

CHAPTER 4: HIGH WIND

INTRODUCTION

The Eastern Shore's location between two coastal bodies, the Chesapeake Bay and the Atlantic Ocean, makes it vulnerable towards high wind events. Hurricanes, coastal spouts, tornadoes, tropical storms, and nor'easters are some of the high wind events that cause the shore to be designated as within the 110 to 120 mph zone. This means that structures built should be able to withstand 110 mph per building code standards. This is consistent with a strong Category 1 hurricane whose 3 second gusts could be anywhere from 93 to 119 mph. High wind events on the Eastern Shore are identified in Table 1. These events were sourced from the NOAA Storm Events Database and do not reflect all high wind events on the Eastern Shore.

NATURAL FORCES AND CONDITIONS

CAUSES OF HIGH WIND

HURRICANES, TROPICAL STORMS, AND TROPICAL DEPRESSIONS

Tropical cyclone storms are reviewed in detail in Chapter 6 – Coastal Flooding, but that discussion centers on coastal flooding, not wind speed, which is the key measure of hurricane intensity as shown in the Saffir-Simpson Wind Scale. However, wind speed is also used to differentiate tropical depressions, tropical storms, and post-tropical depressions.

NOR'EASTERS

Nor'easters, or Northeasters, usually occur in the mid-latitudes over the winter months from September to April. These storms are generally very large and slow moving and can cause severe and widespread damage at the same level as their stronger summer counterpart, the hurricane (USGS, St. Petersburg Coastal and Marine Science Center).

TORNADOES

"We got an emergency message on a cellphone and within 30 seconds, the thing hit and it blew down 40, 50 trees in the park." That's how one man described the early morning EF1 tornado that struck Cherrystone Campground on July 24, 2014, killing three and injuring 36. The popular summertime destination on the Chesapeake Bay near Cheriton, Virginia was packed with 1,328 adults and children and 40 staff members at the time. A New Jersey couple was killed instantly when a tree fell on their tent. Their son, who was in a neighboring tent, died days later from a head injury, also from a fallen tree.

The tragedy brought into sharp focus the dangers posed by tornadoes. The July 24 twister was one of Virginia's deadliest, and although the National Weather Service Office issued a tornado warning 20 minutes before it hit, campers were caught off guard, forcing early risers to scramble for cover and catching others completely unaware.

The catastrophe made national news, and since then the Eastern Shore Disaster Preparedness Coalition has been working cooperatively with campgrounds on preparing materials to be provided to campers at check-in about where to seek shelter during storms and other camper safety information.

Tornadoes have traditionally occurred on the Eastern Shore during the spring and summer months with the largest one reaching F3 status in 1967. This tornado caused 5 injuries and about \$25,000 in damage.

**Table 1: High Wind Events Recorded in NOAA Storm Events Database, 2011-2021
(Excluding Tropical Cyclones and Nor'easters)**

County	Date	Event Category	Property Damage (\$, not adjusted for inflation)	Crop Damage (\$, not adjusted for	Source	Narrative
Accomack Co.	2/25/11	High Wind	2000	0	ASOS	Wind gust of 61 mph was measured at Wallops Flight Facility Airport (WAL). Very strong gradient winds produced wind gusts to around 60 mph over portions of eastern Virginia.
Accomack Co.	8/27/11	Tornado	25000	0	Emergency Manager	Weak tornado (EF0) downed trees and caused minor roof damage. Hurricane Irene moving northward over the outer banks of North Carolina and just off the Virginia coast produced two tornadoes across portions of eastern and southeast Virginia during Saturday, August 27th.
Northampton Co.	6/1/12	Tornado	3000	0	NWS Storm Survey	The tornado was spawned from the same supercell which produced a tornado just east of the Monitor Merrimac Bridge Tunnel and moved across the city of Hampton before moving over the Chesapeake Bay. The tornado produced damage consistent with an EF-0, tossing around kayaks and shearing off the tops of several trees. The tornado occurred at the Savage Neck Dunes Natural Area Preserve.
Accomack Co.	7/14/12	Tornado	15000	0	NWS Storm Survey	A slow-moving tornado made a short narrow path through rural portions of Accomack County just east of Onley. The tornado first touched down in a small residential development just southwest of the intersection of Custis Neck Road and Drummondtown Road. Numerous trees were damaged or brought down by the tornado with one tree falling on an unoccupied vehicle. The tornado then continued slowly southwest through a wooded area with the last visible tree damage seen just southwest of Accawmacke Elementary School.

