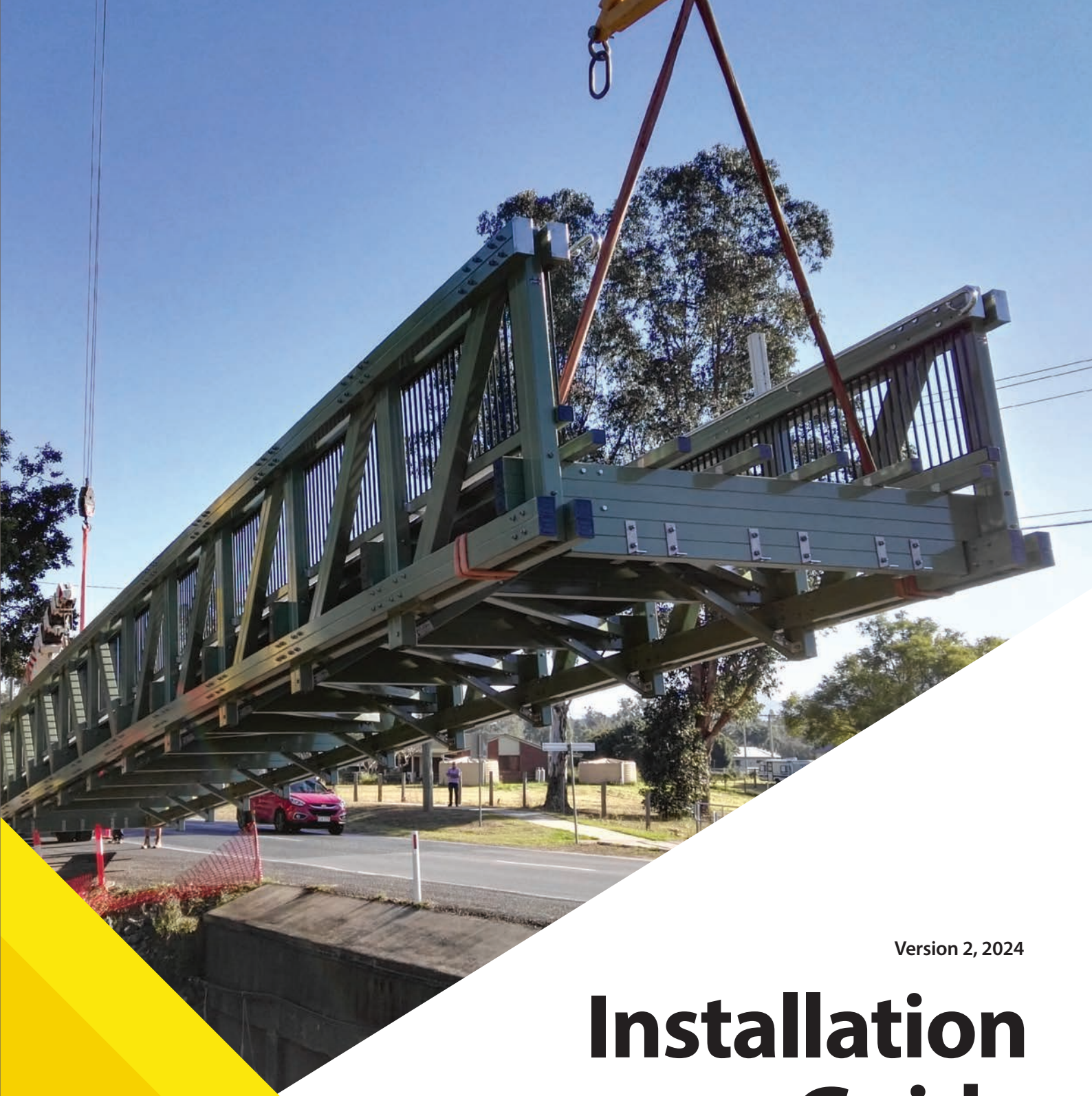


Version 2, 2024

Installation Guide

Wagners Composite Fibre Technologies (CFT)

WAGNERS

Coogee Beach Stairs, NSW, AUS

Table of Contents

DISCLAIMER

The information and recommendations contained in this Installation Guide have been prepared with due care and is offered for the purpose of assisting in the installation of composite fibre products. Wagners CFT Manufacturing Pty Ltd ("the Company") reserves the right to change, cease manufacture or alter any of the products represented in this Guide.

It is assumed that the installer of the composite fibre product has a pre-established, general knowledge of fabrication, building and installation. The installer should also be aware of any local, state or federal laws that could be applicable when installing a structure using Wagners composite fibre products.

Whilst every effort has been made to ensure that this guide is in accordance with current practices, it is not intended as an exhaustive statement of all relevant information. Wagners CFT Manufacturing Pty Ltd accepts no responsibility for errors in, omissions from the manual, nor designs or work done, or omitted to be done, in reliance on this manual. To the fullest extent permitted by law, the Company expressly disclaims all and any liability for direct or indirect damage, injury or loss however caused, to any person, whether as purchaser or otherwise in relation to any product manufactured or recommended by the Company.

Cooktown Fishing Platform, North QLD, AUS

Introduction

Composite materials have proven to be a material of choice with an increased use by civil engineers in recent years. As the use of composite materials becomes more common, their performance advantages have been well received by the aerospace and nautical industries. Additional performance advantages such as high strength, low weight and a long service life are achieved as Wagners composite products do not corrode, rot or shrink. In certain applications, composite materials are superior to traditional construction materials such as steel and wood, ensuring a practical investment for the future of the asset.

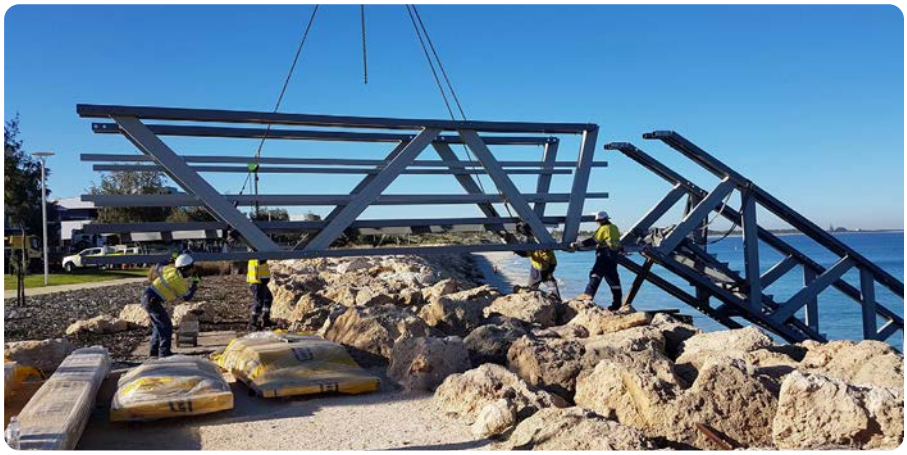
Wagners has pioneered the use of composite materials both in Australia and internationally, exporting products from Toowoomba, Queensland to locations such as the United States, United Kingdom, New Zealand, Russia, Malaysia, Brazil, Canada and Middle East. We are credited with the manufacture, design, and installation of the world's first composite road bridge on a public road network. Our continued research and development ensures we remain a leader in the design and implementation of this exciting building material.

