

# Kickapoo Center Information Packet

## OVERVIEW

Kickapoo Center and Equipment Shed was built to provide not only a centralized location for activities at Kickapoo Mud Creek Nature Conservancy, but also to store the equipment needed to maintain the Conservancy. In keeping with our environmentally friendly focus in the construction we:

- Followed the 3 R's: "Reduce, Reuse, Recycle"
- Locally sourced as many materials as possible
- Used local contractor and crew
- Have a small footprint (1,216 SF for the Center + 813 SF for the Shed)
- Use of as much natural light as possible
- Designed the meeting area of Kickapoo Center to use 1 (one) watt of energy per square foot on the coldest day of the year to heat the building
- Center uses .46 watts per SF for lighting (562 watts/1,216 SF), compared to maximum of 1.0 watts per SF needed to obtain a LEED certification
- No mechanical exhaust fan needed in bathroom
- Used a salvaged cherry tree for the wood porch posts
- Created an earth berm around the building from excavated soil, which provides additional insulation as well as engaging the building into the landscape
- South west facing deep porch & large overhangs to shade the building
- Used energy efficient systems and as many environmentally friendly products as feasible.

The objective of the building was to build a structure that met our needs, but did so in such a way as to serve as an example of what future energy efficient construction could be. The goal of less energy usage is directly impacted by insulation. The construction focal point of the Center was to use structural insulated panels (SIPS), insulated concrete forms (ICFS), an earth tube, a solar roof and a heat recovery system. Kickapoo Center, therefore, was built to be very well insulated, with very little air leakage (loss of energy). To create an air-tight space, we implemented the use of ICF and SIP. A description of this form of construction appears below. As a result of the air-tight nature of the structure, however, we needed to ensure that an adequate volume of fresh air moved through the space, hence the earth-tube and HRV. To ensure against any bacteria that may be carried into the space (via the earth tube), a ultra violet filter has been installed at the earth tube air intake into the Center. The earth tube performs a second purpose in addition to being a "fresh air" source. Because it is installed below the frost line and approximately 100 feet in length, the incoming air will either be hotter or cooler than the outside temperature thereby reducing any energy required to heat and/or cool the space. The heat recovery system and the insulated "envelope" are expected to heat/cool the space with very little energy usage.

The solar roof and heat recovery system was designed to provide virtually all of the heat and cooling required by the space. As a result, the U.S. Department of Energy (DOE) became interested in determining the efficiency of the roof recovery system. They installed sensors and a weather station to

monitor both the outside and inside temperatures and other variables. The data will be collected via specialized software with on-line monitoring beginning in August 2009.

The environmentally friendly practice at the construction site of Kickapoo Center also included donating scrap boards to a local carpenter who is a member of Personal Energy Transportation (PET) - an organization that manufactures hand-cranked wheelchairs for the disabled, land mine victims, and returning veterans. The construction crews saved all of the cans that were recyclable, and took them to a recycle plant. At the end of the job they split the proceeds. Not only did this help keep the job site clean from debris, but provides a little extra funding for those working so hard on the construction.

All well done projects are the result of a team of people that not only excel in their given fields, but believe in the project. To that end, our great appreciation to all of those whose knowledge, skill and imagination helped us to create Kickapoo Center:

Tony Bauer  
**McCance Builders Inc.**  
107 S. Daysville Road  
Oregon, IL  
815.757.5665  
[www.mccancebuilders.com](http://www.mccancebuilders.com)

Victor Zaderej  
Kevin Donovan  
**Solar Homes, LLC**  
35 W. 822 Park Lane  
St. Charles, IL  
630.728.1107  
[www.solarhomesus.com](http://www.solarhomesus.com)

Thom Greene, Architect  
**Greene & Proppe Design Inc.**  
1209 Wet Berwyn  
Chicago, IL  
773.271.1925  
[www.GPDChicago.com](http://www.GPDChicago.com)

## **GENERAL INFORMATION:**

### **SIPS & ICFS**

#### **SIPS (Structural Insulated Panel System)**

SIPS are a simple, fast, highly efficient integrated structural system which provides superior thermal performance and substantially greater strength than conventional stud construction. The panels are pre-cut and custom fabricated. By fitting splines into pre-routed grooves in the panel edges, virtually any wall or roof configuration may be formed. The strength of the adhesive used makes these panels structurally analogous to an I-beam, with the boards functioning as the flanges and the insulating core as the web.

