



**National Center for
Healthy Housing**

Green Housing Series:

Creating a Community Landmark



A beautiful, healthy, and energy-efficient neighborhood asset has emerged from what was once considered a drab neighborhood edifice. Built in the early 1970s, Orness Plaza was a nondescript concrete building that had little aesthetic appeal for the neighborhood or its residents. More than 40 years in service, and years of deferred maintenance had taken a toll on Orness. But a complete overhaul and renovation transformed the hulking, concrete building into a lovely neighborhood landmark.

Orness Plaza, located adjacent to the Franklin Rogers Park and neighborhood in Mankato, MN, is a seven-story, 101-unit public housing complex serving primarily seniors and the disabled. The property was falling apart; and, due to lack of funding, the City of Mankato (City) was only able to take a patchwork approach to much-needed repairs. Windows in the complex leaked, and Orness maintenance staff constantly replaced drywall to address the ongoing mold and mildew issues caused by the infiltration of water. Lack of insulation meant there were

always drafts and cold spots throughout the building in the winter; and the only residents who did not bake in the summer heat were those with their own through-wall air conditioning units. By the early 2000s, the building was deteriorating around the residents, with chunks of concrete falling off the building and rotting windows.

In spite of its poor condition, as one of the very few public housing complexes geared toward seniors and the disabled, Orness Plaza was always full. Many of the residents

Healthy, Energy-Efficient Upgrades

- Geothermal Heating and Cooling System
- Traco Energy Star Windows
- Enhanced and Improved Insulation
- Water Conserving Devices
 - Toilets: 1.28 gallons per flush
 - Bath Faucets: 0.5 gallons per minute
 - Shower Heads: 1.5 gallons per minute
 - Lavatory Faucets: 1.5 gallons per minute
- Energy Star Appliances
- Ventilation System with Fresh Air Exchange
- Fitness Center
- Interior Walking Track
- Exterior Walking Paths
- Enclosed porches and community rooms with Translucent Wall and Window Systems
- Scenic Indoor Pond
- Open atrium with plants and scenic outdoor views
- Dryvit EIFS Stucco Cladding with continuous Insulation
- Energy Star Lighting
- Armstrong Luxury Vinyl Tile (LVT) Flooring
- Sherwin Williams low-VOC paints
- No smoking policy



Photo courtesy of
Steve Bergerson, Bergerson Photography

were long-term; a few had even moved in when the building first opened, 40 years ago. Seniors that leave generally do so to go into a full-care nursing home.

Meeting Affordable Housing Needs in Mankato

The Mankato Economic Development Authority (EDA), the Public Housing Agency (PHA) for the City of Mankato, MN, owns Orness Plaza. The EDA's housing department assesses the community's affordable housing needs and works with local, state, and federal agencies to meet those needs; it also manages housing programs for the Blue Earth County EDA. The department administers the City's and County's Public Housing Program, Housing Choice Voucher Program, programs for first-time homebuyers, and several other housing support programs. Funding for the city's public housing comes from the rents it receives, along with operating subsidies and capital funds allocated by HUD. Through its combined programs, the department manages 520 rental vouchers and 266 properties scattered throughout the city of Mankato and Blue Earth County; units range from one-bedroom apartments to five-bedroom single-family homes. The EDA consistently has waiting lists for both the public housing and housing choice voucher programs. Although not exclusively "senior" housing, Orness Plaza is one of the city's only public housing developments geared toward seniors and the disabled and, even in its worst days, was always full. In fact, it generally maintained a list of about 10 people waiting for an apartment.¹

The EDA constructed most of Mankato's public housing during the 1970s. Over the years, due to limited funding, the EDA concentrated on renovating the single-family homes and replacing disposed units as needed. Financing the renovation of Orness Plaza became a major focus for the EDA in the early 2000s.

Mankato: A Picturesque Community in Southwest Minnesota

Located approximately 75 miles southwest of Minneapolis-St. Paul, Mankato is the fourth-largest city in Minnesota. It is renowned for good parks, trails, and pleasant landscapes; and the area is steeped in historic significance. The City has grown about 24 percent over the past 10 years, partially due to an influx of Asian, East African and Latino immigrants after 2000. Yet, similar to the rest of Minnesota, it retains a strong German, Norwegian, and Irish heritage. As home to Minnesota State University-Mankato, the city also has a relatively low median resident age of just 25 years old; only 11 percent of the City's population is over the age of 65.

