

UNITED STATES COAST GUARD
OFFICE OF CIVIL ENGINEERING
OCEAN ENGINEERING DIVISION
WASHINGTON, D.C.

SPECIFICATION FOR CONSTRUCTION
OF
COLLISION TOLERANT PILE STRUCTURE (CTPS)

SPECIFICATION No. 477
REVISION B
CHANGE 1

Please add/substitute the following paragraphs to the specification:

Prepared by:

SIGNATURE ON FILE

Mr. Sean McEvoy
Buoys & Structures Team

Approved by:

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R.J. Leiger, CDR, USCG
Chief, Ocean Engineering Division

Reviewed By:

SIGNATURE ON FILE

Mr. Stanley D. Walker
Buoys & Structures Team Leader

Date:

February 25, 1998

2.3 Government Documents. The following documents form a part of this specification to the extent referenced herein. Suffixes denoting the specific issue of each document are omitted from future references to the documents in this specification.

SPECIFICATIONS

MIL-P-21929C 15 January 1991	Plastic Material, Cellular Polyurethane, Foam in Place, Rigid (2 pounds per cubic foot)
MIL-P-24647B 2 April 1991	Paint System, Anticorrosive and Antifouling, Ship Hull
QPL-24647-2 29 January 1993	Qualified Products List of Products Qualified Under Military Specification MIL-P-24647, Paint System, Anticorrosive and Antifouling, Ship Hull

STANDARDS

FED-STD-595B 15 DEC 89	Federal Standard Colors
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2.5 Drawings. The following United States Coast Guard Office of Civil Engineering drawing forms a part of this specification to the extent referenced herein, and shall be referred to as "the drawing" throughout this specification:

<u>Drawing Number</u>	<u>Title</u>
121156	Collision Tolerant Pile Structure (CTPS)
121180	CTPS Jetty Style Bottom Section

3.6.2.1 Jetty Style Bottom Section. The ionomer foam cladding and support ring shall not be attached to the jetty style bottom section. The foot pegs and safety rungs shall be welded to the bottom section pipe as detailed in drawing 121180. Prior to the assemble of the chain and spring pieces, the base assembly shall be painted in accordance with paragraph 3.8.1. The spring assembly shall then be inserted into the pipe and the base assembly placed into the concentric reducer. The chain assembly shall then be passed through the spring assembly and the connecting links attached to the chain. The top bar shall be inserted into the jaw end swivel on the top spring termination. The master link shall then be pulled through the base assembly compressing the springs until the bottom bar can be placed through the master link. All exterior surfaces of the jetty style bottom section shall then be painted in accordance with paragraphs 3.8.1 and 3.8.2.

3.8.2 Polyurethane topcoat. All exterior steel surfaces shall be coated with a marine grade of acrylic aliphatic polyurethane. This paint shall meet the following requirements:

- 1) it shall be a commercial product from the same manufacturer that supplies the epoxy primer
- 2) it shall have a Volatile Organic Compound (VOC) content of no more than 340 g/L (2.8 lb/gal), a lead content of less than 0.06% by weight, and a chromium content of less than 0.06% by weight;
- 3) The required color (as specified in the delivery order) shall be in accordance with FED-STD-595: red (Federal Color 11350), green (Federal Color 14193), white (Federal Color 27875), and yellow (Federal Color 13655). Apply by spraying one coat, 3 mils minimum dry film thickness. Sharp corners, edges, and other hard-to-coat areas shall be striped before the full coat is applied.

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WASHINGTON, D.C.

MARCH 1997

SPECIFICATION FOR FABRICATION
OF
COLLISION TOLERANT PILE STRUCTURES (CTPS)

SPECIFICATION NO. 477

REVISION B

1. SCOPE

1.1 General. This specification defines the requirements for fabrication of Collision Tolerant Pile Structures (CTPS) for use as aids to navigation in the navigable waters of the United States.

1.2 Classification. The CTPS components shall be classified in the following manner:

- a.) Top Section
- b.) Middle Section (3 different sizes)
- c.) Bottom Section - includes base assembly and chain assembly
- d.) Plug
- e.) Foundation (3 different sizes)
- f.) Driving Pile
- g.) Flange Hardware (24 fasteners)
- h.) Base Hardware (16 fasteners)

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Coast Guard Documents. . The following United States Coast Guard Office of Civil Engineering documents form a part of this specification to the extent referenced herein. Suffixes denoting the specific issue of each document are omitted from future references to the documents in this specification.

