ALLPLASTICS
ARCHITECTURAL & BUILDING

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Web. www.allplastics.com.au
Address. Unit 20/ 380 Eastern Valley Way,
Chatswood, NSW 2067 AUSTRALIA.

makrolon® Sheet
multiwall

Multiwall System High Wind Load Installation Instructions

STEEL SUB-FRAME & ONE PIECE H-BAR.

1. Create a strong steel sub-frame from defect free steel having length-wise members to support H-Bars; cross-members for fixing through the Multiwall Sheet separated by not more than 1200mm.

2. Sub-frame system shall be assembled flush with the top surfaces of length-wise members and cross-members in the same plane.

3. Minimum fall of the sheets will be 5 degrees to the horizontal length-wise in the direction of the Multiwall Sheet flutes.

4. Fix One Piece H-Bar system with 14g x 42mm fixings consisting of Hexagon Washer Head and Seal to length-wise members at separations no greater than 600mm.

5. Drill 10mm oversize holes for fixings through Multiwall Sheets at equally spaced intervals centred on top of each cross-member.

6. Centrally fix through the sheet holes with 14g x 42mm fixings consisting of 25mm Aluminium Bonded Washer . Do not over-tighten fixing creating a depression in the sheet.

MWS Sheet gauge	MWS Sheet Width	Length-wise Member Centres	Max. Spacing of H-Bar fixings	Max. Cross-wise Member Centres	Sheet Oversize Hole Diameter	No. of MWS Fixings at each position
10mm	1050mm	1070mm	600mm	1200mm	10mm	4

7. Only use the fixings designated:

- 14g x 42mm fixing consisting of Hexagon Washer Head with Seal.
- 14g x 42mm fixing consisting of 25mm Aluminium Bonded Washer.

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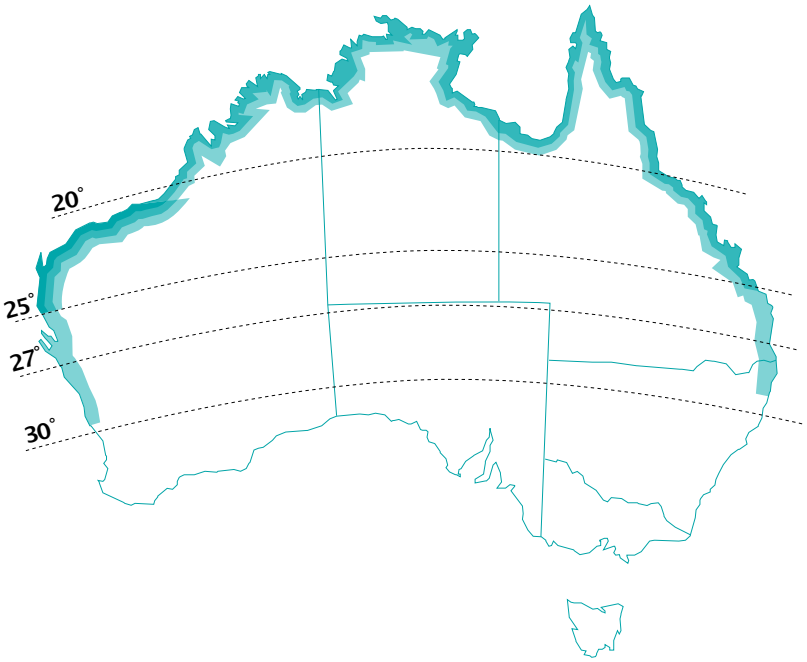
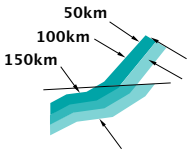
AS4055 Wind Loads For Housing

	Wind Load Selection Guide
1	Select Region
2	Select Terrain Category
3	Select Shielding Factor
4	Select Topography
5	Determine Wind Category

Region Selection



REGION A1-A5
REGION B
REGION C
REGION D



Rationalised Gust Wind Speed* Vz (m/s). Non-Cyclonic Region A1-A5, B and Clyclonic Region C

Region	Terrain Category	TOPOGRAPHY CLASSIFICATION								
		T1			T2			T3		
		SHIELDING FACTOR								
		FS	PS	NS	FS	PS	NS	FS	PS	NS
A1 - A5	3	W28	W28	W33	W33	W33	W36	W33	W33	W41
	2.5	W28	W33	W36	W33	W36	W41	W36	W36	W50
	2	W33	W36	W41	W36	W41	W50	W41	W41	W50
B	3	W33	W36	W41	W36	W41	W50	W41	W41	W50
	2.5	W36	W41	W50	W41	W50	W50	W50	W50	W55
	2	W41	W50	W50	W50	W50	W55	W50	W50	W60
C	3	W41	W50	W55	W50	W55	W60	W55	W55	N/A
	2.5	W50	W50	W55	W50	W60	N/A	W55	W55	N/A
	2	W50	W55	W60	W55	W60	N/A	W60	W60	N/A

FS : Full Shielding PS : Partial Shielding NS : No Shielding T : Topography

Design Factors

Wind speeds have been determined using the following factors, in accordance with AS1170.2-2002.

Terrain Categories ($M_{z,cat}$)

Terrain Category	Regions A1-A5 and B	Regions C and D
2	1	1
2.5	0.92	0.95
3	0.83	0.89

Shielding Factor (M_s)

Shielding Classification	Factor
Full Shielding (FS)	0.8
Partial Shielding (PS)	0.9
No Shielding (NS)	1

Topographic Effect (M_T)

Topographic Classification	Factor
T1	1
T2	1.15
T3	1.28

DIRECTION MULTIPLIER (M_D) - In All Cases a factor of 1.00

The method used for calculating the design gust wind speeds has been developed to comply with the requirements of AS1170.2.2002.
Mulford does not accept any loss or damage suffered as a result in any errors in the interpretation or application of this design guide.

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AS4055 Wind Loads For Housing

Rating Chart Region A

TERRAIN CATEGORY 3	WIND RATING	TOPOGRAPHY T1	T2	T3
FULL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N1 500Pa 700Pa 150Pa	N1 500Pa 700Pa 150Pa	N2 700Pa 1000Pa 150Pa
PARTIAL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N1 500Pa 700Pa 150Pa	N2 700Pa 1000Pa 150Pa	N3 1000Pa 1500Pa 150Pa
NO SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N2 700Pa 1000Pa 150Pa	N2 700Pa 1000Pa 150Pa	N3 1000Pa 1500Pa 150Pa

TERRAIN CATEGORY 2.5	WIND RATING	TOPOGRAPHY T1	T2	T3
FULL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N1 500Pa 700Pa 150Pa	N2 700Pa 1000Pa 150Pa	N2 700Pa 1000Pa 150Pa
PARTIAL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N2 700Pa 1000Pa 150Pa	N3 1000Pa 1500Pa 150Pa	N3 1000Pa 1500Pa 150Pa
NO SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N2 700Pa 1000Pa 150Pa	N3 1000Pa 1500Pa 150Pa	N3 1000Pa 1500Pa 150Pa

TERRAIN CATEGORY 2	WIND RATING	TOPOGRAPHY T1	T2	T3
FULL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N2 700Pa 1000Pa 150Pa	N3 1000Pa 1500Pa 150Pa	N3 1000Pa 1500Pa 150Pa
PARTIAL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N2 700Pa 1000Pa 150Pa	N3 1000Pa 1500Pa 150Pa	N3 1000Pa 1500Pa 150Pa
NO SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N3 1000Pa 1500Pa 150Pa	N3 1000Pa 1500Pa 150Pa	N4 1500Pa 2300Pa 200Pa

Note: Every care has been taken in supplying this information. It is offered as and should only be accepted as a general reference guide to the suitability of Makrolon Multiwall products to particular applications. It is not intended that it reflects in detail, nor should it be assumed that it does reflect in detail an interpretation of the Australian Standards. Mulford Building Products strongly recommends contacting Standards Australia, or Local Council Authorities for specific applications.

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AS4055 Wind Loads For Housing

Rating Chart Region B

TERRAIN CATEGORY 3	WIND RATING	TOPOGRAPHY T1	T2	T3
FULL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N2 700Pa 1000Pa 150Pa	N2 700Pa 1000Pa 150Pa	N3 1000Pa 1500Pa 150Pa
PARTIAL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N2 700Pa 1000Pa 150Pa	N3 1000Pa 1500Pa 150Pa	N3 1000Pa 1500Pa 150Pa
NO SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N3 1000Pa 1500Pa 150Pa	N3 1000Pa 1500Pa 150Pa	N4 1500Pa 2300Pa 200Pa

TERRAIN CATEGORY 2.5	WIND RATING	TOPOGRAPHY T1	T2	T3
FULL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N2 700Pa 1000Pa 150Pa	N3 1000Pa 1500Pa 150Pa	N3 1000Pa 1500Pa 150Pa
PARTIAL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N3 1000Pa 1500Pa 150Pa	N3 1000Pa 1500Pa 150Pa	N4 1500Pa 2300Pa 200Pa
NO SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N3 1000Pa 1500Pa 150Pa	N4 1500Pa 2300Pa 200Pa	N4 1500Pa 2300Pa 200Pa

TERRAIN CATEGORY 2	WIND RATING	TOPOGRAPHY T1	T2	T3
FULL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N3 1000Pa 1500Pa 150Pa	N3 1000Pa 1500Pa 150Pa	N4 1500Pa 2300Pa 200Pa
PARTIAL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N3 1000Pa 1500Pa 150Pa	N4 1500Pa 2300Pa 200Pa	N4 1500Pa 2300Pa 200Pa
NO SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	N3 1000Pa 1500Pa 150Pa	N4 1500Pa 2300Pa 200Pa	N5 2200Pa 3300Pa 300Pa

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AS4055 Wind Loads For Housing

Rating Chart Region C

TERRAIN CATEGORY 3	WIND RATING	TOPOGRAPHY T1	T2	T3
FULL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	C1 1000Pa 1500Pa 150Pa	C2 1500Pa 2300Pa 200Pa	C2 1500Pa 2300Pa 200Pa
PARTIAL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	C1 1000Pa 1500Pa 150Pa	C2 1500Pa 2300Pa 200Pa	C2 1000Pa 1500Pa 150Pa
NO SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	C2 1500Pa 2300Pa 200Pa	C2 1500Pa 2300Pa 200Pa	C3 2200Pa 3300Pa 300Pa

TERRAIN CATEGORY 2.5	WIND RATING	TOPOGRAPHY T1	T2	T3
FULL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	C1 1000Pa 1500Pa 150Pa	C2 1500Pa 2300Pa 200Pa	C2 1500Pa 2300Pa 200Pa
PARTIAL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	C2 1500Pa 2300Pa 200Pa	C2 1500Pa 2300Pa 200Pa	C3 2200Pa 3300Pa 300Pa
NO SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	C2 1500Pa 2300Pa 200Pa	C3 2200Pa 3300Pa 300Pa	C3 2200Pa 3300Pa 300Pa

TERRAIN CATEGORY 2	WIND RATING	TOPOGRAPHY T1	T2	T3
FULL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	C2 1500Pa 2300Pa 200Pa	C2 1500Pa 2300Pa 200Pa	C3 2200Pa 3300Pa 300Pa
PARTIAL SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	C2 1500Pa 2300Pa 200Pa	C3 2200Pa 3300Pa 300Pa	C3 2200Pa 3300Pa 300Pa
NO SHIELDING 	Wind Classification Serviceability Design Wind Pressure Ultimate Limit State Wind Pressure Water Penetration	C2 1500Pa 2300Pa 200Pa	C3 2200Pa 3300Pa 300Pa	C4 3000Pa 4500Pa 450Pa

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Please note that at this stage there is no testing for 10x1050mm

Wind Load Test Results

The table below summarises the test results obtained. The estimates of ultimate loads, which are based on the assumption that ultimate loads are reached when the maximum principal stress reach the ultimate stress of the polycarbonate sheet (60 Mpa), are included in the table. Plots of the maximum principal stress v's load for each of the profiles tested follow the table.

