

Fairfax Village Neighborhood Center

A Leadership in Energy and Environmental Design Community



FORT BELVOIR
RESIDENTIAL COMMUNITIES LLC



What is LEED?

- Leadership in Energy & Environmental Design (LEED) is the nationally accepted benchmark for the design, construction and operation of high performance green buildings.
- LEED is a voluntary certification system created by the U.S. Green Building Council.
- The system is consensus-based, meaning that all aspects of the building industry have a voice in the criteria.
- The system has 4 levels of certification:
 - *Certified* for achieving 40-50% of the possible credits;
 - *Silver* for achieving 50-60% of the possible credits;
 - *Gold* for achieving 60-70% of the possible credits;
 - *Platinum* for achieving 70-80% of the possible credits.
- The Fairfax Village Neighborhood Center is attempting to achieve LEED-Platinum. If certified, the facility will be the first LEED-Platinum building in the state of Virginia and in the entire military.



Why did FBRC choose to go Green?

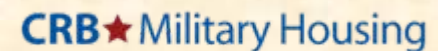


- A 'green' neighborhood center within each Village provides environmental, health, and social benefits to the residents and employees that use the facility.
- FBRC wanted to set the standard going forward for green building on military bases.
- FBRC wanted to prove that it was possible to build a sustainable building that blended in with its surroundings.

What types of projects does LEED certify?

LEED covers different types of projects through different rating systems:

- LEED-CI is for commercial interiors
- LEED-EB is for existing buildings
- LEED-CS is for core and shell buildings
- LEED-H is for residential homes (and is still in the pilot stage)
- LEED-ND is for neighborhood development (and is still in the pilot stage)
- LEED-NC is for new construction
- The Fairfax Village Neighborhood Center is attempting to achieve LEED-NC certification

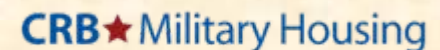


LEED-NC Categories

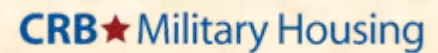
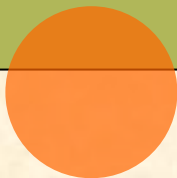


Explanation of Category Requirements

- Category 1 – Sustainable Sites: Focuses on site selection, landscaping, and storm water management design
- Category 2 – Water Efficiency: Focuses on reducing potable water consumption
- Category 3 – Energy & Atmosphere: Focuses on HVAC efficiency, renewable energy, building envelope
- Category 4 – Materials & Resources: Focuses on building with recycled, rapidly renewable, and regional materials, as well as diverting construction waste from landfills
- Category 5 – Indoor Environmental Quality: Focuses on human comfort, day lighting, and the use of low-emitting building materials
- Category 6 – Innovation & Design: Gives credit for items not specifically covered in the rating system



What credits is the Fairfax Village Neighborhood Center pursuing?



Category 1

Sustainable Sites

(10 Points Out of 14 Possible)



- **Site Selection**

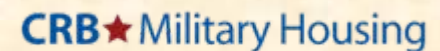
The physical location of the neighborhood center creates a walkable destination for residents in the surrounding villages. With jogging and bike trails connecting to the site, community engagement and outdoor recreation are encouraged and easily accessible.

- **Protecting Habitat**

The grounds around the neighborhood center are designed to protect habitats and biodiversity through full cut-off exterior lights, native species landscaping, vegetated open space, and a butterfly garden.

