

SAUDI ARABIAN OIL COMPANY (Saudi Aramco)

GENERAL INSTRUCTION MANUAL

GI NUMBER Approved

1000.000

ISSUING ORG. ABQAIQ PLANTS MAINTENANCE DEPARTMENT

ISSUE D/TE
03/16/2010REPLACES
02/22/2005

SUBJECT SAUDI ARAMCO MAINTENANCE POLICY AND GUIDELINES

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CONTENT:

A consistent approach to management of the maintenance function can improve safety, reduce costs, enhance manpower development and increase equipment reliability. Saudi Aramco's Maintenance Policy states:

"THE SAUDI ARABIAN OIL COMPANY WILL MAINTAIN ALL OF ITS PLANTS, FACILITIES AND EQUIPMENT IN A SAFE MANNER, OPTIMIZING OPERATIONS AND COST PERFORMANCE, CONSISTENT WITH GOVERNMENT REQUIREMENTS AND COMMUNITY RELATIONS".

In order to accomplish this, guidelines had to be developed to focus the efforts of all organizations towards a common objective. This instruction outlines the guidelines that should be used as a framework by each organization in complying with the Aramco Maintenance Policy.

The text includes:

1. PLANNING
2. ORGANIZATION
3. CONTROL

This G.I. includes two Supplements:

- A. Supplement 1000.000-1: Equipment Repair Assignment Guidelines "ERAG".
- B. Supplement 1000.000-2; Planning & Coordination of Major Hazardous Repairs.

1.0 PLANNING:

- 1.1 OBJECTIVES: The objectives of the organization must be determined, a timetable for their accomplishment should be set and these should be published and known by all personnel.

- 1.1.1 Establish, clarify and rank objectives, establish goals related to each objective and develop indices to measure progress being made.

- * 1.1.2 The objectives of the total maintenance function are determined by considering:

- Safety and health of personnel and safety of facilities and neighboring industries/communities.
- Production Requirements.
- Protection of the environment.
- Reliability of operations
- Effective utilization of equipment and resources.
- Optimum costs and facility performance

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1.2 MAINTENANCE LEVELS: Maintenance levels should be identified and stated in terms which lend themselves to measurement of results.

* 1.2.1 Maintenance should be performed to ensure cost effective equipment reliability. This reliability should consider the cost of repair and PM versus the cost of replacement.

- * 1.2.2 Minimize non-scheduled down time hours of plant and equipment by:
- Establishing an economically sound preventive/predictive maintenance program for applicable classes of equipment.
 - Providing for technical analysis of equipment failures. Effort should be concentrated on those that have been repetitive and costly.
 - Maintaining safety stock critical spare parts for the most critical equipment.
 - Implementing predictive maintenance techniques on specific plant equipments.
 - Maintaining proper plant equipment history to follow up maintenance activity for both maintenance and financial aspects.
 - Establishing relationship between preventive and corrective maintenance and the equipment causing most downtime with highest number of faults.
- 1.2.3 Review shutdowns, T & I's and other repetitive tasks to identify time and cost saving methods of work.
- 1.2.4 Maintain, and have on hand, up-to-date technical data and drawings for equipment and facilities.
- 1.2.5 Refrain from cannibalization of mothballed, spare or standby equipment unless prior written authorization is obtained and a materials order processed.
- 1.2.6 Keep the general appearance of facilities including plants, control rooms, offices, workshops and similar working areas presentable and functional.

1.3 WORK CONTROL: All non-emergency maintenance work orders should be planned, estimated and performed in accordance with Operations assigned priorities. Emergency work orders will be an exception and it will be handled in accordance with G.I. 1000.500.

1.3.1 All maintenance work should be initiated via a formal written work request which provides all relevant information per G.I. 1000.500 (Maintenance Work Order).

1.3.2 All non-emergency Maintenance Work Orders should be planned prior to the execution of the work, to determine;

- (a) the order in which work shall be carried out for optimum manpower utilization;
- (b) materials, spare parts, special tools or equipment required.
- (c) if cost is within maximum authorized limits.

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1.3.3 Approval levels for emergency work will be in accordance with G.I. 1000.500 (Maintenance Work Order).

1.3.4 Operations will consult with Maintenance to establish the order of precedence of outstanding work, and to determine Weekly and Daily maintenance work schedules.

1.3.5 Causes for deviation from planned schedules and major changes to work estimates should be documented and reported to the Operations and Maintenance Superintendents for their action.

