LEED: EXISTING BUILDINGS
OPERATIONS & MAINTENANCE

Missouri Botanical Garden Commerce Bank Education Center

Transforming the Built Environment
Introductions

• Who are we?
  – Chris Laughman
  Corporate Facilities Manager
  • Leader in Graybar’s Corporate Sustainability Initiatives
  • Facility Manager for Corporate Headquarters Facilities
  • IEQ Team- CBEC

Other Team Members:
  Emily Andrews, Caryl Kinsey Fox,
  Polly Scott-Showalter, Jonathan Stern

Transforming the Built Environment
Missouri Botanical Garden Commerce Bank Center for Science Education

INDOOR ENVIRONMENTAL QUALITY
CLASS OVERVIEW

Transforming the Built Environment
Indoor Environmental Quality Overview

Americans spend an average of 90% of their time indoors.

Transforming the Built Environment
IS YOUR BUILDING QUALIFIED?

**Strategies in this topic to address IEQ**

- Increased ventilation
- Management of air contaminants
  - ETS
  - CO2
  - Particulate matter
- Implementation of green cleaning
- Specification of less harmful materials in purchasing
- Allow occupants to control desired settings
- Provide Daylighting and Views

Transforming the Built Environment
CATEGORY OVERVIEW

IS YOUR BUILDING QUALIFIED?

• Prerequisites
  • IEQp1 Minimum Indoor Air Quality Performance
  • IEQp2 Environmental Tobacco Smoke (ETS) Control
  • IEQp3 Green Cleaning Policy
Is Your Building Qualified?

- Indoor Environmental Quality Credits (IEQc)

*Three Categories of IEQ Credits:*

**c1. Indoor Air Quality Best Management Practices:**

- **✓ IEQc1.1** Indoor Air Quality Best Management Practices – Indoor Air Quality Management Program
- **✗ IEQc1.2** Indoor Air Quality Best Management Practices – Outdoor Air Delivery Monitoring
- **✗ IEQc1.3** Indoor Air Quality Best Management Practices – Increased Ventilation
- **✗ IEQc1.4** Indoor Air Quality Best Management Practices – Reduce Particulates in Air Distribution
- **✗ IEQc1.5** Indoor Air Quality Best Management Practices – IAQ Management for Facility Additions & Alterations
IS YOUR BUILDING QUALIFIED?

• Indoor Environmental Quality Credits (IEQc)

Three Categories of IEQ Credits:

c2. Occupant Comfort:

✓ IEQc2.1 Occupant Comfort – Occupant Survey
✓ IEQc2.2 Controllability of Systems – Lighting
✓ IEQc2.3 Occupant Comfort – Thermal Comfort Monitoring
× IEQc2.4 Daylight and Views
CATEGORY OVERVIEW

IS YOUR BUILDING QUALIFIED?

• Indoor Environmental Quality Credits (IEQc)

Three Categories of IEQ Credits:

c3. Green Cleaning:

✓ IEQc3.1 Green Cleaning – High Performance Cleaning Program
✗ IEQc3.2 Green Cleaning – Custodial Effectiveness Assessment
✓ IEQc3.3 Green Cleaning – Purchase of Sustainable Cleaning Products and Materials
✓ IEQc3.4 Green Cleaning – Sustainable Cleaning Equipment
✓ IEQc3.5 Green Cleaning – Indoor Chemical and Pollutant Source Control
✓ IEQc3.6 Green Cleaning – Indoor Integrated Pest Management
INDOOR ENVIRONMENTAL QUALITY
CLASS OVERVIEW

• Resources
  Time
  Money
  Teamwork
  LEED
CATEGORY OVERVIEW

RESOURCES. WHAT DID IT REALLY TAKE?

• Time

  – Building Tours
    • Informal interviews with key building personal & stakeholders, and building walk through
    • Review all drawings, reference guide, LEEDonline, etc.
    • Survey of building occupants
    • Coordination with EA Team
    • Additional focused building visits concentrating on particular credits with stakeholders and additional questions
      – Daylight and View Measurements
      – Controllability of Lighting Counts
      – Custodial Effectiveness Survey (Inspection)
CATEGORY OVERVIEW

RESOURCES. WHAT DID IT REALLY TAKE?

• Money
  – Some credits require capital investment to complete:
    • IEQc1.2 IAQ Best Mngt. - Outdoor Air
      (would require addition of CO2 monitoring devices)
    • IEQc1.3 IAQ Best Mngt. – Increased Ventilation
      (would require additional ability to deliver additional outdoor air but at conflict with Energy Efficiency without heat recovery equipment)
    • IEQc1.5 IAQ Mngt. Plan – Facility Alts & Additions
      (would require facility alteration during performance period)
  – Ability to capture readings on existing equipment
    • IEQc2.3 Thermal Comfort Monitoring
      (basically need a BAS system to provide tracking and optimization of temperatures)
CATEGORY OVERVIEW

RESOURCES. WHAT DID IT REALLY TAKE?

• The Indoor Environmental Quality Team
  Chris Laughman | Emily Andrews
  Caryl Kinsey Fox | Jonathan Stern | Polly Scott-Showalter

  – Broke down Topic Credits and Prereq’s into concentrated areas
  – The Cloud via Dropbox
  – CAD Drawings
  – Site Visits
  – Policy Review and Recommendations

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RESOURCES. WHAT DID IT REALLY TAKE?

- Key Players & Stakeholders
  - Facility Management Staff
    - Custodial Effectiveness Survey
    - Establish Facility Priorities – IEQ vs. EA Questions
  - Corporate Safety Management Staff
    - IAQ Management Plan Administration
  - Coordination for Survey Distribution
    - Approval, Distribution and Collection
  - Maintenance Staff
    - Readings to verify Prerequisite compliance
    - Other readings and initiative implementation
  - Custodial Staff
    - Green Cleaning Program and Documentation
  - Pesticide Vendor
    - Integrated Pest Management Program and Documentation
CATEGORY OVERVIEW

RESOURCES. WHAT DID IT REALLY TAKE?

• LEED Specific
  – Existing Documents
    • Monsanto Center LEED EB:O&M
    – LEED EB:O&M Reference Guide
    – LEEDUser.com
CATEGORY OVERVIEW

RESOURCES. WHAT DID IT REALLY TAKE?

• LEED Online
  – Log In…
    • Familiarize Yourself Ahead of Time
    • *Figure Out THE GOAL*
      – *not always the same as understanding the goal*
    • Work Backwards
  – Required Documentation?
  – Performance Period | **YES/NO**?
    • A specific timeframe allowed for measurement.
  – Who Signs off on the Documents?
• The Process | How did we do it?
• Credit Review

INDOOR ENVIRONMENTAL QUALITY
CREDIT X CREDIT INVESTIGATION

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HOW DID WE DO IT? WHAT DID WE DO?

