



PERMADEC
SAFE | LIGHTWEIGHT | DURABLE

GRP PERMANENT FORMWORK

PERMADEC
SAFE | LIGHTWEIGHT | DURABLE

Head Office Australia

Permadec Pty Ltd
Level 16, Tower 2
Darling Park
201 Sussex Street
Sydney NSW 2000
Australia

00 61 2 9052 4975
sales@permadec.com.au

permadec.com.au

Photo of Permadec Panels installed on
the Sydney Gateway bridge in Australia

LEADERS IN GRP PERMANENT FORMWORK GLOBALLY

Permaderc Formwork Panels are primarily used as permanent bridge beam infill shuttering.

In addition the many advantages of the strong, lightweight, durable, steel reinforced glass fibre panels extend its range of uses to include the construction of:

- Platforms
- Culvert's
- Ramps
- Jetty's
- Floors
- Tanks
- Sewage Treatment Plants
- Capping Slab/Roof

...and many other applications

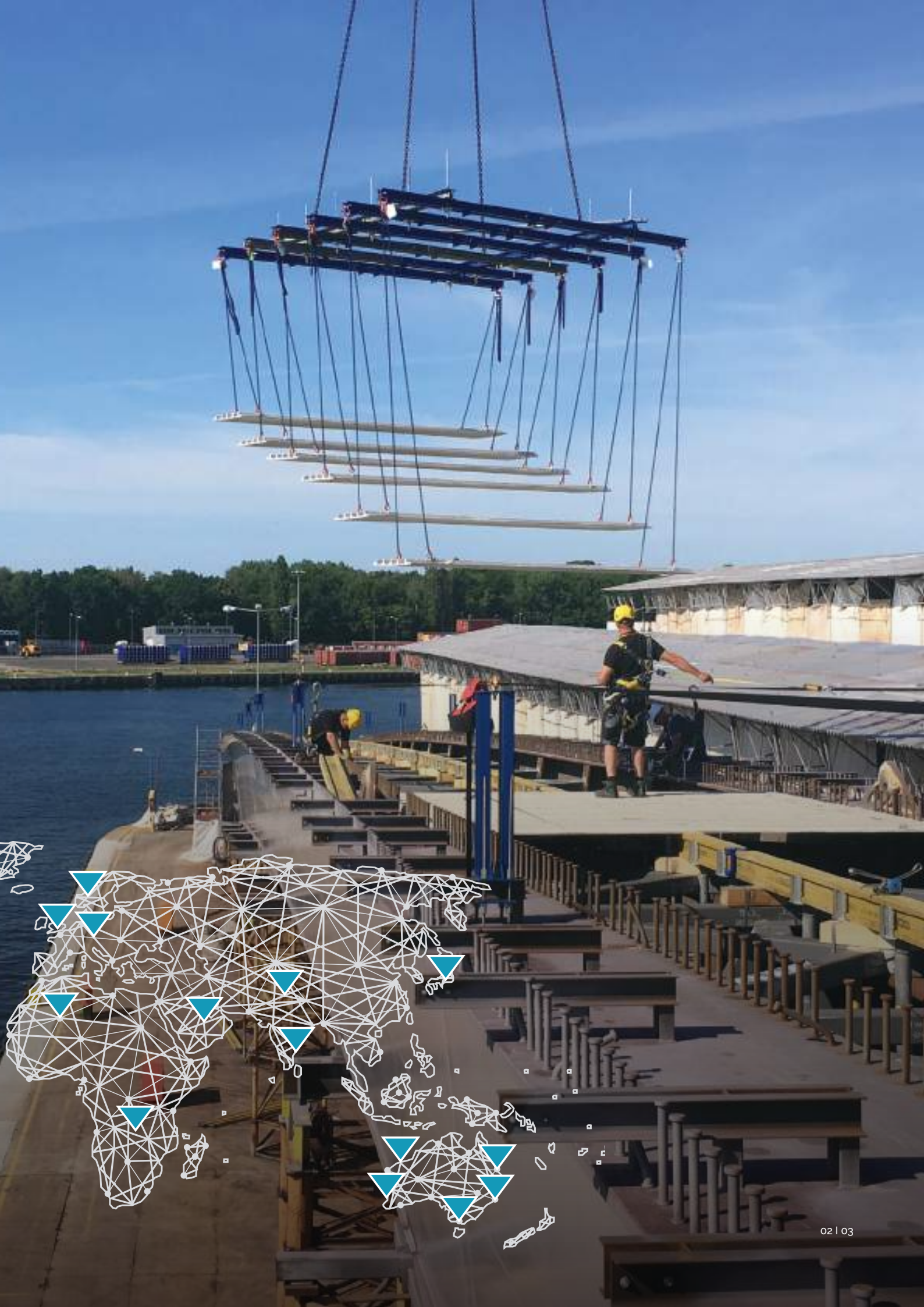
The ease of installation and lightweight nature of Permaderc enables customers to make savings on site labour from reduced handling costs. As the panels are custom built and delivered ready for use, minimal on-site cutting is required.

