Severe Weather Planning Guide

for

Special Event Venues

National Weather Service
Quad Cities

Contact:

Donna Dubberke
Warning Coordination Meteorologist

National Weather Service Quad Cities
9050 Harrison St.
Davenport, IA 52806

donna.dubberke@noaa.gov
563-386-3976 x726

Last Updated November 7, 2013

Table of Contents

How to Develop an Effective Severe Weather Plan 2

Designate the Weather Watcher(s) 3

Develop a Communication Strategy 4

Develop a Sheltering Strategy 6

Identify Decision Thresholds and Actions 8

- Dense Fog 9
- Flash Flood 10
- Heat 12
- High Wind 13
- Lightning, Thunderstorms, and Tornadoes 14
- Snow/Ice 16
- Wind Chill & Extreme Cold 18

Document your plan 20

Train all staff on the plan 20

Hold seasonal sheltering drills 20

After the Storm 21

Putting It All Together: StormReady 22

Appendices:

- Appendix A: Severe Weather Strategy Worksheet 24
- Appendix B: NOAA Weather Radio 29
- Appendix C: Glossary of NWS Messages 32

How to Develop an Effective Severe Weather Plan

It is said that the only thing harder than planning for an emergency is explaining why you did not.

Every safety plan should encompass the range of weather hazards that occurs in the region and should include all aspects of the event, including participants, vendors, spectators, staff, and volunteers. Depending on the nature of the event you may also consider transportation (shuttles, etc.) and accommodations for special needs. Developing a practical and effective plan typically involves working with organizers and staff, alongside local emergency management.

The first step is to determine who should be involved in the planning process.

Pre-planning for all scenarios (normal operations, transportation, etc.) then should include the following elements:

1. Designate the weather watcher(s) and ensure they have the tools to monitor weather.
2. Develop a communication strategy with redundancy and/or backups.
3. Develop a sheltering strategy.
4. Identify decision thresholds and actions for each weather hazard.
5. Document your plan.
6. Train all staff on the plan.
7. Hold seasonal sheltering drills.

This guide provides specific guidance and more detail on each of these elements.

Additional Resources

FEMA Special Events Contingency Planning Guide
.....http://training.fema.gov/EMIWeb/downloads/is15aSpecialEventsPlanning-JAmanual.pdf

1. Designate the Weather Watcher(s)

KEY POINTS:
- Monitors weather
- Alerts decision maker
- Authority to implement emergency plan?

Because of the time and logistics required to shelter people who are likely unfamiliar with the facility's plan, the designated weather watcher is particularly critical to special event venues. By monitoring weather conditions, the designated weather watcher monitors weather information, allowing everyone else to focus on the business at hand. They then alert decision-makers to the potential impact of an impending hazard in time to make these critical decisions.

Ideally, the designated weather watcher has the authority to enact the severe weather plan. When this is not feasible, it is critical that the decision-maker and designated weather watcher communicate extremely well so that dangerous delays in response do not occur.

It is also important that the role of the designated weather watcher is always filled. In other words, the responsibility is best tasked to a position rather than an individual who might or might not be there when the hazard strikes. It doesn't matter as much ***who*** it is, as long as everyone knows they carry the responsibility for monitoring conditions and alerting those who will "make the call".

- **Routine:** The designated weather watcher would typically begin their day by reviewing the Hazardous Weather Outlook and local forecast for an overview of any anticipated hazards. Depending on the scheduled activities, they would then forward information about any potential impacts to the relevant decision makers.

- **Hazardous weather monitoring:** Before and during hazardous weather events, the designated weather watcher monitors weather information as it is updated and continues to alert decision makers to potential impacts. In rapidly changing or emergency situations, the designated weather watcher may be given the authority to enact the safety plan.

Monitor this Information:

Forecast
Forecast Discussion
Hazardous Weather Outlook
Multimedia Weather Briefing
Watch
Advisory
Warning
Radar

Via these Tools:

www.weather.gov or other weather web site
- Point-n-Click Forecast
- Hourly Weather Graph
- Hour-by-Hour Forecast Web Page
- Decision Support Web Page

Cell phone alerts (text or via an app)
email alerts
NOAA Weather Radio (see Appendix D)
Local TV weather
Local Cable Channel or secondary digital channel
Social Media
Private weather services
Phone call to local NWS

Links

National Weather Service Quad Cities ..... www.weather.gov/quadcities
Hour-by-Hour Forecast Web Page (Experimental) ..... http://innovation.srh.noaa.gov
Decision Support Web Page ..... www.weather.gov/quadcities/em-briefing.php

2. Develop a Communication Strategy

KEY POINTS:
- Pre-notify whenever possible
- Is it effective?
- Redundancy and/or backups

Pre-Notify

Pre-notification allows people the opportunity to prepare themselves mentally and physically for something unusual that may occur. When event staff knows beforehand that there is a threat of storms, they may re-familiarize themselves with shelter areas and stay particularly alert for PA announcements. ***Regardless of the situation, response is enhanced when people are already aware that there may be a need to change their plans.***

Pre-notification of a potential hazard can be accomplished through any number of simple means and can also remind people of what they would be expected to do if the hazard occurs. For example, an email in the morning can alert of a severe weather risk later that day and remind staff of their responsibility to stay alert. A sign on the bulletin board at a trailhead or posted in the ticket booth alerts visitors that they should pay particular attention to all announcements in case they would be required to shelter.

Choose an Effective Means

The most effective communication method often depends on both the nature of the hazard and the activities that are ongoing. For slower-to-evolve hazards such as snow storms, for example, email may be sufficient to notify people of a cancellation. On the other hand, sheltering from a tornado is more urgent and requires a more attention-getting method. Regardless of the method used, simpler is usually better and the more consistency that exists year-round, the less confusion there will be.

