

UNL College of Engineering HUD project for New Orleans

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ABSTRACT

The University of Nebraska's College of Engineering in partnership with Catholic Charities Archdiocese of New Orleans is developing a HUD community design program for New Orleans. The program is in the process of developing rehabilitation strategies for 10 houses and documenting the process for future replication. Final drawings for reconstructing 10 houses will also be provided. The difference between the rehabilitation and the reconstruction process are defined. The most significant program contribution will be 10 new final construction designs with 10 variations that can be replicated for a number of sites. Each design and/or strategy will respond to environmental elements as well as sustainability issues. The critical key to the ultimate success of this reconstruction project lies in community involvement, appropriate design fit, and user acceptance. The project includes venues to gain feedback and support from the impacted parties.

Background

The University of Nebraska's College of Engineering School of Architectural Engineering and Construction is working in partnership with Catholic Charities Archdiocese of New Orleans (CCANO) in developing a community design program for neighborhoods in New Orleans. CCANO is an umbrella agency of approximately 33 social and health services programs located throughout the Archdiocese. This agency has helped with housing and care for the needy for 300 years. Charlotte M. Bourgeois is functioning as the Project Director for Housing Development at CCANO. The agency experience in affordable housing is extensive as is Ms. Bourgeois experience working with funding agencies. Past projects include: conversion of historic Sacred Heart School and convent into housing for the elderly funded through Louisiana (LA) tax exempt bonds and historic tax credits; Holly Park Apartments; Olympus Apartments New Orleans, a renovation of two apartment complexes for low income families, funded by LA low income housing tax credits and HOME funds; conversion of historic Holy Angel Academy into independent apartments for low-income seniors; conversion of historic St. Ann Church, school and rectory in the Esplanade Ridge Historic District funded by LA low income housing tax credits; and Conversion of Historic St. Cecilia Catholic Church and rectory in the Bywater

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district into a Program for All-inclusive Care for the Elderly Center for frail elderly funded by HUD Special Projects Grant, State of LA Capital Outlay, and New Orleans CDBG grant. This extensive agency experience joining in partnership with the UNL College of Engineering's Charles Durham School of Architectural Engineering and Construction is positioned to address New Orleans design and construction challenges.

Extent of the Problem

With over 75% of Orleans Parish uninhabitable for several years, there is a need for low-cost, permanent housing which can be rehabilitated, reconstructed or constructed rapidly. In neighborhoods such as the lower Ninth Ward, Esplanade Ridge Tremme, Tulane-Canal, Central City, and Lakeview, many houses will have to be torn down rather than reconstructed. It is important to quickly revitalize neighborhoods for reentry of these low-income, blue-collar families to create the economic and cultural base necessary to the vitality of the City of New Orleans.

The majority of the damage in New Orleans was caused by the flooding that followed the Hurricane. Many of the houses in the areas mentioned do not meet the National Insurance Policy Guidelines for flood plains established in 1985 by the Corps of Engineers (revisions are expected in 2006). Houses with over 50% damage must meet the new codes when rehabilitated. The cost to meet these standards is prohibitive as insurance may not cover losses.

Responsiveness to Pressing Needs

There is a need for low-cost, permanent housing, resistant to natural disasters that can be constructed rapidly. This project responds to these needs by first identifying structures that can be renovated or reconstructed as these can be completed the soonest. Further, modifications will be suggested to make the existing structures more resistant to natural disasters. Houses that need to be newly constructed will be designed with techniques that are responsive to the need of low to middle income families yet sensitive to issues of sustainability and community.

The greatest need in the area is the quick resettlement of displaced families. With proper planning and coordination, homes that were devastated by the hurricane can be rebuilt, providing stronger and more comfortable residences. Some families are concerned that in addition to losing almost all they owned, they will also lose the New Orleans culture that was imbedded in those destroyed neighborhoods. It is most important that the designs reflect the personality and culture of this historic neighborhood and restore the richness that means so much to its residents.