• How *did* we do it?
  – Meeting the “Intent” of the Credit
  – Credit Analysis
    • Policy
    • Program
    • Plan
  – Scorecard
• Performance Period
  – What is it?
    • A specific timeframe allowed for measurement.
    • Can vary between Prerequisites & Credits
    • 3 Months to 2 Years, Preceding Certification
  – Implement tracking procedures beforehand
    • What information/procedures need(s) to be tracked
    how it will be tracked.
    • Who needs to be consulted and/or trained in order for
      tracking to be implemented.
**IEQp1 Minimum Indoor Air Quality Performance**

- **Credit Intent**
  - To establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the health and well-being of the occupants.

- **Requirements**
  - Meet ASHREA Standard 62.1-2007
  - If unable to meet, demonstrate 10 cfm per person of outside air at each air handling unit under all normal operating conditions.
• **IEQp1** Minimum Indoor Air Quality Performance

  – Plan, Policy, Program: **No**
  – Performance Period: **Yes**
    - Measurements demonstrating compliance need to be taken during performance period
  – Pre-LEED Preparation Opportunity: **Yes**
    - Evaluate your current outdoor air rate and insure compliance with ASHRAE 62.1-2007
IEQp1 Minimum Indoor Air Performance

- Meet with your Building Engineer and Facility Manager Early in the process to review this credit
- Determine how you will measure compliance
- Understand how the building is ventilated
- Understand how outdoor airflow rates are measured currently
IEQp1 Minimum Indoor Air Performance

- Data Collection, Monitoring, Calculations:
  - Air flow measurements will be taken at the air handling unit level

-Duct & Plenum Sensors: Minimum Placement Guidelines

- Locate probe at least one damper blade width (Y) upstream of the full open position of the intake damper.
- To avoid “false” wind readings, size AFMS for 200 FPM minimum velocity.
CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

IEQp1 Minimum Indoor Air Quality Performance

- Data Collection, Monitoring, Calculations:
  - Step 1: ASHREA 62.1-2007 compliance

Determine the Breathing Zone Outdoor Airflow for each zone

\[ V_{bz} = R_p \times P_z + R_a \times A_z \]

\( V_{bz} \) = breathing zone outdoor airflow
\( A_z \) = zone floor area (net occupiable floor area of the zone)
\( P_z \) = zone population (maximum number of people expected to occupy the zone during typical usage)
\( R_p \) = outdoor airflow rate required per person (table 6-1 in ASHREA standard)
\( R_a \) = outdoor airflow rate required per unit area (table 6-1 in ASHREA standard)

Transforming the Built Environment
IEQp1 Minimum Indoor Air Quality Performance

- Data Collection, Monitoring, Calculations:
  - Step 2: ASHREA 62.1-2007 compliance

Determine required zone outdoor airflow

\[ V_{oz} = \frac{V_{bz}}{E_z} \]

\( V_{oz} \) = zone outdoor airflow
\( V_{bz} \) = breathing zone outdoor airflow (determined in previous step)
\( E_z \) = zone air distribution effectiveness (see table 6-2 of standard)
CREDIT X CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

IEQp1 Minimum Indoor Air Quality Performance
- Documentation/Submission:
  demonstrate compliance with standard

<table>
<thead>
<tr>
<th>Zone ID</th>
<th>Occupancy Category</th>
<th>Outdoor Airflow Rate Required per person (Rp)</th>
<th>Zone Population (Pz)</th>
<th>Outdoor Airflow Rate Required per unit area (Ra)</th>
<th>Zone Floor Area (Az)</th>
<th>Zone Air Distribution Effectiveness (Ez)</th>
<th>Standard Zone (Voz)</th>
<th>Design Zone (Voz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Office</td>
<td>Office Space</td>
<td>5</td>
<td>45</td>
<td>.06</td>
<td>8000</td>
<td>1.0</td>
<td>.088</td>
<td>.0115</td>
</tr>
<tr>
<td>Class Room</td>
<td>Lecture Hall</td>
<td>7.5</td>
<td>40</td>
<td>.06</td>
<td>750</td>
<td>1.0</td>
<td>.46</td>
<td>.6</td>
</tr>
<tr>
<td>Break Room</td>
<td>Conference, meeting</td>
<td>5</td>
<td>12</td>
<td>.06</td>
<td>216</td>
<td>1.0</td>
<td>.338</td>
<td>.44</td>
</tr>
</tbody>
</table>

Transforming the Built Environment
IEQp1 Minimum Indoor Air Quality Performance

- Documentation Submission:
  Sample for naturally ventilated space

<table>
<thead>
<tr>
<th>Zone ID</th>
<th>Floor Area (sf)</th>
<th>Natural Ventilation Opening Area (sf)</th>
<th>Opening Areas as Percentage of Floor Area</th>
<th>Is Distance to opening 25 feet or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Office</td>
<td>8,000</td>
<td>336</td>
<td>4.20</td>
<td>Yes</td>
</tr>
<tr>
<td>Class Room</td>
<td>750</td>
<td>32</td>
<td>4.30</td>
<td>Yes</td>
</tr>
<tr>
<td>Break Room</td>
<td>216</td>
<td>12</td>
<td>5.60</td>
<td>Yes</td>
</tr>
</tbody>
</table>
IEQp1 Minimum Indoor Air Quality Performance

- Lessons learned, review, comments:
  - It is critical that this prerequisite, its requirements and how to address it be discussed early in the planning process.
  - Make sure that your building engineer or facility manager understands how to obtain the measurements you will need. It is not uncommon for outdoor airflow rate to be a lower priority and the facility may need assistance from an outside contractor to understand how this operates and was designed.
  - Don’t forget to document HVAC Preventative Maintenance.

- Exemplary Performance: No
- Related Credits: IEQ c1.3
HOW DID WE DO IT? WHAT DID WE DO?

• IEQp2 Environmental Tobacco Smoke (ETS) Control

  – Credit Intent
    • To prevent or minimize exposure of building occupants, indoor surfaces and systems to environmental tobacco smoke (ETS).

  – Requirements (This is easy – or hard depending on you)
    • Option 1: Prohibit smoking in building and within 25 feet of entries, outdoor air intakes and operable windows
    • Option 2: Option 1 requirements with exception of designated smoking rooms in which negative pressure must be demonstrated
• **IEQp2** Environmental Tobacco Smoke (ETS) Control
  – Plan, Policy or Program: **Yes - Policy**
  – Performance Period: **Yes**
    • Policy must be in place during performance period, if option 2, verification measurements taken during performance period
  – Pre-LEED Preparation Opportunity:
    • Review policies and insure compliance prior to process, if not in compliance establish compliance.
HOW DID WE DO IT? WHAT DID WE DO?