1.4 **CONTRACTING:** Formulate a contracting strategy to serve as a guide to all maintenance organizations requiring contracting work. This strategy will address the organization's requirements.

1.4.1 Contractors may be used for on going peak-load assistance and supporting services such as excavating, painting, scaffolding, and insulation when in-house resources are not available.

** 1.4.2 Contractor may be used for major Turnaround in order to minimize the downtime and maximize plant/facility availability.

1.5 **MATERIALS:** Maintenance organizations will actively participate with the Materials Supply Organization (MSO) in forecasting spare parts needs for their Departments. This requires an interactive dialogue with MSO to help set service levels, forecast usage and control inventory budgets.

1.5.1 All organizations will periodically review their inventory level requirements and make the necessary changes in order to avoid over-stock situations. All organizations should ensure that adequate stocking levels are maintained for all critical parts.

1.5.2 Any deviation from material standards for reasons of practicality must be fully documented and approved.

2.0 ORGANIZATION:

2.1 **RESPONSIBILITIES:** Maintenance, operations and Engineering must share responsibility in a coordinated effort to optimize plant performance.

2.1.1 Operations, as equipment owners, have accountability for maintenance costs.

2.1.2 Operations has the responsibility to define the work required and set priorities.

2.1.3 Maintenance, as a service function, has responsibility for safe, efficient and technically sound execution of maintenance work.

2.1.4 Field maintenance has the additional responsibility on deciding the most efficient and economical way of repair, and whether to repair the equipment in the field or to send it to one of the Mechanical Services Shops Departments (MSSD) facilities for repair.

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The G.I. Supplement 1000.000-1 "Equipment Repair Assignment Guidelines" will be used in assisting Maintenance management in the assignment to the repairing organization for specific types of equipment.

2.1.5 Engineering has responsibility for providing technical information, guidance and support to operations and maintenance as part of the team effort.

2.2 **AUTHORITY:** Delegate authority to responsible subordinates to allow accomplishment of objectives and goals.

2.2.1 Each department shall formally document and maintain a list of personnel with approval authority in accordance with G.I. 21.201 (Approval Authority Saudi Arab Operations).

2.2.2 Establish approval levels for both discretionary and non-discretionary work and segregate costs. Analyze the need to do discretionary work.

2.2.3 For all priority 1 and 2 jobs that are sent to MSSD for repairs, the approval authority level is the Department Maintenance Manager.

2.3 **SAUDIZATION:** Increase the Saudi Arab component of the maintenance organization thru expatriate replacement in accordance with Corporate Guidelines.

2.3.1 Qualified Saudi Arab personnel will be preferentially selected to fill all positions including administrative, supervisory, technical and craft positions.

2.3.2 Replacement tables will be developed to target jobs for Saudi Arabs.

2.4 **MANPOWER LEVELS:** Manpower requirements will be realistically determined by analysis of zero based manpower studies and projected business/activity levels.

2.4.1 Evaluate manpower hours used at the plant level, including Saudi Aramco labor and Contractor and Mechanical Services support labor, in order to establish the base manpower requirements by plant. Optimum levels should be sought, including examination of manpower levels at similar facilities.

2.5 **TRAINING:** Design Saudi Arab training programs to fill the number of "full job" positions identified by each organization.

2.5.1 Develop Saudi Arab potential at all levels including clerical, basic craftsmen to senior craftsmen, technical, supervisory and professional personnel.

2.5.2 The training of Saudi Arabs should realistically reflect critical skill requirements. The training must be continued throughout the IDP program.

2.5.3 Continually provide up-to-date training that will help improve productivity, develop cost awareness, teach effective supervision, and increase motivation.

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2.5.4 Craftsmen responsible for Saudi Arab on-the-job training should be taught the basics of "proper training techniques" before the trainees are assigned to them.

2.6 SAFETY: Maintenance will comply with all applicable company safety standards.

2.6.1 Maintenance organizations will maintain a close liaison with Loss Prevention and Operations to insure new safety measures are implemented and safety deficiencies are corrected.

2.6.2 Develop a formal program to review compliance with Loss Prevention G.I.'s and other company safety related instructions and procedures. This is to include: employee ability to operate safety equipment properly, first aid training, CPR certification, fire-fighting training, etc.

2.6.3 Hold periodic safety meetings to discuss safety items including additions/ changes to safety procedures and review of any accidents that may have occurred.

* 2.6.4 Copies of up-to-date Safety Manuals, Job Safety Analysis (JSA) and related General Instructions should be available in each supervisor's office.

