

School Lightning Safety Policies – A Look At An Incident At The Ocoee Schools In Orange County, Florida

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1. INTRODUCTION

On August 25, 2004, four children were struck by lightning after getting off a school bus near the town of Ocoee, Orange County, Florida. One of the victims subsequently died from her injuries. The driver of the bus apparently was not aware of the lightning threat at the time the children were dropped off. The incident prompted the Orange County Public School (OCPS) administration to implement a new policy to provide greater safety for the students, faculty, and staff. This Lightning and Inclement Weather Delayed Dismissal Policy included specific guidelines for the dismissal of students with regard to lightning. More specifically, the policy called for the use of the 30-30 lightning safety guideline (Holle, et al., 1999) in determining whether and when it is safe to dismiss students.

Three years later, on August 24, 2007, thunderstorms in the Ocoee area prompted a delayed dismissal at Ocoee Elementary

School and Ocoee Middle School. Due to the extraordinary continuing lightning threat, students were held for up to 5 hours after normal dismissal time. While the Ocoee incident highlights the need for schools to have lightning safety plans and policies, the incident also highlights the need for adequate communications with parents.

In this paper, we will examine this incident in terms of the lightning activity, administrative actions, and the response of the parents. Although the OCPS lightning safety policy is one of the best in the country, our goal is to find out what can be done to improve the decision-making process, and the community preparedness and response for similar events.

2. BACKGROUND INFORMATION ON OCOE ELEMENTARY AND OCOEE MIDDLE SCHOOLS

Ocoee Elementary and Middle Schools are part of the Orange County Public Schools

(OCPS) system. OCPS is the fourth largest school system in the state and one of the largest school systems in the country. The system draws students from an area of about 900 square miles and is comprised of about 180 schools with an attendance of about 175,000 students. In addition, the school system employs a staff of more than 21,000. All totaled, almost 200,000 people attend or are employed by OCPS.

In accordance with [Florida statutes](#), the OCPS system must provide school bus transportation to students who live more than two miles from school. Students who ride a school bus may be required to walk a maximum of one and a half miles to and from the bus stop. As a general rule, students who live less than two miles from the school are not provided transportation. Based on an average walking speed of 3 mph (1 mile in 20 minutes), it could take walkers up to 40 minutes to reach the safety of their homes after dismissal. For those students who ride busses, it could take up to 50 minutes to get home based on a 20 minute bus ride and a one and a half mile walk home.

[Ocoee Elementary School](#) is attended by about 850 students (Kindergarten through 5th grade) and has a staff of about 80 employees. The school draws from an area of about 4 square miles with the farthest residence being about 2.3 miles away from the school. Normal dismissal time is 3:00 pm.

[Ocoee Middle School](#) is attended by about 1650 students (6th through 8th grade) and has a staff of almost 200 employees. The school draws from an area of about 20 square miles with the farthest residence being about 4.2 miles away from the school. Normal dismissal time is 3:50 pm.

3. OCPS LIGHTNING POLICY – THE 30-30 GUIDELINE

Following the fatal lightning incident on August 25, 2004, OCPS implemented a new Lightning and Inclement Weather Delayed Dismissal Policy which called for the use of



Figure 1. School zones for [Ocoee Middle School \(larger area\)](#) and [Ocoee Elementary Schools \(smaller area\)](#)

the 30-30 lightning safety guideline in determining whether it was safe to dismiss students. The 30-30 lightning safety guideline specifies that a person be in a safe place when the time between the flash of lightning and the corresponding thunder is 30 seconds or less and that the person remains in that safe place for at least 30 minutes after the last flash or thunder.

The 30-30 guideline is most useful for storms that move through an area, but does not provide advance warning for storms that develop overhead or nearby. Instead, visual clues, such as darkening skies, must be used to detect a developing storm. The first part of the guideline (30 seconds) is meant to provide protection as a storm approaches and equates to being in a safe place when the nearest lightning is six miles away. The second part of the guideline (30 minutes) is meant to provide protection as the storm moves away and allows time for charges aloft to dissipate. It requires that people remain in a safe place for 30 minutes after the last flash or last thunder is heard. Under good listening conditions, thunder can be heard for a distance of about 10 miles from a lightning strike. Therefore, the latter part of the guideline equates to being in a safe place for 30 minutes after the last lightning strike within 10 miles. In addition, the 30-30 guideline was designed only to assess the immediate lightning threat at the specific location where the weather is being monitored.

