Energy-efficiency with a Personal Touch:

Designing the New Meadows Long Term Care Facility to meet the 2030 Challenge.

BOULDER ASSOCIATES

ARCHITECTS

THE CHALLENGE

Improving the quality of life for elderly and disabled residents, while simultaneously reducing the energy needed to do so, were two key imperatives for the New Meadows Long Term Care Facility in Las Vegas, NM.

In 2002, New Mexico architect Edward Mazria introduced the 2030 Challenge as a roadmap to reducing carbon emissions across the United States. One of his early successes with implementing this strategy came with a 2006 Executive Order from Governor Bill Richardson, requiring new public projects in Mazria's home state to reduce energy use by 50% over typical U.S. energy consumption for that building type. When the New Mexico Behavioral Health Institute commissioned the design of a replacement nursing facility on their Las Vegas campus, the design team was eager to tackle the challenge.

LOCATION, LOCATION, LOCATION!

Since energy efficiency is inherently site-specific, the team members familiarized themselves with local community and site conditions.

The City of Las Vegas is located 65 miles east of Santa Fe off Interstate 25 in northeastern New Mexico, where the Eastern Plains meet the Sangre de Cristo Mountains. Home to a unique Northern New Mexican Spanish community, its population of 14,500 is also influenced by Native American, Northern European and Jewish cultures. The indigenous adobe architecture, a characteristic of major trading points on the Santa Fe Trail, is uniquely intertwined with Victorian structures built by easterners arriving via the Atchinson, Topeka and Santa Fe railroad. While one building type developed as a response to local climatic conditions, the other resulted more from transplanted traditions, giving Las Vegas a distinctive feel.

At 6,500 feet above sea level, the city's semi-arid climate provides summer highs around 84°F and winter lows around 18°F. Temperatures cycle above and below desirable indoor temperatures over the course of the day all summer long, with diurnal temperature variations of around 30° on most days. The 16" of annual precipitation falls mostly during growing season, and snow in winter months disappears quickly.

THE PROJECT

Situated on the fringe of the New Mexico Behavioral Health Institute's campus, which was recently annexed into town, the new facility will eventually replace the existing Meadows Rest Home immediately adjacent, and the Ponderosa Nursing Home facility located in the heart of the campus. This phased project is intended to provide skilled nursing and long term care for up to 180 residents, including individuals with dementia and behavioral health needs.

LAS VEGAS, NM

Phase one is a 50,000 s.f. facility providing 36 resident beds, along with common areas to serve the full build-out. The physical plant is sized to serve phase one, with shelled space for future expansion to accommodate equipment for the proposed additions to the north and south. Currently vacant, the south part of the site will support the 72-bed second phase. The existing Meadows Rest Home to the north will then be decommissioned for build-out of phase three—an addition of 72 beds will bring the total capacity to 180.

LAUNCHING THE DESIGN PROCESS

The team began the design process with two days of focused interaction: a jam-packed day of user group meetings and programming, followed by a full-day eco-charrette. Together they unleashed a flood of invaluable ideas and information, capable of guiding the design effort rapidly towards an effective solution.

From the outset, the Owner's goals included attainment of a LEED Silver certification in addition to the 50% reduction in energy use over what is typical for this facility type. The only precedent available—a State Veterans' nursing home in Washington State—had achieved this by eliminating air conditioning. While this strategy proved feasible in a climate such as that found in the Puget Sound area, it was unfortunately not an option in this part of New Mexico. Lacking a relevant role model, the team started from scratch with the basics: building orientation.

SHAPING THE DESIGN

Nursing units are often designed at right angles intersecting at nurses' stations, which result in resident rooms facing towards every point of the compass. For New Meadows, the wings were drawn in to a 30° angle that allowed alignment in a more east-west fashion, while simultaneously creating a neighborhood united by shared green space. This orientation simplified the requirements for solar control, allowing horizontal aluminum louvers to fulfill the needs on most facades. Climate-adapted deciduous trees were strategically placed to provide additional protection from summer heat gain, and windows treatments specified for added resident control. The full build-out was master-planned at this time, ensuring that the remaining 144 beds would benefit from equal solar access and views.

The envelope was the next element to be studied. As opposed to most types of healthcare facilities, nursing homes are surprisingly static when it comes to remodeling over time. Taking cues from the local adobe structures and the high diurnal temperature swings, eleven-inch insulated concrete forms (ICFs) filled with 6" of concrete and finished with stucco were selected as the primary façade material. This system provides structure, thermal mass, and insulation, while simultaneously reducing air infiltration and sound transmission. Due to the permanence of this type of construction, areas master-planned for expansion were stick-framed instead, allowing for ease of disassembly. Careful placement and sizing of windows resulted in well daylit spaces with a mere 16% window-to-gross wall ratio, increasing the average exterior wall R-value while providing natural lighting and connections to nature. Using feedback from the energy model, the team set the maximum solar heat gain coefficient (SHGC) at .32 SHGC for the glazing, specified thermally broken aluminum frames, and maximized the roof insulation.