2.6.5 Prior to performing any hazardous job: establish work methods, explain the sequence of operations, discuss potential hazards and outline precaution to be taken (Ref: GI 2.100. "Work Permits", and GI 6.012, "Isolation, Lockout and use of Hold Tags").

2.6.6 Work Permit procedures shall be known and strictly followed by all affected personnel.

2.6.7 Necessary personal protective clothing and equipment are to be made available and be used by all personnel.

2.6.8 For the planning and coordination of major hazardous repairs at all offshore and onshore installations, please refer to this G.I.'s supplement 1000.000-2.

3.0 CONTROL

3.1 MANAGEMENT RESPONSIBILITY: The manager should set goals, plan, organize and control the activities under his jurisdiction.

3.1.1 All goals should be specific, well defined and quantifiable, with an estimated time of achievement given for each.

3.1.2 Communicate goals freely and clearly to all those involved.

3.1.3 Goals should be reviewed regularly by the maintenance manager and representatives from maintenance, operations and operations engineering.

3.2 PERFORMANCE: Indices should be developed and used to monitor the effectiveness of actions being taken to meet objectives.

3.2.1 Maintenance performance indices should measure:

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- How well all levels of management are using the resources allocated for maintaining the plant.
- How well work is planned and schedules followed.,
- How well maintenance personnel perform their work.
- Results of work performed, including cost effectiveness.

3.3 CAPITAL EXPENDITURES: Capital investments for existing facilities, new facilities and maintenance must be based on realistic assumptions and be able to provide justifications acceptable to the company.

3.3.1 Capital investment guidelines developed by the Business Analysis Department in Dhahran should be reviewed.

3.3.2 Proposals for capital expenditures on existing and new facilities, design modifications and plant start-ups should have maintenance representation.

3.4 MAINTENANCE ASSESSMENT: Accurate data input to the Corporate Maintenance Management Systems must be made on a regular basis. This will help in the proper development of maintenance indices that will facilitate the decision making process at all maintenance management levels.

3.4.1 Performance indices should be used to help monitor and improve the level of productivity and service.

3.4.2 Measure maintenance effort at appropriate intervals, using work sampling techniques to determine areas for improvement in the system, supervision and workforce effectiveness.

3.4.3 Undertake annual on-site inspections of each maintenance Department's area to review the organization, systems and practices used in the department and to assess the department's level of understanding and application of the Saudi Aramco Maintenance Policy Guidelines.

Approved:

Manager, Abqaiq Plants Maintenance Department

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CONTENT:

This Supplement contains guidelines for all Maintenance Management in the assignment of the repairing organization for various types of industrial equipment. The text includes:

1. Definition
2. General Notes
3. Repair Assignments

1.0 DEFINITION

For each unit of major industrial equipment, the following repair tasks are divided between Field departments ("Field Repairs") and Mechanical Services Shops Department ("MSSD Repairs").

2.0 GENERAL NOTES

- 2.1 Some MSSD Repairs and some Field Repairs include contracted work.
- 2.2 When multiple operations or processes are listed after a repair task, this does not mean that all of these operations are required; only those that apply should be employed.
- 2.3 Some of the repairs listed under "Field Repairs" can also be done at MSSD (with certain exceptions), but not vice versa.
- 2.4 Spare parts for all Field Repairs and MSSD Repairs are the responsibility of the proponent organization.
- 2.5 Saudi Aramco-Yanbu performs both "Field Repairs" and "Shop Repairs" repairs, but also uses MSSD for large motor repairs.

3.0 REPAIR ASSIGNMENTS

3.1 Electric Motors

It is recommended that small motors up to 25 horse power which require complete overhaul, including rewinding, be replaced with a new one, if a replacement is available. The cost of an overhaul is generally not economically justified.

3.1.1 Field Repairs (as required):

- a. Clean (using soft cloth, or compressed air) inside and outside of motor, including stator air passages. Solvent or steam may be used, if the unit is compatible. (Note: Always dry the insulation before operating the motor.)
- b. Clean the copper tubes of air-to-air heat exchangers (TEFC/CACA motors) by using compressed air.