Redundancy and/or Backups

Communication is key in any emergency situation. Unfortunately, things happen: power fails; technology doesn't always work; situations change. Poor communication will slow or even prevent response. To complicate matters further, human nature pushes people to confirm a threat before they act. Thus it is always recommended to establish redundant communication streams. Providing redundant communication streams facilitates people gaining the same official information through different channels and thus spurs their action. When redundancy isn't possible, then a backup plan should be in place for when the primary method fails.

The following table outlines some of the most common communication methods and their advantages and pitfalls.

Common Communication Methods

	Advantages	**Limitations** ***(address with backup or work-around)***
PA System	• Can speak to most of building at once • Can convey instructions and urgency	• Can be disrupted by power outages • Hard to hear in large rooms (cafeteria, etc.) • May not exist in detached buildings
Megaphone or air horn	• Works in lieu of PA systems	• Limited range
Two-way radio	• Can convey instructions and urgency • May reach multiple buildings at once • Inexpensive way to reach detached buildings • Target key recipients	• Limited audience
Official web pages	• Default for many people to check • Considered "official" by people	• Passive (does not "alert" people)
Official Social Media Channels	• Easily forwarded by recipients • Widely used by families and public	• Not monitored 24/7
TV monitors	• Communicates visually in noisy areas	• May fail during power outages
Text messaging	• Can reach many people quickly • Easily forwarded by recipients • Widely used by families	• Hard to convey tone
Twitter	• Can reach many people quickly • Easily forwarded by recipients • Widely used by young people	• Hard to convey tone
Automated phone calling systems	• May work for something expected the next day	• Slow relay times • Phone systems unreliable in storms • May fail during power outages
Phone call tree (manual)	• Not recommended	• Slow relay times • Often incorrect or incomplete info. • Phone systems unreliable in storms • May be limited in power outages

3. Develop a Sheltering Strategy

KEY POINTS:
- Prioritize shelter areas.
- Avoid large span rooms.
- Aim for 3 minutes.
- Consider all logistics.

Sheltering Considerations

- We recommend that everyone be able to reach shelter in ***less than 3 minutes***.
- The logistics of and time required to move people to the shelter areas must also be considered. For example, congestion at stairwells and doorways may slow the sheltering process. Mobility-impaired people may require special assistance and more time.
- Close all doors and windows, including interior fire doors.
- In the shelter, people should have a way to monitor conditions to know when it is safe to emerge.
- Consider posting signs on designated shelter areas.

Choosing Shelter Areas

The greatest threats from strong winds (caused by tornado or severe thunderstorm) are roof failure, breaking glass, and flying debris. Without a specially designed shelter area, it is a matter of identifying those areas that are relatively safer than others. ***We recommend that shelter areas be identified with the help of an engineer or architect familiar with each building's design.*** You may wish to rank areas of your facility according to safety and the logistics of reaching each space. Begin filling the safest areas and continue down your list until you have found space for the entire population.

Evacuate High-Vulnerability Areas

- If the building has more than one level, move people from the upper floor(s) to the lowest level.
- Large-span rooms offer little protection. Move to safer areas.
- Mobile or temporary buildings are no safer than a mobile home and should be evacuated to the nearest sturdy structure.
- Move people out of rooms with exterior windows.

DO Shelter on the lowest floor in small, interior rooms.

The best protection is offered by small, windowless, interior rooms that are away from exterior doors (often bathrooms, hallways, etc.). All doors and windows should be closed. Interior load-bearing walls with short roof spans provide better protection than temporary or non-load-bearing walls.

Do NOT shelter in large-span rooms or rooms with large windows.

The most dangerous locations during strong wind events are generally large rooms with expansive roofs such as gyms, cafeterias, and auditoriums. ***Avoid the temptation to shelter in these areas.*** The collapse of the room's outer load-bearing wall can lead to the failure of the entire roof. Rooms with large windows that can shatter from airborne missiles or pressure stresses are also extremely dangerous. Once wind enters a building, additional damage is highly likely.

Additional Resources

Design Guide for Improving Critical Facility Safety in Earthquakes, Floods, and High Winds www.fema.gov/media-library/assets/documents/8811
Selecting Refuge Areas in Buildings www.fema.gov/media-library/assets/documents/2246
Engineered Safe Rooms ..... www.fema.gov/safe-rooms

Wind Speed	Typical Wind/Tornado Damage	
65 to 85 mph *(43% of tornadoes)*	Trees and large branches snapped	
86 to 110 mph *(31% of tornadoes)*	Broken windows or doors. Temporary buildings/mobile homes rolled	
111 to 135 mph *(18% of tornadoes)*	Buildings unroofed.	
136 to 165 mph *(7% of tornadoes)*	Cars flipped. Roof and outer walls of buildings destroyed.	
166 mph and higher *(1% of tornadoes)*	Significant damage or total destruction of non-hardened buildings	

4. Identify Decision Thresholds and Actions

KEY POINTS:

- Identify threats.
- Determine action thresholds for each.

An effective weather plan addresses the range of impacts caused by the entire spectrum of weather hazards. In your plan, each hazard and its potential impacts should be identified, followed by the specific actions that are taken before, during and after the hazard occurs.

To facilitate developing a comprehensive and effective plan, the following pages provide an outline for the information flow related to specific weather hazards. Each section includes key background information related to that hazard, a table of decision thresholds and recommended actions for each, and links to supporting resources. The table below provides a key.