#### **Benefits of SIPS:**

- The rigid insulation can't sag or shift
- The R-value, a very high R-48, remains very stable over time and is minimally affected by moisture
- There are far fewer interruptions in the insulation which greatly reduce air infiltration and thermal bridging
- There are greatly reduced heating and cooling loads which means savings in HVAC equipment initial purchasing and operating costs
- They also offer ecological savings. Polystyrene insulation can be recycled (thus reducing landfill waste and easing the demand for new petroleum stock) and the use of particle board reduces the need to cut old growth forests and use of nonrenewable fuel resources
- SIP buildings combine 3 stages of conventional shell construction (framing, sheathing and insulation) thereby reducing time required for construction
- SIP buildings are more comfortable and economical to own and operate than stick-built structures
- They are significantly stronger than standard stick-built structures of similar configurations

- The panels' uniformity and one-piece construction make it easier to build because they are straight and plumb
- The two layers of structural board provide each panel with improved stability, a solid nailing base and increased protection against vandalism, break-ins and tenant damage
- SIPS have passed rigorous fire endurance tests required by national codes. Their solid-core construction eliminates the "chimney effect" that causes fires to spread quickly through hollow stick-built walls

### **ICFS (Insulated Concrete Forms)**

Insulated concrete forms are known for their extreme energy efficiency, strength, fire resistance, sound suppression and mold resistance. Constructed from expanded polystyrene and stacked like building blocks to form the exterior walls of a home, the forms are reinforced with steel and filled with concrete. The forms interlock and fasten one to the other to provide seamless "foundation to rafter" fully insulated, reinforced concrete walls. Window and door openings of any size are possible. Insulated concrete forms provide a lasting building envelope, designed to withstand high wind, fire, the elements, and the test of time and can be used below ground, unlike SIPS.

#### **Benefits of ICFS**

- Extremely energy efficient
- High R-value - the insulation, coupled with the thermal mass of the concrete, and the elimination of air leakage, creates an R-22 energy rating or higher. Typical wood framed homes have an R-value of approximately 12. Basements in wood framed homes historically have an R-value of 1 -2.
- Many insurance companies offer favorable rates to customers with homes built with insulated concrete forms due to the superior strength of the construction coupled with the high fire rating
- Often used for the construction of safe rooms in these high-wind areas because of their resistance to strong wind and wind-borne debris
- Provides temperature stability, without the highs and lows of traditional stick-framed housing. Noise is reduced and even eliminated, thanks to the thickness of the walls and the double insulation
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## **Roof / Roof Solar System**

### **Pac-Clad Steel Roof**

- The color of the roof meets Energy Star Requirements
- The metal used in the roof is certified by U.S. Steel to be comprised of 25% scrap in the steels produced for the Construction Market (but this can range between 20 and 30%). Of the scrap used, approximately 80% is Post Industrial Scrap and 20% Post Consumer Scrap

### **Roof Solar System**

- The South facing portion of the metal roof is a hot air solar system. The air temperature in the air space under the metal roof is constantly, and automatically, measured. For space heating, if the temperature in the roof exceeds the indoor temperature by 15 F, two quiet air-handling fans will pull air from the building and heat it in the air space in the roof. This air is then brought back into the building through a plenum in the roof and is moved into an air distribution system in the floor. Eight inches of crushed stone and concrete provide the necessary thermal mass to store the energy for up to two days of heat after one sunny day. During the summer, a temperature-controlled exhaust fan is used to ventilate the air space in the roof to minimize heat build up.

