What is Passive Habitability
Enterprise: Who We Are

Create opportunity for low- and moderate-income people through fit, affordable housing in diverse, thriving communities.
How Enterprise Supports Communities

**Policy**
- CDBG-DR Standing Allocation
- National Flood Insurance Program
- Local Advocacy
- Code

**Solutions**
- Technical Assistance
- Developing Guidance Tools for Resilient Housing
- Piloting Housing Innovation models

**Capital**
- Grants for Recovery
- Grants for Resilience
- Loan Capital
- Investment
“People who are already vulnerable, including lower-income and other marginalized communities, have lower capacity to prepare for and cope with extreme weather and climate-related events and are expected to experience greater impacts”
-National Climate Assessment 2019
To all Tenants of the Sea Horse RV Park:

We regret to inform you due to the severity of damage done by Hurricane Irma we must close the RV Park. We have a number of potential life safety issues and it is not safe to stay at the park.

Please remove all your belongings that have not been damaged by the hurricane and seek housing off the grounds. We recommend you contact FEMA using these contact numbers and websites, they can help you with temporary housing and financial assistance.

Call: 1-800-621-3362 FEMA – Federal Emergency Management Agency
By computer: DisasterAssistance.gov

Electricity service and water supply will not be returned to the park as the damage is too severe to allow it to be connected. Within the next week we will be removing damaged trailers and disassembling any week we will be removing damaged trailers and disassembling any
What is at Stake if we Stand still?
Resilience ... to *prepare, endure, adapt* and *thrive* in a disruptive and changing world.
<table>
<thead>
<tr>
<th>Faces of Resilience</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>The extent of personal discomfort, harm, injury, or loss of life.</td>
</tr>
<tr>
<td>Physical Assets</td>
<td>Loss or damage to structural and architectural building components, MEP and IT equipment, utilities, landscaping, contents.</td>
</tr>
<tr>
<td>Operations</td>
<td>Disruption to building operations and functionality, occupancy, egress/ingress, critical systems, or lab activities.</td>
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<tr>
<td>Revenue</td>
<td>Loss of revenue due to business interruption, specifically in relation to tenants.</td>
</tr>
<tr>
<td>Reputation</td>
<td>Negative media attention or impact on industry reputation in the aftermath of an impactful shock or stress.</td>
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</table>
Strategies for Multifamily Housing Resilience

Community
Strategies that encourage behavior which enhances resilience.

Adaptation
Strategies that improve a facility’s ability to adapt to changing climate conditions.

Protection
Strategies to reduce a building’s vulnerability to extreme weather.

Backup
Strategies that provide critical needs when a facility loses power or other services.
Puerto Rico – The Impacts of Maria
Cascading Impacts
Impact of Hurricane Maria

90% BUILDING DESTROYED

84% OF EDUCATION FACILITIES WERE COMPROMISED.

LEARNING TIME FOR STUDENTS WAS DECREASED BY AT 40%
KEEP SAFE

A GUIDE TO RESILIENT HOUSING DESIGN IN ISLAND COMMUNITIES
KEEP SAFE: A GUIDE FOR RESILIENT HOUSING DESIGN AND CONSTRUCTION IN ISLAND COMMUNITIES

Hurricanes Maria and Irma devastated 87 percent of the homes in Puerto Rico. More than half of the homes in the U.S. Virgin Islands suffered damage. A quarter of the homes in the Florida Keys were destroyed.
Performance Objectives

Building Performance Levels

- **Collapse Prevention**: Building sustains damage and retains no margin against collapse post-event.
- **Life Safety**: Building is damaged but retains a margin of safety.
- **Immediate Occupancy**: Building structure retains its strength, building is safe and functional to re-occupy.
- **Continued Operations**: Very light damage, building is operational during and immediately after the event.

Operational Performance Levels

- **L1.** Maintain life safety operations
- **L2.** Maintain life safety and other critical operations
- **L3.** Maintain operations of all critical operations
- **L4.** Maintain the entire building operations
29 Strategies

- Safe Site
- Protection
- Passive Habitability
- Energy
- Water
- Community + Leadership
- Emergency Preparedness
- Putting it Together
Passive Habitability

- ✓ Reduce heat transfer
- ✓ Increase ventilation
- ✓ Benefit from natural light
- ✓ Control moisture and mold
- ✓ Manage pests
REDUCE THERMAL HEAT TRANSFER

STEP 3 - SHADE THE HOME

Use vegetation and add architectural features to provide shade and prevent the Sun's heat from entering the home.

- The foliage of the tree provides the most shade. Ensure that the tree's height and location will cast shade on the right surface, at the desired time of the day.
- Keep a considerable distance between vegetation and the home to avoid damage during strong winds. The distance from the tree to the house should exceed the tree's height.

EAST
- Vertical and horizontal shading around an east-facing window provide shading for late morning.
- Plant tall shrubs or short trees on the east side to reduce morning direct sunlight.

