



www.BokSmart.com

[f/BokSmart](https://www.facebook.com/BokSmart)

[@BokSmart](https://twitter.com/BokSmart)

Guidelines for Dealing with Lightning

Authors:

Prof Ian R Jandrell (PrEng, BSc(Eng) GDE(Elec) PhD, SMIEEE FSAIEE)

Dr Ryan Blumenthal (MBChB (Pret), MMed (Med Forens) Pret, FC For Path (SA) Dip For Med (SA) PhD (Wits))

Authors' affiliations:

Prof Ian R Jandrell

Ian is a Personal Professor and Dean of the Faculty of Engineering and the Built Environment at the University of the Witwatersrand. He is also the CBI-electric Professor of Lightning.

At Wits Ian is joint leader of the High Voltage and the Lightning/EMC Research Groups and has an NRF C-rating as a researcher. He is the author or co-author of more than 100 papers in the areas of High Voltage Engineering, Earthing and Lightning Protection and Industrial EMC.

Ian is an Associate Editor of the Journal of Lightning Research and a Member of the Scientific Committee of the International Conference on Lightning Protection.

Dr Ryan Blumenthal;

Senior specialist forensic pathologist at the University of Pretoria's Department of Forensic Medicine. His chief field of interest is the pathology of trauma of lightning (keraunopathology).

He has been involved in the publication of numerous articles and textbooks on lightning and electrothermal injuries and has helped generate international standard operating procedures

and guidelines for lightning strike fatality and electrocution victims. He has also published widely in the fields of suicide and other areas involving the pathology of trauma. His chief

mission in life is to help advance Forensic Pathology Services both nationally and internationally.



These Guidelines have been compiled using the World Rugby Guidelines and the additional referenced documents, with some of these points having been taken verbatim. These have then been Peer Reviewed and Edited for accuracy and simplistic application by local experts from the University of the Witwatersrand and the University of Pretoria.

Please note that these guidelines are designed to take account of best international practices on the subject. At the same time these guidelines are designed to be pragmatic. The guidelines were also written in contemplation of the *Safety at Sports and Recreational Events Act (Act 2 of 2010)*

The Guidelines will cover four main areas:

- General lightning safety tips and guidelines applicable to all levels of rugby (practices, and amateur club and school matches, and tournaments that happen most of the year around the country)
- Additional lightning guidelines that are applicable to all professional rugby matches
- Stadium safety
- What to do should a member(s) be struck by lightning

General lightning safety tips:

Rugby is an outdoor activity, and as such players and spectators are at risk during a lightning storm. This section will deal with the topic of 'foreseeability'. In other words, the ability to foresee the risk of lightning strike and lightning danger.

As lightning can strike the ground a large distance from the centre of the storm, and as storms can move very fast, it is critical that everyone involved in rugby, whether during a practice or a match, as a spectator or on the field, is vigilant, especially in areas where thunderstorm activity is common.

If lightning is detected within 20 km of an event, one is considered at risk, and one must therefore remain vigilant. If the storm moves closer, one must seek shelter as soon as possible. If lightning is detected within 10 km of an event, one is at extreme risk, and must seek shelter immediately. If a lightning warning system is installed at an event, one must seek shelter immediately upon hearing the siren.

One must remain in the shelter until the lightning has moved off to a distance of at least 20 km, and is moving away from the event venue.

What can one do to prevent being hit by lightning?

‘When thunder roars, go indoors!’¹

- The most important safety rule when a thunderstorm is moving over an area is to seek shelter immediately.
- The shelter should be a fully enclosed substantial building. This means a brick building, fully enclosed, with preferably a cement floor, such as a club house, change room, school building or purpose-built lightning safety shelter.
- A suitable shelter may also be any fully-enclosed metallic surface area, which is known as a Faraday cage or a Gaussian surface enclosed area.
- Another important safety rule is to seek shelter well before lightning occurs and to remain indoors until the storm has passed.
- As lightning tends to occur ahead of the storm, and behind the storm, one needs to remain in the shelter until the storm has receded to a safe distance.
- If one counts 30 seconds or less between a lightning flash and when one hears thunder, one is at extreme risk and should seek shelter immediately.

¹ Commonly used phrase encapsulating the principle of being at risk out of doors.

- As sound travels at about 300 m/s, a delay of 30 s between seeing the flash and hearing the thunder means that the strike was about 10 km away. That is extreme risk.
- At sporting or outdoor events, organizers must ensure that the players and spectators seek shelter, well before a storm moves over.

