LEED Design and Sustainability Breadth

The environmental impact of building construction and operation is very significant in today's world. According to the U.S. Green Building Council (USGBC), buildings annually consume more than 30% of the total energy and more than 60% of the electricity in the United States. To reduce such a large carbon footprint, the world is shifting to Green and sustainable building design.

Green building practices can substantially reduce or eliminate negative environmental impacts and improve existing unsustainable design, construction, and operational practices. Additionally, green design measures also reduce operating costs, enhance building marketability, increase worker productivity, and reduce potential liability resulting from indoor air quality problems.

Since Southtown Building No. 5 is one of nine buildings going up on Roosevelt Island, the environmental impact of these building is very significant. By designing the buildings with sustainability in mind, the island would be more environmentally friendly and reduce the amount of pollution that the island emits, especially into the already polluted East River. In order to achieve a more eco-friendly building, the USGBC's green-building rating system, Leadership in Energy and Environmental Design (LEED) will be applied to the Building No. 5. Twenty-six points will be evaluated in order to achieve a certified LEED rating.

Sustainable Sites

Southtown Building No. 5 is located in a prime area to achieve many sustainable site credits. It is located only 30 feet from the East River shoreline and utilizes many key sustainable features. The building has a rather small footprint compared to the amount of vegetative land surrounding the building. Beautiful landscaping compliments the building and reduces the surrounding hardscape.

As originally intended, Southtown Building No. 5 is to be designed with a vegetative roof. Of approximately 6000 square feet of exposed roof space, 1000 square feet of green roof

was already in the existing plan. In order to achieve a LEED point for a vegetative roof, an additional 2000 square feet was added to the design as seen in Figure 24.

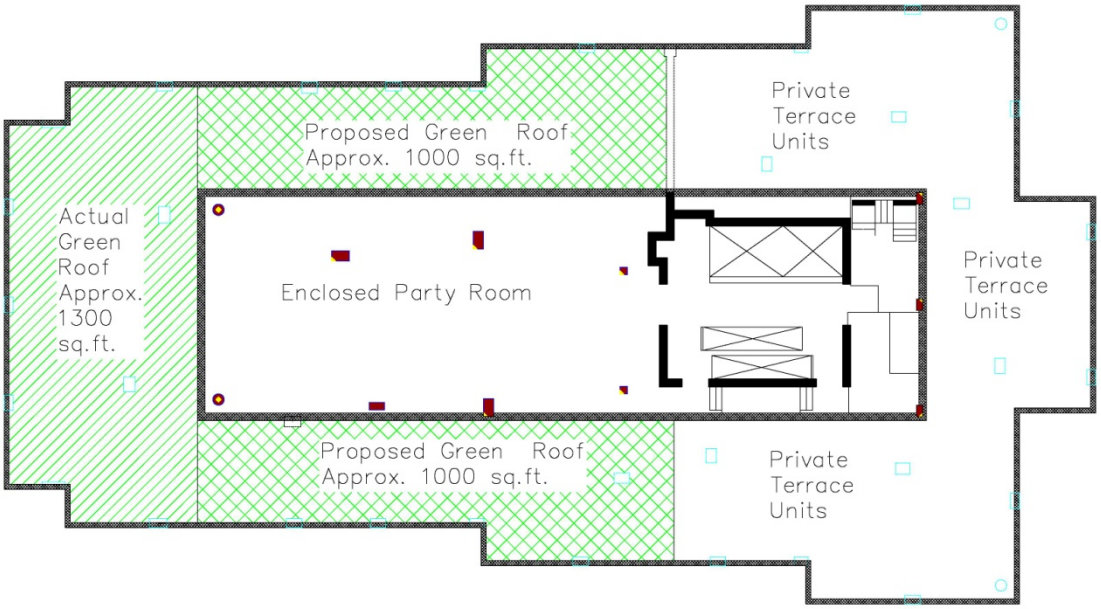

Figure 24: Roof plan for Southtown Building No. 5. Actual green roof and proposed green roof areas can be seen in the different green hatching.

Finally, the intended hardscape of Roosevelt Island is fairly minimal. With the addition of these nine new buildings, many walkways and streets must be added. To fully reduce the amount of reflective material, pavers and other permeable walkways were chosen instead of concrete sidewalks.

SS-1: “Previously undeveloped land that is within 50 feet of a body of water, defined as seas, lakes, rivers, streams and tributaries which support or could support fish, recreation or industrial use.”

SS-4.1: “Locate project within ½ mile of an existing commuter rail, light rail or subway station.”

*Located just a block away from Manhattan's F, and NRW lines.

SS-4.2: "For residential buildings, provide covered storage for securing bicycles for 15% or more of the building occupants in lieu of changing/shower facilities."

SS-4.4: "Provide no new parking."

SS-5.1: "On greenfield sites, limit all site disturbance to 40 ft. beyond the building perimeter; 10 ft. beyond surface walkways, patios, surface parking and utilities less than 12 inches in diameter; 15 ft. beyond primary roadway curbs and main utility branch trenches; and 25 ft. beyond constructed areas with permeable surfaces that require additional staging areas in order to limit compaction in the constructed area.

SS-5.2: "Where a zoning ordinance exists, but there is no requirement for open space, provide vegetated open space equal to 20% of the project's site area."

SS-6.1: "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."

SS-7.1: "50% of site hardscape to be open grid pavement system."

SS-7.2: "Install a vegetated roof at least 50% of the roof area."

