



SHIP SAFETY BULLETIN

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Subject: New Regulations for Vessel Air Emissions: COMPLIANCE WITH AIR EMISSIONS STANDARDS

Purpose

The purpose of this bulletin is to inform stakeholders of new regulations now in place to address air emissions from vessels over 400 gross tonnage operating in Canada. The *Regulations Amending the Vessel Pollution and Dangerous Chemicals Regulations* (the Amendments) were published in Part II of the *Canada Gazette* on May 8, 2013.

Background

The Amendments implement standards for the North American Emission Control Area (NA-ECA), energy efficiency of vessels, and a regime for Canadian vessels in the Great Lakes and St. Lawrence waters. For full text of the Amendments and the Regulatory Impact Analysis Statement, please see the [Canada Gazette, Part II](#).

Please note some requirements for air emissions are already in place under *Vessel Pollution and Dangerous Chemicals Regulations* (the Regulations). As the Amendments will be incorporated into the text of the Regulations, please consult the [Regulations](#).

The Regulations will be enforced in accordance with the [Policy on Compliance and Enforcement of the Canada Shipping Act, 2001](#)- TP13585.

With the Amendments published, Canadian regulations to implement these international standards are now in place.

Keywords:

1. Air Emissions
2. Marine Fuels
3. Regulations
4. Pollution Prevention
5. Compliance

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Marine Safety and Security
Tower C, Place de Ville
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Contact us at: marinesafety-securitemaritime@tc.gc.ca or 1-855-859-3123 (Toll Free).

Emissions Standards: Sulphur oxides

Sulphur oxides are formed during combustion from the sulphur present in the vessel's fuel; therefore the standards are set as the percentage of sulphur content in fuel. With the advent of emission control technology, IMO also set standards based on the sulphur dioxide to carbon dioxide ratio.

For vessels inside the NA-ECA and throughout Canadian waters south of 60°N, the Amendments set a limit of 1.00% on the sulphur content of marine fuel. This will be followed by a 0.10% limit after January 1, 2015.

In waters outside of the NA-ECA, north of 60°N and including all of Hudson's Bay, James Bay and Ungava Bay, the Amendments set the global standards under MARPOL for controlling sulphur oxides. This currently comprises a 3.50% limit on the sulphur content of marine fuel and after January 1, 2020, the Amendments set the standard to 0.50%.

Vessels over 400 gross tonnage are already required by the Regulations to carry bunker delivery notes, which stipulate the sulphur content of fuel delivered to the vessel. Pursuant to section 124(1) of the Regulations and Regulation 18.5 of Annex VI to MARPOL, the vessel's bunker delivery note must contain the following information.

- Name and IMO Number of receiving ship
- Port
- Date of commencement of delivery
- Name, address, and telephone number of marine fuel oil supplier
- Product name(s)
- Quantity in metric tons
- Density at 15°C, kg/m³ tested in accordance with ISO 3675:1998 or ISO 12185:1996.
- Sulphur content (% m/m) tested in accordance with ISO 8754:2003.
- A declaration signed and certified by the fuel oil supplier's representative that the fuel oil supplied is in conformity with the applicable subparagraph of regulation 14.1 or 14.4 and regulation 18.3 of Annex VI to MARPOL.

Determining compliance: Sulphur content in fuel

In most cases, an authorized representative relies on the sulphur content provided in the bunker delivery note. However, Annex VI to MARPOL also requires samples of the fuel to be kept on board. As the Authorized Representative is responsible to have compliant fuel, verification would be prudent.

Appendix VI of Annex VI to MARPOL sets out the “*Fuel Verification Procedure for MARPOL Annex VI Fuel Oil Samples*”, which is to be used to determine if the fuel oil delivered to and used on board ships is compliant with the sulphur limits.

The sulphur content must be tested in accordance with a test method administered by the International Standards Organization; ISO 8754:2003 which can be found at the ISO website. This test method is specified for the determination of the sulfur content of petroleum products, such as naphthas, unleaded motor gasolines, middle distillates, residual fuel oils, base lubricating oils and components. The method is applicable to products having sulfur contents in the range 0.03 % (by mass) to 5.00 % (by mass).

