Single Family Homes less than 3,000 sq.ft.

High Performance Project

3 Sisters Project
Ft. Worth
Participant information

Ferrier Builders
Heather Laminack
5017 Byers Ave
Fort Worth, TX 76107

Phone: 817-237-6262
Email Address: heather@ferriercustomhomes.com
Website: www.ferriercustomhomes.com

Category
Single Family Homes (under 3,000 sq ft.)

High Performance: Yes

Project information
3 Sisters Project
Fort Worth, TX 76107

Date Completed: 06/07/2018

Dimensions of building (all floors of multi-story building):
1st floor 54’x20’
2nd floor 61’x20’

Total sq. ft. of conditioned space: 1,950sf

Built By:
Ferrier Builders
Heather Laminack
5017 Byers Ave
Fort Worth, TX 76107

Panels Manufactured By

Company Name: FischerSIPS
Single Family Homes less than 3,000 sq.ft.

**Designed By** (if different than applicant:
Daniel Van Kunschik
Ferrier Builders
4748 Slippery Rock Drive
Fort Worth, TX 76123

**Total sq. ft. of conditioned space:** 1,950sf

**Describe the end use of the building:** single family residence

**How did SIP construction help you get this job?**
Owners sought us out specifically because they wanted to incorporate SIP’s into their project.

**SIP wall thickness and core material:** 4” wall panels, 6.5” wall panels at stair wall. EPS core
**SIP roof thickness and core material:** 6” roof panels. EPS core

**Describe the benefits of using SIPs on this project. Did SIPs help save time, labor, construction costs, or energy?**
SIP’s were incorporated into the project’s design from the very beginning, as the owners desired the high performance aspects derived from SIP’s (extreme air tightness, great insulation & incredible strength with its reduced homeowners insurance premiums). Install went quickly, and the SIP’s walls & roof contributed to an extremely tight home envelope, which eventually resulted in a HERS score of 9.

**Describe any innovative design elements or structural engineering involved:**
This home is the first of three very similar homes. We had a buildable lot size of 21’ wide and the owner desired a modern look for all three homes. The design also called for a single slope roof & a lot of windows for ample daylighting. The placement of the windows created a challenge to obtain the proper Shear wall strengths. SIP’s contributed greatly to the needed increased Shear Wall strength, and when coupled with extra structural anchors in the concrete slab, exceeded the requirements. SIP’s were the ideal choice for the single slope roof. Simplifying the roof erection on very tight space and giving us an excellent platform for our highly reflective standing seam Galvalume metal roof.

**Please list any certifications the project received, such as ENERGY STAR, LEED, National Green Building Standard, WELL, Passive House, Green Globes or local green building programs. Only list certifications that are completed:**
ENERGY STAR v3.1, Department of Energy Net Zero Energy Ready Program, Water Sense, Fortified Home

**HERS Index** (required only for High Performance Category and recommended for residential projects): 9

**Blower door test results (ACH50)** (required only for High Performance Category and recommended for residential projects): 1.9

**Describe the HVAC system used on the project:**
15 SEER 3 ton heat pump, 8.5 HSPF. 3 ton air handler unit (for 1950sf living space & large vaulted center section) above second floor bathroom. Ducts installed in open web floor trusses or 2nd floor flat ceiling areas & with exposed metal spiral ducts in center vault area. Includes 2 zone damper system and Panasonic 50 CFM spot ERV.
Describe any other energy-saving materials used in the building envelope other than SIPs. List U-values of windows used and the U or R-value of any insulation materials. (judged only for High Performance Category)

Anderson 100 windows (u-value 0.27, SHGC 0.19) and fiberglass insulated exterior doors (R-6.0), all ducts located in conditioned envelope, detached garage insulated with spray foam insulation

Please list any energy-efficient products or design features, such as lighting, hot water heating, appliances, passive solar (judged only for High Performance Category):