Threshold	**Timing and *Sources***	**Recommended Actions**
Bold text: identifies the threshold itself (a decision point usually associated with increased confidence of the hazard's occurrence) *Italicized text: Weather messages that should be monitored for or would identify this threshold*	Plain text: Typical timing of this particular threshold *Italicized text: Where you can find these relevant weather messages*	Actions that are recommended or typically associated with this threshold for this weather hazard

Weather Hazard: Dense Fog

Fog Facts

- Statistically, most local dense fog events occur in January, August, and February (in that order).
- In certain conditions, fog will deposit on roads as ice and cause exceptionally hazardous travel.
- On average, dense fog lasts for about 5 hours.
- Each year an average of 2 dense fog events occur during the morning commute time.
- 82% of the time, dense fog lifts (visibility improves above ¼ mile) by 9 am.

Threshold	**Timing and *Sources***	**Recommended Actions**
Potential for widespread dense fog exists *Forecast or* ***Hazardous Weather Outlook:*** *first mention of potential for dense fog*	Typically 12-24 hours ahead *via web page, email, TV, Weather Radio*	None
Dense Fog Imminent or Occurring ***Dense Fog Advisory****: Visibility reduced to less than ¼ mile for a prolonged period of time over a widespread area due to fog.* *May freeze on roads in certain conditions.*	Typically 0-3 hours before onset *via web page, email, text alert, Weather Radio, TV*	• Evaluate risk of ice on roads • Assess extent and timing • Consider transportation impacts

Special Considerations for Transportation

When temperatures are near or below freezing, fog may freeze on roads, creating an extremely slick and near invisible glaze.

Weather Hazard: Flash Flood

- Flash floods can occur within a few minutes or hours of excessive rainfall, a dam or levee failure, or a sudden release of water held by an ice jam.
- Flash floods often have a dangerous current of water and can carry much debris.
- Flash flooding can continue long after rain ends.
- Know the flood prone areas in advance, such as low-lying spots and locations of rivers or creeks.
- Establish alternate routes to avoid driving through water.
- For flood-prone facilities, consider where and how to evacuate to higher ground.

Threshold	**Timing and *Sources***	**Recommended Actions**
Potential for flooding exists *Forecast or* ***Hazardous Weather Outlook:*** *first mention of potential for heavy rain or flooding*	2-3 days ahead *via web page, email, Weather Radio*	Communicate potential threat to decision makers (pre-notify)
Flooding likely in the area ***Flood or Flash Flood Watch:*** *Heavy rain is likely with a 50% or greater chance for flooding*	Typically a few hours to one day before expected flooding *via web page, email, text alert, Weather Radio, TV*	• Communicate increased threat to all staff • Establish strong communication between weather watcher(s) and decision makers • Ensure alternate transportation routes are accessible to avoid flood-prone spots • Ensure evacuation routes are available at flood-prone facilities
Life-threatening flash flooding is ongoing or imminent ***Flash Flood Warning:*** *Confident of life-threatening flash flooding* ***Flash Flood Warning Update Statements:*** *Updates on impacts of flooding, timing, location, creeks at risk, additional rainfall, status of warnings, etc.*	Typically 30 to 60 minutes before flooding begins; updates issued throughout warning *via web page, email, text alert, Weather Radio, TV*	• Read warnings and updates carefully for locations or creeks that may be under particular threat. • Monitor flood-prone facilities near creeks and other low-lying areas for potential rapid flooding and prepare to move to higher ground • Use alternate transportation routes to avoid flooded roads • Respond to specific impacts as necessary

Special Considerations for Transportation

- Establish an alternate plan for transportation routes that avoids flood-prone roads.
- NEVER ATTEMPT TO DRIVE THROUGH FLOOD WATERS!
  - If the water is too deep to see the road, DO NOT CROSS. The road may have been undermined or the water may be deep enough to stall the vehicle and place all of its occupants in danger.
  - Do not enter underpasses that are filling with water.
  - If the water appears to be flowing, do not enter. The vehicle will act as a barrier and the water will attempt to lift and move it.
  - If water is flooding over or around a bridge, do not cross it, it might collapse from the weight of the vehicle. The foundation of the bridge may have been compromised.
- If caught in flood waters, abandon the vehicle and seek higher ground immediately.

Weather Hazard: Heat

Heat Index Impacts

- As heat continues, people become even more susceptible to its effects.
- Heat Index is the effective temperature the body feels when heat and humidity are combined.
- Heat index assumes shady, light wind conditions. ***Exposure to direct sun adds about 15°F.***

Heat Index	General Effect on People
80 to 89° - Caution	Fatigue possible with prolonged exposure and/or physical activity.
90 to 104° - Extreme Caution	Sunstroke, heat cramps and heat exhaustion possible with prolonged exposure and/or physical activity.
105 to 129° - Danger	Sunstroke, heat cramps or heat exhaustion likely; fatal heatstroke possible with prolonged exposure and/or physical activity.
130° or higher - Extreme Danger	Fatal heatstroke highly likely with prolonged exposure.

