PURPOSE/APPLICATION

This Safe Work Practice is to provide guidance in choosing the safest course of action in the event of lightning, high winds or tornadoes.

The nature of our business often requires us to work outdoors. Each year lightning kills approximately 10 Canadians and injures 100 to 150. Anytime work is being performed outdoors there may be a potential for serious or fatal injury if proper precautions are not taken during a storm.

Direct strikes are responsible for only 5% of lightning-related deaths and injuries. There are two other types of hazardous phenomena caused by lightning; ground current and side flash/splash which account for 60-80% of lightning-related injuries and deaths.

a. A ground current occurs when lightning hits the ground, spreads out and sends a current through a victim.
b. Side flash/splash occurs when lightning hits a tall object, travels partly down the object and then jumps to a nearby victim.

High winds are common when working outside and can create hazards that did not exist without the wind (e.g., any materials lying around can become airborne, taller structure or cranes may tip, personal stability lessens, dust can get in your eyes or interfere with certain processes like welding).

Apart from general high winds, Canada, on average, experiences the second highest number of tornadoes of any country in the world; although the tornadoes recorded in Canada are far less in number and intensity than tornadoes recorded throughout Midwest to Southeast USA. Approximately 70% of recorded tornadoes in Alberta are classified as EF0 (estimated winds speeds between 40-85 mph and light damage like broken branches, shallow-rooted trees tipped over, or signboard damage).

PPE

- No additional requirements

TRAINING

- Review this Safe Work Practice

HAZARDS & CONCERNS

- Exposure to electrical energy
- Fires caused by lightning
- Falling trees/poles/tall structures
- Flying debris (large and small)
- Weather conditions

Tornado Information

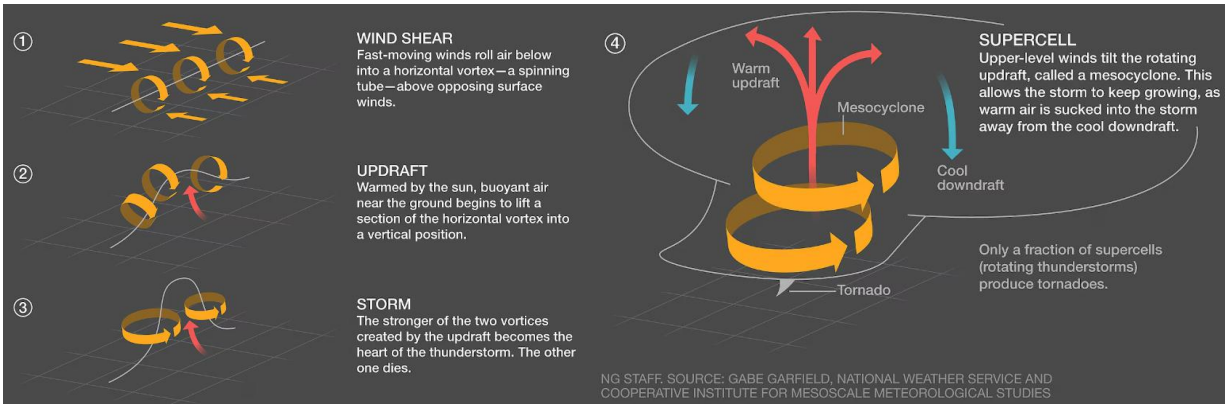
As of the time of this SWP's revision, Alberta averages 13 recorded tornadoes per year. Most recorded tornadoes occur between 4pm – 8pm, and are most common between May – August, with July commonly hosting the most tornado events. Since 2007, tornado intensity has been classified using the Enhanced Fujita Scale, abbreviated as EF# (prior to 2007 it was referred to as the Fujita Scale, abbreviated a F#). These ratings are based on "estimated" wind speeds combined with the damage the tornado caused.

FUJITA SCALE			DERIVED EF SCALE		OPERATIONAL EF SCALE	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	**EF Number**	**3 Second Gust (mph)**
0	40-72	45-78	0	65-85	**0**	**65-85**
1	73-112	79-117	1	86-109	**1**	**86-110**
2	113-157	118-161	2	110-137	**2**	**111-135**
3	158-207	162-209	3	138-167	**3**	**136-165**
4	208-260	210-261	4	168-199	**4**	**166-200**
5	261-318	262-317	5	200-234	**5**	**Over 200**