Pressing needs in the area may call for an alternative to conventional lumber construction. In addition, consideration must be given to sustainable designs that are environmentally friendly yet resistant to environmental forces. Lumber is currently in high demand, and past construction designs and methods have proven less than effective against the most recent disasters. Concrete provides a readily available alternative with rapid assembly and structural soundness against the local environment. Houses designed within the purview of the proposal will consider concrete designs where appropriate and incorporate new wood design standards throughout.

Approach

The following describes the relationship between the proposed activities needed in the community and the purpose of the project. The UNL project team working with Catholic Charities Archdiocese of New Orleans (CCANO) is determining the rehabilitation, reconstruction and construction needs within Esplanade Ridge, a historic neighborhood in New Orleans near the

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French Quarter area. For the purpose of this project, rehabilitation refers to repairs and renovation to structures that are still in place. Reconstruction refers to rebuilding the house to match that damaged beyond repair; and construction refers to a new construction. The major tasks involved in the initial effort included site visits to collect pictures, measurements of sites and planning meetings with project partners.

CCANO understands the community and works closely with St. Peter Claver Parish this includes the Esplanade Ridge neighborhood. Father Michael Jacques, the pastor of St. Peter Claver Parish. Father Jacques created Ujamaa CDC, a nonprofit corporation, to help rebuild the community which indicates the level of commitment to housing development in this area. Their market analysis will provide the team with the necessary information including demographic trends in a range of residential markets to match the design to the area. Considerations such as income and diversity of the population will be paramount in this analysis. The measurable objective for this activity is completion of the analysis and integration of analysis into the planning process.

According to PATH, a program supported by the U.S. Department of Housing and Urban Development, wind damage accounts for only a fraction of the destruction caused by hurricanes. The greatest destruction is caused by water infiltration, not catastrophic structure failure. The majority of the damage in this area was caused by flooding subsequent to the hurricane. Strategies to minimize flood damage often include raising the level of the structure. Other strategies will be researched and incorporated into the design along with hurricane damage mitigation strategies.

Strategies

Strategies to limit wind-driven water intrusion include:

- installing baffled ridge vents and off-ridge vents,
- installing out swinging front doors,
- installing capillary breaks where concrete walls meet the slab,
- applying elastomeric sealant at concrete walls,
- extending fascia boards to terminate below the underside of the soffit,
- and installing natural-gas powered generators.

These recommendations were published in the July 2005 issue of Professional Builder in an article titled, Building for Survival in Hurricane Country.

Strategies to improve wind resistance include:

- cast-in-place concrete construction,
- aligning the roof trusses with interior load bearing wall framing to improve up-lift resistance,
- install hurricane straps,
- install additional reinforcing, using ring-shank nails and a proper nailing schedule,
- and installing a secondary roof covering and window shutters.

These recommendations are based on Building for Survival in Hurricane Country, the PATH report durability by Design, and lessons from a PATH site demonstration in Melbourne, Florida. In the Florida demonstration, a PATH team examined how to exploit the strength of poured concrete walls to enable homes to weather a major storm.

The proposal team has been involved in residential research that includes precast and cast-in-place concrete construction that is durable and affordable as residential dwellings. Concrete has a number of advantages over conventional wood framing in New Orleans as indicated by the PATH initiative. The structure is more resistant to wind and water. Other features include sound resistance, termite resistant, reduced maintenance and longer life cycles.

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Additional activities include research of construction methods for rehabilitation, reconstruction and construction in areas susceptible to hurricanes; and incorporating these methods into the activities relative to rehabilitation strategies and design activities. This research is expected to take eight weeks with the added objective of identifying appropriate new technologies.

The project includes rehabilitation strategy for the homes using appropriate innovative and sustainable technologies. Rehabilitated structures will incorporate some hurricane resistance and sustainability measures but have major limitations. Homes with over 50% damage are required to be brought up to code. Reconstruction designs are more flexible allowing more innovative technologies yet remain sensitive to the needs of the community. Construction plans will utilize green building technologies and innovative designs that are energy efficient yet economical for low and middle income groups while maintaining the culture of the neighborhood.