Threshold	Timing and *Sources*	Recommended Actions
Potential for Extreme Heat ***Forecast or Hazardous Weather Outlook:*** *First mention of extreme heat*	4-5 days ahead *via web page, email, Weather Radio*	Communicate potential threat to decision makers (pre-notify)
Dangerous Heat Likely ***Excessive Heat Watch:*** *Greater than 50% confidence of extreme heat lasting for more than 2 days*	Typically 48 hours before onset *via web page, email, text alert, Weather Radio, TV*	• Communicate threat to all staff • Refresh staff on identification of heat-related illness • Develop alternate plans for outdoor activities (e.g. move indoors or to cooler times of day)
Unusual Heat Imminent or Ongoing ***Heat Advisory:*** *High confidence of unusual heat (heat index >100°F)*	Typically 24 hours before onset *via web page, email, text alert, Weather Radio, TV*	• Communicate threat to all staff • Postpone outdoor activities or move them to cooler times of the day • Monitor closely for heat illness symptoms
Extended Period of Extreme Heat Imminent or Ongoing ***Excessive Heat Warning:*** *High confidence of dangerously high heat for more than 48 hours (heat index > 105°F)*	Typically 24 hours before onset *via web page, email, text alert, Weather Radio, TV*	• Communicate threat to all staff • Monitor people closely for heat illness symptoms • Monitor unairconditioned facilities for dangerously high temperatures

Additional Resources

Recognizing Heat Illnesses from the CDC ..... emergency.cdc.gov/disasters/extremeheat
Red Cross Heat Guidelines ..... www.redcross.org/prepare/disaster/heat-wave

Weather Hazard: High Wind

High Wind Facts

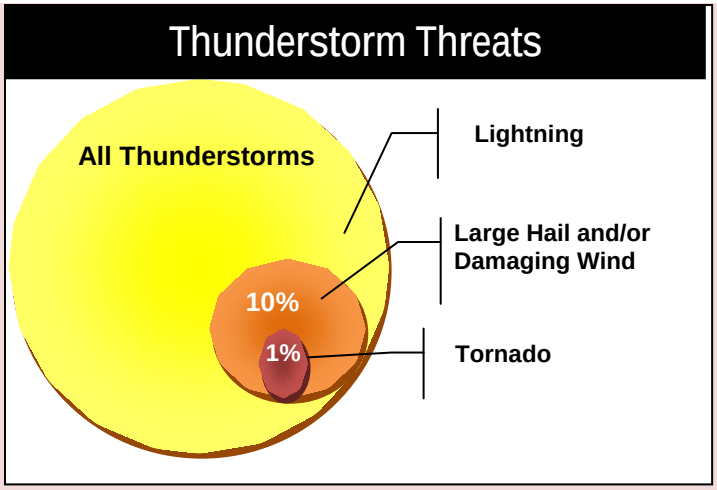
- One third of high wind fatalities are caused by falling trees.
- About the same number of people die from non-thunderstorm wind as from severe thunderstorm wind.
- Most high wind fatalities occur in March, November, and December in that order.
- One half of high wind events in the Midwest occur in March and April.

Threshold	**Timing and *Sources***	**Recommended Actions**
Potential for high wind *Forecast or* ***Hazardous Weather Outlook:*** *first mention of potential for high winds*	3-4 days ahead *via web page, email, Weather Radio*	• Inspect grounds for dead or dangling branches that could be more easily broken
Dangerous Wind Likely ***High Wind Watch****: More than 50% confidence of dangerously high wind (40+ mph sustained and/or 60+ mph gusts)*	Typically 24-48 hours before onset *via web page, email, Weather Radio*	• Communicate threat to decision makers (pre-notify) • Remove dead or dangling branches that could be easily broken.
High wind is imminent or occurring ***Wind Advisory:*** *High confidence of sustained winds of 30 mph+ and/or wind gusts of 45-55 mph*	Typically 6-12 hours before onset *via web page, email, text alert, Weather Radio, TV*	• Alert drivers of high-profile vehicles to increased headwind and cross-wind • Consider rescheduling roof maintenance or other elevated work/activities
Dangerously high wind is imminent or occurring ***High Wind Warning:*** *High confidence of damaging winds (40+ mph sustained and/or 60+ mph gusts)*	Typically 6-12 hours before onset *via web page, email, Weather Radio*	• Alert drivers of high-profile vehicles to increased headwind and cross-wind • Reschedule roof maintenance or other elevated work/activities.

Special Considerations for Transportation

Strong headwind may slow travel, and strong cross-wind can become a driving hazard.

Weather Hazard: Lightning, Thunderstorms, and Tornadoes



- Lightning occurs every month of the year and can happen anywhere.
- Lightning can strike as much as 10 miles from the parent thunderstorm.
- In the local area, we average 4 to 8 lightning strikes annually per km^2.
- ***All thunderstorms produce lightning and thus are potentially fatal***.
- About 10% of storms will also produce large hail and/or damaging wind gusts. Only about 1% will produce a tornado
- Remain indoors for 30 minutes after the last lightning is seen or thunder is heard.

Threshold	**Timing and *Sources***	**Recommended Actions**
Potential for thunderstorms *Forecast or **Hazardous Weather Outlook:** first mention of potential for storms*	2-3 days ahead *via web page, email, TV, Weather Radio*	Communicate potential threat to decision makers and all staff (pre-notify)
Thunderstorms likely in the area in the next few hours ***Severe thunderstorm or tornado watch:** 50% or greater chance for severe storms; Storms may have the potential to produce tornadoes*	Typically a few hours before storms *via Weather Radio , web page, email, text alert, TV*	• Communicate increased threat to all staff • Establish strong communication between weather watcher(s) and decision makers at all facilities • Ensure all staff understand sheltering plan • Consider postponing outdoor events • Monitor radar trends; focus on timing • Depending on timing, consider moving people out of vulnerable locations (temporary buildings, outdoors, etc.)
Storms upstream and approaching *as seen on radar, warnings issued for upstream locations*	One hour or less *Via web page, email, text alert, Weather Radio, TV*	• Monitor radar trends; focus on timing • Move people out of vulnerable locations (temporary buildings, outdoors, etc.) • Close any open windows and doors
Storms moving in *Storms within 10 miles, or visible lightning/audible thunder*	30 minutes or less	• Immediately suspend outdoor activities. • Move all people indoors • Remain indoors for 30 minutes after lightning ends.