Passive solar design on an urban infill lot: the lot primarily faces east and west, creating a challenge. We incorporated a Passive solar design by eliminating all west windows (our biggest enemy of energy efficiency) except for 6 very small rectangular units. The largest are completely shaded by an existing pecan tree. We provided ample daylighting by use of east, south and north windows. The large east windows created too much heat gain during our hot summer months, so we mitigated that by use of carefully sized metal awnings. This allows the cooler morning sun to shine directly into the living space but keeps the hot sun out by 10AM. The south windows are also shaded by computer-sized awnings, which allow the warm winter sun into the living space while keeping the hot summer sun out. Highly reflective Galvalume standing seam roof & wall panels on west side of home, 100% ENERGY STAR appliances, (1) Steibel Eltron electric tankless water heater with 0.99 energy efficient factor, ENERGY STAR LED lighting throughout home, ENERGY STAR ceiling fans in living & bedrooms, all plumbing fixtures are low-flow Water Sense compliant and within a maximum 20’ of water supply line

Were any solar panels installed on the project? If so, indicate the size of the system (judged only for High Performance Category):
Yes, 4.88 kW PV system (panel layout included as a supplement to application)

Please list any sustainable materials or design features not listed above, such as recycled materials, low-VOC finishes, landscaping, etc. (judged only for High Performance Category):
SITE: infill with high density (3 homes on a 92’ wide x 124’ long lot), native adapted (low water need) landscaping & turf grass (side note: landscaping plan was created by local university as part of their sustainable landscaping program), pervious walkways around perimeter of home & pervious alley leading to garage entry. NATURAL RESOURCES: Preserved the native trees & protected non-construction areas. RESOURCE EFFICIENCY & RECYCLED CONTENT/RENEWABLE MATERIALS: Stacked stories, SIP’s (sustainable OSB reduces lumber used on project), interior walls framed with Advanced Framing, renewable wood materials, framing layout and structural SIP and framing plans, prefabricated open web floor trusses, James Hardie fiber cement exterior siding with recycled content (with locally supplied sand & cement in a local plant), reclaimed hardwoods installed on second floor from dwelling that was previously located on that property, locally sourced Shou Sugi Ban wood for rain screen and balcony and handrail, Trex decking contains recycled content, high recycled content standing seam roof, recycled content steel posts, concrete foundation of house was simply sealed (no added flooring) as final floor finish, concrete in foundation, garage approach and sidewalks contained local cement, sand & gravel, quartz countertops (recycled material), pre-finished windows/exterrior sliding door/galvalume metal roof/Trex decking/Tamilyn Extreme Trim. Separate dumpster to recycle all wasted wood. Recycled cardboard, paper & metal. Life Cycle Analysis of SIP’s, roofing, siding, steel awnings, James Hardie vertical siding & Tamilyn Extreme Trim. INDOOR AIR QUALITY: detached garage, no fireplace, hard surface flooring, no carpet in home, formaldehyde-free cabinetry, non-toxic pest control, all paints & stains used on interior of home were low or no VOC content, return air ducts in all bedrooms, properly sized vent-a-hood and wet area exhaust fans.
Any additional comments on the project:
Our client owned a triplex that was previously located on the property. As he approached retirement, he wanted to reinvent the property, while also providing a home for himself & his wife. As such, he hired us to oversee the demolition of existing building (and harvesting of materials that can either be reused or donated), replatting process to take it from 2 lots to 3 single family lots, variances committees with the City, design and construction of all 3 residences. His vision was that each project would be extremely energy efficient, sustainable, similar in design but still unique. As such, the projects have been dubbed the "3 sisters". The first project to be completed is the home we are applying for- the owner's personal home, the 1st sister. We have just completed construction of the 2nd sister, and negotiations are underway for the sale of the 3rd lot & construction of the home on it.

Homeowner Testimonial (taken from our Houzz page review): "We wanted a green house with about 1500 - 2000 square feet. Ferrier's team turned our dreams into reality. We love our house!

We appreciated Ferrier's knowledge about green building and his help during the teardown of the existing buildings, the replat of the property and the design of the new house.

Ferrier sets a high standard for his sub-contractors! Subs had to satisfy not only us but the Ferrier Team!

We enjoyed the journey! Building a new house can be a daunting process. You need a professional like Ferrier!"
Front view

3 Sisters Project Ft. Worth

Single Family Homes less than 3,000 sq.ft.
Single Family Homes less than 3,000 sq.ft.

