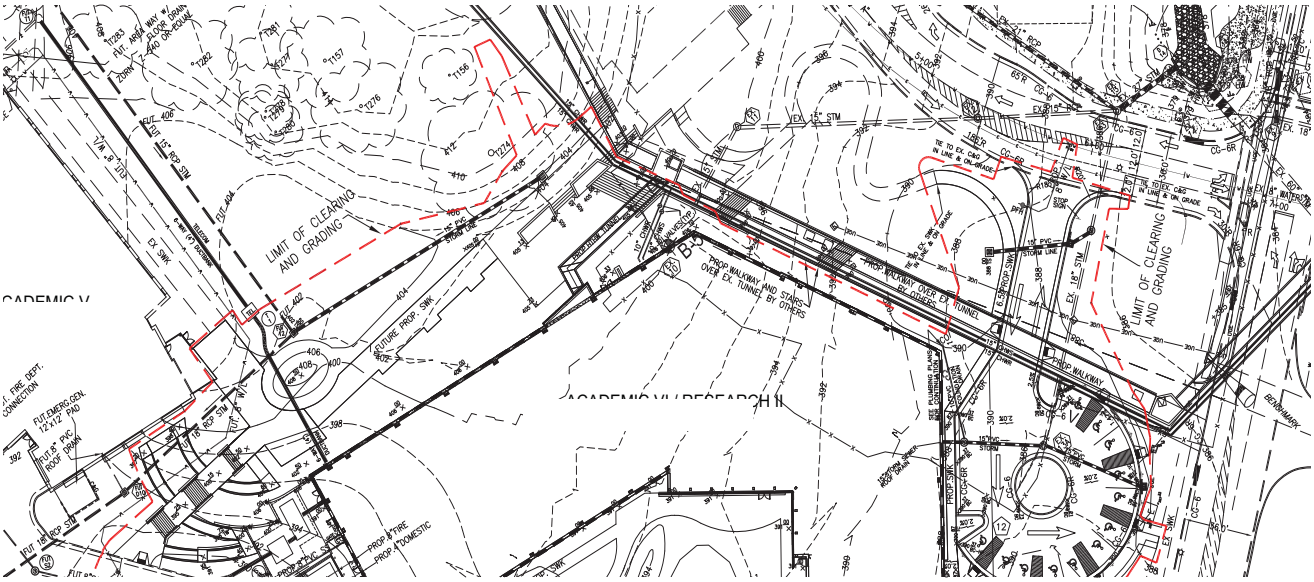
Information can be found on the site plan sheet or the letter provided by the owners regarding site selection.

Intent and Sample Strategies
This credit is intended to encourage the selection of sites in areas with existing infrastructure and where further development does not compromise the environment. Often project design teams have no input in the site selection and this is a credit either received or not received, based on the site given for the project. In the case of design-build projects where the project team (including developer) proposes a site to the owner, it should be noted that this credit could be easily achieved by selecting a site that meets the credit criteria.

The easiest way to achieve this credit is to build on a previously developed site. For the purposes of LEED, previously developed refers to any site that has ever been graded, paved or built upon. A Greenfield site is one that has never been graded and would require the clearing of existing native vegetation for construction activity. For example, a site that was previously a rail yard may be currently a grass-covered lot, but the site has been graded and cleared in the past and would qualify as previously developed.

The credit requires that the building or any hardscape must not be on:

- **Prime farmland (as defined by the USDA)**
- **Previously undeveloped land where the elevation is <5'above the elevation of the 100-year floodplain (as defined by FEMA)**
- **Endangered Species habitat**
- **Within 100' of any wetlands**
- **Previously undeveloped land that is within 50' of a naturally occurring body of water**
- **Land which prior to acquisition for the project was public parkland unless the project is for the Park and Recreation Department, or land of equal/greater value is traded for the site.**



A site Plan illustrates Credit Compliance. Image provided by HOK

SS Credit 2

Development Density & Community Connectivity

Design Responsibility
Owner/ Desig. Profess.

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Sustainable Sites section as Credit 2. It is the responsibility of the owner as marked by the star-shaped symbol. All centrally located commercial office projects in the City of Dallas should be able to achieve this credit. This credit will be verified during plan review.

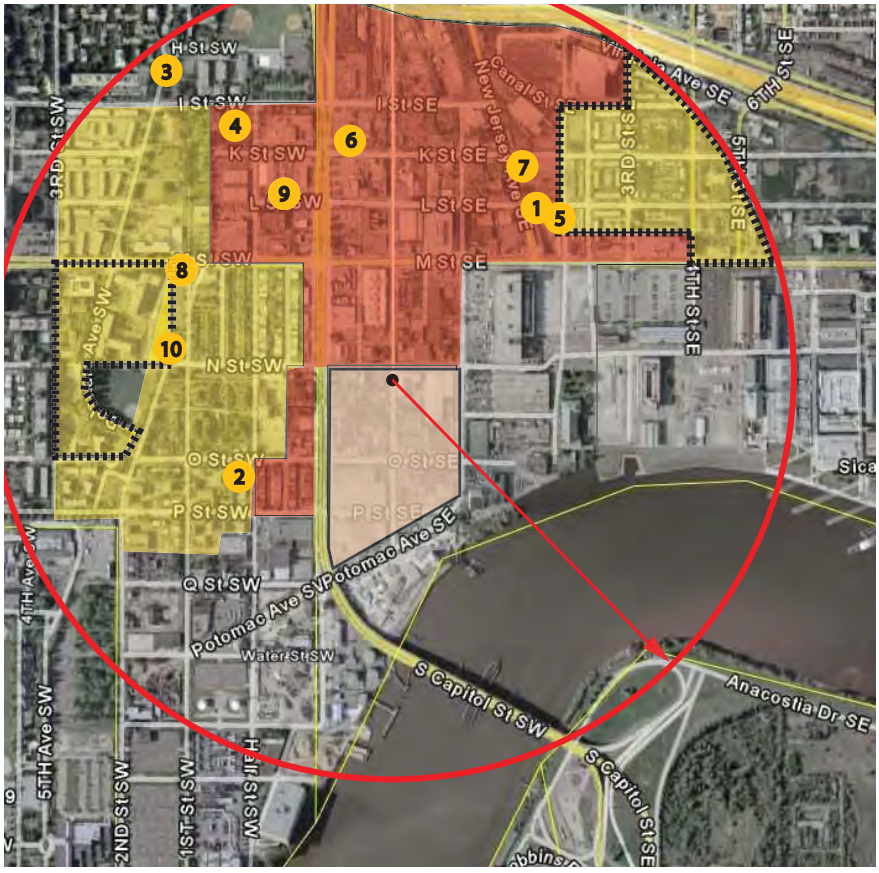
Documentation
There are two options to document this credit. The owner or consultant will check the option box selected for documentation in the Application Checklist. During plan review, the LEED reviewer will sign off on this credit once the submittal documentation required in the checklist has been verified. The documentation for both Option 1 and Option 2 must be submitted with the building permit review set.

Information can be found on the site plan sheet or accompanying site plan to the submitted credit template

Intent and Sample Strategies
This credit is intended to encourage the siting of projects in dense, urban environments with pedestrian access to a variety of services and amenities. Often, local business improvement web sites provide much of this information, particularly where residential development exists within ½ mile radius of your project. Other web sites, such as www.walkscore.com will provide information about local services and amenities as well as the distance to your project address.

The easiest way to document this credit is through Option 2 – Community Connectivity. The owner or the architect can provide a neighborhood site map that shows pedestrian access to a) at least ten basic services (e.g. bank, grocery or convenience store, beauty, recreation or gym, theater, school, health care, restaurant, library, post office, place of worship, etc.) and b) a residential zone with a density of 10 units per acre, all within ½ mile.

In the case of neighborhoods undergoing redevelopment, project teams may document future/ anticipated services and amenities as long as a) there is existing infrastructure in place, and b) there is already a lease or legal agreement in place for that service/amenity. The owner or architect must complete the Application Checklist and provide a neighborhood site plan, indicating the location of the amenities and residential development. In the case of anticipated services, project teams may need to provide documentation of leases or agreements for these services in the locations indicated on the site plan.



Neighborhood Site Plan. Source: Google Maps

SS Credit 3

Brownfield Redevelopment

Design Responsibility
Owner/ Desig. Profess.

Documentation Phase
Plan Review

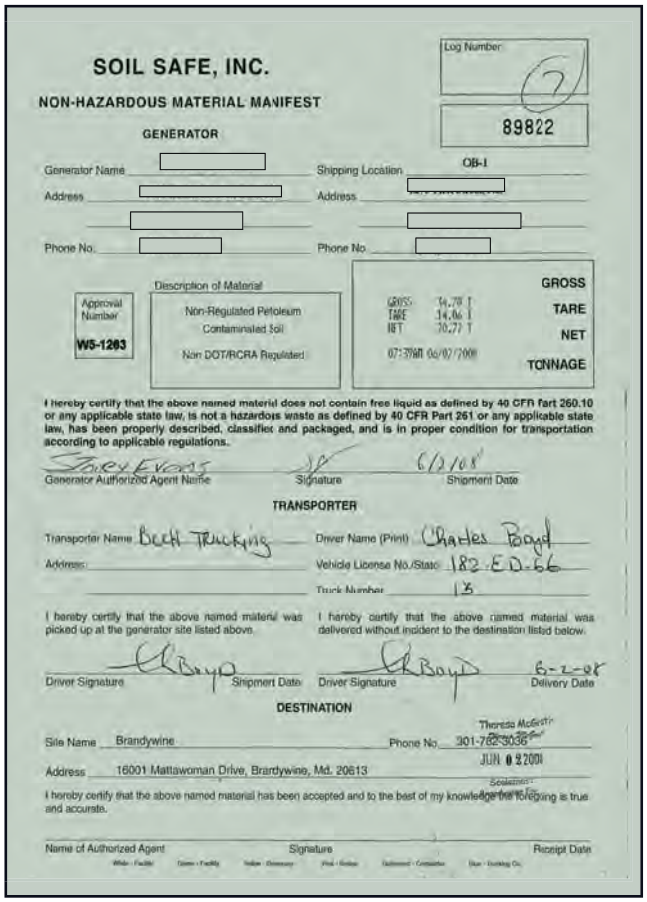
This credit is identified in the Application Checklist in the Sustainable Sites section as Credit 3. It is the responsibility of the owner as marked by the star-shaped symbol. This credit will be verified during plan review.

Documentation
The project owner must complete the Application Checklist, and must submit either:
a) a copy of the acceptance letter for the Voluntary Clean-up Program (VCP),
b) certificates for completed soil remediation, or
c) documentation of groundwater remediation methods.

Information can be found on the letter or document submitted by the owner or owner's representative.

Intent and Sample Strategies
This credit is intended to encourage project teams to remediate soil and groundwater on contaminated sites, which are often centrally located in urban areas with access to existing infrastructure, in lieu of building on Greenfield sites. The project does not have to be designated a Superfund site, it simply must be contaminated and remediated prior to construction of the project. Participation in a Voluntary Clean-up Program would make the project eligible for this credit.

Although contaminated soil may be remediated and recycled, it does not factor into any Construction Waste Management or Recycled Content credits in the Materials & Resources section.



SOIL SAFE, INC.

NON-HAZARDOUS MATERIAL MANIFEST

Log Number: 89822

GENERATOR

Generator Name [redacted] Shipping Location OB-1

Address [redacted] Address [redacted]

Phone No. [redacted] Phone No. [redacted]

Description of Material: Non-Regulated Petroleum Contaminated Soil; Non DOT/RCRA Regulated

Approval Number: WS-1203

GROSS 14.78 T
TARE 14.06 T
NET 20.72 T
07:39AM 06/02/2008

GROSS / TARE / NET / TONNAGE

I hereby certify that the above named material does not contain free liquid as defined by 40 CFR Part 260.10 or any applicable state law, is not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law, has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulations.

Generator Authorized Agent Name [redacted] Signature [redacted] Shipment Date 6/2/08

TRANSPORTER

Transporter Name Beech Trucking Driver Name (Print) Charles Boyd

Address: Vehicle License No./State 182-ED-66

Truck Number 13

I hereby certify that the above named material was picked up at the generator site listed above. Driver Signature [redacted] Shipment Date

I hereby certify that the above named material was delivered without incident to the destination listed below. Driver Signature [redacted] Delivery Date 6-2-08

DESTINATION

Site Name Brandywine Phone No. 301-782-3036

Theresa McCarthy

JUN 02 2008

Address 16001 Mattawoman Drive, Brandywine, Md. 20613

I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate.

Name of Authorized Agent Signature Receipt Date

SS Credit 4.1

Alternative Transportation: Public Transportation Access

Design Responsibility
Owner/ Desig. Profess.

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Sustainable Sites section as Credit 4.1. It is the responsibility of the owner as marked by the star-shaped symbol. This credit will be verified during plan review.

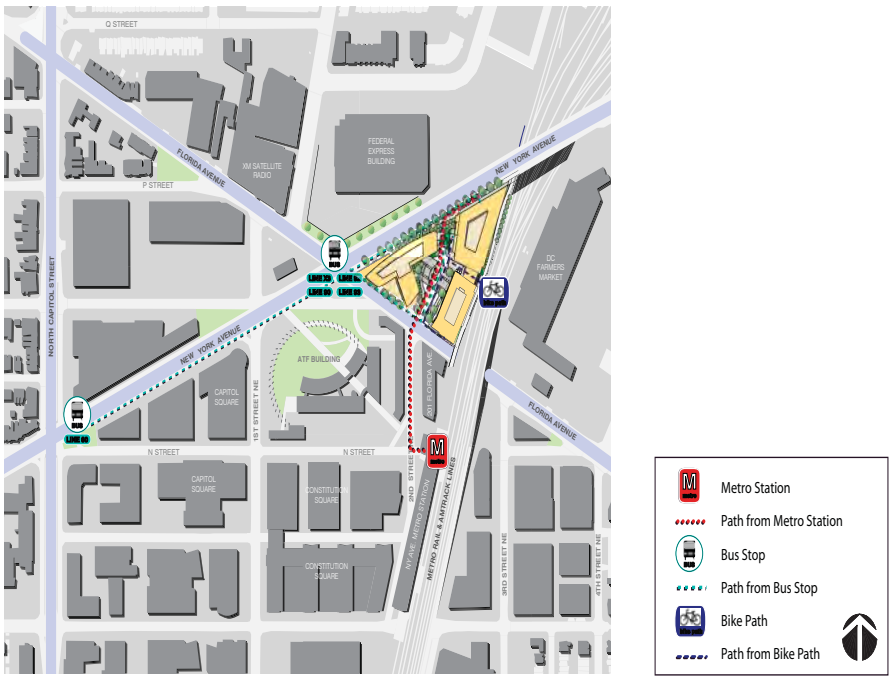
Documentation
The project owner or architect must complete the Application Checklist and provide a project site map that indicates a) the location of transit stops, and b) the distance between transit stops and the project site. For the Exemplary Performance credit, the owner or architect should also provide the rail and/or bus timetables and provide an estimated ride opportunity count for LEED reviewers. Please see Enhanced Performance (EP) section of this Guidebook for further documentation instructions for EP credits.

Information can be found on the site plan sheet, landscape plan or on the accompanying plan created in the approval of this credit.

Intent and Sample Strategies
This credit is to encourage the siting of projects near public transportation access points, such as DART bus stops and DART Rail stations. Ready access to transit options typically encourages greater participation in transit ridership and reduces the amount of Vehicle Miles Traveled (VMT), or the amount of miles Dallas residents or employees will drive to and from work. To achieve the credit, the project need only be within ¼ mile of two or more bus lines (at one or more stops) or within ½ mile of one rail station. Planned and funded rail lines may be counted. All centrally located commercial office projects in Dallas should be able to achieve this credit.

In addition to SS 4.1, projects with an abundance of transit options may be eligible for an Exemplary Performance credit in the Enhanced Performance (EP) section. To achieve this additional credit, teams must show a minimum of 200 ride opportunities per weekday on bus (within ¼ mile) and rail (within ½ mile). A ride opportunity is simply a scheduled bus or train arrival at the nearby stations. A single bus going in one direction stopping at two different stops within the ¼ radius may only be counted once, but the same bus line, stopping on opposite sides of the street, going in two directions, may be counted as two ride opportunities. Teams may count a combination of bus and rail towards this additional credit.

Exemplary/Enhanced Performance/Innovation In Design
Note: there is only one ID credit for Exemplary Performance available for all SS credits 4.1-4.4. No more than one ID credit may be achieved for Exemplary Performance in Alternative Transportation.



Map showing public transportation route. Image by HOK

SS Credit 4.2

Alternative Transportation: Bicycle Storage & Changing Rooms

Design Responsibility
Owner/ Desig. Profess

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Sustainable Sites section as Credit 4.2. It is the responsibility of the owner as marked by the star-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The architect must fill out the Application Checklist and show the location and number of showers on the building plans, as well as site plans indicating the location and number of bicycle racks. Both boxes must be checked in the checklist, if credit is being attempted for the project.

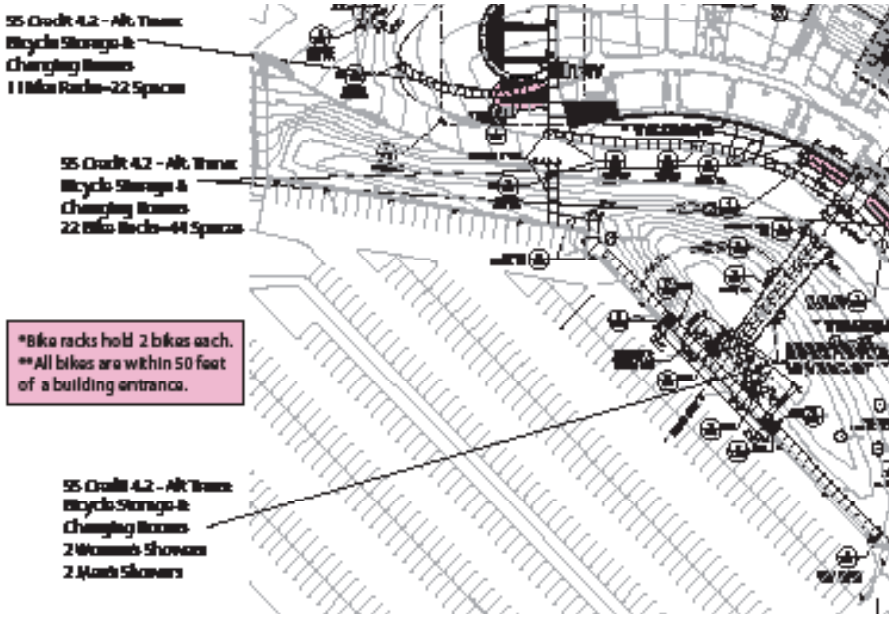
Bicycle storage must be provided for 5% of peak demand (all occupants and visitors) and showers/ changing facilities must be provided for 0.5% of Full Time Equivalents (FTE), either in the building or within 200 yards of the main entrance(s). Bicycle storage does not need to be covered, and can be provided anywhere on site or within a parking garage.

Information can be found on the site plan, landscape plan, or civil drawings. Additional information could be found in the project manual section on bike racks. Review the floor plan to access the location of the shower room, required for this credit.

Intent and Sample Strategies
This credit is to encourage project teams to provide secure bicycle storage for building occupants and visitors, as well as showering and changing facilities for building occupants. By providing amenities to those who wish to cycle to work, the project team provides a significant amenity while reducing the amount of Vehicle Miles Traveled (VMT) or the amount of miles Dallas residents or employees will drive to and from work. Reducing VMT improves local air quality while reducing fuel consumption and its associated costs.

If the project scope includes a fitness facility, its showers may count towards this credit, but only if building occupants have unrestricted access to the facility. For some smaller projects with limited space or budget, showers may be combined with a rest room stall by providing a drain and adequately sloped floor with a non-slip surface.

Projects with exceptionally high peak demand, such as a convention center or baseball stadium may make use of an alternative compliance path, such as a bicycle valet service in lieu of permanent racks. Projects where visitors are unlikely to use bicycles to access the site, such as hotels and international airport terminals, may be able to exclude transient populations from the peak demand.



Bicycle Rack/Changing Rooms & Showers Location. Image by HOK

SS Credit 4.3

Alternative Transportation: Low Emitting & Fuel Efficient Vehicles

Design Responsibility
Owner/ Desig. Profess

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Sustainable Sites section as Credit 4.3. It is the responsibility of the owner as marked by the star-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The architect must complete the Application Checklist, indicating which compliance approach is taken, and submit parking plans to show the location and number of designated parking spaces.

For Option 1, the owner must provide proof of ownership or purchase of compliant fleet vehicles in addition to the above documentation. In this option, the owner is providing compliant cars for 3% of the Full Time Equivalent (FTE) with Preferred Parking for those vehicles. **(Location to be found on the site parking plan.)**

For Option 2, the architect should provide parking plans that show the location and number of designated parking spaces or the owner's reduced price parking permit policy. Either 5% of the entire site parking capacity must be reserved for compliant cars or if parking permits are provided at a cost, the owner can offer a 20% discount on parking permits to any vehicle owners that demonstrate proof of ownership and use of a compliant vehicle. **(Location to be found on the site parking plan.)**

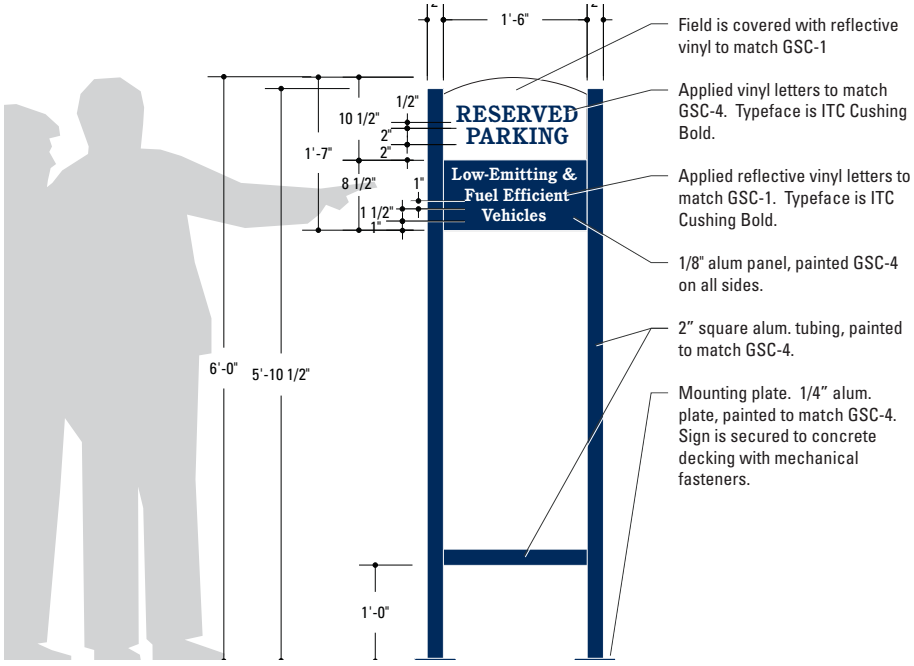
For Option 3, the plans should include location and number of refueling stations as well as specifications for refueling stations. The project team may provide alternative fuel refueling stations at parking spaces (e.g. for electric cars) for 3% of the total site parking capacity.

Information can be found on the site plan, floor plan, accessibility sheet or graphic sheet within the construction set. Additional information can be found in the specification section that details the signage and graphics for the project

Intent and Sample Strategies
This credit is to encourage project teams to provide incentives for building occupants and visitors to use alternative fuel and fuel efficient vehicles to travel to the building. Use of these vehicles improves local air quality while reducing fuel consumption and its associated costs. Compliant vehicles may be found on the 2007 ACEEE Low Emitting/ Fuel Efficient Vehicle List: (http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1762).

Where projects must incorporate fleet vehicle parking, the owner may decide to follow Option 1. In this instance, preferred parking spaces are reserved and located closest to the building entrance, except for accessible spaces. The spaces may be striped or designated by signage.

The owner is responsible for enforcement, by whatever means practical.
Where there are no fleet vehicles to accommodate, or where providing compliant cars is not feasible, the

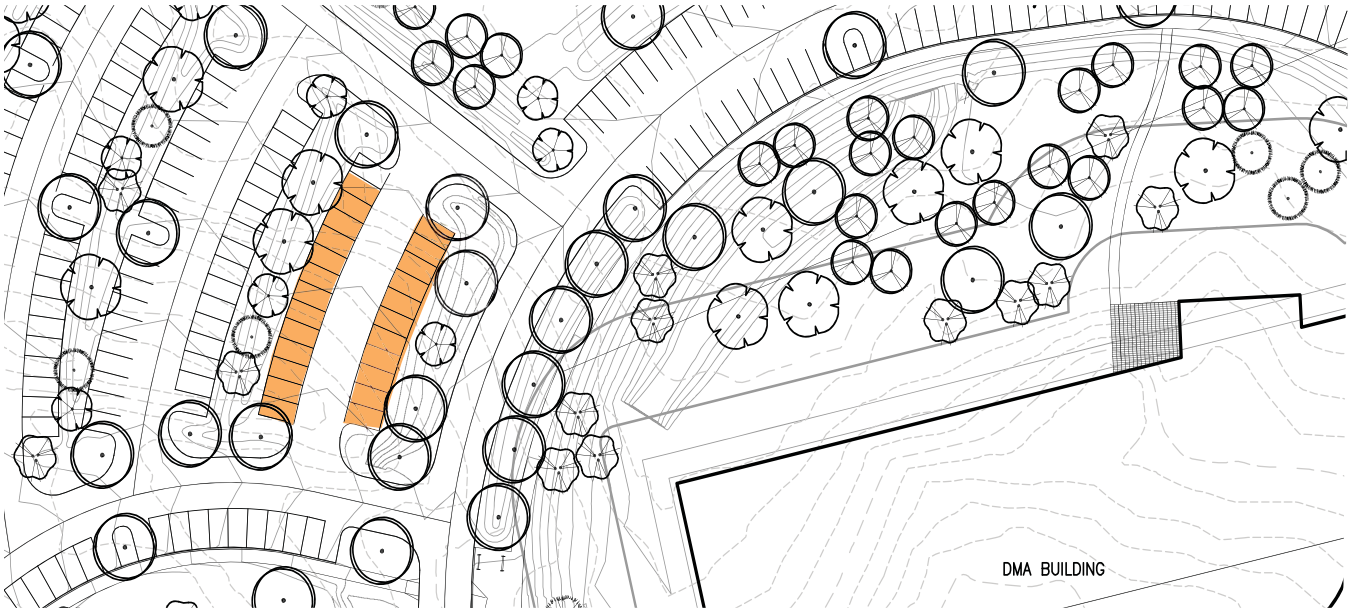


Alternative Vehicle Preferred Parking Signage. Image provided by HOK.

project may still achieve the credit under Option 2. There is no minimum or maximum number of reduced price parking permits, should the owner choose this option. The owner should develop and implement a preferred parking policy and make the building occupants aware of the policy.

Exemplary/Enhanced Performance/Innovation In Design

There is an Exemplary Performance credit option in the Innovation and Design section for a comprehensive Transportation Demand Management Plan. See the ID section for details. Only one ID credit may be achieved under SS credits 4.1-4.4.



Site Plan Illustrating Preferred Parking for Alternative Vehicles. Image by HOK

SS Credit 4.4

Alternative Transportation: Parking Capacity

Design Responsibility
Owner/ Civil

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Sustainable Sites section as Credit 4.4. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Application Checklist, indicating which compliance approach is taken. For Option 1, the owner must provide proof of the carpool parking policy. For Option 2, the architect should provide the number of carpool/vanpool spaces that are on-site. For Option 3, the architect should upload a description of the owner's carpool infrastructure and a site plan to show the location of the pick-up and drop-off zone for participants. For Option 4, the owner may provide a statement that no new parking has been provided.

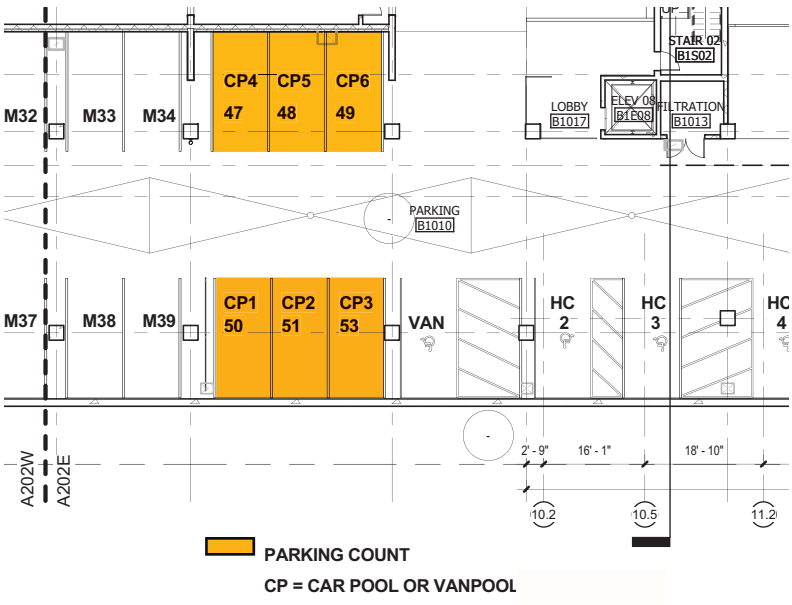
Information can be found on the site plan, attach copies of the owner's carpool policy and any illustrative plans generated for compliance of this credit.

Intent and Sample Strategies
This credit is to encourage project teams to provide incentives for building occupants and visitors to carpool or take mass transit to the building. Carpooling or taking DART reduces the amount of Vehicle Miles Traveled (VMT), or the amount of miles Dallas residents or employees will drive to and from work. Reducing VMT improves local air quality while reducing fuel consumption and its associated costs.

The simplest route to achieving this credit is to follow Option 4, to provide no new parking. However this may not be practical for all projects. Where new parking is to be provided, the total parking capacity must not exceed the number of parking spaces required by zoning. If the project is granted a reduction from the zoned minimum parking requirements or if the project provides exactly the minimum number of spaces required, the project team will meet the first part of the credit requirements. The remaining compliance options hinge on the project not exceeding zoned minimum requirements so verify this first. As parking spaces are expensive to create, particularly in a structured facility, and as Dallas has ample access to public transportation opportunities, this credit should be part of an economical as well as environmental strategy.

Commercial office projects providing no more than the number of parking spaces required by zoning will need to follow Option 1, and provide Preferred Parking for carpool and vanpool vehicles. Preferred parking may be provided by reserving 5% of total parking capacity for carpool/vanpool vehicles, located closest to the building entrance, except for accessible spaces or by offering a 20% discount on parking permits to any vehicle owners that demonstrate proof of carpool participation. Reserved spaces may be striped or designated by signage. The owner is responsible for enforcement, by whatever means practical.

Exemplary/Enhanced Performance/Innovation In Design
There is an Exemplary Performance credit option in the Innovation and Design section for a comprehensive Transportation Demand Management Plan. See the ID section for details. Only one ID credit may be achieved under SS credits 4.1-4.4.



Parking Plan Illustrating Preferred Parking for Carpool Vehicles.

