

## SIGNAL OWNERSHIP & MAINTENANCE

It is the policy of the Department to participate in the construction cost, ownership, maintenance and electrical energy cost of traffic control signals involving the State Highway System. As with all items requiring State Traffic Commission approval, the local Legal Traffic Authority should be contacted and participate in the decision process. Refer to (Policy No HWYS-16 dated March 3,1997.)

**Ownership** - Ownership includes responsibility for ordinary maintenance.

1. The State usually retains ownership of traffic control signals when one or more of the approach roadways are a part of the State Highway System.
2. Ownership of a signal may be transferred to a community under certain conditions:
  - a. the local Legal Traffic Authority (LTA) accepts responsibility for ownership;
  - b. the State reserves the right to reassume ownership of the signal; and
  - c. the signal is in good working condition prior to the transfer and conforms to the Manual on Uniform Traffic Control Devices (MUTCD).
3. Normally, signals in a coordinated system will be owned by one jurisdiction.
4. If requested by a town, the Department may assume ownership of a traffic signal if the following conditions are met:
  - a. the signal is on a State highway;
  - b. the signal is warranted; and
  - c. the signal is in good operating order and the equipment meets the following Department requirements:
    - (1) the installation meets the criteria of the current MUTCD;
    - (2) the traffic control equipment, including detectors, are operating in accordance with the State Traffic Commission (STC) approved plans, sequence and timing; and
    - (3) the Department has interchangeable equipment for maintenance purposes and spare parts are readily available from the manufacturer;
    - (4) a complete set of cabinet prints and plans are in the controller cabinet; and
    - (5) one set of reproducible timing, sequence, signing and marking plans are provided.

## Installation Costs of Warranted Signals

1. Project Funded Signals:
  - a. The State will participate in the installation costs in accordance with the participation ratio established for the highway or bridge project.
  - b. The State will not participate in the installation costs of:
    - (1) unwarranted signals; or
    - (2) those determined the responsibility of others by Statute or circumstance.
  - c. When installing railroad pre-emption, the State will participate to the extent established for the project itself.
  - d. The State will permit town-owned and maintained emergency equipment to pre-empt State-maintained traffic signals wherever practicable. Federal funds may be used for the installation costs for needed traffic signal hardware for primary fire runs and initially for equipment needed in major fire apparatus if such funding is available; however, any non-federal share must be paid by the municipality. The State may elect to participate in emergency pre-emption costs in those instances where there is an overriding State interest.
  - e. State funds will not be used to provide material or equipment considered related but not essential to the operation of the traffic signal systems. For items such as, but not limited to, redundant interconnect cables for fiber optics, confirmation lights for pre-emption, or other special enhancements, any non-federal share must be paid by the municipality.
  - f. State or federal funds will not be used to provide material or equipment considered unrelated to the operation of the traffic signal systems. Items intended for other uses, such as, but not limited to, additional interconnect lines of cable or fiber optics, computers for pre-emption activity recording, CADD stations, or similar equipment will be nonparticipating.
2. Non-Project Funded Signals:
  - a. The State will assume costs for the traffic control signal installation at intersections where all approach roadways are State highways.
  - b. The State will participate in the estimated installation costs at intersections of both State and town roads in proportion to the number of State roadway approaches.
  - c. The State will not participate in the installation costs of:
    - (1) unwarranted signals;

- (2) those determined the responsibility of others by Statute or circumstance; or
- (3) emergency access signals, e.g., firehouse signals.
- d. When installing railroad pre-emption with a new signal, cost-sharing will be the same as the cost-sharing for the signal itself.
- e. The inclusion of certain control features deemed not essential for the intersection by the Department (e.g., fire pre-emption) will be paid for by others. The maintenance of special pre-emption hardware is the responsibility of the town.
- f. Intersectional flashing beacons will be paid for by the State.
- g. The State may participate in the cost of signal revisions (considered major in nature) requested by a town as described in Item 2 b. above.

