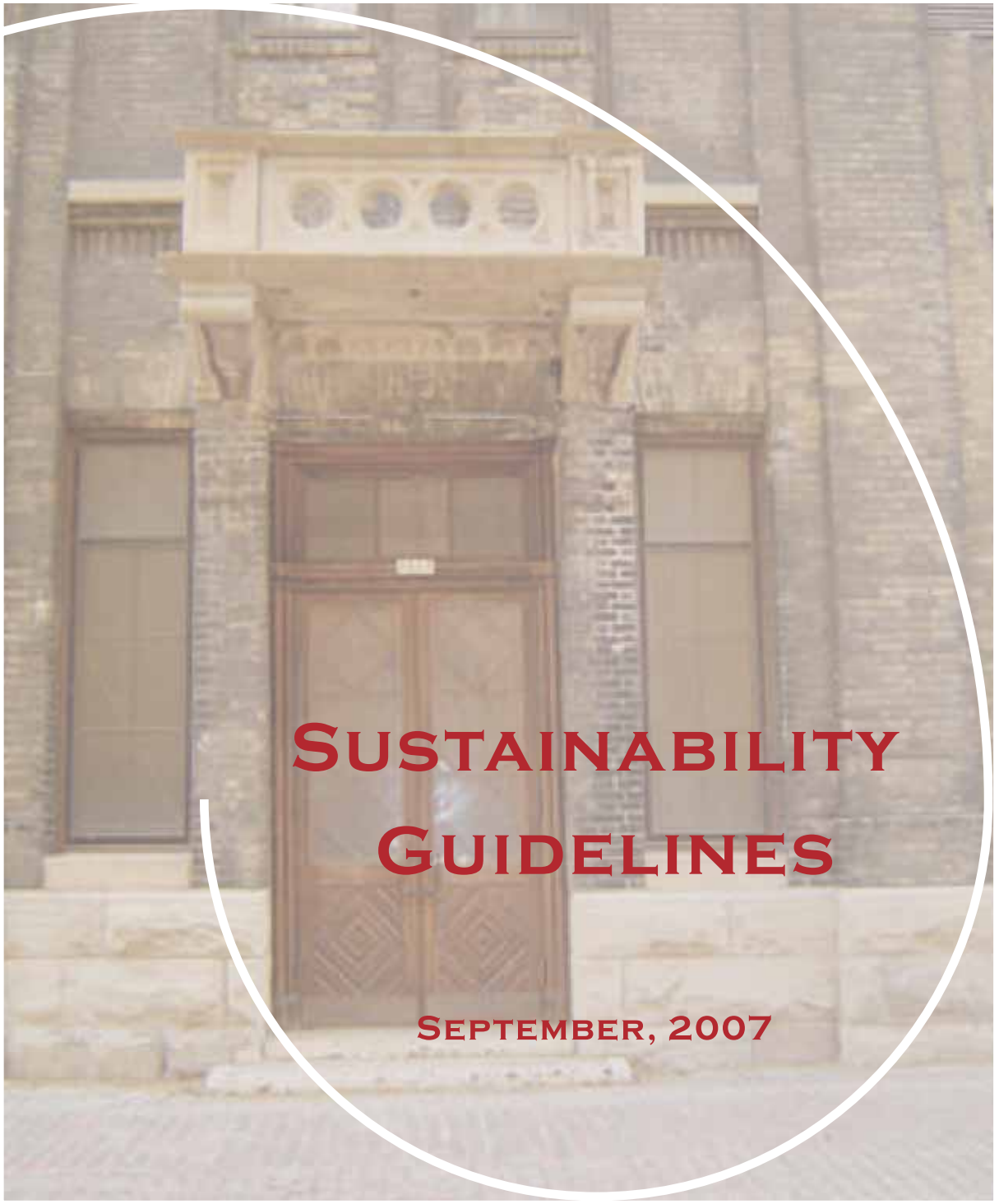
THE BREWERY℠

A Joseph J. Zilber Historic Redevelopment

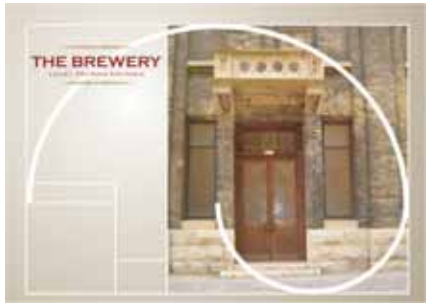


Sustainability Guidelines

September, 2007

The value of a man resides in what he gives and not in what he is capable of receiving."

~ Albert Einstein ~



"the gross national product includes air pollution and advertising for cigarettes, and ambulances to clear our highways of carnage.

It counts special locks for our doors, and jails for the people who break them.

The gross national product includes the destruction of the redwoods and the death of Lake Superior.

It grows with the production of napalm and missiles with nuclear warheads....

And if the gross national product includes all this, there is much that it does not comprehend.

It does not allow for the health of our families, the quality of their education, or the joy of their play.

It is indifferent to the decency of our factories and the safety of streets alike.

It does not include the beauty of our poetry or the strength of our marriages, the intelligence of our public debate or the integrity of our public officials....

The gross national product measures neither our wit nor our courage, neither our wisdom nor our learning, neither our compassion nor our devotion to country.

It measures everything, in short, except that which makes life worthwhile; and it can tell us everything about America-except whether we are proud to be Americans."

~ Robert F. Kennedy ~

Used in Sustainable Seattle report of indicators, 1998

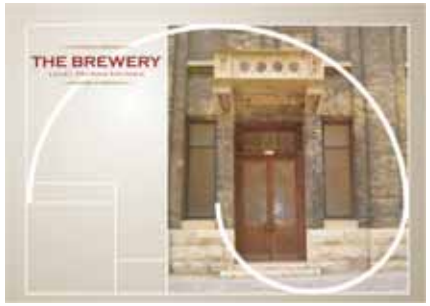


table of contents

Energy

Materials + Resources

Indoor Environmental Quality

Human Aspects

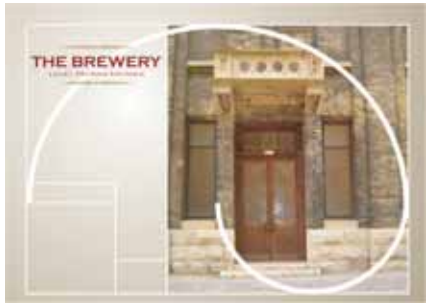
Construction Administration

Operations and Maintenance

to LEED® or not to LEED®

metrics and funding

wrap up



introduction

"It is my intention that this project will be my legacy to the city of Milwaukee."

- Joseph J. Zilber -
Developer and Philanthropist
Founder and Chairman of the Board of Zilber Ltd.
Milwaukee, Wisconsin

Joe Zilber was born and raised in Milwaukee and graduated first in his class at Marquette Law School. He started his career by building homes for GI's returning from World War II. Since then he has become a national leader and innovator in the real estate industry. Mr. Zilber is a man committed to excellence, customer satisfaction, quality and value. His commitment to the development of The Brewery is unprecedented. The project combines historic preservation with the emerging science of sustainability to develop an entirely new, yet historic, mixed use neighborhood. These fundamental principals are blended together to create a model for work/live/play/learn communities that can be applied throughout the United States.

The Legacy of the Pabst

The Pabst Brewery began in 1844 when Jacob Best opened a small brewery just off Juneau Avenue in a German neighborhood of a young and bustling city called Milwaukee.

Some two decades later, Captain Frederick Pabst, a Lake Michigan schooner captain, fell in love with Mr. Best's daughter, married her and became part of the brewery, eventually changing the name of the beer it brewed from Best to Pabst. The blue ribbon won by his namesake beer in 1893 at an international contest would be the icing on the cake and the name of the beer was changed to Pabst Blue Ribbon.

Under the management of Captain Pabst and his successors, the brewery grew and prospered. Moving into more and more of its former neighborhood, it would eventually expand to over six city blocks and 20 plus acres. In the 1950's the brewery was one of the most productive in the world. In the late 20th century the Pabst family would sell the brewery to another entity which would ultimately close the brewery in November of 1996.

The once proud giant of the brewing industry began to fade away. Its historic buildings were left to stand alone on one of the highest points in Milwaukee, in the northwest corner of downtown, waiting for something to happen.

All that began to change in August of 2006 when Joseph Zilber, a philanthropist and successful real estate developer nationwide, purchased the complex. Putting together a team comprised of senior managers from his organization, knowledgeable support staff and experts in historic renovation, remediation and sustainability, Mr. Zilber and his team began the work of transforming the Pabst into one of Milwaukee's newest and potentially greatest neighborhoods.

The Sustainable Plan Emerges

To assure the success of the project, Mr. Zilber committed both monetary and professional resources which were presented to city officials as part of a request to form a private/public partnership. This partnership would provide the finances necessary to offset the brewery's cost difficulties to redevelopment and lead to the implementation of a plan to prepare the site and structures for redevelopment opportunities on an unprecedented scope. The Brewery team is working closely with the city to save the maximum number of historic buildings and combine them with a sustainable program that utilizes the latest technologies available.

In the spring of 2006, discussions began between The Brewery design and development team, the City of Milwaukee and outside consultants to develop a sustainable approach that would break new ground in Milwaukee.

This sustainable approach includes criteria that involves mixed occupancy uses in a designed neighborhood, reuse and preservation of historic buildings, updating the site infrastructure with energy efficient lighting, the use of recycled materials, the reduction of automobile dependence, heat island reduction, and light pollution reduction to name a few.

Perhaps the most notable element in the sustainability plan is a storm water management design which will separate the surface water and aggressively capture, contain and treat storm water within virtually all of the site. The design incorporates bio swales that take advantage of northwest to southwest water flow and porous

pavement areas with underground detention capabilities.

Today in addition to our own project-wide sustainability guidelines, we chose to enhance and measure our sustainability commitment through inclusion with the USGBC for entrance into their Leadership in Energy and Environmental Design (LEED) Neighborhood Development (ND) Pilot. In May 2007, the USGBC announced that the Brewery had been accepted into the pilot project.

The Past, the Present and the Future

For over 150 years, the Pabst Brewing Company provided a good living (and great beer) to thousands upon thousands of Milwaukee residents. Generation after generation took pride in the fact that they were brewing the beer that won the coveted Blue Ribbon. But time and poor management took its toll on this once great brewery. Today the latest technology is being applied to preserve the best of its past and to assure that its future is sustainable. Joe Zilber's vision to build a new neighborhood that will embody the great traditions of the past with the unlimited potential of the future is now becoming a reality.

The guidelines contained within this booklet are designed to give building purchasers, the City of Milwaukee, and all participants the rationale to join Mr. Zilber in creating The Brewery project as a living legacy that will grow and adapt to changes over time, while preserving the historic beauty of the original Pabst complex. All of us who are involved in this project are honored that you have chosen to become a part of history. Your project can help "The Brewery" return as a thriving, historic and sustainable neighborhood. Thank you for the critical role you will play in achieving that goal. We look forward to working with you, as together we implement the guidelines that will make this dream a reality.

- The Brewery Project, LLC.-

overview

Legacy. Joseph Zilber's legacy and a tribute to a city rich with history, tradition, innovation and creativity. The Brewery Project can be a change-making role model to the city of Milwaukee, the region, the state, the nation and the globe. It sounds heady, but it's very real.

executive summary

Imagine being part of a live+work+play+learn neighborhood where businesses and residents are waiting to experience an ethos of true sustainability - boasting healthier indoor environmental quality, higher employee productivity and retention rates, renewable energy, connectivity with nature, and socioeconomic balance.

Imagine being part of leading the city of Milwaukee, the region, and the state of Wisconsin in economic development through a sustainable agenda that attracts and retains both young talent and baby boomers searching for healthy, new urbanism/live+work+play+learn lifestyles and environments.

Sustainability is "meeting the needs of the present without compromising the ability of future generations to meet theirs." While sustainable practices certainly extend vastly beyond the boundaries of sites and buildings, much of The Brewery Project Sustainability Guidelines are dedicated to buildings, economic development and resultant effects on the socioeconomics. Americans spend 90% of their time indoors. As we construct icons, shelters, learning environments, entertainment venues and workspaces, the end result is a dedication of 35% of the total US energy supply and 60% of annual electricity to operating these buildings.

Sustainable buildings are morphing and changing as we better understand high performance technologies, the impact on human performance and health, and the critical need for the facilities to better connect with nature. There is a strong undertow pulling us beyond LEED Platinum to The Living Building, to Regenerative Design…and beyond. As The Brewery Project swells with incoming developers and owners, embracing sustainability from varied perspectives, the Guidelines will benefit from the resultant feedback and experiences. The Guidelines will adapt to reflect the knowledge and experiences of those residing in The Brewery.

There are measurable, quantifiable benefits to building sustainably. And some staggeringly amazing intangible benefits that while not as quantifiable, can have profoundly positive impacts on economic development/sustainomics; people - how they work, live, play and learn; the planet; and prosperity. The triple bottom line. Throughout the Guidelines, efforts were made to bring to the forefront not only the quantifiable, direct benefits such as energy savings and productivity increases, but also to touch upon the less tangible and not as easily measured: the social fabric, the connectivity with nature and the resultant contributions to economic development and the benefits to the city of Milwaukee.

To demonstrate at the outset Zilber leadership's commitment to sustainability, The Brewery Project became registered by the US Green Building Council as a LEED-ND pilot project. The Zilber team is committed to seeing through to the completion a primary focus of sustainability. The Guidelines are a tool for keeping green at the forefront of the Brewery Project development and fulfilling the sustainable vision and mission that is the basis for the Project.

How a project team first starts thinking about a project and site within The Brewery affects the entire design and construction process. There are strategies to be put in place that will ensure a triple bottom line success. Integrated design - bringing stakeholders, design team, contractors together to examine goals, trade-offs and cost-effective approaches - is imperative to

realizing the most cost-effective sustainable outcomes.

There are specific Sustainable Guidelines that are required of developers and owners who decide to become part of The Brewery Project community. Other technologies are encouraged and described, but not mandated. These guidelines are detailed from a macro perspective and offer knowledge and resources that will make it equally useable and beneficial for the design team. The guidelines are specific to The Brewery Project, incorporate LEED measurement tools, and keep in mind the future of green development through recognition and respect for Living Buildings and regenerative design. Categories within the Guidelines are: performance management, site design + planning, water management, energy, materials + resources, indoor environmental quality, human aspects, construction administration and operations and maintenance.

The Zilber leadership and sustainability team respect the US Green Building Council and recognize the benefits of LEED certification. However, other measurement tools exist that are mentioned. In addition, it is not the opinion of the authors and owners of these Guidelines that LEED certification is REQUIRED for a site and/or building to be sustainable. There are benefits and limitations related to LEED.

It is the hope of the Zilber team that The Brewery Project community will provide feedback relative to the Project's individual performance indicators: what are the outcomes that are successful? What has been a challenge? The purpose of the Guidelines is to provide just that - guidelines. As such, this document will evolve as sustainable design advances. What are considered leading edge design approaches and systems today will someday be dated. As owners and developers, we can use these guidelines to look forward to beyond LEED Platinum - to The Living Building. But we also will use the tools that are in place today.

While construction administration and operations and maintenance are addressed toward the end of the Guidelines, one of the very wisest approaches to a sustainable development the owner/developer team can take is to address construction administration and operations and maintenance at the very initial stages of a project. The relatively minimal investment made in the brain power brought in at the early stages is paid many times over in a resultant cost-effective, efficient process.

The Guidelines have been developed as a first step, providing other tools and resources to choose from. The document is one piece of building a successful, sustainable community that can be a model for the globe.

Imagine.

what makes a site and building sustainable

USGBC statistics demonstrate that in the US, buildings account for 65% of electricity consumption, 36% of total energy use, 30% of greenhouse gas emissions, 30% of raw materials use, 30% of waste output (36 million tons annually) and 12% of potable water consumption, as well as the exploitation of substantial amounts of land. As referenced in the chart on page 8, Levin's studies reveal slightly different statistics. And there are others. Despite the variance in exact percentage, sustainable approaches to site and building development can have a significantly positive impact on creating a healthier planet that continues to provide us fresh resources with which to work, live, play and learn.

"Development is sustainable when it meets the needs of the present without compromising the ability of future generations to meet theirs."

~ United Nations World Commission on Environment and Development, 1987 ~

Sustainability is morphing, changing and advancing to regenerative design. A green tower in Dubai designed by Dynamic Architecture[1] exemplifies how the whole sustainable field is rapidly evolving. Forty-eight wind turbines fitted between rotating floors, as well as the solar panels positioned on the roof of the building, will produce $7 million of energy annually from wind and the sunlight. The energy generated will power itself as well as other skyscrapers, with no risk of pollution. What will be considered sustainable as it relates to building and site two years from now? Ten years from now? As stated in the introduction, the Guidelines need to flex and change in order to stay current since The Brewery Project will have a longer duration than the shelf life of current sustainable measurement tools.

To begin the assessment of what would render the Brewery Project sustainable, the Zilber Team and P^{3}Xcel hosted and facilitated an Eco Charette. An Eco-Charette is a one day session in which key leadership, the design and construction team, pertinent stakeholders and potential partners participate in a macro-level, visionary, values-based, integrated decision-making process. The outcome is a tailored approach that best meets the long-term, holistic needs of the organization. (The Brewery Eco-Charette is further described on page 29.)

A building assessment tool which complements this values-based process is The Living Building Challenge developed by Jason McLennon and the Cascadia Region Green Building Council. The Living Building Challenge ("It's time to move beyond the Platinum Level of Building") http://www.cascadiagbc.org/lbc/Lb-challenge-v1-2 represents high, values-based goals such as net-zero energy and net-zero water. The zero building - zero-energy, zero-waste and zero-carbon is beginning to emerge. Developers and owners can, through a values-based process, engage design and construction teams to create legacies to their own values. For the more sustainably aggressive developer, The Living Building Challenge is an inspirational tool designed to create living, zero-waste buildings - moving us closer to a regenerative model of design and construction. Imagine buildings that sustain themselves while actually healing the environment.

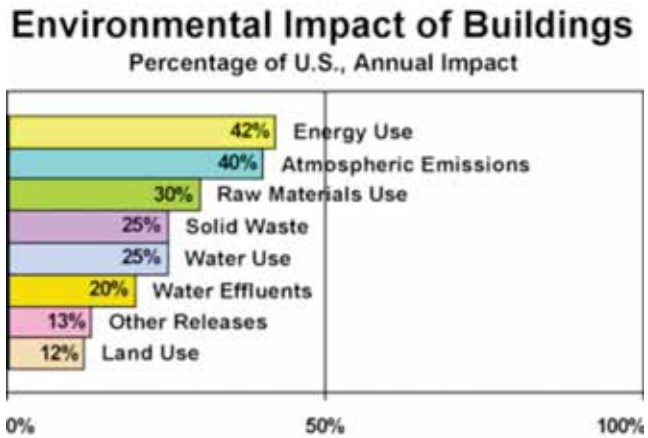
Sustainability relates to both building and site. To better realize a design's sustainability potential, Ecological Design integrates "buildings, land and community within the context of ecological science." As defined by Sym

Van der Ryn, president of Van der Ryn Architects[2] and a renowned leader in sustainable architecture, Ecological Design is "any form of design that minimize(s) environmentally destructive impacts by integrating itself with living processes." Ecological Design reflects the natural systems of a particular place. But Ecological Design only slows the rate of destruction. Real estate developers and leaders in design can help "initiate regenerative processes to replace the degeneration resulting from past practices." The primary ideals behind regenerative design are: a radical change for the better; creation of a new spirit; and returning energy to the source. Similar in theory to ecopsychology, "We will not sustain the will needed to make and maintain these changes, day after day, without evoking the spirit of caring that comes from a deep connection to place."[3]

"In an intelligent and purposeful world, the Regenerative Designer asks not just how do we harvest wood sustainably, but how do we live with the forest in a way that enables the forest to evolve? Regenerative Design is thus reframing the purpose of our role as designers and even what it means to be human."[4]

What makes a building and site sustainable? A common thread running through sustainable approaches and definitions from very diverse resources is a three-pronged balance and interdependence between people, planet and prosperity. Buildings and sites that function to enhance that balance contribute to the "triple bottom line" or natural capitalism are sustainable. At The Brewery Project, LLC, sustainable (also referred to as "green" or "high performance") buildings provide a productive indoor environment (people[5]); significantly reduce greenhouse gas emissions (planet); and are efficient in their use of energy, water and other natural resources (prosperity). Sustainable sites foster a sense of community and neighborhood (people); reduce stormwater quantity and improve stormwater quality, and renewable energies to power site lighting (planet); and utilize natural filtration systems that minimize piping requirements (prosperity). Reaching these goals requires an integrated design process.

The construction and operation of buildings consume the majority of the world's natural resources and energy. Buildings use resources such as energy and raw materials, generate waste and potentially harmful emissions. As the economy and population continue to expand, developers, designers and builders face the challenge to meet demands for new and renovated facilities that are cost-effective, efficient, secure, healthy, and productive while minimizing their impact on the environment.



Source: Levin, H. (1997) Systematic Evaluation and Assessment of Building Environmental Performance (SEABEP), paper for presentation to "Buildings and Environment", Paris, 9-12 June, 1997

Low Impact Development (LID) is an approach to land development that addresses how water enters a site, is stored on-site, and leaves a site. Land development that incorporates LID practices minimizes impervious surface, protects and enhances native vegetation and soils, and manages stormwater at its source.

A useful LID reference tool is King County, Washington's stormwater code and the 2005 Surface Water Design Manual. These documents provide a number of tools that make it easier to use a LID approach and can be found in Appendix C of the 2005 Surface Water Design Manual ("flow control BMPs"). Appendix C of the manual is available online at http://dnr.metrokc.gov/wlr/dss/DMUpdates/Appndx_C.pdf
King County's Department of Development and Environmental Services have found that developers and builders can realize a multitude of benefits from sustainable buildings and site, including:

"Cost Savings: Developers are realizing reduced infrastructure costs associated with low impact design strategies (and)…find significantly lower operating costs with energy and water efficient systems…..In addition, construction practices such as recycling and preventing job site waste further reduce project costs. Though green building doesn't mean higher costs or complicated permitting, green building does require smart decisions during design, permitting and construction that sometimes involve upfront investments that pay future dividends.

Health & Safety: Americans spend the majority of their time indoors. Studies done by the U.S. Environmental Protection Agency have shown that indoor pollutant levels may be two to five times higher than outdoor levels. Green buildings typically offer healthier and more appealing living and work environments for residents or tenants. Strategies to improve indoor environmental quality include choosing low or non-toxic building materials, maximizing natural ventilation and daylighting, and enhancing productivity and comfort for building occupants.

Added Value: Green builders and developers are finding a marketing edge as consumer demand for energy efficiency and durable products increases…buyers are willing to pay more for green features, especially those that promise substantial savings on utility and maintenance costs.

Ecological Benefit: Low impact development, such as carefully siting buildings, minimizing impervious surfaces, and infiltrating runoff, helps to preserve wildlife habitat, decrease stormwater runoff, and prevent erosion that can destroy aquatic systems. Using less water, energy and natural resources, and avoiding toxic chemicals prevents pollution, reduces waste and decreases the strain that we place on the environment."

why sustainability is important

Without taking into consideration the triple bottom line - in essence, including the "planet" with "people" and "prosperity" or "profit" - we will have no resources with which to conduct business. A natural capitalist approach actually benefits the bottom line more than a traditional approach. There are tangible benefits realized: reduced operating costs, higher productivity, greater sales volume and higher lease rates. Less tangible and more difficult to quantitatively measure, but equally significant, if not more so, include stronger brand awareness, market differentiation, contribution to recruiting and retaining top talent, goodwill, and market opportunities.

From the people perspective, benefits ranging from those related to medical health are tangible and proven. Mounting evidence exists as well for substantially increased academic performance as a result of cleaner indoor air, increased daylighting and greater connection with the natural environment. Retail sales increase in daylit spaces. And ecopscyhology - a connection of psychology and ecology for the purpose of healing both the planet and the human mind - is rapidly gaining attention. These benefits we innately knew, but we needed to measure and name these practices to fully become aware of their benefits to working, living, playing and learning.

Both concepts positively contribute to every aspect of the live+work+play+learn environment Zilber is creating at The Brewery Project.

measurable costs and benefits

The Brewery Project Sustainability Guidelines feature measurable costs and benefits directly applicable to The Brewery in the technical sections. In addition to researching performance indicators incorporated most frequently in other guidelines and assessment documents, several have been added that may be of further interest to the developer making an investment in The Brewery Project and its sustainable environment.

"Creating great places for people to live and work - that's what sells. Tenants are more savvy; they know sustainable workplaces reduce absenteeism, increase productivity - employees are happier here."

- Dennis Wilde -
Senior Project Manager, Gerding/Edlen (The Brewery Blocks, Portland, OR)

"If you believe that providing a better environment, with cleaner air, natural light, views, results in happier, more productive, less-likely-to-leave people, it makes a very strong argument for increased rents. If by providing better quality space, you can reduce turnover, absenteeism and increase productivity, the numbers become compelling."

- Daniel Jenkins, Principal
The John Buck Company, Chicago, IL

The performance indicators of real outcomes will be calculated in applying these guidelines. Indicators are listed below and include examples of those found in the technical sections:

Project Lifecycle Costs

- Project capital costs
- Operation and maintenance costs

When incorporating sustainable design elements and an integrated approach, building operating costs decrease between 8% and 9%, and the average return on investment (ROI) improves by 6.6%. (Green Building SmartMarket Report, McGraw Hill Construction, 2006)

Examples specific to The Brewery Project:

- Using strategies for building water savings can provide a cost savings of

20-30% on water utility bills. The current water usage cost in Milwaukee is $9.75/1,000 gallons of water used. PROJECT LIFECYCLE COSTS (OPERATION AND MAINTENANCE COSTS)

- For existing buildings that require partial or full replacement of the roof drain systems, cost savings for siphonic systems could range from 10 to 50% over gravity, depending on the extent of the work. PROJECT CONSTRUCTION COST

Building Value Impacts

- Property Values
- Lending Rates
- Insurance Rates

On average, building value increases by 7.5% (SmartMarket Report) and property values also increase. La Paz Office Plaza, Orange County, California, realized an $0.80 psf increase in actual value ($1.5 million total) increase as a result of energy efficiency and lower priced power purchase.

"Communities benefit when corporations commit to economic, social and environmental responsibility. Our successful construction of green facilities has produced benefits for our customers, employees, shareholders and the community. We have lowered costs, increased efficiency and productivity, as well as created healthier environments in which people live and work."

- James E. Rohr
Chairman and CEO
The PNC Financial Services Group

According to "Building the Business Case for Green," a high performance/ sustainable building approach contributes to achieving more predictable results, reduces project uncertainty and risk (to such a degree that lending institutions and insurers are offering lower rates to sustainable buildings), and an enhanced final product (documented increase in value). In July 2005, Wells Fargo announced that it would commit to investing over $1 billion over five years in environmentally friendly businesses.

In fact, an owner survey conducted by McGraw Hill Construction in 2006 found that 21% of owners reported a "large dedication to green building," with **higher building value** as the primary business motivator. Fifteen percent surveyed felt green building **decreases operating costs by more than 20%**. Furthermore, drastically improved outcomes result from an integrated design approach, energy modeling and value analysis.

Examples specific to The Brewery Project

- Sustainable buildings mean reduced insurance rates for building owners. For instance, Fireman's Fund has received approval to offer a 5% insurance discount for LEED certified commercial buildings. BUILDING VALUE IMPACTS (INSURANCE RATES)

Marketability

- Public Relations
- Lease Rates
- Tenant Value
- Retail Sales

67% of CEOs consider green building as a market differentiator.[6] And in a survey of American Fortune 100 companies, 54% with a corporate sustainability strategy did so with the primary objective to improve brand, and 50% to differentiate products.[7]

"Properties that take advantage of brownfield and other infill redevelopment, while offering proximity to mass transit, walking, biking and shopping/daycare services, have an

automatic advantage in the race to attract top talent." [8]

And people realize the benefits. The occupancy ratio of a green building increases by 3.5% and the rent ratio on average rises by approximately 3%.[9]

"The quality of good press we've gotten out of this has been staggering…couldn't have bought that kind of press."

- Dennis Wilde, Gerding/Edlen

The Solaire, a high performance, multi-unit residential development in Battery Park, New York, has earned the Albanese real estate development company widespread accolades, including the 2003 Environmental Business Leadership Award; the Environmental Design & Construction Magazine Excellence in Design Award 2004; and the Green Roofs for Healthy Cities Award 2004.

The project has been promoted as a global model, green multifamily by DOE at 2002 Sustainable Building Conference and was voted one of the Top Ten Green Projects in 2004. Tangible outcomes to this public relations? The Solaire commands the highest rents in Battery Park (3% higher) and opened its doors with a waitlist.

Sustainable space creates value for tenants in providing a lower long-term cost of occupancy, enhanced indoor air quality and space that is (in line) with their own corporate and/or personal sustainability initiatives. In addition, high performance office and commercial space having more comfortable employees.

The average employee relocation within a building (churn rate) is 25%. Flexible, sustainable features cut churn costs by 90%. *"Features designed to cut energy and water bills help attract tenants to the property and increase the likelihood of continued occupancy."*[10]

Several case studies purport that sustainable environments, especially in relation to daylighting, contribute to more robust retail sales. According to a study commissioned by PG&E, skylighting in retail stores launched the sales index up 40%.

Examples specific to The Brewery Project

- A well integrated and sustainable site/building design provides for a building with increased property value (7.5% higher), an ROI that can be expected to increase by 6.6%, as well as higher occupancy (increased by 3.5%) and rent (increased by 3%) ratios. BUILDING VALUE IMPACTS (PROPERTY VALUE) & MARKETABILITY (LEASE RATES AND TENANT VELOCITY)

Human Impacts and Related Cost

- Health and Well-being
- Productivity
- Absenteeism
- Employee turnover
- Health care costs

While a reduction in energy and other operational costs as a result of high performance design are obviously of value and improve the bottom line, the greatest overhead cost of business is its human capital. Daniel Jenkins, Buck Company advises, "Focus on the cost of the PEOPLE."

And the indoor environments people are exposed to can have a profoundly negative impact on their health, well-being and productivity. "EPA studies indicate that indoor levels of pollutants may be two to five times higher-and occasionally more than 100 times higher-than outdoor levels. These levels of pollution are particularly notable since people tend to spend about 90% of their lives indoors."[11]

High performance environments boost employee productivity through improved daylighting; fresh, clean air; personal environment controls; and connectivity with the natural environment. According to a study by William Browning, et al, "Using green building strategies can result in increases in occupant performance measures by 6 to 26 percent."

And relative to attract and retain, sixty-seven percent of CEOs perceive green as fostering innovation and "forty-four percent of corporate America believes sustainability initiatives help attract and retain more talented and satisfied employees."[12] As documented in "Building the Business Case for Green" *"…rich opportunities ahead for owners and occupants alike to better understand and take advantage of various green building features to enhance worker well-being and performance. 'No wonder businesses are beginning to use high performance buildings as a potent tool for recruiting and retaining the best employees.' "*[13]

Clean and healthy indoor environments not only help attract and retain the best and brightest - these spaces contribute to good health and lessen an organization's or individual's healthcare costs. Sick building syndrome occurs when occupants of a building experience poor health linked to time spent in a building (www.nsc.org). Chemical and biological contaminants, poor ventilation and infiltration of outdoor pollutants can be contributing factors.

The US EPA estimates that improving buildings and indoor environments could reduce healthcare costs and increase worker productivity by $30 billion to $150 billion annually. Annual healthcare savings plus productivity gains in the U.S. are:

- $6 billion to $19 billion from reduced lung disease
- $1 billion to $4 billion from reduced allergies and asthma
- $10 billion to $20 billion from reduced sick building syndrome symptoms

(www.lungusa.org, American Lung Association)

Examples specific to The Brewery Project

- Occupational lung disease is the number one cause of work related illness in the U.S. and approximately 15% of asthma cases in the U.S. are a result of occupational exposures. (American Lung Association) HUMAN IMPACT (HEALTH & WELL-BEING)

Environmental Impacts

- Primary energy
- Climate Change potential
- Waste production

Primary energy is that contained in raw fuels and other forms used as input to a system. Sources include fossil fuels; biomass; biofuels and vegetable oil; hydorelectric; nuclear; wind and solar power; and geothermal. Sustainable energy sources are those that do not deplete sources that are limited or non-renewable. Hydroelectric, wind and solar, and geothermal rely only on renewable resources that the earth naturally provides us. While to varying degrees, others will be eventually depleted. While nuclear energy is a result of technology and not resources, there is controversy over its sustainability for social and political reasons.

Climate change (temperature, precipitation or wind - preferred to over global warming as there are other issues in addition to rising temperatures) is a significant change in measures of climates for decades or longer. Currently, the Earth's temperature is getting warmer, most likely as a result of human impact (National Resource Council 2001). It is possible, however, that some part of

the warming is a result of natural variability (NRC 2001). Precipitation, snow/ice cover and sea levels are also significantly changing. Humans have added substantially to the amount of greenhouse gases (primarily carbon dioxide and methane) in the atmosphere by burning fossil fuels; agricultural and industrial activities; production of coal, natural gas and oil; and the emission of flourinated gases (synthetic). This enhancement of the greenhouse gas effect contributes to the climate change.

According to the Clean Air Council, 56 tons of trash per year are generated by the average person and only one tenth of that gets recycled. U.S. businesses use 21 million tons of paper each year and as of 1992, 14 billion pounds of trash were dumped into oceans around the world ANNUALLY. Americans dispose of 20,000 cars and 4,000 trucks and buses IN ONE DAY. And relative to construction waste, 170,000 commercial buildings are demolished (EPA). This wasteful process contributes to the 136 million tons of construction and demolished waste annually sent to landfills. Not only is the Earth incapable of continuing to absorb this level of waste, it is unprofitable and costly.

If 25 percent of the buildings demolished each year were deconstructed, approximately 20 million tons of debris could be diverted from landfills (National Association of Home Builders). By construction waste and demolition recycling (http://www.ilsr.org/recycling/buildingdebris.pdf), considerable cost savings are realized, even with added labor management costs for onsite separation. Wastecap Wisconsin (www.wastecapwi.org) identifies the savings realized from many local construction and demolition projects. Savings range from $10,000 in avoided disposal costs to $103,651 in project costs (75.35% recycling rate).

Examples specific to The Brewery Project

- 80% of building demolition debris will be recycled or reused, diverting it from traditional landfill sites.

ENVIRONMENTAL IMPACT

Community Impacts and Related Cost

- Community infrastructure demand and associated costs
- Community assets contributed by project
- Economic impacts
- Social impacts

The Brewery Project and its sustainable approach lays the foundation for innovative, high performance infrastructure and land planning, and incoming partners/developers can capitalize on that initiative to perpetuate efficient, effective systems that benefit the community and realize project development and operations cost savings.

Incorporating bold, aggressive, high performance best management practices has provided the city of Milwaukee a new way of thinking about city streets and stormwater management; and will offer local developers a successful model to emulate in sustainable technologies. Creating and CONTRIBUTING green space through pocket parks, bioswales, landscape islands reduces runoff volume and provides filtration of sediment from streets. The bioswales slow runoff and improve water quality through infiltration media which soak up pollutants. The size and scope of The Brewery bioswales is what makes them stand apart from other city of Milwaukee developments. The outcome is that the rate of stormwater runoff is reduced by 25% and a significant improvement of water quality. To the city of Milwaukee and witnessed by its jewel Lake Michigan, this is monumental. The reduction in rate of

flow helps relieve pressure from an already stressed combined sewer overflow (CSO) system.

The Brewery Project offers the opportunity to showcase renewable energy sources and its commitment to a sustainable future. Microturbines are an appropriate use for some areas of the neighborhood. The fact that The Brewery Project site is the highest point of the City, as well as its proximity to Lake Michigan, offers incredible opportunity to capture wind power. Microturbines are compact, can be placed on rooftops, require a low initial cost, and provide very quick payback.

Photovoltaics are also an applicable energy source for The Brewery Project. An appropriately designed photovoltaic system could adequately supply renewable energy needs. A modular system of PV panels installed on rooftops is suitable for placement on any of The Brewery Project buildings. Considerations would need to be made regarding reflectivity and shading, as PV systems would have a significantly decreased output if installed in the shade zone of another building.

Focus on Energy, Wisconsin and the DSIRE database, as also detailed in the funding section of these Guidelines, offer information on funding programs for wind and photovoltaic power.

(For detailed information, reference the "Feasibility Report for The Brewery" prepared by P^3Xcel for The Brewery Project.)

To continue The Brewery Project's efforts to limit the community's infrastructure demand and associated costs, project partners establishing their live+work+play+learn facilities on the site can implement specific strategies:

- Disconnect roof drains (the site provides the facilities with which to connect outfall: bioswales, pocket parks and granular storage areas along 9th and 10th Streets and Juneau Avenue.)
- Incorporate green roof technologies
- Rainwater harvesting
- Landscaping that minimizes use of potable water
- Highly reflective roofing and hardscape materials
- Renewable energies

The city of Milwaukee is currently monitoring stormwater flow from the Brewery Project site to develop baseline data. Monitoring will continue during construction and post-development to evaluate the success of the sustainable strategies in place. The Milwaukee Metropolitan Sewerage District (MMSD) is evaluating water quality for the same purpose.

The city of Milwaukee benefits from The Brewery Project on many levels. In terms of direct assets, the Project's sustainable nature - and resultant efficiencies and beauty - contributes to an increased tax base; decreased tax levy rate; increased employment opportunities; a mixed use property that includes affordable housing; partnerships with Milwaukee-based live, work, play or learn organizations that result in heightened offerings and awareness; attracting emerging industries new to the city of Milwaukee, and offering the development community an innovative, sustainable model heightened by the success of a public/private partnership.

The economic impacts to the immediate neighborhood, the city of Milwaukee, the region and the state of Wisconsin are far reaching. The immediate neighborhood will be positively impacted as a result of job opportunities (waste outsourcing, connectivity of neighborhood residents' talents and services, new business) and

the city of Milwaukee may realize an influx of emerging industries that had not before been attracted to the city. These businesses then grow, flourish and bring talent and brainpower (and keep it here) which benefits the region and the State.

Social impacts are quite powerful and further described in the Human Aspects sections of these guidelines. The Brewery Project provides a stable anchor at the immediate fringe of the central city; can help recreate a vibrant, thriving, diverse and multicultural neighborhood; and can provide a centerpoint for neighboring higher education, healthcare, library, museum and federal courthouse facilities and the diverse people that utilize those resources.

economic development

The Brewery Project, as it is postured in terms of a sustainable mission and vision, can contribute vastly to the city of Milwaukee's growth and economic development. Milwaukee offers much in terms of natural resources, cultural diversity, work ethic, higher education and an environment that is ripe with entrepreneurial prospects. As currently the largest sustainable LEED-ND registered pilot project in Wisconsin (Congress for New Urbanism, www.cnu.org) The Brewery offers the city an opportunity to set precedence in sustainable design and philosophy; lead the region in environmental solutions; model new urbanism, propel the city to a new level of recognition in innovative thinking and help create an environment that fosters integration of cultures, ideas and knowledge.

An index of seven categories of variables deemed important to young professionals searching for a place to live and work was created by Next Generation Consulting, a national authority on young professionals. Interestingly, there is a parallel in theme between these variables and sustainable, new urbanism environments. On a scale of 1 through 10, the following table indicates how the city of Milwaukee scored as published in the Milwaukee Journal Sentinel August 25, 2005.

Index of Variables Important to Young Professionals...in search of a place to live and work

Category	Description	Score
Vitality	Includes air quality, water quality, number of sunny days, miles of public parks, recreation areas, fruit and vegetable consumption, farmers markets and fitness centers.	5
Earning	Includes diversity of employment opportunities, concentration of various artists per capita, distribution of occupations, venture capital, business start-ups and the unemployment rate.	5
Learning	Includes the number of colleges, professional organizations, presence of young professional networks, technical schools, and breakdown of population's educational attainment.	4
Social Capital	Includes the percentage of population ages 18-40, median age, median family size, rank in ethnic and racial change, diversity of religious organizations, number of gay/lesbian households, charitable donations and crime rates.	6
Cost of Lifestyle	Includes average income per capita, average new home costs, and national cost of living index.	4
After Hours	Includes number of bars and nightclubs per capita, art galleries, theater and music venues per capita and restaurants.	6
Around Town	Includes commute times, percentage of population commuting individually vs. car pools, percentage who walk or bike to work, percentage who take public transit, and proximity to other metro areas by plane, train or automobile.	6

The Brewery Project enhances these variables and can contribute to the city of Milwaukee's position in terms of attracting and retaining young talent.

Sustainable live+work+play+learn environments attract people…and keep them there. Once thriving cities, while based on a different business model, exemplified the theory. Walkable communities reduce crime, and a mix of neighborhood types reduces and can eliminate racial tension (see social sustainability, page 30).

People, planet, prosperity. Social, environmental, economic. They represent a holistic approach to sustainable development - also referred to as natural capitalism or the triple bottom line. And a very relevant element of the social/people leg of sustainability relates to how people in a community treat each other. The concept of the social piece of sustainable development can be related to "the advancement quality of life and an emphasis on equity and provision for the least advantaged sections of present and future generations." (Cozens) Relevant to equality and a right to an acceptable quality of life are the feelings of safety. No community is sustainable if it is subject to high levels of crime and/or

fear of crime. The city of Milwaukee, like many urban environments, offers opportunity to address crime and fear of crime.

Sustainable development can address "urban decay" and crime; urgent problems of the inner city as demonstrated throughout the world. The Crime Prevention Through Environmental Design (CPTED) theory (also related to Defensible Space, Designing Out Crime) postulates that "the proper design and effective use of the built environment can lead to a reduction in the fear and incidence of crime, and an improvement in the quality of life." (Crowe, 2000). These approaches involved the use and design of space inside and outside of buildings, how buildings are positioned in relation to each other and streets/walkways/bike paths, landscaping and lighting. A second generation CPTED incorporates social factors and considers neighborhoods more as social ecosystems.

The blend of CPTED and sustainable development may foster safer, more live-able and sustainable urban communities: "urban environmentalism." (Cozens) Crime is within the concept of sustainability. Within sustainable evaluation tools and building sustainable indices should also be included a CPTED or Designing Out Crime element.

Perceptions or image of a community's sustainability and crime can greatly influence the reality of crime. As public space uses are defined, as buildings and streets are populated and vibrant with activity - people walking, bicycling, connecting - and as socioeconomic diversity is accepted, a community is perceived as being safer. This perception, in turn, brings more people who congregate and feel ownership of and care for their environment. This creates a circle of self-fulfilling prophecies of reduced crime.

Achieving safe, healthy and sustainable environments can be supported through design by using CPTED principles. Some of them include:

- Reduce the number of unoccupied dwellings
- Renovate vacant and dilapidated homes
- Encourage urban regeneration through the redevelopment of brownfield sites
- Effectively maintain and manage urban space: keep from underutilization
- Maximize opportunities for natural surveillance (e.g. landscaping, lighting)
- Encourage legitimate activity in public spaces; involve the community and organize the activity to define and promote its preferred use
- Access control to encourage use by respectful users and discourage use by those who may abuse the space
- The Three D Approach
  - Designate the intended use of the area and associated permitted behaviors
  - Define the boundaries of public and private space
  - Design to support the intended use of the space, safely and efficiently

See page 25 for sourcing.

The Brewery Project, through the nature of its adaptive reuse and redevelopment of vacant buildings, location along the fringe of inner city neighborhoods and site design intuitively incorporate the principles of crime reduction design tools and offer incoming partners, the city of Milwaukee and the region the opportunity to capitalize on these design theories. The Project has the potential to positively influence its surrounding

neighborhoods and as a result, significantly improve the socioeconomic sustainability of the Milwaukee region.

Other cities and communities throughout the world are evaluating sustainability and its positive affects on overall quality of life - and as a result, economic development. Two notable examples within the U.S. are West Michigan and the Merrimack Valley region of Massachusetts.

The West Michigan Regional Indicator Project,"Elements of Sustainable Quality of Life"[14] postulates approaches that will improve West Michigan's quality of life and be sustainable. They include:

- Create a diverse and vibrant globally-competitive economy that gives access to satisfying and rewarding work that builds household economic well-being.
- Develop an integrated infrastructure connecting where we live, learn, work and play within the region and to the world.
- Restore, preserve and enhance natural systems.
- Embrace authentic diversity and social distinctiveness and strengthen the local community and cultural identity.

The Merrimack Valley region of Massachusetts is banking on the economic development success of its visionary focus upon the Green Chemistry industry. Green Chemistry is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous materials in manufacturing.[15] The Merrimack Valley is hopeful that the Massachusetts universities can retain world-class talent and translate the knowledge into growth and development for the region.

Both are regional approaches to successfully incorporating sustainability and new urbanism into economic development efforts.

According to recent issue of Multi-Housing News, there will be 60 million new housing units developed over the next 25 years.[16] Their research indicates that the new users will desire work+live+play+learn environments and new urbanism density combined with green. Furthermore, the over 55 year old targeted market is experiencing a national trend of seniors seeking work+live+play+learn.

The University of North Carolina at Chapel Hill is developing community outreach education programs offsite to offer higher education opportunities to the 55 and older market. Imagine coupling the opportunities with Milwaukee's aging segment of population.

human aspects

The Human Aspects of sustainable environments can specifically relate to health and well-being, productivity, reduction in absenteeism, turnover and biophilia/ecopsychology. Regardless of the building type, consideration of the human aspects can have a profound positive impact on attracting and retaining top talent and tenants. As detailed in the previous sub-section, Measurable Costs and Benefits, there are tangible financial benefits that result.

