



Working Near Lightning

Standard
Operating
Procedure

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1.0 Purpose

This SOP provides:

This procedure outlines the expectation for working when there is potential for lightning producing weather and how to determine if a storm with local lightning is active and present

2.0 Roles and Prerequisites

Role(s)	Quantity Required	Prerequisites
All workers	1 or more	1. Understand the content of this SOP and the precautions required to ensure workers remain safe when lightning has been detected

3.0 Tools and Equipment

Minimum Tools and Equipment Required:

- N/A

4.0 Procedure

The Procedure

The following requirements shall be met prior to the start of the procedure:

- Complete Hazard/Aspect and Risk Assessment - **Ensure weather conditions are considered**
- Applicable Personal Protective Equipment (PPE) is available and in good condition
- Consider Environmental Best Management Practices

1.0 Lightning Information and Detection

1.1 Characteristics of Lightning

- *Lightning is an electrical discharge within a thunderstorm*
- *As a thunderstorm develops, the clouds become charged with electricity. Lightning can be described as a transient, high-current electric discharge whose path length is generally measured in miles. The high-current pulse is a direct current transient that has been recorded to reach up to 260,000 amperes that can have duration of up to 200 microseconds. On the average, it will reach 20,000 amperes with 50 microsecond duration. Lightning occurs when some region of the atmosphere attains an electric charge sufficiently large to cause electrical breakdown of the air. The most common producer of lightning is the thunderstorm cloud*
- *Cloud-to-ground lightning is the one that most concerns electric utilities, because it may cause transient spikes, outages or interruptions to overhead power lines*

- *As a lightning strike hits and progresses along a wire, the wave front lengthens and the magnitude is reduced, although can still be very dangerous to the worker(s)*

1.2 Type of Work Being Done

- ***CAUTION : Discontinue all overhead electrical work when there is any indication of lightning or other inclement, lightning producing weather in the surrounding area. Lightning can travel down the line from a long distance and has been known to frequently strike 16km (10 miles) from the storm centre***
- ***Working aloft on a conductor, energized or de-energized can pose a significant risk depending on the length and direction of the overhead line that lightning can travel***
- ***Another example is working elevated position or standing in an open area with no buss work or apparatus above in a substation/switching station etc.***
- *Workers must realize that overhead ground wires and structure grounds were designed to protect the system and associated equipment, not to protect the maintenance worker from possible effects of lightning*

1.3 Weather Recognition

- *As weather passes by and clouds form it is very prudent to recognize severe weather before it can cause problems*
- *Most lightning producing weather happens in spring and summer when unstable air masses collide and cause clouds to build*
- *Heavy rolling clouds, fast moving cold front passage, showers of large rain drops, ice pellets and hail are all indicators of lightning producing weather that may precede an initial strike before any other detection method is activated*

1.4 Lightning Detection

- *Several methods are available to detect lightning. For example, radiofrequency monitors, visual/audible detection and/or weather reports may be helpful*
- *In one form or another, these methods can be applied by employees at all levels to know when a lightning hazard is expected or imminent. All available forms of information should be used to detect lightning and determine if the threat or strikes are remote (more than 6 miles) or local (less than 6 miles)*
- *A major disadvantage of most detection systems is that they cannot predict the first strike of lightning. They can only tell what has already happened. At the front of a fast-moving storm, risk of first strike may be significant. Tracking and early warning is a good feature available from many lightning detection systems*

Note: 30/30 Rule: When a lightning bolt flashes, it is seen immediately, but the sound of thunder takes approximately five seconds to travel a mile (1000 ft. /second). Typically, the furthest distance that a person can hear thunder from a lightning strike is about six miles (30 seconds). So, if after seeing a lightning strike, you can count fewer than 30 seconds before hearing thunder, you could be in danger working outdoors and all employees shall take cover, or other appropriate safety measures. Wait for at least 30 minutes after hearing the last thunder before you resume your activity. This is referred to as the 30/30 rule and is not considered an exact science

