Safety in Focus

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Loss Prevention Department

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Don't Leave Safety Up in the Air

By Kevin L. Parikh, Dhahran Area Loss Prevention Division

No one conducts aviation — or any — operations with the intention of having an incident: major, minor or otherwise. But the possibility is always there. When an incident does happen, a common factor is confusion. Which emergency services are needed? Fire? Police? Medical? And with the many first responders, who is in charge?

To protect people, property and the environment, a quality emergency response plan (ERP) must be developed that defines all responsibilities, procedures and resources required in the event of an aircraft incident.

Emergency response planning

The Safety Management System Elements 8, "Emergency Preparedness," and 2, "Risk Assessment and Management," form the basis for the Saudi Aramco Aviation ERP.

Aircraft incidents can occur anywhere; therefore, the Saudi Aramco Aviation Department works closely with Saudi Arabian government agencies to ensure that quality ERPs are properly developed and implemented in local communities near airports where Saudi Aramco aircraft operate. The effects of a major disturbance at an airport or in a community in the vicinity of an aircraft accident can be significant.

Many services are required to respond to an incident at or in the vicinity of an airport, such as fire, security, medical and local government agencies, as well as airport governmental agencies like the General Authority of Civil Aviation (GACA) and the International Civil Aviation Organization (ICAO). It is important to remember that each of these agencies and emergency responders should have their own proper response plan for an aircraft incident and should test these plans regularly.

What to expect

As with any hazard identification, it is important to consider many different possibilities that would require an emergency response. Airplane crashes with fatalities are the worst case scenarios that require immediate first response from local fire and emergency rescue services, as well as others. The majority of aviation accidents are nonfatal, yet they also require emergency response planning. The following are the most common incidents.

Equipment malfunctions are the most frequently reported incidents. While usually minor, these incidents can impact flight safety.

Diversions occur when an aircraft is diverted from its original destination and lands at an alternate airport or facility. Diversions may be necessary due to inclement weather, equipment malfunctions, low fuel or medical emergencies.

Severe weather conditions at the airport where planes are taking off or landing have the potential to cause aircraft emergencies.

Fires can damage aircraft and airport structures while smoke from nearby fires can interfere with airport operations.

Security threats need to be monitored and response procedures for different security hazards need to be in place.

Hazardous materials are stored at airports and transported on aircraft. Plans should include how to limit or prevent exposure to hazardous materials and how to clean spills that may occur.

One incident — many response plans

Although many services and agencies develop ERPs for one airport, these must be well coordinated. This can only be achieved through the cooperation and integration of the different ERPs. Regular meetings to detail the responsibilities of each service and to practice the command, control and coordination elements of an aviation ERP are necessary. An essential part of the emergency planning process is to ensure that there is no doubt or ambiguity as to all aspects of command, control and coordination.

Command

The incident command system (ICS) delineates the chain of command and determines the person in charge of all the operations. Essentially, the ICS is a system delegating responsibilities and outlining procedures to manage and direct emergency operations.

The supervisor of each responding organization can only command their own employees. A fire chief coordinates

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firefighting operations and health professionals have authority for medical emergencies. But is it more important for the firefighters to go in and the medical people to wait until it is safe? Perhaps the local police need to seal off the area before other services can enter? Are there hazardous materials present? Should heavy equipment be brought in?

These decisions must be made by one person if the emergency response is to be timely, organized and safe. This person is the incident manager (IM). The incident manager is responsible for organization, direction and coordination of logistics for all response activities and is usually the senior management person at the facility. The IM is supported by an incident commander (IC). The IC's job is to manage the incident scene and receive vital information about responders and resources to help develop a tailored response and bring the incident to a safe conclusion.

Control

Control relates to the situation itself. It is the broad direction or control of a response. The IM needs to have the authority, knowledge and flexibility to divert from existing plans; to formulate new criteria; and to take or alter action plans as the accident scenario unfolds.

Coordination

The coordination role is usually the responsibility of the controlling authority as designated in the ERP. The coordinator brings together all those resources identified in the plan.