Principals at the OCPs schools are responsible for initiating a delayed dismissal whenever lightning threatens the safety of the children. Once in effect, dismissal is delayed until at least 30 minutes after the last thunder. When dismissal is delayed, an automatic phone messaging system delivers information (in English and Spanish) via recorded messages to all phones that are registered with the schools.

3. LIGHTNING DATA

For this study, lightning strike data from the National Lightning Detection Network (NLDN) (Cummins and Murphy, 2009) were provided courtesy of Vaisala, Inc. The stroke data were subjectively examined to determine the approximate number of lightning flashes (as opposed to strokes) and to determine an approximate location of the ground contact for each flash. Only one ground contact point was established for each flash, although research has shown that there is an average of 1.5 ground-contact points per flash (Stall, et al., 2009). The NLDN data included the time, polarity, peak current, distance from Ocoee Elementary School, and an estimated location (latitude and longitude). For

multiple stroke flashes, the location of the stroke with the greatest peak current was used as the estimated ground-contact point for the flash.

For the time period of this study, the NLDN detected about 1500 strokes within 10 miles of the school from which about 420 ground contact points were estimated. Applying the correction for multiple ground contact points, we estimate that there were about 630 ground contact points within 10 miles of the school.

4. A LOOK AT THE LIGHTNING EVENT

Prior to dismissal on August 24, 2007, a thunderstorm developed near the Ocoee Elementary/Middle School Complex. The first lightning activity within 6 miles of the school occurred at 2:32 pm. Thunderstorms continued in the area at varying intensities until just after 8:00 pm. During this period, the NLDN detected about 170 lightning cloud-to-ground flashes within 6 miles of the schools, and about 420 flashes within 10 miles of the schools. Figure 2 shows the distribution of lightning activity near the schools for half-hour intervals from 2:00 pm to 9:00 pm.

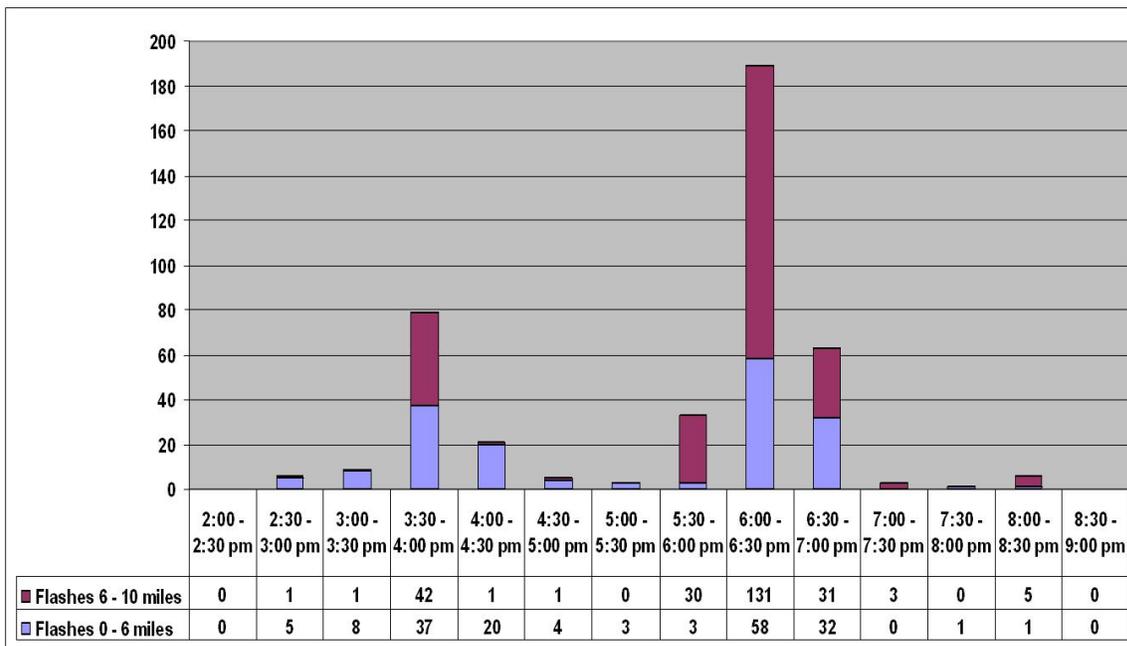


Figure 2. Distribution of lightning flashes within 6 miles and 6 to 10 miles of the Ocoee Schools

The following sections provide more detailed information on lightning activity and the subsequent decisions made by school officials based on that lightning.