Mankato is recognized as a leader in economic growth and, in addition to being business-friendly, the city boasts a relatively low cost of living (82.6 compared to the U.S. average of 100), combined with a relatively low household median income of \$39.5K, compared to the State. Unfortunately, a little more than a quarter of city residents live beneath the poverty line. Even with the recent recession and market decline, housing values have steadily increased over the years: Since 2000, housing values in Mankato have risen more than

¹Since the renovation, the waiting list for Orness Plaza has grown to about 80 people while the turnover rate has decreased markedly.

53 percent. Rising housing costs keeps pressure on the Mankato EDA to maintain and expand its supply of affordable housing for residents not sharing in Mankato's economic boom.

Recruiting a Redevelopment Team for Orness Plaza

By the early 2000s, Orness Plaza's repair needs had reached a crescendo, with fixing its concrete panels and updating its aging plumbing and mechanical systems particular priorities. Combined rental income and HUD operating subsidies cover staff, utilities, and regular maintenance for the property, but not major upgrades. Annually, the EDA receives approximately \$250,000 in capital funds from HUD to modernize its public housing units, but the funds are intended for the City's entire portfolio. While the EDA could have used the capitol funds for Orness Plaza, its repair demands were overwhelming: Replacing just 25 percent of the windows would have expended *all* of the EDA's capital funds for several years. The EDA explored applying for low-income housing tax credits (LIHTC), but at that point, the State was focused on building more family units, which would have required converting a significant number of the complex's one-bedroom units to two bedrooms, as well as changed the resident focus. With no funding alternative in sight, Mankato EDA continued its ongoing maintenance and repair of the building to ensure it met HUD and City inspections.

In 2008, the EDA reached out to the Southwest Minnesota Housing Partnership (SWMHP), an award-winning nonprofit community development corporation, for assistance in applying for tax credits. SWMHP has extensive experience building and renovating green, healthy, and affordable housing throughout Minnesota's southwest region—experience that taught them how to write (and win) tax credits applications, as well as proposals for Community Development Block Group (CDBG) and other HUD funding.

With SWMHP's assistance, the EDA began the difficult task of evaluating Orness Plaza to determine whether the structure should be demolished and replaced or renovated. They identified several

After weighing the pros and cons of new construction versus renovation, the EDA decided it made more sense to renovate the seven-story building than to demolish it and start over.

significant architectural and structural issues with the building, including water infiltration, degradation of the concrete structure itself, inadequate temperature controls, mold, obsolete layout and finishes, insufficient insulation, and severely damaged windows. After weighing the pros and cons of new construction versus renovation, the EDA decided it made more sense to renovate the seven-story building than to demolish it and start over. Moreover, renovating would avoid displacing their elderly residents.

The EDA had several goals for the redevelopment: Given the ongoing shortage of operating funds allocated to the housing authority, Orness needed to be energy and cost efficient; it needed to be comfortable, healthy and safe for its residents; and the housing staff really wanted to create a beautiful, healthy place for their seniors to live.

The EDA and SWMHP also considered if it made sense to "go green." SWMHP has been building and renovating "green" for several years and is a big proponent of green building practices. Working with the National Center for Healthy Housing (NCHH), they had even assessed the impact green building rehabilitation had on Viking Terrace residents' health and well-being. After learning about the long-term operating cost benefits and the many potential health benefits for residents, the EDA decided "green" was the definitely the way to go, and the team moved full steam ahead. Blumentals/Architecture, Inc., a firm with green building renovation experience, was selected to draw up plans to restore Orness Plaza. With SWMHP, they recommended the EDA aim for compliance with Enterprise Green Communities and the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) standards.

