OCEAN ENGINEERING DIVISION

UNITED STATES COAST GUARD

WASHINGTON, D.C.

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SPECIFICATION FOR FABRICATION OF STEEL OCEAN BUOYS

SPECIFICATION NO. 464

REVISION K

1. SCOPE

1.1 Scope. This specification defines the requirements for the fabrication of steel ocean buoys for use as aids to navigation.

1.2 Buoy Classification. The Coast Guard uses a wide variety of ocean buoys. These buoys are classified as either lighted or unlighted. Lighted buoys and unlighted sound buoys are identified by their diameter and length, and various design attributes. Unlighted buoys are identified by their shape (can or nun), class (1st through 5th in descending order of size), and various design attributes. The following tables list the designations corresponding to the buoy design attributes:

Lighted Buoys

Designation	Attribute
L	Lighted
R	Radar Reflector
B	Bell
G	Gong
W	Whistle
I	Ice
C	Can Shape Daymark
N	Nun Shape Daymark

Unlighted Buoys

Designation	Attribute
R	Radar Reflector
C	Can Shape Daymark
N	Nun Shape Daymark
I	Ice
S	Special
T	Tall

Thus, an “8x26LR” is an eight-foot diameter by twenty-six foot long lighted buoy with a radar reflector. 1NR is a first class nun radar reflective buoy, and 3CI is a third class can ice buoy. The following is a list of current Coast Guard steel ocean buoys:

Lighted Buoys and Unlighted Sound Buoys	Unlighted Buoys
9x35LWR	1NR
9x32LR	1CR
9x20BR	1NT
9x20GR	1CT
8x26LR	2NR
8x26LWR	2CR
8x21LR	3NR
7x20LIR	3CR
7x17LR	3NI
6x20LR	3CI
5x11LNR/LCR	4NRS
	4CRS
	5NR
	5CR
	5NI
	5CI

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are referenced in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification which are recommended for additional information or used 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 the referenced documents are listed here.

2.2 Coast Guard Documents. The latest revisions of the following United States Coast Guard Office of Civil Engineering documents form a part of this specification to the extent referenced herein.

Specification	Title
357	Fabrication of Buoy Bells and Gongs
360	Fabrication of Buoy Bell and Gong Tappers
362	Fabrication of Buoy Bell and Gong Stands
374	Fabrication of Aluminum Radar Reflectors
460	Fabrication of Buoy Solar Battery Boxes

2.3 Government Documents. The latest revisions of the following documents form a part of this specification to the extent referenced herein.

SPECIFICATIONS

MIL-PRF-24647	Paint System, Anticorrosive and Antifouling, Ship Hull
QPL-24647	Qualified Products List of Products Qualified Under Military Specification MIL-PRF-24647, Paint System, Anticorrosive and Antifouling, Ship Hull
MIL-PRF-24176	Military Specification, Cement, Epoxy, Metal Repair and Hull Smoothing

STANDARDS

FED-STD-595C	Federal Standard Colors

2.4 Industry Publications. The latest revisions of the following documents form a part of this specification to the extent referenced herein

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A36	Standard Specification for Structural Steel
A48	Standard Specification for Gray Iron Castings
A285	Pressure Vessel Plates, Carbon Steel, Low and Intermediate Tensile Strength
A312	Seamless and Welded Austenitic Stainless Steel Pipes

A314	Standard Specification for Stainless Steel Billets and Bars for Forging
A449	Standard Specification for Quenched and Tempered Steel Bolts and Studs
A666	Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
A706	Standard Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement
A1008	Steel, Sheet, Carbon, Cold-Rolled, Structural High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
A1011	Steel, Sheet and Strip, Carbon, Hot-Rolled, Carbon Structural High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
B209	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
B221	Standard Specification for Aluminum and Aluminum-Alloy Bars, Rods, Wire, Profiles, and Tubes
C33	Standard Specification for Concrete Aggregates.
C150	Standard Specification for Portland Cement
E165	Standard Test Method for Liquid Penetrant Examination
E709	Standard Guide for Magnetic Particle Examination

AMERICAN WELDING SOCIETY

AWS D1.1	Structural Welding Code - Steel
AWS D1.2	Structural Welding Code - Aluminum

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING

SNT-TC-1A	American Society for Nondestructive Testing Recommended Practice

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC-SP 10	Near White Blast Cleaning
SSPC-VIS 1	Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning

AMERICAN SOCIETY FOR QUALITY CONTROL

ANSI/ASQC Q9001 Quality Management Systems - Requirements

2.5 Drawings. The latest revisions of the following United States Coast Guard Office of Civil Engineering drawings form a part of this specification to the extent referenced herein and shall be referred to as "the drawing" throughout this specification:

Drawing Number	Title
120316	Nun Shape Aluminum Radar Reflector
120990	5CI and 5NI Buoys
120994	Buoy Bells and Gongs
120998	Buoy Bell and Gong Stand
121009	24” Battery Rack Assembly
121024	Can Shape Aluminum Radar Reflector
121028	3CI and 3NI Buoy
121056	A/N Cover Plate for 9x35LWR Buoy
121100	Solar Buoy Battery Box
121102	Swingbolt and Clevis Pin
121104	22” Battery Pocket Cover
121108	1988 Type First Class Nun Buoy (1NR)
121109	1988 Type First Class Can Buoy (1CR)
121110	1988 Type Second Class Nun Buoy (2NR)
121111	1988 Type Second Class Can Buoy (2CR)
121112	1988 Type Third Class Nun Buoy (3NR)
121113	1988 Type Third Class Can Buoy (3CR)
121129	1988 Type 7x17LR Buoy
121130	1989 Type 8x26LR Buoy
121131	1989 Type 8x26LWR Buoy
121132	1989 Type 9x32LR Buoy
121137	1990 Type 9x20R Buoy
121140	Buoy Lift Eyes
121143	24” Battery Pocket Cover
121145	1991 Type 8x21LR Buoy
121151	9x35LWR Buoy
121152	1992 Type 6x20LR Buoy
121153	Mooring Eye
121158	1992 Type 5x11LR Buoy
121159	Standard Buoy Tappers
121163	1994 Type Fifth Class Nun Buoy (5NR)
121164	1994 Type Fifth Class Can Buoy (5CR)
121174	8x26LR/LWR Buoy Tower
121175	8x21LR and 9x20R Buoy Tower
121176	6x20LR and 7x17LR Buoy Tower
121182	7x20LIR Lantern Adapter Plate
121186	7x20LIR Battery Rack Assembly
121188	2010 Type 8x26LR Buoy
121190	2010 Type 8x21LR Buoy
121191	2010 Type 7x17LR Buoy

Drawing Number	Title
121192	2010 Type 6x20LR Buoy
121193	2010 Type 7x20LIR Buoy
121194	2010 Type 1CT
121195	2010 Type 1NT
121196	2010 Type 4CRS Buoy
121197	2010 Type 4NRS Buoy

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

Coast Guard Documents.

Commandant (CG-432B)
U.S. Coast Guard Headquarters
1900 Half Street, SW
Washington, D.C. 20593-0001

http://www.uscg.mil/hq/cg4/cg432/drawings_FFATON.asp

Government Documents.

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

http://quicksearch.dla.mil/

Industry Publications.

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

https://www.astm.org/

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

http://www.aws.org/

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

http://www.sspc.org/

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

http://asq.org/index.aspx

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

http://asq.org/index.aspx

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, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First Article Testing. When specified (paragraph 6.1), buoys shall be subjected to first article testing in accordance with paragraph 4.3.

3.2 Materials.

3.2.1 Steel.

3.2.1.1Steel Bars, Shapes, and Plates. Steel bars, shapes, and plates 3/16 inch thick or more shall meet the requirements of ASTM A36.

3.2.1.2 Steel Sheets. Steel sheets less than 3/16 inch thick shall meet the requirements of ASTM A1008, Grade C, D, or E, or ASTM A1011, Grade 36, 40, 45, or 50.

3.2.1.3 Dished and Flanged Heads. The top and bottom buoy heads shall be steel meeting the requirements of ASTM A36 or any grade listed in ASTM A285.

3.2.1.4. Bars for Concrete Reinforcement (Rebar). Rebar shall meet the requirements of ASTM A706.

3.2.1.5 Steel Bolts and Nuts. Steel bolts and nuts shall be zinc-plated SAE Grade 5 and shall meet the requirements of ASTM A449.

3.2.2 Stainless Steel.

3.2.2.1 Stainless Steel Sheet, Plate, Strip, and Bar. Stainless steel sheet, plate, strip, and bar, shall meet the requirements of ASTM A666, type 316 or 316L.

3.2.2.2 Vent Pipe. Stainless steel vent pipe shall meet the requirements of ASTM A312, Grade TP316 or TP316L. The radius end of each vent pipe shall have a 3/4 inch NPT thread. The thread shall be a minimum of 1 inch in length and a maximum of 1-1/2 inches.

3.2.2.3 Hardware. Stainless steel hardware (nuts, bolts, pins, swing bolts, etc.) shall meet the requirements of ASTM A314, type 316 or 316L.

3.2.3 Aluminum.

3.2.3.1 Aluminum plate and sheet. Aluminum plate and sheet shall meet the requirements of ASTM B209, Alloy 5086 H32.

3.2.3.2 Aluminum rod. Aluminum rod shall meet the requirements of ASTM B221, Alloy 5086 H111.

3.2.4 Cast Iron. All cast iron counterweights shall meet the requirements of any class listed in ASTM A48.

3.2.5 Concrete. Concrete counterweights shall have a 28-day compressive strength of at least 3000 psi and a slump between 2 and 4 inches.