4.1 Lightning activity 2:32 pm - 3:00 pm and the decision to delay dismissal at Ocoee Elementary School

The first lightning flash to strike within 6 miles of the Ocoee Elementary and Middle School Complex struck at 2:32 pm and was 3.8 miles from the complex. Between 2:32 pm and the 3:00 pm normal dismissal time for Ocoee Elementary School, an additional 4 cloud-to-ground flashes were recorded within 6 miles of the schools. The closest strike was 3.7 miles away at 2:42 pm. No lightning was recorded between 2:51 and 3:00 pm. Figure 3 shows the locations of cloud-to-ground flashes between 2:30 and 3:00 pm.

The decision to delay the 3:00 pm dismissal at Ocoee Elementary School was in accordance with OCPS policy based on the nearby lightning activity just 10 minutes earlier. However, because the district-wide area network that supports the elementary school was temporarily interrupted, there was a delay in the release of the automated phone message notification to parents. The principal released a message at about 3:30 pm.

As would normally be the case, a number of parents arrived at the Ocoee Elementary School prior to dismissal to pick up their

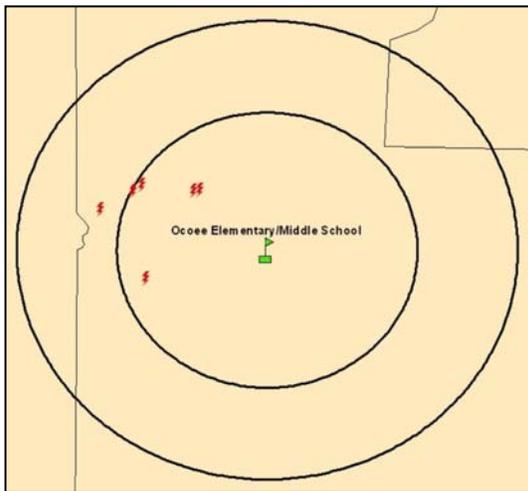


Figure 3. Cloud-to-ground lightning detected by the NLDN between 2:30 and 3:00 pm.

children. However, with active thunderstorm in the vicinity and in the interest of safety, students were not dismissed.

4.2 Lightning activity 3:00 pm - 4:00 pm and the decision to delay dismissal at Ocoee Middle School

Figure 4 shows the cloud-to-ground lightning activity between 3:00 and 4:00 pm. The brief lull in nearby cloud-to-ground lightning activity that started at 2:51 pm continued until 3:22 pm; no flashes were detected within 6 miles of the schools and only one flash was within 10 miles. However, that one flash necessitated a continuation of the delayed dismissal. In addition, at that time, darkening skies and in-cloud lightning likely indicated that a thunderstorm was developing overhead.

If any consideration had been given to dismissing the students after the 30 minute lull in nearby activity, those thoughts would have been quickly dismissed at 3:23 pm when lightning struck 1.5 miles from the school complex. Between 3:23 pm and 3:30 pm, six lightning flashes struck within 2 miles of the schools, the closest being 0.6 miles away. Two additional flashes were observed between 2 and 6 miles away.

Intense lightning continued between 3:30 and 4:00 pm. During this time, 79 cloud-to-ground flashes occurred within 10 miles of the schools, 37 flashes were within 6 miles, and 13 flashes were within 3 miles. The closest strike occurred 0.9 miles away.

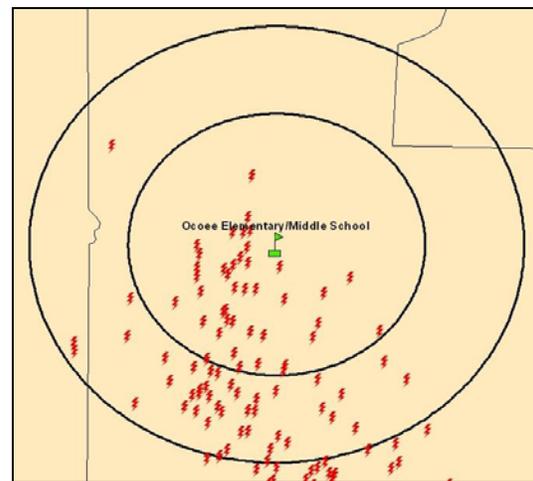


Figure 4. Cloud-to-ground lightning detected by the NLDN between 3:00 and 4:00 pm.