Access to the underside of the panel is unnecessary, eliminating the need for expensive scaffolding or staging. As the panels are a permanent fixture, the requirement for stripping after casting is eliminated. Permaderc has supplied Permaderc panels to over 5,500 structures worldwide.

Permaderc has exported panels across the world, and has supplied projects in the UK, Ireland, Czech Republic, Poland, Norway, Sweden, Uganda, Trinidad, Cayman Islands, Jamaica, Sri Lanka and Australia. The makeup of the panels lends itself ideally to international shipping as it is relatively light in weight and stackable, therefore maximising the use of available space on container loads.

Contents

1	GRP PERMADEC OVERVIEW	02
2	PERMADEC RANGE	05
	ADVANTAGES	05
	PANEL RANGE	06
	PANEL CHARACTERISTICS	08
3	USING GRP PERMADEC PANELS	10
	HANDLING	10
	SEALANT / INSTALLATION GUIDANCE	11
	CUTTING OF PANELS	12
	DESIGN CODE GUIDANCE	12
4	HEALTH AND SAFETY	13
5	TRANSPORT AND PACKAGING	13
6	DESIGN PRINCIPLES	14
7	SEALANT DATA	15



SYDNEY GATEWAY

Permadedec supplied five different structures throughout the Sydney Gateway Project. Various panel sizes including penetrations were delivered. In total, over 14,000m2 of GRP Permanent Formwork was supplied.



ROZELLE INTERCHANGE

**The World's Tightest Curvature
Incrementally Launched Bridge.**

Tapered Permadedec panels were engineered, designed, and supplied to this project. The tapered panels provided an engineered solution for on site installation increasing efficiency. Permadedec's lightweight panels are an ideal solution for incrementally launched bridges.



PORT HEDLAND

Permadedec's GRP Gel Coated panels were an ideal fit for the Port Hedland Project. Our gel coated soffit forms a finish that is perfect for projects located near adverse weather conditions such as salt water. 11 bespoke panel types were designed and supplied to the Port Hedland Project in WA. Permadedec delivered over 5,000m2 of panels in total.



WHITEMAN PARK

Permadedec's type 5 panels were supplied to Whiteman Park Metronet, which will become a major transport hub on the Morley-Ellenbrook line in WA. An engineered solution of penetrations were included in our panels to minimise cutting of our panels on site. Detailed design drawings were provided to site to allow for efficient instal of Permadedec.

PROVIDING AN ENGINEERED SOLUTION TO THE ASIA PACIFIC MARKET.



If you are constructing or designing a concrete deck you may save time and money with the Permadedec formwork system.

Permadedec offers all the advantages of a lightweight, versatile permanent formwork system, some of which are listed below. It is capable of spanning up to 5.7metres with loads in excess of a 700mm concrete deck. Permadedec Panels comply with all relevant design standards including Department of Transport Advice Note BA 36/90. Further information is available online at: www.permadedec.com.au



