2021 ASHRAE LowDown Showdown

Model Building Description

General Description:
The 2021 LDSd model building is a residential care center which includes residential living spaces, amenities, a small clinic for residents, a kitchen with dining room and limited office & meeting space for facility staff. The new building is to be designed for efficiency and sustainability for both the short and long term with an emphasis on net-zero energy operations, resiliency, and community engagement.

Model Building Location: Puerto Rico

65,000 sf of indoor space + 10,000 sf of outdoor space (new construction)

- 55,000 sf of residential
- 1,500 sf office & conference
- 1,500 sf of kitchen (light commercial)
- 4,000 sf of dining space
- 2,500 sf of clinic & PT space
- 1,000 sf lobby
- 1,500 sf circulation spaces
- 8,000 sf amenities (shared spaces for use of residents): Amenities – exact mixture of amenities to be determined by design teams but should be for use of residents from 8am till 10pm

Teams may decide which of the spaces listed above are indoor and which are outdoor. Teams should consider typical space requirements during normal and emergency operations when choosing the indoor and outdoor spaces for their design.

General Design Requirements:

1. Creativity/Innovative Approaches: The architecture and functional use of the building should be creative and innovative. Teams are encouraged to use innovative technologies and thinking to address issues.
2. Resiliency: The building should be designed so natural hazards in the area, such as flooding, tornados, etc. do not affect the short and long term usability of the building. The facility should be able act as a refuge during a disaster and a community resource in the aftermath of a disaster.
3. Community Engagement: The manner in which the facility, its occupants and its staff interact with & form a part of the local community should be defined by each team. The facility should provide a tangible and measurable benefit to the community during normal and emergency operation.
4. Energy Efficiency: The building design should be net-zero energy in operation and must produce on site all energy consumed on site on an annual basis. Passive & load reduction strategies should be utilized first prior to adding renewables to meet the net-zero target. There are no specific renewable system capacity limitations for the competition.
5. Sustainability: The design and construction should take into account the long-term life cycle issues of the building so that the success of the building not only depends on initial systems and materials decisions (first costs) but also on the proper long-term operation and maintenance over the life of the facility.

Additional Guidance:

Innovative Approaches
Teams are encouraged to research and present new innovative approaches to address one or more of the following: integrated design, technological solutions, comfort, health & wellness, carbon neutrality and embodied energy. For all the innovative solutions the teams come up with incremental costs must be applied (if the team thinks the measure will save money in construction costs please also include this). The teams are allowed two free passes, i.e. the teams can include two new and innovative technologies and do not have to include costs for these things such as algae walls, electricity producing walkways and so on. The teams need to justify why they are including these technologies and how they add to the requirements of the building. These technologies cannot include PV, solar thermal or conventional energy storage systems (e.g. batteries).

Indoor Environmental Quality
All spaces will be kept to a thermally comfortable temperature using locally recognized criteria to be selected by the teams. Innovative solutions to removing VOCs and purifying indoor air are required as well as lighting designs that are sympathetic to the occupant's circadian rhythms during normal operations.

The following WELL standards are encouraged to be followed where possible:

- Solar Glare Control (feature 56 - parts 1 and 2)
- Exposure to natural daylight for the retail and restaurant spaces (feature 62 & 63 - parts 1 through 3)
- Lighting levels to be considered with circadian rhythms (feature 54 - parts 1 through 4)
- Ventilation effectiveness, VOC control to be considered, displacement ventilation and air purification techniques are encouraged (feature 3, 21, & 23 - parts 1 and 2)

The WELL Building Standard v1.0 - details and requirements for each Feature can be found in the Standard, which can be downloaded for free at www.wellcertified.com<http://www.wellcertified.com> (see appendix for more about this features)

Appendix

Building Envelope

Feature 56: Solar Glare Control: Though bright light during the day is conducive to good health, uneven levels of brightness in the visual field can cause visual fatigue and discomfort. Glare, or excessive brightness, is caused by light scattering within the eye, thereby creating a "veil" of luminance that reduces the luminance contrast as received by the retina. In buildings, sources of glare are often unshielded or poorly shielded light, or sunlight directly hitting the eye or reflective surfaces. Projects must demonstrate compliance with Parts 1 and 2, where applicable, for this Feature.