Based on the nearby lightning activity, the decision to delay the 3:50 pm dismissal at Ocoee Middle School was warranted and in accordance with Orange County Public School policy. Automatic phone messages were sent out from the Middle School and specifically stated that schools would not be dismissed until 30 minutes after the last lightning strike.

Nevertheless, some parents still arrived at the Middle School prior to dismissal to pick up their children. However, with lightning in the area, students were not allowed to leave the school.

4.3 Lightning activity 4:00 pm – 8:00 pm

Lightning activity continued in the vicinity of the Ocoee schools at various intensities between 4:00 pm and 8:00 pm. Figure 5 shows cloud-to-ground lightning between 4:00 and 8:00 pm. During this time, administrators, resource teachers and parent volunteers monitored lightning activity. Although there were several lulls in nearby cloud-to-ground lightning during this period (as detected by the NLDN), those monitoring the lightning at the Ocoee Schools did not observe any 30-minute lulls in the total lightning activity (Clark, 2010).

Figure 6 is a timeline for the Ocoee incident showing the status of cloud-to-ground lightning activity with respect to the 30-30 guideline. In the timeline, both the red and yellow bars denote times when people should be inside. Initially, the timeline changes from green (safe to be outside) to

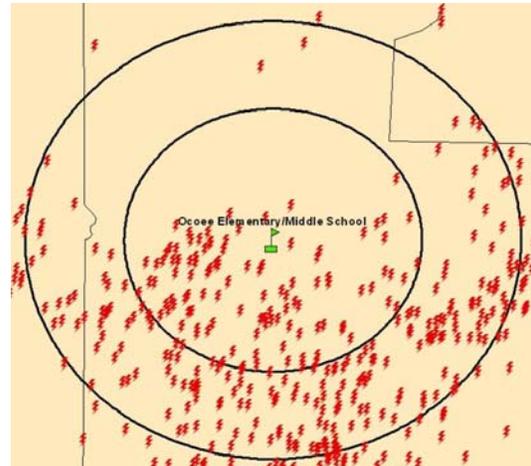


Figure 5. Lightning from 4:00 pm to 8:00 pm.

red (not safe to be outside) at 2:32 pm when lightning strikes within 6 miles of the schools (which equates to the first part of 30-30 guideline). The timeline remains red until there is a full 30 minute period (yellow) with no cloud-to-ground lightning within 10 miles (which equates to the distance that you can hear thunder, the second part of the 30-30 guideline). If no lightning was detected within 10 miles for 30 minutes, the bar changes to green.

As is seen in the figure, after the initial start of the lightning delay at 2:32 pm, the first 30 minute period that met the criterion of no cloud-to-ground lightning within 10 miles was not until the 7:04 to 7:34 pm period. During the 5 hours between 2:32 pm and 7:34 pm, there was never a time that would have allowed for dismissal in accordance with OCPS policy.

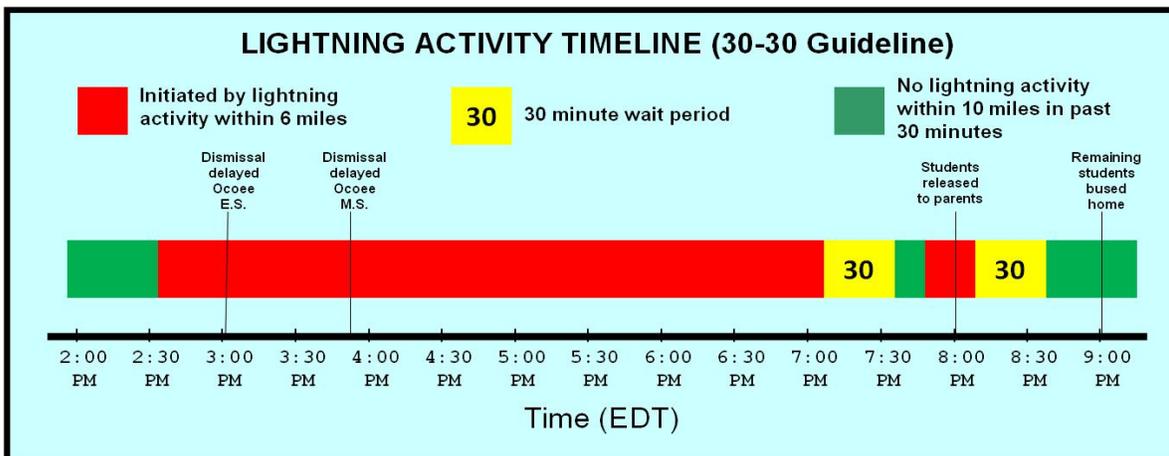


Figure 6. Timeline showing status of cloud-to-ground lightning activity with respect to the 30-30 guideline

