

WINDSTORM RESISTANT STRUCTURE DESIGN

Presenters:

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TEXAS DEPARTMENT OF INSURANCE WINDSTORM PROGRAM

- ▶ **A Little about the purpose of TDI – Windstorm program**
 - ▶ Started January 1, 1988
 - ▶ Normalizes Insurance premiums in High Catastrophic areas
- ▶ **TDI Windstorm Program Process**
 - ▶ WPI-1
 - ▶ WPI-2
 - ▶ WPI-8
- ▶ **Updated Submittal Forms – Coming – Be On the Look Out**
- ▶ **Frequently Asked Questions-**
<https://www.tdi.texas.gov/wind/generalquestio.html>



TEXAS DEPARTMENT OF INSURANCE

Regulatory Policy Division - Windstorm Inspections Program (104-WS)
333 Guadalupe, Austin, Texas 78701 * PO Box 149104, Austin, Texas 78714-9104
(800) 248-6032 | TDI.texas.gov | @TexasTDI

PC350 (WPI-1) | 0908



APPLICATION FOR CERTIFICATE OF COMPLIANCE Form WPI-1

Physical Address of Structure to Be Inspected (Complete 9-1-1 Street address including house/building number):
 _____ Tract or Addition _____
 _____ Lot _____ Tract _____
 _____ Block _____
 City _____ Zip Code _____ County _____
 Inside City Limits Outside City Limits
 Structure is located in: Inland II Inland I Seaward
 Is the structure located in a Coastal Barrier Resource Zone (CBRA): Yes No
Owner:
 Name: _____ Telephone No.: _____ Fax No.: _____
 Mailing Address: _____ City: _____ Zip Code: _____
Builder/Contractor (at time of construction):
 Name: _____ Telephone No.: _____ Fax No.: _____
 Mailing Address: _____ City: _____ Zip Code: _____
Engineer:
 Name: _____ Telephone No.: _____ Fax No.: _____
 Mailing Address: _____ City: _____ Zip Code: _____
 E-Mail Address: _____ Texas Registration No.: _____
 Commencement of Construction (date): _____ Date of Application: _____

1. Type of Building:

- Commercial
- Residential Dwelling
- Duplex
- Garage Attached by Breezeway
- Detached Garage
- Condominium (# of Units: _____*)
- Townhouse (# of Units: _____*)
- Apartments (# of Units: _____*)
- * Per Building
- Farm & Ranch
- Metal Building
- Other (Specify): _____

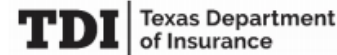
2. Type of Inspection:

- Entire Building (Type): _____
 - Entire Re-Roof (Type): _____
 - Re-decking
 - Partial Re-roof (Type and Area): _____
 - Re-decking
 - Alteration (Type): _____
 - Repair (Type): _____
 - Mechanical Only (Type): _____
 - Foundation Only (Type): _____
 - Addition (Type): _____
 - Retrofit of All Exterior Openings: _____
- (For windborne debris protection only (impact resistant exterior opening products or shutters). All exterior openings shall include windows, doors, garage doors, and skylights.)

Comments: _____

Submitter Information:
 SUBMITTER NAME (please print): _____ DATE: _____
 TELEPHONE NUMBER: _____
 PLEASE CHECK ONE: Owner Builder/Contractor Insurance Agent Engineer Other (Specify) _____

For Texas Department of Insurance Inspections: mail or email to your local field office
For inspections by engineers: mail or email to Austin office: windstorm@tdi.texas.gov



PC436 | 0420

Inspection Verification Form WPI-2 [BC-7]

For ongoing improvements that began construction on or after April 1, 2020

► Instructions

- Print this form and type or print your responses.
- Return this form by email or mail.

Email: windstorm@tdi.texas.gov

Texas Department of Insurance
Windstorm Inspections Program, MC 104-WS
P.O. Box 149104
Austin, TX 78714-9104

► Acknowledgement

I acknowledge that I am a qualified inspector appointed by the commissioner of the Texas Department of Insurance to perform inspections in accordance with Texas Insurance Code Sections 2210.251-2210.258 and with 28 Texas Administrative Code Sections 5.4601-5.4642. I affirm the following:

► Location of structure

_____ Street address (including house or building number)

 City _____ ZIP _____ County _____

► Type of inspection performed

- Entire structure (type): _____
- Entire re-roof (type): _____
- Re-decking: _____
- Partial re-roof (type and area): _____
- Re-decking: _____
- Alteration (type): _____
- Repair (type): _____
- Mechanical only (type): _____
- Foundation only (type): _____
- Addition (type): _____
- *Retrofit of all exterior openings: _____

