Pharos Marine Automatic Power

Foam Buoys

SOFTLITE
IONOMER FOAM

Eco-Friendly

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Softlite Ionomer Foam Buoys

Softlite ionomer foam navigation buoys are the choice of the US Coast Guard and port and lighthouse authorities--as well as commercial users--around the world because of their extreme reliability and durability with none of the maintenance and half the weight of conventional buoys. They are now the buoy of choice to replace steel and hard shelled plastic buoys in many areas of the world.

Advantages

The Softlite ionomer foam buoy has been extensively tested and placed in service by the U. S. Coast Guard. The Coast Guard reports that ionomer foam buoys:

- remain brighter than steel or plastic buoys
- are lightweight – suitable for handling by smaller buoy tenders
- do not sink or crush
- have great flexing strength and energy absorption
- do not severely damage pleasure boats during collisions
- require smaller mooring equipment
- require minimal maintenance
- perform very well in high current areas
- free standing in upright position to minimize space in storage and on deck

For buoy tendering operations, the self-fendering properties of ionomer foam buoys make them far preferable to steel buoys which inevitably damage vessels.

Softlite Ionomer Foam Buoys distributed by Automatic Power, Inc. are a major advance over previous technologies for flotation, buoyancy and energy-absorbing buoys. Extruded, ionically cross-linked ionomer foams are considered the toughest, most durable, flexible low density, closed-cell foams on the market. The inherent structural integrity of ionomer foam provides unsurpassed longevity and performance. Thermoplastic construction allows exceptional design freedom in the shapes and sizes produced. Foamed ionomer is especially well suited for marine buoy applications because they offer unsurpassed toughness, durability, resistance to environmental agents, e.g. radiation, salt, waves, etc. with low weight and density.

The buoys are manufactured to the requirements of the US Coast Guard Specification 450F for the construction of Ionomer Foam Buoys.

Net Buoyancy and Color guaranteed for 12 years

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Material and Construction

The Softlite ionomer foam buoys are constructed of extruded ionomer foam. Ionomer resins are high grade thermoplastic polymers of the polyolefin family manufactured by DuPont under the brand name Surlyn® and by Exxon Chemical under the name Iotek®. Ionomer resins have the unique ability to link ionically between neighboring molecular chains with the same bond as the polymer chain itself. These molecular bonds give structures built of ionomer foam exceptional integrity.

Initially extruded as a continuous sheet, Softlite Ionomer Foam has a very strong, thick-walled, closed cell structure. Softlite Foam is considered the toughest, most durable, flexible, low-density, closed-cell foam on the market. In addition, during the extrusion process, uniform colors and ultraviolet stabilizer and antioxidant are integrated into all the cell structures throughout the buoy mass.

After extrusion, the continuous sheet is rolled up into a cylinder by continuous spiral winding under heat and pressure, causing each successive layer to weld to the previous, using the ionic cross linkages to create an integrally structured homogeneous mass of tough, universally pigmented, flexible, closed-cell ionomer foam. There are no voids or cavities in the foam; such voids are impossible in the Softlite construction process.

This cylindrical mass can be shaped to any exterior contour by heat-cutting. The two flat end surfaces are then "capped" with additional sheets of Softlite heat-welded to the body. The resultant foam structure offers superior strength, energy absorption, compression resistance, water barrier characteristics, and structural integrity.

The final surface of the buoy is a skin of solid ionomer plastic. The skin is tough, but smooth and flexible. The surface resists abrasion, is not rough on ship paint or metal and is non-marking in any color. Since the skin is identical to the interior foam, the buoy's integrity is unsurpassed. There are no seams and problems with skin adherence, interstitial icing, or skin separation, common in composite buoys, are also impossible.

The buoys retain their inherent characteristics at all temperatures from -85° F to +175° F. The buoy bodies will not fracture or distort when dropped on a hard surface or when struck by a vessel under operational conditions.

In an article published in Soundings in March of 1991, the Technical Director of the US Coast Guard R & D Center described the Softlite marine buoys as:

"…almost indestructible…stronger than steel. You can't sink it."