3.2.5.1 Cement. Cement used in the concrete mixture shall meet the requirements of ASTM C150, Type 1.

3.2.5.2 Coarse Aggregate. Coarse aggregate shall be uniformly graded from 1½ inch diameter to No. 4 sieve and shall meet the requirements of ASTM C33

3.2.5.3 Fine Aggregate. Fine aggregate shall be uniformly graded from No. 4 to No. 100 sieve and shall meet the requirements of ASTM C33.

3.2.5.4 Concrete Mix. The concrete mix shall be proportioned by volume as follows: 1 part cement, 2 parts fine aggregate, 4 parts coarse aggregate. Water shall be 6 gallons per 1 cubic foot (94 lb. sack) of cement.

3.2.6 Wood. Fenders shall be fabricated from wood. The wood shall be white oak or salt-treated white oak, red oak, ash, elm, hickory, maple, or walnut.

3.3 Design and Construction.

3.3.1 Design, Dimensions, and Dimensional Tolerances. All portions of the buoy shall conform to the design, dimensions, and tolerances as shown in the drawings.

3.3.2 Threads. The threads on all nuts and bolts shall be Unified Course Thread Series (UNC). The threads on all vent pipes, pipe couplings, nipples, elbows, unions, and pipe plugs shall be American Standard Taper Pipe Threads (NPT).

3.3.3 Counterweights. The finished weight of each counterweight and counterweight assembly shall be in accordance with the drawing. The actual weight of each counterweight shall be documented on the Quality Assurance Inspection Form as required in paragraph 3.7.2.

3.3.3.1 External Counterweights. The surface of the counterweight shall be free of any fused-on sand and shall be smooth (shall not cut skin or cloth). Runners, risers, fins, and other cast-on pieces shall be removed. Repairs to the surface of the counterweight shall be made by plugging or welding. The void between the counterweight and the counterweight tube shall be filled with a hot-applied asphalt enamel. Salient characteristics are: 20-30% filler, not more than 5% of which is calcium; 90% of the filler shall pass through a 200 mesh sieve; good adhesive qualities; shall not flow or sag from a vertical surface; and shall not become brittle.

3.3.3.2 Internal Counterweights. Internal concrete and cast iron counterweights shall be poured after the counterweight/mooring assembly has been fabricated. The concrete counterweights shall be poured after the rebar has been welded in place. The concrete shall be tamped to eliminate voids.

3.3.4 Fenders. After the antifouling paint (paragraph 3.6.1.2) has dried, wooden fenders shall be attached to the fender supports on 9x35LWR and 8x26LWR buoys. Zinc-plated SAE Grade 5 hex bolts and nuts (paragraph 3.2.1.5) shall be used to secure the fenders in place. To prevent the loss of the fastener, the bolts shall be peened and the nuts tack welded.

3.3.5 Welding. The plates, bars, and other shapes forming the various components of the buoy shall be fitted and faired prior to being welded in place. All welds shall be performed as indicated on the drawings. Welds in and around the lifting eyes, mooring eyes, and tower feet shall be inspected using the magnetic particle method (paragraph 4.5.3.2).

3.3.5.1 Steel Welding. 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 buoy. All welding procedures and weld quality for steel, shall meet the requirements of AWS D1.1. All welders employed for welding under this specification shall be qualified by the Contractor using procedures which meet the requirements of AWS D1.1.

3.3.6.2 Aluminum Welding. Gas Metal Arc Welding (GMAW) shall be used to weld the aluminum parts of the buoy. All welding procedures and weld quality shall meet the requirements of AWS D1.2. All welders employed for welding under this specification shall be qualified by the Contractor using procedures which meet the requirements of AWS D1.2.

3.3.6 Watertightness. The buoy body and the battery pockets shall be watertight. Watertightness shall be determined by the air test required in paragraph 4.5.2.

3.3.7 Serial Code. Each buoy shall be identified by a serial code. The serial code shall be of the form 8W-13-01-XX (or 1CR-13-01-XX). The first group of characters represents the buoy type, the next two digits are the last two digits of the calendar year, the next digits are the sequential number of the buoy as manufactured, and the final two letters are the Contractor's designation which will be furnished by the Contracting Officer after contract award. In addition, the letters "USCG" shall be applied to the opposite side of the buoy top head from the serial code.

3.3.7.1 Character Dimensions and Location. The serial code and "USCG" shall be a bead of weld **not less than** 1/8 (± 1/16) inch high by 1/4 (± 1/16) inch wide applied to the buoy top head 3 inches from, and parallel to, the outside edge of the head in the shapes of the characters that make up the serial code. The characters of the serial code shall be block digits with a maximum width of 1-3/4 (± 1/4) inches and a height of 2-1/2 (± 1/4) inches. The 3NI and 5NI ice buoys may have the serial code placed at the top of the upper conical section.