Productivity

In reference to productivity, the WBDG (Whole Building Design Guides) asserts, "Wise use of space also means creating the right context for concentration, learning, communication, and collaboration-the building blocks of productivity." Design elements such as team rooms, daylighting, and direct control over one's environment contribute to a more productive

workspace. It is important to design for flexibility as work groups and projects progress. The General Services Administration's (GSA) report, "The Integrated Workplace," concludes that "since people are the most important resource and greatest expense of any organization, the long-term cost benefits of a properly designed, user-friendly work environment should be factored into any initial cost considerations."[17] As the GSA's report recognizes, most research on the effects of the built environment have been in the areas of indoor environmental quality; thermal comfort; air quality and lighting - and their affect on task performance.

Health and Well-Being

Human health and well-being can contribute to productive work and learn environments, but also attract an increasing number of people to living space that is recognized as healthful. Construction materials with no or low emissions; high-efficiency and filtered ventilation; and prevention of indoor microbial contamination can result in healthful indoor environmental quality that reduces the rate of respiratory disease, asthma, sick building systems and allergy.

A study completed by William Fisk and Arthur Rosenfeld, "Potential Nationwide Improvements in Productivity and Health From Better Indoor Environments," Lawrence Berkeley National Laboratory, May 1998 documented, "For the U.S., we estimate potential annual savings and productivity gains of $6 billion to $19 billion from reduced respiratory disease; $1 billion to $4 billion from reduced allergies and asthma, $10 billion to $20 billion from reduced sick building syndrome symptoms, and $12 billion to $125 billion from direct improvements in worker performance that are unrelated to health. Sample calculations indicate that the potential financial benefits of improving indoor environments exceed costs by a factor of 18 to 47."

Reduction in Absenteeism and Turnover

Quantitative research has concluded that healthier indoor environments result in reduced absenteeism and employee turnover.

Verifone, Costa Mesa, California, saw a 40% drop in absenteeism due to improved comfort resulting from the company's 76,000 s.f. sustainable renovation, and the new 600,000 s.f. high performance Lockheed Building 157 in Sunnyvale, California realized a 15% decline in absenteeism. Lockheed estimates that this reduction in absenteeism paid for the sustainable design elements within one year.[18]

Seattle City Hall's LEED-NC Gold certified 198,000 square feet of new office space successfully enhanced human capital, including a reduction in employee turnover rate.[19]

Biophilia/Ecopsychology

Edward O. Wilson, a Harvard University entomologist, originated the "biophilia" principle, referring to humans' "love of living things" and our innate affinity with nature. Ecopsychology correlates the need for connectivity with the environment to self-destruction and the potential for its reversal to inspire people to care for the planet. In March, 2001, the American Journal of Preventative Medicine reviewed several studies that suggest that being in contact with nature -- or even looking at it -- can boost people's health. These theories are new to the built environment, but rapidly gaining ground in terms of the human benefits resulting from connectivity with the environment.

site design and planning

The Brewery Project demonstrates success in sustainable site design and planning through its investment in LEED-ND. Zilber, Ltd. began in creating a site that offers potential development partners the opportunity to translate those inherent design elements into individual sustainable design projects - whether certification is pursued or not. It has been a critical first step.

The HSWA (Housing Strategy of Western Australia) states that "Urban development has been identified a crucial element of housing sustainability as street design, subdivision development, energy, waste and water management design principles can be addressed at the land development stage to influence sustainable outcomes - which is not possible in housing planned and built in previous decades."[20]

City leaders from Vancouver, Seattle and Portland met in May, 2004 to increase awareness of sustainable infrastructure and identify technical and implementation issues regarding sustainable streets and streetscapes in urban areas. They found that:

- All three cities have had success with the design and construction of sustainable buildings, but sustainable infrastructure initiatives are relatively new.
- Europe is ahead of North America in designing sustainable infrastructure and sustainable streets.
- Seattle, Portland, and Vancouver are North America leaders in exploring innovative approaches to sustainable infrastructure and sustainable streets.
- Need to address multiple objectives in street design (e.g., trees, pedestrians, bikes, safety, transit, lightening, garbage, fire trucks, storm water, business needs).
- Key in developing greener streets is going from "standards/uniformity." oriented thinking to "interest-based/local innovation" thinking
- Street design needs to incorporate maintenance concerns.
- Lack of money is a big problem. Sustainable streets can require increased maintenance and maintenance funding is already inadequate.
- Most successful projects have had substantial community input and many times driven by communities. Important to have effective public process.
- Elected officials have generally been supportive of green projects. Green projects are generally viewed by constituents as positive and hence supported by elected officials.
- It is important to have a local champion to promote greener streets and then partner with the City to deliver them.
- Definition of what is a green/sustainable street has slowed down the process.
- Design charettes are a good way to incorporate sustainable design principles into projects.

A summary of the outcomes can be found at:
http://seattle.gov/environment/building_forumsummary.pdf
A matrix of all three cities' sustainability programs are located at:
http://seattle.gov/environment/building_citymatrix.pdf

The Brewery Project has initiated an innovative, positive, public/private partnership with the city of Milwaukee in the redevelopment of the Pabst Brewery site. It will be imperative for the project's overall success, on all levels, for the momentum to continue in terms of embracing and enhancing sustainability as each parcel is developed. Each tract and

individual project will have its own identity and character, but the thread of sustainability woven throughout The Brewery Project will bring a cohesive outcome where the sum of the parts is greater than the whole. The result will be a warm, inviting, healthful celebration of uniqueness reflective of the city and its neighborhoods.

water management

"It is recognised that water problems cannot be solved by quick technical solutions. Solutions to water problems require the consideration of cultural, educational, communication and scientific aspects. Given the increasing political recognition of the importance of water, it is in the area of sustainable freshwater management that a major contribution to avoid/solve water-related problems, including future conflicts, can be found."

~ The International Hydrological Programme, a UNESCO (United Nations Educational Scientific and Cultural Organization) initiative

The Wisconsin Department of Natural Resources considers runoff Wisconsin's biggest water quality threat and "estimates that runoff threatens 40% of the state's streams and rivers and 90% of its lakes with the pollutants and sediments it picks up along the way."[21] Along with combined sewer overflows, the DNR is worried about the even greater volumes of polluted runoff that carries "Milwaukee street grime" into Lake Michigan.

In the article, Joel Brammeier, then acting executive director of the Lake Michigan Federation, states "sewage overflows are a known source of contamination for Great Lakes beaches. That's something that we can do something about."[22]

In "Turning the Tide in the Great Lakes," researcher Kelly Kizer Whitt writes, "Fertilizers, pesticides, and other pollutants - from sources ranging from large-scale construction sites to small backyard projects - all contribute to runoff and dump unneeded nutrients into the lake. Excess nutrients trigger growth of more algae than the system can absorb, creating serious problems."[23]

According to a study by the Milwaukee Metropolitan Sewerage Commission, rainwater washing pollutants off urban streets and parking lots, construction sites, and rural livestock yards and fields were the sources of 91% of fecal coliform bacteria found in waterways in 2000. The University of Wisconsin, Milwaukee, maintains a monthly Lake Michigan monitoring program, WATERBase.[24] One objective of this program is to determine how human activities are affecting water quality and the Great Lakes ecosystem.

Sustainable design dictates that water and its relationship to building design, development and operation is managed carefully. The Brewery community requires consideration be given to the water quality and quantity issues facing the city of Milwaukee and the Milwaukee Metropolitan Sewerage District as they relate to the combined sewer overflow (CSO) system.

One primary goal of The Brewery site design, as developed by P^{3}Xcel, is to reduce the rate and increase the quality of the stormwater runoff generated by the site. Less runoff means less street grime and other related pollutants directly entering Lake Michigan, and less water entering the region's combined sewer overflow system. Less water entering the CSO results in less sewage entering Lake Michigan. The site plan has been designed to utilize two feature techniques to meet this critical goal:

- Disconnect roof and surface water drainage systems from the existing

combined sewer system;
- Direct roof and surface water drainage to bioswales and porous pavement areas to naturally filter runoff before entering Lake Michigan.

Technical implementation guidance for these techniques is found beginning on page 80 of the Guidelines.

We have only begun to witness the posturing for the battle for fresh water. And the city of Milwaukee, southeastern Wisconsin and Great Lakes region will all be affected and involved in protecting the quality, use and availability of the Great Lakes - the world's largest supply of surface freshwater.

The city of Milwaukee's economic development success depends increasingly upon Lake Michigan for a source of drinking water, the biodiversity it brings to the region, and the beauty and recreation it brings to the lakefront.

Imagine the Calatrava-inspired Milwaukee Art Museum - the graceful, world-renowned symbol of Milwaukee - perched no longer on a sparkling lake. Imagine other lakefront located economic development and quality of life attractions such as Discovery World, Summerfest grounds and Grant Park on the edge of sullied water. Imagine the potential for Bradford Beach! The investment in lakefront amenities is only as valuable as the water is clean and abundant. The Brewery Project's site design and partnership with the city of Milwaukee in developing innovative, sustainable infrastructure will help protect this valuable resource. The Project can serve as a living laboratory and learning tool that will prove to be a national - and even global - neighborhood development model for others to utilize. Hopefully, the result will be an ever-compounding, positive impact on global water resources.

energy

Depending upon the source, buildings are responsible for between 36% and 45% of energy consumption worldwide. To help address growing concern relative to energy and climate change, The Kyoto Protocol, beginning effect in February 2005, is an amendment to the UN Framework Convention on Climate Change. The objective of the protocol is to stabalize greenhouse gas concentrations; specifically, a reduction in emissions to 7% below those of 1990 by 2012. As of December 2006, 169 countries and units of government have adopted the Protocol. The United States and Australia have not, however many individual cities within the U.S. have embraced Kyoto rules. There is some debate as to the usefulness of the Protocol. And U.S. businesses are hearing the call to address energy issues. While eighty percent of businesses have never conducted an energy audit,[25] 75% of corporations surveyed identified increasing energy costs as a driver of green building.[26]

Energy is the biggest consideration in analyzing potential savings in manufacturing facilities, since the industrial sector currently accounts for about one-third of all U.S. energy consumption at an annual cost of more than $120 billion.[27]

Locally, developers and businesses are advancing energy efficient buildings. The Mandel Group's Domus structure claims to be the first eco-friendly condominium constructed in Milwaukee. The building approach incorporates energy efficiency, indoor environmental quality and environmentally friendly building materials "to create residences of unparalleled livability." Johnson Controls

focuses on energy efficiency at their buildings as part of their Climate RESOLVE commitment to reduce greenhouse gas emissions by 18 percent in the United States by 2012.

Integrated building design, as with most sustainable aspects of a building, is critical to achieve the highest performing, most cost-effective buildings in terms of energy efficiency. Building siting/orientation, where feasible, should be considered, as well as building envelope, daylighting and the interaction of building systems. Renewable energy sources, either independent or linked with those incorporated into The Brewery Project site, should be evaluated. The benefits realized are immediate payback in terms of energy cost savings, as well as potential incentive programs. Focus on Energy[28] is a valuable resource for determining appropriate incentive programs. Other benefits include improved indoor and outdoor air quality and the reduction of carbon dioxide emissions (greenhouse gas).

The Zilber team is currently working closely with the city of Milwaukee to incorporate efficient, Dark Sky compliant, streetlight fixtures throughout the development. Renewable energy options, including wind microturbines and photovoltaics, have been studied and are being considered by The Brewery Project.

materials + resources

Building and construction activities worldwide consume 3 billion tons of raw materials each year or 40 percent of total global use.[29] Using green building materials and products promotes conservation of dwindling nonrenewable resources. Incorporating green building materials into building projects can help reduce the environmental impacts associated with the extraction, transport, processing, fabrication, installation, reuse, recycling, and disposal of these materials.

BuildingGreen.com offers a GreenSpec directory that contains information on nearly 2,000 green building products and is organized according to the 16-division CSI MasterFormat™ system.[30] Overall product and material selection should be evaluated based upon resource efficiency, indoor air quality, energy efficiency, water conservation and affordability.

Green building materials, finishes and furnishings should be selected based upon their evolution from recycled or renewable resources. In addition, these materials and products should be recyclable and least damaging to the environment. Construction waste prevention and management strategies are also incorporated.

William McDonough and Michael Braungart formed McDonough Braungart Design Chemistry (MBDC), [31] a partnership that consults and educates the theory of cradle to cradle design. "Instead of designing cradle-to-grave products, dumped in landfills at the end of their 'life,' MBDC transforms industry by creating products for cradle-to-cradle cycles, whose materials are perpetually circulated in closed loops. Maintaining materials in closed loops maximizes material value without damaging ecosystems." Their partnership epitomizes the concept of evaluating the supply chain; the notion of a closed loop system and what exactly is the stuff in all products being used in a building's construction, from where do these materials and products come - is the supply process in and of itself sustainable?

The benefit to investing the time in evaluating materials and their supply chain will help limit the depletion of

natural resources and reduce air, water and soil pollution. Recycled materials and the manufacture of products with post-consumer content will gain market strength and waste management can reduce disposal costs and limit landfill dumping.

indoor environmental quality

"In the struggle to build cost-effective buildings, it is easy to forget that the ultimate success or failure of a project rests on its indoor environmental quality (IEQ). Healthy, comfortable employees are invariably more satisfied and productive. Unfortunately, this simple, compelling truth is often lost, for it is simpler to focus on the first-cost of a project than it is to determine the value of increased user productivity and health."[32].

Indoor Environmental Quality (IEQ) encompasses air quality, thermal comfort and ventilation, noise and vibration, electric lighting, daylighting, views, ergonomics and other factors. Good IEQ contributes to productivity. According to Advanced Buildings, studies have shown that productivity can increase by as much as 16% when IEQ is improved. "Since salaries typically cost five times more than rent, energy, and facility operations and maintenance **combined**, even a slight increase in productivity can significantly improve an organization's performance."[33] In addition, buildings with notable IEQ are valued at a higher premium and contribute to health and safety of tenants/employees. Retail environments experience higher sales, schools realize significant improvement in student performance, and tenants seek out healthier living environments.

Indoor quality can be improved by eliminating products and materials with unhealthy emissions and by outside air filtering combined with high rates of air exchange. Maximized (and controlled) daylighting, along with acoustic control, contributes to healthy IEQ. The ability for regulating individualized comfort is ideal.

Innovative technologies, including active living walls and individual controls, can positively impact human health, productivity and well-being.

Natural ventilation concepts and increased rate of ventilation can help address sick building syndrome. With EPA citing IAQ as one of the top five health concerns, all building types will benefit from investing in technologies that will provide cost effective, healthful environments.

Urban Sustainability Sources

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5 Building occupants are more productive, experience a greater sense of health and well-being, and are overall drawn to office, residential, retail and learning environments that exhibit better indoor air quality and improved lighting. Considering the cost of employees, productivity gains and success in attracting and retaining top talent far outweigh financially the financial benefits realized from energy savings, lessened construction and maintenance costs.

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implementing sustainability at The Brewery

"The future of life on earth depends on our ability to take action."

- Sir David Attenborough -

THE BREWERY AND LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN FOR NEIGHBORHOOD DEVELOPMENT (LEED-ND)

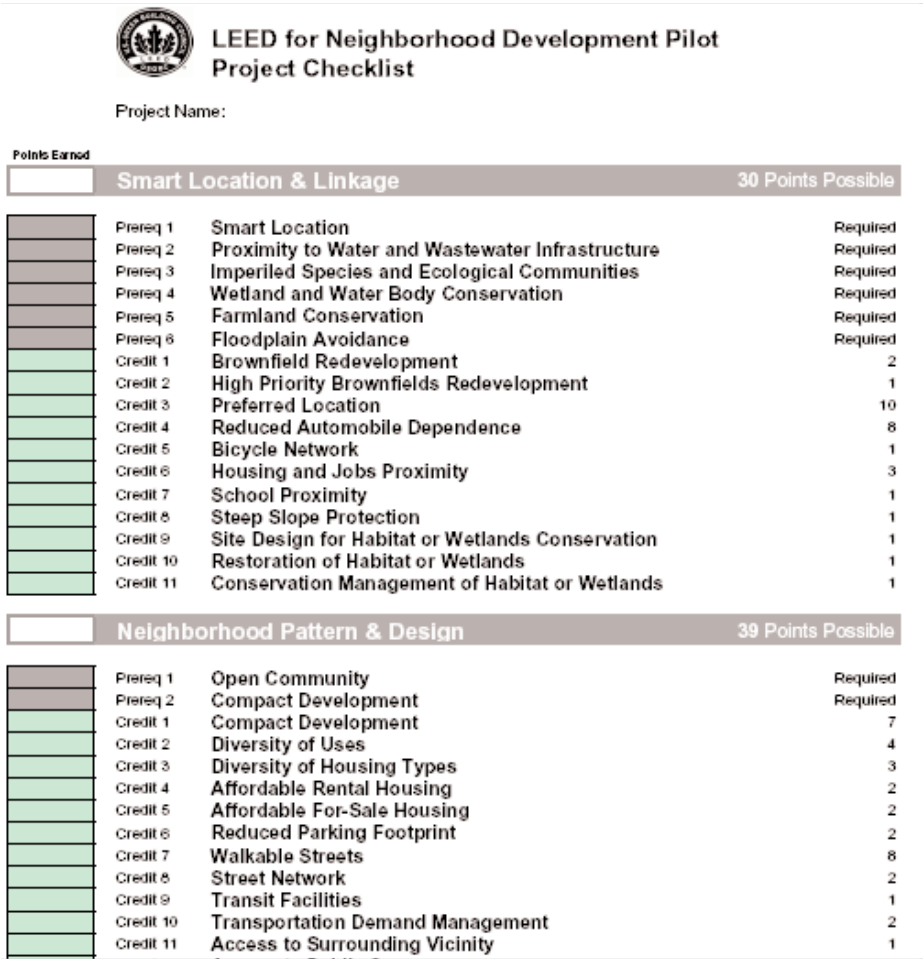
The U.S. Green Building Council (USGBC) is a non-profit organization dedicated to sustainable building design and construction. The USGBC created the LEED (Leadership in Energy and Environmental Design) Green Building Rating System™ which is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. LEED gives building owners and operators the tools they need to have an immediate and measurable impact on their buildings' performance. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

LEED-ND

defined

The U.S. Green Building Council (USGBC), the Congress for the New Urbanism (CNU), and the Natural Resources Defense Council (NRDC) - three organizations which represent some of the nation's leaders among progressive design professionals, builders, planners, developers, and the environmental community - have come together to develop LEED-ND. This rating system will integrate the principles of smart growth, new urbanism, and green building into the first national standard for neighborhood design.

Whereas other LEED products focus primarily on green building practices, with only a few credits regarding site selection, LEED-ND emphasizes smart growth aspects and neighborhood design of development while still incorporating a selection of the most important green building practices. Guided by the Smart Growth Network's ten principles of smart growth and the Charter for New Urbanism, LEED-ND includes compact design, proximity to transit, mixed use, mixed housing type, and pedestrian- and bicycle- friendly design. In short, LEED-ND creates a label which could serve as a concrete signal of, and incentive for, better location, design, and construction of neighborhoods and buildings. Considering The Brewery Project's inherent elements of LEED-ND: urban environment; brownfield redevelopment; connectivity to education, diverse neighborhoods, healthcare and commerce; this seven-block region - once thriving and vital to Milwaukee - is well-suited for this innovative blend of sustainability and new urbanism.



LEED for Neighborhood Development Pilot
Project Checklist

Project Name:

Points Earned			
	Smart Location & Linkage		**30 Points Possible**
	Prereq 1	Smart Location	Required
	Prereq 2	Proximity to Water and Wastewater Infrastructure	Required
	Prereq 3	Imperiled Species and Ecological Communities	Required
	Prereq 4	Wetland and Water Body Conservation	Required
	Prereq 5	Farmland Conservation	Required
	Prereq 6	Floodplain Avoidance	Required
	Credit 1	Brownfield Redevelopment	2
	Credit 2	High Priority Brownfields Redevelopment	1
	Credit 3	Preferred Location	10
	Credit 4	Reduced Automobile Dependence	8
	Credit 5	Bicycle Network	1
	Credit 6	Housing and Jobs Proximity	3
	Credit 7	School Proximity	1
	Credit 8	Steep Slope Protection	1
	Credit 9	Site Design for Habitat or Wetlands Conservation	1
	Credit 10	Restoration of Habitat or Wetlands	1
	Credit 11	Conservation Management of Habitat or Wetlands	1
	Neighborhood Pattern & Design		**39 Points Possible**
	Prereq 1	Open Community	Required
	Prereq 2	Compact Development	Required
	Credit 1	Compact Development	7
	Credit 2	Diversity of Uses	4
	Credit 3	Diversity of Housing Types	3
	Credit 4	Affordable Rental Housing	2
	Credit 5	Affordable For-Sale Housing	2
	Credit 6	Reduced Parking Footprint	2
	Credit 7	Walkable Streets	8
	Credit 8	Street Network	2
	Credit 9	Transit Facilities	1
	Credit 10	Transportation Demand Management	2
	Credit 11	Access to Surrounding Vicinity	1

Sample Page - LEED-ND Pilot Project Checklist

LEED-ND Feasibility Charrette

In the spring of 2006, the Zilber design team began to develop a sustainable approach for this legacy project. The design team analyzed The Brewery's location, site characteristics and buildings to determine the feasibility of seeking LEED-ND

certification. The team concluded that The Brewery offered enough opportunity for sustainability through its existing characteristics and geography - an urban infill site with proximity to retail, educational, and entertainment areas - and through its planned sustainable features, including stormwater management, preservation of historical buildings and re-use of materials, to warrant seeking LEED-ND certification.

The Brewery - LEED-ND Assessment

Zilber and its design team had carefully analyzed The Brewery development and determined it had enough of the qualifying criteria to be considered for the LEED-ND pilot program, which was currently underway. The Brewery project would be submitted to the USGBC as a candidate for this program.

The Brewery EcoCharette

P^{3}Xcel formed and facilitated a day-long ecocharette involving business and community leaders, including representatives from Zilber, the City of Milwaukee, Milwaukee Common Council, Milwaukee Metropolitan Sewerage District (MMSD), P^{3}Xcel and other stakeholders. The purpose of the ecocharette, an event where participants were fully engaged, was to generate big-picture, visionary ideas - the most ideal solutions related to the city of Milwaukee and its neighborhoods - for this landmark development.

Ideal Sustainable Scenarios and Mapping

Session - EcoCharette participants provided input on ideal sustainable scenarios for The Brewery. Example: If the Brewery was a total success, it would capture all the stormwater and re-use it. Participants recorded these types of ideal scenarios on Post It sheets and posted them on the wall. Participants then "voted" for the most desired sustainable scenarios.

Outcomes of the ecocharette include recommendations for renewable energies and stormwater management. Innovative designs underway include consideration for pedestrian movements, gathering

The Brewery EcoCharette

areas, water features and intended land uses within the project limits. The Brewery's stormwater management design will separate the surface water and aggressively capture, contain and treat stormwater within this 18-acre site. The design incorporates bioswales that take advantage of northwest to southeast water flow. Porous pavement areas with underground detention capabilities will also be used. Renewable energy recommendations include photovoltaic and wind energy to generate self-sustaining power needs, including powering LED signs, water feature

lighting and LED lamping technology.

LEED-ND Pilot

In 2006, Zilber submitted The Brewery as a candidate for the LEED-ND Pilot Program. In May 2007, the USGBC announced that The Brewery had been selected as a LEED-ND Pilot project, and in July 2007, the project was officially registered.

The LEED-ND Pilot Program is expected to conclude in 2008. Based on feedback gathered during the pilot, the rating system will be revised to improve its effectiveness and applicability to the marketplace. The revised rating system will then be balloted according to USGBC's consensus process and undergo approval by CNU and NRDC.

translating existing sustainable strategies into your project

The Brewery's existing sustainable strategies include an aggressive stormwater management design that will capture, store and treat stormwater runoff through the use of bioswales and porous pavement; and renewable energy measures. The Brewery also includes several inherently sustainable characteristics, such as walkability, proximity to transit and education, reduced automobile dependence and access to public spaces. These features encompass the entire development and will facilitate sustainability in any building project, regardless of whether the developer decides to pursue LEED certification.

Should a developer decide to pursue LEED for New Construction (NC), s/he will find that The Brewery, through its current sustainable strategies and inherently sustainable characteristics, meets many of the criteria in the Sustainable Sites category of the LEED-NC rating system, including Site Selection, Development Density & Community Connectivity; Brownfield Redevelopment, and Alternative Transportation: Public Transportation Access. A chart detailing associated LEED-NC credits associated with required Brewery Project guidelines is found on pages 47, Technical Guidelines.

The LEED-NC Green Building Rating System for New Construction and Major Renovation, Version 2.2, can be located at:
https://www.usgbc.org/ShowFile.aspx?DocumentID=1095

social sustainability

LEED-ND Public Health Report

The LEED-ND Public Health Report summarizes the relationship between how communities are built and a series of public health outcomes, including physical activity, traffic crashes, respiratory health and mental health. This report summarizes the impact of the built environment on public health issues and addresses how this information can be translated into positive, built environment changes. The report was supported by funding from U.S. Environmental Protection Agency and the Centers for Disease Control and Prevention, and sponsored by the LEED for Neighborhood Development partnership. The Report also provides an overview of the elements of the built environment that impact health outcomes. The specific characteristics are:

- Regional Accessibility/Location of Development
- Population and Employment Density
- Land Use Mix
- Access to Transit
- Streetscape Design/Pedestrian Amenities
- Bicycle Amenities

- Access to Recreational Facilities
- Distance from Roadways
- Diversity of Population/Income in Communities
- Roadway Network (encompassing network design, intersection traffic controls, access management and traffic calming)
- Street Cross Sections (encompassing street width, on-street parking, and pedestrian counter measure)

The full report, titled "Understanding the Relationship Between Public Health and the Built Environment," can be found at http://www.cnu.org/sites/files/LEED_public_health.pdf.

Sustainable elements inherent in The Brewery site contribute to social sustainability. These benefits can be capitalized upon and enhanced by the individual developer. As referenced in the above report, some notable components include:

Walkability. "…walkability is positively correlated to social capital." Studies conducted in Maryland and Portland neighborhoods found that the "strongest predictors of a sense of community were having positive attitudes toward walking, the perception of opportunities for social interaction, and having a safe and interesting walking environment."

In fact, a study by Kevin Leyden in Galway, Ireland postulates that walkability and a mix of neighborhood types reduces racial tension. "…the more places (people) are able to walk to in their neighborhood, the higher their level of social capital."

Significant Public Realm (opportunities for spontaneous interaction). "Diminishing social capital has also been associated with a loss of public spaces…in the sense of social capital include not only sidewalks, parks and plazas where people can meet informally and develop social trust; it also includes the 'great good places.'" This term refers to cafes, coffee shops, bookstores, salons and other places that people connect to exchange knowledge, recreate and build a sense of place.

Mixed Use. An Ohio State University study found that residents in mixed use neighborhoods felt a greater sense of community than single use neighborhoods.

Homogenous income/age communities. A study by J. Eric Oliver analyzed the effect of economic segregation on political participation in the United States. His research found that economically diverse cities are more likely to be politically involved. The report suggests that single-use, single-income areas contribute to the diminishment of social capital.

Sustainomics

As stated in Mohan Munasinghe's article (last updated May 7, 2007), "Sustainomics and Sustainable Development," sustainomics seeks to provide a comprehensive, practical framework for making present and future developments more sustainable. Sustainable development requires balanced and integrated analysis from the three major perspectives - economic, social and environmental - of Munasinghe's sustainable development triangle. This is the typical triple bottom line approach. The economic view is focused on improving human welfare through increases in the consumption of goods and services. The environmental domain involves protection of the integrity and resilience of ecological systems. The social domain is geared toward the enrichment of human relationships and achievement of individual and group aspirations.

In Munasinghe's model, which is being used by world decision makers to address critical policy issues, sustainability is defined as a step-by-step process rather than an endpoint. The primary objective is "making development more sustainable," (MDMS) a practical, gradient-based method of addressing priorities.

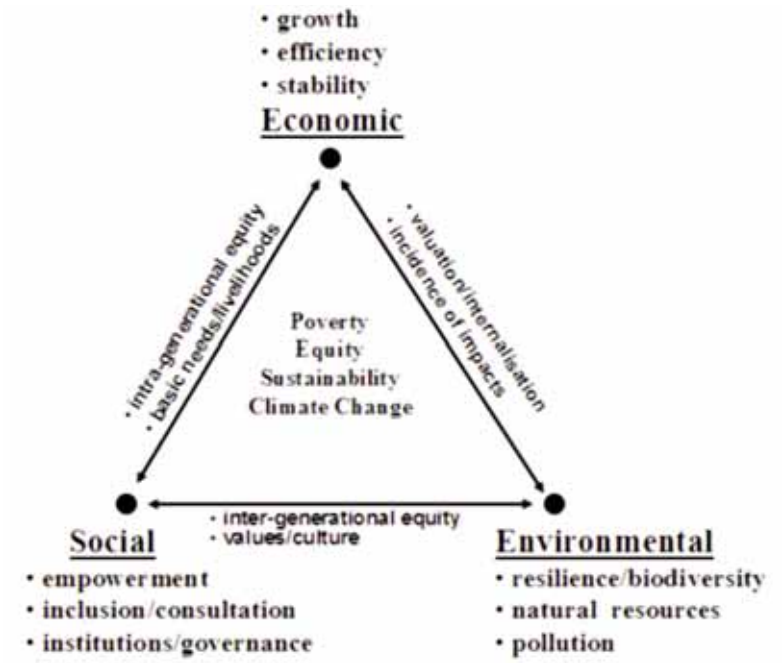


Figure 1. Sustainable development triangle - key elements and links (corners, sides, center). Source: Adapted from Munasinghe, 1992

Poverty Reduction

Munasinghe purports that an important objective reducing poverty is to provide disadvantaged people with assets (e.g., social, natural and economic), that will reduce their vulnerability, and increase the capacity for both short-run coping and longer-run adaptation to external shocks. The Brewery can provide those assets. Farmer's markets can be created in one of the pocket parks and offer people from surrounding neighborhoods the opportunity to sell the produce on site.

Other concepts could include establishing kiosks of local art and wares created by people from surrounding neighborhoods. Food carts operated by people from these neighboring communities could offer healthy, fresh lunch meals to people who are working, living, playing and learning in The Brewery Project.

Another opportunity, whether the space is actually located on The Brewery Project site or located offsite in a neighboring building, is waste management outsourcing. Whether on the site or not, the business could have direct ties to The Brewery Project as construction waste management and recycling will be required over the next several years. There seems to have been success with other waste management outsourcing organizations that have established their start up in an inner city location. The Green Institute in Minneapolis, Minnesota and Oakleaf (http://www.oakleafwaste.com/oakleaf) in East Hartford, Connecticut are both located in inner cities. Oakleaf was named by Inc. magazine as an Inner City 100 company - one of the fastest growing companies in America's inner cities.

Other Inner City 100 companies have developed successful business in the areas of staffing services, furniture manufacturing, software development, and environmental engineering, capitalizing on the vast marketing potential of inner cities.

Initiative for a Competitive Inner City, a nonprofit organization founded by Michael Porter of the Harvard Business School, is a source of business data and economic analysis demonstrating the market potential in America's inner cities.

The Walnut Way Conservation Corporation (http://www.walnutway.org), a community development organization serving the Milwaukee Central City neighborhood, has successfully

implemented such programs and their leaders could be a resource for The Brewery.

These concepts initiate connectivity, foster interaction and bring enhanced understanding of cultures that could contribute to reducing crime, lessen segregation and bringing healthy diversity to the seven-block Brewery neighborhood. Such social sustainable success could serve as a model for other Milwaukee live+work+play+learn communities, thereby enhancing the social health and economic development for the city.

Sustainomics and The Brewery:
In applying The Brewery Sustainability Guidelines, developers can look to Munasinghe's widely-accepted sustainomics model for supplemental, practical guidance in making The Brewery more sustainable.
http://www.eoearth.org/article/Basic_concepts_and_principles_of_sustainomics

Crime Prevention

Meaningful Interaction with Neighbors, Diversity of Use and Walkability Crime Prevention through Environmental Design (CPTED) is a multidisciplinary approach to deterring criminal behavior. Its strategies rely on the ability to influence offender decisions that precede criminal acts. Early pioneers of CPTED principles include Jane Jacobs, author of "The Death and Life of Great American Cities" (1961). Jacobs "…challenged the basic tenets of urban planning of the time: that neighborhoods should be isolated from each other; that an empty street is safer than a crowded one; and that the car represents progress over the pedestrian. An editor for Architectural Forum, Jacobs had no formal training in urban planning, but her work emerged as a founding text for a new way of seeing cities. She felt that the way cities were being designed and built meant that the general public would be unable to develop the social framework needed for effective self-policing. She pointed out that the new forms of urban design broke down many of the traditional controls on criminal behavior, for example, the ability of residents to watch the street and the presence of people using the street both night and day. She suggested that the lack of "natural guardianship" in the environment promoted crime. Jacobs developed the concept that crime flourishes when people do not meaningfully interact with their neighbors. In Death and Life, Jacobs listed the three attributes needed to make a city street safe: a clear demarcation of private and public space; diversity of use; and a high level of pedestrian use of the sidewalks."

~Wikipedia.org~

Jacobs' sentiments are on par with visions for The Brewery - a neighborhood that will offer opportunity for interaction, diversity of use and walkability. Developers within the property can continue to foster elements of design that reduce crime. Pocket parks designed within The Brewery Project offer the opportunity to build a sense of territoriality among the community by involving the surrounding neighborhoods in community activities. (Territoriality contributes to a sense of ownership, natural surveillance and vibrant activity - all tactics that successfully reduce crime.) Activities could include musical performances by local musicians, other performing arts, public forums and those related to children. Further examples are detailed in the previous section, Why Sustainability is Important, beginning on page 10.

Additional information on CPTED can be found here:
http://www.cptedtraining.net/index.htm

guidelines goals

The nature of the LEED-ND site design, the varied land uses and these Guidelines will positively contribute to the culture of The Brewery Project's inhabitants, users, and the city of Milwaukee as a whole. The Brewery Project heightens cultural awareness; from how we interact with each other to how we conduct ourselves. It is a return to a more inter-connected, cohesive ethos that embraces the urban environment and cultivates enthusiasm and appreciation for life, human interaction and our relationship with the environment.

To assure that The Brewery Project fosters sustainable growth and development, the Zilber team has determined that there are specific sustainability requirements of those who choose to become a part of this exciting, vibrant, live+work+play+learn community.

These required guidelines are identified in each of the technical sections and referenced as Level 1 under Performance Goals/LEED credits:

performance goals/LEED credits

Note: Performance Goals provide the "How to" for achieving the goals and technical strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project, LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Example:
Level 1 (required)
Use native plants for 90% of the vegetation on the project and use no invasive plants on any part of the project site. (LEED-ND)

Incorporate into the development the reuse of one building that maintains at least 50% (based on surface area) of the existing building structure and envelope. LEED-ND, GCT CREDIT 4

Level 2 (suggested)
Meet the minimum requirements of Section 4 through 7 of ASHRE 62.1-2004, Ventilation for Acceptable Indoor Air Quality. Mechanical ventilation sytems shall be designed using the Ventilation Rate Procedure or the applicable local code, whichever is more stringent. LEED-NC, EQ PREREQ. 1

The suggested guidelines, referenced as Level 2, are strongly encouraged, but not required. Their implementation will result in a more high performance building and a more sustainable environment. The potential for greater return on investment is also realized.

The goal of the technical guidelines is to educate, inspire and provide design resources related to sustainability. At the beginning of the Technical Guidelines section, there is a detailed, comprehensive listing of those guidelines that are required. The required guidelines are such that they do not place an undue burden on the developer and correspondingly assure a sustainable environment.

To achieve sustainable goals, it is suggested that a project developed within The Brewery have dedicated a sustainability coordinator. This person is responsible for assuring that their organization's development is implementing the sustainability guidelines - both those required and suggested. This individual should also be responsible for the management of the design and construction team as it relates to assuring sustainable design elements are incorporated into the design. The sustainability coordinator may also want to evaluate the level of sustainability as it relates to other aspects of the development operations: purchasing,

transportation, recycling, energy, indoor environmental quality, etc. (See Operations and Maintenance Section of Technical Guidelines.)

design process

"Sustainable development: Improving the quality of life within the carrying capacity of supporting ecosystems."

- UN Environment Programme/WWF/World Conservation Union Report "Caring for the Earth", 1991 -

The integrated design process transcends the traditional building design and construction method. The traditional approach involves a project team whose organization is hierarchical and the design process is transactional. An integrated process engages a much more collaborative, team-based approach: everyone has an equal seat at the table, boundaries are removed, design approaches and benefits are contrasted and compared, and innovation is paramount. An EcoCharette held at the beginning of the project is extremely helpful - shareholders and stakeholders are invited to participate, including the "dissenters." An integrated design approach may incur more time during the preliminary development phases, but will realize a far greater cost savings during the construction document phase. While innovative design ideals and products are key for sustainable building/site projects, the integrated design team can evaluate system cost and effectiveness as well as operations and maintenance in determining the optimum, most cost effective sustainable design and construction. It is critical for all participants to contribute and engage early on and throughout the process, as well as actively listen to their fellow team members. This fosters a truly integrated, whole building design approach.

benefits

Interactive, holistic dialog promotes idea-generation and innovative approaches that would not otherwise be developed

Whole systems design approach is implemented at the outset

Promotes buy-in among stakeholders

Assures project understanding among design team, owner and other stakeholders

Increase philanthropic or other partner participation

goal setting, cost benefit analysis

Inherent in sustainable design is the fortunate tendency to move beyond the building - to consider sustainability as it affects the site, the people in and around the building, how the environment is impacted or improved, the region and the community. Much opportunity exists to evaluate the web of connectivity relating to the building and all impacted around it, as well as the philosophy and ethos within and surrounding the building - and the people who come in contact with it.

To capitalize on the layers of opportunity, a sustainable site and/or building design project is best approached by beginning with an EcoCharrette. To efficiently and effectively identify the sustainable goals, this one day session is facilitated by an individual or team knowledgeable in sustainability and expert in team facilitation. Key decision-makers, the design team and other pertinent stakeholders/potential partners are included. (*Pertinent stakeholders/potential partner involvement, including those involved from a philanthropic perspective, helps foster project interest and buy-in.*) In addition, experts and a-traditional thinkers are suggested as EcoCharette participants to enhance the idea-generation and help the organization innovate by bringing together an eclectic, multi-disciplinary mix that represents the human factors, design factors, engineering, an business relating to the organization's industry, all woven together with a common thread of sustainability.

An EcoCharrette fosters an interactive design approach to arrive at a tailored, yet comprehensive solution that best meets the needs, concerns and goals of the organization embarking on sustainable thinking. It is critical to create an innovation culture in which EcoCharette participants can immerse and develop brilliant ideas. From a very broad perspective, the EcoCharette involves:

- Understanding sustainability and a whole systems approach
- Translating all aspects of sustainability into a building, product or service; its processes, its people, its community and beyond. What are the big picture goals? What is affected?
- Roundtable discussions to develop themes
- Organizing themes
- Mapping, organizing, prioritizing
- Establishing measurable objectives

An EcoCharette is a strategic, imperative first step to any sustainable project; goals are confirmed and tactics for achieving those goals are developed. Macro, high-level thinking is paramount. How can sustainability benefit the organization, the community and serve as a model for others? Are there sustainability elements that reflect and promote organizational goals? The result is a tailored solution that best meets the organization's sustainable needs, concerns and goals.

In an EcoCharette, it is beneficial to incorporate an initial cost benefit (multi-criteria) analysis. While narrowing down the discussion from big picture goals to potential sustainable design elements and approaches, rough design and construction costs should be discussed.

A Cost Benefit Analysis (CBA) assesses project costs and benefits monetarily. When weighing sustainable options, a multi-criteria analysis (MCA) in tandem with a CBA may provide more beneficial than a traditional cost benefit analysis approach. MCA measures a wide range of qualitative impact criteria and categories and is particularly applicable when a single-criterion approach (such as

cost-benefit analysis) is not adequate in evaluating significant environmental and social impacts. Various environmental and social indicators can be developed in tandem with economic costs and benefits, noting specifically that monetary and non-monetary objectives may influence decisions.

team development

A successful team includes a wide variety of individual talents that are brought together as soon as there is a notion of a project. The team extends beyond those involved in building and site (or neighborhood) design; rather, the working group is comprised of representatives from each aspect of ownership, management, design and influence.

It is important that the design team has had sustainability experience; at least the prime consultant. However, the prime will be investing considerable time educating and negotiating sustainable design elements with those sub-consultants who do not have any sustainable knowledge or experience. The more green experience among the design team members, the higher the level of design collaboration and innovative output.

Included on the project team should be:

- Owner representation: This can include the building owner, organization leadership or building operator.
- Stakeholders: People who have a stake in project outcomes. Consider including those who are being sought after in terms of community and business leadership, philanthropy, financial partners.
- A-traditional idea innovators: biologists, anthropologists, artists, writers, academia.
- Design team: All facets of the building development are included to foster an integrated design approach - engineering disciplines, energy consultant, commissioning agent, architect, interior designer, landscape architect, site planner, construction contractor and inspector.

The construction contractor's involvement at the initial stages brings valuable input and knowledge regarding constructability, renewable resources and cost benefit analysis. Furthermore, their early participation will help promote an integrated approach. Sustainable practices reduce wasted energy, water and materials in the construction and operation of a facility. Constructability focuses on the efficient use of materials and labor through more efficient means of construction; but these concepts also influence the design and operability of the site or building.

benefits

Helps maintain commitment to high performance goals.

Promotes team's commitment to design methods and sustainable elements and tools, furthering the potential of achieving project sustainability goals.

Selecting the team through a qualification-based process is ideal. Basing selection from a fee before the sustainability concepts have been defined through an EcoCharette process is unrealistic. This approach will result in fee proposals that are incomparable, as each consultant team attempts to guess at which sustainable design elements are most appropriate without going through a cost-benefit analysis with the owner. A phased process will allow the project to unfold and develop with the design team, with the first phase being an EcoCharette.

The American Institute of Architects offers information on writing a green RFP (request for proposal), found at http://www.aia.org/cote_rfps. Energy and mechanical systems are principal factors in terms of building efficiencies and the primary driver of occupant comfort and satisfaction. Constructability is equally as critical to decision-making. In the end, the key to a successful sustainable building and innovative outcomes is a whole building design or integrated approach as described in the next section. As such, the "prime" role is somewhat mitigated and limited in importance to a contract management perspective.

Technical Strategies

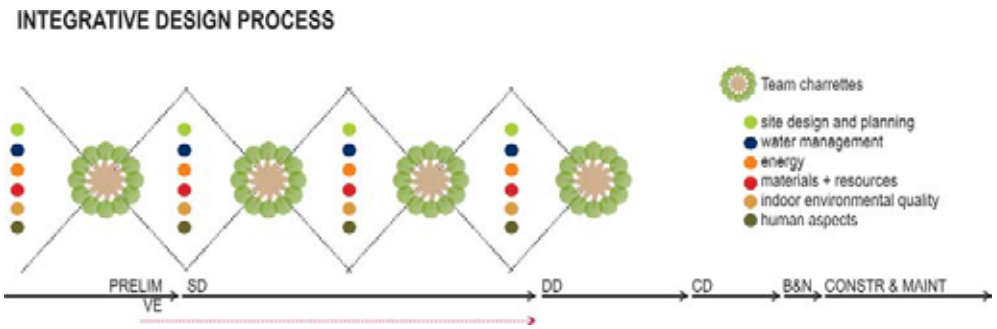
Specific sub-consultant participation. The Specific Requirements and RFP should clearly delineate the team member's contributions to achieving an integrated design.

EcoCharette. All team members participate in goal setting workshops ('charettes') and milestone meetings with the client, which will establish key features of the project and performance targets.

well integrated design

Integrated Design is similar in some ways to the systems thinking field pioneered by MIT's Professor Jay Forrester. Instead of focusing on individual pieces, systems thinking focuses on the feedback relationships and larger interaction between the parts of the system. In other words, "The whole is greater than the sum of its parts." While not limited to sustainable buildings - as most built environment projects would benefit from this approach - integrated design is crucial for a successful high performance building. Integrated design promotes selection of the simplest and maintenance-free equipment whenever possible. Every aspect of a building connects with each other and is dependent upon each other to achieve optimal performance and to create a cost-effective, innovative work+live+play+learn environment. A linear process, where one discipline hands off a partial design to the next to complete, is not effective.

"Communication between different stakeholders is essential. **An integrated design approach requires thinking about the building and its site as interdependent; a single design**



Concept based on DOE integrated design process and the whole system integration process (WSIP).

refinement might simultaneously improve the performance of several building systems. Rather than divide responsibility, the integrated design team works together to make sure the building systems work together as well. Through this system, a single design refinement might simultaneously improve the performance of several building systems. For example, if day lighting, electrical lighting, window size and placement, ventilation systems, and materials (less toxic) are considered together rather than as separate parts of the project, the overall indoor air quality and physical comfort of the building can be enhanced and energy consumption reduced. These multiple benefits, however, are wholly contingent on the ability of …administrators, architects, engineers, consultants, and interior designers to work together to design these components of the system."

