

Reinforcing Roof to Wall Connections

The connection at the intersection of the roof framing with the wall (of the structure) below shall provide sufficient resistance to meet the minimum uplift loads specified in Table F-1 either because of existing conditions or through retrofit measures. For additional guidance based on rafter or truss spacing as well as roof pitch, please consult Table R802.11 found in the 2015 South Carolina Residential Code.

Table F-1

	BASIC WIND SPEED	ROOF SPAN (FEET)							OVERHANG
		12	20	24	28	32	36	40	
Within 6 feet of building corner	85	-69.85	-116.42	-139.70	-162.99	-186.27	-209.55	-232.84	-27
		-82.67	-137.78	-165.34	-192.90	-220.45	-248.01	-275.57	-30.3
	90	-110.51	-184.18	-221.01	-257.85	-294.68	-331.52	-368.36	-37.4
	100	-141.27	-235.45	-282.55	-329.64	-376.73	-423.82	-470.91	-45.3
	110	-174.97	-291.62	-349.94	-408.26	-466.59	-524.91	-583.23	-53.9
	120	-211.60	-352.66	-423.19	-493.72	-564.26	-634.79	-705.32	-63.2
	130	-251.15	-418.59	-502.31	-586.02	-669.74	-753.46	-837.18	-73.3
	140	-293.64	-489.40	-587.28	-685.16	-783.04	-880.92	-978.80	-84.2
	150	-387.40	-645.67	-774.81	-903.94	-1033.08	-1162.21	-1291.35	-108
Greater than 6 ft from building corner	85	-39.10	-65.17	-78.20	-91.24	-104.27	-117.30	-130.34	-27
		-48.20	-80.33	-96.39	-112.46	128.52	-144.59	-160.66	-30.3
	90	-67.95	-113.24	-135.89	-158.54	181.19	-203.84	-226.49	-37.4
	100	-89.78	-149.63	-179.55	-209.48	-239.40	-269.33	-299.25	-45.3
	110	-113.68	-189.47	-227.37	-265.26	-303.16	-341.05	-378.94	-53.9
	120	-139.67	-232.78	-279.34	-325.90	-372.45	-419.01	-465.57	-63.2
	130	-167.74	-279.56	-335.47	-391.38	-447.29	-503.21	-559.12	-73.3
	140	-197.88	-329.80	-395.76	-461.72	-527.68	-593.64	-659.60	-84.2
	150	-264.41	-440.68	-528.81	-616.95	-705.08	-793.22	-881.35	-108

Note: Retrofitting of the roof-to-wall connection to meet or exceed uplift requirements shall be performed on ALL structures where the roof covering is being replaced as part of the program.

Exception: Retrofitting of the existing roof-to-wall connection is not necessary where it can be demonstrated by code adoption date documentation and permit issuance date that existing roof-to-wall connections and/or roof-to-foundation connections meet or exceed the load path requirements for the 2015 South Carolina Building Code.

Any questions regarding the uplift requirements for a specific structure should be referred to structural engineer licensed in the State of South Carolina. As an alternative to site-specific engineered design, the prescriptive retrofit solutions provided in **Sections A through F** shall be accepted as meeting the roof-to-wall connection retrofit requirements of the South Carolina Safe Home Grant Program.

Note: These methods are similar to the requirements for the Institute of Business and Home Safety (IBHS), FORTIFIED standards.

Choosing Roof to Wall Connectors

In addition to following the processes detailed below, the selection of the proper metal connector is also important. The connector must meet the necessary uplift requirements but also be applicable to an appropriate installation on the home. Connectors shall not be modified from their original shape unless intended by the manufacturer. Also keep in mind some homes may require different connectors throughout various locations on the home as one specific connector may not work for all the roof to wall intersections.

Finally, research should be done prior to selecting the connectors for each project as some manufacturers now offer screws that can serve the same specifications as a connector. Using these if applicable to the specific home, can save time, add ease of installation and be comparable in uplift resistance as a connector. Photographic documentation of the connectors used must be provided in the SC Safe Home Reimbursement Request Packet.

Section A: Access for Retrofitting Roof to Wall Connections.

These methods are not intended to limit the means for gaining access to the structural elements of the roof and wall for the purposes of retrofitting the connection. The retrofit of roof to wall connections may be accessible through the area under the eave, from above through the roof, or from the interior of the house. Methods for access also include removal of roof panels or sections thereof or removal of portions of roof paneling at selected locations large enough for access, viewing, and installing the retrofit connectors and fasteners.

