Maritime & Coastguard Agency

INSTRUCTIONS FOR THE GUIDANCE OF SURVEYORS ON

MACHINERY

MSIS27 CHAPTER 4

Rev 05.25

PREFACE

0.1 These Marine Survey Instructions for the Guidance of Surveyors (MSIS) are not legal requirements in themselves. They may refer to statutory requirements elsewhere. They do represent the MCA policy for MCA surveyors to follow.

0.2 If for reasons of practicality, for instance, these cannot be followed then the surveyor must seek at least an equivalent arrangement, based on information from the owner/operator. Whenever possible guidance should be sought from either Principal Consultant Surveyors or Survey Operation Branch, in order to maintain consistency between Marine Offices.

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RECENT AMENDMENTS

The amendments made in the most recent publication are shown below, amendments made in previous publications are shown in the document Amendment History.

Version Number	Status / Change	Date	Author Reviewer	Content Approver	Next Review Date/Expiry Date
09.21	• Updated Code to reflect new requirements of MSN1871 Amendment No.2	31/08/2021	D Fenner	G Stone	01/09/2023
08.22	• Amended definition of Fit for Purpose	1/7/2022	D Fenner	G Stone	01/07/2024
12.22	• Surveyors should refer to Sections 1.23 and 1.24 of MSIS27 Chapter 1 when reviewing modifications to vessels.	2/12/22	D Fenner	L Page	28/11/24
04.24	• Clarify Owners to complete MSN1355. New link to MSF1355 also provided	04/24	D Fenner	L page	03.25
07.24	• Updated guidance on recording of engine power for outboards	05.24	D Fenner	L Page	05.25
05.25	• Clarify that for existing vessels being re-engined, MSF 1336 on MLD to be used	05.25	D Fenner	L Page	05.26

MSIS27 Chapter 4

4.1 INTRODUCTION

4.1.1 This Chapter should be read in conjunction with Chapter 4 of MSN1871, MSN1872 and MSN1873.

4.1.2 Surveyors should refer to Sections 1.23 and 1.24 of MSIS27 Chapter 1 when reviewing modifications to vessels.

4.2 GENERAL

4.2.1 CONSTRUCTION STANDARDS

4.2.1.1 New vessels built prior to 21 July 2020 but after 16 July 2007 of less than 15m LOA are constructed in accordance with the Seafish Construction Standards and will be delivered with Seafish certificates for hull construction and for machinery outfitting. New vessels of less than 15m LOA built after that date are constructed in accordance with the Construction Standards in MGN628 and will be delivered with Fishing Vessel Certifying Authority certificates for hull construction and for machinery outfitting if less than 12m RL and MCA Certificates for hull construction and for machinery outfitting if 12m RL to less than 15m LOA.

4.2.1.2 MSN1871 Amendment No.2 requires that vessels built to MGN628 shall be maintained to that standard. Vessels which were built to a Construction Standard should be maintained in such a manner as to be in accordance with the Construction Standard applicable at the time of construction and as set out in the applicable sections of this Chapter. Previous standards include those set out in Chapter 1 Annex 1 Section 4.2.16 and can be found here. If the vessel joined the Register after 16 July 2007 through the Registration Survey process, the vessel must be maintained in accordance with the standard required by the MCA at the time of its Registration Survey to allow its Registration.

4.2.1.3 For vessels of less than 15m LOA, built to Standards which did not set out requirements for a particular aspect of the Machinery or where at the time of construction Standards did not exist, the existing arrangements shall remain acceptable provided that it continues to remain fit for purpose. For the purposes of these Instructions, “fit for purpose” should be interpreted using section 4.2 of MSIS27 Chapter 1 Annex 1.

4.2.1.4 For vessels over 15m LOA:

- Design approval for machinery, boilers, pressure vessels, and associated systems can be carried out by any of the accepted classification societies. Vessels up to 24m RL may also be certified by Seafish before 21 July 2020 and MCA on or after that date.
- When classed, the classification society is responsible for acceptance of the equipment and materials. Their surveyors should complete the partial declaration for the vessel on form MSF1326, MSF1333, MSF1370, MSF1371 or MSF1373 as appropriate.

- Where a vessel is removed from class and subsequent surveys are to be carried out in full by the MCA, surveyors should certify the equipment and materials and record all details in the Record of Particulars MSF1301. Also, a full survey cycle will need to be submitted by the owner for MCA approval, see chapter 1. Surveys will remain equivalent to class requirements, so the surveyor is to refer to class rules for any items not covered in these instructions. Surveyors should also use the Supplement to Over 24m Unclassed Fishing Vessel Surveys – Automation Tests when using MSF5552 (Unclassed Aide Memoire). The Supplement is attached to this Chapter at Annex 1.

4.2.1.5 Similar requirements apply to any flag-in vessel, with a minimum of 25% of machinery items opened up for initial survey.

4.2.1.6 All installations in machinery spaces should be arranged with due regard to the safety of the crew members. All moving parts should be adequately protected by suitable screens, guards and guard rails; hot surfaces should be insulated; surveyors should confirm these arrangements remain fitted such that crew members attending to the machinery are not exposed to undue risk or possible injury.

4.2.1.7 All machinery installations should be accessible for inspection and maintenance.

4.2.1.8 Where the engine room is periodically unattended, then suitable alarms, detection against fire and flooding, and control systems should be in place. It is also recommended that CCTV be fitted to monitor this space.

4.2.2 MATERIALS

4.2.2.1 All materials used should conform to British Standard (BS) specifications or equivalent standards, such as DIN, ISO, EN (Euro Norm).

4.2.2.2 Where documentation is supplied to show that materials used have been manufactured to a known BS, class approved process or a recognised standard from another country, surveyors do not need to witness tests on these materials.

4.2.2.3 Where material cannot be identified or is not supplied with an acceptable certificate, then it will be necessary to have a specimen of the material tested for ultimate tensile stress, elongation and bending.

4.2.2.4 The material should be tested in accordance with procedures detailed in BS EN ISO 6892-1:2009 and BS EN ISO 6982-2:2011 for metallic materials and BS 2782 for non-metallic materials. The tests should be witnessed by either an MCA surveyor or an accepted classification society surveyor. They should be performed on equipment with a valid calibration certificate issued by the MCA, an accepted classification society or a nationally approved calibration service organisation.

4.3 SURVEY OF BOILERS

4.3.1 GENERAL

4.3.1.1 There are no requirements for Boilers in MSN1871. Requirements for boilers are found in Chapter 4 and Annex 3 of MSN1872 and section 4.1.14 of MSN1873. If a vessel of less than 15m LOA is found to have boilers to which this section refers then as far as is practicable, the instructions as set out below should be applied.

4.3.1.2 Pressure vessels are loosely classified as follows:-

- Class III – unfired under 17.5 bar. This would include pneupress tanks and sprinkler tanks.
- Class II – fired under 3.5 bar, and unfired under 40 bar. This would include some hydraulic accumulators and starting air receivers.
- Class I – fired over 3.5 bar, and unfired over 40 bar. This would include steam boilers.

4.3.1.3 Currently there are no UK registered fishing vessels propelled by steam engines and it is unlikely that there will be any in the foreseeable future. In the event that a steam propelled fishing vessel is built or flagged-in to the UK register, details should be submitted to a Consultant Fishing Vessel Surveyor or Headquarters.

4.3.1.4 Class I boilers are only to be found on some of the larger fishing vessels, and should be anticipated to be auxiliary type at 7 bar. The oil-fired unit may be complemented by an exhaust gas heat exchanger, operating at the same pressure.

4.3.1.5 Thermal fluid systems should also have due regard to fixed firefighting arrangements. These systems consist of an oil-fired heat exchanger operating at low pressure. They may also include an exhaust gas heat exchanger.

4.3.1.6 Components and systems should be constructed to an accepted classification society standards.

4.3.1.7 Periodic survey of boilers can be carried out by Engineer Surveyors employed by either the MCA or one of the accepted classification societies. Normally the surveys will be carried out by a classification society surveyor, but should an MCA surveyor have to carry out this work he should be guided by the information in the following paragraphs.

4.3.2 STEAM BOILERS

4.3.2.1 Classification Society Rules shall be followed.

4.3.3 DOMESTIC CALORIFIERS

4.3.3.1 Calorifiers and boilers for the supply of hot washing water should be vented to the open air, or provided with a suitable safety valve. In addition, safeguards against over pressure in the coils should be provided. Electric heaters are to be thermostatically controlled with an additional high temperature cut out.

4.4 DIESEL PROPULSION MACHINERY

4.4.1 The requirements for Propulsion Machinery are contained in Section 4.3 of MSN1871. See also Sections 4.1.1.2 and 4.1.1.3 above. Where the requirements of the Standard to which the vessel was built or the condition in which the vessel joined the Register through a Registration Survey mean that any of the requirements of 4.3 below would apply, these instructions shall be used. Requirements for Propulsion Machinery are found in section 4.1 and Annex 3 of MSN1872 and section 4.1 of MSN1873.

4.4.2 DEAD SHIP CONDITION

4.4.2.1 The surveyor should ensure that at least one of the following forms of first start equipment is available to get machinery under way in the event of a dead ship condition arising:-

- a manual hydraulic starter; or
- a hand started auxiliary diesel engine driving an electrical generator or an air compressor; or
- an accumulator battery, normally maintained from the electrical supply. This to be duplicated via a double pole changeover switch.
- For vessels of less than 15m LOA, fitted with two means of propulsion (i.e., twin outboard/inboard engines) then, provided each means is independently provided with fuel, cooling and a means of starting, should one means of propulsion fail the other can be considered as a secondary means.

4.4.3 DIESEL MAIN ENGINES

4.4.3.1 The construction of new engines should be covered by certification issued by an accepted classification society for marine use. This shall include EIAPP and Technical files (see current application of MARPOL rules The MCA surveyor should witness running trials; the procedure and criteria for sea trials should be written and agreed by all attending parties prior to the event, together with a timetable, noting the following paragraphs.

4.4.3.2 The main engine should be capable of stop & start from the engine room and from the wheelhouse. In vessels of less than 15m LOA, any new engines fitted to vessels after 6 September 2021 when MSN1871 Amendment No.2 comes into force must comply with this arrangement.

4.4.3.3 With direct reversing engines the reversing gear should be such that, when operated quickly from 'ahead' to 'astern', or vice versa, there should be no possibility of the propelling machinery continuing to run in a direction contrary to that corresponding to the position of the reversing gear.

4.4.3.4 Where a main engine develops 220 kW or more, which can be declutched or which drives a controllable pitch propeller, it should be fitted with an overspeed protection device, in addition to the 115% speed limiter (governor) required by regulation. The speed limiter and overspeed protection device should work

independently of each other and the additional overspeed protection device should limit the engine speed to not more than 20% above the normal running speed. The additional overspeed protection device should be arranged to shut-off the fuel oil supply to the engine.

4.4.3.5 Engine cylinders over 230mm bore shall each be fitted with an efficient cylinder relief valve with the discharge directed so as not to be harmful to those in attendance. The relief valve should be set to release at not more than 40% in excess of the maximum designed cylinder pressure.

4.4.3.6 Engines with cylinders over 200 mm bore shall be provided with approved crankcase explosion doors.

4.4.3.7 In vessels which have machinery spaces that are periodically unattended, the propulsion engines must be fitted with an externally operated remote stopping device in the form of a fuel oil shut-off valve. In vessels of less than 15m LOA, any new engines fitted to vessels after 6 September 2021 when MSN1871 Amendment No.2 comes into force must comply with this arrangement. The device should be seen to operate correctly and surveyors should remind owners or skippers that its operation should be checked at regular intervals not exceeding 3 months.

