

# CERTIFICATE

## By Authority Of THE UNITED STATES OF AMERICA Legally Binding Document

By the Authority Vested By Part 5 of the United States Code § 552(a) and Part 1 of the Code of Regulations § 51 the attached document has been duly INCORPORATED BY REFERENCE and shall be considered legally binding upon all citizens and residents of the United States of America. HEED THIS NOTICE: Criminal penalties may apply for noncompliance.



**Document Name:** ABYC H-22: DC Electric Bilge Pumps Operating Under 50 Volts

**CFR Section(s):** 46 CFR 182.500(b)

**Standards Body:** American Boat and Yacht Council



Official Incorporator:

THE EXECUTIVE DIRECTOR  
OFFICE OF THE FEDERAL REGISTER  
WASHINGTON, D.C.



## DC ELECTRIC BILGE PUMPS OPERATING UNDER 50 VOLTS

### PROJECT H-22

ABYC H-22-86

*Based on ABYC's assessment of the state of existing technology and the problems associated with achieving the requirements of this standard, ABYC recommends compliance with this standard by August 1, 1987.*

#### H-22.1 PURPOSE

These practices and standards are recommended as guides for the design, construction, installation, operation and control of DC electric bilge pumps operating under 50 volts.

#### H-22.2 SCOPE

These standards and recommended practices apply to all boats equipped with DC electric bilge pumps operating under 50 volts intended for control of spray, rainwater and normal accumulation of water due to seepage and spillage. This standard does not cover pumps intended for damage control.

#### H-22.3 DEFINITIONS

a. *Ignition Protection* - The design and construction of a device such that under design operating conditions:

- it will not ignite a flammable hydrocarbon mixture surrounding the device when an ignition source causes an internal explosion, or
- it is incapable of releasing sufficient electrical or thermal energy to ignite a hydrocarbon mixture, or
- the source of ignition is hermetically sealed.

A flammable hydrocarbon mixture is a mixture of gasoline and air or propane and air between the lower explosive limit (LEL) and upper explosive limit (UEL).

*NOTES:* 1) *It is not the intention to require such devices to be "explosion-proof" as that term is defined in the National Electrical Code of the NFPA pertaining to shore systems, or 46 CFR 110.15-65(e), of CG 259, "Subchapter J - Electrical Engineering". It is intended that the protection provided be generally equivalent to that of wiring permitted by this standard wherein a definite short or break would be necessary to produce an open spark.*

2) *Devices that are "explosion-proof" are considered to be ignition protected when installed with the appropriate fittings to maintain their "explosion-proof" integrity.*

3) *It is not the intention to require such devices to be "intrinsically safe" per Article 500 of the National Electrical Code of NFPA or 46 CFR 111.80-5(a)(3) of CG 259, "Subchapter J - Electrical Engineering".*

4) *Devices that are "intrinsically safe" are considered to be ignition protected.*

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- b. *Submersible Pump* - A pump designed to be operated when covered with water.
- c. *Non-Submersible Pump* - A pump designed to be operated with the pump above water.
- d. *Nominal Voltages* - Are those commonly used such as 6, 12, 24 and 32 volts D.C.
- e. *Design Voltage* - Shall be 113.3 percent of nominal voltage.

H-22.4 *REQUIREMENTS - IN GENERAL*

- a. *Bilge Pump Rating* - Bilge pumps shall be rated in gallons per hour versus heads at zero and three feet at design voltage. Positive or semi-positive displacement pumps shall also be rated at the maximum suction in feet at design voltage. Capacity and head may additionally be stated in SI units.
- b. *Overcurrent Protection* - Bilge pump circuits shall be individually protected for overcurrent from both running overload and locked rotor conditions. The overcurrent protection to protect the pump shall be sized as close as practicable to the electrical rating, at design voltage, of the pump. Conductor sizes shall be selected in accordance with the voltage drop table in ABYC E-9, "Direct Current Electrical Systems on Boats".

*NOTE: It may be necessary to test as installed in order to assure compliance with the locked rotor requirement. Voltage drop due to wire size and delay characteristics of the overcurrent protection device may have to be adjusted to protect the motor.*

- c. *Installation Instructions* - Complete installation and operating instructions shall be provided including at least the following information:
  - (1) An electrical diagram identifying each conductor, the proper circuit location of the control switch and the bonding connection if applicable (see ABYC E-1, "Bonding of Direct Current Systems");
  - (2) Recommended overcurrent protection (see ABYC H-22.4.b);
  - (3) The bilge pump rating in accordance with ABYC H-22.4.a;
  - (4) The recommended method of securing the unit;
  - (5) Any other data necessary for the use, installation or connection of the pump including recommended screening, location of discharge fittings and method of securing piping connections.
- d. *Marking* - Each pump shall be marked as follows by nameplate or other means:
  - (1) Manufacturer's name or identification;
  - (2) The model number or identification and/or serial number;
  - (3) The electrical rating in volts and amps or volts and watts;

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- (4) The direction of flow on self-priming pumps.