Where panels or sections are removed, the removed portions shall not be reused. New paneling shall be used and fastened with nails described below:

8d ring shank nails with round heads and the following minimum dimensions:

1. 0.113" nominal shank diameter
2. Ring diameter a minimum of 0.012" greater than shank diameter
3. 16 to 20 rings per inch.
4. A minimum 0.280" full round head diameter
5. Ring shank to extend a minimum of 1 ½" from the tip of the nail.
6. Minimum 2 3/8" nail length.

If partial roof panels are removed such as access holes cut in the deck, the holes shall be deemed adequately repaired if a patch of paneling is installed with no gap greater than ½" between the patch and the existing sheathing and if the patch is supported using one of the following methods:

- (a) Solid 1 ½" lumber shall fully support the patch and shall be secured to the existing sheathing with #8 by 1 ¼" screws spaced a minimum of 3" around the perimeter with screws a minimum of ¾" inch from the near edge of the hole. The patch shall be secured to the lumber with #8 x 1 ¼" screws spaced on a grid not greater than 6" by 6" with no fewer than 2 screws.
- (b) Holes that extend horizontally from a roof framing member to an adjacent roof framing member that are less than or equal to 7" wide along the slope of the roof shall be supported by minimum of 2x4 lumber whose face is attached to each roofing framing members using a minimum of 2 each 3-inch long fasteners (#8 screws or 10d common nails) connecting the two. The patch shall have attached to its bottom running horizontally a minimum of 2x4 either flat wise or on edge secured with #8 x 1 ¼" screws a maximum of 4 inches on center and no more distant from the end of the added lumber than 3 inches. The patch shall be secured with two #8 x 1 ¼" screws to each support member.

B. Partially Inaccessible Straps: Where part of an existing strap is inaccessible and if the portion of the strap that is observed is fastened in compliance with these requirements, the inaccessible portion of the strap shall be presumed to comply with these requirements.

C. Prescriptive Method for Gable Roofs on a Wood Frame Wall. At a minimum, the anchorage of each of the exposed rafters or truss within 6 feet of the corner along the exterior wall on each side of each gable end shall be inspected. Wherever a strap is missing, or an existing strap has fewer than three fasteners on each end, approved straps, ties or right-angle brackets with a minimum uplift capacity of 500 lbs. shall be installed that connect each rafter or truss to the top plate below. Adding fasteners to existing straps shall be allowed in lieu of adding a new strap provided the strap is manufactured to accommodate at least 4 fasteners at each end. Wherever access makes it possible (without damage of the wall or soffit finishes), both top plate members shall be connected to the stud below using a stud to plate connector with a minimum uplift capacity of 500 lbs. Use of straps that connect directly from the rafter or truss to the wall stud below shall be allowed as an alternate provided the two members align with no more than 1 1/2" offset.

D. Prescriptive Method for Gable Roofs on a Masonry Wall. At a minimum, the anchorage of each of the exposed rafters or truss within 6 feet of the corner along the exterior wall on each side of each gable end shall be inspected. Wherever a strap is missing or an existing strap has fewer than four fasteners on each end, approved straps, ties or right angle gusset brackets with a minimum uplift capacity of 500 lbs. shall be installed that connect each rafter or truss to the top plate below or directly to the masonry wall using approved masonry screws that will provide at least a 2-1/2" embedment into the concrete or masonry. When the straps or right-angle gusset brackets are attached to a wood sill plate, the sill plate shall be anchored to the concrete masonry wall below. This anchorage shall be accomplished by installing 1/4" diameter masonry screws, each with supplementary 1/4" washer, having sufficient length to develop a 2-1/2" embedment into the concrete and masonry. These screws shall be installed within 4" of the truss or rafter on both sides of each interior rafter or truss and on the accessible wall side of the gable end truss or rafter.

E. Prescriptive Method for Hip Roofs on a Wood Frame Wall. Unless it is possible to verify through non-destructive inspection or from plans prepared by a design professional that the roof structure is anchored at least as well as outlined below, access shall be provided at a minimum to the hip rafter (commonly known as a "king jack"), to the hip girder and at each corner of the hip roof. The hip rafter, the hip girder and the rafters/trusses adjacent to the hip girder that are not anchored with a strap having at least four fasteners on each end, shall be connected to the top plate below using a strap or a right angle gusset bracket having a minimum uplift capacity of 500 lbs. Adding fasteners to existing straps shall be allowed in lieu of adding a new strap provided the strap is manufactured to accommodate at least 4 fasteners at each end. Wherever access makes it

possible (without damage of the wall or soffit finishes), both top plate members shall be connected to the stud below using a stud to plate connector with a minimum uplift capacity of 500 lbs. Use of straps that connect directly from the hip rafter, hip girder or adjacent rafters/trusses to the wall stud below shall be allowed as an alternate provided the two members align with no more that 1-1/2” offset.