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Comparative Advantages of Ionomer Foam Buoys

1. No Dissimilar Materials

As is the case with dissimilar metals, intimate contact between dissimilar plastics or plastics and fiberglass should be avoided. Dissimilar materials, e.g. hard shells and low density cores, tend to shrink and separate from one another due to ambient temperature variations, vibrations caused by wave and current action, the stresses of use and the natural aging process. This causes voids, blisters and soft spots at the interface.

The Softlite buoy is simply a concentrated, densified reduction of several inches of the original mass itself. This integral skin design eliminates the problems resulting from adjacent dissimilar materials. A single material forms both the core and the shell of the Softlite buoy.

The Softlite buoy pigmentation, ultraviolet and antioxidant protection do not stop at the surface. The entire mass, every ounce of it, is pigmented and ultraviolet /antioxidant protected throughout. Objects with unpigmented and unprotected interiors degrade rapidly as a result of surface damage. They lose marker color visibility and interior foam flotation and fendering integrity. Softlite buoys can withstand such surface mishaps with no loss of marker visibility or damage to interior foam integrity and no consequent loss of buoyancy or fendering ability.

2. Superior Flexibility and Strength

The construction process, interior material, and skin of the Softlite buoys is the same as used in ship fenders which routinely withstand severe and repeated impacts involving compressions of more than 60 % between two vessels or between a ship and a pier.

3. Lightest Heavy Duty Buoys Available

Softlite buoys and fenders not only out-survive multi-material buoys they are substantially lighter and more buoyant. As a result, the Softlite buoys float higher in the water for greater visibility and expose much less area to marine growth; they do not heel excessively in fast water or heavy seas; and can use much lighter mooring and attachments than metal buoys require.

Softlite buoys are a great deal easier and safer to handle, especially on deck in heavy weather. In general, they require fewer personnel to deploy and smaller equipment to manage and service.

4. Universal Pigment

The colors (as well as the antioxidant and ultraviolet protection) of the Softlite buoys are uniform throughout the entire mass of the object. This means, in effect, that no insult to the surface of the object will reveal a dissimilar color or a fragile material. Even if a piece of the object is excised by an accident, the appearance and function is not impaired.

5. Concentrated Skin

The integral skin of the Softlite buoys is formed by concentrating the outer several inches of the structured foam mass down to an approximate thickness of one quarter to one half inch under heat and pressure. This extremely tough, abrasion-resistant surface **(as a matter of fact, the same material as the cover of golf balls)** contains a highly condensed concentration of pigmentation, antioxidant, and ultraviolet inhibitor. The result is a brightly colored surface with a very high degree of resistance to fade and sunburn that is smooth and naturally unattractive to fouling.

6. Impervious to Fuels and Chemicals

Most plastic used for marine flotation and fendering is highly susceptible to degradation upon exposure to commonly used fuels and chemicals (gasoline, diesel, solvents, etc.), through inevitable cracks and punctures of the shell. Softlite Ionomer foam is impervious to these fuels and chemicals.

7. Excellent Fire Safety

Unlike other plastic materials which produce poisonous gasses when burned and cannot be stored below deck or in inhabited structures, Ionomer resins produce no hazardous smoke when burned and are Underwriters Lab rated as offering very good fire retarding characteristics.

8. Near Perfect Balance

The technique of spiral wrapping and welding foam to itself around a central axis guarantees a perfect center of gravity at the tension member. Softlite buoys will not hang, list or float off their axis due to non-uniform distribution of interior material or construction. Servicing the buoys and floats is safer and easier for personnel. Placement of fenders is more accurate and reliable.

9. Highly Water Repellent

"Closed cell foams" differ dramatically in their ability to repel water. This ability is a function of the thickness of the cell walls and the molecular weight of the polymer. Extruded Softlite Ionomer foam surpasses other foamed products in both respects; as a result, Softlite foam is much more resistant to water absorption. The extrusion process used for Softlite allows thicker individual cell walls to form at a controlled rate resulting in a stronger, tougher foam.

10. Unaffected by Ice

The smooth, tough, flexible skin of the Softlite buoys survive ice and freezing conditions without damage to or degradation of the structure, interior or function.

11. Internal Radar Target

Radar targets can be inserted in custom cut sleeves inside the buoys Placed inside; the targets retain angularity better than targets exposed to the environment. Radar visibility is extended.

