

## CHAPTER 13 INTELLIGENT TRANSPORTATION SYSTEMS (ITS) PROGRAM

### 13.1 INTRODUCTION

These guidelines, “Intelligent Transportation System (ITS) Program”, focus on federal-aid Intelligent Transportation Systems (ITS) project development procedures to ensure compliance with the federal ITS regulations, per Code of Federal Regulations (CFR), 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.

#### 13.1.1 GUIDELINES OVERVIEW - ROADMAP TO ITS COMPLIANCE

The application and oversight process for ITS projects is different in some significant ways from the traditional roadway construction process. Because of this difference, many ITS projects have **not** been successful. This is especially true of ITS projects that involve something **new**, which the lead agency has not done before. This might include new technology or new software or new communications, or joint efforts with new partners. Because of the high risk of failure for certain ITS projects, a special process is required to help **mitigate those risks** and to avoid the waste of taxpayer’s funds that occurs when ITS projects fall short.

The process is summarized immediately below and described in full detail in the following sections. The process varies depending upon degree of **risk** involved. As shown in Figure 13-1, there are three steps in the project funding and delivery process shown in Figure 13-1.

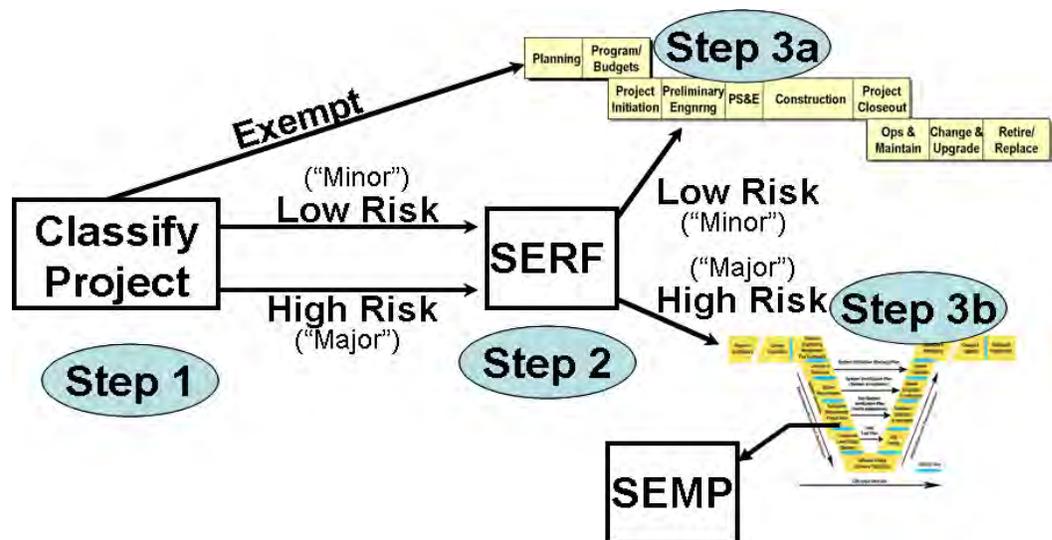


Figure 13-1: Steps to ITS Compliance

**Step 1** occurs when the ITS project is added to the Transportation Improvement Program (TIP). The lead agency makes a **preliminary** classification of the project as **High-Risk**, **Low-Risk**, or **Exempt**. If the project is **Exempt**, then the remainder of the process is exactly the same as for a traditional road building project. **Low-Risk** and **High-Risk** projects proceed to Step 2.

**Step 2** occurs when initial funding is requested. As part of the E-76 application package, the Project Manager must fill out a Systems Engineering Review Form (SERF), which consists of

seven questions. Based on the answers, the project is classified as **Low-Risk** or **High-Risk**, then proceeds accordingly.

**Step 3a** – For **Low-Risk** projects, the remainder of the process (after the E-76 is approved) is *exactly the same* as for a traditional road building project.

**Step 3b** – For **High-Risk** projects, the traditional road building process is **not** appropriate. Instead, the best approach is usually a Systems Engineering process. There are two funding cycles in this process – one at the beginning and the second after most of the design is complete (before implementation begins). A Systems Engineering Management Plan (SEMP) must be completed during the first funding cycle to help manage the implementation and testing.

### 13.1.2 HOW TO USE THESE GUIDELINES

The ITS Program Guidelines are written for a diverse set of audiences, including: MPO/RTPA planners, local-agency project implementers, Caltrans Division of Local Assistance (DLA), and FHWA ITS staff. Some readers have ITS experience, others none.

**For those with experience in using the previous version of these ITS Program Guidelines, significant changes are included in this update.** Emphasis is now placed on **management of risk**. This has introduced new definitions of types of ITS projects and associated examples. The approach to compliance with 23 CFR 940 now takes a closer look at characteristics of risk in addressing the SERF requirements. With the experience from implementation of the ITS Program Guidelines in 2004, the resultant approach is more clearly defined and has resulted in the “Roadmap” in Figure 13-1. A new section on Americans with Disabilities Act (ADA) Requirements has also been added. By no means do we suggest that the reader skip any section of these guidelines, but the significant changes will be found in the sections on “Types of ITS Projects,” “ITS Project Development and Funding,” and “ADA Requirements.”

Any new users of these ITS Program Guidelines should familiarize themselves with the entire chapter. Over time the users will likely return to specific sections. For example, to clarify which type category a project falls into, the user may want to revisit section 13.2 on “Types of ITS Projects.” To initiate project funding, the user may revisit section 13.5 on “Funding Process Step-By-Step Procedures.”