~ "Better Buildings at Brown," Brown University, MacGregor ~

"**Whole-systems design** is crucial for sustainability. The sustainability categories and strategies are interdependent; none stand in isolation. Decisions made in one area may affect the performance in another. A single design improvement might simultaneously improve several

building systems' performance; for example, careful decisions on building shape and window placement that take into account both prevailing wind and sun angles may not only enhance a building's thermal performance but can also result in improved daylighting. On the other hand, considering one building system alone without regard to others may result in poorer performance in the other systems; for example, improving indoor environmental quality by increasing outside ventilation may compromise the energy performance of the building.

Any conflicts among categories should be resolved by using an integrated design approach; and **careful decisions should be made to select those designs that can trigger multiple savings or other benefits**. It is essential that all members of the Project Team work together and consider all sustainability categories in order to be aware of the influence of their decisions on the overall sustainability performance of the building in each category."

~ Stanford Sustainability Guidelines ~

"Sustainable design requires a mindset or mental model that differs from standard practice methodologies. Such a mental model looks at systems in a more complex and integrated way. Instead of looking at just the physical elements of the building, the invisible connections and relationships between the elements need to be understood. These invisible connections and patterns may be manifest, for example, in the downstream impacts resulting from toxins in building materials, or the multiple efficiency and cost relationships between an HVAC system and the building envelope, or the effects that raw material extraction - such as logging practices - has on social systems or habitat.

"…understanding the complex interactions of life and the unique nature of how each place relates to the "whole system" requires a different design process - a process that identifies the key species, patterns, and interrelationships that are unique to the place we are building."

~ Whole System Integration Process (WSIP) ~

"A sustainable building can only be accomplished when everyone (the building owner, future occupants, design team) have the same energy and environmental goals for the project from the start.

Yet basic design goals such as minimizing energy consumption or maximizing daylight **cannot be done without understanding the impact of interrelations between parts of the building,** including window glazing systems, thermal envelope, mechanical system integration, orientation, and floor plate proportions. High performance building design must ensure complete integration to achieve optimal building performance."

~ US Department of Energy ~

The traditional building process is linear. Engineering and design teams are pulled into the process on an as needed basis in an attempt to save costs. Exact cost savings ranges are dependent upon the source. **The mid-range estimate is that integrated design can save 25% or more in services of the total construction process.** (Cramer, The Next Architect, May 2006). Designs are developed without correlation with each other or the overall project parameters. Rather than as an integrated whole, design decisions that have a profound impact on systems and cost are often made intermittently and too late in the process. When all team members collaborate at the inception of a project, valuable knowledge sharing occurs in

terms of viability, cost, interrelationships and vision. This exchange maximizes the potential for a high performance facility without the need to redesign throughout the process.

The more traditional, or dis-integrated process results in a team without a clear and mutual understanding of project goals and vision. As noted in the "Whole Integrated Design: Market Transformation to Sustainability Guideline Standard, Whole System Integration Process (WSIP)," September, 2006, (http://www.integrativedesign.net/resources/pdfs/WholeSystemIntegration.pdf) serious problems arise without an integrated process. Poor communication results in errors, omissions, over-sizing and redundancies; "siloed" decision-making limits the potential for multiple, interconnected benefits and the positive impacts of the interrelationships between building and site design elements; and lack of fully engaging the owner and associated partnerships in the goal setting process loses the opportunity for confirmed vision, mission and buy-in.

When sustainable concepts are integrated into the design from the very beginning, associated building systems become smaller, materials mirror the objectives of the system (and vice-versa), building design complements the site, site design reflects the priorities of the building, resulting in a compounding effect of efficient design.

Integration has been referenced not only as an evaluation of system relationships and goal setting, but also as a "knowledge-centric" activity supported by tools such as Building Information Modeling (BIM.) As explained in a Design Intelligence Report (Design Futures Council), knowledge-centric, as an integrated approach, "the engineering formulas, code regulations and other rules which influence the design…are embedded within intelligent objects in advance of any project being considered." After a model is created, only specific information regarding the project is incorporated to create a unique model. Collaboration is considered "data-centric" and is exemplified as an engineer working from a 30-day old set of drawings while the architect continues making design changes, causing coordination problems and expensive rework in the field. It is most often the sub-contractor or fabricator who is most knowledgeable with design details, but they are rarely engaged early enough to have input. "Amazingly, many owners are unaware of the waste of their investment dollars simply because it is so hard to measure."

Integrated client-stakeholder-design-construction teams also promote higher levels of sustainability with lessened cost when teams, as a result of working together from the outset, take advantage of inherent site, building and materials features before involving mechanical and electrical support. Natural ventilation and lighting are capitalized upon before identifying energy-driven HVAC and lighting systems. Even LEED platinum ratings can be achieved within conventional construction budgets when utilizing an integrated approach.

benefits

$ Maintenance and operating savings can be realized through optimization of several building systems simultaneously

$ Integrated design can achieve reduced building system first costs by downsizing building systems

Innovative technologies and less toxic materials can be paired to enhance building performance

Up front involvement and input of stakeholders can contribute to philanthropy and partnerships, as well as build awareness among the community

resource management

Waste materials from the built environment, construction and demolition (C&D) debris, account for 1/3 of the total waste generated in the United States. Building renovation and demolition accounts for 91% of the C&D generated each year, while new construction accounts for 9%. However, new construction requires more infrastructure and support systems that have a profound, negative impact on natural resources - while consuming valuable open space.

Adaptive reuse, brownfield reclamation, alternative officing and detailing for disassembly are examples of effective resource management. Witness the success of The Brewery Project: adaptive reuse, along with brownfield reclamation, conserves land, reduces urban sprawl, increases density and provides vitality to the downtown. The blend of new urbanism/smart growth and sustainability is more efficient and environmentally responsible as a result of its redevelopment of older buildings, where feasible, close to the urban core. The combination of re-use and density is more sustainable from economic, environmental and socioeconomic perspectives than to build the same span of new construction on removed greenfield sites.

The Brewery Project will be able to save many of the existing buildings for adaptive re-use; but as for the buildings that were razed, 80% to 85% of the materials are being recycled. One third of the demolition costs are being off-set by the salvage value.

Building 10 (shown above) of the Brewery Project is one of many of the original buildings to be reused. It was constructed in 1890 as a boiler house and later converted to house the Pabst Engineering Dept. Today it will be converted and updated once again to an office building.

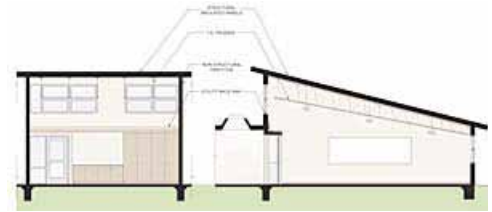
Resource management applies to the entire project as well as to the individual building systems and materials to be considered for whole/partial re-use or salvage value. When the original use of a building or site is no longer applicable, engineers, architects and contractors have the opportunity to change the purpose of the structure and site, but while maintaining some of the systems and architectural details that make it unique. General Motors' (GM) Resource Management program (http://www.gm.com/corporate/responsibility/environment/) has been established to preserve natural resources, reduce environmental impact and realize considerable cost savings. After three years, GM facilities have reduced waste disposal by an average of 30%. The program was designed to eliminate waste during the manufacturing process through a financial incentive program for resource managers. "Rather than paying a waste contractor to dispose of the material, our approach makes the supplier a partner inside the plant, searching for, and benefiting from, waste reduction and recycling opportunities…." The program

has saved over $8.2 million in North America.

Other examples of GM's innovative resource-saving initiatives include:

- Collecting, cleaning and reselling aluminum splashes from the manufacturing floor
- Diverting fly ash, a by-product of their coal-burning power plants, from landfills and adding it to potting soil as a by-product.
- Damaged or scrap pieces of windshield glass are being ground up for use in reflective paints used to mark roads and outdoor signs.
- Cafeteria grease is recycled into pet food and cosmetics.

Chartwell School



Design for Deconstruction (detailing for disassembly) is another effective resource management approach. The Chartwell School in Seaside, California is a collaborative high performance school (a green building rating program for K-12 schools, CHPS) that exemplifies application of lifecycle design. Removable windows and paneling have been installed to maximize potential wood recovery. Utility raceways provide simple access to electrical systems. Structurally insulated panels (SIPs) and SIP connector systems requires fewer nails to allow for ease in deconstruction and less degradation to the building materials. Chartwell School's Design for Disassembly Handbook is found at http://www.lifecyclebuilding.org/resources/DFD.pdf

There are professional organizations that promote the reuse of materials. The Building Materials Reuse Association, http://www.buildingreuse.org/, "is a non-profit educational organization whose mission is to facilitate building deconstruction and the reuse/recycling of recovered building materials." The BMRA annually honors those who have made a contribution to the field of deconstruction and reuse of building materials.

The Lifecycle Building Challenge, http://www.lifecyclebuilding.org/cat-building.htm, is a competitive recognition program with the underlying purpose of changing "how people think about, design and construct and deconstruct buildings." Through the Challenge, the organization builds a resource library of strategies that maximize building materials recovery and reduce economic and environmental costs. The goal is to advance building lifecycle planning and inspire "the green building movement to look beyond a single iteration of a building."

"Lifecycle building is the design of building materials, components, information systems, and management practices to create buildings that facilitate and anticipate future changes to and eventual adaptation or dismantling for recovery of all systems, components, and materials."

Found on the Lifecycle Building Challenge web site are guides that document the successful progress of lifecycle building:

- Design for Disassembly in the Built Environment: A Guide to Closed Loop in Design and Building
- Design for Disassembly in the Built

benefits

$ First cost reduction (avoided demolition, superstructure costs).

$ Longer system replacement cycle.

$ Material conservation reduces waste management costs.

Adaptive re-use reduces consumption of new resources.

Preservation of architectural and urban fabric inherent in historic buildings.

Environment: An Atlanta Home Case Study

- Design for Deconstruction: The Chartwell School Case Study

Technical Strategies

Evaluate internal space use. Make sure that space assignments are optimally sized by considering multiple uses for spaces, alternative officing and universal sizing.

Waste prevention. Survey the existing building materials and systems for potential renovation or salvage value.

Minimize construction interventions. Evaluate programming options that avoid unnecessary reconfiguration.

Future adaptability. Use ample floor-to-floor heights (interstitial spaces) to allow for future modification of mechanical, electrical, plumbing, and communications systems. Select building systems that allow for future adaptability and expansion, and provide adequate floor loading.

Future waste streams. Design for building longevity and durability, and to extend replacement cycles. Detailing for disassembly will reduce future demolition waste and renovation costs.

technical guidelines

"Plans to protect air and water, wilderness and wildlife are in fact plans to protect man."

- Stuart Udall -

This section of the Sustainability Guidelines covers The Brewery specific technical goals, strategies, technologies, requirements, and tools/supplemental resources. The Technical Guidelines are broken down into the chapters of: Performance Management, Site Design & Planning, Water Management, Energy, Materials + Resources, Indoor Environmental Quality and Human Aspects. These chapter provide the specific "how-to's" for sustainable design and construction on The Brewery project, as well as identifying performance indicators/benefits achieved through these goals and strategies.

required guidelines

The following matrix is a summation of The Brewery Project Level 1 guidelines, which are required of the building renovations and new developments within The Brewery Project.

The Level 1 requirements may or may not be applicable to an Owner's building or project. Acknowledge compliance with the listed Level 1 (required) Performance Goals by a yes answer in the Compliance column. If the credit is not applicable, please use N/A. Please submit for preliminary review a progress set of your project's plans and specifications along with any additional documentation that will confirm your compliance with the Level 1 Performance Goals. The final compliance submittal shall consist of a completed performance goal matrix with signatures and City of Milwaukee approved plans and specifications.

The Project Level 1 required guidelines consists of LEED-ND and non-LEED-ND Performance Goals. The LEED-NC column has been included for informational purposes for anyone considering LEED certification for their building.

Goals, technical strategies, and performance indicators for each of these Level 1 (Required) Performance Goals are detailed in the specific categories within the Technical Guidelines.

I, _____,

print

the Owner or Owner's Representative, have reviewed The Brewery Project Sustainability Guidelines and will comply with the appropriate Level 1 Performance Goals.

_____

signature

_____

date

_____

The Brewery LLC approval

Compliance	Guideline Section & Performance Goal	Page Location	The Brewery Project Level 1 (Required) Performance Goals: LEED-ND (a)	Non LEED-ND	LEED-NC
	Performance Management				
	No level 1 criteria				
	Site Design + Planning				
Property Owner					
	Reduced Parking Footprint (b)	68	NPD Credit 6		
	Light Pollution Reduction	68	GCT Credit 20		
	Heat Island Reduction	71	GCT Credit 10		
	Native Landscaping	73	SLL Credit 9		
	Bicycle Network (c)	75	SLL Credit 5		
	Walkable Streets	75-76	NPD Credit 7		
	Universal Accessibility (d)	76	NPD Credit 14		
Master Developer					
	Compact Development (basic level for density requirements)	63-64	NPD Prereq. 2		
	Compact Development (higher level for density requirements)	64	NPD Credit 1		
	Diversity of Housing Types	64	NPD Credit 3		
	Affordable Rental Housing	64	NPD Credit 4		
	Building Reuse and Adaptive Reuse	68	GCT Credit 4		
	Reuse of Historic Building	68	GCT Credit 5		
	Native Landscaping	73	SLL Credit 9		
	Open Community	75	NPD Prereq. 1		
	Housing and Jobs Proximity	75	SLL Credit 6		
	Universal Accessibility (e)	76	NPD Credit 14		
	Transit Facilities	76-77	NPD Credit 9		
	Water Management				
Property Owner					
	Roof Stormwater - Water Quality Treatment (basic level)	82		X	
	Roof Drain Disconnect	82		X	
	Site Stormwater - Water Quality Treatment (basic level)	85-86		X	
	Construction Activity Pollution Prevention	85	GCT Prereq. 1		
	Reduced Water Use (f)	86 & 88	GCT Credit 3		
Master Developer					
	Proximity to Water and Wastewater Infrastructure	88	SLL Prereq. 2		
	Construction Activity Pollution Prevention	85	GCT Prereq. 1		
	Energy				
Property Owner					
	Fundamental Refrigerant Management	100		X	EA Prereq. 3
	Materials + Resources				
Property Owner					
	Comprehensive Waste Management	111	GCT Credit 19		
Master Developer					
	Maintain 50% existing building structure and envelope	106	GCT Credits 4&5 (See Site Design + Planning)		
	Recycled Content for Infrastructure	107	GCT Credit 17		
	Indoor Environmental Quality				
	No Level 1 criteria				
	Human Aspects				
	No Level 1 criteria				
	Construction Administration				
Property Owner					
	Construction Waste Management	136	GCT Credit 18		
Master Developer					
	Construction Waste Management	136	GCT Credit 18		

FOOTNOTES:

(a) For additional information regarding the LEED-ND Level 1 Performance Goals, see the LEED For Neighborhood Development Pilot Rating System at www.usgbc.org.

(b) Coordinate parking design and the 10% carpool/bicycle space requirement with the master developer.

(c) Coordinate the 15% bicycle parking spaces and storage with the master developer

(d) This performance goal is intended for property owners with residential units

(e) Provide accessible routes throughout the site (accessibility into buildings is the property owner's responsibility)

(f) There is a Level 1 Performance Goal for both indoor and outdoor water reduction

performance management

"Our tools are better than we are, and grow faster than we do. They suffice to crack the atom, to command the tides. But they do not suffice for the oldest task in human history: to live on a piece of land without spoiling it."

-Aldo Leopold

Performance management is a tool and means for organizing, managing and documenting the performance goals proposed by The Brewery Project Sustainability Guidelines. Documentation will need to take place through the planning and design phases of the project, most likely during construction and post-occupancy as well. This tool will assist the designers while helping maintain the design intent during construction. Performance Management is intended as a means to track progress and continuously keep sustainability on the table. The process also provides a permanent record for the level of sustainability achieved.

performance management guideline management

guideline management

goals

- Helps organize and document the sustainability process
- Serves as a tool to keep sustainability on the table throughout the design, construction and operation phases of a high performance building.

technical strategies:

- Appoint a Guidelines Leader. The guidelines leader position can be filled by an in-house person dedicated to sustainability or by a member of the consultant design and construction team. The Guidelines Leader is responsible for assuring that the sustainability guidelines are values-based and resultant of an integrated design process and at a minimum, all applicable Level 1 criteria are met, overseeing the documentation of the sustainability process and evaluating the performance indicators. If internal, the role can be expanded to that of a CSR (corporate social responsibility) assuring that the organization and its mission be compatible with sustainability. Creative roles can be developed for facilities with multiple tenants.
- Review The Brewery Project Guidelines and associated documentation forms. Develop a task list for each phase and communicate this list with the owner/developer/design/commissioning/stakeholder team.
- Communicate with The Brewery for any exceptions requested in meeting the Level 1 Guidelines.
- As the building/site team works toward achieving sustainability documentation forms for each technical category at the end of each phase are completed and provided to the Guidelines Leader.
- The Guidelines Leader monitors progress, summarizes the data and reports into an end-of-phase Guideline Report for internal use.
- The Guidelines Leader submits the completed Guidelines Compliance Form to the Brewery Project, LLC..

SUMMARY TABLE FOR PERFORMANCE GOAL COMPLIANCE MONITORING

	Pre-Preliminary: Develope High Performance Plan*	**Schematic Design Phase**	**Design Development Phase**	**Construction Documents Phase**	**Construction Phase**	**Occupancy Phase:** Owner's Manual*
	**Performance Management**					
	**Site Design + Planning**					
	**Water Management**					
	**Energy**					
	**Materials + Resources**					
	**Indoor Environmental Quality**					
	**Human Aspects**					
	**Construction Administration**					
	**Operations and Maintenance**					

planning for conservation

The characteristics of The Brewery Project - brownfield redevelopment, urban environment, EcoCharette, LEED-ND pilot certification (new urbanism, sustainability) - inherently fulfills master conservation planning. Master conservation planning is focused on preserving and protecting the value of the cultural heritage assets, enabling consensus-building with key stakeholders and realizing economic development while successfully maintaining the aesthetic beauty and historic and cultural values of a site/neighborhood/region.

goals

- Keep the development philosophy consistent with the values maintained with the redevelopment of The Brewery. From a macro perspective, the intent of conservation planning at The Brewery Project is to maximize the use of existing facilities and be efficient in utilizing resources.
- Design for flexibility, less materials, cost and energy, and impact on the environment as the building and site are inhabited over time.

technical strategies

When evaluating the building for its potential to renovate or re-build, consider:

- Minimize space requirements
  - Evaluate the demands of the current or new facility to determine what space can be shared to reduce or eliminate the need for additional space.
  - Assess space utilization by others for various uses or use for more hours of the day/days per week.
- Programming/space design
  - Determine the greatest opportunity for space reconfiguration within the existing shell.
  - Design for future use and adaptability.
- Minimize the use of non-renewable materials
- Utilize a design for deconstruction and lifecycle building approach and salvage for re-use all possible materials

tools

Strategy documentation table as a tool, similar to the one found in the Minnesota Sustainability B3 Guidelines following:

Planning for Conservation Strategy Documentation Table
(with sample entries shown)

1. Reduce program needs

Strategy	Square footage avoided	Comment
Eliminate space 1	1000	Use neighboring facility
Reduce space 2	500	Share conference rooms
Reduce space 3	200	Unnecessarily large lobby
Eliminate space 4	1000	Use space 16 hours a day
Reduce space 5	2000	Telecommuting of staff
TOTAL	4700	

2. Reuse existing building

Strategy	Square footage reused	Comment
Reuse building 1	6000	Remodel for offices
TOTAL	6000	

3. Create flexible and adaptable space

Strategy	Square footage affected	Comment
High ceilings	10000	Adaptable to multiple uses
Raised floor	20000	Less costly to renovate

Option: For Item 3, use narrative in place of table if more appropriate.

The conservation strategy process can be documented in a narrative to support a thorough review of conservation options was completed.

supplemental resources

- Building Green in PA videos www.greenworks.tv/green_building/archives.htm

design and construction commissioning

Commissioning is performed in new construction and in major renovations or retrofits and is a highly effective tool in measuring and improving the performance of building systems and equipment. Retro-commissioning is basically the same process as commissioning, but is applied to existing buildings.

To achieve a LEED-NC rating, "fundamental" commissioning must be part of the building design and construction process. Whether or not the choice is to pursue LEED certification, commissioning is highly recommended. Enhanced commissioning supplements fundamental commissioning and reviews building design and construction documents to identify areas for improvement as well as re-commissioning of building systems after occupancy.

goals

- Ensure that systems are designed, installed, tested and capable of being operated and maintained according to the operational needs of the building, occupants, environment and owner.
- Confirm that all building systems perform interactively through inception from the design phase, documenting design intent through construction, and verification of performance.
- Certify that a new building is operating at optimal performance and improve the likelihood that the facility will continue operation at this level.
- Restore an existing building to designed productivity levels as well as assure renovations and equipment upgrades function as designed.
- Verify that Operation and Maintenance (O&M) documentation left on site is complete.
- Make certain that operating personnel are well-trained.

technical strategies

Ideally a commissioning agent is brought on at the conceptual phase of building development. Alternatively, an owner's representative or project manager of the design team can begin the preliminary development of the plan by mapping commissioning milestones. The construction contractor should

$ benefits

Repair costs of roughly 4x the original construction cost would have been invested in a Wisconsin-based laboratory building if the commissioning process had not been engaged. Construction methodology called for concreted block to be sealed in the negative pressure rooms which would have acted as a leak source.

consider building flush out

"Consider a building flush-out period to reduce possible indoor air quality contamination after construction completion and prior to occupancy. This involves running the mechanical system with tempered 100% outside air for an extended period of time (two weeks). Flushing out the building may be particularly important when high VOC- and particle-emitting construction materials, furnishings, interior finishes and cleaning agents have been applied. Care should be taken with regard to humidity levels and microbial growth depending on the seasonal weather conditions. All ventilation air filters should be changed as a final step of building flush-out."

U.S. DOE, Building Commissioning

understand that a third-party person will be observing their work for compliance with the specifications. They should be prepared to assist and provide appropriate documentation.

1. Commissioning Process
   Commissioning begins early in the design process; involves certain bidding requirements during the contractor selection; controls the static and dynamic testing; includes staff training and warranty monitoring; and is best revisited periodically throughout the life of the building.

   Building systems to be commissioned typically include:
   - Building envelope and interior finish materials
   - HVAC/mechanical
   - Electrical
   - Lighting
   - Life safety
   - Plumbing

2. Enlist a commissioning agent at the very initial stages to introduce standards and strategies.
   a. Investing in a commissioning agent at the conceptual, pre-design phases and involving in the EcoCharette can save substantial investment of time and money realized in the construction phase and throughout the life of the building.
   b. The commissioning agent serves as an objective advocate of the owner, directs the commissioning process and provides final performance recommendations to the owner.
   c. As a result of early involvement, the commissioning representative ensures implementation of selected measures by identifying target requirements in construction documents.
   d. After construction is complete, the agent verifies targets have been met and provide direction as to how to operate the building at its highest levels of efficiency. The building is constructed and calibrated to meet the design intent as conveyed in contract documents.

performance indicators

1. The energy, water, productivity, and operational savings resulting from commissioning offset the cost of implementing a building commissioning process. According to the Department of Energy, "recent studies indicate that on average the operating costs of a commissioned building range from 8%-20% below that of a non-commissioned building."
   http://www.eere.energy.gov/buildings/info/operate/buildingcommissioning.html
   (US Department of Energy)

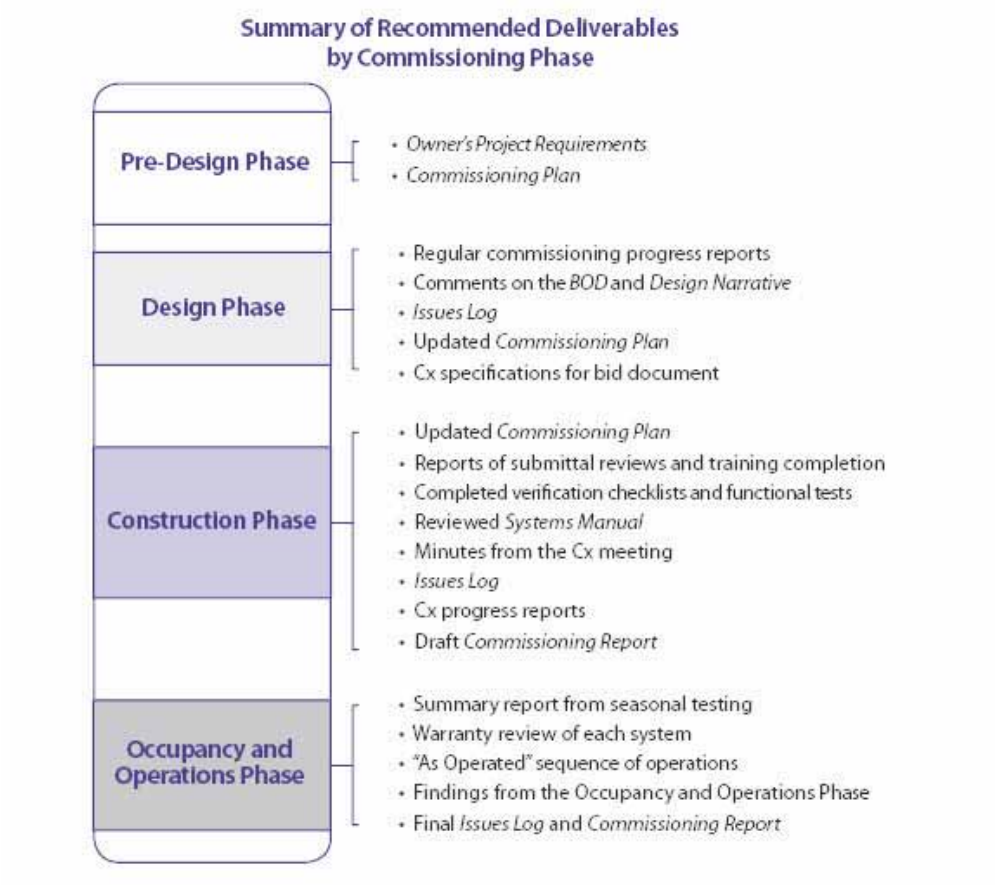
2. The cost of commissioning is determined by many factors, including building size and complexity, new construction or building renovation. The Department of Energy purports that the average cost of commissioning a new building ranges from 0.5% to 1.5% of the total construction cost. For an existing building that has never been commissioned, the cost of retro-commissioning spans from 3% to 5% of the total operating cost.

Cost of Commissioning, New Construction	
Commissioning Scope	**Commissioning Scope**
Entire Building (HVAC, Controls, Electrical, Mechanical)	0.5%-1.5% of total construction cost
HVAC and Automated Control System	1.5%-2.5% of mechanical system cost
Electrical Systems	1.0%-1.5% of electrical system cost
Energy Efficiency Measures	$0.23-$0.28 per square foot

US DOE

tools

- A commissioning plan should be developed and various stages in the commissioning process require documentation. The following Summary of Recommended Deliverables is from the California Commissioning Guide and serves as a valuable model. (http://www.cacx.org/) The California Commissioning Guide in its entirety can be found at http://resources.cacx.org/library/holdings/CA_Commissioning_Guide_new.pdf



- The Building Commissioning Association http://www.bcxa.org/ offers downloadable commissioning process templates to members.

performance goals/leed credits

Note: Performance Goals provide the "How to" for achieving the goals and technical strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project, LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Level 2 (Suggested)

- Develop and refine a commissioning scope and project budget in programming and schematic design. The total commissioning budget, including both project funds and other funded activities should be in the range of 0.75% to 1.5% of the total construction cost.
- Verify that the design is compatible with the Operations Commissioning Plan.
- Scope of items to be commissioned:
  - Mechanical HVAC system including testing, adjusting and balance, energy, (including renewable) systems, power and electrical systems, including lighting and daylighting controls; indoor air quality elements and systems.
  - Indoor air quality procedures during construction and warranty period
  - Construction waste management procedures
  - User Comfort and Satisfaction Assessment as one indicator of overall IEQ performance.
- Additional scope of Commissioning:
  - Plumbing Systems (In addition to required flow rate commissioning above)
  - Interior materials (specification, installation)
  - Envelope integrity
  - Physical measurement of vibrations/acoustics/noise

supplemental resources

- Model Commissioning Plan, Design Phase, US Department of Energy, Seattle Support Office, Portland Energy Conservation, Inc. http://www.cacx.org/resources/documents/samples/Cx/02_Model_Cx_Plan_DesignPhase_PECI.pdf
- Building Commissioning Guidelines, Sourcebook on Building Systems Performance, Prepared for Pacific Gas and Electric Company by Portland Energy Conservation, Inc. (PECI) for the statewide Energy Design Resources program http://www.energydesignresources.com/docs/ch-complete.pdf
- The Cost-Effectiveness of Commercial-Buildings Commissioning; A Meta-Analysis of Energy and Non-Energy Impacts in Existing Buildings and New Construction in the United States. Lawrence Berkeley National Laboratory, Portland Energy Conservation Inc., Energy Systems Laboratory, Texas A&M University. December 2004. http://eetd.lbl.gov/emills/PUBS/Cx-Costs-Benefits.html
- Federal Energy Management Program Building Commissioning Guide http://www1.eere.energy.gov/femp/pdfs/OM_7.pdf

Continuous Commissioning® and Monitoring-Based Commissioning (MBCx)

Continuous Commissioning® and Monitoring-Based Commissioning processes, using retro-commissioning techniques, install extensive metering left in place to provide ongoing commissioning and help ensure

persistence of benefits. While other forms of commissioning on existing buildings have initial design specifications as their goal, continuous commissioning seeks to optimize current operations-how the building is occupied and used today with consideration given to changes since the original design.

In Continuous Commissioning® (practiced by the Energy Systems Laboratory of Texas A&M University), third-party commissioning providers work closely with building staff to commission major pieces of equipment and involve the building staff in selecting and implementing improvements. According to the Energy Systems Laboratory at Texas A&M University, continuous commissioning realized a 15% to 45% reduction over normally commissioned buildings. In another study conducted by the Department of Energy, continuous commissioning resulted in an average measured utility savings of 20% for 130 Federal buildings. (*Continuous Commissioning Guidebook*, http://www1.eere.energy.gov/femp/pdfs/ccg02_introductory.pdf)

The US Department of Energy's Federal Energy Management Program developed a Guidebook to convey principles and results of Continuous Commissioning to federal agencies. (http://eber.ed.ornl.gov/commercialproducts/FEMP%20Continuous%20Cx%20Guidebook.pdf)

Monitoring-based commissioning combines permanent building energy system monitoring with established retro-commissioning protocols to achieve and maintain high performance and low energy use. ("Quantifying Monitoring-Based Commissioning in Campus Buildings: Utility Partnership Program Results, Lessons Learned, and Future Potential" *Newcomb | Anderson | McCormick; Karl Brown, California Institute for Energy and Environment* http://www.peci.org/ncbc/proceedings/2007/Anderson_NCBC2007.pdf)

operations commissioning

goals

- Verify the building is operated to meet the design intent as represented in contract documents.

technical strategies

- Evaluate performance based upon the Measurement and Verification Plan for the following:
  - Water device and system level measurement and verification
  - Water whole building measurement and verification
  - Energy device and system level measurement and verification
  - Energy whole building measurement and verification based on metering and calibrated energy per table below:

Size (sq.ft.)	Metering with Submetering Calibrated Simulation (annual Energy Use)		
	Metering	Sub-Metering	Calibrated Simulation
<10,000	Required	Recommended	Recommended
10-50,000	Required	Required	Recommended
>50,000	Required	Required	Required

- IEQ measurement and verification; air quality, thermal comfort, quality of lighting
- Waste measurement and verification
- User log related to comfort and satisfaction
- Implement O&M practices and annual evaluation

performance indicators

- Vibrations, acoustics and noise verification
- Access to daylight
- View space and window access evaluation
- Personal control of IEQ conditions
- Fostering of healthful physical activity
- Materials measurement and verification
- User comfort and satisfaction assessment survey
- Annual systems re-commissioning

tools

- US DOE's International Performance Measurement and Verification Protocol (IPMVP):
  - Volume I - Concepts and Options for Determining Savings
  - Volume II -Concepts and Practices for Improving Indoor Environmental Quality
  - Volume III - International Performance Measurement & Verification Protocol, January 2006, http://www.evo-world.org/index.php?option=com_docman&task=doc_download&gid=200

supplemental resources

- LEED for Existing Buildings, United States Green Building Council, www.usgbc.org
- ASHRAE Guideline 4-1993, Preparation of Operating and Maintenance Documentation for Building Systems, www.ashrae.org
- Energy Design Resources web site; features a web based tool that provides building commissioning information (designing teams, probable costs, scope, commissioning specifications.) www.energydesignresources.com

lowest life cycle cost

"Life-cycle costing (LCC) is an analysis of the total cost of a system, device, building, or other capital equipment or facility over its anticipated useful life. LCC analyses allow a comprehensive assessment of anticipated costs associated with a design alternative. Factors commonly considered in LCC analyses are initial capital cost, operating costs, maintenance costs, financing costs, the expected useful life of equipment, and future equipment salvage values. The result of the LCC analysis is generally expressed as the value of initial and future costs in today's dollars as reflected by an appropriate discount rate."

Department of Energy, Building Technologies Program, "Select Cost Analysis Method."

Life Cycle Cost is the sum of the first cost + maintenance and repair + energy + water+ replacement less the salvage value. When additional considerations for worker or occupant productivity and community or social values can be calculated with quantitative certainty, they will be included in the formula/model, as well. In the interim, the cost benefits of productivity and health improvements can be considered and used when considering the overall outcomes for net present value.

Considering the total life-cycle cost of the average building, 11% is attributed to the design and construction, 14% to financing and 75% to alterations, operations and energy consumption.

goals

- Determine the lowest life cycle cost when comparing design alternatives.
  - Reduce operation/maintenance costs
  - Extend useful life/durability
  - Increase occupant productivity/comfort
  - Conserve natural resources
  - Lower construction costs
  - Meet government mandates
  - Future facility alteration

technical strategies:

- **Life-Cycle Cost Formula**
  To find the total LCC of a project, sum the present values of each kind of cost and subtract the present values of any positive cash flows such as a resale value. Where dollar amounts are converted to present value by discounting, the following formula applies: Life-cycle cost = first cost
- When additional considerations for values such as worker or occupant productivity and community or social values can be assessed and calculate with certainty, they will be incorporated in the model as well. Organizations may want to consider the cost benefits of worker productivity improvements within their own models and use those as additional factors when considering the overall outcomes for net present value.
- In addition to the LCC formula, there are other methods for combining present values to measure a project's economic performance over time, such as Net Savings, Savings-to-Investment Ratio, Adjusted Internal Rate of Return or Discounted Payback.

technologies/techniques

- Establish the general study parameters for the project, including the base date (the date to which all future costs are discounted), the service date (the date when the new system will be put into service), the study period (the life of the project or the number of years over which the investor has a financial interest in the project), and the discount rate.
- Evaluate project alternatives using simple payback analyses or LCC analysis for larger investments, to set priorities based on greatest ROI.
  - Energy efficiency measure that have a 1- to 2-year payback are most economically attractive.
  - Energy efficiency measures that have 3- to 5-year payback should consider third-party investment.
  - Combine short and long payback measures to increase the number of measures that can be cost-effectively incorporated into a project.
- Conventional cost/benefit analyses should consider the societal benefits from reduced energy use (e.g., reduced carbon emissions, improved indoor air quality). In some cases, these ancillary benefits are assigned an agreed upon monetary value, but the values to be used are strongly dependent on local factors.

tools

- The BLCC Model
- The National Institute of Standards and Technology (NIST) Office of Applied Economics has maintains a Building Life-Cycle Cost (BLCC) computer model that is available at no charge from NIST and that can also be downloaded from their web site.
  http://www1.eere.energy.gov/femp/information/download_blcc.html

supplemental resources

- Life-Cycle Costing Manual for the Federal Energy Management Program. Examines the concepts and underlying math of life cycle costing with numerous examples demonstrating the value of this approach. http://www1.eere.energy.gov/femp/information/download_blcc.html
- 2003 Facilities Standards (P100), Section 1.8 Life Cycle Costing (5 pages) This section of the GSA's Facility Standards manual discusses Life Cycle Costing and contains a table summarizing key LCC formulas and their use. Available through GSA: www.gsa.gov (search for "P100", then go to section 1.8 "General Requirements; Life Cycle Costing" or http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentType=GSA_BASIC&contentId=13844&noc=T)
- OMB Circular A-94 - Guidelines for Benefit-Cost Analysis of Federal Programs Presents guidance for the analysis of projects other than those that are primarily energy related. Broadens the discussion beyond just costs and cost-avoidance to include benefits. www.whitehouse.gov/omb/circulars/a094/a094.html
- Whole Building Design www.wbdg.org

site design and planning

We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.

- Aldo Leopold -

Sustainable site planning and design first identifies the natural, infrastructural and cultural resources on or adjacent to the site, so that the designer/planner can provide an integrated building/site design. This approach allows for low-impact development using strategies to: provide for compact development, reduce the heat-island effect from an urban area, implement sustainable landscaping and encourage alternative forms of transportation. All strategies under this section have the common goals of providing a positive impact on humans and minimizing the negative impact on the environment, while at the same time working to provide a cost-benefit to the developer.

Appropriate site selection is a key component to sustainable development. LEED-ND certification mandates through its smart location and linkage prerequisites that projects be developed on infill sites or with adequate transit services nearby, and not on sites that have an impact on: imperiled species, wetlands, floodplains and prime farmland. By redevelopment in an existing urban area rather than a greenfield site, the Brewery project in Milwaukee sets an example for sustainability in the development community.

site design and planning

understanding the site

goals

- Research existing Brewery site features and resources as well as those for the specific development site.
- Define the constraints involved with the existing site.
- Analyze the relationships between various site features and resources.
- Gain a thorough understanding of site so that design can be a balance between efficiencies, enhancements and cost effectiveness, while conserving and restoring ecological and cultural resources.

technical strategies

- Inventory and analyze the regional and local ecological context with specific focus on:
  - Relevant high humidity and harsh winter (frigid temperatures, snowfall) characteristics
  - Existing air quality and ground level patterns (with an AQI = 140, Milwaukee County ranks as one of the dirtiest cities by the EPA in terms of air quality).
  - Soil testing to determine water table location, bearing capacity and what types of fertilizer and soil amendments might be necessary for planting and facilitate infiltration. Determine the need for retaining/stockpiling existing topsoil. Typical soils for this area are unclassified fill and clays.
- Topographical features - Survey topography and existing drainage system to better understand grading and drainage issues. Pay specific attention to opportunities for redirecting stormwater away from combined sewer system.
- Review the site's cultural and historical resources for possible restoration or incorporation. Pay specific attention to the Brewery buildings registered as National Historic Landmarks.
- Examine the architectural styles(s) present in the neighborhood and consider the use of historical styles or traditional materials as a means of integrating the new or renovated building with the surrounding area.
- Analyze cultural features and activities in the neighborhood and identify possible connections to the project.
- Inventory existing public/private infrastructure and utilities
  - Analyze transportation systems and existing/potential linkages to the site
  - Analyze how best to utilize the private improvements with surrounding public improvements.
  - Identify construction constraints

performance indicators

Thorough research of existing and proposed Brewery site resources can save on new on-site infrastructure such as storm sewer extensions. For instance, if the roof drains could discharge directly into the proposed roadside bioswales, there would not be a need to repair/replace the sewer extensions into the street to the existing combined sewer system. PROJECT CONSTRUCTION COST.

tools

- The Brewery report and website, with overview and block-by-block information, resources, photos and mapping/plans.

www.pabstproject.com

- Milwaukee Department of City Development. http://www.mkedcd.org/downtown/index.html
- ESRI- This software company creates tools for GIS (Geographic Information Systems) mapping. www.esri.com/index.html

supplemental resources

Natural Resources Defense Council - NRDC uses law, science, and a large membership base for protecting of wildlife to ensure a safe and healthy environment www.nrdc.org

compact development and diversity of uses/housing types

goals

- Promote livability, transportation efficiency and walkability.
- Promote site master planning that provides a diverse and compatible mix of uses, including residential, commercial and employment opportunities.
- Enable citizens from a wide range of economic levels and age groups to live and work within the Brewery.

technical strategies

- Work with City of Milwaukee and follow the urban development plan to meet or exceed density goals.
- Consider synergies with neighbors and choose development types and uses based on infrastructure, transportation and quality of life considerations.

performance indicators

- Redevelopment in existing urban areas vs. greenfield sites saves on costs for construction of new utilities and infrastructure, compared to developments requiring all new utilities. Based on data from other projects in the area, the total site construction cost can be up to 8-9% lower. PROJECT CONSTRUCTION COST
- Building a new green building in this urban setting has comparable cost to a similar conventional type building construction. For instance, the cost of building Johnson Controls' Brengel Technology Center in Milwaukee was on par with prevailing construction costs at the time. PROJECT CONSTRUCTION COST
- Green roofs offer alternative landscape (green) areas, allowing denser developments on the same size lot. COMMUNITY IMPACTS AND RELATED COST (ECONOMIC IMPACTS)

performance goals/leed credits

Note: Performance Goals provide the "How to" for achieving the goals and technical strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project, LLC. Level 2 goals are encouraged and suggested, but not mandatory.

LEED-ND, NPD, Prerequisite 2
Build any residential components of the project at an average density of seven or

$ benefits

8-9% savings in construction costs, utilizing existing infrastructure

more dwelling units per acre of buildable land available for residential uses.
AND
Build any non-residential components of the project at an average density of 0.5 FAR or greater per acre of buildable land available for non-residential uses. See LEED-ND, NPD Prerequisite 2 for density calculation.

Level 1 (required)
Design and build the project to achieve the average densities shown in the table below.

Residential Density (DU/Acre)	Non-residential Density (FAR)	LEED Points Available
>40 and <=50	>2.0 and <=2.5	4

LEED-ND, NPD CREDIT 1

Include a sufficient variety of housing sizes and types in the project such that the total variety of housing within the project, or within a 1/4 mile of the center of the project, achieves at least 0.7 using: the calculation (based on the Simpson Diversity Index), the point system and the housing categories all from the LEED-ND Rating System, NPD Credit 3. LEED-ND, NPD CREDIT 3

Include a portion of rental units for households earning below area median income such that:

- At least 15% of total rental units are priced for households up to 50% of area median income
  OR
- At least 30% of total rental units are priced for households up to 80% of area median income. LEED-ND, NPD CREDIT 4.

Level 2 (suggested)
Design and build the project to achieve the average densities shown in the following table.

LEED-ND, NPD CREDIT 1
For both levels on NPD CREDIT 1, the specified average density must be achieved by the point in the project's construction at which 50% of dwelling units are built, or within five years of the date that the first building is occupied, whichever is longer.

Residential Density (DU/Acre)	Non-residential Density (FAR)	LEED Points Available
>50 and <=60	>2.5 and <=3.0	5
>60 and <=70	>3.0 and <=3.5	6
>70	>3.5	7

The scoring for mixed-use development projects is calculated by using weighted average of the different uses.

Include a proportion of For-Sale housing affordable to households at or slightly above the are median income such that: at least 10% of For-Sale housing is priced for households up to 80% of the area median income.
OR
At least 20% of For-Sale housing is

priced for households up to 120% of the area median income.
LEED-ND, NPD CREDIT 5

Design for and promote pedestrian connectivity at mid-block locations whenever possible and specifically for:

- Block 6 between Building 16 & Building 20
- Block 6 through parking from Building 16 & Building 10
- Block 4 along the south side of Building 9
- Block 1 between retail outlets

tools

- Milwaukee Department of City Development, www.mkedcd.org/downtown/index.html
- Method for calculating densities found in the LEED ND Rating System- NPD Credit 1
- Method for calculating points based on proximity to diverse uses in the LEED ND Rating System- NPD Credit 2, and Appendix A of LEED-ND Rating System for definition of diverse uses
- Method for calculating the Simpson Diversity Index, points earned and definition of housing categories from the LEED ND Rating System- NPD Credit 3
- The International Union for the Scientific Study of Population- IUSSP promotes scientific studies of demography and population related issues www.iussp.org
- Density by Design: New Directions in Residential Development by Steven Fader, Urban Land Institute, 2000

supplemental resources

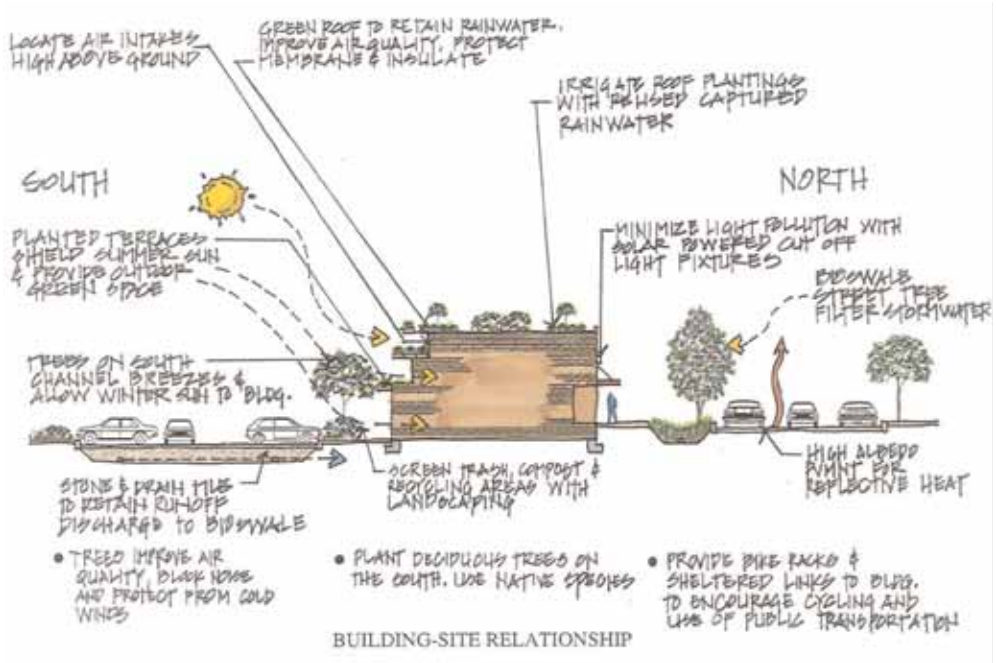
- Congress for New Urbanism www.cnu.org
- Urban Land Institute - nonprofit organization based in Washington, DC that promotes the responsible use of land in order to enhance the total environment www.uli.org
- Changing Places: Rebuilding Community in the Age of Sprawl by Richard Moe and Carter Wilkie, Henry Holt & Company, 1999

building/site relationship & building reuse

goals

- Provide an integrative site and building design that supports the economical and cultural functions of the entire Brewery development.
- Design for open spaces that create a sustainable microclimate, while also reducing building energy use and supporting a high quality interior environment. Blocks 3, 4, 5 and 6 have potential opportunities for open space design.
- Minimize negative impacts on surrounding areas and maximize opportunities to restore natural systems.
- Design parking to increase the pedestrian orientation of the development and to minimize the adverse environmental effects of parking facilities. For example, make use of easily accessible multi-level covered parking as shown in the Brewery Master Plan.
- Achieve enhanced energy efficiency by creating the optimum conditions for the use of passive and active solar strategies.

