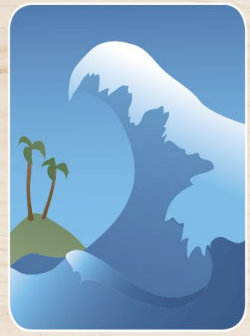
Communication for Community Resilience: The Homeowner's Handbook to Prepare for Natural Hazards

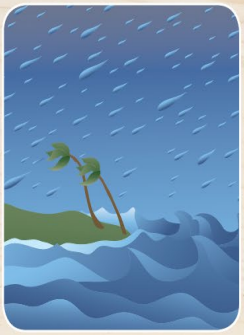
By

Dennis Hwang, Faculty
University of Hawaii Sea Grant College Program, NOAA
djh@opglaw.com
808-544-8608

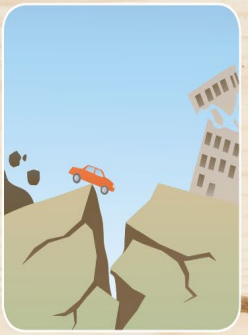
Resilient - Adaptive - Sustainable



TSUNAMIS



HURRICANES



EARTHQUAKES

FLOODS

VOLCANO

CLIMATE CHANGE

University of Hawai'i Sea Grant College Program

HOMEOWNER'S HANDBOOK

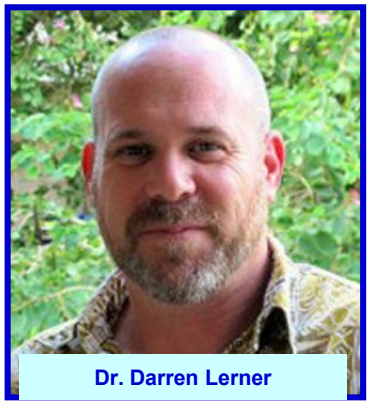
By
Dennis J. Hwang
Darren K. Okimoto

TO PREPARE FOR NATURAL HAZARDS

Fourth Edition

Outline of Talk

- Acknowledgements
- History of the Handbook
- Handbook Content
  - Hazard Risk
  - Emergency Supplies & Evacuation Planning
  - Retrofitting of Homes*
- Retrofit Estimation
- Strategies to Reach the Whole Community


Dr. Darren Lerner


Dr. Darren Okimoto*


Maya Walton


Dr. Mary Donohue


Dolan Eversole


Ruby Pap


Tara Owens


Michael Mezaccappo


Katy Hintzen


Cindy Knapman


Dr. Rachel Lentz


Heather Dudock*

UH Sea Grant College Program

SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY

List of Partners - Government

- University of Hawaii Sea Grant College Program
- School of Ocean, Earth Science &Technology
- State of Hawaii DCCA - Insurance Division
- American Red Cross
- State of Hawaii Emergency Management Agency
- Emer. Man. & Civil Defense - Maui, Kauai, Hawaii, Honolulu
- City Office of Climate Change & Resiliency
- DLNR – National Flood Insurance Program
- FEMA – (Local, Regional & Building Science Branch)
- NOAA National Weather Service
- National Disaster Preparedness Training Center
- Pacific Tsunami Warning Center
- Pacific Tsunami Museum
- International Tsunami Information Center
- Office of State Planning – Coastal Zone Management
- USGS Hawaii Volcano Observatory
- Hawaii State Legislature

List of Partners - Private

- All Island Roll Shutters*
- Building Industry Association
- American Savings Bank*
- Coastal Windows
- Discount Windows
- DR Horton*
- ICAT Insurance*
- Hardware Hawaii
- Hawaii Wildfire Man. Org.
- Hawaiian Electric Company*
- Hurricane Protection Services*
- Martin & Chock*
- Simpson Strong-Tie*
- State Farm Insurance*
- West Oahu Roofing
- Zephyr Insurance*
- * indicates Partner since 2007

Acknowledgements

This handbook would have not been possible without the gracious support of numerous individuals that include: Darren Lerner, Mary Donohue, Cindy Knapman, Heather Dudock, Rachel Lentz, Dolan Eversole, Ruby Pap, Tara Owens, Katy Hintzen, Michael Mezzacapo, Maya Walton, and Diane Sakamoto (University of Hawai'i Sea Grant College Program); Major General Joe Logan, Thomas Travis, Kevin Richards, Arlina Agbayani, and Marsha Tamura (Hawai'i Emergency Mgmt. Agency); Representative Mark Nakashima, Representative Sylvia Luke, Senator Jill Tokuda, and Lori Hasegawa (Hawai'i State Legislature); John Ingargiola, Daniel Bass, Gregory Wilson, Andrew Herseth, Colby Stanton, Lorena Willis, and Gen Tamura (Federal Emergency Mgmt. Agency); Carol Tyau-Beam, Kristen Akamine, Edwin Matsuda, Sam Lemmo, Michael Walker, Rob Hauff, Kirsten Gallaher, and Dietra Myers Tremblay (Dept. of Land and Natural Resources); Leo Asuncion, Justine Nihipali, and Sandy Ma (Hawai'i Office of Planning and Hawai'i Coastal Zone Mgmt. Program); Gordon Ito, Jerry Bump, William Nhieu, Jacqueline Choy, and Chanel Honda (State of Hawai'i Insurance Division); Tim Waite, Joel Frenzel and Will Becker (Simpson Strong-Tie Company); Gary Chock (Martin & Chock, Inc.); Coralie Chun Matayoshi and Maria Lutz (American Red Cross); Gordon Alexander (Hurricane Secure); Alan Oshima, Scott Seu, Darcy Endo-Omoto, Lori Hoo, Ka'iulani DeSilva, Ka'anoi Clemente, Tatiana Quong, Sam Nichols, and Wanya Ogata (Hawaiian Electric); Richard Wacker, Beth Whitehead, and Michelle Bartell (American Savings Bank); Bob and Pam Barrett (Coastal Windows); Hirokazu Toiya, Jennifer Walter, Crystal Van Beelen, and John Cummings (Dept. of Emergency Mgmt., City and County of Honolulu); Joshua Stanbro, Justin Gruenstein, and Matthew Gonser (Office of Climate Change, Sustainability, and Resiliency, City and County of Honolulu); Herman Andaya, Charnan Carroll, and Misty Cordeira (Maui Emergency Mgmt. Agency); Talmadge Magno, John Drummond, and Barry Perriatt (County of Hawai'i Civil Defense Agency); Marlene Murray (Pacific Tsunami Museum); Elton Ushio and Chelsie Sakai (Kaua'i Emergency Mgmt. Agency); Christopher Brenchley, Tom Evans, John Bravender, Kevin Kodama, and Eric Lau (NOAA National Weather Service); Charles McCreery, Stuart Weinstein, and Cindi Preller (Pacific Tsunami Warning Center); Karl Kim, Russell Uyeno, Eric Yamashita, Lydia Morikawa, Rob Porro, and Pradip Pant (National Disaster Preparedness Training Center); George Curtis (UH and Hawai'i Tsunami Advisor); Daniel Walker (UH and Department of Emergency Mgmt. of the City and County of Honolulu Tsunami Advisor); Walter Dudley and Don Thomas (UH Hilo); Clay Trauernicht (UH Coop. Ext.); Christina Neal, Brian Shiro, James Kauahikaua, Paul Okubo, and Janet Babb (USGS - Hawaiian Volcano Observatory); Timothy Johns and Leslie Door (Zephyr Insurance Company); Daniel Losk (State Farm); Samantha Cherry (ICAT); Bob Bruhl, Alan Labbe, Mary Flood, and Tracy Tonaki (D.R. Horton); Gerald Peters (HPS – Hurricane Protection Services); Ian Robertson (Hawai'i State Earthquake and Tsunami Advisory Committee); Gerard Fryer (Hawai'i Institute of Geophysics & Planetology); Mike Ward (Aloha Power Equipment); Laura Kong (International Tsunami Information Center); Christopher Conklin (Federal Executive Board); Gladys Quinto Marrone, Barbara Nishikawa, and Carolyn Hyman (Building Industry Association of Hawai'i); Bernard and Randall Balais (West O'ahu Roofing); Jerry Griffin (Discount Windows); Dave Purrington and Makoto Nakamura (Hardware Hawai'i); and Elizabeth Pickett, Carson Magoon, and Pablo Beimler (Hawai'i Wildfire Management Organization).

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 Hawai'i and the region.

Financial support for the handbook was generously provided by the University of Hawai'i Sea Grant College Program, Hawai'i State Legislature, Hawai'i Emergency Management Agency, State Farm, D.R. Horton, Hawaiian Electric, Simpson Strong-Tie Company, Zephyr Insurance Company, ICAT, Department of Land and Natural Resources, the Hawai'i Coastal Zone Management Program, City and County Office of Climate Change, Sustainability, and Resiliency, West O'ahu Roofing, Coastal Windows, Hardware Hawai'i, and Discount Windows whom we gratefully thank.

History of the Handbook

- Started in 2007, now in the 4th Edition - 10 print runs with over 100,000 copies

- Since 2007 – Over 300 outreach events (workshops, seminars, emergency fairs, presentations, & media interviews) on preparedness. For many organizations (Companies, Chambers of Commerce, Churches, Neighborhood Boards, Rotary Clubs, Politicians, Community Groups, AARP, Essential Workers, Schools, Colleges, Conferences, etc.) Many Lessons Learned!!!

- In ten states or countries - Hawaii,* Mississippi, Alabama, Louisiana, Texas (English & Spanish),* Florida, Delaware,* Massachusetts,* Republic of the Marshall Islands (English & Marshallese), Mariana Islands - *means recently updated or updating

- In preparation – Alaska, Georgia, Federated States of Micronesia

Kudos to other Sea Grant Programs!

University of Hawai'i Sea Grant College Program

HOMEOWNER'S HANDBOOK

By
Dennis J. Hwang
Darren K. Okimoto

TO PREPARE FOR NATURAL HAZARDS

Fourth Edition

DELAWARE

HOMEOWNERS HANDBOOK

TO PREPARE FOR NATURAL HAZARDS

DEMA

Sea Grant Delaware

SECOND EDITION • AUGUST 2019

HOMEOWNER'S HANDBOOK

TO PREPARE FOR COASTAL NATURAL HAZARDS

Sea Grant Texas
AT TEXAS A&M UNIVERSITY

GULF OF MEXICO ALLIANCE

REVISED AND REPRINTED 2018

MASSACHUSETTS

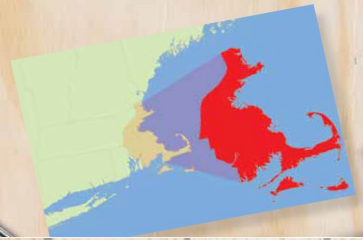
HOMEOWNER'S HANDBOOK

TO PREPARE FOR COASTAL HAZARDS

COUNTY OF BARNSTABLE MASSACHUSETTS

Woods Hole Sea Grant

Sea Grant
Massachusetts Institute of Technology



HOMEOWNER'S HANDBOOK

TO PREPARE FOR NATURAL HAZARDS

REPUBLIC OF THE MARSHALL ISLANDS

By
Don Hess
Dennis Hwang
Karl Fellenius
Ian Robertson
Mark Stege
Ben Chutaro

USAID | PACIFIC ISLANDS

BOK IN KŌMMELELE ÑAN RO EWŌR MWEER IM RI-KKAL RO ÑAN MAÁNJABPOPO ÑE EJETAK LAÑ IM WĀWEEN KO RŌKOUWŌTATA REJ WALOK TOK JĀN MEJATOTO EO IM LOJET EO AD

REPUBLIC OF THE MARSHALL ISLANDS

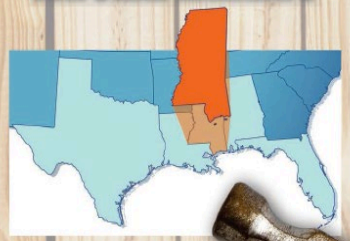
By
Don Hess
Dennis Hwang
Karl Fellenius
Ian Robertson
Mark Stege
Ben Chutaro

USAID | PACIFIC ISLANDS

MISSISSIPPI

HOMEOWNERS HANDBOOK

TO PREPARE FOR NATURAL HAZARDS



Published by the
Mississippi-Alabama Sea Grant Consortium
July 2010
Version 1.1

Sea Grant Mississippi-Alabama

GULF OF MEXICO ALLIANCE

LOUISIANA

HOMEOWNERS HANDBOOK

TO PREPARE FOR NATURAL HAZARDS

Sea Grant Louisiana

GULF OF MEXICO ALLIANCE

Published by
Louisiana Sea Grant
March 2013 Version 1

Goals:

1) Prepare families & homes for multiple natural hazards
2) Reduce risk to property and lives

-Information in the handbook tailored for each location

* Local hazard risk
* Multiple references reviewed for applicability
* Incorporates lessons learned – other disasters
* Develops new best practices to fill need

Four Key Components:

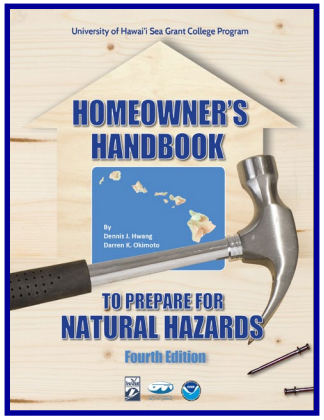
1) Hazard Risk
2) Emergency Supplies
3) Evacuation Plan
4) Strengthen Home

Whole Community – All Individuals & Organizations

Target Audiences

Homeowner's
Businesses/Owners*
Government Workers*
Employees/Workforce*
Families*
Elderly*
Children*
Minorities*
Pet Owners*
Renters
Tourists
Injured or infirm
Military families
Disadvantaged or disabled
Other

* Target audiences associated with Homeowner's



Useful tool but not the entire answer!!

Hazard Risk

Social Science studies and experience indicate a major reason people do not prepare is they do not think there is risk.

Inform of Local Risk to Build Sense of Urgency!

Explain in understandable and graphical manner:

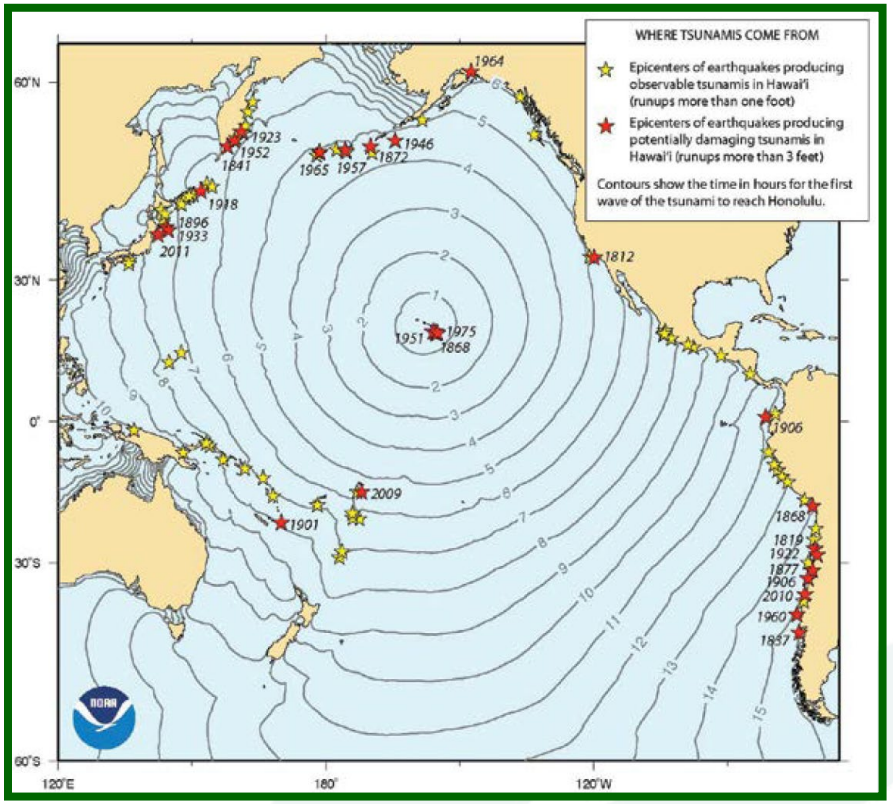
- **Science of the hazard**
- **How to look up their risk**

Understand risk so they can plan and prepare!

Hazard Risk

Tsunamis

Figure 2-1. Inundation from the 1946 tsunami in Hilo reached several thousand feet inland. This photo depicts the tremendous power of a tsunami. Taken from the Hilo Tribune-Herald. Photo courtesy of Pacific Tsunami Museum–Andrew Spaulding Collection.



Explain
What is cause and historical damage from tsunamis?

Where do tsunamis originate? What is travel time to Hawaii?

