permalite

ALUMINIUM INDUSTRIAL FLOOR PLANK SOLUTIONS

The durable solution to the toughest conditions

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1.0 PERMALITE® Aluminium Industrial Floor Plank Solutions

1.1 Introduction

Many areas of Australia experience very adverse conditions such as marine or severe industrial corrosive environments. In these situations, building structures and cladding can benefit from the corrosion resistance feature of aluminium alloys. Its light weight also provides a structural benefit.

Coastal bulk material handling plants such as coal, sugar and grain loaders, as well as water storage reservoirs, agricultural storage sheds, power stations etc., all have high corrosion risk structures. Now architects, builders and engineers can extend the application of aluminium beyond the external cladding and windows to include the support framing and flooring as well.

The PERMALITE® Floor Plank design provides an industrial floor system capable of carrying 5 kPa traffic loads and is especially useful in containing dust particles and preventing falling objects from contaminating environmentally sensitive areas below.

Incorporated into the PERMALITE® plank design is a left and right, fully extruded, kick-rail which saves 4 meters of full welding per lineal meter and totally eliminates any distortion due to the welding process.

The range of aluminium floor plank sections and dedicated accessories are available from Lysaght and can be cut to length knurled and milled if required.

In addition to the standard floor plank shapes Lysaght are able to provide many other structural aluminium alloy extrusions as well as aluminium mesh and plate to your project.

The next section of this design manual provides all the information you need to put PERMALITE® aluminium floor planks to work for you.

Scope

This publication has been prepared with a view of providing designers, specifier's, fabricators, builders and erectors the relevant data to enable easy selection, specification and detailing of an industrial floor plank system using the PERMALITE® aluminium floor plank range. The information contained herein includes:

- Product features, applications and benefits
- Product ordering
- Product handling
- Product detailing, installation and assembly
- Capacity tables
- Information on design, construction and installation
- Product dimensional data and section properties.

The standard range of floor plank products available:

- Aluminium left and right hand kick rail planks
- Aluminium mid planks without kick rails
- Aluminium plank joining strips
- Aluminium angles
- Aluminium round bar
- Screw and rivet fixings
- Nylon grommet washers
- Tremco isolation tape
- Aluminium checker plate

Applications

PERMALITE® floor planks are commonly used in commercial, industrial and rural buildings, reservoirs and severe marine environments examples include:

- Coal loading conveyor galleries
- Mezzanine floor applications

Although the PERMALITE® floor planks sections have been designed for this specific application, due to their versatile shape there is a vast range of other applications where these sections are equally useful.

Packing

PERMALITE® floor planks sections are delivered in strapped bundles. The actual quantity in each bundle will vary with section size, order and length. The bundle mass is generally approximately one tonne. PERMALITE® accessories are delivered in strapped bundles, bags, or packages as appropriate.

Storage On-site

Product that has become wet in transport is to be unpacked immediately and each section dried thoroughly prior to repacking. Contact with moisture, cement dust, lime or abrasive dust is to be avoided. If not required for immediate use, sections should be neatly stacked off the ground, covered and on a slight slope so that water can drain away.

Bundled sections and accessories should not be left exposed in the open for any period as water staining may result between any aluminium surfaces in contact with each other. Mill finish aluminium is particularly susceptible to this type of staining. It should be noted that whilst water staining is unsightly it will not affect the structural integrity or durability of the product in any way.

1.2 Eco-Friendly and Recyclable

Choosing the optimum material for your next project should take account of the full lifetime of the material. This will include construction, use, maintenance and disposal. Materials which can be recycled easily and economically and which do not require landfill disposal should be preferred.

Aluminium's formability, high strength-to-weight ratio, corrosion resistance, and ease of recycling makes it the ideal material for a wide range of building applications. It is almost uniquely suited for harsh industrial and marine projects.

1.3 Material Specification

The floor plank shapes shown below are all produced in a well proven structural aluminium alloy 6060 T5 which combines the properties of high strength with excellent resistance to atmospheric corrosion and is particularly suited to marine structures and other corrosive environments.

Typical average mechanical properties of this alloy across various shapes are:

Alloy	6060
Temper	T5
Ultimate Tensile Strength(UTS)	152 MPa
Tensile Yield Strength	110 MPa
Shear Yield Strength	62 MPa
Modulus of Elasticity	69 MPa

Fixings are recommended to be of corrosion resistant materials such as aluminium alloy or 304/ 316 stainless steel. This combination will give the best results in environments in which aluminium floor planks are most suited.

Available Lengths

PERMALITE® floor planks are available custom-cut to most transportable lengths, however there are some limitations.

For normal deliveries nominal lengths should not exceed 12000mm. Lengths greater than 12000mm require special transportation and on-site handling facilities. Please check local laws regarding permits and requirements for oversize deliveries. Lengths greater than 19500mm require a special transportation permit and non-containerised shipment.

For minimum lengths, and lengths over 12000mm, contact your nearest Permalite office.

Length tolerance for all sections is ±5mm.

2.0 Floor Plank Range

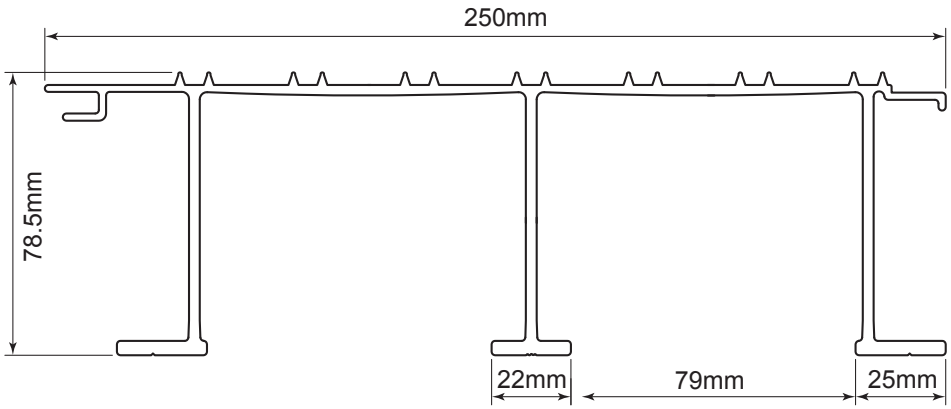
The range consists of 3 plank types as well as ancillary component for fixings.