OVERCOMING VENTILATION HEATING LOADS

With a well-designed envelope pulling its weight, the next big challenge became the ventilation. Skilled nursing units must be ventilated around the clock, and with the high winter heating loads

experienced here, heat loss through exhaust air became the focus. Energy recovery units were incorporated to help manage this continuous flow of heat out of the building, with 80% of exhausted air moving through a desiccant wheel. It was determined that the other 20%—coming from bathroom and chemical use areas—should be directly exhausted due to the potential for moisture absorption (and with that moisture the potential for odors).

Recognizing that not all areas of the building operate 24/7, a design emerged that clearly divided the nursing from non-nursing areas, allowing the mechanical and plumbing systems to be easily divided and managed separately. The air handling and service water heating systems serving the administrative wing were developed to shut-off during unoccupied hours. Close proximity of the staff lockers to the nursing unit allowed easy crossover of the 24/7 system to service the staff showers contained in the administrative portion of the building.

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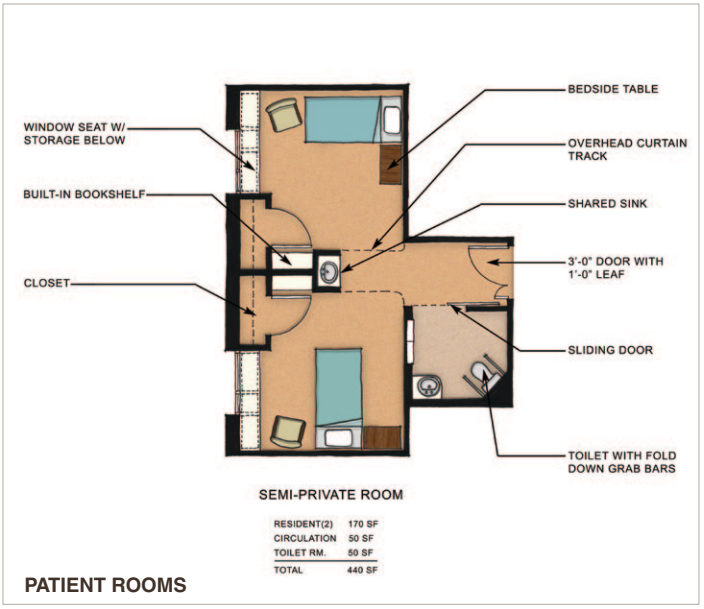
RESIDENTS TAKE CONTROL

With building loads divided at 70% heating/ 30% cooling and a population with diverse needs for thermal comfort, focus then moved to how to heat the building efficiently while maximizing controllability. High-efficiency hydronic fan coil units were selected—one for each resident room, with additional units for staff and common areas—and paired with two 88% efficient boilers. A water-cooled chiller was then selected for cooling, and the entire system made expandable to support the master plan.



Lighting is important on many levels in a nursing home, and the team knew they had to meet the energy-efficiency goals without sacrificing the comfort of the residents or the needs of caregivers. Thoughtful space planning and individual dimming controls in each bedroom will allow residents to select lighting levels appropriate to their own needs, separately from those of their roommates'. Through the use of lighting controls, high-efficiency ballasts paired with fluorescent light fixtures, timeclocks, and LED accent lighting, the interior lighting design was improved by 22% over ASHRAE while maintaining the desired functionality and the residential feel. The exterior lighting power was reduced by 50% through careful placement, sensible light levels, and state-of-the-art LED fixtures.

THE RESULTS

Energy modeling peer-reviewed by the Green Building Certification Institute indicates a 57.2% reduction in energy use over the U.S. average for site energy use of long term care facilities. As opposed to the national average of 124 kBtu/SF/yr, this facility can anticipate using just 53 kBtu/SF/yr, saving the State money for the life of the building, and reducing carbon emissions in the Rocky Mountain Power Area by over 800 tons a year.

1. Information on carbon offsets determine using Practice Greenhealth's Healthcare Energy Impact Calculator accessed on November 10, 2010.

PROJECT TEAM

VIGIL & ASSOCIATES ARCHITECTURAL GROUP – Architects
BOULDER ASSOCIATES ARCHITECTS – Associate Architects
BOULDER ASSOCIATES ARCHITECTS – Interior Designers
CONSENSUS PLANNING – Landscape Architects
MILLER ENGINEERING – Civil Engineers
COUPLAND MORAN ENGINEERING – MEP Engineers
JAYNES CORPORATION – General Contractor
BEAUDIN GANZE CONSULTING ENGINEERS – Commissioning Agent
QUIROGA-PFEIFFER ENGINEERING CORP – Structural Engineers
BOULDER ASSOCIATES ARCHITECTS – LEED Coordinators