Severe Thunderstorm Warning *Thunderstorm with hail quarter size or larger and/or wind over 58 mph is imminent*	0 to 40 minutes before storm (average is 22 minutes) *via web page, email, text alert, Weather Radio, TV*	• Immediately move all people indoors • If wind 70+ mph, hail 1.75+ inches: also immediately move to shelter areas, closing all doors behind you. For duration of storm: • Remain indoors or in shelter • Monitor information sources for updates
Tornado Warning or tornado spotted nearby *Tornado is likely or imminent*	0 to 30 minutes before tornado (average is 11 minutes) *via web page, email, text alert, Weather Radio, TV*	• Immediately move to designated shelters, closing all doors behind you. While in shelter: • Try to find a location that will protect you from debris. Monitor information sources for updates

General Considerations

- We strongly recommend everyone seek a safe location during imminent severe weather.
- When sheltering, staff should close any doors behind them.
- There is no official "all-clear" from the National Weather Service. Monitor radio, TV, and internet sources for updates on the storm to determine when it is safe to come out of shelter.

Special Considerations for Transportation

- Identify safe structures along routes where drivers may seek emergency shelter if severe storms suddenly hit.
- Train drivers on how to react during severe weather:
- If a tornado warning is issued or a tornado is sighted, go immediately to the nearest shelter.
- If shelter is not available, as a last resort, evacuate into the nearest ditch on the downwind side of the road away from power lines and trees. People should lie flat in a low place and cover their heads.
- If time allows, move the vehicle away from the area, radio the base station, and remove the first aid kit.

Special Considerations for Temporary Buildings

Temporary buildings offer no protection from extreme straight-line winds or tornadoes. Temporary buildings should be evacuated before severe weather moves into the area.

After the Storm

Once the storm has passed, stay alert for the possibility of additional storms. If your building sustains damage, shut off the gas and electricity. Do not attempt to evacuate through damaged areas, as downed power lines and debris pose grave danger.

Weather Hazard: Snow and Ice

Threshold	**Timing and *Sources***	**Recommended Actions**
Winter storm possible *Forecast or* ***Hazardous Weather Outlook****: first mention of strength of expected storm*	3-4 days ahead *via web page, email, Weather Radio, TV*	• Communicate potential threat to decision makers (pre-notify)
Life-threatening winter conditions are likely ***Winter Storm Watch*** *or* ***Blizzard Watch****: 50% or greater confidence of 6 inches or more of snow, ¼ inch or more of ice, or blizzard conditions*	2 days before onset *via web page, email, Weather Radio, TV, text alert*	• Communicate threat to all staff • Monitor trends and timing
Life-threatening winter conditions are imminent ***Winter Storm Warning****: Confident of life-threatening winter conditions: 6+ inches of snow, slightly less snow with dangerous blowing and drifting, significant impacts to transportation*	Typically 12 to 18 hours before onset *via web page, email, Weather Radio, TV, text alert*	• Monitor trends and timing • Assess timing of storm relative to activities • Evaluate safety of transportation relative to timing and expected impact of storm • Adjust activities as needed
Life-threatening blizzard conditions are imminent or ongoing ***Blizzard Warning****: Confident of life-threatening blizzard conditions: dangerously low visibility below ¼ mile in blowing snow, wind gusts over 35 mph. May or may not be accompanied by bitter cold temperatures and significant new snow accumulation.*	Typically 0 to 6 hours before onset *via web page, email, Weather Radio, TV, text alert*	• Monitor trends and timing • Assess timing of storm relative to activities • Evaluate safety of transportation relative to timing and expected impact of storm • Adjust activities as needed

Life-threatening ice storm is imminent or ongoing ➡ ***Ice Storm Warning****: Confident of life-threatening ice conditions: power outages, significant impacts to transportation, ¼ inch or more ice accumulation on roads and power lines*	Typically 0 to 12 hours before onset *via web page, email, Weather Radio, TV, text alert*	• Monitor trends and timing • Prepare for power outages • Assess timing of storm relative to activities • Evaluate safety of transportation relative to timing and expected impact of storm • Adjust activities as needed
Hazardous winter conditions are imminent ➡ ***Winter Weather Advisory*** *or* ***Freezing Rain Advisory****: Confident of winter conditions that will be hazardous but should not pose a threat to life if reasonable caution is used (3-5 inches of snow, less than ¼ inch of ice, etc.)*	Typically 12 to 18 hours before onset *via web page, email, text alert, Weather Radio, TV*	• Monitor trends and timing • Be alert to worsening conditions • Be prepared to cancel activities if necessary
Freezing Drizzle or Fog occurs *Minor ice accumulations on roads that cause temporary but significant travel impacts. Might not be well advertised.*	Typically near 0 lead time *May be unanticipated.*	• Evaluate safety of transportation and adjust activities as needed

Special Considerations for Transportation

Strong winds that often accompany winter storms can add significantly to the risk for buses, vans, ambulances, etc. because of their high profile.

Weather Hazard: Wind Chill and Extreme Cold

Wind Chill Chart

Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Calm																		
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times — 30 minutes — 10 minutes — 5 minutes

Key points:

- Note darker shading in chart above for shorter time to frostbite (exposed flesh will freeze).
- In general, extreme cold and wind chill are well forecast, high-confidence events.
- Extreme cold may occur as an isolated threat or as a compounding factor of a winter storm. As the snow/ice threat from the storm diminishes, it is not unusual for the extreme cold threat to continue or increase.
- In the local area, we average 5 events annually in the “advisory” (20-30 minutes to frostbite) range and less than one event annually in the “warning” (10 minutes to frostbite) range.

