Laramie County School District #1

Sustainable Operations and Maintenance Manual

LARAMIE COUNTY SCHOOL DISTRICT 1

June 2012
Acknowledgements

This document prepared on behalf of Laramie County School District #1 by the Institute for the Built Environment at Colorado State University as part of the American Recovery and Reinvestment Act (ARRA), K-12 Facility Energy Efficiency Retrofit and Renewable Demonstration Grant. Primary authors include the following staff members from the Institute for the Built Environment and Laramie County School District #1.

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Executive Summary

As part of a grant funded by the America Recovery and Reinvestment Act (ARRA), the Institute for the Built Environment (IBE) was engaged by Laramie County School District (LCSD) #1 to go beyond the installation of renewable energy and influence the integration of sustainability across the whole district, including district building & operations practices, existing building operations and maintenance, occupant behavior, and educational opportunities. The activities performed by IBE sought to implement valuable changes, offer guidance and resources, and through education and engagement, achieve buy-in and ownership of LCSD #1 staff to ensure district sustainability through the future.

Using the LEED rating system for existing buildings, Alta Vista Elementary and Triumph High School were analyzed to identify opportunities for sustainability. Interviews with staff in facilities, maintenance, purchasing, and custodial helped inform a report defining current practices. This preliminary report then guided the development of a Sustainable Operations & Maintenance manual, developed with the intention of being employed at all LCSD #1 schools.

Existing Building Assessment

The existing building assessment evaluated two LCSD#1 schools; Alta Vista Elementary, and Triumph High School. By evaluating these two schools, IBE was able to identify current sustainable operations practices, and opportunities for greater efficiency. Findings were organized into the following operations manual, summarizing best practices, resources, and defining action items for implementation. This document should be viewed as a catalyst, to inspire action toward moving current practices to best management practices and high performance operations and maintenance.

The document includes:

*Synthesis of Current Operations & Maintenance Practices.* Using Alta Vista and Triumph as cases, district OM practices were explored. Though the practices summarized in this section directly apply to Alta Vista and Triumph, many are consistent of district-wide practices. Practices are organized by Site Maintenance, Water Use, Energy Management, Purchasing & Waste Management, Indoor Environmental Quality, and Cleaning Practices. In each section, current practices are defined and gaps are identified.

*Best Practices for Sustainable Operations & Maintenance.* Using the synthesis of current operations & maintenance practices, best practices were defined and expanded. Each BMP defines the current practice, best practice, applicable CSI division, champion, resources, and action items for implementation.

In summary, this document supplies guidance for enhancing the sustainable operation and maintenance procedures at LCSD#1. This document is intended to provide guidance for maintenance staff to make incremental improvements toward best management practices and sustainable operations. This document should also be seen as a platform for creating a comprehensive O&M manual catered to LCSD#1. Implementation of the changes defined in this document should be done incrementally. Work as a team to pilot changes, evaluate results, determine effectiveness, and revise measures to best suit the needs of the district. The path to sustainable, high-efficiency operations and maintenance is a process, and every organization will follow a unique path.
Introduction

The operations and maintenance practices were analyzed by examining two existing school buildings, Alta Vista Elementary and Triumph High School. IBE interviewed facilities personnel in the operations department; including purchasing, maintenance, custodial, and construction. Documents were also reviewed; building drawings and existing policies. During the investigation process, IBE utilized the LEED Existing Buildings, Operations and Maintenance rating system to define the areas of focus. This rating system also informed the content and organization of the Best Practices section of this manual.

Description of Sample School Buildings

**Triumph High School**

Triumph High School, located in Cheyenne WY, was built in January of 2008. It is a 67,000 square foot building and serves 170 students and 43 faculty and staff. Triumph utilized many sustainable design strategies during design and construction. For example, the classrooms, workrooms, and offices have views to the outdoors and natural light from windows, the heating, air conditioning and ventilation is controlled by a building automation system (BAS), centralized computer operated irrigation systems with rain sensors, and highly reflective roofing and hardscapes. Utility (energy and water) data is readily available and tracked through the districts’ ENERGY CAP program. The building is eligible for ENERGY STAR with an ENERGY STAR rating of 29, which means that this school is in the bottom 30% of schools in the United States. To put it in context, an ENERGY STAR score of 69 is required to be eligible for LEED certification. Since Triumph was built, the energy usage is trending upward year after year showing a 49.5% increase since the first year of operations. A small wind turbine is used to generate 2 kW of electricity, though it is primarily used for educational purposes rather than to offset energy costs. Commissioning was completed during design and construction of the original building, no retro-commissioning has been initiated since it has been operational. HCFC-22 refrigerants are used for cooling.

**Alta Vista Elementary School**

Alta Vista Elementary School, located in Cheyenne WY, was built in 1988 with a major renovation of its electrical and HVAC systems in 2005. The building is 55,186 square feet and serves 320 students and 54 faculty and staff. The remodel removed a glass canopy roof in the atrium and replaced it with a metal roof in order to reduce internal cooling load from passive solar energy gain. Additionally, during the remodel, 6 new air handling units and direct cooling were added. Two existing air handling units were refurbished and the electrical system was upgraded. Utility (energy and water) data is readily available and tracked through the districts’ ENERGY CAP program. The building is eligible for ENERGY STAR with an ENERGY STAR rating of 50, which means that this school is performing at the national average of schools in the United States. To put it in context, an ENERGY STAR score of 69 is required to be eligible for LEED certification. Energy use trends are fairly consistent, but illustrate a 3.6% increase in energy usage from baseline year. In an attempt to further reduce energy costs, the school installed a 42 kW photovoltaic array in the spring of 2012, though performance data has not been analyzed for this report given the timing. Plumbing fixtures are original and there isn’t a formal tracking plan for those that have been changed out. Irrigation system uses centralized computer controls with weather sensors. The trees on site shade the asphalt hardscape but roofing is a mix of gravel and black TPO, which absorbs solar energy and creates a hotter microclimate and increases the cooling load. Interior lighting is controlled manually as there are no centralized lighting controls. Exterior lights have photocells and timers to turn them on and off but it is unknown whether they meet dark sky requirements. Commissioning was completed over the winter of 2011-2012 to investigate, analyze, and optimize the performance of building systems through the identification and implementation of low/no cost and capital intensive Facility Improvement Measures (FIMs) and Energy Conservation Measures (ECMs) and ensure their continued performance. HCFC-22 refrigerants are used for cooling.
Current Operations and Maintenance Practices at LCSD #1

LCSD #1 employs a conventional approach to operations and maintenance (O&M) practices. The best example of the conventional approach is the lack of formal plans, sequence of operations, guidelines and routines. As-built drawings are the only resource for O&M staff and, in many cases, they are hard to read or inaccurate. Additionally, O&M staff are overburdened with routine maintenance and focused on keeping the building running. Staff doesn’t have the capacity to consider strategies and practices to optimize performance related to energy efficiency, health and human comfort or surrounding ecological integrity. Energy use is tracked through utility bills, though not analyzed or optimized. That said LCSD #1 has started doing energy audits, retro-commissioning, and the installation of on-site renewable energy systems throughout the district, which will generate heightened awareness around energy efficiency and optimized energy use and provide updated systems narratives and sequences for more efficient practices. Several other sustainable O&M practices are in place, though lacking in formal tracking and documentation. Furthermore, it was apparent during stakeholder interviews that there is receptivity and interest in implementing sustainable operations and maintenance practices.

SITE MAINTENANCE

Current Sustainable Practices
- Use of low VOC paints and sealants are common practice
- Active IPM in place
- Minimal building and hardscape cleaning
- All green landscape waste is diverted from the landfill to the City of Cheyenne’s composting facility. It is not possible to have onsite composting.
- Newer buildings incorporate native landscaping
- Newer buildings use full cut off exterior lighting and automatic interior lighting controls with automatic shut off after-hours
- White TPO roof membranes are being tested for district wide implementation on new buildings.

Gap Analysis
- No formally written plans outlining requirements or procedures for operations and maintenance
- No vendor contracts outlining requirements for VOC or non-toxic cleaning agents
- Sand and salt for snow and ice control – major source of erosion and pollution of nearby waterways
- Gasoline powered equipment – some electrical equipment?
- Chemical fertilizers and pesticides are standard practice
- Conventional storm water conveyance

WATER USE

Current Sustainable Practices
- Rain sensors on landscape irrigation
- New buildings utilize native, low-water landscaping strategies

Gap Analysis
- No record of plumbing fixture replacements or upgrades
- New schools meeting plumbing code, do not exceed with water saving fixtures
- More extensive native landscape to minimize need for irrigation and maintenance

ENERGY MANAGEMENT
### Current Sustainable Practices
- Energy audits and retro-commissioning in progress throughout district
- Installation of active solar and wind energy systems are currently being installed
- Building automation systems in place, though complex and inconsistent between buildings
- HCFC refrigerants used primarily (R-22)
- Preventative maintenance program in place

### Gap Analysis
- Triumph ENERGY STAR score of 29 (ENERGY STAR 69 or better is BMP)
- Alta Vista ENERGY STAR score of 50 (ENERGY STAR 69 or better is BMP)
- No end use metering in place

### PURCHASING AND WASTE MANAGEMENT

#### Current Sustainable Practices
- Durable goods are salvaged and reused throughout district

#### Gap Analysis
- No formally written policies or guidelines for the purchase of materials with sustainable criteria
- Minimal operational recycling in practice and no formally written policies outlining waste diversion goals
- Replacement lighting is inconsistent in style throughout district and therefore cumbersome to manage
- Purchasing and waste management during facility alterations are left up to the contractor

### INDOOR ENVIRONMENTAL QUALITY

#### Current Sustainable Practices
- No tobacco smoke allowed on premise throughout district
- New buildings provide individual lighting controls
- Operable windows

#### Gap Analysis
- HVAC systems have limited capacity for ventilation
- No interest in occupant comfort surveys

### CLEANING PRACTICES

#### Current Sustainable Practices
- Non-toxic and healthy cleaning products are common practice
- Cleaning equipment is purchased regularly for quality and effectiveness

#### Gap Analysis
- No formally written policies or guidelines for the purchase of non-toxic cleaning products or equipment
Best Practices for Sustainable Operations and Maintenance

Implementing best management practices for operations and maintenance will have a positive impact on staff, students, operating costs, and the environment. For example, studies show that student test scores are improved by up to 16% in schools that employ sustainable operations. The LEED (Leadership in Energy and Environmental Design) rating system for existing buildings: operations and maintenance was used as a framework for defining best practices for LCSD #1. The LEED EB: O&M rating system covers all facets of operations and maintenance, including site maintenance, water use, lighting systems, HVAC systems, purchasing, and cleaning. This should be used as a guide and LCSD #1 staff should start by field-testing new practices to ensure safety, quality, and suitability (see appendix for field test worksheet).

Sections

1. Site and Exterior Maintenance
2. Integrated Pest Management
3. Landscape Management
4. Roof Maintenance
5. Alternative Transportation
6. Lighting
7. Indoor Plumbing Fitting and Fixture Efficiency
8. Heating, Ventilation, and Air Conditioning
9. Sustainable Purchasing
10. Solid Waste Management
11. Green & Non-Toxic cleaning
1. SITE AND EXTERIOR MAINTENANCE

Employ an ecologically sensitive, low-impact building exterior and hardscape management plan that helps to preserve surrounding biological integrity. Best management practices should significantly reduce harmful chemical use, energy waste, water waste, air pollution, solid waste and/or chemical runoff (e.g., gasoline, oil, antifreeze, salts) compared with standard practices. The following sections are components of best management practices related to site and exterior maintenance.