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- c. Replace damaged bearings, if bearing housing is not damaged.
- d. Replace oil seals.
- e. Replace worn-out gaskets.
- f. Replace motor shaft coupling, if available.
- g. Replace rotor, if available.
- h. Replace or repair broken fan (subject to Field Repair capability).
- i. Repair casings if boring is not required (subject to Field Repair capability).
- j. Inspect and adjust motor coupling alignment.
- * k. Check windings insulation resistance before disassembly and repeat tests after assembly

3.1.2 MSSD Repairs (as required):

- a. Repair distorted or worn bearing housing.
- b. Rebabbitt bearings.
- c. Repair mechanical seal, if any (submersible motors, for example).
- d. Repair rotor: Check runout and straighten as necessary. Check for cracked rotor bars and rebraze or replace.
- e. Skim rotor and balance.
- f. Repair shaft wear: Metallize, nickel or chrome plate, plasma spray coat or weld; machine, grind and rebalance.
- g. Rewind, replace or repair worn insulation in motor leads and coil connections. Check for core "hot spots" and repair or replace.
- h. Repair stator body: Welding, machining and grinding.
- i. Fabricate/refurbish: Shaft sleeves, mechanical seals, etc.
- j. Any part that requires special processing: Heat treatment, stress relieving, plasma spraying, etc.
- k. Repair submersible motors.
- l. Repair explosion proof motors (only by using a certified contractor and only with the agreement of Consulting Services Department).
- m. Steam clean, dry, varnish, and bake stator and rotor windings. Partial repair of stator windings (in case of failed top coil only) when rapid repair is critical for Field department operation.

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n. Repair the TEFC/CACA motor heat exchangers. Repair or replace field coils and rotating rectifiers of the synchronous motors.

* o. Check windings insulation resistance before disassembly and repeat tests after assembly

3.2 Valves

NOTE: Repair and testing of relief valves must be done in an approved shop by certified technicians.

3.2.1 Field Repairs (as required):

- a. Disassemble, and clean inside and outside (sandblast, chemical clean, etc.) and check for dirt build-up.
- b. Check seat for wear, and repair or replace.
- c. Add stem packing material or replace.
- d. Replace stems, bushings, seats, seat rings, and other similar components.
- e. Repair parts that can be lapped or resurfaced.

3.2.2 MSSD Repairs (as required):

- a. Refurbish any part that requires welding, metallizing and/or machining.
- b. Repair parts that require special processing: Chrome or nickel plating, heat treatment and plasma spraying, for example.
- c. Fabricate parts such as seat rings, bushings and stems.
- d. Welding which involves the repair of pressurized components or application of an overlay (satellite, for example).
- e. Repair special and unusual valves, (4-way meter prover diverter valves, for example) if beyond the capabilities of the Field Repair organization.
- f. Repair sophisticated actuator systems and vacuum breakers.
- g. Repair drum, superheater, reboiler, and other relief valves.
- h. Repair ball valves, if the ball needs grinding.
- i. Testing of high pressure valves (10,000 psi) or special valves that require a high volume pump (large through-conduit gate valves).
- j. Repair valve body: Welding, metal coating, and/or machining.

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- k. Complete valve overhaul: Subject to Field Repair capability.

3.3 Pumps

3.3.1 Field Repairs (as required):

- a. Disassemble and clean inside and outside: Steam solvent cleaning, sandblasting, etc.
- b. Repair or replace bearings, if housing is acceptable.
- c. Repair or replace oil seals, couplings, etc.
- d. Repair or replace throat bushing, if shaft is acceptable.
- e. Repair or replace shaft and shaft sleeves, subject to Field Repair capability.
- f. Repair or replace rotor.
- g. Repair or replace wear rings, if casing is acceptable; clean and adjust clearances.
- h. Inspect casing gasket and replace.
- i. Inspect and repair coupling and adjust misalignment.
- j. Inspect and repack, or replace stuffing box.
- k. Inspect and replace worn parts of mechanical seal.
- l. Inspect and perform minor casing repairs.

3.3.2 MSSD Repairs (as required):

- a. Repair casing: Welding, metal coating or machining.
- b. Fabricate or refurbish any part that requires welding, metallizing, or machining.
- c. Repair rotors and impellers: welding, machining, boring, grinding and cleanup.
- d. Rotor unstacking and restacking, and balancing for all multi-stage pumps.
- e. Fit rotor for correct clearance of wear rings.
- f. Repair shaft wear: Metallize or weld, etc. and machine and grind.
- g. Inspect shaft runout, straighten and balance.
- h. Bearing rebabbitting.
- i. Repair mechanical seals.
- j. Repair pump cartridges.
- k. Repair submersible pumps, if not possible at Field Repair facilities.
- l. Repair all vertical turbine pumps.
- m. Complete pump overhaul.

