
Attachment D

Hurricane

The Hazard

Nature of the Hazard

The term "hurricane" describes a severe tropical cyclone and sustained winds of 74 miles per hour (mph) or greater that occurs along the Gulf or East Coasts, in the Caribbean, or in the Pacific along the west coasts of Mexico and California or near Hawaii. Tropical cyclones in other areas of the world will have different names (e.g., typhoon).

The hurricane season runs from the first of June until the end of November. Yet hurricanes have occurred in every month of the year.

Hazard Agents

The primary hazard agents associated with a hurricane are the high, sustained winds; flooding from storm surge or heavy rains; battering from heavy waves; and a variety of secondary hazards:

- *High Winds.* The high winds impose significant loads on structures, both direct wind pressure and drag, and tend to propel loose objects at high velocity.
- *Flooding.* The hurricane can cause many different types of flooding. Along the coast the flooding may occur from storm surge, wind-driven water in estuaries and rivers, or torrential rain. The flooding can be still water flooding or velocity flooding caused by wave action associated with wind driven water along the coast. The rainfall associated with a hurricane is on the order of 6 to 12 inches, with higher levels common. The rain may precede landfall by hours and may persist for many hours after landfall, causing severe flooding.
- *Heavy Waves.* The storm may generate waves up to 25 feet high. These can batter the coastline, causing devastating damage to the shoreline itself and to structures near the shore. The velocity of the water moving back and forth undermines the foundations of building and piers by removing the soil from around them. Debris driven inland by the waves can cause severe structural damage;

persons exposed to the moving water and debris are likely to receive severe injuries.

- *Secondary Hazards.* Hurricanes can also cause numerous secondary hazards. Tornadoes and electric power outages are common. Contamination of water supplies, flooding of sewage treatment facilities, and even dam failure may occur.

Estimating the Force of Hurricanes

The Saffir-Simpson scale is a widely recognized and accepted practical tool planners rely on to estimate the destructive forces associated with hurricanes. This scale classifies hurricanes into five categories based on wind speed and describes the destructive forces caused by wind, storm surge, and wave action for each category. The categories are listed below.

| <u>Hurricane Category</u> | <u>Wind Speed (mph)</u> |
|---------------------------|-------------------------|
| 1 | 74-95 |
| 2 | 96-110 |
| 3 | 111-130 |
| 4 | 131-155 |
| 5 | 156+ |

A copy of the Saffir-Simpson scale is located at the end of this attachment, as Table 6-D-1. It should be used to obtain detailed information on each storm category.

Risk Area

To determine the risk area, each jurisdiction's planning team in the hurricane high-risk States should use the Hurricane Evacuation Technical Data Report, if available; FISs and FIRMs; and other local information sources such as maps and historical data on previous hurricanes and other storms that have caused injuries and/or loss of life, property damage, and disruption of essential services.

Assessment of Risk

A vulnerability assessment should be prepared. The assessment identifies the population, facilities, property, land area, etc. that are vulnerable to the hazard agents associated with a hurricane. The assessment provides the planning team the essential data it needs to determine the **hurricane category** for which the jurisdiction should prepare. **It is vital that the team plan for the highest category of hurricane that is likely to strike the jurisdiction.** The assessment should:

- Include a narrative description that identifies the parts of the jurisdiction that are subject to flooding caused by a storm surge. Also, maps that pictorially display this information.
- Identify the population at risk.
- Identify essential services (fire, police, utility substations/plants, etc.) and special custodial facilities at risk (hospitals, nursing homes, jails and juvenile correction facilities, etc.).
- Identify government resources such as essential equipment, tools, stockpiles, vital records, etc., that may need to be moved to a safe location.
- Identify facilities that must be evacuated such as trailer parks, campgrounds, etc.

Hurricane Unique Planning Considerations

This section contains a listing of the functional annexes that typically would require the preparation of a hazard-specific appendix for hurricanes. It also identifies many of the unique and/or regulatory planning considerations that should be examined by the planning team and used, as appropriate, when preparing hurricane-specific appendices.

General: Response Schedule

For this hazard a Hurricane Response Schedule is used in each of the hazard-specific appendices to describe the emergency response actions that should be accomplished when responding to a hurricane. The schedule establishes phases for the approaching hurricane, describes the activities to be completed during each phase, and sets the priority for the activities to be completed. Each phase covers a discrete period of time and details the specific actions that should be completed during the phase.

Time Phases

Usually, phases correspond to hours before the estimated time of arrival of gale/hurricane force winds, immediate response actions after landfall of hurricane force winds, through termination of all response activities. Typical phases include:

- *Awareness.* 72-60 hours before the arrival of gale force winds (32-63 mph).

- *Stand-by.* 60-48 hours before the arrival of gale force winds. It is likely that a tropical storm watch would be issued during this period.
- *Response.* 48 hours before arrival of gale force winds through termination of the emergency. Hurricane watches and warnings would be issued by the NWS during this period.

*Keying
Actions to
Time Phases*

Each phase in the schedule:

- Describes actions to be taken in the phase.
- Identifies the official responsible for the action.
- Defines the hours needed before arrival of gale force winds to carry out the activity.
- Describes the priority of the action to be taken.
- Contains other critical information that tasked organizations need to perform their assigned responsibilities.

