

13.2 TYPES OF ITS PROJECTS

13.2.1 SUMMARY – TYPES OF PROJECTS

For purposes of these Guidelines, ITS projects are divided into three types: **Exempt, Low-Risk, and High-Risk projects**. The planning and development process to be followed is different for these three types. **The previous version of this Guideline referred to Low-Risk projects as “Minor” ITS projects, and High-Risk projects as “Major” ITS projects.** As a transition for the reader, both terms will be noted in these ITS Program Guidelines.

The following attributes can often be used to classify ITS projects as exempt, low, or high risk.

Exempt ITS projects do not require a Systems Engineering Analysis (SEA) and are not covered under these ITS Program Guidelines. All activities of the traditional roadway project development life-cycle process will be followed. No further ITS-specific action is necessary. They can be *any* the following:

- 1.) Upgrades to an existing traffic signal – This may include, for example, adding or revising left-turn phasing or other phasing, adding pedestrian-crossing displays.
- 2.) Installing an “isolated” traffic signal – This is a signal not connected to any type of external signal-control system, nor likely to be in the future because of its isolation.
- 3.) Traffic signal timing projects – This includes all “studies” whose purpose is to change the coordination parameters for controlling a group of signals – but with *no* installation of new hardware or software.
- 4.) Studies, Plans, Analyses – This includes ITS Master Plans, Deployment Plans, Technology Studies, etc. whose product is only a document, with no new hardware or software installed.
- 5.) Routine Operations – This includes operating and maintaining any ITS elements or systems – again with no new hardware or software installed.

Low-Risk (formerly “Minor”) ITS projects are often referred to as ITS infrastructure expansion. Standard Plans, Standard Specification, and Standard Special Provisions are well documented. They will have *all* of the following characteristics:

- 1.) Single jurisdiction; single transportation mode (highway, transit or rail)
- 2.) No software creation; commercial-off-the-shelf (COTS) or proven software
- 3.) Proven COTS hardware & communications technology
- 4.) No new interfaces
- 5.) System requirements fully detailed in writing
- 6.) Operating procedures fully detailed in writing
- 7.) Project life-cycle not shortened by technology service life

High-Risk (formerly “Major”) ITS projects are often referred to as ITS “System Developments.” They have *one (or more)* of the following characteristics:

- 1.) Multi-Jurisdictional or Multi-modal
- 2.) Custom software is required
- 3.) Hardware and Communications are “cutting-edge” or not in common use
- 4.) New interfaces to other systems are required
- 5.) System requirements not detailed or not fully documented
- 6.) Operating procedures not detailed or not fully documented
- 7.) Technology service life shortens project life-cycle

These risk factors are discussed in more detail in Table 13-1.

Table 13-1 – Risk Assessment for ITS Projects

	<u>Low-Risk Project Attributes</u>	<u>High-Risk Project Attributes</u>	<u>Risk Factors</u>
1	Single jurisdiction and single transportation mode (highway, transit or rail)	Multi-Jurisdictional or Multi-modal	With multiple agencies, departments, and disciplines, disagreements can arise about roles, responsibilities, cost sharing, data sharing, schedules, changing priorities, etc. Detailed written agreements are crucial!
2	No software creation; uses commercial-off-the-shelf (COTS) or proven software	Custom software development is required	Custom software requires additional development, testing, training, documentation, maintenance, and product update procedures -- all unique to <u>one</u> installation. This is very expensive, so hidden short-cuts are often taken to keep costs low. Additionally, integration with existing software can be challenging, especially because documentation is often not complete and out-of-date.
3	Proven COTS hardware and communications technology	Hardware or communications technology are “cutting edge” or not in common use.	New technologies are not “proven” until they have been installed and operated in a substantial number of different environments. New environments often uncover unforeseen problems. New technologies or new businesses can sometimes fail completely. Multiple proven technologies combined in the same project would be high risk if there are new interfaces between them.
4	No new interfaces	New interfaces to other systems are required.	New interfaces require that documentation for the “other” system be complete and up-to-date . If not (and often they are not), building a new interface can become difficult or impossible. Duplication of existing interfaces reduces the risk. “Open Standard” interfaces are usually well-documented and low risk.
5	System requirements fully-detailed in writing	System Requirements not detailed or not fully documented	System Requirements are critical for an RFP. They must describe in detail all of the functions the system must perform, performance expected, plus the operating environment. Good requirements can be a dozen or more pages for a small system, and hundreds of pages for a large system. When existing systems are upgraded with new capabilities, requirements must be revised and rewritten.
6	Operating procedures fully-detailed in writing	Operating procedures not detailed or not fully documented	Standard Operating Procedures are required for training, operations, and maintenance. For existing systems, they are often out-of-date.
7	None of the technologies used are near end of service life	Some technologies included are near end of service life	Computer technology changes rapidly (e.g. PC’s and cell phones become obsolete in 2-4 years). Local area networks using internet standards have had a long life, but in contrast some mobile phones that use proprietary communications became obsolete quickly. Similarly, the useful life of ITS technology (hardware, software, and communications) is short. Whether your project is a new system or expanding an existing one, look carefully at all the technology elements to assess remaining cost-effective service life.

