The Somerset County High Performance Public Buildings Program Toolkit

Somerset County Business Partnership

Center for Architecture and Building Science Research at NJIT
Sponsored by AT&T, Johnson & Johnson and HSBC

September 10, 2007

Executive Summary

This Technical Toolkit has been prepared for the municipal engineers and code officials of Somerset County to aid in their review of projects participating in the Somerset County High Performance Public Buildings Program (The Somerset County Program).

The Somerset County Program is a green building initiative developed by the Somerset County Business Partnership (SCBP) with technical support from the Center for Architecture and Building Science Research at the New Jersey Institute of Technology. The SCBP developed the Program to further the County's Smart Growth agenda and to help reinforce the County's leadership role on environmental issues within the State of New Jersey.

The Program sets forth a series of performance requirements that new public sector buildings within the County should achieve. These requirements are based on the US Green Building Council's Leadership in Energy and Environmental Design (LEED™) program, specifically the LEED™ New Construction rating system. **The overarching goal of the requirements is to protect taxpayer investments in public buildings throughout the County by reducing their operating costs, increasing the comfort and productivity of their occupants, and ensuring that all public facilities in the County are designed to be environmentally responsible.** It is hoped that the program will be adopted by many or all of the 21 municipalities of Somerset County.

The specific goal of this Toolkit is to help municipal engineers and code officials review new building projects submitted under the Program. Section 1 of the document introduces the basic "what and why" of the toolkit. Section 2 is intended to help de-mystify high performance buildings. It provides an overview of key high performance building concepts and strategies, with a particular focus on those strategies that provide compelling benefits in a cost effective manner. Section 3 details the specific requirements of the Program. Each requirement is explained and then analyzed in terms of its relation to applicable codes and regulations. Any possible code issues that might arise with respect to a specific requirement are noted and discussed. The Toolkit ends with two case studies of high performance buildings in New Jersey, including a review of the regulatory obstacles encountered and their resolution.

The Technical Toolkit will be available online via the SCBP website as part of the Somerset County Program reference documents. A Best Practices Manual will also be available, which outlines the steps for a municipality to adopt and implement the Somerset County Program.

The SCBP has taken on the task of simplifying the County's path toward greater environmental responsibility with the development of the Program and its supporting documents. The creation of fiscally responsible public buildings that embody the environmentally conscientious values of Somerset County is the ultimate goal.

Somerset County High Performance Public Building Program Overview
The Somerset County High Performance Public Buildings Program (The Somerset County Program) was developed by the SCBP with assistance from the New Jersey Institute of Technology (NJIT) Center for Architecture and Building Science Research (CABSR). Funding for development of the Somerset County Program was provided by Johnson and Johnson, AT&T and HSBC.

The Somerset County Program was developed as a green building program that could be adopted by any of the Somerset County's 21 municipalities, and is intended to apply to county, municipal and educational buildings. The Somerset County Program's purpose is to create new public sector buildings that protect taxpayer investment by focusing on requirements that reduce building operating costs and increased user productivity. It also serves as a demystified path to high performance building. The program requirements are taken from the US Green Building Council's Leadership in Energy and Environmental Design New Construction (LEED™ NC) rating system and incorporates requirements in the areas of: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Environmental Quality. There are 18 requirements in all. Each program requirement was included to serve Somerset County's pursuit of creating high performance buildings using the most essential, practical measures. The requirements balance cost effectiveness with optimal building performance and user health and productivity.

The Somerset County Program does not address site issues, beyond addressing soil erosion during construction. While site issues are critical to high performance buildings, they are also very project specific; for that reason, there are no requirements in this area. It is anticipated that any project participating in the Program would certainly consider site selection and site design strategies that enhance building performance.

Fulfillment of the Somerset County Program requirements also fulfills all of the prerequisites and 16 additional LEED™ credits. Therefore, if a design team is interested in pursuing LEED™ Certification or beyond, the Somerset County Program can put a project well on its way!

What is the Technical Toolkit?
This toolkit is designed to serve as a guide to the Somerset County High Performance Public Buildings Program (the Somerset County Program) for municipal engineers, code officials and administrators. The toolkit includes a discussion of the key concepts of high performance buildings in Section 2. An accompanying slide presentation of this material resides on the Somerset County Business Partnership's website and can be accessed at http://www.scbp.org. Section 3 explains the requirements of the program. Included in this section are examples of how projects might meet the program requirements, followed by the code section or regulation related to that particular requirement, if any. Potential code issues are also discussed. A table summarizing this information is provided at the back of the section. Section 5 presents case studies of two green buildings with a specific focus on the code issues that came about during their design and construction.

Development of the toolkit has benefited from meetings with code officials representing nine of Somerset's 21 municipalities. The Green Building Energy Efficiency Representative from the Department of Community Affairs (DCA) Division of Codes and Standards and the Somerset County Business Partnership (SCBP) Technical Advisory Committee (TAC) were also integral to the development of the Toolkit.

Why is the Toolkit Necessary?
The goal of this toolkit is to provide a link from the Somerset County Program to the local municipality's code officials. By offering some basic information on high performance building and some discussion of code issues in relation to high performance building, it is anticipated that potential obstacles to the delivery of high performance buildings can be resolved. Although the requirements of the Somerset County Program are fairly straightforward, the many ways that those requirements can be met are difficult to predict. Innovation in design and an ever growing array of green materials and products make it difficult to keep up. A study on the code issues that come about with green buildings found that a lack of familiarity with a green alternative often results in the denial of its use, with or without technical concerns.[1] What this toolkit attempts to do is present some of the more common materials and strategies used in high performance buildings, so that code officials have some degree of familiarity with them.

During meetings with code officials in Somerset County for the development of the toolkit, it became clear that training on high performance buildings is desired. While not in the scope of this project, the requests have been discussed with the DCA Division of Codes and Standards. DCA is now considering the development of such training statewide.

Key Concepts of High Performance Buildings
This introduction to high performance buildings discusses what high performance buildings are, why they are valuable – specifically to Somerset County, what is required to create a high performance building and what is the cost for high performance. As noted earlier, a slide presentation of this material can be accessed through the SCBP website at http://www.scbp.org

Green buildings, sustainable buildings, high performance buildings, these are all terms being used somewhat interchangeably, and in the most basic sense describe buildings that have a minimal negative impact on the environment, are energy efficiency, durable and provide a healthy indoor environment.

What are the Key Characteristics of a High Performance Building
- Cost effective
- Healthy and Productive
- Strive for Sustainability
- Integrated Design

Cost Effective
- Optimize for energy efficiency and cost savings
- Use life cycle costing
- Use a commissioning process
- Invest in design

Optimized
High performance buildings are cost effective by being energy efficient, resource efficient and designed to operate as intended from day one. The building envelope and mechanical systems are optimized for energy efficiency and cost savings. Improvements to the building envelope allow the mechanical system to potentially be downsized as compared to a merely code compliant envelope. Savings in the mechanical system can help offset the cost of high performance glazing, increased levels of insulation and extensive air sealing.

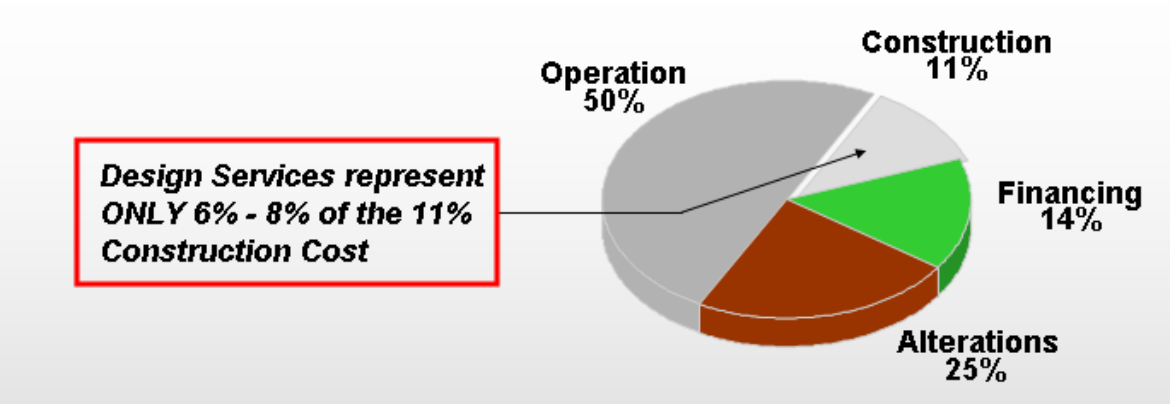
Life cycle costing

1 Eisenberg, Done and Ishida, *Breaking Down the Barriers: Challenges and Solutions to Code Approval of Green Building*

High performance buildings consider life cycle costs, which include the first costs, operating costs and maintenance costs over the life of the building. Life cycle costing reveals which measures are most cost effective by considering not just the cost to buy, or first cost, but considers the cost to own – which can dwarf first costs over the life of a building. This is particularly meaningful for public sector buildings, which typically have a long service life and where first costs, and the cost to own are paid in large measure by the municipality.