- **Alternative Transportation**

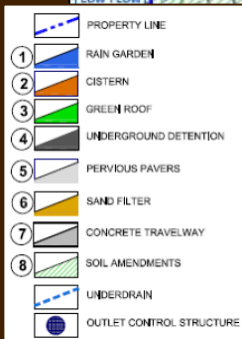
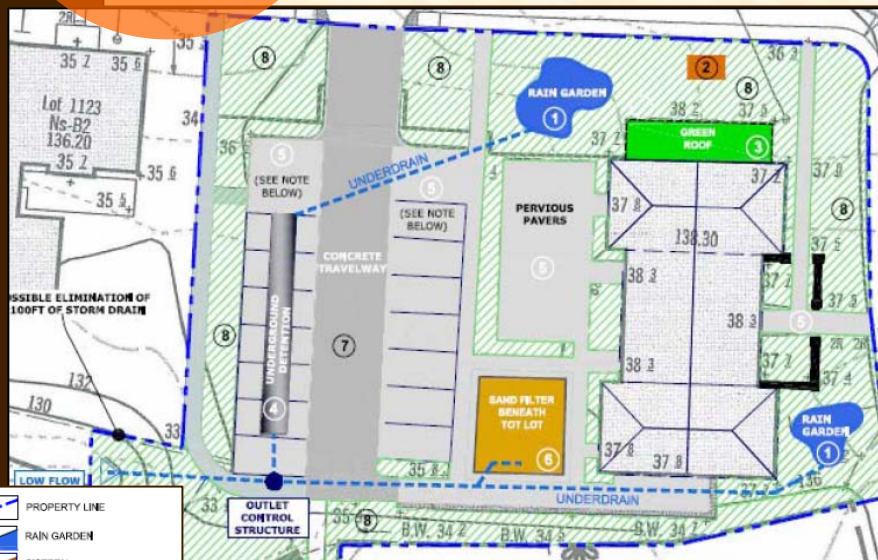
In order to reduce automobile dependence and maintain a cleaner environment, preferred parking spaces are given to carpool and low-emitting vehicles. Bike racks are also provided for resident use.



Sustainable Sites

Category 1

Low Impact Development (LID) Techniques



- Green Space

The amount of green space surrounding the Neighborhood Center is intended to minimize the footprint of the site's development. With special emphasis on pervious hardscape surfaces, native/adapted species plants, and innovative stormwater management, the landscape was designed to protect the site's ecology.

- Heat Island Reduction

Highly-reflectant roofing material, plenty of tree shade, and pervious pavement all help mitigate the heat island effect (temperature differences between developed and undeveloped areas).

- Stormwater Management

Through the use of such features as rain gardens, pervious concrete, quantity and quality controls, and pollutant removal techniques, the stormwater management system helps reduce the development footprint. By capturing and treating the stormwater runoff from 90% of the average annual rainfall, this system helps to keep the Potomac River and Chesapeake Bay clean.

Category 2

Water Efficiency

(4 Points Out of 5 Possible)



- **Energy STAR Appliances**

Energy Star® qualified appliances use 10–50% less energy and water than standard models. This saves money (because of lower utility bills) and is good for the environment.

- **No Permanent Irrigation Systems**

Instead of a permanent irrigation system, the Neighborhood Center's landscaping plants have been selected specifically for their drought-tolerant, native/adapted and non-invasive qualities, which eliminate the need for additional watering.

- **Water Consumption Reduction**

Water saving fixtures, including dual-flush toilets, low-flush urinals, low-flow faucets with sensors, and low-flow showerheads, contribute to this building's 43% water savings (or 12,500 gallons per year) compared to a typical Neighborhood Center.

Category 3

Energy & Atmosphere

(15 Points Out of 17 Possible)



- **Geothermal Heat Pump System**

Located below the parking lot, a closed-loop geothermal heat pump system (16 vertical wells extending over 200 vertical feet) uses the temperature of the earth to heat and cool the building.

- **Renewable Energy**

Solar panels mounted on the roof are used to convert sunlight into electricity, reducing the need for fossil fuels. This on-site renewable energy system generates 23% of the electricity needed in the building.

- **Enhanced Commissioning**

A commissioning agent ensured that the building and systems operate as designed.

- **Reducing Energy Consumption**

The Neighborhood Center achieves a 70% annual reduction in energy costs. A well insulated envelope with high performance glazing, efficient lighting and controls, geothermal HVAC system, roof-mounted photovoltaic panels, and a south facing trellis all contribute to the building's reduced operating costs.

Category 4

Materials & Resources

(9 Points Out of 13 Possible)



- **Recycled Materials**

Over 10% of the materials used at the Neighborhood Center contain recycled-content, including concrete with fly-ash/slag, aluminum roofing, tile flooring, Paperstone countertops, and carpeting. Materials with recycled-content reduce the use of new raw materials.

- **Rapidly Renewable Materials**

Over 2.5% of the materials used at the Neighborhood Center come from rapidly renewable resources, such as sorghum, soy beans, and linseed oil. Rapidly renewable materials are made from plants and resources that are typically harvested within a ten-year cycle or shorter.

- **Construction Waste Management**

Over 75% of the non-hazardous waste generated during construction and demolition were reused or recycled, including wood, metal, gypsum wallboard, concrete/masonry, and cardboard.

Category 4

Materials & Resources

(9 Points Out of 13 Possible)

- **Regional Materials**

Over 20% of the materials used at the Neighborhood Center were harvested or produced within 500 miles of the site. Locally produced materials help reduce the cost and environmental impacts associated with shipping and transportation.

