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United States Coast Guard

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To: Distribution

Subj: INSPECTION OF MACHINERY ALARMS ON SMALL PASSENGER VESSELS

1. PURPOSE. This guidance is to assist owners and operators of small passenger vessels, and Coast Guard field units with the inspection of machinery on small passenger vessels (SPV). Specifically, this policy interprets "test of machinery alarms" in 46 CFR 176.804(i) and 115.804(i) and clarifies the discretionary language for "additional testing or inspections deemed reasonable and necessary" under 46 CFR 176.840 and 115.840. Owners and operators of vessels with microprocessor based propulsion controls or vessels of unusual design with Design Verification Test Procedures (DVTPs) should follow existing procedures. Note: Most small passenger vessels are not required to have DVTP, except as noted above, or Periodic Safety Test Procedures (PSTP).

2. DIRECTIVES AFFECTED. None.

3. BACKGROUND. Neither Subchapter T nor Subchapter K provides regulatory requirements for safety shutdowns or alarms on main propulsion units except for the requirements associated with alarms for wet exhaust when cooled by other than the engine cooling system. Current regulations in Subchapter T and K require vessels to have gauges to indicate water temperature, lubricating oil pressure, and propulsion engine revolutions per minute. New emissions control and performance requirements for prime movers have changed the level of sophistication of the basic engine package such that newer basic engine packages frequently have more alarms and safety devices installed that are not required by regulation.

4. DISCUSSION. Requirements for testing machinery alarms in 46 CFR 176.804(i) and 115.804(i) do not define which machinery alarms or safety devices should be tested. Historically, when required, these tests have been conducted under "additional testing" or "inspections deemed reasonable and necessary" using the regulatory cites of 46 CFR 176.840 and 115.840. Testing alarms or safety devices on machinery systems that can take control away from the operator is considered reasonable and necessary to avoid an increased risk of a casualty. Except as required in regulation, all other machinery or alarms should not normally be tested as a requirement for inspection unless there is cause to indicate a casualty would likely occur if not tested or the system is specifically referred to by regulation.

   Vital system prime movers equipped with a mechanical or Electronic Control Unit (ECU)/Electronic Control Module (ECM) that de-rates, shuts down, or otherwise takes away control from the operator (e.g. generator low lube oil trip, high temperature de-rate to idle)

whether required by regulation or not, should be tested during initial inspection for certification, when new machinery is installed or existing machinery is upgraded, or at any time for cause.

5. ACTION. Owners and operators of small passenger vessels and Coast Guard field units should use this guidance for the inspection of machinery including mechanically and electronically controlled vital system prime movers with alarms or safety devices installed but not required by regulation. Nothing in this policy is intended to discourage vessel operators from conducting additional periodic testing of alarms and safety devices to satisfy their own preventive maintenance schedules. If performed in conjunction with required inspections Marine Inspectors should witness the testing and note if there is any cause to indicate systems are not performing as intended.

   It is incumbent upon the owner or operator to ensure any test will not cause damage to the system. Therefore, the owner or operator should inform the Marine Inspector if a test has the potential to damage engineering systems. It is understood that not all owners or operators have the technical expertise to fully understand engineering systems and if it becomes apparent that an owner or operator cannot perform a test safely, the Marine Inspector should suggest that the owner or operator employ an appropriate technician to conduct the test. The Marine Inspector should only witness a test; nevertheless, if at any time it becomes apparent that a test is proceeding in an unsafe manner the Marine Inspector should stop the test.

   At each annual inspection and renewal inspection for certification, Marine Inspectors should witness the proper operation of vital systems. In doing so, the Marine Inspector should interview the operator and conduct a physical review of the engine's electronic readouts/ control panels to identify any installed safety devices that could take control away from the operator. Any faulted sensors or alarm conditions, whether required by regulation or not, will normally be cause to require further testing and/or repair before proceeding. If prime mover indicators required by regulation (46 CFR 182.410(b) and 119.410(b)) are verified as operable and there is no cause to test any other safety devices or alarms, the vital system testing is considered satisfied.

   ECU/ECM controlled engines often integrate numerous sensors and alarm parameters increasing the complexity of the system. Therefore, when testing these systems it is recommended to use procedures developed by the manufacturers or by manufacturer qualified technical representatives.

   Vessels required by regulation to have USCG approved DVTPs should use those documents for periodic testing as required by the OCMI (see CG-CVC Policy Letter 17-07).