SS Credit 5.1

Site Development: Protect or Restore Habitat

Design Responsibility
Design Prof. (Civil, LA)

Documentation Phase
Final Inspection

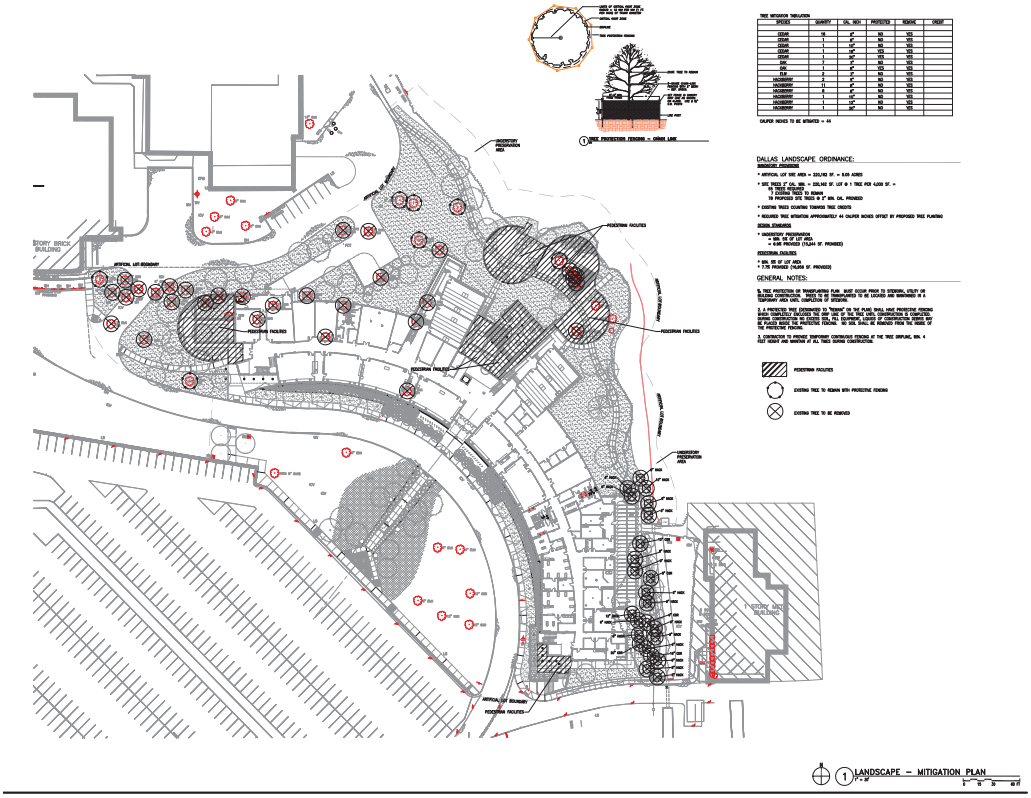
This credit is identified in the Application Checklist in the Sustainable Sites section as Credit 5.1. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
For previously undeveloped sites, the design professional must complete the Application Checklist and provide a site plan showing building area, grading, boundaries and previous development. For previously developed sites, a site plan showing a minimum of 50% of the site area (minus the building footprint) is to be vegetated with native and adaptive plant species must be provided for the Plan Review. A green roof plan should be provided if it is part of this area. A list of plant species should also be included on the drawings.

Information can be found on the site plan or any illustrative drawing complying with this credit.

Intent and Sample Strategies
This credit encourages the development of previously developed sites, or the minimization of site disturbance on undeveloped sites. For the purposes of LEED, previously developed refers to any site that has ever been graded, paved or built upon. A Greenfield site is one that has never been graded and would require the clearing of existing native vegetation for construction activity. For example, a site that was previously a rail yard may be currently a grass-covered lot, but the site has been graded and cleared in the past and would qualify as previously developed.

Projects on previously undeveloped sites must limit the site disturbance to a limited area around the building and hardscape surfaces (see LEED 2.2-NC Reference Guide for details). This approach will require careful oversight during construction.
Most of the sites in the City of Dallas will be previously developed and should therefore follow the second compliance approach regarding restoration of habitat. Projects following this compliance approach must plant native and adaptive vegetation on 50% of the total site area, minus the building footprint. Projects earning SS credit 2 for development density may apply a vegetated roof to this credit. Non-invasive plant species will qualify as adaptive.



Mitigation Planting Plan .

The Vegetated Roof Approach
This is the first of several credits that may be achieved through a vegetated roof strategy. The City encourages their implementation to address local environmental challenges with stormwater and the Urban Heat Island Effect.

SS Credit 5.2

Site Development: Maximize Open Space

Design Responsibility
Design Prof. (Civil, LA)

Documentation Phase
Plan Review

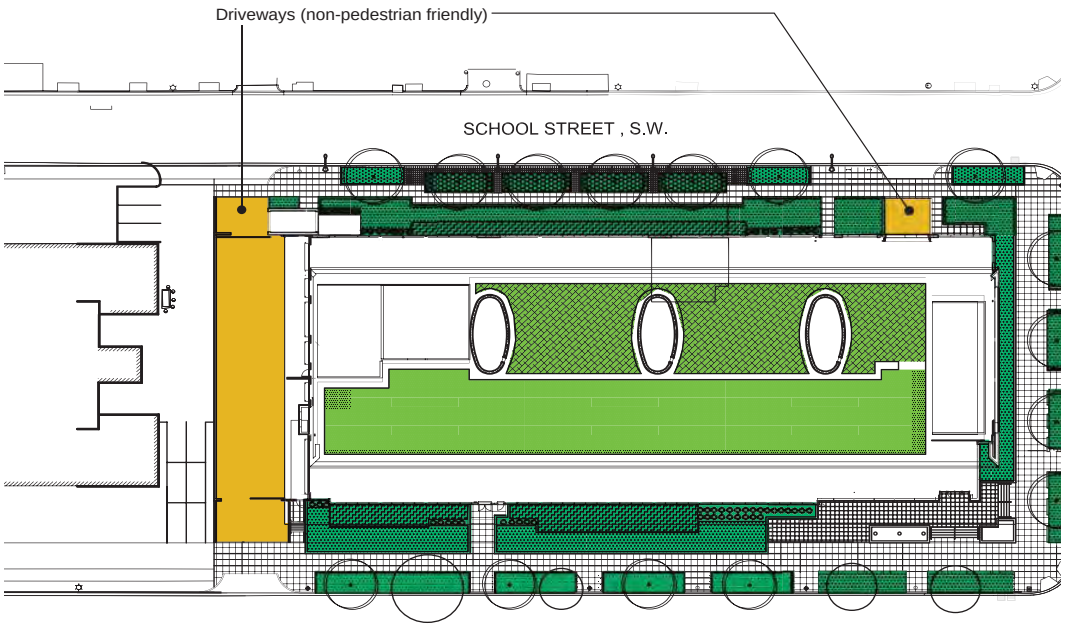
This credit is identified in the Application Checklist in the Sustainable Sites section as Credit 5.2. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Application Checklist and provide site plans showing a minimum of 20% of the site area is to be any combination of vegetated open space, vegetated roof and pedestrian oriented hardscape. A green roof plan should be provided if it is part of this area.

Information can be found on the site plan, illustrative landscape plan or any additional plan generated for compliance of this credit

Intent and Sample Strategies
This credit encourages the preservation of open green spaces, for human enjoyment as well as biodiversity. Most projects in the City of Dallas will fall under Option 3, where zoning exists but there is no requirement for open space. Projects pursuing this credit under Option 3 must provide dedicated open space for 20% of the total site area (the area within your LEED Site Boundary).

Dedicated open space must be vegetated, except for projects that achieve SS Credit 2 for Development Density & Community Connectivity, which may include pedestrian oriented hardscape in their open space calculation as long as at least 25% of all open space is vegetated (e.g. 5% of total site area is vegetated and 15% is pedestrian oriented hardscape). Vegetated roofs may also contribute to the vegetated open space calculation for this credit.



Sustainable Sites Credit 5.2: Site Development: Maximize Open Space
Total Site Area: 84,925 SF
Green Roof: 17,600 SF
Street Level Plantings: 17,730 SF
Pedestrian-Oriented Hardscape: 19,075 SF
Scale: 1:200

The Vegetated Roof Approach
This is one of several credits that may be achieved through a vegetated roof strategy. Vegetated roofs (also called green roofs) have multiple benefits and will likely prove to be a highly economical LEED strategy. The City encourages their implementation to address local environmental challenges with stormwater and the Urban Heat Island Effect.

SS Credit 6.1

Stormwater Management: Quantity Control

Design Responsibility
Design Prof. (Civil, LA)

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Sustainable Sites section as Credit 6.1. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will require a separate Submittal Template to be filled in and submitted at the time of the plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
Provide pre and post development run-off rate and quantity calculations. Provide narrative of site conditions and measures taken. Must comply with SWYPPS plan.

Information can be found on Civil SWYPPS plan drawings, and the paving plan. Additional Information regarding materials used can be found in the paving specification section. Additional information can be in the form of a statement plus calculations as provided by the civil engineers.

Intent and Sample Strategies
This credit encourages the reduction in not just the rate but the quantity of stormwater runoff. It will not be sufficient to just detain stormwater and reduce the rate by which it enters the municipal stormwater system, project teams must also show that the total quantity of runoff is be reduced.

Stormwater runoff is a significant challenge for Dallas. As with many older cities, Dallas faces a Combined Sewer Overflow (CSO) problem. The wastewater and stormwater conveyance pipes are connected below ground and in wet weather the stormwater runoff often overflows and washes sewage into local waterways, like the Trinity River. This creates environmental hazards in the watershed. Increasing development density in the City of Dallas exacerbates the CSO problem.

This credit meets the City of Dallas needs and requirements, as well as LEED credit requirements.

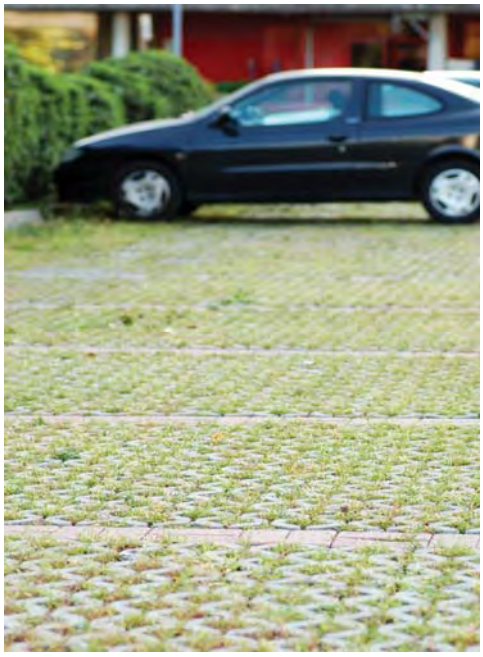
First, the team must determine the percentage of imperviousness on the existing site, prior to construction of this LEED project. Impervious surface materials are likely to include pavement or a building rooftop. Pervious surface areas, by contrast, may include gravel, dirt or vegetation.

Options:

1. For sites with existing imperviousness less than or equal to 50% of the total site area (within the LEED Site Boundary), the proposed design must maintain runoff rate and quantity less than or equal to that of the site prior to the project's development.
2. For sites with existing imperviousness greater than or equal to 50% of the total site area (most likely site conditions in Dallas), the proposed design must reduce the runoff rate and quantity by 25% from prior conditions.

Strategies to reduce runoff rate and quantity may include grey water reuse, site landscaping, low impact development strategies (LIDs), open grid pavement, pervious pavement, bioswales and rain gardens and/or vegetated roofs.

Stormwater collected from the site may be used for irrigation, sewage conveyance (flush fixture supply), fire suppression, radiant cooling systems, etc. The proposed design must show that the required quantity of runoff is used somewhere on the project site and does not enter the municipal stormwater system.



Open Grid/Pervious Paving as a Stormwater Control Strategy.

SS Credit 6.2

Stormwater Design: Quality Control

Design Responsibility
Design Profess (Civil, LA)

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Sustainable Sites section as Credit 6.2. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will require a separate Submittal Template to be filled in and submitted at the time of the plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
Provide list of Best Management Practices (BMP) and percentage of rainfall. Provide list of structural controls and percentage of rainfall treated annually and provide an optional narrative describing any special circumstances or considerations regarding the approach to this credit.

Information can be found in the civil plans, site plan, or in the form of a document generated to qualify and validate the water treatment technologies.

Intent and Sample Strategies
This credit encourages the reduction of pollutants in stormwater runoff, as these will eventually enter local waterways and may cause significant disruption to the health of flora and fauna. Particulate matter in stormwater runoff may seem harmless – after all, there's already dirt in rivers, right? – However when it enters our waterways, it may impact the shape and depth of them, and the cloudiness prevents the penetration of sunlight beneath the surface. A lack of sunlight will diminish the health of underwater plant life, thereby reducing the food supply for water-based fauna. Dallas is particularly concerned with the restoration and maintenance of the health of the Trinity River

Stormwater treatment strategies must treat 90% of the average annual rainfall and be capable of removing 80% of Total Suspended Solids (TSS) through acceptable Best Management Practices (BMPs). Dallas actually requires that 100% of rainfall be treated.

This credit meets City needs and requirements, as well as LEED credit requirements.

Projects choosing to incorporate pervious paving materials should be aware that these are effective stormwater management tools that allow stormwater to percolate back into the ground, however they require maintenance. Over time, the pores in such materials will become clogged with particulate matter and will need to be cleaned out.

Sustainable Stormwater Strategy. Planter Collects Runoff to a Depth of 6 inches until it Flows back out into the Street and is Collected in the Next Downhill Planter.

SS Credit 7.1

Heat Island Effect: Non- Roof

Design Responsibility
Design Profess (Civil, LA)

Documentation Phase
Final Inspection

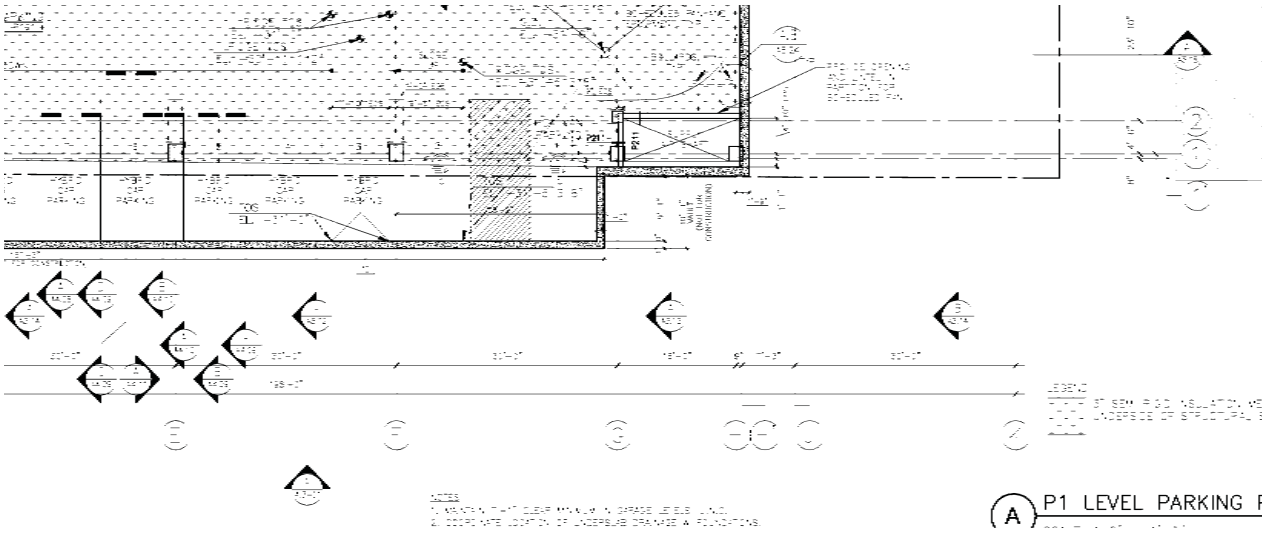
This credit is identified in the Application Checklist in the Sustainable Sites section as Credit 7.1. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Application Checklist and provide site plans that show a) for Option 1, shade for 50% of hardscape (within 5 years) and provide open grid paving material of SRI 29 or higher or b) for Option 2, 50% of parking is covered or in a parking garage and the roof used to cover the parking to be SRI 29 or higher.

Information can be found on the site plan, landscape plan or the floor plans, to illustrate materials used in a ME must review the roofing specification to ensure the SRI rating for the roofing material used, or review the roof plan to identify and locate and acceptable SRI rating for the roofing material.

Intent and Sample Strategies
This credit encourages project teams to address the Urban Heat Island Effect, a phenomenon where dense urban environments are often found to be 2-10 degrees Fahrenheit warmer than the surrounding suburban communities due to an excess of dark, paved surfaces that absorb and re-radiate heat into the local micro-climate. Not only does this make urban areas uncomfortably hot for human inhabitants, it can have significant impacts on the local flora and fauna.
The simplest strategy to follow for Dallas projects is described in Option 2. If the project provides a minimum of 50% parking in a structured, covered or below-grade facility, the credit is earned. In addition, if 100% of parking is covered or below-grade, an Exemplary Performance credit can be earned in the Enhanced Performance section. Teams will need to show that the roof of the parking facility either has a Solar Reflectance Index (SRI) value of 29 or greater, or otherwise meets the requirements of SS Credit 7.2 to earn the Enhanced Performance credit.

For projects that do not plan to make use of structured parking, the credit may be achieved under Option 1, with a strategy whereby 50% of site hardscape surfaces are a combination of pervious pavement (see SS credit 6.1 and 6.2), landscape design that includes shade within 5 years, or surface material with an Solar Reflectance Index (SRI) value of 29 or greater. New concrete with no added color pigment will meet this SRI value. Other materials will need an SRI value provided by the manufacturer or will need to be tested. Projects planning to include surface parking will likely not achieve this credit unless they plan to use concrete pavement (not very economical) or pervious pavement.



Sample Documentation Illustrating Parking Below Grade. Image by HOK

SS Credit 7.2

Heat Island Effect: Roof

Design Responsibility
Design Profess.

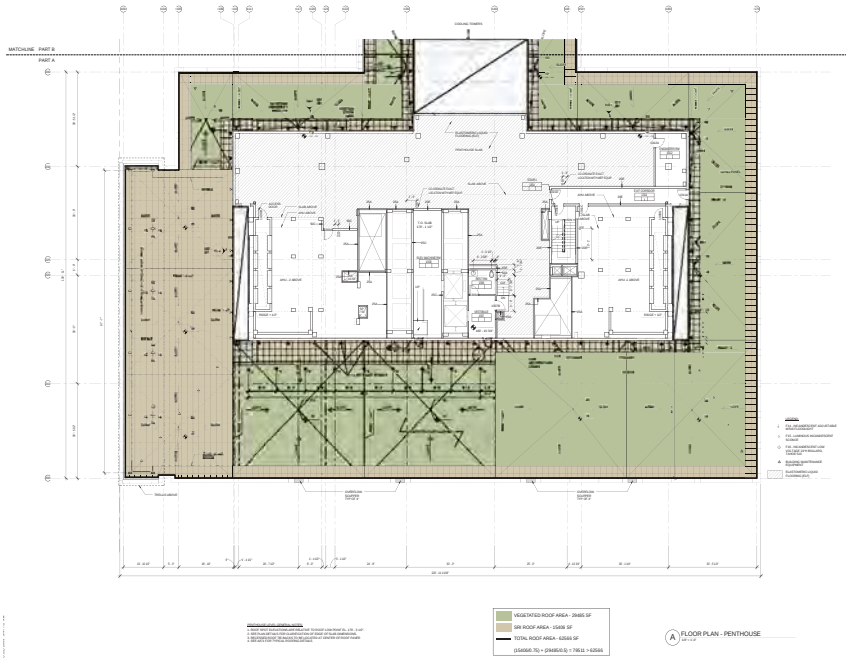
Documentation Phase
Plan Review

Dallas Targeted Credit

This credit is identified in the Application Checklist in the Sustainable Sites section as Credit 7.2. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Application Checklist and provide site plans that show a) for Option 1, 75% of roof materials to be SRI 78 for a slope < than 2:12 (low-slope roof) or SRI 29 for a slope > 2:12 (steep-sloped roof) or b) for Option 2, 50% vegetated roof (green roof) or c) for Option 3, combination of 1 and 2 - (area of SRI roof/0.75) + (area of vegetated roof/0.05) is greater than total roof area.

Information can be found on the roof plan of the project, review of notes that identify the SRI rating, slope, and areas covered by a vegetated roof. Also review the roofing material specification sections of the project manual.



Roof Plan documentation. Image by HOK

Intent and Sample Strategies
This credit encourages project teams to address the Urban Heat Island Effect, a phenomenon where dense urban environments are often found to be 2-10 degrees warmer than the surrounding suburban communities due to an excess of dark, paved surfaces that absorb and re-radiate heat into the local micro-climate. Not only does this make urban areas uncomfortably hot for human inhabitants, it can have significant impacts on the local flora and fauna.

The simplest strategy to follow for Dallas projects is described in Option 2. If the project provides a minimum of 50% vegetated roof (total roof area minus parapets and mechanical equipment are), the credit is earned.

Projects that do not include a vegetated roof may follow Option 1, whereby 75% of the roof area meets the reflectivity requirements. A weighted average may also be taken to show compliance (i.e. 100% roof has slightly lower SRI value).

Roof Type	Slope	Minimum Solar Reflective Index (SRI) values
Low Slope	</= 2:12	78
Steep Slope	>/= 2:12	29

The Vegetated Roof Approach
This is one of several credits that may be achieved through a vegetated roof strategy. Vegetated roofs (also called green roofs) have multiple benefits and will likely prove to be a highly economical LEED strategy. The City encourages their implementation to address local environmental challenges with stormwater and the Urban Heat Island Effect.

SS Credit 8

Light Pollution Reduction

Design Responsibility
Design Profess. (MEP, Civil, LA)
Documentation Phase
Plan Review

Dallas Targeted Credit

This credit is identified in the Application Checklist Template in the Sustainable Sites section as Credit 8. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation

The design professional must complete the Application Checklist and provide a photometric site plan and enter façade lighting details at the time of the plan review. The design professional must provide details of the interior lighting control system. Cut-sheets for site fixtures indicating cut off angles should also be provided

Information can be found on the site plan, illustrative photometric plan or any additional document specially generated for compliance of this credit.

Intent and Sample Strategies

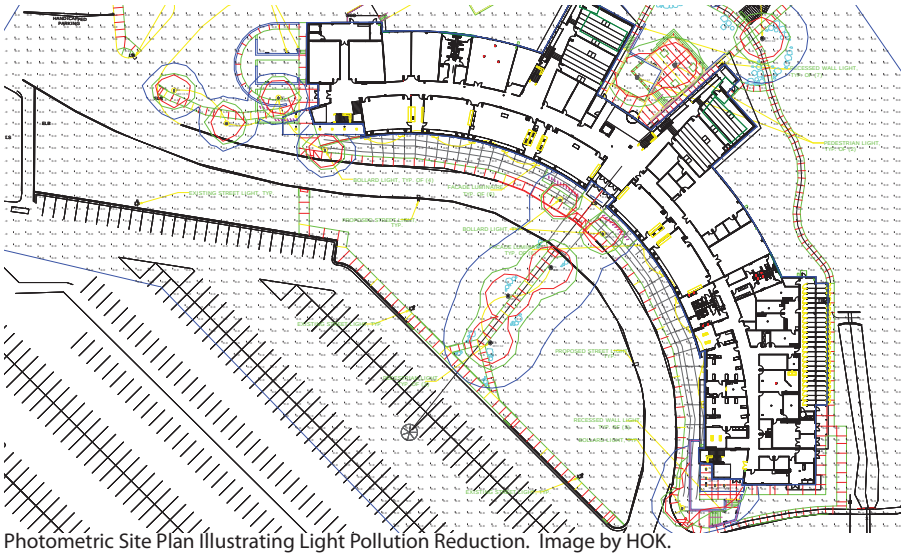
This credit is intended to encourage design teams to prevent or limit light pollution from entering the night sky. Light pollution is an urban problem that disrupts nocturnal species, in addition to unnecessarily adding to a building's operating expenses by using more energy than needed for basic site and building safety requirements.

This credit is not difficult to achieve and is not typically an expensive credit to pursue; however the documentation requirements are extensive and for this reason alone project teams may decide to meet the requirements without pursuing the credit itself. Projects where there are 24-hour operations or extensive exterior security camera requirements may also decide that the full credit requirements are not compatible with the building program.

Project teams should first review the LEED Reference Guide and determine what lighting zone the project is located in. Most Dallas project sites will fall in LZ3 or LZ4.

Interior lighting must be programmed so that all non-emergency lighting is on automatic shut-off after hours with manual override. Manual override may include occupancy sensors, light switches or control panel icons on occupants' computer monitors. Building engineers may also be able to program lights to remain on after hours at occupants' request on specific occasions.

Exterior lighting must make use of cutoffs and baffles to shield light from shining above a 90 degree angle. These fixtures are easy to specify and implement. For projects that will need to display the American flag, the flag must either be taken down at night or use a flagpole downlight (such as the fixture made by Beacon). Project site and façade lighting must be below the lighting power densities in the ASHRAE/IESNA Standard 90.1-2004, Exterior Lighting Section. See LEED Reference Guide for specifics.



Photometric Site Plan Illustrating Light Pollution Reduction. Image by HOK.

Sustainable Sites Resources

SSc1 Site Selection

Greenfield – A greenfield site is one that has never been graded and would require the clearing of existing native vegetation for construction activity. For example, a site that was previously a rail yard may be currently a grass-covered lot, but the site has been graded and cleared in the past and would qualify as previously developed.

Previously Developed - Previously developed sites are a common occurrence in the City. For the purposes of LEED, Previously Developed refers to any site that has ever been graded, paved or built upon.

SSc2 Development Density and Community Connectivity

Business Improvement Districts (BIDs) often provide detailed maps and information about retail, commercial and residential properties within a certain neighborhood, e.g. Downtown Dallas: www.downtowndallas.org

SSc3 Brownfield Redevelopment

Voluntary Clean-up Program (VCP) – The USGBC lists brownfield sites as those established by means of an ASTM E1903-97 Phase II Environmental Site Assessment or a local Voluntary Cleanup Program. The City of Dallas established Voluntary Cleanup Program (VCP) to protect and preserve the ecological system of the City, protect and increase green spaces, and promote the safe use or development of lands that are contaminated or perceived to be contaminated by hazardous substances. VCP oversees owner or developer initiated voluntary remediation of contaminated lands and buildings that return actual or potentially contaminated properties to productive uses. See www.lcaenvironmental.com

Sc4.1-4.4 Alternative Transportation

Full Time Equivalent (FTE) – Project teams may need to establish an FTE number in order to pursue specific credits. One (1) FTE is based upon a standard 8-hour occupancy period. An 8-hour occupant has an FTE value of one while a part-time occupant had an FTE value based on their hours per divided by 8. The FTE count must be used consistently across all applicable credits. In buildings with multiple shifts, use only the highest volume shift in the FTE calculation.

Peak Demand – To estimate peak demand, calculations must include any visitors, or transient occupants (students, visitors and customers) for the peak period for the facility in addition to Full Time Equivalents (FTEs).

Preferred Parking – Preferred Parking may be provided in one of two ways: 1. Parking spaces reserved and located closest to the building entrance, except for accessible spaces. The spaces may be striped or designated by signage. 2. Parking permits offered at a 20% discount from regular rates.

Ride Opportunities - A ride opportunity is simply a scheduled bus or train arrival at the nearby stations. A single bus going in one direction stopping at two different stops within the ¼ radius may only be counted once, but the same bus line, stopping on opposite sides of the street, going in two directions, may be counted as two ride opportunities.

Vehicle Miles Travelled (VMT) – A measure of roadway usage in total miles travelled. Carpooling or transit ridership decreases VMT per person. Reducing VMT improves local air quality while reducing fuel consumption and its associated costs.

SSc5.1-5.2 Protect and Restore Habitat

Biodiversity – A variation of life forms within a given biological system. Sustainable design strategies are often aimed to protect and/or maintain the surrounding biodiversity of a project.

LEED Site Boundary - This may or may not coincide with the Limit of Disturbance (LOD). It may or may not coincide with your property line. It should include all area within your project scope, with the exception of any Right of Way (ROW), unless you choose to include it. The LEED Site Boundary must be consistent for all credit calculations and documentation.

Native and Adaptive Vegetation - Plant species native to the surrounding area of the project site and plant species that have become adapted to the given area and that are not invasive. Using native and adaptive vegetation has many benefits: requires far less maintenance or irrigation; provides habitat for local species; protects biodiversity.

Xeriscaping – Landscape that is designed to reduce the amount of materials and labor needed to maintain it. Xeriscapes are designed with plant species that are adapted to local climate conditions and can thrive on natural sources of irrigation (i.e. rainwater) alone. Xeriscapes need no permanently installed irrigation systems. This can be an extremely useful strategy concerning water conservation and storm-water management needs.

SSc6.1-6.2 Stormwater Management

Biofiltration Systems - Also called bioswales, bio-retention, and rain gardens. Biofiltration systems treat storm water runoff. These systems provide a natural process which allows the runoff to be filtered through a medium that minimizes the buildup and off-site transport of pollutants (petroleum and heavy metals). It is recommended that projects install biofiltration systems at surface parking lots and landscaped grounds with a surrounding permeable surface. Other strategies such as rain gardens, stormwater planters and tree boxes can also be installed to serve as collection points for stormwater runoff. Tree box filter devices are suited for streets and small parking facilities that in combination with underground detention, these filtration systems provide the opportunity for storage and reuse of rainwater for irrigation.

Evapotranspiration - The sum of evaporation and transpiration. Evaporation accounts for the movement of water to the air from sources such as the soil, canopy interception and water bodies. Transpiration accounts for the movement of water within a plant and the subsequent loss of water as vapor through stomata in its leaves.

Impervious - Impervious surfaces promote water runoff rather than infiltration. The degree of imperviousness can be calculated to determine the amount of water runoff one can expect from a particular surface area. Impervious surfaces should be avoided to the extent possible; there may be immediate savings in stormwater management from the investment and use of pervious surfaces, as well as a reduction in stormwater fees.

LEED Site Boundary - This may or may not coincide with the Limit of Disturbance (LOD). It may or may not coincide with your property line. It should include all area within your project scope, with the exception of any Right of Way (ROW), unless you choose to include it. The LEED Site Boundary must be consistent for all credit calculations and documentation.

Pervious – The amount of perviousness of a surface area is determined by the amount of moisture that is allowed to pass through the material and soak into the earth. Projects choosing to incorporate pervious paving materials should be aware that while effective stormwater management tools they require maintenance. Over time, the pores in such materials will become clogged with particulate matter and will need to be cleaned out.
Stormwater Management - Sustainable strategies to reduce runoff rate and quantity may include grey water reuse, site landscaping, Low Impact Development strategies (LIDs), pervious pavement, bioswales and rain gardens and/or vegetated roofs and are crucial in protecting the surrounding ecosystems of dense areas. As with many older cities, Dallas faces a Combined Sewer Overflow (CSO) problem. The city operates on a combined sewer system (CSS) which means that the cities' sanitary sewer system (sewage from homes or business) also serves as a backup for the runoff sewer during heavy rains. However, a combined sewer system can exceed its capacity causing a CSO to occur. During a CSO event, both untreated wastewater and rainwater (which carries pollutants such as oil, gas and other chemicals) flow directly into Trinity Rivers ? posing an environmental

and health risk to surrounding residents. Sustainable strategies help to reduce the number of CSO events by controlling stormwater. In view of this, agencies such as the Dallas Water Utilities (DWU) are revising its stormwater fee structure to advance such strategies as green roofs, rain gardens, and bioswales. The new fee structure will be based on impervious area rather than volume of water used and is rewarding on-site stormwater management through credits, grants and expedited permitting.

