

Pennsylvania Adaptive Signal Control System Evaluation



Please Type or Print all information in Blue or Black Ink

County : _____

Engineering District : _____

Department Tracking # : _____

Initial Submission Date : _____

Purpose: This document is to properly evaluate and streamline the Systems Engineering Process for Adaptive Signal Control Systems. This document follows guidance provided by the [Federal Highway Administration's \(FHWA\) Model Systems Engineering Documents for Adaptive Signal Control Technology \(ASCT\) Systems \(FHWA-HOP-11-027\)](#) and PennDOT's direction for adaptive signal systems in Publication 46. Upon completing this document, the appropriate needs, requirements, and evaluation of acceptable vendor products, a recommendation will be made based on the information and technology available when this evaluation was completed.

A - Project Description

Project Title : _____ Engineering District : _____

County : _____ Municipality (ies) : _____

Project Description.....

Intersections considered for Adaptive.....

Traffic Signals are currently interconnected..... YES If Yes, explain system reliability. NO If No, explain.

Existing Type of System Control.....

Traffic Responsive Closed Loop Interconnection Time Based Isolated Intersections

Other : _____

Type of Network.....

Corridor Grid Other : _____

Explain what alternatives to adaptive signal control system were considered.....

Estimated costs in dollars.....

Installation: \$ _____ Maintenance (yearly): \$ _____

Design: \$ _____ Operational (yearly): \$ _____

B - Attachment Listing

- | | | |
|---|---|---|
| <input type="checkbox"/> TE-160 form (<i>required</i>) | <input type="checkbox"/> Capacity Analysis | <input type="checkbox"/> Municipal Maintenance and Operational Plan (<i>required</i>) |
| <input type="checkbox"/> Municipal Resolution (<i>required</i>) | <input type="checkbox"/> Photographs | <input type="checkbox"/> Map Showing all Adaptive Locations (<i>required</i>) |
| <input type="checkbox"/> Existing Traffic Signal Permits | <input type="checkbox"/> Straight Line Diagram | <input type="checkbox"/> Traffic Volumes / Pedestrian Volumes |
| <input type="checkbox"/> Letter of Financial Commitment | <input type="checkbox"/> Capacity Analysis | <input type="checkbox"/> Turn Restriction Studies |
| <input type="checkbox"/> Crash Analysis | <input type="checkbox"/> Traffic Impact Study (TIS) | <input type="checkbox"/> Other : _____ |
| <input type="checkbox"/> Traffic Signal Study | <input type="checkbox"/> Turn Lane Analysis | |

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C - Concept of Operations

Detailed Network Background

Note: FHWA's Model System Engineering Document for Adaptive Signal Control technology references are provided in parentheses.

- YES NO Attached is a figure showing the proposed locations of the ASCT.
- YES NO Attached is a Municipal Maintenance and Operational Plan for the existing (detail past performance) and proposed system.
- YES NO There are governmental agreements that apply to the corridor.
- YES NO Will a municipal ordinance be established that new traffic signals would need to be the adaptive traffic control system selected?

The existing characteristics of the corridor are (check all that apply).....

- Corridor experiences large fluctuations (~20% change) in traffic volumes that are: _____
Time period that fluctuations occur (check all that apply): AM MID-DAY PM OFF-PEAK
- Corridor handles a large amount of special events that cannot be accommodated with TOD plans, and contribute significantly to network delay.
- Corridor is a PennDOT priority corridor.
- Corridor is in the vicinity of and has access to interstate highways.
- Corridor is an MPO priority corridor.

The major concerns along the corridor are (check all that apply).....

- Which approach is of major concern: _____
- Progression along the corridor.
 - Delay on the corridor.
 - Capacity deficiencies along the corridor.
 - Queuing issues and/or left turn lane spillback.
 - Delay on the side streets approaches.
 - High number of crashes along the corridor.

