Blueprint for Safety™ Program

RETROFIT

BLUEPRINT FOR SAFETY™

Mike Rimoldi

FLASH inc.
FEDERAL ALLIANCE FOR SAFE HOMES

What is FLASH?

- Non-profit, charitable organization dedicated to promoting disaster safety.
- Education oriented.
  - Consumer Awareness
  - Builder Education
- FLASH founding members include:
  - American Red Cross
  - FEMA
  - Department of Community Affairs
  - and private insurance companies like
  - Nationwide, State Farm, First Floridian and USAA

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Austin College International Code Council Central U.S. Earthquake Consortium Texas Tech Wind Science and Engineering Research Center American Red Cross American Society of Home Inspectors Citigroup FEMA Firewise Institute for Business and Home Safety National Roofing Contractors Association National Weather Service Nationwide Neighborworks Insurance Alliance State farm Insurance Companies The Home Depot The Home Depot Foundation The Salvation Army St. Paul Travelers USAA Alabama Department of Insurance Building Officials Association of Florida Citizens Property Insurance Corporation Disaster Contractors Network First Floridian Florida Department of Community Affairs Florida Department of Environmental Protection Florida Department of Financial Services Florida Division of Forestry Florida Emergency Preparedness Association Florida Fire Chiefs Association Florida Insurance Council Florida Select Georgia Department of Insurance Georgia Emergency Management Agency Independent Insurance Agents of Texas Kentucky Division of Emergency Management Kentucky Office of Insurance Kentucky Weather Preparedness Committee New Jersey Office of Emergency Management New York State Insurance Department North Carolina Department of Insurance Texas Department of Insurance Texas Department of Public Safety Virginia Bureau of Insurance Virginia Department of Emergency Management Volunteer Florida West Virginia Insurance Commission Brevard Prepares City of Deerfield Beach Duval Prepares Hernando County Emergency Management Home Builders Association of Greater Dallas Miami-Dade Emergency Management Tulsa Partners Volusia Prepares Walter A. Bell Alabama Insurance Commissioner Jane L. Cline West Virginia Insurance Commissioner Ernie Fletcher Kentucky Governor Alex Sink Florida Chief Financial Officer Alfred W. Gross Virginia Insurance Commissioner Glen Jennings Kentucky Executive Director Office of Insurance North Carolina Commissioner of Insurance Jose Montemayor Texas Commissioner of Insurance John W. Oxendine Georgia Insurance and Fire Safety Commissioner Mike Pickens Arkansas Insurance Commissioner Gregory V. Serio New York State Insurance Superintendent Apalachee regional Planning Council Rocky Mountain Insurance Information Service Southwest Insurance Information Service Tampa Bay Regional Planning Council PGT Industries Simpson Strong Tie Smart Vent Ventilated Awnings Wayne Dalton

What is Blueprint for Safety?

- The most comprehensive set of disaster-resistant building techniques available in Florida today
- Techniques recommended will protect both new and existing homes.

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What is Blueprint for Safety?

- Offers recommendations and examples of “Code Plus” construction techniques

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Blueprint for Safety™ Goals

- Provide builders, citizens and the technical community accurate, current and reliable information about disaster-resistant building practices.
- Contractors field manual supports this by offering information on how to build, remodel, or restore homes using disaster resistant technologies and products

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Blueprint for Safety™ Audience

- Contractors and home builders
- Code officials
- Engineers and architects
- Consumers

Educational Courses:

- Course material available on internet.

www.BlueprintForSafety.org

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Blueprint for Safety™ Program
Wind - Retrofit

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Why Promote “Code Plus” Disaster Reduction Techniques for Existing Homes?

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Construction Can Make A Difference!

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Why Promote "Code Plus" Construction?

- Protection of home contents and valuables
- High level of storm protection
- Sheltering in place is a safer and more convenient alternative to evacuation for non-mandatory evacuations
- Pets
- Peace of mind

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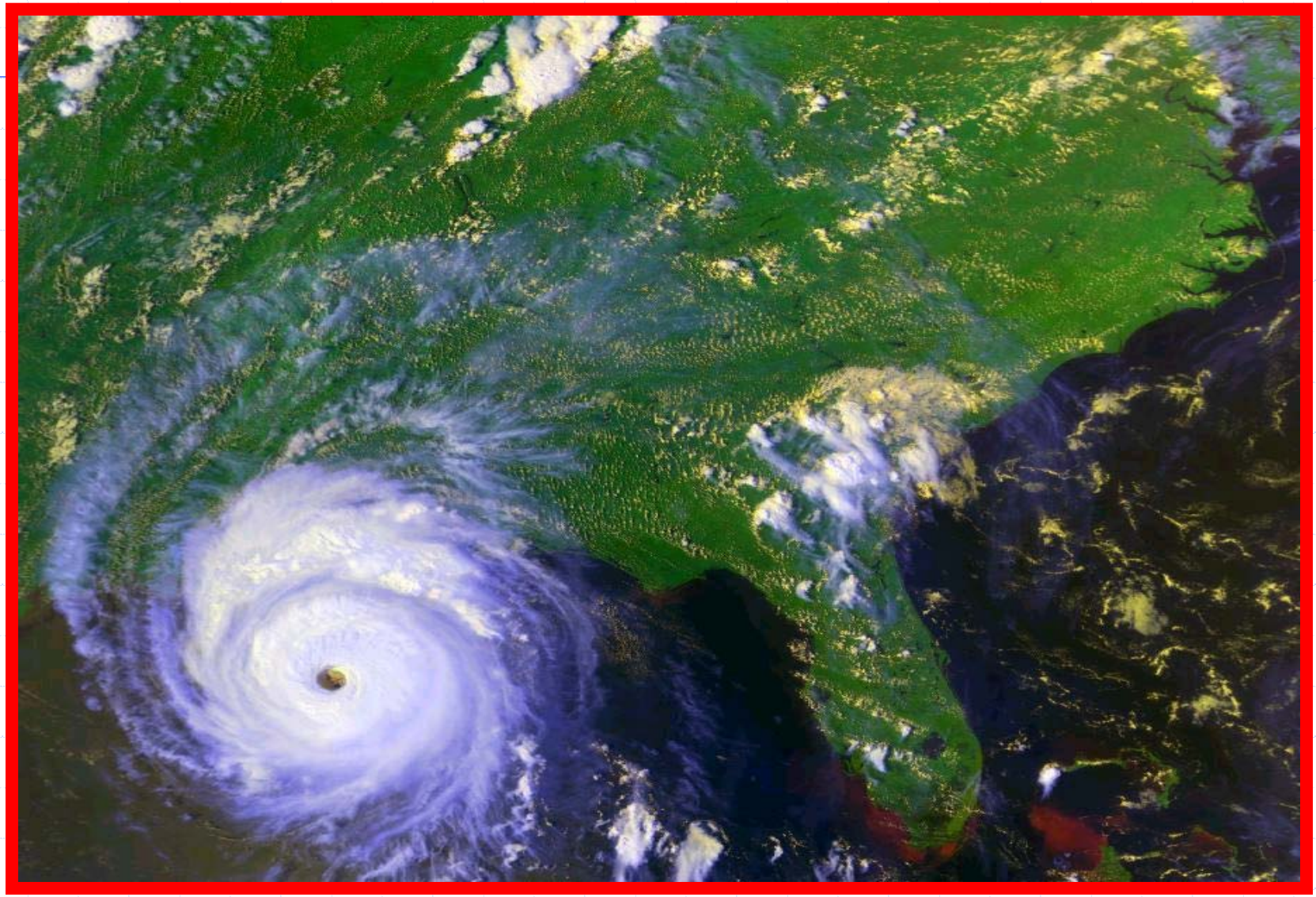
Wind Basics



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Factors Affecting Wind Flow and Forces on a Structure

- Variation with Height
- Surrounding Topography (Exposure)
- Aerodynamic Effects
  - Drag
  - Gusts
  - Turbulence
  - Buffeting, Vortex Shedding, Galloping, Flutter

Variation of Wind Speed with Height

- Ground obstructions retard the flow of air close to the ground
- The height at which flow of air is no longer affected is called the gradient height.
- The rate of increase in wind speed with height is a function of the terrain features.
- Exposures defined – A,B,C, and D (2007 revisions)

Determination of Wind Forces: Exposure Categories

- **Exposure A** - Large city centers
- **Exposures B and C** - Adequately reflect the characteristics of ground surface irregularities except along the shores of large lakes.
- **Exposure D** - Revised 2007, to state "This exposure is not applicable in Florida."

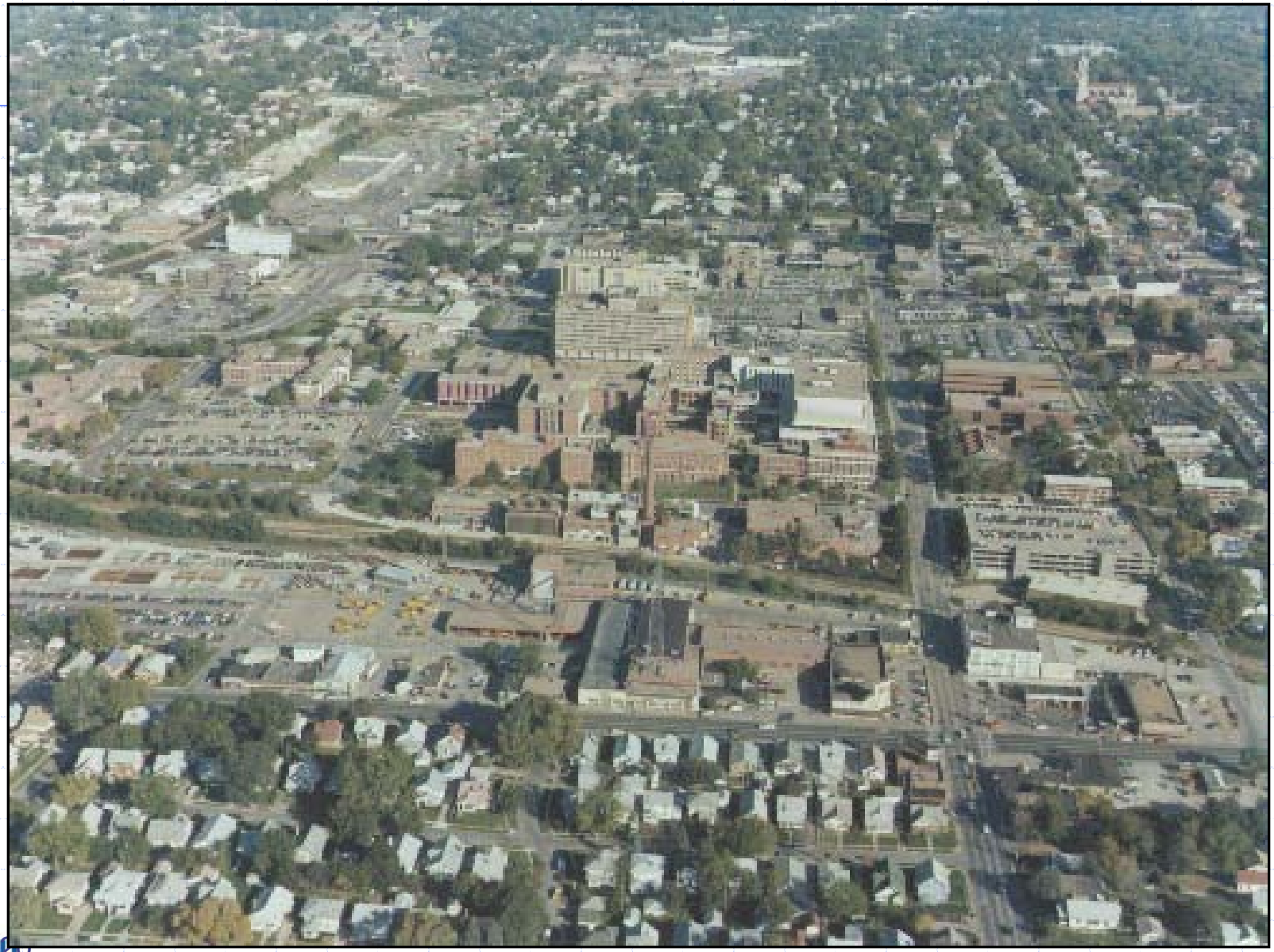
Exposure Category
FBC-Building and Residential

- For each wind direction considered, an exposure category that adequately reflects the characteristics of ground surface irregularities shall be determined for the site at which the building or structure is to be constructed. For a site located in the transition zone between categories, the category resulting in the largest wind forces shall apply.
- Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features. For any given wind direction, the exposure in which a specific building or other structure is sited shall be assessed as being one of the following categories:

Exposure B

- Exposure B shall apply where the ground surface roughness condition, as defined by Surface Roughness B, prevails in the upwind direction for a distance of at least 2,600 feet (792 m) or 20 times the height of the building, whichever is greater.
  - Exception: For buildings whose mean roof height is less than or equal to 30 feet (9144 mm), the upwind distance is permitted to be reduced to 1,500 feet (457 m).
- Surface Roughness B. Urban and suburban areas, wooded areas or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.

Exposure B



Exposure C

- Exposure C shall apply for all cases where Exposure B does not apply.
  - Revised to clarify the effect of open patches.
  - Supplemental changes based on the 2007 revisions.

Surface Roughness C

- Open terrain with scattered obstructions having heights generally less than 30 feet (9144 mm). This category includes flat open country, grasslands, and all water surfaces in hurricane-prone regions.
- This surface roughness shall also apply to any building located within surface roughness B-type terrain where the building is within 100 feet horizontally in any direction of open areas of surface roughness C-type terrain that extends more than 600 feet (182.9 m) and width greater than 150 ft. in the upwind direction.

Surface Roughness C

- Short-term (less than two year) changes in the pre-existing terrain exposure, for the purposes of development, shall not be considered surface roughness C.
- Where development build-out will occur within three years and the resultant condition will meet the definition of surface roughness B, surface roughness B shall be regulating for the purpose of permitting.

- This category includes flat open country, grasslands and ocean or gulf shorelines and shall extend downwind for a distance of 1500 feet.

Exposure C

Exposure B and maybe C?

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Exposure Categories...why?

Pressure Comparisons: Windows, Doors, etc.

Design Wind Speed	Exposure B		Exposure C	
	Enclosed	Partially Enclosed	Enclosed	Partially Enclosed
90	-19.5		-27.3	
100	-24.1		-33.7	
110	-29.1	-36.0	-40.8	-50.3
120	-34.7	-42.8	-48.5	-59.9
130	-40.7	-50.2	-56.9	-70.3
140	-47.2	-58.3	-66	-81.5
150	-54.2	-66.9	-75.8	-93.6

Calculated in accordance with ASCE 7-98; Exposure B; Zone 5; Enclosed Structure; Roof Slope 10^0 to 30^0 (2:12 to 7:12) Effective Wind Area = 10 SF

Aerodynamic Effects

- Windward wall experiences inward (positive) acting pressures
- Leeward and side walls experience outward (negative) acting pressures
- Windward roof experiences inward or outward acting pressures depending on roof slope
- Leeward roof experiences outward acting pressures

Aerodynamic Effects

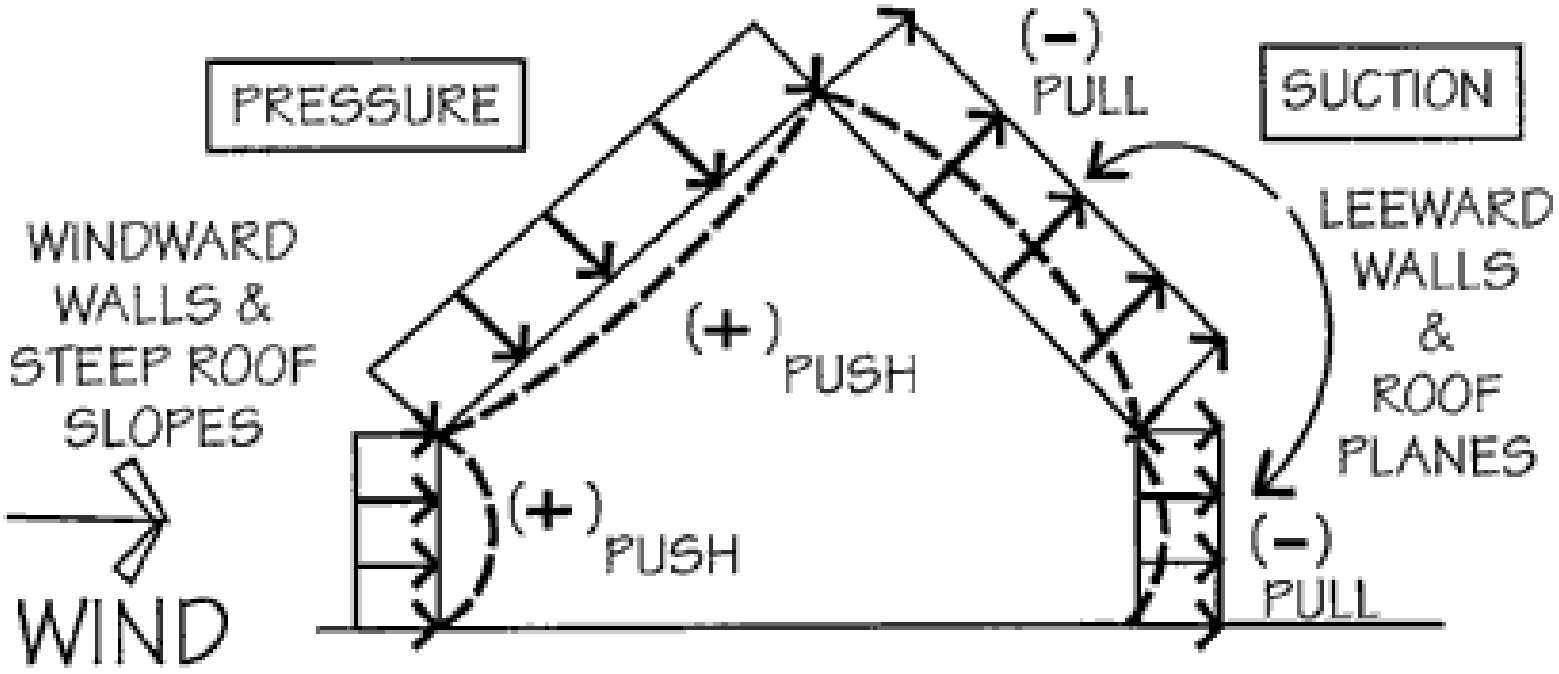
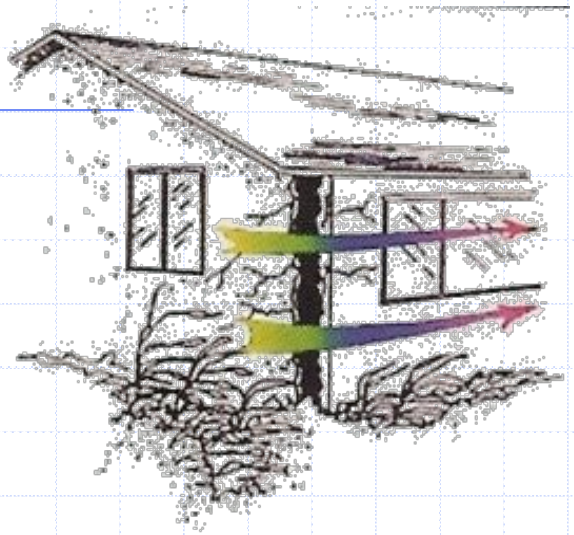
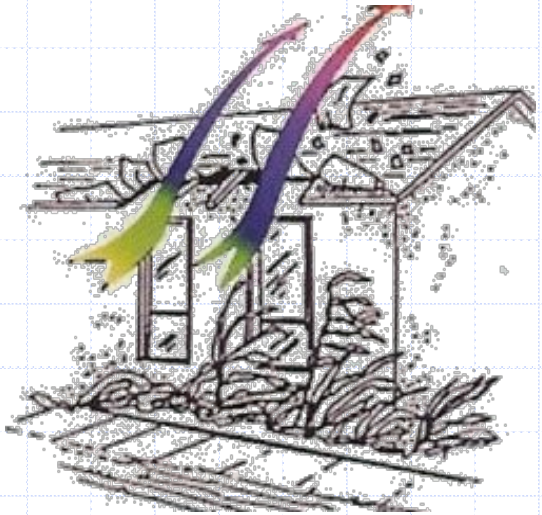