Earthquakes

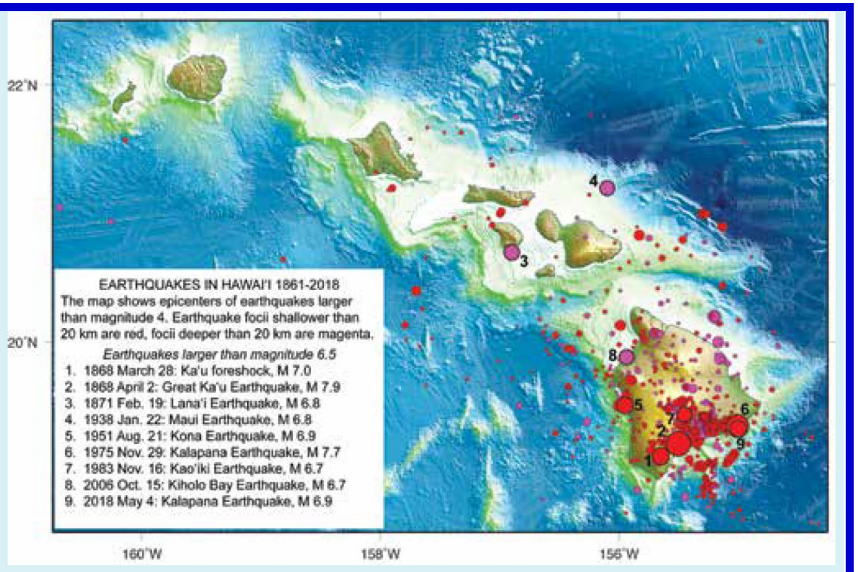


Figure 2-10. Distribution of earthquakes in the Hawaiian Islands from 1861 to 2018. The larger dots are associated with the larger earthquakes. The most frequent and larger events are associated with the southeast coast of the island of Hawai'i. The location of the October 15, 2006 earthquake is marked with dot 8. The magnitude 6.9 earthquake of May 2018 associated with volcanic eruptions is dot 9. Courtesy of USGS and Gerard Fryer – Hawai'i Institute of Geophysics and Planetology, University of Hawai'i.

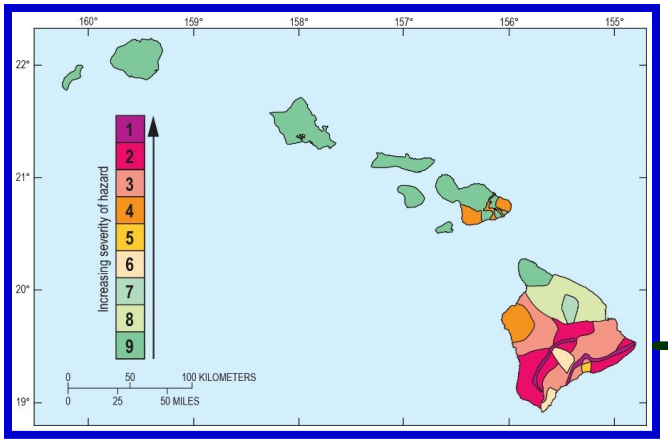
Flooding

Figure 2-12. The Hawai'i Flood Hazard Assessment Tool (http://gis.hawaiinfip.org/fhat) allows users to search for specific properties by site address or Tax Map Key (TMK) and determine their flood zone. A report can be generated for each property which indicates the level of flood risk as explained in Figure 2-13. The report will also indicate if the property is in a tsunami evacuation zone or dam evacuation zone.

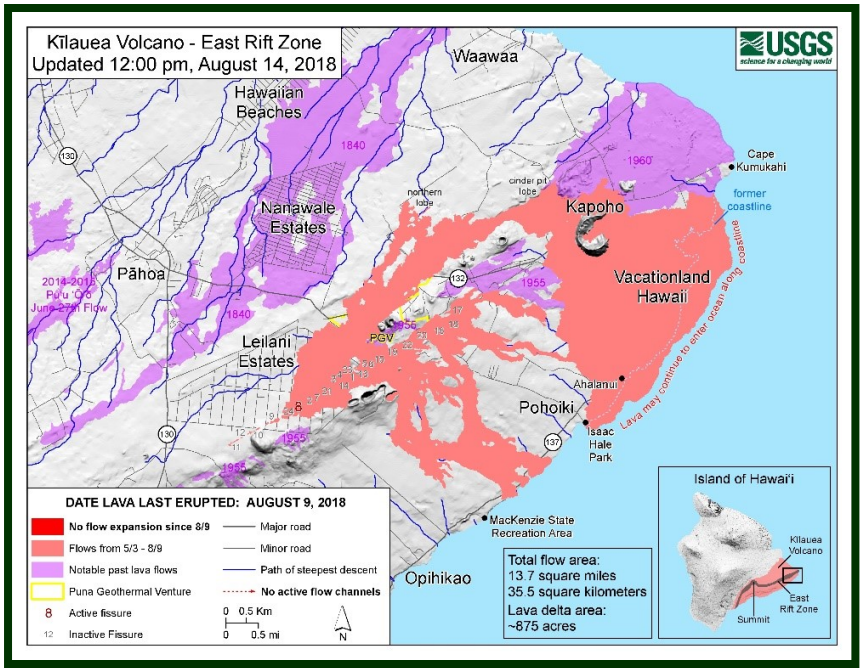
What is my earthquake risk?

How do I look up my flood zone? What is my flood risk?

Volcanoes



What is my lava risk?



How did 2018 lava flow impact islands locally (720 houses destroyed) and on other islands (VOG).

Climate Change (heat, drought, wildfire, infectious disease, sea-level rise, erosion)

Drought

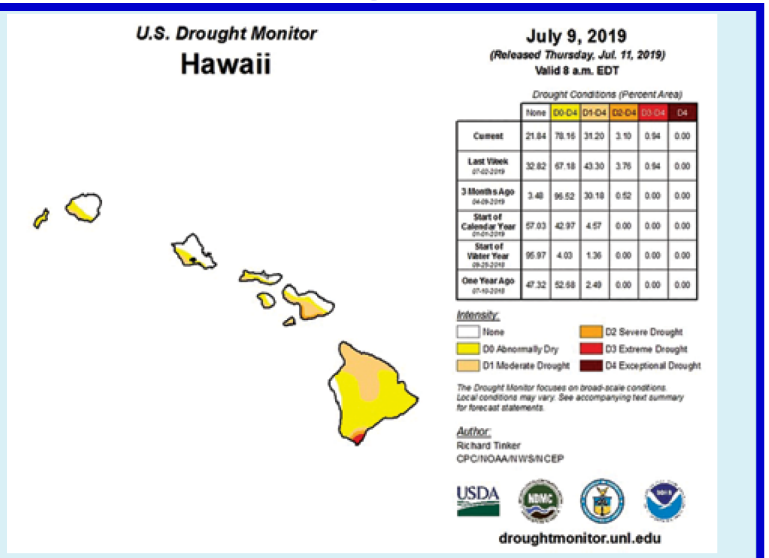


Figure 2-18. The Drought Monitor for Hawai‘i is part of the Drought Monitor for the U.S. and is updated weekly. Drought conditions range from None to Exceptional Drought. D0 can be considered a drought watch with areas going into or coming out of a drought. D1 to D4 are four levels of increasing drought conditions. According to this map, on July 9, 2019, 78.16% of Hawai‘i was in an abnormally dry condition or worse.

Wildfire

Figure 2-19. Data put together by the Hawai‘i Wildfire Management Organization contains over 13,500 fire records. This 2014 map is currently being updated. Note the high frequency of roadside ignitions along the wildland-urban interface, indicating the major role of humans in starting fires. Also note the high frequency of wildfires in leeward areas. Yet wildfires can occur anywhere (see Reference Link 14 and Figure 2-20).

How to Use U.S. Drought Monitor!

History of Wildfire in Hawaii from Hawaii Wildfire Management Organization

Hurricanes

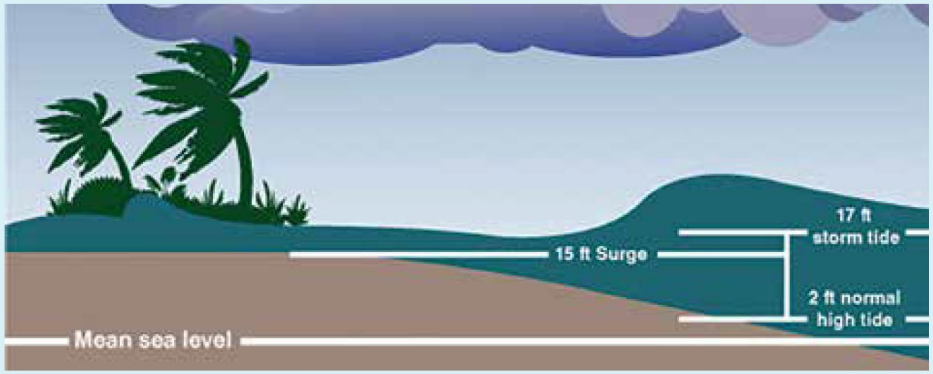


Figure 2-6. During a hurricane, there is an increased elevation of water levels caused by the low pressure of the hurricane and strong winds blowing onshore. The total water level is equal to the tides, plus the storm surge, plus the waves on top. Photo courtesy of NOAA.

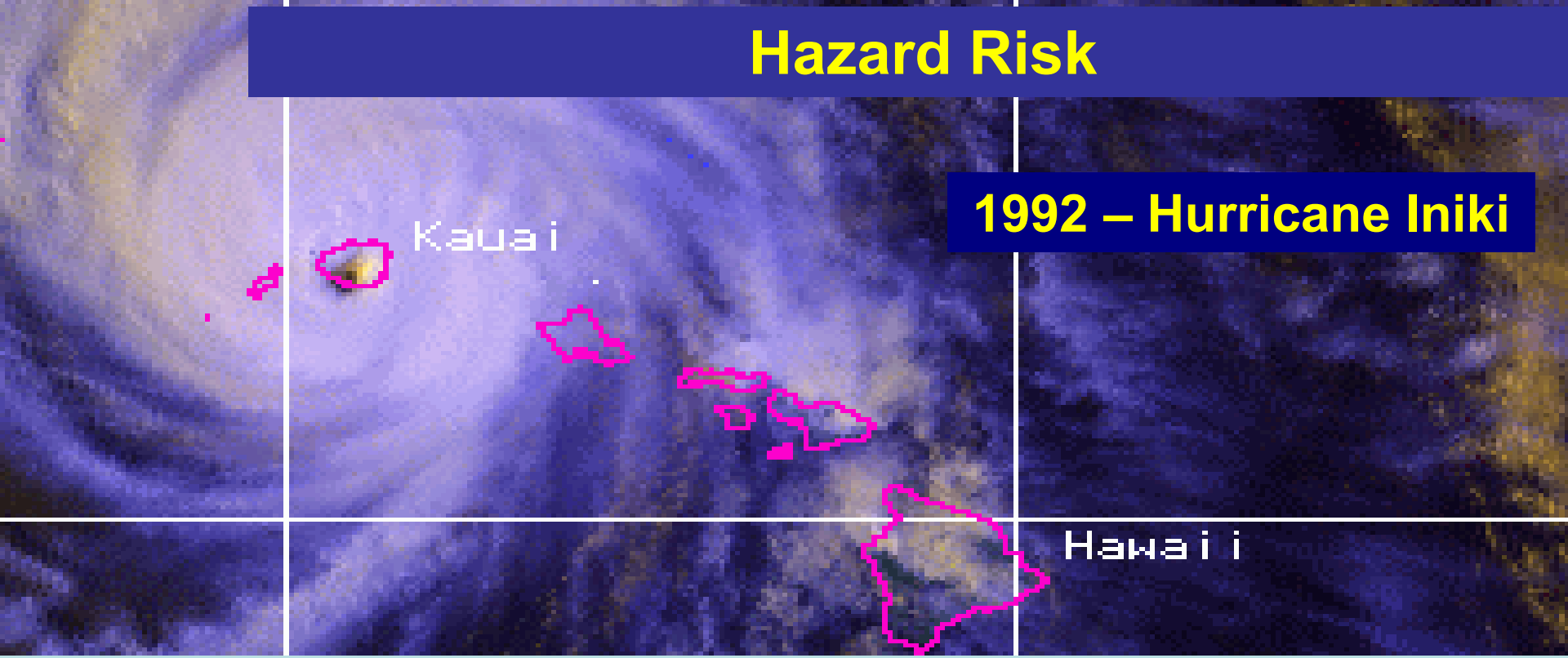
What is Storm Surge?

What is common damage from hurricane?

Figure 2-5. A common site on Kaua'i after Hurricane Iniki. Many roofs were blown off due to a lack of proper connection. Photo courtesy of Department of Commerce and Consumer Affairs Insurance Division.

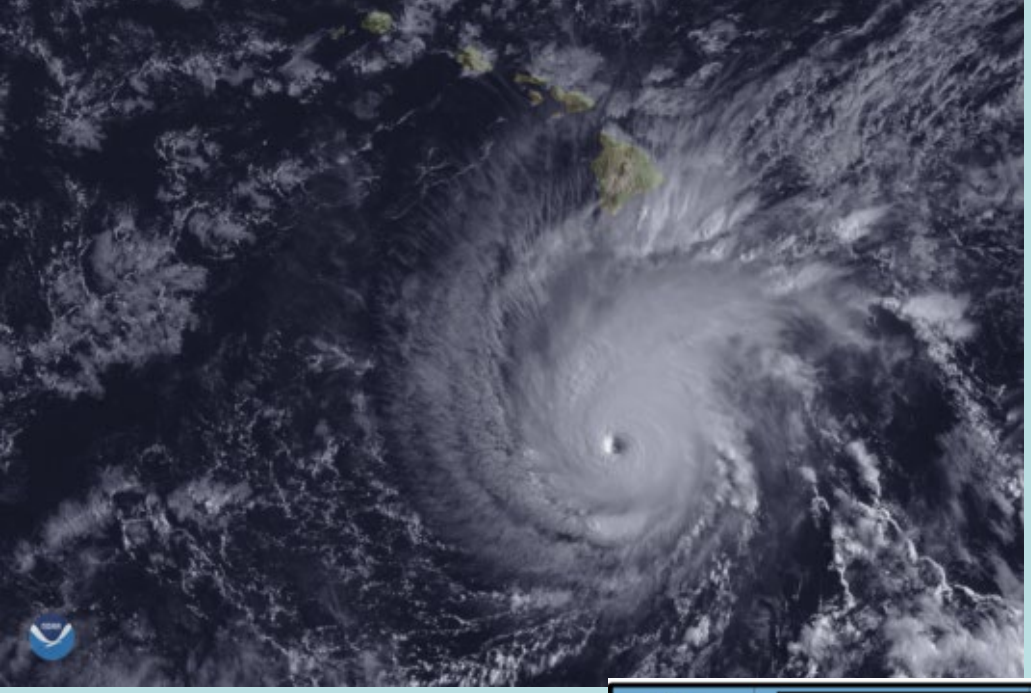
Hazard Risk

1992 – Hurricane Iniki



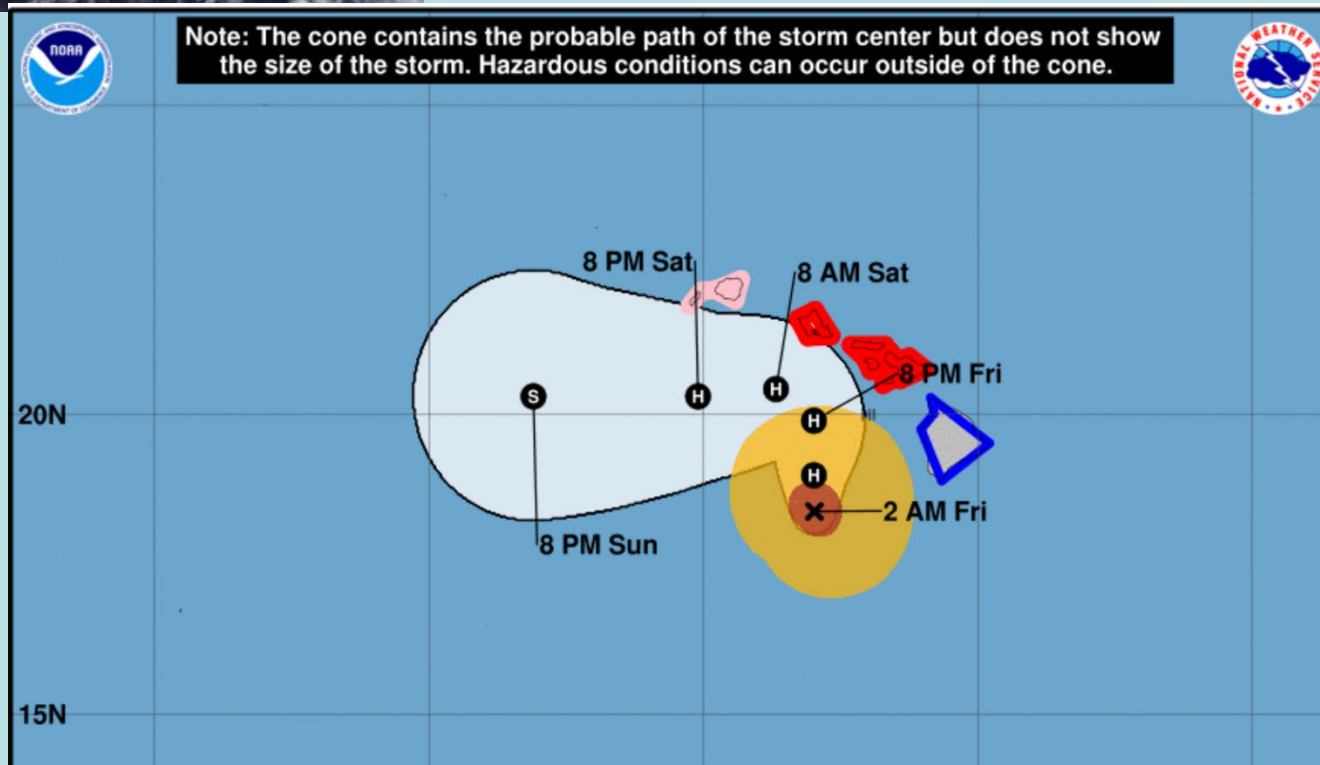
If Iniki turns north 6 hours earlier – about 50,000 houses damaged or destroyed instead of 6,300.

