

# Memo



U.S. Department  
Of Transportation  
**Federal Highway  
Administration**

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Date: May 14, 2015

**Subject:** Implementation of 23 CFR 940 Regulations – ITS Architecture and Systems Engineering for ITS Projects

**From:**  James McCarthy, PE, PTOE, Traffic Operations Engineer  
St. Paul, Minnesota

**To:** Sue Mulvihill – Deputy Commissioner & Chief Engineer  
Nancy Daubenberger – Engineering Services Division Director  
Mitch Rasmussen – State Aid Division Director  
Tim Henkel – Modal Planning & Program Management Division Director  
Michael Barnes – Operations Division Director  
District Traffic Engineers  
District State Aid Engineers

This memo informs you of a change to the oversight and management of Intelligent Transportation Systems (ITS) projects or projects with an ITS component and supports the new FHWA/MnDOT Stewardship Agreement.

## **Implementation**

In order to fulfill the requirements of 23 CFR 940, MnDOT needs to complete the following tasks in the next 12 months. This action will meet the intent of 23 CFR Section 940.1-940.11 and complete the implementation which was required in 2005.

1. Implement new HPDP (Highway Project Development Process) Procedure –ITS Systems Engineering Requirement (Enclosed)
2. Implement new SALT (State Aid for Local Transportation) requirement to follow HPDP Procedure –ITS Systems Engineering Requirement.
3. Adoption of [Minnesota Statewide Regional ITS Architecture](#) by all MPOs in Minnesota.

The implementation of this Rule/Policy will fulfill the requirement for all ITS projects or projects with an ITS component funded in whole or in part from the Highway Trust Fund. **Any ITS Projects or projects with an ITS component authorized after June 30, 2016, shall fully comply with 23 CFR 940 and be properly documented.**

## Background

***Intelligent Transportation Systems (ITS) means electronics, communications, or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system.***

The FHWA Division Office has been working with the MnDOT Office of Traffic, Safety and Technology (OTST) to improve the implementation of 23 CFR 940 in Minnesota. The Transportation Equity Act for the 21<sup>st</sup> Century includes this requirement for a 2005 implementation. We ask for your full support in the completion of this implementation to be in conformance with the National and Regional ITS Architecture, along with the appropriate ITS standards.

Particular project implementation and system integration issues will be resolved with the consistent use of systems engineering. Three examples are provided to help explain why systems engineering is needed for successful technology deployment.

1. The integration of Blue Line LRT (Light Rail Transit) operations with Hiawatha Avenue signal operations – the system design flaws were fully documented in a post construction expert review of this project’s design. This project lacked good systems engineering.
2. Minneapolis TMC/Signal System – the use of systems engineering on this project significantly reduced communication costs and integration with other city agencies versus the original project concept that was developed prior to the systems engineering process.
3. Central Avenue BRT (Bus Rapid Transit) – Because systems engineering was not completed on this project the initial BRT application is unique in its deployment and is not expandable or reproducible on other corridors.

The current management of ITS projects does not provide documentation of compliance with the Systems Engineering regulation; and more importantly is allowing some projects to move forward without proper consideration of interoperability and future expansion needs.

The staff of the OTST Office have been diligent and aggressive in improving the use of the ITS Architecture tools to better bring the planning of ITS projects into conformance with the regulation in a thoughtful and productive manner. Through this effort, the OTST staff has created a model practice for use of ITS Architecture to plan and prioritize ITS projects. The OTST staff has also appropriately addressed the systems engineering requirements in 23 CFR 940 and related these requirements to the new ITS Design Manual procedures.

With the implementation of these improved tools and guidance we would consider MnDOT and all its sub-recipients in conformance with the National and Regional ITS Architecture along with the Systems Engineering requirements.

## Purpose

The use of the 2014 Minnesota Statewide Regional ITS Architecture, provides a positive move to fully meet SAFETEA-LU planning requirement 23 CFR 450.306(7), “Promote efficient system management and operation”. Additionally, the implementation of the Minnesota Statewide Regional ITS Architecture supports FHWA’s Planning for Operations Initiative. The purpose of the Rule/Policy is to foster integration of the deployment of regional ITS systems. Regional ITS architectures help guide the integration of ITS components. During the development of a regional ITS architecture, agencies that own and operate transportation systems must together consider current and future needs to ensure that today’s processes and projects are compatible with future ITS projects.

## 23 CFR 940 Policy Requirements

The key elements of the regulation are presented here for your reference. The complete regulation is attached.

