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CHAPTER 38

Marine Heating and Ventilation

General Considerations, Ship Construction Features, Factors Affecting Design, Requirement for Various Types of Space, Ship Insulation

THE importance of adequate shipboard heating and ventilation arrangements cannot be overemphasized. Installations must not only keep the passengers comfortable and the operating personnel physically fit and mentally capable of maintaining the ship as a profitable business investment, but must also satisfy the human element. The provision of satisfactory living and working conditions is one of the most economical means of keeping a high morale.

GENERAL CONSIDERATIONS

Unlike a shore establishment in connection with which personnel obtain their food, rest and recreation from outside sources, a ship must be self-sufficient and provide for all human needs. Accordingly, every vessel is a complete, independent community comprising, at least to some degree, the facilities available in the average urban development. These facilities must be contained in the minimum practicable space and weight to conserve dead weight and increase the pay load. The pay load may be expressed in terms of cargo carrying ability, passenger carrying capacity, fighting strength, or towing ability.

An atmosphere compatible with efficient operation must be maintained in working and machinery spaces, and temperatures must be such that materials or equipment will not be damaged. Conditions in living spaces, whether ashore or afloat, must permit adequate rest and comfort of occupants. Passenger accommodations must be treated to provide service and living conditions similar to those afforded by the various classes of hotels. Many of the expedients used ashore for this purpose are not applicable afloat. For instance, all living quarters aboard ship cannot be located at a distance from the power plant; but must often have boundaries in common with heat producing spaces. The thermal conductivity of shipbuilding materials such as steel, copper, brass, etc., is many times the value for building materials used ashore, and this, together with concentrated arrangement of equipment, produces a difficult heat transfer and insulation problem. Furthermore, the use of portholes, windows, skylights, and similar openings is greatly restricted in marine applications because of the necessity for strength, water-tightness and protection from the sea in foul weather. During wartime, the utility of portholes, windows, and skylights is greatly restricted because they must be fitted with light-excluding devices.

Much of the cooling and ventilation that is accomplished by natural means ashore must be handled by mechanical means afloat. Space does not exist for the large ventilation trunks required for natural ventilation. Also, because of the restricted space and shipbuilding materials the heat quantities that must be dissipated by ventilation air are often greater than would be required for a similar shore installation. Mechanical ventilation is not merely desirable, but is absolutely necessary in many shipboard spaces to enable the crew to operate the vessel. Furthermore there are numerous spaces which must be ventilated to prevent the accumula-