SSc7.1-7.2 Urban Heat Island

Cool Roofs – Coating materials can be chosen to decrease the absorption of spectral waves and maintain a positive environmental benefit by reducing the urban heat islands effect, positively impact the building's cooling load and reduce roof surface temperature. The measuring standard for a material's ability to reject solar heat is defined as its SRI (Solar Reflectance Index); this is best determined through the use of a spectro-photometric measurement to analyze the reflectance at each different wavelength.

Roof Type	Slope	Minimum Solar Reflective Index (SRI) values
Low Slope	</= 2:12	78
Steep Slope	>/= 2:12	29

Green Roofs – Vegetative roofs offer an extremely effective stormwater management strategy to the typical impervious roof. Vegetated roof surfaces also have benefits which include reducing and filtering storm water runoff, extending the life of the roofing system, reducing the local urban heat island effect, creating an urban habitat, and improving the overall aesthetic of a roof area. Direct monetary benefits can be realized through lower energy costs and reduced or eliminated needs for permanent water management structures such as water retention tanks.

The most common types of vegetated roof surfaces are extensive and intensive. Extensive roofs are typically applied in the U.S. because they are lightweight. Modular tray systems are also available. These trays perform the same function but are easier to place on existing buildings and allow additionally flexibility to move around if access is needed for maintenance.

As these projects are planned, the life-cycle benefits of vegetative roofing systems should be evaluated taking into account the improvements in storm water management and potential for reduction in building HVAC energy consumption.

Green Screen and Green Wall/Living Wall - Vertical vegetation systems. Green Screen involves a wire-like trellis system that trains plant growth vertically from a planter box or landscape on the ground. Green Screens can shade the building from solar heat gain. See www.greenscreen.com for examples of Green Screen. Green Walls/ Living Walls are akin to a vegetated roofing system tipped up to a vertical position. Unlike green screens, the planting medium (engineered soil) and plat root systems are carried all the way up the system. Green walls can provide thermal and acoustic insulation and may provide some stormwater mitigation. See www.eltlivingwalls.com for Green Wall examples. Both systems may reduce the ambient temperature and improve the air quality around the building.

Urban Heat Island Effect – The US EPA sites the urban heat island effect as a growing concern for millions of Americans living in and around cities. The Urban Heat Island Effect describes urban and suburban temperatures that are 2 to 10°F hotter than nearby rural areas. Elevated temperatures impact buildings by increasing peak energy demand, air conditioning costs, and air pollution levels.

SSc8 Light Pollution Reduction

LEED Site Boundary - This may or may not coincide with the Limit of Disturbance (LOD). It may or may not coincide with your property line. It should include all area within your project scope, with the exception of any Right of Way (ROW), unless you choose to include it. The LEED Site Boundary must be consistent for all credit calculations and documentation.

Section Two:
Water Efficiency

Overview

This section deals with the potable water consumption of a building and its site for irrigation as well as flow and flush fixture usage. Many communities are beginning to experience critical water shortages and seek to reduce the burden on municipal water supply from new and existing development. In addition, water treatment and transportation to and from a project site is very energy intensive. By drawing less water from the municipal supply, buildings can reduce municipal energy costs.

This section does not address process water use (e.g. for dishwashers, laundry, etc.) or cooling tower water management. These are addressed in LEED for Schools and LEED for Existing Buildings: Operations & Maintenance, respectively. These credit approaches may be 'borrowed' from the other rating systems and used for Innovation & Design (ID) credits if the team would like to pursue them.

Water is obviously a critical element for human survival, and fortunately the strategies in this section are very economical as well as environmentally beneficial.

Before you begin:

1. Establish a Full Time Equivalent (FTE) number as well as transient or visitor occupancy loads. See glossary for FTE instructions.

In this Section

- Credit 1.1: Water Efficient Landscaping, Reduce by 50%
- Credit 1.2: Water Efficient Landscaping, No Potable Water Use or No Irrigation
- Credit 2: Innovative Wastewater Technologies
- Credit 3.1: Water Use Reduction, 20%
- Credit 3.2: Water Use Reduction, 30%
- Section Resources

WE Credit 1.1

Water Efficient Landscaping: Reduce by 50%

Design Responsibility

Design Profess. (LA)

Documentation Phase

Plan Review

This credit is identified in the Application Checklist in the Water Efficiency section as Credit 1.1. A Submittal Template along with the Application Checklist must be submitted for this credit at the time of the plan review. It is the responsibility of the design professional as marked by the round-shaped symbol. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation

The design professional must complete the Submittal Template, provide a landscape/irrigation plan that includes data and calculations for the option selected. For water efficient irrigation, provide system specifications. For grey or treated water reuse, demonstrate that the supply volume will meet at least 50% of annual irrigation needs for selected plant species.

Information can be found on the landscape plan, irrigation plan, or any additional drawings generated to comply with this credit. Review the plant material specification section for any additional information.

WE Credit 1: Water Efficient Landscaping

EvapotranspirationTable

	ET$_o$
July	4.65

Design Case Table

Landscape Type	Area	Species Factor		Density Factor		Microclimate Factor		K_L	ET_L	IE		PFWA
Trees	100	2	0.5	2	1.0	2	1.0	0.5	2.33	Drip	0.900	258
Shrubs	300	2	0.3	2	1.0	2	1.0	0.3	1.40	Drip	0.900	465
Groundcovers	400	2	0.3	2	0.6	2	0.7	0.1	0.59	Sprinl	0.625	375
Mixed	200	2	0.5	2	1.1	2	1.0	0.6	2.56	Drip	0.900	568
Turfgrass	100	2	0.7	2	1.0	2	1.1	0.8	3.58	Sprinl	0.625	573
		--		--		--				Drip	0.900	
		--		--		--				Drip	0.900	
		--		--		--				Drip	0.900	
Total	1,100										Subtotal [gal]	2,240
											July Graywater Harvest [gal]	
											Net GPWA [gal]	**2,240**

Baseline Case Table

Landscape Type	Area	Species Factor		Density Factor		Microclimate Factor		K_L	ET_L	IE		PFWA
Trees	100	2	0.5	2	1.0	2	1.0	0.5	2.33	Sprin	0.625	372
Turfgrass	600	2	0.7	2	1.0	2	1.1	0.8	3.58	Sprin	0.625	3,437
Mixed	400	2	0.5	2	1.0	2	1.0	0.5	2.33	Sprin	0.625	1,488
										Drip	0.900	
										Drip	0.900	
		--		--		--				Drip	0.900	
		--		--		--				Drip	0.900	
		--		--		--				Drip	0.900	
Total	1,100										**Net GPWA [gal]**	**5,297**
Irrigation Potable Water Use Reduction												**58%**

Documentation Demonstrating Species Factor Approach to Water Efficient Irrigation. Image by HOK.

Intent and Sample Strategies

This credit primarily intends to avoid the commonly seen phenomenon whereby automated landscape irrigation drenches a site in water, rain or shine, 365 days a year. There are more intelligent ways to design and this is a very inexpensive LEED credit to pursue.

The easiest strategy to employ to achieve this credit, as well as WE credit 1.2, is to provide no permanently installed irrigation. Through selection of native and adaptive plants acclimated to local weather conditions, the landscape design team can save building owners the initial costs of the irrigation system itself, as well as the ongoing maintenance and water use fees for a more exotic landscape. The project may employ temporary irrigation for one year while the plants get started on the site. Hose bibs for manual watering during periods of drought are also acceptable.

When some irrigation is desirable, project design teams may still earn this credit through:

- Plant Species Factor (selecting plants that require less water)
- Irrigation Efficiency (using a water efficient system such as drip irrigation)
- Use of captured rainwater or other grey water reuse (e.g. cooling tower condensate)
- Use of wastewater treated on site
- Use of wastewater treated off site and conveyed by public agencies specifically for non-potable use

WE Credit 1.2

Water Efficient Landscaping: No Potable Water Use or No Irrigation

Design Responsibility
Design Profess. (LA)

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Water Efficiency section as Credit 1.2. A Submittal Template along with the Application Checklist must be submitted for this credit at the time of the plan review. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

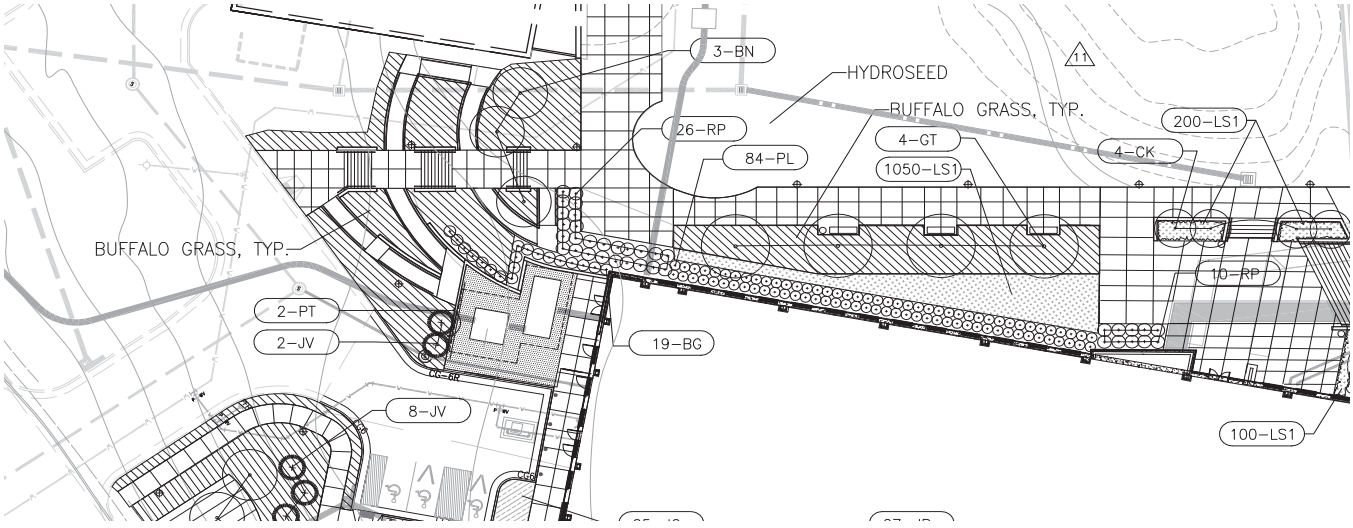
Documentation
The design professional must complete the Submittal Template and provide a plant species list. For grey water reuse, demonstrate that the supply volume will meet 100% of annual irrigation needs for selected plant species

This credit also intends to avoid excessive water consumption by irrigation systems and this is a very inexpensive LEED credit to pursue.

Information can be found on the irrigation plan landscape plan or any specialty documents generated to comply with this credit. Review the plant section of the specification manual for additional information.

Intent and Sample Strategies
The easiest strategy to employ to achieve this credit, as well as WE credit 1.1, is to provide no permanently installed irrigation. Through selection of native and adaptive plants acclimated to local weather conditions, the landscape design team can save building owners the initial costs of the irrigation system itself, as well as the ongoing maintenance and water use fees for a more exotic landscape. The project may employ temporary irrigation for one year while the plants get established on the site. Hose bibs for manual watering during periods of drought are also acceptable.
Another strategy to employ is the collection and reuse of rainwater or greywater. Project teams should verify that the storage of rainwater for irrigation purposes meets with any Dallas Department of Health regulations. Rooftop cooling towers provide another ample source of greywater. Cooling coil condensate is created daily, with the amounts differing depending on system size. The water is clean, and is available in greater quantities in hotter months, when irrigation is most needed. Condensate is typically exhausted into the municipal stormwater system; this strategy provides a great alternative. Infrastructure is relatively simple: the MEP engineer should design a storage tank sized appropriately and a water pump to deliver condensate water to the irrigation system. It is important to note that if the supply tank is connected to municipal water supply for make-up, this credit will not be achievable.

Projects with no landscaping (i.e. lot line-to-lot line) may achieve both WE credits 1.1-1.2 by virtue of having no landscaping and therefore no irrigation.



Site Plan Illustrating the use of Native and Adaptive Plant Species for Water Efficient Landscaping. Image by HOK.

WE Credit 2

Innovative Wastewater Technologies

Design Responsibility
Design Profess. (MEP)

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Water Efficiency section as Credit 2. A Submittal Template along with the Application Checklist must be submitted for this credit at the time of the plan review. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Submittal Template and should provide documents that either a) demonstrate the source of greywater, or b) the water treatment process. For low water devices, the MEP should upload cut sheets for water free urinals and toilets.

Information can be found on the irrigation, landscape plan or any specialty documents generated to comply with this credit.

Intent and Sample Strategies
This credit is intended to encourage project teams to significantly reduce potable water consumption for sewage conveyance. This credit only considers water used for flushing toilets and urinals, no other fixtures are to be included in calculations. Strategies to achieve this credit include treating all black water to tertiary standards on site, employing grey water for flushing, or using dry fixtures. Teams must show a minimum of 50% of waste water is treated on site or potable water use is reduced by 50%.

Source: Living Machine® Located at the City of Emmen Zoo, Netherlands

Perhaps the simplest and most conventional way to achieve this credit is through grey water reuse. In larger buildings, the condensate from cooling coils may provide nearly 100% of the building's flush needs in the summertime and nearly 50% in the winter. Projects may also consider water free urinals and dry, or composting, toilets, but there are justifiable maintenance concerns as well as perceived market aversion to these fixtures in public buildings. Water free or low flow urinals and low flow toilets may be a reasonable strategy; however they will not achieve the 50% threshold alone.

Wastewater is Treated On-Site in this Constructed Wetland in DC. Image Provided by Sidwell Friends School.

One of the most interesting strategies to consider is the use of onsite water treatment systems such as living machines, living systems, constructed wetlands or bio-reactors to treat sewage on site. Treated water can be cycled back through to supply flushing needs and keep the majority of site water in a closed loop. There is a significant first cost to this strategy, so it is rarely pursued.

Though the concept of onsite water treatment through natural systems may be intimidating, the practice is gaining wider acceptance.

WE Credit 3.1 & 3.2

Water Use Reduction: 20% Reduction & 30% Reduction

Design Responsibility
Design Profess. (MEP)

Documentation Phase
Plan Review

Dallas Targeted Credit

This credit is identified in the Application Checklist in the Water Efficiency section as Credit 3.1 & 3.2. A Submittal Template along with the Application Checklist must be submitted for this credit at the time of the plan review. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must fill out the Submittal Template and should provide cut sheets for all flush and flow fixtures.

Information can be found on plumbing plans, diagrams, fixture legend and in any specially generated documents or the specification section concerning toilet fixtures and components.

Intent and Sample Strategies
These credits are intended to encourage the design team to select water conserving fixtures for the project. Fixtures applicable to this credit include urinals, toilets, lavatories, janitor sinks, kitchen/pantry sinks and showers.

There are many fixtures on the market today that will help achieve these credits. Faucets, flush fixtures and shower fixtures can contribute to one or more LEED water efficiency credits through a combination of uses. Use of all required fixtures should approximate 40% water savings from the LEED baseline (Energy Policy Act of 1992). This translates to WE Credits 3.1 and 3.2 plus an additional Innovation & Design (ID) credit for Exemplary Performance.

LEED Recommended and Dallas required water-saving fixtures include:

- Low Flow Urinals (.5 gallons per flush)
- Ultra Low Flow Urinals (.125 gallons per flush)
- Water Free Urinals (require special maintenance)
- Low Flush Toilets (1.1 gallons per flush)
- Dual Flush Valve Toilets (1.6/1.1 gallons per flush)
- Low Flow, Aerated Lavatories (.5 gallons per minute)
- Sensored Lavatories (restrict duration of flow)
- Low Flow, Aerated Showers (1.5, 1.75 and 2.0 gallons per minute)

Source: Zurn Ecovantage High Efficiency Toilet

These fixtures are all fairly inexpensive and usually pay for themselves within 1-2 years with water savings.

Water Free Urinals do require unique maintenance (cartridges that need to be refilled

Source: Zurn Pint Flush Urinal

or replaced), and may require attention to the angle of the waste water piping, The ultra low flow urinal reduces water use from a gallon to a pint. Dual flush valve toilets are perhaps a better option than

low flush toilets. With low flush toilets, there are maintenance concerns around blockages and clogs.

Source: Zurn Dual Flush Handles

Dual flush valves permit users to push the flush lever down for a full flush (typically for solid waste)...

...and pull the lever upwards for a low flush (typically for liquid waste).

There are a few manufacturers and all provide educational and graphic signage to educate building occupants. Perhaps the best reason to consider them is that if building occupants do not know how to use them, they will still flush downwards, as is normal, and receive a full flush.

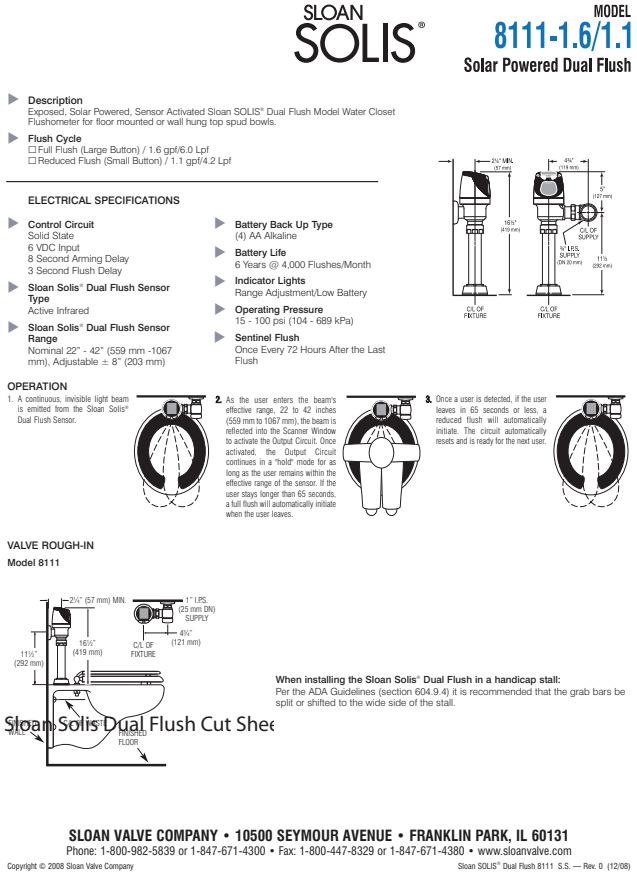
In a best-case scenario, the occupants learn how to use the dual flush fixtures and are able to help save water through their actions. The normal function option should alleviate maintenance concerns. They also make great retrofit options as they are inexpensive and take only a few minutes to install. LEED calculations for water use reduction assume that dual flush valves are effective in women's restrooms only, as men are anticipated to make use of urinals for liquid waste. Therefore, it will make no difference to the achievement of the LEED credits for WEc 3.1-3.2 if dual flush valves are specified for women's rooms only or for both men's and women's rooms.

Low Flow, Aerated Faucets are extremely inexpensive and are also great retrofit options. These fixtures use air to provide a full-pressure stream of water that is virtually indistinguishable

Source: Zurn Aerator

Source: Zurn Aerated Showerhead

from higher flow fixtures. While these are sensible for restrooms, it is not recommended that they be used in kitchens, pantries or janitors mop sinks where users may be hoping to fill vessels more quickly. Low Flow, Aerated Showerheads are fairly inexpensive and are also great retrofit options. These fixtures use air to provide a full-pressure stream of water that is virtually indistinguishable from higher flow fixtures. If the team is pursuing SS credit 4.2 for Bicycle Storage and Changing Rooms, and then consider using these fixtures in the showers.



SLOAN SOLIS®

MODEL 8111-1.6/1.1

Solar Powered Dual Flush

▶ **Description**
Exposed, Solar Powered, Sensor Activated Sloan SOLIS® Dual Flush Model Water Closet Flushometer for floor mounted or wall hung top spud bowls.

▶ **Flush Cycle**
☐ Full Flush (Large Button) / 1.6 gpf/6.0 Lpf
☐ Reduced Flush (Small Button) / 1.1 gpf/4.2 Lpf

ELECTRICAL SPECIFICATIONS

▶ **Control Circuit**
Solid State
6 VDC Input
8 Second Arming Delay
3 Second Flush Delay

▶ **Sloan Solis® Dual Flush Sensor Type**
Active Infrared

▶ **Sloan Solis® Dual Flush Sensor Range**
Nominal 22" - 42" (559 mm -1067 mm), Adjustable ± 8" (203 mm)

▶ **Battery Back Up Type**
(4) AA Alkaline

▶ **Battery Life**
6 Years @ 4,000 Flushes/Month

▶ **Indicator Lights**
Range Adjustment/Low Battery

▶ **Operating Pressure**
15 - 100 psi (104 - 689 kPa)

▶ **Sentinel Flush**
Once Every 72 Hours After the Last Flush

OPERATION

1. A continuous, invisible light beam is emitted from the Sloan Solis® Dual Flush Sensor.
2. As the user enters the beam's effective range, 22 to 42 inches (559 mm to 1067 mm), the beam is reflected into the Scanner Window to activate the Output Circuit. Once activated, the Output Circuit continues in a "hold" mode for as long as the user remains within the effective range of the sensor. If the user stays longer than 65 seconds, a full flush will automatically initiate when the user leaves.
3. Once a user is detected, if the user leaves in 65 seconds or less, a reduced flush will automatically initiate. The circuit automatically resets and is ready for the next user.

VALVE ROUGH-IN
Model 8111

When installing the Sloan Solis® Dual Flush in a handicap stall:
Per the ADA Guidelines (section 604.9.4) it is recommended that the grab bars be split or shifted to the wide side of the stall.

Sloan Solis Dual Flush Cut Shee

SLOAN VALVE COMPANY • 10500 SEYMOUR AVENUE • FRANKLIN PARK, IL 60131
Phone: 1-800-982-5839 or 1-847-671-4300 • Fax: 1-800-447-8329 or 1-847-671-4380 • www.sloanvalve.com

Sloan SOLIS® Dual Flush 8111 S.S. — Rev. 0 (12/08)

Water Efficieny Resources

WEc1.1-1.2 Water Efficient Landscaping

To locate and identify native and adaptive tree species: http://aggie-horticulture.tamu.edu/ornamentals/natives/

Native and Adaptive Vegetation - Plant species native to the surrounding area of the project site and plant species that have become adapted to the given area and that are not invasive. Using native and adaptive vegetation has many benefits: requires far less maintenance or irrigation; provides habitat for local species; protects biodiversity.

Xeriscaping – Landscape that is designed to reduce the amount of materials and labor needed to maintain it. Xeriscapes are designed with plant species that are adapted to local climate conditions and can thrive on natural sources of irrigation (i.e. rainwater) alone. Xeriscapes need no permanently installed irrigation systems. This can be an extremely useful strategy concerning water conservation and storm-water management needs.

WEc2 Innovative Wastewater Technologies

Greywater Reuse - The International Plumbing Code (IPC) describes greywater as “waste discharged from lavatories, bathtubs, showers, clothes washers and laundry trays.” Rainwater and cooling condensate also are grewater. In collaboration with water reduction strategies, a greywater reuse system can play a major role in reducing the load upon the local sewer system. A greywater system consists of separate piping to route water from plumbing fixtures, a holding tank in the lowest level of the building, a filter system and chemical injection system for treating the collected water, and a pressure booster pump system with separate piping to convey the treated water back to the restroom for use in toilet and urinal flushing. There are also chemical and non-chemical water treatment options for cooling towers. These cooling towers use electrolysis to treat the water instead of chemicals. With these systems there is less toxicity, and they can aid in water and energy savings.

Living Machines - Living machines optimize the use of plants, screens, biofilters, and other devices in a biological process to treat a building’s waste stream. The living machine can be used both indoors and outdoors to significantly reduce toxic sludge and sequester heavy metals. No chemical treatments are necessary. The living machine recycles nutrients, organic matter and can treat water to tertiary treatment standards, even potable standards, dependent upon the original make-up.

WEc3.1-3.2 Water Use Reduction

Full Time Equivalent (FTE) – Project teams may need to establish an FTE number in order to pursue specific credits. One (1) FTE is based upon a standard 8-hour occupancy period. An 8-hour occupant has an FTE value of one while a part-time occupant had an FTE value based on their hours per divided by 8. The FTE count must be used consistently across all applicable credits. In buildings with multiple shifts, use only the highest volume shift in the FTE calculation.

Peak Demand – To estimate peak demand, calculations must include any visitors, or transient occupants (students, visitors and customers, for the peak period for the facility) in addition to Full Time Equivalents (FTEs).

Water Efficient Fixtures - A project team can increase long-term financial and environmental savings through water-use reduction measures both within the building and through irrigation systems. Conservation measures can also reduce water flow into city sewers thus easing pressure on the cities’ system and nearby water sources. For new construction and renovation projects, methods include employing low-flow plumbing fixtures, dual-flush water closets, water-free urinals, and efficient dishwashers, as well as integrating sensors and time stops on faucets and shower heads.

American Standard water-conserving fixtures: www.americanstandard-us.com

Bricor water-conserving showerheads: www.bricor.com

Caroma water-conserving fixtures: www.caroma.usa.com

Kohler water-conserving fixtures: www.kohler.com

Oxygenics aerated low flow showerheads: www.oxygenics.com

Sloan water-conserving fixtures: www.sloanvalve.com

Toto water-conserving fixtures: www.totousa.com

Zurn water-conserving fixtures: www.zurn.com

Company Name	.5 gpm Aerators	Waterless Urinal	.125 gpf Urinal	.5 gpf Urinals
Kohler		Y	Y	Y
Toto	Y			Y
Sloan	Y	Y		Y
Zurn	Y	Y	Y	Y
Bricor	Y			
American Standard	Y		Y	Y
Caroma USA			Y (.13)	Y

Company Name	Dual Flush Toilet	.9 gpf Toilet	1.0 gpf Toilet	1.28 gpf Toilet
Kohler	Y		Y	Y
Toto	Y	Y		Y
Sloan	Y			Y
Zurn	Y		Y	Y
American Standard	Y			Y
Caroma USA	Y			

Company Name	<1.75 gpm Showerhead	1.5 gpm Showerhead	2.0 gpm Showerhead	Elec Hydro Faucet
Kohler	Y	Y		
Toto		Y		
Zurn				Y
Oxygenics	Y	Y		
Bricor	Y			
American Standard	Y	Y	Y	

Section Three:
Energy and Atmosphere

Overview

This section is perhaps one of the single most important sections in the LEED rating system in light of climate change. Unmitigated energy consumption puts a tremendous burden on the municipal infrastructure and its production creates both local air quality hazards as well as greenhouse gas emissions, linked to climate change. The USGBC has attributed over 70% of U.S. electricity consumption and nearly 40% of U.S. greenhouse gas emissions to buildings. Clearly, this is an issue that must be addressed by building owners and designers.

Many electrical power facilities are located in low income areas and the local emissions may present air quality concerns and compromise respiratory health of the inhabitants within those neighborhoods. Air pollution derived from power generation is an environmental and social justice issue.

In addition, energy conservation is an economic issue. Given the rising costs of energy, any investment in the improvement of building energy performance will result in operational savings for the building owner (OBI) over time. The payback timeframe may be shorter even than we realize, as energy costs are escalating at an unprecedented rate.

It is important to note that energy performance is not just a mechanical and electrical design problem. The MEP engineer may design efficient systems, but the real reduction in energy use will come from reductions in the loads. Load reduction is an architectural problem that must be addressed in the building massing and orientation as well as the envelope.

Recent changes to the Dallas building codes require that commercial buildings be 30% more efficient than ASHRAE 90.1 2004 as demonstrated by energy modeling or achieving advanced prescriptive energy efficiency guidelines.

Meeting new higher Dallas energy code requirements will earn points under LEED-NC v2.2 Energy and Atmosphere Credit 1: Optimize Energy Performance. Buildings whose energy models demonstrate at least 28% greater energy efficiency than ASHRAE 90.1 2004 are eligible for 6 LEED points under Energy and Atmosphere Credit 1: Optimize Energy Performance and achieving 31.5% better than ASHRAE 90.1 2004 is eligible for 7 LEED points under the same credit.

In this Section

EA Prereq. 1

Fundamental Commissioning of the Building Energy Systems

Design Responsibility
MEP/Civil/LA

Documentation Phase
Final Inspection

This credit is identified in the Application Checklist in the Energy & Atmosphere section as Prerequisite Credit 1. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The Commissioning Agent (CxA) must complete the Application Checklist and submit a copy of
a) the Commissioning Plan,
b) the Owner's Project Requirements,
c) the Basis of Design and
d) a final Commissioning Report.

If the project team chooses to submit the Construction Phase documentation before all commissioning

Drywall Dust Removed from the Face of Airflow Ring in the VAV Box.

activities are complete, then the CxA must complete the Checklist and provide everything but the Final Commissioning Report and provide a timeline for completion of all commissioning activities.

Information can be found on the letter from the owner identifying the commissioning agent and a letter stating compliance to this credit at the end of the project.

Intent and Sample Strategies
This prerequisite is intended to ensure that all building energy systems (i.e. lighting, HVAC, domestic hot water, irrigation and renewable energy systems) are installed and working properly. Typically, commissioning pays for itself in relatively short time through reduced operating costs.

The earlier the Commissioning Agent (CxA) is brought into the project, the more useful their input will be to the building design and construction. It is recommended that a Request for Proposal (RFP) for commissioning services be issued in the schematic

Metal Housing on Honeywell Controls is Missing.

plan review. The CxA will need to review the Owner's Project Requirements and the Basis of Design. Often these documents aren't developed until a CxA is on board, so the earlier all of these activities occur, the better for the project.

For the prerequisite, the CxA may be employed by the owner or the MEP engineering consultant as long as they are not on the team for this particular project. In this way, they are not a true third party, but still independent from the team.

Commissioning requirements should be incorporated into the specifications. Please see the Whole Building Design Guide or BuildingGreen web sites (see resources section) for sample specifications or use the Master Spec template for this section.