**940.5 Policy** -- ITS projects shall conform to the National ITS Architecture and standards in accordance with the requirements contained in this part. Conformance with the National ITS Architecture is interpreted to mean the use of the National ITS Architecture to develop a regional ITS architecture, and the subsequent adherence of all ITS projects to that regional ITS architecture. Development of the regional ITS architecture should be consistent with the transportation planning process for Statewide and Metropolitan Transportation Planning.

**940.7. a. Applicability** -- All ITS projects that are funded in whole or in part with the highway trust fund, including those on the National Highway System (NHS) and on non-NHS facilities, are subject to these provisions.

**940.11.a Project Implementation** -- All ITS projects funded with highway trust funds shall be based on a systems engineering analysis. The analysis should be on a scale commensurate with the project scope.

## Questions

For more information on the technical contents of this memorandum, please contact **Rashmi Brewer** at [Rashmi.Brewer@state.mn.us](mailto:Rashmi.Brewer@state.mn.us).

## Attachments:

- 23 CFR 940
- HPDP Guidance

JPM/jpm

cc: 1 MnDOT – Sue Groth  
1 MnDOT – Ray Starr  
1 MnDOT – Cory Johnson  
1 MnDOT – Rashmi Brewer  
1 FHWA – Dave Scott  
1 eDocs – add number when saved.

## SUBCHAPTER K--INTELLIGENT TRANSPORTATION SYSTEMS

### PART 940--INTELLIGENT TRANSPORTATION SYSTEM ARCHITECTURE AND STANDARDS

Sec.

940.1 Purpose.

940.3 Definitions.

940.5 Policy.

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940.9 Regional ITS architecture.

940.11 Project implementation.

940.13 Project administration.

**Authority:** 23 U.S.C. 101, 106, 109, 133, 315, and 508; sec 5206(e), Pub. L. 105-178, 112 Stat. 457 (23 U.S.C. 502 note); and 49 CFR 1.48.

#### § 940.1 Purpose.

This regulation provides policies and procedures for implementing section 5206(e) of the Transportation Equity Act for the 21st Century (TEA-21), Public Law 105-178, 112 Stat. 457, pertaining to conformance with the National Intelligent Transportation Systems Architecture and Standards.

#### § 940.3 Definitions.

Intelligent Transportation System (ITS) means electronics, communications, or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system.

ITS project means any project that in whole or in part funds the acquisition of technologies or systems of technologies that provide or significantly contribute to the provision of one or more ITS user services as defined in the National ITS Architecture.

Major ITS project means any ITS project that implements part of a regional ITS initiative that is multi-jurisdictional, multi-modal, or otherwise affects regional integration of ITS systems.

National ITS Architecture (also “national architecture”) means a common framework for ITS interoperability. The National ITS Architecture comprises the logical architecture and physical architecture which satisfy a defined set of user services. The National ITS Architecture is maintained by the United States Department of Transportation (DOT) and is available on the DOT web site at <http://www.its.dot.gov>.

Project level ITS architecture is a framework that identifies the institutional agreement and technical integration necessary to interface a major ITS project with other ITS projects and systems.

Region is the geographical area that identifies the boundaries of the regional ITS architecture and is

defined by and based on the needs of the participating agencies and other stakeholders. In metropolitan areas, a region should be no less than the boundaries of the metropolitan planning area.

Regional ITS architecture means a regional framework for ensuring institutional agreement and technical integration for the implementation of ITS projects or groups of projects.

Systems engineering is a structured process for arriving at a final design of a system. The final design is selected from a number of alternatives that would accomplish the same objectives and considers the total life-cycle of the project including not only the technical merits of potential solutions but also the costs and relative value of alternatives.

#### **§ 940.5 Policy.**

ITS projects shall conform to the National ITS Architecture and standards in accordance with the requirements contained in this part. Conformance with the National ITS Architecture is interpreted to mean the use of the National ITS Architecture to develop a regional ITS architecture, and the subsequent adherence of all ITS projects to that regional ITS architecture. Development of the regional ITS architecture should be consistent with the transportation planning process for Statewide and Metropolitan Transportation Planning.

#### **§ 940.7 Applicability.**

(a) All ITS projects that are funded in whole or in part with the highway trust fund, including those on the National Highway System (NHS) and on non-NHS facilities, are subject to these provisions.

(b) The Secretary may authorize exceptions for:

(1) Projects designed to achieve specific research objectives outlined in the National ITS Program Plan under section 5205 of the TEA-21, or the Surface Transportation Research and Development Strategic Plan developed under 23 U.S.C. 508; or

(2) The upgrade or expansion of an ITS system in existence on the date of enactment of the TEA-21, if the Secretary determines that the upgrade or expansion:

(i) Would not adversely affect the goals or purposes of Subtitle C (Intelligent Transportation Systems Act of 1998) of the TEA-21;

(ii) Is carried out before the end of the useful life of such system; and

(iii) Is cost-effective as compared to alternatives that would meet the conformity requirement of this

rule.