## **Earth Tube**

Anytime, but especially in a super sealed and insulated building such as this, there must be a continuous supply of fresh air. This air is provided by a 100 foot long earth tube. This tube was installed under the frost line. The air in the earth tube will, as it travels through the tube to the building, match the temperature of the earth, namely 55 degrees F. The result is that the air temperature taken into the building is effectively raised in the winter and lowered in the summer. It enters the Center via a sealed connection that goes directly into the Enerboss Heat Recovery Ventilator system which is protected by an ultra violet light source that will remove any potential bacteria. The inside of the tube is smooth so that it can easily be cleaned

## **Summary**

Kickapoo Center was designed and built around three fundamental interrelated systems employing elements existing in any structure: roof, walls and floor, and the earth.

- The earth is employed to "automatically" condition air entering the structure year round to approximately 55 degrees F via the earth tube. By so doing the fresh air coming into the structure never needs to be changed more than 10-20 degrees for comfort, if at all.
- Due to the outstanding insulation of the roof, walls, triple pane windows and the slab, very little heat "leaks into or out of" the structure.
- The roof system generates passive solar heat and, by virtue of the use of the slab as a heat bank, stores it in for cloudy winter days.

And the progress continues.....

## **Materials and Equipment**

### **Doors**

#### **Koch & Co., Inc.:** Interior bathroom door, closet door

- Free of synthetic formaldehyde resins, laboratory certified Contains 85% rapidly renewable resource by volume. Stable and engineered core helps to eliminate warping, cracking and splitting. Ultraviolet examination for glue residue removal, Ultra low VOC water based adhesives, Low impact on natural resources, Affordable and made in the USA.
- Environ biocomposites uses 3 distinct layers using 2 resin systems, commonly used in the engineered wood products industry, are combined using state of the art equipment. This process is called Microstrand Wheat and it can be engineered to meet the end users needs. Microstrand Wheat uses only rapidly renewable agricultural fiber from Mid-western farms, helping to protect America's forest lands. This product is recognized as a LEED product and contributes toward LEED credits

#### **Therma Tru Doors:** Front door

- Energy Star Rated & NFRC Certified, Thermal efficiency 3 to 7 times greater than wood doors, High R-Value (u.14 to 6.24) and low U-Value (.14 to .16) resulting in superior thermal performance.

#### **JELD-WEN:** Equipment Shed Door & Garage Door, Design #4, Composite Carriage House

- Doors are packed with environmentally safe, CFS-free, expanded polystyrene insulation, providing stability with no loss of R-value over time.

- Skins and trim boards are made of 100% recycled fiber.
- Exterior of doors is made from thermo set melamine resins combined with refined cellulose fibers create an exterior door skin that is virtually impervious to moisture, cracking, rotting, sub-zero freezing, desert heat and damaging effect of the sun's ultraviolet rays.

### **Insulation**

- Johns Manville Formaldehyde-free Fiber Glass Insulation
- 25% recycled glass (20% post consumer, 5% post industrial)
- JM recycles 90,000 tons of recycled material each year
- Only fiberglass insulation to pass California Environmental Specification 1350 for indoor air quality
- JM implements pollution prevention measures to reduce annual hazardous emissions by 200,000 pounds per year.
- 38 R-Value

**Insulation (under the floor)** There are 8.5 inches of high-density expanded polystyrene under the slab.

- The R-value of this foam is R35 and will virtually eliminate any heat loss to the ground.
- Heat storage from the "solar roof" will be provided by the slab so it is critical heat is not lost to the ground.
- Thermal shorts to the earth are entirely eliminated by having the foam "butt up" to the ICFs surrounding the perimeter of the building.