12. Corrosion proof

Abrasion from vessel hulls, piers, locks, flotsam and jetsam, as well as the regular action of waves and currents can erode any surface coating over time. When this occurs on other materials, the result is corrosion or water absorption which impairs the object's function by reducing structural integrity, color or visibility and increasing weight. Unless the surfaces are recoated, the ultimate effect of abrasion or corrosion is failure of the object. With Softlite buoys corrosion repairs are never necessary.

Because of the continuously welded Softlite construction process and the integral skin finish, there are no seams. Since all the layers as well as the skin are integral to the buoy mass, problems with adherence, interstitial icing, or separation which are reported with composite material designs are impossible with Softlite buoys.

The buoys retain their inherent characteristics at all temperatures from -85 F to +175F.

The buoys will not fracture or fail if dropped on a hard surface or struck by water craft or even if driven by waves onto a shoreline, in the event of mooring failure. Softlite buoys struck by small arms fire up to and including high powered NATO rounds show no appreciable rupture at points of entry. In cases where slugs do exit, exit points show no appreciable rupture either. Since Softlite buoys are solid masses of millions of closed cells, even multiple penetrations by gunfire (the so-called AK-47 Stress Test) have negligible effect on function and little effect on appearance.

Following are performance values of Ionomer resin (i.e. the buoy skin) on relevant ASTM tests which may be compared to the equivalent values for other materials:

Property	ASTM	Ionomer Value
Tensile Strength	D - 638	4,400 p.s.i.
Shore A Hardness	D - 2240	130
Tear Strength	D - 624	118.2 lbs/in min.
Abrasion Resistance	D - 1630	410

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The foam itself is totally non-toxic. Unlike other materials, the Softlite products emit no toxic fumes in the presence of fire and can safely be stored below decks or in enclosed areas with complete confidence.

Reasons to Use Softlite Ionomer Foam Buoys

- **Superior strength**
- **High energy absorption**
- **Compression resistant**
- **Greater structural integrity**
- **Will not fade - permanently colored throughout**
- **Will not sink - no voids or cavities**
- **Will not leak**
- **Will not shatter**
- **Will not severely damage pleasure boats during collisions**
- **Lightweight – suitable for handling by smaller buoy tenders**
- **Can use smaller mooring equipment**
- **Requires minimal maintenance**
- **Performs very well in high current areas**
- **Free standing in upright position to minimize space in storage and on deck**

Environmentally Friendly

Ionomer foam is eco-friendly. Preferred disposal methods are:

- Recycling
- Incineration with energy recovery, and
- Landfill

The high fuel value of this product makes incineration very desirable for material that is not recycled.