Commissioning
A Commissioning process provides quality assurance during the design, construction and operation of the building. During design, commissioning verifies that the owner's requirements are addressed. During construction, commissioning can confirm that the building envelope and mechanical systems are being built and installed according to the construction documents and specifications. After completion, a test run of the facility ensures the building is operating as designed and if not, provides the opportunity for changes to be made. Commissioning is a very cost effective measure to ensure that a high performance building is delivered as designed.

Invest in Design
Within the typical costs associated with a building, design services represent 6% - 8% of the 11% of construction costs. Energy efficiency is largely determined during the design process – if there is proper follow through during construction. Therefore a relatively inexpensive investment in the design services necessary to make a building high performance will reduce operating costs and is extremely cost effective. Early decisions during design are also more cost effective. Making high performance a priority from the outset allows low and no cost measures to be incorporated. Deciding to "go green" after a project is started reduces the thoroughness of the approach and may increase costs prohibitively.



Healthy and Productive
High performance buildings provide an optimal user environment with thermally comfortable spaces, large amounts of natural daylight, properly designed electric lighting and superior indoor air quality. Collectively these attributes create good Indoor Environmental Quality (IEQ) which directly influences the health and productivity of building users.

Sustainable
High performance buildings strive for sustainability by conserving energy and often using renewable energy. They have high performance mechanical and lighting systems for cost and energy savings and superior performance. Environmentally responsive site planning allows the building orientation to be optimized for energy savings. Careful siting can also help and minimize a building's impact on the local ecosystem and beyond. Environmentally preferable building materials such as those that are local or have recycled content help reduce the environmental impact of a high performance building. Water efficient design through the

specification of efficient fixtures and other water conserving measures is also integral to the goal of sustainability.

Integrated Design
High performance buildings are created through an integrated design process. Integrated design is a holistic approach that considers the many interconnected systems a building incorporates. To properly consider all the building's systems, members of the project design team work in close coordination, orchestrating strategies for synergistic results. For example, as an architect begins to analyze a site, one of the first things he or she may consider is site circulation, where will parking be, how will the building be entered. Using an integrated design process the architect would also consider solar orientation and what would be optimal for energy efficiency and views. The architect and engineer can discuss glazing and whether daylighting can reduce electric lighting needs. This in turn may reduce the cooling load, since properly designed daylighting introduces less heat into a space than electric lighting. This iterative process continues through to the final design and extends to all major design decisions. The result is a design that is optimized for peak performance while still achieving all the functional and programmatic goals of the municipality.

Why are High Performance Buildings Valuable to Somerset County?
- Reduced operating costs
- Improved user productivity
- Environmental responsibility

Reduced Operating Costs
Operating costs are reduced in high performance buildings by saving energy, reducing maintenance costs, saving water and minimizing other ongoing operating costs. The amount of savings is directly related to the building's energy efficiency, water efficiency and construction quality, but can range from anywhere between a modest savings to 20% or more.

Improved User Productivity
User productivity is influenced by the indoor environment, specifically by the indoor air quality (IAQ), access to daylight and views, the quality of electric lighting and the thermal conditions. Quantifying user productivity in buildings is a relatively new area of research but most studies endorse the notion that people perform better in improved indoor environments. The potential health benefits and cost savings in the U.S. for improved Indoor Environmental Quality (IEQ) can be as much as $43 billion to $225 billion dollars annually.[2]

Thermal comfort influences task performance and attention spans. Spaces that are too cold can affect dexterity and concentration, while those that are too warm can reduce alertness and cognitive functioning.[3]

Indoor air quality is important considering that typically ninety-percent of our time is spent indoors and indoor air is often two to five times worse than outdoor air. The lung surface area equals that of the skin and is very sensitive to environmental contaminants, including those found in common building materials.

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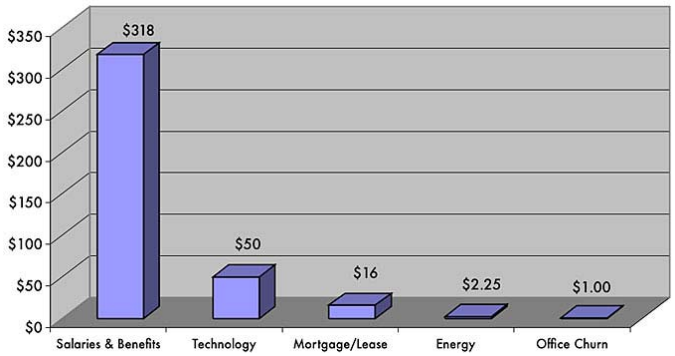
2 Fisk, *Health and Productivity Gains from Better Indoor Environments*

3 McGuffey, C.W. (1982). Facilities. In Walberg, H.J. (Ed.*) Improving educational standards and productivity: The research basis for policy.* Berkeley, CA: McCutchan Publishing. 237-288.

Daylit classrooms have been linked to improved student performance in a study of 21,000 students among three districts in California, Washington and Colorado. Results showed that over one year the classrooms with the most amount of daylighting were linked to a 20% to 26% faster learning rate versus the classrooms with the least amount of daylighting[4.]

When looking at typical office building costs the amount spent on employee salaries and benefits far exceeds all other costs combined. **For this reason an increase in employee productivity through an improved indoor environment can be extremely cost effective over the life of the facility.**



Carnegie Mellon University's Center for Building Performance and Diagnostics

Environmental Responsibility

Somerset County has been a leader in the state with regard to Smart Growth initiatives and resource efficient measures. Creating environmentally responsible buildings is consistent with its sustainability goals. Through the Somerset County Program buildings will be created that are environmentally responsible in the following ways:

- Consciously designed to have a positive influence on the environment
- Energy and water efficient
- Incorporate durable, non-toxic components that are recyclable
- Utilize renewable energy as much as possible
- Have an extended life time resulting in reduced resource utilization

How is High Performance Achieved?

High performance must be set as a high priority goal for all team members from the very beginning of a project. An integrated, holistic design process throughout all phases of the project must be used. Project goals must be revisited systematically and often. When striving for high performance not everything can be done in all projects but certain priorities should be recognized: improved indoor environmental quality (IEQ) with a focus on daylighting, and energy efficiency.

IAQ, IEQ?
IAQ (indoor air quality) is a subset of IEQ (indoor environmental quality). IEQ also considers thermal comfort and daylighting.

The Somerset County Program recognizes the real world constraints facing new construction projects. As such it focuses on IEQ and energy in order to serve the goals of: reduced operating costs, increased user productivity and environmental responsibility in a cost effective manner. As noted earlier, while site design and planning is critical for high performance buildings, there are no Sustainable Site Requirements in the program. The following table shows the program requirements and the corresponding goals they serve.