All planks have a nominal width and height of 250mm x 75mm (cover width 237mm) and a web thickness of 3mm. The planks are connected via a tongue and groove arrangement, providing load sharing as well as the ability to seal the floor system to capture dust and or liquids.

Floor Planks

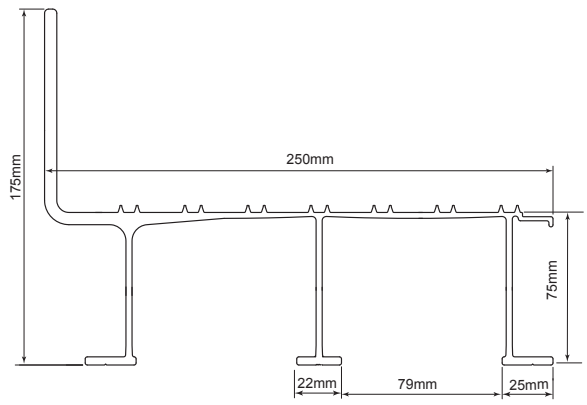
Mid or Standard Plank

As its name implies the Mid plank is used as the main walkway plank in-between the left and right kick rail planks. In situations where kick rails are not required these will be the only planks used.

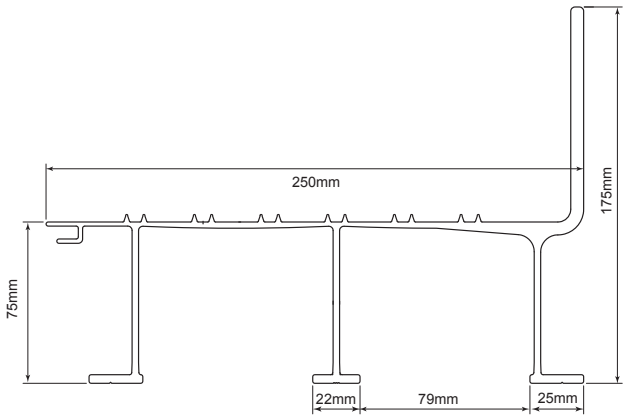


The kick rail planks provide a 100mm kick rail to comply with Australian Standards for commercial and industrial walk / work way designs.

Left Hand Kick Rail (LHKR) Plank



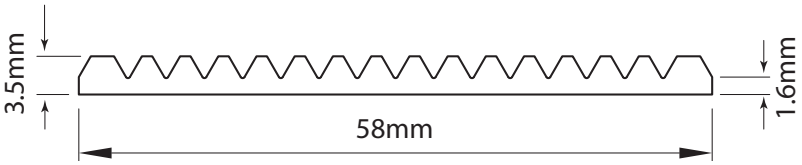
Right Hand Kick Rail (RHKR) Plank

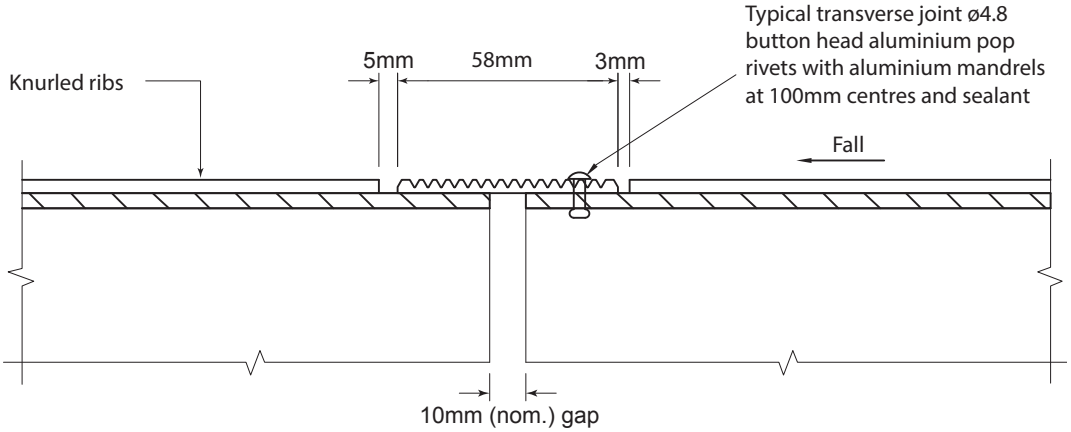


3.0 Floor Plank Accessory Range

Knurled Joiner Strip - STD Transverse Joins

A 58mm x 3mm knurled aluminium plate joining strip is available, to facilitate joining of planks at the end of planks via a transverse joins.





TRANSVERSE JOINT DETAIL

This joining strip maybe fixed via aluminium pop rivets and will require removal of the face flutes from the plank prior to installation.