FEMA RISK ASSESSMENT in 2010 confirms



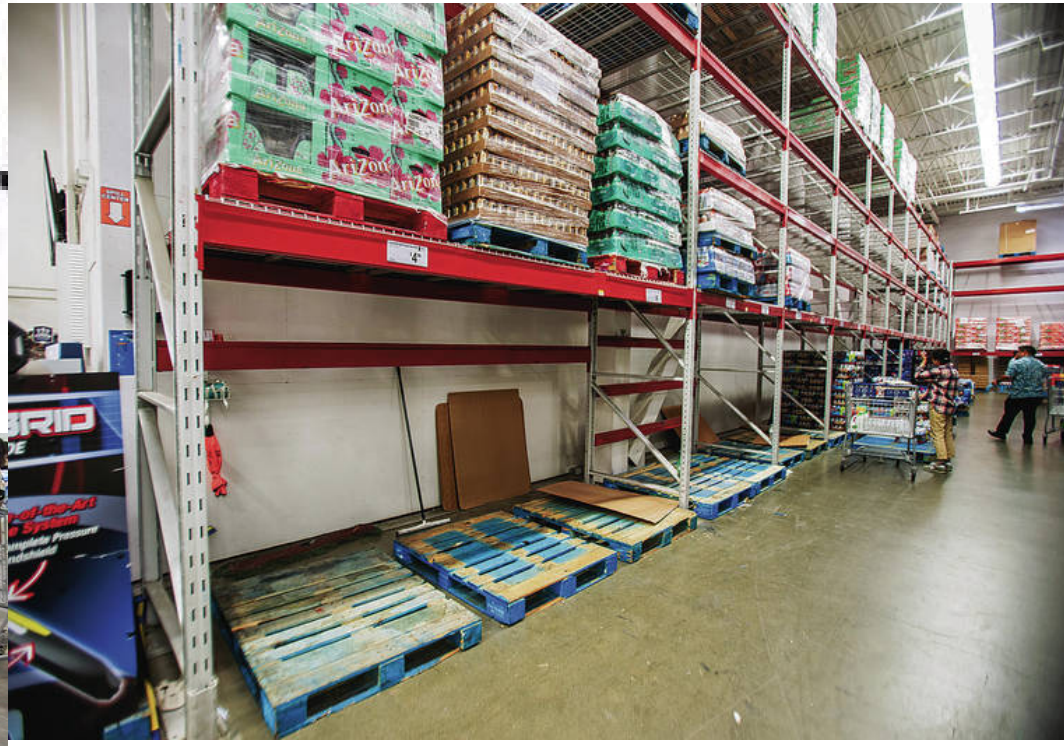
2018 Hurricane Lane

If Category 2 hits Oahu, 52,000 households displaced – $27 billion in damages – 2018 Pacific Disaster Center Study using FEMA HAZUS Tool.



Emergency Supplies

- 14 day supply – non-perishable food and water – flashlight – radio – medications – etc.



Corona Virus Impact

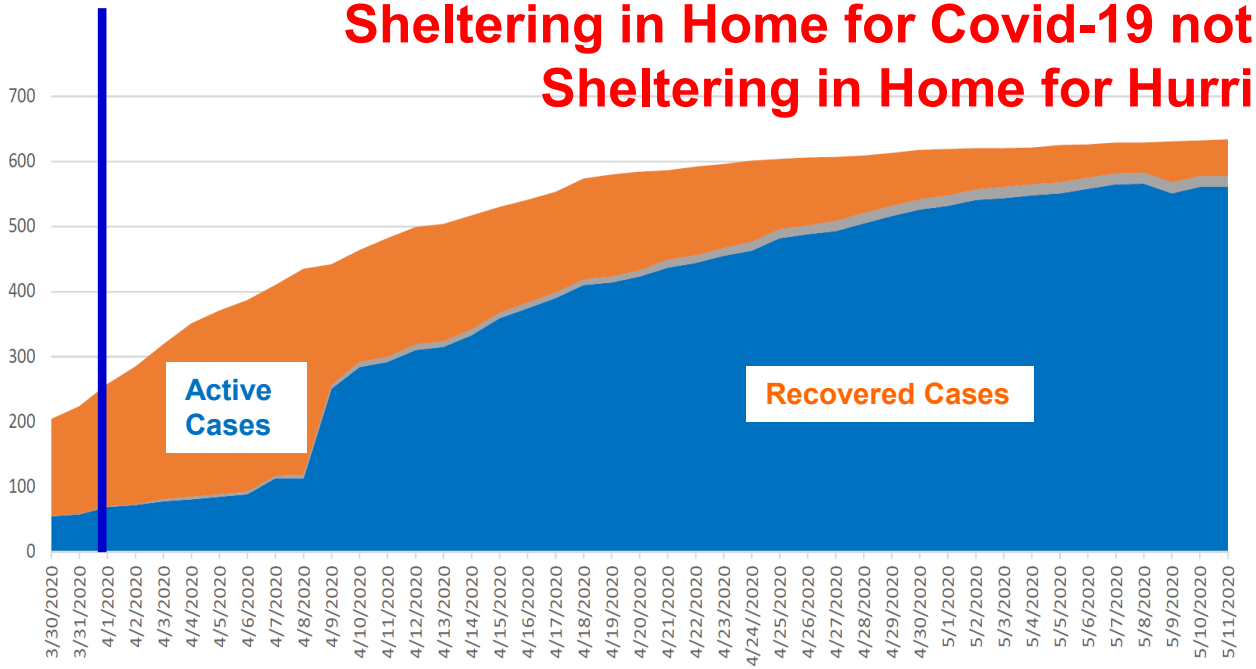
Star-Advertiser 2-27-2020

"It is important families always have their emergency plans and supplies . . . . The handbook provides helpful tips so people can slowly gather their supplies for the long-term, without placing a burden on vendors or creating shortages in the community. With more people staying at home, we encourage people to stay active by working on their health and on projects to strengthen the home found in the handbook."

Lt. Governor Josh Green
April 1, 2020

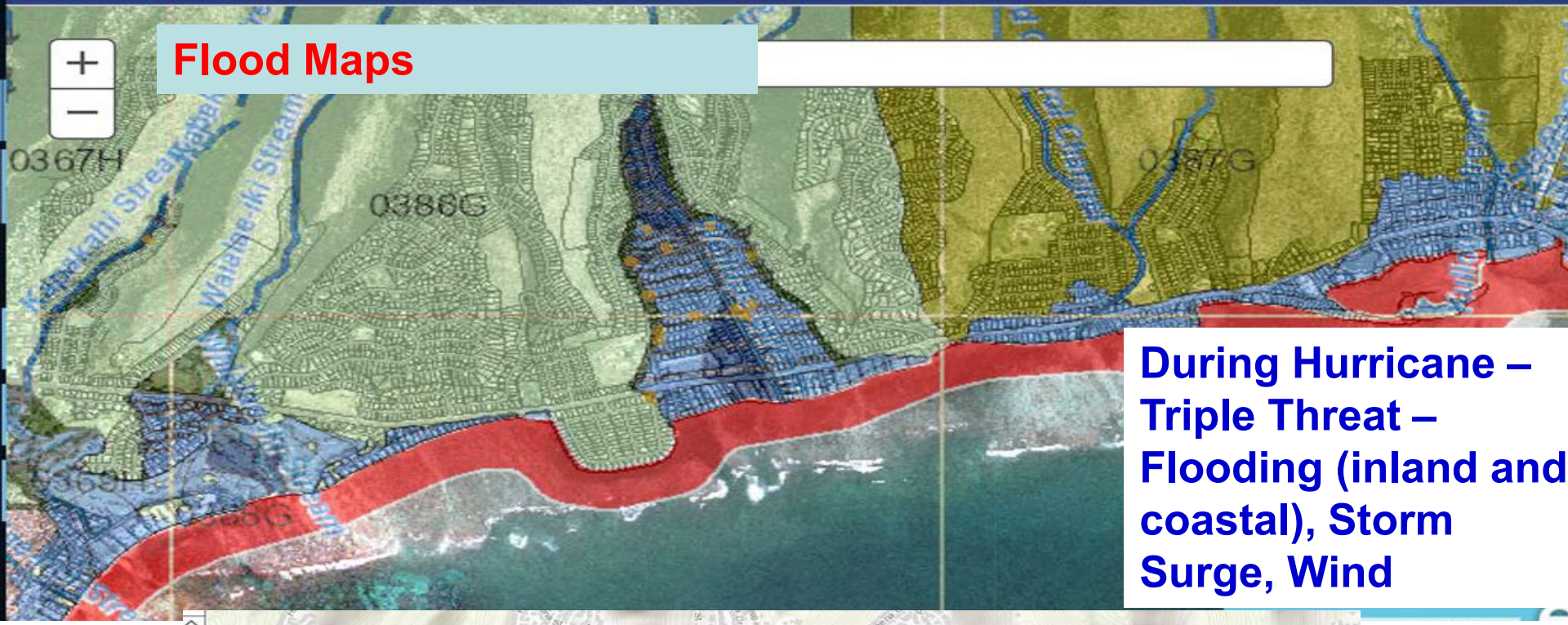
Hurricane Season
June 1, 2020

Sheltering in Home for Covid-19 not the same as Sheltering in Home for Hurricane



Flood Hazard Assessment Tool

Flood Maps



During Hurricane – Triple Threat – Flooding (inland and coastal), Storm Surge, Wind

Storm Surge Maps

Important to wait for que from local emergency managers.

ABILITY TO SHELTER IN PLACE DURING A HURRICANE

PLEASE READ INSTRUCTIONS BEFORE USING THIS TABLE

Safe room

FEMA or Hawai'i Residential Safe Room

Concrete or CMU wall house

Concrete CMU wall house in poor condition → Concrete CMU wall house in good condition → Concrete CMU wall house with hurricane clips → Concrete CMU wall house with hurricane clips & window protection → Concrete CMU wall house with hurricane clips exceeding code & window protection

Double wall house

Double wall house in poor condition → Double wall house in good condition → Double wall house with hurricane clips

- → Double wall house with hurricane clips & window protection → Double wall house with hurricane clips, window protection, garage & roof reinforced
- → Double wall with complete load path → Double wall with complete load path & window protection → Double wall with complete load path, window protection, garage & roof reinforced

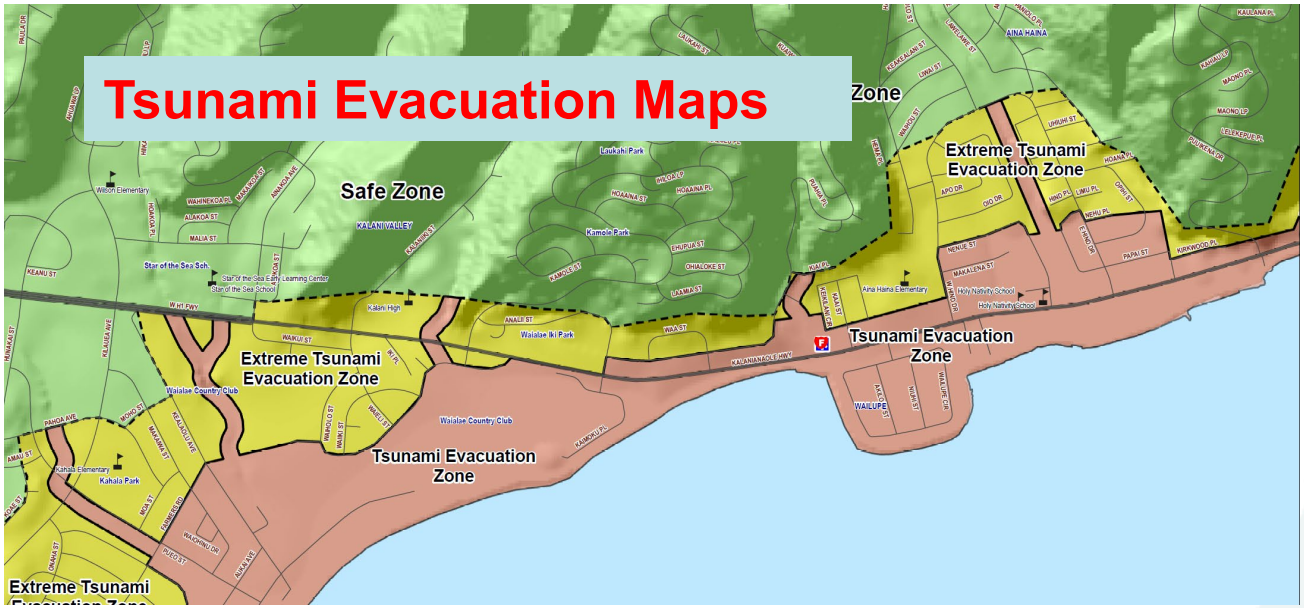
Single wall house

Single wall house in poor condition → Single wall house in good condition → Single wall house with hurricane clips → Single wall house with hurricane clips & window protection → Single wall house with clips, window protection and foundation upgrades

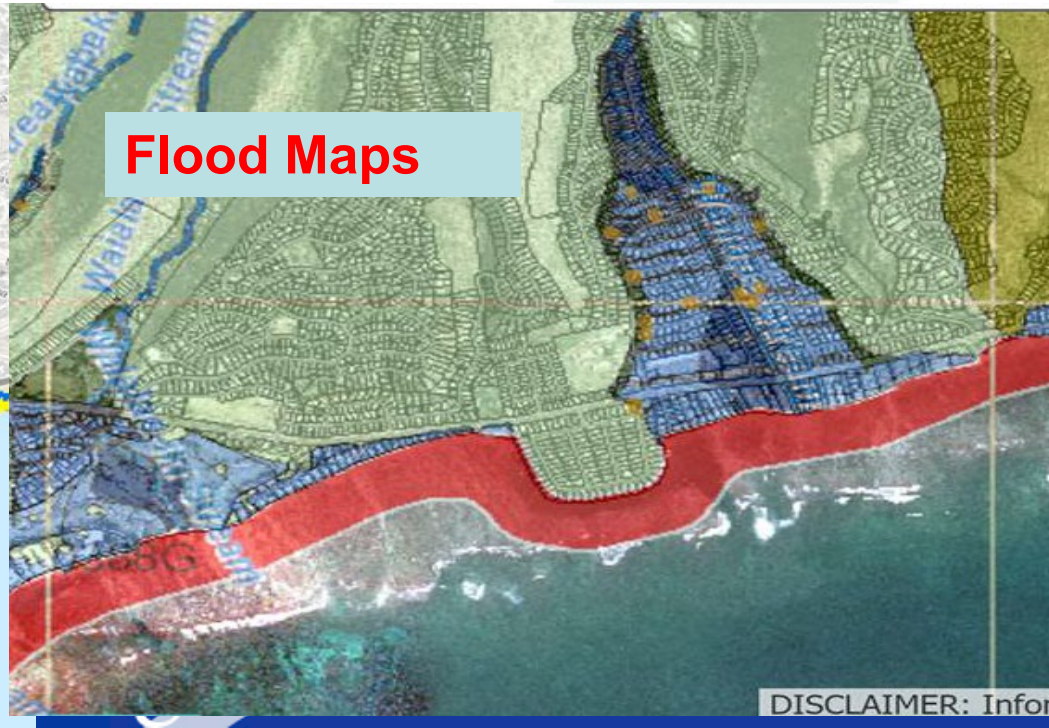
Suggested Action

Unsafe	Marginal	Good	Better	Best
Evacuate! Do Not Shelter in place	Shelter in place up to a Tropical Storm	Shelter in place up to Category 1 hurricane	Shelter in place up to Category 2 hurricane	Shelter in place up to Category 3 hurricane

