

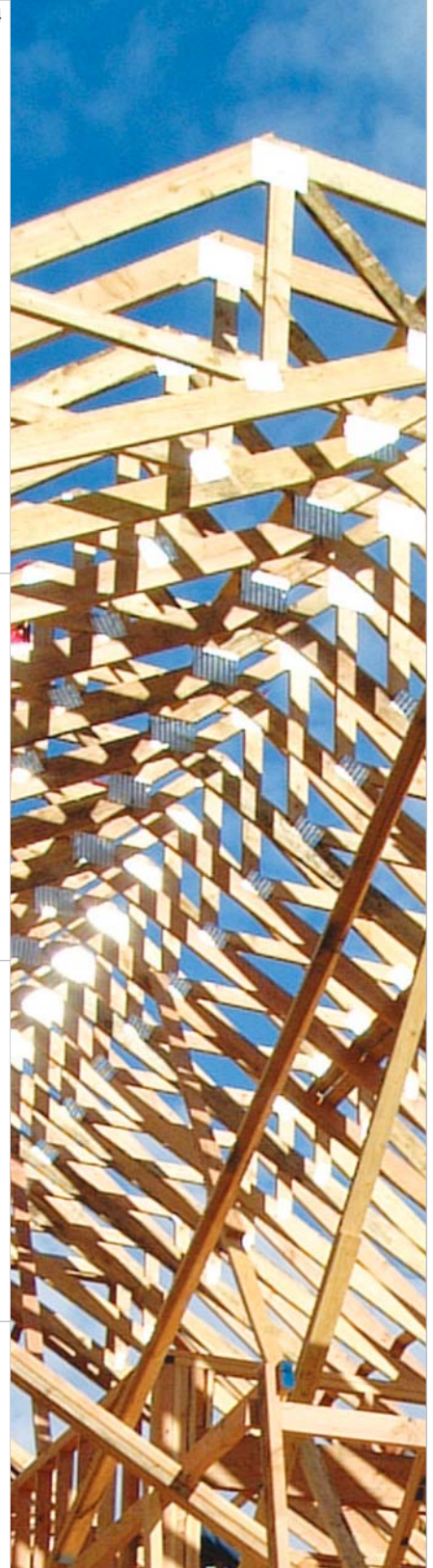
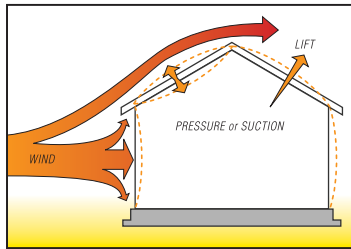
UPLIFT CONNECTORS



Page 1 of 4

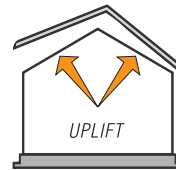
This flier highlights connectors that, when used properly, will help a house resist wind **uplift forces** only. For examples of connectors that resist overturning and sliding forces, please see our Addressing Overturning, The Effects of Wind and/or Earthquake fliers.

When a home is built with a system of connectors at all the joints – from the roof to the foundation – its ability to withstand Mother Nature’s forces increases significantly. This system of connectors redistributes the external pressures of wind from the frame of the house to the foundation. This is referred to as “**continuous load path.**”

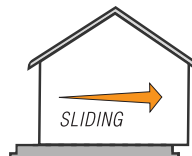


During a thunderstorm, blizzard, hurricane or tornado, the force of wind on a house works in three ways:

1 As it flows over the roof the wind creates a strong lifting effect, much like that of air flowing over an airplane wing. This is called **uplift**.



2 It exerts lateral forces on the structure which attempt to rack the structure or force the structure to slide off of the foundation.



3 If the structure is unable to rack or slide, the lateral forces attempt to rotate or **overturn** elements throughout the structure.



UPLIFT CONNECTORS

Page 2 of 4

International Residential Code®-2000/2003

R301.1 Design.

The construction of buildings and structures shall result in a system that provides a **complete load path** capable of transferring all loads from their point of origin through the load-resisting elements to the foundation.

International Building Code®-2000/2003

1604.4 Analysis.

Any system or method of construction to be used shall be based on a rational analysis in accordance with the well-established principles of mechanics. Such analysis shall result in a system that provides a **complete load path** capable of transferring loads from their point of origin to the load resisting elements.

