

930 Intelligent Transportation Systems

930.1 General

Intelligent transportation systems (ITS) have the potential to reduce crashes and increase mobility on transportation facilities. They also enhance productivity through the use of advanced communications technologies and their integration into vehicles and the transportation infrastructure. These systems involve a broad range of wired and wireless communications-based information, electronics, and information processing technologies. Some of these technologies include cameras, dynamic message signs (DMSs), ramp meters, weather information systems, traffic management centers, and adaptive signal control technology.

The purpose and direction of ITS for the New Mexico Department of Transportation (NMDOT) are led by the New Mexico Statewide ITS Architecture and the yearly update of ITS Goals and Objectives (Annual Plan). ITS projects identified in the ITS Goals and Objectives have been developed using the stakeholder connections and information pathway guidance by the New Mexico Statewide ITS Architecture, as well as the Albuquerque, Santa Fe, Las Cruces, and Farmington architectures.

The New Mexico Statewide ITS Architecture is a tool for ITS project planning and development for the next 20 years. The local architectures do the same for their respective regions. The architectures were developed through a cooperative effort by state and local transportation agencies, covering all modes and all roads in the respective regions. The architectures guide transportation agencies in planning how each agency's ITS network will operate together with other agencies in the future, and how sharing of

information and resources will help provide a safer, more efficient, and more effective transportation system for travelers in the state.

Due to the dynamic nature of ITS, printed guidance becomes outdated quickly. Detailed design guidance and current practices are located on the websites listed in Section 930.2 below. For additional information and direction, the designer should contact the NMDOT ITS Engineer.

930.2 References

- [23 Code of Federal Regulations \(CFR\), Part 940](#), Intelligent Transportation System Architecture and Standards.
- Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), United States Department of Transportation (USDOT), Federal Highway Administration (FHWA), current edition.
- [MAP-21 \(Moving Ahead for Progress in the 21st Century\)](#).
- [NMDOT ITS Bureau Resource Page](#).
 - ITS Architectures:
 - New Mexico Statewide ITS Architecture, 2012
 - Albuquerque Metropolitan Planning Area Regional Architecture, 2016
 - Farmington Regional Architecture, 2015
 - Las Cruces Regional Architectures, 2014
 - Santa Fe Regional Architecture, 2011
 - NMDOT Annual ITS Goals and Objectives, current edition
 - Systems Engineering Training (PowerPoint)
 - [ITS Project Checklist](#)
 - ITS Special Provisions
 - ITS [Standard Drawings](#)
- [SAFETEA-LU \(Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users\)](#)
- [Systems Engineering Guidebook for Intelligent Transportation Systems, Version 3](#), USDOT/CalTrans, November 2009.
- [Systems Engineering for Intelligent Transportation Systems](#), FHWA-HOP-07 069, January 2007.

930.3 Design Coordination

All projects within NMDOT right-of-way must be coordinated through the NMDOT ITS Bureau to determine the location of existing ITS infrastructure and to identify project-related ITS infrastructure that may need to be included in the project.

Coordination shall be made through the NMDOT ITS Engineer and incorporate project details including the project number, control number, route and mileposts, geographic information system (GIS) data (if available), and scope of work.

The NMDOT ITS Engineer will provide details on existing infrastructure and project needs for NMDOT's ITS Bureau within the project's limits. Additional coordination requirements may include consultation with other potentially impacted ITS stakeholders, such as local government entities. ITS coordination, project need, and design requirements shall be documented in the ITS section(s) of the Phase IA/IB Report or the project Scoping Report.

ITS projects shall follow the environmental coordination process outlined in Chapter 130 of the Design Manual. ITS projects are typically considered low impact and are candidates for Programmatic Categorical Exclusions or Categorical Exclusions (CEs). Typical areas of impact include views, privacy, light pollution (from DMSs), and ground disturbance from trenching and excavation for foundations.

Coordination with the NMDOT ITS Bureau will continue through Preliminary Design and will vary depending on the intensity of the ITS design required. In addition, the [ITS Checklist](#) is required as part of the project certification process for any ITS design and/or ITS relocation plans.