**Lightweight
& very strong**



**Large span
capability**



**Safe working
platform**



**Designed to suit
application**



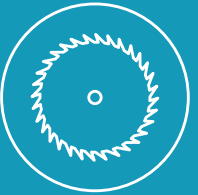
**Quick
manufacturing
& laying times**



**Minimise on
craning with
offsite installation**



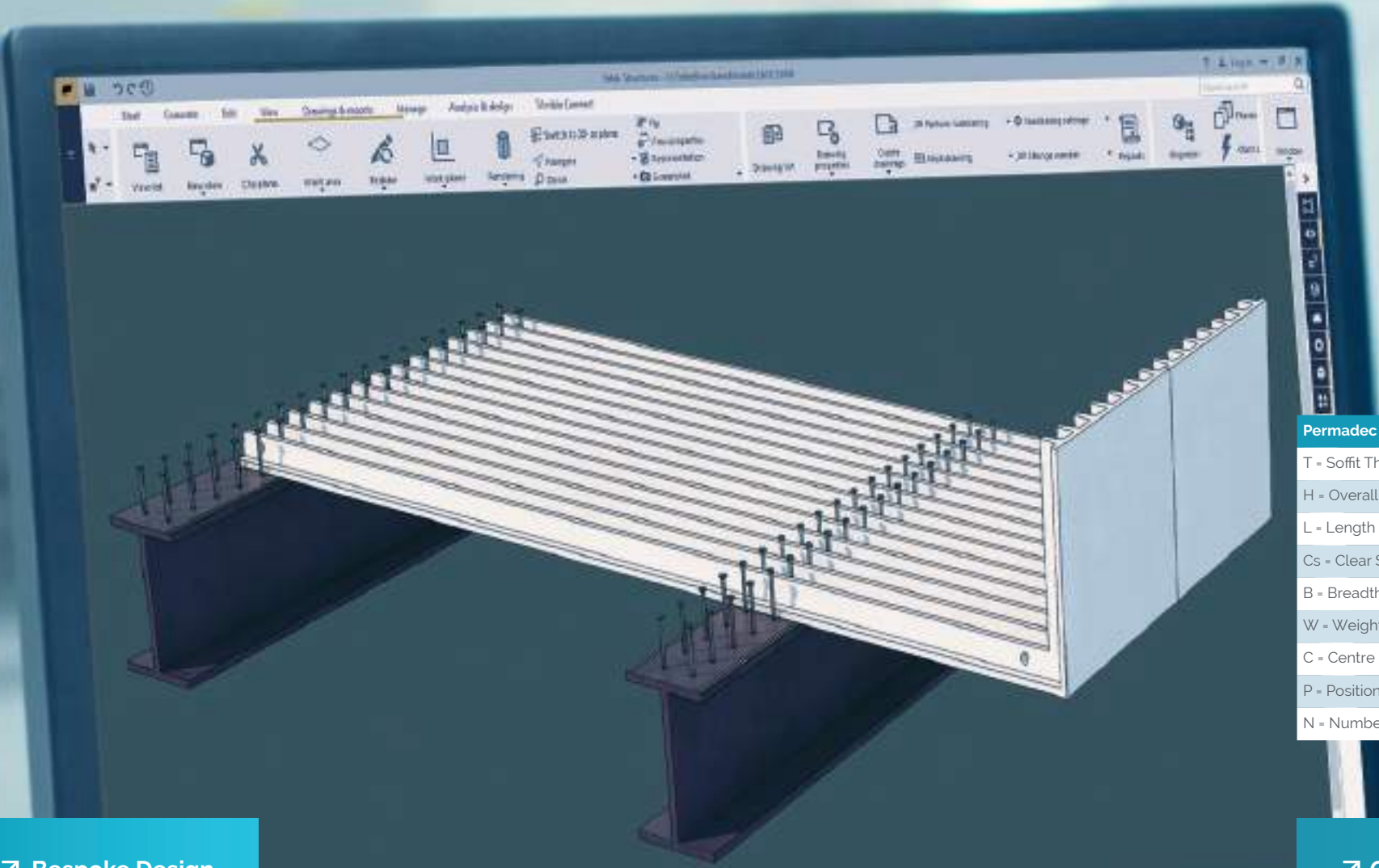
**120 years
durability**



**Safe site cutting
& easy installation**

PANEL RANGE

Permadec range includes various panel types to suit our clients requirements.