13.2.2 Examples of ITS Project Types

An example of an **Exempt** ITS project would be the installation of traffic signal hardware (traffic controller/software, cabinet, detectors, etc) to control an isolated intersection in City A. It meets the signal warrants found in Chapter 4 of the California MUTCD, but there is no current or foreseen need to interconnect to other signals. No software development is needed; merely adjusting programmable settings and parameters for control. Standard plans, specifications, identified special provisions have been well documented over the years for the design and construction of signal control field equipment. The traditional roadway project development process will be used. Typical of this kind of project is for plans, specifications, and estimate (PS&E) to be developed, and construction contracts handled through a low-bid selection.

An example of a **Low-Risk** ITS project is the addition of 30 full matrix changeable message signs to an existing system that has five identical signs already deployed. No changes are needed to the existing central or field equipment. The system was initially designed to accommodate these additional signs so no additional software is needed. Assumptions are: 1) the initial system has been completed and the system is working well, 2) the contractor will deploy the signs, poles and foundations, controllers, and wire the controllers into the signs, and 3) the agency will add configuration information about the signs at the central computer. Updates to the existing plans have been reviewed to ensure that the original design and implementation is not adversely affected as a result of adding the elements.

During the design process, it may be discovered that a number of changes to the existing system are needed in addition to adding the expansion elements. This need could arise because of new and better technologies (or the old hardware is no longer available), or because of the desire to improve or expand the functionality of the “previous” system, or because of the need to use the system in a different way (e.g. sharing control with another party). **Any of these instances would elevate the project to a High-Risk implementation.**

Additional examples of **Low-Risk** ITS projects include:

- Adding five identical CCTV cameras to the existing 20 – with no other changes to the system or how it’s used.
- Adding 50 identical new loops to the existing 200 – no other changes
- Installing an existing parking management system at 2 additional garages – with no changes
- Expanding the pre-existing system/network by adding several more XXXX units – with no changes. (XXXX can be almost any ITS element)
- Expanding existing communications systems – this consists of extending existing fiber-optic or wireless communications systems, using the same technology and specifications as the pre-existing system.
- Leasing turnkey services only (e.g., website-based information service) – with no hardware or software purchases.

High-Risk ITS projects are often referred to as ITS System developments. For example, a High-Risk ITS project will result from adding the following new requirement to the previously described Low-Risk project: “The changeable message signs will have shared control with a partner Agency B.” For this example, Agency B manages events at two activity centers. As part of the installation, Agency A will be installing six signs that would assist agency B for their event management. Agency B would use the CMS to divert traffic to get the attendees in and out of the event faster and more safely. To enable this shared control, new software may need to be developed and integrated into the existing system. With this requirement for new functionality (shared control), new risks and complexity are introduced. Although the traditional roadway

Design/development and construction process is needed for the signs and controllers at each location, there will be a need for systems engineering to address the software development and integration efforts. In this example, revisions to the existing “concept of operations” and development of agreements for interagency coordination will be especially important to clarify expectations and avoid future disputes.

Additional examples of **High-Risk** ITS projects include:

- Multi-jurisdictional or multi-modal system implementation -- Because of the external interfaces required, these projects generally include substantial software development. For example:
 - A traveler information system that collects data from multiple agencies or modes
 - A Bus Traffic Signal Priority system between City Traffic and Regional Transit, or one that crosses multiple jurisdictions.
- The first stage of an “umbrella” system implementation. During this first stage, the full system engineering process would be used to develop the overall system framework plus the first implementation of that framework. For example:
 - New Traffic Signal Coordination system design plus implementation at an initial number of signals, with more signals added in later project(s).
 - New Traffic Information System design plus the first implementation in Cities X and Y, with more cities added in later project(s).
 - New Electronic Fare-Payment System design and initial implementation on Metro buses, with other transit agencies added in later project(s).

If subsequent stages replicate the initial implementation, they would not be high risk. Instead, they fit the definition of a low risk ITS project, expanding the existing system with no new capabilities, and no new interfaces.

13.3 ITS PROJECT DEVELOPMENT AND FUNDING

The three types of ITS projects (Exempt, Low-Risk, and High-Risk) are linked to specific process by way of their risk characteristics. The traditional road building process as shown in Figure 13-2 has been used for many years. Design and installation is well documented. Over the years, requirements have become well defined, product performance is solid, and the technology is proven. As with roadway elements (pavement, drainage), ITS field elements (signals, CMS, CCTV, RWIS) are designed and constructed with Standard Plans, Standard Specifications, and Standard Special Provisions that are well documented. Risk of failure is low for these ITS projects, except when changing to new technology.

For **Exempt and Low-Risk** (formerly “Minor”) ITS projects, the traditional single-phase PE obligation and authorization process will be followed. Work will include all activities of the traditional roadway project development life-cycle process leading up to construction. Funding steps for Low-Risk ITS Projects can be seen in Figure 13-2.