1a. Exterior Paints and Sealants

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paints and sealants used on building exterior</td>
<td>Design specifications</td>
<td>9 – Finishes</td>
<td>No formal plan</td>
<td>Written standard operating procedure (SOP) outlining best management practices (BMPs)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low VOC in practice</td>
<td>Use low VOC paints and sealants</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Minimal exterior maintenance</td>
<td>Implement BMPs at least 20% of time</td>
</tr>
</tbody>
</table>

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**Action Items**
- Write a formal plan to follow Green Seal and SCAQMD Standards
  - Exterior paints coatings, and primers [GS-11](#)
  - Exterior anti-corrosive and anti-rust paints [GC-03 Jan. 1997](#)
  - Clear wood finishes, floor coatings, stains, sealers, and shellacs [South Coast Air Quality Management District (SCAQMD) Rule 1113 Architectural Coatings](#)
- Track and log products used to evaluate VOC data
- Identify compliant products for at least 20% of all applications
- Incorporate best management practices into vendor contracts, where applicable

**Resources**
- [Green Seal Standards for Paints and Finishes](#)
- [Green Seal GS-11](#)
- [Green Seal GS-47](#)
- [Green Seal Anti-corrosives and rust paints](#)
- [South Coast Air Quality Management District (SCAQMD) Rule 1113 Architectural Coatings](#)

**Potential Products**

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Product Type</th>
<th>Manufacture Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mythic Pain</td>
<td>Exterior Paint</td>
<td>Southern Diversified Products, LLC</td>
</tr>
<tr>
<td>EverKote 300</td>
<td>Exterior Paint</td>
<td>Edison Coatings, Inc.</td>
</tr>
<tr>
<td>CCI 921, CCI 921 High Build, and CCI Flex Cote</td>
<td>Exterior Paint</td>
<td>Corrosion Control Industries</td>
</tr>
<tr>
<td>Keim Mineral Silicate Paint</td>
<td>Exterior Paint</td>
<td>Keim Mineral Coatings of America, Inc.</td>
</tr>
<tr>
<td>Silacote Mineral Silicate Paint</td>
<td>Exterior Paint</td>
<td>Silacote USA, LLC</td>
</tr>
<tr>
<td>Safecoat All Purpose Exterior Satin</td>
<td>Exterior Paint</td>
<td>American Formulating &amp; Manufacturing (AFM)</td>
</tr>
<tr>
<td>M3P Primex, Stain, and Paint</td>
<td>Exterior Paint &amp; Stain</td>
<td>Conproco Corporation</td>
</tr>
<tr>
<td>Pro Industrial</td>
<td>Exterior Paint &amp; Steel Coating</td>
<td>Sherwin-Williams Company</td>
</tr>
<tr>
<td>Vista Paint Protec Metal Prime</td>
<td>Steel Coating</td>
<td>Vista Paint Corporation</td>
</tr>
<tr>
<td>Eon Coat</td>
<td>Steel Coating</td>
<td>EonCoat, LLC</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Illmod 600</td>
<td>Foam Joint Sealant</td>
<td>Tremco, Inc.</td>
</tr>
<tr>
<td>Pecora Sealants</td>
<td>Caulk Joint Sealant</td>
<td>Pecora Corporation</td>
</tr>
<tr>
<td>Tremflex 834</td>
<td>Caulk Joint Sealant</td>
<td>Tremco, Inc.</td>
</tr>
<tr>
<td>Supercault and Painter's Caulk</td>
<td>Caulk Joint Sealant</td>
<td>Liquid Nails Adhesive</td>
</tr>
</tbody>
</table>
1b. Cleaning sidewalks, pavement and other hardscapes

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaning sidewalks, pavement and other hardscapes</td>
<td>Concrete pavement Reduce heat island effect with reflective pavement and shading</td>
<td>2 – Concrete 11 – Equipment 32 – Exterior improvements</td>
<td>No formal plan No cleaning agents Gasoline powered sweepers</td>
<td>Written standard operating procedure (SOP) outlining best management practices (BMPs) Use electric powered sweepers regularly or periodically power wash with water only. Limited use of cleaners with biodegradable cleaning agents. Implement BMPs at least 20% of time</td>
</tr>
</tbody>
</table>

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Action Items
• Write a formal plan that includes  
  o Schedule of hardscape cleaning  
  o Equipment and cleaners  
  o Frequency and exceptions  
• Track and log equipment used and frequency of cleaning  
• Identify compliant equipment for at least 20% of all applications

Resources
• The Pennsylvania Green Buildings Operations and Maintenance Manual

Potential Products
<table>
<thead>
<tr>
<th>Product Name</th>
<th>Product Type</th>
<th>Manufacture Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waterbroom</td>
<td>Power washer</td>
<td>Watermiser</td>
</tr>
<tr>
<td>12-Amp Electric Blower with Vacuum Kit</td>
<td>Low decibel leaf blower</td>
<td>Toro</td>
</tr>
</tbody>
</table>
### 1c. Cleaning building exterior & window washing

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaning building exterior &amp;</td>
<td>None</td>
<td>11 – Equipment</td>
<td>Conventional window cleaning agents</td>
<td>Written standard operating procedure (SOP) outlining best management practices (BMPs)</td>
</tr>
<tr>
<td>window washing</td>
<td></td>
<td></td>
<td></td>
<td>Green Seal GS-37 certified cleaning products</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Environmental Choice certified products</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Water/vinegar mixture</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Implement BMPs at least 20% of time</td>
</tr>
</tbody>
</table>

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  [RudellJa@laramie1.org](mailto:RudellJa@laramie1.org), [307-286-0454 - EXT 11219](tel:307-286-0454 - EXT 11219)

**Action Items**
- Write a formal plan to follow Green Seal standards and use of non-toxic cleaning agents
- Track and log cleaning agents used, equipment used, and frequency of cleaning
- Identify compliant cleaning agents and equipment for at least 20% of all applications

**Resources**
- [http://www.greenseal.org/](http://www.greenseal.org/)
1d. Snow and ice removal

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
</table>
| Snow and ice removal | Site orientation for passive snow melt                       | 01 – General Requirements | Sand/salt mixture Gasoline powered plowing | Written standard operating procedure (SOP) outlining best management practices (BMPs)  
Avoid sodium chloride and calcium chloride  
Use potassium chloride, magnesium chloride or potassium acetate  
Spot treatment and plowing / shoveling  
Implement BMPs at least 20% of time |

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Action Items

- Revisit current de-icing program  
  o Calculate the area of your parking lots, service roads and sidewalks.  
  o Identify snow storage areas.  
  o Understand the properties of various deicers, and then select the type(s) to use.  
  o Estimate the amount of material you will need using the application rate charts.  
  o Order based on your estimate.  
- Write a formal policy that specifies the removal of snow and ice  
  o Spot treatment and manual methods (plowing/shoveling)  
  o Use potassium chloride, magnesium chloride or potassium acetate over sand and salt mix and sodium chloride.  
  o Frequency and exceptions  
- Track and log method and/or product used  
- Identify compliant products for at least 20% of all applications

Resources

- Winter Parking Lot and Sidewalk Maintenance Manual  
- Iowa State University Extension Fact Sheet  
- Vermont Agency of Natural Resources  
- White Paper: Peter G. Snow, MgCl, Magnesium Chloride as a Road Deicer: A Critical Review  
- Environmental Best Practices for De-icing (Appendix)
## 1e. Maintenance Equipment

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance equipment</td>
<td>None</td>
<td>11 – Equipment</td>
<td>Gasoline powered equipment</td>
<td>Written standard operating procedure (SOP) outlining best management practices (BMPs)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>32 – Exterior</td>
<td>2-Cycle engines Mulching mowers</td>
<td>Use low water or water reclamation power washer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>improvements</td>
<td></td>
<td>Use electric-powered equipment</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>Direct fuel injection engines with exhaust-power valves</td>
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<td>Low-decibel equipment</td>
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<td>Low-smoke oil in equipment</td>
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<td></td>
<td></td>
<td></td>
<td>Mulching mowers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Implement BMPs at least 20% of time</td>
</tr>
</tbody>
</table>

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**Action Items**

- Write a formal policy that details  
  o Where electric equipment is to be used  
  o Where gasoline powered equipment is to be used  
  o Where manual labor is to be used  
  o Purchasing requirements for new gasoline equipment  
    - EPA emissions standards  
    - Decibel rating less than 70  
    - Low-smoke oil  
    - Gasoline efficiency  
    - Direct fuel injection engines with exhaust-power valves  
- Develop phase-out plan for non-compliant equipment  
- Track and log type of equipment used and run time of use  
- Identify compliant equipment for at least 20% of all applications

**Resources**

- EPA national Ambient Air Quality Standards  
- EPA Small Engine Standards
2. INTEGRATED PEST MANAGEMENT

Employ outdoor/indoor integrated pest management (IPM), defined as managing pests (plants, fungi, insects, and/or animals) in a way that protects human health and the surrounding environment and that improves economic returns through the most effective, least-risk option. IPM calls for the use of least toxic chemical pesticides, minimum use of the chemicals, use only in targeted locations, and use only for targeted species, requires routine inspection and monitoring.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated Pest Management (IPM)</td>
<td>Complimentary floor plan program and layout</td>
<td>10 – Specialties 11 – Equipment</td>
<td>IPM with universal notification program</td>
<td>Written standard operating procedure (SOP) outlining best management practices (BMPs)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Integrated trade supervisor approves all chemical applications</td>
<td>IPM with universal notification program</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>City of Cheyenne manages rodent control</td>
<td>Use only least-toxic products listed on the San Francisco Hazard Screening List</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Implement BMPs 100% of time</td>
</tr>
</tbody>
</table>

Champion
Ed Restivo, Integrated Trades Supervisor
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Action Items
- Write a formal policy that outlines IPM program for indoor and outdoor applications, including
  - Requirements for logging IPM activities
    - Universal notification program
      - Method of notification (email or signage)
      - 72 hour notice of applying toxic pesticides
      - 24 hour notice in an emergency
      - Tracking mechanism to verify universal notification system
  - Approval process for vendor’s use of products
  - Acceptable (limited) applications for toxic pesticides
  - Preferable least-toxic products and their intended application

Resources
- San Francisco Hazard Screening List
- San Francisco Products Screened for IPM
- Amine or Ester: Which is Better? Purdue University Extension Publication
- Weed Science Society of America (See Herbicide Handbook)

Potential Products
<table>
<thead>
<tr>
<th>Product Name</th>
<th>Product Type</th>
<th>Manufacture Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MaxForce ant gel.</td>
<td>Mechanical and glue traps</td>
<td>Bayer</td>
</tr>
<tr>
<td>2,4D Amine</td>
<td>Outdoor pest management: herbaceous (includes fungal pests)</td>
<td>General</td>
</tr>
</tbody>
</table>
3. LANDSCAPE MANAGEMENT

Employ an ecologically sensitive management plan that helps to preserve surrounding biological integrity. Best management practices should significantly reduce harmful chemical use, energy waste, water waste, air pollution, solid waste and/or chemical runoff (e.g., gasoline, oil, antifreeze, salts) compared with standard practices. Sustainable landscaping practices utilize native plant materials to encourage biodiversity and habitat, improve local character, and reduce maintenance efforts. Additionally, best management practices focus on reducing herbicides, pesticides, fertilizers, and watering to maintain ecological integrity while reducing maintenance costs. Guidelines are based on proven technologies and practical applications. The following sections are components of best management practices related to landscape management.

