PILBARA PORTS AUTHORITY

LIGHTNING PREPAREDNESS AND RESPONSE OPERATIONAL PROCEDURE

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LIGHTNING PREPAREDNESS AND RESPONSE OPERATIONAL PROCEDURE

1. USING THIS PROCEDURE

This procedure provides operational level response actions to minimise the risk of personnel working in exposed locations where there are risks associated with lightning activity. The procedure serves as a standalone document, so workers have sufficient information to manage lightning risk to themselves and other personnel.

The procedure can also be read in conjunction with the Lightning Preparedness and Response Plan which provides additional information to assist in understanding lightning risks and additional requirements for specific operational activities.

Supervisors and managers who have responsibility in managing the health and safety of personnel working in or accessing areas where they could potentially be exposed to lightning risks are required to read the Lightning Preparedness and Response Plan in conjunction with this document and should consult with their work teams, and other PCBU's if relevant, in hazard management decision making .

Managers responsible for operations which have specific response plans in the Lightning Preparedness and Response Plan must ensure workers under their control are aware of the requirements.

2. OBJECTIVE

The objective of Pilbara Port Authority's (PPA) Lightning Preparedness and Response Operational Procedure is to minimise the risk of harm to personnel from lightning activity.

3. SCOPE

This procedure applies to:

- A person conducting a business or undertaking (PCBU), and all workers working for a PCBU, for or on behalf of PPA on a PPA site or PPA controlled works.
- A vendor's worker may work under their own company's lightning preparedness and response procedures if formally agreed.
- PPA tenants are required to meet the intent of this procedure, by putting systems in place to manage risks associated with lightning.

The scope excludes:

- Helicopter operations are outside of PPA's core business expertise and subsequently PPA engages specialist contractors to undertake helicopter operations. It is the responsibility of these contractors to manage any risks relating to helicopters and lightning;
- Ship's crew undertaking shipboard operations, which should be conducted under each vessel's safety management system; and
- Members of the public, other than as a visitor, accessing port land and waters are not under PPA's control and are responsible for managing their own health and safety.

4. DEFINITIONS

Table 1: Terms and Definitions

TERM	DEFINITION
Alerts	Notification sent to workers to warn them of detected lightning activity or that an all clear has been declared.
All clear	Issued through Weatherzone or by an authorised management representative when no lightning activity has been detected within 40km in the last 30 minutes (using Weatherzone or a hand-held detection device) or the storm has visually moved on and there has been no observation of lightning or sound of thunder for 30 minutes.
Faraday cage	A Faraday cage or Faraday shield is an enclosure used to block electromagnetic fields. A Faraday shield may be formed by a continuous covering of conductive material, or in the case of a Faraday cage, by a mesh of such materials.
Hazardous activity (due to lightning activity)	An activity where the presence of lightening would introduce new hazards due to the nature of that activity. Includes but is not limited to: • Plumbing and electrical work. • Crane operations and use of an EWP or scissor lift. • Operation of plant and equipment without enclosed cabins in exposed areas. • Refuelling. • Loading, unloading or handling of hazardous cargos, flammable liquids and dangerous goods. • Operation of open topped boats or vehicles. • Assessing areas of mobile or fixed plant which are open to weather or made of conductive material. • Operation of plant or vehicles where lightning strike could cause an accident. • Operation of earthmoving equipment and ground engaging tools. • Walking in open areas • Any activity which is determined as a hazardous activity pursuant to a risk assessment.
Lightning	The occurrence of a natural electrical discharge of very short duration and high voltage between a cloud and the ground or within a cloud, accompanied by a bright flash and typically also thunder.
Lightning activity	An event in which one or more lightning strikes occur within 40km of a Port or other work site where works are being undertaken for or on behalf of PPA.
Safe location	Includes: • Large buildings and offices. • Enclosed metal structures with non-conductive flooring. • Control rooms fitted with lightning protection systems.