• **IEQp2** Environmental Tobacco Smoke (ETS) Control
  – Data Collection, monitoring, calculations: **No**
  – Documentation/submission:
    • Facility ETS Policy
    • Site plans which visually indicate how policy is implemented
    • Facility Manager/Owner sign off
  – Lessons learned, review, comments:
    • This policy was already in place so no challenge on this project
  – Exemplary performance: **No**
  – Related Credits: **No**

Transforming the Built Environment
• **IEQp3** Green Cleaning Policy

  – Credit Intent
  
  • Reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems and the environment.

  – Requirements
  
  • Demonstrate that the facility has a Green Cleaning Policy for the building and site in place.

  *Easy to meet... especially if facility has a policy in place.*

  *If not . . . developing a policy isn’t too difficult*
IEQp3 Green Cleaning Policy

- Plan, Policy or Program: Yes – Policy

Green Cleaning Policy Must Address:

- Purchase of Cleaning Products & Equipment
- Standard Operating Procedures for floor & carpet care
- Strategies for promoting and improving hand hygiene
- Guidelines addressing safe handling and storage of cleaning chemicals
- Staffing and training requirements for maintenance personnel
- Process for collecting & responding to occupant feedback
**CREDIT**

**HOW DID WE DO IT? WHAT DID WE DO?**

- **IEQp3 Green Cleaning Policy**
  - Performance Period: Yes
    - Policy must be in place during performance period
  - Pre-LEED Preparation Opportunity:
    - Review policies and insure compliance prior to process, if not in compliance establish compliance.
  - Data Collection, Monitoring, Calculations: No
  - Documentation / Submission:
    - Green Cleaning Policy
    - Owner / Facility Manager Signatory confirming that Green Cleaning Policy was in place during performance period

Transforming the Built Environment
CREDIT X CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

• **IEQp3** Green Cleaning Policy
  – Lessons learned, review, comments:
    • Relied too heavily on policy from Monsanto
    • Revised after review to include more on cleaning products (IEQc3.3), cleaning equipment (IEQc3.4), added qualitative goals & performance metrics
    • Helpful to work on the policy in conjunction with the high performance cleaning program (LEED User recommendation)
  – Exemplary Performance: **No**
  – Related Credits
    • IEQ c3.1 High Performance Cleaning Program
    • IEQ c3.2 Custodial Effectiveness Assessment
    • IEQ c3.3 Sustainable Cleaning Products & Materials
    • IEQ c3.4 Sustainable Cleaning Equipment

Transforming the Built Environment
• **IEQc1.1 Indoor Air Quality Best Management Practices – Air Quality Management Program** {1 pt}

  – **Credit Intent**
    • To enhance indoor air quality (IAQ) by optimizing practices to prevent the development of indoor air quality problems in buildings, correcting indoor air quality problems when they occur and maintaining the well-being of the occupants.

  – **Requirements**
    • Develop & implement on an ongoing basis an IAQ management program based on the EPA Indoor Air Quality Building Education & Assessment Model (I-BEAM).
• **IEQc1** Indoor Air Quality Best Management Practices – Air Quality Management Program
  
  – Plan, Policy, Program: **Yes – Program**
  
  • Using the US EPA I-BEAM program guidelines, designate an IAQ Manager for the facility. Using forms provided by I-BEAM program, record the basic conditions of the occupied spaces, mechanical systems and exterior.

  – Performance Period: **Yes**
  
  • During performance period, conduct an IAQ audit of the project building and associated grounds to determine the buildings IAQ status. No cost solutions must be implemented during performance period.
• **IEQc1** Indoor Air Quality Best Management Practices – Air Quality Management Program
  – Pre-LEED Preparation Opportunity: **Yes**
  • Prior to LEED, you can go to US EPA website:

  [www.epa.gov/iaq/largebldgis/i-beam/index.html](http://www.epa.gov/iaq/largebldgis/i-beam/index.html)

download the US EPA I-BEAM program. Familiarize yourself with the program, potentially launch the program prior to performance period.
IAQ in Large and Commercial Buildings

IAQ Building Education and Assessment Model (I–BEAM)

The Indoor Air Quality Building Education and Assessment Model (I–BEAM), released in 2002, is a guidance tool designed for use by building professionals and others interested in indoor air quality in commercial buildings. I–BEAM updates and expands EPA’s Building Air Quality guidance (the BAQ is still available via the web at www.epa.gov/iaq/largebldgs/baq_page.htm) and was designed to be a comprehensive state-of-the-art guidance for managing IAQ in commercial buildings. I–BEAM contains text, animation/visual, and interactive/calculation components that can be used to perform a number of diverse tasks.

With I–BEAM you will be able to: Improve indoor air quality (IAQ) within budget; Refine your maintenance program for IAQ; Better manage housekeeping services for IAQ; Conduct an indoor air quality building audit; Train management and staff in indoor air quality; Provide documentation that the building is following IAQ building practices; Reduce liability exposure to indoor air quality complaints; and, Improve the marketability of the building and rental space.

I–BEAM consists of many individual modules which explain different aspects of IAQ.
CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

• **IEQc1.1** Indoor Air Quality Best Management Practices – Air Quality Management Program
  – Data Collection, monitoring, calculations: **Yes**
    • Walk thru IAQ audit must be completed, including occupied spaces, mechanical systems and exterior. Data is collected on I-BEAM program forms.
  – Documentation/submission:
    • Development and documentation of I-BEAM program to include tracking IAQ Inspections
    • Track all IAQ audit results and note when IAQ related issues will be remediated
    • All no cost remedies completed prior to end of performance period
    • Facility Manager/Owner sign off

Transforming the Built Environment
• **IEQc1.1** Indoor Air Quality Best Management Practices – Air Quality Management Program
  
  – Lessons learned, review, comments:
    • The Missouri Botanical Gardens had set up an I-BEAM program with the Monsanto Building, so the program was basically in place.
  
  – Exemplary performance: **No**

  – Related Credits:
    • **IEQc3.6** Indoor Integrated Pest Management
• **IEQc1.2** Indoor Air Quality Best Management Practices – Outdoor Air Delivery Monitoring {1 pt}

  – Credit Intent
    • To provide capacity for ventilation system monitoring to help sustain occupant comfort and well-being.