SPECIFICATION

488

Specification for Fabrication of Ionomer Foam Cladding

2.3 Government Documents. The following documents form a part of this specification to the extent referenced herein. Suffixes denoting the specific issue of each document are omitted from future references to the documents in this specification.

SPECIFICATIONS

MIL-P-21929C 15 January 1991	Plastic Material, Cellular Polyurethane, Foam in Place, Rigid (2 pounds per cubic foot)
MIL-P-24647B 2 April 1991	Paint System, Anticorrosive and Antifouling, Ship Hull
QPL-24647-2 29 January 1993	Qualified Products List of Products Qualified Under Military Specification MIL-P-24647, Paint System, Anticorrosive and Antifouling, Ship Hull

2.4 Industry Publications. The following documents of the issues specified form a part of this specification to the extent referenced herein. Suffixes denoting the specific issue of each document will be omitted from future references to the document in this specification.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 36-94	Standard Specification for Carbon Structural Steel
A 105-95b	Standard Specification for Carbon Steel Forgings for Piping Applications
A 106-94a	Standard Specification for Seamless Carbon Steel Pipe for High Temperature Service
A 125-95	Standard Specification for Steel Springs, Helical, Heat Treated
A 153-95	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A 234-92a	Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
A276-95	Standard Specification for Austenitic Stainless Sheet, Strip, Plate, and Flat Bar Pressure Vessels
A 391-93	Standard Specification for Alloy Steel Chain
D 4066-94b	Standard Specification for Nylon Injection and Extrusion Materials

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1-96	Structural Welding Code - Steel
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AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

SNT-TC-1A	Recommended Practice for Nondestructive Testing
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STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC-SP-10	Near White Blast Cleaning
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AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

ANSI/ASQC C1-1985	General Requirements for a Quality Program
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2.5 Drawing. The latest revision of the following United States Coast Guard Office of Civil Engineering drawing forms a part of this specification to the extent referenced herein, and shall be referred to as "the drawing" throughout this specification:

DRAWING
121156

TITLE
Collision Tolerant Pile Structure (CTPS)

2.6 Source of Documents. The documents and drawings may be obtained from the following sources:

Coast Guard Documents.

Commandant (G-SEC-2B)
U.S. Coast Guard Headquarters
2100 Second Street, SW
Washington, D.C. 20593-0001

Government Documents.

Standardization Documents Order Desk
Building 4, Section D
700 Robbins Avenue
Philadelphia, PA 19111-5094

Industry Publications.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
1916 Race Street
Philadelphia, PA 19103-1187

AMERICAN WELDING SOCIETY (AWS)
550 NW LeJeune Road
PO Box 351040
Miami, FL 33135

STEEL STRUCTURES PAINTING COUNCIL (SSPC)
4400 Fifth Avenue
Pittsburgh, PA 15213-2683

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)
310 West Wisconsin Avenue
Milwaukee, Wisconsin 53203

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)
4153 Arlingate Plaza
Columbus, OH 43228

2.7 Precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supervised applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 General. The Collision Tolerant Pile Structure (CTPS) shall be constructed in accordance with the drawing and shall meet the requirements of this specification

3.2 Materials.

3.2.1 Steel Bars, Shapes, and Plates. All steel bars, shapes, and plates shall meet the requirements of ASTM A 36.

3.2.2 Steel Pipe. All steel pipe shall meet the requirements of ASTM A 106.

3.2.3 Steel Pipe Flanges. All steel pipe flanges shall meet the requirements of ASTM A 105, Grade I.

3.2.4 Steel Helical Springs. All steel helical springs shall meet the requirements of ASTM A 125.

3.2.5 Steel Pipe Concentric Reducer. All steel pipe concentric reducers shall meet the requirements of ASTM A 234, Grade WPB.

3.2.6 Steel Chain. All steel chain shall meet the requirements of ASTM A 391, Grade 80.

3.2.7 Steel Connecting Links. All steel connecting links shall have a wire diameter of 1¼ inches. The connecting link shall have a safe working load of at least 57,500 pounds and an ultimate load of at least 230,00 pounds.

3.2.8 Steel Master Link. All steel master links shall have a wire diameter of 1½ inches. The master link shall have a safe working load of at least 47,880 pounds and an ultimate load of at least 239,400 pounds.

3.2.9 Jaw End Steel Swivel. All jaw end steel swivels shall have a wire diameter of 1½ inches and be hot-dipped galvanized. The swivel shall have a safe working load of at least 45,200 pounds and an ultimate load of at least 226,00 pounds. The hot-dip galvanization shall meet the requirements of ASTM A 153.