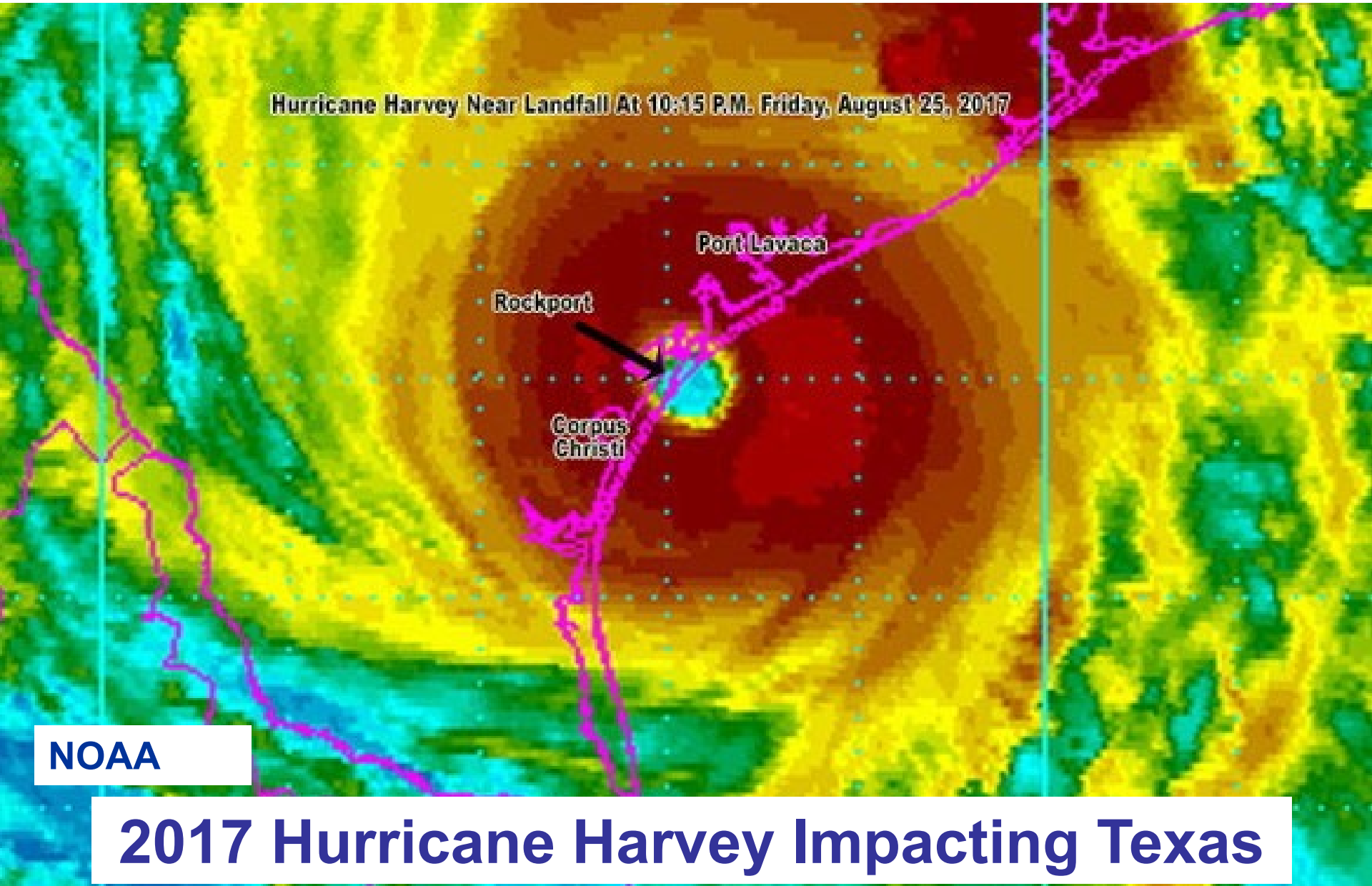
**Based on discussions and review with Ian Robertson, Professor, UH Mānoa, Civil and Environmental Engineering; Gary Chock, Structural Engineer, Martin & Chock Inc.; Tim Waite, PE, Simpson Strong-Tie; and Kevin Richards, Natural Hazards Officer, Hawai'i Emergency Management Agency.*



FOR TSUNAMI ONLY



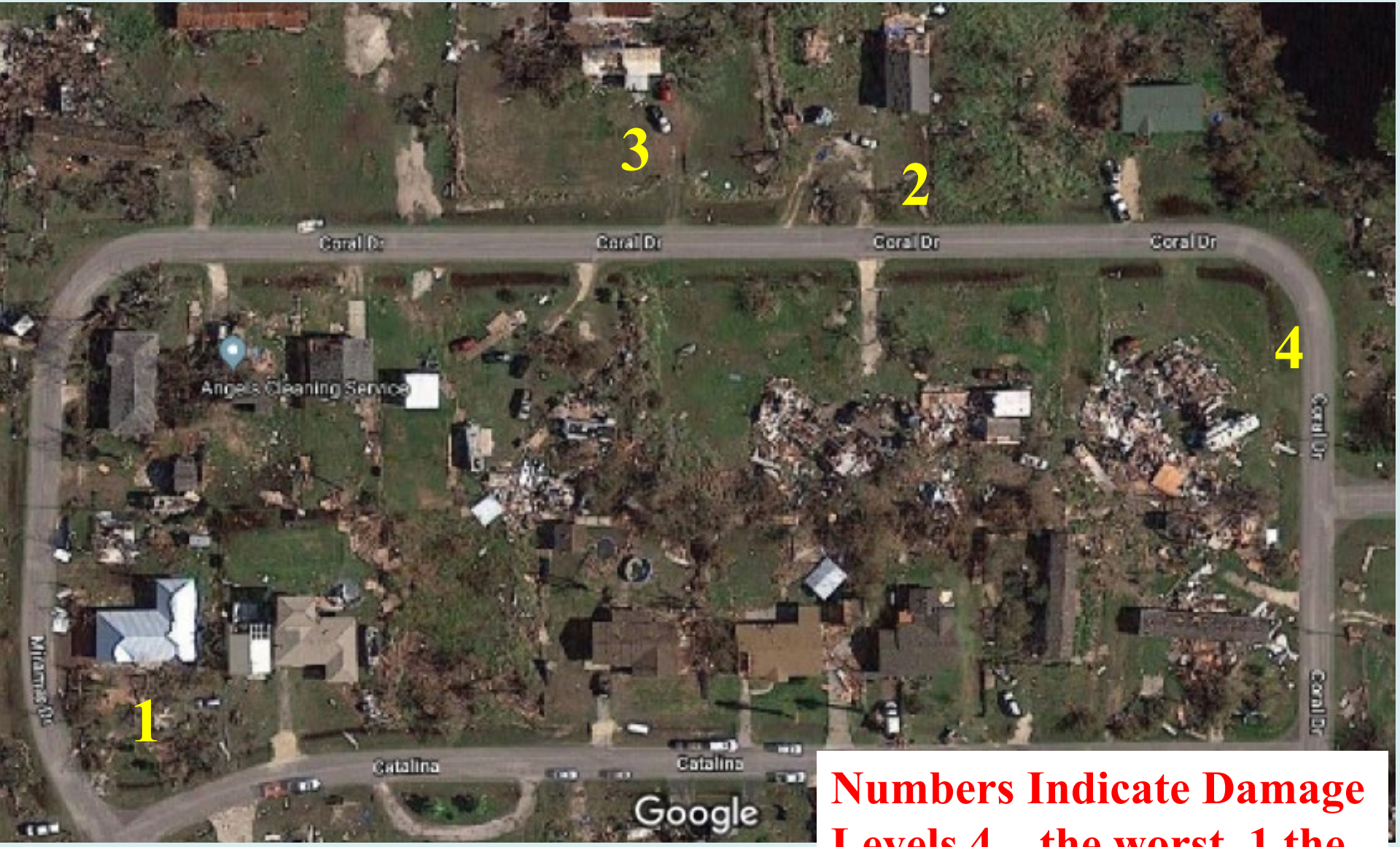
Retrofitting



NOAA

2017 Hurricane Harvey Impacting Texas

2017 Major Hurricane Harvey Impacts – Rockport, Tx.



Numbers Indicate Damage Levels 4 – the worst, 1 the best

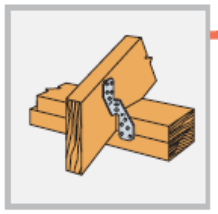
4 – Destroyed House

3 – Major Damage

2 – Moderate Damage

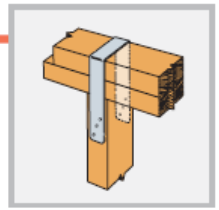
1 – Minor or No Damage

Continuous Load Path Connection



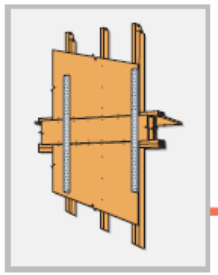
A

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



B

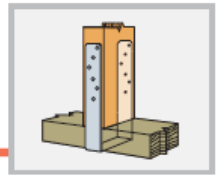
Top Plate-to-Stud Connections:
Transfer forces from the top plate to the stud



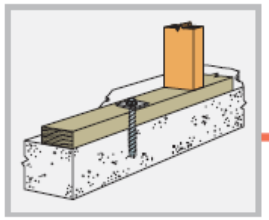
C

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

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



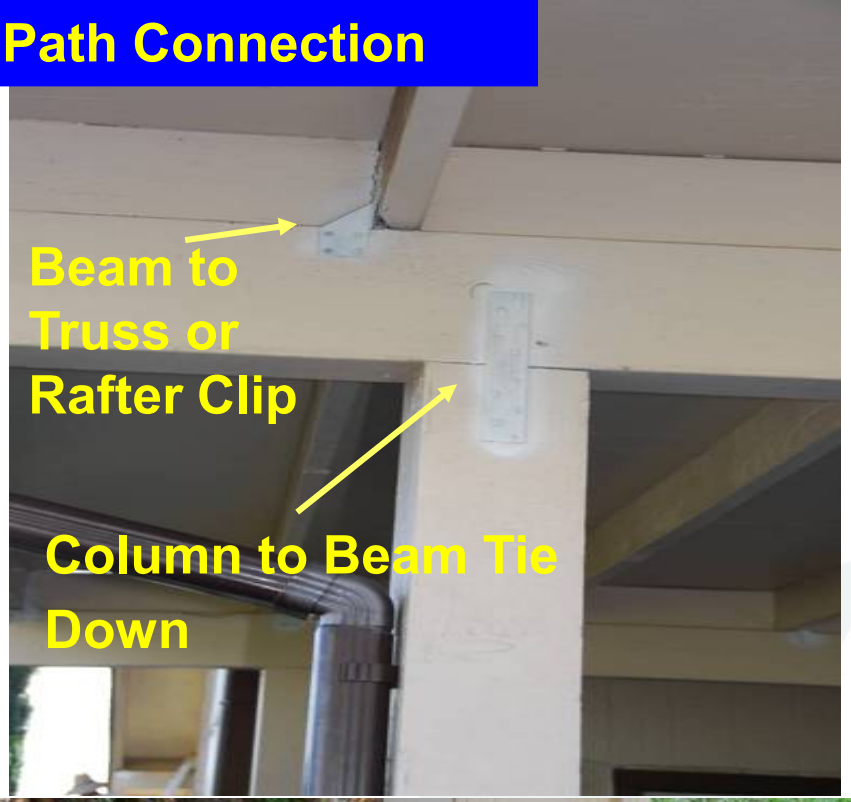
D



E

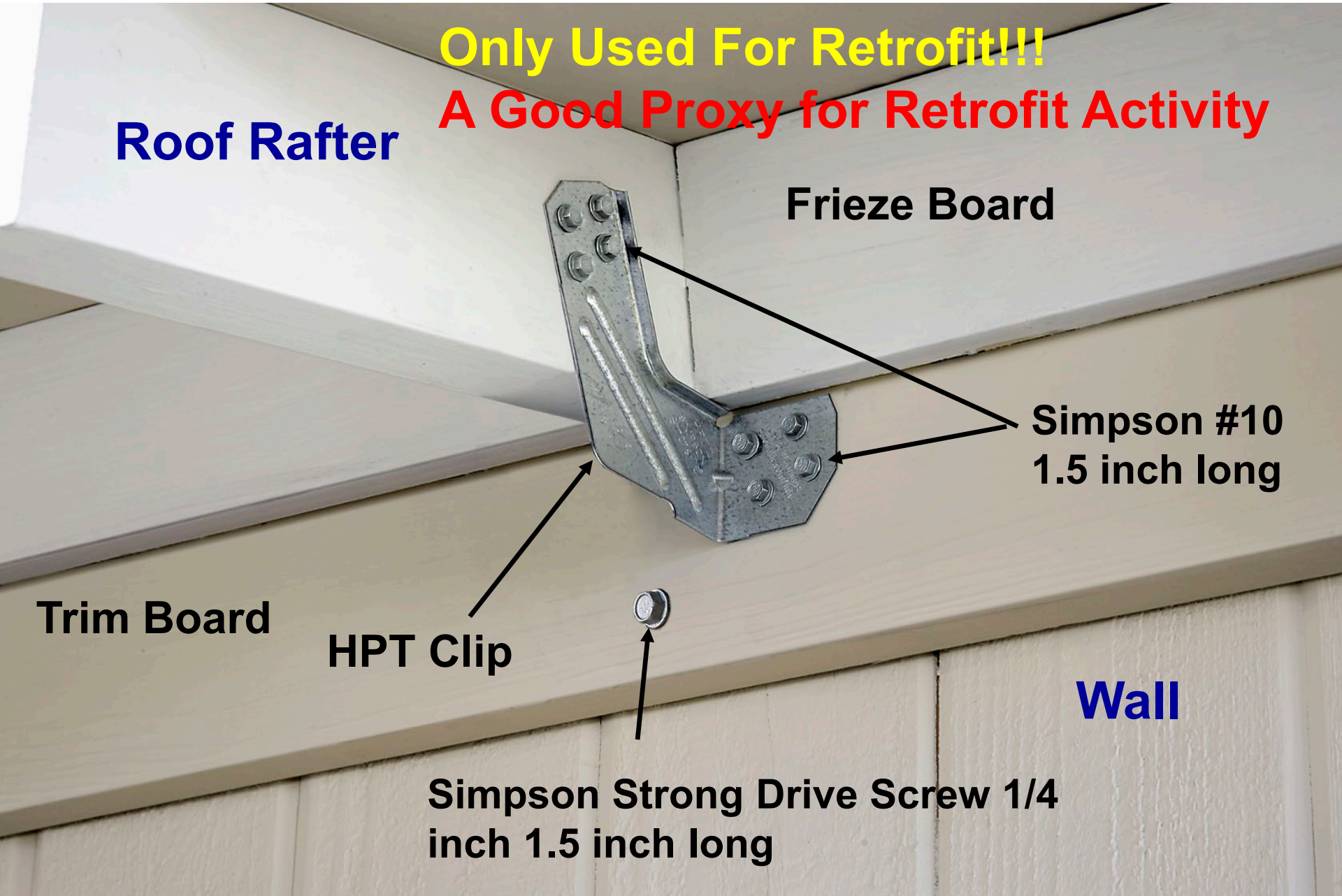
Sill Plate-to-Foundation Connections:
Transfer forces from the mudsill into the foundation

