

SAUDI ARABIAN OIL COMPANY (Saudi Aramco)

GENERAL INSTRUCTION MANUAL

GI NUMBER **Approved**

558.004

ISSUING ORG. SOUTHERN AREA PRODUCTION SERVICES DEPARTMENT

ISSUE DATE
03/14/2006

REPLACES
02/26/2005

SUBJECT EMERGENCY RESPONSE PLAN FOR GAS/OIL/WATER WELLS

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CONTENT:

This General Instruction outlines the Emergency Response Plan to be implemented in the event of a serious emergency or disaster at any Southern Area Gas/Oil/Water well under the control of Southern Area Production Services Department during well completion or well servicing activities. ***Emergency situations or disasters on operating Gas/Oil/Water wells not released to Southern Area Production Services Department remain the responsibility of the proponent department within Southern Area Gas Operations or Southern Area Oil Operations.*** The GI 558-004 compliments existing GI 1850.001 Drilling and Workover Services Onshore Contingency Plan. GI 557.001-15 will be followed in case of Near Emergency Situations on oil & water wells in Southern Area Oil Operations.

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3. ORGANIZATION
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5. DOCUMENTATION OF DISASTER SEQUENCE OF EVENTS
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1.0 OBJECTIVE

The intent of this Plan is to identify the individuals responsible and the activities required to contain and control an emergency situation or disaster on Gas/Oil/Water wells that are released to Southern Area Production Services Department for well completion or well servicing activities. Emergency situations or disasters on operating Gas/Oil/Water wells not released to Southern Area Production Services Department remain the responsibility of the proponent department within Southern Area Gas Operations or Southern Area Oil Operations.

2.0 IMPLEMENTATION

2.1 Oil/Gas/Water Well Emergency During Well Completion or Well Servicing:

- 2.1.1 If a Gas/Oil/Water well emergency or disaster occurs while the well is under the responsibility of Southern Area Production Services Department, the situation will be immediately reported by dialing 110.
- 2.1.2 Southern Area Production Services Department will assume responsibility for all emergency response **unless** the Executive Director, Southern Area Oil Operations or Manager, Southern Area Production Services Department (if the Executive Director cannot be reached) requests Drilling and Workover to take over well control operations by contacting (by priority):

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- Vice President, Drilling & Workover – 873-5885 or
- General Manager, Drilling & Workover – 862-8000 or
- Manager, Drilling & Workover Services – 862-8006.

2.2 Reporting of Emergency During Well Completion or Well Servicing Activities:

2.2.1 The Foreman/Field Supervisor in-charge (and in his absence the next most senior crew member) at the well site will report the emergency by:

- Dialing 110 if he uses a normal telephone.
- Dialing the following numbers to activate the 110, if he uses Mobile Phone, Global Star, Al-Thuraiya or VSAT:
 - Udhailiyah Area 03-516-7110
 - Abqaiq Area 03-572-0110
 - Central Region 01-285-0110

2.2.1.1 If contact cannot be established on 110, the nearest Security Control Center can be contacted directly by dialing:

577-1221 Shedgum Security Control Center
 577-8212 Udhailiyah Security Control Center
 572-5291 Abqaiq Security Control Center
 577-2344 Mubarraz Security Control Center
 576-9313 Hawiyah Security Control Center
 576-2900 Hradh Security Control Center
 574-6200 Hawtah Security Control Center

2.2.1.2 If problems are still encountered, Industrial Security Control Center Dispatcher is to be contacted on the Smart Zone Radio by selecting one of the addresses noted below:

For Gas Emergency SAGS-EMR
 Emergency TX/RX 158.96 Mhz (also used by Pipelines Radios)
 Oil Central TX 159.566 Mhz, RX 163.125 Mhz
 Oil South TX 159.730 Mhz, RX 164.800 Mhz
 Transportation TX/RX 158.84 Mhz
 Water Injection TX/RX 154.4 Mhz

2.2.2 The proper method for reporting an emergency is to speak slowly, calmly and distinctly in a clear voice and give information in the following sequence:

- a. State: "This is a Disaster. There is an emergency at Gas/Oil/Water well #_____ near _____."
- b. Identify yourself by name, badge number, location and contact phone.