Permadec Standard Panel Range		1	3	3A	3B	3C	4	4A	4B	4C	5A	5B	5C	6
T = Soffit Thickness	mm	6	8	8	8	8	8	8	8	8	8	8	8	8
H = Overall Height inc. rib	mm	38	38	50	63	75	38	50	63	75	63	75	105	90
L = Length (maximum)	mm	1200	1400	2100	2800	3700	1500	2300	3100	3800	3300	4200	5300	5100
Cs = Clear Span (maximum)	mm	1100	1300	2000	2700	3600	1400	2200	3000	3700	3200	4100	5200	5000
B = Breadth	mm	1220	750	750	750	750	875	875	875	875	700	700	700	700
W = Weight	kg/m²	16-20	24-29	29-40	37-57	43-64	26-33	32-46	42-65	49-74	53-82	58-89	94-116	97-108
C = Centre of Ribs	mm	229	150	150	150	150	125	125	125	125	100	100	100	100
P = Position of End Ribs	mm	38	75	75	75	75	62	62	62	62	50	50	50	50
N = Number of Ribs	mm	6	5	5	5	5	7	7	7	7	7	7	7	7

7 Bespoke Design & Modelling

We pride ourselves on producing bespoke panels to suit the clients individual requirements, whether it be size, type or any other preference.

7 GRP Composite Panels

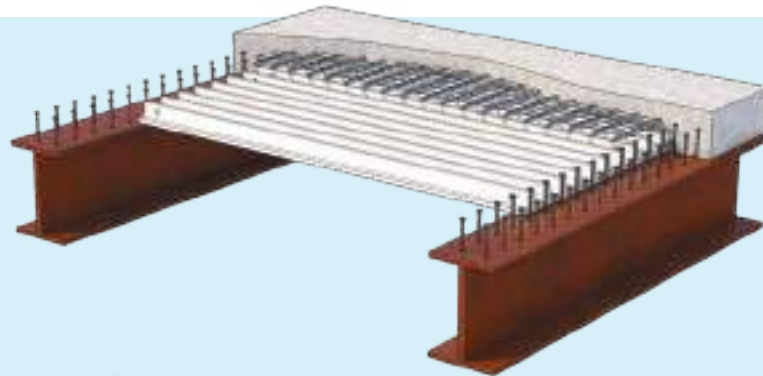
If you are constructing or designing a concrete deck with short span requirements between beams our Value Engineered GRP Composite Permadec Panel will save you even more time and money. Permadec Composite panels offer all the advantages of a lightweight, versatile permanent formwork system, capable of spanning up to 1.5 metres with loads in excess of a 400mm concrete deck thickness.



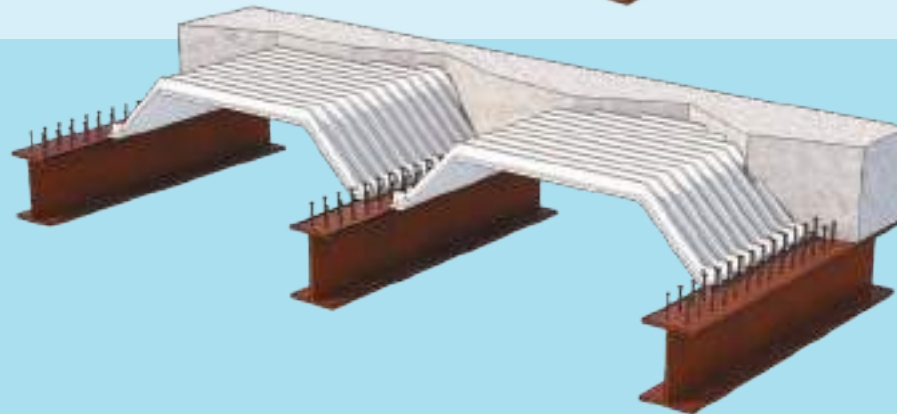
PANEL CHARACTERISTICS

Permadec can offer panels not only to suit the soffit but also the diaphragm, bottom flange and vertical elements as shown. Saving time and cost on site when compared to traditional temporary methods. Off-site installation is also possible in certain scenarios.

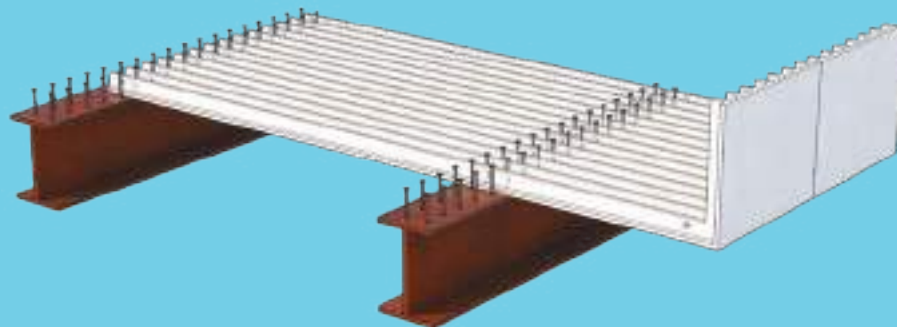
Typical Permadedec Standard panel installed on steel beams