4 Heschong Mahone Group, *Daylighting in Schools, An investigation into the Relationship Between Daylighting and Human Performance*, 1999

Somerset County Goal	Somerset County Program Requirement
Reduced Operating Costs	Water Efficient Landscaping Building Commissioning Optimize Energy Performance Measurement and Verification
Increased User Productivity	Minimum IAQ Performance Construction IAQ Management Plan: During Construction Low-Emitting Materials: Adhesives & Sealants Low-Emitting Materials: Paints & Coatings Low-Emitting Materials: Carpet Systems Low-Emitting Materials: Composite Wood & Agrifiber Products Controllability of Systems: Lighting Thermal Comfort: Design –*separate humidity control is not required.* Daylight & Views: Daylight 75% of Spaces
Environmental Responsibility	**All of the above and:** Construction Activity Pollution Prevention Fundamental Refrigerant Management Storage & Collection of Recyclables Construction Waste Management: Divert 50% from Disposal Recycled Content: 10% (post-consumer + 1/2 pre-consumer

Reduced operating cost

- **Water Efficient Landscaping**
- **Building Commissioning**
- **Optimize Energy Performance**
- **Measurement and Verification**

Water Efficient Landscaping – Reduce potable water use for landscaping by 50%
Reduced water use for landscaping can be achieved by specifying native plantings that are accustomed to local climatic conditions and don't require irrigation other than for initial establishment. Limiting turf areas is also recommended. If irrigation is used, high efficiency systems such as drip irrigation and/or evapotranspiration controllers - systems that use weather data to time watering are recommended. The use of captured rainwater or recycled waste water for irrigation are other effective strategies.

Optimize Energy Performance
Energy efficiency is a critical attribute of high performance buildings. It reduces operating costs and has the greatest impact on a building's environmental performance. Energy efficiency is achieved by designing and constructing buildings to have reduced heating, cooling and electric loads followed by meeting those loads as efficiently as possible. Only after these steps should the use of site generated renewable energy be considered.

Building Orientation
When possible, the best building orientation for reduced heating and cooling loads is for the long axis to be from east to west. This allows the south façade to admit the low winter sun (if desired) and be shaded from the high summer sun.

Building Envelope
An energy efficient building envelope integrates and optimizes insulation levels, glazing and shading coefficients. Increased insulation levels, extensive air sealing and avoidance of thermal bridging are key to reduced heating and cooling loads. Reflective and/or green roofing can be used to reduce heat gain and extend the durability of the roof. Moisture control through the proper specification, detailing and installation of flashing, a drainage plane and vapor barrier

helps to keep building assemblies durable and dry. Proper grading of the site surrounding the building allows surface water to drain away from the building.

Mechanical Systems
High performance buildings use high efficiency mechanical systems that are properly sized for the building's design loads. Controls that optimize system performance and efficient distribution ensure that spaces are conditioned effectively. High efficiency units are available in all types including boilers, furnaces, chillers and AC units. Ground coupled heat pumps – which take advantage of the relatively constant temperature of the earth's surface and use it as a heat sink or a heat source, and combined heat and power systems – which use the residual heat from power generation for space heating, are also being used in high performance buildings.

Building Commissioning
Commissioning ensures that high performance buildings are operating as intended and are meeting the owner's requirements. Commissioning is a quality assurance measure that performs a test run of the building systems prior to occupancy. Commissioning of the energy systems is essential to reveal whether the systems are running as designed and allows for adjustments to be made if necessary. For further quality assurance, commissioning can be extended to all phases of design and construction as well as after occupancy. This ensures that the design and construction documents reflect the owner's requirements and that submittals are in line with the design intent.

Measurement and Verification (M&V)
Measurement and verification allows actual metered energy use to be compared to projections. Without M&V, building performance cannot be readily evaluated. M&V provides a valuable indicator as to whether a building's ongoing energy performance is on target which is especially important for publicly owned facilities.

Increased User Productivity
- **Minimum IAQ Performance**
- **Construction IAQ Management Plan**
- **Low-Emitting Materials**
- **Controllability of Systems: Lighting**
- **Thermal Comfort**
- **Daylight & Views**

Minimum IAQ Performance
An adequate level of ventilation is necessary for the maintenance of good indoor air quality. The amount of ventilation needed is based on a variety of factors and requires calculations specific to the space(s) being ventilated. Ventilation needs can be met mechanically, naturally or using both approaches.

Construction Indoor Air Quality (IAQ) Management Plan: During Construction
During the construction process, dust, debris and other contaminants can enter the duct system. Once these pollutants get in the ducts, they are rarely cleaned out. Protection of the duct system can avoid this and is easily implemented.

Use Low emitting:
- adhesives and sealants
- paints and coatings
- carpeting
- wood products

Low VOC products are readily available and many cost the same as conventional materials. Programs such as the Carpet and Rug Institute's Green Seal program make certain options easily identifiable. Other products can be selecting by verifying that VOC levels are below the thresholds required by the LEED™ program.

Controllability of Systems: Lighting
Provide individuals with control over their lighting using task lighting, ambient lighting that is zoned, or a combination of both. Using a combination of task and ambient lighting offers the most flexibility and allows for the adjustment of lighting intensity. The interaction of automatic lighting controls such as daylight dimming and occupancy sensors have to be considered when providing individual lighting controls.

Thermal Comfort: Design
Design for thermal comfort using optimal temperature and humidity goals versus code minimums. The code only considers air temperature. Thermal comfort is determined by many factors, including air speed; mean radiant temperature, humidity, air temperature and an individual's metabolism and clothing. By designing a system that can provide comfort considering these variables, more building occupants can be comfortable.

Provide Daylight and Views to 75% of indoor spaces
Daylighting can be achieved using the following general guidelines:

- Design windows to allow diffuse, uniform daylight to penetrate deep into building.
- Design room layouts to take advantage of daylight
- Provide controls that turn off or dim lights when there is sufficient daylight

Special care needs to be taken to avoid glare and overheating, especially when overhead glazing is used.

Environmental Responsibility

- **Construction Activity Pollution Prevention**
- **Fundamental Refrigerant Management**
- **Storage & Collection of Recyclables**
- **Construction Waste Management**
- **Recycled Content**

Construction Activity Pollution Prevention
Soil erosion, dust generation and waterway sedimentation are all potential side effects of construction activity. These can be minimized through careful planning and the use of silt fencing, seeding, sediments traps and other strategies. In New Jersey, compliance with the Soil Erosion and Sediment Control Act helps avoid construction activity pollution.

Fundamental Refrigerant Management
CFC (chlorofluorocarbons) based refrigerants are understood to be harmful to the earth's ozone layer and a contributor to global warming. When specifying new mechanical equipment, call for only non-CFC based refrigerants.

Storage and Collection of Recyclables
Building design can simplify the task of recycling by providing occupants with easily accessible collection areas. These areas should be adequately sized and appropriately separated from occupied areas when noise and/or odors are a concern.

Construction Waste Management
Sorting construction waste on the job site for recycling is environmentally responsible and cost effective in New Jersey. According to the NJ DEP, the average cost to recycle asphalt, concrete rubble, used brick and block and wood scraps is cheaper than the average cost of disposal. Recycling construction waste also aligns with the Somerset County Solid Waste Management Plan, which requires the recycling of wood scrap/unfinished lumber (only non-chemically treated, clean wood); cardboard, concrete, asphalt, masonry/paving materials, ferrous scrap, and nonferrous scrap metals.

Recycled Content
Many commonly used materials are available with recycled content such as: steel, acoustic ceiling tiles, gypsum board, carpet tile, and ceramic tile. Many types of insulation have recycled content such as: cellulose, mineral wool, cotton (see Willow School case study), fiberglass and polystyrene and polyisocyanurate(rigid insulations).

What Do High Performance Buildings Cost
The question of cost is always part of the consideration when planning a high performance building. In most cases the comparison is made between buildings that are participating in a green building program, such as LEED™ and those that are not. Within this comparison, there are two answers as to whether high performance costs more:

More, but….
Not Much More
Pays for Itself in Life Cycle Savings
and

No More, but…
Relies on Clear Goal Setting
Demands an Integrated, Team-Based Approach

Various studies have been done supporting both views:

More, but

- The Costs and Benefits of Green Buildings

Greg Kats et al. 2003
www.cap-e.com
This study found that LEED™ Certified buildings cost an average of less than 1% more than non LEED™ buildings.

