

Pioneer

DECKING INSTALLATION GUIDE

VERSION B2.0 | 18/03/2024



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Introduction

Thank you for choosing an Eva-Last decking product. This guide aims to provide the essential information needed to successfully install a Pioneer deck. It is assumed, however, that the user of this document has a basic understanding of deck building practices and pertinent building codes. Compliance with the requirements captured herein must be met for full warranty coverage. The information provided herein is indicative, however, and all applications should also be assessed and/or designed by a competent professional

Pioneer products are made from a foamed mineral-polymer composite core, with an innovative photorealistic print technology which creates the most natural looking composite finish available in the Eva-Last range. See the list of profiles and corresponding fasteners captured in **Appendix A**.

1. Critical installation points

This summary of critical installation points in no way replaces the full Pioneer Installation Guide which is available for download on www.eva-last.com. It is recommended that you download and familiarise yourself with the full installation guide.

Substructure:

- Plan your substructure to align with the intended deck layout and ensure support of the boards along all cut edges.
- Use double joists at all butts joins so that both board edges are fully supported.
- Use noggins between joists where breaker boards are used. The spans between noggins must not be greater than the maximum centre-to-centre span of the applicable deck board profile.
- Ensure the substructure members are appropriately sized for the requisite spans.
- Ensure the installation thereof is sound and level. Ensure suitable connections are utilised between members and between the substructure and the applicable substrate. Consult an appropriately qualified professional wherever necessary.
- Use appropriate spans. This will depend on regional legislative requirements. Most regions require the satisfaction of both ultimate and serviceability conditions.
- Spans may need to be adjusted for stair spans (See section 4.2 of the full Installation Guide), snow loads (See section 4.3 for more information), or diagonal board laying patterns (See section 4.4).

See Section 4.1 for more information.

The table below summarises typical achievable spans (excluding stair applications and/or snow loads, please refer to the appropriate section for more information regarding these scenarios) of various profiles for the conditions outlined above and in Section 4.1. The profile’s moment of inertia and elastic section modulus is also captured for convenience. Profile availability may differ per region, please refer to www.eva-last.com or contact your local distributor for more information. For additional information please refer to the Pioneer Technical Data Sheet (TDS).

Profile details			Maximum span (Metric – mm)						
Profile code	Moment of inertia, Ix (mm ⁴)	Elastic sectional modulus, Sx (mm ³)	US approach		Eurocode (and similar) approach				EN 15334
					Residential (2 kPa)		Commercial (4 kPa)		
			Ultimate	Serviceability	Ultimate	Serviceability	Ultimate	Serviceability	
STFM101A 145 x 21.0	101 499 (0.24)	9 936 (0.61)							
STFM102A 141 x 24.8	171 787 (0.41)	13 878 (0.85)							
STFM103A 141 x 24.6	159 826 (0.38)	13 293 (0.81)		550 22.5		550 22.5		550 22.5	400 16
STFM104A 145 x 21.0	106 038 (0.35)	10 212 (0.84)							

STFM105A 190 x 21.0	145 270 (0.26)	13 813 (0.62)	500 20	500 20	500 20	350 13.75
STFM107A 190 x 21.0	145 570 (0.35)	13 853 (0.85)				

- Please note that the information is based on limited test data at present. Available test data for STFM101A and STFM105A have been used to infer the results of similar profiles.

Note::

- The full end-use adjustment factor was used.
- The duration of load and creep was not included in the analyses.
- The calculation for spans is based on the lesser of a factor of safety of 2.5 for the average test results and 2.1 for the minimum test results.
- Serviceability span assessment is based on a deflection limit of $L/180$ and often dictates.
- A conservative gap of 5 mm between boards was assumed.

Fastening:

- Chain Collated Clips must be used when installing Pioneer. The manufacturer cannot guarantee a successful install using other clips which could then affect the product warranty.
- Use two fasteners (hidden clips or top fixings) at every joist.
- Do not over-tighten any fasteners. The torque setting of your driver must be less than 30% of the maximum allowable.
- When top fixing boards (decking and fascia), ensure a spacing of 30 mm (1.182") between fasteners and from any board edge.
 - It is advisable to use the appropriate Starborn plug system or a countersinking bit. The countersunk head must drill a hole slightly smaller than the screw head diameter. For Hulk composite deck screws (metal or timber substrates), the countersunk cavity should be ± 6.5 mm (0.25") in diameter and 1 mm (0.04") deep. The screw cavity through the board should be based on a 2.8 mm (0.11") diameter drill bit. Test the bit on an offcut to ensure it is at the correct size and depth before use. If the bit is adjustable, periodically check that it has not shifted.
- Maintain a hidden clip fastening distance of between 10 mm (0.38") (minimum) and 20 mm (0.79") (maximum) from the end of the board.
- To ensure individual fasteners are not overloaded, it is important to have an adequate distribution of fasteners. Individual clip screws and Chain collated clips have been tested to withstand withdrawal forces of up to 3.8 kN (854 lbf) per unit. The Chain collated clip is expected to match or exceed this performance when using a 6.0 mm board gap. To meet a minimum of 7.2 kPa (150 psf), ensure that the board application allows for at least six clips span and width will allow for at least six clips per square meter (per 10.7 ft²). If the withdrawal resistance is insufficient for the intended application, consider reducing the deck board span, using alternative substructure or opting for top-fixing screws instead or in addition to hidden fasteners. For further details, please refer to Section 3.3 of the full Installation Guide and/or the relevant appendix in the Pioneer TDS. The following table provides a quick overview of the number of clips needed per square meter based on the width of the board and the span rating of different boards:

Ripping and Cutting:

- Do not rip solid groove boards narrower than 60 mm (2.113") or square edged boards narrower than 90 mm (3.554").

Trim or Fascia:

- Always install your trim or fascia beneath the lip of the boarder board.

Expansion:

- Pioneer can expand and contract up to similar rates experienced with typical wood-plastic composite materials.
- To allow for an appropriate expansion gap per board, multiply the length of the board (L) by 0.04 (0.000022) and by the difference between the installation temperature and the possible maximum temperature of the boards (Change in Temp.):

Change in board length = $L \times 0.04 \times \text{Change in Temp.}$

Example: Change in board length = $5.45\text{m} \times 0.04 \times (36 - 18) \parallel (18' \times 0.000022 \times (96.8 - 64.4))$

Change in board length = 3.924mm \parallel (0.155")

Expansion gap = $3.924\text{mm} / 2 \parallel (0.270" / 2)$

Expansion gap = 1.962 mm (0.078") (either end of the board)

Please refer to the Section 3.5.1 for more information on this topic.

- Use the same method to estimate maximum gap size (when boards are fully contracted) to ensure this is suitable for the project.
- Where the expected temperature range is high consider using lighter coloured deck boards to reduce the required expansion gap.
- To further reduce the expansion gap, boards can be cut to shorter lengths.
- Breaker boards must be used between boards that are installed end-to-end to assist in controlling expansion and contraction.
- Use boarder boards around the perimeter of an installation to further assist in controlling expansion and contraction.

Excessive and unusual heat sources

- Eva-Last products are designed for typical exterior installations but are not covered under warranty for damage caused by excessive heat, including as a result of concentrated sunlight reflected from Low-E glass or other reflective surfaces, which can damage the product's surface, cause immoderate movement, and affect its flexural properties both in the short and long term. If the intended site could result in such exposure, consult the Low-E glass manufacturer for solutions to reduce the reflection/concentration from such surfaces and resultant impacts before installation. Consider using screens, glass treatments/layers, or obstructions, such as vegetation, to block/diffuse sunlight (before and/or after reflection) to help mitigate impact of such scenarios.

2. Pre-installation

2.1 Standards

Legislation may differ between jurisdictions. Before installing any Eva-Last product, ensure that the application is rational and complies with the local regulations and building codes. Wherever necessary, consult a suitably qualified professional. Be sure to comply with material manufacturer specifications. Where manufacturer's specifications and building codes differ, revert to the building code requirements. Check that your choice of product is suitable for its intended application. For further product specification and information visit www.eva-last.com.

2.2 Safety

Refer to the applicable Material Safety Data Sheet (MSDS) for additional information. Please do not hesitate to contact Eva-Last should you require any additional assistance.

Please see **Appendix D** for a Safe Work Procedures (SWP) when working with Pioneer and other glass fibre-reinforced products.

Always wear appropriate Personal Protective Equipment (PPE) for the various activities involved in installing a decking system. This includes, but is not limited to, equipment such as safety glasses, helmets (where necessary), gloves, and boots, masks when cutting or similar, and harness systems when working at heights or similar, as dictated by the local occupational health and safety legislation.

Be mindful of the following:

- Ensure to comply with the local occupational health and safety legislation.
- Cutting (and similar processing activities) of Eclipse can produce fine particulate matter that contains glass fibres and wood dust, as a result, ensure to:
 - Work in well-ventilated areas.
 - Use tools with vacuum attachments.
 - Avoid contact where possible with dust that contains glass fibres as the material may cause skin and eye irritation.
 - Wear safety goggles that provide an adequate seal around the eyes when disposing and processing the material, particularly during cutting.
 - Wear gloves, long sleeved shirts, long trousers, and/or overalls during disposal and processing of the material, particularly during cutting. Where possible or necessary, seal shirt and trouser cuffs.
 - Wear suitable masks when disposing and processing the material, particularly during cutting. Use masks with adequate seals around the nose and mouth. Use mask with respirators and appropriate filters, especially if regularly exposed to dust of this nature.
 - After exposure to dust of this nature, wash with soap and running water. In addition, wash any equipment and clothing separately.
 - Do not rub affected areas that feel irritated. Instead, wash these areas with soap and running water. Contact an appropriate medical professional for further advice and/or when experiencing any symptoms related to exposure.
 - Clean workspace thoroughly. Wet-wipe, mop, or vacuum surfaces. Do not dry sweep as this can disperse the dust. Use of drop sheets may assist.
 - Do not eat, drink, or smoke when using this product. Always wash hands after handling the product.
 - Store and dispose of off-cuts, dust, and/or contaminated materials appropriately.
- Cut boards may have sharp edges (particularly mitered cuts).
- Inform any parties necessary of the above when handling and installing this material, in the vicinity where this is required, or as users of the installed product.

2.3 Storage and handling

Note the following:

- Individual boards are lighter than typical wood-plastic composites (WPC) and can be more easily handled. Boards are, however, bundled for convenience which can be heavy. Take care when lifting, placing on to, or removing from raised pallets. More than one person may be required for lifting depending on the length of the boards and the number of boards. Ensure the mass handled does not exceed safe limits as defined by applicable local legislation.
- When handling lengths of boards greater than 4 m (13 ft), ensure both ends are lifted simultaneously and evenly. Hold the boards 1 m (3 ft) from each end to provide better control.
- Handle the boards carefully. Dropping the boards (and all high impact loads in general) can result in damage to the profiles.
- During transportation use corner protectors where strapping is required.
- All components should be stored completely under cover.
- When storing boards, a pallet or flat surface should be used to support the full length of each component.
- All components should be securely stored.
- No component should sit in water or similar.
- Avoid over-stacking and/or eccentric stacking.
- Keep boards strapped until they are needed for installation.
- Avoid cutting boards until they are needed for installation.

2.4 Planning and site preparation

- Consult an appropriately qualified professional whenever necessary to ensure the product, this document, and the intended application comply with all applicable legislation for that region.
- Assess the environment of the site and ensure the product is suitable for the intended application.
- Identify aspects such as the corrosion category, loading class, etc. of the site and project that may influence the selection of the products or the application thereof.
- Determine appropriate spans for the selected material technology and profile. This will depend on the application as well as the loading class as defined by the local legislation. Suggested spans are provided for typical residential scenarios (refer to Section 4).
- Develop a maintenance plan to ensure the longevity of the system. This should consider aspects such as drainage, corrosion, vegetation growth, cleaning, etc.
 - With respect to drainage, ensure pooling water and/or erosion below and around the deck footprint is prevented.
 - With respect to corrosion, ensure any exposed metals are coated whilst accessible. In areas of high corrosion classes, add additional coating layers and regularly check for signs of corrosion.
 - With respect to vegetation below the deck footprint, ensure all vegetation has been removed prior to installing the deck. Install a suitable geotextile or plastic membrane to prevent further regrowth. Ensure the geotextile/membrane is fixed in place and protected from weathering.
- Decking at certain heights will require railing. Refer to the local legislation or consult a suitably qualified professional for guidance as to the required height and the other railing requirements thereof.

3. Cutting and fastening

IMPORTANT: As detailed in Section 2.2, processing of Pioneer can produce fine particulate matter that contains glass fibres. Implement appropriate occupational health and safety guidelines and/or work procedures.

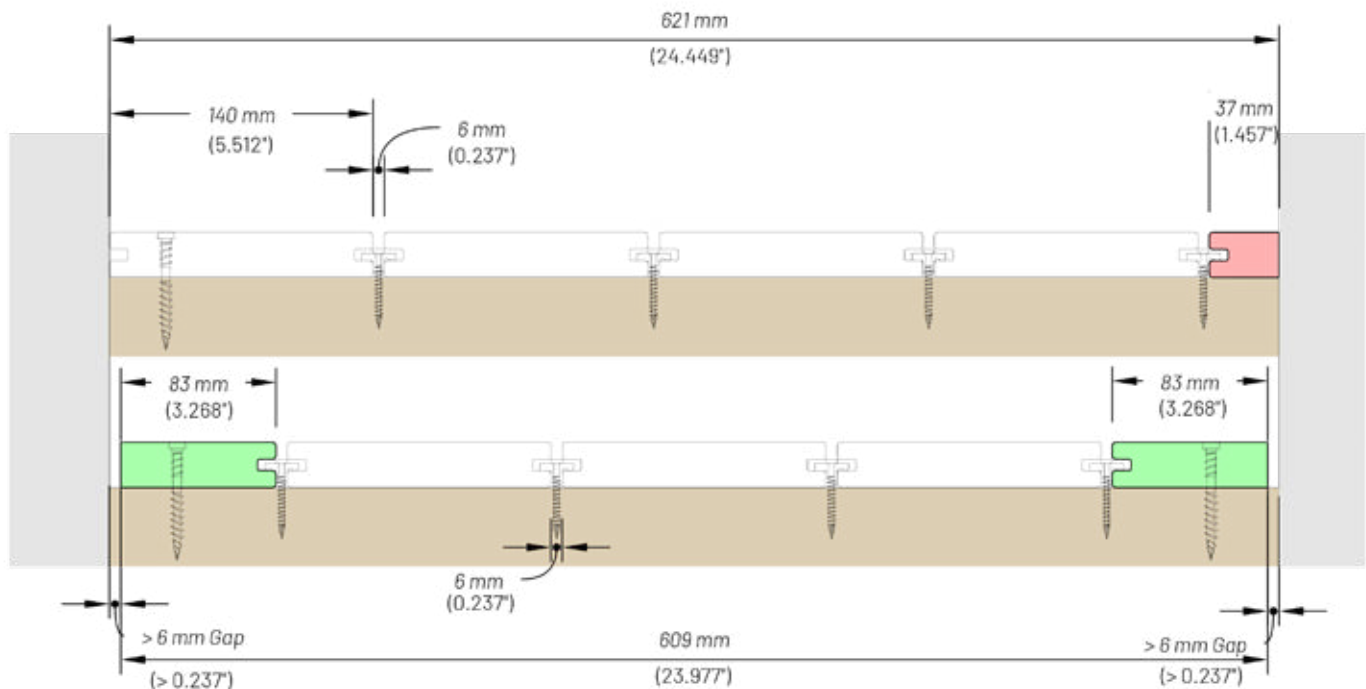
3.1 Cross cutting

- Please ensure that the appropriate PPE and safety precautions are adhered to whilst cutting glass-fibre reinforced materials.
- Use a fine toothed, carbide tipped blade to cut Pioneer material.
- Use an 80-tooth or finer, 260 mm (10") diameter, cross-cut blade.
- Avoid using blunt blades, which may cause cap separation.
- Use slow speeds when cutting through the pioneer cap.
- Ensure the saw blade engages with the cap of the board in a downward rotating direction rather than in an interaction that would result in the cap being pushed away from the core.
- Pioneer boards are provided as factory cut. Ends should be trimmed to carpentry cut.
- Boards can be mitred; angles less than 30° are to be avoided.
- Do not router Pioneer boards.
- Avoid cutting boards until they are needed for installation.
- Cut edges may expose loose strands of glass fibre that can be removed and disposed of with a sharp blade in accordance with Section 2.2. Health and safety guidelines.

