Green Development Plan

[This document was submitted to the Enterprise Foundation’s Green Communities program as part of the submittal to achieve designation as a Green Community.]

Project Team:

Design Architect: ASU Stardust Center for Affordable Homes and the Family
   Principals-in-Charge: Michael Pyatok, Executive Director
   Daniel Glenn, Design Director
   LEED-AP: Nicholas Smith, Project Architect
   Energy Analysis: Ernesto Fonseca, MS in Energy Performance and Climate Responsive Architecture

Architect-of-Record: Cook Associates Architects, Inc

Landscape Architect: Gilmore Parsons

Civil Engineer: AEC Consultants

Structural Engineer: Avant Architecture Engineering

Developer:
   Principal-in-Charge: John Ramirez, Vice President Housing Division
   Project Manager: Charles Wood, Director of Housing Development

General Contractor: Woods Construction Company

Materials Supplier: Premiere Building Systems

Green Development Goals:

This project is a Green Communities Demonstration project by the ASU Stardust Center for Affordable Homes and the Family. The goal of the project is embodied in the mission statement of the ASU Stardust Center, which states:

Through research, education, advocacy and design innovation, the ASU Stardust Center for Affordable Homes and the Family supports organizations, neighborhoods, and professionals in their efforts to improve the growth of quality affordable homes and sustainable communities.

As part of this mission, the Center designs demonstration projects in the region that seek to be exemplars of sustainable, affordable housing. The 46-unit community, Cardenas Villas at Yanche, is designed to provide a greener alternative to the region’s conventional large lot, stick-frame subdivisions while maintaining the single family character of its South Phoenix neighborhood.

From the outset of the project, in 2005, the Center has worked together with its client, the non-profit community development corporation Chicanos por la Causa (CPLC), to develop a project which utilized green design strategies and technologies, including:
- Infill lot development (building within the City of Phoenix infill zone)
- Mixed-income affordable home-ownership family housing (four bedroom units) for income levels at 80 percent or below AMI (constituting 65% of the units) and affordable market-rate units (35% of the units)
- Xeriscaping to reduce water use in the desert
- Doubling of average Phoenix residential density (from 3 du/acre to 6 du/acre)
- 2-story house designs to reduce building footprint and lot size (CPLC had previously only built 1-story homes, as is the norm in the valley)
- Development of small, efficient family units for low initial and long term costs.
- Tandem parking garages (to reduce lot widths and reduce the impact of the automobile)
- Culturally-responsive designs intended for Latino families (the predominant community)
  - Shaded porches to activate and support street life
  - Kitchen/dining areas opening to rear yards for monitoring of young children
  - Units with ground floor bedrooms for multi-generational families
  - Units with courtyards for large family gatherings
  - Bright colors
- Structural Insulated Panel system (SIPS) for a low-energy house (this project will be the first complete subdivision in the Valley to utilize SIPS technology)
- Utilization of local materials whenever possible
- Exploring potential use of photovoltaic systems for the homes

In addition to these initial project goals, as the project progressed, CPLC and its builder, AZ Green Builders, agreed to adopt the Enterprise Foundation’s Green Communities Criteria. The project’s success in meeting these goals is indicated by it achieving 54 Green Communities Criteria points (25 points are required to successfully meet the minimum requirements of the Criteria) and achieving an 89.8 HERS (Home Energy Rating) score (this indicates that the home is 45% more efficient than a conventional code-compliant home.)

**Integrated Design Process**

From the outset of this project, the ASU Stardust Center has acted as Green Development Consultants and worked in close partnership with the developer, Chicanos por la Causa, to design the project and to determine what were the most viable green materials, systems and strategies for the project that could be utilized within the constraints of the budget for an affordable housing project.

The process began with meetings to discuss the possibility of creating a model green project. CPLC had never before engaged in a green approach, but they were interested in the prospect as it furthered their mission of creating long term affordability for Arizona families. Once the decision was made to proceed in this direction, the ASU Stardust Design Director and the CPLC Project Manager sought means and methods to achieve a green project.
A major decision was made during design development to utilize structural insulated panels as the building envelope and structural system. This decision was based on two factors: (1) energy modeling analysis (DOE II and Energy 10 modeling), provided by the ASU Stardust Center, which demonstrated significant energy savings in the desert climate for SIPS vs. conventional stick frame construction, and (2) cost/benefit analysis, based on information from a local SIPS supplier, SIPS Structures, LLC, who provided cost estimating for the construction of the homes with SIPS panels.