EA Prereq 2

Minimum Energy Performance

Design Responsibility
Design Professional

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Energy & Atmosphere section as Prerequisite Credit 2. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

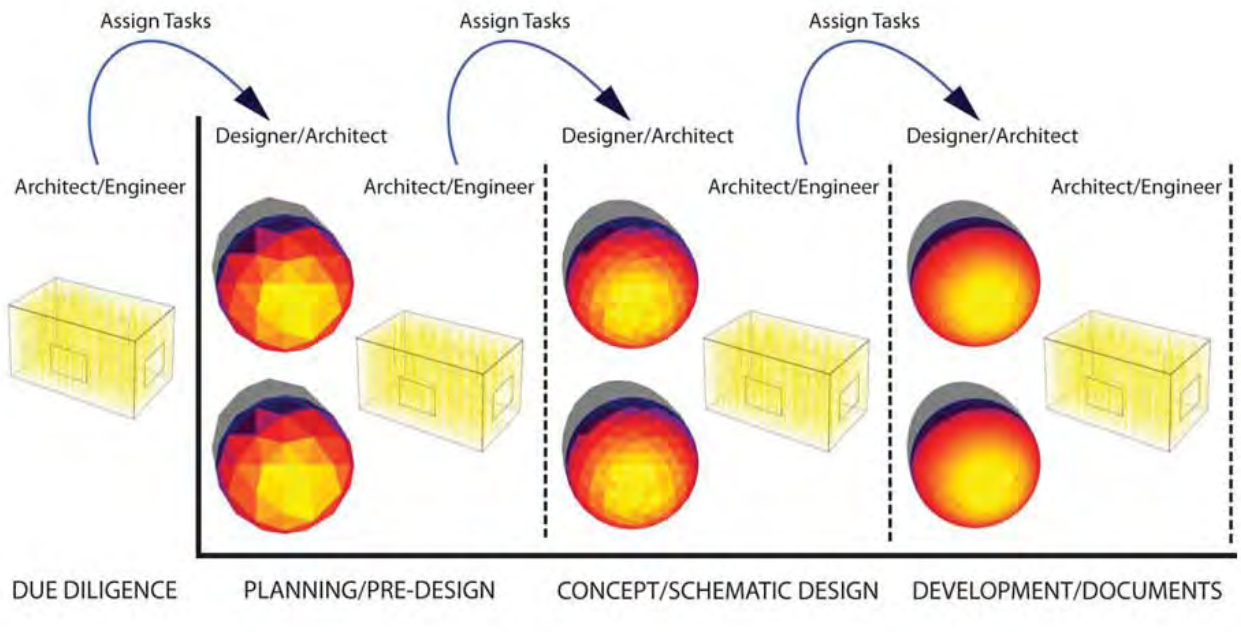
Documentation
The design professional must complete the Application Checklist and provide either a) documentation that the prescriptive compliance path was followed or b) a summary of the energy model showing the annual energy budget for the building.

Information can be found on the review letter from the mechanical engineer stating compliance track and compliance to the credit. Review the copy of the envelope compliance certificate or equal document.

Intent and Sample Strategies
This prerequisite is probably the single most significant hurdle to cross. Justifiably, a building shouldn't be certified as 'green' without being more energy efficient than code compliant buildings. It is required that all projects achieve 2 points in EA credit 1: Optimize Energy Performance. The referenced standard is ASHRAE 90.1-2004. A 2-point minimum in EA Credit 1 means exceeding this standard by 14% for new buildings and 7% for major renovations of existing buildings.
Recent changes to the Dallas building codes require that commercial buildings be 30% more efficient than ASHRAE 90.1 2004 as demonstrated by energy modeling or achieving advanced prescriptive energy efficiency guidelines.

Meeting new higher Dallas energy code requirements will earn points under LEED-NC v2.2 Energy and Atmosphere Credit 1: Optimize Energy Performance. Buildings whose energy models demonstrate at least 28% greater energy efficiency than ASHRAE 90.1 2004 are eligible for 6 LEED points under Energy and Atmosphere Credit 1: Optimize Energy Performance and achieving 31.5% better than ASHRAE 90.1 2004 is eligible for 7 LEED points under the same credit.

As stated in the section overview, it is important to note that energy performance is not just a mechanical and electrical design problem. The MEP engineer may design efficient systems, but the real reduction



Energy Modeling Should be Done as Soon as Possible and Should be Used as an Iterative Design Tool. Image provided by HOK.

in energy use will come from reductions in the loads. Load reduction is an architectural problem that must be addressed in the building massing and orientation as well as the envelope.

Achieving this prerequisite will require significant investment of time and resources to the building design, envelope and systems. Project teams may demonstrate compliance with LEED requirements either by following a prescriptive compliance path or by using free energy modeling software, such as Trane Trace, DOE 2, and eQUEST

Buildings < 100,000 square feet may use the prescriptive Advanced Buildings Core Performance Guide for 2-5 points.

ASHRAE also provides free Advanced Energy Design Guidelines for smaller buildings (< 20,000 square feet). Currently these prescriptive paths exceed the ASHRAE standard by 30%,

Projects with an extensive scope (over 100,000 square feet), complex mechanical or lighting systems, or curtain wall systems will need to use the modeling approach. Modelers must set a 'base case', or code-compliant building of the same size, occupancy patterns and location, and compare this to the 'design case', which makes use of more efficient systems, materials and - potentially - passive strategies.

Energy modeling should begin as early as possible and should be used as an iterative design tool. The model takes into account building orientation, massing, envelope materials, shading devices and other passive strategies in addition to lighting and HVAC systems. Running the model as the design is tweaked can provide valuable feedback to the design team. Modeling can have a significant cost to the project and it is not a very effective use of the investment if the team does not initiate the service early in design or only uses it for a static report for LEED documentation purposes.

Architectural design teams may want to use modeling programs such as Ecotect and IES which give more visual feedback on designs such as orientation, massing, shading, etc.

COM*check* Software Version 3.6.1

Envelope Compliance Certificate

90.1 (2004) Standard

Section 1: Project Information

Project Type: **New Construction**
Project Title : SCIENCE/VET TECH/ALLIED HEALTH BUILDING

Construction Site:
CEDAR VALLEY COLLEGE
DALLAS, TX 75314

Owner/Agent:
DALLAS COMMUNITY COLLEGE DISTRICT
Dallas, TX

Designer/Contractor:
HOK
2711 North Haskell Avenue
Dallas, TX 75204
214.720.6000

Section 2: General Information

Building Location (for weather data):	**Dallas, Texas**
Climate Zone:	**3a**
Heating Degree Days (base 65 degrees F):	**2259**
Cooling Degree Days (base 50 degrees F):	**6587**
Building Type for Envelope Requirements:	**Non-Residential**
Vertical Glazing / Wall Area Pct.:	**37%**

Building Type	Floor Area
School/University	107587

Section 3: Requirements Checklist

Envelope PASSES: Design 18% better than code.

Climate-Specific Requirements:

Component Name/Description	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor
Roof 1: Insulation Entirely Above Deck	55875	---	21.0	0.046	0.063
Floor 1: Slab-On-Grade:Unheated	1708	---	---	---	---
Exterior Wall 1: Steel-Framed, 16" o.c.	61605	19.0	0.0	0.110	0.124
Punched 4x6 (35) S & W: Metal Frame with Thermal Break:Double Pane with Low-E, Tinted, Fixed, SHGC 0.27	840	---	---	0.290	1.220
Punched 4x6 (23) S, N & E: Metal Frame with Thermal Break:Double Pane with Low-E, Tinted, Fixed, SHGC 0.27	552	---	---	0.290	1.220
Level 2 punched: Metal Frame with Thermal Break:Double Pane with Low-E, Tinted, Fixed, SHGC 0.27	1811	---	---	0.290	1.220
Area A curtainwall: Metal Frame with Thermal Break:Double Pane with Low-E, Tinted, Fixed, SHGC 0.27	2331	---	---	0.290	1.220
Area A north punched: Metal Frame with Thermal Break:Double Pane with Low-E, Tinted, Fixed, SHGC 0.27	576	---	---	0.290	1.220
A finger north: Metal Frame with Thermal Break:Double Pane with Low-E, Tinted, Fixed, SHGC 0.27, PF 0.09	3287	---	---	0.290	1.220
A finger north above: Metal Frame with Thermal Break:Double Pane with Low-E, Tinted, Fixed, SHGC 0.27, PF 0.42	432	---	---	0.290	1.220
A finger east: Metal Frame with Thermal Break:Double Pane with Low-E, Tinted, Fixed, SHGC 0.27	807	---	---	0.290	1.220
A finger south: Metal Frame with Thermal Break:Double Pane with Low-E, Tinted, Fixed, SHGC 0.27, PF 0.44	657	---	---	0.290	1.220
A finger punched: Metal Frame with Thermal Break:Double Pane with Low-E, Tinted, Fixed, SHGC 0.27	53	---	---	0.290	1.220

EA Prereq 3

Fundamental Refrigerant Management

Design Responsibility	Documentation Phase
Design Profess. (MEP)	Plan Review

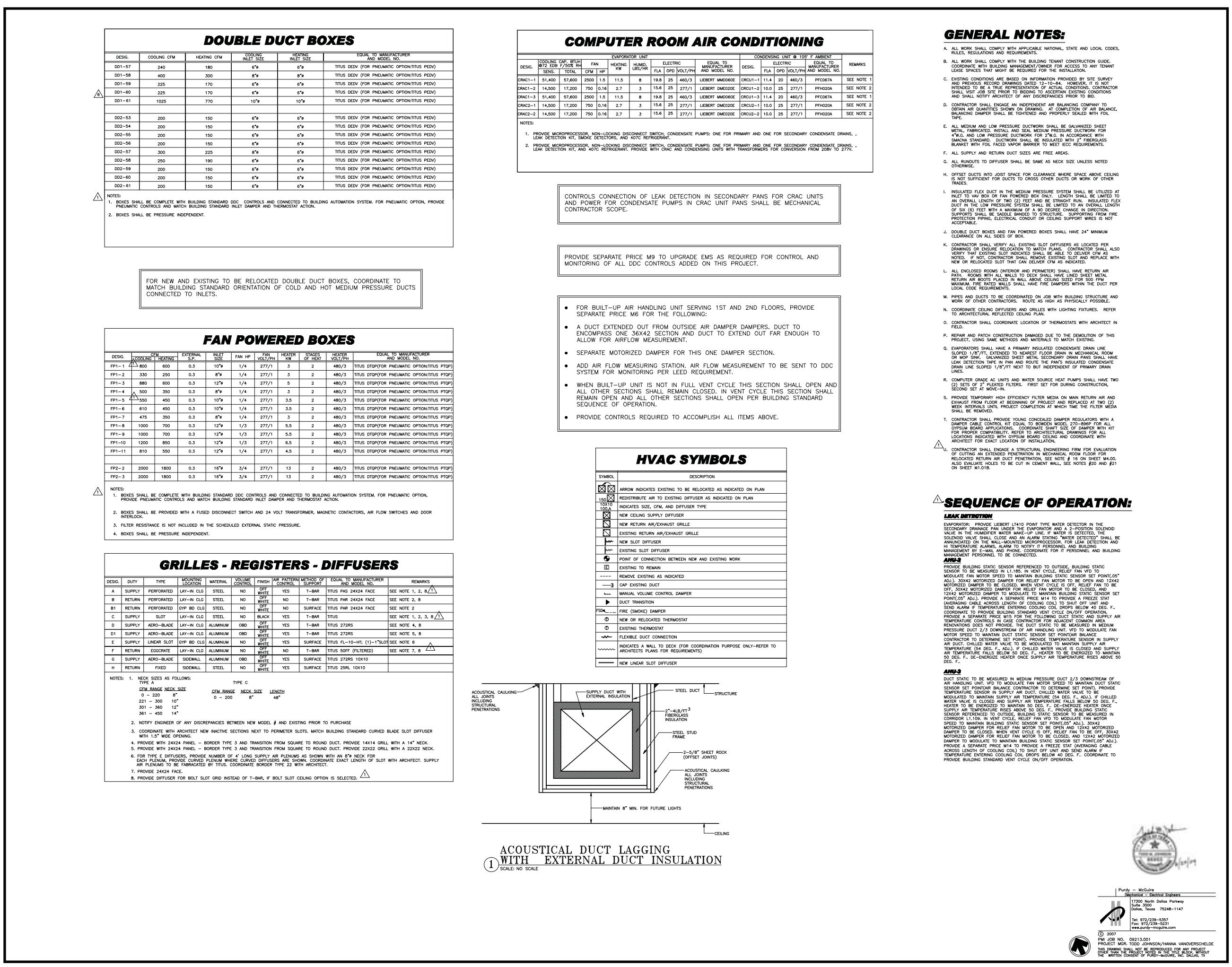
This credit is identified in the Application Checklist in the Energy & Atmosphere section as Prerequisite Credit 3. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Application Checklist and should upload a refrigeration schedule.

Information can be found on the mechanical sheets, or the specification section applicable to the mechanical systems.

Intent and Sample Strategies
This prerequisite is intended to encourage design teams to avoid the use of CFC-based refrigerants to reduce ozone depletion.

For new projects or new equipment, project teams should not anticipate any problems meeting this prerequisite. CFCs are no longer used in new HVAC equipment the U.S.



EA Credit 1

Optimize Energy Performance

Design Responsibility
Design Professional

Documentation Phase
Plan Review

Dallas Targeted Credit

This credit is identified in the Application Checklist in the Energy & Atmosphere section as Credit 1. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Application Checklist and provide either a) documentation that the prescriptive compliance path was followed or b) a summary of the energy model showing the annual energy budget for the building.

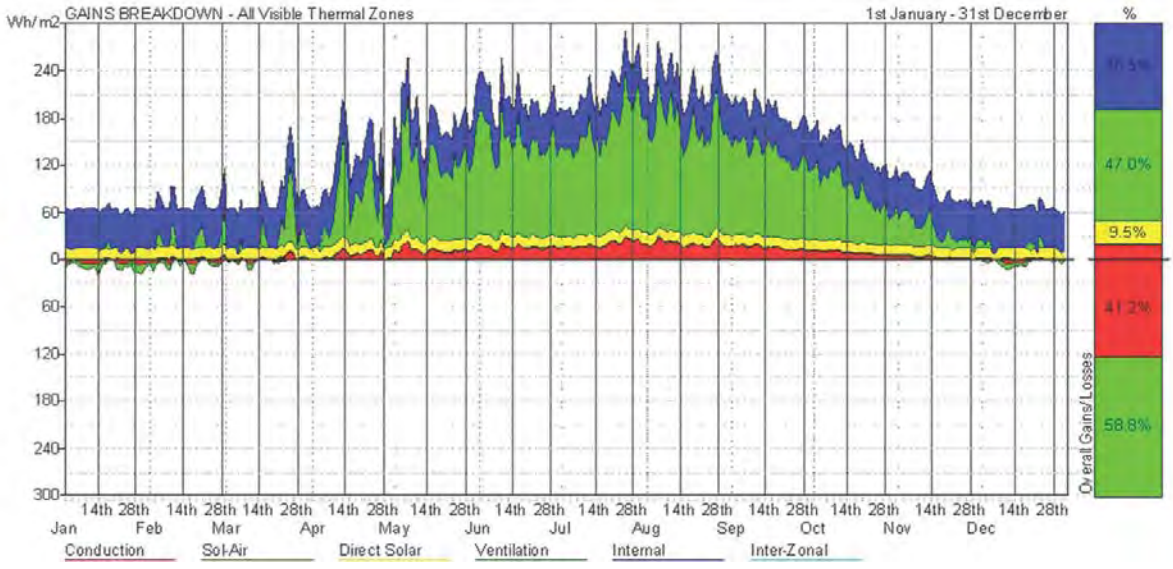
Information can be found on \mechanical sheets, template letter or any specialty report generated to comply with this credit. A letter or document provided by the engineers will also satisfy the compliance of this credit.

Intent and Sample Strategies
It is required that all projects achieve 2 points in EA credit 1: Optimize Energy Performance. The referenced standard is ASHRAE 90.1-2004. A 2-point minimum in EA Credit 1 means exceeding this standard by 14% for new buildings and 7% for major renovations of existing buildings.

New Buildings	Existing Buildings	Points
14%	7%	2
(Required LEED Minimum as of 06/26/2007)		
17.5%	10.5%	3
21%	14%	4
24.5%	17.5%	5
28%	21%	6
31.5%	24.5%	7
35%	28%	8
38.5%	31.5%	9
42%	35%	10

For EA Credit 1, points 1-10, energy costs savings beyond ASHRAE 90.1-2004 will achieve:

ENERGY MODELING RESULTS



Energy Modeling Should be Done as Soon as Possible and Should be Used as an Iterative Design Tool. Image provided by HOK.

Although these points are technically a prerequisite, project teams may still count them toward the credit total needed for Certification.

Recent changes to the Dallas building codes require that commercial buildings be 15% more efficient than ASHRAE 90.1 2004 as demonstrated by energy modeling or achieving advanced prescriptive energy efficiency guidelines.

Meeting new higher Dallas energy code requirements will earn points under LEED-NC v2.2 Energy and Atmosphere Credit 1: Optimize Energy Performance. Buildings whose energy models demonstrate at least 28% greater energy efficiency than ASHRAE 90.1 2004 are eligible for 6 LEED points under Energy and Atmosphere Credit 1: Optimize Energy Performance and achieving 31.5% better than ASHRAE 90.1 2004 is eligible for 7 LEED points under the same credit.

As stated in the section overview, it is important to note that energy performance is not just a mechanical and electrical design problem. The MEP engineer may design efficient systems, but the real reduction in energy use will come from reductions in the loads. Load reduction is an architectural problem that must be addressed in the building massing and orientation as well as the envelope.

Solar Chimneys Assist Natural Ventilation Through the Stack Effect.

Achieving the 2-point minimum and any additional points will require significant investment of time and resources to the building design, envelope and systems. Project teams may demonstrate compliance with LEED requirements either by using free energy modeling software, such as Trane Trace, DOE 2, and eQUEST

Horizontal Sun-shading Devices Protect Building Interior From Solar Heat Gain.

Buildings < 100,000 square feet may use the prescriptive Advanced Buildings Core Performance Guide for 2-5 points.

ASHRAE also provides free Advanced Energy Design Guidelines for smaller buildings (< 20,000 square feet). Currently these prescriptive paths exceed the ASHRAE standard by 30%; the 30% guidelines will achieve 6 energy performance points.

Projects with an extensive scope (> 100,000 square feet), complex mechanical or lighting systems, or curtain wall systems will need to use the modeling approach. Modelers must set a ‘base case’, or code-compliant building of the same size, occupancy patterns and location, and compare this to the ‘design case’, which makes use of more efficient systems, materials and - potentially - passive strategies.

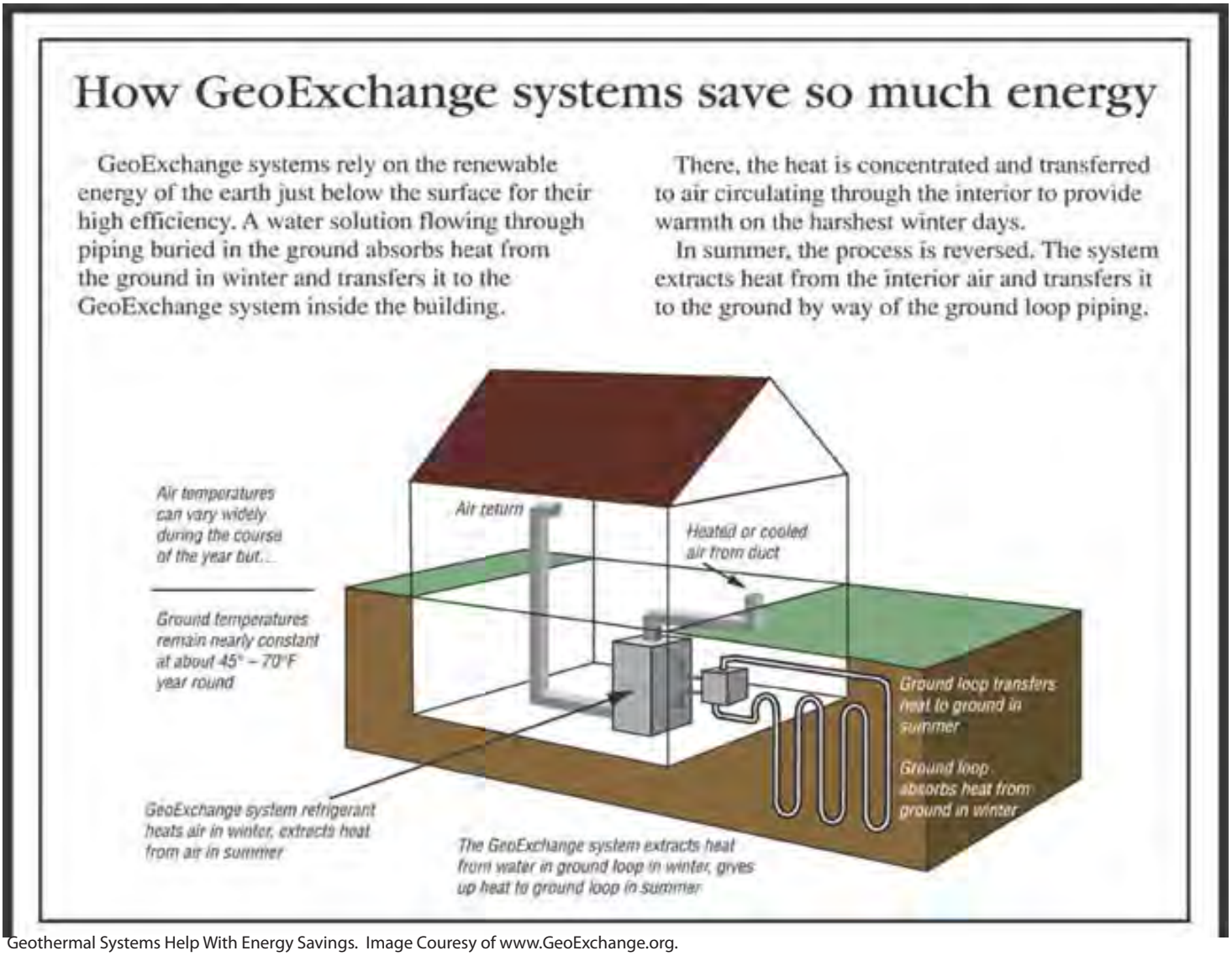
Energy modeling should begin as early as possible and should be used as an iterative design tool. The model takes into account building orientation, massing, envelope materials, shading devices and other passive strategies in addition to lighting and HVAC systems. Running the model as the design is tweaked can provide valuable feedback to the design team. Modeling can add a significant cost to the project and it is not a very effective use of the

investment if the team doesn't initiate the service early in design or only uses it for a static report for LEED documentation purposes.

Architectural design teams may want to use modeling programs such as Ecotect and Integrated Environmental Solutions (IES) which give more visual feedback on design designs such as orientation, massing, shading, etc.

Some technologies that might assist in energy savings include geothermal heating and cooling, energy recovery, daylight harvesting, solar thermal domestic hot water heating, etc. Lower-tech solutions may include horizontal shading devices, light shelves (that bounce daylight further into interior spaces), vertical fins and vertical vegetation systems such as Green Screen and Green Wall. Both systems cool ambient air around the building through evapotranspiration, Green Screen may provide shading to the building while Green Wall, virtually a vegetated roof flipped up on end, may provide increased insulation to the building envelope.

The Building Inspection Division requires projects to be code-compliant and encourages design teams to achieve as many energy performance points as possible through passive design strategies such as orientation, massing and solar shading. High performance systems will be evaluated on their merit as well as first cost and anticipated payback timeframe.



Geothermal Systems Help With Energy Savings. Image Couresy of www.GeoExchange.org.

EA Credit 2

On-Site Renewable Energy

Design Responsibility
Design Profess. (MEP)

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Energy & Atmosphere section as Credit 2. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Application Checklist and should provide product specifications for renewable energy products to be used on site.

Information can be found on the site plan, roof plan, mechanical documents or any specialty documents that illustrate the technologies being used to comply with this credit. Specialty documents may also be used to illustrate the technologies being used.

Intent and Sample Strategies
This credit encourages the installation of on-site renewable power generation. Purchase of off-site renewable power is encouraged in EA Credit 6. Common renewable technologies in the city of Dallas include solar, wind and geothermal. While solar thermal domestic hot water is an economical and energy-saving strategy, it does not produce energy on site and is therefore not included in this credit.

Once the energy modeling efforts have been launched and the team has an approximate idea of the total annual energy budget for the building, various technologies for producing 2.5%, 7.5% or 12.5% of the building's energy needs (for 1, 2, or 3 LEED credits respectively) should be sized and costs estimated to inform the discussion.

% Renewable Energy	Points
• 2.5%	1
• 7.5%	2
• 12.5%	3

Source: Teresita Cochran, Sustainable Minded Interactive Technology, LLC (SMIT); GROW 2

Source: Onsite Building Rooftop Wind Turbines from AeroVironment

EA Credit 3

Enhanced Commissioning

Design Responsibility
Design Profess. (CxA)

Documentation Phase
Final Inspection

This credit is identified in the Application Checklist in the Energy & Atmosphere section as Credit 3. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The Commissioning Agent (CxA) must complete the Application Checklist and provide a copy of a) the Commissioning Plan, b) the owner's Project Requirements (OPR), c) the Basis of Design (BOD) and d) a timeline for completion of remaining commissioning activities as well as verification that all required services are under contract

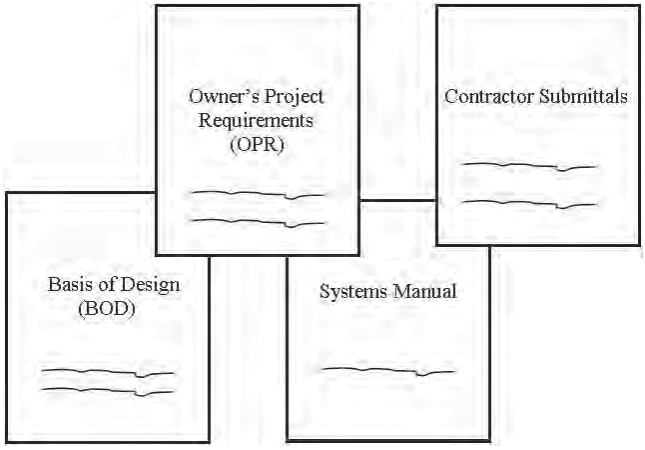
Information can be found on the letter from the owner identifying the commissioning agent and a letter stating compliance to this credit at the end of the project.

Intent and Sample Strategies
This credit is intended to ensure that not only are all building energy systems (i.e. Lighting, HVAC, domestic hot water and renewable energy systems) installed and working properly, but that they are designed properly and that building engineering staff are trained in their ongoing maintenance and operations.

The Commissioning Agent (CxA) must be brought in during the plan review phase to be eligible for this credit. For this credit, the CxA must also be a true third party and not affiliated with the MEP engineering consultant or any other participant in the design team. It is highly recommended that the CxA is a consultant directly to the owner for this credit.

In addition to Fundamental Commissioning activities:

- The CxA will need to review the design documents, the owner's Project Requirements and the Basis of Design prior to mid-construction documents phase and back-check the review comments in the subsequent design submission. The CxA will provide feedback to the project team and the team must demonstrate that they have responded to these comments.
- The CxA will need to ensure that a systems manual is developed for Operations and Maintenance (O&M) staff.
- The CxA will need to verify that O&M staff members have been trained in the operations of building systems.
- The CxA will need to verify that a building systems review with O&M staff will occur within 10 months of substantial completion. Commissioning requirements should be incorporated into the specifications.



The CxA Must Review Design Documents

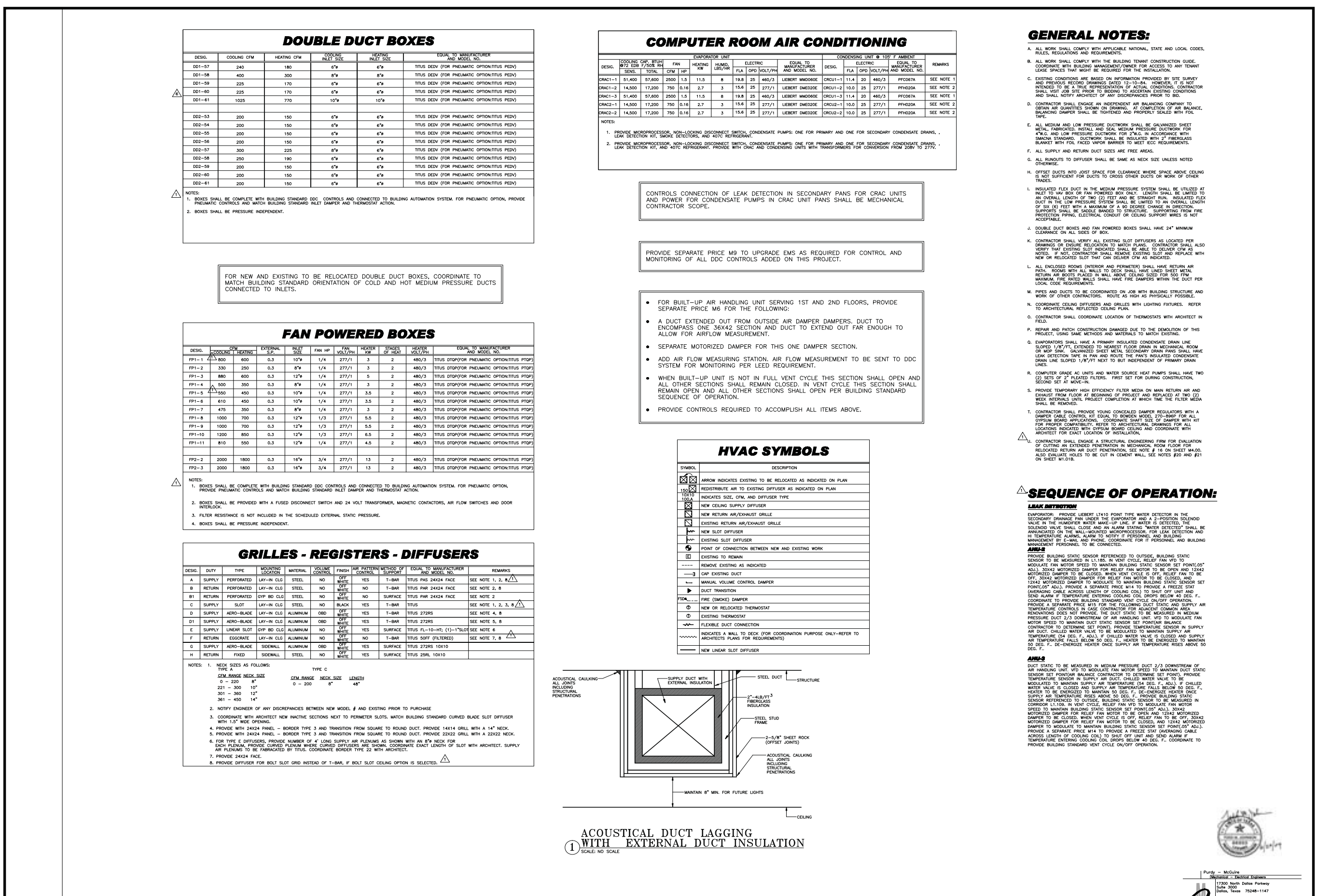
This credit is identified in the Application Checklist in the Energy & Atmosphere section as Credit 4. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Application Checklist and should submit a refrigerant schedule and/or documentation of compliance under the calculation method.

Information can be found in the mechanical section of the documents set, or any specialty document generated to comply with this credit. Additional information can be found in the mechanical section of the specification manual that deals with equipment, and refrigerant management

Intent and Sample Strategies
This Credit is intended to encourage design teams to avoid the use of HCFCs and refrigerants in order to reduce ozone depletion.
If projects cannot show that there are no HCFC-based refrigerants used in the project, there is a calculation method to demonstrate minimal impact on ozone depletion.

This is neither a difficult nor expensive credit to achieve. Project teams should discuss the intent to pursue this credit prior to mechanical systems selection.



