Notice of Change to Controlled Documents #107 /07 Sep 2012

Summary of Changes

NOC#	Ch., Sec., SOP	Summary	Revision#
107	Ch10 Sec 3.0	Quarterly maintenance inspection and vessel visit reports added to report section	**10**
	Ch10 Sec's 6-9 all	Entire chapter revised to eliminate duplicate information. Critical equipment updated for all vessels.	**10**
	Ch 10 Sec's 8, 9	Ship Security Alert System and Ship Security Surveillance and Warning System added to all vessels.	**10**

NOC #107
Chapter 10 Maintenance of Ship and Equipment
All Sections

Topic: Critical Systems updated for all vessels. Annual automation tests removed. Process for requesting a new standard job defined.

Complete Chapter 10, Revision #10 below

Chapter 10 Maintenance of Ships and Equipment

Revision/ Review Log

Chapter 10
Maintenance of Ships and Equipment

Revision Date	Approved by	Reviewed by	Revision Details/ Proposal Notes
11 January 2010 Revision #5	Dr. Jim Brooks	HSE Manager: Sue McDonald	
15 October 2010 Revision #6	Dr. Jim Brooks Dr. Bernie Bernard	HSE Manager: Russell Putt Port Captain: Capt. Pat Fallwell	Changed to electronic format
02 May 2011 Revision #7	Dr. Jim Brooks Dr. Bernie Bernard	Dr. Jim Brooks Dr. Bernie Bernard Dr. Roger Fay Capt. Pat Fallwell Dr. James Howell	In restricted maneuvering situations, two generators should be online
12 Aug 2011 Revision #8	Dr. Jim Brooks Dr. Bernie Bernard	Dr. Jim Brooks Dr. Bernie Bernard	Air Compressors added to critical systems for Brooks McCall
14 May 2012 Revision #9	Dr. Jim Brooks	Dr. Jim Brooks Dr. Roger Fay Capt. Pat Fallwell	Removed reference to center CPP from GX critical equipment
13 August 2012 & 31 August 2012 Revision #10	Dr. Jim Brooks	Dr. Jim Brooks Dr. Roger Fay Capt. Pat Fallwell Port Eng. Charlie Emerson	Vessels maintained according to class, Load Line and USCG requirements. Quarterly Maintenance Inspections and vessel visit reports added to report section Critical equipment reviewed and revised

1.0 Introduction

This chapter describes the maintenance program aboard this vessel. According to the ISM Code, it is the Company's responsibility to establish procedures to ensure that the ship is maintained in conformity with the provisions of relevant rules and regulations and with any additional requirements that may be established by the Company. This includes maintaining the vessel so that it complies with the provisions of international conventions, flag and port state regulation, and classification society rules.

Critical Equipment is defined as equipment and technical systems, the sudden failure of which may result in hazardous situations. This chapter identifies that equipment on each vessel in our fleet and describes procedures in place to enhance the reliability of these systems.

TDI Brooks has adopted the NS5 computer system to schedule and track regular preventative maintenance and testing of equipment, including stand-by equipment and technical systems that are not in continuous use.

2.0 Responsibility

The Master is ultimately responsible for ensuring that the vessel equipment and technical systems are inspected and maintained according to the procedures set forth in the SMM. The Master is also responsible for ensuring that the NS5 system is kept up to date with the latest maintenance issues, both scheduled and unplanned (equipment failure, replacement and repairs).

The Chief Engineer is responsible for ensuring that all inspections, tests and maintenance are conducted according to manufacturer guidelines, best practices, and in compliance with the SMM. The Chief Engineer is also responsible for reviewing the NS5 Maintenance Module at least weekly and ensuring that all maintenance, scheduled and unplanned, is correctly entered into NS5 and the work orders closed in a timely manner.

3.0 Reporting

The NS-5 administrator will work with the Port Engineer, Masters and other personnel to setup the inspection and maintenance programs in NS5. All maintenance issues, with the exception of daily jobs, are to be recorded in NS5. Several types of reports may be generated by NS5 on demand.

In addition, Management who visit the vessels will complete a brief report of the vessel's overall condition, which will be posted on the Crewing Module. Items requiring follow up will be entered on the Crewing Module as working issues and remain open until addressed to management satisfaction.