General Lightning safety principles

- Lightning safety is a combination of personal vigilance and the application of systems and technologies to ensure the safety of people.
- Any major rugby ground should have a lightning detection system installed that can be used in conjunction with personal vigilance to ensure that people move into safe areas before the storm is too close.
- The following guidelines should be followed when a thunderstorm moves over an area:
 - If one is outdoors and one hears a lightning warning siren, or one sees or hears a thunderstorm approaching, one should immediately seek shelter!
 - If one counts 20 seconds or less, one is at risk of a lightning strike
 - One should assume a high level of personal vigilance if there is 30 seconds or less between the lightning flash and the associated thunder clap.
 - When one sees the lightning FLASH count the seconds to where one hears the BANG. At 20 seconds – suspend all outdoor activities and seek safe shelter as lightning strikes are imminent.

Stopping Activities

NOTE: *The estimates provided in kilometres, although not 100% scientifically accurate are rounded off and are provided as such for simplicity of use and understanding, and are based on the approximated values provided by the source documents.*

- In general, a significant lightning threat extends outward from the base of a thunderstorm cloud to about 20 km.
- Therefore, people should be seeking a safe place when a thunderstorm is within 20 km.
- When the lightning strike is within 10 km of the venue, one is at extreme risk and players must be removed from the pitch.
- Remember stopping activity is never convenient!
- It is better to have all members playing the game at a later stage than losing a member to a lightning strike.

Seeking Safe Shelter

- No place OUTSIDE is safe in or near a thunderstorm.
- Stop what one is doing and get to a safer place immediately.

UNSAFE areas:

- Small outdoor buildings including dugouts, rain shelters, sheds, etc. are NOT SAFE
- Open spaces, especially where large numbers of people are assembled together;
- Close vicinity to large structures or trees;
- Small permanent and temporary structures and shelters especially metal structures;
- Under a single tree or a small group of trees;
- Close to a large body of water;
- In open areas

SAFE areas:

- It is advised that all building structures have a lightning conductor near to but not touching the building.
- Substantial buildings with permanent wiring and plumbing to provide safe pathways for current from strikes to go to ground are the safest places.
- Office buildings, schools, and homes offer good protection.
- Once inside, stay away from windows and doors and anything that conducts electricity such as corded phones, wiring, plumbing, and anything connected to these.

- Fully enclosed metal vehicles which are earthed (such as busses) to guide the current around the occupants or a hard-topped metal vehicle with the windows closed also provides good protection.
- Avoid contact with metal in the vehicle and try to keep away from windows.

Resuming Activities

Thunderstorms have a tendency to reverse course and come back over an area that they have just passed.

And because electrical charges can linger in clouds after a thunderstorm has passed, recommendations on best practice state that people should wait until the lightning is at least 20 km away and it has been confirmed that the storm is receding.

Monitoring the Weather and Making Decisions

- Know the weather patterns in the area.
- In circumstances, where live data is available from local meteorological services along with advice from an expert, this data should be used to assist in the decision about whether to allow the event or match to commence, continue or be abandoned.
- Communication with local weather services or tracking of weather alerts should be established in advance of any event.

- Lightning safety plans should specify that someone be designated to monitor the weather for lightning.
- Determination of a chain of command which clearly identifies the person with ultimate responsibility to stop the event, either temporarily or indefinitely or to evacuate the venue is vital.
- It should be ensured that this person is familiar with local protocols and is provided with accurate and up-to-date information.
- The ‘lightning monitor’ should ideally not be the coach, umpire, or referee, since they are busy doing other things and can’t adequately monitor conditions.
- The ‘lightning monitor’ must know the plan’s guidelines and be empowered to follow the guidelines.
- It is important that large venues have lightning detection systems and lightning warning systems that provide an audible warning.
- Personal vigilance is critical at all times.

Summary of proposed actions:

Lightning detected:	Risk level:	Proposed action:
Within 20km of event	Considered at risk	Remain vigilant
Within 10 km of event	Considered at extreme risk	Seek shelter
Lightning siren sounds	Considered at extreme risk	Seek shelter

Professional rugby matches

There should be no difference in the way lightning safety is practiced and managed in professional versus non-professional matches.

However, at matches, which are defined as professional matches i.e. Internationals, Super Rugby, and Currie Cup, each Provincial Union, where they have a home stadium, are advised to have a fixed lightning detection system in place at that stadium. Should this not be possible, a portable fully functional, hand-held device, which meets acceptable industry standards must be utilised.