  – Requirements
    • Install permanent, continuous monitoring systems that provide feedback on ventilation system performance to insure that ventilation systems maintain minimum outdoor airflow rates under all operating conditions.
**IEQc1.2** Indoor Air Quality Best Management Practices – Outdoor Air Delivery Monitoring

- **Requirements (continued)**
  - Mechanical Ventilation: Provide outdoor airflow measurement device capable of measuring, and if needed controlling, the minimum airflow rate at all expected system operating conditions within 15% of the design minimum outdoor air rate.
  - Mechanical Ventilation in densely occupied spaces: CO2 sensors must be located within 3 and 6 feet above the floor and must have accuracy of no less than 75 ppm. CO2 sensors must be monitored and alarmed, with alarm visible to the building operator if any zone rises more than 15% above the minimum outdoor air rate required by ASHREA 62.1-2007.
  - Natural Ventilation: CO2 sensors must be located in the breathing zone of every densely populated room, with alarm if conditions exceed 530 ppm above outdoor CO2 levels or 1,000 ppm absolute.
HOW DID WE DO IT? WHAT DID WE DO?

• **IEQc1.2** Indoor Air Quality Best Management Practices – Outdoor Air Delivery Monitoring

  – Why not?
    • The building was equipped with sensors to accommodate monitoring. Time and budget prevented installation during performance period.

  – Plan, Policy or Program: **No**
  – Performance Period: **No**

  – Pre-LEED Preparation Opportunity:
    • Installation of monitors requires pre-planning and potentially capital investment. By planning for installation prior to LEED project, a facility would increase its ability to meet the requirements of this credit.

Transforming the Built Environment
• **IEQc1.2** Indoor Air Quality Best Management Practices – Outdoor Air Delivery Monitoring
  
  – Data Collection, monitoring, calculations: *Yes*
    * If this credit were pursued, calculations would need to be completed to show compliance with requirements.
  
  – Documentation/submission:
    * Visual documentation of monitoring devices; i.e. floor plans, schematics, elevations and mechanical schedules
    * Track calibration and maintenance of all airflow measurement devices
    * Be aware of and implement the manufacturers recommended calibration for all monitoring devices
CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

• IEQc1.2 Indoor Air Quality Best Management Practices – Outdoor Air Delivery Monitoring
  – Lessons learned, review, comments:
    • This credit requires pre-performance period planning and willingness to invest in IAQ by facility ownership
  – Exemplary performance: No
  – Related Credits:
    • IEQp1 Outside Air Introduction and Exhaust Systems
• **IEQc1.3 Indoor Air Quality Best Management Practices – Increased Ventilation** {1 pt}

  – Credit Intent
    • To provide additional outdoor air ventilation to improve indoor air quality (IAQ) for improved occupant comfort, well-being and productivity.

  – Requirements
    • Mechanically Ventilated Spaces must increase outdoor air ventilation rates for all air-handling units serving occupied spaces by at least 30% above the minimum required by ASHREA Standard 62.1-2007.
• **IEQc1.3** Indoor Air Quality Best Management Practices – Increased Ventilation

  – Requirements (continued)
    • Naturally Ventilated Spaces must show that the natural ventilation systems design meets the recommendations set forth in the CIBSE manuals appropriate to project space.
    Or
    • Use a microscopic, multizone, analytic model to predict that room-by-room airflows will affectively naturally ventilate, defined as providing minimum ventilation rates required by ASHREA 62.1-2007 in at least 90% of occupied spaces.
CREDIT X CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

- **IEQc1.3 Indoor Air Quality Best Management Practices – Increased Ventilation**
  - Why not?
    - The building air supply was not designed to provide the additional ventilation required by this credit. It should be noted, this credit requires careful calculation of the effect of increased ventilation upon energy efficiency. The addition of heat collection equipment from return air would help reduce the additional energy usage required.
  - Plan, Policy or Program: **No**
  - Performance Period: **No**

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• **IEQc1.3** Indoor Air Quality Best Management Practices – Increased Ventilation

  – Pre-LEED Preparation Opportunity:
    • Installation of heat recovery equipment on return air would help reduce the increased energy consumption from the additional ventilation rates required. By planning for installation prior to LEED project, a facility would increase its ability to meet the requirements of this credit.

  – Data Collection, monitoring, calculations: Yes
    • If this credit were pursued, calculations would need to be completed to show compliance with requirements.
HOW DID WE DO IT? WHAT DID WE DO?

- **IEQc1.3 Indoor Air Quality Best Management Practices – Increased Ventilation**
  - Documentation/submission:
    - For mechanically ventilated spaces, maintain a summary showing that flow rate targets are met under normal operating conditions.
    - For naturally ventilated spaces, procure building design documentation that shows compliance with CIBSE Applications Manual 10.
**How did we do it? What did we do?**

- **IEQc1.3** Indoor Air Quality Best Management Practices – Increased Ventilation
  
  - **Lessons learned, review, comments:**
    
    - This credit requires pre-performance period planning and willingness to invest in IAQ by facility ownership. It also takes an understanding of the potential decrease in energy efficiency and understanding of strategies to minimize this decrease.
  
  - **Exemplary performance:** No
  
  - **Related Credits:**
    
    - IEQp1  Outside Air Introduction and Exhaust Systems
    - IEQc1.2  Outdoor Air Delivery Monitoring
• **IEQc1.4** Indoor Air Quality Best Management Practices – Reduce Particulates in Air Distribution {1 pt}

  – **Credit Intent**
    • To reduce exposure of building occupants and maintenance personnel to potentially hazardous particulate contaminants, which adversely affect air quality, human health, building systems and the environment.

  – **Requirements**
    • Have in place filtration media with a minimum efficiency reporting value (MERV) of 13 or greater for all outside air intakes and inside air recirculation returns during the performance period. Establish and follow a regular schedule for maintenance and replacement of these filtration media according to the manufacturer’s recommended interval.
• IEQc1.4 Indoor Air Quality Best Management Practices – Reduce Particulates in Air Distribution

- Why not?

• There was a learning curve concerning filtration media technology and concerns presented by building engineering and facility management staff. Some MERV 13 filters can add higher pressure drop, resulting in higher energy use or equipment re-calibration being required. In addition some MERV 13 filters can cost more, especially if changed out of cycle and could require adjustment to the filter tray dimensions. However, technology advances have reduced many of these concerns. Subsequent generation filters are produced with low pressure drop, which are designed to fit in the existing filter trays and are competitively priced when life cycle costing is factored in.
• **IEQc1.4 Indoor Air Quality Best Management Practices – Reduce Particulates in Air Distribution**
  
  – Plan, Policy or Program: **No**
  – Performance Period: **No**
  – Pre-LEED Preparation Opportunity:
    • This credit is not difficult to achieve, however it is more easily accomplished if the change to MERV 13 filters can be accomplished on the normal filter replacement cycle to reduce additional expense. It is also advised to begin discussions about MERV 13 in advance of the performance period so objections can be addressed.

