


Massachusetts Department of Transportation Highway Division Standard Operating Procedures		S.O.P. No. HMD-60-03-3-000 Page 1 of 7	
Subject: Design, Review, and Construction of Traffic Signals via the State Highway Access Permit System (SHAPS)			
Effective 10/01/2020	Issued 9/10/2020	Supersedes No. HMD-60-03-3-000, 12/12/08	Authorized  <small>Neil Boudreau (Sep 10, 2020 12:44 EDT)</small>

I. PURPOSE

This Standard Operating Procedure (SOP) summarizes the processes and requirements for the design, review, and construction or modification of traffic signals that are located within the State Highway Layout (SHLO) or coordinated with traffic signals operated by the Massachusetts Department of Transportation – Highway Division (MassDOT) through a State Highway Access Permit.

This SOP’s scope is limited only to State Highway Access Permits that construct or modify traffic signals, including emergency signals and pedestrian hybrid beacons, and does not relieve the permit applicant or MassDOT of duties associated with any other types of work.

II. AUTHORITY

MassDOT is granted authority to regulate traffic control devices, including traffic signals, signs, pavement markings, and the operation and maintenance thereof by MGL c. 85 § 2. Through the adoption of 700 CMR 13.00, under the authority of MGL c. 81 § 21 and MGL c. 85 § 2, MassDOT has implemented SOP HMD-60-02-3-000 for the review of State Highway Access Permits, whereby this document shall provide guidance for the modification or installation of traffic signals through the SHAPS process.

III. RESPONSIBILITIES

The Permit Applicant, or their Agent, (the Applicant) is responsible for:

- A complete submission package, as described further in detail in this SOP, at each stage of the design process. This also includes any comment resolution coordination that may be needed at each stage of the design process and ensuring that all design plan submissions conform to MassDOT CAD Standards.
- Development and submission of a Draft and Final Traffic Signal Regulation.
- Development and submission of a Draft and Final Traffic Signal Maintenance Agreement and, once approved, a signed Final Traffic Signal Maintenance Agreement. This shall include providing a signed attestation that the signatory party is duly authorized and empowered to enter into an Agreement with MassDOT. If municipally-owned traffic signals are to be coordinated with MassDOT signals or if emergency preemption or transit signal priority is proposed, a multi-party Traffic Signal Maintenance Agreement that includes the Applicant, MassDOT, and the municipality or transit agency will be required in order to control future access and/or modifications to various components of the traffic signal system.
- Construction of the traffic signal system, per the approved plans and specifications and as indicated within the permit.

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- Construction engineering activities including, but not limited to, shop drawing review and approval, signal inspection, and development and submission of as-built drawings.
- Compliance with all terms of the Traffic Signal Maintenance Agreement.

The District Highway Director, or their designee (the District), is responsible for:

- Review of all submittals by the Applicant, as described further in detail in this SOP.
- Assigning submission reviews to appropriate MassDOT business units.
- Upon approval of the PS&E submission, issuance of the State Highway Access Permit.
- Attendance at the signal inspection.
- Acceptance of the traffic signal pending completion of the signal inspection and approval of all punch list items.
- The transfer of any traffic signals to municipalities for future ownership and maintenance per the language included in the Traffic Signal Maintenance Agreement (if applicable).

The State Traffic Engineer, or their designee, is responsible for:

- Review of plans and specifications at each stage of design.
- Review of Draft and Final Traffic Signal Regulations. Upon approval of each, the State Traffic Engineer will sign and upload to SHAPS.
- Issuance of Traffic Signal Regulation and Signal ID numbers.
- Review of Draft and Final Traffic Signal Maintenance Agreements and, upon approval, delivery of the Final Traffic Signal Maintenance Agreement to Contracts and Records for signature(s).

IV. PROCEDURES

The Applicant shall follow all SOPs for Highway Access Permits, submission requirements outlined on SHAPS, and all requirements listed in the following paragraphs. Note that the items listed below are only those specifically related to modifications to traffic signals and does not relieve the Applicant from other submittal requirements.

A. 25% Design Submittal

The 25% Design package uploaded to SHAPS shall include, but not be limited to, the following:

1. 25% Design Plans.
2. Functional Design Report per MassDOT standards, unless written authorization has been provided in advance by the State Traffic Engineer for alternate documentation.
3. MEPA Certificate (if applicable).
4. Section 61 Finding (if applicable).
5. Identification of ROW Impacts/Land Damage Agreements (as necessary).

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6. *Early Environmental Coordination Checklist (EECC).

