Quality and Quantity SINGLE FAMILY PROJECT COMPARISON

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Passive to POSITIVE
PASSIVE HOUSE AND LOW IMPACT DESIGN

REGEN PITTSBURGH
SINGLE FAMILY DEVELOPMENT - 3 BUILDING TYPES ACROSS 17 SITES

PROJECT PRIORITIES:
CONSISTENCY OF CONSTRUCTION ACROSS BUILDING TYPES
Variety of building form aesthetic within standardization

PASSIVE HOUSE INTEGRATION
Passive House consultants included from the beginning

INTEGRATED DESIGN & CONSTRUCTION TEAM
Experienced architect & developer with immediate past project experience

INTEGRATION BONUS!
Low Embodied Carbon, Resilience, Community Creation
PUT THE **PASSIVE** BACK IN **PASSIVE HOUSE**

Early CPHC integration starting at site planning

Passive House Experienced Developer & Architectural team

Optimized site orientation determined design for Passive measures
Site Design Challenges

**Variable Landscape per Site**
Passive design w/o consistent site shading

**Site Orientation**
All instances of the building are oriented within 15° of south

**Variable Topography per Site**
Building forms reflect the ‘optimized compromise’ between site topo and solar orientation (stack house vs split house)

**Glazing Ratios & Shading**
Reviews built into Architect’s design process
MODELED ALL THREE HOUSES TO FEASIBILITY LEVEL TO DETERMINE WORST CASE SCENARIO

DESIGN TO THE WORST CASE SCENARIO
- Long Linear Layout
- Largest ICFA/Occupant
- Large Southern Glass Wall
- Architecturally open interiors – cathedral ceilings
- Hidden systems
ASSEMBLIES OPTIONS AND ANALYSIS: SELECTION

Simplification by designing for the worst case


Passive House Results

<table>
<thead>
<tr>
<th>Passive House Criteria</th>
<th>Split</th>
<th>Started</th>
<th>Flat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Energy Consumption</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Total Site Energy</td>
<td>10,000 kWh/yr</td>
<td>10,000 kWh/yr</td>
<td>10,000 kWh/yr</td>
</tr>
</tbody>
</table>

House FLAT

<table>
<thead>
<tr>
<th>Case Name</th>
<th>Low Carbon Material Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating</td>
<td>6.51 kWh/ft²</td>
</tr>
<tr>
<td>Cooling</td>
<td>7.06 kWh/ft²</td>
</tr>
<tr>
<td>Lighting</td>
<td>0.13 kWh/ft²</td>
</tr>
<tr>
<td>Appliance</td>
<td>0.14 kWh/ft²</td>
</tr>
<tr>
<td>Energy</td>
<td>9.04 kWh/ft²</td>
</tr>
</tbody>
</table>

Total Site Energy: 10,000 kWh/yr

House SPLIT

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Total Site Energy: 12,040 kWh/yr
ASSEMBLIES
ROOF OPTIONS

Various roof forms on the project:
- Shed
- Gable
- Dormers
- Flat roof

Attempt to use one roof assembly concept

Low slope vented roof is cost savings that we can leverage.
ASSEMBLIES OPTIONS AND ANALYSIS: EMBODIED CARBON

Information as Power and Leverage.

Early iterative studies of Embodied Carbon research and analysis led to new opportunities and added project goals.
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Early iterative studies of Embodied Carbon research and analysis led to new opportunities and added project goals.
Varying house types and topography = Unique conditions for each house => Quick analysis of thermal bridge worst case scenarios.
Design team buy-in meant early conversations with the architectural and structural teams.
RESILIENCE CONCEPTS

- CPHC led conversation – potential for ‘Resilience Upgrade’ Packages.
- Can be an easy add-on for the developer – 3 solar/battery studies, 17 possible upgrades.

Basis of Design: Passive Survivality: High Performance Building Envelope & Systems
- Passive House design principles provide a house that will maintain comfort and occupant safety year-round, with minimal energy inputs.
- Deep and meaningful energy use reductions.
- Robust thermal and airtight envelope, controlled ventilation and use of efficient MEP systems.

Package 1: Net Zero
- Solar PV provided on the roof to meet Net Zero Energy target.

Package 2: Balanced PV and Energy Storage (Resilience)
- Solar PV provided on the roof.
- PV power production is balanced between everyday use and battery storage.
- Includes critical loads review for storage system sizing.

Package 3: Full Zero Energy and Resilience
- Solar PV provided on the roof to meet Net Zero Energy target.
- Additional PV for battery storage.
- Includes critical loads review for storage system sizing.
- Includes possible bi-directional EV charging / EV as house battery system.
Building COMMUNITY
MORE THAN A DEVELOPMENT – PLACEMAKING

What makes this community unique?
What ties these houses together?
How is this place marketable?
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USONION CONCEPT
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USONION CONCEPT
LOW-IMPACT ETHIC
CONSERVATION FIRST – DO NO HARM
EMBODIED CARBON REDUCTION
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HEALTH AND COMFORT

RESILIENT HOMES, RESILIENT COMMUNITY

SHARED RESOURCES

SHARED PURPOSE