



AG-TUF® & AG-TUF® 9

Corrugated PVC Liner Panels

Installation Guide

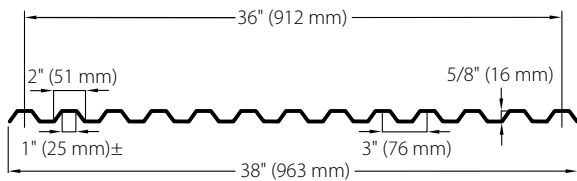


Build On.

A Profile Dimensions:

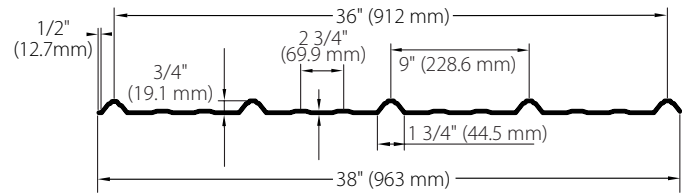
Table 1

Distance between Corrugations		Rib Depth		Panel Width		Number of Corrugations	Coverage		Overlap Corrugations	Overlap %
in.	mm	in.	mm	in.	mm		in.	mm		
3	76	23/32	17	38	963	13	36	912	1	5.3
9	228.6	3/4	19	37.8	961	5	36	914	1	5.2



38" (963mm) width GRECA 76 profile

Figure 1a



AG-TUF 9" Profile

Figure 1b

B Distance Between Supports (ceiling purlins & wall girts):

Table 2

Panel Thickness		Theoretical Weight		Ceiling Supports Distance		Wall Supports Distance	
in.	mm	oz. / ft. ²	g / m ²	in.	mm	in.	mm
1/32	0.8	4.6	1400	24 - 48*	610	26	660

* Installations with purlin spacing greater than 24" may result in increased deflection (sagging).

1. The dimensions depicted in Table 2 above do not supersede any requirements of local construction codes. Before installation, check local building codes for relevant specifications and recommendations. Follow local codes at all times. The support distances depicted are based on the 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" (6.2 m). Longer panels can be supplied on special order (minimum quantities apply). However, it is recommended not to use panels over the length of 25' (7.62 m) due to possible warp and difficulty in achieving satisfactory installation results, both in ceilings and walls.
3. In lieu of longer panels, consider lapping panels to achieve desired length. See Illustration 4a.

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, Palram Americas 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 undue internal stresses leading to crazing and eventual failure.
4. To minimize the possibility of warp and deformation, Palram Americas recommends installing the panels after they have been acclimated. 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 toward 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 & proceed to the left (or right) and up. It is possible to start in the middle and work both ways toward the ends. **Never fasten both edges first and then work towards the middle; this will result in undue slack and wavy appearance-**

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 at with clamps holding the edge, or rolled into a tube.

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 holds it taut, in place.

d. With the panel aligned and taut, B2 will fasten the panel's 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.

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

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

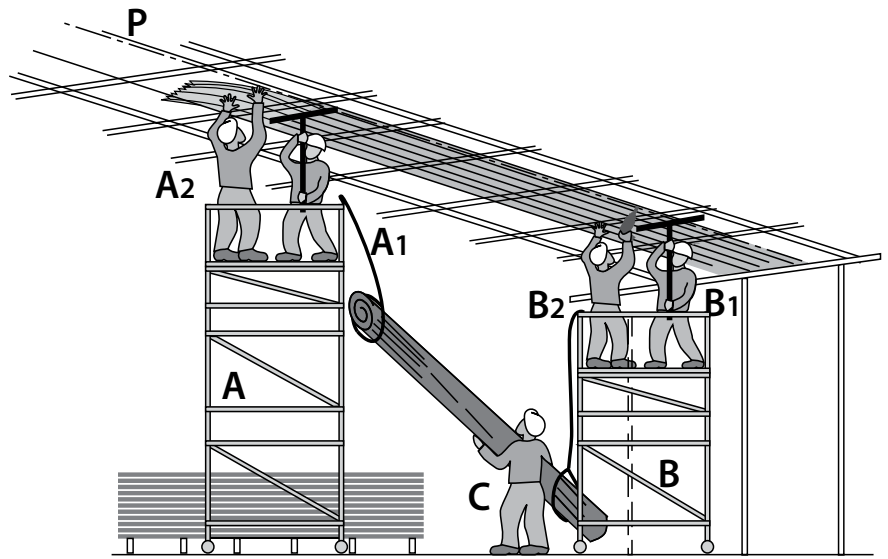
g. When more than one-length panel is required for ridge to eave, or eave to floor cladding, follow instructions in paragraph D Overlap part 1 and Figures 4a to 4e.