**Note if items required with the EECC have been performed for the proposed offsite roadway and traffic signal work as part of the MEPA permitting for the related work site, a certified letter from the Design Engineer stating what items have previously been completed will suffice in lieu of performing these tasks again as part of the EECC for the offsite permitting under these regulations.*

B. 75/100% Design Submittal

Upon notification of completion of the 25% Design review from the District Permits Engineer, the 75/100% Design package may be uploaded to SHAPS by the Applicant and shall include, but not be limited to, the following:

1. Responses to 25% Comments.
2. 75/100% Design Plans.
3. Special Provisions.
4. Preliminary Design Engineer’s Estimate for all work within the SHLO.
5. Preliminary Right of Way Plans with Title and Deed documentation.
6. Draft Traffic Signal Maintenance Agreement.
7. *Preliminary Draft Traffic Signal Regulation, which shall include:
 - a. Traffic Signal Regulation form.
 - b. Coordination Data (for coordinated signals, only).
 - c. Clearance calculations.

**Note that plans do not have to be included as part of the Preliminary Draft Signal Regulation since the design has not been approved and will be reviewed as part of the overall 75/100% Submittal.*

C. PS&E Submittal

Upon notification of completion of the 75/100% Design review from the District Permits Engineer, the PS&E package may be uploaded to SHAPS and shall include, but not be limited to, the following:

1. Responses to 75/100% Comments.
2. PS&E Design Plans.
3. Special Provisions.
4. Final Design Engineer’s Estimate for all work within the SHLO.
5. A copy of the Performance Bond(s), the amount of which shall be determined by the Final Design Engineer’s Estimate. The applicant may request a delay, in writing, in obtaining the bonds if a delay in construction is expected.
6. Final Alteration Plan and documentation for right-of-way impacts.

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7. A Final Traffic Signal Maintenance Agreement signed by the Applicant (see Part III, Responsibilities).
8. A Draft Traffic Signal Regulation, which shall include:
 - a. Traffic Signal Regulation form.
 - b. Construction plans in standard MassDOT CAD format and title block, at 1" = 20' scale, that include the traffic signal plans, traffic signal schedules, communication and/or network plans (if required for construction), and any relevant pavement marking and signage plans.
 - c. Coordination Data (for coordinated signals, only).
 - d. Clearance Calculations.

The Design Plans, Special Provisions, and Design Engineer's Estimate shall each individually include a cover sheet that has been stamped and digitally signed by the Applicant's Engineer of Record. The digital signature shall be verifiable through a Certificate Authority.

D. PS&E Approval

Upon approval of the PS&E Submission, the State Highway Access Permit may be issued by the District Permits Office and the District shall notify the PS&E reviewer from the Traffic & Safety Engineering Section (Boston Traffic Reviewer).

The Boston Traffic Reviewer shall prepare the Draft Traffic Signal Regulation for signature by the State Traffic Engineer. The signed Draft Traffic Signal Regulation approves the proposed design and operation of the traffic signal. When completed, a signed copy shall be uploaded to SHAPS and may be downloaded by the District and/or the Applicant.

The Boston Traffic Reviewer shall prepare the Final Traffic Signal Maintenance Agreement, including assigning an agreement number and routing for internal signatures. Once all signatures have been collected, the Boston Traffic Reviewer shall upload the completed document to SHAPS.

E. Shop Drawings

The Applicant's Engineer of Record shall be responsible for all shop drawing review and approval. This shall include, but not be limited to:

1. Soil boring logs for foundation design for all overhead traffic signal structures.
2. Selection of foundation design for MassDOT standard mast arms.
3. Foundation and structural design for all non-standard mast arms.
4. Foundation design and strain pole dimensions for all strain pole structures.
5. Catalogue cuts and/or drawings of all traffic signal controllers, cabinets, pull boxes, vehicle and pedestrian detection equipment, communication devices, cabinet monitoring, battery back-up/uninterrupted power systems, vehicle and pedestrian indications,

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mounting hardware, adaptive signal control systems, traffic signal management systems, and any other pertinent hardware, software, or structures.

All proposed equipment, the means and methods of installation, and operation shall conform to the Special Provisions, the accepted drawings, the MassDOT Standard Specifications, the Construction Standards, the issued Permit, and any other relevant MassDOT standards unless prior authorization has been provided.

The Applicant shall be responsible for uploading all approved shop drawings to SHAPS.

F. Construction and Inspection

Upon uploading the shop drawings, the general contractor/electrical contractor for the Applicant (the Contractor) may begin work, with approval from the District Permits Office, on the traffic signal installation and/or modification per the terms of the State Highway Access Permit.