- National Review of Green Schools: Costs, Benefits and Implications for Massachusetts

Greg Kats et al. 2005
www.cap-e.com
This review of green schools found that their energy benefit was worth $14/sf, other benefits were quantified including increased earnings at $37/sf, and cold and flu reduction at $4/sf among others. The cost of green was shown as $4/sf. All the figures are considering a 20 year period. **Even if only the energy benefit is considered, there is a net benefit of $10/sf.**

- GSA LEED™ Cost Study

US General Services Administration 2004
www.wbdg.org

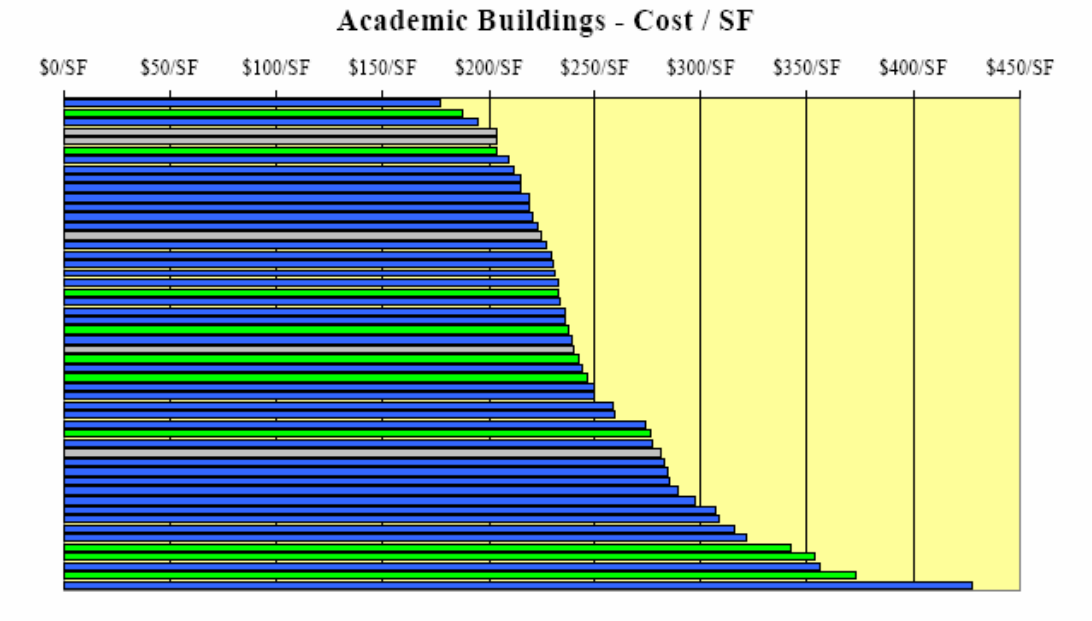
This extensive study analyzed the cost difference between a GSA base building and LEED™ Certified, Silver and Gold at low and high cost levels for each ranking. These six estimates were done for two buildings, a 262,000 sf new courthouse, and a 306,600 sf office building modernization. The numbers for the new courthouse are shown below. The study stresses that the numbers should be used with caution since GSA baseline buildings already incorporate certain LEED™ credit requirements including: commissioning, energy efficiency beyond code, under floor air delivery, a dedicated ventilation system, NON CFC refrigerant and recycled content materials.

	Certified		Silver		Gold	
	Low Cost	High Cost	Low Cost	High Cost	Low Cost	High Cost
New Courthouse	-.4%	1.0%	-.03%	4.4%	1.4%	8.1%

No More, but…

– Costing Green: A Comprehensive Cost Database and Budgeting Methodology
Davis Langdon 2003
www.davislangdon.com

This study looked at 138 buildings, 96 non-LEED™ and 45 seeking LEED™. The study found that the LEED™ seeking buildings did not tend to be more expensive than the non-LEED™ buildings. The comparison of costs per square foot among similar building types was statistically insignificant. The graphic below illustrates the cost per square foot of 52 academic buildings, 15 LEED™-seeking and 37 non-LEED™. The green bars represent LEED™ certified buildings, and silver represent LEED™ Silver buildings.



Davis Langdon 2003

Managing the Cost of Green Buildings
KEMA 2003
www.ciwmb.ca.gov/greenbuilding/

This study found that LEED™ Certification can be achieved at a range of 0-3% additional cost. It maintains that as long as the goal to achieve certification is made early on, and the project has a reasonable base budget, it should be a no-added-cost endeavor.

Either way first costs trend lower with experience in high performance building on the part of the owners, designers, consultants, contractors, code officials**,** essentially everyone involved in the project from design through to completion.

Life cycle costs are always lower in high performance buildings so there is always a net benefit**.**

The bulk of "Additional" costs are soft costs, which helps explain why costs trend down with experience.

Mindset is Critical. If the team thinks a high performance project "has to" cost more…it will

Critical Barriers to Controlling Costs include:

- Lack of a clear green design goal
- Mid-stream attempts to incorporate green
- Decentralized management of the green building process
- Lack of experience/knowledge with green building
- Insufficient time/funding

The Somerset County High Performance Public Buildings Program
The Somerset County High Performance Public Buildings Program is focused on creating buildings that protect taxpayer investment with reduced building operating costs and increased user productivity. The program has 18 requirements in the areas of Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials and Resources and Indoor Environmental Quality. The Somerset County Program is based on the US Green Building Council's LEED™ New Construction rating system. Fulfillment of the Somerset County Program requirements also fulfills all of the LEED™ prerequisites and 16 additional LEED™ credits. Therefore, if a design team is interested in pursuing LEED™ Certification or beyond, the Somerset County Program can put a project well on its way. .

Organization of the Program requirements is as follows. Each requirement is listed, followed by *What You May See in a Project*, *Related Code or Regulatory Requirement, Potential Code Issues and Associated LEED™ credit*. This is summarized in Table 1 at the end of the section.

Somerset County High Performance Public Buildings Program Requirements
1. Construction Activity Pollution Prevention
2. Water Efficient Landscaping
3. Building Commissioning
4. Fundamental Refrigerant Management
5. Optimize Energy Performance: 21% Cost Savings
6. Measurement and Verification
7. Storage & Collection of Recyclables
8. Construction Waste Management: Divert 50% from Disposal
9. Recycled Content: 10% (post-consumer + 1/2 pre-consumer)
10. Minimum IAQ Performance
11. Construction IAQ Management Plan: During Construction
12. Low-Emitting Materials: Adhesives & Sealants
13. Low-Emitting Materials: Paints & Coatings
14. Low-Emitting Materials: Carpet Systems
15. Low-Emitting Materials: Composite Wood & Agrifiber Products
16. Controllability of Systems: Lighting
17. Thermal Comfort: Design
18. Daylight & Views

1. Construction Activity Pollution Prevention
Intent
Reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation.

Requirements
Create and implement an Erosion and Sedimentation Control (ESC) Plan for all construction activities associated with the project. The ESC Plan shall conform to the erosion and sedimentation requirements of the 2003 EPA Construction General Permit OR local erosion and sedimentation control standards and codes, whichever is more stringent. The Plan shall describe the measures implemented to accomplish the following objectives:
• Prevent loss of soil during construction by stormwater runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.
• Prevent sedimentation of storm sewer or receiving streams.
• Prevent polluting the air with dust and particulate matter.

The Environmental Protection Agency Construction General Permit (CGP) outlines the provisions necessary to comply with Phase I and Phase II of the National Pollutant Discharge Elimination System (NPDES) program. While the CGP only applies to construction sites greater than 1 acre, the requirements are applied to all projects for the purposes of this prerequisite. Information on the EPA CGP is available at:
http://cfpub.epa.gov/npdes/stormwater/cgp.cfm.

What You May See in a Project
Seeding to stabilize soil, mulching, silt fencing, sediment traps and basins,

Related Code or Regulatory Requirement
New Jersey Soil Erosion and Sediment Control Act

Potential Code Issue(s)
There should be no code conflict to meet the requirements of this prerequisite. Compliance with the New Jersey Soil Erosion and Sediment Control Act fulfills this requirement.