Project Partners/Funders

Mankato Economic Development Authority
 Southwest Minnesota Housing Partnership
 Blumentals/Architecture, Inc.
 Robert W. Carlstrom Co., Inc.
 Steen Engineering
 National Center for Healthy Housing
 Center for Sustainable Building Research at the University of Minnesota
 Case Western University
 Questions and Solutions Engineering
 American Recovery and Reinvestment Act
 HUD Office of Lead Hazard Control and Healthy Homes
 Minnesota Department of Employment and Economic Development
 Minnesota Housing Finance Agency
 Greater Minnesota Housing Fund
 Enterprise Community Partners
 Blue Cross and Blue Shield of Minnesota Foundation

After completing the evaluation of the options and priorities and successfully applying for tax credits,² renovation plans for the property came to a screeching halt with the implosion of the housing market. With Fannie Mae and Freddie Mac in free fall, the

²Although low-income housing tax credits (LIHTC) are awarded by the State, recipients must find investors willing to purchase the credits to raise the capital necessary to develop their project. As long as the project maintains compliance with the program requirements regarding qualified residents and housing affordability, the investor receives a dollar-for-dollar credit to offset their federal tax liability over a 10-year period.

Health Outcomes

With funding from the Department of Housing and Urban Development's Office of Lead Hazard Control and Healthy Homes, NCHH studied the health outcomes of seniors residing at Orness Plaza pre- and post-renovation. NCHH's primary research goals included

- Determining if self-reported health changed from baseline (i.e., prior to the renovation) to one year post-renovation (approximately three years apart);
- Determining how the changes in the self-reported health of Orness seniors compared to similar low-income populations over time;
- Evaluating whether levels of indoor air toxins and allergens changed significantly as a result of the green building renovations; and
- Determining if the number of housing deficiencies identified in the pre-renovation visual assessment had changed by the one-year post-renovation assessment.

NCHH also worked with Questions and Solutions Engineering and CSBR to determine how well the building performed in relation to the design criteria specified by the green building renovation standards (See "Energy Outcomes" for more information).

NCHH used a health survey adapted from the Medicare Health Outcomes Survey (HOS) to interview the residents of Orness Plaza prior to renovation. At baseline and at one-year post-renovation, they interviewed 40 people, 22 of whom were 65 years or older. NCHH asked questions about the residents' physical and mental health, depression, any chronic medical conditions, and daily activities. Results from the surveys were compared to a group of low-income Minnesota residents who had also taken the Medicare Health Outcomes Survey (HOS) to evaluate the impact of the green, healthy renovations.

Although it is reasonable to expect seniors' health to decline over time, NCHH hoped that the health of Orness residents would show less decline than the HOS comparison group, due to the healthy green building practices used during Orness' renovation. The mental health of the residents of all ages improved significantly more than that of the HOS comparison group. In addition to mental health improvements, there were significant reductions in reported falls. Of the people who smoked, more reported smoking outside rather than inside their homes one year after renovation, likely reflecting the no-smoking policy instituted as part of the renovation.

City was unable to find an investor willing to purchase the credits, especially for a property suffering huge losses, such as Orness.

The EDA finally caught a huge break in 2009 with the American Recovery and Reinvestment Act (ARRA). Orness Plaza was considered "shovel ready" and primed to receive ARRA funding based on the work they had completed the year before in their bid for LIHTC. After years of looking for funds, the City was finally awarded \$9.2 million ARRA dollars from HUD for Orness Plaza.

Building to green standards helped Orness realize many of the City's goals, but to ensure that the project not only met but exceeded expectations, SWMHP suggested bringing in several other organizations, including NCHH and the Center for Sustainable Building Research (CSBR) at the University of Minnesota, with expertise in healthy homes and energy efficiency. With funding from the Blue Cross and Blue Shield of Minnesota Foundation and the EDA attending, SWMHP convened several design charrettes, both with the full design and construction team, as well as with smaller technical teams, to plan modifications that would not only create a more energy-efficient building, but also incorporate elements designed to improve residents' health and well-being. The EDA surveyed Orness residents about what they would like incorporated into their new home and shared the results with the development team during the charrette process.

NCHH and CSBR provided input on design to boost the health benefits and energy efficiency of the building and became integral members of the design and development team. NCHH surveyed the residents to assess their health prior to the renovation to evaluate the impact the green renovation practices had on resident health. CSBR provided guidance on efficiency practices and helped evaluate proposed changes to assess which ones made the most sense for the project goals.