### **USG Drywall**

- USG Corporation Sheetrock Brand gypsum panels shipped from East Chicago, IN.
- 100% recycled paper and raw materials

**Lighting/Ceiling Fans** 762 Watts (Total, Center & Shed) of electricity used while all lights are on, compared to 2,993 Watts of typical lights, in thanks to numerous LED lights and efficient CFL lights.

**LED Benefits:** 50,000 Hours of Life, which at 8 hours/day, 7 days a week will last a little over 17.1 years. Environmentally friendly, contains no harmful Mercury. Does not emit harmful infrared or ultraviolet light. Generates little heat, compared to CFL, Halogen & incandescent.

#### **MaxLite Company, Meeting Room Cove & Kitchen Under cabinet lighting:**

- 5-Year warranty, 112.2 Watts used total (3.3 Watts/Foot)

#### **Edge: Display Room Track Lighting**

- LED monorail contain no Mercury or Lead, each bulb avoids .5 tons of CO2 emissions in life cycle (10 bulbs equals to 5 tons of CO2, compared to Halogen), 8 Watts each head.

#### **CreeLLS: Meeting Room Soffit & Shower**

- Recessed LED cans, 10.5 Watts each

#### **Halo: Kitchen:**

- Recessed LED can lights, 14.8 Watts each

#### **SPJ Lighting: Meeting Room**

- Wall sconce LED lights, 3 Watts each

### G.E.: Garage

- High efficient T8 bulbs (25 Watts each)

## **Heating and Air Conditioning**

### Nu-Air Enerboss HRV & Heating system and HVAC hardware

- 74% less operating cost than conventional furnace
- Programmed air flow
- Silent operation and continuous filtering
- Properly matched components for maximum efficiency
- Small footprint
- Integrated heat recovery ventilator, a ECM (Electronic Control Module) high efficiency motor that provides continuously filtered fresh air that is drawn through a 100 foot long earth tube, providing preheated air in the winter and cooled air in the summers.
- The heat source will be a closed loop instantaneous water heater using propane
- The building maximum heating load will be roughly 1200 watts or roughly 4000 Btus per hour.

### Lenox XC 13

- Uses 13 SEER (Seasonal Energy Efficient Ratio)
- Energy Star qualified, meeting or exceeds EPA guidelines
- High-efficiency outdoor coil
- Uses chlorine-free refrigerant

### Hunter Fan: Meeting Room

- 54 inch Paramount XP with light, Energy Star Rated

## **Flooring**

- Locally produced finished concrete
- Once installed it is permanent and never needs to be updated or replaced
- Colormaker/Patinaetch is a mildly acidic water-based solution designed to etch and stain concrete.
- It is manufactured in Cleveland Ohio, approximately 500 miles from installation site.
- No VOC's (volatile organic compounds)
- Acid stains use the least amount of energy of any floor in its manufacturing process.

## **Porch Concrete**

- Scofield Systems CHROMIX Admixtures.
- Concrete locally produced
- stain is 99% recycled materials
- Autumn Beige (light color) reflect more of the suns heat resulting in less heat build-up (i.e. less energy to heat and cool)

## **ICF/SIPS – by Insulspan**

ICFS are installed along the front wall and along the North and South walls to just below the windows

- R value of 22 - with an additional R13 added in the insulation on the inside of the ICFS inside a 2 X 4 built inner wall, for a total R value of R35

SIPS make up the roof system and the walls. The roof and walls are 12 inches of EPS (expanded polystyrene). The structure will be very air tight in that the joints are sealed between the ICFs, SIPs and the joints between them.

- R-value of R48.

### **Bathroom & Kitchen Tile**

#### **Terra Classic Tile, Bathroom & Kitchen**

- Environmentally friendly, Terra Classic's unique "glass fusion" technology combines recycled glass and minerals to create a new generation of ceramic tile. Made from over 55 to 75 percent waste glass (windows, mirrors, and post-consumer glass like bottles and jars).
- Made in USA.