4.0 Sliding Cross-over Materials

Aluminium Checker Plate

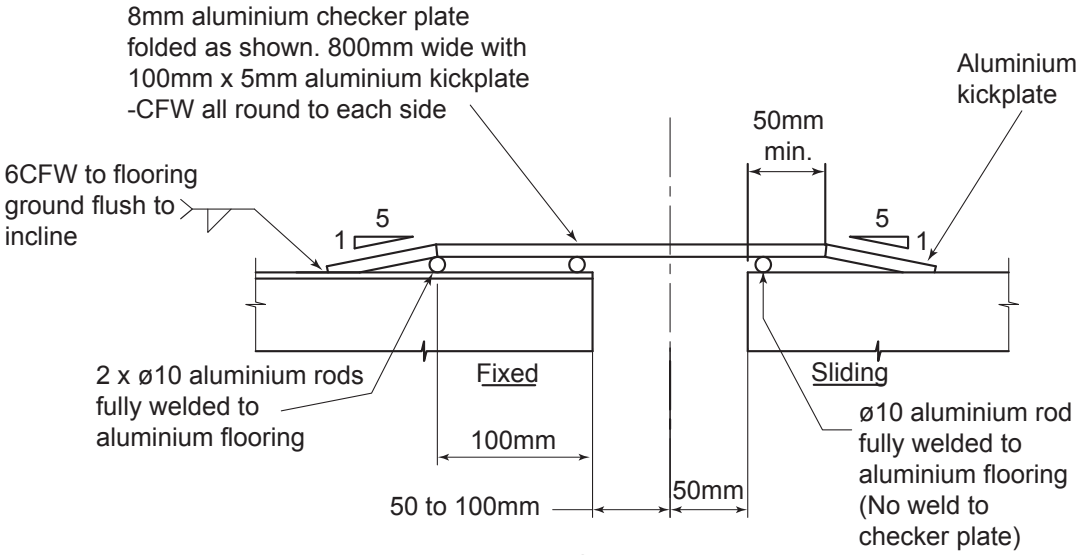
Aluminium checker plate can be provided in a range of thickness and sizes to allow fabrication into various configurations to suit your project.

Typical thicknesses include:

- 3mm
- 4mm
- 5mm

Round Bar

Aluminium round bar can be utilised to form supports for crossover plates at changes in levels, or at expansion points, the prevalent size used for this application is 10mm diameter.

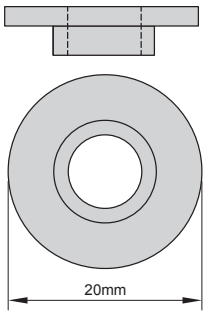


Typical Aluminium Sliding Joint Detail

Fixings

A full range of Stainless Steel fixings and isolative materials are available including:

- 14 x 31 self-drilling screws
- Nylon isolation washers
- Tremco isolation tape
- Aluminium rivets
- Sealants



Nylon Washer

20mm nylon isolation washer

RA114

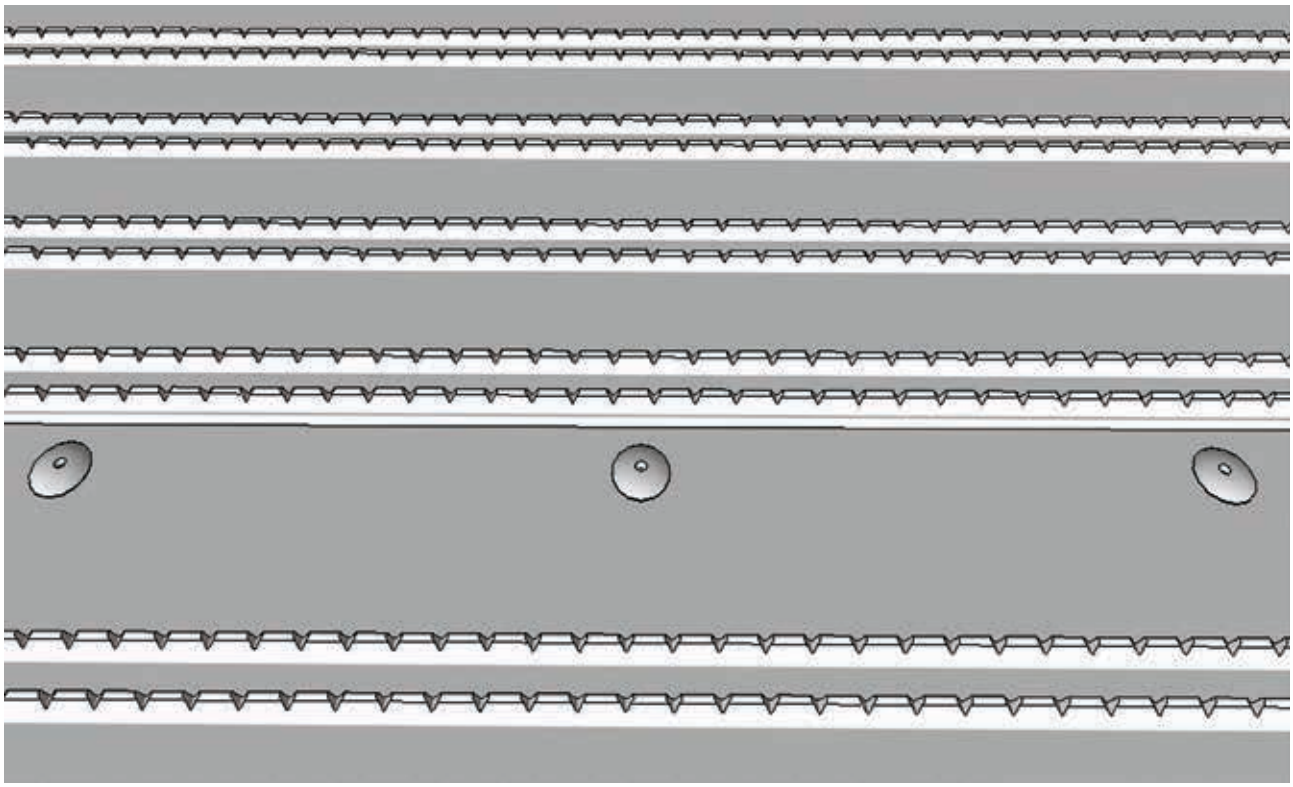
14X31 hex. head stainless steel self drilling screw