- Minimize light trespass from site, reduce sky-glow to increase night sky access, improve nighttime visibility through glare reduction, and reduce development impact on nocturnal environments. (Reference the Brewery Feasibility Report, 02/21/07).
- Extend the life cycle of existing buildings: conserve resources, reduce waste and reduce environmental impacts of new buildings with respect to materials manufacturing and transport.
- Encourage use of registered historic buildings in the Brewery, in a manner that preserves their historical materials and character, in accordance with the Federal or State's Historical Society.



BUILDING-SITE RELATIONSHIP

technical strategies

- Site new building mass, orientation and outdoor spaces to provide efficient access to services; incorporate open areas that have multiple functions in addition to visual value.
- Employ passive solar principles in architectural design, orientation and siting. Make use of We Energy credits.
- Employ means to block winter winds and admit summer breezes.
- Map sun and shade patterns associated with new areas. Design landscaping in ways that optimize selection and positioning of plants for sun and shade.
- Include adequate space for operational recycling and maintenance, including space for collection, storage, and access for collection vehicles. Use shared service areas where possible.
- Minimize off-street surface parking and make use of shared parking structures.
- Consider synergies with neighbors and choose development types and uses based on infrastructure, transportation and quality of life considerations. Be mindful of surrounding neighborhood needs.

- Coordinate landscape design with building envelope design. Orient new building or existing building windows and outdoor spaces to work together, taking advantage of light, air flows, and interesting views. Capitalize on views into and out of the development and adjacent areas.
- Avoid adverse impacts on adjacent properties, such as reflected glare and light at night, shading of adjacent greenspace, noise, air pollution and waste heat.
- Select light fixtures that reduce or eliminate the effects of light pollution on neighboring sites and the sky.
- Use light-colored or reflective edges along driveways or walks to reduce dependence on high-wattage electrical site lighting at night.
- For new construction projects, look for opportunities to re-use and/or re-cycle historically or culturally appropriate materials in their landscapes, i.e. cobbles, pavers, iron fencing, gates, etc.
- Design exterior lighting using high-efficiency and/or solar powered fixtures to save on energy cost.
- Design green roofs as destinations for additional pedestrian zones.
- Building sites abutting green space should provide views to look out over the green space.
- Building sites abutting green space shall allow for direct access from building to exterior green space whenever possible.
- Building sites abutting green space shall be designed with terraces overlooking the green space.

performance indicators

- A well integrated and sustainable site/building design provides for a building with increased property value (7.5% higher), an ROI that can be expected to increase by 6.6%, as well as higher occupancy (increased by 3.5%) and rent (increased by 3%) ratios. BUILDING VALUE IMPACTS (PROPERTY VALUE) & MARKETABILITY (LEASE RATES AND TENANT VELOCITY)
- Sustainable buildings mean reduced insurance rates for building owners. For instance, Fireman's Fund has received approval to offer a 5% insurance discount for LEED certified commercial buildings. BUILDING VALUE IMPACTS (INSURANCE RATES)
- Improved occupant satisfaction through landscaping and views increases occupancy for residential building and promotes use for commercial buildings. MARKETABILITY (PUBLIC RELATIONS & RETAIL SALES)
- Green Roofs provide additional usable open space at no increased real estate cost. COMMUNITY IMPACTS AND RELATED COST (COMMUNITY ASSETS CONTRIBUTED BY PROJECT)

technologies/techniques

- Green roof systems. Spectrum of intensive and extensive green roof systems for benefit of aesthetics, recreational use, stormwater storage and energy savings. (See Heat Island reduction and Sustainable Landscape subsection, and Water Management Section for more information.)
- High-Efficiency and/or Solar powered exterior lighting. Use for benefit of energy savings for appropriate parking and pedestrian areas. (Example: NEPTUN Induction Street Lights used in the City of Chicago)

$ benefits

On a national average: 7.5% higher property values, 3.5% higher occupancy, 3% increased rent, 6.6% increase in ROI

5% insurance discount

Induction versus high pressure sodium site lighting reduces energy costs by $140/street light/year

performance goals/leed credits

Note: Performance Goals provide the "How to" for achieving the goals and technical strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project, LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Level 1 (required)

Locate all off-street surface parking facilities at the side or rear of buildings, leaving building frontages and streetscapes free of surface parking lots.
AND
Use no more than 20% of the total development footprint area for off-street surface parking facilities, with no individual surface parking lot larger than 2 acres.
AND
For any non residential buildings or multifamily residential buildings that are part of the project, provide bicycle and carpool parking spaces equivalent to 10% of the total automobile parking for each non-residential and multi-family building on the site. Signage indicating carpool parking spots should be provided, and bicycle parking should be within 200 yards of the entrance to the building that it services. The 10% carpool/bicycle space requirement can be met with any combination of bicycle and carpool parking. LEED-ND, NPD CREDIT 6

For exterior lighting in shared portions of the project, only light areas as required for safety and comfort. Do not exceed 80% of the lighting power densities for exterior areas and 50% for building facades and landscape features as defined in ASHRAE/IESNA Standard 90.1-2004, Exterior Lighting Section.
AND
Design exterior lighting so that all site and building mounted luminaries produce a maximum initial illuminance value no greater than 0.20 horizontal and vertical foot-candles at the site boundary, and no greater than 0.01 horizontal foot-candles 15 feet beyond the site. For site boundaries that abut a public right-of-way, light trespass requirements may be met relative to the curb line instead of the site boundary.
LEED-ND, GCT CREDIT 20

For developments reusing portions of two or more existing buildings, incorporate into the project the reuse that achieves the greater of the following:

- 50% of one existing building plus an equivalent amount reused among one or more buildings (based on surface area)
- 20% of the existing building stock (based on surface area)
  LEED-ND, GCT CREDIT 4

Incorporate into the development one or more buildings that have been: designated, listed or identified as a historic or contributing structure in a locally designated historic district pursuant to a local preservation ordinance; OR designated, listed or identified as a historic or contributing structure in a historic district under a state historic register, or on the National Register of Historic Places.
AND
Rehabilitate the building(s) in accordance with local or federal standards for rehabilitation and obtain confirmation that rehabilitation meets the standards of the authority having jurisdiction. LEED-ND GCT CREDIT 5.

Level 2 (suggested)

Design or purchase any street lights, water or sewer pumps that are included as part of the project to achieve a 15% energy reduction beyond estimated baseline energy use for this infrastructure.
LEED-ND, GCT CREDIT 15

Historical building sites with landscape/courtyard opportunities are encouraged to design historically appropriate "period " landscapes.

tools

- ASHRA, ASHRAE/IESNA Standard 90.1-2004: Energy Standard for Buildings, www.ashrae.org
- Illuminating Engineering Society of North America, lighting zones as defined in IESNA RP-33 This organization provides general exterior lighting design guidance and acts as a link to other IESNA outdoor lighting, www.iesna.org

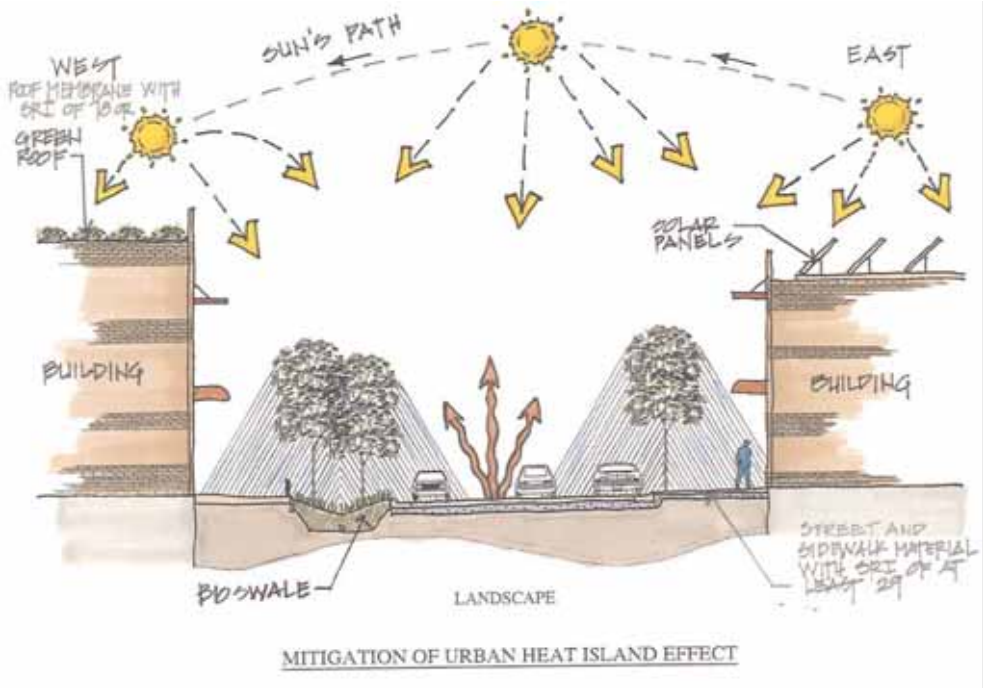
supplemental resources

- National Park Service, Denver Service Center-Guiding Principles for Sustainable Design http://www.nps.gov/dsc/d_publications/d_1_gpsd.htm
- Sustainable Design Guide, HOK, Inc. Washington DC, 1998.
- Green Roofs for Healthy Cities, www.greenroofs.org
- International Dark-Sky Association- A nonprofit agency dedicated to educating and providing solutions to light pollution, www.darksky.org/ida/ida_2/index.html
- Wisconsin State Historical Society, www.wisconsinhistory.org
- WE Energy Credits http://www.we-energies.com/

heat island reduction

goals

- Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.
- Reduce the heat island effect through tree planting, pavement selection and roof membrane reflectivity.
- Reduce heat island effect to help reduce HVAC energy consumption.

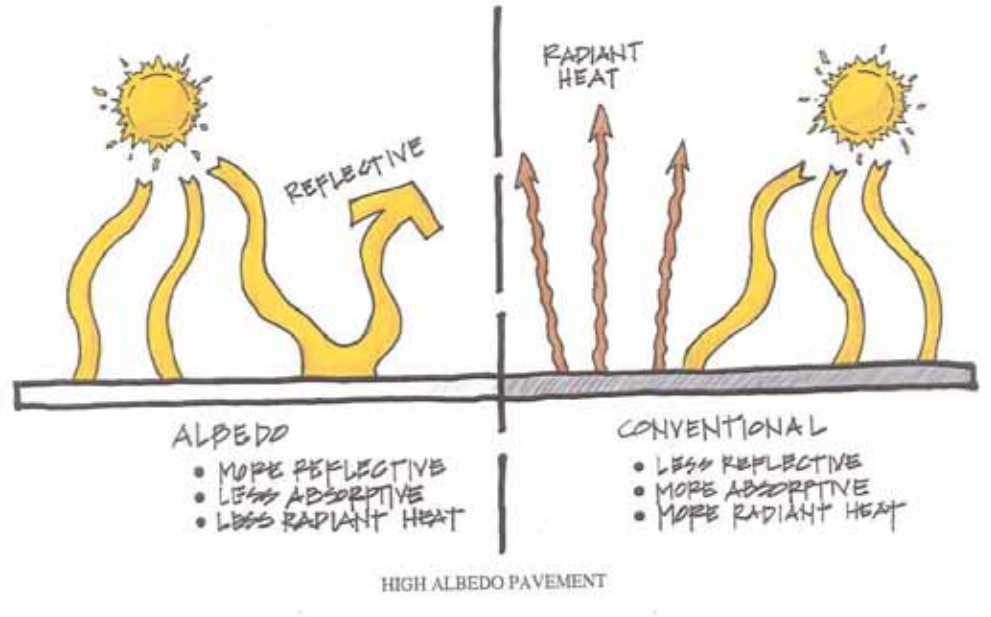


MITIGATION OF URBAN HEAT ISLAND EFFECT

technical strategies

- Shade construction surfaces on the site with landscape features (ex. canopy trees for surface parking areas) and utilize high-reflectance materials (ex. high albedo pavement) for hardscape.

- Replace existing constructed surfaces (i.e. roof, roads, sidewalks, etc.) with vegetated surfaces, open grid paving, or specify high-albedo materials to reduce the heat absorption.
- In parking areas, use planting strips between sections of pavement to screen cars, reduce vast expanses of asphalt, and separate pedestrians from traffic and service areas.
- Plant trees and other vegetation wherever possible on the site, green roofs, open areas along the perimeter of parking lots, or if possible within the parking area itself.
- Protect east and west building walls from direct rays of the sun by means of trees and vine-covered trellises.
- Provide high albedo canopies over parking areas (potentially with photovoltaic panels on top).
- Provide seasonal fabric structures over parking and pedestrian zones.
- Specify light colored paving (with Solar Reflective Index [SRI] of at least 29) and/or porous pavement.
- Use deciduous shade trees and exterior structures such as louvers, arbors, and trellises to reduce cooling loads within the building.



HIGH ALBEDO PAVEMENT

performance indicators

- Typical energy savings, for low rise commercial buildings with lightly colored more reflective roofs versus a building with a dark roof, is 10 to 20% for air-conditioning electricity usage. PROJECT LIFECYCLE COST (PROJECT CAPITAL COST)
- An energy study for the City of Chicago stated that a one story green roof structure can reduce cooling costs by 20 to 30%. PROJECT LIFECYCLE COST (PROJECT CAPITAL COST)
- Green Roofs extend the life of waterproofing membranes by 40+ years. PROJECT LIFECYCLE COST (O&M COST)
- Open space landscaped areas and green roofs improve the microclimate by cooling and humidifying the surrounding area. ENVIRONMENTAL IMPACT (GLOBAL WARMING POTENTIAL)

- Reduction in outdoor air temperature provides for increased comfort for pedestrians and residences in the summer months. HUMAN IMPACT (HEALTH & WELL-BEING)

- Resulting lower temperatures through heat island reduction measures can slow urban smog formation. ENVIRONMENTAL IMPACT (WASTE PRODUCTION) & HUMAN IMPACTS (HEALTH AND WELL-BEING)

technologies/techniques

- Green roof systems. *Spectrum of intensive and extensive green roof systems for benefit of heat island reduction as well as aesthetics, recreational use, stormwater storage and energy savings. (See Building/Site relationship and Sustainable Landscaping subsection, and Water Management section for more information.)*
- High albedo materials. *Light in color, reflecting the sunlight away from the surface.*
- Open-grid pavement materials and pervious concrete pavement. *Porous pavement stays cool through evaporation and percolation of water.*

performance goals/leed credits

Note: Performance Goals provide the "How to" for achieving the goals and technical strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project, LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Level 1

For NON-ROOF areas, provide any combination of the following strategies for 50% of the non-roof impervious site landscape (including roads, sidewalks, courtyards, parking lots and driveways):

- Shade (within five years of occupancy)
- Paving materials with an SRI of at least 29
- Open grid pavement system

OR

- Place a minimum of 50% of parking spaces under cover (defined as underground, under deck, under roof, or under building). Any roof used to shade or cover parking must have an SRI of at least 29

OR

- For ROOF areas, use roofing materials that have an SRI equal to or greater than the values in the table below for a minimum of 75% of the roof surface of all buildings within the project; or install a "green" (vegetated) roof for at least 50% of the roof area of all buildings within the project. Combinations of SRI compliant and vegetated roof can be used, provided that they collectively cover 75% of the roof areas of all buildings. LEED-ND, GCT CREDIT 10

Roof Type	Slope	SRI
Low-Sloped Roof	<= 2:12	78
Steep-Sloped Roof	>= 2:12	29

Level 2

- Provide arbors or canopies over hardscape pedestrian zones.
- Provide arbors or canopies over parking areas.

tools

- LEED-NC v2.2 Reference Guide SS Credits 7.1 & 7.2. Reference tables from these sections for Solar Reflective Index (SRI) values for standard paving materials and typical roofing materials.
- "Urban Small Sites Best Management Practices" (Metropolitan Council)

supplemental resources

- Heat Island Effect, U.S.

$ benefits

Reflective roofs realize 10-20% energy savings

Green roofs reduce energy costs by 20-30%

$ benefits

$220 savings in irrigation realized with native landscaping

Realized value of trees 3x the initial investment

Environmental Protection Agency, www.epa.gov/heatisland

- Heat Island Group, Lawrence Berkeley National Laboratory, http://eetd.lbl.gov/HeatIsland/ and http://eetd.lbl.gov/HeatIsland/CoolRoofs/
- American Concrete Pavement Association, See the R&T Update #3.05, June 2002, "Albedo: A Measure of Pavement Surface Reflectance," www.pavement.com/downloads/RT/RT3.05.pdf
- Cool Roof Rating Council, www.coolroofs.org
- EPA ENERGY STAR Roofing Products, provides solar reflectance levels required to meet ENERGY STAR labeling requirements, www.energystar.gov/ia/partners/product_specs/eligibility/roofs_elig.pdf
- The International Council of Local Environmental Initiatives Local Governments for Sustainability program, www.hotcities.org
- Green roof websites, www.greenroofs.org, and www.greenroofs.com

sustainable landscape practices

goals

- Use non-irrigated landscaping and plantings (unless recycled water).
- Create native wildlife habitats.
- Select landscaping and configure to suit climate and site conditions.
- Maintain appropriate level of water quality on the site and in buildings.
- Create habitats using self-sustaining landscape design and site maintenance procedures.
- Minimize the use of turf areas.

technical strategies

- Reduce reliance on plant species that require frequent irrigation and maintenance.
- Use plants that are native to the region and microclimate (reference Native Plant lists for City of Milwaukee and Southeast Wisconsin) to eliminate need for irrigation after plants are established.
- Emphasize plant diversity and plants which naturally grow together and are self-sustaining (i.e. reseed and spread without much maintenance).
- Where planting adjacent to building openings such as air intakes, entries, or operable windows, do not use allergy-causing plantings and those requiring chemical treatment.
- Do not use invasive plant species (those which threaten local native ecosystems).
- Reduce dependence on fertilizer by using plants that contribute nitrogen to the soil (clover, honey locusts, black locusts and other legumes).
- Provide good growing conditions, including adequate root space for plants, and especially for street trees. Tree pits should be 3-5 times the size of root ball dimensions. Wherever possible, locate trees so that rooting zones of more than one tree can be combined.
- Where possible harvest rainwater and roof stormwater for landscape irrigation.
- Eliminate water pollution from pesticides, herbicides, and fertilizers by using plant combinations and maintenance methods that do not require chemicals.
- Use mulch to conserve soil moisture, restore soil fertility, and reduce the need for fertilizers. Leave grass clippings, small plant debris, and fallen leaves to decompose on the ground. Use compost for soil amendment in lieu of peat moss.
- Use recycled, renewable, and locally

available materials when constructing landscape features (e.g. recycled timber, plastic, rubber tires, brick and granite stone pavers).
- Encourage companion plantings.
- Reference Heat Island Reduction subsection for use of landscaping and plantings to help reduce heat island effect and energy consumption.

performance indicators

- Using native landscaping versus typical landscaping provides an estimated savings of $220 per dwelling unit per year, in cost for potable water irrigation. PROJECT LIFE-CYCLE COST (O&M COST)
- AES out of Brodhead, WI states that installing a native landscape costs less than installing a turf landscape, and the cumulative cost for maintaining a native landscape is 85% less over a 20-year period. PROJECT LIFECYCLE COST (O&M COST)
- A study done in Chicago found that the projected value of trees (i.e. pollution reduction, energy savings and increased property value) is nearly three times the cost to plant the tree. COMMUNITY IMPACT AND RELATED COST (ECONOMIC IMPACTS & COMMUNITY ASSETS CONTRIBUTED BY PROJECT)
- Landscaped areas and green roofs provide a location for social gathering as well as private relaxation. COMMUNITY IMPACTS AND RELATED COST (SOCIAL IMPACTS) & HUMAN IMPACTS (HEALTH & WELL-BEING)
- Sustainable landscaping gardens create a natural habitat for plants and animals. ENVIRONMENTAL IMPACT
- Sustainable landscaping maintains historical plant heritage and native gene pool/diversity. ENVIRONMENTAL IMPACT

technologies/techniques

- Rain Barrels. Use as a tool for drip irrigation for native landscaping on site. www.rainbarrelguide.com
- Native landscaping. Wisconsin has many options for low maintenance native landscaping for development projects (see Tools).
- Green roof systems. Spectrum of intensive and extensive green roof systems, using native plantings, for benefit of aesthetics, recreational use, stormwater storage and energy savings. (See Building/Site Relationship and Heat Island Reduction subsection, and Water Management section for more information.)

performance goals/leed credits

Note: Performance Goals provide the "How to" for achieving the goals and technical strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project, LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Level 1 (required)

Use native plants for 90% of the vegetation on the project and use no invasive plants on any part of the project site. LEED-ND, SLL CREDIT 9

Level 2 (suggested)

Use only organic fertilizing products and methods. There are local landscape maintenance contractors and organic product manufacturers that specialize in organic, chemical-free approaches.

Incorporate recycled materials, ideally from The Brewery Project site, into landscape features.
LEED-NC, MR CREDIT 3.1

$ benefits

Homebuyers ranked pedestrian paths 3rd out of 39 attributes used to select a home.

tools

- U.S. E.P.A. Landscaping with Native Plants Fact Sheets (with reference to Wisconsin) www.epa.gov/greenacres/nativeplants/factsht.html
- Natures Heartland - Native Plant communities of the Great Plains, by Bill Boon and Harlen Groe, Iowa State University Press, 1990
- I.P.W.A., Invasive Plants Association of Wisconsin, www.ipaw.org

supplemental resources

- Ecological Restoration - online publication from the University of Wisconsin- Madison Arboretum, http://ecologicalrestoration.info
- North American Native Plant Society, www.nanps.org
- Plant Native, www.plantnative.org
- Green roof websites, www.greenroofs.org, and www.greenroofs.com
- Design for Human Ecosystems: Landscape, Land Use, and Natural Resources, by John Tillman Lyle, Island Press, 1999
- Landscape Restoration Handbook, by Donald Harker, Marc Evans, Gary Libby, Kay Harker and Sherrie Evans, Lewis Publishers, 1999.

alternative transportation and community proximity

goals

- The development should offer support facilities for pedestrians, bicycling, easy access to mass transit, hybrid vehicles, carpooling and/or other less polluting means of transportation.
- Provide preferred parking spaces for carpool vehicles, hybrids and bicycle racks for on-site parking.
- Provide appealing and comfortable pedestrian on-site environments in order to promote pedestrian activity.
- Develop site to create pedestrian connections within the Brewery and the surrounding neighborhoods (for example, Milwaukee Area Technical College and the Park East Corridor).

technical strategies

- Provide adequate bicycle amenities such as secure interior and/or exterior storage and lockers and shower facilities for office uses.
- Development to make use of bus stop shelter areas, or provide waiting areas within enclosed building lobby, as applicable. Provide direct pedestrian access from building to public sidewalks/bus shelters.
- Differentiate pedestrian and vehicular areas with clearly marked crosswalks.
- Provide a preferred hybrid user and/or carpool parking area as an incentive for users.
- Where appropriate, provide alternative fueling facilities such as ethanol, a natural gas pumping station, and/or an electric car battery charging site.
- For developments adjacent to MATC, provide for pedestrian access to make use of the multiple bus stops every weekday.

performance indicators

- Homebuyers ranked walking and biking paths 3rd out of 39 attributes used to select a home. MARKETABILITY (PUBLIC RELATIONS)
- The economic viability of retail and employment centers is affected by their proximity to residential units and the quality of the pedestrian environment connecting them, particularly in urban areas. MARKETABILITY (TENANT VELOCITY & RETAIL SALES)
- Safe and accessible paths for biking

and walking provide the opportunity for the daily physical exercise recommended by health experts. HUMAN IMPACTS (HEALTH & WELL-BEING)

- For fuel-efficient hybrid vehicles, reduced operating costs on a per-mile basis can offset higher initial purchase prices. Today, the break-even period for buying a Prius versus a gas powered Camry has dropped to less than a year, assuming you drive 15,000 miles a year. Developers that meet the market demand by providing and encouraging alternative transportation options attract a growing consumer population. MARKETABILITY (PUBLIC RELATIONS & TENANT VELOCITIES)

technologies/techniques

- Plan for and design the buildings with transportation amenities such as bicycle racks and shower/changing facilities and provide pedestrian and bike access from buildings to public transportation.
- Plan for shared parking facilities for multiple buildings.
- Provide incentive parking for individuals carpooling or using alternative fuel vehicles.

performance goals/leed credits

Note: Performance Goals provide the "How to" for achieving the goals and technical strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project, LLC. Level 2 goals are encouraged and suggested, but not mandatory.

LEED-ND, NPD Prerequisite 1

Designate all streets and sidewalks that are built as part of the development or serving the development directly as available for general public use and not gated. Gated areas and enclaves are not considered available for public use, with the exception of education and health care facilities where gates are used for security purposes.

Level 1 (required)

Design the development such that 50% of the dwelling units or business entrances are within three miles of at least four or more of the diverse uses listed in Appendix A (LEED-ND Rating System) using an existing and/or proposed biking network (three-mile distance is measured along the biking network, not as a straight radius), AND

For any non-residential buildings or multi-family residential buildings that are part of the project, provide bicycle parking spaces or storage for a capacity of no less than 15% of the parking space capacity provided for cars for those buildings. LEED-ND, SLL CREDIT 5

Design and build the project such that all of the following are achieved:

- A principal functional entry of each building has a front façade that faces a public space such as a street, square, park, paseo, or plaza.
- A minimum of 30% of all street frontages located within the project, if any, are planned for development that complies with the minimum building-height-to-street-width proportions of 1:3; and where building sites are planned along streets bordering the project, a minimum of 15% of the total street frontage of such sites contains (or is dedicated to) development that will produce a building-height-to-street-width proportion of 1:3. Street frontages are to be measured in linear feet.
- Continuous sidewalks or equivalent provisions for walking are provided along both sides of all streets in the project. New sidewalks must be at least four feet wide.
- All streets along non-residential or

mixed-use blocks within the project, whether new or existing, are designed for a max speed of 25 mph. LEED-ND, NPD CREDIT 7

Design and build the project such that six of nine of the following items are achieved:

- The front façade of at least 80% of all buildings are no more than 25 feet from the front property line.
- The front façade of at least 50% of all buildings are no more than 18 feet from the front property line.
- The front façade of at least 50% of mixed-use and non-residential buildings are contiguous to the sidewalk.
- Functional building entries occur every 75 feet, on average, along non-residential or mixed use blocks.
- All ground-level non-residential interior spaces that face a public space have transparent glass on at least 33% of the ground-level façade.
- No blank (without windows or doors) walls longer than 50 feet occur along sidewalks.
- Any ground-level storefront windows must be kept open and visible (unshuttered) at night.
- Street trees occur between the vehicle travel way and sidewalk at intervals of no greater than 40 feet
- At least 50% of ground-floor dwelling units have an elevated finished floor no less than 24 inches above the sidewalk grade.
- Trees or other structures provide shade within 5 years of occupancy over at least half of the length of sidewalks included within or contiguous to the project. LEED-ND, NPD CREDIT 7

For each residential unit type developed, design 20% (and not less than one) of each type to comply with the accessible design provisions of the Fair Housing Amendments Act (FHAA) and Section 504 of the Rehabilitation Act, as applicable. Separate residential unit types include: single-family, duplex, triplex, multi-unit row or townhouses, and mixed-use buildings that include residential units. (Compliance for multi-family buildings of four or more units is already a regulatory requirement.). All paths of travel between residential units and other buildings within the project shall comply with the accessible design provisions of the FHAA and Rehabilitation Act, as applicable;
AND
For projects with common-use or recreational facilities constructed as part of the project:

- For any residential areas, apply the accessible design provisions of the FHAA and the Rehabilitation Act to facilities and rights-of-way; and
- For any non-residential areas, apply the accessible design provisions of the American Disabilities Act (ADA) to facilities and rights-of-way.

LEED-ND, NPD CREDIT 14

Provide covered and at least partially enclosed shelters, adequate to buffer wind and rain, with at least one bench at each transit stop within the project boundaries. Shelters shall be illuminated to five average maintained footcandles (light levels may be reduced after hours). Existing external lighting can contribute to this level, but any new lighting shall meet light pollution requirements in LEED ND GCT Credit 20, and designed to not directly illuminate any windows of residential properties.
AND
Provide kiosks, bulletin boards, and/or signs devoted to providing local transit information as part of the project, including basic schedule and route

information at each transit stop that borders or falls within the project. LEED-ND, NPD CREDIT 9

Level 2 (suggested)

Include a residential component equaling at least 25% of the project's total building square footage, and locate the development within a ½ mile walk distance of a number of pre-project jobs equal to or greater than 50% of the number of dwelling units in the project.

Include a residential component in the project that constitutes at least 25% of the project's total building square footage. Design the development so that at least 50% of the project's dwelling units are within ½ mile walk distance of an existing or planned school. LEED-ND, SLL CREDIT 7

Include a residential component in the project that constitutes at least 25% of the project's total building square footage; and design or locate the project such that at least 50% of the dwelling units are within ½ mile walk distance of at least ten of the diverse uses defined in Appendix A of the LEED-ND Rating System. Uses may either be in nearby areas or built within the development. LEED-ND, NPD CREDIT 2

tools

- Fuel Economy Website - This U.S. D.O.E. site allows comparisons of cars based on gas mileage (mpg), greenhouse gas emissions, air pollution ratings, and safety information for new and used cars, www.fueleconomy.gov/feg

supplemental resources

- Office of the Transportation and Air Quality, U.S. E.P.A., www.epa.gov/otaq
- Advanced Transportation Technology Institute, www.atti-info.org
- Alternative Fuels Data Center, http://www.eere.energy.gov/afdc/
- American Council for an Energy Efficient Economy (ACEEE), www.greencars.com
- Clean Cities Vehicle Buyer's Guide for Consumers, www.eere.energy.gov/cleancities/vbg

water management

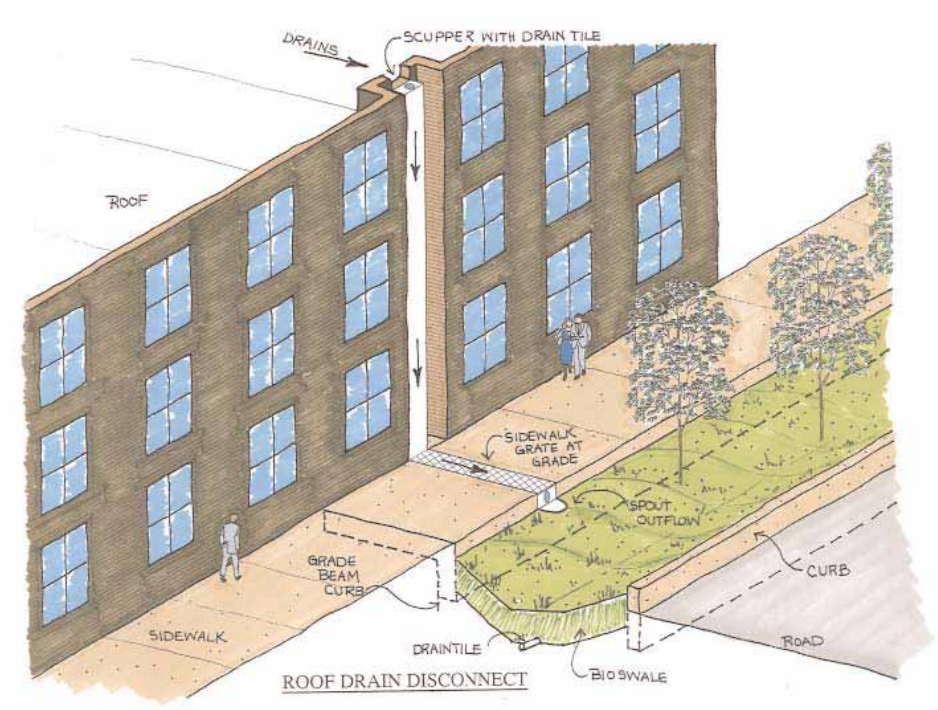
When the well is dry, we know the worth of water.

- Benjamin Franklin -
(1706-1790), Poor Richard's Almanac, 1746

A comprehensive water management plan for a project like The Brewery looks for strategies to conserve, clean and reuse/recycle all types of water involved in building and site development. This includes stormwater management and reuse, water savings strategies for domestic water, and gray water reuse where appropriate. This section looks first at managing roof stormwater with sustainable strategies for holding, storing and conveying the roof water from both an existing/renovated, as well as a new building in the Brewery development. Secondly, the section provides strategies for handling site stormwater in a sustainable way. The third subsection covers plumbing water management strategies inside the buildings.

water management

sustainable alternatives for roof stormwater



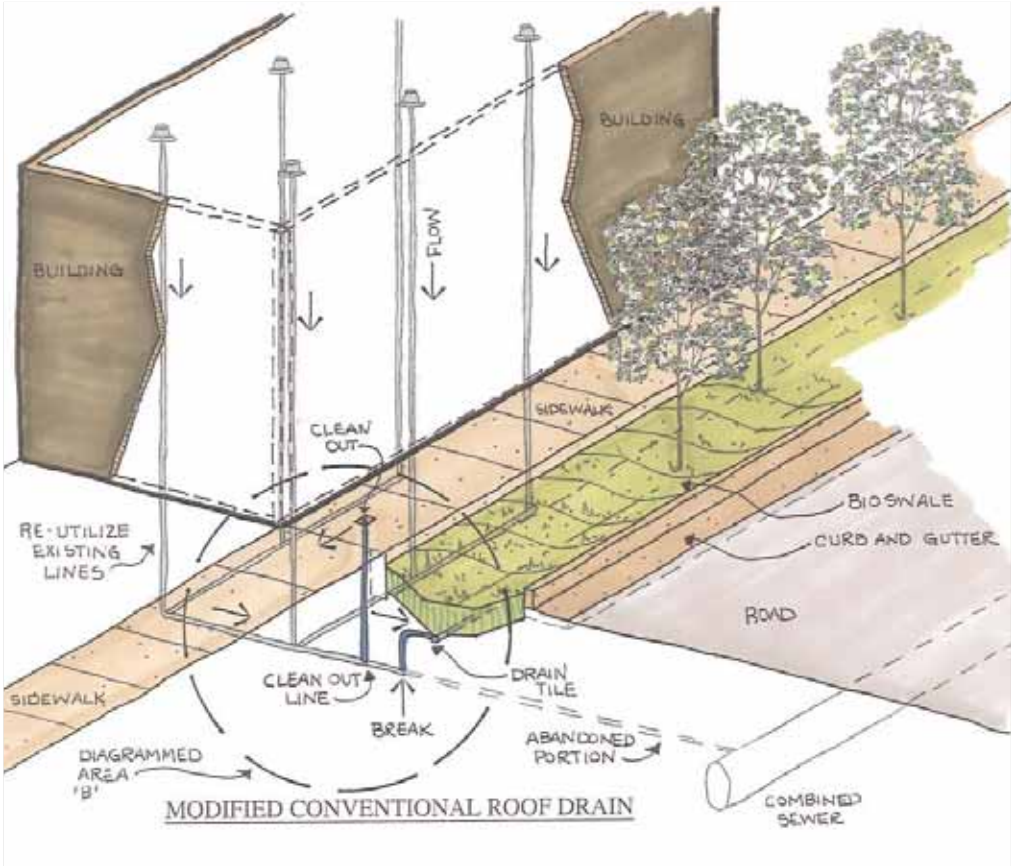
goals

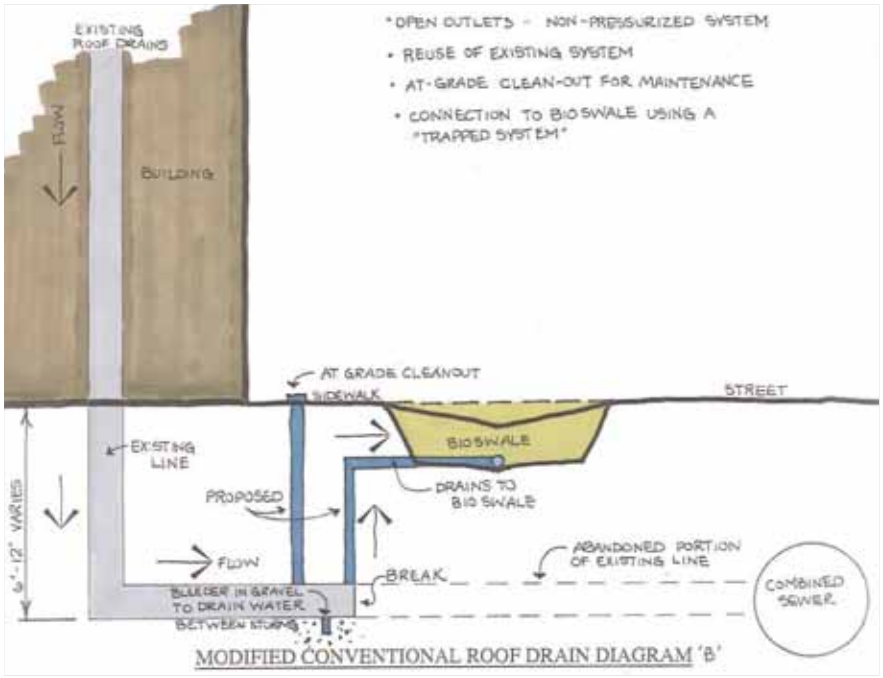
- Provide rooftop water quantity and quality stormwater management measures.
- Contain stormwater onsite through use of roof gardens and roofwater storage systems.
- Reduce the size of roof drain systems and/or reduce the flow of stormwater from rooftops through the use of innovative systems.
- Disconnect existing and new roof drain systems from direct connection to MMSD combined sewer.
- Reuse roofwater for plant watering, irrigation and building graywater uses.

technical strategies

- Plant roof areas with intensive and extensive green roof systems to reduce the amount of rooftop stormwater runoff.
- Disconnect roof drain systems from direct connection to MMSD combined sewer and discharge with a "trapped" pipe system or "gooseneck" structure into bioswales, rain gardens or other pervious land surfaces. Existing roof drain systems and sewer connections, for renovated buildings, may remain as back-up systems.
- Provide new buildings and retrofit existing buildings with siphonic roof drain systems. Use existing roof drain system as a back-up system.
- Provide new buildings and retrofit existing with controlled flow roof drainage systems, by storing the rainwater on the roof through the use of restricted flow weirs. Use existing roof drain piping for controlled flow system.
- Design new buildings or retrofit existing with attached or recessed roof collection downspouts that discharge stormwater into open space/green space areas.

- Provide sidewalk grates and curb/pipe outlets to discharge roof drain outlets into roadside bioswales or onto pervious pavement
- Discharge building downspouts into rain barrels and use as a water source for urban garden watering.
- Collect roof water in above or underground cistern type storage tanks. Store and reuse stormwater for lawn watering or building gray water (treat, as required) purposes.





performance indicators

- Stormwater harvesting versus using potable water irrigation systems, provides an estimated savings of $90/year for roof garden irrigation on a typical 30,000 square foot building footprint. PROJECT LIFECYCLE COST (O&M COST)
- Garden roofs reduce water runoff by 50-90% therefore keeping stormwater onsite and reducing the stormwater runoff volumes into the combined sewer system. COMMUNITY IMPACTS (ECONOMIC IMPACTS) & ENVIRONMENTAL IMPACTS (WASTE PRODUCTION)

$ benefits

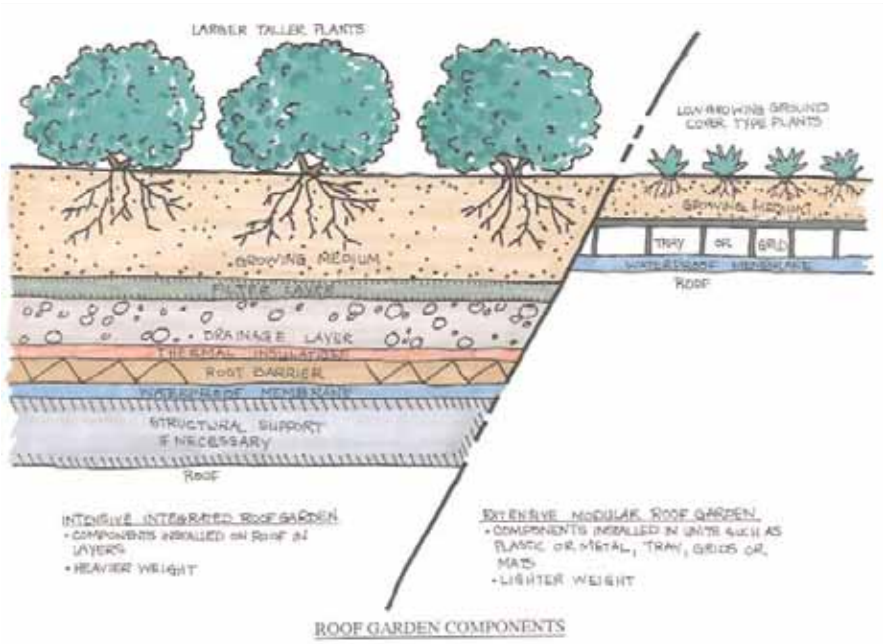
Savings of $90/year for roof garden irrigation on a typical 30,000 square foot building footprint

Reduced water runoff by 50-90%

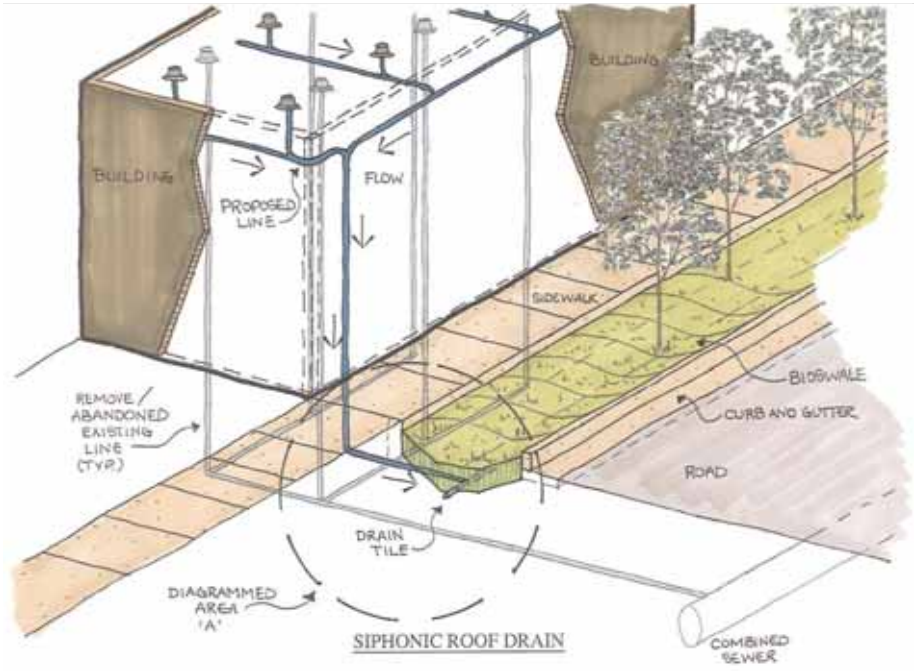
- For new construction, siphonic roof drain systems save approximately $0.30/SF over a conventional gravity flow roof drain system. PROJECT CONSTRUCTION COST
- For existing buildings that require partial or full replacement of the roof drain systems, cost savings for siphonic systems could range from 10 to 50% over gravity, depending on the extent of the work. PROJECT CONSTRUCTION COST
- Siphonic roof drain system allows for maximum use of building space without intrusion of conventional stack and horizontal drainage piping. BUILDING VALUE IMPACTS

technologies/techniques

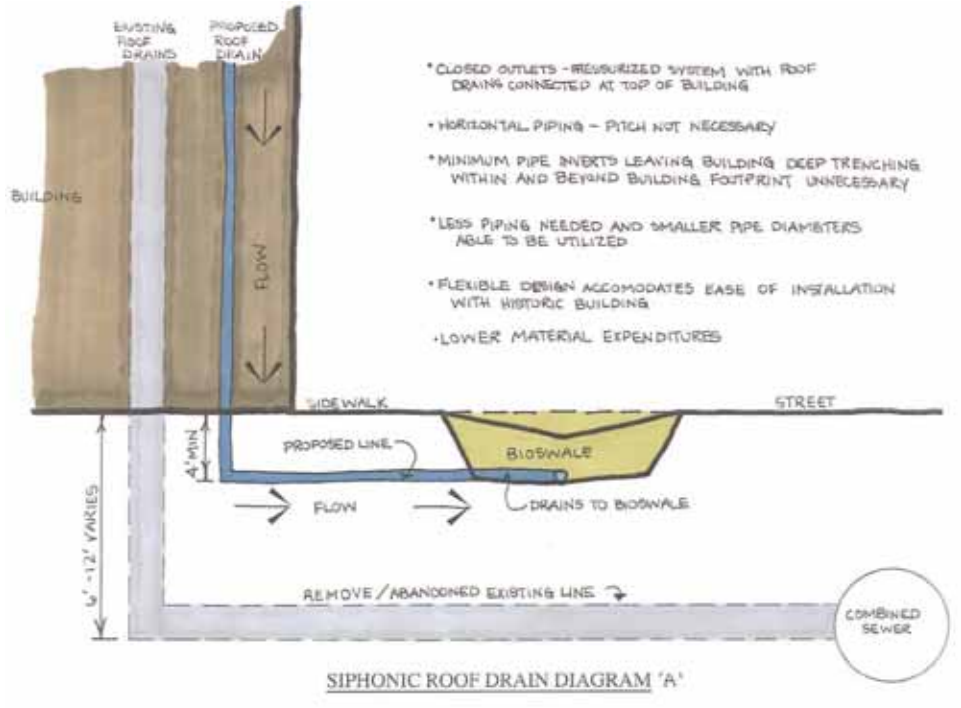
- Green Roof Systems Spectrum of intensive and extensive green roof systems for benefit of stormwater conservation as well as aesthetics, recreational use and energy savings. Green roof system may include a watertight membrane, protective layer, insulation, drainage system, filter layer, engineered soil and appropriate plantings.
- Siphonic Roof Drains. System used to downsize roof drain piping and laterals, and eliminate need for underslab drainage piping. System can be retrofitted to an existing building. Over the past 30 years many corporations have installed siphonic roof drain systems in their buildings.
- Rain Barrels. 50-100 gallon barrels located at bottom of downspouts, where stormwater is collected, stored and used for garden watering.
- Cistern. 200 to 10,000 gallon storage tanks used to capture store and reuse stormwater.
- Rain chains. Alternative to downspout to gently direct water from roof gutters into rain gardens adjacent to building.
- Gooseneck roof drain outfalls. Outfall option that allows underground roof drain pipe to discharge at grade.
- Scuppered roof drain system. Allows for collection and discharge at grade of roof drainage.



