CLIMATE ZONE 6
(BIG RAPIDS, MI/MILWAUKEE, WI)

- TEMP. RANGE: 14°-85°
- HUMIDITY: 79%
- SNOWFALL: 64” AVG
- RAINFALL: 36” AVG

<table>
<thead>
<tr>
<th>CLIMATE ZONE 2</th>
<th>CLIMATE ZONE 4</th>
<th>CLIMATE ZONE 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMP. RANGE</td>
<td>TEMP. RANGE</td>
<td>TEMP. RANGE</td>
</tr>
<tr>
<td>30°-102°</td>
<td>26°-85°</td>
<td>6°-96°</td>
</tr>
<tr>
<td>SNOWFALL</td>
<td>SNOWFALL</td>
<td>SNOWFALL</td>
</tr>
<tr>
<td>0” AVG</td>
<td>14” AVG</td>
<td>60” AVG</td>
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<tr>
<td>RAINFALL</td>
<td>RAINFALL</td>
<td>RAINFALL</td>
</tr>
<tr>
<td>33” AVG</td>
<td>43” AVG</td>
<td>14” AVG</td>
</tr>
<tr>
<td>HUMIDITY</td>
<td>HUMIDITY</td>
<td>HUMIDITY</td>
</tr>
<tr>
<td>66.5%</td>
<td>66%</td>
<td>36.8%</td>
</tr>
</tbody>
</table>

IECC 2015 CLIMATE ZONE MAP
ARCHITECTURE

DESIGN CONCEPT AND GOALS

AESTHETIC
AFFORDABLE
INNOVATIVE
SUSTAINABLE

DESIGN CONCEPT

VITALITY:
THE POWER GIVING CONTINUANCE OF LIFE

PARTI PRIS

NATIVE AMERICAN ROCK ART
“TIME TO CHANGE”
RENEWABLE ENERGY COST

- $216/MO. GASOLINE SAVINGS
- $142/MO. UTILITY SAVINGS

RETURN ON INVESTMENT

- 15 YRS. 7 MO. RETURN ON INVESTMENT
- $366,790 w/ RENEWABLE ENERGY
- $298,088 w/o RENEWABLE ENERGY

TOTAL COST

- $205 / SF
- $167 / SF

MORTGAGE COSTS

- $438,716 15 YR. MORTGAGE
- $569,552 30 YR. MORTGAGE

MORTGAGE

- $2,437/ MO.
- $1,582/ MO.

CONSTRUCTION COSTS

- $366,790 w/ RENEWABLE ENERGY
- $298,088 w/o RENEWABLE ENERGY

$67,078 RENEWABLE ENERGY COST
DURABILITY & RESILIENCE

- **ZINC ROOFING**
  - Self-healing Patina
  - Withstand Temp. Variation
  - Low Maintenance
  - Lifespan: 80-100 yrs.

- **HZ-5 REVEAL PANEL**
  - Non-combustable Fiber Cement
  - Lifespan: 50 yrs.

- **HZ5-ARTISAN LAP SIDING**
  - Non-combustable Fiber Cement
  - Lifespan: 50 yrs.

- **BAMBOO FLOORING**
  - Abrasion Resistant
  - Moisture Resistant

- **FIBER CEMENT BOARD**

- **TERRACOTTA TILES**

- **POLYCARBONATE**

- **ZINC ROOFING**
EMBODIED ENERGY COMPARISON

MUSKEGON RIVER RESIDENCE  441,505,364.02 BTU
CONVENTIONAL RESIDENCE  1,249,527,223.02 BTU
DIFFERENCE  808,021,859.00 BTU
INTEGRATED DESIGN

PASSIVE STRATEGIES & LIGHTING

BASIC BUILDING DESIGN
- **FORM**
- **ORIENTATION**
- **SITE**

PASSIVE SYSTEMS
- **HEATING**
  - Direct Solar Gain
  - Window Placement
  - Thermal Curtains
- **DAYLIGHTING**
- **COOLING**
  - Operable Windows
  - Overhangs
  - Carport Shading
COMFORT & ENVI. QUALITY

HEAT RECOVERY VENTILATOR (HRV)

- Fresh air from outside
- Air exhaust to outside
- Stale air from home
- Warm air supply to home

HEAT RECOVERY UNIT
ENERGY PERFORMANCE

ENERGY BUDGET

ON-SITE SOLAR PRODUCTION
ON-SITE HYDROELECTRIC PRODUCTION

HEATING CONSUMPTION
COOLING CONSUMPTION
HOT WATER CONSUMPTION
APPLIANCE & LIGHTING CONSUMPTION
EV CHARGING CONSUMPTION
EKOTROPE PERFORMANCE FACTOR

MUSKEGON RIVER RESIDENCE
REFERENCE HOME

+9,110 kWh
0 kWh
+10,512 kWh
0 kWh

HEATING CONSUMPTION
-4,135.4 kWh
-18,231.4 kWh

COOLING CONSUMPTION
-61.1 kWh
-323.1 kWh

HOT WATER CONSUMPTION
-920.4 kWh
-4,608.9 kWh

APPLIANCE & LIGHTING CONSUMPTION
-4,377.2 kWh
-7,080.2 kWh

EV CHARGING CONSUMPTION
8,960 kWh
0 kWh

EKOTROPE PERFORMANCE FACTOR
-729.2 kWh
0 kWh

TOTAL ENERGY CONSUMPTION
+438.7 kWh
-30,243.6 kWh

TOTAL ENERGY CONSUMPTION

MUSKEGON RIVER RESIDENCE
REFERENCE HOME

-438.7 kWh
+30,243.6 kWh

MUSKEGON RIVER RESIDENCE
REFERENCE HOME

-438.7 kWh
+30,243.6 kWh

ENERGY BUDGET

ELECTRIC VEHICLE CHARGING
APPLIANCES & LIGHTING
HEATING
COOLING
HOT WATER

30
-3
19
36

HERS
w/o RENEWABLES
HERS
w/ RENEWABLES
EUI
w/o EV
EUI
w/ EV
ENERGY PERFORMANCE

HYDROELECTRIC GENERATOR

TURBINE

Rectifier + Dumpload → AC Inverter → Electrical Panel → LOAD → METER → GRID

28.8 kWh DAILY PRODUCTION | 10,512 kWh ANNUAL PRODUCTION

SOLAR POWER GENERATION

Solar Panels → AC Microinverters → EV Chargers

25.0 kWh DAILY PRODUCTION | 9,110 kWh ANNUAL PRODUCTION
LEED PLATINUM

Integrated Process: 1/1
Location and Transportation: 3/15
Sustainable Sites: 7/7
Water Efficiency: 6/12
Energy and Atmosphere: 34/38
Materials and Resources: 8/10
Indoor Environmental Quality: 15/16
Innovation: 6/6
Regional Priority: 4/4

Total: 84

Green Building Program: LEED