

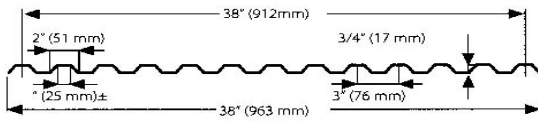


H &F Manufacturing Corp. Ag-Tuf Installation

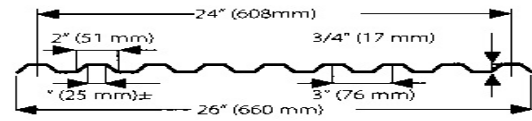
A: Profile Dimensions:

Distance between Corrugations		Rib Depth		Panel Width		Number of Corrugations	Effective Width		Overlap Corrugations	Percent Overlap %
in.	mm	in.	mm	in.	mm		in.	mm		
3	76	23/32	17	38	963	13	36	912	1	5.3
3	76	23/32	17	26	660	9	24	608	1	7.8

Table 1



38" (963mm) width GRECA 76 profile
Figure 1a



26" (660mm) width GRECA 76 profile
Figure 1b

B: Distance between Supports (Ceiling purlins and wall girts):

Panel Thickness		Theoretical Weight		Ceiling Supports Distance		Wall Supports Distance	
in.	mm	oz. / sf	g / sm	in.	mm	in.	mm
1/32	0.8	4.6	1400	24	610	26	660

Table 2

1. The dimensions depicted in Table 2 above do not supercede any requirements of local construction codes. The support distances depicted are on typical structural properties with sheet deflection by dead load and thermal expansion factors taken into consideration, according to customary construction practice for internal lining materials.

2. The maximum recommended panel length is up to 20'4" (6,200 mm). Longer panels could be supplied with minimum quantities. However, it is recommended not to use panels of the length of 25' (7500 mm) due to possible warp and difficulty in achieving satisfactory installation results, both in ceiling and walls.

C: Positioning the Panels:

1. The panels may be installed on ceilings with the corrugations parallel or perpendicular to the direction of the main supporting structure, providing the purlins are prepared as depicted in table 2, perpendicular to the corrugations.

2. When the ceiling is sloped, H & F Manufacturing Crop recommends installing panels with the corrugation in the direction of the slope.

3. Never try to adapt the Ag-Tuf panel to a wider or narrower dimension by stretching & forcing the corrugations in or out during installation. Such an action distorts the panel, inducing internal stresses leading to crazing and eventual failure.

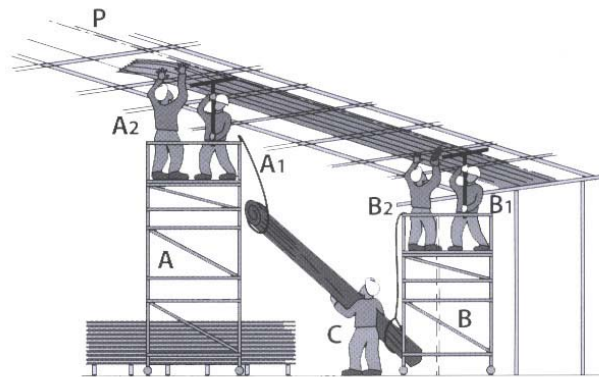
4. To minimize the possibility of warp and deformation, H & F Manufacturing Corp recommends installing the panels after they have been acclimatized. The panels should be stored inside the interior space in which they have to be installed until their temperature is equalized to the ambient temperature inside the structure. This way there will be no warp through drastic changes of thermal expansion / contraction.