- **Certified Wood**

All framing lumber and rough carpentry used at the Neighborhood Center are Forest Stewardship Council-certified (FSC-certified). This means the wood product comes from sustainably-managed forests.

- **Material Reuse**

Reclaimed materials used at the Neighborhood Center include bricks salvaged from Jadwin Village, a used tot lot, and reclaimed oak flooring. Using reclaimed materials reduces the environmental impacts of producing new materials.



Indoor Environmental Quality

(13 Points Out of 15 Possible)

Category 5



- **Low-Emitting Materials**

To ensure a superior indoor environment, the Neighborhood Center has good ventilation and non-toxic, low-emitting, formaldehyde-free finishes and products, such as paints, carpets, adhesives, sealants, and composite wood materials.

- **Thermal Comfort**

The HVAC system is sized to maintain appropriate temperature and humidity levels in the building. Thermostats are available in each room for building occupants to adjust settings based on personal preferences. Monitors placed in the Great Room and meeting room measure carbon dioxide levels and automatically adjust dampers to allow more fresh air into the spaces.

- **Controllability of Systems**

The Neighborhood Center features lighting dimmers, dual-switching lights, and accessible thermostats to enable building occupants to adjust settings based on personal preferences and/or activity.

Innovation & Design

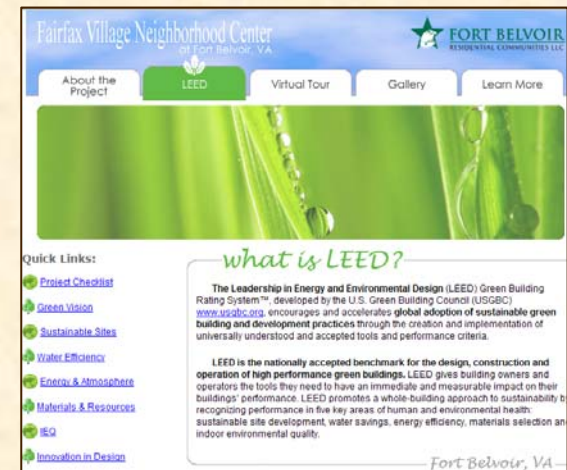
Category 6

(5 Points Out of 5 Possible)



- Green Education Program

This program includes several aspects that together emphasize the principles on which this project was established: 1) a self-guided tour that spotlights twenty-four (24) sustainable features on the interior and exterior of the building; 2) an educational signage program throughout the site and building; 3) an LCD monitor display in the foyer that continuously shows graphic real-time building energy usage (geothermal HVAC system status and solar panel renewable energy data); and 4) an interactive website, www.greenbelvoir.com that features tons of information on the sustainable aspects of the project.



Innovation & Design

(5 Points Out of 5 Possible)