Courtesy of Simpson Strong-Tie



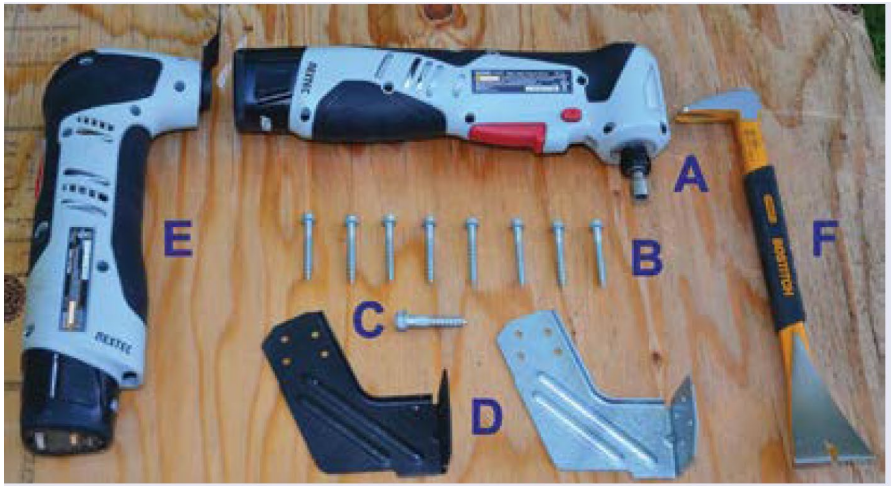
Hurricane Iniki-- 1992

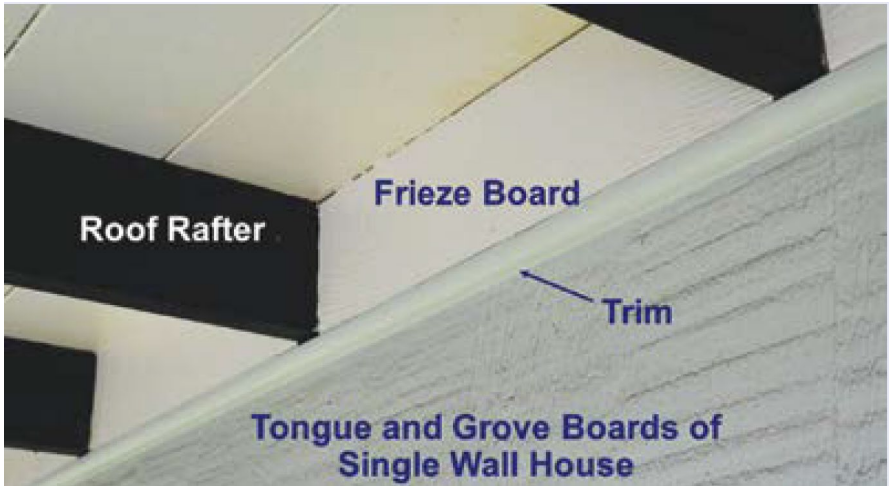
HPT Clip Installation

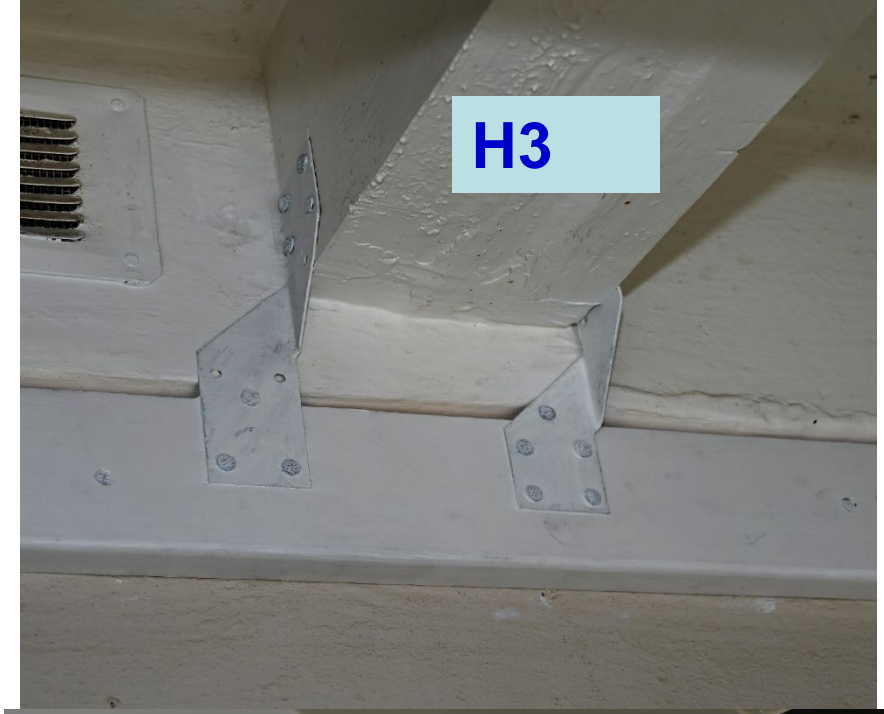


Guide for Installing Hawaii Plantation Tie (HPT) Hurricane Tie

For all retrofits – first seek advice of licensed structural engineer or architect.







Almost every house in the State can be relatively easily retrofitted.

Make the roof to wall connection first!

Structural Seismic Retrofits For Hawaii Single Family Residences With Post and Pier Foundations

Volume I

Results of Study, Structural Analysis and Retrofit Strategies

Prepared for

FEMA

Hazard Mitigation Grant Program
DR-1664-HI

Final Report
May 15, 2009

Principal Investigators: Ian Robertson, Ph.D., P.E.
Gary Chock, P.E.

The following demonstration is based off the report by Dr. Ian Robertson and Gary Chock. You may be able to do most of the work yourself, but first, seek the advice of a licensed structural engineer. The work can reduce earthquake and hurricane damage.

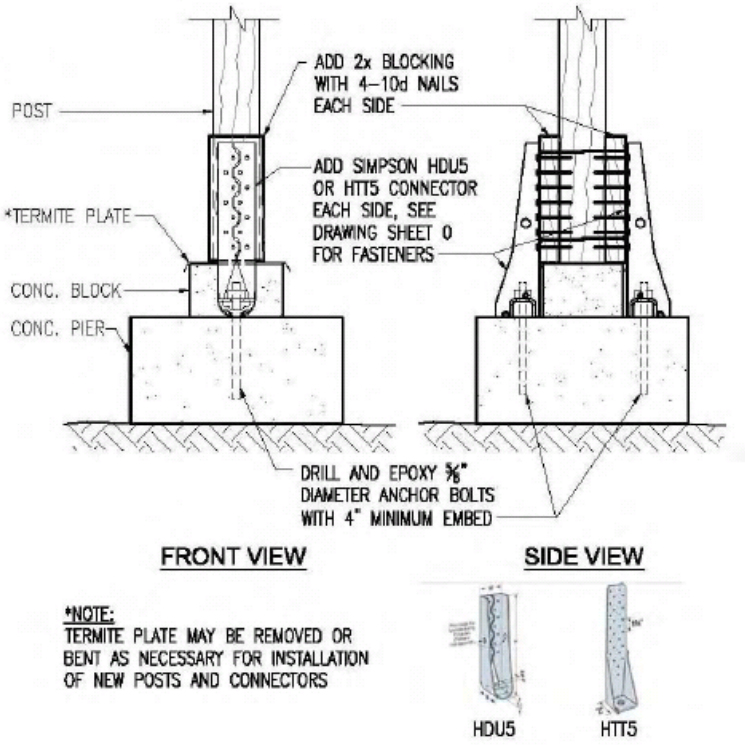
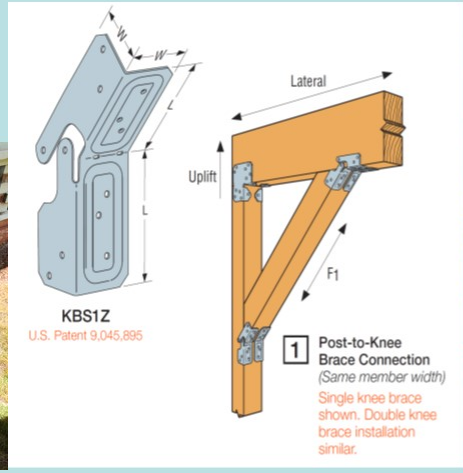


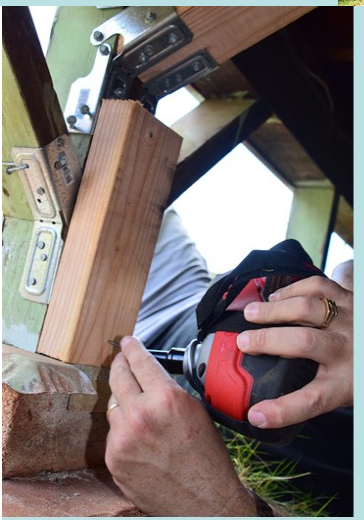
Figure 7: Simpson HDU Hold-down Connection

Procedures

Remove decorative fencing with multi-tool using flat wood blade, hammer and small nail-trim remover.

Knee brace stabilizer (Simpson KBS1Z) installed for all knee braces.





Drill hole with rotary hammer, clean hole of dust with air spray and brush. Then fill with epoxy. If epoxy used – drill hole is 1/8” larger than anchor bolt. Set anchor bolt and holdown.

Attach 2” x 4” between post and edge of tofu block.

Attach Simpson HDU2 holdown to 2” x 4” and concrete foundation.

Repeat process for outside of post with 2” x 4”

Attach HTT5 holdown to 2” x 4” and concrete foundation.

Long Holdown & Epoxy Anchor Bolt

Short Holdown & Epoxy Anchor Bolt

Short Holdown & Titen Concrete Anchor Screw

The Titen concrete anchor screw eliminates the need to epoxy. Drill hole with rotary hammer - same size as anchor screw (e.g., 5/8” hole for 5/8” anchor). Drill anchor screw with impact driver. Treat for corrosion with zinc rich galvanizing spray, primer for galvanized metal and enamel paint.

Three coat treatment for corrosion resistance.

1956 single-wall house now has a continuous load path.

Single-Wall House with Load Path!!

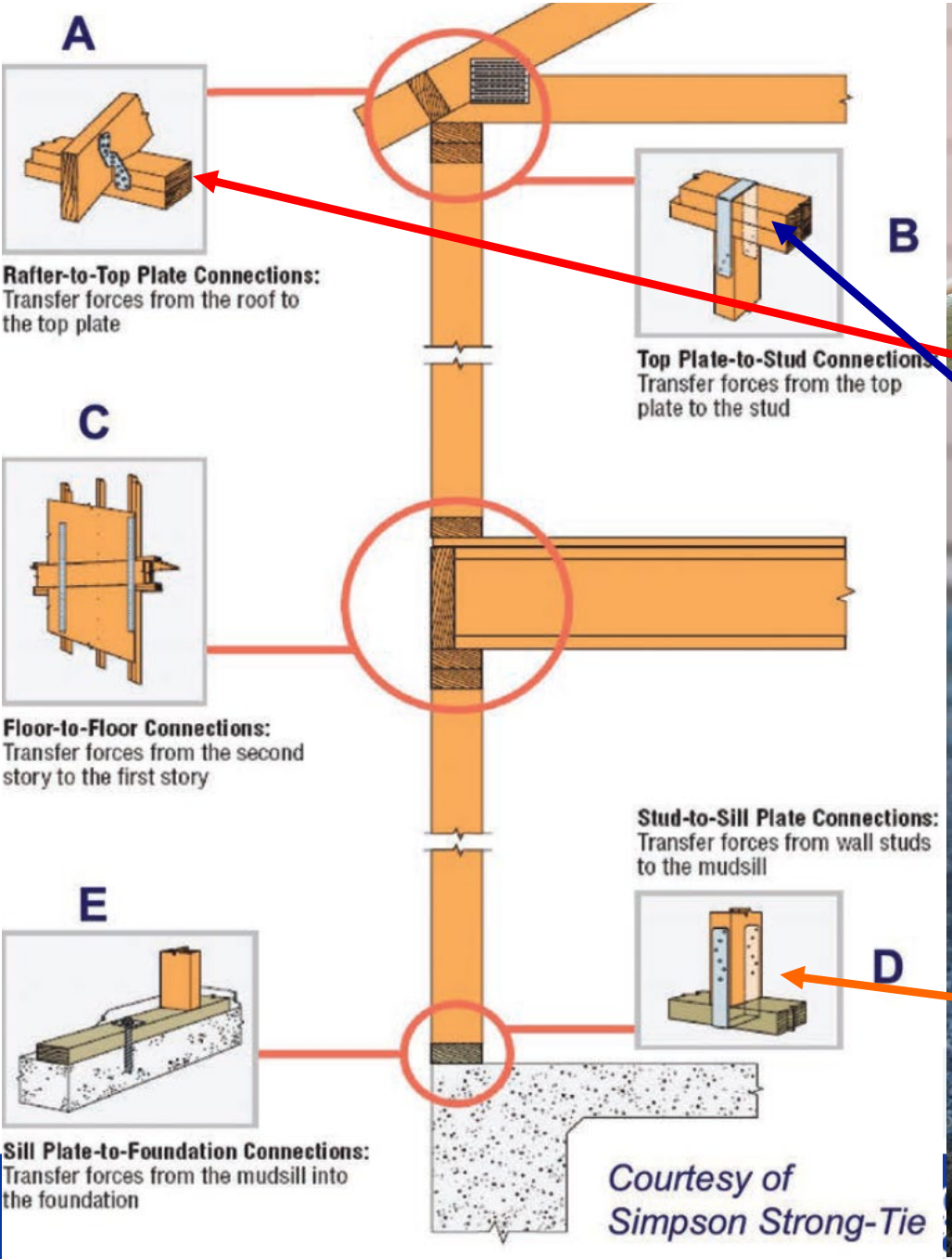
HPT hurricane clip on each rafter. See Part 4.1.1 of the Homeowner's Handbook on procedures.

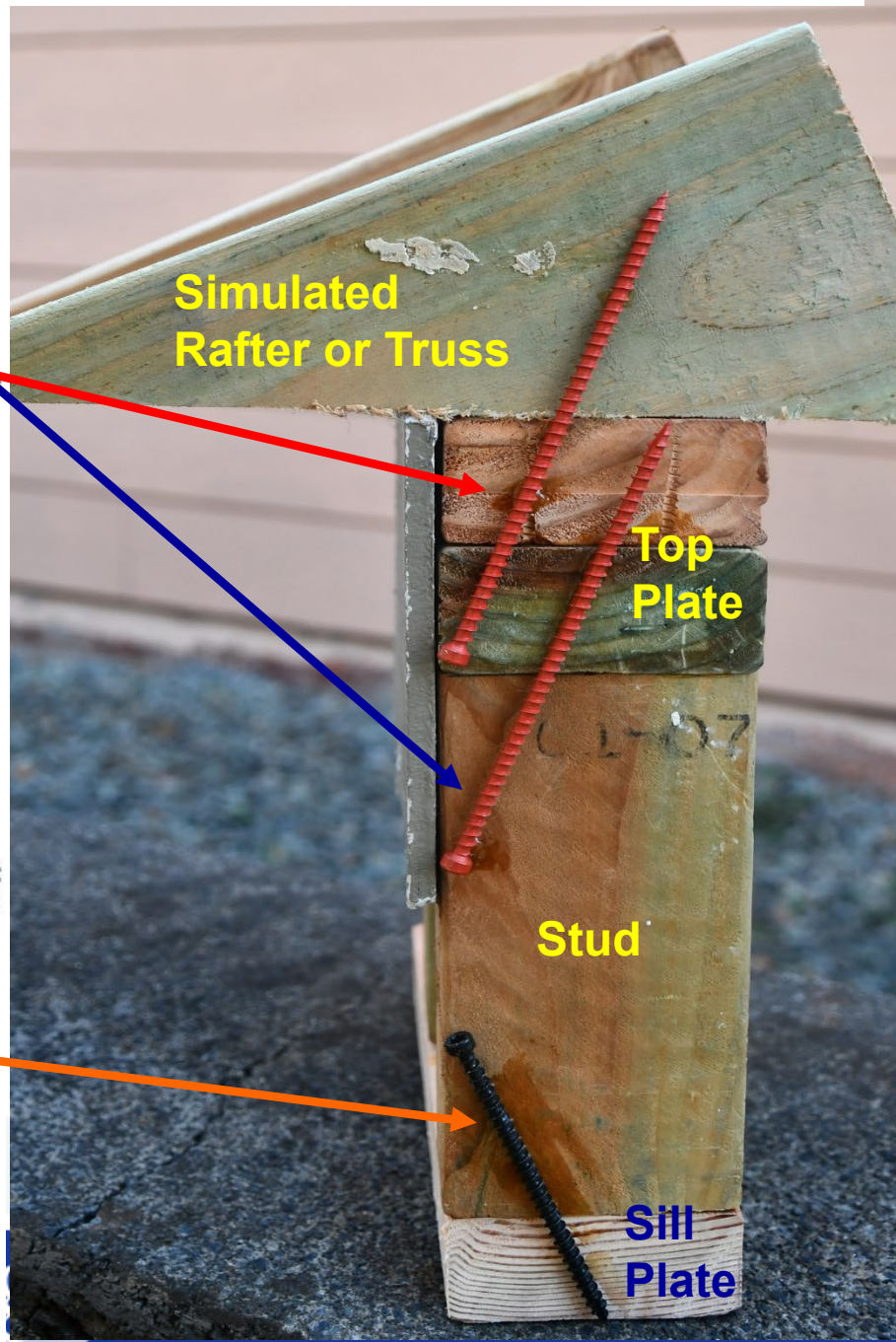
Each exterior post retrofitted. See Part 4.1.2 of the Homeowner's Handbook on procedures.

