

## PROJECT BRIEF

# Multi-Family Housing Variable Refrigerant Flow



June 2012

## Project Description

Saint Vincent de Paul (SVDP) is the largest nonprofit human service organization in Lane County, Oregon. SVDP has the following core missions: affordable housing, emergency services, homeless services, recycling programs, retail thrift stores and self-sufficiency services. To accomplish their mission of providing affordable housing, SVDP built the Lamb Building in 2010. The 37,500 square foot, four-story building, located in Eugene, Oregon, consists of commercial spaces on the ground floor 35 residential units, a community room and two small offices on the upper floors.

The Lamb Building was designed for sustainability and efficiency with the goal of low energy use and low maintenance costs. Some of the design features include an energy efficient heating, ventilating and air conditioning (HVAC) system, ENERGY STAR appliances, compact fluorescent light fixtures, high-performance lighting in the retail spaces, a solar hot water heating system and water conserving fixtures.

## Choosing a VRF System

The Lamb Building is heated and cooled by a Variable Refrigerant Flow (VRF) system with heat recovery capability. The VRF system cost more than a traditional HVAC system, but the VRF system is expected to save energy in the following four ways:

- VRF systems efficiently provide heating and cooling via refrigerant line. Traditional HVAC systems provide warm and cool air through ductwork, which is not as efficient as delivering it through refrigerant lines.
- VRF systems vary compressor and fan speeds to meet loads, resulting in high part-load efficiencies.



The Lamb Building

- VRF systems re-use heat whenever possible, rather than rejecting it to the outside like traditional air conditioning systems. With heat recovery capability the system can recover heat from one apartment on the south side of the building and use it for someone on the north side that needs heat.
- Code ventilation requirements are met by ducting unconditioned outside air to a location, behind the refrigerator in each apartment, and stale air is exhausted from kitchen and bathrooms. The energy-use associated with this approach is much lower than for a forced-air HVAC system, where ventilation air is supplied and conditioned by a central system.

## Energy Savings

Based on energy simulation models, the Lamb Building VRF system is expected to use 80,000 kWh less than the same building would use with packaged terminal heat pumps.



## Utility Incentives

Eugene Water and Electric Board (EWEB) will pay Saint Vincent de Paul approximately \$20,000 for the Lamb Building VRF system. In order to receive the incentive, SVDP provided EWEB with copies of the energy simulation models, documentation of the VRF system incremental cost, and VRF system manufacturer's data. The savings will be verified by long-term measurement and verification.

## Feedback

### Owner:

*"Maintenance was the key reason for choosing the VRF system. Ground source heat pumps were considered, but their maintenance costs are too high. The Lamb Building VRF system has fewer compressors than either packaged terminal heat pumps or ground source heat pumps, resulting in much lower maintenance costs. For anyone considering a VRF system, it's recommended that the refrigerant manifold not be accessible to tenants"*

—Kristen Karle, with Saint Vincent de Paul

### Engineer:

*"Modeling VRF system energy use requires special techniques because VRF system algorithms are not universally available; the hourly reports should always be verified to ensure the results are reasonable"*

—Peter Reppe, Mechanical Engineer and Energy Analyst with Solarc Architecture/Engineering

### Mechanical Contractor:

*"VRF systems offer flexibility and have been well received by engineers, general contractors and owners. They save space and don't require running large ducting through tight spaces. The control system is easy to use and very functional, and both indoor and outdoor units are quiet and virtually vibration free "*

—Jeff Elling, Project Manager for HCH Mechanical

### Architect:

*"The wall-hung indoor-units allowed higher ceilings and bigger windows, eliminating the costs associated with a dropped ceiling"*

—Mike Magee of Bergsund Delaney Architecture and Planning