Net Buoyancy and Color guaranteed for 12 years

ALL

IONOMER FOAM BUOYS

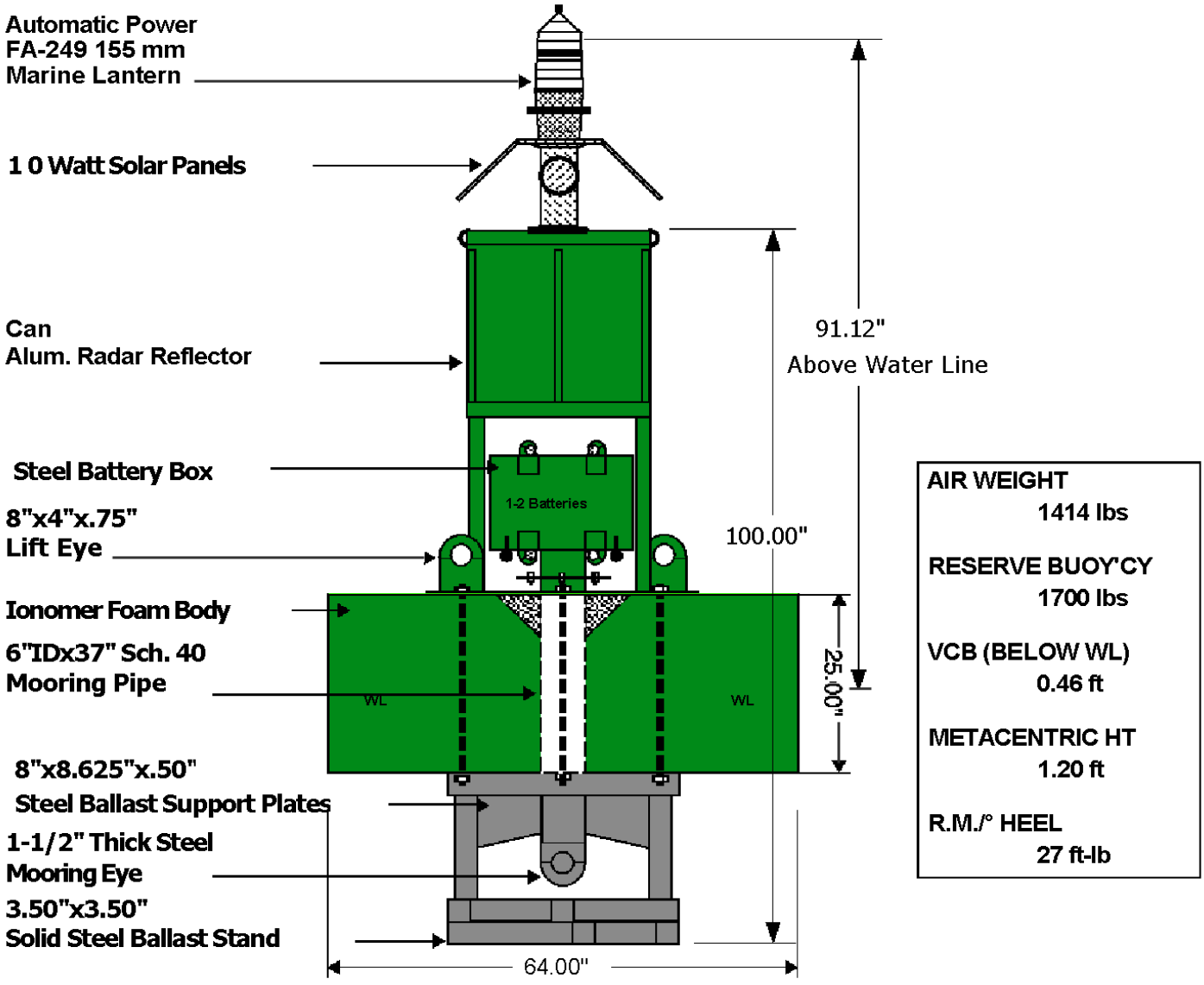
COMPLY WITH

THE UNITED STATES COAST GUARD

SPECIFICATION