Comments: _____

MAJOR CHANGES TO WINDSTORM

- ▶ **Wind Maps**
 - ▶ Utilizing higher Ultimate number for windspeed
- ▶ **Protection of Openings**
 - ▶ Corrosion Resistant Fasteners must be permanently attached to the framing
 - ▶ All TDI areas now REQUIRE Window Protection Method
 - ▶ All TDI areas require Window Protection Inspection stage
- ▶ **Roof Coverings**
 - ▶ **Roof Covering Nails**
 - ▶ Plastic or Metal Nail Caps Required
 - ▶ **Roof Covering Inspection**
 - ▶ Roofing Underlayment must now bare the label of approved ASTM rating
 - ▶ ASTM D226 – D1970 – D4869 – D6757



PANELMATE ANCHORS

PanelMate Pro® Anchors in Stalgard & Stainless Steel - Simple and Affordable Hurricane Protection

Suitable for all Concrete, Wood, or Masonry applications



PanelMate® Pro Storm Panel Anchors & Fasteners offer one-time installation – these anchors stay in place, ready for even faster and easier panel mounting as the next storm approaches. Easier and faster than hanger bolts. Suitable for use with all types of Storm Panels and Plywood Panels

PROTECTION OF OPENING FASTENING

PLYLOX CLIPS

Carbon Steel Residential Hurricane Window Clips



Stainless Steel Residential Hurricane Window Clips



PROTECTION OF OPENINGS

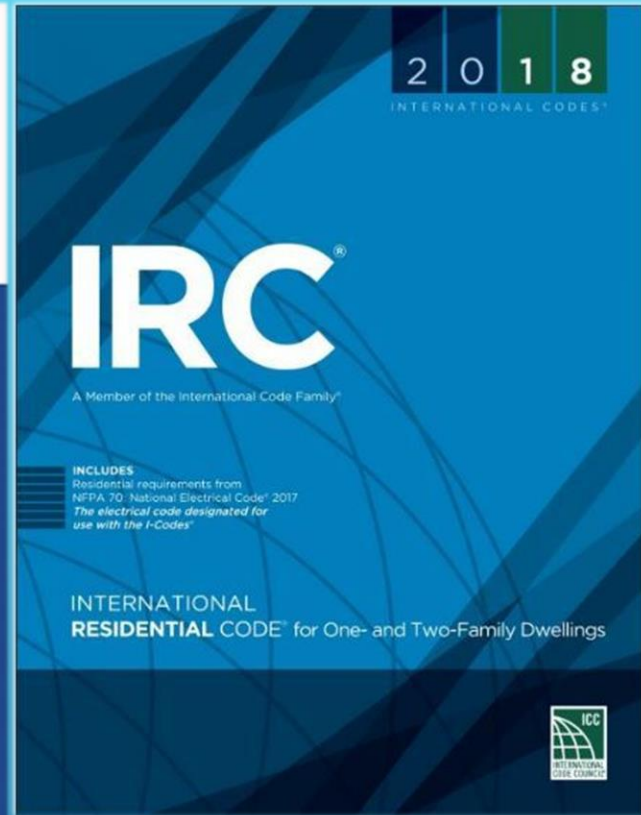


WINDSTORM RESISTANT DESIGN – A BRIEF INTRO

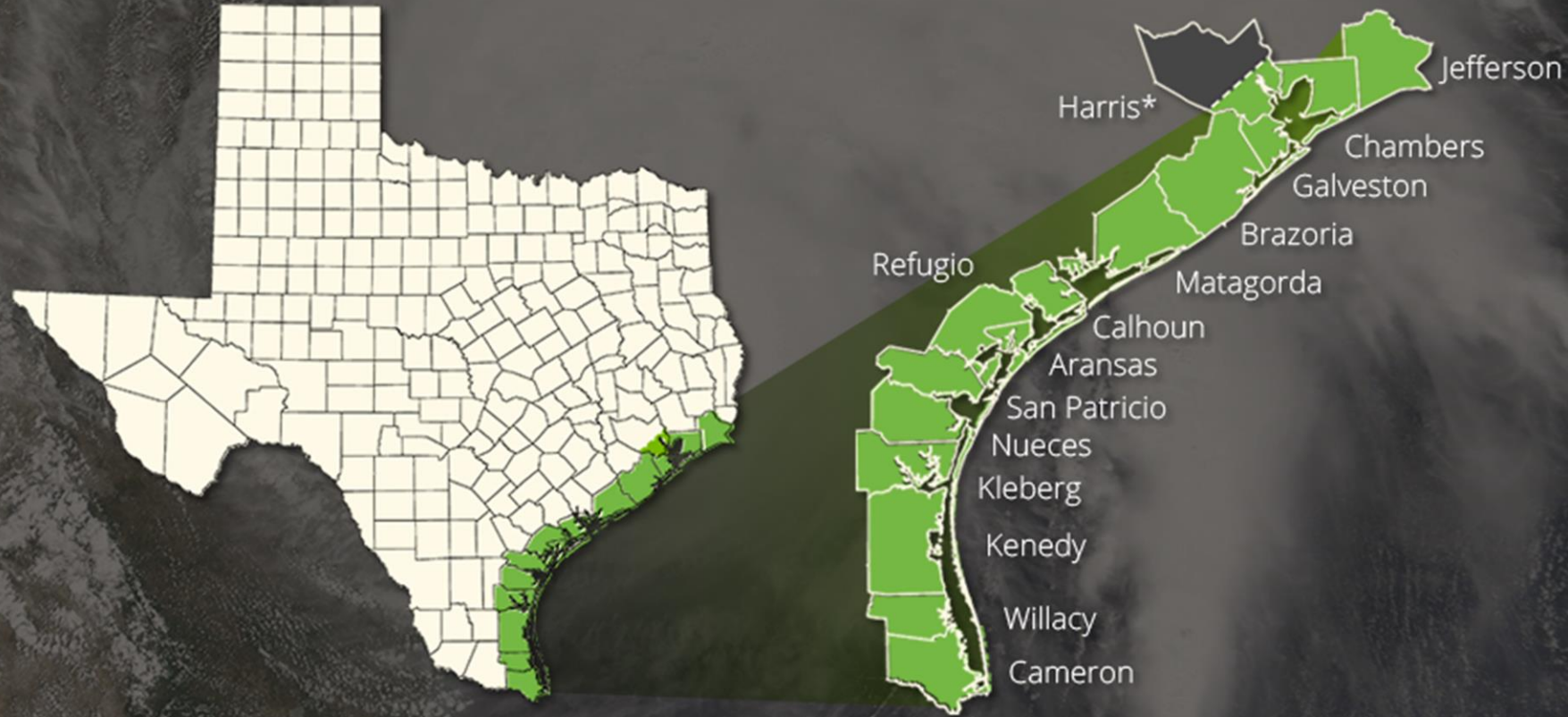
- ▶ American Society of Civil Engineers(ASCE), American National Standards Institute (ANSI) and International Code Council (ICC) decide Minimum design loads.
