

# Intelligent Transportation Systems (ITS) Guidelines

## INTRODUCTION

This guideline focuses on federal-aid Intelligent Transportation Systems (ITS) project procedures to assure compliance with the federal ITS regulations, per Code of Federal Regulations, Chapter 23, Section 940 (23 CFR 940) entitled “Intelligent Transportation System Architecture and Standards.” In addition, these procedures establish the roles and responsibilities for all parties who are involved in the federal-aid ITS process. However, there is a need for the basic understanding of ITS and ITS regulations in order to understand the ITS project procedures. Therefore, this guideline is set up with basics on ITS, a summary of the ITS regulations, followed by the federal-aid ITS procedures.

The target audience for this guideline is primarily federal, state and local agency project management personnel. Some of these managers may have little or no expertise in ITS, therefore, every effort was made to simplify the definitions and language in this guideline. Hopefully, this simplification will not cause any misunderstanding. A point to make is that one should not be expected to understand everything there is to know about systems, telecommunications, electronics, etc., in order to manage ITS projects. For most public transportation managers, ITS represents a relatively new field that will require a certain amount of training to comprehend terminology and assure compliance with ITS regulations. Periodic training may also be necessary in order to keep up with technological changes in ITS.

Designing and developing ITS projects also represent a paradigm shift in the engineering mindset, compared to traditional highway projects. For example, ITS projects may not have a clear break between the preliminary engineering phase and construction phase. Furthermore, some ITS projects may not include a construction phase and may not be suitable for “low-bid” construction contracts. The iterative nature of Systems Engineering for ITS projects also implies a greater risk and uncertainties to successful completion of an ITS project. There are also other factors that appeared to be more critical to ITS projects than the traditional highway projects. Such factors are verification, validation, compatibility, reliability, usability, supportability, and maintainability.

## WHAT ARE ITS?

Intelligent Transportation Systems are the electronics, communications, or information technology (IT) processing, applied to transportation operations that result in improved transportation efficiency and safety. In simple terms, it is primarily any electronic transportation system that communicates to the traveler to provide transportation safety and efficiency. The traveler as well as the system planner or operator is provided with better travel information and improved services. A more precise definition of ITS can be found in the “Definitions” section of this guideline. ITS follows a logical process of data collection, processing, and acting on the processed information.

Examples of ITS components are traffic signals, surveillance cameras, changeable message signs, ramp meters, weigh-in-motion devices, roadway service patrols, and transportation management centers. Examples of ITS are: centralized control from traffic or transit management centers of many of these components, traveler information broadcast systems, traffic signal priority for emergency or transit vehicles, ITS data archive management, and vehicle safety warning systems. An ITS project is any project that in whole or in part, funds the deployment of ITS component

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and/or systems that provide or significantly contribute to one or more ITS user services as defined in the National ITS Architecture (NA). An example of a relatively small ITS project would be the installation of traffic signal hardware (traffic controller, detectors, etc) at an intersection. An example of a relatively large ITS project is the installation of a network of traffic signals that is controlled from a traffic management center.

A traditional highway project, which has an ITS element, such as a traffic signal or a ramp meter, meets the definition of an ITS project. However, it is our intent to apply ITS regulations only to the ITS portion of a project. The amount of Systems Engineering applied to an ITS project should also be commensurate with its complexity. ITS projects are unlike traditional highway projects in a number of ways. Some of the differences are as follows:

- Traditional highway projects involve mostly civil engineering, whereas ITS projects involve significant amounts of electronic engineering as well as other engineering disciplines.
- Due to the complexity of electronics in ITS projects, user and functional requirements need to be defined and testing plans formalized before detailed design begins.
- Highway projects are usually in segments affecting only a corridor, whereas ITS projects can ultimately have regional impacts.
- A completed highway project is normally owned, operated and maintained by one public agency, whereas a completed ITS project could be owned, operated and maintained by more than one public agency.
- Procurement procedures for ITS projects are not as clear-cut as traditional highway improvements. In addition to construction contracts that are based on competitive bidding, consideration should be given to engineering and design services contracts on the basis of qualifications-based selection, followed by competitive negotiations.

## NATIONAL ITS ARCHITECTURE (NA)

The National ITS Architecture (NA) provides a nationwide common framework and template for planning and designing ITS projects for interoperability. It can save the planner and designer a significant amount of study and research time when it is used for planning and designing ITS projects. It helps to identify the ITS subsystems or components that are needed in a region.

The key components of the NA are:

- User Services
- Logical Architecture
- Physical Architecture
- Market Packages
- Equipment Packages
- ITS Standards

Successful ITS integration and interoperability require two different fundamental activities: *Technical*, and *Institutional Integration*. *Technical Integration* of electronic systems enables information to be received, processed, stored and accessed by various parts of the system. It requires interconnectivity, compatibility and standardization. *Institutional Integration* requires

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coordination between various agencies and jurisdictions to achieve seamless operations and interoperability. In order to achieve effective *Institutional Integration* of systems, the stakeholder agencies and jurisdictions must agree on the benefits of an ITS, and the value of being part of an integrated system. They must agree on roles, responsibilities, and shared operational strategies. They must also agree on standards, technologies, and operational procedures in order to ensure interoperability. The transportation agencies must also coordinate with other ITS users, such as emergency services and law enforcement agencies where transportation is not a key part of their business.