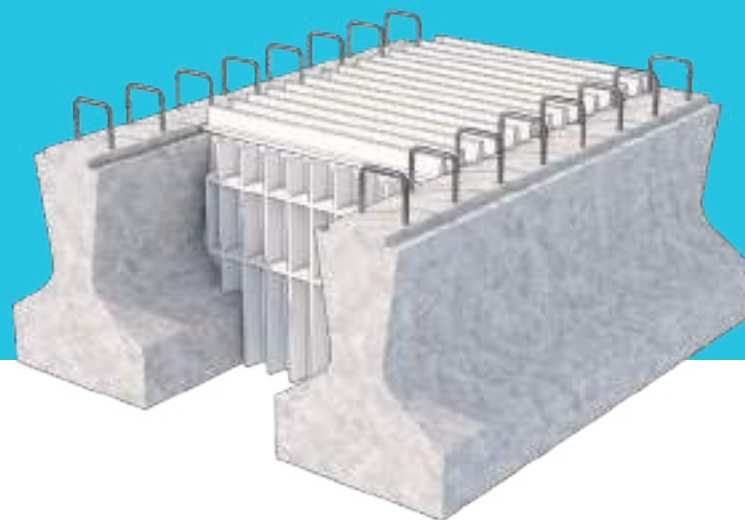
Typical Permadedec Haunched panel installed on steel beams



Typical Permadedec Cantilever panel installed on steel beams



Typical Permadedec Diaphragm panel installed on concrete beams



LOW IN WEIGHT

Varies from 15 to 104kg/m² dependent on span.



LARGE SPAN

Permadec has supplied panels to span 5.7m carrying 1.2m of wet concrete and has the capability to handle much greater spans.



DESIGN

Permadec offers a complete design service for all of its Permadedec panels to ensure our customer requirements are accommodated



FINISH

May be supplied with a variety of permanent finishes to soffit, such as standard textured, smooth matt or smooth high gloss with various colours upon request. Standard panels are supplied in Light Grey to British Standard 4800 10-A-03.



HANDLING

Prior to lifting, the contractor is advised to check the weight of a typical panel against its company policy for the maximum weight any one operative is permitted to lift. This will then indicate the number of general operatives required to lay any one panel.



Important Notice: The installation information given is provided only as general guidance for trade contractors. This document does not form a specification. The responsibility for the installation of the panels rests wholly with the contractor and not with Permadec.

SEALANT / INSTALLATION GUIDANCE

Sealants should be applied to steel soffits or concrete rebates once the formwork has been made available locally. Permadec recommends 10 to 20 linear metres to be laid at once, depending on conditions applicable at the time of laying. This can be increased once fluency has been established from the repetitive nature of the work. The formwork panels are to be lifted into position and rested on the sealant. Care should be taken to ensure the adequate bearing to the ends of the formwork panel.

The sealant positioned between the panels at the point where the panels butt up against each other should be applied at any point prior to pouring concrete and after positioning. It should be noted that a nominal gap of an average 2mm may appear between the panels, this is anticipated.

Once the panel is correctly positioned it is capable of supporting the live weight of the operative and can be walked upon. Caution should be observed working near the edges of panels, especially at heights.

Permadec Butyl 2 x 6mm Ø Twin-track adhesive butyl bead x 8mtr

This provides the seal between the panel and the bearing component i.e. concrete/steel beam. This sealant arrives on a roll of 8m in length and is applied to the bearing surface; the backing is then removed prior to laying of panel.



This sealant has been specially designed to stop ingress of water during the life of the structure and also to prevent any grout loss when pouring. It has been tested to prove excellent adhesion against two substrates, the maximum force required to remove the panel after sealing is equivalent to 6.15kN/m run of panels.

Permadec Grey adhesive butyl tape with polyester backing 50mm wide x 35mtr length

This is used to seal the adjacent panels. This arrives on a 35m roll and is applied firmly to the butt joint between panels on the top side surface prior to fixing rebars and pouring concrete.