Wagners use the 'pultrusion process' to fabricate the structural fibreglass sections. These sections are traditional in geometry and shape to that of rolled hollow section steel but are manufactured from fibreglass reinforcements and vinyl ester resins. The material combination has been chosen by Wagners to optimise the structural system as well as maximise cost efficiency.

In the past, our composites have been used in transportation, marine and electrical applications, amongst many others. However, it is not until recently that the ability to build large structures has been fully utilised by our experienced staff. Many years of research and development have resulted in the successful application of composite fibre technology to a number of products including wharves, road bridges, electrical crossarms and pedestrian structures.

Pre-assemble

Partial pre-assembly



Kit form/ Full on-site assembly

Supply Options

Wagners' composite structures can be supplied to site via the following options:

- Pre-assembled
- Partial pre-assembly
- Kit form
- Full on-site assembly

PRE-ASSEMBLED

This is the most efficient option of supply if there is accessibility for a loaded truck and crane. Products such as road bridges, pedestrian bridges, decks and beams will mostly arrive to site assembled and ready for a quick and easy installation assuring minimum community disruptions and reduced time on-site.

Transport of components to site can be arranged with Wagners utilising our in-house transport fleet. By request, we can supply a site crew to take care of all facets of fitting of the composite structure.

PARTIAL PRE-ASSEMBLY

Larger composite structures may need to be transported in a partially pre-assembled state whereby portions of the structure are assembled by the Wagners production team but still require final assembly and installation on-site. Typically, long span bridges or large wharf projects will come in this form due to transportation restrictions.

KIT FORM

This option requires a higher level of construction expertise as there is potential for cutting, drilling, and inserting on-site. For this option, Wagners will aim to provide as many members as possible cut to size, pre-drilled, inserted, and glued, however due to possible site variables such as final pile layout, some of these processes may need to be completed in-situ.

All members supplied as part of this option will be labelled with the corresponding member ID to match the construction drawings for ease of installation.

This option lends itself well to the installation of boardwalks where members are typically smaller and can be moved without the aid of large machinery.

Wagners complete most of the manual work in the factory which greatly reduces the time on-site and ensures all components are installed with ease.

FULL ON-SITE ASSEMBLY

This option requires the highest level of on-site support and experience compared to the other options listed above. Composite members, inserts, bracketry and hardware are delivered to site and will require cutting, drilling, inserting, and assembly by the installer. The aim of this installation guide and the simple Wagners design ensures this process is easily completed by individuals with a good knowledge of building and construction.

For all above forms, Wagners CFT design methodology integrates BIM Technology utilising Revit software. Upon finalization, Wagner provides a link for accessing the comprehensive 3D model, which encompasses detailed product specifications, components, dimensions, and a visual representation of the final structure post-completion.

2.0

Piling

2.1 Pile Driving

SAFETY

- Helmet
- Eye protection
- Hearing protection
- Steel cap safety boots
- Safety gloves
- Long sleeves

TOOLS

- Vibratory pile driver, **OR**
- Impact/drop hammer pile driver
- Wagners piling frame (recommended)
- Survey level Instrument

PROCEDURE

1. Wagners' fibre composite piles can either be drop hammer or impact/vibratory driven. The driving process is very similar to small steel or timber piles. The construction drawings will have details on the approximate drop hammer weight and drop height required as well as the required pile set to achieve effective resistance of design loads. Drop hammer weights and drop heights can be varied from the recommendation, however this should be discussed with Wagners for calculation of the relevant pile set verification details that correlate to the specific hammer chosen for the project.
2. Prior to commencing any excavation, ensure that the "dial before you dig" request has been made, thoroughly reviewed, fully understood, and promptly acted upon to mitigate any risks associated with underground utilities.
3. Establish the pile locations and level region in proximity to the piles in order for the driving jig to sit level on the ground.
4. Place the pile driving jig in the correct position aligned with the survey mark and then pin the jig into the ground at the required location.
5. Place the piles into the jig at correct distances apart in conjunction with the construction drawings.
6. Ensure that the end of the SHS pile with the anti-crush block insert the end been driven into the ground. CHS piles do not require anti-crush insert at the bottom when driven into sand/clay soils due to their geometry.
7. Manoeuvre the pile driver into position, ensuring the driver is level with the pile.
8. Begin driving of the pile using the chosen driving method. For drop hammering, drive the pile one blow at a time ensuring it is level and no twisting is occurring. When using an impact/vibratory hammer, utilise a spotter to help monitor the driving progress of the pile and check progressively to ensure it's level and there is no twisting.

When driving fibre composite piles, it is imperative to constantly monitor the progress of the driving to ensure no damage to the pile (both above and below ground) is occurring.

When using a drop hammer, continue driving until the permanent set over five blows is reached. This requirement will be detailed in the construction drawings. If required by the certifying engineer, additional testing of the pile may be required and could include re-checking the permanent set after 24 hours or loading of the pile and checking for any height changes.

When using a vibratory/impact hammer, it is very difficult to determine when the permanent set has been reached. Testing of the piles will be necessary to ensure the piles are embedded enough to withstand the design loads. Consult with Wagners about possible testing methods specific to the project and site conditions.

Possible testing options would include confirming the pile set progressively over the project using a drop hammer on pre-driven piles. Another option is for loading of the pile to simulate the expected design loads. Requirements for testing procedure, frequency and loading will be provided by Wagners or the certifying engineers.

It is highly recommended to use a steel cap when driving the piles to reduce damage from the impact or the vibrating hammers. Once the pile has been driven to the required depth, cut off any excess or any damage to the top of the pile caused by the driving process.

Refer to the following section if pile splicing is required.

Positioning of piles using jigs

Drop hammer

Impact/vibratory hammer

2.2 Pile Splicing

SAFETY

- Eye protection
- Hearing protection
- Respirator (recommended)

TOOLS

- Electric and/or battery powered drill (min. 1,800 RPM recommended)
- Hole saws (diamond tipped recommended)
- Wagners drill jig (recommended)
- Trestles (recommended)
- Clamps
- Screwdriver
- Nylon or rubber mallet
- Stop pins
- Impact wrench
- Spanners and/or shifters
- Anti-seize lubricant

PROCEDURE

If deep pile driving is required, pile splicing may be necessary. The splices will be supplied pre-manufactured by Wagners and will require installation into the piles on-site.

For specific information regarding cutting, drilling and bolting of fibre composite members, refer to the relevant sections of this document.