Fig.1 - PRESSURE VS. SUCTION

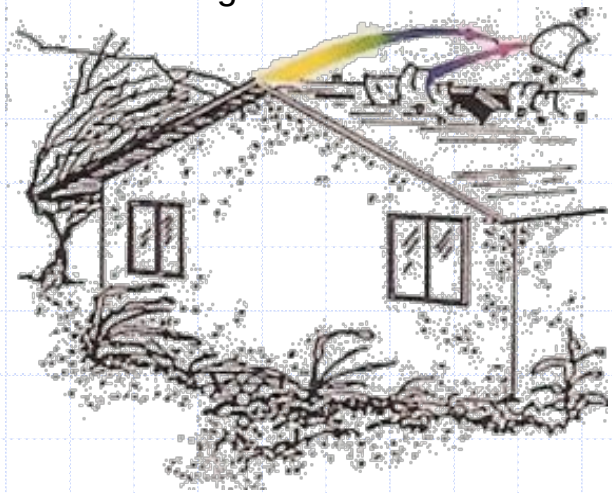
Localized High Pressures



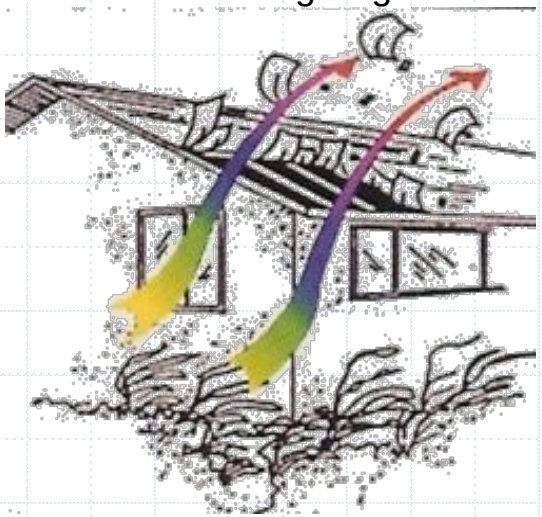
Building Corners Zone 5



Roof Overhang Edge Zone 2



Roof Ridge Zone 2



Roof Corners Zone 3

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Basic Wind Speeds

- 3 second gusts = New Building Codes
- Fastest-mile = Old Building Codes
- Sustained = Hurricane Category Classification

Basic Wind Speed

- Previous editions of ASCE 7 and the Standard Building Code use the Fastest-Mile Wind Speed Map.

- A fastest mile is defined as the average speed of one mile of air passing an anemometer.

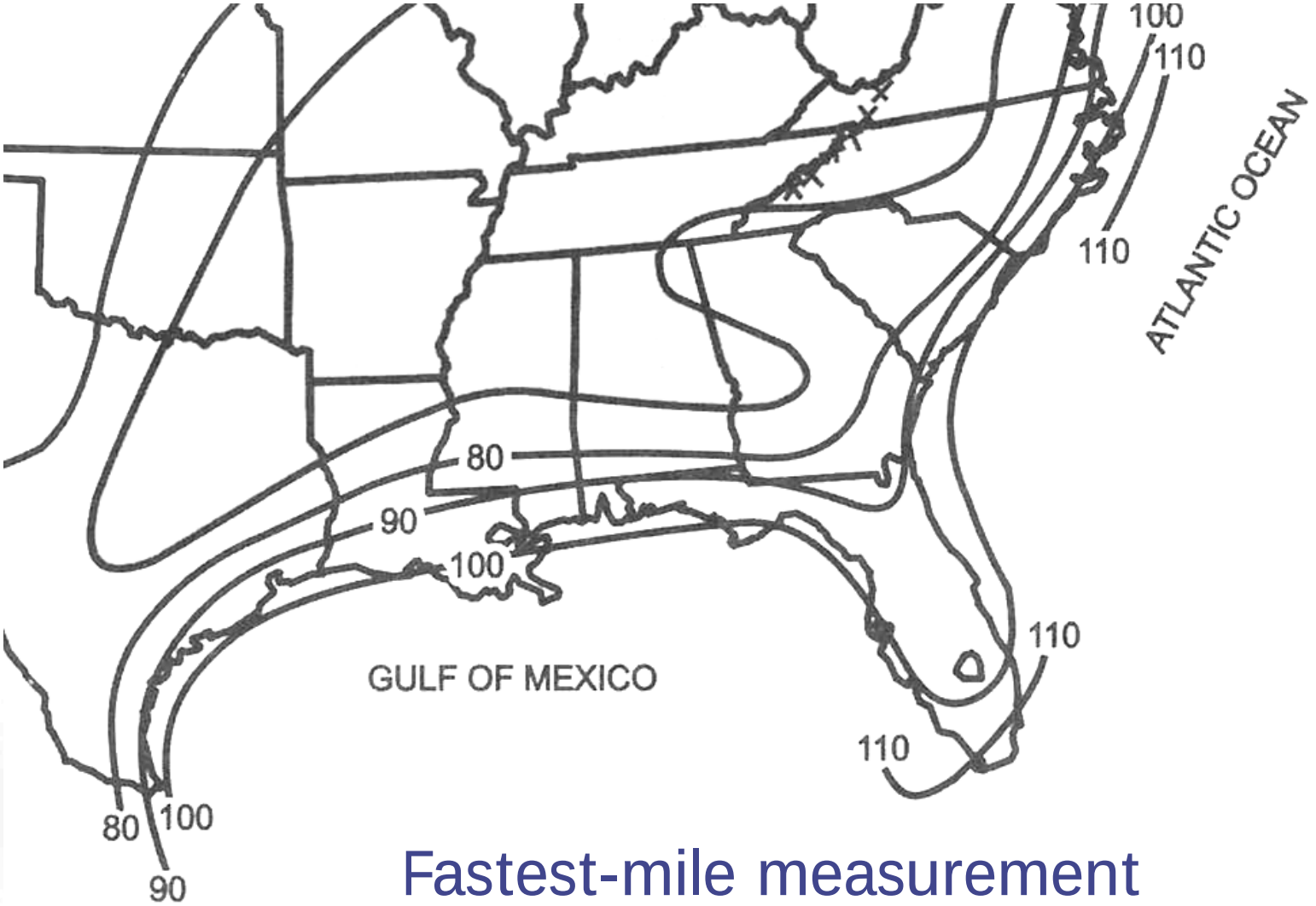
Basic Wind Speed

- Since some referenced standards are based on the fastest-mile map, the Florida Building Code contains a table for converting fastest-mile wind speeds to 3-sec gusts.
- 2007 FBC 1609.3.1

TABLE 1609.3.1
EQUIVALENT BASIC WIND SPEEDS

V3S (3 second gust)	85	90	100	105	110	120	125	130	140	145	150	160	170
Vfm (Fastest mile)	71	76	85	90	95	104	109	114	123	128	133	142	152

Old Basic Wind Speed Map
(prior to 1995)

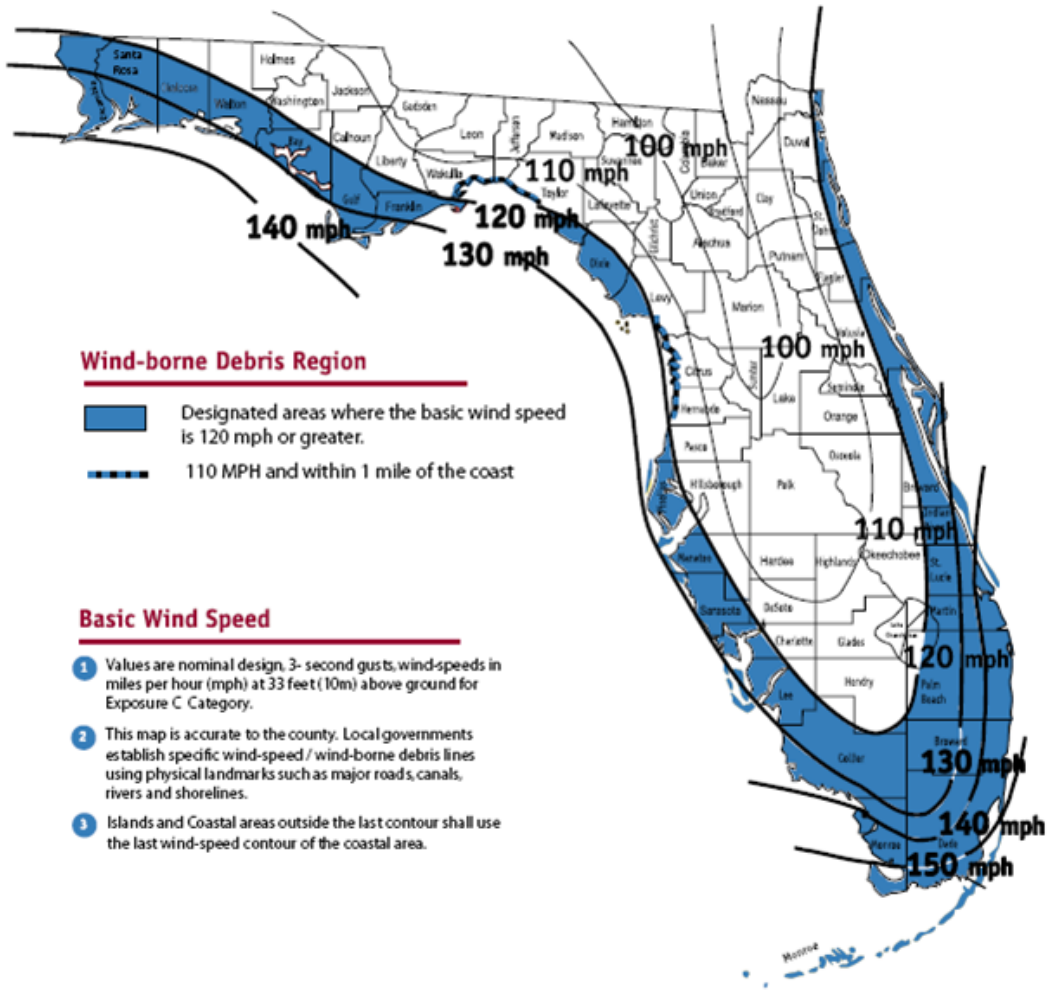


Fastest-mile measurement

As Amended by Law cs /HB 1A - 2007

State of Florida

Wind-Borne Debris Region



Wind-borne Debris Region

Designated areas where the basic wind speed is 120 mph or greater.

110 MPH and within 1 mile of the coast

Basic Wind Speed

1. Values are nominal design, 3- second gusts, wind-speeds in miles per hour (mph) at 33 feet (10m) above ground for Exposure C Category.
2. This map is accurate to the county. Local governments establish specific wind-speed / wind-borne debris lines using physical landmarks such as major roads, canals, rivers and shorelines.
3. Islands and Coastal areas outside the last contour shall use the last wind-speed contour of the coastal area.

www.florida building.org

Basic Wind Speed

- It's important to note that the wind speeds in the 3-sec gust map are not conversions from the fastest mile map.
- The wind speed conversions provide equivalent speeds based on averaging times.
- The equivalent wind **speeds** do not necessarily provide equivalent wind **pressures.**

Wind Speed Comparisons

Category	Wind Speed Over Water			
	Saffir-Simpson Wind speed (1 min)	Building Code Wind speed (3 sec)	SBC-97 Wind speed (fastest mile)	Storm Surge (feet)
1	74 – 95	94 – 121	74 –101	4 – 5
2	96 –110	122 – 140	102 –120	6 – 8
3	111 –130	141 – 165	121 –145	9 – 13
4	131 –155	166 – 197	146 –177	14 – 18
5	155 +	198 +	178 +	18 +

Wind Basics

- Wind can push in a garage door, window, or door on the windward side of the house and move inside, increasing uplift forces on the roof.
- When wind forces break open part of the home, wind and water enter the home and damage to the interior escalates dramatically.
- Because older less wind resistant homes often break open in high winds, a lot of the focus over the past couple of decades has been on strengthening the structure.