For the installation of a new traffic signal at a location that was previously under no control, stop or yield control, or flashing beacon control, the following shall apply:

1. A minimum of 5 business days in advance of powering the signal on, the Contractor shall notify the District. This notification will allow the District to visit the site to ensure that the intersection layout corresponds to the approved plans, to inspect the hardware to ensure that it corresponds to the approved shop drawings, and to verify that all vehicle detection is installed and operational as specified. Upon approval, the traffic signal shall be placed in flashing operation for a duration established by the District.
2. Upon completion of the flashing operation duration and approval from the District, the traffic signal shall be placed in regular “stop and go” operation. The signal will remain in regular operation for a minimum of 30 consecutive days without major incident while the Contractor tests and/or fine tunes any components. Major incidents may result in a restart of the 30-day period, at the discretion of the District.

For the installation of a new traffic signal at a location that is currently under traffic signal control, typically referred to as traffic signal reconstruction, the following shall apply:

1. A minimum of 5 business days in advance of changing control from the old signal system to the new, the Contractor shall notify the District. This notification will allow the District to visit the site to ensure that the intersection layout corresponds to the approved plans, to inspect the hardware to ensure that it corresponds to the approved shop drawings, and to verify that all vehicle detection is installed and operational as specified.
2. Upon approval from the District, control may be changed from the old signal system to the new. The new system shall remain in regular operation for a minimum of 30 consecutive days without major incident while the Contractor tests and/or fine tunes any components. Major incidents may result in a restart of the 30-day period, at the discretion of the District.

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For modifications to a signal system where the majority of the existing equipment shall remain in place, the following shall apply:

1. A minimum of 5 business days in advance of installing the new equipment, the Contractor shall notify the District. This notification will allow the District to determine if a site visit is necessary, depending on the complexity of the work.
2. Upon approval from the District, the Contractor may install the new equipment. For new traffic signal controllers, cabinets, and detection systems, the equipment shall remain in regular operation for a minimum of 30 consecutive days without major incident while the Contractor tests and/or fine tunes the new equipment. Major incidents may result in a restart of the 30-day period, at the discretion of the District. The duration of operation for all other equipment may be shorter, or waived entirely, with written approval from the District.

The Applicant may request a formal traffic signal inspection by uploading a written request to SHAPS during the minimum 30 consecutive day testing/fine tuning period. The signal inspection shall be conducted by the Contractor and the Engineer of Record in the presence of district staff and shall follow the latest MassDOT SOP for Traffic Signal Inspections. The Applicant shall be responsible for providing any Police Details required during the inspection.

The District may choose to waive any or all portions of the signal inspection, at its discretion. This waiver shall be uploaded to SHAPS and shall inform the Applicant that the development of as-built drawings, as described below, may commence.

Following the signal inspection, the District shall upload the punch list items to SHAPS. Once the punch list items have been determined to be complete, the Engineer of Record shall make any necessary modifications to the approved PS&E plans in order to create as-built drawings to account for any field changes, and the Applicant shall upload the following documentation to SHAPS:

- Serial numbers for all controllers, MMUs or CMU/ADUs, and any operational or diagnostic software.
- All manufacturer warranties.
- Digital photos of all intersection approaches and interior of cabinet (including view from rear doors, if present).

G. Acceptance

The Final Traffic Signal Regulation may be uploaded to SHAPS after the as-built drawings have been completed. This package shall include:

1. Traffic Signal Regulation form.
2. As-built plans in standard MassDOT CAD format and title block, at 1" = 20' scale, that include the traffic signal plans, traffic signal schedules, communication and/or network

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plans (if required for construction), and any relevant pavement marking and signage plans.

3. Coordination Data (for coordinated signals, only).
4. Clearance Calculations.

Once uploaded, the Applicant may upload to SHAPS a written request for acceptance of the traffic signal(s). However, this written request may not be made prior to the completion of the minimum 30 consecutive day testing/fine tuning period described in the previous section.

If the traffic signal is under MassDOT jurisdiction and the Traffic Signal Maintenance Agreement specifies the utility costs of the traffic signal shall be borne by MassDOT, the Applicant shall notify MassDOT of any pending transfers of utility billing. For new traffic signals, the Contractor shall be responsible for paying all utility costs until final acceptance, at which time the Contractor shall obtain an account transfer form from the utility company for transfer of the account to MassDOT or municipality that has jurisdiction of the signals, or to any third party identified in the Final Traffic Signal Maintenance Agreement. For existing signals that are reconstructed or modified, the utility costs shall remain with the current party unless otherwise specified in the Final Traffic Signal Maintenance Agreement.

If all other improvements have been completed per the State Highway Access Permit, the Applicant may request, in writing to the District, the close out of the State Highway Access Permit subject to the conditions and procedures set forth in the Permit.

H. Traffic Signal Regulation

Once the Final Traffic Signal Regulation package has been uploaded to SHAPS, the Boston Traffic Reviewer shall prepare the Traffic Signal Regulation for e-signature by the State Traffic Engineer. When completed, signed copies shall be uploaded to SHAPS and will be available for download by all parties.