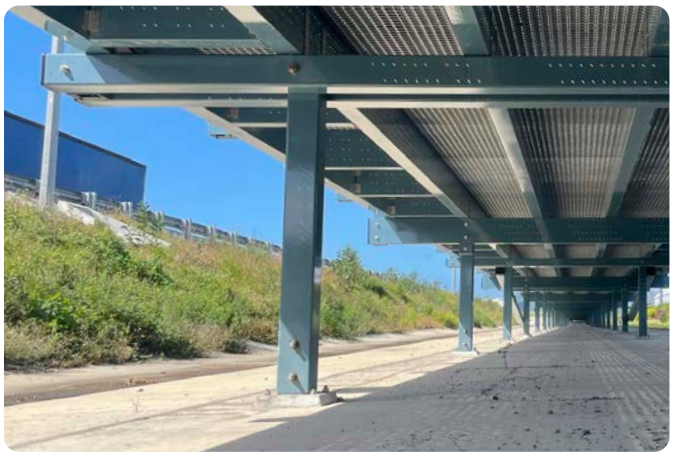
1. Drive base pile until there is at least 800-1,000 mm of 'clean' pile out of the ground. The pile is deemed to be clean if there is no damage to the pultrusion caused by the driving process.
2. Cut off any damage to the top of the pile before marking of bolt holes.
3. Once cut, mark the centre of the 22 mm hole for the splice bolt 600 mm down from the top of the pile and drill.
4. Set up the second pile to be drilled on trestles when possible and drill the second bolt hole 600 mm up from base of secondary pile.
5. Using a rubber or nylon mallet, tap pre-made splice into the secondary pile and secure bolt.
6. Once secure, place assembled top pile onto the bottom pile and secure second bolt through the bottom pile and splice.
7. Once all bolts have been secured continue driving as per the previously discussed methodology.

FRP SHS pile splice

Pile splice fixed into a pile

2.3 Other Foundation Options

Alternative foundation options can be FRP posts cast-into concrete bored pier, or fixed to the top surface of the concrete using shoe brackets and anchors. Photos in this page show (from top to bottom), post fixed to concrete using bolted shoe bracket and chemset anchor connection, bracing and aligning of the post for bored pier, post with insert and rod at the bottom, and post after concrete is poured.



Post fixed to concrete using bolted shoe bracket and chemset anchor connection

Bracing and aligning of the post for bored pier

Post with insert and rod at the bottom

Post after concrete is poured

3.0

Cutting

SAFETY

- Eye protection
- Hearing protection
- Respirator
- Gloves
- Long sleeves and/or white suit

TOOLS

- Circular saw (diamond tipped blade recommended), **OR**
- Drop saw, **OR**
- Angle grinder with cut-off wheel
- Trestles (recommended)

Cutting of FRP material using angle grinder with diamond coated blade

PROCEDURE

Cutting fibre composite is as straight forward as cutting steel or timber, however due to the abrasive nature of the material standard cutting blades need to be avoided. Diamond tipped blades are best suited for cutting the composite as they do not wear out as quickly. If generation of dust is an issue, wet sawing of the fibre composite is an option, however the member must be fully dry before any sealing of the cut is completed.

1. Mark members to cut as per construction drawings, ensuring an allowance for blade thickness is made.
2. If using a drop saw, hold member firmly against fence and ensure the blade is 90° to the member. A cutting guide is recommended when cutting bonded members using a circular saw to ensure straight and square cuts.
3. Blunt blades will cause burning/scorching to the cut fibres similar to timber.
4. Cleaning of the final cuts is generally not expected however 'dags' of fibre may become apparent if the member was not properly supported on either side of the cut or if the blade is starting to become blunt. A light sand or grind will remove this material and clean up the cut.

All pultrusion that has been cut on-site must be sealed.
Refer to section 9.2 for the sealing procedure.

- Place the member into the cutting jig/fixture at correct distances in conjunction with the construction drawings.
- To avoid tearing and the need for repairs, it's recommended to use an off cut piece as support during cutting.

Townsville Stadium Boardwalk, Townsville, QLD, AUS

Riveted Connections

4.1 Standard Riveted Connections

SAFETY

- Eye protection (recommended)
- Hearing protection

TOOLS

- Electric and/or battery powered drill
- *5mm drill bit (5mm is the tip/hole diameter)
- Pneumatic rivet gun, **OR**
- Battery powered rivet gun

PROCEDURE

1. Locate the two members to be connected and place the appropriate bracket on the joint as per the construction drawings.
2. Ensure that rivets with the correct grip range are selected. The grip range must accommodate the combined thickness of the brackets and the composite member.
3. Drill one hole in the first composite member and then install the rivet using either a pneumatic or battery powered rivet gun. Hand rivet guns are not recommended as the stainless rivets work-harden and are very difficult to 'pop-off' by hand.
4. Check that the bracket is correctly aligned and then drill and install a second rivet into the second composite member.
5. Follow the same process for the other rivets.
6. Typically, Wagners standard riveted connections use 3-3 rivets (approximately 4.8 mm diameter).

The composite joists can be drilled using standard drill bits, however as the fibreglass material is abrasive, they will become blunt quickly. It is recommended to use tile or diamond tipped drill bits which will last much longer and save time.

Drilling of hole before riveting

Installing rivet using rivet gun

4.2 Stair Tread Brackets

SAFETY

- Eye protection (recommended)
- Hearing protection

TOOLS

- Electric and/or battery powered drill
- *5mm drill bit (5mm is a tip/hole diameter)
- Pneumatic rivet gun, **OR**
- Battery powered rivet gun
- Wagners stair tread guide (recommended)

* Hole size is very critical parameter to have the rivets installed properly. Recommended drill bits for the 4.8mm rivets are:
  - 5mm straight flute drill bit (D3060500 - Sutton)
  - 5mm spearhead tile drill bit (Full Boar)

PROCEDURE

The installation of the riveted stair tread brackets is the same as the standard brackets. If a template/guide is not being used, it is critical to position the stair tread brackets correctly as the treads will need to be level and square between all stringers.

Attention needs to be made to the left and right-hand stair tread brackets to ensure they are installed at the right side/orientation.