Successful dealing with both the technical and institutional issues requires a high-level conceptual view of the future system and careful comprehensive planning. The framework for this system is referred to as the architecture. Architecture defines the key functions, system components, the organizations involved, and the type of information shared between organizations and various parts of the system. Architecture, therefore, is fundamental to the success of system implementation, integration and interoperability. The NA is therefore, developed to assure this success. The NA is now available and maintained by the U.S. Department of Transportation (USDOT) at the Internet web site <http://itsarch.iteris.com/itsarch>. The most current version of the NA is also available on CD-ROM from FHWA. The Internet and CD versions include useful traceability features, which will guide the developer or designer to the appropriate or applicable elements of the NA, such as relating the functions with the correct market packages and standards. It will continue to evolve as new applications and as new needs will occur over time.

## **CONNECTICUT STATEWIDE ITS ARCHITECTURE/ REGIONAL ARCHITECTURE (RA)**

According to 23 CFR 940, federally funded ITS projects should conform to the NA. The federal definition of conformance with the NA is the development of a Regional ITS Architecture (RA). The RA is a regional level framework and template for ensuring institutional agreement and technical integration for the implementation of ITS projects or groups of projects. It defines the pieces of the system, how they are linked to each other, and what information is exchanged between them.

The RA is a tailored version of the NA to meet regional needs. It specifically describes the region, identifies user services to be provided, ownership of ITS subsystems, all of the stakeholders, the users in the region, and their roles and responsibilities.

A region is defined as an area no less than the boundaries of a metropolitan planning area. It can be the entire state. The regions are allowed until April 8, 2005, to have RA developed. Their architecture must be consistent and should be an integral part of the regional or metropolitan transportation planning process.

Development of a Regional ITS Architecture depends on addressing the following eight items:

1. Description of the region.
2. Identification of the participating agencies and stakeholders.
3. Preparation of an operational concept that identifies roles and responsibilities of stakeholders.
4. Definition of high-level system functional requirements.
5. Determination of interface requirements and information exchanges with planned and existing systems and subsystems.
6. Definition of sequence of projects required for implementation.

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7. Development of list of agency agreements required for operations.
8. Identification of ITS Standards supporting regional and national interoperability.

The RA for Connecticut has been developed by ConnDOT to ensure that all areas of the state are covered by a regional ITS architecture. It should be noted that some areas within the state are developing their own regional ITS architectures. These include the Hartford Area, for which ConnDOT completed a regional architecture in 2004, and the Greater Bridgeport area. The statewide architecture is not meant to supersede any existing or future regional architectures. Instead, it is meant to serve as the regional architecture for areas in the state that are not covered by another regional architecture, ensuring that the federal requirements are met.

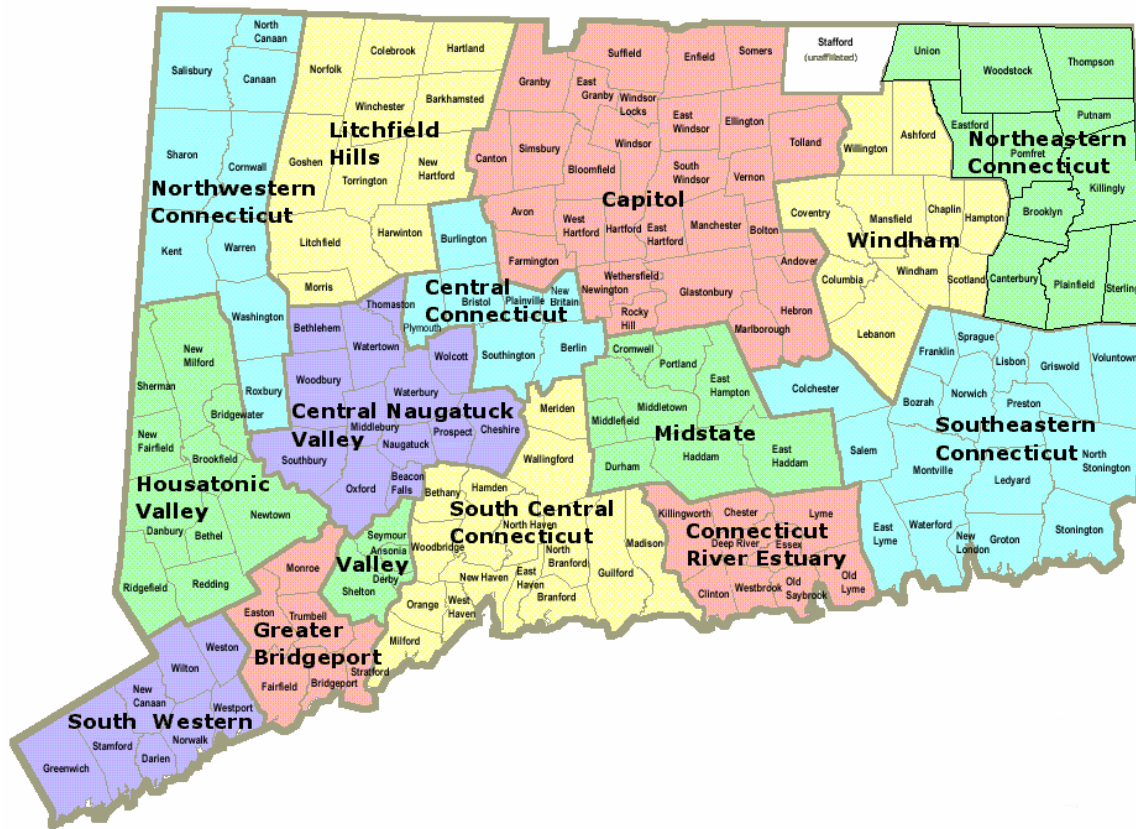
[http://consystec.com/ct/web/\\_regionhome.htm](http://consystec.com/ct/web/_regionhome.htm)