Once this decision was made, the design plan, sections, and elevations were modified to accommodate changes necessary due to the use of SIPS panels, including lintel widths above openings, opening placement, elimination of attic space and reconfiguration of ductwork to be accommodated within the conditioned space (ductwork is typically placed in unconditioned attic spaces in the region, resulting in significant energy inefficiencies.)

At a later stage in the process, the ASU Stardust Center introduced the Green Communities Criteria to the client and it was jointly determined that the Criteria were achievable within the budget of the project. Since that point, a series of meetings have been held with the client, the builder, the architect-of-record, and the Stardust Center to discuss the Criteria and to implement it within the project.

**Design and Development Team for Green Feature Implementation:**

The ASU Stardust Center’s Design Director and the Center’s LEED-AP are working closely with the developer during design and construction to ensure that the Green Criteria as outlined in this plan are implemented. The developer’s Project Manager, Charles Wood, is fully engaged in implementing the plan and will be requiring the General Contractor to meet all the requirements as outlined in this plan.

**Follow-up Measures:**

The ASU Stardust Center is being contracted by the developer, CPLC, to continue acting as the project’s Green Development Consultants through the construction of the project. As part of this effort, the Center will be developing the Durability Plan, as well as providing input and additions to the Cardenas Villas at Yanche Homeowner Association materials and requirements regarding energy and water-conservation approaches for homeowners. The ASU Media Services has agreed to provide documentary film coverage of the construction of the project which will be utilized to document the complete construction process.

In addition, the Center is contracted to monitor the first year following the completion of the project to ensure that the project goals were achieved. This will include reviewing of energy and water bills with the new homeowners to determine if the predicted savings has been realized. Part of the Enterprise Foundation’s Green Communities Grant supports these efforts.
Green Features:

Smart Site Location

Proximity to Existing Development
The project is located in South Phoenix, a developing area within the City of Phoenix’s designated infill area. The new streets planned for the subdivision tie directly into major thoroughfares of the Phoenix city grid and it is surrounded by subdivisions in the immediate area. The site was purchased by the community development corporation, Chicanos por la Causa, for the development of affordable housing.

Protecting Environmental Resources
The immediate site was previously undeveloped agricultural land. However, like many infill sites in the Valley, it was bypassed as development spread further and further outward away from the central city. Therefore, with development in all directions, it is a small leftover parcel and no longer prime farmland.

Proximity to Services
The urban infill site is within a quarter mile of public transportation, a community park and other services.

Compact Development
The project is six units to the acre with two-story units and small lots to increase density. This is a relatively low density but it is double the average density of the Valley and it provides single family detached family housing for first-time home buyers and lower income families.

Walkable Neighborhoods – Sidewalks and Pathways
Sidewalks are provided on both sides of the street and link the subdivision to the surrounding neighborhood streets.

Passive Solar Cooling
The buildings are designed with shade porches or trellises and shade awnings are proposed for any exposed south facing opening. Due to budget, trees are limited to street trees. However, residents will be encouraged to plant native trees to protect exposed western facades through educational pamphlets planned by the ASU Stardust Center and Chicanos por la Causa.

Transportation Choices
The project site is within ¼ mile of a bus stop with half-hour bus service during peak periods.

Site Improvements

Environmental Remediation
A Phase 1 ESA was conducted as required by the City of Phoenix for new construction.

Erosion and Sedimentation Control
These controls are required by the City of Phoenix and are being carried out by the builder as required. A perimeter site wall is being constructed as part of the site improvements prior to any house or roadway construction.

Landscaping
All landscaping provided within common areas of the development and along public streets have been designed by the design team’s landscape architect. These areas are all xeriscaped and utilize native drought resistant desert plantings and trees.
Homeowners will be informed of native plantings and how to utilize plantings to provide shading in the summer and heat gain in the winter via the Homeowner Association Manual which is being developed with input from ASU Stardust Center.

**Water Conservation**

*Water-Conserving Appliances and Fixtures*
The general contractor is required by the developer, Chicanos por la Causa, to provide all water-conserving fixtures that meet or exceed the Green Communities Criteria.

*Efficient Irrigation*
All common areas of the development are xeriscaped and will be drip-irrigated to establish the plantings. The Homeowners Association manual, developed by CPLC with input by the ASU Stardust Center, will require xeriscaping throughout the development on private lots.

**Efficient Energy Use**

*Home Energy Rating System Score: 89.6*
This score indicates that the home is 45% more efficient than a conventional code-compliant home. This was achieved by a highly efficient building envelope utilizing a Structural Insulated Panel System for roof and walls (R-24 walls and R-38 roof), as well as dual pane, low-e windows, incorporating ductwork within the conditioned space, and an energy-efficient HVAC system.