3a. Native Plantings and Vegetation

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native plantings and vegetation</td>
<td>Landscape design</td>
<td>32 – Exterior improvements</td>
<td>Some native plantings and natural stone, Vastly turf vegetation, 100% landscape waste is composted, Synthetic based fertilizers and herbicides, Wastes diverted from landfill</td>
<td>Written standard operating procedure (SOP) outlining best management practices (BMPs), Divert wastes from the landfills through composting, Minimize use of chemical/synthetic fertilizers, Open space, vegetation and native plantings on-site, Incorporate outdoor learning spaces</td>
</tr>
</tbody>
</table>

Champion: Ed Restivo, Integrated Trades Supervisor  
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Action Items
- Write a formal plan outlining requirements for native vegetation, landscape waste diversion, and fertilization
- Recycle landscape waste on-site or at mulching facility
- Provide native and/or adapted vegetated open space for 25% of site (excluding footprint)
- Integrate natural plantings to reduce turf mowing/maintenance/fertilizing
- Test soils and only use fertilizer as needed based on the results of soil tests, not on a predetermined schedule
- Keep fertilizers at least 25 feet from water bodies, use organic and natural materials and slow-release formulas
- Evaluate the lifecycle cost impacts of implementing native vegetation and reducing chemical fertilizers and pesticides
- Track and log type of fertilizers and pesticides used and quantities applied
- Contact fertilizer supplier to find a comparable organic fertilizer to use 20%-50% of the regime

Resources
- Lady Bird Johnson Wildflower Center Native Plant Database
- Plant Native
- Center for Green Schools Webcast: Groundskeeping (18m)  
  ◦ Companion Guide
### 3b. Storm water Control

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storm water Quantity Control</td>
<td>Design BMPs for on-site storm water treatment</td>
<td>33 – Utilities</td>
<td>No formal storm water management plan Conveyed directly to streams. Sand for snow &amp; ice control negates vegetated buffers Conventional storm conveyance design</td>
<td>Develop storm water management plan and preventative maintenance protocol Monitor and maintain storm water management regularly Maintain inspection logs</td>
</tr>
</tbody>
</table>

#### Champion

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#### Action Items

- Write a formal plan outlining requirements for permanent and temporary erosion and sediment control devices and communication process
- Eliminate the use of sand and salt for snow and ice control
- Incorporate bio-swales and other natural filtration systems where possible to intercept storm water and sediment prior to reaching storm drain system
- Evaluate lifecycle cost impact of eliminating sand and salt for snow removal as a way to implement best management practices for erosion and sediment control

#### Resources

- [EPA Storm water pollution prevention plans for construction activities](#)
- [EPA, National Pollutant Discharge Elimination System, Sediment Traps](#)
- [Wyoming Water Quality Division](#)
- [Wyoming Water Quality Division, Urban Best Management Practices for Non-Point Source Pollution, 1999](#)
- [Sediment trap design and Basin maintenance](#)
- [Protecting Water Quality from Urban Runoff](#)
- [Erosion, Sediment and Runoff Control for Roads and Highways](#)
- [EPA, National Pollutant Discharge Elimination System, Sediment Traps](#)
## 3c. Erosion Control

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erosion Control</td>
<td>Landscape design</td>
<td>32 – Exterior improvements</td>
<td>Temporary controls during construction per regulation</td>
<td>Written standard operating procedure (SOP) outlining best management practices (BMPs)</td>
</tr>
<tr>
<td>Champion</td>
<td>Ed Restivo, Integrated Trades Supervisor</td>
<td><a href="mailto:restivo@laramie1.org">restivo@laramie1.org</a>, 307-771-2228 Ext 10345</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action Items</td>
<td></td>
<td></td>
<td>• Write a formal plan outlining the frequency of storm drain and curb cleaning using brooms and shovels and maintenance schedule</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Inspect and maintain erosion and sedimentation controls monthly and after a heavy rainfall event</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Track and log erosion and sedimentation control inspections</td>
<td></td>
</tr>
<tr>
<td>Resources</td>
<td></td>
<td></td>
<td>• <a href="#">Wyoming Department of Environmental Quality</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• <a href="#">International Erosion Control Association</a></td>
<td></td>
</tr>
</tbody>
</table>
4. ROOF MAINTENANCE

Use highly reflective roof membrane materials and maintain roof reflectance over the life of the building. Highly reflective roofing reduces the heat gain and thermal gradient differences between developed and undeveloped areas.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
</table>
| Roof maintenance   | Heat island effect, roof | 7 – Thermal and moisture protection | White TPO on new roofs  
No cleaning of existing roofs  
Dark roof membranes on existing buildings | Written standard operating procedure (SOP) outlining best management practices (BMPs)  
Cool roofs or roof membranes on new buildings  
Cool roof coating on existing buildings |

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Action Items
- Perform routine roof inspections monthly  
- Keep roofs clean and free of debris  
- Keep drainage systems clear  
- Keep roof access limited to authorized personnel to minimize foot traffic  
- Consider adding a reflective roof coating or replacing existing roofs with a more reflective roof

Resources
- Green Roofs, The Berry Biodiversity Conservation Center at University of Wyoming
5. ALTERNATIVE TRANSPORTATION

Foster and encourage alternative transportation to reduce pollution and land development impacts from automobile use for commuting.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative Transportation</td>
<td>Bike racks, showers, and changing rooms</td>
<td>12 – Furnishings</td>
<td>No bus stops; limited bike racks; lack of alternative transportation culture</td>
<td>Bike to school day</td>
</tr>
<tr>
<td></td>
<td>Locate school building near bus stops</td>
<td>32 – Exterior</td>
<td></td>
<td>Active safe routes to school program</td>
</tr>
<tr>
<td></td>
<td></td>
<td>improvements</td>
<td></td>
<td>Available and accessible bike racks and showers</td>
</tr>
</tbody>
</table>

Champion

Micheal Helenbolt
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Della Rose Buchmann
buchmannd@laramie1.org, 307-771-2310

Action Items

- Survey staff and students on interest in walking and biking to work and perception of associated safety
- Install bike racks adequately sized to meet the needs
- Implement safe routes to school programs throughout district
- Work with City transportation officials for a bus stop closer to the schools

Resources

- [National Center for Safe Routes to School](#)
- [Center for Green Schools Webcast: Transportation (29m)](#)
  - [Companion Guide](#)
6. LIGHTING

Minimize light trespass from the building and site, reduce sky-glow to increase night sky access, improve nighttime visibility through glare reduction and reduce development impact from lighting on nocturnal environments. Improve occupant comfort, well-being, and productivity with a high level of individual control to adequately meet the needs of respective spaces (e.g., offices, classrooms or conference areas). Understand that each space will have different lighting needs and the lighting controls should meet those needs.

6a. Site and exterior lighting

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Lighting</td>
<td>Full cut off</td>
<td>26 – Electrical</td>
<td>New schools use full cut off site fixtures</td>
<td>Full cutoff for exterior fixtures greater than 50 watts</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Follows Wyoming Facilities Building Guidelines for security, includes cut off specifications</td>
<td></td>
</tr>
</tbody>
</table>

Champion

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Action Items

- Shield all exterior fixtures 50 watts and over so that they do not directly emit light to the night sky
- When replacing fixtures, specify fully shielded fixtures
- Consider retrofitting existing fixtures with shielding to prevent the need for complete fixture replacement
- Consider using low-wattage, lower-lumen alternatives instead of shielding
  - For instance, LED lighting that is less than 50 watts does not need to be shielded
- Consider low-wattage uniform site lighting for safety and security – high wattage bright lighting can create high contrast between lit and unlit spaces
- Incorporate Dark Sky Initiative principles into policies for retro fits and new construction

Resources

- PA Sustainable O&M manual
- Energy Star Building Manual
- Dark Sky Initiative
### 6b. Interior lighting

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior Lighting</td>
<td>Energy efficiency</td>
<td>26 – Electrical</td>
<td>New schools have automatic lighting shut off controls</td>
<td>Auto controls to reduce interior lighting to 50% after hours</td>
</tr>
<tr>
<td></td>
<td>Automated interior lighting controls for sweeping off after hours</td>
<td></td>
<td>New schools have high level of individual lighting controls</td>
<td>All lighting at openings shut off after hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Preventative maintenance program for building lighting controls</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High level of individual lighting control for occupants</td>
</tr>
</tbody>
</table>

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**Action Items**
- Set schedule of operations to automatically turn off non-emergency fixtures in each interior lighting zone for at least 50% of annual nighttime hours
- Set schedule of operations to automatically turn off all nonemergency built-in luminaires with a direct line of sight to any openings
- Develop a preventive maintenance program to regularly inspect and adjust the automatic controls to ensure proper operation
- Provide lighting controls that enable adjustments to suit the task needs and preferences of individuals for at least 50% of individual workstations, and 100% of classrooms and conference rooms

**Resources**
- PA Sustainable O&M manual
- Energy Star Building Manual
7. INDOOR PLUMBING FITTING AND Fixture EFFICIENCY

Reduce potable water use of indoor plumbing fixtures and fittings to a level equal to or below the 2006 editions of the Uniform Plumbing Code (UPC) or International Plumbing Code (IPC) pertaining to fixture and fitting performance. Fixtures and fittings included in this section are water closets, urinals, showerheads, faucets, faucet replacement aerators and metering faucets.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor plumbing fitting and fixture efficiency</td>
<td>Low water fittings and fixtures</td>
<td>22 – Plumbing</td>
<td>Follows plumbing code at time of construction No records of fixture replacement or upgrades</td>
<td>Written standard operating procedure (SOP) outlining low water fixtures at the time of replacement Low-water fixture and fittings throughout portfolio</td>
</tr>
</tbody>
</table>

**Champion**

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**Action Items**

- Write a formal plan for replacing old plumbing fixtures with low water fixtures at end of life
- Retrofit current fixtures with aerators and low flushometers
- Replace showerheads with low flow
- Incorporate water conservation in curriculum

**Resources**

- The Uniform Plumbing Code
- The International Plumbing Code
- USGBC WaterUse Reduction Guide
- Center for Green Schools Webcast: Water Management (27m)
  - Companion Guide
**8. HEATING, VENTILATION, AND AIR CONDITIONING**

Develop an understanding of the operation of major energy-using systems, options for reducing energy consumption, and creating consistent feedback loops for continual improvement and accountability. Promote continuity of information to ensure that energy-efficient operating strategies are maintained and provide a foundation for training and system analysis.

### 8a. Energy Audits and Commissioning

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASHRAE Level I assessment</td>
<td>O&amp;M manuals to include operating procedures before turn over</td>
<td>1 – General Requirements</td>
<td>Commissioning select schools within district Some systems narratives and operating procedures exist, though disjointed and inconsistent</td>
<td>Written program for scheduling energy audits throughout school district Implement low- to no-cost energy improvements</td>
</tr>
<tr>
<td>Commissioning</td>
<td>Commissioning throughout design and construction</td>
<td>1 – General Requirements</td>
<td>Retro-commissioning select schools</td>
<td>Written policy for commissioning new schools and retro-commissioning existing schools</td>
</tr>
</tbody>
</table>

**Champion**

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Shannon Fertig  
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**Action Items**

- Subcontract a commercial building energy auditor to perform an ASHRAE level I energy audit and create the following  
  - Building Operating Plan  
  - Systems Narrative  
  - Sequence of Operations  
  - Preventive Maintenance Plan  
  - Summary Report of an ASHRAE Level I Walkthrough  
- Determine whether to employ an ASHRAE Level II audit or hire a commissioning agent to perform retrocommissioning  
- Write an action plan for carrying out low- to no-cost energy improvements  
- Consider ongoing commissioning for complex or outdated buildings  
- For buildings selected for ongoing commissioning, confirm that schedule of commissioning process does not exceed 24 months

**Resources**

- ENERGY STAR Building Upgrade Manual  
- Procedures for Commercial Building Energy Audits  
- Building Owners and Managers Association, Preventive Maintenance and Building Operation Efficiency  
- Energy Design Resources, Cx Assistant Commissioning Tool
8b. Track and Monitor Energy Data

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Star Score</td>
<td>Whole building efficient design</td>
<td>1 – General requirements 23 – Heating, Ventilation and Air conditioning 7 – Thermal and Moisture Protection</td>
<td>Alta Vista - 50 Triumph – 29</td>
<td>ENERGY STAR’s Portfolio Manager is used to track energy use on a quarterly basis</td>
</tr>
</tbody>
</table>

Champion

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Action Items

• Update ENERGY STAR portfolio for Triumph and Alta Vista (current scores are based on utilities up to October 2011)
• Implement low/no cost facility upgrades identified in retro-commissioning report for Alta Vista
• Conduct retro-commissioning or energy audit for Triumph
• Consider physical and programmatic opportunities to improve total energy use intensity (EUI) and ENERGY STAR score
• Start tracking utility information for all buildings in district in ENERGY STAR's Portfolio Manager program
• Consider pursuing ENERGY STAR certification for buildings with an eligible ENERGY STAR score
• Determine building-specific and district-wide energy use intensity (EUI)
• Report ENERGY STAR scores to operations and maintenance staff

Resources

• ENERGY STAR Portfolio Manager
• Center for Green Schools Webcast: Energy Management (38m)
## 8c. Refrigerants

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerants</td>
<td>Zero CFC based cooling systems and refrigerants in specifications</td>
<td>11 – Equipment 23 – Heating, Ventilation and Air Conditioning</td>
<td>R-22 (HCFC) refrigerant is used as the primary refrigerant for the cooling systems</td>
<td>Written standard operating procedure (SOP) outlining requirements for zero CFC-based refrigerants for all new schools</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Phase out all CFC-based refrigerants in older buildings, where exists</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>If/when phase out is not feasible, minimize annual leakage rate to 5%</td>
</tr>
</tbody>
</table>