1.4.1 The following methods can be used to detect lightning:

Visual/Audible Detection

- *This method involves the employees' ability to recall the "flash-to-bang" method to determine the distance of lightning strikes*
- *Once a lightning flash is observed, the sound of the associated thunder takes 5 seconds to travel one mile. Using this rule of thumb, employees can easily detect and measure the distance to a lightning event*

Maximum audible range of the thunder associated with lightning is approximately 6 miles, flash-to-bang time of 30 seconds. With the speed of some storms and the exposed locations of work, detection of lightning at a range of 6 miles may not provide employees enough time to take protective measures or discontinue especially hazardous operations. Because of the weakness of the sight and sound detection method, other methods of detection should be used to help identify the approaching hazard and provide some extra amount of lead time

Weather Reports

- *Weather reports are available through various media; radio, television and internet. These reports, especially forecasts, are useful to know when to expect lightning hazards and plan accordingly*

2.0 Lightning Detected

2.1 Steps to take if lightning is suspected due to inclement weather

- *Actions:*
 - a) *Notify personnel of increased lightning hazard*
 - b) *Revisit the HARA to indicate steps taken*
 - c) *Closely monitor lightning activity*
 - d) *Identify locations/vehicles to go to for shelter if needed*
 - e) *Begin to secure the jobsite and equipment*



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f) Do not start new work procedures and activities other than critical tasks

- **Local Lightning detected at 6 miles (Thunder is heard within 30 seconds of lightning strike):**

Actions:

a) Immediate cessation of all outdoor electrical or lightning hazardous work. Abandon efforts to secure equipment if not completed

b) All personnel take cover in designated shelters. If no shelter is available, personnel can move to hardtop automobiles for shelter. Personnel on foot should find low risk locations and disperse if no other options are available

2.2 If a Vehicle or Equipment is Struck by Lightning

- If the vehicle stalls due to a lightning strike, coast and steer the vehicle to a safe location off the driving surface if possible.
- Stay in the vehicle if safe to do so in the event that lightning strikes again in proximity of the stalled vehicle.
- Stay inside until the threat of lightning passes using the 30/30 rule, and contact someone if possible to come to the location with a different vehicle to retrieve the worker(s)
- If everything appears operational, continue driving with extreme caution and constantly monitor the electronic indicators (gauges) of the unit for possible malfunction and drive to a safe location until lightning subsides or has passed by to a safe distance away.
- Vehicle/Equipment must be inspected by qualified person before is put back into service

3.0 Work can Resume

- All outdoor electrical or lightning hazardous work shall remain ceased for the time that the lightning is local (within 6 miles) and for 30 minutes after the last local strike is detected before work can resume

5.0 Components

The following is a list of components for this SOP which can be accessed through the SOP System:

Component Name	Component Type	Component Description	Location of Component
Lightning Safety Poster	Job Aid	A poster for display at the workplace to raise awareness of the 30/30 rule	SOP Online - Working Near Lightning SOP

6.0 Acronyms, Definitions and Symbols

Acronyms and Abbreviations

N/A



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Definitions

Lightning

The movement of rain and ice inside a thunder cloud create an electrical charge, with the negative charge (electrons) forming at the bottom and the positive charged (protons) forming at the top. Because opposites attract, the negative charge seeks out the shortest route to something with a positive charge. This may be a tree, tall building or a tower.

Thunder

Intense heat from lightning causes the surrounding air to rapidly expand and create a sonic wave that you hear as thunder.

Symbols

N/A

7.0 Policies and Regulatory Requirements

This SOP is a result of the following regulations, policies, industry standards, and corporate directives and standards:

Regulatory Requirement(s)

- N/A

Policies

- Hazard/Aspect and Risk Assessment Policy
- Personal Protective Equipment Policy
- Working Alone Policy

Standards

- Hazard/Aspect and Risk Assessment Standard
- Deviation from Safe Work Procedure Standard

Other

- Safety and Environment Rulebook
- Environmental Best Management Practices

8.0 References

References

Working Near Lightning Safety bulletin