**Electrical Energy Costs**

- 1. When all approach roadways are State-owned, the State will pay electrical energy costs.
- 2. When one or more of the approach roadways is a town road, the town will be expected to assume the energy costs.
- 3. When the signal services a major traffic generator, the owner(s) of that facility will be expected to assume the energy cost. Minor traffic generators, signalized as an incidental need for signal operation, will not be expected to pay energy costs.
- 4. Energy costs for intersectional flashing beacons will be the responsibility of the State.

Where previous agreements have been made that differ from the above, those agreements will be honored. Whenever significant changes are made to the traffic control signal with such agreement, the ownership and energy cost arrangements should be revised to agree with the above.

A record of responsibilities (ownership, construction costs, maintenance and electrical energy costs) and changes in responsibilities, will be maintained through reports to the State Traffic Commission.

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**Pre-emption Systems**

A map for the primary fire route in each town will be provided to the engineer by the town. This map will be stored in Unit 1406 (Electrical). Federal funds may not be used for pre-emption on non-primary fire routes. Emitters are provided for major fire apparatus only. The towns money for participation must be in hand before a project is forwarded to processing. The prime designer will be responsible to obtain the cost-sharing agreement for pre-emption.

## SIGNAL DESIGN CHECKLIST

1. Complete title block.
2. R.O.W. is shown on plan. Note on Plan – “Stake all R.O.W. prior to excavation.” Even if all appurtenances are on state property, if a property owner may have some interest in the location of the appurtenance (span pole in a residential area) the owner should be contacted during the design stage, as a courtesy.
3. North arrow is shown according to standard convention, i.e. up or to the right.
4. State route numbers must be shown on plans and in the title block. Alternate street names are to be in parenthesis.
5. Town owned signals should be noted as such.
6. Show proposed and existing utility poles and pole numbers.
7. Symbols for traffic signal appurtenances are correct.
8. All appurtenances are to be no closer than 3 m (10') from utility poles.
9. Steel pole, controller, pedestal, loops, handholes, etc. have station numbers or are tied down off fixed objects, not pavement markings.
10. Loops are to be dimensioned laterally off curb or by construction note. Tie down front edge of loop by station or fixed object. Loops should be identified per phase, per lane.
11. Confirm easements are secured where required. Verify easements have been recorded on town land records. Show easement on the plan with the file number.
12. Steel pole/mast arm foundation do not conflict with proposed or existing underground utilities.
13. Steel pole/mast arm assemblies have sufficient horizontal and vertical clearance from proposed or existing overhead utility lines.
14. Steel poles have sufficient height to get 5.5 m (18') clearance for the lowest traffic signal. Locate outside the clear zone. See Clear Zone guidelines page 101. See the Highway Design Guidelines for horizontal curve correction factors and additional information on clear zones.
15. Steel poles/mast arms are proper gage to support designed loads.
16. Cable is sufficient. Cable closure is curb side, approximately 1.5 m (5') controller side of span.
17. Conduit is large enough to hold all cables not to exceed 40% of area and in accordance with the National Electrical Code.
18. Check location of signal appurtenances for visibility to the signal indications for both drivers and pedestrians.

19. Signal face numbers and detector numbers should correspond to the appropriate phase, where possible.
20. The Traffic Signal Maintenance Category will be provided by the Division of Traffic Engineering.
21. Energy calculations will be provided by the Division of Traffic Engineering.
22. Check Controller location for intrusion into sight triangle.
23. Check pedestrian timing and that it is shown in the proper phase, especially where side streets have separate phases.
24. Where applicable, following note to be added to developer's signals on plan layout: "Property owner responsible for major component replacement."
25. Town must request approval for all proprietary items with proper justification. An individual letter is required for each item.
26. The size of signal faces and pedestrian symbols are to be shown on the signal plan.
27. If yellow interval is set at "0" in the controller, it will revert back to the default value of 3". Therefore in instances where a short yellow interval is desired (exclusive walk phase), the yellow should be 0.1". The red interval may be set at 0".
28. If Max 2 = Future, then the timing shown for Max 2 should be the same as Max 1.
29. Check with municipality to see if they want pre-emption and, if so, what type.
30. Confirm all utility involvement has been identified and all estimates for reimbursable utility work have been received. The prime designer must include money in the proposal estimate as Activity 26 (Work by Utilities).
31. Prime designer must include enough money in the proposal estimate as Activity 56 (Work by State Forces) to cover anticipated costs by the Office of Maintenance. Example: When Item 1108207A-INSTALL STATE-FURNISHED CONTROLLER is used, \$13,000.00 is included for material, labor and equipment to prepare the controller for the contractor.
32. All special provisions must be submitted in electronic format in the correct template, which can be found on the DOT web site under available publications. Before submission, the Contract Checker Program should be used. This program is available at the DOT web site.