- ▶ Wind design per IRC limits prescriptive design to structures < 140 mph (ASCE 7-16)
- ▶ Engineered Design for areas where wind speed is expected to exceed the above speeds. Design per ASCE – 7 standard “Minimum Design Loads and Associated Criteria for Buildings and Other Structures” – the latest edition in use is ASCE 7-16

TEXAS DEPARTMENT OF INSURANCE WINDSTORM PROGRAM

- ▶ **Texas Department of Insurance – Windstorm program**
 - ▶ Adoption IRC/IBC 2018 beginning September 1, 2020
 - ▶ Permits and WPI-1 must be in to TDI by September 1, 2020
 - ▶ Applies to new structures constructed, repaired, or added to on or after September 1, 2020
- ▶ **Wind speed (V mph) criteria – what do they mean.**
 - ▶ V under ultimate speed design methods (ASCE 7-16)
 - ▶ Wind Speed maps in ASCE-7-16 categorized per Risk Category
- ▶ **Catastrophe areas per TDI**
 - ▶ Inland I, Inland II, and Seaward Zones will no longer exist under the 2018 TDI code update
 - ▶ TDI designated catastrophe area will not change.
 - ▶ Wind speed within designated catastrophe area to be determined by inspector/engineer using IBC 2018 or code standards referenced in IRC 2018 (ASCE 7-16)
 - ▶ ASCE 7 Hazard Tool
 - ▶ ATC Hazard by Location Tool



TDI | Designated catastrophe area



ASCE 7 HAZARD TOOL



Subscribe

Location

Hitchcock, Texas, ,

Elevation 13 ft with respect to North American Vertical Datum of 1988 (NAVD 88)