These lightning detection systems should be used prior to- and during all professional matches to ensure the continued safety of the players, spectators and match officials involved.

Professional clubs or Provincial Rugby Unions should also have an **automated external defibrillator (AED)**. This is a [portable electronic device](#) that automatically diagnoses the life-threatening [cardiac arrhythmias](#) or [ventricular fibrillation](#) and [ventricular tachycardia](#) in a patient struck by lightning and is able to treat them through [defibrillation](#), the application of electrical therapy which stops the arrhythmia, allowing the heart to reestablish an effective rhythm.

Regardless of the above mentioned devices, the general lightning safety tips and guidelines applicable to all levels of rugby should still be applied to decision making and also prior to the kick-off. Personal vigilance is critical at all times.

The hosting Union Match Manager must appoint an independent person from the local Provincial Union to function as a 'lightning monitor' for professional matches played at the Provincial Union stadium or pre-determined alternative stadia, with the Match Manager having the necessary authority to decide whether a match starts, continues or must be abandoned, based on the evidence supplied by the lightning detection devices, the appointed 'lightning monitor', all local weather service communications and the guidelines provided for in this document.

Where professional matches are taken away from the official Provincial Stadium to further outlying areas, or alternative stadia within the Province, the hosting Provincial Rugby Union still needs to ensure that they can apply the same or similar protocols and levels of detection. This could mean taking the hand-held device with or ensuring that the relevant stadia have a fixed lightning detection system in place prior to the match being played.

In the event that any of the devices reflect a notable lightning threat, the weather service indicates a significant threat, or the 'lightning monitor' identifies a threat of lightning to the players and match officials according to

the general lightning safety tips and guidelines, the protocols indicated would apply. The responsibility of the final decision lies with the hosting Union Match Manager at the professional level of the game.

If deemed necessary, the match must then be stopped, and all involved should move to a pre-identified safe area, until the lightning threat has moved away to within a safe distance from the field. If the storm does not move away within a reasonable time after stoppage, a decision then needs to be made by the hosting Union Match Manager to suspend the match.

Once the match has been stopped due to risk of lightning, spectators should also be made aware of the threat.

Stadium Safety:

Do seek advice on any aspect of lightning protection not covered above. For example, contact the South African Institute of Electrical Engineers (SAIEE) who can provide guidance on this subject.

What to do should a member(s) be struck by lightning

In the event that someone is struck by lightning during a match.

1. Do call for help immediately, if any of the members are struck by lightning and are unconscious, try to revive them by all means possible (cardiopulmonary resuscitation). One should therefore have at least one member that is trained and certified in basic CPR.

2. CPR saves lives!
3. The lightning safety monitor should have the telephone numbers of those on standby for Emergency Medical Services and Paramedics close to hand.
4. If an **automated external defibrillator (AED) is available use it as per the ACLS guidelines.** This is a [portable electronic device](#) that automatically diagnoses the life-threatening [cardiac arrhythmias](#) of [ventricular fibrillation](#) and [ventricular tachycardia](#) in a patient struck by lightning and is able to treat them through [defibrillation](#), the application of electrical therapy which stops the arrhythmia, allowing the heart to reestablish an effective rhythm.

Remember: Lightning is dangerous: WHEN THUNDER ROARS – GO INDOORS!

Information Sources:

1. Safety at Sports and Recreational Events Act (Act 2 of 2010)
2. <http://www.lightningsafety.noaa.gov/sports.htm>
3. South African Weather Service article, 19 March 2015, 'Recent lightning tragedies in South Africa', Compiled by Morne Gijben, Hannelee Doubell and Elsa de Jager.
4. Anderson, R.B. 'SMART Lightning Safety Do's and Don'ts'. ESKOM and SAIEE Sponsored booklet.
5. World Rugby Guidelines:
<http://playerwelfare.worldrugby.org/?subsection=67>

6. Advanced Cardiovascular Life Support Provider Manual. By American Heart Association. ISBN 13 978-1-61669-350-3.
7. Cooper MA, Holle R, Andrews CJ, Blumenthal, R. Lightning Injuries. In: Auerbach, PS. Wilderness Medicine. 6 ed. Elsevier Mosby Publishers, PA. 2012. ISBN: 978-1-4377-1678-8. pp. 60 – 101.