Basic Stability

- Overturning
- Uplift
- Sliding

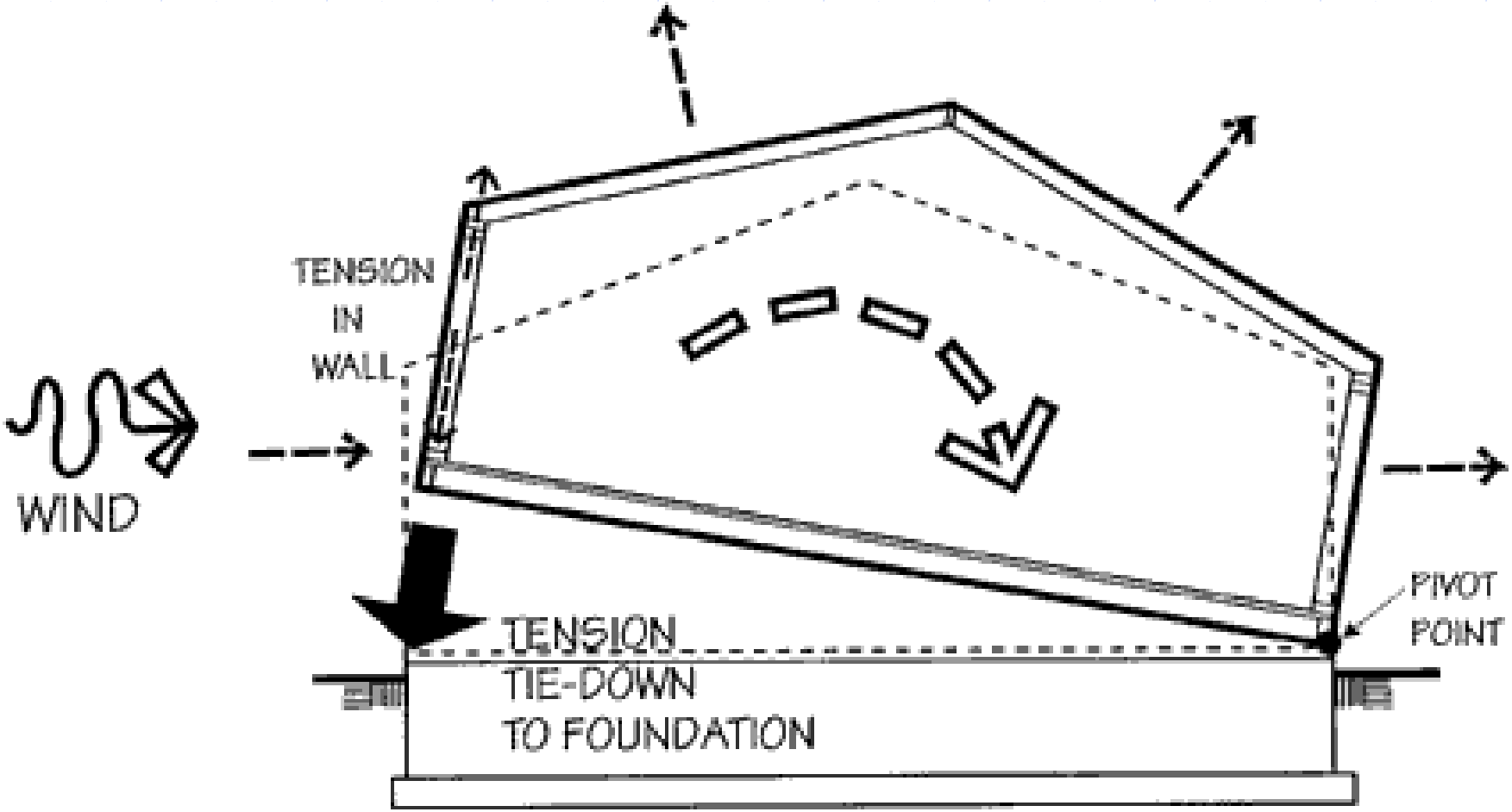


Fig. 10 - OVERTURNING

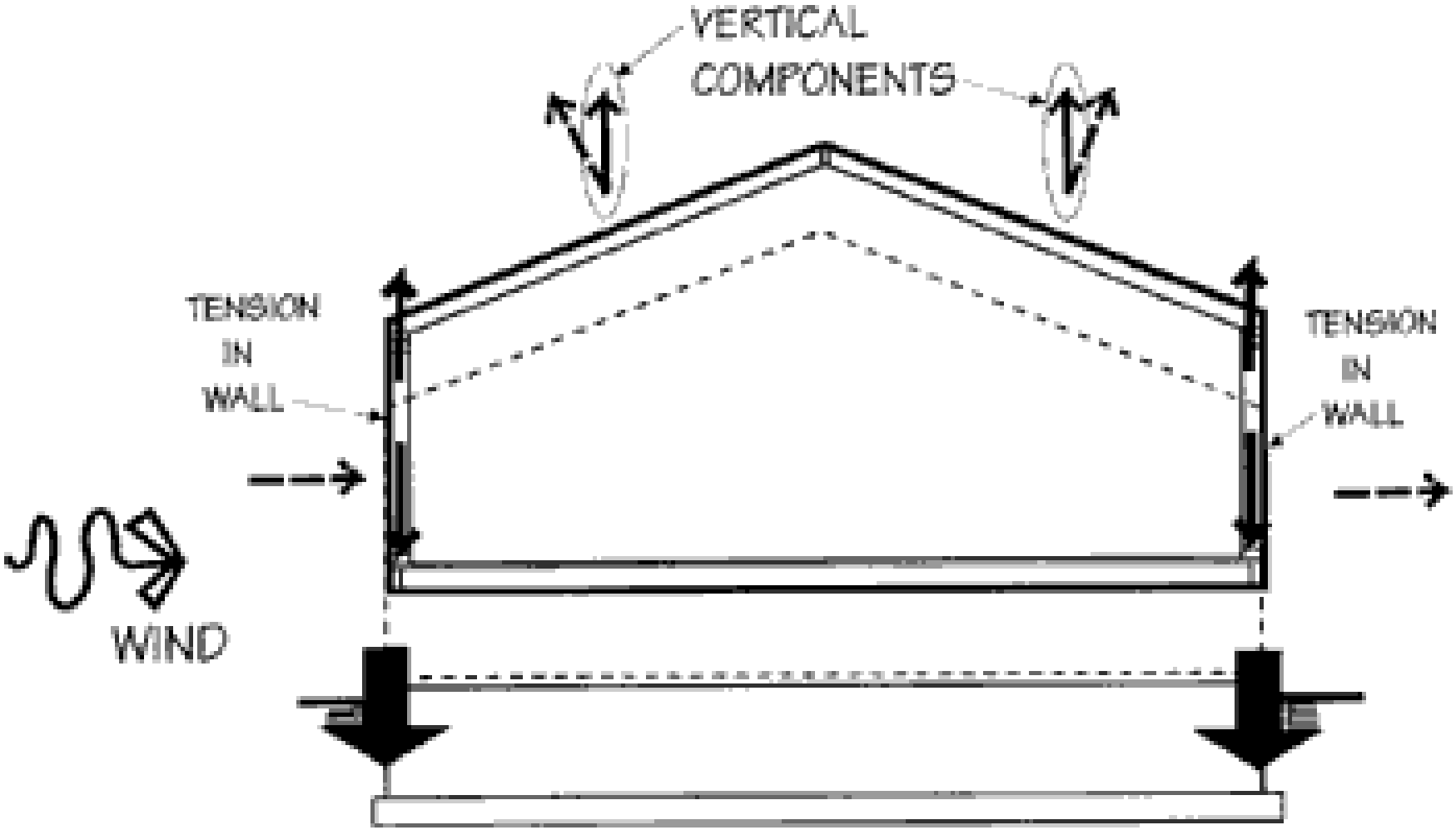


Fig. 12 - UPLIFT

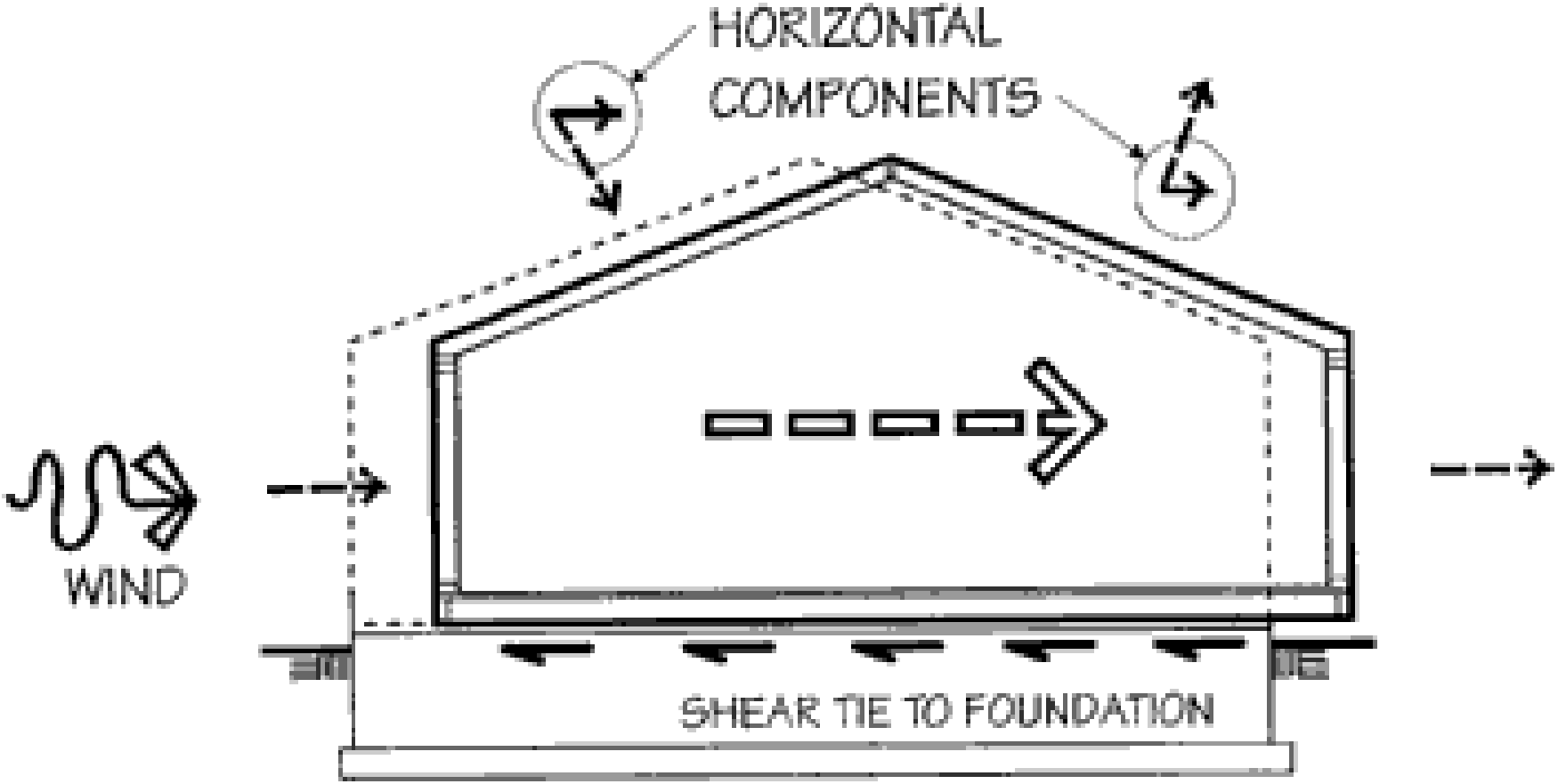
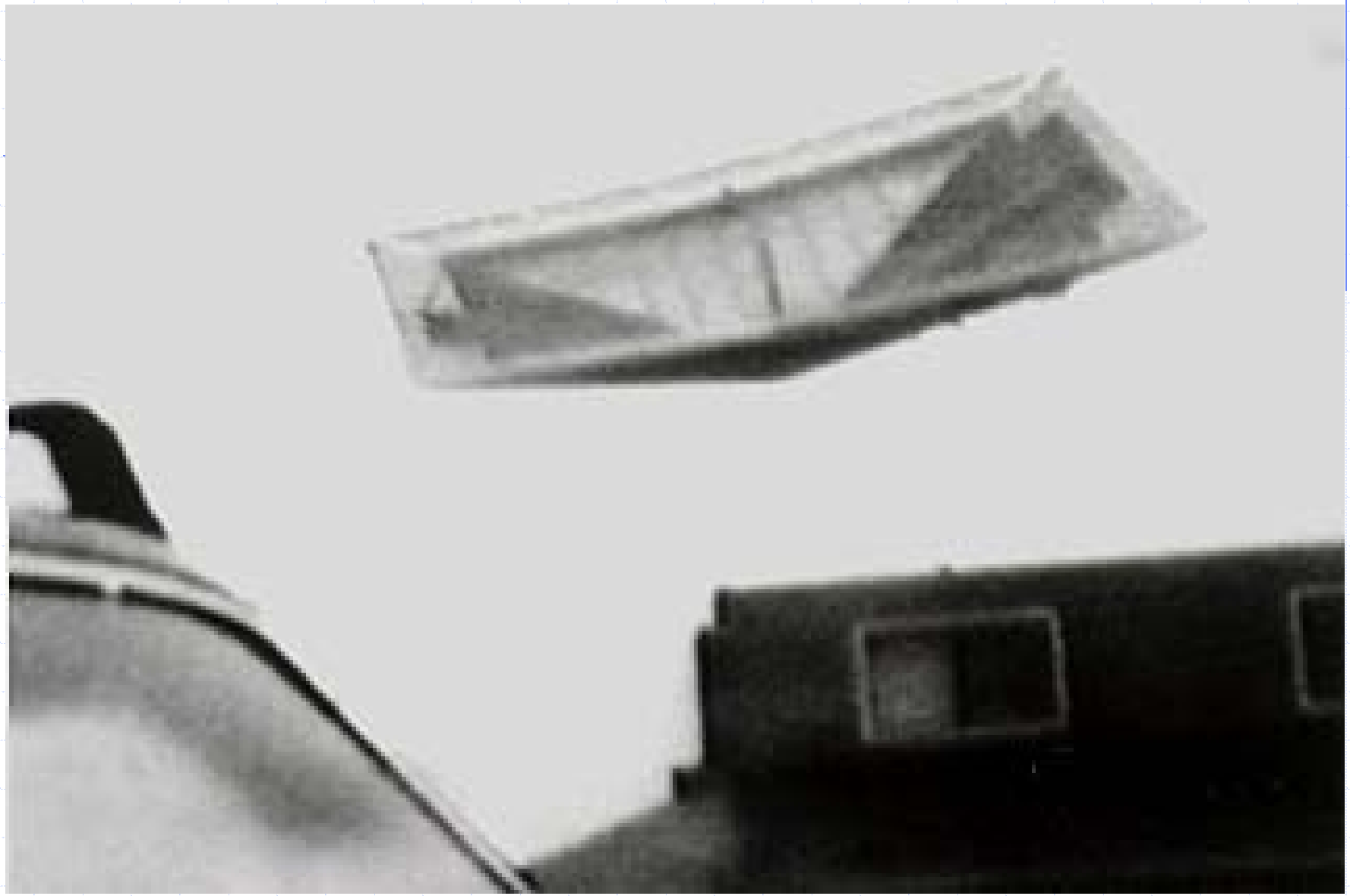


Fig. 11 - SLIDING



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SO WHAT CAN WE DO???

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ENOUGH WAS ENOUGH!..
WA
OR
CA
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WV
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NC
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PA
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MA
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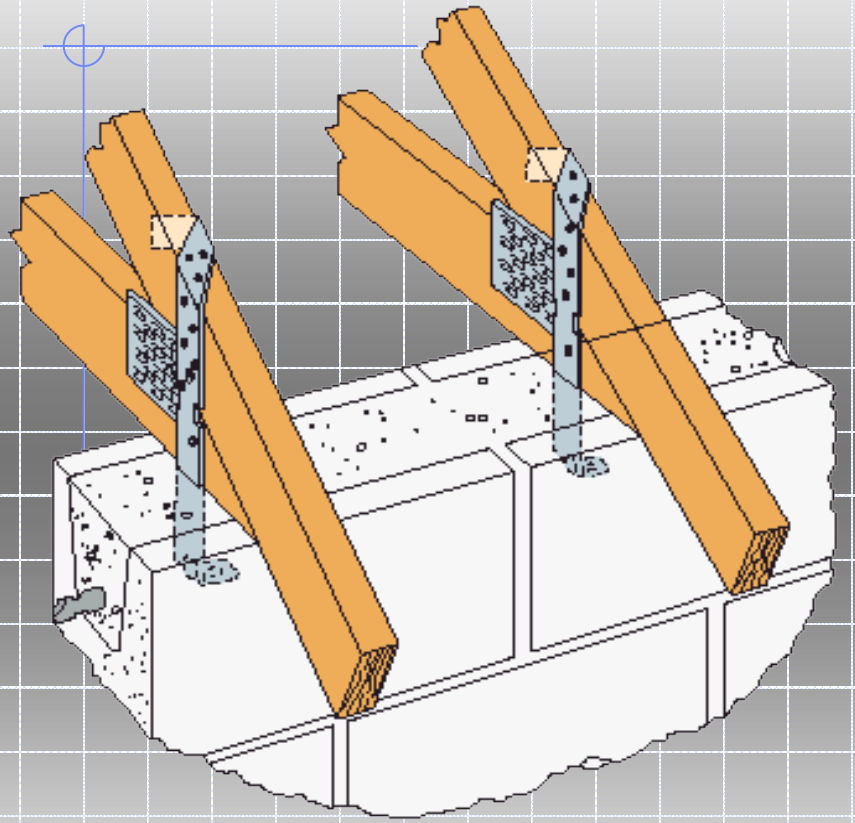
CT
NJ
DE
MD
Newsday

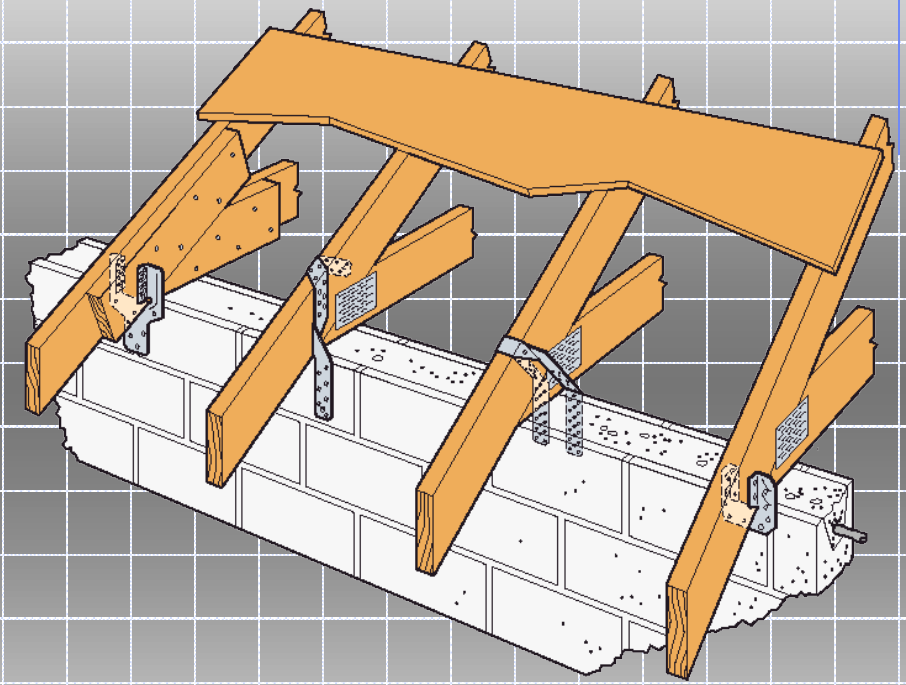
Continuous Load Path

- A way to visualize what is needed is to think in terms of how you would connect the roof if you intended to turn the house upside down and shake it up and down.
- Hurricane straps are used to anchor the roof trusses or rafters to the tops of the walls.
- It's not enough to just connect the roof to the tops of the walls. The uplift loads have to be carried far enough down into the house so that the weight of the house including the floors becomes greater than the uplift forces caused by the wind.

Truss to Block

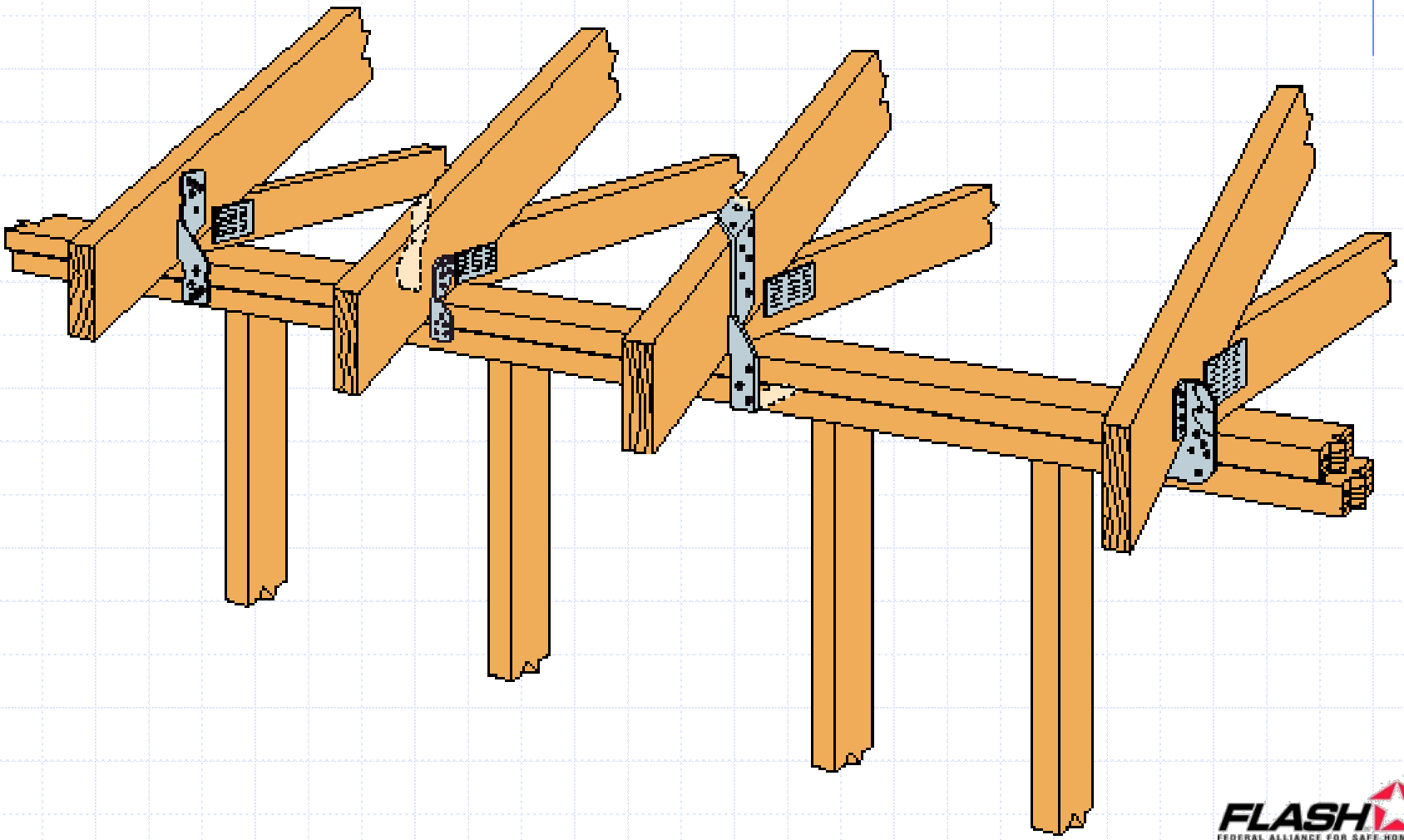


Straps embedded in masonry (New Construction)



Connectors fastened to masonry with masonry screws (Retrofit)

