UNC CHARLOTTE

BUILDING & BROCHURE DESIGNED FOR THE
UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE
BY

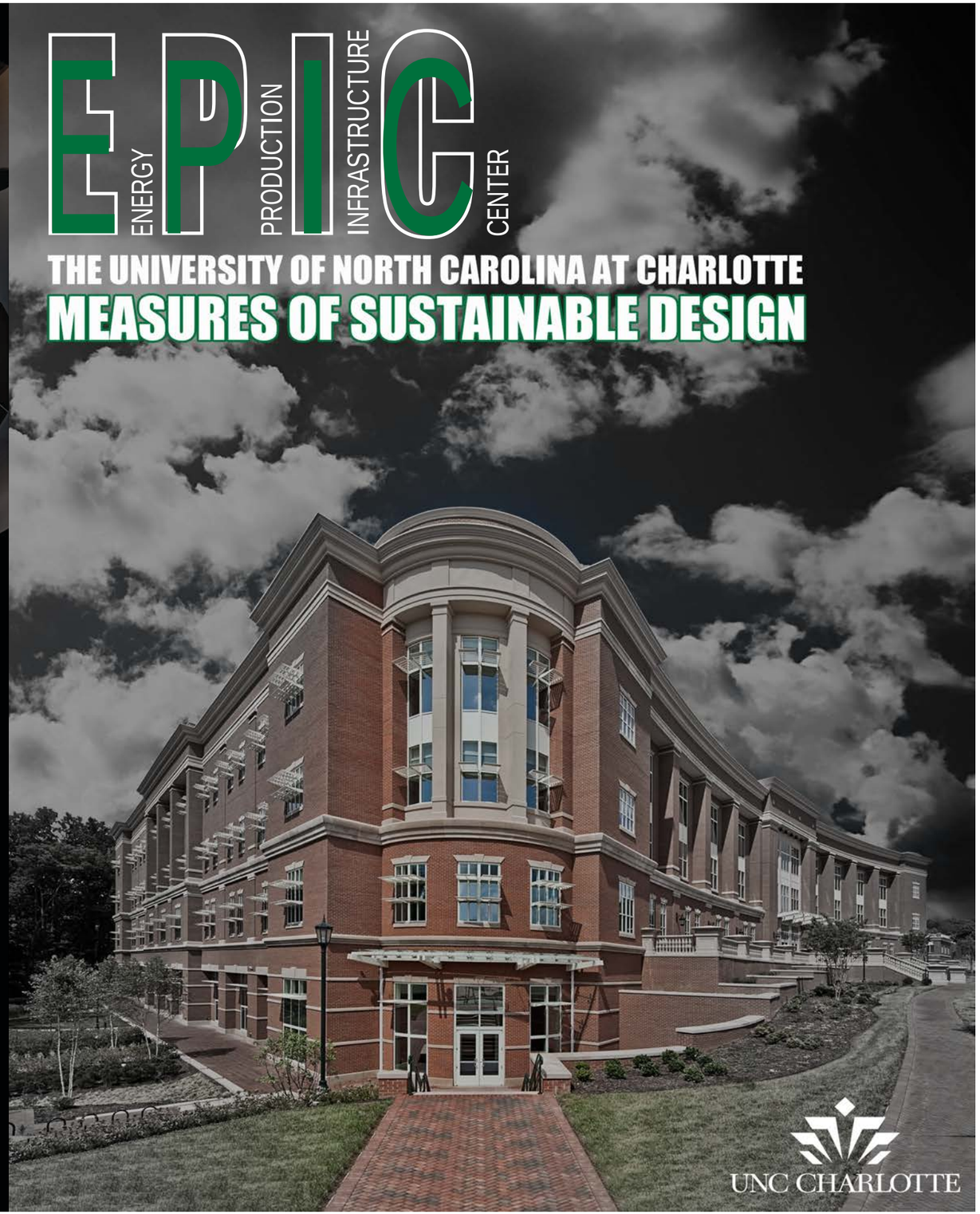
Creech & Associates
ARCHITECTURAL DESIGN

