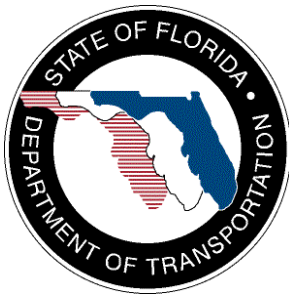


White Paper

Traffic Signal Head Removal Prior to Hurricanes

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Version 2**



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Table of Contents

List of Acronyms	ii
1. Overview	1
2. Signal Removal Practices	2
3. Conclusion.....	4
4. Final Decision.....	5

List of Acronyms

DTOE.....	District Traffic Operations Engineer
FACERS	Florida Association of County Engineers and Road Superintendents
FDOT	Florida Department of Transportation
FHWA.....	Federal Highway Administration
<i>MUTCD</i>	<i>Manual on Uniform Traffic Control Devices</i>
TEOO.....	Traffic Engineering and Operations Office

1. Overview

Four major hurricanes struck Florida during the 2004 hurricane season, leaving in their wake an estimated \$41 billion in damages to homes, businesses, and public facilities, including the state's transportation infrastructure. While highly unusual, this devastating occurrence has given the Florida Department of Transportation (FDOT) an opportunity to learn which of its hurricane preparation activities were successful and which were not.

One such activity, the removal of traffic signal heads at intersections prior to a hurricane's arrival, was used in preparation for the hurricanes and deals directly with the state's transportation system. This white paper presents some experiences of the maintaining agencies that removed signals from intersections before the storms' arrivals, and of other agencies that considered the practice but did not implement it. In particular, the paper discusses why the removal was implemented, how it was performed, and how effective the removal was in preventing further damage and loss. It presents the possible pros and cons of performing traffic signal head removal, and whether the agencies contacted recommend removal in future hurricane events.

2. Signal Removal Practices

The three agencies contacted for information regarding the practice of removing signal heads were Palm Beach County, Indian River County, and Volusia County. All three agencies provided similar information about the practice. The agencies considered the concept of signal head removal because of the difficulty in finding replacement signal heads due to previous hurricane damage throughout Florida, as well as their own prior experiences with hurricanes.

As for the timing of removals, the agencies decided to take down the signal heads when the three-day weather forecast indicated a significant strike probability for an approaching hurricane. All three agencies contacted their respective FDOT District Traffic Operations Engineer (DTOE) for concurrence with the practice and the agencies that received concurrence proceeded with implementing the practice.¹

The two agencies that did implement the practice used similar methodologies for removal of the signal heads. For example, both agencies decided to remove signal heads at intersections with near and far side indications from the near side, and both agencies removed a signal head from the dual left turn indications. The one difference was that Indian River County removed signal heads down to a single indication where there were two or more indications for a direction. In Palm Beach County, however, the decision was made that under no circumstances were signal heads to be removed when it would result in a violation of the Federal Highway Administration's (FHWA) *Manual on Uniform Traffic Control Devices*' (MUTCD)² requirement for at least two signal heads for indication in a given direction.

The removals were accomplished using county staff and, if available, contract personnel that had been employed to assist in damage repair from other hurricanes. The process for removal began with major intersections, where the signal heads were removed, labeled, and stored in county facilities. After the hurricane, the signals were restored to intersections according to which intersections had power, with major intersections having power being the first priority. A cost for the removal and replacement was not obtained from the agencies; however, both agencies indicated that they thought the removal process was effective and beneficial overall.

¹ Volusia County did not conduct signal head removal because they did not receive FDOT approval.

² Federal Highway Administration, *Manual On Uniform Traffic Control Devices (MUTCD)* (July 2004). More information regarding the *MUTCD* is available online at <http://mutcd.fhwa.dot.gov>

The agencies listed the advantages of signal head removal as follows:

- The removal saved signal heads that might otherwise have been destroyed;
- The signal heads that had been removed and stored were available for immediate reinstallation following the hurricane;
- The removal allowed the empty disconnects to survive the storm;
- The removal lightened the span load and this, in combination with span tightening, saved intersections from further damage; and
- The removal allowed the system to be returned to normal operation quicker than would have been possible otherwise.

The maintaining agencies did not list any drawbacks to the removal of signal heads. There are issues, however, that are potential problems that need to be considered, including:

- The removal of signal heads to numbers lower than the allowable indications required by the *MUTCD* leaves the counties or state in a vulnerable position should an incident occur due to the lack of indications at an intersection;
- Taking down signal heads prior to a storm based on a three-day forecast may result in an unnecessary removal if an approaching hurricane changes course; and
- Not realizing that traffic signals had been previously removed, contractors may mistakenly replace signals thought to be damaged or missing due to a hurricane.

It should be noted that all three agencies indicated that the potential liability issue had been considered, but felt that if a single indication for a direction was acceptable after a hurricane event until an intersection could be fully restored, then the same configuration for a short period of time prior to a hurricane event should also be acceptable. Volusia County said this issue was to be discussed by the *MUTCD* committee to see if the *MUTCD* should be revised for emergency situations.

3. Conclusion

Overall, the agencies that performed signal head removal believed that the time, effort, and costs entailed in conducting this procedure were well justified by the savings in protecting these assets and in the quicker recovery time after the storms had passed. All three agencies indicated that they would consider and/or recommend the removal of signal heads for any future hurricanes of a Category 2 or higher magnitude. However, even though the counties believe the practice is beneficial, the FDOT should consider both the pros and cons of employing it, and develop a policy for future statewide practice during hurricane seasons.

4. Final Decision

The FDOT Traffic Engineering and Operations Office (TEOO), DTOEs, and members of the Florida Association of County Engineers and Road Superintendents (FACERS) met on January 27, 2005, and reached the following decision regarding signal head removal.

With the approval of the FDOT, signal heads may be removed if desired as long as there are the resources to accomplish the removal, and as long as the removal does not impact evacuation efforts or public safety. Removal of signal heads will not violate the FHWA's minimum requirements as detailed in the *MUTCD*.