DISASTER RESPONSE HOUSING UNITS

The objectives is to build sustainable housing units for disaster response workers and construction workers in disaster ravaged areas. Self contained, insulated concrete buildings can be built within 30 days to house workers. Long term use of the buildings for the community would be business offices, retail shops, rental units or senior housing. Disaster resistant construction and renewable energy technology makes it possible to serve this unmet need.

DESIGN: The buildings would be passive solar in nature with a sunspace for heat storage and communal gathering. A single building would contain four living quarters with mechanical room and storage at one end of the building. Common restrooms using contained units such as composting or chemical toilets, cisterns, and solar hot water systems make the facility independent of community services. Once water, sewer, and utility systems have been restored to the area, the building can be connected to the utilities.

CONSTRUCTION: Insulated concrete walls would be precast and bolted onto a monolithic slab. A patented building method of insulated concrete walls has been used for award winning high performance homes in Colorado for the past 10 years. The exterior finish would be in keeping with the local community buildings (stucco, brick, siding, etc). The walls between the living quarters would be concrete for sound and fire attenuation. One framed wall would be constructed in each quarter for plumbing purposes. Electrical outlets with conduit to the top of the walls would provide for electrical wiring. The roof would be insulated concrete construction. The south wall would have extensive glazing for passive solar effect and would be provided with storm shutters to protect the windows in case of high winds. The wall between the sunspace and living quarters would be concrete for heat storage.

UTILITIES: A carport for shading is proposed. The photovoltaic panels for electricity can be positioned on the carport or on the roof of the building. The inverter, batteries and generator would be housed in the mechanical room. Solar hot water collectors would be placed on the roof over the restrooms with a storage tank. Propane-fired baseboard heaters would provide any additional heating, if necessary. High efficiency window unit air conditioners would be used. Assuming local sewer systems are interrupted, self contained composting or chemical toilets would be provided in the common restrooms. Each of the four units would have a half a bath and plumbing for future kitchen. A water supply cistern would be stored in the mechanical room. A greywater cistern would allow for drainage from showers and hand washing sinks.