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- c. Describe the emergency briefly, i.e. blowout, fire, leak, etc.
- d. State if there are any injured persons and how many.
- e. Report all relevant critical information such as:
 - 1. Wind direction (i.e. H₂S environment).
 - 2. Location and status of all nearby and effected Government roads and residential areas.
 - 3. Nearest drilling rig.
- f. Repeat the above information.
- g. Ask the Security Control Dispatcher to repeat the information to make sure it is complete and correct.

2.2.3 The Foreman/Field Supervisor in-charge (and in his absence the next most senior crew member) at the Gas/Oil/Water well site will contact the operation Superintendent of the responsible division and the Southern Area Production Services Department employee on call to man the nearest Emergency Control Center and to report the emergency. If the operation Superintendent is not available, Southern Area Production Services Department Manager should be contacted to report the emergency.

2.3 Order of Priorities

2.3.1 Rescue and Protection of Personnel

- 2.3.1.1 The first objective of this plan is the preservation and protection of human life. In the event that there are any injured or dead, the Gas/Oil/Water well site Foreman/Field Supervisor will be responsible for obtaining emergency medical treatment and transportation during emergency reporting to 110. The Foreman/Field Supervisor should state the number of persons injured or number of deaths.
- 2.3.1.2 A Saudi Aramco representative from well location to be posted at block top intersection until security and support organization arrive to well location.
- 2.3.1.3 Security patrols will be dispatched to restrict access to the area to Saudi Aramco authorized personnel only and required service companies.
- 2.3.1.4 The Gas/Oil/Water well site Foreman/ Field Supervisor will designate a team to immediately begin monitoring the surrounding area for flammable leaks and hydrogen sulfide (H₂S) or other potential hazards.
- 2.3.1.5 Persons in any endangered area determined by the Foreman/ Field Supervisor or security and their team (see 2.3.1.3 above) near the emergency site must be evacuated and reported to the Command Post Director.
- 2.3.1.6 Fire Protection will respond to the emergency by dispatching necessary personnel and equipment.

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2.4 Safeguarding of Company Property

2.4.1 Well Control

Well site Foreman/ Field Supervisor or Superintendent of the responsible division will supervise on-site well control operations **until** the well has been controlled or turned over to the D&WO Well Control Team (SWAT team).

2.4.2 Ignition

Well site Foreman/ Field Supervisor or Superintendent of the responsible division will supervise on-site uncontrolled Gas/Oil flow from well without being ignited, automatically or accidentally, the decision to ignite will be based on the following criteria:

- A. If flow from a Gas well contains in excess of 20 ppm H₂S, ignite it immediately and if flow from an oil well contains in excess of 30 ppm H₂S, ignite it immediately.
- B. If the flow presents immediate and serious danger to inhabited areas or facilities, ignite it immediately.
- C. Any flow condition other than those described in items (A) & (B) above will be evaluated on a case-by-case basis. The decision to ignite will be made by SAOO management in coordination with VP, Drilling and Workover, after all the facts have been evaluated. If communication can not be established with higher levels of Management or if the situation becomes critical, then a decision to ignite can be made by the senior most authority amongst Manager Southern Area Production Services Department, Operation Superintendent, Foreman/ Field Supervisor, or the Senior most crew member at the job site that can be contacted by the site crew.

Note: Uncontrolled flow of water well will be evaluated and a decision to control the flow will be made based on the assessment of well condition.

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3.0 ORGANIZATION

The Emergency Response Organization will consist of the Disaster Command Post and the Udhailiyah or Abqaiq or Mubarraz Emergency Control Center.

