

CERTIFICATE

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Document Name: ABYC H-02: Ventilation of Boats Using Gasoline

CFR Section(s): 46 CFR 28.340(c)

Standards Body: American Boat and Yacht Council



Official Incorporator:

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

H-2 VENTILATION OF BOATS USING GASOLINE

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, 1990.

H-2.1. PURPOSE

These recommended practices and engineering standards establish requirements for ventilation of boats.

H-2.2. SCOPE

These recommended practices and engineering standards apply to boats using gasoline for electrical generation, mechanical power or propulsion. Outboard boats are covered by this standard.

NOTE: Ventilation requirements for boats using diesel fuel are contained in ABYC H-32, "Ventilation of Boats Using Diesel Fuel".

H-2.3. DEFINITIONS

- a. *Accommodation Compartment* - Spaces designed for living purposes for persons aboard a boat. Examples of specific uses of accommodation compartments include: staterooms, heads (bathrooms), galley, pilot house, navigation, workshop and other similar people oriented uses. These uses contrast with engine and fuel tank compartments.
- b. *Gasoline* - Any fuel containing gasoline.
- c. *Open to the Atmosphere* - Refers to a space or compartment that has at least 15 square inches of net open area directly exposed to the atmosphere for each cubic foot of net compartment volume.
- d. *Ventilation* - The changing of air within a compartment by natural or mechanical means. Ventilation may be effected by dilution of contaminated air, by introduction of fresh air, or by local exhaust of contaminated air.

H-2.4. REQUIREMENTS - IN GENERAL

- a. *Ventilation Principle* - Ventilation cannot be relied upon to remove all flammable vapors that are possible from the presence of liquid fuel resulting from fuel system failures or fuel spillage. (See ABYC H-24, "Fuel Systems".) Boat ventilation cannot create a safe condition when liquid gasoline is exposed to the atmosphere in a boat, because liquid gasoline will continue to create gasoline vapors as long as liquid gasoline is present.
- b. *Storage Batteries* - Compartments containing storage batteries shall provide for the escape of hydrogen in accordance with ABYC E-10, "Storage Batteries".

(H-2.4)

- c. *Powered Ventilation* - Each compartment, not open to the atmosphere, that has a permanently installed gasoline engine with a cranking motor, must be ventilated by an exhaust blower system.
- d. *Natural Ventilation* - Each compartment, not open to the atmosphere, must be provided with a natural ventilation system, if it:
 - (1) contains a permanently installed gasoline engine;
 - (2) contains a portable fuel tank that vents into the compartment. Space under a motor well in outboard boats that is large enough to accommodate a six gallon portable fuel tank but is not intended for such usage shall be labeled to prohibit its use for fuel storage. See Figure 1 for a typical label.
 - (3) contains a non-metallic fuel tank:
 - (a) with an aggregate permeability rate exceeding 1.2 grams of fuel loss in 24 hours per cu. ft. of net compartment volume.
 - (b) if the net compartment volume is less than one cubic foot, having a permeability rate exceeding 1.2 grams of fuel loss in 24 hours. Reference fuel "C" at 40 degrees Celsius plus or minus 2 degrees Celsius from ASTM D-471-1979 is to be used in determining the permeability rate.

NOTE: Non-ignition protected electrical components are not permitted in compartments containing permanently installed fuel tanks. See ABYC E-8, "AC Electrical Systems" and ABYC E-9, "DC Electrical Systems".

- e. *Ambient Temperature* - For design purposes, the ambient temperature of machinery spaces is considered to be 50° C (122° F) and all other spaces is considered to be 30° C (86° F).

EXCEPTION: Temperatures in machinery spaces after engine shut-down may exceed this design ambient temperature.

H-2.5. DESIGN AND CONSTRUCTION

a. *Spaces Open to the Atmosphere*

- (1) Spaces which are open to the atmosphere do not require ventilation.
- (2) Compartments or spaces connecting with engine or portable fuel tank spaces that are open to the atmosphere do not require ventilation if the connecting space has open area of at least 15 square inches per cubic foot of its net volume. The open area shall be open either to the atmosphere or into another open space providing there is a total area open to the atmosphere for the combined net volume of the connecting spaces of at least 15 square inches per cubic foot.

