

NHDOT Guidelines for the Preparation of Traffic Signal System Plans on Design-Build Projects January 2011

INTRODUCTION

Use the following Guidelines in developing the Traffic Signal System Plans.

GENERAL PROCEDURES AND REQUIREMENTS

The Traffic Signal System Plans shall include all existing and proposed traffic signals, electrical and programming details, utilities, communications cable (if any) and conduit routing and project special provisions.

The Traffic Signal System plans shall be in compliance with the following Department approved documents (latest editions unless noted otherwise):

- Manual on Uniform Traffic Control Devices for Streets and Highways (current Department-approved edition).
- NHDOT Standard Specifications for Road and Bridge Construction (2010 Edition)
- NHDOT Division 100 – General Provisions for Design-Build Projects
- NHDOT Standard Plans for Road Construction (2010 Edition)
 - Section TS1-TS5 contains traffic signal and other signal related standard details. These will need to be incorporated into the plans for most work activities.
- National Electrical Safety Code
- National Electric Code
- AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

In addition to the above documents, the following design criteria shall be followed:

- Span wire traffic signal systems shall not be installed except for temporary signals.
- A typical 4 approach intersection shall have a mast arm in each quadrant.
- Traffic signal system equipment shall be as indicated on the Item 616. Special Provisions (temporary or permanent signals) prepared by the design-Builder in accordance with the Special Provision Templates.
- Signal heads shall be vertically mounted.
- Intersection lighting shall be mounted above masts arms when it is warranted.

PLAN LAYOUT

General Overview

Submit Traffic Signal System Plan Sheets to comply with the following:

- Title sheets showing an overview of all existing traffic signals within project limits.
- Permanent traffic signal designs (including existing and proposed utilities; underground and overhead).
- Temporary traffic signal designs (as required to maintain traffic flow).
- Proposed mast arms showing signal component locations.
- Proposed conduit runs (including splice details).
- Full-size sheets should be 22" x 34"
- Half-size sheets should be 11" x 17"
- Signal plans shall be prepared to a scale 1:20

- Number all sheets
- Traffic signal analysis of the intersections to determine the necessary criteria (cycle lengths, clearance intervals, maximum intervals, etc.) for the required phasing.
- All traffic signal equipment shall be designed to be wholly within the State Rights-of-Way. All vertical equipment (signal poles and pedestals) shall include a maintenance area of at least five feet of all sides of the equipment. Maintenance area may be by easement.

Traffic Signal Plans

Traffic Signal Plans shall be prepared for permanent and temporary installations on the standard size border and shall include, but not be limited to, the following information with all supporting documentation:

- Phasing diagrams for each active movement through the intersection. Phasing diagrams shall show actual operation. “Typicals” shall not be accepted (STD 8 NEMA Controller). All approaches within the signalized intersection shall be provided vehicle signal indications.
- Table of Signal Phasing (Timing Chart).
- North arrows
- Equipment Legends
- General and Construction Notes
- Loop / detection installation charts for all detection devices (detector schedule), including system loop detectors.
- Locations, sizes, arrangements, and identification of signal heads
 - Vehicular signal heads shall be labeled in accordance with their applicable phase (i.e. Phase 2 signal head(s) shall be labeled Signal Head(s) 2)
 - Pedestrian signal heads shall be countdown-type and shall be located in accordance with ADA requirements.
 - Vehicular and pedestrian signal heads shall be light emitting diodes (LED).
- Location of Mast Arm poles (Span wire systems are not allowed except for temporary signals). One mast arm per Quadrant.
- Location of pedestal poles (as required).
- Location of proposed underground conduit and pull boxes using standard equipment as shown on the Special Provision 616 Template.
- Location of pedestrian detection equipment and signs (push buttons).
- Location of proposed loop detector lead-in routing.
- Location of Geotechnical Borings.
- Proposed foundation type according to NHDOT Std. TS-1 to TS-3, or special foundation design in accordance with existing soil conditions and stamped by a licensed Professional Engineer in the State of New Hampshire.
- Location of the existing utility poles as shown on the roadway construction plans
- Location of right-of-way
- Mast Arm mounted luminaires and bracket arms (if required). Luminaires on signal poles shall be coordinated with the local utility company and NHDOT for ownership and maintenance agreements.
- Railroad pre-emption phasing notes and equipment (as required).
- Emergency vehicle pre-emption system notes and equipment (as required by the local Fire Department)