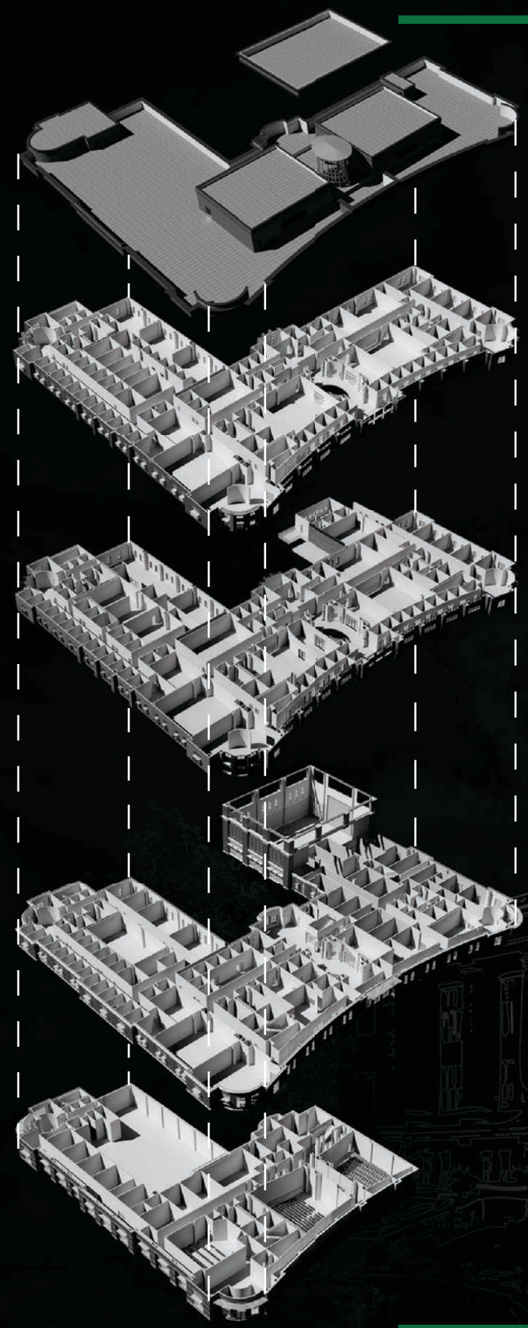
EPIC

ENERGY PRODUCTION INFRASTRUCTURE CENTER

THE UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

MEASURES OF SUSTAINABLE DESIGN





ROOF PLA

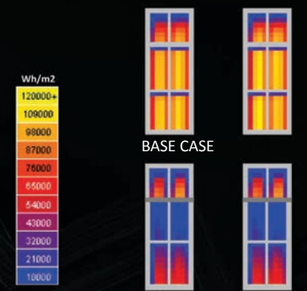
THIRD FLOOR

SECOND FLOO

FIRST FLOOR

GROUND FLOO

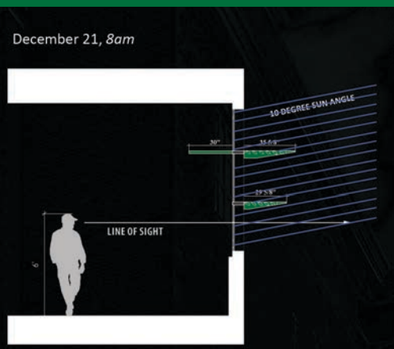
The campus master plan dictated a building orientation that did not offer optimum conditions for harvesting daylight without introducing additional heat load. These external shading devices eliminate direct solar penetration from March through September, and the internal light shelves reflect daylight and push it further into the space.



Amount of radiant heat on an unshaded window versus a window with an external shading device.