4.0 Maintenance Program

Maintaining the vessel in good operating condition will require input and assistance at all levels of the organization—from the president to the vessel crew.

Vessels require both pro-active or preventative maintenance, as well as reactive or unplanned maintenance. Unplanned maintenance occurs when something breaks and requires repair. Preventative maintenance is scheduled regularly to prevent failures and minimize reactive maintenance. Both types of maintenance are tracked in NS-5.

The NS-5 system tracks maintenance issues through scheduled standard jobs which are automatically linked to the associated equipment. Unplanned maintenance is entered as a new work order and manually linked to the associated equipment, creating a maintenance history. This system directly links the office with the vessels via routine replication to ensure that current information is available to all concerned parties.

To ensure the vessels are maintained to their class, Load Line and USCG requirements, a series of inspection checklists have been developed for the vessels as part of the **Quarterly Maintenance Inspection**. This inspection will be conducted aboard each vessel and documented in NS5. It is designed to review several departments in detail to ensure the vessel is properly and consistently maintained. Work orders are created as needed for repairs and are to remain open until the repair is complete.

The maintenance of cranes, winches, and A-frames is described in **SOP GEN-010A**.

5.0 Standard Jobs

A standard job, as defined in the NS-5 system, is a recurring procedure that is required to maintain the vessel in good operating condition. Standard jobs are identified by equipment manuals, codes and regulations, best practices, vessel crew, office personnel, and a variety of other sources.

Any requests for the addition of a standard job will be directed in writing to the NS-5 System Administrator who will then enter the job into the NS-5 system following approval from the **Port Engineer and/ or Compliance Officer**. The standard job list varies by vessel based on equipment aboard.

6.0 Critical Systems R/V GeoExplorer

The Company recognizes the importance of all vessel equipment, but has identified the following systems as critical for the R/V GeoExplorer:

- Air Compressors
  - Main propulsion engines air starters
  - Main generators air starters
- Main propulsion
- Bow thrusters
- Ship's service system
- Steering system
- Fire pump
- Bilge system
- Fire detection system
- Ship Security Alert System
- Ship Security Surveillance and Warning System

6.1 Air Compressors

This system consists of two air compressors.

Operation procedures

- At least one compressor is online at all times. Rotated weekly.
- Periodic tests consist of checking relief valve and motor open valves.

6.2 Main propulsion

This system consists of three (3) Caterpillar 3412 diesel engines available for propulsion. Cooling water for the diesel mains is provided by a keel cooling system.

Operation procedures

- At least two Caterpillar mains must be on-line in restricted maneuvering situations.
- Caterpillar mains sets are run at all times, if all operational.

6.3 Bow Thruster

The bow thruster consists of a Detroit Diesel Model No. 8V-71N. This is an omni-directional thruster that can provide thrust in any direction.

Operation procedures

- The thruster is used for docking maneuvers, but is not used while keeping station.

6.4 Ship Service System

The system consists of three (3) Detroit 8V-71N diesel generator sets, switchboard and power distribution system. Depending upon electrical loads, one diesel generator is capable of carrying the electrical load. The #1 generator is kept as an emergency generator and is not used in regular rotation, but is tested regularly.

Operation procedures

- At least one generator set is on-line in restricted maneuvering situations.
- Generator sets #1 and #2 are rotated to be on line to spread running hours and ensure dependability.

6.5 Steering System

The steering system consists of two Vickers hydraulic steering pumps, each having one Sperry solenoid that provides electronic control or, in an emergency, manual control of the hydraulic steering rams.

Operation procedures

- Steering checked prior to entering or departing a port

6.6 Fire pump

This vessel has one (1) fire pump located in the engine room.

Operation procedures

- Suction valves remain in the open position. The pump can be started from the bridge or the engine room.

6.7 Bilge System

This vessel has one bilge pump in line with an Oily Water Separator (OWS). The OWS is a Heli-Sep Model 1000 with oil content detector. The system also consists of bilge level sensors.

Operation procedures

- Used regularly to dewater bilges.

6.8 Fuel Oil Purification System

This vessel has one Wesfalia Separator Model OTA 7-00-066. This fuel oil purifier is capable of supplying all the vessel's fuel oil needs.

