BLUE EARTH COUNTY JUSTICE CENTER

Green Design

Green Design

Strategies and Methods Used to

Achieve Higher Environmental Performance for the

Blue Earth County Justice Center

Introduction

The Blue Earth County Justice Center was built following a growing need for jail space, court security and a more streamlined criminal justice system. For several years Blue Earth County has been a leader in the development of programs that preserve and protect our environmental resources, so it was important for County policy makers to incorporate green building initiatives within the facility's design.

Green design not only makes a positive impact on public health and the environment, it also reduces operating costs, potentially increases occupant productivity, and helps create a sustainable community. Toward that end, the Blue Earth County Justice Center has received a Leadership in Energy and Environmental Design (LEED) Certification from the United States Green Building Council. Making it the first public LEED certified green building in south-central Minnesota.

This brochure outlines aspects of the facility that contributed to its recognition as a LEED-certified building.

Site Considerations

From the very outset, building development affects and transforms the land. On a macro level it often is destructive to local ecology, contributing to deforestation, destruction of wetlands, sprawl, and other environmental problems.

SITE CONSIDERATIONS

1 Erosion and Sedimentation Control

Site clearing and earth moving during construction often results in erosion problems because adequate environmental protection strategies are not employed. Erosion results from precipitation and wind processes, leading to degradation of property and sedimentation of local water bodies. This affects water quality as well as navigation, fishing and recreation activities.

The Blue Earth County Justice Center project utilized the following strategies to control erosion and sedimentation during construction:

- Temporary Seeding
- Perimeter Silt Fence
- Preservation of Natural Vegetation
- Permanent Seeding and Planting
- Dust Control - watering
- Temporary Sediment Basin
- Geotextile Mats
- Drainage Swales
- Outlet Protection
- Storm Drain Inlet protection
- Rock construction entrances

These practices kept topsoil from leaving the site and contributing to air and water pollution.

SITE CONSIDERATIONS

2 Alternative Transportation

Reduction of private automobile use reduces reliance on fossil fuels, fuel consumption and the associated release of air and water pollutants in vehicle exhaust. Downsizing the amount of parking areas also reduces the amount of pavement impacting natural systems, and to allow for more ecologically responsive approaches to the site.

The Blue Earth County Justice Center project helps to reduce reliance on fossil fuels and use of automobiles by providing bicycle storage and shower-changing facilities. This will encourage staff to cycle to and from the building

during appropriate weather conditions. Additionally, preferred parking is provided for both carpools and low-emitting (hybrid) vehicles.

Driving a fuel-efficient, low-emitting vehicle that achieves 40 mpg or better can reduce carbon emissions by a minimum of 625 tons per year. Two people carpooling in a standard vehicle can achieve similar reductions. Additionally, carpooling or driving high-mileage vehicles can save an average of $3,000 per year in transportation associated costs.

Blue Earth County's efforts will help to reduce 16,250 tons of CO_2 per year as well as help employees save money. Reducing CO_2 emissions by 16,250 tons equates to planting 6,770 trees annually.

SITE CONSIDERATIONS

3 Development Footprint

Development of undeveloped areas can disturb and/or destroy wildlife and plant habitat as well as wildlife corridors that allow animal migration. Ecological site damage can be avoided or minimized by limiting the extent of construction activities in the site and by restricting the development footprint to the greatest extent possible. The Blue Earth County Justice Center project helps to reduce site disturbance and the development footprint by providing a contiguous, vegetated open-space area adjacent to the building that exceeds the building footprint. This area preserves open space as potential habitat for wildlife and native plant species.

SITE CONSIDERATIONS

4 Stormwater Management

Rain falling on the ground generates large amounts of stormwater. If the ground is grassy or planted, most of the stormwater seeps into the ground naturally. If the ground surface is paved (streets, sidewalks and parking lots), most of the stormwater is carried by pipes below ground to rivers, lakes or streams. The stormwater runoff contains sediment and other contaminants (oil, fuel, lubricants, salt) that have a negative impact on water quality.