4.4.3.8 Engines over 2,250 kW or having cylinders over 300mm bore require a crankcase oil mist detector.

4.4.3.9 Engine fault conditions should indicate in the wheelhouse.

4.4.3.10 Drip trays should be fitted under all oil filters, pumps and heaters. Duplex oil filters (which allow removal of one filter during operation) are to be installed. These requirements are equally applicable to existing vessels.

4.4.4 MEANS FOR GOING ASTERN

4.4.4.1 The means of going astern should be such that the operation can be effected rapidly enough to enable the vessel to be properly handled. It should not be possible to stall a non-reversing engine when changing from ahead to astern or vice versa.

4.4.5 PERIODIC ENGINE SURVEYS

4.4.5.1 Vessels under 24m are not usually classed. The surveyor should survey all components of the diesel and gearbox in accordance with the agreed survey schedule. Overhaul should be conducted by a competent person, in accordance with the manufacturer's instructions. In the case of overhaul by the makers representative, their satisfactory work report may be accepted. For fishing vessel surveyors who are not engineers, documentation signed by a responsible person e.g., superintendent or engineering manager may be accepted and placed on file.

4.4.5.2 Any proposal to extend the survey schedule due to reduced running hours, would be subject to receipt of a satisfactory lub. oil analysis and satisfactory operational

tests witnessed by an MS1 engineer surveyor. Main engine running hours in accordance with the maker's recommendations are acceptable in lieu of a calendar-based schedule.

4.4.5.3 Vessels of 24m and over should have engine surveys conducted by a classification surveyor.

4.4.5.4 In the case of vessels which have dropped out of class, surveys can be conducted by MCA or their appointed representative. Surveys will remain to class standards:

- All running gear to be dismantled and renewed as necessary. Components to be checked include camshafts and driving gear, pistons and rings, bearings, liners, cylinder heads with valves, rockers, springs and guides etc. Torsional vibration dampers or flexible couplings are to be serviced as per manufacturers recommendations. Dampers should be examined for signs of deterioration with the aid of fluid sample reports, if applicable. All new jointing and new copper rings to be used in reassembly. Where a new copper ring is not available, the existing ring must be annealed before reassembly;
- Cylinder heads to be cleaned and the combustion face crack tested with dye penetrant, especially at each valve pocket seating;
- Engines should have the fluid cooling passages of the cylinder liners and of the cylinder heads tested by hydraulic pressure to 1.5 x normal coolant pressure;
- Turbo chargers and fuel injection equipment should be overhauled at a specialist service agent;
- Water cooled turbocharger casings should be pressure tested to 1.5 x working pressure. The casing may require thickness readings taken, due to water erosion, at the surveyor's discretion;
- Coolers and intercoolers should be opened up, cleaned, inspected and pressure tested to 1.5 x working pressure;
- On reassembly, new filters should be used in conjunction with new or purified lub. oil;
- Satisfactory running tests would include check of power balance, and checking of all statutory alarms and trips;
- Large engines may be partially surveyed in accordance with an agreed survey schedule, rather than all at one time; and
- It is recommended that engines over 375kW be fitted with sheathed "double skin" fuel delivery lines. Where this is not feasible, suitable screening should be fitted between fuel lines and hot exhaust pipes and turbocharger inlets.

4.4.5.5 On smaller engines, any fuel delivery pipes made of copper, which are prone to work hardening and fracture, should be replaced with steel piping.

4.4.5.6 Maximum Continuous Engine Power (MCEP) should be recorded by the surveyor at survey or inspection when the vessels is new to the register or when changes are noted at each survey. This applies equally to inboard and outboard main engines. Details of engine manufacturer, model, power rating and rpm to be recorded from the engine tally plate. If changes are noted from that recorded on

the Certificate of Registry, a new MCEP checklist proforma MSF1336 should be completed. If surveyors are attending an existing vessel which has been re-engined, as MSF1336 is part of MSF2301, surveyors should use MSF1336 herewhich is still available on the MLD and forward ~~to the Fishing Section of the Registry of Shipping and Seaman~~ and submit to UKSR.

4.4.5.7 Guidance on the de-rating of engines is given in MGN435. Note that outboard engines should not be de-rated. "Factory modified" outboard engines will be accepted at the power indicated on the tally plate provided that the factory modification remains extant.

4.4.5.8 Should it be suspected that the factory modification on an outboard engine has been removed and the engine is operating in excess of the power rating stated on the vessel's certificate of registry, the surveyor should add the following text to the inspection evaluation on Pelorus:

"It is considered likely that the power rating of outboard engine serial number XXXX has been increased from the power of XXXX kW declared on the engine tally plate and on the vessel's Certificate of Registry. The owner should be advised that MCA will be advising the relevant UK Fisheries Administration".

4.4.5.9 the Marine Office Business Support Manager should then be asked to forward the inspection report to INTEL@marinemanagement.org.uk

4.4.5.10 If the engine is clearly different to that stated on the Certificate of Registry and the vessel file confirms this, then a deficiency shall be raised, a revised MSF1336 issued and the Marine Office Business Support Manager should then be asked to forward the inspection report to INTEL@marinemanagement.org.uk.

4.4.5.11 Note that increasing the power of a de-rated or factory modified engine may compromise the structural strength of the transom of the vessel, particularly for GRP construction (ref MGN628 part 6 section 6.9.15). Particular attention should be paid to this area of vessel structure should it be suspected that the engine is operating in excess of the power rating stated. An engine operating at increased power may also have implications for search and rescue co-ordination.

4.5 SHAFTS

4.5.1 The requirements for Shafts are contained in Section 4.3 of MSN1871. See also Sections 4.1.1.2 and 4.1.1.3 above. Where the requirements of the Standard to which the vessel was built or the condition in which the vessel joined the Register through a Registration Survey mean that any of the requirements of 4.4 below would apply, these instructions shall be used. Requirements for Shafts are found in section 4.1 and Annex 3 of MSN1872 and section 4.1 of MSN1873.

4.5.2 GENERAL

4.5.2.1 Dimensions for new shafts are calculated according to classification rules, or for under 24m vessels, to Seafish standards before 21 July 2020 and the Construction Standards in MGNs 628 and 629 from that date forward.

4.5.3 SURVEY RECORDS

4.5.3.1 The following information will be of assistance when performing the following checks and should, for vessels of 15m LOA and over, wherever possible, be recorded under the heading of machinery items on the Record of Particulars MSF1301 (formerly FV2):-

- Engine power *kW*
- Speed at which the engine is rated *rpm*
- Reduction ratio of the gearbox (if fitted)
- Ultimate tensile strength (UTS) of shaft material N/mm^2
- Shaft material specification - BSS No. or equivalent

4.5.3.2 MSF1301 is not used for Fishing vessels of less than 15m LOA. The records stated in 4.4.2.1 above should, wherever possible, be recorded in the Sharepoint file for the vessel.

4.5.3.3 The following information should always be stated on the surveyor's report (MSF1328):-

- if the propeller shaft was removed or not;
- if yes, was it subsequently renewed or reconditioned;
- if not, the date of the last removal or partial withdrawal, and if renewed or reconditioned; and
- if the propeller shaft has been accepted below rule size;
- tailshaft and intermediate shaft clearances

4.5.4 SHAFT REMOVAL CONSIDERATIONS

4.5.4.1 Removal of a propeller shaft is to be anticipated whenever the vessel is drydocked for FVC renewal survey, in accordance with the survey schedule.

4.5.4.2 However, where there is evidence available to indicate that the stern gear is in good working order, it may not be necessary to insist on removal. The following checks are designed to ensure that, when completed, the surveyor should be satisfied that the stern gear, including the propeller shaft, will continue in a serviceable condition for the period covered by his declaration. If there is any reasonable doubt, the propeller shaft should be removed, either partially or fully. In

order to assist surveyors arrive at a decision the following points should be considered:-

- evidence of recent maintenance work carried out on the stern gear; and
- any other relevant comments by the owner/skipper on the running condition of the stern gear. These to be recorded by the owner on form MSF1355, which is then signed by the owner and forwarded to the MCA.

Note: Wherever possible, the surveyor should see the engine run with the vessel afloat, prior to slipping, to help him assess its running condition.

4.5.4.3 In both of these cases the surveyor should make a judgement taking into account the following items:-

- date the propeller shaft was last withdrawn;
- date the propeller shaft was last replaced or reconditioned;
- any records of excessive noise/vibration;
- indication that the propeller shaft is bent;
- any evidence of the intermediate bearings (if any) between the engine (or gearbox) and the stern tube running hot;
- in an oil lubricated stern gear system any evidence of oil consumption over a known period of time;
- any evidence of water in the oil reservoir; and
- any evidence of oil leakage past an internal seal.

4.5.4.4 With the vessel slipped additional in-situ checks, which vary for different types of stern gear, should be made. The following paragraphs details these checks, which cover water, grease and oil lubricated propeller shafts respectively; Table 1 indicates which checks are applicable. Wherever possible advice should be sought and taken, from competent repair technicians on how to proceed with examination of the stern gear.

4.5.4.5 In cases where further advice on in-situ checks is required a Principal Fishing Vessel Surveyor should be contacted.

4.5.4.6 In order to carry out some of the following checks it may be necessary to dismantle some parts of the stern gear to gain access to surfaces hidden from view.

4.5.4.7 In-situ checks:-

- *Wear* - check for by lifting or jacking the shaft, utilising a dial gauge or feeler gauges. In some vessels a smaller than rule size shaft may be found for which exemption has previously been obtained. Where the wear exceeds the allowable limits detailed in paragraph 4.4.3.3, then a new shaft should be fitted;

Note: When jacking or lifting care should be taken not to damage the shaft by excessive movement. Jacking should not be utilised where mechanical seals are fitted.

- On larger vessels, the wear is measured using a weardown gauge;
- *Bent shaft and/or oval worn bushes* - check by rotating the shaft against a dial gauge;
- *Visible corrosion and/or cracking* - check in way of aft bearing and propeller mounting. This will involve removal of the propeller and release of the inboard shaft coupling to partially withdraw the propeller shaft;
- *Grooving in way of inboard gland* - check by releasing the gland and removing the packing or seal. The reduced diameter in way of the grooving should not fall below the limits set in paragraph 4.4.3.3;
- *Visual examination of seals (if fitted)* - check for any signs of deterioration or significant damage;
- *Grease supply to bearings* - check for broken external supply pipes and prove supply by pumping grease; and
- *Lubricating oil* - check by analysis for signs of contamination.

Table 1 - Applicability of checks

CHECK for	BEARING TYPE		
	WATER LUBRICATED	GREASE LUBRICATED	OIL LUBRICATED
(a) Wear	Yes	Yes	Yes
(b) Bent shaft	Yes	Yes	Yes
(c) Corrosion/pitting	Yes	Yes	Yes
(d) Grooving	Yes	Yes	Yes
(e) Seal/cutlass bearing	Yes	Yes	Yes
(f) Grease supply	N/A	Yes	N/A
(g) Oil analysis	N/A	N/A	Yes

Notes –

Water lubricated propeller shaft bearings

This type of stern gear has many variations in operating conditions which can affect its serviceability, including whether the shaft material is corrosion resistant or not. The stern gear should be checked as detailed in Table 1.

Grease lubricated propeller shaft bearings

This type of stern gear can be expected to need less frequent maintenance than water lubricated bearings, but not always achieve the extended maintenance free periods of oil lubricated bearings. Depending on whether seals, glands, or a combination of these are fitted, the stern gear should be checked as detailed in Table 1.

Oil lubricated propeller shaft bearings

This type of stern gear is designed to operate maintenance free for long periods of time. The system should not be disturbed unless there are clear grounds to proceed beyond the basic in-situ checks as detailed in Table 1 plus removal of propeller for signs of cracking or corrosion.