CUTTING OF PANELS

Permadec panels can be cut using a standard Stihl saw (or similar). A steel blade should be used; bearing in mind the panel has a stone like texture with steel content.

For personal safety, please ensure suitable protective clothing, goggles, respiratory mask, leather gloves etc. as standard to be worn for all cutting operations.

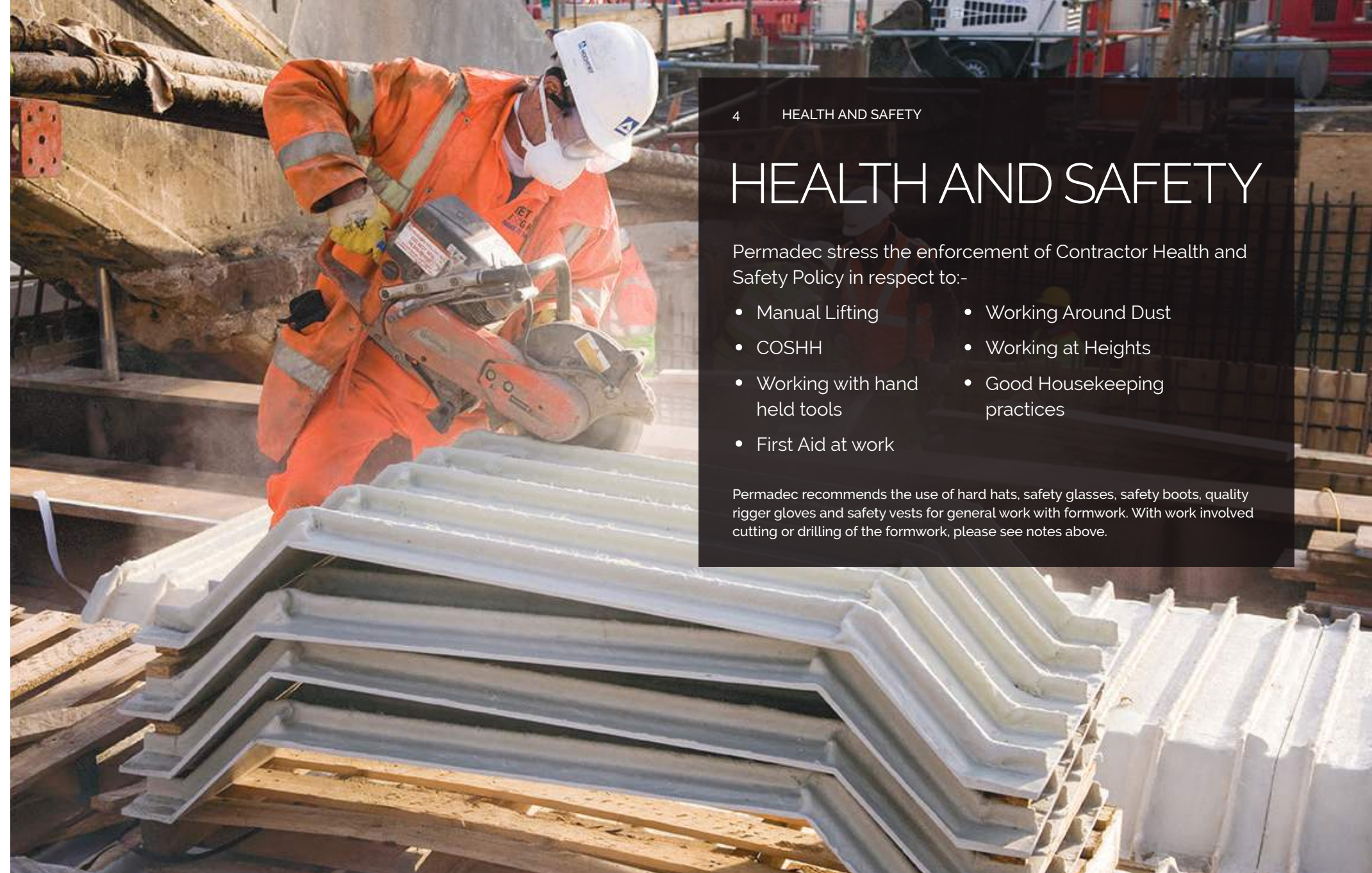
Should you cut through the ribs of the panels, please note that both ends of each rib still need to be supported prior to concreting. On the cut edges this can normally be supported either off the diaphragm shutter, alternatively by using the shutter to cast a rebate into the concrete to provide a supporting edge. Cutting through a rib will also expose the steel inserts; these should be painted with cold zinc metal paint such as 'Galvafruid' or others for protection prior to pouring concrete.