3.1 Disaster Command Post

3.1.1 The Disaster Command Post will be the Gas/Oil/Water well site Foreman/ Field Supervisor portable or Vehicle if accessible and parked at a safe distance upwind from the Oil/Gas/Water well, until arrival of the SAPSD Emergency Communications Van.

3.1.2 The Disaster Command Post will select his radio to 'Smart-Zone' Emergency channel to communicate with the ECC commander. The Command Post Director start on the operation channel and then to switch to emergency channel upon the request of ECC commander.

3.1.3 The Disaster Command Post Director will be the most senior person at the site as follows:

WS Superintendent of the involved division.
Operation Superintendent of the involved division.
PE Supervisor of the concerned area.
Gas/Oil/Water Well site Foreman/ Field Supervisor.
Gas/Oil/Water Well site Supervising Operator.

3.1.4 The Disaster Command Post Director will wear an orange vest for identification and will give a clear turnover of the emergency situation when relieved by the next most senior person.

3.1.5 Transfer of the Disaster Command Post Director responsibility will be announced on the emergency Radio channel.

3.1.6 Personnel reporting to the Disaster Command Post and their duties are listed in APPENDIX I – DUTIES AND RESPONSIBILITIES OF OPERATIONS ORGANIZATIONS.

3.2 Udhailiyah/Abqaiq/Mubarraz Emergency Control Center

3.2.1 For Udhailiyah Emergency Control Center

3.2.1.1 The Udhailiyah Emergency Control Center (ECC) is located in R-3535 of the Udhailiyah East Administration Building.

3.2.1.2 The Udhailiyah ECC Commander will be the Manager, Southern Area Production Services Department. In his absence, the Commander will be in the following order:

SAPED Manager, then
Operation Manager of the affected area, then
PE General Supervisor of the concerned area

3.2.1.3 The Udhailiyah ECC is normally locked to limit access to authorized persons only. Authorized persons can gain admission to the Udhailiyah ECC by the following door lock key pad combination: Press numbers 3 & 4 simultaneously, release and press number 1, then open the door.

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3.2.1.4 Personnel reporting to the Udhailiyah ECC and their duties are listed in APPENDIX I – DUTIES AND RESPONSIBILITIES OF OPERATIONS ORGANIZATIONS.

3.2.2 For Abqaiq Emergency Control Center

3.2.2.1 The Abqaiq Emergency Control Center (ECC) is located in room C-3105 of the Abqaiq Central Administration Building

3.2.2.2 The Abqaiq ECC Commander will be the Manager, Southern Area Production Services Department. In his absence, the Commander will be in the following order:

SAPED Manager, then

Operation Manager of the affected area, then

PE General Supervisor of the concerned area

3.2.2.3 The Abqaiq ECC is normally locked to limit access to authorized persons only. Authorized persons can gain admission to the Abqaiq ECC by key which is always available with security on first floor of the Central Administration Building. Another key is also available with authorized personnel.

3.2.2.4 Personnel reporting to the Abqaiq ECC and their duties are listed in APPENDIX I – DUTIES AND RESPONSIBILITIES OF OPERATIONS ORGANIZATIONS

3.2.3 For Mubarraz Emergency Control Center

3.2.3.1 The Mubarraz Emergency Control Center (ECC) is located in R-130 of the Mubarraz South East Administration Building.

3.2.3.2 The Mubarraz ECC Commander will be the Manager, Southern Area Production Services Department. In his absence, the Commander will be in the following order:

SAPED Manager, then

Operation Manager of the affected area, then

PE General Supervisor of the concerned area

3.2.3.3 The Mubarraz ECC is normally locked to limit access to authorized persons only. Authorized persons can gain admission to the Mubarraz ECC by the following door lock key pad combination: Press numbers 3 & 4 simultaneously, release and press number 1, then open the door.

3.2.3.4 Personnel reporting to the Mubarraz ECC and their duties are listed in APPENDIX I – DUTIES AND RESPONSIBILITIES OF OPERATIONS ORGANIZATIONS.