Many of these types of shafts will have controllable pitch propellers fitted to them. It is most important that it is demonstrated that the sealing arrangements between hub and blade bases are in good working order.

Corrodible tailshafts

Some tailshafts are made from corrodible steel which are liable to corrosion anywhere, but especially prone to severe corrosion/wastage in the hidden section between the outer bearing and inner bearing (or gland). In some cases, brass or similar protective liners are fitted in way of the bearing surfaces, but any unprotected surface will remain hidden from view. In such cases, the tailshaft will need be withdrawn to the extent necessary for the unprotected section to be examined.

4.5.4.8 At this point the surveyor should make a decision based on evidence already available and that obtained from the above checks whether to remove, or partially remove the stern gear for examination.

4.5.5 CALCULATION OF PROPELLER SHAFT ALLOWABLE WEAR

4.5.5.1 The manufacturers' recommended allowable tolerances for wear between the stern tube and propeller shaft should be consulted. Where these are not available, the permissible clearance will vary depending on shaft diameter, but should not normally exceed 6 to 10mm in the case of lignum vitae or Tufnol. In the case of oil lubricated shafts, bearing weardown of 2mm will warrant remetalling. The following points should be considered when making a judgement on acceptability and period before re-survey or otherwise:

- The rate of wear obtained between successive dockings in the past; consideration being given for initial high rates of wear that can be experienced after re-wooding;
- Past and prospective future service of the vessel;
- Next probable occasion when renewal of the bearings could be carried out;
- Any recent history of excessive stern-gland leakage which may make it necessary to limit the wear to less than the general limits specified in the following table;
- Whether the shaft exceeds the required diameter for its material strength; and
- As a rule of thumb, for on-the-spot decisions, shaft wear of 2%, with a maximum of 5mm should be considered for replacement.

4.5.6 SHAFT SURVEY

4.5.6.1 Shafts should be carefully examined for cracks, particularly at keyways. The forward and aft ends of liners where corrosion may sometimes be found should be examined. Signs of fretting are occasionally evident on the shaft cone, owing possibly to unsatisfactory fit of the propeller or inadequate hardening up of the nut. Areas of corrosion, sometimes in the form of a circumferential band at the large end of the cone, should be viewed with suspicion. In extreme cases, circumferential stress corrosion cracking has developed from such areas. This defect is usually attributable to the presence of sea water.

4.5.6.2 Where screwshafts require examination at the forward part of the cone or the fillet in flanged propeller attachments by an efficient crack detection method, this should be of the magnetic particle type (MPI) for shafts of ordinary steel. Facilities for MPI are available at most drydocks but where they are not, the shaft can be readily magnetized by encircling it with a few turns of cable connected to a suitable low voltage, high amperage electric current.

4.5.6.3 Any cracks found will generally be the result of fatigue. The extent and depth of any crack should be determined by grinding out the affected area until it has been confirmed by MPI that the crack has been entirely removed. Where defects are situated near the end of a liner, it must be verified that these do not continue under the liner. The liner should be machined back if necessary.

4.5.6.4 The threaded end and nut should be carefully examined.

4.5.7 REPLACEMENT SHAFTING

4.5.7.1 Only materials known to be suitable for the manufacture of shafts, shaft couplings and coupling bolts are to be used for that purpose. A test certificate for the material must be produced, in order that strength calculations may be undertaken. Any doubt, the surveyor should submit details to a Principal Fishing Vessel Surveyor or Headquarters.

4.5.7.2 Where the diameter of a forged steel shaft is 250 mm or greater it should be subjected to ultrasonic tests.

4.5.7.3 Shaft couplings should be forged from the solid shaft or may be formed by upsetting the ends by hydraulic pressure. Couplings, when separate from the shaft, may be steel castings or forged from ingot steel.

4.5.7.4 Shaft coupling bolts should be manufactured from ingot steel having an ultimate tensile strength (UTS) of 430 to 780 N/mm^2 or equivalent UTS of the shaft material used. The makers' guarantee regarding the quality of the material may be accepted.

4.5.7.5 If calculations are required for components dimensions, these can be obtained from class rules.

4.5.8 REPAIRS

4.5.8.1 Localised corrosion damage or gland wear, up to a depth of 3mm, may be repaired by a class approved spray welding process. However, this repair would not be acceptable in way of bearing contact.

4.5.8.2 If the shaft was oversize, it may be machined down to that required for the power rating. Where the shaft has been machined to remove surface cracks, and the shaft is to be refitted, the material around the depressions must be carefully blended into the adjacent surface of the shaft to avoid stress raisers. Machining in way of bearings would require that new bearings would be fitted.

4.5.8.3 Bronze liners worn in way of stern gland packing may be repaired by welding, in accordance with a class approved procedure.

4.6 EXHAUST SYSTEMS

4.6.1 The requirements for Exhaust Systems are contained in Section 2.15 and 4.3 of MSN1871. See also Sections 4.1.1.2 and 4.1.1.3 above. Where the requirements of the Standard to which the vessel was built or the condition in which the vessel joined the Register through a Registration Survey mean that any of the requirements of 4.5 below would apply, these instructions shall be used. Requirements for Shafts are found in section 4.1 and Annex 3 of MSN1872 and section 4.1 of MSN1873.

4.6.1 Exhaust manifolds, pipes and silencers should be efficiently cooled or lagged, where risk of fire (surface temperature > 200OC) or injury to personnel exists.

4.6.3 Surveyors should check that exposed exhaust pipes, including flanges and silencers, inside and outside machinery spaces are suitably protected against flammable materials coming into contact with them. Where there is an actual risk of such contact, insulation material or guards should be fitted, but only to those areas where problems might occur.

4.6.4 Insulation material should be non-combustible, protected by corrosion resistant sheathing to prevent mechanical damage. Oil absorbent lagging to be protected by sheet metal sheathing, or equivalent, where necessary. The thickness should be sufficient to reduce the temperature of the exposed surface to less than 60oC. The insulation material should be sealed, as far as is practical, to prevent corrosion of the covered surfaces. On existing vessels, precautions should be taken to the possibility of encountering asbestos.

4.6.5 Backflooding via shipside exhausts should be eliminated by the installation of effective non return valves.

4.7 AIR PRESSURE SYSTEMS

4.7.1 The requirements for Air Pressure systems are contained in Section 4.2 and 4.3 of MSN1871. See also Sections 4.1.1.2 and 4.1.1.3 above. Where the requirements

of the Standard to which the vessel was built or the condition in which the vessel joined the Register through a Registration Survey mean that any of the requirements of 4.6 below would apply, these instructions shall be used. Requirements for air pressure systems are found in section 4.1 and Annex 3 of MSN1872 and section 4.1 of MSN1873.

4.7.2 GENERAL

4.7.2.1 Where machinery is started by compressed air, an adequate number of compressors and receivers is required to ensure an adequate supply for normal service conditions, including the ability for six successive starts of a non-reversible engine main engine, or twelve successive starts for a reversible one.

4.7.2.2 Surveyors should ensure that owners, skippers and crew are aware of M Notices 474 and 852, as may be amended or superseded, with regard to flammable liquids or mixtures in the air starting pipelines and air intake manifold.

4.7.3 COMPRESSORS

4.7.3.1 Vessels which require compressed air for starting should be provided, as a minimum, with the following:-

- An air compressor, driven independently from the main engine, should always be available for charging air receivers; and
- In addition to the above air compressor, a mechanically driven starting air compressor which can be put into operation without external aid, when no power units are running and when no compressed air is available in the vessel.

4.7.3.2 Such compressors to be fitted with adequate relief valves so that 10% of the maximum working pressure cannot be exceeded with the discharge valve closed. Any cooling water space is to be protected by a relief valve or bursting disc. The air discharge pipe to be led directly to the start air receiver, with provision for draining oil and water. The compressor air intake to be located in an atmosphere having minimal oil vapour, or fed from ducting.

4.7.4 AIR RECEIVERS

4.7.4.1 Air pressure vessels should be considered in accordance with an accepted classification society requirements. Air receivers should be stamped with the following information:-

- Test Authority;
- Test pressure;
- Working pressure;
- Date tested; and
- Surveyor's initials.

4.7.4.2 Alternatively, air receivers manufactured in accordance with BS EN 286-1:1998+A2:2005, or equivalent, may be accepted subject to satisfactory test certificates being supplied by the manufacturer.

4.7.4.3 Vessels which require compressed air for starting should be provided with the following:-

- Normally two air receivers are fitted for starting the main engine. The arrangements should be such that one of the receivers can be kept fully charged ready for use, in case the air pressure in the other receiver or receivers falls below the pressure necessary to start the main engine. The number of starts from one air receiver and the lowest pressure at which the engine can be satisfactorily started should be ascertained and a record kept on the vessels official file;
- Where only one air storage receiver for main engine starting air is fitted, surveyors should ensure that the separate provision for the storage and distribution of compressed air for starting the main generators is also adequate for any additional services essential for the propulsion and safety of the vessel which are dependent on compressed air for their operation. This requirement may necessitate the provision of duplicate piping arrangements from the additional source of compressed air to essential equipment operated by air pressure;
- Surveyors should pay particular attention to installations where failure of the air supply for control or operating gear of propulsion machinery, shafting, gearing and propeller could endanger the vessel; and
- Periodic inspections would include internal examination for corrosion and pitting.

4.7.4.4 Where the receiver is too small for inspection, a hydraulic test of 1.5 times maximum working pressure can be accepted. Relief valves should be overhauled and tested. All other valves to be opened up for inspection and overhaul. Drain lines to be proven clear.

4.7.5 PIPES AND FITTINGS

4.7.5.1 Air pressure pipes should be made of steel with flanged joints where practicable.

4.7.5.2 Pipes less than 20 mm bore may be made of copper.

4.7.5.3 Air pressure pipes should be properly supported and provision should be made to keep the interior of the pipes free from oil and either to prevent the passage of flame from the cylinders of the engine to the pipes or to protect the pipes from the effects of an internal explosion.

4.7.5.4 An isolating non return valve or the equivalent should be fitted at the inlet end of the starting air manifold.

4.7.5.5 Where main propulsion engines use an air starting system, it should be fitted with a flame arrester or pressure relief device at the starting air valve on each cylinder, if the bore of the air pipes between the manifold and the starting valves on the cylinders exceeds 20 mm. Main propulsion and auxiliary engines not fitted with

flame arresters at each cylinder should be fitted with a pressure relief device on the starting air manifold at about its mid length.

4.7.5.6 For new vessels air pressure pipes and fittings shall be tested by hydraulic pressure to twice the maximum working pressure; however, when bursting discs are fitted, the test pressure should not be less than the nominal bursting pressure of the discs plus 14 kgf/cm2. Representative samples of bursting discs fitted to protect the pipes and fittings from the effects of an internal explosion should be tested to destruction to confirm their normal bursting pressure. During renewal surveys specimen sections should similarly be tested.

4.7.5.7 Valves used in air pressure piping should be so designed and constructed as to prevent the cover of the valve chest being slackened back or loosened when the valve is operated.

4.8 COOLING WATER SYSTEMS

4.8.1 The requirements for Cooling Water systems are contained in Section 4.9 of MSN1871. Provided that the piping and fittings are of sound construction and efficient in operation, the cooling water system fitted will be accepted. When the Cooling Water systems are renewed or the engine replaced, then the new system or parts thereof shall be to the requirements of MGN628. Requirements for Cooling Water systems are found in section 4.1 and Annex 3 of MSN1872 and section 4.1 of MSN1873.

4.8.2 Each system, including the connected water passages, should be arranged so as to avoid air pockets as far as possible. Air cocks should be provided where necessary.