Lat: 29.34677

Long: -95.01089

Standard: ASCE/SEI 7-16

Risk Category: II

Soil Class: E - Soft Clay Soil

Wind

Overlay

147 Vmph

DETAILS

FULL REPORT

SUMMARY

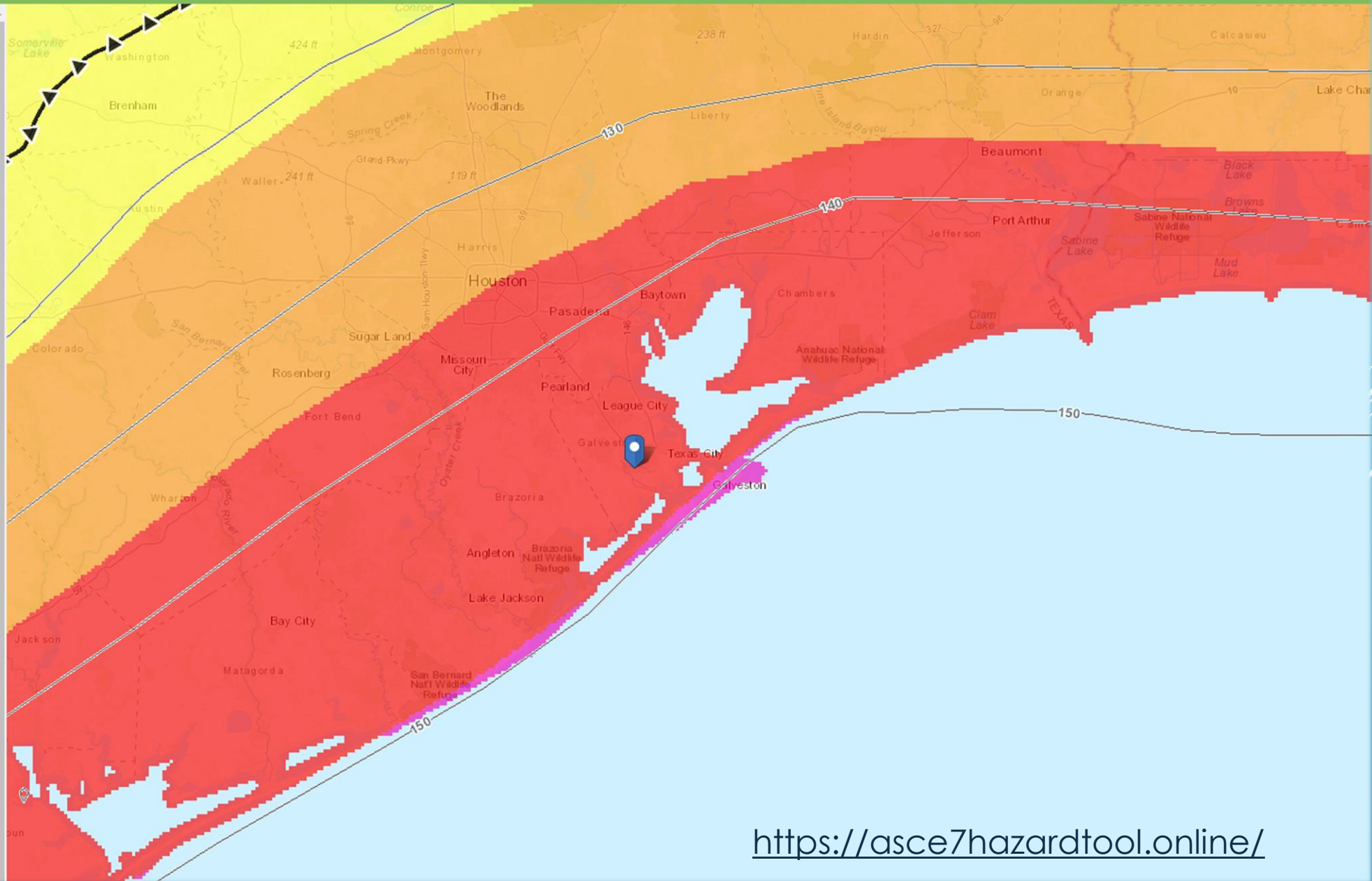
All data are per the requirements of the ASCE/SEI 7 standard; local requirements may vary.



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ASCE 7 Online

A faster, easier way to work with Standard ASCE 7



<https://asce7hazardtool.online/>

Search by Address Search by Coordinate

htichcock TX, USA

Search

Coordinates: 29.3482905, -95.0160368

Wind Snow Tornado Seismic

Print these results

Save these results

ASCE 7-16

Select a dataset to view contours.

MRI 10-Year 79 mph

MRI 25-Year 98 mph

MRI 50-Year 113 mph

MRI 100-Year 124 mph

Risk Category I 138 mph

You are in a wind-borne debris region if you are also within 1 mile of the coastal mean high water line.