3.3 Support Services Organizations

3.3.1 The Udhailiyah/Abqaiq/Mubarraz ECC Commander will coordinate support services provided by various departments as well as Service Companies. Each department providing a support service will be responsible for adequate preparation to provide prompt and efficient service during the emergency.

3.3.2 Duties of other organizations are outlined in APPENDIX II – DUTIES AND RESPONSIBILITIES OF SUPPORT ORGANIZATIONS.

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4.0 INFORMATION SYSTEMS

4.1 Maps and Well Data

4.1.1 Surveying Services maps of SAPSD operational areas detailing the location of all Gas/Oil/Water well sites and access roads will be maintained in the Udhailiyah ECC, R-3535, Udhailiyah East Admin Building, Abqaiq ECC, R-C-3105, Central Administration Building, and Mubarraz ECC, R-130 South Administration Building.

4.1.2 Lists of all Gas/Oil/Water wells requiring operations support detailing critical data such as coordinates, bearings and distances to manned facilities and communities, H₂S concentration and blowout rates will be maintained in the Udhailiyah/Abqaiq/Mubarraz ECC.

4.2 Telephone Directories and Rosters

4.2.1 Telephone directories, important rosters, management alert lists and critical contact numbers will be maintained on the Udhailiyah/Abqaiq/Mubarraz ECC Web Site and in binders in the Udhailiyah/Abqaiq/Mubarraz ECC.

4.2.2 Schematics and manuals for communications systems in the Udhailiyah/Abqaiq/Mubarraz ECC will be maintained by Southern Area Community Service Department (SACSD).

4.3 Meteorological Information

Wind speed, direction and ambient temperature are continuously monitored by a meteorological station mounted on the roof of the Udhailiyah/Abqaiq/Mubarraz Administration Building. This information can be accessed by clicking on the Weather Vane Icon on the computer desktop in the Udhailiyah/Abqaiq/Mubarraz ECC.

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5.0 DOCUMENTATION OF DISASTER SEQUENCE OF EVENTS

Complete daily logs will be maintained from the time of the initial report and activation of the Udhailiyah/Abqaiq/Mubarraz ECC.

The final report will be prepared by the responsible SAPSD division and shall contain a complete sequence of events, planning, decisions, photographs, etc. Upon completion of the final report, a critique will be held to evaluate all the causes, actions and results of the various phases of the emergency up to the final restoration of normal operations.

6.0 RESPONSE ASSURANCE

6.1 Disaster Drills

SAPSD will conduct quarterly disaster drills that involve manning the Udhailiyah/Abqaiq/Mubarraz ECC and use of emergency communications circuits. Drill schedules and scenarios will be prepared by each SAPSD Operation Division.

6.2 Emergency Conference Circuit Tests:

SAPSD will conduct a weekly emergency conference circuit test in Udhailiyah/Abqaiq/Mubarraz ECC to ensure the integrity and reliability of the system.

6.3 Emergency Response Plan Dissemination

SAPSD division heads are to ensure that persons under their supervision review this instruction at least on a quarterly basis. This instruction is to be included in new employee orientations to ensure that personnel are thoroughly familiar with their duties and responsibilities.

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6.4 Emergency Response Plan Revisions

The Plan will be reviewed and updated every two years by Southern Area Production Services Department.

Recommended by:

Manager, Southern Area Production Services Department

Concurred by:

Manager, Southern Area Production Engineering Department

Manager, Loss Prevention Department

Manager, Fire Prevention Department

General Manager, Industrial Security Operations

Approved by:

Executive Director, Southern Area Oil Operations

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APPENDIX I

DUTIES AND RESPONSIBILITIES OF OPERATIONS ORGANIZATIONS

Many of the duties and responsibilities of the members of the Contingency Plan Organization are listed below in order to clarify their various functions. This list is not intended to describe all the actions necessary for any particular emergency.

