**Minnesota Statewide Regional ITS Architecture**

**and Systems Engineering Checklist for**

**CLASS A-1: STANDARD ITS APPLICATION -**

**Railroad-Highway Grade Crossing**

**FHWA Final Rule 940 and FTA National ITS Architecture Policy**

For all ITS projects or projects with an ITS component, a Systems Engineering Checklist shall be completed and submitted with the Project Submittal Form. For questions regarding the completion of this checklist contact Rashmi Brewer, P.E. – MnDOT Office of Connected & Automated Vehicles (CAV-X) at 651-304-7572 or e-mail at [Rashmi.Brewer@state.mn.us](mailto:Rashmi.Brewer@state.mn.us).

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*(Enter project name or type)*

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| **SECTION 1 – Project Information** | |
| **1.1 CONTACT PERSON (e.g. PROJECT MANAGER)**   |  |  | | --- | --- | | Name/Title: | Agency: | | Signature: | Date: | | Email: | Phone: | | | |
| **1.2 PROJECT LOCATIONS** *(List all)* | **1.3 PROJECT NUMBER**  1.3A Federal Project Number:  1.3B State/Local Project Number: |
| **1.4 PROJECT SCHEDULE**   |  | | --- | | Letting Date:  Anticipated Start Date: | | | |
| **1.5 NATURE OF WORK** *(Check all that apply)*   |  |  |  |  | | --- | --- | --- | --- | | Scoping | Design | Software/Integration | Construction | | Operations & Management | Evaluations | Planning | Equipment Replacement | | Research & Development | Others (Please Specify) | | | | | |
| **1.6 PROJECT FEATURES AND ITS APPLICATIONS** *(Check all that apply)*  Railroad-Highway Grade Crossing Features for Project Site(s):   |  |  | | --- | --- | | Railroad Flashing-Light Signals | Railroad Cantilever Flashing-Light Signals | | Standard Railroad Gates | Four Quadrant Railroad Gates | | Traffic Signal Preemption |  | | | |
| **1.7 NEEDS ASSESSMENT**  Please describe the problem statement, goals and objectives of the project.    How were the needs identified? *(Check all that apply)*   |  |  |  | | --- | --- | --- | | Internal Assessment | Stakeholder Involvement | Regional ITS Architecture (Implementation Volume) | | Standard Systems Engineering Concept of Operations/Functional Requirements Documents | | | | Other ITS Planning or Technical Documents (Please Specify) | | | | Design documents (Please Specify) | | | | | |
| **1.8 SYSTEMS ENGINEERING DOCUMENTATION**  A programmatic Systems Engineering analysis has been developed for this application. A Concept of Operations and a Functional Requirements document are available as references and **shall be reviewed for consistency** at <http://www.dot.state.mn.us/its/projects/2016-2020/cavreadiness.html>.  Standard Railroad-Highway Grade Crossing Systems Engineering documents (i.e. Concept of Operations and Functional Requirements) have been reviewed, and the project is consistent with these documents.  Or,  If the project is not entirely consistent with the standard Systems Engineering documents, a project specific concept of operations and/or functional requirements will be developed using the standard Systems Engineering documents as a base. Contact the MnDOT Office of Connected & Automated Vehicles (CAV-X) contact person listed at top of page 1 for guidance and assistance. | | |
| **1.9 RELATIONSHIP TO OTHER PROJECTS AND PHASES**  Please list any construction and tied projects.  **Project Title Project Number**   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  | |  |  |  | |  |  |  | |  |  |  | |  |  |  | | | |

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| **SECTION 2 – Regional Architecture Assessment** |
| **2.1 PROJECT IS INCLUDED IN THE MINNESOTA STATEWIDE REGIONAL ARCHITECTURE** (*Refer to ITS Initiatives and Project Concepts for Implementation, Sections 4.3 and 4.4 of the Implementation Volume,* ***Minnesota Statewide Regional ITS Architecture,*** *2018,* [*http://www.dot.state.mn.us/its/projects/2016-2020/itsarchitecture/implementation-volume.pdf*](http://www.dot.state.mn.us/its/projects/2016-2020/itsarchitecture/implementation-volume.pdf)*)*  Yes  No  If “No”, please list additional ITS devices, features, and/or functions that are not listed in **1.6** and send a copy of the complete checklist via email to the MnDOT Office of Connected & Automated Vehicles (CAV-X) contact person listed at top of page 1.    If “Yes”, Project ID (from *Sections 4.3 and 4.4 of the Implementation Volume*):  Is the project consistent with the description in the Architecture?  Yes  No  If “No”, please summarize the differences below and send a copy of the complete checklist via email to the MnDOT Office of Connected & Automated Vehicles (CAV-X) contact person listed at top of page 1. |
| **2.2 DATA COLLECTION AND SHARING**  Please use the table below to provide the following information:   1. Operational data obtained from the system 2. Frequency of obtaining the data (e.g. every 5 minutes, daily, weekly, monthly, etc.) 3. Purpose(s) of obtaining the data, 4. Is the data archived, and 5. Who do you share the data with? (e.g. MnDOT RTMC, Maintenance, Railroad Company, etc.)   The list below is not a complete list. Please add additional data and rows to the list as appropriate.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Data Obtained** | **Frequency of Obtaining Data** | **Purposes** *(Check all that apply)* | **Is Data Archived?** | **Data Sharing Partners** | | Crossing equipment current state and modes of operation |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | | Track status including whether a train is approaching and the length of time crossing will be closed |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | | Crossing equipment condition and failure alarms |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | | Crossing warning time |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | | Traffic signal equipment (if present) operational status ad fault indication |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | |  |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | |  |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | |  |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | |  |  | Monitoring and Control  Operational Analysis  Planning Analysis  Performance Reporting  Other (please specify): | Yes  No |  | |
| **2.3 ITS STANDARDS** *(For information only)*  Applicable ITS Standards for railroad-highway grade crossing projects may include:   * NTCIP Center-to-Field Group * NTCIP 1201: Global Object Definitions * NTCIP 1202: Object Definitions for Actuated Traffic Signal Controller (ASC) Units * IEEE 1570-2002: Standard for the Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection   General information on ITS Standards can be found at <http://www.standards.its.dot.gov/>.  \*Minnesota Standards are listed in Section 10 of Volume 13 of the *Minnesota Statewide Regional ITS Architecture 2018* as generated by RAD-IT. |

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| **SECTION 3 – Procurement** | | | | | |
| **3.1 Procurement Methods** *(Check all that apply)*  Construction Contract  Professional Technical Services Contract/Agreement  Joint Powers Contract/Agreement  Interagency Contract/Agreement  Work Order Contract/Agreement  Commodities Contract  Purchase Order (State/Local Furnish)  Other  Comments: | | | | | |

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| **SECTION 4 – Operations and Management Commitment** |
| **4.1 ANNUAL Staffing and resources needed for operations and Management**  *(Staff hours covering, for example, signal maintenance plus management. Estimate and specify per year and per site or for all sites in project)* |
| **4.2 Estimated annual operations and Management costs**  *(Question 4.1 staffing labor hours x average direct hourly rate, plus direct expenses)* |
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| **Section 5 - Approval** |
| **Approval (Refer to page 7 of the HPDP ITS Systems Engineering Requirement for a list of approval agencies)**  I certify that to the best of my knowledge all of the information on this checklist is accurate. I acknowledge that I am aware of the requirements set forth in the HPDP – ITS Systems Engineering for this project.   |  |  | | --- | --- | | Name/Title: | Agency: | | Signature: | Date: | | Email: | Phone: | |