*Energy Star Appliances*
The General Contractor will be required to provide and install all Energy Star appliances.

*Energy Star Lighting - Interior*
The General Contractor will be required to provide and install all Energy Star-labeled lighting fixtures.

*Energy Star Lighting - Exterior*
The General Contractor will be required to provide and install all Energy Star-labeled lighting fixtures, and all fixtures have been designed to meet Phoenix, AZ night time sky pollution requirements.

*Electricity Meter*
All homes are individually metered.

*Additional Reductions for Energy Use – New Construction*
Modeled and certified by the local energy utility, the neighborhood is comprised of three unit types, each achieving a Home Energy Rating Standard score above the Energy Star-qualified home requirement of 86. Two of the unit types scored more than 10% change in energy efficiency while the third unit type achieved greater than 15% reduction in energy use.

**Materials Beneficial to the Environment**

*Construction Waste Management*
Designed on a standard 4’ wide increment and constructed with Structurally Insulated Panels, the construction of these 46 homes will significantly reduce the amount of waste generated during construction.
Engineered Wood

In addition to using 35% less wood than conventional framing, all of the wood components of SIPS framing are engineered. Finalized pricing by the contractor, should reflect remaining wood components and framing to be less than 50% of the total package.

Water-Permeable Parking Areas

In an effort to reduce heat island, non-roof affects, each unit has been designed with a driveway consisting of a pair of 24” wide concrete ribbons, in lieu of a traditional concrete pad, reducing the total amount of concrete required for site parking by more than 50%.

Healthy Living Environment

Low/No VOC Paints and Primers

The General Contractor will be required to provide and install only low VOC paints and primers as indicated in the project specifications.

Low/No VOC Adhesives and Sealants

The General Contractor will be required to provide and install only low VOC adhesives and sealants as indicated in the project specifications.

Formaldehyde-free Composite Wood

The General Contractor will be required to provide and install only formaldehyde-free composite wood.

Green Labeled Certified Floor Coverings

The General Contractor will be required to provide and install only Green Labeled certified flooring in each home as indicated in the project specifications.

Exhaust Fans - Bathroom

The General Contractor will be required to provide and install exhaust fans in each bathroom.

Exhaust Fans - Kitchen

The General Contractor will be required to provide and install exhaust fans in each kitchen.

Ventilation and HVAC Sizing

The project’s Architect-of-Record has sized all mechanical equipment to meet ASHRAE 62.2, and decreased mechanical sizes where appropriate due to increased insulation and floor plan layout.

Water Heaters – Mold Prevention

Tankless water heaters have been specified for each home.

Cold-Water Pipe Insulation

According to standard building practices in dry arid climates, condensation resulting from un-insulated cold water pipes is not a problem. CPLC has elected not to incur the added costs resulting from the insulation of cold water pipes.

Materials in Wet Areas

Ceramic and vinyl tile has been specified for all wet areas.

Materials in Wet Areas – Tub and Shower Enclosure

One-piece fiberglass tub and shower enclosures have been specified for all bathrooms.
Basements and Concrete Slabs – Vapor Barrier and Radon
According to standard building practices in dry arid areas, vapor barriers are not required. Likewise, standard radon prevention measures are not required in non-EPA Zone regions. CPLC has elected not to incur added costs resulting from vapor barrier and radon prevention measures.

Surface Water Drainage
Down spouting, flashing and grade drainage are water diversion measures employed on each home.

Garage Isolation
The General Contractor will be required to provide and install combination fire CO2 alarms per local fire code in each home.

Clothes Dryer Exhaust
Each home’s laundry exhausts dryer air directly to the outdoors.

Integrated Pest Management
The “tightly sealed” nature of SIP envelopes eliminates the crack and penetrations found in typical stick frame construction.

Operations and Maintenance

Homeowner Association Manual
CPLC will provide a “Home Owner Association Manual” (with input from the ASU Stardust Center) explaining the basic maintenance required on the various integral workings of a “green” home. As part of the Stardust Center’s on-going efforts to educate our community partners and residents, the Center will include information explaining the differences and benefits of a “green” home versus a conventional home. Each resident will receive a copy of this manual during the initial walk-through.

Homeowner and New Resident Orientation
CPLC provides an orientation for each new home owner. Included in this will be the opportunity to have questions answered relating to the components of a “green” home.