5. When installing Ag-Tuf panels vertically on walls or horizontally sloped on ceilings, start installation at the bottom and work up towards the wall eave or ceiling top. Be sure to maintain the correct fastening sequence (Figure: 6A, 6B, 6C, 6D). Commence at bottom edge, at right or left side and proceed to the left (or right) and up. It is possible to start in the and work both ways toward the ends. Never fasten both edges first and then work towards the middle, this will result in undue slack or possible stress.
6. Recommended method and installation steps of Ag-Tuf on ceilings:
 - a. An installation crew of 5 or 6, two teams (A & B) on mobile scaffoldings, 2 workers on each, with a ground team (C.) to prepare and hand out the lining panel for installation. The panel will be lifted by ropes either flat with clamps holding the edge, or rolled as a scroll.

b. A plumb line (P) will be put up, to mark the precise starting position and direction.

c. B1 of team B will hold one end of the panel against the 1st bottom purlin, while B2 along with team A aligns the panel along the plumb-line and tense it.

d. With the panel aligned and taut B2 will fasten the panels edge to the purlin. Next, with team A stationary, holding the liner edge against the last purlin, the ground crew will push team B's tower under the subsequent purlin, the fastening process repeated and so on.



Ceiling Installation
Figure 2

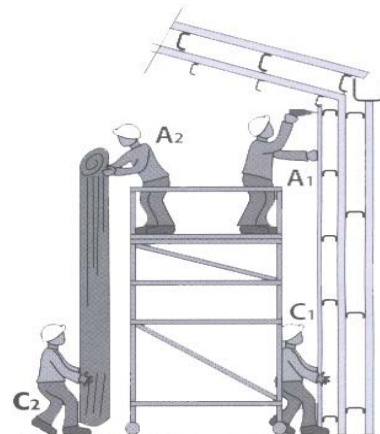
e. The liner should always be kept flush and taut during positioning and fastening. A slack panel during installation will result in deformation and sloppy execution.

f. It is also possible to begin installation in the middle of the panel and proceed to both sides. Never commence installation from both ends towards the middle. It may result in imprecise execution and undue slack.

g. When more than one-length panel is required for ridge to eave, or eave to floor cladding, follow instructions in paragraph D overlap part 1 and Figures 4a to 4e.

h. Horizontal installation on walls should work out virtually the same (with necessary adjustments).

i. Vertical wall cladding can be done with the team A1-A2 on a tower and ground crew C1-C2. Installation can begin from the bottom up or vice versa. Working from the top down is more logical and easier. However, when more than one panel is required, always begin with the bottom array and proceed upward.



Wall Installation
Figure 3

7. Use only approved scaffoldings, lifting devices and equipment, for safe and efficient work.
8. For safety sake, do not leave partially installed panels unattended until all the required fasteners have been placed and properly tightened.