- Traffic signal coordination plans (if required). Coordination plans shall include time of day plans and cycle/split/offset information.
- Title block information
- Metered power service connection equipment and locations
- Graphic representation of the traffic volumes for signal timing and phasing.
- Coordination of the traffic signal plans with the final pavement marking plan to show the final detection locations.
- The supporting documentation for each signal design shall include:
 - Signed clearance chart with distances (show dimensions)
 - Controller timings for all existing signalized locations
 - Most recent traffic counts with breakdown (vehicular and pedestrian)
 - Roadway plan sheet for intersection
 - Capacity analysis reports using an approved NHDOT procedure (i.e Highway Capacity Manual or Synchro 6)
 - Specialized items (emergency preemption, pedestrian signals, metal poles, system work, etc.)
 - Notes on all correspondence with Department personnel (signal related).

Prior to development of the final traffic signal plans, the signal timing and phasing must be reviewed and approved by the Bureau of Traffic.

Coordinate the traffic signal plans with the construction staging to determine whether temporary traffic signal treatment will be necessary to maintain actuated signalized operation during construction phasing. Temporary traffic signal treatment may be defined as the following:

- Moving traffic signal poles out of the construction zone.
- Temporary traffic signals (to be removed at the completion of the construction) which require new traffic signal plans.
- Revised phasing at existing traffic signal locations which requires revised traffic signal plans.
- Temporary traffic signals installed during a construction phase which will be revised during another construction phase and / or for final traffic patterns.
- Temporary Signal plans (if used) shall be on a separate plan sheet and shall follow the traffic signal plan requirements.

All Traffic Signal Plans shall be sealed by the Engineer. The Engineer must be duly licensed to practice engineering in New Hampshire.

Electrical and Programming Plans

Electrical and programming detail plans shall be prepared for all traffic signal plans with supporting documentation to include but not be limited to the following information (this information is supplied per Standard Specification 616.2.5):

- Field connection hook-up charts showing the connection in the controller cabinet for each signal head.
- Conflict monitor / Malfunction management unit programming card details showing the required jumpers and switch settings.
- NEMA overlap card details showing all required jumpers.

- Equipment information sections showing the controller brand and model number, cabinet type and mounting style (pole-mounted or base-mounted), number of load bay positions, load switches used, phases used, and overlaps used.
- Typical connection charts for detectors defining the detector pin functions and the connection on the loop termination panel or detector rack set-up.
- Backup protection relay wiring details showing required jumpers and connections for phase omits and the wiring circuitry needed to serve the omit phases.
- Special detector wiring details showing any special wiring needed for detection operation. Details will be required for detection other than inductive detection loops (microwave, ultrasonic, machine vision, etc.).
- Communication interface details showing the telemetry panel and all connections.
- Preemption panel wiring details showing the preemption panel and all connections.
- Detail notes addressing installation and programming procedures in sufficient detail for construction. Notes shall address start-up programming, start-up phases, power-up flash times, unused phases, conflict-flash, etc.
- Special cabinet wiring details showing any special wiring needed to the controller cabinet.
- Complete programming input charts for all standard controller programming, to be maintained in the traffic signal cabinet.
- All non-standard controller programming shall be shown such as preemption programming, time-of-day programming, special ring configurations, etc. All controller display screens and menus needed to program these features shall be shown.
- Final electric and programming detail plans shall be sealed by the Engineer. The Engineer must be duly registered to practice engineering in New Hampshire.

Project Special Provisions

- Project Special Provisions shall include the following information with all supporting documentation and information:
- The project special provisions will cover all items of work, material, equipment, and methods of construction for the installation of a complete traffic signal installation that are not otherwise covered in the *Standard Specifications for Road and Bridge Construction*, Dated 2010 and all addendum or *NHDOT Division 100 – General Provisions for Design-Build Projects*.
- Each traffic signal plan (permanent and temporary) shall include an accompanying Special Provision 616 in accordance with 616.2.1 and using the Special Provision 616 templates provided with this contract.
- All other project special provisions shall contain subsections titled: Description, Materials, and Construction Requirements

Catalog Cut Sheets and Mast Arm Drawings

Product Catalog Cut Sheets shall include the following information with all supporting documentation and information:

- Manufacturer's make and model number for each piece of equipment.
- Quantity of items to be used.
- Catalog Cuts will not require an Engineer's seal.
- Mast Arm calculations shall follow the requirements of Section 105.02 of the *NHDOT Division 100 – General Provisions for Design-Build Projects*.