Rivet

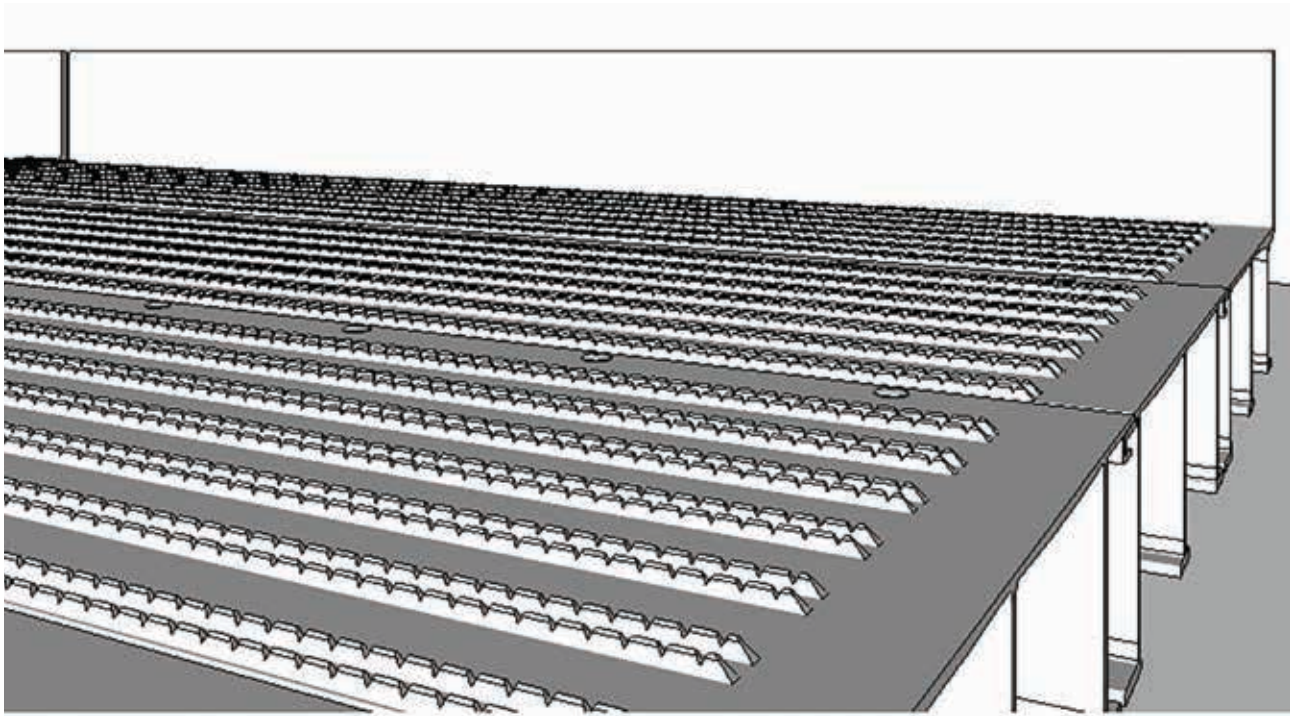
4.8mm dia. button head rivet with aluminium mandrel

5.0 Milling and or Knurling of Planks

PERMALITE® aluminium floor plank profiles can be supplied with knurled or un-knurled face flutes. Knurling of the face flutes provides a highly slip-resistant surface which is ideal in wet environments:



These face flutes, and knurling, may be factory removed (milled) in specified locations to provide a flat surface to affix joiner strips or cross over plates. Alternatively, this milling may be completed on-site by installation crews.



Fixings

The system provides time-tested security through the use of stainless steel screw fixings to floor frame and aluminium rivets for plank to plank connections.

Allowance for expansion of floor planks is recommended as thermal movements of approximately 0.25mm per metre per 10°C is often encountered. Nylon washers under screw heads are recommended to reduce thermal movement, noise and any risk of crevice corrosion. The use of PVC isolation tapes or equivalent, e.g. Tremco ALTA 300-40 Isolation tape, to the full width of the flange should be used to separate dissimilar materials.

Figure 1

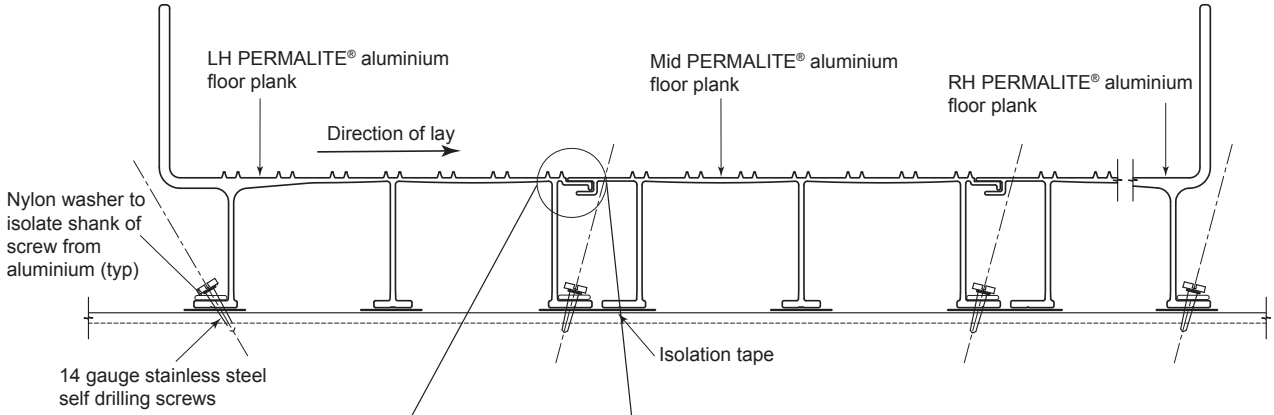
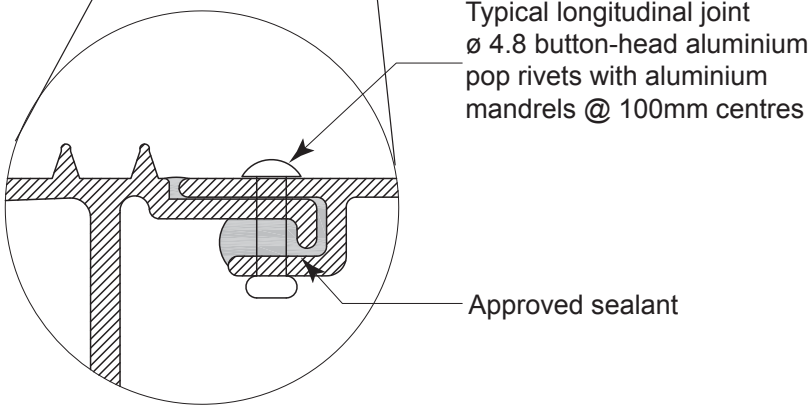


Figure 2



Plank Foot To Floor Frame

Recommended fixings are detailed below. Planks should be fixed to supporting cross-frames at each intersection point as detailed above. A nylon isolation washer should be used with each fixing.