3.2 Ripping

- For best results when ripping composite boards use a table saw or ripping jig.
- Cutting boards will expose the foamed core of the board. Plan the board layout/install appropriately to limit the visibility of these edges so as not to negatively impact the aesthetics of the install.
- Do not rip boards thinner than 60 mm (2.113") for grooved boards or 90 mm (3.544") for square edged boards.
- In the case where it would be necessary to cut a board to less than 60 mm (2.113") wide, rip both the first and last board of the deck footprint to balance the required widths instead. Refer to below infographic for guidance.

The following illustration outlines typical installation principles for ripping a deck board, which can be used for boards of any size. By following the above principles, you can ensure a successful installation.



3.3 Fixing frequency

Wider profiles and larger spans increase the load per fixing. It is important to use enough fasteners to meet the individual load requirements per fixing. In cases where this does not occur, it is necessary to reduce the board span, upgrade the substructure or add/switch to top-fixing screws instead of hidden fasteners. Please refer to the relevant appendix in the Pioneer TDS.

The following table provides a summary of withdrawal results for the different screws, and t for reference

Screw	Material	Withdrawal resistance (kN)	Minimum number of clips per m ² (10.7 ft ²) to match US Approach	Structure and notes
Metal deck screw	C1022	3.3	7	2.0 mm (14 ga) Gauge steel
Composite deck screw	SS316	5.7	4	Pine with Specific gravity of 0.46
Metal clip screw and Chain collated deck clip	C1022	3.8	6	2.0 mm (14 ga) Gauge steel
Timber clip screw and Chain collated deck clip	SS316	3.8	6	Pine with Specific gravity of 0.46
Chain collated deck clip	SS304	3.4 to 5.0	6	Normal performance at 6.0 mm groove Worst case at 8.9mm groove

The following table provides a quick overview of the number clips required per square meter based on the profile width and span for distributed loads of 4.79 kPa or 100 psf and the applicable

Boards	Width mm (in)	Largest possible span rating based on USA requirements mm (in)	Clips/m ² (Clips/10.7ft ²) *	Load capacity of Chain collated clips per m ² (10.7 ft ²). kPa (psf)**	Requirement per US Approach with Safety factor of 3.0 kPa (psf)**
STFM101A	145 (5.7)	559 (22)	7	26.6 (555)	21.6 (450)
STFM102A	141 (5.5)				
STFM103A	141 (5.5)				
STFM104A	145 (5.5)				
STFM105A	190 (7.5)	500 (20)	6	22.8 (476)	
STFM107A	190 (7.5)				

* Calculated as the lowest integer of clips per m² for the applicable board width at the allowable span.

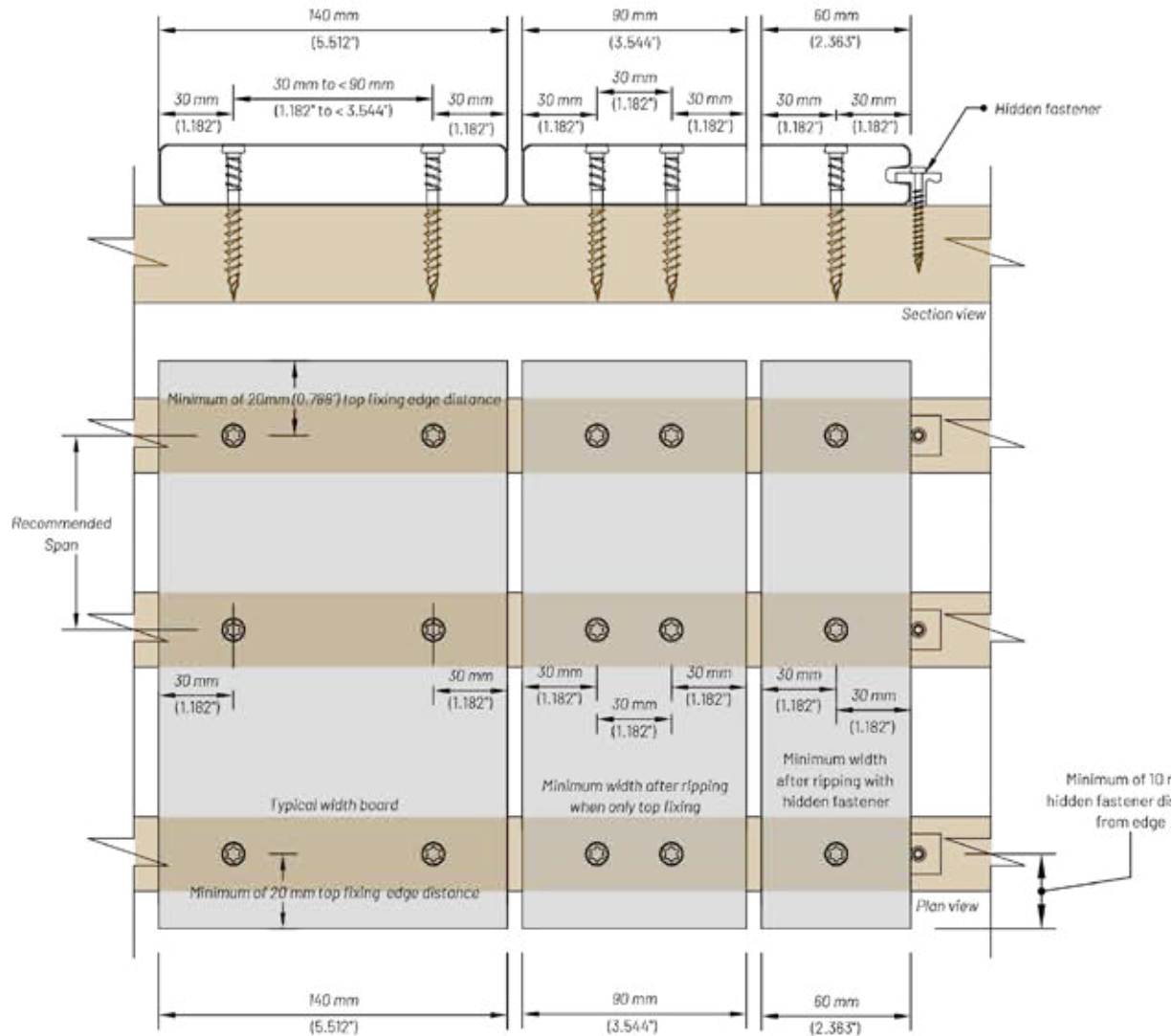
**These values are based on extrapolations of test results of the individual fixings the in the respective substrates from the previous table.

Hulk top-fixing screws typically offer relatively higher withdrawal resistance as there are two fixings per board per joist. As a result, this data is not included here. If required, please refer to the relevant TDS section.

3.4 Top fixing

- Fasten the boards 30 mm (1.18 ") from any edge of the board.
- The distance to adjacent screws should be at least 30 mm (1.18 ") .
- When top fixing boards (decking and fascia), ensure a spacing of 30 mm (1.182") between fasteners and from any board edge.
 - It is advisable to use the appropriate Starborn plug system or a countersinking bit. The countersunk head must drill a hole slightly smaller than the screw head diameter. For Hulk composite deck screws (metal or timber substrates), the countersunk cavity should be ± 6.5 mm (0.25 ") in diameter and 1 mm (0.04 ") deep. The screw cavity through the board should be based on a 2.8 mm (0.11 ") diameter drill bit. Test the bit on an offcut to ensure it is at the correct size and depth before use. If the bit is adjustable, periodically check that it has not shifted.
- Fasten at every joist and use a minimum of two fasteners per joist.
 - Pre-drill composite in temperatures below 5°C (41°F). Pre-drilling hole sizes should be equal to the minor diameter of the screw.
 - Use high quality fasteners suitable for the lifespan of the deck and the atmospheric conditions of the site. Consider the corrosion category of the site relative to the corrosion protection offered by the fastener. Consult with a suitably qualified professional where necessary. Feel free to also contact a member of Eva-Last for further assistance.
- A drill with adjustable torque settings is recommended. Set the torque settings to less than 30% of the maximum allowable torque of the driver. Do not overdrive the screw. Do not use an impact driver.

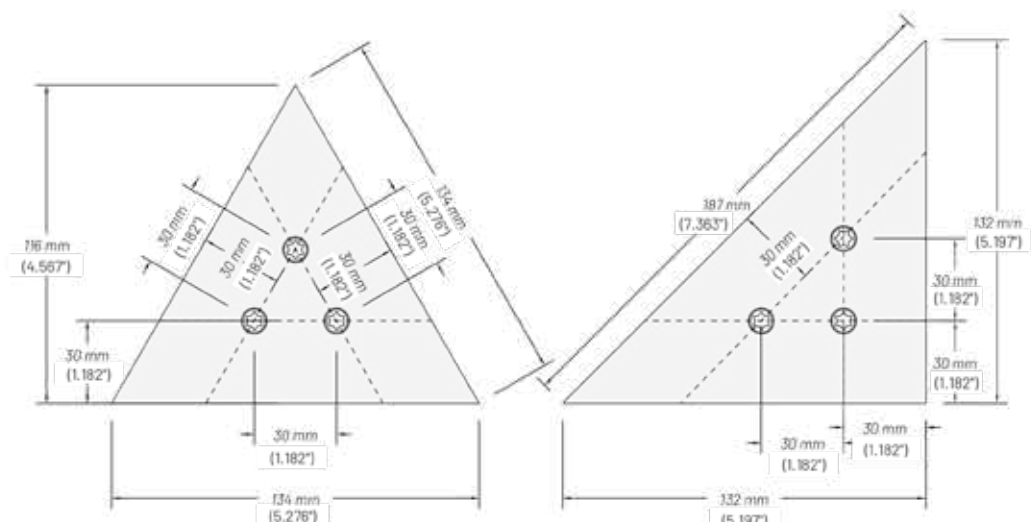
The following illustrations outline typical fastening principles for a top fixing application on the minimum ripped profile size as related to the recommended fastening edge distances, which can be implemented for profiles of any size.



3.4 Cutting and fastening triangular pieces

- Where deck boards are cut to odd shapes, additional fasteners may be required.
- All three edges of a triangular piece should be supported. All three corners of a triangular piece should be fastened.
- Spacing between fasteners should be at least 30 mm (1.182") apart and must maintain 30 mm (1.182") from any edge.
- Geometry of triangular pieces are limited by the fastening and edge distance. Below infographics provide an indication of minimum allowable sizes of different theoretical triangular pieces.

The following illustrations outline typical fastening principles for small triangular deck pieces, which can be used for profiles of any size.



3.5. Cutting length

Before boards are laid, the final cut length of a board must take into consideration the possible changes in length of the board due to thermal expansion and contraction. Appropriate expansion gaps must always be maintained between boards and/or between boards and other obstacles for full warranty coverage.

3.5.1 Fundamentals of expansion and contraction

- The expansion, and contraction, of a board is influenced by:
 - The material of the board,
 - The length of the board, and
 - The change in temperature the board experiences relative to the temperature of the board at installation.
- The linear coefficient of expansion for the Pioneer material technology is up to $33.4 \times 10^{-6} \text{ mm/m/}^{\circ}\text{C}$ ($0.000185 \text{ "/"}/^{\circ}\text{F}$). This means that a board of this material can expand, and contract, up to 0.04 millimetres per meter length ($0.000022 \text{ " inches per inch length}$), per degree change in temperature.
- To estimate an appropriate expansion gap (ΔL) per board, multiply the length of the board (L) by a coefficient of 0.04 (0.000022)(α) and by the maximum difference in temperature between the installation temperature and the possible temperature of the boards (ΔT): $\Delta L = L \times \alpha \times \Delta T$
- The temperature change of the board will be influenced by the colour of the board. Darker board colours will result in board temperatures higher than the ambient temperature of the site.
- A summary matrix of expansion gaps for different temperature and length conditions is captured in **Appendix C** for convenience.

3.5.2 Steps to determining expansion and contraction gaps

- Research the site temperature extremes.**
 - Find the record high and low temperatures for the site. Weather forecast websites usually provide historical data for specific areas, which helps indicate the most extreme temperatures the deck will experience.
- Account for sunlight exposure.**
 - Boards exposed to direct sunlight can often be 25 to 30°C (77 to 86°F) hotter than the air temperature.
 - Add a buffer. A good rule of thumb is to use the difference between the installation temperature and the maximum site temperature as:
- Temperature buffer = (Maximum site temperature – Ambient temperature)**
 - Adjust the buffer for excessive exposure to account for reflective surfaces or extreme UV conditions.
- Determine Change in temperature.**
 - Expansion gap temperature = Maximum site temperature – Ambient temperature + Buffer
 - Contraction gap temperature = Ambient temperature – Minimum site temperature
- Calculate the Expansion and contraction.**
 - Use a linear coefficient of expansion to estimate board movement. For Eclipse, this coefficient is $\pm 0.034 \text{ mm/m/}^{\circ}\text{C}$. The formula to calculate the

Required gap size = Length of the board in meters(inches) x $0.034 \text{ mm/m/}^{\circ}\text{C}$ or $(0.0185 \text{ in/in/}^{\circ}\text{F})$ x change in temperature

Alternatively use this table to find the expected gap size based on temperature change. Multiply the gap size per meter by the length of your board in meters to get the required gap size. Remember to add the buffer..

Gap size per meter of board per temperature change (gap size (mm) /m/°C) *												
Temperature change (°C)	5	10	15	20	25	30	35	40	45	50	55	60
Gap size per meter (mm)	0.2	0.4	0.5	0.7	0.9	1.0	1.2	1.4	1.5	1.7	1.9	2.0
Temperature change (°F)	41	50	59	68	77	86	95	104	113	122	131	140
Gap size per foot (in)*	1.002	0.004	0.006	0.008	0.01	0.012	0.014	0.016	0.018	0.020	0.022	0.024

*When using the table to determine imperial units add 32° to F to adjust the temperature scale.