Benefits

- Stronger House – Reduced risk - Peace of mind – more likely to be able to shelter in place for weaker tropical cyclone events.
- Hurricane Insurance Premium per year $1,184 to $932
- Hurricane Fortifications listed on sale of house – distinguished from other older houses in area – greatly facilitated sale – under $500 material cost.

SDWC Structural Screw for New Construction or Retrofit

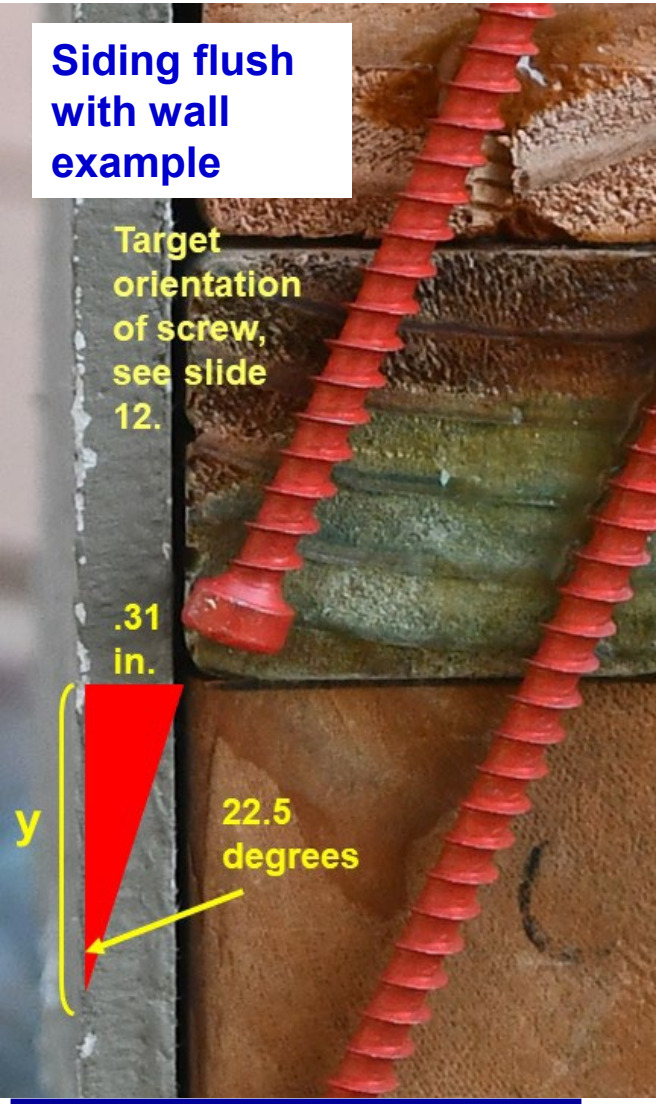


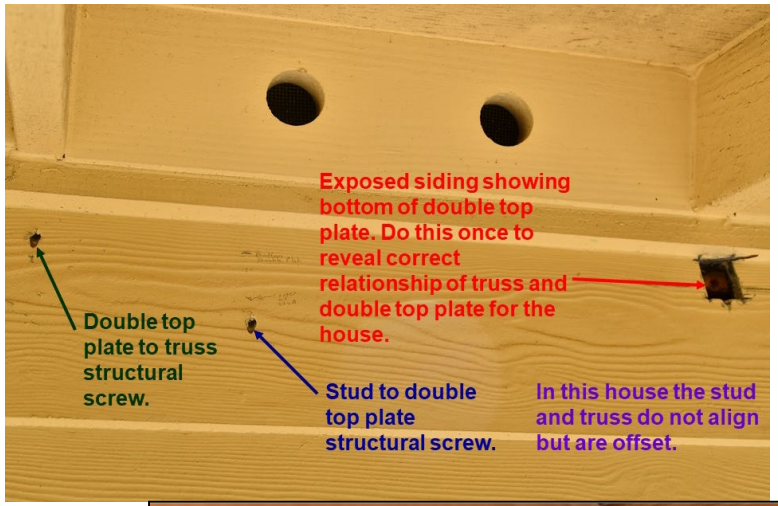


SDWC Structural Screw - New Construction Example

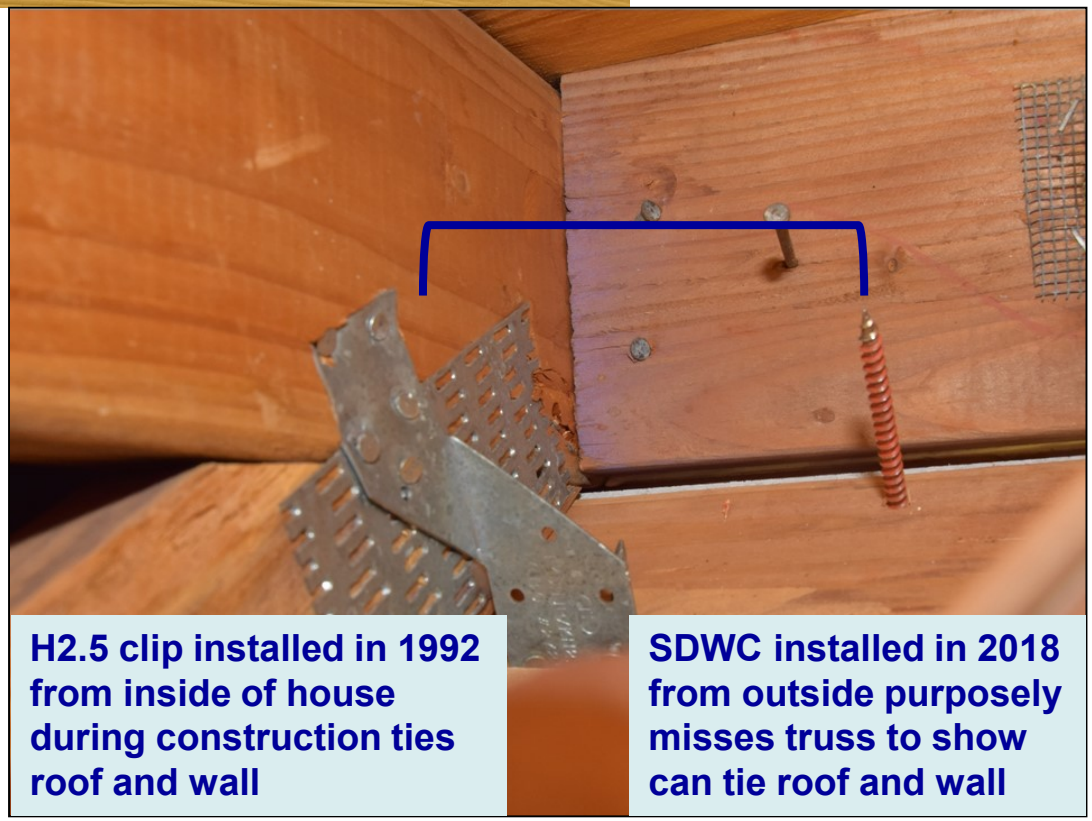
Approved by Building Department, Building Inspector & Project Structural Engineer for this house built in 2017!!

SDWC Structural Screw – Retrofit Example



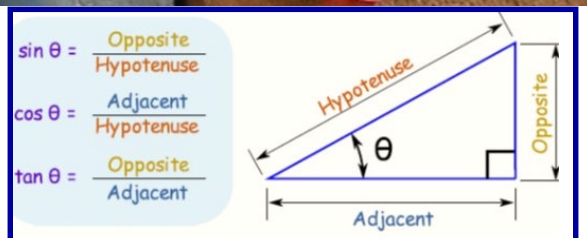


Consult with licensed structural engineer and architect before proceeding!



H2.5 clip installed in 1992 from inside of house during construction ties roof and wall

SDWC installed in 2018 from outside purposely misses truss to show can tie roof and wall



Structural Screw - Retrofit Example - Fiber Cement Siding

1. Install Screw – Tie Stud to Double Top Plate

2. Patch with Silicone Sealant & Cement Filler

3. Sand & Paint – Looks like New!


1992 double wall house -156 structural screws at three different levels in 2020 help complete load path. Many during quarantine.
Dead Load Resists Wind Forces
Sliding
Uplift
Overturning
Racking

Why Protect Your House from the Wind?
Why You may need to Evacuate even if Inland?

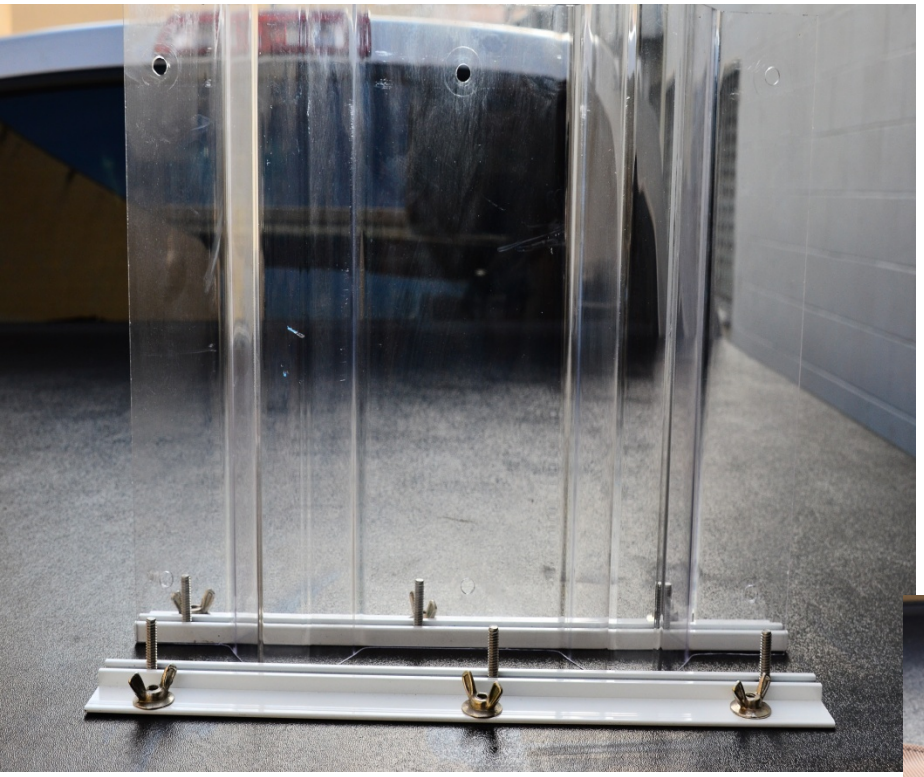
Hurricane Iniki – flying debris punctured the envelope of the house – creating a funnel for the wind which lifted roofs off their walls.


Roll Down Shutters
NOAA
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
National
Weather
Service

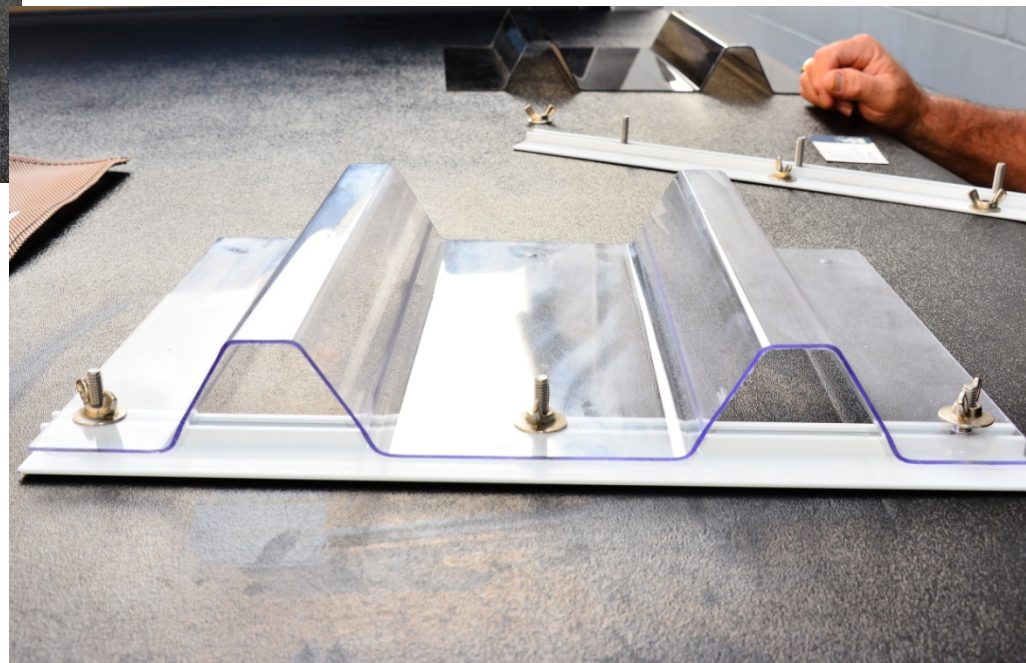
Hurricane Screening

Accordion Shutters

Hurricane Panels



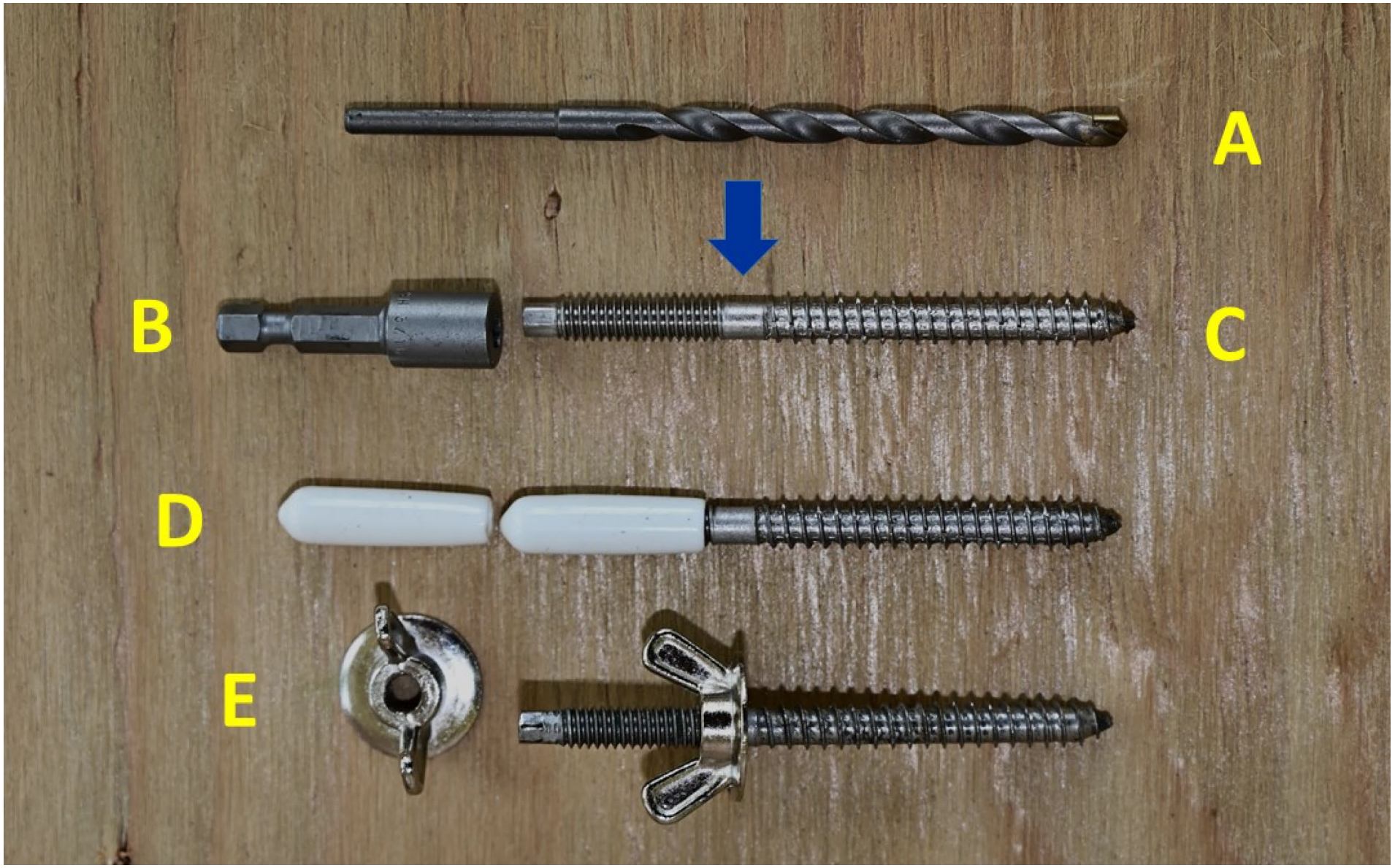
Steel, Aluminum
or Clear Plastic



Plywood Shutters – Cheap. Readily Available, Heavy

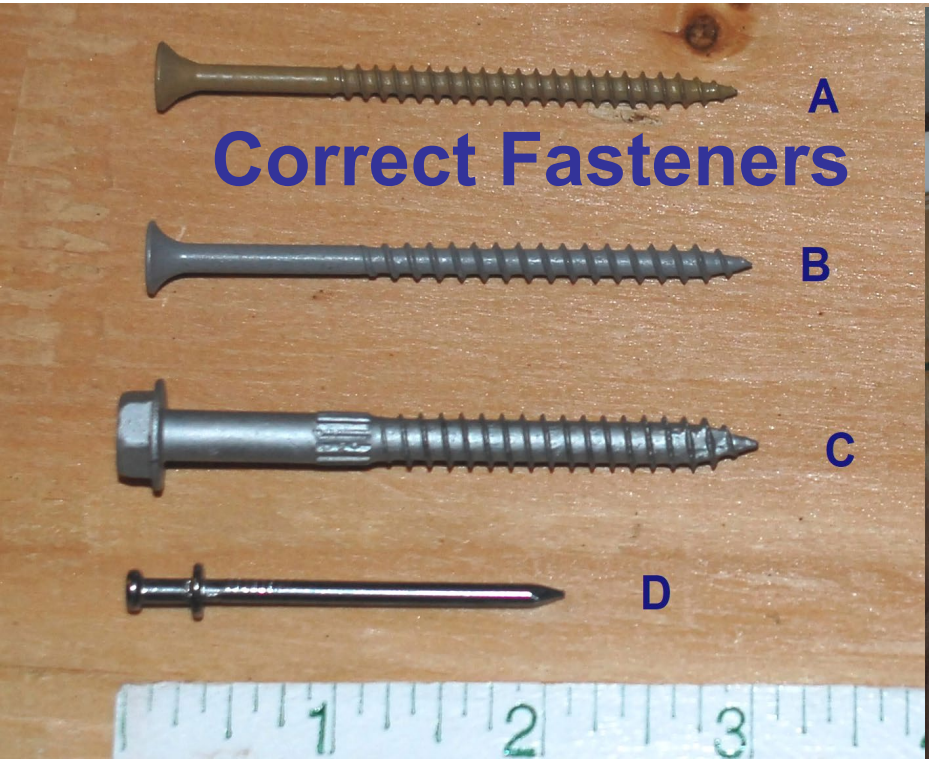
New Polycarbonate Panels, Lightweight, Strong, Becoming More Available