SOLAR RADIATION STUDY - EXTERNAL SHADING

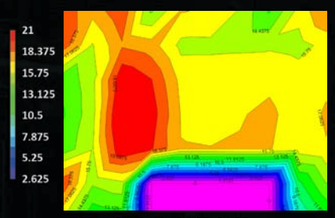
DIRECT SOLAR PENETRATION DIAGRAM
**OFFICE FACING SOUTHEAST*



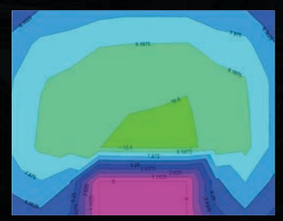
DIRECT SOLAR PENETRATION DIAGRAM
**OFFICE FACING SOUTHEAST*

DAYLIGHTING OF CRITICAL SPACES

The Daylighting + Energy Performance Lab evaluated the base case clerestory design and seven alternates that included various combinations of shading devices. The diagrams indicate the difference in quantity and balance in luminance values when the partial clerestory shade was added and the lower level windows were removed. The addition of the solar shading mitigates hot spots and yields a more even or uniform light distribution throughout the space.



EPIC HIGH BAY - BASE CASE



EPIC HIGH BAY - INTUITIVE CASE

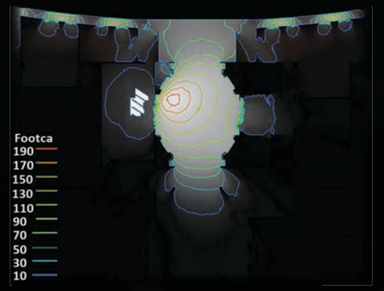
LEED GOLD - 37% ENERGY SAVINGS

ENERGY PRODUCTION INFRASTVIRONMENTAL QUALITY

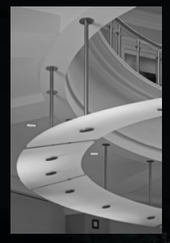
LEED SCORES

NC VERSION 2.2 - GOLD OBJECTIVE (39-51 POINTS)

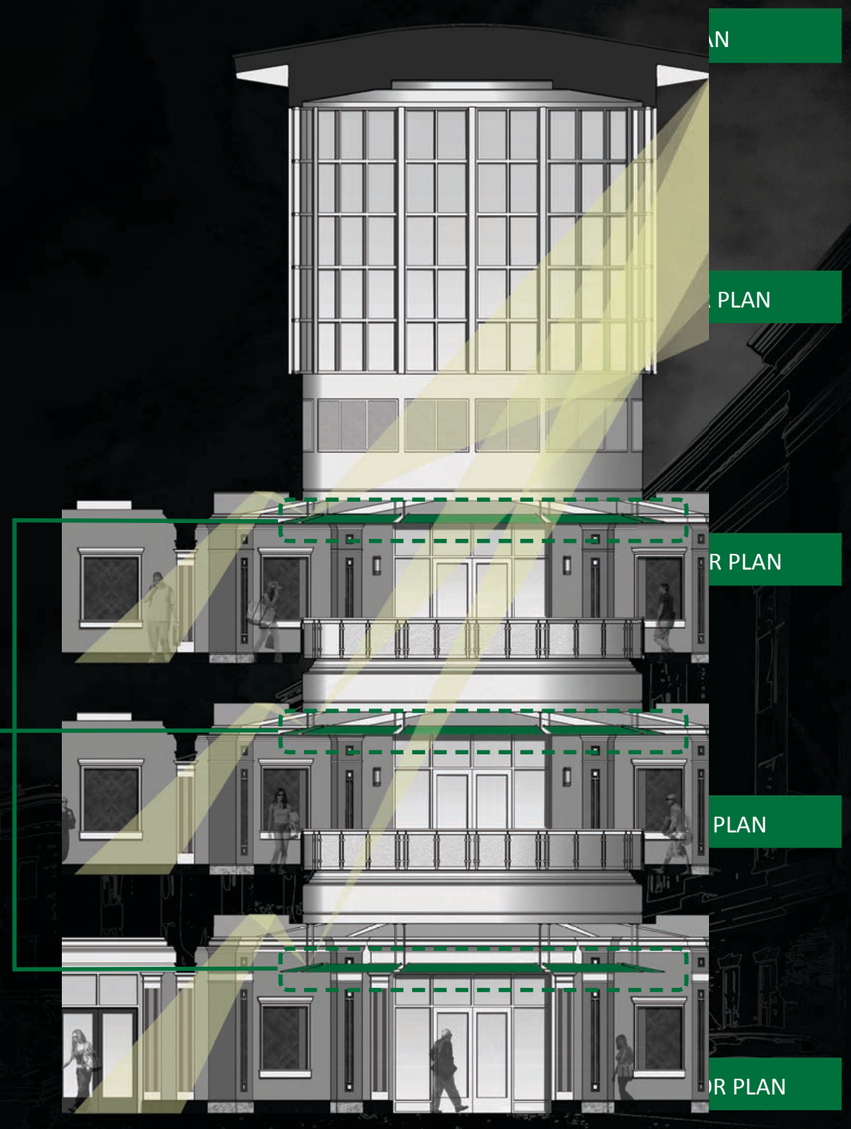
SS: SITES	**10**/14
WE: WATER	**05**/05
EA: ENERGY	**06**/17
MR: MATERIALS	**05**/13
ID: INNOVATION	**04**/05
EQ: INDOORS	**10**/15
POINTS/POSSIBLE POINTS	**40/**69