3.5.4 Example for Bloemfontein South Africa

- **Board Length:** 5 meters or 16.4 feet
- **Ambient installation temperature at time of installation:** 22°C (71.6°F)
- **Maximum temperature:** 58°C (40°C Record high + (40-22))°C buffer) or 136°F (118.4°F + (118.4-71.6))°F buffer)
- **Minimum temperature:** 14 °F (As it is unlikely the deck will be used below freezing temperatures and the aesthetic impact of the gaps will be minimal the lower temperature can be adjusted to 0°C. (32°F))

Temperature change example

- Max temperature change: 58°C - 22°C = 36°C
- Min temperature change: 22°C - (0°C) = 22°C

Calculation example using the expansion formula

- Total required gap size: 5m x 0.034 x 36°C = 6.12mm
- Potential gap increase: 5m x 0.034 x 22°C = 3.74mm
- Max potential gap possible: 6.12 + 3.74 = 9.86mm

Temperature change example for direct conversion (IMPERIAL)

- Max temperature change: 136°F - 71.6°F = 64.4°C
- Min temperature change: 71.6°C - 32°F = 39.6°C

Calculation example using the expansion formula (IMPERIAL)

- Total required gap size: 196.85" x 0.000185 x 64.4°F = 0.24"
- Potential gap increase: 196.85" x 0.000185 x 39.6°F = 0.14"
- Max potential gap possible: 0.24 + 0.14 = 0.39"

Calculation example from table

Max temperature change: 36°C - 40°C (round up)

- Max temperature change: 1.4mm (from table)
- Min temperature change: 1.4mm/m x 5m = 7mm

Min temperature change: 22°C - (0°C) = 22°C - 25°C

- length change per meter: 0.9mm (from table)
- Min temperature change: 0.9mm/m x 5m = 4.5mm

Max potential gap possible: 7 + 4.5 = 11.5mm

Calculation example from table (IMPERIAL)

Max temperature change: 96.8°F - 104°F (round up)

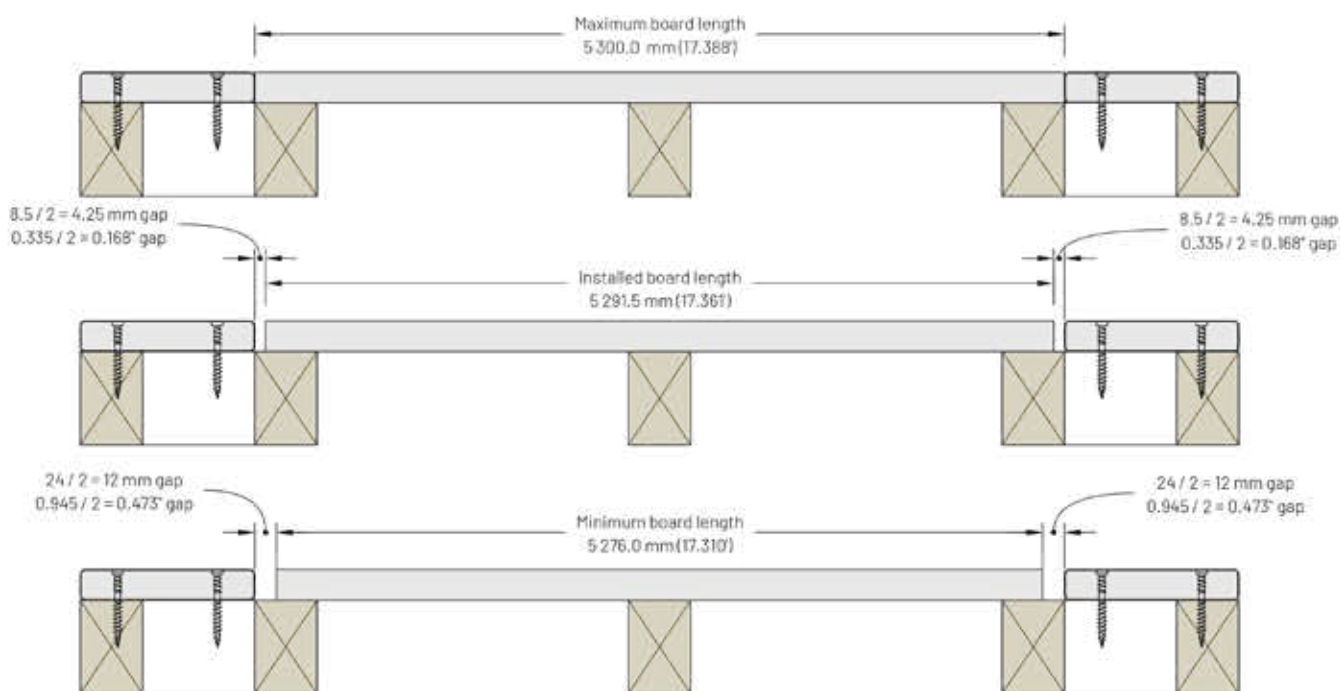
- Max temperature change: 0.016" (from table)
- Min temperature change: 0.016" x 16.4ft = 0.26 inch

Min temperature change: 71.6°F - 77°F (round up)

- length change per meter: 0.01" (from table)
- Min temperature change: 0.01 in/ft x 16.4 ft = 0.163"

Max potential gap possible: 0.263 + 0.164 = 0.424"

*When using the table add 32° to F to adjust the temperature scale.



3.5.5 Implementing expansion gaps on site.

- Allow boards to acclimatise on site before installation to ensure uniform expansion.
- If the calculated maximum potential gap is gap sizes are larger than desired, the boards can be cut to shorter lengths to reduce the expansion gap. You may need to adjust the structural layout, accordingly, as detailed in section 4.0.

- Use boarders and breaker boards to create line breaks between boards, allowing them to be cut to the same length. This approach ensures that the expansion of acclimatized boards is more uniform and manageable than in a staggered pattern of different lengths.
 - If the boards are laid in an accessible straight line, the board edges can be cut after laying, though this is considered an advanced technique, and care must be taken not to damage the structure.
- When cutting the boards to length, remember to account for the final length needed to allow for expansion gaps based on the temperature at time of installation.
- When laying the boards, leave the expansion gap between the boards as calculated. You may need to adjust the gap size if the temperatures vary over the course of the installation.
 - Shims and spacers matching the required gap size can be used to automatically create the gaps.
 - Remember to leave a gap between the building and the deck

4. Planning and installation

4.1 Substructure

- Plan your substructure to align with the intended deck layout and ensure support of the boards along all cut edges.
- Use double joists at all butts joins so that both board edges are fully supported.
- Use noggins between joists where breaker boards are used. The spans between noggins must not be greater than the maximum centre-to-centre span of the applicable deck board profile.
- Ensure the substructure members are appropriately sized for the requisite spans. Ensure the installation thereof is sound and level. Ensure suitable connections are utilised between members and between the substructure and the applicable substrate. Consult an appropriately qualified professional wherever necessary.
- Use appropriate spans. This will depend on regional legislative requirements. Most regions require the satisfaction of both ultimate and serviceability conditions.
- Spans may need to be adjusted for stair spans (See section 4.2 below), snow loads (See section 4.3 below), or diagonal board laying patterns (See section 4.4).

The table below summarises typical achievable spans (excluding stair applications and/or snow loads, please refer to the appropriate section for more information regarding these scenarios) of various profiles for the conditions outlined above. The profile's moment of inertia and elastic section modulus is also captured for convenience. Profile availability may differ per region, please refer to www.eva-last.com or contact your local distributor for more information. For additional information please refer to the Pioneer Technical Data Sheet (TDS).

Maximum span* mm (in)									
Profile code	Moment of inertia, I _x (mm ⁴)	Elastic sectional modulus, S _x (mm ³)	US approach		Eurocode (and similar) approach				EN 15334
					Residential (2 kPa)		Commercial (4 kPa)		
			Ultimate	Serviceability	Ultimate	Serviceability	Ultimate	Serviceability	
STFM101A 145 x 21.0	101 499 (0.24)	9 936 (0.61)							
STFM102A 141 x 24.8	171 787 (0.41)	13 878 (0.85)							
STFM103A 141 x 24.6	159 826 (0.38)	13 293 (0.81)		550 22.5		550 22.5		550 22.5	400 16
STFM104A 145 x 21.0	106 038 (0.35)	10 212 (0.84)							
STFM105A 190 x 21.0	145 270 (0.26)	13 813 (0.62)							
STFM107A 190 x 21.0	145 570 (0.35)	13 853 (0.85)		500 20		500 20		500 20	350 13.75

*Please note that the information is based on limited test data at present. Available test data for STFM101A and STFM105A have been used to infer the results of similar profiles.

Note:

- The full end-use adjustment factor was used.
- The duration of load and creep was not included in the analyses.
- The calculation for spans is based on the lesser of a factor of safety of 2.5 for the average test results and 2.1 for the minimum test results.
- Serviceability span assessment is based on a deflection limit of $L/180$ and often dictates.
- A conservative gap of 5 mm between boards was assumed.

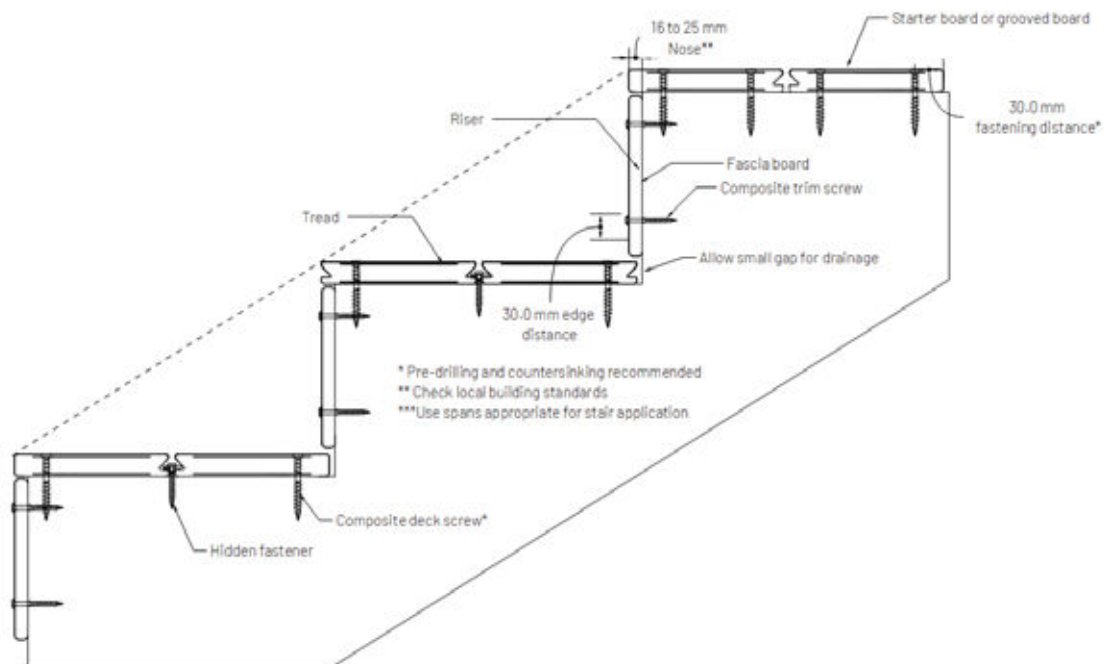
4.2 Stairs span requirements

The following profiles have been tested in accordance with CCRR requirements limiting deflection to 3.2mm (0.125 in) for a 1.3 kN (300 lbf) point load and appropriate factor of safety. Please see the Mechanical section of the applicable TDS for more information. Please also see Appendix B for further installation details.

Profile code	Maximum span for stair applications (mm)
STFM101A 145 x 21.0	305 mm
STFM104A 145 x 21.0	(12")

It is assumed that the remaining profiles, which all have better sectional properties than the tested profiles above, will satisfy the same stair spans.

The following illustration outlines typical principles for stair applications.



4.3 Snow load spanning capacity per ICC-ES AC174

The following snow load span calculations for deck boards are based on the ICC-ES AC174 Acceptance Criteria for Deck Board Span Ratings and Guardrail Systems (Guards and Handrails). These calculations utilise flexural test data obtained from internal and external testing sources. The analysis focuses on calculating the allowable spans for various snow load conditions, considering the specific material properties and configurations of each profile. Please refer to the relevant Technical Data Sheets (TDS) for specific profile and material properties and results. These calculations have not been reviewed by a third-party certified engineer and must be assessed by a competent professional before installation.

Profile details				Adjusted snow load span (mm (in))				
Profile Code	Board Width [mm (in)]	Board Height [mm (in)]	US Approach - Span [mm (in)]	4.78 kPa 100 PSF	9.6 kPa 200 PSF	14.4 kPa 300 PSF	19.2 kPa 400 PSF	23.9 kPa 500 PSF
STFM101A 145 x 21.0	145 (5.7)	21.0 (0.82)	559 (22)	559 (22)	406 (16)	355 (14)	305 (12)	305 (12)
STFM102A 141 x 24.8	141 (5.5)	24.8 (0.98)						
STFM103A 141 x 24.6	141 (5.5)	24.6 (0.96)						
STFM104A 145 x 21.0	145 (5.5)	21.0 (0.82)	508 (20)	508 (20)				
STFM105A 190 x 21.0	190 (7.5)	21.0 (0.82)						
STFM107A 190 x 21.0	190 (7.5)	21.0 (0.82)						

Note:

- The full end-use adjustment factor was used.
- The duration of load and creep was not included in the analyses.
- The calculation for spans is based on the lesser of a factor of safety of 2.5 for the average test results and 2.1 for the minimum test results.
- Serviceability span assessment is based on a deflection limit of L/180 and often dictates.
- A conservative gap of 5 mm between boards was assumed.

4.4 Span adjustments for Diagonal laying patterns

Where boards are not installed perpendicularly to joists, the joist spacing must be modified to ensure that the board spans do not exceed that specified for the applicable profile. This can be calculated as follows

- Adjusted Span = Original Span xcos(ø)
 - Where:
 - Adjusted Span refers to the new (reduced) perpendicular distance between the joists.
 - Original Span refers to the intended/unadjusted span of the actual deck board. This span is in principle maintained by adjusting the span.
 - øis the intended angle (in degrees) of the board direction relative to the joist layout. As the figure below indicates, it is specifically the angle from the previous(perpendicular) board position to the new intended board position.
- Example: Adjusted Span

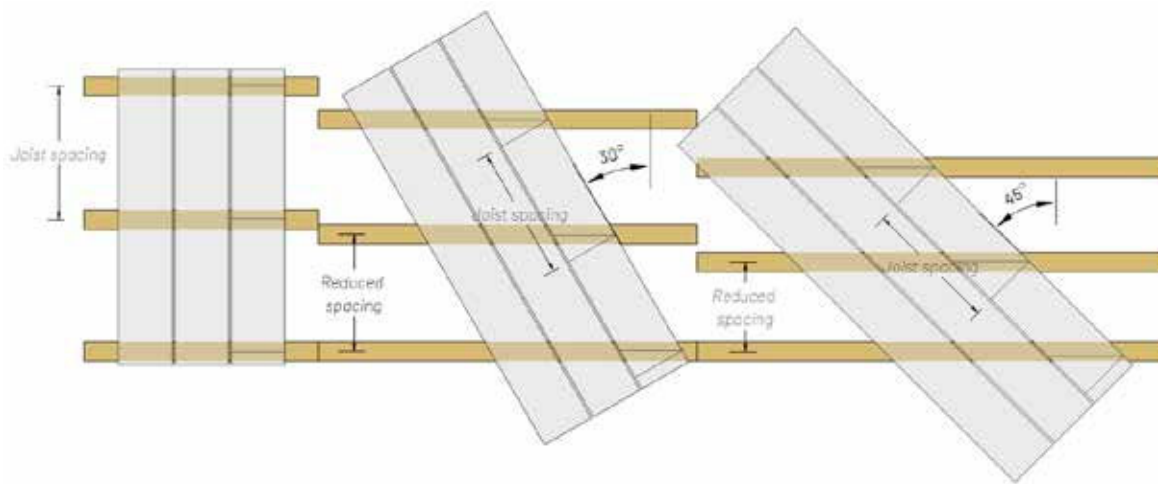
= 457 mm x cos 45° or 18" x cos 45°

= 318.2 mm or 12.7"

The below table provides a quick summary of typical spans at common angles:

Typical joist spacing millimetres (inches)	Reduced span at different board angles	
	30°	45°
550 mm (22 ")	485 mm (21.8 ")	395 mm (15.56 ")
500 mm (20")	439 mm (17.3 ")	359 mm (14.1 ")
450 mm (18 ")	396 mm (15.4 ")	323 mm (12.7 ")
400 mm (16 ")	351 mm (13.8 ")	287.4 mm (11.3 ")
300 mm (12 ")	264 mm (10.3 ")	215 mm (8.5 ")

The following illustration outlines the basic principles of adjusted spans in relation to the original joist span and example board angles.