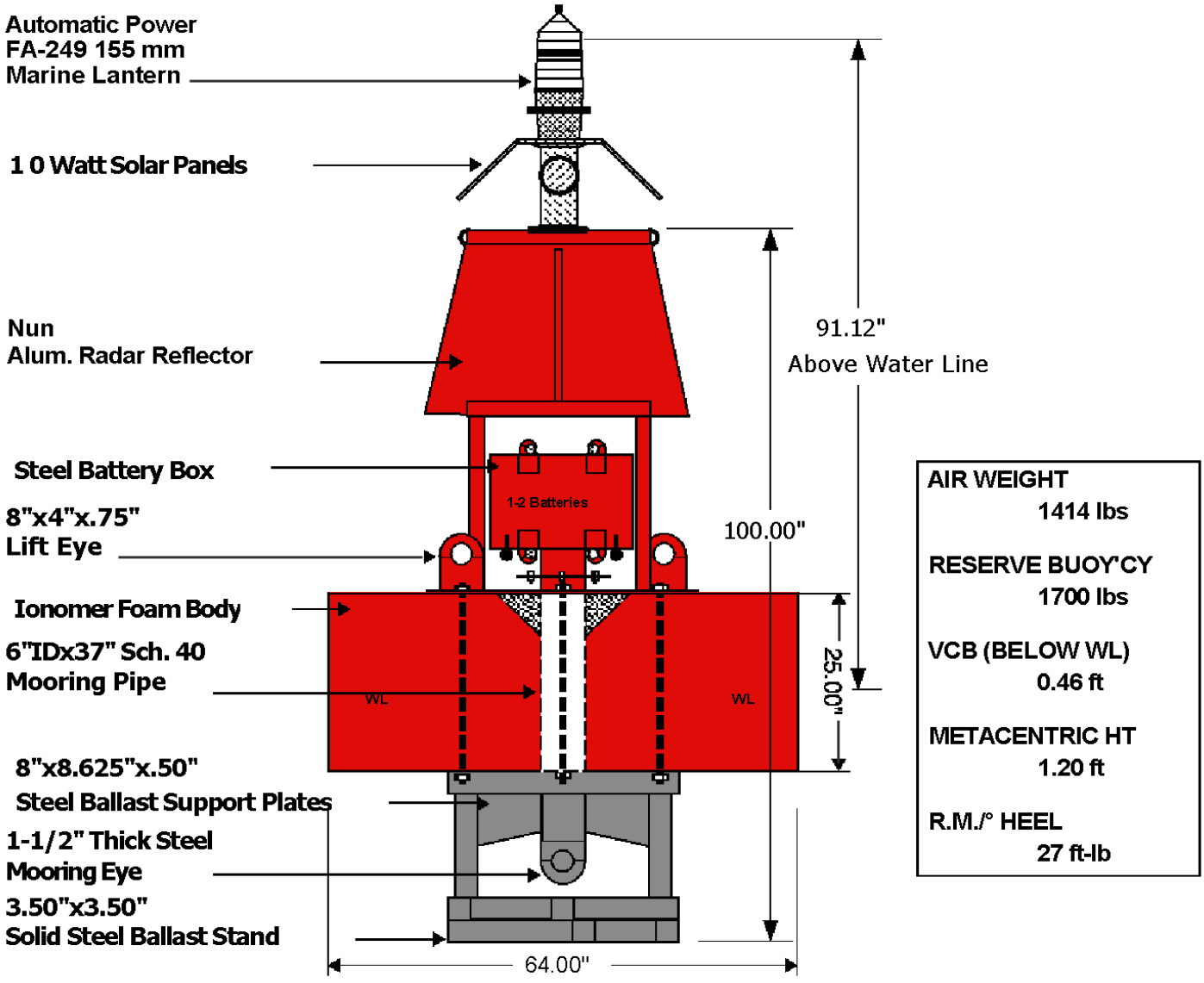
450E

5X9 LCFR



AIR WEIGHT	1414 lbs
RESERVE BUOY'CY	1700 lbs
VCB (BELOW WL)	0.46 ft
METACENTRIC HT	1.20 ft
R.M./° HEEL	27 ft-lb