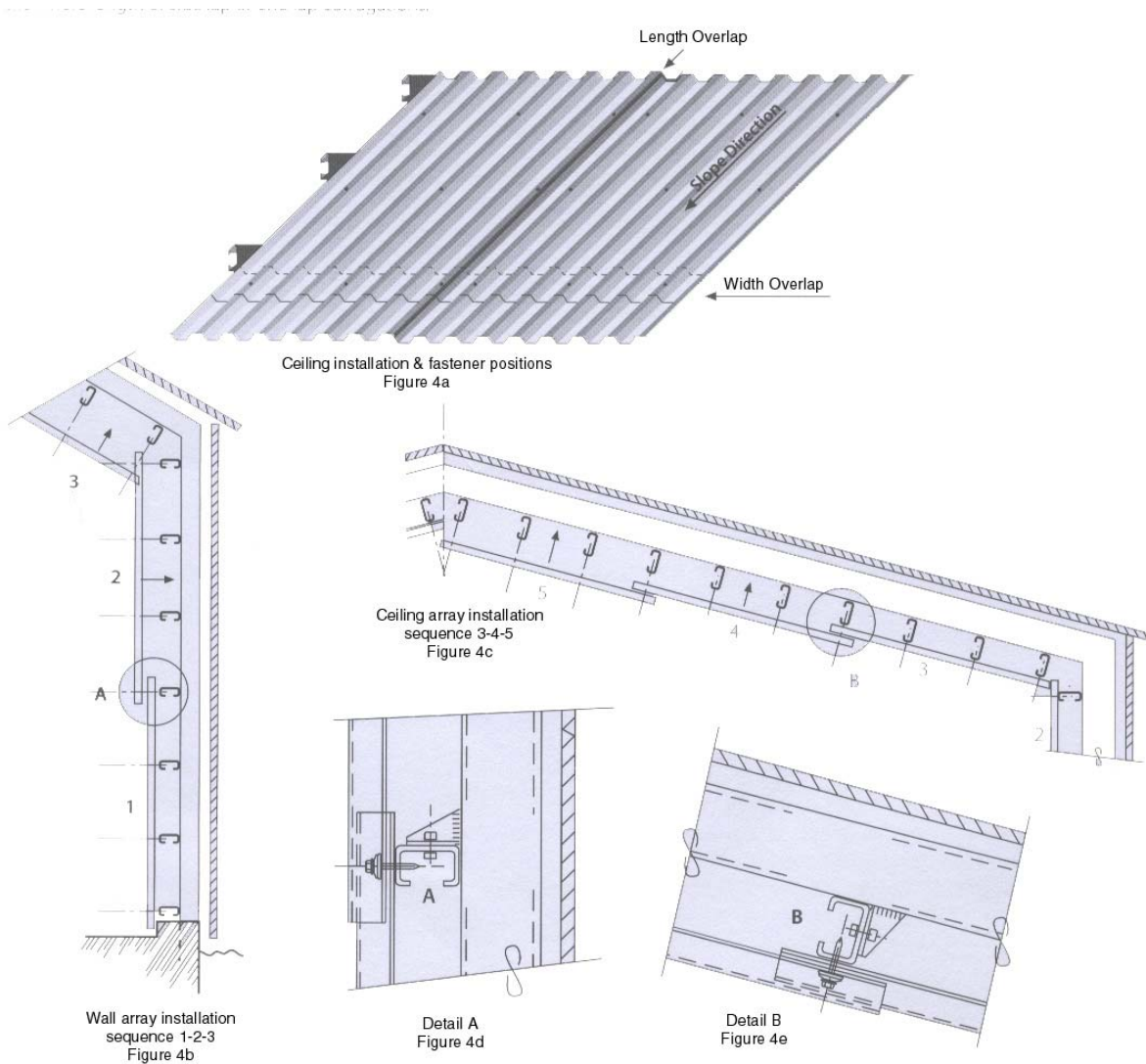
D. Overlap:

1. End-Lap: (at panels short edges): Minimal recommended overlap - 4" (100 mm). Minimum distance of 2" from each panel edge to the centerline of the support (line of fasteners). Maximum overlap 8" (200 mm). Always install the lower panels array first, and lap with the upper panels, so the drip down the slope or wall does not penetrate into the ceiling or wall cavity and wet the insulation. (See Fig. 4a - 4e and paragraph C.6.I.)

2. Side - Lap: One corrugation.

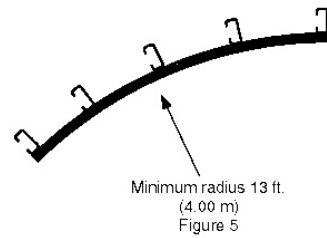
3. Panels Edge Overhang: The panels edge should not extend more than 4" (100 mm) from the centerline of edge support on both sides. Minimal extension - 2" (50 mm).

4. Overlap Seals: In wash areas or extremely wet conditions, H & F Manufacturing Corp recommends installation of butyl - rubber sealing strip along the whole length of side lap or end lap corrugations.



E. Arching Radius:

When lining a curved ceiling, it is possible to set the panels against a curved (concave) structure so they will arch within their range of elasticity, without inducing undue stress. The minimal radius recommended for such an arch is 13'.