Associated LEED™ Credit
Sustainable Sites Prerequisite 1

2. Water Efficient Landscaping: Reduce by 50%
Intent
Limit or eliminate the use of potable water, or other natural surface or subsurface water resources available on or near the project site, for landscape irrigation.

Requirements
Reduce potable water consumption for irrigation by 50% from a calculated mid-summer baseline case.
Reductions shall be attributed to any combination of the following items:
• Plant species factor
• Irrigation efficiency
• Use of captured rainwater
• Use of recycled wastewater
• Use of water treated and conveyed by a public agency specifically for non-potable uses

What You May See in a Project
Specification of native plantings, reduced turf areas, high efficiency irrigation systems, collection of rainwater for irrigation, use of on-site treated wastewater for irrigation.

Related Code or Regulatory Requirement
None

Potential Code Issue(s)
Collected rainwater and or treated wastewater for reuse as landscape irrigation may raise issues of concern with the local health department. The design team should meet with the local board of health early in the design process to review the proposed project and discuss potential regulatory issues. See the Willow School case study in Section 4.

Associated LEED™ Credit
Water Efficiency credit 1.1

3. Building Commissioning

Intent
Verify that the building's energy related systems are installed, calibrated and perform according to the owner's project requirements, basis of design, and construction documents. Begin the commissioning process early during the design process and execute additional activities after systems performance verification is completed.

Benefits of Commissioning
Benefits of commissioning include reduced energy use, lower operating costs, reduced contractor callbacks, better building documentation, improved occupant productivity, and verification that the systems perform in accordance with the owner's project requirements.

Requirements
The following commissioning process activities shall be completed by the commissioning team, in accordance with the LEED™-NC 2.2 Reference Guide.
1. Prior to the start of the construction documents phase, designate an independent Commissioning Authority (CxA) to lead, review, and oversee the completion of all commissioning process activities. The CxA shall, at a minimum, perform Tasks 2, 5 and 9. Other team members may perform Tasks 4 and 5.
    a. The CxA shall have documented commissioning authority experience in at least two building projects.
    b. The individual serving as the CxA shall be—
        i. independent of the work of design and construction;
        ii. not an employee of the design firm, though they may be contracted through them;
        iii. not an employee of, or contracted through, a contractor or construction manager holding construction contracts; and
        iv. (can be) a qualified employee or consultant of the Owner.
    c. The CxA shall report results, findings and recommendations directly to the Owner.
    d. This requirement has no deviation for project size.
2) The Owner shall document the Owner's Project Requirements (OPR). The design team shall develop the Basis of Design (BOD). The Owner and design team shall be responsible for updates to their respective documents. The CxA shall conduct, at a minimum, one commissioning design review of the Owner's Project Requirements (OPR), Basis of Design (BOD), and design documents prior to mid-construction documents phase and back-check the review comments in the subsequent design submission.
3) Develop and incorporate commissioning requirements into the construction documents.
4) Develop and implement a commissioning plan.
5). The CxA shall review contractor submittals applicable to systems being commissioned for compliance with the OPR and BOD. This review shall be concurrent with A/E reviews and submitted to the design team and the Owner.
6) Verify the installation and performance of the systems to be commissioned.
7). Develop a systems manual that provides future operating staff the information needed to understand and optimally operate the commissioned systems.
8). Verify that the requirements for training operating personnel and building occupants are completed.
9). Assure the involvement by the CxA in reviewing building operation within 10 months after substantial completion with O&M staff and occupants. Include a plan for resolution of outstanding commissioning-related issues.
10) Complete a summary commissioning report.

Commissioned Systems

Commissioning process activities shall be completed for the following energy-related systems, at a minimum:
• Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems (mechanical and passive) and associated controls
• Lighting and daylighting controls
• Domestic hot water systems
• Renewable energy systems (wind, solar etc.)

Related Code or Regulatory Requirement
None

Potential Code Issues
There should be no code conflict to meet the requirements of this credit. There are no code requirements for commissioning.

Associated LEED™ Credit
Energy & Atmosphere prerequisite 1, Fundamental Commissioning of the Building Systems
Energy & Atmosphere credit 3: Enhanced Commissioning

4. Fundamental Refrigerant Management
Intent
Reduce ozone depletion.

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

What You May See in a Project
HVAC equipment with CFC free refrigerant. New HVAC equipment available in the US is no longer made with CFC based refrigerants.

Related Code or Regulatory Requirement
None

Potential Code Issues
There should be no code conflict to meet the requirements of this prerequisite.

Associated LEED™ Credit
EA Prerequisite 3: Fundamental Refrigerant Management

5. Optimize Energy Performance: 21% Cost Savings

Intent

Achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.

Intent

Achieve 21% energy cost savings above ASHRAE 90.1-2004 to reduce environmental and economic impacts associated with excessive energy use.

Requirements

Select one of the two compliance path options described below.

OPTION 1 — WHOLE BUILDING ENERGY SIMULATION

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

OR

OPTION 2 - PRESCRIPTIVE COMPLIANCE PATH

Comply with the prescriptive measures of the ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004. (available at ashrae.org) The following restrictions apply:

• Buildings must be under 20,000 square feet
• Buildings must be office occupancy
• Project teams must fully comply with all applicable criteria as established in the Advanced Energy Design Guide for the climate zone in which the building is located

What You May See in a Project

Upgraded building components including: the building envelope, lighting, mechanical systems and service water heating. On the following page, the “Climate Zone 5 Recommendation Table” from the ASHRAE Advanced Energy Design Guide for Small Office Buildings shows the prescriptive path for Somerset County’s climate.

Climate Zone 5 Recommendation Table

	Item	Component	Recommendation	How-To's in Chapter 4
Envelope	Roof	Insulation entirely above deck	R-20 c.i.	EN2, 17, 20-21
		Metal building	R-13 + R-19	EN3, 17, 20-21
		Attic and other	R-38	EN4, 17-18, 20-21
		Single rafter	R-38 + R-5 c.i.	EN5, 17, 20-21
		Surface reflectance/emittance	No recommendation	
	Walls	Mass (HC > 7 Btu/ft^2)	R-11.4 c.i.	EN6, 17, 20-21
		Metal building	R-13 + R-13	EN7, 17, 20-21
		Steel framed	R-13 + R-7.5 c.i.	EN8, 17, 20-21
		Wood framed and other	R-13 + R-3.8 c.i.	EN9, 17, 20-21
		Below-grade walls	R-7.5 c.i.	EN10, 17, 20-21
	Floors	Mass	R-10.4 c.i.	EN11, 17, 20-21
		Steel framed	R-30	EN12, 17, 20-21
		Wood framed and other	R-30	EN12, 17, 20-21
	Slabs	Unheated	No recommendation	EN17, 19-21
		Heated	R-10 for 36 in.	EN14, 17, 19-21
	Doors	Swinging	U-0.70	EN15, 20-21
		Non-swinging	U-0.50	EN16, 20-21
	Vertical Glazing	Window to wall ratio (WWR)	20% to 40% maximum	EN23, 36-37
		Thermal transmittance	U-0.42	EN25, 31
		Solar heat gain coefficient (SHGC)	N, S, E, W - 0.46 N only - 0.46	EN27-28
		Window orientation	(A_N * $SHGC_N$ + A_S * $SHGC_S$) > (A_E * $SHGC_E$ + A_W * $SHGC_W$)	A_x–Window area for orientation x EN26-32
		Exterior sun control (S, E, W only)	Projection factor 0.5	EN24, 28, 30, 36, 40, 42 DL5-6
	Skylights	Maximum percent of roof area	3%	DL5-7, DL8, DL13
		Thermal transmittance	U-0.69	DL7, DL8, DL13
		Solar heat gain coefficient (SHGC)	0.39	DL8, DL13
Lighting	Interior Lighting	Lighting power density (LPD)	0.9 W/ft^2	EL1-2, 4, 8, 10-16
		Light source (linear fluorescent)	90 mean lumens/watt	EL4, 9, 17
		Ballast	Electronic ballast	EL4
		Dimming controls for daylight harvesting for WWR 25% or higher	Dim fixtures within 12 ft of N/S window wall or within 8 ft of skylight edge	DL1, 9-11, EL6-7
		Occupancy controls	Auto-off all unoccupied rooms	DL2, EL5, 6
		Interior room surface reflectances	80%+ on ceilings, 70%+ on walls and vertical partitions	DL3-4, EL3
HVAC	HVAC	Air conditioner (0-65 KBtuh)	13.0 SEER	HV1- 2, 4, 6, 12, 16-17, 20
		Air conditioner (>65-135 KBtuh)	11.0 EER/11.4 IPLV	HV1- 2, 4, 6, 12, 16-17, 20
		Air conditioner (>135-240 KBtuh)	10.8 EER/11.2 IPLV	HV1- 2, 4, 6, 12, 16-17, 20
		Air conditioner (>240 KBtuh)	10.0 EER/10.4 IPLV	HV1- 2, 4, 6, 12, 16-17, 20
		Gas furnace (0-225 KBtuh - SP)	80% AFUE or E_t	HV1- 2, 6, 16, 20
		Gas furnace (0-225 KBtuh - Split)	90% AFUE or E_t	HV1- 2, 6, 16, 20
		Gas furnace (>225 KBtuh)	80% E_c	HV1- 2, 6, 16, 20
		Heat pump (0-65 KBtuh)	13.0 SEER/7.7 HSPF	HV1- 2, 4, 6, 12, 16-17, 20
		Heat pump (>65-135 KBtuh)	10.6 EER/11.0 IPLV/3.2 COP	HV1- 2, 4, 6, 12, 16-17, 20
		Heat pump (>135 KBtuh)	10.1 EER/11.0 IPLV/3.1 COP	HV1- 2, 4, 6, 12, 16-17, 20
	Economizer	Air conditioners & heat pumps - SP	Cooling capacity > 54 KBtuh	HV23
	Ventilation	Outdoor air damper	Motorized control	HV7-8
		Demand control	CO_2 sensors	HV7, 22
	Ducts	Friction rate	0.08 in. w.c./100 feet	HV9, 18
		Sealing	Seal class B	HV11
		Location	Interior only	HV9
		Insulation level	R-6	HV10
SWH	Service Water Heating	Gas storage	90% E_t	WH1-4
		Gas instantaneous	0.81 EF or 81% E_t	WH1-4
		Electric storage 12 kW	EF > 0.99 – 0.0012xVolume	WH1-4
		Pipe insulation (d<1½ in./ d≥1½ in.)	1 in./ 1½ in.	WH6