High Wind

County	Date	Event Category	Property Damage (\$, not adjusted for inflation)	Crop Damage (\$, not adjusted for	Source	Narrative
Accomack Co.	10/29/12	High Wind	10000	0	911 Call Center	The very strong winds downed trees, produced minor structural damage, and caused scattered power outages. Wind gust of 59 knots (68 mph) was measured at WAL. Wind gust of 55 knots (63 mph) was measured at Accomack County Airport (MFV). Intense low pressure moving from off the northern Mid Atlantic Coast northwest into extreme southern New Jersey produced very strong west to northwest winds across eastern Virginia. The very strong winds downed numerous trees, produced minor structural damage, and caused scattered power outages.
Northampton Co.	10/29/12	High Wind	10000	0	911 Call Center	The very strong winds downed trees, produced minor structural damage, and caused scattered power outages. Intense low pressure moving from off the northern Mid Atlantic Coast northwest into extreme southern New Jersey produced very strong west to northwest winds across eastern Virginia. The very strong winds downed numerous trees, produced minor structural damage, and caused scattered power outages.
Accomack Co.	3/6/13	High Wind	3000	0	ASOS	Wind gust of 55 knots (63 mph) was measured at WAL. Intense low pressure moving off the Mid Atlantic Coast produced very strong northeast winds across southeast Virginia. The very strong winds downed trees, produced minor structural damage, and caused scattered power outages.
Accomack Co.	6/18/13	Funnel Cloud	0	0	Public	A funnel cloud was reported over Tasley. A cold front produced scattered showers and thunderstorms across central Virginia. Isolated severe weather produced strong winds, heavy rainfall, and a funnel cloud.
Northampton Co.	7/24/14	Tornado	200000	0	NWS Storm Survey	The tornado began in the Chesapeake Bay, a few miles west of Cherrystone Campground. The tornado then tracked eastward affecting the northern portions of Cherrystone Campground. The tornado then continued eastward across Old Cherrystone Road and Route 13 before lifting near Seaside Road close to the Northampton Landfill. Many trees were downed or snapped off. Numerous camping trailers were damaged, and several were destroyed. Several trees were downed on cabins.

Eastern Shore of Virginia Hazard Mitigation Plan 2021

County	Date	Event Category	Property Damage (\$, not adjusted for inflation)	Crop Damage (\$, not adjusted for)	Source	Narrative
Accomack Co.	8/4/15	Tornado	2000	0	Public	A weak tornado was reported by several people near and east southeast of Saxis. Large limbs were downed in the road. Other debris was blown around. Scattered severe thunderstorms in advance of a cold front produced damaging winds, large hail, and one weak tornado across portions of the Virginia Eastern Shore.
Accomack Co.	1/23/16	High Wind	75000	0	ASOS	Wind gust of 61 knots (70 mph) was measured at WAL. Wind gust of 50 knots (58 mph) was measured at MFV. Numerous trees were downed on Chincoteague Island, with a few trees falling on homes. Strong Low Pressure moving from the Southeast United States northeast and off the Mid Atlantic Coast produced very strong wind gusts across portions of Eastern Virginia.
Northampton Co.	10/8/16	High Wind	75000	0	Emergency Manager	Post Tropical Cyclone Matthew tracking northeast just off the North Carolina and Virginia coasts, produced very strong northeast or north winds across portions of southeast Virginia from Saturday, October 8th into Sunday, October 9th. The very strong winds downed numerous trees, some onto homes, and caused some power outages.
Northampton Co.	8/7/17	Funnel Cloud	0	0	911 Call Center	Funnel cloud was reported near Birdsnest.
Accomack Co.	3/2/18	High Wind	25000	0	Emergency Manager	Wind gusts of 61 knots (70 mph) were measured at Chincoteague (1 WSW). Wind gust of 56 knots (64 mph) was measured at WAL. Intense low pressure spinning off the southern New England coast produced very strong northerly winds across portions of central and eastern Virginia. The very strong winds downed numerous trees, produced structural damage, and caused power outages.
Northampton Co.	3/2/18	High Wind	25000	0	Emergency Manager	Wind gust of 57 knots (66 mph) was measured at Kiptopeke State Park. Intense low pressure spinning off the southern New England coast produced very strong northerly winds across portions of central and eastern Virginia. The very strong winds downed numerous trees, produced structural damage, and caused power outages.

High Wind

County	Date	Event Category	Property Damage (\$, not adjusted for inflation)	Crop Damage (\$, not adjusted for	Source	Narrative
Northampton Co.	10/11/18	High Wind	15000	0	Emergency Manager	Tropical Cyclone Michael tracked from South Carolina northeast and off the Mid Atlantic Coast from Thursday morning, October 11 into early Friday morning, October 12. Very strong northwest winds on the back side of the storm produced damaging wind gusts across portions of south central, eastern, and southeast Virginia. Numerous trees were downed and there was minor structural damage. Several campers were overturned or damaged at Cherrystone campground.
Accomack Co.	10/11/18	High Wind	5000	0	Law Enforcement	Tropical Cyclone Michael tracked from South Carolina northeast and off the Mid Atlantic Coast from Thursday morning, October 11 into early Friday morning, October 12. Very strong northwest winds on the back side of the storm produced damaging wind gusts across portions of south central, eastern, and southeast Virginia. Numerous trees were downed and there was minor structural damage.
Northampton Co.	5/29/19	Thunderstorm Wind	5000		Emergency Manager	Isolated severe thunderstorm in advance of a trough of low pressure produced damaging winds across portions of the Virginia Eastern Shore. Several trees were downed and there was some light damage to weak structures in Eastville.
Accomack Co.	12/25/20	Thunderstorm Wind	2000	0	Utility Company	Scattered severe thunderstorms in advance of a strong cold front produced damaging winds and two tornadoes across portions of eastern and southeast Virginia. Trees were downed at Indian Trail Road and Scarboroughs Neck Road.

