

## RE-ROOFING WITH METAL

Residential or agricultural buildings are typically constructed with roof coverings such as shingles, slate, roll asphalt roofing or wood shakes. When these coverings outlive their 5 to 20 year life span, metal becomes an attractive and practical option for a re-roofing or renovation project.

Zoning and code restrictions must be reviewed to determine what type of roof coverings are acceptable in neighborhoods, local communities, developments, cities, counties, state, or regional areas.

Slate and wood shakes should be removed from the existing roof. With slate roofs, the removal of the slate is essential because of the heavy weight that this material imposes on the structure. In addition, slate is a "recyclable" material that is in high demand in some areas. Wood Shake shingles are large and bulky. The wood shakes tend to be very uneven and do not give a flat enough surface to attach the metal roofing. This condition will, in many cases, telegraph through and give a wavy appearance on the newly installed metal roof.

With any re-roofing project, it is important to determine the physical condition of the structure. The condition of the existing structure can be inspected from the underside of the roof, such as an attic space, if accessible. If no access exists to examine the roof from underneath, the existing shingles may need to be removed to inspect the existing structure. Any damaged areas should then be replaced or repaired to meet current building codes.

Once the structure is determined to be in satisfactory condition to support the new roof, re-roofing with metal can be accomplished in several ways. One is to determine the "buildup" of roof coverings. One layer of shingles weighs between 2.4 and 3.2 pounds per square foot (psf). Two layers are approximately 5.0 to 6.0 psf. Most trusses are designed for a 10 psf total dead load, which is a load that remains permanently in place on the structure.

Metal roofs add only 0.8 psf to 1.5 psf of dead load weight to a structure. The dead load capacity of the structure and the dead load already in place on the structure must be checked first to determine if the existing shingles/roll roofing or metal must be removed. **If only one or two layers of asphalt shingles exist, metal can usually be installed without the costly tear-off, removal, and disposal of the shingles (many landfills no longer accept asphalt shingles due to environmental concerns).**

In addition to dead load requirements, it is necessary to evaluate the condition of the existing shingles. If the shingles are badly damaged or deteriorated, split, badly curled or waterlogged, this may indicate deterioration of the underlying structure and may cause problems for the new metal roof. If this is the case, remove the shingles, make any necessary repairs to the decking, and install the new metal roof over synthetic underlayment or 30 lb. felt. If the shingles will remain, re-roofing with metal can be accomplished by installation of synthetic underlayment or 30 lb felt and then 2" x 4" purlins or 1" x 4" furring strips with the panels attached to these purlins.

The underlayment can be located directly on top of the old shingles or on top of the purlins,

and will act as an extra layer of protection for moisture -- from within or from the outside. Note: on hot, sunny days the felt will "bleed" asphalt which can get on the worker's shoes and then be tracked onto the metal roof panels, which will require cleaning. Synthetic underlayment will not cause tracking since it is not an asphalt-based product. Please note that 30 lb felt cannot be used under a standing seam roof without adding a slip sheet of red rosin paper or equal to prevent the thermal movement of the standing seam roofing from tearing the 30 lb felt. Ice and Water Shield should also be used along the eaves and in valleys, especially in cold weather climates and in valley's in any climate. This prevents moisture from "Ice Damming" finding its way into the structure. (For more information on Ice Damming, please see Technical Bulletin #404) Metal panels have been installed directly over shingles covered with Titanium underlayment or 30 lb felt, but the appearance can be poor and getting a proper seal on the fastener washers is difficult due to the uneven surface below the panels. Sentrigard Metal Roofing Systems does not recommend this method.

The 2 x 4 purlins, placed flat on the roof, should be screw fastened into the trusses or rafters with two fasteners at each purlin to rafter connection. The decking material and thickness must be known to determine the wood screw size, length and spacing. A 2 x 4 yields a full 1-1/2" of wood thickness in which to attach the metal roofing screws. These purlins should be spaced at a maximum of 24" o.c. horizontally, up the slope of the roof (see chart on page 3). When using purlins for a re roof, make sure that the valleys are filled in solid 12" from the center of the valley on both sides. This is necessary to support the valley flashing. For exposed fastener panels like Grandrib 3 the use of #9 screws is perfectly acceptable when attaching to 2x4's, we do however; require the larger diameter #14 screws when attaching the panels to plywood or OSB.

When re roofing with Climaguard, Horizon 16, Ultra-loc or 5v-Crimp panels, which are made to go over a solid substrate, there needs to be a solid substrate for the re-roof as well. This can be accomplished by removing the shingles to expose the existing substrate, which can be costly and time consuming, or by filling in the areas between the purlins with a solid material such as rigid insulation or fiber board. This will create a solid substrate and add insulation value. Do not use rigid insulation or fiber board on entire roof and fasten the metal roofing to these materials. The use of purlins is necessary to have a solid material to fasten into existing trusses or rafters and to fasten the metal roofing. The rigid insulation or fiber board is only to be used between the purlins to "fill in" the voids created by the purlins. 1 1/2" SSR is a structural panel and may be installed over open purlins, although the appearance is better over a solid deck.