Three milestones for this part of the project are completion of the rehabilitation strategy, completion of reconstruction designs, and completion of construction plans. The rehabilitation strategy should be completed within six months and reconstruction designs with nine months. Ten appropriate residential design solutions will be prepared for new construction with 10 variations for presentation to prospective residents and community officials based on careful analysis of user needs:

- neighborhood scale,
- grain and textures;
- historical and cultural factors,
- site determinants;
- life-cycle energy costs.
- structural durability requirements;
- construction and operational safety;
- and local environmental impacts.

Reconstruction designs will incorporate many of the same aspects, yet retain the original look of the building. The design team will hold town meetings, and carefully document end-user input to seeking acceptance, rejection, and/or modifications to designs. Based on a second round of meetings, final schematic designs will be prepared. These schematic designs will be reviewed by potential stakeholders, local builders, developers, architects, and constructors for input to the proposed designs. Their comments, in combination with those of officials representing cognizant regulatory entities, will become the determining parameters for taking accepted designs further into design development and construction documentation. This process of schematic design and review will be accomplished by means of open design charettes. The objective of this activity is to collect the data necessary to complete the design process. The preparation, review, and design adjustment phase is a major project milestone and should be completed within a four month time period.

Using the collected information on the target communities and the results of the market survey, a cost/benefit analysis will be completed. This analysis will evaluate the economic feasibility of the rehabilitation, reconstruction, and construction alternatives. A utility function will be developed to account for the presence of multiple and possibly conflicting criteria (e.g. social, environmental, or political impacts) that have different degrees of importance. The outcome of this analysis will be a list of alternatives ranked according to their cost-effectiveness...

A design charrette will be organized using the preliminary design and a three dimensional model situated on a site within the designated area. This allows for viewing of the site as it actually existed, so that members of the charrette can suggest modifications that are more suited to the area. This process will take two days and include two members of the team with local code enforcement officials and the residents of the community. It will be important to include residents to ensure the design fits comfortably in the neighborhood.

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Deliverables

Final designs and construction specifications will be produced by the UNL team for the builder or developer to acquire the professional stamps, if necessary, for construction permit approval by the local jurisdiction. During this phase, and based upon building materials and systems research conducted in the previous phases, careful consideration of potential construction technologies will be made. Short and long-term financial determinants will be reflected in successful design solutions. Designs must be developed and delivered within all cost parameters related to insurance, governmental assistance programs, private financing, construction loan requirements, or mortgage financing requirements.

It is recognized that a variety of delivery schedule adjustments may be required, depending on the type and extent of destruction that has occurred in the neighborhoods. Both conventional construction methods and industrialized housing systems methods will be analyzed. From among a variety of technological options, those appropriate to specific communities, neighborhoods, and sites will be selected. It will also be necessary to select from among different fiscal delivery systems in order to best-fit designs to specific sites. It is also recognized that design implementation will require the detailed involvement of local businesses, local civic groups, and user and community constituencies, including social and religious organizations, local educational entities, and particularly local government representatives.

Inclusion of all stakeholders in the successful rebuilding of the community will be mandatory, and the design team will provide for such involvement during development of technical documents. In cases where innovative construction systems may be proposed, it will be necessary to work closely with local regulatory and inspection entities. Further, for both compliance and cost reasons, it will be necessary to depend heavily upon local architects, engineers, constructors, and building products organizations to assure that local, regional, and traditional construction procedures and methods are followed. The objective of this activity is to prepare final design drawings.

Ten sites will be selected for rehabilitation, 10 for reconstruction and 20 (10 new designs with 10 variations) or more for construction, with the help of CCANO and St. Peter Claver Parish, in the Esplanade Ridge neighborhood. The 20 sets of drawings for construction, including variations, can be used repeatedly on multiple sites by CCANO, St. Peter Claver or other builders or developers.