TOP PLATES-TO-STUD

IRC-2000/2003-R301.1/R601.2/ R801.2 and IBC-2000/2003-1604.4/1604.8.1

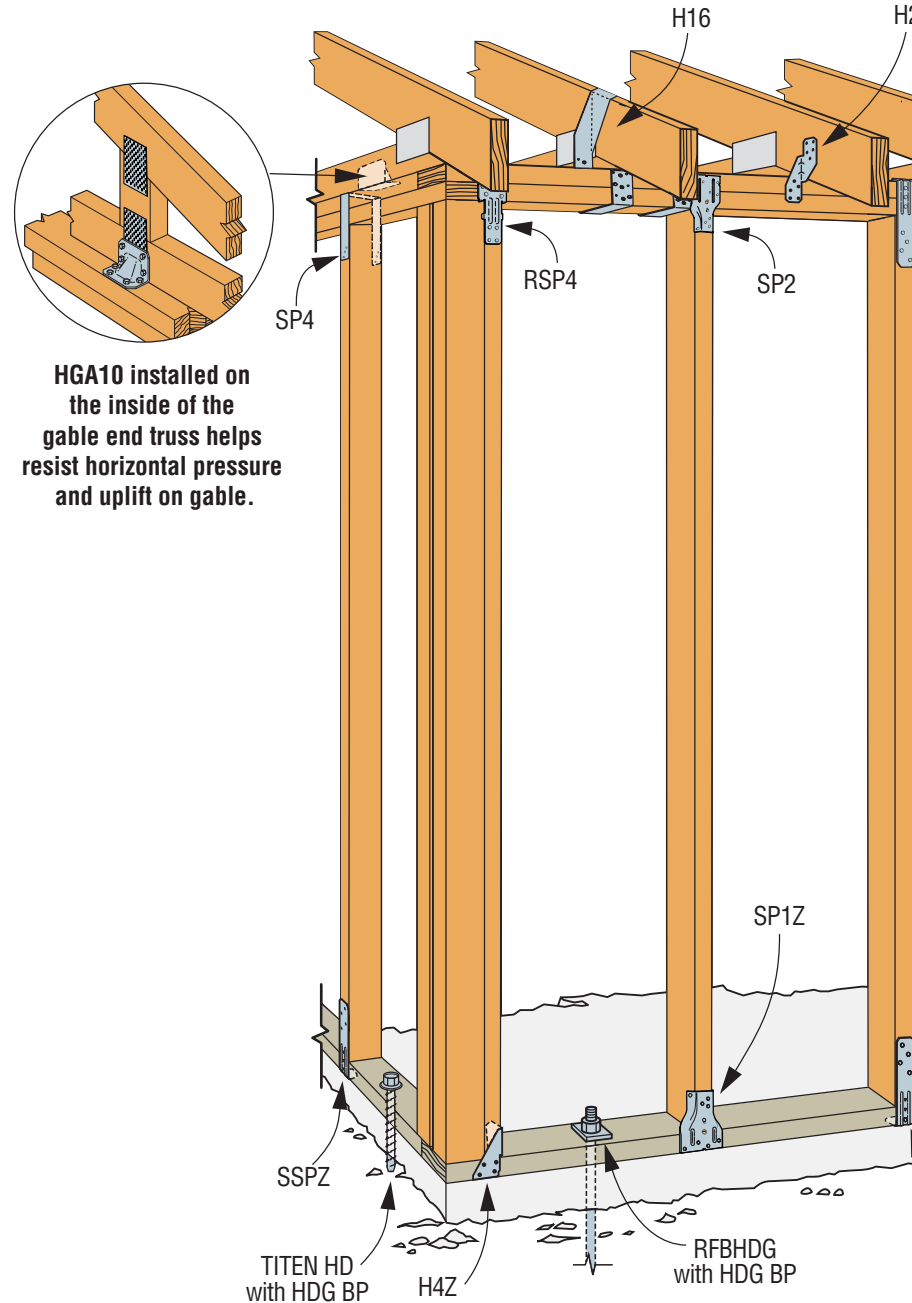
Requires that the uplift load be transferred from the top plates to studs for a continuous load path.