Executive Director, Southern Area Oil Operations

1. Assume executive authority over the well control emergency and report conditions and operating progress to the Senior Vice President or President.
2. Request Drilling & Workover to take over well control operations, if required.
3. Advise Vice President, Government Affairs of statements for news release.
4. Appoint investigating committee.

Manager, Southern Area Production Services Department

1. Notify Executive Director, SAOO and staff that the Contingency Plan has been activated and direct well control operations from the Udhailiyah/Abqaiq/Mubarraz ECC.
2. Advise Executive Director, SAOO when the emergency situation warrants transfer of responsibility for well control operations to Drilling and Workover, i.e. well blowout.
3. Consult with Vice president, D&WO and Executive Director, SAOO concerning ignition of well effluent, if required.
4. Notify proponent SAGO Gas Plant managers or related area SAOO Producing Managers and Managers of support services departments of the emergency.
5. Provide support and direction to the Disaster Command Post Director at the Gas/Oil/Water well site.
6. Coordinate services provided by other departments.

Manager, Southern Area Production Engineering Department

1. Attend in the ECC to provide technical support to the ECC Commander.
2. Ensure that the required support to handle the situation is in place in addition to continuous field coverage by qualified engineer(s).
3. Establish and maintain communication with PE&D for the required support and consultation.

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WS Superintendent of Concerned SAPSD Division

1. Notify Manager, SAPSD of the emergency.
2. Proceed to emergency location and assume position of Disaster Command Post Director.
3. Designate a team to monitor the area for flammable gas and hydrogen sulfide (H₂S) or other potential hazards.
4. Maintain on-scene control and keep Manager, SAPSD advised of any change in the emergency situation.
5. Advise and assist with evacuation and rescue operations if needed.

General Supervisor, Concerned SAPED Production Engineering Division

1. Report to the Udhailiyah/Abqaiq/Mubarraz ECC and assist the Manager, SAPSD as required.
2. Assemble relevant well data including well configuration sketch, wellhead drawing, morning reports and other reference information, which may be of use.
3. Designate qualified and experienced engineer(s) to go to the well site to:
 - (a) Assess the situation and work jointly with SAPSD to propose a remedial action.
 - (b) Provide engineering assistance as required.
4. Prepare kill program including fluid type, density and pumping rates.

Material Unit Supervisor of Concerned SAPSD Operation Division

1. Coordinate materials and equipment needed for use at the disaster site.
2. Assist Commander in the Udhailiyah/Abqaiq/Mubarraz ECC with coordination of services provided by other departments.
3. Maintain a record of costs incurred and appropriate documentation as described.

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Gas/Oil/Water Well site Foreman/ Field Supervisor

1. Report the emergency by dialing 110.
2. Notify the concerned SAPSD Division Operation Superintendent or if not available the SAPED concerned area General Supervisor, regarding the emergency.
3. Ensure all personnel are safely removed from the site and accounted for.
4. Coordinate emergency medical and fire protection responses.
5. Maintain communications contact with Udhailiyah/Abqaiq/Mubarraz ECC.
6. Be familiar with paragraph 2.4.2 of this OIM concerning criteria requiring ignition of uncontrolled well flow.

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APPENDIX II

DUTIES AND RESPONSIBILITIES OF SUPPORT ORGANIZATIONS

Medical

1. Provide emergency medical services at the disaster site as required.
2. Stabilize and transport injured personnel to the nearest medical facility.

Fire Protection

1. Provide personnel and fire fighting equipment to support emergency operations as required.
2. Advise and assist Disaster Command Post Director on rescue operations if necessary.

Security

1. Establish traffic control points and restrict unauthorized personnel to the disaster site.
2. Expedite movement of emergency equipment.

Loss Prevention

Provide personnel at the well site and Udhailiyah/Abqaiq/Mubarraz ECC to advise on safety related issues.

Communications

1. Monitor emergency communication systems at the disaster site and Udhailiyah/Abqaiq/Mubarraz ECC.
2. Support and maintain emergency communications circuits as required.