Threshold	Timing and *Sources*	Recommended Actions
Extreme cold potential exists *Forecast or* ***Hazardous Weather Outlook:*** *first mention of severity of expected cold*	Typically 3 days ahead *via web page, email, TV, Weather Radio*	• Communicate potential threat to decision makers (pre-notify)
Extreme cold/wind chill is likely ***Wind Chill Watch****: More than 50% confidence of wind chills falling to -30°F or colder*	Typically 1-2 days before onset *via web page, email, TV, Weather Radio, text alert*	• Communicate threat to all staff • Refresh staff on identification of frostbite and hypothermia • Verify furnaces are in good working condition.
Extreme cold/wind chill is imminent ***Wind Chill Advisory****: Confident of wind chills -20 to -29°F that can lead to frostbite in 20-30 minutes*	Typically 12-24 hours before onset *via web page, email, TV, Weather Radio, text alert*	• While ongoing, remain indoors as much as possible
Life-threatening cold/wind chill is imminent ***Wind Chill Warning****: Confident of wind chills -30°F or colder that can cause frostbite in about 10 minutes*	Typically 12-24 hours before onset *via web page, email, TV, Weather Radio, text alert*	• While ongoing, remain indoors

Additional Resources

Recognizing Winter Illnesses from the CDC..... http://emergency.cdc.gov/disasters/winter/staysafe
Winter Storms Preparedness Guide ..... www.nws.noaa.gov/os/winter/resources/Winter_Storms2008.pdf

5. Document Your Plan

KEY POINTS:
- Keep it simple.
- Train and practice.

Once you have developed a strategy for each of the weather hazards that may affect your facility(ies), document the plan. A worksheet can be found in the appendices of this guide to get you started.

You may find it useful to incorporate the weather strategy into a more comprehensive multi-hazard plan. A word of caution, however plans that are long and cumbersome quickly become useless! ***Keep it simple!*** The most critical elements of your plan and any facility specifics should be summarized briefly for ready access at each location.

6. Train all Staff on the Plan

One of the greatest challenges to severe weather planning at special event venues and recreational locations is that the people involved are constantly changing. Staff come and go, and visitors are highly variable.

By ensuring that the staff is up-to-date on the severe weather plan for their current role and location well before severe weather strikes, confusion is minimized and precious minutes are saved in those moments when seconds could make a difference. Even when the situation is less urgent, training on a plan (and sticking to it), minimizes confusion and builds trust.

In-service sessions and staff meetings provide an excellent opportunity for training on the severe weather strategy for a facility. Newsletters, email, and other one-way communication methods may be suitable for a short refresher of a seasonal threat.

7. Hold Seasonal Sheltering Drills

Practice makes perfect! Practicing your severe weather emergency plan through periodic severe weather drills and severe weather safety training is critical to success. Drills not only teach staff the actions they need to take, but will allow you to evaluate your plan's effectiveness.

When conducting a drill, evaluate the following:

1. Did everyone hear the alert message?
2. Did everyone understand what to do?
3. Were they able to get to designated safe areas in a reasonable amount of time? (We recommend that everyone be able to reach their designated shelter area in ***less than 3 minutes***.)
4. Would the designated safe areas accommodate all the potential people in a worst case scenario?

You may wish to conduct the spring drill in conjunction with your state's Severe Weather Awareness Week. (Illinois and Missouri usually designate the first week of March and Iowa typically designates the last week of March.) During Severe Weather Awareness Week, a time is set for a statewide tornado drill when a test tornado warning will be issued. This provides you an opportunity to test your communications and sheltering strategy from beginning to end.

Additional Resources

Annual Tornado drill dates and times ..... weather.gov/om/severeweather/severewxcal.shtml

After the Storm

Damaged Facilities

- Once a storm has passed, stay alert for the possibility of additional storms.
- If your building sustains damage, shut off the gas and electricity.
- Do not attempt to evacuate through damaged areas, as downed power lines and debris pose grave danger.

Family Communication Plan

Part of your plan should include communication with family of staff and public who might be at your event or facility. If the building sustains damage, who should family members contact to check on their loved ones?

StormReady

What is StormReady?

To help Americans guard against the ravages of severe weather, NOAA's National Weather Service introduced StormReady, a program designed to help communities and organizations arm themselves with the communication and safety tools necessary to save lives and protect property. In a nutshell, StormReady establishes an industry standard for severe weather preparedness and communication.

Tornado Damage to Greensburg High School

Photo Courtesy FEMA

Photo Courtesy FEMA

How does this apply to me?

In much the same way that StormReady principles saved the lives of 50 movie goers in a single Ohio movie theater, the StormReady program could save the lives of dozens or even hundreds of concertgoers or cycling competitors.

What are the benefits of StormReady?

StormReady provides an opportunity to review and improve your severe weather plans based on current science and technology. Most importantly you will gain confidence and public recognition that you are doing all that you can to protect the lives of all those involved in your event.

Is there a cost for the program?

No. Application and participation is free – just the time to review your procedures and submit the application.

What are the StormReady Supporter eligibility guidelines?

StormReady Supporter guidelines vary slightly from area to area. In the Quad Cities region, guidelines include:

- Endorsement by local emergency management officials
- Written severe weather plan encompassing all components of the operation
- Practices, exercises, and/or training as appropriate
- Redundant ways to monitor weather, including NOAA Weather Radio where available
- Redundant dissemination method(s) and other means of taking effective action

How do we apply for StormReady?

The appropriate safety or leadership official submits a StormReady application, completing any parts applicable to the facility. A printable form is available online at www.stormready.noaa.gov. The application is submitted to the local National Weather Service office, where it is then reviewed by the local StormReady board, comprised of representatives from the National Weather Service and local and state emergency management.

Find out more!

