ASHRAE Chapter Technology Awards

Application Form:

Harmony House for Cats

2914 North Elston Avenue
Chicago, IL 60618

Owner: Harmony House
Architect: Farr Associates
Engineer of Record: dbHMS

Illinois Chapter, Region VI

CHAPTER/REGIONAL TECHNOLOGY AWARD - SHORT FORM

1. Category (Check one and indicate New or Existing, if applicable)

○ Commercial Buildings	○ New or ○ Existing	
Institutional Buildings:		
○ Educational Facilities	○ New or ○ Existing	
● Other Institutional	● New or ○ Existing	
○ Health Care Facilities	○ New or ○ Existing	
○ Industrial Facilities or Processes	○ New or ○ Existing	
○ Public Assembly	○ New or ○ Existing	
○ Residential (Single and Multi-Family)		

2. Name of building or project: Harmony House for Cats

City/State: Chicago, Illinois

3. Project Description: 7,085 sq. ft. state-of-the-art, LEED Platinum animal shelter

Project Study/Design Period: 09/2009 (Begin date (mm/yyyy)) to 01/2012 (End date (mm/yyyy))

Percent Occupancy at time of submission: 100%

4. Entrant (ASHRAE member with significant role in project):

a. Name: Anand (Last) Sachin (First) (Middle)

Membership Number: 5184161

Chapter: Illinois

Region: VI

b. Address (including country): 303 W. Erie St., Suite 510

Chicago (City) Illinois (State) 60654 (Zip) United States (Country)

c. Telephone: (O) (312) 915-0557 d. Email: sanand@dbhms.com

e. Member's Role in Project: Design Engineer

f. Member's Signature: 

5. Engineer of Record: dbHMS

By affixing my signature above, I certify that the information contained in this application is accurate to the best of my knowledge. In addition, I certify that I have discussed this entry with the owner and have received permission from the owner to submit this project to the ASHRAE Technology Awards Competition.

Harmony House is a one-story 7,085 square-foot no-kill, no-cage cat shelter located in Chicago, IL. The shelter is comprised of open office, cat holding areas, adoption areas, and support spaces. It is organized around a central landscaped courtyard for maximum day-light and access for all shelter uses—visually and physically—to nature. It features low-VOC, recycled and regional content finishes, high-albedo paving and roofing, and native landscaping. The project was fully commissioned by an independent third-party and achieved LEED Platinum.

Energy Efficiency

The building is designed to exceed the ASHRAE 90.1-2007 Appendix G Baseline by 63% and achieved 19 under LEED EAc1 Energy and Atmosphere. Table 1 lists the measured energy data from the first year of operation and the predicted energy from the design.

Table 1: Summary of Energy Performance

	Measured*	Energy Model
Electricity Consumption	103,330 kWh	79,692 kWh
PV Production	30,248 kWh	36,975 kWh

*September 2012 through August 2013

Deviations from the design performance are due to increased electric lighting levels set by the occupants, variations from the typical meteorological year, a slight increase in building infiltration, and additional fan energy from heavy filter loading (see maintenance section below). The team is further investigating the data for other sources of deviation.

The HVAC system consists of Ground-Source packaged heat pumps tied to a ground heat-exchanger (14 boreholes at 450ft deep and 20ft on-center spacing) and ERV.

Domestic hot water loads (primarily wash water for cat bedding) were estimated at 43% of the total building energy consumption during design. A solar thermal system provides 78% of this load with (20) flat plate, glazed collectors mounted on the south roof. The panels feed a 250 gallon pre-heat tank connected to an electric storage water heater and a water-to-water ground source heat pump.

The over-all building envelope U-value is 0.058 Btu/hft2°F. A blower-door test was performed indicating a leakage rate of 0.265 CFM/sf-exterior at 0.2” wg pressure differential (2.32 ACH).

Efficient fluorescent and LED lighting is used throughout the space. The lighting has daylighting controls to reduce energy. Occupancy sensors located throughout the building control the lights and turn down the space HVAC system.

The photovoltaic system consists of (96) panels mounted at 0-degrees providing 30kW of nominal capacity. The panels feed two 15 kW inverters and is net-metered with the utility grid.

Figure 1 attached compares the measured and model consumption by major end-use. The increase in measured receptacle consumption indicated in February 2013 is due to an error in the trending log. The measured receptacle load missing from September 2012 to January 2013 is added to this month.

Indoor Air Quality

Cat spaces are kept at a negative pressure relative to the rest of the building. The exhaust system is designed so all the outside air from non-cat spaces is transferred and exhausted through the cat spaces to the ERV. The ERV fixed-plate exchanger membrane prevents cross contamination but allows latent recovery.

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The system outside air intake is sized for 4,100 cfm, exceeding ASHRAE 62.1-2007 requirements by 30%. The required out-door air intake was calculated via the system Ventilation Rate Procedure for a multi-zone recirculating system with a system efficiency of 0.84. Exhaust requirements were determined per ASHRAE 62.1-2007 and local code.

CO2 sensors monitor CO2 concentrations in the people space breathing zone and modulate the outside air intake based on CO2 concentration. The outside air minimum flow is dictated by the differential pressure and exhaust air make-up requirements. A pre-occupancy flush-out was performed to remove space contaminates.

Innovation

Electrical sub-metering by end-use is incorporated in the design. Lighting, receptacles, and building equipment are circuited separately to individual metering breakers in the building switchgear. The first year of operating data is presented in Figure 1 attached.

Because of the high ventilation a rate, the over-all building load is heating dominated. The solar thermal system dumps excess heat to the ground loop during early fall to balance the ground heat-exchange.

