

The Greening of Architecture: *Sustainable design*

That's green as in green space, greenery, or green groceries—fresh, natural elements that sustain health and well-being. Green buildings take that freshness inside, creating indoor space with plentiful daylight and reduced toxins, blended with an ecologically responsible built environment.

The process of producing green architecture is called sustainable design. Its goal is to minimize the environmental impact of a building, from design through construction and occupancy, finding ways to preserve energy and natural resources.

Until recently, sustainable design was considered something of a luxury. But new research and technologies have changed the economies. Studies and owner experiences substantiate the benefits, including

significant decreases in heating, lighting and operating costs, and improvements in worker productivity.

Sustainable design connects well with Metropolitan Council's mission to address quality of life issues in the Twin Cities. Even with a tight budget and site, BWBR and Met Council are exploring ways to integrate sustainable strategies into its new East Metro Transit Facility for housing public buses.

Initial siting decisions located the EMTF building to respect the ecosystem and minimize site work, like removing soil.

Numerous strategies for reducing energy use through lighting, heating, cooling and ventilating will be weighed. Specifying low-toxin materials will help ensure indoor air quality. Where possible, recycled building materials will be used and construction wastes recycled.

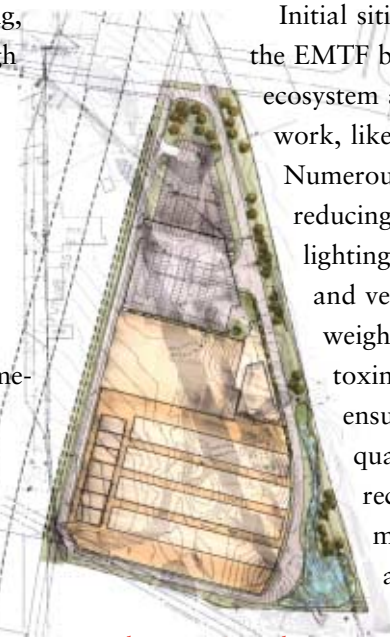
Green buildings are growing up. Germany's

Commerzbank—the tallest building in Europe—has a double facade allowing natural ventilation, and computerized systems

Sustainable design respects the interdependence of the human and natural environment. It implies a responsibility for meeting basic needs, like shelter, without compromising the ability of future generations to meet theirs.

that constantly analyze and adjust air temperature and movement. Green credentials for the 4 Times Square office tower in New York—like deep daylighting, and systems to vent toxins and increase fresh air flow—created a distinctive identity that helped lease most space before construction started.

Green architecture strikes a balance between smart business and environmental responsibility. BWBR is committed earning our architectural green thumbs, so to speak, by increasing our knowledge and use of sustainable design.



*Preliminary Site Plan
Metropolitan Council/Metro Transit
East Metro Transit Facility*

KEY ELEMENTS OF SUSTAINABLE DESIGN

The highest levels of sustainability consider the environmental impact of a product or method through its entire life cycle, from creation through construction and occupancy and, finally, to recycling, re-use, or safe disposal.

Life cycle costing examines the economics over the lifespan of the building. While energy-efficient mechanical/electrical systems, for instance, cost more up front, reduced operating expense can more than make up for it. Buildings must conform to government regulations too, but sustainable design usually exceeds them. We organize sustainable options into these areas:

Site analysis and planning.

Environmentally sensitive site planning allows the building to respond to the site, rather than forcing the site to react to the building. Impact on existing habitat, drainage patterns, and utilities are considered. Prevailing wind patterns, solar orientation, slope, and soil are optimized.

Energy.

Sustainable design seeks to reduce all aspects of energy use in a building. Passive methods are most effective, including shading, insulation, daylighting and natural ventilation. Active methods include energy efficient heating, ventilating, air conditioning

(HVAC) and lighting systems. Hybrid systems combine methods.

Building materials.

Sustainability weighs the effect of building materials on indoor environment quality and energy consumption. Total environmental impact is considered along with durability, aesthetics, and cost-effectiveness.



Indoor environment.

Indoor air quality, acoustics, lighting, and thermal conditions affect a building's comfort level. Architects and interior designers working together can optimize human comfort through electrical/mechanical systems, interior finishes and the integrated design.

Recycling and waste management.

Wastes can be reduced through design management, reuse and recycling, both during and after construction. Providing recycling facilities within the building encourages occupant participation.

