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Guidelines for the selection and installation of solar Mounting clamps to GRS produced concealed-fix sheeting

Solar mounting clamps are used to affix components like photovoltaic panels and walkways to the narrow flutes of GRS concealed-fix roofing products. The application needs to happen without affecting the integrity of the sheeting and its resistance to environmental conditions like wind. The clamps can also not be of an incompatible metal or alloy to the sheeting being fixed to.

GRS solar mounting clamps are made of aluminium and designed to fit snugly around the ribs or narrow flutes of our proprietary products to ensure that vertical downwards (walkway) and upwards (wind uplift pressure) can be resisted without damaging the sheet. Furthermore, all edges are deburred to ensure non-abrasive clamping action and is compatible with most common coated roofing materials, except copper. It is however not advisable to fit photovoltaic panels to unpainted galvanized and aluminium-zinc sheeting as the concentrate dripping off the edge of the panels (particularly during winter) affects the metallic coating's protection ability.

When solar mounting clamps are fixed to sheeting, forces acting on the solar panels are transferred to the sheeting by point loads which differs to the standard method of applying uniform distributed forces to the sheeting. This requires special considerations like the clamping capacity of the mounting clamps as well as the distribution and frequency of fixing mounting clamps to the sheeting.

The clamping capacity of the mounting clamp is determined by testing. The deflection and deformation of the sheeting rib due to bending between purlin supports under wind load to which the attachment is fixed, are taken into consideration. GRS clamps are tested in accordance with SANS 10237:2023 – South African National Standard for the design, testing and installation of self-supporting metal cladding annexure B (clauses B1 to B3 and B6). Clamps are tested in the centre between purlins spaced at the maximum purlin centres as well as 100mm away from the purlin to determine whether the solar clamp has a negative effect on the concealed fix sheet and to determine the holding capacity of the mounting clamp

Various permutations of fixing solar panels to sheeting are possible. Based on using four mounting clamps per panel with the spacing between mounting clamps at 1,4m centres (fixed to the centre ribs of every second sheet), the holding capacity of the clamps needs to be 177kg when 10 similar tests are done and 221kg when only 3 similar tests are performed. This variation in required results is in accordance with abovementioned SANS 10237:2023 to allow for the variability factor, which is determined by the number of tests performed. This clamping requirement is to prevent a clamp from slipping off the rib of a sheet and by doing so transfer higher forces to other clamps, causing them to also slip off the ribs being fixed to.

The use of solar mounting clamps changes the mechanism by which wind uplift pressure is applied to the sheeting. With-out solar panels, wind uplift is applied as a uniform distributed load and resisted by all narrow flutes of the sheeting, however, when solar panels are fixed, wind uplift needs to be resisted by only those narrow flutes to which the solar mounting brackets are fixed. This results in loading being applied to the sheeting unequally. The wind uplift pressure sheeting can resist thus reduces with the standard method of four mounting clamps per solar panel. The wind uplift capacity can only be improved by increasing the frequency at which mounting brackets are fixed.

Furthermore, fixing mounting brackets to side laps, particularly on long length sheeting is not advisable as the clamping of two adjoining sheets interferes with the ability of sheets to expand and contract individually with temperature variation. Good practice is to not fix mounting clamps to side laps and only fix to centre ribs. By using only four clamps per solar panel, mounting clamps would be fixed at intervals of 700mm and 1400mm which affects the amount of wind pressure that can be resisted. It is thus good practice to avoid fixing solar panels to the areas where high wind uplift pressure is experienced. On flat roofs the high wind uplift pressures occur around the perimeter of the roof which is the area to not fix solar panels unless additional precautions like the use of more mounting clamps are taken.

Summary

1. Use solar mounting clamps that fits snugly around narrow ribs to which it is fixed and are deburred to prevent damage to the finish of the sheeting.
2. Ensure clamping capacity of solar mounting clamps are tested in accordance with SANS 10237 Annexure A. Tests need to be conducted at the centre of the purlin span as well as 100 mm away from the purlin to determine whether the expected wind uplift force is matched.
3. Don't fit solar panels to unpainted galvanized roofs unless precaution is taken to prevent concentrate from the panel dripping onto the roof.
4. Obtain the calculated small element and fixings design wind uplift pressures in accordance with SANS 10160 Part 3 to determine the number of clamps needed for fixing solar panels.
5. Pay special attention to high wind uplift pressure zones like F and G on flat roofs (located around the perimeter of the roof) to determine whether sufficient clamps can be installed to match the higher wind uplift acting on small elements and fixings in these areas and consider side effects when adjacent sheets are clamped together.