Main Street Landing Design & Construction Principles

Sustainable Design for Main Street Landing**:** Goals, Guidelines and Strategies

I. Introduction and Scope
II. Goals
    a. Sustainable Design
        i. Site Selection
        ii. Site Design
        iii. Building Design
            1. Overall Design
            2. Energy Conservation
            3. Mechanical Systems
            4. Lighting Systems
            5. Materials Selection
        iv. Building Operation
    b. Specific Sustainable Design Strategies
        i. Relationship to Surrounding Properties
        ii. Site Considerations
        iii. Transportation
        iv. Energy
            1. Select Systems Based on Life Cycle Cost Analysis
            2. Reclaim Waste Energy
            3. Use solar after loads have been substantially reduced if appropriate application can be found
            4. Mechanical Systems
            5. Electric Lighting
        v. Daylighting
        vi. Envelope Design

I. Introduction and Scope

In August 1993, The Main Street Landing Company commissioned William Maclay Architects and Planners to develop sustainable design principles for the Main Street Landing project. William Maclay, John Quinney, *Blair Hamilton* and the Main Street Landing design team worked on that draft. The current draft, developed and refined during the early months of 2000, reflects the involvement of the Main Street Landing development and design team and environmental design consultants, William Maclay and Andy Shapiro of Vermont Energy Investment Corporation. These guidelines build on the work of many practitioners and sources in the sustainable design field.

The environmental goals, guidelines and strategies that follow have been developed to assist the Main Street Landing Company with developing Burlington waterfront projects that incorporate realistic, attainable and cost effective sustainable design strategies. The overall intent of this effort is to minimize the environmental impacts of construction and demonstrate opportunities for implementing emerging and existing environmentally responsible technologies and methods. The more specific intent of the present document is to identify sustainable design strategies that can be utilized by the design and construction teams in the Main Street Landing Waterfront Project.

This document defines goals, guidelines and strategies as follows:

- Goals describe the overall intention for the project
- Guidelines describe the general ways these intentions may be met and/or describe specific ways of measuring if and how the goals are met.
- Strategies describe specific elements to be integrated into the project that meet the guidelines and/or support the goals

For example:

Goal: Demonstrate a model of highly efficient use of energy.

Guideline: Exceed Burlington Energy Code and use 50% less energy than ASHRAE Standard 90.1 (an energy usage standard.)

Strategies: These may be many, including such things as low-mass, high efficiency boilers, cooling equipment with coefficient of performance above 4.0, energy recovery ventilation, etc.

For success in achieving the goals indicated it is necessary that all project professionals work closely together. After goals and guidelines have been approved by all parties, the specific strategies meeting the guidelines are developed and analyzed by the design team. Strategies accepted for inclusion are then incorporated into architectural, engineering and landscaping construction documents, including drawings and specifications. All parties must insure compliance with guidelines during the construction process and later during building operation.

II. Goals

The overall goal of sustainable design is to meet present needs without compromising the ability of future generations to meet their needs. While it is likely that sustainable design will dramatically change how buildings are built in the future, there are many measures that are achievable and cost effective and can

be incorporated now. These goals are not intended to dictate design, but rather to provide opportunities for improving environmental performance of the project.

- To provide a model of environmentally responsive development for future projects in Burlington.
- To demonstrate the preservation and enhancement of the natural environment and living systems appropriate to the urban location of the site.
- To demonstrate buildings that are models of highly efficient use of energy.
- To demonstrate healthy buildings that have excellent indoor air quality.
- To demonstrate materials selection that maximizes recycling and minimizes environmental impacts, depletion of resources and energy required to produce and transport materials.
- To demonstrate that sustainable design can provide a higher quality of life for people while reducing damage to the environment, and saving money, resources and energy over conventional design.
- To demonstrate an integrated design process that incorporates environmental concerns from the beginning of the project throughout building and site design.
- To educate the public on the benefits of environmentally sustainable design.
- To maximize pedestrian circulation, and public transportation while minimizing automobile traffic through mixed use design integrating residential, commercial and recreational uses at a location that minimizes the necessity for automobile traffic.

As a result of these goals, users of these buildings and site improvements will be more healthy, comfortable, and productive than users of standard current buildings while use of environmental resources will be reduced. Operating costs will be reduced while marketability to users will increase.

a. Sustainable Design Guidelines

- Utilize LEED as either a guideline or actually participate in the LEED rating process
- Look at energy and resource conservation strategies holistically based on life cycle analysis and environmental impact.
- Reduce loads radically prior to using sustainable or green technologies to meet loads.
-

i. Site Selection

- The mixed uses of housing, retail, office and recreation at this site will reduce energy consumption for transportation and reduce traffic problems in the Burlington area.
- The location of new housing at this site in downtown Burlington will reduce traffic problems and minimize energy consumption over new housing outside of Burlington.
- The location of this site adjacent to a proposed transportation center in combination with the proposed office/retail will reduce energy for transportation and traffic problems by allowing work and shopping to be connected to transportation.
-

ii. Site Design

- Analyze natural systems, including wildlife, plants, drainage, sun, climate, etc.
- Minimize environmental impacts and preserve fragile ecosystems and historic features.
- Minimize run-off of rain water from the site.
- Cluster activity areas to maintain natural features and allow for recreational and/or public use.
- Recognize and design for solar impacts on the building. Use vegetation and building orientation as appropriate to improve building comfort and minimize energy consumption.
- Reuse site resources such as gravel, topsoil, stone, wood, etc., where appropriate.
- Interconnect with surrounding land uses and mass transit with pedestrian, bicycle, recreational links.