930.4 Systems Engineering

Systems engineering is a typical part of any ITS project development process. It is required on any federal-aid project that has an ITS work element, per [23 CFR Part 940.11](#). Systems

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engineering is an interdisciplinary step-by-step process for complex projects, such as ITS projects, to:

- Assess a system's needs and its relationship to the regional architecture.
- Plan a project that meets those needs as well as stakeholder needs and expectations.
- Define other specific requirements for the project/system.
- Develop and implement the project/system.
- Define the operations and maintenance requirements for the system.
- Plan for the refinement or replacement of the system.

Using systems engineering on ITS projects has been shown to increase the likelihood of a project's success. A successful project is one that meets the project scope and stakeholder/project sponsor expectations, is completed on time and within budget, and is efficient and cost-effective to operate and maintain.

The level of systems engineering used for a project should be on a scale commensurate with the scope, cost, and risk of the project. The extent of systems engineering required for each project will be determined through consultation with the NMDOT ITS Engineer and documented through the [ITS Checklist](#).

Additional information can be found in the USDOT's Systems Engineering Guidebook for Intelligent Transportation Systems and two documents on the NMDOT ITS Bureau Resource Page: the Systems Engineering Training PowerPoint and the [ITS Checklist](#).

930.5 ITS Continuity Plan

Based on the size of the project and the direction provided by the NMDOT ITS Engineer, the project engineer shall create an ITS Continuity Plan. The plan shall be submitted to NMDOT's ITS Bureau for review and approval prior to its use. A thorough ITS Continuity Plan will protect the integrity of New Mexico's ITS network and the services the system provides, and will ensure that ITS-specific design, notes, standards, specifications, and special instructions are communicated to the contractor.

The ITS Continuity Plan shall document impacts to all existing ITS infrastructure, proposed new ITS infrastructure, and the proposed implementation plan, to ensure system functionality throughout construction.

The ITS Continuity Plan should address:

- Network surveillance systems
- Traveler information dissemination systems
- Communications systems
- Electrical service continuity
- Key personnel
- Scheduling and notification procedures
- Unplanned outage recovery procedures
- Inventory management procedures
- Plan to return to service
- Smart work zones

Additionally, depending on the duration and complexity of the project, the responsibility for line spotting and responding to New Mexico One-Call (811) tickets within the project limits will be borne by the contractor or an agent acting on the contractor's behalf. The costs associated with this are incidental to the project. The determination of the applicability to transfer 811 responsibilities will be made by the ITS Bureau prior to letting the project.

It is imperative that the ITS Continuity Plan include a transition plan for implementing new or temporary communications. The plan shall include a schedule approved by NMDOT's ITS Bureau Chief. The proposed schedule should minimize the duration of scheduled outages and outages shall not exceed 24 hours. The schedule should take into account any planned events (e.g., Balloon Fiesta, State Fair, concerts, sporting events) in the area where access to ITS infrastructure is considered critical and should be dynamic to accommodate the need to monitor for unplanned events (e.g., severe weather events) that pose a risk to transportation safety.

930.6 Fiber Design

Fiber design shall be coordinated with the NMDOT ITS Engineer and NMDOT ITS Network Specialist. The fiber route shall be approved by the NMDOT ITS Engineer and shall, to the best extent possible, avoid congested utility areas, minimize exposure to future construction impacts (planned by the NMDOT, another agency, or a private entity), and be located in an area serviceable by NMDOT maintenance staff.

Upon direction from NMDOT's ITS Engineer, the project engineer may be required to submit signal loss calculations for proposed fiber designs.

Fiber installation guidance is provided by [ITS Special Provisions](#) Section 750A, B, and C for Fiber, Conduit, and Pull Boxes/Manholes and NMDOT [Standard Drawings](#) 750-01 through 750-03.

930.7 Closed Circuit Television (CCTV)

The location and design of Closed Circuit Television (CCTV) systems shall be coordinated with the NMDOT ITS Engineer and the NMDOT ITS Network Specialist. CCTV locations shall be approved by the NMDOT ITS Engineer and shall, to the best extent possible, maximize the viewshed of the NMDOT jurisdiction while minimizing the incidental viewshed of potentially sensitive surrounding properties. The project engineer shall provide a concept of the viewshed (through figures, photos, or other means) to the NMDOT ITS Engineer for approval. CCTVs shall be located in areas with room for a cabinet and lowering device, and which have vehicle access for service by NMDOT maintenance staff.