Petroleum fuels can vary greatly in composition depending on the stock crude and refining process they were subjected to. Therefore, variability between test results needs to be accounted for when determining if the fuel is compliant to the sulphur content standard.

The ISO test method provides an accepted variability, amounting to $\pm 0.02\%$ in terms of measured sulphur content or a relative variance of 5%. However, the international standards for sulphur content in marine fuel is set by Annex VI to the MARPOL Convention and are set out as absolute limits. Therefore, this must be considered when managing the natural variation of the fuel and that of laboratory measurements.

The Fuel Verification Procedure manages for a variance by setting requirements for when a test should be repeated by a second laboratory and those results included in the calculation or if the entire test should be repeated. A sample with a sulphur content found to be over the MARPOL standard and 0.59 times the reproducibility standard set by the ISO test method is deemed to have failed.

Determining compliance: Sulphur dioxide to carbon dioxide ratio

The Amendments allow for compliance to be in accordance with in the IMO *Guidelines for Exhaust Gas Cleaning Systems*, Resolution MEPC.184(59). This document may be accessed at the IMO web site through the Knowledge Centre, index of IMO Resolutions, under the [list of MEPC Resolutions](#).

The Guidelines allow compliance with the sulphur content standards to be determined by the ratio of sulphur dioxide to carbon dioxide (SO_2/CO_2) in the vessel’s exhaust as set out in Table 1 below.

Table 1. Sulphur content compared to ratio of sulphur dioxide to carbon dioxide

Fuel Sulphur Content (%m/m)	Ratio of SO_2 (ppm) to CO_2 (% v/v)
4.50	195.0
3.50	151.7

1.50	65.0
1.00	43.3
0.50	21.7
0.10	4.3

The Guidelines allow compliance to be demonstrated by two schemes, A– by parameter and emissions checks and B – by continuous monitoring of emissions. Both require the vessel have a SO_x Emissions Compliance Plan or SECP.

The SECP should refer to the technical manual, Exhaust Gas Cleaning System Record Book or Engine-Room logger system and Onboard Monitoring Manual. It should be noted that as an alternative, the maintenance records may be recorded in the ship’s Planned Maintenance Record System, as allowed by the Administration. Details should be provided demonstrating that the rating and restrictions for the exhaust gas cleaning unit are complied with. Required parameters should be monitored and recorded when the EGC is in operation in order to demonstrate compliance. **Emissions Standards: Nitrogen oxides**

The Amendments set controls for nitrogen oxides for engines installed on vessels that have power ratings over 130 kilowatts as described in table 2 below.

Beyond this, the Amendments adopt the requirements for the management of engines to limit emissions of nitrogen oxides set out in the NO_x Technical Code, 2008.

In the event a vessel undergoes a major conversion, or a new engine is installed which is substantially different from the old one, the more current standard would apply. For example, if a vessel built in 2001 undergoes a major conversion in 2014, it will then be subject to Tier II standards rather than Tier I.

Table 2. Nitrogen oxide emissions limits

Tier I	Tier II	Tier III
Engines installed on vessels built between December 31, 1999 to December 31, 2010	Engines installed on vessels built after December 31, 2010	Engines installed on vessels built after January 1, 2016, that operate in ECAs
<ul style="list-style-type: none"> • 17.0 g/kWh when n is less than 130 rpm; • $45 \cdot n^{(-0.2)}$ g/kWh when n is 130 or more but less than 2,000 rpm; • 9.8 g/kWh when n is 2,000 	<ul style="list-style-type: none"> • 14.4 g/kWh when n is less than 130 rpm; • $44 \cdot n^{(-0.23)}$ g/kWh when n is 130 or more but less than 2,000 rpm; • 7.7 g/kWh when n is 	<ul style="list-style-type: none"> • 3.4 g/kWh when n is less than 130 rpm; • $9 \cdot n^{(-0.2)}$ g/kWh when n is 130 or more but less than 2,000 rpm; and • 2.0 g/kWh when n is

rpm or more.	2,000 rpm or more.	2,000 rpm or more.
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Note: n = rated engine speed (crankshaft revolutions per minute)

Determining compliance: Nitrogen oxides

Nitrogen oxides are formed during the combustion process are nitrogen and oxygen. Therefore, unlike sulphur oxides, the basis for the emission standards stems from measurements of nitrogen oxides in the exhaust stream.

