



Technical Bulletin

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RESIDENTIAL ROOFING

Typical construction for residential roofing consists of rafters or trusses spaced 16" or 24" on center and at a pitch, or roof slope, of 3/12 up to 12/12. A plywood, Oriented Strand Board -- OSB (this product is becoming more common), or wafer board (flake board) is used as a decking on top of the rafters/trusses. This decking provides two properties - one, it helps brace the framing in a diaphragm load or "racking" and, secondly, it provides a solid surface to attach the roof covering.

A 15# (pound) or 30# asphalt impregnated felt paper is the next item. The weight, or thickness, is determined by code stipulations. This felt is either tacked in place by staples or, in some regions of the USA, it is required to be nailed down in a specific pattern with roofing nails and/or nails with "tin tabs" or caps. The tin tabs are a thin metal washer, typically quarter sized, and larger than the nail head; this aids in holding more surface of the felt paper in place.

Once all these items are in place, the roof covering is attached to shed the rain and snow and to protect the contents of the building from the natural elements and conditions. Various roof coverings include, but are not limited to: shingles, cement tiles, clay tiles, rubber, asphalt rolls, tar, wood shakes, slate, and **METAL**. 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.

When using metal or Grandrib 3, 5V Crimp, 8V Crimp, Strongrib (exposed fastener panels) in particular, certain conditions must be determined and proper application is important. The construction of rafters/trusses is to be designed and adequate - a house designed to have shingles (typical weight: 2.5 to 3.4 pounds per square foot) will support Grandrib 3 panels (weight: .8 lbs/sq. ft.) sufficiently. A minimum 2-1/2" rise in 12" horizontal (2-1/2 / 12 pitch) is required for Grandrib 3 or exposed fastener panels. The decking material is recommended to be a minimum 5/8" thick plywood with proper attachment to the rafters/trusses provides an adequate base. The plywood thickness provides sufficient screw thread engagement to hold the metal roof onto the wood sheathing when wind occurs (see chart for plywood thickness vs. pullout). A minimum 30# felt paper is recommended to provide extra protection against water seepage and to protect the underside of the metal roofing panels from rubbing against nail heads.

Flake or wafer board is not recommended for use with a metal roof because of inconsistencies in the manufacturing, as well as having below minimum uplift or screw pullout strength. OSB can be used with the addition of furring strips or purlins. The torque required to seal a washer to the metal is approximately the same torque that strips the threads out on this type of decking. If OSB is used, a 2X or 1X furring strip is recommended to be used over top of the felt paper, spaced at a maximum of 24" o.c. The furring should be attached into decking and rafter/truss every 8" center-to-center (c/c) with a 3" or longer deck or wood screw. The screws should attach into every rafter/truss for additional security. The solid wood furring strip gives adequate attachment of the metal woodgrip roofing screws.



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Grandrib 3 panels are to be applied according to General Installation Instructions. The application over plywood for residential should include the following changes. A good gun-grade butyl or sealant tape should be placed along the entire sidelap (see diagram) to ensure a weatherproof lap.

Screw fastening is recommended because it provides a better sealing quality, better withdrawal or uplift load resistance, and stays securely fastened in place over the life span of the roof. Nails tend to back out slightly over years of exposure to the elements which can cause leaks or extra maintenance to the roof. #14x1" Mill Points or "A" points are to be used for attachment of the metal to the plywood. A #10 Woodgrip screw does not have sufficient thread depth to work properly into plywood. The #14 has the larger thread diameter and depth which provides more withdrawal resistance (see chart) and better installation ease.

The application of screws across the width of the profile is of the same pattern as shown in the General Installation Instructions (see diagram). The spacing of the screws up the slope of the roof must be determined by the contractor, architect or engineer to meet the code requirements for wind uplift in the particular geographical region of the application. Roof height, slope, shape, and location are all taken into account for the uplift design (see chart for uplift resistance vs. screw spacing).

Besides the main roof area, other roof areas such as the gable, ridge, eave, valley, endlaps, and hips must be reviewed for extra fastening conditions. These areas are prone to increased uplift criteria and should be calculated to determine the fastening patterns. For greater fastener resistance to uplift, furring strips or purlins can be attached on top of the felt paper/plywood/rafters. The furring strips/purlin thickness is best recommended as a 2" x 4" (allows for 1-1/2" of screw engagement). Pine or Spruce is the best softwood species. A 1 x 4 or 1 x 6 (only gives 7/8" of actual wood depth for screw engagement) is a viable option as long as the screw withdrawal strength is calculated for the reduction in wood thickness penetration. **Furring strips, or purlins, are recommended when attaching to plywood under 5/8" nominal thickness or going over an OSB sheathing.**



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FURRING/PURLINS (see note 3)

The furring or purlins are recommended to be attached with 3" long deck or wood screws. The screws are located at a maximum of 8" o.c. along the furring, into the plywood and through to the rafters at the 16" rafter spacing. The 30# felt can be applied to the plywood under the furring/purlin or on top of the furring/purlin. The felt acts as a vapor barrier to prevent moisture from within the house from reaching the metal roof which holds a temperature close to the outside temperature. If warm moisture from within is allowed to reach a cold metal or other roofing products, condensation can occur. If condensation occurs, the water droplets gather and can leak into the house which gives the owner the perception that the roof is "leaking." Proper ventilation at the eave soffit and gable/ridge is essential to prevent condensation.