3.3.7.2 Buoy Identification Characters. The following characters shall be used as the first group of characters for identifying buoys in the serial code:

BUOY	CODE	BUOY	CODE	BUOY	CODE
9x35LWR	9W	1NR	1NR	3NI	3NI
9x32LR	9	1CR	1CR	3CI	3CI
9x20BR/GR	9S	1NT	1NT	4NRS	4NRS
8x26LR	8	1CT	1CT	4CRS	4CRS
8x26LWR	8W	2NR	2NR	5NR	5NR
8x21LR	8S	2CR	2CR	5CR	5CR
7x20LIR	7I	3NR	3NR	5NI	5NI
7x17LR	7	3CR	3CR	5CI	5CI
6x20LR	6				
5x11LNR/LCR	5				

3.3.8 Weight. After painting, each buoy shall be weighed. This weight shall be recorded on the buoy's Quality Assurance Inspection Form (paragraph 3.7.2) and DD form 250 (paragraph 3.7.4).

3.4 Additional Equipment.

3.4.1 Solar Battery Box. When specified in the delivery order, the Contractor shall delivery a lighted buoy with a solar battery box. The solar battery box shall be fabricated in accordance with Specification No. 460 and Drawing 121100. The solar battery box shall be painted the same color as the buoy it is to be attached too. The solar battery box shall be attached to the bell stand after the buoy has been painted.

3.4.2 Cover Plate and Battery Rack. Each 9x35LWR buoy shall be delivered with one A/N cover plate (Drawing 121056) and one battery rack assembly (Drawing 121009). The A/N cover shall be tied to the buoy tower with wire or a nylon cable tie. The battery rack shall be painted grey and shall be placed in one of the battery pockets.

3.4.3 Bell/Gong. As indicated in the delivery order, each 9x20R buoy shall be delivered with either a bell or gong. The bell, gong, bell stand, gong stand, and tappers shall be fabricated in accordance with the following Coast Guard drawings and specifications:

Item	Specification No.	Drawing No.
Bell and Gong	357	120994
Bell and Gong Stands	362	120998
Tappers	360	121159

3.4.3.1 Government Loaned Property. The bell and gong patterns will be provided to the Contractor as Government Loaned Property. Upon completion of the contract, the Contractor shall be responsible for reconditioning and shipping the patterns back to the Coast Guard Surface Forces Logistics Center (SFLC) in Baltimore, MD. The patterns shall be returned to the Coast Guard in the same condition as received.

3.4.4 Aluminum Radar Reflectors. As indicated in the delivery order, each 5x11LR shall be delivered with an aluminum radar reflector. The reflectors shall be fabricated in accordance with Specification No. 374. Buoys specified in a delivery order as LCR shall be fitted with a "can" radar reflector shown in Drawing 121024. Buoys specified in a delivery order as LNR shall be fitted with the "nun" radar reflector shown in Drawing 120316. The stainless steel bolts connecting the radar reflector to the support stand shall be fitted with "top hats" or "isolation washers" to avoid contact between dissimilar metals.

3.5 Surface Preparation. All exterior surfaces, and the inside surfaces of whistle tubes and battery pockets, shall be blast cleaned to near-white metal in accordance with SSPC-SP 10.

3.5.1 Surface Profile. The surface profile after blasting shall be 1.5 to 3.0 mils.

3.5.2 Post-Blast Surface Characteristics. Specific guidance is provided in SSPC-SP 10. After blasting, the surface shall be free of all oil, grease, dust, dirt, mill scale, rust, coatings, oxides, corrosion products, and other foreign matter except for random staining. Per SSPC-SP 10, random staining may consist of light shadows, slight streaks, or minor discolorations caused by stains of rust, stains of mill scale, or stains of previously applied coatings on no more than 5% of the surface area. Examples of the visual appearance of a surface blasted to near-white metal can be found in SSPC-VIS 1.

3.5.3 Epoxy Repair Compound. After all surfaces have been blasted clean, any weld containing porosity shall be filled with an epoxy repair compound meeting the requirements of DOD-PRF-24176. The epoxy repair compound shall only be used to fill porosity discontinuities that are within the allowable maximums stated in table 6.1 of AWS D1.1.

3.6 Painting. Buoys shall be painted with the coating system outlined below. All painting shall be performed after the buoys have been cleaned in accordance with paragraph 3.5 and have successfully passed the air test required by paragraph 4.5.2. 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. When buoy towers are purchased alone (i.e. not part of a complete buoy), they shall be primed only.

3.6.1 Buoy Coating system. The buoy coating system consists of three components: a high-build epoxy primer, an ablative antifouling paint, and a marine-grade aliphatic polyurethane topcoat. The paints in the coating system are commercial products available from a variety of manufacturers. However, the paints shall be applied as a complete system; i.e., all of the paints used on any given buoy (primer, antifouling, and topcoat) shall be from the same manufacturer.

