Dennis Hwang, Faculty
UHawaii Sea Grant College Program, NOAA

djh@opglaw.com
808-542-7263
HOMEOWNER’S HANDBOOK TO PREPARE FOR NATURAL HAZARDS

By Dennis J. Hwang
Darren K. Okimoto
Second Edition

Hawaii*, Mississippi*, Alabama*, Louisiana*, Texas (English and Spanish)*, Florida*, Delaware, Massachusetts, Mariana Islands (including Guam), Republic of the Marshall Islands (English and Marshallese)

In Preparation – Georgia, Alaska, Connecticut, New Jersey
This handbook would not have been possible without the gracious support of numerous institutions that include: Darton Lerner, Mary Detoeur, Cindy Knappman, Heather Dacko, Delen Everde, Rufe Fay, Tara Orains, Kathy Harron, Chantal Chang, Mary Watson, Kathy Cheng, Eunice Yee and Diane Sakamoto (University of Hawaii’s Sea Grant College Program); Mayor General Joe Logan, Thomas Terron, David Kauanui, Jeannette Wilson, Kevin Richards, Arlene Aguayot and Marilyn Dimatali (Hawaii’s Emergency Management Agency); Representative Mark Nakashima, Representative Sylvia Luke, Senator Jill Tokuda and Lori Ensignes (Hawaii’s State Legislature); John Ingajani, Daniel Rader, Company Willow, Andrew Harver, Cathy Stuart, Leona Willis and Gen Tamura (Federal Emergency Management Agency); Carol Tupa-Beam, Kristen Almeida, and Edwina Marquina (Department of Land and Natural Resources - State Natural Flood Insurance Program); Lee Annison, Joseline Hamaishi and Sandy Man (Hawaii’s Office of Planning and Hawaii’s Coastal Zone Management Program); Gordon Ri, Jerry special, William Nishi, Jacqueline Choy and Channele Honda (State of Hawaii’s Insurance Division); Tim Walea, Joel Fennell and Will Bakcer (Sinnipson Strong-Tie Company); Gary Chock (Martin & Chock, Inc.); Cinque Charm Matsumoto and Misti Luia (American Red Cross); Gordon Alexander (Herculean Source); Alan Otsuka, Scott Seu, Darcy Endo-Urado, Lori Ho, Karina Delvalle, Karina Clemente, Tatiana Quang, Sami Nicholas and Wanya Ogata (Hawaii’s Direct Company); Richard Wam, Beth Whitehead and Michelle Rutberg (American Savings Bank); Rob and Sara Bennett (Coastal Windows); Melvin Kake, Hirokane Taya, Crystal Van Earn, and John Cummings (Department of Emergency Management, City and County of Honolulu); Henneman Andaya, Chaimann Crow and Sony Conde (Mani Emergency Management Agency); Talmadge Magnos, John Drummond and Barry Penizl (County of Hawaii’s Civil Defense Agency); Malene Munsky (Pacific Tsunami Museum); Elton Ubico, Chela Salat and Eric Abbot (Kauai Emergency Management Agency); Justin Tokumoto (County Council, County of Kauai); Christopher Brenkley, Tom Evans, John Breadow, Kevin Kershman and Eric Lui (NWS National Weather Service); Charles McCrory, Naeri Weitzstein and Cindy Preller (Pacific Tsunami Warning Center); Karl Kim, Russell Uyeno, Eric Yamasaki, Lydia Mekakahana, Bob Perron, Phil Bolj, Ashley Musurakis (National Disaster Preparedness Training Center); George Curtin (USF and Hawaii 1 Tsunami Advisory), Daniel Walker (USF and Department of Emergency Management of the City and County of Honolulu’s Tsunami Advisory); Walter Dudley and Dan Thrust (UH at Hilo); Christina Neal, Deini Slives, James Kanaka, Paul Otaka and Janet Ruby (United States Geological Survey - Hawaiian Volcano Observatory); Bobby Lee and Leslie Door (Zephyr Insurance Company); Daniel Lack (State Farm); Samantha Clency (ICAT); Bob Kriken; Alan Loring, Mary Wood and Tracy Tomita (D.M. Lordon National Park Preserve); Mike Roberts (Coastal Windows); Laura Konecni (International Tsunami Information Center); Christopher Conolly (Federal Executive Board); Gladys Quinon Munroe, Barbra F팖kawas and Carolyn Hinojosa (Building Industry Association of Hawaii); Bernard and犬eika Bahan (West O‘ahu Roofing).

It is our hope that the information contained within the handbook, which is in part a compilation from numerous publications associated with natural hazards and hazard mitigation, will be widely used and adopted by stakeholders in Hawaii and the region.