Makrolon Multiwall Sheet	End span (mm)	Internal span (mm)	Factored Ultimate Load (kPa) From Testing	Failure Load (kPa) From Testing	Failure Load (kPa) From Analysis	Wind Category Rating
Multiwall Sheet 8mm Standard Installation	Width 700	N/A	0.31	0.56; 0.40; 0.45	0.55	N1
Multiwall Sheet 10mm Standard Installation	Width 980	N/A	0.30	0.40; 0.39; 0.40	0.45	N1
Multiwall Sheet 8mm High Wind* Installation	Width 700	1200	2.50	3.5; 3.5; 3.25	N/A	N2, N3 N4, N5
Multiwall Sheet 10mm High Wind* IInstallation	Width 980	1200	2.12	2.75; 3.25; 3.1	N/A	N2, N3 N4, N5

*To achieve these results special High Wind installation instructions for Makrolon ° Multiwall must be followed.

Makrolon Cleaning Instructions

The Following techniques for cleaning Makrolon polycarbonate sheet are based on standard industry practice. To ensure acceptability of the results, always test a sample of the material with the cleaner and technique to be used.

Guidelines:
Do rinse the sheet with warm water prior to cleaning process.
Do follow the application with a lukewarm water rinse.

Don't use abrasives or high alkaline cleaners.
Don't leave cleaners on sheet for long periods, wash immediately.
Don't apply cleaners in direct sunlight or at elevated temperatures.
Don't use scrapers, squeegees or razors.
Don't clean with gasoline.

Compatible Cleaners and Detergents:
Joy[1], Windex with Ammonia D[2], Palmolive[3], Naphtha VM&P Grade, Isopropyl Alcohol

To Minimize Fine or Hairline Scratches:
Plastic Polishes applied and removed per manufacturer instructions.

Suggested Polishes:
Mirror Glaze Clear Plastic Polish, Cleaner & Detailer (by Meguiars 800-347-5700 or Meguiars.com)
Novus Plastics Polish #1, #2 (by Novus Inc. 800-NOVUS60 or noscratch.com)
Plexus Plastic Cleaner and Polish (by BTI Chemical Co. PlexusPlasticCleaner.com)

To Remove Masking Adhesive and Glazing Compound:
Apply Naphtha VM&P grade, Kerosene or Isopropyl Alcohol with clean soft cloth. Wash immediately with soap and lukewarm water and rinse with thoroughly with clean water.

To Remove Graffiti:
Naphtha VM&P grade, Isopropyl Alcohol or Butyl Cellosolve removes paint, marker ink. (Do not use in direct sunlight).
Isopropyl Alcohol, Naphtha VM&P grade or Kerosene will help lift stickers and other adhesive backed labels. Wash immediately with soap and lukewarm water and rinse with thoroughly with clean water.

® Registered Trademarks of [1]Proctor&Gamble, [2]Drackett Products, [3]Colgate Palmolive

MAK_Cleaning_1-06

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Makrolon Environmental Resistance

Makrolon polycarbonate sheet may be used in a diverse range of environmental conditions. However, as with any thermoplastic, some environmental conditions have proven to be detrimental to Makrolon sheet. Varying degrees of stress, strain and temperature may also alter the resistance of Makrolon sheet; consequently fabricated parts should be tested thoroughly under actual in-service conditions prior to final design.

Makrolon is resistant to:

Chemicals:
Amyl Alcohol
Aluminum Chloride
Aluminum Sulphate
Ammonium Chloride
Ammonium Nitrate
Ammonium Sulphate
Antimony Trichloride
Arsenic Acid 20%
Butyl Alcohol
Calcium Nitrate
Chlorinated Lime Paste
Chrome Alum
Chromic Acid 20%
Citric Acid 40%
Copper Chloride
Copper Sulphate
Cuprous Chloride
Formic Acid 10%
Formalin 30%
Glycerine
Heptane
Hydrochloric Acid 10%
Hydrogen Peroxide 30%
Hydrofluoric Acid 10%
Isopropanol
Lactic Acid 20%
Magnesium Chloride
Magnesium Sulphate
Manganese Sulphate
Mercuric Chloride
Nickel Sulphate
Nitric Acid 10%
Nitric Acid 20%
Oleic Acid
Oxalic Acid
Pentane
Phosphoric Acid 10%
Potassium Bromate
Potassium Bromide
Potassium Nitrate
Potassium Perchlorate
Potassium Permanganate
Potassium Persulphate
Potassium Sulphate
Silicone Oil
Silver Nitrate
Sodium Bicarbonate
Sodium Bisulphate
Sodium Carbonate
Sodium Chlorate
Sodium Chloride
Sodium Hypochlorite
Sodium Sulphate
Stannous Chloride
Sulfur
Sulfuric Acid 10%*
Sulfuric Acid 50%
Tartaric Acid 30%
Zinc Chloride
Zinc Sulphate

Industrial Petroleum Products:
Axle Oil
Compressor Oil
Diesel Oil
Kerosene
Refined Oil
Spindle Oil
Transformer Oil
Vacuum Pump Oil

Common Household Materials:
Beer
Borax
Cocoa
Cement
Chocolate
Cod Liver Oil
Cognac
Coffee
Detergents (nonionic and anionic)
Fish Oil
Fruit Syrup
Grapefruit Juice
Gypsum
Joy Liquid Detergent
Insulating Tape
Linseed Oil
Liquor
Milk
Mineral Water
Mustard
Olive Oil
Onions
Orange Juice
Paraffin Oil
Rapeseed Oil
Rum
Salad Oil
Salt Solution 10%
Soap (soft and hard)
Table Vinegar
Tincture of Iodine 5%
Tomato Juice
Vodka
Washing Soap
Water
Wine

Sulfuric acid 1% attacks polycarbonate

Makrolon has limited resistance to:

Anti-freeze
Calcium Chloride
Cyclohexanol
Ethylene Glycol
Hydrochloric Acid (concentrate)
Milk of lime (CaOH)
Nitric Acid (concentrate)
Sulfuric Acid (concentrate)

Makrolon is not resistant to:

Acetaldehyde
Acetic Acid (concentrate)
Acetone
Acrylonitrile
Ammonia
Ammonium Fluoride
Ammonium Hydroxide
Ammonium Sulfide
Benzene
Benzoic Acid
Benzyl Alcohol
Brake Fluid
Bromobenzene
Butyric Acid
Carbon Tetrachloride
Carbon Disulfide
Carbonic Acid
Caustic Potash Solution 5%
Caustic Soda Solution 5%
Chlorothene
Chlorobenzene
Cutting Oils
Cyclo Hexanone
Cyclohexene
Dimethyl Formamide
Ethane Tetrachloride
Ethylamine
Ethyl Ether
Ethylene Chlorohydrin
Formic Acid (concentrate)
Freon (refrigerant & propellant)
Gasoline
Lacquer Thinner
Methyl Alcohol
Nitrobenzene
Nitrocellulose Lacquer
Ozone
Phenol
Phosphorous Hydroxy Chloride
Phosphorous Trichloride
Propionic Acid
Sodium Sulfide
Sodium Hydroxide
Sodium Nitrate
Tetradydronaphthalene
Thiophene
Toluene
Turpentine
Xylene

Makrolon is dissolved by:

Chloroform
Cresol
Dioxane
Ethylene Dichloride
Methylene Chloride
Pyridine

In general, Makrolon sheet has good resistance to water, organic and inorganic acids, neutral and acid salts and aliphatic and cyclic hydrocarbons. Alkalines, amines, ketones, esters and aromatic hydrocarbons attack Makrolon. Solvents for Makrolon are: methylene chloride, ethylene dichloride and dioxane

This chemical and solvent resistant listing is intended to assist designers in determining whether Makrolon sheet can be used in certain environments. It is very important to test prototype parts under end-use conditions for final verification of performance. All data is based on 70^{0}F and 0% strain.

Makrolon sheet has good resistance to water up to approximately 150^{0}F Above this temperature, the effect of moisture is time-temperature related. Exposing Makrolon sheet to repeated steam cleaning or dish washing can create hydrolic crazing. The result can be a clouding of the surface and ultimately a loss of physical strength properties.