SOUTH
- Horizontal shading over a single south-facing window provides good shading year-round. Porches, overhangs, and awnings provide similar effect, see examples below in #4.
- Plant tall trees on the South side to reduce day-long direct sunlight. Awnings or shaded porches can also serve this purpose.

WEST
- Vertically and horizontally shade west-facing windows to block afternoon sun.
- Plant tall shrubs or short trees on West side to reduce afternoon direct sunlight.
- Interior shade for glare control or if window is an accordion "miami" style curtain, close them slightly.
- Plant light greenery on the North side for glare control, if necessary.
INCREASE VENTILATION

As outside air moves through a space, it affects both the temperature and the moisture content of air inside. Ventilation—replacing indoor air with outdoor air without the use of mechanical fans—reduces moisture, equalizes air temperature and humidity, and cools our bodies as it evaporates sweat. Even humid air moving quickly across our skin will make us feel cooler, so increasing the speed and volume of air exchanged between the inside and outside of a space makes the environment feel more comfortable.

WHAT YOU NEED TO KNOW

- Creating clear paths for air to flow through the home encourages passive ventilation.

- Passive ventilation relies on air currents generated by prevailing breezes, adjacent buildings and terrain and differences in temperature between spaces.

- Window and door placement, size and operation affect ventilation rate and effectiveness.

- Cross-ventilation refers to the concept of placing window and door openings to allow air to move into and out of a space or the whole house.

- Island Location—Puerto Rico is exposed to Caribbean Trade Winds, which determine the predominant wind direction (North-South).
### BENEFIT FROM NATURAL LIGHT

#### STEP 2 - CONTROL NATURAL LIGHT

<table>
<thead>
<tr>
<th>A. Vegetation</th>
<th>B. Window Size</th>
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<tbody>
<tr>
<td>￭ Trees reduce direct sunlight.</td>
<td>￭ Size your windows according to sun exposure in the home.</td>
</tr>
<tr>
<td>￭ The foliage of the tree will provide the most shade. Ensure that the tree's</td>
<td></td>
</tr>
<tr>
<td>height relates to the opening you wish to protect.</td>
<td></td>
</tr>
<tr>
<td>￭ Keep a distance between the greenery and the building to avoid damage</td>
<td></td>
</tr>
<tr>
<td>during strong winds.</td>
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</tbody>
</table>

The distance from the tree to the house should exceed the tree's height.
CONTROL MOISTURE AND MOLD

STEP 1 - INSPECT YOUR HOME

If you suspect you have mold, hire a mold inspector (see inset)

- Olfactory Inspection: Not all mold spores are visible. Musty/moldy smell is an accurate indicator of the presence of mold.
- Visual Inspection: Look for changes on color and/or texture on the surface of the materials. Molds show usually as dark spots of rounded spots, although they can take other shapes and colors. Note however that not all stains caused by humidity are not always mold. Molds are often confused with efflorescence, discolorations and substance infiltrations.
- Moisture Inspection: Look for evidence of water intrusion such as drip lines, water marks, mildew, and bubbled paint. Determine the source of the water and take action to eliminate or control it.

Use a moisture meter to monitor your space and find concealed mold and water damage. A moisture content above 14% indicates that your space is humid enough to develop mold.

A. CHECK FOR WATER LEAKS TO PREVENT MOLD

BATHROOM
Clean toilet bowl, tiles and sink regularly to prevent mold growth frequently.

LAUNDRY ROOM
Pay close attention to the areas

KITCHEN
Pay close attention to sinks and fridges, checking also their backs and underneath areas.
- Check cabinets' interior regularly.
- Keep dry the back splash and/or any other surface prone to condensate moisture coming

SURFACES
Identify condensation in openings, walls, or ceilings, both inside and outside.
- Identify condensation in areas that generate sudden temperature changes, as kitchen back splashes, and surfaces nearby air conditioning units.

B. WHAT TO LOOK FOR

MOLD
- WHAT IT IS: A superficial growth produced by a fungus.
- WHERE IT DEVELOPS: Nutrient rich and moist materials like wood or concrete such as lumber, plywood, and paper facing
- HOW TO PREVENT IT: Apply a hydrophobic sealant to prevent water absorption.

EFFLORESCENCE
- WHAT IT IS: Efflorescence is the deposit of salt in the surface of a porous material. It manifests itself like a small wet spot.
- WHERE IT DEVELOPS: Nutrient rich and moist materials like wood or concrete such as lumber, plywood, and paper facing
- HOW TO PREVENT IT: Apply a hydrophobic sealant to prevent water absorption.

RUST STAINS
- WHAT IT IS: A discolored spot on a particular location.
- WHERE IT DEVELOPS: Concrete walls or ceilings,
- HOW TO PREVENT IT: Contact a contractor and/or specialist to provide advice.
Resilience Building Process

1. Diagnose
   - Assessment of shocks and stresses

2. Strategize
   - Develop holistic, integrated resilience strategy
   - Train and Educate

3. Implement
   - Design and build physical and operational risk reduction measures

4. Manage, Monitor & Improve
   - Constant review, learning and innovation
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