CCANO is already working with financial lending institutions to set up financing for rebuilding the area and will be responsible to secure the financing for construction of all the sites in this proposal. The objective of this activity is to secure financing and will be ongoing throughout the two year program, but will be necessary for houses selected for rehabilitation within six months of starting the project. The reconstruction and construction financing will be needed after completion of final designs. However, the process can begin after schematic designs.

New Orleans uses the International Building Code, 2000, which is the same code used in Nebraska. Local discrepancies may exist that could inhibit acceptance of the design of units that incorporate new technologies. It will be important for the project team to work with authorities early in the design stages through a local consultant with knowledge of officials, codes and practices.

A workshop will be organized by UNL and CCANO to disseminate information for builders, investors and civic leaders including lessons learned from the rehabilitation efforts, reconstruction designs and efforts, and construction designs. A UNL website will be created and updated on a regular basis for open access by the community, builders, developers and university professors. This will begin after final design preparation, and continue to the end of the project. Architectural services will be provided by the UNL design team for modifications to selected

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sites for up to 2 years from award. These services will include minor changes to the 10 construction designs and 10 variations for modification to match site condition and changes.

Best Practices

A summary of best practices will be provided on a UNL website and developments updated on a regular basis for open access by the community, builders, developers and university professors. A workshop to disseminate lessons learned for builders, investors and civic leaders such as: documented procedures, processes and construction techniques will be conducted. The group will present at conference proceedings and in journal articles the results of this effort and the appropriate intermediate and final report will be submitted.

Student Benefits

These real world activities help students relate the classroom presentations to the profession they have chosen. More importantly it imparts a sense of community service that is a life long lesson. Projects similar to this that serve those less fortunate are frequently used in the classroom at UNL. The goal is to select projects that are significant in terms of societal impact as well as professional development. These activities will be incorporated into the design and management classes. Student will help design the houses, be involved in the management of the process and hopefully be active supervisors in the rehabilitation, reconstruction and construction. Approximately 50 students will be enrolled in the spring, in the drawing course that includes a design studio component. The final project for this class and subsequent classes in the fall will include work related to this project. The project is unique in that it requires an understanding of design and planning issues that are not typical. It is expected that these final student projects will become the final construction plans with some modifications by the architects on staff and volunteers from the communities in Omaha and New Orleans.

Several service learning projects have been incorporated into the coursework to help students understand their role in the industry and their role in the community. In 2003, students helped design and build a formed concrete house for Habitat for Humanity. Student service learning was initiated in 2004 and 2005 and resulted in a formed concrete house. Students also supervised the renovation of two low income houses last year.

Summary

The broader impact on the community is the integration of hurricane resistant and sustainable designs into the local codes and the community housing. The designs that preserve the cultural integrity of the community while providing housing that remain intact against environmental forces will serve the community for decades. In addition, the documented procedures for rebuilding will be helpful with future disaster remediation efforts.

The University of Nebraska and specifically the Charles W. Durham School of Architectural Engineering and Construction is committed to research that relates to sustainable designs and construction as well as service learning. The project will impact long-term commitments by providing experience necessary to acquire future funding. This will allow the faculty and students to advance research in sustainable design and construction as well as provide the school with valuable experiences in service learning.

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Avery Schwer, Ph.D., has over 30 years of construction experience which includes insulated concrete form houses. His expertise in green building is being used to implement and improve the sustainable features in the project. Prior to joining the faculty at the University of Nebraska, Dr. Schwer was a construction engineering manager on General Electric's Corporate Staff. .

James Goedert, Ph.D., P.E. is the Chairman of the Construction Systems Department at UNL and he is the project director. His 35 years of construction experience includes project management for a design build firm in building residential and commercial construction. He has been on the faculty since 1989, serving as its chair for the last four years.