The region covered by the statewide architecture is the entire state of Connecticut. As shown in Figure 1-1, the state is covered by 15 planning regions. In each of these regions, a Regional Planning Organization (RPO) is responsible for planning activities. The 15 RPOs are the following:

- Capitol Region Council of Governments
- Central Connecticut Regional Planning Agency
- Connecticut River Estuary Regional Planning Agency
- Council of Governments of the Central Naugatuck Valley
- Greater Bridgeport Regional Planning Agency
- Housatonic Valley Council of Elected Officials
- Midstate Regional Planning Agency
- South Central Regional Council of Governments
- South Western Regional Planning Agency
- Southeastern Connecticut Council of Governments
- Valley Council of Governments
- Litchfield Hills Council of Elected Officials
- Northeastern Connecticut Council of Governments
- Northwestern Connecticut Council of Governments
- Windham Region Council of Governments

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**Figure 1-1: Connecticut Regional Planning Areas**



## FEDERAL LAWS AND REGULATIONS

The federal laws and regulations, shown below, apply to all ITS projects. It is important to note that even though the federal regulations allows until April 8, 2005, for the development of a RA, other parts of the regulations such as ITS Standards and Systems Engineering are effective as of April 8, 2001.

### Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA)

- Created the ITS Program.
- Provided funding for ITS research.
- Provided for the development of the NA.
- Established the requirement for conformity with NA.
- Provided \$101 million to \$122 million per year nationwide for the ITS Deployment Program. These program funds are limited to earmark by Congress in TEA-21 and the annual Appropriation Acts during the life of TEA-21 (6 years).
- Clarified ITS project eligibility for funds from the National Highway System (NHS) Program, the Surface Transportation Program (STP), and the Congestion Mitigation and Air Quality (CMAQ) Program.

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## 23 CFR 940, Intelligent Transportation System Architecture and Standards

**Applicability** - The National ITS Architecture regulations, per 23 CFR 940, applies to all ITS projects that are funded in whole or in part with Federal-aid Highway Funds as of April 8, 2001.

- Required that all ITS projects funded from the Highway Trust Fund should be in conformity with the NA and applicable standards.
- Conformity with the NA is defined as:
  - a) Developing RA by April 8, 2005, for those regions currently implementing ITS projects, or
  - b) Developing RA within four years of final design of their first ITS project for those regions which have not had an ITS project yet,
  - c) Using the NA as a resource in developing the RA,
  - d) Developing RA that contains the 8 items described in the section above on *Regional ITS Architecture*,
  - e) Subsequent adherence of ITS projects to the RA, and
  - f) Prior to development of RA, a major ITS project must have a Project Level ITS Architecture (PA) developed that is coordinated with the development of RA.
- The agencies and other stakeholders participating in the development of RA shall develop and implement procedures and responsibilities for maintaining the RA, as needs evolve in the region.
- Requires that all ITS projects be developed and designed using a Systems Engineering Analysis, and
- Requires that all ITS projects use ITS Standards and interoperability tests that were officially adopted by the USDOT.

### Exceptions:

The FHWA may, however, authorize exceptions to the National ITS Architecture and ITS Standards for:

- Certain research projects outlined in 23 CFR 940.7, and
- The upgrade or expansion of an ITS system in existence on the date of the enactment of TEA-21; if it would not adversely affect the goals or purposes of ITS under TEA-21, is carried out before the end of the useful life of such system, and is cost-effective as compared to alternatives that would meet the conformity requirements of this rule.

## FEDERAL-AID ITS PROGRAMS

Even though there are no specific programs or budget for regular federal-aid ITS projects, such projects are eligible for federal-aid funds from the NHS Program, STP Program and CMAQ Program. Some ITS Projects such as Traffic Signal Projects can be funded from the Hazard Elimination Safety (HES) Program. The funding pro-rata depends on each program respectively. Furthermore, TEA-21 clarified the eligibility of operation and management of ITS for NHS, STP and CMAQ funds. These projects follow normal federal-aid regulations and procedures for project development with the exception of some extra steps for compliance with Systems Engineering requirements as shown in the Project Procedures section in this subchapter.

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## **PRELIMINARY ENGINEERING (PE)**

Preliminary Engineering (PE) activities for ITS projects may include traditional roadway design, environmental process, and ITS system (software and hardware) design using a formal Systems Engineering process.

The Systems Engineering Analysis Form (SEAFORM) is filled out by the Project Manager (PM) and submitted for review by FHWA. The completed SEAFORM should be submitted as soon as possible to FHWA for SEAFORM review comments in order to assure adequate guidance for preparing an acceptable Systems Engineering Management Plan (SEMP), thus avoiding unnecessary project delays.

Based on 23 CFR 940, all ITS projects shall undergo Systems Engineering Analysis. The SEMF provides for management of the Systems Engineering Analysis. See the Systems Engineering section and Figure 1-2 for additional details.

Since software development in ITS projects involve a certain amount of iterative development and uncertainty, such projects are not suitable for low-bid type contracts. Therefore, flexibility is allowed for non-construction ITS projects or software/hardware component developments, to be procured by consultant services contracts. See Procurement Section of this guideline for the definition of non-construction. If an ITS project includes minor amounts of construction, say 5% to 10% of project, compared to the non-construction portion, flexibility is allowed to have the entire project deployed in the PE phase.