A reminder to:

- Support boards along all cut edges.
- Use double joists at all butt joints so that both board edges are fully supported.
- Use noggins between joists where breaker boards are required. The spans between noggins must not be greater than the maximum centre-to-centre span of the applicable profile.
- Do not overhang boards by more than 20 mm (0.788") from a support edge.
- Allow for clearance between the ground and deck, and between the deck and other potential obstructions, such as doors opening out over the deck.
- Allow for drainage and water control. Consult a suitably qualified professional if required.
- Allow for railing where necessary. Consult a suitably qualified professional if required.

4.5 Decking planning and installation

Below are guidelines to consider during the planning and installation of decking:

- The layout of a deck is often dictated by existing geometrical constraints on site. Best practice involves optimisation between the standard dimensions and constraints of the deck boards supplied with the desired aesthetics of the layout.
- Attempt to keep layouts symmetrical. As a result, where it is necessary to rip boards, rip both the first and last board of the deck footprint equally to balance the required widths. Where possible, avoid ripping boards at all.
- An ideal expansion gap size at maximum contraction would be 6 mm (0.237") to match that of the typical gap between boards installed parallel to each other.
- Use breaker boards and boarder boards to provide an aesthetically pleasing finish whilst assisting in controlling expansion and contraction.

- Use multiple combinations of shorter boards with breaker boards to balance long runs against expansion and contraction limitations.
- Butt joints can be installed so they align or are staggered. Both options have advantages and limitations with respect to aesthetics and installation practicality.
- Consider the orientation of the boards relative to typical foot traffic direction as well as the site layout. Typical approaches are to install deck boards parallel with the longest dimension of the site layout. In areas where better slip resistance is required, most composite textures have better slip resistance with the boards orientated perpendicular to common foot traffic direction. In general, Pioneer deck boards have good slip resistance characteristics in all board orientations (please refer to the Pioneer TDS for further information). Additionally, consider the length of the available space in relation to the lengths and widths of the boards available. In some cases, certain orientations can be very efficient from a material perspective. Finally, consider existing obstructions and their straightness; it is easier to

Deck clearances and ventilation.

- To prevent damage to boards, substructure, and adjacent structure, ensure the following:
 - At least 50% ventilation/airflow in confined or low-clearance areas. Adequate drainage and surface water control beneath the deck.
 - The substructure is suitably durable for the application and has adequate drainage.
- A minimum 38 mm (1.5") deck clearance for suitable substrates. Consult local building codes for any specific deck clearance requirements related to the type of structure and durability classes.
- Ensure the deck setup and clearance accommodates access for maintenance and pest control.

4.6 Decking planning and installation

Below is a brief set of steps to assist with optimising a layout so that the site and environmental influences, client requirements, and material impacts are taken into consideration.

1. **Layout and environment:** Determine site layout/footprint and establish any critical environmental parameters that may influence the installation or performance of the installation. Particular aspects to consider include extreme temperature ranges, high corrosion classes, large catchment areas, steep slopes, etc.
2. **Optimisation:** Optimise deck layout relative to the site layout and the deck board dimensions. Incorporate allowances for the established critical environmental aspects in Step 1. Cater for additional factors that may influence the layout such as expansion and contraction, preferred aesthetics, foot traffic, existing obstructions, clearances, railing, etc. This step may take several iterations. Establish the primary board orientation first, then incorporate supporting elements, such as breaker boards, perimeter boards, etc., where necessary. Once finalised, the quantity of deck boards can be determined.
3. **Substructure, fasteners and ancillaries:** With a layout finalised, the substructure can be outlined based on the required supports and spans. Aspects such as supports for railing, pergolas, etc. must be allowed for at this stage. Once established, the deck board and substructure layout will allow the type and number of fasteners required to be calculated. Ancillary items, such as railing, pergola, etc., can then be quantified.

Below is an example that lays out the implementation of the steps suggested above. The same example deck discussed in **Section 3** is incorporated.



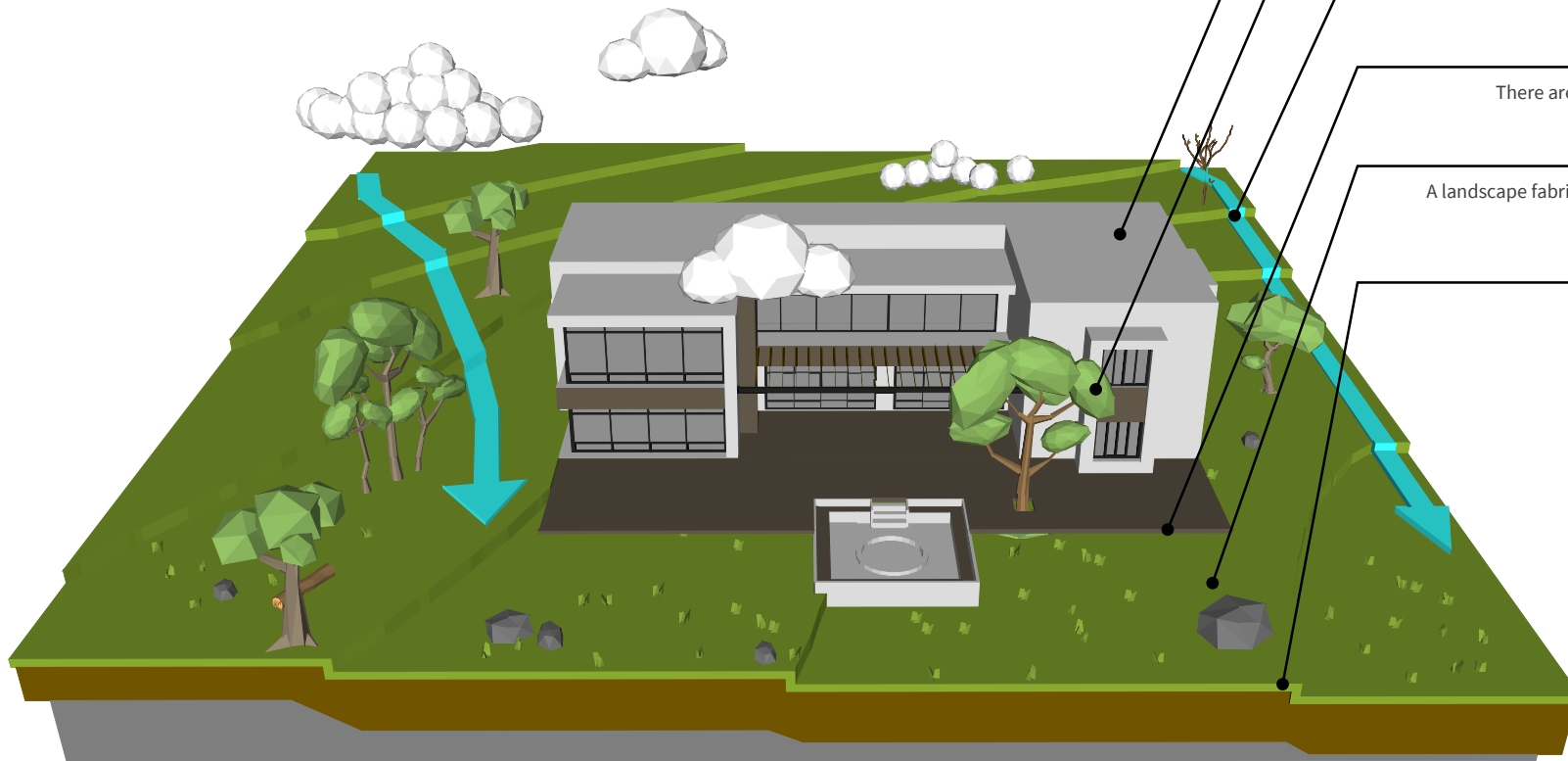
LOCATION AND MACRO ENVIRONMENTS

Bloemfontien is located on the southern edge of the South African highveld with record temperatures ranging between **40 °C and -10 °C**, while falling under a typical **C3 Class (moderate) atmospheric corrosion category** with low salinity and only moderate pollution.



SITE ASSESSMENT OF THE MICRO ENVIRONMENT

A site assessment provided more **specific details surrounding the building site and its environment**



PROPERTY TYPE

Residential

EXISTING FEATURES

An existing recessed Fire pit 450 mm drop .

HYDROLOGICAL

The deck requires no further intervention as water flows away from the deck to natural water catchment areas

UTILITIES

There are no utilities running across the footprint of the deck.

VEGETATION

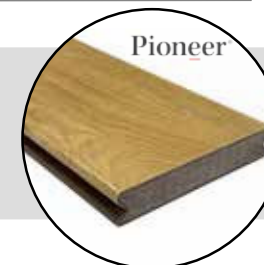
A landscape fabric or plastic sheet should be applied beneath the deck to prevent vegetative growth beneath the deck.

TOPOGRAPHICAL

The ground has 2° slope resulting in a 900 mm drop from the final required floor height.

CUSTOMER PREFERENCES

The client has specified **Pioneer decking** in the **Marula (Light brown)** colour, with the boards **running perpendicularly away from the building** .



Board

Pioneer grooved deck board

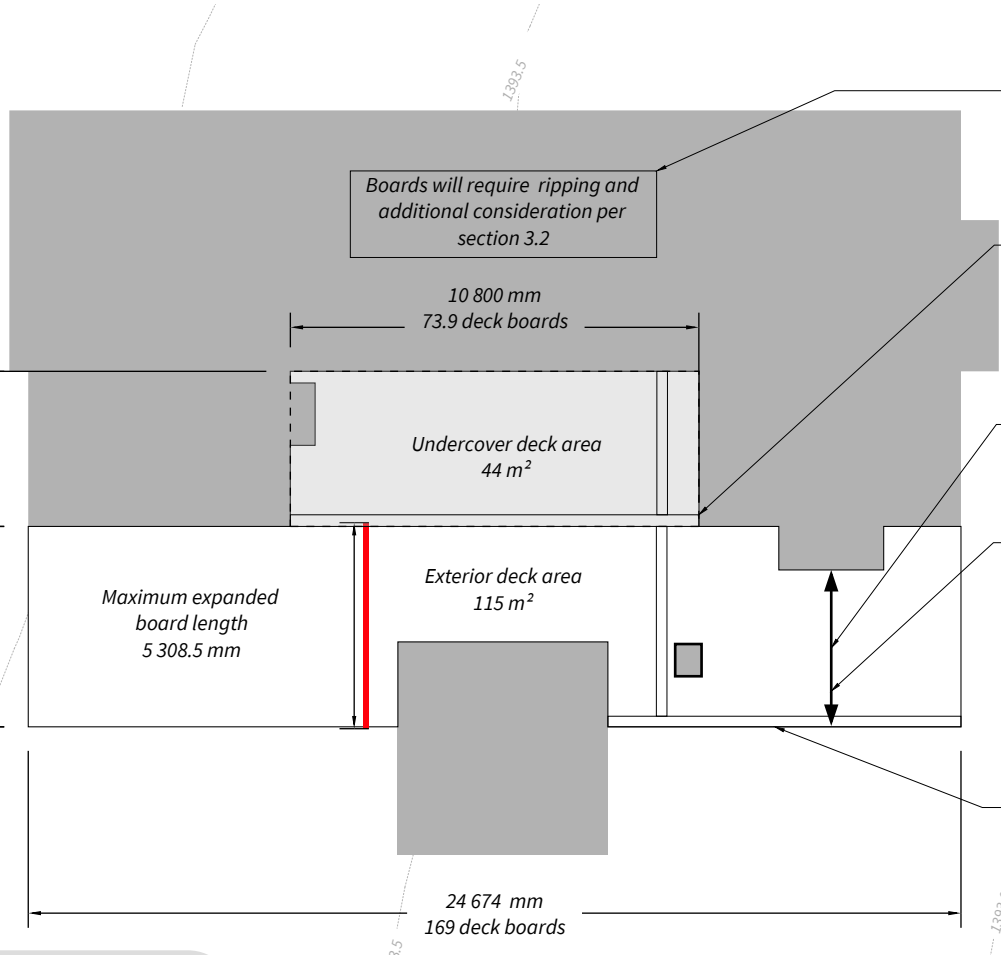
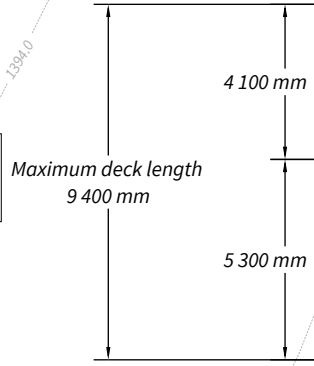
Colour

Marula (light brown)

DECK ASSESSMENT

A appropriately qualified professional has specified the structure and fastener combination to meet the environmental and loading requirements for the deck. In this example the professional has specified a galvanised steel frame and composite to steel deck fastener, specific to this site. The footprint of the deck has been assessed in relation to the dimensions of the specified deck board.

As boards are 5 450 m lengths, Two boards will be required to cover this length



Boards will require ripping and additional consideration per section 3.2

BOARD WIDTHS AND GAPS
Before laying boards, consider the cover width of a deck board (board width plus fastener gap), particularly in enclosed areas .

BREAKER BOARD AND BOARD LENGTH
The deck is 9 400 mm long while deck boards are a maximum of 5 450 mm, requiring a join at some point. A breaker board can be used to control expansion gaps.

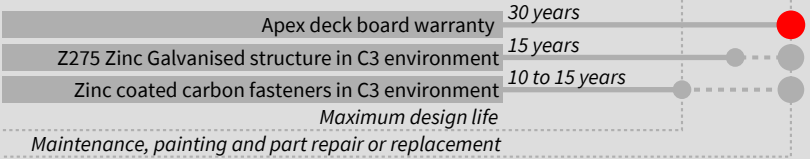
BOARD DIRECTION
The laying direction has been specified.

SLIP RESISTANCE
Board laying direction and finish have an impact on slip resistance. See the TDS for Slip resistance information.

RIM BOARDS
Starter boards and breaker boards can be used to finish and hide the deck edge.

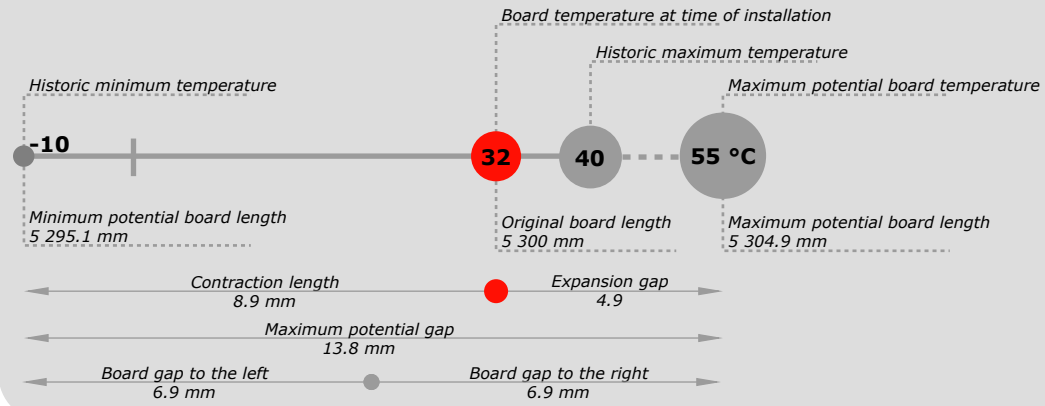
LIFESPAN DESIGN

The design life of a deck system requires balancing the lifespans of the individual components, to the part with the lowest life span. The system life expectancy can be extended with proactive maintenance, painting, and replacing parts once the part expires.



