



Florida Department of Transportation

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TRAFFIC ENGINEERING AND OPERATIONS BULLETIN 20-02
STRUCTURES DESIGN BULLETIN 20-05
ROADWAY DESIGN BULLETIN 20-08

DATE: July 08, 2020

TO: District Directors of Operations, District Directors of Transportation Development, District Traffic Operations Engineers, District Design Engineers, District Construction Engineers, District Consultant Project Manager Engineers, District Maintenance Engineers, District Roadway Design Engineers, District Project Management Engineers, District Materials Engineers and District Structures Design Engineers

FROM: Trey Tillander, P.E., Director, Traffic Engineering and Operations Office
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SUBJECT: **Adding Backplates to Existing Traffic Signals**

This bulletin announces revisions to the criteria for the addition of backplates on existing traffic signal structures. These revisions affect the January 2020 Traffic Engineering Manual (TEM), the Structures Manual, and the FDOT Design Manual (FDM).

SUMMARY OF REVISIONS

- **Traffic Engineering Manual, Chapter 3 Signals**
 - **Section 3.9 – Countdown Pedestrian Signal Applications** was rescinded on 11/1/17 and replaced with the new TEM 3.9 Section Installing Retroreflective Signal Backplates on Existing Structures.
 - **Section 3.9 – Installing Retroreflective Signal Backplates on Existing Structures:** New section added. Provided criteria for analyzing and installing flexible backplates to existing traffic signal structures with exceptions to structural capacity analysis.
- **Structures Manual, Volume 3 – FDOT Modifications to LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals**
 - **Section 5.12 – Combined Forces:** add the following:
 - When designing mast arm signal structures, replace “ ≤ 1.0 ” with “ ≤ 0.95 ” in all equations under this section.
 - **Section C5.12,** add the following:

- For mast arms, designing to a maximum limit of 0.95, allows for future attachments such as cameras and other ITS equipment.
 - **Section 18.3 – Category 2 Analytical Evaluation with Proposed Additional Loading:** Replace the 2nd paragraph of Section 18.3 with the following:
 - When retrofitting “flexible” backplates to an existing mast arm or span wire, see TEM Section 3.9. When adding more than just "flexible" backplates to an existing mast arm or span wire, a structural analysis is required. The analysis may assume 2-1/2” wide "flexible" backplates on all the signals.
 - **Section C18.3**, add the following:
 - If "flexible" backplates are required, label the backplates as “Flexible Backplates” in the plans.
- **FDOT Design Manual**
 - Replace **FDM 114.3.2, Item (10)** with the following:
 - (10) Addition of signal backplates where it would not require structural modifications to mast arm or span wire systems. See **TEM, Section 3.9** for use of flexible backplates where needed.
 - Add the following paragraph to the end of **FDM 232.1.5**:
 - See **TEM, Section 3.9** for use of flexible backplates where needed.

COMMENTARY

Studies have shown that retroreflective signal backplates improve visibility of traffic signal indications and help reduce the number of crashes at signalized intersections. As a follow-up to the Traffic Operations Bulletin 01-12, revisions have been made to the TEM, Structures Manual, and FDM to provide criteria on evaluating existing traffic signal structures for the addition of backplates.

Furthermore, in anticipation of changing technologies and the need to accommodate new types of equipment and devices, such as connected vehicle communication devices, cameras, blank-out signs, vehicle microwave detectors, etc., all new traffic signal structures shall be designed to accommodate future attachments. This future loading is based on a Combined Force Interaction Limit of 0.95 and shall be used to accommodate future attachments.

IMPLEMENTATION

These changes are effective on projects beginning design on or after October 1, 2020 and on projects currently in the design phase where implementation will not adversely impact production schedules.

The requirements of the bulletin are effective immediately on all design-build projects for which the final Request for Proposal (RFP) has not been released. Implementation of this bulletin for design-build projects for which the final RFP has been released is at the discretion of the District.

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Section 3.9

INSTALLING RETROREFLECTIVE SIGNAL BACKPLATES ON EXISTING STRUCTURES

3.9.1 PURPOSE

To provide guidance on retrofitting existing signal structures with retroreflective signal backplates on the State Highway System.

3.9.2 BACKGROUND

The use of retroreflective signal backplates improves the contrast between the traffic signal indications and their surroundings for enhanced conspicuity during both day and night conditions and during power outages. The FHWA Crash Modification Factor (CMF) Clearinghouse recognizes a CMF of 0.85, or a 15% crash reduction, for crashes of all types and severities when retroreflective backplates are installed.

The [*FDOT Design Manual \(FDM\) 232.1*](#) requires that retroreflective signal backplates be installed on all new or reconstructed traffic signals for all approaches. However, retrofitting backplates to existing signal head indications has been a challenge for many years due to the unknown structural capacity limits of existing signal support structures. Research and structural analysis evaluations using flexible retroreflective backplates have shown negligible wind loading impacts to mast arm and span wire support structures. The purpose of this section is to establish guidelines for installing flexible retroreflective signal backplates on existing mast arm and span wire structures at signalized intersections where backplates have not been utilized.

3.9.3 DEFINITIONS

Flexible Retroreflective Backplate (FRB): A signal backplate that allows portions of the panels to fold back when subjected to high winds and return to their original position when the wind subsides.

Mast Arm: A structure that is rigidly attached to a vertical pole and is used to provide overhead support of highway traffic signal faces or grade crossing signal units.

Rigid Retroreflective Backplate (RRB): A traditional signal backplate that remains fixed in one position when subjected to wind loading.

Signal Face: An assembly of one or more signal sections that is provided for controlling one or more traffic movements on a single approach.

Signal Head: An assembly of one or more signal faces that is provided for controlling traffic movements on one or more approaches.

3.9.4 PROCEDURE

For existing mast arm and span wire structures, the use of FRBs that are listed on the Department's Approved Product List (APL) are exempt from the structural capacity analysis requirements of [FDM 261](#), Structural Supports for Signs, Signals, Lighting, and ITS. This exemption is only applicable when the elements to be added to an existing signal structure are the FRBs. For all FRB installations, Districts Traffic Ops Office shall track and document locations and date of implementation by updating their respective Traffic Signal Maintenance and Compensation Agreement (Exhibit A) listings through the Central Office GIS web portal.

All other signal hardware, features, and attachments that are proposed for retrofitting on existing traffic signal structures are required to undergo structural analysis in accordance with [FDM 261](#) to determine if adequate structural capacity is available. Examples of signal hardware, features and attachments requiring structural analysis include, but are not limited to:

- (1) Rigid Backplates
- (2) Signal Heads
- (3) Street Name Signs
- (4) Blank out Signs

Structural analysis of existing traffic signal structures when required shall be performed in accordance with [FDM 261](#), Structural Supports for Signs, Signals, Lighting, and ITS. Refer to the [Structures Manual, Volume 3 – FDOT Modifications to LRFDLTS-1](#), Section 18.3, Category 2 Analytical Evaluation with Proposed Additional Loading for additional information regarding the analysis of existing structures. FRBs can be used to alleviate loading capacity per the [Structures Manual](#) guidance.