Risk Category II 147 mph

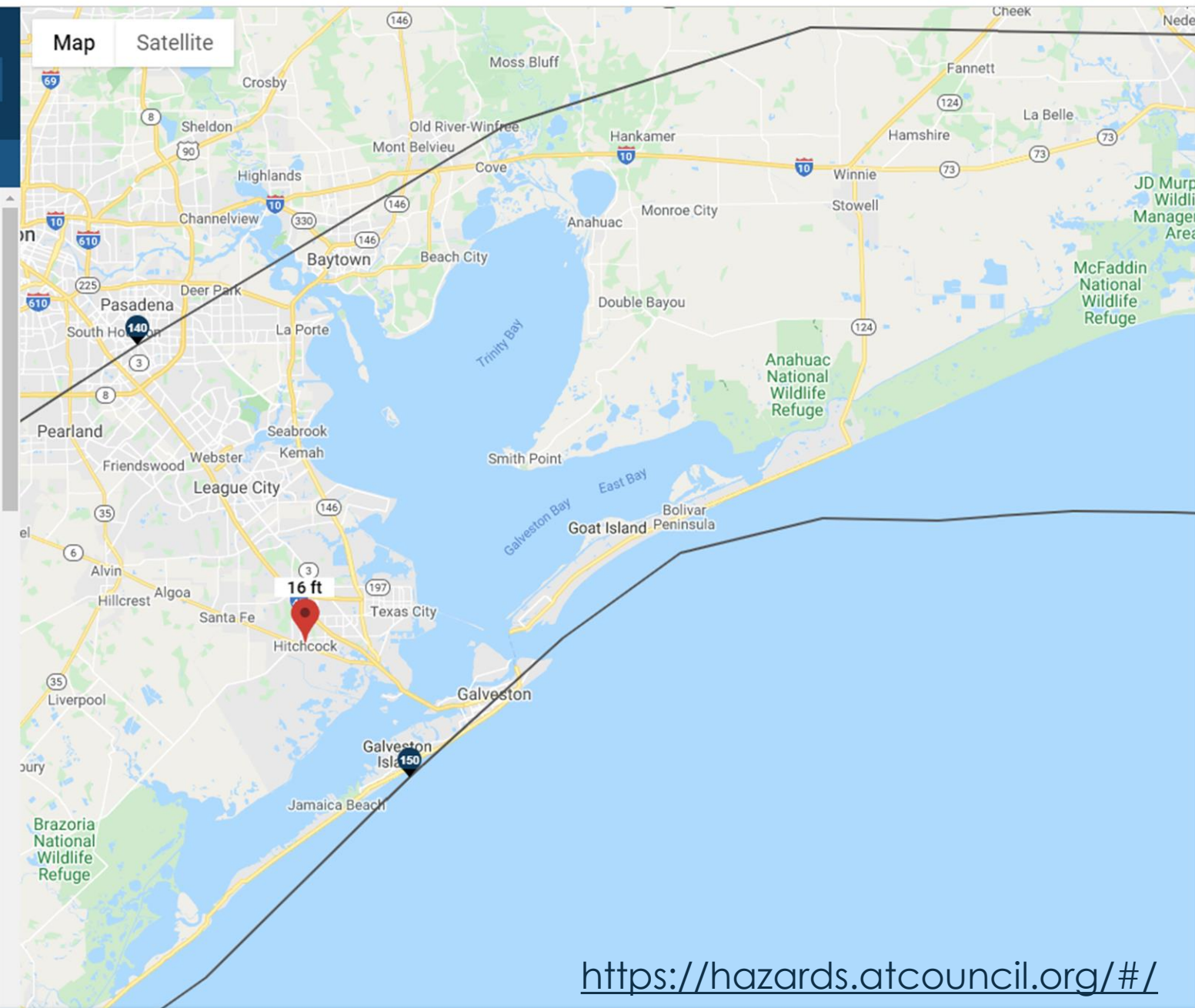
You are in a wind-borne debris region.

Risk Category III 157 mph

If the structure under consideration is a healthcare facility and you are also within 1 mile of the coastal mean high water line, you are in a wind-borne debris region. If other occupancy, use the Risk Category II basic wind speed contours to determine if you are in a wind-borne debris region.

Risk Category IV 164 mph


You are in a wind-borne debris region.



WIND LOAD TRANSFER

- Wind pressure is collected by roof and walls
- Wind pressures are distributed into diaphragms at roof and floors
- Diaphragms transfer loads to shear walls, portal frames, etc.
- Shear walls transfer loads to the foundation parallel to their planes

CALCULATING LOADS ON STRUCTURES

- Determine wind pressures for roof and wall (s)
 - Convert the pressures to loads base on tributary areas
 - Distribute loads to wall brace lines for shear wall design
 - Reduce loads as allowed per code to determine anchoring
- 
- A decorative graphic consisting of several parallel white lines of varying lengths and orientations, located in the bottom right corner of the slide.