3.6.1.1 Epoxy primer. All exterior steel surfaces, the exterior counterweights, and the inside surfaces of whistle tubes and battery pockets shall be coated with epoxy primer. Epoxy primer shall meet the requirements of MIL-PRF-24647, Type II, Class 1, Grade A or B, Application 1, 2 or 3 and shall be listed in QPL-24647. The colors required are haze gray and off-white or buff (manufacturers' standard colors are acceptable). Apply by spraying two coats, 5-7 mils dry film thickness each, using contrasting colors for each coat (haze gray followed by off-white or buff). Sharp corners, edges, and other hard-to-coat areas shall be striped before each full coat is applied.

3.6.1.2 Ablative antifouling paint. All exterior surfaces below the waterline and the inside surfaces of whistle tubes shall be coated with ablative antifouling paint (waterlines for the purpose of painting are indicated in Figure 1). Ablative antifouling paint shall meet the requirements of MIL-PRF-24647, Type II, Class 1, Grade A or B, Application 1, 2 or 3 and shall be listed in QPL-24647. The colors required are red and black (manufacturers' standard colors are acceptable). Apply by spraying two coats, 5-7 mils dry film thickness each, using contrasting colors for each coat (black followed by red). Commence application of the first coat of antifouling when the epoxy is tack-free (i.e., the epoxy can be lightly touched with no paint coming off on the fingertips) and no later than when the epoxy is still slightly soft to finger pressure. If the epoxy has cured too hard (no longer soft to finger pressure), apply another 1-2 mils wet film thickness of epoxy, following the manufacturer's specified recoat interval. Then, commence application of the antifouling as described above. Failure to apply the antifouling to the epoxy in this manner may result in loss of adhesion and premature failure of the coating system. Sharp corners, edges, and other hard-to-coat areas shall be striped before each full coat is applied.

3.6.1.3 Polyurethane topcoat. All exterior steel surfaces above the waterline shall be coated with a marine grade of acrylic aliphatic polyurethane (waterlines for the purpose of painting are indicated in Table 1). This paint shall meet the following requirements: 1) it shall be a commercial product from the same manufacturer that supplies the epoxy primer and ablative antifouling paints; 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) it shall meet the requirements of SSPC Paint Specification No. 36, Level 3. Apply by spraying one coat, 3-4 mils dry film thickness. Sharp corners, edges, and other hard-to-coat areas shall be striped before the full coat is applied. The required colors (as specified in the delivery order) shall be in accordance with FED-STD-595: red (Federal Color 11350), green (Federal Color 14193), dark green (Federal Color 14062) white (Federal Color 27875), and yellow (Federal Color 13655).

3.6.1.3.1 Preferred Channel Marks. When specified in a delivery order, a buoy shall be painted with a preferred channel paint scheme. The buoy shall be painted with three horizontal stripes above the water line. The stripes will be red/green/red or green/red/green. All lighted buoys with radar towers shall have the top radar panels painted in the primary color, the bottom radar panels and tower legs painted in the secondary color, and the buoy top head to the water line painted in the primary color. For unlighted buoys, the radar reflector shall be painted in the primary color. The top head to the water line shall be split in half with the upper half being painted with the secondary color and the lower half being painted with the primary color. Figure 2 shows the stripe configuration for various buoys

3.6.1.3.2 Safewater Paint Scheme. When specified in a delivery order, a buoy shall be painted with a safewater paint scheme. Eight alternating red and white vertical segments shall be applied to all steel and aluminum surfaces above the water line. The vertical segments shall be arranged to bisect the 90 degree angle of the radar reflector (see Figure 3).

3.7 Documentation.

3.7.1 Monthly Status Report. The Contractor shall prepare and deliver a monthly status report to the Contracting Officer's Representative (COR). This report shall be typewritten on standard (i.e., 8½x11 inch) white paper. The report shall be prepared in the Contractor's format and shall be legible, in English, and suitable for reproduction. The reporting period shall start on the first day and end on the last day of each month of the year.

3.7.1.1 Report Content. At a minimum the report shall include:

a) The Contractor's name and address, the contract number, the date of the report, the period covered by the report.
b) A list of active delivery orders.
c) A description of progress made for each active delivery order during the reporting period.
d) A description of any problems encountered during the reporting period. Problem areas are any aspects of contract performance which prevent the contractor from meeting:
    1. technical requirements
    2. delivery schedule requirements
    3. quality assurance provision requirements

e) In addition, problems with subcontractor, vendor, and supplier-provided products and services shall be specifically noted.
f) Results, positive and negative, obtained from resolving problems discovered during the reporting period or for previously identified problems. A description of the action taken or a recommendation shall be provided for each problem.
g) Record of significant telephone calls, emails and meetings and any commitments or action items made as a result of such telephone calls or meetings.
h) The identification and status of Engineering Change Proposals (ECPs) which have been proposed, approved, or are being implemented.
i) A brief description of planned activities for the next reporting period.
j) Authentication by the responsible company official preparing the report. This shall include the person's name, signature, date signed, and telephone number.
k) Any necessary tables, references, photographs, illustrations, charts, or drawings shall be included as appendices.