Interior stairwell

3 Sisters Project Ft. Worth
Interior stairwell

3 Sisters Project Ft. Worth
Single Family Homes less than 3,000 sq.ft.

Interior Kitchen

3 Sisters Project Ft. Worth
Entrance

3 Sisters Project Ft. Worth

Single Family Homes less than 3,000 sq.ft.
Side view

3 Sisters Project Ft. Worth

Single Family Homes less than 3,000 sq.ft.
Front view

3 Sisters Project Ft. Worth

Single Family Homes less than 3,000 sq.ft.
Single Family Homes less than 3,000 sq.ft.

Front view

3 Sisters Project Ft. Worth
Side view

3 Sisters Project Ft. Worth

Single Family Homes less than 3,000 sq.ft.
Construction

3 Sisters Project Ft. Worth

Single Family Homes less than 3,000 sq.ft.
Construction

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Single Family Homes less than 3,000 sq.ft.
Construction

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Single Family Homes less than 3,000 sq.ft.
Construction

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Single Family Homes less than 3,000 sq.ft.
Construction

3 Sisters Project Ft. Worth

Single Family Homes less than 3,000 sq.ft.
HERS Rating

3 Sisters Project Ft. Worth

Home Energy Rating Certificate
Final Report

HERS® Index Score:
Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

This home meets or exceeds the criteria of the following:
- Energy Star v3
- 2012 International Energy Conservation Code
- 2009 International Energy Conservation Code
- 2006 International Energy Conservation Code

Rating Completed by:
Energy Patriot, LLC
3001 West Ave., Fort Worth, TX 76107
817-580-0780

This report does not constitute a warranty or guarantee.
Single Family Homes less than 3,000 sq.ft.

Floor Plan 1

3 Sisters Project Ft. Worth
Single Family Homes less than 3,000 sq.ft.

Floor Plan 2

3 Sisters Project Ft. Worth
Building Summary

Single Family Homes less than 3,000 sq.ft.

3 Sisters Project Ft. Worth

<table>
<thead>
<tr>
<th>General Building Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
</tr>
<tr>
<td>City</td>
</tr>
<tr>
<td>Builder</td>
</tr>
<tr>
<td>Organization</td>
</tr>
<tr>
<td>Inspection Status</td>
</tr>
<tr>
<td>Inspector ID</td>
</tr>
<tr>
<td>REHNET Registered (Confirmed)</td>
</tr>
</tbody>
</table>

| Number of Bedrooms | 2 |
| Number of Floors | 2 |
| Unconditioned Attached Garage | No |
| Conditioned Floor Area (sq. ft.) | 1,940 |
| Conditioned Volume (cu. ft.) | 10,248 |
| Total Units on Building | 1 |
| Residence Type | Single family detached |
| Model | Not Available |
| Community | N/A |
| Climate Zone | 3A |

<table>
<thead>
<tr>
<th>Framed Floor Library List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>R-45.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RIM Joint Library List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>R25</td>
</tr>
<tr>
<td>R10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Slab Library List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Uninsulated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wall Library List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Brick/Stone</td>
</tr>
<tr>
<td>Setting Veneer</td>
</tr>
</tbody>
</table>
Building Summary

3 Sisters Project Ft. Worth

Single Family Homes less than 3,000 sq.ft.
Single Family Homes less than 3,000 sq.ft.

Building Summary

3 Sisters Project Ft. Worth
Building Summary

### 3 Sisters Project Ft. Worth

#### Property
- Building: 3 Sisters
- Location: Ft. Worth, TX 76107
- Type: Former Custom Homes
- Size: Under 3,000 sq.ft.