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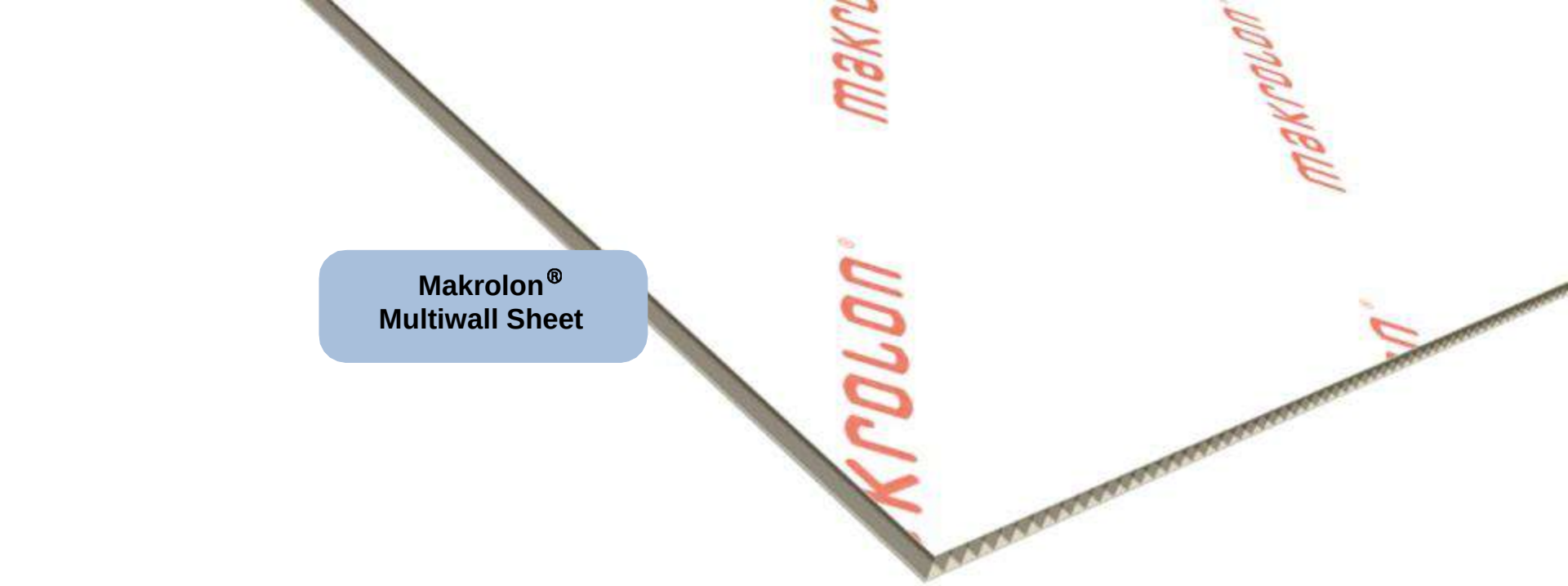
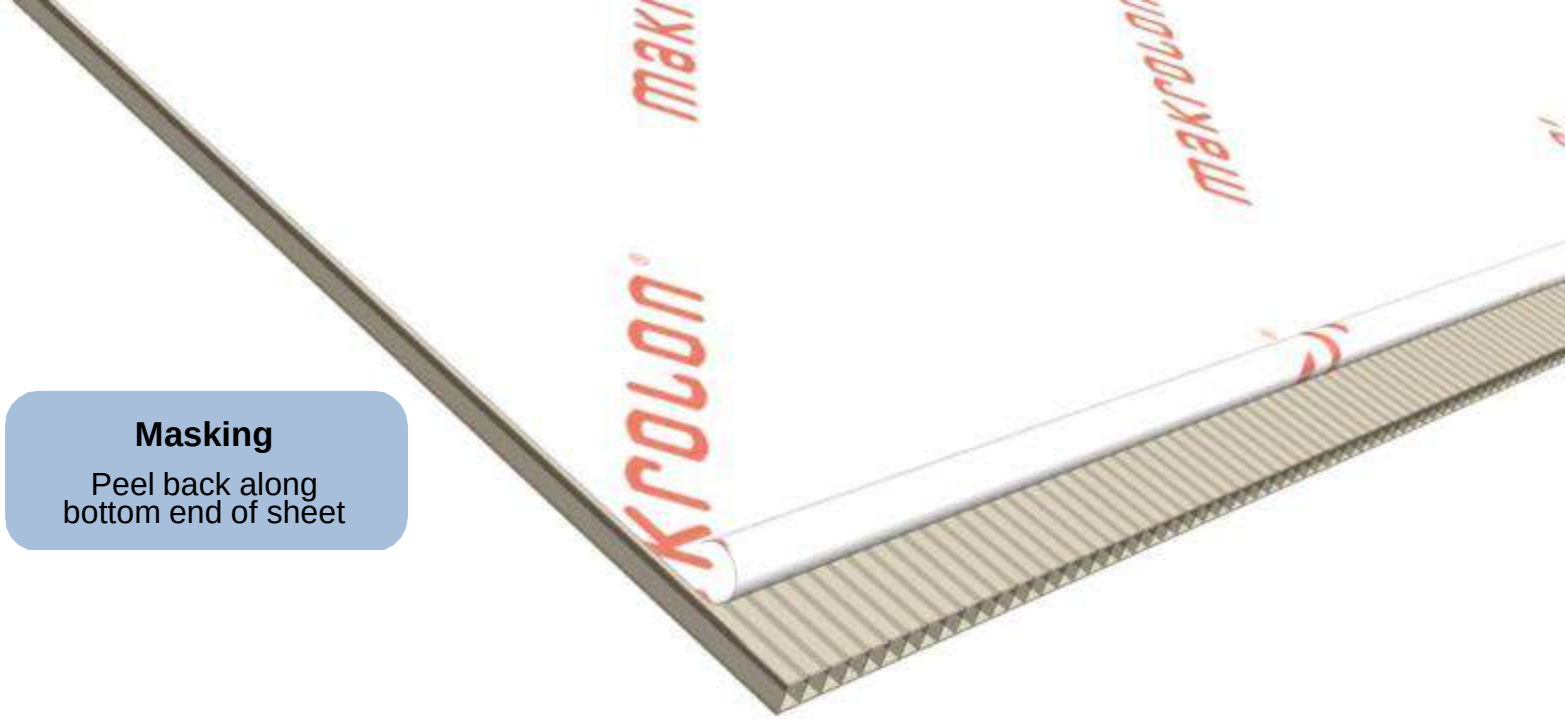
How to install