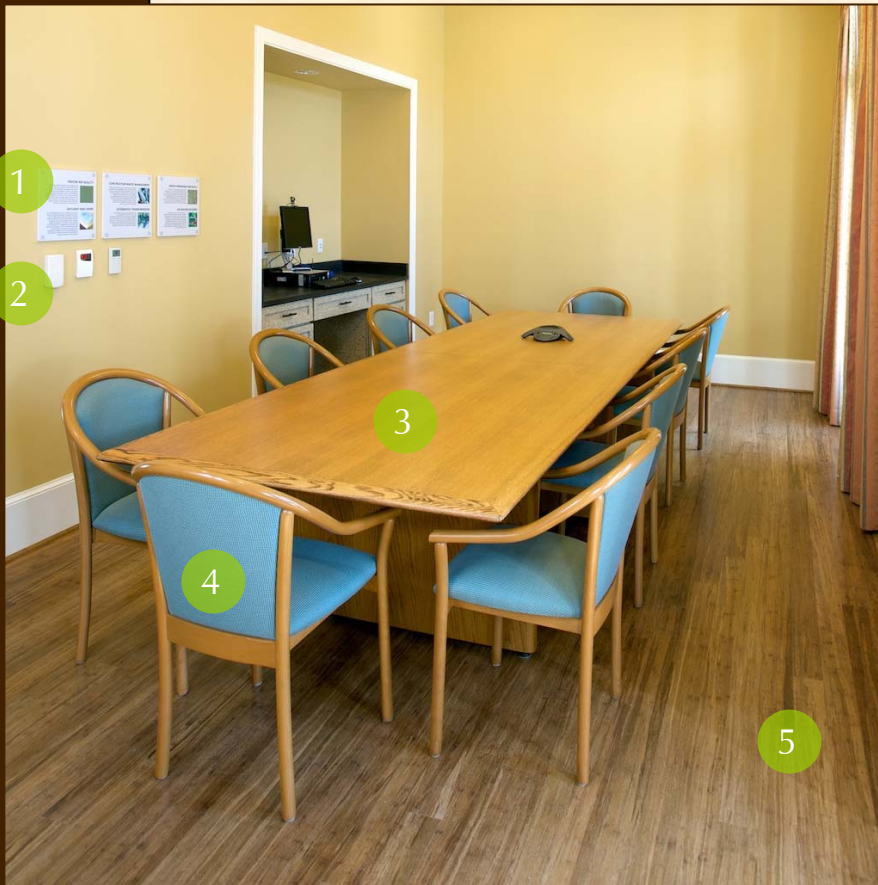
Category 6

• Exemplary Performance

The Neighborhood Center incorporates several features that go beyond the credit requirements: Water Use Reduction (40%+); Optimize Energy Performance (45.5%+); and On-Site Renewable Energy (17.5%+).

