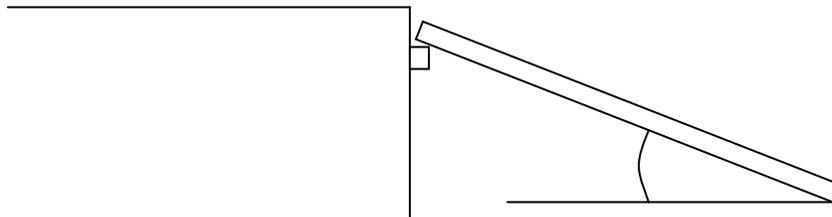


MJK Multiwall Systems, LLC

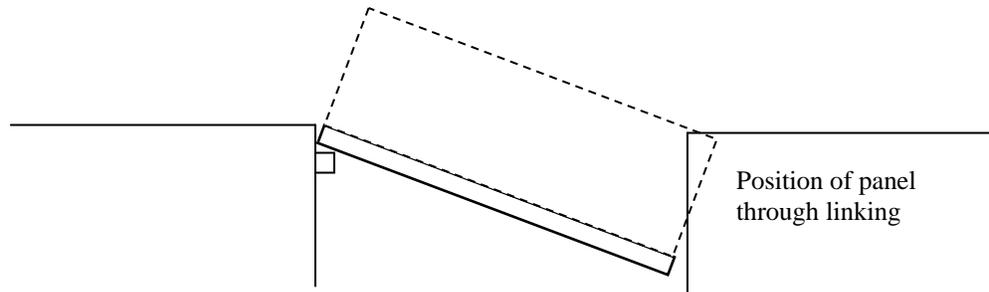
MANUFACTURING OF Twinfix ®MULTI-LINK PANELS / SITE KNOWLEDGE

Determining Sizes

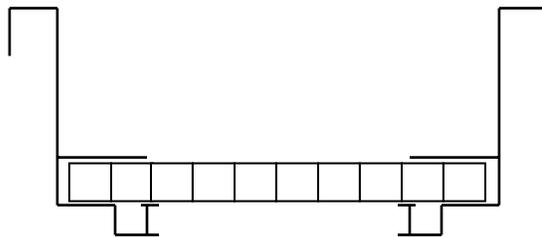
1. Basic questions to ask:
 - i.) Overall length down the slope, including for overhang (1/2 way into the gutter is recommended).
 - ii.) Overall width of application from outside edge to outside edge.
2. Elementary site details required:
 - i.) Site layout – i.e. mono-pitch roof or ridged roof.
 - ii.) Existing or new standard details – i.e. wall plate, ridge beam, or curb upstands.
 - iii.) Site difficulties / obstructions – i.e.:
 - Parapet wall with top copingstones.
 - Chimney breasts.
 - Rear walls stepping in or out.
 - Application not parallel front to back nor end to end.
 - Any overhanging roofs, guttering, flag poles, gantries.
 - Overhead cranes or steelwork.
 - Any restrictions forward of the panels, another building or steel frameworks.
 - Any existing pipe work protruding through the roof.
 - Any existing smoke vents, air ducts, down pipes, etc.
 - Any awkward detail, i.e. shaped panels, internal valley corners, or external hip corners.
3. Basic principles to remember:
 - i.) Minimum pitch = 10 degrees.



- ii.) The adjacent wall restricts Panel 2 and all further panels in this application.
- iii.) Fixing of panels in this application can be tricky, as there may not be enough room to link the panels.
- iv.) Break bars would be needed to replace the standard bars in this application.



- v.) Break panel:



- vi.) Maximum span of MLP10 is 3 meters or 10 feet.
Maximum span of MLP16 is 4 meters or 14 feet.
(Check loading requirements and add purlins as needed).
- vii.) Know the maximum panel width. The following are recommended:

Multiwall Gauge	Maximum Panel Width
10 mm	24 inches
16 mm	48 inches

- viii.) Attention must be taken regarding sheet expansion dimensions (clear expansion is 0.125 inches per 4 feet of length per 100 °F temperature change).
- ix.) Always use block edge / closed edge sheet if possible.

Production of Panels

Overall Panel Sizes

1. The fixing location channel on the male bar is 16 mm or 0.6” wide. Therefore, the overall length of the run must have this measurement deducted from each end, i.e. $2 \times 16 \text{ mm} = 32 \text{ mm}$ or $2 \times 0.6'' = 1.2''$.

Example: Run length of 30 ft less 1.2 inches = 29' 10.8”

Therefore, 29' 10.8” is divided into an equal number of panels. In this example, if 16 mm or 0.625” sheet were used, the number of panels would be calculated as follows:

$$\begin{array}{rcl} 29' * 12''/1' & = & 348 \text{ inches} \\ & + & \underline{10.8 \text{ inches}} \\ \text{Total} & & 358.8 \text{ inches} \\ 358.8'' \div 48'' \text{ max} & = & 7.5 \text{ panels} \end{array}$$

Rounding up, there will be 8 panels – each being 44.85” wide from center to center of glazing bars.

2. Determine run fitting criteria, i.e. to fit right to left or left to right.
3. The production of panels is in fact simple enough once all of the above panel size calculations have been established.