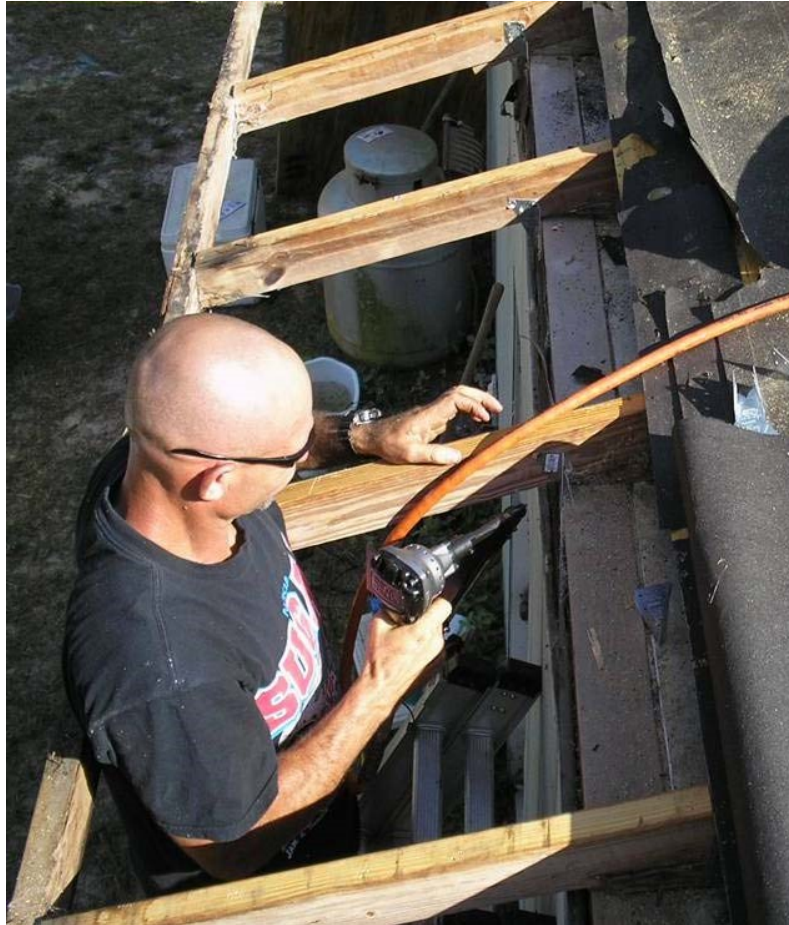


Figure F-1

Adding fasteners to existing house after removing roof sheathing.

F. Prescriptive Method for Hip Roofs on a Masonry Wall. Unless it is possible to verify through non-destructive inspection or from plans prepared by a design professional that the roof structure is anchored at least as well as outlined below, access shall be provided at a minimum to the hip rafter (commonly known as a “king jack”), to the hip girder and at each corner of the hip roof. The hip rafter, the hip girder and the rafters/trusses adjacent to the hip girder that are not anchored with a strap having at least four fasteners

on each end, shall be connected to the concrete masonry wall below using approved straps or right angle gusset brackets with a minimum uplift capacity of 500 lbs. Adding fasteners to existing straps shall be allowed in lieu of adding a new strap provided the strap is manufactured to accommodate at least 4 fasteners at each end. The straps or right-angle gusset brackets shall be installed such that they connect each rafter or truss to the top plate below or directly to the masonry wall using approved masonry screws that will provide at least a 2-1/2" embedment into the concrete or masonry. When the straps or right-angle gusset brackets are attached to a wood sill plate, the sill plate shall be anchored to the concrete masonry wall below. This anchorage shall be accomplished by installing 1/4" diameter masonry screws, each with supplementary 1/4" washer, with sufficient length to develop a 2-1/2" embedment into the concrete and masonry. These screws shall be installed within 4-inches of the truss or rafter on both sides of each interior rafter or truss and on the accessible wall side of the gable end truss or rafter.

G. Priorities for Mandated Roof-to-Wall Retrofit Expenditures. Priority shall be given to connecting the exterior corners of roofs to walls where the spans of the roofing members are greatest. For houses with both hip and gable roof ends, the priority shall be to retrofit the gable end roof-to-wall connections unless the width of the hip end is more than 1.5 times greater than the width of the gable end.