We wanted to make a home the seniors would be proud of.

—Patti Ziegler

Since the vast majority of Orness Plaza residents are seniors, the EDA wanted to avoid displacing any of their residents and to minimize any discomfort the construction process would have on them. The EDA stopped leasing units about a year before construction was scheduled to begin, and were able to clear about a quarter of the units by the time the renovation kicked off. The process was designed to occur in four phases, and residents were relocated within the building to allow the construction crew clear access to a quarter of the building at a time. Temporary walls, set up with guidance from NCHH, helped reduce the impact of dust and construction debris on the residents.

What Was Old Becomes New

One of the most challenging steps in the design of Orness Plaza's renovation was determining how to stabilize its damaged foundation and add insulation to the concrete panel walls. After evaluating several different systems to replace or encapsulate the concrete panels, an Exterior Insulation and Finishing System (EIFS), which insulates the exterior walls and provides a finished surface resembling stucco, was chosen. The new system provides continuous insulation and achieves an R-value of 16.

The building's insulation increased a whopping 500 percent.

There was also considerable air leakage between units and floors, which caused significant drafts and reduced not only the energy efficiency of the building, but also the comfort of its residents. After caulking the perimeter of the building from floor to floor and blanketing the building with EIFS, the building's insulation increased a whopping 500 percent.

Replacing nearly all of the leaky single-pane windows with efficient, low-E double-pane windows was the next step the development team took to ensure the building's energy efficiency. The new windows meet solar heat gain coefficients recommended by the Building Enclosure Council³ and have an operable center window that residents can open easily for fresh air.

Prior to renovation, an old hydronic system provided heat for Orness Plaza. There was no central air conditioning and ventilation was exhaust-only. The renovation team wanted to upgrade the ventilation system to provide fresh air to the atrium and residents' units and install a mechanical system that was both energy-efficient and beneficial to the indoor environmental quality (IEQ). Orness Plaza has an atrium that extends the full seven stories of the building. Units line the periphery of the building, with front doors opening on corridors that surround and overlook the atrium. Although the space was intended to be open and airy, it lacked fresh air, and the wide-open area made it difficult to determine airflow.

The team settled on a central geothermal system, which required new venting and ductwork to move conditioned air through the building, to upgrade the heating system and add central air conditioning. They also installed a new, balanced fresh-air ventilation system which pumps fresh air into each unit and continuously exhausts air from the building through the units' bathroom fans. The geothermal system, in conjunction with the upgraded ventilation system, provides even heating and cooling throughout the building and has managed to lower energy costs while improving the building's indoor air quality. And now, the atrium really is fresh and airy, and no longer stuffy.

After the team properly sealed and insulated the building, and installed appropriate heating, cooling and ventilation systems, they turned to the remaining design and renovation features. Plumbing throughout the building was upgraded with fixtures designed to meet Green Communities criteria, including low-flow showerheads, kitchen and bath faucets, and toilets. Energy Star light fixtures and outdoor daylight sensors were installed, and all appliances and fixtures installed, such as bathroom fans and stove vents, meet Energy Star ratings to help reduce costs and boost the building's energy efficiency.

Beyond the introduction of fresh air from the upgraded ventilation system, IEQ was further improved by the abatement of mold and

³The Building Enclosure Council (BEC) Initiative was launched through an agreement between the National Institute of Building Sciences Building Enclosure Technology and Environmental Council (BETEC) and the American Institute of Architects in 2004. More than 3,000 engineers, architects, contractors, and others interested in building enclosures are involved in 25 BEC chapters across the country. They promote information exchange and discussions on the science and best practices of building enclosures.

Orness Plaza Before and After



Photos courtesy of Blumentals/Architecture

asbestos throughout the building, continuous exhaust shower vents in the revamped venting systems, and using materials that minimize air contaminants, such as low- or no-volatile organic compound (VOC) paints and sealants, Green label carpeting, and no-formaldehyde cabinetry.