4.3 Riveted Truss Brackets

SAFETY

- Eye protection (recommended)
- Hearing protection

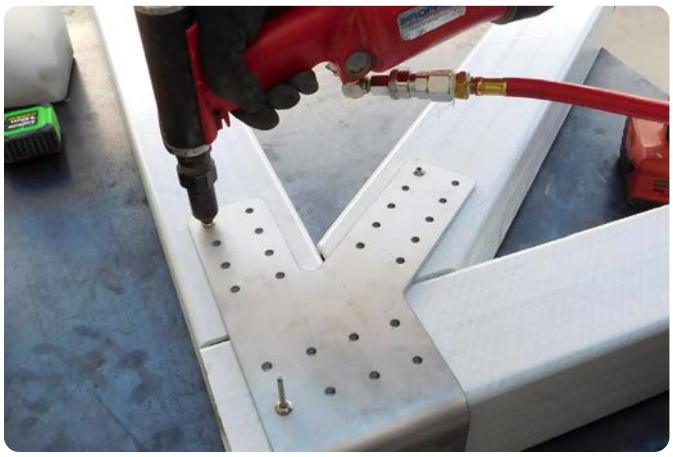
TOOLS

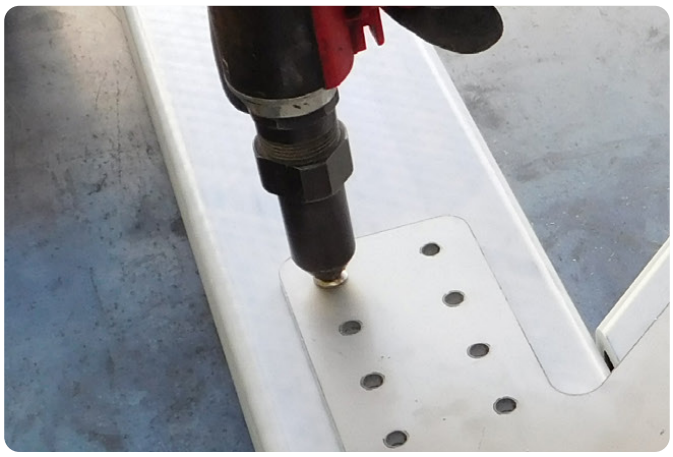
- Electric and/or battery powered drill
- 6.5 mm drill bit (carbide recommended)
- Pneumatic rivet gun
- Clamps

PROCEDURE

Installation of riveted truss brackets is very similar to standard connections. Larger structural rivets are generally required for these brackets to increase the connection capacity.

1. Ensure brackets are aligned square and straight on the members and are positioned in accordance with the construction drawings.
2. Clamp the bracket and members in place using quick clamps while riveting. It is not advised to use clamps that require screwing to tighten, such as G clamps or F clamps, as this can damage the surface coating.
3. Drill one hole in the first composite member and then install the rivet using a pneumatic/battery operated rivet gun. Hand or battery rivet guns are not recommended as the larger stainless rivets are too difficult to 'pop-off'.
4. Check that the bracket is correctly aligned and then drill and install a second rivet into the second composite member. Follow the same process for the other rivets on the bracket.





Drilling and riveting of truss members

Riveted truss brackets vertical-chords

Riveted truss brackets vertical-outrigger

5.0

Bolted Connections

5.1 Drilling

SAFETY

- Eye protection
- Hearing protection
- Respirator (recommended)

TOOLS

- Electric and/or battery powered drill (min. 1,800 RPM recommended)
- Hole saws (diamond tipped recommended)
- Wagners drill jig (recommended)
- Trestles (recommended)
- Clamps
- Screwdriver

PROCEDURE

Set up the members to be drilled on trestles when possible, ensuring trestles will not clash with holes to be drilled as this will destroy the hole saw.

1. Mark the position of the drill hole on the members as per the construction drawings.
2. Mark two points of 50 mm on either side of the hole position for edge location of the drill jig.
3. Adjust drill jig to suit the size of the member being drilled to allow the jig to locate the centre of the member.
4. Place drill jig on previously marked locations and clamp in place making sure it is clamped tight and flat against the member.
5. With the appropriate hole saw attached to the shaft start drilling through the composite member.
6. Ensuring to keep the drill as straight as possible and held firmly.
7. Check and clear the hole saw after each hole to prevent slugs getting jammed.
8. Use a screwdriver to push the slugs out of the diamond coated hole saw.

All pultrusion drilled on-site must be sealed. Refer to section 9.2 for the sealing procedure.

Marking of hole position before drilling

Adjusting drill jig

Drilling of composite member

Pushing of slugs out after drilling

5.2 Inserting

SAFETY

- Eye protection
- Hearing protection

TOOLS

- Nylon or rubber mallet
- Pushing bar
- Stop pins
- Clamps
- Trestles (recommended)

PROCEDURE

Unless otherwise noted, all bolted connections require Wagners inserts to resist crushing when tightening bolts and to increase the bearing strength of the connection. Most bolted connections will come from the factory pre-drilled, inserted and glued where required. Generally, inserts installed will not need gluing into place but may require a small pop rivet to ensure no movement occurs. Bush inserts can also sometimes be used in lieu of Wagners inserts, however prior approval from Wagners will need to be given.

1. Set up and clamp the members to be inserted on trestles when possible. It is not advised to use clamps that require screwing to tighten, such as G clamps or F clamps, as this can damage the surface coating.
2. Wedge appropriate Wagners insert (correct size and hole diameter) into member.
3. Place the stop pin into the pre-drilled hole and use it as an indicator of when the insert is close to the hole location.
4. Use a nylon or rubber mallet to hammer the insert into the member as far as possible. Do not allow the handle of the mallet to hit the end of the composite member as this may cause structural damage.
5. Push the insert the remaining distance into the member using manual pusher bars, use short bars and work up in size where appropriate to reduce personal strain.
6. Once the insert touches the stop pin, remove the pin and continue pushing the insert in small increments.
7. The stop pin can then be used to move the insert into its final location concentric with the pre-drilled hole.

Before riveting brackets and stringers, ensure that inserts are inserted into the profile. Riveting brackets and stringers prior to sliding inserts into the profile may prevent further insertion due to obstructing rivets.

Standard sizes WCFT Stainless steel bush inserts	
M16	21.3 OD & 2.11 WT
M20	26.7 OD & 2.11 WT
M24	33.4 OD & 3.38 WT

Hammering of insert

Pushing insert using manual push bar

5.3 Bolting

SAFETY

- Eye protection (recommended)
- Hearing protection

TOOLS

- Impact wrench
- Spanners and/or shifters
- Anti-seize lubricant to avoid galling

PROCEDURE

Unless otherwise noted, Wagners structures utilise 316 stainless steel connections. All bolts are to be installed with two washers and one nyloc nut. All threaded rods are to be installed with two washers, a nyloc nut on one end and the other end with two standard nuts, or one standard nut and one thin nut where the latter is placed next to the joint and tightened to 25% - 50% of the overall tightening torque.

1. For threaded rod installation, thread on two hex nuts from one end, leaving three threads past the outer nut.
2. Tighten the outer hex nut against the inner nut using spanners.
3. Once tightened and placed through the composite members and/or brackets, tighten the nyloc nut onto the opposite end of the rod using the impact wrench while keeping the spanner on the outer hex nut.
4. Cut any excess threaded rod off so that three threads are protruding past the end of the nyloc nut.
5. Use a nyloc nut on the back face of the bolt and secure.

All bolts are to be 'snug tight' but shall not exceed the maximum torques as per table right. Snug tightness, as per AS 4100, can be attained by few impacts of an impact wrench or by full effort of a person using a standard podger spanner, which brings the connecting part into firm contact.

Bolt Size	Max. Torque (Nm)
M12	66
M16	162
M20	190
M24	300

It is imperative that for high corrosive environments all threads are to be coated with anti-seize spray before fastening. This preventative measure significantly reduces the likelihood of seizing, ensuring smooth and trouble-free installation processes.

Also, in high chloride applications and/or other corrosive environments, steel seal such as Lanotec to be used, or other suitable connection hardware to be considered.