Screws fasten the metal panels to the purlins per the fastening pattern on page 3 of this bulletin. The spacing of the 2 x 4s should be determined by the contractor, architect or engineer to meet the requirements for wind uplift resistance set forth in the local building code. The design wind speed for the particular geographical region, roof height, slope, shape, location, and building use should all be taken into account for the uplift design. Eaves, ridges, hips, and gables are areas of increased wind uplift and require additional screw fasteners and/or closer purlin spacing. Sealing the sidelaps with a good gun-grade butyl or butyl sealant tape is recommended for maximum weather-tightness. Any endlaps must be sealed with butyl sealant tape.

Insulation can be added in between 2 x 4s. The addition of insulation will soften the sound of rain on the new metal roof, and can be effectively used to reduce noise in any application, not just metal. Secondly, insulation helps to provide condensation protection by shifting the dew point temperature. The proper thickness and R-value (insulation thermal remittance) is critical for proper energy performance. A good vapor barrier (such as a 6 mil plastic) on the warm side of the insulation, in conjunction with proper ventilation, will minimize the potential for condensation within the attic space. Care must be taken not to build up too much insulation under the metal roof - this may "bulge" the metal.

Aluminum is the best metal roofing option with respect to life span. Aluminum is also the only product that can be warranted in a salt water spray environment near the ocean. Acid rain and corrosive atmospheres (chimney, smoke stacks, etc.) that exist in today's environment can take a toll on all roofs. Grandrib 3 PLUS or Alutuff are the best steel panels to use for an exposed fastener metal roof followed by Grandrib 3 or Alutuff II. Standing seam metal roofs are more expensive in comparison, but provide a clean, concealed fastener, weather-tight roof in either steel or aluminum. Ultimately, the building owner will decide the price range and features that are important for his metal roof.

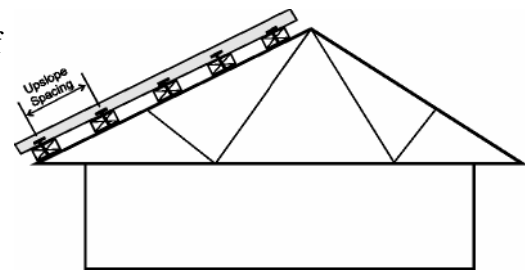
NOTES:

1. Refer to Sentrigard Metal Roofing Systems' "Storage and Installation Instructions", F-102 for additional information.
2. Use of furring/purlins: Non-treated lumber should be used for furring/purlins. Treated lumber can have a variety of harmful substances that are incompatible with metal roofing. If treated lumber is used, a separation should be provided between the metal and the wood. This separation can be plastic sheeting, builders felt, or bituminous paint. Please refer to Sentrigard Metal Roofing Systems' Technical Bulletin #803 for additional information on treated lumber.

**CHART**

Typical Wind Speeds and Load ranges

80 MPH = 14.7 Pounds per Square Foot (psf) to 21.3 psf  
 100 MPH = 23 psf to 33.3 psf  
 120 MPH = 33.2 psf to 48 psf  
 90 MPH = 18.7 psf to 27 psf  
 110 MPH = 27.9 psf to 40.3 psf  
 Formula:  $(120)^2 \times (.00256) \times (.9 \text{ or } 1.3)$



**LOAD-SPAN TABLE FOR 29 GAGE GRANDRIB 3**  
 Allowable Wind Uplift Loads (psf)

Substrate	Fastener	9"	12"	15"	18"	21"	24"
3/4" Plywood	#14 x 1" MP	275.6	206.7	165.4	137.8	118.1	103.4
3/4" Plywood	#9 x 1" Woodfast	NR	NR	NR	NR	NR	NR
5/8" Plywood	#14 x 1" MP	160	120	96	80	68.6	60
5/8" Plywood	#9 x 1" Woodfast	NR	NR	NR	NR	NR	NR
1/2" Plywood	#14 x 1" MP	135.9	101.9	81.5	67.9	58.2	51.0
1/2" Plywood	#9 x 1" Woodfast	NR	NR	NR	NR	NR	NR
23/32" OSB	#14 x 1" MP	115.9	86.9	69.5	57.9	49.7	43.5
23/32" OSB	#9 x 1" Woodfast	NR	NR	NR	NR	NR	NR
19/32" OSB	#14 x 1" MP	100.7	75.5	60.4	50.3	43.1	37.8
19/32" OSB	#9 x 1" Woodfast	NR	NR	NR	NR	NR	NR
7/16" OSB	#14 x 1" MP	61.5	46.1	36.9	30.7	26.3	23.1
7/16" OSB	#9 x 1" Woodfast	NR	NR	NR	NR	NR	NR
Solid 2x SPF	#14 x 1" MP	293.3	220.0	176.0	146.7	125.7	110.0
Solid 2x SPF	#9 x 1" Woodfast	218.7	164.0	131.2	109.3	93.7	82.0
Solid 1x Pine	#14 x 1" MP	207.1	155.3	124.2	103.5	88.7	77.7
Solid 1x Pine	#9 x 1" Woodfast	168.4	126.3	101.0	84.2	72.2	63.2
	Screws per Square	190	150	120	100	90	80

- Note:
1. Furring strips must be designed to provide adequate uplift resistance.
  2. Ridges require 2" or longer screws to attach through the flashing and high rib.

**Diagram**