# **GUIDELINES FOR REVIEWING TRAFFIC SIGNALS DESIGNED BY CONSULTANTS**

All designs must be confirmed with utility company engineers. Submit minutes of the meeting conducted with utility company representatives.

1. Complete title block with engineering firm name.
2. R.O.W. is shown on plan. Note on plan-“Stake all R.O.W. prior to excavation.” Even if all appurtenances are on state property, if a property owner may have some interest in the location of the appurtenance (span pole in a residential area) the owner should be contacted during the design stage, as a courtesy.
3. North arrow is shown according to standard convention, i.e. up or to the right.
4. State route numbers must be shown on plans and in the title block. Alternate street names are to be in parenthesis.
5. Town owned signals should be noted as such.
6. Show proposed and existing utility poles and pole numbers.
7. Symbols for traffic signal appurtenances are correct.
8. All appurtenances are to be no closer than 3 m (10') from utility poles.
9. Steel pole, controller, pedestal, loops, handholes, etc. have station numbers or are tied down off fixed objects, not pavement markings.
10. Loops are to be dimensioned laterally off curb or by construction note. Tie down front edge of loop by station or fixed object. Loops should be identified per phase, per lane.
11. Confirm CE will secure easements where required. Verify easements have been recorded on town land records. Show easement on the plan with the file number.
12. Steel pole/mast arm foundation do not conflict with proposed or existing underground utilities.
13. Steel pole/mast arm assemblies have sufficient horizontal and vertical clearance from proposed or existing overhead utility lines.

14. Steel poles have sufficient height to get 5.5 m (18') clearance for the lowest traffic signal. Located outside the clear zone. See Clear Zone guidelines on page 101. See the Highway Design Guidelines for horizontal curve correction factors and additional information on clear zones.
15. Steel poles/mast arms are proper gage to support designed loads.
16. Cable is sufficient. Cable closure is curb side, approximately 1.5 m (5') controller side of span.
17. Conduit is large enough to hold all cables not to exceed 40% of area and in accordance with the National Electrical Code.
18. Loops should provide sufficient detection especially if phase is in non-lock.
19. Where span and messenger is proposed to attach to utility poles, confirm adequate clearance from SNET lines and secondary service.
20. CE must contact utility company to notify them of their involvement and get written approval for attachments to utility poles.
21. Where signals will be town owned and/or included in existing town interconnect systems, the CE must consult with town engineers for proper interconnect information i.e., preferred equipment, type of cable, connection to existing system.
22. Look at overall scheme such as phasing, detector placement interconnect, pre-emption, etc. Will it work? Would it be more efficient a different way? Review program flash operation.
23. The Division of Traffic Engineering will check with the municipality to see if they want pre-emption and, if so, what type.

## Timing and Sequence

24. Complete revision information.
25. Complete energy data, service source, responsibility, etc.
26. If existing controller is to be used, can it be modified for new sequence? If not, recommend new. If existing controller is used, are phases shown correct?
27. No more than 4 overlaps.
28. Non-actuated advance must be in max recall.
29. Concurrent walk to have only 1 sec. in Don't Walk interval.

30. If yellow interval is set at 0 in the controller, it will revert back to the default value of 3". Therefore, in instances where a short yellow interval is desired (exclusive walk phase), the yellow should be 0.1". The red interval may be set at 0".
31. Show max times for each phase. If Max II is not used in the function chart, then label it for future use. If Max 2=FUTURE, then the timing shown for Max 2 should be the same as Max 1.
32. Are pre-emption notes correct?
33. Are technical/skip notes necessary and are they correct?
34. Is the proper interconnect data shown? See No. 21.