Financial support for the handbook was generously provided by the University of Hawaii’s Sea Grant College Program, Hawaii’s State Legislature, Hawaii’s Emergency Management Agency, State Farm, D.R. Horton, Hawaiian Electric Company, Simpson Strong-Tie Company, Zephyr Insurance Company, ICAT, Department of Land and Natural Resources - State Natural Flood Insurance Program, the Hawaii’s Coastal Zone Management Program and West O‘ahu Roofing, whom we gratefully thank.
Goals: 1) Prepare families and homes for multiple natural hazards
2) Reduce risk to property and lives

-Information in the handbook:
  * Tailored for each location
  * Multiple references reviewed for applicability
  * Incorporates lessons learned – other disasters
  * Develops new best practices to fill need

Four Key Components
1) Local Hazard Risk
2) Emergency Supplies
3) Strengthen Homes
4) Evacuation Planning
1. Local Hazard Risk

- Hurricanes
- Tsunamis
- Earthquakes
- Floods
- Sea-Level Rise
- Droughts
- Wildfires
- Volcanoes
2. Emergency Supplies


From: City and County of Honolulu Department of Emergency Management.
3. Strengthen Homes

Damaged and undamaged homes in Rockport Texas after Harvey

How to add a continuous load path connection

How to protect using a wind and rain resistant envelope around the house
Numbers Indicate Damage Levels: 4 – the worst, 1 the best.
1 – Minor or No Damage

Modern Building Codes
1. Continuous Load Path
2. Strong Roof
3. Window Protection
Hurricane Iniki-- 1992

90-95 mph winds
HPT Clip Installation

Roof Rafter

Frieze Board

Trim Board

HPT Clip

Simpson #10 1.5 inch long

Wall

Simpson Strong Drive Screw 1/4 inch 1.5 inch long

About 1,000 Homes Retrofitted!!!
New - Completing Load Path - Existing Double Wall Houses

A. Rafter-to-Top Plate Connections: Transfer forces from the roof to the top plate.

B. Top Plate-to-Stud Connections: Transfer forces from the top plate to the stud.

C. Floor-to-Floor Connections: Transfer forces from the second story to the first story.

D. Stud-to-Sill Plate Connections: Transfer forces from wall studs to the mudsill.

E. Sill Plate-to-Foundation Connections: Transfer forces from the mudsill into the foundation.

Simulated Rafter or Truss

Top Plate

Stud

Sill Plate

Courtesy of Simpson Strong-Tie
This single wall house on O‘ahu now has a continuous load path. Depending on the carrier, there are potential discounts on hurricane insurance for the different retrofits based on the stronger house and the reduced risk of property damage. This will vary with each company.

- Hurricane Clips – 10%
- Foundation Upgrades – 10-12%

Upgrades are cumulative, so total discount for this house is up to 22%.

One quote for this house went from $1,184 to $932.
Why Protect Your House from the Wind? Why You may need to Evacuate even if Inland?

Hurricane Iniki – flying debris punctured the envelope of the house – creating a funnel for the wind which lifted roofs off their walls.
Partial Deployment for Ana
1/4 the Fasteners

Large Windows – Make Inverse Roof
Window Coverings

- Impact Resistant Glass*
- Roll Downs*
- Colonial Shutters
- Bahama Shutters
- Accordion Shutters*
- Laminates
- Storm Panels*
- Plastic Honeycomb Panels*
- Hurricane Screen*
- Plywood*

Cost

Time to Deploy
Other Topics Covered

1. Roofs
2. Strengthening Attic Structure
3. Solar Panels
4. Trees
5. Insurance
   a. Flood, Hurricane, Other
   b. Coverages, Discounts
6. Climate Change (wildfire, drought, heat, sea-level rise, erosion)
# 4. Evacuation Planning

## Ability to Shelter in Place During a Hurricane

**Please read instructions before using this table.**

<table>
<thead>
<tr>
<th>Safe room</th>
<th>Concrete or CMU wall house</th>
<th>Double wall house</th>
<th>Single wall house</th>
<th>Suggested Action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Concrete CMU wall house in poor condition</td>
<td>Concrete CMU wall house in good condition</td>
<td>Concrete CMU wall house with hurricane clips</td>
<td>Concrete CMU wall house with hurricane clips &amp; window protection</td>
</tr>
<tr>
<td></td>
<td>Double wall house in poor condition</td>
<td>Double wall house in good condition</td>
<td>Double wall house with hurricane clips &amp; window protection</td>
<td>Double wall house with complete load path &amp; window protection</td>
</tr>
<tr>
<td></td>
<td>Single wall house in poor condition</td>
<td>Single wall house in good condition</td>
<td>Single wall house with hurricane clips</td>
<td>Single wall house with hurricane clips &amp; window protection</td>
</tr>
</tbody>
</table>

---

**Unsafe**
Evacuate! Do Not Shelter-In-place

**Marginal**
Shelter-in-place up to a Tropical Storm

**Good**
Shelter-in-place up to Category 1 hurricane

**Better**
Shelter-in-place up to Category 2 hurricane

**Best**
Shelter-in-place up to Category 3 hurricane