ROOF GARDEN COMPONENTS



SIPHONIC ROOF DRAIN



SIPHONIC ROOF DRAIN DIAGRAM 'A'

performance goals/leed credits

Note: Performance Goals provide the "How to" for achieving the goals and technical strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project, LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Level 1 (Required)

Provide stormwater water quality treatment designed to remove 40% of the average annual post development Total Suspended Solids.

Where green roofs or rooftop/cistern storage are not possible; use strategies and technologies listed above to disconnect primary roof drain systems from direct connection to the MMSD combined sewer system.

*Make use of roadside bioswales and water storage areas to meet these Level 1 performance goals.

Level 2 (Suggested)

Implement a comprehensive stormwater management plan for the project that infiltrates, re-uses, or evapotransporates the below-specified amount of rainfall from the project's development footprint

and other areas that have been graded so as to be effectively impervious. LEED-ND, GCT CREDIT 9

Points achievable	Arid Watersheds (less than 20" of rain/year)	Semi-arid Watersheds (between 20" -40" rain/year)	Humid Watersheds (at least 40" rain/year)
1 point	0.15"	0.225"	0.3"
2 points	0.3"	0.45"	0.6"
3 points	0.45"	0.675"	0.9"
4 points	0.6"	0.9"	1.2"
5 points	0.75"	1.125"	1.5"

tools

- Hydraflow Hydrographs stormwater modeling program www.intelisolve.com
- WinSLAMM (Source Loading and Management Model) PV & Assoc., LLC, water quality modeling program
- RECARGA, Version 2.3, University of Wisconsin- Madison Civil & Environmental Engineering Department and Water Resource Group
- Green roofs for Healthy Cities- website with features, benefits, design and construction information www.greenroofs.net

supplemental resources

- Green roofs http://www.wbdg.org/design/greenroofs.php Whole Building Design article detailing the features and benefits of constructing green roofs
- Other green roof websites, www.greenroofs.org and www.greenroofs.com
- Rain barrels- How-to Guide for using rain barrels for water collection www.rainbarrelguide.com local supplier~ http://www.everydrop.org/
- Siphonic roof drain systems- RMS Engineering, LLC http://www.rmsengineering.pro/RMS%20Siphonic%201.htm

managing site stormwater

goals

- Provide site appropriate water quantity and quality stormwater management measures.
- Contain stormwater onsite through the use of bioswales, rain gardens, permeable pavements and underground storage.
- Reuse stormwater for plant watering, irrigation and building graywater reuse.
- Avoid completely using domestic water for irrigation.
- Minimize the amount of stormwater entering the MMSD combined sewer system.

technical strategies

- Collect, store and reuse rainwater as a water source for irrigating landscaped areas and watering urban gardens.
- Wherevever feasible convert existing impervious areas to pervious surfaces and or green space areas, to reduce stormwater runoff.
- Utilize proposed open space areas such as landscaped roundabouts or pocket park areas (ex. Juneau Ave & 10th St- south) as stormwater runoff storage areas.
- Use permeable pavement and other types of pervious surfaces for pedestrian walkways, appropriate vehicular areas, and other required hardscapes.
- Use drought tolerant plant species.
- Where feasible, increase the coverage of canopy trees to capture more stormwater.
- Design water features (i.e. fountains, waterfalls, etc) with a recirculating water system.
- Store, treat/filter as required, and reuse stormwater for landscape features such as garden fountains, water falls and misting fountains.
- Detain and treat stormwater onsite to reduce peak discharge to MMSD combined sewer, by using roadside bioswales, rain gardens and underground storage areas.
- Use approved storm sewer manufactured devices to filter and clean storm runoff from surface parking areas.
- Develop an Erosion Control Plan that meets or exceeds state and local standards, to eliminate sediment runoff and tracking of soil into streets and the storm sewer system, during construction.
- Develop an innovative and cost-effective stormwater management system that meets and exceeds the requirements of the City of Milwaukee, MMSD and WI DNR and Department of Commerce.

performance indicators

- Stormwater management features add value to the development as a site amenity. MARKETABILITY (PUBLIC RELATIONS)
- Smaller onsite stormwater collection and treatment systems lessen the burden on municipalities. COMMUNITY IMPACTS AND RELATED COST (COMMUNITY INFRASTRUCTURE DEMAND AND ASSOCIATED COSTS)
- Native landscaping, once established, should not require any irrigation, versus weekly and sometimes daily watering requirements for turf grass in the summertime. For instance a 5,000 SF lawn requires 50,000 gallons of water per summer. At current City of Milwaukee water rates, native landscaping can save approximately $500 a year in irrigation water cost. PROJECT LIFECYCLE COSTS (OPERATIONS AND MAINTENANCE COSTS)
- Drip irrigation systems usually costs

$ benefits

Native landscaping can save approximately $500 annually in irrigation water cost (at current City of Milwaukee water rates).

less to install and have lower water use and maintenance requirements CONSTRUCTION COST & PROJECT LIFECYCLE COSTS (OPERATION AND MAINTENANCE COSTS)

- Permeable pavements improve road safety because of better skid resistance. HUMAN IMPACTS AND RELATED COST (HEALTH & WELL-BEING)
- Onsite stormwater management devices such as bioretention swales, rain gardens, permeable pavements and underground storage reduce the peak flows and volumes, for stormwater going to the public MMSD combined sewer system. ENVIRONMENTAL IMPACTS (WASTE PRODUCTION) AND COMMUNITY IMPACTS AND RELATED COSTS (ECONOMIC IMPACTS)

technologies/techniques

- Permeable Pavement. Asphalt, concrete and modular block paver systems, as well as grass or gravel pavers that allow stormwater to filter through open void material in the paved surface into the ground or into an underground storage area.
- Rain Gardens. Small vegetated depressions used to collect, store and infiltrate stormwater runoff.
- Roadside Bioswales. Landscaped depression, generally 2 feet deep, located between the sidewalk and roadway. Planted with non-turf plantings and trees and underlain with 2 feet of engineered soil and draintile piping.
- Underground storage system. Stormwater collection area located underground, using storm piping or the void area of stone aggregate material to temporarily store and possibly infiltrate stormwater runoff.
- Manufactured storm sewer filtering devices. Approved and patented devices such as Stormceptor, Vortechnics and Baysaver used to collect and filter out pollutants such as gas/oils, heavy metal and silt from paved surfaces.

performance goals/leed credits

Note: Performance Goals provide the "How to" for achieving the goals and technical strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project, LLC. Level 2 goals are encouraged and suggested, but not mandatory.

LEED-ND, GCT Prerequisite 1

Create and implement an Erosion and Sediment Control Plan for all construction activities associated with the project. The Plan and Best Management Practices shall meet the requirements and be approved by the City of Milwaukee and either WI Department of Commerce or WI Department of Natural Resources, depending on who has jurisdiction. (LEED-ND)

Level 1 (Required)

Provide stormwater water quality treatment designed to remove oils & greases (for surface parking areas) and 40% of the average annual post development Total Suspended Solids (TSS), in accordance with WI NR151 Standards, by implementing Best Management Practices (BMP's). All BMP treatment systems shall include a maintenance plan, factor of safety and a

safe overflow plan, in case of clogging or failure. All manufactured devices require independent laboratory testing to confirm stated levels of TSS removal.

*Make use of roadside bioswales and water storage areas to meet this Level 1 performance goal.

Install landscaping that does not require permanent irrigation systems, OR use only captured rainwater or recycled graywater (treated as required) for landscaping irrigation. Temporary irrigation systems used for plant establishment are allowed only if removed within one year of installation. LEED-ND, GCT CREDIT 3 (Option 2)

Level 2 (Suggested)

Implement a stormwater management plan that prevents the post-development peak discharge rate and quantity from exceeding the pre-development peak discharge rate and quantity for the one- and two-year, 24-hour design storms.

Provide stormwater water quality treatment designed to remove oils & greases (for surface parking areas) and 80% of the average annual post development Total Suspended Solids (TSS), by implementing Best Management Practices (BMP's). All BMP treatment systems shall include a maintenance plan, factor of safety and a safe overflow plan, in case of clogging or failure. All manufactured devices require independent laboratory testing to confirm stated levels of TSS removal.

Implement a stormwater management plan that prevents the post-development peak discharge rate and quantity from exceeding the pre-development peak discharge rate, in accordance with the MMSD stormwater ordinance requirements for greenfield sites.

tools

- Hydraflow Hydrographs stormwater modeling program www.intelisolve.com
- WinSLAMM (Source Loading and Management Model) PV & Assoc., LLC, water quality modeling program
- RECARGA, Version 2.3, University of Wisconsin- Madison Civil & Environmental Engineering Department and Water Resource Group
- USLE spreadsheet for computing sediment runoff
- Calculation method for determining the percent reduction in potable water use for irrigation, found in the LEED NC Rating System - WE Credit 1.

supplemental resources

- City of Milwaukee Stormwater Ordinance http://cc-codenew.milwaukee.gov/code/volume1/ch120.pdf
- MMSD Chapter 13 Stormwater Ordinance
- MMSD Stormwater Runoff Reduction Program Interim Report, MMSD Contract W91004E03, December 29, 2005
- WI DNR NR151 Technical Guidelines and DNR Technical Standards www.dnr.state.wi.us/org/water/wm/nps/stormwater/publications.htm
- Stormwater Best Management Practice Design Guide, EPA/600/R-04/121A September 2004. www.epa.gov/ORD/NRMRL/pubs/600r04121/600r04121a.pdf

$ benefits

Cost savings of 20-30% on water utility bills.

building water efficiency

goals

- Reuse stormwater for plant watering, irrigation and building graywater uses.
- Avoid completely using domestic water for irrigation systems and limit the amount of potable water used for non-potable purposes.
- Minimize the amount of stormwater and building wastewater from entering the MMSD combined sewer system.
- Reduce domestic water consumption in the buildings through proper selection of fixtures and equipment.

technical strategies

- Design for, specify and construct plumbing components that are certified to meet ANSI/NSF Standard 61 for drinking water standards.
- Make use of filtered tap water systems in the building in lieu of purchasing and trucking in bottled water for drinking.
- Design plumbing systems to reduce building water use, meeting or exceeding the requirements of the Energy Policy Act (EPACT) of 1992.
- Design for and specify plumbing components that perform above: EPACT, State of Wisconsin and City of Milwaukee laws for water conservation.
- Develop strategies to design for gray water reuse systems (for water closets, urinal flushing and floor drain washdown). Establish private/public partnerships, to allow for designed systems that are acceptable and approvable by City of Milwaukee and WI Department of Commerce plumbing review agencies.
- Make use of existing Brewery storage tanks or other existing tanks for storage for water reuse systems.

performance indicators

- Using strategies and Level 2 goals for building water savings can provide a cost savings of 20-30% on water utility bills. The current water usage cost in Milwaukee is $9.75/1,000 gallons of water used. Project LIFECYCLE COSTS (OPERATION AND MAINTENANCE COSTS)
- By handling reduced water volumes, water/wastewater treatment facilities can delay expansion and infrastructure capital investment costs, and maintain stable water rates and municipal taxes. COMMUNITY IMPACTS AND RELATED COST (ECONOMIC IMPACTS)
- The reduction of potable water use in buildings reduces the total amount of water drawn from the lake, aquifers and other natural water bodies. ENVIRONMENTAL IMPACTS
- Using centralized filtered water system versus bottled water or water coolers for drinking water in the building, saves on long term cost of water delivery to the buildings. COMMUNITY IMPACTS AND RELATED COST (ECONOMIC IMPACTS)

technologies/techniques

- Low flow water fixtures and systems
- Waterless urinals and composting toilets
- Sinks, showers, urinals and toilets with low flow rates, automatic flushing and shut-off controls
- Dual option flushing controls for toilets
- Chlorine dioxide or UV light for treating gray water for reuse
- Particulate filter systems for filtering gray water for reuse

performance goals/leed credits

Note: Performance Goals provide the "How to" for achieving the goals and technical strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project, LLC. Level 2 goals are encouraged and suggested, but not mandatory.

LEED-ND, SLL Prerequisite 2

Locate development on a site served by existing water or wastewater infrastructure. Replacement or other on-location improvements to existing infrastructure are considered existing for the purpose of achieving this prerequisite.

Federal water efficiency standards for plumbing fixtures and fixture fittings required by the US Energy Policy Act of 1992

Product	Maximum Water Use	Compliance Date
Toilets*		
Gravity tank-type	1.6 gal/flush	1/1/94
Flushometer tank	1.6 gal/flush	1/1/94
Electromechanical hydraulic	1.6 gal/flush	1/1/94
Blowout†	3.5 gal/flush	1/1/94
Commercial, gravity tank-type, white two-piece §	3.5 gal/flush	1/1/94 to 12/31/96
Commercial, gravity tank-type, white two-piece §	1.6 gal/flush	1/1/97
Flushometer valve‡	1.6 gal/flush	1/1/97
Urinals †‡	1.0 gal/flush	1/1/94
Showerheads §	2.5 gpm (80 psi)	1/1/94
Faucets §		
Lavoratory §	2.5 gpm (80 psi)	1/1/94
Lavoratory replacement aerators	2.5 gpm (80 psi)	1/1/94
Kitchen	2.5 gpm (80 psi)	1/1/94
Kitchen replacement aerators	2.5 gpm (80 psi)	1/1/94
Metering	0.25 gal/cycle (80 psi)	1/1/94

*Compliance with ASME-ANSI Standards A 112.19.2M-1990 and 112.19.6-1990
†No data on conversion to lower volume
‡Must bear conspicuous label that states "For Commercial Use Only"
§Compliance with ASME-ANSI Standard A112.18.1M-1989

The energy policy act: Assessing its impact on utilities
By: Amy Vickers / In: Journal of the American Water Works Association
http://www.cepis.ops-oms.org/muwww/fulltext/repind48/energy/energy.html

Level 1 (Required)

For non-residential buildings and residential buildings over 3 stories: Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements. LEED calculations are based on estimated occupant usage and shall include only the following fixtures (as applicable to the building): water closets, urinals, lavatory faucets, showers, and kitchen faucets.
OR
For residential buildings 3 stories or fewer, comply with 2 out of 3 of the following requirements:

- The average flow rate for all lavatory faucets must be <= 2.0 GPM.
- The average flow rate for all shower heads must be <= 2.0 GPM.
- The average flow rate for all toilets, including dual flush toilets, must be <= 1.3 GPF.

LEED-ND, GCT CREDIT 3

Level 2 (Suggested)

For non-residential buildings and

residential buildings over 3 stories: Employ strategies that in aggregate use 30% less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements. LEED calculations are based on estimated occupant usage and shall include only the following fixtures (as applicable to the building): water closets, urinals, lavatory faucets, showers, and kitchen faucets.
OR
For residential buildings 3 stories or fewer, comply with all of the following requirements:

- The average flow rate for all lavatory faucets must be <= 2.0 GPM.
- The average flow rate for all shower heads must be <= 2.0 GPM.
- The average flow rate for all toilets, including dual flush toilets, must be <= 1.3 GPF. LEED-ND, GCT CREDIT 3.

Reduce potable water use for building sewage conveyance by 50% through use of water conserving fixtures (water closets, urinals) or non-potable water (captured rainwater or recycled graywater).

tools

- Calculation method and tables for determining water use savings, found in the LEED-ND and LEED-NC Rating System- WE Credit 2 and 3.
- US Department of Interior Water Measurement Manual: A Water Resources Technical Publication www.usbr.gov/pmts/hydraulics_lab/pubs/wmm/

supplemental resources

- City of Milwaukee and Department of Commerce Safety & Buildings Plumbing Code requirements
- ANSI/NSF Standard 61- Drinking Water System Components- Health Effects www.nsf.org
- US EPA Code of Federal Regulations, Parts 141-149
- US EPA, 1992 Manual: Guidelines for Water Reuse, Office of Water, EPA/625/R-92/004
- US EPA, 1998 Water Conservation Plan Guidelines, Office of Water, EPA-832-D-98-001
- US EPA Water Use Efficiency Program www.epa.gov/owm/water-efficiency
- Rocky Mountain Institute, Water Efficiency: A Resource Guide for Utility Managers, Community Planners and other Decision Makers, US EPA Office of Water/Office of Wastewater, 1991. www.rmi.org/sitepages/pid76.php

energy

"If it were only a few degrees, that would be serious, but we could adapt to it. But the danger is the warming process might be unstable and run away. We could end up like Venus, covered in clouds and with the surface temperature of 400 degrees. It could be too late if we wait until the bad effects of warming become obvious. We need action now to reduce emission of carbon dioxide."

- Professor Stephen Hawking -
Lucasian Professor of Mathematics, Cambridge University, on Larry King Live, Dec 25, 1999

The intent of this section is to help building owners achieve energy efficiency in the building's mechanical systems, and thus realize lower energy and other related cost. Renewable energy technologies are also encouraged as an alternative to energy systems that ultimately use fossil fuel as an energy source. In addition to the long term cost savings of reducing total building energy consumption and peak electrical demand, these strategies help reduce air pollution, slow depletion of fossil fuels and lessen contributions to global warming and ozone depletion.

energy

energy efficiency in buildings

goals

- The design and construction professionals, along with the owner, function as a team and provide building design through integrated design process.
- Provide energy efficient building envelope design.
- Reduce size of mechanical equipment for building by reducing building heating ventilation and air conditioning demand.
- Incorporate day-lighting to create a better working environment and reduce lighting power consumption.
- Provide higher efficiency lighting solutions, consumer equipment, and mechanical equipment to conserve energy generation.
- Assist development to meet LEED ND certification.
- Consider renewable energy solutions:
  - Purchasing "green power" from an offsite party who generates power from a renewable off site location
  - Producing electricity onsite via photovoltaic panels or wind turbines.
- Design and build an energy neutral building. This building shall consume zero net energy on an annual basis.
- Strive to create a zero carbon development.

technical strategies

- Integrated design process is the key to achieve total building energy performance. All parties having impact on building design should collaborate and bring ideas to the drawing board early in the pre-schematic/concept phase of the project.
- For new construction, provide a building envelope that has a better assembly thermal resistance (R value) than ASHRAE 90.1 2004 table 5.5-6.
- For existing building envelope, add insulation to the envelope to make overall envelope thermal resistance (R value) better than 2006 Wisconsin Enrolled Commercial Building Code.
- Provide energy efficient lighting solutions for the building. The overall lighting power density for building should be equal or lower than that defined by ASHRAE 90.1 2004 table 9.5.1.
- New and retrofit buildings to have space occupancy sensors that turn off lights to the space when it is not occupied. Integrate the sensors with the HVAC control system to turn off heating and cooling systems in areas that are not occupied.
- Incorporate day lighting sensors in the building lighting system design. Day lighting sensor system shall allow the lights in building perimeter zones to dim or turn off when an IESNA recommended lighting level (fc; foot candle) is met by utilizing natural day light.
- Provide all heating ventilation and air conditioning (HVAC) as well as domestic hot water systems with performance ratings greater than that defined by ASHRAE 90.1 2004 tables 6.8.1A through 6.8.1G.
- Use an energy analysis software to evaluate the design impact and energy savings from strategies being used. Evaluate the cost/benefit data for the energy saving measures in the schematic and early design development phase of the project.
- Designate a commissioning authority (CxA) during pre-design phase of the project. The CxA shall be independent of the project design team and shall review the project through design and construction to make sure it meets project goals.
- Off site renewable energy programs:
  - Energy For Tomorrow (We

Energies) - Customers are able to purchase power from renewable sources that include wind, solar, hydro and biomass. Participants who sign up for this program predetermine the amount of renewable energy that will be purchased based on a percentage of total electricity consumed. The renewable energy provided is at a higher rate than non-renewable rate. Verify the current rates with We Energies for this sustainable program.

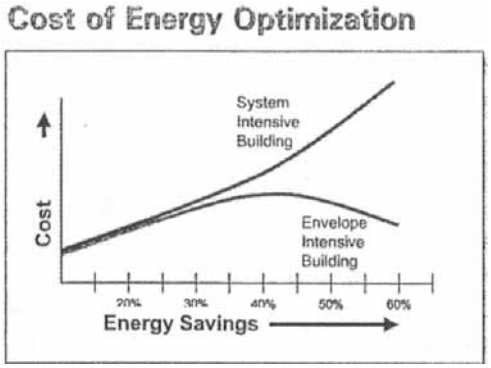
- Tradable Renewable Certificates (TRC) - These certificates are purchased so that electricity consumers can offset some or all of the traditionally generated electricity they use with renewable energy. Typically these TRC's are purchased because the local utility does not have renewable energy programs such as the Energy For Tomorrow program (described above) offered by We Energies. TRC's are also known as renewable energy credits (REC), green tickets and green tags. The companies that sell these certificates are required to keep strict records and documentation of the energy produced and the amount of TRC's sold. This is to prevent overselling of the TRC's and it ensures that the total amount of renewable energy being purchased is the amount of renewable energy being produced.
- Onsite renewable energy sources - Careful consideration should be given to onsite generation via renewable sources. There are many configurations possible, however a grid tie system would be recommended in lieu of a battery storage system, or a stand alone system. A battery storage system is better applied to remote sites that do not have access to the urban utility infrastructure available at this site. A stand alone system may be possible, but typically requires a significant field area for placement of panels. A grid tie system sells electricity to the utility and typically puts out the most electricity on very sunny summer days when electrical demand for electricity is very high. At night buildings will consume electricity from the utility when the demand on the utility is very low.
- Typically for this region of the country, approximately 100sf of area is required for 1KW of panels, however a site specific study should be performed prior to proceeding with the design of an onsite renewable energy system.
- Utilize building energy consumption reduction techniques and renewable energy sources to create a zero net energy building. On an annual basis, this building shall produce equal to or more energy than it consumes. The energy source should be renewable as well. This also reduces the carbon generation at the energy plant as less fuel is required to support the development.

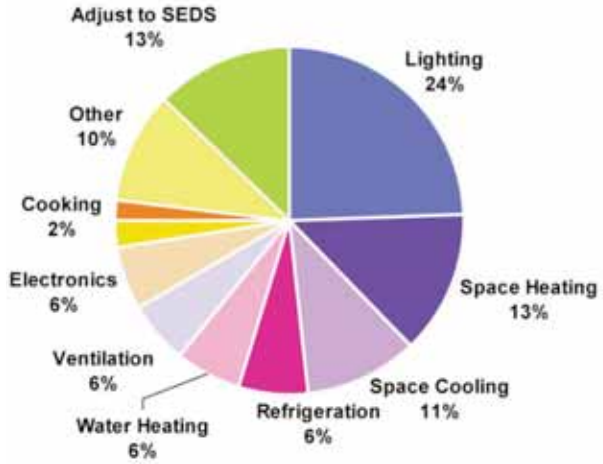
performance indicators:

- In an integrated design approach, the mechanical engineer will calculate energy use and cost very early in the design, informing designers of the energy-use implications of building orientation, configuration, fenestration, mechanical systems, and lighting options. PROJECT LIFECYCLE COSTS (PROJECT CAPITAL COSTS)
- S.C. Johnson Worldwide built a new energy efficient professional headquarters in Racine, WI in 1997. The annual energy cost for the new

building is $0.46 per square foot, a significant savings compared to the previous facility at $1.15 per square foot and the national average for a building with similar programming at $2.20 per square foot. PROJECT LIFE CYCLE COSTS (O&M COSTS)

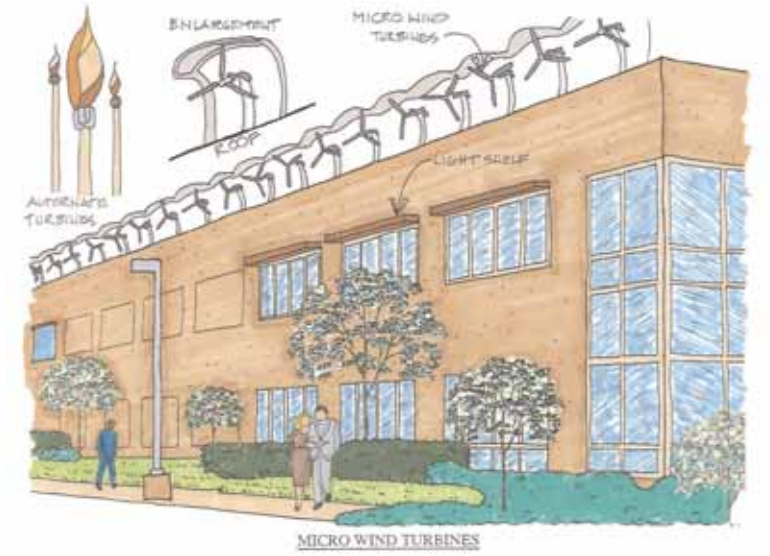
- In a typical office/commercial building, energy costs average $1.50 to $2.50 per square foot, while salaries exceed $200 per square foot. Cutting energy use in half typically saves $1.00 per square foot per year, while boosting productivity just 5% saves more than $10.00 per square foot. HUMAN IMPACTS AND RELATED COSTS (PRODUCTIVITY)
- Building envelope includes windows (glazing as well as frame) doors, walls, roof, slab for a building. The envelope not only protects the building occupants but also provides an indoor environment. It is the medium for flow of energy between indoors and outdoor, the greater the temperature deviation between the two; the higher the energy flow. Thus, it is a key component for energy savings at the Brewery. It is important to keep a 'whole building approach' when optimizing the building for energy savings. A better, more thermally resistant envelope can lead to smaller HVAC and electrical equipment. Extra financial resources invested in high performance envelope constructions can reduce investment in mechanical and electrical systems. The table below indicates how the relationship might look like in a typical building at The Brewery. PROJECT LIFECYCLE COSTS (PROJECT CAPITAL COSTS)





Source: Department of Energy. The above chart indicates the percent of building energy used for a generic commercial building. Building lighting consumption levels should be limited to that defined by ASHRAE 90.1 2004 table 9.5.1 and 9.6.1.

- Building lighting consumes 15 to 25% of building energy based on type of building. Natural day lighting allows reduced electrical lighting power densities in the perimeter zones. By placing day lighting sensors, the lights in the perimeter space can be turned off when sufficient day lighting is present. PROJECT LIFECYCLE COSTS (O&M COSTS)
- High efficiency mechanical systems should be used for the Brewery projects. The minimum efficiency levels are defined by ASHRAE 90.1 2004 Chapter 6. PROJECT LIFECYCLE COSTS (O&M COSTS)
- The process of commissioning HVAC systems applies to existing buildings, as well as to new construction. Commissioning methodology is used to solve persistent problems in existing buildings, as a component of a comprehensive preventative maintenance program, or to commission post-occupancy facility modifications. Ineffective communication and coordination between designers and contractors, and among contractors, can produce HVAC systems with installation deficiencies that do not perform properly. Without verification of the correct interaction and operation of all systems and components, system performance as specified and intended is unlikely to occur. PROJECT LIFECYCLE COSTS (O&M COSTS)



MICRO WIND TURBINES

- The aggregate of renewable energy systems connected to the grid in this region of the United States will lessen the demand in the future for new conventional power plants to come online.
- Offsite generation of energy, in particular electricity, is fairly inefficient. A fossil fuel power plant is only about 35% efficient when producing electricity. The rest is wasted as heat. Additional energy is lost during electrical transmission. Thus, onsite generation of electricity by renewable sources conserves fossil fuel, reduces green house gasses, and then reduces utilities cost for the owner. ENVIRONMENTAL IMPACTS (PRIMARY ENERGY/GLOBAL WARMING POTENTIAL)

technologies/techniques:

- At the schematic phase of the project, create a simplified energy model for baseline building and the proposed building. Compare the loads and the output. Brainstorm energy saving techniques and use the energy model to compare and evaluate cost-benefit for the techniques. Adopt the effective

techniques. Develop the HVAC systems and finalize the specifications early in the design phase.

- Following minimum envelope thermal resistance (R values) should be used for new construction buildings at The Brewery Project:

Elements	Assembly minimum R value [h-ft2-F/Btu]	Assembly maximum U value [Btu/h-ft2-F]	Assembly maximum SHGC
Roof	25		
Wall	20		
Slab on grade floor	10		
Glazing north		0.3	0.4
Glazing non-north		0.3	0.25
Skylight		0.35	0.25

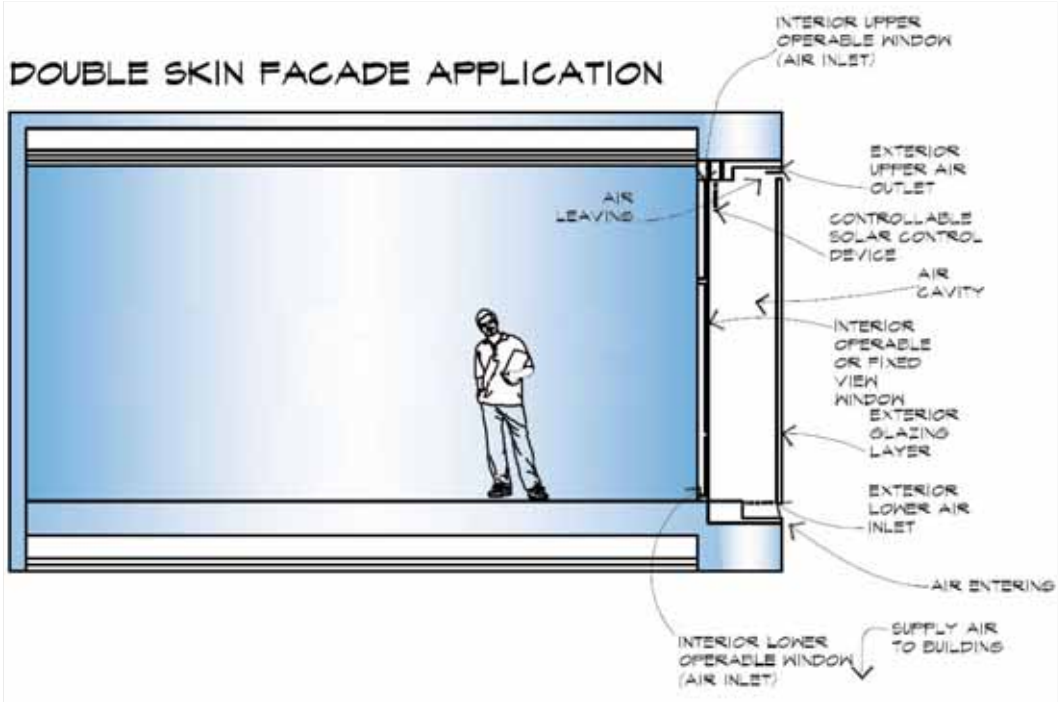
- All existing and new building envelopes should be sealed, caulked, gasketted or weather-stripped based on ASHRAE 90.1 2004 section 5.4.3.
- By applying external shading devices on the West and East facades of the building, the building cooling load can be reduced. The fins should be mounted in a location to allow for day lighting, yet reduce the building heat gain in the perimeter zones. External shading also reduces glare and increases occupant comfort.
- By placing occupancy sensors in all private and common spaces, the lights can be turned off automatically when no occupant motion is sensed for a duration of time. This conserves electrical energy and resources used in generating it.
- The minimum space supply air/ventilation air can be reset to zero if no occupants are detected at the occupancy sensors for lights. The mechanical building automation control system will be integrated with the space lighting occupancy sensors for this energy saving technique to be cost effective. Code variance may be required as well.
- Integrate building perimeter lights with day light sensors. A day light integrated system consists of a control photo-sensor that is located in the space. This sensor sends a signal to the day light integration controller that either turns off the electric lights or sends a signal to dimming unit to dim the lights (based on the system). The system works to maintain a set lighting level in the space.
- Interior automated or manual shading devices can be used to reduce energy consumption and glare. Interior shades can either be integrated with the lighting sensors (to reduce or increase the light levels in the space), or can be controlled manually.
- If a space has high outside air requirement then exhaust/relief air heat recovery systems should be evaluated. Heat recovery systems vary from enthalpy wheels to run around recovery coils. The best system for a building is based on the application, function and loads of that specific building. An energy analysis should be performed to evaluate different options and select

the most feasible option.

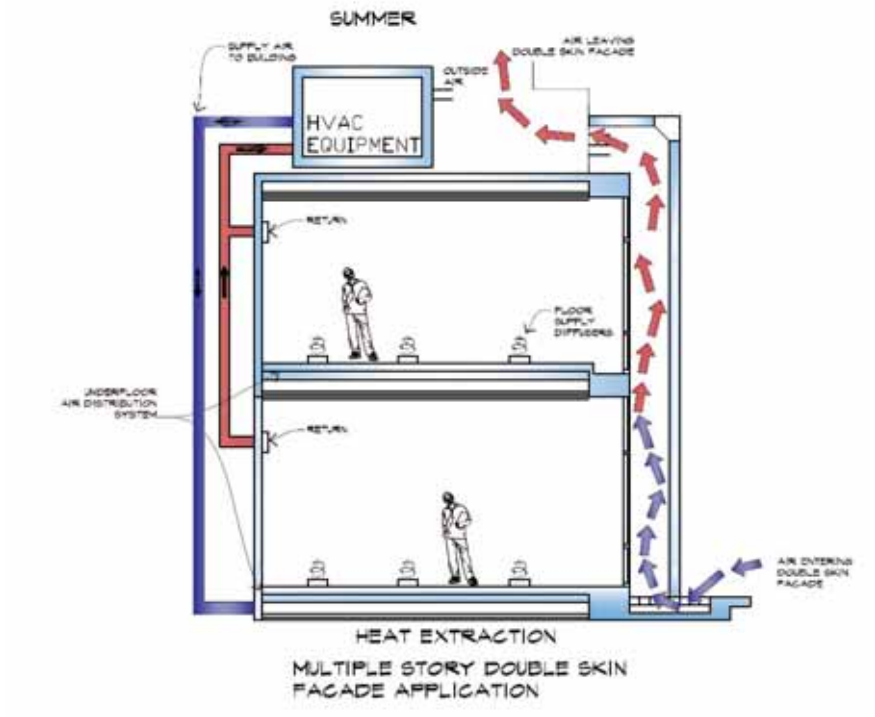
- Energy analysis should be performed based on ASHRAE 90.1-2004 Appendix G. A combination of DOE-2 (version 2.1E) and Visual DOE can be used to perform enhanced energy modeling of a building. DOE-2 is a widely used and accepted building energy analysis program, created by Lawrence Berkeley Lab at UCLA that can predict the energy use and cost for all types of buildings. DOE-2 uses a description of the building layout, constructions, operating schedules, conditioning systems (lighting, HVAC, etc.) and utility rates provided by the user, along with weather data, to perform an hourly simulation of the building and to estimate utility bills. Visual DOE is a graphical interface that allows the user to input the building graphically, and it interprets the numerical code of DOE-2 to produce the energy modeling results in graph form. Visual DOE 4.1, a Windows application, is being used worldwide by private architects and engineers, utilities, national laboratories, universities, and others to evaluate energy costs for alternative building system designs. eQuest, Energy 10 or other simpler energy analysis programs can also be used based on the detail of energy analysis required.
- Commissioning is a systematic process that addresses these issues (See Performance Management section). It facilitates and ensures the required communication, coordination, testing, and verification, and results in the delivery of a building whose HVAC systems perform as intended. Effective HVAC commissioning is an intentional, visible, cooperative and proactive process. It includes design review, installation verification, proper system start-ups, and functional performance tests, operations and maintenance (O&M) training, and complete documentation of the HVAC systems. It assists in the coordination of construction schedules and sequences to facilitate an efficient construction process and challenges systems to perform as designed under all specified modes of operation. O&M staff training provides a basis for continued optimum HVAC systems performance throughout a facility's existence. In summary, commissioning serves the owner's best interests by delivering a facility with systems that perform as specified, intended and paid for.
- In an earth pipe/concrete pipe system, building outside air passes through large concrete pipes buried below grade prior to entering the building ventilation system. These pipes are buried below the earth frost line (about 5 feet below grade), since the earth temperature is about 55 degrees for The Brewery area and remains fairly constant year-round. In summer the concrete pipes pre-cool the outside air and in winter the pipes pre-heat the outside air. Pipes should be sized to minimize additional fan static pressure (that converts into additional energy) required. Also, careful consideration should be given to condensation removal from the pipes. By utilizing ground as a heat sink, building mechanical cooling and heating loads are reduced.

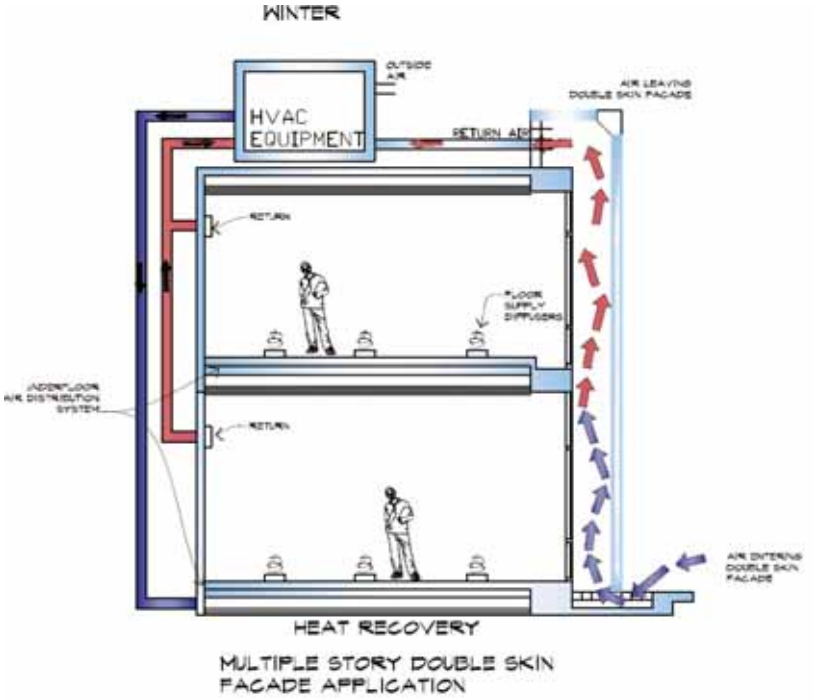
Earth pipe/concrete pipe system

- A second layer of façade can be placed in front of the conventional façade to create a double skin design for the building. This provides the building with multiple opportunities to conserve energy. Hot air stack effect can be utilized between the two facades. Building cooling and heating loads are reduced by creating a buffer zone between outside and inside. Operable windows can be placed in the interior façade to utilize natural ventilation.
- The graphic below describes a typical single story double skin façade.



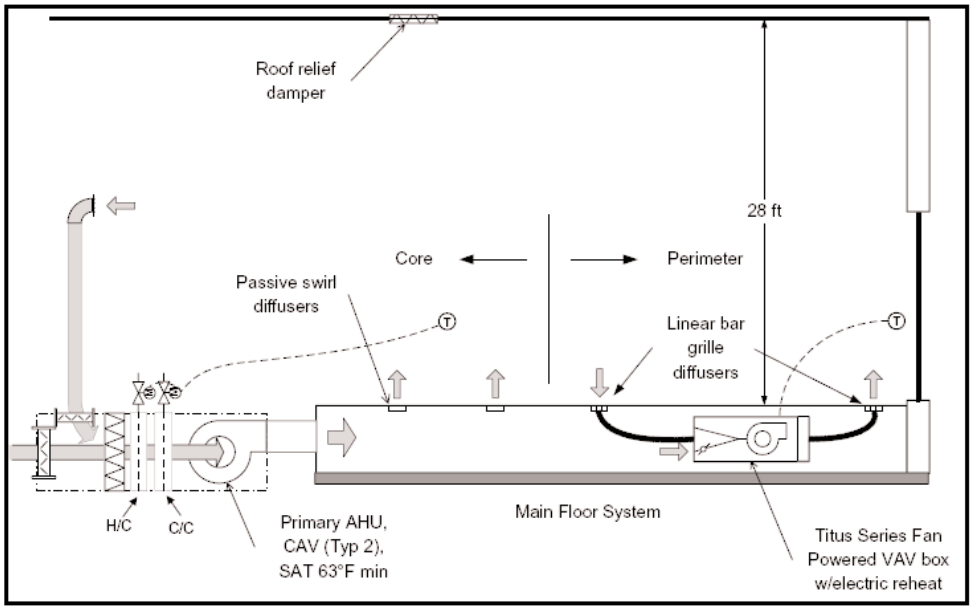
- The double skin façade is used as a heat extraction device in summer months and reduces the cooling load on the building. Outside air enters the façade system at the bottom. The air warms up as it picks up energy from the façade. Warm air rises to the top of the building where it exits out.
- In winter, the double skin façade works as a heat recovery device. Cold air enters the façade system at the bottom of the façade. As it warms up due to solar energy, it rises to the top where it is routed to the building mechanical systems as pre-heated air.





- Chilled beams can be used to meet cooling and heating loads of space. There are two types of chilled beams, passive and active. Passive chilled beams utilize the natural convection to cool or heat the space. Ventilation air is provided separately to the space. Active chilled beams consist of diffusers and introduce ventilation air to space in addition to maintaining air temperature. Chilled beams do not dehumidify the space and are feasible for low space load conditions (generally less than 20 btu/h/ft2). Since chilled beams require cool water instead of chilled water, evaporative coolers can be utilized to provide 65^{O}F water. Also reclaimed heat and condensing boilers can be used to generate warm water (120^{O}F) for heating. Chilled beam systems should be engineered for the building and should not be oversized. It is a feasible system for The Brewery when building infiltration is minimized at the envelope, primary airflow is increased, outdoor air (ventilation air) to space is dehumidified prior to introducing to space, morning start-up is controlled and gradual, and space loads are minimized.

- Under floor air distribution system (UFAD) can be utilized for the building to provide a higher efficiency mechanical system with effective performance and individual controls for comfort. This system utilizes a raised (accessible) floor system build above the floor slab to create an air plenum. This plenum is pressurized and air is supplied through floor mounted swivel diffusers that can be turned down. Air temperature and pressure is maintained in the plenum. Air is returned through an over head system. Fan powered boxes are used in the perimeter zones to meet additional heating load.
- Displacement ventilation can be utilized for open spaces such as entrance lobbies, atriums, rooms with high ceilings, and large multipurpose rooms in The Brewery Project buildings. Displacement ventilation involves introduction of fresh supply air at floor level in space and capture of contaminated air at ceiling level. Air is introduced into the space at a very low velocity to make sure there is no air mixing and turbulent air currents in the space. As the graphic below indicates, the fresh air starts to rise when it meets a 'load'. The air stays fresh in the breathing zone. Air is supplied at temperatures close to 61^{O}F to the space. This system is engineered to avoid cold drafts at feet and very high vertical temperature gradient.



