Creating the Environment for New Beginnings *Case Study*

Largest Relief Center in USA

A new center to meet the physical and spiritual needs of the homeless is the largest facility of its type in the country. Chicago's Pacific Garden Mission, which has served this population since 1877, was designed and built using state-of-the-art building practices and renewable energy technologies. At the heart of the mechanical plant is a roof-mounted integrated Prefabricated Equipment Centers (iPEC™).

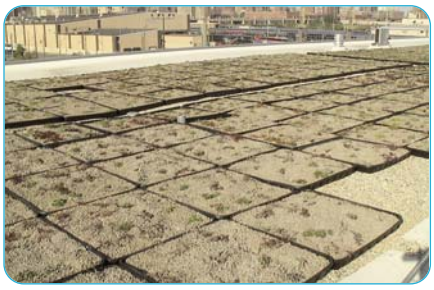
With this is a design for solar water heating, green roof, natural lighting, and a sophisticated HVAC system to assure a comfortable and hygienic environment. This system features evaporative-cooled condensers and an array of multiple supply fans using FANWALL TECHNOLOGY®. The result is an efficient and reliable building comfort system that meets all of the needs of this 156,000 sq, ft. multi-use facility.

At a Glance

- A new 156,000 sq ft homeless rescue mission in Chicago capable of housing up to 1000 people
- Constructed in 2007 using green design principles and LEED® Silver certification as the goal
- Desire was to minimize space for HVAC plant while employing energy saving and sustainable technologies.
- HVAC plant design: 70,000 CFM @ 7.5" TSP, and 236-tons
- Solution: Roof mounted iPEC™—integrated Prefabricated Equipment Center; Solar panels for domestic hot water; Green roof; Natural lighting; and more

Pacific Garden Mission

Roof-mounted solar collectors provide for most domestic hot water.



A "green" roof helps reduce building load and water runoff.

A terraced roof system aids in providing natural lighting.

Wide hallways, bright floors, and a systematic layout of building materials gives a sense of order.

Mammoth®

Bringing Order to Disorder

It is not everyday that one takes the opportunity to give back to the community for the good things one receives. However, when Stanley Tigerman, President, Tigerman McCurry Architects, and David Lehman, President, Design Consultants, LLC, saw an opportunity with the homeless of Chicago, they seized it.

Having outgrown its current campus of facilities for caring for the homeless of Chicago, the Pacific Garden Mission was successful in securing a new site to build a more environmentally-friendly facility dedicated to transforming the lives of those in need.

"One of the architectural goals," Stanley began, "was to create a open concept and to expose everything—ductwork, conduit, fire protection system, air conditioning—as much as the building code allowed. We were not designing for comfort, but for utility. However, many of the visitors to the Mission come in a state of disorder, and we wanted to project a sense of order when they entered the building. With exposed ceilings, we didn't want it to be a maze of pipes and conduit. We made it our goal to bring order and symmetry to the building's furnishings and finish, right down to the wire clips."

The look is very hard by design—it was not meant to look like a home. Hallways take on the look of streets with street-like lighting and signs identifying the different rooms. The hallway floors are painted a sunny yellow color to contrast the concrete streets its visitors see day in and day out.

New Skills For A New Life

Pacific Gardens Mission is not only a shelter for an overnight stay, but a training center to help its visitors integrate back into society. Volunteers with specific skills can sign on for a year to help teach classes in exchange for room and board. "You would be amazed at the skill base of some of those in distress," Tigerman added.

To help feed the masses, two green houses with a composting center were designed into the facility. They will grow food for their own consumption, and to sell at local farmer markets.

Leading with LEED®

One of early decisions was to design for LEED® Silver certification. Tigerman commented, "I believe you can't be a responsible architect or mechanical engineer today and not build LEED buildings. When you look at the building costs over its life-cycle, it is worth the investment. And I say that in a city that doesn't see that many sunny days for solar collectors. Many of the things you can get LEED points for, we did."

One of the energy-saving technologies utilized involves over 100 roof-mounted solar panels for the heating of domestic water. Big users of hot water are two laundry facilities that run nearly 24/7. The mission dispenses over 56,000 items of clothing each month.

In Search of the Right Mechanical Solution

"When we looked at mechanical solutions, David Lehman injected, "it would have been an easy solution to "pepper" the rooftop with packaged rooftops. However, when you consider

(L-R) David Lehman, Reid Woods, and Stanley Tigerman

"I believe you can't be a responsible architect or mechanical engineer today and not build LEED® buildings."

Mammoth® iPEC™ unit supplying HVAC to the Pacific Garden Mission.

the number of zones, how people move through the building in a day, and the odors from the different activities, packaged rooftops didn't seem like a viable option. Plus, we wanted a kW/ton less than one, which was hard to do with packaged rooftop units." Tigerman added, "We also wanted to conserve roof area for the solar panels and for the green roof. This meant we had to minimize the HVAC equipment footprint."

Lehman continued, "We looked at a chiller/air handler/tower system but it consumed too much indoor space and we didn't want a cooling tower on the roof for aesthetic and maintenance reasons. A heat pump system was considered but didn't work out due to the high amount of outdoor air required for this multi-use facility, and by Chicago code.

A big diversity advantage in the building's design was that only the basement and first floor were occupied during the day, and only dormitory floors two and three were occupied in the evening. This enabled the HVAC plant to be sized at about 60-percent of what it would have been had the entire building been conditioned simultaneously.