4.8.3 Doors, suitably placed, should be provided in the water spaces for cleaning and inspection.

4.8.4 Inlet and outlet thermometers should be provided for ascertaining that the system is in order and that sufficient water is passing through each part which requires to be cooled.

4.8.5 Where a freshwater cooling system is fitted, the freshwater pumping arrangements should be such that an adequate supply of fresh water will be provided and that an adequate alternative supply of cooling water will be available from a standby freshwater pump or from an emergency connection to a sea water pump.

4.8.6 Where vessels are fitted with box coolers for main engine or auxiliary cooling, surveyors should check the anodes and condition of the steelwork in the vicinity of the hull apertures for signs of excessive corrosion.

4.8.7 Sea water pipes should be accessible for inspection and maintenance. Compression fittings are not suitable for seawater pipes fitted below the waterline. At periodic surveys, surveyors should thoroughly check this pipework, with liberal

use of hammer testing, including strainers and isolation valves, as failure has resulted in flooding. Any leakage found merits pressure test of the whole section, not just a localised repair. In no case can plastic or rubber hoses be accepted on sea inlets or discharges. Sea water valves must be capable of closure from above the floorplates level.

4.8.8 Corrosion resistant materials should be used. Where dissimilar metals are connected, there is a danger of galvanic corrosion. Note should be taken of the premature failure of copper pipework in engine cooling water systems, as detailed in MGN190.

4.8.9 Flexible piping presents a risk of flooding, therefore should either be insulated or of fire-resistant material, ref. ISO 7840:2004. Alternatively remote closing may be fitted.

4.8.10 Any GRP or other plastic pipes must be in compliance with class rules.

4.9 LUBRICATING AND HYDRAULIC OIL SYSTEMS

4.9.1 The requirements for lubricating and hydraulic oil systems are contained in section 4.9 of MSN1871. See also Sections 4.1.1.2 and 4.1.1.3 above. Where the requirements of the Standard to which the vessel was built or the condition in which the vessel joined the Register through a Registration Survey mean that any of the requirements of 4.8 below would apply, these instructions shall be used. Requirements for lubricating and hydraulic oil systems are found in section 4.1 and Annex 3 of MSN1872 and section 4.1 of MSN1873.

4.9.2 Means should be provided so that the pressure, temperature and flow prevailing in the important parts of the lubricating system can be readily observed.

4.9.3 In vessels of 24m and over, particular attention is drawn to the indication of pressure on the discharge side of the lubricating oil pumps and the inlet and outlet sides of the lubrication oil filters. Lubricating oil filters should be capable of being cleaned without interruption of supply (e.g., duplex or backflush type).

4.9.4 The lubricating oil systems of main propelling machinery in all vessels should be provided with an audible and visible alarm to give a warning should the pressure of the oil supply fall below a safe level, prior to any auto shutdown.

4.9.5 Flexible pipes used in lubricating and hydraulic oil systems should be of minimal length (maximum permitted is 1.5m) and of an approved type, where a fire risk is present. Double braided hoses using steel braiding with machine swaged-on steel couplings are considered the norm.

Ref. BS EN 853/856: 2015 or equivalent ISO standard

4.9.6 Hydraulic tanks over 65 litres capacity require remotely operated isolation valves. Alternatively, if directly supplying pumps, remote stopping of the pumps can be accepted. Also, low level tank alarm should be fitted to detect leakage.

4.9.7 Vessels of 24m and over require tank gauges having flat plate glasses to be fitted. They should be attached to the tank by means of self-closing cocks which will not permit discharge of the contents in the event of damage to the glass. Gauges which do not require penetration of the tank below its top are preferable, to minimise the risk of accidental outflow.

4.9.8 Vessels under 24m length may have tubular gauge glasses fitted. Surveyors should be satisfied that they are of substantial construction (plastic tubing is not acceptable), and that they are protected by adequate metal shields. They should also be attached to the tank by means of self-closing cocks.

4.9.9 Periodic surveys of oil pipework would include a visual examination and sampling hydraulic tests at 2 x max working pressure. It should be ensured that suitable screening from hot surfaces is provided. Flexible pipework has a limited life and may need replacement.

4.9.10 An emergency stop is to be fitted at the helm position for all hydraulically operated deck equipment. Where a winch or hauler is controlled from the helm position, a local emergency stop device is to be fitted, and clearly marked. These to be checked at periodic surveys.

4.10 OIL FUEL INSTALLATIONS - MACHINERY

4.10.1 The requirements for Oil fuel Installations are contained in section 4.9 of MSN1871. See also Sections 4.1.1.2 and 4.1.1.3 above. Where the requirements of the Standard to which the vessel was built or the condition in which the vessel joined the Register through a Registration Survey mean that any of the requirements of 4.9 below would apply, these instructions shall be used. Requirements for Oil fuel installations are found in section 4.1 and Annex 3 of MSN1872 and section 4.1 of MSN1873.

4.10.2 GENERAL

4.10.2.1 The flash point of oil is the minimum temperature at which oil gives off flammable vapour and the closed flash point is obtained using the Pensky Marten apparatus for temperatures above 45°C and the Abe apparatus for temperatures of 45°C and less. Fuel oil used in machinery spaces should have a closed flash point of not less than 60°C. This should be indicated on the bunker supply note.

4.10.2.2 Oil catches fire rapidly and the speed at which the fire spreads depends to a great extent on the temperature of the oil relative to its flash point. If the temperature of any waste oil in the bilges or on tank tops is near to the flash point the fire spreads very quickly and if the temperature exceeds the flash point there will be an added risk of explosion. Two precautions are therefore, of the greatest importance as follows:

- the temperature of the surfaces on which waste oil may collect should be kept cool, so that their temperatures are at least 15°C below the flash point of the oil; and

- the conditions which will allow a small fire to spread, to an accumulation of waste oil in the bilges or on double bottom tank tops, must be avoided. This can only be achieved by maintaining a high standard of cleanliness.

4.10.3 PLANS AND PARTICULARS

4.10.3.1 For new construction, the following plans should be obtained from the builder:

- General arrangement drawing showing position of machinery and position of storage, settling and service tanks;
- Details of any tanks not built into the vessel's structure;
- Oil fuel filling arrangements;
- Arrangement of air vents, overflow, sounding and pumping systems;
- Arrangement and details of oil fuel suction remote shut off valves, including arrangement of remote power operated system, including details of valves, actuators and control system, capacity of the associated air or oil receivers, control piping material and pipe couplings;
- Arrangement of gutterways, coamings, save alls, screens and oily drains;
- General arrangement of oil fuel units and associated pipes and fittings; design details of filters and heaters; and
- Arrangement of any tanks and piping for galleys which have oil fired stoves.

4.10.4 SURVEYS

4.10.4.1 At initial surveys it should be confirmed that the oil fuel installations are fitted in accordance with class rules and with the accepted plans. The surveyor should witness the required hydraulic tests. Where the ship is classed, the foregoing can be carried out by the class surveyor, but the remote controls and other safety devices should be tested by MCA surveyors.

4.10.4.2 At periodic surveys, surveyors should see that machinery spaces are clean, particularly in way of savealls and bilges, that the means of remote control in respect of certain valves and trips are in good working order, and that the markings and notices at the operating positions are easily legible.

4.10.4.3 The regulations concerning oil fuel installations in oil fired steam and diesel engine plants together with these Instructions, are aimed mainly at preventing the outbreak and spread of fire, but they will be of no effect if certain simple precautions are neglected. Fires generally originate from occurrences which might be regarded as insignificant; e.g., from oil dripping from the furnace fronts on to tank tops or from ignition of an almost imperceptible spray of oil leaking from a gland or joint onto a hot exhaust.

4.10.4.4 Shields or baffles should be fitted, and remain in positions where the surveyor considers these necessary, to prevent oil coming into contact with hot surfaces.

4.10.4.5 At periodic surveys, a vessel which is not classed would require MCA internal examination of fuel tanks, prior to any pressure test, in accordance with the survey schedule. Before a tank which has contained oil fuel is entered, any oil should be

removed, and care should be taken that all oil vapour is also removed by steaming and by efficient ventilation. Tests of the atmosphere in the tanks or bunkers should made, in accordance with the *Code of Safe Working Practices for Merchant Seamen* to ensure safety of life before inspection or work in them is begun. This is especially relevant to smaller vessels where surveys are being managed by the crew rather than a competent repair yard.

4.10.4.6 On vessels of 45 metres in length and over a plan, suitably mounted, of the oil piping arrangements should be provided for the guidance of the vessel's engineers. On other vessels, surveyors should establish, where possible, that vessel's personnel are acquainted with the layout of the oil fuel system.

4.10.5 STORAGE

4.10.5.1 Oil fuel tanks should not be situated immediately above boilers, engines, or other sources of ignition. Where tanks are situated in the vicinity of such machinery or any source of heat, sufficient space should be allowed between them to permit a free and ample circulation of air Also attention should be paid to position of overflow arrangements.

4.10.5.2 Tanks over 50 litres capacity should be of welded construction. The scantlings of oil fuel tanks should be adequate having regard to the maximum pressure to which they may be subject in service. The plate thickness of tanks less than 200 litres capacity should be at least 3mm, and for tanks over 200 litres capacity the plate thickness should be at least 5mm. The tanks should be provided with adequate wash plates and internal stiffening.

4.10.5.3 The temperature of oil in tanks in engine rooms should not ordinarily exceed 55°C, and never come within 20°C of the flash point. Vessels operating with heavy fuel oil will require temperature monitoring and control. Thermometers should be fitted in enclosed thermometer pockets, so that their removal does not compromise the tank integrity.

4.10.5.4 All oil fuel tanks in the machinery spaces should be fitted with save-alls, gutters or cofferdams as necessary to prevent the spread of any leaking oil and to guide such oil into a tank reserved for that purpose. Drain cocks must be of the self-closing type.

4.10.5.5 On long range vessels, the surveyor should have a general check of all ballast tanks, especially the forepeak, to ensure no unauthorised carriage of extra fuel has taken place. The risks to the vessel from fire, stability, and pollution aspects cannot be emphasised enough.

4.10.6 OUTBOARDS AND PETROL STOWAGE

4.10.6.1 Carriage of petrol is hazardous because of its low flash point. Where an outboard motor is fitted, a small quantity of spare petrol (approximately 50 litres) may be carried. It should be stored in suitable containers in a well-ventilated compartment situated in a safe place adjacent to the open deck. Warning notices should be placed next to the compartment clearly indicating its contents and prohibiting smoking in the vicinity. The warning notice may additionally contain instructions to jettison the petrol containers overboard in the event of a shipboard fire in the vicinity of the store.

4.10.6.2 Suitable arrangements should be made for stowing the motor and fuel tank ready for operating and protected from the weather. For rescue boat engines the position should be located so that it can be reached in the case of a machinery space or accommodation space fire. If the motor and fuel tank are stowed in the boat, they should stowed in such a manner that damage to the motor or fuel tank will not occur when the boat is stowed on board the vessel.

4.10.6.3 Any petrol fuel tank should be specially protected against fire and explosion and be separate from the engine. It must be of substantial steel construction or other accepted material and the joints must not depend on solder for tightness. Completed fuel tanks and their connections should be capable of withstanding hydraulic pressure corresponding to a head of at least 4.5 metres above the top of the tank. The maker's Certificate of Conformity may be accepted in this respect. Provision should be made for sealing the air vent when the tank is not in use to prevent fuel spillage. A steel tank constructed to a recognised standard with rounded corners and edges is considered fire and explosion proof. Aluminium explo-foil is not acceptable in steel tanks for explosion proofing.

4.10.6.4 The fuel pipe may be of a suitable non-metallic material and its end connections should be self-sealing. Provision should be made for shutting off the fuel at the motor.