makrolon® Sheet multiwall

One Piece H-Bar System

Bayer MaterialScience

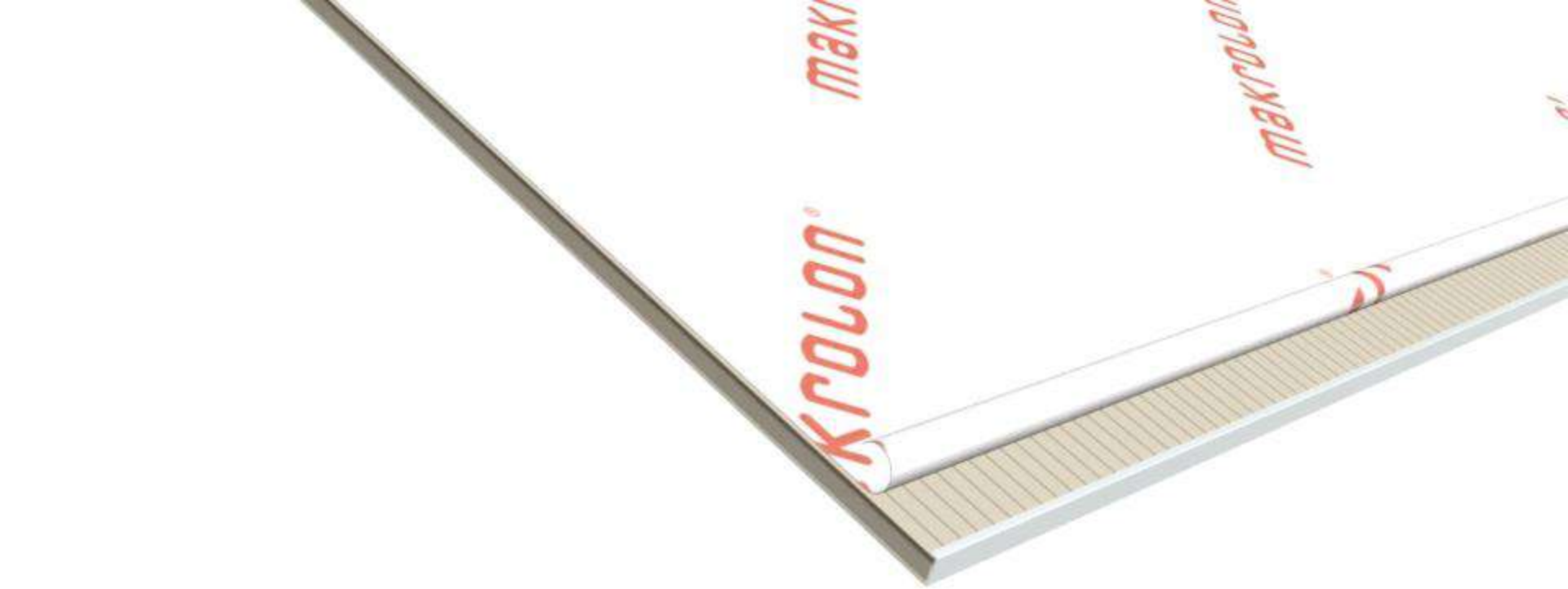

Makrolon®
Multiwall Sheet



Masking

Peel back along bottom end of sheet

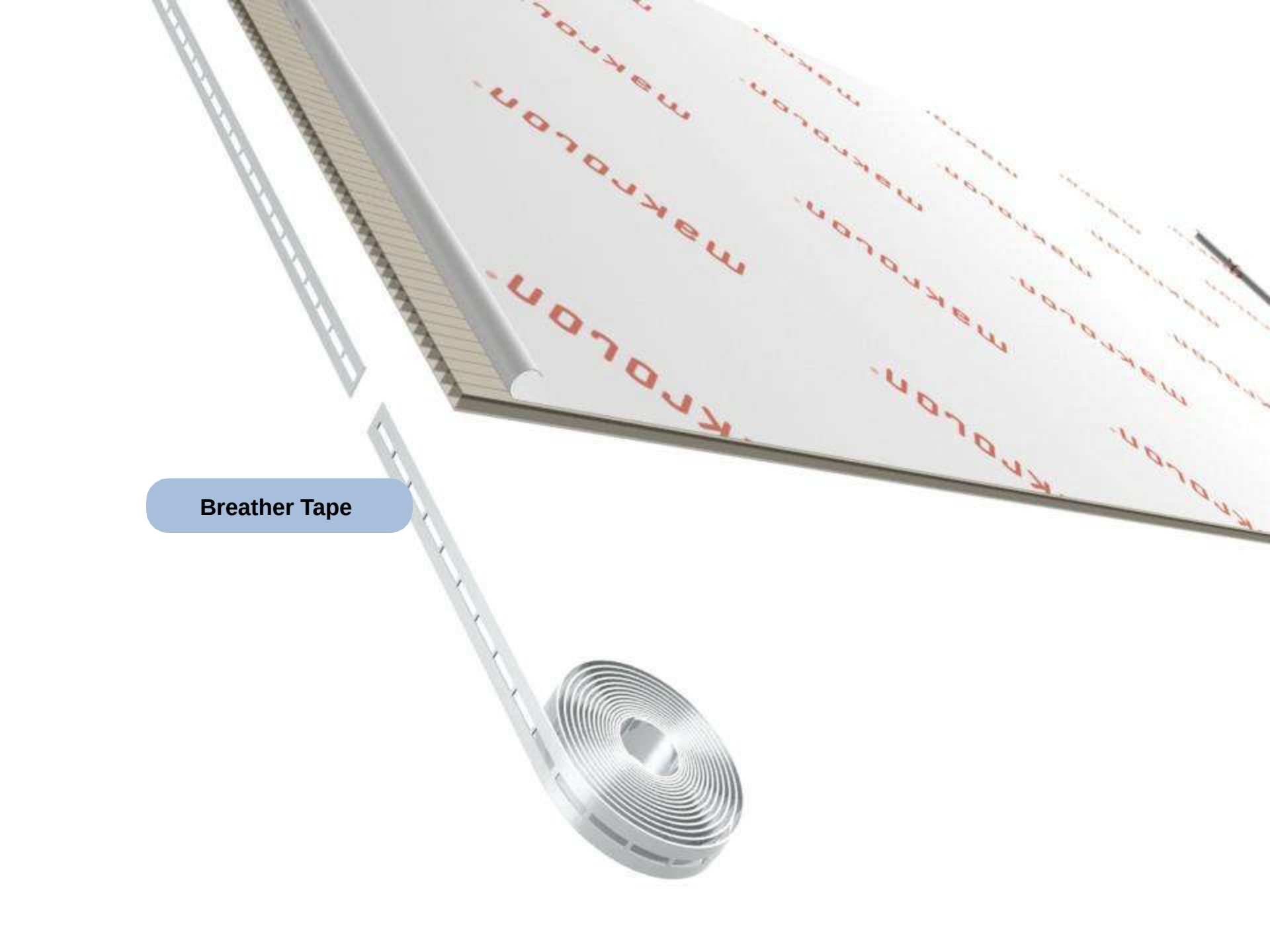

Sealing Tape

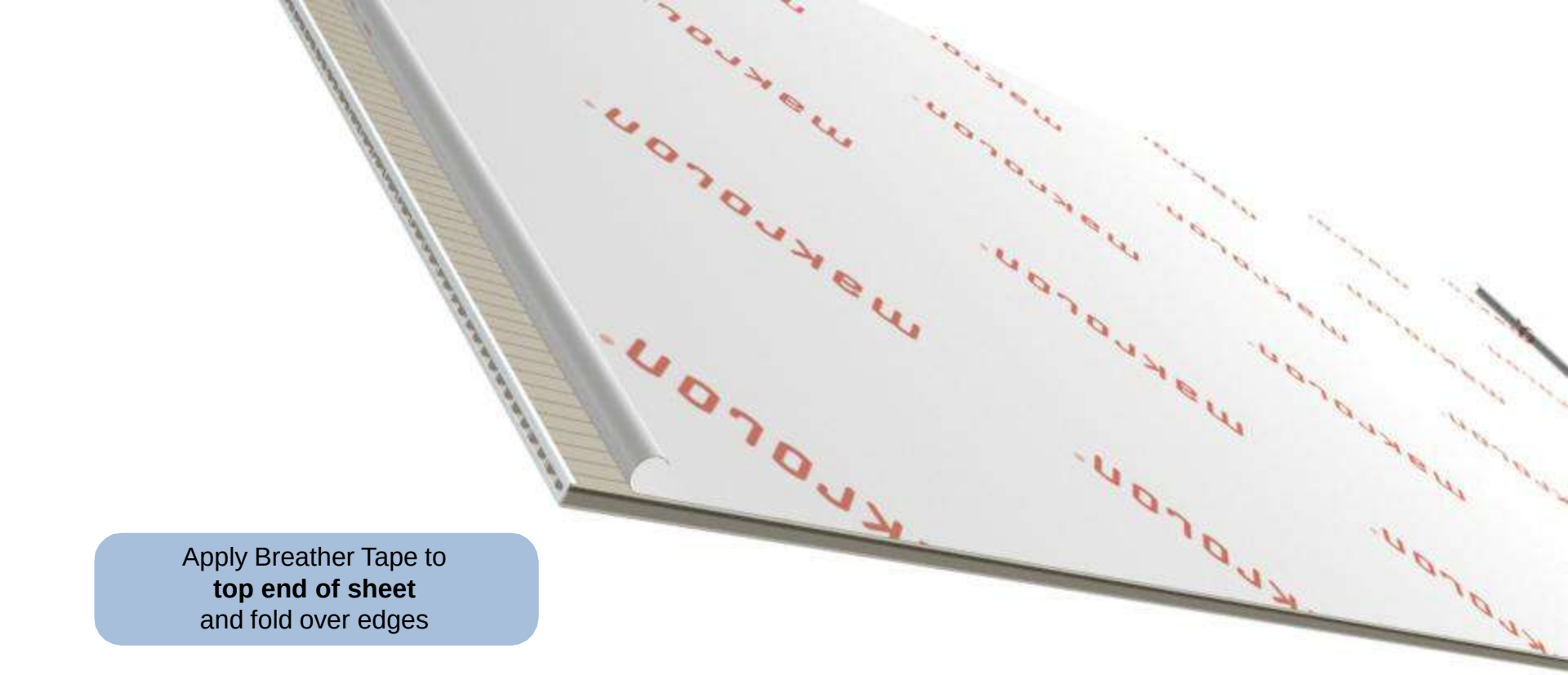