Manufacture / Assembly of Panels

1. Cut bars, male and female, to overall length down slope.
2. Cut sheet to overall length down slope.
3. Cut sheet to required panel width if necessary, i.e. 15 mm or 0.625” smaller than overall panel size.
4. Blow out cut sheet with dehumidified air and seal with appropriate tapes on top and bottom.

5. Apply 'blobs' of polycarbonate compatible silicone sealant inside jaws of male bar in three places – top, bottom, and middle – each blob being approximately 6”-8” long and quite sizeable (don't skimp).
6. Place sheet on bench with top UV face of sheet facing upward and apply male glazing bar to right hand side of sheet if fitting left to right and to left hand side of sheet if fitting right to left.

Working from the bottom of the sheet (anti-dust tape end), start by lining up the bar and pushing onto the sheet at one end only. Push the bar over the sheet edge and firmly into place. Work the bar along the edge for the full length of the sheet.

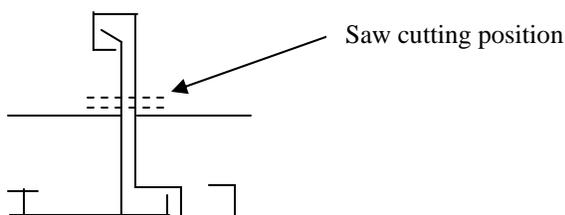
Stand the sheet on the floor in a vertical position and gently tap the male bar with a rubber mallet to ensure a proper fit, taking care to line it up parallel with ribs of sheet.

7. Apply 'blobs' of silicone sealant to the female bar and fit it in the same fashion as above.
8. Take care to check dimensions while assembling the panel. This can be easily done by fixing simple brackets or stops and tape measures to the bench.
9. Cut aluminum 'U' profile to size. i.e. size is the dimension between each of the Multi-Link bars on each side of the polycarbonate sheet.

Production Notes

1. One way of assisting the flashing process is to manufacture panels with either cut backs to the top of the panel or the application of top closure sections.

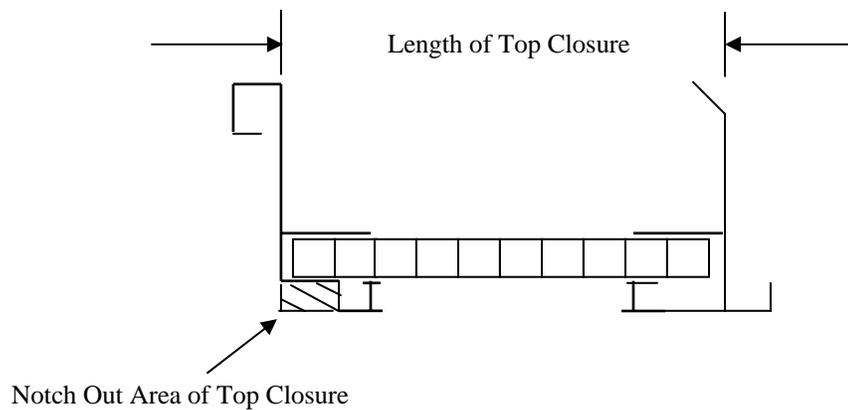
Cut back tops are the simplest to manufacture. Simply cut away the top section of Multi-Link bars a maximum of 150 mm or 5.9” in from the end and to the maximum depth, i.e. just above the top surface of the jaws that hold the sheet.



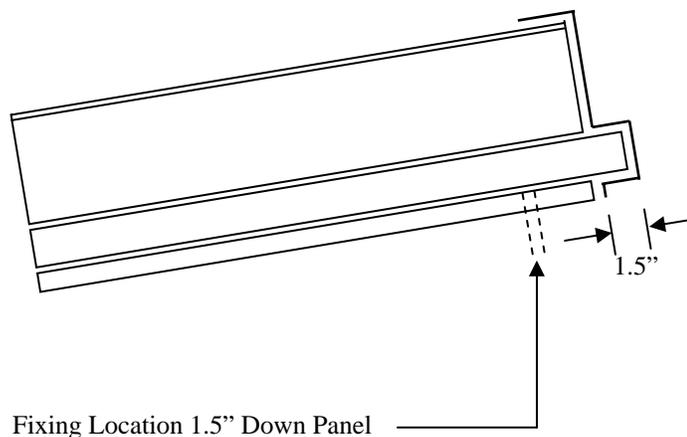
Top closure sections are the alternative, where the polycarbonate sheet must be 25.4 mm or 1" longer than the actual length of the bars. The bars are fitted so that the sheet protrudes past the end of the bars at the top end.

Top closure aluminum section is to be cut exactly to size, the size being the exact width of the required panel (bar center to bar center). The top closure is gently tapped onto the sheet and lined up to finish flush with the outside edge of the glazing bar central upstands on each side.

A notch will have to be cut out of the top closure profile on the side fitted to the female bar. The notch is cut out around the bottom edge of the female profile where the male bar fixing channel is located. This is to enable the panel to link and slide into position.