TERM	DEFINITION
	• Stationary and enclosed vehicles with the windows up[1]. • Stationary and enclosed mobile plant (i.e., front-end loaders or cranes) with the windows up. • Enclosed metal boats with lightning protection systems.
Task Supervisor	A worker assigned to supervise other workers perform a specific task with the intention to provide an increased level of hazard management and risk control.
Unsafe location	Includes but is not limited to: • Open areas (i.e., open fields and parking areas), hilltops, ridges and ship's bridge wings. • Areas on top of buildings or in open structures. • Sumps, dams and other water bodies. • Touching water. • Near wire fences, clothes lines, overhead wires and fixed rails. • Near isolated trees. • Near electrically conductive objects. • Near windows (inside buildings). • Open-sided vehicles plant and machinery (including scooters, motorcycles, and bicycles). • Open boats without masts. • Communication or lighting towers and navigational beacons. • Non-metal topped or open vehicles. • Touching the structure of cranes, hoists and ship loading apparatuses outside of lightning protected control rooms. • Any location which is determined as an unsafe location pursuant to a risk assessment.
Weatherzone	Lightning detection network that sends out notifications when lightning is detected or an all clear has been declared. This lightning detection network is available at PPA's Port Hedland, Dampier, and Ashburton sites.
Visitor	A person who is signed in as a visitor at a PPA site and typically has not completed the PPA induction program and who is not engaged to participate in any work activities. They are escorted at all times by inducted personnel.

[1] Convertibles do not have metal roofs and as such cannot be considered a safe location. In addition, some vehicles are manufactured out of non-metal parts, which impedes the ability of lightning to flow around the car and as such are also not considered as a safe location.

5. RESPONSIBILITIES

Table 2: Responsibilities

ROLE	RESPONSIBILITES
Line Managers and Task Supervisors	Understand and comply with the requirements of this procedure and the Lightning Preparedness and Response Plan. Ensure that workers under their control are aware of, understand and comply with the requirements of this procedure and any sections of the Lightning Preparedness and Response Plan relevant to their work activities.
Employees and vendors	Comply with the requirements of this procedure.
Contract Owners and delegated Contract Coordinators	Ensure compliance with this procedure as per Vendor Management Procedure expectations for the engagement method selected.
Visitors	Comply with all reasonable instructions given by your escort.

All workers are responsible for their own safety decisions. If you feel at threat from lightning activity, seek immediate shelter in a safe location. Workers will not be penalised for leaving an area or situation that they deem dangerous because of lightning activity, nor decisions they make to protect other personnel under their escort.

6. MONITORING AND ALERTS

A system must be in place to monitor for lightning activity and provide alerts to workers of lightning activity when undertaking any outdoor work or hazardous activities where it is reasonably foreseeable that lightning activity could occur within the duration of the works. This includes:

- January to March which is the peak period for lightning activity in the Pilbara; and
- Where weather forecasts indicate potential for storm activity within the duration of the works.

The system of monitoring and receiving alerts should be documented in the task risk assessments where risk of storm activity is present.

Details of approved monitoring and alert systems in use by PPA are described in the Lightning Preparedness and Response Plan.

7. LIGHTNING RESPONSE

7.1 Responding to Alert Levels

Lightning alert levels are determined by proximity of lightning activity (both inter and intra cloud strikes and ground strikes) with the highest alert level applying. The alert levels from lowest to highest are:

- "Blue Alert" – lightning within 40 km;
- "Yellow Alert" – lightning within 20 km; and

- "Red Alert" – lightning within 10 km.

Alert levels downgrade after 30 minutes with no lightning activity being detected within the designated range and an "All-Clear" is issued when no lightning has been detected within 40 km for a period of 30 minutes.

The process for determining alert levels is described in the Lightning Preparedness and Response Plan.

The required response action at each alert level is described in Table 3.

Table 3: Alert Levels and Response Actions

ALERT	RESPONSE
Blue Alert Lightning detected within 20 - 40km	All personnel are advised that lightning activity has been detected. Familiarise yourself with the requirements of future lightning alert stages. Prepare to take further action. Identify the nearest safe location (see Section 9.1) and if none are nearby either: • Be prepared to move to a safe location if the lightning alert level increases; or • Consider moving one or more light vehicles to the job site which can be used as a safe refuge for the work group if lightning activity moves closer. Task Supervisor or delegate to monitor lightning activity (see Section 6).
Yellow Alert Lightning detected within 10 - 20km	Line manager (or delegate, e.g., a task supervisor) is to risk assess current operations in relation to lightning activity giving specific consideration to unsafe locations and hazardous activities. Suspension of the following hazardous activities: • Crane operations (booms lowered where the crane design allows); • EWP and scissor lift activities; • Bulk liquid and dangerous goods operations; • Refuelling operations; and • Hazardous activity or work in unsafe locations where the location or nature of the work mean that a safe location[2] cannot be reached within 5 to 10 minutes. All personnel in unsafe locations with no nearby safe location to relocate to a safer location.

[2] Vehicles parked at the jobsite with enough seating capacity for the work crew may be considered as safe location.