EA Credit 5

Measurement & Verification

Design Responsibility
Design Profess. (MEP)

Documentation Phase
Final Inspection

This credit is identified in the Application Checklist in the Energy & Atmosphere section as Credit 5. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Application Checklist and should provide a) a copy of the Measurement & Verification (M&V) Plan and b) either a contract for implementation of the M&V Plan or a description from the owner (OBI) as to how the plan will be implemented with in-house resources.

This information and M&V plan is to be provided by the engineers for the compliance of this credit.

Intent and Sample Strategies
Buildings can be designed 'green' but need to be operated and maintained green to maintain the high level of performance intended in the design. Without measurement and reliable feedback, there is no mechanism by which to verify a building is performing at least as well as designed, or tweaked to improve performance. The Measurement & Verification (M&V) credit is offered to encourage teams to include the infrastructure to measure and improve building performance over time.

Source: EMON; Green-Meter

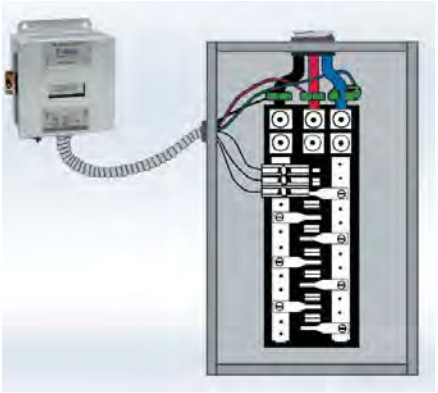
The Green Building Act requires publicly owned non-residential buildings to 'institute building systems monitoring and maintenance accountability methods' upon receiving the Certificate of Occupancy.

It is up to the team to determine if the remaining M&V plan activities, including evaluation of actual to predict building performance, will provide useful feedback that is worth the investment. Building owners may contract this evaluation service to a consultant or may implement the M&V Plan with in-house staff, where qualified staff is available.

This credit will require a certain level of sub-metering as well as an M&V Plan. Sub-metered systems may include, but are not limited to the following loads:

- Mechanical Systems
- Vertical Circulation
- Domestic Hot Water
- Irrigation
- On-site renewable energy systems
- Lighting systems and controls
- Constant and variable motor loads
- Variable frequency drive operation
- Chiller efficiency
- Cooling load
- Air and water economizer and heat recovery cycles
- Air distribution static pressures and ventilation air volumes
- Boiler efficiencies
- Building-related process energy systems and equipment
- Indoor water riser and outdoor irrigation systems

The M&V Plan should include a timeline for at least one year of post-occupancy ongoing evaluation. Evaluation should include the comparison of actual systems performance to the performance estimated in the Energy Model for EA Prerequisite 2 and EA Credit 1.



Source: EMON Submetering Panel

EA Credit 6

Green Power

Design Responsibility
Owner/ Design. Profess.

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Energy & Atmosphere section as Credit 6. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The owner must complete the Application Checklist and should provide a copy of the green power purchase agreement. The quantity of green power purchased must represent 35% or 70% of the building's anticipated power consumption for two years (as determined by the energy model) or the owner may upload a 2-year contract with a local utility for the purchase of 35% or 70% green power for one or two LEED credits respectively.

Information can be a letter or document provided by the owner committing to the purchase of green power.

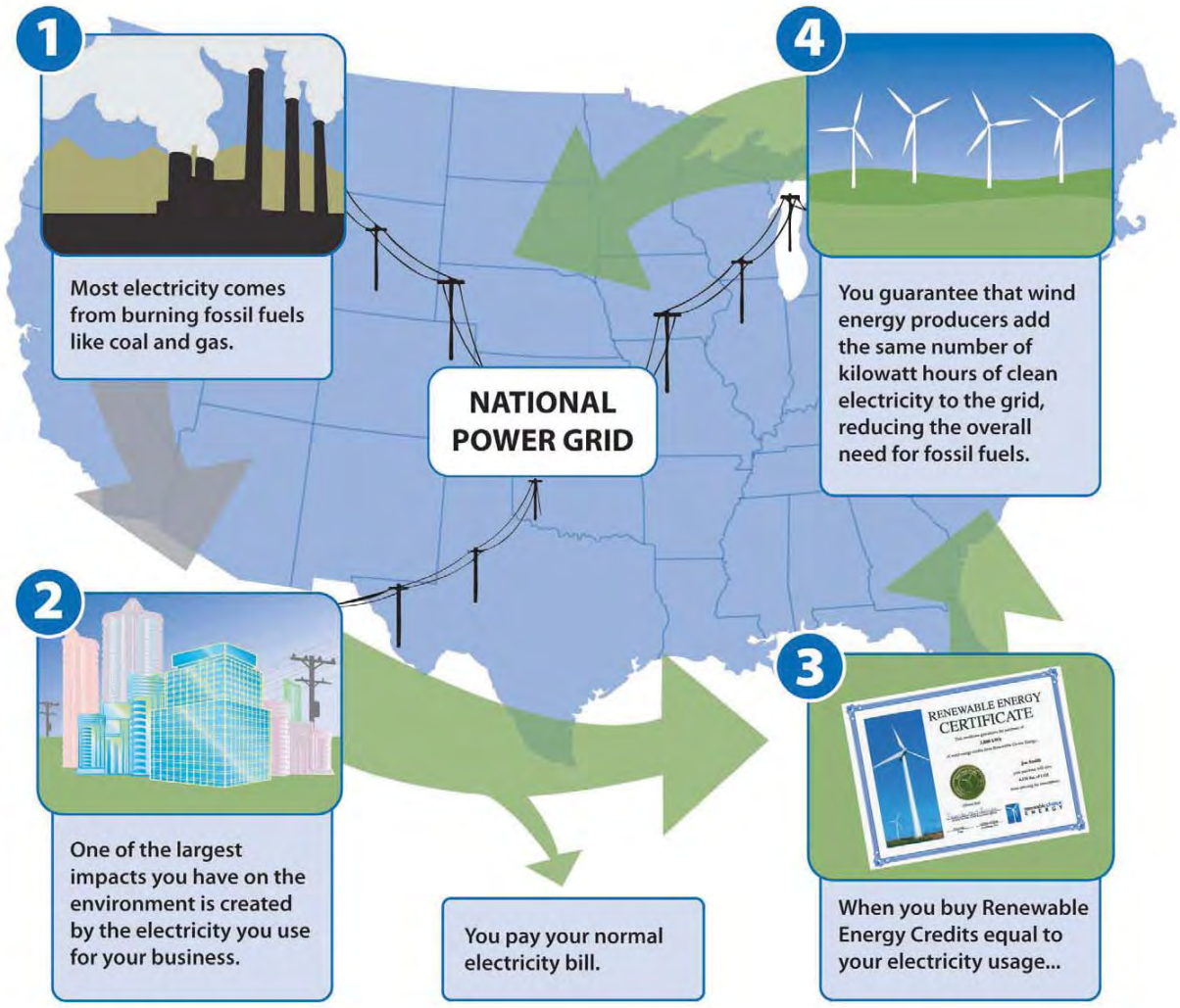
Intent and Sample Strategies
This credit is perhaps one of the most misunderstood in the LEED Rating System. Many project teams equate this credit to purchasing offsets, when this isn't a very accurate depiction of events. Many project sites aren't conducive to generation of their own on-site renewable energy. The solution may be to purchase green or renewable energy that is produced elsewhere.

You should be able to estimate your green power needs once the energy model has been completed for EA Prerequisite 2 and EA Credit 1, providing a quantified value of total kilowatt hours (kWh) your project is anticipated to use in a year. You must reserve 35% of your needs for two years for EA Credit 6 or 70% for two years for the extra Exemplary Performance credit in the Innovation & Design section (ID).

Despite the fact that building owners may purchase green energy directly from the utility, it should be pointed out that the electrons generated from renewable sources are sent to the same grid as electrons produced from non-renewable sources. Your purchase of green power does not necessarily mean that wind-generated or solar-generated electrons are entering your building on their own special green power highway. You are getting a mix of all electrons from all sources. However, you do know that with your purchase, the amount of electricity that your building consumes will be replaced by renewably sourced power in the amount that you choose to purchase. For LEED-NC purposes that will be 35% for two years for EA credit 6 or 70% for two years for an Exemplary Performance credit. So if you cannot purchase green power directly from your utility or if it is more economical to purchase Renewable Energy Credits (RECs) from a third-party provider, this is a viable alternative.

Renewable Energy Credits are basically derived from splitting up renewably-generated power from its 'green' qualities and selling the kWh at market price to grid-consumers local to the power generation and selling the RECs for a small price to consumers anywhere. So a wind farm in Colorado can be supplying wind-generated electrons to the Denver grid, where consumers may not pay any premium for this green power and the Renewable Energy Credit provider can then turn around and sell you the RECs for something in the neighborhood of $0.005-$0.01/ kWh. These credits may not be sold twice. They represent a mechanism for selling consumers green power in remote marketplaces when it is impractical to transmit that energy from its source to the consumer. Aside from infrastructure costs associated with laying new transmission lines across the country, up to ¾ of electricity is lost in transmission, so it is much more efficient to use the power locally and to sell the RECs to consumers in locations where renewable power generation is less practical.

This is a credit that can be tabled until the project reaches its completion. Many teams decide to purchase green power if they need an additional point or two to reach the targeted level of LEED Certification. This strategy is perfectly acceptable, however green power is a fairly cost effective point strategy to pursue within the LEED Rating System and should be discussed as a viable part of the permanent strategy, not just as a 'quick fix' at a project's completion.



Source: Renewable Choice; How Renewable Energy Credits Work

Energy and Atmosphere Resources

Overview

EApr1 Fundamental Commissioning of Building Energy Systems/EAc3 Enhanced Commissioning

Whole Building Design Guide definition, benefits, drivers and overview of the commissioning process: www.wbdg.org/project/buildingcomm.php

Cost Effectiveness of Commercial Buildings Commissioning: eetd.lbl.gov/emills/PUBS/Cx-Costs-Benefits.html

Commissioning Authority (CxA) – The commissioning process is a great advantage for owners to verify and document the performance of their building systems before occupancy and is mandatory in achieving a green building certification level from the USGBC. A commissioning Agent (CxA) leads this process and must be independent of both the design and construction team. The role of the commissioning agent will vary dependent upon the phase of the project as well as the team's pursuit or non-pursuit of enhanced commissioning. See the USGBC document, Who Can Be the Commissioning Authority: www.usgbc.org/ShowFile.aspx?DocumentID=1262.

EApr2 Minimum Energy Performance/EAc1 Optimize Energy Performance

Free Energy Design Guides for Small Buildings: www.ashrae.org/technology/page/938

Chilled Beams: www.aeieng.com/services/sustainable/chilledbeam.htm

Green Building Information Modeling (BIM): www.greenbimnetwork.blogspot.com

Advanced Buildings Core Performance Guide – This guide was adopted by the USGBC as a prescriptive path alternative to energy modeling for projects less than 100,000 square feet. If a project follows the requirements of the Core Performance program, it can achieve 2-5 LEED points under EA credit 1. It was developed by the New Buildings Institute and is an updated version of the Advanced Buildings Benchmark program. www.advancebuildings.net

Advanced Energy Design Guidelines - ASHRAE provides a free Advanced Energy Design Guidelines for smaller buildings. Currently these prescriptive paths exceed the ASHRAE standard by 30%, but there are 50% guidelines in development that should be released soon (for free access to guides see: www.ashrae.org/technology/page/938).

ASHRAE 90.1-2004 – Formulated by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE), this standard establishes minimum requirements for the energy –efficient design of buildings. It's components referenced for LEED purposes consist of the building envelope, HVAC systems, service water heating, power, lighting, and other equipment.

Daylight Harvesting – User-operated daylight dimming, in combination with photocell and occupancy sensors, can reduce energy through lighting minimization. Projects should utilize daylight sensors, provide additional light switches, and reduce foot-candle levels overhead by providing higher levels of task lighting at the individual work space if applicable.

Dimmable ballasts can trim excess foot candle areas down. Other energy savings strategies included in the daylight harvesting system include reducing electrical lighting around windows and providing additional light switches. The additional light switches provide for personal controls, and thereby motivates individuals to turn off lights.

Daylight Harvesting	Company	Sensors / Controls	Complete System	DALI Ballasts (Dimmable)
	Lutron		Y	Y
	Sensor Switch	Y	Y	
	Leviton	Y	Y	
	Universal Lighting Tech. / Address Pro	Y	Y	Y
	GE			Y
	Solatube	Y	Y	Y
	Tridonic-Adco	Y	Y	Y

Lighting Control	Company	Sensors / Controls	Complete System	DALI Ballasts (Dimmable)
	Advance Transformers			Y
	Cooper Controls	Y		
	Delta Controls	Y		

Daylighting Strategies	Company	Skylights
	HUVCO	Y
	Natural Lighting Co.	Y
	Ciralight	Y
	NaturaLight	Y

Access to outdoor views, natural daylighting, and personal lighting controls not only contribute to energy savings but also help to improve the mind set and well-being of the building's occupants.

Daylighting Resources:

Energy Recovery Device, the Enthalpy Wheel - The enthalpy wheel is an energy recovering device that reduces heating and cooling operating needs thus maximizing energy savings and minimizing costs. This device contains rotating wheels filled with an air-permeable medium that conditions incoming air by capturing then transferring heat and moisture from one air stream to the other. An enthalpy wheel can improve a building's indoor air quality, ventilation and energy standards while also preventing wasted heat.

Green Screen and Green Wall/Living Wall - Vertical vegetation systems. Green Screen involves a wire-like trellis system that trains plant growth vertically from a planter box or landscape on the ground. Green Screens can shade the building from solar heat gain. See www.greenscreen.com for examples of Green Screen. Green Walls/ Living Walls are akin to a vegetated roofing system tipped up to a vertical position. Unlike green screens, the planting medium (engineered soil) and plant root systems are carried all the way up the system. Green walls can

provide thermal and acoustic insulation and may provide some stormwater mitigation. See www.eltlivingwalls.com for Green Wall examples. Both systems may reduce the ambient temperature and improve the air quality around the building.

Solar Thermal Domestic Hot Water - Solar domestic hot water systems can be a cost-effective way to generate hot water. Solar water heating systems include storage tanks and solar collectors for two types of systems, active or passive.

EApr3 Fundamental Refrigerant Management

Chlorofluorocarbons (CFC) - An ozone depleting agent. LEED certification at any level requires the strict avoidance of CFC-based refrigerants in new HVAC&R systems and materials.

EAc1 Optimize Energy Performance - See EAp2: Minimum Energy Performance (above)

EAc2 On-site Renewable Energy

Building Integrated Photovoltaic system (BIPV) –An energy system that converts sunlight to electricity and reduces the greenhouse gas emission levels and energy costs of a building. BIPVs have gained increasing popularity for their direct integration within building materials. Manufacturers such as Open Energy produce photovoltaics capable of being integrated into the roofing membrane or architectural glass applications such as canopies.

Geothermal Heating and Cooling – Geothermal and water-source heat pumps are able to heat, cool, and potentially supply a building with hot water using the constant temperature of the earth as an exchange medium.

Photovoltaic Application - Photovoltaic arrays harvest daylight to generate electrical power, which can be sold back to the grid or stored on-site for grid-independent energy use. Net metering allows excess power to be sold back to the utility during peak times, reducing utility loads during high-rate hours and providing flexibility in utility rate negotiation. Given the variation in solar radiation on any given day, a photovoltaic system should only be used for backup power if a storage system is in place to ensure constant output regardless of solar conditions.

Photovoltaic systems can be added to existing buildings and also be used in new construction in rooftop arrays and/or integrated into building materials such as glazing systems or shading devices. New parking structures are good examples of opportunities to use photovoltaics in new construction. The options are numerous and include translucent cells used as building skin and parking shade canopies covered in photovoltaic units. The cost of installing photovoltaic units varies according to the application, location, and use but averages around $.20 per kWh.

Piezoelectric Energy - Piezoelectricity is the ability of some materials (notably crystals and certain ceramics) to generate an electric potential in response to applied stress. The word is derived from the Greek piezein, which means to squeeze or press. This is a solar choice that may be appropriate to DC - Sustainable Minded Interactive Technology, LLC (SMIT) has a product in development called GROW.1 that will incorporate a hybrid system of solar and piezoelectric energy technology to produce energy from both the sun and air movement around the building.

Wind Power - In addition to photovoltaics, emerging wind power turbine technology can be considered in urban locations. Additionally, most proposed parking structures are an appropriate site for an urban-scaled, building-integrated wind power turbine. These turbines differ from the more common wind propellers found predominantly in rural areas. In contrast to the objections raised about propellers, building integrated wind turbines react favorably to turbulent winds, can be placed at lower elevations, produce less noise, and inherently eliminate the “runaway” risks of large-scale propellers. Horizontal and vertical axis turbine units are available, and both can be installed on building rooftops. The vertical axis unit responds to varying wind directions and totals 20 feet in height. The horizontal axis unit is similar in size but rotated 90 degrees so that it can be integrated into the building’s architecture, providing a less visually distinct system.

The geometry of the building will influence the efficiency of the system. Curved surfaces or wind ducts provide a smooth, continuous surface for the wind to travel against the building skin, across the roof, and through the rotor. Wind Energy for the Built Environment, a European wind energy advocacy group, concluded that wind power is cost effective if the power generated accounts for at least 20 percent of the building's power consumption. The payback period depends on the wind speed and utility rate. A U.S. wind turbine design and manufacturing company, has identified a ten-year payback for a horizontal axis unit in sites with 10 MPH annual winds and $.10/kWh utility rates. The vertical axis unit has a lower average payback period of six to seven years for similar conditions.

EAc3 Enhanced Commissioning - See EApr1 Fundamental Commissioning of Building Energy Systems (above)

EAc4 Enhanced Refrigerant Management

Hydrofluorocarbons (HCFCs) – Refrigerants that do not deplete the stratospheric ozone layer. The USGBC promotes the disuse of this compound as some HCFCs have high global warming potential.

EAc6 Green Power
Additionality - Green power that is generated in addition to any amount of power that is required by the state. A project team can purchase certified renewable credits to obtain LEED points for green power.
Green-e - A voluntary certification program that sets consumer-protection and environmental-integrity standards for greenhouse gas (GHG) emission reductions sold in the voluntary market. Green-e Energy allows companies to display the logo when they have purchased a qualifying amount of renewable energy and passed specific verification standards. Companies such as Green-e Energy can be used for obtaining green power credits as points under the USGBC rating systems.

Renewable Energy Credits (RECs) – RECs are basically derived from splitting up renewably-generated power from its 'green' qualities and selling the actual kilowatts at market price to grid-consumers local to the power generation and selling the RECs for a small price to consumers anywhere.

Section Four:
Materials and Resources

Overview

This section addresses the environmental qualities of materials brought on and off site. In part because of the increasing market adoption of LEED and green building best practices, many more materials with environmental qualities are available than even a few years ago. The increased availability of these materials has brought down the cost so that these materials are priced competitively with their non-green equivalents. In some cases, manufacturers have even stopped making products that don't meet minimum environmental standards as the demand for 'greener' products is high and it is inefficient to make two different versions of the same product.

Increased market adoption of LEED and green building practices also means that there is a growing labor force skilled in working with and installing green products and materials. Dallas projects should have no trouble finding a general contractor that is readily versed in LEED implementation and documentation requirements. Dallas contractors should also not be significantly challenged to find sub-contractors that are also well versed. Many Dallas construction companies are designating their own internal LEED consultants or experts to guide the process on the job site. Nevertheless, the project design team should a) attend pre-bid meetings to answer any questions about LEED requirements for the project to promote accurate bidding, and b) should hold an orientation for the construction team once the project has been awarded.

Before You Begin

1. Building material and site clearing waste as a result of demolition is taken into account in your Construction Waste Management credits. Ensure that these materials are recycled or otherwise diverted from landfills to maximize your credit earning potential in MR 2.1-2.2. See Specification Guidance chapter.
2. Establish a construction dollar value utilzed for Construction Specification Institute Master Format 1995 ed. (CSI) Divisions 2-10 (estimation is ok for credit feasibility analysis). For many of the credits you will need to use this number to derive a total materials value that excludes labor. The LEED default for total materials value is 45% of the total construction value for Divisions 2-10. However project teams may wish to use an actual materials value to boost credit calculations. This is fine, though it does take more work. Regardless, teams should use the default value to derive ballpark numbers and to benchmark credit achievement with various building materials under consideration.

In this Section

- Prerequisite 1: Storage & Collection of Recyclables
- Credit 1.1: Building Reuse, Maintain 75% of Walls, Floor & Roof
- Credit 1.2: Building Reuse, Maintain 95% of Walls, Floor & Roof
- Credit 1.3: Building Reuse, Maintain 50% of Interior, Non-Structural Elements
- Credit 2.1: Construction Waste Management, Divert 50% from Disposal
- Credit 2.2: Construction Waste Management, Divert 75% from Disposal
- Credit 3.1: Resource Reuse, 5% Salvaged Materials
- Credit 3.2: Resource Reuse, 10% Salvaged Materials
- Credit 4.1: Recycled Content, 10%
- Credit 4.2: Recycled Content, 20%
- Credit 5.1: Regional Materials, 10% Locally Harvested, Extracted, Mined or Salvaged and Manufactured within 500 miles
- Credit 5.2: Regional Materials, 20% Locally Harvested, Extracted, Mined or Salvaged and Manufactured within 500 miles
- Credit 6: Rapidly Renewable Materials, 2.5%
- Credit 7: Certified Wood
- Section Resources

MR Credit Prereq 1

Storage & Collection of Recyclables

Design Responsibility
Owner/ Design. Profess.

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Materials & Resources section as Prerequisite 1. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Recycling Collection Points

Documentation
The design professional must complete the Application Checklist and should provide a copy of building plans showing a) collection points and b) adequately sized storage for recyclables. The architect may also provide a copy of the recycling policy any exceptions to this prerequisite must be accounted for by the owner.

Information can be found on floor plans illustrating the designated collection areas or in any additional illustrative plan required to meet this credit.

Intent and Sample Strategies
This prerequisite requires that all LEED candidate buildings provide recycling infrastructure for building occupants. Recyclables must include, at a minimum: paper, cardboard, glass, plastics (at least #1 & #2), and metals (i.e. aluminum and tin cans).

This prerequisite includes requirements for a) collection points, b) an adequately sized recyclables storage space, and c) participation in a recycling program.

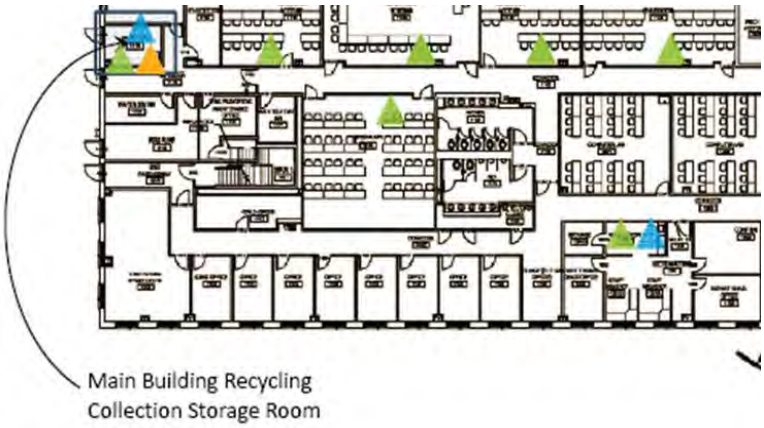
Collection points may be provided in any location that is practical for the design team, however typically

- Paper is collected in copy areas, recommended to be collected at work stations as well
- Glass, Plastics, Metals and mixed paper are collected in vending areas, cafeterias, pantries or kitchens
- Cardboard is collected at loading dock

Storage areas for recyclables should be sized according to the chart below unless the owner can show that recyclables will be picked up frequently enough to reduce the space requirements in the LEED Rating System.

Building square footage	Minimum recyclables storage area
0 - 5,000 sf	82 sf
5,000 - 15,000 sf	125 sf
15,001 - 50,000 sf	175 sf
50,001 - 100,000 sf	225 sf
100,001 - 200,000 sf	275 sf
200,001 or more sf	500 sf

Building owners should be encouraged to incorporate aluminum can crushers and trash compactors at their loading docks.



Documentation Illustrating Prerequisite Compliance. Image by HOK

MR Credit 2.1 & 2.2

Construction Waste Management: Divert 50% or 75%

Design Responsibility
Contractor

Documentation Phase
Final Inspection

This credit is identified in the Application Checklist in the Materials & Resources section as Credit 2.1 & 2.2. A Submittal Template must be submitted for this credit as a part of the construction submittal. It is the responsibility of the general contractor as marked by the triangle-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The contractor must complete Application Checklist and should provide a) a construction waste management plan (that includes diversion methods and locations of salvage or recycling facilities), and either b) all dump tickets and receipts for salvage and recycling, or c) a completed waste management report from the third party waste hauler.

Information can be found on a letter or documentation to be provided by the general contractor at the end of the project. Additional information can be found in the general construction section of the specification manual, which details the waste management plan and requirements.

Intent and Sample Strategies
The USGBC attributes over 75% of landfill waste to demolition and construction debris. With the cost of new materials on the rise, it makes sense to divert this waste from landfills so that it may be used in place of virgin materials in the manufacture of new building products.

Construction teams may elect to sort demolition and construction waste on site and to manage the process of recycling, salvaging and documenting these credits.

For teams that do not wish to sort waste on site or that do not have a staging area for multiple dumpsters, some third party waste haulers accept co-mingled construction and demolition waste and sort it off site. These are very efficient operations that are often able to divert 85-95% of waste through their recycling and salvage efforts. Because these businesses make a profit on your project waste, this service is often competitive with or even less expensive than tipping fees typically charged to dump waste in a landfill.

Projects achieving over 95% diversion may submit documentation for an Exemplary Performance credit in the Innovation & Design section (ID).

MR credits 2.1-2.2 may be tracked by either weight (in tons) or volume (in cubic yards) so long as the method is consistent throughout the project. Projects with a great amount of demolition debris, such as asphalt from parking lots, concrete, steel or masonry, etc. should probably opt to track by weight. Projects with relatively light materials may opt to track by volume instead. If demolition waste is crushed up and reused on or off site as aggregate, fill or road bed, this still counts as diversion. Contractors should estimate or quantify total weight or volume of this material. Unfortunately, land clearing debris such as vegetation and soil may not be counted towards this credit, even if it is recycled. It should not be included in the waste calculations at all. The exclusion of land clearing debris is intended to avoid rewarding projects that clear entire sites (see SS credit 5.1: Site Development, Protect & Restore Habitat). It is excluded from waste calculations so that it neither harms nor helps the credit achievement.

Construction Waste Management Plans Help to Reduce Landfill Waste from Demolition and Construction Debris

Requirements for 50% or 75% (or 95%) diversion should be included in your specifications. Construction waste management (CWM) progress reports should be provided by the general contractor.

MR Credit 3.1 & 3.2

Material Reuse: 5% or 10%

Design Responsibility
Contractor

Documentation Phase
Final Inspection

This credit is identified in the Application Checklist in the Materials & Resources section as Credit 3.1 & 3.2. A Submittal Template must be submitted for this credit as a part of the construction submittal. It is the responsibility of the general contractor as marked by the triangle-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The general contractor must complete the Application Checklist and should provide receipts for salvaged materials purchased for use in the project. If materials are obtained at no cost or at lower cost than new equivalent materials, the contractor may provide documentation of the value used to calculate these credits.

Information can be found on a letter or documentation to be provided by the general contractor at the end of the project.

Intent and Sample Strategies
These credits encourage teams to explore the reuse of salvaged materials. It should be noted that this credit does not include recycled content materials, but rather whole building materials that are salvaged from building demolition or overages from other job sites that are diverted from landfill. This credit includes materials that are essentially reused in the same form as their previous life. Salvaged materials may be refinished or refurbished, but re-manufactured materials should be included in MR credits 4.1-4.2, not in Materials Reuse.

Salvaged materials may include brick, stone, wood, light fixtures, hardware, windows, tile, etc. This credit does not typically include furnishings or any materials that are not permanently installed within the project (i.e. formwork). Projects may include furniture so long as it is consistently included in calculations for MR credits 3-7.

Assessing the Feasibility of Achieving MR credits 3.1-3.2
These credits are calculated by cost. To assess the feasibility of these credits, you will need to first establish the total construction cost for CSI Divisions 2-10. Then you should take 45% of the total construction cost for Divisions 2-10 to establish the total materials cost for Divisions 2-10. This figure is the denominator in the equation. You will note that Divisions 2-10 do not include MEP systems. This is due to the disproportionate costs of such systems compared to building materials.

You must then determine 5% and 10% of your total materials cost. For example if a project's total construction budget for Divisions 2-10 is $1,000,000, then the total materials cost for Divisions 2-10 would be $450,000. 5% of this is $22,500 and 10% is $45,000. So for MR credit 3.1, you need to use the equivalent of $22,500 in salvaged materials. And for MR credit 3.2, you must use the equivalent of $45,000 in salvaged materials. If the material value is less than the cost of new materials, then you may use the cost of new material equivalents in place of actual salvaged material costs.

Sample Calculation
- If the total construction budget for Divisions 2-10 = $1,000,000
- then the Total Materials Cost for Divisions 2-10 (default value is 45% of line A) = $450,000
- so the Materials Reuse Value for MR credit 3.1 (5% of Line B) = $22,500
- and the Materials Reuse Value for MR credit 3.2 (10% of Line B) = $45,000
- and the Materials Reuse Value for ID credit, Exemplary Performance (15%) = $67,500

If it seems reasonable to incorporate salvaged materials for 5% or 10% of the total materials cost for Divisions 2-10, then these credits may be pursued.

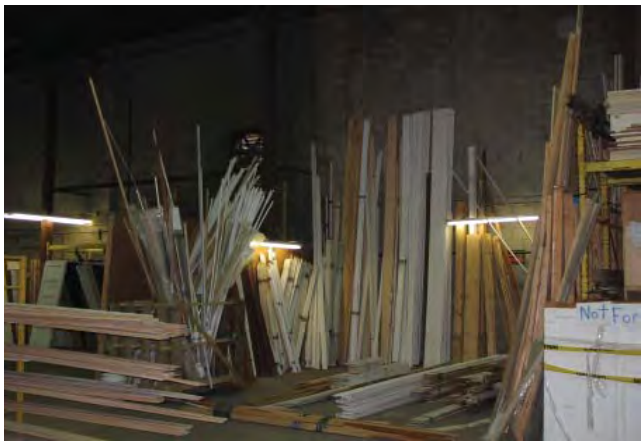
Image: Jim Schulman, President, Community Forklift; Brandishing Salavged Lumber

There is also an Exemplary Performance credit available for achieving 15% Materials Reuse awarded in the Innovation & Design section (ID). Keep in mind that these numbers represent a fairly significant amount of your materials and that they will have an impact on the appearance of the building. If this coincides with or enhances your design goals, then these credits make sense to include in your LEED strategy.

The architect or interior designer should include requirements for materials reuse in the specifications as well as the plans. The design team may wish to specify particular sources for salvaged materials.

Note to Contractors: When calculating any Materials & Resources credits, the general contractor may opt to use either the 45% default permitted in LEED or may opt to use the actual total materials cost for Divisions 2-10, so long as the total materials cost is the same for all MR credit calculations. It may be more time consuming to derive the actual materials costs from all subcontracts, but it may provide a smaller denominator, or total materials cost, which would make MR credits somewhat easier to achieve.