Truss to Wood Wall



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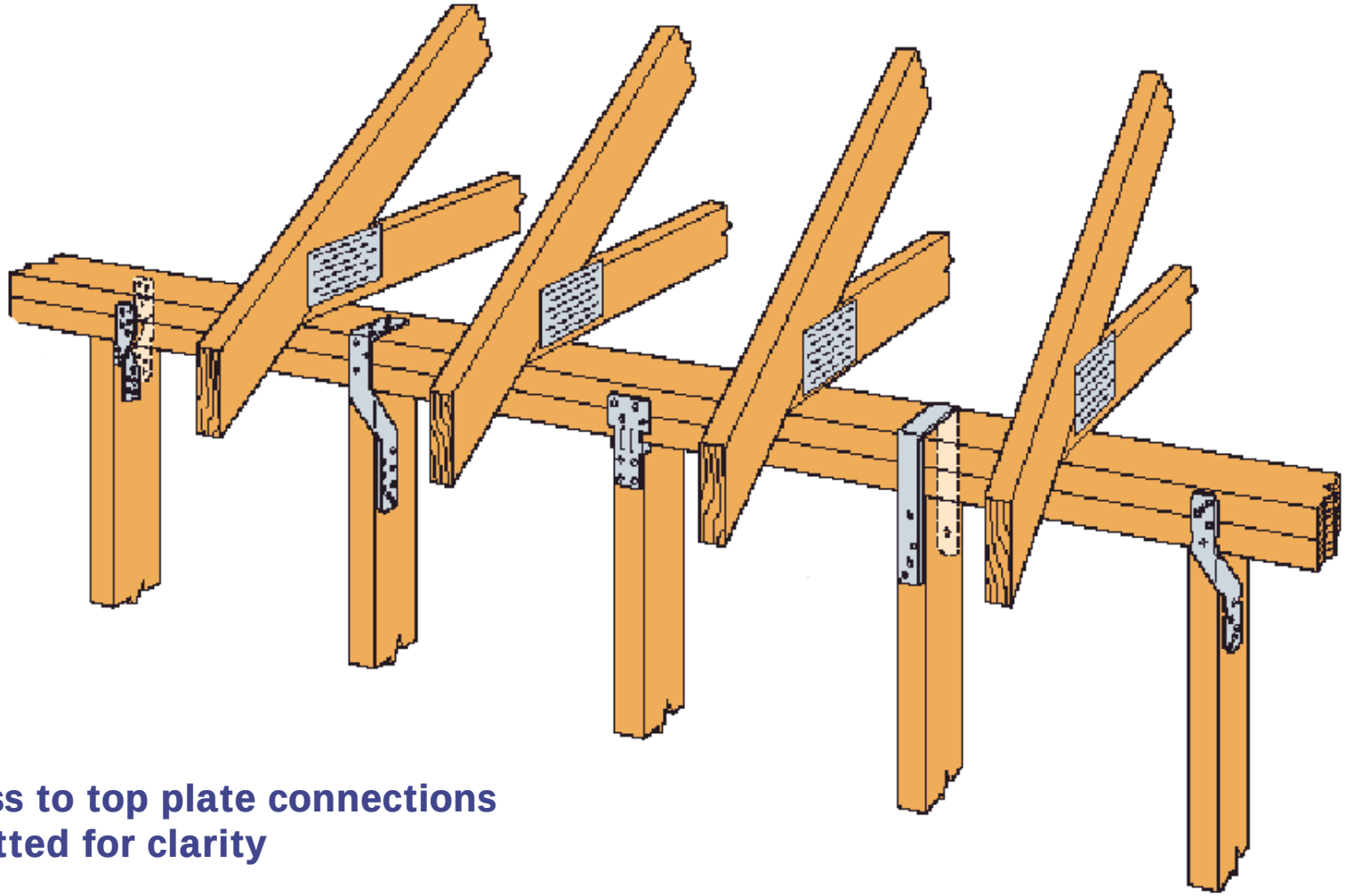
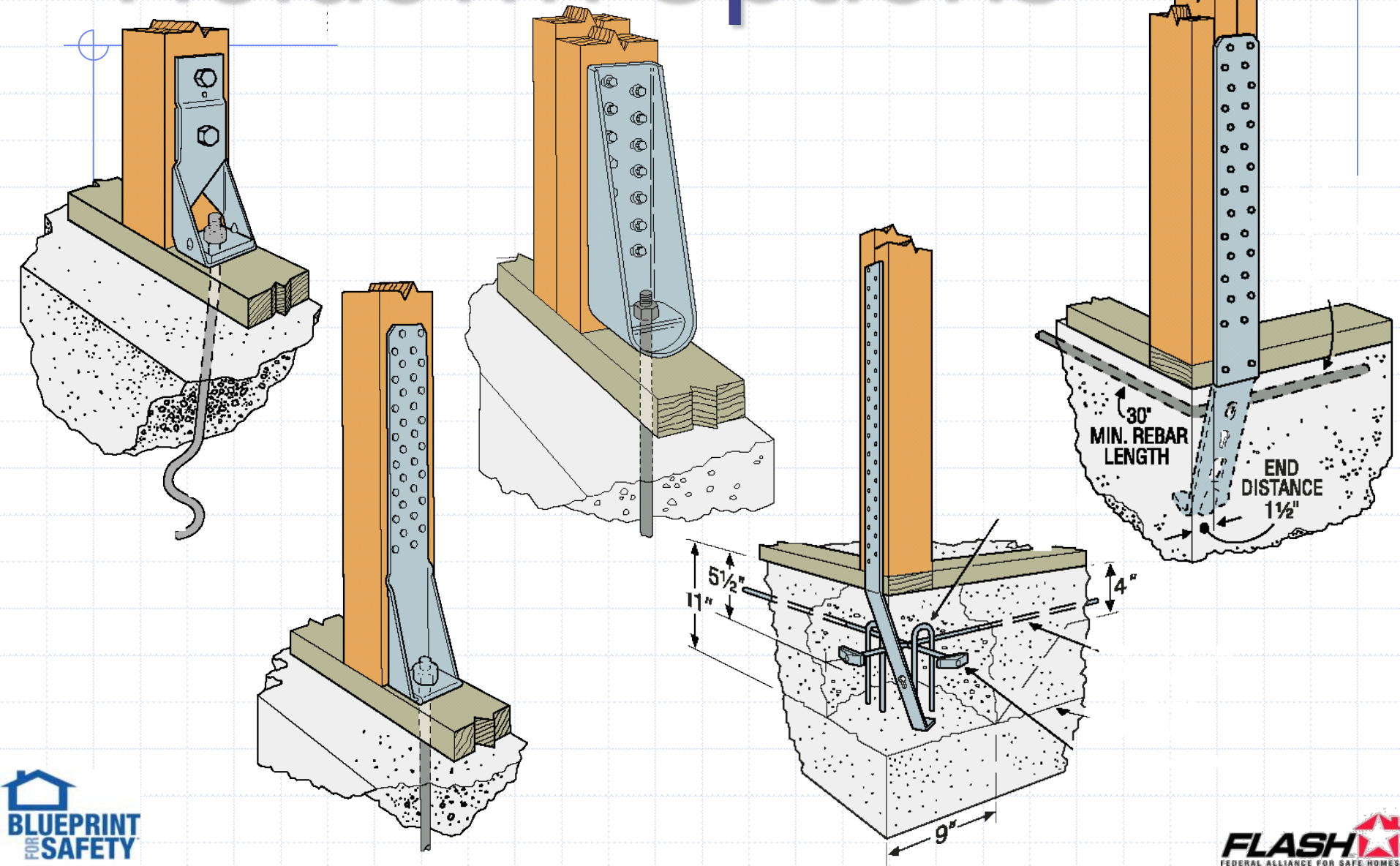
Top Plate to Stud



Truss to top plate connections omitted for clarity

Holdown Options



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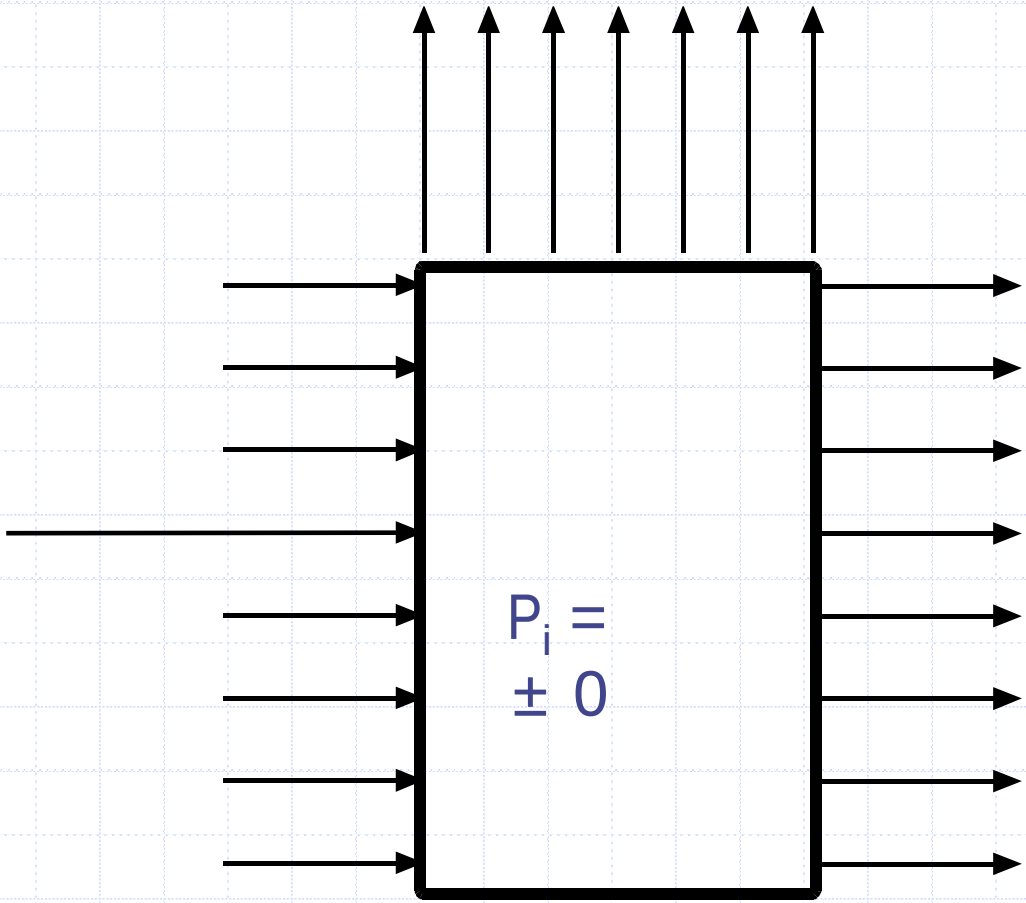
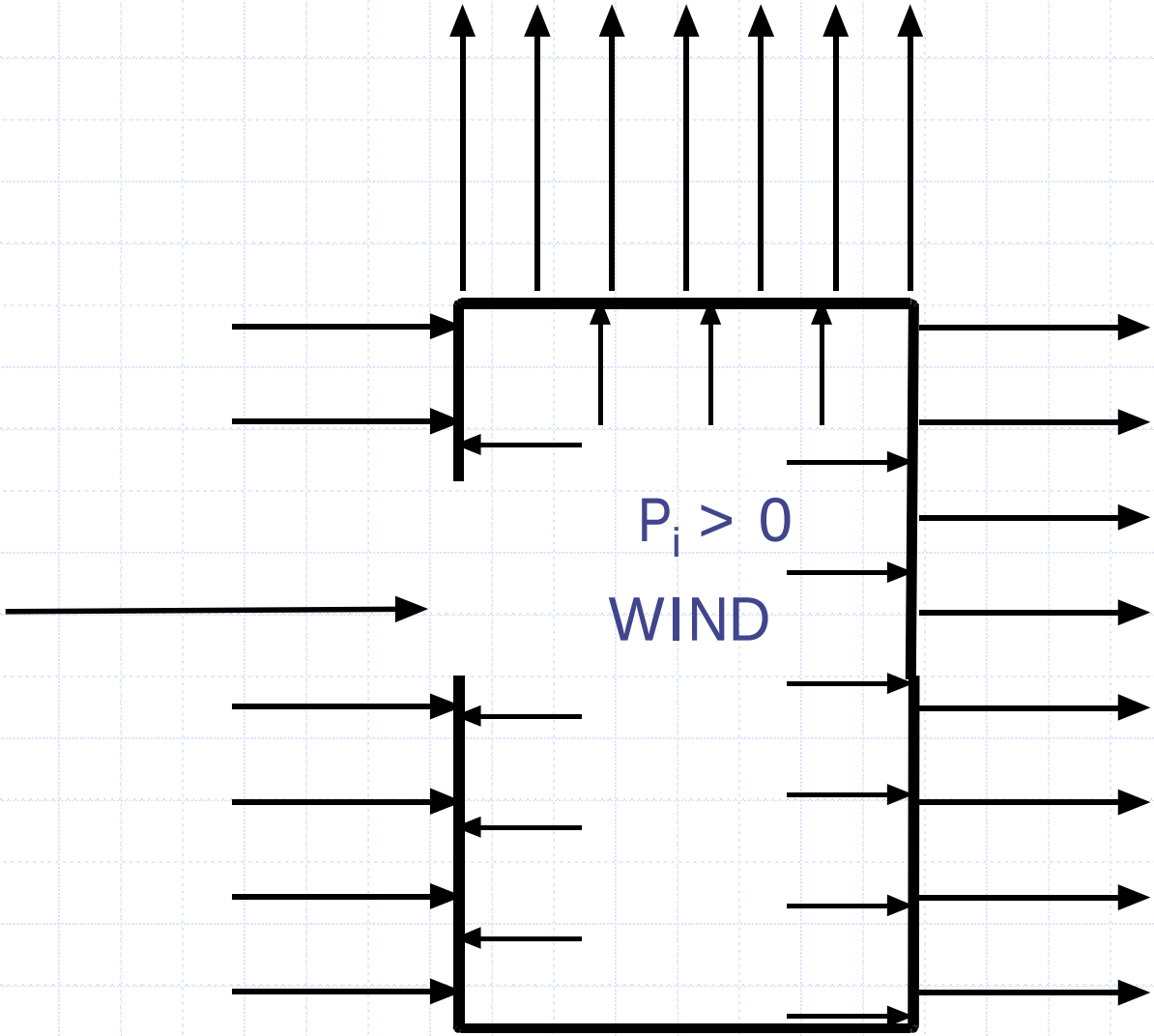
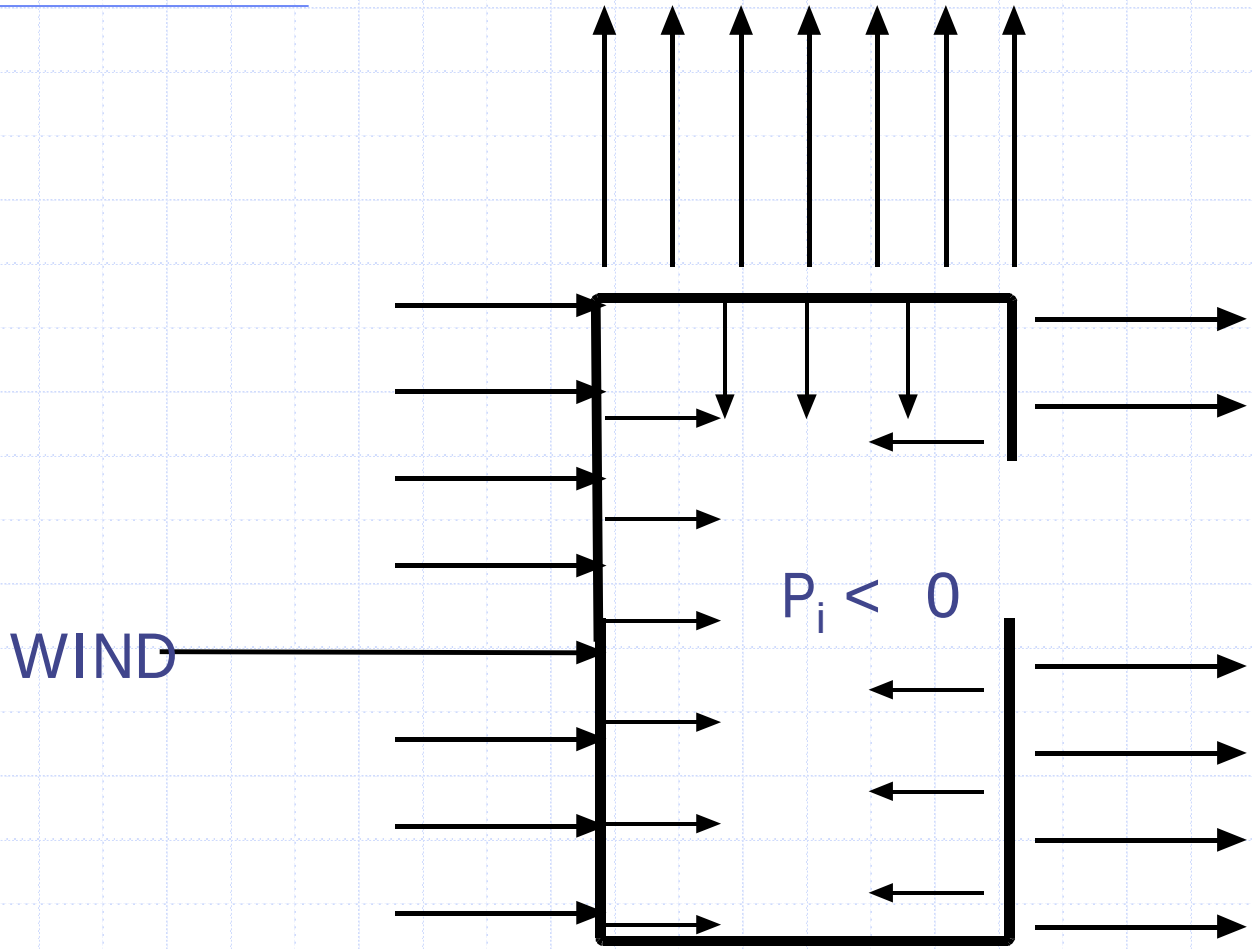
Wind & Structural Interaction: Internal Pressure