### **Kitchen Cabinets/Countertops**

#### **Merillat Classic/Avenue/Maple/Sable**

- KCMA ESP CERTIFICATION. Merillat is a member of the Kitchen Cabinet Manufacturers Association (KCMA). For more than 40 years it set the standards for how cabinets are made, industry performance and product durability. When it introduced its sustainability program, called the Environmental Stewardship Certification Program (ESP), Merillat was on board. The certification evaluates Merillat's commitment to the environment regarding energy efficiency, recycling, reducing the amount of greenhouse gases emitted and community sponsorships.

#### **Green Building Supply:**

- Bamboo Countertops. Bamboo benefits: grows fast, regenerates & re-grows after harvesting. Harvested from Gov. controlled, 4-5 year old trees.
- Marmoleum (recycled linoleum) on Window Ledge. Marmoleum benefits: made by all natural materials (tree resin, wood flour, pigments, linseed oil, jute fiber), Anti - Static: won't attract dust & allergens, Hygienic: prevents bacteria from multiplying.

### **Windows - Loewen Widow Company**

- Heat Smart Plus 3 windows (triple glazed)
- Low -E, Argon filled,
- 7.9 R-Value (resistance of heat transfer through the glass)
- Lowest solar heat gain and UV transmittance
- 1/8" double strength glass providing vast improvement to strength, durability and clarity.

### **Appliances**

#### **GE Profile Electric Cook top PP930DMBB**

#### **GE Advantium Oven SCA1000DMBB**

- 120-volt convection oven and microwave, Cooks using both halogen lights and microwaves.
- Energy Star Qualified

Reused/recycled turn of the century cast iron drain-board sink from GreenSky in Chicago

#### **Summit Compact Refrigerator BI605BFF**

- CFC free
- Energy Star Rated

**Bosch Front Load Washer WFCM220RUC**

- All Bosch washers are ENERGY STAR® rated through 2011, which has helped make Nexxt® washers the most efficient models on the market.

**Caroma Dual Flush Toilet**

- Dual flush technology uses 1.6/0.8 GPF vs. 3.5 GPF standard toilets.
- Reduces water consumption up to 18,000 gallons per year.

**On Demand Water Softener**

- Conserves water
- Less energy used to heat water
- No water wasted in the process of turning water on and off
- 24000 grains

**Paints:** **Sherwin Williams "Harmony" Series** No Volatile Organic Compounds (V.O.C.)

**Tack Board:** **Homasote** "Design Wall" 100% Recycled Polyester Tack Board

## **Web Sites for Major Suppliers**

**Blackhawk Lumber, Oregon Illinois**

[www.blackhawklumber.com](http://www.blackhawklumber.com)

**Insulspan**

[www.insulspan.com](http://www.insulspan.com)

**Johns Manville**

[www.jm.com/insulation](http://www.jm.com/insulation)

**Special Effex (Finished Concrete Floor)**

[www.specialeffexonline.com](http://www.specialeffexonline.com)

**USG Drywall**

[www.usg.com](http://www.usg.com)

**Merillat Cabinets**

[www.merillat.com](http://www.merillat.com)

**Bamboo**

[www.greenbuildingsupply.com](http://www.greenbuildingsupply.com)

**Koch & Co., Inc.**

[www.kochandco.com](http://www.kochandco.com)

**Nu-Air Ventilation Systems**

[http://www.loraxec.com/index.php?pr=Nu-Air\\_Enerboss](http://www.loraxec.com/index.php?pr=Nu-Air_Enerboss)

**Air Conditioning**

[www.lennox.com](http://www.lennox.com)

**Front Door**

[www.jeld-wen.com](http://www.jeld-wen.com)

**Appliances**

[www.farleysappliance.com](http://www.farleysappliance.com)

**Windows**

[www.loewen.com](http://www.loewen.com)

**Steel Roof**

[www.pac-clad.com/msds/galvanized\\_flip](http://www.pac-clad.com/msds/galvanized_flip)