Note: If the table contains "No recommendation" for a component, the user must meet the more stringent of either Standard 90.1 or the local code requirements in order to reach the 30% savings target.

Related Code or Regulatory Requirement
ASHRAE 90.1-2004, the state energy code for commercial buildings.

Potential Code Issues
There should be no code conflict to meet this requirement as it exceeds the state commercial energy code, ASHRAE 90.1-2004.

Associated LEED™ Credit
Energy & Atmosphere prerequisite 2: Minimum Energy Performance
Energy & Atmosphere credit 1: Optimize Energy Performance

6. Measurement & Verification
Intent
Provide for the ongoing accountability of building energy consumption over time.

Requirements
• Develop and implement a Measurement & Verification (M&V) Plan consistent with Option D: Calibrated Simulation (Savings Estimation Method 2), or Option B: Energy Conservation Measure Isolation, as specified in the International Performance Measurement & Verification Protocol (IPMVP) Volume III: Concepts and Options for Determining Energy Savings in New Construction, April, 2003.
• The M&V period shall cover a period of no less than one year of post-construction occupancy.

What You May See in a Project
Metering equipment to measure energy use.

Related Code or Regulatory Requirement
None

Potential Code Issues
There should be no code conflict to meet the requirements of this credit.

Associated LEED™ Credit
Energy & Atmosphere Credit 5: Measurement and Verification

7. Storage & Collection of Recyclables
Intent
Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

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

What You May See in a Project
A dedicated area within the building for recyclable materials. Special equipment for sorting, and or compacting the materials may also be included.

Related Code or Regulatory Requirement
None

Potential Code Issues
There should be no code conflict to meet the requirements of this prerequisite.

Associated LEED™ Credit
Materials and Resources Prerequisite 1: Storage and Collection of Recyclables

8. Construction Waste Management: Divert 50% from Disposal
Intent
Divert construction, demolition and land-clearing debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

Requirements
Recycle and/or salvage at least 50% of non-hazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or comingled. Excavated soil and land-clearing debris do not contribute to this credit. Calculations can be done by weight or volume, but must be consistent throughout.

What You May See in a Project
Designated areas on jobsite for recycling collection and storage

Related Code or Regulatory Requirement
The Somerset County Solid Waste Management Plan

Potential Code Issues
There should be no code conflict to meet the requirements of this credit. The Somerset County Solid Waste Management Plan requires recycling of wood scrap/unfinished lumber (only non-chemically treated, clean wood); cardboard, concrete, asphalt, masonry/paving materials, ferrous scrap, and nonferrous scrap metals.

Associated LEED™ Credit
Material and Resources Credit 2.1: Construction Waste Management: Divert 50% from Disposal

9. Recycled Content: 10% (post-consumer + ½ pre-consumer)
Intent
Increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials.

Requirements
Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost) of the total value of the materials in the project. The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

Mechanical, electrical and plumbing components and specialty items such as elevators shall not be included in this calculation. Only include materials permanently installed in the project.

Post-consumer material is defined as waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose.

Pre-consumer material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

What You May See in a Project
Many commonly used materials are available with recycled content such as: steel, acoustic ceiling tiles, gypsum board, carpet tile, and ceramic tile. Many types of insulation have recycled content such as: cellulose, mineral wool, cotton (see the Willow School case study in Section 4), fiberglass and polystyrene (a type of rigid insulation). Polyisocyanurate, another type of rigid insulation, also has recycled content, but may not meet the 10% requirement.

Related Code or Regulatory Requirement
None

Potential Code Issues
There should be no code conflict to meet the requirements of this credit as long as materials used for interior finishes and or insulation have the required flame spread index and smoke-developed index.

Associated LEED™ Credit
Materials and Resources Credit 4.1: Recycled Content: 10% (post-consumer + ½ pre-consumer)

10. Minimum IAQ Performance
Intent
Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants.

Requirements
Meet the minimum requirements of Sections 4 through 7 of ASHRAE 62.1-2004, Ventilation for Acceptable Indoor Air Quality. Mechanical ventilation systems shall be designed using the Ventilation Rate Procedure or the applicable local code, whichever is more stringent. Naturally ventilated buildings shall comply with ASHRAE 62.1-2004, paragraph 5.1.

Related Code or Regulatory Requirement
IBC Section 1202.4 for natural ventilation or International Mechanical Code 2006 section 403 for mechanical ventilation

Potential Code Issues
Compliance with ASHRAE 62.1-2004 Ventilation for Acceptable Indoor Air Quality, Sections 4 thru 7(as this credit requires) may not meet the International Mechanical Code requirement for ventilation rates. ASHRAE 62.1 ventilation rate procedure considers "zone air distribution effectiveness" or "system ventilation efficiency"… to determine ventilation rate, the International Mechanical Code does not. This requirement states "Mechanical ventilation systems shall be designed using the Ventilation Rate Procedure or the applicable local code, whichever is more stringent".

Associated LEED™ Credit
Indoor Environmental Quality Prerequisite 1: Minimum IAQ Performance

11. Construction IAQ Management Plan: During Construction
Intent
Reduce indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.

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

What You May See in a Project
Sealing off of ductwork during construction. If HVAC system is used during construction, filters at grilles and openings of MERV 8 or higher.

Related Code or Regulatory Requirement
None

Potential Code Issues
There should be no code conflict to meet the requirements of this credit. There are no code requirements for IAQ management plans.

Associated LEED™ Credit
Environmental Quality Credit 3.1: Construction IAQ Management Plan: During Construction

12. Low-Emitting Materials: Adhesives & Sealants
Intent
Reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirements
All adhesives and sealants used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the requirements of the following reference standards:
• Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management District (SCAQMD) Rule #1168. VOC limits are listed in the table below and correspond to an effective date of July 1, 2005 and rule amendment date of January 7, 2005.