Apply Sealing Tape to
bottom end of sheet
and fold over edges

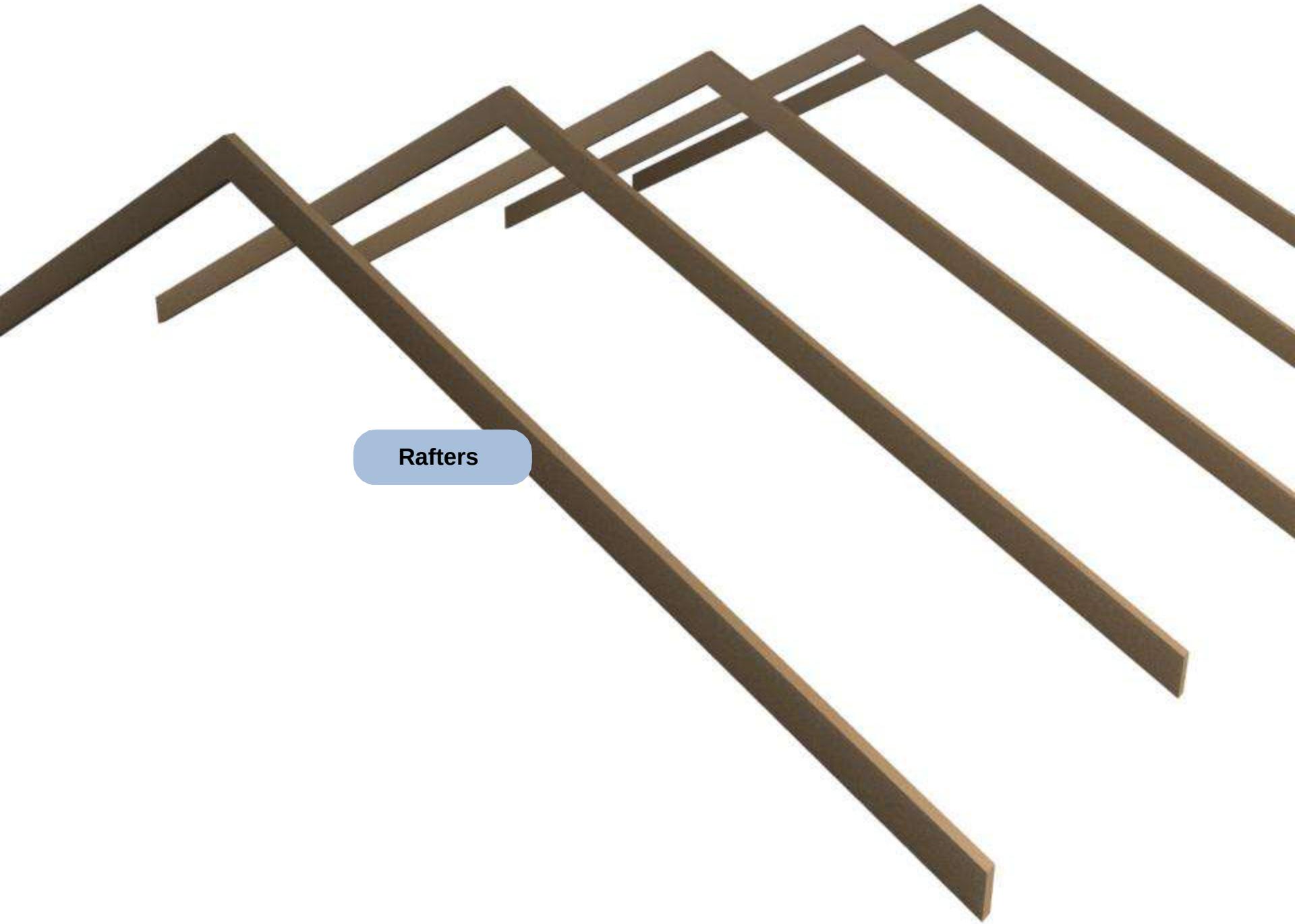
Masking

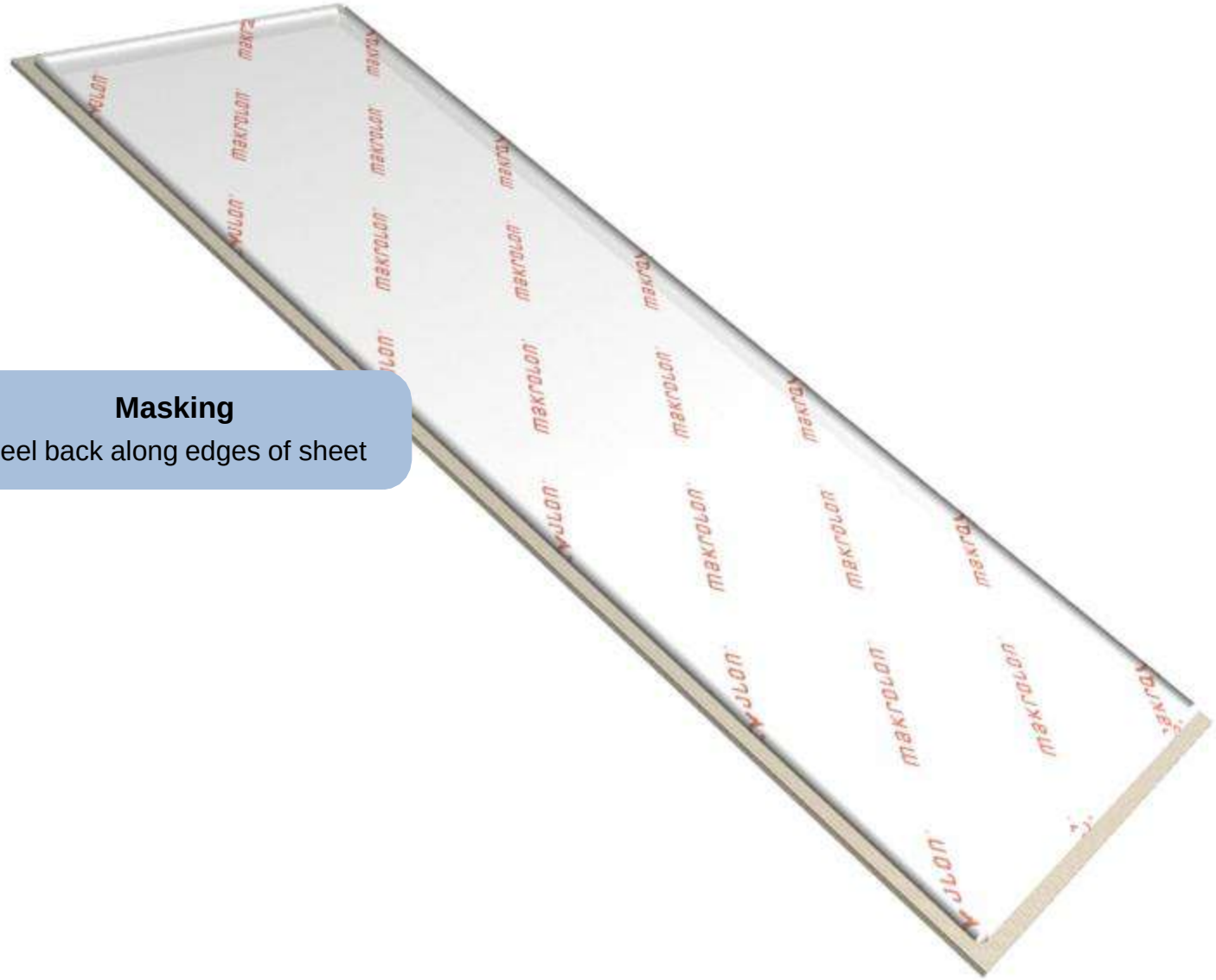
Peel back along
top end of sheet


Breather Tape



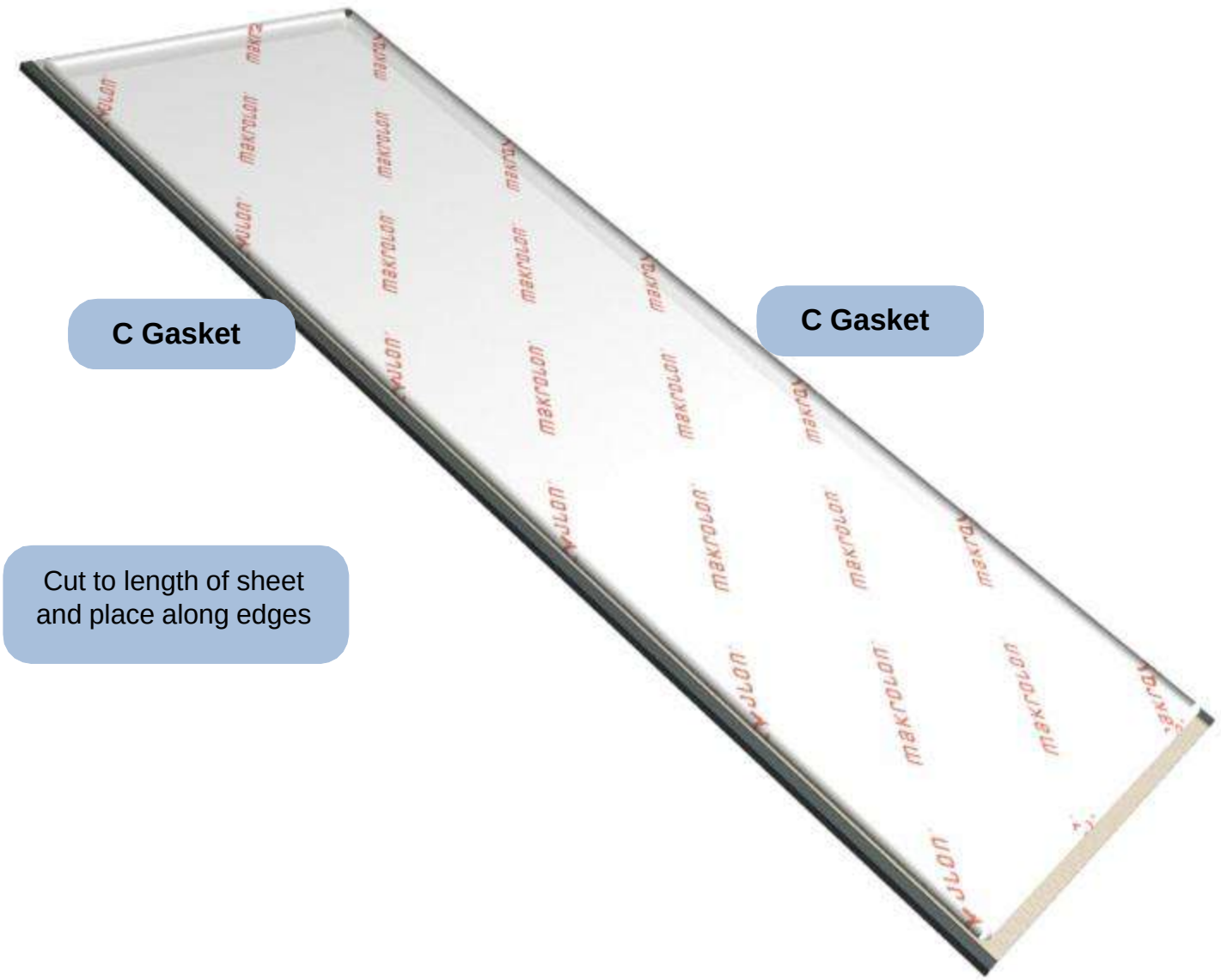
Apply Breather Tape to
top end of sheet
and fold over edges