ATRIUM LIGHT DISTRIBUTION



In order to introduce natural light into the center of a floor plate the design team utilized an elliptical daylight well that extends more than 30 feet above the roof level. The opening is shaded by the penthouse forms on both sides, and a large roof overhang. Each floor includes a translucent light shelf made from 100% recycled materials that captures daylight falling in the atrium space and reflects it deeper into the interior spaces. The daylight also illuminates the light shelves to combine aesthetics with functionality. The combination of fenestration and light shelves yields more than 80 footcandles of natural light at the first floor level, which is laboratory quality luminance.



SECTION THROUGH ATRIUM

At first glance the Neo-Classical architecture of the Charlotte Research Institute (CRI) campus is in contrast to the high-tech curriculum of an energy building. Design parameters such as symmetry and classical massing can inhibit a passive environmental approach. The intent is to combine old and new into a truly “transitional” style that provides a classical framework in which more contemporary elements can be expressed. Current fenestration treatments bring a layer of interest to the façade, and outwardly portray the building as an extension of the curriculum it serves. The front elevation is shaped by the ellipse the building faces, and allows daylight into a gallery intended for project display. The inclusion of a research oriented courtyard, along with the entry sequence brings nature to the front door by framing the connection to an existing greenway. The building is organized around “nodes of collaboration” in public areas intended to bring together students, professors, and industry partners to create a synergistic environment for the improvement of energy supply and delivery.

ENERGY SAVINGS THROUGH DAYLIGHTING

54% OCCUPIED SPACE DAYLIT

INDOOR ENVIRONMENTAL QUALITY

STRUCTURE CENTER OVERVIEW

LEED SCORES

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The courtyar
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COU

1. Alternative Transportation

Reserving these parking spaces closest to the building encourages faculty and staff to carpool and drive vehicles that use less fuel and produce less pollution than typical vehicles. Bicycle racks and showers are provided to encourage alternate means of transportation.

2. Energy Use

This facility uses an active chilled beam system to provide primary space comfort needs. Each space will be aupplemented with outside air directly from heat recovery units located in the rooftop penthouse. Each heat recovery unit is nearly 80% effective in recovering energy from ventilation air exiting the building to the raw outside air entering the building. The building is designed to consume 30% less energy than a typical building.

3. Materials

There are many different materials used in this facility that conserve resources and protect the environment. Paints and carpets meet a strict criteria for low emissions of harmful air contaminants. A portion of the wood in the building is from certified suppliers that use environmentally responsible forest management practices.

4. Reduced Water Usage

This facility will utilize 81% less domestic water than a typical building by utilizing low flow fixtures and a gray water system. This gray water system collects the building HVAC condensate into a 6,000 gallon underground holding tank. The water source is cleaned with ultra-voilet light and injected with blue biodegradable dye before distribution to the water closets and urinals.