#### H-22.5 MATERIALS

- a. All materials shall be corrosion resistant or protected to resist corrosion and shall be galvanically compatible.
- b. Structural integrity shall include the ability of materials to withstand maximum operating stresses, normal handling, servicing and shipping conditions.
- c. The material weights, joints and methods of fabrication and mounting of components shall maintain their intended relationship during normal marine service.
- d. All materials used in the construction of the pump or its accessory parts shall be capable of withstanding an ambient temperature range of  $-40^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$  to  $+140^{\circ}\text{F}$ ).

*NOTE: The  $-40^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$ ) temperature requirement is not intended to require operation below freezing but is included to determine that the device will withstand dry storage temperatures in northern areas.*

- e. Materials shall be suitable for the marine environment and shall not be adversely affected by gasoline, diesel fuel, cleaners identified as bilge cleaners, lube oil, kerosene and salt water.

#### H-22.6 DESIGN AND CONSTRUCTION

- a. The design and construction shall be such that the pump will withstand the pressures, temperatures and stresses likely to be encountered in normal marine service.
- b. The pump shall be designed and constructed in accordance with the following provisions:
  - (1) *Finish* - All exposed parts of the assembly shall be so designed and finished that roughness and sharp edges which are reasonably likely to cause injury to persons installing, operating or servicing the unit will be eliminated or protected.
  - (2) *Mounting* - Means shall be provided for securing the pump assembly to the boat to resist pump movement during normal marine service.
  - (3) *Piping Connections* - Piping connections, whether designed for rigid piping, tubing or hose, shall be sufficiently strong to prevent failure by stresses likely to be imposed on such connections. Hose connections shall be sufficiently long to provide support and permit the use of clamps.
  - (4) *Ignition Sources* - All potential sources of ignition located in machinery spaces and in fuel tank spaces shall be ignition-protected.
  - (5) *Motors* - Motors of submersible pumps must be sealed or protected to perform in an environment of bilge water, spray and condensation.

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- (6) *Electrical Connections* - Submersible pumps shall have watertight electrical connections. The use of a length of watertight electrical cable sealed at the pump connection is recommended so that all electrical connections can be made above the normal bilge water level. The electrical connections and conductors shall be installed in accordance with ABYC E-9, "Direct Current Electrical Systems on Boats" and identified in accordance with ABYC E-3, "Wiring Identification on Boats".
- (7) *Electrical Bonding Ground* - Metallic parts of the pump, exposed to contact with bilge water, which may become a source of stray current leakage, shall have provision for the connection of a bonding conductor.

*EXCEPTION: A pump designed with a double insulated electrical system, that requires a break in two distinct insulation systems before electrical leakage can reach exposed metallic parts, does not require a bonding connection.*

- (8) *Circuit Conductor* - All current-carrying conductors shall be insulated, not less than 16 AWG, and none shall be connected to any metallic parts of the pump in contact with the water.

*EXCEPTION: 18 AWG conductors may be used if run together in a sheath.*

H-22.7 LOCATION AND INSTALLATION

- a. Bilge pumps shall be mounted in an accessible location to permit servicing and cleaning of the intake and/or screening.
- b. The bilge pump inlet shall be located so that excess bilge water can be removed at normal boat trims. Multiple pumps or manifolding may be used.
- c. Pump intakes shall be protected to prevent ingestion of debris that are likely to cause pump failure.
- d. Intake tubing, if used, shall not collapse under maximum pump suction.
- e. Pump discharge systems shall be as nonrestrictive as practicable.

*NOTE: Pump discharge capacity as installed may be reduced by such factors as:*

*-length of discharge piping,  
-number and radius of bends,  
-roughness of the interior surfaces of piping and fittings, and  
-reduction in cross-sectional area of discharge system components such as check valves and thru-hulls.*

- f. The discharge location shall be above the waterline created by maximum conditions of the boat's loading, heel, trim and motion astern.

*EXCEPTION: The discharge may be located below the waterline if the discharge line is provided with a vented loop to prevent siphoning into the boat. A check valve shall not be used for this purpose.*

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- g. A check valve may be used, if necessary, to prevent an automatic bilge pump from cycling on-and-off due to back flow from the discharge line.
- h. Hose connections shall be secured with a non-corrosive type of clamp.
- i. Motors of non-submersible bilge pumps shall be located above the maximum anticipated bilge water level.
- j. Automatically controlled pumps shall be installed with an overriding manual switch which is readily accessible. (See ABYC E-9, "Direct Current Electrical Systems on Boats").
- k. Manually controlled pumps shall be installed with a switch which is readily accessible. (See ABYC E-9, "Direct Current Electrical Systems on Boats").

H-22.8 *OPERATION*

- a. Pumps shall be capable of operating at their design voltage and maximum amperage for a continuous 24 hour period without failure or creating a hazardous situation. Submersible pumps shall be able to meet this requirement fully submerged.
- b. Pumps shall be capable of operating dry at their design voltage for at least 7 1/2 hours without creating a fire hazard or means integral with the pump shall be provided to automatically shut the pump off to prevent a fire hazard.
- c. If low voltage operation results in amperage high enough to create a fire hazard, means integral with the pump shall be provided to automatically shut the pump off.
- d. No external temperature shall exceed 150°C (302°F) when operating at 120% of nominal voltage in an ambient temperature of 60°C (140°F) for seven hours.

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