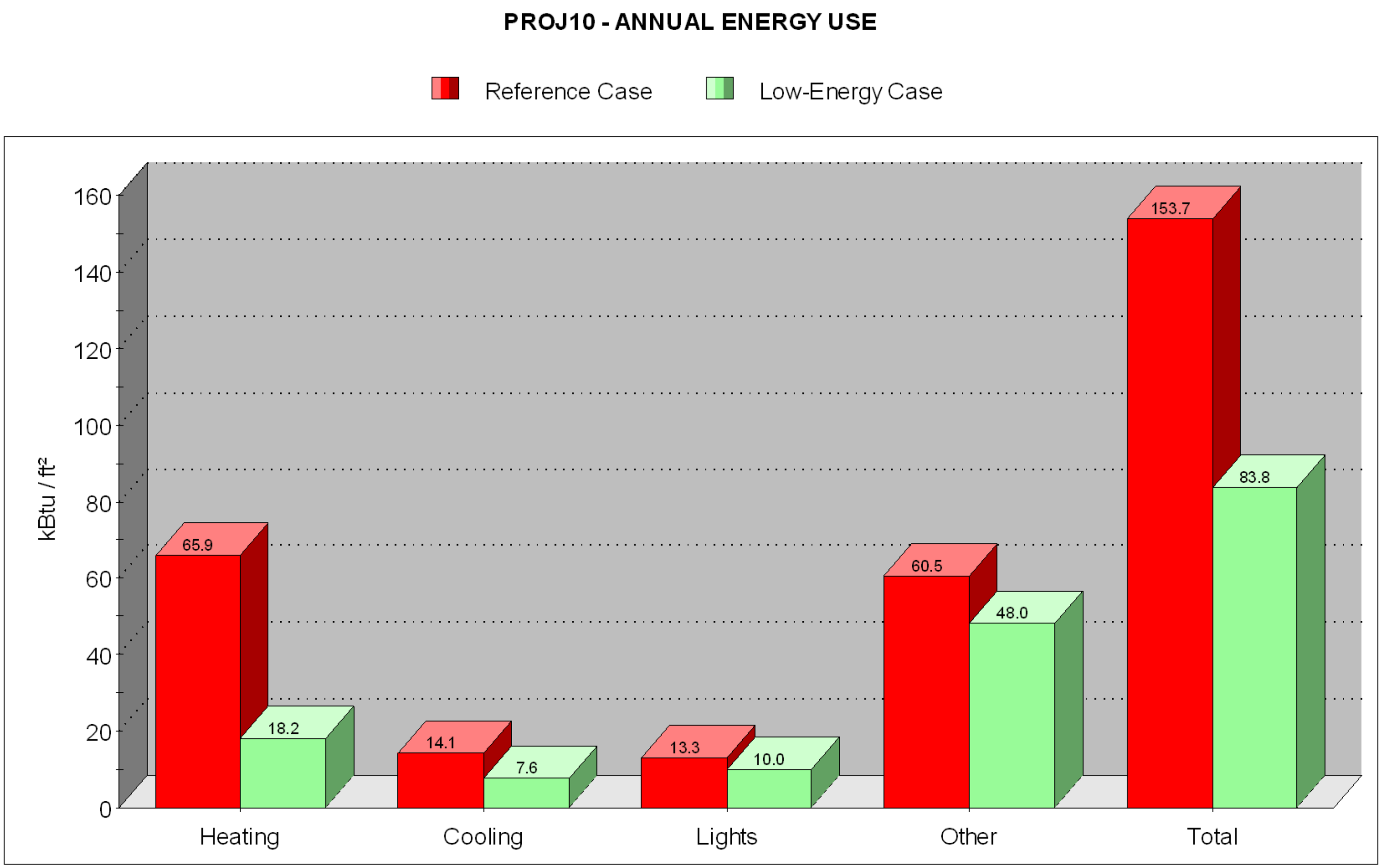
FURNISHINGS: The quarters would be comparable to motel rooms but with limited services. Kitchenettes, bathroom sink and toilet, cots, countertops, table and 4 chairs, small refrigerator and microwave oven could be provided. A cleaning/safety deposit would be required to control inventory of the furnishings.

CLIENTELLE: The FEMA trailers that house displaced residents of a disaster area are not available for construction workers. These disaster housing units could be erected in as short at 30 days from mobilization. Disaster relief workers, demolition crews and reconstruction contractors could make reservations by the day or week for any number of units. Subcontractors who typically need to be on the jobsites for relatively short periods of time would benefit from having readily available housing when local motels may be damaged or unavailable.

Long term use of the facility would be passed on to local businesses as needed for small business complex such as government agencies, realtors, insurance, etc. Retail sales or small enterprises such as barber shop, consignement shop, paper goods could make use of the building. Extended-stay rental units could be the ultimate use for senior housing. All units would be ADA compliant.

MANAGEMENT: Maintenance of the restrooms, water supply, temporary greywater cistern, and other utilities would be necessary. Owners of the complex would require payment for basic services and deposits for cleaning and furnishings.

CONCLUSION: The primary purpose of the buildings would be to serve the unmet need of providing a place for disaster response and reconstruction workers to live. Not quite as fast as getting into a FEMA trailer, the units can be completed in less than a month without waiting for traditional facilities and services. The advantage over modular units is the disaster resistance, permanent nature and use of renewable energy technologies of the buildings which make them much more sustainable.


PROJ10 - ANNUAL ENERGY USE
Reference Case
Low-Energy Case
kBtu / ft²
0
20
40
60
80
100
120
140
160
65.9
18.2
14.1
7.6
13.3
10.0
60.5
48.0
153.7
83.8
Heating
Cooling
Lights
Other
Total

Energy-10 Summary Page Sep 15, 2007

Project: GBworkerunits **Project Directory:** C:\Program Files\Energy-10\Version 1.8\Projects\PROJ10

