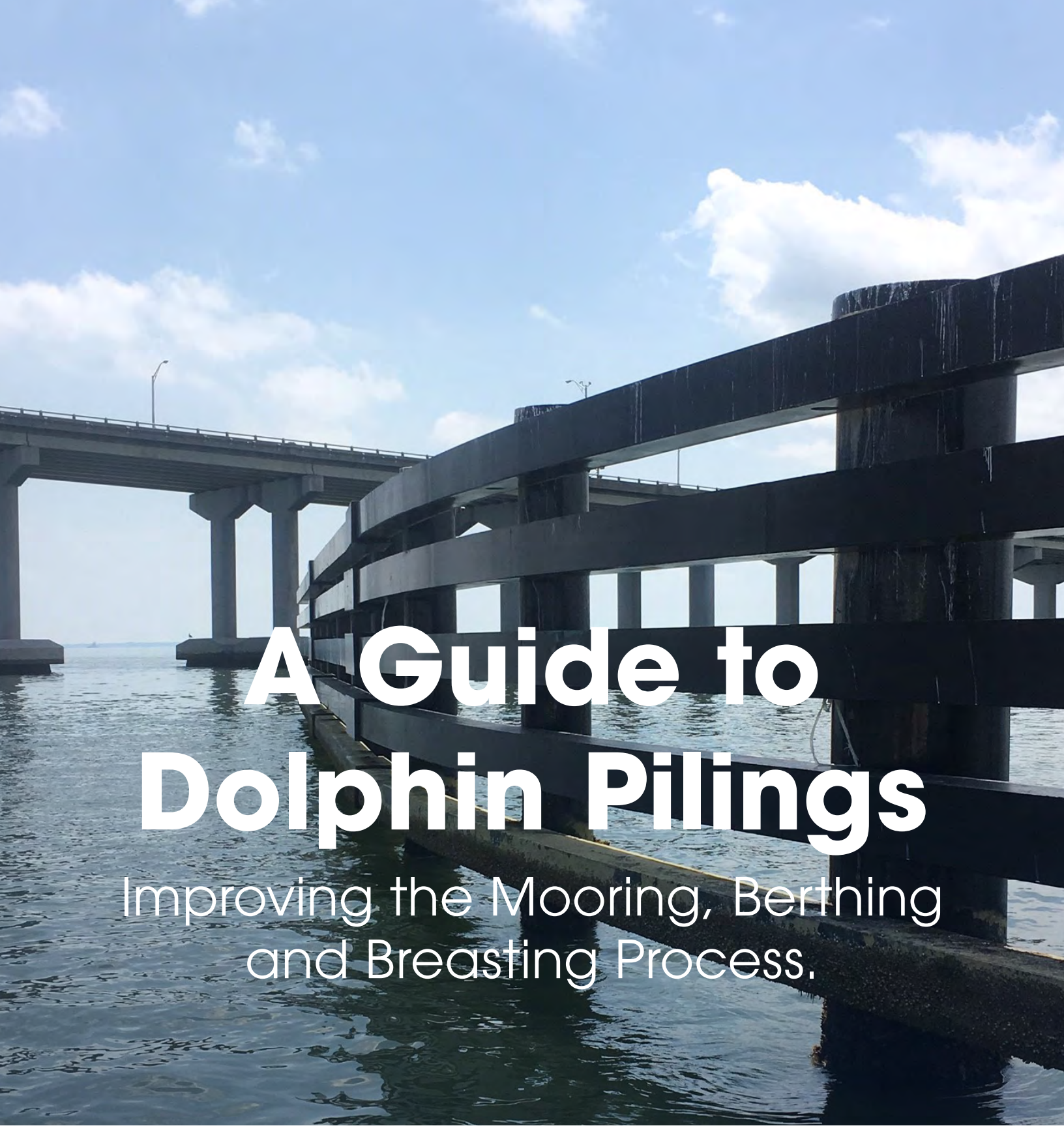

A Guide to Dolphin Pilings

Improving the Mooring, Berthing and Breasting Process.