Contact your local National Weather Service Warning Coordination Meteorologist (WCM) or local Emergency Manager for further information about the StormReady Supporter program.

Appendices

Appendix A: Severe Weather Plan Worksheet

Identify the people involved:

- ☐ Staff
- ☐ Volunteers
- ☐ Participants
- ☐ Spectators
- ☐ Vendors
- ☐ First responders
- ☐ Local Emergency Manager
- ☐ Other:_____
- ☐ Other:_____
- ☐ Other:_____

Designate the Weather Watcher(s): *Who will monitor conditions?*

	Designated Weather Watcher *Role and/or Name*	**Monitoring Tools** *Examples include:* • *Private weather company* • *Web page* • *Mobile Alerts* • *TV* • *Phone call* • *NOAA Weather Radio*
Before Event		
During Event		

Communication: *At least 2-3 methods for each.*

People: *Check all that apply:* ☐ *Staff* ☐ *Volunteers* ☐ *Vendors* ☐ *Participants* ☐ *Performers/crew* ☐ *Spectators* ☐ *First responders* ☐ _____ ☐ _____	**Training:** *Examples include:* • *Meetings* • *Briefings* • *Drills* • *Tabletop exercise* • *Newsletter* • *Email* • *Flyers* • *Twitter*	**Pre-threat notification via:** *Examples include:* • *Meetings/briefings* • *Flyers* • *PA system* • *Electronic signs* • *Posted signs* • *Sandwich signs* • *Bulletin boards* • *Twitter* • *Test messaging*	**Imminent threat notification via:** *Examples include:* • *Twitter* • *Text messaging,* • *Electronic signs* • *PA system* • *Megaphone* • *Radio* • *Pager* • *Lightning alert* • *First responders*
e.g. Staff	*Email, Tabletop, drill*	*AM Briefing, PA, Radio*	*PA, Radio*

Identify the threats and develop a strategy for each:

Threat	Threshold(s)/Trigger(s) *Consider:* ✓ *Number of people* ✓ *Time needed*	Action(s) *Consider:* ✓ *Number of people* ✓ *Time needed*
Dense Fog		
Flash Flood		
Heat		
High Wind		

Threat	Threshold(s)/Trigger(s) *Consider:* ✓ *Number of people* ✓ *Time needed*	Action(s) *Consider:* ✓ *Number of people* ✓ *Time needed*
Lightning, Thunderstorms, and Tornadoes		
Snow/Ice		
Wind Chill & Extreme Cold		
Other		

Shelter Areas *Identify shelter areas in all facilities.*

Move from these areas:	**To this shelter area:**	**Time needed:**
e.g.: Main stage	*Green Room*	*5 min.*

Max time needed to shelter: _____minutes *(recommended time is 3 minutes)*

Document your plan

Plan reviewed by:

- ☐ Facility Manager(s)
- ☐ Shift Supervisors(s)
- ☐ Transportation Director
- ☐ Local emergency manager
- ☐ Volunteer coordinator
- ☐ Other_____
- ☐ Other_____
- ☐ Other_____

Electronic version posted here_____

After the Storm

Person(s) responsible for main electricity and gas shut off:_____

Public communication: *Who will do it and how?*_____

_____

_____

Appendix B: NOAA Weather Radio All Hazards

NOAA Weather Radio All Hazards (NOAA Weather Radio) is the ***smoke detector of severe weather***. Our warnings are delivered directly to you immediately when they are issued, so you can take the actions you deem necessary. NOAA Weather Radio provides a continuous broadcast of weather information direct from the local National Weather Service office. Special radios needed to receive the broadcast are available at many stores that sell electronics.

About the Broadcast

Recorded weather messages are repeated every three to five minutes. Routine programming includes current conditions, the 7-day forecast, and recent river stages. During severe weather, the National Weather Service preempts the routine weather broadcast and substitutes the warning messages.

All-Hazards

NOAA Weather Radio broadcasts alerts for all types of hazards - not just weather! As conditions warrant, the broadcast includes emergencies such as earthquakes, chemical releases, oil spills, nuclear emergencies, AMBER alerts, and national emergencies. Working with State and Federal agencies, NOAA Weather Radio truly is an all-hazards radio network, making it the single source for the most comprehensive weather and emergency information available to the public.

Local Coverage

Each station covers an area approximately 40 miles from the antenna site. The effective range depends on many factors, particularly the transmitter height, terrain, receiver quality, and present weather. An outside antenna can significantly improve reception.

For event venues, we recommend:

- A radio with SAME capability. This type of radio will sound an alarm when a warning is issued for your specific county. (You control the programming of this radio.)
- A battery backup in case of a power failure.
- Some more expensive models can be tied into your PA system, can set off a pager, or have flashing lights.
- Consider portable radios for your security staff or other key decision makers.

Remember to:

1. Place the radio in a central location where the alarm can be heard by the decision makers.
2. Make sure the radio is in stand-by mode, ready to alarm when a warning is issued.
3. Replace the back-up battery yearly to make sure it will work in the case of a power failure.
4. Monitor the weekly tone-alert test to make sure your radio is working properly and receiving the tone alert signal. (Tests are conducted on Wednesday around 11 am.)

Programming Your Radio

The county codes for your local area of concern, called FIPS numbers, should be programmed into your radio according to its specific instructions. While each situation is unique, it is usually a good idea to include warnings for an adjacent county especially when located near a county line.

Additional Resources

National NOAA Weather Radio Page ..... www.weather.gov/nwr
FIPS codes for programming your radio ..... www.nws.noaa.gov/nwr or 888-NWR-SAME

Appendix C: Glossary of NWS Messages

The National Weather Service provides a number of messages which can assist you in decision-making for weather-sensitive activities. All of these messages are available 24-7 on our web page and via NOAA All Hazards Radio. A brief description of the most common messages follows.