- Minimize site area devoted to circulation.
- Design the site and landscape to minimize long-term requirements for maintenance and irrigation, and to eliminate the need for pesticides or herbicides.
- Minimize cost of utilities infrastructure and maintenance.
- Maximize public involvement in the design process.
- Use gray water and roof collection for site irrigation.

iii. Building Design

1. Overall Design

- Design buildings to be durable and long lasting.
- Provide excellent indoor air quality through materials selection, building layout and ventilation.
- Integrate space planning with site and solar orientation.
- Design structures to be adaptable to other uses.
- Maximize public involvement in the design process.
- Minimize waste in construction through efficiency, reuse and recycling.
- Minimize water use
- Involve building occupants (kitchen personnel, kitchen designer, hotel, restaurant and pub owners and operators) in design as soon as possible.

2. Energy Conservation

- Exceed ASHRAE Energy Use Standard by 50%.
- Maximize natural ventilation including use of prevailing winds.
- Utilize renewable energy sources such as solar, wood, wind, geothermal, hydro, etc., as appropriate. Provide for expansion of use of renewable energy where presently not cost-effective
- Orient buildings to maximize energy conservation.
- Provide high thermal performance levels on exterior envelope.
- Use high performance glazings to minimize energy use and to improve utilization of daylight.
- Capture and use waste heat and resource flows, such as ventilation energy and moisture, equipment energy use, gray water and other sources.

3. Mechanical Systems

- Install optimal efficiency mechanical system to support excedance of ASHRAE 90.1 by 50%.
- Provide optimum fresh air and temperature for all occupants
- Provide maximum occupant control of temperature and ventilation.
- Minimize mechanical system noise.
- Design systems to avoid condensation and moisture problems.
- Reclaim waste energy as appropriate.
- Design for eventual connection to district heating and cooling systems.
- Design for connection to mini-district heating system including other Main Street Landing projects.
- Design for use of lake water cooling assist (heat rejection to the lake.)
- Investigate use of cogeneration**.**

4. Lighting Systems

- Maximize use of daylight for perimeter and center of buildings.
- Locate areas with daytime lighting to take advantage of sunlight.
- Balance and integrate task and ambient lighting levels.

- Install high efficiency, high color rendition lighting.
- Use automatic controls to respond to daylight and occupancy.
- Select colors for surfaces and furnishings to maximize lighting efficiency.

5. Materials Selection

- Use salvaged building materials.
- Use materials which reduce waste and are recyclable.
- Avoid building materials whose production pollutes or damages the environment, such as HCFC products that harm the ozone layer.
- Use materials which are sustainable, such as wood that is certified sustainably harvested, rather than "old growth" tropical hardwoods.
- Use materials which are the least toxic and provide the best indoor air quality for building users and for construction workers.
- Encourage use of materials with low embodied energy (direct and indirect energy consumed in extraction, manufacture installation and transportation).
- Favor use of materials with superior energy performance.
- Favor use of locally produced materials.
- Favor use of durable materials.
- Favor materials with the least operation and maintenance costs.

iv. Building Operation

- Provide a building operation manual with environmental parameters for proper use of building.
- Purchase energy efficient computers, printers, photocopiers and other equipment.
- Purchase equipment which is designed for disassembly, reuse and/or recycling.
- Avoid equipment with toxic emissions or properly ventilate equipment. Minimize toxic affects of work processed.
- Avoid toxic furnishings.
- Provide for convenient local and central recycling locations.
- Set goal of 50% post-consumer recycled content of purchased goods as an average minimum.
- Select goods and equipment that are the least waste generating and can be reused and/or recycled.
- Compost organic wastes or collect for off-site composting.
- Avoid all toxic maintenance and operation products.

b. Specific Sustainable Design Strategies

i. Relationship to Surrounding Properties

- Design the building, site and mechanical systems to permit connection to mini- or maxi-district heating and/or cooling, i.e. site mains and 4-pipe system in buildings.
- Investigate immediate connection with adjoining properties, particularly One Main St. And the proposed transportation center. This may start as a mini-district-system-ready building and/or actually putting in infrastructure, such as culvert or even piping across the street if the loads and design criteria can be determined.
- Investigate lake for future district cooling.
- Investigate biomass for future district heating.
- Investigate opportunities to use district load diversity to reduce design capacity.