The Justice Center project helps to manage and control stormwater runoff through the use of a stormwater management plan that promotes infiltration and captures and treats the stormwater runoff by using native plantings, grasses and a stormwater retention pond among other strategies. These strategies help the project spend less money on storm sewer infrastructure and help to recharge local aquifers through onsite infiltration - mimicking the natural water cycle.

Water Efficiency

Building construction and operation draws heavily on water from the environment. Most of the earth's water is located in oceans and is too salty for residential, commercial or industrial use. Only about 0.003 percent of earth's water is readily available as fresh water for human use. Building material manufacturing, construction and operations consumes 16 percent of available fresh water annually.

WATER EFFICIENCY

1 Water-efficient Landscaping

Landscape irrigation practices in the United States consume large quantities of potable (drinkable) water although water volumes of non-potable (lower-quality) water are equally effective for irrigating landscapes. The Blue Earth County Justice Center project eliminates the use of potable water use for irrigation by the use of native and adapted vegetation that do not require as much water as other plant species. Native landscape that have lower irrigation requirements also tend to attract native wildlife. Rain water is collected and stored for irrigation use.

The plantings used on the Justice Center site are:

Grasses:

All grasses used are native, drought-tolerant species appropriate for the unique microclimate characteristics of south-central Minnesota.

- Karl Forester Grass
- Big Blue Stem
- Native, Wet and Turf Grass Seed
- Prairie Dropseed
- Little Blue Stem

WATER EFFICIENCY

site plantings continued...

Trees:

- Bur Oak
- Swamp White Oak
- Fall Gold Ash
- River Birch
- Ironwood
- Norway Pine
- Red Oak
- Common Hackberry
- Quaking Aspen
- Blue Beech
- White Pine
- Black Hills Spruce

Shrubs:

- Nine Bark
- Sumac
- Juniper
- Honeysuckle
- Dogwood

Flowers:

- Sedum
- Various Coneflowers
- Hosta

Eliminating the need for irrigation on this project saves an estimated 375,421 gallons of water per year, enough to cover 10.5 football fields with one inch of water at a cost savings of $3,200 per year (based on the cost of $3.13 per cubic feet for water and $3.18 per cubic feet for sewerage). This represents a 100 percent reduction in potable water and 61 percent reduction in total water applied for irrigation purposes.

WATER EFFICIENCY

1 Water Use Reduction in Plumbing Fixtures

Toilet flushing uses the most water in residential and commercial buildings, accounting for approximately 4.8 billion gallons of water per day.

The Blue Earth County Justice Center project is estimated to use 464,233 gallons of water annually for sewage conveyance (toilets, urinals, sinks, showers). By installing low-flow toilets, urinals, faucets, sinks, showerheads and dishwashers, Blue Earth County is saving an estimated 35 percent of water used in the building -- or 246,163 gallons of water per year, enough to cover seven football fields with one inch of water at a cost savings of $2,100 per year (based on a combined price for water and sewage costs of $6.31 per 100 cubic feet).

Energy and Atmosphere

Buildings are energy intensive in their construction and operation. According to the Worldwatch Institute, about 40 percent of the world's total energy usage is dedicated to the construction and operation of buildings.

In the United States, construction and material production account for roughly 9 percent of energy use, and building operation accounts for 30 percent. This energy use has serious impacts on the environment. Buildings account for about one-third of the emissions of heat-trapping carbon dioxide from fossil fuel burning and two-fifths of acid-rain-causing sulfur dioxide and nitrogen oxides. Buildings also contribute to other side effects of energy use, including oil spills, nuclear waste generation, river damming, toxic run-off from coal mines, and mercury emissions from coal burning.

Energy consumption can be dramatically reduced through practices that are economical and readily achievable. Improving the energy performance of buildings lowers operational costs, reduces pollution generated by power plants and other energy-producing equipment and enhances comfort.

It is essential to consider a building's energy load as a whole and then integrate energy efficiency measures in order to maximize savings.

Several strategies and methods were used to achieve higher energy performance in the Justice Center.

ENERGY AND ATMOSPHERE

1 Building Commissioning

The Justice Center project achieves greater energy and operational efficiency by use of an objective third-party commissioning process.