Corridor Objectives

The operational objectives for the signals to be coordinated are (check all that apply): (3.4).....

- Smooth the flow of traffic along coordinated routes.
- Maximize the throughput along coordinated routes.
- Equitably serve adjacent land uses.
- Manage queues, to prevent excessive queuing from reducing efficiency.
- Variable, with either a combination of these objectives, or changing objectives at different times.
- For a critical isolated intersection, maximize intersection efficiency.

Corridor Needs and Constraints

The system operator needs the ability to (check all that apply).....

- Be able to identify changing traffic conditions. (4.8)
- Be able to notify operations and maintenance staff of equipment and software failures, and automatically adjust the operational mode without disrupting traffic flow. (4.12)

In the event of failure, how should the system operate and what failure modes are required.....

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Project Specific Needs

Municipal Requirements (check all that apply).....

- The system will be operated and monitored from the (specify agency) TMC. (4.10)
- The system will be operated and monitored from the (specify agency) signal shop. (4.10)
- The system will be operated and monitored from workstations located (specify who will have workstations and where they will be located). (4.10)
- An operator will be able to have full access to the system from each local controller or on-street master. (6.0-4)
- The central server equipment will be housed at (specify location) in a climate-controlled environment. (6.0-5)
- The municipality selection of controller will not be constrained by the adaptive software. (6.0-6.0-2)
- The municipality prefers specific detector technology. (Specify your selected detector types.) (6.0-6.0-3)

- The municipality prefers to use the following controller types. (Specify acceptable controller types.) (6.0-6.0-4)

Other types of operations to be considered along the corridor include (check all that apply).....

- Pedestrian movements
- Transit priority
- Emergency vehicle or ramp preemption

D - Adaptive State Requirements

The following are State requirements of ASCT systems to be considered prior to installation in Pennsylvania. The proposed system must comply with each of the following requirements. If your project does not comply with a requirement then explain why at the end of this section.

Note: FHWA's Model System Engineering Document for Adaptive Signal Control technology references are provided in parentheses.

Operations

- YES NO 1. The system shall meet Requirements 2.1.1.0-7.01 through 2.1.1.0-12. (4.1)
- YES NO 2. The system shall have a fallback state that allows coordination using a common cycle length for all signals within a coordinated group. (5.3.0-1)
- YES NO 3. The system shall have a fallback state that allows individual intersections to operate in a vehicle-actuated, isolated mode in the event of failures of the processor software or hardware, detectors or communication. (5.3.0-2)
- YES NO 4. The system shall have a fallback state that allows one or more intersections to be slaved from a critical intersection in the event of failures of the processor software or hardware, detectors or communication. (5.3.0-3)
- YES NO 5. The system shall meet the Sequence-based adaptive coordination or Non-Sequenced based adaptive coordination Requirements 2.2 and 2.3. (4.1)
- YES NO 6. The traffic adaptive system shall optimize no less than every 5 minutes and shall provide updates to the central software each cycle to monitor performance and track the changes made to the splits and offsets.
- YES NO 7. The traffic adaptive system shall include the identification of detector errors/diagnostics as a function of the complete system. Upon receipt of a detector error message (e.g., max presence, erratic, or no activity) from the controller, the traffic adaptive system will remove/neglect that detector from its calculations. When the detector is repaired and starts reporting correct data again, the information shall automatically be re-introduced in the calculations.
- YES NO 8. The traffic adaptive system shall handle incidents by modifying the splits and offsets of the traffic pattern to adapt to the increases and decreases in traffic flows on the facility it is managing. Detector diagnostics/failure conditions are the responsibility of the controller software.
- YES NO 9. The traffic adaptive system shall archive its performance measures and decisions to a data store for future analysis and retrieval.