RAFTER/TRUSS-TO-TOP PLATES

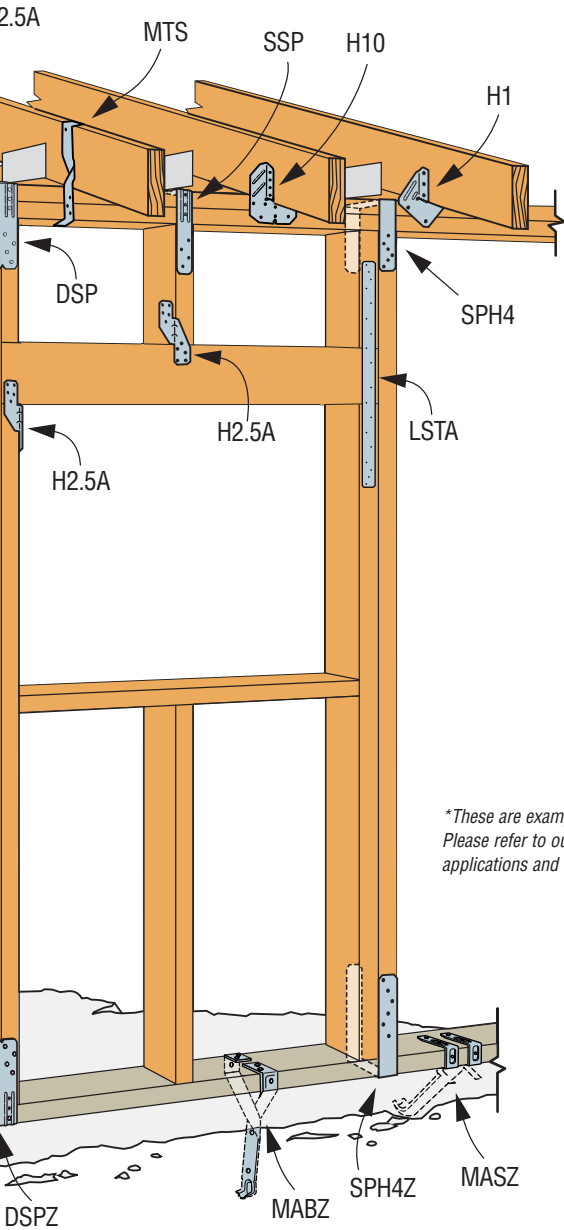
IRC-2000/2003-R802.10.5 and R802.11 (trusses only) and IBC-2000/2003-2308.10.1, 1609.1.3

Notes:

- Based on testing and analysis of this connection, Jim Cheng, Senior Research Analyst for State Farm Insurance states, "Most toe-nailed connections of a wood-framed structure can fail when wind speed goes beyond 90 M.P.H. Building failures...are often due to failures of toe-nailed connections".
- AF&PA – NDS 1997 – 12.1.3.2 – Proper installation of nails.
- AF&PA – NDS 1997 – 12.4.1 #2 – Toe-nailing cannot split the wood.
- Installing hurricane ties on the outside of the wall is best done direct to framing. If installing on the outside of structural sheathing the nail must penetrate into the top plates 10 diameters.
- When installing hurricane ties to the inside of the wall or using non-structural sheathing, the next connection down (top plates-to-stud) must be on the same side of the wall.



HGA10 installed on the inside of the gable end truss helps resist horizontal pressure and uplift on gable.



*These are examples of uplift connectors. Please refer to our catalog for appropriate applications and loads for your area.

NOTE: Refer to www.strongtie.com/info for corrosion information.

PLEASE NOTE: Many of the new Pressure Treated Woods use chemicals that are corrosive to steel. By selecting connectors that offer greater corrosion resistance (Stainless Steel, Post Hot-Dip Galvanized, or ZMAX™) you can extend the service life of your connectors. However, corrosion will still occur. You should perform periodic inspection of your connectors and fasteners to insure their strength is not being adversely affected by corrosion. In some cases, it may be necessary to have a local professional perform the inspections. Because of the many variables involved, Simpson Strong-Tie cannot provide estimates on service life of connectors, anchors or fasteners.

Allowable loads for more than one direction for a single connection cannot be added together. A design load which can be divided into components in the directions given must be evaluated as follows:

**Design Uplift/Allowable Uplift
+ Design Lateral Parallel to Plate/
Allowable Lateral Parallel to Plate
+ Design Lateral Perpendicular to Plate/
Allowable Lateral Perpendicular to Plate < 1.0.**

Some hurricane ties and toenails alone may not be sufficient to meet the unity equation.