This process included:

- review of the design
- creation and utilization of a commissioning plan
- installation of building systems verification
- equipment and systems start up and check-out
- testing of each system and product
- development of an operations manual
- training of maintenance staff
- ongoing operational procedures.

2 Refrigerant Management

Older refrigeration equipment uses chlorofluorocarabons (CFCs) and sometimes hyrdochlorofluorocarbons (HCFCs) in its refrigerants. CFCs and HCFCs are the root cause of serious environmental and health problems. Leaks in refrigeration results in CFC releases into the atmosphere. The reaction between a CFC and an ozone molecule in the earth's stratosphere destroys the ozone and reduces the stratosphere's ability to absorb a portion of the sun's ultraviolet (UV) radiation. CFCs and HCFCs in the stratosphere can also absorb infrared radiation and function as potential greenhouse gases,

causing significant health impacts in humans such as skin cancer, cataracts, weakened immune systems and asthma.

The Justice Center project does not use HVAC systems and equipment containing CFCs or HCFCs.

ENERGY AND ATMOSPHERE

3 Energy Conservation/Performance

Energy efficiency reduces the harmful environmental side effects of energy production and use. Conventional forms of energy production have devastating environmental effects. Production of electricity from fossil fuels creates air and water pollution; hydroelectric generation plants can make waterways uninhabitable for indigenous fish; and nuclear power has safety concerns as well as problems with disposal of spent fuel.

The institution of energy efficiency measures can be done at no cost to occupant comfort or building services. The Justice Center project is designed to save 32 percent of energy use and costs beyond code requirements. This equates to $132,433 per year at October 2007 energy prices.

Energy savings for this project are attained in the following ways:

- Insulation at thermal envelope (walls, roof, foundation, and floor of building)
- Daylighting (using as much window light as possible)
- High-performance windows and glazing
- Exterior shading devices
- Lighting and temperature controls
- Geo-thermal heating and cooling system
- Variable air volume controls
- High-efficiency pumps, motors, fans
- Heat recovery
- Occupancy sensors to control variable air volume and ventilation rates
- High-efficiency equipment

Materials and Resources

Building design and construction uses significant quantities of natural resources and materials. The building industry consumes three billion tons of raw materials annually - 40 percent of the total material flow in the global economy. The manufacturing process of new materials is water and energy intensive and contributes to environmental degradation and pollution. Harvesting, extraction, mining, and processing new materials pollutes the air and rivers and threatens ecosystems and wildlife habitat. Construction and demolition wastes constitute about 40 percent of the total solid waste stream in the United States.

1 Storage and Collection of Recyclables

By creating convenient recycling opportunities for building occupants, a significant portion of the solid waste stream can be diverted from landfills. Recycling of paper, metals, cardboard and plastics reduces the need to extract virgin natural resources.

Paper

- It is possible to achieve significant reductions in the cost of buying office paper by reducing paper use and reusing paper where possible.
- Recycling office paper may reduce waste bills by as much as 50 percent.
- Making new paper from old paper uses 30 to 55 percent less energy than making paper from trees, and reduces related air pollution by 95 percent.

- 77 percent of paper waste generated in offices is recyclable.
- Typical business offices generate about 1.5 pounds of waste paper per employee each day.
- Nearly half of typical office paper waste is high-grade office paper.
- Recycling one ton of paper typically saves about 3.3 cubic yards of landfill space. A cubic yard of office paper weighs about 380 pounds.
- Commercial and residential paper waste accounts for more than 40 percent of waste going to the landfill. Eliminating this paper from our waste would nearly double the lives of current landfills.
- Newspaper is recycled into newspaper, game boards, egg cartons, gift boxes, animal bedding, insulation, and packaging material.
- Office paper is recycled into office paper, tissue paper, paper towels and toilet paper.
- Corrugated cardboard is recycled into new cardboard and cereal boxes.

MATERIALS AND RESOURCES

Resources Saved Per Ton of Paper Recycled

- 17 trees
- 350 pounds of limestone
- 60,000 gallons of water
- 3.3 cubic yards of landfill space
- 275 pounds of sulphur
- 9,000 pounds of steam
- 225 kilowatt hours

Plastic

- 35 percent of the polyester carpet sold in America contains recycled PET (polyethylene teraphthalate) bottles (primarily soft drink bottles).
- Recycled plastics are made into fiberfill, bottles, shower stalls, recycling bins, scouring pads, paint brushes, industrial strapping, drainpipes, plastic lumber, and flowerpots.

