MARINE MINERALS ADMINISTRATION

SAFETY ALERT

Safety Alert No. 527
Date

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Prevent Cable Arcing and Arc Flash through Design, De-energization, Verification, and Inspection

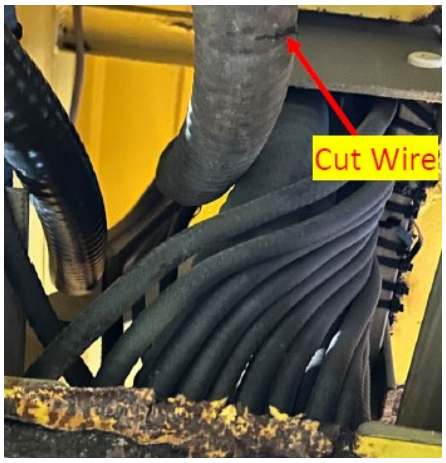


Figure 1: Live cable cut during replacement.



Figure 2: Damage to cable from ground lug installation.

Background:

A review of reported electrical incidents at offshore and marine facilities identified multiple events involving cable arcing, arc flashes, and electrical fires. The incidents revealed recurring deficiencies in electrical installation, inspection, maintenance, and safe work practices. Contributing factors included insulation failure, improper installation, inadequate maintenance and exposure to harsh marine environments. These incidents highlight the importance of implementing robust design, installation and maintenance practices aligned with National Fire Protection Association 70E (NFPA 70E), American Petroleum Institute Recommended Practices 14F and 14FZ (API RP 14F, API RP 14FZ).

Incidents:

- **Portable tool cable arc:** A portable floor-preparation tool arced when a worn power cable was flexed under load. The tool had not been inspected before use and lacked ground-fault circuit interrupter (GFCI) protection in a conductive environment.
- **Compressor motor cable arc flash:** During a motor change-out, a worker cut a live cable from the wrong circuit. Lockout/tagout (LOTO) procedures were incomplete, and absence of voltage had not been verified (Figure 1).
- **Control panel cable fire:** A damaged ground lug and improperly routed cable led to chafing, overheating, and an electrical fire. Strain relief was missing, and mechanical damage was evident (Figure 2).

Findings:

- Work was performed without establishing an electrically safe work condition, including incomplete lock-out/tagout procedures or failure to verify the absence of voltage.
- Job safety planning and briefings were not documented, and hazard identification and risk assessments for shock and arc flash were inadequate.
- Damaged or improperly maintained cables, lugs, strain relief, and terminations; insufficient inspections; and missing GFCI protection in wet or conductive areas.
- Improper cable selection and routing increased the risk of mechanical and environmental damage. Inadequate sealing allowed moisture or flammable gases to enter enclosures.
- Overcurrent protection devices were not always coordinated or properly rated. Single-line diagrams and equipment labels were outdated.
- Inadequate grounding and bonding contributed to stray currents and potential arcing.

Therefore, the Marine Minerals Administration recommends that operators and their contractors, where appropriate, consider the following:

Design and Installation Controls

- Select marine-rated cables suitable for environmental conditions and the application in accordance with applicable requirements, including API RP 14F Section 5.8. Consider armored or impervious-sheathed cables in hazardous and wet locations.
- Install Nationally Recognized Testing Laboratory (NRTL)-listed cable seals at all enclosure entries where required by applicable National Electrical Code (NEC) provisions, including NEC 501.15 for Class I hazardous locations.
- Make cable terminations according to manufacturer instructions, including specified torque values, conductor preparation, and minimum bend radius.
- Ground and bond all cable armor, enclosures and metallic sheaths in accordance with NEC Article 250 and applicable API RP 14F requirements.

Circuit Protection and Coordination

- Size overcurrent protection devices in accordance with NEC Article 240 and the applicable system design.
- Evaluate overcurrent protection coordination and available fault current to help minimize system disruption, equipment damage and arc-flash incident energy.
- Use current-limiting devices, such as current-limiting fuses, where appropriate to reduce fault current let-through and arc-flash incident energy.

Inspection, Testing, and Maintenance

- Implement regular inspection intervals and pre-use checks for cord- and plug-connected equipment. Remove defective tools from service and tag them “DO NOT USE.”
- Test insulation resistance periodically. Inspect cables, terminations, lugs and enclosures for corrosion, chafing, and damage. Repair or replace degraded components.
- Maintain equipment according to manufacturer instructions. Update single-line diagrams and keep maintenance records current.

Environmental and Operational Controls

- Route cables to protect from mechanical damage, hot surfaces, chemicals, abrasion, vibration and other environmental hazards.
- Use compatible fittings, adapters and thread types. Avoid mixing metric and National Pipe Taper (NPT) threads on fittings.
- Where appropriate, install space heaters or breathers rated for the area classification to prevent condensation in electrical enclosures.
- Provide strain relief at cable and cord terminations to prevent excessive bending or loading.
- Provide appropriate GFCI protection in accordance with applicable NEC provisions, particularly in wet or conductive locations.

Note: GFCIs protect against shock (ground-fault leakage), AFCIs detect arcing faults, and arc-flash mitigation is achieved through engineered controls (such as current-limiting fuses).

NFPA 70E Electrical Safety Practices

- Establish and implement an electrical safety program that includes risk assessments for shock and arc flash hazards.
- Establish an electrically safe work condition in accordance with NFPA 70E. Identify the circuit, isolate all energy sources, apply lock out/tag out procedures under Article 120 and verify the absence of voltage before work begins.
- Do not rely solely on circuit identification, labeling, drawings, or control room indications to determine whether equipment is de-energized. Test for absence of voltage using a properly rated meter. Verify the meter on a known live source before and after testing.
- Define boundaries and select personal protective equipment (PPE) based on incident energy or the arc flash PPE category, as applicable. Label equipment with arc flash information as required by NFPA 70E, Section 130.5(H).

- Train and qualify personnel who perform electrical work or are exposed to electrical hazards (Article 110.2). Provide retraining at intervals not exceeding three years and when conditions warrant. Verify compliance through work-practice audits (Section 110.3(L)).

Note: The documents referenced in this alert are for guidance only. Operators should always consult the latest editions applicable to their installations to ensure alignment with current electrical safety, arc-flash, and lockout/tagout best practices.

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A Safety Alert is a tool used by the Marine Minerals Administration to inform the offshore oil and gas industry of the circumstances surrounding a potential safety issue. It also contains recommendations that could assist in avoiding potential incidents on the Outer Continental Shelf.

As of July 10, 2026, the Department of the Interior has reunified the Bureau of Ocean Energy Management and the Bureau of Safety and Environmental Enforcement into the Marine Minerals Administration, which will oversee the responsible development of the nation's offshore energy and marine mineral resources with an integrated focus on safety, environmental protection and efficient oversight. For more information, visit Transition to the Marine Minerals Administration | U.S. Department of the Interior.

CATEGORY: Electrical Safety; Cable Integrity; Arc Flash Prevention; Portable Equipment