ALERT	RESPONSE
	Familiarise yourself with the requirements of future lightning alert stages. Prepare to take further action (include identifying safe park up zones front end loaders taking into consideration potential for lightning strikes to cause tyre explosions) Task Supervisor or delegate to monitor lightning activity (see Section 6).
Red Alert Lightning detected within 0 - 10km	Suspension of activities as per Yellow Alert plus the following additional controls. All personnel immediately seek a safe location (see Section 9.1) and remain in place until the alert is downgraded. Relocation to another safe location should only occur in exceptional circumstances and by the shortest route possible. Remove yourself from unsafe locations and cease hazardous activities (see Section 10). Suspension of out-door front end loader operations. Front end loaders to be parked such that potential line of fire if a tyre explosion was to occur is minimised. Line manager (or delegate) to monitor lightning activity (see Section 6). Use of wired radios in vehicles or buildings to be kept to a minimum. NOTE: When Weatherzone is available and practicable, the security guards will broadcast over the public announcement system to advise personnel at Ashburton, Dampier or Port Hedland (as relevant) that the site is on “Red Alert”. The message will say something along the lines of *“Attention, attention, attention. Lightning has been detected within a 10km radius of this facility. Safely stop your task and take shelter immediately. You will be advised when it is safe to return to work.”* At the Utah Point Gatehouse, a red flashing beacon will be activated by the security guards following Weatherzone advice that site is on red alert. The red flashing beacon will remain on until advice has been received that the lightning risk has reduced (i.e., the site is no longer on red alert).
All Clear	Return to outdoor activities with caution. Continue monitoring for further lightning activity (see Section 6). NOTE: When Weatherzone is available and practicable, the security guards will broadcast over the public announcement system to advise people at Ashburton, Dampier or Port Hedland (as relevant) that the site is “All Clear”. The message will say something along the lines of *“Attention, attention, attention. All clear has been given, please return to outdoor activities with caution”.*

If it is thought that following a control creates a greater risk than not following it and this is confirmed by a risk assessment, then the control does not need to be followed and instead the controls identified in the risk assessment will apply.

Additional task or site-specific controls may apply. See your Task Supervisor or the Lightning Preparedness and Response Plan for more detail.

7.2 Responding to Unexpected Lightning Events

Avoid unsafe locations, like under trees. Where the safest option is to move to a safer location, do so as quickly as possible.

If you are caught in an unsafe location during lightning activity you should:

- Move to a safe location as quickly and safely as possible;
- Avoid contact with conductors (such as metal or water).

Avoid touching, handling and proximity to metal objects that may become part of the discharge path, for example towers, mobile plant, power lines, fences and pipes. Avoid using electrical equipment and hand tools. Avoid handling umbrellas, or any metal objects and stay clear of sheet metal, wire fences, and water bodies.

If you feel your hair standing on end, and/or hear "crackling noises," and/or feel a tingling sensation, this may indicate that you are in lightning's electric field and that a lightning strike is imminent. If the nearest safe location is more than a few steps away it is considered safer to crouch down and assume a safe position than to try and reach the safe location.

The safest position when caught in the open during lightning activity is:

- Do not lay down. Crouch down as small as possible (minimising your size as a target);
- Keep your feet close together (this minimises the risk of step voltage injuries[3]);
- Tuck your head down;
- Place your hands on your knees;
- Remove metal objects from your person (jewellery, belts, keys etc).

If in a group, the Department of Mines, Industry Regulation and Safety (DMIRS) recommends staying approximately 3m from other persons.

Laying down flat on the ground increases your total body surface area, which also increases your chance of getting struck by lightning.

[3] See the Lightning Preparedness and Response Plan for more detail on step voltage injuries.

7.3 Responding to Lightning Strikes

7.3.1 To Another Person

(a) Call for Help

Call 000 and the VTS as per PPA's Emergency Response Plan for the Port at which the incident has occurred. The VTS will contact PPA's site security who have first aid training and access to defibrillators.

(b) Assess the Situation

Ongoing lightning activity or other hazards may pose a threat to both the victim and responder. If the victim is in a high-risk area, consider moving them to a safe location if safe to do so[4].

(c) Respond

The person struck may be unconscious, disorientated, or unable to speak. The victim also may have stopped breathing. If they are not breathing, begin first aid immediately (if competent to do so) and continue until medical attention arrives. If the victim is burnt or bleeding, apply appropriate first aid.

People who have been hit by lightning do not carry a charge and as such undertaking first aid will not result in an electric shock from touching them.

7.3.2 To Equipment or Infrastructure

Notify your supervisor as soon as possible who will initiate response actions as detailed in the Lightning Preparedness and Response Plan.

8. PROTOCOLS FOR MARINE OPERATIONS DURING LIGHTNING EVENTS

In addition to the response actions listed in this procedure, the local Vessel Traffic Services Centre (VTSC) will initiate their adverse weather response protocols.

