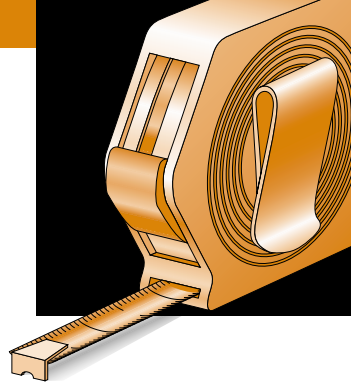
Roof Sheathing Fastening Schedules for Wind Uplift



Introduction

This Data File provides recommended nailing schedules for wood structural panel roof sheathing – plywood, COM-PLY® and oriented strand board (OSB). These schedules were established to provide resistance to wind uplift pressure, with particular emphasis on high wind exposures.

Recommendations were developed through computer analysis and verified by full-scale laboratory testing. Wet, as well as dry specimens of plywood and OSB panels were tested for full panel withdrawal under uniform pressure. The results of this testing were compared with wind loads calculated in accordance with the design provisions of ASCE 7-88, Minimum Design Loads for Buildings and Other Structures.

Recommended Fastening Schedules

The fastening schedules presented in Table 1 reflect the differences in wind uplift pressures that may be anticipated over various portions of roof systems. Higher pressures at eaves, corners, ridges and gable-ends require more restrictive schedules than at interior portions of the roof system. For this reason, fastening schedules may have different requirements for each of the three roof fastening zones illustrated on Figure 1.

Three fastening schedules are provided in Table 1 for roof applications with framing spaced at 24 inches on center or less. These schedules assume the use of wood structural panels 5/8 inch thick or less and are appropriate for buildings with a mean roof height of up to 35 feet. All fasteners listed in the tables are minimum 8d common nails with smooth or ring shanks, depending on the basic wind speed and fastener location. All recommendations are based on the use of full length nails meeting the requirements of FF-N-105B (ASTM F1667).

The three schedules provided give nailing recommendations for basic uplift, intermediate uplift, and high wind uplift conditions as follows:

Basic uplift – The basic uplift fastening schedule is appropriate for buildings located in areas where the basic wind speed, as determined by your local building department, is 80 mph (fastest mile wind speed) or less. These areas are normally included under the prescriptive sections of building codes. As such, the nailing schedule is the familiar 6 inches on center at supported panel edges, including gable-end walls, and 12 inches on center over intermediate panel supports. Note, however, that *minimum 8d nails are recommended* for all panels 5/8 inch thick or less. Former APA minimum fastening recommendations included the use of 6d nails for panels 1/2 inch thick or less.

Intermediate uplift – The intermediate uplift fastening schedule is appropriate in inland areas with a basic wind speed above 80 mph and below the basic wind speeds for which the high wind uplift schedule is recommended.

High wind uplift – The schedule for high wind uplift is appropriate for *all hurricane oceanline regions* (Atlantic and Gulf of Mexico coastal areas). In addition, this schedule should be considered for the *transition zone between hurricane oceanline and inland regions*. Appendix A is provided to assist in determining at which basic wind speed (for inland regions) the high wind uplift schedule is recommended. Contact your local building department for basic wind speed used for design in your area.

For conditions that are not addressed by these general guidelines, such as the "special wind regions" identified in ASCE 7-88, engineered design is recommended.

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FIGURE 1

ROOF FASTENING ZONES FOR WIND UPLIFT

(ZONES SHOWN BELOW INDICATE AREAS OF THE ROOF WITH DIFFERENT FASTENING REQUIREMENTS AND SHOULD NOT BE CONFUSED WITH ASCE 7 PRESSURE COEFFICIENT ZONES.)