Architectural Applications	VOC Limit [g/L less water]	Specialty Applications	VOC Limit [g/L less water]
Indoor Carpet Adhesives	50	PVC Welding	510
Carpet Pad Adhesives	50	CPVC Welding	490
Wood Flooring Adhesives	100	ABS Welding	325
Rubber Floor Adhesives	60	Plastic Cement Welding	250
Subfloor Adhesives	50	Adhesive Primer for Plastic	550
Ceramic Tile Adhesives	65	Contact Adhesive	80
VCT & Asphalt Adhesives	50	Special Purpose Contact Adhesive	250
Drywall & Panel Adhesives	50	Structural Wood Member Adhesive	140
Cove Base Adhesives	50	Sheet Applied Rubber Lining Operations	850
Multipurpose Construction Adhesives	70	Top & Trim Adhesive	250
Structural Glazing Adhesives	100		
Substrate Specific Applications	**VOC Limit [g/L less water]**	**Sealants**	**VOC Limit [g/L less water]**
Metal to Metal	30	Architectural	250
Plastic Foams	50	Nonmembrane Roof	300
Porous Material (except wood)	50	Roadway	250
Wood	30	Single-Ply Roof Membrane	450
Fiberglass	80	Other	420
Sealant Primers	**VOC Limit [g/L less water]**		
Architectural Non Porous	250		
Architectural Porous	775		
Other	750		

• Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36 requirements in effect on October 19, 2000.

Aerosol Adhesives:	VOC weight [g/L minus water]
General purpose mist spray	65% VOCs by weight
General purpose web spray	55% VOCs by weight
Special purpose aerosol adhesives (all types)	70% VOCs by weight

What You May See in a Project
Low VOC Adhesives and sealants meeting the South Coast Air Quality Management District Rule #1168 Limits; aerosol adhesives meeting the Green Seal Standard for Commercial Adhesives GS-36

Related Code or Regulatory Requirement
None

Potential Code Issues
There should be no code conflict to meet the requirements of this credit as long as materials used for interior finishes and or insulation have the required flame spread index and smoke-developed index.

Associated LEED™ Credit
Environmental Quality Credit 4.1: Low-Emitting Materials: Adhesives & Sealants

13. Low-Emitting Materials: Paints & Coatings
Intent
Reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

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

• Architectural paints, coatings and primers applied to interior walls and ceilings: Do not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, First Edition, May 20, 1993.
Not to exceed:
o Flats: 50 g/L
o Non-Flats: 150 g/L
• Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates: Do not exceed the VOC content limit of 250 g/L established in Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997.
• Clear wood finishes, floor coatings, stains, and shellacs applied to interior elements: Do not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.
o Clear wood finishes: varnish 350 g/L; lacquer 550 g/L
o Floor coatings: 100 g/L
o Sealers: waterproofing sealers 250 g/L; sanding sealers 275 g/L; all other sealers 200 g/L
o Shellacs: Clear 730 g/L; pigmented 550 g/L
o Stains: 250 g/L

What You May See in a Project
Low VOC paints meeting Green Seal Standards GS-11, Anti-corrosive and anti-rust paints meeting Green Seal Standard GC-03, Clear wood finish not exceeding the South Coast Air Quality Management District (SCAQMD) Rule 1113

Related Code or Regulatory Requirement
None

Potential Code Issues
There should be no code conflict to meet the requirements of this credit as long as materials used for interior finishes and or insulation have the required flame spread index and smoke-developed index.

Associated LEED™ Credit
Environmental Quality Credit 4.2: Low-Emitting Materials: Paints & Coatings

14. Low-Emitting Materials: Carpet Systems
Intent
Reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

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

What You May See in a Project
Carpet and carpet cushion meeting the Carpet and Rug Institute's Green Label Plus program. Carpet adhesive with a VOC limit of 50g/L

Related Code or Regulatory Requirement
None

Potential Code Issues
There should be no code conflict to meet the requirements of this credit as long as materials used for interior finishes and or insulation have the required flame spread index and smoke-developed index.

Associated LEED™ Credit
Environmental Quality Credit 4.3: Low-Emitting Materials: Carpet Systems

15. Low-Emitting Materials: Composite Wood & Agrifiber Products
Intent
Reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirements
Composite wood and agrifiber products used on the interior of the building (defined as inside of the weatherproofing system) shall contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins. Composite wood and agrifiber products are defined as: particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates and door cores. Materials considered fit-out, furniture, and equipment (FF&E) are not considered base building elements and are not included.

What You May See in a Project
Formaldehyde free medium density fiberboard (MDF), formaldehyde free plywood,

Related Code or Regulatory Requirement
None

Potential Code Issues
Materials used for interior finishes and or insulation have to meet code requirements for flame spread index and smoke-developed index.

In a related effort to avoid using pressure treated lumber, the Willow School used salvaged redwood for wall plates rather than pressure treated wood. Initially this was questioned by the code official, but the IBC does recognize heartwood of redwood, black locust or cedar as naturally durable and therefore acceptable in contact with masonry.

Associated LEED™ Credit
Environmental Quality Credit 4.4: Low-Emitting Materials: Composite Wood & Agrifiber Products

16. Controllability of Systems: Lighting
Intent
Provide a high level of lighting system control by individual occupants or by specific groups in multi-occupant spaces (i.e. classrooms or conference areas) to promote the productivity, comfort and well-being of building occupants.

Requirements
Provide individual lighting controls for 90% (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences.
AND
Provide lighting system controllability for all shared multi-occupant spaces to enable lighting adjustment that meets group needs and preferences.

What You May See in a Project
Lighting controls for individuals and specific groups. A mix of ambient and task lighting.

Related Code or Regulatory Requirement
ASHRAE 90.1-2004 (the commercial energy code in New Jersey) Section 9.4.1.2 Space Control. Each space enclosed by ceiling height partitions shall have at least one control device to independently control the general lighting within the space. Each manual device shall be readily accessible and located so the manual device shall be readily accessible and located so the occupants can see the controlled lighting.

Potential Code Issues
No conflict this requirement exceeds code for individual lighting control

Associated LEED™ Credit
Environmental Quality Credit 6.1: Controllability of Systems: Lighting

17. Thermal Comfort: Design
Intent
Provide a comfortable thermal environment that supports the productivity and well-being of building occupants.

Requirements
Design HVAC systems and the building envelope to meet the requirements of ASHRAE Standard 55-2004, Thermal Comfort Conditions for Human Occupancy. Demonstrate design compliance in accordance with the Section 6.1.1 Documentation. NOTE: Separate humidity control is not required.

Related Code or Regulatory Requirement
IBC 2006 Section 1203.1 The code requires that, "…space-heating systems capable of maintaining a minimum indoor temperature of 68°F (20°C) at a point 3 feet (914 mm) above the floor on the design heating day."

Potential Code Issues
There should be no conflict, the requirement exceeds code by requiring that the comfort criteria goes beyond air temperature and includes radiant temperature, air speed and relative humidity. That the system can maintain the code required temperature at the designated height should still be verified.

Associated LEED™ Credit
Environmental Quality Credit 7.1: Thermal Comfort: Design. NOTE: the Somerset County Program does not require separate humidity control. If a project is to pursue this LEED™ credit, separate humidity control must be provided.

18. Daylight & Views: Daylight 75% of Spaces
Intent
Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.
Requirements
OPTION 1 — CALCULATION
Achieve a minimum glazing factor of 2% in a minimum of 75% of all regularly occupied areas. The glazing factor is calculated as follows:

$$\text{Glazing Factor} = \frac{\text{Window Area [SF]}}{\text{Floor Area [SF]}} \times \text{Window Geometry Factor} \times \frac{\text{Actual } T_{vis}}{\text{Minimum } T_{vis}} \times \text{Window Height Factor}$$

OR

OPTION 2 — SIMULATION

Demonstrate, through computer simulation, that a minimum daylight illumination level of 25 footcandles has been achieved in a minimum of 75% of all regularly occupied areas. Modeling must demonstrate 25 horizontal footcandles under clear sky conditions, at noon, on the equinox, at 30 inches above the floor.