### Estimates for Projects

35. Do quantities shown for a particular intersection match those shown on the detailed estimate?
36. Is detailed estimate complete?
37. Does detailed estimate match proposal estimate?
38. If applicable, Activity 26 (Work by Utilities) and Activity 56 (Work by State Forces) must be included in the project proposal estimate.
39. Are items shown correctly on proposal estimate? Are "A" suffixes used when special provisions are required?

### Additional Review Guidelines

40. Is Developer's name and address on plan for correspondence?
41. Are salvage forms complete?
42. Are service request forms complete?
43. Show programmed flash for future use if not being called for.
44. Check cross-sections when doing pole calculations.
45. Steel span pole and mast arm calculations must be submitted by consultants.
46. The calculated inductance for each lane should be recorded on the loop detector test data chart and shall be submitted by the consultant.

47. Specifications and standard installation details are not to be provided until all design criteria listed above is satisfied.
48. All special provisions must be submitted in electronic format in the correct template which can be found on the DOT web site under available publications. Before submission, the Control Checker Program should be used. This program is available at the DOT web site.
49. Cost estimates by the consultant engineer for development's work are required for bonding purposes.
50. Check for conformance with ADA guidelines.
51. Check location of signal appurtenances for visibility to the signal indications for both drivers and pedestrians.
52. Signal face numbers and detector numbers should correspond to the appropriate phase, where possible.
53. On all state projects proprietary items must be submitted for Department approval. The request for proprietary items must originate from the town and include justification. An individual letter is required for each item.
54. The Traffic Signal Maintenance Category will be provided by the Division of Traffic Engineering.
55. Energy calculations will be provided by the Division of Traffic Engineering.
56. Check Controller location for intrusion into sight triangle.
57. Check pedestrian timing and that it is shown in the proper phase, especially where side streets have separate phases.
58. Where applicable, following note to be added to Developer's signals on plan layout: "Property owner responsible for major component replacement."
59. The size of signal faces and pedestrian symbols are to be shown on the signal plan.
60. Review construction notes. Notes should be used only to clarify an area of the installation that may be ambiguous to the contractor, or where specific instruction is needed.

## Recommended Clear Zone Distances (ft)

Design Speed	Design Year ADT	CUTS or FILLS (Negative Shelf)		CUTS or FILLS (Positive Shelf)	
		6:1 or flatter	4:1	4:1	6:1 or flatter
≤40 MPH	Under 750	7	7	7	7
	750-1500	10	12	10	10
	1500-6000	12	14	12	12
	Over 6000	14	16	14	14
45-50 MPH	Under 750	10	12	8	10
	750-1500	14	16	12	14
	1500-6000	16	20	14	16
	Over 6000	20	24	18	20
55 MPH	Under 750	12	14	10	10
	750-1500	16	20	14	16
	1500-6000	20	24	16	20
	Over 6000	22	26	20	22
60 MPH	Under 750	16	20	12	14
	750-1500	20	26	16	20
	1500-6000	26	32*	18	24
	Over 6000	30	36*	24	26
65-70 MPH	Under 750	18	20	14	14
	750-1500	24	28	18	20
	1500-6000	28	34*	22	26
	Over 6000	30	38*	26	28

\* For design exception purposes, the maximum required clear zone is 30 ft.

### Notes:

1. All distances are measured from the edge of the travel lane.
2. See Connecticut Department of Transportation Highway Design Manual for application of clear zone criteria.
3. For clear zones, the "Design Year ADT" will be the total ADT on two-way roadways and the directional ADT on one-way roadways (e.g., interchange ramps and one roadway of a divided highway, unless noted otherwise).
4. The values in the table apply to all facilities both urban and rural. See Section 13-2.02 of the Connecticut Department of Transportation Highway Design Manual for utility poles in urban areas.