Glass

- Every ton of glass recycled saves the equivalent of nine gallons of fuel oil needed to make glass from virgin materials.
- At least 30 percent of glass containers on grocery store shelves can be recycled.
- Container glass can be recycled repeatedly with no loss of quantity or quality.

Metal

- Every three months, the U.S. throws away enough aluminum to rebuild our entire commercial airline fleet.
- Recycling aluminum uses 95 percent less energy than making new aluminum from bauxite ore.
- We throw away enough iron and steel to continuously supply all of America's auto makers.
- Metal is melted down and reformed into new products such as cans, automobile parts, siding, appliances and building materials.

2 Use of Materials Containing Recycled Content

By selecting materials with recycled content, environmental impacts associated with extracting, harvesting and manufacturing virgin materials are often reduced. The solid waste stream is also reduced by diverting recyclable materials that would otherwise by deposited in a landfill, with associated impacts to land, water and air also lessened.

The Justice Center project utilizes materials containing recycled content equivalent to over two-thirds of the total materials cost of the project. This amount is more than double the amount required for achieving the LEED credit, and allows the project to attain a special innovation and design credit.

Materials Containing Significant Percentages of Recycled Material Content on this Project:

- Concrete Steel Reinforcing
- Precast Concrete Deck
- Structural Steel Framing
- Steel Decking
- Metal Fabrications and Stairs
- Hollow Metal Doors and Frames
- Exterior Glass walls and framing
- Acoustical Ceiling Tile
- Plastic Toilet Compartments
- Cast in Place Concrete
- Precast Concrete Walls
- Steel Joists
- Metal Studs
- Sheet metal Flashing
- Wood Doors
- Gypsum Wall Board
- Carpeting
- Metal Lockers

MATERIALS AND RESOURCES

3 Local/Regional Materials

By purchasing regionally manufactured building materials, the local economy is supported, transportation costs and environmental impacts are reduced and dollars are retained in the region, supporting the regional economy.

The Justice Center project utilizes regional materials (materials obtained within 500 miles of the project site) equivalent to over one-third of the total materials cost of the project. This amount is significantly higher than the amount required for achieving the LEED credit, and allows the project to attain a special innovation and design credit.

Local/Regional Manufactured Materials used on this Project:

- Concrete Steel Reinforcing
- Precast Concrete Deck
- Structural Steel Framing
- Steel Decking
- Metal Fabrications and Stairs
- Hollow Metal Doors and Frames
- Wood Doors
- Metal Lockers
- Cast in Place Concrete
- Precast Concrete Walls
- Steel Joists
- Metal Studs
- Sheet metal Flashing
- Sectional Overhead and Coiling Doors
- Exterior Glass walls, Glazing and Framing

Local/Regional Harvested Materials used on this Project:

- Cast in Place Concrete
- Precast Concrete Walls
- Precast Concrete Deck

4 Certified Wood

Wood has the potential to be a truly sustainable resource because it is renewable, biodegradable, non-toxic, energy efficient and recyclable. Too often, however, wood is linked to the degradation or destruction of forest ecosystems. Responsible forestry practices aim to minimize or eliminate these problems. Responsible forestry meets the long-term forest product needs of humans while maintaining the function and biodiversity of forested landscapes.

The Justice Center project utilizes very little wood in its construction - limiting wood use to doors, cabinetry and millwork. The wood materials used in the Justice Center are FSC certified. FSC certification is a seal of approval awarded to forest managers who adopt environmentally and socially responsible forest management practices and to companies that manufacture and sell products made from certified wood.

Indoor Environmental Quality

A healthy, productive and comfortable environment is expected at home and in the workplace. Yet many modern buildings create unhealthy and potentially dangerous interior environments for their occupants. Lighting may be inadequate or incorrect for its intended function. Thermal conditions may become extreme, and its control may be inaccessible to the occupants. Ventilation systems installed to protect air quality often subject occupants to stale air, or harbor and spread unhealthy molds, bacteria and viruses. The medical, human comfort, performance and productivity costs of unhealthy interior environments may run into the tens of billions of dollars each year. Research also shows that buildings with daylight, fresh air and occupant control are consistently rated as more comfortable and contribute to occupant performance and productivity.