In addition to features designed to improve the building's energy efficiency and indoor air quality, the team incorporated many design elements to improve the units and make residents more comfortable. During the charrette process, residents asked to have their narrow apartment stoves replaced with full-sized stoves, so the team restructured the kitchen layouts to provide more open space and fit standard-sized stoves. In the process of updating the interior, the team incorporated a variety of other measures designed to help seniors into the renovation.

"Wayfinding"⁴ measures, such as color visual cues on walkways, corridors, and around residents' doors, were integrated into the interior paint design to help residents easily navigate the building. Each floor now has a variety of colors, which alternate between units to help residents remember where their door is located. Chair rails, which can also serve as handrails, were installed along the walls with contrasting colors above and below to help seniors see

⁴"Wayfinding" incorporates sensory cues to help people navigate their surroundings. The practice generally involves four basic stages: orientation, route decision, route monitoring, and destination recognition. Signs and maps are common wayfinding tools. Color coding hallways, doorways, and floors have become common practices in hospitals and senior housing to help people more easily orient themselves and navigate a building.

the rail better. New one-piece, non-slip showers were installed; doors were widened as feasible; thresholds were removed or minimized to reduce tripping hazards and ensure rollability of scooters and wheelchairs; and single-handle lever faucets and lever door handles were installed throughout the complex.

A significant number of revisions made to the common areas at Orness Plaza promote active lifestyles and social interaction.

A significant number of revisions made to the common areas at Orness Plaza promote active lifestyles and social interaction. The EDA worked with gerontologists from Minnesota State University-Mankato on several aspects of the redesign to ensure that the measures would help to achieve health goals for their senior residents. The EDA even recruited Human Performance interns from the university to organize and run fitness classes.

The design team captured and/or reconfigured numerous un- or underutilized spaces to increase social and activity areas. Shared balconies (one on every other floor) were enclosed and repurposed as resident lounges and a library; each provides an abundance of natural light and a view to the outdoors. Enclosing an unused outdoor patio space created a new fitness room, equipped with large mirrors, railing, and equipment appropriate for seniors. A small game and activities room was enlarged to serve as a meeting space for various clubs, with a billiard table installed to make it attractive during non-club hours. The community room was also enlarged and a flat-screen television equipped with a Wii system was installed. The Wii game is a collection of several sport simulations, such as bowling, tennis, and golf, which residents can play to get exercise in the cold winter months.

By far, the change that has gotten the most residents up, moving, and engaged was the redesign of the atrium area and adjoining community spaces. Pre-renovation, the lobby area itself was somewhat small and cramped and only accommodated about six chairs for residents waiting for a ride or the local bus. The renovation enlarged the atrium's lobby space by enclosing an unused outdoor patio and now features about 20 different seating options. Tables and umbrellas added to the area provide a bit of an outdoor bistro feeling, encouraging residents to sit and gather. Sunshine from the numerous skylights now beams down on a garden of green plants and a fish pond with a waterfall. But the pièce de résistance is the indoor walking path that meanders throughout the atrium. It has soft padding, similar to that found on a playground, and it weaves around the indoor garden and pond, across a bridge, and around the seating area. It offers residents a place to walk, see neighbors, and "get out" during the long Minnesota winters, without actually having to go out into the cold.

But renovations at Orness Plaza were not limited to the interior, so when spring does finally arrive, residents also have lots of space outdoors to keep them busy and active. The redesign of Orness Plaza's dining room gives residents greater access to the room, both to and from the interior of the building as well as to the great outdoors. New exterior doors give residents better access to the renovated patios and outside walkways; prior to renovation, residents had to walk all the way around the building to access them.



Resident Door-Wayfinding Measure



Outdoor patio space and landscaping

Photos courtesy of Blumentals/Architecture

Other changes to the grounds of Orness Plaza include the enlargement and update of an existing patio, which now features a covered picnic and grill area to encourage residents to use it more often. Varied-height retaining walls along the walkways provide both a place to stop and sit for a moment or to steady oneself as residents walk around the grounds.

An asphalt walkway installed near the patio wraps around the building, connecting to the front walk. It offers alternative paths leading either into the surrounding neighborhood or through a park area to meet an existing path to the local baseball stadium, shopping, and nearby medical facilities. The area provides lots of green space and tree canopy, and benches strategically placed throughout the area provide residents a place to sit and rest. A raised garden bed was built for residents so those interested in gardening could do so without having to bend down to the ground.