4.10.7 REMOTE STOPS, VALVES AND FITTINGS

4.10.7.1 *Remote means of control – general*

4.10.7.1 In new vessels, controls for the emergency closure of oil fuel suction valves, closing of openings, stopping of fans, etc should be centralised as far as is practicable, and clearly labelled for identification.

4.10.7.2 Where such valves are arranged for remote control other than by extended spindles or trip wire i.e., by pneumatic or hydraulic means; the remote-control system should incorporate a means to indicate at the remote position that action has been taken to close the oil fuel valves.

4.10.7.3 Where the means for the remote closing of oil fuel valves is by extended spindle, not incorporating low melting point materials, no special fire protection need be

provided. Where the means is electric, pneumatic or hydraulic, the operating system should be capable of withstanding a standard fire test and the design of such valves should be such that remote operation will at all times remain available. The source of power to effect the closure of such power operated systems should be located outside the space in which the valves are situated and failure of the power source should “fail set” and not cause the oil fuel supply system to shut down.

4.10.7.4 For routine testing of wedge type gate valves with remote closing, it is recommended the valves be only half open during testing to prevent seizure, which sometimes occurs due to strong spring action forcing the wedge into the valve body.

4.10.7.5 Every oil fuel levelling valve should be so arranged that it may be opened or closed from a readily accessible position outside the compartment where the valve is situated.

4.10.7.6 *Pull wire arrangements*

4.10.7.7 Pull wire arrangements for closing oil fuel suction valves are not to be fitted in new vessels, since in a fire the wire may stretch unduly, but arrangements incorporating only a short length of wire may be considered on their merits. Where permitted, the wire should be of steel without fibre core. At periodic surveys, these arrangements should be tested. Items to consider are stretching & fraying of wires, seized pulley wheels, and insecure end fastenings.

4.10.7.8 *Power operation*

4.10.7.9 Power operated means for the closure of openings should, if they are the only means, be treated in a similar manner to power operated means provided for the closure of oil fuel valves.

4.10.7.10 Provision should be made whereby all oil fuel pumps and oil fuel separators can be stopped both locally and from a readily accessible position outside the compartment in which they are situated not likely to be cut off in the event of fire.

4.10.7.11 The remote means of stopping oil fuel pumps and separators should not permit the oil pumps to be started from the remote-control position and surveyors should ensure that such a facility is not merely part of a remote-control system, i.e., designed to stop and start the said pumps, unless a manual reset is provided which requires to be operated before starting can be effected.

4.10.7.12 It is a condition of acceptance of any system in which a low temperature fusible element is fitted that such a device should be mounted on, or adjacent to, the valve it protects, and that means be provided for simulating its operation and testing its efficiency and that the control system be continuously pressurised or energised and will fail safe.

4.10.7.13 Pressurised control piping should be of steel or copper or equivalent material.

4.10.7.14 Pipe couplings should be proven capable of transmitting the designed pressure under fire test conditions.

4.10.7.15 Local manual control of fuel valves should be provided so that the oil fuel system may remain operative in the event of failure of the remote-control system.

4.10.8 PIPING ARRANGEMENTS

4.10.8.1 Oil fuel pipe arrangements intended for the transfer of oil should be separate from the other piping systems in the vessel and positive means, e.g., spectacle blank, should be employed to prevent interconnection with any other piping system. In vessels where tanks can be used alternatively for oil fuel and water ballast an oily water separator should be provided. In this respect attention is drawn to the Prevention of Oil Pollution Regulations 1996.

4.10.8.2 Where a power transfer pump is used for filling service or settling tanks, alternative pumping arrangements should be available in the event of failure of the power pump.

4.10.8.3 *Fuel oil filters*

4.10.8.4 Oil filters in the suction and discharge lines should be capable of being cleaned without interrupting the oil supply or permitting the discharge of oil during the changeover or cleaning operation. It must be obvious on changeover filters which filter is in use, and therefore prevent the in-use filter cover from being removed whilst pressurised. Such filters require drip trays underneath them.

4.10.8.5 Small engines without cleanable filters, should carry ample spare filter elements.

4.10.8.6 *Oil pressure pipes*

4.10.8.7 Oil pressure pipes are to be of seamless steel or other approved material. Those for conveying heated oil should be placed in a conspicuous position above the platforms in well-lit parts of the machinery room. Flexible pipes of suitable construction may be accepted between burners and the supply line if made of fire and oil resistant material. For the purpose of these Instructions an oil pressure pipe is a pipe on the discharge side of an oil fuel pressure pump forming part of an oil fuel unit.

4.10.8.8 The thickness of pipes conveying heated oil under pressure should be in accordance with an accepted classification society requirements for a working pressure of 14 bar or the design pressure, whichever is the greater. The coupling flanges should be suitable for a corresponding pressure. The flanges should be machined and any jointing material used should be the thinnest possible and impervious to oil heated to 150°C.

4.10.8.9 Pressure pipes and associated fittings should be tested after jointing to 1.5 times the working pressure.

4.10.8.10 The thickness of pipes for transfer, suction and other low-pressure applications should similarly be in accordance with classification society requirements but for a working pressure of 7 bar. After jointing, the pipes and fittings are to be tested to 14 bar. Low pressure pipes on the suction side of fuel injection “jerk” pumps may be subject to high cyclic pressure fluctuations as the pump spills. Attention should be paid to signs of fatigue of this piping and the condition of any pressure surge damping arrangements fitted during resurvey.

4.10.8.11 Seamless copper or copper alloy pipes may be accepted in oil fuel systems for low pressure applications, if under 25 mm bore but due to the tendency of copper to “work harden” these are not recommended for use on engines where cyclic pressure fluctuations and high vibration is likely to be experienced.

4.10.8.12 *Low Pressure Pipes*

4.10.8.13 Transfer, suction and other low pressure oil pipes and all pipes passing through oil storage tanks are to be made of steel, having flanged joints suitable for a working pressure of not less than 6,9 bar. The flanges are to be machined and the jointing material is to be impervious to oil. Where the pipes are 25mm bore or less, they may be of seamless copper or copper alloy, except those which pass through oil storage tanks. Oil pipes within the engine and boiler spaces are to be fitted where they can be readily inspected and repaired.

4.10.8.14 *Testing after assembly on board*

4.10.8.15 Heating coils in tanks, gas fuel and fuel oil piping are to be tested by hydraulic pressure, after installation on board, to 1,5 times the design pressure but in no case to less than 4 bar (4,1 kgf/cm2).

4.10.8.16 *Oil fuel filling and overflow arrangements*

4.10.8.17 Oil fuel filling stations should be well ventilated and provided with suitable save-all and drainage arrangements, with all filler caps permanently labelled.

4.10.8.18 Oil fuel filling pipe arrangements should, where necessary, be provided with means of preventing overpressure. The discharge from such pressure relief arrangements should be led to a safe place.

4.10.8.19 Where a drain or overflow tank is provided to cope with such a discharge it should be fitted with an audible alarm and a visual indicator to show when the tanks are overflowing.

4.10.8.20 *Air pipes*

4.10.8.21 Every oil fuel tank should be fitted with at least one air pipe, the open end of which should be led to the open air, in such a position that oil vapour issuing from the pipe when the tank is being filled cannot be readily ignited. To prevent this, every such pipe should be fitted with a wire gauze diaphragm of ample area which can

be readily removed for cleaning or renewal. Identifying nameplates should be attached to the upper ends.

4.10.8.22 The cross-sectional area of the air pipes to be 25% greater than the corresponding filling pipe.

4.10.8.23 *Overflow arrangements*

4.10.8.24 Overflow arrangements should be provided on settling tanks and service tanks or any oil fuel tank that is being frequently filled. The overflow should be led to a suitable tank and the overflow arrangements should include a suitable alarm or indicator to warn the watchkeeper that an overflow is taking place.

4.10.8.25 For other tanks where air pipes serve as overflow pipes there must be no possibility of the overflow running into or near a boiler room, galley or any other place in which the oil may be ignited. Where air or overflow pipes pass through holds, they should be of ample scantlings and suitably protected against damage.

4.10.9 HEATERS

4.10.9.1 *Oil fuel heating equipment*

4.10.9.2 An oil fuel unit is defined as the equipment used for the preparation of oil fuel for delivery to an oil-fired boiler or to an internal combustion engine, including oil pressure pumps, heaters and filters which deal with oil at a pressure more than 2 bar. The unit must be fitted with suitable save-all, drains and screening.

4.10.9.3 Heaters and filters fitted in suction lines should be tested to 3.5 bar or twice the maximum working pressure, whichever is the greater. Heaters and filters fitted in pressure circuits should be type approved and should be tested with their pipes and fittings, after jointing, to 28 bar or to twice the maximum working pressure, whichever is the greater. Provision should be made to prevent overpressure in any part. Any relief valves fitted to prevent overpressure in the oil fuel heater should be in closed circuit.

4.10.9.4 *Electric immersion heaters*

4.10.9.5 Electric immersion heaters fitted with thermostatic temperature controls may be accepted for use in oil fuel heaters which are also fitted with high temperature “lock out” safety devices and are in a closed circuit from which atmospheric air is been excluded.

4.10.9.6 Electric immersion heaters cannot be accepted for lubricating oil tanks unless the makers can guarantee that the design of the heating element is such that, in the event of the current being switched on with the element uncovered in the tank, the temperature of the outer casing will not exceed 230°C.

4.10.10 FLEXIBLE PIPES

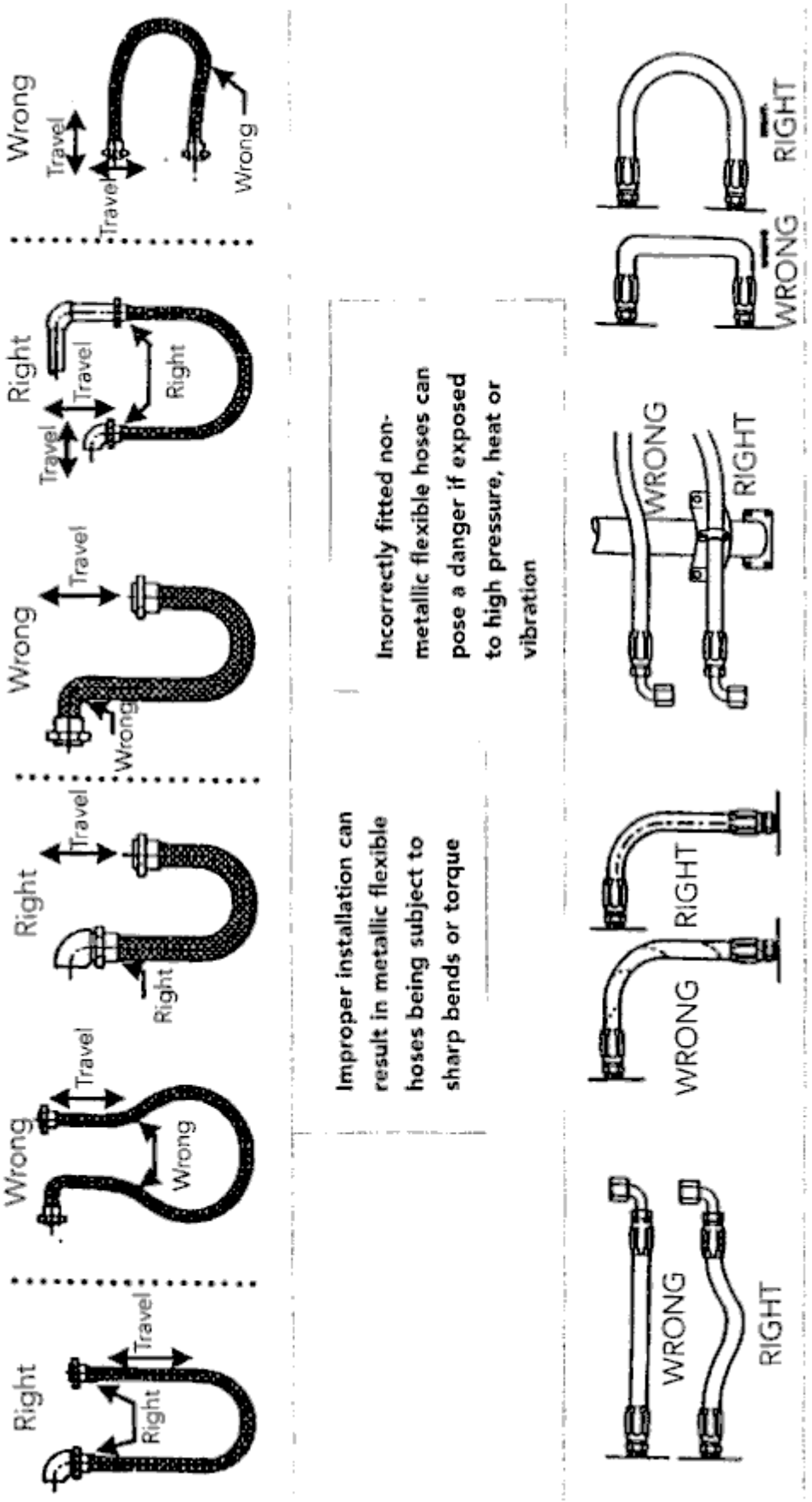
4.10.10.1 Flexible pipes for the carriage of flammable liquids must be manufactured to BS EN 856: 2015 or other acceptable standards or have been certified by the MCA or