CREATIVE COMPOSITES GROUP

Although most people think of playful marine mammals when they hear the word "dolphin," this term also describes the pilings that help berth and moor marine vessels. Ferries, barges, and ships use dolphin pilings to absorb collision impacts or secure themselves.

Dolphin pilings may be used at the start of a waterway construction to absorb initial impacts; or to provide berthing lanes for vessels without the need to construct piers. Conventional dolphins have consisted of between three and 64 timber piles.

The Three Types of Dolphins

Because water currents influence the movement of a vessel during the berthing process and when it's docked, workers must build systems that absorb the berthing energy and keep the vessel in place. Most ferry terminals and fender protection systems rely on dolphin pilings to accomplish this, and these products generally come in three different types:

Mooring Dolphins

Mooring refers to the practice of securing a vessel to a dock or pier using ropes. These dolphins are specially designed to support the tension that mooring lines apply to them. By doing so, mooring dolphins reduce a docked vessel's longitudinal movement.

Berthing Dolphins

While the main function of mooring dolphins is to support the tension of mooring lines and prevent longitudinal movement, berthing dolphins primarily act to stabilize a moored vessel and reduce its sideways movement.

Breasting Dolphins

Breasting refers to when a vessel comes abreast or alongside a fender system or ferry slip. Breasting dolphins primarily guide vessels, especially ferries, into approach terminals and piers. For this reason, these materials are sometimes also called approach dolphins.

Breasting dolphins also assist in forming buffer zones between vessels and piers or other structures, preventing the vessel from pressing against and damaging a pier structure. Breasting dolphins can also serve as mooring points to restrict longitudinal and/or lateral movement of a moored or docked vessel. Because they serve many functions, breasting dolphins are seen as a cost-efficient way to enhance a berthing safety.

This dolphin type is subjected to the most demanding loads and operational requirements. This is the dolphin type that benefits the most by using new technology.

Dolphin Pilings: Wood vs. FRP

Dockworkers have traditionally constructed dolphin pilings out of wood clusters, but modern manufacturing technology has developed viable alternatives in the form of fiberglass-reinforced polymer (FRP) dolphins. However, FRP dolphins have not completely replaced the benefits of wood in piling construction, and each material comes with its advantages and disadvantages.

Wood Dolphins

Pretty much since the dawn of sailing itself, dockworkers have used wood to build pilings. Today, wood pilings can comprise a single structural member or a combination of several structural members bound together to create greater stability. Still today wood piles have a number of reasons for usage, which include:

- **Easy availability:** Wood is a naturally renewable resource that is relatively cheap to obtain
- **Construction expertise:** There is a significant baseline of construction experience to be drawn on.

These advantages continue to make wood pilings the standard construction material. However, wood pilings also come with some disadvantages, such as:

- **Decay potential:** Bacteria and other elements in sea water cause wood to decay
- **Construction costs:** Wood cluster construction can be expensive
- **Corrosion risks:** Wood pilings are susceptible to corrosion caused by mold and mildew
- **Insect threats:** Insects and other life forms may eat wood over time
- **Environmental:** Treated wood leaches unwanted chemicals into the water

While wood pilings are the traditional choice, their susceptibility to decay and corrode ultimately makes them more expensive in the long run than more modern dolphin construction.

FRP Dolphin Pilings

To overcome the disadvantages of wood pilings, ferry operators and fender protection systems are increasingly turning to FRP dolphins. Building dolphins from FRP bring many advantages, such as:

- **Impact resistance:** FRP can be easily manufactured to withstand high energy impact
- **Design flexibility:** FRP can be designed in a wide variety of diameters and colors
- **Corrosion resistance:** FRP can weather saltwater conditions and other chemicals with no deterioration over time, and it is not susceptible to mold, mildew, or insects
- **Affordability:** FRP involves low installation and maintenance costs

These advantages make FRP a viable choice for constructing dolphins at ferry terminals and fender protection locations. Composite Advantage provides a comprehensive suite of FRP dolphin pilings for any energy requirement.