If the construction portion is significant, and a significant amount of software development is involved, care should be taken to coordinate closely the completion of the software and electronic equipment portion with the construction portion to avoid any contract delays. This will be typically performed by different procurement methods, software by consultant services and construction by low-bid contract. Many ITS projects are relatively complex requiring the need for most designers to obtain consultants for engineering and design services to develop and design an ITS project. For these types of services, the Consultant Selection procedures (qualifications based) must be followed. These ITS consultant contracts could involve traditional planning, research, design, system integration, traffic management, software development, operations, maintenance and project evaluation services.

The special skills of a system integrator and/or a system manager may also be needed to assure successful development and deployment of ITS projects. The system integrator's role is to establish solid requirements, assure successful integration of ITS components, subsystems and systems, and possibly perform the subsystem and system testing. The system manager will work on behalf of and in coordination with the PM to complete the overall implementation of the ITS projects. By the nature of this activity, consultant contracts for ITS system integrators and system managers normally extend through the PE, construction, and testing phases. For complex ITS projects, it is strongly advised that such services be obtained in order to assure a successful project.

Per Federal Laws and Regulations section in this guideline, the FHWA may authorize exceptions to ITS Standards for the upgrade, or expansion of existing ITS systems under certain conditions. Therefore, for minor ITS projects, the PM is delegated the authority to make the exception determination based on 23 CFR 940.7 and document the determination. For major ITS projects, the FHWA will make the exception determination based on 23 CFR 940.7.

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ITS projects that include a state contribution of funds (STIP funds) have relatively short PE and construction deadlines. These state-mandated deadlines are too short to account for the services of a systems integrator or systems manager. Therefore, the local agencies must be aware of the need to request time extensions in advance of the deadline in order to be reimbursed for these services, or classify the construction phase of the consultant's activities as construction engineering.

## ENVIRONMENTAL

The environmental process and environmental clearances for ITS projects are processed under normal federal-aid regulations and procedures. Generally, the only ground disturbance that normally occurs on ITS projects is the excavation of long narrow trenches on existing public roads for fiber optics. Existing utility poles are often used for mounting surveillance equipment. Occasionally, ITS projects involve the construction of transportation management centers or information kiosks. These types of projects create relatively small "footprints." Such projects are not likely to cause any negative environmental impacts, except in rare cases where they might encounter an archaeological site, a historic site or an endangered species habitat. With few exceptions, most ITS projects can be classed as either Programmatic Categorical Exclusion (PCE) or Categorical Exclusion (CE). CE approvals remain with FHWA, whereas the PCE approvals are delegated to ConnDOT. CE projects are normally projects that do not have any significant impacts.

The following are examples of ITS projects which are normally CE:

- Traffic operations improvement projects, which include: *installation of ramp metering, deployment or construction of a transportation management center and interconnect of traffic signals along a corridor.*
- Construction of bus transfer facilities (an open area consisting of passenger shelters, boarding areas, kiosks) when located in a commercial area or other high activity center in which there is adequate street capacity for projected bus traffic. *Traveler information kiosks are in this category.*

PCE projects are normally CE projects that do not have any unusual circumstances or require any special studies. Normally, projects that do not involve any ground disturbance fit the PCE category. For example, ITS projects consisting only of electronic equipment installation in an office and /or software development activities fit the PCE category.

## RIGHT-OF-WAY

Generally, the amount of right-of-way needed for ITS projects are minor, since the right-of-way is primarily used for the placement of fiber optics under existing city streets or county roads. The only right-of-way that may be needed is easements for fiber optics. Occasionally, an ITS project may involve utility relocations or the purchase of right-of-way for construction of a traffic management center, information kiosk, etc.

## UTILITIES

Utilities are typically limited to electrical service installation and are considered to have minor project impact. Occasionally, telephone service is required to connect field devices to the Traffic