"Underfloor Air Distribution System," Tom Weber, U. of California Lawrence Berkeley National Laboratory, 2004

- Solar Chimneys are very effective in inducing updraft for natural ventilation in a building. The number of fans used in the building can be reduced, leading to lower project initial cost as well as operating cost and energy. Solar chimneys are engineered and incorporated into the building architecture through integrated design approach. These chimneys can be designed in multiple ways for different applications. They can be painted black to generate larger hot air stack effect. Solar panels can be incorporated. A paint that varies in color can be painted such that it coordinates with the location of the sun and seasons to induce more or less stack effect. Exhaust damper controls can be incorporated. If there is enough stack

effect, a vertical wind turbine generator can also be placed in the chimney to produce electrical power. Heat recovery coils can be placed at the chimney to recover heat for domestic hot water system from air being exhausted. An energy-cost analysis should be performed on every building to design the appropriate system for that building.

- Onsite renewable energy sources - Photovoltaics/Solar Panels: using solar energy as energy source for building systems. Onsite solar panels can provide up to 40% of energy needed for hot water heaters and 10%-15% of energy needed for electricity in the building. These systems, which can be placed onsite in an open area or on the roof of a building, are encouraged to be utilized as part of a sustainable design.

Photovoltaic Panels
Cooper School - Milwaukee, Wisconsin

- Onsite renewable energy sources - Wind Turbines: using wind energy as an energy source for building systems. Wind turbines have a faster pay back than photovoltaics and are also encouraged to be utilized as part of a sustainable design.

performance goals/leed credits

Note: Performance Goals/LEED Credits provide the "How to" for achieving the Goals and Technical Strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project, LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Level 1 (Required)

- Provide for zero use of CFC-based refrigerants in new base building HVAC and refrigeration systems. When reusing existing HVAC systems, conduct an inventory to identify equipment that uses CFC refrigerants and provide a replacement schedule for these refrigerants. For new buildings, specify new HVAC equipment in the base building that uses no CFC refrigerants. LEED-NC, EA PREREQ. 3

Level 2 (Suggested)

- Design the building project to comply with both the mandatory provisions (Sections 5.4, 6.4, 7.4. 8.4, 9.4 and 10.4) of ASHRAE/IESNA Standard 90.1-2004 (without amendments); and the prescriptive requirements (Section 5.5, 6.5, 7.5 and 9.5) or performance requirements (Section 11) of ASHRAE/IESNA Standard 90.1-2004 (without amendments). LEED-NC, EA PREREQ. 2
- Complete "fundamental" commissioning of the building energy systems in accordance with the requirements of the LEED-NC, EA section Reference Guide. For a detailed description of fundamental commissioning, please refer to the Performance Management Section. LEED-NC, PREREQ. 1
- Design and construct at least 90% of all buildings in the development such that they meet one of the following requirements according to the appropriate category: LEED-ND, GCT Credit 2

Category 1: For non-residential buildings and residential buildings over 3 stories:

OPTION 1 - WHOLE BUILDING ENERGY SIMULATION

Demonstrate a minimum 10% improvement in the proposed building performance rating compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004 (without addenda) by a whole building project simulation using the Building performance Rating Method in Appendix G of the Standard. Appendix G requires that this energy analysis include ALL of the energy costs within and associated with the building project. To achieve this point, the proposed design:

- Must comply with the mandatory provisions (Sections 5.4, 6.4, 7.4, 8.4, 9. and 10.4) in Standard 90.1-2004 (without addenda)
- Must include all the energy costs within and associated with the building project; and
- Must be compared against a baseline building that complies with Appendix G to Standard 90.1-2004 (without addenda). The default process energy cost is 25% of the total energy cost for the baseline building. For buildings where the process energy cost is less than 25% of the baseline building energy cost, the LEED submittal must include supporting documentation substantiating that process energy inputs are appropriate.

For the purpose of this analysis, process energy is considered to include, but is not limited to, office and general miscellaneous equipment, computers, elevators and escalators, kitchen cooking and refrigeration, laundry washing and drying, lighting exempt from the lighting power allowance (e.g. lighting integral to medical equipment) and other (e.g. waterfall pumps). Regulated (non-process) energy includes lighting (such as for the interior, parking garage, surface parking, façade, or building grounds, except as noted above), HVAC 9 such as for space heating, space cooling, fans, pumps, toilet exhaust, parking garage ventilation, kitchen hood exhaust, etc.), and service water heating for domestic or space heating purposes.

For this credit, process loads shall be identical for both the baseline building performance rating and for the proposed building performance rating. However, project teams may follow the Exceptional Calculation Method (ASHRAE 90.1-2004 G2.5) to document measures that reduce process loads. Documentation of process load energy savings shall include a list of the assumptions made for both the base and proposed design, and theoretical or empirical information supporting these assumptions.

OR

OPTION 2 - PRESCRIPTIVE COMPLIANCE PATH A

Comply with the prescriptive measures of the ASHRAE Advanced Energy Design Guide for Small Office Buildings or the AHSRAE Advanced Energy Design Guide for Small Retail Buildings, as appropriate to building type. The following restrictions apply:

- Buildings must be less than 20,000 square feet.
- Buildings must be office or retail occupancy.
- Project teams must fully comply with all applicable criteria as established in the Advanced Energy Design Guide for the climate zone in which the building is located.

OR

OPTION 3 - PRESCRIPTIVE COMPLIANCE PATH B

Comply with the Basic Criteria and Prescriptive Measures of the Advanced Buildings Benchmark™ Version 1.1 with the exception of the following sections 1.7 Monitoring and Trend-logging, 1.11 Indoor Air Quality, and 1.14 Networked Computer Monitor Control. The following restrictions apply:

- Project teams must fully comply with all applicable criteria as established in Advanced Buildings Benchmark for the climate zone in which the building is located.

Category 2: For residential buildings 3 stories or fewer:

Qualify as an ENERGY STAR Home by either a performance path (through a Home Energy Rating - HERS Index rating) or a prescriptive path (Building Option Package or BOP).

2 POINTS CAN BE EARNED AS FOLLOWS:
Design and construct at least 90% of all buildings in the project such that they meet one of the following requirements according to the appropriate category:

Category 1: For non-residential buildings and residential buildings over 3 stories:
OPTION 4 - WHOLE BUILDING ENERGY SIMULATION
Demonstrate a minimum 15% improvement in the proposed building performance rating compared to the baseline described above in OPTION 1 of Category 1.
OR
OPTION 5 - PRESCRIPTIVE COMPLIANCE PATH A
Comply with the prescriptive measures of the ASHRAE Advanced Energy Design Guide for Small Office Buildings or the AHSRAE Advanced Energy Design Guide for Small Retail Buildings, as described above in OPTION 2 of Category 1.

Category 2: For residential buildings 3 stories or fewer:

Qualify as an ENERGY STAR Home by either a performance path (through a HERS Index rating) or a prescriptive path (builder Option Package or BOP).

3 POINTS CAN BE EARNED AS FOLLOWS:
Design and construct at least 90% of all buildings in the project such that they meet one of the following requirements according to the appropriate category:

Category 1: For non-residential buildings and residential buildings over 3 stories:

OPTION 6 - WHOLE BUILDING ENERGY SIMULATION
Demonstrate a minimum 20% improvement in the proposed building performance rating compared to the baseline described above in OPTION 1 of Category 1.
OR
OPTION 7 - PRESCRIPTION COMPLIANCE PATH A
Comply with the prescriptive measures of the ASHRAE Advanced Energy Design Guide for Small Office Buildings or the ASHRAE Advanced Energy Design Guide for Small Retail Buildings, as described above in OPTION 2 of Category 1.

Category 2: For residential buildings 3 stories or fewer:

Exceed the ENERGY STAR for Homes requirements by achieving a minimum HERS Index of at least 75 for IECC (as per the LEED-ND GCT Credit 2) Climate Zone 6 (Milwaukee).

Use onsite renewable energy sources.
LEED-ND, GCT Credit 13

OPTION 1 - (PRESCRIPTIVE) ELECTRICAL BASELINE
Design and incorporate the use of shared onsite nonpolluting renewable energy generation technologies with peak electrical generating capacity of at least 5% of the development's specified electric service load.

OPTION 2- (PERFORMANCE)
TOTAL ENERGY BASELINE
Design and incorporate the use of shared onsite nonpolluting renewable energy generation technologies with peak electrical generating capacity of at least 5% of the development's annual electrical and thermal consumption, as established through an accepted building energy performance simulation tool.

For both options, calculations for total onsite energy can include future site or building-integrated systems, stipulated through CCC&R's or other binding documents.

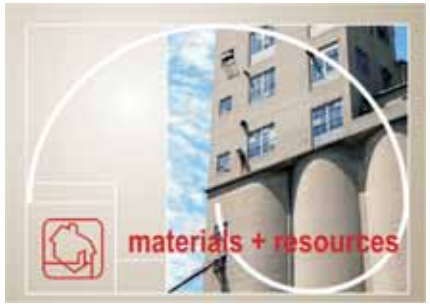
Provide at least 35% of the building's electricity from renewable sources by engaging in at least a two-year renewable energy contract. Renewable sources are as defined by the Center for Resource solutions. LEED-NC, EA Credit 6

tools

- VisualDoe, a front end to DOE 2.1E. Architectural Energy Corporation, www.archenergy.com
- Equest, DOE2.2 based energy simulation tool, www.doe2.com/equest/
- ASHRAE, American Society of Heating, Refrigeration and Air Conditioning Engineers, www.ashrae.org
- PVWatts, grid connected PV production estimator, http://rredc.nrel.gov/solar/calculators/PVWATTS/
- Solar Radiation History Resource, http://rredc.nrel.gov/solar/old_data/nsrdb/redbook/atlas/

supplemental resources

- Advanced buildings, www.advancedbuildings.org
- Building Upgrade Manual Energy Star, www.energystar.gov
- Building Energy Codes Program U.S. Department of Energy, www.energycodes.gov
- Office of Energy Efficiency and Renewable Energy U.S. Department of Energy, www.eere.energy.gov
- American Wind Energy Association (AWEA) www.awea.org
- WE Energies Renewable Energy Programs, http://www.we-energies.com/business_new/altenergy/renewable.htm
- United States Department of Energy - Green power, http://www.eere.energy.gov/greenpower/ Chilled Beam Application Guidebook by REHVA, Guidebook number 5.
- Displacement ventilation in non-industrial premises by REHVA, Guidebook number 1.
- Massachusetts Institute for Technology's (MIT) Laboratory for Energy and the Environment, http://lfee.mit.edu/metadot/index.pl



materials + resources

"Obviously, the highest type of efficiency is that which can utilise existing material to the best advantage."

- Jawaharlal Nehru -
First Prime Minister of India (1889 - 1964)

Buildings consume enormous amounts of resources and generate significant amount of waste. The manufacture of building materials also contribute to waste and generate pollution. Poor indoor air quality lowers productivity and can affect the health of building occupants. The goal is to select and use materials that contribute to a healthy environment while minimizing the use of resources.

materials + resources

building and material reuse

goals

- Extend the life cycle of existing building stock
- Retain cultural resources
- Reduce waste
- Reduce environmental impacts of new buildings as they relate to materials manufacturing and transport
- Reuse existing building materials and products to reduce demand for virgin materials
- Encourage use of historic buildings in a manner that preserves their historic materials and character

technical strategies

- Certain buildings have been identified to be reused and are noted on the following development photo:

Brewery Project LLC Demolition Abatement Plan, Phase 1

performance indicators

- Reuse of existing buildings and building materials can provide for lower up front construction cost on building construction projects. For instance a building reuse project for an Energy Resource Center in California realized savings of: 87% for masonry work, 57% for site work, 49% for concrete work and 70% in carpentry costs. PROJECT CONSTRUCTION COSTS
- Reuse of existing building construction lessens the negative impact on the environment and the depletion of natural resources. ENVIRONMENTAL IMPACTS (WASTE REDUCTION)

technologies/techniques

- Identify opportunities to incorporate existing building elements and materials into the proposed new project.
- Elements to consider are structure and envelope.
- Consider salvaged materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick and decorative items.

performance goals/leed credits

Note: Performance Goals/LEED Credits provide the "How to" for achieving the Goals and Technical Strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Level 1 (Required)

For existing buildings that are deemed reusable, maintain 50% (based on surface area) of the existing building structure (including structural floor and roof decking) and envelope (including exterior skin and framing, excluding window assemblies and non-structural roofing material). Hazardous materials that are remediated as a part of the project shall be excluded from the calculation of the percentage maintained.

Reference Site Design and Planning technical section (building/site relationship and building reuse) performance goals/LEED-ND, GCT Credits 4 and 5, for building reuse.

Level 2 (Suggested)

Use existing interior non-structural elements (interior walls, doors, floor coverings and ceiling systems) in at least 50% (by area) of the completed building. Use salvaged, refurbished or reused materials such that the sum of these materials constitutes at least 5%, based on cost, of the total value of materials on the project. LEED-NC, MR CREDIT 1.3

tools

- Salvaged Building Materials Exchange Green Building Resource Guide, www.greenguide.com/exchange/search.html

supplemental resources

- Building Materials Reuse Association, www.ubma.org
- Used Building Materials Exchange, www.build.recycle.net
- Potential salvage material suppliers

infrastructure material use

goals

- Use recycled materials to reduce the environmental impact of extraction and processing of virgin materials.

technical strategies

- For roadways, sidewalks, curbs, concrete pipe and parking lots (exclude above-ground structured and underground parking), if present in the project, shall use the indicated recycled materials.

performance indicators

- Reuse of materials for infrastructure construction lessens the negative impact on the environment and the depletion of natural resources. COMMUNITY IMPACTS AND RELATED COST (COMMUNITY INFRASTRUCTURE DEMAND AND ASSOCIATED COSTS) ENVIRONMENTAL IMPACTS (WASTE PRODUCTION)

technologies/techniques

- Any aggregate base and aggregate subbase shall be recycled aggregate materials from crushed Portland cement concrete and asphalt concrete.

- Any asphalt base shall be recycled asphalt pavement.
- Any asphalt concrete pavement shall have one of the following materials:
  - Recycled asphalt pavement
  - Rubberized asphalt concrete from crumb rubber from scrap tires
  - Pre-consumer or post-consumer asphalt roofing shingles
- Any Portland cement concrete pavement shall contain reclaimed concrete material aggregate and recycled mineral admixtures such as:
  - Coal fly ash
  - Ground granulated blast furnace slag
  - Rice hull ash
  - Silica fume
  - Other pozzolanic industrial by-product
- Any Portland cement concrete piping shall contain recycled mineral admixtures such as:
  - Coal fly ash
  - Ground granulated blast furnace slag
  - Rice hull ash
  - Silica fume
  - Other pozzolanic industrial by-product

performance goals/leed credits

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Level 1 (Required)

Roadways, sidewalks, curbs, concrete pipe and parking lots (exclude above-ground structured and underground parking), if present in the project, shall use recycled materials as follows:

- Any aggregate base and aggregate subbase shall be 90 % by volume recycled aggregate materials such as crushed Portland cement concrete and asphalt pavement.
- Any asphalt base shall be a minimum 15% by volume recycled asphalt pavement.
- Any asphalt concrete pavement shall:
  - Be a minimum 15% by volume recycled asphalt pavement, OR
  - Be a minimum 15% by volume rubberized asphalt concrete from crumb rubber from scrap tires (crumb rubber modifier), OR
  - Include a minimum of 5% (of total weight) of pre-consumer or post-consumer asphalt roofing shingles.
- Any Portland cement concrete pavement shall contain:
  - Recycled mineral admixtures to reduce by at least 25% the concrete mix's typical Portland cement content, AND
  - A minimum of 10% by volume reclaimed concrete material aggregate.
- Any Portland cement concrete piping shall contain recycled mineral admixtures to reduce by at least 25% the concrete mix's typical Portland cement content. LEED-ND, GCT Credit 17

supplemental resources

- Local asphalt and concrete plants/suppliers/contractors
- Recycled aggregates and concrete pavements , Concrete Technologies, www.cement.org/tech/cct_aggregates_recycled.asp
- Recycled Concrete Materials Report, Ohio DOT, http://www.dot.state.oh.us/testlab/In-House-Research/consolidated%20results%20of%20RCM%20tests.PDF
- Investigation of Recycled Asphalt Pavement Mixtures, U. of MN, Center for Transportation Studies, www.cts.umn.edu/Research/Project

Detail.html?id=1996038

- Technical Standard for use of fly-ash in Concrete, ASTM Standard C618, www.astm.org

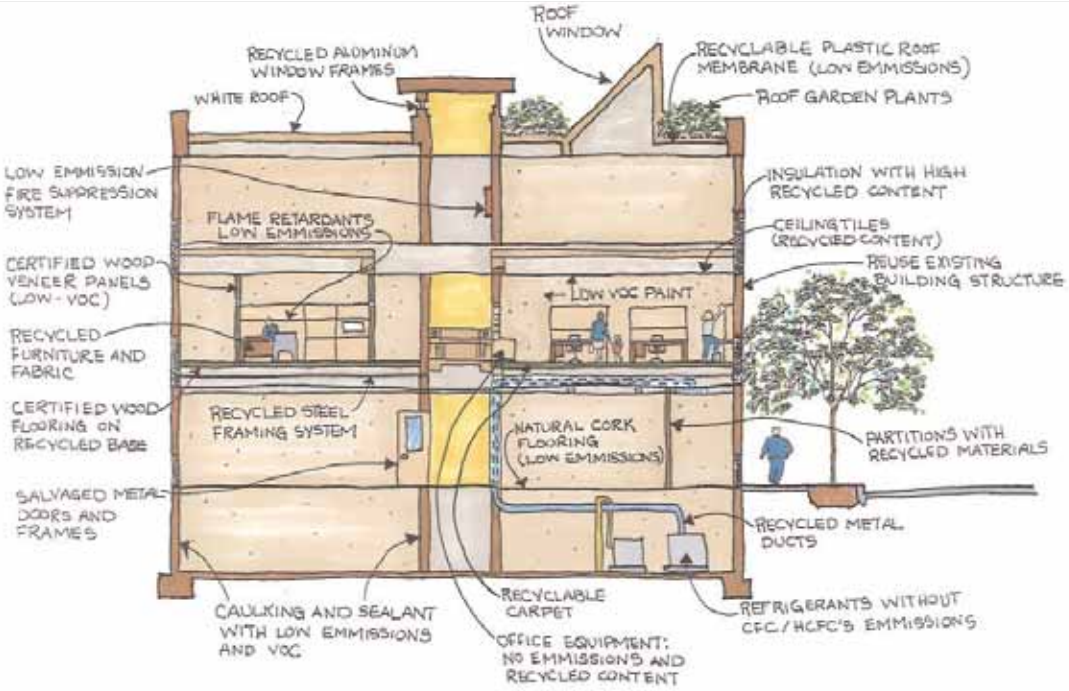
building material use

goals

- Use recycled materials to reduce the environmental impact of extraction and processing of virgin materials.
- Increase demand for building products that incorporate recycled content materials.

technical strategies

- Establish a project goal for recycled content materials.
- When selecting products and materials, consider a range of environmental, economic and performance attributes.



HIGH PERFORMANCE MATERIAL AND PRODUCT SELECTION

performance indicators

- Use of recycled building materials and/or materials with recycled components for building construction lessens the negative impact on the environment and the depletion of natural resources. ENVIRONMENTAL IMPACTS (WASTE PRODUCTION)

performance goals/leed credits

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Level 2 (Suggested)

Use materials with recycled content such that the sum of post-consumer recycled content, plus one-half of the pre-consumer content, constitutes at least 10% (based on cost) of the total value of the materials in the project.

Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10% (based on cost) of the total materials value.

Use rapidly renewable building materials and products (made from plants that are typically harvested within a ten-year cycle or shorter) for 2.5% of the total value of all building materials and products used in the project, based on cost.

Use a minimum of 50% of wood-based materials and products, which are certified in accordance with the Forest Stewardship Council's (FSC) Principles and Criteria, for wood building components. These components include but are not limited to, structural framing and general dimensional framing, flooring, sub-flooring, wood doors and finishes. LEED-NC, MR 4-7

tools

- Method, calculations and tables for determining quantities, for sustainable materials used, from the LEED-NC Materials and Resources section, Credits 4-7.
- Method for defining recycled content, International Standard, ISO 14021-1999- Environmental Labels and Declarations- Self-Declared Environmental Claims (Type II Environmental Labeling) www.iso.org
- Green Seal program, http://www.greenseal.org/

supplemental resources

- Certified Forest Products Council, www.certifiedwood.org
- EcoDesign Building Products, www.ecodesign.bc.ca/products
- Forest World, www.forestworld.com
- GreenSpec: The Environmental Building News Product Directory, www.greenspec.com
- Matrix of recycled content levels and product availability, http://www.ciwmb.ca.gov/GreenBuilding/Materials/Matrix.htm
- Recycled Contents Products Database, www.ciwmb.ca.gov/rcp
- Oikos, www.oikos.com
- Guide to Resource-Efficient Building Elements, www.crbt.org/index
- Recycled content products manufacturers database, http://www.ciwmb.ca.gov/rcp/

comprehensive waste management

goals

- Reduce the amount of waste generated by building occupants that is hauled to and disposed of in landfills.
- Promote ongoing resource conservation in the operation of the building.

technical strategies

- Design building to accommodate areas for recycling of waste materials
- Provide an easily accessible area(s) dedicated to the collection and storage of non-hazardous materials for recycling.
- Items to be recycled:
  - Containers
    - Plastic
    - Cans
    - Glass
    - Paper
    - Newspaper and advertising inserts
    - Corrugated cardboard
    - Magazines, catalogs and phone books
- Prepare an operational waste prevention and recycling plan. Have an assigned person responsible for the implementation and updating of the plan as necessary.
- Educate building users and offer incentives/reward programs for recycling
- Adopt green meeting practices
- Make purchasing decisions that use products with recycled content, avoid product with excessive packaging, etc.

performance indicators

- Recycling keeps prices down COMMUNITY IMPACTS AND RELATED COST (ECONOMIC IMPACTS)
- Recycling cuts down on the amount of garbage we throw away and bury (ENVIRONMENTAL IMPACTS (WASTE PRODUCTION)
- Recycling reduces air pollution (ENVIRONMENTAL IMPACTS (WASTE PRODUCTION)
- Recycling conserves our natural resources (ENVIRONMENTAL IMPACTS (WASTE PRODUCTION)
- Recycling creates jobs COMMUNITY IMPACTS AND RELATED COST (ECONOMIC IMPACTS)

Recycling Area Guidelines	
Commercial Building Square Footage [sf]	Minimum Recycling area [sf]
0 to 5,000	82
5,001 to 15,000	125
15,001 to 50,000	175
50,001 to 100,000	225
100,001 to 200,000	250
200,001 or greater	500

technologies/techniques

- Designate well marked collection and storage areas for recyclables. The above table provides guidelines for the recycling storage area based on overall building square footage. The intent is for the building owner and the design team to size the facilities appropriately to the specific building operations.
- Incorporate into the building design, recycling facilities such as compactors, chutes or other technologies to accommodate predicted volumes.

performance goals/leed credits

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and Technical Strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Level 1 (Required)

Publicize the availability and benefits of the drop-off point(s), station(s), or services:

- Include at least one drop-off point as part of the project, available to all project occupants for office or household potentially hazardous wastes such as paints, solvents, oils, batteries; OR determine that the local government jurisdiction provides services for collecting these materials. If a plan for post-collection disposal or use does not exist, establish one.
- Include at least one recycling or reuse station as part of the project, available to all project occupants, dedicated to the separation, collection, and storage of materials for recycling, including at a minimum: paper, corrugated cardboard, glass, plastic and metals; OR determine that the local government jurisdiction provides services for recycling services for these materials. If a plan for post-collection use does not exist, establish one.
  LEED-ND, GCT Credit 19

Level 2 (Suggested)

- Include at least one compost station as part of the project, available to all building occupants, dedicated to the collection and composting of food wastes; OR determine that the local government jurisdiction provides services for composting materials. If a plan for post-collection use does not exist, establish one.
  LEED-ND, GCT Credit 19

Prepare and implement a building user recycling plan and guidelines in conformance with the Milwaukee Recycles website.

tools

- Mayoral Directive on Waste Prevention and Efficient Materials Management Policies of 1996.
- McGraw-Hill Recycling Handbook by Herbert F. Lund, McGraw-Hill, 2000.
- GSA Recycling and Waste Reduction Fact Sheet

supplemental resources

- City of Milwaukee Recycling, http://www.mpw.net/Pages/MilwaukeeRecycles.htm
- Earth 911, Information regional links on recycling, www.earth911.org/master.asp
- U. S. Conference of Mayors, information on workplace recycling efforts, www.usmayors.org/USCM/recycle
- Recycling/pollution prevention resource, EPA Office of Solid Waste, www.epa.gov/epaoswer/osw/recycle.htm
- Building for Environmental and Economic Sustainability (BEES) Software offers information on cost effective, environmentally-preferable building products. http://www.bfrl.nist.gov/oae/software/bees.html

indoor environmental quality

"In the struggle to build cost-effective buildings, it is easy to forget that the ultimate success or failure of a project rests on its indoor environmental quality.

Healthy, comfortable employees are invariably more satisfied and productive."

- Whole Building Design Guide, WBDG Sustainable Committee - June 2007

Acceptable indoor air quality is defined by ASHRAE 62-1989 as "air in an occupied space toward which a substantial majority of occupants express no dissatisfaction and in which there are not likely to be known contaminants at concentrations leading to exposure that pose a significant health risk." A high level of indoor environmental quality is a goal that can have a significant positive affect on the building occupants' health, which in turn leads to lower absenteeism rates and higher productivity. Through the strategies and technologies following, a building can be a healthy place to live work and/or play, as well as a place where the building occupant has the opportunity to monitor and control for optimum thermal comfort.

indoor environmental quality

indoor environmental quality

goals

- Provide a comfortable temperature and humidity environment in the building.
- Provide a clean and pollutant free environment during, as well as post-, construction/renovation.
- Eliminate tobacco use within the building to create a healthy environment for all.
- Provide individual and specific group lighting control to promote productivity, comfort and satisfaction among building occupants.
- Provide individual control for thermal comfort.
- Provide a well ventilated building.
- Strive for a 'living' building that makes the Brewery neighborhood and environment healthier.
- Provide space with excellent acoustical characteristics based on the program and use of the space.

technical strategies

- Provide mechanical or natural space ventilation to maintain thermal comfort conditions as per the ASHRAE 55 2004 requirements. Incorporate into the design in the early phases of the project.
- Provide building mechanical systems that would meet or exceed the outside air requirements set by ASHRAE 62.1 2004. For naturally ventilated spaces meet the ASHRAE 62.1 2004 requirements.
- Prohibit smoking in the buildings. Designate exterior smoking areas located away from the building entries.
- Control dust and pollutants during the construction/renovation process. Follow guidelines created by SMACNA to reduce indoor air quality problems during construction/renovation.
- Protect construction materials from moisture damage and provide a comfortable and clean environment for the construction workers.
- Provide building flush out post-construction and pre-occupancy of building users. This reduces the space pollutants present after construction clean up is completed and reduces building construction material odor.
- Adhesives, sealants, sealant primers, paints, coatings, wood finishes and other such compounds used during construction are one of the major sources of pollutants in the building. Use adhesives and sealants with lower VOC (Volatile Organic Compounds) levels.
- Provide occupancy lighting sensors for all spaces to conserve lighting energy when space is not in use.
- Provide individual lighting level controls for individual occupants and common multi-use spaces.
- Provide a building HVAC system that allows thermal comfort control for individual occupants or specific groups in multi-occupant spaces.
- Provide active and passive living walls inside the buildings. Multiple smaller living wall systems can also be designed to serve individual spaces.
- There are four major aspects of space acoustics to consider when designing a space. These aspects should be evaluated through integrated design approach in order to apply the best strategies and techniques to meet the space acoustical programming requirements. The four aspects include; external sound isolation, MEP sound source control, equipment vibration control, and

room acoustical characteristics.

- External sound is the sound entering the building from sources external to the building. This includes traffic and externally located equipment noise.
- MEP sound control can be sub-divided into transmission noise from equipment (for example, noise through mechanical room walls and noise through ceiling for above ceiling mounted equipment) and airborne noise traveling through the HVAC ductwork.
- Vibrations for building service equipment can cause noise concerns in occupied spaces. It is important to control vibrations at the source to eliminate vibration transmission through building structure and walls.
- The space acoustical characteristics should be thoroughly evaluated to meet the desired space function as well as sound levels. For example, space carpet, rugs, acoustical ceiling tiles and other soft surfaces lower the sound levels in the space.

performance indicators

- The West Bend Mutual Insurance Co. of West Bend, WI built a new 150,000 square foot building for 500 employees. It was constructed in 1991 for $90 per square foot, when market averages were $125 per square foot. The building has energy efficient lighting, better windows and shell insulation, and an efficient HVAC system. PROJECT CONSTRUCTION COSTS HUMAN IMPACTS AND RELATED COST (HEALTH AND WELL-BEING/PRODUCTIVITY)
- In a typical office/commercial building, energy costs average $1.50 to $2.50 per square foot, while salaries exceed $200 per square foot. Cutting energy use in half typically saves $1 per square foot per year, while boosting productivity just 5% saves more than $10 a square foot. HUMAN IMPACTS AND RELATED COST (PRODUCTIVITY)
- ASHRAE 55 2004 provides the criteria to meet thermal comfort satisfaction for most of the occupants. The standard uses a predicted mean vote (PMC) comfort model which provides the personal and environmental comfort factors based on different space functions, clothing, air speed and humidity. Occupant satisfaction can be addressed by complying with this standard. Research shows that thermal satisfaction increases performance among occupants that lead to higher profits, attendance and retention. HUMAN IMPACTS AND RELATED COST (HEALTH AND WELL-BEING/PRODUCTIVITY)
- ASHRAE 62.1 2004 sets the minimum outside air required for a building based on number of occupants, their function and types of spaces. The outside airflow per person required by ASHRAE 62.1 2004 is generally higher than that required by Wisconsin State Code. A better indoor environment is created at an expense of higher energy consumed to bring more outside air to temperature. HUMAN IMPACTS AND RELATED COST (HEALTH AND WELL-BEING)
- The minimum amount of outside air can be increased up to 30% over the value indicated by ASHRAE 62.1 2004. This provides a much better indoor air quality, however the energy cost can increase substantially if there is no energy recovery in the main air handling unit. It is important to have energy recovery if outside air is increased over ASHRAE 62.1 2004 requirements. PROJECT LIFECYCLE COSTS (O&M COSTS)

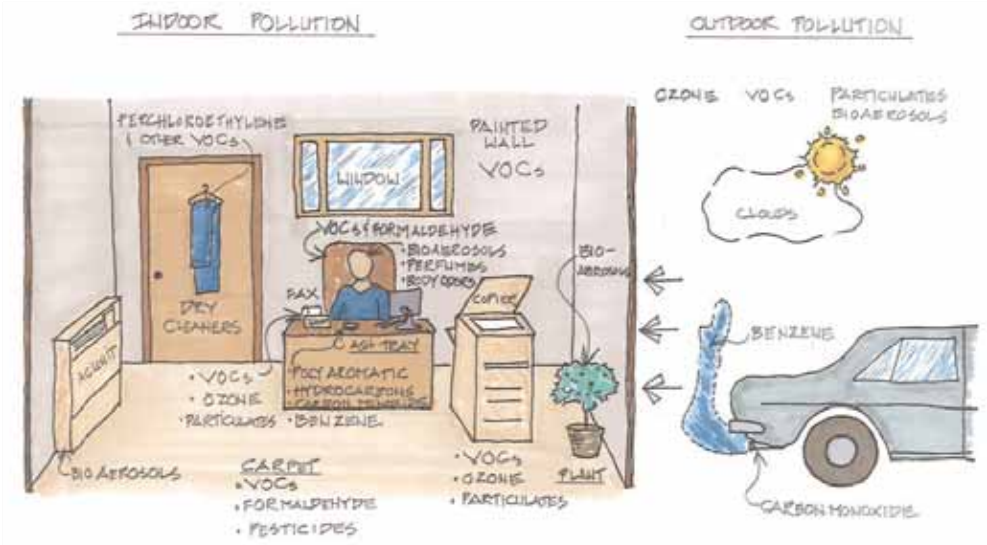
Compared to the old building, productivity increased 16%. Office temperature complaints dropped from 40 per day (at a documented cost of $25 per call plus $300 in maintenance) to two per week.

- Space CO2 monitors show the amount of CO2 particles per million in that space. CO2 monitoring can be used to increase the amount of outside air, if the space CO2 levels are above the recommended levels per ASHRAE 62.1 2004. HUMAN IMPACTS AND RELATED COST (HEALTH AND WELL-BEING)
- Smoking, as well as second hand smoke, can have adverse effects on health. It has been documented and demonstrated by many studies that tobacco use and second hand smoke have very adverse health effects including lung disease, cancer and heart attack. It is important to keep the indoor environment clean of tobacco smoke to create a healthy living and working environment for all occupants. HUMAN ASPECTS AND RELATED COST (HEALTH AND WELL-BEING/ HEALTHCARE COSTS)
- A construction site clean of dust and pollutants leads to fewer health problems among the onsite workers as well as a finished space that has better air quality for the occupants. By using temporary heating devices, the permanent building HVAC systems don't get exposed to construction dust. A construction air quality control plan should be created to address on site filtration, temporary heat, daily clean up by all trades, and ductwork/equipment protection. HUMAN IMPACTS AND RELATED COST (HEALTH AND WELL-BEING) PROJECT LIFECYCLE COSTS (CAPITAL COSTS)
- Post construction building flush out reduces the space pollutants present after construction cleanup is completed. It also reduces building construction material odors. There is research available that indicates a correlation between superior indoor air quality and worker productivity, and higher productivity generates higher profits for companies. Research shows that better climate control and improved air quality can increase employee productivity by 11% to 15% annually. Building flush out generally takes about two weeks right after construction clean up is completed, and the building is ready for occupancy. Allowance for building flush time should be included in the construction schedule to avoid any last minute conflicts. HUMAN ASPECTS AND RELATED COST (PRODUCTIVITY)
- Adhesives, sealants, paints, primers and other such chemical compounds used during construction cause odors, irritation and discomfort to the installers as well as occupants. Pollutant source control is the key for better indoor air quality. The lower the amount of pollutants in the space during construction, the lesser amount of clean-up and flush-out required. Using adhesives and sealants with lower VOC levels improves the air quality and reduces health related complaints during construction. HUMAN IMPACTS AND RELATED COSTS (HEALTH AND WELL-BEING)
- Building occupants have different comfort levels for lighting intensity. Occupant lighting level comfort level changes based on the type of function being performed. By providing task lights for occupants, users can have light intensity control over their space. Lighting controls for multi-occupant specific purpose spaces, such as conference rooms, allows the space lighting level to be modified with out making any changes to surrounding lighting levels. This allows the space to be effectively used whether for projector presentation or weekly team

meetings. Lighting control can not only increase space utilization, but also productivity which can lead to company profits and occupant job satisfaction. It is very important to use the integrated design approach and consider the combined effect of building lighting level controls, day lighting, space utilization, heat gain from lights, HVAC load and equipment size. Additional lighting controls may increase the first cost of the project, however they may also reduce the lighting electricity consumption as well as the cooling load on the building HVAC system, hence reducing the cooling energy consumption and even the HVAC equipment size which can offset the cost of additional lighting controls. HUMAN IMPACTS AND RELATED COST (PRODUCTIVITY) PROJECT LIFECYCLE COSTS (O&M COSTS)

- Occupant thermal discomfort complaints are one of the most common user complaints. These complaints generate service orders and eventually cost to building users. Studies show better thermal comfort can increase occupant performance and attendance. The additional cost of controls and HVAC system that allows for individual control can be offset by employee satisfaction and increased performance. Building occupant salary cost is the largest cost in the life-cycle cost of the building. Thus, occupant satisfaction can have a major impact on the overall building running cost. Individual control allows for better turn down on the HVAC system, which leads to energy savings.
- In 2002, the Environmental Protection Agency cited indoor air quality (IAQ) as one of the top five public heath concerns. Public awareness of indoor air quality has been enhanced by increased cases of human illness associated with poor air quality in schools, homes, and office buildings. Because modern buildings are designed to be sealed from the outdoors and to reduce both passive leakage and active ventilation, there is an increased risk for the development of fungicide, and a greater potential for illnesses such as Sick Building Syndrome (SBS). HUMAN IMPACTS AND RELATED COST (HEALTH & WELL-BEING/HEALTH CARE COSTS/PRODUCTIVITY)

NASA has estimated that SBS negatively affects workforce production by $60 billion per year in the United States. Indoor plantation and living walls are known to improve indoor air quality.



PRIMARY SOURCES OF INDOOR AIR POLLUTION

- In addition to improving indoor air quality, a living wall can contribute toward significant cost savings. Most buildings maintain indoor air quality by bringing in fresh air from the outside through ventilation systems. In the winter, outdoor air must be heated to room temperature, and in the summer it needs cooling. That adds up to 10% of the total energy a building consumes. A biofilter can substantially reduce the need to bring in fresh air by generating clean air indoors. If it is used to its fullest capacity, it can save 0.3 to 3.5 kilowatts per person in the height of summer and winter. PROJECT LIFECYCLE COSTS (OPERATION AND MAINTANENCE COSTS)
- Unlike standard filters, the living wall does not become saturated because the microbes break down the contaminants rather than simply soak them up. PROJECT LIFECYCLE COSTS (OPERATION AND MAINTANENCE COSTS)
- Another advantage of a living wall is the psychological benefit of green plants. A current research study is quantifying that effect at the University of Guelph-Humber in Toronto. Additionally, studies from Washington State University found that greening indoor office spaces can reduce absenteeism by 10% and boost productivity by 12%. The most eye-catching feature of the Integrated Learning Centre at Queen's University in Ontario is the living wall, located in the main lobby. Along with its functional benefits, the living wall is the central aesthetic feature of the building, prompting visitors and employees to frequently pause and enjoy this "indoor garden." HUMAN IMPACTS AND RELATED COST (ABSENTEEISM/ PRODUCTIVITY)
- In integrated design approach, space acoustics is an important part of space design. The acoustical design requirements for a restaurant are greatly different than that for an office environment. Designing/Engineering the space for the appropriate noise levels generates the appropriate mode for the space. The right acoustic comfort and mode fosters occupant comfort, satisfaction and a sense of well being. Appropriate levels of sound in space provides privacy and increases occupant performance. HUMAN IMPACTS AND RELATED COST WELL-BEING

technologies/techniques:

- For mechanical ventilation systems use enthalpy and temperature economizer function to utilize as much 'free' cooling and outside air as possible.
- Monitor space CO2 levels by placing CO2 sensors. Send CO2 level signals to building management system. The maximum space CO2 levels can be determined by Appendix A ASHRAE 62.1 2004. When space CO2 levels are above maximum levels permitted, building outside air can be increased to bring the levels with in limits.
- Prepare and implement during construction/remodel an indoor air quality control plan. This plan should recommend method of protecting HVAC equipment and include measures to avoid contamination of absorptive materials such as insulation, carpeting, ceiling tile, and gypsum wall board.
- Provide temporary heating systems during construction so that the permanent building systems are not contaminated by the construction pollutants.
- All adhesives, sealants and sealant

primers should comply with South Coast Air Quality Management District (SCAQMD) Rules. Incorporate the rule and VOC limits for these compounds in the project specifications.

- All paints, coatings and primers should comply with the Green Seal VOC Standards. Clear wood finishes, floor coatings, and stains should comply with VOC limits set by the SCAQMD Rules.
- To reduce the VOC levels from carpeting used in the building, meet the Carpet and Rug Institute's Green Label Plus program requirements.
- Lighting level controls can be achieved by using occupancy sensors, day lighting sensors, task lighting, scheduled lighting level control systems, and common space dimmable lighting controls. Appropriate lighting level controls should be designed early in the project based on space, layout and potential usage.
- Technologies that allow individual occupant control for thermal comfort include: operable windows, (integrated with building mechanical system control), under floor air distribution system with floor diffusers, desk or over head diffusers with integrated volume control and an integrated space zoning approach.
- Select a building site that is away from sound sources. Locate on-site sound sources (for example emergency generators) away form the sensitive areas in building.
- Where exterior noise-generating equipment is located close the building, exterior wall insulation can be increased and special sound absorbing blankets can be included in the exterior wall assembly. Careful tight assembly of the exterior wall is also important. Further, building mechanical systems outside air intakes and exhausts should be located away from such equipment.
- Building programming and interior space layout can locate sound sensitive rooms away from exterior sound sources.
- Mechanical rooms and noise generating equipment located inside the building should be coordinated with the space use classifications adjacent or close to them. Both airborne and thru wall transmission noise levels should be evaluated. Noise absorbing panels can be placed on mechanical room walls to reduce noise transmission into the adjacent spaces. Space acoustic buffers, such as corridors, lobbies and storage rooms, can also be used to separate noise sensitive areas with noise generating areas.
- Mechanical, electrical and plumbing equipment should be selected to reduce sound levels. Careful selection should be made for fans, pumps, pressure reducing valves, chillers, cooling towers, and other noise generating equipment.
- It is important not to exceed an aspect ratio of 4:1 on HVAC ductwork. Higher aspect ratio creates vibrations in the duct that can be heard through the ceiling and airside.
- Use double wall duct construction with rigid fiber board in the middle for all duct mains entering/exiting the chase and 10 feet from connection to the building central HVAC system. Exterior duct lagging can also be used. This reduces the duct break out noise. Round ducts have lower break out noise than rectangular ducts. Flexible duct connections should be used when connecting ductwork to mechanical equipment to reduce vibration conduction. Use up to 5 feet of flexible duct when connecting to diffusers to reduce airborne noise. Ductwork branch balancing dampers

should be located at the branch take-off the main.

- Major mechanical, electrical and plumbing equipment should be installed at the lowest level in the building to reduce vibration in structure and additional structural cost to eliminate that. All major equipment should be installed on housekeeping pads with vibration isolators. For sound sensitive areas, ductwork and piping can be hanged using vibrating isolator springs to reduce vibrations from equipment being carried over to occupied spaces.
- Sound attenuators can be used in ductwork to reduce airborne noise. However, they should be used as a last resort due to the addition of static pressure on the system fans that leads to greater energy consumption.
- Use the following table based on ASHRAE Applications 2007, 47.34 to design space sound levels;
- A living wall is a vertical garden. Plants are rooted in compartments between two sheets of fibrous material anchored to a wall. Water trickles down between the sheets and feeds moss, vines and other plants. This water could be re-used utility water. The plants may purify slightly polluted water, such as greywater, by digesting the dissolved nutrients. Bacteria mineralize the organic components to make them available to the plants. Thanks to the action of microbes that live on the plant roots, up to 90% of air impurities such as volatile organic compounds are metabolized. This process significantly improves indoor air quality in an environmentally sustainable manner. Indoor living walls, very suitable for Brewery projects, increase oxygen levels in re-circulated air.

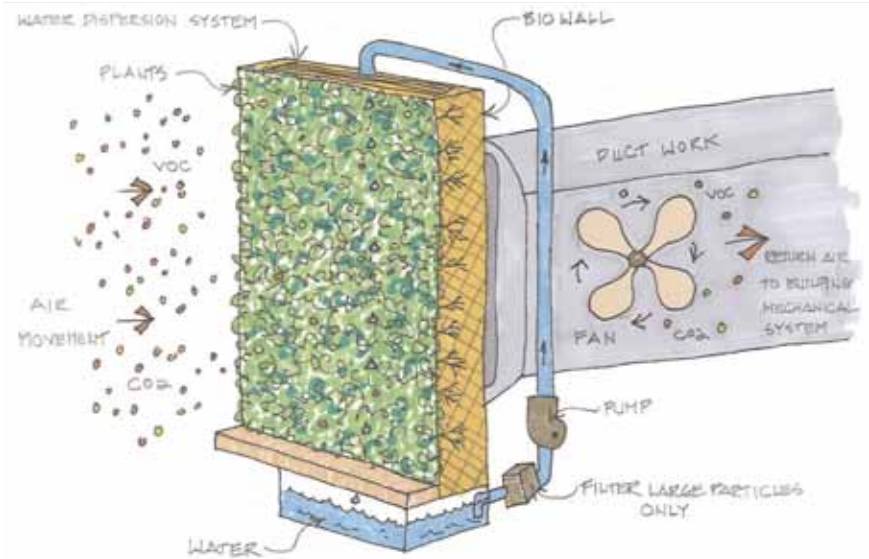
ROOM TYPES	RC(N)
Residences, Apartments, Condominiums	25 to 35
Hotels/Motels	
Individual rooms or suites	25 to 35
Meeting/Banquet rooms	25 to 35
Corridors, lobbies	35 to 45
Service/support areas	35 to 45
Office Buildings	
Executive and private offices	25 to 35
Conference rooms	25 to 35
Teleconference rooms	< 25
Open offices	< 40
Corridors and lobbies	40 to 45

Biowall
Robertson Office Building, Toronto

Living walls can be composed of plants only, which filter the air through their leaves and surface area. Living walls can also incorporate biofilters, which increase air filtration capacity. Biofiltration is defined as the process of drawing air in through organic material (such as moss, soil, and plants), resulting in the removal of organic gases (volatile organic compounds) and contaminants. Micro organisms inherent within the biofilter absorb, minimize, separate, break-down and transform dangerous compounds so as to re-circulate clean air. A study performed at the University of Guelph (Toronto, Ontario, Canada) in 2002 determined that up to 80% of dangerous compounds in indoor environments can be eliminated through the use of a biofilter.