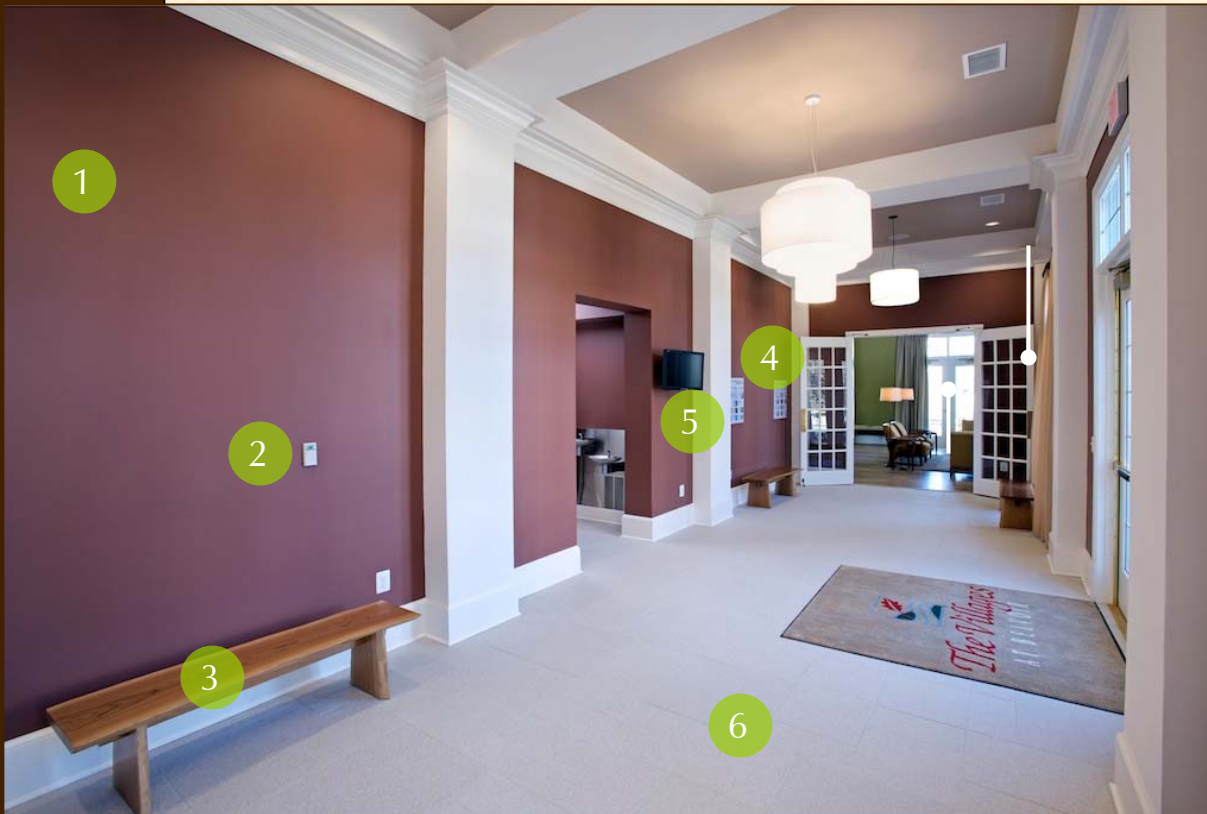
Neighborhood Center	
1	VENTILATION AND THERMAL COMFORT The Neighborhood Center is designed to provide comfortable and healthy indoor conditions, including proper ventilation and thermal comfort.
2	SYSTEM CONTROLLABILITY The Neighborhood Center features lighting dimmers, dual-switching lights, and accessible thermostats to enable building occupants to adjust settings based on personal preferences and/or activity.
3	RECLAIMED MATERIALS Reclaimed materials used at the Neighborhood Center include bricks salvaged from Adjivia Village, a used toilet, and reclaimed oak flooring. Using reclaimed materials reduces the environmental impacts of producing new materials.
4	RECYCLED-CONTENT MATERIALS Over 10% of the materials used at the Neighborhood Center contain recycled-content, including concrete with fly ash/dag, metal roofing, tile, Paperstone, and carpeting. This reduces the use of new raw materials.
5	FSC-CERTIFIED WOOD All framing lumber used at the Neighborhood Center is Forest Stewardship Council-certified (FSC-certified). This means the wood product comes from sustainably-managed forests.
6	BUILDING INSULATION The soy-based spray foam insulation in the exterior walls and ceilings help keep the building warm in the winter and cool in the summer, making it energy-efficient and comfortable.
7	HABITAT PROTECTION The grounds around the Neighborhood Center are designed to protect habitats and biodiversity through full cut-off exterior lights, native species landscaping, vegetated open space, and a butterfly garden.
8	HEAT ISLAND EFFECT MITIGATION High-reflectant roofing material, plenty of tree shade, and pervious pavement all help mitigate the heat island effect (temperature differences between developed and undeveloped areas).
9	INNOVATIVE STORMWATER MANAGEMENT The entire site around the Neighborhood Center limits the disruption of natural hydrology by reducing impervious hardscape, increasing on-site infiltration, and managing stormwater runoff.
10	NO PERMANENT IRRIGATION Instead of a permanent irrigation system, the Neighborhood Center's landscaping plants have been selected specifically for their drought-tolerant, native/adapted and noninvasive qualities, which eliminate the need for additional watering.
11	COMPACT FLUORESCENT LAMPS (CFLs) use about 75% less energy and produce about 75% less heat than standard incandescent lamps. Combined with occupancy sensors, CFLs reduce the building's lighting energy costs by more than 30%.
12	HIGH PERFORMANCE WINDOWS High performance, energy-efficient windows and French doors save energy and money, reduce carbon dioxide emissions, increase indoor comfort, and protect interior furnishings from sun damage.
13	SMART BUILDING ORIENTATION The Neighborhood Center is oriented along the east-west axis to take advantage of daylighting and solar heat gain during the winter. Proper building orientation helps reduce energy requirements.
14	SMART SITE LOCATION The physical location of the Neighborhood Center creates a walkable destination for residents in the surrounding villages. With jogging and bike trails connecting to the site, community engagement and outdoor recreation are encouraged and easily accessible.
15	LOW FLOW FIXTURES & SENSORED FAUCETS Water saving fixtures, including dual-flush toilets, low-flush urinals, low-flow faucets with sensors, and low-flow showerheads, contribute to this building's 43% water savings (12,500 gallons per year) compared to a typical Neighborhood Center.
16	ENERGY STAR APPLIANCES Energy Star® qualified appliances use 10-50% less energy and water than standard models. This saves money (because of lower utility bills) and is good for the environment.
17	CONSTRUCTION & DEMOLITION WASTE MANAGEMENT Over 75% of the non-hazardous waste generated during construction and demolition was reused or recycled, including wood, metal, gypsum wallboard, concrete/masonry, and cardboard.
18	ALTERNATIVE TRANSPORTATION In order to reduce automobile dependence and maintain a cleaner environment, alternative methods of environmentally friendly transportation are encouraged for those visiting the Neighborhood Center.
19	RAPIDLY RENEWABLE MATERIALS Over 25% of the materials used at the Neighborhood Center come from rapidly renewable resources, such as sorghum, soy beans, and linseed oil. These resources are typically harvested within a ten-year cycle or shorter.
20	AIR SEALING/CAULKING Air sealing and caulking exterior walls, ceilings, windows, doors, floors, and penetrations is one of the most cost-effective ways to improve energy efficiency and comfort and reduce carbon dioxide emissions.
21	INDOOR AIR QUALITY To ensure a superior indoor environment, the Neighborhood Center has good ventilation and non-toxic, low-VOC, and formaldehyde-free finishes and products, such as paints, carpets, adhesives, sealants, and composite wood materials.
22	DAYLIGHT & VIEWS Bringing in natural light and providing views to the outdoors are some of the most cost-effective ways to increase comfort and aesthetics while reducing energy consumption.
23	RENEWABLE ENERGY Solar panels mounted on the roof are used to convert sunlight into electricity, reducing the need for fossil fuels. This on-site renewable energy system generates 23% of the electricity needed in the building.
24	GEOHERMAL HEAT PUMP SYSTEM This Neighborhood Center uses 60% less energy than a typical Neighborhood Center. One of the major strategies contributing to this is the geothermal heat pump system, which uses the constant temperature of the earth to provide heating, cooling, and hot water.