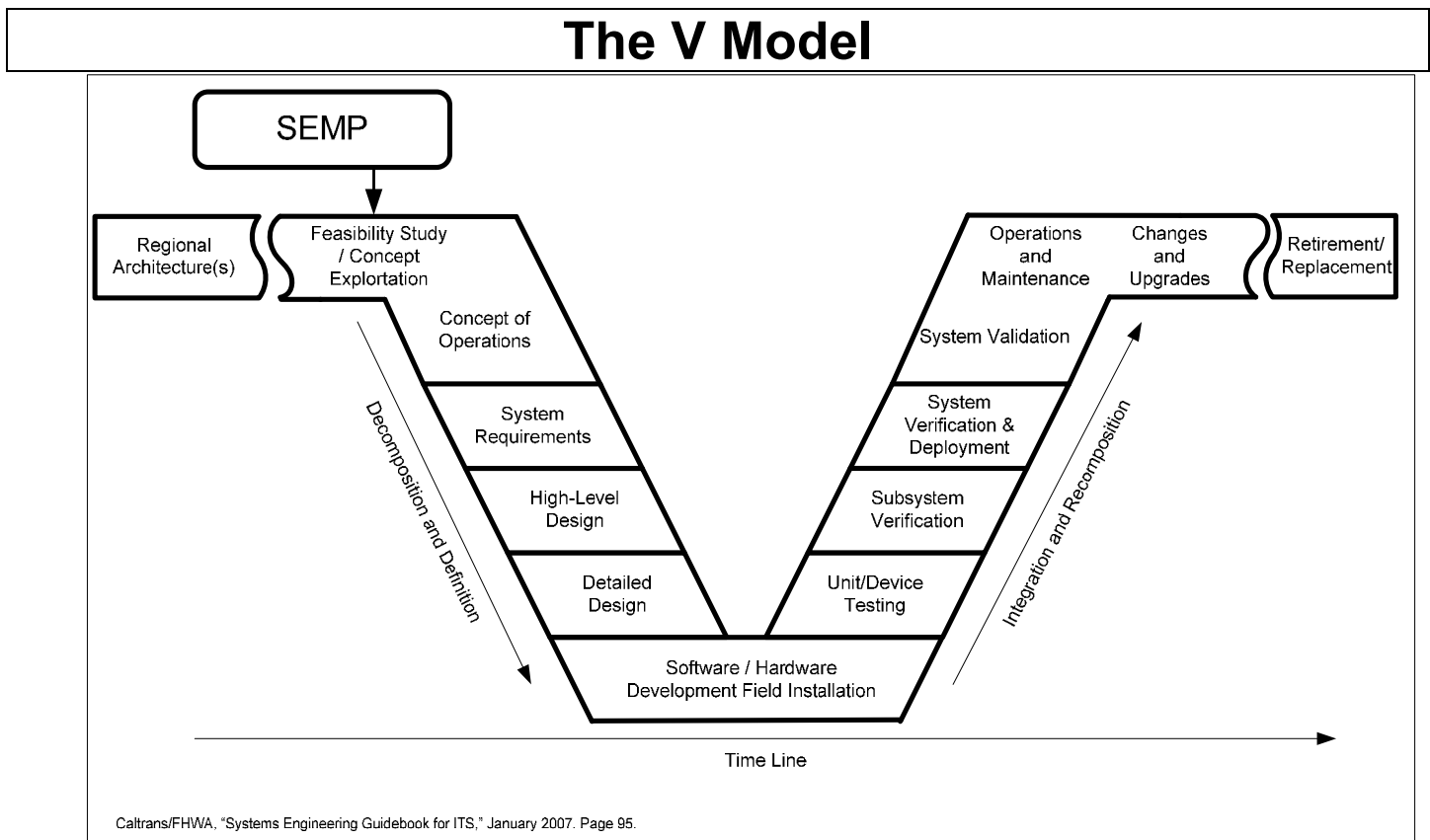
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Operations Center (TOC). Electrical and telephone service can be connected to traffic signal cabinets, variable message signs, portable variable message signs, closed circuit television cameras, highway advisory radio and weather monitoring stations.

## SYSTEMS ENGINEERING

Systems Engineering is required for all federal-aid ITS projects per 23 CFR 940, regardless of size or complexity. However, the amount of Systems Engineering should be commensurate with the project scope and complexity. Systems Engineering is a way of thinking about developing and completing a project. It is a process, not a checklist. The figure below shows the Systems Engineering process. The process covers the entire life cycle of a project, from planning (concept of operations, stakeholder and user needs identification) to design, operations and maintenance. The process transforms user needs into system requirements and then into a system design. As a result Systems Engineering ensures a successful and long-lasting system by (1) reducing long-term system costs, (2) reducing risk, (3) satisfying user's needs, and (4) improving system quality.