5. Water Cycle

The building stormwater management system is an integrated solution that will collect, treat, and store site runoff from the 1" storm event. This system includes approximately 20,000 gallons of below grade cistern rainwater storage for re-use as site irrigation. No potable water will be used for irrigation.

6. Recycling Stations

Stations to recycle paper, glass, plastic, and aluminum are located throughout the building in public areas to encourage less waste in the landfills.

7. Site Ecology

The rain gardens have been engineered to treat the 1" rainfall event and bypass the 10, 25 and 50 year storm events. The discharge from the 1-year 24 hour rainfall event has been decreased to less than pre-existing conditions. Additionally, a portion of the roof runoff will be directed into underground cisterns for distribution through the campus irrigation system.

8. Daylight

Effective daylight can offset energy consumption while creating a positive environment to work and learn. Daylight harvesting was integrated with esxterior shading to allow no net increase to the cooling loads. Two types of glazing are used to differentiate windows for light versus windows for view. Daylight and occupancy sensors throughout the building reduce use of electricity during daytime hours.

LEED SCORES

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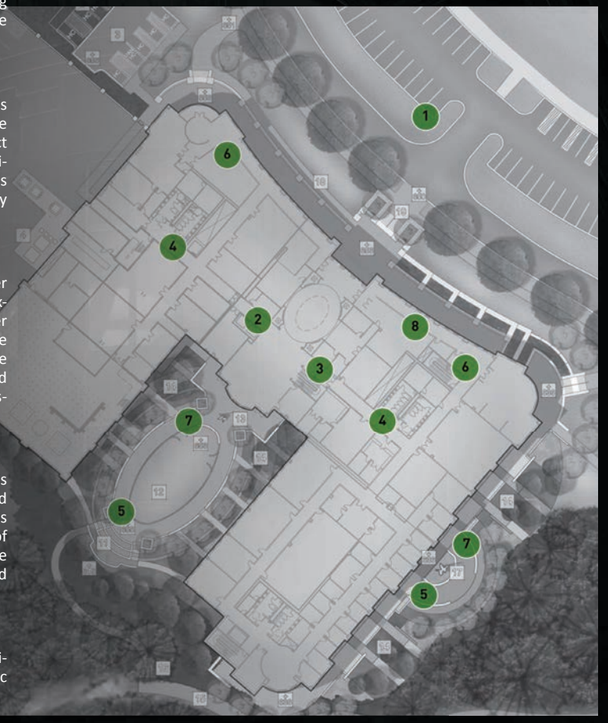

BUILDING AS A LEARNING TOOL

Signage has been located both inside and outside the building to educate the public on sustainable design features that when combined yield a LEED Gold Certification. That information combined with this brochure serves as a self-guided tour map for learning ways the built environment can minimize site impacts, consume less energy, and preserve natural resources.

NO POTABLE WATER USED FOR IRRIG

20% RECYCLED CONTENT

INNOVATION & DESIGN

MATERIALS/RESOURCES

30% REGIONAL MATERIALS

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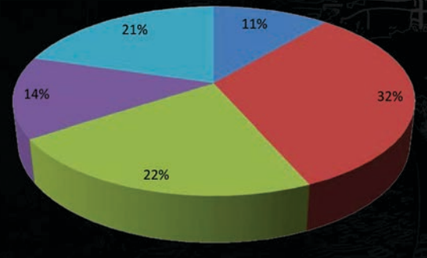
10 REGIONAL MATERIALS