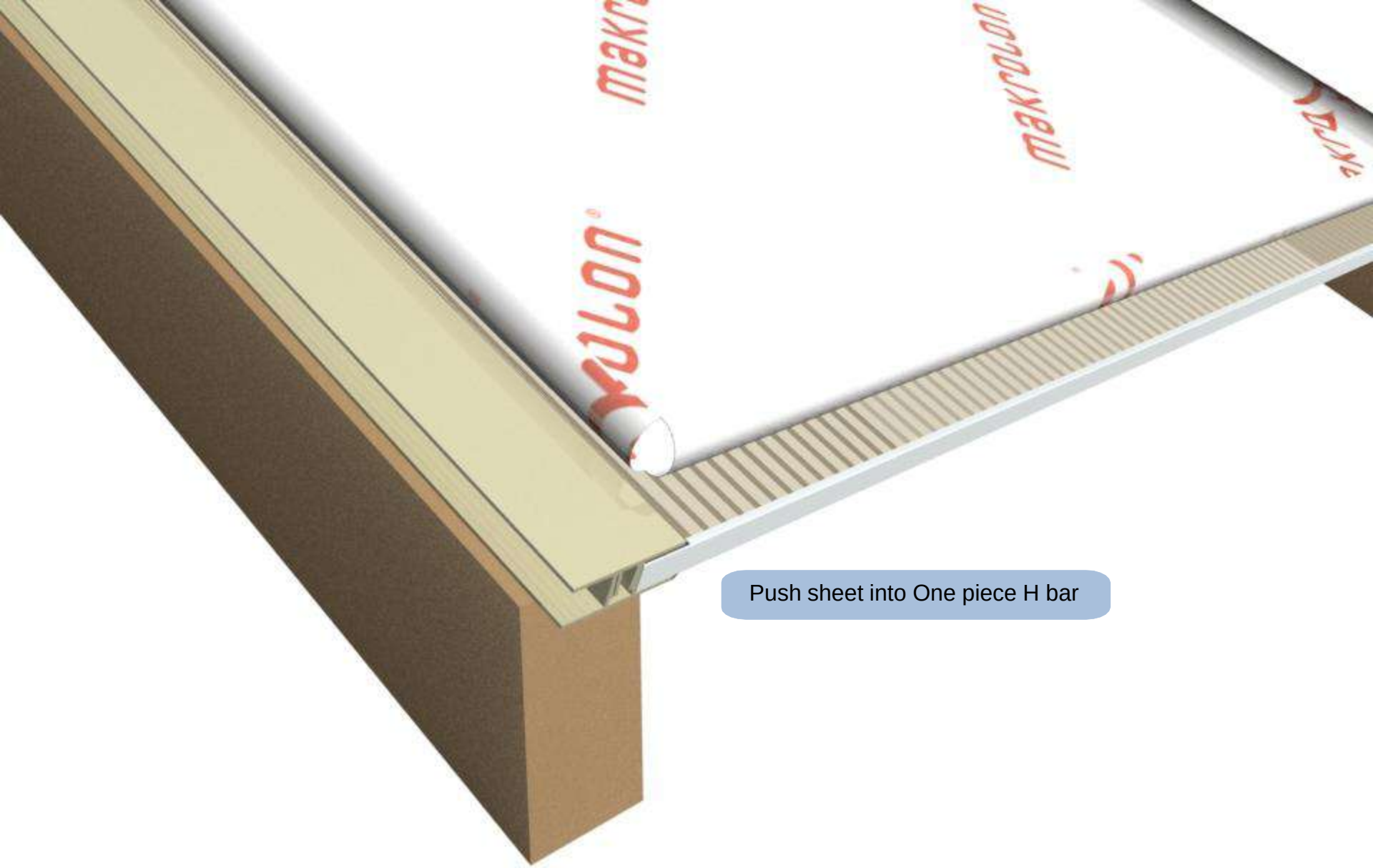

Rafters

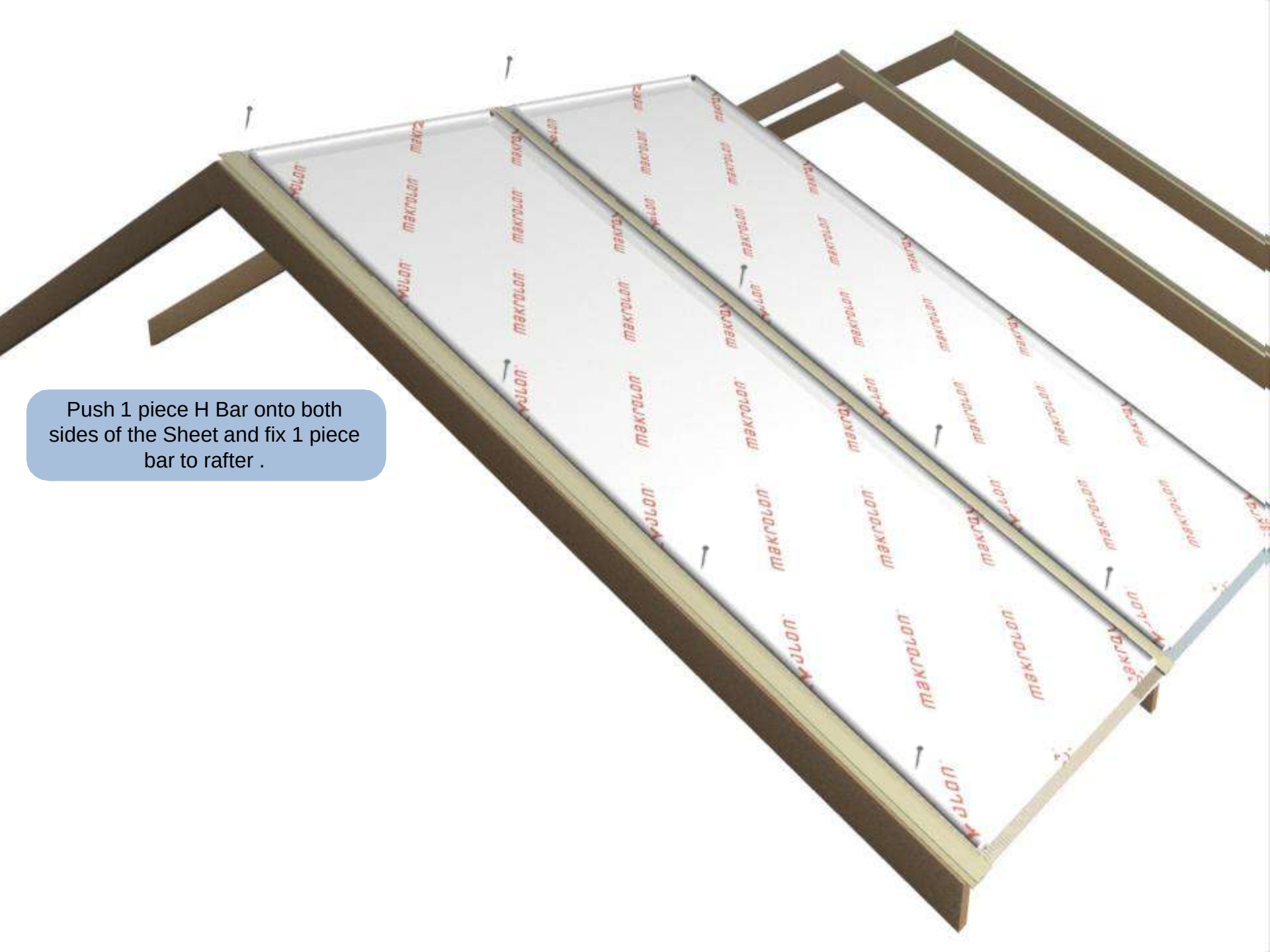


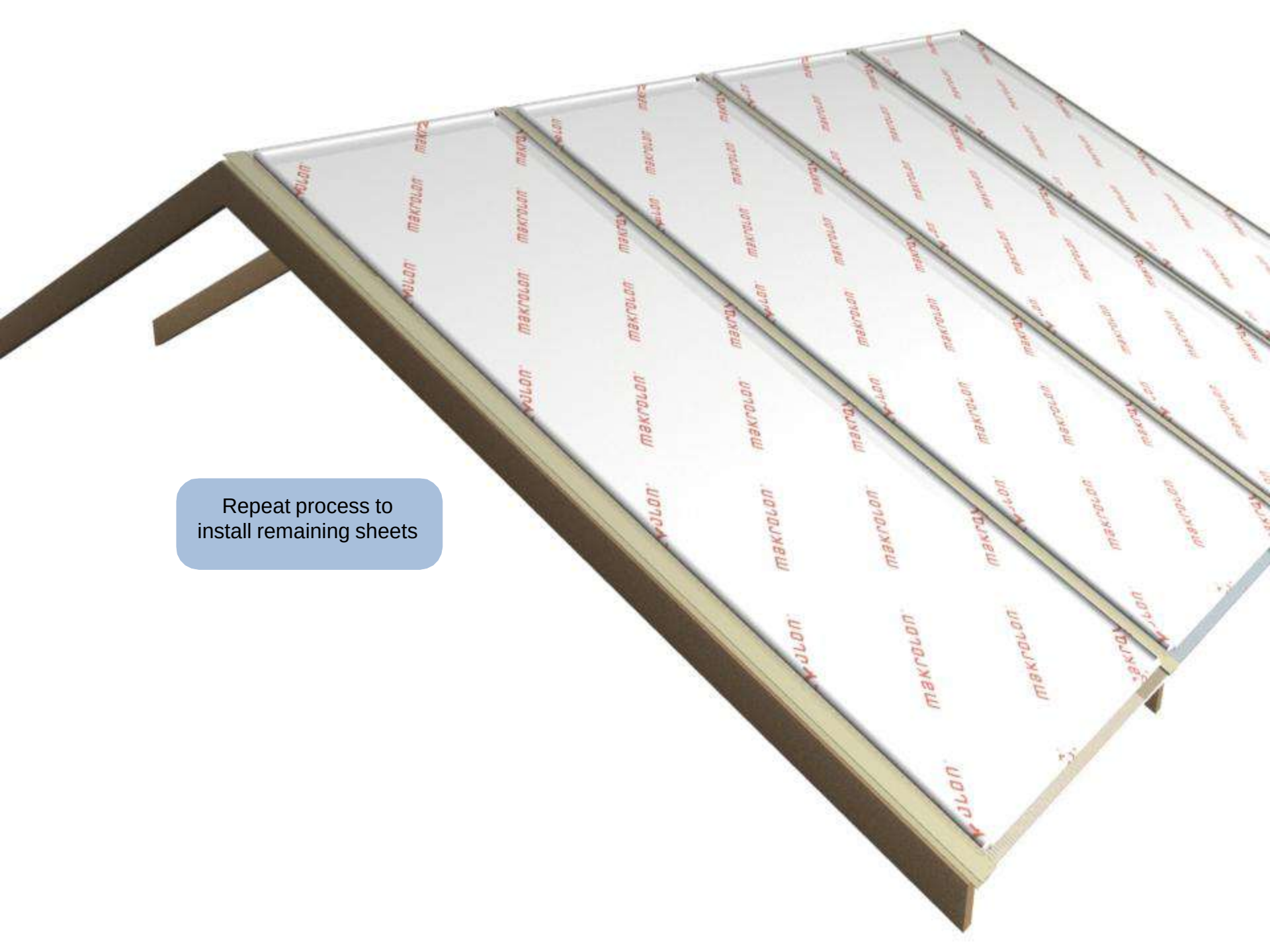
Masking

Peel back along edges of sheet

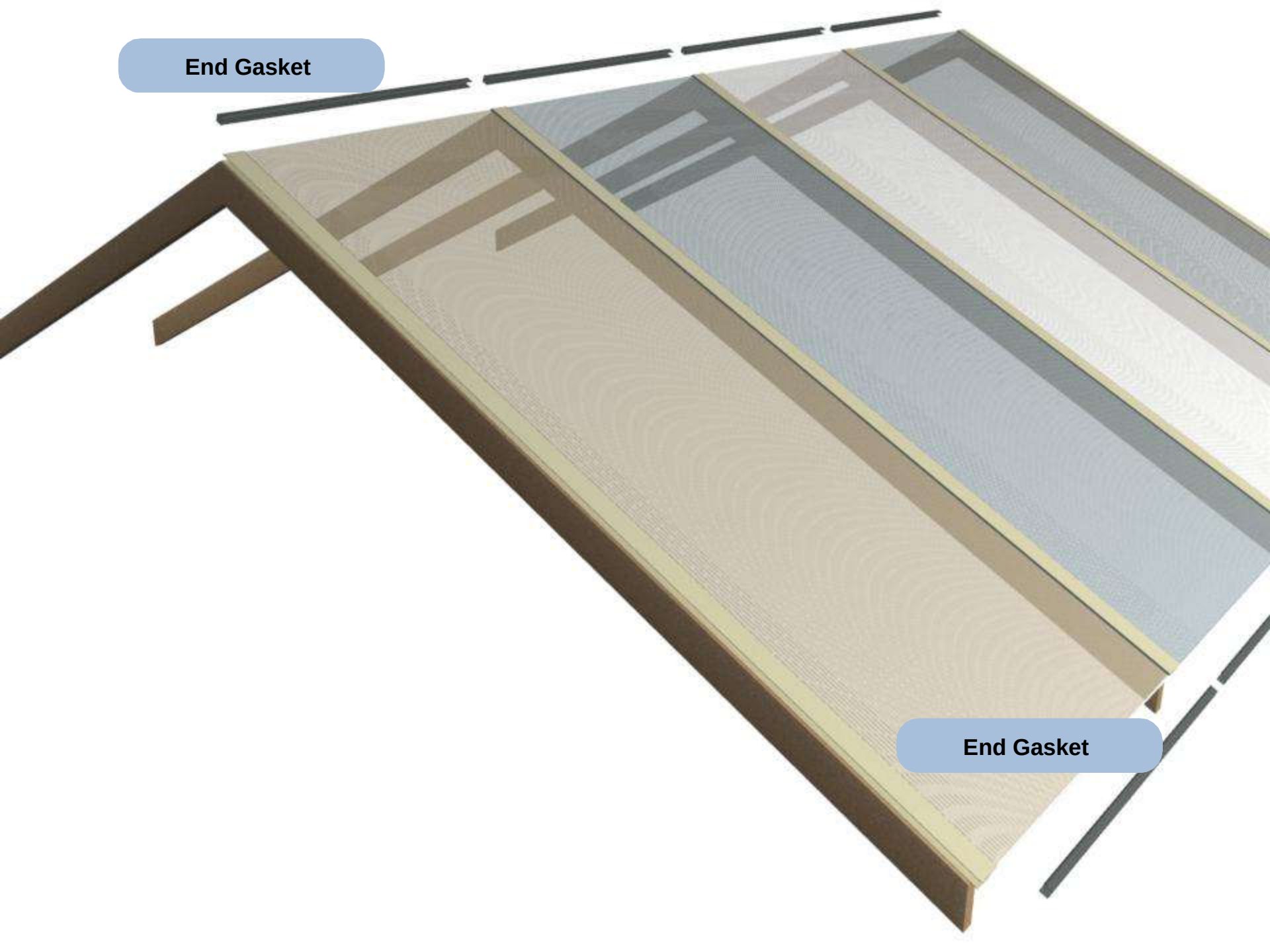

C Gasket
C Gasket
Cut to length of sheet
and place along edges

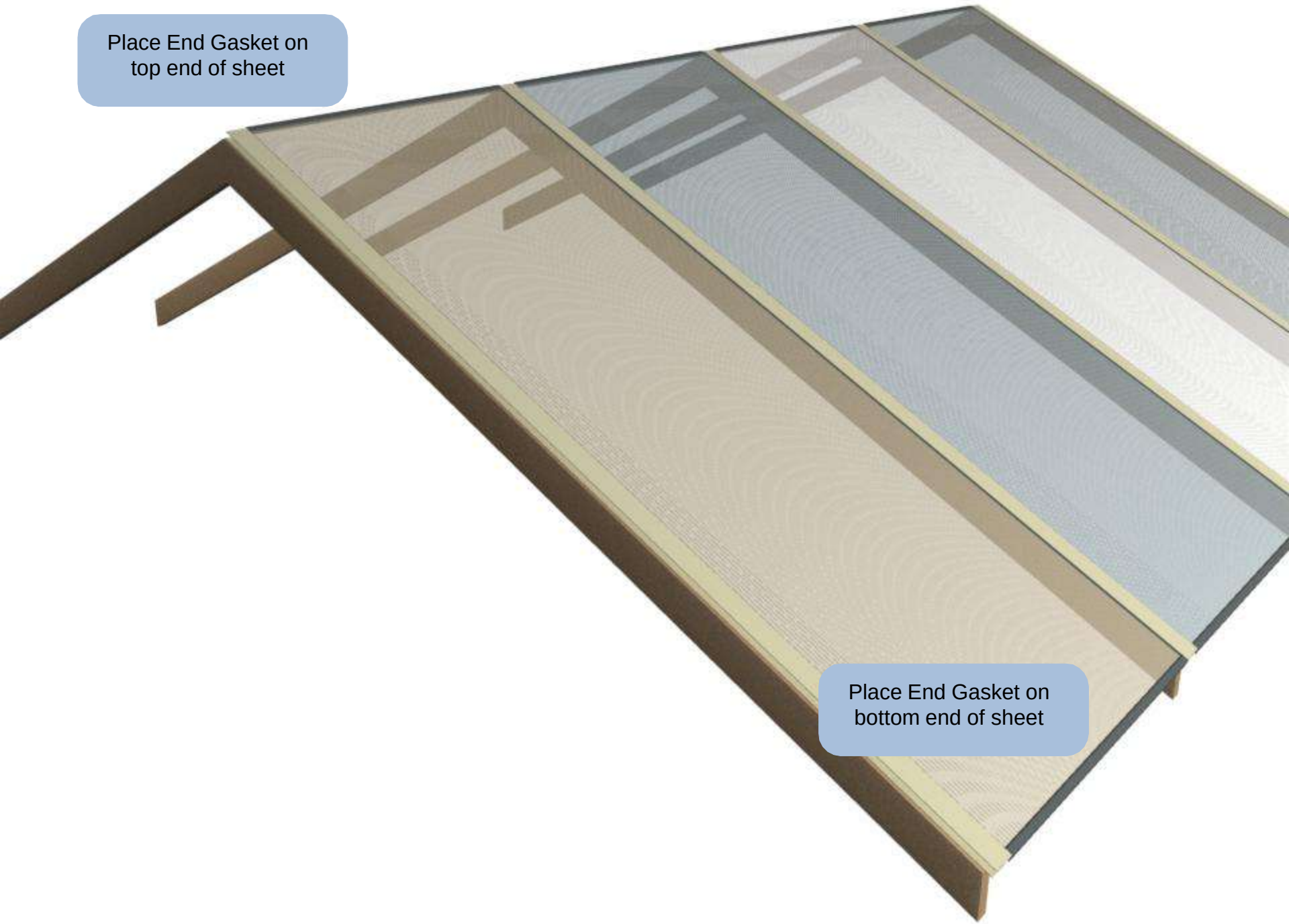

Push sheet into One piece H bar