Wind & Structural Interaction: Internal Pressure

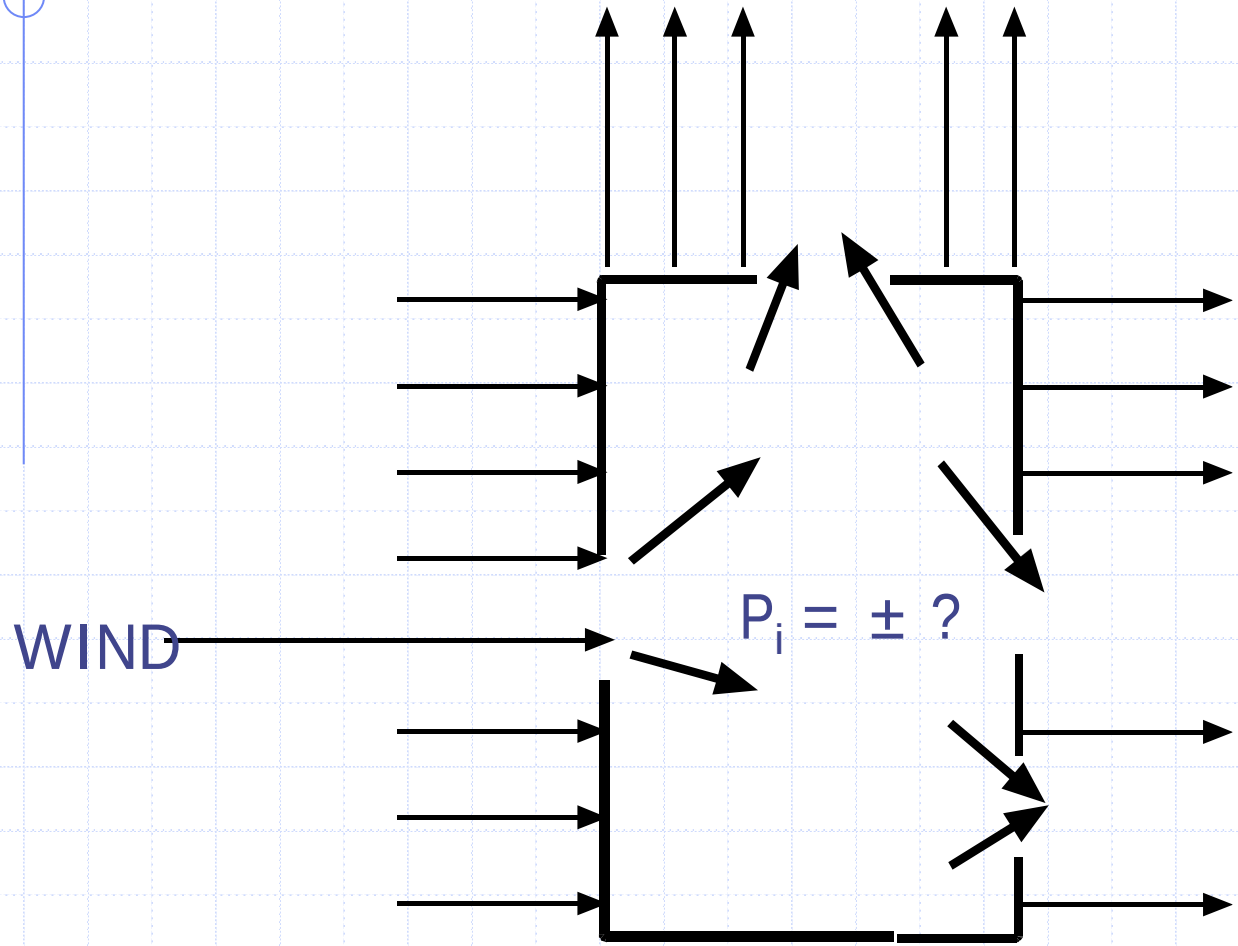


Wind & Structural Interaction: Internal Pressure



(c) SUCTION OPENING

Wind & Structural Interaction: Internal Pressure



(d) OPENING ON MORE THAN ONE SIDE

Wood-Frame vs. Masonry

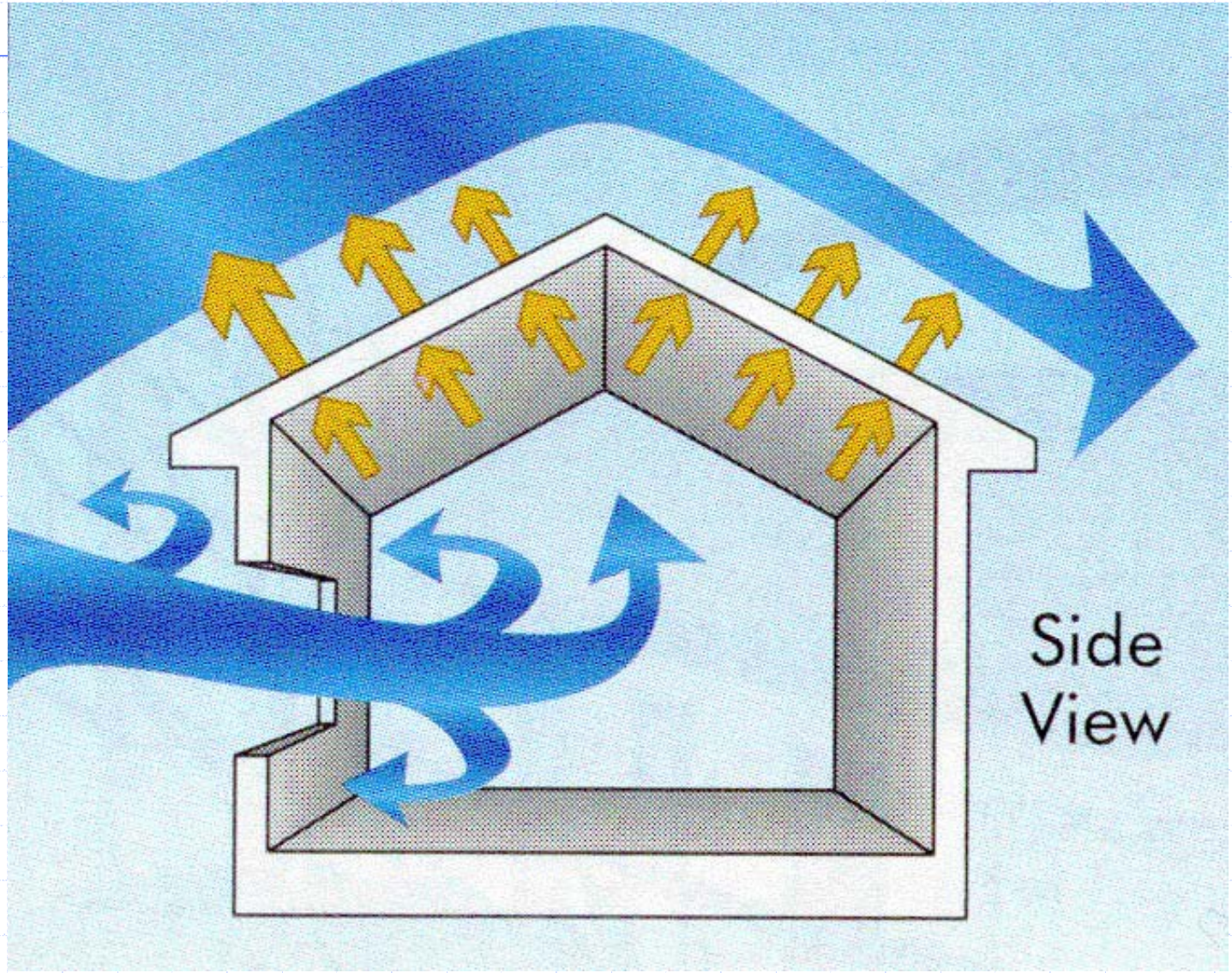
Retrofit	Wood-Frame	Masonry	When
Windows	x	x	Any Time
Entry Doors	x	x	Any Time
Garage Doors	x	x	Any Time
Gable-End Roof Vents	x	x	Any Time
Gable End Walls	x	x	Any Time
Reinforcing Walls	x	Difficult	Remodeling
Wall Foundation Tie-Downs	Difficult	Difficult	Remodeling
Between Story Tie-Downs	Difficult	Difficult	Remodeling
Roof-Wall Tie-Downs	x	x	Re-Roofing or Remodeling
Roof Sheathing	x	x	Re-Roofing
Roof Secondary Water Barrier	x	x	Re-Roofing

Long term residents???

Effects of Openings in Building Envelope

- Depending on the location of openings in the building envelope with respect to the wind direction, external and internal pressures act in the same direction on some walls and the roof to produce high outward acting pressures
- Some internal pressure exists in all buildings due to permeability

Effect of Opening



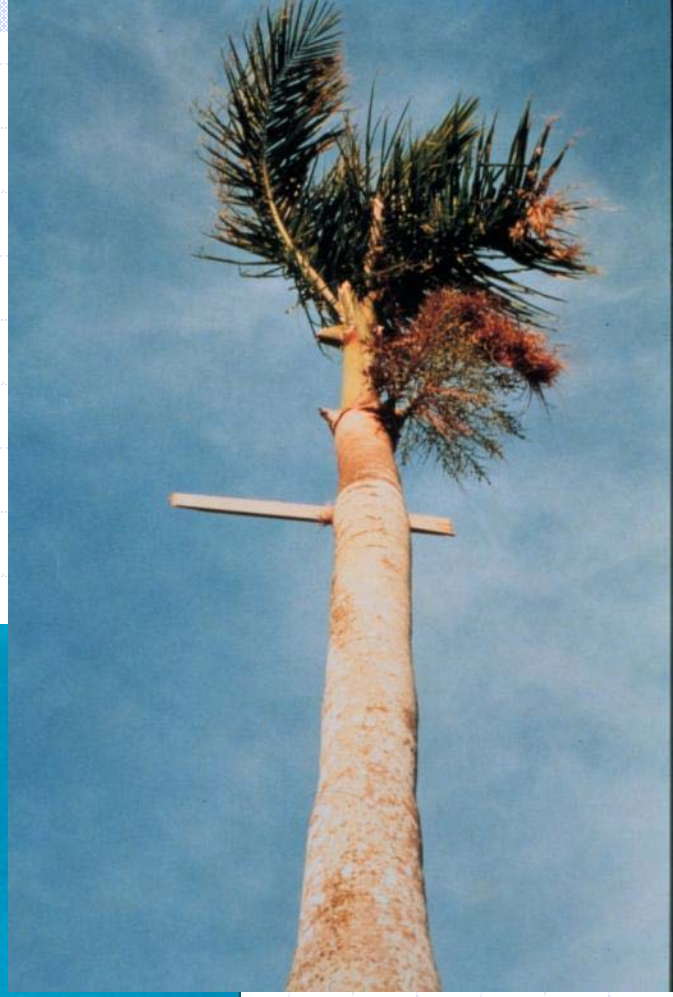
Openings in the Building Envelope & Structure Design

- Enclosed Buildings
- Partially Enclosed Buildings
- Open Buildings

Envelope Protection

- Blueprint for Safety does not recommend designing buildings as Partially Enclosed
- Overall Structure may survive…but won’t protect against
  - Flying debris breaking windows
  - Water and wind infiltration of the building

Windborne Debris



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More Windborne Debris

Glazed Opening Protection
Florida Building Code 2007

1609.1.2 Protection of openings. Glazed openings in buildings located in wind-borne debris regions shall be protected from wind-borne debris. Glazed opening protection for wind-borne debris shall meet the requirements of SSTD 12, ASTM E 1886 and ASTM E 1996, ANSI/DASMA 115 (for garage doors and rolling doors) or TAS 201, 202 and 203 or AAMA 506 referenced therein.

Glazed Opening Protection
Florida Building Code 2007 (cont'd)

1. Glazed openings located within 30 feet (9144 mm) of grade shall meet the requirements of the Large Missile Test.

2. Glazed openings located more than 30 feet (9144 mm) above grade shall meet the provisions of the Small Missile Test.

Glazed Opening Protection
Florida Building Code 2007 (cont'd)

3. Storage sheds that are not designed for human habitation and that have a floor area of 720 square feet (67 m^2) or less are not required to comply with the mandatory windborne debris impact standards of this code.

4. Openings in sunrooms, balconies or enclosed porches constructed under existing roofs or decks are not required to be protected provided the spaces are separated from the building interior by a wall and all openings in the separating wall are protected in accordance with Section 1609.1.2. Such spaces shall be permitted to be designed as either partially enclosed or enclosed structures.

Protecting the Building Envelope

- Provide Protection for:
  - Windows
  - Exterior Doors
  - Garage Doors
  - Gable End Vents

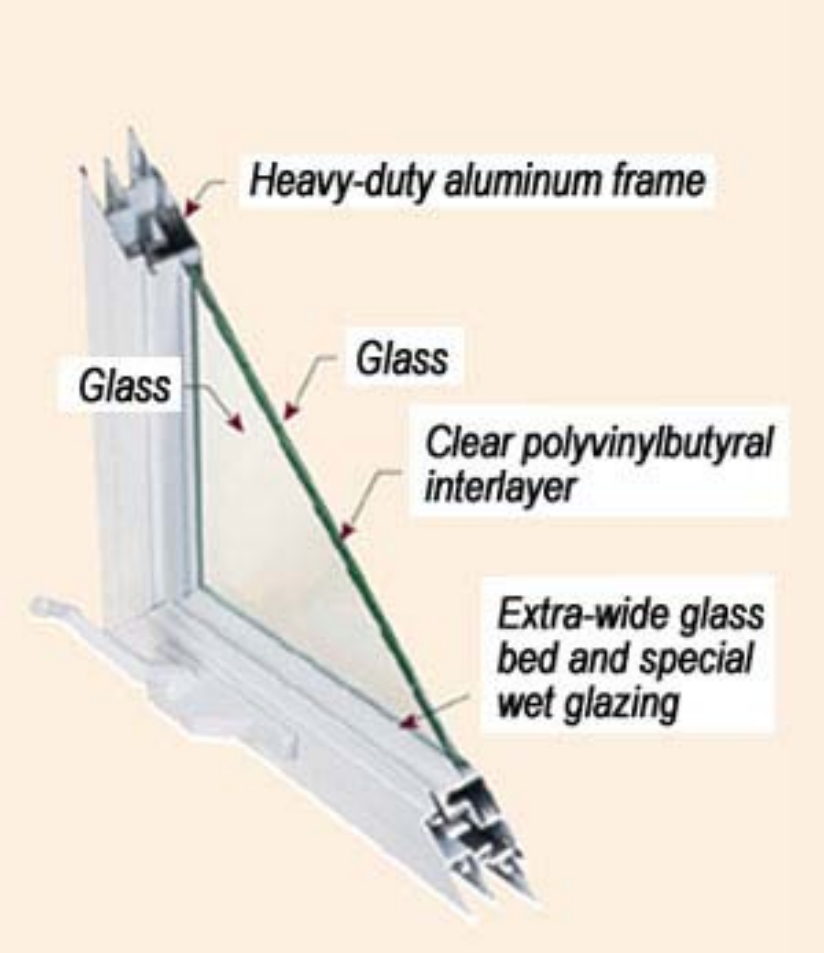
Impact-Resistant Options for Windows

2 Options:

- Impact resistant glazing
  - More expensive option
  - Always in place providing continuous protection
- Shutters
  - Economical option
  - Must be installed or engaged when storm is coming

Impact Resistant Windows

- Windows made from glazing that is impact resistant (usually an interlayer laminated between two sheets of glass)
- Tested window assembly includes the frame and installation method



Impact Resistant Windows

- Important components
  - Glazing
  - Frame
  - Hardware

Attachment

- Inspect framing around opening to ensure adequacy to support impact resistant window

Shutters

- Permanent
  - Roll
  - Colonial
  - Bahama
  - Accordion
- Temporary
  - Steel
  - Aluminum
  - Polycarbonate
  - Screen Products

Roll Shutters

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Colonial (swing) Shutters

Bahama Shutters

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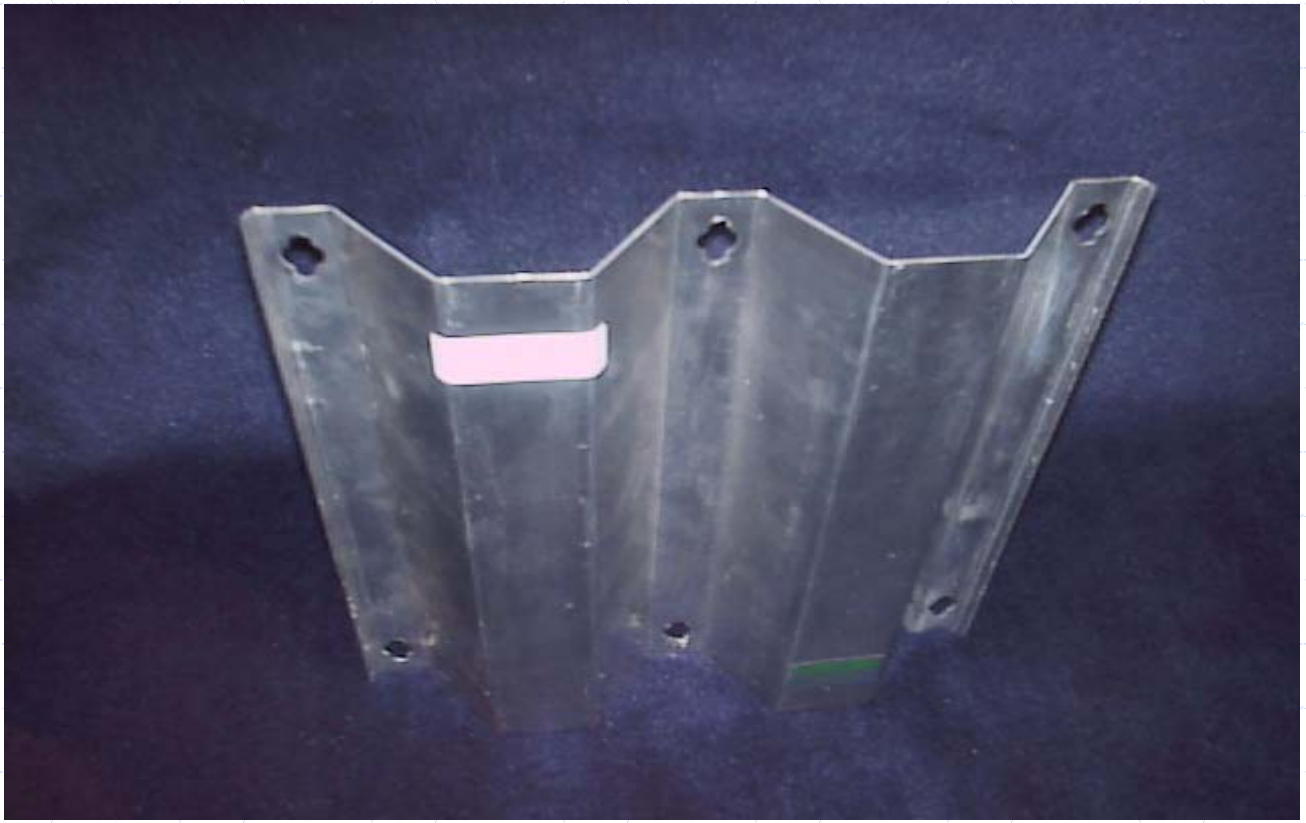
Accordion Shutters

Commercial Panel Shutters

Hurricane Panels



Flexible Screen Material ArmorScreen

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Wayne Dalton Fabric-Shield™

Exeter Storm Shield

Protech Screens

Storm Busters

Plywood Shutters

Hurricane Impact Product Test Standards

- ASTM E1896 & E1996Standard
- Miami-Dade County Building Code Compliance Office Test Procedure TAS 201, 202, & 203
- SSTD 12 Test Standard
- FBC TAS 201, 202, & 203

Hurricane Impact-Resistant Tests and Standards

- Large Missile Test
- Small Missile Test

} 1st part of test

- Pressure Cycling Test

} 2nd part of test

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Hurricane Impact-Resistant Tests and Standards

- Large Missile
  - 9 lb 2x4 at 50 fps
  - Assembly height ≤ 30 ft
- Small Missile
  - 2 gram (+/- 5%) steel balls at 130 – 132 fps
  - Assembly height > 30 ft

Impact-Resistant Product Approvals

MIAMI-DADE COUNTY, FLORIDA
METRO-DADE FLAGLER BUILDING

BUILDING CODE COMPLIANCE OFFICE
METRO-DADE FLAGLER BUILDING
140 WEST FLAGLER STREET, SUITE 1603
MIAMI, FLORIDA 33130-1563
(305) 375-2901 FAX (305) 375-2908

CONTRACTOR LICENSING SECTION
(305) 375-2227 FAX (305) 375-2336

CONTRACTOR ENFORCEMENT SECTION
(305) 375-2966 FAX (305) 375-2908

PRODUCT CONTROL DIVISION
(305) 375-2902 FAX (305) 372-6339

PRODUCT CONTROL NOTICE OF ACCEPTANCE

Select Manufacturing
1450 Albert Street
Youngstown OH 44505

Your application for Product Approval of:
"Hurricane Series 7000" - Window Screen
under Chapter 8 of the Code of Miami-Dade County governing the use of Alternate Materials and Types of Construction, and completely described herein, has been recommended for acceptance by the Miami-Dade County Building Code Compliance Office (BCCO) under the conditions specified herein.