Fixing Type	Base Material and Thickness			
	Extruded Aluminium	Hot Rolled Steel		
	2mm to 6mm	1.5mm to 3mm	3mm to 6mm	6.1mm to 12mm
304 SS Fixing	14-14x31 Tek®	14-14x31 Tek®		
Pilot hole (mm)	Not required	Nil	5.3	5.3

Plank To Plank Connections

Connections of floor plank, tongue and grooves are achieved with 4.8mm diameters button head aluminium rivets with aluminium mandrels at appropriate centres. This connection is also suitable for a range of lightweight transverse joint details. For heavy duty connections such as crossover connection then aluminium welding in accordance with AS 1665 is appropriate.

6.0 Design Criteria

Limit State Design

The load capacity tables and span capacity tables have been developed to Limit State Design principles in accordance with AS/NZS 1664:1:1997 and AS/NZS 1170.0:2002.

Design Notes for Capacity Tables

Capacity tables are applicable only for floor plans installed in accordance with this Manual.

Minimum bearing length at end supports = 100mm

Minimum bearing length at internal supports = 150mm

Design Philosophy

The planks are not designed to transmit any axial forces.

All related modes of failure required by AS/NZS 1664.1:1997 have been considered including local buckling, lateral buckling, maximum stresses due to bending moments and shear forces .

Deflection

There are no specific rules governing acceptable deflections, though structural codes give guidance. You need to consider the specific requirements of any structure. It may be necessary to design for deflection under more than one load combination. See also assumptions used in tables.

Point Loads

The values in this publication assume uniformly distributed loading. However, in many applications (like the mounting of services and maintenance equipment) the loads applied to a structure are point loads. Thus, to use these tables for point loadings, the loads must be converted to equivalent distributed loads.

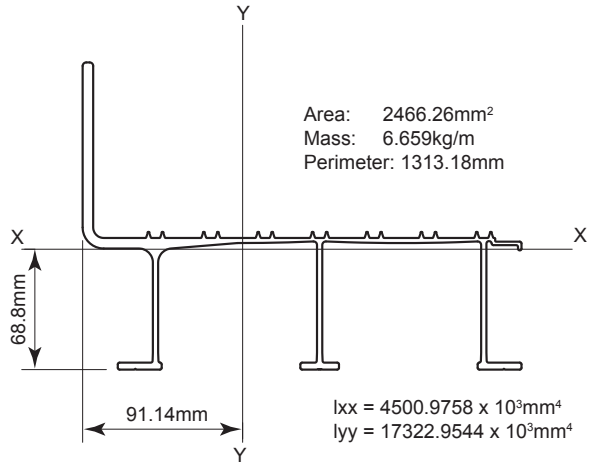
Design Optimisation

The capacity tables provide economical design solutions for most projects. Designs can be optimised by varying:

- Screw specifications and number
- Reduced or enlarged end spans
- Span range
- Cantilevers at one or both ends
- Load distribution

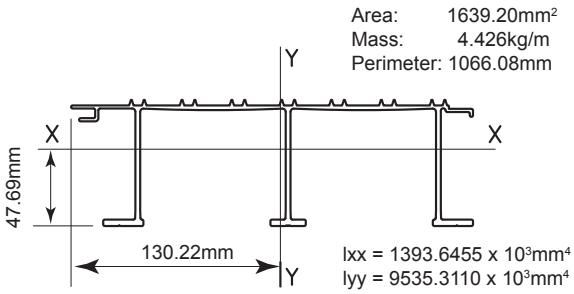
Second Moment of Area

Left Hand Kick Rail (LHKR) Plank



Second Moment of Area

Mid Rail (MID) Plank



Second Moment of Area

Right Hand Kick Rail (RHKR) Plank

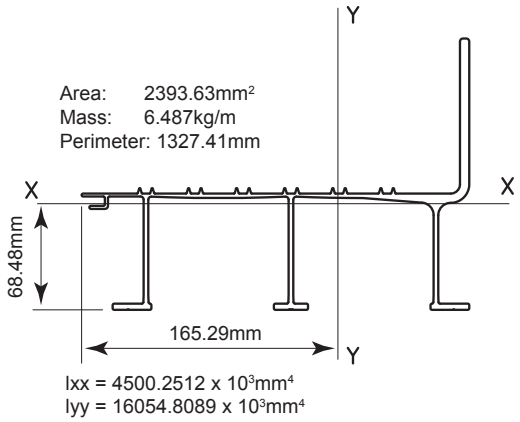


Table 1: PERMALITE® Aluminium Floor Plank Load Capacity Table (kPa)

Single Span

Maximum Span (mm)	Maximum Load for Strength	Maximum Load for Deflection Span/250
2000	13.91	13.39
2500	8.86	6.85
3000	6.12	3.97
3500	4.46	2.49
4000	3.39	1.68
4500	2.66	1.17
5000	N/A	N/A
5500	N/A	N/A

Double Span Continuous

Maximum Span (mm)	Maximum Load for Strength	Maximum Load for Deflection Span/250
2000	13.04	32.61
2500	8.43	16.70
3000	5.80	9.67
3500	4.20	6.09
4000	3.18	4.08
4500	2.47	2.86
5000	1.98	2.09
5500	1.60	1.57

Three Span Continuous

Maximum Span (mm)	Maximum Load for Strength	Maximum Load for Deflection Span/250
2000	16.18	25.73
2500	10.53	13.17
3000	7.25	7.62
3500	5.27	4.80
4000	3.99	3.22
4500	3.11	2.26
5000	2.48	1.65
5500	2.02	1.24

Four Span Continuous

Maximum Span (mm)	Maximum Load for Strength	Maximum Load for Deflection Span/250
2000	15.15	27.53
2500	9.83	14.09
3000	6.76	8.15
3500	4.91	5.14
4000	3.72	3.44
4500	2.90	2.42
5000	2.31	1.76
5500	1.88	1.32

All spans are in millimetres (mm) unless otherwise noted.