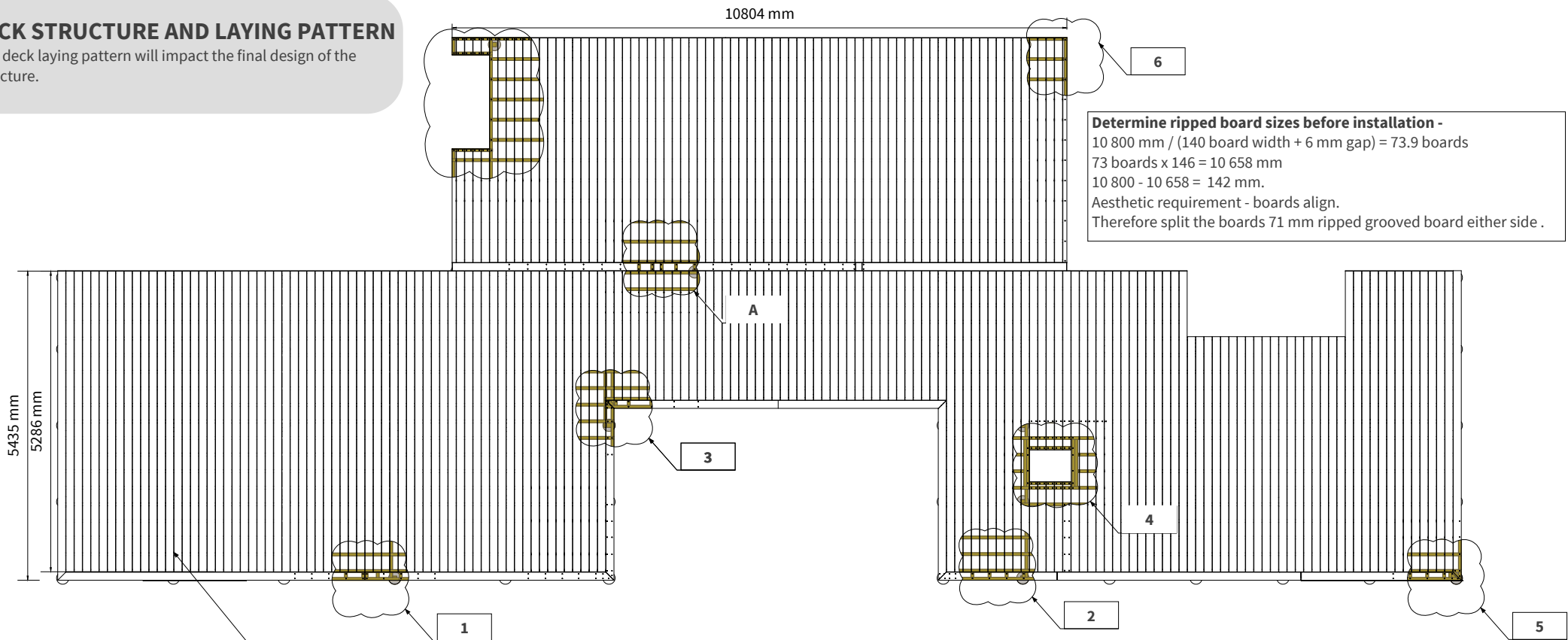
EXPANSION GAP CALCULATION

The final cut length of a board must take into consideration the possible changes in length of the board due to thermal expansion and contraction. The below infographic provides a summary of the example provided in section 3.5.2. as applied to the above deck example.



DECK STRUCTURE AND LAYING PATTERN

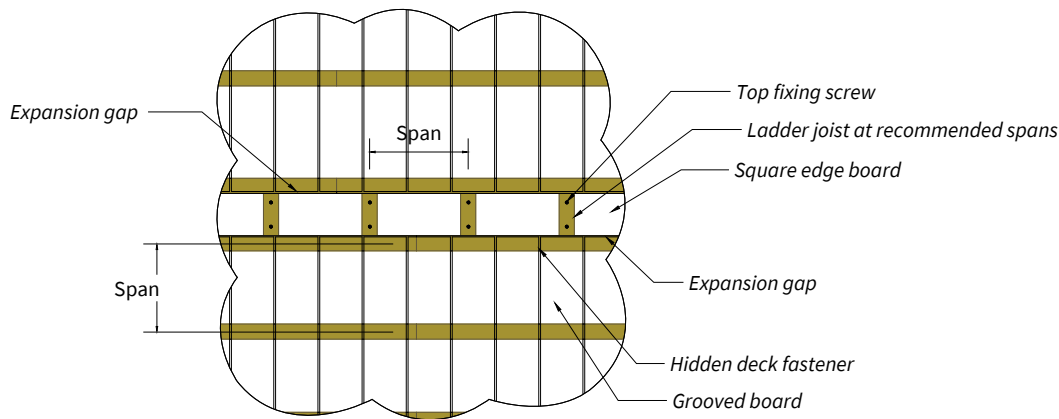
The deck laying pattern will impact the final design of the structure.



Determine ripped board sizes before installation -
10 800 mm / (140 board width + 6 mm gap) = 73.9 boards
73 boards x 146 = 10 658 mm
10 800 - 10 658 = 142 mm.
Aesthetic requirement - boards align.
Therefore split the boards 71 mm ripped grooved board either side .

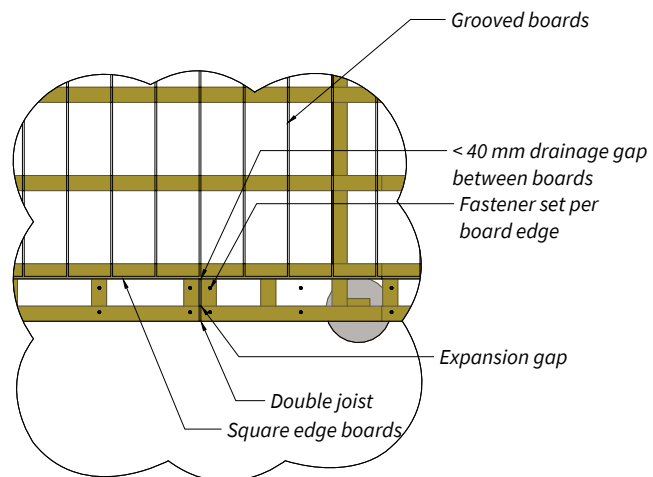
LAYING PATTERN PLAN

Expansion gap for 5 300 mm board per example outlined in section 3. at 8.5 mm at each end

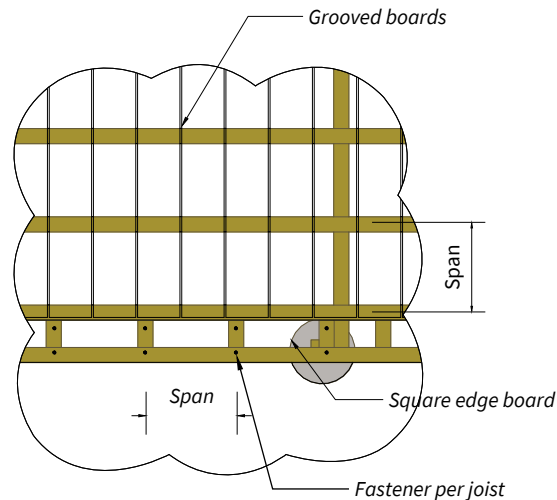


A Breaker board detail

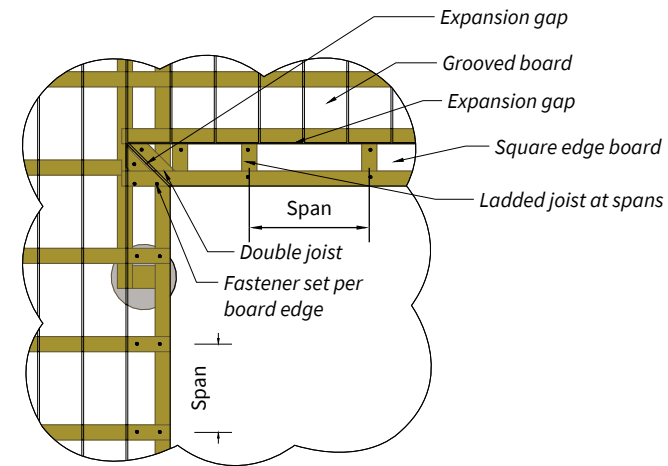
Deck scedule			
Profile	Size	Board length	Profile
Square edge	140 x 24 mm	5 450 mm	
Grooved	140 x 24 mm	5 450 mm	



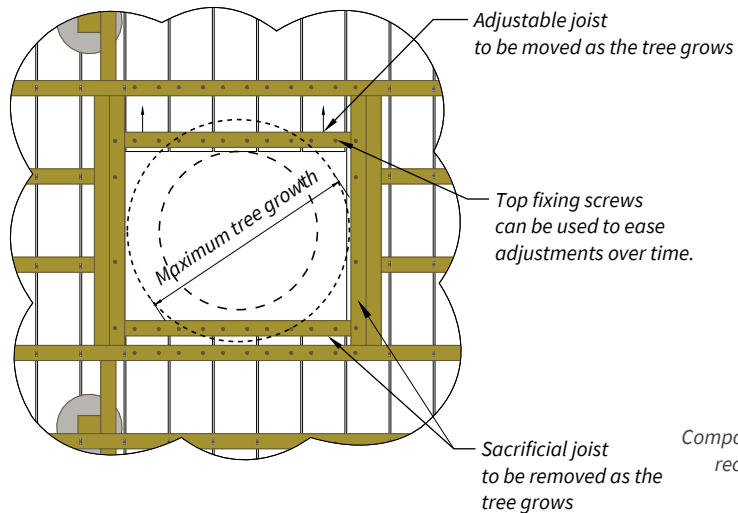
1 Double joist on abutting boards



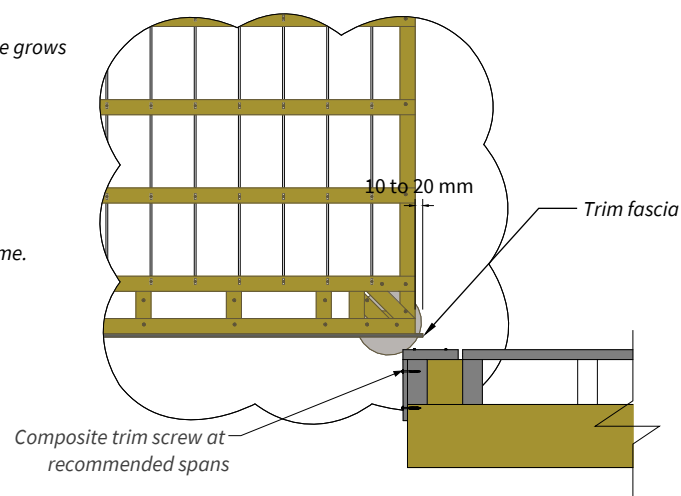
2 Ladder joist for breaker boards



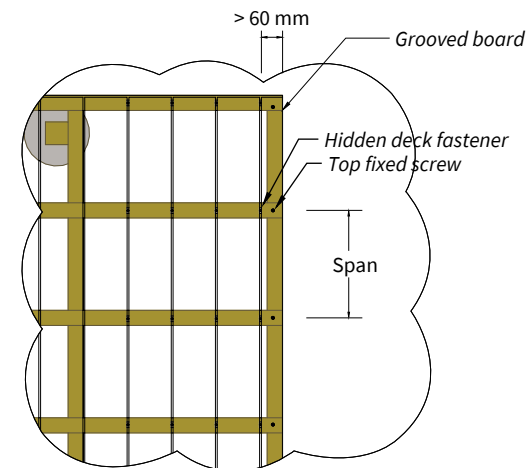
3 Mitre join detail on breaker boards



4 Board support around a tree



5 Trim detail



6 Ripped board detail

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Appendix A

Profiles and compatible fasteners

See TDS for additional information where required.

A.1 Pioneer profile family

Below is a summary of profiles available in the Pioneer material technology.

Code	Application type	Board width (mm) (inch)	Thickness (mm) (inch)	Mass per meter (kg/m) (lb/ft)	Cover width (1) (mm) (inch)	Coverage (2) (m/m²) (ft/ft²)	Coverage mass (3) (kg/m²) (lb/ft²)
STFM101A	Deck board	145.0 (5.71)	21.0 (0.83)	2.2 (1.48)	151.0 (5.95)	6.7 (2.04)	14.1 (2.89)
STFM102A	Deck board	141.0 (5.55)	24.5 (0.97)	2.6 (1.75)	147.0 (5.79)	6.8 (2.07)	17.6 (3.61)
STFM103A	Deck board	141.0 (5.55)	24.5 (0.97)	2.5 (1.68)	147.0 (5.79)	6.8 (2.07)	16.6 (3.40)
STFM104A	Deck board	145.0 (5.71)	21.3 (0.84)	2.3 (1.55)	151.0 (5.95)	6.6 (2.02)	15.5 (3.18)
STFM105A	Deck board	190.0 (7.49)	21.0 (0.83)	3.1 (2.09)	196.0 (7.72)	5.1 (1.56)	15.8 (3.24)
STFM107A*	Deck board	190.0 (7.49)	21.0 (0.83)	3.1 (2.09)	196.0 (7.72)	5.1 (1.56)	15.8 (3.24)
STFM106	Fascia board	151.0 (5.95)	12.5 (0.49)	1.4 (0.94)	157.0 (6.18)	6.4 (1.95)	9.9 (2.03)

(1) Coverage width = Board width + an assumed typical gap of 6 mm. (0.24")

(2) Coverage = 1000/Coverage width

(3) Coverage mass = Coverage x mass per meter (feet)

A.2 Compatible fasteners

Below is a summary of fasteners available for fixing the Apex family of profiles. Please refer to www.eva-last.com for profiles available to your regions.

Fastener type	Size (mm)	Length (mm)	Material	Note
S6 decking clip	6.0 (0.237)	38 (1.497)	SS 430	Compatible with boards that have a 6 mm (0.237") groove height.
S9 decking clip	9.0 (0.335)	38 (1.497)	SS 430	Compatible with boards that have a 9 mm (0.354") groove height.
Chain Collated decking clip	6.0 (0.237)	19 (0.749)	SS 316 or SS 304	Compatible with boards that have a groove height of between 6 mm (0.237") and 12 mm (0.472"). To be used with hand tool.
Clip screw for timber substructure	M 4.2 (# 8)	40 (1.575)	C 1022 SS 316	Compatible with all listed clips. Two corrosion resistance options.
Clip screw for metal substructure	M 4.2 (# 8)	31 (1.221)	C 1022	Compatible with all listed clips.
Top fixing deck screw for timber	M 5.0 (# 10)	63 (2.481)	C 1022 SS 305	For 20 mm to 25 mm (0.787 to 0.984") thick boards into timber structures greater than 40 mm (1.575") thick. Two corrosion resistance options.
Top fixing deck screw for metal	M 5.0 (# 10)	45 (1.772)	C 1022	For 20 mm to 25 mm (0.787 to 0.984") thick boards into metal structures 0.8 mm to 2.0 mm (0.032 to 0.079") thick.
Top fixing trim screw for timber	M 5.5 (# 10)	48 (1.890)	10 B 21 SS 316	For 11 mm to 16 mm (0.433 to 0.629") thick boards into timber structures greater than 40 mm (1.575") thick. Two corrosion resistance options.
Top fixing trim screw for metal	M 5.5 (# 10)	35 (1.378)	10 B 21 SS 410 H	For 11 mm to 18 mm (0.433 to 0.709") thick boards into metal structures 0.8 mm to 2.0 mm (0.032 to 0.079") thick. Two corrosion resistance options.