Description:	Reference Case	Low-Energy Case
Scheme Number:	1 / Not Saved	2 / Not Saved
Library Name:	Local Only	Local Only
Simulation status, Thermal/DL	valid/NA	valid/NA
Weather file:	GREENSBURG.ET1	GREENSBURG.ET1
Floor Area, ft^2	3000.0	3000.0
Surface Area, ft^2	8182.4	8182.4
Volume, ft^3	27000.0	27000.0
Total Conduction UA, Btu/h-F	838.6	323.8
Average U-value, Btu/hr-ft^2-F	0.102	0.040
Wall Construction	steelstud 4, R=8.1	tch 4"/3", R=22.0
Roof Construction	flat r-38, R=38.0	flat r-38, R=38.0,etc
Floor type, insulation	Slab on Grade, Reff=13.7	Slab on Grade, Reff=61.9
Window Construction	4060 double, alum, U=0.70	4060 low e vinyl, U=0.27,etc
Window Shading	None	40 deg latitude
Wall total gross area, ft^2	2182	2182
Roof total gross area, ft^2	3000	3000
Ground total gross area, ft^2	3000	3000
Window total gross area, ft^2	432	400
Windows (N/E/S/W:Roof)	3/6/3/6:0	4/1/12/1:0
Glazing name	double, U=0.49	double low-e, U=0.26
Operating parameters for zone 1		
HVAC system	PTAC with Gas Boiler & HW Coil	PTAC with Gas Boiler & HW Coil
Rated Output (Heat/SCool/TCool),kBtu/h	121/67/89	66/44/59
Rated Air Flow/MOOA,cfm	3071/450	1580/450
Heating thermostat	70.0 °F, no setback	70.0 °F, setback to 65.0 °F
Cooling thermostat	76.0 °F, no setup	76.0 °F, setup to 81.0 °F
Heat/cool performance	eff=80,EER=8.1	eff=90,EER=13.0
Economizer?/type	no/NA	no/NA
Duct leaks/conduction losses, total %	2/0	2/0
Peak Gains; IL,EL,HW,OT; W/ft^2	0.85/0.22/2.38/0.96	0.64/0.16/2.38/0.96
Added mass?	none	1500 ft^2, 8in cmu
Daylighting?	no	no
Infiltration, in^2	ELA=290.3	ELA=78.6

Results:

Energy cost	1.000$/Therm,0.114$/kWh,2.470$/kW	1.000$/Therm,0.114$/kWh,2.470$/kW
Simulation dates	01-Jan to 31-Dec	01-Jan to 31-Dec
Energy use, kBtu	461193	251485
Energy cost, $	8625	4851
Saved by daylighting, kWh	-	NA
Total Electric (**), kWh	46220	26682
(** less Sellback, if any)		
Internal/External lights, kWh	9356/2314	7017/1735
Heating/Cooling/Fan, kWh	0/12409/2065	0/6714/633
Hot water/Other, kWh	0/19837	0/10509
Peak Electric, kW	17.0	9.3
Fuel, hw/heat/total, kBtu	105824/197652/303476	105824/54613/160437
Emissions, CO2/SO2/NOx, lbs	97960/399/229	54809/228/130
Construction Costs	475880	581168
Life-Cycle Cost	753899	730270

Photovoltaics System Summary:

Description:	Reference Case	Low-Energy Case
PV System Definition Status:	Undefined	Applied
Total PV Array Area, ft² / m²	--	755 / 70
Total PV Rated Output, kW	--	8.3
Total Inverter Rated Capacity, kW	--	12.0
Total PV System First Cost, $	--	82650

(See Menu "Reports\Perf. Summary Reports\PV Summary" for additional details.)

Solar Hot Water System Summary:

Collector Array Area, ft² / m²	--	184 / 17
Storage Capacity, gal. / liters	--	332 / 1256
Total Solar DHW System First Cost, $	--	7372

SDHW Simulation Results:

HW End-Use Load, MBtu	--	107.6
HW End-Use Load with SDHW, MBtu	--	107.6
SDHW Annual Solar Fraction	--	0.00
Annual Solar on Collector, MBtu	--	0.1
Annual Solar Collected, MBtu	--	0.0
Annual Collector Efficiency	--	0.00
Annual SDHW system efficiency	--	-0.00