

Engine Room Ventilation Systems *) **)

To comply with the regulations for ventilation systems for service rooms, e.g. engine rooms, the ventilation systems shall be in line DIN EN ISO 8861. "Engine room ventilation in ships with diesel propulsion".

The following provisions in addition to DIN EN ISO 8861 shall be complied with:

1. Flow rates of supply fans

The choice of supply fans is governed by the calculated total air flow and the total pressure drop Δp_t .

When determining the pressure drops on the fan suction and delivery side, special attention shall be made to the resistances of fixed shutters and silencers and to the resistance due to reduced cross-sections at deck penetrations, trunk stiffeners and abrupt deflections of the air flow. In the case of axial fans, attention shall be paid to equal inflow and outflow over the entire cross-section. A satisfactory solution lies in the provision of channelled stabilization ducts on the suction and delivery side of the fans equal in length to five times the impeller diameter in each case.

2. Supply air ducts and discharge velocities

The supply air ducts and their openings shall be arranged so that:

- effective ventilation of the open engine room space is ensured;
- an adequate air supply to the closed rooms and to the permanent workplaces in the open engine room is assured for the purpose of temperature control;
- air consumers, such as diesel engines and oil firing equipment, are provided with a sufficient supply of combustion air; and
- in heavy seas, seawater can not penetrate through air outlet openings on to electrical or mechanical installations.

Branches in the supply air duct shall be designed to facilitate air flow. Auxiliary supply air ducts can be joined to main ducts, in which case provision shall be made for guiding the air into the branching duct. This can, for instance, be achieved by the use of baffle plates.

In closed rooms and at permanent workplaces, the discharge velocity from the supply air inlet openings shall be 1 to 3 m/s if the air outlet is situated in the immediate vicinity of the permanent work places. With deflected ventilation systems, discharge velocities of up to 10 m/s are permissible. Higher discharge velocities are acceptable if lamellas are installed in the cross-section of the outlet aperture.

The unimpeded outflow of the supply air shall not be significantly affected by piping, cable raceways etc.

Openings of supply air ducts shall be provided in separator rooms and in the vicinity of separator stations.

*) *These requirements only apply to seagoing ships with diesel main propulsion engines.*

**) *See also Form Lü (02/2012) "Ventilation Plants in Engine Rooms".*

3. Discharge air openings and exhaust air fans

Special openings for the removal of waste air shall be located in the engine room. Doors, installation openings etc. do not constitute such openings.

The size of the cross-section of the discharge air openings shall be based on the flow rate of the discharge air at a maximum mean velocity of 6 m/s via the open cross-section using the following formula:

$$q_{ab} = q - (q_{dp} + q_{dg}) \quad *) \text{exhaust air flow rate}$$

q_{dg} applies to an auxiliary diesel engine where no shaft generators are fitted;
 $q_{dg} = 0$ where shaft driven generators are fitted.

The flow rate q for the calculation of q_{ab} is the calculated value. If the delivery rate of the supply fans is greater than the calculated figure, the size of the discharge air opening may be based on this delivery rate.

Exhaust air fans shall be fitted if the waste air cannot be satisfactorily evacuated through the discharge air openings. Exhaust air fans must also be installed if the satisfactory evacuation of waste air cannot be ensured under unfavourable weather or seaway conditions (see also appendix B to DIN EN ISO 8861).

If the exhaust air openings contain internal elements such as fixed shutters, the area calculated from the flow rate q_{ab} and the velocity in the exhaust air opening (max. 6 m/s) shall be multiplied by the factor $f_1 = 1,6$ in order to obtain the total area of the exhaust air opening.

The velocity of 6 m/s shall similarly not be exceeded where there is an appreciable narrowing of the engine room casing or the funnel casing through decks, in pipes or in exhaust pipes.

Closed rooms located within the engine room - and not equipped with exhaust air fans - shall be provided with discharge air openings or ducts leading to the open engine room. The discharge air openings shall be fitted with silencers where necessary.

Separator rooms shall be equipped with separate exhaust air systems.

4. Pressure drops in ventilation system silencers

In determining the pressure drops in ventilation systems, special attention shall be paid to the resistances presented by silencers.

The specialized companies provide graphs for silencer elements in ventilation systems from which the corresponding pressure drops can be determined.

5. Ventilation of the open engine room, permanent workplaces and closed rooms

Supply air and discharge openings shall be arranged in such a way as to ensure optimum ventilation of the space concerned. Short circuits shall be avoided.

In order to optimise the ventilation of the open engine room, the openings of the supply air ducts shall be positioned as far away as possible from the discharge air openings in the engine room casing.

*) q_{ab} = exhaust air flow rate
 q = total air flow rate according to DIN EN ISO 8861
 q_{dp} = flow rate of combustion air in m^3/s for diesel propulsion engines
 q_{dg} = flow rate of combustion air in m^3/s for auxiliary diesel engines

In closed rooms inside the engine room, supply air openings shall, wherever possible, be located in the lower half of one bulkhead with the exhaust air openings in the upper half of the opposite bulkhead, so ensuring diagonal ventilation in the room's longitudinal direction (direct ventilation).

At permanent work places in the open engine room, the supply air openings shall be so positioned that the air supply is as far away as possible from the exhaust opening, thereby ensuring good ventilation.

