GARDNER

ENGINE ROOM VENTILATION IN MARINE CRAFT

1. Experience over many years has shown that frequently insufficient attention is given at the design stage to the vitally important matter of engine room ventilation.

2. The provision of adequate ventilation is an essential requirement in order that:

   (*a*) Engines shall not exceed their designed operating temperature.

   and (*b*) Engines may receive sufficient weight of air for their designed fuel delivery and output.

   Furthermore, it is highly desirable to provide ventilation in order to prevent hull deterioration, especially in wooden vessels.

3. An engine in operation disposes of its waste heat in three ways.

   (*a*) By water circulation through cylinder jackets, heat exchangers and oil coolers.

   (*b*) By the emission of its exhaust gases.

   and (*c*) By radiation from its outer surfaces to the air surrounding it.

4. If there is insufficient circulation of air at or near external air temperature around the outer surfaces of a marine engine unit, the temperature of the engine oil, reversing gear oil, reduce gear oil, etc., will be in excess of designed values. In addition, engine room "electrics," fuel, etc., will be undesirably heated.

5. The power rating of marine engines, which is regulated by the volume setting of the fuel injection pump, is set appropriately for the climatic conditions in which they are to operate. If the air in the engine room becomes unduly heated, the engine is unable to induct sufficient weight of air to provide complete combustion of its designed fuel injection volume and it will not develop its designed horsepower and R.P.M. The British Standard derating for atmospheric temperature is 2% per 10°F and it will readily be seen that if an engine be operated in a 120°F atmosphere when it is designed for a 60°F atmosphere it should have its fuel supply reduced by 12% and, consequently, its power output reduced.

6. The effects of incomplete combustion have a cumulative effect on engine room temperature, since the increased waste heat that is generated has to be disposed of by the engine. The products of incomplete combustion can manifest themselves in lubricant contamination, internal deposits and fouling, also high piston, valve and sprayer temperatures, etc., and may lead to unreliability and high maintenance.

Because of variations in the size of engine rooms, space occupied by machinery, headroom, type and layout of exhaust system employed, etc., it is not possible to lay down rules which are applicable to all cases, but in general the less the headroom and free space in an engine room the greater the need for a forced ventilation system. Attention given to the following recommendations, based on the assumption that the headroom in the engine room is not less than 5 ft., will ensure satisfactory results.

(*a*) Engine air requirements for combustion are generally in the region of 2 cfm/B.H.P. For reasonable engine room ventilation 2½ times this volume of air per B.H.P. is necessary, i.e. 5 cfm/B.H.P.

(*b*) Induction fans should be fitted to deliver this 5 cfm/B.H.P. installed, and the air trunked down to discharge below engine floor plate level, preferably at aft end of engine.

(*c*) Extractor fan or fans should be installed at the opposite end to that occupied by the induction fans and should be capable of extracting approximately 50% of the difference between input of the induction fans and the total volume of air required for combustion. These extractor fans should be installed so as to extract air at the deckhead position.

(*d*) In addition to the above, natural ventilation could be employed with advantage by means of weatherproof marine pattern ventilators with rotatable cowls; the intake ventilators trunked to below floor plate level and the outlet ventilators terminating at engine room deckhead level.

In installations where a dry type silencer is used the Gardner ventilating funnel type provides an effective additional outlet for heated air, see pages 31 and 32.

Installation Drawings and recommended fan sizes for various single and twin screw installations are shown in our Publication No. 762, but where installations require special consideration, such as engine rooms having a deck-head height of less than 5 ft., or where heating equipment is installed, we will be pleased to put forward suitable recommendations on receipt of a general arrangement and machinery layout drawing of the vessel.

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NOTES ON FLEXIBLE MOUNTING ARRANGEMENTS FOR GARDNER ENGINES IN MARINE INSTALLATIONS.

The objects of installing engines on flexible mountings in marine craft are to insulate the structure of the vessel from noise and vibration generated by the engines and the extent to which an attempt to attain these objectives can be justified should be considered against the type of vessel involved.

In general, the owners of pleasure craft, from luxury Yachts to Cabin Cruisers and the operators of passenger carrying launches, including Pilot Vessels and Ambulance Vessels, are tending to demand higher standards of comfort and silence. It is, therefore, on vessels of this type, as distinct from commercial craft such as fishing boats, tugs, workboats and the like, that the use of flexible engine mountings would be justified and desirable.

The three sources of noise from a diesel engine are:—

1. Exhaust noise.
2. Combustion noise.
3. Mechanical noise.

The first can be dealt with by adequate silencing arrangements and the other two, which are of a remarkably low order on Gardner Engines, can largely be insulated from the structure of the vessel by a suitable choice of flexible engine mountings.

The vibrations (which are in themselves a source of noise) set up by Gardner Engines are of low magnitude but even so if the Engines are rigidly mounted, particularly on steel bearers in a steel hull, the vibrations will be transmitted to other parts of the vessel and may be amplified by resonance effects. Suitably chosen flexible engine mountings will insulate the structure of the vessel from such vibrations and minimise their effect.

If maximum silence is to be achieved, it will be necessary, in addition to employing flexible engine mountings, to line the deckhead and bulkheads of the engine room with sound absorbing material, in order to prevent these large predominantly flat surfaces from becoming energised by airborne sound waves.

When flexible engine mountings are used it will, of course, be necessary to introduce flexible connections in all pipework to and from the engine and in some cases, depending upon the unsupported length of the intermediate shaft, to have one or more flexible couplings in the shaft line.

It is also most important that the use of flexible engine mountings should not be regarded as a substitute for perfect alignment of engine bearers, which should be parallel with the shaft line, perfectly flat and in the same plane with each other. It cannot be too strongly emphasised that flexible engine mountings are not intended to accommodate errors in the engine bearers because if such errors exist incorrect unit loading on the flexible mountings will ensue and this could result in synchronous vibration.

It is equally important that the Engine, when at rest, should be in perfect alignment with the Shaftline and that this condition is obtained without disturbing the calculated static deflection on each of the flexible engine mountings.

Detailed instructions as to how this condition can be obtained will be included on drawings obtainable from the Works on request.

In all cases where it is intended to install Gardner Engines on flexible mountings the following scale drawings, with principal dimensions included, should be submitted.

1. Machinery arrangement, including exhaust system.
2. Propeller Shaftline arrangement.
3. Details of engine seatings.

Only on receipt of these drawings can detailed proposals for flexible engine mounting arrangements be put forward.