Feature 62: Daylight Modeling: Exposure to appropriate amounts of natural light reinforces the alignment of circadian rhythms and reduces dependence on electricity for artificial lighting; however, excessive sunlight can cause glare and unwanted visual contrast. Projects must demonstrate compliance with Part 1 for this Feature.

Feature 63: Daylighting Fenestration: Exposure to natural light can improve mood, alertness, and overall health. Ideal lighting involves proper exposure to diffuse daylight, as well as careful design of windows and glazing to avoid excessive glare and heat gain. Windows are the key variable for both ensuring that occupants receive enough light for positive physiological and subjective effects, but also not too much light that causes discomfort or becomes a source of distraction. Balancing energy performance, thermal comfort, and access to quality daylight are essential to proper building design. Projects must demonstrate compliance with Parts 1 through 3 for this Feature.

Lighting Systems

Feature 54: Circadian Lighting: Light is one of the main drivers of the circadian system, which starts in the brain and regulates physiological rhythms throughout the body's tissues and organs, affecting hormone levels and the sleep-wake cycle. Circadian rhythms are kept in sync by various cues, including light which the body responds to in a way facilitated by intrinsically photosensitive retinal ganglion cells (ipRGCs): the eye's non-image-forming photoreceptors. Through ipRGCs, light of high frequency and intensity promote alertness, while the lack of this stimulus signals the body to reduce energy expenditure and prepare for rest. The biological effects of light on humans can be measured in Equivalent Melanopic Lux (EML), a proposed alternate metric that is weighted to the ipRGCs instead of the cones, which is the case with traditional lux. The best source of the required EML is the sun, though the same required frequency and intensity can also be achieved using LED light fixtures. Projects must demonstrate compliance with Parts 1 through 4, where applicable, for this Feature.

Air Systems

Feature 3: Ventilation Effectiveness: Routine indoor activities including cooking, cleaning, building operations and maintenance and even the presence of occupants themselves can degrade air quality. Many indoor pollutants resulting from such activities, including particulate matter<http://standard.wellcertified.com/glossary#Particulate_Matter> and VOCs can cause discomfort and trigger asthma<http://standard.wellcertified.com/glossary#Asthma> and eye, nose and throat irritation. Because it is difficult to test for every potential pollutant, and because carbon dioxide is easy to detect, carbon dioxide levels serve as a proxy for other indoor pollutants. Projects must demonstrate compliance with Parts 1 and 2 for this Feature.

Feature 21: Displacement Ventilation: By strategically designing the height of air ventilation, displacement ventilation can enhance air change effectiveness. Displacement ventilation supplies air at very low velocity levels at or near the floor level, which then rises to the ceiling level. Since heat in a room is naturally stratified, displacement ventilation not only ensures that air is not delivered and pushed through the return air path (often the dirtiest portion of the air stream), but also tends to concentrate pollutants near the ceiling. Once there, the pollutants are out of the breathing zone and can be more easily removed. Projects must demonstrate compliance with Parts 1 and 2 for this Feature.

Feature 23: Advanced Air Purification: Some circumstances justify greater investment in air purification strategies. For example, proximity to highly traveled roads, manufacturing plants and seasonal variation can affect outdoor air quality, increasing ozone and VOC content, and in turn diminishing indoor air quality. Similarly, climates with high humidity levels and inadequate indoor ventilation can foster the development of mold and spores in indoor environments. Project teams are encouraged to research passive ways of adding air purification to the building without adding additional energy demand for a building with the goal of implementing net-zero energy. Projects must demonstrate compliance with Part 2 for this Feature, or apply an Alternative Adherence Path (AAP) for how to control ozone and VOC levels within the building.