by an accepted classification society. Approval will also incorporate a fire test at 800°C for 30 minutes.

4.10.10.2 Installations using flexible pipes should comply with the following conditions:-

- It is essential that flexible pipes are suitable for the intended pressure ranges of the system and are compatible with the liquid used. Double braided pipes using steel braiding are considered normal for use on all high-pressure systems;
- Surveyors should ensure that couplings attached to the ends of flexible pipes are made of steel and are preferably swaged on by a machine method. End fittings should not depend on brazing or silver solder for their security and pressure tightness. They should be designed so that they will not cause the flexible pipe to twist when being tightened during installation. Brass end fittings are not acceptable;
- The fitting of some types of non-return and stop valves can cause flow problems when inserted in a system. However, wherever practical valves should be fitted at termination of flexible pipes.

Right and wrong way to install flexible pipes



- Drip trays or other suitable arrangements should be fitted to prevent contamination of bilges when renewing flexible pipes within machinery spaces;
- Flexible pipes should be shielded if there is any danger of failure in areas where flammable liquid could spray on hot surfaces e.g., machinery, exhausts, turbo-blowers, electric fittings, heaters etc;
- Flexible pipes should not exceed 1.5 metres in length. Very short flexible pipes need not be clipped but long lengths should be secured in position to prevent flexing under normal operating conditions;
- Surveyors should be aware that flexible pipes have a limited 'shelf' life and should therefore be changed at various intervals, depending on the duties to which the flexible pipe is subjected. At every survey pipework should be inspected and sub-standard flexible pipes replaced as necessary;
- Flexible pipes should have the manufacturer's assurance that each batch of pipes manufactured has been tested to 5 times its working pressure or 3.5 times its working pressure where the working pressure exceeds 50 bar. On fitting of new flexible pipes, the system should be operated at the maximum attainable pressure and checked for leaks; and
- It should be stressed that in most cases damage to flexible pipes is caused by rupture due to high internal pressure often caused by relief valves being set above designed pressure, and poor fitting of end connections which allow flexing and chafing to occur. Surveyors must ensure that all installations are fitted using good engineering practices.

4.10.11 COMBUSTION CONTROL SYSTEMS

4.10.11.1 Oil fuel systems in which the burners and air registers are controlled automatically or manually from a remote position within the machinery space may be accepted subject to the complete system being tested, after installation, in accordance with the requirements of the following paragraphs:

- The system should permit local manual control to override the remote control of burners, air registers and oil fuel units;
- Where automatic light up facilities are provided, the pilot burner control system should allow a reasonable air purge period before the main burner light up sequence starts;
- The system should be arranged so that fuel cannot be admitted to any furnace whilst burners have been removed;
- A suitable form of flame failure protection should be provided with audible alarms fitted at the local and remote operating positions;
- The system should be arranged to 'fail safe' in the event of failure of the electrical supply or the compressed air supply, or in the event of failure to ignite the fuel within a predetermined time limit;
- Audible alarms should be fitted in the remote-control position to indicate malfunctioning and loss of pressure in the fuel oil system; and
- The control apparatus should cut off the fuel supply to the burners when the boiler pressure rises to a predetermined value below the safety valve set pressure and also when the water level in the boiler falls below the normal

low water level by a predetermined amount. Audible alarms at the remote and local positions should be activated in both cases.

4.11 VENTILATION

4.11.1 The requirements for Ventilation are contained in sections 2.14 and 4.2 of MSN1871. See also Sections 4.1.1.2 and 4.1.1.3 above. Where the requirements of the Standard to which the vessel was built or the condition in which the vessel joined the Register through a Registration Survey mean that any of the requirements of 4.10 below would apply, these instructions shall be used. Requirements for Ventilation are found in sections 2.2.7 and 4.1.14 and Annex 3 of MSN1872 and sections 2.2, 5.1.3, 6.1.7, 10.3 and 10.5 of MSN1873.

4.11.2 Ample ventilation should be provided in engine rooms and also in all compartments adjacent to any oil storage tanks or in which an oil storage tank is situated. This ventilation should supply fresh air to all parts of the spaces and should be capable of removing foul air in a reasonably short time. This whilst all doors and hatches are closed.

4.11.3 The clearance space between boilers and double bottom tanks and the sides of the storage tanks or bunkers in which oil fuel is carried must be adequate for the free circulation of air necessary to keep the temperature of the stored oil well below the flash point.

4.11.4 In vessels of 24m and over, adequate capacity ventilating fans are usually provided for the machinery spaces and surveyors need only concern themselves with the safety aspects of the installation, e.g., provision of remote stops or rotating machinery hazards. Some problems may however arise in smaller vessels and surveyors should satisfy themselves that adequate air for combustion and cooling is supplied to the engine room. Recent developments in under 15m vessels have resulted in engines of greatly increased output being installed and it is essential that the ventilating system has sufficient capacity to meet the engine air intake requirements in addition to maintaining the engine room at a safe working temperature. Where vessels are being re-engined with higher powered units it should be established that the ventilating system also satisfies these requirements.

4.11.5 It is essential that the air flow is adequate in quantity and properly directed. The air supply should be trunked to as low a point as possible in the engine room and the air exhausted from ventilators placed directly over the major heat sources. Supply and exhaust ducts should be positioned so that the air flow is across the engine room from supply, and heat sources to exhaust. Supply air should not be directed towards hot engine components.

4.11.6 The minimum air required to maintain a reasonable engine room temperature is approximately the same as the engine's exhaust flow. The ejector type of ventilator fitted in the engine exhaust pipe utilises the kinetic energy of the exhaust gases to draw out a quantity of ventilating air approximately equal to the flow of

exhaust gases. The air drawn in by this method is no more than the amount required to dissipate the heat due to radiation from the engine surfaces.

4.11.7 The above air quantities are in addition to the engine combustion requirements which should be in accordance with the engine manufacturer's recommendations.

4.12 WATERTIGHT DOORS

4.12.1 The requirements for Watertight Doors are contained in section 2.7 of MSN1871. See also Sections 4.1.1.2 and 4.1.1.3 above. Where the requirements of the Standard to which the vessel was built or the condition in which the vessel joined the Register through a Registration Survey mean that any of the requirements of 4.11 below would apply, these instructions shall be used. Requirements for air pressure systems are found in section 2.1.7 of MSN1872 and section 2.1.7 of MSN1873.

4.12.2 Every watertight door should have been tested at the maker's works to a pressure equivalent to the maximum head that could arise in service measured from the door sill but in no case less than 6 metres head for sliding doors or less than 3 metres head for hinged doors. Provided the hydraulic test was satisfactory, the watertight door and its frame will be stamped with the following information:-

Tested to .....metres head

Date .....

Surveyor's, Classification Dept.

or Test House Organisation initials .....

4.12.3 Door frames should be efficiently secured by bolting or other approved method to the watertight bulkhead. Any material used to obtain a watertight joint between the frame and the bulkhead should not be adversely affected by heat or the local environment.

4.12.4 The surveyor should be satisfied that the door will operate against a 15° adverse list.

4.12.5 The door, frame and attachment to the bulkhead should be capable of withstanding a hose test for watertight bulkheads to the surveyor’s satisfaction, at any survey.

4.12.6 Vessels under 45m length may have hinged type doors which must be capable of operation from each side. “KEEP CLOSED AT SEA” signs should be attached. Similarly for vessels over 45m above the waterline.

4.12.7 Vessels over 45m length require remotely operated sliding watertight doors below the waterline. The operation of sliding doors from above the freeboard deck should be rapid in action and capable of operating the doors under unfavourable conditions. Horizontal sliding doors should be so constructed that they will not

close or open as a result of the motion of the vessel. The remote position should have means to indicate when the door is open or closed. Local operation from both sides is also required. Failure of mains power supply should be augmented by an emergency supply capable of 3 local movements (close/open/close).

4.12.8 The hand operating gear of power operated doors should be permanently engaged unless satisfactory means are provided for engaging it from above the freeboard deck. The lead of shafting to the door from above the bulkhead deck should be as direct as possible, with provision for lubricating the working parts and guards fitted, where necessary. Suitable hand operated fluid transmission systems for operating these doors may be considered.

4.13 STEERING GEAR

4.13.1 The requirements for Steering Gear are contained in section 4.6 of MSN1871. See also Sections 4.1.1.2 and 4.1.1.3 above. Where the requirements of the Standard to which the vessel was built or the condition in which the vessel joined the Register through a Registration Survey mean that any of the requirements of 4.12 below would apply, these instructions shall be used. Requirements for Steering gear are found in section 4.4 of MSN1872 and section 4.5 of MSN1873.

4.13.2 *General*

4.13.3 New construction of 24m and over vessels would be in accordance with class requirements. Copies of class approved drawings of the steering gear including the tiller should be obtained and placed on file. Also copies of class certificates for the components. Under 24m vessels to be in accordance with classification or, prior to 21 July 2020, Seafish standards, and from that date forward, the Standards contained in MGNs 628 or 629.

4.13.4 All parts are to be of adequate strength in relation to the power of the gear and to the stresses which may arise when the rudder is struck by a heavy sea. When assessing the design of the steering gear and rudder stock consideration should have been given to the possibility of damage resulting from running at maximum astern speed or at maximum astern power, or by manoeuvring during fishing operations.

4.13.5 Valves which will facilitate a quick change over from main to auxiliary steering should be fitted in the hydraulic system to enable the main and auxiliary units to be isolated in the event of a failure. A pressure relief valve or valves should be fitted in the hydraulic system to prevent over pressure and mechanical damage to the steering gear.

4.13.6 The various parts of the hydraulic system should be tested to 1.5 times the pressure at which the relief valve or valves are set to lift. Hydraulic steering gear pipes should be arranged so as to avoid the possibility of damage, either from the fishing operation or as a result of side damage.

4.13.7 Where steering and propulsion are combined in one unit (e.g., Voith Schneider system) the need to provide auxiliary steering gear will be specially considered in each case by submitting proposals to a Consultant Fishing Vessel Surveyor or Headquarters.