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3.4 Compressors

3.4.1 Centrifugal Compressors

3.4.1.1 Field Repairs (as required):

- a. Disassemble and clean deposits on rotor and diffuser.
- b. Replace bearings and adjust clearances, if bearing housing is acceptable.
- c. Replace and seals, couplings, rotor (as a unit) and instrumentation.
- d. Repair and/or replace loose parts.

3.4.1.2 MSSD Repairs (as required):

- a. Repair or replace interstage seals.
- b. Repair or replace damaged impellers.
- c. Inspect shaft runout, straighten and rebalance.
- d. Repair shaft wear: Metallize or weld, and machine and grind.
- e. Repair mechanical seals and couplings.
- f. Fabricate or refurbish any part requiring welding, metallizing or machining, if beyond the capability of Field Repair facilities.
- g. Bearing rebabbitting.
- h. Repair casings: Welding, coating, and machine.
- i. Complete centrifugal compressor overhaul.

3.4.2 Reciprocating Compressors

3.4.2.1 Field Repairs (as required):

- a. Disassemble and clean inside and outside (solvent, steam, etc.).
- b. Replace connecting rod bearings, crankshaft bearings, piston rings, shaft cylinder liners, and crankshaft.
- c. Replace packing or stuffing box.
- d. Replace crosshead guides.
- e. Inspect and replace pistons.
- f. Repair or replace valves, lap seats, (rings, plates and springs).
- g. Replace oil pump and air cleaner.

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3.4.2.2 MSSD Repairs (as required):

- a. Repair crankshaft: Regrind or replace.
- b. Repair or replace piston rods and piston pins.
- c. Complete reciprocating compressors overhaul.

3.5 Steam Turbines

3.5.1 Field Repairs (as required):

- a. Disassemble and replace bearings, shaft seals, rotor and discs.
- b. Inspect and clean nozzles, or change nozzle sets.
- c. Inspect and replace carbon ring seals.
- d. Replace diaphragms and valves.
- e. Repack or replace packing (gland and interstage).

3.5.2 MSSD Repairs (as required):

- a. Repair casing: Weld, metal coating, and machining, etc.
- b. Fabricate or refurbish parts requiring welding, metallizing and machining.
- c. Repair or replace guide plates and diaphragms.
- d. Unstack and restack rotor, and re-balance.
- e. Repair and replace rotor blades and stator blades.
- f. Repair impeller wheels: Weld or machine and re-balance.
- g. Repair nozzles.
- h. Inspect shaft runout: Straighten and rebalance.
- i. Repair shaft wear: Metallize or weld, and machine and grind.
- j. Repair hydraulic actuators and governors.
- k. Repair mechanical seals and couplings.
- l. Bearing rebabbiting.
- m. Complete steam turbine overhaul.

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3.6 Gas Turbines

3.6.1 Field Repairs (as required):

- *
 - a. Disassemble and repair or overhaul all industrial gas turbines (using contractors or MSSD HIT Team, as required). However, any part that requires fabricating, refurbishing, or any special processing will be sent to MSSD.
 - b. External parts replacement only on aero-derivative gas turbines.

6.3.2 MSSD Repairs (as required):

- a. Repair or refurbish parts for industrial gas turbines.
- b. Repair rotor and rotor components: Shaft, shaft seals, etc.
- c. Unstack and restack compressor, and re-balance.
- d. Repair compressor components: Blades, guide vanes, etc.
- e. Replace bearings.
- f. Repair or replace combustion liner cracks.
- g. Repair or replace combustion liners.
- h. Repair or replace turbine blades, nozzles, etc.
- i. Complete overhaul of aero-derivative gas turbines.

3.7 Diesel Engines

3.7.1 Field Repairs (as required):

- a. Replace external components (air filter, fuel filter, oil filter, etc.). In addition, the proponent must disconnect components before the engine is sent to MSSD for repair (radiator, alternator, transmission, etc.) and send the components separately.

3.7.2 MSSD Repairs (as required):

- a. Complete diesel engine repair or overhaul.

3.8 Gearboxes

3.8.1 Field Repairs (as required):

- a. Disassemble and inspect gears for cracking, distortion or breakage: Replace in whole sets and adjust backlash.

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- b. Replace bearings, oil seals, oil breather, gaskets, couplings.

3.8.2 MSSD Repairs (as required):

- a. Disassemble and inspect shaft runout: straighten and re-balance.
- b. Repair shaft wear at bearings or seal areas: Metal cast, weld, and machine, grind, and balance.
- c. Repair or replace bearing housing.
- d. Repair casing: Weld or metal cast, and Machine and grind.
- e. Major gearbox overhaul.