It should be noted that during the 5 hours between 2:32 pm and 7:34 pm, there were lulls in the nearby (within 6 miles) lightning activity, however none of the lulls met the 10-mile criterion. One such lull occurred between 5:17 and 5:52 pm when no cloud-to-ground flashes were detected within 6 miles of the schools, however 12 flashes were detected between 6 and 10 miles (between 5:36 and 5:51 pm) as another thunderstorm approached the area.

The most intense lightning of the day occurred between 5:52 pm and 6:41 pm. During this 50-minute period, 92 flashes struck within 6 miles of the schools and 259 flashes that struck within 10 miles.

From 6:42 to 7:03, 16 lightning strikes were recorded between 6 and 10 miles as the storm moved out of the area. No cloud-to-ground lightning activity was recorded within 10 miles of the schools between 7:04 and 7:48 pm although officials and volunteers at the school continued to report in-cloud lightning (Clark, K., 2010).

A final burst of lightning activity occurred between 7:49 and 8:07 pm. During this period 2 flashes struck within 6 miles of the schools and 5 additional flashes were detected between 6 and 10 miles.

5. OCPS ADMINISTRATIVE PREPAREDNESS AND RESPONSE TO THE STORM

The Ocoee lightning event occurred at the end of the first week of school. Information concerning the delayed dismissal policy was provided to parents earlier in the week via first-day back-to-school packets and through an automated phone messages. However, feedback from parents during the incident, as aired in the media, indicated that some parents were not aware of these policies.

As is normally the case, some parents arrived at the schools prior to dismissal to pick up their children. Undoubtedly, some parents were at or on their way to the schools when the schools' delayed dismissal policy was declared. While some of these parents did not receive the delayed dismissal notification messages, the nearby

lightning should have indicated that a delayed dismissal would be in effect. Also, the lightning probably prompted other parents to come to the school to pick up their children so the children wouldn't have to walk home in dangerous conditions. In addition, the automated phone notification messages probably prompted other parents to drive to the schools to pick up their children.

With parents continuing to arrive at the schools, and few, if any, leaving, roadways in the area surrounding the schools became clogged. At one point, the clogged traffic slowed an emergency vehicle that was responding to a medical emergency in the neighborhood near the schools.

Initially, the schools were in what would be considered a near-lockdown mode with limited access to the buildings. In general, parents who arrived at the schools to pick up their children were denied access to the schools. Children with cell phones were allowed to call home to inform their parents of the situation.

Inside each school, teachers, staff, and parent volunteers kept the students busy in their classrooms with a variety of activities. Parents who had been volunteering at school that day stayed and assisted administrators and staff in preparing food.

Students had access to bathrooms and were provided with food (sandwiches and/or snacks) and drink. Parents whose students had medical needs were escorted to classrooms to dispense any necessary medicine. One student at Ocoee Middle School was escorted out of the building by police due to a medical emergency.

During the storms, updates were sent out to parents via the automated phone system, and local media carried information about the delays. In addition, administrative staff answered incoming phone calls.

Around 8:00 pm, students were dismissed to parents and guardians. Dismissal at the Middle School was slowed because many parents were not aware of their children's schedule and did not know what classroom(s) their children were in. At that

time, a phone message was sent out through the automated phone system alerting parents that their children could be picked up at the school. Any student that was not picked up by their parents by 9:00 pm was taken by bus to their homes. Due to darkness and rain, no students were allowed to walk or ride bikes home.

6. PARENTAL RESPONSE TO THE STORM

While there were many parents who waited patiently for the lightning to end, a vocal group of parents became increasingly frustrated and angry as the situation evolved. Many demanded to be allowed to sign their children out of the school. However, in the interest of safety, they were not allowed to do so.

As the delay continued, the parents became irate and the situation became more tense and chaotic. As required by the district emergency procedures, officials from the OCPS Security Office, the Orange County Sheriff's Office, and the Ocoee Police Department responded to assist the sites in managing the weather emergency. The agencies worked collaboratively using the National Incident Management System (NIMS) response model.