Table 2: PERMALITE® Aluminium Floor Plank Span Capacity Table (mm)

Single Span

Maximum Load (kPa)	Maximum Span for Strength	Maximum Span for Deflection Span/250
1.5	4540	4150
3.0	4240	3290
5.0	3310	2780
7.5	2710	2430

Double Span Continuous

Maximum Load (kPa)	Maximum Span for Strength	Maximum Span for Deflection Span/250
1.5	5630	5580
3.0	4110	4430
5.0	3220	3740
7.5	2650	3260

Three Span Continuous

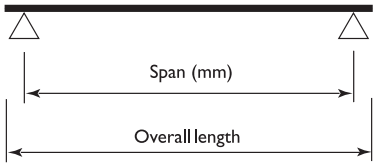
Maximum Load (kPa)	Maximum Span for Strength	Maximum Span for Deflection Span/250
1.5	5680	5160
3.0	4580	4090
5.0	3590	3450
7.5	2950	3020

Four Span Continuous

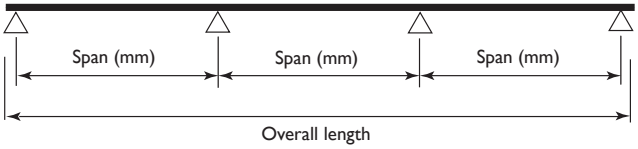
Maximum Load (kPa)	Maximum Span for Strength	Maximum Span for Deflection Span/250
1.5	5690	5280
3.0	4430	4190
5.0	3470	3530
7.5	2850	3080

All spans are in millimetres (mm) unless otherwise noted.

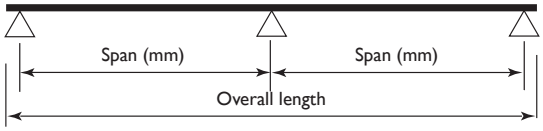
Single Span



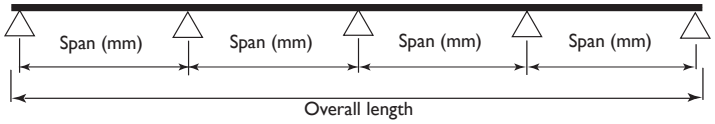
Three Span



Double Span



Four Span



7.0 Floor Plank Installation Process

1. Install Tremco ALTA 300-40 isolation tape (or similar) to all steel structures in contact with aluminium members.
2. Starting at the left hand side, and working across the structure towards the right hand side, layout floor planks as per structural details. Particular attention should be given to:
   a floor plank milling details and plank dimensions match detailed structural drawings
   b required notching out around impeding structures or penetrations,
   c ensuring that edged floor planks are equidistant from the internal edges of the Gallery structure and that the plank ends align.

   Optimum floor plank layout is for a theoretical 4050 walkway. Please note that this layout provides for a theoretical spacing of 1.25mm between each plank. In practice the actual spacing may slightly vary from this, however the overall dimensions should be achieved.
3. Mark out and predrill both aluminium Floor planks and supporting steel structure with 5.6mm diameter hole to receive 14 x 31 self-drilling screw. NB the left hand edge planks are fixed at both sides of the plank whilst the remaining planks are only fixed at the tail edge as per Figure 5.
4. Enlarge hole in floor plank from 5.6mm to 10mm to receive nylon grommet washer.
5. Thoroughly remove all swarf / dirt etc. prior to final fitting of floor planks and or application of silicone.

Note that 2 screw fixings are required to the underside of the left hand edge floor planks, whilst only 1 Taptite fastener is required for all other planks.