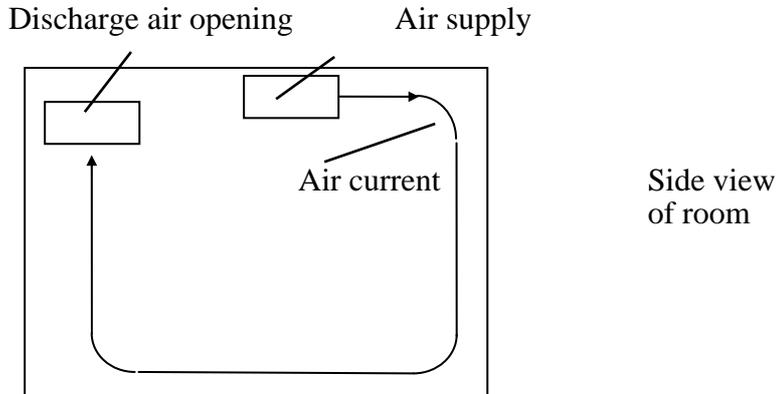
In the ventilation of closed rooms and permanent workplaces in the open engine room, a distinction is made between direct ventilation and deflected ventilation.

Direct ventilation

The supply air ducts shall be arranged horizontally and provided with several - at least three - upward pointing outlet openings to ensure improved air distribution and lower outlet speeds. The terminal section of these supply air ducts shall be closed off. They shall be positioned at a height of up to 1,5 m above the walking/standing surface. If this is not possible for structural reasons, the supply air ducts may be placed higher, provided that the supply air is directed downwards at an angle of 45°.

Deflected ventilation

In deflected ventilation, the supply air is projected against the wall of a closed room or against a bulkhead in the open engine room, in order to avoid creating draughts at the operating position or workplace. The arrangement of the ventilation system and the air currents are shown in the sketch below.



6. Secondary systems

If it is not possible in the design to ensure the necessary air supply via a primary system, a secondary system shall be installed. The secondary system assists selective ventilation of the permanent workplaces.

7. Permanent workplaces and the temperatures at these locations

The following conditions shall be met with regard to permanent workplaces:

Permanent workplaces within the meaning of UVV See § 43(3)	Temperatures at permanent workplaces	
	Temperatures which should not normally be exceeded	Difference in relation to outside temperature when over 28 °C
Workshop	33 °C	$\Delta t = 5 \text{ °C}$
Cylinder station) Pump station) of main Crankcase area) engine 1) Auxiliary diesel engine 1) Nozzle test stand Filter plants (for fuel, lubricating oil) separate from engine Operating positions, e.g. trimming consoles, engine and boiler control platforms	35 °C	$\Delta t = 7 \text{ °C}$
Engine control room / watch room	35 °C 28 °C 2)	$\Delta t = 7 \text{ °C}$

At the workplaces, the air velocity must be between 0,1 and 0,5 m/s.

The condition calling for compliance with a temperature difference Δt of 7 °C is normally satisfied if the total quantity of air supplied to the main engines and the auxiliary diesel stations corresponds, for the main propulsion engines, to the sum of the combustion air flow rate V_{LVH} in m^3/s and the quantity of heat P_{WH} in kW to be removed by the engine room ventilation, less 40% of the combustion air flow rate for the main propulsion engines, and to the sum of the comparable values for the auxiliary diesel engines.

For (fuel, lubricating oil) filter plants separate from the engine, the condition calling for maintenance of the 7 °C temperature difference Δt is normally satisfied if adjustable air duct openings are placed in these locations.

8. Heat-radiant surfaces

Permanent workplaces shall not be located in areas with radiant heat surfaces. If this condition cannot be met for structural reasons, the heat-radiant surfaces shall be adequately insulated.

9. Tank insulation

Heated tanks, the temperature of whose liquid contents is higher than 70 °C and which radiate heat into closed room (e.g. workshops, or areas with permanent workplaces in the open engine room) must be provided with 100 mm insulation. This requirement is restricted to the surfaces adjacent to the closed rooms or to the areas with permanent workplaces.

1) With main engine or auxiliary diesel stopped.

2) Where an air-cooling system is installed.

10. Heat dissipation from particular plant items

Due account shall be taken of the amount of heat P_{WEin} in kW given off by other items of plant, such as compressors and separators. On normally fitted out cargo ships, no facilities are required for the determination of P_{WEin} .

11. Miscellaneous

The design of one of the supply fans shall be such that the direction of rotation can be reversed.

The expelled cooling air of generators driven by an auxiliary diesel shall not be discharged in the vicinity of the auxiliary diesel.

The supply and exhaust air system of the engine room shall be so designed that an excess pressure of 50 Pa is not exceeded.

Emergency exit casings shall not be used as ventilation ducts.

Louvre type shutters may be accepted as closing arrangements for engine rooms subject to the following conditions, provided it can be shown that this arrangement is as equally effective and if the shutters have a Class A Fire Damper approval according to the Marine Equipment Directive (MED approval) or the construction is according to the following specification:

- the chosen materials ensure a maintenance free bearing,
- the bearing pins of the concentric lamella axis shall be protected (encapsulated),
- the closing devices and power driven appliances are easy accessible for maintenance work,
- every single lamella is closed against a surrounded frame or is equipped with a suitable profile to avoid air leakage.

In spaces in which self starting diesel engines are installed, the fan port covers shall also open automatically. Otherwise, the supply and exhaust air openings shall always be open in compliance with the load line regulations.

Welding bays, e.g. in engine room workshops, shall be fitted with exhaust air fans.

In order to prevent a fire hazard, oil traps should be installed in suction ventilation plants (e.g. for separators). These oil traps must be arranged so that they are easily accessible.