Water Efficiency

A case study of a 27-story green residential high rise in New York City was studied to compare similarities for the Water Efficiency credits. The Solaire building was able to earn all five WE credits. A wastewater treatment system treats 100% of the wastewater from the building. Water recaptured by the system is used to supply the building's toilets, and 5000 gallons per day are provided to the adjacent public park. A stormwater storage tank which harvests rainwater is used for all irrigation needs. 50% less potable water is needed from the municipal water supply than would be used in a conventional apartment building and no potable water is used outdoors. Additionally, low-flow appliances and fixtures were used, and

the public restroom facilities use waterless urinals, contributing to a water use reduction of 88% within the building.

By implementing the same type of criteria for this residential high-rise and its surrounding buildings, I believe that the same credits could be obtained.

WE-1.1: “Reduce potable water consumption for irrigation by 50% from a calculated mid-summer baseline case.”

WE-1.2: “Use only captured rainwater, recycled wastewater, recycled graywater, or water treated and conveyed by a public agency for non-potable uses for irrigation.”

WE-2: “Reduce potable water use for the building sewage conveyance by 50% through the use of water-conserving fixtures or non-potable water.”

WE-3.1: “Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building after meeting the Energy Policy Act of 1992 fixture performance requirements.”

WE-3.2: Same as above with 30” less water than the water use…

Energy and Atmosphere

Using Energy-10, an energy building model was created to compare the existing HVAC system to a proposed system. Currently, a Packaged Terminal Air Conditioner (PTAC) & Electric Heat system is used in every room in each apartment. These systems are mounted beneath windows and combine heating and cooling. They use refrigeration components and forced ventilation to cool and reverse cycle refrigeration as the prime heating source. As these units are generally more expensive than window air conditioners and base board electric heat, they are often less environmentally friendly with the large amount of refrigerant used.

As a proposed method of heating and cooling, an air source heat pump was compared to the existing PTAC units. Additionally, photo-voltaic cells were added to the roof to help conserve the overall energy consumption of the building. A single floor was modeled in Energy-

10 and the two systems were compared. The total energy used in the existing system was 960000 kBtu versus 810000 kBtu of the proposed system. This equates to an 18% reduction per floor. Additionally, the emissions were reviewed for the two systems. Carbon dioxide emissions were reduced from 345000 lbs to 300000 lbs per floor and Nitrous Oxide was reduced from 1100 lbs to under 900 lbs.

As you can see, the proposed system would be environmentally beneficial to use. It would require a heat pump to be placed in every apartment in order for the building to measure individual energy costs per unit. However, with the amount of benefits gained by this new system, the installation costs would be offset by the energy savings. The following credits would be obtained from the new proposed system.

EA-1: “Demonstrate a percentage improvement in the proposed performance rating compared to the baseline building performance rating.”

*Since the renovations are all proposed to a new building design, 18% improvement would allocate 3 points to the LEED rating.

EA-2: “Use pm-site renewable energy systems to offset building energy cost.”

*Photovoltaic cells implemented on the roof would allow for a 3% reduction in heating costs. This equates to 1 point.

EA-6: “ Provide at least 35% of the building’s electricity from renewable sources by engaging in at least a two-year energy contract.”

Materials and Resources

Building material choices are important in sustainable design due to the large amount of time it takes to extract, process, and transport them. The steps required to create the building materials may pollute air and water as well as deplete the natural resources used to make

them. When selecting materials for a project, it is important to evaluate new and different sources.

Southtown Building No. 5 is one of nine buildings going up in its development. By using material left over from previous building construction, total material costs will be lowered and less new material will need to be processed. Also, with the proposal of developing the building in steel, recycled-content materials, such as steel, reuse waste products that would otherwise be deposited in landfills. Finally, the use of local materials, such as steel manufactured in Pennsylvania, support local economy and reduce transportation. These options would allow the building to earn the Materials and Resources credits listed below.

MR-2.1: “Recycle and/or salvage at least 50% of non-hazardous construction and demolition.”

MR-3.1,2:” Reuse building material and products in order to reduce demand for vigin materials and to reduce waste.”

*With the consistency between the nine proposed buildings, the construction material should be recycled and used for the next constructed building.

MR-4.1: “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% of the total value of the materials in the project.”

MR-5.1: “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% of total materials value.”

Indoor Environmental Quality

Using higher ratios of filtered outside air, increasing ventilation rates, managing moisture, and controlling the level of contaminants in the cleaning substances used can provide optimal air quality for building inhabitants. Additionally, occupant well-being can be improved by providing occupants with the ability to control their personal thermal environment.

The owner, building design team, contractors, subcontractors and suppliers must all play an integral role in order to achieve such improved indoor air quality and occupant satisfaction. The following Indoor Environmental Quality credits could be attained.

EQ-3.2: “Conduct baseline IAQ testing, after construction ends and prior to occupancy.”

EQ-4.3: “All carpet installed in the building interior shall meet the testing and product requirements of the Carpet and Rug Institute’s Green Label Plus program.

EQ-6.1: “Provide individual lighting controls for 90% of the building occupants enable adjustments to suit individual task needs and preferences AND provide lighting system controllability for all shared multi-occupant spaces to enable lighting adjustments that meets group needs and preferences.

Conclusions

In today’s world, it is very important to study the impact of a building, from construction to maintenance to building management. As shown, twenty-six LEED points have been outlined and credited to achieve a LEED certified building. It would take a lot of effort from all parties involved in the development, design, and construction of the building but the environmental impact would greatly outweigh any additional costs.

If Southtown Building No. 5 was to achieve a LEED rating, it could possibly change the way owners and developers look to construct later buildings on Roosevelt Island; a once natural habitat to many plants and animals. As a result of this breadth topic, I believe that LEED building is a step in the right direction in order to preserve our Earth and its species.