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• **IEQc1.4** Indoor Air Quality Best Management Practices – Reduce Particulates in Air Distribution
  – Data Collection, monitoring, calculations: **No**
  – Documentation/submission:
    • Document compliance with credit requirements
    • Provide a maintenance schedule and log for filter replacement
  – Lessons learned, review, comments:
    • More upfront planning and education on filtration technology advances can reduce apprehension and assist in implementation.
  – Exemplary performance: **No**
  – Related Credits:
    • **IEQp1** Outside Air Introduction and Exhaust Systems
CREDIT X CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

• IEQc1.5 Indoor Air Quality Best Management Practices – Indoor Air Quality Management for Facility Additions and Alterations {1 pt}

  – Credit Intent
    • To prevent indoor air quality (IAQ) problems resulting from any construction or renovation projects to help sustain the comfort and well-being of construction workers and building occupants.

  – Requirements
    • Develop and implement an IAQ management plan for the construction and occupancy phases:
• **IEQc1.5 Indoor Air Quality Best Management Practices – Indoor Air Quality Management for Facility Additions and Alterations**

  – Requirements (cont)
    – 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.
    – If facility undergoes a tenant improvement, develop and implement an IAQ management plan for all phases that includes a flush-out procedure that supplies a total of 14,000 cubic square foot per square foot while maintaining an internal temperature of 60 degrees and humidity no higher then 60%.
    – Protect stored on-site or installed absorptive materials from moisture damage.
    – If permanent air handlers are used during construction, cover all return air grilles with MERV 8 filters.
CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

• **IEQc1.5** Indoor Air Quality Best Management Practices – Indoor Air Quality Management for Facility Additions and Alterations
  – Plan, Policy or Program: **No**
  – Performance Period: **No**
  – Pre-LEED Preparation Opportunity:
    • Discuss with Facility Management/Ownership if facility improvements are planned, if they can coordinate with the performance period and IAQ plan is utilized an additional point can be gained.

Transforming the Built Environment
• **IEQc1.5** Indoor Air Quality Best Management Practices – Indoor Air Quality Management for Facility Additions and Alterations
  
  – Data Collection, monitoring, calculations: **Yes**
    • Flush-out procedure calculations documented to show compliance
  
  – Documentation/submission:
    • Provide Construction IAQ Management Plan
    • Maintain a photo log of construction IAQ plan documenting implementation
    • Provide Documentation of flush-out
    • Facility Manager Sign Off
  
  – Exemplary performance: **No**
• **IEQc2.1 Occupant Comfort – Occupant Survey** {1 pt}

  – **Credit Intent**
    • To provide for the assessment of building occupants comfort as it relates to thermal comfort, acoustics, indoor air quality (IAQ), lighting levels, building cleanliness and any other comfort issues.

  – **Requirements**
    • Implement an occupant comfort survey and complaint response system to collect anonymous responses about thermal comfort, acoustics, IAQ, lighting levels, building cleanliness and other occupant comfort issues. The survey must be collected from a representative sample of building occupants making up at least 30% of the total occupants.
• **IEQc2.1 Occupant Comfort – Occupant Survey**
  
  – Plan, Policy, Program: **No**
  – Performance Period: **Yes**
    • During performance period, conduct an occupant survey with a minimum of 30% response.
  
  – Pre-LEED Preparation Opportunity: **No**
  – Data Collection, monitoring, calculations: **Yes**
    • Survey of building occupants to collect responses
  
  – Documentation/submission:
    • Provide documentation of survey
    • Use both qualitative and quantitative reports to compile survey results
    • Create corrective action plan

Transforming the Built Environment
• **IEQc2.1 Occupant Comfort – Occupant Survey**

  - Lessons learned, review, comments:
    - The survey provided useful insights that assisted in implementation of other initiatives connected with the LEED O&M project:
      - Occupants surveyed revealed dissatisfaction with lighting levels, actually expressing that it was over lit. This provided leverage to assist EA Team in delamping strategy to reduce energy usage.
      - Occupants surveyed complained about cleaning, however the issues expressed were actually tenant responsibilities. This revealed an underlying misunderstanding of what the responsibilities are for the cleaning staff and helped occupants understand their own responsibilities. Communication strategies could then be implemented to address the misinformation.
HOW DID WE DO IT? WHAT DID WE DO?

- **IEQc2.1** Occupant Comfort – Occupant Survey

CBEC LEED EBOM, IEQ Occupant Comfort Survey
Executive Summary

The occupants of the CBEC building on the Missouri Botanical Gardens Campus were given an occupant survey which concluded on February 15, 2012. This survey asked their opinion about the building/spaces in which they work. Questions included their opinion of furnishings, air temperature and quality, lighting and acoustics, overall building cleanliness, as well as whether these enhanced or interfered with their ability to get work done. Participants were asked to respond using a rating scale from 1 (very satisfied) to 7 (very unsatisfied) with 4 being a neutral opinion.

34 out of 52 occupants responded to the survey, reflecting 65% of the total building occupants. Areas of concern would be when more than 20% of the respondents have less than neutral responses. Since 20% of 34 is 6.8, 7 or more unsatisfied responses (giving a 5, 6, or 7 rating) have been further studied for the nature of the comments. Occupants also noted in which department they work so that negative comments can be isolated to specific locations in the building.

**Category 1 – Workspace Environment**
• **IEQc2.1** Occupant Comfort – Occupant Survey
  – Exemplary performance: **No**
  – Related Credits:
    • **IEQp1** Minimum Indoor Air Quality Performance
    • **IEQc2.3** Thermal Comfort Monitoring
HOW DID WE DO IT? WHAT DID WE DO?

• **IEQc2.2 Controllability of Systems - Lighting {1 pt}**
  
  – Credit Intent
    • To provide a high level of lighting system control by individual occupants or groups in multi-occupant spaces (e.g. classrooms or conference areas) to promote the productivity, comfort and well-being of building occupants.

  – Requirements
    • For at least 50% of building occupants, use lighting controls that enable adjustments to suit the task needs and preferences of individuals for at least 50% of individual workstations, and for groups sharing a multi-occupant space or working area for at least 50% of multi-occupant space in the building.
**CREDIT X CREDIT**

**HOW DID WE DO IT? WHAT DID WE DO?**

- **IEQc2.2 Controllability of Systems - Lighting** {1 pt}
  
  - Plan, Policy, Program: No
  - Performance Period: Yes

  - During performance period, conduct audit documenting compliance of 50% of individual and 50% of multi-occupant spaces.