3.7.2 Quality Assurance Inspection Form. The Contractor shall develop and provide a Quality Assurance Inspection Form (QAIF). The QAIF shall be used to document the inspections and tests performed on every buoy throughout its fabrication process. The form shall be typewritten on standard (i.e., 8½x11 inch) white paper. Inspection results may be handwritten on the form. The form shall be prepared in the Contractor's format and shall be legible, in English, and suitable for reproduction. The form shall be delivered to the COR for review along with the DD-250 (paragraph 3.7.4) prior to any shipment.

3.7.2.1 QAIF Content. At a minimum the QAIF shall include:
a) Buoy classification and serial number.
b) Material certification reference numbers (paragraph 3.7.3).
c) Date of test or inspection.
d) Test or inspection to be performed (list every test and inspection required by section 4.0).
e) Result of test or inspection.
f) Accept/Reject criteria for each test or inspection.
g) Notes.
h) Initial or signature of Contractor’s test personnel.

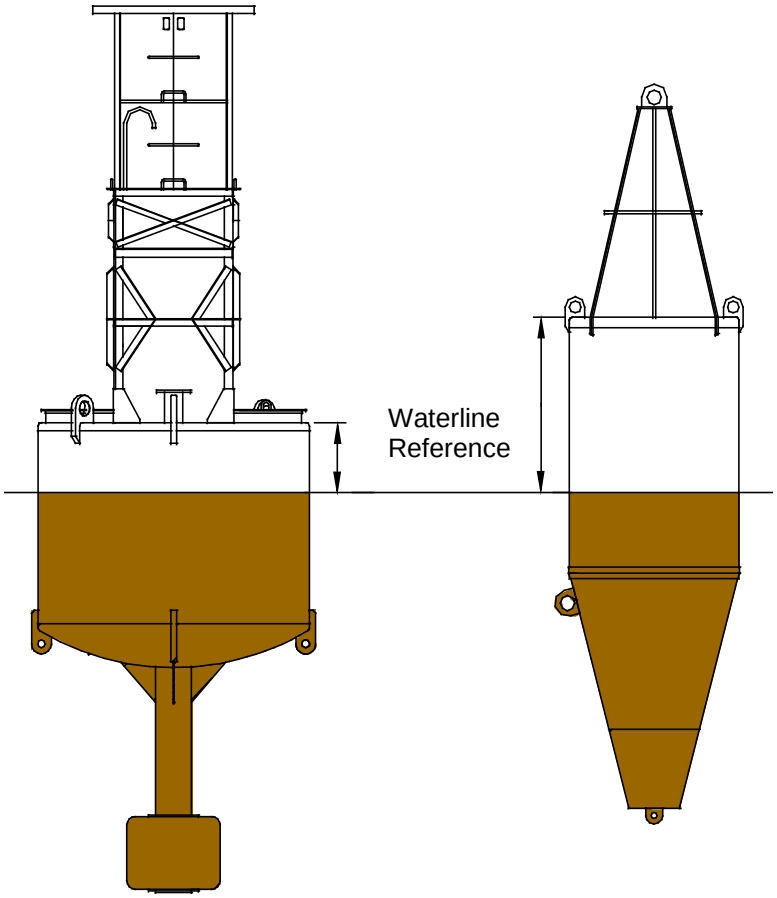
3.7.3 Material Certifications. When requested by the COR, the Contractor shall furnish material certifications, either from the material manufacturers or an independent testing laboratory, to the effect that all of the material described in paragraphs 3.2.1 through 3.2.6 have been tested and found to meet the requirements of the applicable sections of this specification. Each material certification shall be assigned a reference number by the Contractor. When any material is used in the fabrication process of a buoy, the material certification reference number shall be documented in the QAIF (paragraph 3.7.2.1). The material certifications shall be stored by the Contractor for the life of the contract.

3.7.4 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 COR.

FIGURE 1

STANDARD WATERLINES FOR STEEL OCEAN BUOYS

Noted below are the standard waterlines (line between color coat and antifouling paint).