(H-2.5.a.)

- (3) Long narrow spaces formed by side panels or accommodation floors shall have openings at both ends or along the sides if they are to be considered open to the atmosphere.

b. *Connecting Compartments or Spaces*

- (1) Compartments communicating with compartments open to the atmosphere, which have interconnecting openings the area of which is equal to 2% or less of the area between the compartments, shall not be considered as connecting compartments.
- (2) The volume of compartments or spaces that are not open to the atmosphere, and which communicate with a compartment requiring ventilation by means of interconnecting openings whose aggregate area is more than 2% of the area between the compartments, must be added to the volume of the compartment or space requiring ventilation when determining ventilation requirements, or must be ventilated separately.
- (3) An accommodation compartment above a compartment requiring ventilation that is separated from the compartment requiring ventilation by a deck or other enclosure is not considered a connecting compartment.

c. *Powered Ventilation System*

(1) *Blowers*

- (a) Blowers shall be rated for continuous operation at 120% of nominal voltage.
- (b) As installed, no surface temperature shall exceed 150°C (302°F) when operating, and with a stalled rotor, at 120% of nominal voltage in an ambient temperature of 60°C (140°F) for a period of 7 hours.
- (c) Blowers shall meet the external ignition protection requirements of UL 1128, "Standard for Marine Blowers"; UL 1500, "Ignition Protection Test for Marine Products"; SAE J1171, "External Ignition Protection of Marine Electrical Devices", or equivalent standard.
- (d) Blowers shall be rated for air flow in cubic feet per minute, at nominal voltage in accordance with Figure 12 of Air Movement and Control Association (AMCA) standards 210-74, "Test Code of Air Moving Devices", or Underwriters' Laboratories, UL 1128, "Standard for Marine Blowers", dated August 23, 1977, or equivalent standard.

(2) *Installation of Powered Ventilation*

- (a) Blower(s) capacity shall be selected in accordance with the "blower capacity curve" in Figure 2. More than one blower may be used. ..

(H-2.5.c.(2))

- (b) As installed, the blower system(s) shall exhaust air from the boat at a rate in accordance with the "system performance curve" in Figure 2 when the engine is not operating and the blower is operating at the electrical system's nominal voltage.
- (c) Blowers shall be mounted above the normal level of accumulated bilge water.
EXCEPTION: Submersible blower motors.
- (d) Blowers shall be installed with ducts whose intake openings are:
 - permanently fixed,
 - located in the lower one-third of the compartment.
 - above the normal level of accumulated bilge water, and
 - as nearly as practicable below the engine(s) which it serves.
- (e) Electrical wiring shall be installed in accordance with ABYC E-9, "Direct Current Electrical Systems".
- (f) Electrical wiring shall be identified in accordance with ABYC E-3, "Wiring Identification".
- (g) Each boat that has a powered ventilation system shall have a label displaying the information shown in Figure 3, located in plain view of the operator and as close as practicable to each ignition switch (includes auxiliary equipment).

d. *Natural Ventilation*

- (1) Each natural ventilation system shall be constructed with at least one intake opening. Each intake opening shall be on the boat's exterior surface.
- (2) Each compartment requiring natural ventilation shall be equipped with exhaust duct(s) originating in the lower one third of the compartment, the duct opening permanently fixed above the normal accumulation of the bilge water. If the compartment is an engine compartment, exhaust duct(s) shall be located as nearly as practicable below the engine(s).

NOTE: "Exhaust(s) and intake(s)" may not function as intended when wind direction varies.

- (3) Each exhaust opening shall terminate on the boat's exterior surface.

(H-2.5.d.)

- (4) Air intake openings inside a compartment shall be separated from exhaust duct openings inside the compartment by at least 24 inches, compartment dimensions permitting.
- (5) The minimum aggregate internal cross-sectional area of intake ducts or openings shall be calculated as follows:

$A = 5 \log_e (V/5)$ where:

A = The minimum aggregate internal cross-sectional area of the openings or ducts in square inches.

V = The net compartment volume in cubic feet, including the net volume of other compartment sharing the same ventilation system.