Aviation emergencies can and do happen everywhere and involve many responders and experts. It is the efforts of the agencies and emergency services involved, both within Saudi Aramco and in the community working together with a quality ERP, that keeps airports running smoothly and communities safe.

Electrical Area Classification – A Valuable Tool

By Efiok I. Ekanem, Tanajib Area Loss Prevention Division

One of the most unforgettable and tragic images of the twentieth century is the 1937 Hindenburg disaster, when static electricity ignited hydrogen gas leaking from an airship, resulting in an enormous explosion. The disaster, which killed 36 people and essentially ended the era of airship travel, shows the potential for catastrophe when the volatile combination of electricity and flammable gas meet.

In the oil and gas industry, many fire and explosion incidents are the result of incorrect design and unauthorized use of electrical equipment in electrically hazardous areas. One way to manage the risk of fire and explosion in oil and gas installations is electrical area classification — a method of analyzing and classifying environments where explosive gas atmospheres may occur. This is done to facilitate the proper selection and installation of equipment, and to develop safe operational and maintenance procedures.

Guiding codes and standards

Two classification schemes are widely recognized within the industry — the division scheme (class/division/group) and the zone scheme (class/zone/group). Saudi Aramco Engineering Standard (SAES)-B-068, *Electrical Area Classification*, is the principal document that sets the requirements for the process and specifies the use of the zone scheme, as defined by American Petroleum Institute Recommended Practice (API RP) 505, for all new facilities.

In the zone scheme, class denotes the type of material:

- Class I refers to flammable gases.
- Class II refers to combustible dust.
- Class III refers to ignitable fibers.

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In the oil and gas industry, the most common threat is from Class I materials (flammable gases).

The zone represents the level of flammable gas or vapor within the area being considered. API RP 505 has extensive definitions for each zone:

- Zone 0 is an area in which an ignitable concentration of flammable gas or vapor is continuously present or present for long periods.
- Zone 1 is an area in which an ignitable concentration of flammable gas or vapor occurs for short periods in normal operations.
- Zone 2 is an area in which an ignitable concentration of flammable gas or vapor is not likely to occur in normal operation but, if it does occur, will only persist for a short period.

The last section in the classification scheme, group, refers to the properties of the flammable/explosive substance expected in the area.

How is classification conducted?

Electrical area classification should be conducted by a multidisciplinary team of people who understand the applicable codes and standards; properties of flammable materials, electrical equipment and wiring; chemicals used; fire detection and protection systems; process operations and conditions; maintenance procedures, etc. A team typically includes process, electrical, operations, maintenance and loss prevention engineers.

The process begins during the design stage, usually when the initial process and instrumentation diagrams and layout plans are available. It involves gathering relevant documentation, field surveys and analysis of available information to delineate the facility into zones based on the guiding standard.

The initial electrical area classification document may be revised several times during the project phase, with the final document confirmed only before plant start-up. The document must be up-to-date throughout the facility life cycle. Revisions may be needed when the facility is modified, new equipment is installed or the operating procedures or conditions are changed. Any change must be implemented and documented through the management of change process.

Protection methods

The first protection strategy is to physically isolate the hazard by locating electrical equipment outside the electrically classified area, but in some cases this is not practicable.

National Fire Protection Association (NFPA) 70 provides detailed specifications and requirements for the design and installation of electrical equipment within electrically classified areas. Such equipment is designed to prevent ignition sources such as arcs, sparks and high temperatures. These are examples of recommended protection measures:

- **Flameproof.** A fireproof enclosure designed to contain any explosion that develops within the equipment. This type of protection is recommended for Class I, Zone 1 or 2 areas.
- **Intrinsically safe.** This type of protection renders the electrical equipment incapable of releasing sufficient electrical or thermal energy to cause ignition of a specific hazardous atmospheric mixture. This is recommended for Class I, Zone 0, 1 or 2 areas.
- **Increased safety.** A type of protection in which various measures are applied to reduce the probability of excessive temperatures and the occurrence of arcs or sparks in any parts of electrical apparatus. This is recommended for Class I, Zone 1 or 2 areas.