Innovations at the Fairfax Village Neighborhood Center – Conference Room



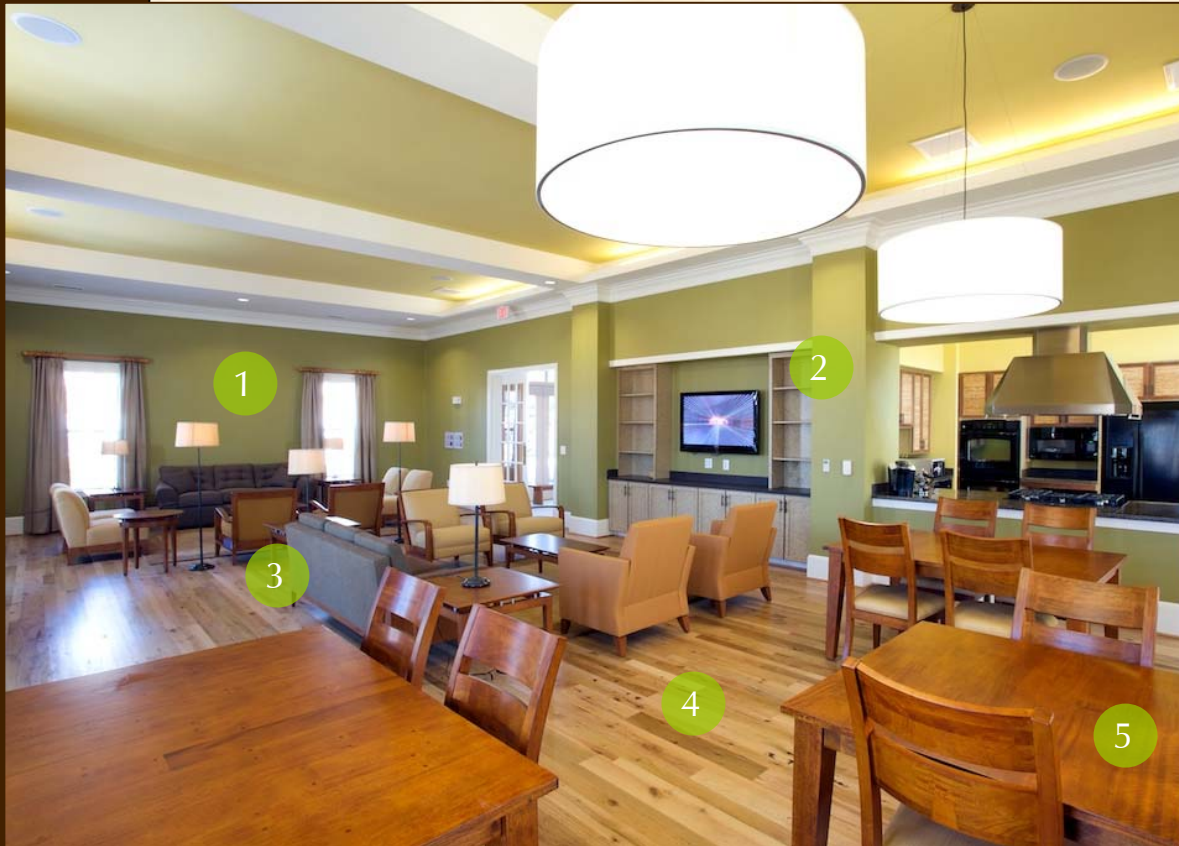
1. Green Education Signage Program
2. Zoned Temperature Controls & Indoor CO2 Sensors
3. Salvaged & Re-purposed Conference Table
4. Salvaged Conference Chairs With 100% Recycled Polyester Fabric
5. 100% Bamboo Flooring (Plyboo)