1. Carolina Stalite - Fly Ash
   *Mfr - 54 m. / Extract - 33 m.
2. G. Ameristeel - Rebar
   *Mfr - 338 m. / Extract - 338 m.
3. N. A. Stainless - Dec. Metal railings
   *Mfr - 338 m. / Extract - 81 m.
4. Crossville, Inc. - Tiling
   *Mfr - 242 m. / Extract - 86 m.
5. Clark Western - Light Mtl. Studs
   *Mfr - 179 m. / Extract - 155 m.
6. Owens Corning - Thermal Insulation
   *Mfr - 242 m. / Extract - 223 m.
7. Hohmann & Barnard, Inc. - Brick
   *Mfr - 474 m. / Extract - 474 m.
8. W.R. Meadows, Inc. - Air/Vapor Bar.
   *Mfr - 401 m. / Extract - 239 m.
9. Pine Hall - Unit Paving
   *Mfr - 95 m. / Extract - 95 m.
10. Gerdau Ameristeel - Struct. Steel
    *Mfr - 66 m. / Extract - 234m.

**92 materials and their extracts harvested and manufactured regionally (within 500 miles of EPIC site*

RECYCLED CONTENT



1. 0 - 20% recycled content: 17
2. 20 - 40% recycled content: 49
3. 40 - 60% recycled content: 34
4. 60 - 80% recycled content: 21
5. 80 - 100% recycled content: 31

d is designed as an extension of
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events and awards ceremonies
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is framed on all sides by
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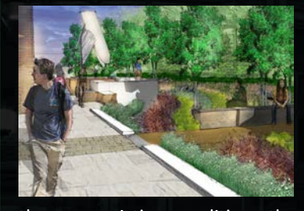
RTYARD RAIN GARDENS



Minimizing watershed impacts was identified as a primary ecological goal. Post developed runoff will be directed into a water quality infrastructure system that includes strategically located rain gardens, sand filter and underground detention. We have decreased the discharge from the 1-year 24 hour rainfall event to less than pre-existing conditions through the use of underground detention and water quality structures. Additionally, the roof runoff will be directed into underground cisterns for distribution through the campus irrigation system.

EAST RAIN GARDENS

ATION

SUSTAINABLE SITES

WATER EFFICIENCY

6,000 G. GREYWATER CISTERN

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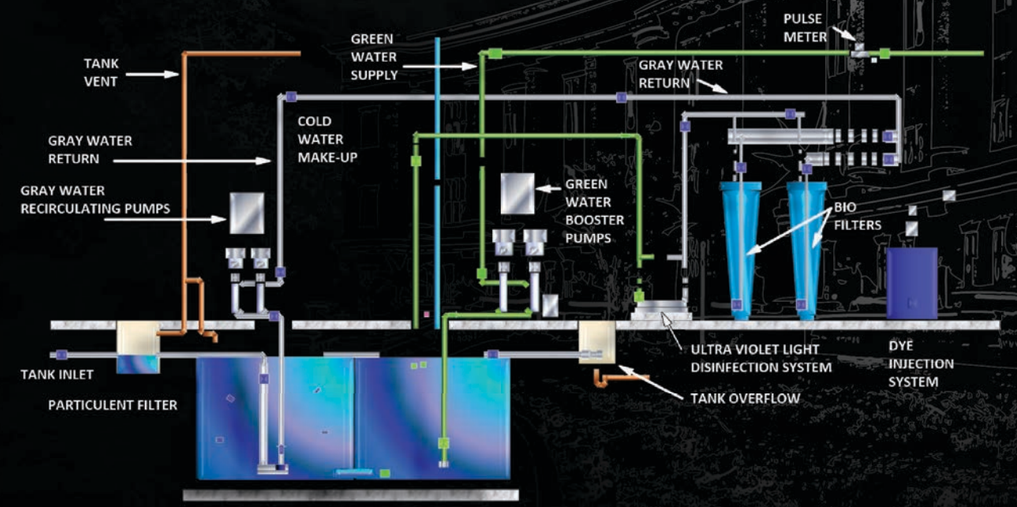
Typical storm precipitation managed on site: **60%**

Total water used indoors: **1,928,518 gal/yr**

Total water used outdoors: **1,300,000 gal/yr**

Percent of total water from reclaimed sources: **81%**

The projected use of reclaimed water and potable water for indoor use is 1,928,518 gallons with 1,331,185 gallons being used strictly for the water closets and urinals. The source for these 1,331,195 gallons is the buildings HVAC condensate. This gray water system collects the building's HVAC condensate into a 6,000 gallon underground holding tank. An ultra violet light final disinfection system is utilized to deactivate potential pathogens from the water source. The treated gray water is injected with blue biodegradable dye before distribution to the water closets and urinals. The dye distinguishes the water as non-potable. This project is projected to have an 81% domestic water savings by utilizing low flow fixtures and the previously described gray water system.