Building operation.

Proper operation, balancing and maintenance of all building systems is essential to realizing the full value of sustainable design decisions. Conscientious building management ensures reward and payback for the effort.

BEHIND THE GREEN SCENE: STATISTICS

Since the Industrial Revolution, the negative effects of human ingenuity on the environment have multiplied exponentially. The earth's population has multiplied with the same velocity—six times since 1804, expected to reach six billion people on October 12, 1999.

Here are some statistics that begin to illuminate the ecological impact of the building and construction industry in the U.S. alone:

- **Building and construction operations are said to consume 40 percent of U.S. energy use.**
- **The U.S. Environmental Protection Agency (EPA) rates indoor air pollution among the top 5 environmental risks to public health.**
- **An estimated \$5.4 billion or more is "lost" each year due to decreased worker productivity linked to poor indoor air quality.**
- **Nearly 1/4 of the chlorofluorocarbons threatening the earth's protective ozone are emitted by building systems and materials.**
- **Typical construction in North America generates 4 lbs. of waste per s.f. of floor area, says the EPA.**



Christian Korab

Andersen Elementary School, Bayport, MN
Level One Lighting Choice: Place windows to increase daylight, reduce heating costs and promote human well-being.



Don Wong

Augsburg College Library & Information Technology Center, Minneapolis, MN
Level Two Lighting Choice: Reduce energy use with high efficiency lamps and ballasts, plus sensors and dimmers for local control.

North Memorial Health Care, Robbinsdale, MN
Level Three Lighting Choice: Bring daylight deep into buildings with atriums, skylights, clerestories, lightwells and courtyards, to amplify effect on health and well-being.



Christian Korab

SHADES OF GREEN: Levels of Sustainability

Grouping the wide spectrum of sustainable design options into levels of cost and payback helps clarify the possibilities for owners/clients:

LEVEL 1: No cost or low cost options that have an impact.

This first level incorporates basic concepts of sustainable design with immediate payback and/or negligible cost, such as:

Floor-by-floor control of heat, ventilation and air conditioning (HVAC); specifying indoor materials that emit few toxins (aka volatile organic compounds or VOCs); locating a building to minimize site work; and landscaping with low-maintenance native plantings.

LEVEL 2: Sustainability as a feature.

Choices at this level cost more up front, but pay for themselves with noticeable benefits in two to five years, for example:

Computerized control to maximize energy savings with HVAC systems; specifying low-flow plumbing fixtures, and optimal criteria for insulation and windows beyond building code minimums; increasing energy efficiencies through the NSP Energy Assets program (see back page).

LEVEL 3: Sustainability as a major design parameter.

Major concepts and methods that require a committed client. At this level, the synergistic impact of the whole building design exceeds the sum of its parts. Sustainable features may require a 5- to 10-year payback, or may not have an easily measured payback.

For example: Optimal building siting that considers impact on existing ecosystems; mandatory recycling of construction wastes; recycling “barely used” sink water in toilets; use of alternative energy and new technologies.

GREEN POWER The NSP Energy Assets Programsm

The average Minnesota building project finishes with a 5 to 10 percent savings over state energy code requirements. With the Northern States Power (NSP) Energy Assets Program, that same project can save 30 to 40 percent over energy code with a payback of less than three years, making it a real boon for new building owners.

NSP offers the free design assistance program to customers in Minnesota for buildings over 80,000 square feet, or smaller structures with high energy use. It pays for a comprehensive analysis of potential strategies, equipment and systems to reduce energy use in new buildings, even compensating architects and engineers for their needed input.

Augsburg College took advantage of NSP's program for its recently completed library. After the analysis, they were offered numerous energy saving options, such as: perimeter-only light switches that can be turned off with adequate daylight, stack light controls and variable air volume systems that sense and respond to occupancy levels, and more efficient electrical/mechanical equipment.

Augsburg selected a "bundle" of options that will save them \$62,000 per year in energy use at current rates. Since opening, the library's energy use has tracked exactly as predicted.

Why does NSP go to all this expense to essentially short circuit their business? To reduce peak load and annual energy use so they don't need to build far more expensive new generating plants.



Christian Korab

BWBR has employed the Energy Assets Program on numerous buildings including Augsburg's Library (previous page), the U of M's Basic Sciences & Biomedical Engineering Building (above), Lawson Commons (below), and the Woodwinds Medical Office Building.



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