Innovations at the Fairfax Village Neighborhood Center - Lobby



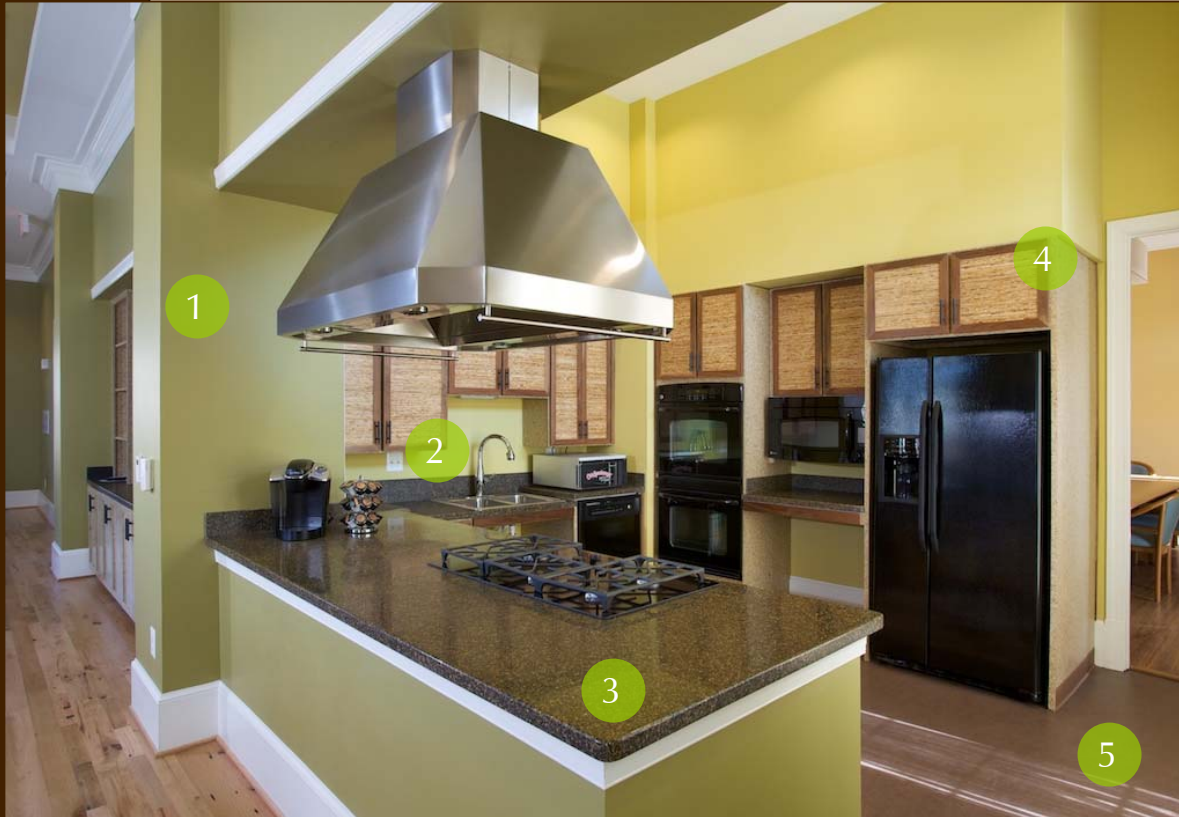
1. Low-VOC Paint
2. Zoned Temperature Controls
3. FSC-Certified Wood Benches
4. Green Education Signage Program
5. Real-Time Building Energy Usage Display
6. 70% Recycled Porcelain Tile Flooring

Innovations at the Fairfax Village Neighborhood Center – Great Room



1. Low-VOC Paint
2. Rapidly Renewable Sunflower Husk Cabinetry With 100% Recycled Paper Countertops
3. All Furniture Upholstered With 100% Recycled Polyester
4. 100% Reclaimed American Oak Flooring
5. Salvaged Tables & Chairs

Innovations at the Fairfax Village Neighborhood Center – Kitchen



1. Low-VOC Paint
2. Low-Flow Faucet
3. 100% Pre-Consumer Recycled Metal Shaving Countertops
4. Rapidly Renewable Kirei Board Cabinetry
5. Rapidly Renewable Linoleum Flooring