As the dismissals continued to be delayed, broadcast media arrived at the schools to cover the incident. While the local broadcast media provided the public with information on the delayed dismissal, they also provided a forum for the more vocal and angry parents to publically air their outrage. Local stations, including [WESH Channel 2](#) and [Central Florida News 13](#), covered the incident.

The media stories tended to focus more on the volatile atmosphere created by angry parents rather than the safety provided by the school policies. Although parents who supported the actions of the schools welcomed the opportunity to be interviewed, their offers were declined both during and after the incident (Clark, 2010).

While the children remained safe inside the school, the parents spent most of their time

waiting outside the schools. Many exposed themselves to the lightning threat by standing outside their vehicles.

Parental outrage continued in the days immediately following the event. Some of the parents accused the schools of "using extremist powers" to illegally "detain" the children as "hostages." An anonymous threatening phone message was left on the Middle School's phone system which necessitated the need to limit access to the school for two days. In several cases, parents threatened to sue the school system over the event, although to the school system's knowledge, no one actually filed a lawsuit against the district related to the weather emergency.

7. OCPS SCHOOL BOARD REVIEW OF THE EVENT AND SUBSEQUENT CLARIFICATIONS OF THE DELAYED DISMISSAL POLICY

Shortly after the August 24th incident, the OCPS Safety, Security and Environmental Services Office, in conjunction with the District's Students and Family Empowerment (SAFE) Office, conducted an OCPS School Board work session regarding emergency preparedness and violence prevention protocol in place throughout the OCPS system. More than half of the work session focused on the severe weather event that occurred four days earlier in West Orange County, including the Ocoee Schools. Safety, Security and Environmental Services staff [presenters explained activities and operations that went well and also shared areas for improvement](#). These areas included:

- * Communication of the delayed dismissal was hampered due to a power outage caused by the storm and because parents had not yet provided emergency contact information

- * Many parents were not aware of the OCPS policy regarding delayed dismissals for lightning and were also not familiar with the 30-30 lightning safety guideline.

- * There were questions concerning procedures of when and how students

should be released to parents in these situations.

Following the incident, the OCPS system continues to use the 30-30 guideline in determining the need for a delayed dismissal and, during a delay, when it is safe to dismiss children. In addition, the School Board clarified the OCPS position such that, although discouraged, authorized persons would be allowed to sign out children during delayed dismissals so long as the practice does not pose undue danger on other students and staff.

8. WHAT CAN BE LEARNED FROM THE OCOEE EVENT

Although many issues surfaced during and after the August 24 incident, the most important outcome of the event was that no children were injured or killed by lightning that day. The policies of the school quite possibly saved one or more lives or prevented serious injury that day. The OCPS administration and the principals involved should be commended for having a lightning safety policy and for adhering to that policy despite mounting parental pressure to abandon it.

We agree with the OCPS administrative assessment regarding the issues that surfaced during the incident. Lack of adequate communication both before and during the event contributed to the problems that evening. Parental behavior also complicated a process designed to protect children in a learning environment. Obviously, the lightning delay would have created fewer issues if the parents had been more aware of school policies and if they had provided the schools with the appropriate emergency contact information.

The controversy involving parental rights to sign the children out of school during thunderstorms is not within the scope of this paper. However, it is worth noting that the OCPS School Board has clarified its sign-out policy to allow authorized persons to sign out children during delayed dismissals for lightning as long as that process does not unduly place other staff or students in danger.

The Ocoee incident does point out the need to educate parents on the dangers of lightning and the need for delayed dismissals. Parents must first understand why these policies are in place in order to appreciate the safety that they provide. The [NOAA Lightning Safety website](#) (NOAA, 2010) is a good site to become acquainted with the dangers of lightning and provides a wealth of information on lightning safety.

The OCPS policy provides students with a real-life example of safe behavior when thunderstorms are nearby. Parents must realize that their behavior during these situations can either reinforce this safety message or undermine it. For the safety of all involved, it is important for parents to follow the guidelines established by the OCPS administration. While these guidelines will be inconvenient at times, they do save lives.

As was previously noted, the 30-30 guideline was designed to be used at a specific location when safe shelter is immediately available. While this guideline is applicable while students are at school, it was not designed for larger areas such as school zones or instances when shelter is not immediately available (such as when children are walking home). In order to provide for the safety of students who walk home from either a school or a bus stop after dismissal, the 30-30 guideline should be used in conjunction with other information such as local short term forecasts, RADAR, and visible signs of developing thunderstorms.

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