TYPE, LOCATION, AND EXTENT

DAMAGES

High wind events cause progressive failure of structures. Once a building's envelope has been breached, wind will start to enter the building and either pull or push at other parts of the structure. Partially enclosed buildings experience a 30% higher wind pressure than enclosed buildings. Once a building becomes partially enclosed due to wind damage, higher wind pressures cause further damage (*FEMA Coastal Construction Manual, 2011*).

A building fails in high winds because the wind speed exceeds the capacity of the structure to hold up. This can happen in two ways: wind speed exceeds the design or construction standards used or windborne debris damages the structure, and as a result of increased wind pressure, the design or construction standards are surpassed. Wind damage commonly assumes a couple of forms. Roofs can fail, lightweight structures can overturn at the foundation, siding and shingles can be pulled off the building, and openings can be blown in. Once a structure's envelope has been penetrated by wind, wind-driven rain and debris causes additional damages (*FEMA Coastal Construction Manual, 2011*).

Storms that occur when the trees are in full leaf, like Hurricane Isabel, also cause tremendous tree damage. Thousands of trees were blown over due to the winds from Isabel and saturated soils. Many of these trees damaged houses, auxiliary structures, power lines, and vehicles.

EXPOSURE AND POTENTIAL LOSS

The building code requires all structures to withstand 110 mph winds, the equivalent of a Category 2 hurricane. However, a community shelter on the Eastern Shore must be built to withstand 160 mph winds, due to the Shore's categorization as a Zone II wind zone (ASCE 7-98). With these standards, a community shelter should withstand a F2 tornado and a Category 4 hurricane.

This wind speed is based on the 100-year return frequency. That means that over 70 years a structure would have a 50% chance that the 110-mph wind speed would be met or exceeded. However, wind speed design builds in a 1.5 safety factor so a structure should withstand a higher wind speed (*FEMA Coastal Construction Manual, 2011*).

Siting decisions affect the types of wind speed seen at a building. Ocean promontories generally receive high wind speed due to the topography of the area. A more exposed condition because of lack of vegetation around the structure will open the building up to greater wind speeds. Those structures near open water are exposed to higher winds than structures located more landward. In addition, the height of a structure above the ground can be a factor in wind damage. The higher a house is located above ground the higher the wind speed will be around the structure. This can be an issue in flood zones since elevation of the building is the primary means of mitigating flood damage (*FEMA Coastal Construction Manual, 2011*).

In addition, a structure is only as wind resistant as its smallest component. If a window, door, roof covering, siding or chimney fails, the rest of the structure will be subjected to wind pressures that can cause other components to fail even though they perform to their design guidelines (*FEMA Coastal Construction Manual, 2011*).

SECONDARY HAZARDS

Auxiliary hazards of high wind are salt spray and soil erosion. High winds can gather salt from the ocean and spread it over the Eastern Shore, causing crops to be destroyed and power lines to fail. Hurricane Isabel caused both types of damage. Additionally, strong winds from the northwest are common during the winter months on the Eastern Shore. According to local oral accounts, these winds can cause significant soil erosion to fields in the winter, stripping critical nutrients from fields and depositing them in local waterways.

HUMAN SYSTEMS

There are various ways that property damage and personal injury can be minimized. Preparation is one of the most important of these. Resilient construction is key to this, as discussed previously in the Exposure and Potential Loss section above. Early warnings are also vital to ensuring that people can move to shelter prior to the onset of a high wind event.

WARNING ANNOUNCEMENTS

The National Weather Service provides warnings for high winds through their Land-based Wind Hazard Announcements and Water-based Wind Hazard Announcements. These warnings are available to the residents of the Eastern Shore via several delivery methods: television, radio, internet, and mobile phone alerts (including CodeRED alert system).

CONSTRUCTION STANDARDS

The 2011 FEMA Coastal Construction Manual lays out very specific design standards for wind, flooding, fire, and more. Design for wind loads is essentially the same whether the winds are due to hurricanes, thunderstorms, or tornadoes, and both Counties (and subsequently their respective incorporated Towns), go by these standards for building and zoning codes.

PERSONAL RESPONSIBILITY

Even if structures are built to the proper standard, regular maintenance to ensure their stability and resilience are important. FEMA has produced a guide to protecting property from high winds, available online in PDF format. Some of the recommendations include documenting the contents of the home for insurance purposes, building a safe room for sheltering during storm events, using storm shutters for windows and glass doors, reinforcing garage doors and double-entry doors, fortifying the roofs, securing objects outside the home, and more.