If construction teams decide to continue using the default (45% of total construction costs for Divisions 2-10), then they may assume that 45% of each subcontract represents the materials value for that subcontract.



Salvaged Wood Trim. Image provided by Community Forklift.

Salvaged Wood Beams

Salvaged Old Brick

MR Credit 4.1 & 4.2

Recycled Content: 10% or 20%

Design Responsibility
Contractor

Documentation Phase
Final Inspection

This credit is identified in the Application Checklist in the Materials & Resources section as Credit 4.1 & 4.2. A Submittal Template must be submitted for this credit as a part of the construction submittal. It is the responsibility of the general contractor as marked by the triangle-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The general contractor must complete the Application Checklist and should provide product data or letters from the manufacturer for each recycled content product and itemize the post-consumer and pre-consumer recycled content. Where product data is not available, the general contractor must assume that the entire recycled content is pre-consumer and will only receive half-credit for it.

Note to Contractors: When calculating any Materials & Resources credits, the general contractor may opt to use either the 45% default permitted in LEED or may opt to use the actual total materials cost for Divisions 2-10, so long as the total materials cost is the same for all MR credit calculations. It may be more time consuming to derive the actual materials costs from all subcontracts, but it may provide a smaller denominator, or total materials cost, which would make MR credits somewhat easier to achieve.

If construction teams decide to continue using the default (45% of total construction costs for Divisions. 2-10), then they may assume that 45% of each subcontract represents the materials value for that subcontract.

Image of Recycled Product: Enviroglas

When including a component of an assembly, if the general contractor is able to obtain information about the individual component cost and recycled content, then it may be entered into the equation. When the recycled content of the component is known, but not the individual cost, the general contractor must determine the percentage of the component by weight of the total assembly and then multiply that percentage by the assembly's cost.

Information can be found on the letter and other necessary documentation provided by the contractor, at the end of the project. Additional information could be found on the specification document, in the sections regarding concrete, terrazzo, carpet, and other materials.

Intent and Sample Strategies
These credits encourage teams to explore the use of recycled content materials in projects. Recycled content materials not only keep waste from entering landfills, but they protect natural resources in preventing virgin materials from being harvested to manufacture building products. This is a different set of credits from MR credits 2.1-2.2 which encourage the recycling of materials taken from the site and diverted from landfills. This credit also does not include salvaged materials, which should be included in MR credits 3.1-3.2.

Recycled content materials may include concrete (specifically fly ash, rebar, aggregate), pre-cast panels, steel, aluminum, gypsum wall board, insulation, ceiling tiles, carpet and carpet backing, glass, counter tops, horizontal surfaces, rubber flooring, toilet partitions, etc.

It should be noted that LEED will give full credit for any post-consumer recycled content, but only gives half-credit for pre-consumer recycled content. Post-consumer recycled content describes products made from materials that have already been used and discarded. For example, cellulose insulation might use recycled newspapers; some carpet manufacturers take back used carpeting and recycle it into new carpet fiber and backing. Pre-consumer recycled content describes materials that are the by-product of an industrial or manufacturing process. For example, a cotton batt insulation product may be made from denim scraps at a blue jean factory. Some products will contain both types of recycled content and that can all be factored into the equation.

Assessing the Feasibility of Achieving MR credits 4.1-4.2
These credits are calculated by cost. To assess the feasibility of these credits, you will need to first

establish the total construction cost for Divisions 2-10. Then you should take 45% of the total construction cost for Divisions 2-10 to establish the total materials cost for Divisions 2-10. This figure is the denominator in the equation. You will note that Divisions 2-10 do not include MEP systems. This is due to the disproportionate costs of such systems compared to building materials.

You must then determine 10% or 20% (for credits 4.1 and 4.2), and 30% (for an Exemplary Performance credit in Innovation & Design (ID) section) of your total materials cost.

Sample Calculation

- If the total construction budget for Divisions 2-10 = $1,000,000
- then the Total Materials Cost for Divisions 2-10 (default value is 45% of line A) = $450,000
- 10% of this is = $45,000
- 20% is = $90,000
- 30% is = $135,000

So for MR credit 4.1, you need to use $45,000 in recycled content (100% of Post-Consumer content + 50% of Pre-Consumer content multiplied by the cost of the product).

If a product contains recycled content, it is only a percentage of the cost of the product that may be included in the numerator. Put simply, if a product is 50% recycled content, then 50% of the cost of the product goes into the numerator. You must establish the recycled content value of each product first, then the sum recycled content value of all products as a percentage of the total materials cost for Divisions 2-10.

Assume our sample project only tracks the recycled content of one product. This project intends to use carpet that contains 10% Post-Consumer Recycled Content and 50% Pre-Consumer Recycled Content. The cost of the carpet is $150,000.
The calculation looks like this:

((0.50 x Pre-consumer content % x cost of material) + (Post-consumer content % x cost of material)) / Total materials cost for Divisions 2-10

So you would input actual numbers into this equation and it would look like this:

((0.50 x 0.50 x $150,000) + (0.10 x $150,000)) / $450,000 = 11.66%

So the purchase of this carpet would achieve MR credit 4.1 for over 10% recycled content but would not achieve any additional credits. The project team should look for additional recycled content materials.

You will be given a total recycled content percentage for the project. If it seems reasonable to incorporate recycled content materials for 10%, 20% or 30% of the total materials cost for Divisions 2-10, then these credits should be pursued.

The architect or interior designer should include requirements for recycled content in the specifications as well as the plans. The design team may wish to specify particular manufacturers for recycled content materials. See MR Section Resources.

There is an abundance of recycled content materials to choose from in the Dallas region. Recycled content progress reports should be provided by the general contractor along with other LEED and general progress reports.

MRc 4 - Recycled Content
Contractor Submittal Template

Interior Door & Side Light Frames	Curries	$30,799.00	35.4	7.4	Curries LEED Statement
Fixed Aluminum Sunscreens	Eastern Metal Supply	$71,469.00	25	50	Hydro Aluminum north America Billet
Modernfold-STC Steel Skin Panels-11'6.5" Hei	Modernfold	$11,290.00	6.07	45.52	Modernfold project specific LEED Information
Modernfold-Non Rated MDF 4 in pocket door	Modernfold	$1,845.00	2.52	63.68	Modernfold project specific LEED Information
Structural Bar joists	Nucor/Vulcraft	$175,000.00	35	13	Nucor 2008 Recycled content of Nucor Steel
Structural Metal Decking	Nucor/Vulcraft	$135,000.00	52.2	9.8	Nucor 2008 Recycled content of Nucor Steel
Light Gauge and Structural metal Framing	Dietrich Metal Framin	$89,979.00	36.9	16.7	Dietrich Metal Product Information Letter
CertainTeed Fiber Glass Insulation	CertainTeed Corporati	$2,571.00	25	0	CertainTeed Compliance Certificate
Envirogles	Courster Tops	$12,600.00	37.3	37.3	Envirogles LEED Information
Gypsum Wall board (Fire Rated)	American Gypsum	$86,421.00	4	0	American Gypsum Product Information

Total Value of Post Consumer Content	$ 318,634
Total Value of Pre Consumer Content	$ 191,959
Total Combined Recycled Value ($)) Post Consumer + 1/2 Pre Consumer	$ 414,593
Combined Recycled Content Value (as a % of total materials cost)	10.70%

MR Credit 5.1 & 5.2

Regional Materials: 10% or 20%

Design Responsibility
MEP/Civil/LA

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Materials & Resources section as Credit 5.1 & 5.2. A Submittal Template must be submitted for this credit as a part of the construction submittal. It is the responsibility of the general contractor as marked by the triangle-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The general contractor must complete the Application Checklist and should provide product data or letters from the manufacturer for each regional product that breaks down the location of manufacture as well as the location of extraction/harvest/salvage/mining. Where product data is not available, the general contractor may not include the product in the calculation.

Note to Contractors: When calculating any Materials & Resources credits, the general contractor may opt to use either the 45% default permitted in LEED or may opt to use the actual total materials cost for Divisions 2-10, so long as the total materials cost is the same for all MR credit calculations. It may be more time consuming to derive the actual materials costs from all subcontracts, but it may provide a smaller denominator, or total materials cost, which would make MR credits somewhat easier to achieve.

If construction teams decide to continue using the default (45% of total construction costs for Divisions 2-10), then they may assume that 45% of each subcontract represents the materials value for that subcontract.

Information can be found on the documents provided by the general contractor at the end of the project. Additional information or instructions could be found on the specification section of all materials applicable to all finishes and construction materials, including and not limited to the general construction

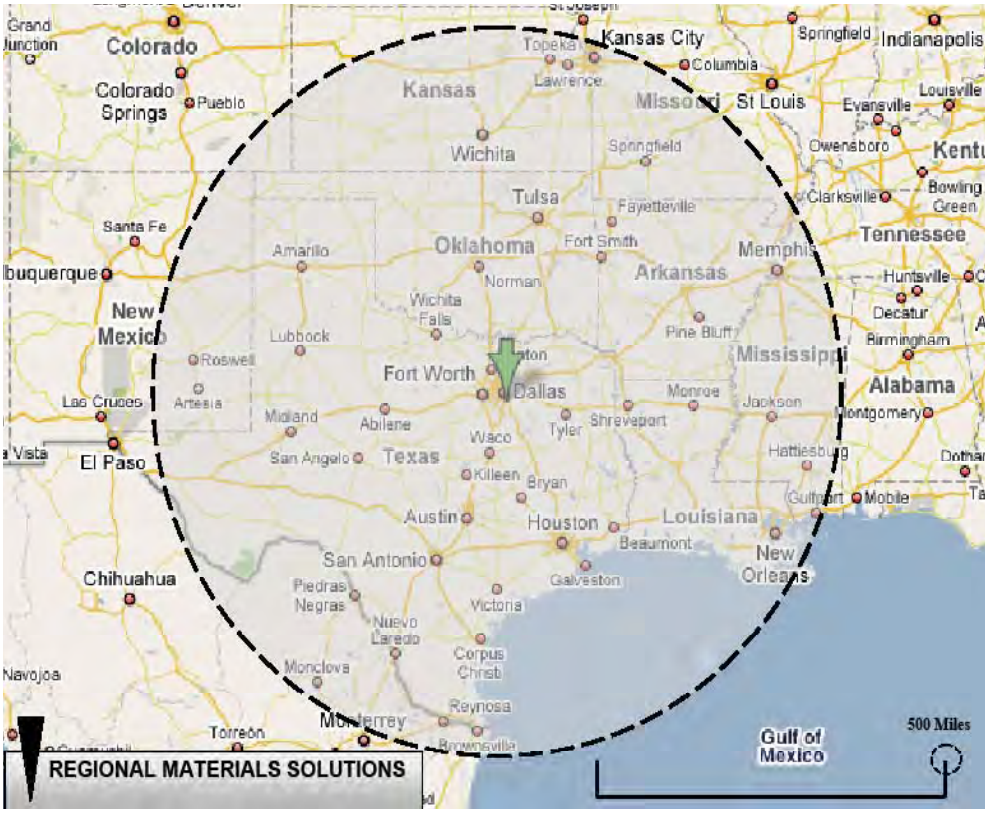


Image of a 500 Mile Radius from Dallas, Texas. Regional Materials are those that have been Extracted, Harvested, Mined or Salvaged within 500 miles of the project site and the total product is manufactured within 500 miles as well.

Intent and Sample Strategies

These credits encourage teams to explore the use of regionally sourced materials. Materials that must be transported to the project site over long distances have a higher embodied energy than local materials. Wherever possible, if products of equal quality and relatively equal price are available regionally, these should be given priority over products that must come from further away. For the purposes of LEED, regional materials are defined as those where the product components are extracted, harvested, mined or salvaged within 500 miles of the project site and the total product is manufactured within 500 miles as well. In the case of recycled content, the location of salvage is considered the location of 'harvest'. Product manufacturers should provide you with this information upon request. Regional materials may include concrete, masonry, pre-cast panels, millwork, gypsum wall board, composite wood products, insulation, ceiling tiles, glass, etc.

Assessing the Feasibility of Achieving MR credits 5.1-5.2

These credits are calculated by cost. To assess the feasibility of these credits, you will need to first establish the total construction cost for Divisions 2-10. Then you should take 45% of the total construction cost for Divisions 2-10 to establish the total materials cost for Divisions 2-10. This figure is the denominator in the equation. You will note that Divisions 2-10 do not include MEP systems. This is due to the disproportionate costs of such systems compared to building materials.

You must then determine 10%, 20% and 40% (for Exemplary Performance credit in Innovation & Design (ID) section) of your total materials cost.

Sample Calculation

- If a project's total construction budget for Divisions 2-10 is $1,000,000,
- then the total materials cost for Divisions 2-10 would be $450,000
- 10% of this is = $45,000
- 20% is = $90,000
- 40% is = $180,000

Assume our sample project only tracks one regional material. This project intends to use ceiling tiles that are manufactured in Louisiana. The cost of the ceiling tiles is $75,000.

The calculation looks like this:

Total Cost of Regional Materials / Total materials cost for Divisions 2-10

So you would input actual numbers into this equation and it would look like this:

$75,000 / $450,000 = 16.66%

So the purchase of these ceiling tiles would achieve MR credit 5.1 for over 10% Regional Materials but would not achieve any additional credits. The project team should look for additional regional materials.

The architect or interior designer should include requirements for regional products and materials in the specifications as well as the plans. The design team may wish to specify particular manufacturers for regional materials.

There is an abundance of regionally manufactured products that use regionally extracted/harvested/salvaged/mined materials to choose from in the Dallas region. Regional materials progress reports should be provided by the general contractor along with other LEED and general progress reports.

MRc 5 - Regional Materials
Contractor Submittal Template

Fixed Aluminum Sunscreens	Eastern Metal Supply	$71,469	100%	$ 71,469	754	242	Hydro Aluminum
Portland Cement	Texas Leigh Cement	$162,984	100%	$ 162,984	204	204	Texas Leigh Cement
Metal Roofing	AEP Span	$72,614	20%	$ 14,522	250	250	AEP Span
Concrete Rebar	Gerlau Ameristeel	$162,984	100.00%	$ 162,984	276	276	Gerlau Ameristeel
Light Gauge Structural Metal Framing	Dietrich Metal Framing	$89,979	100.00%	$ 89,979	0.54	5	Dietrich Metal Letter
Air Bloc	Henry	$55,733	50%	$ 27,866	27.2	27.2	Henry LEED Info Sheet
Georgia Pacific Dens Glass Gold	Georgia Pacific	$30,547	100%	$ 30,547	236.5	236.5	Georgia Pacific LEED Sheet
Envirogles	Envirogles	$12,600	100%	$ 12,600	37.5	37.5	Envirogles LEED Sheet
Sika Sarnatherm Insulation	SIKA	$116,496	20%	$ 23,299	178	178	SIKA Letter
			Total value ($) of locally manufactured and extracted materials:				$175,409
			Local material value as a percentage of total materials cost:				33.80%

MR Credit 6

Rapidly Renewable Materials

Design Responsibility
Contractor

Documentation Phase
Final Inspection

This credit is identified in the Application Checklist in the Materials & Resources section as Credit 6. A Submittal Template must be submitted for this credit as a part of the construction submittal. It is the responsibility of the general contractor as marked by the triangle-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The general contractor must complete the Application Checklist and should provide product data or letters from the manufacturer for each rapidly renewable product.

Note to Contractors: When calculating any Materials & Resources credits, the general contractor may opt to use either the 45% default permitted in LEED or may opt to use the actual total materials cost for Divisions 2-10, so long as the total materials cost is the same for all MR credit calculations. It may be more time consuming to derive the actual materials costs from all subcontracts, but it may provide a smaller denominator, or total materials cost, which would make MR credits somewhat easier to achieve.

If construction teams decide to continue using the default (45% of total construction costs for Divisions 2-10), then they may assume that 45% of each subcontract represents the materials value for that subcontract.

When including a component of an assembly, if the general contractor is able to obtain information about the individual component cost and rapidly renewable content, then it may be entered into the equation normally. When the rapidly renewable content of the component is known, but not the individual cost, the general contractor must determine the percentage of the component by weight of the total assembly and then multiply that percentage by the assembly's cost.

Image of a Rapdily Renewable Product: BIOFIBER™ Composite

Information can be found on the letter and other necessary documentation provided by the contractor, at the end of the project. Additional information could be found on the specification document, in the sections regarding bamboo, cotton, wool, and other materials.

Intent and Sample Strategies
This credit encourages teams to explore the use of rapidly renewable materials, rather than materials that have long growing cycles that may suffer from over-harvest.

For the purpose of LEED, rapidly renewable materials are defined as ones with a 10-year or less growing cycle. Rapidly renewable materials may include soy, cotton, bamboo, wool, agrifiber, cork, linoleum, wheatboard, strawboard, etc.

Assessing the Feasibility of Achieving MR credit 6
This credit is calculated by cost. To assess the feasibility of this credit, you will need to first establish the total construction cost for Divisions 2-10. Then you should take 45% of the total construction cost for Divisions 2-10 to establish the total materials cost for Divisions 2-10. This figure is the denominator in the equation. You will note that Divisions 2-10 do not include MEP systems. This is due to the disproportionate costs of such systems compared to building materials.

You must then determine 2.5% of your total materials cost or 5% for the Exemplary Performance Credit in the Innovation & Design section (ID)

Sample Calculation
- If a project's total construction budget for Divisions 2-10 is $1,000,000
- then the total materials cost for Divisions 2-10 would be $450,000
- 2.5% of this is = $11,250
- 5% is = $22,500

If a product contains rapidly renewable content, but is not entirely rapidly renewable, then it is only a percentage of the cost of the product that may be included in the numerator. Put simply, if a product is 50% rapidly renewable by weight, then 50% of the

cost of the product goes into the numerator. You must establish the rapidly renewable content value of each product first, then the sum recycled content value of all products as a percentage of the total materials cost for Divisions 2-10.

Assume our sample project only tracks the rapidly renewable content of one product. This project intends to use cork flooring in the lobby that is 100% rapidly renewable. The cost of the flooring is $5,000.

The calculation looks like this:

Total Cost of Rapidly Renewable Products / Total materials cost for Divisions 2-10

So you would input actual numbers into this equation and it would look like this:

$5,000 / $450,000 = 1.11%

So the purchase of this flooring would not achieve MR credit 6 for over 2.5% rapidly renewable content. The project team should look for additional rapidly renewable content materials.

The architect or interior designer should include requirements for rapidly renewable content in the specifications as well as the plans. The design team may wish to specify particular manufacturers for

Image of a Rapdily Renewable Product: BIOFI-BER™ Wheatboard

LEED MRc6 - Rapidly Renewable Materials
Contractor Submittal Form

Material Name/Description	Manufacturer	Total Material Cost ($)	Percentage of Product that Meets Rapidly Renewable Criteria (% by Weight)	Compliant Product (Total Material Cost x % of Qualifying Product)

recycled content materials.

Rapidly renewable material progress reports should be provided by the general contractor along with other LEED and general progress reports.

MR Credit 7

Certified Wood

Design Responsibility
Contractor

Documentation Phase
Final Inspection

This credit is identified in the Application Checklist in the Materials & Resources section as Credit 7. A Submittal Template must be submitted for this credit as a part of the construction submittal. It is the responsibility of the general contractor as marked by the triangle-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The general contractor must complete the Application Checklist and should provide Chain-of-Custody (COC) certificates for all wood products included in the calculation for this credit.

Information can be found on the letter provided by the general contractor at the end of the project documenting the requirements of this credit.

Intent and Sample Strategies
This credit encourages teams to explore the use of sustainably harvested wood products. Deforestation is one of the leading causes of greenhouse gas emissions.

For the purpose of LEED, certified wood must be certified by the Forest Stewardship Council (FSC) as sustainably harvested. The FSC provides a Chain-of-Custody certificate that accompanies the wood from the forest to the mill, and eventually to your project site.

The credit is achieved when 50% of all wood products by cost are FSC Certified. Additional clarification may be found here: Revised Chain-of-Custody Requirements for Certified Wood credits (see resources section). This credit only requires that solid wood products be calculated (e.g. veneers, wood, substrates, trim, blocking, etc.) but project teams may include composite wood products (e.g. MDF, OSB, plywood, etc.) so long as all composite wood products are included. The less wood used on a project, the easier this credit is to obtain. Projects that achieve over 95% FSC Certified Wood may submit documentation for an Exemplary Performance credit in the Innovation & Design section (ID).

Image of FSC Certified Wood

The Rainforest Alliance

VT INDUSTRIES, INC.

IS CERTIFIED FOR FOREST STEWARDSHIP COUNCIL CHAIN-OF-CUSTODY

Certificate Registration Code: SW-COC-000736
Valid from: July 1, 2007 to June 30, 2012

CERTIFICATE SCOPE:

Single CoC certificate based on SW CoC STD for 1/98 ISC requirements (Dec 04) for VT Industries, Inc., 1000 Industrial Park Holstein, Iowa 51025 USA

Wolfram Pinker
Managing Director, SmartWood Program of the Rainforest Alliance
65 Millet Street, Richmond, Vermont USA 05477

SMARTWOOD IS A PROGRAM OF THE RAINFOREST ALLIANCE ACCREDITED BY THE FSC

ACCREDITED
FSC-ACC-004

FSC

Example of Chain of Custody document

Section Four:
Indoor Environmental Quality

Overview

This section addresses the health of building occupants, as well as construction personnel. Many new building products contain chemicals that may be harmful to building occupants. Volatile Organic Compounds (VOCs) and Urea-Formaldehyde in particular have been linked to respiratory health problems, headaches, nausea, fatigue and may be carcinogenic. Inadequate ventilation rates for buildings have also been linked to Sick Building Syndrome. This section addresses the many sources of indoor contamination.

This section also addresses the qualitative aspects of the indoor environment. Providing access to daylight, views, individual lighting and thermal comfort controls, as well as designing for occupant comfort have all been shown to contribute to higher productivity, reduced absenteeism, and the general well-being of building occupants.

Since we spend the majority of our adult lives inside buildings of some kind, it is especially important that the indoor environment be as conducive to our health as possible.

In this Section

- Prerequisite 1: Minimum IAQ Performance
- Prerequisite 2: Environmental Tobacco Smoke (ETS) Control
- Credit 1: Outdoor Air Delivery Monitoring
- Credit 2: Increased Ventilation
- Credit 3.1: Construction IAQ Management Plan, During Construction
- Credit 3.2: Construction IAQ Management Plan, Before Occupancy
- Credit 4.1: Low-Emitting Materials, Adhesives & Sealants
- Credit 4.2: Low-Emitting Materials, Paints & Coatings
- Credit 4.3: Low-Emitting Materials, Carpet Systems
- Credit 4.4: Low-Emitting Materials, Composite Wood & Agrifiber
- Credit 5: Indoor Chemical & Pollutant Source Control
- Credit 6.1: Controllability of Systems, Lighting
- Credit 6.2: Controllability of Systems, Thermal Comfort
- Credit 7.1: Thermal Comfort – Design
- Credit 7.2: Thermal Comfort – Verification
- Credit 8.1: Daylight & Views – Daylight for 75% of Spaces
- Credit 8.2: Daylight & Views – Views for 90% of Spaces

EQ Prereq. 1

Minimum IAQ Performance

Design Responsibility
Design Profess. (MEP)

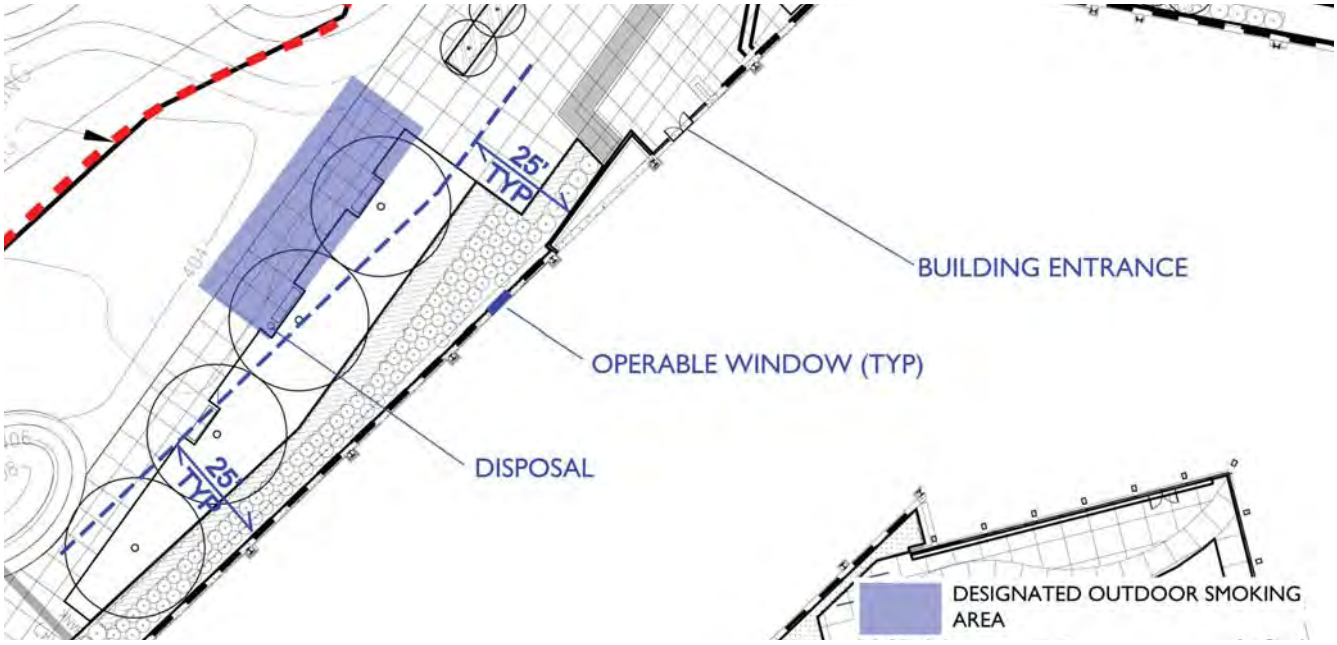
Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Indoor Environmental Quality section as Prerequisite 1. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process

Documentation
The design professional must complete the Application Checklist and should provide any supporting documentation including a narrative description of the mechanical system.

Information can be on a letter or document provided by the mechanical engineer, attesting to the compliance of the ASHRAE Standards at the completion of the project.

Intent and Sample Strategies
This prerequisite requires that projects meet the ventilation rate requirements in the ASHRAE 62.1-2004 Standard. This is compatible with building codes and projects in the City should have no trouble meeting this prerequisite.



Documentation Illustrating Designated Smoking Area.

EQ Prereq 2

Environmental Tobacco Smoke (ETS) Control

Design Responsibility
Owner/ Design. Profess.

Documentation Phase
Plan Review

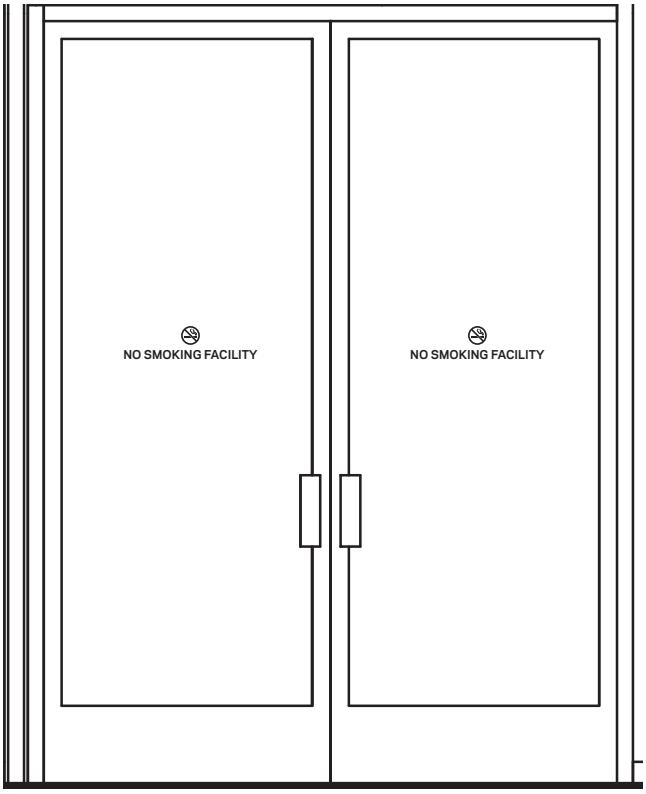
This credit is identified in the Application Checklist in the Indoor Environmental Quality section as Prerequisite 2. It is the responsibility of the owner as marked by the star-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Application Checklist and should provide a copy of the site plan indicating where the designated outdoor smoking area is (if one has been designated). In lieu of an owner policy banning smoking in the building, the architect may also upload a copy of the City of Dallas no-smoking ordinance found here: http://www.dallascityhall.com/pdf/ehs/SmokingOrdinance.pdf.

Information can be found on the site plan, landscape plan or any other plan where the location is designated. Additional information can be found in the general notes sheet that refers to graphics and signage.

Intent and Sample Strategies
The simplest way to meet the requirements of this prerequisite is to ban smoking in the building and to provide a designated outdoor smoking area at least 25' from operable windows, entries and intakes.

Dallas has banned smoking in all places of employment, so every project in Dallas may achieve this prerequisite through this compliance path.



EQ Credit 1

Outdoor Air Delivery Monitoring

Design Responsibility
Design Profess. (MEP)

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Indoor Environmental Quality section as Credit 1. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Application Checklist and should provide plans that indicate the location of all carbon dioxide monitors. Carbon dioxide monitors should be located between 3' and 6' from the finished floor.

Information can be found on the mechanical floor plans that show the location of all of the carbon dioxide monitors. Additional information can be found in the interior elevation of the rooms or in the specification section, which details the monitors. Please refer to installation instructions.

Intent and Sample Strategies
This credit is intended to encourage design teams to design more efficiently for densely occupied spaces, such as auditoriums, conference rooms, cafeterias, etc. Any space with greater density than 25 people per 1000 sf will need to supply a carbon dioxide monitor. Carbon dioxide monitors will ensure that the space receives sufficient ventilation when it is occupied, but will also scale back the rate of ventilation when the space is unoccupied, thus saving energy.

EQ Credit 2

Increased Ventilation

Design Responsibility
Design Profess. (MEP)

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Indoor Environmental Quality section as Credit 2. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Application Checklist and should provide a mechanical system design narrative.

Information can be on a letter or document provided by the mechanical engineer attesting to the compliance of the ASHRAE Standards at the completion of the project.

Intent and Sample Strategies
This credit is intended to encourage teams to exceed ventilation rates required in ASHRAE 62.1-2004 by 30%. There have been many studies that show increased ventilation improves employee productivity and reduces absenteeism.

Most mechanical systems are easily capable of delivering increased outside air, however that air must be conditioned and will have an impact on the operating expenses. One way to counteract this increase in energy consumption is to use an enthalpy wheel, also called a heat recovery or energy recovery system.

An Enthalpy Wheel Will help to Counteract Increases in Energy Consumption. Image provided by the Sidwell Friends School.

The increased ventilation credit requirements are not a capital expense, but rather an operating expense. An enthalpy wheel is a capital expense, but will contribute to the overall efficiency of the building whether the project team pursues this credit or not.