This approval shall not be valid after the expiration date stated below. BCCO reserves the right to secure thi product or material at anytime from a jobsite or manufacturer's plant for quality control testing.
If this product or material fails to perform in the approved manner, BCCO may revoke, modify, or suspend the use of such product or material immediately. BCCO reserves the right to revoke this approval, if it is determined BCCO that this product or material fails to meet the requirements of the South Florida Building Code.

The expense of such testing will be incurred by the manufacturer.

Acceptance No.: 99-1001.03
Expires: 07/20/2003

Raul Rodriguez
Chief Product Control Division

THIS IS THE COVERSHEET, SEE ADDITIONAL PAGES FOR SPECIFIC AND GENERAL CONDITIONS

BUILDING CODE & PRODUCT REVIEW COMMITTEE

This application for Product Approval has been reviewed by the BCCO and approved by the Building Code and Product Review Committee to be used in Dade County, Florida under the conditions set forth above.

Francisco J. Quintana, R.A.
Director
Miami-Dade County
Building Code Compliance Offi

Approved: 07/20/2000

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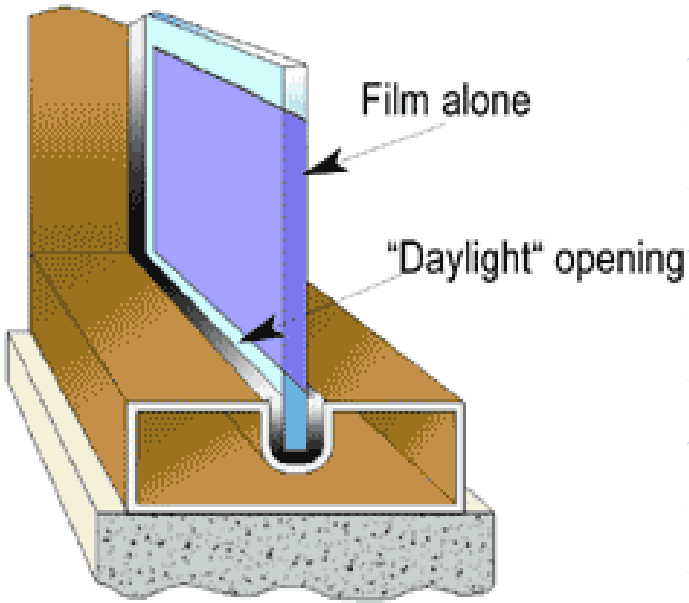
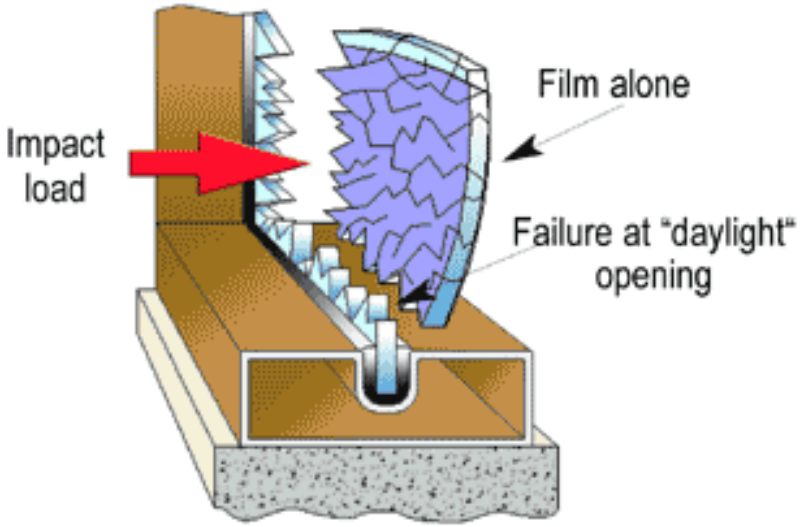
Window Film

- The most common method of installing window film is known as “daylight installation.”
- This type of installation does nothing to keep the window attached to the frame, so it provides very little or no additional protection from winds and rain entering the house.





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Garage Doors

- 3 Potentially Weak Areas
  - Deflection under wind loading
  - Track strength
  - Impact resistance


PRUDENTIAL


2626

Garage Doors are a Weak Link

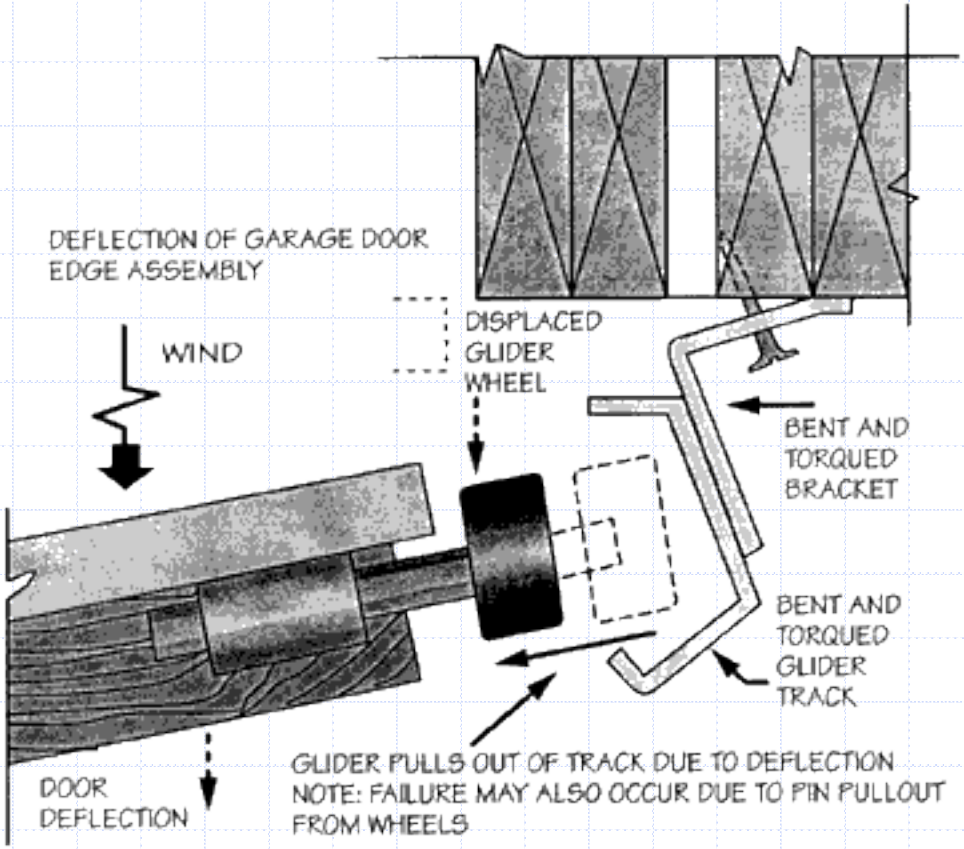


FIG. 9 - WIND - BEHAVIOR ON GARAGE DOOR TRACK ASSEMBLY

As door is pushed in or sucked out, track deflects and either bends enough for door to come out of track, or track pulls away from framing

Replace standard (weak) garage doors with a wind and impact resistant model

Wind and impact resistant garage doors are reinforced and have a stronger track, fastened to framing more often.

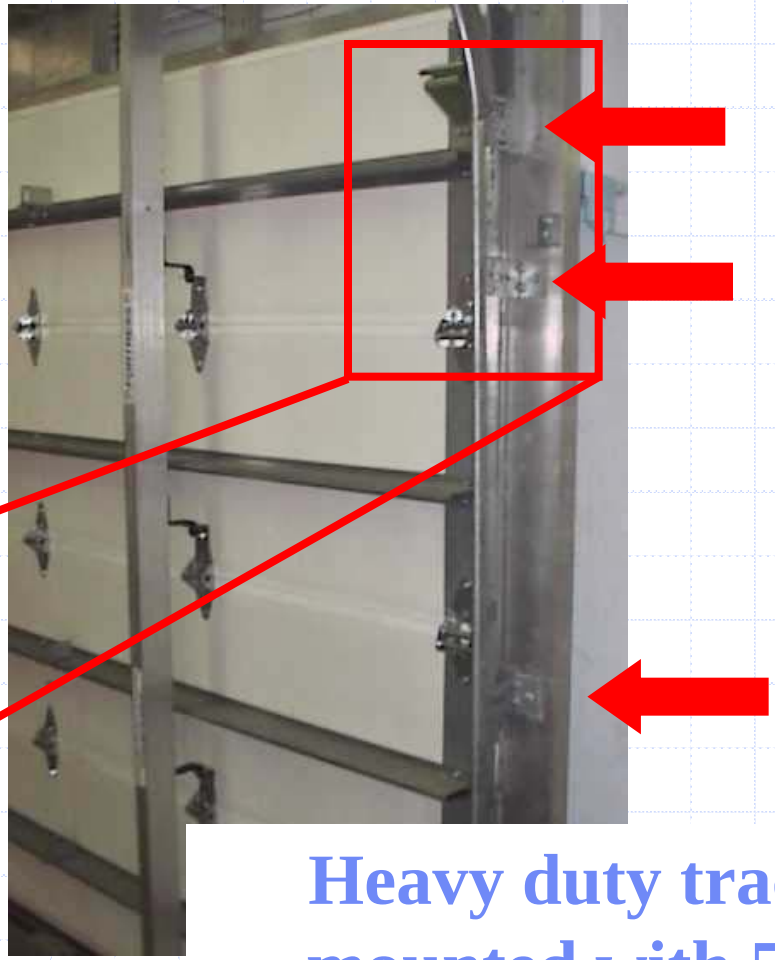
Garage Doors

Vertical Post system (After-market)

Vertical reinforcement in door design

Horizontal bracing

Braced Garage Doors



Heavy duty track mounted with 5-6 brackets per side

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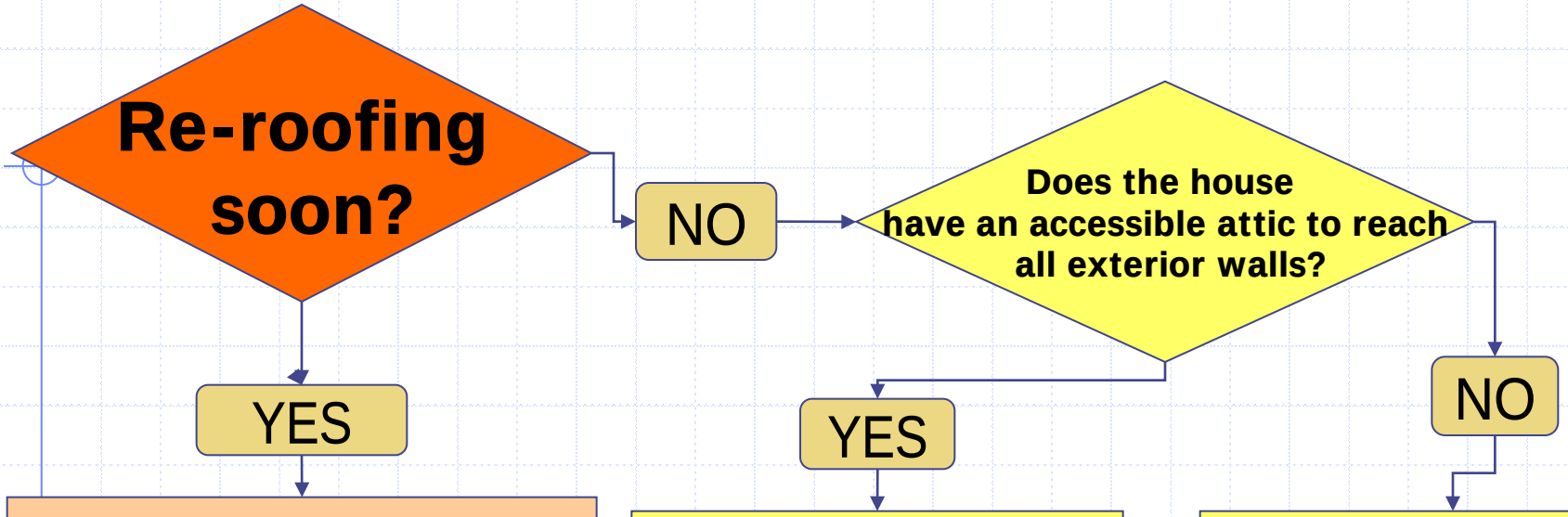
Maintaining the Integrity of the Roof System

- Issues
  - Roof Covering
  - Roof Framing/Decking
  - Gable Ends

Retrofit Evaluation Chart



Conduct these activities during re-roofing:

1. **Refasten roof sheathing**
2. **Re-roof with a wind-resistant covering**
3. **Install hurricane straps at roof-wall connections**
4. **Brace gable end walls that have ceiling diaphragms.**

Conduct these activities with attic access:

1. Apply construction adhesive to glue roof sheathing to rafters/ trusses
2. Install hurricane straps at roof-wall connections
3. Brace gable end walls

Evaluate feasibility of installing hurricane straps at roof-wall connection:

- Is it feasible to install hurricane straps at roof-wall connections from the exterior?
- Is it feasible to install hurricane straps at all roof-wall connections from the interior?

Roof to Wall Connection

- Install hurricane straps when re-roofing by removing bottom row of sheathing.

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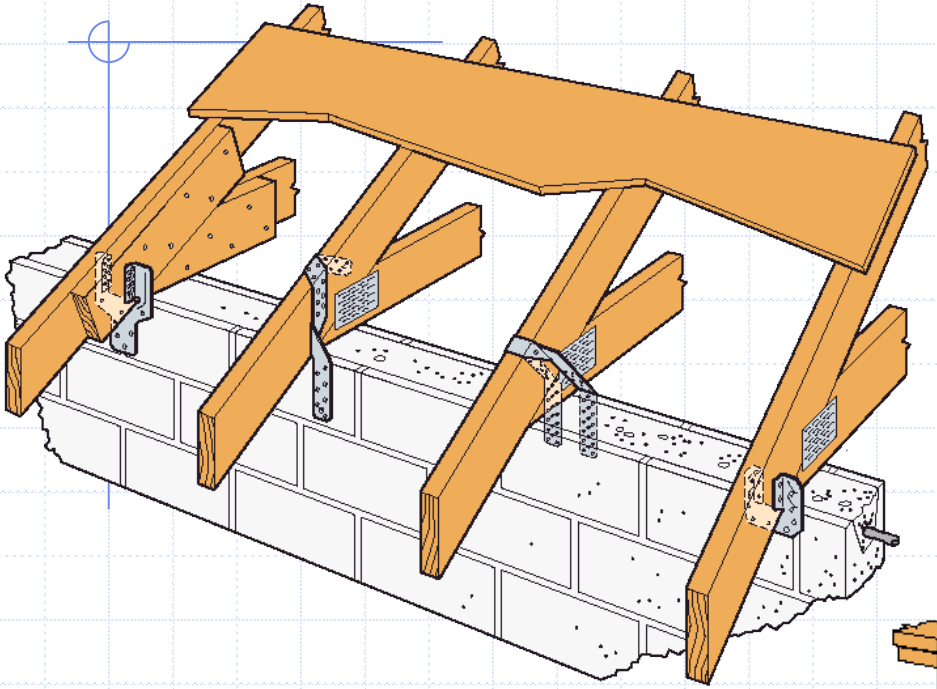
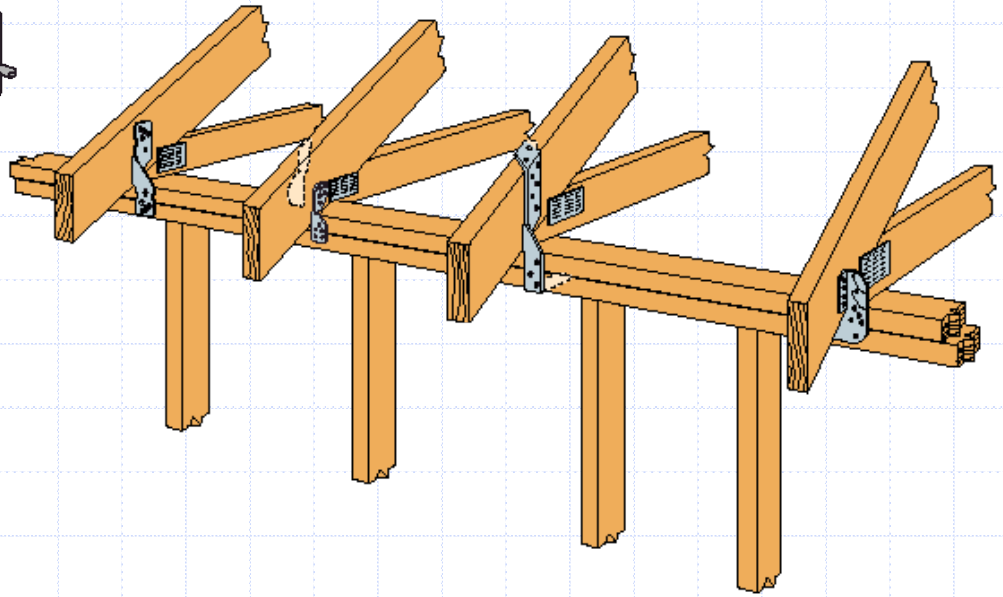
Choosing Connectors

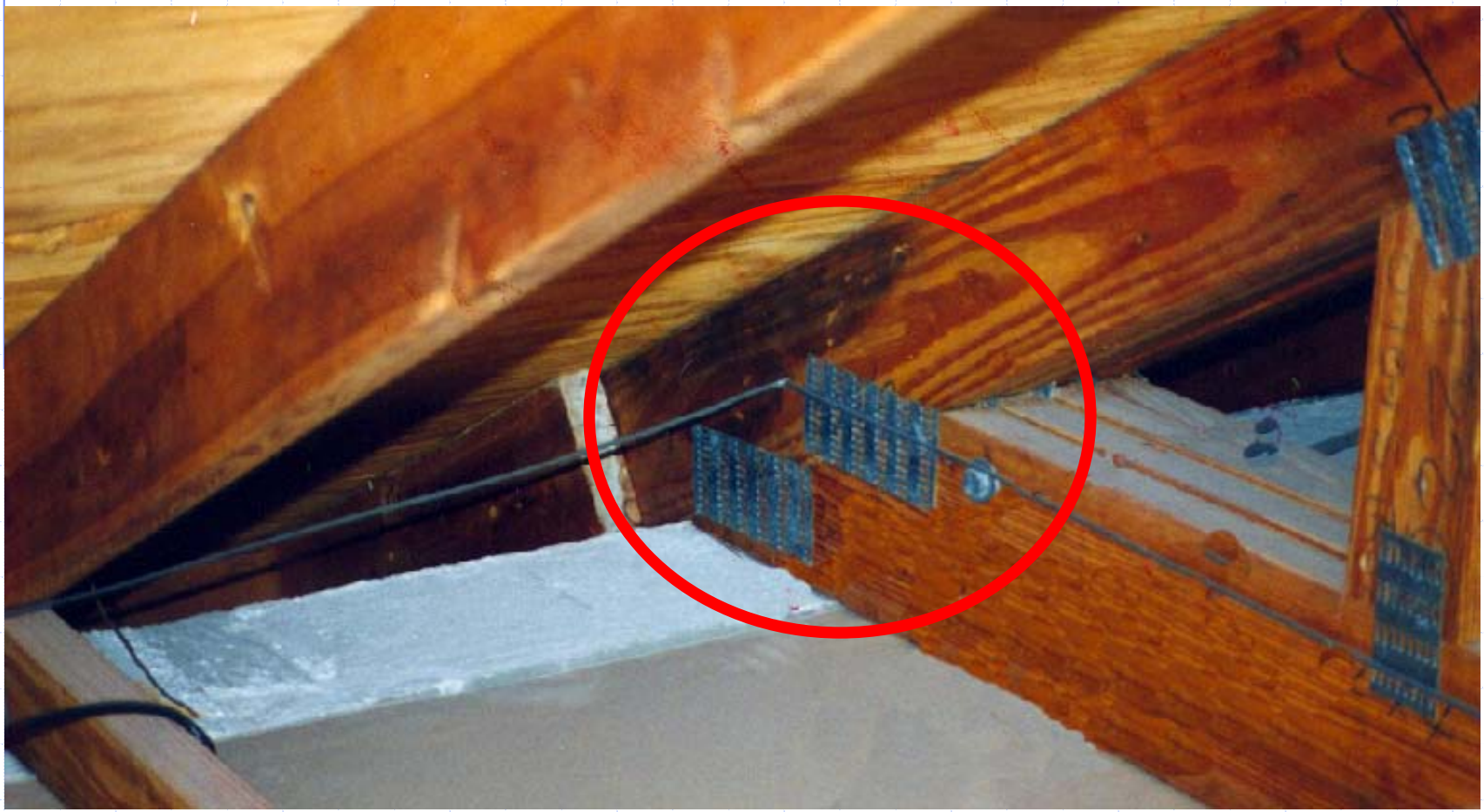




Install straps at roof to wall connection

Tie Down NOT Properly Installed

Four Ply Girder--Straps Missing



Typical Wood Framed Gable End

Gable End Wall Failure

Gable End Wall Failures...