(c) These provisions do not apply to funds used for operations and maintenance of an ITS system in existence on June 9, 1998.

**§ 940.9 Regional ITS architecture.**

(a) A regional ITS architecture shall be developed to guide the development of ITS projects and programs and be consistent with ITS strategies and projects contained in applicable transportation plans. The National ITS Architecture shall be used as a resource in the development of the regional ITS architecture. The regional ITS architecture shall be on a scale commensurate with the scope of ITS investment in the region. Provision should be made to include participation from the following agencies, as appropriate, in the development of the regional ITS architecture: highway agencies; public safety agencies (e.g., police, fire, emergency/medical); transit operators; Federal lands agencies; State motor carrier agencies; and other operating agencies necessary to fully address regional ITS integration.

(b) Any region that is currently implementing ITS projects shall have a regional ITS architecture by [Insert date 30 days after publication in the **Federal Register** plus 48 months].

(c) All other regions not currently implementing ITS projects shall have a regional ITS architecture within four years of the first ITS project for that region advancing to final design.

(d) The regional ITS architecture shall include, at a minimum, the following:

- (1) A description of the region;
- (2) Identification of participating agencies and other stakeholders;
- (3) An operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the systems included in the regional ITS architecture;
- (4) Any agreements (existing or new) required for operations, including at a minimum those affecting ITS project interoperability, utilization of ITS related standards, and the operation of the projects identified in the regional ITS architecture;
- (5) System functional requirements;
- (6) Interface requirements and information exchanges with planned and existing systems and subsystems (for example, subsystems and architecture flows as defined in the National ITS Architecture);
- (7) Identification of ITS standards supporting regional and national interoperability; and

(8) The sequence of projects required for implementation.

(e) Existing regional ITS architectures that meet all of the requirements of paragraph (d) of this section shall be considered to satisfy the requirements of paragraph (a) of this section.

(f) The agencies and other stakeholders participating in the development of the regional ITS architecture shall develop and implement procedures and responsibilities for maintaining it, as needs evolve within the region.

**§ 940.11 Project implementation.**

(a) All ITS projects funded with highway trust funds shall be based on a systems engineering analysis.

(b) The analysis should be on a scale commensurate with the project scope.

(c) The systems engineering analysis shall include, at a minimum:

(1) Identification of portions of the regional ITS architecture being implemented (or if a regional ITS architecture does not exist, the applicable portions of the National ITS Architecture);

(2) Identification of participating agencies roles and responsibilities;

(3) Requirements definitions;

(4) Analysis of alternative system configurations and technology options to meet requirements;

(5) Procurement options;

(6) Identification of applicable ITS standards and testing procedures; and

(7) Procedures and resources necessary for operations and management of the system.



(d) Upon completion of the regional ITS architecture required in §§ 940.9(b) or 940.9(c), the final design of all ITS projects funded with highway trust funds shall accommodate the interface requirements and information exchanges as specified in the regional ITS architecture. If the final design of the ITS project is inconsistent with the regional ITS architecture, then the regional ITS architecture shall be updated as provided in the process defined in § 940.9(f) to reflect the changes.

(e) Prior to the completion of the regional ITS architecture, any major ITS project funded with highway trust funds that advances to final design shall have a project level ITS architecture that is coordinated with the development of the regional ITS architecture. The final design of the major ITS project shall accommodate the interface requirements and information exchanges as specified in this project level ITS architecture. If the project final design is inconsistent with the project level ITS architecture, then the project level ITS architecture shall be updated to reflect the changes. The project level ITS architecture is based on the results of the systems engineering analysis, and includes the following:

- (1) A description of the scope of the ITS project;
- (2) An operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the ITS project;
- (3) Functional requirements of the ITS project;
- (4) Interface requirements and information exchanges between the ITS project and other planned and existing systems and subsystems; and
- 5) Identification of applicable ITS standards.

(f) All ITS projects funded with highway trust funds shall use applicable ITS standards and interoperability tests that have been officially adopted through rulemaking by the DOT.

(g) Any ITS project that has advanced to final design by [Insert the effective date of this rule] is exempt from the requirements of paragraphs (d) through (f) of this section.

#### **§ 940.13 Project administration.**

(a) Prior to authorization of highway trust funds for construction or implementation of ITS projects, compliance with § 940.11 shall be demonstrated.

(b) Compliance with this part will be monitored under Federal-aid oversight procedures as provided under 23 U.S.C. 106 and 133.