3.9 Governors

3.9.1 Field Repairs (as required):

- a. Do minor repairs, except speed-setting adjustment. However, Ras Tanura Refinery has a Woodward testing and calibrating machine and performs all required repairs.

3.9.2 MSSD Repairs (as required):

- a. Replace bearings, oil seals, oil pump and springs.
- b. Realign couplings.
- c. Repair flyweight head-pilot valve assembly.
- d. Compensating system adjustment.
- e. Inspection, testing and recalibration.
- f. Major governor overhaul.

3.10 Heat Exchangers

3.10.1 Field Repairs (as required):

- a. Gasket replacement.
- b. Repair external leaks, when unit cannot be taken out of service.
- c. Hydrotest after Field repair.
- d. On-line cleaning for heavy fouling service units that require frequent clean-up, if the piping configuration allows.
- e. Retorque bolted fittings to stop leaks.
- f. Tube re-rolling to stop leaks.

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g. Cleaning to remove hazardous materials before sending to MSSD.

h. Hydrojetting and chemical cleaning of fin fan heat exchangers.

3.10.2 MSSD Repairs (as required):

3.10.2.1 Shell and Tube Heat Exchangers

- a. Tube chemical cleaning and hydrojetting.
- b. Tube plugging.
- c. Tube bundle removal and retubing.
- d. Internal component weld repair.
- e. Complete heat exchanger overhaul.
- f. Body flange repair and/or replacement.
- g. Shell weld repair.
- h. Design changes to improve heat transfer or tube bundle service life (inlet impingement, baffling, and material change).

3.10.2.2 Air Cooled Heat Exchangers

- a. Chemical cleaning and hydrojetting.
- b. Tube plugging
- c. Plenum shroud repair.
- d. Gearbox repairs (see section 3.8).
- e. Complete overhaul.
- f. Retubing - partial or complete.
- g. Repair headers, or fabricate new.

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CONTENT:

This Supplement outlines the planning and coordination of Major Hazardous Repairs at all offshore and onshore installations. It does not cover T&I work. The text includes:

1. Purpose
2. Definition
3. Initiation
4. Responsibility - General
5. Responsibility - Operations Superintendent
6. Responsibility - Maintenance Superintendent
7. Responsibility - Operations Engineering Supervisor
8. Responsibility - Repair Procedure Task Force
9. Responsibility - MHR Coordinator and Team
10. Responsibility - Inspection Supervisor
11. Responsibility - Loss Prevention Engineer
12. Responsibility - Fire Chief
13. Responsibility - Utilities Superintendent
14. Responsibility - Others
15. Procedure Contents
16. Bar Charts / Schedules

1.0 PURPOSE:

The purpose of this Supplement is to provide:

- 1.1 A guide for the planning and coordination of both emergency and planned Major Hazardous Repairs.
- 1.2 Definition of responsibilities and authorities.
- 1.3 The required contents of a Major Hazardous Repair procedure.

2.0 DEFINITION:

Major Hazardous Repairs (MHR) are repairs beyond the normal daily maintenance work and vary in scope from plant to plant.

- 2.1 The classification of a job as a Major Hazardous Repair is a judgment based on knowledge and experience. The facility Operating Superintendent and/or Facility Maintenance Superintendent are both delegated the authority to designate a repair as a Major Hazardous Repair.

3.0 INITIATION:

When the facility operations superintendent or maintenance superintendent initiate action under this Supplement, he must inform the following in his operating area:

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3.1 Manager of Operations/Maintenance Departments

3.2 Operations Engineering Supervisor

3.3 Inspection Unit Supervisor

3.4 Loss Prevention Department

3.5 Area Maintenance Engineer

In addition to the following, when applicable:

3.6 Fire Marshal

3.7 Government Affairs

3.8 Medical Department

3.9 Personnel Department

3.10 Power Distribution Department

3.11 Project Management Organization

3.12 All others who would or could be affected by the repair/damage/shutdown.

4.0 RESPONSIBILITY - GENERAL:

The Maintenance Superintendent and the Operations Superintendent shall jointly designate one overall MHR Task Force and appoint one MHR Coordinator. The MHR coordinator will usually be the Area Maintenance Engineer, T&I Planning Engineer or a Construction Engineer.

The MHR Coordinator and his team will be released from their usual duties and responsibilities to devote their full time to this special assignment.