#### Distribution System

<table>
<thead>
<tr>
<th>Distribution Type</th>
<th>Heating Equipment</th>
<th>Cooling Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forced Air</td>
<td>Air-source heat pump (1)</td>
<td>Air-source heat pump (1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sq. Feet Served</th>
<th>Supply Duct R Value</th>
<th>Return Duct R Value</th>
<th>Supply Duct Area [sq. ft.]</th>
<th>Return Duct Area [sq. ft.]</th>
<th>Duct Leakage to Outdoors (CHH2D)</th>
<th>Total Leakage [CFM/1000#/Airflow]</th>
<th>Total Leakage Duct Test Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1540</td>
<td>6</td>
<td>6</td>
<td>537.8</td>
<td>27</td>
<td>0</td>
<td>0.0</td>
<td>Rough-in, with Air Handler</td>
</tr>
</tbody>
</table>

Use Ductless A/C? Yes

#### Water Distribution

<table>
<thead>
<tr>
<th>Water Fixture Type</th>
<th>Use Default Hot Water Pipe Length</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Water Pipe Length [ft]</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>At Least 0.3 Pipe Diameter</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Hot Water Recirculation System?</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Hot Water Branch Length [ft]</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Recirculation Pump Power [Watts]</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Recirculation System Pipe Loop Length [ft]</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>DRAIN Water Heat Recovery?</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

#### Clothes Dryer

<table>
<thead>
<tr>
<th>Field Type</th>
<th>Electric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cafe</td>
<td>2.917</td>
</tr>
</tbody>
</table>

#### Clothes Washer

<table>
<thead>
<tr>
<th>Label Energy Rating</th>
<th>794 kWh/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Rate</td>
<td>$1.58/kWh</td>
</tr>
<tr>
<td>Annual Gas Cost</td>
<td>$33.90</td>
</tr>
<tr>
<td>Gas Rate</td>
<td>$0.56/Therm</td>
</tr>
<tr>
<td>Capacity</td>
<td>2.874 Bushel</td>
</tr>
<tr>
<td>Tumbler Size</td>
<td>0.331 Bushel</td>
</tr>
</tbody>
</table>

#### Appliances and Controls

| Programmable Thermostat? | Yes |
| Direct-Drive Dryer | Standard |
| Dryer Efficiency | 205 kWh |
| Range Type | Electric |
| Convection Oven? | No |
| Induction Range? | No |
| Refrigerator Energy | 500 kWh/Year |

#### Notes
4.88KW SOLAR ARRAY INSTALL AT WARE RESIDENCE

G.C. DON FERRIER: 1 (817) 475-8881

(16) 305W MODULES
Electrical Plan

3 Sisters Project Ft. Worth

Notes:
1. Equipment shall be installed in accordance with NEC Article 490.
2. Conductors are to be copper unless otherwise noted and comply with NEC 110.14.
3. All PV system components shall be listed and comply with UL 774 and UL 774-1.
4. Wiring materials not protected in conduit shall be suitable for sun exposure and wet locations.
5. Conduit to be placed to be suitable for NEC 90.44 (B).
6. The equipment grounding conductor shall be continuous per NEC 690.48.
7. The equipment grounding conductor shall be installed in accordance with NEC 690.43, 690.45 and 250.122.
8. The grounding electrode conductor shall be installed in accordance with NEC 250.54 (C) and 600.47 (A).
9. The grounding electrode conductor shall be protected from physical damage between the grounding electrode and the panel (or inverter) or smaller than #4 copper wire (NEC 250.84 B).
10. The DC grounding electrode conductor shall be sized according to NEC 250.106 and 600.47 (B).
11. The AC grounding electrode conductor shall be installed in accordance with NEC 90.46 (A) and 250.66.
12. Label solar modules and power inverters with listing agency name and number per NEC 110.63 (B).
13. Backed PS breaker shall be installed at the opposite end of the bus bar from the main breaker.
14. AC disconnect shall be externally operated knife blade type which is lockable in the "off" and "on" positions and is directly accessible to the utility.

WIRE CALCULATIONS
1. PER SINGLE MODULE / PHASE M/GD INVERTER COMBO
   - MAX AC CURRENT PER LARGEST STRING
     - 1180A @ 120VDC
     - I SP Conductors (4-6)
     - 125A @ 120VDC
     - 125A @ 277VDC
     - 50A @ 240VDC
   - 125A @ 277VDC
   - 125A @ 240VDC
   - 50A @ 240VDC

2. COMBINED INVERTER OUTPUT @ 120V
   - 1.25 x 120V = 240VDC
   - 250VA

3. SINGLE FAMILY HOMES less than 3,000 sq.ft.