The Industrial Hygienist Role In The U.S. Green Building Council’s LEED® Certification Process

PO-128

David Regelbrugge, CIH, CSP
Gary N. Crawford, CIH
Steve Blonz, AIA
PH: 847-692-4700
E-Mail: dcr@boelterassociates.com

AIHce
June 2-7, 2007
Philadelphia, Pennsylvania
What Is LEED Certification?

- Leadership in
- Energy and
- Environmental
- Design

Source: USGBC web site
What Does LEED Address?

- **Green Building Design/Sustainability**
  - Building design that meet specific standards that reduces the impact on occupants and the environment
Available LEED Programs

- LEED-NC - NC - New Construction
- LEED-CI - CI - Commercial Interiors
- LEED-EB - EB - Existing Buildings
- LEED-CS - CS - Core & Shell
- LEED-Homes - Homes
- LEED-Schools - Schools
- LEED-ND - Neighborhood development
Categories Within LEED

- Site Planning
- Water Management
- Material Usage
- Energy Performance
- Innovation & Design
- Indoor Environmental Quality
<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Points</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable Site</td>
<td>14</td>
<td>20%</td>
</tr>
<tr>
<td>Water Efficiency</td>
<td>5</td>
<td>7%</td>
</tr>
<tr>
<td>Energy Performance</td>
<td>17</td>
<td>25%</td>
</tr>
<tr>
<td>Material Usage</td>
<td>13</td>
<td>19%</td>
</tr>
<tr>
<td>Indoor Environmental Quality</td>
<td>15</td>
<td>22%</td>
</tr>
<tr>
<td>Innovation &amp; Design</td>
<td>5</td>
<td>7%</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>69</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
## Levels of LEED Certification

<table>
<thead>
<tr>
<th>Certification</th>
<th>LEED-NC</th>
<th>LEED-EB</th>
<th>LEED-CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Platinum</strong></td>
<td>52-69 pts</td>
<td>64-85 pts</td>
<td>42-57 pts</td>
</tr>
<tr>
<td><strong>Gold</strong></td>
<td>39-51 pts</td>
<td>48-63 pts</td>
<td>32-41 pts</td>
</tr>
<tr>
<td><strong>Silver</strong></td>
<td>33-38 pts</td>
<td>40-47 pts</td>
<td>27-31 pts</td>
</tr>
<tr>
<td><strong>Certified</strong></td>
<td>25-32 pts</td>
<td>32-39 pts</td>
<td>21-26 pts</td>
</tr>
</tbody>
</table>
What Are The Benefits?

- Reduced environmental impact
- Peak efficiency, lower energy costs
- Increased marketability
- Improved productivity
- Improved employee retention
- Reduced absenteeism
- Possible tax benefits
• **Target - two Chicagoland stores**
  - Capture rain water & use for irrigation & toilet conveyance
    • 30% Water Savings

• **Philadelphia's Sheraton Rittenhouse Hotel**
  - Incandescent bulbs to compact fluorescent bulbs
    • 78% Energy savings

• **Toyota Motor Company, Portland Distribution Facility**
  - Day light and natural ventilation usage
    • 33% Energy savings

Who Is Interested In LEED?

- Architects
- Building owners & managers
- Tenants
- Code officials
- Contractors
- Financial representatives
- Engineers/Industrial Hygienist
What Role Does the IH Play In LEED?

- Site Planning
- Water Management
- Material Usage
- Innovation & Design
- Energy Performance
- Indoor Environmental Quality
IH Roles In The LEED-NC IEQ Category

• Assisting with compliance of ventilation & comfort requirements
  - ASHRAE 55-2004-Thermal Environmental Conditions for Human Occupancy
  - e.g., CO₂, temperature & humidity monitoring

• Confirming negative pressure pollution sources
  - E.g., Printing rooms, smoking rooms, garages, etc.
  - Minimum 0.004 inches of water gauge
  - Potential tracer gas testing of source rooms
IH Roles In The LEED-NC IEQ Category

- **Oversight during construction**
  - Ensure compliance with the Sheet Metal and Air Conditioning Contractors’ National Association (SMACNA) IAQ Guidelines For Occupied Buildings Under Construction
    - [www.smacna.org](http://www.smacna.org)

- **Selection of building materials**
  - Low VOC and no formaldehyde

- **Measuring/confirming light levels**
  - Minimum of 25 foot candles of daylight in 75% of occupied spaces

