FASTENING OF INSULATION ON METAL DECKS

INTRODUCTION

Windstorm damages many built-up roofing systems on metal decks each year. This damage has resulted not only from winds of hurricane and tornado force, but also from winds with velocities of less than 50 mph (80 km/h).

In most cases, failure of the roofing system results from:

- Poor or improper application or lack of adhesive;
- Delamination of insulation by loading that has been concentrated by the strip-application of adhesive;
- Weak flashing.

POSITION

Mechanically fasten the first layer of the insulation board to the metal deck.

New Installations

For installation of new roofing systems, mechanically fasten the insulation to the metal deck with the required number and type of fasteners listed for the maximum anticipated uplift pressure on the building. The maximum anticipated uplift pressure is determined by using the local building design standards[1] and PRC.2.0.1.1. Once the uplift pressure is determined, use Table 1 to determine which roof rating is acceptable for the uplift pressure.

TABLE 1
Maximum Uplift Pressure of Rating of Roofs

Roof Wind Uplift Rating	Maximum Uplift Pressure (psf)
30	15
60	30
90	45
120	60
150	75
180	90

SI Units: 1 psf = 47 Pa

Existing Installations

For existing roof systems where it is known that the roof system is not adequately secured or cannot be determined if the roof system is adequately secured, use Table 2 to determine the required depth (distance in from the roof edge) of perimeter-nailing of the insulation. Select the depth based on the wind velocity and building height.

TABLE 2
Recommended Depth In Feet Of Perimeter Nailing For Various Building Heights And Wind Velocities

	Building Height	
Basic Wind Velocity in mph	0 - 50 ft	50 - 100 ft
90	4	8
100 and greater	8	8

SI Units: 1 mph = 0.447m/sec; 1 ft = 0.305 m

The depths of perimeter fastening are based on steel decks of 22-gage (0.031 in., 0.78 mm) or heavier and buildings enclosed to the extent that wind will normally have minimal effect on internal pressures.

For open-sided structures, i.e., aircraft hangars, double the depth of perimeter nailing.

Install these fasteners with 2⅛ in. (54 mm) diameter metal discs or 3 in. (76 mm) square stress plates and in accordance with the insulation manufacturer's specifications. Usually these require four fasteners for a 2 ft × 4 ft (0.6 m × 1.2 m) insulation board, or six fasteners for a 3 ft × 4 ft (1 m × 1.2 m) board.

DISCUSSION

As wind passes over a building, it creates an uplift force on the roof. Extremely strong but localized negative pressure occurs near or at the edge of the roof. It is this pressure that first pulls the roof system apart.

The weakest link in the wind uplift resistance system is the method of securing the insulation to the metal deck. Without proper fastening of the insulation to the metal deck, wind can tear the roof system away. In the past, flood coating of steep asphalt was used to secure the insulation to the deck. However, the use of asphalt increases the combustibility of the roof to unacceptable levels.

To overcome the problem of combustible roofs, mechanically fastening the insulation to the deck reduces the amount of combustible materials that can contribute to the spread of fire. Once the first layer of insulation is secured to the metal deck, additional layers can be secured with adhesives, asphalt or mechanical fasteners. The presence of the adhesives or asphalt in the second layer does not contribute significantly to the fire loading.

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