Transportation/Heavy Equipment/Aviation

1. Provide for movement of authorized personnel, materials and equipment.
2. Provide aerial surveillance for security and well conditions.

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APPENDIX III

A. HYDROGEN SULFIDE EFFECTS

Hydrogen sulfide (H₂S) is an extremely flammable, highly toxic, irritating, colorless gas with a characteristic "rotten-egg" odor. It is HEAVIER THAN AIR and will accumulate in low spaces. Your sense of smell is paralyzed by concentrations of 150 ppm and smell is not a reliable warning to detect presence of the poisonous gas. Prolonged exposure at even lower concentrations will dull the sense of smell and a false sense of security may develop.

In addition to its high health hazard to humans, hydrogen sulfide offers another aspect of danger in that it is an extremely flammable gas. In concentrations 4.3 to 46 percent by volume in air, it explodes upon ignition. Since the vapors are heavier than air, H₂S may travel a considerable distance to a source of ignition and flash back. Therefore, it is necessary that all sources of ignition, open flame, sparks (including static discharge) and heat-Production equipment be excluded from contact with the gas.

Furthermore, H₂S can destroy a person's ability to reason. He may have enough physical strength to crawl out of an enclosed space, but he cannot direct his mind to take the correct action. Below are shown the subjective order responses and the effect on humans from exposure to various concentrations of Hydrogen Sulfide.

PPM H₂S IN AIR BY VOLUME

ODOR RESPONSE

0.02 ppm	No odor
0.13 ppm	Minimum perceptive odor
1 ppm	Rotten egg smell is noticeable
4.60 ppm	Easily detectable, moderate odor
10 ppm	Safe work limit for an 8-hour shift
10+ ppm	Wear fresh air-packs (Scott air-pack) at levels above 10 ppm.
27 ppm	Strong unpleasant odor, but not intolerable
100 ppm	Sense of smell is paralyzed
150 ppm	Deadens sense of smell

PPM H₂S IN AIR BY VOLUME

PHYSICAL EFFECTS

10 ppm	Maximum allowable exposure to H ₂ S gas for a 7 or 8-hour workday and 40 hour work week.
10+ ppm	Wear fresh air-packs (Scott air-pack) at levels above 10 ppm.
20 ppm	Irrigates eye and throat
50 - 100 ppm	Slight eye irritation and swelling and respiratory tract irritation after one-hour exposure.

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PPM H₂S IN AIR BY VOLUME

PHYSICAL EFFECTS

150 ppm

Deadness sense of smell.

350 ppm

Fatal in less than one hour without fresh air.

500 - 700 ppm

Rapid loss of consciousness, breathing stops and possible death in 30 minutes to one hour unless victim is removed to fresh air and revived by resuscitation.

700 - 1000 ppm

Rapid unconsciousness, cessation of respiration and death.

1000 - 2000 ppm

Unconsciousness at once, with early cessation of respiration and death within few minutes. Death may occur even if individual is removed to fresh air at once.

40,000 ppm (i.e. 4%)

Explodes and burns

B. EFFECT OF THERMAL RADIATION

Radiation Intensity (Kw/m²)

Observed Effect

37.5

Sufficient to cause damage to process equipment.

25

Minimum energy required to ignite wood at indefinitely long exposures (non-piloted).

12.5

Minimum energy required for piloted ignition of wood, melting of plastic tubing.

9.5

Pain threshold reached after 8 seconds; second degree burns after 20 seconds.

4

Sufficient to cause pain to personnel if unable to reach cover within 20 seconds; however blistering of the skin (second-degree burns) is likely; 0% lethality.

1.6

Will cause no discomfort for long exposure.

C. FLAMMABILITY LIMITS

LFL

Lower flammable limit of the mixture; represents the theoretical minimum concentration that can be ignited in air.

½ LFL

50% of the lower flammable limits; this provides a safety margin to account for concentration fluctuations in the cloud.