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Administrative

- YES NO 10. In the event of a detector, communications, or adaptive processor failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system. (4.12.0-1 and 4.12.0-2)
- YES NO 11. The ASCT shall not prevent access to the local signal controller database, monitoring or reporting functions by any installed signal management system.(4.10.0-2)
- YES NO 12. The system shall have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions and have this information available to PennDOT. (4.11.0-2)
- YES NO 13. The system shall have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions and have this information available to PennDOT. (4.11.0-7)
- YES NO 14. The system shall fully satisfy all requirements when connected with standard (NEMA or other standard) cabinet configurations. (4.15.0-1.0-1)
- YES NO 15. The system shall allow access by PennDOT and other authorized users outside the agency via secured VPN.
- YES NO 16. The system shall have the ability to be operated and monitored from the (specify agency) TMC. (4.10)

Maintenance

- YES NO 17. Equipment shall be readily accessible to the responsible maintaining agency. (7.0-5.0-8)
- YES NO 18. Maintenance Requirements:
 - a. Biannual preventive maintenance of system-wide communications systems, master controllers, central computers and system software in accordance with *PennDOT Publication 191, Guidelines for the Maintenance of Traffic Signal Systems* and manufacturer maintenance guidance.
 - b. Responsive maintenance activities of system-wide communications systems, master controllers, central computers and system software within 24 hours of notification and in accordance with *PennDOT Publication 191, Guidelines for the Maintenance of Traffic Signal Systems*.
 - c. Record keeping in accordance with *PennDOT Publication 191, Guidelines for the Maintenance of Traffic Signal Systems*.
 - d. Provide and implement system-wide software updates as well as traffic signal controller and detection system software updates.
 - e. Annual report to review operations and future enhancements.
- YES NO 19. Oversight Requirements:
 - a. Monthly confirmation to all parties and their traffic signal maintenance providers noting the system is functioning. This includes verification that there is active two-way communication to all traffic signals, the system software and traffic responsive software is operational, and confirmation that all detection zones are functioning.
 - b. Monthly review of event logs and notification to impacted stakeholders and their traffic maintenance providers if the system is malfunctioning. Notification does not include authority to authorize repairs.
 - c. Quarterly status reports to all parties and their traffic signal maintenance providers detailing system operations, timing modifications, and system maintenance activities.

Indicate why you answered "NO" to any of the questions within Section D - Adaptive State Requirements.....

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E - Adaptive Recommendations

Based upon the preliminary findings, the following recommendation is made.....

YES NO ASCT is recommended for the network.

Engineering recommendation to support decision.....

F - Adaptive Systems Information Review

What technologies were evaluated?.....

	Product Name	Company Name	Company Website	Contact Phone #	Contact E-mail
(1)					
(2)					
(3)					
(4)					
(5)					

Note: Attach product specification documents to this form.

G - Adaptive System Recommendations

YES NO Do all technologies meet the needs and requirements?

If "NO" provide summary identifying which technologies do not meet requirements and why.....

YES NO Is a proprietary item request needed (less than two technologies that meet needs and requirements)? If "YES", complete TE-152 form.

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H - Approval of the Pennsylvania Adaptive Signal Control System Evaluation

Comments.....

Form Completed by.....

Name : _____

Company : _____

Phone # : _____

E-mail : _____

Reviewed and Approved by Signature (Traffic Signals Supervisor or Manager)

Signature : _____ Date : _____

Reviewed and Approved by Signature (District Traffic Engineer)

Signature : _____ Date : _____

Reviewed and Approved by Signature (District Executive)

Signature : _____ Date : _____

Reviewed and Approved by Signature (BOMO Director)

Signature : _____ Date : _____

Reviewed and Approved by Signature (FHWA Division Administrator) if applicable.

Signature : _____ Date : _____

Copy Provided to MPO/RPO

I - Verification and Validation (to be completed after system is up and functional)

Do the needs and requirements established within this document meet expectations?..... YES NO

Explain.....

Provide the results of the before and after evaluation.....

Verified and validated by: _____

Date : _____

Verified and validated by: _____

Date : _____