  - Pre-LEED Preparation Opportunity: Yes

  - Prior to LEED project, initiate project to insure task lighting is provided to building occupants in accordance with credit guidelines.

  - Data Collection, monitoring, calculations: Yes

  - Audit will be required to calculate compliance, number of building occupants will need to be known for this credit and identification of individual workstations and multi-occupant space. Calculations will be completed to document the percentage in compliance with credit guidelines.
• **IEQc2.2 Controllability of Systems - Lighting** {1 pt}
  
  – **Documentation/submission:**
    
    • Floor plan showing where workstations are located and where multi-occupant spaces are located and which locations have individual lighting controls.
  
  – **Lessons learned, review, comments:**
    
    • With some planning, exemplary performance can be achieved on this credit if all building occupants are assigned task lighting.
  
  – **Exemplary performance:**
    
    • 95% occupant controlled lighting in both individual workstations and multi-occupant spaces
  
  – **Related Credits:**
    
    • IEQc2.4 Daylighting and Views
• **IEQc2.3 Occupant Comfort – Thermal Comfort Monitoring** {1 pt}
  
  – **Credit Intent**
  
  • To support the appropriate operations and maintenance of buildings and building systems so they continue to meet target building performance goals over the long term and provide a comfortable thermal environment that supports the productivity and well-being of building occupants.

  – **Requirements**
  
  • Have in place a system for continuous tracking and optimization of systems that regulate indoor comfort and conditions (air temperature, humidity, air speed and radiant temperature) in occupied spaces. Monitoring system must be permanent and insure compliance with ASHREA 55-2004.
• **IEQc2.3** Occu$pant Comfort – Thermal Comfort Monitoring
  – Requirements (continued)
  • The building must establish the following:
    – Continuous monitoring of air temperature and humidity in occupied spaces (sampling interval cannot exceed 15 minutes)
    – Periodic testing of air speed and radiant temperature in occupied spaces (using handheld devices is permitted)
    – Alarms for conditions that require system adjustment or repair
    – Procedures that deliver prompt adjustments or repairs in response to problems identified
    – All monitoring devices must be calibrated within the manufacturer’s recommended interval
• **IEQc2.3 Occupant Comfort – Thermal Comfort Monitoring**
  – **Why Not?**
    • The current building automation (BAS) system did not monitor all of the requirements of this credit. We were unable to obtain commitment to expand the BAS to cover the required monitoring.
  – **Plan, Policy, Program:** **No**
  – **Performance Period:** **No**
  – **Pre-LEED Preparation Opportunity:** **Yes**
    • Prior to LEED project, initiate project to insure building automation system is present and can provide the requirements of this credit. Also insure building engineering is performing maintenance on the BAS, to include sensor calibration.
How did we do it? What did we do?

- **IEQc2.3 Occupant Comfort – Thermal Comfort Monitoring**
  - Data Collection, monitoring, calculations: No
  - Documentation/submission:
    - Maintain a log showing building automation monitoring of air temperature, humidity and air speed
    - Maintain records of system sensors and actuator calibration
  - Lessons learned, review, comments:
    - MOBOT had connected the facility to their Andover Building Automation System, unfortunately the BAS did not provide the required monitoring. Expansion of sensors to cover required monitoring was unable to be accomplished for this project.
  - Exemplary performance: No
  - Related Credits:
    - EAc3.1 Performance Measurement – Building Automation System
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CREDIT X CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

• IEQc2.4 Daylight and Views {1 pt}

  – Credit Intent
    • To provide building occupants with a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.

  – Requirements
    • Project teams must achieve the performance thresholds in either the daylight or views requirements:
      o For Views achieve direct line of sight to outdoor environment via vision glazing between 30 inches and 90 inches above the finished floor for building occupants in 45% of all regularly occupied areas.
• **IEQc2.4** Daylight and Views
  
  – Requirements (continued)
    
    – Daylighting paths:
      
      o Path 1 – Simulation: Through computer simulations demonstrate 50% or more of all regularly occupied space areas achieve 25 footcandles (fc) and a maximum of 500 fc in clear conditions on September 21 at 9am and 3 pm.
      
      o Path 2 – Prescriptive: Use a combination of side-lighting and/or top lighting to achieve a total daylighting zone that is at least 50% of all regularly occupied spaces.
      
      o Path 3 – Measurement: Demonstrate through records of indoor light measurements that a minimum daylight illumination level of 25 fc is achieved in 50% of all regularly occupied areas.
      
      o Path 4 – Combination of any of the above paths, documenting daylighting of a minimum of 50% of regularly occupied spaces.
• **IEQc2.4 Daylight and Views**
  
  – **Why Not?**
  
  • The configuration of the floor space within the facility did not lend itself to accomplishing the required percentage of daylighting or views. Strategies to increase the percentage of daylighting require capital expenditure and were not implemented in time for the performance period.
  
  – **Plan, Policy, Program:** No
  
  – **Performance Period:** No
  
  – **Pre-LEED Preparation Opportunity:** Yes
  
  • Prior to LEED project, initiate project to insure building is configured to provide the requirements of this credit.
• **IEQc2.4 Daylight and Views**
  – Data Collection, monitoring, calculations : **Yes**
    • Calculations and Data Collection required to demonstrate compliance
  – Documentation/submission:
    • Maintain documentation of floor plans, sections and elevations highlighting the location of regularly occupied spaces with a qualifying amount of daylight and/or views
    • Develop spreadsheet with calculations demonstrating compliance with daylighting and/or view requirements
  – Lessons learned, review, comments:
    • Make sure that floor plans are available that include configuration of work spaces. The construction of the facility may limit the ability to obtain this credit without significant capital investment. In addition, while daylighting and views have demonstrated the ability to produce increased productivity, they also can negatively impact HVAC performance and facility energy usage.
**CREDIT**

**HOW DID WE DO IT? WHAT DID WE DO?**

- **IEQc2.4 Daylight and Views**
  - Exemplary performance: **Yes**
    - Project must achieve both 75% of daylighting and 90% of views.
  - Related Credits:
    - IEQc2.2 Controllability of Systems - Lighting
    - MRc 2.2 Sustainable Purchasing – Furniture
      - Workstations with panels below 42 inches assist in achieving this credit
How Did We Do It? What Did We Do?