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

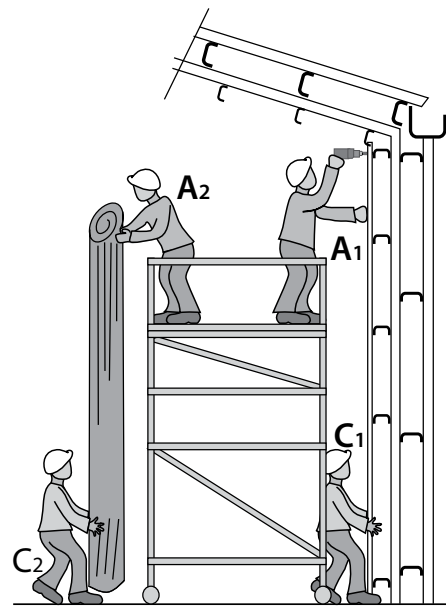
i. Vertical wall cladding can be done with team A1-A2 on a tower and ground crew C1-C2. Installation can be begin from the bottom up or vice versa. Working from the top down is more logical and easier. However, when more than one panel is required, always begin with the bottom array and proceed upward.

7. Use only approved scaffoldings, lifting devices and equipment, for safe and efficient work.

8. For safety's sake, do not leave partly installed panels unattended until all the required fasteners have been placed and properly tightened.