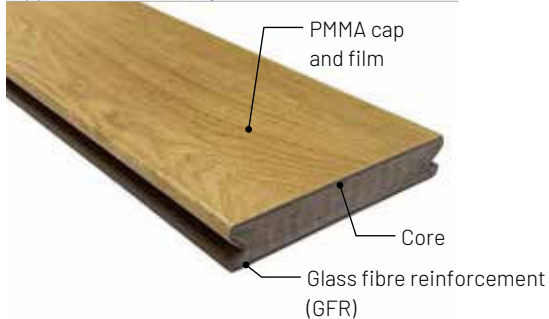
Appropriate fasteners must be employed relative to applicable legislation, the intended application, and the conditions present. Particular attention should be paid to the corrosion conditions of the site and the state of the substrate available. Applications should adhere to any applicable standards. All timber profiles should be treated appropriately, and all metal profiles should be coated appropriately. Movement of materials within the system can degrade connections over time, and it is prudent that this is avoided or reduced to an acceptable limit where possible. Coatings can degrade over time and regular, proactive maintenance should be employed.

Appendix B

Installation

Profile properties

Product code	STFM101A
Sectional area (mm ²)	2 843
Approximate mass (kg/m)	2.1



Sectional properties in typical orientation

I_x (mm ⁴)	101 499
I_y (mm ⁴)	4 615 773
C_x (mm)	72.4
C_y (mm)	10.2
S_x (mm ³)	9 936
S_y (mm ³)	63 713

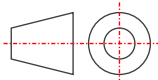
Drawing title

STFM101A - Grooved deck board - Pioneer

File name

Apex plus infographics

File details



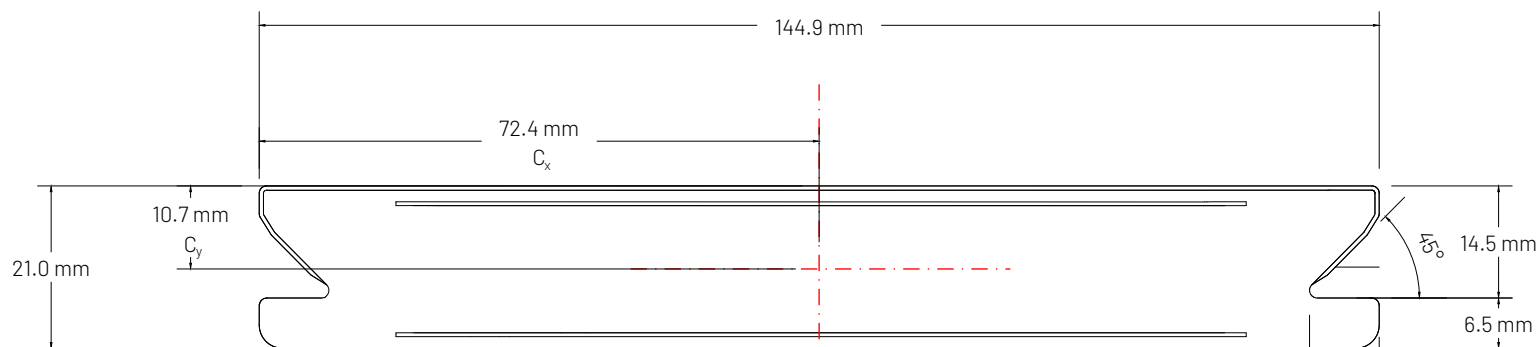
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Date	January 25, 2023
Page	N/a
Scale	NTS

Unless otherwise specified all dimensions are in millimeters.

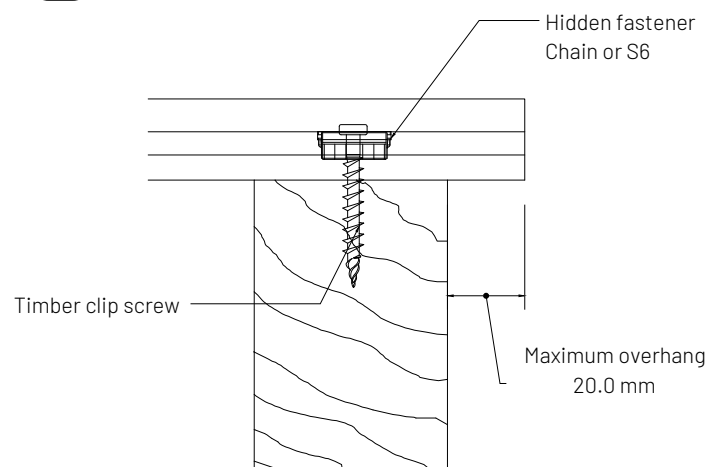
Issued for information. See supporting documentation for disclaimers and details.

Pioneer

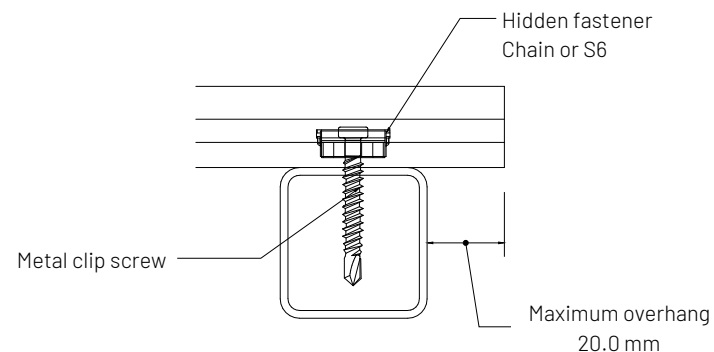
A PRODUCT BY **EVA-LAST**
INSPIRED BY NATURE. DESIGNED FOR LIFE.



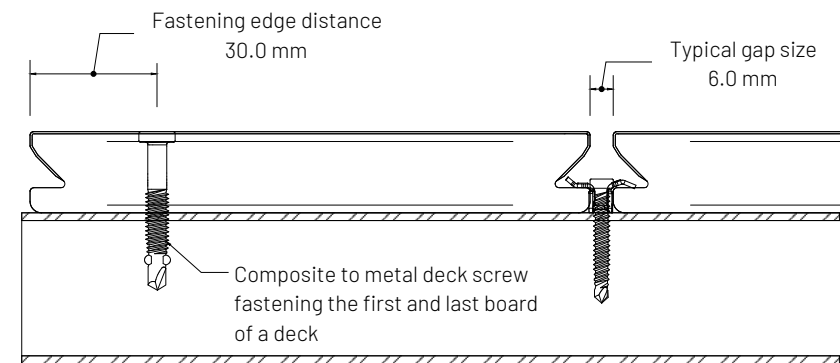
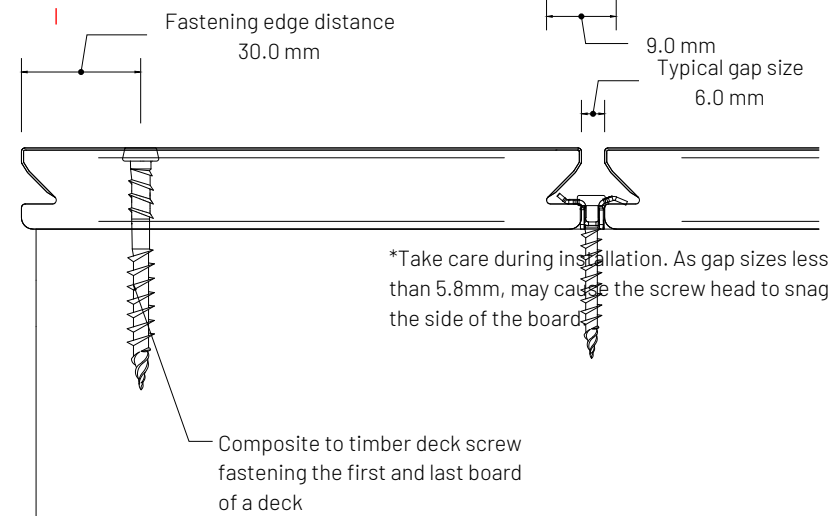
A STF101A Grooved deck board
Scale 1:1



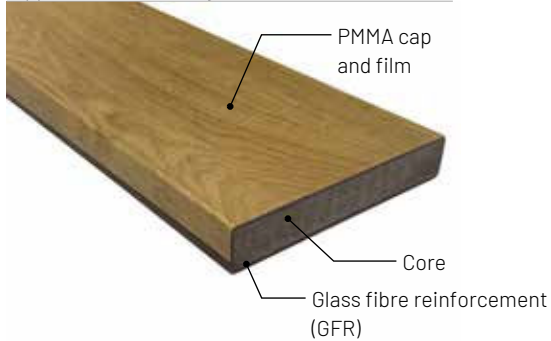
B1 STF101A. Grooved deck board in a Timber application
Scale 1:2



B2 STF101A - Grooved deck board in a metal application
Scale 1:2



Profile properties	
Product code	STFM102A
Sectional area (mm ²)	3 447
Approximate mass (kg/m)	2.6



Sectional properties in typical orientation

I_x (mm ⁴)	171 787
I_y (mm ⁴)	5 663 635
C_x (mm)	70.6
C_y (mm)	12.4
S_x (mm ³)	13 878
S_y (mm ³)	80 277

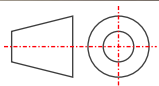
Drawing title

STFM102A - Square edge deck board - Pioneer

File name

Apex plus infographics

File details



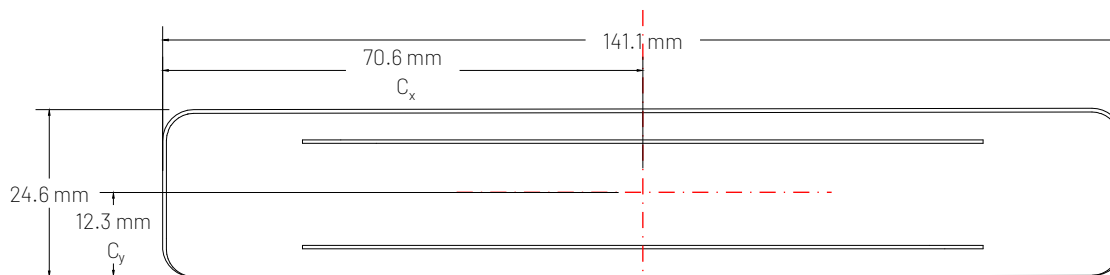
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Scale	NTS

Unless otherwise specified all dimensions are in millimeters.

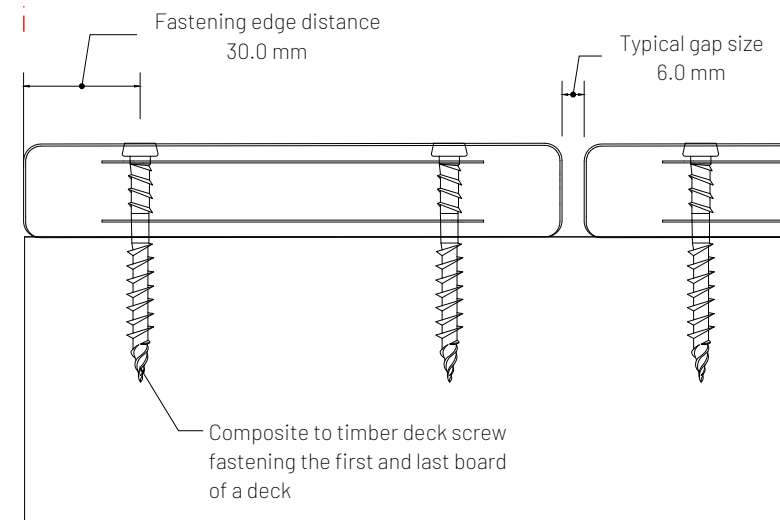
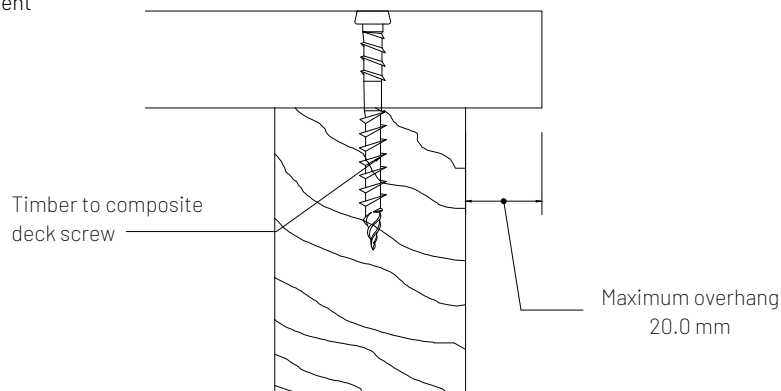
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Pioneer

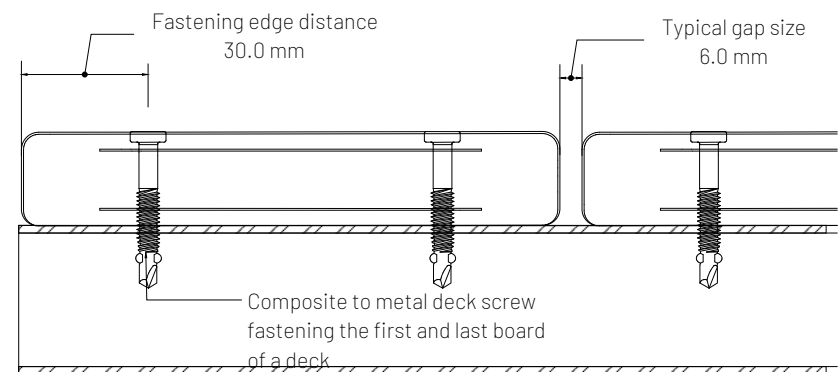
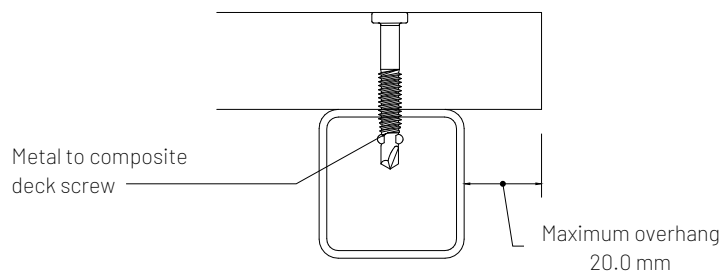
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A STF102A. Square edge deck board
Scale 1:1



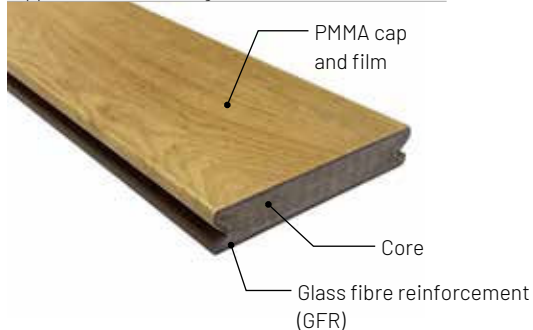
B1 STF102A. Square edge board in a Timber application
Scale 1:2



B2 STF102A- Square edge deck board in a metal application
Scale 1:2

Profile properties

Product code	STFM103A
Sectional area (mm ²)	3 264
Approximate mass (kg/m)	2.4



Sectional properties in typical orientation

I_x (mm ⁴)	159 826
I_y (mm ⁴)	5 061 233
C_x (mm)	70.0
C_y (mm)	12.0
S_x (mm ³)	13 293
S_y (mm ³)	72 303

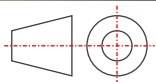
Drawing title

STFM103A - Grooved deck board - Pioneer

File name

Apex plus infographics

File details



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Date	January 25, 2023
Page	N/a
Scale	NTS

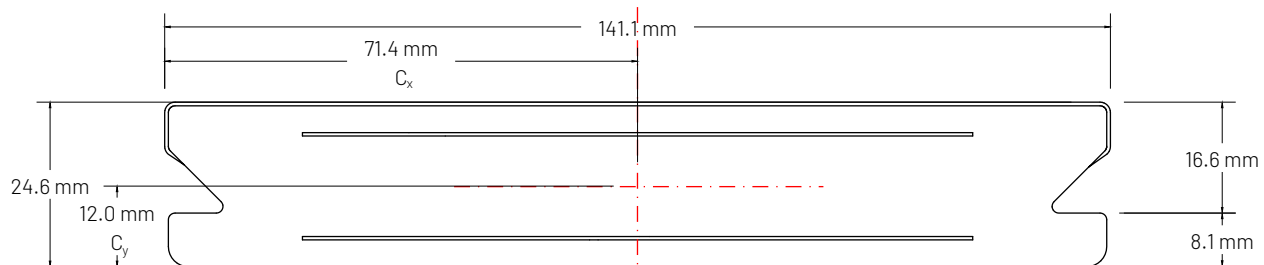
Unless otherwise specified all dimensions are in millimeters.