Figure 1-2 Systems Engineering Methodology

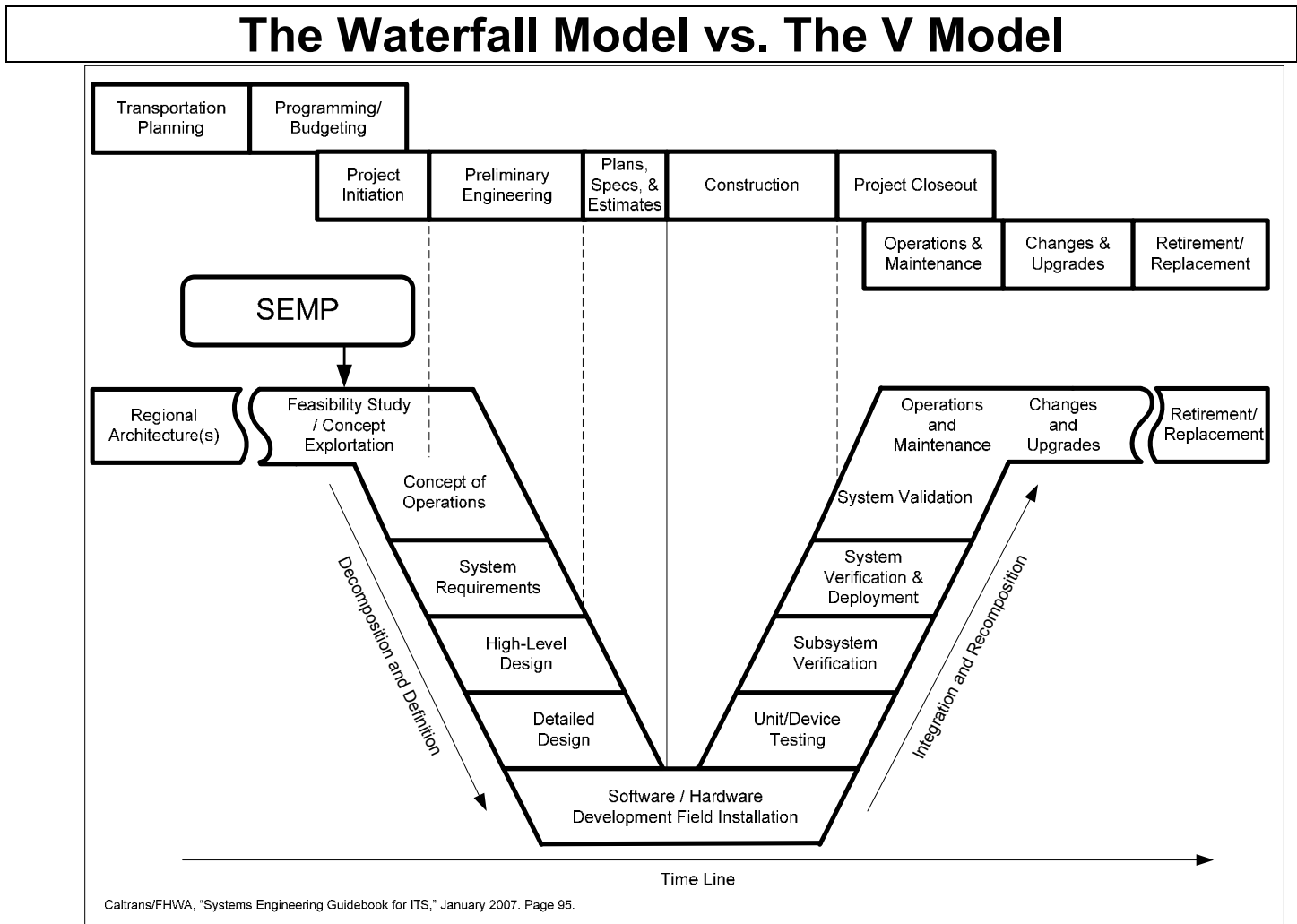


Systems Engineering is an iterative process of technical management, system design, acquisition, product realization, and technical evaluation. Similarities exist between the Systems Engineering process as used for ITS project and the Traditional Engineering process. Systems Engineering

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transforms user needs and/or operational requirements into system scope and design, whereas the Traditional process transforms highway needs into project scope and design.

**Figure 1-3 Traditional Engineering vs. Systems Engineering Methodology**



Systems Engineering spans the entire life cycle from systems analysis, requirements definition and conceptual design at the outset of a development through integration, testing, and operational support, to ultimately planning for replacement, and eventual retirement and disposal at the end of a program. In accordance with the 23 CFR 940, the Systems Engineering process will address at a minimum for all ITS projects the following:

- Identification of portions of the RA being implemented or if a RA does not exist; the applicable portions of the National ITS Architecture.
- Identification of participating agencies and their roles and responsibilities.
- Requirements definitions.
- Analysis of alternative system configurations and technology options to meet requirements.
- Procurement options.
- Identification of applicable ITS standards and testing procedures.

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- Procedures and resources necessary for operation and management of the system

## **Systems Engineering Management Plan (SEMP)**

The SEMP is the primary, top-level technical management document that defines and describes the Systems Engineering Management, the tailored Systems Engineering process, and how the technical disciplines will be integrated for the life of a transportation project. SEMP establishes the technical program organization, direction, and control mechanisms for the project to meet its cost, schedule, and performance objectives. It is the foundation for all engineering activities during the entire project. The SEMP applies to all team personnel and all technical activities conducted in the fulfillment of the project. It applies to all processes and products that are deemed necessary for accomplishing the project, whether or not they are required under contract.

A SEMP should be developed for every project that includes software/hardware integration. It should be tailored to project size, complexity, and cover all development phases. The SEAPLAN is not necessarily a long document but for some projects, it could be a page long, for others it could be hundreds of pages long. The plan needs to be specific to the needs of the project.

The SEMP, therefore, is a living document and as a result, additions, deletions, and modifications will occur as it is utilized. It will be updated as the development work proceeds, and Systems Engineering process products are produced. All updates must be reviewed and approved by the transportation agency project manager. See below for details on SEMP submittal, review, and approval, please refer to the “Procedures” section in this chapter.

- a. Project planning – lays out the activities, resources, budget, and timeline for the project.
- b. Project Monitoring and Control – establishes project monitoring and project technical reviews.
- c. Risk Management – identification and control of risks during all phases of the project life cycle.
- d. Configuration Management – establish and maintain a management process to ensure consistency that the project

The information contained within a SEMP can be organized in different ways, but in general it should include introductory section (including system description, top-level-schedule, and relevant documents), technical planning and control, system engineering processes tailored specifically for the project, and plans for coordinating the efforts of multiple engineering disciplines to accomplish the project tasks.

## **PROCUREMENT (CONTRACTING)**

The federal-aid procurement regulations as set forth in 23 CFR 172, 635, 655, and 49 CFR 18, define the requirements that state and local agencies must adhere to when procuring projects with federal-aid highway funds. These procurement regulations identify possible contracting options available for designing and constructing projects including such contracts as “engineering and design related services,” “construction,” and “nonengineering/non-architectural.” Procurement regulations require the use of competitive contract award procedures for any federal-aid highway project and award as follows:

- Construction contracts on the basis of competitive bidding,
- Engineering and Design services contracts on the basis of qualifications-based selection, and

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- Non-engineering/non-architectural contracts use state approved procurement procedures in accordance with 49 CFR 18.