Typically, ventilation improvements corresponded with 0.48-11% productivity increase.

EQ Credit 3.1

Construction IAQ Management Plan- During Construction

Design Responsibility
Contractor

Documentation Phase
Final Inspection

This credit is identified in the Application Checklist in the Indoor Environmental Quality section as Credit 3.1. A Submittal Template must be submitted for this credit as a part of the construction submittal. It is the responsibility of the general contractor as marked by the triangle-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The general contractor must complete the Application Checklist and should provide a) a copy of the IAQ Management Plan, b) six photos taken on at least three occasions that document compliance with the IAQ Management Plan (minimum 18 total photos) and c) Minimum Efficiency Reporting Value (MERV) filter of 8 (product numbers).

Information to be found in the contractor's provided IAQ management plan and a letter attesting compliance to this credit.

Sealed Ductwork.

Intent and Sample Strategies
This credit is intended to ensure that indoor air quality is preserved during construction activities. Most of these practices are fairly common and will not be difficult to implement on the job site. It is extremely important that the contractor take photos of the IAQ management plan in action. At least 6 photos must be taken on each of 3 or more occasions (minimum 18 photos) at different times during construction. They should be labeled and dated.

The architect should include requirements for IAQ management in the specifications. The contractor must develop and implement an IAQ Management Plan. IAQ management practices include:

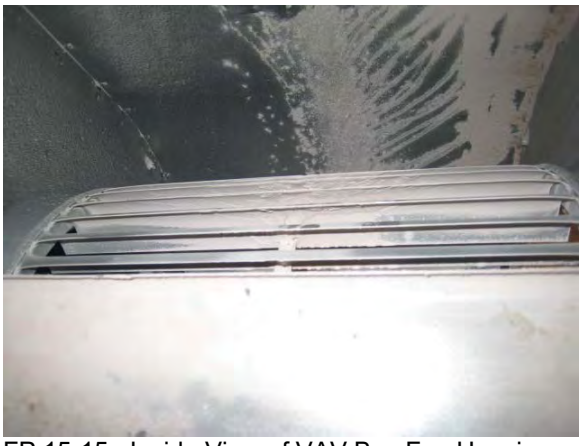
- Keeping ductwork sealed if HVAC systems will not be used during construction (the MEP engineer may specify that ductwork must arrive on the job site already sealed at the factory).
- Ductwork must be kept free of particulate matter, food debris, smoke, etc.
- If the HVAC system is to be used during construction, the contractor must install temporary filtration at each return air grille with a Minimum Efficiency Reporting Value of 8 (also called MERV 8 filters). These must be replaced immediately prior to occupancy.

Insulation Wrapped and Protected From Moisture.

Some mechanical equipment warranties (e.g. Variable Air Volume (VAV) boxes) may be invalidated by the introduction of different filtration media. In this event, the credit is still achievable if the construction team a) does not use the mechanical equipment, or b) leases temporary heating or cooling equipment for use during construction.

Materials stored on site must be kept dry and clean. For example, drywall sheets should be placed on a

pallet off of the ground or indoors, and covered. This is to prevent mold growth as well as to protect the integrity of the materials.
Wet materials, such as paint, should be kept covered when not in use. This prevents those materials from outgassing Volatile Organic Compounds (VOCs). Dry materials, such as carpet, should be installed after wet materials, such as paint, have been installed. This is to prevent the wet materials from out gassing VOCs that are then absorbed by the dry materials and released later, when the building is occupied.



FP 15-15: Inside View of VAV Box Fan Housing

FP 15-15: Inside View of VAV Box Housing

VAV Boxes Accumulate Construction Debris and Particulate Matter When Not protected on the Job Site. Images provided Paul Tseng.

JACOBS Consultancy

Commissioning
Construction Phase IAQ
Management Plan Narrative

In keeping with the Indoor Air Quality Management Plan for the Construction Phase of the North Lake College Workforce Development Center project, the design approaches of the SMACNA IAQ Guidelines for Occupied Buildings under Construction, 1995, Chapter 3 were followed. The following is a listing of the design approaches indicated and how they were followed for this project.

HVAC Protection

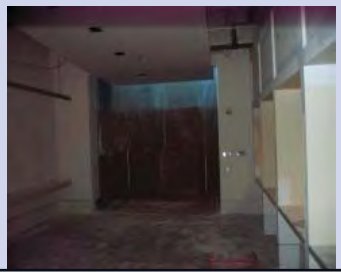
- As documented in the photographs submitted with this credit, the HVAC system for this facility was protected in several methods. Ductwork was covered and cleaned from construction dust and debris prior to installation and sealed on the ends once installed. The return and exhaust duct opening for the AHU and exhaust fan serving the space were covered with temporary media which was changed as required. Additionally, the AHU serving the space was shut down for the majority of the construction period. The filters for the fan-powered terminal boxes were covered with temporary media during construction activities and all filters were changed prior to occupancy.

Source Control

- As documented in several other LEED credits, sustainable products with a focus on low VOC and other contaminants were selected for this project. These products were installed in the facility while the HVAC was still protected as indicated above. Additionally, there were no significant uses of gas or diesel powered equipment utilized for construction activities within the space.

Pathway Interruption

- Due to the location of this project, for the majority of the construction phase, there was no direct contact between the occupied spaces of this facility and the construction location. The entrance to the new space was cut through to the occupied space later in construction and was protected through plastic barriers that were maintained until the substantial completion of the project when the doors were installed. With the HVAC system to the new space shut down during the majority of the construction activities, the space was effectively depressurized in comparison to the adjacent occupied space.
- The following photographs are representative of the barrier maintained between the occupied space and the new facility.



EQ Credit 3.2

Construction IAQ Management Plan- Before Occupancy

Design Responsibility
Contractor

Documentation Phase
Final Inspection

This credit is identified in the Application Checklist in the Indoor Environmental Quality section as Credit 3.2. A Submittal Template must be submitted for this credit as a part of the construction submittal. It is the responsibility of the general contractor as marked by the triangle-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The general contractor must complete the Application Checklist and should provide either a narrative describing the flush out process or a copy of the AQ testing results and a plan indicating the location and number of AQ testing sites.

Information can be found on the IAQ plan. Additional information can be found in the specification section applicable to the job site, as well as any documents provided by the contractor at the end of the project to ensure compliance with this credit.

Intent and Sample Strategies
This credit is intended to encourage project teams to verify the level of indoor air quality prior to occupancy. This may be accomplished in two different ways:

1. The contractor may conduct a flushout, exhausting any airborne contaminants in the building or ductwork. This requires supplying 14,000 cubic feet of outdoor air per square foot of floor area at a minimum of 60 degrees F and a maximum 60% humidity. This does not add to the construction cost, but depending on the time of year, may add to the operations cost as all of the outside air must be conditioned. This also adds time to the construction schedule.

2. If a flushout is not practical, the contractor may perform air quality testing. This requires a separate AQ test for every 25,000 continuous square feet or separate air handling units. The testing procedure takes about 4 hours and usually costs about $1000 - $1500 per test. If any of the air quality tests results show failure to meet LEED requirements, then the contractor must still conduct a flushout to achieve this credit.

EQ Credit 4.1 & 4.2 & 4.3 & 4.4

Low Emitting Materials

Design Responsibility
Contractor

Documentation Phase
Final Inspection

These credits are identified in the Application Checklist in the Indoor Environmental Quality section as Credits 4.1-4.4. A Submittal Template must be submitted for these credits as a part of the construction submittal. It is the responsibility of the general contractor as marked by the triangle-shaped symbol. These credits will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
For all credits, the Contractor must complete the Application Checklist and:

For EQ credits 4.1-4.2, the Contractor must supply Material Safety and Data Sheets (MSDS) for all adhesives, sealants, paints and coatings installed on site. If the VOC budget method is employed (it may be employed for either EQ 4.1 or 4.2 separately, if needed), the Contractor must also supply a calculation or spreadsheet showing a) the quantity of each product used, b) the allowable VOCs and c) the actual VOCs. As long as the sum of actual VOCs is less than the sum of allowable VOCs for the entire category of products, then the credit is still achievable.

For EQ credit 4.3, the Contractor must provide a CRI Green Label Plus Certification number for all carpet installed or documentation of a FloorScore certification for all resilient flooring installed, whichever is specified. These numbers may be supplied by the manufacturer or on the Carpet and Rug Institute website: www.carpet-rug.org/commercial-customers/green-building-and-the-environment/green-label-plus/.

For EQ 4.4, the Contractor must provide product data from the manufacturer - for all composite wood products permanently installed on site - that indicates “no added urea-formaldehyde”.

Information can be found in specification section concerning materials qualities, and acceptable substitutes in addition to any additional documentation required for the contractor to meet this credit.

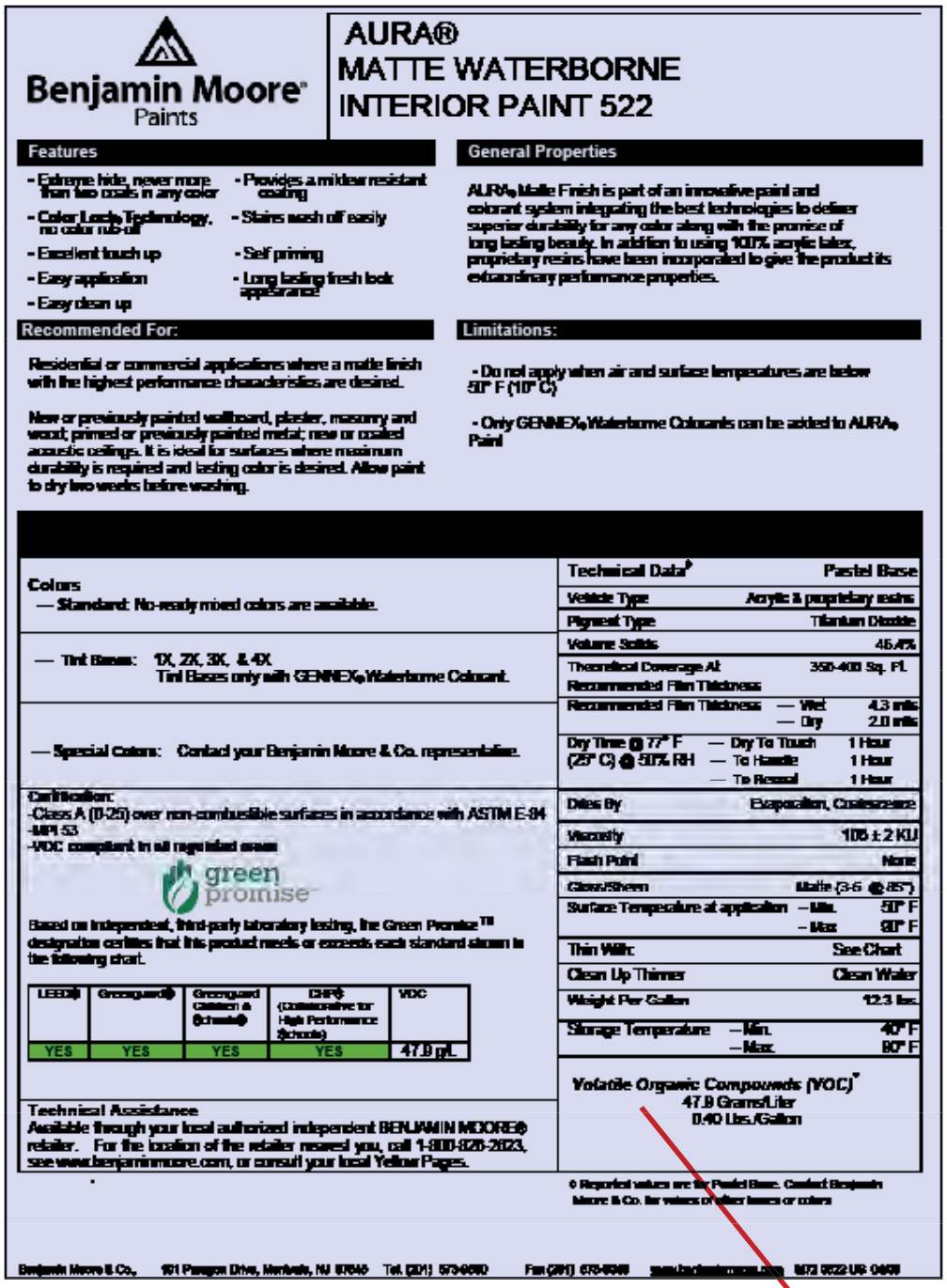
Intent and Sample Strategies
These credits are intended to preserve healthy indoor air by reducing the level of harmful emissions permitted in the building. Many new building products outgas Volatile Organic Compounds (VOCs) and formaldehyde, among other toxic chemicals.
There is usually no cost premium for low-emitting adhesives, sealants, paints or coatings, so EQ credits 4.1-4.2 are readily achievable.

There is also usually no premium for Carpet & Rug Institute (CRI) Green Label Plus Certified carpet systems, so EQ credit 4.3 is not difficult to achieve. This requirement simply must be included in the specifications. If your project will include no carpet or if you do not wish to use Green Label Plus Certified carpet, you may use a FloorScore-certified resilient flooring product for 100% of the non-carpet finished flooring, and it must contribute to at least 25% of the finished floor area.

It is also reasonable to specify no-added-urea-formaldehyde composite wood products for EQ credit 4.4. This credit has no ‘budget’ option and all composite woods (e.g. plywood, MDF, OSB, particle board, etc.) must comply with the requirements. There is a slight premium for these products and there may be a longer lead time for certain casework or millwork orders, so this should be well thought-out and researched.

Note to contractors: EQ credits 4.1-4.2 only apply to adhesives, sealants, paints and coatings applied on site, within the weather-proofing membrane, or to any products that penetrate the membrane. These credits are not concerned with shop-applied primers, etc.

If a particular adhesive, sealant, paint or coating is not available within the LEED VOC limits, the contractor may use the VOC budget method to track these credits. This method requires that the contractor provide quantities for every product used, the allowable VOC content and the actual VOC content. If a product with less than the allowable VOC limit is used, it may accrue a VOC ‘credit’ that will cover another product that may be slightly in excess of its VOC limit. This is a far more time consuming method of documentation and it would be far simpler



Benjamin Moore® Paints

AURA®
MATTE WATERBORNE
INTERIOR PAINT 522

Features

- Extreme hide, never more than two coats in any color
- Color Lock® Technology, no color rub-off
- Excellent touch up
- Easy application
- Easy clean up
- Provides a mildew resistant coating
- Stains wash off easily
- Self priming
- Long lasting fresh look appearance

General Properties

AURA® Matte Finish is part of an innovative paint and colorant system integrating the best technologies to deliver superior durability for any color along with the promise of long lasting beauty. In addition to using 100% acrylic latex, proprietary resins have been incorporated to give the product its extraordinary performance properties.

Recommended For:

Residential or commercial applications where a matte finish with the highest performance characteristics are desired.

New or previously painted wallboard, plaster, masonry and wood; primed or previously painted metal; new or coated acoustic ceilings. It is ideal for surfaces where maximum durability is required and lasting color is desired. Allow paint to dry two weeks before washing.

Limitations:

- Do not apply when air and surface temperatures are below 50° F (10° C)
- Only GENNEX® Waterborne Colorants can be added to AURA® Paint

Colors
— Standard: No-ready mixed colors are available.

— Tint Bases: 1X, 2X, 3X, & 4X
Tint Bases only with GENNEX® Waterborne Colorant.

— Special Colors: Contact your Benjamin Moore & Co. representative.

Certification:
-Class A (0-25) over non-combustible surfaces in accordance with ASTM E-84
-MPI 53
-VOC compliant in all regulated areas

green promise

Based on independent, third-party laboratory testing, the Green Promise™ designation certifies that this product meets or exceeds each standard shown in the following chart.

LEED®	Greenguard®	Greenguard Children & Schools®	CHPS (Collaborative for High Performance Schools)	VOC
YES	YES	YES	YES	47.9 g/L

Technical Assistance
Available through your local authorized independent BENJAMIN MOORE® retailer. For the location of the retailer nearest you, call 1-800-826-2623, see www.benjaminmoore.com, or consult your local Yellow Pages.

Technical Data*	Pastel Base
Vehicle Type	Acrylic & proprietary resins
Pigment Type	Titanium Dioxide
Volume Solids	46.4%
Theoretical Coverage At Recommended Film Thickness	350-400 Sq. Ft.
Recommended Film Thickness — Wet	4.3 mils
— Dry	2.0 mils
Dry Time @ 77° F (25° C) @ 50% RH — Dry To Touch	1 Hour
— To Handle	1 Hour
— To Recoat	1 Hour
Dries By	Evaporation, Coalescence
Viscosity	105 ± 2 KU
Flash Point	None
Gloss/Sheen	Matte (3-6 @ 85°)
Surface Temperature at application — Min.	50° F
— Max.	90° F
Thin With:	See Chart
Clean Up Thinner	Clean Water
Weight Per Gallon	12.3 lbs.
Storage Temperature — Min.	40° F
— Max.	90° F

Volatile Organic Compounds (VOC)*
47.9 Grams/Liter
0.40 Lbs./Gallon

* Reported values are for Pastel Base. Contact Benjamin Moore & Co. for values of other bases or colors

Benjamin Moore & Co., 101 Paragon Drive, Montvale, NJ 07645 Tel (201) 573-9600 Fax (201) 573-9046 www.benjaminmoore.com M73 0522 US 0409

to ensure that all products in this category meet their VOC requirements.

Low-Emitting Materials progress reports should be provided by the general contractor along with other LEED and general progress reports.

LEED VOC Requirements

LEED requirements only deal with VOC limits. This product not only complies, but goes well beyond the requirements because the limit for a Non-Flat paint is 150 and it is 2.

The LEED calculation excludes water and tints.

Sample Technical Sheet for VOC content

EQ Credit 5

Indoor Chemical & Pollutant Source Control

Design Responsibility
Design Profess.

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Indoor Environmental Quality section as Credit 5. A Submittal Template must be submitted for this credit as a part of the design submittal. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professionals must collaborate on documentation for this credit. It is advised that the credit be initially assigned to one of the disciplines who may fill out relevant portions of the Application Checklist and provide relevant data. Then the credit may be reassigned to the other disciple so that the remaining information, checklist and documentation are provided.

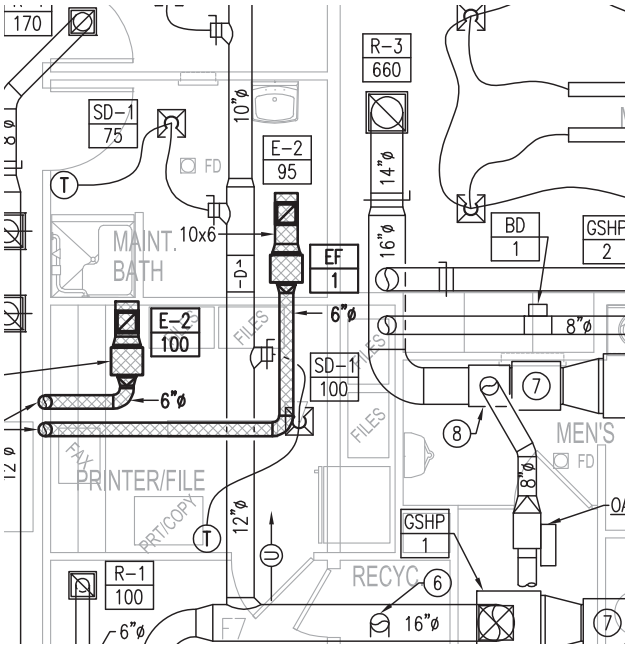
Both the architect and the MEP engineer must complete the Checklist and provide a) floor plans indicating size and location of walk-off mats, b) sections indicating deck-to-deck partitions for areas of chemical concentration, c) mechanical plans indicating separate exhaust for areas of high chemical concentration, and d) at least MERV 13 filter data (product numbers).

Information can be found on the floor plan or mechanical plan to designate and illustrate areas of potential chemical pollutants sources and remedies as required in the paragraph above.

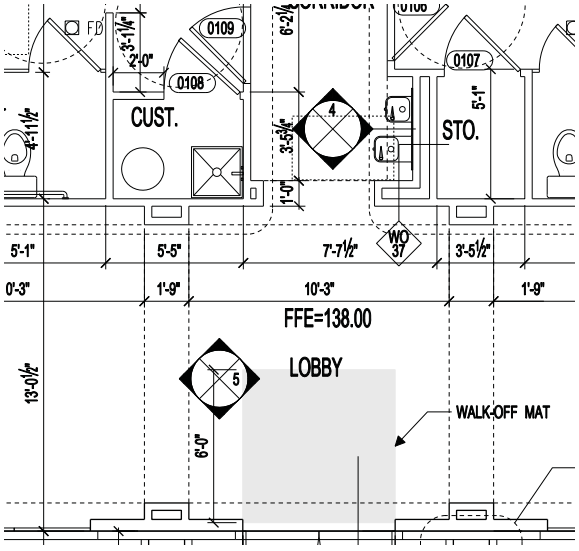
Intent and Sample Strategies
This credit encourages project teams to reduce the opportunities for introduction of particulate matter and pollutants in the occupied space. It also encourages owners to maintain a high level of indoor air quality through filtration. It is a multi-pronged credit that requires all requirements be met for credit achievement. The following must be included in the project design:

1. Walk off mats or grilles must be provided, either permanent or temporary (temporary must be cleaned on a weekly basis), at all major entry points to the building. Walk-off mats or grilles must be at least six feet in the direction of travel.

2. All areas of chemical concentration (e.g. janitor



Mechanical Plans Indicating Separate Exhaust

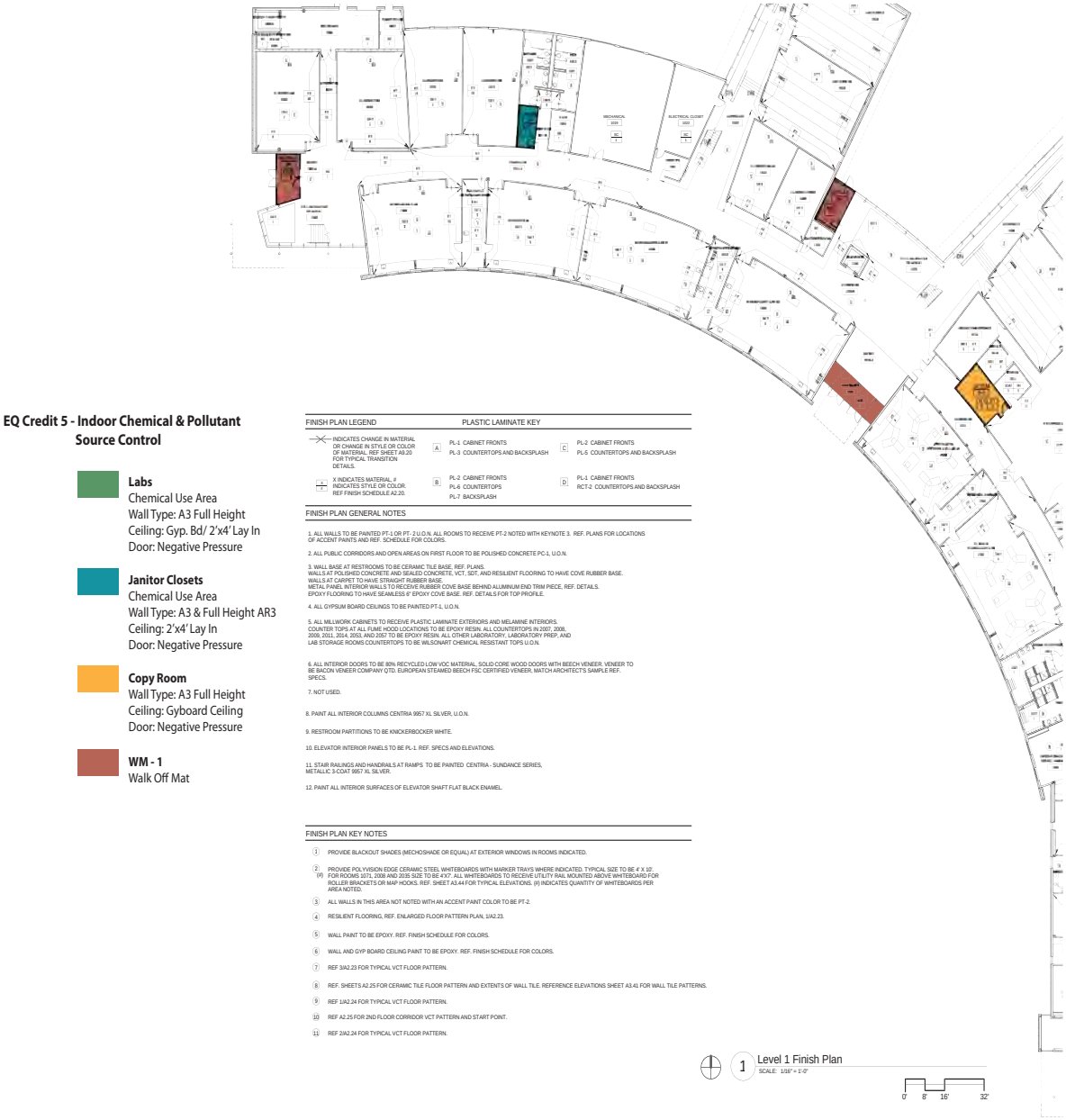


Floor Plans Indicating the Location and size of a Walk-Off Mat.

closets and high volume copy areas) must be mechanically and physically separated from the remainder of occupied space. This requires deck-to-deck partitions, self-closing doors and separate exhaust (it is okay to tie to bathroom exhaust).
3. Filters with a Minimum Efficiency Reporting Value of 13 (also called MERV 13 filters) must be provided at all return air grilles. There are no exceptions.

Reports have shown that improvements to Indoor Environmental Quality in green buildings could reduce healthcare costs and reduce work losses by:

- 9-20% from communicable respiratory diseases
- 18-20% from allergies and asthma
- 20-25% from non-specific health and discomfort



EQ Credit 5 - Indoor Chemical & Pollutant Source Control

Labs
Chemical Use Area
Wall Type: A3 Full Height
Ceiling: Gyp. Bd/ 2'x4' Lay In
Door: Negative Pressure

Janitor Closets
Chemical Use Area
Wall Type: A3 & Full Height AR3
Ceiling: 2'x4' Lay In
Door: Negative Pressure

Copy Room
Wall Type: A3 Full Height
Ceiling: Gyboard Ceiling
Door: Negative Pressure

WM - 1
Walk Off Mat

FINISH PLAN LEGEND

INDICATES CHANGE IN MATERIAL OR CHANGE IN STYLE OR COLOR OF MATERIAL. REF SHEET A9.20 FOR TYPICAL TRANSITION DETAILS.

X INDICATES MATERIAL. # INDICATES STYLE OR COLOR. REF FINISH SCHEDULE A2.20.

PLASTIC LAMINATE KEY

A: PL-1 CABINET FRONTS; PL-3 COUNTERTOPS AND BACKSPLASH
B: PL-2 CABINET FRONTS; PL-6 COUNTERTOPS; PL-7 BACKSPLASH
C: PL-2 CABINET FRONTS; PL-5 COUNTERTOPS AND BACKSPLASH
D: PL-1 CABINET FRONTS; RCT-2 COUNTERTOPS AND BACKSPLASH

FINISH PLAN GENERAL NOTES

1. ALL WALLS TO BE PAINTED PT-1 OR PT- 2 U.O.N. ALL ROOMS TO RECEIVE PT-2 NOTED WITH KEYNOTE 3. REF. PLANS FOR LOCATIONS OF ACCENT PAINTS AND REF. SCHEDULE FOR COLORS.
2. ALL PUBLIC CORRIDORS AND OPEN AREAS ON FIRST FLOOR TO BE POLISHED CONCRETE PC-1, U.O.N.
3. WALL BASE AT RESTROOMS TO BE CERAMIC TILE BASE. REF. PLANS.
WALLS AT POLISHED CONCRETE AND SEALED CONCRETE, VCT, SDT, AND RESILIENT FLOORING TO HAVE COVE RUBBER BASE.
WALLS AT CARPET TO HAVE STRAIGHT RUBBER BASE
METAL PANEL INTERIOR WALLS TO RECEIVE RUBBER COVE BASE BEHIND ALUMINUM END TRIM PIECE, REF. DETAILS.
EPOXY FLOORING TO HAVE SEAMLESS 6" EPOXY COVE BASE. REF. DETAILS FOR TOP PROFILE.
4. ALL GYPSUM BOARD CEILINGS TO BE PAINTED PT-1, U.O.N.
5. ALL MILLWORK CABINETS TO RECEIVE PLASTIC LAMINATE EXTERIORS AND MELAMINE INTERIORS.
COUNTER TOPS AT ALL FUME HOOD LOCATIONS TO BE EPOXY RESIN. ALL COUNTERTOPS IN 2007, 2008, 2009, 2011, 2014, 2053, AND 2057 TO BE EPOXY RESIN. ALL OTHER LABORATORY, LABORATORY PREP, AND LAB STORAGE ROOMS COUNTERTOPS TO BE WILSONART CHEMICAL RESISTANT TOPS U.O.N.
6. ALL INTERIOR DOORS TO BE 80% RECYCLED LOW VOC MATERIAL, SOLID CORE WOOD DOORS WITH BEECH VENEER. VENEER TO BE BACON VENEER COMPANY, QTD. EUROPEAN STEAMED BEECH FSC CERTIFIED VENEER, MATCH ARCHITECT'S SAMPLE REF. SPECS.
7. NOT USED.
8. PAINT ALL INTERIOR COLUMNS CENTRIA 9957 XL SILVER, U.O.N.
9. RESTROOM PARTITIONS TO BE KNICKERBOCKER WHITE.
10. ELEVATOR INTERIOR PANELS TO BE PL-1. REF. SPECS AND ELEVATIONS.
11. STAIR RAILINGS AND HANDRAILS AT RAMPS TO BE PAINTED CENTRIA - SUNDANCE SERIES, METALLIC 3-COAT 9957 XL SILVER.
12. PAINT ALL INTERIOR SURFACES OF ELEVATOR SHAFT FLAT BLACK ENAMEL.

FINISH PLAN KEY NOTES

1. PROVIDE BLACKOUT SHADES (MECHOSHADE OR EQUAL) AT EXTERIOR WINDOWS IN ROOMS INDICATED.
2 (#). PROVIDE POLYVISION EDGE CERAMIC STEEL WHITEBOARDS WITH MARKER TRAYS WHERE INDICATED. TYPICAL SIZE TO BE 4' X 10'. FOR ROOMS 1071, 2008 AND 2035 SIZE TO BE 4'X7'. ALL WHITEBOARDS TO RECEIVE UTILITY RAIL MOUNTED ABOVE WHITEBOARD FOR ROLLER BRACKETS OR MAP HOOKS. REF. SHEET A3.44 FOR TYPICAL ELEVATIONS. (#) INDICATES QUANTITY OF WHITEBOARDS PER AREA NOTED.
3. ALL WALLS IN THIS AREA NOT NOTED WITH AN ACCENT PAINT COLOR TO BE PT-2.
4. RESILIENT FLOORING, REF. ENLARGED FLOOR PATTERN PLAN, 1/A2.23.
5. WALL PAINT TO BE EPOXY. REF. FINISH SCHEDULE FOR COLORS.
6. WALL AND GYP BOARD CEILING PAINT TO BE EPOXY. REF. FINISH SCHEDULE FOR COLORS.
7. REF 3/A2.23 FOR TYPICAL VCT FLOOR PATTERN.
8. REF. SHEETS A2.25 FOR CERAMIC TILE FLOOR PATTERN AND EXTENTS OF WALL TILE. REFERENCE ELEVATIONS SHEET A3.41 FOR WALL TILE PATTERNS.
9. REF 1/A2.24 FOR TYPICAL VCT FLOOR PATTERN.
10. REF A2.25 FOR 2ND FLOOR CORRIDOR VCT PATTERN AND START POINT.
11. REF 2/A2.24 FOR TYPICAL VCT FLOOR PATTERN.