During "Red Alert", all work activities which require access to an exposed area on a vessel are to cease and personnel are to remain in a safe shelter location until the alert level is downgraded.

Marine Pilots, both PPA employees and workers operating under a contract, may work during a Red Alert when the following conditions are met:

- The Marine Pilot has real time access to Weatherzone's Oracle Weather mapping radar module;
- The Marine Pilot has been trained and deemed competent on how to use and interpret the Oracle Weather mapping radar module; and

[4] The Lightning Safety Guidelines (Zimmermann *et. al.* 2002) state that it is relatively unusual for victims who survive a lightning strike to have major fractures or internal injuries unless they have suffered a fall or been thrown a distance. As such, relocating victims to an area of lesser risk is recommended. The guidelines state that rescuers should not be afraid to move the victim rapidly if necessary. If relocating a victim who is not breathing it is recommended to give them a few quick breaths beforehand.

- The Marine Pilot has deemed that personnel are not at risk of lightning after interpreting the data on Oracle Weather mapping radar module.

The Marine Pilot must continuously monitor the live Oracle Weather mapping radar module if they are working under Red Alert conditions and stop work if they assess that operations are no longer safe to continue.

A Harbour Master, Deputy Harbour Master, and the Marine Pilot can stop work at any time they consider that there is risk from lightning.

The Marine Pilot does not have the authority to instruct other workers to work under red alert conditions.

Note - Marine Pilot transfer by helicopter is not within the scope of this procedure. Operators of helicopters are required to assess and manage all risks to helicopter operations.

9. SHELTER LOCATIONS

9.1 Safe Locations

Safe locations are listed in Table 1. See the Lightning Preparedness and Response Plan for further information on safely sheltering in buildings, fixed plant and vehicles.

Personnel in a safe location are required to shelter in place until it is safe to leave. When there is lightning activity, you must not travel across open areas to relocate to another refuge that is perceived to be safer or more comfortable.

It is recommended that personnel in an enclosed vehicle arriving to site to start their shift where “Red Alert” is declared, park safely and shelter in place.

If you are sheltering in a safe location during “Red Alert” when your normal shift end occurs, it is recommended to remain in that safe location until the lightning alert is downgraded and it is safe to go home. If there is potential that extended time onsite could result in workers experiencing fatigue, see the Fitness for Work – Fatigue Management Procedure. Workers that chose to leave site during a “Red Alert” are placing themselves at risk of injury.

Workers on small open vessels unable to make it back to a safe location on shore before lightning activity reaches them may consider sheltering under the structure of a berth. Where there is enough headroom to safely shelter, considering tidal conditions and potential storm surge, sheltering under a berth is safer than travelling across open water.

9.2 Unsafe Locations

Unsafe locations are listed in Table 1.

Movement across unsafe locations must only be undertaken by the shortest route possible to the nearest safe location and must only be undertaken when remaining in the current location is unsafe.

10. ACTIVITIES WHICH ARE HAZARDOUS DURING LIGHTNING

Hazardous activities are listed in Table 1. See the Lightning Preparedness and Response Plan for further details on crane operations and accessing exposed areas on mobile or fixed plant and machinery.

11. RETURN TO WORK AFTER A LIGHTNING EVENT

After a lightning event, workers should remain in a safe location until either:

- An All Clear has been issued for the site; or
- The storm is travelling away from the site and the lightning alert level has been downgraded to a level in which their work activity is permitted.

Issuing of an All Clear or downgrading an alert level must either by via Weatherzone or the person in charge following protocols as described in the Lightning Preparedness and Response Plan.

12. INSPECTING WORKPLACES AND ASSESSING WORKERS AFTER A LIGHTNING EVENT

Lightning from cyclones and storms can be traumatic events for those involved and there can be a sense of urgency around clean-up activities. Harbour Masters should arrange an assessment of any lightning damage to power poles, trees, work areas in advance of return to work following a cyclone, storm or flood. The WorkSafe Information Sheet: Clean up after cyclones, storms or floods may be of use. Consideration should also be given to managing stress and trauma workers may have experienced.

13. REFERENCES

WorkSafe, Information Sheet, Clean up after Cyclones, Storms or Floods (2023)

WorkSafe, Fact Sheet – Lightning and Outdoor Work (2018)

PPA Lightning Preparedness and Response Plan

Zimmermann, C. Cooper, M.A. Hole R.L. (2002) Lightning Safety Guidelines, Annals of Emergency Medicine 39(6)

14. PROCESS OWNER

The Director Health and Safety is responsible for this Procedure.