- **IEQc3.1 Green Cleaning – High Performance Cleaning Program** {1 pt}
  - Credit Intent
    - Reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems and the environment.
  - Requirements
    - High-performance cleaning program in place during performance period – supported by a Green Cleaning Policy (IEQp3)

An Expansion of the Green Cleaning Policy

Transforming the Built Environment
HOW DID WE DO IT? WHAT DID WE DO?

- **IEQc3.1** Green Cleaning – High Performance Cleaning Program
  
  - Plan, Policy, Program: **Yes – Program**
    - High Performance Cleaning Program must address:
      - Appropriate staffing plan
      - Personnel training in the hazards, use, maintenance, disposal and recycling of cleaning chemicals
      - Proper use of chemical concentrates
      - Use of sustainable cleaning materials, hard floor and carpet care products meeting criteria in IEQc3.3
      - Use of cleaning equipment meeting criteria in IEQc3.4

  - Performance Period: **Yes**
CREDIT X CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

• **IEQc3.1 Green Cleaning – High Performance Cleaning Program**

  – Pre-LEED Preparation Opportunity: **Yes**
    • Examination of cleaning specifications and establishment of high performance cleaning program can be established prior to LEED project.

  – Data Collection, monitoring, calculations: **No**

Transforming the Built Environment
HOW DID WE DO IT? WHAT DID WE DO?

- **IEQc3.1 Green Cleaning – High Performance Cleaning Program**

  - **Documentation/submission:**
    - Provide documentation of high performance cleaning program
      - Insure program includes appropriate staffing plan that includes ongoing training
      - Maintain chemical usage log for any chemicals used within your building
      - Establish purchasing procedures (including tracking of purchases) of cleaning products, materials and equipment
    - Correlate requirements of program to page numbers in the uploaded program
HOW DID WE DO IT? WHAT DID WE DO?

• **IEQc3.1 Green Cleaning – High Performance Cleaning Program**
  – Lessons learned, review, comments:
    • We revised with more detailed narrative on staffing plan and cleaning chemical best practices
    • Updated Sustainable Purchasing Policy (MRp1) to include cleaning products, materials, and equipment
  – Tips:
    • Program = everything you need to implement policy
    • Submitted two versions of updated program: one “clean”; one with “track changes”
  – Exemplary Performance: **No**
  – Related Credits
    • IEQp3 Green Cleaning Policy
    • IEQc3.4 Sustainable Cleaning Equipment
    • IEQc3.2 Custodial Effectiveness Assessment
    • IEQc3.3 Sustainable Cleaning Products & Materials

Transforming the Built Environment
• **IEQc3.2 Green Cleaning – Custodial Effectiveness Assessment**  {1 pt}
  
  – Credit Intent
    • Reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems and the environment, by implementing, managing and auditing cleaning procedures and processes.
  
  – Requirements
    • Conduct audit using APPA Custodial Staffing Guideline
    • Determine appearance level of facility based on Guidelines
    • Must score 3 or less to achieve credit (Casual Inattention)
    • 10% of each space type AND 10% of total floor area cleaned must be audited
CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

• **IEQc3.2 Green Cleaning – Custodial Effectiveness Assessment**
  – Why Not?
    • In the end, we were denied credit because of typos!
      LESSON = have someone assigned to quality assurance and quality control!
  – Plan, Policy, Program: **No**
  – Performance Period: **Yes**
    • Assessment of 10% of each space type and 10% of total floor area cleaned must be audited during performance period
  – Pre-LEED Preparation Opportunity: **No**
• **IEQc3.2 Green Cleaning – Custodial Effectiveness Assessment**
  – Data Collection, monitoring, calculations: **Yes**
    • Audit should occur after any green cleaning policies are enacted
    • Space types should be identified to ensure they are included
    • APPA recommends a third party auditor, however allows for an in-house audit if this is not possible. 2 members from the project team or otherwise associated with the building, working separately, may perform the audit if trained in the process and a post audit quality control check is used to ensure accuracy
    • Final Score is aggregated for submission
How did we do it? What did we do?

- **IEQc3.2 Green Cleaning – Custodial Effectiveness Assessment**
  - Documentation/submission:
    - Owner or Facility Manager Signatory Required
    - Fill in table with:
      - Type of space (classroom, office, lobby, etc.)
      - Total area of each space type
      - Number of rooms in each space type
      - Number of rooms & area audited in each space type
      - Average score for each space type
    - Opportunities improved custodial effectiveness based on audit
  - Lessons learned, review, comments:
    - Did not audit enough rooms first time, so re-did audit
    - Square footage inconsistency in total building and amount audited required additional narrative to explain
    - Have someone assigned to quality assurance and quality control for submittals (typos, check compliance against guidelines, etc.)
• **IEQc3.2 Green Cleaning – Custodial Effectiveness Assessment**

  – Exemplary Performance: **Yes**
    • Facilities that score a 2 or less in appearance level (Ordinary Tidiness)

  – Related Credits:
    • IEQc3.1 High Performance Cleaning Program
    • IEQc3.3 Sustainable Cleaning Products & Materials
    • IEQc3.4 Sustainable Cleaning Equipment
CREDIT X CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

• **IEQc3.3 Green Cleaning – Purchase of Sustainable Cleaning Products and Materials** {1 pt}
  
  – Credit Intent
    • Reduce the environmental impacts of cleaning products, disposable janitorial paper products and trash bags.
  
  – Requirements
    • Implement sustainable purchasing for cleaning materials and products, disposable janitorial paper products and trash bags used by in-house staff or outsourced service providers.
    • 30% of the total annual purchases of products must meet at least one of specific sustainability criteria outlined in the Reference Guide (examples include Green Seal & Environmental Choice)

Transforming the Built Environment
• **IEQc3.3 Green Cleaning – Purchase of Sustainable Cleaning Products and Materials**
  
  – Plan, Policy, Program:  Yes
    
    • Sustainable Cleaning Product & Material Program
  
  – Performance Period:  Yes
    
    • Track and calculate the percentage of total cleaning products and materials purchased during the entire performance period, demonstrating that at least 30% meet requirements outlined in credit.
  
  – Pre-LEED Preparation Opportunity:  No
  
  – Data Collection, monitoring, calculations:  Yes
    
    • Track purchase of sustainable and non-sustainable cleaning products and materials by cost

**Transforming the Built Environment**
CREDIT X CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

• **IEQc3.3 Green Cleaning – Purchase of Sustainable Cleaning Products and Materials**
  
  – Documentation/submission:
    • Total cost of all cleaning products and materials purchased during performance period
    • Fill out table with:
      – Date of Purchase and Purchasing Entity (dept)
      – Item, cost and quantity purchased
      – Purchase category (paper product, hand soap, etc)
      – Sustainability Criteria
    • Documentation verifying compliance with sustainability criteria
HOW DID WE DO IT? WHAT DID WE DO?