## Construction versus Non-Construction

Understanding the definition of “construction” is necessary for determining the most cost effective method of procurement. Provided next page are examples of construction and non-construction:

### Improvements that typically meet the definition of Construction:

- Physical installation of field hardware and devices for freeway management and traffic signal control systems including changeable message signs, ramp meters, new traffic signals, new controller cabinets, lane use control signs and vehicle detectors.
- Erection of towers to support wireless communication, direct-bury conduit and hardware interconnect between signals and field devices or systems.
- Installation of field hardware and devices to provide detection and verification capabilities.

### Improvements that individually may not meet the definition of construction (Non-Construction):

- Procurement of portable message signs, electronic devices and communication interfaces within traffic signal controllers and cabinets, computer hardware, and software development.
- Communication devices, which are wireless or require only limited installation (e.g. on existing poles or towers)
- Traffic Operations Centers including service patrol operation, 1-800 call-in, incident management, recurring communications fees,

### Miscellaneous Contract Conditions

ITS deployment contracts should include documentation and training. Documentation and training are necessary to assure successful operation and maintenance of any electronic system. Documentation is in the form of logistical support manuals, which will provide the new ITS operators/owners with information necessary for operation and maintenance of the system including sources for technical support and replacement parts. It is also advisable to consider maintainability and supportability of the system in the contract for such items as: the supply support network (i.e., spares, repair parts, operating inventories), test and support equipment, transportation and handling equipment, computer resources (i.e., software), personnel and training, facilities and technical data. Other considerations are repair policies and contract warranty provisions.

## CONSTRUCTION

As noted in the PE Section in this guideline, ITS projects, which involve software development, are not suitable for low-bid construction contracts. Therefore, all ITS projects should be carefully examined to determine the appropriate contracting method(s), or contracting combinations to use in accordance with the federal procurement regulations. For guidance see the Preliminary Engineering and Procurement sections in this guideline.

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## RECORD KEEPING

The U.S. DOT and the Comptroller General of the United States have the right to access to all documents pertaining to federal-aid projects. Nonfederal partners must maintain sufficient documentation to substantiate the costs. Such items as: direct labor, fringe benefits, material costs, consultant costs, public involvement costs, subcontract costs, and travel costs should be included in that documentation. These project records must be kept on file for a minimum of three (3) years beyond the date the final voucher is paid for each project.

## PROCEDURES

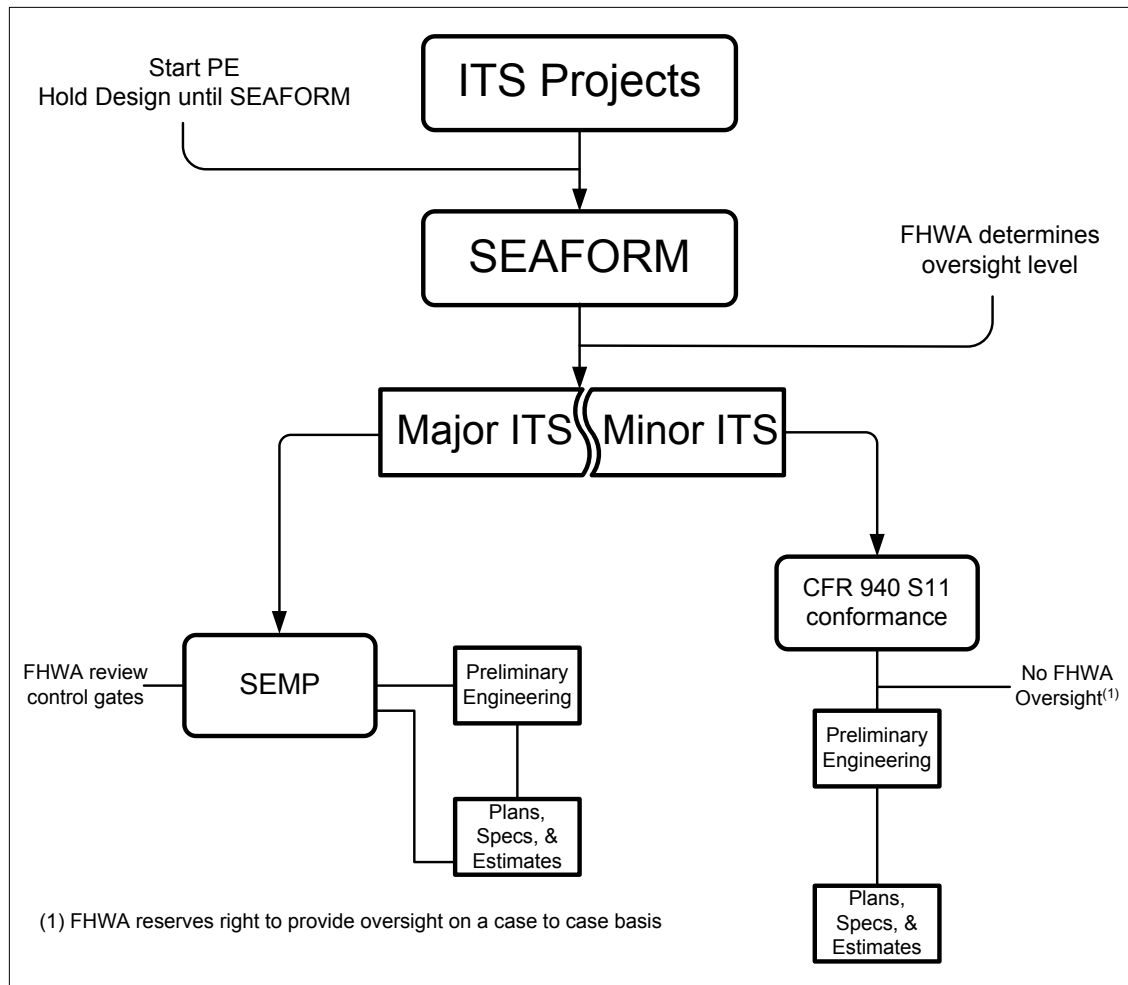
### A. INITIAL ACTION FOR ALL ITS PROJECTS