GRAY WATER SYSTEM

LEED SCORES
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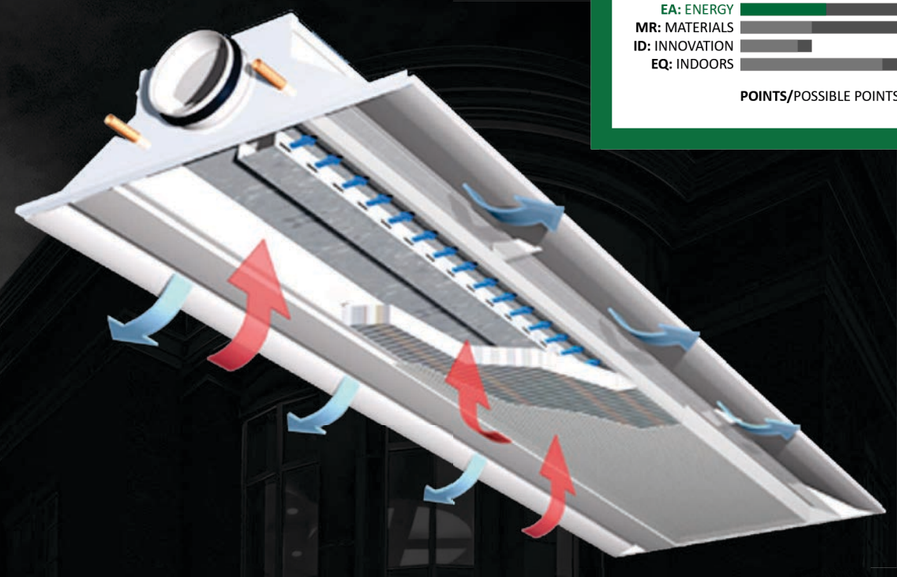
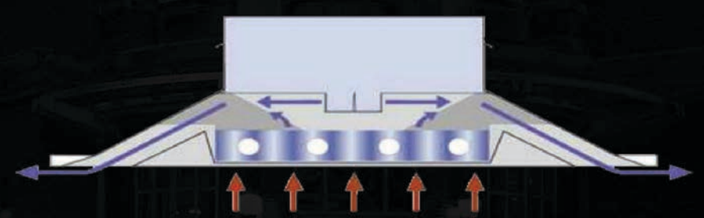
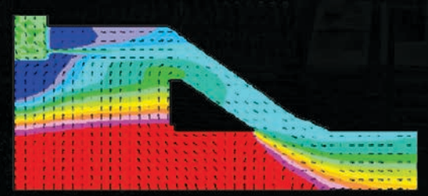
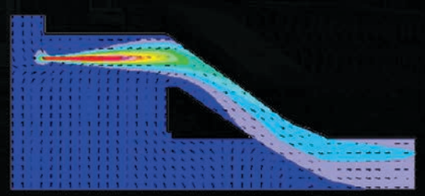


North Carolina senate bill #668 requires all new state-owned buildings to use 30% less energy than a typical building of similar size. In order to meet this requirement, the design team utilized an active chilled beam system to provide primary space comfort needs. Each beam will be provided ouside air directly from heat recovery units located in the rooftop penthouse. Each heat recovery unit is nearly 80% effective in recovering energy from ventilation air exiting the building to raw outside air entering the building.





TEMPERATURE PROFILE



VELOCITY PROFILE

37% ENERGY REDUCTION

ENERGY & ATMOSPHERE