Storm Panel Screws



Follow the 4 P's - Panels should be:

1. Precut to Proper Measurements
2. Prelabeled
3. Premark fastener locations
4. Predrill holes



Impact Resistant Windows

Resilient
Sustainable
Adaptive
Practices

Impact Resistant Glass can:

1) dampen sound, which significantly reduces unwanted noise, from traffic to the howling winds of a storm or hurricane. Look for the ASTM Outdoor/Indoor Transmission Class (OITC) rating.

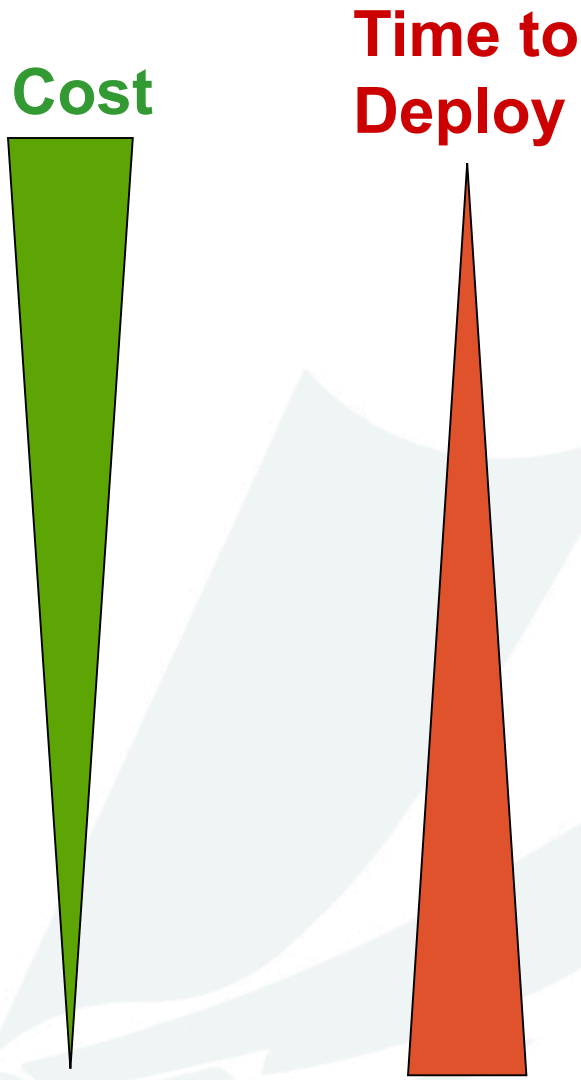
2) block harmful UV radiation, which can fade fabric, furniture, or other materials, but the glass still allows for unaffected plant growth. Look for the Damage Weighted Transmission Measurement (Tdw) for the fading reduction potential.

3) reduce solar heat gain in-take, making houses cooler, reducing energy or air conditioning costs while providing balanced temperatures year round.

4) open view planes while maintaining privacy. The reflective properties of laminated glass create a mirror effect during the day, maintaining privacy even when blinds are open.

Window Coverings

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



Roofing

If Re-roof – 8d Ring Shank Nails 6” on center, or Simpson DSV Wood Deck Screws

If don’t Re-roof – Subfloor Adhesives – AFG-01 standards

Asphalt Shingle Roofing

Guideline Following FEMA Home Builders Guide to Coastal Construction

Roof Underlayment for Asphalt Shingle Roofs

HOME BUILDER'S GUIDE TO COASTAL CONSTRUCTION Technical Fact Sheet No. 7.2

Purpose: *To provide recommended practices for use of roofing underlayment as an enhanced secondary water barrier in coastal environments.*

Note: The underlayment options illustrated here are for asphalt shingle roofs. See FEMA publication 55, Coastal Construction Manual, for guidance concerning underlayment for other types of roofs.

Key Issues

- Verifying proper attachment of roof sheathing before installing underlayment.
- Lapping and fastening of underlayment and roof edge flashing.
- Selecting underlayment material type.

Note: This fact sheet provides general guidelines and recommended enhancements for improving upon typical practice. It is advisable to ***consult local building requirements*** for type and installation of underlayment, particularly if specific enhanced underlayment practices are required locally.

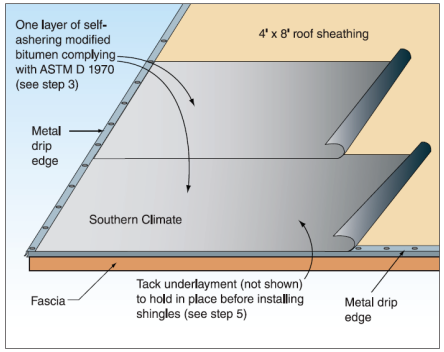
ROOFING 7

Sheathing Installation Options

The following three options are listed in order of decreasing resistance to long-term weather exposure following the loss of the roof covering. Option 1 provides the greatest reliability for long-term exposure; it is advocated in heavily populated areas where the design wind speed is equal to or greater than 120 mph (3-second peak gust).[1] Option 3 provides limited protection and is advocated only in areas with a modest population density and a design wind speed less than or equal to 110 mph (3-second peak gust).[1]

Installation Sequence – Option 1[2] (for moderate climates)

1. Before the roof covering is installed, have the deck inspected to verify that it is nailed as specified on the drawings.
2. Broom clean deck before installing self-adhering modified bitumen products. If the sheathing is OSB, check with the OSB manufacturer to determine if a primer needs to be applied before installing these products.
3. **In Southern Climates, apply a single layer of self-adhering modified bitumen complying with ASTM D 1970 throughout the roof area.**
4. Seal the self-adhering sheet to the deck penetrations with roof tape or asphalt roof cement.



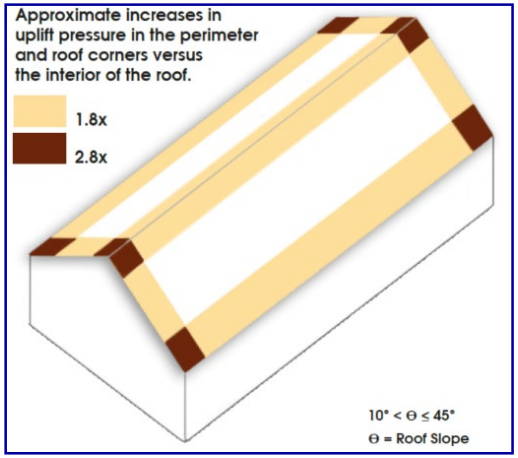
1 The 110 and 120 mph speeds are based on ASCE 7-05. If ASCE 7-10 is being used, the equivalent wind speeds are 139 and 152 mph for Risk Category II buildings.

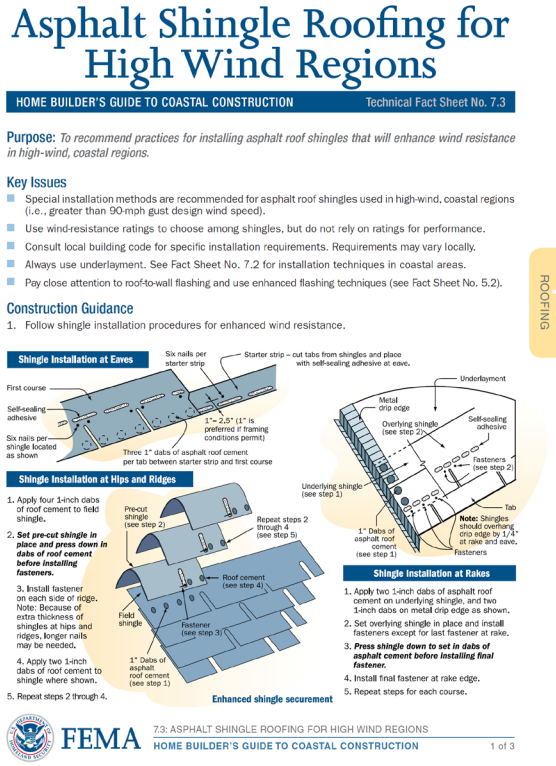
Create Sealed Roof

Self Adhering Modified Bitumen Layer – ASTM D1970 - To prevent leaks

Asphalt Shingle Roofing (cont.)

Roof Pressure Greatest on edges, ridges & corners.




Asphalt Shingle Roofing for High Wind Regions

HOME BUILDER'S GUIDE TO COASTAL CONSTRUCTION — Technical Fact Sheet No. 7.3

Purpose: *To recommend practices for installing asphalt roof shingles that will enhance wind resistance in high-wind, coastal regions.*

Key Issues

- Special installation methods are recommended for asphalt roof shingles used in high-wind, coastal regions (i.e., greater than 90-mph gust design wind speed).
- Use wind-resistance ratings to choose among shingles, but do not rely on ratings for performance.
- Consult local building code for specific installation requirements. Requirements may vary locally.
- Always use underlayment. See Fact Sheet No. 7.2 for installation techniques in coastal areas.
- Pay close attention to roof-to-wall flashing and use enhanced flashing techniques (see Fact Sheet No. 5.2).

Construction Guidance

1. Follow shingle installation procedures for enhanced wind resistance.

Shingle Installation at Eaves

Shingle Installation at Hips and Ridges

Shingle Installation at Rakes

Enhanced shingle securement

FEMA 7.3: ASPHALT SHINGLE ROOFING FOR HIGH WIND REGIONS
HOME BUILDER'S GUIDE TO COASTAL CONSTRUCTION 1 of 3

ROOFING

Keep the roof cool to lower energy and air conditioning costs, while increasing the life expectancy of roof components. Cool roofs can also reduce peak energy demand and combat the urban heat island effect by lowering local temperature. Look for these factors:

Solar Reflectivity (TSR), measured from 0 to 1, indicates the amount of the solar spectrum that the roof reflects. Higher values indicate more energy is reflected.

Thermal Emittance (TE), measured from 0 to 1, is the amount of heat released to the atmosphere, instead of being absorbed in the building. Higher values means more heat is lost to the atmosphere.

Solar Reflectance Index (SRI), calculated from (TSR) and (TE), indicates how well the roof discards solar heat. The higher the SRI, the cooler the roof.

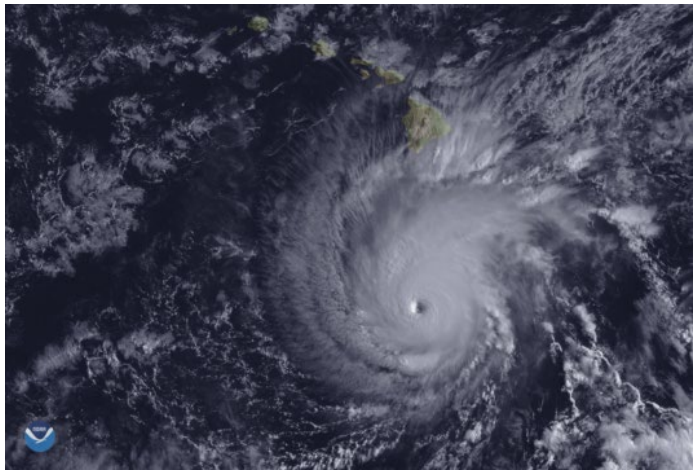
Resilient
Sustainable
Adaptive
Practices

Other Topics in Book

- Garage Doors
- Solar Units
- Trees
- Landscaping
- Energy
- Flooding, Earthquake, Wildfire Best Practices & Retrofits Practices
- Insurance – Property, Wind, Flood

Potential Risk Reduction Benefit From Retrofit

Category 2 strike on Oahu – 2018 Pacific Disaster Center Study using FEMA Hazus Assessment tool – 52,000 homes damaged or destroyed - $25 billion in residential property damage.



From 2010 to 2019 - 80,202 HPT hurricane clips sold. HPT clips can only be used for retrofit!

Retrofitted Single Wall House – used 40 HPT clips

Retrofitted Double Wall House – Used 58 H3 clips and 27 HPT clips

Average 33.5 HPT clips for single wall and double wall houses.

80,202 HPT clips sold / 33.5 clips per house = 2,394 Houses

2,394 houses * 1.25 (other clips could have been used e.g., H3 are cheaper and easier to install, or stronger H1, H10, HM9s) * .75 (not all HPT clips installed) * 1.15 (other retrofit measures, windows, cables – from Hurricane Behavioral Study)

= 2,581 Estimated Number of Houses Retrofitted

2,581 houses / 52,000 * 25 billion in residential damages = 1.27 billion

Approximate 2,500 Homes Retrofitted – Potential Risk Reduction Benefit – over 1 billion dollars.