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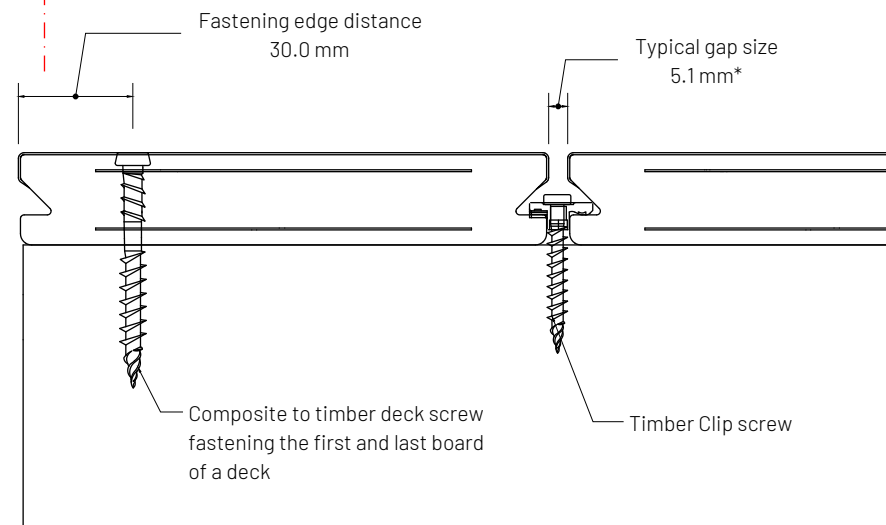
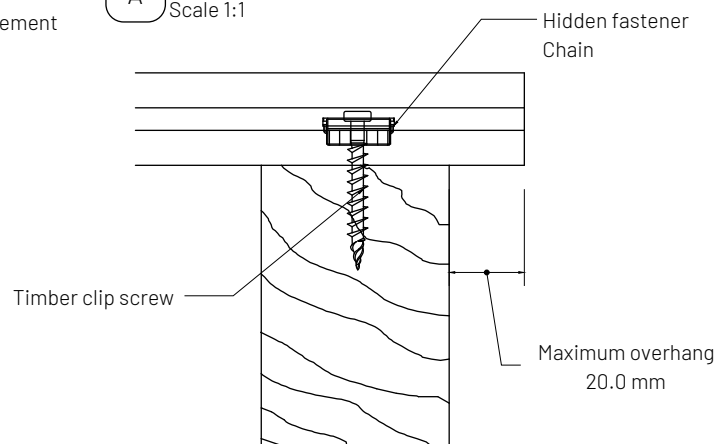
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A PRODUCT BY

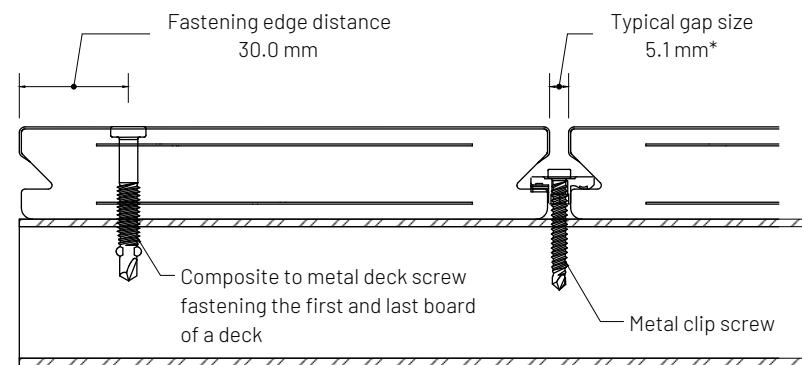
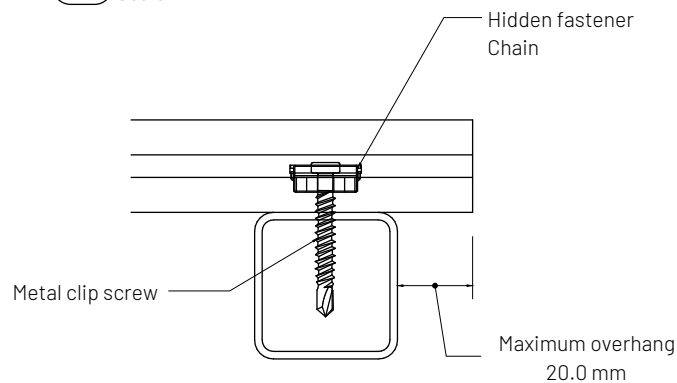
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A STF103A Grooved deck board
Scale 1:1

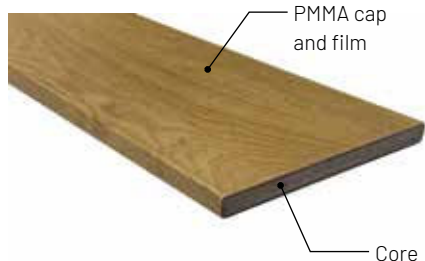


B1 STF103A. Grooved deck board in a Timber application
Scale 1:2



B2 STF103A - Grooved deck board in a metal application
Scale 1:2

Profile properties	
Product code	STFM106
Sectional area (mm ²)	1 879
Approximate mass (kg/m)	1.4

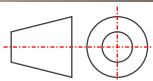


Sectional properties in typical orientation	
I_x (mm ⁴)	3 513 737
I_y (mm ⁴)	24 405
C_x (mm)	6.3
C_y (mm)	75.6
S_x (mm ³)	46 505
S_y (mm ³)	3 887

Drawing title
STFM106 - Fascia board - Timber structure - Pioneer

File name
Apex plus infographics

File details



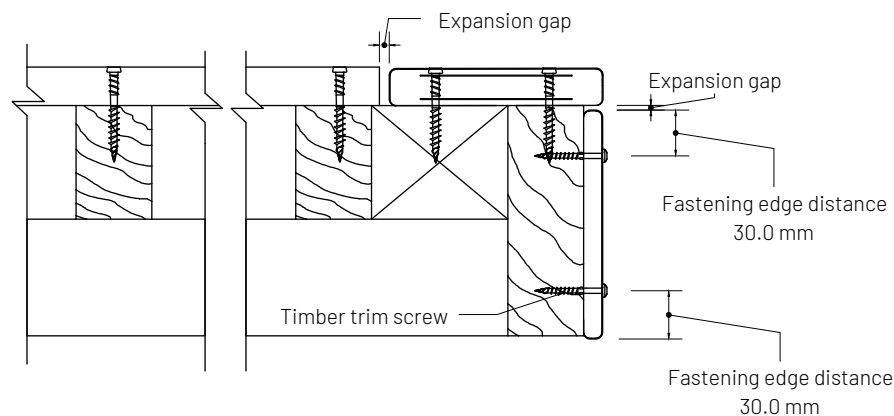
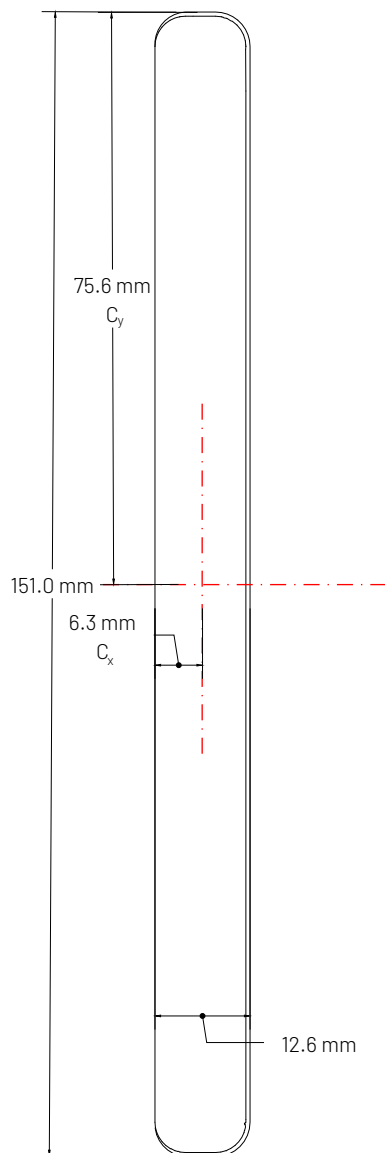
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Unless otherwise specified all dimensions are in millimeters.

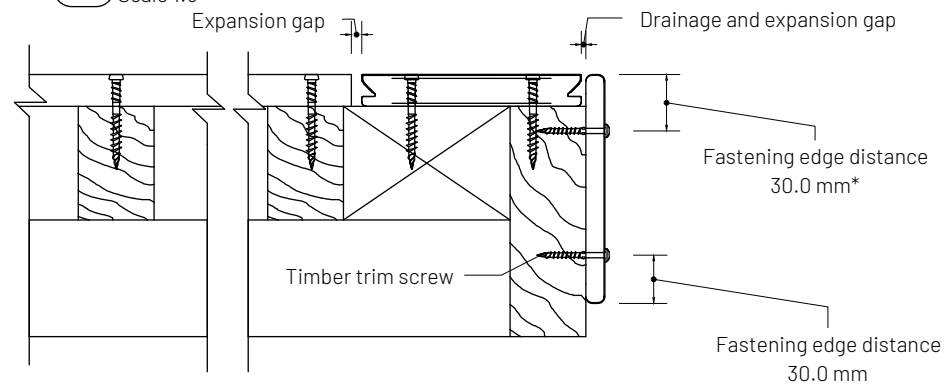
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Pioneer[®]

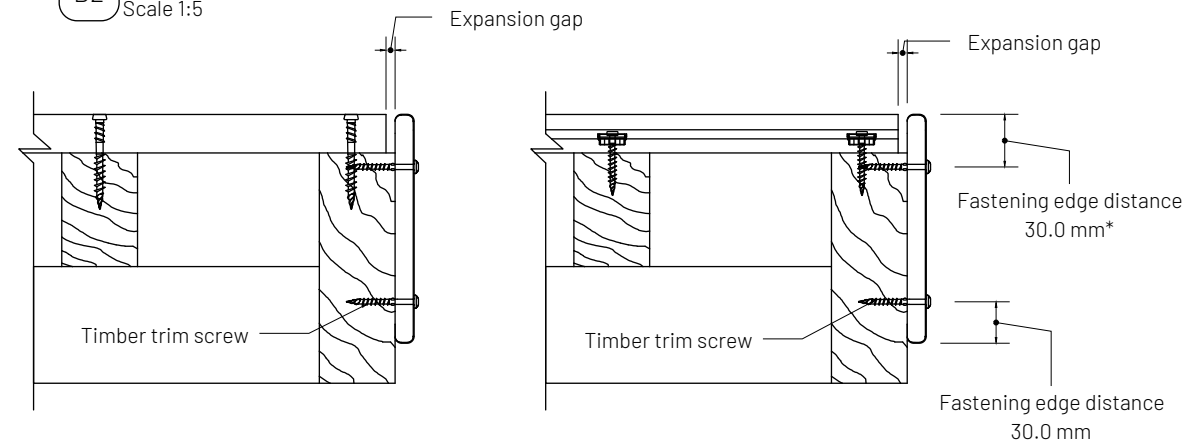
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B1 STF106. Grooved deck board in a Timber application beneath a breaker board
Scale 1:5

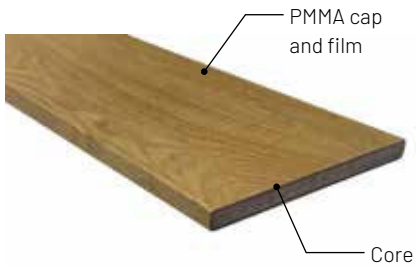


B2 STF106. Grooved deck board in a timber application covering a grooved board edge
Scale 1:5



B3 STF106. Timber application covering board edges
Scale 1:5

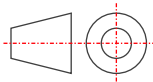
Profile properties	
Product code	STFM106
Sectional area (mm ²)	1 879
Approximate mass (kg/m)	1.4



Sectional properties in typical orientation	
I_x (mm ⁴)	3 513 737
I_y (mm ⁴)	24 405
C_x (mm)	6.3
C_y (mm)	75.6
S_x (mm ³)	46 505
S_y (mm ³)	3 887

Drawing title	
STFM106 - Fascia board - Metal structure - Pioneer	
File name	
Apex plus infographics	

File details	
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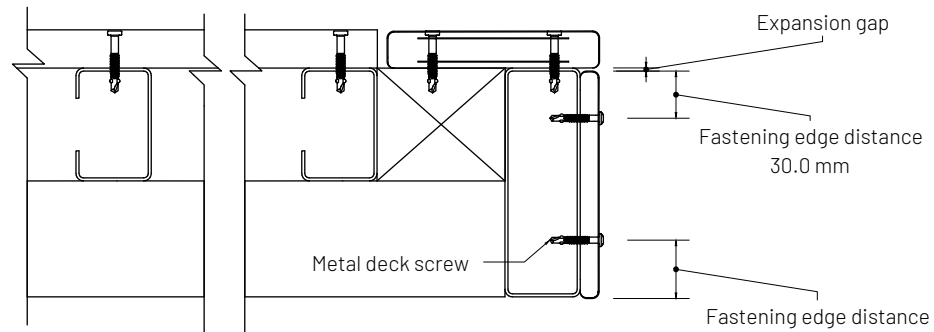
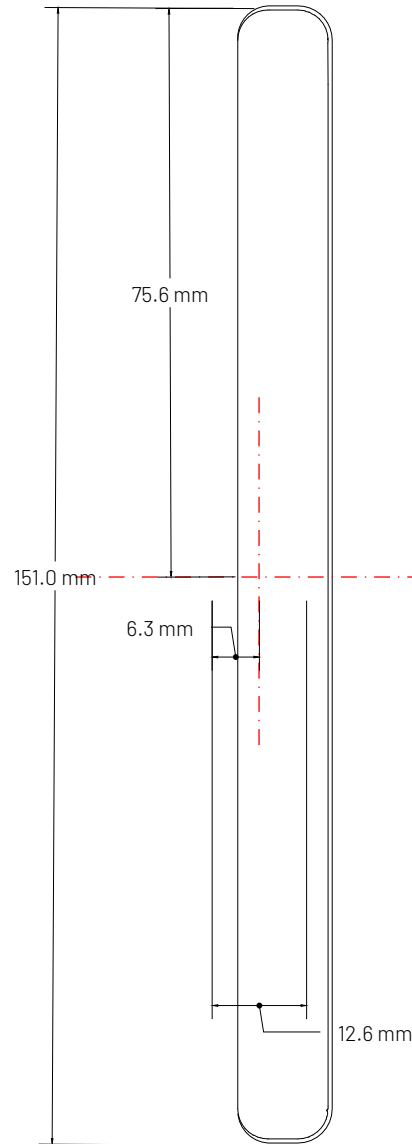
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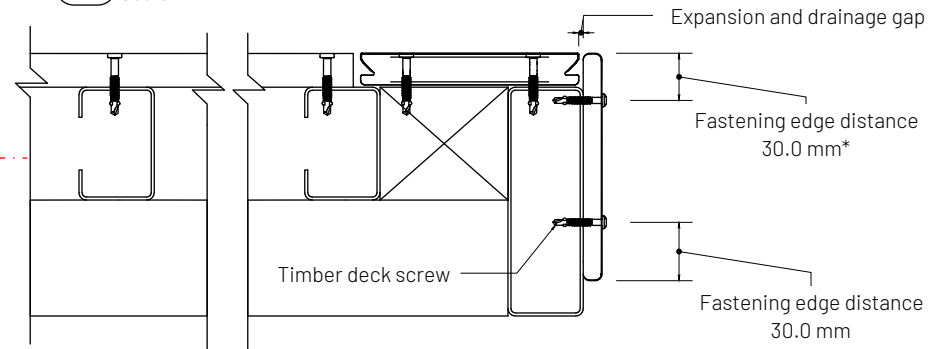
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Pioneer