The top closure is fixed into position by screwing through each glazing bar profile into the screw port channels (1 screw port on female profile, 1 screw port on male profile).



The top closure detail can be used on triangular panels, i.e. hip panels, as well as ridge and normal applications. It is recommended that triangular panels be made on site or made to fit a template (provided by the contractor).

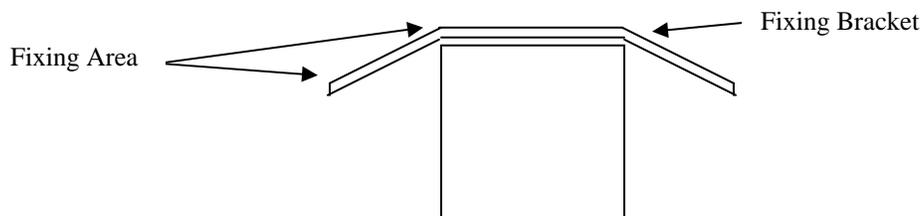
The corner is priced the same as a full panel plus an additional lump sum, i.e. \$50 per panel.

2. The alternative way of making hips would be to cut back the tops of the bars, (as above) then to flash the hip with butyl type flashing to weather the joint, then fix a pre-made metal flashing over the entire length to finish off.

Important Notes

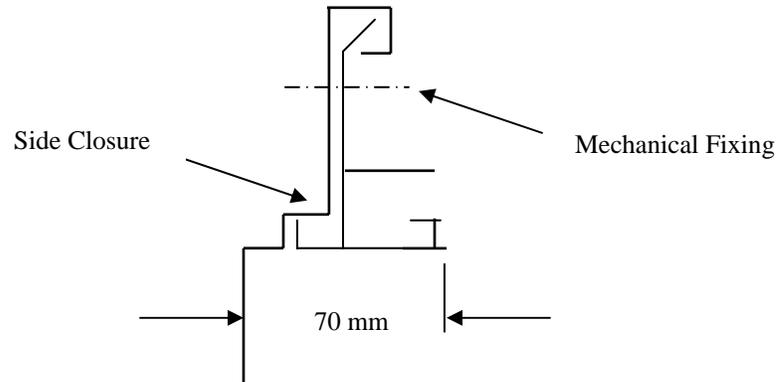
1. Working drawings on sheet dimensions are used for customer information.
2. Working drawings will be returned to the contractor and must be approved before commencing manufacture of panels. Any changes to the drawings made by the contractor must be signed and dated.
3. Valleys, hips, and ridges all need particular care and attention. One fundamental part common to all is that they each need a structural framework to be provided by others. The framework must be sufficiently wide enough for the panels to be securely fixed from each side with at least two fixings in each panel.

A 76.2 mm or 3" ridge timber, for example, is too narrow to fix MLPs with top closures twice. The top closure adds approximately 38.1 mm or 1.5" to the top edge of each panel, before even getting to the male bar fixing channel. A simple remedy is to supply some 3 mm or 0.125" thick aluminum angle brackets that fix to the ridge and provide a fixing location for the MLP bars.

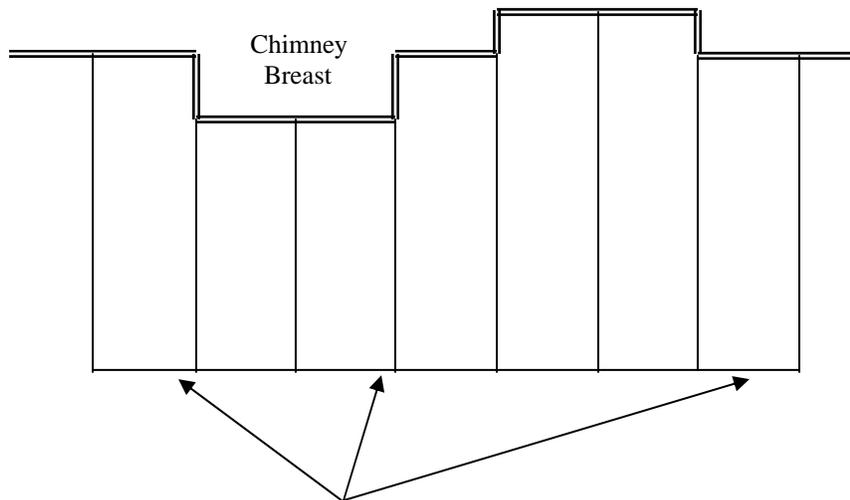


4. If MLP side closure is used, the overall base width of the male bar and side profile is the same as a full male / female bar, i.e. 70 mm or 2.75".
5. The side trim is usually added on with no calculations required, as it goes past the end vertical detail. The profile will need to be mechanically fixed and secured in

place, i.e. rivet / screwed through the vertical face into the male profile vertical face.



6. Multi-Link panels will slide into position so they can be fitted in applications where restricted access above exists, i.e. overhanging roof.
7. When coming up against steps in the rear wall, chimney breasts, or ventilation or smoke vent applications, it is best to finish at these points with the full panel and have a bar at the junction. This makes installation easier as you have a definite start / finish position to work to / from.



Panels are manufactured to ensure that the bars line up at the appropriate points.