F. Wall and Ceiling Fastener Location:

1. A fastener should be installed every third corrugation valley, fastened into the centerline of each support (Fig 4a, b, c, d). In case the lining is intended to support insulation mats or blankets (rockwool or glass - fiber) in ceilings or walls, a fastener should be installed every second corrugation valley.
2. A pre - drilled hole, 1/16" larger in diameter than the intended fastener, is recommended at every fastener location. A special self - drilling / wood screw, equipped with additional protrusions at top of screw stem, preparing a larger entry hole during insertion can also be used.
3. The fasteners should be tightened by an electric screw driver equipped with adjustable clutch, taking care not to overtighten.
4. At the side - lap, two valley fasteners should be installed at both sides of the overlapping corrugations (Fig 7b).

Positions of ceiling/wall fasteners in regular installation without insulation.

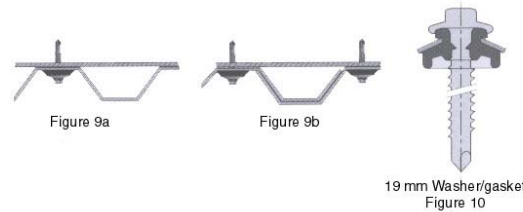
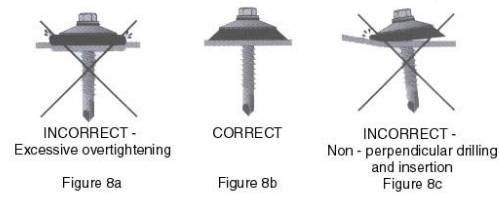


Positions of ceiling/wall fasteners with insulation mats.



G. Wall and Ceiling Fastener Location:

1. For optimal long - term maintenance - free service H & F Manufacturing Corp. recommends the use of corrosion resistant #12-14 x 1" fastening screw, with H & F Manufacturing Corp. 3/4" (19mm) special washer with profiled EPDM rubber gasket, to fasten the panel to the supports. In wash areas or extremely wet conditions stainless steel fasteners are recommended.
2. The screw can be hex - head, self - drilling, self - tapping or wood screw, according to the type of the supports and the method of fastener installation. Each fastener will be fitted with H & F Manufacturing Corp. 3/4" special washer / gasket.
3. The screws should be tightened moderately, without deforming the washer, squashing the gasket and distorting the panel. Careful attention should be given to assure perpendicular insertion of the fasteners.
4. Excess tightening and oblique insertion will distort the panel, induce internal stresses, leading to fracture and cracks, eventually ending in failure.
5. Never use an impact wrench / driver for fastening Ag - Tuf. Tighten by hand or by an adjustable torque power screwdriver.



H. Handling and Storage:

1. Ag - Tuf panels must be transported and stored horizontally on a flat, sturdy pallet whose dimensions are equal to or larger than the sheets themselves. The sheets should be secured and fastened to the pallet. It is possible to store sheets of smaller dimensions on top of larger sheets of the same type. (Never store sheets of larger dimensions on top of smaller sheets!) The sheets must be stored in a cool and shaded location.
2. In case it is necessary to store the pallet outdoors, cover it with a white opaque polyethylene sheet, cardboard, or other suitable materials that do not absorb or conduct heat. The total area of the pallet should be covered.
3. To minimize the possibility of warp and deformation, H & F Manufacturing Corp. recommends installing the panels after they have been acclimatized. The panels should be stored inside the interior space which they have to be installed until their temperature is equal to the ambient temperature inside the structure. This way there will be no warp through drastic changes of thermal expansion / contraction.

I. Cutting

1. It is possible to cut Ag - Tuf with a circular saw, using a blade intended for hardwood or a special one for plastics, rotating at a high speed. Advance the saw at a slow feed rate. H & F Manufacturing Corp. recommends cutting a few panels stacked together, for cleaner cuts and smaller risks of breaks and rough edges.
2. It is possible to use an electric jigsaw, a handsaw or sheet - metal shears for local or limited cropping, especially for curved lines or complex cuts. In any case, it is important to support the panels in the vicinity of the cut and clean away the dust and debris generated by cutting.