Active Living Wall
Queen's University
Kingston, Ontario

"Active" living walls are joined to a building's air circulation system. Fans pull air through the wall and then re-circulate the air throughout the building. Even when the fans aren't running, air continues to slowly move through the wall. Some active walls are kept behind glass to create more predictable airflow effects. "Inactive" living walls have no mechanized air circulation. Instead, they are kept open to promote as much free air circulation as possible.



ACTIVE LIVING WALL

performance goals/leed credits

Note: Performance Goals/LEED Credits provide the "How to" for achieving the Goals and Technical Strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project, LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Level 2 (Suggested)

Meet the minimum requirements of Section 4 through 7 of ASHRAE 62.1-2004, Ventilation for Acceptable Indoor Air Quality. Mechanical ventilation systems shall be designed using the Ventilation Rate Procedure or the applicable local code, whichever is more stringent. LEED-NC, EQ PREREQ. 1

Naturally ventilated buildings shall comply with ASHRAE 62.1-2004, paragraph 5.1. LEED-NC, EQ PREREQ. 1

Prohibit smoking in the building (prohibit smoking in all common areas of the building for residential uses). Locate any exterior designated smoking areas at least 25 feet away from entries, outdoor air intakes and operable windows. LEED-NC, EQ PREREQ. 2

Install permanent monitoring systems that provide feedback on ventilation system performance to ensure that ventilation systems maintain design minimum ventilation, in accordance with the requirements of the LEED-NC EQ Section of the Reference Guide. LEED-NC EQ CREDIT 1

Design mechanically ventilated spaces to increase the breathing zone outdoor air ventilation rates to all occupied spaces by at least 30% above the minimum rates required by ASHRAE 62.1-2004. Design natural ventilation systems for occupied spaces to meet the recommendations set forth in the Carbon Trust "Good Practice Guide 237" and in accordance with the requirements of the LEED-NC EQ Section of the Reference Guide. LEED-NC, CREDIT 2

Develop and implement an Indoor Air Quality Management Plan for the construction and/or pre-occupancy phases of the building, in accordance with the requirements of the LEED-NC EQ Section of the Reference Guide. LEED-NC, CREDITS 2 and 3

All adhesives and sealants used on the interior of the building (defined as inside weatherproofing system and applied on-site) shall comply with the requirements of the standards referenced in the LEED-NC EQ Section of the Reference Guide. Paintings and coatings used on the interior of the building (defined as inside weatherproofing system and applied on-site) shall comply with the criteria listed in the LEED-NC EQ Section of the Reference Guide. LEED-NC, CREDIT 4.1 and 4.2

All carpet installed in the building shall meet the testing and product requirements of the Carpet and Rug Institute Green Label program and carpet cushion shall meet the requirements of the Carpet and Rug Institute Green Label program. All carpet adhesive shall meet the requirements specified in the LEED-NC EQ Section of the Reference Guide, with a VOC limit of 50 g/L. LEED-NC, CREDIT 4.3

Composite wood and agrifiber products used on the interior of the building (defined as inside weatherproofing system) shall contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins. LEED-NC, EQ CREDIT 4.4

Design to minimize and control pollutant entry into buildings at entryways that are directly connected to the outdoors and that serve as regular entry points for building users, in accordance with the requirements of the LEED-NC EQ Section of the Reference Guide. Design to minimize and control later cross-contamination of regular occupied areas where hazardous gas or chemicals may be present or used, in accordance with the requirements of the LEED-NC EQ Section of the Reference Guide. In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media, prior to occupancy, that provides a Minimum Efficiency Reporting Value (MERV) of 13 or better. Filtration shall be applied to process both return and outside air that is to be delivered as supply air. LEED-NC, EQ CREDIT 5

Provide individual lighting controls for 90% (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences.
AND
Provide lighting system controllability for all the shared multi-occupant spaces to enable lighting adjustment that meets group needs and preferences. LEED-NC, EQ CREDIT 6.1

Provide individual comfort controls for 50% (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences. Operable windows can be used in lieu of comfort controls for occupants that are 20 ft. inside of and 10 ft. to either side of the operable part of the window. The areas of operable window must meet the requirements of ASHRAE 62.1-2004, paragraph 5.1, Natural Ventilation.
AND
Provide comfort system controls for all shared multi-occupant spaces to enable adjustments to suit group needs and preferences. Conditions for thermal comfort are described in ASHRAE Standard 55-2004. LEED-NC, EQ CREDIT 6.2

Design HVAC systems and the building envelope to meet the requirements of ASHRAE Standard 55-2004, Thermal Comfort Conditions for Human Occupancy. Demonstrate design compliance in accordance with the Section 6.1.1 Documentation. LEED-NC, EQ CREDIT 7.1

Achieve a minimum Daylight Factor of 2% in 75% of all space occupied for critical tasks, with activity based exceptions, in accordance with the requirements of the LEED-NC EQ Section of the Reference Guide. LEED-NC, CREDIT 8.1

Achieve a direct line of sight to vision glazing for building occupants in 90% of all regularly occupied spaces, excluding support spaces, in accordance with the requirements of the LEED-NC EQ Section of the Reference Guide. LEED-NC, CREDIT 8.2

tools

- A building occupant survey/ assessment should be used as a tool to verify effective thermal comfort of occupants. The survey should be carefully drafted to meet the project, occupants and owner's initial parameters of indoor air quality. It should collect anonymous responses for space users and evaluate their satisfaction with indoor environmental quality. A survey can also assist in trouble shooting any specific space issues that may have developed over time.

supplemental resources

- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), www.ashrae.org

- U.S. Environmental Protection Agency, www.epa.gov/iaq
- IAQ Guidelines for Occupied Buildings Under Construction, www.smacna.org
- South Cost Air Quality Management District (SCAQMD), www.aqmd.gov/rules
- Green Seal Standard, www.greenseal.org
- Carpet and Rug Institute, http://www.carpet-rug.org/
- Requirements, methods and tables found in the LEED NC Reference Guide, Indoor Environmental Quality (EQ) section.

human aspects

"What we are doing to the forests of the world is but a mirror reflection of what we are doing to ourselves and one another."

- Mahatma Gandhi -

The human aspects of sustainable site and building development are those which involve the greatest impact to the financial performance of an organization and/or development - in terms of direct costs and those more difficult to measure: innovation, well-being, productivity, and mental and physical health. People are affected by their atmosphere; whether the space is for working, living, playing or learning. Those aspects that are common sense - fresh, non-toxic indoor air, plenty of daylighting, high ceilings, and direct control over their environment - are those that make a significant, measurable difference in attracting tenants and talent, enhancing productivity and innovation and contributing to health and well-being. Outside the building, the human aspects of sustainability can affect segregation, income disparity, and socioeconomics overall. Interestingly, the people aspects are often disregarded, when in fact the people are the greatest financial investment - regardless of the use of the space.

There are several ways to examine how people are included in the financial performance of the building and its surrounding site. When the employment costs of the building users (tenants) are included in the building life cycle equation, the capital costs are about 3%, the operating costs about 6% and the personnel costs about 91% of the total life cycle costs of the facility. (FMA Australia, High Performance Facilities)

Or, looking at annual operating expenses of commercial space on a dollars-per-square-foot basis, by far, the largest item is salaries, followed by rent. Operations and maintenance and energy costs are relatively insignificant. A one percent savings in salaries or one percent productivity improvement of $2.00/s.f. per year, exceeds either O&M or energy costs.

WORKER PRODUCTIVITY	
Improved worker productivity ranges from 6% to 16%.	
Average cost per year for a typical US office:	
Salaries & Benefits	$318.00 per sf
Technology	$50.00 per sf
Mortgage/Lease	$16.00 per sf
Energy	$2.35 per sf
Churn	$1.00 per sf
TOTAL	$387.35 per sf
A 1% increase in productivity equals $3.18 per sf	
A 5% increase in productivity equals $15.90 per sf	
A 10 % increase in productivity equals $31.80 per sf	
In a 44,000 sf project, a 5% productivity increase could equal $699,600 per year!	

Environmental Building News, April 2005

In addition, only 2 percent of the 30-year costs of a building are in its initial construction -- another 6 percent is expended on operations and maintenance and the remaining 92 percent is spent on the people who work there. A one percent savings in personnel costs could justify increased construction cost for an improved working environment.

Bank of America chair Ken Lewis told Bob Fox that his **top goal for their New York-based building is to attract and retain the best employees**. For the Cook + Fox design team this meant that "we have to produce a building that is the healthiest and the best work environment we can," Fox said. This makes good economic sense: corporations' biggest expense is employees; increasing their productivity can yield substantial savings.

(The New York Academy of Sciences, "The High Performance High Rise, Transforming NYC's environment through sustainable design," Robert F. Fox, Jr., Fox + Cook Architects, Reported by Christine Van Lenten | posted Jan 26, 2006, http://www.nyas.org/ebrief/miniEB.asp?ebriefID=474

One Bryant Park; New York, New York; The Durst Organization Bank of America. Cook+Fox Architects

health and well-being

On floors occupied by the bank, exterior offices' inside walls will be glass, too, "so everyone has access to daylight. Everybody can see whether the sun is out; whether it's raining. They can look down into Bryant Park." This is "a huge advantage in terms of productivity and a sense of well-being," Fox observed.

Health and Well-Being is somewhat of an elusive term. Other segments within this Human Aspects section of the Guidelines, to varying degrees, fall under this broad term. For the sake of offering knowledge and how the technical sections are being applied, it has been maintained as its own segment.

The World Health Organization (www.who.int/), the leading authority for health within the United Nations System, established a Healthy Cities project in 1987. They defined a healthy city as "one that is continually creating and improving those physical and social environments and expanding those community resources that enable people to mutually support each other in performing all the functions of life and in developing to their maximum potential." The goal of the project is to improve health in urban areas.

The Organization has listed the following characteristics of the healthy urban area:

- A clean, safe physical environment of high quality;
- Stable and sustainable ecosystems;
- A strong, mutually supportive, integrated and non-exploitative community;
- A high degree of participation and control by inhabitants over decisions affecting their lives, health and well-being;
- Basic needs of all inhabitants met (in terms of food, water, shelter, income, safety and employment);
- Access to a wide variety of experiences and social and cultural resources;
- A diverse, vital and innovative urban economy;
- Enabling connections with the cultural and biological heritage of the various urban inhabitants;
- An urban form that is compatible with enhancement of all the other specified characteristics;
- An optimum level of appropriate public health and care services accessible to all; and
- High levels of positive health outcomes and low levels of morbidity.

Urban Environment, Royal Commission on Environmental Pollution, Lawton March 2007)

These characteristics translate well to the overall goals of The Brewery Project; both in terms of the site and the buildings.

goals

- Create environments sensitive to ecopsychology and biophilia principles
- Implement an organizational culture and/or lifestyle that promotes transportation through physical means (walking, biking, etc.) and outdoor connectivity encouraged during the workday.
- Provide clean indoor air
- Supply self-controlled environments
- Abundant natural daylight

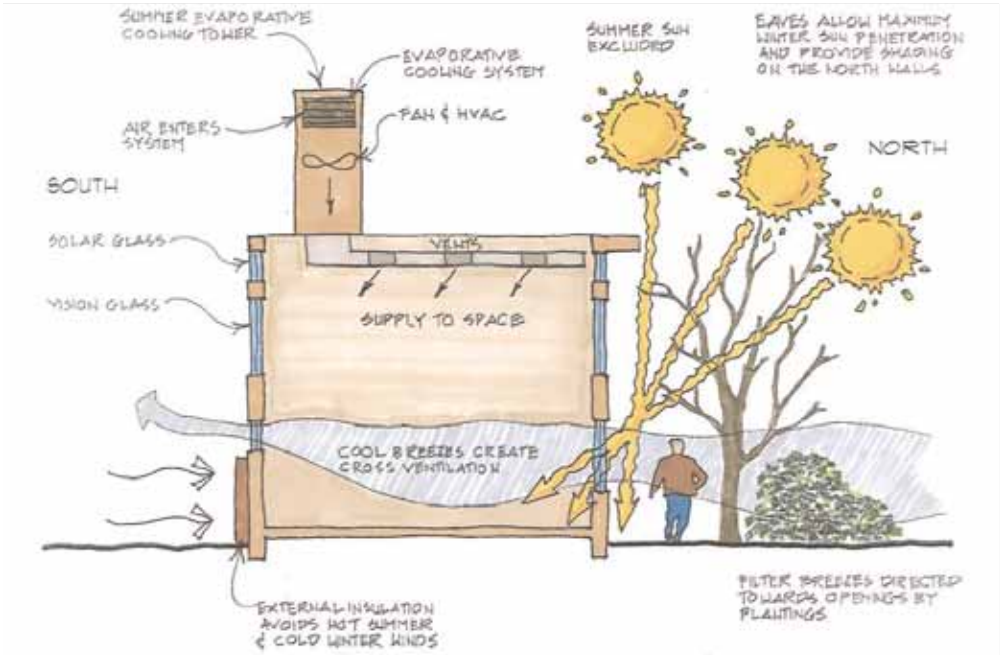
technical strategies

- Exposed thermal mass of building structure
- Night flushing of buildings
- Mixed mode HVAC
- Indirect evaporative cooling systems
- 95% filtered, pure, quiet, temperate air
- State-of-the-Art Ventilation
- Filter out particulate matter along with ozone and all volatile organic compounds (VOCs), known carcinogens contained in paint, carpet, and other materials.

- Utilize underfloor air distribution system and provide individual, adjustable, floor-mounted diffusers for occupants
- Flow as much controlled daylight as possible into the building interior, without glare
- Passive heating/cooling systems
- Reward employees/tenants for biking/walking as part of their day

performance indicators

- Increased worker productivity
- Enhanced tenant health
- Employee retention
- Lease rate and velocity



PASSIVE VENTILATION

technologies/techniques

- Integrate daylighting with electric lighting design to maximize net energy savings
- Operable windows
- High (≥14') ceiling heights
- Evaporative cooling systems often supply 100% outside air, increasing ventilation rates and reducing indoor pollutant concentration. Energy savings can reach 50%.
- Glass type varied by orientation and location
- Light sensors to control electric lighting
- Narrow floor plans to optimize natural daylight
- High benefit lighting upgrades
- Displacement ventilation

In some climates, direct or indirect evaporative cooling systems can replace compressor-based cooling. These evaporative systems supply 100% outside air; increase ventilation rates and reduce indoor concentrations of indoor-generated pollutants. Energy savings relative to compressor-based cooling can be significant. Research and technology transfer is needed to develop and optimize systems, quantify and demonstrate IAQ and energy performance gains, and evaluate and

address concerns about maintenance and increased indoor humidity.

performance goals/leed credits

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Level 2 (Suggested)

- Provide outdoor space for private gardens (residential)
- One organization-sponsored (non-residential), outdoor activity per month to take place during workday hours
- 95% filtered air
- No VOCs, no ozone
- Provide safe locker/shower facilities in non-residential buildings
- Provide incentives for physical activity

tools

- Direct and Indirect Evaporative Coolers: cost information http://www.toolbase.org/Technology-Inventory/HVAC/evaporative-coolers
- Daylighting http://www.betterbricks.com/default.aspx?pid=article&articleid=470&typeid=8&topicname=daylighting&indextype=

supplemental resources

- Business Week, "Is Your Office Killing You? Sick buildings are seething with molds, monoxide--and worse," Michelle Conlin, June 5, 2000. http://www.businessweek.com/2000/00_23/b3684001.htm
- Natural Capitalism, Hawken, Lovins and Lovins; http://www.natcap.org/
- The Urban Environment, Royal Commission on Environmental Pollution http://www.rcep.org.uk/urban/report/urban-environment.pdf
- CSE, "Underfloor air distribution is gaining popularity in today's built environment," R. Stephen Spinazzola, P.E., RTKL, 1/1/2007 http://www.csemag.com/article/CA6407672.html
- HPAC Engineering, "Variable-Speed Underfloor Fan Terminals Provide Perimeter-Zone Heating, Cooling"; February, 2007 http://www.hpac.com/GlobalSearch/Article/45207/
- Illuminating Engineering Society of North America http://www.iesna.org/

productivity

Nationwide, the value of improved productivity of office workers from indoor environmental improvements is estimated to be $20 to $160 billion. (W.J. Fisk, "Health and Productivity Gains from Better Indoor Environments and Their Relationship to Building Energy Efficiency,"
Annual Review of Energy and the Environment, 25: 537-566, 2000.)

The tenant may also consider the financial benefit of increased worker productivity, estimated in numerous case studies to be greater than 5 percent. For a company with 500 employees in the example building, a productivity increase of only 1 percent would represent a savings of approximately $250,000 per year. Land Development Today, May 2005

To achieve dual goals of reducing the impact on the environment along with harvesting the productivity gains possible from high performance facilities, higher first costs may be required. Revisiting the facility life cycle analysis and factoring in higher capital costs (30%), reduced operating costs (20%) and reduced personnel costs (10%) realizes a 10% reduction in the 30 year life cycle cost of the facility. High performance facilities can provide continuous benefit of eight new staff to the business and a 20% reduced impact on the environment. Mutual Insurance Headquarters, West Bend, Wisconsin completed in 1991 a 150,000 sf building for $90/sf when market averages were $125/sf. Workstations are equipped with Environmentally Responsive Workstations (ERW) that provides individual control over air flow, lighting, temperature and white noise. A raised floor system provides air supply, allowing displacement ventilation to reduce HVAC requirements. In comparison to their previous building, West Bend found that a 16% productivity increase (4-6% attributed to the ERWs) realized an annual savings of approximately $500,000.

Another notable case study that demonstrated the business case for daylighting in a large commercial structure evaluated Lockheed Building 157 in Sunnyvale, Calif. Several daylighting strategies enhanced visual comfort and reduced Lockheed's lighting cost by 75 percent. With daylight generating less heat than electric lighting, space cooling loads also fell. More importantly, management reported that employee productivity was up and absenteeism had declined. Lockheed officials indicated an increase in productivity by 15 percent on the first major project undertaken in the new facility, as compared to previous experience in their old facility.

goals

- Increase/enhance natural daylighting
- Increase ventilation while incorporating energy recovery systems

technical strategies

- daylighting
- daylight control to reduce HVAC loads
- light shelves for shading
- light and occupancy sensors
- narrow floor plans to optimize natural daylight
- high benefit lighting upgrades
- under floor air distribution
- displacement ventilation
- occupant control of heat, light and air
- operable windows and mixed mode HVAC
- exposed thermal mass of building structure
- advanced filtration and good ventilation rates
- properly commissioned and maintained HVAC systems

performance indicators

- Minimum 5% increase in productivity
- Productivity gains of a minimum of $125,000 annually

technologies/techniques

- installed more efficient lamps with better light quality
- lowered the ceiling to improve heating and cooling,
- sloped ceiling to enhance indirect lighting, bring daylight deep into space
- improved acoustics
- light shelves installed on the south side of the building
- fluorescent fixture dimmed with photocells
- glaze roof of atrium space

performance goals/leed credits

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Level 2 (Suggested)

- Maximize natural daylighting into all occupied building spaces.
- Worker productivity is increased by at least 5%.
- Provide individual temperature and lighting controls

tools

- AGi32 lighting design software, daylighting, http://www.agi32.com/
- Solatube, www.solatube.com

supplemental resources

- FMA Australia, "High Performance Facilities," September, 2003, ws_facility_ma[1].pdf www.nfee.gov.au/public/download.jsp?id=248
- Greening the Building and the Bottom Line, Romm and Browning, Rocky Mountain Institute, December, 1994 http://www.rmi.org/images/PDFs/BuildingsLand/D94-27_GBBL.pdf
- Building Operations Management, "Studies Relate IAQ and Productivity, GREEN BUILDING REPORT," Presented by the U.S. Green Building Council and Building Operating Management, David P. Callan, http://www.facilitiesnet.com/emails/bomarticle/112106.html

absenteeism/turnover

Health problems can be linked to absenteeism. A study of absenteeism among office workers in a large east coast company found that the absenteeism rate was 35% lower in offices with higher ventilation rates (about 50.85 cfm per person) compared with moderate rates of 25.43 cfm (Milton et al. 2000). The use of humidification and complaints about air quality were also associated with increased sick leave. The study analyzed sick leave of 3720 hourly workers in 40 buildings. The study controlled for gender, age, seniority, hours of non-illness absence, shift, ethnicity, crowding, and type of job.

At Verifone, Costa Mesa, California, 76,000 sf of office space was upgraded through increased daylighting, high performance windows, energy efficient air handlers, natural gas fired cooling system and 60% more insulation than code. Absenteeism dropped 40% due to improved comfort. "Verifone…has made healthy workplaces a top priority since the early 1990s…..I believe it has done more to boot productivity than all the bandwidth in the world." William R. Pape, cofounder, VeriFone, Inc.

goals

- Foster superior ventilation while concurrently maintaining energy efficiency

technical strategies

- Higher ventilation rates (air exchange between the inside and the outside of a building)
- Higher air circulation rates (air movement within and between the interior spaces of a building)
- Increased filtration
- Utilize natural ventilation
- Provide sufficient ventilation to dilute contaminants generated within the building space
- Disperse built-up air contaminants locally while not adversely affecting occupants' perception of temperature
- Incorporate heat exchange equipment to reduce energy costs by extracting heat from the facility's exhaust air stream before it is vented outside

performance indicators

- Lessened absenteeism
- Healthier tenants
- Reduced turnover

technologies/techniques

- Run-around coil systems: captures heat with methods other than exhaust air
- Regenerative heat wheels: either reduces entry of warm, moist outside air into the space or recovers heat and moisture that would have been exhausted for the building
- Heat pipes: compact in size but restrict location of supply/exhaust air streams
- Fixed-plate exchangers: typically quite large to perform effectively
- Operable windows and window placement

performance goals/leed credits

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Level 2 (Suggested)

- Outdoor air supplied to each room at a minimum of 15 cfm/person. (Wisconsin State Building Code designates 7.5)
- Outdoor air supplied to each room at 30% higher rate than ASHRAE 62.1 2004 suggests LEED-NC, EQ CREDIT 2
- Lessen absenteeism by a minimum of 15%

tools

- U.S. Department of Energy's Building Energy Software Tools Directory http://www.eere.energy.gov/buildings/tools_directory/subjects.cfm/pagename=subjects/pagename_menu=other_applications/pagename_submenu=ventilation_airflow

supplemental resources

- Ventilation Rates and Technologies, http://eetd.lbl.gov/ied/viaq/v_rates_6.html

biophilia/ecopsychology

Biophilia and Ecopsychology are closely related concepts. The biophilia theory developed by Edward O. Wilson, a Harvard biologist, purports an innate bond between human beings and nature. He defined biophilia, referring to humans' love of living things, as "the connections that human beings subconsciously seek with the rest of life."

"We care about biophilia in building design-or we should care-for two primary reasons. First, it is becoming increasingly well demonstrated that biophilic elements have real, measurable benefits relative to such human performance metrics as productivity, emotional well-being, stress reduction, learning, and healing. And second, from an environmental standpoint, biophilic features foster an appreciation of nature, which, in turn, should lead to greater protection of natural areas, eliminate pollution, and maintain a clean environment."

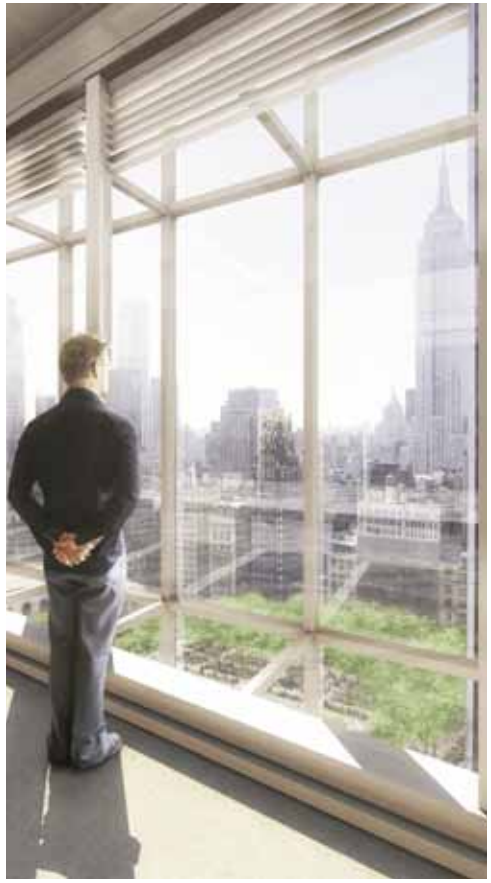
Environmental Building News
July 2006

Ecopsychology recognizes the relationship between humans and ecosystems. This science professes an emotional bond between human beings and the natural environment out of which we evolve. Restoring the earth and healing the mind are interdependent.

"At the heart of the coming environmental revolution is a change in values, one that derives from a growing appreciation of our dependence on nature. Without it there is no hope. In simple terms, we cannot restore our own health, our sense of well-being, unless we restore the health of the planet." (cf. Roszak et al, 1995; Roszak, 2001; Fisher, 2002 - authors of Ecopsychology, Restoring the Earth, Healing the Mind)

goals

- Create indoor spaces that connect people with nature: essential to human well-being
- Create outdoor spaces that foster reflection and revitalization
- Offer easy access to natural workspace outside the building
- Enhance site/immediate area surrounding the building to include rain gardens, labyrinths, "thinking" gardens (outdoor skunkworks)
- Maximize windows and access to windows - ideally operable



Clean air isn't the only thing that makes people happy. Fox's firm researched biophilia: human beings' innate desire to relate to nature and living things. Most office buildings don't promote it. One Bryant Park will-notably with exterior windows that stretch from the floor to ceilings 9 feet, 6 inches high.

technical strategies

- Create urban garden spaces for people, plants and wildlife; offer building tenants and residents the opportunity to help plant and maintain - use greywater to irrigate
- Walkable green roofs and rooftop gardens
- Develop indoor gardens that bring a light, pleasant sense of smell
- Incorporate living walls (both passive and active) into interior space
- Construct low-level green facades or living walls
- Fashion interior, daylit "streets" that are bordered with planters and gardens

Miller SQA Building
Holland, MI; William McDonough Architect

- Incorporate color patterns, furniture and finishings reflective of nature and made of natural materials
- Attract to the buildings birds and other non-pest creatures with small spaces that offer nesting, food and water
- Create a sense of place
- Maximum use of daylighting
- Incorporate water features

performance indicators

- Reduced absenteeism
- Attract and retain top talent
  - Measure, attract and retain rates in biophilia-designed environments; compare with prior space
- Increase lease rates, velocity
  - Track lease or condominium purchase velocity
  - Monitor lease rates. Are people willing to invest more in environments sensitive to biophilia?
- Inspire innovative thinking, enhanced critical thinking
- Reduced stress

Indoor tile mosaic stream,
Rainbow Valley Farm, New Zealand

Is artificial nature exhibited with fabricated outdoor scenery or tile emulating an actual river a deterrent from investing the effort in connecting with the real thing? There's debate. But it can be an effective supplement.

technologies/techniques

- SkyCeiling system (www.theskyfactory.com)
  An integrated design approach will help determine the sustainable costs and benefits of greater levels of energy (or other sources) required to incorporate these types of design elements
- See Indoor Air Quality section for information on living walls
- See Site Design + Planning and Water Management sections for information on green roofs confirm location

performance goals/leed credits

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Level 2 (Suggested)

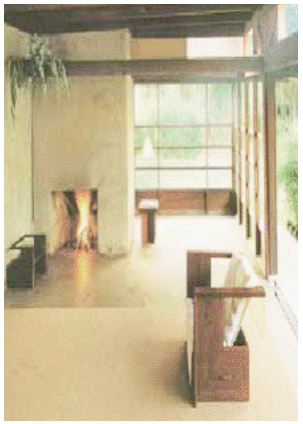
- One space within the building will offer connectivity to the environment
- See Indoor Air Quality section for information on living walls
- See Site Design + Planning and Water Management section for information on green roofs
- Streetscape and pocket parks are easily accessible and uniquely designed

tools

- Creating Urban Gardens http://www.greentreks.org/allprograms/roughterrain/urbangardening/index.asp
- Constructing grey water gardens http://www.abc.net.au/gardening/stories/s1366316.htm
- Wisconsin's Water library, grey water sources http://www.aqua.wisc.edu/waterlibrary/books_conservation.asp
- "Wastewater Gardens", creating urban oases and greenbelts by productive use of the nutrients and water in domestic sewage, Nelson, Treadwell, West Australia http://www.wastewatergardens.com/pdf/NELSON_UNEP.pdf
- See Indoor Air Quality section for information on living walls
- See Site Design + Planning and Water Management section for information on green roofs

supplemental resources

- *Ecopsychology, Restoring the Earth, Healing the Mind*, Roszak, Gomes, and Kanner, Sierra Club Books, 1995.
- Arousing Biophilia: A Conversation with E.O. Wilson, 1991 http://arts.envirolink.org/interviews_and_conversations/EOWilson.html
- *Last Child in the Woods*, Richard Louv, 2005
- Biomimicry Guild, http://www.biomimicry.net/
- *Biomimicry, Innovation Inspired by Nature*, Janine M. Benyus, 1997
- The Journal of Environmental Psychology, "The connectedness to nature scale: A measure of individuals' feeling in community with nature," F. Stephan Mayer, Cynthia McPherson Frantz, 2004 http://www.oberlin.edu/psych/pdf/mayer-frantz.pdf
- *Building for Life: Designing and Understanding the Human-Nature Connection*, Stephen R. Kellert, Island Press, 2005
- *The Biophilia Hypothesis*, Kellert, Wilson, 1993
- Creating Learning Communities http://www.creatinglearningcommunities.org/



Biophilic Office Space
photo credit: Rocky Mountain Institute

construction administration

"The starting point: respect nature. The ending point: imitate nature."

- Gunter Pauli -

The construction phase implements all of the projects sustainability goals and objectives. This section provides ways to reduce waste generated during construction, and methods for effective waste management, including salvage and recycling.

construction waste management

goals

- Divert construction and demolition debris from disposal in landfills and incinerators.
- Redirect recyclable recovered resources back to the manufacturing process.
- Redirect reusable materials to appropriate sites.

technical strategies

- Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted onsite or commingled.
- Consider recycling cardboard, metal (aluminum, copper, steel and brass), brick, acoustical tile, concrete, plastic, clean wood, glass, gypsum wallboard, carpet and insulation.

performance indicators

- Construction and demolition waste makes up about 30% of the total solid waste stream in the United States. Diverting waste from a landfill can generate revenue through the sale of high value material and can save money by avoiding tipping fees. PROJECT CONSTRUCTION COSTS COMMUNITY IMPACTS AND RELATED COST (ECONOMIC IMPACT)
- Recycling and reuse of building materials is an effective way of conserving our natural resources. ENVIRONMENTAL IMPACTS (WASTE REDUCTION)

Construction waste management

technologies/techniques

- Establish goals for diversion from disposal in landfills and incinerators.
- Adopt a construction waste management plan to achieve these goals.
- Identify licensed haulers and processors of recyclables.

performance goals/leed credits

Note: Performance Goals/LEED Credits provide the "How to" for achieving the Goals and Technical Strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Level 1 (Required)

- Recycle and/or salvage at least 50% of non-hazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be stored onsite or commingled. Excavated soil and land-clearing debris do not contribute to this credit. Calculations can be done by weight or volume, but must be consistent throughout. LEED-ND, GCT Credit 18

Level 2 (Suggested)

- Recycle and/or salvage at least 75% of non-hazardous construction and demolition debris. Excavated soil and land-clearing debris do not contribute to this credit. Calculations can be done by weight or volume, but must be consistent throughout.
- Prepare and implement a Construction Waste Management Plan in accordance with Waste Spec: Model Specifications for Construction Waste Reduction, Reuse and Recycling.

tools

- Calculations and table from the Construction Waste Management section (MR Credit 2) of the LEED-NC Reference Guide.
- Waste Spec: Model Specifications for Construction Waste Reduction, Reuse and Recycling by Triangle J Council of Governments, http://www.tjcog.dst.nc.us/

supplemental resources

- Waste Cap Wisconsin, www.wastecapwi.org
- Construction Materials Recycling Association, www.cdrecycling.org
- Contractor's Guide to Preventive Waste and Recycling by Resource Venture, http://www.resourceventure.org/
- A Sourcebook for Green and Sustainable Building, www.greenbuilder.com/sourcebook/ConstructionWaste.html
- Characterization of Building-Related Construction and Demolition Debris in the United States, US Environmental Protection Agency, Office of Solid Waste, EPA Report No. EPA530-R-98-010, June 1998.

operations and maintenance

"Sustainable design does not by itself result in high performance buildings. It must be combined with effective building operation and maintenance to achieve the desired results."

-Ward Hubbell -
Green Building Initiative President, testifying before the US Senate Committee on Environment and Public Works
(May 15, 2007)

Proper operation and maintenance of a building and its components, whether it be for: landscaping and other site features, building equipment and systems or general building upkeep and cleaning, ensures that a building can achieve the goals of aesthetic appeal, energy efficiency, cost-effective operation, resource conservation and pollution prevention. An effective O&M plan makes certain that systems perform the way the designer, engineer and contractor intended them to, and that they operate effectively to meet the requirements of comfort, health, productivity and safety for the building users.

site and landscape elements

goals

- Design for and install landscaping that requires a minimal amount of ongoing maintenance.
- Install high quality pavement and sidewalk material that require a minimal amount of ongoing maintenance.
- Install high quality utility piping and structures that require minimal amount of ongoing maintenance.
- Create a maintenance plan for landscape measures that maintains their long term viability and their aesthetic, as well as financial value.
- Have an efficient and cost-effective plan in place for the ongoing maintenance of pavement, walkways and utilities.
- Develop an efficient and cost-effective plan for the ongoing operation and maintenance of onsite stormwater management measures.

technical strategies

- Use landscaping designed to be "naturally manicured."
- Use native or indigenous landscaping, chosen to promote low maintenance and to reduce cutting as well as the long-term needs for water, fertilizers and fossil fuels.
- Prepare and plan for the care and maintenance of all site landscape measures. Have an assigned person responsible for the implementation and updating of the plan as necessary.
- Use ongoing stormwater best management practices such as street sweeping and stormwater flushing and sediment removal to extend the life of structural stormwater practices.
- Avoid storing extraneous equipment, products or other materials in outdoor areas.
- Use landscaping products with recycled content as required by EPA's Comprehensive Procurement Guidelines (CPG) for landscaping products.

performance indicators

- Landscaping requiring little or no long term maintenance and water provides savings for long term O&M cost. PROJECT LIFECYCLE COSTS (O&M COSTS)
- Using landscaping that requires little or no: fertilizers, pesticides, herbicides and watering, protects the environment and saves on water as a natural resource. ENVIRONMENTAL IMPACTS (WASTE REDUCTION)
- Non-structural measures such as pavement sweeping extends the life of stormwater BMP's and minimizes the amount silt entering the public storm sewer system. PROJECT LIFECYCLE COSTS (CAPITAL COSTS) COMMUNITY IMPACTS AND RELATED COST (INFRASTRUCTURE DEMAND AND ASSOCIATED COSTS)

technologies/techniques

- If necessary, use only non-toxic outdoor fertilizers and pesticides.
- Consider composting/recycling yard waste.
- Use low-maintenance storm water practices such as bioretention and rain gardens.

performance goals/leed credits

Note: Performance Goals/LEED Credits provide the "How to" for achieving the Goals and Technical Strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Level 2 (Suggested)
Install low maintenance native landscaping that does not require a permanent irrigation system.

Have in place over the performance period a low impact site and green building exterior management plan that addresses the topics below. One LEED-EB point is earned for each four items addressed:

- Maintenance equipment
- Plantings
- Animal and vegetation pest control
- Landscape waste
- Irrigation management
- Fertilizer use
- Snow removal
- Cleaning of building exterior
- Paints and sealants used on building exterior
- Other maintenance of the building exterior

Prepare and implement a documented maintenance plan for landscaping measures, approved by a Wisconsin registered landscape architect.

Develop and incorporate an operation and maintenance plan for all stormwater plumbing systems, in accordance with the WI Department of Commerce, Safety and Buildings requirements, Comm 82.36 (13).

tools

- Comprehensive Procurement Guidelines for landscaping products, US Environmental Protection Agency, www.epa.gov/cpg/products.htm#land
- WI Department of Commerce, Plumbing Code Comm 82

supplemental resources

- Landscape Management, US General Services Administration, www.gsa.gov/Portal/gsa/ep/channelView.do?pageTypeId=8195&channelPage=%2Fep%2Fchannel%2FgsaOverview.jsp&channelId=-16832
- Green Landscape with Native Plants, www.epa.gov/greenacres
- Water-Efficient Landscaping, U. of Missouri Extension, www.muextension.missouri.edu/xplor/agguides/hort/g06912.htm
- City of Milwaukee stormwater maintenance plan requirements, Manual of Storm Water Management Practices, www.city.milwaukee.gov/displayFile.asp?docid=12934&filename=/Groups/citySWMP/documents/Manual_of_Storm_Water_Management_Practices.pdf

building systems

goals

- Operate and maintain building mechanical systems in accordance with the design and construction intent; to maintain value, extend the life and ensure high performance of equipment.
- Provide maintenance and upkeep of equipment to ensure energy efficiency, as well as building user health and comfort.
- Prevent disruptive failures in the building and its systems.
- Ensure that facility managers, maintenance staff and appropriate building occupants are trained in how building equipment and systems should operate.
- Implement a plan that ensures all building systems continue to function as designed.
- Set performance goals and measure performance so that building can be benchmarked against other buildings.

technical strategies

- Bring O&M considerations to the table during the design phase. Have lead commissioning agent on board during the design phase to identify any potential barriers to good O&M and to suggest alternative design options.
- Design building systems and equipment for simplification of use and easy access for operation and maintenance.
- Prepare a comprehensive Operations and Maintenance Manual to include for example; monitoring of energy use, luminary, and filter maintenance.
- Make use of the commissioning report in the preparation of the O&M manual.
- Make any building O&M plan easily accessible to all building management, operations and maintenance personnel.
- Have appropriate building contractor(s) and engineer(s) train the building owner staff on the use and maintenance of building equipment and systems.
- Develop a Preventative Maintenance Plan to allow for continuous monitoring and maintenance of building equipment and documentation of all maintenance activities.
- Schedule for regular and periodic energy performance review of building systems.
- Prepare a Recommissioning Plan when appropriate, such as for a change in facility use, quality and schedule of maintenance activities, frequency of operational problems and whenever major energy consuming systems or controls are replaced.
- Turn off lights, computer, monitors and other equipment when not in use.
- Develop a building envelope maintenance program to ensure weather tightness and thus energy efficiency of the building envelope.
- Schedule regular window cleaning, especially in areas where windows are close to sources of airborn dust, fumes and gas, to maximize the designer's intent for daylighting.

performance indicators

- Measures intended to provide savings on O&M costs, can have a substantial impact for a builder/owner, since over the thirty year life of a building, the owner spends three times as much to operate and maintain a building than to design and build it. PROJECT LIFE CYCLE COSTS (O&M COSTS)
- By implementing a measurement and

verification plan of the building's energy use, optimization of the building systems can be achieved and thus minimize the cost and environmental impacts associated with energy use.PROJECT LIFE CYCLE COSTS (O&M COSTS) ENVIRONMENTAL IMPACTS (PRIMARY ENERGY)

- Properly operated and maintained systems not only ensures energy savings, but also provide savings in reduced damage/repairs and the extended life of building equipment. PROJECT LIFE CYCLE COSTS (O&M/CAPITAL COSTS)
- Continuously monitored systems allow for small fluctuations in indoor conditions to be picked-up and addressed before they have any negative impact on the building users. HUMAN IMPACTS AND RELATED COST (HEALTH AND WELL-BEING)
- Well-documented energy cost saving information will promote increased participation and higher levels of sustainable building achievements, therefore increasing energy efficiency and decreasing environmental impacts of buildings. ENVIRONMENTAL IMPACTS (PRIMARY ENERGY/GLOBAL WARMING POTENTIAL)
- Since salaries account for 92% of a facility's 30-year costs, an efficient and well-managed O&M plan increases productivity, reduces absenteeism, and makes the best use of a buildings most valuable resource, its employees and users. HUMAN IMPACTS AND RELATED COST (PRODUCTIVITY/ ABSENTEEISM/EMPLOYEE TURNOVER

technologies/techniques

- Use automated monitors and controls for energy, water, waste, temperature, moisture, and ventilation.
- Use schedule, occupancy, or luminary sensors to control lighting and other functions.
- Use timers for HVAC equipment.
- Enable power down features on office equipment when available (for example, Energy Star computers).
- Make use of performance tracking benchmarking tools such as ENERGYSTAR Portfolio Manager.

performance goals/leed credits

Note: Performance Goals/LEED Credits provide the "How to" for achieving the Goals and Technical Strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Level 2 (Suggested)

Prepare and implement a comprehensive Operations and Maintenance Manual, written in accordance with ASHRAE Guideline 4-1993.

Have in place over the performance period a building operations and maintenance staff education program that provides each staff person primarily working on building maintenance with at least 24 hours of education each year over the performance period. The education program should provide information on building and building systems operation, maintenance and achieving sustainable building performance. Training must be of high quality and relevant to building operations and maintenance.

A comprehensive Best Practices Equipment Preventative Maintenance Program established during the

performance period should include documentation of in-house resources or contractual services to deliver post-warranty maintenance.

Have in place over the performance period a system for continuous tracking and optimization of systems that regulate indoor air comfort and the conditions (temperature, humidity and CO2) delivered in occupied space. The system must include:

- continuous monitoring of system equipment performance and of the indoor environmental conditions delivered in the building
- alarms for performance or conditions that require repair
- a system in place that delivers prompt repairs to problems identified

Develop and implement a Measurement & Verification (M&V) Plan consistent with Option D: Calibrated Simulation (Savings Estimation Method 2), or Option B: Energy Conservation Measure Isolation, as specified in the International Performance Measurement & Verification Protocol (IPMVP) Volume III; Concepts and Options for Determining Energy Savings in New Construction, April, 2003. The M&V period shall cover a period of no less than one year of post-construction occupancy.

Document overall building operating costs for the previous five years (or length of building occupancy if shorter), and track changes in overall building operating costs over the performance period. Document building operating cost and financial impacts of all the aspects of LEED-EB implementation on an ongoing basis.

Agree to implement a thermal comfort survey of building occupants within a period of 6 to 18 months after occupancy. This survey should collect anonymous responses about thermal comfort in the building, including an assessment of overall satisfaction with thermal performance and identification of thermal comfort-related problems. Agree to develop a plan for corrective action if the survey results indicate that more than 20% of occupants are dissatisfied with thermal comfort in the building. This plan should include measurement of relevant environmental variables in problem areas in accordance with ASHRAE Standard 55-2004.

tools

- ENERGYSTAR Portfolio Manager, web-based tool that uses energy bill data and building characteristics to rank the building compared to a similar building, www.energystar.gov/benchmark
- International Performance Measurement and Verification Protocol (IP-MVP), non-profit organization that properly values energy efficiency, www.ipmvp.org.
- Methods, calculations, tables, plan requirements for achieving LEED-EB credits and determining building system costs, from the LEED-EB Reference Guide.

supplemental resources

- ASHRAE Guidelines 4-1993, Preparation of Operation and Maintenance Documentation for Building Systems, www.ashrae.org
- International Facility Management Association (IFMA), www.ifma.org
- Energy-Efficiency Operation of Commercial Buildings, by Peter Herzog, McGraw-Hill 1997.
- Preventive Maintenance and Building Operation Efficiency by the Building Owner's and Managers Association, http://shop.boma.org/showItem.aspx?product=213PREMAIN&session=1CC08CF1A1F

custodial operations

goals

- Protect the health and comfort of building occupants and decrease the environmental impact through proper housekeeping and operations activities
- Purchase non-toxic building cleaning products and supplies and employ safe custodial operations to reduce human exposure to physical and chemical hazards and odors.
- Purchase cleaning products and supplies that use less packaging, are concentrated and possibly biodegradable, to minimize environmental impacts.

technical strategies

- Use non-toxic pest controls as well as cleaning products for plant care and building cleaning for indoor spaces.
- Obtain the material safety data sheets for cleaning products and post in an area where they can be readily seen.
- Use Integrated Pest Management Practices in facilities.
- Coordinate custodial operations and building ventilation to ensure the adequate ventilation during and after cleaning.
- Keep air ducts clean and free of microorganisms through a structured program of preventative maintenance.
- Use textured versus smooth pavement for outside approaches to buildings, so that soil material can scrape off shoes prior to users entering the building.
- Install recessed metal grating in vestibules and tracking mats in entryways to again prevent dirt from getting into the building.
- Design restroom and kitchen areas with maintenance and cleaning considerations in mind.
- Provide adequate storage space and proper ventilation for cleaning product storage and mixing, in janitor closets.

performance indicators

- An efficient cleaning program and efficient use of cleaning products provides for savings in both labor and material O&M cost. PROJECT LIFECYCLE COSTS (O&M COSTS)
- Non-toxic cleaning products used in the appropriate quantity; reduce the potential for negative impacts on humans and the environment, and they use resources more wisely than conventional products. HUMAN IMPACTS AND RELATED COST (HEALTH AND WELL-BEING) ENVIRONMENTAL IMPACTS (WASTE PRODUCTION)
- Automated chemical dispensing equipment have an added upfront cost, but will save money over the life of the building by reducing overuse and waste of cleaning products, as well as avoiding costly spills. PROJECT LIFECYCLE COSTS (O&M COSTS)
- 80% of all dust and dirt in a building is tracked in on the shoes of those entering the building. Therefore, entryway tracking systems can: reduce contaminants in the building, save on cost for cleaning, and increase the longevity of flooring materials. HUMAN IMPACTS AND RELATED COST (HEALTH AND WELL-BEING) PROJECT LIFE CYCLE COSTS (CAPITAL COSTS)
- A well cleaned building environment leads to higher building occupant productivity as well as a reduction in work absenteeism. HUMAN IMPACTS AND RELATED COST (PRODUCTIVITY/ ABSENTEEISM)
- The Brengel Technology Center in Milwaukee has developed a Green

Housekeeping Plan which integrates a number of key elements for the safe and sustainable cleaning of the building. For example: entryway systems and a carpet maintenance program are in place to extend the life of the flooring, chemical concentrates are ordered when a chemical cleaning product is needed to minimize transportation and packaging cost, and all storage and mixing is restricted to designated, properly isolated and ventilated chemical storage areas for safety and to ensure good IEQ. PROJECT LIFECYCLE COSTS (O&M COSTS) HUMAN IMPACTS AND RELATED COSTS (HEALTH AND WELL-BEING)

technologies/techniques

- Use Green Seal or equivalent cleaning products to maintain healthy and efficient custodial operations.
- Use mechanically dispensed portion control devices for cleaning solution mixing and for soap and paper towel dispensing.
- Use vacuum cleaners with high-efficient vacuum bags or high efficient particle air (HEPA) filters, to ensure effective cleaning of carpeted areas.

performance goals/leed credits

Note: Performance Goals/LEED Credits provide the "How to" for achieving the Goals and Technical Strategies that are important to the Brewery. Level 1 goals are required by the Brewery Project LLC. Level 2 goals are encouraged and suggested, but not mandatory.