1 Level 1 Finish Plan
SCALE: 1/16" = 1'-0"
0' 8' 16' 32'

EQ Credit 6.1

Controllability of Systems: Lighting

Design Responsibility
Design Profess. (MEP)

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Indoor Environmental Quality section as Credit 6.1. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

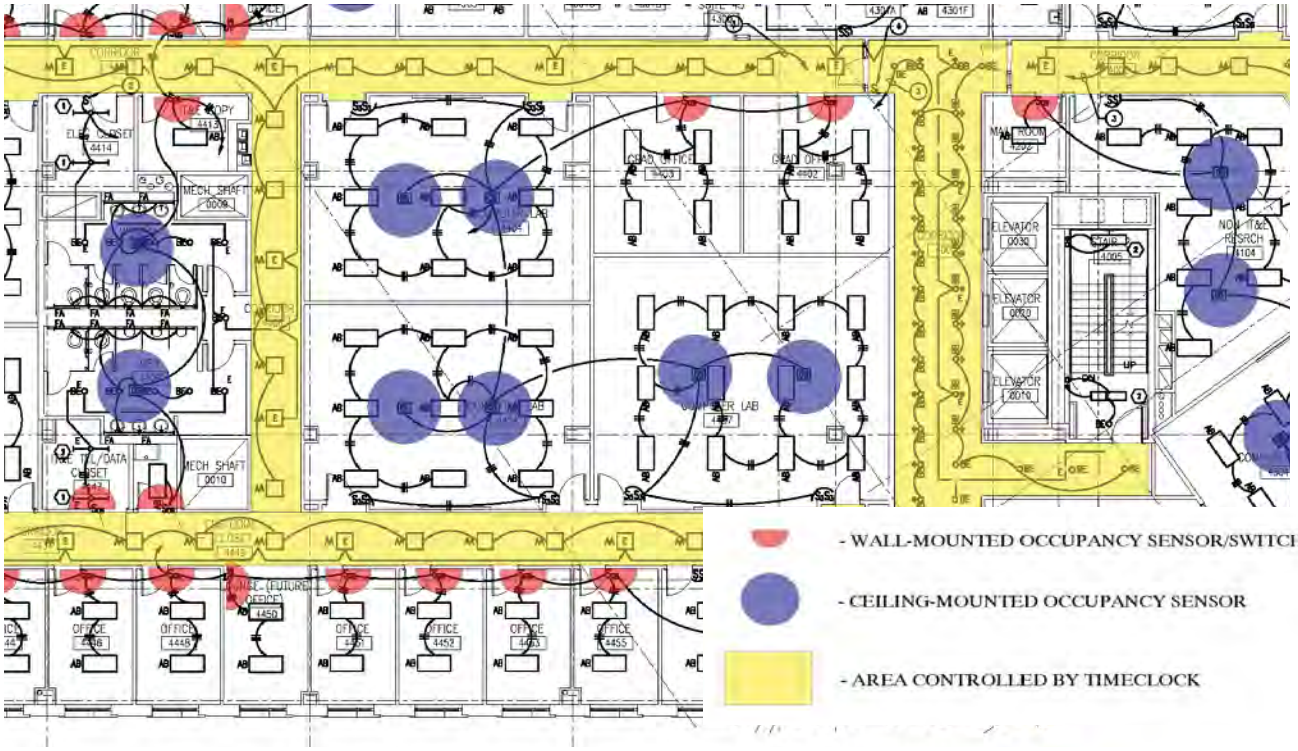
Documentation
The electrical engineer or lighting designer must complete the Application Checklist and provide electrical plans showing lighting controls for 90% of regular building occupants. If task lighting is to be provided by the owner or with systems furniture for open office areas, then documentation of this must also be provided.

Information can be found on floor plans, illumination plans or any electrical plan on the project that details sensors or any other device utilized to meet this credit.

Intent and Sample Strategies
This credit encourages design teams to provide a high level of controls for building occupants in regards to lighting. This credit requires that 90% of regular occupants are able to control their own lighting levels through a) individual controls for private offices, b) individual controls for classrooms, auditorium and classrooms, and c) task lighting at individual work stations for open office areas.

By providing individual lighting controls, the lighting designer or electrical engineer may design the occupied space at lower ambient light levels, providing greater energy efficiency directly through reduced lighting loads, and indirectly through reduced cooling loads. Individuals are able to adjust their own lighting as needed to accommodate visual tasks. This credit seeks to avoid scenarios where the lighting for entire sections, quadrants or floors of an occupied space are controlled by a single switch.

Spaces such as conference rooms, auditoriums or classrooms where group activities occur only need one set of lighting controls.



Floor Plans Illustrating the Location of Occupancy Sensors and Lighting Controls. Image provided by HOK.

EQ Credit 6.2

Controllability of Systems: Thermal Comfort

Design Responsibility
Design Profess. (MEP)

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Indoor Environmental Quality section as Credit 6.2. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

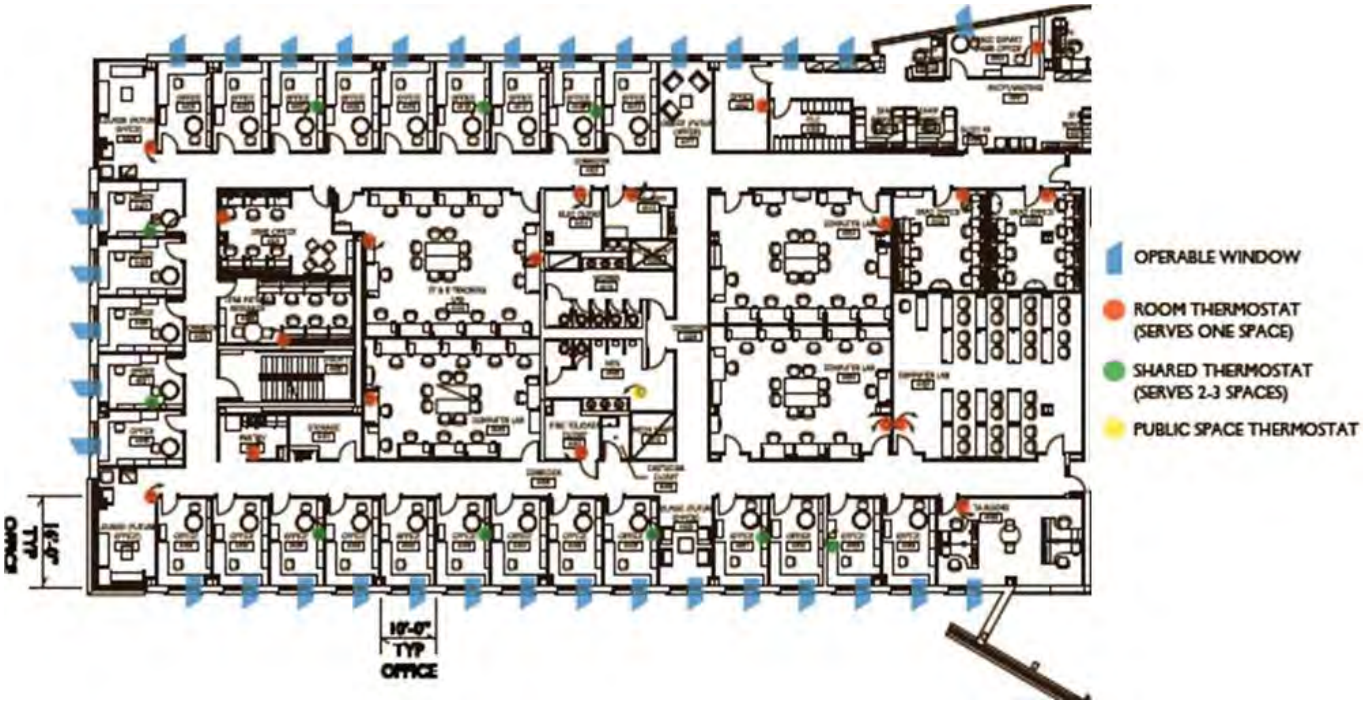
Documentation
The mechanical engineer must complete the Application Checklist and provide plans indicating location of VAV boxes, under floor vents or thermostats. The architect may upload drawings indicating number and location of operable windows if this compliance path is selected.

Information can be found on floor plans, illumination plans or any electrical plan on the project that details thermostat locations or any other device utilized to meet this credit.

Intent and Sample Strategies
This credit encourages design teams to provide a high level of controls for building occupants in regards to thermal comfort. This credit requires that at least 50% of regular occupants are able to control their own thermal comfort levels through a) individual controls (e.g. thermostats, VAV boxes), b) under floor air distribution and/or c) operable windows.

There is a capital cost impact for pursuing this credit but there may be some payback. Under floor air distribution may provide operational cost savings through greater energy efficiency. Because the conditioned air is supplied at the level of occupants (floor level), it can be cooled to a lower temperature than air that is forced from the ceiling. It also stratifies naturally through the stack effect: polluted and warmer air will rise to the ceiling without mechanical assistance. This means that clean, conditioned, outside air does not get forced through warmer, polluted air that naturally rises to the ceiling level. This provides a greater level of indoor air quality.

In addition, under floor air distribution may reduce capital costs by reducing or eliminating horizontal ductwork and by reducing the floor-to-floor height of the building, thus saving on structural and cladding materials costs.



Floor Plans Illustrating the Location of Thermal Comfort Controls

EQ Credit 7.1

Thermal Comfort: Design

Design Responsibility
Design Profess. (MEP)

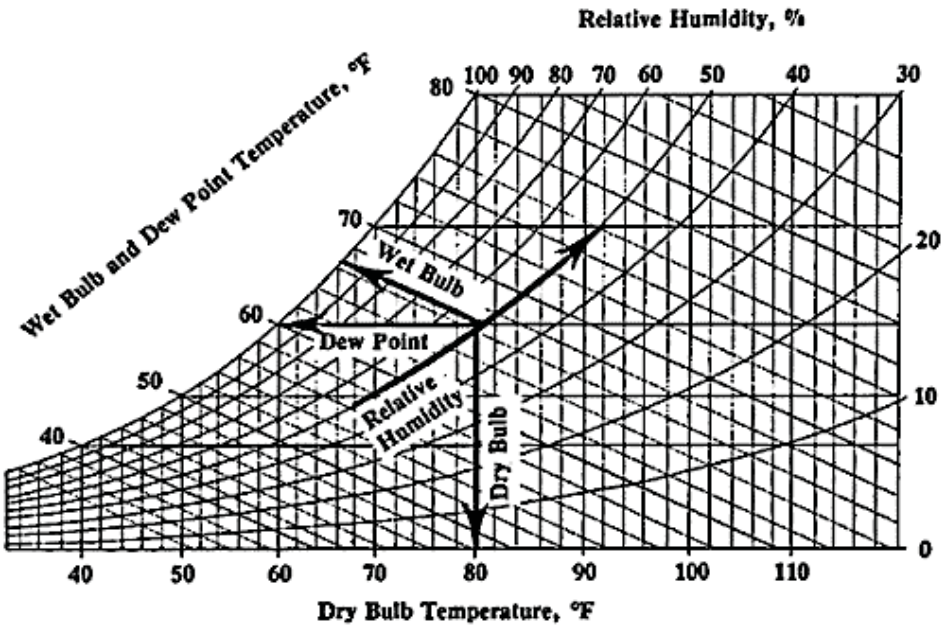
Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Indoor Environmental Quality section as Credit 7.1. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The mechanical engineer must complete the Application Checklist and should provide a mechanical systems narrative that specifically addresses dehumidification.

Refer to mechanical specifications or the letter from the engineer attesting to the compliance of the ASHRAE standards to meet this credit.

Intent and Sample Strategies
This credit encourages project teams to comply with the ASHRAE standard 55-2004. Dehumidification is typically taken care of by the cooling system. The mechanical engineer will need to specify how the dehumidification occurs.



The ASHRAE 55-2004 Standard Isolates a Comfort Zone of Temperature and Humidity on the Psychrometric Chart..

EQ Credit 7.2

Thermal Comfort: Verification

Design Responsibility
Design Profess. (MEP)

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Indoor Environmental Quality section as Credit 7.2. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The owner must complete the Application Checklist and should provide a narrative describing a) who will be surveyed, b) sample questions that may be included in the survey, c) what forms of corrective action might be taken, if needed. If a third party will conduct the survey, such as the Center for the Built Environment, the owner should provide a copy of the contract to provide these services.

Information can be found on the commissioning report, letter from the owner or statement attesting that the credit has been met

Intent and Sample Strategies
This credit encourages project owners to seek feedback from building occupants regarding their thermal comfort. A survey must be administered within 18 months of occupancy. A sample survey can be found on the Center for the Built Environment website (the CBE will also administer the survey for a flat rate of $1000): www.cbe.berkeley.edu/research/survey.htm. The owner must commit to taking 'corrective action' if more than 20% of survey respondents report being dissatisfied with some aspect of their thermal comfort.

It is recommended that the survey be administered within the mechanical equipment warranty period. The corrective action may be, therefore, to have the equipment manufacturer send out a representative to ensure that the equipment is working properly. Other courses of corrective action may include: re-commissioning, training for building engineering staff, system testing and balancing, relocating employees next to windows (solar exposure) or vents, etc. It is not necessary to predict the specific aspects of thermal discomfort or therefore, to know precisely what form the 'corrective action' might take. It is sufficient for the owner to a) commit to conducting the survey, b) provide a list of the types of occupants who will be surveyed (i.e. all regular building occupants or full time employees) and c) provide a narrative of corrective action that might occur.

This credit does not add to construction costs and is a useful tool for ensuring that all equipment is working properly while it is still covered by warranty. In addition, it may be tied to market research and used to gather feedback about other environmental aspects of the project and their appeal to the occupants.

EQc7.2 Thermal Comfort: Verification

I. Explanation of compliance

Edgemoor Investment Advisors has committed to conducting a web-based Survey to provide for the assessment of GMU's thermal comfort over time. In order to complete this survey effectively, it will be administered within 18 months of occupancy to the 291 full-time occupants that will be located in the building at that time.

II. Addressing dissatisfaction

The survey will be conducted anonymously and within the warranty period on all mechanical equipment so that if more than 20% of the surveyed population expresses dissatisfaction with some specific element of thermal comfort, the next course of action will be to have representatives of the equipment manufacturers visit the site and inspect the equipment for defects.

If the equipment seems to be installed and performing correctly then the second course of action will be to review the Operations Manual mechanical operators to ensure that they are operating the equipment correctly.

It is difficult to elaborate on further specific courses of action without attempting to predict what specific aspects of thermal comfort the surveyed population might be dissatisfied with, however a follow up survey will be conducted after these two actions have been completed to determine if the problems were addressed. If there is still significant dissatisfaction a consultant will be called in to assist in the identification of the problems and the development of solutions.

Thermal Verification Survey Example form

EQ Credit 8.1

Daylight & Views: Daylight 75% of Spaces

Design Responsibility
Design Profess.

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Indoor Environmental Quality section as Credit 8.1. A Submittal Template must be submitted for this credit at the time of the plan review. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation

The design professional must complete the Application Checklist and should provide: a) plans and sections demonstrating that a 2% daylight factor is achieved in over 75% of regularly occupied spaces, b) a narrative description of which spaces are 'regularly occupied', which are excluded, and why, c) product data about glazing materials (including Visible Light Transmittance), daylight products (i.e. sky lights, solar tubes, fiber optic or daylighting fixtures, etc.), d) daylight modeling report, or e) light meter readings.

Information can be found on the specially illustrated plan showing compliance with the credit and any required calculations.

Daylighting Can Boost Office Productivity and Reduce Absenteeism.

Intent and Sample Strategies

This credit is intended to encourage design teams to provide access to daylight for a majority of building occupants. Studies show that access to daylight increases productivity and reduces absenteeism. Strategies for achieving daylight may include clerestory windows, light shelves that bounce daylight further into the interior space, light wells, light tubes, fiber optic daylighting fixtures, sidelights or glass partitions for perimeter offices, narrow floor plate, skylights, atria, modular furniture with translucent or transparent panels, etc.

A 2% Daylight Factor must be achieved in 75% of regularly occupied spaces, or metering must show a minimum of 25 foot candles in over 75% of regularly occupied spaces. Regularly occupied spaces include those that are occupied consistently throughout a normal work day, whether by one person, by groups of people, or intermittently by various occupants. Spaces that should be included are enclosed offices, open work areas, classrooms, conference rooms, etc. You do not need to include 'back of house' spaces such as pantries, copy rooms, storage, etc.

This credit may be achieved through three methods: a) calculations, b) daylight modeling, and c) light metering once the building is complete.

It should be noted that while current window and curtain wall products support energy efficiency, they also reduce the visible light transmittance and compromise the project's ability to achieve this credit through the calculation method. LEED calculations for daylight only consider about the first 15' from the perimeter as receiving adequate daylight, so projects with deep floor plates may find this challenging, even if glazing is provided floor-to-ceiling. Projects with narrow footprints will be ideally suited to achieve this credit.

If the project team has access to and fluency in modeling software, this credit may be achievable without resorting to the cumbersome calculation method. Programs such as Revit, Ecotect, IES and Radiance have incorporated daylight modules that

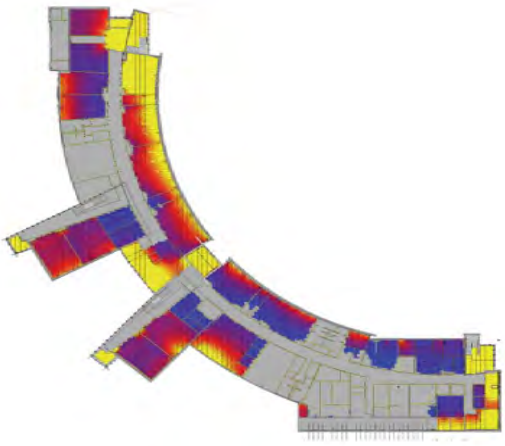
may assist the design team in achieving this credit. Even if the LEED Credit remains elusive, the benefits of daylighting will be available to occupants.

Using a light meter to measure daylight in the space once it is completed is another method for achieving this credit. Metering will not provide useful feedback in the design process, however if the project is designed with daylight in mind, the feasibility of this credit should be evaluated in the construction process. It may be deferred until the final inspection review, if the team decides to meter the space at a later date.

Daylighting may contribute to significant operational cost savings, in addition to boosting productivity and reducing absenteeism.

Whether occupants turn off lights manually when ample daylight is available, or rely on Daylight Harvesting systems, there is a significant reduction in lighting loads, and indirectly on cooling loads, when daylight plays a prominent role in lighting the interior space.

Interior Light Shelves and Clearstory Windows Bounce Daylight Further into Classroom Spaces.



Example of Ecotect Indoor light calculation model.

Examples of Daylighting Products such as Skylights and Lightwells.

EQ Credit 8.2

Daylight and Views: Views for 90% of Spaces

Design Responsibility
Design Profess.

Documentation Phase
Plan Review

This credit is identified in the Application Checklist in the Indoor Environmental Quality section as Credit 8.2. A Submittal Template must be submitted for this credit at the time of the plan review. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The design professional must complete the Application Checklist and should provide plans and sections demonstrating a line of sight at 2'6" and 7'6" above finish floor for over 90% of regularly occupied spaces. A narrative description of which spaces are 'regularly occupied', which are excluded, and why should also be uploaded.

Information can be found on a specially created illustrated plan or sections that shows compliance with the requirements of this credit.

Intent and Sample Strategies
This credit is intended to provide view corridors for over 90% of regularly occupied spaces. This credit is somewhat less difficult to pursue than the preceding The views credit, however, does require attention to interior layout and finish materials.

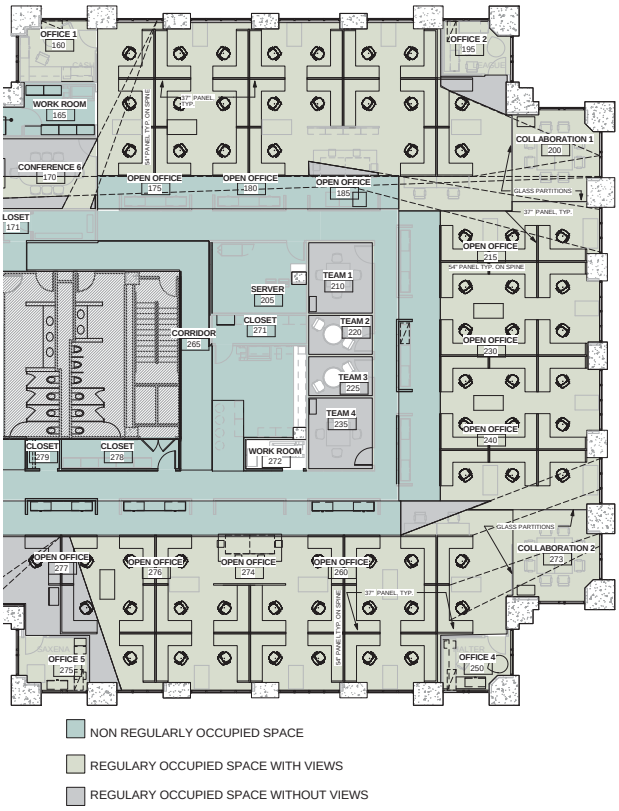
Regularly occupied spaces include those that are occupied consistently throughout a normal work day, whether by one person, by groups of people, or intermittently by various occupants. Spaces that should be included are offices, open work areas, classrooms, conference rooms, etc. You do not need to include 'back of house' spaces such as pantries, copy rooms, storage, etc.

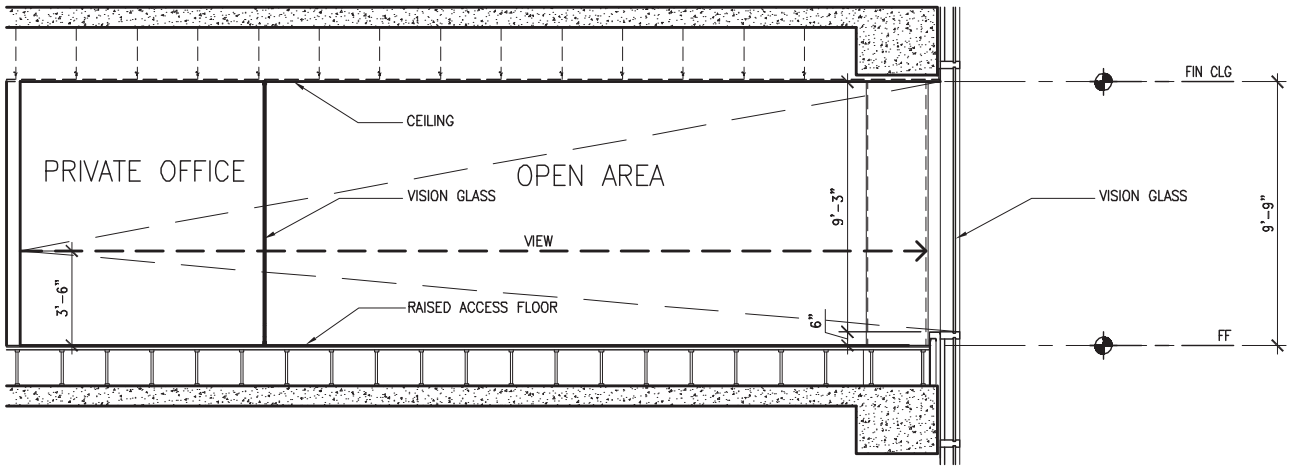
Strategies for achieving views may include open office areas around the perimeter, sidelights or glass partitions for perimeter offices, atria, modular furniture with transparent panels, etc.

The line of sight from an occupant's work area can be from any distance from the building perimeter; however it must be maintained at 42" from the floor (average eye level for seated occupant). If the work environment of the project includes seats that are higher than normal (i.e. laboratory stools) or requires occupants to stand for a great portion of the day, the line of sight may be adjusted, so long as the team provides a narrative describing why an alternative height was used.

This credit is significantly easier to achieve in a typical core and shell building where the team may assume an open floor plan. Where the occupants are known and the space must be partitioned off, it is advisable to locate back-of-house spaces, such as storage and pantries, close to the core and to locate open offices around the perimeter and provide interior glazing (full wall or sidelights) for perimeter offices. An open door to a private office is not considered a line of sight and may not be included in view calculations for LEED.

Projects with complex geometry may find this a difficult credit to document, but this is not necessarily a difficult credit to achieve. There are projects with privacy considerations that may elect not to pursue this credit if it is incompatible with the program.





Section Demonstrating a Line of Sight at 42" for Daylight and Views 90%

Indoor Environmental Air Quality Resources

EQc4.1-4.4 Low Emitting Materials

Material Safety and Data Sheets (MSDS) – A MSDS sheet is designed to provide proper procedures for handling or working with a material. MSDS's include information such as physical data, toxicity, health effects, storage, disposal, protective equipment, and spill/leak procedures. The USGBC requires MSDS documentation in order to provide full details on the chemical and physical make-up of certain items (such as the VOC levels present in paints and coatings).

Outgas - Many new building products and materials outgas Volatile Organic Compounds (VOCs) and formaldehyde, among other toxic chemicals. The 'new paint smell' or 'new car smell' you may be familiar with is actually an odor that accompanies these emissions and lets you know that the air quality may be harmful. Many people experience headaches, dizziness, nausea, fatigue and/or respiratory distress when exposed to formaldehyde and VOCs.

Volatile Organic Compounds (VOCs) – Carbon compounds that participate in atmospheric photochemical reactions. VOCs include a variety of chemicals which may have short- and long-term adverse health effects. The USGBC addresses VOCs as they are often emitted by a wide ranging list of materials; paints, cleaning supplies, pesticides, office equipment, etc.

Green Guard (certifies low-emitting systems furniture)
Other No added Urea Formaldehyde Composite Wood:

Section Six:
Innovation and Design Process

Overview

This section allows project teams to earn LEED credit for strategies not included in the regular LEED-NC v2.2 Rating System. This section allows the project team to define its own compliance path for up to four (4) credits.

This section also encourages project teams to include at least one LEED Accredited Professional (LEED-AP). This person has passed the accreditation exam and therefore has a fundamental knowledge of the LEED Rating System and Certification process. Having these skills and understanding how to apply them will be an asset to your project team. There is only one credit for having a LEED-AP on the team; no matter how many LEED-APs participate, only one credit will be granted.

This is the only section in LEED that allows this level of freedom and creativity and it is highly recommended that every LEED project pursue all four of the 'choose-your-own-adventure' credits and, of course, achieve the fifth credit for having a LEED-AP on the team.

In this section:

ID Credit 1.1-1.4

Innovation/ Enhanced Performance

Design Responsibility

All

Documentation Phase

This credit is identified in the Application Checklist in the Innovation In Design section as Credit 1.1-1.4. A Submittal Template must be submitted for this credit as a part of the design or construction submittal. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation

The LEED coordinator or responsible discipline must complete the Application Checklist and provide a) a description of the proposed ID credit intent, b) the proposed credit requirements, c) a description of how the project meets the requirements, and d) any drawings, calculations or other documentation that demonstrates compliance with the ID credit requirements.

Information can be found on the documents submitted to meet this credit.

Intent and Sample Strategies

There are four ways to achieve Innovation & Design (ID) credits:

A. Exemplary Performance: if your project exceeds LEED requirements for certain credit, typically by the next incremental percentage.

B. Pre-approved ID credit: if a Credit Interpretation Request (CIR) on LEED Online proposes an ID credit compliance path that makes sense for your project, and it was approved, then your project may borrow the same strategy.

C. New ID credit: if your project strategy achieves a quantifiable environmental benefit outside of LEED's purview, your project team may submit a new CIR and get approval to submit your strategy for an ID credit.

Public Transportation - Light Rail Train Can Provide Over 200 Ride Opportunities

D. Borrowed Credit: if your project meets the requirements for a prerequisite or credit under another LEED Rating System, your project team may 'borrow' this strategy for an ID credit.

Education and Outreach: The Renewable Energy Dashboard Provides Current Information on Consumption and Operations

Green Housekeeping. image Courtesy of johnson Diversey.

Virtual Tours Help to Provide Education and Outreach.
Image Courtesy of Sidwell Friends School

Solar Trash Compactor, Fair Park

ID Credit 2

LEED Accredited Professional

Design Responsibility

Documentation Phase

This credit is identified in the Application Checklist in the Innovation In Design section as Credit 2. It is the responsibility of the design professional as marked by the round-shaped symbol. This credit will be initially verified during plan review. Final certification or approval of this credit will be obtained during the final inspection process.

Documentation
The LEED coordinator must complete the Application Checklist and provide a copy of their LEED AP certificate.

Information can be found on documents submitted to meet this credit.

Intent and Sample Strategies
This credit is intended to encourage project teams to include at least one LEED-Accredited Professional (LEED-AP) on each team. Someone who has passed the LEED-AP exam will have a much better idea of how the Certification process works and how to implement sustainable design strategies into the project design. There is only one ID credit available for including a LEED-AP on the team; although many LEED-APs would be beneficial, it will not earn any additional credits. At a minimum the LEED coordinator, whether an internal team member or a third-party consultant should be LEED Accredited.

Innovation and Design Process Resources

Solar-powered trash compactors and recycling bins, ideal for parks or public spaces as a means of reducing service trips: www.bigbellysolar.com

Cradle-to-Cradle product certification: www.mbdc.com/c2c/

Carbon Calculation/Reporting
Carbon calculations: www.carbontrust.co.uk
EPA Personal Emissions Calculator: www.epa.gov/climatechange/emissions/ind_calculator.html

Green Housekeeping (LEED-EB or ID credit option)
One Source: www.one-source.com/en/green-cleaning.html
Green Mop: www.freewebs.com/thegreenmop

Green Lease – Green leases have become more common with the growing need for a legal tool to help building owners and managers maintain a green building through operations and management practices. A green lease can include as much or as little of a building's sustainable practices as an owner desires. Their intention is to remove barriers to sustainability, set standards, and communicate these standards and goals with tenants to ensure the building is compliant along with the LEED standards it has committed to.
Green Seal Commercial & Institutional Green Cleaning Standard: www.greenseal.org/certification/cleaning_services_gs_42.pdf

Education and Outreach
Information Green Building kiosk: www.qualityattributes.com/greentouchscreen

BOMA's Guide to Writing a Commercial Real Estate Lease, Including Green Lease Language: shop.boma.org

Ride Opportunities - A ride opportunity is simply a scheduled bus or train arrival at the nearby stations. A single bus going in one direction stopping at two different stops within the ¼ radius may only be counted once, but the same bus line, stopping on opposite sides of the street, going in two directions, may be counted as two ride opportunities.