Gable Endwalls

Gable end wall with cathedral ceiling – note the horizontal joint running across the wall just below the semicircular window

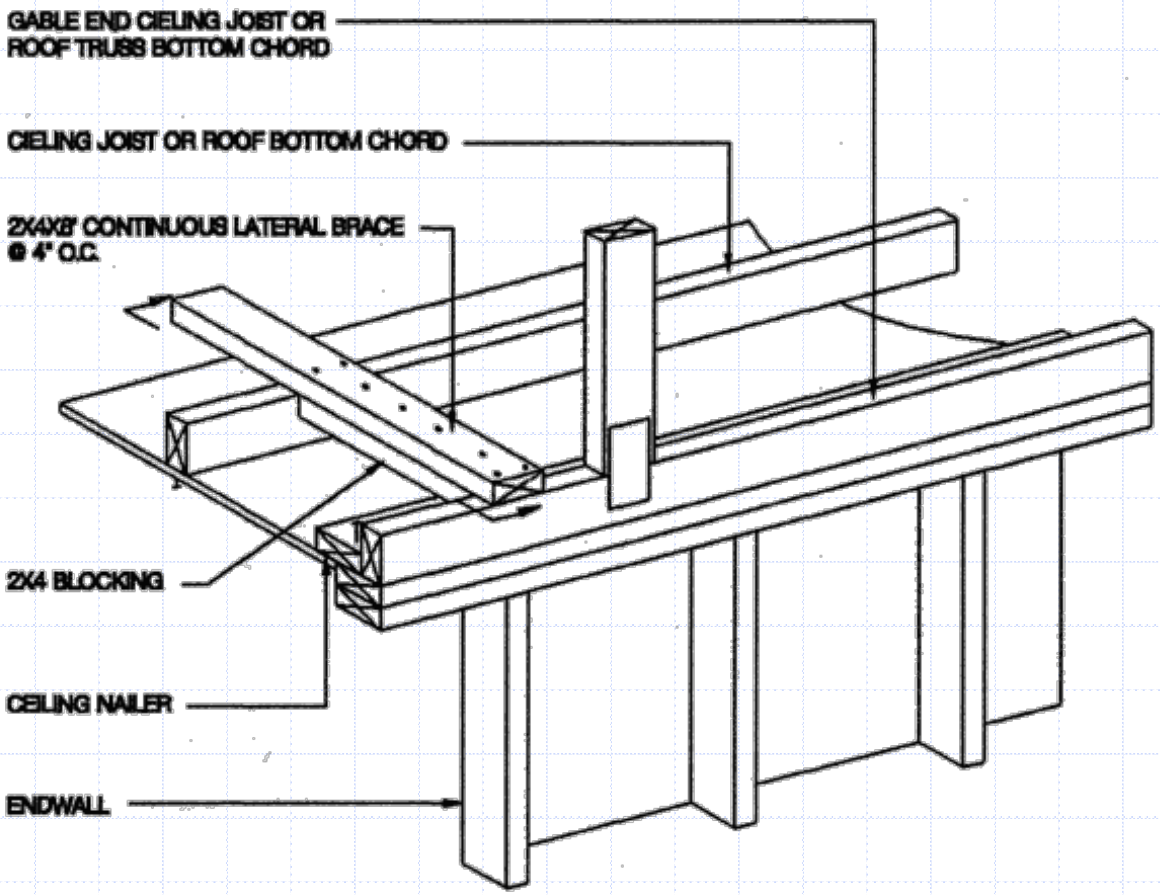
Gable End Wall- A Better Method

The red lines indicate where continuous wall framing members could have been used by the builder to avoid the weak connection between the rectangular wall at the bottom and the triangular wall at the top.

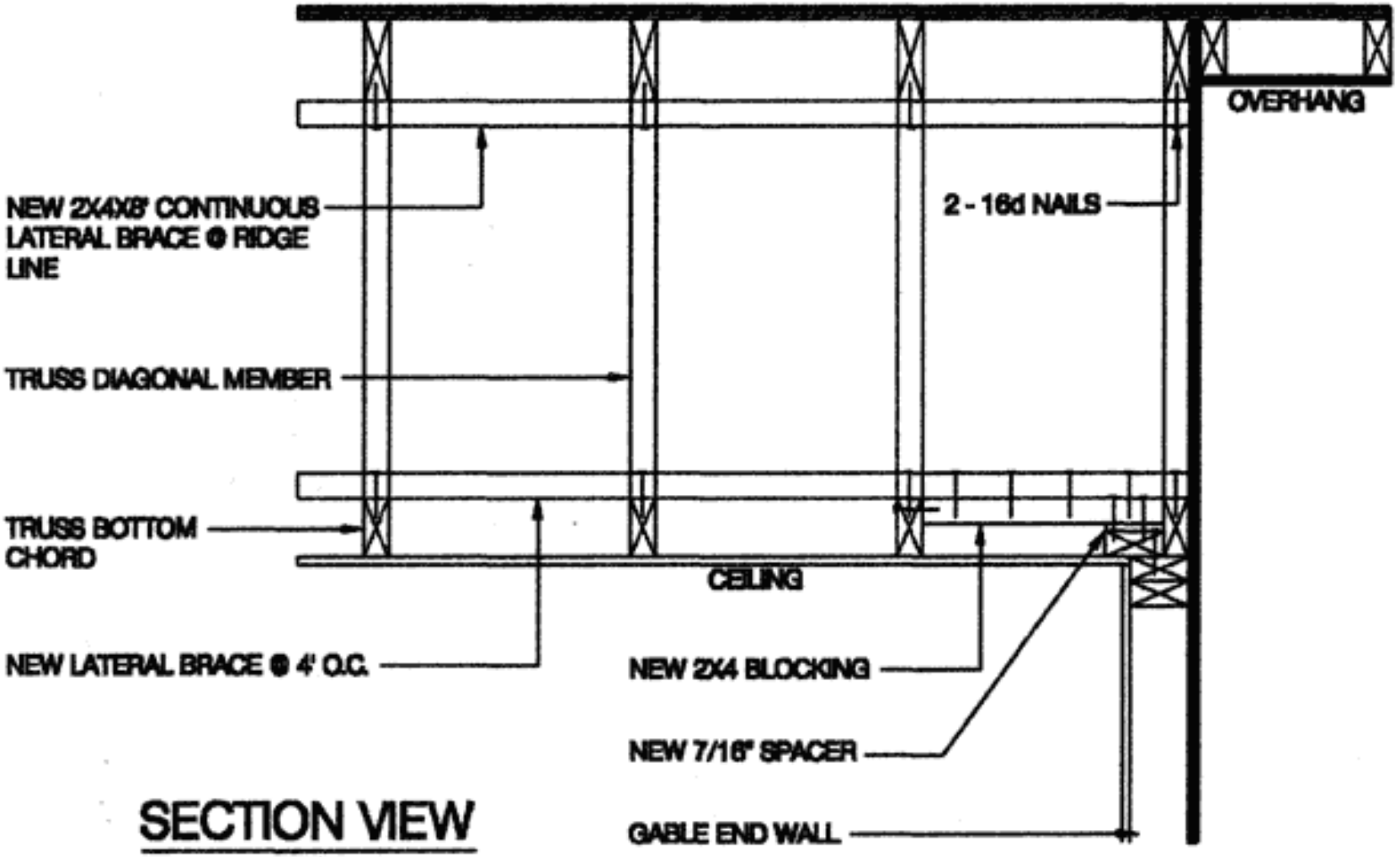
Bracing at the top

- Two methods
  - 2x4x8 at 6ft o.c. on the underside of top chord
  - 2x4 blocking at 48 in. o.c. between gable end framing and first two rafters or trusses

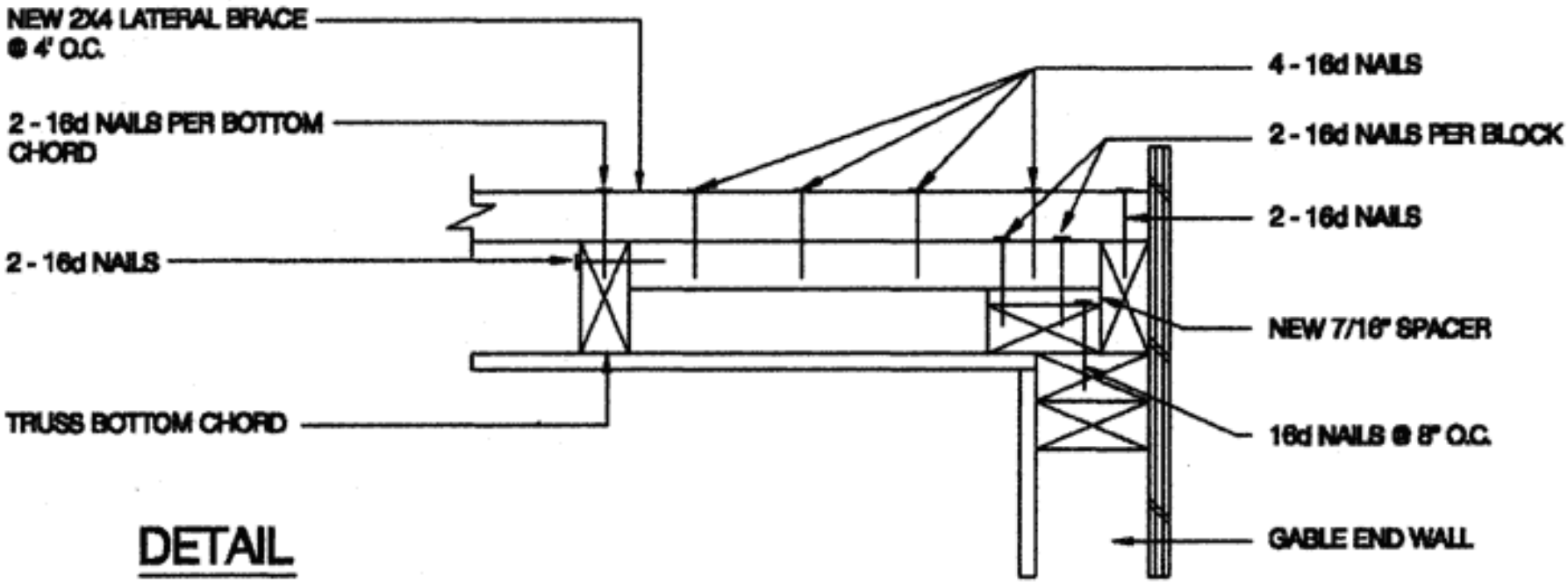
Gable end bracing



41 LATERAL REINFORCEMENT OF GABLE END WALL



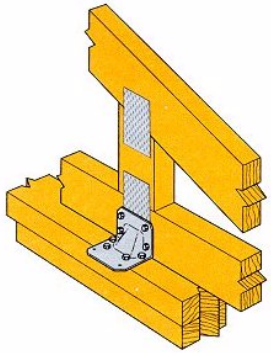
SECTION VIEW


NEW 2X4 LATERAL BRACE @ 4' O.C.
2 - 16d NAILS PER BOTTOM CHORD
2 - 16d NAILS
TRUSS BOTTOM CHORD
4 - 16d NAILS
2 - 16d NAILS PER BLOCK
2 - 16d NAILS
NEW 7/16" SPACER
16d NAILS @ 8" O.C.
GABLE END WALL

DETAIL

Gable End Walls

Gable End Walls



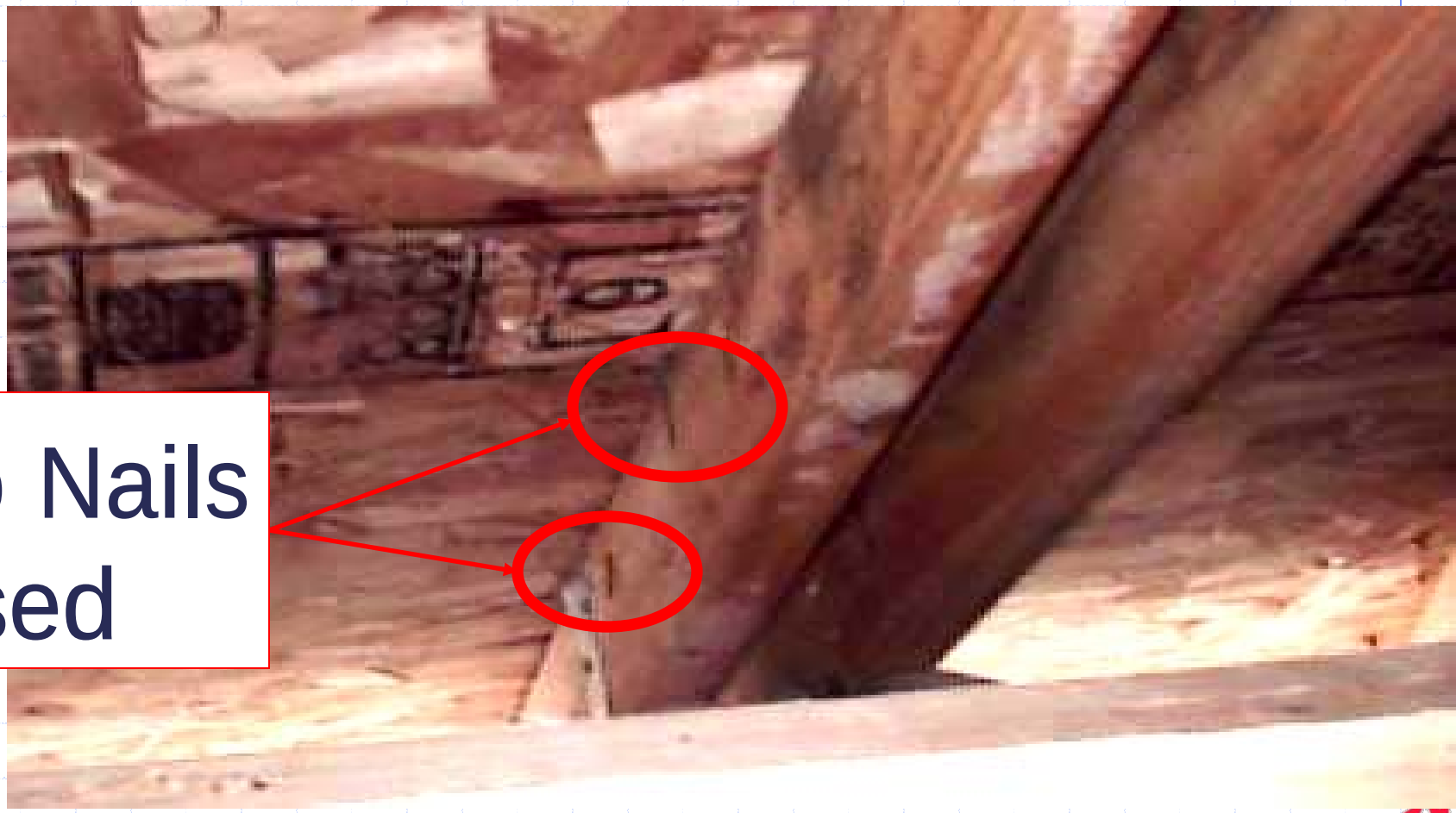
HGA10
Installation
to a 2x4 Wall

Roof Sheathing

Refasten Roof Sheathing

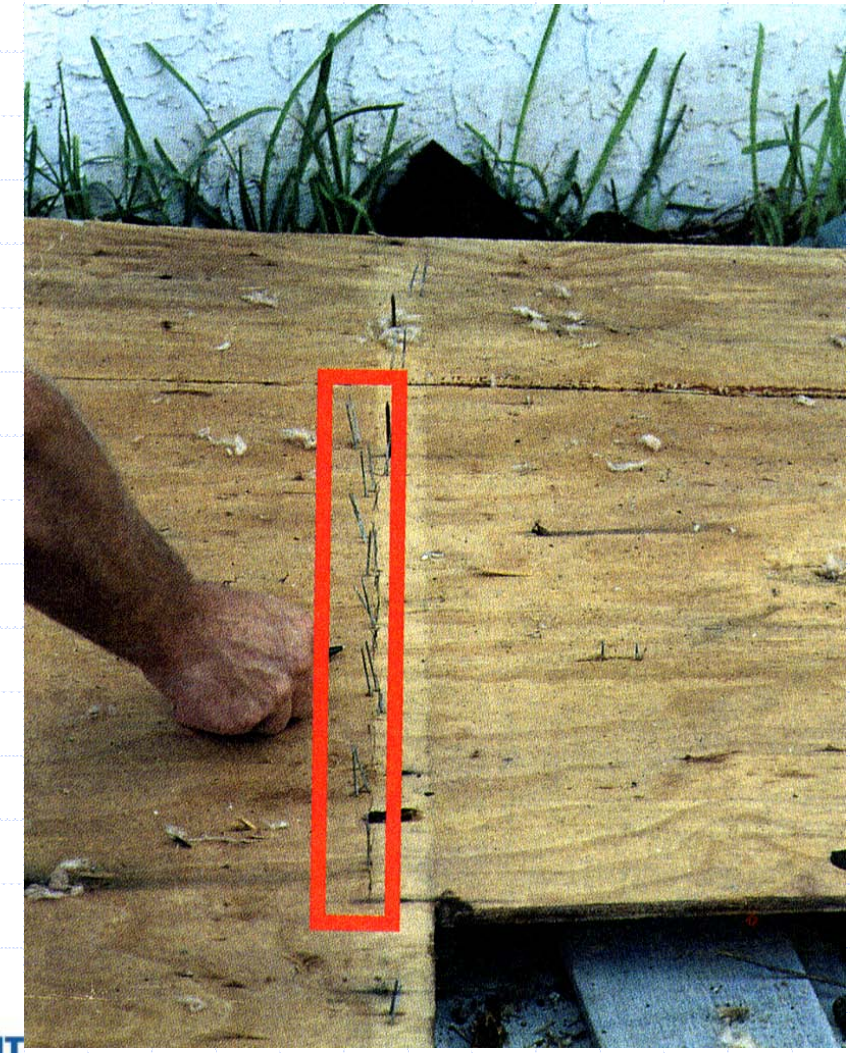
- With roof covering removed, inspect for
  - Fasteners size
  - Fastener spacing
  - Sheathing thickness
- Remove damaged or rotted sheathing