Tightening of nyloc nut using impact wrench

Tightening of nut using spanners

Threaded rods after installation leaving at least three threads past outer nut

6.0

Endcaps & Tee-Pieces

6.1 Endcaps

Endcaps are used to prevent water and debris from entering the hollow sections as well as improving the final presentation of the finished product. There are four types of endcaps available; normal endcaps, trimmed flush endcaps, riveted metal endcaps, web caps and rubber endcaps.

6.1.1 Normal & Flush Endcaps

SAFETY

- Eye protection (recommended)
- Hearing protection
- Gloves
- Electric and/or battery powered drill

TOOLS

- Caulking gun
- Wagners endcap groover
- Rubber mallet
- Butane burner

Check for exposed flame and confirm if hot works or an open flame permit is required onsite before proceeding with any activities.

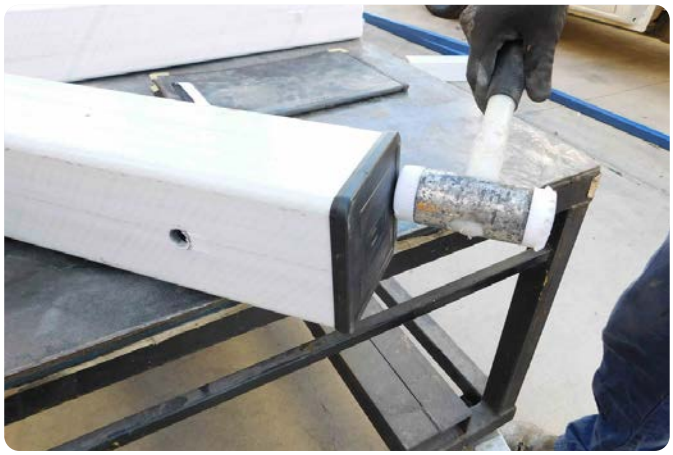
PROCEDURE

1. Connect the endcap groover to the powered drill.
2. Place the groover tool firmly against the end of the fibre composite profile, ensuring it is sitting flush and square.
3. Run groover around the internal perimeter of the composite member.
4. Check that the tool has made a sufficient groove (approx. 2mm deep) into all four internal faces of the member to help secure the endcap.
5. To ensure a good bond of adhesive to the cap, run the butane burner around the edge of the endcaps approximately 40mm from the surface following the groove where the composite will sit inside the endcap. The flame will only need to touch the surface once. A flame treated surface has a matt looking finish.
6. Take care not to place the flame too close to avoid burning or scorching the plastic surface.
7. Once the endcap has been flame treated, the surface must not be touched and it needs to be used within 24 hours of treatment. If outside of the 24 hours or contaminated, redo the flame treatment process.
8. Apply a small bead of Sikaflex (or similar) in the groove on the endcap.
9. Once the endcap has been placed on the end of the composite member, gently tap it on with a rubber mallet until the clips engage.
10. Clean up any Sikaflex that has squeezed out with a clean rag. Ensure the Wagners logo is facing the correct way on the member.

Grooving the internal perimeter of composite member

Running butane burner around the edge of endcap

Adding Sikaflex in the groove of endcap



Tapping of end cap using rubber/nylon mallet

6.1.2 Riveted Metal Endcaps

SAFETY

- Eye protection (recommended)
- Hearing protection

TOOLS

- Electric and/or battery powered drill
- 5 mm drill bit (carbide recommended)
- Pneumatic rivet gun, **OR**
- Battery powered rivet gun, **OR**
- Manual rivet gun
  (aluminum or zinc rivets only)
- Caulking gun

PROCEDURE

1. Place endcaps into the composite member and centralise.
2. Using a 5 mm drill bit, drill a single rivet hole through the composite member and then into metal endcap. The rivet hole is to be placed centrally on the member and approximately 20 mm from the end.
3. A second rivet on the opposing face may be necessary should there be a concern of endcap movement. It is not foreseen that sealing of the endcap would be necessary in most cases.
4. If the composite member requires a water tight seal, Sikaflex or a similar rubberized sealant can be used around the outside of the endcap before placement.
5. Excess sealant can then be wiped off using a clean rag.

6.1.3 Webcaps

SAFETY

- Eye protection (recommended)
- Hearing protection

TOOLS

- Electric and/or battery powered drill
- 5.0mm drill bit
  (5mm is the hole diameter)
- Rubber mallet
- Pneumatic rivet gun, **OR**
- Battery powered rivet gun

PROCEDURE

Web caps are predominantly used on truss bridges where members are cut on an angle and the standard endcaps will not fit.

1. These web caps can be placed over the fibre composite member and lightly tapped on using a rubber mallet if necessary.
2. Once the cap is level, and utilising the pre-drilled holes in the cap, drill through the composite member using a 5mm drill bit.
3. Install rivets through all available holes to secure the cap to the composite fibre member.

6.1.4 Rubber Endcaps

SAFETY

- Eye protection (recommended)
- Gloves

TOOLS

- Rubber mallet

PROCEDURE

Rubber endcaps are predominantly used on 100x75 mm RHS handrail where the handrail overhangs from handrail post.

1. Place rubber endcaps on the ends of 100x75RHS handrail, and lightly tapped on using a rubber mallet if necessary.
2. Rubber endcaps require more attention during install. Locitite 406 and primer with flame treated endacps are required along with square/flat cut to assure full contact and good adhesion.

6.2 Tee-Pieces

SAFETY

- Eye protection (recommended)

TOOLS

- Rubber mallet

Tee-pieces at the handrail

PROCEDURE

1. Place tee-pieces on the ends of the pre-cut handrail member ensuring the notch is facing the same way that the bracket will be installed.
2. Gently tap the handrail using a rubber mallet (if necessary) in between handrail posts and secure the rail using standard riveted bracket connections. Standard rail bracket notches will be pre-made on the 100 x 75 mm tee-pieces however cutting of the notches may be required if special brackets are required or 100 x 100 mm rails are used.


Mercy Footbridge, Dalby, QLD, AUS

7.0

Balustrade & Handrailing

7.1 Balustrade

SAFETY

- Eye protection (recommended)

TOOLS

- Electric and/or battery powered drill, **OR**
- Impact driver
- Clamps

PROCEDURE

1. Once the composite top rail has been installed, clamp and centralise the balustrade on the rail keeping the panel just on the inside of the rail brackets. The gap between the handrail post and the first balustrade upright must be no greater than 125mm.
2. Place the plastic endcaps into the balustrade rails, these will automatically grip and should not need adhesive, however adhesive may be necessary if vandalism is a concern or if full sealing is required.
3. Using a 3/8" or 5/16" size hex bit on an impact driver preferably, if powered drill is used, it needs to be set at a low setting. Drive the balustrade screws through the pre-drilled holes through the balustrade and into the composite rail. Stop driving the screw once it firmly secures the balustrade to the rail. Do not over-drive the screw as this can damage the balustrade and strip the composite rail.
4. Once the balustrade has been secured to the top rail, install the bottom rail firmly against the balustrade panel using tee-pieces and riveted brackets.