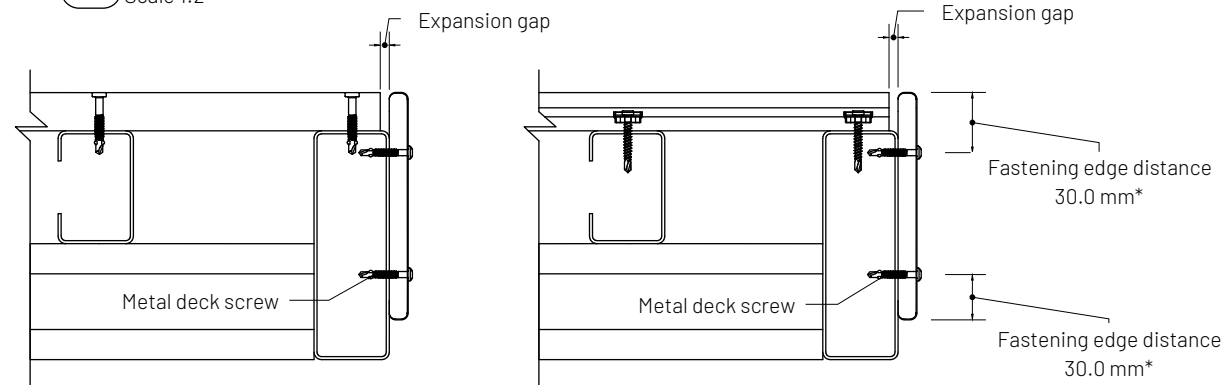
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B1 STF106. Grooved deck board in a metal application beneath a breaker board
Scale 1:2



B2 STF106. Grooved deck board in a metal application covering a grooved board edge
Scale 1:2



B3 STF106. Metal application covering board edges
Scale 1:2

Appendix C

Summary matrix of expansion gaps for different conditions

Expansion coefficients

In **Section 3** material length changes in direct proportion to temperature changes. The table below, provided for information and convenience, displays common materials' expansion coefficients.

Material	Expansion coefficient (mm/mm/°C)	Expansion coefficient (inch/inch/°F)
Infinity (HDPE)	40.1 x 10 ⁻⁶	22.3 x 10 ⁻⁶
Origins (HDPE)	40.1 x 10 ⁻⁶	22.3 x 10 ⁻⁶
Eva-tech (HDPE)	45.3 x 10 ⁻⁶	25.2 x 10 ⁻⁶
Apex (PVC)	70.0 x 10 ⁻⁶	38.9 x 10 ⁻⁶
Apex PLUS (PVC + GFR)	35.0 x 10 ⁻⁶	19.4 x 10 ⁻⁶
Pioneer (PVC + GFR + PMMA Cap)	35.0 x 10 ⁻⁶	19.4 x 10 ⁻⁶
Lifespan/Ultraspans (Aluminium)	24.0 x 10 ⁻⁶	13.3 x 10 ⁻⁶
Galvanised steel	12.5 x 10 ⁻⁶	6.9 x 10 ⁻⁶

Pioneer

Summary matrix of estimated expansion gaps (to the nearest 0.5 mm) for Pioneer material technology at different board lengths and different increases in board temperature relative to the installation temperature.

Coefficient	Required expansion gap (mm) estimate per increase in temperature relative to the installation temperature (°C)												
0.0000334	1	5	10	15	20	25	30	35	40	45	50	55	60
Board length (m)	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
1.0 m	0.0	0.2	0.3	0.5	0.7	0.8	1.0	1.2	1.3	1.5	1.7	1.8	2.0
2.0 m	0.1	0.3	0.7	1.0	1.3	1.7	2.0	2.3	2.7	3.0	3.3	3.7	4.0
3.0 m	0.1	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
4.0 m	0.1	0.7	1.3	2.0	2.7	3.3	4.0	4.7	5.3	6.0	6.7	7.3	8.0
5.0 m	0.2	0.8	1.7	2.5	3.3	4.2	5.0	5.8	6.7	7.5	8.4	9.2	10.0
5.45 m	0.2	0.9	1.8	2.7	3.6	4.6	5.5	6.4	7.3	8.2	9.1	10.0	10.9
5.8 m	0.2	1.0	1.9	2.9	3.9	4.8	5.8	6.8	7.7	8.7	9.7	10.7	11.6

Below is a summary matrix of estimated expansion gaps for Pioneer material technology, converted to inches using a conversion factor of 0.556 from mm/mm/°C. These values are rounded to two decimal places and are calculated for various board lengths and different temperature increases relative to the installation temperature.

Coefficient	Required expansion gap (inches) estimate per increase in temperature relative to the installation temperature (°F)												
0.000018	34	41	50	59	68	77	86	95	104	113	122	131	140
Board length (ft)	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	°F
3.2 ft	0.00	0.01	0.01	0.02	0.03	0.03	0.04	0.05	0.05	0.06	0.07	0.07	0.08
6.5 ft	0.00	0.01	0.03	0.04	0.05	0.07	0.08	0.09	0.11	0.12	0.13	0.14	0.16
9.8 ft	0.00	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24
13.4 ft	0.01	0.03	0.05	0.08	0.11	0.13	0.16	0.18	0.21	0.24	0.26	0.29	0.32
16.4 ft	0.01	0.03	0.07	0.10	0.13	0.16	0.20	0.23	0.26	0.30	0.33	0.36	0.39
17.9 ft	0.01	0.04	0.07	0.11	0.14	0.18	0.21	0.25	0.29	0.32	0.36	0.39	0.43
19 ft	0.01	0.04	0.08	0.11	0.15	0.19	0.23	0.27	0.31	0.34	0.38	0.42	0.46

Appendix D

Corrosion references

Fastener Life expectancy

Screw corrosion classification

The following table provides a summary of typical fasteners, their coating thicknesses, and respective lifespans in different corrosion zones. In all cases consult an appropriately qualified professional.

- Red – the fastener is not suitable
- Orange – The protective coating is suitable for some composite product systems. See appropriate TDS document for more information.
- Green – The coating is suitable for the given environment and most composite systems
- Tick(✓) – The material itself is suitable for the given environment and most composite systems

		ISO 9223 corrosion category		C3	C4	C5	C5+
Fastener category	Material	Coating	Zinc corrosion rate	0.7 to 2.1 (µm/annum)	2.1 to 4.2 (µm/annum)	4.2 to 8.4 (µm/annum)	8.4 to 25 (µm/annum)
			Coating Thickness	Expected lifespan of fastener coatings (years)			
Carbon clip screws	C1022	Magni 599 (full coat)	20 µm	10 to 28	5 to 10	2 to 5	<1 to 2
Carbon deck screws							
Carbon Frame screws							
Carbon trim screws	10B21		20 µm	10 to 28	5 to 10	2 to 5	<1 to 2
Tek screw	C1022	Class 3	25 µm	12 to 35	6 to 12	3 to 6	1 to 3
		Class 4	50 µm	24 to 72	12 to 24	6 to 12	2 to 6
		Zinc plated	8 µm				
Stainless Steel S clips	SS430	Enamel		✓	✓		
Stainless clip screw	SS316	Magni 599 (full coat)	20 µm	10 to 28 + ✓	5 to 10 + ✓	2 to 5 + ✓	<1 to 2 + ✓
Stainless deck screw		Enamel head coating	N/a	✓	✓	✓	✓
Stainless trim screw							
Stainless chain clip	SS316	Polypropylene (PP)	600 µm	✓	✓	63 to 130 ✓	✓

Material corrosion rates

The following table provides typical corrosion rates ($\mu\text{m} / \text{annum}$) for common materials seen in composite building systems. Not all materials are published in relation to ISO 9223 corrosion rates but are indicated by source material as suitable for certain environments. It has been assumed that references to a marine environment would be equivalent to a C5 environment.

Material Category	Corrosion rates (µm/annum) of constituents in different corrosion zones					Note
	ISO 9223 corrosion category	C3	C4	C5	C5+	
	Equivalent category	Rural	Urban	Marine	Marine Industrial	
Zinc		0.7 to 2.1	2.1 to 4.2	4.2 to 8.4	8.4 to 25	Per published ISO 9223 rates
Copper		0.6 to1.3	1.3 to 2.8	2.8 to 5.6	5.6 to 10	
Aluminium		Negligible				
Steel	Carbon	25 to 50	50 to 80	80 to 200	200 to 700	
Stainless steel	SS410	✓	x	x	x	Per ASKzn website. Unrelated to ISO 9223
	SS430	✓	✓	0.0381	0.0406	
	SS316	✓	✓	0.0051	0.0076	
Plastics	Polypropylene (PP)	✓	✓		4.6 to 7.5	Per online sources. Unrelated to ISO 9223
	Polypropylene (PE)	✓	✓		4.3 to 9.5	

Appendix E

Troubleshooting

Common complaints	Typical issues	Potential solution
Deck is bouncy or springy.	Inappropriate spans.	Reduce spans and/or provide additional supports.
Deck boards sag between joists.	Inappropriate spans.	Reduce spans and/or provide additional supports.
Deck board ends lift or tent.	Inappropriate fastening distance from edge of the board and/or overhang.	Fasten board down closer to the board edge. Ensure board support and substructure are adequate. Ensure appropriate overhang distance.
Expansion gap is too large.	The installed gap did not consider potential minimum board temperatures for the site.	Refit using appropriate expansion gaps. Make use of shorter boards and/or breaker boards.
Ends of the deck boards are no longer even.	Boards were not left to acclimatise before installation and/or boards were installed at different temperatures without allowing for this.	Now that the boards have acclimatised, cut the boards to the same lengths. Ensure this is done at a consistent temperature to avoid similar problems in the future.
Boards 'tent' at butt joints.	Inappropriate expansion gaps.	Calculate correct expansion gap for site and cut board ends to satisfy. Make use of breaker boards and similar where possible.
Board end sags under load.	Inappropriate board overhang.	Ensure board end is adequately supported within 20 mm of board end.
Screws snapping.	Inappropriate number of fasteners per board and/or over-tightening/over-torquing of screws and/or incorrect fastener utilised for the application.	Ensure appropriate fastener is used. Ensure two fasteners (hidden clips or top fixings) are used at every joist. Ensure appropriate torque settings are utilised.
Boards are cracking at board edges in vicinity of top-fixing screws.	Inappropriate fastening edge distance and/or pre-drilling.	Replace board and ensure top fixing to edge distances are correct. Pre-drill in low-temperature installations.
'Mushrooming' occurring at top-fixings.	Over-tightening/over-torquing of screws and/or high deck board temperatures during installation.	Ensure appropriate torque settings are utilised. Avoid installations at particularly high site temperatures. Pre-drill the fastening holes.
Deck is squeaky.	Board-clip-substructure interaction is producing a noise when loaded.	Replace hidden fastener with a smaller fastener and/or a fastener with a suitable polymer coating.
Strands of glass fiber of visible after cutting	Blades used to cut the board are not sharp or fast enough	Trim the strands with a sharp blade and dispose of the strands in accordance with health and safety requirements.

Appendix F

Glass reinforced material range Safe Work Procedure (SWP)

GLASS FIBER REINFORCED MATERIAL RANGE

SAFE WORK PROCEDURE (SWP)

SWP JOB TITLE OR TASK: GLASS FIBER REINFORCED MATERIAL RANGE		DATE: JANUARY 2023
Potential Hazards	Personal Protective Equipment	Training required
Hazardous Substances	Safety Glasses	MSDS
Dust fiber particles	Respiratory Protection	Health and Safety Induction
Flying particles	Overalls	First Aid
Unsafe use of equipment	Gloves	Health and Safety Induction
Unsafe use of tools	Other (as per installer's risk assessment)	Other (as per Installers risk assessment)
Incompetent operators/workers		

Note: Properly installed, the Glass Fiber Reinforced Material Range are not considered to pose a health risk. It is only during installation, or when these materials are disturbed or broken (e.g. during renovations) that you need to be concerned.

- The material contains glass fiber reinforcement. When the final product is processed (cutting mainly) fine glass fiber dust gets released. Installers is obligated inform their employees, subcontractors, any other parties on site and the client of the potential risk when handling and installing this material.
- Installers must provide appropriate personal protective equipment to help employees protect themselves from glass fiber exposure. Safety glasses or goggles will prevent the fibers from entering the eyes.
- Selecting the right clothes can help minimize contact with the fibers, reducing the risk for irritation and injury. Workers should wear pants and long-sleeve shirts when working with this material. The fabric will prevent glass fiber dust from irritating the skin and reduce the risk of fibers becoming embedded in the skin. Keep your employer's dress code in mind when selecting the clothing you will wear when handling glass fiber. You can use duct tape to close the gap at the end of long sleeves and trousers.
- Wearing gloves reduces skin contact with the glass fiber and may prevent irritation.
- Workers regularly exposed to this type of dust should wear masks with respirators, which contain filters that prevent dust and other particles from entering the mouth and respiratory system. Masks that cover the nose and mouth can prevent workers from inhaling or swallowing the fibers.
- Fumes from resins and other substances used in this product and installation should be avoided as much as possible, because they may cause respiratory problems such as tight chest, shortness of breath and wheezing. Other possible symptoms may include eye and nose irritation, headache, dizziness, and nausea.
- Don't rub your skin or eyes if they feel itchy or irritated.
- After working, wash with soap and running water (a shower is best). Wash your work clothes separately. Separate working clothes from town clothes. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reuse.
- Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and when leaving work. Do not eat, drink, or smoke when using this product. Always wash hands after handling the product.
- Keep your workspace clean, and wet-wipe or mop surfaces after working. Vacuuming is also good, but don't sweep – this spreads dust around. Vacuum attachments for cutting equipment should be utilised to mitigate risk.
- Keep glass fiber materials properly stored and dispose of any scrap.
- Material Safety Data Sheets (MSDS) of all materials to be used must be made available at the workplace.
- You should seek prompt medical advice, ideally from an occupational physician or specialist, if you experience any symptoms related to exposure to any of the products and substances mentioned above.
- Installers must ensure compliance with their country's Health and Safety Obligations and Laws.
- The client is obligated to inform anyone necessary of the potential risk when handling and installing this material.
- Omissions from the above responsibilities do not relieve the employer from any of these or other obligations and does not transfer any risk to the product supplier.

Received by: _____

Signature: _____

Date: _____