Level 2 (Suggested)

Implement sustainable purchasing for cleaning materials and products, disposable janitorial paper products and trash bags. Cleaning product and material purchases include building purchases for use by in house staff or used by outsourced service providers. Calculate the percentage of the total sustainable material and product purchase that meet at least one of the specified sustainability criteria. The percentage of total sustainable cleaning product and material purchases determine the number of LEED-EB points earned up to total of three points. One point will be earned for each 30% of the total annual purchase of these products (on a cost basis) that meet one of the following sustainability criteria:

- Cleaning products that meet the Green Seal GS-37 standard if applicable, OR if GS-37 is not applicable (e.g. for products such as carpet cleaners, floor finishes or strippers), use products that comply with the California Code of Regulations maximum allowable VOC levels
- Disposable janitorial paper products and trash bags that meet the minimum requirements of US EPA Comprehensive Procurement Guidelines.

Utilize over the performance period, entryway systems (grills, grates, mats, etc.) to reduce the amount of dirt, dust and pollen and other particles entering the building at all entryways, and develop the associated cleaning strategies to maintain those entryway systems, as well as the exterior walkways.

Have in place over the performance period, structural deck-to-deck partitions with separate outside exhausting, no air re-circulation and negative pressure in all janitorial closets. Provide hot and cold water in areas where janitorial equipment and chemicals are stored and cleaning chemical concentrate mixing occurs.

Have in place over the performance period, a low-impact environmental cleaning policy addressing:

- Sustainable cleaning systems.

- Use of sustainable cleaning products.
- Use of chemical concentrates and appropriate dilution systems
- Proper training and maintenance personnel in the hazards, use, maintenance and disposal of cleaning chemicals, dispensing equipment and packaging.
- Use of hand soaps that do not contain antimicrobial agents, except where required by health codes and other regulations.
- Use of cleaning equipment that reduces impacts on IAQ.

Develop, implement and maintain a low environmental impact integrated indoor pest management policy. Any cleaning products included in the integrated pest management policy must meet the requirements identified above.

Implement a policy for the use of janitorial equipment that maximizes effective reduction of building contaminants with minimum environmental impact. Cleaning equipment policy needs to specify that:

- Vacuum cleaners meet the requirements of the Carpet & Rug Institute "Green Label" Testing Program- Vacuum Cleaner Criteria and are capable of capturing 96% of particulates o.3 microns in size and operate with a sound level less than 70dBA.
- Hot water extraction equipment for deep cleaning carpets is capable of removing sufficient moisture such that carpets can dry in less than 24 hours.
- Powered maintenance equipment including floor buffers, burnishes and automatic scrubbers is equipped with vacuums, guards and/or other devices for capturing fine particulates, and shall operate with a sound level less than 70dBA.
- Propane-powered floor equipment has high-efficiency, low emissions engines.
- Automated scrubbing machines are equipped with variable-speed feed pumps to optimize the use of cleaning fluids.
- Battery-powered equipment is equipped with environmentally preferable gel batteries.
- Where appropriate, active micro fiber technology is used to reduce cleaning chemical consumption and prolong life of disposable scrubbing pads.
- Powered equipment is ergonomically designed to minimize vibration, noise and user fatigue.
- Equipment has rubber bumpers to reduce potential damage to building surfaces.
- A log will be kept for all powered housekeeping equipment to document the date of equipment purchase and all repair and maintenance activities and include vendor cut sheets for each type of equipment in use in the logbook.

tools

- Green Seal Standard GS-37 Industrial and Institutional Cleaners: General-purpose, Bathroom and Glass Cleaners, Green Seal, independent, non-profit organization, certifying and promoting environmentally responsible products and services, www.greenseal.org
- Methods, calculations and tables for achieving LEED-EB credits and defining sustainable cleaning methods and products, from the LEED-EB Reference Guide.
- EPA Cleaning Products Pilot Project, http://www.epa.gov/epp/pubs/cleaner.pdf

supplemental resources

- Regulations for Reducing VOC Emissions From Consumer Products, Title 17, California Code of

Regulations, Division 3, Chapter 1, Subchapter 8.5, Article 2, California Air Resource Board, www.arb.ca.gov

- EPA Comprehensive Procurement Guidelines, US Environmental Protection Agency, http://www.epa.gov/cpg/products.htm
- EPA Environmental Preferable Purchasing, http://www.epa.gov/epp/
- EPA Pesticides website, provides information on integrated pest management (IPM) and the environmental effect of pesticides, www.epa.gov/pesticides
- Protecting the Built Environment: Cleaning for Health by Michael A. Berry, Tricomm Twenty First Press, 1994.
- International Sanitary Supply Association (ISSA), an association of companies that manufacturers, markets and distributes cleaning products equipments and services, www.issa.com

to LEED® or not to LEED®

"Sustainability can only be achieved through better design."

- Edwin Datschefski - Biothinking, London

In the nine years since LEED was introduced as a pilot program in 1998, LEED and other green building rating systems have played a large part in transforming sustainable design and construction. What was once a small niche market driven largely by "saving the planet" has rapidly become the norm for mainstream building projects, driven now by long-term economic vision with energy savings and indoor & outdoor environmental quality. The marketing advantages of a green building are becoming increasingly evident to owners, developers and property managers. Having an official or market recognized third party certification, such as LEED or some other industry recognized rating system, gives "green" credibility, as well as marketing value to the building project.

The LEED (Leadership in Energy & Environmental Design) rating system is a nationally accepted benchmark, developed by the US Green Building Council, for design, construction, and operation of high performance green buildings. LEED promotes sustainability by recognizing performance in five key areas; sustainable sites, water savings, energy efficiency, materials selection and indoor environmental quality. In addition to the LEED for Neighborhood Development (LEED-ND) certification process, currently in process for the overall Brewery development, building specific LEED programs include:

- **LEED for New Construction (LEED-NC)**- LEED for New Construction and Major Renovations is a green building rating system that was designed to guide and distinguish high-performance commercial and institutional projects, with a focus on office buildings. Practitioners have also applied the system to K-12 schools, multi-unit residential buildings, manufacturing plants, laboratories and many other building types.
- **LEED Core and Shell (LEED-CS)**- LEED for Core and Shell Rating System encourages the implementation of green design and construction practices in areas where the developer has control. Broadly defined, core and shell construction covers base building elements, such as the structure, envelope and building-level systems. The LEED for Core and Shell product recognizes that the division between owner and tenant responsibility for certain elements of the building varies between markets. LEED for Core and Shell is designed to be complementary to the LEED for Commercial Interiors Green Building Rating System.
- **LEED for Commercial Interiors (LEED-CI)**- LEED for Commercial Interiors is a standard for certifying that high-performance green interiors of buildings are healthy, productive places to work, are less costly to operate and maintain, and reduce environmental footprint.
- **LEED for Existing Buildings (LEED-EB)**- LEED for Existing Buildings is a rating system for previously developed and occupied buildings. It provides a recognized, performance-based benchmark for building owners and operators to measure operations, improvements and maintenance on a consistent scale. This certification allows building owners to show an ongoing commitment to sustainability. USGBC provides free registration for LEED-EB, for any project already certified under LEED-NC or LEED-CS.
- **LEED-NC for Retail Application Guide**- This guide addresses the unique challenges and opportunities of implementing green building strategies into retail projects. USGBC is currently accepting applications for projects who would like to participate in the pilot test of the guide.

pros and cons of LEED certification

PROS:

- LEED certification provides national recognition that the building meets certain established standards for sustainability.
- LEED is a good fit for larger/high profile commercial building projects.
- LEED certified buildings have a growing market advantage.
- By going through the certification process, credits do not "fall by the wayside" when budget issues come up.
- The third party commissioning process, required as part of LEED, gives greater assurance that building systems do what they say they will do.
- LEED certification ensures the integrity of a green building project that doesn't cut corners.
- As more and more projects achieve LEED certification, the more these procedures, products and ideas become mainstream.

CONS:

- There is a registration fee and certification fee to the USGBC for a LEED certified project.
- LEED tends to be geared towards new construction projects versus rehab and renovated buildings.
- There are various soft cost associated with LEED certification including: energy modeling, commissioning and document preparation for submittal/downloading to USGBC for review and approval.
- Sometimes it is in the best interest of the building project for the available budget to be spent otherwise.
- LEED is not necessarily the best fit certification process for some smaller (10-30,000 sf) projects.
- A site and building can achieve a high level of sustainability, but if one prerequisite is not met, the project cannot become certified.

other green building rating systems

- Green Globes by Green Building Initiative www.thegbi.com - Green Globes is a whole building green management tool that includes an assessment protocol, rating system and design guide. The online rating system features modules for New Construction and Continual Improvement of Existing Buildings. The program provides feedback during each phase of the design process. Green Globes is less expensive then LEED and requires less paperwork. GBI currently offers the use of Green Globes and provides a web-based building assessment, free for its members.
- Energy Star Green Building Design by US Environmental Protection Agency http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager_intro - Energy Star is a building rating system based on energy use, with the building labeled as an Energy Star building if it achieves a rating of 75 or above. The program was established to identify and promote energy efficiency and also show that the building meets

industry standards for comfort and indoor air quality. One year after a building starts operating, owners can access the Energy Star website, enter their utility bills and see how the building is operating.

- Building Research Establishment's Environmental Assessment Method (BREEAM) by Building Research Establishment Limited (BRE) www.breeam.org/index.html - Program where credits are awarded in each area according to performance. A set of environmental weightings then enables the credits to be added together to produce a single overall score. The building is then rated on a scale of PASS, GOOD, VERY GOOD or EXCEL.
- Green Building Challenge; GB Tool by International Initiative for the Sustainable Built Environment (IISBE) http://www.greenbuilding.ca/ - A whole building rating tool that does require specific technical expertise. The rating tool is free with iiSBE registration.
- ISO 14000 by International Organization for Standardization (ISO) http://www.iso14000-iso14001-environmental-management.com/ - The new series of ISO14000 standards are designed to cover; environmental management systems, environmental auditing, environmental performance evaluation, environmental labeling life-cycle assessment, and environmental aspects in product standards.
- GREEN TIER by Wisconsin Department of Natural Resources (WI DNR) www.dnr.wi.gov/org/caer/cea/environmental - Green Tier is based on a collaborative system of contracts and charters crafted jointly by participating businesses and the DNR. It was put into place to streamline environmental requirements, and in many cases encourage new environmental technologies. Green Tier is designed to help environmentally responsible companies achieve environmental and economic gains.

metrics and funding

"The indicators a society chooses to report to itself about itself are surprisingly powerful. They reflect collective values and inform collective decisions. A nation that keeps a watchful eye on its salmon runs or the safety of its streets makes different choices than does a nation that is only paying attention to its GNP. The idea of citizens choosing their own indicators is something new under the sun - something intensely democratic."

- Donella H. Meadows -
(1941-2001), Ph.D. in biophysics, Harvard University; founder of the Sustainability Institute; Pew Scholar in Conservation and Environment; MacArthur Fellow.

The following metrics represent a collection of possibilities for future assessment by Zilber and The Brewery Project ownership. These metrics are not currently in place for valuation; instead, they are included in the Guidelines as a placemark and for future reference as The Brewery Project becomes a change-making development.

Milwaukee is a great city. It is rich in history and traditions representative of American culture - hard work, innovation, community. Milwaukee is Wisconsin's major population center built around an increasingly valuable water resource - the glorious Lake Michigan. Milwaukee will grow and prosper as long as new urbanism and sustainability build momentum in an effort to increase wages and lessen inequality, segregation, and poverty - to create a region rich with live+work+play+learn opportunities that draw people of all ages and cultures to experience its sense of vibrant community.

To measure the outcomes of the Sustainability Guidelines, suggested performance indicators have been developed for future assessment. Criteria considered in the creation of the indicators included: relevance, reflective of The Brewery Project values, attractive to local media (press publicizes and uses to analyze community trends), statistically measurable, logically defensible, reliable, leading (provide information while still time to respond), and policy-relevant.

The performance indicators as outlined and compared in these Guidelines are the beginning of a process. These indicators would benefit from developer, agency and community feedback to successfully monitor outcomes. Whenever appropriate, the performance-based guidelines replace prescriptive measures. There are linkages - how the social, economic and environmental systems overlap each other - that will, as development progresses within the Brewery, become increasingly notable.

The performance indicators of real outcomes to be calculated in applying these guidelines (to be further developed in following phases) include subsets of the following:

- Project Lifecycle Costs
- Operation and Maintenance Costs
- Building Value Impacts
- Marketability
- Human Impacts and Related Cost
- Environmental Impacts
- Community Impacts and Related Cost

These suggested performance indicators could serve as a measurement tool to evaluate trends; they are not benchmarks. Throughout the Guidelines, performance indicators are referenced.

potential performance indicators

These indicators have been created as a starting point for future discussion. They are relevant to The Brewery Project and may be implemented to measure project lifecycle costs, building value impacts, marketability, human impacts and related costs, environmental impacts, and community impacts and related cost. These are the measurable costs and benefits associated with all aspects of The Brewery Project and referenced throughout the Guidelines.

As the indicators are revisited and evaluated in the future, they will need to be quantified. For example, an indicator listed under Human Impacts and Related Cost currently states, "Employers in The Brewery will realize a reduction in absenteeism as a result of constructing a high performance building." If The Brewery Project owners determine this should remain as a valuable indicator, a specified reduction - such as 15% - needs to be defined.

It is noted at various points of this section that current city of Milwaukee property values, lease rates, lending rates and other metrics are cited and compared with those realized of The Brewery

Project. These comparative city of Milwaukee or state of Wisconsin values should be documented at the time when building owners begin to measure project-specific outcomes.

project lifecycle costs

Project capital costs

The building project economics that involve initial, substantial commitments of capital are dependent to a large degree on how the project recovers the cost of the initial capital outlay. The outlay is comprised of both the cost of purchasing the building (or land) and the capital carrying cost.

Integrated design promotes a healthy trade-off exercise at the outset of examining capital costs; evaluating trade-offs and focusing on integrated solutions results in a high performance facility constructed at the same or even lower cost as a non-sustainable building. Examples of design and construction strategies that can reduce first costs (again, many of these strategies are inherent in the existing traits of The Brewery Project site:

- Optimize site and orientation
- Re-use/renovate older buildings and use recycled material
- Reduce project size
- Eliminate unnecessary finishes and features
- Avoid structural over-design and construction waste
- Fully explore integrated design, including energy system optimization
- Use construction waste management approaches
- Decrease site infrastructure
- Concrete with slag content or fly ash
- Carpet with recycled content
- Low-emitting paint and recycled paint
- Certified wood products
- Waterless urinals

The Department of Energy constructed a prototype building (two-story, 20,000-sf office building, Baltimore, MD) implementing these sustainable strategies realizing a reduction in first costs of up to $2.60/ft, lowering the total building cost by about 2%. http://www1.eere.energy.gov/femp/pdfs/buscase_section2.pdf

Potential Indicator: The Brewery Project developments will realize better than average (city of Milwaukee) building economics as a result of incorporating sustainable building systems. It is projected that debt incurred from capital costs will be recovered quicker as a result of savings gained from reduced project construction costs, higher tenant velocity, lower lending and insurance rates, and higher lease rates (the latter not applicable to affordable housing components). For some of these same reasons, capital costs may also be less at the outset.

Operation and Maintenance Costs

Sustainable operations and maintenance assures the efforts to design and construct a high performance building are preserved for the life of the building. Systems need to be operated with recycle-ability and occupant productivity, safety, health, comfort and security as a primary focus. Non-toxic cleaning products can maintain healthful indoor air quality; automated systems and regular testing of sensor control points assures energy efficiency; proper training minimizes system failures; waste minimization can be realized through source reduction and recycling; environmentally preferable landscaping practices can minimize the need for irrigation and toxic pesticides and fertilizers; and vehicular travel and improved health can be fostered through teleconferencing, working at home and bicycle/pedestrian travel.

"Steve Bushnell, product director with the Fireman's Fund, said green building properties like the Tower Building and Blair Towns are attractive to insurers because there's 'less risk in a building that is constructed with products and systems so state-of-the-art that they lower operating costs, increase resale [appraisal] values, create a healthier work environment, and provide an opportunity for greater worker productivity.'"

~ Dave Barista ~
June 1, 2007
(Building Design & Construction, "Building Owner Gets 5% Discount on Insurance Premium for Going Green"

Supplementary Measures, Lifecycle Costs

Supplementary measures of economic evaluation are Net Savings (NS), Savings-to-Investment Ratio (SIR), Adjusted Internal Rate of Return (AIRR), and Simple Payback (SPB) or Discounted Payback (DPB). They are sometimes needed to meet specific regulatory requirements. Payback measures, either SPB or DPB, are only consistent with Lifecycle Cost Analysis if they are calculated over the entire study period.

All supplementary measures are relative measures, i.e., they are computed for an alternative relative to a base case.

NS	=	Net Savings: operational savings less difference in capital investment costs
SIR	=	Savings-to-Investment Ratio: ratio of operational savings to difference in capital investment costs
AIRR	=	Adjusted Internal Rate of Return: annual yield from an alternative over the study period, taking into account reinvestment of interim returns at the discount rate
SPB	=	Simple Payback: time required for the cumulative savings from an alternative to recover its initial investment cost and other accrued costs, without taking into account the time value of money
DPB	=	Discounted Payback: time required for the cumulative savings from an alternative to recover its initial investment cost and other accrued costs, taking into account the time value of money

Evaluation Criteria

Lowest LCC (for determining cost-effectiveness)
NS > 0 (for determining cost-effectiveness)
SIR > 1
AIRR > discount rate
PB, DPB < than study period

Potential Indicator: The Brewery Project buildings will be operated and maintained within 10% of their initial levels of efficiency and indoor air quality.

building value impacts

- Property Values

  A sustainable approach to building and reconstruction contributes to higher property values. (Cite current downtown Milwaukee property values.)

Potential Indicators: The Brewery Project will realize higher than average downtown Milwaukee property values as a result of its sustainable, new urbanism model.

- Lending Rates

  Increasingly, lending rates are being adjusted downward by financial institutions to reflect the high performance building advantages of building green. *"Lenders respond to low vacancy, longer lease terms, and higher NOIs (net operating income), which are all factors that green buildings can positively influence,"* Dave Harmon, commercial lender, ShoreBank Pacific, as quoted in Land Development Today.

(Cite current lending rates among city of Milwaukee banks for traditional properties.)

Potential Indicators: The Brewery Project developers and owners may obtain lower lending rates in comparison to other developers and owners in the same region that are not utilizing high performance building strategies.

- Insurance Rates
  Insurance companies, such as the Fireman's Fund Insurance Company, have designed packages to provide lower premiums (5% discounts) for buildings certified under LEED and or other rating systems.

Potential Indicators: The Brewery Project developers and owners may obtain lower insurance rates in comparison to other developers and owners in the same region that are not utilizing high performance building strategies.

marketability

- Public Relations
  While sustainability is not a new approach to building design and construction, high performance building outcomes are of interest across all market sectors. The opportunities for positive public relations relative to sustainability, both internal and external to an organization, are plentiful.

"The quality of good press we've gotten out of this has been staggering…couldn't have bought that kind of press."

Dennis Wilde, Senior Project Manager, regarding media attention, The Brewery Blocks, Portland, Oregon; Gerding/Edlen Development Company

"Beyond any direct financial benefits, creating green projects is the right thing to do," said Wilde. "It also gives a developer greater market exposure, improved public and political relations and enhanced credibility, all of which can have significant value."

Potential Indicators: The Brewery Project will receive mounting media coverage relative to high performance outcomes, both internal to the organizations that belong to The Brewery Project community and external as they relate to the Project, the city of Milwaukee and the region. This media attention brings increasing recognition to The Brewery and attracts more developers, owners, tenants, and users.

- Lease Rates
  Green sites and buildings are increasingly realizing higher lease rates. Communicating these tangible, triple bottom line benefits is key.

"That leaves a major hurdle: educating the real estate community on the benefits of high-performance green buildings, which include lower insurance premiums, lower energy costs and healthier and more productive tenants. 'We believe that these will translate to ***higher lease rates****, better retention and, ultimately, lower cap rates,' "*

Ken Hubbard, executive vice president with Houston-based developer Hines. National Real Estate Investor, "Developers and Architects See the Light," July 1, 2003, Alexis Petrakis.

(Cite current downtown Milwaukee lease rates.)

Potential Indicators: The Brewery Project will realize higher than average downtown Milwaukee lease rates.

- Leasing Velocity (current velocity rates for downtown Milwaukee: office, living, retail, higher education)

Potential Indicators: The Brewery Project will realize higher than

average downtown Milwaukee leasing velocity.

- Retail Sales (current retail sales for downtown Milwaukee)

Potential Indicators: The Brewery Project will realize higher than average downtown Milwaukee retail sales per square foot.

(Cite current downtown Milwaukee retail sales.)

human impacts and related cost

- Health and Well-being
  The Brewery Project preserves, enhances and creates natural systems because they offer a richness that nurtures the human spirit as well as protects air and water quality.

(Cite physical and mental healthcare expenditures per capita in Milwaukee, or if not available, in Wisconsin.)

Potential Indicators: Residents of The Brewery project will be more physically and mentally healthy, overall, than the average city of Milwaukee or State of Wisconsin resident.

- Asthma
  As of 2007, the city of Milwaukee is ranked 7th out of 100 Asthma Capitals http://aafa.org/pdfs/FinalPublicList_AC_2007.pdf Metropolitan areas in the United States were evaluated in an annual research project conducted by the Asthma and Allergy Foundation of America. Asthma affects 9% of Wisconsin residents and roughly 7% of residents in the Milwaukee/Racine/ Waukesha corridor (American Lung Association, 2007, www.lungaction.org.)

Potential Indicators: Residents of The Brewery will experience an asthma rate less than city of Milwaukee average.

- Productivity
  As stated throughout these Guidelines, productivity increase is directly correlated with high performance space. It makes intuitive sense, but now numbers are being documented. And while energy and other operational savings are a valuable benefit of green buildings, the highest cost of business is its people.

Potential Indicator: Office space developed in The Brewery Project will demonstrate higher productivity levels as a result of high performance indoor environmental quality, an experienced sense of place and community

- Absenteeism
  Sustainable, high performance environments contribute to lower absenteeism in the workplace and schools. There are many studies that have been conducted indicating objective, measurable results averaging between a 30% and 40% reduction.

Potential Indicators: Employers in The Brewery will realize a reduction in absenteeism as a result of constructing a high performance building.

- Employee Turnover
  "Properties that take advantage of brownfield and other infill redevelopment, while offering proximity to mass transit, walking, biking and shopping/daycare services, have an automatic advantage in the race to attract top talent."

People are looking for healthy lifestyles and vibrant communities. As a result, sustainable neighborhoods result in attracting and RETAINING top talent, less employee turnover, and a healthy tenant mix and activity level. Nationwide, the average employee turnover rate including both employee-driven and employer-driven is 10%.

Potential Indicator: Businesses in The Brewery will realize a higher attraction rate and lower employee turnover rate than they experienced before locating to the neighborhood.

- Market Differentiation

  It is anticipated that the unique sustainable, live+work+play+learn environment associated with The Brewery Project will prove to differentiate itself successfully from other city of Milwaukee developments. Owners will appreciate the high performance buildings and sustainable site as they positively impact these organizations' triple bottom lines. It is postulated that the dedication to sustainability, as witnessed by these Guidelines, will also attract businesses and organizations that otherwise may have not considered the city of Milwaukee as a home.

  Successful market differentiation will have a positive impact on The Brewery Project's rate of sales. In turn, this heightened sales movement will be beneficial to the overall retail, lease, attract and retain activity for those organizations within The Brewery Project. It may be valuable to measure the rate of sales experienced by The Brewery in comparison with the activity levels experienced by other relevant, Milwaukee-based developments.

Potential Indicators: Organizations locating to The Brewery Project will realize greater triple bottom line outcomes compared with other/previous locations, if applicable.

"Green buildings also provide a higher quality work environment, and companies with healthy, productive employees who are comfortable in the workplace are more inclined to renew their leases."

Land Development Today, "Green Building Can Make Financial Sense," May 2005.

environmental impacts

- Primary Energy

In 2005, Wisconsin expenditures for energy increased 19.4%, totaling an estimated $18.5 billion on energy. Over $12 billion ($5,500 per household) of that investment left the state's economy since Wisconsin imports roughly two-thirds of its energy. http://www.doa.state.wi.us/docview.asp?docid=767

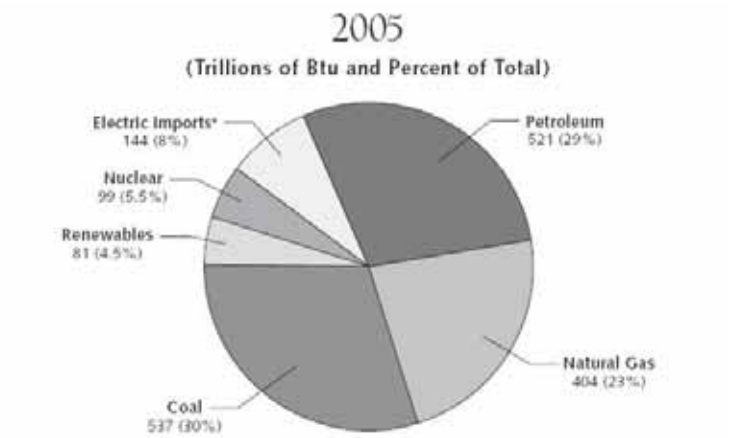
In addition, Wisconsin climate has been warmer than the 30-year normal 15 out of the last 16 years. Summers are getting warmer, burdening the electrical system with increased cooling needs.

Potential Indicator: The Brewery Project will set a goal to use less energy (in BTUs) per capita than the State average.

- Renewable Energy

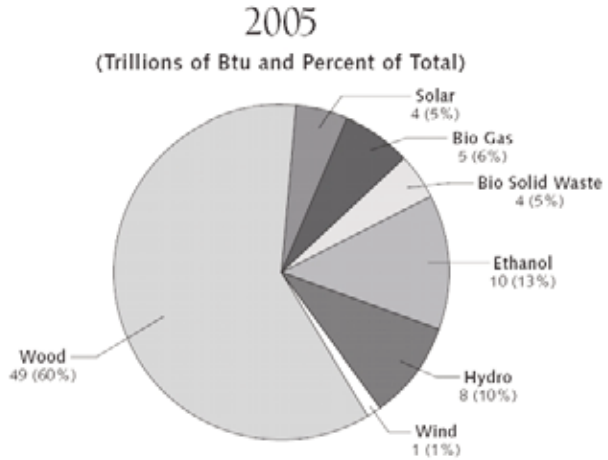
  Renewable energy investments, using primarily indigenous resources, will help keep energy dollars at home. Renewable energy production, being more labor intensive, can also create more jobs. In Wisconsin, renewable energy use increased 5.7% in 2005, primarily in wood and ethanol use.

Wisconsin Resource Energy Consumption, by Type of Fuel



State of Wisconsin, Department of Administration,
http://www.doa.state.wi.us/docview.asp?docid=768&locid=5

Wisconsin Renewable Energy Use, by Type of Fuel



State of Wisconsin, Department of Administration,
http://www.doa.state.wi.us/docview.asp?docid=4264&locid=5

The Brewery Project and its community of developers and owners can help drive this resource model by leading in renewable energy use for the purpose of not only providing cost- and environmentally-beneficial energy to its immediate development community, by also contributing to the state's economic development. Furthermore, modeling the use of under-utilized renewable sources such as wind and solar would help advance these other technologies throughout the region and the state. http://www.hawaii.gov/budget/puc/dockets/03-0371_LOL(Exhibit6)_2004-07-14.pdf

Potential Indicator: The Brewery Project will use a greater percentage of renewables than Wisconsin average.

This may positively affect climate change in the city of Milwaukee and Southeastern Wisconsin region.

- Waste Production
  (Cite the waste saved by The Brewery Project's demolition and waste recycling efforts.)

Potential Indicator: The Brewery Project maintained a higher recycling rate than the average realized on city of Milwaukee-based developments.

community impacts and related cost

- Community Infrastructure Demand and Associated Costs

- Pollution Prevention
  Together with the Milwaukee Metropolitan Sewerage District (MMSD), The Brewery Project is measuring, through on-site monitoring efforts, the pre-development runoff **quality** from the site.

- Water
  Together with the city of Milwaukee, The Brewery Project is measuring, through on-site monitoring efforts, the pre-development runoff **rate** and **quantity** from the site.

Potential Indicator: Stormwater runoff will be reduced by 25%. Water quality will be improved compared with pre-development levels.

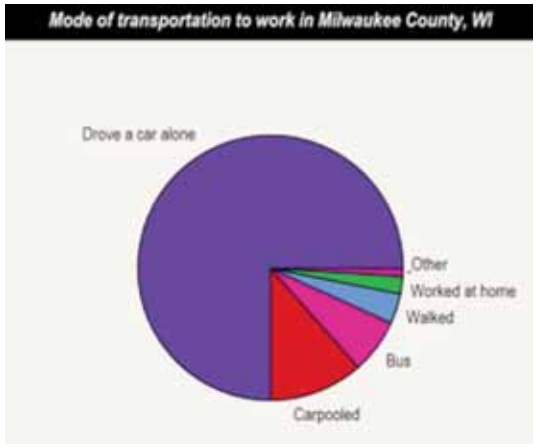
- Vehicle Miles and Fuel Consumption
  The city of Milwaukee 2005 estimated daily vehicular miles traveled was 25.7, ranking 10th out of 39 US urban areas (http://www.publicpurpose.com/).

Potential Indicator: Decrease the vehicular miles to less than city of Milwaukee average traveled by people who work and live at The Brewery Project.

- Community Assets Contributed by Project
  Local food production: increase number of local farmers selling produce on site

- Economic Impacts
  Economic development
  As of May, 2007, city of Milwaukee unemployment rates are at 7.1%.

Potential Indicator: The Brewery Project will contribute to an increased city of Milwaukee employment level, contributing new jobs to the city of Milwaukee and employing central city residents.



http://www.city-data.com/county/Milwaukee_County-WI.html

Means of transportation to work

- Drove a car alone: 320,665 (75%)
- Carpooled: 49,293 (12%)
- Bus or trolley bus: 28,507 (7%)
- Streetcar or trolley car: 136 (0%)
- Subway or elevated: 53 (0%)
- Railroad: 162 (0%)
- Ferryboat: 22 (0%)
- Taxi: 574 (0%)
- Motorcycle: 308 (0%)
- Bicycle: 1,234 (0%)
- Walked: 15,857 (4%)
- Other means: 1,853 (0%)
- Worked at home: 8,956 (2%)

- Income Distribution
  As stated in the Milwaukee Journal Sentinel dated August 29, 2007, 26% of the city of Milwaukee residents are living at or below poverty level.

Potential Indicator: Poverty level will decrease.

- Housing Affordability:
  Children living in poverty: In the city of Milwaukee 42.9% of the children are living in poverty (2002). http://www.greatermilwaukeefoundation.org/research/poverty.shtml

Potential Indicator: Children living in poverty will decrease.

- Crime Rate
  The City of Milwaukee violent crime rate ranks 19th among the country's 50 biggest cities and is better than the rates of such places as Minneapolis; Dallas; Sacramento, Calif.; Kansas City, Mo.; Nashville, Tenn.; Charlotte, N.C.; and Boston. 122 homicides 2005. Reduce the number.

Potential Indicator: Violent crime rates will fall.

- Segregation
  Milwaukee is among the most segregated metropolitan areas in the US.

  According to the federal bureau of labor statistics, Milwaukee has the widest employment gap between blacks and whites of any city in the US.

Potential Indicator: The Brewery will be occupied by a social/economically diverse group of occupants.

- Social Impacts
  Maintain pocket parks: contribution to open/green space. (Cite the percentage of pocket parks/open space of the total development.) Increased open space; parks were not part of the Pabst Brewery; enhanced.

Potential Indicator: The increased open space will be used for community events and other public uses, connecting various socioeconomic groups.

- Pedestrian and bicycle friendly streets
  Contribute to sustainable communities. (Cite the percentage of development that has pedestrian and bike systems.)

Potential Indicator: Trends will continue as a result of The Brewery Project as a model, thereby increasing walking and cycling in the city.

potential funding sources

When identifying potential funding sources, it is important to incorporate a couple rules of thumb:

1. Pursue local funding sources first
2. Develop a preliminary funding plan before making contacts with agencies
    a. Know what you need in terms of funding
    b. The performance outcomes of your project

Involving students or the community in your sustainable project, in terms of knowledge sharing or site use (green space, gardens, tours) can contribute to funding success.

local

www.dsireusa.org is an online database of renewable energy and energy efficiency incentive programs by state. Federal programs are also listed. This web site contains a more conclusive and detailed list of local funding and incentive-type sources.

1. Focus on Energy
    a. Renewable Energy Grant Programs

Incentive Type:	State Grant Program
Eligible/Renewable/Other Technologies:	Solar Water Heat, Solar Space Heat, Photovoltaics, Wind, Biomass, Anaerobic Digestion
Applicable Sectors:	Commercial, Industrial, Residential, Nonprofit, Local Government, Tribal Government, Institutional
Amount:	Varies by technology and estimated energy production
Maximum Amount:	$260,000 to any individual or business during each fiscal year
Equipment Requirements:	2-year installation warranty; 1-year equipment warranty; A system performance meter must be included in electric generating systems
Installation Requirements:	Following installation requirements of each technology
Effective Date:	7/1/07 - 12/31/07
Website:	http://www.focusonenergy.com/page.jsp?pageId=905

    b. Renewable Energy Cash-Back Rewards

Incentive Type:	State Rebate Program
Eligible/Renewable/Other Technologies:	Solar Water Heat, Photovoltaics, Wind, Non-Residential Wood-Burning Systems
Applicable Sectors:	Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, Tribal Government
Incentive Amount:	Varies by technology and type of project
Maximum Amount:	Varies by technologyr
Eligible System Size:	Wind: 20 kW maximum; PV: 0.5 kW - 20 kW ; Solar hot water and biomass combustion: 5,000 therms/year maximum
Equipment Requirements:	Requirements vary according to use of new or used equipment, warranty length, etc.
Installation Requirements:	Systems must comply with all federal, state and local codes. PV systems must be grid-tied; other technologies may be grid-tied or off-grid. Incentive levels vary accordingly.
Ownership of Renewable Energy Credits:	Remain with customer/generator
Effective Date:	December 31, 2007
Website:	http://www.focusonenergy.com/page.jsp?pageId=672&

2. State of Wisconsin

a. Solar and Wind Energy Equipment Exemption

Incentive Type: Property Tax Exemption

Eligible/Renewable/ Other Technologies: Passive Solar Space Heat, Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Photovoltaics, Wind, Solar Pool Heating

Applicable Sectors: Commercial, Industrial, Residential

Amount: 100%

Maximum Limit: None

Authority 2: Wis. Stat. § 70.111

Website: http://www.revenue.wi.gov/forms/govexmpt/pr-303.pdf

3. WE Energies

a. Biogas Buy-Back Rate

Incentive Type: Production Incentive

Eligible/Renewable/ Other Technologies: Biomass, Anaerobic Digestion

Applicable Sectors: Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, Agricultural, Institutional

Amount: $0.08 per kilowatt-hour (8.0¢/kWh) for on-peak generation; $0.049 per kilowatt-hour (4.9¢/kWh) for off-peak generation

Terms: Available to systems up to 800 kW in capacity; maximum aggregate capacity limit of 10 MW

Website: http://www.we-energies.com/business_new/altenergy/custgen.htm#terms

b. Solar Buy-Back Rate

Incentive Type: Production Incentive

Eligible/Renewable/ Other Technologies: Photovoltaics

Applicable Sectors: Commercial, Industrial, Residential, Nonprofit, Schools, Agricultural, Institutional

Amount: $0.225 per kilowatt-hour (22.5¢/kWh); 10-year contract

Maximum Incentive: No maximum specified

Terms: System capacity must be between 1.5 kW - 100 kW; aggregate capacity of all participating systems is 1 MW; must comply with applicable national, state and local electrical codes, rules and regulations; electric service rules and regulations of We Energies; requirements of Wisconsin Administrative Code Chapter PSC 119; the state's Distributed Generation Interconnection Agreement, and "Energy for Tomorrow" Power Partner Program Agreement

Website: http://www.we-energies.com/business_new/altenergy/custgen.htm#terms

Effective Date: 10/1/2005

Expiration Date: 9/30/2011

4. Alternative Fuel Incentive and Laws for Wisconsin: http://www.eere.energy.gov/afdc/progs/state_summary.cgi?afdc/WI
5. Local equipment suppliers (demonstration project)
6. Local contractors (partners in sustainable solutions; potential research)
7. For local Green Power purchase, go to http://www.eere.energy.gov/greenpower/

federal

1. U.S. Department of Energy, Energy Efficient Building Technologies
   - $100,000 - $4,500,000 annually
   - Utilization of DOE's EnergyPlus building energy simulation program
   - Tax Incentive
     - Credit for Fuel Cells and Microturbines
   - Stationary microturbine <2,000kW
     - 10% investment tax credit, 2006-2007
   - Fuel cell with nameplate capacity of 0.5kW
     - 30% investment tax credit, 2006-2007
   - Tax Incentive
     - Clean Renewable Energy Bond Program
   - Turbine, fuel cell, heat recovery generator
   - IRS - $800 million in clean energy bonds
   - Federal income tax credit
   - April 26, 2006

2. StEPP Foundation
   - Renewable energy, energy efficiency or pollution prevention projects
   - Matching funds http://www.steppfoundation.org/about_us/about_us.htm

3. The **Climate Savers** program is a collaboration between the World Wildlife Fund (WWF), and The Center for Energy and Climate Solutions (CESD) to help businesses voluntarily lower energy consumption and reduce emissions. The program is attracting Fortune 100 corporations, many of which might be willing to become funding partners for your showcase project.

   The other project collaborator, CESD is a non-profit organization and a division of the Global Environment and Technology Foundation (GETF).
   The Center's Director, Dr. Joseph Romm, is the author of "Cool Companies: How the Best Businesses Boost Profits and Productivity by Cutting Greenhouse Gas Emissions."
   www.worldwildlife.org

4. US Department of Energy's Planning and Financing Multifamily Buildings
   http://www.eere.energy.gov/buildings/info/multifamily/finance.html

5. www.dsireusa.org for federal renewable energy and energy efficiency incentives

6. US Department of Energy's Wind Energy Program
   http://www1.eere.energy.gov/windandhydro/financial.html

7. US Department of Energy, alphabetical listing of all EERE programs
   www.eere.energy.gov/AB.

8. Environmental Protection Agency (EPA), grants information (Wisconsin is Region 5)
   http://www.epa.gov/epahome/grants.htm

9. U.S. Combined Heat and Power Association (USCHPA)

Incentive Type:	Corporate Tax Credit
Eligible/Renewable/ Other Technologies:	Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Geothermal Electric, Fuel Cells, Solar Hybrid Lighting, Direct Use Geothermal, Microturbines
Applicable Sectors:	Commercial, Industrial
Amount:	For equipment placed in service from January 1, 2006 until December 31, 2007, the credit is 30% for solar, solar hybrid lighting, and fuel cells, and 10% for microturbines. The geothermal credit remains at 10%.
Maximum Incentive:	$500 per 0.5 kW for fuel cells; $200 per kW for microturbines; no maximum specified for other technologies
Eligible System Size:	Microturbines less than 2 MW; fuel cells at least 0.5 kW
Date:	1/1/2006
Expiration Date:	12/31/2007

10. Business Energy Tax Credit

Incentive Type:	Corporate Tax Credit
Eligible/Renewable/ Other Technologies:	Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Geothermal Electric, Fuel Cells, Solar Hybrid Lighting, Direct Use Geothermal, Microturbines
Applicable Sectors:	Commercial, Industrial
Amount:	For equipment placed in service from January 1, 2006 until December 31, 2008, the credit is 30% for solar, solar hybrid lighting, and fuel cells, and 10% for microturbines. The geothermal credit remains at 10%.
Maximum Incentive:	$500 per 0.5 kW for fuel cells; $200 per kW for microturbines; no maximum specified for other technologies
Eligible System Size:	Microturbines less than 2 MW; fuel cells at least 0.5 kW
Authority 1:	26 USC § 48
Authority 2:	IRS Form 3468 (Tax Year 2006)

private foundations

1. The Kresge Foundation, through their Green Building Initiative, offers planning grants ranging from $25,000 to $100,000 for nonprofit organizations working in the arts, health and human services areas. http://www.kresge.org/content/displaycontent.aspx?CID=7

2. The MacArthur Foundation is interested in affordable housing grantmaking opportunities in the United States. The Foundation is also interested in global sustainability programs. http://www.macfound.org/site/c.lkLXJ8MQKrH/b.855229/k.63D6/Macarthur_Foundation_Home.htm

3. Rockefeller Brothers Fund Programs: Sustainable Development. A grantee must be a tax exempt organization or an organization seeking support for an educational or charitable project. http://www.rbf.org/programs/programs_show.htm?doc_id=472517

wrap up

Those who contemplate the beauty of the earth find reserves of strength that will endure as long as life lasts. There is something infinitely healing in the repeated refrains of nature.

- Rachel Carson, Author of Silent Spring -

Imagine a live+work+play+learn neighborhood that

- brings economic development opportunities not yet imagined to the city of Milwaukee
- encourages and celebrates diversity, fostering a crime- and poverty-free community
- contributes to cleaner air and water
- thrives on renewable energy resources, even contributing energy back to the grid
- honors beauty in historical buildings rich in texture and warmth
- fosters connectivity through open green spaces
- re-uses water for irrigation
- is teeming with people walking, talking and celebrating together - sharing knowledge, philosophy and energy.

Imagine.

The following pages include Acknowledgements of the people who came together to develop the Sustainability Guidelines, Contact Information of those associated with The Brewery Project and P^{3}Xcel and Appendices containing documents that may be helpful in managing the sustainability process.

acknowledgements

The Brewery Project, LLC Sustainability Guidelines are the result of many progressive thinkers and numerous valuable sources. The High Performance Guidelines, City of New York, April 1999 and the State of Minnesota Sustainable Building Guidelines (MSBG) B3, version 2.0, September 1, 2006 were significant resources. Other phenomenal work was researched and is referenced throughout the Guidelines and in the Resources section.

Legacy. It begins with innovation, dedication, tenacity, commitment and true grit. Many people, including business and community leaders and city of Milwaukee leadership, were involved in articulating the sustainable approach to The Brewery Project and helping see it through to implementation. Unwavering commitment to marking a Legacy, and embracing sustainability as it courses through all strata of a Legacy, has resulted in an innovative, new urbanist, sustainable model that will serve as a model for development around the globe.

Once the ideas and vision were named, Zilber leadership, in their role as master developer, confirmed their commitment to a sustainable approach with the creation of sustainability guidelines. The Brewery Project Sustainability Guidelines Stewardship Committee was appointed for the purpose of visioning, researching, documenting, writing, reviewing and implementing The Brewery Project, LLC Sustainability Guidelines.

the committee is comprised of:

Joseph Zilber, Chairman of the Board and owner of Zilber Ltd., and Brewery Project LLC
John Kersey, President, Brewery Project LLC
Michael Mervis, Vice President, Brewery Project LLC
Dan McCarthy, Vice President, Brewery Project LLC
Kevin Mantz, AIA Director of Design, KM Development Corp/Zilber Ltd.
Dennis Stapleton, Architect, KM Development Corp/Zilber Ltd.
Wendy Heintz-Joehnk, Founder + Director, studio [re]generate, former Founder + Director, P³Xcel
Steve Whayland, Sustainability Co-Champion, Design Team, P³Xcel

P3Xcel acknowledges the stewardship committee, most notably Dennis Stapleton and Kevin Mantz, for their significant and collaborative contributions of leadership and commitment to the successful outcome of the Brewery Guidelines. The Brewery Project Sustainability Guidelines were researched and authored by P³Xcel, the sustainable division of Arnold & O'Sheridan, Inc. The members of P³Xcel dedicated to developing the Guidelines are:
Wendy Heintz-Joehnk, Team Leader
Jim Joehnk, PE
Farhan Khatri, PE, LEED® AP
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