

# Special Specification 4167

## Dolphins



### 1. DESCRIPTION

Remove 10, 14, 19, or 23-pile timber or reinforced composite plastic dolphins and install a 10, 14, 19 or 23-pile fiberglass or steel reinforced composite plastic dolphin in accordance with this specification or as directed.

### 2. EQUIPMENT

Furnish all equipment and tools needed to perform the work. Furnish pile helmets and driving tips as required to facilitate installation and to prevent damage to pile. Submit a list of all equipment and proposed installation methods to Engineer for approval. Keep and maintain all equipment in good operating condition in order to be able to properly perform the work as approved and directed by the Engineer. Operate all water-going vessels, barges, etc. in accordance with United States Coast Guard regulations.

### 3. MATERIALS

Furnish all materials necessary to perform the work. Submit product data sheets including material performance and strength information that meets or exceeds requirements in the plans and specifications. Obtain approval of proposed piling before ordering materials. Fabricate piles to sufficient strength and toughness to accommodate handling and driving forces. Provide members that are full length as shown on the plans.

- 3.1. **Polymeric Piling.** Furnish solid circular fiberglass reinforced composite plastic or cylindrical pipe fiberglass marine piling in the sizes and lengths shown on the plans. The outer surface of the piling must be a high-density polyethylene (HDPE) bonded to core of shell material. Outer skin of pile must be installed during fabrication process.

Provide a standard manufactured product. Provide certification from the manufacturer that the product supplied meets all physical properties specified in Table 1.

- 3.1.1 **Type A.** Provide composite plastic that is a mixture of one or more of the following recycled post-consumer or post-industrial thermoplastics: high density polyethylene, polypropylene and low density polyethylene, for the main core material. Mix plastic with appropriate colorants, U.V. inhibitors and antioxidants.

- 3.1.2 **Type B.** Provide glass fibers embedded in high-strength resin (fiberglass) for the main shell material. Minimum glass fiber to resin ratio is 60:40 by weight.

**Table 1**  
**Core/Shell Typical Properties**

	Composite Plastic (Type A)	Fiberglass (Type B)
Density (ASTM E12)	34-47 lbs./cu. ft.	110-130 lbs./cu. ft.
Chemical Resistance (ASTM D543)(wt. increase)	Sea Water < 1.5% Gasoline < 7.5% No.2 Diesel < 6.0%	Sea Water < 1.5% Gasoline < 7.5% No.2 Diesel < 6.0%
Tensile Properties (ASTM D638)	500 psi (min)	50 ksi (min)
Compressive Modulus	40 ksi (min) (ASTM D695)	55 ksi (min) (ASTM D6641)
Nail Pull Out (ASTM D1761, Section 102)	60 lbs. (min)	Minimum 60 lbs.

3.1.3

**Outer Skin.** The outer skin of the composite plastic marine pile and composite plastic lumber will be produced so that it is continuous and homogenous throughout the entire length and perimeter. The outer skin will conform to those applicable sections of Table 2, and be black in color.

**Table 2**  
**Outer Skin Typical Properties**

Density (ASTM D792)	55 – 65 lbs/cu. ft.
Water Absorption Increase (ASTM D570)	@ 24 hrs. < 0.5% wt.
Brittleness (ASTM D746)	No break at -40 F at 5 ft-lbs/in.
Impact Resistance (ASTM D746 Modified)	Greater than 4 ft-lbs/in.
Hardness (ASTM D2240)	45-75 Shore D
Ultraviolet (ASTM D4329 UVA-340)	No more than 10% change in Shore D hardness after 500 hours
Abrasion (ASTM D4060)	Weight Loss: <0.02 oz Wear Index: 2.5 to 3.0 Cycles = 10,000, Wheel = CS17, Load = 2.2 lbs
Chemical Resistance (ASTM D543)	Sea Water < 1.5% Gasoline < 7.5% No.2 Diesel < 6.0%
Tensile Properties (ASTM D638)	500 psi (min)
Compressive Modulus (ASTM D695)	40 ksi (min)
Coefficient of Friction (ASTM F489)	0.25 (max), wet

3.1.4

**Fiberglass Reinforcement.** Provide composite plastic marine piles (Type A) internally reinforced with fiberglass reinforcing elements that act compositely with core material. Fiberglass reinforcement conforms to the characteristics indicated in Table 3 below.

**Table 3**  
**Fiberglass Reinforcement (Physical Properties)**

Tensile Properties (ASTM D638)	Ultimate Tensile Strength	70 ksi (min)
Flexural Strength (ASTM D790)	Flexural Strength	70 ksi (min)
Compressive Properties (ASTM D695)	Compressive Strength	40 si (min)

The required amount of fiberglass reinforcement in the piling will be as indicated on the plans. Each individual reinforcing element will typically run the entire length of the member, terminating flush with the ends, with the element exposed. No plastic, fiberglass or metal elements or supports for the reinforcing element will be used in the member.

3.1.5

**Delivery, Storage, and Handling.** Handle piling with ropes or nylon slings without dropping, breaking, bruising or penetrating the outer surface with tools. In order to prevent scaring or sagging of the members, store members above ground on blocking which is shaped or padded. Arrange and cover storage racks to permit air circulation and to provide protection from direct sunlight.

3.2.

**Wire Rope.** Provide .75 in. diameter wire rope cable for the dolphins that is galvanized 6 x 7 improved plow steel, right regular lay with fiber core (natural or synthetic). Supply 5/16 in. x 5 in. galvanized wire staples. Supply all other hardware, cable clamps, bolts, etc., which will also be galvanized, necessary to complete the work.

3.3

**Steel Cylinder.** Provide galvanized steel cylinder per details in the plan sheets for the dolphin specified. 23 -pile dolphins will require 7'-3 3/4" X 8' Long Cylinders. 14 and 19-pile dolphins will require 6'-3 3/4" X 8' Long Cylinders.

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**4. CONSTRUCTION**

Remove all pilings and piling stubs as shown on plans, or as directed. Dispose of all damaged material outside of the highway right of way at locations provided by the Contractor, unless otherwise specified in the plans. The disposal site(s) will be approved by the Engineer.

Drive new piles in 10, 14, 19, or 23-pile cluster so as to create dolphin as shown on the plans, or as directed. Locate the newly constructed cluster as near the original location as practical, or as directed. Repair any damage to piling or outer HDPE skin as directed. Wrap dolphin with wire rope as shown on the plans.

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**5. MEASUREMENT**

Removing and replacing the 10, 14, 19, or 23-pile dolphin will be measured by each dolphin. Each dolphin includes all piling, cable, hardware, etc., necessary to complete each installation, including removal and replacement of steel cylinder and all parts of existing dolphin. All other items of work shall be considered subsidiary to the bid items.

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**6. PAYMENT**

The work performed and materials furnished in accordance with these Items and measured as provided under "Measurement" will be paid for at the unit prices bid for "Remove/Replace Dolphin" of the number of piles specified. These prices shall be full compensation for removing and replacing dolphin, and polyethylene pipe, including the furnishing of all materials, equipment, labor, tools, and incidentals necessary to complete the work.