**Champion**

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**Action Items**

- If older buildings use CFC refrigerants, work with qualified third party professional (often done by equipment vendor) to determine if systems replacement of conversion is economically feasible
  - If economically feasible (simple payback of 10 years or less), prepare comprehensive 5-year phase out plan
  - If not feasible, develop a refrigerant management plan that works to minimize annual refrigerant leakage rate to 5% or less and the total leakage over the remaining life to less than 30%
- Incorporate refrigerant management program into preventative maintenance and inspection plan
- Incorporate refrigerant inspection and maintenance tasks into ongoing commissioning plans

**Resources**

- Facility Management, Coping with the CFC Phase-out
## 8d. Building Automation Systems & Metering

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Automation Systems</td>
<td>Whole building energy efficiency</td>
<td>26 – Electrical 33 – Utilities</td>
<td>BAS exist throughout district, though inconsistent and complex BAS monitors minimum HVAC functions. Separate lighting control system, not as part of BAS</td>
<td>At minimum, BAS monitors the status of sensors and controlled devices, schedules equipment off when not in use, schedules set points and setbacks, trends equipment status, and schedules lights to turn off during unoccupied times.</td>
</tr>
<tr>
<td>System – level metering</td>
<td>Controls design Measurement and Verification</td>
<td>26 – Electrical</td>
<td>Utility meter total energy consumption by energy type</td>
<td>End uses sub-metered separately from one another, such as space heating, cooling, area lighting, and ventilation fans</td>
</tr>
</tbody>
</table>

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- Shannon Fertig  
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### Action Items
- Consider upgrading or retrofitting old pneumatic BAS systems throughout district to direct digital control (DDC) systems to improve response, accuracy and consistency district-wide
- Include assessment of current BAS in ongoing commissioning activities
- Confirm that BAS monitors, at minimum, building conditions, compares those conditions to desired conditions, and signals equipment to adjust as necessary to bring the building within desired setpoints
  - Specifically, BAS should monitor the status of sensors and controlled devices, scheduling equipment, set points and setbacks, and trending equipment status
- Lighting controls should turn lights off after occupied hours (occupancy sensors or building-wide sweep function)
- Incorporated regular sensor and actuator calibration for BAS components into preventative maintenance plan

### Resources
- Federal Energy Management Program
8e. Indoor Air quality & ventilation

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor air quality &amp; ventilation: During occupancy</td>
<td>Life cycle considerations</td>
<td>23 – Heating, Ventilation, and Air Conditioning</td>
<td>No upgrades or adjustments to ventilation system since start up Systems malfunction when too much fresh air is brought in</td>
<td>Adjusted ventilation systems to meet current ventilation code requirements (ASHRAE 62.1 2007 or most current)</td>
</tr>
</tbody>
</table>

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**Action Items**
- Identify if a more efficient MERV filter could potentially be used that cost effective and compatible with the system.
- Create an “Air Filter Management Program.” This program at the very least should determine a change out schedule and should involve representatives from the school, purchasing, and maintenance departments.
- Train employees that replace the filters annually includes: checking for gaps, worn or missing filter holding clips, and ensuring proper gasketing is in place. Training would also cover personal protection and system protocols for changing filters.

**Resources**
- [EPA Indoor Air Quality Building Education and Assessment Model (I-BEAM), EPA Reference Number 402-C-01-001, December 2002](http://www.energystar.gov/ia/business/EPA_BUM_CH8_AirDistSystems.pdf)
- [Sheet Metal and Air Conditioning National Contractors Association (SMACNA)](http://www.energystar.gov/ia/business/EPA_BUM_CH8_AirDistSystems.pdf)
- [Center for Green Schools Webcast: Indoor Environmental Quality (38m)](http://www.energystar.gov/ia/business/EPA_BUM_CH8_AirDistSystems.pdf)
  - [Companion Guide](http://www.energystar.gov/ia/business/EPA_BUM_CH8_AirDistSystems.pdf)
### 8f. Renewable Energy Systems

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable Energy (on-site or off-site)</td>
<td>Design integration</td>
<td>26 – Electrical</td>
<td>Renewable energy systems being installed on select schools</td>
<td>Written district goals for the purchase of on-site or off-site renewable energy for a predetermined percentage of district energy budget</td>
</tr>
</tbody>
</table>

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- Mike Peel
  [peelmi@laramie1.org](mailto:peelmi@laramie1.org)
- Fred Heil
  [heile@laramie1.org](mailto:heile@laramie1.org)

**Action Items**
- Determine building-specific and district-wide energy use intensity (EUI)
- Define district goal for district-wide non-renewable energy offset with on-site renewable energy
  - Target 3 - 15% offset per building
- Consider purchasing renewable energy credits (RECs) or carbon offsets for the remaining non-renewable energy budget
  - Solicit multiple proposals for the purchase of RECs and carbon offsets to ensure competitive pricing
- Coordinate the purchase of RECs and offsets for multiple buildings or portfolios to get a volume discount and bring down the cost per building
- Identify buildings in district with optimal potential for renewable energy systems
- For existing renewable energy systems in district, confirm that systems are submetered from other base building systems

**Resources**
- Database of State Incentives for Renewables and Efficiency
- Renewable Energy Credits Third Party Verification Program: Green-e
9. SUSTAINABLE PURCHASING

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable Purchasing</td>
<td>None</td>
<td>1 – General Requirements</td>
<td>No policy or set of guidelines for environmentally preferable purchasing</td>
<td>Written policy outlining requirements for purchasing environmentally preferable products</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cost is driving decision making factor</td>
<td>30% of purchases (target 60%) of ongoing consumables, durable goods, and facility alterations meet environmentally preferable requirements</td>
</tr>
</tbody>
</table>

Champion
Brian Harmsen, Senior Buyer
harmsena@laramie1.org, 307-771-2128

Action Items
- Write a formal policy that guides sustainable purchasing for those products purchases that are within the building and site management’s control. Include purchasing guidelines for the following
  - Ongoing consumables
  - Durable goods
  - Facility alterations and additions
  - Mercury-containing lamps
- Evaluate and determine on a product-by-product basis which environmentally-preferable product options are cost-effective
- Track and log products purchased to evaluate sustainable criteria
- Identify compliant products for at least 30% of all purchases
- Incorporate sustainable purchasing goals into vendor contracts, where applicable

Resources
- Center for Green Schools Webcast: Materials & Sustainable Purchasing (32m)
  - Companion Guide

Sustainability Criteria

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Example Products</th>
<th>Sustainable Criteria</th>
</tr>
</thead>
</table>
| Ongoing consumables                   | Paper (printing and copy paper, notebooks, notepads, envelopes), toner cartridges, binders, batteries, and desk accessories. | • contain at least 10% postconsumer and/or 20% postindustrial material
• contain at least 50% rapidly renewable material
• contain at least 50% materials harvested, extracted, and processed within 500 miles of the facility
• consist of at least 50% Forest Stewardship Council certified paper products
• or rechargeable batteries. |
| Durable goods, electric powered equipment | Computers, microwaves, refrigerators                                               | • ENERGY STAR certified
• Battery or corded-electric equipment replaces gas-powered |

Laramie County School District #1 | Sustainable Operations & Maintenance Manual 33 : 44
Durable goods, furniture

- contain at least 10% postconsumer and/or 20% postindustrial material.
- contain at least 70% material salvaged from off-site or outside the organization.
- contain at least 70% material salvaged from on-site, through an internal organization materials and equipment reuse program.
- contain at least 50% rapidly renewable material.
- contain at least 50% Forest Stewardship Council (FSC)-certified wood.
- contain at least 50% material harvested and processed or extracted and processed within 500 miles of the project.
### 10. SOLID WASTE MANAGEMENT

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Solid Waste Management</strong></td>
<td>Adequately sized recycling collection and storage capacity</td>
<td>1 – General Requirements</td>
<td>No formal policy or infrastructure for operational recycling City of Cheyenne offers recycling services</td>
<td>Written policy outlining requirements to recycle (at minimum) materials accepted by City of Cheyenne Comprehensive recycling infrastructure throughout schools to foster waste reduction culture and align with city recycling programs 30% of waste stream (target 60%) diverted from landfill</td>
</tr>
</tbody>
</table>

**Champion**
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- Jim Rudell, Custodial Supervisor  
  RudellJa@laramie1.org, (307)286-0454 x11219

**Action Items**
- Write a formal policy that defines waste reduction targets and procedures for waste from ongoing consumables, durable goods, landscaping materials, hazardous waste, electronic waste and facility alterations for each building in the district
- Coordinate with waste haulers and surplus to quantities and weights of each waste stream category recycled
- Track, measure, and evaluate recycling, reuse, source reduction, and donations from each waste stream
- Incorporate best management practices into vendor contracts, where applicable

**Resources**
- [Center for Green Schools Webcast: Recycling & Waste Management (30m)](#)
  - [Companion Guide](#)
## 11. GREEN & NON-TOXIC CLEANING

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Design Considerations</th>
<th>CSI Division Number</th>
<th>Current Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaning</td>
<td>Separately exhaust janitor closets</td>
<td>1 – General Requirements 11 - Equipment</td>
<td>Use non-toxic and healthy cleaning products are common practice</td>
<td>Written policy outlining requirements for non-toxic and healthy cleaning products and equipment 30% of purchases (target 60%) of ongoing consumables, durable goods, and facility alterations meet environmentally preferable requirements</td>
</tr>
</tbody>
</table>

### Champion
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  - riverad@laramie1.org

### Action Items
- Write a formal policy that defines requirements for the purchasing of healthy, non-toxic, and environmentally preferable cleaning products and practices, including
  - purchasing of cleaning products (as well as floor and carpet care products)
  - purchasing cleaning equipment
  - hand-hygiene strategies
  - chemical storage and handling
  - maintenance staff training procedures
  - and collection of occupant feedback and complaints
- Determine which practices need to be revamped to meet the best practices outlined in the green cleaning policy
- Track and log products and equipment purchased to continually evaluate environmental friendliness and non-toxic status
- Track and log cleaning procedures to continually evaluate effectiveness
- Identify compliant products for at least 60% of all applications
- Incorporate best management practices into vendor contracts, where applicable

### Resources
- Eco Logo
- Green Seal
- California Code Regulations Maximum Allowable VOC levels
- International Sanitary Supply Association
- Center for Green Schools Webcast: Green Cleaning (37m)
  - Companion Guide
Conclusion

As part of a grant funded by the America Recovery and Reinvestment Act (ARRA), the Institute for the Built Environment (IBE) was engaged by Laramie County School District (LCSD) #1 to go beyond the installation of renewable energy and influence the integration of sustainability across the whole district, including district building & operations practices, existing building operations and maintenance, occupant behavior, and educational opportunities. Using the LEED for Existing Buildings: Operations and Maintenance rating system as a guide for sustainable operations and maintenance practices, we analyzed two schools, Alta Vista Elementary and Triumph High School, to identify gaps in current practices and opportunities for sustainability.

Notable current practices are

- Active IPM in place
- All green landscape waste is diverted from the landfill to the City of Cheyenne’s composting facility. It is not possible to have onsite composting
- Newer buildings use full cut off exterior lighting and automatic interior lighting controls with automatic shut off after-hours
- White TPO roof membranes are being tested for district wide implementation on new buildings
- Energy audits and retro-commissioning in progress for select buildings throughout district
- Installation of active solar and wind energy systems are currently being installed
- Building automation systems in place, though complex and inconsistent between buildings
- HCFC-22 refrigerants used primarily
- Preventative maintenance program in place
- Durable goods are salvaged and reused throughout district
- Operable windows are typical
- Non-toxic and healthy cleaning products are common practice
- Cleaning equipment is purchased regularly for quality and effectiveness

While interviews with LCSD #1 stakeholders showed several current practices that incorporate sustainable criteria and best management practice, both Triumph and Alta Vista schools are operating far below the national benchmark for energy efficiency, using ENERGY STAR as a standard (ENERGY STAR 29 and 50, respectively). Interestingly, Alta Vista, built in 1988 and remodeled in 2005, is performing much better than Triumph, which was built new in 2008. Furthermore, energy use for both schools has trended upwards in recent years, with Triumph showing the most significant increase in energy use since its first year of operations, a 49.5% increase since 2009. The biggest challenge with LCSD #1 will be improve energy performance of the district portfolio significantly. Sustainable operations and maintenance is as much about the people occupying the building as it is about the equipment. Therefore, cultivating the ethic of sustainable behavior in student, teachers and staff will be as important as optimizing systems and equipment. Additionally, sustainable operations and maintenance require formal best management practices written in plans and policies. The development of these programs is a time intensive process that requires coordination, integrated decision making, team work and top-down and bottom-up buy in, though formalizing programs ensures accountability and improves the ability to track and measure progress. The district administration will rely on the buy-in of staff in order to carry out the vision of sustainable operations and maintenance. Likewise, LCSD #1 faculty and staff will rely on the clear direction and support of the administration. While the journey may be long from here, the first step is always the hardest. This operations and maintenance assessment was the first step and will serve as a roadmap for direction along the way.
Appendix A: Glossary

Adaptive plantings | cultivars of native plants that are adapted to the local climate and are not considered invasive species or noxious weeds.