$\log_e (V/5)$ = the natural logarithm of the quantity $V/5$. (See Figure 4)

- (6) The minimum aggregate internal cross-sectional area of exhaust ducts or openings shall be calculated in the same manner as for intakes. Refer to H-2.5.d.(5).
- (7) Duct sizes shall be selected using cross-sectional areas based on their nominal diameters.
- (8) The nominal diameter of ventilation ducting shall be at least 2 1/2 inches. Openings shall be of at least equivalent cross-sectional area. See Table I for standard duct sizes.
- (9) The minimum cross-sectional area of terminal fittings for flexible ventilation ducts must not be less than 80% of the required internal cross-sectional area of the flexible ventilation duct.

e. *Arrangements of Openings*

- (1) Ventilation openings shall be located to prevent entrance of significant amounts of water considering maximum conditions of heel or trim, reverse operation, eccentric loading or wave action.
- (2) External openings of intakes and exhausts shall be arranged to minimize recirculation and entry of engine exhaust fumes.
- (3) External openings of intakes and exhausts shall be located and oriented to prevent entry of fuel vapors. In no instance, shall the intakes and exhausts be closer than 15 inches from the gasoline fill and vent fittings.
- (4) Ventilation openings shall remain outside of weather enclosures.

(H-2.5.e.(4))

TABLE I - STANDARD DUCT SIZES

4.91 sq. in.	(2 1/2 in. diam.)
7.07 sq. in.	(3 in. diam.)
9.62 sq. in.	(3 1/2 in. diam.)
12.57 sq. in.	(4 in. diam.)
19.63 sq. in.	(5 in. diam.)

FIGURE 1 - WARNING LABEL FOR NON-VENTILATED SPACE

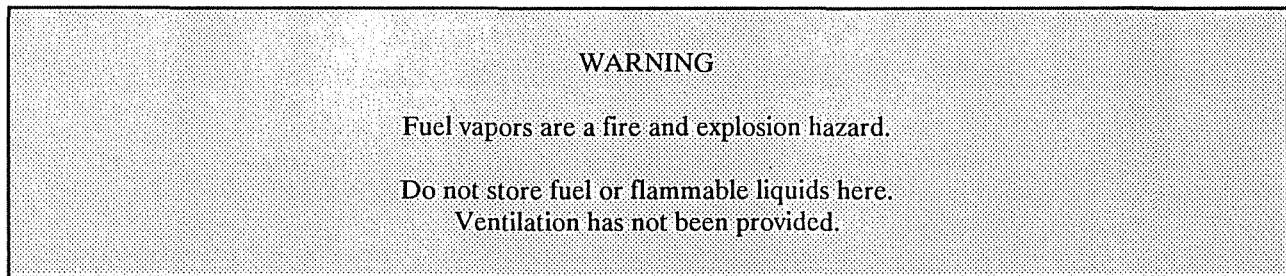
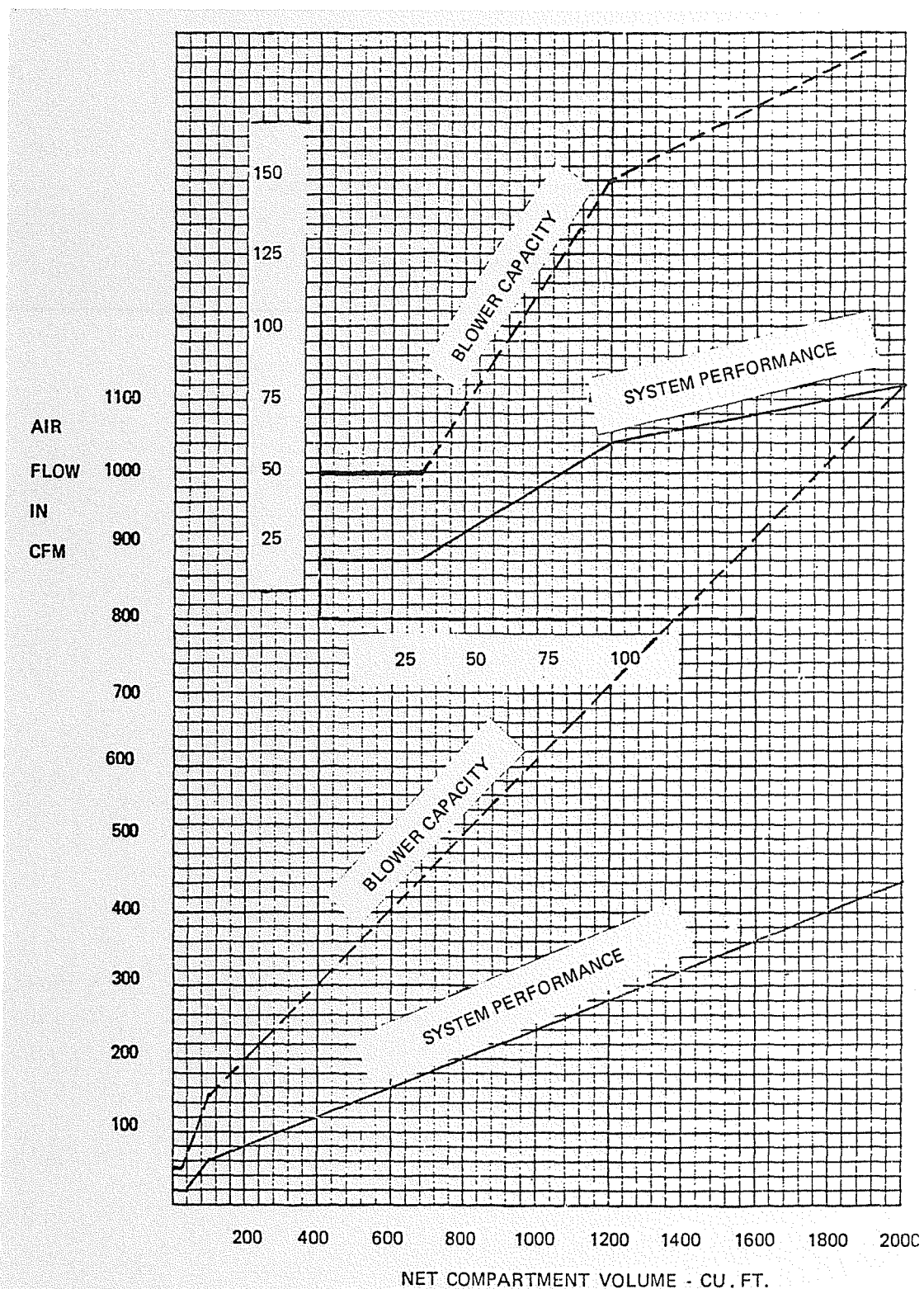