Clamping of balustrade and driving the screws

7.2 Handrail

SAFETY

- Eye protection (recommended)
- Hearing protection
- Gloves (recommended)

TOOLS

- Electric and/or battery powered drill
- 6.5mm drill bit (6.5mm is the hole diameter)
- 5.0mm drill bit (5mm is the hole diameter)
- Pneumatic rivet gun,
- Angle grinder, **OR**
- Drop or band saw

Stainless steel CHS rail

PROCEDURE

1. Position the offset rail brackets as per heights shown on the construction drawings.
2. Install one 6.4 mm diameter rivet into the brackets using the same process as described in section 4.1 (Standard riveted connections) utilising the pre-drilled holes in the offset bracket.
3. It is recommended to install multiple brackets at once to ensure the rail remains level over the length of the walkway.
4. Loosely place the offset rail onto the brackets and adjust each bracket until the rail is level.
5. Once level, install all remaining rivets into the brackets.
6. Care must be taken not to rub the drill or rivet gun against the rail bracket as this can contaminate the stainless steel and cause it to rust.
7. Once all brackets have been riveted, install the rail using the pre-drilled holes in the saddle of the bracket.
8. If cutting of the rail is necessary, it is recommended that a drop or band saw is used.
9. When cutting the stainless steel rail, keep the blade constantly wet using water or a suitable cooling fluid as a hot blade can leave burn/scorch marks on the polished rail.
10. Install joiners into rails with the split facing upwards using 4.8mm diameter rivets through the bottom of the rail into the joiner. The second rail can then be positioned 2mm from the first and secured to the joiner.
11. Cooling fluid may also be necessary with this step to remove the risk of scorching the rail when drilling.
12. The rail end returns can be installed the same way, ensuring they do not protrude any more than 300 mm from the last handrail post.
13. While drilling, ensure the drill speed is set to low and apply pressure for effective drilling.

8.0

Decking

8.1 Cutting Decking

SAFETY

- Eye protection
- Hearing protection
- Respirator
- Long sleeve and/or white suit
- Gloves (recommended)
- Face shield (recommended)

TOOLS

- Circular saw (diamond tipped blade recommended), **OR**
- Angle grinder
- Cutting guide
- Clamps
- Trestles

Cutting of decking using circular saw

PROCEDURE

1. Cutting of decking may be required on-site depending on the sheet size supplied, the walkway width, and if any changes of direction are incorporated into the design.
2. For visual purposes, it is recommended to cut on the closest closed edge (also known as a rib) of the mesh decking.
3. For accuracy of cutting against the ribs, it is suggested that the decking is laid upside down. This will also make it easier for sliding the circular saw and protect it from rubbing against the non-slip surface.
4. Place the decking on trestles and mark a cut line along the closest closed edge.
5. Set up the cutting guide along the marked line and clamp it to the decking.
6. It may also be necessary to clamp the decking to the trestle if the sheet size is small and has a tendency to move.
7. Ensure the decking is well supported on both sides of the cut to reduce the risk of the panel tearing once it's cut.
8. Where notching around the handrail posts, the use of an angle grinder with a cutting disc is best suited.

If generation of dust is an issue, wet sawing of the decking is an option, however the panel must be completely dry before any sealing of the cut is completed.

All decking cut on-site must be sealed. Refer to section 9.2 for the sealing procedure.

Due to the abrasive nature of the material, Diamond tipped blades are best suited for cutting the composite.

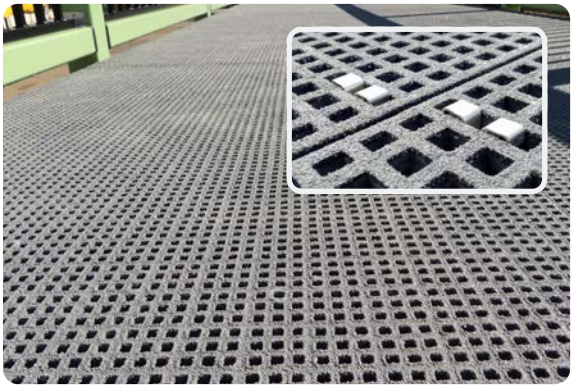
8.2 Securing Mesh Decking

SAFETY

- Eye protection (recommended)
- Hearing protection (recommended)

TOOLS

- Electric and/or battery powered drill, **OR**
- Impact driver
- Hammer



Installing of decking screw through M-clips

PROCEDURE

1. Place the deck panel onto a joist or substructure.
2. Ensure to leave a 2 mm gap between all panels.
3. Locate all M clips on the deck panel ensuring the clip is sitting flush on the grating ribs.
4. Position the first set of clips on each deck panel approximately 50mm from each edge of the panel in the longitudinal direction (with the direction of the walkway).
5. Internal clips must not be positioned any greater than 600mm apart.
6. There shall be a minimum of five screws per square metre of decking, however it is recommended to secure into every joist.
7. A minimum of four screws is required on any one panel irrespective of its size.
8. Install the decking screw through the M clip and into the joist using an impact driver on a low torque setting.
9. Stop driving the screw once it firmly secures the clip, and the decking and joist are in full contact.
10. Do not over drive the screw as this can bend the clip and create a trip hazard.

8.3 Securing Covertop Decking

SAFETY

- Eye protection
- Hearing protection

TOOLS

- Electric and/or battery powered drill
- Impact driver
- Wagners countersinking tool
- Wire brush

PROCEDURE

1. Place deck panel onto a joist or substructure.
2. Ensure to leave a 2 mm gap between all panels.
3. Mark all screw holes on the deck panel ensuring that the washer will bear on at least two of the mesh decking ribs.
4. Position the first set of washers on each deck panel approximately 50 mm from each edge of the panel in the longitudinal direction (with the direction of the walkway).
5. Internal panel fixings must not be positioned any greater than 500mm apart.
6. There shall be a minimum of five fixings per square metre of decking, however it is recommended to secure into every joist.
7. A minimum of four fixings is required on any one panel irrespective of its size.
8. Using the supplied countersinking tool, pre-drill a hole through the deck at the previously marked locations.
9. Once the countersinking tool reaches the deck surface, begin countersinking/boring into the top of the deck.
10. The countersinking tool will continue to bore until the height adjustment touches the top face of the decking.
11. If necessary, use a wire brush to clean the countersinking tool of excess dust to ensure the tool works effectively.
12. Once bored, test the countersinking depth by using a washer and ensuring it does not protrude more than 1-2mm above the deck level.
13. Clean the bored area of any remaining dust and place the washer in bored hole.
14. Screw through the deck and joist using an impact driver until fully secure.

All decking that has been countersunk on-site must be sealed. Refer to section 9.2 for the sealing procedure.

Countersinking tool for decking fixing

Fixing of deck using countersunk/oversize washer

8.4 Handling

Handle composite decking with care to avoid bending or damage, especially to the edges and surface. Use proper PPE, lifting techniques and avoid dragging or dropping the boards.
Store decking materials on a flat, level surface. To manage weight, conduct proper load assessment. Employ safe lifting practices such as using lifting straps, and avoid metal chains as it can harm decking surface. Prevent manual lifting to avoid strain or injury.