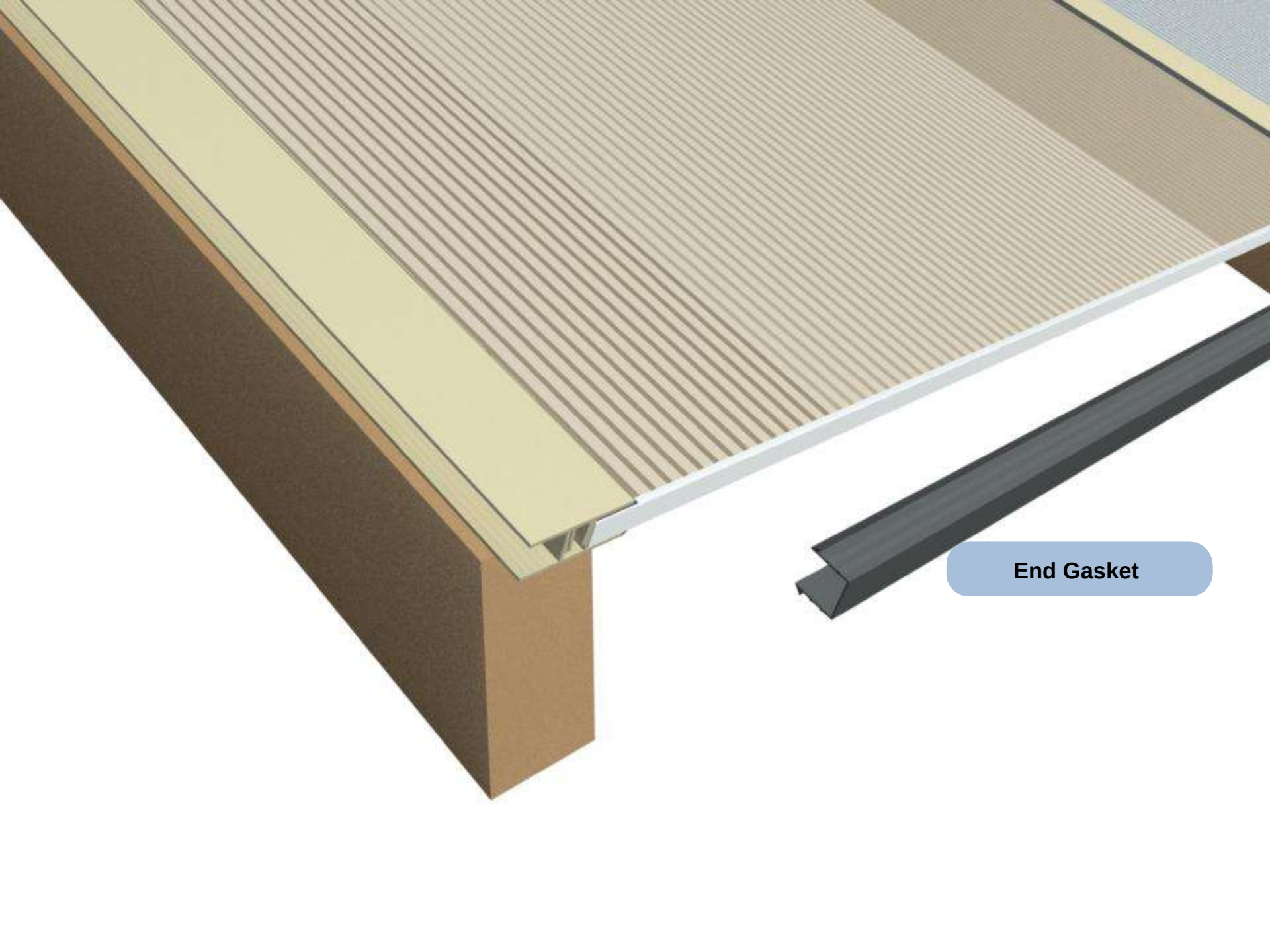

Push 1 piece H Bar onto both sides of the Sheet and fix 1 piece bar to rafter .


Repeat process to
install remaining sheets

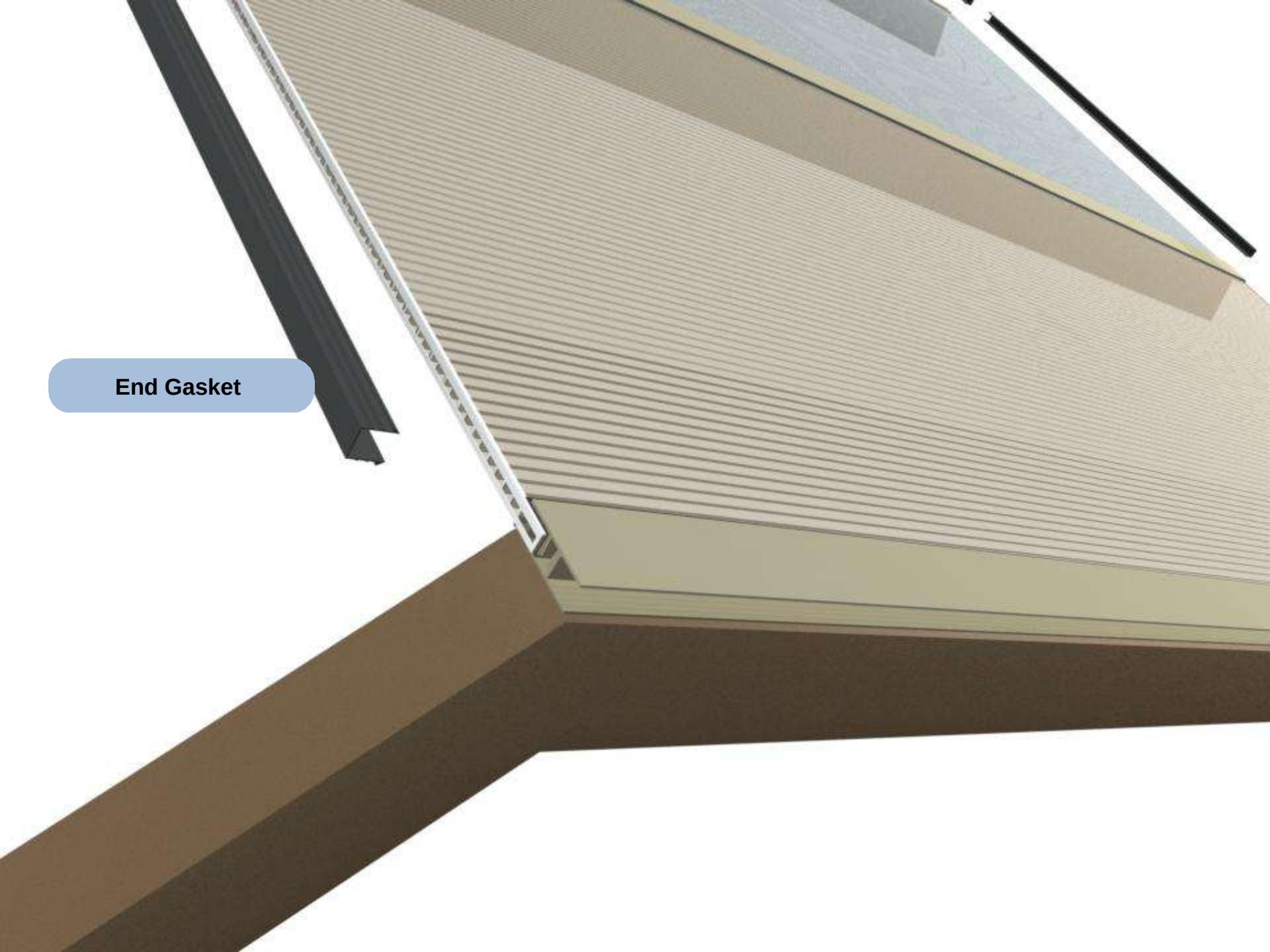

Remove masking
makrolon® Multiwall
Extensive colour range
Bronze Tint
Clear
Grey Tint
Opal
Platinum
Available in 700mm, 980mm or 1050mm width,
and in 8mm or 10mm thickness