SHEAR WALLS



1ST TO 2ND FLOOR CONNECTIONS

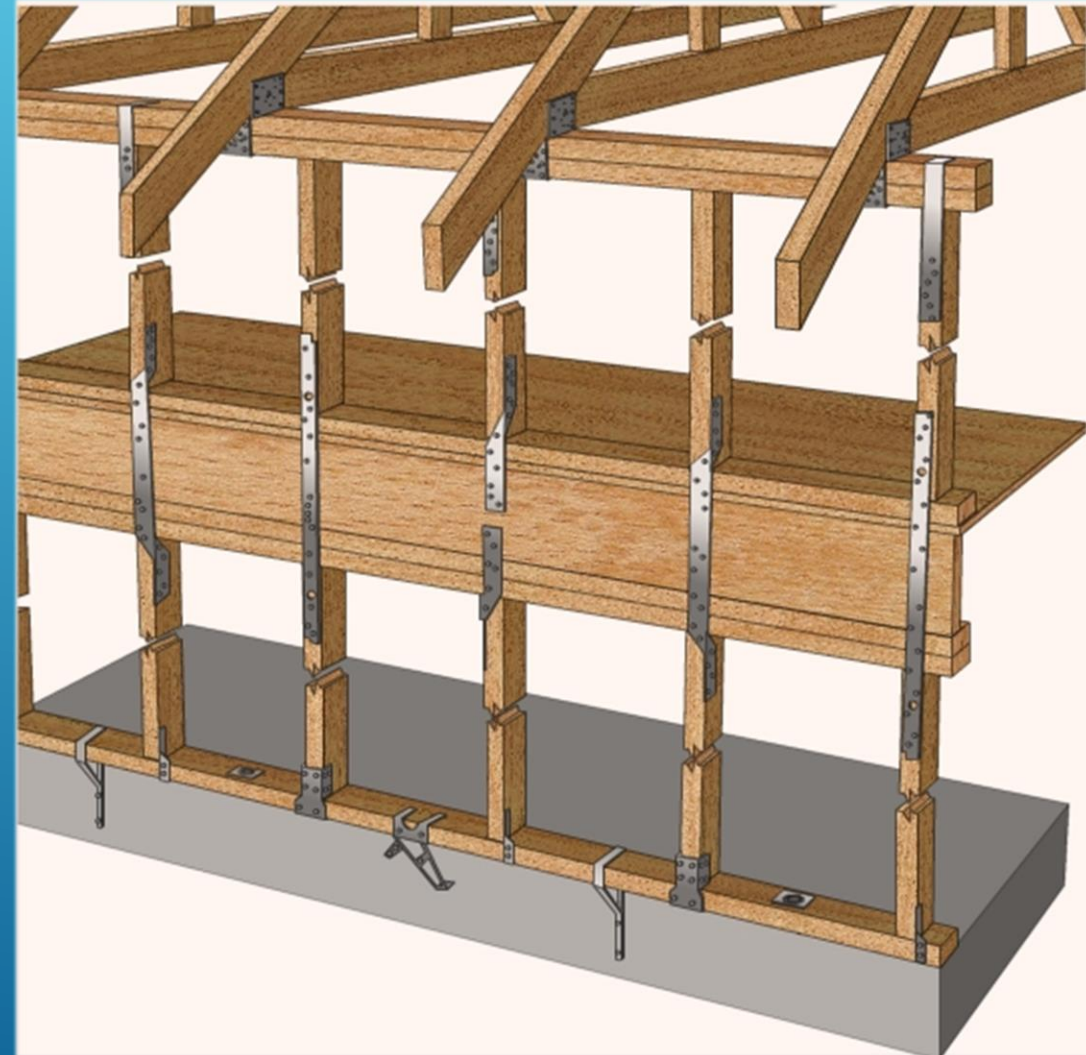


BLOCKED SHEAR WALL AT EDGE

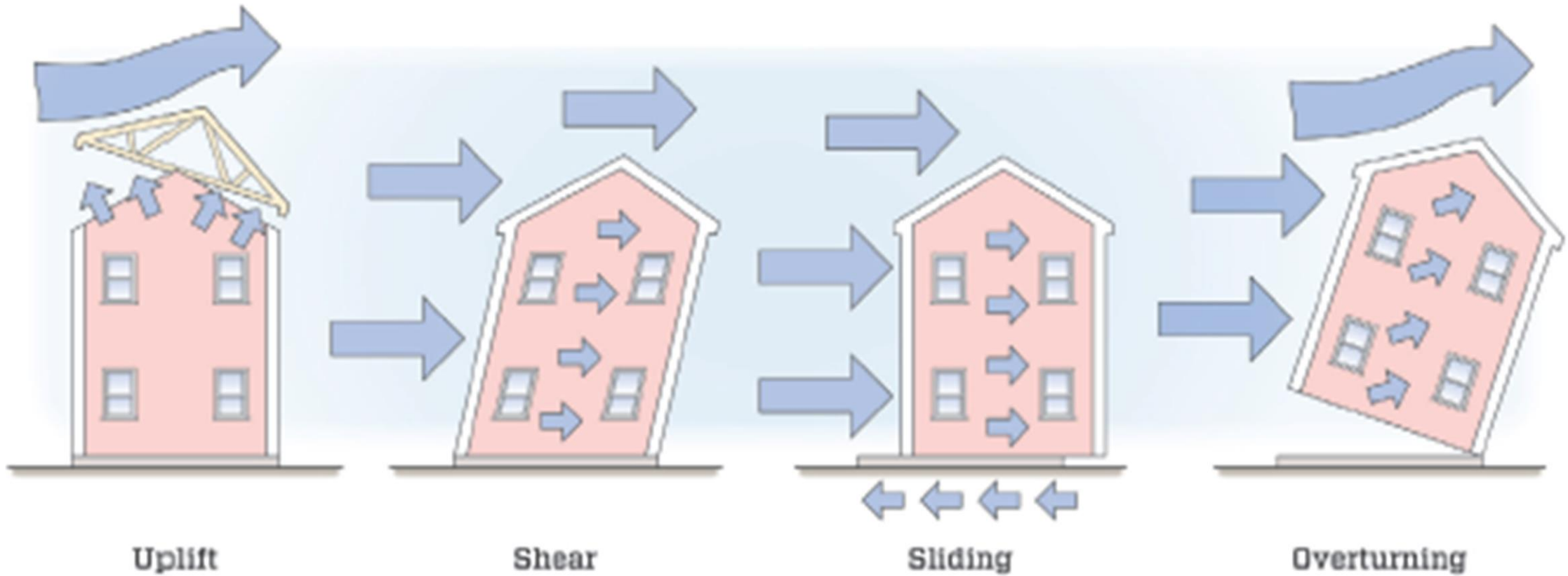


CONTINUOUS LOAD PATH CONNECTIONS

- Roof to Walls
- Wall to Floor
- Wall to Wall
- Floor to Sill Plate
- Sill Plate to Foundation