The MHR Coordinator's Team will provide 24 hours coverage when necessary.

5.0 RESPONSIBILITY - OPERATIONS SUPERINTENDENT:

The Operations Superintendent has full responsibility for his facility. During a MHR repair, he will, in addition to paragraphs 3 & 4 above.

5.1 Approve the detailed MHR repair procedure.

5.2 Provide Safety and Fire Watch.

5.3 Ensure compliance with relevant safety and work permit G.I.S.

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6.0 RESPONSIBILITY - MAINTENANCES SUPERINTENDENT:

In addition to paragraphs 3 & 4 above, the Maintenance Superintendent will:

- 6.1 Approve the detailed MHR repair procedure.
- 6.2 Provide necessary support to the MHR Coordinator who will report directly to the Manager.

7.0 RESPONSIBILITY - OPERATIONS ENGINEERING SUPERVISOR:

- 7.1 Provide engineering personnel to support the MHR Task Force and review the repair procedures. Engineering personnel should report to the MHR coordinator.
- 7.2 Obtain technical help from other Engineering Departments/Divisions as necessary.

8.0 RESPONSIBILITY - MHR REPAIR PROCEDURE TASK FORCE:

Reference should be made to CHBs (Chemical Hazard Bulletins) and/or MSDS (Material Safety Data Sheets) for all hazardous materials which are expected to be present during the MHR.

- 8.1 Visit Job-site and assess requirements.
- 8.2 Write an MHR procedure, prepare a list of materials and include all applicable items mentioned in paragraph 15 of this Supplement.
- 8.3 Seek information and assistance as needed to produce a preliminary draft of the repair procedure for review by the facility Operations and Maintenance Superintendents and other members.
- 8.4 Revise the preliminary draft procedure after its review during the planning meeting detailed in paragraph 9.6.
- 8.5 Obtain the written approval of the procedure by the:
 - 8.5.1 Operations Superintendent
 - 8.5.2 Maintenance Superintendent
 - 8.5.3 Others as necessary
- 8.6 Obtain concurrence of the procedure by the:
 - 8.6.1 Inspection Supervisor
 - 8.6.2 Operation Engineering Supervisor
 - 8.6.3 Loss Prevention Engineer

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8.6.4 Fire Marshal

8.6.5 Others as necessary

8.7 Major Revisions to the procedures (as determined by Maintenance or Operations Superintendent) must be approved following the original approval procedure steps.

8.8 To overcome problems of distance and time, it is permissible to have approval signatures on different copies of the procedure via fax machines.

8.9 Be continuously on-call to help MHR Coordinator in clarifying and/or revising the procedure throughout the repair operation. Obtain approval, as in paragraph 8.5, of major changes in procedure.

8.10 Prepare minutes of the Review and Critique meeting held after the repair is completed.

8.11 File all pertinent information related to the MHR in the Operations files.

8.12 Initiate the necessary revisions to existing GIM, PIM, RIM, OIM, Manuals etc. as become evident after the Review and Critique meeting.

9.0 RESPONSIBILITY - MHR COORDINATOR AND TEAM:

The MHR Coordinator shall direct the repairs at the site in close coordination with the operations foreman, who maintains his normal responsibilities, especially those related to issuing work permits. The Coordinator's team will be responsible to him. They will perform any functions as he directs them. The Coordinator will be reporting to the Manager of Maintenance Department and will:

9.1 Maintain a Control and Communication Center, preferably at the repair site, following the guidelines in G.I. 525.001.

9.2 Prepare the job-site for the repair.

9.3 Procure and request the necessary material, manpower, and equipment. All activities should be based on a preliminary agreement between the Task Force, the Operations Superintendent and all others as deemed necessary by the Coordinator.

9.4 Obtain Work Permits.

9.5 Call a planning meeting to discuss the preliminary repair procedure developed in paragraph 8.2. The following departments should be represented at the meeting:

9.5.1 Maintenance

9.5.2 Operations

9.5.3 Operations Engineering

9.5.4 Inspection

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9.5.5 Loss Prevention

9.5.6 Fire Protection

9.5.7 Others as necessary, such as the Contractor's designated Job Coordinator if the repair or any part of it is going to be contracted.

9.6 Request revisions to the procedure as it becomes necessary during the course of the repair.

9.7 Execute the repairs according to the approved / revised procedure.

9.8 Maintain a daily repair log book with comments on the procedure application.

9.8.1 Issue the log to all personnel who approved the procedure or who attended the Planning Meeting.

9.9 Inform the Fire Marshal and the Utilities Superintendents of special needs for their assistance; and of the completion of the repair.