If you are cutting more than 2 ribs from a panel or plan to cut for openings, then please check with Permadec that this is suitable.

PLEASE NOTE: The responsibility for the implementation of health and safety regulations lies solely with the Contractor once the formwork has been delivered.

Panels should be free of all traces of oil and grease at the time of concreting. Any damaged panels should be rejected prior to installation. When placing panels, ensure that the bearing cover is equal on both sides. A minimum bearing of 30mm to Ideally a min bearing of 30mm is required on the surface of the concrete rebate or the steel beam flange.

Concrete should be placed and compacted in accordance with the requirements of local codes and should not accumulate in heaps or be dropped from heights greater than the code allows.



HEALTH AND SAFETY

Permadec stress the enforcement of Contractor Health and Safety Policy in respect to:-

- Manual Lifting
- COSHH
- Working with hand held tools
- First Aid at work
- Working Around Dust
- Working at Heights
- Good Housekeeping practices

Permadec recommends the use of hard hats, safety glasses, safety boots, quality rigger gloves and safety vests for general work with formwork. With work involved cutting or drilling of the formwork, please see notes above.

DESIGN CODE GUIDANCE

In 1994 The Department of Transport issued further guidance on BA 36/90 The Use of Permanent Formwork with Interim Advice Note 131/11 as it was sometimes misinterpreted with regard to deflection of formwork panels. i.e It is the creep deflection of formwork only between completion of concreting and 4 hours later which should not exceed 1 in 300 of the span.

Permadec panels fully meet this criteria as they do deflect during concrete pour but do not creep during concrete setting.

For safety reasons panels are recommended to be made long enough so that they can never drop out, if accidentally dislodged during rebar fixing. This can be done by specifying a panel length which if dislodged will butt up to the shear studs on a steel beam, but still have the minimum recommended bearing at the opposing end, therefore preventing possible dislodgement. In 2006 BS8500 was updated with regard to rebar cover, minimum cover between GRP interface and nearest reinforcement bars was reduced to only 20mm. This now makes it much easier to accommodate the GRP panels into the deck design.

Spacer blocks can be used supported from bearing beam or GRP Permadec panels themselves. Typical spacer block information is available upon request.

TRANSPORT AND PACKAGING

Permadec offers various packaging methods to suit our client requirements. Our Permadec panels are typically loaded on standard pallets, as individual packs. Each of these packs is clearly marked with panel type and dimensions.

They are banded and shrink wrapped ready for transportation. We apply a stick on label formwork pack to state as follows:

- Receiving Contractor
- Reference Number
- Project Name
- Project Address

Permadec panels are packed singularly with soffit face down to avoid the requirement turning during installation. The bottom panel in all packs has the rib face down.

We also offer a crating service that allows containers for shipping worldwide.

For distribution overseas Permadec use pallets which meet the International Standards for Phytosanitary Measures No. 15 (ISPM 15) for exporting.

DESIGN PRINCIPLES

Engineering Theory of Bending

The design of the panels is based on Engineering Elastic Theory of Bending where the plane of the section will remain plane after bending.

Design Standard

An appropriate standard for the design of permanent formwork does not exist. By default, the industry has adopted the advice note recommendation provided by HA to design permanent formwork (BA 36/90). Whilst this advice note offers very useful information and guidance to design and installation of the formwork, it does not extend its scope and falls short of being a code of practice thus engineering judgment sometimes is necessary to finalise the design.

Design Load

The loads have been taken from recommendation of BA36/90 with view that they are higher than the limits stipulated by Eurocode.

Loads to be considered in the design are as follows:

Self-weight of the panels

Wet concrete of the insitu deck

Live load

BA 36/90- Clause: 4.1.1 (iii) recommends that the formwork shall be capable of resisting a live load of 1.5kN/m².

Table 4.1 of EN 1991 part 1.6 recommends a value of 1kN/m² to be considered as a representative value of construction load over the area of panel.