A “Reborn” Orness Plaza

The huge advances made in building design and function over the past 40 years enabled the EDA and its partners to take the dilapidated building that was Orness Plaza and breathe new life into it. Orness Plaza’s renovation took approximately three years and cost \$9.2 million. Former Vice President and Minnesota Senator Walter Mondale, who attended the original dedication in the 1970s, returned to celebrate the building’s rededication. Many of the residents of the surrounding Hilltop neighborhood also attended the rededication and open house. The resounding consensus: renovation efforts and costs were well spent.

Integrated design charrettes helped to ensure the renovation was done well and that essential health and energy considerations were incorporated into the process.

SWMHP’s development background and experience definitely brought a lot to the table to help ensure the successful renovation of Orness Plaza. Integrated design charrettes helped to ensure the renovation was done well and that essential health and energy considerations were incorporated into the process. SWMHP also developed a guide and provided training for the residents and maintenance staff to ensure that everyone understands the green products used throughout Orness Plaza. The guide provides maintenance and cleaning instructions to help insure that the many green, healthy measures incorporated into the building’s renovation continue to provide their intended benefits.

Investing in Health and Energy Efficiency

Having NCHH and CSBR involved from the beginning also allowed the EDA another golden opportunity: it provided an opportunity to evaluate the health benefits and energy performance of their investment.

NCHH used funding from HUD’s Office of Lead Hazard Control and Healthy Homes to examine how the green renovation affected the physical and mental health of seniors at Orness Plaza. NCHH compared Orness seniors to a similar low-income population to understand how, or if, residents’ health changed after the renovation.

NCHH evaluated whether the green renovation altered levels of indoor air toxins and allergens and documented building conditions. NCHH also worked with CSBR to determine how well the building performed based on the green building renovation standards.

Before Orness Plaza’s renovation, NCHH interviewed residents from 72 units about their physical and mental health, depression, any chronic medical conditions, and daily activities. These pre-renovation interviews helped NCHH establish a health baseline that allowed for the comparison of Orness residents to a similar “control” population. Because one would expect the seniors’ health to decline over time, the control group helped NCHH identify whether any of the changes in health improvements could be attributed to the green renovation practices.

Water and Energy Efficiency Results

Using energy targets set by Architecture 2030,¹ the development team’s goals for energy efficiency and conservation upgrades at Orness Plaza were to reduce the building’s total energy consumption by 50 percent over its pre-renovation condition. Water-saving strategies incorporated into the renovation consisted primarily of installation of efficient low-flow and flush fixtures to meet Green Communities Criteria. Post-renovation building commissioning confirmed modeled ventilation and exhaust rates in the units and throughout the common areas.

CSBR analyzed the property’s energy use prior to renovation and found that Orness Plaza consumed 127 thousands of British Thermal Units per square foot per year (kBtu/sf/yr). Following Architecture 2030 criteria, CSBR targeted the post-renovation energy use to 63.5 kBtu/sf per year. CSBR assessed Orness Plaza’s energy use one year after renovation was complete at 71.5 kBtu/sf per year. Although Orness’ energy use post-renovation was higher than the target, it is still 28.5 kBtu/sf per year better than an average multi-family building in Minnesota built to code. Additionally, compared to pre-renovation, energy use has been reduced by 44 percent. Building envelop improvements lowered the amount of energy needed to heat and cool the building, while energy-efficient systems and appliances further reduced energy use and greenhouse gas emissions from power plants. The new systems lowered monthly utility costs to about \$67 per unit.

Because Orness Plaza has little outdoor landscaping, most of the water consumed on the property can be attributed to interior uses. Prior to its renovation, CSBR found the total water consumption was 71.5 gallons/person/day (g/p/d). Post-renovation, the usage sank to 31.8 gallons/person/day. Based on the fixtures specified for the renovation, water consumption was modeled at 41.5 g/p/d; i.e., a predicted reduction of 40 percent. Actual use at Orness is approximately 54 percent less than average and significantly below the average indoor water consumption estimated by the American Water Works Association (AWWA), which is 69.3 g/p/d.

