

executive summary

Granby Tower is a proposed mixed-use, luxury, high-rise located in the downtown historic district of Norfolk, Virginia. The tower stands 450 feet to the top of its spire, and consists of 34 floors, 6 of which are reserved for parking. Post-tensioned slabs allow for maximum span to depth ratio, while dual shear wall cores are centrally located to allow for unobstructed views of downtown Norfolk.

depth study

Research will be conducted to investigate the possibility of integrating wind power generation into the design of Granby Tower, as a means of capitalizing on the favorable wind speeds. Granby Tower will be the tallest building in Norfolk, so there will be little building interference affecting the wind available for power generation. By funneling wind through the building's interior, the effective story shears decrease on the windward face and the leeward suction decreases due to Bernoulli's Principle. A dynamic analysis will be required to determine the resulting lateral loads, but an expected decrease in loads offers the potential to design a more efficient shear wall system. Some slight changes in shear wall orientation and location may need to occur to allow for turbines and additional equipment. The feasibility of this system will be evaluated by cost, energy production, architectural impact, and efficiency in lateral design.

breadth studies

Sustainability

The first breadth study will focus on receiving certification through the United States Green Building Council's Leadership in Energy and Environmental Design (LEED) program. LEED is a rating system that incorporates proper planning, material selection, and commissioning to minimize the impact of a building on its environment. Incorporating renewable energy generation into the building process has potential to earn at least 6 points: Energy & Atmosphere, Credit 2 – On-Site Renewable Energy, Energy and Atmosphere, Credit 6 – Green Power, and Innovation in Design, Credit 1.1-1.4 – Innovation in Design. Through multiple other green measures, this breadth study will demonstrate that luxury can be “green.”

Architecture

Allowing for wind tunnels at various locations will drastically affect the architecture of Granby Tower. Floor plans on and around the levels chosen for wind tunnels and power generation require alterations to account for reduction of floor space, changes in shear wall layout, and possible changes in floor height. Consideration for exterior alterations due to location of wind tunnels and funneling of wind into said tunnels is necessary. Wind studies will determine if building rotation is required to maximize efficiency, in which case lobby space and store front conditions should be altered.