Innovations at the Fairfax Village Neighborhood Center - Bathrooms



1. Dual-Flush Toilets
2. 55% Recycled Glass Tile Flooring
3. Sensored Low-Flow Faucets
4. 100% Recycled Plastic Bottle Countertops
5. Paperless High-Speed Hand Dryer

Innovations at the Fairfax Village Neighborhood Center - Offices



1. Daylight & Outside Views Contribute to Indoor Environmental Quality
2. Green Guard Certified Recycled Carpeting
3. Reused Furniture In All Offices
4. All Furniture Upholstered With 100% Recycled Polyester

Innovations at the Fairfax Village Neighborhood Center - Exterior

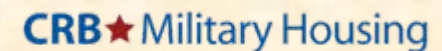


1. Recycled Aluminum Light Colored Roof Reduces Heat Absorption
2. Salvaged Brick From Another Village On Ft. Belvoir
3. Pervious Concrete Reduces Stormwater Runoff From the Parking Lot
4. On-site Renewable Energy System Generates 23% Of The Building's Electricity
5. Salvaged Tot Lot From Another Village On Ft. Belvoir

Innovations at the Fairfax Village Neighborhood Center - Exterior



1. Green Education Signage Throughout
Butterfly Garden
2. Native/Adapted Species
Butterfly Garden
3. Access To Fairfax Ruins
Nature Trail
4. 16 Geothermal Wells
Extend 200ft Below The
Parking Lot To Heat And
Cool The Building



How Much Did It Cost?



- Fort Belvoir Residential Communities, LLC is the long term owner of the building.
- Many of the materials and building systems have a payback that justifies the upfront investment.
- As energy prices continue to increase, the payback periods associated with energy-saving strategies in the Neighborhood Center are reduced.
- Several LEED credits focus on elements of sustainability and environmental quality (materials, indoor air quality controls, low-impact development techniques). While these features are the 'right' things to do, their use does not translate into energy efficiency and payback.
- Utility savings and cost premiums are compared on a consumption and cost basis with a standard Neighborhood Center built in 2005.

Payback Analysis

Fairfax Village Neighborhood Center VS. Typical 2005 Neighborhood Center*

FFX NC Construction Cost Premium – \$800,000

% Reduction in Annual Energy Cost – 70%

% Increase in Energy Rates per Year (over 2008 rate) – Payback Period

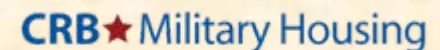
5% – 48 years

10% – 31 years

15% – 24 years

(18% Increase from 2007 to 2008)

*2005 Construction Costs have been escalated to today's dollars at 3% per year



Payback Analysis

Ground Source Heat Pump System VS. Gas Furnace System*

FFX NC GSHP Cost Premium – \$214,000
% Reduction in Annual Energy Cost – 28%

% Increase in Energy Rates per Year (over 2008 rate) – Payback Period

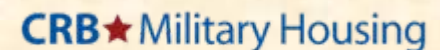
5% – 49 years

10% – 31 years

15% – 24 years

(% Increase from 2007 to 2008 – 18%)

*2005 Construction Costs have been escalated to today's dollars at 3% per year



Payback Analysis

Photovoltaic System

FFX NC Solar Panel System Cost – \$140,500

Yearly Energy Generated – \$870

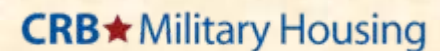
% Increase in Energy Rates per Year (over 2008 rate) – Payback Period

5% – 46 years

10% – 30 years

15% – 24 years

(18% Increase from 2007 to 2008)



Additional Benefits



- Improved Air Quality – Employee Health & Productivity
- Reduced Car Dependence
- Green Education

What Did FBRC Learn?



- Establish team members & goals early in the process.
- Communication & coordination are critical to a successful 'green' building.
- Obtaining documentation from manufacturers and suppliers is a challenge.
- Proper construction oversight is a necessity to ensure building specifications.
- A building does not have to look 'green' to be 'green'.



Thanks To The Project Team

Owner – Fort Belvoir Residential Communities

General Contractor – CRB Military Housing

Architect – Torti Gallas & Partners

Civil Engineer – Bowman Consulting Group

MEP – E.K. Fox & Associates

Landscape Architect – Parker Rodriguez

Interior Designer – HOK

LEED Consultant – Sustainable Design Consulting

Building Commissioning – Advanced Building Performance

Sustainability Consultant – Wetland Studies & Solutions