- **Pre-occupancy air testing**
• **LEED-NC (Version 2.2), EQ Credit 3.2**
  - Reduce IAQ problems generated by construction materials
  - Two options
    1. Flush-out
      • No verification required
    2. Air Testing
      • Using protocols consistent with the US EPA - Compendium of Methods for the Determination of Air Pollutants in Indoor Air
### LEED IAQ Air Testing Requirements

<table>
<thead>
<tr>
<th>Contaminate</th>
<th>Maximum Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formaldehyde</td>
<td>50 ppb</td>
</tr>
<tr>
<td>Particulate (PM-10)</td>
<td>50 µg/M³</td>
</tr>
<tr>
<td>Total Volatile Organic Compounds (TVOC)</td>
<td>500 µg/M³</td>
</tr>
<tr>
<td>*4-Phenylcyclohexene (4-PCH)</td>
<td>6.5 µg/M³</td>
</tr>
<tr>
<td>Carbon Monoxide (CO)</td>
<td>9 ppm and no greater than 2 ppm above outdoor levels</td>
</tr>
</tbody>
</table>

*This test is only required if carpets and fabrics with Styrene Butadiene (SB) latex backing are installed*
Case Study 1

LEED Certification on a Remolded Floor in a Federal Court Building
Major architectural firm attempting to achieve LEED certification on remodeled floor of a federal court building using LEED-NC (Version 2.2). Our group provided pre-occupancy air testing.
Case Study 1

• Step One
  - Prior to monitoring
  • Review materials, ventilation and conditions
    - Styrene Butadiene (SB) latex backing not used in carpet or fabrics
    - Review floor plan & ventilation system (8 zones)- each zone sampled
    - Construction completed - area unoccupied
    - Tenant pushing to get into the space
    - Discussed testing procedures with architect
## Case Study 1

### Step Two – Air Sampling

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Sampling Media</th>
<th>Analytical Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formaldehyde</td>
<td>ChemDisk Badge</td>
<td>NIOSH 2016</td>
</tr>
<tr>
<td>PM-10</td>
<td>SKC Personal Environmental Sampler (PM 760-203B)</td>
<td>SKC IP-10A</td>
</tr>
<tr>
<td>TVOCs</td>
<td>Multi-sorbent preconditioned sampling tube</td>
<td>EPA Method TO-17</td>
</tr>
<tr>
<td>CO</td>
<td>TSI Q-Trak</td>
<td>Instantaneous</td>
</tr>
</tbody>
</table>
Case Study 1

- **Sampling Conditions**
  - Conducted with furniture & fixtures installed
  - During normal business hours
    - Unoccupied
  - Ventilation operating as normal at minimum OA rate
  - Collected at “breathing zone” height
    - 3 to 6 feet above the floor
  - Collected over the minimum 4 hour period
    - In most cases more than 4 hours to achieve appropriate detection limits
## Sample Results

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Concentrations</th>
<th>LEED Allowable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formaldehyde</td>
<td>14.5 - 22.6 ppb</td>
<td>50 ppb</td>
</tr>
<tr>
<td>PM-10</td>
<td>&lt;40 to 72 µg/M³</td>
<td>50 µg/M³</td>
</tr>
<tr>
<td>TVOCs</td>
<td>487 - 1800 µg/M³</td>
<td>500 µg/M³</td>
</tr>
<tr>
<td>CO</td>
<td>1 ppm (OA=5 ppm)</td>
<td>9 ppm and no greater than 2 ppm above outdoor levels</td>
</tr>
</tbody>
</table>
Case Study 1

- **Result**
  - PM-10 & TVOC concentrations were above LEED allowable levels
  - Client decides *not* to retest
Case Study 2

LEED Certification On A Newly Constructed Middle School
Major engineering firm attempting to achieve LEED certification on newly constructed middle school using LEED-NC (Version 2.2). Our group was asked to provided pre-occupancy air testing in August.
Case Study 2

• **Step One**
  - Prior to monitoring
  - Review materials, ventilation and conditions
    - Styrene Butadiene not used in carpet or fabrics
    - Reviewed floor plan & ventilation system
    - District pushing to get into the space
      » Two weeks prior to school opening
• Result
  - Client decides to “flush out” the school prior to occupancy
1. IHs have roles in LEED certification
   - IEQ & possibly other roles
2. Get involved early
3. Use laboratories that have LEED experience
4. LEED air sampling is expensive
5. LEED allowable air contaminant levels are stringent
6. IHs need to be more involved in LEED standard setting process
• http://www.usgbc.org

Source: USGBC web site
Speaker Contact Information:

David C. Regelbrugge, CIH, CSP
Director, Environmental Health & Safety
Boelter Associates, Inc.
847/685-9276
dcr@boelterassociates.com
QUESTIONS