Section Design

Stress analysis of the section is carried out with a view that the stresses shall remain within the linear elastic limit of the material. We also utilise the advantages of composite section in our design. Thus in stress analysis, a converted section based on their relative modulus of elasticity (GRP & Steel) is used.

The section will then be designed based on the ultimate capacity with the aim of a minimum of 1.5 safety factor to allow for any unforeseen events. The permanent formwork is designed, executed and maintained with application of appropriate degrees of reliability to:

- **Perform adequately under all expected loads**
- **Withstand all loads with adequate durability**

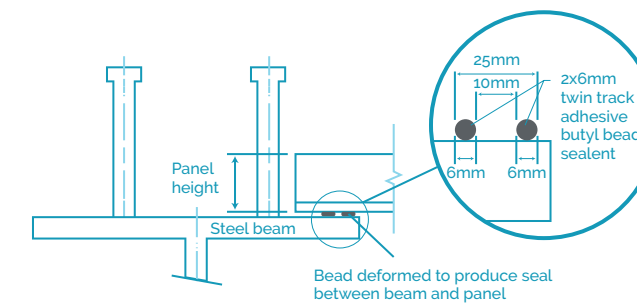
Level of reliability has direct relationship with certainty of the design. With an accurate approach reflecting a realistic execution situation, an appropriate safety factor is used. The validity of use of the design principles are assured because:

- **Panels are designed by appropriately qualified and experienced personnel.**
- **We ensure that the execution is carried out by personnel having necessary skill and experience.**
- **Products are produced under a highly monitored and controlled environment. Permadedec employ and maintain a Quality Management System which is BE EN ISO9001 Certified.**
- **A quality control policy is in place to ensure the products are checked prior to delivery.**

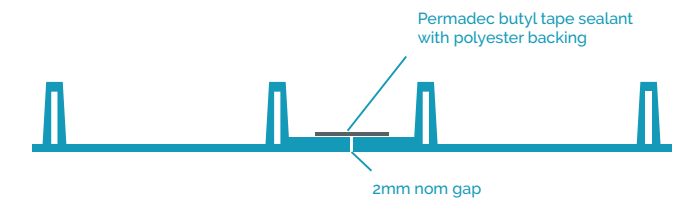
Taking all the above facts into account, with the use of the technical guidance of the advice note, reviewing all available relevant codes of practice and our engineering judgment, we are confident that our design with allowance for appropriate degrees of safety factor, results in the production of a high quality product suitable for use in the project. As an additional step, at request we can carry out a load test on a panel to demonstrate the site condition.

SEALANT DATA

Permadedec Butyl 2 x 6mm Ø Twin-track adhesive butyl bead x 8mtr



Permadedec Grey adhesive butyl tape with polyester backing 50mm wide x 35mtr length



Permadedec Butyl 2 x 6mm Ø Twin-track adhesive butyl bead x 8mtr for sealing between Permadedec panel and steel beam flange, or concrete rebate. This acts as a long term seal to stop moisture travelling from the soffit of the panels to the beam flange, therefore cannot reach past this to concrete or onto studs/rebar.

Description

High performance strip-bead sealants based on new technology which includes high strength rubber compounded with selected fillers and plasticisers to give very good movement accommodation and adhesion to most building materials.

For use where strong jointing sealants is required which offers good bonding characteristics. Good joint performance requires good initial contact between the strip and both surfaces of the joint.

Typical uses: Air, dust, water seal in construction and automotive industry. High performance bonding of plastic damp proofing and barrier membranes. Industrial roofing lap & cover joint sealing. Marine, Telecommunications. Sealing water retaining structures. Approved by: Water Research Council, Nat, Fed Roofing.

Performance: Quality Assured to ISO9001:2000

Movement accommodation +/- 15%

Tensile Strength: 98 kPa

Shear Strength: 46 kPa

Outdoor service temperature: -40°C to +90°C

Permadedec Grey Adhesive Butyl Tape with polyester backing 50mm wide x 35mtr strips with clear polyester backing to one side for sealing joints between butt joints of panels. This stops grout loss and also acts as a long term seal to stop moisture ingress to concrete or rebar.

Application

Surface preparation: All surfaces should be clean, dry and free from frost, grease and loose materials. Apply directly from the reel onto one surface pressing to give adequate initial adhesion. Push firmly to ensure good contact with full area of strip along the length of the joint.

Application temperature: +5°C to +30°C