6. POLICY. Coast Guard Marine Inspectors should use this guidance to inspect and document the inspection results in MISLE. In general, tests should only be conducted during an initial inspection for certification, when new machinery is installed or existing machinery is upgraded, or for "cause". Periodic testing should not be required except as specified in regulation or in accordance with CVC Policy Letter 17-07 for microprocessor and computer based propulsion control systems.

a. Testing protocols of alarms or safety devices installed but not required by regulation.

i. Machinery alarm functional tests/calibration tests: during initial inspection for certification, when new machinery is installed or existing machinery is upgraded or at any time for "cause".

ii. Machinery automatic shutdown and de-rates: during installation/commissioning or for "cause".

iii. Results of these tests shall be documented in MISLE in accordance with Enclosure (1) at the time of initial installation and shall note what alarms and safety devices, including all functional parameters, will trigger those alarms or safety devices.

iv. When shutdowns or alarms are required by regulation, follow the appropriate intervals, usually annual tests, as identified in the regulations. Common examples include fixed fire suppression system and bilge high-water alarms.

b. Definitions:

i. Alarm testing – A test of any machinery alarm, including procedures developed by the manufacturers that includes verification of recommended servicing and functional safety tests, or diagnostic software used to identify malfunctioning sensors or shutdown without interaction with the operator.

ii. Calibration test – A procedure in which a prime mover alarm is tested to confirm that it conforms to the manufacturer's design standard.

iii. Cause (or "for cause") – An indication, or reasonable assumption based on objective evidence, that a system or device is not working properly, could have been altered from the manufacture's standard or design (e.g. a component failure/change out, faulted probes/sensors, or an ECU change out), exhibits chronic system faults (continuous/ nuisance alarms may indicate faulty circuits, changed parameters or other mechanical problems), or a trend of malfunctions. Cause may also include overhauling of the engine or its components which requires testing per manufacture guidance.

iv. ECU/ECM - An Electronic Control Unit (ECU)/ or Electronic Control Module (ECM) is a type of electronic control unit that controls a series of actuators on an internal combustion engine to ensure optimal engine performance.

v. Functional test – A quality assurance test to verify the machinery alarm conforms to the required performance or limitations as designed by the manufacturer.

vi. Indicator – A visual instrument that displays certain information about a condition such as a gauge to display information about temperature, revolutions per minute, or pressure for a prime mover.

vii. Loss of control (or "to take control away") – A condition that causes the vessel operator to lose control of the vessel, system, or component, specifically in reference to vital

systems including propulsion, steering, or associated controls that could lead to a marine casualty. This can include an automation feature or safety device that causes the engine to shut-down or slow-down.

viii. Machinery alarm – An alarm which indicates a malfunction or other abnormal condition of the machinery and its electrical components.

ix. Prime mover - A machine or mechanism that converts energy into work (e.g. the diesel engines for generators / propulsion systems or electric motors for steering systems).

x. Safety Device – A system component intended to prevent harm to machinery or personnel. These devices are often integrated with other features.

xi. Shutdown or De-rate Device - A safety device that causes machinery or other systems to shutdown, slow-down, trip off-line, or otherwise operate in a manner to prevent damage to the machinery, system, or personnel but as a consequence may result in loss or reduced control of the vessel. De-rate is a predetermined operational capacity of the engine

Note: As described in paragraph 5 of this policy letter, SPVs required by regulation to have USCG approved DVTPs should use those documents for periodic testing as stated in CG-CVC Policy Letter 17-07.

The owner or the designated representative may be required to perform functional and/or diagnostic test(s) to be witnessed by an attending Coast Guard Marine Inspector. This testing may be performed by the owner, the manufacturer's representative or a third party qualified technician. The Coast Guard Marine Inspector may also accept a manufacturer's representative or a qualified third party's technician report. To provide objective evidence of a satisfactory test, the owner or the designated representative should provide documentation of the tests completed in accordance with the manufacturer's recommended protocols including replacement of components during calibration and testing procedures.

7. ENVIRONMENTAL ASPECT AND IMPACT CONSIDERATIONS. Environmental considerations were examined in the development of this Instruction and have been determined to be not applicable.

8. DISCLAIMER. This policy letter guidance is neither a substitute for applicable legal requirements, nor a rule. It is not intended nor does it impose legally-binding requirements on any party. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other Federal and state regulators, in applying statutory and regulatory requirements. An alternative approach may be used for complying with these requirements if the approach satisfies the requirements of the applicable statutes and regulations. If you want to discuss an alternative approach (you are not required to do so), you may contact the Coast Guard Office of Commercial Vessel Compliance (CG-CVC) who is responsible for implementing this guidance.

9. QUESTIONS. Questions concerning this policy letter and guidance should be directed to the Office of Commercial Vessel Compliance, COMDT (CG-CVC), Domestic Compliance Division at CG-CVC-1@uscg.mil. This policy letter and other domestic vessel policy documents are posted on the CG-CVC website at http://www.uscg.mil/hq/cgcvc/cvc/policy/policy_letters.asp.

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Enclosure: (1) MISLE Activity Format