Wind Effects



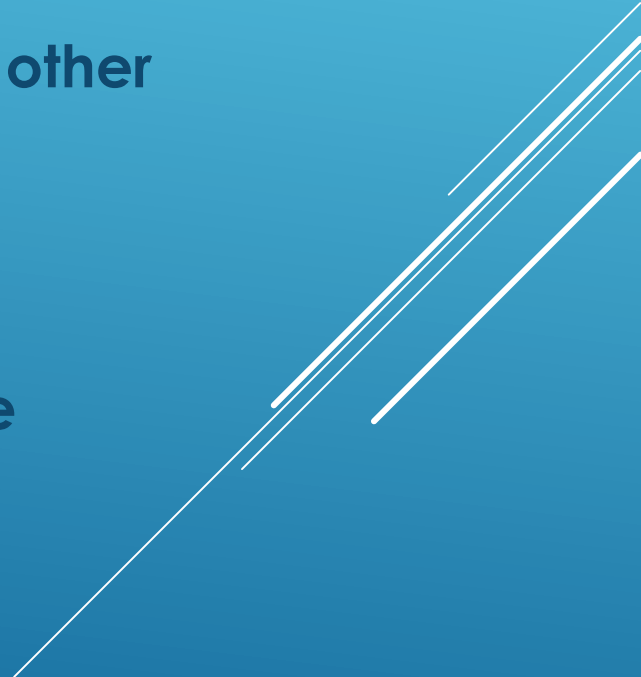
- Clips & Straps
- Sill Anchors

- Shear Walls
- Portal Frames

- Sill Anchors
- Shear Plates

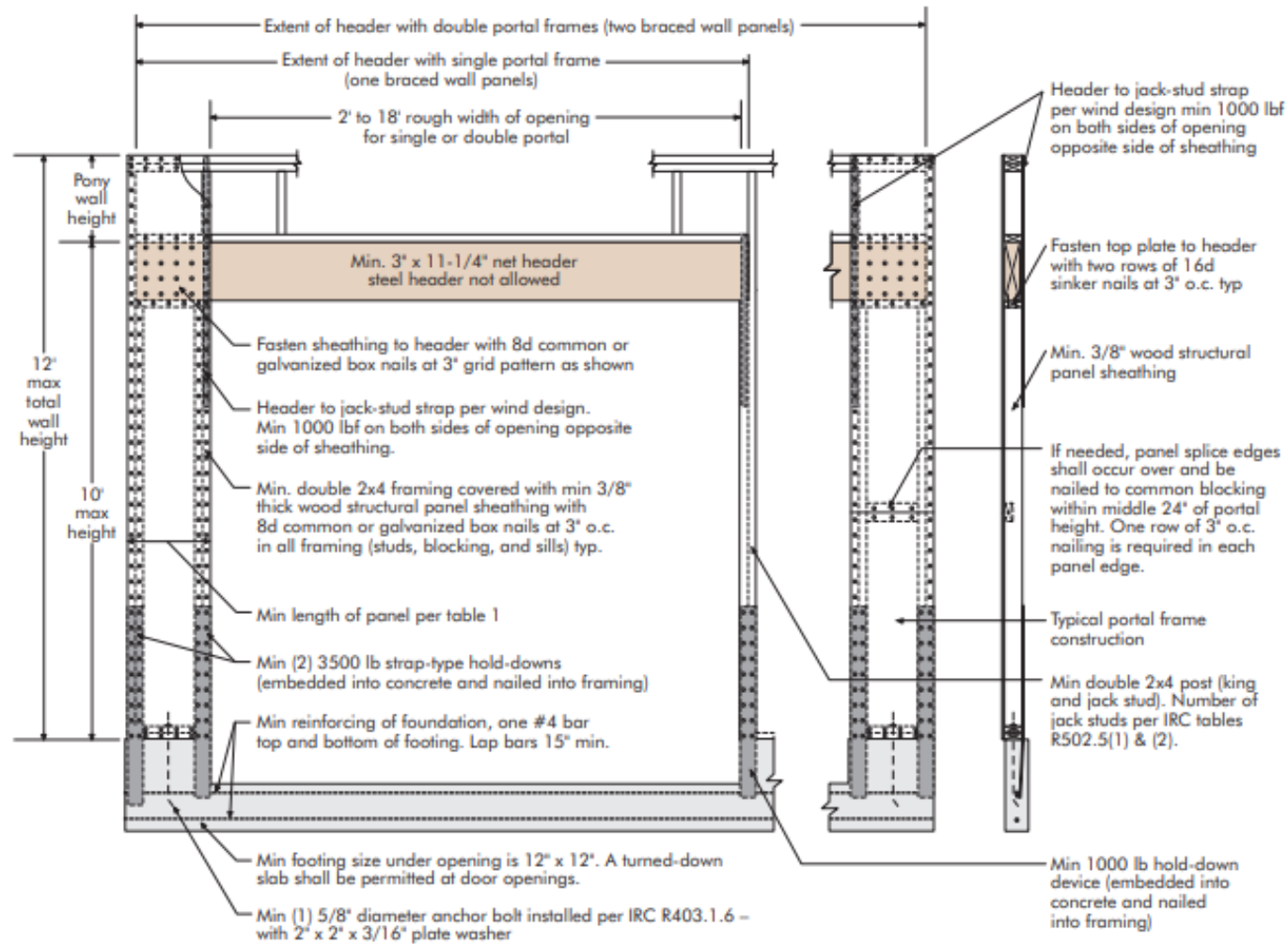
- Hold downs

DESIGN FEATURES

- ▶ **Portal Frames:** Tested assemblies with empirical data. Since these are not calculated wall components, constructing them exactly per the details published by American Plywood Association (APA) TT-100 for High wind areas and IRC for other areas inland.
 - ▶ **Sheathing options**
 - ▶ **Bay Windows:** Presence of bay windows introduces a discontinuity in the wall. May be a problem for resistance elements.
- 

PORTAL FRAME DETAIL

Figure 1. Construction Details for APA Portal-Frame Design with Hold Downs



GARAGE PORTAL FRAME CONSTRUCTION



DESIGN FEATURES THAT MAY IMPROVE QUALITY AND COST

- ▶ **Windows:** Perhaps the one important and most prevalent feature of any home are the windows. Using Transoms, Window filled walls etc. add to the complexity of the Wind resistance design.
- ▶ **Steep roofs:** Although sometime the roof is part of the aesthetic appeal of the house, shallower roofs allow for less complex windstorm designs.
- ▶ **Slab on Grade Design Vs Pier / beam or Piling design:** This may not be an option in some coastal areas, but the cost increase is a factor to remember when planning a project.
- ▶ **Steel or no Steel:** Sometimes having Steel frames to resist wind forces may not be all bad considering the flexibility in other aspects that can be achieved.

INSPECTION PROCESS AND TDI REQUIREMENTS

- ▶ **Inspections should typically include:**
 - ▶ Clips, straps and shear walls