8.5 Installation

Carefully plan the layout of composite decking boards, ensuring proper spacing and alignment. Use stainless steel for fastening. Leave appropriate expansion gaps between boards to accommodate temperature changes.

9.0

Touch-ups & Finishing

9.1 Touch-up Paint

SAFETY

- Eye protection
- Respirator (recommended)
- Gloves
- Long sleeves and/or white suit (recommended)

TOOLS

- Touch-up paint
- Brush, **OR**
- Roller (seamless foam recommended)
- Fine grit sandpaper
- Painters and/or masking tape
- Mixing container
- Measuring stick (recommended)

PROCEDURE

1. Lightly sand the area requiring touch-up paint using the fine grit sandpaper. For best results use 320 grit paper.
2. Once sanded, wipe the surface with acetone using the wipe on/wipe off method (use one cloth to wipe on acetone and another cloth to wipe it off).
3. It is critical to ensure that all contaminants are removed from the surface to guarantee proper adhesion of paint.
4. Some surfaces may require a light buffing to remove the visible join lines or surface irregularities.
5. Once fully prepped, mask off any areas that will not be painted such as brackets or adjoining members.
6. Unless noted otherwise, no primer coat is necessary on the Wagners product. Wagners use two types of florupolymer anti-graffiti paint systems: V700 and V795 for any elements subjected to constant UV light (such as handrails or other elements above deck level), and V620 for any below deck members such as joists and bearers.

7. The Bill Of Materials (BOM) supplied by Wagners will detail what paint is to be used on the members, this includes the specific paint colour.
8. Mix Part A of the paint thoroughly using a mixing stick to consistently blend the liquid.
9. Decant the Part A paint into a mixing container, take care not to decant too much paint to reduce the risk of paint curing in the container before touch-ups are complete.
10. The mixed paint will have an estimated maximum useable life of three hours, depending on weather conditions.
11. Decant Part B into the previously decanted Part A at the ratio as recommended by the supplier.
12. Mix Part A and Part B for a minimum of two minutes until the paint is fully blended.
13. Using a paint brush or roller, apply the mixed paint to the composite member, blending/feathering into the existing paint as much as possible.
14. Apply the paint so that the minimum wet film thickness is achieved (available on material data sheets or via Wagners upon request).
15. The paint will be touch-dry after 30 minutes at 25°C, dry to handle after 16 hours at 25°C, and fully cured after seven days.
16. Before using paint, carefully analyse the relevant Technical Data Sheets (TDS) and Material Safety Data Sheets (MSDS) from the supplier for specific application and safety requirements.

Cameron Rocks Fishing Platform, Hamilton, QLD, AUS

9.2 Sealing

SAFETY

- Eye protection
- Respirator (recommended)
- Gloves
- Long sleeves and/or white suit (recommended)

TOOLS

- Touch-up paint, **OR**
- Approved resin equivalent
- Paint brush
- Mixing container
- Measuring stick (recommended)

PROCEDURE

1. All cuts and bolt holes made to the composite fibre members on-site must be sealed to ensure longevity of the product over its design life.
2. Depending on available material and application, either the supplied touch-up paint or resin can be used to complete the sealing.
3. Refer to the above procedure for sealing using touch-up paint.
4. When using resin, follow all procedures and safety information received from the material supplier to ensure proper application.
5. Contact Wagners for approval of proposed resin systems prior to application on the members.
6. All sealing must be completed and allowed to cure before bolting or handling to ensure the sealing is retained on the exposed composite.

Sealing of holes in decking

9.3 On-site Repairs

Cosmetic repairs, such as paint touch-ups, are permitted without prior approval. However, any structural repairs must be approved by Wagners before implementation.

Table below presents a list of foreseen possible defects but does not include all possible problems that may arise during installation and the actions that are described below are general in nature. Specialist engineering advice should be sought on the rectification of any structural defects that may appear.

Item No.	Defect	Action
1	Chipping of surface with exposed laminate but no visible damage to laminate	Touch up surface as per A&I guidelines.
2	Delamination of composites to depth of up to 0.5mm and area not exceeding 50mm x 50mm or equivalent	Touch up surface as per A&I guidelines.
3	Incorrect seating of beam	If the beam is not sitting on the supports correctly, due to incorrect installation or movement of structure then it should be re-installed. Priority given to this action dependent upon degree of misalignment.
4	Minor impact damage, depth not exceeding 0.5mm and area not exceeding 50mm x 50mm square or equivalent with damage restricted to first layer of glass.	Touch up surface as per A&I guidelines.
5	Significant impact damage, depth greater than 0.5mm and/or area exceeding 50mm x 50mm square or equivalent	Seek specialist engineering advice and/or contact WCFT.
6	Delamination exceeding depth of 0.5mm and/or area of 50mm x 50mm square or equivalent.	Seek specialist engineering advice and/or contact WCFT.
7	Wearing/cracking in covertop decking surface	Re apply a mix of sand and resin on the small affected areas. If damage is throughout the whole surface, remove the sand completely, clean the surface and apply new resin and sand. Re applying resin coats on regular basis can prolong the life of decking surface.

10.0

Prefabricated Bridges Installation

10.1 Lifting

SAFETY

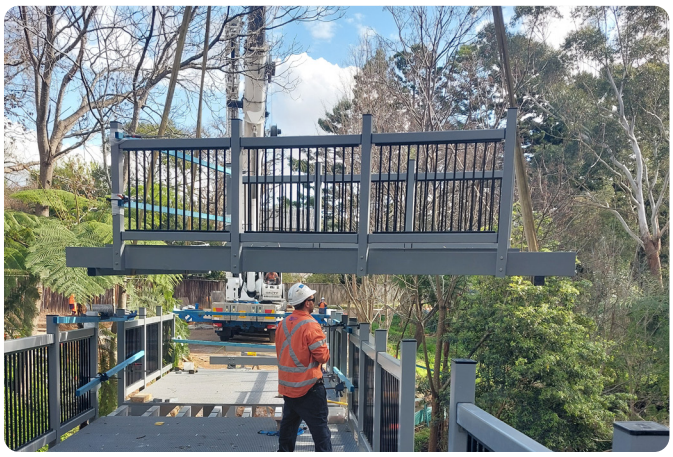
- Hard hat
- Gloves (recommended)

TOOLS

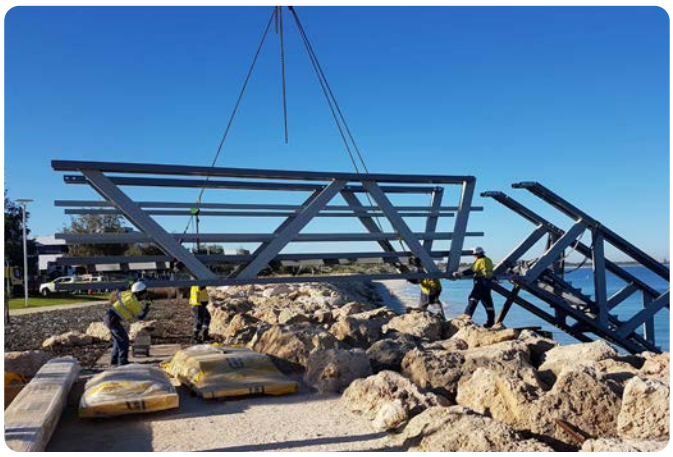
- Soft sling
- Spreader bar (recommended)

PROCEDURE

1. Given the light weight nature of the Wagners composite fibre product, lifting bridge structures is typically straight forward and will usually require smaller machinery than traditional construction materials such as timber, steel and concrete.
2. Recommended lifting points on the bridge can be provided by Wagners if required.
3. The specific project lifting procedure and safety recommendations must be developed and/or approved by the suitably qualified lifting sub-contractor in conjunction with advice from Wagners engineers to ensure the safest and most efficient process is used.
4. Decking, balustrade, or elements of the bridge structure may need to be removed for safe and/or efficient lifting.
5. No structural element is to be removed without written approval by Wagners.
6. Soft slings must be used when contact with the Wagners bridge structure is possible.
7. If soft slings are not an option, appropriate protection is required to prevent any damage to the members.