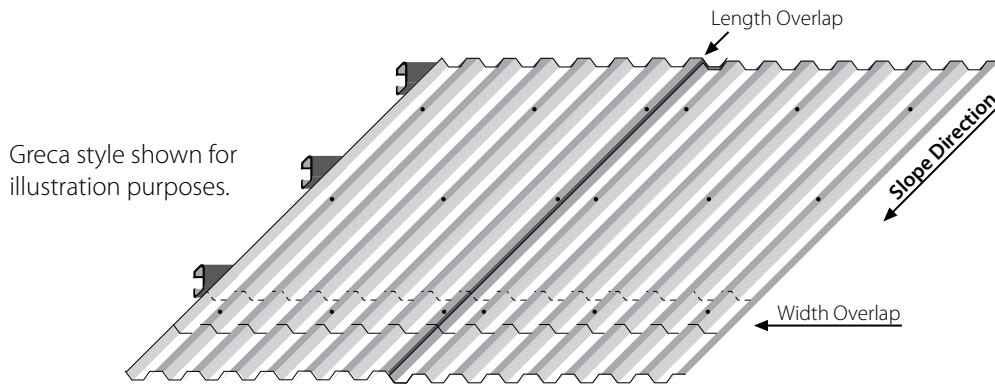
Ceiling installation
Figure 2



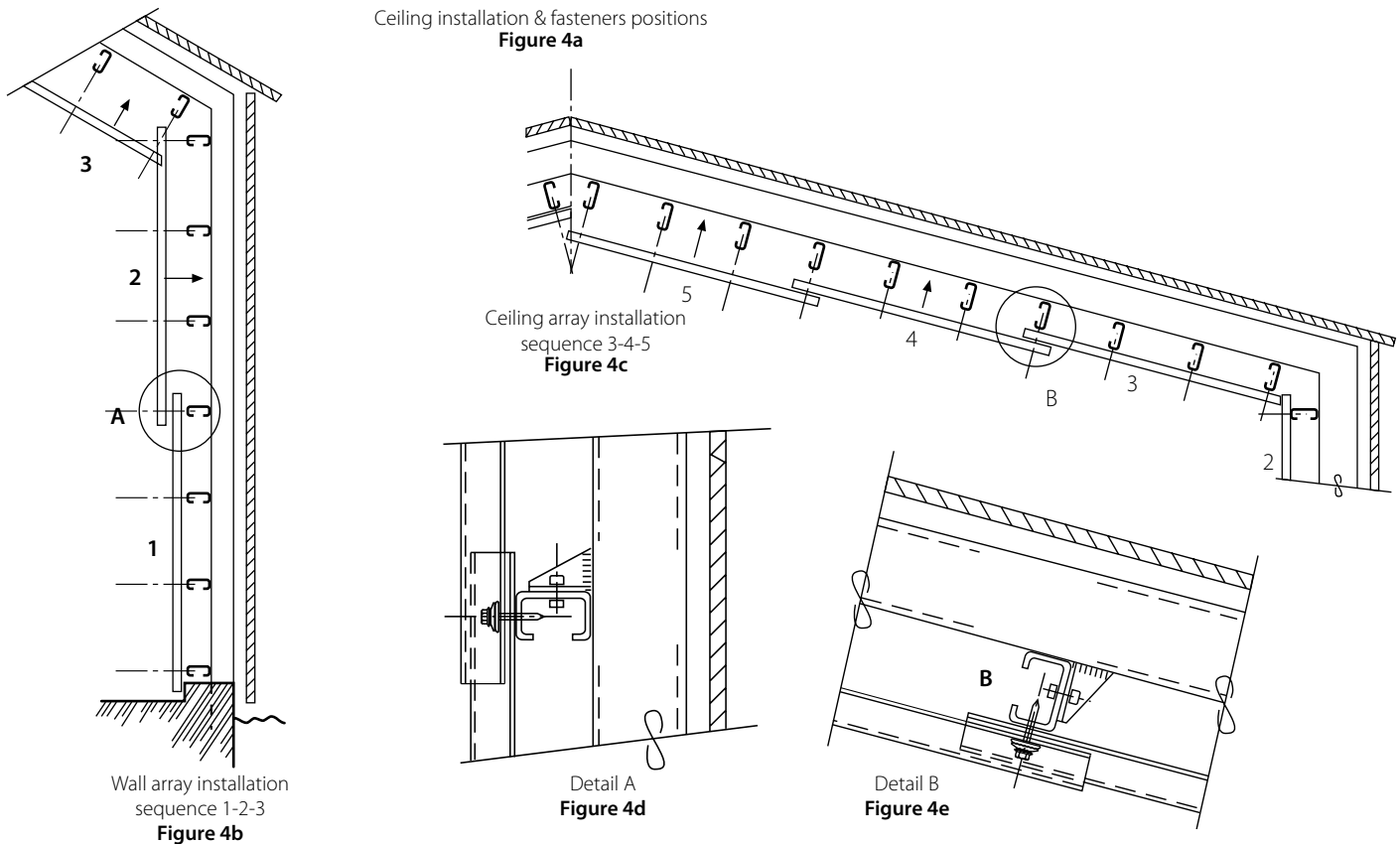
Wall installation
Figure 3

D Overlap:

1. End-Lap: (at panel's 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. Panel's Edge Overhang: The panel's 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, Palram America recommends installation of butyl-rubber sealing strip along the whole length of side lap or end lap corrugations.

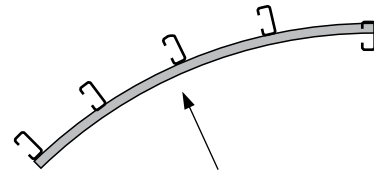


Ceiling installation & fasteners positions
Figure 4a



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 ft. (4.00 m)



Minimum radius 13 ft.
(4.00m)
Figure 5

F Wall and Ceiling Fastener Location:

1. A fastener should be installed every third corrugation valley, screwed into the centerline of each support (Fig 4a, b, c,d). If the panel is going to be used in conjunction with insulation (blankets or blown in), in ceilings or walls, a fastener should be used in every 2nd 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 (Fig 11; Available from others; Not available from Palram; Use for Ag-Tuf PVC panels only; Not recommended for use with polycarbonate)
3. The fasteners should be tightened by an electric screwdriver 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.



Figure 6a - 38"



Figure 6b - 37.8"

Positions of ceiling/wall fasteners with insulation mats.



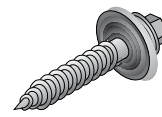
Figure 6c - 38"



Figure 6d - 37.8"

G Fasteners, Washers and Gaskets:

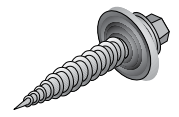
1. For optimal long-term maintenance-free service, Palram Americas recommends the use of corrosion resistant #12-14 x 1" fastening screw, with Palram Americas 3/4" (19 mm) special washer with profiled EPDM rubber gasket, to fasten the panel to the supports. In wash areas, extremely wet areas, or in highly corrosive environments like hog or cattle confinement, stainless steel fasteners are recommended.
2. The screw can be hex-head or pan-head Phillips, 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 Palram Americas 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 possibly distort the panel, induce undue 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.