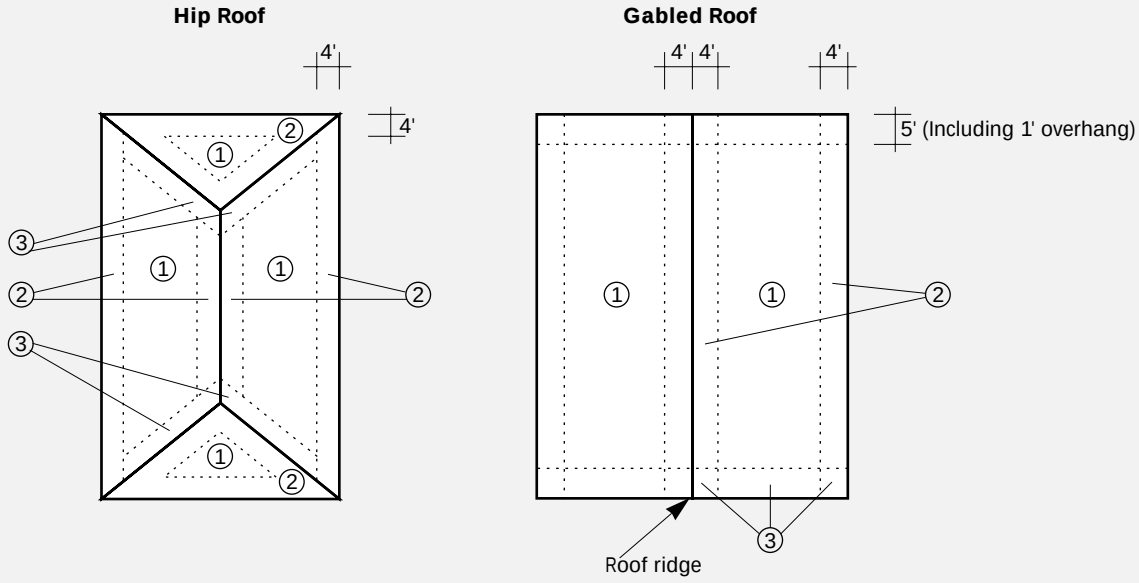

TABLE 1

ROOF SHEATHING FASTENING SCHEDULE

Region	Nails	Panel Location	Roof Fastening Zone		
			1	2	3
			Fastening Schedule (inches on center)		
High Wind Uplift	8d common	Panel edges[a]	6	6	4[b]
		Panel field	6	6	6[b]
Intermediate Uplift	8d common	Panel edges[a]	6	6	4
		Panel field	12	6	6
Basic Uplift	8d common	Panel edges[a]	6	6	6
		Panel field	12	12	12

(a)Edge spacing also applies over roof framing at gable-end walls.

(b)Use 8d ring-shank nails in this zone if mean roof height is greater than 25'.

Appendix A

High Wind Uplift Fastening Schedule for Inland Regions

The high wind uplift fastening schedule is recommended at hurricane oceanlines and transition regions. To determine the basic wind speed at which the high wind uplift fastening schedule is recommended for a specific structure in an inland region, consider the following:

1. The ability of a roof sheathing panel to resist high winds is directly related to how well it is secured to the roof framing. The type and number of fasteners required for a specific application is obviously an important consideration. Another important consideration is the wood species of the roof framing members into which the sheathing fasteners are driven. Wood of more dense species such as Douglas-fir and southern pine provides greater nail withdrawal resistance and significantly improves the performance of the sheathing nailing. As shown in Table A1, if less dense species such as hem-fir or spruce-pine-fir are specified and used, the high wind uplift schedule is recommended at lower basic wind speeds than if the denser species are used.

2. Another consideration relates to the condition of the building envelope during the high wind event. If the building envelope remains intact during the storm the destructive forces of the wind are considerably less than experienced if a large window, sliding glass door, or garage door is breached, or if there are permanent openings. Breaching of the building envelope can be prevented by the use of impact resistant glazing or shutters.

Generally speaking, well designed and installed shutter systems are intended to keep the building envelope intact during high wind conditions. In addition to maintaining the building envelope intact and lowering the wind forces on the structure, shutters also serve to protect the interior of the building from water damage caused by failed doors and glass. As can be seen from Table A1, the high wind uplift schedule is recommended at lower basic wind speeds when there is a possibility that the envelope may be breached by breakage or by permanent openings.

TABLE A1

BASIC WIND SPEEDS[(a)(b)] FOR WHICH THE HIGH WIND UPLIFT SCHEDULE IS RECOMMENDED FOR INLAND REGIONS

Wood Species of Roof Framing	Building Envelope Intact (Shutters or impact resistant glazing)	Building Envelope Breached
Hemlock, Eastern Spruce, Hem-fir, White Pine, Northern Pine or Spruce-Pine-Fir (Specific gravity between 0.42 and 0.49)	100 MPH or greater	90 MPH or greater
Douglas-fir or Southern Pine, (Specific gravity between 0.50 and 0.55)	110 MPH or greater	100 MPH or greater

(a) Fastest mile wind speed.

(b) Contact your local building department for basic wind speed used for design in your area.

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