FIGURE 2 - MINIMUM BLOWER CAPACITY AND SYSTEM PERFORMANCE



NOTE: The blower capacity curve is added for information purposes and represents the average relationship of capacity to performance.

FIGURE 3 - POWERED VENTILATION LABEL

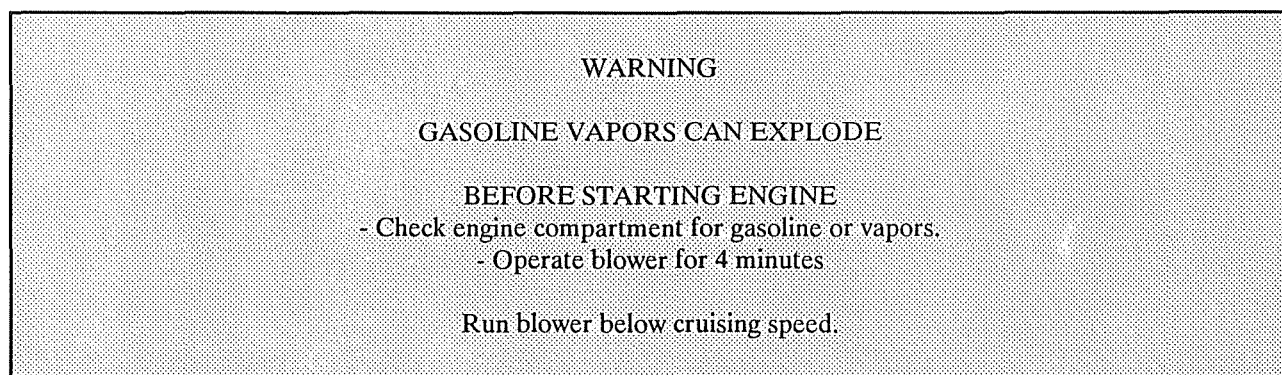
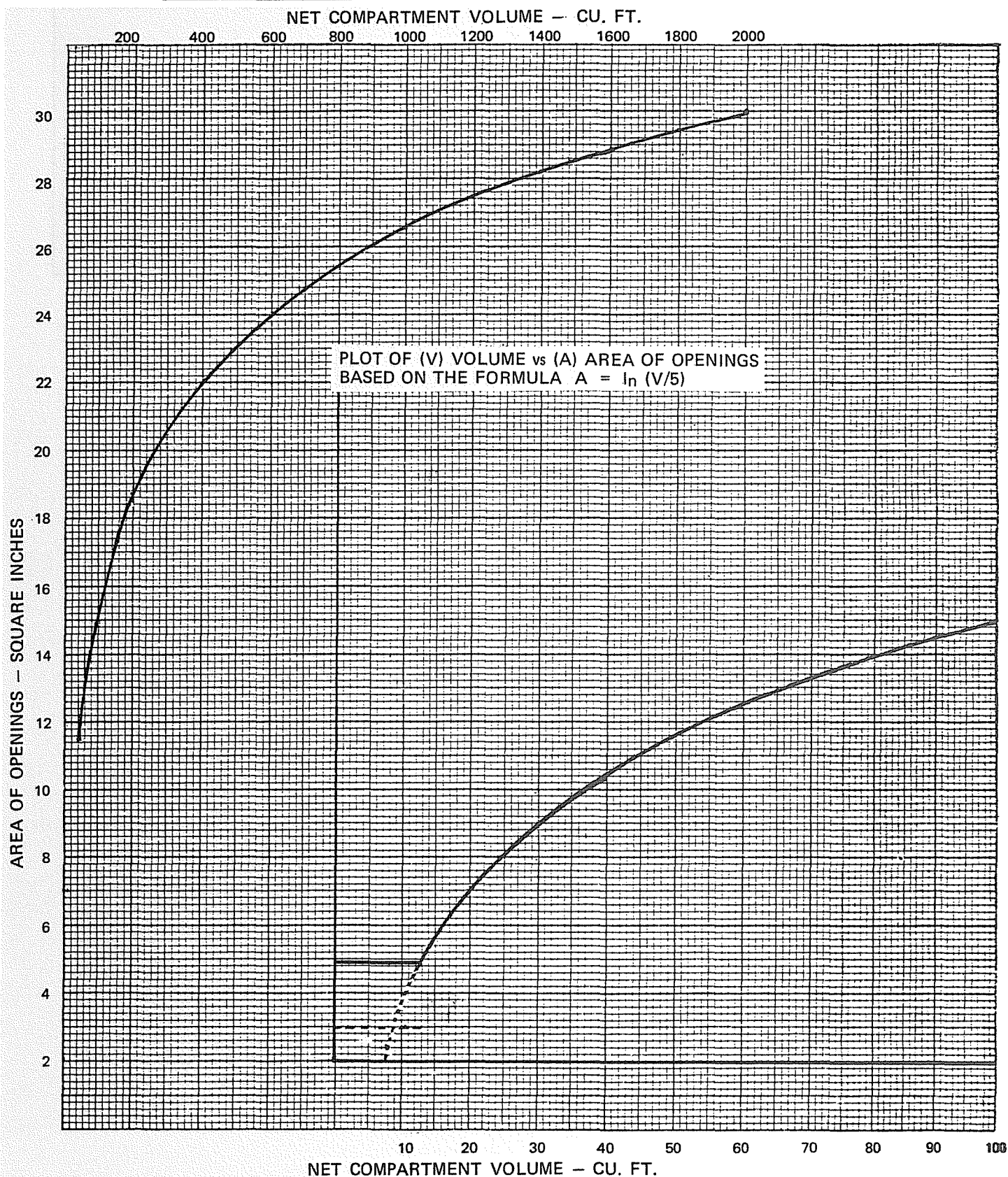


FIGURE 4 - AREA OF OPENINGS



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