Direction and Control

Initial actions are started before the beginning of the awareness phase when it appears likely that a specific storm could threaten the jurisdiction. They continue through the response phase. Therefore, provisions should be made, as appropriate, to address the following planning considerations in one or more appendices to a direction and control annex:

- Determine when response organizations should:
 - Be placed on stand-by, partial activation, or full activation.
 - Suspend or curtail day-to-day functions and services and focus on emergency response tasks.
- Ensure response organizations can continue to perform assigned operational tasks throughout all three phases (e.g. secure, disperse, or relocate operations centers, vehicles, equipment, vital records, and other essential resources).

- Determine timing for taking action on the following critical concerns:
 - Alerting the public.
 - Closing schools and businesses.
 - Restricting access to the risk area.
 - Opening mass care facilities.
 - Ordering an evacuation.
- Assign specific tasking to each response organization for each phase. Critical concerns include:
 - Decision for and timing to:
 - Initiate coordination and implement mutual aid agreements with other jurisdictions.
 - Suspend non-emergency government services and operations.
 - Release non-emergency government employees from work.
 - Reporting status/observations to the EOC.

Warning

Since hurricanes are typically slow-moving storms, sufficient warning time will be available to allow those people at risk to evacuate and find a safe place to stay before the storm reaches land.

The following provisions for notifying the public should be addressed, if appropriate, in one or more appendices to a warning annex.

- Roles and responsibilities of government spokespersons during each phase.
- Coordination with the NWS and media representatives to ensure timely and consistent warning information is provided.

**Emergency
Public
Information**

This section deals with the provisions that should be made to prepare and disseminate notifications, updates, and instructional messages to follow up on the initial warning.

The following planning considerations should be addressed, if appropriate, in one or more appendices to an EPI annex:

- Instructions for preparing homes/businesses (inside and outside) to weather the storm.
- Hurricane-specific survival tips for those who choose not to evacuate (e.g., remember that the eye of the storm is not the end of the storm).
- Instructions on implementing any hurricane-specific provisions for evacuation (e.g., when and where to go).
- Locations of mass care facilities that have been opened.

Evacuation

Where available, hurricane evacuation studies conducted by the States, the U.S. Army Corps of Engineers, the National Hurricane Center, and FEMA should be used to obtain vital evacuation planning data. The information gained from such studies and the risk assessment should be used to develop the planning instructions that will be relied upon to carry out an evacuation for those people at risk. These planning instructions detail the time-phased actions to be taken to evacuate people and relocate, if practical, essential services, special custodial facilities, and government resources from the risk area. All actions must be completed before the landfall arrival of gale force winds.

The following planning considerations should be addressed, if appropriate, in one or more appendices to an evacuation annex:

- Identifying specific evacuation zones. These zones delineate the natural and manmade geographic features of the areas(s) to be evacuated.
- Designating evacuation routes for each zone.
- Estimating the number of people requiring transportation support to evacuate the risk area.

- Specifying the clearance times needed to conduct a safe and timely evacuation under various hurricane threats. Consider the following complications that could impede or delay evacuation before finalizing the time-phased actions:
 - Heavy rains and localized flooding may slow traffic movement.
 - Bridge approaches may flood before evacuation can be completed.
 - Evacuees will need time to close up their homes and businesses, secure their boats, gather the essentials (medicines, food, clothing, etc.) to take with them, fill their vehicle with gas, etc.
 - Special custodial facility managers will need time to mobilize their staff, close up the facility, and make the necessary arrangements to move the resident population.
 - Traffic entering the evacuation zone to secure homes, businesses, boats, etc.
 - Evacuees from other jurisdictions passing through the zone and occupying the same evacuation route(s).
 - The need for special modes of transportation (ferries and air transport) to evacuate people from barrier islands.

Mass Care

The following planning considerations should be addressed, if appropriate, in one or more appendices to a mass care annex:

*Location of
Mass Care
Facilities*

These safety considerations should be addressed:

- Ensure the facilities designated for use are located outside of the Category 4 storm surge inundation zone.
- Ensure the facilities are located outside of the 100 or 500 year floodplain, as deemed appropriate.

- Ensure the facilities are not vulnerable to flooding due to dams or reservoirs that overflow.

*Structural
Survivability*

Ensure each facility designated for use has been certified as capable of withstanding the wind loads specified by the American Society of Civil Engineers or the American National Standards Institute guidelines. If it is necessary to use uncertified facilities, ensure that a structural engineer knowledgeable of the criteria contained in the guidelines cited, identifies and ranks the facilities that offer the best protection available.

**Resource
Management**

The following planning considerations should be addressed, if appropriate, in one or more appendices to a resource management annex:

- Provisions for purchasing, stockpiling, or otherwise obtaining essential hurricane response items such as ice machines, water purification systems, polyethylene sheeting, sand bags, fill, pumps (of the right size and type, with necessary fuel, etc.), generators, light sets, etc.
- Resource lists that identify the quantity and location of the items mentioned above, as well as points of contact (day, night, and weekend) for obtaining them.

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