### 13.1.3 PURPOSE OF THESE GUIDELINES

The ITS Program Guidelines describe best professional practices for planning and implementing ITS projects. They also establish the roles and responsibilities for all parties who are involved in the federal-aid ITS process, as well as define the process required for all ITS projects that will utilize federal funds (in any amount). 23 CFR 940 requires that all federal-aid projects:

- be consistent with **the Regional ITS Architecture**,
- use applicable **ITS Standards**,
- perform a **Systems Engineering Analysis** that is commensurate with the scope of the project.

Designing and developing ITS projects 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 will not be suitable for “low-bid” construction contracts. The nature of the engineering development for ITS projects also implies a greater risk and uncertainties to successful completion.

Although not a requirement, FHWA strongly encourages the use of the FHWA/Caltrans "*Systems Engineering Guidebook for ITS*" (<http://www.fhwa.dot.gov/cadiv/segb>) as a reference for organizing the ITS project tasks, defining work products, and managing the development. The terminology used in these ITS Program Guidelines is defined fully at the Systems Engineering guidebook website.

#### 13.1.4 TARGET AUDIENCES

The ITS Program Guidelines will be used by several audiences:

- 1.) **Planning agencies**, who will program the funds in the TIP and maintain the regional ITS architecture.
- 2.) **Local agencies**, who will carry out the projects. This includes their consultants, who may provide assistance with project management, and/or provide systems engineering technical assistance.
- 3.) **Caltrans DLA**, who will be the contracting agency for federal funding.
- 4.) **FHWA Division Office**, who will obligate federal funding and oversee some aspect of High-Risk projects.

Some of these participants may have little or no expertise in ITS, therefore, every effort is made to simplify the definitions and language in this guideline. A point to make is that no individual is expected to understand everything there is to know about systems, telecommunications, electronics, etc. in order to manage ITS projects.

As a relatively new field for most public-sector transportation managers, the knowledge required to successfully implement these projects varies widely. In particular, highly complex and risky projects require special knowledge and skills, which are often not available with local agencies. A certain amount of education and training will be necessary to comprehend and assure compliance with ITS regulations. Periodic training may also be necessary in order to keep up with technological changes in ITS.

For more information on ITS and Systems Engineering training opportunities, please see the USDOT ITS Professional Capacity Building Program website: <http://www.pcb.its.dot.gov>.

#### 13.1.5 DEFINITION OF ITS

The definition of ITS has changed dramatically over the past decades, and it continues to evolve. Several decades ago, most people considered a computerized traffic signal to be “state-of-the-art” ITS. Today, every traffic signal is computerized and most people do not call them “ITS” – they are just “hardware” now. As state and local agencies have installed more and more electronic equipment over the past two decades, the emphasis of ITS has shifted from **internal** operational improvements to **external** coordination with other agencies, which enable each agency to achieve their mission more effectively. This **inter-agency cooperation** is the major objective of the Regional ITS Architecture (RA).

In 2001, 23 CFR 940 defined ITS as “...*electronics, communications, or information technology, used singly or in combination, to improve the efficiency or safety of the surface transportation system.*” This is a broad definition, covering the range from small, simple devices up to large and complex systems. In addition to this legal definition, most people say that **ITS must include comprehensive management strategies and apply technologies in an integrated**

**manner.** The purpose of ITS integration is to share information and reduce redundant spending between jurisdictions. ITS Integration includes both **technical** and **inter-agency** aspects of system development.

The inter-agency (or “institutional”) challenge is to take advantage of the investment in infrastructure that has occurred over the years and use it to tackle **regional** mobility challenges. This means removing the institutional barriers that have existed in order to benefit a region as a whole. One example of institutional integration is sharing information between transit, arterial, and freeway agencies to improve flow for buses on the transportation network. Another type of integration is when agencies use technologies that are compatible with each other, such as traffic signals and emergency vehicle preemption to enable emergency vehicles to respond faster.

These ITS Program Guidelines reflect the latest ITS concepts by emphasizing “best professional practices” and requirements for ITS projects that are more complex and that include external cooperation. In contrast, procedural requirements for simple and Low-Risk projects have been simplified or eliminated.

To gain a basic understanding of ITS applications, please see the following USDOT website: <http://www.itsoverview.its.dot.gov>.

### 13.1.6 RISK MANAGEMENT

As said above, the application and oversight process for ITS projects is different in some significant ways from the traditional roadway construction process. This is because most ITS projects have **not** been successful. A successful ITS project is one which completes on schedule, within budget, and delivers all capabilities required. Studies of Information Technology (IT) application developments in the U.S. show 24% of projects are cancelled prior to completion. Further results indicate 44% were challenged (late, over budget, and/or with less than the required features and functions. This is especially true of ITS projects that involve something **new**, which the lead agency has not done before. This might include new technology or new software or new communications, or joint efforts with new partners. Because of the high risk of failure for certain ITS projects, special procedures are required to help **mitigate those risks** in order to avoid the waste of taxpayer’s funds that occurs when ITS projects fall short.

Project risk may be defined in terms of schedule, cost, quality, and requirements. These risks can increase or decrease significantly based on several identified factors associated with ITS projects. The factors are:

- 1.) Number of jurisdictions and modes
- 2.) Extent of software creation
- 3.) Extent of proven hardware and communications technology used
- 4.) Number and complexity of new interfaces to other systems
- 5.) Level of detail in requirements and documentation
- 6.) Level of detail in operating procedures and documentation
- 7.) Service life of technology applied to equipment and software

The following Section 13.2 will address the level of each of these risk factors for types of ITS projects. For more information on Risk Management, the reader is encouraged to access the FHWA/Caltrans *Systems Engineering Guidebook for ITS* website at: <http://www.fhwa.dot.gov/cadiv/segb/views/process/index.htm>.