In most cases, the Authorized Representative would rely on the type approval of engines installed on their vessels that they meet the emission limits set out in Table 2 above. As well, under the NOx Technical Code, 2008, the exhaust systems would have nitrogen oxide monitoring equipment (approved by Class) and providing a record of emissions.

The Regulations require that the Record Book of Engine Parameters be kept on board along with a technical file of the engine. Flowcharts that provide guidance for compliance with survey and certification of marine diesel engines, as described the NOx Technical Code, 2008, are set out in Appendix 1 to this Bulletin.

Questions

Questions should be directed to:

Environmental Protection (AMSEE)
Operations and Environmental Programs
Marine Safety and Security
Transport Canada
330 Sparks St, 10th floor
Ottawa, Ontario K1A ON8
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Appendix: Flowcharts for survey and certification of marine diesel engines

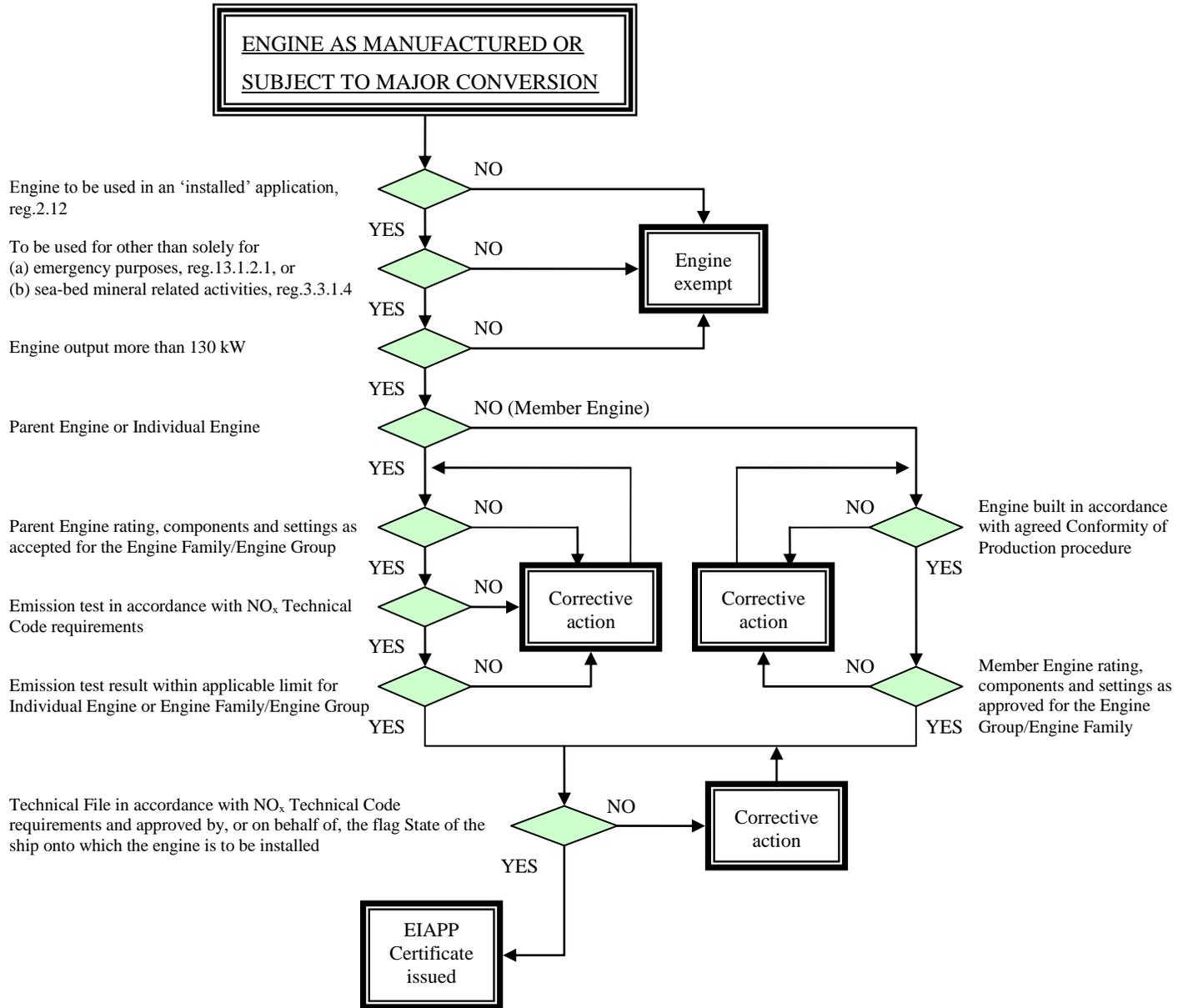


Figure 1 – Pre-certification survey at the manufacturer’s facility

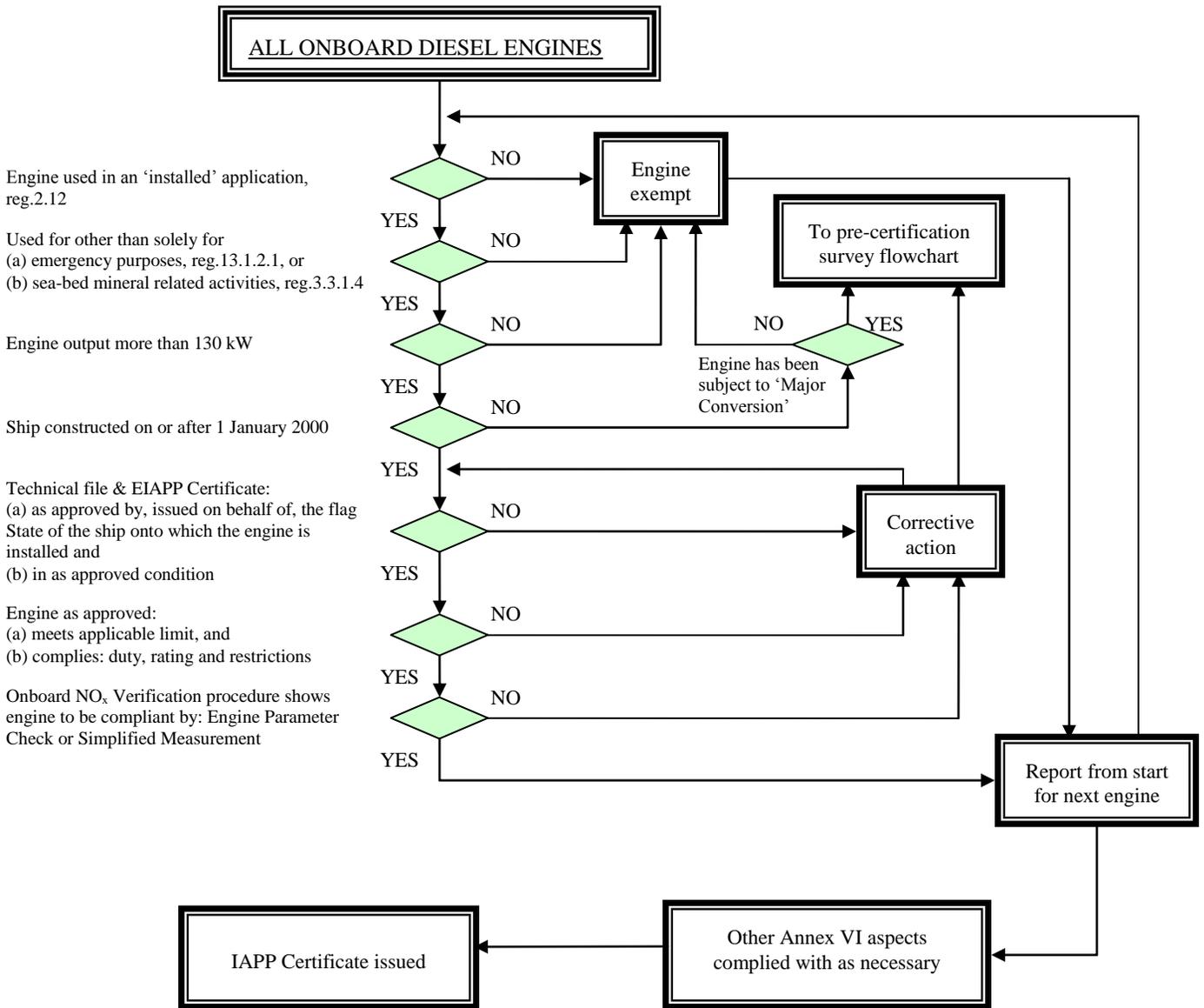


Figure 2 – Initial survey on board a ship

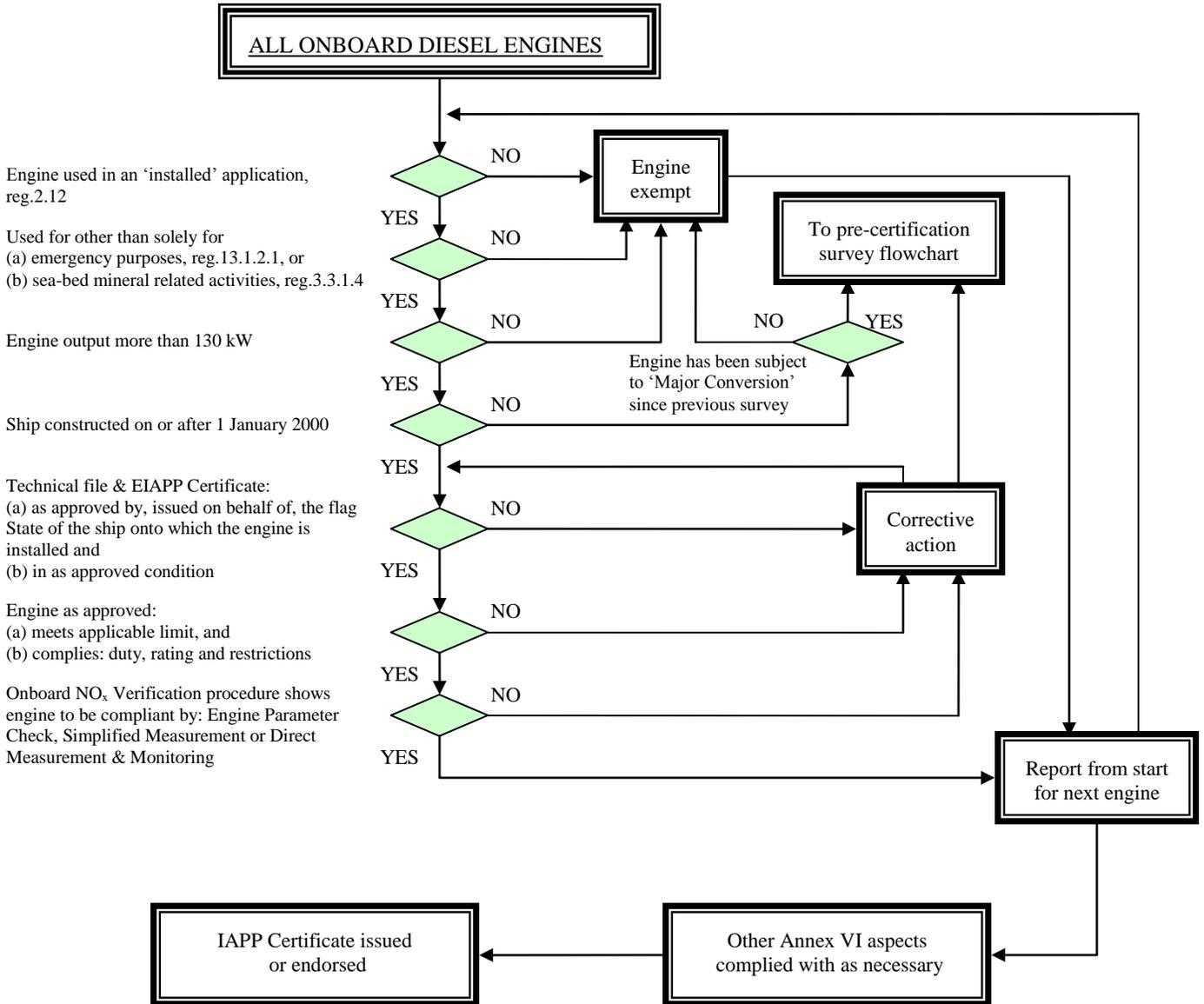


Figure 3 – Renewal, annual or intermediate survey on board a ship