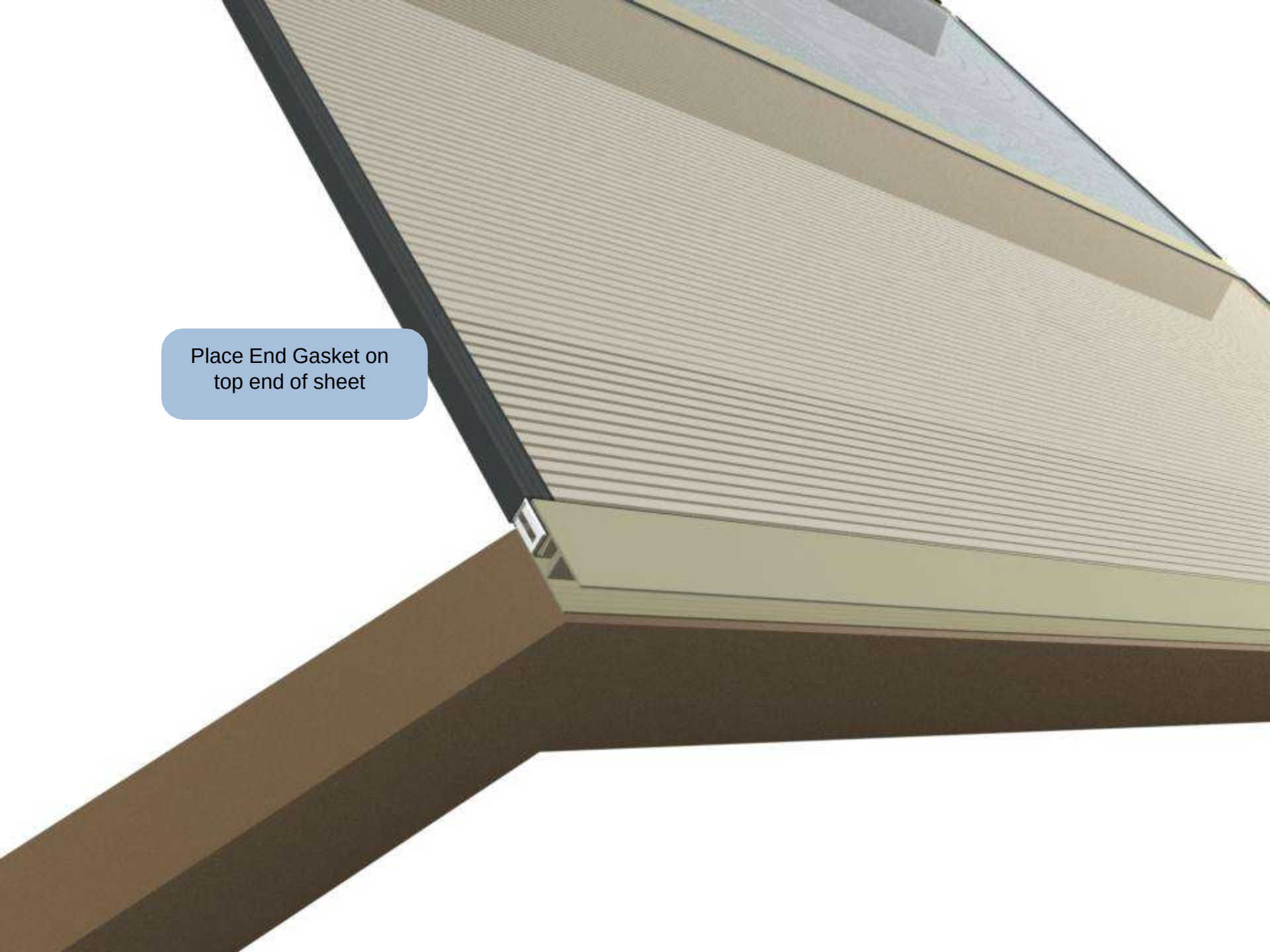

End Gasket
End Gasket


Place End Gasket on top end of sheet
Place End Gasket on bottom end of sheet


End Gasket

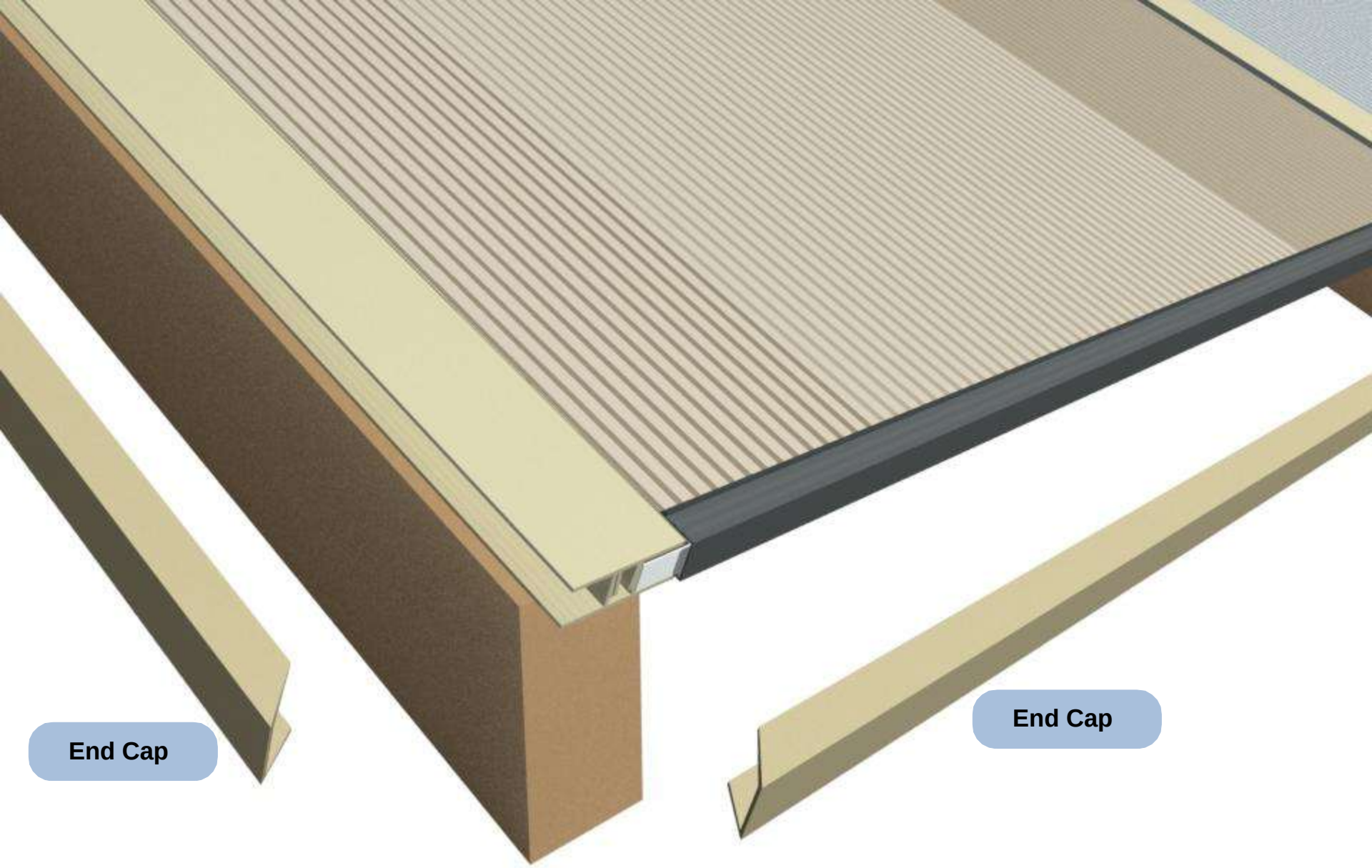

Place End Gasket on
bottom end of sheet

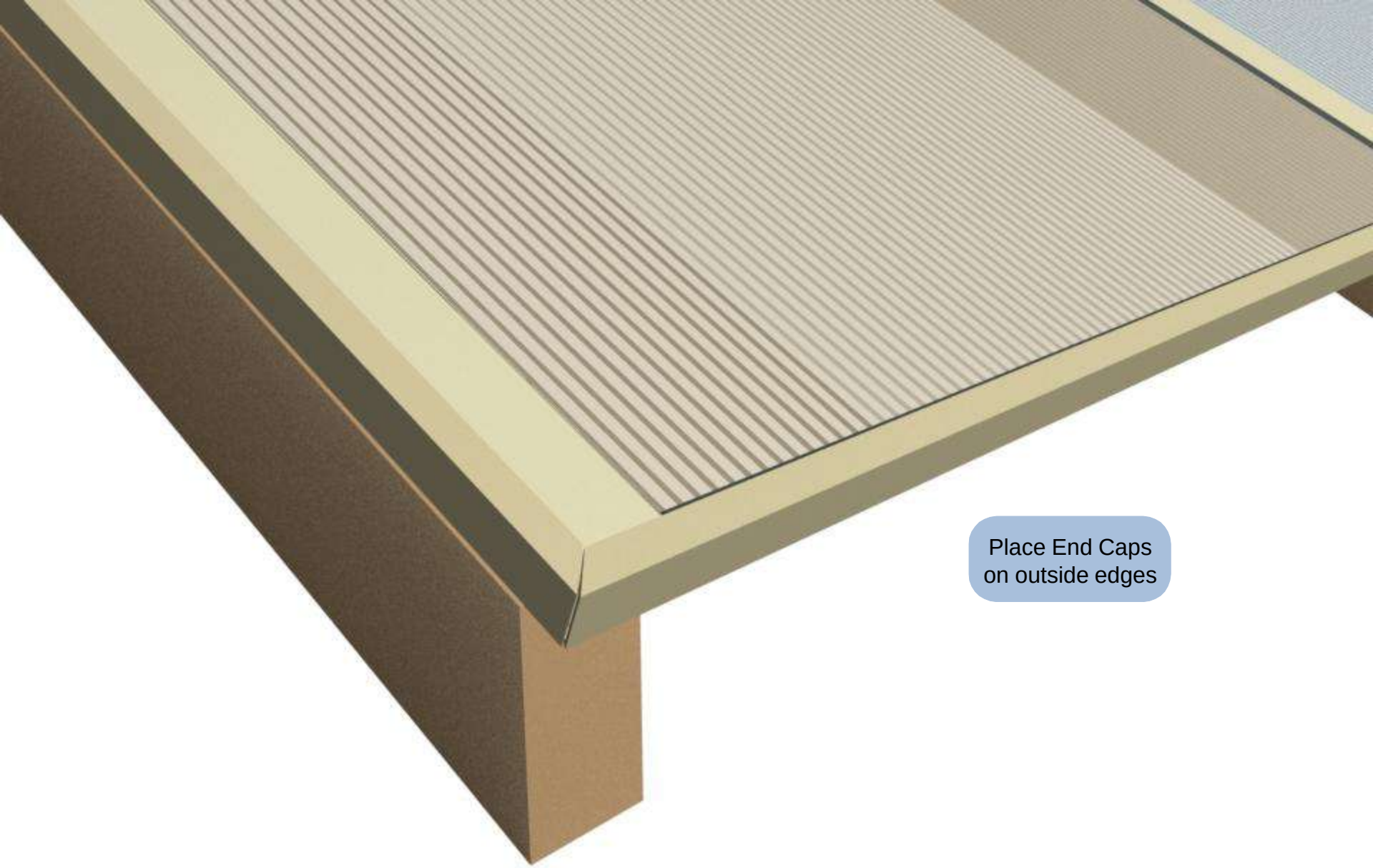

End Gasket


Place End Gasket on
top end of sheet


End Cap
End Cap
End Cap
End Cap


Place End Caps
on outside edges


End Cap
End Cap


Place End Caps
on outside edges


Drill a small drainage hole on underside of End Cap where it intersects with the H-Bar

Fixings

Fixings

Insert into End Cap


Repeat process on
other side of apex


Ridge Cap
Place on apex of roof

Fixings

Insert Fixings

Disclaimer:

This presentation is a general guide only. Before installing, please refer to the Makrolon® Multiwall brochure for full installation instructions.

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