BUOY	W/L (IN.)
9x35LWR	24
9x32LR	30
9x20R	18
8x26LR	24
8x26LWR	24
8x21LR	24
7x20LI	*
7x17LR	18
6x20LR	18
5x11LR	12

BUOY	W/L (IN.)
1NR/1CR	60
1NT	152**
1CT	108**
2NR/2CR	36
3NR/3CR	24
3NI	60**
3CI	54**
4NRS/4CRS	24
5NR/5CR	24
5NI	46**
5CI	33**

Note: * Located at largest diameter of the buoy
** Measured from the top horizontal surface

FIGURE 2
PREFERRED CHANNEL PAINT SCHEME

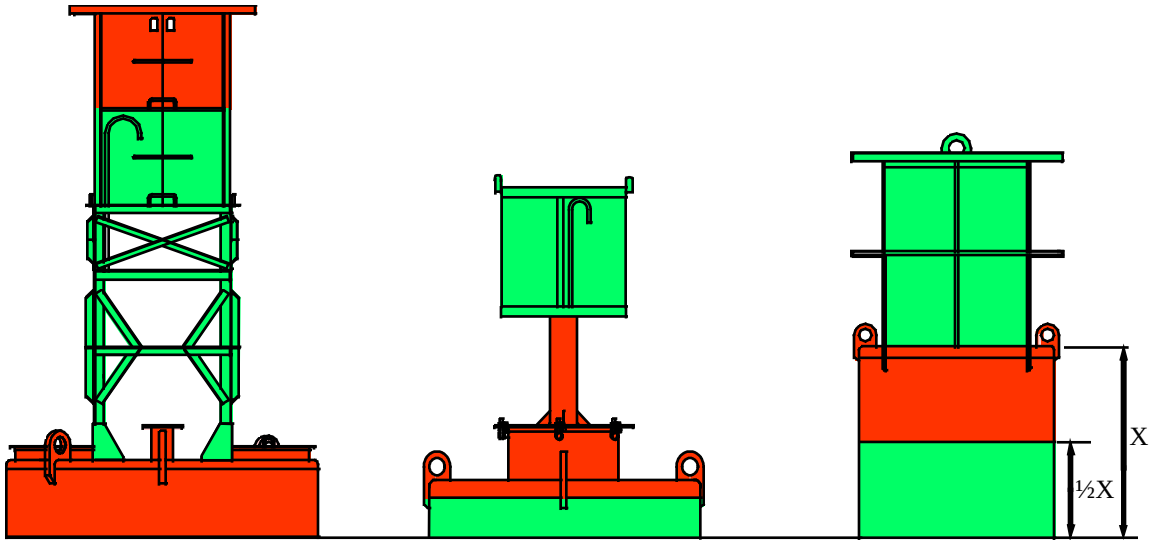
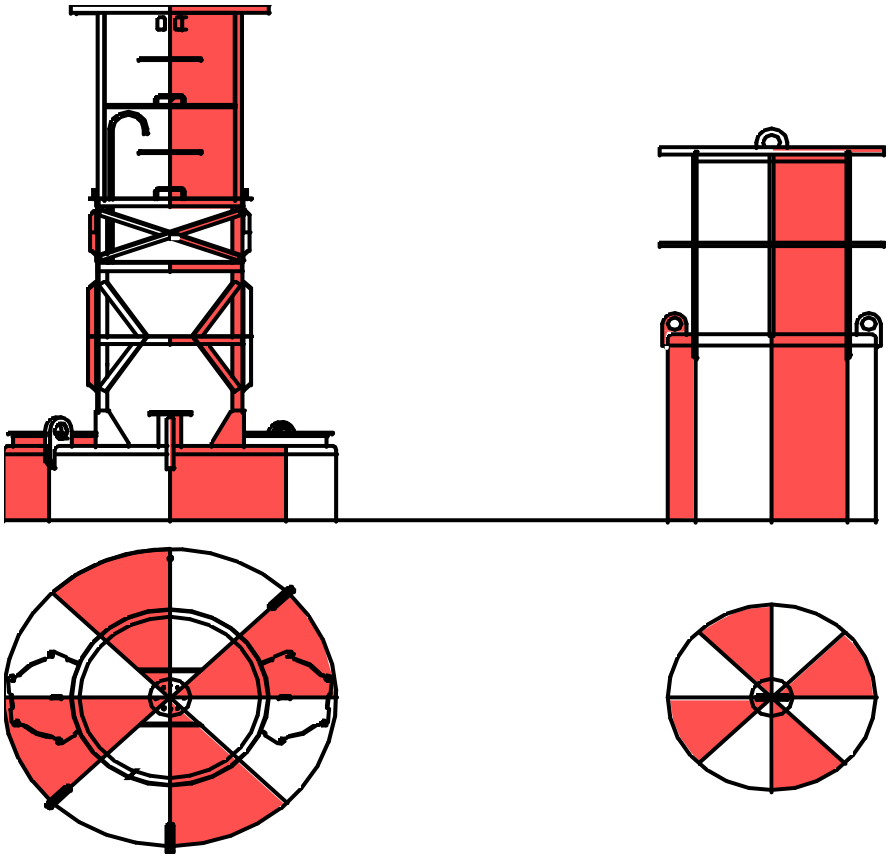


FIGURE 3
SAFEWATER PAINT SCHEME



4. VERIFICATION

4.1 General. The Contractor's quality assurance program shall meet the requirements of ANSI/ASQC Q9001. However, the Contractor DOES NOT have to be Q9001 certified.