FiberPILE: The FRP Dolphin Solution

Using a single, large-diameter FiberPILE as a dolphin monopile replaces clusters of wood piles without sacrificing impact resistance, strength against mooring tension, or corrosion resistance. Here are some advantages you can expect from FiberPILE FRP dolphin pilings.

Strength

FiberPILE uses high-strength directional fiberglass to create corrosive-resistant resins that can stand the test of time. Using these materials reduces the amount of wear and tear on the pilings, which results in the need for less maintenance over time. FiberPILE pilings also stand up to the various performance expectations of mooring or breasting dolphins, meaning that they can be installed for any intended end use. FiberPILE pilings offer the same strength as steel but with lower bending stiffness, which results in enhanced energy absorption over steel, concrete, and wood systems.

> Jamestown-Scotland Ferry Facility Manager Wes Ripley noted that the FRP piles' superior strength was a selling point. 'Ships are getting bigger,' he says. 'Wind conditions increased the potential for impact damage from vessels.

Design Flexibility

Whereas wood, steel, and other materials tend to come in modular forms, FRP allows for much more flexibility in design. Designers can specify many different diameters, levels of reinforcement, wall thicknesses, colors, and shapes when ordering FiberPILE pilings.

Standard diameters come between 18" and 60", and FRP dolphins can come in continuous lengths of up to 120', allowing for greater conformity throughout the structure.

Fewer Maintenance Requirements

Because FRP resists corrosion, warping, and insect/mold damage, it requires less maintenance than other materials.

Performance Advantages

These manufacturing benefits streamline design and installation and eliminate the need for maintenance, but the true test of FiberPILE comes in how it performs. Some of the performance advantages that you can expect from FiberPILE dolphin pilings include:

FiberPILE meets the demands of the many requirements of mooring and breasting dolphin

- Superior energy absorption
- Recoverable deflection
- Splicing capabilities
- Enhanced dimensional stability
- Hollow construction for easy driving
- High strength
- Corrosion resistance
- Decreased driving friction
- Lowered driving acoustics
- Ability to install with vibration or impact drivers

pilings. This makes FiberPILE a viable replacement to traditional dolphins.

Discover the World of FRP Products with Creative Composites Group

Creative Composites Group designs and manufactures FRP products for a wide range of infrastructure applications. When waterways, ferry terminals, marinas and ports switch to our trademark FiberPILE dolphin pilings, they can rest assured that valuable infrastructure and vessels will remain safe and secure.

Contact us to learn how working with Creative Composites Group on your dolphin pilings can save you both time and money while improving the berthing and protection systems at your location.

Partner With Creative Composites Group

Your Single Source for Innovative Engineered Solutions Using Fiber Reinforced Polymer Composites

Advance your products and projects beyond the limitations of traditional concrete, steel, and wood by leveraging the combined strength of Creative Composites Group.

We are the driving force of technical innovation that has created the industry's most advanced engineered FRP. Our team of industry leaders includes:

- **Creative Pultrusions**
- **Composite Advantage**
- **E.T. Techtonics**
- **Kenway Composites**
- **Tower Tech**

As Creative Composites Group, we can help you to create products and structures of any size or shape — for projects of any ambition or vision.

Other companies commoditize FRP in off-the-shelf shapes and forms; Creative Composites Group does not. We are the single source for the broadest range of engineered FRP solutions to build your ideal projects. That's possible only with our proven engineering processes and end-to-end collaboration, service and support resources.

Discover Your Custom Engineered FRP Provider

We're much more than a construction material supplier. Creative Composites Group is committed to becoming a trusted business partner who is keenly interested in your project's success.

Creative Composites Group works alongside your team, from facility owners to design engineers to contractors, to help you develop the most economical FRP solution that meets the most demanding structural requirements and environmental conditions.

Have a project that you think engineered FRP is right for? Call us. We'd be thrilled to discuss it with you.

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