Operation procedures

- The fuel oil purifier is ensured for cleanliness before operation.

6.9 Fire Detection Alarm System

The vessel is protected by a System 3 Cerberus Pyrotronics Fire Alarm system, model PS-35. This system monitors the bow thruster compartment, foc'sle deck, main deck, and engine room. All other area/cabins are protected by smoke detectors.

Operation procedures

- Maintained and monitored by the bridge.

6.10 Ship Security Alert System

Operation procedures

- Periodically tested by the bridge department.

6.11 Ship Security Surveillance and Warning System

The vessel is protected by a series of video cameras, motion detectors and alarms.

Operation procedures

- Periodically tested and inspected by the bridge department.

7.0 Critical Systems (R/V Gyre)

The Company recognizes the importance of all vessel equipment, but has identified the following systems as critical for the R/V Gyre:

- Air Compressors
  - Main propulsion engines air starters
  - Main generators air starters
- Main propulsion
- Ship's service system
- Steering system
- Fire pump
- Bilge system
- Fire detection system
- Ship Security Alert System
- Ship Security Surveillance and Warning System

7.1 Air Compressors

This system consists of two air compressors.

Operation procedures

- At least one compressor is online at all times. Rotated weekly.
- Periodic tests consist of checking relief valve and motor open valves.

7.2 Main propulsion

This system consists of two (2) Caterpillar D398 diesel engines available for propulsion. Cooling water for the diesel mains is provided by a keel cooling system.

Operation procedures

- At least two Caterpillar mains must be on-line in restricted maneuvering situations.
- Caterpillar mains sets and center main are rotated to be on-line to spread running hours and ensure dependability.

7.3 Ship Service System

The system consists of two (2) Caterpillar D379 250 kw diesel generator sets, switchboard and distribution system. Depending upon electrical loads, one diesel generator is capable of carrying the electrical load.

Operation procedures

- At least two generator sets are to be on-line in restricted maneuvering situations.
- Generator sets #1 and #2 are rotated to be on line to spread running hours and ensure dependability.

7.4 Steering System

The steering system consists of two Vickers steering motors, each having one Sperry Vickers solenoids for emergency controls.

Operation procedures

- Steering checked prior to entering or departing a port

7.5 Fire pump

This vessel has two (2) fire pumps located in the engine room and steering compartment.

Operation procedures

- Suction valves remain in the open position. The pump can be started from switches outside the workshop starboard side or the engine room.

7.6 Bilge System

This vessel has two bilge pumps. The system also consists of bilge level sensors.

Operation procedures

- Used regularly to dewater bilges.

7.7 Fuel Oil Purification System

This vessel has one fuel oil purifier. This fuel oil purifier is capable of supplying all the vessel's fuel oil needs.

Operation procedures

- The fuel oil purifier is ensured for cleanliness before operation.

7.8 Fire Detection System

The vessel is protected by a Fire Detection Alarm system.

Operation procedures
- Maintained and monitored by the bridge.

7.9 Ship Security Alert System

Operation procedures
- Periodically tested by the bridge department.

7.10 Ship Security Surveillance and Warning System

The vessel is protected by a series of video cameras, motion detectors and alarms.

Operation procedures
- Periodically tested and inspected by the bridge department.

8.0 Critical Systems (R/V BrooksMcCall)

The Company recognizes the importance of all vessel equipment, but has identified the following systems as critical for the R/V Brooks McCall:

- Air Compressors
  - Main propulsion engines air starters
  - Main generators air starters
- Main propulsion
- Ship's service system
- Steering system
- Fire pump
- Bilge system, including pump and bilge level alarm
- Fire detection system
- Ship Security Alert System
- Ship Security Surveillance and Warning System

8.1 Air Compressors

This system consists of two Quincy model 325 air compressors.

Operation procedures

- At least one compressor is online at all times. Rotated weekly.
- Periodic tests consist of checking relief valve and motor open valves.

8.2 Main propulsion

This system consists of three Detroit V16-92 diesel engines of 700 hp each, available for propulsion. Cooling water for the diesel mains is provided by a keel cooling system.

Operation procedures

- At least two mains must be on-line in restricted maneuvering situations.