INDOOR ENVIRONMENTAL QUALITY

1 Indoor Air Quality and Ventilation

Optimal indoor air quality performance in buildings results in improved occupant comfort, well-being and productivity. Key components for maintaining superior indoor air quality include using high-quality outdoor air and providing adequate ventilation rates.

2 No-smoking Policy

The relationship between smoking and various health risks, including lung disease, cancer and heart disease, has been well documented. A strong link between second-hand smoke and health risks has also been demonstrated. The Justice Center prohibits smoking in the building, and a minimum of within 50 feet near entryways, operable windows and exterior air intakes for the building's mechanical system.

3 Construction IAQ Management

Building construction processes invariably include activities that contaminate the building during construction. Often, these activities result in residual building contamination that continues to impact indoor air quality over the lifetime of the building. Fortunately, construction management strategies can be instituted during construction and before occupancy to minimize the potential for building contamination and to clean up any contamination that has occurred. Protection of HVAC systems during construction and indoor air quality testing and flush-out of the building prior to occupancy are effective methods to mitigate the impact of construction activities and products on indoor air quality.


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INDOOR ENVIRONMENTAL QUALITY

4 Low-Emitting Materials and Indoor Pollutant Control

A large number of building products contain compounds that have a negative impact on indoor air quality and the earth's atmosphere. The most prominent of these compounds, volatile organic compounds (VOCs), contribute to smog generation and air pollution outdoors while having an adverse effect on the well being of occupants indoors. By selecting low-VOC-emitting materials, both outdoor and indoor air quality impacts can be avoided.

The Blue Earth County Justice Center project selected and utilized interior materials that contain no or low VOC contents in the following materials and systems in order to improve indoor air quality:

- Low VOC Adhesives and Sealants
- Low VOC Carpeting and Floor Systems
- Low VOC Composite Wood and Laminate Adhesives
- Low VOC Paints

The Blue Earth County Justice Center project also utilized the following strategies in order to improve indoor air quality:

- Permanent entryway grills to capture dirt, particulates, etc. from entering the building at all high-volume entryways.
- Where chemical use occurs (including housekeeping areas and copying/printing rooms), provide segregated areas with deck-to-deck partitions with separate outside exhaust system.
- Provide drains plumbed for appropriate disposal of liquid waste in spaces where water and chemical concentrate mixing occurs.

INDOOR ENVIRONMENTAL QUALITY

5 Thermal Comfort

Temperature and humidity are important parameters in maintaining optimal environmental conditions for occupants' comfort. Optimal temperature set points depend on occupant activity levels as well as air movement in the space. Spaces with low humidity levels create static electricity, which has detrimental effects on office equipment, human respiratory systems and certain types of furniture. Conversely, spaces with high humidity provide conditions conducive to mold and mildew growth on furnishings and interior surfaces, creating potential health hazards and increased maintenance requirements. A properly designed building can provide optimal temperatures and humidity levels throughout the year.

The Justice Center's HVAC system complies with American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 55-1992 for Thermal Comfort Standards including humidity control within established ranges per climate zone.

The building also utilized design strategies to provide thermal comfort while avoiding increased energy use:

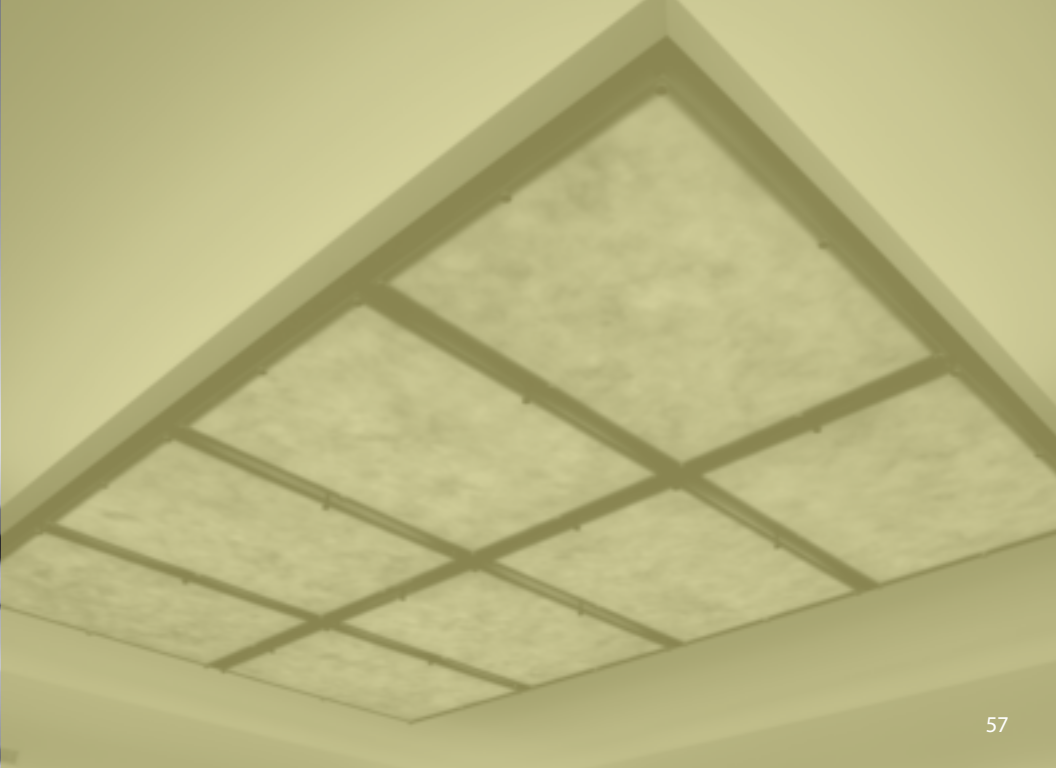
- The building is airtight enough to prevent condensation and excessive energy use caused by unplanned or undesired airflows.
- The building uses shading, insulation, high-quality glazing and thermal mass to manage interior surface temperatures of walls, ceilings, floors and windows.
- The building diverts rainwater safely away from the building.
- The building manages the flow of water vapor by combining the thermal conductivity, vapor resistance and vapor storage capacity properties of materials to prevent accidental humidification of interior spaces and condensation within the building shell.

INDOOR ENVIRONMENTAL QUALITY

6 Lighting Controls

Daylighting improves the indoor environment of buildings by exposing occupants to natural light. Studies have demonstrated that productivity increases dramatically for building occupants working in daylit areas. In addition, daylighting decreases energy costs for buildings by providing natural solar lighting. A well-designed daylit building (without increasing cooling load due to unwanted solar gain) is estimated to reduce lighting energy use by 50 to 80 percent.

The Justice Center project utilizes efficient lighting, lighting controls, dual-level switching and occupancy sensors in the design of the building such that 90 percent of all regularly occupied spaces have individual occupant control.



INDOOR ENVIRONMENTAL QUALITY

7 Energy Efficient Equipment and Appliances

The Justice Center project utilizes efficient ENERGY STAR-rated equipment in the building including appliances, office equipment and electronics.


PROCESSING JOB

INDOOR ENVIRONMENTAL QUALITY

8 Low-emitting Furniture

The Justice Center project required that all office furniture introduced into the project space that has been manufactured or refurbished within one year prior to occupancy must meet GreenGuard Indoor Air Quality Requirements. This helps provide better indoor air quality for occupants and staff.

GreenGuard certified products have been manufactured with improved air quality in mind and have low VOC emissions.

KEY TO SITE & GREEN DESIGN FEATURES

A Administrative
B Courts
C Jail
D Service
E Storm Water Retention Pond
F Native Prairie
G Wetland
H Security Cleared Parking
I Picnic Tables
J Rain Garden
K Security Fence/Gate
L Expansion Area
M Main Entry
N Rain Garden
O Visitor Parking
P Entry Plaza
Q Employee Parking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Blue Earth County Justice Center

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