Using electrical area classification

Electrical area classification drawings should be referred to before any equipment with the potential of being an ignition source is used. The equipment must be suitable, per manufacturer recommendations, for the electrical area classification where it will be located. SAES-B-068 also requires that only listed, intrinsically safe equipment be located in Zone 0 conditions.

Electrical area classification is not a substitute for poor process design, improper operations, poor facility or equipment maintenance, or an unacceptable gas release. Measures are included in operational and maintenance procedures, as well as General Instructions (GIs), to prevent the presence of ignition sources in hazardous concentrations of flammable gases or vapor in electrically classified areas.

It is the responsibility of everyone in electrically classified areas to adhere to the requirements in approved procedures and GIs to prevent fire and explosion incidents.

Using 220 V Portable Power Tools

By Chris G. Meringer, Planning & Technical Services Division, Loss Prevention Department

Historically, Saudi Aramco's power supply for the majority of its communities, offices and operating facility support buildings has been 110 volts (V). Consequently, company standards for using portable electric power tools met this requirement. In August 2010, however, the Saudi Arabian Ministry of Commerce and Industry decreed that the power supply across the Kingdom would be standardized to 400/230 V in residential areas and commercial buildings to increase capacity and reliability of the power supply grids.

The Kingdom's subsequent decision to ban the import of electrical products rated less than 220 V has resulted in a depleted supply of 110 V products, including portable electric power tools. To meet operational and project schedule demands without compromising safety to personnel and assets, Saudi Aramco revised its standards to allow for alternative operating voltage tools.

What can be used in Saudi Aramco?

Within company operating areas, portable electric power tools must be rated for use at a voltage not exceeding 240 V. Personnel in project sites and support facilities can now use either 110 V or 220 V tools as long as only a single voltage is used and the tools used match the supplied power source voltage. Using a single voltage throughout a job site will help prevent the use of plug adaptors or transformers, which when defective or not properly rated or constructed, increase the risk of fire and electrical hazards.

Another factor that increases the risks at a job site is the use of defective products. The best way to avoid the use of defective products is to use products that bear the mark of an independent testing and certification authority. These marks indicate that the product meets international product safety standards. Saudi Aramco requires portable electrical power tools to be certified by independent services, such as the North American Underwriters Laboratories (UL), Factory Mutual (FM), the European KEMA-KEUR or an equivalent.

Since tools are certified as a complete unit, any alteration from their original manufactured state nullifies their certification. Power tools must not be modified in any way, including the replacement of parts, such as the tool's plug to match the power source outlet.

Additional precautions

Replacing portable electric power tools with pneumatically powered or battery-operated tools is one method to eliminate the risk of electrical shock. If portable electric power tools are used, specific measures must be in place to compensate for the increased risk of electrical shock from higher voltages:

- Position cords and cables where they are not likely to be damaged by running them overhead or protecting them inside impact-resistant conduits or enclosures.
- Use double-insulated tools or tools with a manufacturer-installed three-prong plug.
- Install residual current devices (RCDs) close to the power source (i.e., at the distribution board or panel) to protect against electrical shorts in the cord or tool.

What is an RCD?

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RCDs, which also include ground fault circuit interrupters (GFCIs) and earth leak current breakers (ELCBs), are devices that can save an individual from a fatal electrical incident. An RCD compares the amount of electricity flowing from the outlet to the amount returning to the outlet. If there is a difference, which is an indication of a short in the power tool or cord, the RCD opens the circuit, effectively shutting off the flow of current.

These devices can be installed on the equipment supply cord, extension cord, receptacle or outlet, or mounted on the supply panel. RCD use in construction environments or their installation on portable equipment requires the user to visually inspect and conduct a function check of the RCD by operating the test button daily. RCDs should also be tested every three months by competent personnel with appropriate test equipment that can simulate a ground/earth fault.

Using portable electric power tools rated at 220 V and power supplies at higher voltages can be done safely. It is critical that the type of equipment selected is suitable for use on the job site and that the power supply, outlets, plugs and ground fault protection meet the safety standards specified in the online Saudi Aramco *Construction Safety Manual*, Volume II, Part I, Chapter 11, Hand Tools and Power Tools.