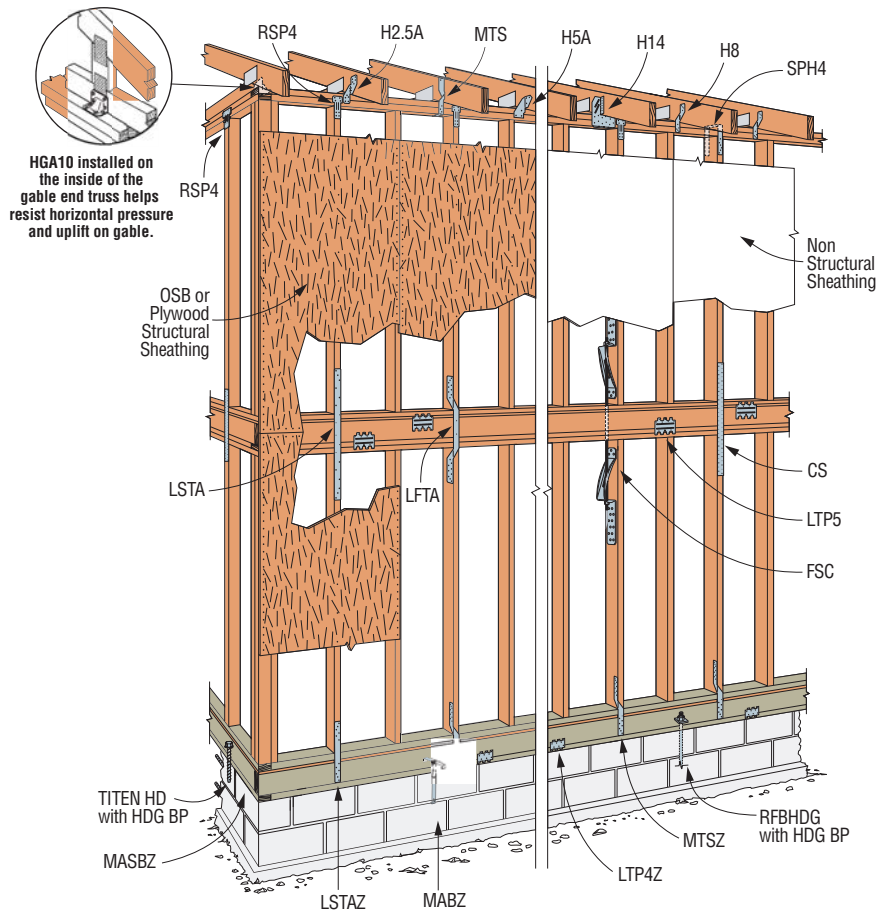
STUD-TO-SILL PLATE

IRC-2000/2003-R301.1/R601.2 and IBC-2000/2003-1604.4/1604.8.1

Requires that the uplift load be transferred from the studs to the sill plate for a continuous load path.

Notes:

- If using structural sheathing to resist uplift loads, the design professional should specify nailing requirements to achieve continuous load path.
- If using non-structural sheathing, a mechanical connection may be required for a continuous load path.



NOTE: Refer to www.strongtie.com/info for corrosion information.

*These are examples of uplift connectors. Please refer to our catalog for appropriate applications and loads for your area.

CODE ANALYSIS: FLOOR-TO-FLOOR

IRC-2000/2003 – R301.1/R601.2 and IBC-2000/2003 – 1604.4/1604.8.1

requires that the uplift load be adequately transferred from the second story to the first story.

IBC-2000/2003 – 2305.1.2 states, "Diaphragm and shear wall sheathing shall not be used to splice boundary elements".

Notes:

- If using structural sheathing to span the joints at a floor system, the design professional should specify nailing requirements to achieve continuous load path. Also, blocking would be required to achieve the lateral load nailing schedule as required by code.
- When using flat straps (CS, LSTA, MSTA) to connect the upper story to the lower story, nails are required in the upper story studs and lower story studs only. Consideration should be given to installation to prevent bowing of the straps.

Home Office

4120 Dublin Blvd., Ste 400
Dublin, CA 94568
FAX: 925/833-1496

Northwest USA

5151 S. Airport Way
Stockton, CA 95206
FAX: 209/234-3868

Southwest USA

260 N. Palm Street
Brea, CA 92821
FAX: 714/871-9167

Northeast USA

2600 International Street
Columbus, OH 43228
FAX: 614/876-0636

Southeast USA

2221 Country Lane
McKinney, TX 75069
FAX: 972/542-5379

Quik Drive Factory

436 Calvert Drive
Gallatin, TN 37066
FAX: 615/451-9806

Eastern Canada

5 Kenview Blvd.
Brampton, ON L6T 5G5
FAX: 905/458-7274

Western Canada

11476 Kingston St.
Maple Ridge, BC V2X 0Y5
FAX: 604/465-0297

Warehouses:

Enfield, CT
Jacksonville, FL
Kent, WA
Langley, BC

800-999-5099

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Printed in the USA

F-UPLIFTCON06 1/06