- **IEQc3.3 Green Cleaning – Purchase of Sustainable Cleaning Products and Materials**
  - Lessons learned, review, comments:
    - Be sure to check in with custodial staff in advance:
    - Ensure that both Green Cleaning Policy and Sustainable Purchasing Policy reference requirements of this credit
    - Do the Products & Materials currently being used comply with LEED criteria?
    - Are purchases being tracked?
  - Exemplary Performance: Yes
    - 60% or more of total annual purchases of these products meets at least one of the required criteria
  - Related Credits
    - IEQp3: Green Cleaning Policy
    - IEQc3.1 Green Cleaning Program
    - MRp1: Sustainable Purchasing Policy
 Transforming the Built Environment

HOW DID WE DO IT? WHAT DID WE DO?

• **IEQc3.4 Green Cleaning – Sustainable Cleaning Equipment** {1 pt}
  
  – Credit Intent
    • Reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants that adversely affect air quality, human health, building finishes, building systems and the environment, from powered cleaning equipment
  
  – Requirements
    • Implement program for use of janitorial equipment that reduces building contaminants and minimizes environmental impact, addressing sustainability criteria of:
      o Vacuum cleaners
      o Carpet extraction equipment
      o Powered floor maintenance equipment
      o Propane-powered floor equipment
      o Automated scrubbing machines
      o Battery-powered equipment
• **IEQc3.4 Green Cleaning – Sustainable Cleaning Equipment**
  
  – **Plan, Policy, Program**: **Yes**
    - Sustainable Cleaning Equipment Program
  
  – **Performance Period**: **Yes**
    - Track and calculate the percentage of total cleaning products and materials purchased during the entire performance period, demonstrating that all powered cleaning equipment and at least 20% of all janitorial meet requirements of at least 1 of the sustainability criteria required by this credit.
  
  – **Pre-LEED Preparation Opportunity**: **No**
  
  – **Data Collection, monitoring, calculations**: **Yes**
    - Collect information on powered cleaning equipment
    - Track repair and maintenance of powered cleaning equipment
    - Track any purchase of powered equipment

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X CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

• **IEQc3.4 Green Cleaning – Sustainable Cleaning Equipment**
  – Documentation/submission:
    • Facility Manager Signatory
    • Fill out table to include:
      – Powered janitorial equipment name
      – Date and cost of equipment purchase
      – Product category (i.e. Vacuum Cleaner, Automated Scrubbing Machine)
    – Sustainability Criteria
    • Documentation verifying compliance with sustainability criteria for any purchases
    • Equipment Repair and Maintenance Logs
Transforming the Built Environment

CREDIT X CREDIT

HOW DID WE DO IT? WHAT DID WE DO?

- **IEQc3.4 Green Cleaning – Sustainable Cleaning Equipment**
  - Lessons learned, review, comments:
    - **TIP:** You can extend performance period to include date of a purchase
    - Be sure to check in with custodial staff in advance:
    - Which sustainability criteria applies to which piece of equipment?
    - Are they tracking repair and maintenance?
    - Are equipment purchases being tracked?
    - Ensure any purchases made during performance period meet sustainability criteria
  
  - Exemplary Performance: **No**
  
  - Related Credits
    - IEQp3: Green Cleaning Policy
    - IEQc3.1 Green Cleaning Program
    - MRp1: Sustainable Purchasing Policy
HOW DID WE DO IT? WHAT DID WE DO?

- **IEQc3.5 Green Cleaning – Indoor Chemical and Pollutant Source Control** {1 pt}
  - **Credit Intent**
    - To reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems and the environment.
  - **Requirements**
    - Use permanent entryway systems at least 10 feet long to capture dirt and particulates entering the building at all public entry points.
    - Develop associated cleaning strategies to maintain those entryway systems as well as exterior walkways.
    - Public entryways not in use or serve only as emergency exits and private offices are excluded.
HOW DID WE DO IT? WHAT DID WE DO?

- **IEQc3.5 Green Cleaning – Indoor Chemical and Pollutant Source Control**
  - Plan, Policy, Program: **No**
  - Performance Period: **No**
  - Pre-LEED Preparation Opportunity: **Yes**
    - Prior to LEED project, facility could convert entryway mat system to a compliant, permanently installed system and institute appropriate janitorial services. This could however result in capital expense if not already existing.
  - Data Collection, monitoring, calculations: **No**
• **IEQc3.5 Green Cleaning – Indoor Chemical and Pollutant Source Control**
  - Documentation/submission:
    • Facility Manager Signatory
    • Floor plan highlighting all entryways and entryway systems with unused or emergency exits marked
    • Narrative describing cleaning strategies used on entryways and exterior walkways
  - Lessons learned, review, comments:
    • Either you have the entryway systems or you don’t
    • Could add appropriately sized walk off mats would be a low-cost way to achieve another credit
  - Exemplary Performance: **No**
HOW DID WE DO IT? WHAT DID WE DO?

- **IEQc3.6 Green Cleaning – Indoor Integrated Pest Management** {1 pt}
  - Credit Intent
    - To reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems and the environment.
  - Requirements
    - Cleaning Products must meet criteria in IEQc3.3
    - Integrated Pest Management Plan must include:
      - Integrated methods
      - Routine pest & site inspections and maintenance
      - Pest population monitoring
      - Evaluation of the need for pest control
      - Specification of the circumstances under which an emergency application of pesticides can be conducted
      - Communication strategy if pesticides other than least-toxic options are used
• **IEQc3.6** Green Cleaning – Indoor Integrated Pest Management
  
  – Plan, Policy, Program: **Yes**
    • Integrated Pest Management Plan
  
  – Performance Period: **Yes**
  
  – Pre-LEED Preparation Opportunity: **Yes**
    • Prior to LEED project, facility should meet with Pest Control Vendor (if applicable) and determine if current program meets IPM criteria. If not, transition to an IPM program as outlined in this credit.
  
  – Data Collection, monitoring, calculations: **Yes**
    • Track any pesticide application during performance period, including date and circumstances
• **IEQc3.6 Green Cleaning – Indoor Integrated Pest Management**
  - Documentation/submission:
    • Facility Manager Signatory
    • Integrated Pest Management Plan
    • Log noting any pesticide application during performance period
  - Lessons learned, review, comments:
    • Be sure to give internal staff notice that you’ll need log at end of performance period
  - Exemplary Performance: **No**

  - Related Credits
    • SSc3 Integrated Pest Management, Erosion Control and Landscape Management
LEED – Existing Buildings Operations & Maintenance

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