All ITS projects shall follow the Preliminary Engineering process flow shown below in Figure 1-4. Application and control of the Systems Engineering process is a key reason for the PE process as shown below. Federal-aid ITS projects shall follow the regular federal-aid procedures. The completion of the SEAFORM and the PE obligation and authorization procedure assure conformity with the NA regulations.

**Figure 1-4 ITS Preliminary Engineering Process**

## Preliminary Engineering Process

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## Project Development:

All ITS projects require SAEFORM preparation and review. The completed SEAFORM form may include a Systems Engineering Management Plan (SEMP). In the SEAFORM, the Project Manager must provide as much information as possible for each of the following ITS requirements, and include a commitment to address them in detail during system design.

- Identification of portions of the RA being implemented.
- Identification of participating agencies roles and responsibilities.
- Requirements definitions.
- Analysis of alternative system configurations and technology options to meet requirements.
- Procurement options.
- Identification of applicable ITS standards and testing procedures.
- Procedures and resources necessary for operations and management of the system

The SEAFORM is submitted to FHWA for concurrence and oversight level. ConnDOT and FHWA will then determine if the project is a Major or Minor ITS project.

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The SEAFORM will typically be transmitted via email. FHWA will reciprocate with determinations through email.

FHWA oversight can consist of approval of the Systems Engineering Management Plan (SEMP); products from each step of the Systems Engineering process, or portions thereof, or merely participate in scheduled process technical review points. FHWA is also available to provide additional ITS technical assistance and guidance as needed.

A more articulate procedure after determination of major/minor is outlined below.

## **B. MAJOR ITS PROJECTS - PROCEDURES**

1. The Project Manager (PM) forwards the SEAFORM to FHWA for concurrence and oversight level.
2. FHWA reviews the SEAFORM for FHWA oversight determination, comments on the SEAFORM, and sends the information back to the PM.
3. The PM revises the SEAFORM upon receipt from FHWA. If the project is determined to be a Major ITS project, the PM will submit a SEMP and the Systems Engineering process to FHWA for review and approval.
4. FHWA notifies the PM that they approved the SEMP and Systems Engineering process.
5. Upon receiving final SEMP and process product(s) approval, the PM may proceed with PE.

### **Construction:**

1. If the ITS project includes activities defined as construction; the PM must submit a PS&E package requesting construction authorization. The request includes the necessary federal-aid paperwork and clearances.
2. Beyond this point, normal federal-aid procedures apply for completing the project.

## **C. MINOR ITS PROJECTS - PROCEDURES**

The procedures for minor ITS projects will follow the traditional federal aid PE procedures. ITS documentation remains a requirement. However, no SEMP review and FHWA review are required.

1. The Project Manager (PM) forwards the SEAFORM to FHWA for concurrence and oversight level.
2. FHWA reviews the SEAFORM for FHWA oversight determination, comments on the SEAFORM, and sends the information back to the PM.
3. The PM revises the SEAFORM upon receipt from FHWA. If the project is determined to be a Minor ITS project, the PM will proceed with PE.

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## REFERENCES

2007 U.S. DOT/FHWA Systems Engineering for Intelligent Transportation Systems, “An Introduction for Transportation Professionals.”

1991 Intermodal Surface Transportation Efficiency Act (ISTEA)

1998 Transportation Equity Act of the 21<sup>st</sup> Century (TEA-21), Section 5206(e)

Title 23 USC 103(b)(6), Eligibility for NHS Program

Title 23 USC 133(b), Eligibility for STP Program

Title 23 CFR 940, National ITS Architecture

Title 49 CFR 18, Common Rule

FHWA Memorandum dated March 22, 2002, Guidance on Federal-aid Eligibility of Operating Costs for Transportation Management Systems

January, 2002 Using the National ITS Architecture for Deployment, NHI training course

The Caltrans Local Assistance Program for ITS projects. Please note that Systems Engineering requirements are discussed beginning on page 12-31.

[http://www.dot.ca.gov/hq/LocalPrograms/lam/prog\\_g/g12othr.pdf](http://www.dot.ca.gov/hq/LocalPrograms/lam/prog_g/g12othr.pdf)

<http://www.dot.ca.gov/hq/LocalPrograms/public.htm>

A “Systems Engineering Guidebook for ITS” was first published in February 2005 by Caltrans and FHWA, updated as version 2.0 in January 2007. It is a valuable reference tool. The SE Guidebook is available as an interactive version on the web and can be accessed by clicking on the following link: <http://www.fhwa.dot.gov/cadiv/segb>

April, 2005 Connecticut Statewide ITS Architecture, Final Report

Virginia Department of Transportation, ITS Projects – Systems Engineering and Architecture Compliance (Rule 940) Checklist

June 2000 Intelligent Transportation Systems Procurement, NHI training course