ENERGY STAR | a government-backed program helping businesses and individuals protect the environment through superior energy efficiency.

Green Cleaning | cleaning methods and products with environmentally friendly ingredients designed to preserve human health and environmental quality, in addition to cleaning techniques and products that avoid the use of chemically reactive and toxic cleaning products which contain various toxic chemicals, some of which emit volatile organic compounds causing respiratory and dermatological problems.

Heat island effect | Heat islands are defined as thermal gradient differences between developed and undeveloped areas.

Native plantings | Plants indigenous to a locality.

Renewable Energy Credits (RECs) | tradable, non-tangible energy commodities in the United States that represent proof that 1 megawatt-hour (MWh) of electricity was generated from an eligible renewable energy resource (renewable electricity). RECs allow customers to continue to buy the same grid-supplied power, while also buying the environmental attributes of electricity produced by a renewable source. The actual renewably generated electricity is sold separately to the grid for market price as normal power.

SRI | The solar reflectance index (SRI) is a measure of the constructed surface’s ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black surface (reflectance 0.05, emittance 0.90) is 0 and a standard white surface (reflectance 0.80, emittance 0.90) is 100. To calculate the SRI for a given material, obtain the reflectance value and emittance value for the material. SRI is calculated according to ASTM E 1980. Reflectance is measured according to ASTM E 903, ASTM E 1918 or ASTM C1549. Emittance is measured according to ASTM E 408 or ASTM C 1371.

Submetering | Submetering is used to determine the proportion of energy use within a building attributable to specific end uses or subsystems (e.g., the heating subsystem of an HVAC system).

Volatile Organic Compounds (VOC) | Volatile organic compounds, or VOCs are organic chemical compounds whose composition makes it possible for them to evaporate under normal indoor atmospheric conditions of temperature and pressure.
STAKEHOLDER QUESTIONS – MASTER QUESTIONNAIRE

The following is a list of plans and inventories that we will need to consult:

- Site plans showing plant materials and species composition, drainage, irrigation, hard scape materials and quantities
- Building footprints, property boundaries,
- Floor plans showing: plumbing, HVAC equipment and duct placement, elevations of each building, lighting interior/exterior
- Specifications and manuals for equipment, inventories of plumbing fixtures, lighting,
- SMACNA specs and as built plans
- Commissioning specs and/or plans
- Utility bills for past 2 years.

The following questions pertain to Sustainable Sites credits 2:

**Sustainable Sites credits 2: Building Exterior and Hardscape Management**

- Does your building have a staff person directly responsible for exterior and hardscape management? If yes, who?

- Do you have exterior building and grounds maintenance plans? If yes, do all buildings in the district adhere to the plan? Do you have hard copies of the maintenance plan CAD files, or PDF’s? If no, is there willingness to develop comprehensive plans to incorporate building exterior and hardscape maintenance?

- How are painting and sealing managed for the project building’s exterior and hardscape? Are there opportunities for using less toxic, “environmentally preferable” products? (Product name, chemical name, and MSDS)

- How is snow and ice removal handled on drives and walkways? Is there an opportunity to implement an “anti-deicing” program? (Product name, chemical name, and MSDS)
• How is building exterior and hardscape cleaning handled? (Product name, chemical name, and MSDS & Equipment make, model)?

• How often are roofs inspected? Cleaned? What types of sealants are used (Product name, chemical name, and MSDS & Equipment make, model)?

• What maintenance equipment is currently used on-site? How and when is maintenance equipment purchased? Are there opportunities for procuring low-impact equipment? Do opportunities exist for substituting manual practices for power equipment, or electric for gas-powered equipment? (Equipment make & model)

• Do your existing vendors offer environmentally friendly services? If no, are they willing to learn and adopt new practices?

• What types of adhesives are used throughout the building? (Please list: product name and function, chemical name, and MSDS)

• What work, if any, is sub contracted? If so, is it possible to incorporate the best-management practice into contracts?

• How often are windows cleaned in and out? What product is used?

• Are you responsible for cleaning the building exterior? If not do you know who is?

• How often are sidewalks and building exteriors cleaned? What equipment is used to achieve this? (i.e. gasoline powered, electric, water, chemicals etc) Please specify which task the chemical or equipment is used for:
  • Equipment make and model –
  • Chemical – brand name, chemical name,

Sustainable Sites credit 3: Integrated Pest Management, Erosion Control, and Landscape management

• How are the grounds maintained for project building? Do you hire contractors for mowing, weed control, shrub/tree pruning, and irrigation maintenance or is that handled in house?
  • What are your current practices for the above mentioned grounds care?
• Mowing-
• Weed control-
• Shrub/tree pruning-
• Irrigation-

• Do your existing vendors offer environmentally friendly services? If no, are they willing to learn and adopt new practices?

• Are there opportunities for using less environmentally harmful products? (i.e Burn Out instead of Roundup)? What opportunities exist for reducing the environmental impacts associated with current practices? (Product name, chemical name, and MSDS)
  ▪ Product-
  ▪ Frequency-

• What is your fertilizer regimen throughout the year? What opportunities exist for using a natural fertilizer 20% to 50% of the time? (Product name, chemical name, and MSDS)
  ▪ Product-
  ▪ Frequency-

• Are fertilizers necessary to maintain soil health? Would you consider mulching mowing grass clippings, mulching landscaped beds, aerating and top dressing with compost on turf areas instead of fertilizing?
  ▪ What soil tests are used to determine fertilizer need?
  ▪ When is mulch replaced on the landscaped beds? Are landscaped beds fertilized? Would you consider slow release fertilizer spread prior to the mulch?

• What maintenance equipment is currently used on-site? How and when is maintenance equipment purchased? Are there opportunities for procuring low-impact equipment? (Low decibel, electric,) Do opportunities exist for substituting manual practices for power equipment, or electric for gas-powered equipment? (Using manual methods 20% of the time is the metric goal) (Equipment make & model)
• What are your strategies for pest management? What opportunities are there to develop an integrated pest management plan?
  - Indoor pest management
  - Outdoor pest management (includes herbaceous and fungal pests)
  - Rodent control
  - What form of Universal notification is currently being used?
  - Who reviews and approves chemical applications for pests on the premises?

• What erosion and sedimentation plans are being employed for the existing site? Is it possible to incorporate the best-management practice into daily/weekly routine and/or contracts? Practices such as sweeping debris and leaves from the curbs instead of using a blower, keeping storm drains clear and free of sediment, garbage and cigarette butts.

• What erosion and sedimentation plans are currently being employed for construction activities? Is it possible to incorporate the best-management practice into daily/weekly routine and/or contracts? Who is in charge of making sure all applicable state and federal storm water pollution prevention plans are in place and functioning effectively?

• Where does green landscape waste go? Is it possible to introduce an onsite composting facility? Is there an off-site composting facility that could be used? Is it possible to chip woody debris for use onsite as mulch? Are grass clippings bagged? Where does leaf waste go?

**Sustainable Sites Credit 4: Alternative Commuting Transportation**

• What would you like to see changed in your district?

• Is there collection of people that are charismatic or participatory leaders that would take initiative to create a carpooling coordination circle?

• Is there someone internally expressing interest in coordinating transportation? Carpooling schedules and networks can be posted online so that building employees are aware of them.

• Are you open to administering a survey to capture your building occupants commuting behaviors and level of comfort?
What is the best means for administering a survey? Paper, web-based, email?

Is there someone that will create a plan to promote alternative transportation which could consist of:
- Weekly audits
- Changing defaults on printers, etc.
- Communication campaign

Do you currently track alternative transport use as part of a local or regional government program?

Does an alternative transportation program providing information, infrastructure, or incentives currently exist at the building? Could that program readily be enhanced to increase use of alternative commuting options?

Do you have the means to distribute an occupant commuting survey and tabulate the results? You can use an online survey tool (which tabulates the results for you), an email survey, or a paper survey.

What conservation methods are currently being used in the building? (Recycling, composting, energy & water conservation, etc.).

**Sustainable Sites credit 5: Site Development – Protect or Restore Open Habitat**

Is there an up-to-date master landscape plan identifying all the vegetation on the site? Is there someone on staff that can properly identify plant material?

How much of each site (Triumph & Alta Vista) is landscaped with native or adapted vegetation (site is landscaped for the benefit of habitat, includes water bodies, exposed rock, un-vegetated ground or other features that are part of the historic natural landscape within the region and provide habitat value)?
- Total Site sf (include building footprint) =
- Total landscaped area =
- Total area of turf =
- Landscaped area that is planted with native/adapted vegetation =
Does LCSD #1 own any open space land off-site that is maintained as native or adapted vegetation? If so, how much total square area?

**Sustainable Sites credit 6: Stormwater Quality Control**

- Perform a site inventory cataloging surface types, such as asphalt, concrete, roof areas, and landscaped areas. (Site analysis should be done in conjunction with SSc5). Are site plans readily available identifying the above mentioned items?
  - Asphalt=
  - Concrete=
  - Roof areas=
  - Landscaped areas=
  - Turf area=

- What stormwater management strategies are currently in place?

- What is the capacity of cisterns, detention ponds, or other stormwater collection systems on site? What are the areas of surfaces from which they collect water, based on design documents or other system information?

- Do you have inspection logs that show any needed maintenance or repairs are performed within 60 days of inspections?

- What are the opportunities for increased stormwater mitigation (based on inventory results) through water harvesting techniques or modifying surface areas to increase the amount of pervious surface? Is there a line item in the operating budget for infrastructure repairs and improvements that could be allocated toward this credit?

- Can porous paving materials be used in place of conventional asphalt and concrete? This may require installing a new sub-base and is not as simple as repaving.

- Are there opportunities to harvest stormwater in tanks and cisterns for reuse? Stormwater may be treated and used for irrigation and indoor uses such as toilet flushing, fire suppression, laundry, and cooling tower make-up water.

- Does vegetation cover at least 20% of the site area? Is there any interest in vegetated roofs?
• Are there areas that could be converted into bio-infiltration swales, rain gardens, vegetated filter strips, or bio-remediation ponds?

• What regulations on stormwater detention features may influence your management plan?

• Is stormwater capture legal? (Example of Colorado, where existing downstream water rights take precedence)

• Is there a preventative maintenance plan to evaluate stormwater management facilities regularly and ensure optimal performance?

**Sustainable Sites Credit 7.2: Heat Island Effect – Roof**

• Is there a district-wide commitment for white or cool roofs for future new buildings?

• Are there plans to renovate the roof or are funds allocated for improvements?

• Has regular cleaning (at least every two years) been conducted to maintain the SRI value? Can cleaning be arranged in the future?

• If the roof does not have a highly reflective surface coating, when is it due for replacement? Could the roof be replaced with highly reflective roofing?

• If the roof does not have a highly reflective surface coating, can a coating be applied to raise the SRI value to a compliant level?

• Is a vegetated roof a viable alternative? Can a green roof be supported structurally? Is the climate conducive to supporting native plant life without permanent irrigation? Have other buildings in this locale successfully used green roofs? Is a green roof cost effective over the long term?

**Sustainable Sites Credit 8: Light Pollution Reduction**

• Does the district have intentions for installing automatic interior lighting shut off controls for all new construction?