ii. Site considerations

- Downtown location near public transportation to minimize auto transportation
- Select plantings for low water requirements
- Manage park rainfall with absorption, rather than piping runoff, to the extent possible, through use of porous materials, ponds and water features, accounting for freezing conditions.
- Utilize pervious parking and walkway materials, as appropriate, given the high water table at lower level of site.
- Re-use any excavated material and asphalt
- Use trees and other vegetation to provide solar shading – balance with view of lake
- Consider living roof over single floor area of restaurant or perhaps mosaic design elements in ballasted roofing
- Cluster activity areas to maintain natural features and allow for recreational and/or public use.
- Minimize solar shading of buildings.
- Reuse site resources such as gravel, topsoil, stone, wood, etc., where appropriate.
- Interconnect with surrounding land uses and mass transit with pedestrian and bicycle path links.
- Minimize land area devoted to circulation on site.

iii. Transportation

- Bicycle storage and shower facilities for bicycle commuting
- Bike path connection to main waterfront bike path
- Maintain pedestrian connection through the building
- Minimize land area devoted to parking

iv. Energy

1. **Do thorough energy analysis of project loads by occupancy, process and/or building section, as appropriate. Select systems based on life cycle cost analysis.**

    - Heating
    - Cooling
    - Ventilation
        - Provide 20 cfm outside air per person
        - Occupancy-controlled ventilation wherever appropriate
        - Operable windows in every room with a window. Design mechanical system to be happy with operable windows used at any time**.**
    - Lighting
    - Refrigeration: Outside air economizer for medium temp walk-ins.
    - Process energy
        - Restaurant – dishwashing, cooking, warming, ventilation, refrigeration
        - Brewery –what are wash-down requirements? What are refrigeration requirements?
        - Bakery **–** what is air requirement for oven? Can any heat be reclaimed? How efficient is typical burn and can it be enhanced? Refrigeration requirements? Wood storage requirements?
    - Plug loads – computers, etc.
        - Use all Energy Star copiers and other equipment

  - Ink jet instead of laser printers
  - occupancy sensors to turn off unused equipment
  - timers on drink coolers
  - find and use efficient coolers
- Electrical distribution
  - As appropriate, use higher building voltages to reduce losses
  - Improve power factor

2. Reclaim waste energy

- Grey water heat recovery for showers
- Process energy recovery
- Ventilation energy reclamation, both latent and sensible
- Utilize gravity in brewery where possible

3. Use solar after loads have been substantially reduced if appropriate application can be found.

- Solar thermal for hot water and/or process energy
- Provide for future expansion of renewable energy systems

4. Mechanical Systems: Utilize optimum efficiency boilers, chillers, condensers, evaporators, distribution systems, motors, fans elevators and other equipment to meet remaining loads.

- Building-wide digital control system
  - Efficient control
  - Energy use tracking
  - Tenant billing for energy use
  - Advanced control strategies to improve performance
  - Consider one system for mechanical, electrical, controls, security and fire protection.
- Minimize moisture carry through problems (bacteria and fungi) by low velocity air movement (500 fpm or less) as well as cooling coil configuration in mechanical systems.
- Provide fresh outside air of 20 cfm per person minimum.
- Provide high number of total air changes per hour (1 air change per hour in public spaces and ½ air change per hour in residential spaces).
- Explore using high efficiency gas fired absorption chiller with no CFCs.
- Use variable volume units, as appropriate, with maximum occupant control.
- Use variable speed control for fans and pumps as appropriate
- Capture and use waste heat form equipment, gray water and other sources.

- Design for good part-load efficiencies.
- Reduce duct pressure, leakage and conduction losses.
- Reduce piping pressure and conduction losses.
- Reduce coil and filter face velocities.
- Reduce heat exchanger pressure drops and approach temperatures.
- Consider gas-fired cooling systems

5. Electric Lighting

- Arrange interiors for maximum daylight utilization
- Choose highest efficiency fixtures, lamps and ballasts, meeting color requirements
- Design lighting for specific tasks
- Avoid incandescent lighting, choosing fluorescent with high quality ambience
- Utilize task lighting
- Auto-dimming fluorescent, based on available sunlight and lumen maintenance
- Occupancy sensors where appropriate, to turn off lights
- Choose light colors and white at locations where light walls, celings will reduce electric lighting needs and will enhance daylighting.
- Balance and integrate task and ambient lighting levels (typically, 30 footcandles ambient and 70 footcandles for task lighting).
- Install high efficiency, high color rendition fluorescent lighting with electronic ballasts.
- Select colors for interior surfaces and furnishings that are highly reflective to maximize efficiency of natural and artificial light.
- Select LED or electro-luminescent exit signs.

v. Daylighting

1. Maximize daylighting in roofs and walls.
2. Select optimum glazings.
3. Put windows as high in spaces as possible.
4. Incorporate light wells for the occupied areas on the east side of building.
5. Install roof monitors with north and south glazing at restaurant roof.
6. Investigate overhead skylights for appropriate top floor spaces
7. Choose light colors and white at locations where light walls, ceilings will reduce electric lighting needs and will enhance daylighting. Locate areas with daytime lighting needs within a distance which is 2 times the height of windows for conventional windows.

vi. Envelope Design