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Australian Standard 2388—1980

VENTILATION OF ENGINE ROOMS IN STEAM-TURBINE DRIVEN SHIPS

STANDARDS ASSOCIATION OF AUSTRALIA
Incorporated by Royal Charter

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THE FOLLOWING SCIENTIFIC, INDUSTRIAL AND GOVERNMENTAL ORGANIZATIONS and departments were officially represented on the committee entrusted with the preparation of this standard:

American Bureau of Shipping

Australian Chamber of Shipping

Australian Shipbuilders Association

Bureau Veritas

Department of Defence

Department of Industry and Commerce

Department of Transport

Institute of Marine Engineers

Lloyds Register of Shipping

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AUSTRALIAN STANDARD

VENTILATION OF ENGINE ROOMS IN STEAM-TURBINE DRIVEN SHIPS

AS 2388—1980

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PREFACE

This standard was prepared by the Association's Committee on Shipbuilding at the request of the Department of Transport.

The standard has been based on Swedish Standard VIS 726 Engine Rooms Ventilation, Turbine Ships—Conditions and Calculation Fundamentals.

The standard is intended to apply to new ships, and to ships that are to be extensively modified or converted.

Users of the standard should note that while observing the requirements of the standard, they should at the same time ensure compliance with such statutory and classification society requirements, rules and regulations as are applicable to the individual ship concerned.

For requirements for ventilation of engine rooms in diesel-engine and gas-turbine driven ships, reference should be made to—

AS 2387 Ventilation of Engine Rooms in Diesel-engine Driven Ships

AS 2389 Ventilation of Engine Rooms in Gas-turbine Driven Ships.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
VENTILATION OF ENGINE ROOMS IN STEAM-TURBINE DRIVEN SHIPS

1 SCOPE. This standard specifies conditions and calculation fundamentals for a ventilation plant for an engine room of a steam-turbine driven ship. It covers normally occurring conditions in all waters.

2 CONDITIONS. The outside ambient air temperature shall be taken as 35°C.

3 GENERAL CALCULATION FUNDAMENTALS. The plant shall be positively balanced, i.e. the sum of the exhaust air flow rate and the combustion air requirements of the plant shall not exceed the intake flow rate.

The total air requirement shall be based on the air requirement for heat dissipation, but shall be not less than the combustion air requirement plus 50 percent. Standby plant shall not be considered.

NOTE: Where the forced-draught fans draw air for combustion directly from atmosphere, an air allowance in addition to the requirements of air for heat dissipation may be required to maintain an acceptable rate of air change.

The temperature rise shall be taken as 12.5°C.

4 COMBUSTION AIR REQUIREMENTS. The combustion air requirements shall be based on a 100 percent load on the boilers, and shall be calculated by the following formula:

$$q_f = \frac{W_s \times q_{ms} \times q_m}{\rho}$$

where

q_f = combustion air requirement, in cubic metres per second

W_s = total steam consumption, in kilograms per second

q_{ms} = fuel consumption, in kilograms (fuel) per kilogram (steam)

NOTE: For fuel oil, where specific data are not available, q_{ms} = 0.07 kg/kg may be used for calculations.

q_m = combustion air requirement for fuel, in kilograms (air) per kilogram (fuel)

NOTE: For fuel oil, where specific data are not available, q_m = 17.7 kg/kg may be used for calculations.

ρ = the density of the air at 35°C, in kilograms per cubic metre

= 1.15 kg/m³.

5 AIR REQUIREMENT FOR HEAT DISSIPATION.

5.1 Air Requirement. The air requirement for heat dissipation shall be based on the total heat emitted to the engine room from all heat sources in the engine room, and shall be calculated by the following formula:

$$q_v = \frac{P_p + P_r + P_{tur} + P_e + P_g + P_s}{\rho \times c \times \Delta t}$$

where

q_v = air requirement for heat dissipation, in cubic metres per second

P_p = heat emitted from boilers, in kilowatts (see Clause 5.2)

P_r = heat emitted from steam and condensing pipes, in kilowatts (see Clause 5.3)

P_{tur} = heat emitted from main turbine and turbine for alternator, in kilowatts (see Clause 5.4)

P_e = heat emitted from the electrical installation, in kilowatts (see Clause 5.6)

P_g = heat emitted from alternators, in kilowatts (see Clause 5.5)

P_s = heat emitted from hot tanks, in kilowatts (see Clause 5.7)

ρ = the density of the air at 35°C, in kilograms per cubic metre

= 1.15 kg/m³

c = specific heat capacity of the air, in kilojoules per kilogram kelvin

= 1.01 kJ/kg.K

Δt = temperature rise in the engine room, in kelvin

= 12.5 K (see Clause 3).

5.2 Heat Emitted from Boilers. The heat emitted from boilers shall be based on a 90 percent power output, and shall be calculated by the following formula:

$$P_p = W_s \times q_{ms} \times i \times \frac{U_p}{100} \times 0.9 \times B$$

where

P_p = heat emitted from boilers, in kilowatts

W_s = maximum steam consumption, in kilograms per second

q_{ms} = fuel consumption, in kilograms per kilogram (see Clause 4)

i = specific enthalpy of the fuel, in kilojoules per kilogram

NOTE: For fuel oil, where specific data are not available, i = 41 800 kJ/kg may be used for calculations.

U_p = heat loss at maximum boiler load in accordance with boiler manufacturer's data, percent.

NOTE: Where specific data are not available, heat loss values from Fig. 1 may be used for calculations.

B = constant at partial load of boiler (see Fig. 1).

5.3 Heat Emitted from Steam and Condensing Pipes. The heat emitted from steam and condensing pipes shall be based on 0.25 percent of the fuel oil heat of the boiler, and shall be calculated by the following formula:

$$P_r = W_s \times q_{ms} \times i \times 0.0025$$

where

P_r = heat emitted from steam and condensing pipes, in kilowatts

W_s = total steam consumption, in kilograms per second