Navigating New Climates: Three ICF & SIP Passive Houses in North Texas

Charles MacBride AIA, NCARB, CPHC®
University of Texas at Arlington
Navigating New Climates: Three ICF & SIP Passive Houses in North Texas

I Welcome to DFW
II Two ICF / SIP Houses
III Design Build at UTArlington
US/CAN largest metropolitan areas

2020 US Census; 2016 Canadian Census
Hunt County Passive House & Passive Guest House

- **location**: Celeste TX
- **status**: construction begins Dec 2023
- **iCFA**: 3186 sf (house) / 1320 sf (guest)
- **construction**: ICF walls / SIP roof
- **climate zone / HDD / CDD**: 3A / 2250 / 2419
- **design certification**: Phius ZERO (2021)

Brazos Passive House

- **location**: Palo Pinto TX
- **status**: construction begins Jan 2024
- **iCFA**: 2465 sf (house)
- **construction**: ICF walls / SIP roof
- **climate zone / HDD / CDD**: 3A / 2497 / 3364
- **design certification**: Phius ZERO (2021)

Wynn Terrace Senior Living Cottages Passive House

- **location**: Arlington TX
- **status**: construction began Sep 2023
- **iCFA**: 482 sf
- **construction**: ICF walls / SIP roof
- **climate zone / HDD / CDD**: 2A / 2342 / 3284
- **design certification**: Phius ZERO (2021)
Hunt County Passive House & Passive Guest House, Celeste TX
**ACTIVE SYSTEMS**
- low-volume heating/cooling mini-splits
- energy recovery ventilation (ERV)
- independent dehumidification system
- heat pump water heater
- project meets Indoor airPLUS

**SITE DESIGN**
- save existing old growth trees
- utilize slope with lower walk-out Lining Room
- reuse sandstone outcroppings
- landscape to use only native plants & trees

**APPLIANCES & FIXTURES**
- all appliances meet EnergyStar
- all fixtures meet WaterSense
- ventless heat pump clothes dryer

**WATER MANAGEMENT**
- rainwater harvesting for all potable water
- greywater recycling for irrigation water
- enlarged roof increases catchment area
- courtyard creates central water collection area

**DAYLIGHTING**
- south wall managed heat gain & solar access
- triple pane windows U=0.16 SHGC=0.274
- use of clerestory to reduce artificial lighting

**SOLAR PV**
- 13kW pole-mounted array
- will achieve project net-zero energy

**EFFICIENT ENVELOPE**
- increased air-tightness < 0.6 ACH50
- continuous insulation / no thermal bridges
- insulated concrete form (ICF) wall (R-28)
- structural insulated panel (SIP) roof (R-54)
- below-slab insulation (R-11)
- rainscreen cementitious cladding
Wynn Terrace Senior Living Cottages
Passive House, Arlington
1. IECC HOUSE ("BASELINE")

- Asphalt / Composite Shingles
- 3/4" Plywood Underlayment / Ice and Water Shield
- 14" Furring Strips and Ventilation cavity
- ICE & WATER WRAP UNDERLAMENT
- R-4 CONTINUOUS INSULATION
- 7/8" OSB SYSTEM ROOF DECK
- 2" BATTERS
- R-26 RATT CAVITY INSULATION
- 1/2" EPSOIM BOARD

- 5/16" CONCRETE HANG BOARD CLADDING
- 1/2" VERTICAL FURRING STRIPS
- W/ TYPHOON WRAP
- 1" DF & OSB SYSTEM SHEATHING / PROTECT-O-BOARD
- R-23 RATT INSULATION
- 24" WOOD FRAMING
- 1/2" EPSOIM BOARD

2. ENERGY STAR HOUSE

- Asphalt / Composite Shingles
- 3/4" Plywood Underlayment / Ice and Water Shield
- 14" Furring Strips and Ventilation cavity
- ICE & WATER WRAP UNDERLAMENT
- R-4 CONTINUOUS INSULATION
- 7/8" OSB SYSTEM ROOF DECK
- 2" BATTERS
- R-26 RATT CAVITY INSULATION
- 1/2" EPSOIM BOARD

- 5/16" CONCRETE HANG BOARD CLADDING
- 1/2" VERTICAL FURRING STRIPS
- W/ TYPHOON WRAP
- 1" DF & OSB SYSTEM SHEATHING / PROTECT-O-BOARD
- R-23 RATT INSULATION
- 24" WOOD FRAMING
- 1/2" EPSOIM BOARD

3. DOE ZERH HOUSE

- Asphalt Shingles
- 5/8" Plywood Underlayment / Ice and Water Shield
- 14" Furring Strips and Ventilation cavity
- ICE & WATER WRAP UNDERLAMENT
- R-43.75 SF (12 1/2")
- 1/2" EPSOIM BOARD