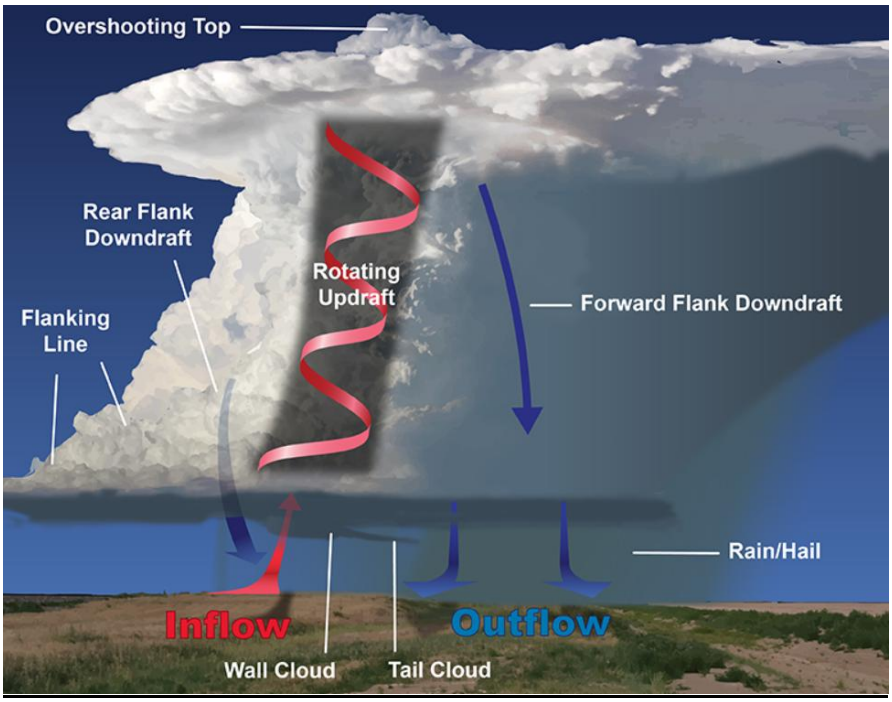
F Scale	Character	Estimated winds	Description
Zero (F0)	Weak	40-72 mph	**Light Damage.** Some damage to chimneys; branches broken off trees, shallow-rooted trees uprooted, sign boards damaged.
One (F1)	Weak	73-112 mph	**Moderate damage.** Roof surfaces peeled off; mobile homes pushed off foundations or overturned; moving autos pushed off road.
Two (F2)	Strong	113-157 mph	**Considerable damage.** Roofs torn from frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light objects become projectiles.
Three (F3)	Strong	158-206 mph	**Severe damage.** Roofs and some walls torn from well- constructed houses; trains overturned; most trees in forested area uprooted; heavy cars lifted and thrown.
Four (F4)	Violent	207-260 mph	**Devastating damage.** Well- constructed houses leveled; structures with weak foundation blown some distance; cars thrown; large missiles generated.
Five (F5)	Violent	260-318 mph	**Incredible damage.** Strong frame houses lifted off foundations, carried considerable distances, and disintegrated; auto-sized missiles airborne for several hundred feet or more; trees debarked.

There are two main types of tornadoes, tornadoes stemming from Supercell cloud formations and landspout or waterspout tornadoes. Landspout or waterspout tornadoes form from strong wind travelling near ground level with a wind shear and updraft occurring closer to the ground. This causes the winds to begin to rotate and turn upwards. Landspout/waterspout tornadoes do not usually grow to be large enough to cause notable damage (commonly see these in flat, dusty areas like parking lots).

Tornadoes created from Supercell cloud formations are larger and present more concern. ***Supercells*** form when there is Wind Shear which is when the wind at ground level is travelling a different direction than winds higher in the atmosphere. These opposing winds create a horizontal rotating effect, rapidly bringing large amounts of moisture, pressure, and temperature differences together from the ground (called an ***Updraft***), and creating a gigantic bubbly, pillow-like cloud. Eventually, the horizontal rotation turns into a vertical orientation, creating a ***Mesocyclone*** within the Supercell, making it extend up to thousands of meters into the atmosphere. As the mesocyclone continues to pull on the dry, rising air (updraft), it creates a large temperature difference between the air within the Mesocyclone and the air outside; this creates a ***Rear Flank Downdraft***, forcing air downwards in a spiral motion. If the Rear Flank Downdraft forces the mesocyclone downward into the moisture filled ***Wall Cloud*** hanging beneath the Supercell, it has a chance of extending towards the ground to form a funnel cloud, and potentially a tornado if it creates enough speed and energy to reach the ground.



A Supercell cloud formation is accompanied by a thunder/lightning storm, heavy rain and hail.



GENERAL PRECAUTIONS

THE DO's (Lighting)

DO Plan for a safe day, check the weather forecast first.
DO Review any incoming weather in the daily tailgate meeting and discuss the plan for a response.
DO Watch the skies for developing thunderstorms and listen for thunder.
DO Plan for a safe place to muster in the event of lightning. Review the plan as part of your HIAC.
DO Stay away from tall objects if caught outdoors far from shelter (e.g., trees, poles, wires, and fences). Go to a low-lying area but be on the alert for possible flooding.
DO Get to a safe place. A safe location is a fully enclosed building with wiring and plumbing. Sheds, picnic shelters, tents or covered porches do not protect you from lightning. If no sturdy building is close by, get into a metal-roofed vehicle and close all the windows.
DO Alert other workers in the area of the situation (e.g., muster horns, radios, phones, etc.).
DO Follow the 30/30 Rule at a minimum (refer to the 30/30 Rule section below).