In its own right, the design process was innovative. The engineer worked closely with the architect and owner during a Pre-SD phase to influence the program and massing for optimal performance. The team set aggressive goals including LEED Platinum and net-zero energy performance. During the first year of operation, the user, contractor and engineer have continued to work together to trouble-shoot the building operation.

Operation & Maintenance

A building automation system is used to control the HVAC systems and lighting. This system also monitors the building energy consumption by end-uses. Data from the system is displayed at an energy dash board in the lobby and recorded for monitoring purposes.

Over the first year of operation, this system allowed the design team to fix an error in the solar thermal operation sequence and identify issues with filter loading. To this end, the user recently signed a maintenance contract with the contractor for regular filter replacement.

Cost Effectiveness

The design team worked closely with the owner and contractor to eliminate superfluous cost. One example of this optimization was combining the lighting control system with the building automation system. A button on the thermostat is used as the space light switch.

Environmental Impact

Table 2 summarizes the predicted reduction in the building CO_2 emissions relative to the ASHRAE 90.1-2007 Appendix G Baseline:

Table 2: CO2 Reduction from ASHRAE 90.1-2007 Baseline			
	Measured	Baseline	Reduction
LBs CO2 Emitted	159,128	461,278	302,150
Estimated Building Energy Intensity (kBtu/sf)	35	144	109

*1.54 lbs CO2/ kWh - EPA 2009

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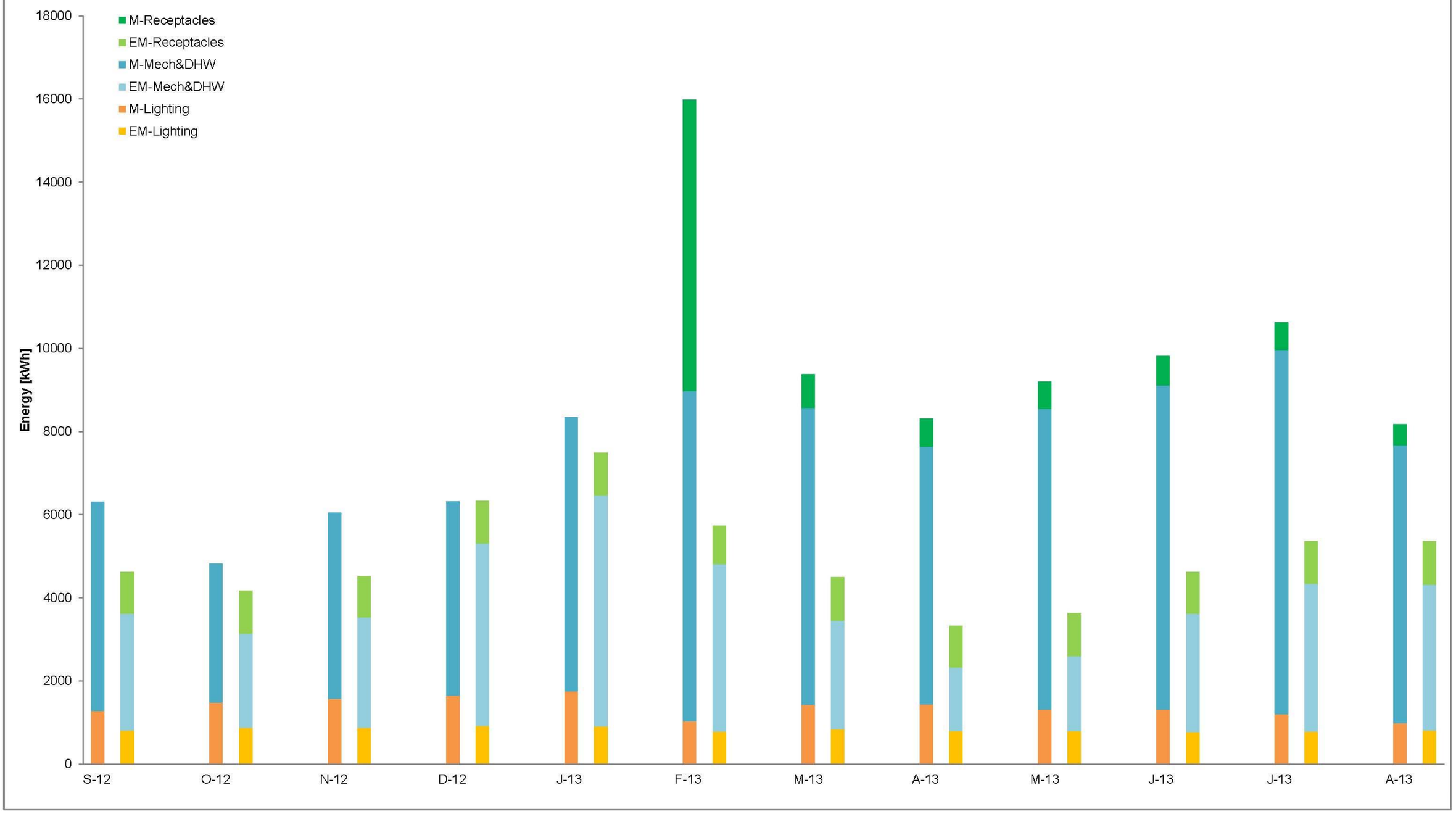
Figure 1: Measured vs. Energy Modeled Monthly Energy Consumption by End-Use



dbHMS
design build engineering

OWNER'S RELEASE
ASHRAE Chapter/Regional Technology Awards 2013

I, Ann Dieter, certify that I am a representative of Harmony House for Cats, 2914 North Elston Avenue, Chicago, IL, and grant permission to dbHMS, 303 W Erie. St., Chicago, IL, to enter the project for the ASHRAE Society Level Technology Awards competition 2013.

Ann M Dieter

Signature:

Date: 10/9/13