Lifting of partially assembled structures



Lifting of partially assembled structures

Lifting of pre-assembled bridge members

Lifting of pre-assembled bridge members

10.2 Landing

SAFETY

- Eye protection
- Hearing protection
- Hard hat (recommended)
- Respirator (recommended))

TOOLS

- Impact wrench
- Spanners and/or shifters
- Chemical anchor gun
  (relevant to anchor supplier)
- Hammer drill
- Caulking gun

Landing of bridge structure on abutment

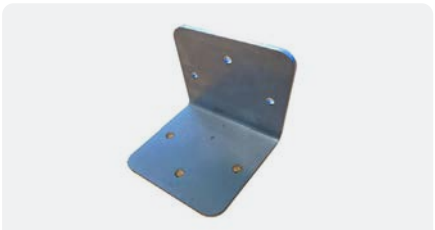
Adjustment of bridge position

PROCEDURE

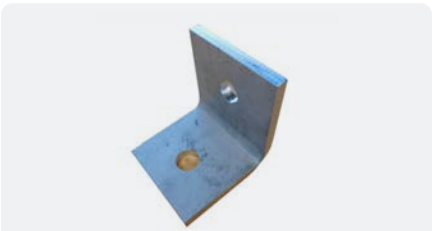
1. When landing a Wagners bridge onto new abutments, it is recommended not to pour the backwall until the bridge is in place.
2. This will ensure a neat connection between the bridge and the abutment and will remove any negative effects of onsite 'as built' variances.
3. Place rubber bearing pads onto the abutments as per construction drawing locations.
4. While referencing the construction drawings and confirming measurements from the prefabricated bridge, drill through rubber pads and concrete abutments using the appropriate hammer drill.
5. Use of a hole saw may be easiest for drilling rubber bearing pads.
6. If required, Wagners can fabricate a template for the bolt hole locations which can help to have the abutments pre-drilled prior to the arrival of the bridge. This can help reduce lane closures or on-site downtime.
7. Before installation of the bridge, it is recommended to remove the first decking panel from either end of the bridge to be able to access the hold down brackets.
8. In conjunction with the lifting procedure developed as per above, land the bridge onto the abutments as per locations shown on the construction drawings.
9. Special attention is needed when abutment heights are not equal as the aluminium balustrade attached to the bridge may have an angled rake to keep the posts vertical and would therefore determine which end of the bridge needs to be placed on which abutment.
10. The majority of larger Wagners' bridges will be supplied with a fix end and a sliding end.
11. The chemically anchored hold down bolts should be positioned central of the slotted hole.
12. Once the bridge is fully landed and in place, install hold down bolts through the supplied brackets using the appropriate chemical anchor. Please review the TDS and MSDS for the chemical anchor to ensure the correct procedure and safety information is followed.
13. Once bolts are set into the abutments, fully secure all washers and nuts.
14. Replace end decking panels and secure.
15. Pour concrete abutment backwall and wingwalls when required.
16. For connection between the concrete abutments and the fibre composite bridge, install backing rod or similar foam joint filler and seal using Sikaflex or approved equivalent.

Wagners Componentry

Stair Tread Bracket



Riveted 'L' Bracket



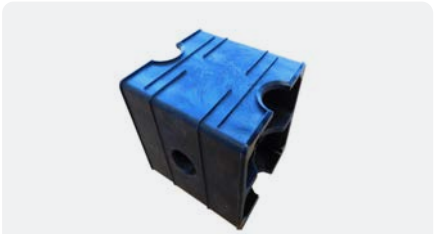
Bolted 'L' Bracket

Wagners Drill Jig

Wagners Endcap Groover

Wagners Piling Jig

Wagners Countersinking Tool

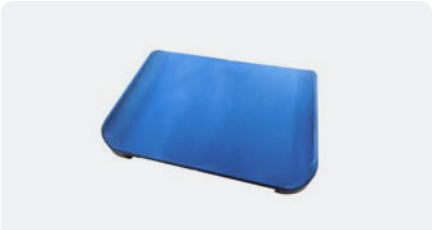


Anti-Crush Insert

Normal Endcap

Flush Endcap

Riveted Metal Endcap



Tee-Piece

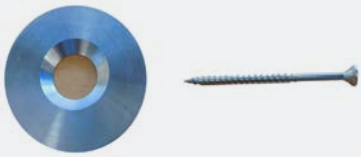
Balustrade

Rail Bracket

Handrail Joiner

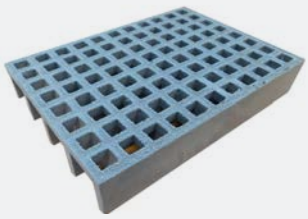
Handrail Return

Flush Faced Truss Bolt

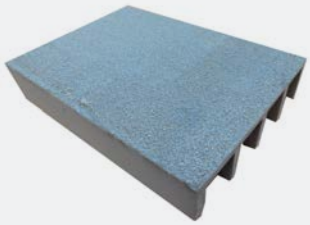


Covertop Countersunk Washer

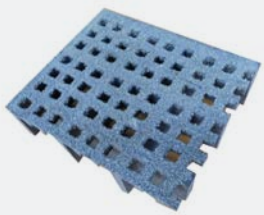
Mesh M Clip



Minimesh

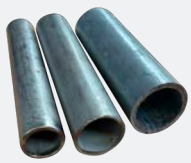


Covertop



Micromesh

Treddeck



SS Bush Insert

Ballin Drive Pedestrian Bridge, Toowoomba, QLD, AUS

Wagners Composite Fibre Technologies (CFT)

Installation Guide

Published by Wagners CFT Manufacturing Pty Ltd

© Wagners CFT Manufacturing Pty Ltd
ABN 91 099 936 446

Head Office
11 Ballera Court, Wellcamp
Queensland, Australia 4350

Postal Address
PO Box 151, Drayton North,
Toowoomba Qld 4350, Australia

T +61 7 4637 7777
F +61 7 4637 7778
E cftsales@wagnerscft.com.au

WAGNERS

wagnerscft.com.au