Figure 4

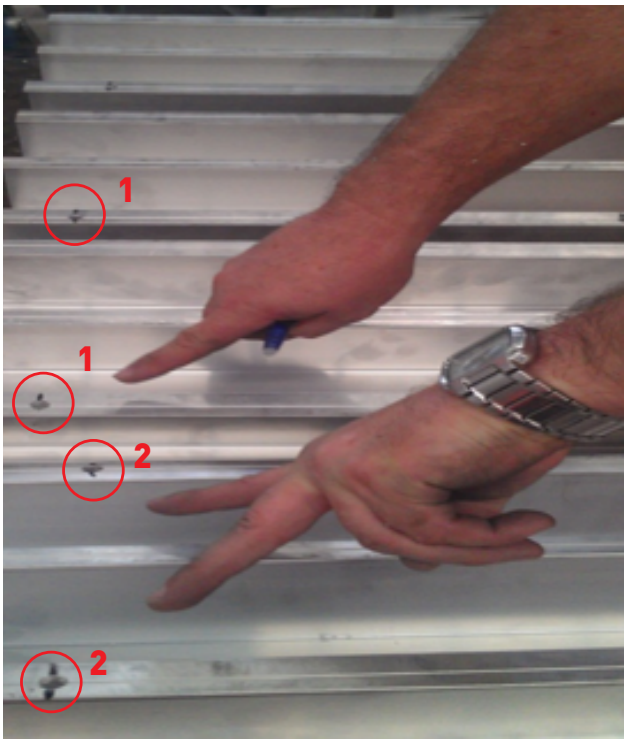


Figure 5

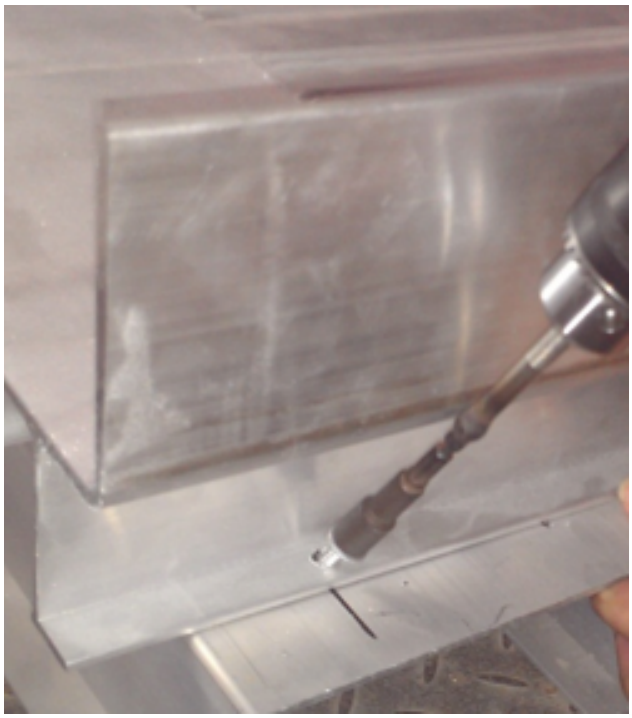
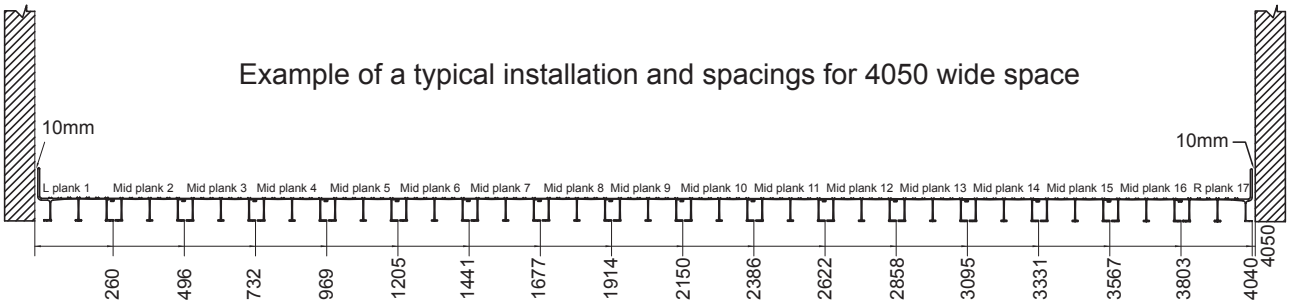


Figure 3



6. Commencing from the left hand side of the structure. Screw fix 1st plank into position, with a battery or electric screw gun, at both the outside edge of the structure and on the internal edge of the plank as shown in Figure 6. NB a 150mm extension bit will be required to achieve this.
7. Position the next plank. Prior to final positioning of the plank apply appropriate silicone sealant to the "female edge" of plank and then slide the plank onto the fixed plank. (Figure 9) Ensure any excess silicone is removed prior to silicone cure to avoid contamination with foreign material or differential staining of the flooring.
8. Screw fix this plank as per the first, installing screws only to the edge furthest away from the affixed plank, then install pop rivets to plank join, as per detail. (alternatively rivets may be installed after silicone sealant has cured to avoid aluminium swarf contaminating "wet" silicone. (Figure 10)

Figure 6

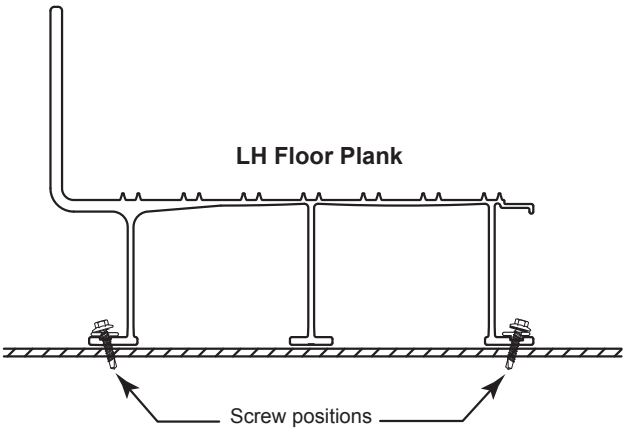


Figure 7

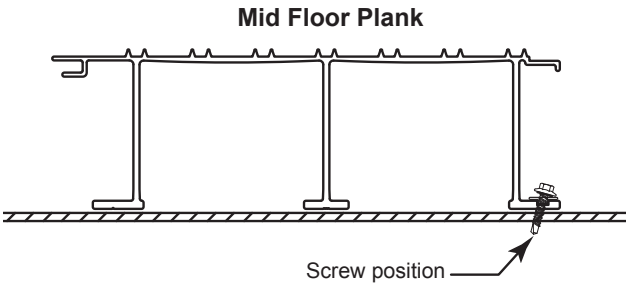


Figure 8

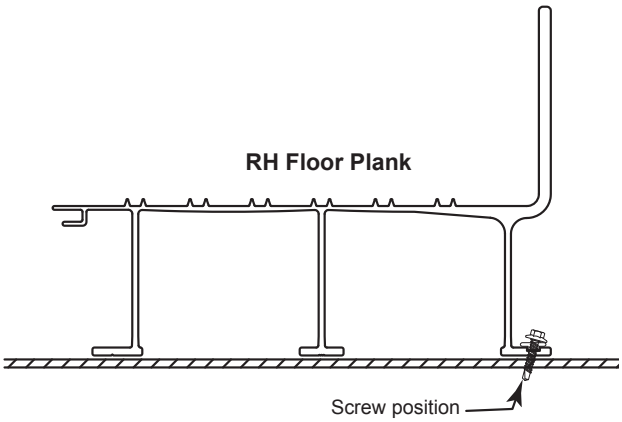
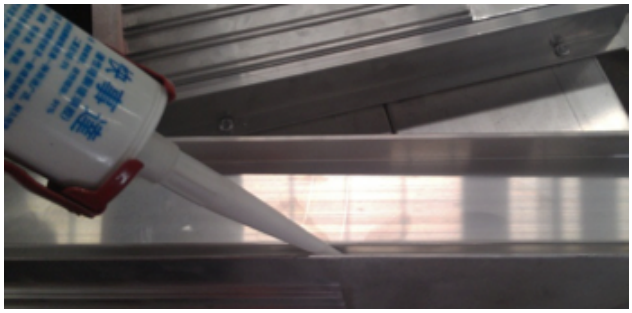
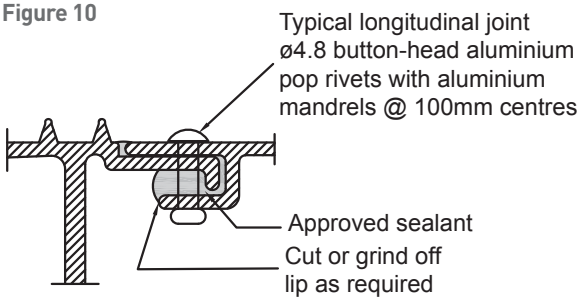