¹Architecture 2030 is a nonprofit organization established in 2002 to address how the built environment influences and is impacted by climate change.

Post-renovation, NCHH found that the mental health of the residents improved significantly over that of the comparison group. There were also significant declines in reported falls and, of those who smoked, more residents reported smoking outside rather than inside their homes (although that might have simply reflected Orness Plaza's new no-smoking policy).

Using energy targets set by Architecture 2030,⁵ the team designed the energy efficiency and conservation upgrades at Orness Plaza to reduce the building's total energy consumption by 50 percent over its pre-renovation condition. Water saving strategies incorporated into the renovation consisted primarily of installation of efficient, low-flow and flush fixtures to meet Green Communities Criteria. Post-renovation building commissioning confirmed modeled ventilation and exhaust rates in the units and throughout the common areas.

CSBR analyzed the property's energy use prior to renovation and again once renovation was completed, residents had returned to their units, and new residents occupied the units left vacant during the renovation process. Although the renovations did not quite meet the targeted goals, energy consumption declined by 44 percent and the building uses less energy than a comparable multi-family building built to code in Minnesota. Water consumption, on the other hand, beat the targeted goals. When CSBR modeled the design, it expected the upgraded fixtures would lower consumption by approximately 40 percent, but the actual use at Orness is approximately 54 percent less. It is also significantly lower than the estimated water consumption for a similar-sized building.

Orness Plaza residents are proud of their new homes. The measures the EDA incorporated into the redevelopment have helped improve their quality of life by increasing social interaction and physical activity. Community residents participate in nutrition and exercise classes held at Orness, which promotes greater social cohesion with the surrounding community. Mankato EDA truly created a community landmark with the renovation of Orness Plaza.

Tried-and-True Approaches

- Allow enough time during design and development for public health input and integrated design with a multi-disciplinary team.
- Assemble the right team at the start of the project.
 - Bring the design and construction team together early to identify any unique challenges to the renovation, how they should be addressed, and what decision process will be used to ensure goals and objectives are met.
 - Involve property and maintenance staff in the design and construction process so they understand system requirements. Follow up with necessary training specific to any new systems.
 - There will always be additional questions and second-guessing of decisions; make sure due diligence work is properly documented.

⁵Architecture 2030 is a nonprofit organization established in 2002 to address how the built environment influences and is impacted by climate change.

Challenges

Although the EDA's development team held construction meetings every week, they still encountered unforeseen challenges during the construction process.

- During the upgrade of bathroom fans, the construction crew found that ductwork in the building had never been cleaned and was leaky. The crew spent a fair amount of time clearing and improving the ductwork prior to installing the new fans.
- Use of ARRA funds at Orness Plaza required "Made in America" products, but since many of the products initially specified did not comply with the requirement, there was a scramble to find alternatives. None of the team members were aware of the number of construction products not made in America: anchors in parapet walls had to be replaced because the box showed they were made in Canada; even though the low-flow toilets were manufactured by an American company in the U.S., not all of the pieces were, so they did not meet the criteria; and the original flooring specified for the lobby and in some areas of individuals units was made in Europe.
- The specified linoleum flooring ended up creating problems because it would not install properly: squares would not lay flat, creating a trip hazard. The EDA ended up having to move residents who had returned to their renovated units out again, in order to address the installation issue.
- Code required the installation of heavy fire-rated doors with auto door closures in the hallways. Many of Orness Plaza's frail residents find the doors very difficult to open and close. Although the EDA development team has researched how to address the problem, no solution has been discovered.
- Although residents specifically requested full-sized stoves, once they saw how much apartment space was lost with the bigger stove, several were upset. Because the dimensions of the apartments could not be altered during the renovation, the development team had to work with what they had. Although the team was able to gain more space by reconfiguring the kitchen layout and eliminating windows that looked out into the corridors, the bigger stoves definitely eliminated some counter and cabinet space.

The National Center for Healthy Housing (NCHH) is a 501(c)(3) nonprofit dedicated to creating healthy and safe homes for children through practical and proven steps. For more information about green and healthy housing, visit: www.nchh.org/training/Green-and-Healthy-Housing.aspx.