OR

OPTION 3 — MEASUREMENT

Demonstrate, through records of indoor light measurements, that a minimum daylight illumination level of 25 footcandles has been achieved in at least 75% of all regularly occupied areas. Measurements must be taken on a 10-foot grid for all occupied spaces and must be recorded on building floor plans.

In all cases, only the square footage associated with the portions of rooms or spaces meeting the minimum illumination requirements can be applied towards the 75% of total area calculation required to qualify for this credit.

In all cases, provide daylight redirection and/or glare control devices to avoid high-contrast situations that could impede visual tasks. Exceptions for areas where tasks would be hindered by the use of daylight will be considered on their merits.

What You May See in a Project

Combinations of daylight glazing and vision glazing, roof monitors, skylights, light shelves, shading devices, high performance glazing, photocell controls of electric lights

Related Code or Regulatory Requirement

None

Potential Code Issues

There should be no code conflict to meet the requirements of this credit. The code has requirements for light and air, but daylight is not specifically required.

Associated LEED™ Credit

Environmental Quality Credit 8.1: Daylight & Views: Daylight 75% of Spaces

Summary of Program Requirements

Somerset County Program	What You May See in a Project	Related Code/Regulation	Potential Code Issue	Associated LEED™ Credit
1. Construction Activity Pollution Prevention	Seeding to stabilize soil, mulching, silt fencing, sediment traps and basins	Soil Erosion and Sediment Control Act	Compliance with the Soil Erosion and Sediment Control Act fulfills the requirements of this prerequisite.	SS Prerequisite 1: Construction Activity Pollution Prevention
2. Water Efficient Landscaping: Reduce by 50%	Specification of native plantings, reduced turf areas, high efficiency irrigation systems, collection of rainwater for irrigation, use of on-site treated wastewater for irrigation.	No code requirement	Collected rainwater and or treated wastewater for reuse as landscape irrigation may raise issues of concern with the local health department.	WE Credit 1.1: Water Efficient Landscaping: Reduce by 50%
3. Building Commissioning		No code requirement		EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems EA Credit 3: Enhanced Commissioning
4. Fundamental Refrigerant Management		No code requirement		EA Prerequisite 3: Fundamental Refrigerant Management
5. Optimize Energy Performance	ASHRAE Advanced Energy Design Guide for Small Office Buildings prescriptive path for Zone 5	ASHRAE 90.1-2004	No conflict, exceeds state commercial energy code, ASHRAE 90.1-2004, by 21%	EA Prerequisite 2: Minimum Energy Performance EA Credit 1: Optimize Energy Performance
6. Measurement and Verification	Metering equipment to measure energy use.	No code requirement		EA Credit 5: Measurement and Verification
7. Storage & Collection of Recyclables	Areas within building for recycling	No code requirement		MR Prerequisite 1: Storage & Collection of Recyclables
8. Construction Waste Management: Divert 50% from Disposal	Designated areas on jobsite for recycling collection and storage	Somerset County Solid Waste Management Plan	The Somerset County Solid Waste Management Plan requires recycling of wood scrap/unfinished lumber (only non-chemically treated, clean wood); cardboard, concrete, asphalt, masonry/paving materials, ferrous scrap, and nonferrous scrap metals.	MR Credit 2.1: Construction Waste Management: Divert 50% from Disposal

Somerset County Program	What You May See in a Project	Related Code/Regulation	Potential Code Issue	Associated LEED™ Credit
9. Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	Recycled content steel, acoustic ceiling tiles, gypsum board, carpet tile, ceramic tile; insulation including: cellulose, mineral wool, fiberglass, polystyrene and polyisocyanurate	No code requirement	Materials used for interior finishes and or insulation have to meet code requirements for flame spread index and smoke-developed index.	MR Credit 4.1: Recycled Content: 10% (post-consumer + 1/2 pre-consumer)
10. Minimum IAQ Performance	Low volume displaced air ventilation	IBC Section 1202.4 for natural ventilation or International Mechanical Code 2006 section 403 for mechanical ventilation	Compliance with ASHRAE 62.1-2004 Ventilation for Acceptable Indoor Air Quality, Sections 4 thru 7(as this credit requires) may not meet the MEC requirement for ventilation rates. ASHRAE 62.1 ventilation rate procedure considers "zone air distribution effectiveness" or "system ventilation efficiency" to determine ventilation rate, the MEC does not. The requirement states "Mechanical ventilation systems shall be designed using the Ventilation Rate Procedure or the applicable local code, whichever is more stringent".	EQ Prerequisite 1: Minimum IAQ Performance
11. Construction IAQ Management Plan: During Construction	Sealing off of ductwork during construction. If HVAC system is used during construction, filters at grilles and openings of MERV 8 or higher.	No code requirement		EQ Credit 3.1: Construction IAQ Management Plan: During Construction
12. Low-Emitting Materials: Adhesives & Sealants	Low VOC Adhesives and sealants meeting the South Coast Air Quality Management District Rule #1168 Limits; aerosol adhesives meeting the Green Seal Standard for Commercial Adhesives GS-36	No code requirement	Materials used for interior finishes and or insulation have to meet code requirements for flame spread index and smoke-developed index.	EQ Credit 4.1: Low-Emitting Materials: Adhesives & Sealants

Somerset County Program	What You May See in a Project	Related Code/Regulation	Potential Code Issue	Associated LEED™ Credit
13. Low-Emitting Materials: Paints & Coatings	Low VOC paints meeting Green Seal Standards GS-11, Anti-corrosive and anti-rust paints meeting Green Seal Standard GC-03, Clear wood finish not exceeding the South Coast Air Quality Management District (SCAQMD) Rule 1113	No code requirement		EQ Credit 4.2: Low-Emitting Materials: Paints & Coatings
14. Low-Emitting Materials: Carpet Systems	Carpet and carpet cushion meeting the Carpet and Rug Institute's Green Label Plus program. Carpet adhesive with a VOC limit of 50g/L	No code requirement		EQ Credit 4.3: Low-Emitting Materials: Carpet Systems
15. Low-Emitting Materials: Composite Wood & Agrifiber Products	Formaldehyde free medium density fiberboard (MDF), formaldehyde free plywood,	No code requirement	Materials used for interior finishes and or insulation have to meet code requirements for flame spread index and smoke-developed index.	EQ Credit 4.4: Low-Emitting Materials: Composite Wood & Agrifiber Products
16. Controllability of Systems: Lighting	Lighting controls for individuals and specific groups. A mix of ambient and task lighting.	ASHRAE 90.1-2004 Section 9.4.1.2	9.4.1.2 Space Control. Each space enclosed by ceiling height partitions shall have at least one control device to independently control the general lighting within the space. Each manual device shall be readily accessible and located so the manual device shall be readily accessible and located so the occupants can see the controlled lighting. No conflict the requirement exceeds code for individual lighting control	EQ Credit 6.1: Controllability of Systems: Lighting

Somerset County Program	What You May See in a Project	Related Code/Regulation	Potential Code Issue	Associated LEED™ Credit
17. Thermal Comfort: Design		IBC 2006 Section 1203.1	The code requires that, "…space-heating systems capable of maintaining a minimum indoor temperature of 68°F (20°C) at a point 3 feet (914 mm) above the floor on the design heating day." the requirement exceeds code by requiring that the comfort criteria goes beyond air temperature and includes radiant temperature, air speed and relative humidity.	EQ Credit 7.1: Thermal Comfort: Design – *the program does not require separate humidity control, to achieve this LEED credit, separate humidity control is required.*
18. Daylight & Views: Daylight 75% of Spaces	Combinations of daylight glazing and vision glazing, roof monitors, skylights, light shelves, shading devices, high performance glazing, photocell controls of electric lights.	No code requirement	The code has requirements for light and air, but daylight is not specifically required.	EQ Credit 8.1: Daylight & Views: Daylight 75% of Spaces