"Even with the diversity advantage, Lehman added, "the load was pushing the limits for large packaged rooftops." That is when Reid Woods, CES Group® representative, Midwest Applied Solutions, Inc., suggested evaporative-cooled condensers and an array of multiple supply fans using FANWALL TECHNOLOGY®.

iPEC™ Solution

The system finally selected was an integrated Prefabricated Equipment Center (iPEC™) manufactured by Mammoth, Inc., a CES Group company. Packaged inside the iPEC were:

- 70,000 cfm of FANWALL TECHNOLOGY by HUNTAIR supply fans at 7.5" TSP
- 236-tons of Dx refrigeration using high efficiency rotary screw compressors and evaporative-cooled condensers with R134a refrigerant
- Runaround loop heat recovery
- Airside economizer
- Exhaust fans
- Space for hot water heating boilers
- Space for system pumps and pipes
- Electrical control center with VFD drives

Evaporative-cooled condensers can reduce compressor energy consumption 20-40%, depending on location. Less condenser surface is required when compared to air-cooled condensers, which can reduce unit footprint as much as 50%.

iPEC provides plenty of service space for Dx compressors and accessory maintenance. Co-locating equipment in a common location can save space and reduce maintenance costs.

Because of its direct-drive design and smaller fan diameters, the FANWALL array has a lower acoustic impact, especially in the lower frequencies, which are more difficult to attenuate.

- EPiC™ DDC controls
- Filter bank with charcoal filters
- UVC treatment of cooling coils

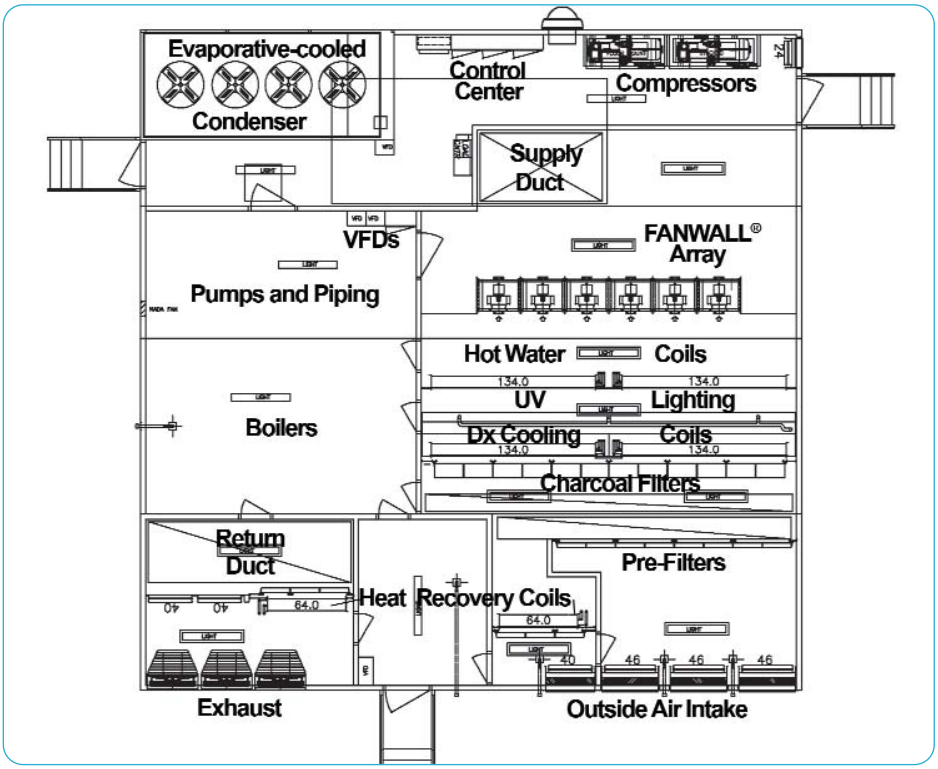
"The iPEC came to the job site in four sections and each section was bolted together in place on the roof. We really liked the concept of a prefabricated assembly arriving on the job site. It mitigated a lot of job site risk and helped to keep us on schedule since we had a tight construction timeline," Lehman added. "And what architect wouldn't want to have a hand in design of the cabinet geometry and selection of paint color!"

Since there will be people from all origins passing through this facility, 12-inch charcoal filters and UV lighting were added. Also, CO_2 sensors are used for resetting outdoor air intake. The dormitory area was designed for 100% outdoor air (20,000 cfm) in the evening, and the runaround loop heat recovery provides much of the air tempering

Supplying air to the VAV system is a 12-fan FANWALL® array. Each fan has has a 10 HP high efficiency motor that operates at 80 Hz at design with a variable frequency drive.

"We can't believe how quiet the supply FANWALL array is inside the unit," Lehman observed, "You can be standing right next to the discharge of 70,000 cfm of supply air with 120 HP in motors and carry a conversation with someone. The FANWALL array gives better energy efficiency than two large plenum fans, and was much quieter—eliminating expensive sound abatement devices and their inherent cost increase."

The facility was dedicated by Chicago Mayor Richard M.Daley on October 13, 2007 and the transition for the homeless begins— from the old to the new beginnings.



Plan view of 70,000 cfm, 236-ton, evaporative-cooled iPEC™ manufactured by Mammoth, Inc. with FANWALL TECHNOLOGY® by HUNTAIR®, 2025 sq ft in size, and located on roof of Pacific Garden Mission, Chicago, IL.

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