3.2.10 Stainless Steel Hardware. Stainless steel hardware (nuts, bolts, washers, etc.) shall meet the requirements of ASTM A 276, type 316, or 316L. The threads on all nuts and bolts shall be Unified Course Thread Series (UNC).

3.2.11 External Foam Cladding. All external foam cladding shall meet the requirements of U.S. Coast Guard Civil Engineering Specification No. 488.

3.2.12 Polyurethane Foam. The polyurethane foam shall be a rigid unicellular polyurethane foam which meets the requirements of MIL-P-21929.

3.2.13 Nylon. All nylon shall meet the requirements of ASTM D 4066 type PA0114.

3.3 Identification. Each CTPS section shall be assigned an identification code/number by the Contractor for inspection purposes. This code/number shall be permanently affixed to each section.

3.4 Design, Dimensions, and Dimensional Tolerances. All portions of the CTPS shall conform in design, dimensions, and tolerances as specified in the drawings.

3.5 Construction.

3.5.1 Pipe Sections. All pipe used to fabricate the CTPS sections and the driving pile shall be of continuous length. Two or more pieces of pipe SHALL NOT be welded together to obtain the required length of pipe.

3.5.2 Foam Cladding. The foam cladding shall be slid over the middle section pipe and bottom section pipe in one piece after the pipe has been cleaned and painted. The foam cladding SHALL NOT be cut vertically and banded, tied, or heat sealed around the pipe.

3.5.3 Welding. The plates, bars, and other shapes forming the various components of the CTPS shall be fitted and faired prior to being welded in place. All welds shall be performed as indicated on the drawings. Shielded Metal Arc Welding (SMAW), Flux-Cored Arc Welding (FCAW), Gas Metal Arc Welding (GMAW), or Submerged Arc Welding (SAW) shall be used to weld the steel parts of the CTPS. All welding procedures and weld quality shall meet the requirements of AWS D1.1. All welders employed for welding under this specification shall be qualified by the Contractor with procedures which meet the requirements of AWS D1.1.

3.5.3.1 Nondestructive Testing (NDT). NDT is required for welds around the bearing plate, the concentric reducer, all lift lugs, and all welding neck flanges. Either the magnetic particle or liquid dye penetrant method shall be performed. All NDT shall meet the requirements of section 6 in AWS D1.1.

3.5.3.2 NDT Personnel Qualifications. Only personnel qualified for NDT Level II in accordance with SNT-TC-1A may perform nondestructive testing.

3.6 Assembly.

3.6.1 Middle Section. The middle section shall be fabricated to the length specified in the delivery order. The top flange, lift lugs, and support ring shall be welded to one end of the pipe. The pipe, flange, lugs, and support ring shall be cleaned and painted. After the paint dries, the ionomer foam cladding shall be slid over the pipe. The end cap shall then be welded to the bottom flange and the flange welded to the pipe. The ionomer foam cladding shall be protected during the welding process. The bottom flange and the heat affect area around the flange shall be cleaned and painted. The middle section shall then be filled with closed cell polyurethane foam.

3.6.1.1 Foaming. Foaming equipment, job site requirements, and specific installation procedures shall be in accordance with the foam manufacturer's recommendations. The foam shall be injected into the middle section in multiple shots, and each shot shall be allowed to expand completely before the next shot is added.

3.6.2 Bottom Section. The ionomer foam cladding shall be fitted on the bottom section using the same procedure as specified in paragraph 3.6.1. After all items are painted, the spring assembly shall be inserted into the pipe and the base assembly placed into the concentric reducer. The chain assembly shall then be passed through the spring assembly and the connecting links attached to the chain. The top bar shall be inserted into the jaw end swivel on the top spring termination. The master link shall then be pulled through the base assembly compressing the springs until the bottom bar can be placed through the master link.

3.7 Surface Preparation. All steel surfaces shall be blast cleaned to near-white metal in accordance with SSPC-SP-10. Dry sand, steel shot, or steel grit are acceptable blasting media. Prior to painting, all surfaces shall be free of contaminants such as oil, water, grease, dirt, blasting residue, weld spatter, slag, and flash rust.

3.8 Painting. The CTPS shall be painted with the coating system outlined below. All painting shall be performed after the CTPS has been cleaned in accordance with paragraph 3.7. In so far as is practical, all welding, machining, cutting, drilling, forming, or any other operation which would damage the coating system shall be performed prior to painting. The Contractor shall follow the manufacturers' instructions for correct application of the coating system. In addition, the Contractor shall be responsible for implementing appropriate worker safety procedures for the application of the coating system, and for ensuring that the procedures are strictly followed by the paint applicators.