  • If so, is the schedule of operations set to automatically turn off non-emergency fixtures in each interior lighting zone for the requisite 2,190 hours per year—or 50% of annual nighttime hours?
• Are there opportunities to reduce exterior lighting levels for existing buildings? What is the exterior/site lighting strategy for new construction projects?

• Are any exterior lamps over 50 watts? Are they shielded?

• What is the typical site lighting strategy? Does light trespass or shed beyond the building boundary?

• Does the preventative maintenance program include lighting controls?

• If interior lighting systems are not controlled automatically, assess the level of effort required to integrate automatic controls into the interior lighting system. Will or do custodians already turn off all of the interior lights for 50% of the night?

• Do you have an inventory of all exterior lighting fixtures to determine fixture shielding? Which fixtures need to be altered?

• Modify fixture shielding where necessary and minimize illumination of architectural and landscaping features.

• How many exterior lights are aimed upwards, what opportunities are there to remove those or reduce the number of fixtures aimed up?

• Can facilities staff perform these modifications?

The following questions pertain to Water Efficiency Credits:

Water Efficiency Credit 1: Water Performance Measurement

• Are there separate meters for water systems in the building now? How is water tracked for the whole building and grounds?

• Does the building use reclaimed water? If so is there a way to monitor how much water is used for those systems?

• Have existing water meters been calibrated recently?

• Is there currently a preventative maintenance program to regularly inspect plumbing fixtures and fittings, ensuring proper operation?

• Is there someone who will track water usage on a weekly basis? Who?
• Does the irrigation have a separate meter for their water use? Does the city of Cheyenne utilities provide a discount on sewer charges for water consumption from this use?

• Does an inventory exist for all the fixtures in the building? This includes: record manufacturer, model number, flush or flow rate and date of installation.

**Water Efficiency credit 3: Water Efficient Landscaping**

• Is potable water consumption for irrigation being sub-metered? Are records of irrigation water consumption from previous years available?

• Do you have landscaping plans that show species composition and areas?
• Are there local, regional, state programs that assess irrigation performance in your area?
• What opportunities exist to incorporate native and adaptive landscaping onto the project site?
• What types of irrigation systems are employed (ie. Rain/ freeze sensors, soil moisture sensors, smart clock)?

The following questions pertain to Energy Atmosphere Credits:

**2.1-2.3: Existing Building Commissioning- Investigation and analysis, implementation, & ongoing commissioning**

• When was the building last commissioned or audited? Have any major systems been upgraded or altered since that process was completed?

• Do the building occupants regularly have thermal comfort issues and/or indoor air quality complaints?

• Would you be open to administering an occupant comfort survey?

• What level of training do building operators and managers currently receive? Do you or can we meet the LEED recommendation of 24 hours per staff person per year, on energy-efficiency related topics?
• Are there any complex buildings in the district that require the use of a building automation system to manage highly integrated controls and advanced building systems that warrants ongoing monitoring and proactive testing of energy systems performance?

• Does the BAS have direct digital controls available to assist with some of the data collection and monitoring activities?

• Is there someone who is willing to benchmark current energy usage?

• Are all sources of energy serving the project building, including that consumed by district energy systems, metered? Are consumption data points available for intervals no longer than 65 days?

• Do you have at least 12 consecutive months of metering data for all types of energy used in the building?

• What opportunities are there for improving energy performance through operational changes identified by an ASHRAE Level 1 Walkthrough Audit? What opportunities exist for improving energy performance through equipment upgrades?

• Is comprehensive commissioning likely to uncover significant energy savings opportunities?

• Can the tracking be done in house or will a consultant be hired to track energy usage and Energy Star Portfolio set up?

• Does the building have any automated energy saving tools or systems in place or plans to install them in the near future? (i.e automated light controls, pre-programmed set points)

Energy Atmosphere Credit 3.1: Performance Measurement—Building Automation System
• Does the existing BAS meet the needs of the building and the LEED criteria or does a new or upgraded BAS need to be installed?

• Does the building have any automated energy saving tools or systems in place or plans to install them in the near future? (i.e automated light controls, pre-programmed set points)

• Does the existing BAS measure HVAC by:
  • Monitoring status of sensors and controlled devices?
  • Scheduling equipment to turn on/off during normal and when not in use?
  • Scheduling set points & setbacks?
  • Trending equipment status?

• Is the existing BAS capable of trending for the following:
  • Accurately monitoring the status of each piece of equipment?
  • Data capacity to store at least one month of trend outputs with time-stamped data?
  • Are the following components trended?
    ▪ fan and pump status
    ▪ economizer operation
    ▪ heating and air-conditioning status
    ▪ terminal device status

• Does the building have 100% tie in to BAS for HVAC systems

• Are written records kept of the preventative maintenance alerts and responses in the BAS?

• Are the following system maintenance activities performed on a regular basis?
  • **Sensor and Actuator calibration** for: Outside air temperature sensors, mixed air temperature sensors, return air temp. sensors, discharge or supply air temp. sensors, Chilled water supply and return temp. sensors, Condenser water supply and return temp sensors, Heating water supply and return temp sensors, Wet bulb temp. or relative humidity sensors, Space temp. sensors, Economizer and related dampers, Cooling and Heating coil valves, Static pressure transmitters, Air and water flow rates, Terminal unit dampers and flows.
Other Activities: Conducting overall visual inspection, Verifying control schedules, Verifying setpoints, Resetting and cleaning time clocks, Checking all gauges, Checking control tubing (pneumatic systems), Checking outside air volumes, Checking deadbands, Checking sensors, Checking equipment status indicators, and Verifying percentage that VFD speed, percentage boiler firing rate, and/or percentage chiller speed match the graphical user interface.

Energy Atmosphere Credit 3.2: Performance Measurement—Building Automation System

- To what level is energy use from systems metered?
- Is sub-metering of systems an option that can be pursued?

Energy Atmosphere Credit 4: On-site and Off-site Renewable Energy

- Are there plans to install onsite renewable energy sources?
- How large will the systems be?
- What opportunities exist for purchasing off-site renewable energy (Renewable Energy Credits)?

Energy Atmosphere Credit 5: Enhanced Refrigerant Management

- Do you keep records of all refrigerants used in base building systems?
- What is the refrigerant used in the buildings?
- Does any of your HVAC equipment or fire suppression systems use CFCs, HCFCs or halons?
- How efficiently does your base building equipment use refrigerants?
- Do you have a refrigerant management program in place to minimize leakage?
- Please answer the following
  - N = Quantity of HVAC Equipment Type:
- $Q =$ Cooling capacity of each equipment unit:
- $R_c =$ Refrigerant Charge (pounds of refrigerant per ton of cooling capacity):
- $L_r =$ Annual leakage rate as a percentage of the equipment’s full charge lost over a 12-month period (default value of 2.0% minimum value of 0.5%)

The following questions pertain to Materials and Resources Credits:

**MRp1 Sustainable Purchasing Policy, MRp2 Solid Waste Management Policy and MRc1 Sustainable Purchasing – Ongoing Consumables:**

- Does your project have existing purchase-tracking processes in place, or does a system need to be created?
- What types of purchases are within the building and site management’s control?
- Which of these purchases will your team address under an environmentally preferred purchasing policy? (Durable goods - Equipment & furniture, On-going consumables - cleaners, paints & finishes, light bulbs and fixtures, batteries, etc)

- Who will be responsible for managing and enforcing the policy?

- What actions are necessary for a new policy to take effect?

- How will the responsible parties track, measure and evaluate sustainable purchasing? (Sustainable purchasing includes locally manufactured products, Energy Star qualified equipment, recycled content products, low toxicity chemicals, no VOC paints and finishes, etc.)

- What procedures and strategies will your team implement to meet the goals and intent of the policy?

- How can you involve your vendors in supporting your sustainable purchasing goals?

- Have specific, ongoing consumable sustainability criteria been addressed by your department? (On-going consumables - cleaners, paints & finishes, light bulbs – no mercury
and fixtures, batteries, or of at least 50% Forest Stewardship Council (FSC)-certified paper products, etc)

- Can existing tracking processes be repurposed to track the product environmental qualities required by this LEED credit? (i.e. recycled content, locally produced, rapidly renewable resource, low toxicity chemicals, no VOC paints and finishes, etc.)

- Who is responsible for purchasing—one person or a group of people? Does a centralized department manage procurement, or is each division separately responsible for procuring the materials they use?

- What are the potential barriers to this project achieving sustainable purchasing?

- How can you involve your existing and future vendors in supporting your sustainable purchasing goals?

**MRc2: Sustainable Purchasing – Durable Goods**

- Which individuals or departments are responsible for procuring goods that are eligible for this credit?

- Has your project purchased, or will it purchase, any electronics, appliances, or furniture within two years of the anticipated end date of the performance period? If so, you might be eligible to earn this credit.

- Do any electronics or furniture need to be replaced? Schedule replacement of these goods during the performance period to qualify for this credit.

- Is there a system to track purchasing of all durable goods? If not, you will need to establish one to earn this credit.

- Have specific, durable goods sustainability criteria been addressed by your department? (Durable goods – Equipment, electronics, and appliances – Energy star rated & furniture – contains at least 10% post-consumer and/or 20% post-industrial material, at least 50% rapidly renewable material (e.g., bamboo, cotton, cork, wool), or at least 50% materials
harvested and extracted and processed within 500 miles of the facility, and Rechargeable batteries.)

**MRC3 Sustainable Purchasing – Facility Alterations and Additions**

- Is a facility alteration or addition scheduled to occur within the next year?

- Have specific building materials been addressed in an Environmentally Preferred Purchasing policy? (i.e. salvaged material, rapidly renewable resources, processed/produced within 500 miles, no VOC - paints and finishes, carpeting and carpet cushion that meets the requirements for the CRI Green Label Plus Carpet Testing Program?)

- Have certain products already been internally mandated by the project for design consistency for future additions or alterations? If they don’t meet sustainability criteria, can sustainable alternatives to these products be used? Such as: Light fixtures/ballast and no mercury bulbs, high percentage of recycled content, no VOC - paints and finishes, cleaning products and equipment, air filters etc.

- Can existing product tracking processes be reconfigured to track environmental qualities required by this credit? Or does such a system need to be created?

- Who is responsible for purchasing these types of materials? If applicable, how can a tracking system address multiple purchasing entities, including contractors, subcontractors, and operations staff?

- What are the project’s potential barriers to sustainable purchasing?

- How can you involve your vendors in supporting your sustainable purchasing goals?

**MRC4 Sustainable Purchasing – Reduced Mercury in Lamps**

- Does the project building have an accurate inventory of all lamps installed on-site? What is the effort level required to generate such an inventory?
• In multi-tenant facilities, does the project team control lamp purchasing throughout the building? If not, does the project building house any tenants who might be unwilling or unable to share lamp data?

• Are lamp vendors or manufacturer representatives available to support development of a low-mercury lamp purchasing plan?

• Who is responsible for placing purchase orders for lamps? Can they be responsible for tracking lamp purchases over the performance period?

• Provide manufacturer cut sheets for at least 20% of the total number of lamps purchased during the performance period, for the LEED submittal. The 3 main pieces of data needed are:
  • “Rated Average Life”: For fluorescent lamps, make sure to use the value for the three-hour instant start.
  • “Mean Lumens”: Make sure to use the value for “Design Mean Lumens.” Do not use the value for “Initial Lumens” unless the manufacturer does not provide a value for the mean lumens.
  • Sylvania Lighting provides a LEED-EBOM calculator on its commercial website that may be used as product documentation for mercury content.

**MRC5 Sustainable Purchasing - Food**

• How is the project team currently sourcing foodstuffs?

• If the project team does not provide food services in-house on a daily basis, does the project building ever sponsor or host events at which food is provided? Either of these scenarios provides an opportunity to pursue this credit successfully. Buildings must host at least one event where food is served to earn this credit.

• If your team sources products through a vendor, does the vendor have access to credit-compliant products, and can they document that the products meet the criteria? (See examples identified in the Reference Guide and Documentation Toolkit)

• Is your project team capable and willing to find a new vendor, or take over food purchasing if their vendor is not on board?
• Who assesses the products currently used and identifies sustainable alternatives?
• “Produced” food must be harvested and processed regionally to qualify for this credit. For example, in order for cheese to qualify, the dairy farm and processing plant must both be within 100 miles of the project site.