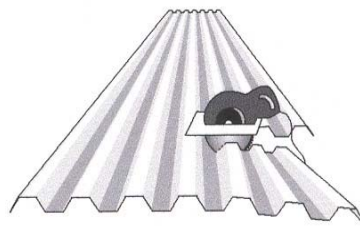
J. Drilling

1. Drilling should be carried out with a drill bit intended for metal. The hole diameter must be 1/16" (2mm) greater than the diameter of the fastening screw. It is important to support the sheet in the vicinity where the sheet is being drilled. The dust generated by drilling must be cleared away before the insertion of the screw.

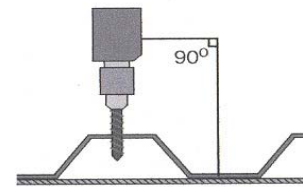
Special attention should be given to drill all the required holes perpendicular to the face of the material.



Storage of sheets.
Figure 11



Cutting the sheet.
Figure 12



Drilling the sheet.
Figure 13

K. Chemical Resistance: (compatibility to environmental chemicals, sealants and adhesives)

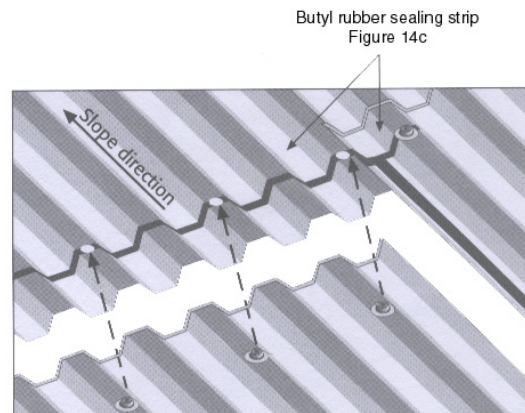
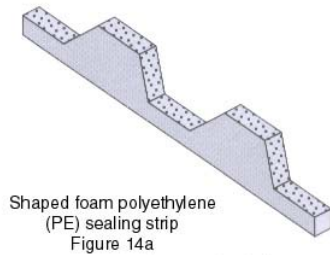
1. Ag - Tuf panels are resistant to a wide variety of chemicals and display limited resistant to others. A third group of chemicals may attack and damage the panel. The degree of damage will depend on the severity of attack and the duration of exposure.
2. In case of doubt consult the list of chemical resistance of PVC to various chemicals, depicted in H & F Manufacturing Corp publications, to find out if there is any risk to the liner.
3. Materials not on the list, which have not received the Manufacturer's explicit approval, may harm the panel and void all warranties and responsibility of the manufacturer for the performance of Ag - Tuf panels.
4. Your local distributor can provide additional information and forward materials for evaluation of the compatibility with Ag - Tuf panels.

L. Sealing and Bonding:

1. Silicone Sealants:

We strongly recommend the use of Sunseal approved silicone sealant, and other tested and approved sealing, bonding and adhesives materials that may be required.

2. Other silicone sealants and sealing, bonding or adhesive materials should be referred to H & F Manufacturing Corp. or its distributor for evaluation and approval before use.
3. Obscure sealing or bonding materials should be referred to H & F Manufacturing Corp. or its distributor for evaluation and approval before use. Unapproved materials may chemically attack the Ag - Tuf, originate failure and revoke any and all warranties.
4. Corrugated closure strips are used to stop entry of water, wind, insects or small animals through the openings above or below the edges of the installed sheets. The closure between the sheet and edge purlins or top trim is done by an Ag - Tuf contoured closure strip. The strips are held in place by the sheet fastening screws. They are made of cross - linked expanded polyethylene (XPE).
5. In wash areas or extremely wet conditions butyl - rubber sealing strips should be used along the side and end - laps of Ag - Tuf sheets, to prevent moisture penetrating the wall or ceiling cavities.



In as much as H & F Manufacturing Corporation's material has many approved uses, any non - standard uses should be tested by the user to determine its suitability. Proper installation techniques must be in accordance with H & F Manufacturing Corporation's procedures, and H & F will not be liable for damages due to improper installation. In accordance with our company's continual product development, you are advised to check with your H & F Manufacturing Corp. supplier to ensure that you have the most up-to-date information.



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