1. 2,500 homes retrofitted – over 1 billion in Potential Risk Reduction Benefit – Proactive People

2. Importance of education and outreach – have such an impact with very little budget. The low hanging Fruit.

3. Long way to go – 49,500 other houses.

4. How do We Reach Unreceptive/Skeptical – a large part of the population!!

Communication Strategy & Outreach Plan To Prepare the Community for Natural Hazards

A Report to the Legislature on House Bill 571-2017
Proposed by Representative Mark Nakashima

Signed into Law as Act 61 - 2017
By Governor David Ige on June 23, 2017

By

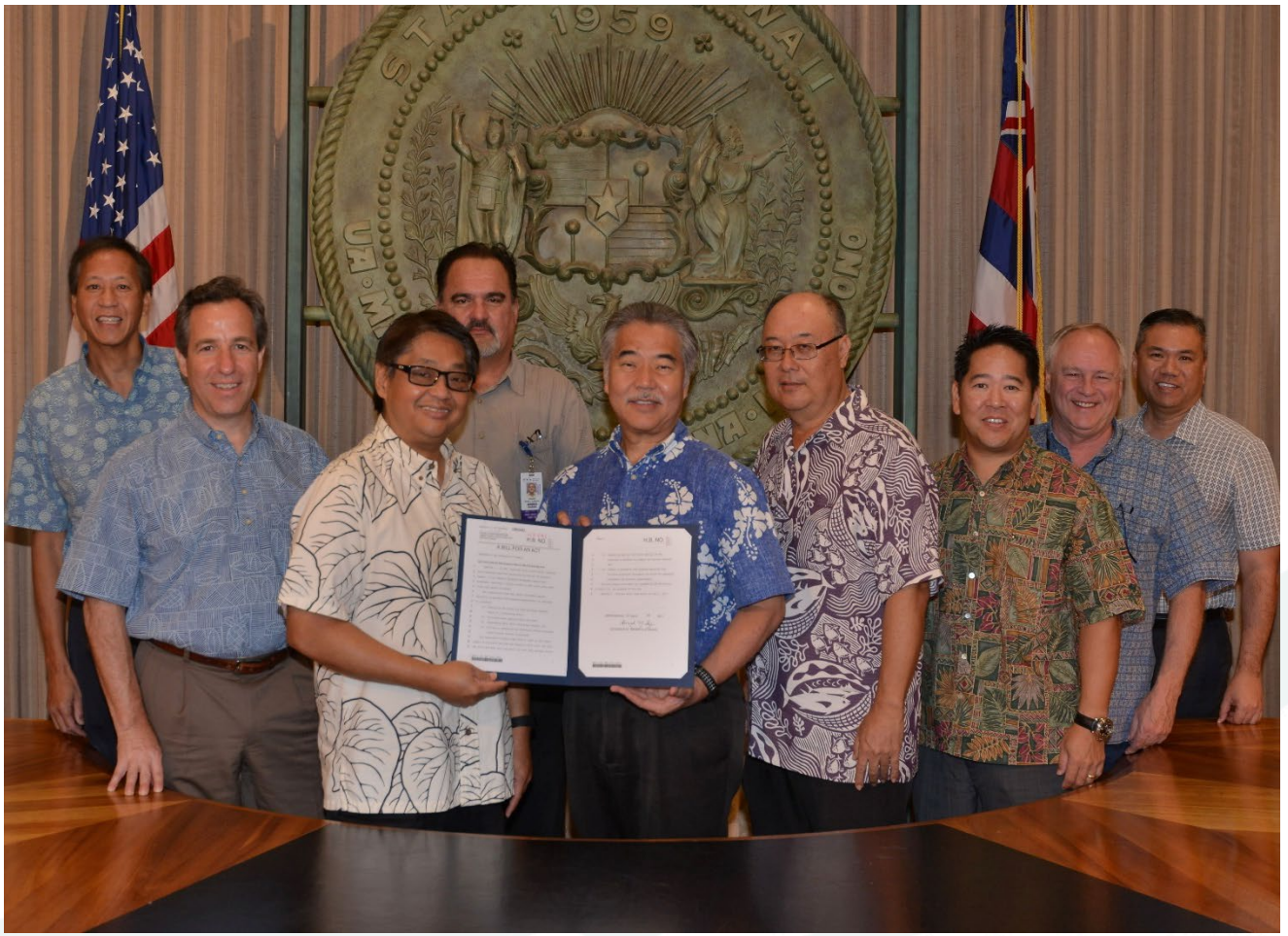
University of Hawai'i Sea Grant College Program
December, 2019

Strategies to Reach the Whole Community

House Bill 571 - Act 61

Signed into Law by Governor Ige On 6/23/2017

Initiated by Rep. Mark Nakashima



House Bill 571 – Act 61

1. Update and Publish Fourth Edition of the Homeowner's Handbook to Prepare for Natural Hazards
2. Conduct Systematic and Targeted Outreach Initiative throughout the State for Emergency Management and Disaster Preparedness.
3. Develop a Communication Strategy (School Education and Community Outreach Plan) for Emergency Management and Disaster Preparedness.

Communication Plan – Informed

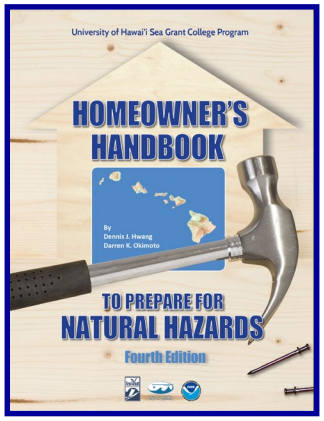
1. Concepts of Social Science
2. Hurricane Behavioral Study – FEMA, USACOE, Hawaii Emergency Management Agency
3. Lessons Learned – Outreach – 2007 to 2019 – over 300 events (seminars, workshops, emergency fairs, presentations, classes, etc.)
4. Interviews – Primarily Emergency Managers

Reaching Whole Community

Target Audiences

Homeowner's
Businesses/Owners*
Government Workers*
Employees/Workforce*
Families*
Elderly*
Children*
Minorities*
Pet Owners*
Renters
Tourists
Injured or infirm
Military families
Disadvantaged or disabled
Other

* Target audiences associated with Homeowner's



&

Target Audiences Based on Behavior

Add Strategies For

Proactive

Citizen Emergency Response Teams (CERT)

Hawaii Hazards Awareness & Resilience Program (HHARP)

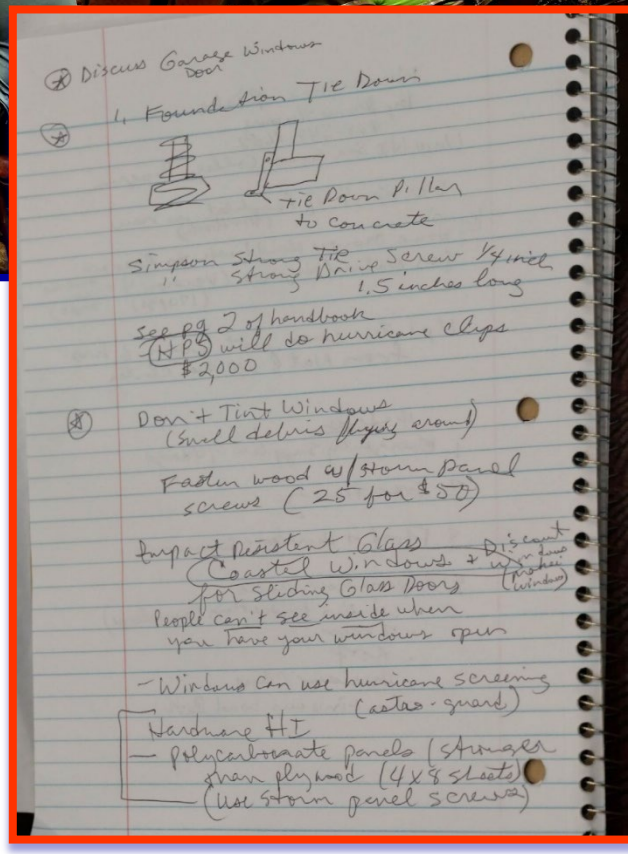
Proactive (2.)

Attend Seminar on Hazard Preparedness and Strengthening Home

Proactive (3.)

BIA Home Show - August 2019

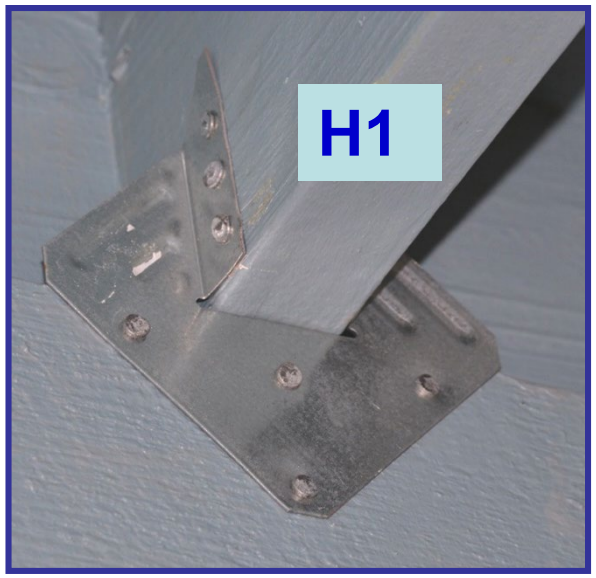
4 attendees taking pictures with smart phone of need to hold wind envelope.



Notes by attendee on foundation upgrade retrofits, adding hurricane clips, window protection options & contractors.

PROACTIVE PEOPLE CAN RECEIVE DETAILED INFORMATION!!!

Proactive (4.)



~2,500 Homes Retrofitted with hurricane clips. Many more with other measures

Protect home and families

University Professor – April 29, 2020 "I am sending you pictures of hurricane clips and window protection that were installed. I never would have known why to do this or how if it were not for the Handbook."

MVP Most Valuable Proactive Homeowner Howard - all retrofits & emergency supplies. If an event, will shelter over 20 family members children, grandchildren. Convinced 25-30 homeowners to retrofit with hurricane clips and window protection.

Receptive – Open to the message if proper setting and materials provided

Unreceptive/Skeptical

1. Does not think event will happen, or not that bad or not worth the time and effort. Too busy.
2. Will not collect Emergency Supplies.
3. Will rush to store during a watch or warning for food, water and gas.
4. Returning items after an event.
5. No hurricane insurance – putting in double jeopardy.
6. No evacuation plan for tsunami vs. hurricane.
7. Do not attend emergency fairs, seminars, workshops.
8. Large part of population

TARGET OF THIS STRATEGY

Communication Strategy
Strategy on Behavioral Characteristics

PROACTIVE – Takes the initiative to learn of risk and prepare.

RECEPTIVE – Open to the message if proper setting and materials provided.

UNRECEPTIVE/SKEPTICAL – Hazard will not happen, or too costly or time consuming to prepare. Will not attend seminars or emergency fairs. No supplies or emergency plans.

ASSISTED (People that need assistance – Sick, Infirm and Disadvantaged)

Detailed Information

Risk Based Message

Modes of Delivery

Handbook Utility

Proactive

Receptive

Unreceptive

Target is Unreceptive – Simple risk-based messages. Provide Hope and Solutions. How do we deliver the message?

1. Mandatory Training

Effective - Mix of Proactive, Receptive and Unreceptive Citizens - Highest Percentage of Attendance

HECO Training on Hazard Preparedness Reaches 500 Workers - One Session for 200 and 3 for 100.

Examples of Mandatory Training

- **University Employees – Title IX Related to Sexual Discrimination**
- **Utilities - Corporate Compliance – Safety training depending on the job. Hazard Preparedness for line workers.**
- **Financial Institutions – Cyber Security**
- **Some Companies – Sherman & Clayton Antitrust; Code of Conduct**
- **Department of Education – Short 14 minute video on tsunami preparation and planning. A similar all hazards video can be created of shorter duration that forms the basis of this strategy.**

If it is important enough, its appropriate. Short session encouraged by policy as a start.

2. Continuing Education Credits

Architects – American Institute Architects
Planners – American Planning Association
Emergency Managers – Int. Assoc. Emergency Managers
Floodplain Managers – Assoc. State Floodplain Managers

National Disaster Preparedness Training Course

2. Continuing Education Credits (Broaden the Scope)

Building Officials, Architects, Engineers

Insurance Agents

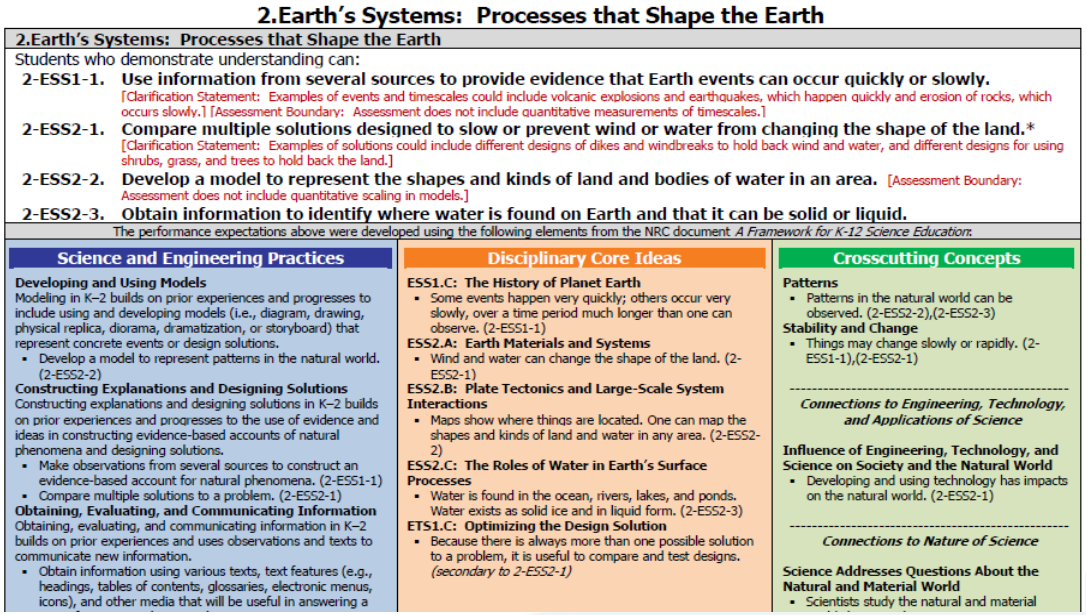
Attorneys, Government

Many Opportunities to increase number of professions offering CEC courses with preparation messages Teachers, Attorneys, Realtors, Health Profession, etc.

3. Public Education

Preliminary Discussion with Department of Education

Interest - Weave Preparation messages into National Science Standards For K-12 with teacher tool kits.



2.Earth's Systems: Processes that Shape the Earth

2.Earth's Systems: Processes that Shape the Earth

Students who demonstrate understanding can:

2-ESS1-1. **Use information from several sources to provide evidence that Earth events can occur quickly or slowly.** [Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.] [Assessment Boundary: Assessment does not include quantitative measurements of timescales.]

2-ESS2-1. **Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.*** [Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.]

2-ESS2-2. **Develop a model to represent the shapes and kinds of land and bodies of water in an area.** [Assessment Boundary: Assessment does not include quantitative scaling in models.]

2-ESS2-3. **Obtain information to identify where water is found on Earth and that it can be solid or liquid.**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.
- Develop a model to represent patterns in the natural world. (2-ESS2-2)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
- Make observations from several sources to construct an evidence-based account for natural phenomena. (2-ESS1-1)
- Compare multiple solutions to a problem. (2-ESS2-1)

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.
- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth
- Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)

ESS2.A: Earth Materials and Systems
- Wind and water can change the shape of the land. (2-ESS2-1)

ESS2.B: Plate Tectonics and Large-Scale System Interactions
- Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2-2)

ESS2.C: The Roles of Water in Earth's Surface Processes
- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)

ETS1.C: Optimizing the Design Solution
- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. *(secondary to 2-ESS2-1)*

Crosscutting Concepts

Patterns
- Patterns in the natural world can be observed. (2-ESS2-2),(2-ESS2-3)

Stability and Change
- Things may change slowly or rapidly. (2-ESS1-1),(2-ESS2-1)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World
- Developing and using technology has impacts on the natural world. (2-ESS2-1)

Connections to Nature of Science

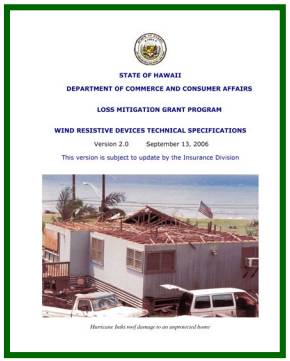
Science Addresses Questions About the Natural and Material World
- Scientists study the natural and material

Reach the student and parents.

If not successful reaching parent at least change culture of preparation through classroom over many years. Sustained education.

4. Financial Incentive Programs

Hawaii – 2006-2008 Loss Mitigation Grant Program – Retrofitted 490 homes


STATE OF HAWAII
DEPARTMENT OF COMMERCE AND CONSUMER AFFAIRS
LOSS MITIGATION GRANT PROGRAM
WIND RESISTIVE DEVICES TECHNICAL SPECIFICATIONS
Version 2.0 September 13, 2006
This version is subject to update by the Insurance Division

Existing Retrofit Programs other States - FIX THE BRICKS Earthquake retrofit Salt Lake City. SOONER SAFE Oklahoma create safe rooms for tornado

Other

- Insurance Discounts for reduced risk
- Property Tax Credits for Safe Rooms
- Real Estate Marketing Incentives

Strategies To Reach Whole Community - Add

1. **Mandatory & Voluntary Training** - Videos of different length – top down strategy as well as bottom up
2. **Continuing Education Credits** – Broaden scope of professions receiving CEC for courses with preparation messages. Initial Targets – Insurance Agents & Realtors. Attorneys, Health Profession and other to follow.
3. **School Education & Community Outreach**
   a) Hazard Risk into K12 National Science Standards with teacher tool kits.
   b) Short video on hurricane/tsunami prep. with current training
4. **Financial Incentives** – tax credits, property tax credits, insurance discounts, retrofit grant programs
5. **Other Programs** – Working with Legislature and other partners. Natural Hazard Center!? Attempts to reach all members of the Community!

Other Important Resources

FEMA Building Science Library

https://www.fema.gov/building-science-publications

National Disaster Preparedness Training Center

https://ndptc.hawaii.edu/

Natural Hazards Center

https://hazards.colorado.edu/

Hawaiian Electric Co. Emergency Preparedness Handbook

https://www.hawaiianelectric.com/safety-and-outages/storm-center/emergency-preparedness-handbook

UH Sea Grant – Homeowner's Handbook – 4th Ed.

https://seagrant.soest.hawaii.edu/homeowners-handbook-to-prepare-for-natural-hazards/

Thank You Everyone & Natural Hazards Center – Stay Safe and PROACTIVE! Hope to work with you in the Future!