9.10 Call for a Review and Critique meeting to be held within one week after the facility is back on-stream. The meeting should be attended by the same departments that attended the Planning meeting. Discuss:

9.10.1 Response to the application of the MHR.

9.10.2 Repair procedure deviations, if any.

9.10.3 Field coordination and job performance.

9.10.4 Turning over the facility to Operations.

9.10.5 How to prevent/minimize future similar occurrences.

9.10.6 Suggest revision to existing GIM's, PIM's, OIM's Manuals, etc. and addition of new instructions, etc.

9.11 Issue status reports to the Managers of Operations/Maintenance Departments.

10.0 RESPONSIBILITY - INSPECTION SUPERVISOR:

10.1 Visit the job-site immediately, then daily throughout the repair.

10.2 Provide previous inspection data, and any other pertaining information.

10.3 Review the preliminary repair procedure and participate in the Planning meeting.

10.4 Approve the revised procedure.

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10.5 Provide the manpower, expertise, and equipment to inspect the repaired facility as required, before, during, and after the completion of the repair according to the approved procedure.

10.6 Participate in the Review and Critique meeting.

11.0 RESPONSIBILITY - LOSS PREVENTION ENGINEER:

11.1 Visit the Job-site immediately, then periodically, throughout the repair.

11.2 Participate in both the Planning and the Review meetings.

11.3 Review and Concur with the repair procedure.

11.4 Follow the repair in the field and recommend specific actions to correct unsafe equipment and/or construction / craftsmanship practices or procedures.

12.0 RESPONSIBILITY - FIRE MARSHAL OR HIS DESIGNATED REPRESENTATIVE:

12.1 Visit the job-site immediately, then periodically throughout the repair.

12.2 Provide necessary fire fighting chemicals, equipment, etc. at the job-site.

12.3 Help establish the safety and fire watch.

12.4 Concur with the repair procedure.

12.5 Participate in both the Planning and the Review meetings.

12.6 Modify preparedness as conditions change at the site or as informed by the MHR Coordinator.

13.0 RESPONSIBILITY - UTILITIES SUPERINTENDENT:

Utilities Superintendent is to be informed of the MHR to assure that interruption of necessary utilities are avoided or planned for. He must be kept informed of specific needs as far in advance as possible such as water requirements for hydrotesting, excessive discharge to the sewers, etc.

14.0 RESPONSIBILITY - OTHERS:

The other departments and personnel who could be involved should be checked for each job, particularly when:

14.1 Government Relations is involved.

14.2 Contractors are employed in any part of the repair.

14.3 The repair is for offshore facility where Marine is involved.

15.0 PROCEDURE CONTENTS:

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All repair procedures should contain the following sections whenever applicable:

- 15.1 Job Outline.
- 15.2 The Facilities team assigned to the MHR procedure should include a formal "Hazard Identification Plan" to account for all the potential hazardous conditions that could occur during the repair and the corresponding safety procedures needed to preclude their occurrence.
- 15.3 Timing and Duration Restrictions.
- 15.4 Blinding schedule marked on a drawing, or a sketch based on a field visit.
- 15.5 Prevention and/or minimization and removal of oil spills.
- 15.6 Steaming, purging, or gas inerting, as required.
- 15.7 Detailed repair procedure such as cold cutting, hot cutting, hot bolting, unbolting, installation of sleeves, W + E welding, pre and post heating, etc.
- 15.8 Detailed procedure for flushing, hydrotesting, and returning the facility to normal and safe operation.
- 15.9 Communication flow network including assigned personnel list, telephone number (home and office), job title, etc.
- 15.10 Emergency procedure including an on-site alarm system (what to do, whom to contact, etc.)
- 15.11 A list of all necessary safety equipment required on the site and who is assigned to operate each.
- 15.12 A procedure for deviation from the approved procedure.
- 15.13 Bar (or GANTT) chart schedules should be developed to minimize timing errors and expedite the repairs.
- 15.14 Emphasize the safety requirement of having only the absolute minimum number of personnel at the repair site.

16.0 BAR (OR GANTT) CHART/SCHEDULES:

Detailed Bar charts (GANTT) are to be developed for the following:

- Overall Master Schedule
- Different Main Activities (Milestones)
- Materials Requirement by Main Activity
- Construction Equipment Requirements
- Manpower Including Daily Manning Requirements
- Contracted Activities

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