5X9LNFR



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MODIFIED

5X9

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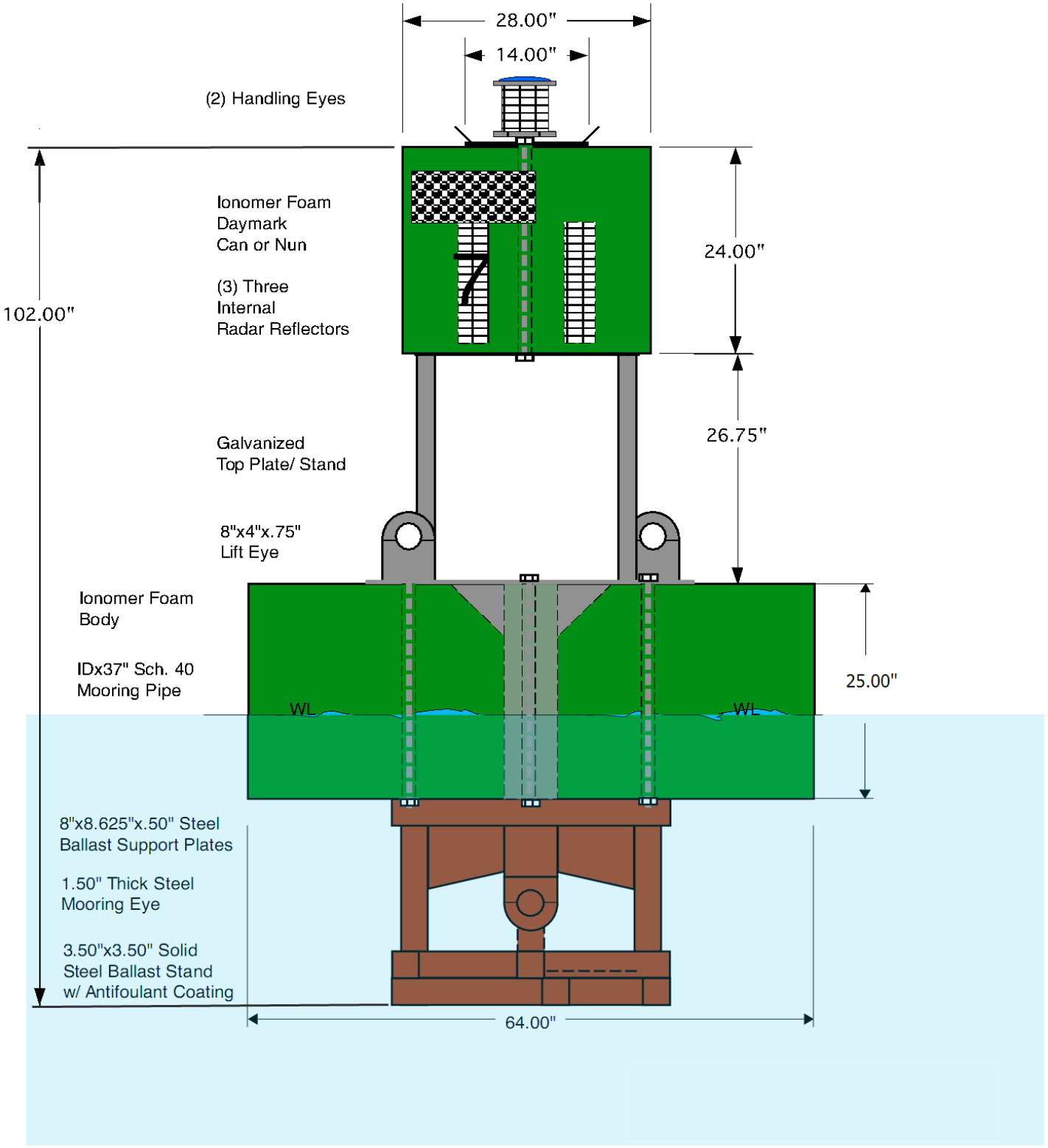
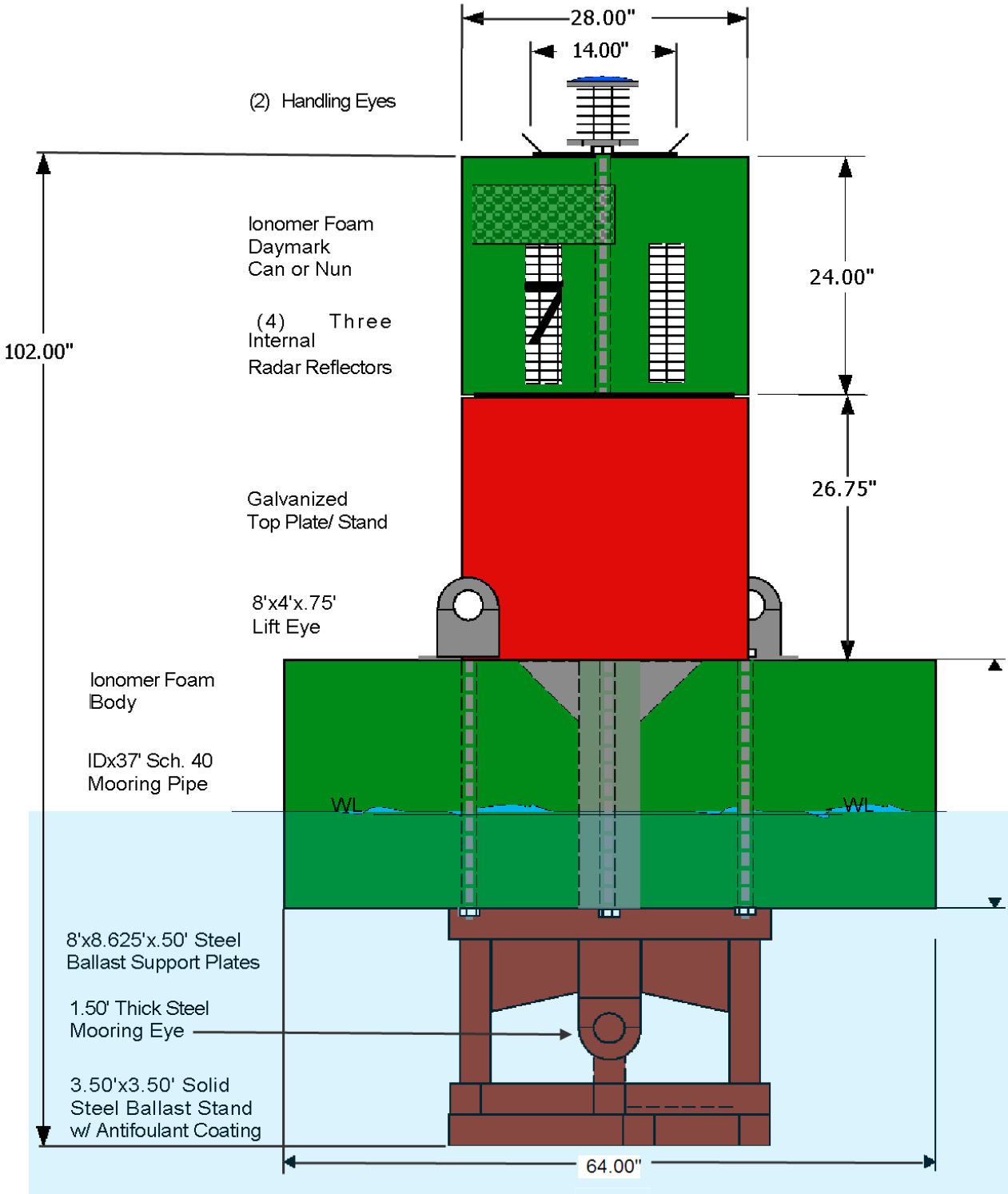
5X9 Lighted Foam Buoy