4.13.8 *Steering positions*

4.13.9 The rudder position indicator required for power operated steering gears should be of a type which will show the exact position of the rudder and if electrically operated should be supplied from an emergency source of power.

4.13.10 In addition to the principal steering position in the wheelhouse an alternative steering position should be provided sheltered from the sea and weather, where practicable, e.g., the steering flat, fitted with suitable communication.

4.13.11 Where a hand/hydraulic steering gear is fitted and a hand tiller is provided as the auxiliary gear, suitable bypass arrangements should be fitted in the system to release the hydraulic pressure for manual operation. Emergency operation instructions should be posted nearby and the crew familiar with it.

4.13.12 *Rudder stops*

4.13.13 Suitable stops should be provided to prevent the rudder exceeding the maximum helm positions. In certain types of steering gear such a feature may be incorporated in the design.

4.13.14 *Brake*

4.13.15 In the event of an emergency, a brake or some other suitable means should be provided to enable a safe changeover to be made from main to auxiliary steering.

4.13.16 *Hydraulic piping*

4.13.17 Replacement lengths of oil pressure pipes intended for the hydraulic system should be of seamless steel or other suitable material of thickness as determined by class rules.

4.13.18 *Rod and chain gears*

4.13.19 This equipment would normally be found on under 24m length vessels only.

4.13.20 The dimensions of the component parts should be adequate for the size and speed of the vessel to which the gear is fitted; shackles, pins, links and other fittings should be suitable for the size of chain and fitted with locking devices to prevent nuts and pins working loose. Reference can be found in the Seafish construction standards for vessels completed before 21 July 2020 and in MGNs 628 or 629 for vessels under 24m who have Construction Certificates issued from that date forward.

4.13.21 All steering chain should have been subjected to proof and breaking tests at a licensed proving house and test certification be available.

4.13.22 The layout of the gear should be such that the leads of the chains are as direct as possible without sharp bends; the lead angle should be not less than 120°.

4.13.23 Spring buffers should be fitted in each side of the vessel when a power operated gear is fitted.

4.13.24 The auxiliary gear should be equal in strength to the main gear. If wire tackle auxiliary gear is fitted, the blocks and wire ropes should be of tested quality and should not be used for any other purpose. The auxiliary gear should incorporate a suitable shock absorber.

4.13.25 *Operational tests*

4.13.26 For new construction or where modifications/repairs have been carried out, surveyors should ensure the following tests have been conducted:-

1. MCA surveyors should be satisfied with the behaviour of the vessel when manoeuvring:

(a) Where the main steering gear is power operated, it should be capable of putting the rudder over from 35° one side to 35° the other side, at its deepest draught and maximum speed. Similarly, from 35°one side to 30° the other within 28 seconds.

(b) Where the auxiliary steering gear is power operated, it should be capable of putting the rudder over from 15° on one side to 15° the other side in 60 seconds, when at half full speed (minimum of 7 knots). Where the auxiliary steering gear is not power operated, tests should be carried out to ensure that it is sufficient to enable the vessel to be steered at a navigable speed.

(c) It should be demonstrated that the steering gear can be readily changed from main to auxiliary steering.

(d) It should be demonstrated that the vessel is able to manoeuvre astern

2. Surveyors should test that when the steering wheel is moved to one side from amidships the following occurs:

(a) The rudder blade and any tell-tale or indicator moves in the same direction.

(b) The rudder angle corresponds with the angle of the indicator.

(c) Any marking, port or starboard, with their corresponding colours, refers to the direction in which the vessel's head would turn when going ahead.

3. In addition to performance ahead and astern, surveyors should consider the effect of the proposed fishing methods on the steering gear.

4. At all surveys, alarms for motor power failure and low-level hydraulic header tank to be demonstrated.

4.13.27 *Communication*

4.13.28 For vessels of 24m and over, means of communication should be provided between the alternative steering position and the wheelhouse. Failure of the

power unit should also alarm in the wheelhouse. These should be tested at periodical surveys.

4.14 CONTROLLABLE PITCH PROPELLERS.

4.14.1 The are no requirements for Controllable pitch propellers in MSN1871. See also Sections 4.1.1.2 and 4.1.1.3 above. Where the requirements of the Standard to which the vessel was built or the condition in which the vessel joined the Register through a Registration Survey mean that any of the requirements of 4.13 below would apply, these instructions shall be used. Requirements for controllable pitch propellers are found in section 4.1 of MSN1872 and section 4.1 of MSN1873.

4.14.2 Designs of controllable pitch propellers, the operating mechanisms and the control media vary according to the manufacturer, and should incorporate features necessary for safe operation of the propeller as part of the machinery installation.

4.14.3 Any controllable pitch propeller installation should therefore meet the following basic requirements which are considered essential for safe operation:-

- A pitch indicator should be fitted at each position from which it is possible to control the pitch of the propeller i.e., in the wheelhouse and, where applicable, in the engine room;
- A propeller speed indicator should be fitted in the wheelhouse;
- The engine and associated shafts should be protected from excessive torque due to changes in propeller pitch. This protection may take the form of an engine overload protection device controlled by a special governor or by the engine fuel linkage. Alternative arrangements proposed by engine builders or propeller manufacturers can be considered if effective protection is provided;
- The design of the propeller unit should permit adjustment of pitch and the facility for locking the propeller in the desired position in the event of failure of pitch control power;
- Where the operation of the propeller is dependent on a compressed air operated clutch, an air bottle should be provided for this purpose and a duplicate air supply from the air bottle to the clutch provided; and
- When a fault occurs which reduces the propeller pitch control power to a predetermined level an audible and visual alarm should be given at each control position. The control mechanism should still be effective at this level.

4.14.4 Whenever the vessel is surveyed in drydock, full operation of the blades should be observed for smooth and efficient movement, with no leakage of oil. Any leakage would necessitate immediate renewal of seals. In accordance with the approved survey schedule, the internal parts of the hub should be opened up for examination, to ensure the crankpins, sliding shoes, centre posts, etc. are in good condition. Satisfactory working of the various parts depends upon the operating oil being totally clean, therefore great care is necessary in dismantling and reassembly. For vessels that are not classed, this survey would be undertaken by the MCA surveyor.

4.15 REFRIGERATING PLANTS

4.15.1 The requirements for lubricating and hydraulic oil systems are contained in section 4.7 of MSN1871. See also Sections 4.1.1.2 and 4.1.1.3 above. Where the requirements of the Standard to which the vessel was built or the condition in which the vessel joined the Register through a Registration Survey mean that any of the requirements of 4.14 below would apply, these instructions shall be used. Requirements for Refrigerating Plant are found in section 4.1 of MSN1872 and section 4.1 of MSN1873.

4.15.2 GENERAL

4.15.2.1 Surveyors need only concern themselves with the precautions necessary to avoid unsafe conditions arising from an escape of the refrigerating medium, due to failure or defect in any part of the installation when in operation, or when under repair and, in vessels subject to MARPOL Annex VI air pollution potential of the refrigerant gas, see chapter 15. To this end, newbuilds should be designed with the following considerations:

- Refrigerating machinery space should be separated from adjacent spaces by gastight bulkheads, with access preferably from an open deck;
- This space to be provided with gas leakage detection, alarming at the wheelhouse;
- Accommodation spaces to be separated from the refrigeration machinery space by an intermediate space, having a gas alarm which is audible in the accommodation; and
- Where this arrangement is not feasible, the refrigeration plant may be installed in the engine room providing the gas does not cause immediate danger to personnel and that a gas leakage alarm is fitted.

4.15.2.2 The strength of pressure vessels and pipes situated in positions where failure might result in injury to personnel should be adequate for the proposed working pressure. Pressure relief devices are to be provided at positions where they are necessary, the discharges being led to a safe place. All spaces containing refrigerating compressors should be adequately ventilated. Cold stores and, where fitted, evaporator rooms and pump rooms for secondary refrigerants should be provided with:

- tight fitting doors which can be opened from either side;
- “locked in” alarms which can be operated from within rooms;
- means for locating the exit door should lights in rooms be switched off or fail; and
- mechanical means for the extraction of any harmful vapours from evaporator

4.15.2.3 Cold stores should have no permanently open vent or channel which will permit the passage of refrigerants to other parts of the vessel. When the refrigerant gas is either toxic or suffocating, the piping should be run so that leaking gas will not endanger personnel. Refrigerating machinery utilising toxic refrigerants should be separated from adjacent crew accommodation by a gas tight bulkhead. Escape

exits from such spaces should not lead directly into crew accommodation. Where toxic refrigerants are used one of the exits should lead to the weather deck.

4.15.2.4 Where any gas harmful to persons is used, at least one remote or self-contained breathing apparatus should be placed convenient to the refrigeration plant but not in a position likely to become inaccessible in the event of leakage of gas. Breathing apparatus provided as part of the vessel's firefighting equipment may be considered as meeting all or part of this provision provided they are suitably placed to meet both provisions. Where self-contained breathing apparatus is supplied, additional compressed air cylinders should be provided.

4.15.3 SECONDARY COOLING FLUIDS

4.15.3.1 Where it is impracticable to operate a direct expansion system, it is recommended that special calcium chloride brine with additives is utilised when temperatures not lower than -34.4°C are required.

4.15.3.2 Where temperatures below -34.4°C are required e.g. -40°C it may be necessary to utilise trichloroethylene. Surveyors should be aware of the hazards involved when this liquid is carried on board a vessel:

- The main hazard associated with trichloroethylene is vapour inhalation. Prolonged exposure to high concentrations may lead to lack of co-ordination and unconsciousness. Complete recovery can be expected on removal from exposure. Trichloroethylene has no flash point and neither the liquid nor the vapour will support combustion. Mixtures of vapour and air containing 11 to 41 per cent by volume of the vapour can be ignited by sufficiently powerful sources of ignition, but the flame is not self-sustaining and propagates slowly. In general, elimination of potential sources of ignition from spaces containing residual liquid or vapour will remove any fire hazard. Trichloroethylene storage tanks should be situated in well ventilated positions to the surveyor's satisfaction.
- Warning notices stressing the dangers of smoking in the presence of trichloroethylene should be posted in conspicuous positions on board the vessel. Caustic alkalis may react with trichloroethylene to form an explosive mixture.

4.15.4 CARBON DIOXIDE

4.15.4.1 The escape of a moderate quantity of gas (CO_2) from a carbon dioxide refrigerating machine situated in a well-ventilated space is unlikely to be harmful.

4.15.4.2 A machine of this type may be placed in a well-ventilated engine room if the charge, or portion thereof, which might be released by a breakdown of the machine, does not exceed 136kg.

4.15.4.3 Portable means of detecting the concentration of any leakage of harmful gas should be provided.

4.15.5 CFCS

4.15.5.1 Ozone depleting agents such as chlorofluorocarbons R11 and R12 are no longer permitted as refrigerants. Further guidance on the Montreal Protocol can be found in MSN1819 (M+F).

4.15.6 AMMONIA

4.15.6.1 Ammonia (R717, NH3) is lighter than air and is flammable in very high mixing ratios with air. Ammonia is highly soluble in water. Ammonia is a toxic gas, which forms a flammable mixture with air in the range from 16 to 25%. A very high ignition energy is then required to start a fire.

4.15.6.2 Although previously not permitted, MCA now accepts ammonia plant on new fishing vessels of 24m and over, under the following conditions:-

- The design, construction, testing and installation should be to the rules of a recognised Classification Society;
- Periodical survey by Class; and
- The on-board engineer responsible for operating the plant should possess a minimum of a Class One (Fishing) Certificate of Competency and is trained in the safe use of ammonia (a minimum of a two-day course).