Safe Use of Ladders

By Pedro A. Adriao Fonte, Ras Tanura Area Loss Prevention Division

Ladders are very useful and versatile; however, people frequently underestimate the dangers associated with them. Many employers also assume that their employees are familiar with ladder related hazards. A bad assumption! According to the US National Institute for Occupational Safety and Health (NIOSH), improper use of ladders is a major cause of injury on the job.

What's the danger?

Broken bones, head injuries and even death are common outcomes from falls off ladders. Electrocution is also a possible outcome if a metal ladder comes in contact with a live electrical circuit.

Choose the right ladder!

It is important that you always use a ladder that is the appropriate size and type for the task. Many types of ladders are available and each is designed to do a certain kind of work. There are stepladders made for industrial, commercial or household use. There are single ladders, sectional ladders, extension ladders and rolling ladders. Ladders may be made of wood, fiberglass or metal, and they may be portable or fixed.

Ladders are designed and constructed to safely withstand a specific weight. The duty rating (as defined by the American National Standards Institute) is the maximum safe load capacity of the ladder. A person's fully clothed weight plus the weight of any tools and materials that are carried onto the ladder must be less than the duty rating.

Ladder duty ratings

- **Type IAA** — Extra heavy-duty industrial. Capable of supporting a 170-kg load.
- **Type IA** — Extra heavy-duty industrial. Capable of supporting a 136-kg load.

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- **Type I** — Heavy-duty industrial. Capable of supporting a 113 kg-load.
- **Type II** — Medium-duty commercial. Capable of supporting a 102-kg load.
- **Type III** — Light-duty household. Capable of supporting a 90-kg load.

Protect yourself one rung at time

Anyone who uses the wrong ladder or uses it inappropriately is courting trouble. Follow these simple ladder safety tips:

- **Each ladder is different —** Read the manufacturer's instructions. They contain essential information, such as weight and height limits, to help you set up and use your ladder safely.
- **Choose wisely —** Select the proper ladder for the task. If the ladder is to be used near electrical sources, use a ladder constructed from nonconductive material (e.g., wood or fiberglass). If the work is above 1.8 m or carried out over a long period, use an alternative means of access, such as a scaffold or lift platform.
- **Inspect the ladder before use —** Before stepping on the first rung, check the ladder for damage, defects, cracks or loose bolts. Make sure it is in good condition, the rungs are clean and all parts are intact. Never climb on a slippery or unstable ladder. Remove broken or damaged ladders from service immediately.
- **Secure the ladder —** Place all the ladder's feet on a firm, level surface. Spreaders, the devices that keep the front and back sections of a stepladder in the open position, should be completely extended and locked before placing any weight on the ladder. Properly secure and tie off extension ladders at the top and bottom.
- **Ladder angle —** When using a straight or extension ladder, follow the 4:1 rule (i.e., set it 1 m [3 ft] away from the wall for every 4 m [12 ft] of vertical rise). Straight and extension ladders can be placed vertically only if both side rails are rigidly attached to a supporting structure at the top, middle and bottom of the ladder.
- **Size it right —** Always use a ladder that is tall enough for the job. It should extend a minimum of 1 m (or roughly three rungs) above the top landing point.
- **Use a belt —** Don't carry tools and materials in your hands while climbing up or down a ladder. Use a tool belt or have someone hand the tools and material to you.
- **Face the ladder —** Ascend and descend the ladder facing the rungs and keeping your body and weight centered between both side rails. Maintain three points of contact with the ladder at all times (i.e., two hands and one foot or two feet and one hand).
- **Don't get too ambitious —** While on the ladder, don't overextend your reach. Over-reaching is a common cause of ladder incidents.

Ladder Safety Crossword Puzzle

Put your knowledge to the test. While you are cracking the crossword puzzle clues, think about how they relate to the safe use of ladders.