**MRc6 Solid Waste Management – Waste Stream Audit**

• How are trash and recycling currently handled at the project building? Does a solid waste management plan currently exist?
• Do building occupants recycle currently?

• What are the typical waste materials in your building? These might include commingled recycling, compost, batteries, fluorescent bulbs, and trash.

• How is trash and recycling currently handled at the project building? Does a solid waste management plan currently exist?

• Is there anyone interested in performing a waste audit? (Sorting and determining the amount of waste that could be recycled or diverted from landfills)

• Is there a location onsite where waste can be sorted and audited? Does the project building have enough space for staff to sort the materials and conduct the audit onsite, or will off-site processing be necessary?

**MRc7 Solid Waste Management – Ongoing Consumables**

• What materials do you currently recycle?

• Can you expand the recycling program?

• Who are the haulers that need to be considered? Many buildings use specialized haulers for certain recyclables, such as shredded paper.
• Can the waste hauler(s) provide accurate and timely information on the amount of landfill and recycled waste each month?

• How is waste disposal and diversion being tracked currently? Do you need to set up a new tracking system to monitor diversion rates? Who will be responsible for collecting this data?

• Can you conduct a waste audit, to assess the effectiveness of your recycling program and identify areas for improvement?

• What can you do to foster better diversion rates for the building?

• How do the individual tenants and occupants fit into the solid waste management puzzle, and what can you do to encourage them to participate in the solid waste management program?

**MRC8 Solid Waste Management – Durable Goods**

• What durable goods are likely to be a part of the building’s waste stream?

• How are these materials currently handled from a waste management perspective? What individuals or departments are involved?

• Does the building participate in donations, salvage programs, or other means to keep reusable materials out of landfills?

**MRC9 Solid Waste Management – Facility Alterations and Additions**

• Is a facility alteration or addition scheduled to occur within the next year?

• Has a waste management plan been developed for the construction?
• Is there a local market for sending waste to be recycled or salvaged? Are there organizations to which the waste can be donated? (Partially used paints, sealants, and finishes; drywall, trim, ceiling panels; wall studs, doors, windows, and insulation)

• Can the project reuse any demolition materials?

• Are there items that can be deconstructed in a manner that allows for reuse — de-nailing 2x4 wood planks, for example?

• Does the construction team or hauler have an existing system of tracking construction waste? Can that system be repurposed to track waste in the manner required by this LEED credit?

• What are your district's potential barriers to waste diversion?

• Your department already takes some recyclables, would you consider expanding the materials you hold or are there district barriers that prevent you from doing so?

• What recyclables do you already handle for the district?

• What contractors do you use and how often do they pick up?

• What other recyclables are you open to handling for the district?

• Do you currently collect district electronic waste (computers, monitors, copiers, printers, etc.) for recycling pickup? If not why?

• Are you open to collecting e-waste for the district voluntarily?

• Do you have the authorization to begin collecting other materials or are there district protocols that you have to go through?

• If a formal policy was written that required your department to begin taking electronic waste what difficulties would you face? (Space, time, resources)

• Do you break down durable goods into recyclable components for recycling? (i.e. separate metal from wood for salvage)

• Do you salvage metal? If not why?

• Do reusable building elements make their way to your department such as doors, windows, wall studs, insulation, carpet etc.? Would you consider taking these materials if you felt they could be sold or redistributed?
• Has a waste management plan been developed for the construction/additions?

The following questions pertain to Interior Air Quality Credits

1.1-1.5: Indoor Air Quality Best Management Practices
• Are CO2 monitors currently installed in the building?

• Provided that this is a nontechnical audit, does your organization have the staff time to perform the audit in-house? Who?

• Does your building have variable ventilation loads due to changes in use from hour to hour or day to day?

• Have you already completed the ventilation rate procedure (VRP) calculations and Outdoor Airflow (OA) measurements?

• Is the mechanical system compatible with MERV 13 filters? What filters are currently used?

• How will the use of MERV 13 filters impact the building’s energy use?

• Is there a cost premium for purchasing MERV 13 filters?

• What filters can be used on the system to provide a high level of filtration without going through system upgrades, overhauls, or expensive renovations?

• Are any facility alterations or additions planned in the near future?

• Does your HVAC system have the capacity to flush out impacted areas after construction before they are occupied?

• Do you have an existing policy in place mandating that 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, 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3)?
• During construction activities do you specify containment control strategies that include protecting the HVAC system, controlling pollutant sources, interrupting pathways for contamination, enforcing proper housekeeping and coordinating schedules to minimize disruption and keep particle contaminants to a minimum?

• Does your HVAC system have the capacity to flush out impacted areas after construction before they are occupied? If not, can you use temporary equipment to perform the flush-out?

• Do have a policy in place requiring that mandate a flush out procedure as follows: After construction ends and all interior finishes have been installed, install new filtration media and flush out the affected space. The flush out must be done by supplying a total outdoor air volume of 14,000 cubic feet per square foot of floor area while maintaining an internal temperature of at least 60° F and maintaining a relative humidity no higher than 60% where cooling mechanisms are operated. The affected space may be occupied only after the delivery of at least 3,500 cubic feet of outdoor air per square foot of floor area and the space has been ventilated at a minimum rate of 0.30 cfm per square foot of outdoor air or the design minimum outside air rate (whichever is greater) for at least 3 hours prior to occupancy until the total of 14,000 cubic feet per square foot of outdoor air has been delivered to the space. The flush-out may continue during occupancy.

• Are all stored on-site or installed absorptive materials protected from moisture damage?

• If permanently installed air-handlers must be used during construction, is a filtration media with a minimum efficiency reporting value (MERV) of 8 used at each return air grille, as determined by ASHRAE Standard 52.2-1999 (with errata but without addenda1). Replace all filtration media immediately prior to occupancy?

• Upon the completion of construction, are all HVAC and lighting systems returned to the designed or modified sequence of operations?

2.2 & 2.4: Controllability of Systems—lighting & daylighting

• What type of lighting controls will improve both occupant comfort and energy performance?

• Is there currently a standardized lighting system throughout the district? Would you like to have a standardized system in place?

• What bulbs and ballasts/fixtures would you prefer?

3.1-3.6 Cleaning
IEQc3.1

- What are the existing cleaning products and procedures? Are they written down? (Product name and function, chemical name, and MSDS)

- Does your project building incorporate nontoxic strategies into the current cleaning program? Are they written down?

- Is the cleaning program is handled by an outside vendor, does the vendor have a green cleaning program that it can execute on your site? If not, is the vendor willing to learn to integrate green cleaning practices into an existing program?

- Do your building's preferred product suppliers carry nontoxic options?

- How is training handled for cleaning staff? What does the training curriculum entail?

- Does your project building have a tracking system for cleaning supply and equipment purchases? (Product name and function, chemical name, and MSDS & Equipment make & model)

- Do you use dilution systems in your cleaning program?

- Do you have a staffing plan for the cleaning program?

- Do you have a system for collecting occupant feedback?

- What opportunities are there to improve the existing cleaning program?

- Does your building contain spaces with special cleaning requirements such as laboratories, health care, or food processing? If so, describe the cleaning requirements for these unique spaces in your documentation.

IEQc3.2

- Do you have the time to perform the APPA (Association of Physical Plant Administrators Custodial Staffing Guidelines) audit in-house?
• Do you regularly consult APPA custodial guidelines for training and effective custodial cleanliness of your buildings?

IEQc3.3

• How is the project team currently sourcing products?

• What are the existing cleaning products and procedures? Are they written down? (Product name and function, chemical name, and MSDS)

• Does your project building incorporate nontoxic strategies into the current cleaning program? Are they written down?

• Is the cleaning program is handled by an outside vendor, does the vendor have a green cleaning program that it can execute on your site? If not, is the vendor willing to learn to integrate green cleaning practices into an existing program?

• Do you have a system for collecting occupant feedback?

• Who can supply an inventory of products currently in use? (Product name and function, chemical name, and MSDS)

• If the team is currently sourcing products through a vendor, does the vendor have access to IEQc3.3-compliant products?

• Is the project team willing and authorized to take over purchasing if their vendor is not on board?

• Does your building contain spaces with special cleaning requirements such as laboratories, health care, or food processing? If so, describe the cleaning requirements for these unique spaces in your documentation.
IEQc3.4

- How is your project team currently sourcing equipment?

- Who can supply an inventory of equipment currently used in your building? (Equipment make & model)

- If your team is currently sourcing equipment through a vendor, does the vendor have access to compliant equipment? (Ergonomically designed to reduce fatigue and minimize vibrations, CRI certified, operates at less than 70 dBA, vacuums fitted with HEPA filters, propane powered equipment operates at less than 90 dBA and have high efficiency engines, equipped with variable speed pumps and on board chemical metering optimizing cleaning fluids)

- Is your project team willing, and authorized, to take over purchasing if the current vendor is not on board?

- How much of a cost premium is your team willing to pay to achieve compliance? This will vary according to how much equipment you need to purchase in order to meet the 20% threshold.

- How obsolete is your current inventory of cleaning equipment? Have there been regular complaints about any particular pieces of equipment from either maintenance personnel or occupants? If obsolete equipment needs to be replaced anyway, that can present a good opportunity to earn this credit.

- Do you consider CRI certified (Carpet and Rug Institute) equipment when purchasing new equipment?

- How much of your current inventory is CRI certified? (Carpet and Rug Institute: <70 dBA sound level for vacuums and other small powered devices, <90 dBA for larger powered equipment floor buffers, etc.)

- How does your tracking system work? Is there room for improvement within the tracking system?

- Are you willing to write a green cleaning policy, or at least parts of it, or update the existing policy so that it reflects the requirements outlined above (CRI certified equipment)?
• How often is maintenance performed on equipment?

IEQc3.5
• Does the building have grilles, carpets or mats that are at least 10 ft. long?

IEQc3.6
• How are indoor pests controlled? Mechanical and biological controls rather than chemicals?
• Are sanitation practices and structural repairs used to resolve pest issues in and around the facility?
• Are pest populations monitored and inspected?
• What types of preventive pest management exist at the project building and site? (i.e. Nontoxic traps, cleaning regimens, inspections)
• Are chemical controls considered a first or last resort for managing pest populations?
• Do existing vendors offer environmentally friendly services? If no, are they willing to learn and adopt new practices?
• Does the project building have a staff member dedicated to managing pest and landscape issues?
  • If not, it is important to designate at least one point person to develop and implement the comprehensive Integrated Pest Management Plan.
  • If so, it is important to get that designated person involved from the start of the project to ensure that all environmental best management practices are thoroughly developed, included in any related vendor contracts, and implemented on an ongoing basis.
• Does the district send out a universal notification 24 hrs in advance identifying the pest (fact sheet) and chemical (MSDS) to be used to all building occupants when a chemical control is to be used in the building?
### General Building Information
- **Project:** Laramie County Schools
- **Building Name:** Triumph High School
- **Date Recorded:** 11.1.11
- **Recorded By:** April Wackerman, IBE

| Site Factors                                                                 | Y | M | N | Comments \n|---|---|---|---|---|
| LEED Certified building                                                      | X | No LEED certifications in district | Champion |
| Exterior hardscape management plan (building and hardscape cleaning, de-icing, exterior paints) | X | No plan in place - district wide | Ed Restivo |
| Integrated pest management, erosion control, and landscape management plan   | X | No plan in place - district wide | Ed Restivo; Dave Ohde |
| Alternative transportation (estimate)                                        | X | Single occupancy vehicle is the norm, no shorten work weeks, bus stop within 3/4 mile | Mike Hellenbolt |
| Native or adapted vegetation (% of site area)                                | X | Native landscaping and turf | Site plans, floor plans, elevations by Mike Peel |
| Stormwater management program                                                | X | Detention on-site, designed to be drained | Site plans, floor plans, elevations by Mike Peel |
| Hardscape areas: asphalt, concrete, pervious, etc                           | X | Asphalt parking, no concrete cleaning of sidewalks | Site plans, floor plans, elevations by Mike Peel |
| Roof materials                                                              | X | White TPO                        | Blake Davis |
| Exterior lighting (controls, shading devices, photometrics)                  | X | Timeclocks, full cut off fixtures, photocells | Fred Heil |
| Interior lighting (controlled to turn off during non-business hours?)        | X | All lighting auto-controlled     | Fred Heil |