CCTV installation guidance is provided by [ITS Special Provisions](#) Section 750D and E for Closed Circuit Television Systems and Lowering Devices. The relevant NMDOT [Standard Drawings](#) are in Section 750-04.

930.8 Dynamic Message Signs (DMSs)

The location and design of DMSs shall be coordinated with the NMDOT ITS Engineer and the NMDOT ITS Network Specialist. DMS locations shall be approved by the NMDOT ITS Engineer and shall, to the best extent possible, maximize the viewshed from the approaching roadway while minimizing incidental light pollution into potentially sensitive surrounding properties. The location should consider exposure to other light sources that could impact performance of the DMS daytime/nighttime brightness sensors. Upon request of the NMDOT ITS Engineer, the designer shall provide figures of the DMS viewshed, including the angle of the DMS sign to the approaching roadway and the light-emitting diode (LED) viewing angle, to ensure suitable vehicle duration within the viewing area for the desired message display. Each DMS shall be located in an area with room for a cabinet and which has vehicle access for service by NMDOT maintenance staff.

DMS placement and operation guidance is provided by the MUTCD, Chapter 2L, and the [NMDOT Dynamic Message Sign Operations Manual](#).

DMS installation guidance is provided by [ITS Special Provisions](#) Section 701A, Permanent Changeable Message Sign/Dynamic Message Sign.

930.9 Vehicle Detection Stations (VDS)

The location and design of vehicle detection systems (VDSs) shall be coordinated with the NMDOT ITS Engineer and the NMDOT ITS Network Specialist. VDS locations shall be approved by the NMDOT ITS Engineer and shall, to the best extent possible, work within the existing detection systems and avoid merge areas, weaving areas, and intersection approaches. VDSs and other ITS devices may be co-located for design efficiency. VDSs shall be located in areas having space for a cabinet and which have vehicle access for service by NMDOT maintenance staff.

VDS installation guidance is provided by [ITS Special Provisions Section 750G, Vehicle Detection System \(VDS\)](#). The relevant NMDOT [Standard Drawings](#) are 750-04 and the [ITS Equipment Cabinet](#).

930.10 Road Weather Information Stations

The location and design of Road Weather Information Stations (RWISs) shall be coordinated with the NMDOT ITS Engineer and the NMDOT ITS Network Specialist and shall be approved by the NMDOT ITS Engineer. RWISs shall be located in areas with room for a cabinet and which have vehicle access for service by NMDOT maintenance staff.

RWIS placement and installation guidance is provided directly by the NMDOT ITS Bureau.

930.11 Geographical Information Systems Data

The NMDOT ITS Bureau requires the contractor to provide ESRI shape files with global positioning system (GPS) coordinates of each installed ITS element to the NMDOT ITS Bureau. GPS data shall be collected in World Geodetic System 1984 (WGS84) and decimal degrees format. The contractor shall contact the ITS Engineer at (505) 222-6552 prior to any data collection. The elements for which data shall be collected include but are not limited to ITS manholes, ITS pullboxes, ITS poles, cameras, sensors, DMSs, highway advisory radio (HAR) stations, RWISs, power meters, transformers, conduit, and any infrastructure between the utility drop and the associated ITS items. Data shall be logged in Excel files provided to the contractor by the ITS Engineer. Data shall be submitted to the ITS Engineer. Photographs shall be taken of all ITS infrastructure.

GIS data requirements are included in [ITS Special Provisions Section 750H, ITS System Acceptance Testing](#).

930.12 Smart Work Zones

When construction projects are of sufficient complexity and/or duration to have a considerable impact to motorists, the use of smart work zones and project websites may be warranted. The integration of these project elements and the reporting of events occurring within the work zones shall be seamlessly aligned with the NMDOT's existing traveler information system, NMRoads. Inclusion of smart work zones for projects shall be coordinated with NMDOT's ITS Engineer.

930.13 Documentation

The following documentation may be required for NMDOT projects involving ITS as appropriate to the scope of the project:

- Description of proposed impacts and work in Phase IA/IB report or project Scoping Report
- Systems engineering document
- [ITS Checklist](#)
- ITS Continuity Plan
- Signal loss calculations (for fiber design)
- Viewshed concept (for CCTV design)
- Viewshed angles (for DMS design)
- GIS inventory (as-builts)