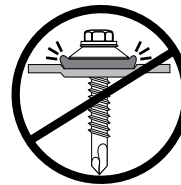
Self-tapping screw
Figure 7a



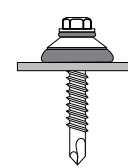
Self-drilling screw
Figure 7b



Wood screw
Figure 7c



INCORRECT
Excess overtightening
Figure 8a



CORRECT
Figure 8b



INCORRECT
Non-perpendicular.
Figure 8c

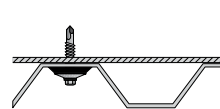


Figure 9a

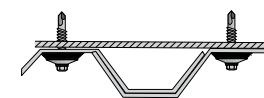
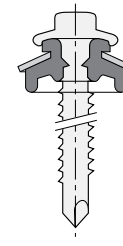
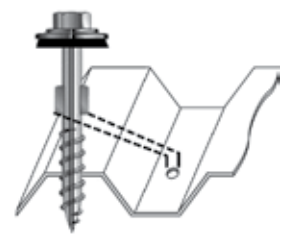


Figure 9b



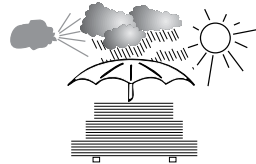
19mm Washer/Gasket help prevent over-tightening; provides best seal.
Figure 10



One-Step Fastener eliminates pre-drilling. Creates oversize hole to accommodate expansion and contraction.
Figure 11

H Handling and Storage:

1. Ag-Tuf panels should be transported and stored horizontally on a flat, sturdy pallet whose dimensions are equal to or larger than the panels themselves. The panels should be secured and fastened to the pallet. It is possible to store panels of smaller dimensions on top of larger panels of the same type. (Never store long panels on top of smaller ones!)
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, Palram America recommends installing the panels after they have been acclimated. 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.

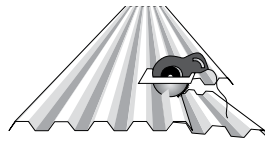


Storage of sheets.

Figure 12

I Cutting:

1. It is possible to cut Ag-Tuf panels 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. Palram America 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 jig saw, a handsaw or sheet-metal shears for local or limited cropping, especially for curved lines or complex cuts.
3. 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.

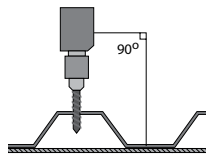


Cutting the sheet.

Figure 13

J Drilling:

1. Drilling should be carried out with a drill bit intended for metal. The pre-drilled hole diameter should be 1/16" (2 mm) greater than the diameter of the fastening screw. Support the panel in the vicinity of the drilling. Clear away the dust generated by the drilling before the insertion of the screws.
2. Attention should be paid to drill the required holes perpendicular to the face of the panel.



Drilling the sheet.

Figure 14

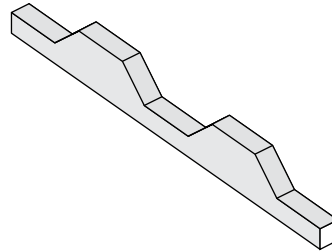
K Chemical Resistance:

(Compatibility to environmental chemicals, sealants and adhesives)

1. Ag-Tuf panels are resistant to a wide variety of chemicals and display limited resistance 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 Palram Americas 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 their compatibility with Ag-Tuf panels.

L Sealing and Bonding:

1. Palram does not manufacture a sealant for use with Ag-Tuf. When choosing a sealant, it is important to contact the sealant manufacturer to verify its compatibility with PVC prior to using.
2. Incompatible materials may chemically attack the Ag-Tuf, resulting in failure and voiding any and all warranties.
3. 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 profile contoured closure strips. 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 & end-laps of Ag-Tuf sheets, to prevent moisture penetrating the wall or ceiling cavities.



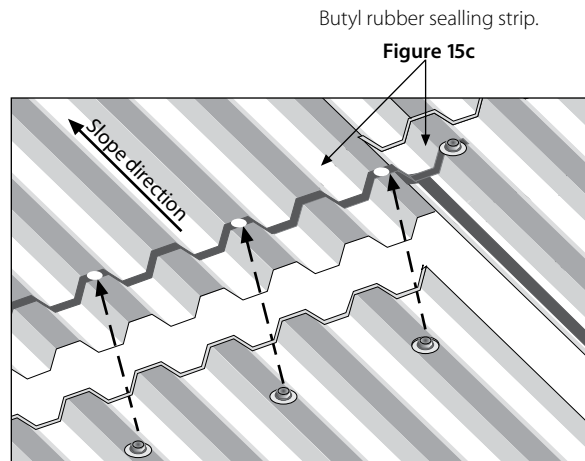
Shaped foam polyethylene (PE) sealing strip.

Figure 15a



Silicone sealant.

Figure 15b



WARNING

Palram does not manufacture a sealant for use with Ag-Tuf. When choosing a sealant, it is important to contact the sealant manufacturer to verify its compatibility with PVC prior to using. Expanded polyurethane is not recommended for use in Ag-Tuf Installation. Extensive use of this material will render the sheets fragile at the area of contact through mechanical bond effect.

When in doubt, consult the sealant manufacturer.

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