- 5/16" CONCRETE HANG BOARD CLADDING
- 1/2" VERTICAL FURRING STRIPS
- W/ TYPHOON WRAP
- R-23 & 1/2" R-1/2" WITH PROTECT-O-BOARD
- 1/2" EPSOIM BOARD

4. PHIUS ZERO PASSIVE HOUSE

- Metal Roof @/"VENTILATED BATTENS AND RADIANT BARRIERS
- 5/8" Plywood Underlayment / Ice and Water Shield
- 14" Furring Strips and Ventilation cavity
- ICE & WATER WRAP UNDERLAMENT
- R-43.75 SF (12 1/2")
- 1/2" EPSOIM BOARD

- 5/16" CONCRETE HANG BOARD CLADDING
- 1/2" VERTICAL FURRING STRIPS
- 13.15" OSB WALL / CONCRETE CORE W/ PROTECT-O-BOARD
- R-23 CONTINUOUS INSULATION
- AIR-وذCHEM PERMATEX & UNDER SLAB
### EAST WALL

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturer</th>
<th>R Value</th>
<th>Total Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framing</td>
<td>-</td>
<td>3.84</td>
<td>-</td>
</tr>
<tr>
<td>Exterior Finish</td>
<td>-</td>
<td>3.84</td>
<td>-</td>
</tr>
<tr>
<td>Insulation</td>
<td>-</td>
<td>3.84</td>
<td>-</td>
</tr>
<tr>
<td>Total Component R</td>
<td>-</td>
<td>14.67</td>
<td>-</td>
</tr>
<tr>
<td>Total Component %</td>
<td>-</td>
<td>14.67</td>
<td>-</td>
</tr>
</tbody>
</table>

### SOUTH WALL

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturer</th>
<th>R Value</th>
<th>Total Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation</td>
<td>-</td>
<td>3.84</td>
<td>-</td>
</tr>
<tr>
<td>Total Component R</td>
<td>-</td>
<td>14.67</td>
<td>-</td>
</tr>
<tr>
<td>Total Component %</td>
<td>-</td>
<td>14.67</td>
<td>-</td>
</tr>
</tbody>
</table>

### WEST WALL

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturer</th>
<th>R Value</th>
<th>Total Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation</td>
<td>-</td>
<td>3.84</td>
<td>-</td>
</tr>
<tr>
<td>Total Component R</td>
<td>-</td>
<td>14.67</td>
<td>-</td>
</tr>
<tr>
<td>Total Component %</td>
<td>-</td>
<td>14.67</td>
<td>-</td>
</tr>
</tbody>
</table>

###asca 6.6 S FT.

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturer</th>
<th>R Value</th>
<th>Total Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Finish</td>
<td>-</td>
<td>3.84</td>
<td>-</td>
</tr>
<tr>
<td>Insulation</td>
<td>-</td>
<td>3.84</td>
<td>-</td>
</tr>
<tr>
<td>Total Component R</td>
<td>-</td>
<td>14.67</td>
<td>-</td>
</tr>
<tr>
<td>Total Component %</td>
<td>-</td>
<td>14.67</td>
<td>-</td>
</tr>
</tbody>
</table>

### Formation

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturer</th>
<th>R Value</th>
<th>Total Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Finish</td>
<td>-</td>
<td>3.84</td>
<td>-</td>
</tr>
<tr>
<td>Insulation</td>
<td>-</td>
<td>3.84</td>
<td>-</td>
</tr>
<tr>
<td>Total Component R</td>
<td>-</td>
<td>14.67</td>
<td>-</td>
</tr>
<tr>
<td>Total Component %</td>
<td>-</td>
<td>14.67</td>
<td>-</td>
</tr>
</tbody>
</table>
UTA School of Architecture Design Build:
addressing the housing crisis / housing inequities
community engagement / community partnership
learning hands-on / learning first-hand
teaching building technology / performance
Navigating New Climates: Three ICF & SIP Passive Houses in North Texas

Charles MacBride AIA, NCARB, CPHC®
University of Texas at Arlington

Acknowledgements

WUFI Energy Modeling & CPHC Verifier Roger Taylor Dallas BuildGreen
Hunt County Chris Bearden RBCS Inc
Brazos John Verdier Charvold Homes, Chris Maxwell-Gaines Innovative Water Solutions LLC
Wynn Terrace Donna VanNess Housing Channel of Fort Worth, Brad McCorkle University of Texas at Arlington, Josh Nason University of Texas at Arlington, Erick Jones, Jr PhD University of Texas at Arlington, Marone Abraham University of Texas at Arlington, James Hale University of Texas at Arlington, Matthew Gartner University of Texas at Arlington