8.3 Ship Service System

The system consists of two Detroit diesel generator sets, switchboard and distribution system each producing 165 kW of 440v/3 phase. Depending upon electrical loads, one diesel generator is capable of carrying the electrical load.

Clean power and hotel power for dockside use is provided by one 75 kW Detroit diesel generator (440v/3 phase) located on the main deck.

Operation procedures

- At least one generator set is on-line in restricted maneuvering situations.
- Generator sets #1 and #2 are rotated to be on line to spread running hours and ensure dependability.

8.4 Steering System

The steering system consists of 2 Vickers Pumps, each one with a Vickers Solenoid.

Operation procedures

- Steering checked prior to entering or departing a port

8.5 Fire pump

This vessel has the fire main pump located in the engine room. The fire main is plumbed into the bilge/ballast piping so that the bilge/ballast pump may be used as a fire pump, drawing water from the sea chest.

Operation procedures
- Suction valves remain in the open position. The pump can be started from the bridge or the engine room.

8.6 Bilge System

This vessel has one bilge pump and bilge level sensors.

Operation procedures
- Used regularly to dewater bilges.

8.7 Fire Detection Alarm System

The vessel is protected by a Fire Detection Alarm system.

Operation procedures
- Monitored by the bridge.

8.8 Ship Security Alert System

Operation procedures
- Periodically tested by the bridge department.

8.9 Ship Security Surveillance and Warning System

The vessel is protected by a series of video cameras, motion detectors and alarms.

Operation procedures
- Periodically tested and inspected by the bridge department.

9.0 Critical Systems (ORV Rylan T)

The Company recognizes the importance of all vessel equipment, but has identified the following systems as critical for the ORV Rylan T:

- Air Compressors
  - Main propulsion engines air starters
  - Main generators air starters
- Main propulsion

- Bow Thruster
- Ship's service system
- Steering system
- Fire pump
- Bilge system, including pump and bilge level alarm
- Fire detection system
- Ship Security Alert System
- Ship Security Surveillance and Warning System

9.1 Air Compressors

This system consists of two air compressors.

Operation procedures
- At least one compressor is online at all times. Rotated weekly.
- Periodic tests consist of checking relief valve and motor open valves.

9.2 Main propulsion

This system consists of two Caterpillar 3512B diesel engines of 700 hp each, available for propulsion. Cooling water for the diesel mains is provided by keel cooling.

Operation procedures
- At least two mains must be on-line in restricted maneuvering situations.

9.3 Bow Thruster

The bow thruster consists of a Caterpillar 3412. This is a fixed type of thruster that provides port or starboard thrust.

Operation procedures
- The thruster is used for docking maneuvers and keeping station.

9.4 Ship Service System

The system consists of two Caterpillar 3306/190 KW generator sets, switchboard and distribution system. Depending upon electrical loads, one diesel generator is capable of carrying the electrical load. The emergency

generator, Caterpillar 3304/60KW, is not used in regular rotation, but is tested regularly.

Operation procedures

- Generator sets #1 and #2 are rotated to be on line to spread running hours and ensure dependability.

9.5 Steering System

The steering system consists of two Jastram steering motors, each one having Jastram solenoids for emergency controls.

Operation procedures

- Steering checked prior to entering or departing a port

9.6 Fire pump

This vessel has two fire pumps located in the engine room. One fire pump is in the emergency generator room. The fire main is plumbed into the bilge/ballast piping so that the bilge/ballast pump may be used as a fire pump, drawing water from the sea chest.

Operation procedures

- Suction valves remain in the open position on one pump. The pump can be started from the bridge or the engine room.

9.7 Bilge System

This vessel has two bilge pumps and oil water separator (OWS). The OWS is a Heli-Sep Model 500 with oil content detector. The system also consists of bilge level sensors.

Operation procedures

- Used regularly to dewater bilges.

9.8 Fire Detection System

The vessel is protected by an Ansal Auto Pulse IQ-301 (on E system) Fire Detection system.

Operation procedures

- Unit is self maintained and provides maintenance alerts when detected. System is monitored by the bridge.

9.9 Ship Security Alert System

Operation procedures

- Periodically tested by the bridge department.

9.10 Ship Security Surveillance and Warning System

The vessel is protected by a series of video cameras, motion detectors and alarms.

Operation procedures

- Periodically tested and inspected by the bridge department.