Look for “Shiners” in attic space



All Nails Missed

Roof Deck Failures

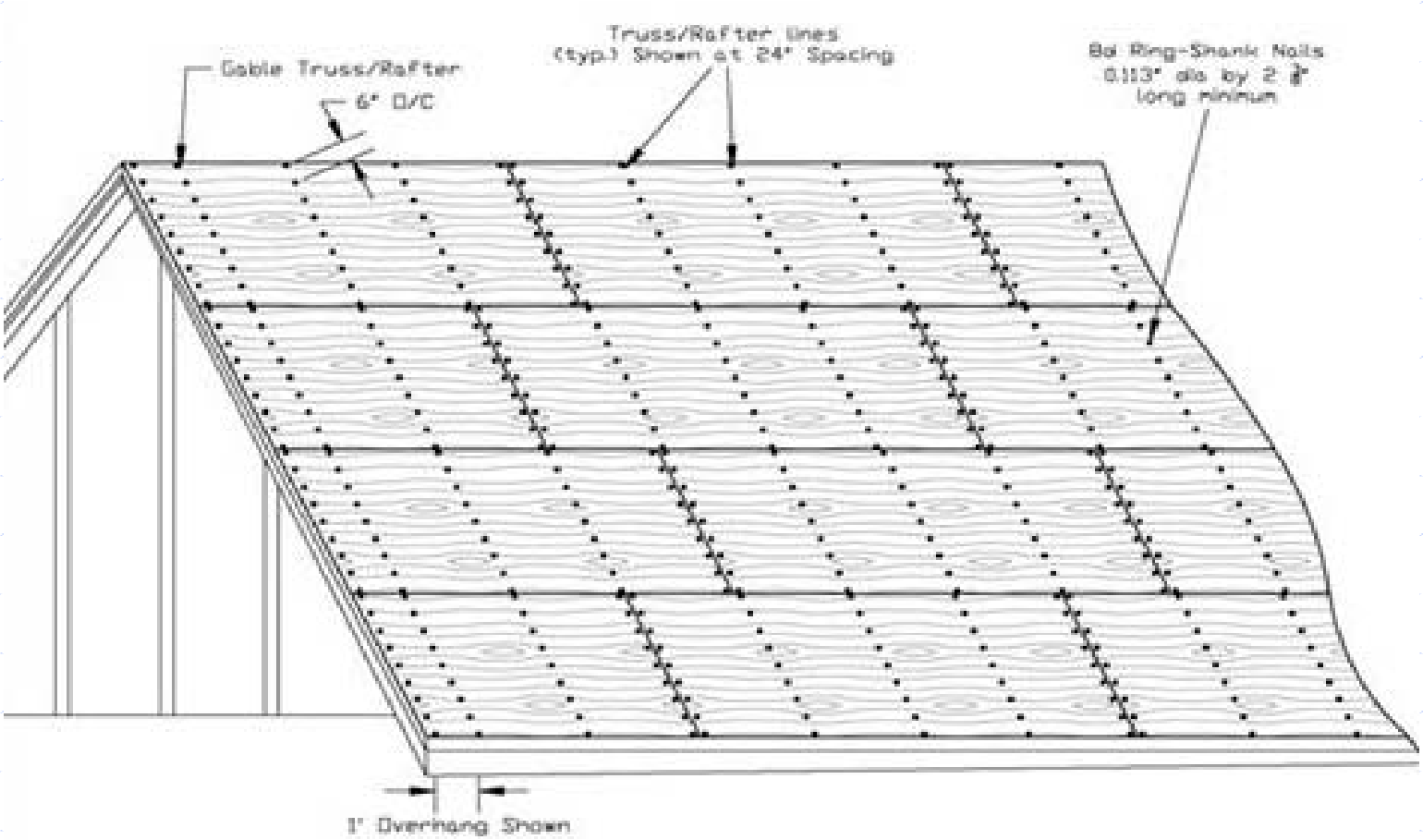


- Staples no longer permitted for high wind areas
- Staples missed framing

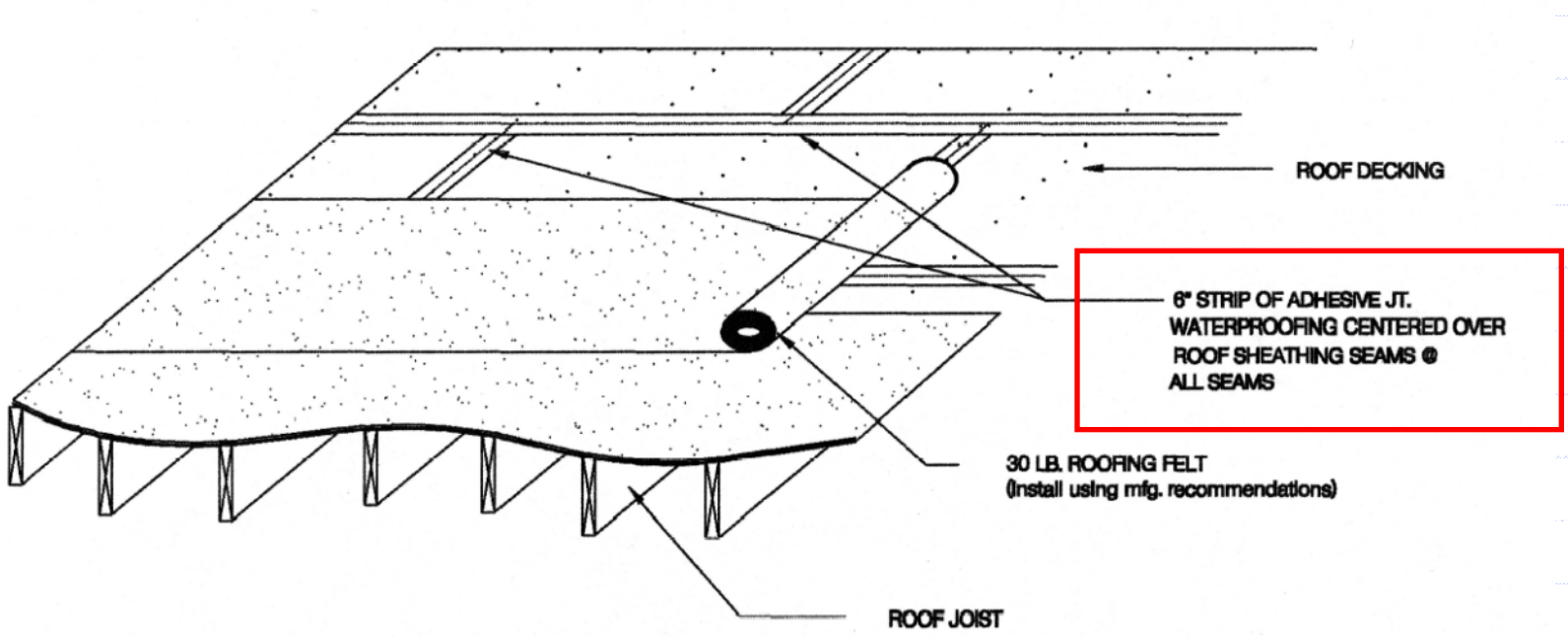
Blueprint for Safety Recommendations for Re-Roofing

- Roofing requirements
  - 5/8” min. CDX plywood sheathing
  - 8d ring shank nails @ 6” and 6” inch spacing (6” on the edge and 6” in the field)
  - Edgewise Blocking at all horizontal sheathing joints 6 ft from gable end

8d Ring Shank nails @ 6 inch spacing



Sealing Sheathing Joints Secondary Water Barrier



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For the ultimate in water resistance, seal sheathing joints with flashing tape for Secondary Water Barrier

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Roof Covering Performance

Roof Covering – Asphalt Shingles

- Standard shingles rated for 60 mph
- Well below hurricane force winds
- Use shingles tested to:
  - Miami-Dade PA 107
  - ASTM D 3161 (modified to 110 mph)

Asphalt Shingle Requirements – FBC

1507.3.7 Attachment. Asphalt Shingles…For roofs located where the basic wind speed per Figure 1606 is 110 mph (49 m/s) or greater, special methods of fastening are required. Unless otherwise noted, attachment of asphalt shingles shall conform with ASTM D 3161 (modified to 110 mph) or M-DC PA 107-95.

Retrofitting when Re-roofing is Years Away

- With attic access
- With no attic access
  - Access from the exterior
  - Access from the interior

With Attic Access

- Install straps connecting roof framing to top plate (or wall below)
- Install straps connecting top plate to wall below
- Brace gable endwalls
- Construction Adhesive

Roof Sheathing Enhancement

- Construction Adhesive
  - AFG – 01 rated
  - ¼” bead along intersection roof sheathing and truss/rafter. Both sides.
  - 200 psf uplift capacity
  - Use quarter-round, 1x, or 2x pieces embedded with adhesives at gable ends
    - Increases capacity by 50%

Deck to framing connection can be strengthened by adding a bead of Construction Adhesive

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What to look for:

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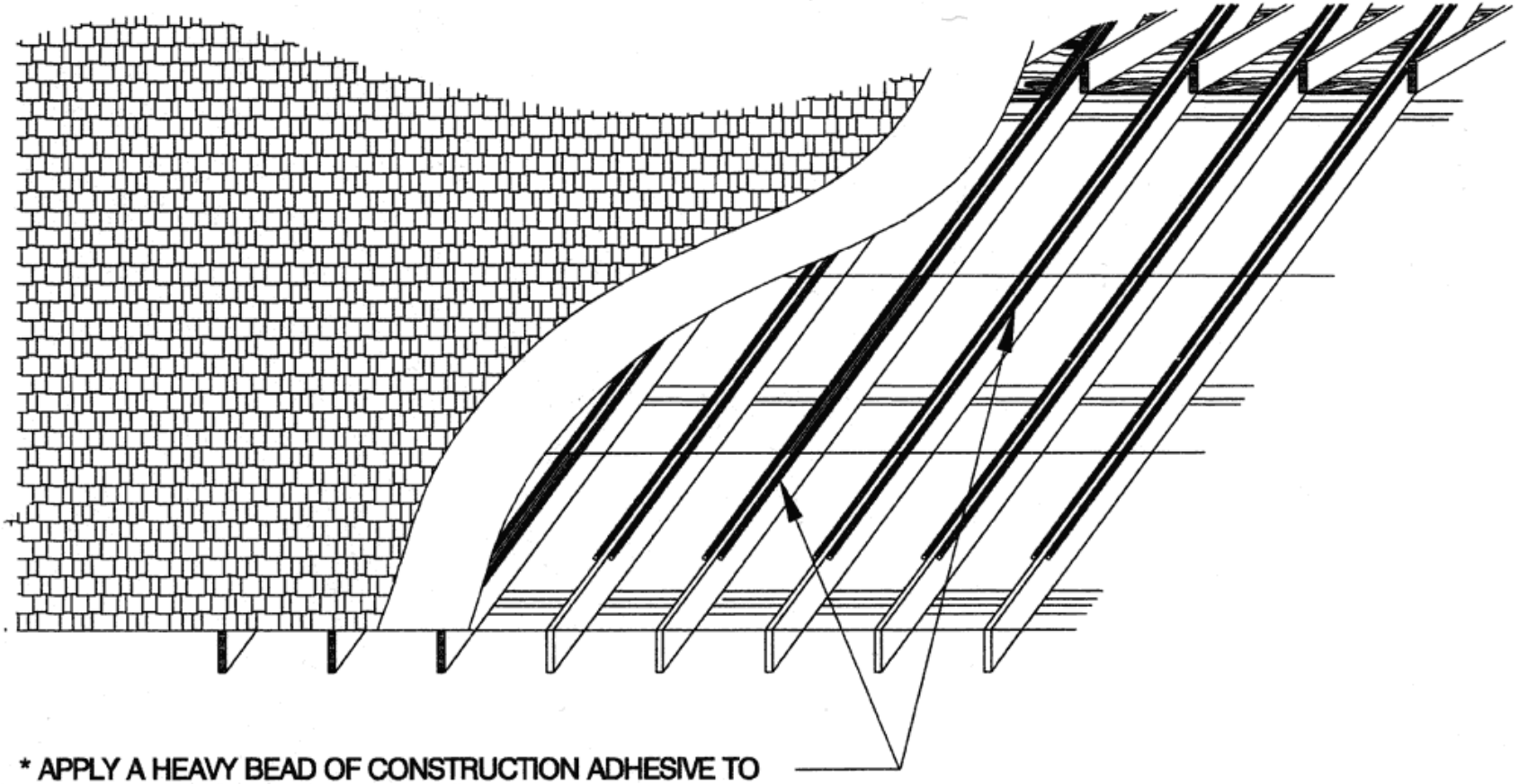


* APPLY A HEAVY BEAD OF CONSTRUCTION ADHESIVE TO ENTIRE LENGTH OF EACH SIDE, EACH MEMBER TO REINFORCE THE ROOF FRAME TO ROOF DECK CONNECTION

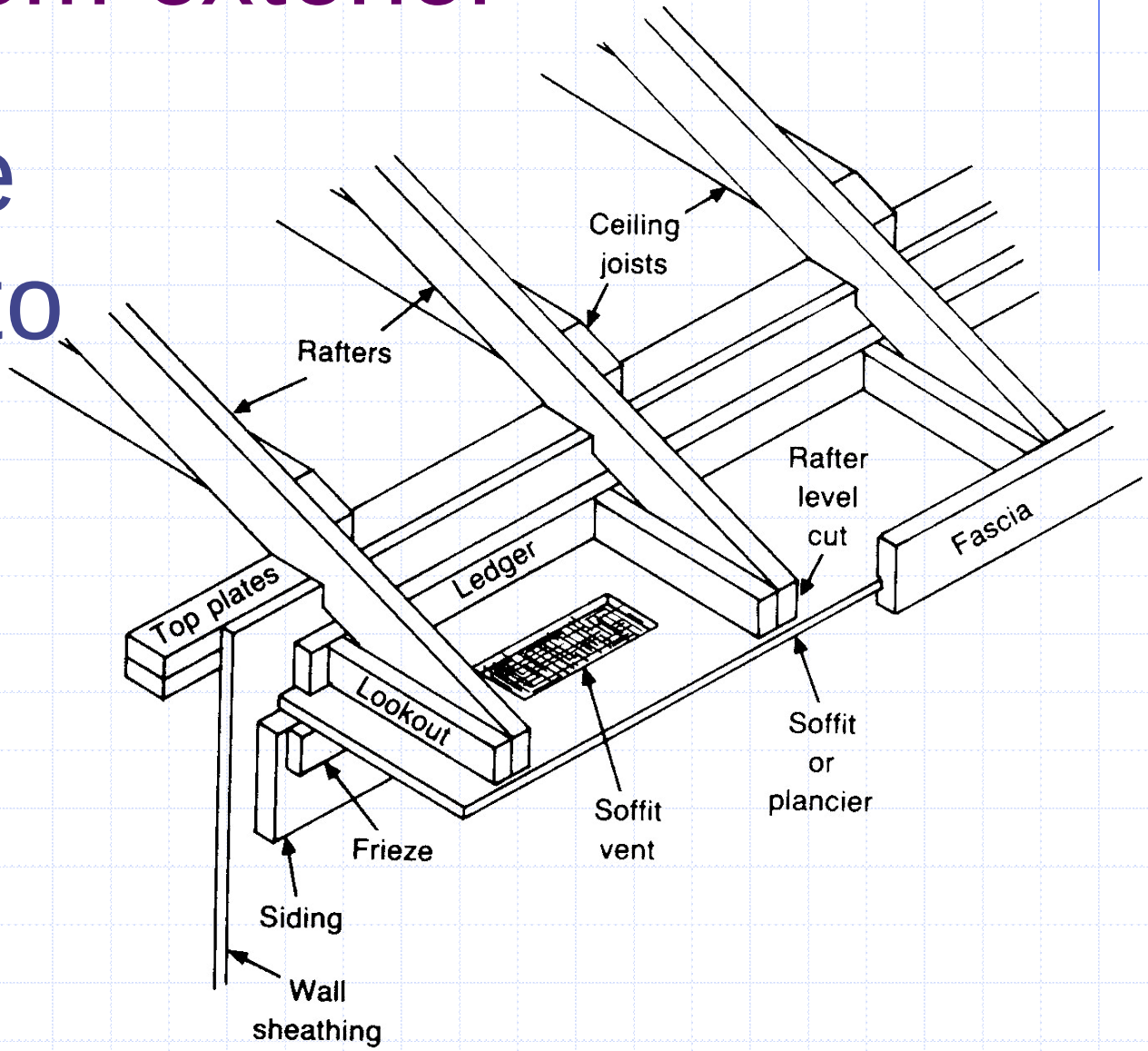
(42) REINFORCEMENT @ ROOF MEMBER / ROOF DECK CONNECTION

No Attic Access

- Access from exterior
  - Examine soffit and exterior cladding
    - Cost
    - Degree of intrusion
    - Time
  - May have to remove some of exterior siding

Access from exterior

It may be possible to remove soffit and apply hurricane ties



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- FEMA 320 *Taking Shelter From the Storm: Building a Safe Room Inside Your House*
- SSTD 10-99 *Standard for Hurricane Resistant Residential Construction*
- AF&PA *Wood Frame Construction Manual for One- And Two-Family Dwellings, High Wind Edition*
- FEMA Technical Bulletin 8-96 *Corrosion Protection for Metal Connectors in Coastal Areas*

Thank you!!!

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