4.15.6.3 Ammonia is toxic and under certain conditions, flammable/explosive. Therefore, installations using ammonia must be suitably constructed, continuously monitored and operated correctly.

4.15.6.4 The following principal arrangements are required:-

- A separate compartment, in isolation to the accommodation;
- An independent and negative ventilation system (at least 30 changes per hour);
- Fresh air inlets at a low level, exhausts at a high level;
- Fixed ammonia detector systems (alarms inside and outside the compartment;
- An independent bilge system;
- At least two suitable means of access;
- A fire extinguishing water spray system, as set out in MSN1873 Amendment No.1 Section 4.1.17.4 vi(a) is to be:

a) [see 4.1.17.5(ii) of MSN1873 re “a water spray system”] a drencher water spray system, which may be fitted near where gas leaks may occur and shall be operable from the vicinity of the entrance to the refrigeration machinery room.

(b) a fine water spray curtain effective in reducing the spread of ammonia gas which is to be provided in way of the access doors. The actuating device is to be fitted close to the entrance outside the protected space;

Care should be taken so that water does not come into contact with a pool of liquid ammonia because this would cause a large increase in the evolution of gaseous ammonia resulting in increased risk of injury to persons in the vicinity.

- At least two (additional) sets of breathing apparatus, both with two spare bottles; and
- Materials should be compatible with ammonia (e.g., condensers to be made from titanium or stainless steel).

4.15.6.5 Classification Society standards require ammonia plant to be periodically surveyed (based on operating data and experience of previous surveys), together with an annual survey.

4.15.6.6 The monitoring and operation of ammonia plant is crucial for the safety of the plant and crew onboard. Engineers in charge of such plant should be suitably qualified and trained in the safe use of ammonia.

4.15.6.7 Manufacturers of ammonia plant often provide safety training for operating their plants. Such courses are not normally less than two days duration.

4.15.6.8 See MSIS 27, Chapter 9, Section 9.3.22 for additional requirements for Refrigerating Gases.

4.16 ANCHORS AND CHAIN CABLES

4.16.1 The requirements for Anchors and chain cables are contained in section 4.12 of MSN1871. See also Sections 4.1.1.2 and 4.1.1.3 above. Where the requirements of the Standard to which the vessel was built or the condition in which the vessel joined the Register through a Registration Survey mean that any of the requirements of 4.15 below would apply, these instructions shall be used. Requirements for Anchors and chain cables are found in section 4.4 of MSN1872 and section 4.5 of MSN1873.

4.16.2 GENERAL

4.16.2.1 The equipment numeral (E) of a fishing vessel is derived from the formulae:

- For under 15m vessels $E = L\ (B + D)$

as defined in Seafish Standards before 21 July 2020 and in MGN628 from that date forward.

- For 15–24m vessels $E = D^{2/3} + 1.6\ BH + A/10$

as defined in Seafish Standards before 21 July 2020 ad in MGN629 from that date forward and the 15-24m Code.

- For 24m and over vessels $E = D^{2/3} + 2\ BH + A/10$

as defined in Classification Rules and in the 24m and over Code.

4.16.2.2 A "length" or “shackle” of chain cable is 27.5 metres.

4.16.2.3 Full details of the vessels anchors and chain cables should be included on the Record of Particulars MSF1301 (formerly FV2).

4.16.3 EXISTING VESSELS

4.16.3.1 Where arrangements on board existing vessels have proved satisfactory they will continue to be accepted as adequate, with the exception of the following:-

- Any vessel on which the anchor weight exceeds 68 kgs, requires to have a windlass, or a winch that can be used for anchor handling.
- Anchors, chain cables and ropes should be stowed such that they can be run out freely and without the need for power assistance. This enables a vessel to deploy the anchor during dead ship condition which may prevent a risk of grounding.

4.16.3.2 *Renewal*

4.16.3.3 Any reduction of mean chain diameter over 11% should have that “shackle” renewed.

4.16.3.4 Surveyors may require anchor chain cables to be renewed for reasons other than a reduced mean diameter e.g., elongation of links or severe pitting.

4.16.3.5 Unless lugless shackles are fitted, it should be ensured that each length consists of an odd number of links, so that each shackle leads the same way over the windlass.

4.16.4 NEW EQUIPMENT

4.16.4.1 Wherever possible, owners or skippers should be encouraged to fit a separate windlass or winch with free-running capacity.

4.16.4.2 Where there are no special requirements to consider and the equipment proposed by the builder complies with the rules of a recognised Classification Society, it will be acceptable.

4.16.4.3 The individual weight of the anchors must be largely a matter for the owners and will depend on the type of fishing and the area in which the vessel operates. However, if one anchor is lighter than the other it should still be heavy enough for normal usage.

4.16.4.4 Where it is proposed to supply anchors and chain cables that do not comply with the dimensions tabulated in the respective Codes, and there is doubt as to whether they are adequate, full particulars should be submitted for consideration before the equipment is required to be increased. These details should include the principal dimensions and draught of the vessel, the nature of her service (particularly any special conditions affecting the anchors and chain cables) and the method to be used for lifting the anchors.

4.16.4.5 Anchors, chain cables and ropes are to be stowed such that they can be run out freely and without the need for power assistance.

4.16.4.6 Where appropriate, anchors and chain cables should be tested and marked in accordance with class rules. Such equipment when supplied to the vessel should be accompanied by test certificates which should be inspected by the surveyor at the initial survey and at subsequent surveys when the equipment has been renewed or retested.

4.16.5 CALCULATION OF ANCHORS AND CHAIN CABLE SIZES

4.16.5.1 The number and sizes of anchors and chain cables required for vessels are detailed in tables, included in the respective Code, as originating from Seafish Standards before 21 July 2020 and MGNs 628 and 629 from that date forward or Class Rules, which are based on the equipment numeral of the vessel, see 4.15.1.1 However where special fishing methods or local conditions apply some alteration to equipment requirements can be considered.

4.16.5.2 Where stud link cable is used the diameter may be 1.5mm less than the tabular diameter.

4.16.5.3 Where it is proposed to use high holding power anchors a reduction in weight up to 20% can be accepted.

4.16.5.4 Where wire rope is substituted for chain cable the breaking strength of the wire rope, which may be used as anchor cable, should be not less than that of the chain cable required and 12.5 metres of chain cable should be attached to the anchor.

4.16.5.5 Wire rope may be substituted for both chains for vessels up to 30m length. One substitution allowed for vessels between 30m and 40m. These wires to be 1.5 times the required chain length.

4.17 SPARE GEAR

4.17.1 On vessels of 24m and over, spare gear and tools should be carried to an accepted classification society standard, as laid down in their rules, and sufficient for the intended voyage, to the satisfaction of the MCA surveyor.

4.17.2 On vessels under 24m operating in coastal waters, sufficient filters, tools, pipe repair kit, electrical fuses and bulbs, and machinery parts to make emergency repairs must be carried. A portable salvage pump is strongly recommended.

ANNEX 1

Supplement to Over 24 m Unclassed Fishing Vessel Surveys Automation tests

No	Description/Check/Test	Tested/Satisfactory	Remarks/Applicable
1	Engine Room Log Book checked		
2	Record of alarms if paper or electronic system fitted checked		
3	Any faults noted as above and cleared?		
4	Check records (paper or electronic) show that automation control is satisfactory for temperatures of Oil, Water and Fuel		
5	Any outstanding SIAS report items on automation?		
6	Outstanding SIAS items cleared?		
7	Where is automation test to be carried out		Sea Trial or Alongside
8	Stand by function of essential pumps is tested (such as Lub Oil, Gear Box Oil etc.)		
9	Air Compressors:-		
	Start and Stop automatically depending on the pressure in the air receivers		
	Automatic drain devices work correctly for air receivers or air systems		
10	Remote Control System tested with the following manoeuvres		
	Half Ahead to Stop		
	Stop to Dead Slow Astern		
	Dead Slow Astern to Dead Slow Ahead		
	Dead Slow Ahead to Half Astern		

	Half Astern to Stop		
	Stop to Half Ahead		
	Main Engine Emergency Stop tested from:-		
	Bridge		
	Engine Control Room and/or Engine Side		
11	Machinery Alarm Systems – Alarms are audible and visual in the following spaces:-		
	Engine Room		
	Bridge		
	Engineer's Accommodation and any public spaces		
	The following alarms and tests are required to be carried out as applicable to actual fittings on board the vessel:-		
	Main Engine:-		
	Main Engine Lub Oil pressure		
	Gear Box Lub Oil pressure		
	Jacket Water pressure		
	Main Engine Shut Down (and possibly Slow Down, noting that these may not always be fitted) functions tested:-		
	Lub Oil Low pressure		
	Gear Box Oil Low pressure		
	Jacket water pressure		

	Jacket water temperature		
	Over speed (electronic or mechanical)		
	The following alarms and tests are at the surveyor's discretion as they may or may not be fitted:-		
	Lub Oil temperature		
	Gear Box Lub Oil temperature		
12	Following blackout, the electrical supply is restored by the following:-		
	Stand by Emergency Generator starting and connecting automatically		
	Stand by Emergency Generator started from -		
	Remote control from bridge		
	Remote control from Engine Control Room		
13	On power failure automatic switching to battery is provided for:-		
	Alarm Systems		
	Safety Systems		
	Electronic Speed Governor (if fitted)		
	Does battery/ies at 24 V or more cover all alarms and essential items?		
14	Non-essential supplies are disconnected if necessary in case of overload of generators (Preference Trips)		
15	Generators and Switchboard testing of the following where possible and practicable depending on actual provision:-		

	Can two or more generators be run in parallel? If yes prove generators can be put on switchboard together		
	Reverse Power trip		
	Over Current trip		
	Over Voltage trip		
	Earth Leakage Indicator/Alarm on Main and/or Emergency Switchboards at 440/220/24 V		
16	Steering Gear alarms and tests:-		
	Failure of Power Supply		
	Overload/Phase Failure		
	Failure of Control Voltage		
	Hydraulic Oil tank low level		
17	Boilers – it is extremely unlikely that any boiler larger than a domestic central and water heating boiler will be fitted and thus the tests are limited to simple checks of these units. Should a full-size boiler be fitted advice should be sought on tests from a Principal Engineer Surveyor.		
	The following tests on domestic boilers to be carried out:-		
	Check the burner shuts down within 5 seconds if ignition is not established on starting up		
	Check the burner shuts down within 1 second if the flame is extinguished		
	Check the burner shuts down on operation of the Emergency Stop		
18	Fire detection systems – random checks on detectors carried out		
19	Miscellaneous Alarms tested:-		
	Fish Room Bilge		

	Other space bilge		
	Engineer's Call system (if fitted) from Bridge and Machinery Space		
20	If vessel runs with Unmanned Machinery Spaces test:- Alarms audible and visual on Bridge, Engineers Accommodation and Public Spaces What arrangements for UMS rounds – dead man alarm etc.?		

DOCUMENT AMENDMENT HISTORY

Version Number	Status / Change	Date	Author Reviewer	Content Approver	Next Review Date/Expiry Date
09.21	• Updated Code to reflect new requirements of MSN1871 Amendment No.2	31/08/2021	D Fenner	G Stone	01/09/2023
08.22	• Amended definition of Fit for Purpose	1/7/2022	D Fenner	G Stone	01/07/2024
12.22	• Surveyors should refer to Sections 1.23 and 1.24 of MSIS27 Chapter 1 when reviewing modifications to vessels.	2/12/22	D Fenner	L Page	28/11/24
04.24	• Clarify Owners to complete MSN1355. New link to MSF1355 also provided	04/24	D Fenner	L page	03.25
07.24	• Updated guidance on recording of engine power for outboards	05.24	D Fenner	L Page	05.25