Figure 9



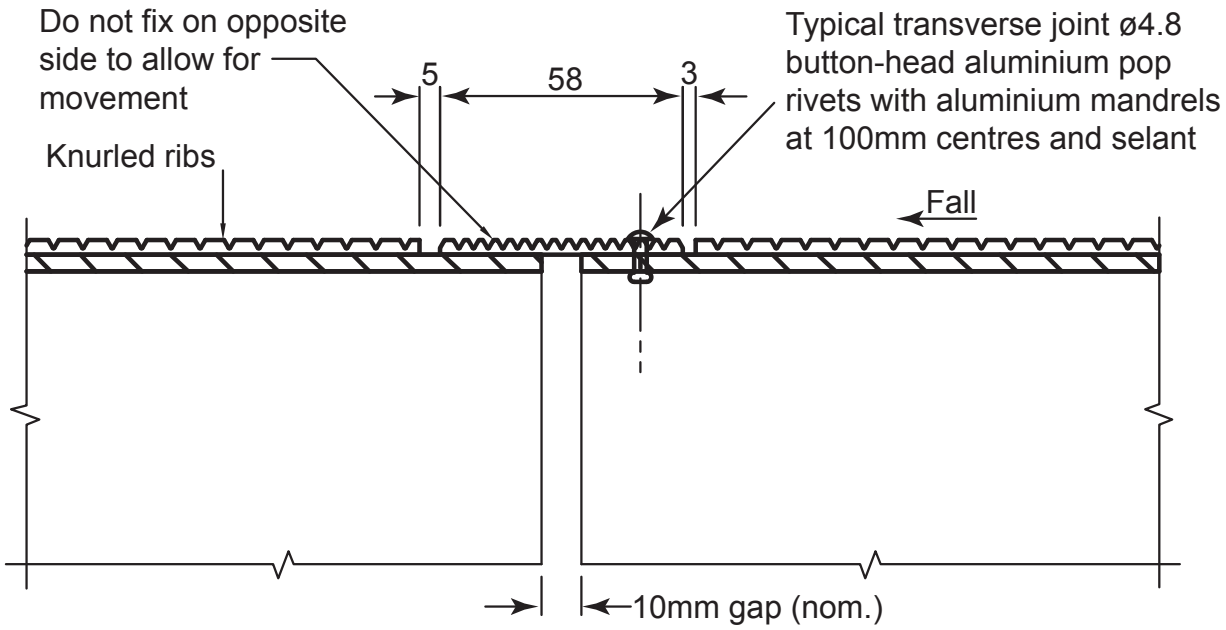
9. Repeat this procedure for the remaining planks including the final RH floor plank as per Figure 8.
10. Remove swarf from pop rivet installation and either, apply finishing bead of silicone, or cut back excess silicone to achieve a "flush finish" to the plank join.
11. Transverse joints should be completed as per detail. (Figure 11)

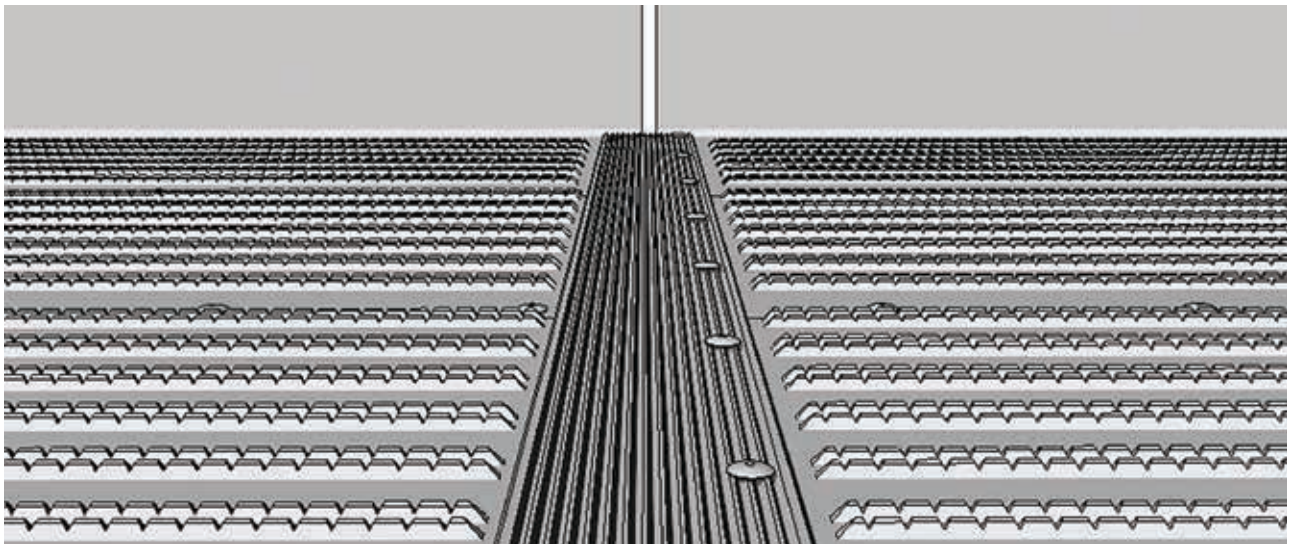
Figure 10



Floor plank joint detail

Figure 11: Transverse joint detail





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Product Descriptions

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