THE DON'Ts (Lightning)

DON'T Handle electrical equipment, or plumbing; these are all electrical conductors.
DON'T Shelter under tall trees or structures.
DON'T Return to the work area to pack up if work is suspended for the day.

THE DO's (Tornado or High Winds)

DO Plan for a safe day, check the weather forecast first; if lighting storms are possible, do not rule out high winds or a tornado. Many weather apps and the government Emergency Alert system will warn of tornadoes.
DO Review any incoming weather in the daily tailgate meeting and discuss the plan for a response.
DO When HIAC'ing tasks, consider how high winds could affect your tasks (e.g., Aerial Work Platform operation, Work at Heights, Dropped Objects Prevention, Lifting/Hoisting, etc.).

DO Watch the skies for developing thunderstorms and listen for thunder. Pay attention to Supercell cloud formations. Supercells directly over top of you may not be easy to identify, watch for Wall Clouds overhead.
DO Plan for a safe place to muster in the event of a tornado. Review the plan as part of your HIAC.
DO Have several emergency kits packed; consider a shelter in place kit (up to 14 days of supplies), and an evacuation away from home/travel kit (up to 3 days of supplies).
DO Consider important items such non-perishable food, water, clothes, toiletries, prescriptions/medications, sentimental or hard-to-replace items, and pet considerations.
DO Keep areas well organized and clean. Most injuries and fatalities from tornadoes and high winds are caused by flying debris.
DO Stay away from tall objects if caught outdoors far from shelter (e.g., trees, poles, wires, and fences). Go to a low-lying area but be on the alert for possible flooding.
DO Get to a safe place. The safest location in the event of a tornado is a small interior room or hallway on the lowest floor possible. If no sturdy building is close by, find a low-lying area, like a ditch, and shelter as low as possible. If that is also not possible, get to or stay in a metal-roofed vehicle, close all the windows, buckle up, apply parking brake, and remain as low as possible.
DO Alert other workers in the area of the situation (e.g., muster horns, radios, phones, etc.).
DO Follow the 30/30 Rule at a minimum (refer to the 30/30 Rule section below).
DO Wait a few extra minutes, if possible, before leaving your shelter after a tornado. If the building you are in is structurally compromised, exit as quickly and safely as possible.

THE DON'Ts (Tornado or High Winds)

DON'T Attempt to outrun a tornado. Their travel path(s) and speed(s) are highly variable and unpredictable.
DON'T Shelter in/under sheds, picnic shelters, tents, covered porches, mobile homes, large buildings with long spanning roofs, or bridges/overpasses; these structures do not provide great protection from tornadoes.
DON'T Return to the work area to pack up if work is suspended for the day.
DON'T Rush out of your shelter following a tornado. There can be many hazards created/exposed in the aftermath of a tornado (e.g., exposed electrical, unstable buildings, suspended objects in trees overhead, etc.).
DON'T Exit your vehicle if an electrical line contacted your vehicle or in your immediate area.
DON'T Enter buildings that may be structurally compromised after a tornado. Same rule as H_2S training, keep yourself safe first so you can potentially help and become another casualty.

Applying the 30 & 30 Rule

When the sound of the thunder comes **30** seconds or less from when the lightning is seen, it is time to implement the muster order. Initiate the muster signal and move to an enclosed grounded building. If there is no appropriate building available stay in a rubber-tired vehicle.

Allow **30** minutes before returning to work from the last time the thunder is heard 30 seconds or less after the lightning is seen. The 30-minute wait is reset at each occurrence.

First aid for lightning victims

- Lightning victims do not carry an electrical charge and can be safely touched.
- Call for help. Victims may be suffering from burns or shock and should receive medical attention immediately. Activate you Emergency Response Plan, Call 9-1-1 or your local ambulance service.
- Give first aid. If breathing has stopped, administer CPR (cardio-pulmonary resuscitation).

REFERENCES / ADDITIONAL INFORMATION

Environment Canada

National Weather Service

Canadian Centre for Occupational Health and Safety

COP 06 – Fall Protection

SWP 24 – Overhead Power Lines

SWP 41 – Critical Hoisting

SWP 93 – Aerial Work Platforms

HSEMS Section 2 – Hazard Identification, Assessment, and Control

HSEMS Section 5 – General Rules

HSEMS Section 11 – Emergency Preparedness & Response

REGULATIONS

Alberta OHS Code

Part 12 General Safety Precautions

British Columbia OHS Regulation

Part 4: General Conditions

Saskatchewan OHS Regulation

PART 3 General Duties

Manitoba OHS Regulation

Part 46 General Provisions

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