Flashing and finishing the residential home is done with low profile, smaller accessories than typical post-frame construction. Fabral provides a number of residential details to satisfy any builder's aesthetic and practical needs. Sealing the sidelaps is recommended for extra protection against moisture or snow/ice from gaining entrance in through the metal roof laps.

Insulation can be used with metal roofing for two purposes. First, it dampens the sound that rain makes on metal. Insulation is great for reducing the noise in any application, not just metal. Secondly, it provides condensation protection. Proper insulation design is essential for heating and cooling protection. A good vapor barrier in conjunction with proper ventilation will provide a dry area on the inside of the roof structure.

Another form of residential construction, not quite as common, is purlins/furring attached directly to the rafters/trusses. This form eliminates the structural wood decking. This type of construction requires more diaphragm evaluation, enhanced bracing and vapor barrier application. If this construction is applicable (check local codes), the purlins/furring are recommended to be a minimum 2x4 applied flat over the rafters/trusses and screw attached. For condensation prevention, a quality vapor barrier should be applied to the warm side or underneath side, of the rafters/trusses.

Insulation can be located between the rafter/trusses running vertically and/or on top of the purlins under the metal. 1-1/2" or 2" thick, compressible blanket insulation of .6 density is the maximum thickness that can be applied between the purlins and the metal. Thicker or denser material will "show through" the metal and be objectionable in appearance. A quarter inch thick or 1/2" thick foil faced, bubble insulation is commonly used in between the metal and the purlins to provide a vapor barrier and condensation deterrent. The foil insulation provides enough dew point temperature difference that prevents moisture from forming.

Cathedral type ceilings should be insulated between rafters and a good vapor barrier applied to the bottom (warm) side of the rafter before drywall or boards are applied. This prevents moisture from rising up through the ceiling and contacting the cold metal or other roofing material, on top of the roof.



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METAL SELECTION

Aluminum is the best metal roofing option as far as longevity is concerned. Acid rain and corrosive atmospheres (chimney, smoke stacks, etc..) that exist in today's environment can take a toll on any roof. Grandrib 3 PLUS is the best steel panel to use for an exposed fastener metal roof. Standing seam metal roofs are more expensive in comparison, but provide a clean, weather tight roof in either steel or aluminum. Standing seams can be used for roofs that have slopes as low as a 1/12 pitch. Ultimately, the homeowner will decide what price range and what features they want in their residential metal roof.

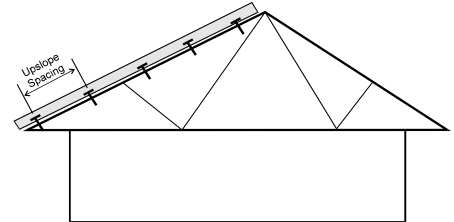
NOTES:

1. This Technical Bulletin has been revised since May 1996. The revisions address the roofing industry trend toward the use of 1/2" or 7/16" OSB as roof sheathing. Fabral recognizes this construction practices but cautions the use with metal roofing without proper furring. The screw manufacturers are currently testing various applications to determine the best long term methods of attachment and screw shapes that will securely hold metal roofing to these new roof sheathing. OSB does not allow consistent enough density and structure to properly hold the threads of a screw secure enough over time. For this fact, Fabral recommends a 5/8" minimum plywood or solid wood furring to securely hold the screws in place, that attach the metal roofing to the roof.
2. Refer to Fabral's Storage and Installation Instructions, F-102 for additional information.
3. 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 can be plastic sheeting, builders felt or bituminous paint. Please refer to Fabral 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
- 90 MPH = 18.7 psf to 27 psf
- 100 MPH = 23 psf to 33.3 psf
- 110 MPH = 27.9 psf to 40.3 psf
- 120 MPH = 33.2 psf to 48 psf
- (120 squared X .00256 X .9 or X 1.3)



Grandrib 3 - screws spaced 9" c/c across width (see diagram) X up-slope spacing (see above)

<u>Thickness Plywood</u>	<u>Up-slope Spacing c/c</u>	<u>#14-10 Design Load</u>
1/2" Nom.. Plywood	12"	113.4 psf
5/8" Nom.. Plywood	12"	138.9 psf
3/4" Nom.. Plywood	12"	197.6 psf
1/2" Nom.. Plywood	18"	71.1 psf
5/8" Nom.. Plywood	18"	92.6 psf
3/4" Nom.. Plywood	18"	131.7 psf
1/2" Nom.. Plywood	24"	53.3 psf
5/8" Nom.. Plywood	24"	69.4 psf
3/4" Nom.. Plywood	24"	98.8 psf

Note: At 24" c/c spacing, Grandrib 3 requires approximately 80 screws per 100 square feet of metal

Diagram