3.8.1 Coating system. All exterior steel surfaces, and the inside surfaces of the top section shall be coated with epoxy primer. Epoxy primer shall meet the requirements of MIL-P-24647, Type I, Class 1A, Grade A or B, Application 1 or 2, and shall be listed on the latest edition of QPL-24647. The finished color shall be black (manufacturers' standard colors are acceptable). Apply by spraying two coats, minimum 5 mils dry film thickness each, using contrasting colors for each coat. Sharp corners, edges, and other hard-to-coat areas shall be striped before each full coat is applied.

3.9 Weight. Each CTPS section shall be weighed. This weight shall be recorded on the inspection data sheet (paragraph 3.10.2) and DD form 250 (paragraph 5.3).

3.10 Documentation. The following documentation is required for each CTPS and shall be made available to the Contracting Officer's Technical Representative (COTR) upon request.

3.10.1 Material Certifications. The Contractor shall furnish material certifications, either from the material manufacturer or an independent testing laboratory, to the effect that all of the materials described in paragraphs 3.2.1 through 3.2.12 and 3.5.1 have been tested and found to meet the requirements of the applicable paragraphs of this specification.

3.10.2 Inspection Data Sheet. The Contractor shall furnish inspection data sheets for each CTPS listing all results of the tests and inspections required by section 4.. These sheets shall include but not be limited to the following information:

- a.) CTPS identification code/number.
- b.) Date of each test/inspection performed.
- c.) Name/type of test or inspection.
- d.) Acceptance/rejection criteria.
- e.) Result of test/inspection.
- f.) Corrections performed if any.
- g.) Observations and/or notes.
- h.) Initials of person who performed test/inspection.
- h.) Signature of Contractor's quality assurance manager.

4. VERIFICATION

4.1 General. The Contractor's quality assurance program shall meet the requirements of ANSI/ASQC C1.

4.2 Responsibility for Inspections. The Contractor is responsible for the performance of all inspection requirements as specified herein. The Coast Guard reserves the right to perform any of the inspections set forth in this specification.

4.3 Inspections. The inspections required by this section are not intended to supplant any controls, examinations, inspections, or tests normally employed by the Contractor to assure product quality.

4.3.1 Visual Inspections. The visual inspection shall include checks of dimensional conformance, mechanical fit, alignment of parts, workmanship, welds, surface preparation, and painting.

4.3.2 Weld Inspections. All weld inspections shall be performed prior to the application of the epoxy primer.

4.3.2.1 Visual Weld Inspections. All welds shall be visually inspected and shall be acceptable if the criteria of Table 6.1 in AWS D1.1 is satisfied.

4.3.2.2 NDT Inspections. The Contractor shall provide written proof that all NDT is in accordance with paragraph 3.5.3.1.

4.3.3 Paint Inspection. Paint thickness shall be gauged at no fewer than six different random locations for each CTPS section. The ambient temperature, humidity, induction and cure times shall be documented on the data sheet.

4.3.4 Documentation Review. Material certifications and inspection data sheets required by paragraph 3.10.1 and 3.10.2 shall be review by the COTR.

5. PACKAGING

5.1 Packaging. Packaging requirements are specified in Section D, Part I, Contract Schedule

6. NOTES

6.1 Shipping. One complete CTPS (top section, middle section, bottom section, plug, foundation, driving pile, flange hardware, and base hardware) shall be considered one shipment.

6.1.1 CTPS Sections. The CTPS sections shall be shipped unassembled (sections not bolted together) on a flat bed trailer. Each section shall be properly supported and protected to prevent damage during shipment.

6.1.2 Stainless Steel Hardware. The stainless stain hardware shall be shipped in two small wooden boxes. One box shall contain 24 flange bolts, 24 lock washers, and 24 hex nuts. The other box shall contain 16 base bolts, 16 lock washers, and 16 hex nuts.

6.2 Marking. Each box used for packing the stainless steel hardware shall be marked in legible writing at lease two inches in height. The box with the 24 flange fasteners shall be marked, "FLANGE HARDWARE". The box with the base fasteners shall be marked, "BASE HARDWARE".

6.3 Material Inspection and Receiving Report (DD Form 250). A form DD-250 shall be used as a certification of product quality assurance, as a packing list, and as a certification of acceptance. A separate DD-250 shall be prepared by the Contractor for each shipping lot. Prior to shipment, the DD-250 must be signed by the COTR.

SPEC. No. 477B - FABRICATION OF COLLISION TOLERANT PILE STRUCTURE
MARCH 1997

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CDR Larry E. Jaeger, USCG
Chief, Ocean Engineering Division

Date:

March 13, 1997