Watches - Issued when a greater than 50% chance of life-threatening weather exists.

- **Blizzard Watch** - issued 18 to 36 hours in advance of possible blizzard conditions.
- **Excessive Heat Watch** – prolonged, extreme heat is possible.
- **Fire Weather Watch** – Extreme fire danger conditions are possible in the next few days.
- **Flash Flood Watch** - flash flooding is possible. Flash Flood Watches are generally issued for areas less than the size of a state and can be valid for up to about 12 hours.
- **Flood Watch** - flooding is possible. Flood Watches are generally issued for areas less than the size of a state and can be valid for up to about 12 hours.
- **High Wind Watch** – dangerously high (non-thunderstorm) winds are possible.
- **Severe Thunderstorm Watch** - severe weather (hail quarter size or larger and/or damaging straight-line winds 58 mph or greater) is possible. These watches are generally issued for areas the size of a state, and are valid for a four- to six-hour period.
- **Tornado Watch** – severe thunderstorms with tornadoes are possible. These watches are generally issued for areas and durations similar to severe thunderstorm watches.
- **Winter Storm Watch** - issued 18 to 36 hours in advance of severe winter weather conditions (snow, blowing snow, sleet, freezing rain, or a combinations) that may become life threatening.
- **Wind Chill Watch** - issued 18 to 36 hours in advance of expected extreme wind chills (-30°F or colder; time to frostbite ~10 minutes).

Warnings - Issued when life-threatening conditions exist or are imminent.

- **Blizzard Warning** - Sustained wind or frequent gusts >35 mph, considerable blowing and drifting snow, and a visibility of ¼ mile or less.
- **Dust Storm Warning** - Heat Index (HI) 105°F and a minimum overnight HI of 75°F.
- **Excessive Heat Warning** - Heat Index (HI) 105°F and a minimum overnight HI of 75°F.
- **Flash Flood Warning** - Heavy rains are or will shortly result in life-threatening circumstances due to overflowing streams or creeks, mud slides, dam breaks, water over roadways, etc. Usually issued for portions of a few counties for up to six-hour duration.
- **Freeze Warning** – Freezing temperatures are expected to affect vegetation.
- **High Wind Warning** - Sustained winds 40 mph for 1 hour or more or gusts 58 mph or higher.
- **Ice Storm Warning** – Ice accumulations ¼ inch or more.
- **Red Flag Warning** – Extreme fire conditions exist (fires will spread rapidly out of control).
- **Severe Thunderstorm Warning** - A severe thunderstorm (hail quarter size or larger - and/or straight-line wind >58 mph) is indicated by radar or has been reported by a reliable source. Usually issued for parts of a few counties up to one hour in duration.
- **Severe Weather Statement** – Primary message for providing updates on a severe thunderstorm or tornado warning. Usually issued for parts of a few counties up to one hour in duration.
- **Tornado Warning** - A tornado is indicated by radar or a reliable source. Usually issued for parts of a few counties up to one hour in duration.
- **Wind Chill Warning** - Wind chill values -30°F or colder (time to frostbite ~10 minutes).
- **Winter Storm Warning** - >6 inches of new snow in 12 hours or >8 inches in 24 hours, or for sleet accumulations >½, or a combination.

Advisories - Issued when conditions are hazardous but should not be life threatening if reasonable caution is used.

- **Air Quality Advisory** – During periods of poor air quality as determined by the state DNR.
- **Dense Fog Advisory** – Widespread visibility ¼ mile or less, creating a significant hazard.
- **Freezing Rain Advisory** – Freezing rain or drizzle with minor ice accumulations.
- **Frost Advisory** – Frost formation is possible over a widespread area and may affect vegetation.
- **Wind Advisory** - Sustained winds >30 mph or gusts >45 mph.
- **Wind Chill Advisory** - Wind chill values -20 to -29° F (time to frostbite ~20-30 minutes).
- **Winter Weather Advisory** - Hazardous (but not generally life-threatening) conditions of
    - snow - generally 3-5 inches.
    - blowing snow – visibility less than ½ mile due to blowing.
    - sleet – less than ½ inch accumulation.
    - combination of winter precipitation.

Other Messages

- **7-Day Forecast** - routine forecasts updated at least every 3 hours which contain the basic forecast elements (high and low temperatures, precipitation type and probability, wind, clouds, etc.) for the next 7 days.
- **Forecast Discussion** – a technical discussion of the reasoning behind the forecast.
- **Hazardous Weather Outlook** - A plain-language outlook of the potential for significant weather for the next twenty-four hours in detail, with a broader overview through the next 7 days. The timing, location, and intensity of the expected hazardous weather element(s) are discussed. This message is designed for decision makers such as emergency managers, school districts, and public works departments. The Hazardous Weather Outlook is issued each morning by 5 am, and updated as needed.
- **Hourly Observations** - a collection of weather observations taken shortly after the top of the hour which include temperature, current weather, wind, dew point, air pressure and seasonally, the wind chill or heat index.
- **Public Information Statement** – Usually issued to provide information on a NOAA Weather Radio outage. May also provide program updates or other administrative-type information.
- **Special Weather Statement** - our primary method for communicating forecasts of short-term (one to six hours in advance) weather that could have an impact.
- **Video (Multimedia) Weather Briefing** – a video briefing on an event of significant impact. Video briefings are posted on our web page, office YouTube channel, Facebook page, and Twitter feed.
- **Weather Story Graphic** – a graphic image of the most important weather for the next several days. The Weather Story is viewable on our office web page.