4.2 Classification of Inspections. The inspections required by this section are not intended to supplant any controls, examinations, inspections, or tests normally employed by the Contractor to ensure product quality. The inspection requirements specified herein are classified as follows:

a. First Article Inspection (see paragraph 4.3)
b. Conformance Inspection (see paragraph 4.4)

4.3 First Article Inspection. When first article samples are required (see paragraphs 3.1 and 6.1), the Contractor shall perform a First Article Inspection. This inspection shall include the tests and examinations listed in paragraphs 4.5.1 through 4.5.6.

4.4 Conformance Inspection. The Conformance Inspection, to be performed by the Contractor, shall include the tests and examinations listed in paragraphs 4.5.1 through 4.5.6.

4.5. Tests and Inspections.

4.5.1 Visual Inspection. Buoys shall be visually inspected for conformance to this specification and the drawings. The visual inspection shall include checks of dimensional conformance, mechanical fit, alignment of parts, and workmanship.

4.5.2 Air Test. Each buoy body and battery pocket shall be subjected to an air test to determine its watertight integrity. Separate air tests shall be performed on the buoy body and on the buoy battery pockets. At no time during testing shall both the buoy body and the battery pockets be under pressure at the same time. Air tests shall not be conducted within 1 hour after any hot work (i.e. welding, grinding, etc.) has been performed on the buoy. All welding to the hull shall be completed prior to the air testing. Any welding completed after air tests have been conducted shall require all air tests to be repeated.

4.5.2.1 Buoy Body Air Test. The buoy body shall be pressurized to 3 psi and the air source shall be secured. The pressure shall not change over a period of 10 minutes. While the buoy is pressurized, all welds on the buoy body shall be checked for leaks by applying a soapy water solution with a soft brush. An air test should be considered a failure if either (a) drop in pressure occurs or (b) leak is detected by the soapy water application.

4.5.2.2 Battery Pocket Air Test. The battery pockets shall be sealed by closing the pockets cover and plugging the vent pipes prior to testing. The crossover pipe between the battery pockets shall not be obstructed during this test in order that both pockets may be equally pressurized at the same time. The battery pockets shall be pressurized to 2 psi and the air source shall be secured. The pressure shall not change over a period of 5 minutes. An air test shall be considered a failure if any drop in pressure occurs.

4.5.2.3 Pressure Gauges. The pressure gauge range shall be selected such that a test pressure of 2.0 psi is not less than 20% of the scale of the gauge. The gauge shall have a one percent (1%) accuracy at the test pressure. The gauge shall have a 1 psi sensitivity.

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

4.5.3.1 Visual Weld Inspection. All welds shall be visually inspected for quality in accordance with section 6.9 of AWS D1.1.

4.5.3.2 Non Destructive Testing (NDT). Welds in and around the lifting eyes, mooring eyes, and tower feet shall be inspected using the magnetic particle testing method. The procedures and technique shall be in accordance with ASTM E709.

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

4.5.4 Surface Preparation. Prior to the application of the epoxy primer, all exterior surfaces and the inside surfaces of whistle tubes and battery pockets shall be inspected to ensure conformance with SSPC-SP 10.

4.5.5 Paint Inspection. The Contractor shall ensure that each buoy was painted in accordance with paragraph 3.6 and all sub-paragraphs. Paint thickness shall be gauged at no fewer than six different random locations on the buoy. The ambient temperature, humidity, induction, and cure times shall be documented on the QAIF (paragraph 3.7.2).

4.5.6 Certifications Review. When requested by the COR, material certifications required by section 3.7.3 shall be provided for review.

5. PACKAGING.

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

6. NOTES

6.1 First Article Inspection. First article inspection shall be performed by the Contractor and at the Contractor's facility. The first articles shall consist of fully assembled buoys with written certifications in accordance with this specification. The first article shall be inspected and tested for requirements in this specification and those tests and inspections listed in paragraphs 4.5.1 through 4.5.6. The following buoys shall be inspected: 8x26LR with solar battery box; 7x20LIR; and 2NR. These buoys must pass the first article tests before the Coast Guard will place any production orders.

6.2 Packaging. The buoys shall be shipped fully assembled. The ends of the vent pipes shall be covered with a heavy tape to protect them from damage and to prevent water from entering the battery pockets. The buoys shall be properly supported and protected from abrasive wear to prevent damage to the buoy, including paint, during shipment. The lighted buoy towers and counterweights shall be supported to prevent vibration during shipment.

SPECIFICATION NO. 464 K -- FABRICATION OF STEEL OCEAN BUOYS

August 2013

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