 - ▶ Roof decking and shingles
 - ▶ Siding, brick, stucco and other façade
 - ▶ Windows and doors (pressures and installation)
 - ▶ Fastening of A/C units, Garage door pressures and installation and provision for protection of openings (plywood/shutters etc.)
- ▶ Inspections must be performed in a sequence so as not to miss any inspections.
- ▶ Foundation inspection to ascertain the adequacy of foundations for uplift resistance.

INSPECTION PROCESS AND TDI REQUIREMENTS

- ▶ **Why are Windows and Doors inspections important?**
 - ▶ The basic model assumes completely enclosed buildings, which means all the windows and doors should be able to withstand wind pressure and not allow the wind to come into the structure there by causing uplift forces on the roof and lateral push out on the walls.
 - ▶ In hurricane prone zones, flying debris can break the glazing and produce openings for wind to enter the house and damage roofs and walls. Therefore, in High debris areas the use of impact resistant windows recommended.
 - ▶ Garage doors are the single largest opening in the house. If they fail / buckle wind can cause damage to the walls and the roof.

Wind Load Failure Example



Garage door turned inside out!

SIMPSON MUD SILL 18" OC



GARAGE RETURN STHD 14



HTT - 16



SOLID STUD CORNER W/ STHD 14



HEADER STRAPPING





PURLIN TO JOIST

SHEAR WALL BLOCKING





COMPONENTS AND CLADDING

- ▶ TDI Design Features utilizing New IRC 2018 code
- ▶ Cladding: What are components and cladding.
 - ▶ Windows, Doors, Siding, Brick, Shingles, Tile etc
- ▶ TDI approved components and cladding only?!
- ▶ More about this topic from
Doug Klopfenstein Sr.

QUESTIONS ?