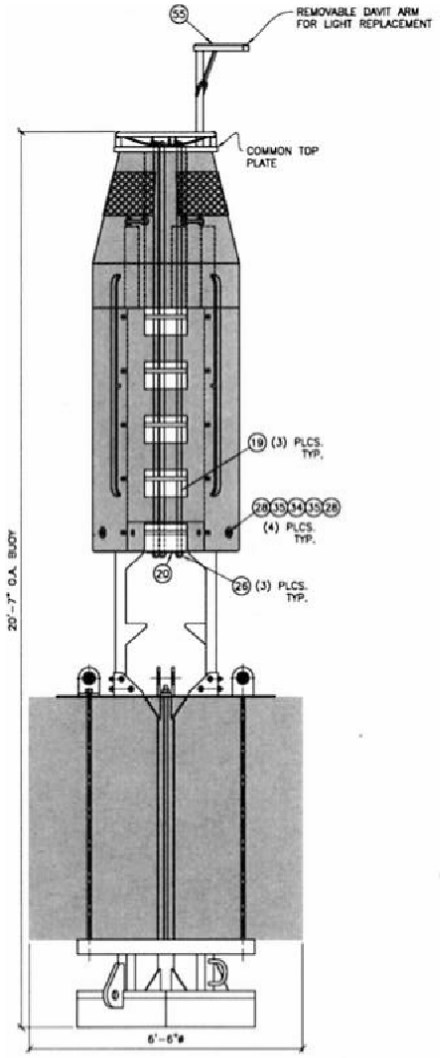
Lighted 5x9 Foam Buoy



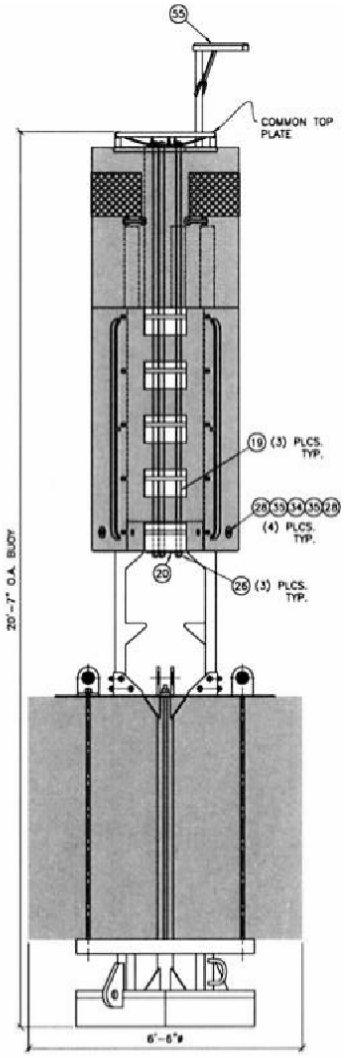
United StatesCoast Guard
Large Lighted
Ionomer Foam Buoys

6.5 x 21

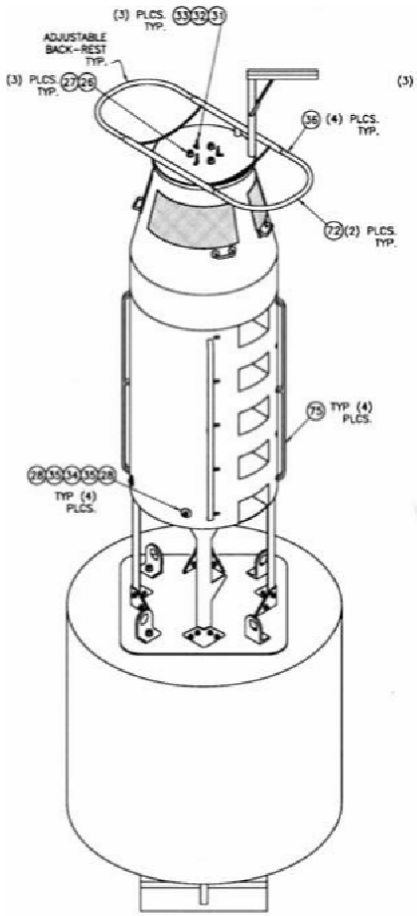

6



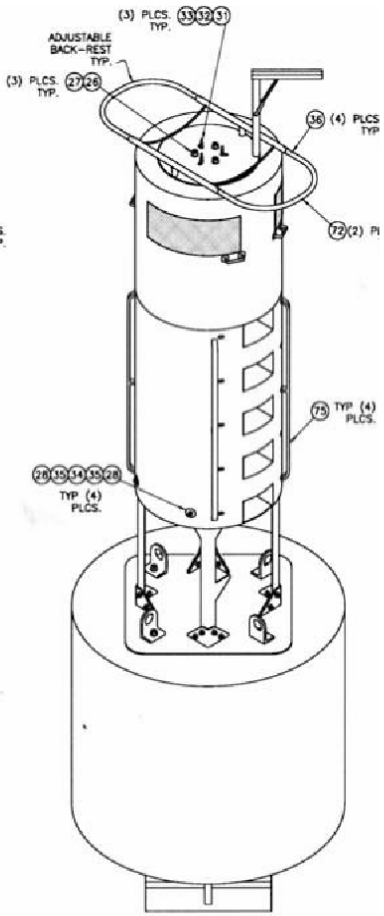
6.5x21 BUOY ~ NUN CONFIGURATION
ELEVATION VIEW
SCALE: ½"=1'-0"



6.5x21 BUOY ~ CAN CONFIGURATION
ELEVATION VIEW
SCALE: ½"=1'-0"



6.5x21 BUOY ~ NUN CONFIGURATION
ISOMETRIC VIEW



6.5x21 BUOY ~ CAN CONFIGURATION
ISOMETRIC VIEW

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Buoy Technical Data

Technical Data	6.5 x 21 Ionomer Foam	5 x 9 Ionomer Foam (mod)
Overall Length	20’ 7”	8’ 8”
Float Top to Tower Top	12’ 7”	4’ 6.25”
Freeboard	3’	1’ 1”
Reserve Buoyancy	6,296 lbs	1,700 lbs
Float Diameter	6’ 6”	5’ 4”
Lbs/inch immersion	150.8	110
Air Weight	6,067 lbs	1,314 lbs