### Water Factors
- **Plumbing fixture upgrades**
  - **Comments:** New building
  - **Champion:** Greg Tucker
- **Year of substantial completion of plumbing fixtures**
  - **Comments:** Jan-08
  - **Champion:** Greg Tucker
- **Whole building water meter**
  - **Comments:** None
  - **Champion:** Greg Tucker
- **Water submeters (irrigation, process water, cooling tower water, DHW, etc.)**
  - **Comments:** Irrigation sub-meter
  - **Champion:** Ed Restivo
- **Conventional or water efficient landscaping**
  - **Comments:** Rain sensors
  - **Champion:** Ed Restivo
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<tr>
<td>Conventional or high efficiency irrigation system</td>
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<td>Refrigerants (CFCs, HCFCs, fire suppression system)</td>
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<td>R-22, Fire is water</td>
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<td>Shannon Fertig</td>
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<td>2kW on-site wind turbine for educational purposes (7 installed district wide)</td>
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<td>Check Eaton commissioning report</td>
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<td>Check Eaton commissioning report</td>
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<td>Filter MERV rating or efficiency</td>
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<td>No smoking on any campus</td>
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<td>Multi-level switching in classrooms</td>
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<td>Daylight measuring or modeling</td>
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<td>None</td>
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<td>Green cleaning policy</td>
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<td></td>
<td>No policy in place - district wide</td>
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<tr>
<td>Janitorial services done in house or contracted out</td>
<td>X</td>
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<td></td>
<td>In house</td>
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</table>
**Building Walkthrough Checklist**

**Project:** Laramie County Schools  
**Building Name:** Alta Vista Elementary School  
**Date Recorded:** 11.1.11  
**Recorded By:** April Wackerman, IBE

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### General Building Information

- **Built in 1988,** major remodel in 2005 (HVAC) - replaced atrium windows with metal roof, added 6 new AHUs, 2 existing AHUs were refurbished, added Dx cooling, electrical upgrade
- **55, 186 square feet**
- **Energy audits and commissioning planned**
- **42 kW photovoltaic system planned for March 2012**

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### Site Factors

<table>
<thead>
<tr>
<th>Y</th>
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<th>N</th>
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<td>LEED Certified building</td>
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<td>Exterior hardscape management plan (building and hardscape cleaning, de-icing, exterior paints)</td>
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<td>Integrated pest management, erosion control, and landscape management plan</td>
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<td>Alternative transportation (estimate)</td>
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<td>Native or adapted vegetation (% of site area)</td>
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<td>Stormwater management program</td>
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<td>Hardscape areas: asphalt, concrete, pervious, etc</td>
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<td>Roof materials</td>
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<td>Plumbing fixture upgrades</td>
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<td>Whole building water meter</td>
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<tr>
<td>Current preventative maintenance plan</td>
<td>X</td>
<td>District-wide</td>
<td>Blake Davis</td>
<td></td>
</tr>
<tr>
<td>Energy audit (ASHRAE Level I, II, or III)</td>
<td>X</td>
<td>Level II audit is planned, RFQ for corrections, T8 lighting retrofit is planned</td>
<td>Blake Davis</td>
<td></td>
</tr>
<tr>
<td>ENERGY STAR Rating (access to utility bills)</td>
<td>X</td>
<td>ENERGY CAP pro for access to utility information</td>
<td>Blake Davis</td>
<td></td>
</tr>
<tr>
<td>Refrigerants (CFCs, HCFCs, fire supression system)</td>
<td>X</td>
<td>R-22, Fire is water</td>
<td>Greg Tucker</td>
<td></td>
</tr>
<tr>
<td>Retro or re-commissioning</td>
<td>X</td>
<td>Retro-commissioning is planned</td>
<td>Shannon Fertig</td>
<td></td>
</tr>
<tr>
<td>Commissioning plan</td>
<td>X</td>
<td>In progress</td>
<td>Shannon Fertig</td>
<td></td>
</tr>
<tr>
<td>Building Automation System (BAS)</td>
<td>X</td>
<td>BAS exists on all buildings though they don't all talk very well, lighting is not included</td>
<td>Greg Tucker</td>
<td></td>
</tr>
<tr>
<td>System level energy meters</td>
<td>X</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renewable energy systems (on-site or off-site)</td>
<td>X</td>
<td>Photovoltaic panels in progress to be installed March 2012</td>
<td>Greg Tucker</td>
<td></td>
</tr>
<tr>
<td>Emissions tracking</td>
<td>X</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Materials Factors</strong></td>
<td>Y M N Comments Champion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustainable purchasing policy</td>
<td>X</td>
<td>No policy in place - district wide; Each school has a purchasing budget, then each teacher has a budget to purchase supplies from district warehouse; Big ticket items go through purchasing department</td>
<td>Brian Harmsen</td>
<td></td>
</tr>
<tr>
<td>Solid waste management policy</td>
<td>X</td>
<td>No policy in place - district wide</td>
<td>Desi Rivera</td>
<td></td>
</tr>
<tr>
<td>Fluorescent lamp purchasing policy</td>
<td>X</td>
<td>No policy in place - district wide</td>
<td>Brian Harmsen</td>
<td></td>
</tr>
<tr>
<td>Waste stream audit? When? Who would do? Willing to consider?</td>
<td>X</td>
<td>Would be up to each school on willingness and interest</td>
<td>Desi Rivera</td>
<td></td>
</tr>
<tr>
<td>Waste disposal details (provider, contract, etc)</td>
<td>X</td>
<td>One teacher takes recycling to collector, no formal program in place</td>
<td>Desi Rivera</td>
<td></td>
</tr>
<tr>
<td>Current recycling program</td>
<td>X</td>
<td>Paper and cardboard are recycled district wide; Teacher personally recycles paper, plastic, aluminum and glass though recycling rates are lower than they could be given available collection capacity</td>
<td>Desi Rivera</td>
<td></td>
</tr>
<tr>
<td>Indoor Environmental Quality Factors</td>
<td>Y</td>
<td>M</td>
<td>N</td>
<td>Comments</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>------------------------------------------------------------</td>
</tr>
<tr>
<td>Current ventilation strategy &amp; equipment</td>
<td></td>
<td>X</td>
<td></td>
<td>Maximize economy, optimize comfort; heat wheel recovery</td>
</tr>
<tr>
<td>ASHRAE 62.1 / cfm per person</td>
<td></td>
<td>X</td>
<td></td>
<td>Check O&amp;M manual from renovation</td>
</tr>
<tr>
<td>Minimum outside air damper position</td>
<td></td>
<td>X</td>
<td></td>
<td>Check Eaton commissioning report</td>
</tr>
<tr>
<td>Outdoor airflow measurement devices</td>
<td></td>
<td>X</td>
<td></td>
<td>Check Eaton commissioning report</td>
</tr>
<tr>
<td>Filter MERV rating or efficiency</td>
<td></td>
<td>X</td>
<td></td>
<td>Merv 8</td>
</tr>
<tr>
<td>IAQ plan for facility alterations and additions</td>
<td></td>
<td>X</td>
<td></td>
<td>No plan in place</td>
</tr>
<tr>
<td>Interior smoking policy</td>
<td></td>
<td>X</td>
<td></td>
<td>No smoking on any campus</td>
</tr>
<tr>
<td>Location of exterior designated smoking areas (distance from entries, air intakes, &amp; operable windows)</td>
<td></td>
<td>X</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Adjustable task lighting at individual work stations</td>
<td></td>
<td>X</td>
<td></td>
<td>No task lighting in administration spaces</td>
</tr>
<tr>
<td>Lighting controls for multi-occupant spaces</td>
<td></td>
<td>X</td>
<td></td>
<td>Multi-level switching in classrooms</td>
</tr>
<tr>
<td>Daylight measuring or modeling</td>
<td></td>
<td>X</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>Green cleaning policy</td>
<td></td>
<td>X</td>
<td></td>
<td>No policy in place - district wide</td>
</tr>
<tr>
<td>Building cleaned with conventional or green / non-toxic cleaning products</td>
<td></td>
<td>X</td>
<td></td>
<td>No policy in place - district wide</td>
</tr>
<tr>
<td>Janitorial services done in house or contracted out</td>
<td></td>
<td>X</td>
<td></td>
<td>In house</td>
</tr>
</tbody>
</table>
Environmental Best Practices for Deicer Application

**Storage**
Store salt in an area where you can recover the solids after the snow melts.

Locate snow down-slope from salt and sand storage to prevent snow melt from flowing through salt or sand storage area.

Store salt where rain, snow and melt water cannot access it. Store salt on an impervious surface.

Cover all piles, ideally indoors.

Sweep loading areas back into the pile to reduce leaching.

Store bags away from rain or snow.

**Anti-Icing**
Anti-icing—a proactive approach—should be first in a series of strategies for each winter storm. By applying a small and strategic amount of liquid or pre-wet deicer before a storm, you can prevent snow and ice from bonding to the pavement.

Pretreated or pre-wet materials are not as efficient as liquids for anti-icing; you need more material and they don’t track as well. They will work if applied at very low application rates immediately before the snow event.

It is better to use less than more. Over-application can cause slippery conditions.

Anti-icing is often effective for heavy frosts.

Anti-icing works best when combined with accurate surface weather information.

**Deicing/Traction**
Deicing is a reactive operation where a deicer is applied to the top of an accumulation of snow, ice, or frost that has already bonded to the pavement surface and can no longer be physically removed. Deicing costs more than anti-icing in materials, time, equipment, and environmental damage.

Don’t try to melt all the snow or ice on the surface with salt. This is an overuse of materials. Apply just enough to loosen the bond between the surface and the ice so it can be plowed off.
**Sidewalk Deicing**
Always power sweep or plow snow away prior to applying deicers. If you plow first, the chances of refreeze diminish and slush build-up is minimized. For large entrances to buildings where people access the sidewalks directly from streets, move the snow away from the curb and deice these areas as well. Sand build-up on sidewalks can become a hazard and will track into buildings, damaging carpets and flooring.

Use drop spreaders, not rotary spreaders, for narrower sidewalks. If using a rotary spreader, adjust the opening to limit dispersion of deicers to the sidewalk.

Look for opportunities to close extra entrances during the winter to reduce the need to use chemicals on all sidewalks and steps.

Focus on aggressive mechanical removal of snow. The less snow, the less deicer required. This will lend to a safer walking surface.

**Parking Lot Deicing**
Always plow before applying the chemical.

Handicap parking spots should not get excess salt and sand.

Sand/salt mix isn’t advised but may help in some situations such as freezing rain.

You may be able to use a lower rate in high traffic areas. Traffic tends to help mix and melt.

**Drainage**
Take time to inspect drainage ways and remove obstructions to prepare for the spring melt.

Never open frozen storm drains with high doses of salt. This is toxic to aquatic life in the receiving waters.

Use other methods such as heat to open drains. Look for ways to capture any solids before they enter the storm drain system.

Make sure your parking lot does not drain through your salt storage area.

**After the Storm**
When snow and ice control operations have ended after the storm, evaluate what was done, what worked, and what could be changed to improve operations.

Accurately record your material use.

Clean and check all equipment.
At the end of the season, clean and maintain the truck, tanks, brine-making systems, and pumps according to manufacturer specifications.

Do not use deicers at the end of the season just to use them up. Save them for next year. Place all piles on an impervious pad and cover them. This includes salt and salt/sand mixes.
To be completed weekly by building managers (and by others as needed).

Name ______________________________ Building ___________________________

O&M Strategy (select all that apply)
- Exterior Paints and Sealants
- Interior Paints and Sealants
- Hardscape Cleaning and Maintenance
- Integrated Pest Management
- Green Landscaping of Buildings
- Snow Removal and De-icing
- Roofing Maintenance
- Parking Garage Maintenance
- HVAC Maintenance
- Plumbing Upgrades and Maintenance
- Lighting Maintenance
- Cleaning Procedures
- Cleaning Product Selection

Specific procedures/sections that were completed successfully.
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Specific procedures/sections that were difficult to complete.
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Recommendations for improvements or additions to specific procedures/sections.
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Did you have any problems identifying products or with product performance?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

General comments on procedures or product recommendations.
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Please fax completed Feedback Forms to [insert name] at [phone number]