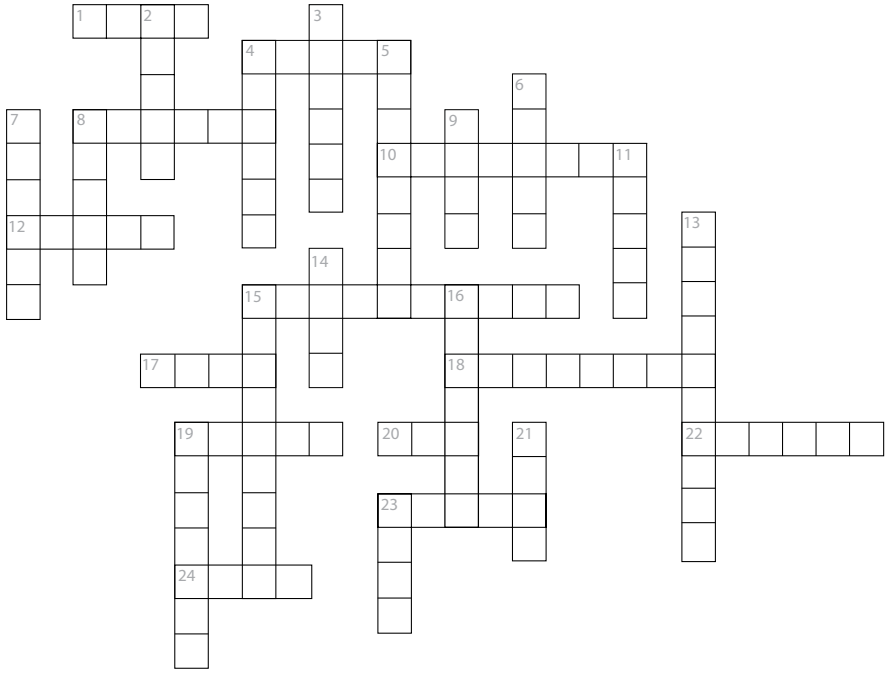
Across:

1. The thing on which something rests
4. Hand implements
8. Attach firmly
10. A lightweight metallic element
12. Apparatus for lifting
15. Relating to the flow of negatively charged ions
17. A unit of measure
18. A long narrow connecting bar
19. Slight hollows made in a surface
20. A single unit
22. To cause harm to property
23. Resulting in death
24. Sounded a bell

Down:

2. Reaction characterized by pain and muscular spasm
3. Stiff or lifeless
4. To draw or fasten together
5. Not curved
6. To create a masterpiece
7. Holds a boat in place
8. Not hollow
9. There is often an exception for every one
11. Not an alloy
13. Use this instead of a desk or chair
14. To incline
15. The new part of a house
16. Look at closely
19. Ruin completely
21. Sometimes Autumn
23. Number of players needed for Bridge

The answers to this puzzle will appear in the August 2013 issue of *Safety in Focus*.



Resources

Resources available at Loss Prevention's homepage: http://lp.aramco.com.sa

1. **Safety Films** available from the LPD Film Library:
   - 100.029 – High Impact Fall Protection
   - 100.054 – Spiral to Disaster
   - 100.079 – Emergency Action Plan: Crisis under Control
   - 100.158 – Using Hand and Power Tools Safely
   - 901.458 – Ladders
2. **E-Learning Courses**
   - Incident Management
3. **Special Publications**
   - Visit LPD's special page dedicated to the Fall Prevention at: http://lp.aramco. com.sa/site/education/campaigns/fallprevention
4. **References**
   - Saudi Aramco *Safety Handbook*
   - Saudi Aramco *Construction Safety Manual*
   - Saudi Aramco General Instructions (GIs) 2.100, *Work Permit System* and 6.008, *Restriction of Portable Electrical/Electronic Devices*
   - Saudi Aramco Engineering Standard (SAES)-B-067, *Electrical Area Classification*
   - National Fire Protection Association (NFPA) 70, *National Electrical Code*.
   - American Petroleum Institute Recommended Practice (API RP) 505, *Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone I and Zone 2.*
5. **SafetySmart™**
   - The international reference site SafetySmart™ available through a special link on LPD's homepage at: http://www.safetysmart.com/safetysmart/Learner.aspx?success

The editorial staff welcomes readers' comments and ideas. Please email your suggestions to SafetyinFocus@aramco.com or mail them to *Safety in Focus*, Saudi Aramco Loss Prevention Department, A-117, Building 3150, LIP, Dhahran 31311, Saudi Arabia or call 872-8868.

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